Edmund G. Brown, Jr.
*Governor*

# IMPERIAL VALLEY AND TEHACHAPI IMPLEMENTATION GROUPS

# APPENDICES

PIER FINAL PROJECT REPORT

*Prepared For:*
**California Energy Commission**
Public Interest Energy Research Program

*Prepared By:*
Center for Energy Efficiency and Renewable Technologies

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# APPENDIX A

Development Plan for the Phased Expansion of Electric Power Transmission Facilities in the Tehachapi Wind Resource Area: Second Report of the Tehachapi Collaborative Study Group, 5 volumes.

Finalized by CPUC Energy Division and forwarded to SCE only for purposes of formal filing and distribution to the Renewable Transmission OII (05-09-005) Service List.

# APPENDIX A - 1

Transmittal Letter

**BEFORE THE PUBLIC UTILITIES COMMISSION OF THE**

**STATE OF CALIFORNIA**

| | | |
|---|---|---|
| Order Instituting Investigation to facilitate proactive development of transmission infrastructure to access renewable energy resources for California. | ) ) ) ) | I. 05-09-005<br><br>(Filed September 8, 2005) |

**SOUTHERN CALIFORNIA EDISON COMPANY'S (U 338-E)**

**NOTICE OF AVAILABILITY**


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Dated: April 19, 2006

**BEFORE THE PUBLIC UTILITIES COMMISSION OF THE**

**STATE OF CALIFORNIA**

| | | |
|---|---|---|
| Order Instituting Investigation to facilitate proactive development of transmission infrastructure to access renewable energy resources for California. | ) ) ) ) | I. 05-09-005<br><br>(Filed September 8, 2005) |

**SOUTHERN CALIFORNIA EDISON COMPANY'S (U 338-E)**

**NOTICE OF AVAILABILITY**

Southern California Edison Company ("SCE") was ordered to file the second report of the Tehachapi Collaborative Study Group on April 19, 2006. SCE has filed the report as ordered.

In accordance with Rule 2.3 (c) of the Commission's Rules of Practice and Procedure, Southern California Edison Company provides copies of this Notice of Availability to all parties on the service list. The exact title of the document is "Second Report of the Tehachapi Collaborative Study Group." It concerns various plans for interconnecting generation in the Tehachapi region.

A copy of the Second Report of the Tehachapi Collaborative Study Group will be provided upon written request to SCE's Case Administration at the contact information provided below, or can be accessed at a Commission site ftp://ftp.cpuc.ca.gov/tehachapi/.

Correspondence or communications regarding this Notice of Availability should be addressed to:


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Dated: April 19, 2006

# CERTIFICATE OF SERVICE

I hereby certify that, pursuant to the Commission's Rules of Practice and Procedure, I have this day served a true copy of **SOUTHERN CALIFORNIA EDISON COMPANY'S (U 338-E) NOTICE OF AVAILABILITY** on all parties identified on the attached service list(s). Service was effected by one or more means indicated below:

- ☐ Transmitting the copies via e-mail to all parties who have provided an e-mail address. First class mail will be used if electronic service cannot be effectuated.
- ☐ Placing the copies in sealed envelopes and causing such envelopes to be delivered by hand or by overnight courier to the offices of the Commission or other addressee(s).
- ☐ Placing copies in properly addressed sealed envelopes and depositing such copies in the United States mail with first-class postage prepaid to all parties.
- ☐ Directing Prographics to place the copies in properly addressed sealed envelopes and to deposit such envelopes in the United States mail with first-class postage prepaid to all parties.

Executed this 19th **day of April, 2006**, at Rosemead, California.

_____

Samantha Bertolone, Case Analyst
SOUTHERN CALIFORNIA EDISON COMPANY

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SOUTHERN CALIFORNIA EDISON
An *EDISON INTERNATIONAL* Company

**Michael D. Mackness**
Senior Attorney
Mike.Mackness@SCE.com

April 19, 2006

Docket Clerk
California Public Utilities Commission
505 Van Ness Avenue
San Francisco, California 94102

**RE: I.05-09-005**

Dear Docket Clerk:

Enclosed for filing with the Commission are the original and five copies of **SOUTHERN CALIFORNIA EDISON COMPANY'S (U 338-E) NOTICE OF AVAILABILITY** in the above-referenced proceeding.

We request that a copy of this document be file-stamped and returned for our records. Also, we request that the original deposit receipt be returned for our records. Self-addressed, stamped envelopes are enclosed for your convenience.

Your courtesy in this matter is appreciated.

Very truly yours,

Michael D. Mackness

MDM:nlg:DM1278576
Enclosures
cc: All Parties of Record
(U 338-E)

# APPENDIX A - 2

Tehachapi 2nd Report, Volume 1 of 5

Development Plan for the
Phased Expansion of

# Electric Power Transmission Facilities

in the

# Tehachapi Wind Resource Area

# Second Report

of the

## Tehachapi Collaborative Study Group

California Public Utilities Commission

OII 05-09-005
OII 00-11-001

**April 19, 2006**

**The report is printed in 5 volumes or electronic files:**

**Volume 1 contains the Second Report;**

**Volume 2 contains Study Plan #2 the basis for the Second Report (referred to in the Report as Appendix 1);**

**Volume 3 contains the PG&E Studies (referred to as Appendix 2);**

**Volume 4 contains the SCE Studies (referred to as Appendix 3);**

**Volume 5 contains the CAISO Studies and all remaining Appendices 5, 6 and 7.**

# Development Plan for the Phased Expansion of **Transmission** in the **Tehachapi Wind Resource Area**

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**The Tehachapi Wind Energy Project**
**"Transmitting Tehachapi Energy to Consumers"**

**Second Report**
**To the California Public Utilities Commission**
**From the**
**Tehachapi Collaborative Study Group**
**April 19, 2006**

# Executive Summary

**Introduction**

When completed, the Tehachapi Wind Energy Project will capture large amounts of energy from the wind, transform it into electric energy and transmit this electricity to California consumers. In the next few years, thousands of modern wind turbines clustered in wind "farms" spread over more than one thousand square miles will be built in the Tehachapi region. The Tehachapi Project is expected to provide enough electric energy to satisfy the needs of nearly 2 million California homes. If developed to the extent forecast, it will produce more electrical power than any other generation project in California and supply about 5% of California's total electricity needs.

The infrastructure that comprises the Tehachapi Project consists of three essential components - the wind turbines themselves; power lines and equipment to collect electricity from turbines in the local area; and high voltage transmission facilities to reliably interconnect the wind generation with the existing California electricity grid and distribute this power to California consumers.

Permit applications for the initial transmission components of the Tehachapi Project already have been submitted to the CPUC and environmental reviews of these facilities are now underway. In addition, wind generation projects comprising more than half of the total expected project capacity have been submitted to the California Independent System Operator (CAISO) for interconnection studies. However, these projects require transmission facilities to be constructed to enable the electricity generated to reach consumers. Private investment is expected to provide the capital required for the project, estimated at $8 - $9 billion. Approximately $1 billion of that total represents the estimated cost of transmission facilities needed to connect the Tehachapi Project to the grid. The overall project cannot proceed until the CPUC establishes the mechanism by which the recovery of the $1 billion of transmission investments will be assured.

In Decision 04-06-010 (June 9, 2004), the California Public Utilities Commission (CPUC) requested that the Tehachapi Collaborative Study Group (TCSG) devise a

comprehensive plan for the transmission lines, major substations, and other transmission infrastructure needed for the project. The first Preliminary Report from the TCSG was submitted to the Commission in March, 2005.[1] That report identified a number of alternatives for the transmission infrastructure and recommended further study to select the best among them. This second report narrows and refines the alternatives submitted last year and makes further recommendations to complete the planning process and facilitate detailed technical studies, approval and construction of the transmission facilities needed for the Tehachapi Project.

**Achieving Tehachapi Transmission Planning Goals**

The primary goal of the TCSG is to devise a conceptual transmission plan that would allow the wind generation potential in Tehachapi, currently estimated at 4,500 MW, to reach California consumers.[2] The TCSG has consensus agreement on the transmission facilities to provide access for approximately 3,000 MW, and has identified two main alternatives for providing access for the remaining 1,500 MW.

The TCSG also has the goal of providing its recommendations to the CPUC on a schedule that facilitates permitting and construction of needed facilities by 2010. Prior to the beginning of the TCSG process, Southern California Edison Company's (SCE) expert analysis had identified transmission facilities for initial phases of the Tehachapi plan. In its 2005 report, the TCSG agreed with SCE's recommendations which it referred to as Phases 1 and 2. Construction of these facilities is expected to accommodate about 1,600 MW of Tehachapi generation. Permitting is underway for the first 700 MW (Phase 1) of these facilities.

However, certificates of Public Convenience and Necessity (CPCN) for initial Phase 1 facilities have not yet been issued, and CPCN applications have not been filed for subsequent phases. As discussed below, the TCSG urges the CPUC to accelerate its permitting process in order to achieve the state's renewable energy goals.

Of the expected 4,500 MW of incremental capacity in the Tehachapi WRA, interconnection requests for Tehachapi wind projects totaling approximately 3,600 MW have already been submitted to the CAISO. In light of this, the TCSG believes that this indicates that transmission facilities to connect an additional 4,500 MW of Tehachapi generation are likely to be needed.

The TCSG believes that in developing a transmission plan for Tehachapi area generation, consideration should be given to a plan's potential to provide benefits to the State's transmission network, if possible, in addition to providing full grid access to potential Tehachapi wind generation. As discussed below, facilities being considered may provide network benefits and/or may negatively impact grid

[1] Report of the Tehachapi Collaborative Study Group, March 16, 2005

[2] The California Energy Commission provided the estimate of 4,500 MW of potential wind development in Tehachapi and nearby Antelope Valley, and the TCSG has used that value for planning purposes. As of this report, projects totaling approximately 3,600 MW have been submitted to the ISO for interconnection approval, despite the lack of transmission access at the present time. Some observers believe eventual total wind generation in Tehachapi may be significantly larger than 4,500 MW.

performance. Assessment and quantification of the potential network benefits and potential operational challenges will require additional assistance from the CAISO. In order to properly evaluate remaining alternatives, the TCSG therefore recommends that further Tehachapi transmission analysis be conducted under the auspices of the CAISO. The planning process also should determine which facilities of the final two phases (Phases 3 and 4) should be constructed first.[3]

**Connecting the Tehachapi Wind Resource Area (WRA) to the California Grid**

The Tehachapi WRA lies at the southern end of the San Joaquin Valley in the mountainous region between Bakersfield and Mohave. Transmission connections between Tehachapi and the existing grid can be made to the west at the Midway substation near Buttonwillow and to the south at the Vincent substation near Lancaster.[4] Three existing transmission lines connect the Midway and Vincent substations, collectively referred to as Path 26.

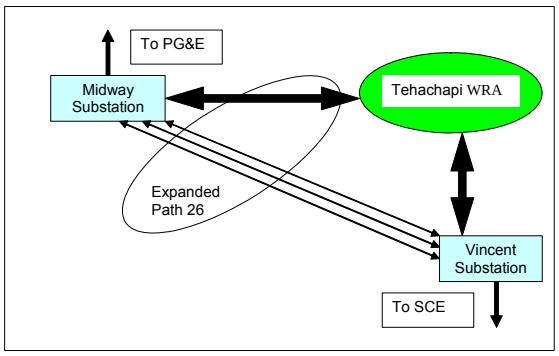


Figure 1 – First alternative – Expanded Path 26 option

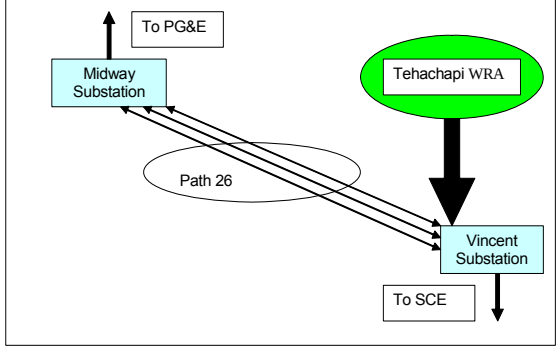


Figure 2 – Second alternative – Gen-tie option

Power lines from Tehachapi can connect at Midway, at Vincent, or at both substations.[5] The TCSG has considered two connection alternatives in detail, as described in Chapter 6. The first alternative connects Tehachapi at both Midway and Vincent as shown in Figure 1. The other alternative connects Tehachapi only at Vincent as shown in Figure 2.

Permit applications have been filed for the first transmission components which will connect Tehachapi to the Vincent substation with one 500 kV line. Two more 500 kV lines are expected to be needed to export 4,500 MW of wind power from the Tehachapi WRA to the existing state grid.[6]

A detailed comparison of the two alternatives is found in Chapter 6. Costs for the two plans are comparable, estimated to be in the neighborhood of $1 billion. A choice between

[3] The phases identified in the 2005 TCSG report were for organizational purposes and did not imply that the Phase 3 facilities should necessarily be constructed prior to those discussed in Phase 4.

[4] This is a simplified description of the transmission connections. Other facilities and connections to the grid have been examined by the TCSG and are described in detail in Chapters 2 and 6.

[5] The two options discussed here appear to be the most likely alternatives among those studied by the TCSG,, but connections to other points may be considered by the ISO. See Chapter 2 for complete description of facilities and connections considered by the TCSG.

[6] For planning purposes, the TCSG assumes that all three of these lines will be operated by the investor owned utilities. However, there are also power lines in the region owned by the Los Angeles Department of Water and Power and by a private company. If substantial amounts of Tehachapi energy were to be transmitted on these lines, a third IOU line from Tehachapi might not be needed.

the two alternatives hinges on benefits of each plan that the TCSG has not yet been able to quantify.

The salient feature of the alternative involving a new Midway – Tehachapi 500 kV line is that it comprises an additional link in Path 26, the major transmission artery connecting Northern and Southern California. The TCSG refers to this alternative as the Expanded Path 26 option. This configuration is expected to be considered a "network facility" which would provide two important benefits to the California grid, namely additional reliability, operating flexibility and additional import capacity into Southern California[7] when Tehachapi generation is low.[8]

The Expanded Path 26 option could complicate grid management, however, since some power from Tehachapi would flow on existing Path 26 lines and use some of the path transfer capacity. This could complicate grid operations as operators must consider these variable flows when scheduling power into Path 26.

The second alternative would provide Tehachapi with access to the grid only at the Vincent substation.[9] In this option, all three of the 500 kV lines necessary to export Tehachapi power would extend south from Tehachapi. Providing access to Tehachapi wind power would be the primary benefit of this alternative. Power lines which serve only to connect generation to the grid are referred to a "gen-ties", and the TCSG calls this plan the "Gen-tie option". The feasibility of constructing a third 500 kV line from the Tehachapi area to Vincent in the Gen-tie option may be complicated, however, due to the rapid urbanization of the Antelope Valley which lies between the Tehachapi and Vincent substations.

The TCSG supports the Commission's February 26, 2006, resolution to immediately pursue further environmental, engineering, cost, operational, regulatory, and other necessary studies that are needed to construct all the transmission facilities included in planning Phases 1, 2 and 3 of the 2005 report.

Resolution of the above issues related to reliability, grid operations, network benefits and costs will require the active assistance of the CAISO. The TCSG therefore recommends the following :

**Recommendation #1**
**The TCSG recommends that additional study of all Phase 3 and 4 alternatives discussed herein be conducted expeditiously under the auspices of the CAISO in a forum that is open and collaborative, similar to the TCSG process to date.**

[7] Additional transmission facilities will be needed to transmit power to the SDG&E system.
[8] A frequent criticism of wind power is that "the wind doesn't blow all the time." A transmission plan that enables additional power transfers during periods of low wind generation would allow the CAISO to manage the variability of wind generation more easily.
[9] This is a simplified description. As described in Chapter 6, SCE's Antelope substation lies between Tehachapi and Vincent. Power exported south from Tehachapi might enter the grid either at Antelope or at Vincent substations.

**Financial and Cost Recovery considerations**

The Tehachapi Project will require investment of substantial amounts of capital, estimated to be in the neighborhood of $8-$9 billion for the entire project. Transmission facilities in either of the options discussed above will require approximately $1 billion. No debt is expected to be incurred by the state for the Tehachapi Project; all of this capital is expected to come from private sources. In order to attract the required capital for the transmission facilities, however, the mechanism through which the investment will be repaid by electricity consumers must be firmly established.

The TCSG emphasizes that cost recovery issues are of utmost importance and must be resolved in order for the Tehachapi project to proceed, as further discussed in Chapter 7. The TCSG therefore recommends:

> **TCSG Recommendation #2**
> **The TCSG urges the Commission to adopt a decision implementing the provisions of P.U. Code §399.25, by May, 2006, as scheduled in I.05-09-005, and ensure that all utility investments related to construction of Tehachapi transmission facilities will be recovered.**

**Streamlining CPUC Transmission siting and permitting process.**

In the I.05-09-005 proceeding, the utilities and other Parties have raised issues over the existing CPUC transmission permitting process. In response to these concerns, the CPUC developed preliminary recommendations and conducted a workshop on March 23, 2006 for further comments. The next step would be to implement streamlining measures that would facilitate transmission for renewables.

> **TCSG Recommendation #3**
> **TCSG urges the CPUC to consider and implement recommended streamlining approaches to the existing CPUC transmission permitting process.**

**Summary of the TCSG Cost/Benefit Analysis**

Economic evaluation of the transmission options is discussed in Chapter 2. Chapter 3 describes the CAISO cost analysis. Cost estimates for each of the facilities considered were obtained from Pacific Gas & Electric and Southern California Edison. The TCSG emphasizes that these estimates are preliminary. Facilities selected for construction will require further study in order to obtain firm estimates which will be conducted as part of the CPCN application process.

The CAISO provided the TCSG with its analysis of the various transmission options using production cost simulation computer modeling. The model dispatches the least

cost generation facilities throughout the Western Interconnection (WECC) that are required to meet projected loads, consistent with projected transmission system capabilities. The analysis modeled Tehachapi wind power as a must-take resource similar to Qualifying Facilities, such that all of the incremental 4,500 MW plus the 700 MW of existing Tehachapi power is part of this generation mix.

Each transmission option considered by the TCSG changes the overall Western transmission system and therefore also changes the mix of dispatchable generation facilities chosen by the computer model. The model calculates the annual electricity production cost of the entire WECC for each option, and the difference between the annual production costs for each of the Tehachapi options studied provides a measure of the relative benefits.

For example, if WECC annual production cost for the transmission system with one choice of Tehachapi transmission facilities is $15 billion compared to $15.1 billion for another, the first choice is presumed to have benefits of lower cost relative to the second of $0.1 billion ($100 million) per year. For each alternative under consideration, the revenue requirement associated with the capital costs was calculated and added to the present value of the WECC production costs and operations and maintenance (O & M) costs over 50 years to arrive at an overall economic assessment of the alternative. Each of the major options, together with the costs, is shown in Chapter 2, Table 2.1.

**Other facilities considered by the TCSG**

As previously reported to the Commission, the TCSG considered a number of other transmission facilities. At the time of that preliminary report, several transmission options in addition to those described above had not been adequately evaluated due to the limited information available. The TCSG now believes it has sufficient information to exclude these options from further consideration as part of the Tehachapi Project.

The transmission lines that carry power north from the Midway substation are known as Path 15. With either of the transmission options described above, power flows on Path 15 are expected to be at the path limit for many hours during the year. That is, Path 15 is expected be "congested" some of the time[10], even though the capacity of Path 15 was recently expanded. The TCSG considered a variety of facilities that would reduce congestion on Path 15 that are expected to occur when the Tehachapi Project is connected to the grid.

As discussed in Chapter 3, the CAISO provided the TCSG with the results of its production simulations for all of the options considered. After weighing the costs of congestion on Path 15 against the cost of facilities that would relieve the congestion,

[10] Predominantly when power flows north of Midway are from South to North (primarily during off-peak hours).

the TCSG concluded that on this basis, these facilities are not cost effective additions to the grid at the present time for the sole purpose of delivering Tehachapi wind energy to Northern California load centers. However, analysis of their network benefits may suggest that they be reconsidered in the future.

Additional transmission facilities in northern California may be desirable for a variety of other economic and/or reliability reasons about which the TCSG has no information. The CAISO will determine all necessary interconnection-related upgrades required in accordance with Federal Energy Regulatory Commission (FERC) interconnection policy.
Another transmission facility examined by the TCSG at considerable length is described in Appendix 5. This facility, referred to by the TCSG as the "Fresno 230 kV Tie", would connect the Pacific Gas & Electric (PG&E) system to the Southern California Edison (SCE) Big Creek lines near Fresno. As described in the report, the Fresno 230 kV Tie facilities would allow a fraction of the electricity generated by the Tehachapi Project to bypass Path 15 and enter the PG&E system near Fresno, thereby reducing congestion on Path 15. As with other facilities in Northern California, the TCSG concluded that the Fresno 230 kV Tie is not a cost effective addition to the grid for the sole purpose of transmitting power from the Tehachapi Project to northern California load centers.

**Project Manager for Tehachapi**
A project manager should be appointed to expedite implementation of the Tehachapi transmission infrastructure as explained in Section 7.4, below. Accordingly, the TCSG makes the following recommendation.

> **Recommendation # 4**
> **The CPUC should work with the CEC, the legislature and key stakeholders to identify candidates for the position of Tehachapi Power Project manager. The project manager would engage stakeholders to establish a schedule for project implementation and work plan addressing every element of the transmission and generation development. The project manager would report progress to state agencies, stakeholders and the public quarterly.**

**Accelerating the Schedule**
The March 2005 Report of the TCSG included a conceptual schedule for completing the Tehachapi transmission upgrades by December 2010. The 2005 schedule assumed that the CPCN applications for Phase 1 would be processed and approved by June 2006. It now appears that various delays in the CPCN approval process will cause those applications to be approved no earlier than December 2006. Although the 2005 conceptual schedule was described as "the fastest practicable schedule" for completing the plan by 2010, and time has been lost since, the TCSG believes that it may still possible to meet the 2010 completion goal if all of a number of aggressive

actions to accelerate the process, fully described in chapter 8 and summarized briefly below, are taken.

The TCSG emphasizes the critical importance of completing Segments 1 and 2 of Phase 1 as soon as possible. These segments must be completed before Phase 2 construction can commence. Phase 2 is essential for all projects because they require the additional south-of-Antelope transmission capacity that this phase will provide.

**Recommendations:**

- Accelerate the CPCN review process for the Tehachapi upgrades by taking all of the specific actions described in Chapter 8;
- Direct the Energy Division, utilities and other TCSG parties to develop a detailed schedule of specific tasks and parties responsible (the "who, what, when") that must be achieved if the larger milestones shown in Chart 8.2 are to be met (moving the schedule back if it is determined in this process that the 2010 completion goal is infeasible);
- Direct the Energy Division to work with SCE to ensure that complete CPCN applications for Phases 2 and 3 be filed as soon as possible;
- Expedite the CPCN approval process for future phases by proposing, on the Commission's own motion, without evidentiary hearings, a finding that Phases 2 and 3 are needed to facilitate the achievement of RPS goals.

## *Summary of Recommendations*

**Recommendation #1**
**The TCSG recommends that additional study of all Phase 3 and 4 alternatives discussed herein be conducted expeditiously under the auspices of the CAISO in a forum that is open and collaborative, similar to the TCSG process to date.**

**TCSG Recommendation #2**
**The TCSG urges the Commission to adopt a decision implementing the provisions of P.U. Code §399.25, by May, 2006, as scheduled in I.05-09-005, and ensure that all utility investments related to construction of Tehachapi transmission facilities will be recovered.**

**Recommendation #3**
**TCSG urges the CPUC to consider and implement recommended streamlining approaches to the existing CPUC transmission permitting process.**

**Recommendation # 4**
**The CPUC should work with the CEC, the legislature and key stakeholders to identify candidates for the position of Tehachapi Power Project manager. The project manager would engage stakeholders to establish a schedule for project implementation and work plan addressing every element of the transmission and generation development. The project manager would report progress to state agencies, stakeholders and the public quarterly.**

**Recommendation # 5**
All aggressive actions to complete the Tehachapi transmission upgrades by December 2010 should be taken now. It is critical to complete Segments 1 and 2 of Phase 1 as soon as possible because they must be completed before Phase 2 construction can commence. Phase 2 is essential for all projects because they require the additional south-of-Antelope transmission capacity that this phase will provide.

# CHAPTER 1

## *INTRODUCTION*

### Background

On June 9, 2004, as part of Proceeding I.00-11-001, the administrative law judge issued Decision 04-06-010 entitled "Interim Opinion on Transmission Needs in the Tehachapi Wind Resource Area". It called for "a collaborative study group to develop a comprehensive transmission development plan for the phased expansion of the transmission capabilities in the Tehachapi area." The plan was to be incorporated in a report to be submitted on March 9, 2005. The submittal date was later changed to March 16, 2005.

### The Tehachapi Collaborative Study Group (TCSG)

The Decision cited above further stipulated that the plan was to be the product of a study group, coordinated by Commission staff, assisted by the CAISO with SCE, PG&E, wind developers and other interested parties "…to participate in the collaborative study process." In compliance with this order, the Tehachapi Collaborative Study Group (TCSG) was formed.

### The March 16, 2005 Report

The underlying assumption guiding this stage of the planning was that approximately one half of the output from Tehachapi would flow to PG&E and the other half to SCE.

A second assumption was made that the average capacity added by each of the three 500 kV lines is approximately 1,500 MW. Based on these two principles, the transmission planning departments at PG&E and SCE produced alternatives for delivering 4,000 MW of incremental generation from Tehachapi proper and 500 MW from the adjoining Antelope Valley, with 2,000 MW going to PG&E. The path to PG&E was either from Tehachapi to SCE's Vincent Substation and thence over the existing three 500 kV circuits that comprise Path 26, or over a 500 kV line from Tehachapi to PG&E's Midway Substation or Gregg Substation plus Tehachapi-Vincent-Path 26.

PG&E presented two alternatives: in one, a 500 kV line from Midway to Los Banos Substation (a fourth circuit on Path 15) plus a 500 kV line from Los Banos to Tesla Substation in the Bay Area, the Tehachapi generation to Midway is delivered over Path 26. And in the second, a 500 kV line from Tehachapi to Gregg Substation in the Fresno area to Tesla Substation, the Tehachapi generation is delivered in part directly to Gregg and in part to Midway over Path 26.

SCE presented four alternatives, designated 1, 2, 3 and 10, each with three 500 kV lines out of Tehachapi. Alternative 1 has a line from Tehachapi to Midway and two 500 kV lines from Tehachapi to SCE's Antelope Substation, north of Vincent; Alternative 2 has all three 500 kV lines to the SCE grid, with two lines to Antelope and one directly to Vincent. Alternatives 3 and 10 are variations on Alternative 1 with internal differences on the SCE system.

In addition, a 230kV tie between the SCE and PG&E networks in the Fresno area was studied. The tie would deliver Tehachapi generation to PG&E from Tehachapi to Antelope and thence over existing 230 kV lines from Antelope to Big Creek Substation with a phase shifted tie from these lines to PG&E's Helms-Gregg lines. The capacity of the tie would be 300 MW or more, depending on the extent of upgrades to the SCE system. This alternative would supplement Path 26 flow and could deliver generation to PG&E with a minimum of transmission upgrades. It could be a feasible alternative if Tehachapi development did not exceed 2,000 MW.

A phased development of the transmission infrastructure was proposed, consisting of:

Phase 1: Antelope-Pardee, Antelope-Vincent and Tehachapi-Antelope 500 kV lines operated at 230 kV. Deliverability of Tehachapi and Antelope Valley generation is 700 MW.

Phase 2: Upgrade Antelope-Mesa 230 kV line to 500 kV with connection to Vincent Substation, operated at 230kV. Deliverability of Tehachapi and Antelope Valley generation increases to 1,600 MW.

Phase 3a: A second 500 kV line between Tehachapi and Antelope Substations operated at 230 kV. Deliverability of Tehachapi and Antelope Valley generation increases to 2,350 MW.

Phase 3b: 500kV yards are added at Tehachapi, Pardee and in Alternatives 1 and 2 at Antelope Substations and the 500 kV lines previously operated at 230 kV are operated at rated voltage. Deliverability of Tehachapi and Antelope Valley generation increases to 3,300 MW.

Phase 4: A 500 kV line from Tehachapi to Midway and the first of PG&E's alternatives is implemented, or the second PG&E alternative is implemented. Deliverability of Tehachapi and Antelope Valley generation increases to 4,500 MW.

The capital cost of every transmission component was estimated and the cost of the alternatives was calculated. A schedule for implementation of the Tehachapi infrastructure in time to meet the Energy Action Plan 2010 target was prepared.

When all this material had been put together, the study group ran out of time. The information was presented in the report with the conclusion "The TCSG was unable to formulate a definitive transmission plan in the time available. Alternatives for the connection of Tehachapi generation to the network and alternative network upgrades to transmit the generation to load centers in the PG&E and SCE service areas have been defined. Further study is required to select among these alternatives a definitive plan for implementation."

### Start of Second TCSG Study

The recommendation above was implemented by means of letters dated March 30, 2005 from the Director of the Energy Division of the CPUC to PG&E, SCE and the CAISO. The letters requested that the representatives from these agencies to the TCSG continue to work on to the second phase of the study and established a deadline for a second report on March 1, 2006. The request for personnel participation was granted and TCSG members from CEERT, CalWEA, and the wind industry have also stayed on, so that the original team has been maintained virtually intact.

### Study Plan # 2

Highlights of the plan, as reproduced in Appendix A, for the second stage of the study include:

- Refinement of power flow studies, particularly for the Fresno Tie project
- PG&E revised its second alternative from Tehachapi-Gregg-Tesla to Tehachapi-Midway-Gregg-Tesla (SCE's Alternative 1 contains Tehachapi-Midway).
- The CAISO committed to doing a production simulation study of the alternatives in which Tehachapi wind would be dispatched in accordance with recorded wind flow patterns for the area and other generation based on economics. Tehachapi generation would flow into the system as determined by network configuration and the non-Tehachapi generation that was dispatched, rather than assigning a set proportion of Tehachapi generation to a given area.

That is, the requirement that 2,000 MW be transmitted to PG&E would no longer hold. In addition, the new 500 kV lines could be loaded up to 3,400 MW, the thermal rating of Edison's 500 kV lines.

- The recommended alternative, or set of alternatives would be selected based on economics: from the capital costs, the utilities' revenue requirements would be calculated, to which would be added the present value over the life of the projects of the O & M costs and, as obtained from the production simulation study, the present value over the life of the projects of the incremental cost over the cost of the alternative, or set of alternatives, whose cost was the least. A spread sheet would be made showing all the cost elements for each of the alternatives, or set of alternatives, and the ranking of the set based on least cost.

# CHAPTER 2

## *PROCESS TO EVALUATE ALTERNATIVES*

### 2.1 Introduction

The power flow studies done by PG&E and SCE have defined a number of alternatives equally capable of delivering the full incremental 4,500 MW of Tehachapi generation to load centers. To choose among them the principal criterion is economics: which alternative or combination of alternatives will do the job for the least cost. Since this cost is on the order of $1 billion, a careful evaluation is justified.

The recommended alternative, or set of alternatives would be selected based on economics: from the capital costs, the utilities' revenue requirements would be calculated, to which would be added the present value over the life of the projects of the O & M costs and, as obtained from the production simulation study, the present value over the life of the projects of the incremental cost over the cost of the alternative, or set of alternatives, whose cost was the least. A spread sheet would be made showing all the cost elements for each of the alternatives, or set of alternatives, and the ranking of the set based on least cost.

### 2.2 Calculation of Project Cost

There are three components to the cost of each project or alternative or combination of alternatives: the utility's revenue requirement for the construction of the facility, the operation and maintenance costs for the facility over the life of the project and the electric system operating costs over the life of the project. This third component consists of network losses, congestion payments and generation, not including Tehachapi generation, which is assumed to be taken as available (as the wind blows) and is therefore the same for all projects. The present value of the operation and maintenance costs and the present value of the production costs are added to the revenue requirement to obtain the total cost of the project over its economic life. If only economics are taken into consideration, the least-cost project is preferred.

### 2.3 Elements of Economic Evaluation

Capital Cost: The actual amount paid for engineering, construction, interest during construction. These costs were estimated by the utilities and are given in Appendices 2 and 3. An exception is the cost of the Tehachapi-Midway transmission

line, which was estimated by the TCSG Cost Subgroup, whose report is contained in Appendix 8. It should be emphasized that these estimates are preliminary. Facilities selected for construction will require further study in order to obtain firm estimates. The cost of acquisition of rights-of-way is especially uncertain, since routes cannot be finalized until environmental reviews have been completed. Moreover, some routes must pass through regions undergoing rapid urbanization, making future acquisition costs difficult to predict. In addition, the two utilities use different methodologies for making their estimates, making comparison difficult. Nevertheless, the TCSG believes that the capital cost estimates are adequate for the purposes of comparison of alternatives.

To cover the capital cost, the utilities have a "revenue requirement", which is obtained by applying a multiplier to the capital cost to take into account return on capital, taxes, insurance, administration and depreciation. This multiplier was calculated as follows. In the CAISO Board Report of 2/24/05 on the PVD2 project, SCE's "real economic carrying charge for transmission" is 10.43%, which is a value applicable to a capital cost to obtain stream of annual costs. To convert this to a multiplier applicable to a single cost, its present value based on SCE's assumed rate of return of 7.16%[11] and a project life of 50 years was calculated to be 1.41.

The transmission facility is assumed to go on line in 2010, but all costs are calculated for 2005, therefore the present value of the revenue requirement for 2010 is calculated for 2005, based on the 7.16% rate of return and 5 years, which yields a multiplier of 0.708.

Annual operating and maintenance is assumed to be 1% of the capital cost. Its present value is based on a project life of 50 years starting in 2010 and projected to 2005 with a 7.16% discount rate.

The production costs were calculated by the CAISO using a production cost simulation program, described in Chapter 3, below. For the purpose of comparing projects, the incremental costs over the lowest cost project or scenario were used. The present value of the annual incremental cost based on a 50 year project life beginning in 2010 and projected to 2005 with an interest rate of 7.16% was calculated.

## 2.4 Study Scenarios

The scenarios designated on Table 2.1 below, are a subset of those analyzed in Chapter 3. Each of the scenarios below would accommodate the full Tehachapi projected output. See Figures 2.1 through 2.6 below.

[11] See Note 2 of Table 2.1

| | |
|---|---|
| Scenario E, Figure 2.1:<br>SCE Alternative 1 | 500kV lines, two from Tehachapi to Antelope to Vincent, one from Antelope to Pardee, one from Tehachapi to Midway. |
| Scenario F, Figure 2.2:<br>SCE Alternative 1 with PG&E Alternative 4 | 500kV lines, two from Tehachapi to Antelope to Vincent, one from Antelope to Pardee, one from Tehachapi to Midway to Los Banos to Tesla. |
| Scenario G, Figure 2.3:<br>SCE Alternative 2, PG&E Alternative 4 | 500kV lines, two from Tehachapi to Antelope to Vincent, one from Antelope to Pardee, one from Tehachapi to Vincent, one from Midway to Los Banos to Tesla. |
| Scenario G-NNM, Figure 2.4:<br>SCE alternative 2 | 500kV lines, two from Tehachapi to Antelope to Vincent, one from Antelope to Pardee, one from Tehachapi to Vincent. |
| Scenario I, Figure 2.5:<br>SCE Alternative 1 with PG&E Alternative 5 | 500kV lines, two from Tehachapi to Antelope to Vincent, one from Antelope to Pardee, one from Tehachapi to Gregg to Tesla. |
| Scenario J, Figure 2.6:<br>SCE Alternative 2 with PG&E Alternative 6 | 500kV lines, two from Tehachapi to Antelope to Vincent, one from Antelope to Pardee, one from Tehachapi to Vincent, one from Midway to Gregg to Tesla. |

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## 2.5 Results

The results given in Table 2.1 provide a cost comparison of the transmission alternatives examined to integrate the full incremental 4,500 MW of Tehachapi wind generation. As can be seen, the

production cost simulations differ slightly when comparing simulations that take into account the full WECC area with those that consider only the CAISO controlled area. These differences are minimal. Noteworthy is the fact that the projects with the lower production costs (F, G, I, J) have large infrastructure investments which make them more costly overall than the low infrastructure investment projects, E and G-NM. Based on the cost comparison, SCE's Alternative 2 with PG&E's Alternative 1 (shown on Table as Scenario G-NM) was found to be the alternative with the lowest total cost. SCE's Alternative 1 with PG&E's Alternative 1 (shown on Table as Scenario E) was found to be the alternative with the second lowest total cost. The total cost of these two is probably within the accuracy of the calculations and can therefore be considered equal on an economic basis. The remaining alternatives resulted in a total cost increase ranging from $870 million to $1.22 billion as compared to the lowest cost alternative.

## *TABLE 2.1*

## *COST COMPONENTS OF TRANSMISSION ALTERNATIVES*

PRODUCTION COST COMPONENT FOR ALL WECC AREA COMPARED TO CAISO AREA ONLY

| COST COMPONENT | MULTIPLIER | CAISO PRODUCTION COST RUN | | | | | |
|---|---|---|---|---|---|---|---|
| | | E F | | G | G-NM (10) | I | J |
| SINGLE LINE DIAGRAM | | 2.1 | 2.2 | 2.3 | 2.4 | 2.5 | 2.6 |
| CAPITAL COST (1) | | $1,090 | $2,015 | $1,863 | $938 | $2,060 | $1,908 |
| REVENUE 1. REQUIREMENT (2) | 41 | $1,538 | $2,843 | $2,628 | $1,323 | $2,907 | $2,692 |
| PV REVENUE REQUIREMENT (3) | 0.708 | $1,089 | $2,012 | $1,860 | $937 | $2,057 | $1,905 |
| ANNUAL O & M | CAPITAL COST *0.01 | $11 | $20 | $19 | $9 | $21 | $19 |
| PV ANNUAL O & M (4) | 12.61 | $137 | $254 | $235 | $118 | $260 | $241 |
| INCREMENTAL PRODUCTION COST (5) | | | | | | | |
| ALL WECC AREA | | $8 | $8 | $3 | $16 | $13 | $0 |
| ISO AREA ONLY | | $16 | $0 | $15 | $27 | $11 | $15 |
| PV INCREMENTAL PRODUCTION COST (6) | | | | | | | |
| ALL WECC AREA | 12.61 | $101 | $101 | $38 | $202 | $164 | $0 |
| ISO AREA ONLY | 12.61 | $202 | $0 | $189 | $340 | $139 | $189 |
| TOTAL COST (7) | | | | | | | |
| ALL WECC AREA | | $1,327 | $2,366 | $2,132 | $1,257 | $2,481 | $2,145 |
| ISO AREA ONLY | | $1,428 | $2,266 | $2,283 | $1,395 | $2,455 | $2,335 |
| DIFFERENCE FROM LOWEST COST (9) | | | | | | | |
| ALL WECC AREA | | $70 | $1,110 | $876 | $0 | $1,224 | $889 |
| ISO AREA ONLY | | $33 | $870 | $888 | $0 | $1,060 | $939 |
| RANK (8) | | | | | | | |
| ALL WECC AREA | | 2 | 5 | 3 | 1 | 6 | 4 |
| ISO AREA ONLY | | 2 | 3 | 4 | 1 | 6 | 5 |

# NOTES TO TABLE 2.1

NOTES

1: Construction cost estimated by SCE or PG&E in 2005 M$, includes AFUDC.

2: Construction cost plus taxes, insurance, administration and depreciation (2005 M$) based on PVD2 CAISO 2/24/05 Board Report: rate of return = 7.16%, "'real economic carrying charge rate for transmission" = 10.43%. Present value in 2010 of 10.43% at 7.16% discount rate for 50 years is 1.41 per formula shown below. (((1+0.0716)^50-1)/((1+0.0716)^50*0.0716)*0.1043

3: Present value in 2005 of annual revenue requirement in 2010, discount rate at 7.16% per formula shown below. 1/(1+0.0716)^5

4: Present value in 2005 of annual O & M for 50-year project life starting in 2010 at 7.16% discount rate, inflation assumed at 2% per year per formula shown below. (((1+0.0716-0.0200)^50-1)/((1+0.0716-0.200)^50*(0.0716-0.0200)))*(1/(1+0.0716)^5)

5: WECC-wide annual production cost (2005 M$) minus annual production cost of lowest cost alternative (Run J),

6: Present value in 2005 of annual incremental production cost for 50-year project life starting in 2010 at 7.16% discount rate, inflation assumed at 2% per year per formula shown below. (((1+0.0716-0.0200)^50-1)/((1+0.0716-0.200)^50*(0.0716-0.0200)))*(1/(1+0.0716)^5)

7: Sum of present value of revenue requirement plus present value of O &M plus present value of incremental production cost.

8: Cost ranking starting with lowest cost alternative

9: Increase of total cost over total cost of lowest cost alternative.

10. Tehachapi-Midway rated 3400MW.

11. Same as G, except no PG&E upgrade.

## CAPITAL COSTS

2005 M$, includes AFUDC

| COST COMPONENT | CAPITAL COS |
|---|---|
| Antelope-Pardee 500kV line | 80.3 |
| Antelope-Vincent 500kV line | 63.6 |
| Antelope-Tehachapi 500kV line | 99.5 |
| Upgrade Antelope to 500kV: one 1000MVA, 500-230kV transformer | 37.5 |
| Upgrade Pardee to 500kV: one 1000MVA, 500-230kV transformer | 37.5 |
| Upgrade Tehachapi to 500kV: four 1000MVA, 500-230kV transformers | 150 |
| Sum of Phase 1 additions at 500kV | 468.4 |
| Phase 2: Upgrade Antelope-Mesa line with Antelope-Vincent segment at 500kV | 145 |
| Upgrade Vincent Substation: add 500kV transformer bank and terminations and shunt capacitors | 62.1 |
| Tehachapi-Vincent 500kV line | 163.1 |
| Tehachapi-Midway 500kV line at 3400MVA | 315.4 |
| Tesla-Los Banos-Midway 500kV line | 924.4 |
| Tesla-Gregg-Midway 500kV line | 969.8 |
| **CAISO ALTERNATIVE** | |
| E1: Phase 1 at 500kV, Phase 2, Upgrade Vincent Substation, Second Antelope-Tehachapi 500kV line, Tehachapi-Midway 500kV line at 3400MVA | 1090.4 |
| F: Phase 1 at 500kV, Phase 2, Second Antelope-Tehachapi 500kV line, Tesla-Los Banos-Midway 500kV line, Upgrade Vincent Substation, Tehachapi-Midway 500kV line at 3400MVA | 2014.8 |
| G: Phase 1 at 500kV, Phase 2, Second Antelope-Tehachapi 500kV line, Tesla-Los Banos-Midway 500kV line, Upgrade Vincent Substation, Tehachapi-Vincent 500kV line | 1862.5 |
| GNNM: Phase 1 at 500kV, Phase 2, Second Antelope-Tehachapi 500kV line, Upgrade Vincent Substation, Tehachapi-Vincent 500kV line | 938.1 |
| I: Phase 1 at 500kV, Phase 2, Second Antelope-Tehachapi 500kV line, Tesla-Gregg-Midway 500kV line, Upgrade Vincent Substation, Tehachapi-Midway 500kV line | 2060.2 |
| J: Phase 1 at 500kV, Phase 2, Second Antelope-Tehachapi 500kV line, Tehachapi-Vincent 500kV line, Upgrade Vincent Substation, Tesla-Gregg-Midway 500kV line | 1907.9 |

Fig 2.1: Project E
Existing: solid lines
New: dotted lines
PG&E: black
SCE: red

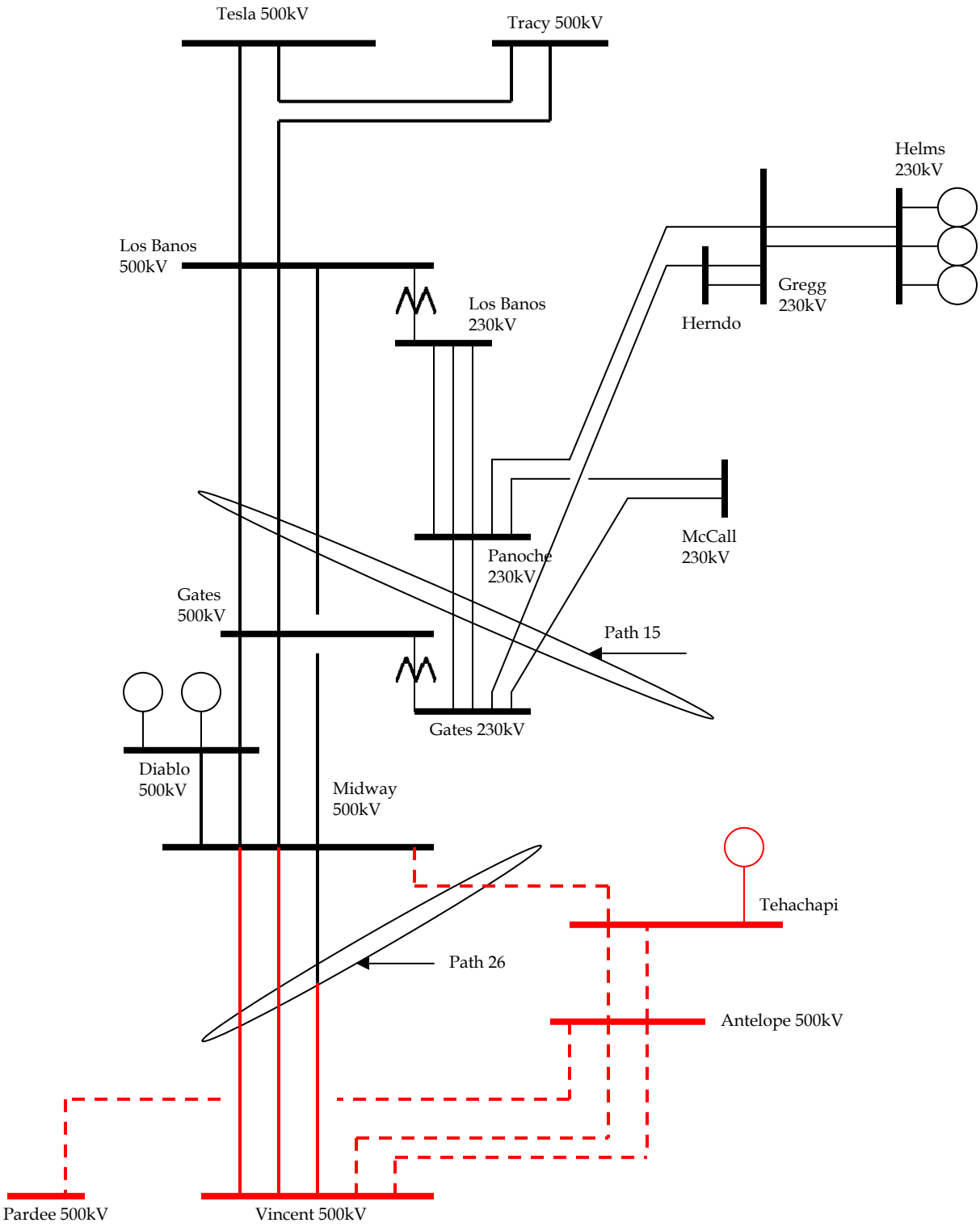


Fig 2.2: Project F

Existing: solid lines
New: dotted lines
PG&E: black
SCE: red

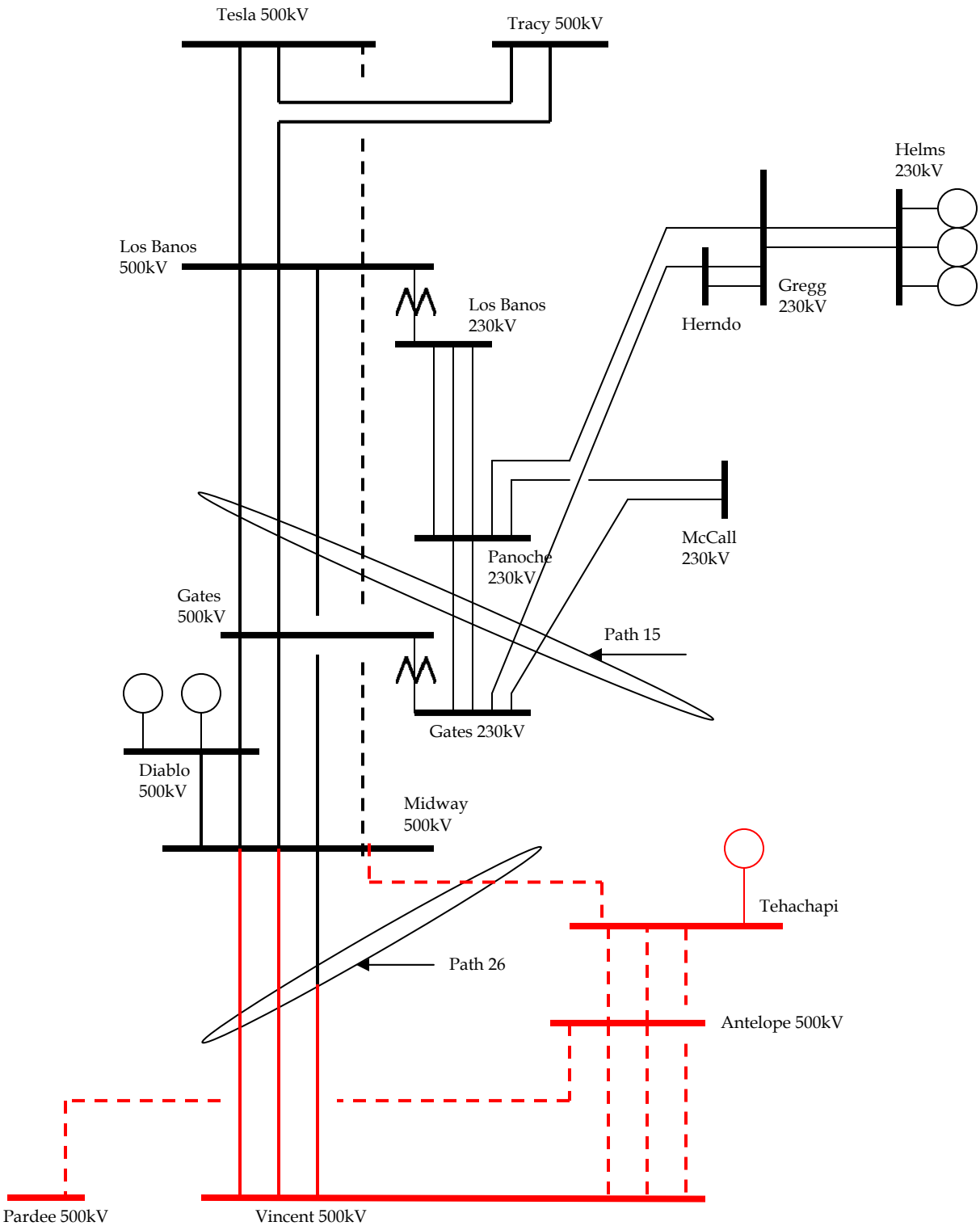


Fig 2.3: Project G

Existing: solid lines
New: dotted lines
PG&E: black
SCE: red

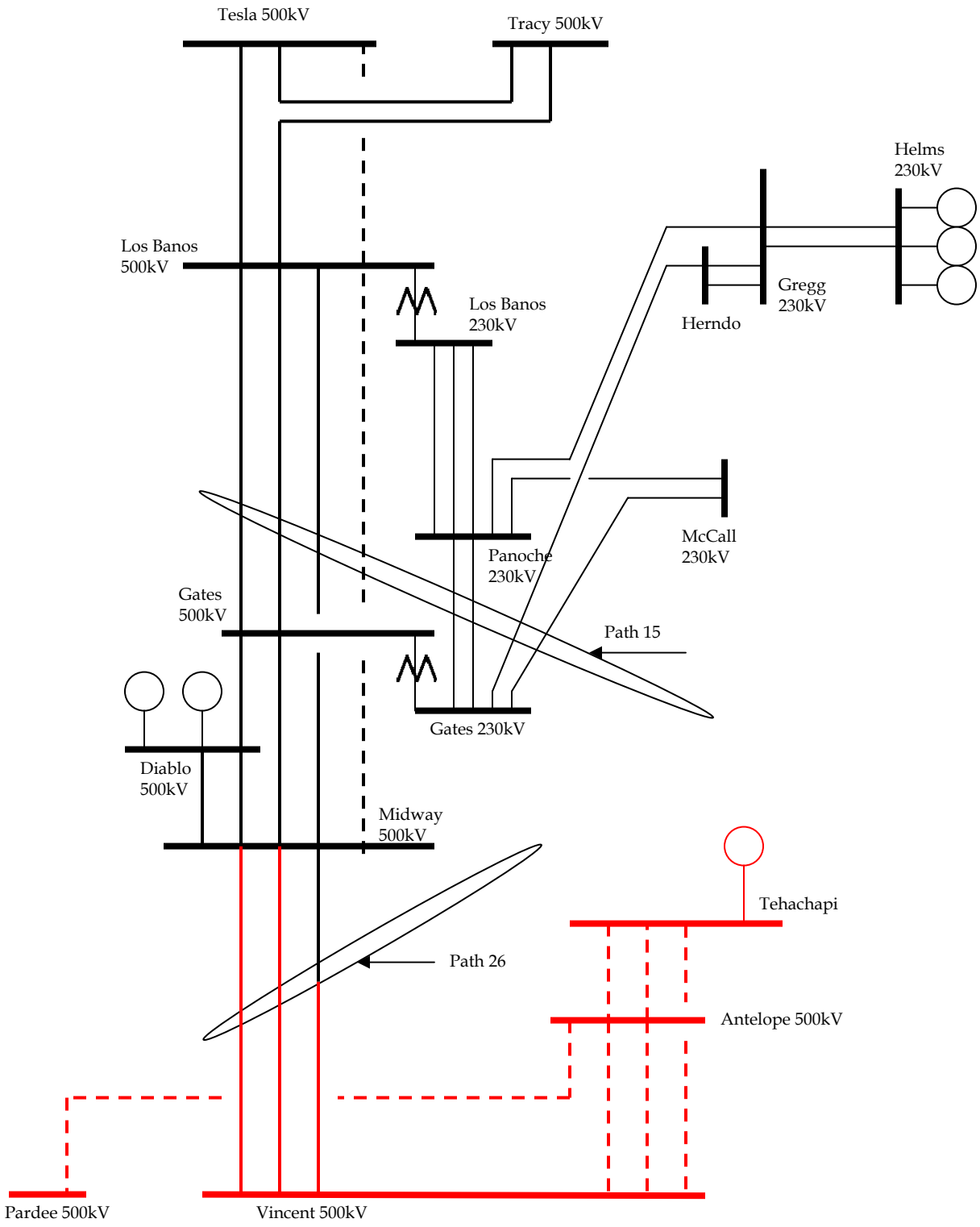


Fig 2.4: Project G-NM

Existing: solid lines
New: dotted lines
PG&E: black
SCE: red

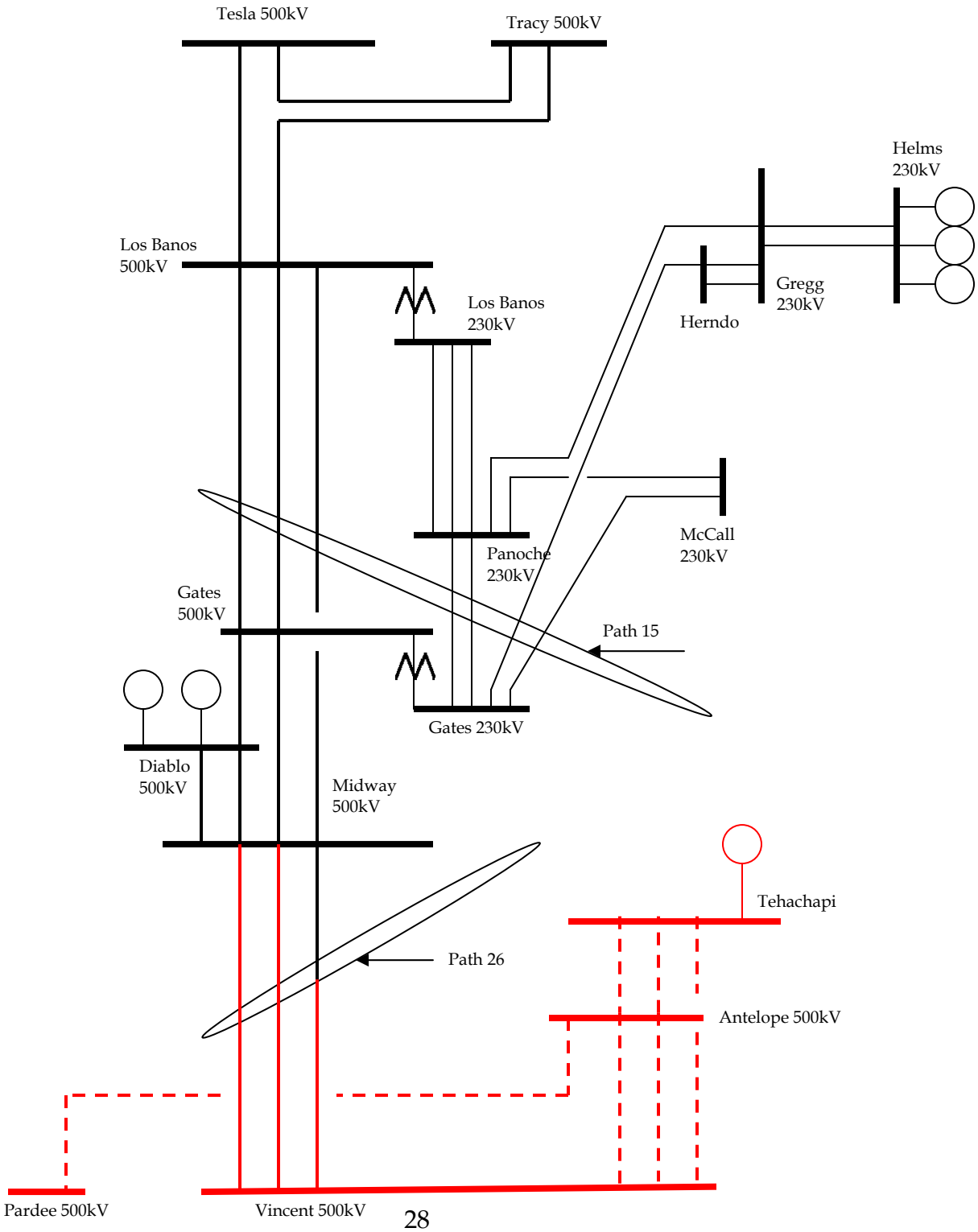


Fig 2.5: Project I
Existing: solid lines
New: dotted lines
PG&E: black
SCE: red

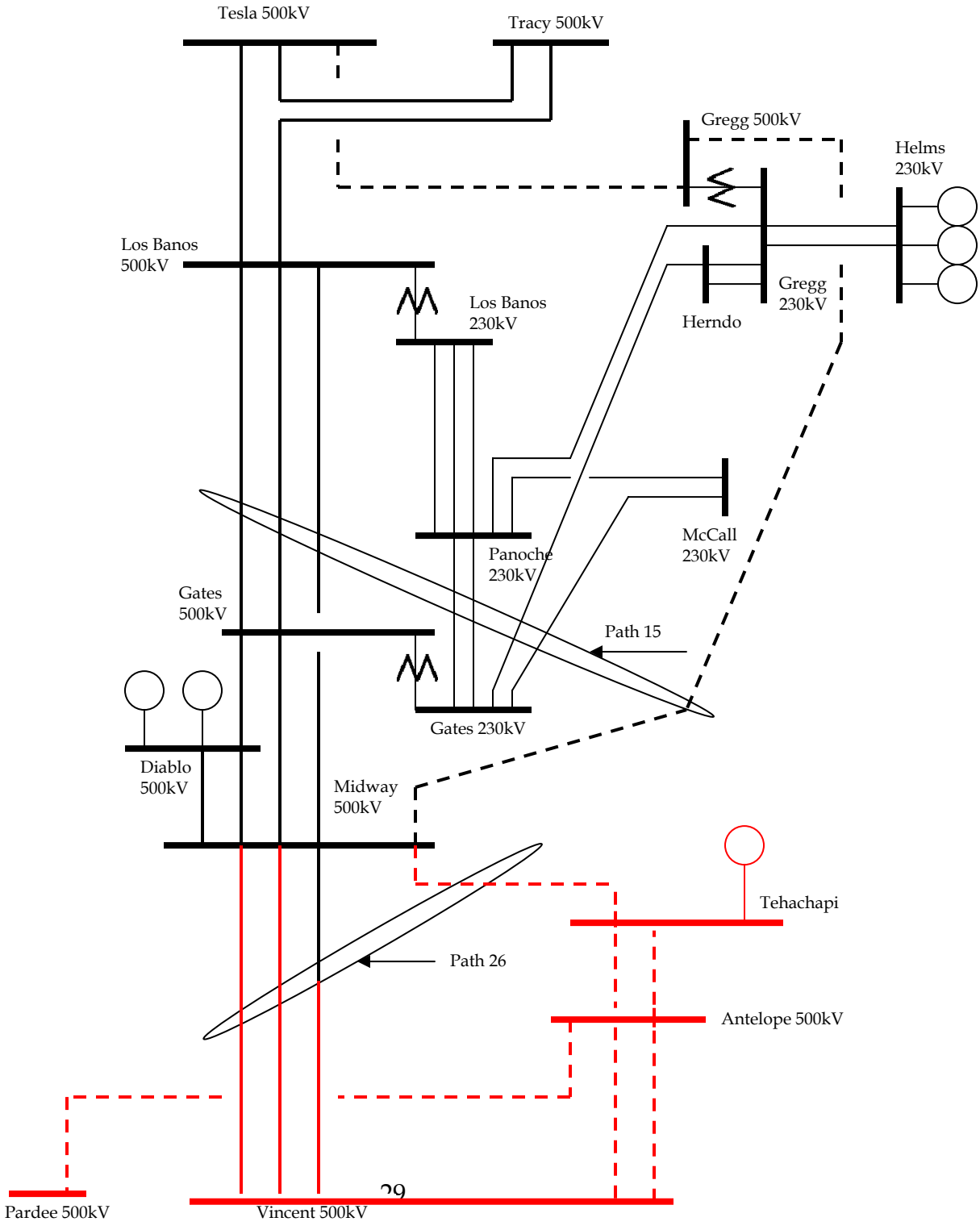
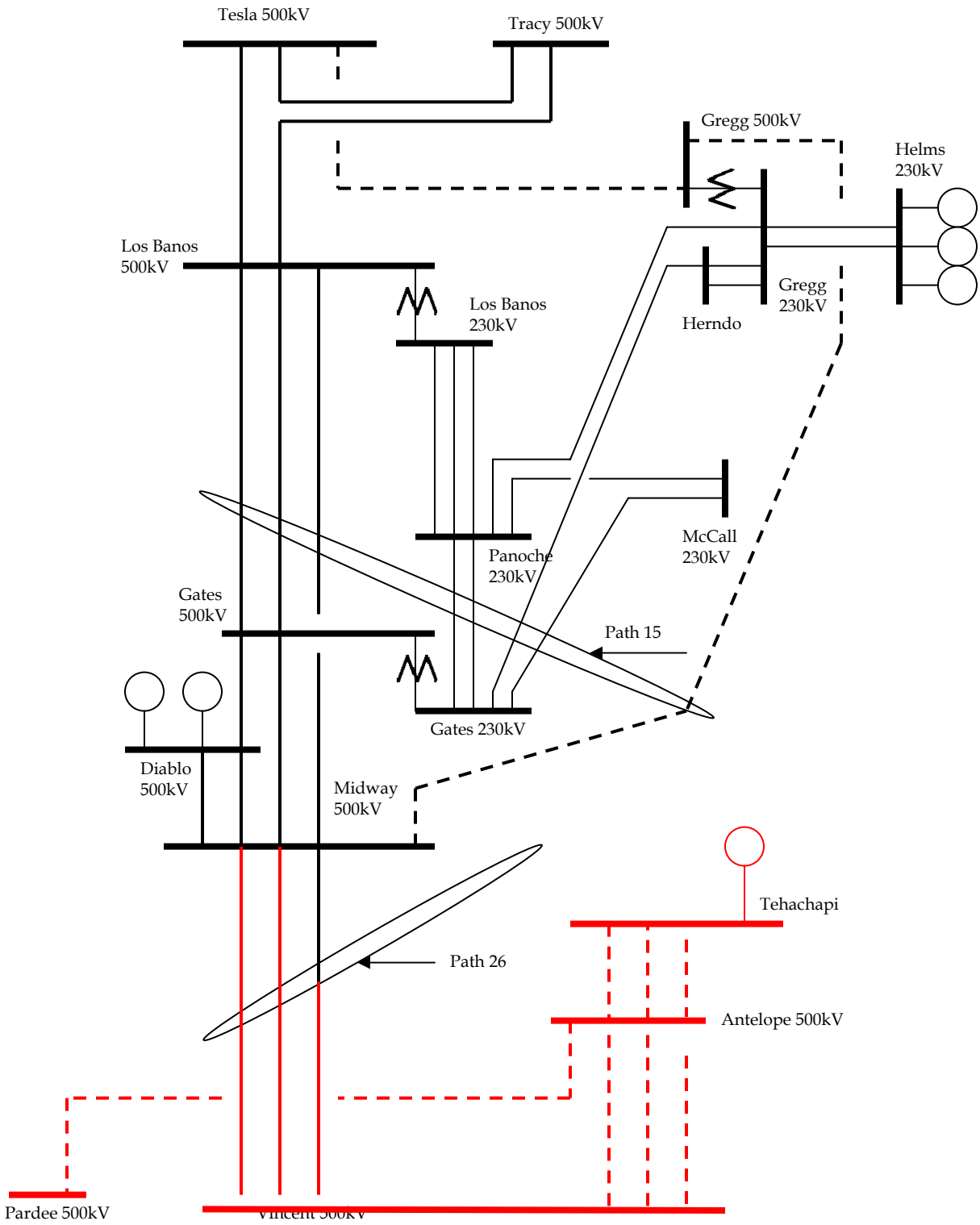


Fig 2.6: Project J
Existing: solid lines
New: dotted lines
PG&E: black
SCE: red



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# CHAPTER 3

# PRODUCTION SIMULATION STUDIES BY CAISO

## *3.1 Background*

As part of the TCSG study plan, the CAISO was requested to perform production cost modeling to determine production costs, congestion costs and system losses associated with the various transmission alternatives. The production cost simulation software provides an economic optimization of generation dispatches to minimize the total hourly production cost for the transmission system that is subject to generation, transmission and operational constraints modeled. The output of the production simulation tool was processed to estimate the comparative production cost, and any loss and congestion savings of each of the alternatives. The purpose of this portion of the study was to help determine any significant differences and provide a relative ranking of the transmission alternatives developed by the TSCG.

Productions cost simulations were performed to determine the annual production costs of the entire WECC system for the various alternatives being considered to incorporate 4,500 MW of incremental wind potential in the Tehachapi area. In addition, the annual results for California participants were determined to provide a California area perspective. The analysis was used to compare differences in the WECC production costs, power losses and congestion hours resulting from the alternative transmission configurations being considered. The analysis did not consider other potential benefits such as reduction in reliability-must-run generation cost, reduction in emission and increased operational flexibility. It should also be noted that potential concerns involved with the intermittency of wind and its potential impacts on system operation such as regulation and reserve are not part of this evaluation.

The 2008 SSG-WI (Seams Steering Group-Western Interconnection) base case developed by SSG-WI Planning Work Group (PWG) and also used in the recent Imperial Valley Study[12] was used as a starting case to maintain consistent assumptions between similar studies. The SSG-WI base case was modified with the CAISO load level to reflect forecasted 2010 conditions. In addition, new transmission projects in southern California

[12] Development Plan for the Phased Expansion of Transmission to Access Renewable Resource in the Imperial Valley, dated September 30,2005

that are approved and planned to be online by 2010 were included in the model. The analysis is based on all lines in service and does not consider any contingency or loss of facility conditions. Appendix 4 summarizes the study assumptions used, including the transmission and operational constraints applied in the simulations to optimize system operations.

## *3.2 Study Scenarios Descriptions*

CAISO evaluated the study scenarios provided by the TCSG which are described in the Study Plan #2 of Appendix 1 and based on the Tehachapi transmission alternatives documented in the TCSG March 16, 2005 report. Various levels of incremental Tehachapi wind output from 0 MW, 1,600 MW, 3,300 MW and 4,500 MW were modeled to assess the differences in the annual production costs and were used to help determine a relative ranking of the transmission configurations proposed. Sensitivities to combining PG&E alternatives with SCE alternatives were performed to determine if additional reinforcements on the PG&E system north of Midway would be economic and what optimum combination, if any, could be identified. The analysis also considered a 300 MW, 500 MW and a 600 MW 230 kV phase shifted tie (Phase angle regulator – PAR) in the Fresno area interconnecting SCE's Big Creek 230 kV transmission system with PG&E's Helms 230 kV transmission and was based on thermal analytical analysis discussed in Chapter 4. The Fresno tie was analyzed to see if it could provide any potential incremental benefits with coordinating the Tehachapi wind generation and the existing Helms pumped storage facility. Not all sizes of the Fresno PAR were investigated for the scenarios.

Table 3.1 summarizes the scenarios[13] based on the progressive phases of the conceptual transmission plans and combinations of transmission alternatives developed to accommodate a potential of up to 4,500 MW of incremental wind in the Tehachapi and Antelope Valleys.

Chapter 2 and Appendix 4 provide figures to illustrate the transmission configurations.

[13] Scenario lettering corresponds to Study Scenarios outlined in Chapter 2 and in Study Plan #2.

## *Table 3.1: Study Scenarios Reviewed*

| Alternative | | Scenario | Description |
|---|---|---|---|
| **PG&E** | **SCE** | | |
| **0 MW Incremental Tehachapi Area Wind Generation** | | | |
| SCE Phase 1 Facilities | | A | Existing system after completion of SCE's Phase 1 Facilities (Segments 1, 2 & 3: Antelope-Vincent, Antelope-Pardee). Build at 500 kV operate at 230 kV |
| | | B | Scenario A with a Fresno phase shifter (+/- 600 MW capability assumed) |
| **1600 MW Incremental Tehachapi Area Wind Generation** | | | |
| SCE Phase 1 & 2 Facilities | | C | Scenario A with Phase 2 Facility Upgrades (Vincent-Mesa 230 kV, Antelope-Vincent built at 500 kV operate at 230 kV) |
| | | D | Scenario C with Fresno 230 kV tie (Phase shifter, +300, +500, +600 MW, +/-600 MW capabilities) |
| **3300 MW Incremental Tehachapi Area Wind Generation** | | | |
| 4 | 1 | K | 500 kV Tesla-Los Banos-Gates-Midway-Tehachapi with 2 Tehachapi-Antelope, Antelope-Vincent, Antelope-Pardee |
| 5 - Phase 1 | 1 | L | 500 kV Tesla-Gregg-Tehachapi with 2 Tehachapi-Antelope, Antelope-Vincent, Antelope-Pardee |
| 4 | 1 | M | Tesla-Los Banos-Gates-Midway 500 kV with Fresno 230 kV tie, two 500 kV lines Tehachapi-Antelope |
| 5C | 1 | N | Tesla-Gregg 500 kV with Fresno 230 kV tie, two 500 kV lines Tehachapi-Antelope |
| **4500 MW Incremental Tehachapi Area Wind Generation, Without Fresno 230 kV Tie**<br>**No North of Midway Reinforcements** | | | |
| - | 1 | E | Scenario C with Tehachapi-Midway 500 kV, SCE Phase 1 & 2 Facilities operated at 500 kV |
| - | 2 | G-NM | 500 kV lines -3 Tehachapi-Antelope, 2 Antelope-Vincent, Antelope-Pardee |
| **4500 MW Incremental Tehachapi Area Wind Generation, Without Fresno 230 kV Tie**<br>**With North of Midway Reinforcements** | | | |
| 4 | 1 | F | 500 kV Tesla-Los Banos-Gates-Midway-Tehachapi with 2 Tehachapi-Antelope, Antelope-Vincent, Antelope-Pardee |
| 4 | 2 | G | Scenario F with 500 kV Tehachapi-Midway replaced with 500 kV Tehachapi-Vincent |
| 5 - Phase 1 | 1 | H | 500 kV Tesla-Gregg-Tehachapi with 2 Tehachapi-Antelope, Antelope-Vincent, Antelope-Pardee |
| 5 | 1 | I | 500 kV Tesla-Gregg-Midway-Tehachapi with 2 Tehachapi-Antelope, Antelope-Vincent, Antelope-Pardee |
| 5 | 2 | J | Scenario F with 500 kV Tehachapi-Midway replaced with 500 kV Tehachapi-Vincent |

| Additional Sensitivities With<br>4500 MW Tehachapi Area Wind Generation | | | |
|---|---|---|---|
| - | 2 | O | 230 kV Fresno Tie with 2 Tehachapi-Antelope, Tehachapi-Vincent, Antelope-Vincent, Antelope-Pardee 500 kV |
| 4 | 3 | P | 500 kV Tesla-Los Banos-Gates-Midway-Tehachapi with 2 Tehachapi-Vincent and 230 kV Antelope-Vincent, Antelope-Pardee |
| 5 | 3 | | 500 kV Tesla-Los Banos-Gates-Midway-Tehachapi with 2 Tehachapi-Vincent and 230 kV Antelope-Vincent, Antelope-Pardee |
| 4 | 10 | Q | 500 kV Tesla-Gregg-Midway-Tehachapi, Tehachapi-Vincent, Tehachapi-Pardee |
| 5 | 10 | | 500 kV Tesla-Gregg-Midway-Tehachapi, Tehachapi-Vincent, Tehachapi-Pardee |

### *3.3 Local Area Transmission Interfaces*

There are two major transmission pathways in the vicinity of the Tehachapi area that may be impacted by integrating a large amount of new resources into the 500 kV bulk power system. The Path 15 and Path 26 interfaces measure the power flows north and south of the PG&E's Midway area. Path 15 measures power flow north of Midway through the Los Banos area and Path 26 the flow imported or exported south of the Midway area. Path 26 is comprised of the three 500 kV lines between PG&E's Midway Substation and SCE's Vincent Substation and currently forms the only existing transmission link between both PG&E and SCE, but also northern and southern California. The SCE alternatives developed would inject over 4000 MW of Tehachapi wind into the Vincent area at the southern end of the existing Path 26 lines under SCE Alternative 2 or into the middle of the Path 26 if the 500 kV system is reinforced from Midway through the Tehachapi area to the Vincent area as provided by SCE Alternatives 1, 3 or 10. PG&E alternatives would provide reinforcement across Path 15.

## RESULTS

### *3.4 Annual Production Costs*

The simulations of hourly production runs optimized the system with sufficient generation resources to meet hourly demand and transmission losses subject to transmission and operational constraints for the conditions studied. Monitored

transmission lines and interfaces were found congested for various time periods for all the scenarios studied.

Table 3.2 provides a summary of the annual results comparing each of the study scenarios based on the entire WECC system. While there may be some inefficiencies of system operation as shown occurring by the number of congestion hours of Path 15, Path 26, or the entire WECC system, the resulting annual production cost for the WECC system demonstrates the overall efficiency and impact on system operation of the alternative transmission configurations. Additional details of the results and annual flow duration curves for select scenarios studied are provided in Appendix 4.

The annual benefits of reinforcing Path 26 and/or Path 15 can be seen by the reduction in congestion of those interfaces paths and the resulting incremental cost difference between the alternatives.

## *Table 3.2 – Summary of WECC Results*

| **Alternative** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **PG&E** | **SCE** | **Scenario** | **WECC Transmission Losses (TWH)** | **WECC System Congestion (Hrs)** | **Path 26 Congestion (Hrs)** | **Path 15 Congestion (Hrs)** | **WECC Annual Production Cost (M$)** |
| **0 MW Tehachapi Area Incremental Wind Generation** | | | | | | | |
| SCE Phase 1 Facilities | | A | 34.751 | 147375 | 350 | 1403 | 15690 |
| | | B(+/-600[1] | 34.644 | 147968 | 284 | 1282 | 15692 |
| | | B(+300)[1] | 34.673 | 152720 | 269 | 1253 | 15686 |
| **1600 MW Tehachapi Area Incremental Wind Generation** | | | | | | | |
| SCE Phase 1 & 2 Facilities | | C | 34.825 | 145671 | 397 | 1546 | 15422 |
| | | D(+/-600)[1] | 34.717 | 145646 | 335 | 1421 | 15429 |
| | | D(+600)[1] | 34.705 | 148719 | 317 | 1338 | 15433 |
| | | D(+500)[1] | 34.737 | 149077 | 299 | 1357 | 15431 |
| | | D(+300)[1] | 34.705 | 151500 | 347 | 1410 | 15418 |
| **3300 MW Tehachapi Area Incremental Wind Generation** | | | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 4 | 1 | K | 34.647 | 143115 | 176 | 1 | 15135 |
| 5 - Phase 1 | 1 | L | 34.469 | 143808 | 41 | 110 | 15143 |
| 4 | 1 | M(+/-600)[1] | 34.450 | 144546 | 446 | 1505 | 15134 |
| 5C | 1 | N(+/-600)[1] | 34.502 | 146426 | 1904 | 0 | 15120 |
| **4500 MW Tehachapi Area Incremental Wind Generation, Without Fresno 230 kV Tie**<br>**No North of Midway Reinforcements** | | | | | | | |
| - | 1 | E | 34.782 | 144227 | 2 | 2573 | 14934 |
| - | 2 | G-NM | 34.762 | 144276 | 803 | 1986 | 14942 |
| **4500 MW Tehachapi Area Incremental Wind Generation, Without Fresno 230 kV Tie**<br>**With North of Midway Reinforcements** | | | | | | | |
| 4 | 1 | F | 34.719 | 142507 | 757 | 0 | 14934 |
| 4 | 2 | G | 34.737 | 145563 | 2691 | 0 | 14929 |
| 5 - Phase 1 | 1 | H | 34.486 | 142914 | 85 | 0 | 14961 |
| 5 | 1 | I | 34.491 | 143246 | 137 | 0 | 14938 |
| 5 | 2 | J | 34.553 | 146198 | 2577 | 0 | 14926 |
| **Additional Sensitivities With**<br>**4500 MW Tehachapi Area Wind Generation** | | | | | | | |
| - | 2 | O(+/-600)[1] | 34.601 | 144944 | 695 | 1722 | 14948 |
| - | 2 | O(+300)[1] | 34.615 | 150878 | 2391 | 0 | 14931 |
| 4 | 3 | P | 34.778 | 143092 | 953 | 0 | 14940 |
| 5 | 3 | | 34.580 | 144188 | 911 | 0 | 14938 |
| 4 | 10 | Q | 34.751 | 142764 | 879 | 0 | 14940 |
| 5 | 10 | | 34.533 | 143301 | 821 | 0 | 14937 |

Notes:

1) Fresno PAR +/- 600 MW, +600 MW, +500 MW or +300 MW SCE to PGE direction.
2) New Midway-Tehachapi line rating 3421 MVA.

Table 3.3 provides a summary of the annual cost difference results comparing the WECC system with the California Participants[14] for each of the study scenarios. The incremental annual cost differences are referenced from the lowest annual cost result within each of the 0 MW, 1600 MW, 3300 MW and 4500 MW Incremental Tehachapi output levels. As an example within the 1600 MW Incremental Tehachapi output level, Scenario D(+300 MW)

[14] California Participants Annual results are the sum of PG&E, SCE and SD&E annual results. Includes all generation (including IPPs) modeled within PG&E, SCE and SDG&E

is used as the reference with the lowest annual production cost and Scenario D(+600 MW) would result in $15 million higher annual operating costs for the WECC system. Similarly, within the 4500 MW Incremental Tehachapi output level, Scenario J (SCE Alternative 2 with PG&E Alternative 5) is used as the reference with the lowest annual production cost and Scenario E (SCE Alternative 1) results in $8 million higher annual operating costs for the WECC system. A similar comparison of Scenario J and E based on the CAISO Participant results shows only a $1 million annual savings

## *Table 3.3 – Comparison of Incremental Annual Cost Differences*

| **Alternative** | | | **WECC** | | **California Participants**[3] | |
|---|---|---|---|---|---|---|
| **PG&E** | **SCE** | **Scenario** | **Annual Production Cost (M$)** | **Cost Difference**[2] **(M$)** | **Annual Cost (M$)** | **Cost Difference**[2] **(M$)** |
| **0 MW Incremental Tehachapi Area Wind Generation** | | | | | | |
| SCE Phase 1 Facilities | | A | 15690 | 4 | 4271 | 11 |
| | | B(+/-600[1] | 15692 | 6 | 4260 | **0** |
| | | B(+300)[1] | 15686 | **0** | 4263 | 3 |
| **1600 MW Incremental Tehachapi Area Wind Generation** | | | | | | |
| SCE Phase 1 & 2 Facilities | | C | 15422 | 3 | 4108 | 11 |
| | | D(+/-600)[1] | 15429 | 11 | 4103 | 5 |
| | | D(+600)[1] | 15433 | 15 | 4108 | 11 |
| | | D(+500)[1] | 15431 | 13 | 4106 | 8 |
| | | D(+300)[1] | 15418 | **0** | 4097 | **0** |
| **3300 MW Incremental Tehachapi Area Wind Generation** | | | | | | |
| 4 | 1 | K | 15135 | 15 | 3923 | 6 |
| 5 - Phase 1 | 1 | L | 15143 | 23 | 3917 | **0** |
| 4 | 1 | M(+/-600)[1] | 15134 | 14 | 3937 | 20 |
| 5C | 1 | N(+/-600)[1] | 15120 | **0** | 3921 | 4 |
| **4500 MW Incremental Tehachapi Area Wind Generation, Without Fresno 230 kV Tie No North of Midway Reinforcements** | | | | | | |
| - | 1 | E | 14934 | 8 | 3818 | 16 |
| - | 2 | G-NM | 14942 | 16 | 3829 | 27 |

| | | | | | | |
|---|---|---|---|---|---|---|
| **4500 MW Incremental Tehachapi Area Wind Generation, Without Fresno 230 kV Tie With North of Midway Reinforcements** | | | | | | |
| 4 | 1 | F | 14934 | 8 | 3802 | **0** |
| 4 | 2 | G | 14929 | 3 | 3817 | 15 |
| 5 – Phase 1 | 1 | H | 14961 | 35 | 3817 | 15 |
| 5 | 1 | I | 14938 | 13 | 3813 | 11 |
| 5 | 2 | J | 14926 | **0** | 3817 | 15 |
| **Additional Sensitivities With 4500 MW Incremental Tehachapi Area Wind Generation** | | | | | | |
| - | 2 | O(+/-600)[1] | 14948 | 22 | 3816 | 12 |
| - | 2 | O(+300)[1] | 14931 | 5 | 3813 | 11 |
| 4 | 3 | P | 14940 | 14 | 3801 | -1 |
| 5 | 3 | | 14938 | 12 | 3806 | 4 |
| 4 | 10 | Q | 14940 | 14 | 3811 | 9 |
| 5 | 10 | | 14937 | 11 | 3813 | 11 |

Notes:

1) Fresno PAR +/- 600 MW, +600 MW, +500 MW or 300 MW SCE to PGE direction.
2) Cost difference reference is based on the lowest annual cost within of each of the 0 MW, 1600 MW, 3300 MW and 4500 MW Tehachapi output levels.
3) California Participants Annual results are the sum of PG&E, SCE and SD&E annual results. Includes all generation (including IPPs) modeled within PG&E, SCE and SDG&E
4) New Midway-Tehachapi 500 kV line normal rating of 3950 Amps assumed.

For the conditions studied and assumptions used, these results do not show significant cost benefits and result in differences of less than 1% in annual savings between the alternative transmission configurations. The WECC annual savings are within about 0.25% difference and California Participant results are within a 0.7% difference for the alternatives to incorporate 4,500 MW of Incremental Tehachapi wind. Differences between the WECC and California Participant results are due to internal California congestion that may be overshadowed when considering the overall WECC system optimization compared with the results within the California area only.

## *3.5 With and Without North of Midway Reinforcement*

To incorporate the expected Tehachapi full output to be developed, SCE Alternative 1 (Scenario E – without reinforcements north of Midway) shows about $ 8 million to $11 million lower annual savings compared to SCE Alternative 2 (Scenario G-NM, without reinforcements north of Midway). The incremental annual savings resulting

from reinforcing north of Midway with the PG&E Alternative 4 or 5 in combination with the SCE Alternatives 1 or 2 are summarized in the Table 3.4.

## *Table 3.4 - North of Midway Reinforcement Annual Savings*

*4500 MW Incremental Tehachapi Wind Output*

| Alternative | | Incremental Annual Saving (M$) | |
|---|---|---|---|
| PG&E | SCE | WECC | California Participant |
| 4 | 1 | 0 | 16 |
| 5 | 1 | -4 | 5 |
| 4 | 2 | 13 | 12 |
| 5 | 2 | 16 | 12 |

## *3.6 Helms Pumped Storage Coordination with Tehachapi Wind*

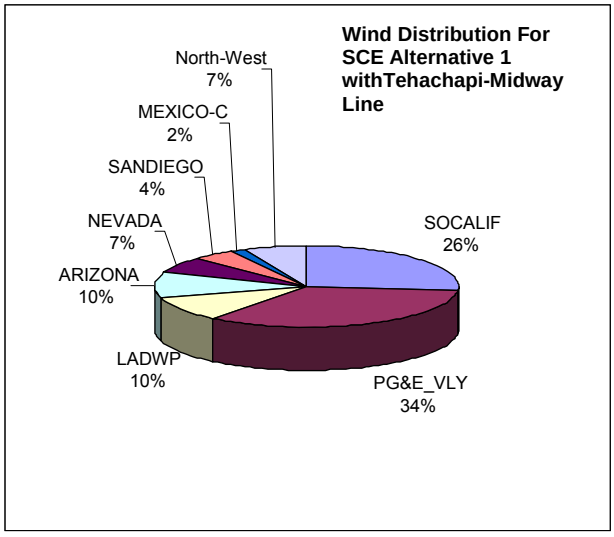
The production cost simulations did not demonstrate any difference in the operation of the Helms pumped storage facility with or without a Fresno 230 kV tie model. This is a result of how the pump storage facility schedules are determined. Schedules developed are based on the load level within a region and estimated generating and pumping thresholds for the facility. The schedule of the pumped storage facilities cannot be coordinated with the assumed hourly wind profile without a significant effort and would result in a fixed scheduled that would be separate from the optimization of the system resources. Therefore this was not investigated further under this study.

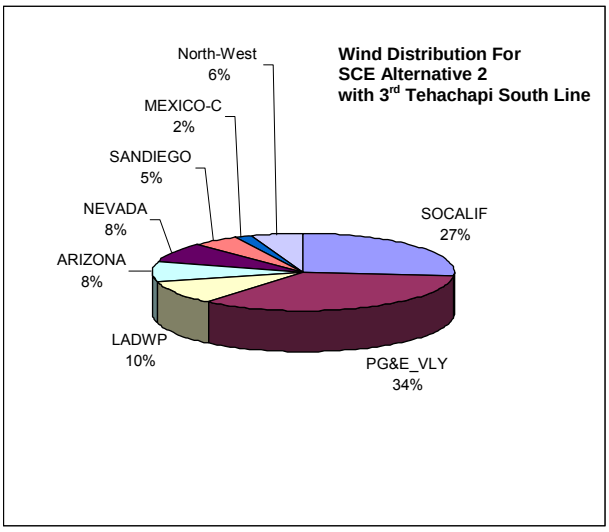
## *3.7 Fresno 230 kV Tie Operation*

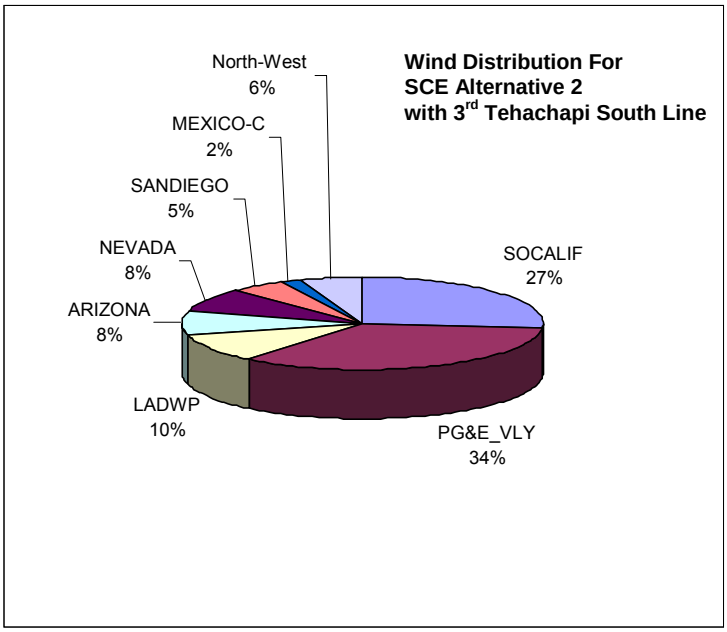
The Fresno phased-shift tie modeled in this analysis assumed a capability up to +/-600 MW and with an angle range of +/-45 degrees. Simulations found the tie frequently changed schedule and angle from hour to hour and suggested that control of the facility may require constant intervention by operators. It was also found that a 300 MW tie resulted in lower system operational costs than no tie or higher rated ties of 500 MW or 600 MW and is influenced by the available Midway and Bay area generation for hourly dispatch with the Tehachapi wind.

## 3.8 Distribution of Tehachapi Wind

The Tehachapi wind was modeled as an hourly resource that must be taken if available and would be used to displace high cost inefficient generation on the system. Although there is a general assumption that the Tehachapi power would be equally split between PG&E and SCE the production simulation program will dispatch the system with wind for the most efficient low cost WECC system operation. The following figures compare the annual energy distribution with and without Tehachapi wind to illustrate the potential recipients of the power based on SCE Alternative 1 and SCE Alternative 2. There is no significant difference in the annual energy distribution between the two alternatives.



It is important to note that subsequent to completion of this production cost analysis, it was determined through thermal analytical studies discussed in Appendix 7, that Path 26 thermal transfer capability in the north to south direction may be less than the 4000 MW assumed for SCE Alternatives 1, 3 or 10 that include a new 500 kV Midway-Tehachapi-Vincent path that would parallel the existing Path 26. Based on the incremental differences between the alternatives, it is not expected that there would be any significant change in the results and savings would be within the ranges shown. Additional detailed thermal, voltage and stability studies would be required to determine the actual Path 26 transfer capability.

These production cost study results alone do not provide an adequate basis for making investment decisions. These production cost simulation study results, the results of the power flow and stability studies, and the cost of implementing the individual projects will all influence the choice of upgrade ultimately selected (see Chapter 2). It is also important to note that this production cost simulation study was developed solely for comparing transmission alternatives required to incorporate a large amount of wind resources in the Tehachapi area and should not interpreted as a determination of wind as a preferred renewable resource.

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# CHAPTER 4: POWER FLOW STUDIES AND FACILITY COST STUDIES

The evaluation described in Chapter 2 shows that the upgrades studied for north of Midway (including the 230 kV tie to transmit power to PG&E in the Fresno Area) would not be economic for the sole purpose of transferring Tehachapi generation to load centers in Northern California at this time. The material in Section 4.1 describes the studies done by PG&E, on which this conclusion is based.

## *4.1 PG&E Transmission Alternatives*

Under summer peak conditions, the import of Tehachapi wind generation to serve the Bay Area loads would schedule power flow in the south-to-north direction (counter to the prevalent flow) on Path 15 and Path 26 and is not expected to cause normal or emergency overloads on the existing PG&E system. Power flow studies show that under summer on-peak operating conditions when the prevalent power transfer is typically from north to south on Path 26, addition of generation south of Midway would tend to decrease power transfer into Southern California. Even in those instances when it may be necessary for the CAISO to increase the power transfer into Southern California by an amount equal to this expected decrease, it would only bring the north to south power transfer at Midway back to the original amount, resulting in a net change of zero MW on Path 26. In addition, since La Paloma, Elk Hill, and Sun Rise combined-cycle plants were released for commercial operation in 2003, Path 15 power flow is typically lightly loaded under summer peak conditions. (See Table 2-1, Appendix 2.)

Accordingly, all PG&E alternatives investigated for North of Midway are for mitigating expected off-peak transmission problems when the prevalent power transfer is in the south to north direction (see Tables 2-2 and 2-3, Appendix 2). In the Study completed for the TCSG Report filed on March 16, 2005 PG&E had investigated three alternatives in addition to the status quo (Alternative 1) to mitigate the impacts of scheduling and delivering 2,000 MW of Tehachapi generation (Alternatives 4 and 5) and two alternatives to mitigate the impact of scheduling and delivering 300 MW of Tehachapi area renewable generation (Alternatives 2 and 3) to PG&E. Alternative 3 to deliver 300 MW to PG&E was subsequently dropped because it could not provide the intended 300 MW of transfer capability. In this study PG&E performed further investigation on

Alternatives 1, 2, 4 and 5. In addition, Alternative 2 was expanded to investigate the impact of scheduling and delivering 300 MW, 600 MW and 1,200 MW of Tehachapi area renewable generation. (See Appendix 2 for further discussion on Alternatives 1, 2, 4 and 5.)

PG&E's conceptual transmission alternatives are listed below (see Tables 4.1.1 and 4.1.2). These include the status quo base case with no or minimum transmission upgrades to the PG&E system added. The study results, possible phasing and technical requirements associated with each alternative are further discussed in Appendix 2. Note that the PG&E alternatives include placeholders only for shunt voltage support devices because no voltage stability studies, which are required for this determination, were performed. Further studies will be needed to explore opportunities to adjust each remaining alternative before the plan of service can be determined.

### *Table 4.1.1 Summary of Conceptual Transmission Plan and Planning Level Cost Estimates [15] for PG&E Alternative 2 [16] (see Figure 4.1.2)*

| Cumulative Import Level | Plan "A" (100% at Switching Station #1) | Plan "B" (50% at Switching Station #1 and 50% at Switching Station #2) |
|---|---|---|
| 300 MW | Build Switching Station #1 with a 300 MVA phase shifter<br>**Other Reinforcement in PG&E Area:**<br>• Upgrade Borden-Gregg 230kV line (peak)<br>**Conceptual Cost Estimate: $85 million**. | N/A |
| 600 MW | Same as 300MW import level, except with one 600MVA phase shifter and building a new 230kV line between Switching Station #1 and Gregg.<br>**Other Reinforcement in PG&E Area:**<br>• Upgrade Borden-Gregg 230 kV line (peak)<br>• Upgrade Storey 1 – Gregg 230kV line (peak)<br>**Conceptual Cost Estimate: $222 million** | Build Switching Station #1 and #2 with a 300 MVA phase shifter at each station.<br>**Other Reinforcement in PG&E Area:**<br>• Upgrade Hass-McCall and Balch-McCall 230 kV lines (peak & off-peak)<br>• Upgrade Borden-Gregg 230kV line (peak)<br>**Conceptual Cost Estimate: $179 million** |
| 1200MW (Peak) | **Not feasible** (Due to the maximum phase angle range of +/-45 degree) | **Not feasible** (Due to the maximum phase angle range of +/-45 degree) |

[15] These planning-level cost estimates are preliminary, unit cost-based estimates and do not reflect project-specific engineering, environmental mitigation requirements, or permit, land acquisition, and legal costs and assumes all over-head line construction. All estimates include 30% contingency and are subject to change based on final engineering and design as well as the requirements of any CPUC or other required permit processes.

[16] The cost estimates are for PG&E's portion of the Alternative only and include the UPC(s) for controlling power flows from SCE to PG&E

## *Table 4.1.1 Summary of Conceptual Transmission Plan and Planning Level Cost Estimates [15] for PG&E Alternative 2 [16] (see Figure 4.1.2)*

| Cumulative Import Level | Plan "A" (100% at Switching Station #1) | Plan "B" (50% at Switching Station #1 and 50% at Switching Station #2) |
|---|---|---|
| 1200MW (Off-peak) [17] | Same as 600 MW import level, except with two 600MVA phase shifters.<br>**Other Reinforcement in PG&E Area:**<br>• Install 450 MVAR of voltage support.<br>• Restrict the import level to Helms operation at 600 MW or more of pumping.<br><br>**Conceptual Cost Estimate: $326 million** | Same as 600 MW import level, except with a 600 MVA phase shifter at each station.<br>**Other Reinforcement in PG&E Area:**<br>• Upgrade Hass-McCall and Balch-McCall 230 kV lines.<br>• Restrict the import level to Helms operation at 600 MW or more of pumping.<br>**Conceptual Cost Estimate: $380 million** |

[17] The import capability would depend upon the Helms pumping operation. This alternative could support 1200 MW of import only under the off-peak conditions with at least two Helms units in pumping operation.

## *Table 4.1.2 Summary of Conceptual Transmission Plan and Planning Level Cost Estimates[1] for PG&E Alternatives 1, 4 and 5*

| Cumulative Import Level | PG&E Alternative 1 (See 4.1.1) | PG&E Alternative 4 (See Figure 4.1.3) | PG&E Alternative 5 (See Figure 4.1.4) |
|---|---|---|---|
| 500MW | **Network upgrade not determined (see discussion on above)**<br><br>**Conceptual Cost Estimate: Not determined** | **Phase 4A**:<br>Build a new Los Banos-Midway 500kV line operated at 230kV.<br>**Other Reinforcements in PG&E Area:**<br>None<br>**Conceptual Cost Estimate: $533 million** | **Phase 5A:**<br>Build a new Gregg-Midway 500kV line operated at 230kV.<br>**Other Reinforcements in PG&E Area:**<br>None<br>**Conceptual Cost Estimate: $406 million** |
| 1100MW | **Network upgrade not determined (see discussion on above)**<br><br>**Conceptual Cost Estimate: Not determined** | **Phase 4B:**<br>Same as 4A, except also reconnecting the new line to 500kV and installing 65% series compensation.<br>**Other Reinforcements in PG&E Area:**<br>Upgrade Los Banos – Westley 230 kV line and Los Banos 500/230 kV bank<br>**Conceptual Cost Estimate: $137 million** | **Phase 5B:**<br>Same as 5A, except also building Gregg 500kV Substation with a 500/230kV, 1122/1350 MVA bank and reconnecting the new line.<br>**Other Reinforcements in PG&E Area:**<br>None<br><br>**Conceptual Cost Estimate: $76 million** |

| | | | |
|---|---|---|---|
| 2000MW | **Network upgrade not determined (see discussion on above)**<br><br>**Conceptual Cost Estimate: Not determined** | **Phase 4C:**<br>Same as 4B, except, also building Tesla – Los Banos 500 kV line.<br><br>**Other Reinforcements in PG&E Area:**<br>Install additional RAS<br>**Note:** This Phase would increase the OTC from 5000 MW to 7000 MW. However, it may ***not*** be feasible to increase Path 15 Rating to 7,400 MW from the existing Rating of 5,400 MW[18]<br>**Conceptual Cost Estimate: $254 million** | **Phase 5C:**<br>Same as 5B, except also installing series comp on Gregg -Midway line (31%), and Tesla-Gregg line (62%).<br>**Other Reinforcements in PG&E Area:**<br>None<br><br>**Conceptual Cost Estimate: $451 million** |

### *4.1.1 PG&E Alternative 1: Status quo.*

This Alternative investigates the possibility of installing no or minimum transmission upgrade and instead accommodating 2,000 MW of Tehachapi wind generation through curtailment of generation under normal conditions. Power flow study to date shows overloads, ranging from 3% to 48% over the ratings (or allowable limit) of eight transmission facilities under normal (all facilities in service) operating conditions (see Table 2-3, Appendix 2). As a result, this alternative would expand the times and conditions under which curtailment of generation would be required. It would also require installation of Remedial Action Schemes (RAS) to trip additional generation immediately after a disturbance and/or reduction in existing Path 15 transfer capability.

If existing generation in areas around Midway Substation is curtailed to allow transfer of Tehachapi power, Path 15 south to north transfer capability will have to be reduced. This is because the existing Path 15 south-to-north transfer capability under normal conditions can only be supported with operation of the Remedial Action Scheme (RAS) immediately following identified outages. If Midway area generation that is connected to the existing RAS were dispatched off-line or kept at minimum generating levels (assuming that the FERC open

[18] The Path 15 south-to-north flow was modeled at the Operating Transfer Capability (OTC) limit of 5000 MW in the pre project base case. This alternative would be able to import additional 2000 MW of generation at Midway by tripping 4319 MW of generation/pumps/load using the Remedial Action Scheme (RAS) for the simultaneous loss of Los Banos-Midway 500 kV and the new Los Banos-Midway 500 kV line in Phases 4A and 4B). The additional import would result in the Path 15 south-to-north flow at 7000 MW. However, unlike the findings in the previous study, this alternative would not be able to increase the Path 15 south-to-north Path Rating from 5400 MW to 7400 MW without increases in load shedding via RAS. Such increases may not be acceptable.

access rules were somehow satisfied), there would be no effective way of reducing power flow on Path 15 immediately following a double line outage and before the operator can intervene. As a result, Path 15 would have to be operated under normal conditions at a reduced level[19].

Connecting Tehachapi generation to the RAS to support Path 15 is neither effective nor is it practical even assuming installation of a new type of RAS controller and other equipment so it can predict the amount of wind generation available to trip if the outage occurs. For wind turbines to be part of generation RAS to replace the Midway generation RAS, the new RAS controller would need to ensure that sufficient generation was available to trip regardless of the wind output. At this time, no solution has been identified that will not in turn require tripping a higher amount of load commensurate with the increased amount of generation tripped to keep the net amount of net generation to be tripped within the allowable limit. The need for facility upgrades can be triggered by transient stability and post-transient voltage study results or the determination that the use of special protection systems is ineffective, violates criteria or otherwise could not be utilized.

In addition, Compliance with FERC Open Access rules, WECC approval and agreement from the CAISO, among other requirements would also be needed.

### *4.1.2 PG&E Alternative 2: Fresno 230 kV Phase-Shifted Tie:*

PG&E Alternative 2 is to establish a new 230 kV connection between PG&E and SCE by constructing a switching station at the crossing of PG&E-owned and SCE-owned transmission lines and installing a phase-shifting transformer to "push" power from SCE's Big Creek corridor into the PG&E system. This study investigated impacts on the PG&E system, and the possible mitigation measures for the connection. This study evaluated "pushing" 300 MW, 600 MW, and 1,200 MW by the following two Plans:

> Plan A (PG&E_Alt-2A):
> Establish one 230 kV tie between PG&E and SCE. Build Switching Station #1 at the crossing of PG&E's Helms – Gregg 230 kV lines and SCE's Big Creek – Rector 230 kV lines. Install one phase shifter or power flow controller to control the tie line flow

[19] Curtailing all Midway area generation that can be curtailed (about 2,600 MW) would reduce Path 15 south to north transfer capability from 5,000 MW to about 3,600 MW. This would enable Path 26 to load to about 2,700 MW.

Plan B (PG&E_Alt-2B):
Same as Plan "A", except, also building Switching Station #2 at the crossing of PG&E's Haas-McCall and Balch-McCall 230 kV lines and SCE's Big Creek – Rector 230 kV lines. Install a phase shifter or power flow controller at both switching stations to control the tie line flow.

### 4.1.3 PG&E Alternative 4: Tesla – Los Banos - Midway 500 kV line

PG&E Alternative 4 is to build a new Tesla – Los Banos 500 kV line and a new Los Banos – Midway 500 kV line. This alternative could be implemented in the following three phases:

Phase A (PG&E_Alt-4A): Build a new Los Banos – Midway 500kV line operated at 230 kV.

Phase B (PG&E_Alt-4B): Same as 4A, except, re-connecting the new Los Banos – Midway line to 500kV bus and installing 65% series compensation.

Phase C (PG&E_Alt-4C): Same as 4B, except, also building a new Tesla - Los Banos 500kV line without series compensation.

### 4.1.4 PG&E Alternative 5: Tesla –Gregg – Midway 500 kV line

PG&E Alternative 5 is to build a new Tesla – Gregg 500 kV line and a new Gregg – Midway 500 kV line. This alternative could be implemented in the following three phases:

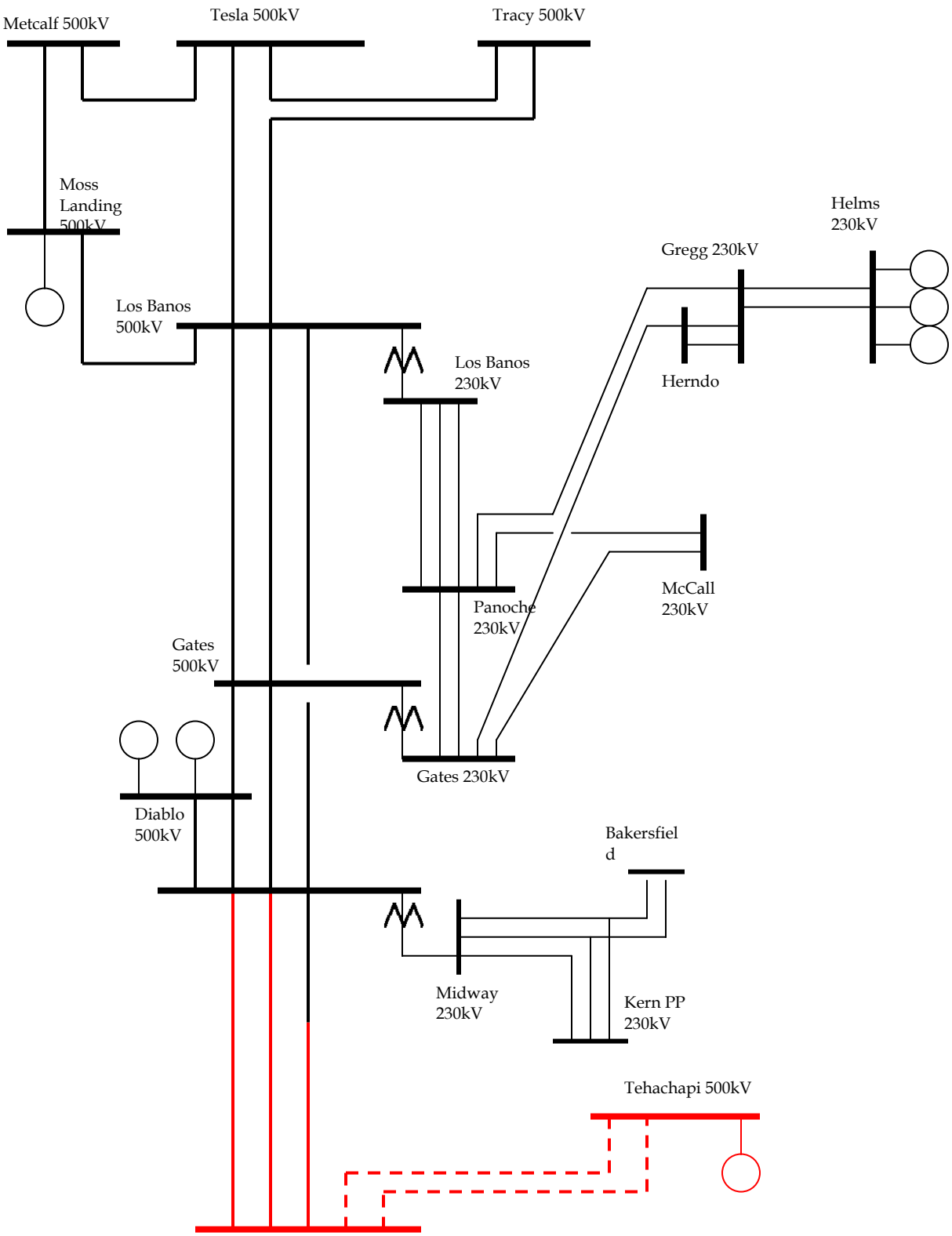
Phase A (PG&E_Alt-5A): Build a new Gregg - Midway 500kV line operated at 230 kV.

Phase B (PG&E_Alt-5B): Same as 5A, except also building a Gregg 500 kV Substation with a 500/230 kV transformer bank and re-connecting the new Gregg - Midway 500kV line.

Phase C (PG&E_Alt-5C): Same as 5B, except also building a new Tesla - Gregg 500kV line with 62% series compensation and installing 31% series compensation on the Gregg – Midway 500 kV line.

The impact of balancing and integrating the initial 1,100 MW of an intermittent energy such as wind generation in Phase A on the Fresno area customers and resolution of any physical limitation of Helms PSP would also need to be addressed.

## *Figure 4.1.1 - PG&E Existing System*



## *Figure 4.1.2 - PG&E Alternative 2: Fresno 230 kV Tie*

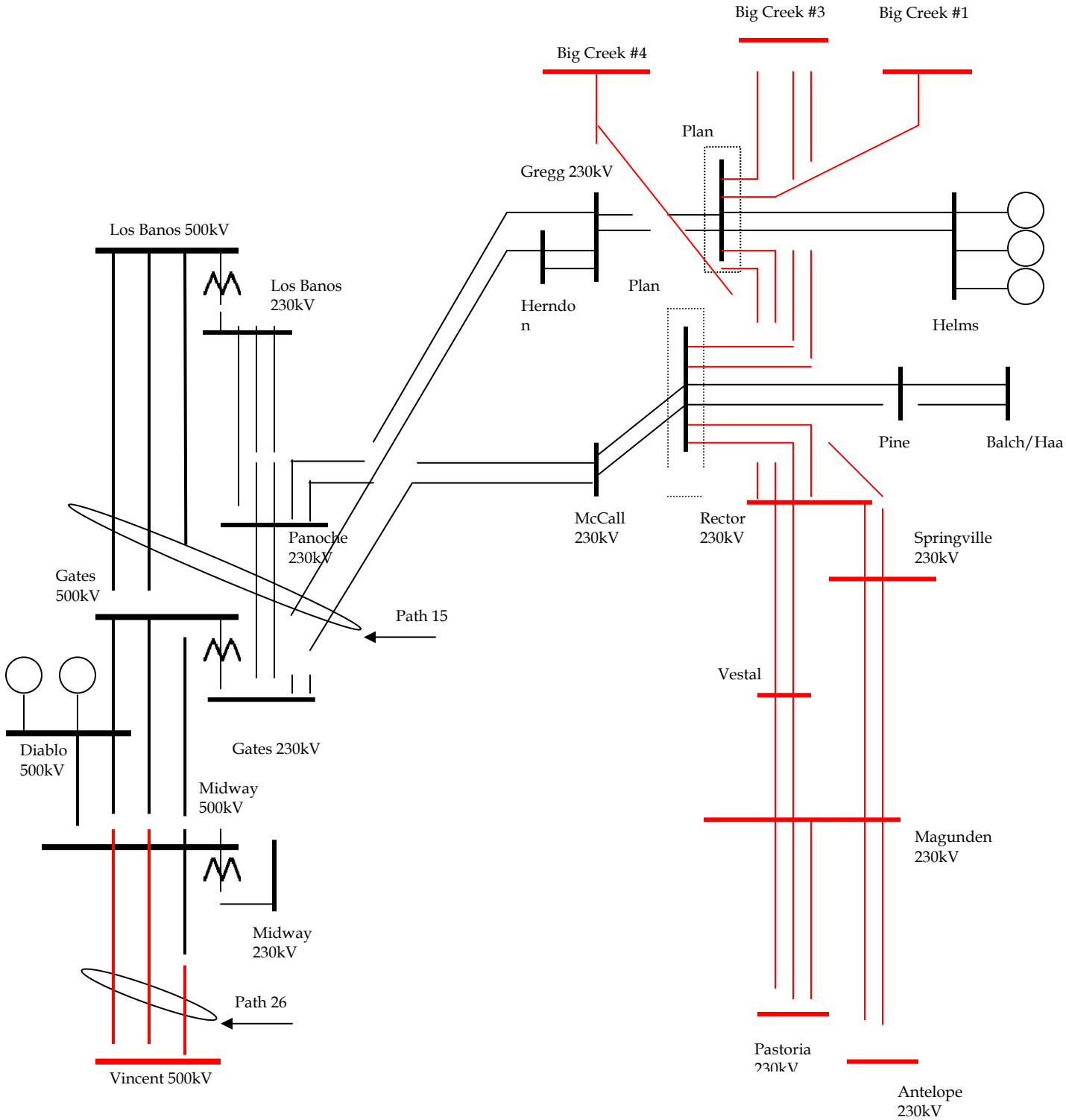


***Figure 4.1.3 - PG&E Alternative 4: Tesla – Los Banos – Midway 500 kV line***

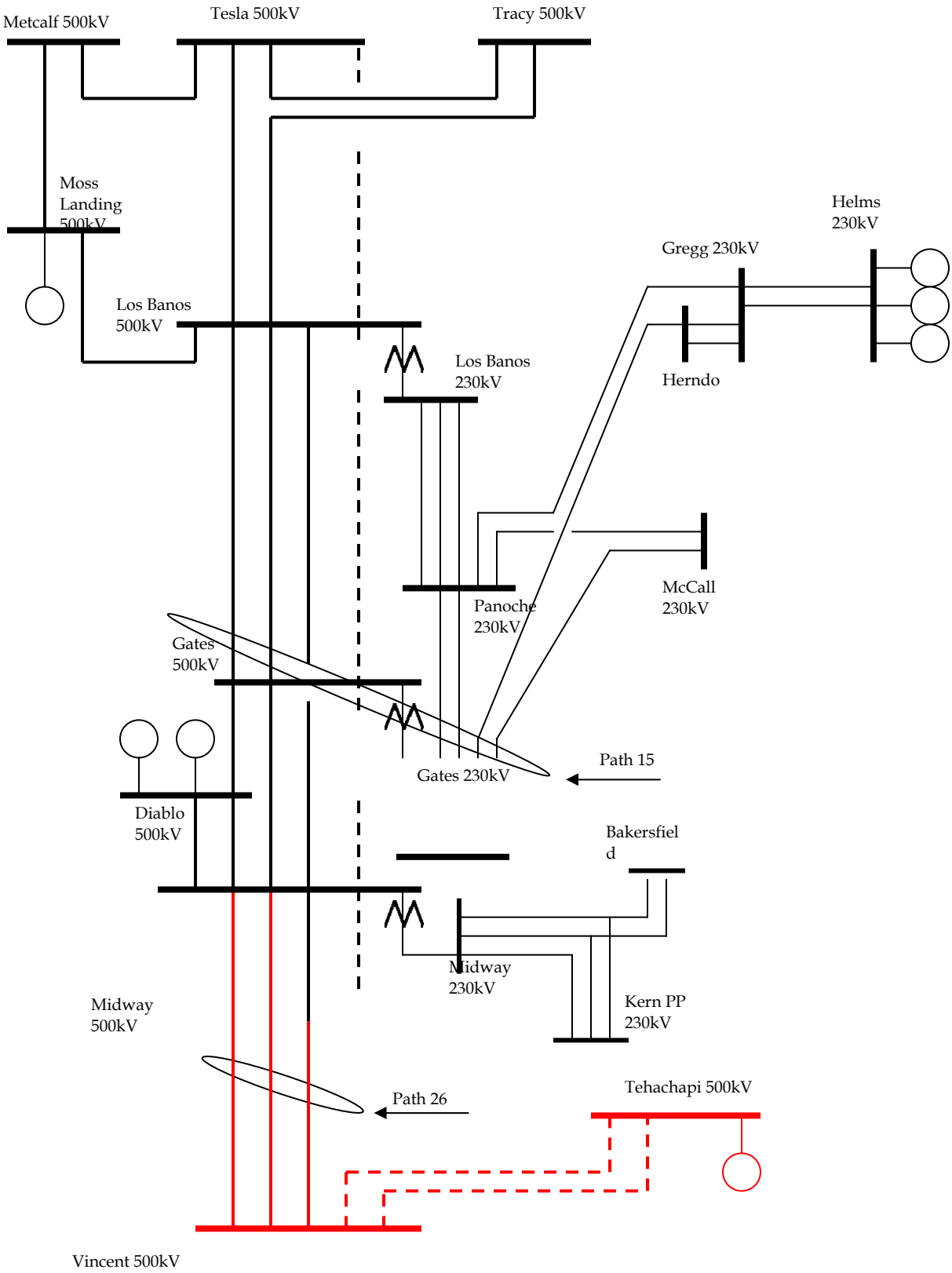
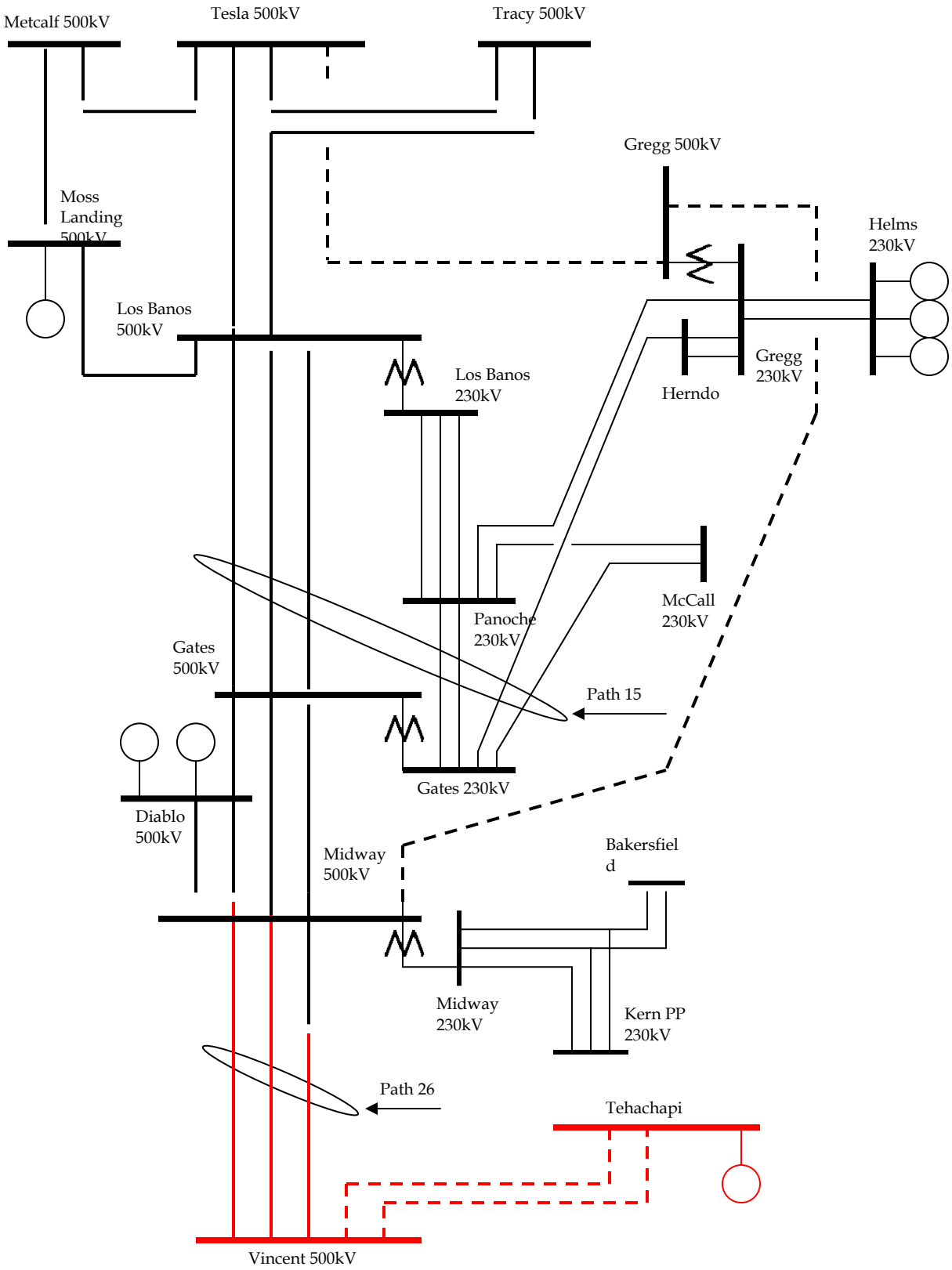


***Figure 4.1.4 - PG&E Alternative 5: Tesla – Gregg – Midway 500 kV line***



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## *4.2 Southern California Edison Studies*

**SCE Transmission Alternatives**

Under summer peak conditions, scheduling the Tehachapi wind generation to serve the Los Angeles Basin Area loads would result in power flow in the north-to-south direction adding to the total south of Vincent and south of Lugo flow (Path 26, imports from southern Nevada Area, and SCE Northern Area). Such flows are expected to cause normal or emergency overloads on the existing SCE Bulk Power system. Scheduling power north to PG&E to serve the Bay Area loads would result in decreasing power flow on Path 26 (counter to the prevalent flow). It should be noted that such a "scheduling" reduction on Path 26 may not actually result in a real-time reduction on Path 26 since the CAISO could reschedule additional power on Path 26 thereby effectively transmitting all of the Tehachapi wind generation to the south.

Power flow studies show that under summer on-peak operating conditions when the prevalent power transfer is typically from north to south on Path 26, and all generation resources in the SCE Northern area are anticipated to be dispatched to serve SCE load, the addition of generation resources located in Tehachapi would increase power transfer into the Los Angeles Basin Area. Accordingly, all SCE alternatives investigated options for integrating Tehachapi wind generation into the existing system and for increasing the power transfers south of the SCE Antelope and Vincent substations.

In the study completed for the TCSG Report filed on March 16, 2005 SCE had investigated two fundamental alternatives for integrating Tehachapi wind generation into the existing system. The first alternative involved constructing all facilities south from Tehachapi to SCE's Antelope and Vincent substations. The second alternative involved constructing facilities both to SCE and to PG&E. The conceptual transmission plans were developed with the assumption that 2,000 MW of Tehachapi wind generation would be scheduled to SCE and an additional 2,000 MW would be scheduled to PG&E. In addition, SCE evaluated alternatives that delivered power from the SCE San Joaquin Valley via the Big Creek Corridor to the PG&E Fresno Area via the Gregg-Helms 230 kV transmission lines. As part of this study, SCE performed detailed parametric studies to further investigate a potential phase-shifted system tie with an intended purpose of delivering up to 1,200 MW from the SCE San Joaquin Valley to the PG&E Fresno Area utilizing phase-shift technology. This alternative has been subsequently dropped due to significant operational issues and significant cost associated with the alternative (see Appendix 3 for further discussion on the Big Creek-Fresno System Tie alternative).

SCE's conceptual transmission alternatives derived under heavy summer load conditions are listed below in Table 4.2.1. SCE is in the process of formalizing the complete project description for Phase 2, which will be the subject of a CPCN filing with the Commission as required per CPUC Resolution E-3969. Based on recent generation interconnection studies underway, the integration plan involves conversion of the existing Mesa Substation to 500 kV instead of utilizing the Rio Hondo substation as previously conceptualized. As a result, cost estimates for Phase 2 are conceptual and do not include estimates for converting the Mesa substation to 500 kV. SCE will provide complete cost estimates and a detail scope of work as part of the CPCN application. It should also be noted that no shunt voltage support devices were included into the Summary because no voltage stability studies, which are required for this determination, have been conducted. Further studies will be needed to explore opportunities to adjust each of the elements of the conceptual transmission alternative before the final plan of service can be determined. With the recent submittal of interconnection requests for additional wind generation projects in the area made to the CAISO, SCE anticipates finalizing the exact plan of service as part of the detailed Feasibility, System Impact, and Facilities Studies. Results of these more detailed studies will provide sufficient information to identify triggering thresholds for phasing of transmission facilities and may identify the need for additional facility upgrades not addressed in these conceptual studies. The need for such facility upgrades can be triggered by transient stability and post-transient voltage study results or the determination that the use of special protection systems is ineffective, violates criteria or otherwise could not be utilized.

### *Table 4.2.1 Summary of Conceptual Transmission Plan and Planning Level Cost Estimates[20] for SCE*

| Cummlative Generation | Alternative 1 | Alternative 2 |
|---|---|---|
| 700 MW | Antelope Transmission Project<br>• Antelope-Pardee 500kV line (energized at 230 kV)<br>• Antelope-Vincent 500kV line (energized at 230 kV)<br>• Antelope-Tehachapi 500kV line (energized at 230 kV)<br>**Conceptual Cost Estimate: $243.4 million** | Same Alternative 1 |
| 1,600 MW | Tehachapi Transmission Plan Phase 2<br>• New Substation #5 230 kV Substation[21]<br>• Antelope-Substation#5 230 kV (double-circuit)<br>• Antelope-Mesa Corridor Upgrade (500 kV) ($145 M)<br>• Mesa Substation Conversion to 500 kV ($150 M)<br>• Vincent-Mira Loma 500 kV[22]<br>**Conceptual Cost Estimate: $ 349 million** | Same Alternative 1 |
| 3,000 MW | Tehachapi Transmission Plan Phase 3<br>• Second Antelope-Substation#5 230 kV (double-circuit)<br>• Second Antelope-Tehachapi 500kV line ($99.5)<br>• Increase Antelope Operating Voltage to 500 kV<br>• Increase Pardee Operating Voltage to 500 kV<br>• Increase Tehachapi Operating Voltage to 500 kV<br>**Conceptual Cost Estimate: $341 million** | Same Alternative 1 |
| 4,500 MW | Tehachapi Transmission Plan Phase 4A<br>• Midway-Tehachapi 500kV line<br>• Expand Midway Substation<br>• Increase Tehachapi 500 kV Capability<br>**Conceptual Cost Estimate: $390.4 million** | Tehachapi Transmission Plan Phase 4B<br>• Vincent-Tehachapi 500kV line<br>• Increase Tehachapi 500 kV Capability<br>**nceptual Cost Estimate: $238.1 million** |

[20] These planning-level cost estimates are preliminary, unit cost-based estimates and do not reflect project-specific engineering, environmental mitigation requirements, or permit, land acquisition, and legal costs and assumes all over-head line construction. All estimates include a 30% contingency and are subject to change based on final engineering and design as well as the requirements of any CPUC or other required permit process.

[21] A wind developer with a 300 MW project is evaluating permitting this substation as part of their wind project through Kern County. Considering only this first project and assuming a temporary operating solution is approved, the PTC could allow a portion of the first project to be in service outside of Phase 2. If it is later determined that the substation permitting should be undertaken by SCE, or the wind developer does not permit an adequate substation site as part of the wind project sufficient to accommodate all other wind projects requesting interconnection, or a temporary operating solution is not authorized, SCE will undertake the permitting of this substation with timelines consistent to those of Phase 2 or Phase 3.

[22] Cost for the Mira Loma-Vincent 500 kV transmission line not assigned to Tehachapi.

**Antelope Transmission Project**

## *Figure 4.2.1 Tehachapi Conceptual Transmission Plan Phase 1*

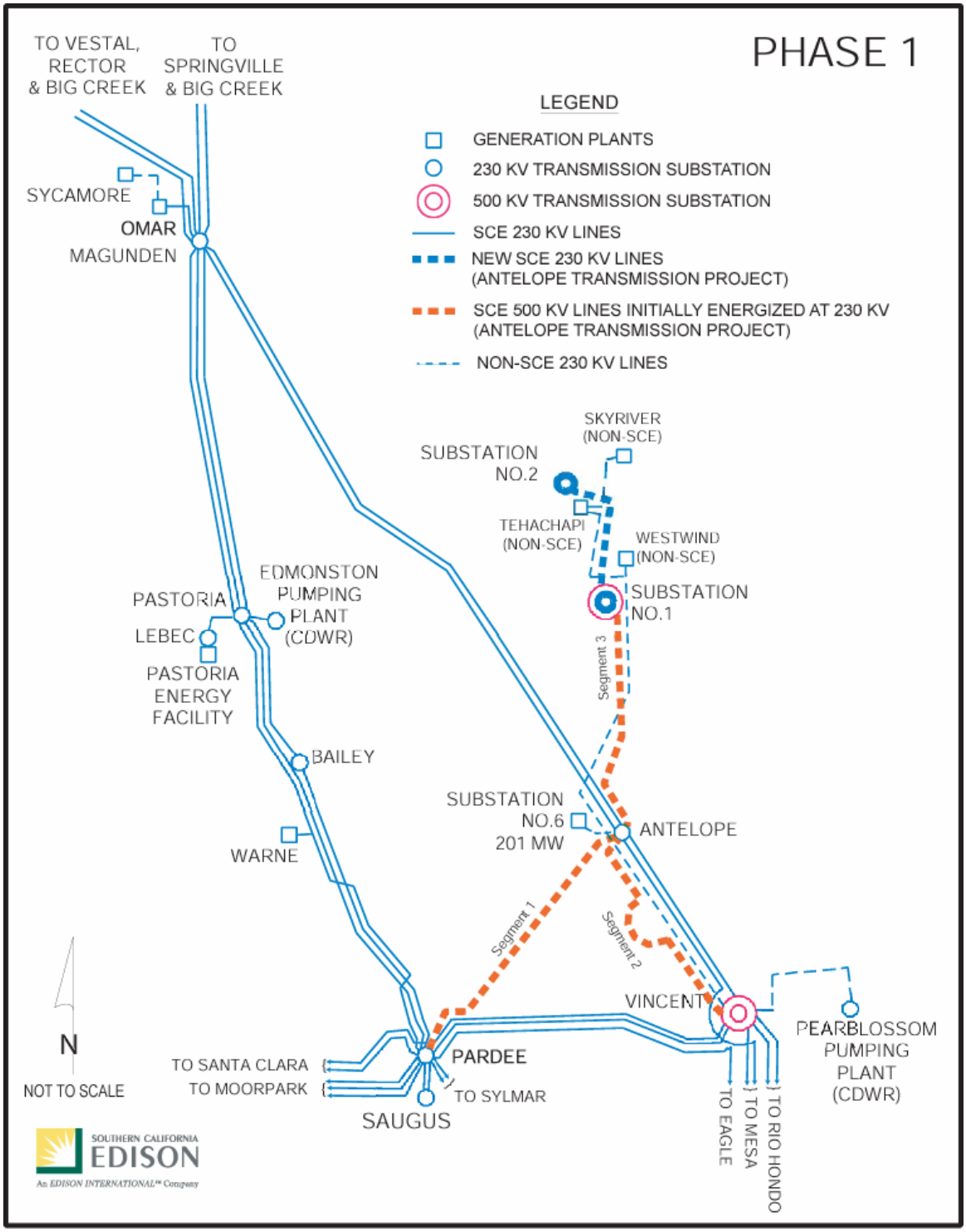


***Figure 4.2.2 Tehachapi Conceptual Transmission Plan Phase 2***

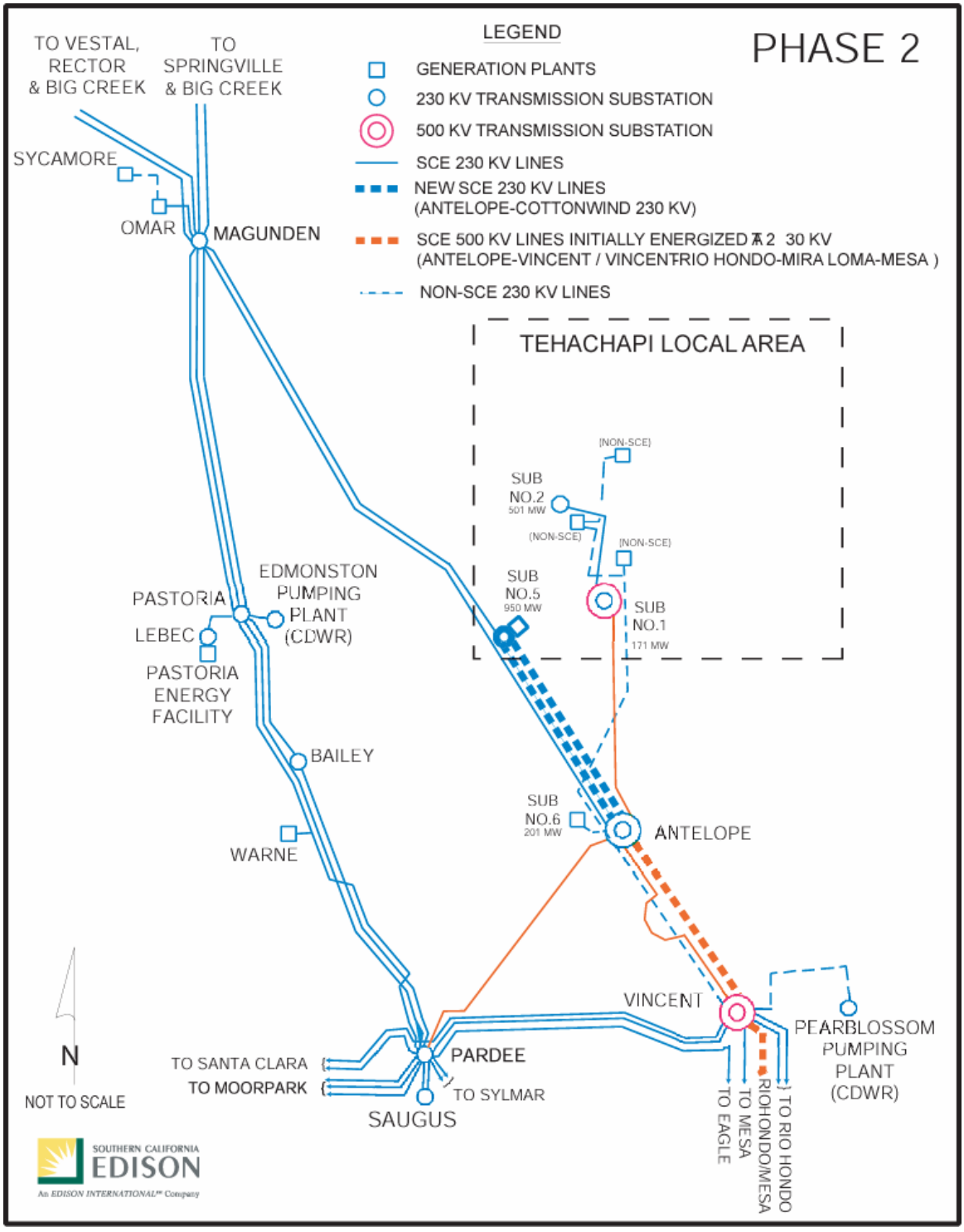
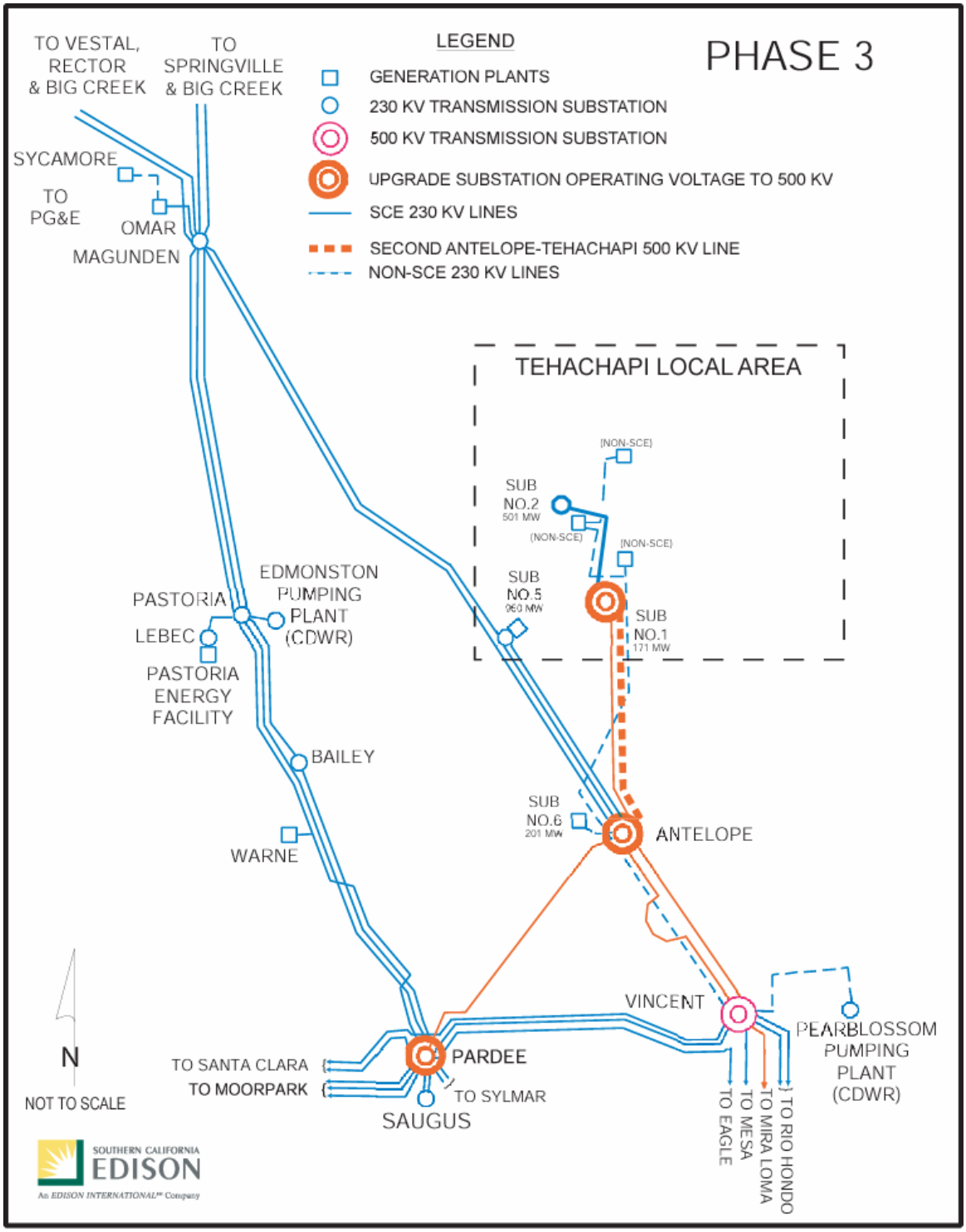
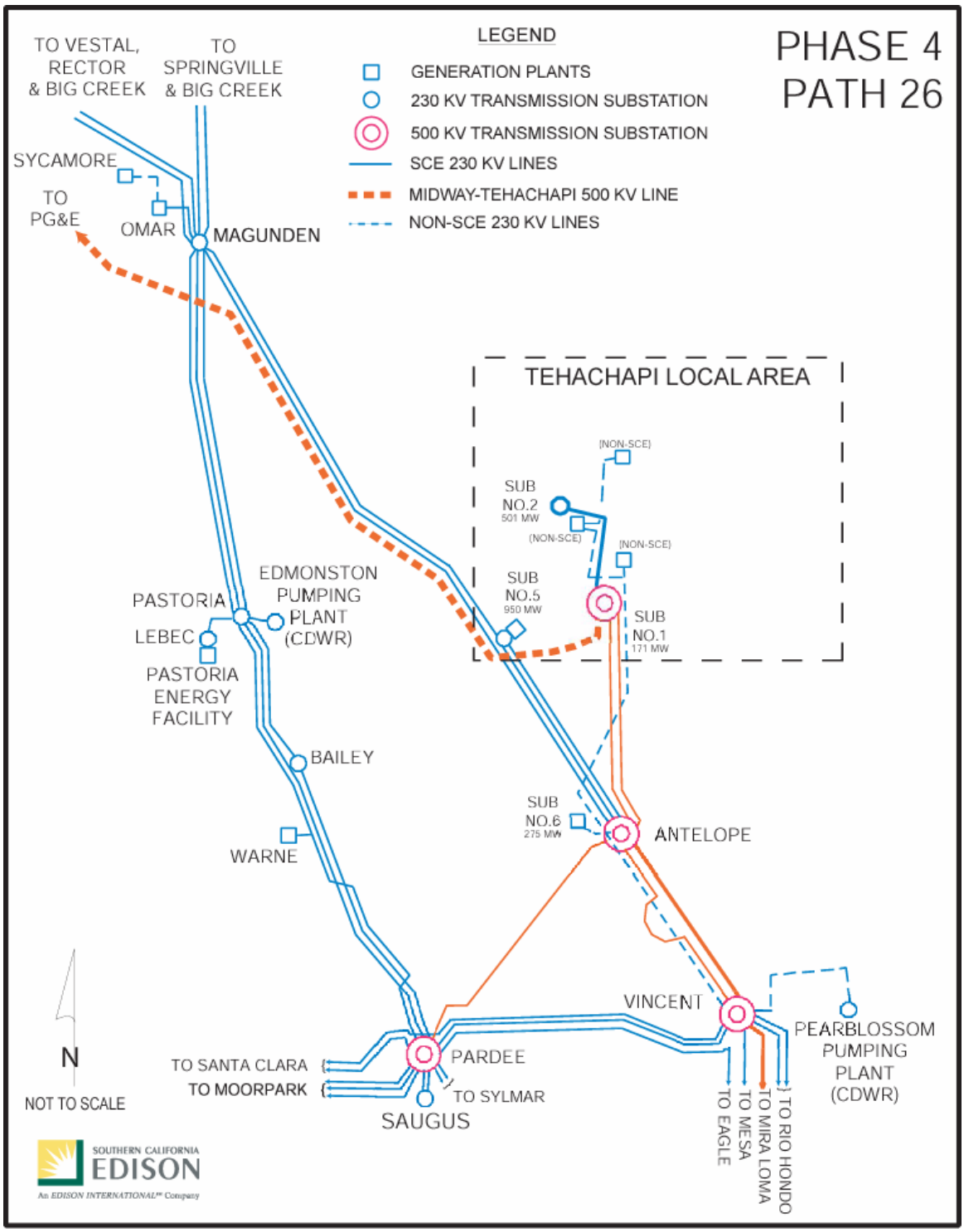


***Figure 4.2.3 Tehachapi Conceptual Transmission Plan Phase 3***



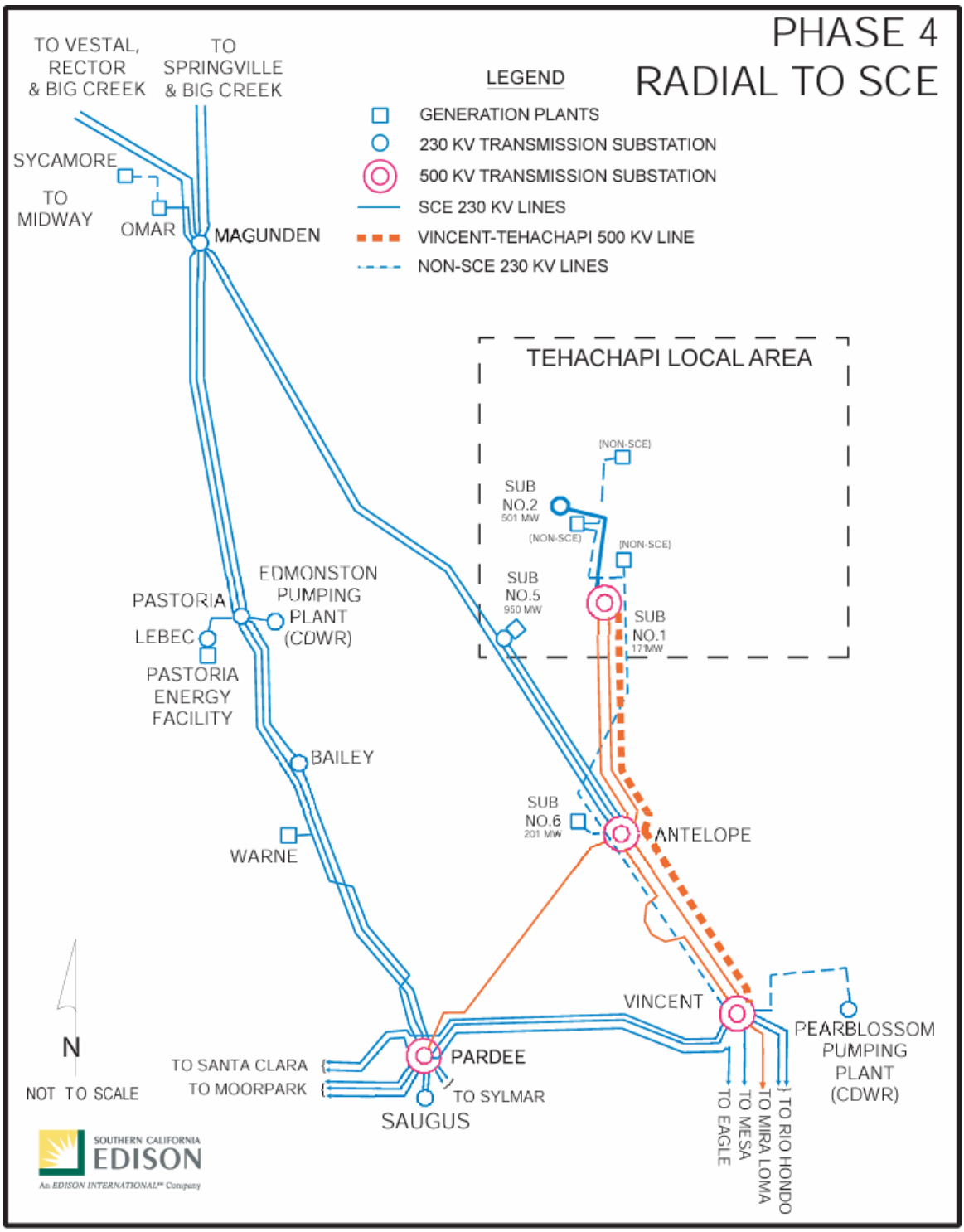
## *Figure 4.2.4 Midway-Tehachapi 500 kV Transmission Line*

**Tehachapi Conceptual Transmission Plan Phase 4**



## *Figure 4.2.5 Vincent-Tehachapi 500 kV Transmission Line*

**Tehachapi Conceptual Transmission Plan Phase 4**



# Chapter 5

## *Operations Analysis of 5,200 MW of Wind Generation in the Tehachapi Area*

### 5.1 Introduction and Background

The California ISO (CAISO) has significant operating experience with managing the impact of over 2,200 MW of wind generation in our control area. The CAISO control area is one of the largest in the Western Interconnection and it covers approximately 70% of the State of California. The advantage of a large control area is that 2,200 MW of wind generation is still only 4% of the total generation resources in this area. The other advantage is the wind generation is spread throughout the state in five different geographic areas with different weather patterns and different power production patterns. When one area has increasing energy production, one of the other areas may have decreasing production and the result is a smoother and more manageable energy production pattern. Tehachapi and San Gorgonio are the two largest wind generation areas today and their energy production has the largest impact on CAISO Grid Operations.

Currently the Tehachapi area has 740 MW of installed wind generation capacity. The plan is to add more 4500 MW of generation in this area in a series of phases. Although the transmission expansion plan is focused on the additional amount of generation, the operational impact must look at the impact from the total amount of generation in this area.

**Table 5.1: Planned Capacity Additions**

| | Installation of Additional MW | Cumulative Additional MW Capacity | Total Generation MW Capacity |
|---|---|---|---|
| Phase 1 | 700 | 700 | 1,440 MWs |
| Phase 2 | 900 MW | 1,600 MW | 2,300 MWs |
| Phase 3 | 1,700 MW | 3,300 MW | 4,000 MWs |
| Phase 4 | 1,200 MW | 4,500 MW | 5,200 MWs |

The exact timing for all the new generation construction in these phases is not firm but the goal is to complete all of these generation additions by 2010 for the utilities to meet

their RPS goals. The addition of 4,500 MW of new wind generation over the next 5 years in the Tehachapi area will have significant impact on both the transmission system and the real-time operation of the California power grid.

## 5.2 Market Issues

There are market issues that need to be solved for the consumers in the State to receive the maximum benefit from the use of renewable resources. Wind generation energy must be accurately forecasted and scheduled in the Day-Ahead market. Accurately forecasted wind energy should displace the most expensive energy that would normally be produced by fossil fueled generators. Accurate Day-Ahead energy production forecasts are essential for unit commitment decisions and optimum procurement of ancillary services.

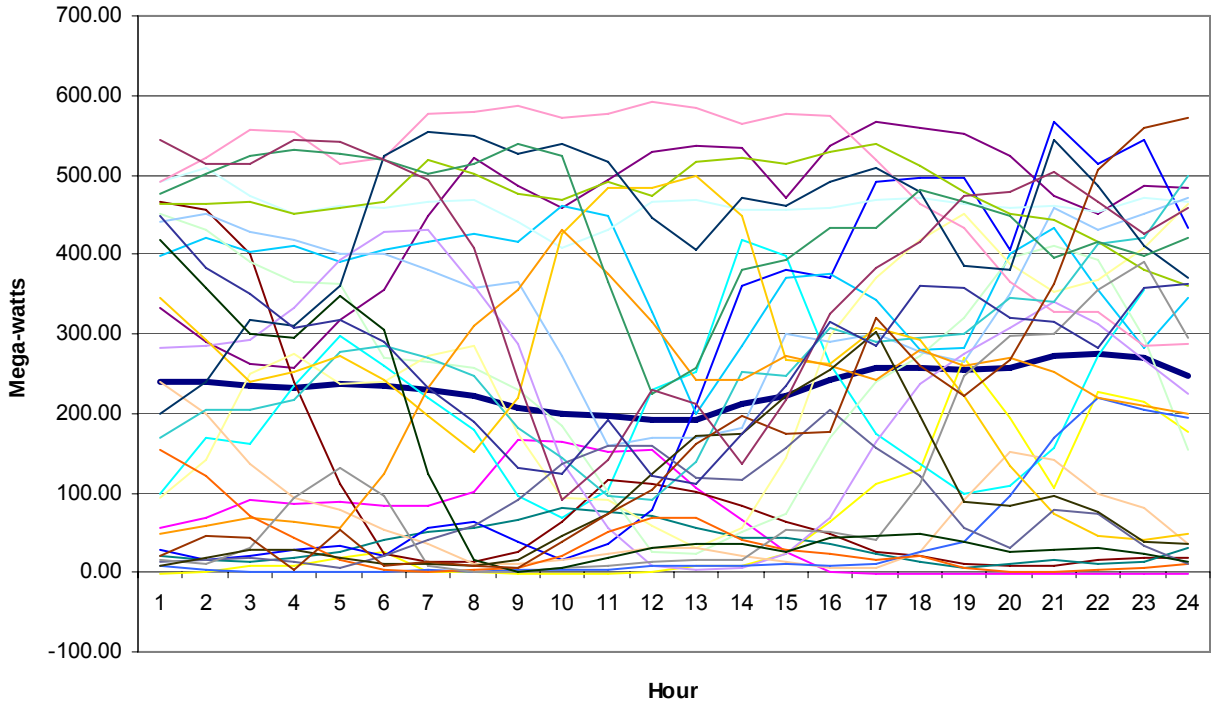



Figure 5.1 - Daily Wind Generation Energy Production inTehachapi for April 2005

Figure 5.1 shows the hourly wind generation energy production in Tehachapi for April 2005. Although the average production is approximately 200 Megawatts, the hourly pattern for any specific day shows how extremely variable the energy production is on any specific day. This picture illustrates the difficulty of forecasting the daily and

hourly power production for this area. The January through April period is probably one of the more difficult sets of months to accurately forecast daily energy production due to the variability of the weather patterns. The summer weather patterns for the Tehachapi area are more predictable and the energy production forecasts are more accurate.

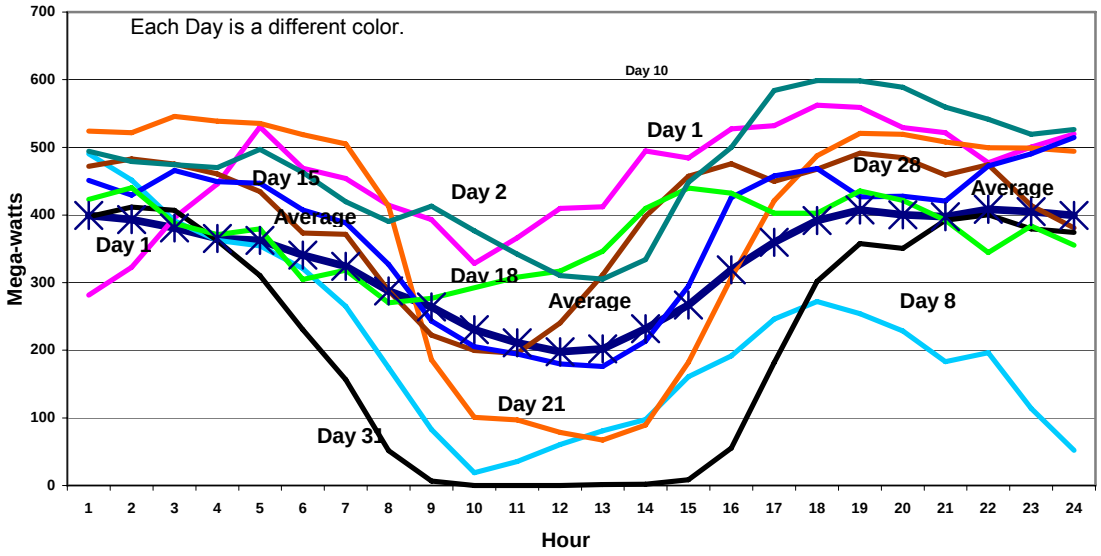



Figure 5.2 – Daily Wind Generation Production in Tehachapi for May 2005

Figure 5.2 shows the hourly production for the existing 740 MWs of wind generation in Tehachapi for May 2005. The average production has increased to approximately 300 Megawatts and the hourly energy production patterns exhibit more of the typical summer energy production patterns for this area.

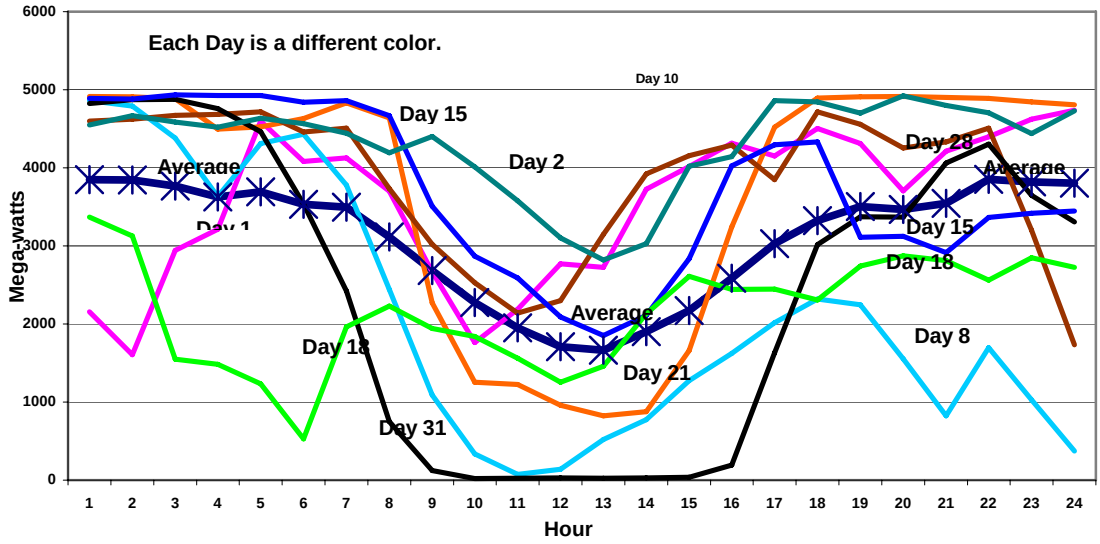



Figure 5.3 – Model of the Predicted Daily Wind Generation Production for Tehachapi with 5200 Megawatts of Installed Wind Generation Capacity

Figure 5.3 shows what the typical daily energy production could look like for a high production month like May when the amount of wind generation capacity has been increased to a total of 5200 Megawatts. The average production has increased to approximately 3000 Megawatts. The major operational concern will be the large daily energy ramps, both up and down, that could exceed 1800 Megawatts in an hour. These large ramps will require new ramp forecasting tools and new strategies to insure reliable operation of the grid.

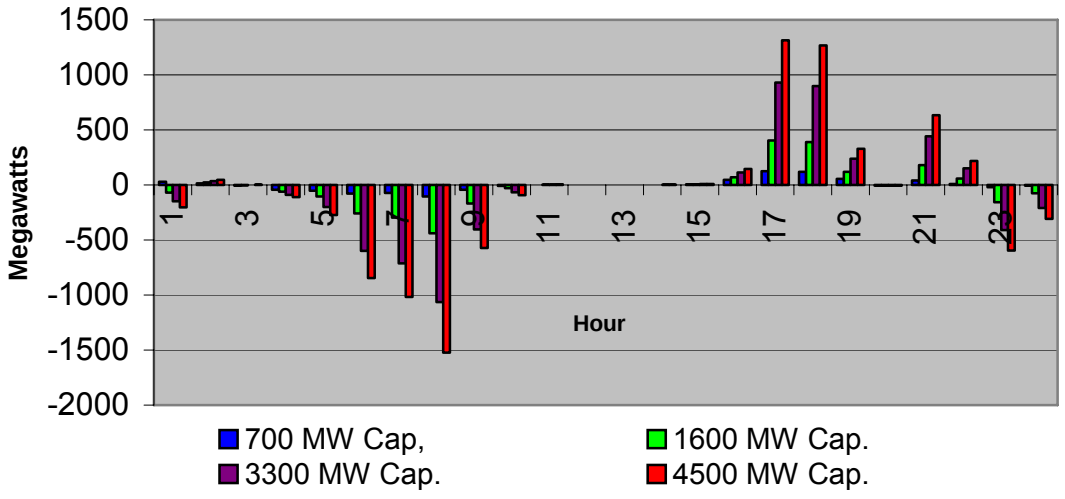



Figure 5.4 – Hour Ramps as new Generation in Added in Tehachapi

Figure 5.4 shows some of the expected energy ramps with up to 4500 Megawatts of generation capacity. With 5200 Megawatts of generation capacity, the energy ramps can be as high as 1800 to 2000 Megawatts in an hour. Unfortunately the large ramps down between 6 AM and 9 AM are the opposite of the morning ramp up of loads. From a Control Area Operators perspective, they will have to ramp up as much as 2000 to 3000 Megawatts in an hour to rebalance the system and control frequency.

Scheduling of the Tehachapi energy production in the Day-Ahead market will also help to mitigate transmission congestion issues and insure there are feasible schedules for delivery of the energy to the load centers. The new CAISO market system is expected to be operational by November 2007. Under the new market rules, the Tehachapi energy will have to be scheduled as a source and the load area (sink) will have to be identified for the energy schedules. This information will be used to verify that sufficient transmission capacity is available for the delivery of the energy. Transmission congestion issues will be resolved in the Day-Ahead market with feasible schedules for all generators in the control area.

In addition, accurate energy production forecasts will be needed five hours ahead of the real-time operating hour for the CAISO to send the correct dispatch notices to quick start units that may be required to replace wind generation energy. Ideally the forecasted hourly wind generation energy production will be scheduled in the Day-Ahead and Hour-Ahead energy markets. The CAISO is working with the CEC and their consultants to develop improved wind generation energy forecasting methodologies that can improve the scheduling of energy from these wind generation resources.

## 5.3 Operational Issues

The operational issues that must be addressed to accommodate this large amount of new wind generation in the Tehachapi area are:

1. Low Voltage Ride-Through (LVRT) Capability
2. Reactive Power supply and voltage control
3. Supervisory Control and Data Acquisition (SCADA) Capability
4. Impact on Regulation Resources
5. Load Following –Supplemental Energy Dispatch
6. Ramps and Ramp Rates
7. Frequency Response Issues
8. Operating Reserves
9. Energy Production Fit with Daily Load Pattern
10. Capacity factor for meeting summer peak loads

### 1. Low Voltage Ride-Through (LVRT) Capability

The WECC LVRT Standard requires wind generating plants to remain in-service during 3-phase faults with normal clearing times (4-9 cycles or 0.15 sec) and single line to ground faults with delayed clearing, and subsequent post-fault recovery to prefault voltage unless clearing the fault effectively disconnects the generator from the system. (Minimum voltage of 0.15 per unit as measured on the high side of the wind generating plant step up transformer)

All new wind generation built in the Tehachapi area should have a Low Voltage Ride Through Capability that meets the WECC planning standards. The existing 740 MWs of generation in the Tehachapi area does not have this capability and it is probably not practical to retrofit these existing units to bring them into compliance with the new standard. The net result is there will be some risk of a loss of 740 MWs of generation due to a three-phase fault in the Tehachapi, Antelope, or Vincent areas. 740 MWs is still below the CAISO's MSSC (Most Severe Single Contingency event), which is typically the loss of 1100 MW unit. As long as all the new generation built in the Tehachapi area meets the WECC LVRT standard, the loss of ALL the generation (4500 MWs) in the Tehachapi area should be a very low probability event.

### 2. Reactive Power Supply and Voltage Control

The CAISO standard is that a wind generating plant shall operate with a power factor within the range of 0.95 leading to 0.95 lagging, measured at the Point of Interconnection as specified in the LGIA (Large Generator Interconnection Agreement) in order to maintain a specified voltage schedule, if the Interconnection System Impact Study shows that such a requirement is necessary to ensure safety or

reliability. The key requirement is the ability to control the generation facilities to meet the required voltage schedule at the interconnection point.

### 3. Supervisory Control and Data Acquisition (SCADA) Capability

The CAISO needs real-time (4 second) SCADA data from the wind generation facilities and from metrological data associated with this facility. The detailed specification for the SCADA data and metrological data will be the same or similar to the current requirements for the CAISO's PIRP (Participating Intermittent Resources Program) and these requirements are published on the CAISO Web site.

### 4. Impact on Regulation Resources

Regulation Resources are used to automatically rebalance the system on a minute-to-minute basis within a specified tolerance band. The tolerance band for the CAISO is approximately plus and minus 110 MWs. The Automatic Generation Control (AGC) system sends control signals every 4 seconds to the generating units on regulation to increase or decrease generation to match the changes in system load and changes in other generating units. The CAISO typically procures between 600 MWs and 800 MWS of regulation per hour.

The currently 740 MWs of installed capacity in Tehachapi does not make a noticeable impact on the CAISO procurement and use of regulation resources. The minute-to-minute changes in the Tehachapi Wind Generation energy production are well within the control capability of the CAISO systems.

Increased generation capacity to Phase 2 – 1,600 MW; Phase 3 – 3,300 MW and Phase 4 – 4500 MWs is expected to have an impact on the amount of regulation resources required. Certainly Phase 3 and 4 will have an impact. Studies are still in progress to determine the magnitude of these impacts and these results should be available by summer 2006.

### 5. Load Following –Supplemental Energy Dispatch

Load following or Supplemental Energy Dispatches are used to rebalance the system every 5 minutes. The CAISO market based systems do an automatic supplemental energy dispatch every 5 minutes to follow increases/decreases in load and generation. These supplemental energy dispatches are often several hundred megawatts per hour. Generators typically have block hourly schedules or Preferred Operating Point (POP). Load however can vary by hundreds of megawatts in an hour so the supplemental energy dispatches are used to increment or decrement the generator schedules to make their energy production match the changes in system load. The Supplemental Dispatches change the real-time market-clearing price.

As can be seen in Figure 5.1 above, the Tehachapi energy production can vary from minimum to maximum or from maximum to minimum within a couple of hours. The existing 740 MW of Tehachapi wind generation can result in 50 to 250 MW of Supplement Energy Dispatch per hours during periods of major changes.

As the amount of wind generation increases in Tehachapi in Phases 1, 2, 3, and 4, there will be major increases in the amount of Supplemental Energy Dispatches. Figure 5.4 illustrates the size of the increases such as 200, 400, 500, 1,000 and even 1,500 MW per hour of supplemental energy dispatches, both increases and decreases[23]. Figure 5.4 also shows that the Tehachapi wind generation typically has major decreases in energy production morning load pickup period (6 AM to 10 AM). This will require the CAISO to send dispatch notices to other generation resources to either INC of DEC 2,000 to 3,000 MW of supplemental energy during some of these periods. The INC notices increase generation to make up for the decrease in wind generation energy production during the morning load pickup. The opposite situation will be true in the evening hours as the temperature sensitive load (air conditioning) is dropping off at the same time as the wind generation is increasing.

To successfully integrate the planned increase in Tehachapi wind generation, the CAISO will need many generating units to increase and decrease their supplemental energy bids. This will provide the flexibility needed to move the production of many units to keep the system in balance and meet frequency and control performance standards.

## 6. Ramps and Ramp Rates

A serious issue with the large amount of wind generation in the Tehachapi area is the hourly energy ramps, both positive and negative. To successfully integrate this large amount of generation into the control area will require a ramp-forecasting tool. This type of forecasting tool is different from the market energy-forecasting tool as its objective is to forecast the hourly energy ramps for the next day. This will enable the operator to get the system set up to handle the large ramps. The ISO will also need a real-time metrological forecasting tool that enables the operator to see large weather fronts that are approaching the Tehachapi area that will drive these large energy production ramps. The CAISO will work with the state agencies, the IOU's and the wind generation developers in the Tehachapi area to determine the best ramp-forecasting tool that would benefit all parties. Such a tool would assist the CAISO to integrate this much wind generation into daily operations.

## 7. Frequency Response Issues

[23] Figure 5.2 is based upon preliminary analysis and scale-up of historic data. Further investigation of new technology and its impacts is required.

The WECC[24] has decided to move ahead with a new Frequency Response Standard for the Western Interconnection. The WECC is considering adoption of the recommendations of the FRR[25] task force as published in their White Paper. The FRR standard will be written by the WECC MORC[26] Work Group and the goal is to have it reviewed and approved by the NERC[27] Board of Directors by the end of 2006.

The major issue for the CAISO is that the wind generators do not have a governor or any frequency response capability. Therefore, the ISO will have to have many other units on line that can provide the frequency response that will be required by the new WECC Standard in 2007.

## 8. Operating Reserves

The amount of operating reserves the CAISO procures today is not driven by the amount of wind generation. However, with the concentration 4,500 MW in the Tehachapi area, this may change.

If this generation is carried on two transmission lines, and it is producing at its maximum capability, the ISO would have to plan for the loss of as much as 2,300 MW of generation due to the loss of one line. This could become the ISO's MSSC[28]. A remedial action scheme may be required to trip wind generation in the event of a transmission line outage.

The CAISO's operating reserve requirement could increase by as much as 1,000 MW. This may not be a serious operating problem, as this would most likely occur at night and not during peak hours. Reserves would probably be available but added procurement would t increase costs.

## 9. Energy Production Fit with Daily Load Pattern

The wind generation energy production pattern for the Tehachapi area tends not to fit the daily load pattern and have a minimum amount of energy production across the afternoon peak load periods in the hot summer days. Morning load ramps tend to coincide with wind generation ramp-downs. The ideal solution is to have a large energy storage capability such as a new pumped storage system or other types of energy storage that can be used to shift the off-peak energy production to delivery during peak load periods. Unfortunately current energy storage technology is still too expensive to provide this capability and unless we have a national or state tax credit

[24] Western Electricity Coordination Council
[25] Frequency Response Reserve
[26] Minimum Operation Reliability Criteria
[27] North American Electric Reliability Council
[28]

plan for storage investments, it will be hard to finance investments in storage technology.

**10. Potential Over-Generation Conditions**

An issue that Operations encounters today with the current fleet of wind generation is the fact that the wind generation often peaks at night when the system is at minimum load. During off-peak hours in April, May and June, the ISO can experience over generation conditions when off-peak hydro generation levels are high due to heavy runoff and off-peak wind generation is high. Additional wind generation will increase the frequency and magnitude of over generation conditions.

**11. Capacity Factor for Meeting Summer Peak Loads**

The CAISO is calculating the actual capacity factor the Tehachapi wind generation for the past three years based upon the CPUC's formula for calculating the capacity factor. [29]

**12. Additional Issues**

The following list of actions is currently being studied by the CAISO in conjunction with the Intermittency Analysis Project at the CEC. Significant results are expected by December 2006.

1. Determine the best methodology for calculating the amount of regulation and load following resources that are needed on a month-to-month basis.
2. Determine the attributes required for new generation that can complement the production characteristics of wind generation and other renewable resources. Every type of generator has some type of limitation so we should determine the best mix of future generation types that meets operational requirements and energy reliability at reasonable cost.
3. Develop new concepts for automatic generation control and dispatch of controllable loads to assist with mitigating the impact of the variability of wind generation energy production.
4. Explore changes in interconnection scheduling protocols, policies and procedures to remove one of the barriers to moving wind generation energy between control areas.
5. Wind generators currently cannot increase energy output in response to frequency dips during system disturbances. What should be done to ensure the operator can meet interconnect performance standards.

[29] *[Cite to this document: This information should be available later by March 2006.]*

6. There are over-generation problems during light load periods. What can be done to increase the flexibility for reducing power output from all generation resources, including wind generation, during minimum load periods?
7. Explore the feasibility of using energy storage technology to shift off-peak energy production to delivery during peak load periods.
8. Improve wind energy forecasting tools and weather forecasting.
9. Develop procedures and protocols with wind generators for controlling large ramps up and down during periods of high wind variability such as major storms.

# Chapter 6

# Recommended Facilities for Each Phase of Development

Since its first report to the CPUC, the TCSG has continued to examine various potential transmission lines to reliably connect the Tehachapi WRA to the California grid. This chapter summarizes the TCSG findings, describes the current status of the Tehachapi plan and recommends actions to complete the plan.

## *6.1 Key Considerations for Connecting Tehachapi to the Grid*

The northern and southern sections of California's electricity grid currently are connected by three high voltage transmission lines known collectively as Path 26. The northern terminus of Path 26 is PG&E's Midway substation at the southern end of Path 15. SCE's Vincent substation, which connects to several lines feeding southern California, is the southern terminus of Path 26. The Tehachapi WRA lies east of Path 26, as shown in Figure 6.1, and connections from Tehachapi to the grid can be made either to Northern or Southern California or to both regions.

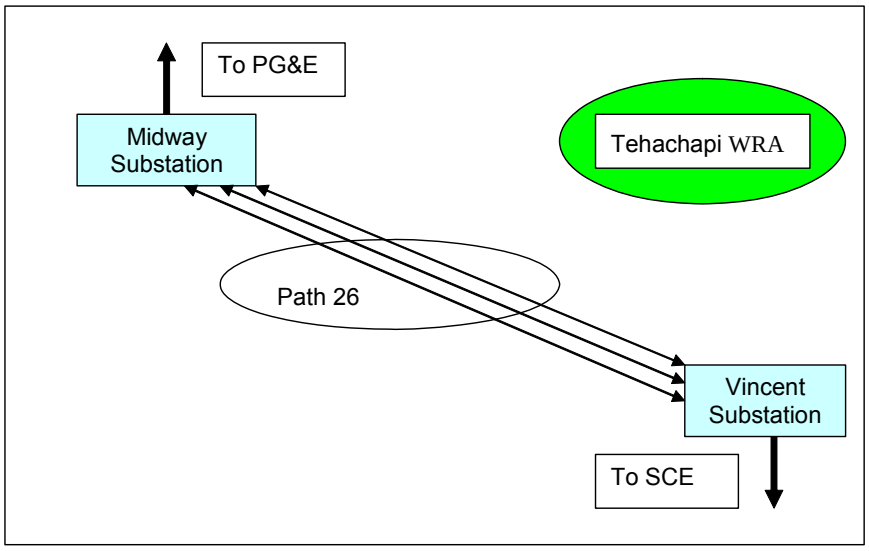



***Figure 6.1***

Based on the direction of the CPUC in D.04-06-010, the TCSG uses 4,500 MW as the total projected output in the Tehachapi WRA[30]. As of the date of this report, Tehachapi wind projects totaling about 3,600 MW have submitted interconnection requests to the CAISO for processing. The ultimate eventual generation capacity from Tehachapi is unknown, of course, and may be more or less than the assumed 4,500 MW. Nevertheless, the TCSG continues to believe that 4,500 MW remains the appropriate planning target.

TCSG identified three 500 kV connections as being needed to reliably export Tehachapi generation to the grid. An alternative approach of connecting Tehachapi with only two high-capacity 500 kV lines is reported in Section 6.8 below. [31]

Prior to the inception of the TCSG, SCE had developed a conceptual transmission plan that included one 500 kV connection between Tehachapi and Southern California via the SCE Vincent substation.[32] This SCE plan became the basis for TCSG Phases 1 & 2 as described in its earlier report. An updated description of Phase 1 and 2 facilities is included below.

Since issuing its March 16, 2005 report, the primary effort of the TCSG has been to examine feasible connections for the second and third 500 kV lines connecting Tehachapi to the grid. The overriding issue has been whether or not to connect to both Northern and Southern California. While the TCSG has roughly estimated the costs of this option, it could not fully evaluate the benefits to the state's electricity network or the impact of the options on grid operations. The TCSG therefore does not now have a consensus recommendation for whether the second and third major Tehachapi connections should include a new 500 kV line from Tehachapi to Midway, and if so, whether that line should be built before or after a second 500 kV line connection from Tehachapi to Southern California.

The California Independent System Operator (CAISO) has developed a Transmission Economic Assessment Methodology (TEAM) which is used to evaluate the costs and benefits of transmission proposals. The TEAM analyzes how proposed facilities affect physical flows and market prices (i.e., reliable operation of the grid, congestion relief, access to new (lower cost) generation). In addition, CAISO grid operations experts can evaluate the impacts of new transmission options on grid management. The TCSG therefore recommends that

[30] As described in Chapter 1, the 4,500 MW was initially made up of approximately 4,000 MW develop in the Tehachapi region proper and 500 MW in the Antelope Valley region. As of the date of this report, projects totaling approximately 1,300 MW have requested interconnection to the CAISO Grid in the Antelope Valley region. There is also 740 MWof existing wind generation connected to the SCE grid over either SCE 66 kV lines or over the privately owned Sagebrush line.

[31] There is also a possibility that power lines in the region owned by the Los Angeles Department of Water and Power and by a private corporation could be utilized to export some Tehachapi generation. If so, these lines might serve as the third connection between Tehachapi and the EHV grid.

[32] SCE Renewable Conceptual Transmission Plan, filed August 29, 2003.

further development of the Tehachapi conceptual transmission plan be conducted under the auspices of the CAISO.

## *6.2 Phase 1: First 500 kV Connection to Southern California*

Phase 1 development consists of three segments, with all facilities to be built by SCE:

Segment 1, the "Antelope to Pardee Transmission Project," consists of a new 25.6 mile, 500 kV transmission line connecting the Antelope and Pardee substations. This line would initially be operated at 220 kV.

Segment 2, the "Antelope to Vincent Transmission Project," includes the construction of a new 21.5 mile, 500 kV transmission line to connect SCE's existing Antelope Substation, located in Lancaster, with SCE's existing Vincent Substation located near Acton. This line would be built on new right-of-way to be acquired over private land between the two existing substations, both in Los Angeles County. This line would be initially operated at 220 kV.

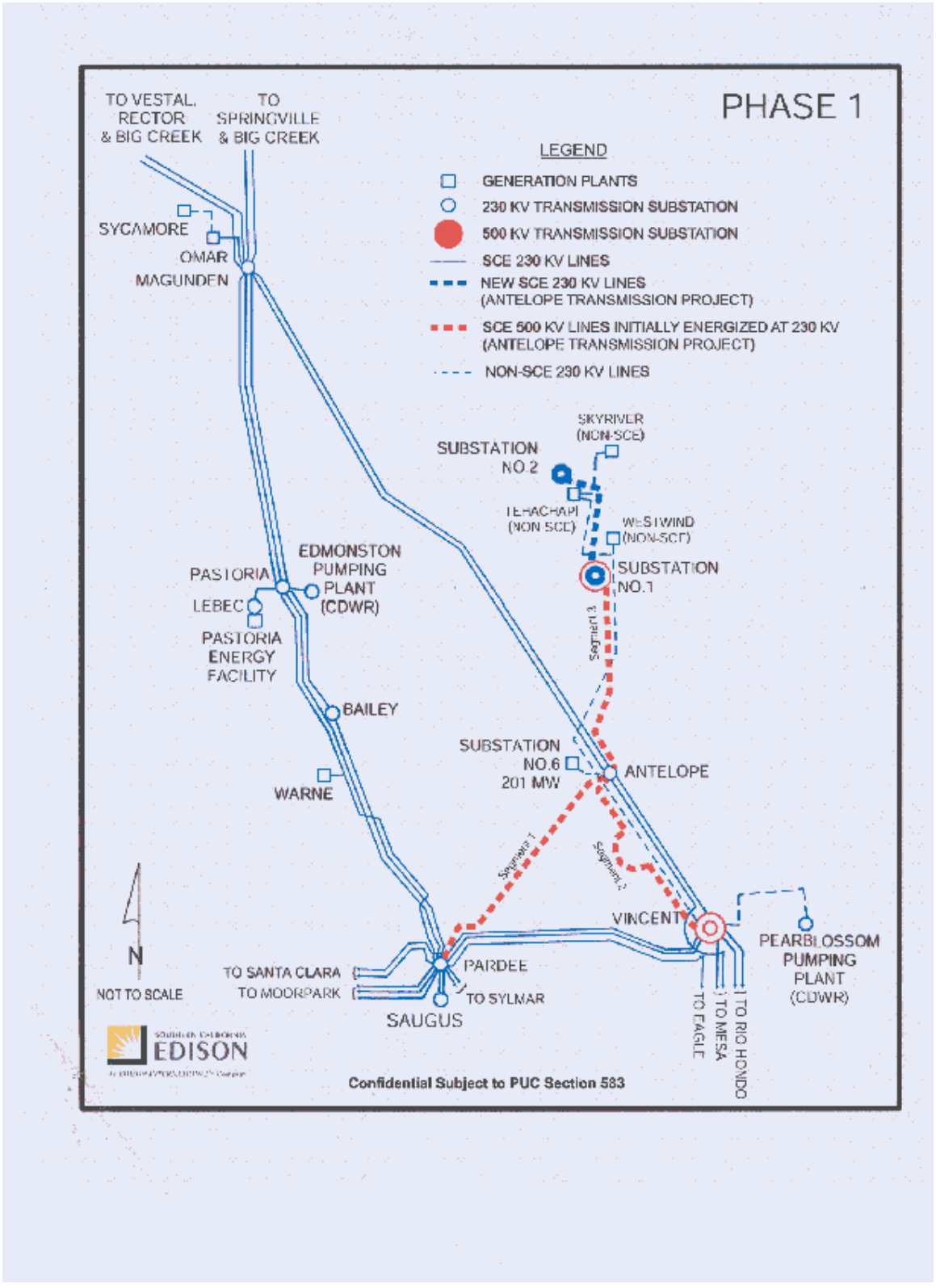
Segment 3, the "Antelope to Tehachapi Transmission Project," includes four elements:

- A new 26.1 mile, 500 kV transmission line to connect SCE's Antelope Substation with a new Tehachapi Substation One to be located near Cal Cement. This line would be initially operated at 220 kV.
- A new 500/220/66 kV substation (Tehachapi Substation One).
- A new 220/66 kV substation (Tehachapi Substation Two) near Monolith.
- A new 9.4 mile, 220 kV transmission line to connect Substation One with Substation Two.

SCE refers to Segments 1-3 collectively as the Antelope Transmission Project. It submitted separate CPCN applications for Segment 1 (A.04-12-007) and for Segments 2 & 3 (A.04-12-008) on December 9, 2004, and filed an amended application for Segments 2 & 3 on September 30, 2005.

The total wind generation able to be exported with Phase 1 upgrades is 700 MW. These upgrades are shown in Figure 6.2.

The environmental documents for Segment 1 (Antelope-Pardee) are scheduled to be released for public review by August 30, 2006. The CPUC could thus act to approve Segment 1 in October 2006.


PHASE 1
TO VESTAL, RECTOR & BIG CREEK
TO SPRINGVILLE & BIG CREEK
LEGEND
GENERATION PLANTS
230 KV TRANSMISSION SUBSTATION
500 KV TRANSMISSION SUBSTATION
SCE 230 KV LINES
NEW SCE 230 KV LINES (ANTELOPE TRANSMISSION PROJECT)
SCE 500 KV LINES INITIALLY ENERGIZED AT 230 KV (ANTELOPE TRANSMISSION PROJECT)
NON-SCE 230 KV LINES
SYCAMORE
OMAR
MAGUNDEN
SKYRIVER (NON-SCE)
SUBSTATION NO 2
TEHACHAPI (NON SCE)
WESTWIND (NON-SCE)
SUBSTATION NO.1
EDMONSTON PUMPING PLANT (CDWR)
PASTORIA
LEBEC
PASTORIA ENERGY FACILITY
BAILEY
WARNE
SUBSTATION NO.6 201 MW
ANTELOPE
Segment 3
Segment 1
Segment 2
VINCENT
PEARBLOSSOM PUMPING PLANT (CDWR)
PARDEE
TO SANTA CLARA
TO MOORPARK
TO SYLMAR
SAUGUS
TO EAGLE
TO MESA
TO RIO HONDO
N
NOT TO SCALE
EDISON
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### *Figure 6.2. Phase 1 Upgrades*

In March 2006, the CPUC hired its environmental consultant to review the environmental studies conducted by SCE for Segments 2 & 3. The CPUC expects to have draft environmental documents for these segments available for public review by December 2006. The CPUC is expected to rule on Segments 2 & 3 in mid-2007.

## *6.3 Phase 2A: Antelope to Substation No. 5*

The intent to construct new transmission evidenced by the Phase 1 CPCN filings made it possible for wind generation companies to advance their projects in the region. Since those filings, more than 1,100 MW of wind projects have entered the CAISO queue requesting interconnection to Substation No. 5. A developer proposing the first 300 MW of the total is evaluating permitting Substation No. 5. Assuming a temporary operating solution is approved, a Permit to Construct (PTC) could potentially allow a portion of the project to be in service before construction of additional network facilities is complete.

The remainder of the generation resources connecting at Substation No. 5 may require construction of at least one new 18.6 mile, double circuit 230 kV transmission line from the Antelope Substation to the new 230 kV Substation No. 5. This transmission line and new 230 kV Substation No. 5 were identified as part of Phase 2 development facilities in the TCSG March 2005 report. It is the TCSG's understanding is that the construction of these facilities may be permitted as a Permit to Construct (PTC), while the new lines might require a CPCN. Facilities to be located north of Antelope/Vincent may be permitted separately from the facilities to be located south of Antelope/Vincent.

## *6.4 Phase 2B: Network Upgrades of the SCE System*

The second phase of Tehachapi transmission development consists of network upgrades of the SCE system needed to enable power to flow from the Antelope-Vincent substation area to Southern California load centers. In the TCSG March 2005 report, these were identified collectively as the Antelope-Mesa upgrades. Part of the cost of these upgrades may be in common or shared with SCE's planned Vincent-Mira Loma 500 kV transmission line (T/L) project. These upgrades will increase cumulative Tehachapi export capacity to 1,600 MW. The major components of these upgrades include:

- Tear down and rebuild the Antelope-Mesa and Antelope-Vincent 230 kV T/L between Antelope and Vincent with a second new 500 kV T/L. (The

first new Antelope-Vincent 500 kV T/L is to be built in Phase 1, Segment 2).

- Tear down and rebuild the section of the existing Antelope-Mesa 230 kV T/L between Vincent and Rio Hondo with a third Vincent-Rio Hondo 500 kV T/L, initially operated at 230 kV.
- Tear down and rebuild the section of the existing Antelope-Mesa 230 kV T/L between Rio Hondo and Mesa with a second Rio Hondo-Mesa 230 kV T/L.

CPUC Resolution E-3969 (February 16, 2006) ordered SCE to perform the studies necessary for the preparation of PEAs and the filing of CPCNs by the end of 2006 for these Antelope-Mesa upgrades and for the Antelope-Tehachapi Substation 5 230 kV transmission line.

Phase 2 upgrades are shown on Figure 6.3 below.

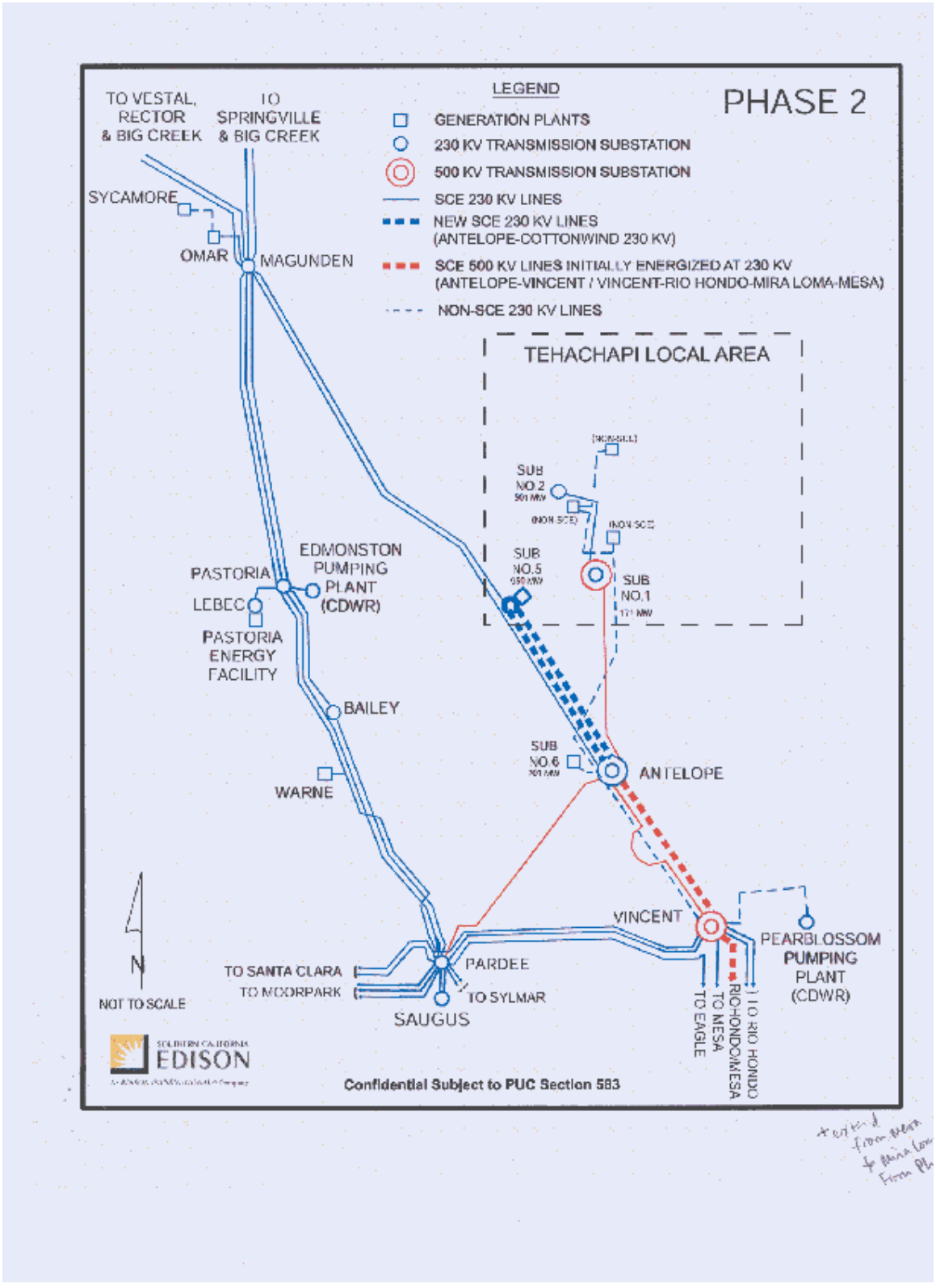
PHASE 2
LEGEND
GENERATION PLANTS
230 KV TRANSMISSION SUBSTATION
500 KV TRANSMISSION SUBSTATION
SCE 230 KV LINES
NEW SCE 230 KV LINES
(ANTELOPE-COTTONWIND 230 KV)
SCE 500 KV LINES INITIALLY ENERGIZED AT 230 KV
(ANTELOPE-VINCENT / VINCENT-RIO HONDO-MIRA LOMA-MESA)
NON-SCE 230 KV LINES
TEHACHAPI LOCAL AREA
TO VESTAL, RECTOR & BIG CREEK
TO SPRINGVILLE & BIG CREEK
SYCAMORE
OMAR
MAGUNDEN
SUB NO.2
SUB NO.5
SUB NO.1
SUB NO.6
EDMONSTON PUMPING PLANT (CDWR)
PASTORIA
LEBEC
PASTORIA ENERGY FACILITY
BAILEY
WARNE
ANTELOPE
VINCENT
PEARBLOSSOM PUMPING PLANT (CDWR)
PARDEE
TO SANTA CLARA
TO MOORPARK
TO SYLMAR
SAUGUS
TO EAGLE
TO MESA
RIO HONDO/MESA
TO RIO HONDO
N
NOT TO SCALE
SOUTHERN CALIFORNIA EDISON
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***Figure 6.3. Phase 2 Upgrades***

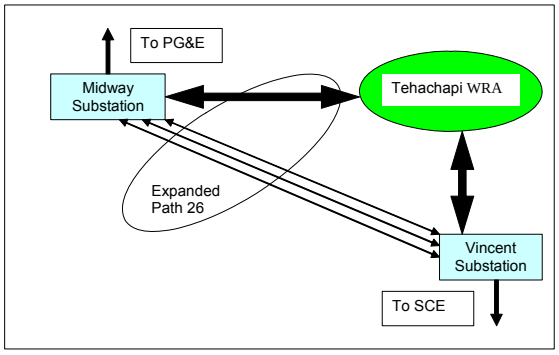
## *6.5 Alternatives for the Second and Third Tehachapi Connections*

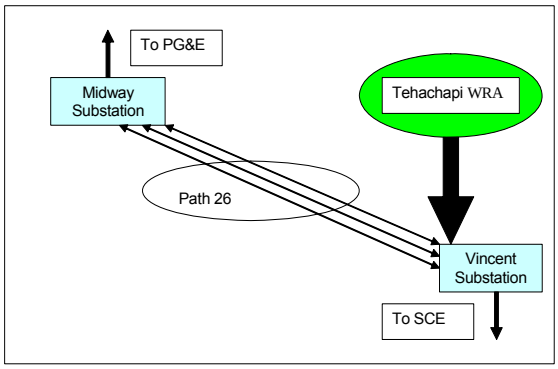
Following the Phase 2 network upgrades, two additional 500 kV connections will be needed, one in each of Phase 3 and Phase 4. These lines could be configured as two lines from Tehachapi to the south/SCE system; or alternatively, as one line to the north/PG&E system and one line to the south.

In the first TCSG report to the CPUC, Phase 3 consisted of a second 500 kV transmission line connecting Tehachapi with the Southern California grid. Phase 4 of that plan considered a connection to Northern California. It must be emphasized that the phase numbering was for identification purposes only and was not meant to imply that construction of the phases occur in the numbered order.

A connection between Tehachapi and Northern California, together with one or more connections to Southern California, would constitute an additional link in Path 26, the major transmission artery connecting Northern and Southern California. The TCSG refers to this alternative (Figure 6.4 below) as the Expanded Path 26 option. This configuration is expected to be considered a "network facility" which would provide two important benefits to the California grid, namely additional reliability, operating flexibility and additional import capacity into Southern California[33] when Tehachapi generation is low.[34]

***Figure 6.4. Expanded Path 26 Option Figure 6.5. Gen-tie Option***




[33] Additional transmission facilities will be needed to transmit power to the SDG&E system.

[34] A frequent criticism of wind power is that "the wind doesn't blow all the time." A transmission plan that enables additional power transfers during periods of low wind generation would allow the CAISO to manage the variability of wind generation more easily.

The Gen-Tie Option (see Figure 6.5) would provide Tehachapi with access to the grid only at substations in Southern California.[35] In this option, all three of the 500 kV lines necessary to export Tehachapi power would extend south from Tehachapi. Providing access to Tehachapi wind power would be the primary benefit of this alternative. Power lines which serve only to connect generation to the grid are referred to as generation tie lines or "gen-ties", and the TCSG calls this the Gen-tie option. The feasibility of constructing a third 500 kV line from the Tehachapi area to Vincent in the Gen-tie option may be complicated, however, due to the rapid urbanization of the Antelope Valley which lies between the Tehachapi and Vincent substations.

The Expanded Path 26 option could complicate grid management, however, since some power from Tehachapi would flow on existing Path 26 lines and use some of the path transfer capacity. This could complicate grid operations as operators must consider these variable flows when scheduling power into Path 26. Under the Gen-tie option, management of Path 26 flows would be simpler. Further study of these alternatives from a grid operations standpoint will be required. The TCSG does not have the data to conduct these studies.

The results of production cost simulations comparing the two alternatives are discussed in Chapter 3. Costs for the two configurations appear comparable, estimated to be in the neighborhood of $1 billion. A choice between the two alternatives hinges on benefits of each that the TCSG has not yet been able to quantify.

Issues related to reliability, grid operations and network benefits are beyond the expertise of the TCSG. Resolving these issues will require both more active assistance from the CAISO and more active involvement of the CPUC. The TCSG therefore makes the following recommendation:

> Recommendation #1
> The TCSG recommends that additional study of Phases 3 and 4 be conducted expeditiously under the auspices of the CAISO in a forum that is open and collaborative, similar to the TCSG process to date.

To resolve which facilities should be built in Phase 3, CPUC Resolution E-3969 orders SCE to submit a recommendation by 12/31/06, for preferred and alternate routes for three options: Tehachapi Substation One to Midway Substation; Tehachapi Substation One to Vincent Substation; or other alternative.

[35] SCE's Antelope substation lies between Tehachapi and Vincent. Power exported south from Tehachapi might enter the grid either at Antelope or at Vincent substations.

Together with the CAISO analysis of the Expanded Path 26 option (Tehachapi-Midway) and the Gen-Tie option (Tehachapi-Vincent), this will determine which facilities should be built first.[36]

The component facilities of Phase 3 and Phase 4, regardless of which is built first, are described in the following sections.

## *6.6 Phase 3: Second 500 kV Connection to the Grid*

Phase 3 will bring cumulative Tehachapi export capacity to 3,300 MW. As noted above, the numbering of phases 3 and 4 is not intended to indicate development or construction priority.

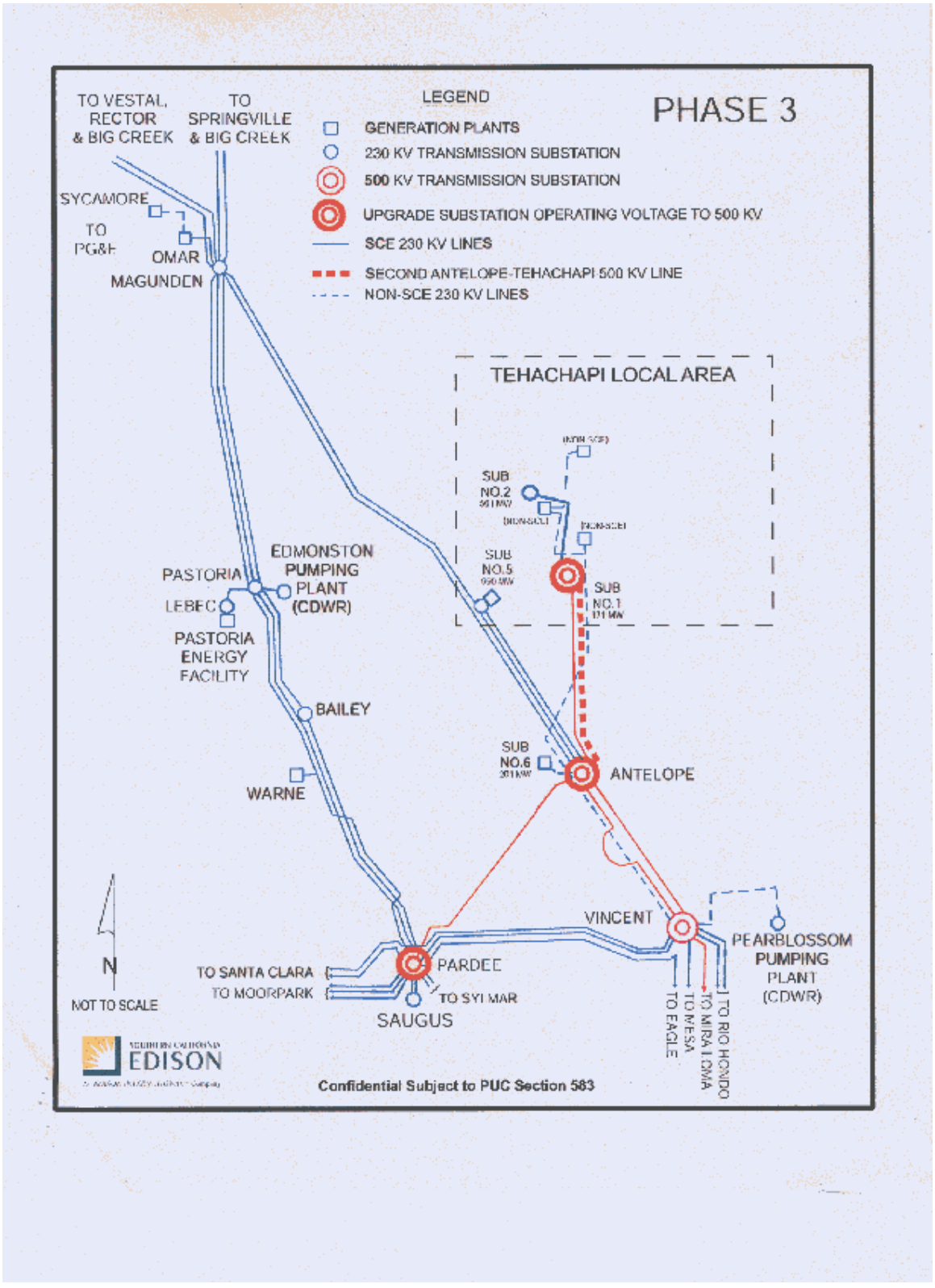
Phase 3 upgrades, as presented on Figure 6.6, shows the Antelope-Tehachapi #2 500 kV line added to Phase 1 and Phase 2 upgrades. In its first report, the TCSG contemplated that the second southern line would connect to the grid through the Vincent substation. Given the Phase 2 upgrades of the SCE system south of Antelope, the TCSG now believes that a second 500 kV line will be required only between Tehachapi and the SCE Antelope substation.

In Phase 3, all of the 500 kV facilities built in Phases 1 and 2 but energized initially at 230 kV will then be operated at 500 kV. This will entail the conversion of the Antelope, Pardee, Tehachapi and Vincent substations to 500 kV. More specifically, this will require adding one 500 kV transformer bank to the Antelope Substation, and to the Pardee Substation; adding three 500 kV transformer banks to the Tehachapi Substation One; and adding and equipping a breaker-and-a-half 500 kV bay at the Vincent 500 kV Substation.

Operating the Tehachapi transmission facilities at 500 kV will also require additional reactive support equipment throughout the SCE service territory.

CPUC Resolution E-3969 orders SCE to immediately pursue further environmental, engineering and other studies necessary to support approval of all the transmission facilities included in planning Phases 1, 2 and 3 of the 2005 report. The Resolution states further that the CPUC will order the preparation of a PEA and the filing of a CPCN for the preferred second 500 kV connection from Tehachapi to the EHV grid by 12/31/07. The TCSG recommends that the Commission direct its Energy Division to work with SCE to ensure that complete CPCN applications for Phases 2 and 3 are filed as soon as possible.

[36] The CAISO may identify other connection alternatives and/or other network upgrades necessary to accommodate the very significant amount of Tehachapi energy as well.


PHASE 3
LEGEND
GENERATION PLANTS
230 KV TRANSMISSION SUBSTATION
500 KV TRANSMISSION SUBSTATION
UPGRADE SUBSTATION OPERATING VOLTAGE TO 500 KV
SCE 230 KV LINES
SECOND ANTELOPE-TEHACHAPI 500 KV LINE
NON-SCE 230 KV LINES
TO VESTAL, RECTOR & BIG CREEK
TO SPRINGVILLE & BIG CREEK
SYCAMORE
TO PG&E
OMAR
MAGUNDEN
TEHACHAPI LOCAL AREA
SUB NO.2
SUB NO.5
SUB NO.1
SUB NO.6
ANTELOPE
EDMONSTON PUMPING PLANT (CDWR)
PASTORIA
LEBEC
PASTORIA ENERGY FACILITY
BAILEY
WARNE
VINCENT
PEARBLOSSOM PUMPING PLANT (CDWR)
PARDEE
TO SYLMAR
TO SANTA CLARA
TO MOORPARK
SAUGUS
TO EAGLE
TO MESA
TO MIRALOMA
TO RIO HONDO
N
NOT TO SCALE
EDISON
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### *Figure 6.6. Phase 3 Upgrades*

## *6.7 Phase 4: Possible Third 500 kV Connection to the Grid*

Phase 4 adds a third 500 kV connection between Tehachapi and the EHV grid. This would increase the cumulative export capacity to 4,500 MW. As noted, the numbering of phases 3 and 4 is not intended to indicate development or construction priority. Further study will identify the least cost interconnection configuration, and determine the need for three lines.

Phase 4 can be configured in either of two alternative ways:

- as an expansion of Path 26, with a new 500 kV line from Tehachapi Substation One to the PG&E Midway Substation. This configuration is shown on Figure 6.7 below. The TCSG calls this the Expanded Path 26 option.
- with a third 500 kV line from Tehachapi Substation One to the SCE Vincent Substation. Figure 6.8 diagrams this configuration, which is labeled, "Radial to SCE." The TCSG refers to this as the Gen-Tie option.

In the latter case, all three 500 kV lines would connect Tehachapi generation to the SCE system; there would be no direct connection to the PG&E system/Northern California.

The TCSG anticipates that the CAISO studies necessary to identify the relative grid impacts and costs/benefits of these two alternative configurations will be completed later in 2006. Given that 3,600 MW of wind projects have already applied for interconnection in the Tehachapi region, environmental studies and permitting for Phase 4 should begin immediately after the choice of routing for the third 500 kV connection is made.

## *6.8 4,000 MW from Tehachapi Over Two Circuits*

The possibility of using only two not three circuits emerged after studies of three lines were well under way. Although few collaborators could support the alternative at this late date the CPUC Energy Division staff, due to potential substantial capital cost savings, urges the CAISO to assess the two-circuit alternative within its further study of Phases 3 and 4.

In the July 14, 2004 Tehachapi Study Plan, and results as presented in the 2005 report, all transmission alternatives to interconnect Tehachapi generation assumed conventional capacity (well under 2000 MW) for each of three 500 kV circuits. However, it has since been learned that for its Phase 1 segments the thermal limit of SCE's standard design 500kV circuit is 3400MW. Staff's initial

analysis indicates that only two such circuits could potentially deliver 4,000 MW from Tehachapi Substation 1 to the existing network and that a single circuit may suffice under emergency conditions. System performance for specific contingencies must still be assessed, and there could be problems with voltage support and possibly stability under the N-1 condition. The CAISO should identify the problems, formulate measures to mitigate them, and compare the cost of mitigation to the cost of the third circuit to Antelope or to Midway.

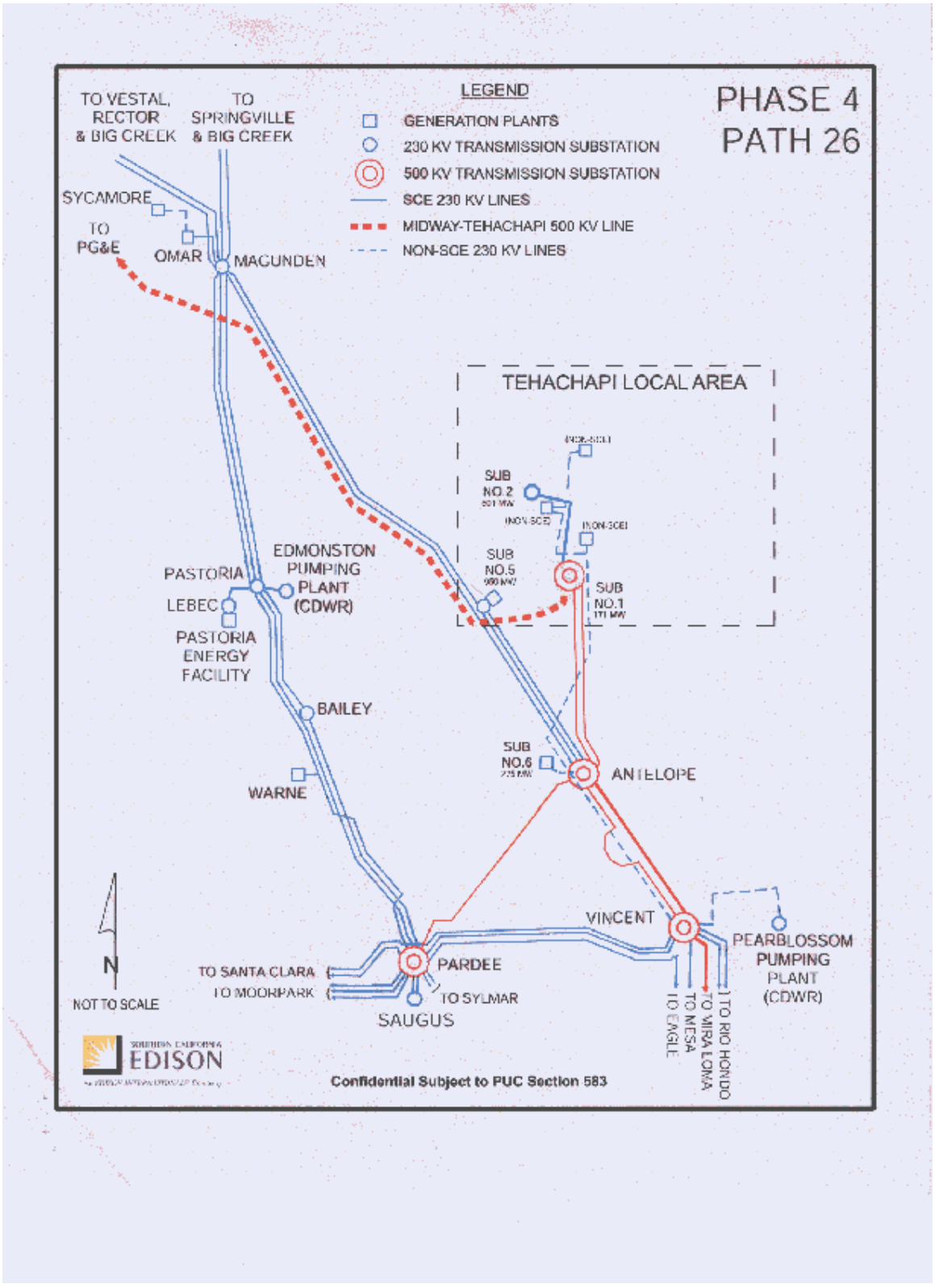



***Figure 6.7. Phase 4 Upgrades, Expanded Path 26***

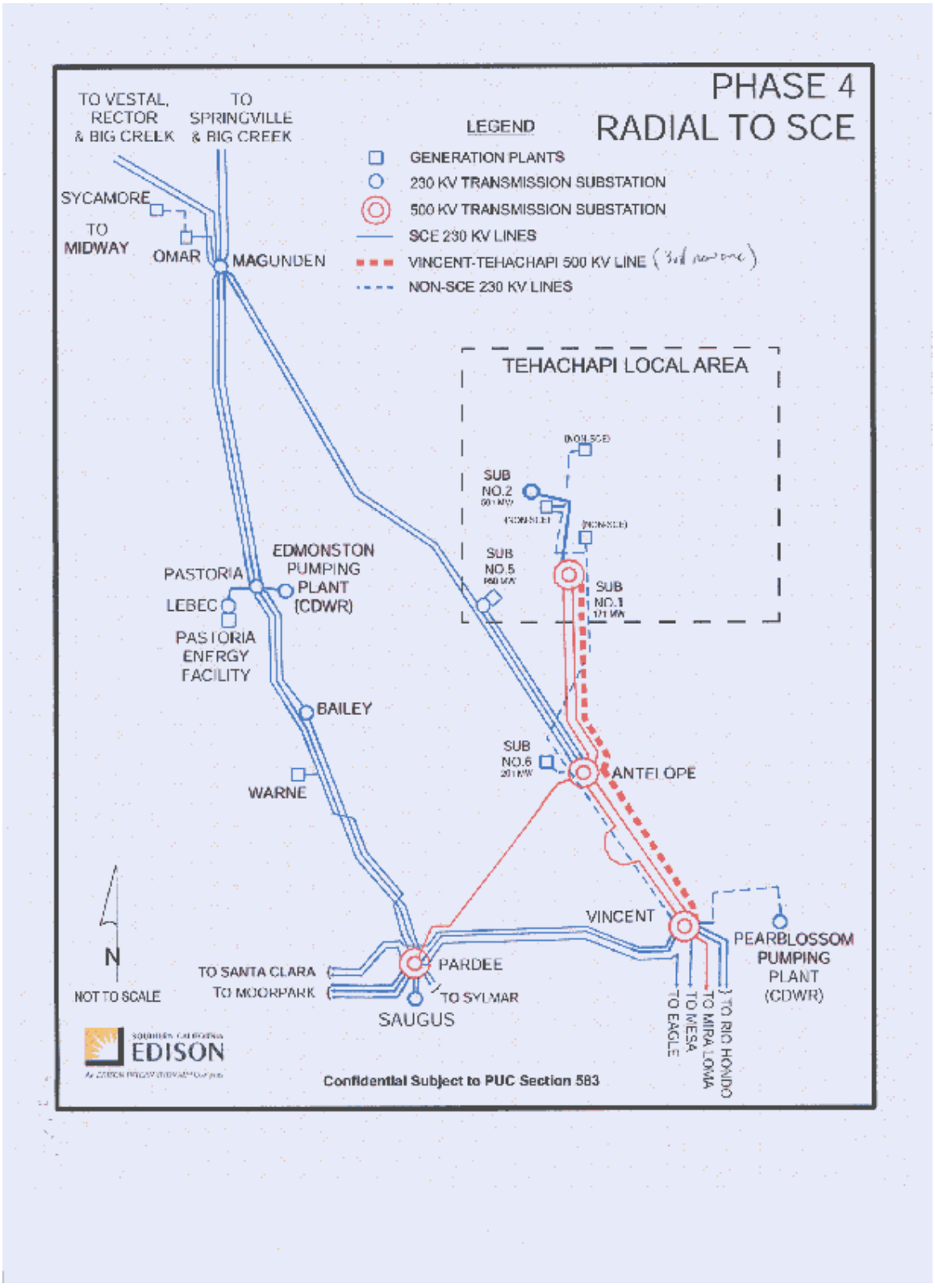



***Figure 6.8. Phase 4 Upgrades, Gen-Tie Option***

# CHAPTER 7

# POLICY AND IMPLEMENTATION ISSUES

## Cost Recovery Issues

This chapter explains the necessity of using the P.U. Code Section 399.25 backstop provisions regardless of the type of transmission upgrade. It also explains the uniqueness of the Tehachapi transmission project: there is at present no pre-construction assurance of cost recovery for construction costs. Finally, it explains that the cost-recovery backstop provided by Section 399.25 is necessary to solve the problem.

### *7.1 The Uniqueness of Tehachapi: Why Advance Assurance of Cost Recovery is Required*

The Tehachapi transmission project differs from most major transmission projects because of its relationship to the interconnected generating units. This difference affects the principles and process by which cost recovery certainty is obtained for Tehachapi's sponsor.

In the customary situation, a major transmission upgrade is constructed to accommodate a known, large generating plant. In this case, the generating facility can plan and pay for an appropriately sized interconnection facility with the in-service dates of each facility coinciding. In addition, traditional generation facilities can be located in areas that minimize the need for transmission facility upgrades.

The Tehachapi project, in contrast, is spawned by the anticipated construction of a large number of small wind generation projects to support the state's RPS mandate. These projects must be located in the relatively remote area where the renewable resource exists. Constructing interconnection facilities to support each project as it materializes would lead to numerous gen-tie facilities from Tehachapi to Antelope and other low-voltage facilities that would have to be replaced with higher-voltage facilities later -- an environmentally and

economically irresponsible approach. Yet, no single wind project can bid a project that includes the cost of an upgrade that will efficiently accommodate the other projects in the resource area. This is due in part to the long lead time required for large transmission projects; developers cannot reliably price power from a project that cannot be built for several years due to lack of transmission capacity.[37]

The solution for the Tehachapi WRA is for the utility to plan, finance and construct transmission facilities that are sized to accommodate the expected wind generation projects. This, in turn, requires the utility to be assured of cost recovery in the absence of firm generator commitments to utilize 100% of the upgrade capacity.

## *7.2 The Source of Assurance of Cost Recovery: P.U. Code Section 399.25*

California utilities will not begin construction without assurance of cost recovery. Section 399.25 authorizes the PUC to offer that assurance, if the costs are prudent.

Such assurances must be made whether the upgrade is "network" or "non-network." For a **network upgrade**, built before interconnection agreements, FERC will protect the utility from disallowance due to insufficient demand, if certain criteria are met.[38] This protection does not translate into advance assurance of cost recovery. Pursuant to customary FERC practice, the utility may not seek cost recovery until construction is complete. For this reason, in its recent Resolution E-3969, the CPUC has provided backstop cost recovery assurances for Tehachapi planning and permitting costs for various but not all elements of the recommended plan contained in this report.. This same assurance will be necessary for construction costs, at the time that the CPUC approves each CPCN application. This assurance is truly backstop, since a facility's network status, and FERC's announced protection from disallowance in the event of excess capacity, will translate into cost recovery through FERC-jurisdictional transmission rates. However, there remains a possibility

[37] A developer will not place its equipment order without knowing the in-operation date. Absent placement of equipment orders, equipment prices -- which can be affected by currency exchange rates, primary resource costs, and turbine supply/demand issues -- are unpredictable. Compounding the problem is uncertainty in future federal tax benefits. On the other side of the table, the purchasing utility is unlikely to sign a bid whose price is uncertain. For the same reasons, it is difficult for developers to sign interconnection agreements.

[38] With respect to interconnection-related network upgrades, the TCSG expects that utilities can be encouraged to exercise their discretion to provide up-front funding if FERC provides early assurances of cost recovery, including 100% recovery for abandoned plant. FERC has already indicated its willingness to work with California utilities in this regard. See *Southern California Edison Company*, 112 FERC ¶ 61,014 (2005) at para. 61. The TCSG hopes FERC would grant similar relief to all California utilities proposing to make similar investments in network upgrades needed to help facilitate the development of renewable resources.

that FERC's view of what should have been built will differ from the Commission's; the backstop is also necessary to cover these potential instances.

> For a **non-network upgrade**, the cost cannot be expected to be recovered in FERC-jurisdictional transmission rates.[39] In this non-network context, Section 399.25 provides the only path to cost recovery assurance; all planning and construction costs will be recovered from retail ratepayers and/or from generators on a pro-rata basis after each generator comes on line.

The details of how these cost recovery provisions should be implemented are being addressed in I.05-09-005, where the parties have submitted briefs and reply briefs and a final decision is expected in May 2006.

## *7.3 Cost Recovery Recommendations*

A. The Commission should issue a final decision on cost recovery policy according to the schedule set forth in I.05-09-005, resulting in a final decision by May 2006. That decision should be applied to the Tehachapi case based on these principles:

   a.) The individual generator would be responsible for construction of an individual gen-tie from its project site to a designated new substation(s) identified in this plan whose function is to be a collection point for shared transfer of multiple projects to the common grid. Presumably the generator would recover this cost in the price it charged for the project's energy output. The recovery risk for the cost of this gen-tie is solely on the generator.

   b.) For transmission projects that are needed for reliability or to promote economic efficiency within the meaning of the CAISO Tariff, but are also needed to facilitate achievement of RPS goals, "all feasible [CPUC] actions" should include, at a minimum: (1) supporting Participating Transmission Owner (PTO) requests for CAISO approval for addition of the project to the CAISO-controlled grid; (2) supporting utility requests for the recovery of the prudently-incurred costs of such projects within FERC-jurisdictional rates; and (3) allowing

[39] SCE petitioned FERC to allow the multiple-generator Tehachapi "trunk line" to be rolled into rates, but its petition was rejected on the basis of SCE's and the ISO's assertion that the upgrade would be devoid of network benefits; for FERC to have enabled roll-in, network benefits are required under the FERC's precedents.

recovery in retail rates of the costs of any such projects that are not approved for inclusion in FERC rates.

c.) For projects that are not needed for reliability or to promote economic efficiency within the meaning of the CAISO Tariff, and therefore would not be needed but for the interconnection of new generation, but *are* "network upgrades" for which a utility may be willing to exercise its discretion to provide up-front funding under federal interconnection policy, the Commission's actions should include: (1) supporting utility requests to FERC for early cost recovery assurances, including exceptions to abandoned plant policy, as well as reasonable arguments that the facilities in question are "network facilities" rather than "direct assignment facilities" or "gen-ties"; (2) after the facilities are placed in service, supporting utility requests for the recovery of prudently-incurred costs within FERC jurisdictional rates; and (3) allowing recovery in retail rates of any such costs that are not approved for inclusion in FERC rates.

d.) Finally, for high-voltage, bulk transfer generation-tie lines serving multiple RPS generators that are not needed but for the interconnection of new renewable generation and also do not qualify as network facilities, the Commission should allow full recovery of prudently-incurred costs. These costs would be recovered in retail rates and/or from generators. For the Tehachapi plan, the utility would exercise the option to fund and construct such facilities built in advance of generation. The exact locations/sizes/construction timing of these collection points would be determined as individual generation projects matured.

B. The Commission should provide cost recovery assurances for planning and permitting costs to all elements related to integration of Tehachapi WRA generation.

While this chapter has focused on providing cost recovery assurance for utilities, the TCSG points out that an essential purpose of this assurance is also to provide reasonable regulatory certainty to generators as to what costs they will be responsible for before committing to a fixed-price bid and securing financing for a project Therefore, the TCSG further recommends the following:

C. The Commission should provide generators with reasonable certainty concerning the transmission costs they will be responsible for before the generator is required to make a binding price bid. The CPUC should require the utility to develop a estimate of the pro-rated facilities charge it will assess to generators interconnecting to the authorized facilities before construction of the transmission facilities commences.[40] Various solutions may be possible. For example: any costs exceeding this amount could be recoverable through the ratepayer backstop;[41] or, the generator could be allowed to adjust its PPA according to actual costs.

## 7.4 Existing CPUC Transmission Permitting Process

The CPUC reviews regulated utility transmission projects under the present requirements of PUC Section 1001 and 1002, General Order 131-D, Rule 17.1 and the CPUC Decision 89905 Appendix B Information and Criteria List (Criteria List) for the Proponent's Environmental Assessment (PEA) filings. In addition, to the requirements and practices of the proceeding process, the CPUC, as Lead Agency, must comply with the CEQA process. Further, if the project has not been determined to be exempt, the CPUC ED staff must also conduct a contract process for an environmental consultant under the requirements of state contracting and General Order 163A.

***Processing Non-Exempt 131-D PTC and CPCN Projects***

The CPUC transmission review for a Permit to Construct (PTC) or a Certificate of Public Convenience Necessity (CPCN) is generally conducted in the following steps with the ALJ general proceeding and the CEQA process in somewhat parallel tracks:

**CEQA Process**

1. Application and PEA is filed with the CPUC.

2. If the project is not 131-D or CEQA exempt, a contract process must be initiated for an environmental consultant. Completing the contract process takes 3 to 4 months and has taken place either before or after the filing of the application. It requires the completion of the contract request process, advertisement of the Request for Qualifications (RFQ) for at least 4 weeks; review of the Statement of Qualifications (SOQs); consultant interviews; completion of evaluations; contract package preparation; and Department of General Services (DGS) approval.

[40] That charge will be a component of the standard interconnection agreement that the parties file at FERC.

[41] Potentially charging ratepayers for a share of costs may be particularly appropriate when the upgrade provides system benefits (though short of what is required to achieve "network" status) or when the upgrade is expected eventually to become part of a larger network configuration.

3. Contractor and the CPUC Project Manager (PM) review the application using the PEA Information and Criteria List and generally do 1 to 2 rounds of PEA deficiency reviews with the first required in 30 days per GO 131-D and CEQA Guideline15101.

4. After the application is deemed complete, a determination must be made on whether an Environmental Impact Report (EIR) or Mitigated Negative Declaration/Negative Declaration (MND/ND) is necessary. This is usually based on the conclusions of a consultant prepared initial study that utilizes the PEA information.

5. Environmental Document Preparation for EIR or MND

***Draft Environmental Impact Report (DEIR) Major Tasks***

- DEIR preparation involves site visits; incorporating and supplementing, as necessary, PEA information; clarifying the project description; developing and screening alternatives; consulting with applicable agencies; conducting public scoping meetings; preparing of any scoping report; working with applicant on data requests; preparing a draft mitigation and monitoring report; completing any required biological or cultural surveys if not done by the applicant or can be done prior to construction; and preparing and reviewing administrative draft documents. Public review of the DEIR is normally 45 days.

- Workshops are conducted during the public review period. ALJ may hold public participation hearings (PPHs) in this same time frame which is separate from the CEQA public meeting requirements.

- The EIR is finalized after draft review. The Energy Division (ED) PM works with consultants to complete responses to comments on DEIR. Per the Permit Streamlining Act, CEQA 21151.5, and Rule 17.1, the final EIR must be completed and certified within a year after the application is deemed complete.

***Draft Mitigated Negative Declaration (DMND) Tasks***

- Utilizing and supplementing PEA information, the consultant prepares the initial study and draft MND. This usually requires site visits, agency consultations, data requests with the applicant, and ED review of the administrative draft MND.

- In coordination with the consultant and legal the PM discusses the proposed mitigation measures with the applicant to reach agreement for publishing a MND; otherwise an EIR would be required without applicant agreement on mitigation measures.

- Draft MND is released for a 30 day public review period. Scoping meetings and agency consultations may be scheduled during this time period.
- The consultant in coordination with the ED PM prepares the response to comments and finalizes the MND. Per the Permit Streamlining Act, CEQA 21151.5, and Rule 17.1, a final MND must be completed and adopted within 180 days of deeming the application complete.

**ALJ Proceeding Process**

1. After the application and PEA is filed in the docket office, the ALJ has generally started the proceeding process during the above discussed EIR or MND preparation activities. The ALJ conducts a prehearing conference and prepares a scoping memo outlining the issues and schedule for testimony, briefs, and possible hearings. The EIR or MND process and schedule is included in the memo. Certain issues including need may be bifurcated and proceed ahead of the final EIR/MND completion.

2. The ALJ may conclude all proceeding activities prior to or at the time the EIR or MND is finalized by the ED; or the ALJ may continue the proceeding process focusing on routing issues after the EIR or MND has been finalized by the ED.

3. At the conclusion of the proceedings, the ALJ will prepare the proposed decision that involves certification of the EIR or the adoption of the MND and the decision.

4. The Commission votes on the proposed decision.

5. The Notice of Determination must be sent to the State Clearinghouse (SCH) within 5 days of the effective date of a final Commission decision approving a project in order to preserve the CEQA statute of limitations of 30 days for filing a civil challenge. If the five days is missed an entity has 180 days to challenge [CEQA Guidelines 15094 (g) 15112(c)].

6. After the CPUC decision process is completed and the project is approved, the ED staff and the consultant prepare a mitigation monitoring compliance and reporting program (MMCRP). Throughout the construction period, the consultant and ED staff coordinate with the applicant on the implementation of mitigation measures and monitoring construction activities. The ED staff works with the consultant on notices to proceed for construction and any necessary variances.

***Processing Exempt 131-D Projects***

GO 131-D III (B) (1) allows exemptions from PTC or CPCN requirements. The process is generally as follows:

1. The utility must file a notice/advice letter for the exemption not less than 30 days before the date when construction is intended to begin per 131-D. If no protests are filed, the utility may proceed with construction 45 days after first publication of the notice.

2. Within 20 days after the notice is mailed or published, an individual can object to the exemption.

3. The utility has five business days upon receipt of the protest to respond. Construction can't commence until the Executive Director has issued an Executive Resolution.

4. Within 30 days of the utility's response, the Executive Director must issue an Executive Resolution on whether the utility must file a PTC or the protest is dismissed for the lack of a valid reason. Also, the Executive Director must state the reasons for granting or denying the protest.

## 7.5 Policy Issues Associated With The Existing CPUC Permitting Process and Streamlining

In the I.05-09-005 proceeding, the utilities and other interested parties have raised issues regarding the existing CPUC transmission permitting process. As part of the proceeding, parties were directed by Commissioner Grueneich to file comments identifying the top six issues that the CPUC should address in 2006 and in 2007. Parties filed comments on November 15, 2005. A subsequent workshop was held on December 6, 2005. One of the top six priority items identified by the parties in the briefings and at the workshop was streamlining the siting and permitting process for transmission. The parties identified the following issues in their November briefings and at the December workshop:

- CPUC consultants should not duplicate applicant's environmental analysis.
- CPUC should focus only on the requirements of CEQA.
- EMF policy should not be relitigated in every proceeding.
- CPUC needs to follow the required time frames for handling protests to 131-D exempt projects.
- Utility should be able to use an existing environmental document in lieu of a PEA where applicable.
- CPUC should avoid time consuming EIRs when a mitigated negative declaration would be appropriate with up-front negotiated mitigation measures.

- CPUC needs to start contract process prior to application filing to avoid review delays.
- CPUC needs to fully utilize PEA for preparing a MND or EIR and not duplicate efforts.
- CPUC should consider ways to consolidate NEPA/CEQA reviews.
- There needs to be more up front collaboration and cooperation.
- CPUC needs to adopt internal procedures to ensure compliance with Permit Streamlining Act and 131-D timeframes.
- CPUC should consider general changes in process to streamline and expedite the CPCN/PTC approval process.
- CPUC should consider separating the approval of a transmission corridor from the approval of the detailed siting and engineering of the transmission towers within the corridor.

The CPUC Energy Division has also found that the process has not always gone as smoothly and expeditiously as possible. There are numerous reasons for this situation including the following:

- The existing mandated state contract process takes 3 to 4 months, and is often not initiated prior to the application filing. This tends to extend out the time for PEA deficiency review and consultant preparation of the EIR or MND documentation.
- The contract process was not conducted in a reasonable amount of time.
- At the time of filing, the PEA has numerous deficiencies.
- In a joint EIR/EIS (environmental Impact statement), the memorandum of understanding (MOU) agreement was not done up front in a timely manner which allows co-lead agency issues to go unresolved for long periods of time.
- At the time of filing, up-front strategic planning was not done for handling and resolving known issues between ED and their consultant and, if applicable, with co-lead agency.
- The applicant is not timely with responses to PEA deficiencies or data requests as required by ED staff and consultant to maintain schedule.
- The ED staff and/or consultant do not adhere to the agreed upon schedule or there was not an up front commitment to a schedule by all parties.
- There was higher than anticipated public and agency controversy which in turn required more meetings, more alternative analysis, more required documentation on impacts and mitigation, and a longer proceeding with hearings, briefings, etc.

- Ed staff, their consultant, and/or the applicant did not anticipate issues that later seriously impacted the schedule.
- The ALJ proceeding schedule is longer for any number of reasons.

In light of the above proceeding comments and the identified issues with the existing permitting process, the CPUC Energy Division CEQA Unit staff prepared a memo to Commissioner Grueneich's office responding to the parties' comments and provided preliminary recommendations on streamlining the transmission permitting process.

At the direction of Commissioner Grueneich, Energy Division staff then scheduled a workshop for March 23, 2006 to further discuss permitting issues and to allow comments on the Energy Division staff's preliminary recommendations on streamlining the permit process. Prior to the workshop, staff's recommendations and their detailed responses to parties' 11/15/05 briefs and 12/6/05 workshop comments were sent to the parties for their review and comment. Energy Division staff's preliminary recommendations specifically included the following for exempt and non- exempt transmission projects:

### 1. Exempt Projects Under 131-D III (B) (1), Rule 17.1 and/or CEQA

Applicant needs to provide specific information for ED to quickly determine exempt projects by providing adequate justifications and clearly identifying the appropriate exemption. In addition, applicant needs to strictly adhere to exemption language to avoid protest and lengthy resolution of issues or the possible decision that a MND or EIR is required by the CPUC. ED staff must adhere to CPUC time frames for handling protests and preparing resolutions.

### 2. Processing Steps for Non-exempt Projects

**Pre-Filing Steps**

***CPUC/ED Staff***

1. At 6 months before utility filing, ED staff/Contracts Office/DGS initiates and completes contract process within 3 months.
2. At 3 months before filing the PEA, ED staff along with the consultant awarded contract, review the administrative draft of the PEA and provides and completes input to the utility within 2 months of filing.

***Utility/Applicant***

1. Utility develops specific project based on the procurement process.
2. Notifies ED staff within 6 months of filing of the project.

3. Conducts open houses and consultations with the public and agencies to discuss and assess any issues.
4. At not later than 6 months before filing, the utility should be making a concerted effort to resolve any issues (public, agencies, and others) or have strategic plan for doing so prior to filing or early on after filing.
5. At ED contract completion or at 3 months before filing, the utility develops an administrative draft PEA or equivalent information that fully adheres to 131-D and the PEA Information and Criteria List and addresses all issues to the maximum extent possible.
6. Utility works with ED staff on their administrative draft PEA input.

**Application Filed and Deemed Complete**

***CPUC/ED Staff***

1. Assuming PEA has been revised with all ED input, the application and PEA can be deemed compete within 30 days of filing.
2. Within 30 days of deeming the application complete, ED must decide whether to prepare ND or EIR. Utilizing the PEA and any supplemental information, ED prepares an initial study to make this determination; or decides that an EIR is clearly required and does not formally prepare an initial study.
3. If MND initially determined, ED and consultant works with the utility to develop project modifications/or mitigation measures that would allow for the public release of a MND instead of an EIR.
4. If an EIR is determined in 1 above, ED and consultant must immediately address unresolved issues internally and/or in concert with the applicant. For any unresolved issues, a strategic approach for resolution needs to be developed in writing and agreed to by all applicable parties including the applicant.
5. In accordance with the Permit Streamlining Act, a schedule for the MND or EIR completion must be developed at the early stages of deeming the application complete. It must be adhered to by all parties including ED, its consultants, applicant, and any other agency if a joint document.

***Utility***

1. Utility files PEA as revised by ED input after 6 months of project notification.
2. Utility works with ED and its consultant on project modifications and/or mitigation measures that will allow for a MND.
3. Utility responds expeditiously to any data requests submitted by CPUC ED staff and its consultants during the preparation of EIR or MND.

***ALJ***

1. After 30 days from filing the application, the ALJ should schedule a prehearing conference to address issues and schedule for the proceeding and the CEQA process.
2. A scoping memo outlining the issues and schedule should be prepared as soon as possible after the prehearing conference.

3. The ALJ should consider scheduling parts of the proceeding prior to the environmental document being finalized by ED staff and consultant.
4. ALJ should prepare the proposed decision as soon as possible after the environmental document is finalized by ED staff and consultant.

**OTHER CONSIDERATIONS FOR STREAMLINING THE PROCESS POSSIBLY REQUIRING CHANGES TO REQUIREMENTS AND PROCEDURES**

In addition to activating the above procedural steps in the near term, there are other overall considerations for streamlining the process.

**Contract Process**

1. Consider going back to the use of On-Call consultants by utility service areas and some other geographic delineation. Need to work with legal and Contracts Office.
2. ED could re-evaluate the "Round Robin" format of contracting. ED could develop a pool of consultants that could be utilize throughout the state, This format along with the one above will require Contracts Office and Legal Division support and input to successfully implement at the CPUC.

**Personnel Issues**

1. In addition to fully utilizing existing staff, management needs to support hiring additional staff at a sufficient level to make a 100% commitment to a more efficient streamline process.
2. CEQA Unit needs consistent legal support for exemption determinations, contract questions, and assisting in issue resolutions and developing a successful approach to legal questions on CEQA as ED is conducting the MND or EIR process.
3. CEQA Unit should be trained in the proper use of project management methods (scope, schedule, quality control), such as anticipating impacts that could affect the schedule and resolving them before they happen.

On March 23, 2006 the workshop was held to further discuss the permitting process and to comment on staff's preliminary recommendations. There were over 25 participants. A number of comments were presented on the existing process and on the staff' s recommendations including a project management approach to the Tehachapi development. The Energy Division is presently preparing a workshop report that will be finalized by mid April 2006. This report will present all the workshop comments and provide for next steps in implementing streamlining measures.

## 7.6 A Project Management Approach to Tehachapi Development

The TCSG joins the parties in I.05-09-005 in recommending that the CPUC implement the proposals in section 7.5 above to streamline and shorten CPUC permit approval processes. But streamlining the state's current approach to renewable energy and transmission development is inadequate to the opportunity at hand.

The need to build new generation in the state, the Loading Order adopted by the Commission, and the Energy Action Plan goal of having renewables supply 20% of our electricity by the end of 2010 combine to give Tehachapi development special urgency. Wind energy is less expensive than gas-fired generation, and every year of delay in Tehachapi development imposes real economic costs on California ratepayers. With 3,600 MW of projects already in the CAISO queue, wind companies have demonstrated the ability to meet the full build-out target for Tehachapi development on a schedule to meet the EAP 2010 goal. Streamlining the current permit application and approval process is essential, but by itself is unlikely to bring the necessary transmission into service in time. The current approach puts the CPUC in a largely reactive posture, at a time when proactive CPUC leadership is called for.

D.04-06-010 outlines an agenda of developing transmission in advance of interconnection requests.[42] With this decision, the Commission demonstrated its understanding that a business-as-usual approach to transmission development would not meet the goals indicated in state law and adopted, in concert with the CEC and the Governor, as its own policies. Adopting a project management approach to Tehachapi transmission development would better enable the Commission to follow through on the vision outlined in D.04-06-010.

In this approach, the CPUC would act as the project manager for the development of all Tehachapi transmission facilities. It would establish a detailed work plan and milestone schedule for all phases of the proposed development, and act to ensure achievement of the milestones.

If feasible, the schedule should be geared to a December 31, 2010 in-service date for the transmission facilities necessary to export 4,500 MW of wind generation from the Tehachapi region. The schedule and accompanying work plan would identify interim milestones and the supporting tasks necessary to complete each phase of the development in the optimum sequence.

[42] Interim Opinion on Transmission Needs in the Tehachapi Wind Resource Area, June 9, 2004, in I.00-11-001.

The schedule and work plan will thus clarify exactly when the Commission must order the IOUs to complete studies and file applications; and the dates by which the Commission itself must approve applications. It will also identify other Commission actions, including coordinating procurement activities with the transmission development schedule, and providing cost recovery assurances. As discussed in sections 7.1 through 7.3 above, ensuring cost recovery at least cost to ratepayers may advise working with the CAISO to amend provisions of its tariff, and to establish cost recovery in transmission rates through a coordinated Section 205 Federal Power Act filing at FERC.

Members of the TCSG are prepared to assist the Commission in establishing such a milestone schedule and work plan to guide Tehachapi transmission development.

Organizing Tehachapi transmission development as one integrated project to be completed in phases over four years may make a Programmatic EIR the most effective permitting vehicle. Determining whether or not to develop a P-EIR for the inter-related phases of Tehachapi development should be one of the first tasks of the work plan.

### 7.6.1 CPUC Project Manager

This approach requires the Commission to appoint a project manager to lead this effort. The project manager will have responsibility for ensuring that all elements of the transmission development are completed on schedule. S/he will:

- coordinate the development of the milestone schedule and project work plan;
- monitor progress on each element of the schedule;
- anticipate problems and delays;
- work with CPUC staff and consultants, IOU staff, and state, federal and local agency staff to solve all problems necessary to keep the overall development on schedule;
- establish a stakeholder working group to assist in solving problems;
- ensure that the Commission is informed and prepared to take action, by issuing orders or otherwise, necessary to meet schedule milestones.

To this end, the project manager must have the authority to mobilize the full resources of the Commission, without regard to departmental boundaries.

### 7.6.2 CEQA Considerations of the Project Management Approach

CEQA does not preclude the CPUC from being the lead agency in charge of a Tehachapi EIR while also being the project proponent. Government entities commonly serve as lead agency on infrastructure projects that they intend to fund, build, own and/or operate. The key proviso in such cases is that the agency (i.e., the CPUC) prepare the EIR before making the decision to proceed with the project. The dual role of project proponent and lead agency also requires that CEQA provisions be scrupulously observed.

In sum, a project management approach gives the Commission powerful new tools with which to lead transmission development. It will enable the Commission to know the status of every major component of the overall project at all times, and so to anticipate problems and delays.

### 7.6.3 The Tehachapi Power Project

Building 4,500 MW of new generation at Tehachapi and the transmission to access it is the largest power project undertaken in California since Diablo Canyon. The TCSG believes that it is appropriate to consider the combined $10 billion generation and transmission development as one integrated project. Expediting its completion meets important state economic development, fuel diversity, rate stabilization, environmental and climate goals.

The wind generating plants, which represent the great bulk of the investment required, are expected to be built by private companies. Publicly owned utilities and private entities over which the CPUC has no jurisdiction may supply some of the transmission needed to export Tehachapi generation. POUs are also expected to purchase significant quantities of Tehachapi generation.

Getting the Tehachapi Power Project built at least cost and on the Energy Action Plan schedule will thus require coordinating the activities of a range of power purchasers, wind generating companies and their bankers and suppliers, transmission owners, the CAISO, the CPUC, and local, state and federal permitting agencies. Appointing a project manager invested with the

mandate to get the project built can help ensure timely completion of the project.

The TCSG accordingly recommends that the CPUC work with the CEC, the legislature and key stakeholders to identify candidates for the position of Tehachapi Power Project manager. Candidates should have experience overseeing large scale infrastructure projects. The project manager would engage stakeholders to establish a milestone schedule and work plan addressing every element of the generation and transmission development. The small staff necessary to support this project manager role could be drawn from the CPUC, CEC IOUs and/or other stakeholders. The project manager would report progress to state agencies, stakeholders and the public quarterly.

# CHAPTER 8

# CONCEPTUAL SCHEDULE FOR COMPLETING TEHACHAPI PLAN & NECESSARY RELATED ACTIONS

## *8.1 Updated Conceptual Schedule*

The March 2005 Report of the TCSG included a conceptual schedule for completing the Tehachapi transmission upgrades by December 2010. Chart 8.1 updates this schedule based on what has actually occurred since that report was issued, and shows that the March 2005 timeline for completion has now slipped to 2011. Chart 8.2 presents a revised schedule that would now be required to complete the plan by 2010.

The 2005 schedule assumed that the CPCN applications for Phase 1 would be processed and approved by June 2006. It now appears that various delays in the CPCN approval process will cause those applications to be approved no earlier than December 2006. Although the 2005 conceptual schedule was described as "the fastest practicable schedule" for completing the plan by 2010, and time has been lost since, the TCSG believes that it may still be possible to meet the 2010 completion goal if all of a number of aggressive actions to accelerate the process, as described in this chapter, are taken.

The TCSG emphasizes the critical importance of completing Segments 1 and 2 of Phase 1 as soon as possible. These segments must be completed before Phase 2 construction can commence. Phase 2 is essential for all projects because they require the additional south-of-Antelope transmission capacity that this phase will provide. Without Phases 1 and 2, the contributions from the potential Tehachapi wind generations to help meet the RPS mandated state goal is severely hindered.

Completing the goal by 2010, as shown in Chart 8.2, is very ambitious when compared to the timelines that are normally expected for major transmission projects. Accelerating the process is, however, necessary to preserve the opportunity for the Tehachapi region to meet its promise, as stated in Finding of Fact 3 of D. 04-06-010, to provide "a significant portion of the goals for renewable energy development in California." If the state is to reach its ambitious RPS goal of 20% renewable generation by 2010 with wind generated

from Tehachapi, the time and process required to permit and build major new transmission facilities to access Tehachapi wind must be streamlined.

In addition to providing the infrastructure necessary to meet the state's RPS goals, accelerating the schedule is important also because the schedule will affect developers' ability to obtain temporary interconnections to enable their projects to come on line (with some curtailment) before the planned transmission facilities are operational. This is because the CAISO may approve a temporary interconnection on a case by case basis only if the permanent facilities are "planned." The filing and processing of a CPCN (or PTC) provides clear evidence of those plans.

The balance of this chapter describes the actions that are necessary to accelerate every phase in order to complete construction by 2010, and the additional particular actions that are necessary in specific phases. In summary, we recommend that the Commission take the following actions:

**Recommendations:**

- Accelerate the CPCN review process for the Tehachapi upgrades by taking all of the specific actions described in this chapter;

- Direct the Energy Division, utilities and other TCSG parties to develop a detailed schedule of specific tasks and parties responsible (the "who, what, when") that must be achieved if the larger milestones shown in Figure 8.2 are to be met (moving the schedule back if it is determined in this process that the 2010 completion goal is infeasible);

- Direct the Energy Division to work with SCE to ensure that complete CPCN applications for Phases 2 and 3 be filed as soon as possible;

- Expedite the CPCN approval process for future phases by proposing, on the Commission's own motion, without evidentiary hearings, a finding that Phases 2 and 3 are needed to facilitate the achievement of RPS goals.

In addition, as discussed in Chapter 7, the TCSG recommends that the Commission identify a Tehachapi project manager who would be responsible for ensuring that all of these recommendations are carried out in a timely fashion, in order to maximize the opportunity to complete the upgrades by 2010.

## *8.2 Actions Necessary in Every Phase to Complete Construction By 2010*

To complete the Tehachapi plan by 2010, the Commission will need to complete the CPUC review and approval process for each application within twelve months or less in most cases. Although this same recommendation was made in the March 2005 TCSG report (Section 6.3.1), the process for each segment of Phase 1 will have taken at least two years, a significant source of delay in the overall plan. To accomplish review of CPCN applications within 12 months, each of the three phases of the Commission's approval process: consulting contracting, preparation of the CEQA document, and preparation of the Commission's Proposed Decision requires significant reform. These issues are being discussed and addressed presently as part of I.05-09-005 as outlined above in Chapter 7. The TCSG believes that, to create the possibility of completing the Tehachapi plan by 2010, it will be necessary for the CPUC to implement a number of those reforms in the processing of the Tehachapi CPCN applications, including the following:

- Acquire additional CPUC staff capabilities in the CEQA Unit and direct the utilities to acquire additional staffing capabilities as necessary to meet the milestones in the 2010 schedule;

- Consultants should be in place for each phase of the Tehachapi development plan three months before the CPCN application is filed. For phases 2 and 3, if the CPUC clarifies that the applications are due by the end of December 2006, this would be September 30, 2006;

- The Energy Division, the utility and the CPUC's consultant should conduct pre-filing meetings to (a) determine the appropriate scope for the application (limiting the scope to what is required under CEQA), (b) enable the utility to anticipate and address all issues in its application, and (c) ensure that all necessary data is supplied in the application. The consultant should conduct its independent review in parallel with the utility's preparation of the application;

- The application should be deemed complete within a week of its filing (given the pre-filing communication and coordination, which should result in a complete application);

- Direct the consultants to expedite review of the application to meet adopted milestones for the project phase;

- Direct the assigned ALJ to quickly establish in a scoping memo an expedited calendar of activities (briefs, testimony, hearings, etc.) to ensure that the final EIR is certified within one year of an application being deemed complete as required under CEQA; and

- Direct the ALJ to adopt the findings of the Energy Division's review without further litigation of EMF, routing, and other issues that were addressed in the review process.

Additional actions that the CPUC can take to expedite the schedule are:

- Re-conceive the application process as a collaborative endeavor between the Commission and the utility, given the state's interest in meeting the RPS goals;

- Anticipate the permits that will be required by other agencies and closely coordinate with those agencies to minimize post-CPUC permitting delays (see discussion in subsection 8.3);

- Direct SCE to plan for construction, e.g., arrange for equipment, in anticipation of receiving all necessary permits so that construction can begin immediately after those permits are granted.

- Ensure that adequate staffing is in place to handle protests to projects that are exempted from CPCN or PTC requirements, and ensure that the CPUC Executive Director's Resolution is issued within 30 days as required. Late protests should automatically be deemed denied.

## *8.3 Post-CPUC Permitting -- Resource Agency and Local Permitting*

In addition to meeting CPUC permit requirements, utilities proposing to construct Tehachapi transmission facilities must also obtain all required federal and state resource agency permits as well as local (ministerial) permits. The specific permits required will depend on the exact routing and design of each project, and cannot be known with certainty until detailed routing, environmental, and engineering studies are completed (and, where required, after the CPUC has selected the approved route). Such permits and approvals may include those issued under the federal and state Endangered Species Acts (U.S.F.W.S. and California Department of Fish and Game), the Clean Water Act (U.S. Army Corps of Engineers), the Porter-Cologne Water Quality Control Act

(California Regional Water Quality Control Boards), regulations governing use of federally managed lands (e.g., Forest Service, BLM), or local land use regulations. (Although the CPUC preempts all discretionary local authority over the Tehachapi transmission projects, ministerial permits such as encroachment permits may be required.)

In order to minimize the timeline impact of the non-CPUC permitting, the CPUC must closely coordinate with all applicable responsible agencies throughout its project approval process. Where impacts to federal jurisdictional resources are significant enough to trigger full NEPA review, the Commission should consider preparation of a joint EIR/EIS in order to minimize post-CPCN delays. Even where no major issues exist, obtaining resource agency and local permits can be time-consuming in light of limited agency staffing, applicable procedural requirements, and other factors. In selecting the approved routes for Tehachapi transmission projects, the Commission should (1) strive to minimize impacts to jurisdictional resources, (2) closely coordinate with other responsible agencies, and (3) expedite its own processes. These steps will help reduce the time needed to obtain non-CPUC permits, and leave the utilities with adequate time to do so.

## *8.4 Specific Actions That Must Be Taken to Accelerate Particular Phases*

**Phase 1.** Construction of Segments 1, 2 and 3 could occur within the same 18-month time period, provided human and material resources are available and CPCN applications have been approved.

Expediting Phase 1 is urgent because load-serving requirements will prevent the commencement of construction for Phase 2 until Segments 1 and 2 of Phase 1 are completed.

**Phase 2A (Antelope-Substation 5).** There are over 1,100 MW currently in the CAISO queue at Substation 5. A 300 MW project is advancing through the permitting process with Kern County and several other projects will soon follow. There is an opportunity presently for a temporary interconnection at Tehachapi Substation 5 that would enable the development of the first project in the queue (with some delivery constraints) in advance of construction of Antelope-Substation 5. CAISO's approval of a temporary interconnection would be contingent on the approval of (or exemption from) a CPCN or PTC for the Antelope-Sub 5 upgrade and the level of facilities required for such a temporary interconnection. The CPUC can help realize this opportunity by exempting Antelope-Substation 5 from a CPCN and instead require a less complex and

time-consuming permit-to-construct (PTC) (or provide an exemption from both). A PTC would be reasonable if this upgrade can take place within the existing transmission corridor and does not involve any new route or alternative routing. The schedule assumes that the Commission exempts the upgrade from a CPCN and instead requires a PTC.

Quickly approving and constructing the Antelope-Substation 5 upgrade could also be important because once it is completed, along with Segments 1 and 2 of Phase 1, it may be possible to temporarily interconnect some of the other projects in the queue in advance of the completion of Phase 1: Segment 3 and Phase 2. If so, development of these projects, including local permitting, could commence as soon as the CAISO approved the temporary interconnection, which would be conditioned upon the completion of transmission facilities for Antelope-Sub 5 and for Segments 1 and 2 of Phase 1.

The feasibility of bringing on line some amount of capacity in advance of the completion of Phases 1 and 2 requires additional consideration by all parties. For example, the logistics of completing upgrades that require transmission to be taken out of service may limit the level or the timeframe that temporary interconnection may be feasible. Considering the possibility of temporary interconnections is important, however, given the time that will be required to complete Phases 1 and 2.

**Phase 2B (Antelope-Mesa).** SCE is planning to submit applications for Phase 2B and Phase 3 by spring and summer of 2007, respectively. The Energy Division should work with SCE to ensure that complete CPCN applications for Phases 2 and 3 are filed no later than these dates (and earlier if possible). The Commission should be prepared to immediately begin processing those applications so that they may be approved by December 2007 (Phase 3) and June 2008 (Phase 2, which has forest land complications). It will speed the process if the Commission makes a need finding prior to or early in the CPCN process on its own initiative, rather than requiring the utility to prove need. This is discussed further in subsection 8.4.

Phase 2B would be located, in part, on land subject to the jurisdiction of the United States Forest Service (USFS), Angeles National Forest, which complicates the review process and requires a joint EIR/EIS. In order to begin construction of Phase 2B as soon as Segments 1 and 2 are completed, therefore, it will also be necessary for SCE and the CPUC to work with the Forest Service in advance of the Phase 2B CPCN filing to ensure that the application review process can be completed within the 18-month timeframe shown in the timeline. As indicated in the December 12, 2005, Assigned Commissioner's Ruling in A.04-12-007, we have learned in the CPCN application process for Phase 1: Segment 1 that early coordination is essential to avoid delays.

**Phase 3.** As stated above, the Energy Division should work with SCE to ensure that a complete CPCN application for Phase 3 is filed no later than summer 2007, and the Commission should adopt a need finding on its own initiative, no later than the initial stages of the CPCN application process. Phase 1: Segment 3 environmental work should be used to the extent applicable.

## *8.5 Proactive Finding of Need for Phases 2 and 3*

The Commission can speed the CPCN approval process for future phases by proposing, on its own motion, a finding that Phases 2 and 3 are needed to facilitate the achievement of RPS goals. The Commission can propose such a statement either (1) in I. 05-09-005, after a review of this report and an opportunity for comments, or (2) in the CPCN dockets for Phases 2 and 3, shortly after the filing of those applications. The Commission also should anticipate taking this action with regard to Phase 4 at the appropriate time.

Adopting a need statement on the Commission's own initiative before or early in the CPCN approval process is necessary and appropriate for the following reasons:

1. A Need Statement for Phases 2 and 3 Follows the Process Used for Phase I in D. 04-06-010.

In D. 04-06-010, the Commission found that the "magnitude and concentration" of Tehachapi wind resources, as identified in the CEC's Renewable Resources Report,[43] justified a finding that the first phase of Tehachapi transmission upgrades was needed to facilitate achievement of RPS goals.[44] The Commission noted that this need determination was "separate and severable" from the need finding that would be made in individual CPCN proceedings for specific transmission projects.[45] That individual need determination would examine alternatives to the proposed project, as required under G.O. 131-D, and would examine whether the specific project was likely to further RPS goals based on the results of the RPS process to date. The Scoping Memo for Edison's CPCN application for Segment 1 of Phase I re-affirmed this more limited scope of the need determination in individual CPCN proceedings.[46] In other words, the individual CPCN proceedings for the Phase 1 segments will determine whether additional transmission

[43] "Renewable Resources Development Report," CEC Publication Number 500-03-080F, November 2003. In this study, the CEC estimated that the Tehachapi area contains the largest wind resource in California, with undeveloped potential of about 14,000 gigawatt-hours per year, representing the single largest cost-competitive renewable resource potential in the state. The CEC's two scenarios for the state to achieve 20% renewable generation by 2010 both assume 4,060 MW of new wind generation would be installed in the Tehachapis, and would supply 40% of the renewable generation needed to meet the RPS goals.

[44] D.04-06-010, *mimeo*., p. 44 and Conclusion of Law 11.

[45] *Id.*, p. 16 - 17.

[46] *See* A. 04-12-007, "Scoping Memo And Ruling Of Assigned Commissioner" (June 7, 2005), at 5.

access to the Tehachapi region is needed based on whether or not it aids in meeting RPS goals. The remaining focus of the individual CPCN cases will be to assure that the specific proposed projects are the best projects among the alternatives and will continue to further RPS goals.

At this time, the TCSG believes that Phases 2 and 3 of the Tehachapi transmission plan also would benefit from an advance Commission finding that they are needed to achieve RPS goals. The TCSG has reached a consensus on the Phase 2 and 3 facilities that should be built to provide access to 3,300 MW of new wind generation in the region—an amount of transmission less than would be required by the Tehachapi wind generation projects already in the CAISO interconnection queue.

2. Substantial evidence of the need for Phases 2 and 3 exists now.

There are numerous indications that wind projects under development in the Tehachapi region will substantially fill the Phase 2 and 3 capacity:

- As of March 17, 2006, the CAISO's interconnection queue included 3,583 MW of wind projects in the Tehachapi region. These projects are listed on Figure 8.3. As shown on the Figure, these projects expect to be on-line by 2010. These queue positions exceed the combined carrying capacity of Phases 1, 2 and 3, estimated to be 3,300 MW. Developers who take queue positions must make significant financial commitments to interconnection studies, indicating that the projects in the queue are likely to be "real" projects.

- Developers have responded strongly and positively to the initial plans for transmission development. While Tehachapi developers have many potential projects in their portfolios, they generally do not make substantial financial commitments for a particular project until they are confident that the necessary transmission capacity will be built. The pent-up demand for Tehachapi transmission has recently been demonstrated by (a) the three additional wind projects totaling 860 MW that entered the queue at Substation 5 within 18 months of an interconnection request being filed by an initial 250 MW project at that location, and (b) the 10 Tehachapi wind projects totaling 2,882 MWs that entered the queue in the year since SCE filed its Phase 1 CPCN applications in December of 2004. This strong response shows that, as developers gain confidence that the necessary transmission capacity will be built, they will enter the interconnection queue. It is reasonable to expect that most if not all of these projects will show up sooner or later on IOUs' (or other retail sellers' or municipal utilities') short-lists and under signed contracts.

- In the initial 2003 and 2004 RPS solicitations, SCE and SDG&E have signed RPS contracts for 500 MW of Tehachapi wind generation. Additional Tehachapi wind projects are expected to be short-listed in the

> IOUs' 2005 RPS solicitations, the results of which will be known in the next several months. Thus, it is now clear that the 700 MW of capacity in Phase I will be fully utilized.

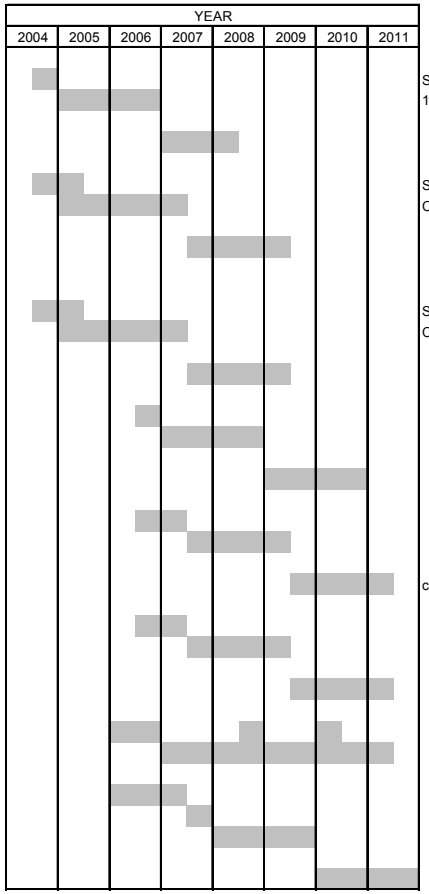
Today, it is apparent that the Phase 1 capacity will be fully utilized for RPS-eligible generation, and developers clearly are pursuing enough new wind generation in the Tehachapi region to more than fill the capacity of Phases 2 and 3. Accordingly, the Commission should find that these next phases are needed to achieve RPS goals. Such a finding would allow the CPCN proceedings for Phases 2 and 3 to focus on the environmental impacts and specific alternative routes for these projects.

The Commission should avoid reading the "necessary" language of Section 399.25(a) as requiring certainty. It is unreasonable for the Commission to expect projects to have executed power purchase contracts and signed interconnection agreements early in the transmission facility permitting stage. The Commission should be looking for an array of evidence which, taken as a whole, demonstrates that, without the transmission facility, achievement of the state's RPS goals would be unlikely to occur. The Commission must be prepared to make a judgment that there is reasonable assurance that the resource area will be developed if transmission capacity is provided, and that substantial progress toward that end has occurred and is continuing. Based on the evidence presented above, the TCSG believes that the Commission should reach the judgment that Phases 2 and 3 are needed for the state to reach its RPS goals.

# *FIG. 8.1 SCHEDULE TO 2011*

**CHART 8.1**
**TEHACHAPI CONCEPTUAL DEVELOPMENT SCHEDULE**
**ACCELERATED TO COMPLETE PLAN BY 2011**

| PROJECT PHASE | CUMULATIVE CAPACITY MW | PROJECT ELEMENT | TASK | NOTES |
|---|---|---|---|---|
| 1 | 700 | ANTELOPE-PARDEE | CPCN APPLICATION | SCE filed 12/04 |
| | | 500kV LINE | CPCN APPROVAL | 12/12/05 ACR says December 2006 |
| | | Segment 1 | POST-CPUC PERMITTING | |
| | | | ROW ACQ & CONSTRUCT | |
| 1 | | ANTELOPE-VINCENT & | CPCN APPLICATION | SCE filed 12/04; supplement 9/05 |
| | | ANTELOPE-TEHACHAPI | CPCN APPROVAL | CPUC currently aiming for 2007 Q2 |
| | | 500KV LINES | POST-CPUC PERMITTING | |
| | | Segments 2&3 | ROW ACQ & CONSTRUCT | |
| 1 | | TEHACHAPI SUBSTATIONS | CPCN APPLICATION | SCE filed 12/04; supplement 9/05 |
| | | & 230KV LINES | CPCN APPROVAL | CPUC currently aiming for 2007 Q2 |
| | | Segment 3 | POST-CPUC PERMITTING | |
| | | | ROW ACQ & CONSTRUCT | |
| 2A | | ANTELOPE-SUBSTATION 5 | CPCN APPLICATION | |
| | | | CPCN APPROVAL | |
| | | | POST-CPUC PERMITTING | |
| | | | ROW ACQ & CONSTRUCT | |
| 2B | 1600 | UPGRADE ANTELOPE- | CPCN APPLICATION | |
| | | MESA 230KV | CPCN APPROVAL | |
| | | | POST-CPUC PERMITTING | |
| | | | ROW ACQ & CONSTRUCT | can't start until Ph1/Segs 1&2 complete |
| 3A | 2350 | TEHACHAPI-ANTELOPE | CPCN APPLICATION | |
| | | 500KV LINE | CPCN APPROVAL | |
| | | | POST-CPUC PERMITTING | |
| | | | ROW ACQ & CONSTRUCT | |
| 3B | 3300 | INCREASE OPERATING | TRANSM PLANNING STUDIES | |
| V | | OLTAGE TO 500KV | CONSTRUCT | |
| 4 | 4500 | ISO-APPROVED TR | ANSM PLANNING STUDIES | |
| | | ALTERNATIVE TBD | CPCN APPLICATION | |
| | | | CPCN APPROVAL | |
| | | | POST-CPUC PERMITTING | |
| | | | ROW ACQ & CONSTRUCT | |

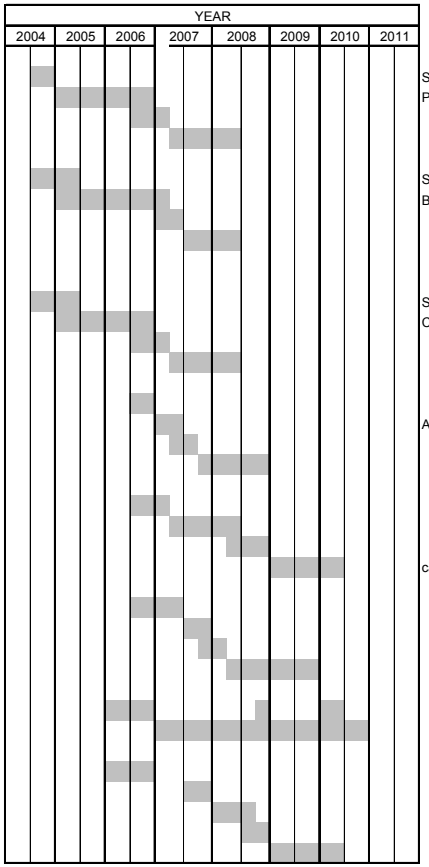



NOTE: TEHACHAPI AREA COLLECTOR LOOP WILL BE DEVELOPED AS REAL PROJECTS MATERIALIZE

# *FIG. 8.2 SCHEDULE TO 2010*

**CHART 8.2**
**TEHACHAPI CONCEPTUAL DEVELOPMENT SCHEDULE**
**ACCELERATED TO COMPLETE PLAN BY 2010**

| PROJECT PHASE | CUMULATIVE CAPACITY MW | PROJECT ELEMENT | TASK | NOTES |
|---|---|---|---|---|
| 1 | 700 | ANTELOPE-PARDEE | CPCN APPLICATION | SCE filed 12/04 |
| | | 500kV LINE | CPCN APPROVAL | Possible approval by Oct 2006 |
| | | Segment 1 | POST-CPUC PERMITTING | |
| | | | ROW ACQ & CONSTRUCT | |
| 1 | | ANTELOPE-VINCENT & | CPCN APPLICATION | SCE filed 12/04; supplement 9/05 |
| | | ANTELOPE-TEHACHAPI | CPCN APPROVAL | By March 2007 |
| | | 500KV LINES | POST-CPUC PERMITTING | |
| | | Segments 2&3 | ROW ACQ & CONSTRUCT | |
| 1 | | TEHACHAPI SUBSTATIONS | CPCN APPLICATION | SCE filed 12/04; supplement 9/05 |
| | | & 230KV LINES | CPCN APPROVAL | CPUC currently aiming for 2007 Q2 |
| | | Segment 3 | POST-CPUC PERMITTING | |
| | | | ROW ACQ & CONSTRUCT | |
| 2A | AN | TELOPE-SUBSTATION 5 | CPCN APPLICATION | |
| | | | CPCN APPROVAL | Assumes exemption from CPCN |
| | | | POST-CPUC PERMITTING | |
| | | | ROW ACQ & CONSTRUCT | |
| 2B | 1600 | UPGRADE ANTELOPE- | CPCN APPLICATION | |
| | | MESA 230KV | CPCN APPROVAL | |
| | | | POST-CPUC PERMITTING | |
| | | | ROW ACQ & CONSTRUCT | can't start until Ph1/Segs 1&2 complete |
| 3A | 2350 | TEHACHAPI-ANTELOPE | CPCN APPLICATION | |
| | | 500KV LINE | CPCN APPROVAL | |
| | | | POST-CPUC PERMITTING | |
| | | | ROW ACQ & CONSTRUCT | |
| 3B | 3300 | INCREASE OPERATING | TRANSM PLANNING STUDIES | |
| VOL | | TAGE TO 500KV | CONSTRUCT | |
| 4 | 4500 | ISO-APPROVED TRAN | SM PLANNING STUDIES | |
| | | ALTERNATIVE TBD | CPCN APPLICATION | |
| | | | CPCN APPROVAL | |
| | | | POST-CPUC PERMITTING | |
| | | | ROW ACQ & CONSTRUCT | |




NOTE: TEHACHAPI AREA COLLECTOR LOOP WILL BE DEVELOPED AS REAL PROJECTS MATERIALIZE

## *FIG. 8.3 CAISO Queue March 17, 2006*

### Chart 7.3. Tehachapi Region Active Wind Projects in the CAISO Generation Queue as of March 17, 2006

| Request Status | | | Max MW | Location | | Point of Interconnection | On-line Date | |
|---|---|---|---|---|---|---|---|---|
| Queue Position | Interconnection Request Receive Date | Queue Date | Summer | County | Utility | Station or Transmission Line | Proposed On-line Date | Current On-line Date |
| 18 | 4/15/2003 | 4/15/2003 | **200** | Los Angeles | SCE | Antelope | 12/31/2005 | 12/12/2007 |
| 20 | 8/19/2003 | 9/4/2003 | **300** | Kern | SCE | Antelope | 12/31/2006 | 12/31/2008 |
| 31 | 4/12/2004 | 5/11/2004 | **201** | Kern | SCE | Monolith Substation | 12/31/2007 | 12/31/2009 |
| 34 | 7/19/2004 | 7/19/2004 | **300** | Kern | SCE | Monolith Substation | 7/1/2007 | 12/31/2009 |
| 73 | 6/6/2005 | 6/27/2005 | **250** | Kern | SCE | Antelope | 12/31/2007 | 12/31/2008 |
| 77 | 8/19/2005 | 8/22/2005 | **300** | Kern | SCE/PGE | TBD Bakersfield | 11/15/2007 | 11/15/2007 |
| 79 | 5/24/2005 | 9/7/2005 | **51** | Kern | SCE | Proposed New Dutchwind Sub | 6/1/2006 | 12/15/2009 |
| 84 | 11/22/2005 | 121/1/2005 | **400** | Kern | SCE | Cottonwind Substation | 12/31/2009 | 12/31/2009 |
| 85 | 12/28/2005 | 12/28/2005 | **120** | Kern | SCE | Segment 3 230 Collector Loop Tehachapi | 9/30/2007 | 9/30/2007 |
| 93 | 2/22/2006 | 2/22/2006 | **51** | Kern | SCE | Segment 3 of Antelope Transmission Project | 3/31/2010 | 3/31/2010 |
| 94 | 2/24/2006 | 2/24/2006 | **220** | Kern | SCE | Tehachapi Conceptual Station 1 | 12/31/2008 | 12/31/2008 |
| 95 | 3/1/2006 | 3/1/2006 | **180** | Kern | SCE | Tehachapi Conceptual Station 2 | 12/31/2008 | 12/31/2008 |
| 96 | 3/1/2006 | 3/1/2006 | **550** | Kern | SCE | Tehachapi Conceptual Station 1 | 12/31/2009 | 12/31/2009 |
| 97 | 3/1/2006 | 3/1/2006 | **600** | Kern | SCE | Tehachapi Conceptual Station 1 | 12/31/2009 | 12/31/2009 |
| 98 | 3/9/2006 | 3/9/2006 | **160** | Kern | SCE | Tehachapi Conceptual Station 5 | 12/31/2009 | 12/31/2009 |
| **Total** | | | **3,883** | | | | | |

# APPENDIX A - 3

Tehachapi 2nd Report, Volume 2 of 5

Development Plan for the
Phased Expansion of

# Electric Power Transmission Facilities

in the

# Tehachapi Wind Resource Area

# Second Report

of the

## Tehachapi Collaborative Study Group

Volume 2 of 5: Appendix 1

California Public Utilities Commission

OII 05-09-005
OII 00-11-001

**April 19, 2006**

**The report is printed in 5 volumes or electronic files:**

**Volume 1 contains the Second Report;**

**Volume 2 contains Study Plan #2 the basis for the Second Report (referred to in the Report as Appendix 1);**

**Volume 3 contains the PG&E Studies (referred to as Appendix 2);**

**Volume 4 contains the SCE Studies (referred to as Appendix 3);**

**Volume 5 contains the CAISO Studies and all remaining Appendices 5, 6 and 7.**

# Continuation of Tehachapi Collaborative Study

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# Study Plan #2

## Purpose

The purpose of this continuation of the Tehachapi Collaborative Study is to formulate a plan for the transmission of 4,000MW of wind generation at Tehachapi and 500MW in the Antelope Valley to load centers in the PG&E and SCE service areas. It is assumed that half the 4,000 MW at Tehachapi will go to PG&E and half will go to SCE. The plan resulting from this study will be sufficient to initiate the preparation of Proponent's Environmental Assessments (PEAs) which will form the basis of CPCN applications for the facilities defined in the plan. The plan covers only the facilities from Tehachapi Substation 1 to the load centers and does not include the Tehachapi collector system. It is envisioned that this transmission plan may be fine-tuned to accommodate each (or each group of) specific wind plant projects as they move through the ISO Interconnection Process andas the Tehachapi collector loop beyond Tehachapi Substation 1 becomes more precisely defined.

## Background

Pursuant to CPUC Decision 04-06-010, the Tehachapi Collaborative Study Group (TCSG) was formed to develop a comprehensive transmission development plan for the phased expansion of transmission capabilities in the Tehachapi area. The CPUC Staff coordinated the collaborative study group. As directed by the decision, TCSG completed a study that assumed there would be more than 4,000 MW of wind resources at Tehachapi Wind Area[1]. To conduct the study the TCGS further assumed that 50% of the 4,000 MW would be delivered to load centers in the transmission system North of Path 26 and the remaining 50% would be delivered to load centers in the system south of Path 26[2]. The Executive Director extended the original due date for filing the report, by one week by letter dated March 4, 2005. The report entitled, "Development Plan for the Phased Expansion of Transmission in the Tehachapi Wind Resource Area" (Report), was filed by Southern California Edison (SCE) on March 16, 2005.

As stated in the Report, the development plan prepared by the TCSG is a conceptual roadmap to the eventual Tehachapi transmission system rather than a

[1] Decision 04-06-010, at 6
[2] Study Plan, date July 14, 2004, at 18

definitive plan[3]. The Report recommended that further study be performed to select among the alternatives identified in the Report (and referred to herein with the same identification numbers as in the Report). These alternatives require further planning evaluation in order to formulate a single plan for implementation. To do this, additional studies (specific rather than generic) need to be performed and facility cost estimates refined. The final plan for the Tehachapi collector system requires information concerning actual wind project locations and capacities which are not available at this time, and therefore is not covered in the study. However, it is envisioned that the transmission plan may be fine-tuned in the future as each (or each group of) specific wind plant projects moves through the ISO Interconnection Process and the Tehachapi collector loop beyond Tehachapi Substation 1 becomes more precisely defined.

The CPUC Energy Division convened a study group consisting of CPUC Staff, CAISO, SCE and PG&E. The study group will be coordinated by the CPUC Staff. This new study plan will build on the earlier TCSG Study Plan, dated July 14, 2004 (Attachment A), and utilizes essentially the same study assumptions. As such, only exceptions to those earlier assumptions will be noted in this study plan.

## 1. Fresno 230 kV Tie: Big Creek – Fresno Interconnection

Establish a new 230 kV connection between PG&E and SCE by constructing a switching station at the crossing of PG&E-owned and SCE-owned transmission lines and installing a phase-shifting transformer to "push" power from the Big Creek corridor into the PG&E system. This study will investigate impacts on the SCE system and the PG&E system, the possible mitigation measures, and provide cost estimates for the connection and the mitigation measures associated with the amounts of power that would be "pushed" into the PG&E system. The studies will evaluate "pushing" 300 MW to 1,200 MW in successive increments. The study will consider PG&E Alternative 2, Plan A alone and in conjunction with PG&E Alternative 2, Plan B.

The cost per megawatt transferred will be evaluated to determine the optimum capacity of the connection.

**Alternative 2: PG&E and SCE Fresno 230 kV Tie Plan A.**

[3] Report, at 3

Build a switching station at the crossing of PG&E's Helms – Gregg 230 kV lines and SCE's Big Creek – Rector 230 kV lines. Establish a 230 kV tie between PG&E and SCE. A phase shifter or power flow controller may be needed to control the tie line flow.

**Alternative 2: PG&E and SCE Fresno 230 kV Tie Plan B.**

Build a switching station at the crossing of PG&E's Haas-McCall and Balch-McCall 230 kV lines and SCE's Big Creek – Rector 230 kV lines. Establish a 230 kV tie between PG&E and SCE. A phase shifter or power flow controller may be needed to control the tie line flow.

## A. SCE Studies

### Base Case Assumptions

SCE will utilize the load forecast currently under development for the upcoming CAISO Controlled SCE Transmission Expansion Plan. Studies for evaluating the two plans will be conducted assuming both heavy summer and spring load forecast in order to ensure that system performance is maintained within allowable thermal limits. Heavy summer load forecast will include a 1-in-10 year heat wave adjustment consistent with CAISO Planning Standards. Light Spring conditions will be modeled with load at 50% of summer peak consistent with study assumptions utilized in performing generation interconnection studies in the Big Creek Corridor.

### Power Flow Studies

Power flow studies will be conducted by systematically increasing the power transfer from SCE to PG&E through the phase-shifted system tie. The increment step size will be 100 MW.

a. North of Magunden study

   i. Increase power transfer into the PG&E system at the Fresno 230kV tie (Plan A and Plan A in conjunction with Plan B); investigate system performance under normal (all facilities in service) conditions and under NERC/WECC Category B (N-1) contingencies and 230 kV common corridor lines in the Big Creek Corridor. (See Appendix A for a list of contingencies to be studied.) Where the system does not meet the Planning Standards,

develop mitigation measures, such as the addition of a transmission upgrade.

ii. Repeat step 1 until the power transfer reaches between 1,000 MW to 1,200 MW.

iii. Develop cost estimates corresponding to each power transfer level

b. South of Magunden study

i. Repeat the North of Magunden Study, for transmission system south of Magunden.

## B. PG&E Studies

The study will include two different scenarios, namely, summer peak and off-peak conditions. The objectives for developing summer peak and off-peak cases are to identify transmission import and reliability concerns during both conditions. The following Table 1 describes the critical study assumption for the two scenarios proposed for this study.

### Base Case Assumptions

For summer peak studies PG&E will use the summer peak base case developed for the 2005 PG&E Transmission Grid Assessment Study. This case is being developed. PG&E will send the PG&E case to the ISO for approval, but PG&E's work will not be delayed pending this approval. For the summer off peak case, the load for the Greater Fresno Area will be modeled at 50 % of the peak load from summer peak base case for the study area.

### Study Scenarios

| Study Scenarios | Summer peak | Summer Off peak |
|---|---|---|
| Starting base case | 2005 PG&E Grid Expansion Study, 2010 Heavy Summer North Peak case | 2005 PG&E Grid Expansion Study, 2010 Summer Off-peak case |
| Fresno load level | PG&E 1 in 5 year adverse weather load forecast for 500 | 50 % of 2010 summer peak case for the area. |

| | | |
|---|---|---|
| | kV system studies, and 1 in 10 year adverse weather load forecast for Greater Fresno Area for 230 kV system studies | |
| Helms units | 3 units generation | 3 units pumping depending on the import level to find boundary conditions |
| Hydro dispatch | Summer peak average hydro level | Summer off-peak average hydro level |
| COI | 4800 MW (n to s) | 3650 MW (s to n) |
| Path 15 flow | | 5400 MW (s to n) or other relevant operating limit(s) |
| Path 26 flow | 3700 MW (n to s) | <3000 MW (s to n) |
| Sensitive study | 1. Spring hydro spill condition<br>2. Path 26 4000 MW N-S | Spring light load case with Helms PGP units Off line |

Sensitivities may be run depending on the initial results.

**Generation Assumptions in addition to those used in the earlier TCSG Study**

Kingsburg and Sanger Qualifying Facility units will be assumed off for the summer off peak case as per the existing contracts for these units.

SCE will furnish the model to be used for the Tehachapi collector system in the absence of firm wind developer commitments. GE Wind generators will be used for the wind plant model and SVCs (at various locations) will be sized as required to provide voltage and transient stability.

**Fresno 230 kV Tie Assumptions**

SCE and CAISO will provide the necessary data for SCE load, network topology, generation level and pattern for the Big Creek facility. The data provided and approved by CAISO for the SCE system will be used in the base case. ISO will provide data on expected wind generation variations, such as, expected wind generation changes in MW/sec.

**Technical Analyses**

The technical analysis will include the following:

a. For each of the base case and study alternatives, Power Flow simulations will be carried out for the following CAISO contingency Categories in the Greater Fresno Area:

   i. ISO Category "B": B1, B2, B3 and overlapping line and generator outage in the study area. (See Appendix B for a list of contingencies).

   ii. ISO Category "C" list for 500 KV outages, 230 kV common tower line outages in the Greater Fresno Area, and 230 kV common corridor lines in the Big Creek Corridor, also listed in Appendix B.

b. Run Post Transient and Voltage Stability simulations for critical Categories B and C contingencies to assess the reactive support requirements and potential facility overloads on the more promising alternatives.
c. Run Transient stability simulations of critical Categories B and C contingencies .

**2. Further Studies on PG&E Alternatives 4 and 5**

The earlier conceptual study results show that the cost estimates for PG&E Alternatives 4 and 5 are practically the same. To select the preferred alternative, more detailed studies using more specific information are needed.

**A. PG&E Alternative 4**

No voltage Stability study or transient stability study was conducted in the conceptual study. To form a more definitive selection of the alternatives, these studies need to be run based on selected Categories B and C contingencies in Appendix B.

**B. PG&E Alternative 5**

In the earlier conceptual study, Alternative 5 included a 500 kV line between Tehachapi and Gregg. This study will investigate if this Gregg – Tehachapi 500 kV line can be separated into two sections:

- Gregg – Midway 500 kV line
- Tehachapi – Midway 500 kV line

a. Run Power flow simulations for normal and single and double contingencies based on the list of ISO Categories B and C contingencies. (See Appendix B).

b. Run Post Transient and Voltage Stability simulations for critical Categories B and C contingencies to assess the reactive support requirements and potential facility overloads on the most promising alternatives..

c. Run Transient stability simulations critical Categories B and C contingencies on the most promising alternatives.

**3. Further Studies on SCE Alternatives**

SCE's Alternatives 1, 2, 3 and 10 will be studied as described above for PG&E Alternatives 4 and 5.

**4. Production Simulation Study**

The CAISO will run production simulation models to determine the production costs, congestion costs and system losses associated with the various transmission alternatives using the SSG-WI data base for study year 2008 after it is updated. The purpose of this portion of the study is to help in answering the following questions:

a. How would the Fresno 230 kV Tie be operated? How frequently would the angle change and how large would the flow be across the phase shifter?
b. How would the Helms pumped storage plant operation change with the addition of the Tehachapi generation?
c. Would the potential line additions north of Midway provide a substantial economic benefit?
d. If a line is constructed north of Midway, what is to preferred termination?
e. How would the addition of the Tehachapi generation impact the operation of the generators connected at Midway and in other areas of the system?
f. What is the optimum combination of the Fresno 230 kV Tie, PG&E's Alternatives 4 and 5 and SCE's Alternatives 1, 2, 3 and 10.

g. Would the adding a line between Tehachapi and Midway instead of from Tehachapi south help transmit Tehachapi generation to PG&E? If so, at what level of Tehachapi generation?
h. Would adding a line between Tehachapi and Midway benefit the transmission system more than adding a line from Tehachapi south? If so, identify the party or parties that benefit(s).

A. Assumptions:

Hydro conditions: Initially average and high hydro will be studied. Additional studies to examine high and low hydro scenarios will be conducted as necessary. For Fresno 230 kV Tie, PG&E will need to consider high hydro conditions, since this alternative would inject power into a generating system. SCE considers all hydro conditions as valid conditions that need to be explored.

Gas cost: Modeled per SSG-WI base case assumptions.

Coal cost: Modeled per SSG-WI base case assumptions.

Wind modeling: The wind generation will be modeled as non-dispatchable, fixed hourly generation quantities. Two wind generation output models will be studied. One that has been developed by NREL and others and a second that is simply a scaling up of the existing Tehachapi historical output. The production simulation runs will determine the megawatthours of wind generation used. The cost assigned to wind generation will be determined as part of this study and will be applied to the wind generation quantity determined in each run to yield the total production cost.

New resources will be included as modeled by SSG-WI, which will be consistent with each LSE's filed Long Term Plans.

Path ratings, line ratings, and nomograms: Modeled per SSG-WI base case assumptions.

Selected non-simultaneous Ratings:
COI: 4,800 MW N-S; 3,675 MW S-N
Path 15: 3,265 MW N-S; 5,400 MW S-N
Path 26: 3,700 MW N-S; 3,000 MW S-N

**Additional limits to be modeled:**

*a.* Path 26: Power flow between 3,000 MW and 3,700 MW N-S is supported by a RAS that trips Midway area generation. The Path 26

limit will be decreased by 1 MW for every 1 MW decrease in Midway generation (La Paloma, Sunrise, Elk Hills)

b. Path 15: 5,400 MW S-N is supported by RAS that trips generation connected to Midway. The Path 15 limit will be decreased by 1 MW for every 2 MW decrease in Midway generation (La Paloma, Sunrise, Elk Hills).
c. Run power flow and stability studies to see if there is a simultaneous interaction between the Fresno 230 kV Tie and Path 26. If there is, model the nomogram in the production simulation.

d. SCIT nomogram: Either from existing SCIT nomogram studies or assume no more than 60% of SCE's load would be supplied from imports into Southern California.

B. Study Scenarios

**Tehachapi and Antelope Valley wind generation = 0 MW**

a. Existing system after completion of SCE's Phase 1 Facilities, Segments 1, 2 and 3

b. Same as (a) but with the Fresno 230 kV Tie
Phase shifter setting to be determined.

**Tehachapi and Antelope Valley wind generation = 1600 MW**

c. Existing system plus SCE Phase 1 and Phase 2 facilities.
d. Same as a, but with the Fresno 230 kV Tie.

**Tehachapi and Antelope Valley wind generation = 4,500 MW without Fresno 230kV tie**

e. Existing System after completion of SCE's Phase 1 and Phase 2 facilities.
f. PG&E Alternative 4 with SCE Alternative 1, i.e., Tesla-Los Banos-Gates-Midway-Tehachapi, Tehachapi-Antelope, Antelope-Vincent and Antelope-Pardee. (Total of two lines between Tehachapi-Antelope)
g. PG&E Alternative 4, modified to remove Tehachapi-Midway line, and SCE Alternative 2, i.e., Tesla-Los Banos-Gates-Midway, and Tehachapi-Antelope-Vincent, Tehachapi-Vincent and Antelope-Pardee (Two lines between Tehachapi-Antelope and one Tehachapi-Vincent)
h. PG&E Alternative 5 with SCE Alternaitve 1

i. PG&E Alternative 5 modified to replace Gregg-Tehachapi with Gregg-Midway with SCE Alternative 1, i.e., Tesla-Los Banos-Gregg-Midway-Tehachapi-Antelope–Vincent and Antelope-Pardee. (Total of two lines between Tehachapi-Antelope)
j. PG&E Alternative 5, modified to replace Gregg-Tehachapi with Gregg-Midway line and SCE Alternative 2, i.e., Tesla-Los Banos-Gregg-Midway; and Tehachapi-Antelope-Vincent, Tehachapi-Vincent and Antelope-Pardee (Total of two lines between Tehachapi-Antelope).

**Tehachapi and Antelope Valley wind generation = 3,300 MW**

k. Same as f, above.
l. Same as h, above.
m. Tesla-Gregg, with Fresno 230kV tie, two 500kV lines Tehachapi-Antelope.
n. Tesla-Los Banos-Gates-Midway, with Fresno 230kV tie, two 500kV lines Tehachapi-Antelope

Based on the above, choose the best PG&E alternative.

o. Fresno 230 kV Tie with SCE Alternative 2

p. Best PG&E alternative with SCE Alternative 3

q. Best PG&E alternative with SCE Alternative 10

## 5. Cost Estimation of Facilities

All costs associated with the Fresno 230 kV Tie, PG&E Alternatives 4 and 5 and SCE Alternatives 1, 2, 3 and 10, including engineering and permitting, purchase of equipment and rights-of way, construction, interest during construction, contract administration, etc. will be estimated in 2005 dollars

## 6. Determination of Recommended Plan

The present value of the costs given by the production simulation runs in Section 4, above, plus the wind generation costs, over 30 years, at a discount rate to be established in the study, will be added to the costs of the facilities, determined in Section 5, above, to obtain the least cost combination of alternatives. This total present value cost will also be expressed as a series of annual costs.

This combination of alternatives will be the recommended plan.

## 7. Study Schedule

| WORK ITEM | START | FINISH | 2005 May | June | July | Aug | Sep | Oct | Nov | Dec | 2006 Jan | Feb |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SCE: Fresno 230 kV Tie PG&E Plan A, N of Magunden power flow | 5/1/05 | 6/1/05 | ■ | | | | | | | | | |
| SCE: Fresno 230 kV Tie PG&E Plan A, S of Magunden power flow | 6/1/05 | 7/1/05 | | ■ | | | | | | | | |
| SCE: Fresno 230 kV Tie PG&E Plan A with Plan B power flow | 7/1/05 | 8/1/05 | | | ■ | | | | | | | |
| PG&E: Base Case Available | 6/1/05 | | | o | | | | | | | | |
| PG&E: Fresno 230 kV Tie power flow | 6/1/05 | 7/1/05 | | ■ | | | | | | | | |
| Meeting of Participants at PG&E | 6/28/05 | | | | o | | | | | | | |
| SCE & PG&E: Fresno facilities cost estimate | 6/1/05 | 9/1/05 | | ■ | ■ | ■ | | | | | | |
| CA ISO: first results of production simulations | 7/1/05 | 9/1/05 | | | ■ | ■ | | | | | | |
| All: determine optimum capacity of Fresno Tie: Plan A or A & B | 9/1/05 | 10/1/05 | | | | | ■ | | | | | |
| SCE & PG&E: cost of facilities for all alternatives | 6/1/05 | 11/1/05 | | ■ | ■ | ■ | ■ | ■ | | | | |
| CA ISO final report on results of production simulations | 9/1/05 | 11/1/05 | | | | | ■ | ■ | | | | |
| CPUC: calculates ranking of combinations of alternatives | 11/1/05 | 11/15/05 | | | | | | | ■ | | | |
| Meeting of Participants | 11/15/05 | | | | | | | | o | | | |
| CA ISO operator report on compatibility of Fresno Intertie | 10/1/05 | 12/15/05 | | | | | | ■ | ■ | ■ | | |
| CPUC: Develop Table of Contents | 10/1/05 | 11/1/05 | | | | | | ■ | | | | |
| ALL: draft report | 11/1/05 | 12/15/05 | | | | | | | ■ | ■ | | |
| CPUC: Final Report | 12/15/05 | 3/1/06 | | | | | | | | ■ | ■ | ■ |

**ERRATA:** CAISO 12/15/05 operator report topic should read "system operability with 4500MW of wind generation at Tehachapi/Antelope Valley".

# Appendix A
# SCE list of on Contingencies

Table 1
Single Contingency Outage List

| Outage Number | From Bus No. | To Bus No. | From Bus | | To Bus | | Circuit ID |
|---|---|---|---|---|---|---|---|
| | | | Name | Voltage | Name | Voltage | |
| N1-1 | 24301 | 24302 | BIG CRK1 | 230 | BIG CRK2 | 230 | 1 |
| N1-2 | 24301 | 24320 | BIG CRK1 | 230 | EASTWOOD | 230 | 1 |
| N1-3 | 24302 | 24303 | BIG CRK2 | 230 | BIG CRK3 | 230 | 1 |
| N1-4 | 24302 | 24305 | BIG CRK2 | 230 | BIG CRK8 | 230 | 1 |
| N1-5 | 24304 | 24303 | BIG CRK4 | 230 | BIG CRK3 | 230 | 1 |
| N1-6 | 24305 | 24303 | BIG CRK8 | 230 | BIG CRK3 | 230 | 1 |
| N1-7 | 24316 | 24303 | MAMMOTH | 230 | BIG CRK3 | 230 | 1 |
| N1-8 | 24303 | 24235 | BIG CRK3 | 230 | RECTOR | 230 | 2 |
| N1-9 | 24301 | 25900 | BIG CRK1 | 230 | FRSNOSCE | 230 | 1 |
| N1-10 | 24303 | 25900 | BIG CRK3 | 230 | FRSNOSCE | 230 | 1 |
| N1-11 | 30820 | 39000 | HELMS PP | 230 | FRSNOPGE | 230 | 1 |
| N1-12 | 30820 | 39000 | HELMS PP | 230 | FRSNOPGE | 230 | 2 |
| N1-13 | 30810 | 39000 | GREGG | 230 | FRSNOPGE | 230 | 1 |
| N1-14 | 30810 | 39000 | GREGG | 230 | FRSNOPGE | 230 | 2 |
| N1-15 | 24235 | 25900 | RECTOR | 230 | FRSNOSCE | 230 | 1 |
| N1-16 | 24235 | 25900 | RECTOR | 230 | FRSNOSCE | 230 | 2 |
| N1-17 | 24141 | 24304 | SPRINGVL | 230 | BIG CRK4 | 230 | 1 |
| N1-18 | 24141 | 24235 | SPRINGVL | 230 | RECTOR | 230 | 1 |
| N1-19 | 24153 | 24235 | VESTAL | 230 | RECTOR | 230 | 1 |
| N1-20 | 24235 | 24153 | RECTOR | 230 | VESTAL | 230 | 2 |
| N1-21 | 24235 | 24087 | RECTOR | 230 | MAGUNDEN | 230 | 1 |
| N1-22 | 24087 | 24141 | MAGUNDEN | 230 | SPRINGVL | 230 | 1 |
| N1-23 | 24087 | 24141 | MAGUNDEN | 230 | SPRINGVL | 230 | 2 |
| N1-24 | 24087 | 24153 | MAGUNDEN | 230 | VESTAL | 230 | 1 |
| N1-25 | 24087 | 24153 | MAGUNDEN | 230 | VESTAL | 230 | 2 |
| N1-26 | 24142 | 24101 | SYC CYN | 230 | OMAR | 230 | 1 |
| N1-27 | 24087 | 24101 | MAGUNDEN | 230 | OMAR | 230 | 1 |
| N1-28 | 24087 | 24115 | MAGUNDEN | 230 | PASTORIA | 230 | 1 |
| N1-29 | 24087 | 24115 | MAGUNDEN | 230 | PASTORIA | 230 | 2 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| N1-30 | 24087 | 24115 | MAGUNDEN | 230 | PASTORIA | 230 | 3 |
| N1-31 | 24087 | 24401 | MAGUNDEN | 230 | ANTELOPE | 230 | 2 |
| N1-32 | 24087 | 27020 | MAGUNDEN | 230 | TEHACH_5 | 230 | 1 |
| N1-33 | 24401 | 27020 | ANTELOPE | 230 | TEHACH_5 | 230 | 1 |
| N1-34 | 24401 | 27000 | ANTELOPE | 230 | TEHACH_6 | 230 | 1 |
| N1-35 | 24115 | 25613 | PASTORIA | 230 | EDMONSTN | 230 | 1 |
| N1-36 | 24115 | 28050 | PASTORIA | 230 | LEBEC | 230 | 1 |
| N1-37 | 24114 | 24115 | PARDEE | 230 | PASTORIA | 230 | 1 |
| N1-38 | 24114 | 24217 | PARDEE | 230 | WARNETAP | 230 | 1 |
| | 24115 | 24217 | PASTORIA | 230 | WARNETAP | 230 | 1 |
| | 24218 | 24217 | WARNE | 230 | WARNETAP | 230 | 1 |
| N1-39 | 24403 | 24115 | BAILEY | 230 | PASTORIA | 230 | 1 |
| N1-40 | 24114 | 24403 | PARDEE | 230 | BAILEY | 230 | 1 |
| N1-41 | 24114 | 24155 | PARDEE | 230 | VINCENT | 230 | 1 |
| N1-42 | 24155 | 24091 | VINCENT | 230 | MESA CAL | 230 | 1 |
| N1-43 | 24155 | 24126 | VINCENT | 230 | RIOHONDO | 230 | 1 |
| N1-44 | 24155 | 24126 | VINCENT | 230 | RIOHONDO | 230 | 3 |
| N1-45 | 24091 | 24126 | MESA CAL | 230 | RIOHONDO | 230 | 1 |
| N1-46 | 24091 | 24126 | MESA CAL | 230 | RIOHONDO | 230 | 2 |
| N1-47 | 24076 | 24126 | LAGUBELL | 230 | RIOHONDO | 230 | 1 |
| N1-48 | 24114 | 24147 | PARDEE | 230 | SYLMAR S | 230 | 1 |
| N1-49 | 24114 | 24147 | PARDEE | 230 | SYLMAR S | 230 | 2 |
| N1-50 | 24036 | 24114 | EAGLROCK | 230 | PARDEE | 230 | 1 |
| N1-51 | 24147 | 24089 | SYLMAR S | 230 | GOULD | 230 | 1 |
| N1-52 | 24036 | 24147 | EAGLROCK | 230 | SYLMAR S | 230 | 1 |
| N1-53 | 24086 | 24156 | LUGO | 500 | VINCENT | 500 | 1 |
| N1-54 | 24086 | 24156 | LUGO | 500 | VINCENT | 500 | 2 |
| N1-55 | 24156 | 24092 | VINCENT | 500 | MIRALOMA | 500 | 1 |
| N1-56 | 24500 | 24156 | ANTELOPE | 500 | VINCENT | 500 | 1 |
| N1-57 | 24500 | 24156 | ANTELOPE | 500 | VINCENT | 500 | 2 |
| N1-58 | 24500 | 24510 | ANTELOPE | 500 | PARDEE | 500 | 1 |
| N1-59 | 24520 | 24500 | TEHACHPI | 500 | ANTELOPE | 500 | 1 |
| N1-60 | 24520 | 24500 | TEHACHPI | 500 | ANTELOPE | 500 | 2 |
| N1-61 | 24520 | 30060 | TEHACHPI | 500 | MIDWAY | 500 | 1 |
| N1-62 | 30060 | 24156 | MIDWAY | 500 | VINCENT | 500 | 1 |
| N1-63 | 30060 | 24156 | MIDWAY | 500 | VINCENT | 500 | 2 |
| N1-64 | 30060 | 24156 | MIDWAY | 500 | VINCENT | 500 | 3 |
| T1-1 | 25900 | 39000 | FRSNOSCE | 230 | FRSNOPGE | 230 | 1 |
| T1-2 | 24156 | 24155 | VINCENT | 500 | VINCENT | 230 | 1 |
| T1-3 | 24092 | 24093 | MIRALOMA | 500 | MIRALOMA | 230 | 1 |
| T1-4 | 24500 | 24401 | ANTELOPE | 500 | ANTELOPE | 230 | 1 |
| T1-5 | 24510 | 24114 | PARDEE | 500 | PARDEE | 230 | 1 |

Table 2
Double Contingency Outage List

| Outage Number | From Bus No. | To Bus No. | From Bus | | To Bus | | Circuit ID |
|---|---|---|---|---|---|---|---|
| | | | Name | Voltage | Name | Voltage | |
| N2-1 | 24301 | 25900 | BIG CRK1 | 230 | FRSNOSCE | 230 | 1 |
| | 24303 | 25900 | BIG CRK3 | 230 | FRSNOSCE | 230 | 1 |
| N2-2 | 24235 | 25900 | RECTOR | 230 | FRSNOSCE | 230 | 1 |
| | 24235 | 25900 | RECTOR | 230 | FRSNOSCE | 230 | 2 |
| N2-3 | 24303 | 24235 | BIG CRK3 | 230 | RECTOR | 230 | 2 |
| | 24141 | 24304 | SPRINGVL | 230 | BIG CRK4 | 230 | 1 |
| N2-4 | 24303 | 24235 | BIG CRK3 | 230 | RECTOR | 230 | 2 |
| | 24141 | 24235 | SPRINGVL | 230 | RECTOR | 230 | 1 |
| N2-5 | 24141 | 24304 | SPRINGVL | 230 | BIG CRK4 | 230 | 1 |
| | 24141 | 24235 | SPRINGVL | 230 | RECTOR | 230 | 1 |
| N2-6 | 30820 | 39000 | HELMS PP | 230 | FRSNOPGE | 230 | 1 |
| | 30820 | 39000 | HELMS PP | 230 | FRSNOPGE | 230 | 2 |
| N2-7 | 30810 | 39000 | GREGG | 230 | FRSNOPGE | 230 | 1 |
| | 30810 | 39000 | GREGG | 230 | FRSNOPGE | 230 | 2 |
| N2-8 | 24153 | 24235 | VESTAL | 230 | RECTOR | 230 | 1 |
| | 24235 | 24153 | RECTOR | 230 | VESTAL | 230 | 2 |
| N2-9 | 24153 | 24235 | VESTAL | 230 | RECTOR | 230 | 1 |
| | 24235 | 24087 | RECTOR | 230 | MAGUNDEN | 230 | 1 |
| N2-10 | 24235 | 24153 | RECTOR | 230 | VESTAL | 230 | 2 |
| | 24235 | 24087 | RECTOR | 230 | MAGUNDEN | 230 | 1 |
| N2-11 | 24087 | 24141 | MAGUNDEN | 230 | SPRINGVL | 230 | 1 |
| | 24087 | 24141 | MAGUNDEN | 230 | SPRINGVL | 230 | 2 |
| N2-12 | 24087 | 24153 | MAGUNDEN | 230 | VESTAL | 230 | 1 |
| | 24087 | 24153 | MAGUNDEN | 230 | VESTAL | 230 | 2 |
| N2-13 | 24087 | 24115 | MAGUNDEN | 230 | PASTORIA | 230 | 1 |
| | 24087 | 24115 | MAGUNDEN | 230 | PASTORIA | 230 | 2 |
| N2-14 | 24087 | 24115 | MAGUNDEN | 230 | PASTORIA | 230 | 1 |
| | 24087 | 24115 | MAGUNDEN | 230 | PASTORIA | 230 | 3 |
| N2-15 | 24087 | 24115 | MAGUNDEN | 230 | PASTORIA | 230 | 2 |
| | 24087 | 24115 | MAGUNDEN | 230 | PASTORIA | 230 | 3 |
| N2-16 | 24087 | 24401 | MAGUNDEN | 230 | ANTELOPE | 230 | 2 |
| | 24087 | 27020 | MAGUNDEN | 230 | TEHACH_5 | 230 | 1 |
| N2-17 | 24087 | 24401 | MAGUNDEN | 230 | ANTELOPE | 230 | 2 |
| | 24401 | 27020 | ANTELOPE | 230 | TEHACH_5 | 230 | 1 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| N2-18 | 24403 | 24115 | BAILEY | 230 | PASTORIA | 230 | 1 |
| | 24114 | 24217 | PARDEE | 230 | WARNETAP | 230 | 1 |
| | 24115 | 24217 | PASTORIA | 230 | WARNETAP | 230 | 1 |
| | 24218 | 24217 | WARNE | 230 | WARNETAP | 230 | 1 |
| N2-19 | 24403 | 24115 | BAILEY | 230 | PASTORIA | 230 | 1 |
| | 24114 | 24217 | PARDEE | 230 | WARNETAP | 230 | 1 |
| | 24115 | 24217 | PASTORIA | 230 | WARNETAP | 230 | 1 |
| | 24218 | 24217 | WARNE | 230 | WARNETAP | 230 | 1 |
| N2-20 | 24114 | 24115 | PARDEE | 230 | PASTORIA | 230 | 1 |
| | 24114 | 24217 | PARDEE | 230 | WARNETAP | 230 | 1 |
| | 24115 | 24217 | PASTORIA | 230 | WARNETAP | 230 | 1 |
| | 24218 | 24217 | WARNE | 230 | WARNETAP | 230 | 1 |
| N2-21 | 24114 | 24403 | PARDEE | 230 | BAILEY | 230 | 1 |
| | 24114 | 24217 | PARDEE | 230 | WARNETAP | 230 | 1 |
| | 24115 | 24217 | PASTORIA | 230 | WARNETAP | 230 | 1 |
| | 24218 | 24217 | WARNE | 230 | WARNETAP | 230 | 1 |
| N2-22 | 24114 | 24155 | PARDEE | 230 | VINCENT | 230 | 1 |
| | 24036 | 24114 | EAGLROCK | 230 | PARDEE | 230 | 1 |
| N2-23 | 24114 | 24147 | PARDEE | 230 | SYLMAR S | 230 | 1 |
| | 24114 | 24147 | PARDEE | 230 | SYLMAR S | 230 | 2 |
| N2-24 | 24147 | 24089 | SYLMAR S | 230 | GOULD | 230 | 1 |
| | 24036 | 24147 | EAGLROCK | 230 | SYLMAR S | 230 | 1 |
| N2-25 | 24155 | 24126 | VINCENT | 230 | RIOHONDO | 230 | 1 |
| | 24155 | 24126 | VINCENT | 230 | RIOHONDO | 230 | 3 |
| N2-26 | 24156 | 24092 | VINCENT | 500 | MIRALOMA | 500 | 1 |
| | 24155 | 24126 | VINCENT | 230 | RIOHONDO | 230 | 1 |
| N2-27 | 24156 | 24092 | VINCENT | 500 | MIRALOMA | 500 | 1 |
| | 24155 | 24126 | VINCENT | 230 | RIOHONDO | 230 | 3 |
| N2-28 | 24091 | 24126 | MESA CAL | 230 | RIOHONDO | 230 | 1 |
| | 24091 | 24126 | MESA CAL | 230 | RIOHONDO | 230 | 2 |
| N2-29 | 24091 | 24126 | MESA CAL | 230 | RIOHONDO | 230 | 1 |
| | 24076 | 24126 | LAGUBELL | 230 | RIOHONDO | 230 | 1 |
| N2-30 | 24091 | 24126 | MESA CAL | 230 | RIOHONDO | 230 | 2 |
| | 24076 | 24126 | LAGUBELL | 230 | RIOHONDO | 230 | 1 |
| N2-31 | 24086 | 24156 | LUGO | 500 | VINCENT | 500 | 1 |
| | 24086 | 24156 | LUGO | 500 | VINCENT | 500 | 2 |
| N2-32 | 24500 | 24156 | ANTELOPE | 500 | VINCENT | 500 | 1 |
| | 24500 | 24156 | ANTELOPE | 500 | VINCENT | 500 | 2 |
| N2-33 | 24520 | 24500 | TEHACHPI | 500 | ANTELOPE | 500 | 1 |
| | 24520 | 24500 | TEHACHPI | 500 | ANTELOPE | 500 | 2 |
| N2-34 | 30060 | 24156 | MIDWAY | 500 | VINCENT | 500 | 1 |
| | 30060 | 24156 | MIDWAY | 500 | VINCENT | 500 | 2 |

# Appendix B
# PG&E list of Contingencies

## "B" contingencies for 500 kV system:

- Tesla – Los Banos 500 kV line outage,
- Los Banos – Gates 500 kV line outage,
- Los Banos – Midway 500 kV line outage,
- Gates – Midway 500 kV line outage,
- Tesla – Gregg 500 kV line outage (Alt. 5),
- Gregg – Midway 500 kV line outage (Alt. 5),
- PDCI Bi-pole Outage.

## "C" contingencies for 500 kV system:

- Tesla – Los Banos and Tracy – Los Banos 500 kV double line outage (Los Banos north),
- Los Banos – Midway and Los Banos – Gates #3 500 kV double line outage (Los Banos south),
- Los Banos – Midway and Gates – Midway 500 kV double line outage (Midway north),
- Los Banos – Midway #1 and #2 (new) 500 kV double line outage (Midway north for Alt. 4),
- Tesla – Los Banos and Tesla – Gregg (new) 500 kV double line outage (Alt. 5),
- Two Palo Verde generation units outage,
- Two Diablo Canyon generation units outage.

# Attachment C
# July 14, 2004 Study Plan

# Phased Transmission Development Plan for Interconnecting Over 4,000 MW of Wind Generation In North Los Angeles and Kern Counties Referred to as the "Tehachapi Area"

## Study Plan

July 14, 2004

For information or questions regarding this Study Plan, please contact Jorge Chacon via phone at (626) 302-9637 or e-mail at jorge.chacon@sce.com

# Summary of Revisions

A number of participants provided comments to the Tehachapi Collaborative Study Plan date June 21, 2004. The following is a summary of the revision made to the Study Plan.

A new section that discusses the purpose of the Tehachapi Conceptual Transmission Plan was added.

Objective No.2 was expanded to include the goal of a single phased conceptual transmission plan and what happens if consensus is not reached.

Objective No.7e was expanded to include determination of how much spacing between transmission lines is required to consider the lines to be on "separate" right-of-way.

Objective No.9 was added to address whether regional transmission approach should be adopted for other renewable areas in the State.

CPUC Staff responsibilities were added to the responsibility section.

The section covering currently proposed projects was expanded to include electrical characteristics and thermal ratings so that the collaborative group can effectively model these projects into any study case.

A new section was added to cover electrical characteristics and thermal ratings for each of the Alternative Tehachapi Area Conceptual Plans.

A new element was added to the power flow base case assumptions section to cover the generation displacement assumptions as provided by the CAISO

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## Introduction

The Tehachapi area has been categorized as the largest wind resource area in the State of California. This area, if more fully developed, could meet a significant portion of the goals for the renewable energy development in California. In order to tap this energy resource area, large-scale transmission upgrades are required as the existing transmission facilities in the area, the Antelope-Bailey 66-kV subtransmission network and the Big Creek 230-kV Corridor, are already fully utilized.

Transmission constraints into the Tehachapi area have been discussed as part of the ongoing Assembly Bill (AB) 970 Investigation 00-11-001 with Phase 6 of the proceeding devoted to Tehachapi. The outcome of AB 970 Phase 6 is an Interim Opinion on Transmission Needs in the Tehachapi Wind Resource Area which orders (CPUC Decision 04-06-010) the formation of a collaborative study group to be convened to develop a comprehensive transmission development plan for the phased expansion of transmission capabilities into the Tehachapi area.

The CPUC Staff will coordinate the collaborative study group with assistance by the California Independent System Operator (CAISO) as needed. The collaborative study group will include participation by Southern California Edison Company (SCE), Pacific Gas and Electric Company (PG&E), wind developers, and any other interested parties including the California Energy Resources Conservation and Development Commission (CEC), Department of Defense, the counties of Kern and Los Angeles, the Los Angeles Department of Water and Power (LADWP), and the owners of the independently owned Sagebrush line. It is envisioned that the collaborative study group will function

in a manner similar to the Southwest Transmission Expansion Plan (STEP) process.

This Study Plan provides a proposed guideline for the Tehachapi Comprehensive Transmission Development Assessment. The study plan is divided into fourteen sections: (1) Introduction, (2) Background, (3) Purpose of Tehachapi Conceptual Transmission Plan, (4) Objectives, (5) Responsibilities, (6) Currently Proposed Projects in Area, (7) Alternative Tehachapi Area Conceptual Plans, (8) Electrical Characteristics and Thermal Ratings of Alternate Conceptual Plans, (9) Assessment Process Outline, (10) Study Areas and Study Conditions, (11) Power Flow Base Case Assumptions, (12) Power Flow Screening Level Preliminary Assessment, (13) Final Report, and (14) Schedule of Major Milestones. The study plan will be followed by the Collaborative Study Group in completing the order set forth which requires Edison, acting on behalf of the study group, to file a report in the AB 970 proceeding containing the study group's findings and recommendations within nine months of the effective date of CPUC Decision 04-06-010 which is March 9, 2005.

Background

Southern California Edison has performed a number of conceptual studies for interconnecting renewable wind generation in the Tehachapi area. These conceptual studies were performed for the purpose of identifying conceptual transmission facilities necessary to meet future delivery needs for wind generation in the Tehachapi area. The initial conceptual study was done with participation of ten wind developers who collectively identified, on a conceptual basis, a total of 2,500 MW of potential wind development in the Tehachapi area.

A subsequent conceptual study (Phase 2) was performed with participation of eight wind developers. The purpose for this subsequent conceptual study was to perform preliminary substation site selection studies in the Cal Cement, Monolith, and Jawbone areas as well as identify potential line routes for new transmission into the Tehachapi area. Total wind generation considered was unchanged at the 2,500 MW level. Testimony was filed by SCE in the AB 970 Phase VI proceeding based on the study results of this conceptual study. The CAISO interjected testimony suggesting a different project alternative to interconnect Tehachapi area wind generation.

A third conceptual study (Phase 3) was performed to evaluate an additional 770 MW of wind generation development increasing the total Tehachapi wind

generation potential from 2,500 MW to 3,270 MW. This conceptual study resulted in two conceptual transmission alternatives (230-kV and 500-kV conceptual alternative) for integrating Tehachapi area wind generation. The 500-kV transmission alternative plan was further refined to accommodate increased Tehachapi area wind generation potential as identified by the CEC in their Electric Transmission Plan for Renewable Resources in California Report to the Legislature dated December 1, 2003. The new Tehachapi area wind generation potential as identified by the CEC is now in excess of 4,000 MW. The CPUC adopted the 500-kV transmission alternative in their report to the Legislature for interconnecting over 4,000 MW of wind generation.

This increased MW potential and the identification of a 500-kV transmission alternative has resulted in the presentation of yet another transmission alternative to the SCE Conceptual Study Plan. The alternative, as presented by Oak Creek Energy Systems and CalWea, includes the development of a fourth Midway-Vincent (via Tehachapi)
500-kV transmission line.

These project alternatives resulted in a number of outstanding issues that need to be addressed by the Tehachapi Collaborative Study Group. The outstanding issues include the determination if the CAISO proposed PG&E-SCE interconnection alternative provides statewide benefits and allow wind generation development to proceed, identification of expected demarcation between gen-ties and network transmission facilities, and consideration of regional benefits when developing revised Tehachapi Phased Conceptual Transmission plan.

Purpose of Tehachapi Conceptual Plan

Conceptual studies are no substitute for System Impact or Facilities Studies, which will be required prior to interconnecting any new wind generation in the area. The results of the conceptual studies are to be used as a roadmap in developing transmission facilities into the Tehachapi area. The roadmap will serve as a means to avoid the piecemeal transmission additions associated with construction of facilities to interconnect only each year's winning RPS bidders or to interconnect only the projects which request interconnection (incremental requests). The actual timing of construction of transmission facilities will be driven by actual interconnection requests. However, instead of sizing the facility to accommodate the requested interconnection amount, the facilities will be developed in a way that is consistent with the conceptual transmission plan.

It should be noted that conceptual transmission plans should not be viewed as a permanent plan. Modifications to the conceptual transmission plan may be necessary as a result of actual need. In other words, the plan needs to be flexible so that future changes can be made if actual generation locations turn out to be different than what is assumed in developing this conceptual transmission plan.

Objectives

Edison, PG&E and the collaborative study group, in coordination with the CPUC Staff and the CAISO, will:

a. assess the amount of resources available in the Tehachapi Area that can be accommodated using existing transmission system capacity

b. develop a comprehensive Tehachapi transmission development plan in order for upgrades in the Tehachapi area to be most cost effective, least environmentally disruptive, orderly, and logical based on the magnitude of the wind resource identified by the CEC

   i. The study group should cooperatively work on developing a single phased conceptual transmission plan, at least for the initial portions of the phased upgrades

   ii. If consensus among the participants is not reached, the study group should explain clearly factors that would influence a choice among any alternative proposals

c. incorporate the transmission facilities for the Tehachapi Upgrades necessary to interconnect the PPM Project into the conceptual plan

   i. the PPM Project has completed the System Impact and Facilities Studies, has priority over conceptual projects, is ready to pursue as a Market Participant, and should not be held-up by the Collaborative Study Group

   ii. approval of System Impact and Facilities Studies should follow the FERC Interconnection Process

d. identify viable transmission alternatives, taking a statewide approach, for systematically phasing transmission into the Tehachapi area to ultimately interconnect the full Tehachapi wind resource potential identified by the CEC (over 4,000 MW)

e. assess the extent to which each transmission alternative configuration would assist in the transport of power to companies other than Edison in order to meet their corresponding RPS goals

f. develop phasing and priority of each transmission alternative

i. develop a list of short lead time transmission upgrades can be pursued on a fast-track schedule

ii. identify phase development of each transmission alternative in an orderly, rational and cost effective manner

iii. determine the amount of wind generation that can be accommodated with each phase of each transmission alternative

iv. determine if any additional transmission elements should be included into a subsequent CPCN filing

v. identify all new conceptual transmission facilities (e.g. lines, substations, and upgrades to existing lines and substations) required to transmit the power from Tehachapi to the various load centers (PG&E, Edison, and SDG&E)

vi. identify the expected demarcation between gen-ties and network transmission facilities to the extent feasible

vii. develop recommendations regarding the procedures whereby each phase of the upgrades would be trigger after the first phase

g. perform preliminary feasibility analysis for the transmission facilities identified

i. perform preliminary "screening-level" power flow analysis

ii. perform preliminary engineering review to identify transmission elements that may be problematic

iii. perform preliminary environmental review of transmission facilities based on available information contained in currently available environmental data bases in order to identify potential significant environmental constraints

iv. develop a preliminary list of licensing and environmental requirements for the transmission line right-of-way and potential substation sites

v. resolve with the Department of Defense any critical issues surrounding transmission line routes and heights and minimum distance between lines to consider lines as different corridor

vi. address how long it would take for the anticipated transmission owner to prepare and file each of the needed certificate applications based on the study group recommendations

vii. identify the maximum reasonably foreseeable build-out for the utility-owned assets in order to comply with CEQA requirements

h. identify estimates of the transmission costs, including substation costs and land acquisition costs, based on standard, off-the-shelf, general unit cost basis

i. determine if the regional transmission planning approach should be adopted for other renewable areas in the State

Responsibilities

The following are assignments for the supply of information to the Study Group to facilitate the development of a Collaborative Transmission Development Plan

a. The CPUC Staff will coordinate the collaborative study group with assistance by the California Independent System Operator (CAISO) as needed.

b. Edison is responsible for completing the aforementioned objectives for identifying

a. conceptual facilities required within SCE's service territory to interconnect additional Tehachapi wind generation into SCE's existing network

b. potential transmission upgrades needed to deliver energy to SCE's load center or to the first interconnection point with PG&E and/or SDG&E,

c. potential impacts to SCE's network as a result of new facilities that are proposed to interconnect the SCE system with the PG&E system,

d. potential impacts to SCE's existing network as a result of implementing third party transmission expansion.

c. PG&E is responsible for completing the aforementioned objectives for

a. Identifying new facilities within PG&E's service territory required to deliver Tehachapi wind generation from SCE's first interconnection point to PG&E's load center in the Bay area,

b. evaluating new facilities that are proposed to directly interconnect additional Tehachapi wind generation into PG&E's existing network

c. evaluating potential impact to PG&E's network as a result of new facilities that are proposed to interconnect the SCE system with the PG&E system

d. potential impacts to SCE's existing network as a result of implementing third party transmission expansion

d. The CAISO is responsible for conducting cost analysis for

a. quantifying any new RMR exposure identified in either SCE's or PG&E's system as a result of the proposed alternatives,

b. quantifying any additional congestion exposure on Path 26, Path 15, and other parts of the ISO Grid as a result of either connecting the SCE system with the PG&E system, delivering Tehachapi area wind generation to SDG&E, or delivering Tehachapi area wind generation to PG&E

e. Third Parties who may wish to participate (such as LADWP and the Sagebrush Owners) in the study process are responsible for

a. identifying whether they are interested in participating in conceptual studies to support Tehachapi,

b. providing the specifics on how any facilities currently owned by those entities or new proposed facilities to be owned by those entities can be used to integrate additional Tehachapi area wind generation

If active participation of these third parties does not evolve or is of limited input, the study group should dispense in evaluating how these non-CAISO

controlled assets could be utilized since they are outside the jurisdiction of the CAISO and CPUC and therefore should not be rolled into the final plan.

Currently Proposed Projects in the Area

The following are transmission projects that have been identified in a different forum and should be included into the starting base cases. The Collaborative Tehachapi Study Group should base transmission development plans with these projects included into the starting cases.

1. Transmission requirements to interconnect the 201 MW PPM project (Antelope-Pardee)

   I. transmission requirements to interconnect the PPM project includes a new transmission line from the SCE Antelope substation to the SCE Pardee substation and substation expansions at Pardee and Antelope to accommodate the new line

   II. the CAISO has reviewed the System Impact and Facilities studies for this project and will present to their governing board on July 29 for approval

   III. electrical characteristics (per-unit) for this transmission line are as follows:

      a. 100 MVA / 230-kV base R=0.00124 X=0.02812 B=2.0699
      b. 100 MVA / 500-kV base R=0.00026 X=0.00595 B=0.4380

   IV. transmission ratings are as follows:

      a. Normal Rating = 3950 amps
      b. Long-Term Emergency Rating = 4540 amps
      c. Short-Term Emergency Rating = 5330 amps

2. Pastoria-Pardee Transmission Line Reconductor

   This project is an infrastructure replacement project which was identified in the 2004-2008, 2013 CAISO Controlled SCE Transmission Expansion plan. The scope of the project is to replace the existing 605 ACSR conductor on the Pastoria-Bailey, Pastoria-Pardee, and Bailey-Pardee 230-kV transmission lines with 666.6 ACSS/TW. This conductor type is the largest conductor that can be utilized on the existing transmission towers without requiring tear-down and rebuild. The project is not driven by Tehachapi wind generation needs.

The CAISO has reviewed the studies for this project and provided conditional concurrence pending receiving any input from the Collaborative Study Group.

SCE has presented this project to the Collaborative Study Group for informational purposes only and did not receive any opposition

V. electrical characteristics (per-unit) for this upgrade provided on 100 MVA / 230-kV base are as follows:

a. Pastoria-Pardee R=0.0109 X=0.0587 B=0.1085
b. Pastoria-Bailey R=0.0035 X=0.0187 B=0.0346
c. Pardee-Bailey R=0.0073 X=0.0398 B=0.0737

VI. ratings for the Pastoria-Bailey and Pardee-Bailey lines are as follows:

a. Normal Rating = 1240 amps
b. Long-Term Emergency Rating = 1426 amps
c. Short-Term Emergency Rating = 1500 amps

VII. ratings for the Pastoria- Pardee line is 1500 amps under all conditions

3. San Joaquin Valley Rector Loop and SVC

This project is a reliability driven project first identified in the 2002-2006, 2011 CAISO Controlled SCE Transmission Expansion plan and validated over the last two expansion plans. The project consists of constructing a new 15-20 mile double-circuit 230-kV transmission line so that the existing Big Creek3-Springville 230-kV line can be looped in and out of the Rector 230-kV substation and adding a 175 MVAR static VAR compensator (SVC) at Rector. This project has been approved by the CAISO governing board on June 24, 2004.

electrical characteristics (per-unit) for this upgrade provided on 100 MVA / 230-kV base are as follows:

a. New Big Creek3-Rector R=0.0106 X=0.0889 B=0.1711
b. New Rector-Springville R=0.0079 X=0.0660 B=0.1277

ratings for the New Big Creek3-Rector line will be as follows:

c. Normal Rating = 1200 amps (wave trap)
d. Long-Term Emergency Rating = 1200 amps (wave trap)
e. Short-Term Emergency Rating = 1284 amps (wave trap)

ratings for the New Rector-Springville line will be as follows:

f. Normal Rating = 1200 amps (wave trap)
g. Long-Term Emergency Rating = 1200 amps (wave trap)
h. Short-Term Emergency Rating = 1284 amps (wave trap)

Alternative Tehachapi Area Conceptual Plans

The following is a discussion of the currently proposed Tehachapi Area Conceptual Transmission Alternatives:

Revised SCE Conceptual Transmission Plan

New 500-kV Transmission line from Pardee to the Tehachapi area via Antelope. The line section between Antelope and Pardee (25 miles) should be included into the starting cases (initially energized at 230-kV) for reasons identified above. This line section will replace an existing 66-kV transmission line between Antelope and Pardee requiring expansion of existing right-of-way (ROW). New ROW will be required between Tehachapi and Antelope
(30 miles).

New 500-kV Transmission line from Vincent to the Tehachapi area via Antelope. The line section between Vincent and Antelope will replace existing 230-kV transmission line(s). New ROW will be required between Tehachapi and Antelope that is distinct from the ROW required above (30 miles).

Second new 500-kV Transmission line from Vincent to the Tehachapi area via different route due to right-of-way restrictions. This line will require new ROW between Vincent and Tehachapi.

Additional capacity between Vincent and the Los Angeles Basin in order to deliver output from the Tehachapi area wind generation to the SCE or SDG&E load centers.

New 500/230-kV substation(s) located near the Tehachapi Pass with several (up to four) 230/66-kV substations located in the various wind regimes.

220-kV transmission lines from the new 500/230-kV substation(s) to the 230/66-kV substations.

66-kV transmission lines from the new 230/66-kV substation(s) to the windfarms to collect the wind generation from the various sites.

Substation Expansion at Pardee and Vincent.

SCE-PG&E Phase-shifted System-Tie (CAISO Suggestions)

New phase-shifted system-tie in the Fresno Area

New phase-shifted system-tie in the Bakersfield Area

New 500-kV or 230-kV transmission line from the Tehachapi area to existing transmission facilities (to be determined). New ROW will be required between Tehachapi and the existing transmission facilities.

New 500/230-kV substation(s) located near the Tehachapi Pass with several (up to four) 230/66-kV substations located in the various wind regimes.

220-kV transmission lines from the new 500/230-kV substation(s) to the 230/66-kV substations.

66-kV transmission lines from the new 230/66-kV substation(s) to the windfarms to collect the wind generation from the various sites.

Midway-Vincent No.4 via Tehachapi

New 500-kV Transmission line from Midway to the Tehachapi area. Some new ROW may be required.

New 500-kV Transmission line from Vincent to the Tehachapi area via Antelope. This line will replace existing 230-kV transmission line(s) between Vincent and Antelope. New ROW will be required between Tehachapi and Antelope.

New 500/230-kV substation(s) located near the Tehachapi Pass with several (up to four) 230/66-kV substations located in the various wind regimes.

220-kV transmission lines from the new 500/230-kV substation(s) to the 230/66-kV substations.

66-kV transmission lines from the new 230/66-kV substation(s) to the windfarms to collect the wind generation from the various sites.

Substation Expansion at Midway and Vincent.

Electrical Characteristics and Thermal Ratings of Alternative Conceptual Plans

The following are the corresponding electrical characteristics and corresponding thermal ratings for each Tehachapi Area Conceptual Transmission Alternative. The transmission line parameters are provided in percent per mile and the transformer parameters are provided in percent.

Revised SCE Conceptual Transmission Plan

New 500-kV Transmission lines based on 100 MVA / 230-kV Base
Bundled 2156 ACSR R=0.00496 X=0.11250 B=8.2798

New 500-kV Transmission lines based on 100 MVA / 500-kV Base
Bundled 2156 ACSR R=0.00105 X=0.02380 B=1.7520

New 230-kV Transmission lines based on 100 MVA / 230-kV Base
Bundled 1590 ACSR R=0.00627 X=0.10330 B=0.4060

New 66-kV Transmission lines based on 100 MVA / 66-kV Base
954 SAC R=0.28 X=1.49 B=0.0280

Transmission Line Ratings (amps)
500-kV: Normal-3,950 Long-Term Emergency-4,540 Short-Term Emergency-5,330
230-kV: Normal-3,230 Long-Term Emergency-3,710 Short-Term Emergency-4,360
66-kV: Normal-1,090 Long-Term Emergency-1,470 Short-Term Emergency-1,470

Transformer Parameters
500/230-kV: 15.0 percent based on 1120 MVA with $V_{from}$ of 525 and $V_{to}$ of 230
230/66-kV : 19.7 percent based on 280 MVA with $V_{from}$ of 230 and $V_{to}$ of 70.5
230/34.5-kV : 11.5 percent based on 100 MVA with $V_{from}$ of 230 and $V_{to}$ of 34.5
34.5/0.545kV : 5.75 percent based on 1.5 MVA with $V_{from}$ of 34.5 and $V_{to}$ of 0.545

Transformer Ratings
500/230-kV: 1120 MVA
230/66-kV : 280 MVA
230/34.5-kV : 100 MVA
34.5/0.545kV : 1.5 MVA

SCE-PG&E Phase-shifted System-Tie (CAISO Suggestions)

New switching station north of Rector at the crossing of Helms/Big Creek lines

Loop existing Big Creek-Rector lines into new switching station (FresnoTie)

i. Big Creek1-FresnoTie R=0.0079 X=0.0403 B=0.0760
j. Big Creek3-FresnoTie R=0.0049 X=0.0250 B=0.0470
k. Rector-FresnoTie No.1 R=0.0139 X=0.0707 B=0.1330
l. Rector-FresnoTie No.2 R=0.0139 X=0.0707 B=0.1330
m. Normal Rating = 885 amps Emergency Rating = 936 amps on all lines

Loop existing Gregg-Helms lines into new switching station (FresnoTie)

n. Helms-FresnoTie No.1 R=0.0025 X=0.0313 B=0.1110
o. Helms-FresnoTie No.2 R=0.0025 X=0.0313 B=0.1110
p. Gregg-FresnoTie No.1 R=0.0025 X=0.0313 B=0.1110
q. Gregg-FresnoTie No.2 R=0.0025 X=0.0313 B=0.1110
r. Normal Rating = 1,910 amps Emergency Rating = 2,264 amps on all lines

Assume SCE 230-kV transmission line characteristics provided above for new line from Bakersfield (PG&E) to Magunden (SCE)

Assume same electrical parameters as the Crystal 230-kV phase-shifter shown in WECC Base Case for new phase shifters at Bakersfield and new switching station

Midway-Vincent No.4 via Tehachapi

SCE 500-kV transmission lines are discussed above in Item 1b

PG&E 500-kV transmission lines (100 MVA / 500-kV Base)
Bundled 2300 AAL R=0.00102 X=0.02470 B=1.7440

Transmission Line Ratings (amps)
Summer Normal-2,478 Summer Emergency-2,964

Assume parameters discussed above in item for Tehachapi localized 230-kV and 66-kV Facilities

Assessment Process Outline

The following is the process outline for developing the phased Tehachapi Transmission Plan.

Develop Tehachapi conceptual transmission plans for the various alternatives in order to interconnect the magnitude of the wind resource identified by the CEC.

From each conceptual transmission plan, identify the short-lead time project elements that can be pursued on a fast-track schedule

Determine if any of the short-lead time project elements should be included into a Phase 1b CPCN filing so that SCE can amend CPCN filing as needed

Perform necessary conceptual studies in order to identify phase development of each transmission alternative in an orderly, rational and cost effective manner

determine the amount of wind generation that can be accommodated with each phase of each transmission alternative on a conceptual basis

identify all new conceptual transmission facilities (e.g. lines, substations, and upgrades to existing lines and substations) required to transmit the power from Tehachapi to the various load centers (PG&E, Edison, and SDG&E)

validate potential impacts associated with (a) and (b) above by performing screening level power flow studies and determine if project element(s) should be further evaluated

Perform preliminary feasibility analysis for the transmission facilities identified in the various alternatives that pass the screening level study

i. perform preliminary engineering review to identify transmission elements that may be problematic

ii. perform preliminary environmental review of transmission facilities based on available information contained in currently available environmental data bases in order to identify potential significant environmental constraints

iii. resolve with the Department of Defense any critical issues surrounding transmission line routes and heights

Determine how long it would take for the anticipated transmission owner to prepare and file each of the certificate applications based on the outcome of the preferred alternative

develop a preliminary list of licensing and environmental requirements for the transmission line right-of-way and potential substation sites

identify the maximum reasonably foreseeable buildout for the utility-owned assets in order to comply with CEQA requirements

Develop appropriate transmission cost estimates, including substation costs and land acquisition costs, based on standard, off-the-shelf, general unit cost basis

Study Areas and Study Conditions

Edison proposes the following study areas and study conditions in developing the transmission facilities necessary to interconnect the full potential of renewable resources in the Tehachapi area as identified by the CEC:

CAISO Controlled SCE Transmission System Areas

Edison will utilize the latest heavy summer and light spring power flow cases developed for the 2004-2008, 2013 Annual CAISO Assessment recently completed. The cases will be adjusted as necessary to accommodate the additional wind generation modeled in the Tehachapi area in order to reflect maximum anticipated stress conditions on SCE transmission facilities consistent with the ISO Grid Planning Criteria assuming delivery of wind generation to either PG&E or SCE/SDG&E. The adjustment will be made by displacing either import generation into SCE from the north to capture delivery of wind generation to PG&E via Path 26 or displacing SCE and/or SDG&E internal generation to capture delivery into SCE and/or SDG&E. The displacement will be made as identified in Section XI Item 6. The cases will include transmission projects identified and approved by the CAISO as part of the annual expansion plan.

4. Main 500-kV and 230-kV System – Heavy Summer Load Conditions

Summer peak load conditions requiring high internal SCE generation dispatch and high imports result in maximum stress on the system.

Although historical data indicates that under peak load conditions the Tehachapi area wind generation levels are relatively low, the study will be performed assuming maximum wind generation dispatch to cover those instances when wind generation actually produces at a high generation levels during high system load conditions.

Studies will be performed to cover fifty percent delivery to the north and remaining fifty percent delivered to the south. These studies will address the conditions where power from wind generation resources are partially delivered to the north with remaining output delivered to the south. Sensitivity studies may be performed to evaluate full deliveries to the south and full deliveries to the north. Actual deliveries resulting from actual RPS contracts may be different and therefore additional transmission facilities not identified by this study may be required to deliver to the load centers.

5. Main 500-kV and 230-kV System – Spring Peak Load Conditions

Spring peak load conditions, with high import levels, high Big Creek corridor generation and reduced main system generation (sufficient generation on-line to maintain adequate voltages in the Los Angeles Basin) will be examined. Studies will be performed to cover fifty percent delivery to the north and remaining fifty percent delivered to the south. These studies will address the conditions where power from wind generation resources are partially delivered to the north with remaining output delivered to the south. Sensitivity studies may be performed to evaluate full deliveries to the south and full deliveries to the north. Actual deliveries resulting from actual RPS contracts may be different and therefore additional transmission facilities not identified by this study may be required to deliver to the load centers.

6. Big Creek and San Joaquin Valley 230-kV System – Under heavy summer load with maximum generation, light spring load with maximum generation, and off-peak load summer with maximum hydro pumping conditions

This portion of the system, which is served practically radial from the Main Transmission system, has been identified to be transmission deficient under both maximum load with maximum generation and minimum load with maximum generation. The system includes two Special Protection Schemes (Big Creek and Pastoria Energy Facility) that could be affected by additional wind generation. Studies

will be performed to evaluate corridor under both heavy summer load and light spring load conditions.

## CAISO Controlled PG&E Transmission System Areas

PG&E will utilize the latest heavy summer and light autumn power flow cases developed for the 2004-2008, 2013 Annual CAISO Assessment recently completed. The cases will be adjusted as necessary to accommodate the additional wind generation modeled in the Tehachapi area in order to reflect maximum anticipated stress conditions on the PG&E transmission facilities consistent with the ISO Grid Planning Criteria assuming delivery of wind generation at the existing Midway substation or the proposed new 230 kV tie at Big Creek and Magunden. Old and less efficient generation units in the NP15 will be displaced to accommodate the import of wind generation into the PG&E system. The cases will include transmission projects identified and approved by the CAISO as part of the annual expansion plan

Heavy Summer Load Conditions

Summer peak load conditions with maximum North to South flow on Path 26 will be evaluated to assess impact of delivering Tehachapi area wind generation to the Bay area via Path 26 and Path 15

Autumn or Winter Off-Peak Load Conditions

Autumn or Winter Off-peak load conditions, with maximum South to North flow on Path 15 will be evaluated to assess impact of delivering Tehachapi area wind generation to the Bay area via Path 26 and Path 15.

Fresno and Bakersfield Area Studies

Studies will be performed to evaluate the impact of the proposed Big Creek-Helms Interconnection on the Fresno area transmission system. The studies will be based on the Fresno area summer peak base cases modeling three Helms units generating and Fresno area summer off-peak base cases modeling two Helms units pumping.

Studies will also be performed to evaluate the impact of the proposed Magunden Interconnection on the Kern area transmission system. The studies will be based on the summer peak base cases modeling 3400 MW of north-to-south flow on Path 26 and the autumn off-peak base cases modeling 5400 MW of south-to-north flow on Path 15.

Power Flow Base Case Assumptions

Edison proposes the following key assumptions in developing the conceptual transmission facilities necessary to interconnect the full potential of renewable resources in the Tehachapi area as identified by the CEC:

Load Related Assumptions

Loads will be modeled in load flow studies as follows:

Peak summer load conditions for SCE or PG&E will represent maximum anticipated loads based on a coincident load forecast, which will include

consideration of a one-in-ten-year heat wave. Three cases will be used to represent coincident Control Area Peak, Northern California Peak and Southern California Peak.

Peak summer load conditions for RMR analysis within SCE and PG&E will represent maximum anticipated loads based on a localized coincident load forecast, which will include consideration of a one-in-five-year heat wave.

Spring Peak representing typical daily Spring Season load will be assumed for the main SCE 500-kV and 230-kV system. This load assumption represents approximately 65% of the summer normal peak loads through the main SCE network and approximately 50% of the summer normal peak for the Big Creek Corridor.

Autumn or Winter Off-Peak load will be assumed for the main SCE 500-kV and 230-kV system. This load assumption represents approximately 50% of the summer normal peak loads through the main SCE network and approximately 40% of the summer normal peak for the Big Creek Corridor. For PG&E, this load assumption represents approximately 45% of the summer normal peak. Both systems experience maximum pumping under this load condition.

Loads located within the service area of a Non-Participating Transmission Owner that is directly interconnected to a transmission or distribution facility owned by SCE or PG&E will be modeled based on the most recent forecast that the Non-Participating TO has provided.

Reactive load WATT/VAR ratios for the transmission substation loads represented in the base cases will reflect reasonable values for the operating conditions being studied.

Generation Related Assumptions

a. Edison and PG&E will incorporate the generation resources required to meet the WECC Minimum Operating Reliability Criteria (MORC): 1% for regulation plus 7% or the largest generation unit. The required generation will include all existing generation: 2004 Reliability Must Run (RMR), regulatory must-take resources (QF), Hydro, and Nuclear and all existing market generation resources.

b. Future market generation proposed through the FERC Interconnection Process for which has an active request will be incorporated into the

completed phased development plan if those projects can impact the study results since these projects have priority over conceptual resources.

c. Hydro generation located within the Edison and PG&E CAISO Controlled Grid will be modeled at an output level that provides the maximum anticipated stress conditions on the corresponding transmission systems.

d. Nuclear generation will be assumed at the maximum capability consistent with the ISO Grid Planning Criteria.

e. All QF generation will be modeled in the base case consistent with the ISO Grid Planning Criteria and study practices for transient stability analysis, provided data is available to simulate actual machine characteristics.

f. All QF generation explicitly represented in the power flow base cases will have their reactive capabilities modeled according to contractual requirements, otherwise historical operating data will be used. Actual reactive power capabilities (i.e. manufacturer data or field test data) will be modeled for dynamic stability analysis as available.

g. All generation connected to Edison's or PG&E's distribution system (at 12, 16, or 33-kV) will be netted with the transmission substation loads on the low side of the transformers. Other generation connected to the subtransmission systems will be represented with equivalent generators at the low side of the transmission substation transformers, when these systems are not CAISO controlled.

Imports into SCE

The generation import for SCE will be scheduled at the present 2004 maximum Southern California Import Transfer limit (SCIT), 14,300 MW for the summer and 13,600 MW for the spring, with Path 26 (Midway-Vincent) north-to-south flows modeled at maximum (3,400 MW) in order to stress the SCE 500-kV system and the 500/230-kV transformer banks

Edison will perform studies for delivering wind generation output to either SCE and/or SDG&E by assuming maximum north-to-south flow on Path 26 (Midway-Vincent). Edison will perform studies for delivering wind generation output to PG&E by reducing exchanges between Edison and

PG&E, which will result in lowering north-to-south flow on Path 26 (Midway-Vincent).

Imports into PG&E

The generation import for PG&E in the Autumn/Winter off-peak cases will be scheduled at the maximum allowable south-to-north flow on Path 26 (Midway-Vincent). Path 15 will be stressed to the south-to-north rating of 5400 MW.

PG&E will perform studies for receiving wind generation output at Midway by increasing exchanges between Edison and PG&E and displacing older and less efficient generation units in the NP15, which will result in increasing south-to-north flow on Path 26 (Midway-Vincent) and Path 15.

Generation Displacement

In order to assess the impacts on the bulk system when performing the power flow simulations it is important to schedule the 4,000+ MW to "reasonable" locations. To perform the necessary conceptual studies which would identify the facilities necessary to interconnect and deliver renewable resources to the load centers, 50% of the Tehachapi area wind generation will be assumed to be delivered to the system north of Path 26 and the remaining 50% delivered to the system south of Path 26. This will be accomplished by reducing generation as follows:

COI by 7.5 % (import north of Path 26)
NP-15 by 42.5% (north of Path 26)
SCE by 17.5% (south of Path 26)
SDG&E by 17.5% (south of Path 26)
CFE by 2.5% (south of Path 26)
West-of-River by 12.5% (import south of Path 26)

These estimates are subject to change based on feedback from the study group. The feedback should be provided no later than the second meeting (August 18th) since last minute changes to the assumptions will result in failure to meet the scheduled milestones.

Other Assumptions

The Tehachapi Comprehensive Transmission Development Assessment will comply with the CAISO Grid Planning Standards which incorporate the NERC/WECC Planning Standards.

Existing or proposed special protection schemes in the Big Creek Corridor will be operational.

Comply with the CAISO guidelines on the use of Special Protection Schemes to integrated Tehachapi area generation. In particular, limit the tripping of generation to 1,150 MW for the loss of one transmission line and 1,400 MW for the loss of two transmission lines.

Major Path Flows will be modeled at reasonable and expected patterns.

For the long-term, include the generation projects identified by the CEC.

The existing Path 15 RAS and Path 26 RAS will be modeled in the studies.

Power Flow Screening Level Preliminary Assessment

To assess the performance of the CAISO Controlled Grid owned by Edison and PG&E, screening-level preliminary power flow analysis will be performed under base case and contingency conditions for both summer and spring/autumn/winter load assumptions. Contingency analysis will follow the requirements of the ISO Grid Planning Criteria. Contingency evaluation will include selective single contingencies (e.g. loss of a transmission line, generating unit, or transformer bank) and selective multiple-contingencies (e.g. overlapping outage of two transmission lines), consistent with the ISO Grid Planning Criteria.

If the loading of a transmission component of the CAISO Controlled Grid owned by Edison is determined to exceed its thermal rating during normal or contingency conditions, Edison will identify the corrective action(s) necessary to address the reliability concern (e.g. facility addition, special protection scheme, etc.) and will provide one project alternative. There may be other alternative solutions that may not be identified in these conceptual studies which would be evaluated in the future system impact studies.

If the loading of a transmission component of the CAISO Controlled Grid owned by PG&E is determined to exceed its thermal rating during normal or contingency conditions, PG&E will identify the corrective action(s) necessary to address the reliability concern (e.g. facility addition, special protection scheme, etc.) and will provide one project alternative. There may be other alternative solutions that may not be identified in these conceptual studies which would be evaluated in the future system impact studies.

Final Report

The final report, to be filed by SCE with the CPUC, will contain all criteria, assumptions, methodologies, simulation results, conclusion, and recommendations for "master plan", and any other pertinent information necessary to comply with CPUC Order #04-06-010. A draft report will be made available for comments to the Collaborative Study Group four weeks prior to filing with the CPUC. The results and recommendations will be presented to all interested parties for discussion three weeks prior to filing with the CPUC. Final comments are due one week prior to filing with the CPUC.

Schedule of Major Milestones

The schedule of the Major Milestones of the Tehachapi Comprehensive Transmission Development Assessment is as follows:

| Ref. # | Milestone | Target Date |
|---|---|---|
| 1. | **Milestone Meeting #1** at CPUC for presentation and discussion of the Tehachapi Comprehensive Transmission Development Assessment Study Plan | 06/23/2004 |
| 2. | Written comments on Tehachapi Comprehensive Transmission Assessment Study Plan including identification of additional project alternatives are due to Edison via e-mail (jorge.chacon@sce.com) | 07/06/2004 |
| 3. | Edison posts revised Study Plan | 07/12/2004 |
| 4. | Development of preliminary conceptual transmission plans for the various transmission alternatives and identification of additional fast-track project elements using the top-down approach | 07/21/2004 to 08/11/2004 |
| 5. | **Milestone Meeting #2** at CPUC to discuss fast-track project elements, additional project alternatives (if any), and progress of the phased assessment and solicit input | 08/18/2004 |
| 6. | Written comments on project alternatives and requests for sensitivity studies due to Edison via e-mail (jorge.chacon@sce.com) | 08/25/2004 |
| 7. | Commence development of transmission phasing prioritization for each conceptual transmission plan (Edison, PG&E, CAISO, and other project alternatives) | 08/26/2004 |
| 8. | **Milestone Meeting #3** at CPUC to discuss progress of the phased assessment | 10/27/2004 |
| 9. | Written comments on progress of the phased assessment and requests for last sensitivity studies due to Edison via e-mail (jorge.chacon@sce.com) | 11/03/2004 |
| 10. | Finalize development of transmission phasing prioritization for each conceptual transmission plan (Edison, PG&E, CAISO, and other project alternatives) | 11/05/2004 |
| 11. | Commence preliminary feasibility analysis for the conceptual transmission facilities identified in finalized transmission alternative | 11/08/2005 |
| | **NOTE: Edison Files CPCN for Phase 1** | 12/09/2004 |
| | **VACATION ANYONE?** | 12/18/2004 to 01/02/2004 |
| 12. | **Milestone Meeting #4** at CPUC to discuss progress of the preliminary feasibility analysis for the conceptual transmission facilities identified in finalized transmission alternative | 01/05/2004 |
| 13. | Written comments on preliminary feasibility analysis due to Edison via e-mail (jorge.chacon@sce.com) | 01/11/2005 |
| 14. | Finalize preliminary feasibility analysis | 01/25/2004 |
| 15. | Commence draft report of complete Tehachapi Transmission Phased Development Plan | 01/26/2005 |
| 16. | Edison makes draft report of complete Tehachapi Transmission Phased Development available | 02/09/2005 |
| 17. | **Milestone Meeting #5** at CPUC for study group to present final study | 02/16/2005 |

| | | |
|---|---|---|
| | report of complete transmission phased development | |
| 18. | Final comments due to Edison via e-mail (jorge.chacon@sce.com) | 02/23/2005 |
| 19. | Edison files final draft report of complete Tehachapi Transmission Phase Development Plan with Commission | 03/09/2005 |

# APPENDIX A - 4

Tehachapi 2nd Report, Volume 3 of 5

Development Plan for the
Phased Expansion of

# Electric Power Transmission Facilities

in the

# Tehachapi Wind Resource Area

# Second Report

of the

## Tehachapi Collaborative Study Group

Volume 3 of 5: Appendix 2

California Public Utilities Commission

OII 05-09-005
OII 00-11-001

**April 19, 2006**

**The report is printed in 5 volumes or electronic files:**

**Volume 1 contains the Second Report;**

**Volume 2 contains Study Plan #2 the basis for the Second Report (referred to in the Report as Appendix 1);**

**Volume 3 contains the PG&E Studies (referred to as Appendix 2);**

**Volume 4 contains the SCE Studies (referred to as Appendix 3);**

**Volume 5 contains the CAISO Studies and all remaining Appendices 5, 6 and 7.**

# Appendix 2

# Preliminary Power Flow Study Report
# PG&E Area Conceptual Transmission Plan
# Continuation of Tehachapi Collaborative Study

**Purpose**

The purpose of this continuation of the Tehachapi Collaborative Study is to formulate a plan for the transmission of 4,000MW of wind generation at Tehachapi and 500MW in the Antelope Valley to load centers in the PG&E and SCE service areas. It is assumed that half the 4,000 MW at Tehachapi will go to PG&E and half will go to SCE. The plan resulting from this study will be sufficient to initiate the preparation of Proponent's Environmental Assessments (PEAs) which would form the basis of CPCN applications for the facilities defined in the plan. The plan covers only the facilities from Tehachapi Substation 1 to the load centers and does not include the Tehachapi collector system. It is envisioned that this transmission plan will be updated in the future as each (or each group of) specific wind plant project moves through the ISO Interconnection Process and the Tehachapi collector loop beyond Tehachapi Substation 1 becomes more definitive.

**Background**

Pursuant to CPUC Decision 04-06-010, the Tehachapi Collaborative Study Group (TCSG) was formed to develop a comprehensive transmission development plan for the phased expansion of transmission capabilities in the Tehachapi area. The CPUC Staff coordinated the collaborative study group. As directed by the decision, TCSG completed a study that assumed there would be more than 4,000 MW of wind resources at Tehachapi Wind Area[1]. To conduct the study the TCGS further assumed that 50% of the 4,000 MW would be delivered to load centers in the transmission system North of Path 26 and the remaining 50% would be delivered to load centers in the system south of Path 26[2]. The Executive Director extended the original due date for filing the report by one week in a letter dated March 4, 2005. A report entitled, "Development Plan for the Phased Expansion of Transmission in the Tehachapi Wind Resource Area" (Report), was filed by Southern California Edison (SCE) on March 16, 2005.

As stated in that Report, the development plan prepared by the TCSG is a conceptual roadmap to the eventual Tehachapi transmission system rather than a definitive plan[3]. The Report recommended that further study be performed to select among the alternatives identified in the Report (and referred to herein with the same identification numbers as in the Report). These alternatives require further planning evaluation in order to formulate a single plan for implementation. To do this, additional studies (specific rather than generic) need to be performed and facility cost estimates refined. The final plan for the

[1] Decision 04-06-010, at 6
[2] Study Plan, date July 14, 2004, at 18
[3] Tehachapi Collaborative Study Report, at 3

Tehachapi collector system requires information concerning actual wind project locations, capacities and characteristics which are not available at this time, and therefore is not covered in the study. However, since the Tehachapi collector system and actual wind projects would impact the utilities' transmission plan, it is envisioned that the utilities' transmission systems would be updated in the future as each (or each group of) specific wind plant project moves through the ISO Interconnection Process and the Tehachapi collector loop beyond Tehachapi Substation 1 becomes more definitive. This flexible approach will allow the study to move forward at this time.

PG&E had investigated three alternatives in addition to the status quo (Alternative 1) to mitigate the impacts of scheduling and delivering 2,000 MW of Tehachapi generation (Alternatives 4 and 5) and two alternatives to mitigate the impact of scheduling and delivering 300 MW of Tehachapi area renewable generation (Alternatives 2 and 3) to PG&E. Alternative 3 to deliver 300 MW to PG&E was subsequently dropped because it could not provide the intended 300 MW of transfer capability. In this study PG&E performed further investigation on Alternatives 1, 2, 4 and 5. In addition, Alternative 2 was expanded to investigate the impact of scheduling and delivering 300 MW, 600 MW and 1,200 MW of Tehachapi area renewable generation.

**Study Objective**

The objective of this study is to evaluate the impact of importing 2000 MW (half of potential 4,000 MW, which is assumed to be technically available) of Tehachapi wind generation on the bulk transmission system in Northern California. This study evaluated the summer peak conditions with north-to-south transfer over Path 26 and the summer off-peak conditions with south-to-north transfer over Path 15 and Path 26.

**Study Conclusion**

The study conclusion is summarized in the following Tables 2-1 through 2-5. This study confirms the findings of the earlier study that determined: 1) the additional 2,000 MW of import at Midway, under system peak conditions with the Path 26 flow in the North to South direction, is not expected to require upgrades in the PG&E system (see Table 2-1); and 2) there is no spare transmission capacity for additional power import at Midway under system off-peak conditions with the Path 26 flow in the South to North direction (see Tables 2-2 and 2-3).

Table 2-1
2010 Summer Peak Base Case

| **Descriptions** | **Existing Transfer** | **Import 2,000 MW at Midway w/o Upgrade** |
|---|---|---|
| Path 66 Flow (north to south) | 4,793 | 4,503 |
| Path 15 Flow (north to south) | -29 | -1,958 |
| Path 26 Flow (north to south) | 3,394 | 1,397 |
| PDCI Flow (north to south) | 3,104 | 3,104 |
| PG&E Area Load plus Losses | 28,358 | 28,390 |
| PG&E Area Generation | 26,910 | 25,239 |
| Fresno/Yosemite Division Loads | 2,923 | 2,923 |
| Helms PSP Generation | 1,218 | 1,218 |
| Imports from Tehachapi Generation | 0 | 2,000 |
| Generation Reduction in the Bay Area | 0 | 1,700 |

Table 2-2
2010 Summer Off-Peak Base Case

| Descriptions | Existing Transfer | Import 2,000 MW at Midway w/o Upgrade |
|---|---|---|
| Path 66 Flow (south to north) | 3,666 | 3,614 |
| Path 15 Flow (south to north) | 4,999 | 7,005 |
| Path 26 Flow (south to north) | 1,624 | 3,752 |
| PDCI Flow (south to north) | 1,845 | 1,845 |
| PG&E Area Load plus Losses | 13,430 | 13,620 |
| PG&E Area Generation | 15,478 | 13,487 |
| Fresno/Yosemite Division Loads | 1,409 | 1,409 |
| Helms PSP Generation* | -600 | -600 |
| Imports from Tehachapi Generation | 0 | 2,000 |
| Gen Reduction in Bay Area | 0 | 2,000 |

* Note: Positive values denote operation in the generating mode. Negative values denote operations in the pumping mode

Table 2-3
2010 Summer Off-peak Base Case without Contingency

| Transmission Facilities | SN Rating | Existing Transfer | | Import 2,000 MW at Midway w/o Upgrade | |
|---|---|---|---|---|---|
| | (Amps) | (Amps) | (%) | (Amps) | (%) |

| | | | | | |
|---|---|---|---|---|---|
| Gates - Midway #1 500 kV line | 2230 | 2088 | 93.6 | 3299 | ***147.9*** |
| Los Banos - Midway 500 kV line | 2230 | 1805 | 80.9 | 2814 | ***126.2*** |
| Los Banos - Gates #1 500kV line | 2230 | 1605 | 72 | 2466 | ***110.6*** |
| Los Banos - Gates #3 500kV line | 4332 | 800 | 18.5 | 1216 | 28.1 |
| Gates - Panoche #1 230kV line | 742 | 491 | 66.1 | 765 | ***103.1*** |
| Gates - Panoche #2 230kV line | 742 | 491 | 66.1 | 765 | ***103.1*** |
| McCall - Henrietta tap2 230kV line | 825 | 781 | 94.6 | 941 | ***114.1*** |
| Gates - Henrietta tap1 230kV line | 1600 | 1376 | 86 | 1642 | ***102.6*** |
| Gates - Midway 230kV line | 742 | 617 | 83.2 | 826 | ***111.3*** |
| Los Banos - Westley 230 kV line | 1484 | 783 | 52.7 | 1296 | 87.3 |

Note: Potential problems in the 115 kV and 69 kV systems are not included.

Since Path 15 does not have spare capacity for transporting additional generation from Midway to the Bay Area under certain off-peak conditions, this study evaluated several alternatives and explored potential phasing development for importing 2,000 MW of Tehachapi wind generation into PG&E. The results are summarized in Tables 2-4 and 2-5 below:

Table 2-4
Study Conclusions for PG&E Alternative 2 (Figure A2.1)

| Import Level | Plan "A" (100% at Switching Station #1) | Plan "B" (50% at Switching Station #1 and 50% at Switching Station #2) |
|---|---|---|
| 300 MW | Build Switching Station #1 with a 300 MVA phase shifter<br>**Other Reinforcement in PG&E Area:**<br>• Upgrade Borden-Gregg 230kV line (peak). | N/A |
| 600 MW | Same as 300MW import level, except, with one 600MVA phase shifter and building a new 230kV line between Switching Station #1 and Gregg.<br>**Other Reinforcement in PG&E Area:**<br>• Upgrade Borden-Gregg 230 kV line (peak)<br>• Upgrade Storey 1 – Gregg 230kV line (peak) | Build Switching Station #1 and #2 with a 300 MVA phase shifter at each station.<br>**Other Reinforcement in PG&E Area:**<br>• Upgrade Hass-McCall and Balch-McCall 230 kV lines (peak & off-peak)<br>• Upgrade Borden-Gregg 230kV line (peak) |
| 1200MW (Peak) | Not feasible (Due to the maximum phase angle range of +/-45 degree) | Not feasible (Due to the maximum phase angle range of +/-45 degree) |
| 1200MW (Off-peak) | Same as 600 MW import level, except, with two 600MVA phase shifters.<br>**Other Reinforcement in PG&E Area:**<br>• Install 450 MVAR of voltage support.<br>• Restrict the import level to Helms operation at 600 MW or more of pumping. | Same as 600 MW import level, except, with a 600 MVA phase shifter at each station.<br>**Other Reinforcement in PG&E Area:**<br>• Upgrade Hass-McCall and Balch-McCall 230 kV lines.<br>• Restrict the import level to Helms operation at 600 MW or more of pumping. |

Table 2-5
Study Conclusion for PG&E Alternatives 1, 4 and 5

| Import Level | PG&E Alternative 1 | PG&E Alternative 4 (Figure A2.2) | PG&E Alternative 5 (Figure A2.3) |
|---|---|---|---|
| **500MW** | Network upgrade not determined (see discussion above) | **Phase 4A**: Build a new Los Banos-Midway 500kV line operated at 230kV. **Other Reinforcements in PG&E Area:** None | **Phase 5A:** Build a new Gregg-Midway 500kV line operated at 230kV. **Other Reinforcements in PG&E Area:** None |
| **1100MW** | **Network upgrade not determined** (see discussion above) | **Phase 4B:** Same as 4A, except, re-connecting the new line to 500kV and installing 65% series compensation. **Other Reinforcements in PG&E Area:** Upgrade Los Banos – Westley 230 kV line and Los Banos 500/230 kV bank | **Phase 5B:** Same as 5A, except, building Gregg 500kV Substation with a 500/230kV, 1122/1350 MVA bank and re-connecting the new line. **Other Reinforcements in PG&E Area:** None |
| **2000MW** | **Network upgrade not determined** (see discussion above) | **Phase 4C:** Same as 4B, except, also building Tesla – Los Banos 500 kV line. This Phase would increase the OTC from 5000 MW to 7000 MW. However, it may ***not*** be feasible to increase Path 15 Rating to 7,400 MW from the existing Rating of 5,400 MW[4] **Other Reinforcements in PG&E Area:** | **Phase 5C:** Same as 5C, except, installing series comp on Gregg -Midway line (31%), and Tesla-Gregg line (62%). **Other Reinforcements in PG&E Area:** None |

[4] The Path 15 south-to-north flow was modeled at the Operating Transfer Capability (OTC) limit of 5000 MW in the pre project base case. This alternative would be able to import additional 2000 MW of generation at Midway by tripping 4319 MW of generation/pumps/load using the Remedial Action Scheme (RAS) for the simultaneous loss of Los Banos-Midway 500 kV and the new Los Banos-Midway 500 kV line in Phases 4A and 4B). The additional import would result in the Path 15 south-to-north flow at 7000 MW. However, unlike the findings in the previous study, this alternative would not be able to increase the Path 15 south-to-north Path Rating from 5400 MW to 7400 MW without increases in load shedding via RAS. Such increases may not be acceptable.

| | | | |
|---|---|---|---|
| | | Install additional RAS | |

**PG&E Area Transmission Alternatives**

This study evaluated the following four transmission alternatives:

**(1) PG&E Alternative 1 (Status Quo):**

This Alternative investigates the possibility of installing no or minimum transmission upgrade and instead accommodating 2,000 MW of Tehachapi wind generation through curtailment of generation under normal conditions. Power flow study to date shows overloads, ranging from 3% to 48% over the ratings (or allowable limit) of eight transmission facilities under normal (all facilities in service) operating conditions (see Table 2-3). As a result, this alternative would expand the times and conditions under which curtailment of generation would be required. It could also require installation of Remedial Action Schemes (RAS) to trip additional generation immediately after a disturbance and/or reduction in existing Path 15 transfer capability.

If existing generation in areas around Midway Substation is curtailed to allow transfer of Tehachapi power, Path 15 south to north transfer capability will have to be reduced. This is because the existing Path 15 south-to-north transfer capability under normal conditions can only be supported with operation of the Remedial Action Scheme (RAS) immediately following identified outages. If Midway area generation that is connected to the existing RAS were dispatched off-line or kept at minimum generating levels (assuming that the FERC open access rules were somehow satisfied), there would be no effective way of reducing power flow on Path 15 immediately following a double line outage and before the operator can intervene. As a result, Path 15 would have to be operated under normal conditions at a reduced level. Study shows that curtailing all Midway area generation that can be curtailed (about 2,600 MW) would reduce Path 15 south to north transfer capability from 5,000 MW to about 3,600 MW. This would enable Path 26 to load to about 2,700 MW.

Connecting Tehachapi generation to the RAS to support Path 15 is neither effective nor is it practical even assuming installation of a new type of RAS controller and other equipment so it can predict the amount of wind generation available to trip if the outage occurs. For wind turbines to be part of generation RAS to replace the Midway generation RAS, the new RAS controller would need to also arm those generators that are on-line to provide regulation for the

Tehachapi wind generation to the extent they are connected to systems south of Midway. It is also less effective because of the system configuration, a larger amount of generation from Tehachapi generators and these "regulating" generators will need to be tripped to provide the same relief on Path 15. This will in turn require tripping a higher amount of load commensurate with the increased amount of generation tripped to keep the net amount of net generation to be tripped within the allowable limit. Such a RAS would also increase by many folds the complexity of the existing Path 15 RAS and increase the probability of RAS misoperation.

In addition, Compliance with FERC Open Access rules, and agreement from the CAISO, approval from WECC, among other requirements would also be needed.

**(2) PG&E Alternative 2 (Figure A2.1):**

PG&E Alternative 2 is to establish a new 230 kV connection between PG&E and SCE by constructing a switching station at the crossing of PG&E-owned and SCE-owned transmission lines and installing a phase-shifting transformer to "push" power from SCE's Big Creek corridor into the PG&E system. This study investigated impacts on the PG&E system, and the possible mitigation measures for the connection. This study evaluated "pushing" 300 MW, 600 MW, and 1,200 MW by the following two Plans:

Plan A (PG&E_Alt-2A):

Establish one 230 kV tie between PG&E and SCE. Build Switching Station #1 at the crossing of PG&E's Helms – Gregg 230 kV lines and SCE's Big Creek – Rector 230 kV lines. Install one phase shifter or power flow controller to control the tie line flow.

Plan B (PG&E_Alt-2B):

Same as Plan "A", except, also building Switching Station #2 at the crossing of PG&E's Haas-McCall and Balch-McCall 230 kV lines and SCE's Big Creek – Rector 230 kV lines. Install a phase shifter or power flow controller at both switching stations to control the tie line flow.

**(3) PG&E Alternative 4 (Figure A2.2):**

PG&E Alternative 4 is to build a new Tesla – Los Banos 500 kV line and a new Los Banos – Midway 500 kV line. This alternative could be implemented in the following three phases:

Phase A (PG&E_Alt-4A):

Build a new Los Banos – Midway 500kV line operated at 230 kV.

Phase B (PG&E_Alt-4B):

Same as 4A, except, re-connecting the new Los Banos – Midway line to 500kV bus and installing 65% series compensation.

Phase C (PG&E_Alt-4C):

Same as 4B, except, also building a new Tesla - Los Banos 500kV line without series compensation.

**(4) PG&E Alternative 5 (Figure A2.3):**

PG&E Alternative 5 is to build a new Tesla – Gregg 500 kV line and a new Gregg – Midway 500 kV line. This alternative could be implemented in the following three phases:

Phase A (PG&E_Alt-5A):

Build a new Gregg - Midway 500kV line operated at 230 kV.

Phase B (PG&E_Alt-5B):

Same as 5A, except, also building a Gregg 500 kV Substation with a 500/230 kV transformer bank and re-connecting the new Gregg - Midway 500kV line.

Phase C (PG&E_Alt-5C):

Same as 5B, except, also building a new Tesla - Gregg 500kV line with 62% series compensation and installing 31% series compensation on the Gregg – Midway 500 kV line.

**Power Flow Base Case Assumptions**

Post-transient power flow studies for 500 kV system were based on the 2010 summer peak and 2010 summer off-peak WECC full loop system base cases developed for PG&E's 2005 Electric Transmission Grid Expansion Plan Study (a05sum2010.sav and a05sumopk2010.sav). The summer peak system base cases model 1-in-5 year load forecasts for the Northern California Area.

Contingency power flow studies for 230, 115 and 70 kV system were based on the 2010 summer peak and 2010 summer off-peak area base cases (a05sum2010_pge_a6.sav, and a05sumopk2010_pge.sav). The summer peak area base cases model 1-in-10 year load forecasts for Area 6 that includes the Yosemite, Fresno and Kern Divisions.

Since this study is to evaluate the impact of importing 2000 MW (half of potential 4,000 MW) of Tehachapi wind generation on the bulk transmission system in Northern California, only the PG&E portion of the Tehachapi wind generation (up to 2000 MW) was modeled on line and scheduled to PG&E at Midway and SCE portion of the Tehachapi wind generation was modeled off line in the study

base cases. This would not impact the results of studies on system performance north of Midway since SCE's portion, which, if on line, would be scheduled to SCE would therefore not flow to PG&E.

These study base cases were reviewed and approved by CAISO and other stakeholders. Table 2-6 summarized the PG&E area loads, generation, and the major path flow assumptions modeled in the 2010 summer peak and 2010 summer off-peak system base cases. The study assumptions used for this study differs somewhat from that used in PG&E's 2005 Electric Transmission Grid Expansion Plan studies because the assumptions developed in the Grid Expansion Plan studies are meant to be starting cases, from which modifications would be made to simulate case-specific system conditions. These system conditions are indicated in Table 2-6 below.

Table 2-6
Area Loads/Generation and Major Path Flow

| | Descriptions | Summer Peak System Base Case | Summer Off-peak System Base Case |
|---|---|---|---|
| 1 | Path 66 Flow (north_to_south) | 4800 | -3670 |
| 2 | Path 15 flow (north_to_south) | <500 | -5000 |
| 3 | Path 26flow (north_to_south) | 3400 | -1625 |
| 4 | PDCI flow (north_to_south) | 3100 | -1848 |
| 5 | PG&E Area Loads plus Losses | 28441 | 13402 |
| 6 | PG&E Area Generation | 26294 | 14453 |
| 7 | Fresno/Yosemite Division Loads | 2923 | 1409 |
| 8 | Helms Generation | 1200[5] | -900[6] |

* Note: Positive values denote operation in the generating mode. Negative values denote operations in the pumping mode

**Power Flow Studies for Pre-Transmission Project Conditions**

Power flow studies were conducted to evaluate the potential thermal violations before the transmission alternatives for importing Tehachapi wind generation. The power flow studies were based on the 2010 summer peak area base case modeling the three Helms units on line at 1200 MW of generation, and the 2010 summer off-peak area base case modeling the three Helms units off-line. It is important to note that PG&E's 2005 Electric Transmission Grid Expansion Plan studies only model 930 MW of Helms generation in the 2010 summer peak area base case. Therefore, this study shows additional thermal overloaded facilities that were not identified in the Expansion Plan studies. The study results were summarized in Table A3-3 of Attachment 3 for summer peak conditions and in Table A4-2 of Attachment 4 for summer off-peak conditions. The study results show emergency overloads on the following facilities:

**(1) 2010 Summer Peak Conditions[7]**

- Herndon 230/115kV Bank-1 and Bank-2.
- Atwater Jct-Cressey Jct 115kV line

[5] The Helms generation may be outside the current Fresno Area Generation Nomogram. See CAISO Operating Procedure T-129. Helms generation was modeled at 930 MW in PG&E's 2005 Electric Transmission Grid Expansion Plan studies base case for Fresno area.

[6] In order to simulate a reasonably stressed summer off-peak conditions, Helms units were modeled off line for PG&E_Alt-2 analyses, on-line at -600MW of pumping for PG&E_Alt-4 analyses, and on-line at -900MW of pumping for PG&E_Alt-5 analyses.

[7] Most of the emergency overloads were due to Helms generation operated outside Fresno Area Generation Nomogram.

- Herndon - Woodward 115kV line
- Merced-Atwater Jct 115kV line
- Wilson A-Merced 115kV line
- Wilson B-Merced 115kV line

**(2) 2010 Summer Off-peak Conditions**

- Helm-McCall 230kV line
- Henrietta-GWF_HEP 115kV line
- Henrietta-McCall 230kV line

**Power Flow Studies Results for PG&E Alternative 2**

Power flow studies for PG&E Alternative 2 were based on the 2010 summer peak base case modeling three Helms units on-line with a total of 1200 MW generation and the 2010 summer off-peak base case modeling three Helms units off-line.

**(1) 2010 Summer Peak Conditions with Helms at 1200 MW of Generation**

The power flow study results for 2010 summer peak conditions were summarized in Attachment 3.

(1.1) Import 300 MW with Plan "A"

This alternative would build the Switching Station #1 and import 300 MW of generation. The study results show that the Borden – Gregg 230 kV line could load up to 108.8% of summer normal rating of 675 amperes under the summer peak conditions studied. (See Table A3-1, Attachment 3.) The import would not cause emergency overload for "B" or "C" contingencies studied. The following transmission facilities would need upgrading:

- Borden – Gregg 230 kV line

(1.2) Import 600 MW with Plan "A"

This alternative would build the Switching Station #1 and import 600 MW of generation. The existing Helms – Gregg #1 and #2 230 kV lines do not have spare capacity for importing additional 600 MW under summer peak conditions with three Helms units on line at 1200 MW of generation. This study assumes that this alternative would also build an additional 230 kV line between the proposed Switching Station #1 and Gregg Substation.

The study results show that the Borden – Gregg 230 kV line could load up to 127.7% of summer normal rating of 675 amperes. (See Table A3-1, Attachment

3.) In addition, the import could also cause emergency overload on the Storey 1 – Gregg 230 kV line for loss of the Wilson – Storey 2 – Borden 230 kV line with Melones #1 offline (Category "B" contingency; G-1/L-1). (See Case F-B213, Table A3-3, Attachment 3.) The following transmission facilities would need upgrading:

- Borden – Gregg 230 kV line, and
- Storey 1 – Gregg 230 kV line.

The following transmission facilities would be needed:

- A new 230 kV line between Switching Station #1 and Gregg,

(1.3) Import 600 MW with Plan "B"

This alternative would build both Switching Station #1 and #2, and import 300 MW of generation at each stations (total 600 MW). The study results show that the import could cause normal overload on the Borden – Gregg 230 kV line. In addition, the import could also cause normal overloads on the Haas – McCall and Balch – McCall 230 kV lines between the proposed Switching Station #2 and Mc Call Substation while the hydro power houses on Kings River were dispatched at the maximum generation of 520 MW. (See Table A3-1 and 2, Attachment 3.) The following transmission facilities would need upgrading:

- Borden – Gregg 230 kV line, and
- Haas – McCall and Balch – McCall 230 kV lines between Switching Station #2 and McCall Substation.

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(1.4) Import 1200 MW with Plan "A" or "B"

The power transfer capability of a phase shifter is determined by the MVA rating and the maximum phase angle range. This study assumes the maximum phase angle range of +/- 45 degree, which is the same as most phase-shifters in the WECC system. The study results show that, due to the phase angle limitation, this Alternative would only be able to transfer 600 MW from SCE's Big Creek system to PG&E's Fresno area under the summer peak conditions with all three Helms units dispatched online at 1200 MW of generation.

**(2) Summer Off-peak Conditions with Helms off line**

The power flow study results for 2010 summer off-peak conditions were summarized in Attachment 4.

(2.1) Import 600 MW with Plan "A" or "B"

The study results show that the existing transmission system has adequate capacity for importing 600 MW of generation with either Plan "A" or "B" under 2010 summer off-peak conditions studied. The import would not cause normal or emergency overloads. (See Attachment 4.)

(2.2) Import 1200 MW with Plan "A"

This alternative would build the Switching Station #1 and import 1200 MW of generation. The power flow studies results show that the voltage at Switching Station #1 230 kV bus could be as low as 217.8 kV (0.947 pu) under the 2010 summer off-peak conditions with all facilities in service. The study results also show that the Big Creek/Fresno area could experience voltage collapse following a Midway north 500 kV double-line outage[8]. This alternative would need a 150 MVAR of shunt capacitor bank at Switching Station #1 to improve steady state bus voltage and another 300 MVAR of switchable shunt capacitors to avoid voltage collapse following a Midway north 500 kV double-line outage.

The study results show that the import could cause normal overload on the Cottle B – Warnerville 230 kV line under summer off-peak conditions studied. (See Table A4-1, Attachment 4.) The import could also cause emergency overloads on the following lines (see Table A4-2, Attachment 4):

- Borden – Gregg 230kV line,
- Storey 2 – Borden 230 kV line,
- Storey 1 – Gregg 230 kV line, and
- Wilson – Storey 1 230 kV line. .

The study results also show that the Gates – Midway 500 kV line could load up to 3598 amperes (101.2% of 30-minute emergency rating of 3556A) following the Los Banos – Midway 500 kV single line outage. (See Case OPK-B3, Table A4-3, Attachment 4.) The Los Banos – Westley 230 kV line could also load up to 2276 amperes (113.8% of emergency rating of 2000A) for the Los Banos north 500 kV double-line outage[9]. (See Case OPK-C1, Table A4-4, Attachment 4.)

There is an operational solution for the above described normal and emergency overloads. The study results show that the import of 1200 MW would not cause normal or emergency overloads if two of the three Helms units were dispatched on line with 600 MW of pumping during summer off-peak conditions studied.

[8] Simultaneous loss of Midway – Gates 500 kV line and Midway – Los Banos 500 kV line
[9] Simultaneous loss of Tesla – Los Banos 500 kV line and Tracy – Los Banos 500 kV line

The study results show the following facilities would still be needed for voltage support:

- 450 MVAR of 230 kV shunt capacitor banks.

(2.3) Import 1200 MW with Plan "B"

This alternative would build both Switching Station #1 and #2, and import 600 MW of generation at each stations (total 1200 MW). The study results show that the import could cause normal overload on the Haas – McCall and Balch – McCall 230 kV lines between the Switching Station #2 and McCall Substation under summer off-peak conditions. (See Table A4-1, Attachment 4.)

The study results also show emergency overload on the Cattle B – Warnerville 230 kV line for the Pacific DC Intertie bipolar outage (Category "B" contingency). (See Case OPK-B5, Table A4-3, Attachment 4.) The Los Banos – Westley 230 kV lines could also experience emergency overload for the Los Banos north 500 kV double-line outage with 3360 MW of RAS (Category "C" contingency). (See Case OPK-C1, Table A4-4, Attachment 4.)

The study results also show that the import would not cause the emergency overloads if two of the three Helms units were dispatched on line with 600 MW of pumping during summer off-peak conditions studied. The following transmission facilities would still need upgrading:

- Haas – McCall and Balch – McCall 230 kV lines between Switching Station #2 and McCall Substation.

**Power Flow Studies Results for PG&E Alternative 4**

The power flow studies were based on the 2010 summer off-peak base case modeling two Helms units on line with a total of 600 MW pumping. The preliminary power flow study results for PG&E Alternative 4 are summarized in Attachment 5. The study results show that this alternative would have adverse impact on Helms pumping operation. This alternative would increase loading on the Gates – Gregg and Gates – McCall 230 kV lines that would results in emergency overloads following a PDCI bipolar outage (Category "B" contingency). See Case B7, Table A5-2, Attachment 5.

**(1) Phase A (PG&E_Alt-4A): Import 500 MW**

Phase A is to build a new Los Banos – Midway 500 kV line operated at 230 kV. This alternative would increase the existing Path 15 south-to-north transfer capability by about 500 MW. The most limiting facility is the Gates – Midway

500 kV line for the Los Banos – Midway 500 kV single line outage (Category "B" contingency). (See Case B3, Table A5-2, Attachment 5.)

**(2) Phase B (PG&E_Alt-4B): Import 1100 MW**

Phase B is same as Phase A, except, re-connecting the new Los Banos – Midway line to the 500 kV buses and operate at 500 kV and installing 65% of series compensation on the new 500 kV line. This alternative would increase the existing Path 15 south-to-north transfer capability by about 1100 MW.

The study results show that the Los Banos – Westley 230 kV line could load up to 105.3% of its short-term emergency rating of 2000 amperes and the Los Banos 500/230 kV transformer bank could also load up to 102.2% of its 1-hour emergency rating of 1050 MVA after loss of Tesla – Los Banos and Tracy – Los Banos 500 kV lines with 3369 MW of RAS under the 2010 summer off-peak conditions studied. (See Case C1, Table A5-3, Attachment 5.)

The Gates – Henrietta section of the Gates – Gregg 230 kV line could also load up to 101.5% of its emergency rating of 1600 amperes after the PDCI bipolar outage. Helms pumping operation could be decreased to relieve the emergency overload. (See Case B7 in Table A5-2, Attachment 5.) The following transmission facilities would need upgrading:

- Los Banos – Westley 230 kV line
- Los Banos 500/230 kV transformer bank

**(3) Phase C (PG&E_Alt-4C): Import 2000 MW**

Phase C is same as Phase B, except, also building a new Tesla – Los Banos 500 kV line without series compensation. This alternative would increase the existing Path 15 south-to-north transfer capability by 2000 MW up to about 7000 MW. The study results show that the Gates – Midway 500 kV line could load up to 98.7% of its short-term emergency rating of 3556 amperes after loss of the existing Los Banos – Midway #1 500 kV line and the new Los Banos – Midway #2 500 kV line (Category "C" contingency) with 4319 MW of load and resources tripped through Remedial Action Scheme (RAS) under the 2010 summer off-peak conditions studied. The RAS includes 2578 MW of generation at Midway, 691 MW of pumps and 1050 MW of loads. (See Case C3 in Table A5-3, Attachment 5.) The following reinforcements would be needed:

- Install additional RAS.

The Gates – Henrietta section of the Gates – Gregg 230 kV line could also load up to 102.2% of its emergency rating of 1600 amperes after the PDCI bipolar outage

(Category "B" contingency). Helms pumping operation could be decreased to relieve the emergency overload. (See Case B7 in Table A5-2, Attachment 5.)

**Power Flow Studies Results for PG&E Alternative 5**

The power flow studies were based on the 2010 summer off-peak base case modeling three Helms units on line with a total of 900 MW pumping. Attachment 6 summarizes the study results. This alternative would increase the Fresno area import capability and improve Helms pumping operation.

**(1) Phase A (PG&E_Alt-5A): Import 500 MW**

Phase A is to build a new Gregg – Midway 500 kV line operated at 230 kV. This alternative would increase the existing Path 15 south-to-north transfer capability by about 500 MW. The most limiting facility is the Gates – Midway 500 kV line for the Los Banos – Midway 500 kV single line contingency (Category "B" contingency). (See Case B3, Table A6-2, Attachment 6.)

**(2) Phase B (PG&E_Alt-5B): Import 1100 MW**

Phase B is same as Phase A, except, also building a new Gregg 500 kV Substation with a 500/230 kV 1122 MVA transformer bank and re-connecting the new Gregg - Midway 500kV line to the 500 kV buses to operate at 500 kV. This alternative would increase the existing Path 15 south-to-north transfer capability by about 1100 MW. The most limiting facility is the Gregg 500/230 kV transformer bank that could load up to 99.2% of its normal rating of 1122 MVA. (See Table A6-1, Attachment 6.) Gregg 500/230 kV transformer bank would also load up to 102.5% of its emergency rating of 1260 MVA for the Gates – Midway 500 kV single line outage (Category "B" contingency). The Gregg 500/230 kV transformer bank would need the normal and emergency ratings of at least 1122 and 1350 MVA, respectively.

In addition, the Panoche – Kearney, Warnerville – Wilson, and Gates – Gregg 230 kV lines would also load above their respective emergency ratings for loss of the new Gregg – Midway 500 kV line (Category "B" contingency). (See Cases B6 at Table A6-2, Attachment 6.) Helms pumping operation could be decreased to relieve the emergency overload.

**(3) Phase C (PG&E_Alt-5C): Import 2000 MW**

Phase C is same as Phase B, except, also building a new Tesla - Gregg 500kV line with 62% series compensation and installing 31% series compensation on the Gregg – Midway 500 kV line. This alternative would increase the existing Path 15 south-to-north transfer capability by about 2000 MW. The most limiting facility is the Gregg 500/230 kV transformer bank that could load up to 106.4% of its emergency rating of 1260 MVA for the Tesla – Gregg 500 kV single line outage

(Category "B" contingency). (See Case B5, Table A6-2, Attachment 6.) The Gregg 500/230 kV transformer bank would need to have a normal rating of 1122 MVA and a summer emergency rating of at least 1350 MVA.

**Future Studies**

Additional sensitivity studies of Helms units off line need to be conducted for PG&E Alternative 4 and 5. The sensitivity studies may discover additional restrictions on the import capability for each phase of the Alternative 4 and 5.

Transient stability studies and post-transient voltage studies also need to be conducted for PG&E alternatives 1, 2, 4 and 5.

**Attachment list**

1. Contingency List
2. One-line Diagrams
3. 2010 Summer Peak Power Flow Study Results for PG&E Alternative 2
4. 2010 Summer Off-peak Power Flow Study Results for PG&E Alternative 2
5. Preliminary Power Flow Study Results for PG&E Alternative 4
6. Preliminary Power Flow Study Results for PG&E Alternative 5

## Attachment 1
## Contingency List

**500 kV Contingencies**

The following "B" contingencies for 500kV lines were studied:

- Tesla – Los Banos 500 kV line outage,
- Los Banos – Midway 500 kV line outage,
- Los Banos – Gates #3 500 kV line outage,
- Gates – Midway 500 kV line outage,
- PDCI Bi-pole Outage.

The following "C" contingencies for 500 kV lines were studied:

- Tesla – Los Banos and Tracy – Los Banos 500 kV double line outage (Los Banos north),
- Los Banos – Midway and Los Banos – Gates #3 500 kV double line outage (Los Banos south),
- Los Banos – Midway and Gates – Midway 500 kV double line outage (Midway north),
- Two Palo Verde generation units outage,
- Two Diablo Canyon generation units outage.

**230, 115 and 70 kV Contingencies:**

Additional "B" and "C" contingencies for 230, 115 and 70 kV system in the Fresno/Yosemite area were also run. Attachment 3 lists the contingencies.

Attachment 2

Figure A2.1 - PG&E Alternative 2: Fresno 230 kV Tie

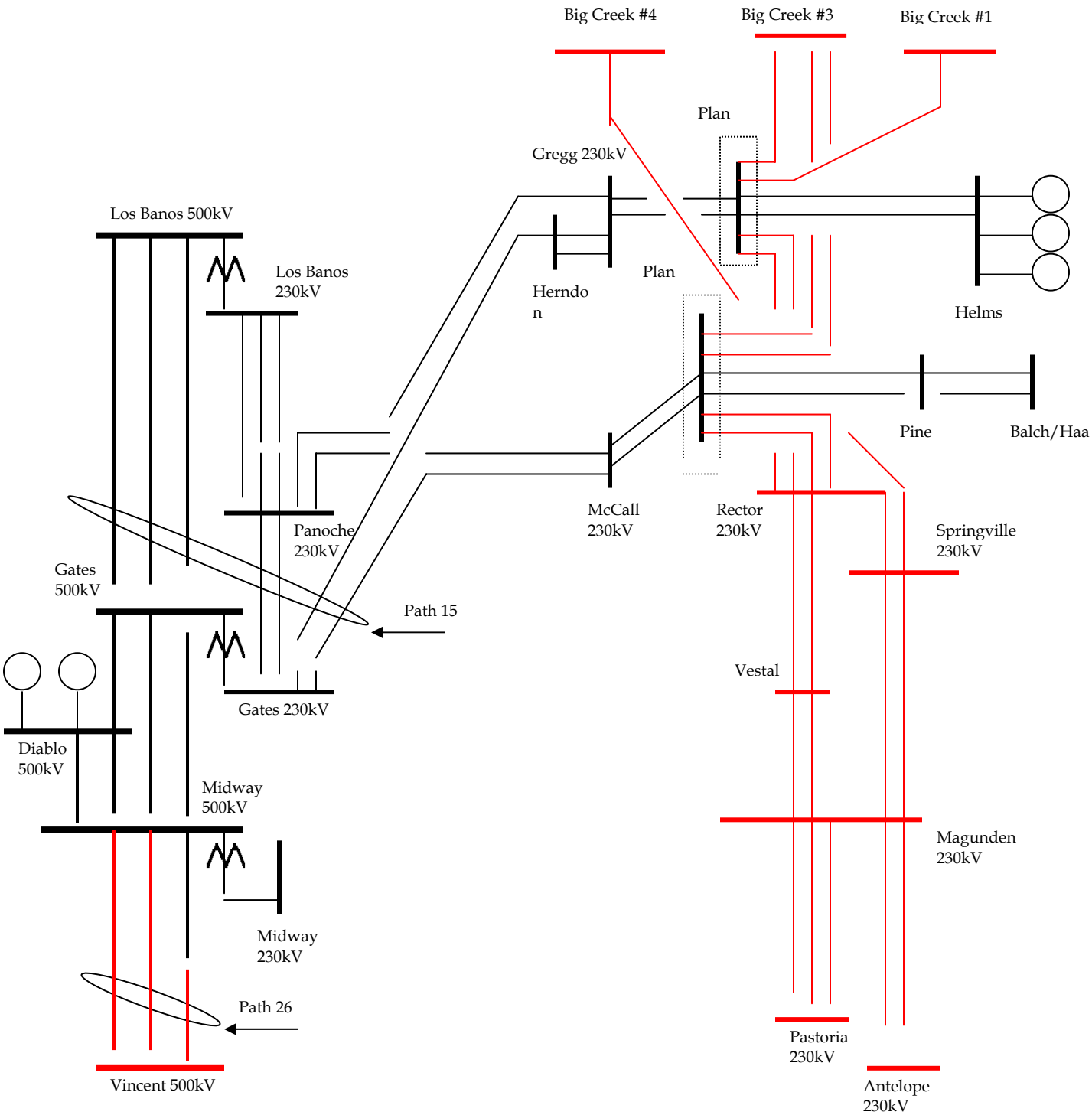


Figure A2.2 - PG&E Alternative 4: Tesla – Los Banos – Midway 500 kV line

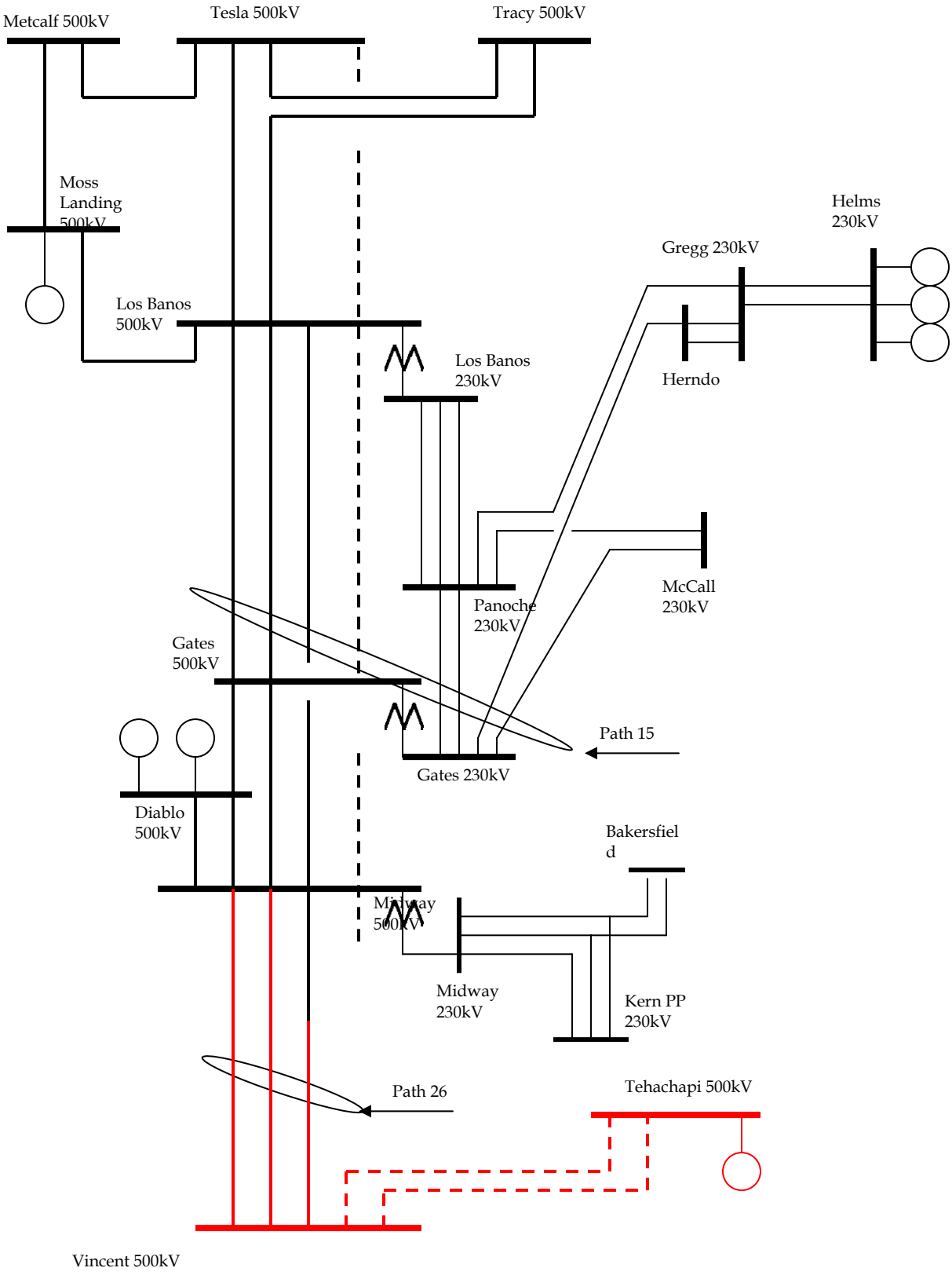
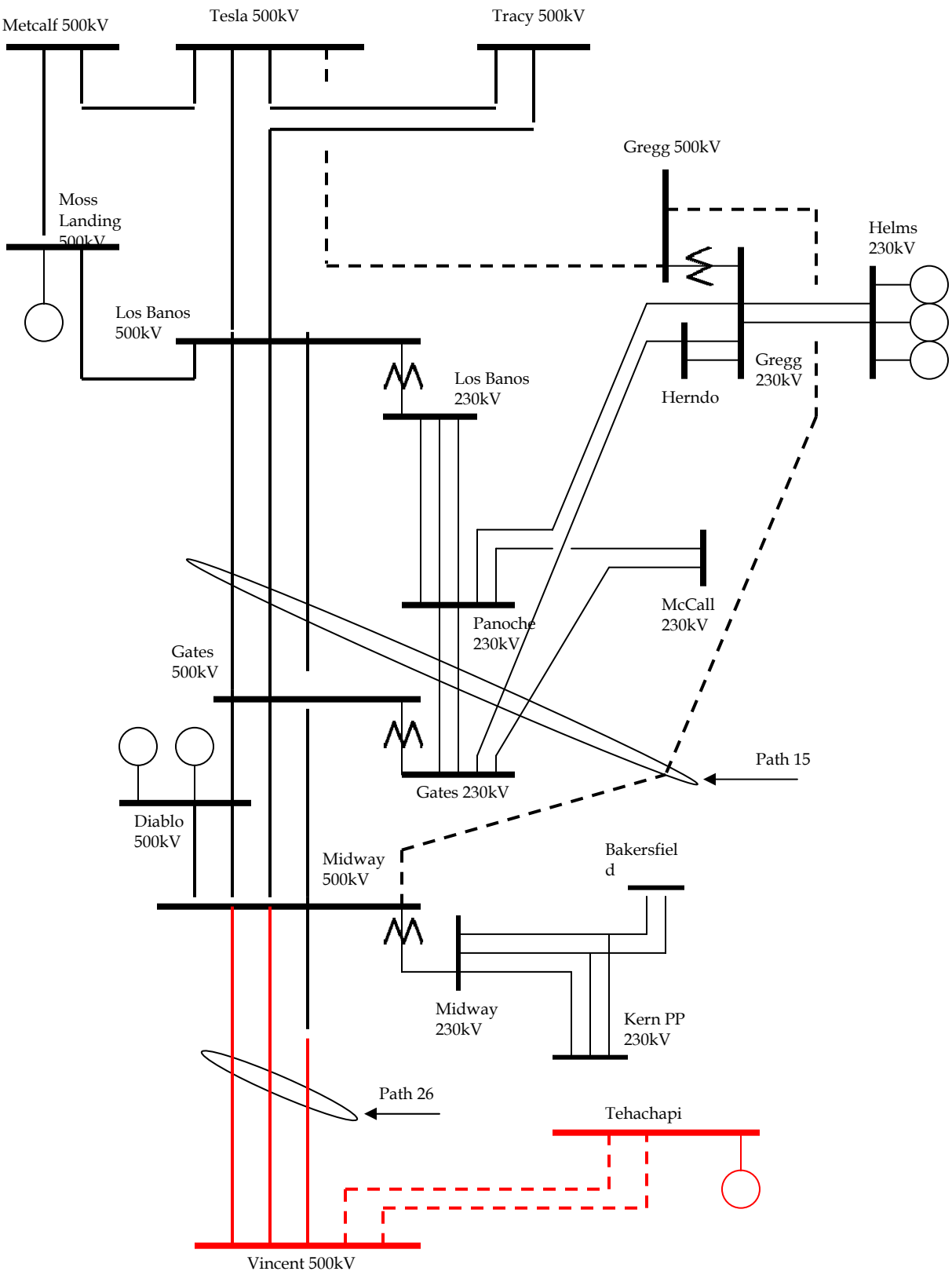


Figure A2.3 - PG&E Alternative 5: Tesla – Gregg – Midway 500 kV line



**Attachment 3**
**Preliminary Power Flow Study Results for PG&E Alternative 2**
**(2010 Summer Peak conditions with Helms Generation = 1200 MW)**

Table A3-1
Steady State Power Flow Study Results for PG&E Alternative 2
(2010 Summer Peak Conditions with Helms Generation = 1200 MW)

| | Transmission Facilities | | Base (sumpk_alt2.sav) | | Alt 2A (pk_3g2a-300.sav) | | Alt 2A (pk_alt2a-600.sav) | | Alt 2B (pk_3g2b-600.sav) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | SN Rating | Import = 0 MW | | Import = 300 MW | | Import=600MW | | Import = 600 MW | |
| | | (Amps) | (Amps) | (%) | (Amps) | (%) | (Amps) | (%) | (Amps) | (%) |
| 1 | GREGG-PGE_1_W #1 230KV LINE | 1907.8 | 1502.4 | 78.8% | 1879 | 98.5% | 1512 | 79.3% | 1889 | 99.0% |
| 2 | GREGG-PGE_1_W-1 #2 230KV LINE | 1907.8 | 1502.4 | 78.8% | 1879 | 98.5% | 1512 | 79.3% | 1889 | 99.0% |
| 3 | GREGG-PGE_1_W #3 230KV LINE (1) | 1907.8 | n/a | n/a | n/a | n/a | 1512 | 79.3% | n/a | n/a |
| 4 | BORDEN - GREGG 230KV LINE | 675.2 | 558.1 | 82.7% | 734 | **108.8%** | 862 | **127.7%** | 779 | **115.4%** |
| 5 | STOREY 1 - GREGG 230KV LINE | 675.2 | 302.3 | 44.8% | n/a | <95% | 673 | 99.6% | n/a | <95% |
| 8 | HERNDON - CHLDHOSP 115KV LINE | 823.4 | 692.0 | 84.0% | n/a | <95% | n/a | <95% | n/a | <95% |
| 9 | WOODWARD - CHLDHOSP 115KV LINE | 823.4 | 673.8 | 81.8% | n/a | <95% | n/a | <95% | n/a | <95% |
| 10 | MC CALL-PGE_2_W #1 230KV LINE | 753.1 | 378.7 | 50.3% | n/a | <95% | n/a | <95% | 740 | 98.2% |
| 11 | MC CALL-PGE_2_W #2 230KV LINE | 753.1 | 378.7 | 50.3% | n/a | <95% | n/a | <95% | 740 | 98.2% |

(1) A new Gregg – PGE_1_W #3 230 kV line was modeled in the base case to avoid an 18.7% normal overload for Alt. 2A importing 600MW.
(2) This study assumes +/-45 degree is the maximum phase angle range for the phase shifters installed at the Fresno Switching Station that would be able to import about 600 MW from SCE to PG&E under summer peak conditions studied.

Table A3-2
Steady State Power Flow Study Results for PG&E Alternative 2
Sensitivity Study for Kings River Generation at Pmax = 520 MW
(2010 Summer Peak Conditions with Helms Generation = 1200 MW)

| | Transmission Facilities | SN Rating | Base (pk_3g2b-0_kings.sav) | | Alt 2B (pk_3g2b-600_kings.sav) | |
|---|---|---|---|---|---|---|
| | | | Import = 0 MW | | Import = 600 MW | |
| | MC CALL - PGE_2_W #1 230KV LINE | 753 | 540 | 71.6% | 913 | **121.2%** |
| | MC CALL - PGE_2_W #2 230KV LINE | 753 | 540 | 71.6% | 913 | **121.2%** |

Table A3-3
230 and 115 kV Contingencies for PG&E Alternative 2
(2010 Summer Peak Conditions with Helms Generation = 1200 MW)

| Case # | Overloaded Transmission Facilities | Worst "B" and "C" Contingency | SE Rating | Base (sumpk_alt 2.sav) | Alt 2A (pk_3g2a-300.sav) | Alt 2A (pk_3g2a-600.sav) | Alt 2B (pk_3g2b-600.sav) |
|---|---|---|---|---|---|---|---|
| | | | | Impor t= 0MW | Impor t= 300MW | Impor t= 600MW | Impor t= 600MW |
| | | | (Amps) | (%) | (%) | (%) | (%) |
| F-B214 | Borden - Gregg 230kV line | Melones #1; Wilson - Storey 1 - Gregg 230kV line | 793.2 | <95% | <95% | **108.9%** | <95% |
| F-B61 | Corcoran 115/70KV BK-2 (MVA) | Guernsey - Henrietta 70kV line | 33.8 | 120.4% | 120.4% | 120.4% | 120.4% |
| F-B151 | Henrietta - Jacob Corner 70kV line | GWF- Hanford (lose 23 MW) | 346.4 | 107.9% | 108.0% | 107.7% | 107.9% |
| F-B123 | Herndon - Woodward 115kV line | Kerckhoff #2 PH (lose 129 MW) | 823.4 | 105.0% | 110.1% | 117.7% | 100.3% |
| F-B112 | Herndon 230/115kV Bk-1 | Herndon 230/115kV Bk-2 | 462 | 108.8% | 117.0% | 128.6% | 103.1% |
| F-B111 | Herndon 230/115kV Bk-2 | Herndon 230/115kV Bk-1 | 463.7 | 108.6% | 116.0% | 128.2% | 102.4% |
| F-B138 | McCall - Wahtoke 115kV line | Kings River PH (lose 47 MW) | 492 | 100.6% | <95% | | <95% | 102.9% |
| F-B36 | McCall - Wahtoke 115kV line | Kings River - Sanger - Reedley 115kV line | 562.3 | 106.0% | 104.2% | 101.2% | 107.5% |
| F-B106 | McCall 230/115 kV Bk-1 (MVA) | McCall 230/115 kV Bk-2 | 133 | 108.3% | 103.8% | 97.0% | 114.1% |
| F-B213 | Storey 1 - Gregg 230kV line | Melones #1; Wilson - Storey 2 - Borden 230kV line | 793.2 | <95% | <95% | **105.8%** | <95% |
| Y-C1 | Atwater Jct-Cressey Jct 115kV line | Wilson-Atwater and El Capitan-Wilson 115kV Lines | 512 | 166.3% | 166.7% | 165.4% | 167.0% |
| F-C20 | Borden - Gregg 230kV line | Herndon-Kearney and Herndon-Ashlan 230kV lines | 793.2 | <95% | <95% | **111.9%** | <95% |
| F-C19 | Gregg-Ashlan 230kV line | Gregg-Herndon #1 and #2 230kV lines | 850 | 182.0% | 209.3% | 233.0% | 195.6% |
| F-C3 | Herndon - Woodward 115kV line | Herndon-Barton and Herndon-Manchester 115kV lines | 974 | 106.6% | 116.9% | 129.9% | <95% |
| F-C19 | Herndon-Ashlan 230kV line | Gregg-Herndon #1 and #2 230kV lines | 850 | 115.3% | 141.3% | 167.1% | 127.9% |
| F-C6 | Le Grand-Chowchilla 115kV line | Kerckhoff-Clovis-Sanger #1 and #2 115kV lines | 396.6 | 110.9% | <95% | <95% | <95% |
| F-C8 | McCall-Wahtoke 115kV line | Kings R-Sanger-Reedley and Balch-Sanger 115kV lines | 562.3 | 106.3% | 104.6% | 101.5% | 107.8% |
| Y-C1 | Merced-Atwater Jct 115kV line | Wilson-Atwater and El Capitan-Wilson 115kV Lines | 738 | 138.2% | 138.6% | 137.5% | 138.8% |
| Y-C1 | Wilson A-Merced 115kV line | Wilson-Atwater and El Capitan-Wilson 115kV Lines | 471.9 | 137.2% | 137.0% | 122.7% | 137.0% |
| Y-C1 | Wilson B-Merced 115kV line | Wilson-Atwater and El Capitan-Wilson 115kV Lines | 471.9 | 124.0% | 123.5% | 136.2% | 123.4% |

Notes:

1. Case # F-B61 should be modified to reflect that Guernsey – Henrietta 70 kV line will not close circuit breaker No. 52 follow this outage. As a result, the Corcoran 115/70 kV transformer loading should reduce to within its ratings for the base alternative.

2. Case # F-B151 should use the emergency rating of the Henrietta – Jacobs Corner 70 kV line, which is 395 Amps. As a result, the Henrietta – Jacobs Corner 70 kV line will not overload for the base alternative.

3. Case # F-B123 should use the emergency rating of the Herndon – Woodward 115 kV line, which is 974 Amps. As a result, the Herndon – Woodward 115 kV line will not overload for the base alternative.

4. Cases #F-B138, F-B36 and F-C8, the Mc Call-Wahtoke 115 kV line is comprised of 1113 AAC with (SN/SE) 825/975 amps. As a result, the Mc Call-Wahtoke 115 kV line is not projected to overload for the base alternative.

5. Case #F-B106, Mc Call 230/115 kV Transformer No. 2 was re-rated for 150 MVA emergency. Therefore, Mc Call 230/115 kV Transformer No. 2 is not expected to overload for the base alternative.

6. Case #F-C19 and C6, there are existing SPS' that are in place to mitigate thermal overloads on the identified transmission lines.

Table A3-4
500 kV Contingencies for PG&E Alternative 2
(2010 Summer Peak Conditions with Helms Generation = 1200 MW)

| | | | | | Base (pk_alt2-0.sav) | | Alt 2A (pk_alt2a-300.sav) | | Alt 2A (pk_alt2a-600.sav) | | Alt 2B (pk_alt2b-600.sav) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | IMPORT = 300 MW | | IMPORT = 600 MW | | IMPORT = 600 MW | |
| | Outages Facilities | Overloaded Facilities | RAS | SE Rating | post-outag Flow | | post-outag Flow | | post-outag Flow | | post-outag Flow | |
| | **Single Contingency (Category "B")** (MW | ) | | (A) | (A) | (%) | (A) | (%) | (A) | (%) | (A) | (%) |
| PK-B1 | Tesla-Los Banos 500kV line | Borden-Gregg 230kV line | none | 793 | 612 | 77.2% | 733 | 92.5% | 868 | **109.4%** | 785 | **99.0%** |
| PK-B2 | Los Banos-Gates #3 500kV line | Borden-Gregg 230kV line | none | 793 | 613 | 77.3% | 733 | 92.4% | 865 | **109.0%** | 782 | 98.6% |
| PK-B3 | Los Banos-Midway 500kV Line | Borden-Gregg 230kV line | none | 793 | 608 | 76.6% | 725 | 91.4% | 857 | **108.1%** | 775 | 97.7% |
| PK-B4 | Gates-Midway #1 500kV Line | Borden-Gregg 230kV line | none | 793 | 614 | 77.5% | 725 | 91.5% | 856 | **107.9%** | 775 | 97.8% |
| PK-B5 PDCI | Bipole | Borden-Gregg 230kV line | none | 793 | 533 | 67.2% | 610 | 76.9% | 735 | 92.7% | 665 | 83.9% |
| | **Double contingency (Category "C")** | | | | | | | | | | | |
| PK-C1 | Tesla-Los Banos, Tracy-Los Banos 500kV lines | Borden-Gregg 230kV line | none | 793 | 608 | 76.6% | 735 | 92.6% | 877 | **110.6%** | 795 | **100.3%** |
| PK-C2 | Los Banos-Gates #3, Los Banos-Midway #1 500kV lines | Borden-Gregg 230kV line | none | 793 | 607 | 76.5% | 725 | 91.4% | 859 | **108.3%** | 777 | 98.0% |
| PK-C3 | Gates-Midway, Los Banos-Midway 500kV lines | Borden-Gregg 230kV line | none | 793 | 611 | 77.0% | 713 | 89.9% | 845 | **106.6%** | 768 | 96.8% |
| PK-C4 | Diablo Canyon G-2 | Borden-Gregg 230kV line | none | 793 | 549 | 69.3% | 665 | 83.8% | 794 | **100.1%** | 711 | 89.7% |
| PK-C5 | Palo Verde G-2 | Borden-Gregg 230kV line | none | 793 | 550 | 69.4% | 647 | 81.6% | 777 | 98.0% | 700 | 88.3% |

**Attachment 4**
**Preliminary Power Flow Study Results for PG&E Alternative 2**
**(2010 Summer Off-Peak Conditions with Helms off-line)**

Table A4-1
Steady State Power Flow Study Results for PG&E Alternative 2
(2010 Summer Off-peak Conditions with Helms Offline)

| T | ransmission Facilities | SN Rating | Base (sumopk_r2.sav) | | Alt 2A (opk_alt2a-600.sav) | | Alt 2A (opk_alt2a-1200.sav) | | Alt 2B (opk_alt2b-600.sav) | | Alt 2B (opk_0p2b-1200.sav) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Import = 0 MW | | Import = 600 MW | | Import = 1200 MW | | Import = 600 MW | | Import = 1200 MW | |
| | | (Amps) | (Amps) | (%) | (Amps) | (%) | (Amps) | (%) | (Amps) | (%) | (Amps) | (%) |
| 1 | WARNERVL - COTTLE B 230KV LINE | 675.2 | 290.6 | 43.0% | 473 | 70.1% | 692 | **102.5%** | 432 | 63.9% | 611 | 90.5% |
| 2 | BELLOTA - COTTLE B 230KV LINE | 675.2 | 261.2 | 38.7% | 444 | 65.7% | 661 | 98.0% | 403 | 59.6% | 581 | 86.1% |
| 3 | McCall-PGE_2_W #1 230kV line | 753.1 | 27.4 | 3.6% | n/a | <95% | n/a | <95% | 403 | 53.5% | 770 | **102.2%** |
| 4 | McCall-PGE_2_W #1 230kV line | 753.1 | 27.4 | 3.6% | n/a | <95% | n/a | <95% | 403 | 53.5% | 770 | **102.2%** |

Table A4-2
230 and 115 kV Contingencies for PG&E Alternative 2
(2010 Summer Off-Peak Conditions with Helms Offline)

| Case # | Overloaded Transmission Facilities Worst | Contingency | SE Rating | Base (opk_op2a -0.sav) | Alt 2A (opk_0p2a -300.sav) | Alt 2A (opk_0p2a -600.sav) | Alt 2A (opk_0p2a -1200.sav) | Alt 2B (opk_0p2b -600.sav) | Alt 2B (opk_0p2b -1200.sav) |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | Import = 300MW | Import = 600MW | Import = 1200MW | Import = 600MW | Import = 1200MW |
| | | | (Amps) | (%) | (%) | (%) | (%) | (%) | (%) |
| F-B207 | Borden - Gregg 230kV line | Exchequer PH; Wilson - Storey 1 - Gregg 230kV line | 793.2 | <95% | <95% | <95% | **121.7%** | <95% | <95% |
| F-B146 | Borden - Gregg 230kV line | Friant PP (22.5 MW) | 675.3 (1) | <95% | <95% | <95% | **101.3%** | <95% | <95% |
| F-B100 | Gates – Midway 230kV line | Gates 500/230kV bank | 1390 | <95% | <95% | <95% | <95% | <95% | <95% |
| F-B6 | Storey 1 – Gregg 230kV line | Borden – Gregg 230kV line | 793.2 | <95% | <95% | <95% | **119.9%** | <95% | <95% |
| F-B207 | Storey 2 – Borden 230kV line | Exchequer PH; Wilson – Storey 1 – Gregg 230kV line | 793.2 | <95% | <95% | <95% | **102.9%** | <95% | <95% |
| F-B6 | Wilson – Storey 1 230kV line | Borden – Gregg 230kV line | 851 | <95% | <95% | <95% | **106.9%** | <95% | <95% |
| | | | | | | | | | |
| F-C12 | Helm-McCall 230kV line | Gates-Gregg and Gates-McCall 230kV lines | 850 | **106.3%** | <95% | <95% | **138.7%** | <95% | <95% |
| F-C16 | Henrietta-GWF_HEP 115kV line | Gates-McCall and Helm-McCall 230kV lines | 743 | **105.0%** | <95% | <95% | <95% | <95% | <95% |
| F-C13 | Henrietta-McCall 230kV line | Gates-Gregg and Panoche-Kearney 230kV lines | 975 | **107.9%** | <95% | <95% | <95% | <95% | <95% |

(1) Summer normal rating for G-1 contingency.

Table A4-3
500 kV "B" Contingencies for PG&E Alternative 2
(2010 Summer Off-Peak Conditions with Helms Offline)

| | | | | | Base (sumopk_r2.sav) | | Alt 2A (opk_alt2a-600.sav) | | Alt 2A (opk_alt2a-00.sav) | | Alt 2B (opk_alt2b-600.sav) | | Alt 2B (opk_alt2b-200.sav) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Import=600 MW | | Import =1200 MW | | Import=600 MW | | Import =1200 MW | |
| | | | | | Post-outage Flow | | Post-outage Flow | | Post-outage Flow | | Post-outage Flow | | Post-outage Flow | |
| | Outages Facilities | Overloaded Facilities | RAS (MW) | SE (A) | (A) | (%) (A) | | (%) (A) | | (%) (A) | | (%) (A) | | (%) |
| OPK-B1 | Tesla-Los Banos 500kV line | Cottle B-Warnerville 230kV line | none | 793 | 395 | 49.8% | 596 | 75.2% | 819 | **103.2%** | 555 | 69.9% 745 | 94.0% | |
| OPK-B2 | Los Banos-Gates #3 500kV line | Warnervill-Wilson 230kV line | none | 793 | n/a | <95% | 119 | 15.0% | 447 | 56.3% 70 | | 8.8% 309 | | 39.0% |
| OPK-B3 | Los Banos-Midway 500kV Line | Gates-Midway 500kV Line | none | 3556 | 3489 | 98.1% | 3504 | 98.5% | 3598 | **101.2%** | 3493 | 98.2% 3543 | | **99.6%** |
| OPK-B3 | Los Banos-Midway 500kV Line | Gates-Midway 230kV line | none | 1390 | 736 | 52.9% | 684 | 49.2% | 653 | 47.0% | 676 | 48.6% 627 | 45.1% | |
| OPK-B3 | Los Banos-Midway 500kV Line | Arco-Midway 230kV line | none | 1390 | 668 | 48.1% | 627 | 45.1% | 602 | 43.3% | 619 | 44.5% 580 | 41.7% | |
| OPK-B4 | Gates-Midway #1 500kV Line | Los Banos-Midway 500kV Line | none | 3556 | 2922 | 82.2% | 2948 | 82.9% | 3058 | 86.0% | 2940 | 82.7% 3021 | 85.0% | |
| OPK-B4 | Gates-Midway #1 500kV Line | Gates-Midway 230kV line | none | 1390 | 886 | 63.7% | 819 | 58.9% | 785 | 56.4% | 807 | 58.1% 751 | 54.0% | |
| OPK-B4 | Gates-Midway #1 500kV Line | Arco-Midway 230kV line | none | 1390 | 791 | 56.9% | 737 | 53.0% | 709 | 51.0% | 726 | 52.3% 681 | 49.0% | |
| OPK-B5 PDCI | Bipole | Cottle B-Warnerville 230kV line | none | 793 | 431 | 54.4% | 675 | 85.1% | 875 | **110.4%** | 630 | 79.4% 815 | | **102.8%** |
| OPK-B5 | PDCI Bipole | Borden-Gregg 230kV line | none | 793 | 220 | 27.7% | 547 | 69.0% | 836 | **105.4%** | 452 | 57.0% 637 | 80.3% | |
| OPK-B5 | PDCI Bipole | Storey 1-Gregg 230kV line | none | 793 | 166 | 21.0% | 490 | 61.8% | 800 | **100.9%** | 403 | 50.8% 614 | 77.4% | |

Table A4-4
500 kV "C" Contingencies for PG&E Alternative 2
(2010 Summer Off-Peak Conditions with Helms Offline)

| | | | | | Base (sumopk_r2.sav) | | Alt 2A (opk_alt2a-00.sav) | | Alt 2A (opk_alt2a-00.sav) | | Alt 2B (opk_alt2b600.sav) | | Alt 2B (opk_alt2b-00.sav) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Import=600 MW | | Import =1200 MW | | Import=600 MW | | Import =1200 MW | |
| | | | | | Post-outage Flow | | Post-outage Flow | | Post-outage Flow | | Post-outage Flow | | Post-outage Flow | |
| | Outages Facilities | Overloaded Facilities | RAS (MW) | SE (A) | (A) (%) | (A) | | (%) (A) | | (A) (%) | | (A) (%) | | (A) |
| OPK -C1 | TSL-LSB, TCY-LSB 500kV line | Cottle B-Warnerville 230kV line | 3369 | 793 | 384 | 48.4% 585 | | 73.8% 834 | | **105.2%** | 545 | 68.8% | 761 | 96.0% |
| OPK -C1 | TSL-LSB, TCY-LSB 500kV line | Los Banos-Panoche #1 230kV line | 3369 | 825 | 75 | 9.1% | 34 | 4.2% 121 | | 14.7% 50 | | 6.1% 144 | | 17.5% |
| OPK -C1 | TSL-LSB, TCY-LSB 500kV line | Los Banos-Panoche #2 230kV line | 3369 | 742 | 71 | 9.6% | 34 | 4.6% 112 | | 15.1% 48 | | 6.5% 134 | | 18.0% |
| OPK -C1 | TSL-LSB, TCY-LSB 500kV line | Los Banos-Panoche #3 230kV line | 3369 | 742 | 72 | 9.7% | 33 | 4.5% 114 | | 15.3% 48 | | 6.5% 136 | | 18.3% |
| OPK -C1 | TSL-LSB, TCY-LSB 500kV line | Los Banos-Westley 230kV line | 3369 | 2000 | 1731 | 86.6% 1926 | | 96.3% 2276 | | **113.8%** | 1970 | 98.5% | 2345 | **117.3%** |
| OPK -C1 | TSL-LSB, TCY-LSB 500kV line | Los Banos 500/230kV bk | 3369 | 1050 | 749 | 71.3% 719 | | 68.5% 718 | | 68.4% 722 | | 68.8% 722 | | 68.8% |
| OPK -C2 | LSB-GTS #3, LSB-MDY #1 500kV lines | Los Banos-Gates #1 500kV line | 1832 | 3556 | 3068 | 86.3% 3264 | | 91.8% 3531 | | 99.3% 3277 | | 92.2% 3547 | | 99.7% |
| OPK -C3 | GTS-MDW, LSB-MDW #1 500kV lines | Gates-Midway 230kV line | 2057 | 1390 | 1329 | 95.6% 1176 | | 84.6% 1195 | | 86.0% 1144 | | 82.3% 1107 | | 79.7% |
| OPK -C3 | GTS-MDW, LSB-MDW #1 500kV lines | Arco-Midway 230kV line | 2057 | 1390 | 1157 | 83.2% 1031 | | 74.2% 1048 | | 75.4% 1003 | | 72.2% | 975 | 70.2% |
| OPK -C4 | Diablo Canyon G-2 | None n/a | | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| OPK -C5 | Palo Verde G-2 | None | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |

Attachment 5
Preliminary Power flow Study Results for PG&E Alternative 4

Table A5-1
Steady State Power Flow Study Results for PGE Alternative 4
(2010 Summer Off-Peak Conditions with Helms = -600 MW)

| T | ransmission Facilities | SN Rating (1) | Base (sumopk_r1_2p.sav) | | Alt 4A (opk_alt4c-500.sav) | | Alt 4B (opk_alt4a-1100.sav) | | Alt 4C (opk_alt4b-2k.sav) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Import = 0 MW | | Import=500MW | | Import=1100MW | | Import=2000MW | |
| | | (Amp) | (Amp) | (%) | (Amp) | (%) | (Amp) | (%) | (Amp) | (%) |
| 1 | Gates - Midway #1 500 kV line | 2230 | 2088 | 93.6% | 2197 | **98.5%** | 1844 | 82.7% | **2173** | **97.4%** |
| 2 | Los Banos - Midway #1 500 kV line | 2230 | 1805 | 80.9% | 1895 | 85.0% | 1561 | 70.0% | 1858 | 83.3% |
| 3 | Los Banos - Gates #1 500kV line | 2230 | 1605 | 72.0% | 1678 | 75.2% | 1370 | 61.4% | 1631 | 73.1% |
| 4 | Los Banos-Gates #3 500kV line | 4332 | 800 | 18.5% | 832 | 19.2% | 690 | 15.9% | 811 | 18.7% |
| 5 | Panoche-McMulln1 230kV line | 825 | 785 | 95.2% | 797 | 96.6% | 816 | 98.9% | 792 | 96.0% |
| 6 | McMulln1 - Kearney 230kV line | 825 | 765 | 92.8% | 779 | 94.4% | 795 | 96.4% | 771 | 93.4% |
| 7 | McCall - Hentap2 230kV line (1) | 825 | 780 | 94.6% | 777 | 94.2% | 808 | 97.9% | **822** | **99.6%** |
| 8 | Los Banos - Westley 230 kV line | 1484 | 784 | 52.8% | 1001 | 67.4% | 1056 | 71.1% | 895 | 60.3% |
| 9 | Tesla-Los Banos #2 500kV line (new) | 2230 | n/a | n/a | n/a | n/a | n/a | n/a | 1563 | 70.1% |
| 10 | LosBanos-Midway #2 500kV line (new) | 2230 | n/a | n/a | n/a | n/a | 1802 | 80.8% | 2134 | 95.7% |
| 11 | LosBanos-Midway #2 500kV line operate at 230kV (new) | 2230 | n/a | n/a | 1723 | 69.5% | n/a | n/a | n/a | n/a |

(1) The SN ratings are in ampere for line and MVA for transformer.

Table A5-2
500 kV Category "B" Contingencies for PG&E Alternative 4
(2010 Summer Off-Peak Conditions with Helms = -600MW)

| | | | | Base | | Alt 4A | | Alt 4B | | Alt 4C | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Import = 0 MW | | Import=500MW | | Import=1100MW | | Import=2000MW | |
| | Outages Facilities | Overloaded Facilities | SE Rating (A) | post-outag Flow (A) | post-outag Flow (%) | post-outag Flow (A) | post-outag Flow (%) | post-outag Flow (A) | post-outag Flow (%) | post-outag Flow (A) | post-outag Flow (%) |
| B1 | Tesla-Los Banos 500kV line | Gates-Henrietta Tap1 230kV line | 1600 | n/a | <95% | n/a | <95% | 1564 | 97.7% | n/a | <95% |
| B2 | Los Banos-Gates #3 500kV line | Gates-Henrietta Tap1 230kV line | 1600 | n/a | <95% | n/a | <95% | n/a | <95% | n/a | <95% |
| B2 | Los Banos-Gates #3 500kV line | Los Banos-Midway #2 500kV Line operate at 230 kV (new) | 3556 | n/a | n/a | 1718 | 48.3% | n/a | n/a | n/a | n/a |
| B3 | Los Banos-Midway 500kV Line | Gates-Midway 500kV Line | 3556 | 3433 | 96.5% | 3556 | **100%** | n/a | <95% | n/a | <95% |
| B3 | Los Banos-Midway 500kV Line | Gates-Henrietta Tap1 230kV line | 1600 | n/a | <95% | n/a | <95% | n/a | <95% | 1530 | 95.7% |
| B3 | Los Banos-Midway 500kV Line | Los Banos-Midway #2 500kV Line operate at 230 kV (new) | 3556 | n/a | n/a | 1713 | 48.2% | n/a | n/a | n/a | n/a |
| B3 | Los Banos-Midway 500kV Line | Los Banos-Midway #2 500kV Line (new) | 3556 | n/a | n/a | n/a | n/a | | <95% | n/a | n/a |
| B4 | Gates-Midway #1 500kV Line | Los Banos-Midway 500kV Line | 3556 | 2847 | 80.1% | n/a | <95% | n/a | <95% | n/a | <95% |
| B4 | Gates-Midway #1 500kV Line | Los Banos-Midway #2 500kV Line operate at 230 kV (new) | 3556 | n/a | n/a | 1717 | 48.3% | n/a | n/a | n/a | n/a |
| B4 | Gates-Midway #1 500kV Line | Los Banos-Midway #2 500kV Line (new) | 3556 | n/a | n/a | n/a | n/a | | <95% | n/a | <95% |
| B7 | PDCI Bipole | Gates-Henrietta Tap1 230kV line | 1600 | 1573 | 98.3% | 1575 | 98.4% | 1624 | **101.5 %** | **1635** | **102.2 %** |

Table A5-3
500 kV Category "C" Contingencies for PG&E Alternative 4
(2010 Summer Off-Peak Conditions with Helms = -600 MW)

| | | | | Base | | | Alt 4A | | | Alt 4B | | | Alt 4C | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Import = 0 MW | | | Import=500MW | | | Import=1100MW | | | Import=2000MW | | |
| O | utages Facilities | Overloaded Facilities | SE (A) | post-outage Flow (A) | post-outage Flow (%) | RAS (MW) | | | | post-outage Flow (A) | post-outage Flow (%) | RAS (MW) | post-outage Flow (A) | post-outage Flow (%) | RAS (MW) |
| C1 | Tesla-Los Banos, Tracy-Los Banos 500kV lines | Los Banos-Westley 230kV line | 2000 | 1378 | 68.9% | 3369 | 1671 | 83.6% | 3368 | 2106 | **105.3 % (1)** | 3369 | n/a | <95% | 1985 |
| C1 | Tesla-Los Banos, Tracy-Los Banos 500kV lines | Los Banos 500/230kV xfr bank 1050 | | n/a | n/a | 3369 | 989 | 94.2% | 3368 | 1073 | **102.2 % (1)** | 3369 | n/a | <95% | 1985 |
| C2 | Los Banos-Gates #3, Los Banos-Midway #1 500kV lines | Los Banos-Gates #1 500kV line | 3556 | 3324 | 93.5% | 1532 | 3458 | **97.3%** | 1532 | 2255 | 63.4% | 1532 | n/a | <95% | 1532 |
| C3 | Los Banos-Midway #1 and #2 500kV lines (Alt 4) | Gates-Midway 500kV line | 3556 | n/a | n/a | 2648 | n/a | n/a | n/a | 3362 | 94.5% | 2648 | 3511 | **98.7%** | **4319 (2)** |
| C3 | Los Banos-Midway #1 and #2 500kV lines (new) | Los Banos-Gates #1 500kV line | 3556 | n/a | n/a | 2648 | n/a | n/a | n/a | n/a | <95% | 2648 | 2758 | 77.6% | **4319 (2)** |
| C4 | Gates-Midway, Los Banos-Midway 500kV lines | Gates-Midway 230kV line | 1390 | 1216 | 87.5% | 2648 | 1208 | 86.9% | 2648 | 707 | 50.9% | 2648 | 817 | 58.8% | 2984 |
| C4 | Gates-Midway, Los Banos-Midway 500kV lines | Los Banos-Midway #2 500kV Line (new) | 3556 | n/a | n/a | 2648 | n/a | n/a | 2648 | 2917 | 82.0% | 2648 | 3519 | **99.0%** | 2984 |
| C5 | Palo Verde G-2 | none | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| C6 | Diablo Canyon G-2 | none | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |

(1) Upgrade the Los Banos 500/230 kV transformer bank and the Los Banos – Westley 230 kV lines to relieve the emergency overloads.
(2) The RAS includes 2578 MW of generation, 691 MW of pumps and 1050 MW of loads. The net generation drop is 837 MW.

Attachment 6
Preliminary Power flow Study Results for PG&E Alternative 5

Table A6-1
Steady State Power Flow Study Results for PGE Alternative 5
(2010 Summer Off-Peak Conditions with Helms = -900MW)

| T | ransmission Facilities | SN Rating (1) | Base (sumopk_r1_2p.sav) | | Alt 5A (opk_alt5a-500.sav) | | Alt 5B1 (opk_alt5b1-1100.sav) | | Alt 5C1 (opk_alt5c1-2k.sav) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Import = 0 MW Helms=-600MW | | Import=500MW | | Import=1100MW | | Import=2000MW | |
| | | (Amp) | (Amp) | (%) | (Amp) | (%) | (Amp) | (%) | (Amp) | (%) |
| 1 | Gates - Midway #1 500 kV line | 2230 | 2088 | 93.6% | **2124** | **95.3%** | 2085 | 93.5% | 2152 | 96.5% |
| 2 | Los Banos - Midway #1 500 kV line | 2230 | 1805 | 80.9% | 1838 | 82.4% | 1907 | 85.5% | 1943 | 87.1% |
| 3 | Los Banos - Gates #1 500kV line | 2230 | 1605 | 72.0% | 1637 | 73.4% | 1767 | 79.2% | 1781 | 79.8% |
| 4 | Los Banos-Gates #3 500kV line | 4332 | 800 | 18.5% | 816 | 18.8% | 879 | 20.3% | 884 | 20.4% |
| 5 | Panoche-McMulln1 230kV line | 825 | 785 | 95.2% | 701 | 85.0% | 350 | 42.4% | 369 | 44.7% |
| 6 | McMulln1 - Kearney 230kV line | 825 | 765 | 92.8% | 680 | 82.4% | 331 | 40.2% | 347 | 42.1% |
| 7 | McCall - Hentap2 230kV line | 825 | 780 | 94.6% | 746 | 90.4% | 609 | 73.8% | 652 | 79.1% |
| 8 | Los Banos - Westley 230 kV line | 1484 | 784 | 52.8% | 806 | 54.3% | 1036 | 69.8% | 984 | 66.3% |
| 11 | Tesla-Gregg 500kV line (new) | 2230 | n/a | n/a | n/a | n/a | n/a | n/a | 1042 | 46.7% |
| 12 | Gregg-Midway 500kV line (new) | 2230 | n/a | n/a | n/a | n/a | 1238 | 55.5% | **2195** | **98.4%** |
| 13 | Gregg-Midway 500kV line operate at 230kV (new) | 2478 | n/a | n/a | 1304 | 52.6% | n/a | n/a | n/a | n/a |
| 14 | Gregg 500/230kV Transformer (new) | 1122 | n/a | n/a | n/a | n/a | **1113** | **99.2%** | 990 | 88.2% |

(1) The SN ratings are in ampere for line and MVA for transformer.

Table A6-2
500 kV Category "B" Contingencies for PG&E Alternative 5
(2010 Summer Off-Peak Conditions with Helms = -900MW)

| | | | | Base | | Alt 5A | | Alt 5B1 | | Alt 5C1 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Import = 0 MW Helms=-600MW | | Import=500MW | | Import=1100MW | | Import=2000MW | |
| | Outages Facilities | Overloaded Facilities | SE Rating (A) | post-outag Flow (A) | post-outag Flow (%) | post-outag Flow (A) | post-outag Flow (%) | post-outag Flow (A) | post-outag Flow (%) | post-outag Flow (A) | post-outag Flow (%) |
| B1 | Tesla-Los Banos 500kV line | Gates-Henrietta Tap1 230kV line | 1600 | n/a | <95% | 1368 | 85.5% | n/a | <95% | n/a | <95% |
| | | Gregg 500/230kV bank (new) | 1260 | n/a | <95% | n/a | n/a | 1170 | 92.8% | n/a | <95% |
| | | Gregg-Midway 500kV line (new) | 3556 | n/a | <95% | n/a | n/a | n/a | <95% | n/a | <95% |
| B2 | Los Banos-Gates #3 500kV line | Gates-Henrietta Tap1 230kV line | 1600 | n/a | <95% | 1331 | 83.2% | n/a | <95% | n/a | <95% |
| | | Gregg 500/230kV bank (new) | 1260 | n/a | n/a | n/a | n/a | 1134 | 90.0% | n/a | <95% |
| B3 | Los Banos-Midway 500kV Line | Gates-Midway 500kV Line | 3556 | 3433 | 96.5% | 3457[10] | **97.2%** | 3390 | 95.3% | 3312 | 93.1% |
| | | Gates-Henrietta Tap1 230kV line | 1600 | n/a | <95% | 1374 | 85.9% | n/a | <95% | n/a | <95% |
| | | Gregg 500/230kV bank (new) | 1260 | n/a | n/a | n/a | n/a | 1259 | **100.0 %** | n/a | <95% |
| | | Tesla-Gregg 500kV line (new) | 3556 | n/a | n/a | n/a | n/a | | <95% | n/a | <95% |
| | | Gregg-Midway 500kV line (new) | 3556 | n/a | n/a | n/a | n/a | | <95% | n/a | <95% |
| | | Gregg-Midway 500kV line operate at 230kv (new) | 2962 | n/a | n/a | 1383 | 46.7% | n/a | <95% | n/a | <95% |

[10] A sensitivity case modeling the import of 600 MW was run. The Gates-Midway 500 kV line would load up to 3550 amperes (99.8% of SE rating of 3556A) for the Los Banos – Midway 500 kV line outage.

Table A6-2 (continue)
500 kV Category "B" Contingencies for PG&E Alternative 5
(2010 Summer Off-Peak Conditions with Helms = -900 MW)

| | | | | Base | | Alt 5A | | Alt 5B1 | | Alt 5C1 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Import = 0 MW Helms=-600MW | | Import=500MW | | Import=1100MW | | Import=2000MW | |
| | Outages Facilities | Overloaded Facilities | SE Rating (A) | post-outag Flow (A) | post-outag Flow (%) | post-outag Flow (A) | post-outag Flow (%) | post-outag Flow (A) | post-outag Flow (%) | post-outag Flow (A) | post-outag Flow (%) |
| B4 | Gates-Midway #1 500kV Line | Los Banos-Midway 500kV Line | 3556 | 2847 | 80.1% | 2863 | 80.5% | 2840 | 79.9% | n/a | <95% |
| | | Gregg 500/230kV bank new) | 1260 | n/a | n/a | n/a | n/a | 1292 | 102.5 % | n/a | <95% |
| | | Gregg-Midway 500kV line (new) | 3556 | n/a | n/a | n/a | n/a | | <95% | n/a | <95% |
| | | Gregg-Midway 500kV line operate at 230kV (new) | 2962 | n/a | n/a | 1403 | 47.4% | n/a | <95% | n/a | n/a |
| B5 | Tesla-Gregg 500kV line | Gregg 500/230kV bank (new) | 1260 | n/a | n/a | n/a | n/a | n/a | n/a | 1341 | 106.4 % |
| B6 | Gregg-Midway 500kV line | McCall-Hentap2 230kV line | 975 | n/a | n/a | n/a | | <95% | 972 | 99.7% | n/a | <95% |
| | | Panoche-McNulln1 230kV line | 975 | n/a | n/a | n/a | <95% | 1050 | 107.7 % | n/a | <95% |
| | | McMUlln1-Kearney 230kV line | 975 | n/a | n/a | n/a | <95% | 1031 | 105.7 % | n/a | <95% |
| | | Warnerville-Wilson 230kV line | 793 | n/a | n/a | n/a | <95% | 801 | 101.0 % | n/a | <95% |
| | | Gates-Henrietta Tap1 230kV line | 1600 | n/a | n/a | n/a | <95% | 1785 | 111.5 % | 1558 | 97.4% |
| B7 | PDCI Bipole | Gates-Henrietta Tap1 230kV line | 1600 | 1573 | 98.3% | 1442 | 90.1% | n/a | <95% | n/a | <95% |
| | | McCall-Hentap2 230kV line | 975 | n/a | <95% | 845 | 86.7% | n/a | <95% | n/a | <95% |
| | | Gregg 500/230kV bank (new) | 1260 | n/a | <95% | n/a | n/a | 1262 | 100.1 % | 988 | 78.4% |

Table A6-3
500 kV Category "C" Contingencies for PG&E Alternative 5
(2010 Summer Off-Peak Conditions with Helms = -900 MW)

| | | | | Alt 5a | | | Atl 5b | | | Alt 5c | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Import = 500 MW | | | Import=1100MW | | | Import=2000MW | | |
| | Outages Facilities | Overloaded Facilities | SE Rating (A) | post-outag Flow (A) | post-outag Flow (%) | RAS (MW) | post-outag Flow (A) | post-outag Flow (%) | RAS (MW) | post-outag Flow (A) | post-outag Flow (%) | RAS (MW) |
| C1 | Tesla-Los Banos, Tracy-Los Banos 500kV lines | Los Banos-Westley 230kV line | 2000 | 1879 | 93.9% | 1951 | 1815 | 90.8% | 3369 | 1837 | 91.8% | 1951 |
| C1 | Tesla-Los Banos, Tracy-Los Banos 500kV lines | Tesla-Gregg 500kV line (new) | 3556 | n/a | n/a | n/a | n/a | n/a | n/a | | <95% | 1951 |
| C1 | Tesla-Los Banos, Tracy-Los Banos 500kV lines | Gregg-Midway 500kV line (new) | 3556 | n/a | n/a | n/a | n/a | <95% | 3369 | n/a | <95% | 1951 |
| C2 | Los Banos-Gates #3, Los Banos-Midway #1 500kV lines | Los Banos-Gates #1 500kV line | 3556 | 3424 | **96.3%** | 1832 | 3276 | 92.1% | 2948 | 3378 | 95.0% | 1832 |
| C2 | Los Banos-Gates #3, Los Banos-Midway #1 500kV lines | Gates-Midway 500kV line | 3556 | 2865 | 80.6% | 1832 | 2591 | 72.9% | 2948 | n/a | <95% | 1832 |
| C2 | Los Banos-Gates #3, Los Banos-Midway #1 500kV lines | Tesla-Gregg 500kV line (new) | 3556 | n/a | n/a | n/a | | n/a | n/a | n/a | <95% | 1832 |
| C2 | Los Banos-Gates #3, Los Banos-Midway #1 500kV lines | Gregg-Midway 500kV line (new) | 3556 | n/a | n/a | n/a | | <95% | 2948 | n/a | <95% | 1832 |
| C4 | Gates-Midway, Los Banos-Midway 500kV lines | Gates-Midway 230kV line | 1390 | 1298 | 93.4% | 2057 | 1061 | 76.3% | 2948 | 1108 | 79.7% | 2057 |
| C4 | Gates-Midway, Los Banos-Midway 500kV lines | Tesla-Gregg 500kV line (new) | 3556 | n/a | n/a | n/a | n/a | n/a | n/a | n/a | <95% | 2057 |
| C4 | Gates-Midway, Los Banos-Midway 500kV lines | Gregg-Midway 500kV line (new) | 3556 | n/a | n/a | n/a | n/a | <95% | 2948 | 3222 | 90.6% | 2057 |
| C4 | Gates-Midway, Los Banos-Midway 500kV lines | Gregg 500/230kV bank (new) | 1260 | n/a | n/a | n/a | 1251 | **99.3%** | 2948 | 715 | 56.7% | 2057 |
| C5 | Palo Verde G-2 | Panoche-Kearney 230kV line | 975 | n/a | <95% | None | n/a | <95% | None | n/a | <95% | None |
| C5 | Palo Verde G-2 | Warnerville-Wilson 230kV line | 793 | n/a | <95% | None | n/a | <95% | None | n/a | <95% | None |
| C6 | Diablo Canyon G-2 | Panoche-Kearney 230kV line | 975 | n/a | <95% | None | n/a | <95% | None | n/a | <95% | None |
| C6 | Diablo Canyon G-2 | Warnerville-Wilson 230kV line | 793 | n/a | <95% | none | n/a | <95% | None | n/a | <95% | None |

# APPENDIX A - 5

Tehachapi 2nd Report, Volume 4 of 5

Development Plan for the
Phased Expansion of

# Electric Power Transmission Facilities

in the

# Tehachapi Wind Resource Area

# Second Report

of the

## Tehachapi Collaborative Study Group

Volume 4 of 5: Appendix 3

California Public Utilities Commission

OII 05-09-005
OII 00-11-001

**April 19, 2006**

**The report is printed in 5 volumes or electronic files:**

**Volume 1 contains the Second Report;**

**Volume 2 contains Study Plan #2 the basis for the Second Report (referred to in the Report as Appendix 1);**

**Volume 3 contains the PG&E Studies (referred to as Appendix 2);**

**Volume 4 contains the SCE Studies (referred to as Appendix 3);**

**Volume 5 contains the CAISO Studies and all remaining Appendices 5, 6 and 7.**

# Appendix 3

## SCE Study Alternatives

SCE filed a report titled "Development Plan for the Phased Expansion of Transmission in the Tehachapi Wind Resource" (Report) on behalf of the TCSG in March 16, 2005 as directed by the Commission. The Report presented alternative transmission concepts for interconnecting and delivering Tehachapi wind generation to various load centers. The Report recommended that the study be continued in order to select the best alternative from the four candidate options and to further evaluate the potential for a new interconnect between SCE and PG&E in the Fresno area. This section provides SCE's modifications to these four alternatives plus the results of the SCE-PG&E Fresno area connection study.

It was assumed that a local Tehachapi Area 230 kV system would be developed to support the large amount of wind generation potential identified in the CEC Report. These facilities are common to all project alternatives and can only be developed once more information is made available as to exact wind generation locations and amounts. It is therefore impossible to properly develop the local area network at this point in time.

### 1. TRANSMISSION PLANS INTERCONNECTING WIND RESOURCES IN THE TEHACHAPI AREA TO THE GRID

The four alternatives that remained open from the original TCSG share the same Tehachapi local area wind collector facilities as discussed in Chapter 2, Section 2.2 of the March 16, 2005 TCSG Final Report and differed slightly in the facilities identified to be necessary to connect the wind resource areas to the main bulk power system. These four Tehachapi Interconnection facilities were summarized in Section 1 of Appendix A of the March 16, 2005 TCSG Final Report. SCE has conducted further review of these alternatives and has concluded that modifications are needed to these alternatives due to lack of available undeveloped land to support additional right-of-way requirements. As an example, SCE found it necessary to reroute Segment 2 of the Antelope Transmission Project (Phase 1) in the supplemental CPCN Application (A.04-12-008) filing submitted to the CPUC on September 2005. This reroute was needed to accommodate new housing projects developing adjacent to the existing Antelope-Vincent right-of-way. The following sections provide a detailed discussing of impacts to the four alternatives that were to be further reviewed.

## *1.1. Discussion of Modifications to Proposed Alternatives*

### *1.1.1. Antelope-Substation #5 Transmission Section*

The conceptual transmission plans identified in the March 16, 2005 TCSG Final Report were based on the assumption that only 300 MW of wind generation was to be located in the Cottonwood Creek area and connected to a proposed Cottonwind 230 kV Switching Station (a.k.a. Substation #5). All four alternatives included a reconductor of the existing Antelope-Magunden No.2 230 kV transmission line section between Antelope and the new switching station assuming the use of a Special Protection System (SPS) could be implemented and approved by the CAISO.

The use of an SPS was found to be unacceptable based on the study results obtained in a system impact study (SIS) performed for the 300 MW wind generation project. The SIS identified that the amount of monitoring points, number of outages, and the total amount of generation tripping required to maintain system reliability violated established CAISO Guidelines for implementing an SPS. Consequently, the recommended upgrade involves replacing an existing single circuit transmission line with a new double-circuit 230 kV transmission line. In addition, recent generation interconnections have been submitted which identify this substation as the point of interconnection. The total amount of wind generation proceeding through the CAISO interconnection process totals 1,110 MW. As a result, both existing single-circuit 230 kV transmission lines will need to be replaced with two double-circuit 230 kV transmission lines. It may be necessary to include additional transmission upgrades due to the large amount of generation interconnection requests in this area.

### *1.1.2. Antelope-Vincent Transmission Section*

A detailed review of available land in the area was performed in support of the Antelope Transmission Project Segment 2 and 3 CPCN Supplemental Application. This detailed review concluded that only two 500 kV transmission facilities can be accommodated between Antelope and Vincent without significant impacts to existing residential owners or housing developments currently under construction. Alternative one shown below in Figure 3-1 included one 500 kV and two 230 kV transmission lines between Antelope and Vincent. Alternatives two and three shown below in Figure 3-2 and 3-3 respectively included two 500 kV and two 230 kV transmission lines between Antelope and Vincent. Alternative four included one 500 kV and three 230 kV

transmission lines between Antelope and Vincent. In order to maximize capability between Antelope and Vincent, it is recommended that the conceptual transmission plan be modified to include an alternative with two 500 kV transmission lines.

### *1.1.3. Vincent-Rio Hondo/Mesa Transmission Section*

SCE has been conducting studies in support of a new Mira Loma-Vincent 500 kV transmission line. The need for this new 500 kV line into the Mira Loma area was identified as part of the SCE CAISO Annual Expansion Program and is required to serve growing load demand in the Mira Loma area. This new line will provide an added benefit of supporting delivery of Tehachapi area wind generation to the SCE load center. Since last year's report, SCE has integrated this line with the Phase 2 of last year's TCSG Final Report, rebuild of the Antelope-Mesa 230 kV transmission line, in order to minimize the number of facilities and amount of new land disturbance that would otherwise result with building separate transmission projects.

In order to integrate the Vincent-Mira Loma 500 kV transmission line with the Antelope-Mesa Upgrades, the following upgrades are required:

- Rebuild the portion of the existing Antelope-Mesa 230 kV single circuit transmission line between Vincent and the southern boundary of the Angeles National Forest (City of Duarte) with single circuit 500 kV transmission line

- Replace a small section of the existing Vincent-Rio Hondo 230 kV transmission line outside of the Vincent Substation (approximately five miles) with single circuit 500 kV transmission (part of the Mira Loma-Vincent 500 kV transmission line project) to allow operation of this line at 500 kV

- Rebuild the portion of the existing Antelope-Mesa 230 kV single circuit transmission line between the City of Duarte and the Mesa Substation with double-circuit 500 kV transmission line

- Develop and permit a new Mesa 500 kV substation

Previous conceptual studies identified the utilization of the Rio Hondo substation as the 500 kV entry point to the Los Angeles Basin. Further review of this substation site has concluded that insufficient property is available to increase the underlying 230 kV capability needed to support a 500 kV substation. As a result, SCE is currently evaluating the Mesa substation for converting it to

500 kV. This substation site provides sufficient 230 kV transmission capacity to support a 500 kV substation. The substation site could provide for up to twelve 230 kV transmission lines, which serve the Los Angeles Basin, if necessary, without the need to construct new transmission on new right-of-way. In comparison, the Rio Hondo substation site allowed for only three 230 kV transmission lines to serve the Los Angeles Basin load center. Additional 230 kV transmission lines in new right-of-way would be necessary to support a Rio Hondo 500 kV substation site. These new 230 kV transmission lines would be extremely difficult, if not impossible, to construct given the land right-of-way restrictions that exist in the area (i.e. no available land). The new Mesa 500 kV substation will require three 500/230 kV transformers initially due to the large amount of load demand in the area.

### *1.1.4. Mesa-Chino Transmission Section*

As part of the Mira Loma-Vincent 500 kV transmission line project, SCE had been evaluating requirements to bring the new 500 kV line all the way into the Mira Loma 500 kV Substation. With the integration of the Mira Loma-Vincent and Antelope-Mesa, SCE is now evaluating the utilization of an existing Mira Loma-Serrano 500 kV transmission line to avoid having to construct the new Mira Loma-Vincent 500 kV transmission line all the way into Mira Loma. This requirement is supported by preliminary study results, which have identified that outage of the new Mesa-Vincent 500 kV transmission line (part of the Antelope-Mesa Upgrade) results in rerouting a significant amount of power flow towards Mira Loma via Lugo through the step-down transformers at Mira Loma and finally through the underlying 230 kV network towards the Mesa area. As a result, the potential for a voltage collapse and thermal overloads were identified with high deliveries from the north (Path 26, Big Creek Corridor, Ventura area and the Tehachapi area) under loss of the new Mesa-Vincent 500 kV transmission line.

In order to provide continued reliable service to the Mesa local area loads, a second line to Mesa will be required. This line can be added by constructing the Mira Loma-Vincent 500 kV transmission line with double circuit 500 kV standard transmission design from the Mesa area to the Chino area (Mira Loma-Serrano right-of-way). The existing Mira Loma-Serrano 500 kV line can be "cut" and at the point where the new double circuit line joins the existing Mira Loma-Serrano 500 kV transmission line. Utilizing the Mira Loma section of the existing Mira Loma-Serrano 500 kV transmission line can then form the Mira Loma-Vincent 500 kV transmission line. The Mesa-Serrano 500 kV transmission line can be formed by adding a second circuit on the double-circuit 500 kV transmission line between the Mesa area and the Chino area and utilizing the Serrano section of the existing Mira Loma-Serrano 500 kV transmission line.

### *1.1.5. Second Mesa-Vincent Transmission Section*

Depending on the overall increase of power deliveries to the south (i.e. SCE, SDG&E, LADWP, CFE, or Arizona utilities) and corresponding study results under loss of both the new Mesa-Vincent and Mira Loma-Vincent 500 kV transmission lines (same corridor through the Angeles National Forest and same tower from the City of Duarte to the Mesa substation), a second 500 kV transmission line from Vincent may be required in a separate right-of-way. Feasibility studies for the recent batch of interconnection requests will commence shortly (Study Agreement provided to customer), which will result in clarifying timing need for this additional upgrade. As a conceptual plan, SCE envisions utilizing the existing 500 kV transmission line section on the existing Vincent-Santa Clara 230 kV transmission line between Pardee and Vincent and operating it at 500 kV by sectionalizing line and terminating 230 kV section at the Pardee 230 kV bus and 500 kV section at the Pardee and Vincent 500 kV buses. The second 500 kV transmission line to Mesa can then be added by replacing a portion of the existing Pardee-Eagle Rock 230 kV transmission line (second smallest line south of Vincent) towards the Gould area and ultimately down to Mesa. This upgrade could also minimize the amount of loop flow from SCE to LADWP resulting from the addition of significant levels of Tehachapi wind generation.

## *1.2. Common Facilities in Alternatives (Not Modified)*

### 1.1.1. 500 kV Transmission Line between Antelope and Pardee

This 500 kV transmission line is also referred to as Segment 1 of the Antelope Transmission Project (Phase 1). The CPCN Application (A.04-12-007) for this transmission line has been filed with the CPUC since December 9, 2004. The application is currently under review by the CPUC with approval anticipated before the end of the year.

### 1.1.2. 500 kV Transmission Line between Antelope and Vincent

This 500 kV transmission line is also referred to as Segment 2 of the Antelope Transmission Project (Phase 1). The CPCN Application (A.04-12-008) for this transmission line has been filed with the CPUC since December 9, 2004. A supplemental filing was made by SCE on September 2005 in order to augment environmental information. The application review has recently been initiated by the CPUC and as such SCE does not currently have an anticipated approval date.

### 1.1.3. Initial Transmission Facilities between Antelope and Tehachapi

A new 500 kV transmission line from Antelope to a new Tehachapi area substation site, two new Tehachapi area substations, and a 230 kV transmission line connecting the two new substations collectively are referred to as Segment 3 of the Antelope Transmission Project (Phase 1). The CPCN Application (A.04-12-008) for this transmission line has been filed with the CPUC since December 9, 2004. A supplemental filing was made by SCE on September 2005 in order to augment environmental information. The application review has recently been initiated by the CPUC and as such SCE does not currently have an anticipated approval date.

### 1.1.4. Second 500 kV Transmission Line between Antelope and Tehachapi

This 500 kV transmission line is similar to the 500 kV transmission line identified in Segment 3 of the Antelope Transmission Project but would utilize a separate right-of-way to provide sufficient separation thus avoiding conditions which could result in simultaneous loss of both transmission lines. Putting the second Antelope-Tehachapi 500 kV transmission line on the same right-of-way would limit the amount of Tehachapi area wind generation that can be supported to 1,400 MW due to CAISO Spinning Reserve requirements.

### 1.1.5. Additional Reactive Resources

Additional reactive resources may need to be added throughout the network in order to restore bus voltages to levels identified prior to adding and dispatching the Tehachapi area wind resources. With all the transmission upgrades needed to support the Tehachapi area and new Mira Loma-Vincent 500 kV transmission line, it is unclear exactly how much and where such reactive support should be located. Therefore, these resources where not included into this conceptual transmission plan. SCE will identify how much and where such reactive support should be installed as part of the detailed interconnection studies currently underway. If additional permitting is required, due to the need for substation expansion to support additional reactive resources, SCE will identify such requirements as part of the CPCN Applications to be submitted as required per CPUC Resolution E-3969.

## *1.3. Uncommon Facilities in Alternatives (Not Modified)*

### 1.3.1. Third 500 kV Transmission Line between Antelope and Tehachapi

Alternative 2 included a third 500 kV transmission line between Antelope and Tehachapi. This line is similar to the 500 kV transmission line identified in Segment 3 of the Antelope Transmission Project Separation would only be required if the amount of generation tripping under loss of both 500 kV lines in the same right-of-way exceeds 1,400 MW. Without the benefit of detailed studies (power flow, post-transient voltage, and transient stability), the assumption can be made that this third line could potentially be placed in the same right-of-way as the second 500kV transmission line between Antelope and Tehachapi.

### 1.3.2. New 500 kV Transmission Line from Tehachapi to PG&E

SCE's Alternatives 1, 3, and 10 included a new 500 kV transmission line north of Tehachapi towards PG&E. For evaluation of the SCE network, Alternatives that involve a 500 kV transmission line to the north from Tehachapi were assumed to terminate at Midway. However, evaluation of the PG&E network considered terminating the transmission line further north due to anticipated potential transmission problems North of Midway Substation. Such an increase is likely to occur for two reasons:

1. The first involves transferring 2,000 MW more power on an already constrained path if Tehachapi area wind generation is to displace existing generation resources located in northern and central PG&E system.

2. The second is attributed to reduction in Path 15 transfer capability from 5,400 MW down to 4,100 MW if Tehachapi area wind generation is to displace existing generation resources located in the Midway area. Such reduction is necessary since the 5,400 MW rating can only be supported when the Midway area generation is dispatched as part of the Path 15 Remedial Action Scheme (RAS). Displacing this generation in order to accommodate the Tehachapi wind resource will result in reducing the support provided in the RAS, thus adversely impacting Path 15 transfer capability and will lead to increased congestion.

From an SCE perspective, conceptual study results are not anticipated to differ much regardless of where PG&E ultimately terminates the new 500 kV transmission line, or whether there would be a new PG&E 500 kV line, since study results from all parts of the systems will be overlaid to develop the integrated conceptual plans.

Figure 3.1.1
TCSG Alternative 1 Identified in the March 16, 2005 TCSG Final Report

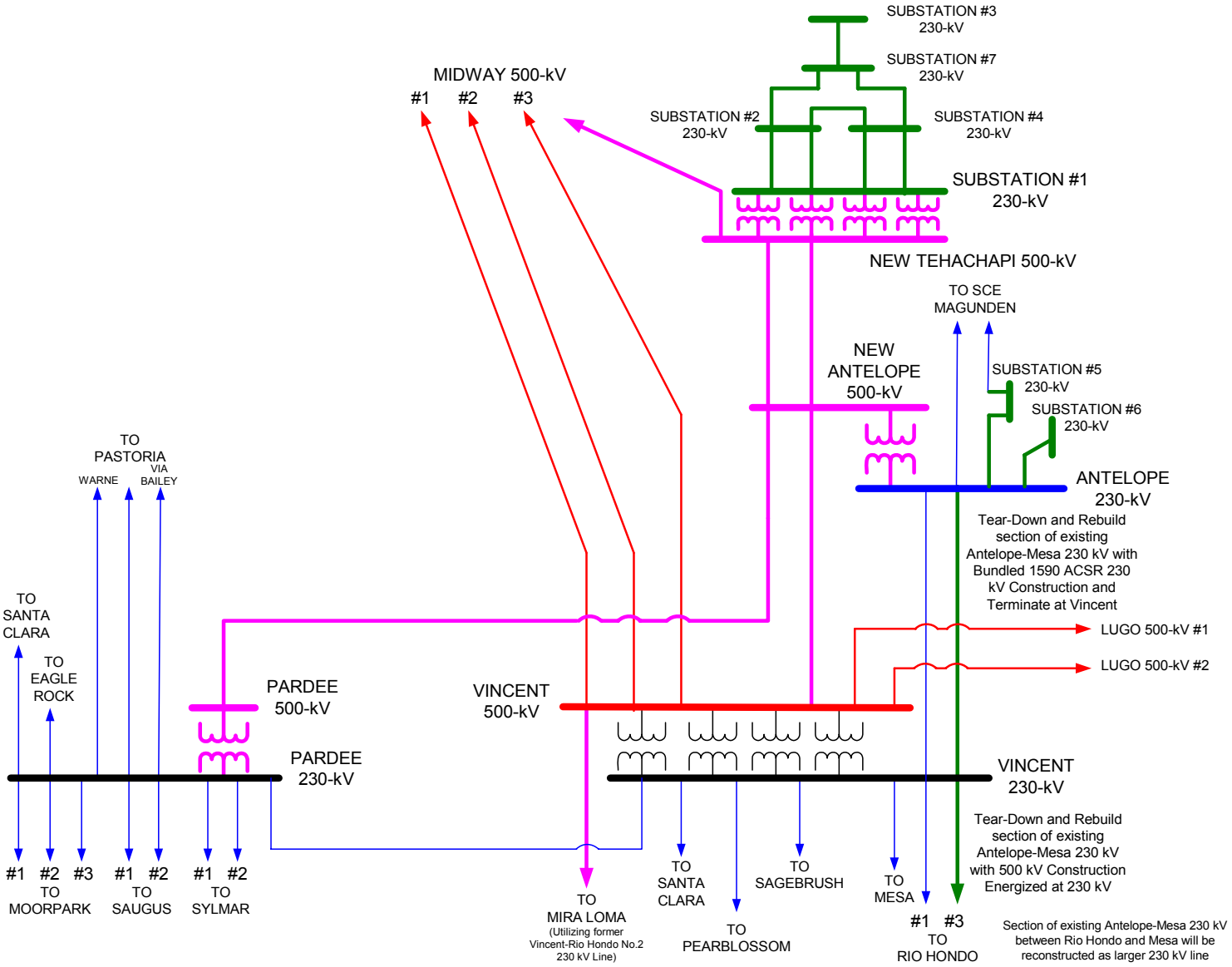


Figure 3.1.2
TCSG Alternative 2 Identified in the March 16, 2005 TCSG Final Report

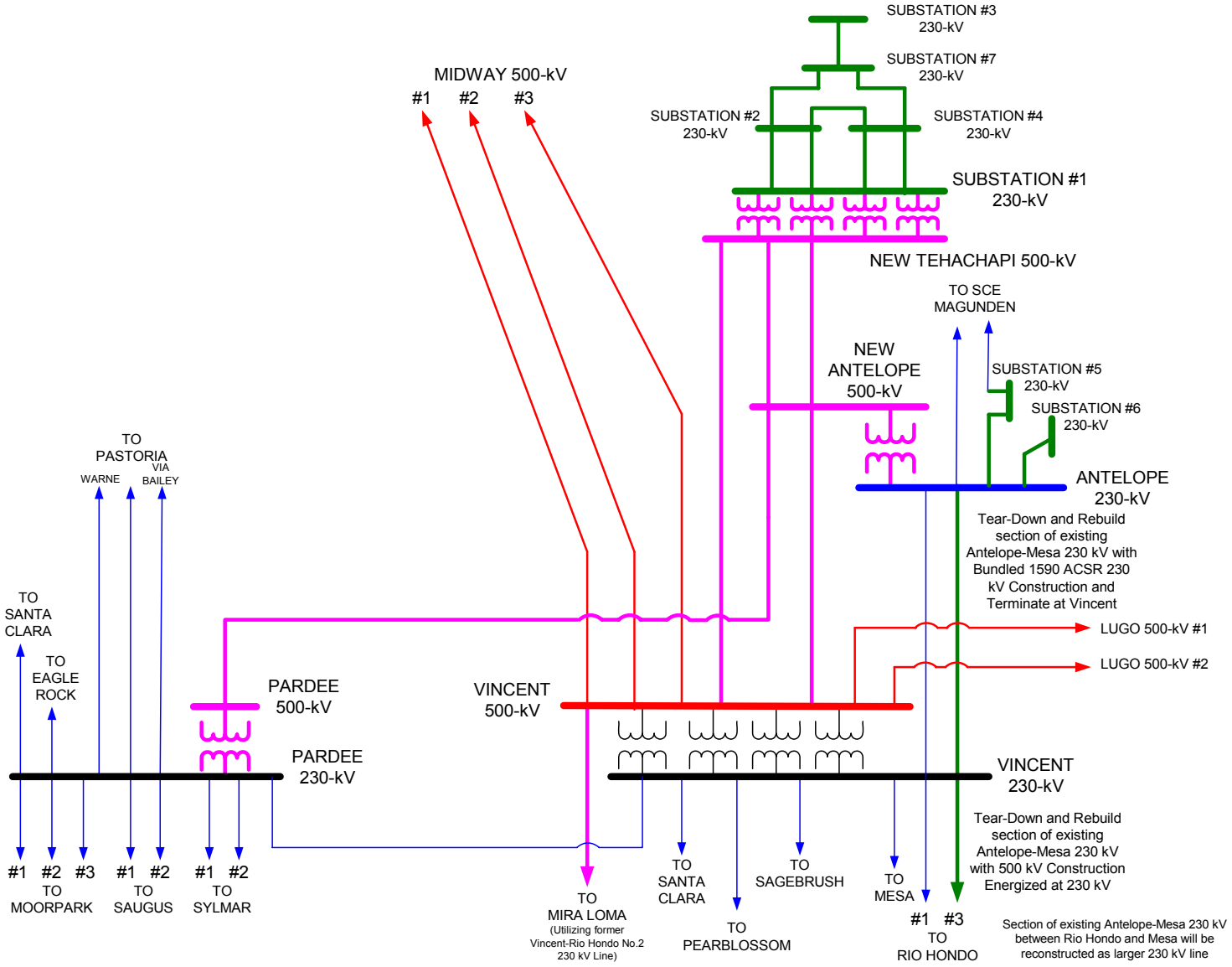


Figure 3.1.3
TCSG Alternative 3 Identified in the March 16, 2005 TCSG Final Report

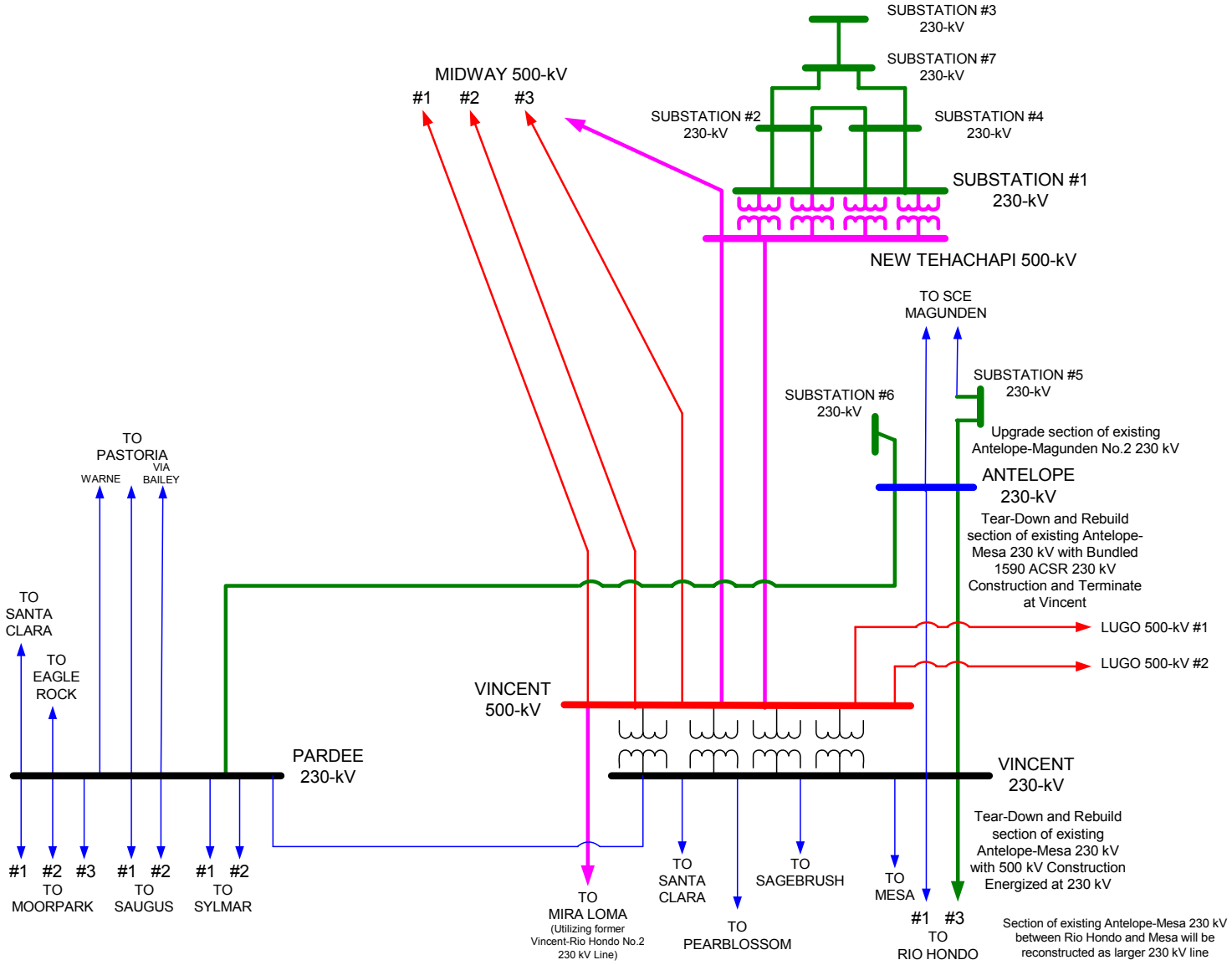


Figure 3.1.4
TCSG Alternative 10 Identified in the March 16, 2005 TCSG Final Report

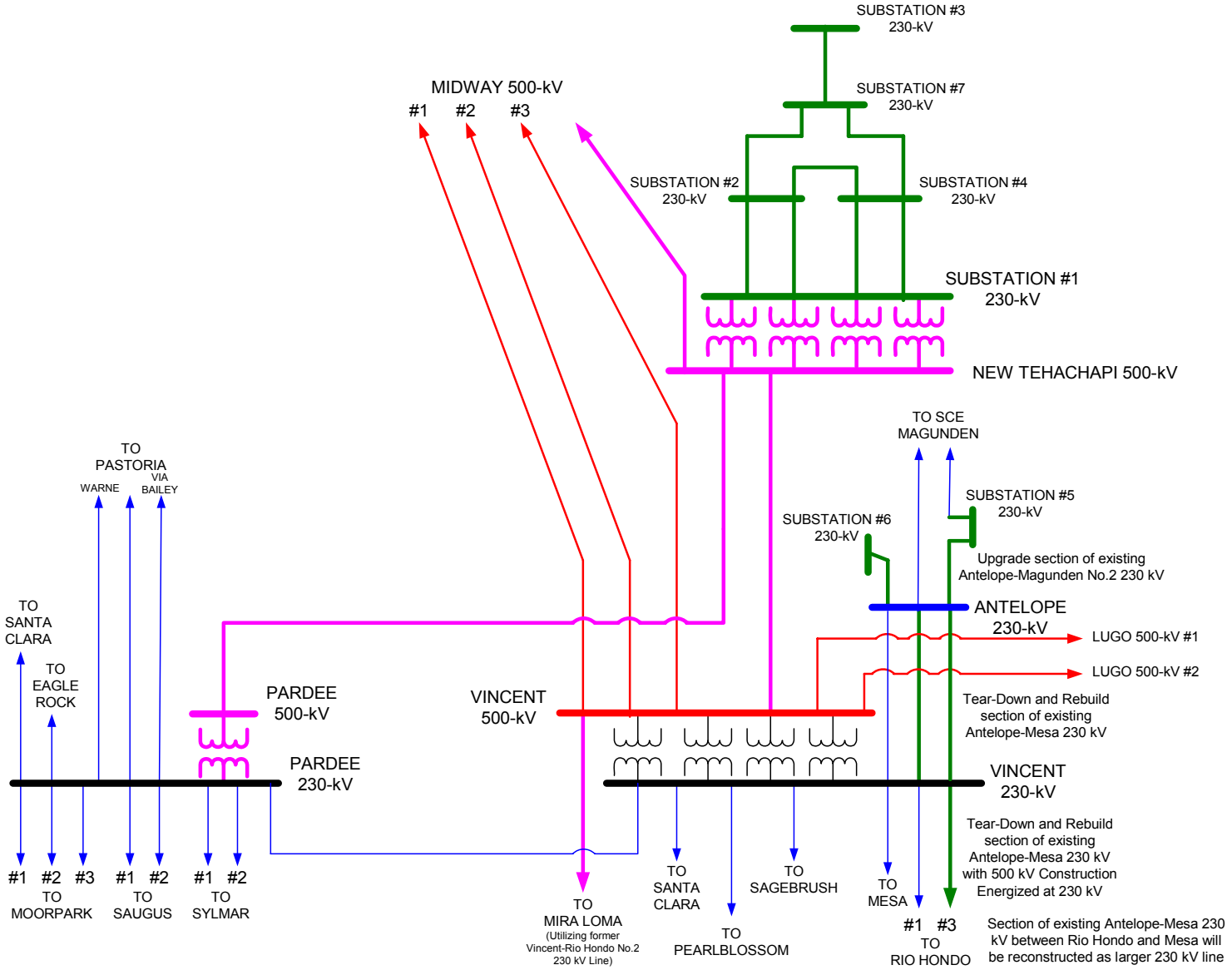
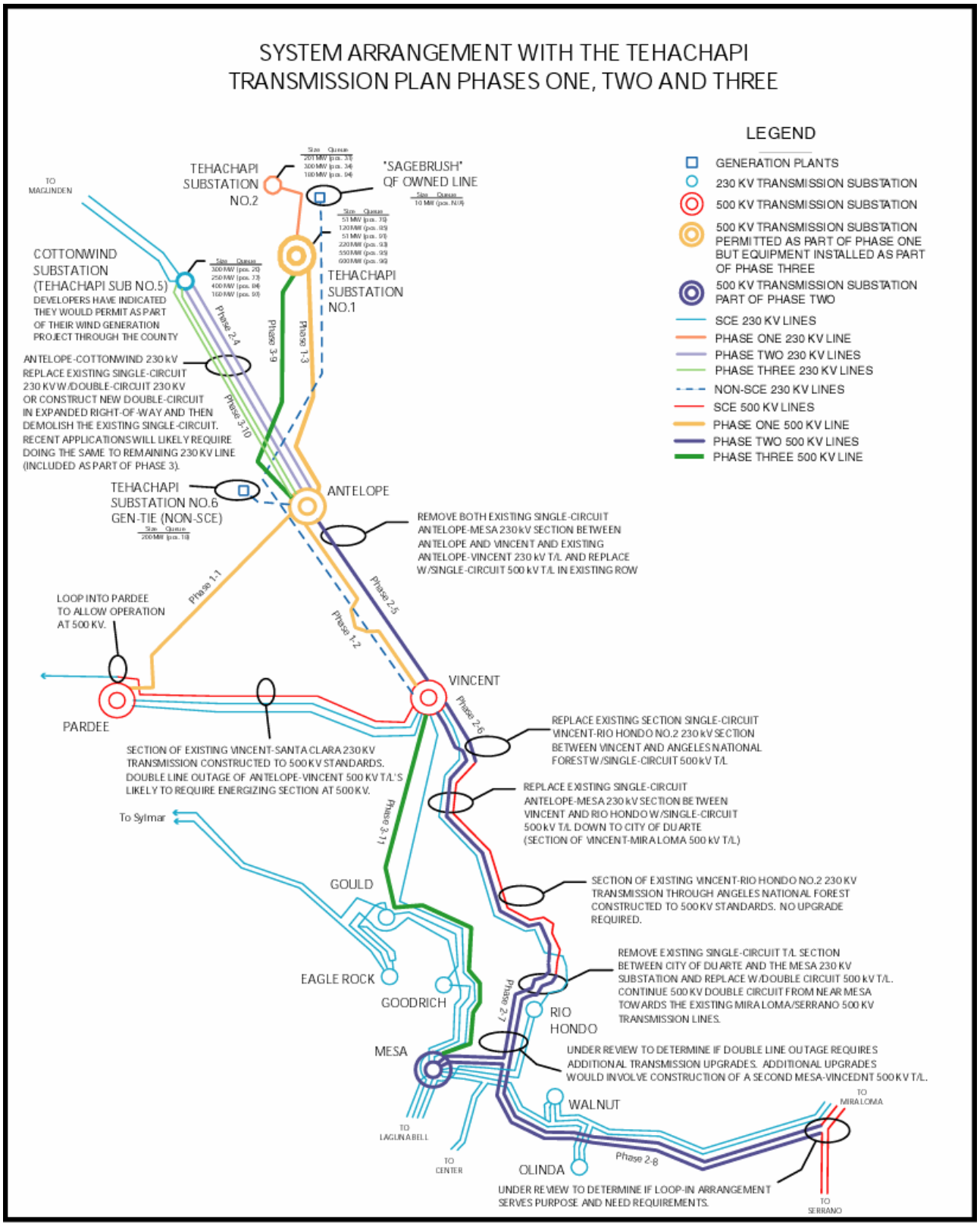


Figure 3.1.5
Revised Tehachapi Transmission Plan



# 2. GRID UPGRADES TO DELIVER TEHACHAPI WIND RESOURCES – STUDY RESULTS

SCE is in the process of performing Feasibility, System Impact, and Facilities Studies for a number of wind generation projects proceeding through the interconnection process. As a result, SCE did not revisit the previous conceptual power flow studies associated with the four alternatives remaining on the table. Instead, SCE utilized the study results from a limited number of Feasibility studies conducted to modify the previous transmission plans as presented above in Section 1.

With the modification included into the study case, SCE identified a few additional impacts that may need additional upgrades. The first is that increase power deliveries into the Cottonwind Substation (i.e. Substation #5) results in power flow "loop flow" up towards the SCE Magunden Substation and down the west leg of the corridor towards the Pastoria and Pardee Substations. The second is the potential for "loop flow" to impact three LADWP 230 kV transmission lines from Sylmar to Rinaldi.

## *2.1. Loop Flow on the Magunden-Pastoria-Pardee and Sylmar-Rinaldi Transmission Corridors*

### 2.1.1. Loop Flow on the Magunden-Pastoria-Pardee Corridor

Depending on which generation resources are displaced, the amount of "loop-flow" increases loading on the three Magunden-Pastoria 230 kV transmission lines as well as the three transmission lines south of Pastoria. Two of the three transmission lines between Magunden and Pastoria are small conductored lines, which have a limited capability of 825 amps (approximately 325 MVA). The third line is a larger conductored line with a 1240 amp capability (approximately 490 MVA). As far as transmission south of Pastoria, two of these three lines are in the process of being reconductored with a trapezoidal ACSS conductor in order to increase capacity from 885 amps (approximately 350 MVA) up to 1,500 amps (approximately 600 MVA). The remaining line is conductored with 1240 amp capability (approximately 490 MVA) and is not being reconductored at this time. Reconductoring of the two smaller Magunden-Pastoria 230 kV and the Pastoria-Pardee-Warne 230 kV transmission lines may be required to support the large amount of generation interconnection at the Cottowind Substation. Such determination will be made as part of the detailed studies currently underway.

### 2.1.2. Loop Flow on Los Angeles Department of Water and Power (LADWP) Sylmar-Rinaldi Transmission Corridor

Imports from the north to the main Los Angeles Basin is delivered by a number of 500 and 230 kV transmission lines as well as through the Pacific DC Intertie. Since the network is an integrated network, schedules and actual flows may not coincide. This is due to the fact that there exist certain amounts of "loop-flow." In other words, power deliveries will follow the path of least resistance (impedance) from the source to the load.

The addition of significant amounts of Tehachapi wind generation results in increasing deliveries from the north to the Los Angeles Basin. This increase in deliveries from the north increases loadings on the following transmission lines:

- 500 kV transmission lines from Vincent to Lugo and ultimately down to Mira Loma
- 230 kV transmission lines from Pardee to Sylmar and from Pardee to Gould
- 230 kV transmission lines from Vincent to Rio Hondo and from Vincent to Mesa
- 230 kV transmission lines from Sylmar to Rinaldi (LADWP) due to loop flow
- 500 kV transmission line from Rinaldi to Victorville (LADWP) and ultimately to Lugo due to loop flow.

These increases in flow results in the potential to overload the 230 kV transmission lines between Sylmar and Rinaldi (LADWP). SCE does not know exact nature of transmission limitation, as LADWP did not actively participate in the collaborative study process. Consequently, mitigation requirements within the LADWP electrical system were not explored. However, SCE has identified the need for adding a second Vincent-Mesa
500 kV transmission line and operating transmission between Pardee and Vincent at 500 kV. SCE envisions utilizing the existing 500 kV transmission line section on the existing Vincent-Santa Clara 230 kV transmission line between Pardee and Vincent and operating it at 500 kV by sectionalizing line and terminating 230 kV section at the Pardee 230 kV bus and 500 kV section at the Pardee and Vincent 500 kV buses. The second 500 kV transmission line to Mesa can then be added by replacing a portion of the existing Pardee-Eagle Rock 230 kV transmission line (second smallest line south of Vincent) towards the Gould area and ultimately down to Mesa. It is expected that this upgrade would minimize the amount of loop flow through the Sylmar-Rinaldi 230 kV transmission lines.

## *2.2. Big Creek-Fresno Tie Evaluation*

The CPUC and PG&E demonstrated interest in determining if this interconnection can supplement capability to move power from SCE to PG&E or possibly eliminate the need for transmission upgrades from PG&E to the Tehachapi area. The interconnection involves constructing a new 230 kV switching station at the crossing of the PG&E-owned and SCE-owned transmission lines. The existing SCE-owned Big Creek-Rector 230 kV and PG&E-owned Gregg-Helms 230 kV transmission lines are proposed to be looped into this new switching station as shown below in Figure 3.2.1. Power flow control devices such as phase-shifting transformers or unified power flow controllers (UPFC) will be required to "push" power from the SCE network to the PG&E network thereby appearing as additional load in the SCE Big Creek 230 kV corridor north of Magunden.

To evaluate the north of Magunden portion of the Big Creek Corridor, parametric studies covering 8,760 hourly load and generation conditions based on historical data were conducted. These studies were performed utilizing a simplified equivalent power flow case reflecting only the north of Magunden SCE facilities and the facilities from PG&E's Gregg Substation to the Helms Pump Storage Facilities. These facilities are all connected radial and can therefore be "cut-out" to examine local area problems. Complete WECC base cases were subsequently utilized to examine overall system performance and validate the local area problems identified in the parametric studies. Two methods were used in examining the local area. The fist method involved modeling a fixed power flow from the SCE network to the PG&E network throughout the entire calendar year while the second method involved modeling a fixed tap setting.

<u>Fixed Tap Setting Model</u>

This model reflects the use of traditional phase-shift transformers to connect the PG&E and SCE systems together. Several limitations exist with use of traditional phase-shift transformers that affect system operations. The limitations are summarized as follows:

- Phase-shift transformers have mechanical moving load taps that are used to adjust amount of flow through the transformer
- These load taps are generally set and adjusted on a seasonal basis
- Load taps are slow moving and thus do not respond well to system dynamics
- Load taps require frequent maintenance if they are constantly used.

- Phase-shift transformers increase reactive losses on the system adversely affecting system voltages

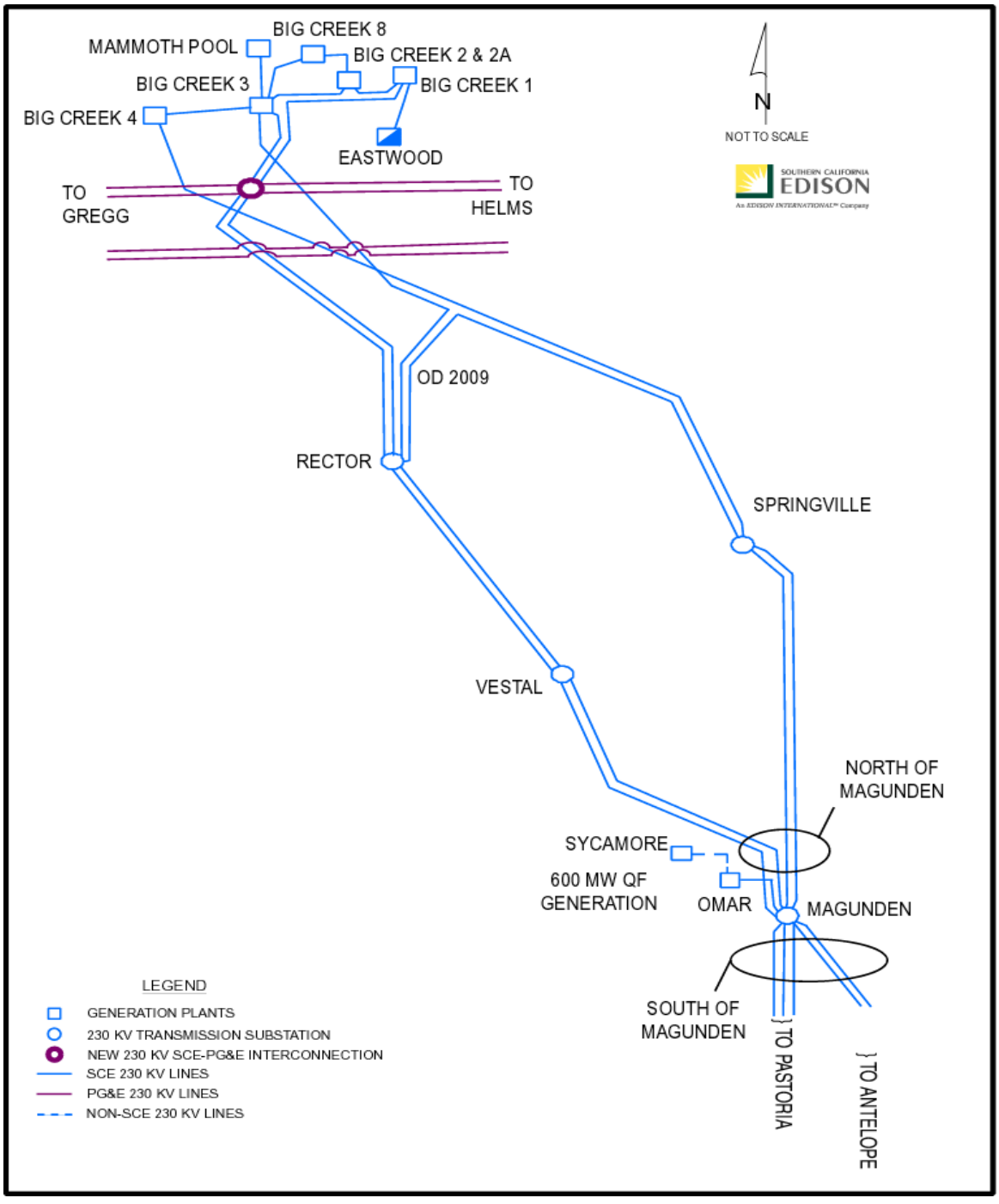
These limitations can subject the system to unintended performance. As a result, a robust transmission system is required to support a transformer phase-shifted system.

Fixed Power Flow Model

This model reflects the use of Flexible AC Transmission System (FACTS) technology to connect the PG&E and SCE systems together. Implementing a system tie with a FACTS device eliminates all of the limitations identified above. The benefits of utilizing a FACTS device are summarized as follows:

- Power electronics eliminate all mechanical moving parts
- The absence of mechanical moving parts allows for dynamic settings not possible with a phase-shift transformer
- FACTS devices respond well to system dynamics
- FACTS devices can be developed as to provide reactive resources improving system voltages

Figure 3.2.1
Big Creek-Fresno System Tie



### 2.2.1. Big Creek-Fresno Tie Study Results – Fixed Power Flow Model

#### 2.2.1.1. Impacts to South of Magunden Line Flows

The addition of a new system tie between SCE and PG&E with a device to "push" fixed power from SCE to PG&E has the equivalent effect of increasing load in the San Joaquin Valley. This increase is graphically illustrated below in Figures R-1 through R-6. Figure R-1 illustrates the hourly South of Magunden line flows prior to adding the new system tie with adjusted San Joaquin Valley load to reflect 2014 forecast. Figures 3.2.2 through 3.2.5 illustrate the hourly South of Magunden line flows with the inclusion of a 300 MW, 500 MW, 1,000 MW, and 1,200 MW new system tie. Figure 3.2.7 provides the corresponding load duration curves for various system tie levels. SCE notes that adding a 300 MW system tie has the equivalent effect as 30 years of local load growth.

Figure 3.2.2
South of Magunden Flow Patterns Adjusted for 2014 Load

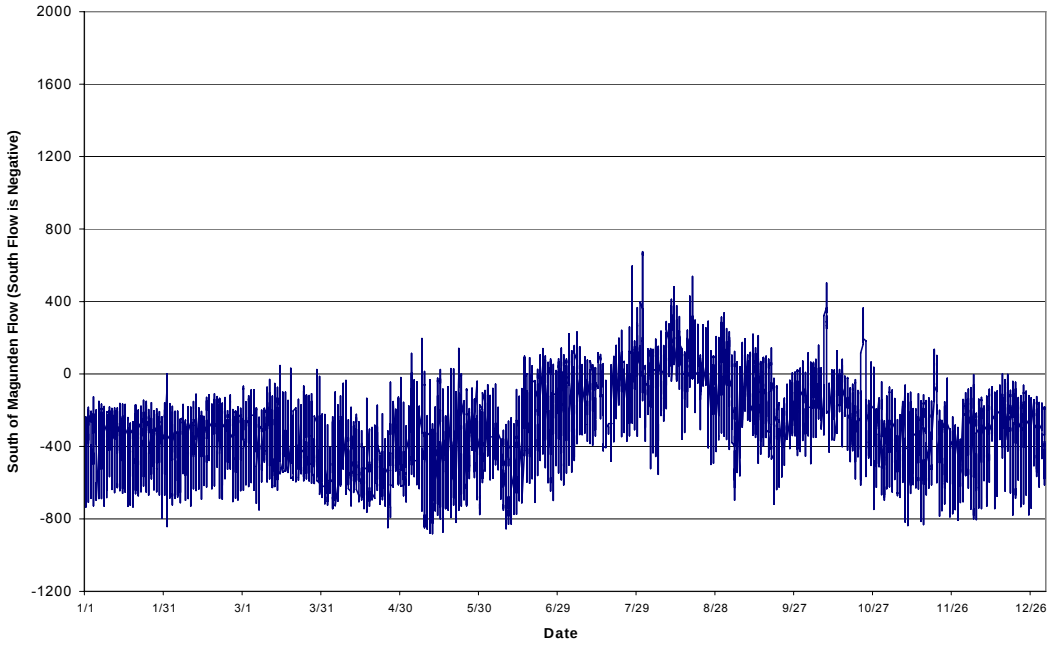


Figure 3.2.3
South of Magunden Flow Patterns with 300 MW System Tie

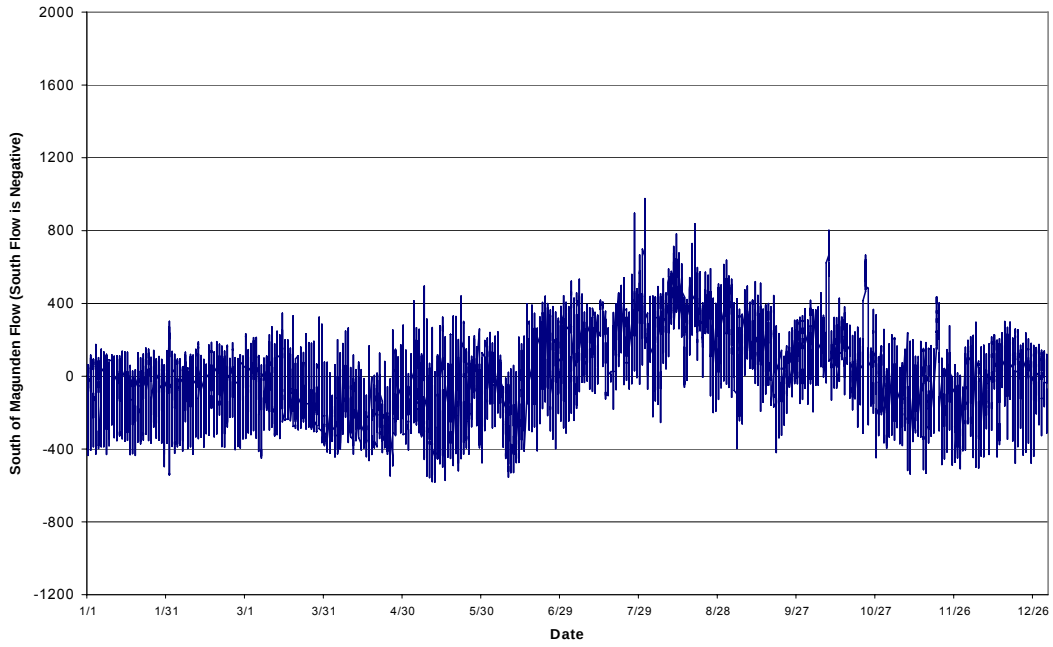



Figure 3.2.4
South of Magunden Flow Patterns with 500 MW System Tie

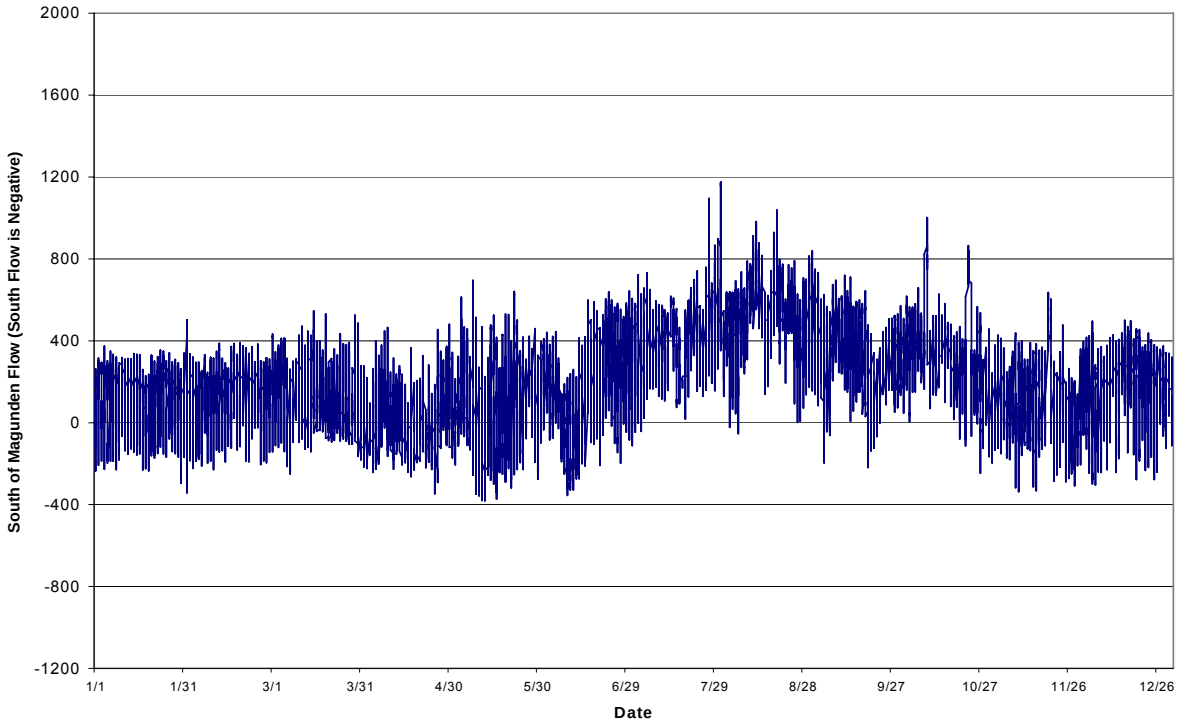


Figure 3.2.5
South of Magunden Flow Patterns with 1,000 MW System Tie

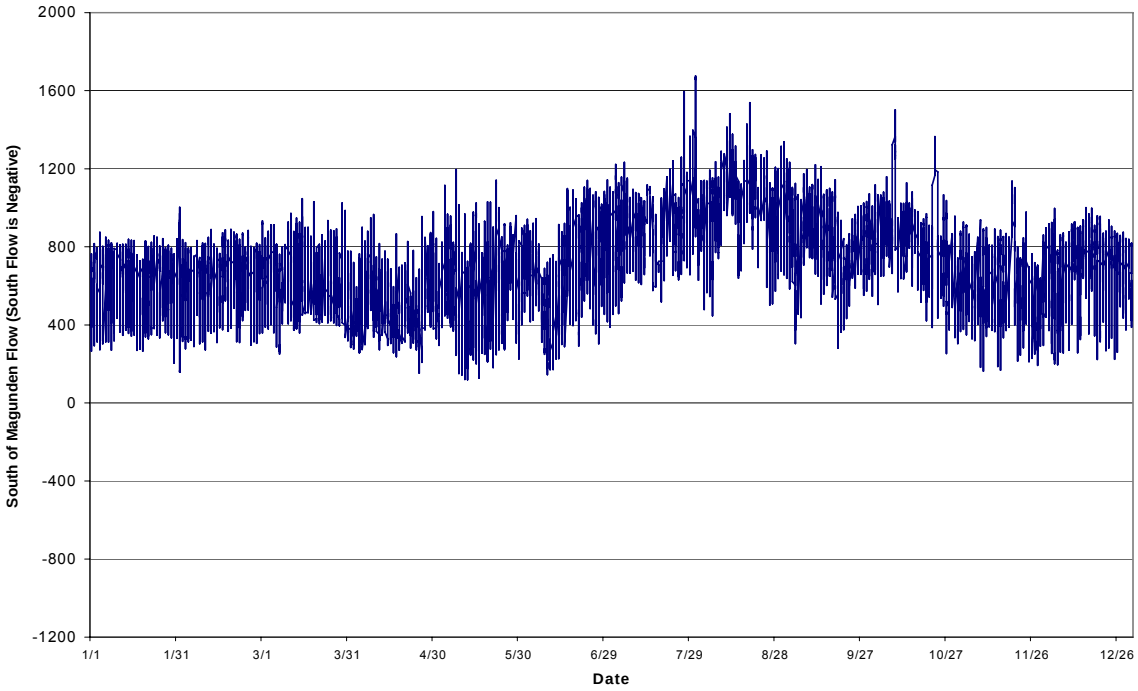



Figure 3.2.6
South of Magunden Flow Patterns with 1,200 MW System Tie

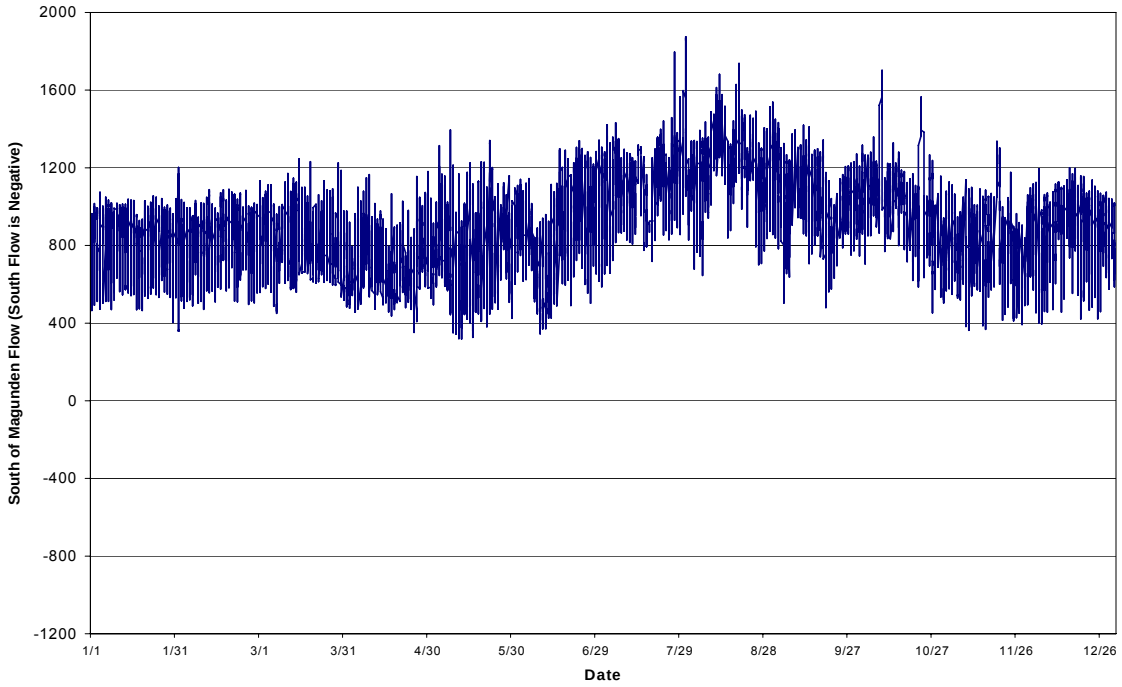
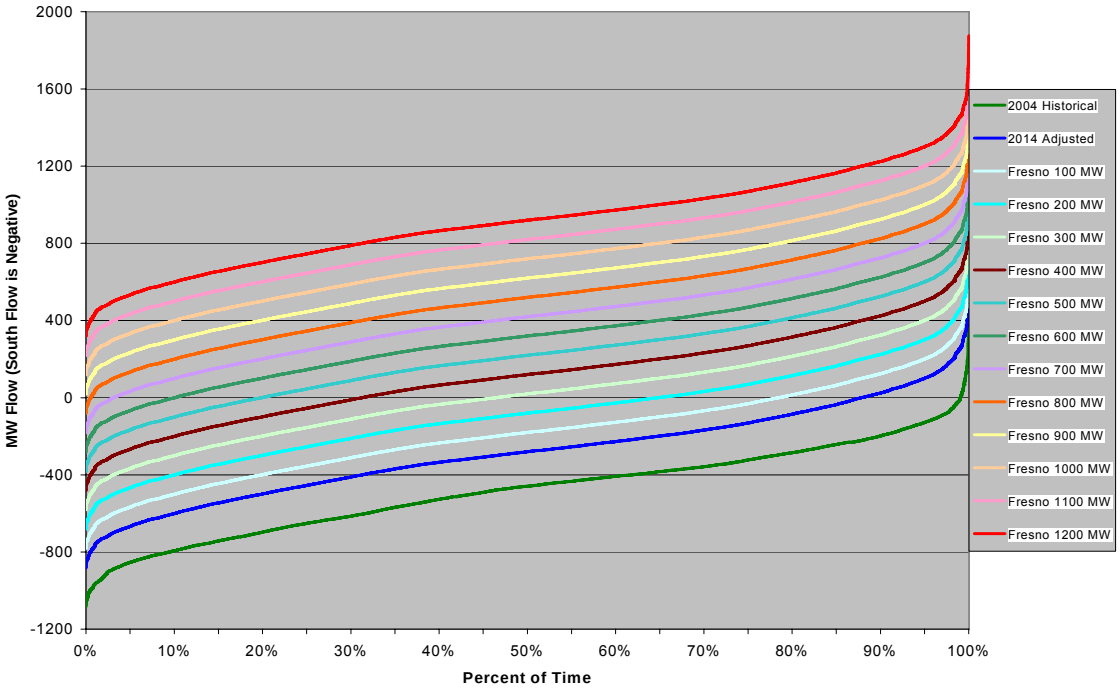


Figure 3.2.7
South of Magunden Flow Patterns with 1,200 MW System Tie



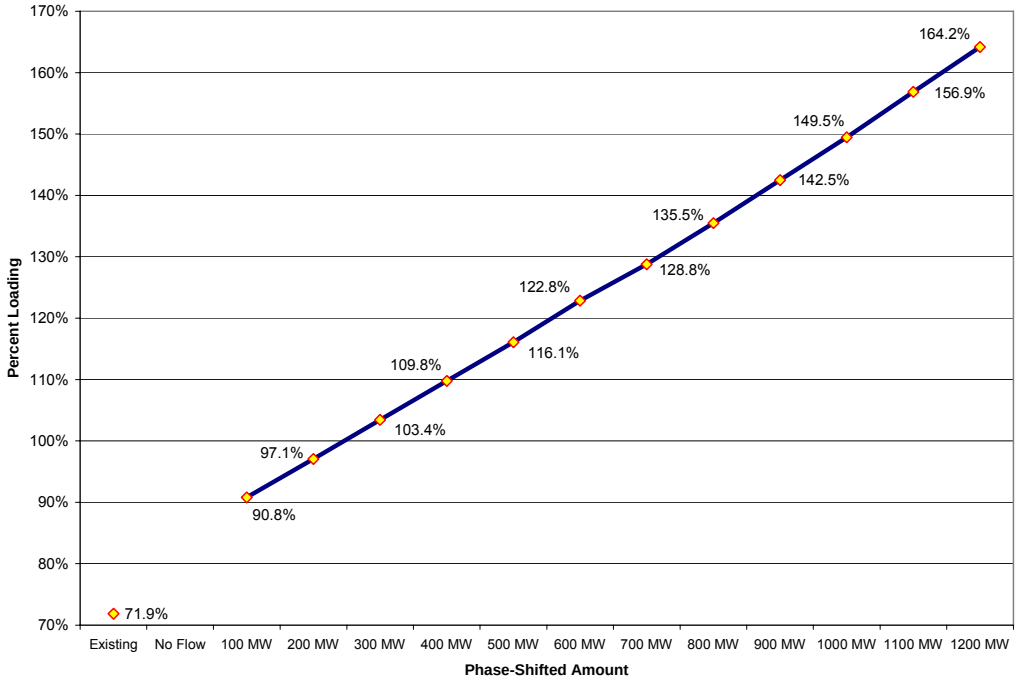

### 2.2.1.2. North of Magunden 230 kV Transmission Line Loadings Under Base Case Conditions

Four 230 kV transmission lines connect the Big Creek hydro complex, located in northern Fresno County, to the rest of the SCE network. Two of the four lines connect Big Creek to the SCE Rector 230 kV Substation, continue south towards the SCE Vestal 230 kV Substation and finally connect to the SCE Magunden 230 kV Substation. The other two lines connect Big Creek to the SCE Springville 230 kV Substation and continue south to the SCE Magunden 230 kV Substation.

The new system tie is proposed to connect to the two SCE 230 kV transmission lines heading towards the SCE Rector Substation, as shown above in Figure 3.2.1. Power flow study results indicate that additional system upgrades will be necessary to mitigate thermal overload problems identified with the addition of the new system tie represented as a fixed power flow model. Loading on the section of the existing Big Creek3-Rector 230 kV line between Big Creek 3 and the new system tie was found to exceed the maximum allowable thermal limits with all facilities in-service. Depending on the amount of power "pushed" from SCE to PG&E, thermal loading was identified to increase from 91% of the normal conductor limit up to 164% as shown below in Figure 3.2.8. To mitigate this

overload, rebuild of a section of the existing Big Creek3-Rector 230 kV transmission line will be necessary to support a larger conductor.

Figure 3.2.8
Section of Existing Big Creek3-Rector 230 kV (BC to Fresno Tie)
Line Loading with All Facilities In-Service




Figures 3.2.9 through Figure 3.2.13 illustrate loading on the other transmission facilities in the Big Creek Corridor north of the SCE Magunden 230 kV Substation.

Figure 3.2.9
Section of Existing Big Creek1-Rector 230 kV (BC to Fresno Tie)
Line Loading with All Facilities In-Service

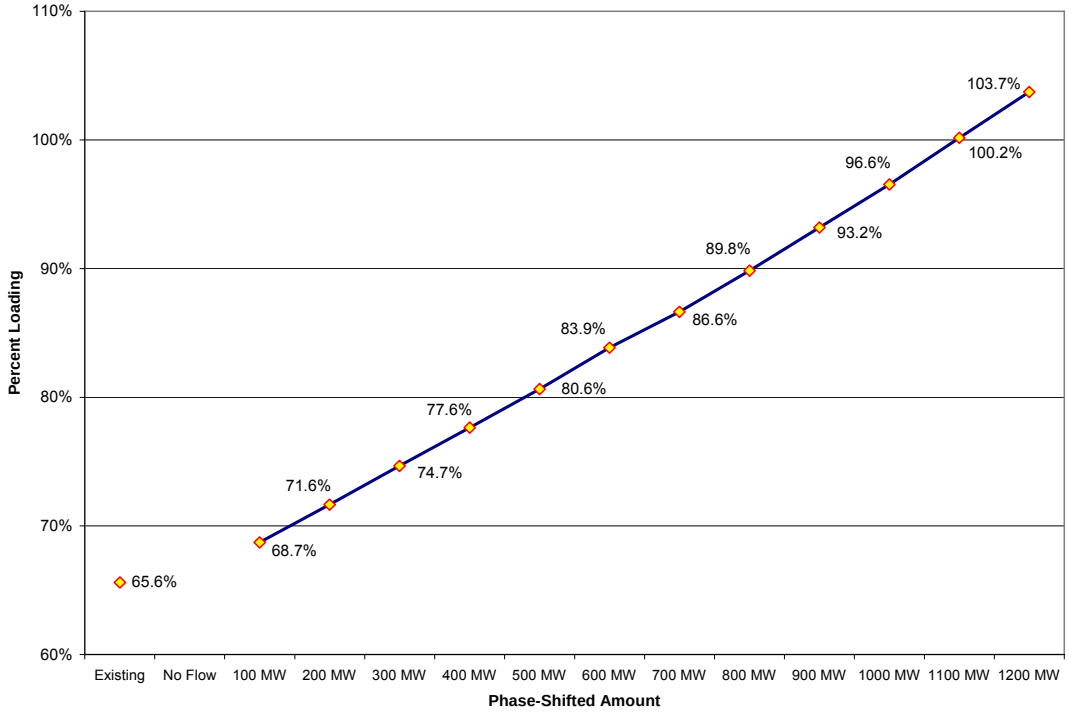



Figure 3.2.10
Section of Both Existing Big Creek-Rector 230 kV (Rector to Fresno Tie)
Line Loading with All Facilities In-Service

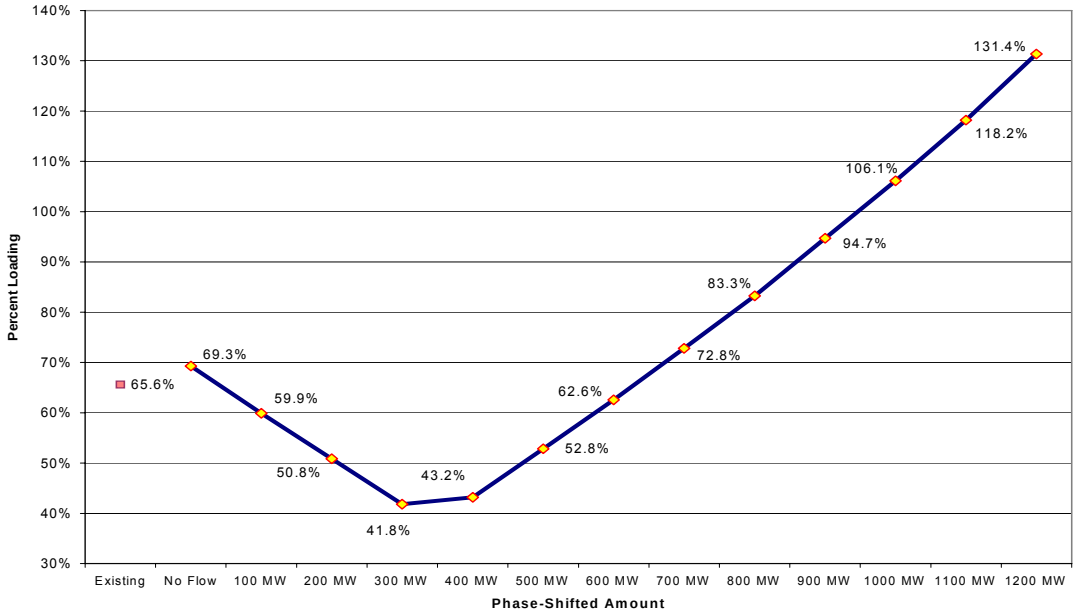


Figure 3.2.12
Both Existing Vestal-Rector 230 kV
Line Loading with All Facilities In-Service

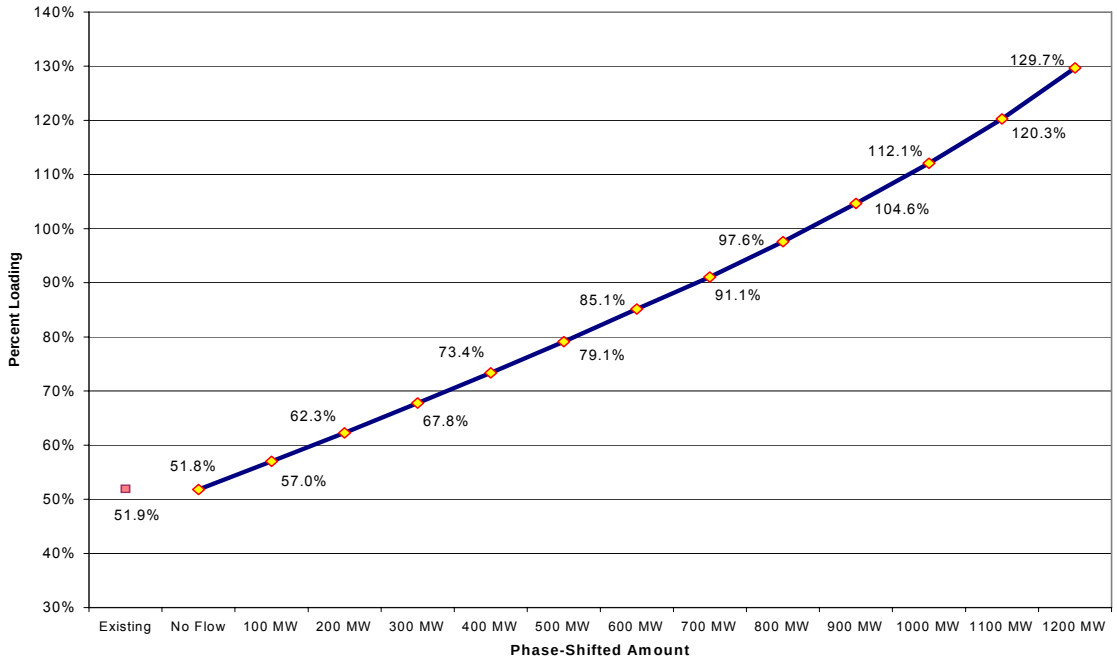
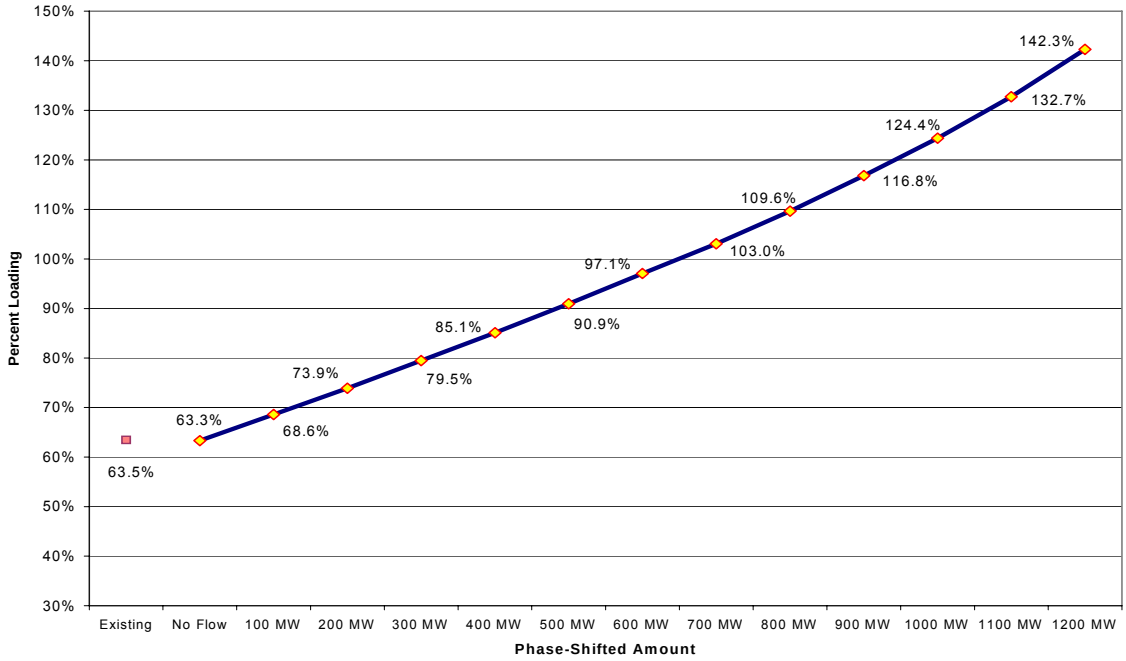


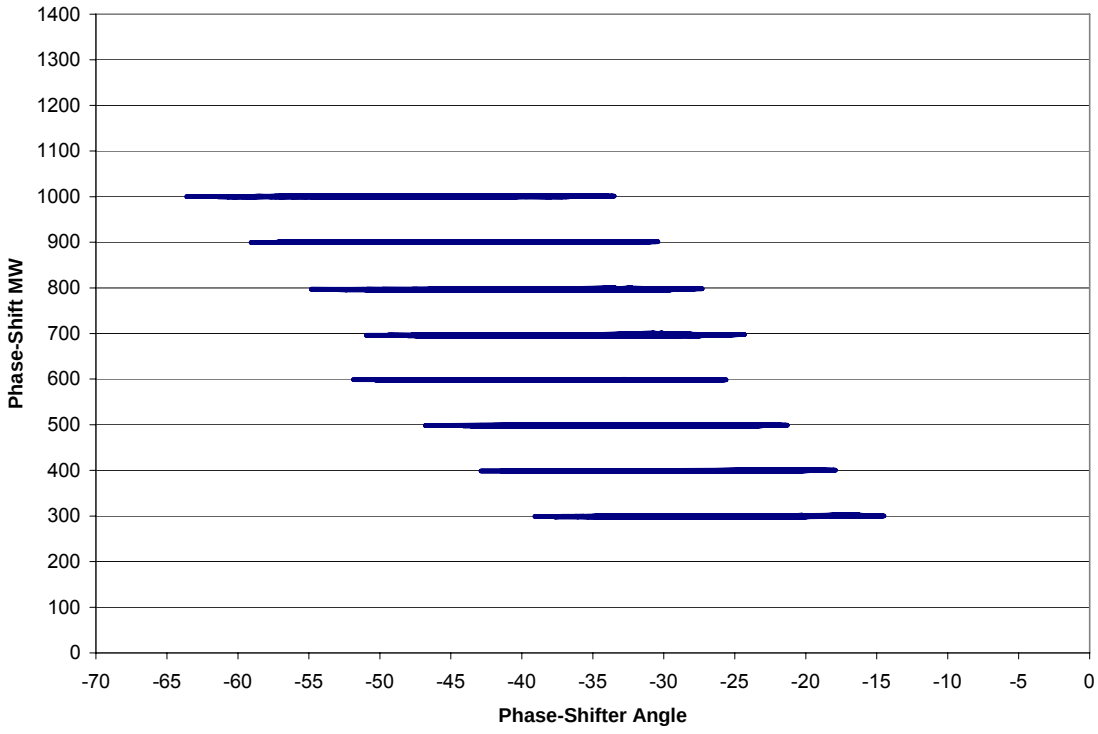

Figure 3.2.13
Both Existing Magunden-Vestal 230 kV
Line Loading with All Facilities In-Service



### 2.2.1.3. Phase-Shift Angle Requirements

Detailed system studies indicate a wide range of phase-shift operation in order to maintain the specified power level. Such operation is indicative of a need to install a unified power flow controller which utilizes power electronics to maintain the specified power flow instead of a traditional phase-shift transformer which cannot be manage to maintain a constant flow. The amount of phase-shift angle capability required depends on numerous factors. These factors involve SCE local area load and generation conditions (San Joaquin Valley load demand and Big Creek hydro generation output), PG&E local area load and generation conditions (Fresno area load demand and Helms operations), as well as major path flows (Pacific Intertie, Path 26, Path 15, etc.). For purposes of identifying potential angle bandwidth requirements, SCE performed parametric studies, which adjusted only the SCE local area load and generation. All other system conditions were held constant. Based on these studies, SCE determined that a phase-shift capability in excess of 60 degrees would be needed to support such a phase-shifted system tie. A summary of these findings is provided below in Figure 3.2.14.

Figure 3.2.14
Constant Power Phase-Shift Requirements



### 2.2.1.4. Reactive Resource Requirements

With the inclusion of the new phase-shifted system tie, loadings on the existing transmission lines are increased resulting in additional reactive losses, which adversely impact local system voltage performance. To determine the amount of additional reactive resources required under base case conditions to maintain pre-existing voltage levels, bus voltages at the Rector, Magunden and the new Fresno Tie Substations were maintained at unity by adding an assumed synchronous condenser at each location. Studies were then conducted for each hour of the year based on historical performance. The studies captured output of the synchronous condensers without the new phase-shifted system tie and with the new phase-shifted system tie so that an adequate comparison could be made. Reactive requirements identified without the addition of the new phase-shifted system tie were subtracted from the reactive requirements identified with the addition of the new phase-shifted tie in order to properly capture the incremental reactive resource required due to the addition of the new phase-shifted system tie. Study results for a 200 MW phase-shifted system tie are shown below in Figure 3.2.15. The 600 MW phase shift analysis was conducted with and without a new 230 kV transmission line from Magunden to Rector and is provided in Figure 3.2.16. As can be seen, the reactive requirements needed to support a 200 MW system tie is approximately 125 MVARs while the requirements needed to support a 600 MW system tie is approximately 500 MVARs. With the inclusion of a new line, the reactive requirement needed to support the 600 MW system tie is reduced down to approximately 200 MVARs. Additional resources may be required to maintain adequate voltages under outage conditions.

Figure 3.2.15
Reactive Requirements to Support a 200 MW Phase-Shifted System Tie

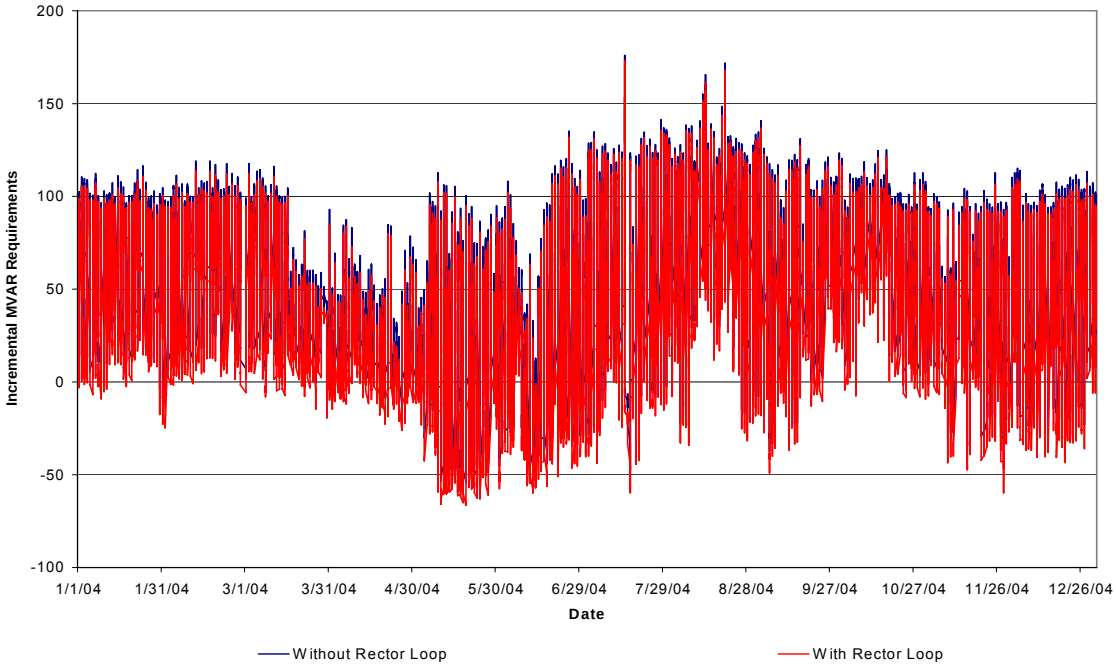
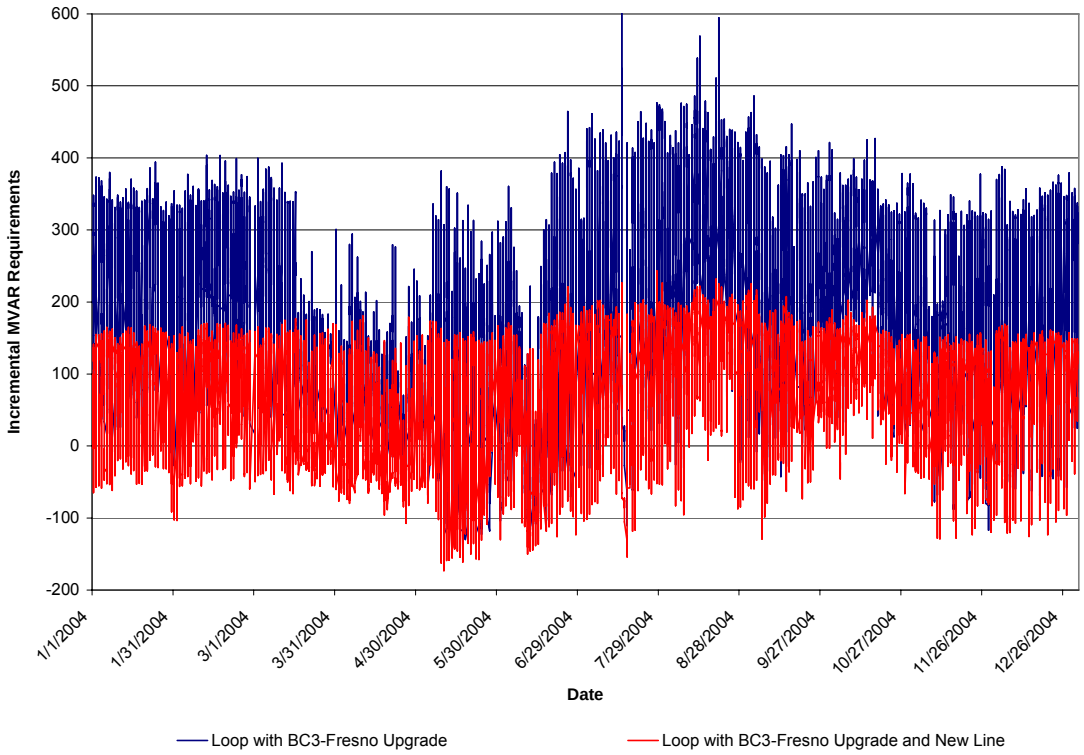


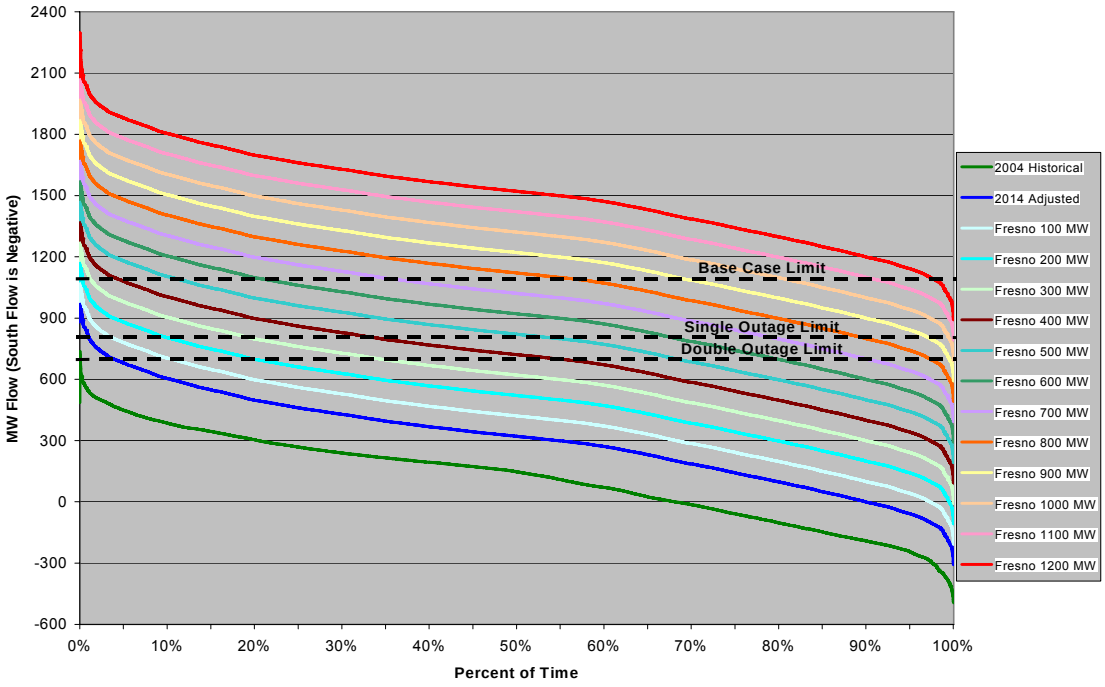

Figure 3.2.16
Reactive Requirements to Support a 600 MW Phase-Shifted System Tie



### 2.2.1.5. Study Results Under Loss of One Transmission Line

As previously discussed, adding a new system tie to "push" power from SCE to PG&E has the equivalent effect of increasing load in the San Joaquin Valley. With this increase in load, base case and outage conditions will result in higher thermal overload problems than are currently anticipated. Currently, the existing 230 kV transmission lines north of Magunden are anticipated to be fully utilized to support forecast load demand. Without new facilities, the existing system cannot support the new system tie at any level. Figure 3.2.17 provides the north of Magunden flow duration curves for various system tie levels and includes system limitations. As can be seen, adding a 300 MW system tie results in potentially exposing the system to thermal loading levels above the current single contingency limit for approximately 20 percent of the time. Increasing the system tie from 300 MW up to 600 MW will result in further increasing the overload exposure from 20 percent to 55 percent.

Figure 3.2.17
North of Magunden Flow Duration Curve




A proposed solution of opening the system tie under outage conditions may not be a workable solution. Generally, WECC supports the establishment of Operating Nomograms developed to limit the amount of power that can be scheduled through a WECC Path. In other words, the Path rating will be established based on limiting elements during outage conditions. As a result,

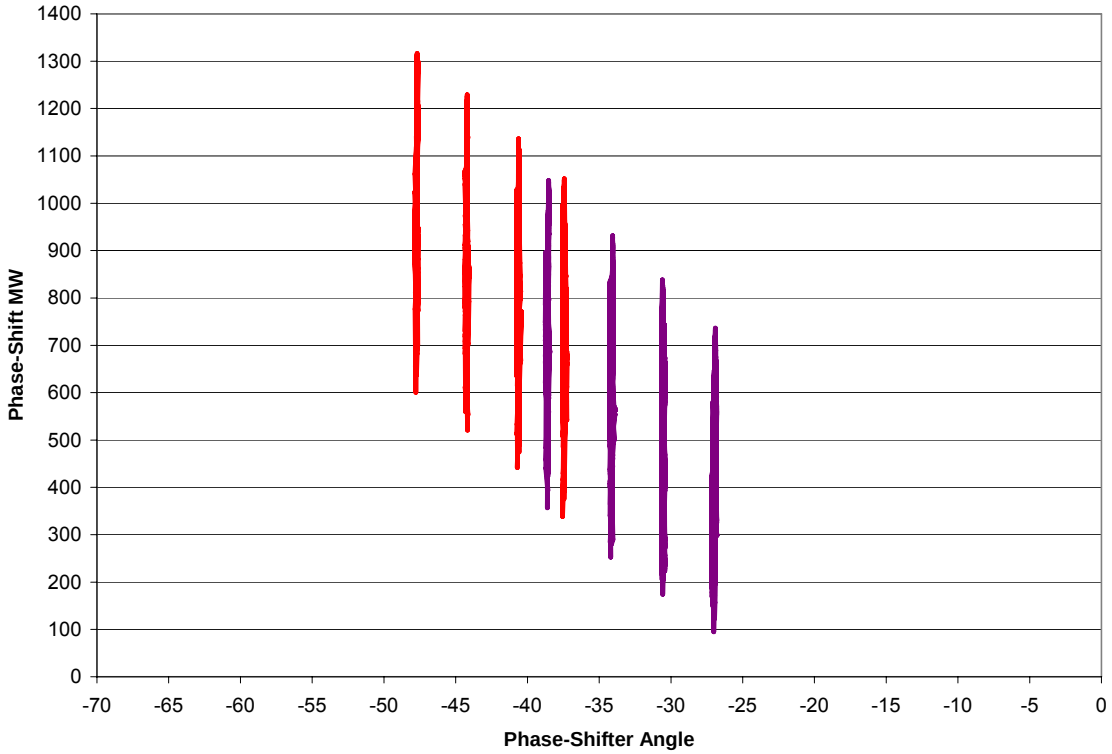
upgrades will be required to support a new Phase-Shifted System Tie. These upgrades will involve adding a new transmission line(s) between Magunden and Big Creek. The exact amount of system tie capability that can be accommodated with this transmission in-service is unknown at this time. Detailed WECC Path Rating studies will be required to make this determination. Conceptually, SCE anticipates a maximum constrained capability (Operating Nomogram) of 400 MW with the addition of a new line. This value is derived by considering the existing base case limitation of 1,150 MW, which is expected to be the new limit under loss of the new line. The total north of Magunden flows under non-summer conditions will exceed the 1,150 MW limit when considering higher phase-shift transfer levels. The CAISO should review all other conditions where the use of the system tie could result in loadings that exceed the 1,150 MW limit. This should be done to determine if the use of congestion management (i.e. use of an Operating Nomogram) is an acceptable means for limiting flows on a system tie that is actively managed (i.e. constant power flow model).

### 2.2.2. Big Creek-Fresno Tie Study Results – Fixed Tap Setting Model

#### 2.2.2.1. Impacts to Power Flows

The fixed power flow model results for each phase-shift level examined were used as the basis for conducting the fixed tap setting power flow studies. Resulting angles were examined and an average value was selected for each phase-shift capacity scenario to represent the "best" tap setting to use for that scenario. This assumption, while not perfect, captures system behavior when selecting a particular tap setting. Results of this study indicate that any given tap setting has the potential to operate within a 700 MW bandwidth as shown below in Figure 3.2-18. As an example, the curve corresponding to an angle of approximately 30 degrees can result in phase-shifting anywhere between 200 MW and 850 MW.

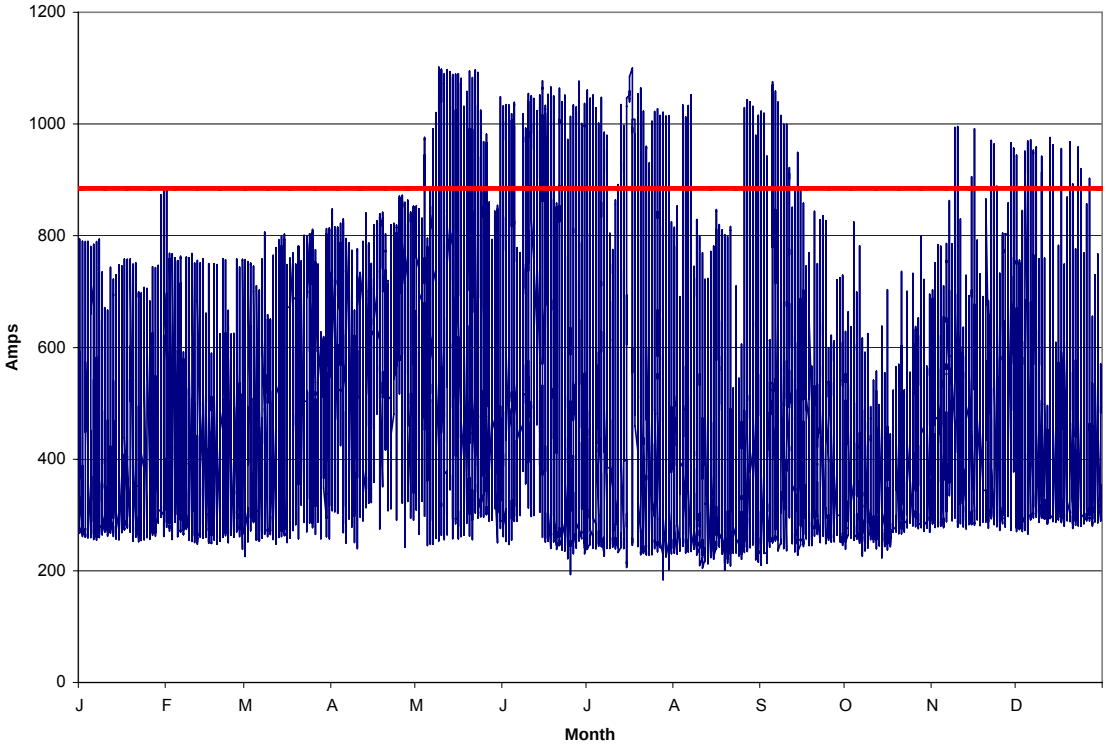
Figure 3.2.18
Fixed Angle Phase-Shifted Power




### 2.2.2.2. North of Magunden 230 kV Transmission Line Loadings Under Base Case Conditions

As shown below in Figure 3.2.19, loading on a section of the existing Big Creek3-Rector 230 kV line (between Big Creek and the Fresno System Tie) was identified to exceed the maximum allowable limit under base case conditions with a fixed tap setting of 30 degrees. Complete tear-down and rebuild of this transmission facility will be necessary as the current infrastructure does not support use of a larger conductor. This tear-down and rebuild will necessitate environmental review to comply with both the California Environmental Quality Act (CEQA) and the National Environmental Policy Act (NEPA) since the line traverses the Sierra National Forest.

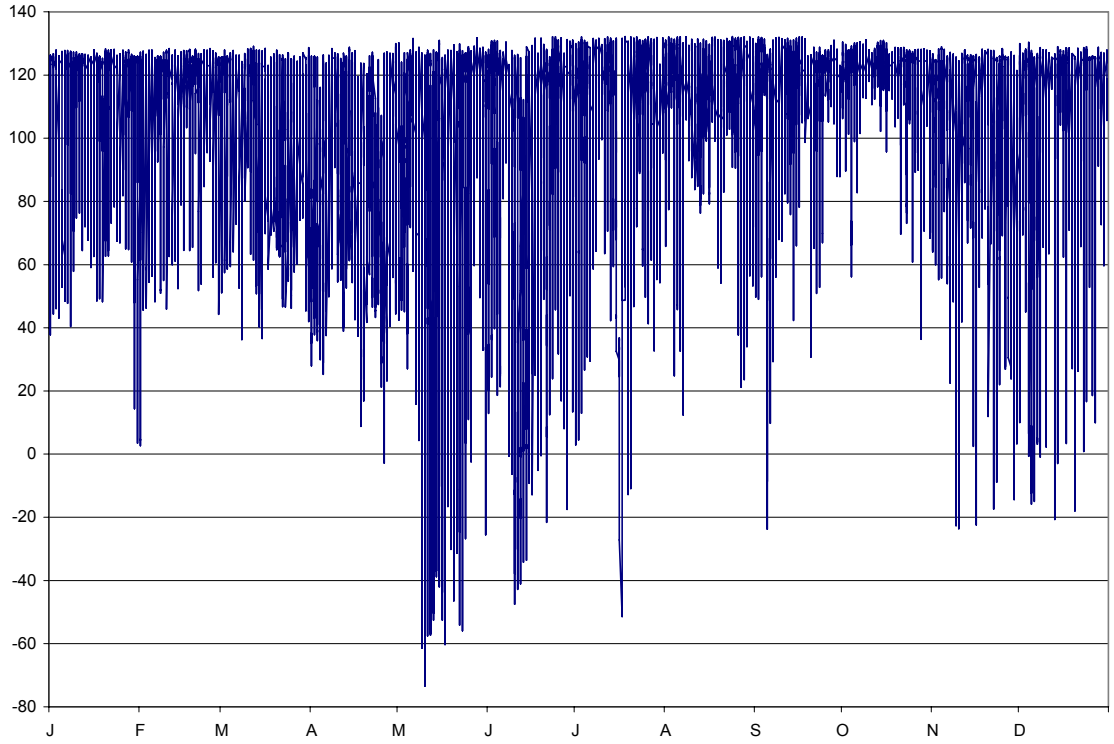
Figure 3.2.19
Loading on the Big Creek3-Rector 230 kV Transmission Line




### 2.2.2.3. Reactive Resource Requirements

With the inclusion of the new fixed tap phase-shifted system tie set to 30 degrees, loadings on the existing transmission lines are increased resulting in additional reactive losses, which adversely impact local system voltage performance. The same methodology utilized above for a fixed power level was used to determine the amount of additional reactive resources required under base case conditions. Study results for a fixed tap phase-shifted system tie set to 30 degrees are shown below in Figure 3.2.20. As can be seen, the reactive requirements needed to support a fixed tap phase-shifted system tie set to 30 degrees is approximately 130 MVARs. Additional resources may be required to maintain adequate voltages under outage conditions

Figure 3.2.20
Reactive Requirements to Support a Fixed Tap Phase-Shifted System Tie
Tap Setting Set to 30 Degrees




### 2.2.2.4. Fixed Power Flow Model Under Loss of One Transmission Line

As discussed above in the assumptions section, the fixed tap setting model does not respond well to system outage conditions. As a result, it is extremely difficult to forecast system behavior during faulted conditions. What can be said is that a surge of power through phase-shift transformer is likely due to system impedance change under the outage conditions and very slow moving load tap changers (if automated). This surge in power could lead to additional thermal overloads on the existing Big Creek 230 kV transmission lines that have not been identified under the base case conditions. System upgrades needed to support the full range of flow patterns as identified above for base case conditions should include sufficient capability to accommodate outage conditions. Detailed WECC Path Rating studies will be required to make an exact determination as to how much capacity can be made available with the addition one or more 230 kV transmission lines. Conceptually, SCE estimates that use of a fixed tap setting model will require complete upgrade of the western side of the Big Creek corridor which includes adding two new 230 kV transmission lines.

### 2.2.3. Big Creek-Fresno Tie Study Points of Discussion

*Study Assumptions*

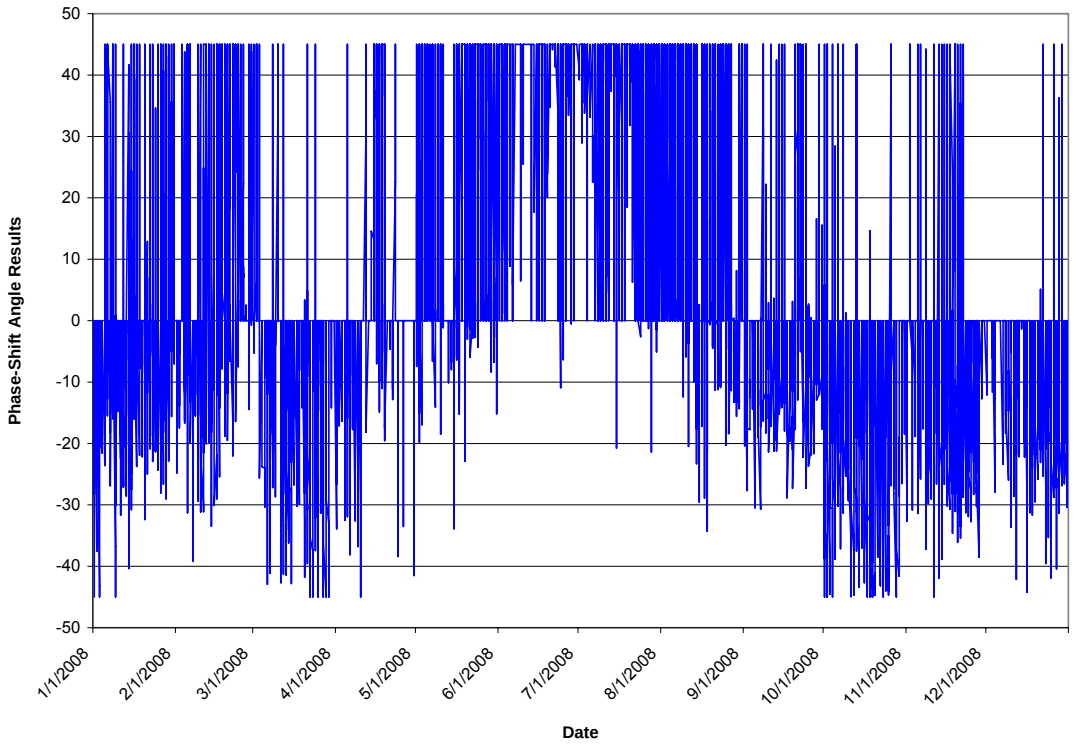
The CPUC Energy Division staff participating in the collaborative study has expressed concerns with the study assumptions implemented in performing this study. Specifically, the concerns centered on modeling of proper operating conditions for the new system tie assuming power flows could be managed. In a letter from the CPUC Energy Division to SCE dated July 9, 2005, the following was expressed:

> "From our recollection of the presentation [June 28, 2005], it consisted largely of a determination of the characteristics of a phase shifting transformer to deliver power to PG&E in a Northerly direction from the Big Creek-Rector lines under conditions of summer peak load. It is our understanding that under these conditions the flow across Path 26 is in the opposite direction, from North to South, which would explain the high angle shift required of the transformer. Forcing flow from SCE to PG&E under these conditions appears to us to be undesirable. More relevant to the study are the off-peak conditions under which the Path 26 flow is from South to North. Under off-peak conditions a phase-shifting transformer or flow controller is needed only to augment existing South to North flow in Path 26 to accommodate delivery of Tehachapi generation to the grid."

The study assumptions utilized in conducting these parametric studies included all operating conditions by simulating an entire year using historical metered data. Based on the results of the study, the phase-shift angle problems identified are not limited to summer peak conditions. With minimal flows on the new system tie, the phase-shift angle problems were also identified under spring run-off conditions (April and May) when Big Creek hydro is at maximum. With greater flows on the new system tie, the problems were found to occur year round. The reason for this is that local area loads and generation dispatch patterns play a dominant role in defining the phase-shift angle requirements necessary to deliver power from SCE to PG&E. In other words, the flow direction of the Pacific intertie does not necessarily dictate local phase-shift angle requirements.

This conclusion has been validated by the CAISO in the economic dispatch studies performed to evaluate system performance with the inclusion of a 600 MW phase-shifted system tie. SCE requested and reviewed the data supporting the study results presented by the CAISO at the September 19, 2005 Tehachapi Collaborative Study Meeting. Based on SCE's review of the data, the phase-shift angle problems identified are anticipated to occur throughout the year as shown below in Figure 3.2.21.

Figure 3.2.21
CAISO Economic Dispatch Study Results
600 MW Fresno Phase-Shift System Tie

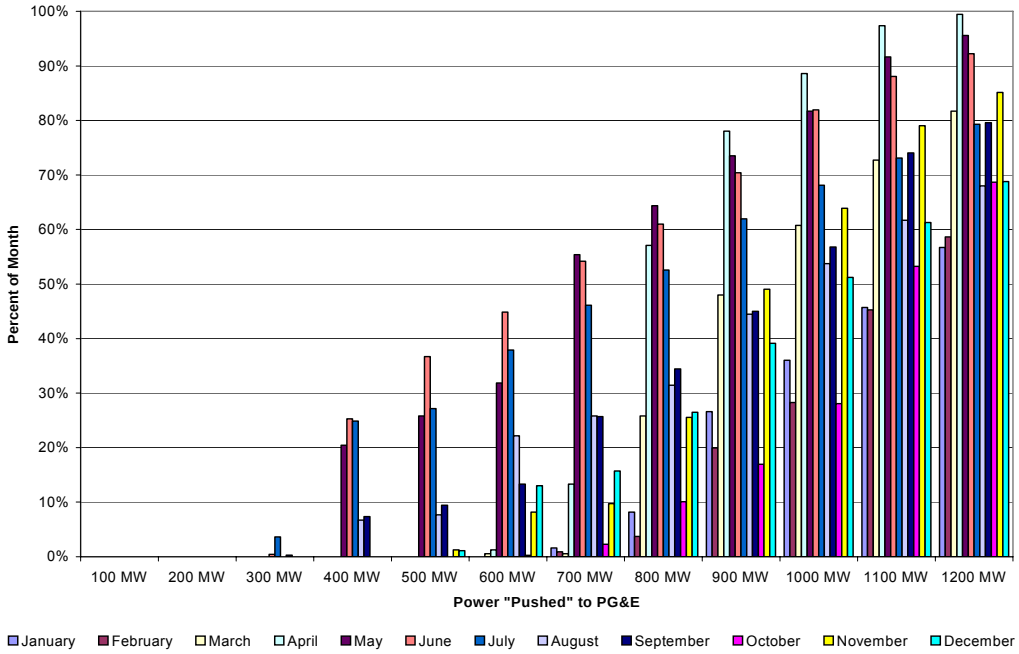



*Power Flow Validation*

Several of the Tehachapi Collaborative Study Group participants have expressed concerns with the study results portraying loadings that would not occur when the phase-shift transformer would be in service or would be "pushing" power from SCE to PG&E.

To determine when such overloads would occur, output data obtained from the thousands of power flow studies conducted was reviewed. The results of this data review are presented below in Figure 3.2.22. As can be seen, exposure to the thermal overload problem identified on the section of Big Creek3-Rector 230 kV transmission line between Big Creek and the Fresno system tie begin when the system tie is at 300 MW. This overload problem initially occurs during May, June and August but extends out for the entire year as the system tie is increased. Based on these results, SCE will require upgrades to mitigate this identified base case overload.

Figure 3.2.22
Section of Existing Big Creek3-Rector 230 kV (BC to Fresno Tie)
Overload Frequency




*Operating Procedure to Open System Tie*

Several participants suggested that an Operating Procedure be implemented to open the system tie anytime the Big Creek3-Rector 230 kV transmission section between Big Creek and the Fresno Tie is thermally overloaded.

The proposed solution of opening the system tie anytime there is an overload is not a workable solution. Since the system tie will be a new established WECC Path, the tie will need to remain in service under all normal operating conditions. A thermal overloads caused by the daily dispatch of the system does not constitute an abnormal operating condition. The CAISO has provided their comments on this subject matter in an e-mail issued on September 9, 2005. The CAISO states the following:

> "Generally, in regard to operation of a new phase-angle regulator, it would not be advisable to propose a new facility that would need to be periodically taken out-of-service to limit flows."

In addition, a Special Protection Scheme is currently in place which runs back Big Creek generation whenever either of the Big Creek-Rector 230 kV transmission lines is overloaded. Adding this system tie without upgrades can lead to unintended operation of this run-back scheme. WECC RAS Task Force requires that impacts to special protection schemes resulting from the addition of new

facilities be mitigated. In this case, the mitigation would be the upgrade to the overloaded facility and operate the system within the limits of the next limiting component. Additional transmission upgrades will be necessary to accommodate a larger fixed power model.

*Reasons for Power Flow Patterns*

One of the participants questioned why the transmission section between Big Creek and the Fresno Tie would thermally overload.

As can be seen in Figure 3.2.1, the distance from the Big Creek 1,000 MW hydro facility to the new system tie is relatively short. "Pushing" power from SCE towards PG&E will result in increasing Big Creek hydro generation flows on the two lines from Big Creek to the Fresno Tie. The reason for this can be explained by applying Ohm's Law, which basically states that current is inversely proportional to the apparent impedance. In other words, current follows the path of least resistance (i.e. Big Creek generation is a shorter distance to the new system tie as compared to Tehachapi generation and therefore has a much smaller impedance). For this reason, the Fresno phase-shifted system tie cannot be directly linked to Tehachapi since Tehachapi power will never flow on the system tie unless the size of the tie is in excess of the total Big Creek hydro generation.

### 2.2.4. Big Creek-Fresno Tie Study Conclusions

Because of the complexities associated with the use of a traditional phase-shift transformer, design of a system tie with such facility, while cheaper than a FACTS device, will require significantly much more transmission line upgrades to allow for reliable operation. The use of a FACTS device on the other hand reduces the amount of transmission line upgrades required and improves overall operability of the system tie. The CAISO should be consulted as to which alternative can be supported from an operations perspective considering scheduling difficulties as well as hour-to-hour operations.

Conceptually, the study results indicate that the use of a traditional phase-shift transformer needed to "push" 200 MW needs to be designed sufficient to accommodate 850 MW. In comparison, the use of a FACTS device to "push" 200 MW requires sufficient upgrades to accommodate only 200 MW. Table 1 below summarizes the facilities needed to accommodate each type of system tie.

Table 3.1
Transmission Facilities Needed to Support New System Tie

| **Fixed Power System Tie FACT Device Designed for 200 MW** | **Traditional Phase-Shift Transformer Fixed Tap System Tie Designed for 850 MW** |
|---|---|
| Currently Planned San Joaquin Valley Rector Loop 230 kV Project | Currently Planned San Joaquin Valley Rector Loop 230 kV Project |
| New 60 mile Antelope-Magunden 230 kV Transmission Line | New 60 mile Antelope-Magunden 230 kV Transmission Line |
| New 135 mile Magunden-Vestal-Rector-FresnoTie-Big Creek Transmission Line with connections to each of the substations | New 135 mile Magunden-Vestal-Rector-FresnoTie-Big Creek Transmission Line with connections to each of the substations |
| Magunden, Vestal, Rector, and Big Creek Substation Expansion | Magunden, Vestal, Rector, and Big Creek Substation Expansion |
| Supplemental Shunt Capacitor Banks since most dynamic supply can be provided by the FACTS device | Dynamic Reactive Resources such as SVC |
| | Second new 135 mile Magunden-Vestal-Rector-FresnoTie-Big Creek Transmission Line with connections to each of the substations |
| | Additional Magunden, Vestal, Rector, and Big Creek Substation Expansion |

SCE notes that regardless of which facility is ultimately selected, much more study work is required to support establishment of an official path rating. This study work will include short-circuit duty analysis as well as transient stability review. This study should only be undertaken if this alternative appears to be cost effective when compared against other Conceptual plans and with formal approval from the CAISO Operations Group. Conceptually, the cost estimate for this new system intertie is in excess of $450 million.

# APPENDIX A - 6

Tehachapi 2nd Report, Volume 5 of 5

Development Plan for the
Phased Expansion of

# Electric Power Transmission Facilities

in the

# Tehachapi Wind Resource Area

# Second Report

of the

## Tehachapi Collaborative Study Group

Volume 5 of 5: Appendix 4

California Public Utilities Commission

OII 05-09-005
OII 00-11-001

**April 19, 2006**

**The report is printed in 5 volumes or electronic files:**

**Volume 1 contains the Second Report;**

**Volume 2 contains Study Plan #2 the basis for the Second Report (referred to in the Report as Appendix 1);**

**Volume 3 contains the PG&E Studies (referred to as Appendix 2);**

**Volume 4 contains the SCE Studies (referred to as Appendix 3);**

**Volume 5 contains the CAISO Studies and all remaining Appendices 5, 6 and 7.**

# Appendix 4

# CAISO STUDIES

# APPENDIX 4

# CAISO STUDIES

## Production Cost Simulation Methodology and Tool

ABB's GridView production cost simulation software was used to evaluate the relative ranking of the transmission alternatives under consideration. This tool provides an economic optimization of the generation dispatches to minimize the total hourly production cost for the transmission system that is subject to generation, transmission and operational constraints. The output of the production simulation tool is processed to estimate the comparative production cost, loss and congestion savings of each of the alternatives, to assist in determining differences, if any, of the transmission alternatives.

The program input data includes:

- Generation data such as capacity, fuel costs, heat rates, maintenance schedule, start up cost, shut down cost, up time, down time, forced outage rate and outage duration.
- Transmission data such as network topology, thermal limits and operational constraints.
- Hourly demand data and distribution.
- Hourly hydro and wind dispatch.

The program output result includes hourly dispatch for each generation unit, hourly production cost, hourly transmission line flows and Locational Marginal Prices (LMP) at each node.

The production cost simulation was performed to determine annual production costs of the entire WECC system for the various alternatives being considered to incorporate over 4000 MW of wind potential in the Tehachapi area. These simulations provide both economic and operational information to assist in determining a relative ranking of the transmission alternatives. The analysis was used to compare differences in the WECC production cost, power losses and congestion hours resulting from the alternative transmission configurations being considered. The analysis did not consider other potential benefits such as reduction in reliability-must-run generation cost, reduction in emission and increased operational flexibility. It should also be noted that potential concerns involved with the intermittency of wind and its potential impacts on system operation such as regulation and reserve are not part of this evaluation. The analysis is based on all lines in-service and does not consider any contingency or loss of facility conditions.

Base Case Assumptions

The 2008-SSG-WI (Seams Steering Group-Western Interconnection) base case developed by SSG-WI Planning Work Group (PWG) and also used in the recent is Imperial Valley Study[1] was used as a starting case to maintain consistent assumption between similar studies. Summarized below are the assumptions used in the starting base case that are common to both the Tehachapi and the Imperial Valley studies:

- The base case included the generation and transmission infrastructure that may be assumed to be in place by 2008. Generation units with official retirement dates prior to 2008 were modeled out of service.
- SSG-WI PWG developed approximate industrial figures for variable and non-variable operation and maintenance costs, minimum and incremental heat rates, forced outage rate and outage duration for different generation units based on fuel type, technology, size and age. SSG-WI generation assumptions also include start up/shut down costs, minimum up time/down time and maintenance duration for different generation units. Table 1 summarizes SSG-WI generation assumptions.
- SSG-WI base case assumed average hydro conditions. Hydro generation outputs were modeled as an hourly resource. Similarly, all wind generators were modeled as an hourly resource. Hourly resources are considered as must-take resource and are therefore not optimized. The existing wind generation dispatch was based on historical data.
- SSG-WI base case transmission representation model is based on the WECC 2008 HS2-SA approved case, dated February 2004. An updated case developed by the SSG-WI received 8/5/2005 was used for the analysis.
- SSG-WI PWG used publicly available data including WECC load and resources report to construct 2008 monthly peak and energy amounts for each of the power flow area. The area loads were then spatially spread to the entire WECC network using load distribution factors as used in power flow model.
- Average monthly fuel (Gas, Coal, Uranium) prices for generation plants were forecasted for 2008. The prices were adjusted to account for the cost of delivering the fuel to the generation plant. Detailed description of SSG-WI fuel pricing assumptions is available at http://www.ssg-wi.com/documents/.

The Tehachapi wind generation dispatch profile shown in Figure 3 was provided by National Renewable Energy Laboratory (NREL) and is based on 70 meter rotors, 7.5 m/s wind speed and a 2% unavailability (45% capacity factor). Based on a potential of 4500 MW in the area, this wind profile was scaled and assumed a total annual production of 17,209,942 MWH from the Tehachapi and Antelope wind. For simplicity the 4500 MW was modeled at the Tehachapi bus. The Tehachapi wind was dispatched as base load generation - modeled hourly and represented no fuel or maintenance cost.

[1] Development Plan for the Phased Expansion of Transmission to Access Renewable Resource in the Imperial Valley, dated September 30,2005

| Fuel Type | Technology | Size/MW | Vintage | Min. Heat Rate (Btu/kWh) | Variable O&M Cost ($/MWh) | Forced Outage Rate | Forced Outage Duration (hrs) |
|---|---|---|---|---|---|---|---|
| Gas/Oil | Steam | <100 | <1960 | 12,194 | 5.001 | 0.071 | 55 |
| | | >100 | | 9,125 | | | |
| | | <100 | >1960 | 9,214 | | | |
| | | >100 | | 6,856 | 3.001 | | |
| Gas | SCCT | - | <1985 | 11,403 | 8.001 | 0.036 | 89 |
| | CCCT | - | | 9,600 | 5.001 | 0.055 | 22 |
| | SCCT | <70 | >1985 | 14,114 | | 0.036 | 89 |
| | SCCT | >70 | | 12,106 | | | |
| | CCCT | - | >1985 | 8,815 | 2.000 | 0.055 | 22 |
| Gas/Oil | CCCT-Frame F | - | >2001 | 3,620 | 2.000 | | |
| Gas | DT | - | <1985 | 9,600 | 5.001 | | |
| | | | >1985 | 10,695 | | | |
| Oil | IC | - | - | 9,125 | 13.250 | 0.036 | 55 |
| | SCCT | - | - | 11,403 | 8.001 | | |
| Coal | Steam | <100 | <1960 | 12,000 | 4.000 | 0.066 | 38 |
| | | >100 | | 11,500 | 2.000 | | |
| | | <100 | >1960 | 11,000 | 3.001 | | |
| | | >100 | | 10,500 | 2.000 | | |
| Bio/WH/Wood | Steam | - | - | 12,194 | 5.001 | 0.071 | |
| Geothermal | GE | - | - | - | 4.000 | 0.071 | 16 |
| Uranium | Nuclear | - | - | - | - | 0.070 | 298 |

Table 1 SSG-WI Generation Assumptions

The SSG-WI base case was modified with the CAISO load level to reflect forecasted 2010 conditions. In addition, the following new transmission projects in southern California that are approved and planned to be online by 2010 were included in the model:

- Harquahala-Devers 500 kV line
- New 500 kV Substation to be located at the Midpoint of Palo Verde- Devers and Harquahala-Devers 500 kV lines
- Blythe I and II Combined Cycle plant (1000 MW) connecting to Midpoint Substation
- Reconductoring of four West of Devers 230 kV lines

Table 2 provides specific non-simultaneous interface limits enforced in the production cost optimization runs for interfaces within the immediate area of the study.

**Table 2: Non-Simultaneous Interface Limits**

| Interface | North-South Flow (MW) | South-North Flow (MW) |
|---|---|---|
| COI | 4800 | 3675 |
| Path 15 | 3265 | 5000[1] |
| Path 26 | 3700[2] | 3000 |

**Notes:**
1) Path 15: 5,000 MW S-N is supported by RAS that trips generation connected to Midway. The Path 15 limit will be decreased by 1 MW for every 2 MW decrease in Midway generation (La Paloma, Sunrise, Elk Hills).
2) Path 26: Power flow between 3,000 MW and 3,700 MW N-S is supported by a RAS that trips Midway area generation. The Path 26 limit will be decreased by 1 MW for every 2 MW decrease in Midway generation (La Paloma, Sunrise, Elk Hills). Assumed Path 26 capability N-S increased to for 4000 MW as provided SCE for Alternatives 1, 3 and 10 that include a new 500 kV Tehachapi-Midway line. Detail studies are required to determine actual capability with the new transmission.

In addition, the following transmission facility assumptions were simulated as part of the study.

- Transmission models and ratings used for alternatives were provided by SCE and PG&E.
- With a new Midway-Tehachapi 500 kV line, the Path 26 N-S thermal capability was assumed to be 4000 MW for production cost simulation studies.
- All WECC transmission paths were modeled according to 2005 Path rating catalog
- Limits for all 500 kV transmission facilities were enforced.
- Lower voltage (230 kV and below) limits were not enforced.
- SCIT limit was modeled at 17900 MW
- EOR limit was modeled at 9255 MW
- WOR limit was modeled at 11318 MW

- All AC transmission lines monitored were limited to 95% of their thermal capacity or applicable rating in order to accommodate reactive flows which are absent in this production simulation studies.
- Nomograms were used to reflect transmission system constraints.
- Transmission losses were modeled.
- Transmission line/Path limit violation penalty of $1000 per MWh was applied.

The following figures supplement the productions cost simulation analysis and are provided for informational purposes.

Figure 1 - Interface Definitions
Figure 2 - Path 15 and Path 26 Historical Flows
Figure 3 – Tehachapi Wind Load Duration Curve
Figure 4 – Flows During a Peak Summer Day With Tehachapi Wind
Figure 5 – Flows During a Off-Peak Summer Day With Tehachapi Wind
Figure 6 – Comparison of Path 26 Flows With 4500 MW Tehachapi Wind
Figure 7 – Comparison of Path 15 Flows With 4500 MW Tehachapi Wind
Figure 8 – 600 MW Fresno Phase Shifter Power Flow With 1600 MW Tehachapi Wind
Figure 9 – 600 MW Fresno Phase Shifter Angle Range With 1600 MW Tehachapi Wind
Figure 10 – Scenario E Oneline
Figure 11 – Scenario F Oneline
Figure 12 – Scenario G Oneline
Figure 13 – Scenario H Oneline
Figure 14 – Scenario H Oneline
Figure 15 – Scenario J Oneline

A The following Figure 1 illustrates the Path 15 and Path 26 interfaces with the existing and new transmission under the various alternatives Path 15 includes additional underlying 230 kV transmission not shown.

Figure 1 – Interface Definitions

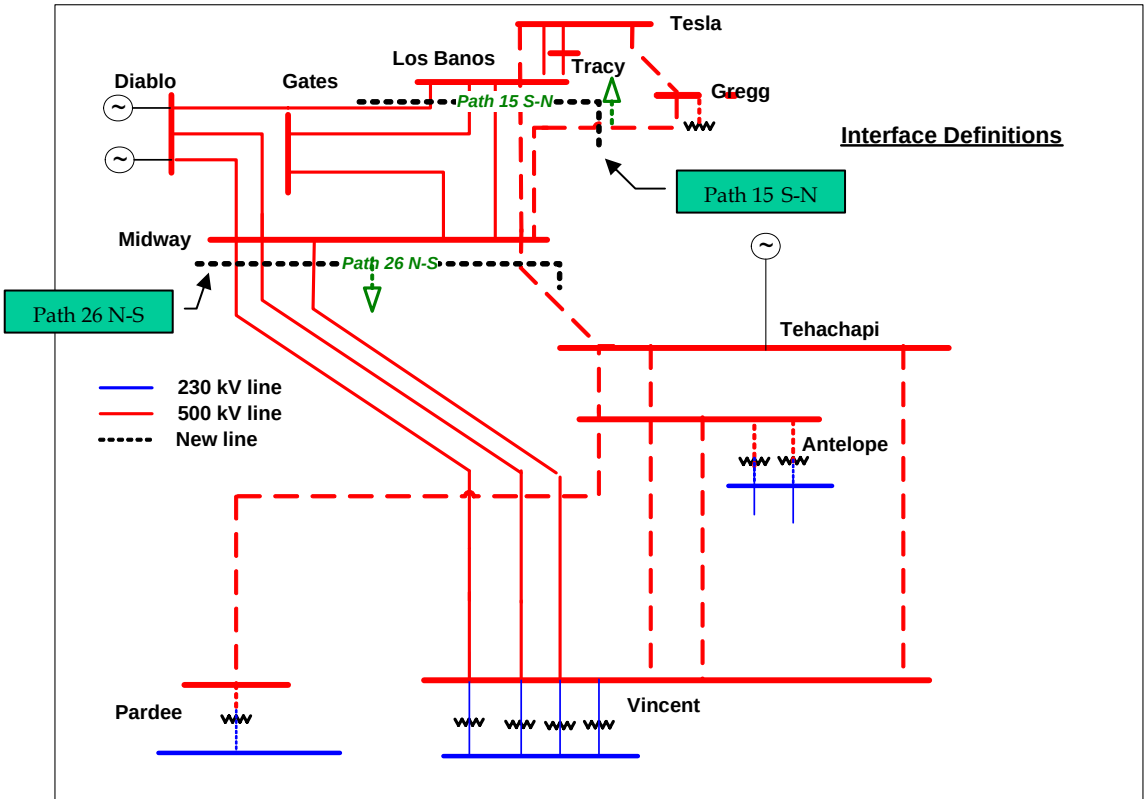


Figure 2 – Path 15 and Path 26 Historical

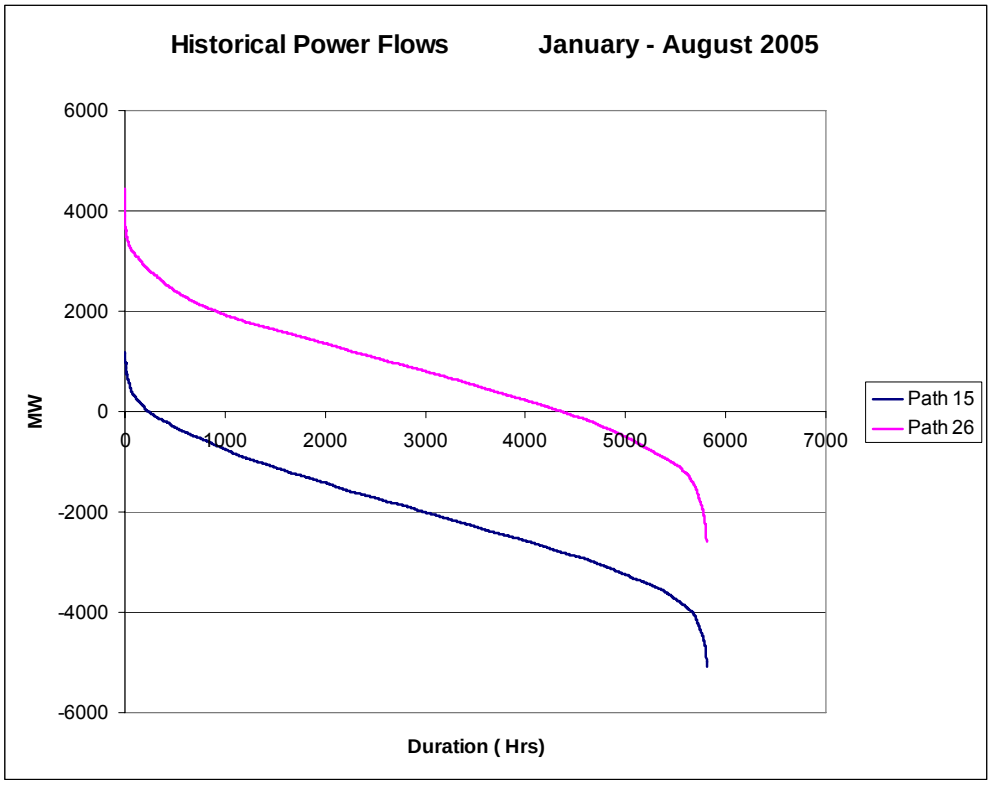



Figure 3 – Tehachapi Wind Load Duration Curve

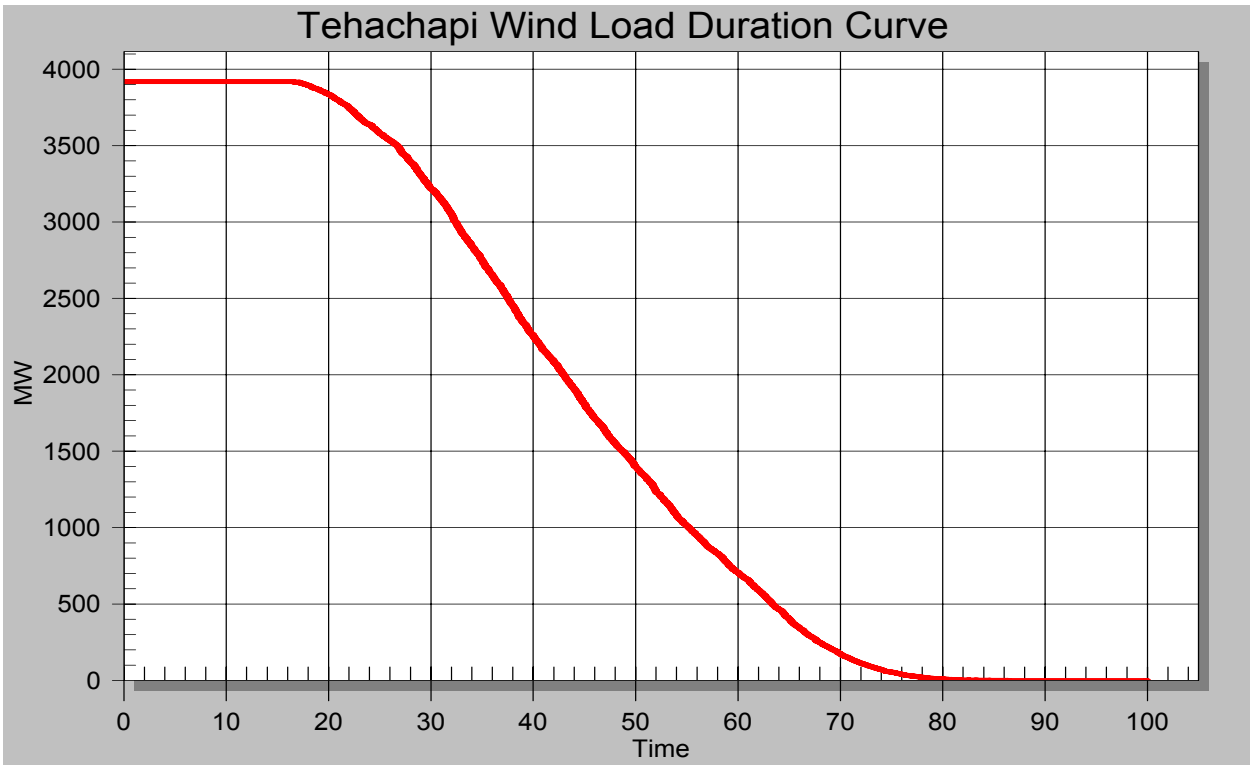


Figure 4 – Flows During a Peak Summer Day With Tehachapi Wind

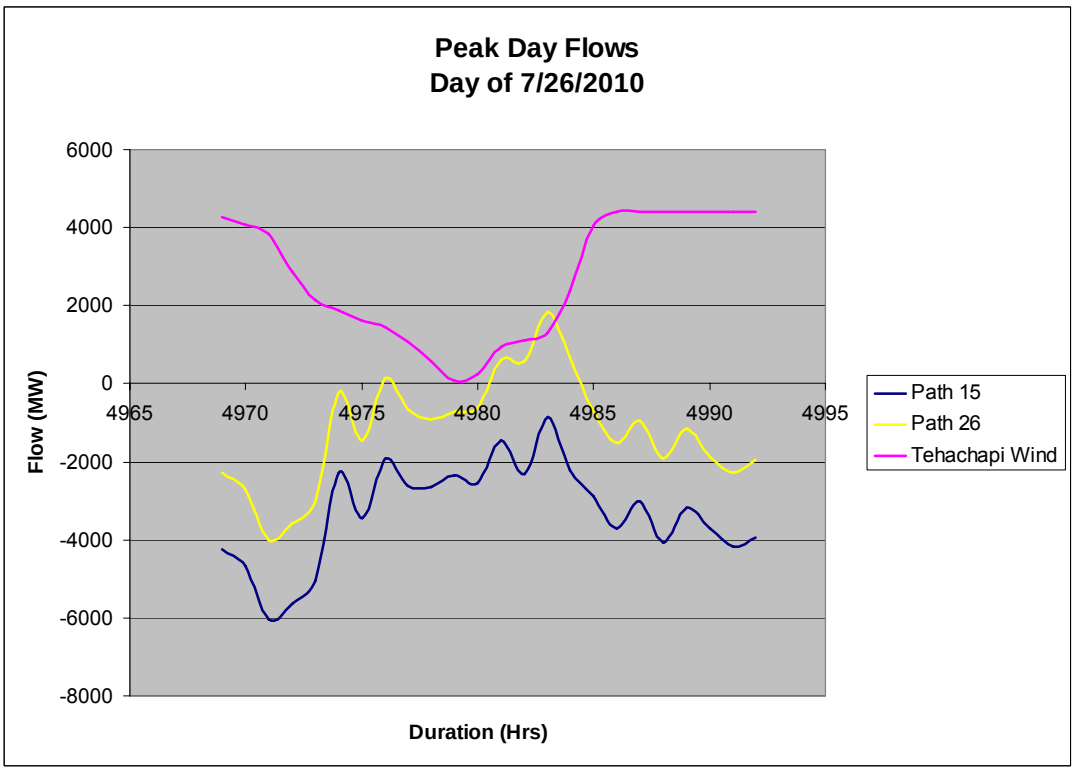



Figure 5 – Flows During a Off-Peak Summer Day With Tehachapi Wind

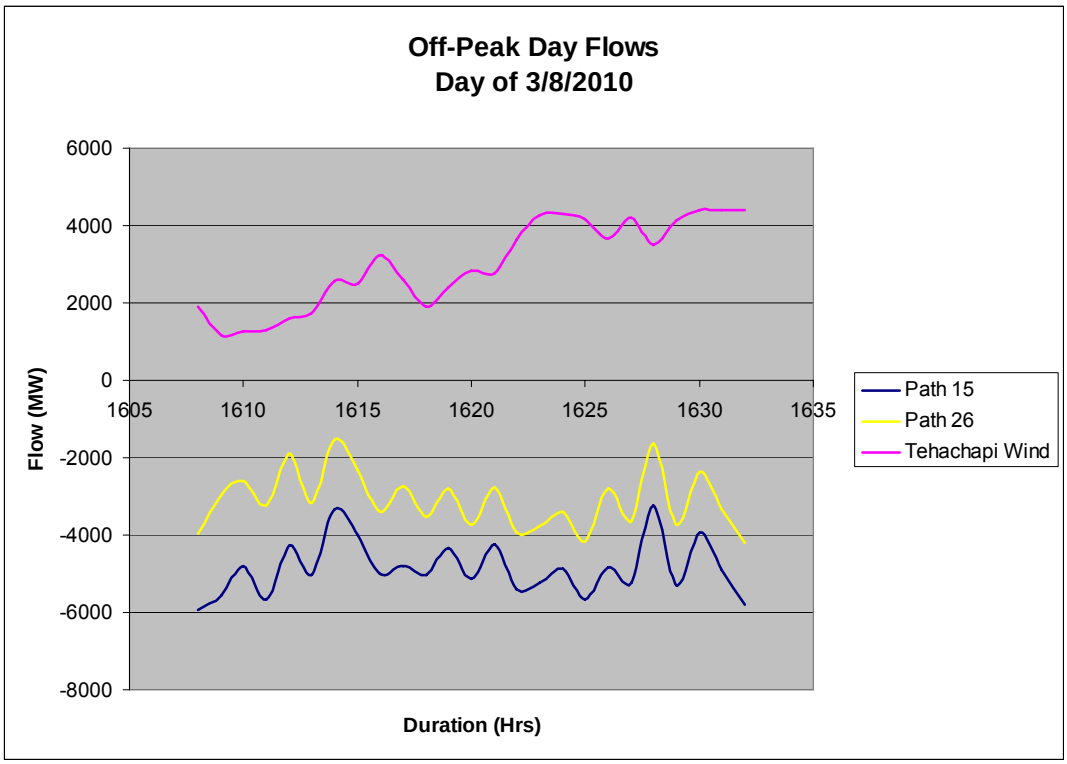


Figure 6 – Comparison of Path 26 Flows With 4500 MW Tehachapi Wind

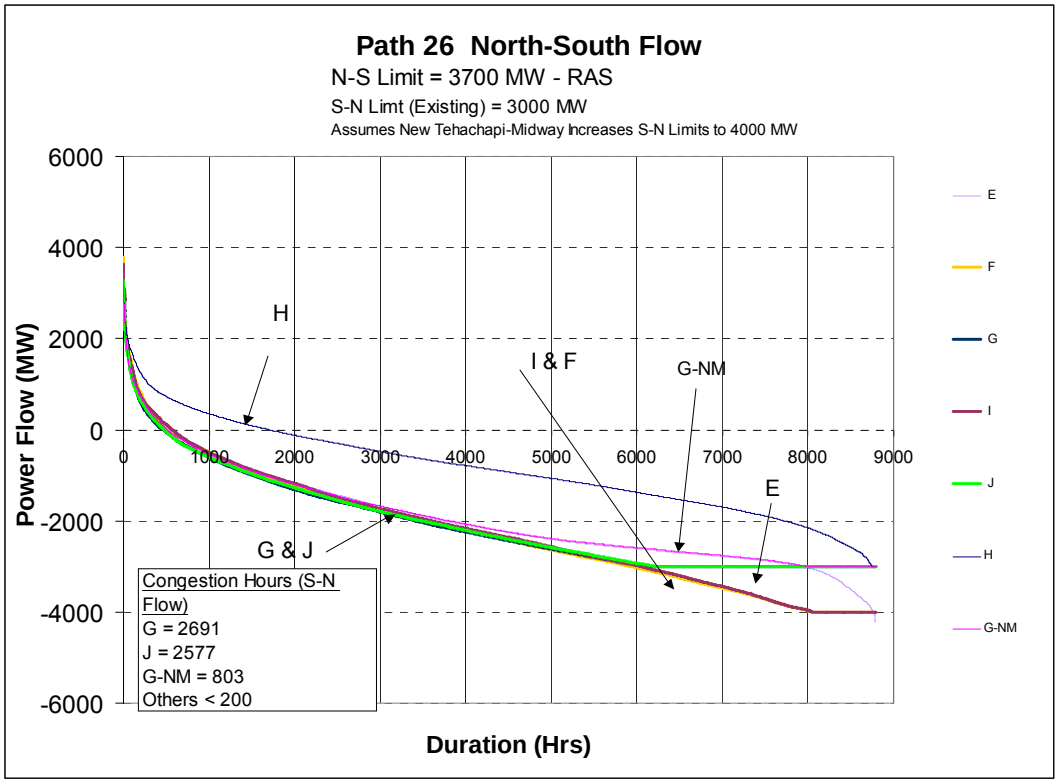



Figure 7 – Comparison of Path 15 Flows With 4500 MW Tehachapi Wind

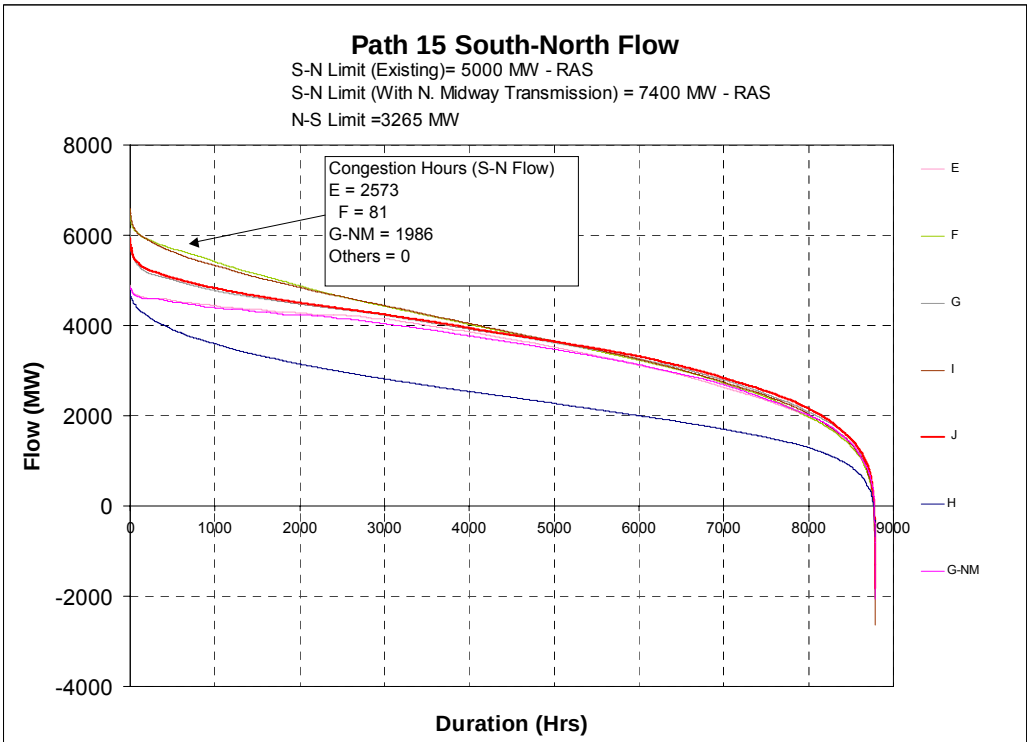


Figure 8 – +/- 600 MW Fresno Phase Shifter Power Flow With 1600 MW Tehachapi Wind

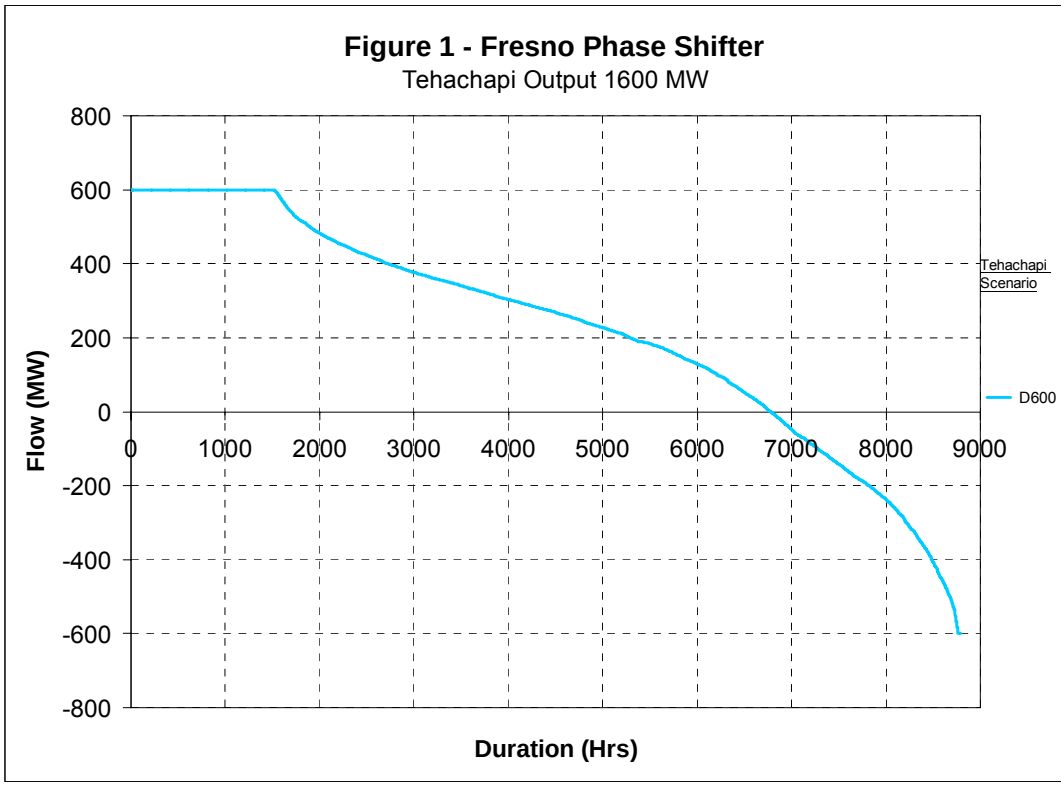



Figure 9 – +/- 600 MW Fresno Phase Shifter Angle Range With 1600 MW Tehachapi Wind

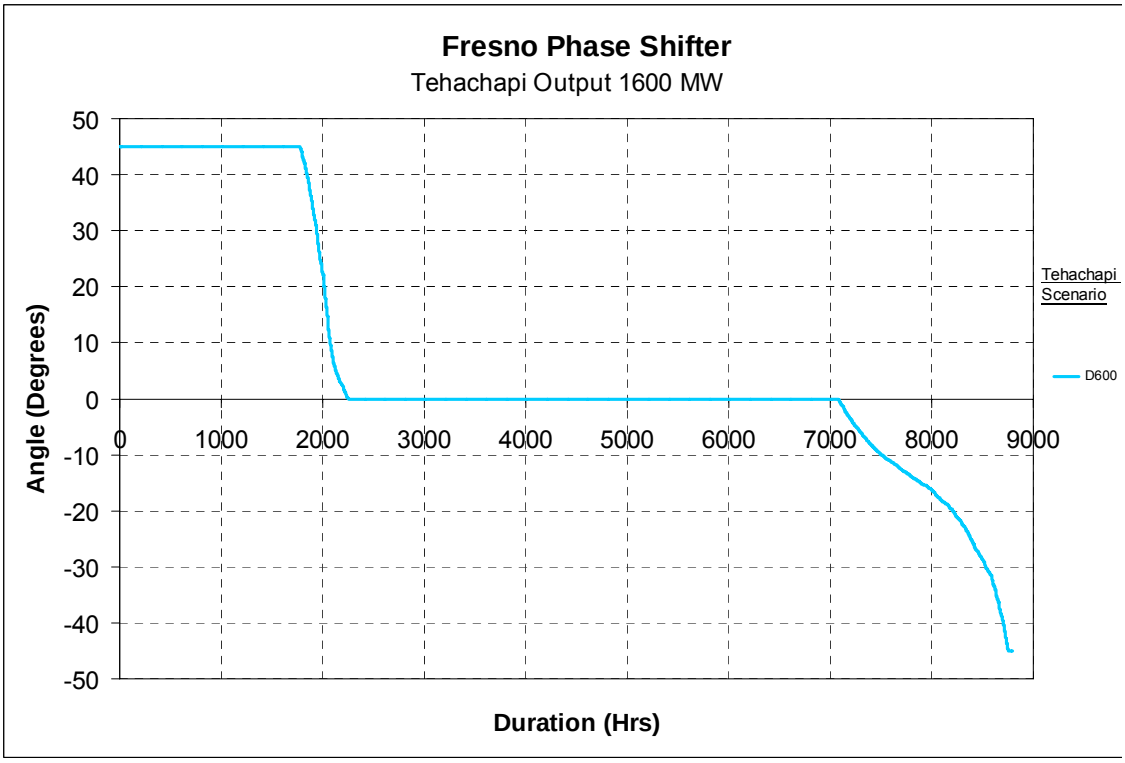


Figure 10 – Scenario E Oneline

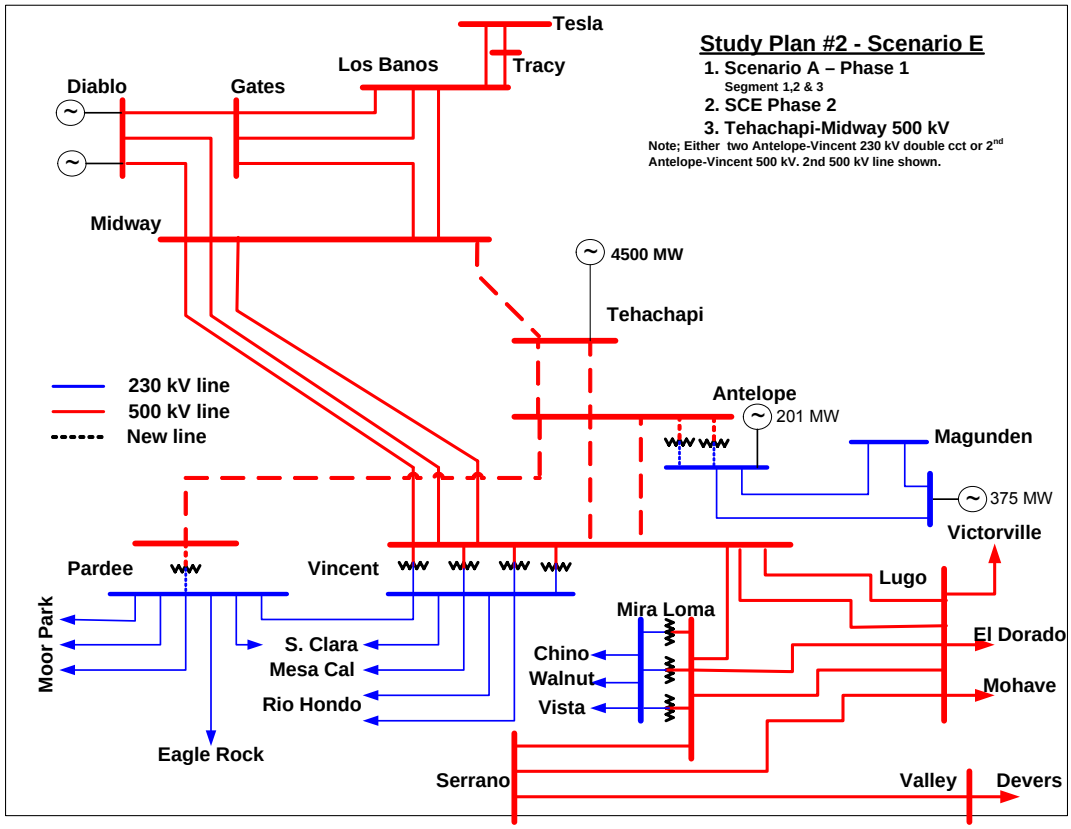



Figure 11 – Scenario F Oneline

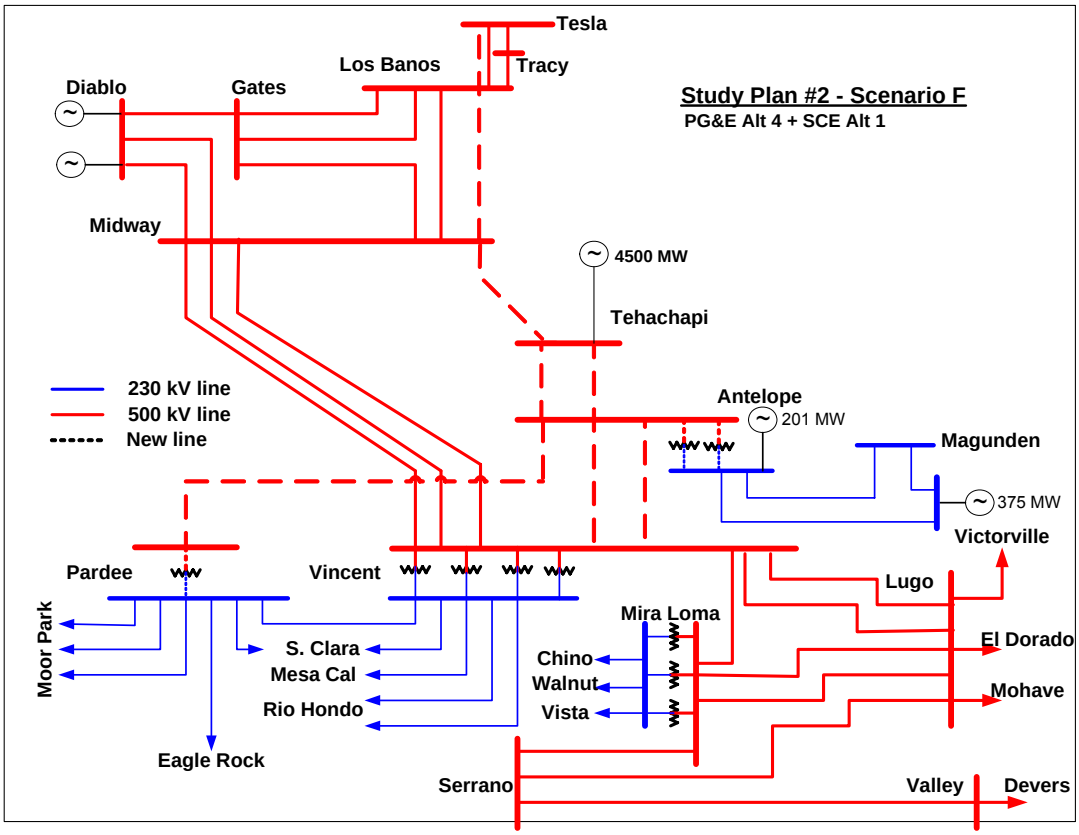


Figure 12 – Scenario G Oneline

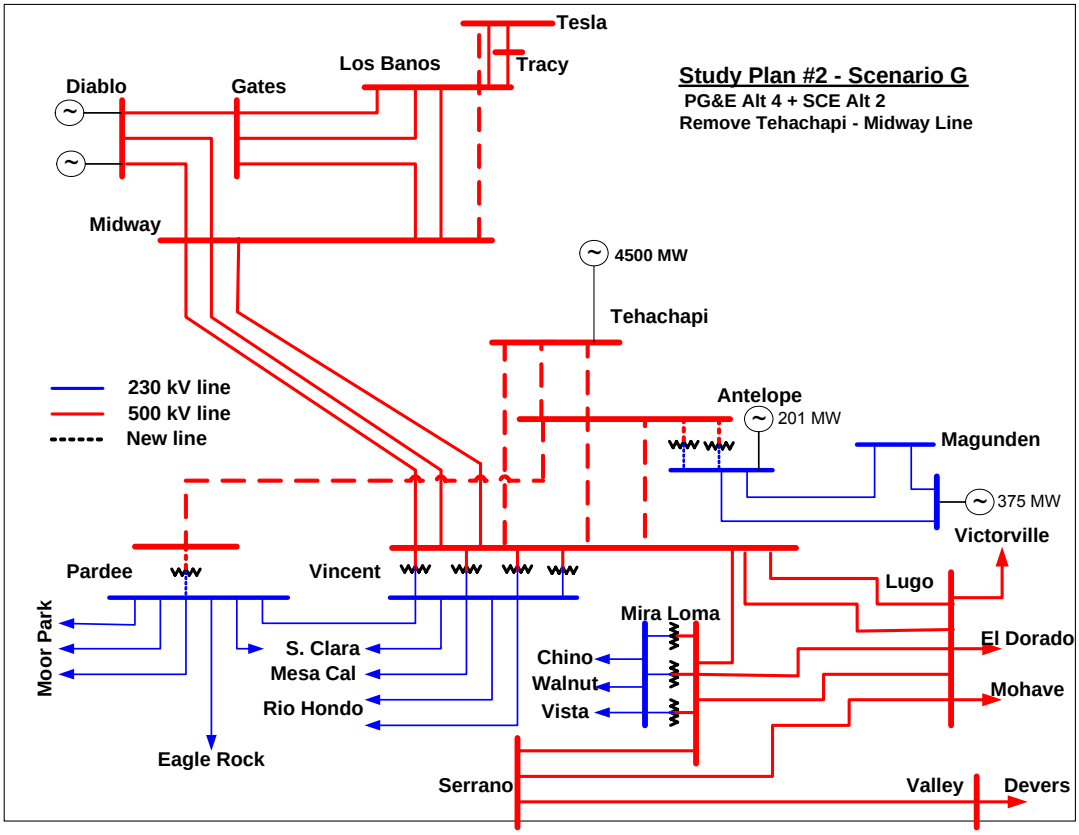



Figure 13 – Scenario H Oneline

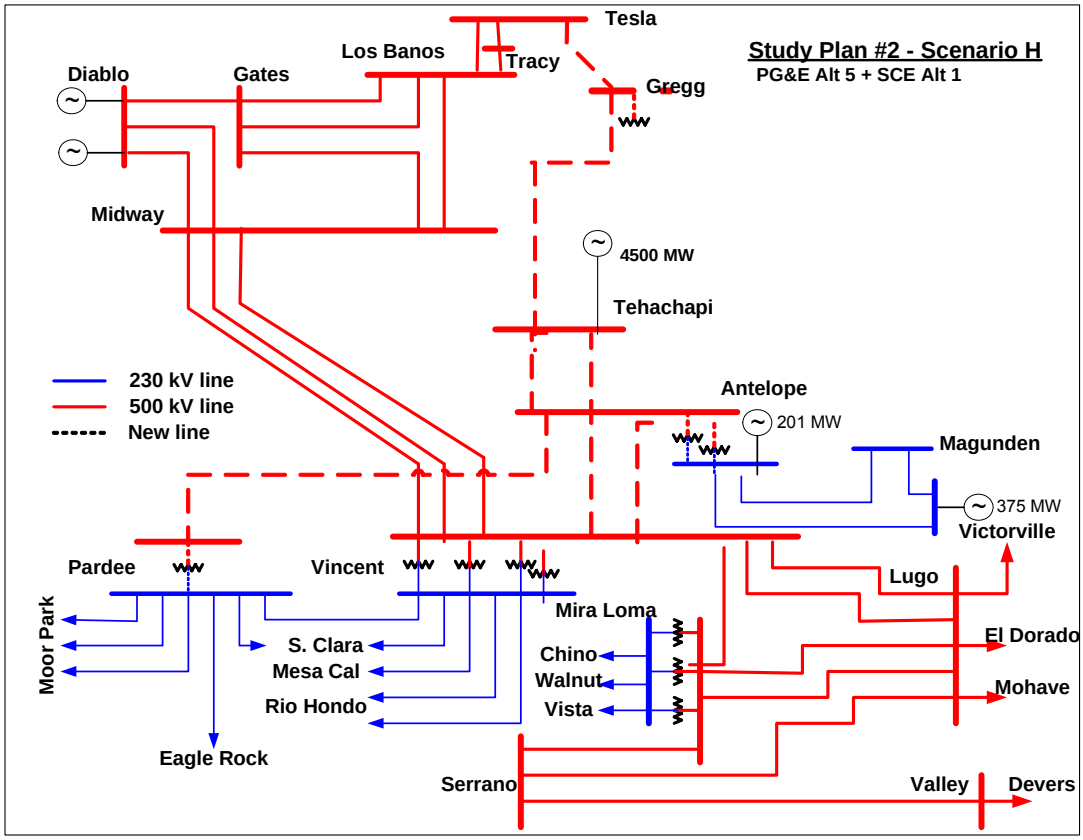


Figure 14 – Scenario I Oneline

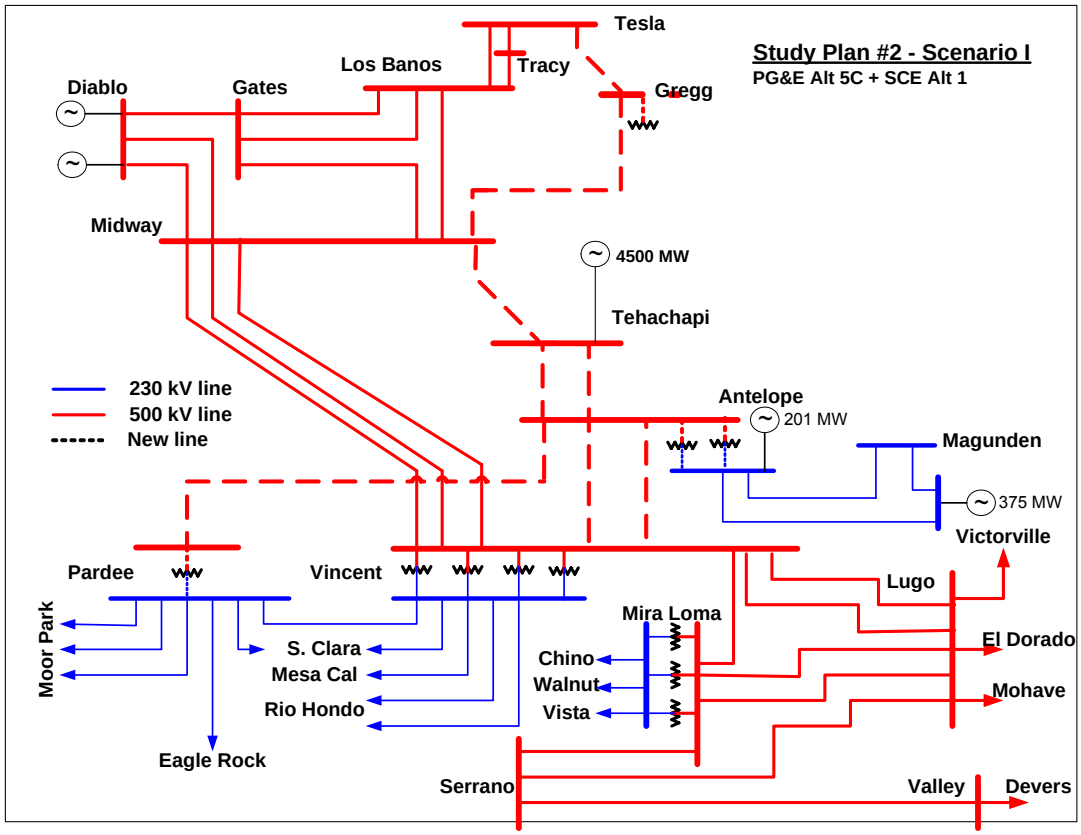
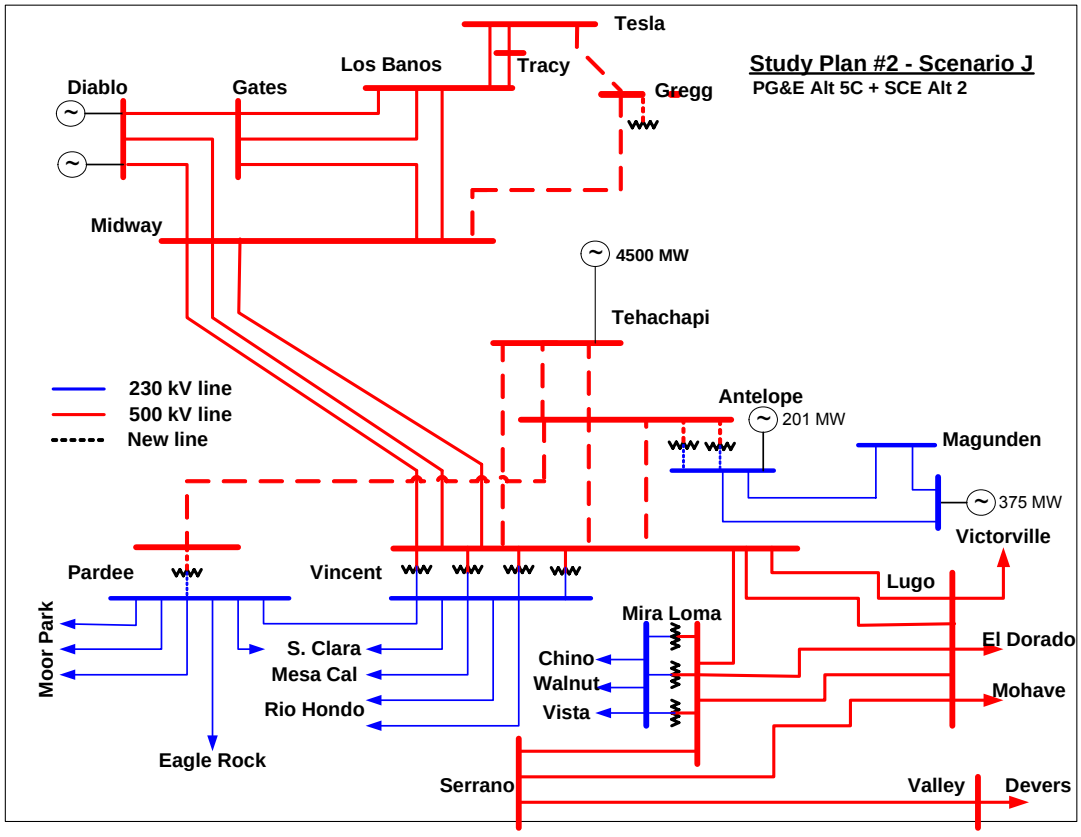



Figure 15 – Scenario J Oneline



# APPENDIX 5
# Fresno 230 kV Tie

# APPENDIX 5

## Fresno 230kV Tie

A5.1 Purpose

If the output of the Tehachapi Wind Farm were to be in the order of 2000MW with half of that to be transmitted to PG&E, a low cost tie that would require a minimum investment, supplemented by flow over Path 26 would be cheaper than any EHV alternative. As indicated in the Executive Summary, the likely development of Tehachapi is now in the order of 3500MW and, as shown in Chapter 1, power bought by PG&E does not have to be delivered into the PG&E service area. The evaluation of the Fresno 230kV Tie was a blind alley which the TCSG went up and the following description is presented for academic interest only.

A5.2 Description, Figure A5

Two 230kV lines connect SCE's Antelope Substation with Magunden and four such circuits connect Magunden with the Big Creek hydroelectric plants. Two 230kV circuits connect PG&E's Helms pumped storage plant with Gregg Substation. These lines run west to east and cross the four Magunden to Big Creek lines which run south to north. A connection between the Helms-Gregg lines and two of the Magunden-Big Creek lines would transmit Tehachapi generation to PG&E with little modification to the grids. Because of the difference in the power angle between the two systems in this area, the connection would have to include a phase shifter, which could be a fixed or variable phase shifting transformer, or a solid state device. With a capacity of 300MW, no upgrade of the networks would have to be made other than voltage support. At higher capacities, varying levels of upgrade to the highly loaded SCE network would be needed depending on the incremental capacity of the tie and the loading of the lines at the time the Tehachapi generation was available. Power flow computer runs to determine the relationship between the amount of Tehachapi power flowing over the lines to the tie and line loading due to loads in the Fresno area were not made, so that it was not possible to determine the optimum capacity of the tie.

A5.3 Production Cost Study

Production cost simulation runs were made modeling variable phase shifting transformers of 300MW, 500MW and 1000MW capacities. The 300MW transformer reduced the production cost by a small amount, but with the two larger capacities the cost actually increased over the cost of identical conditions without the tie. The fact that the addition of a network component would

increase production cost is hard to understand and leads to the question of whether the program is correctly modeling the device. The limitations of the program in modeling the performance of the pumped storage, which in the real world would be coordinated with the wind generation, also contributes to the perception that the effect of the phase shifting transformer was short shrifted by the program.

A5.4 Conclusions

1. With the level of production presently expected from Tehachapi and the fact that it does not need to be delivered into the PG&E system, the 230kV tie is not needed.
2. The ABB GridView production simulation program needs to be improved to correctly simulate the phase shifting transformer and to optimize the performance of pumped storage.

# Appendix 6
# Path 26 Impacts

**Path 26 Impacts**

## *Introduction*

When wind geneation in Tehachapi is connected to the grid with new transmission lines, wind power will flow on existing lines as well. Since Path 26 is a vital transmission link between Northern and Southern California, the TCSG investigated how power flows from Tehachapi will affect Path 26.

The ability of Southern California to import power from the North through Path 26 on hot summer days, when air conditioning loads are highest, is especially important. The TCSG's analysis therefore focused on Path 26 flows and Southern California imports during this peak period.

Since wind generation is variable, the amount of Tehachapi power flowing on Path 26 will also be variable. As discussed in Chapter XXX, grid operators will have be able to adjust other flows on Path 26 to ensure reliability limits will not be exceeded. However, the TCSG did not attempt to analyze the impact of Tehachapi wind generation on grid operations for any of the alternatives studied.

## Summary of findings

The TCSG examined the effects on Path 26 for two alternative ways of connecting Tehachapi to the grid: the Expanded Path 26 option (Alternative 1) and the Gen-tie option (Alternative 2). The Expanded Path 26 option adds a fourth 500 kV tie between Northern and Southern California; the Gen-tie configuration connects Tehachapi only to Southern California and provides no additional connection between the regions.

The Expanded Path 26 option increases the transfer capacity between Northern and Southern California above the amount existing today, under all conditions. The Gen-tie option does not increase the transfer capacity between the regions.

## Alternative 2 (Gen-tie option) – south-to-north flows

When power is flowing from Southern California to Northern California, i.e., south-to-north on Path 26 (generally during off-peak periods), some power from Tehachapi will also flow north on this path. At the present time, south-to-north flows are limited by the capacity of Path 15 (north of PG&E's Midway substation) rather than by the capacity of Path 26. Therefore, although some of the capacity of Path 26 will be used by Tehachapi generation, system impacts are minimal.

**Alternative 2 (Gen-tie option) –north-to-south flows**

When Southern California is importing power, i.e., power is flowing north-to-south on Path 26 (generally during on-peak periods), this path is unaffected by Tehachapi generation. Power from Tehachapi simply adds to power flowing south on Path 26.

**Alternative 1 (Expanded Path 26 option) – south-to-north flows**

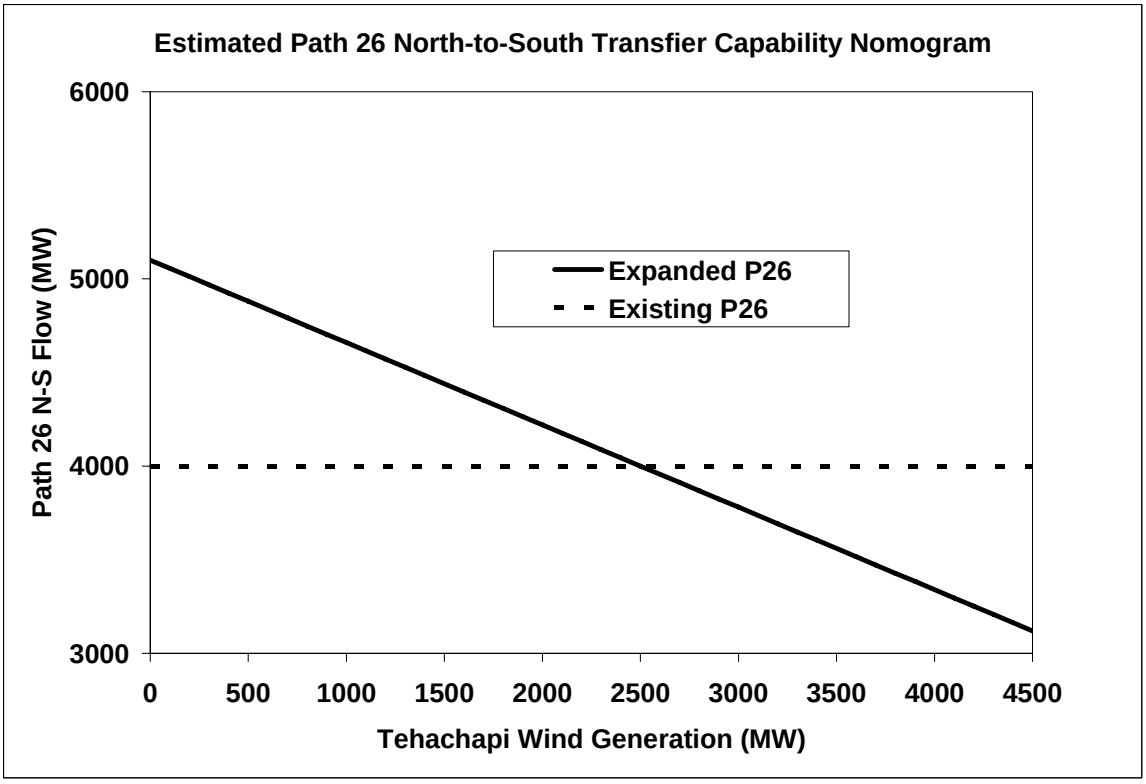
When power is flowing south-to-north in the Expanded Path 26 configuration, Tehachapi generation flows on Path 26, but as mentioned above, south-to-north flows are limited by the capacity of Path 15 at the present time. The system impacts of Tehachapi generation therefore are expected to be minimal, as with the Gen-tie option.

**Alternative 1 (Expanded Path 26 option) – north-to-south flows**

When Southern California is importing power and flows are north-to-south on Path 26, the effects of Tehachapi generation on Path 26 become important. As described below in a report by the TCSG Path 26 subcommittee, these effects differ depending on whether Tehachapi generation is high or low, i.e., whether the wind is blowing hard in Tehachapi or not.

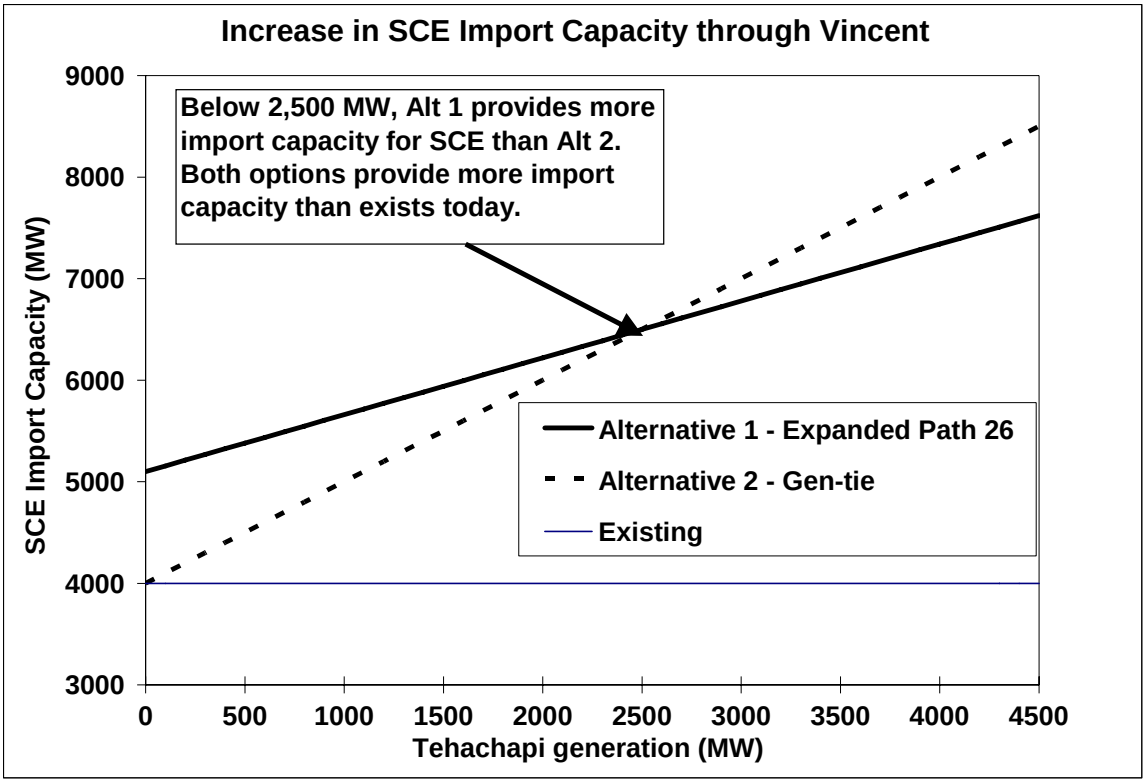
When Tehachapi wind generation is low, the additional link between Northern and Southern California provided by the Expanded Path 26 configuration allows more power to flow between the regions than can be accommodated today. Even though some Tehachapi power flows north-to-south on Path 26 (see figure 5 in the subcommittee report below), there is a net increase in transfer capability due to the additional 500 kV link. When Tehachapi wind generation is high, the power transfer from Northern California to Southern California is less than when wind generation is low. This is because the amount of Tehachapi power flowing on Path 26 is enough to reduce the net thermal transfer capacity of the Path. Even in this case, however, the net power delivered to Southern California is higher than is possible today, because of the new generation added at Tehachapi. The transfer capacity of Path 26 as a function of Tehachapi generation is shown in the following chart[2]:

[2] The data shown in this chart assumes 70% series compensation on the Midway-Tehachapi line.




The decline in Path 26 transfer capability for the Expanded Path 26 shown in Figure XXX indicates that as Tehachapi wind generation increases and uses some of the capacity in Path 26, the amount of power that can be exported from Northern California south through Path 26 decreases.

However, the import capacity into Southern California *increases* over existing levels for both options, as shown in the following chart:




Concerns over the variability of wind generation are often expressed as "What happens when the wind doesn't blow?" As the above chart indicates, even when Tehachapi wind generation is zero, the Expanded Path 26 option provides Southern California with additional import capacity while the Gen-tie option does not. When Tehachapi generation is above 2,500 MW, the Gen-tie option provides Southern California with more import capacity than does the Expanded Path 26 option.

The key conclusion is that both alternatives provide more import capacity than exists at present, because of the addition of new generation at Tehachapi and new 500 kV lines to connect it.

## *TCSG Path 26 Subcommittee Report*

# `Comparison of the Effects on the Transfer Capability of Path 26 of Alternatives 1 and 2 for Delivering Tehachapi Power to the Grid Taking Into Account the Variability of Wind Generation

## Conclusions

1. Alternative 1 consists of one 500kV line between Tehachapi and Midway and two 500kV lines between Tehachapi and Antelope, see Figure 1. Alternative 2 consists of three 500kV lines between Tehachapi and Antelope, see Figure 2.
2. During off-peak hours when the power flow is from South to North across Path 26, Path 26 transfer capability is limited by Path 15 capability, therefore there is no difference between Alternative 1 and Alternative 2 under this condition.
3. During peak hours when the power flow is from North to South, when the wind is not blowing, the transfer capability with Alternative 1 will be increased from 4000MW to 5100MW and 4500MW given 70% and no series compensation, respectively, on the Tehachapi- Midway line. However, the usefulness of this capability is dependent on an increase in generation at north of Midway. With Alternative 2, the transfer capability is unchanged by the level of generation at Tehachapi and remains at 4000MW.
4. During peak hours when the power flow is from North to South and the wind is blowing, the transfer capability of Path 26 with Alternative 1 will decrease from 4000MW to 3400MW and 3700MW with 4000MW at Tehachapi, and 70% and no series compensation, respectively. The transfer capability as a function of varying levels of Tehachapi generation is shown on Figure 3. With Alternative 2, the transfer capability is unchanged by the level of Tehacahpi generation and remains at 4000MW.
5. Alternative 1 would provide benefit during scheduling clearance for maintenance by providing additional transmission facilities over the interface assuming wind generation at Tehachapi are off-line compared to the existing system or Alternative 2.

Alternative 1

Power flow with One Tehachapi-Midway and Two Tehachapi – Antelope lines

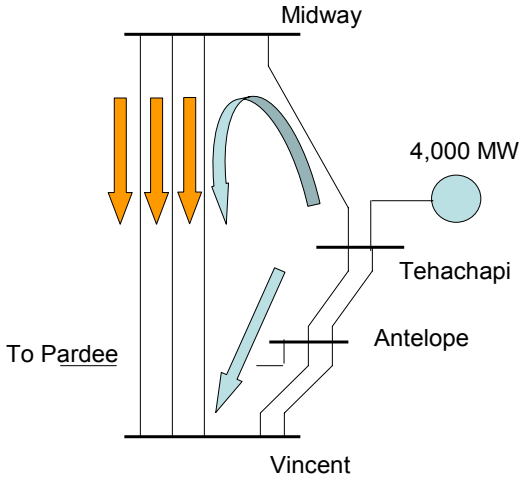



Figure 1

Alternative 2

Power flow with Three Tehachapi – Antelope lines

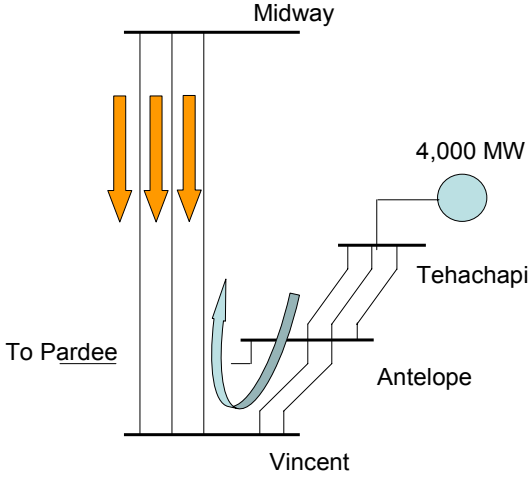
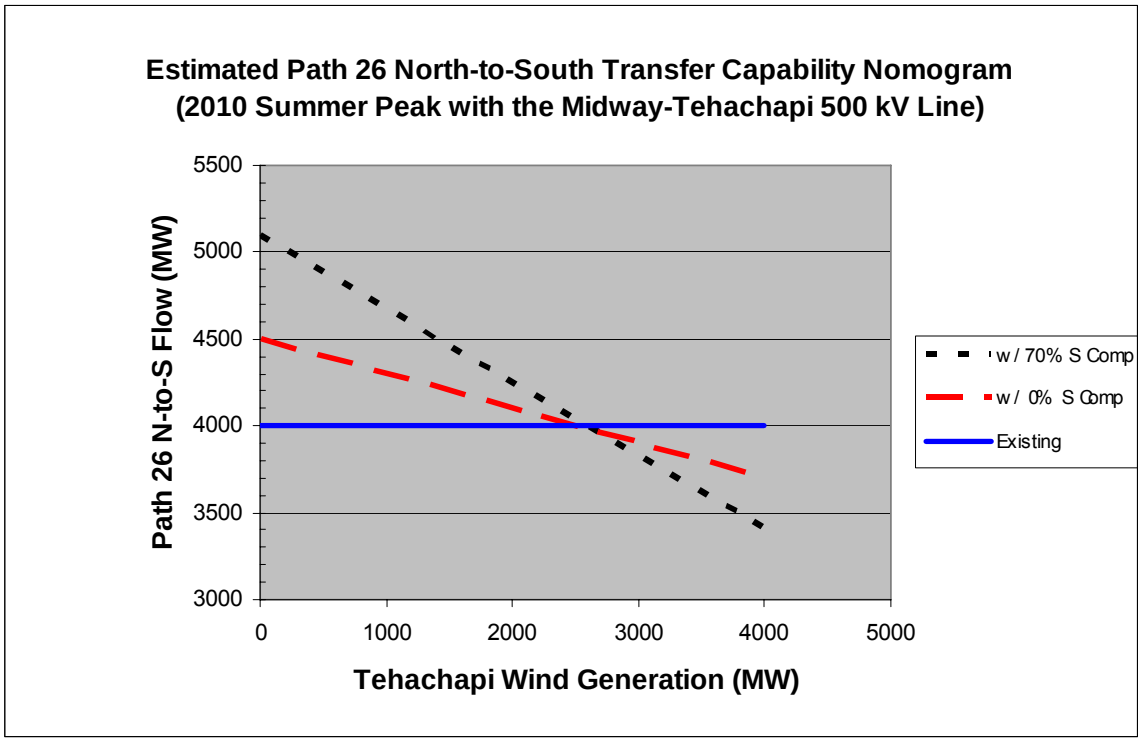



Figure 2

**Fig. 3**
**Estimated Path 26 North-to-South Transfer Capability Nomogram**




## The Alternatives

The only existing transmission link between northern and southern California are the three 500 kV lines between PG&E's Midway Substation and SCE's Vincent Substation which define the Path 26 interface. The existing Path 26 transfer capability in either the North to South (N-S) or South to North (S-N) direction is determined by normal and emergency loading on the Midway – Vincent #3 500 kV line or voltage criteria violations. The limiting facilities are the existing 3500 A emergency rating of the series capacitor banks on the Midway-Vincent #3 line and the 1736A summer normal rating of the #3 line conductors. The worst contingency is the loss of both the Midway-Vincent #1 and #2 lines.

The existing maximum Path 26 N-S transfer limit of 4000 MW is based on heavy summer conditions and requires a Remedial Action Scheme (RAS) to trip 1400

MW[3] of Midway area generation and 500 MW of loads in southern California following the loss of the Midway-Vincent #1 and #2 lines. Without the RAS, existing maximum Path 26 N-S transfer limit is 3000 MW. The maximum existing Path 26 S-N transfer limit is 3000 MW and does not require RAS to support this limit. Path 26 S-N flows are typically limited to below 3000 MW due to congestion on Path 15.

With the Tehachapi wind generation electrically near the Path 26 interface, there is a potential to impact the transfer capability depending on the 500 kV transmission reinforcements selected. Figure 1 shows SCE's proposed Alternative 1, which provides two 500kV circuits from Tehachapi Substation 1 to Antelope Substation and a 500 kV line from Midway to Tehachapi, thereby creating a 4th path from Midway to Vincent in parallel with the existing Path 26 interface. As such, the Path 26 interface would need to be redefined to include this new transmission path. The transfer capability of this path would be dependent on the level of Tehachapi wind power injected into the new Midway-Tehachapi-Vincent line at Tehachapi and also by the level of series compensation on the line. Due to the variability of the wind, the wind generation output may range from 0 to the maximum of 4000 MW. Under peak load conditions, when the prevailing power flow is from North to South, part of the Tehachapi power would flow North to Midway, then use the existing N-S transfer capability to back South over the existing Path 26 lines. That would decrease the available N-S transfer capability for transporting power from north of Midway to southern California.

Figure 2 shows SCE's proposed Alternative 2, which consists of three 500kV lines from Tehachapi Substation 1 to Antelope/Vincent. This alternative would not affect the present Path 26 thermal transfer capability in either the N-S or S-N direction.

[3] Maximum amount of generation rejection for loss of two elements under CAISO Planning Guidelines

## Comparison of the Effects of the Alternatives

The following table provides a comparison of the estimated Path 26 thermal transfer capability. Detailed thermal, voltage and stability studies are needed to definitively determine actual capabilities.

### *TABLE: Estimated Path 26 Thermal Transfer Capability*

| SCE Alternative | Tehachapi Wind Output (MW) | Path 26 | |
|---|---|---|---|
| | | N-S (MW) | S-N (MW) |
| Existing System | - | 4000[1] | 3000[2] |
| Alt. 1 – 500 kV, one Midway-Tehachapi, two Tehachapi-Antelope-Vincent | 0 | 4500[1] –5100[3] | 3000[2] |
| | 4000 | 3400-3700[1] | 3000[2] |
| Alt. 2 – Three 500 kV Tehachapi-Antelope-Vincent | 0 | 4000[1] | 3000[2] |
| | 4000 | 4000[1] | 3000[2] |

Notes:

1) Path 26 RAS will trip 1400 MW of Midway generation and 500 MW of southern California loads for Midway – Vincent #1 and #2 500 kV double-line outage.
2) No RAS required. Path 26 S-N transfers may be limited by Path 15 capability.
3) Range indicates without series compensation and with a high level of series compensation (70%) on the Midway-Tehachapi 500 kV line. Appropriate series compensation needs to be determined through additional studies. New Midway-Tehachapi rating assumed appropriately sized to avoid thermal constraints.
4) Does not consider any limitation resulting from SCIT transfer capability.

Alternative 1 would provide a significant increase in the N-S capability of Path 26 when there is no generation at Tehachapi. However, it would also decrease the existing N-S capability when Tehachapi is at full output, see Figure 3 for the transfer capability as a function of varying levels of Tehachapi generation. However, in order to take advantage of any increased capability, CAISO Operations would need sufficient advance forecast of the wind generation output. This may be problematic until better forecasting methods are implemented. The upper range of this capability depends on use of the Midway RAS. Since the existing Path 26 interface RAS arms the maximum amount of generation for rejection for the limiting N-2 contingency, no additional generation, such as

Tehachapi wind, may be armed unless it is accompanied with an equivalent amount of load rejection on the SCE system.
Alternative 1 S-N: Without an upgrade of Path 15, no increase in Path 26 S-N capability is expected since Path 26 would be limited by the existing Path 15 capability
Alternative 1 would provide benefit during scheduling clearance for maintenance by providing additional transmission facilities over the interface assuming wind generation at Tehachapi are off-line compared to the existing system or Alternative 2.

Alternative 2 would not provide any new transfer capability for Path 26, as it does not involve reinforcement or upgrade of the existing path.

# Appendix 7

# Midway-Tehachapi Costs

# Tehachapi-Midway Cost Estimate

for TCSG Report, April 7, 2006

One major export path for Tehachapi generation is to connect to the state backbone grid at the Vincent substation at the southern end of Path 26. The TCSG has relied on the cost estimates for the Tehachapi-Vincent connections contained in SCE's CPCN Applications for the Antelope-Pardee (Application No. 04-12-007), and Antelope-Vincent and Antelope-Tehachapi Transmission Projects (Application No. 04-12-008).

Another major transmission alternative for connecting Tehachapi generation to the grid considered by the TCSG, outside of Tehachapi-Vincent corridor routings, is a line from Tehachapi to the Midway substation, at the southern end of Path 15, west of Bakersfield.

The Midway substation is roughly 90 miles west of the proposed Tehachapi substation #1. At this point, Tehachapi-Midway is only a conceptual routing. Neither SCE nor PG&E has yet identified any physical routings for such a connection. Without a physical routing, line distance can only be roughly estimated; no environmental studies have been performed. With so many factors unknown, any such conceptual cost estimate can only be roughly approximate.

PG&E estimates the cost of acquiring the land, doing the permitting work and building the line to be $508 million. SCE estimates this cost to be $315 million. This large disparity in conceptual cost estimates led the TCSG to appoint a subcommittee to better understand the basis of each company's estimate. The subcommittee held several meetings via conference call with the land and permitting experts of both utilities. Notes of the subcommittee conference call meeting of January 10, 2006 explain the components of each, and document the basis for cost estimate. These notes are available from the CPUC coordinator of the TCSG.

For purposes of evaluating a Tehachapi-Midway conceptual routing, the subcommittee recommended that the TCSG use the SCE estimate of $315 million for the 90-mile project.

The SCE estimate is in line with the cost estimates of the other components of the Tehachapi transmission projects proposed to date.

Tehachapi-Midway Conceptual Cost Estimates
$, millions

| | PG&E | SCE |
|---|---|---|
| Land Acquisition, Planning and Permitting | $245.9 | $90.4 |
| (includes PEA, CPUC CPCN process) | | |
| Construction | $262.1 | $225.0 |
| Total Conceptual Cost Estimate | $508.0 | $315.4 |

# APPENDIX B

Development Plan for the Phased Expansion of Electric Power Transmission Facilities in the Tehachapi Wind Resource Area

# APPENDIX B - 1

Transmittal Letter

State of California

# Memorandum

**Date:** May 19, 2006

**To:** Commissioner Grueneich

**From:** **Public Utilities Commission—San Francisco –** Brian Schumacher
Project Manager
Energy Division

**File No:** OII 05-09-005

**Subject:** *Second Report of the Tehachapi Collaborative Study Group*

The Tehachapi Collaborative Study Group (TCSG) prepared a report that Southern California Edison Company (SCE) filed on its behalf in March 2005 per D.04-06-010. The TCSG continued its work and SCE filed the TCSG's Second Report in April 2006 per I.05-09-005. Energy Division now is re-circulating last month's Report in order to provide on behalf of the TCSG a report whose appearance reflects the major effort, detail and collaboration it contains. In order to maintain the integrity of this product of the TCSG, the language and contents of the report are unchanged except for:

1. Adding a GLOSSARY at p.7;
2. Adding language to the Exec Summary at p. 9 shown in italics:
   …wind generation potential in Tehachapi, currently estimated at 4,500 MW, *over and above the 740 MW generation presently installed in the area*, …
3. Revising a summary sentence on p.1 of Appendix 6 to read:
   *In combination with Tehachapi generation both the expanded Path 26 option and the Gen-Tie option increase the capacity into the south above the amount existing today.*

Edison's April 19, 2006 Notice of Availability for the Second Report referred to a CPUC ftp site for it. That site and the same Second Report it yielded now appear under Tehachapi Collaborative Second Report under April 2006 (6 PDF files). The enclosed May 19, 2006 version appears there under May 2006 (3 PDF files). Initial comments due and filed by parties on May 10, 2006 21 days after filing would be unchanged by this replacement, as would the reply comments due May 20, 2006.

Please feel free to contact me at bds@cpuc.ca.gov with any questions.

Cc: ALJ Halligan
Sean Gallagher, Director, Energy Division
Tehachapi Collaborative Study Group
Service List I.05-09-005

# APPENDIX B - 2

Tehachapi Collaborative Second Report

Development Plan for the
Phased Expansion of

# Electric Power Transmission Facilities

in the

# Tehachapi Wind Resource Area

# Second Report

of the

## Tehachapi Collaborative Study Group

California Public Utilities Commission

OII 05-09-005
OII 00-11-001

**April 19, 2006**

**The report was re-printed in 2 volumes or electronic files on May 17, 2006:**

**Volume 1 contains the Second Report;**

**Volume 2 contains all Appendices**

# Second Report of the
# Tehachapi Collaborative Study Group

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# GLOSSARY

| | |
|---|---|
| ACE | Area Control Error |
| AGL | Above Ground Level |
| CAISO | California Independent System Operator |
| CEC | California Energy Commission |
| CEQA | California Environmental Quality Act |
| CFE | Comision Federal de Electricidad |
| CFERT | Center for Energy Efficiency and Renewable Technologies |
| COI | California-Oregon Interconnection |
| CPCN | Certificate of Public Convenience and Necessity |
| CPUC | California Public Utilities Commission |
| Definitive Plan | A transmission line and facilities specified well enough that it could be approved by regulatory agencies for ratemaking and construction, versus a Conceptual Plan. |
| EIR | Environmental Impact Report |
| FERC | Federal Energy Regulatory Commission |
| FS | Facility Study |
| Gen-tie | Transmission line connecting a generator to the grid |
| IID | Imperial Irrigation District |
| IOU | Investor Owned Utility |
| IVSG | Imperial Valley Study Group |
| kWh | Kilowatt-hour |
| Looping | Connecting a new third point between two existing points already connected. |
| MW | Megawatt |
| NERC | North American Electric Reliability Council |
| NP15 | North of Path 15 |
| PEA | Proponent's Environmental Assessment |
| PG&E | Pacific Gas & Electric |
| Phase Shifted Tie | Connection between PG&E and Edison requiring a special transformer |
| PPA | Power Purchase Agreement |
| PSP | Pumped Storage Plant to absorb surplus power by pumping water uphill to a reservoir and returning that power less losses to the grid at a later time. |
| RAS | Remedial Action Scheme |
| RMR | Reliability Must Run |
| ROW | Right Of Way |
| SCE | Southern California Edison Company |
| SDG&E | San Diego Gas & Electric Company |
| Sec 399.25 | Section of California Public Utilities Code |
| SIS | System Impact Study |
| SMUD | Sacramento Municipal Utility District |
| SPS | Special Protection System |
| TCSG | Tehachapi Collaborative Study Group |
| TTP | Tehachapi Transmission Project |
| WECC | Western Electricity Coordinating Council |

# The Tehachapi Wind Energy Project
# "Transmitting Tehachapi Energy to Consumers"

**Second Report**
**To the California Public Utilities Commission**
**From the**
**Tehachapi Collaborative Study Group**
**April 19, 2006**

# Executive Summary

## Introduction

When completed, the Tehachapi Wind Energy Project will capture large amounts of energy from the wind, transform it into electric energy and transmit this electricity to California consumers. In the next few years, thousands of modern wind turbines clustered in wind "farms" spread over more than one thousand square miles will be built in the Tehachapi region. The Tehachapi Project is expected to provide enough electric energy to satisfy the needs of nearly 2 million California homes. If developed to the extent forecast, it will produce more electrical power than any other generation project in California and supply about 5% of California's total electricity needs.

The infrastructure that comprises the Tehachapi Project consists of three essential components - the wind turbines themselves; power lines and equipment to collect electricity from turbines in the local area; and high voltage transmission facilities to reliably interconnect the wind generation with the existing California electricity grid and distribute this power to California consumers.

Permit applications for the initial transmission components of the Tehachapi Project already have been submitted to the CPUC and environmental reviews of these facilities are now underway. In addition, wind generation projects comprising more than half of the total expected project capacity have been submitted to the California Independent System Operator (CAISO) for interconnection studies. However, these projects require transmission facilities to be constructed to enable the electricity generated to reach consumers. Private investment is expected to provide the capital required for the project, estimated at $8 - $9 billion. Approximately $1 billion of that total represents the estimated cost of transmission facilities needed to connect the Tehachapi Project to the grid. The overall project cannot proceed until the CPUC establishes the mechanism by which the recovery of the $1 billion of transmission investments will be assured.

In Decision 04-06-010 (June 9, 2004), the California Public Utilities Commission (CPUC) requested that the Tehachapi Collaborative Study Group (TCSG) devise a comprehensive plan for the transmission lines, major substations, and other transmission infrastructure needed for the project. The first Preliminary Report from the TCSG was submitted to the Commission in March, 2005.[1] That report identified a number of alternatives for the

[1] Report of the Tehachapi Collaborative Study Group, March 16, 2005

transmission infrastructure and recommended further study to select the best among them. This second report narrows and refines the alternatives submitted last year and makes further recommendations to complete the planning process and facilitate detailed technical studies, approval and construction of the transmission facilities needed for the Tehachapi Project.

## Achieving Tehachapi Transmission Planning Goals

The primary goal of the TCSG is to devise a conceptual transmission plan that would allow the wind generation potential in Tehachapi, currently estimated at 4,500 MW, *over and above the 740 MW generation presently installed in the area*, to reach California consumers.[2] The TCSG has consensus agreement on the transmission facilities to provide access for approximately 3,000 MW, and has identified two main alternatives for providing access for the remaining 1,500 MW.

The TCSG also has the goal of providing its recommendations to the CPUC on a schedule that facilitates permitting and construction of needed facilities by 2010. Prior to the beginning of the TCSG process, Southern California Edison Company's (SCE) expert analysis had identified transmission facilities for initial phases of the Tehachapi plan. In its 2005 report, the TCSG agreed with SCE's recommendations which it referred to as Phases 1 and 2. Construction of these facilities is expected to accommodate about 1,600 MW of Tehachapi generation. Permitting is underway for the first 700 MW (Phase 1) of these facilities.

However, certificates of Public Convenience and Necessity (CPCN) for initial Phase 1 facilities have not yet been issued, and CPCN applications have not been filed for subsequent phases. As discussed below, the TCSG urges the CPUC to accelerate its permitting process in order to achieve the state's renewable energy goals.

Of the expected 4,500 MW of incremental capacity in the Tehachapi WRA, interconnection requests for Tehachapi wind projects totaling approximately 3,600 MW have already been submitted to the CAISO. In light of this, the TCSG believes that this indicates that transmission facilities to connect an additional 4,500 MW of Tehachapi generation are likely to be needed.

The TCSG believes that in developing a transmission plan for Tehachapi area generation, consideration should be given to a plan's potential to provide benefits to the State's transmission network, if possible, in addition to providing full grid access to potential Tehachapi wind generation. As discussed below, facilities being considered may provide network benefits and/or may negatively impact grid performance. Assessment and quantification of the potential network benefits and potential operational challenges will require additional assistance from the CAISO. In order to properly evaluate remaining alternatives, the TCSG therefore recommends that further Tehachapi transmission analysis be conducted under the auspices of the CAISO. The planning process also should

[2] The California Energy Commission provided the estimate of 4,500 MW of potential wind development in Tehachapi and nearby Antelope Valley, and the TCSG has used that value for planning purposes. This quantity is over and above the 740 MW presently operating at Tehachapi. In future references to generation at Tehachapi, it should be understood that the quoted value is incremental to what is there now. As of this report, projects totaling approximately 3,600 MW have been submitted to the ISO for interconnection approval, despite the lack of transmission access at the present time. Some observers believe eventual total wind generation in Tehachapi may be significantly larger than 4,500 MW.

determine which facilities of the final two phases (Phases 3 and 4) should be constructed first.[3]

## Connecting the Tehachapi Wind Resource Area (WRA) to the California Grid

The Tehachapi WRA lies at the southern end of the San Joaquin Valley in the mountainous region between Bakersfield and Mohave. Transmission connections between Tehachapi and the existing grid can be made to the west at the Midway substation near Buttonwillow and to the south at the Vincent substation near Lancaster.[4] Three existing transmission lines connect the Midway and Vincent substations, collectively referred to as Path 26.

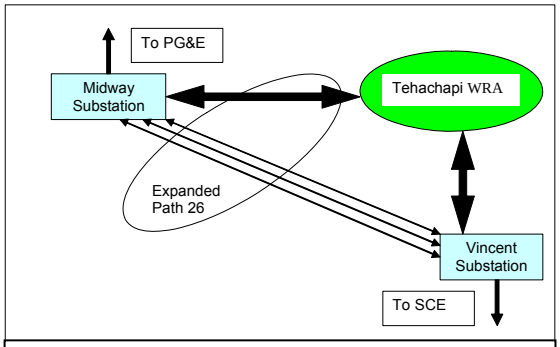


Figure 1 – First alternative – Expanded Path 26 option

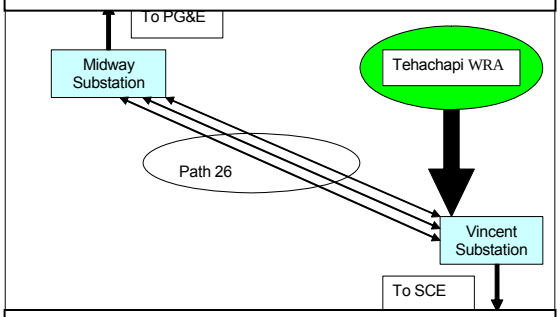


Figure 2 – Second alternative – Gen-tie option

Power lines from Tehachapi can connect at Midway, at Vincent, or at both substations.[5] The TCSG has considered two connection alternatives in detail, as described in Chapter 6. The first alternative connects Tehachapi at both Midway and Vincent as shown in Figure 1. The other alternative connects Tehachapi only at Vincent as shown in Figure 2.

Permit applications have been filed for the first transmission components which will connect Tehachapi to the Vincent substation with one 500 kV line. Two more 500 kV lines are expected to be needed to export 4,500 MW of wind power from the Tehachapi WRA to the existing state grid.[6]

A detailed comparison of the two alternatives is found in Chapter 6. Costs for the two plans are comparable, estimated to be in the neighborhood of $1 billion. A choice between the two alternatives hinges on benefits of each plan that the TCSG has not yet been able to quantify.

The salient feature of the alternative involving a new Midway – Tehachapi 500 kV line is that it comprises an additional link in Path 26, the major transmission artery connecting Northern and Southern California. The TCSG refers to this alternative as the Expanded Path 26 option. This configuration is expected to be considered a “network facility” which would provide two important benefits to the California grid, namely additional reliability, operating

[3] The phases identified in the 2005 TCSG report were for organizational purposes and did not imply that the Phase 3 facilities should necessarily be constructed prior to those discussed in Phase 4.
[4] This is a simplified description of the transmission connections. Other facilities and connections to the grid have been examined by the TCSG and are described in detail in Chapters 2 and 6.
[5] The two options discussed here appear to be the most likely alternatives among those studied by the TCSG,, but connections to other points may be considered by the ISO. See Chapter 2 for complete description of facilities and connections considered by the TCSG.
[6] For planning purposes, the TCSG assumes that all three of these lines will be operated by the investor owned utilities. However, there are also power lines in the region owned by the Los Angeles Department of Water and Power and by a private company. If substantial amounts of Tehachapi energy were to be transmitted on these lines, a third IOU line from Tehachapi might not be needed.

flexibility and additional import capacity into Southern California[7] when Tehachapi generation is low.[8]

The Expanded Path 26 option could complicate grid management, however, since some power from Tehachapi would flow on existing Path 26 lines and use some of the path transfer capacity. This could complicate grid operations as operators must consider these variable flows when scheduling power into Path 26.

The second alternative would provide Tehachapi with access to the grid only at the Vincent substation.[9] In this option, all three of the 500 kV lines necessary to export Tehachapi power would extend south from Tehachapi. Providing access to Tehachapi wind power would be the primary benefit of this alternative. Power lines which serve only to connect generation to the grid are referred to a "gen-ties", and the TCSG calls this plan the "Gen-tie option". The feasibility of constructing a third 500 kV line from the Tehachapi area to Vincent in the Gen-tie option may be complicated, however, due to the rapid urbanization of the Antelope Valley which lies between the Tehachapi and Vincent substations.

The TCSG supports the Commission's February 26, 2006, resolution to immediately pursue further environmental, engineering, cost, operational, regulatory, and other necessary studies that are needed to construct all the transmission facilities included in planning Phases 1, 2 and 3 of the 2005 report.

Resolution of the above issues related to reliability, grid operations, network benefits and costs will require the active assistance of the CAISO. The TCSG therefore recommends the following:

**Recommendation #1**
**The TCSG recommends that additional study of all Phase 3 and 4 alternatives discussed herein be conducted expeditiously under the auspices of the CAISO in a forum that is open and collaborative, similar to the TCSG process to date.**

## Financial and Cost Recovery considerations

The Tehachapi Project will require investment of substantial amounts of capital, estimated to be in the neighborhood of $8-$9 billion for the entire project. Transmission facilities in either of the options discussed above will require approximately $1 billion. No debt is expected to be incurred by the state for the Tehachapi Project; all of this capital is expected to come from private sources. In order to attract the required capital for the transmission facilities, however, the mechanism through which the investment will be repaid by electricity consumers must be firmly established.

The TCSG emphasizes that cost recovery issues are of utmost importance and must be resolved in order for the Tehachapi project to proceed, as further discussed in Chapter 7. The TCSG therefore recommends:

[7] Additional transmission facilities will be needed to transmit power to the SDG&E system.
[8] A frequent criticism of wind power is that "the wind doesn't blow all the time." A transmission plan that enables additional power transfers during periods of low wind generation would allow the CAISO to manage the variability of wind generation more easily.
[9] This is a simplified description. As described in Chapter 6, SCE's Antelope substation lies between Tehachapi and Vincent. Power exported south from Tehachapi might enter the grid either at Antelope or at Vincent substations.

**TCSG Recommendation #2**
**The TCSG urges the Commission to adopt a decision implementing the provisions of P.U. Code §399.25, by May, 2006, as scheduled in I.05-09-005, and ensure that all utility investments related to construction of Tehachapi transmission facilities will be recovered.**

**Streamlining CPUC Transmission siting and permitting process.**

In the I.05-09-005 proceeding, the utilities and other Parties have raised issues over the existing CPUC transmission permitting process. In response to these concerns, the CPUC developed preliminary recommendations and conducted a workshop on March 23, 2006 for further comments. The next step would be to implement streamlining measures that would facilitate transmission for renewables.

**TCSG Recommendation #3**
**TCSG urges the CPUC to consider and implement recommended streamlining approaches to the existing CPUC transmission permitting process.**

**Summary of the TCSG Cost/Benefit Analysis**

Economic evaluation of the transmission options is discussed in Chapter 2. Chapter 3 describes the CAISO cost analysis. Cost estimates for each of the facilities considered were obtained from Pacific Gas & Electric and Southern California Edison. The TCSG emphasizes that these estimates are preliminary. Facilities selected for construction will require further study in order to obtain firm estimates which will be conducted as part of the CPCN application process.

The CAISO provided the TCSG with its analysis of the various transmission options using production cost simulation computer modeling. The model dispatches the least cost generation facilities throughout the Western Interconnection (WECC) that are required to meet projected loads, consistent with projected transmission system capabilities. The analysis modeled Tehachapi wind power as a must-take resource similar to Qualifying Facilities, such that all of the incremental 4,500 MW plus the 700 MW of existing Tehachapi power is part of this generation mix.

Each transmission option considered by the TCSG changes the overall Western transmission system and therefore also changes the mix of dispatchable generation facilities chosen by the computer model. The model calculates the annual electricity production cost of the entire WECC for each option, and the difference between the annual production costs for each of the Tehachapi options studied provides a measure of the relative benefits.

For example, if WECC annual production cost for the transmission system with one choice of Tehachapi transmission facilities is $15 billion compared to $15.1 billion for another, the first choice is presumed to have benefits of lower cost relative to the second of $0.1 billion ($100 million) per year. For each alternative under consideration, the revenue requirement associated with the capital costs was calculated and added to the present value of the WECC production costs and operations and maintenance (O & M) costs over 50 years to

arrive at an overall economic assessment of the alternative. Each of the major options, together with the costs, is shown in Chapter 2, TABLE 2.1.

## Other facilities considered by the TCSG

As previously reported to the Commission, the TCSG considered a number of other transmission facilities. At the time of that preliminary report, several transmission options in addition to those described above had not been adequately evaluated due to the limited information available. The TCSG now believes it has sufficient information to exclude these options from further consideration as part of the Tehachapi Project.

The transmission lines that carry power north from the Midway substation are known as Path 15. With either of the transmission options described above, power flows on Path 15 are expected to be at the path limit for many hours during the year. That is, Path 15 is expected be "congested" some of the time[10], even though the capacity of Path 15 was recently expanded. The TCSG considered a variety of facilities that would reduce congestion on Path 15 that are expected to occur when the Tehachapi Project is connected to the grid.

As discussed in Chapter 3, the CAISO provided the TCSG with the results of its production simulations for all of the options considered. After weighing the costs of congestion on Path 15 against the cost of facilities that would relieve the congestion, the TCSG concluded that on this basis, these facilities are not cost effective additions to the grid at the present time for the sole purpose of delivering Tehachapi wind energy to Northern California load centers. However, analysis of their network benefits may suggest that they be reconsidered in the future.

Additional transmission facilities in northern California may be desirable for a variety of other economic and/or reliability reasons about which the TCSG has no information. The CAISO will determine all necessary interconnection-related upgrades required in accordance with Federal Energy Regulatory Commission (FERC) interconnection policy.
Another transmission facility examined by the TCSG at considerable length is described in Appendix 5. This facility, referred to by the TCSG as the "Fresno 230 kV Tie", would connect the Pacific Gas & Electric (PG&E) system to the Southern California Edison (SCE) Big Creek lines near Fresno. As described in the report, the Fresno 230 kV Tie facilities would allow a fraction of the electricity generated by the Tehachapi Project to bypass Path 15 and enter the PG&E system near Fresno, thereby reducing congestion on Path 15. As with other facilities in Northern California, the TCSG concluded that the Fresno 230 kV Tie is not a cost effective addition to the grid for the sole purpose of transmitting power from the Tehachapi Project to northern California load centers.

## Project Manager for Tehachapi

A project manager should be appointed to expedite implementation of the Tehachapi transmission infrastructure as explained in Section 7.4, below. Accordingly, the TCSG makes the following recommendation.

[10] Predominantly when power flows north of Midway are from South to North (primarily during off-peak hours).

**Recommendation # 4**
**The CPUC should work with the CEC, the legislature and key stakeholders to identify candidates for the position of Tehachapi Power Project manager. The project manager would engage stakeholders to establish a schedule for project implementation and work plan addressing every element of the transmission and generation development. The project manager would report progress to state agencies, stakeholders and the public quarterly.**

## Accelerating the Schedule

The March 2005 Report of the TCSG included a conceptual schedule for completing the Tehachapi transmission upgrades by December 2010. The 2005 schedule assumed that the CPCN applications for Phase 1 would be processed and approved by June 2006. It now appears that various delays in the CPCN approval process will cause those applications to be approved no earlier than December 2006. Although the 2005 conceptual schedule was described as "the fastest practicable schedule" for completing the plan by 2010, and time has been lost since, the TCSG believes that it may still possible to meet the 2010 completion goal if all of a number of aggressive actions to accelerate the process, fully described in chapter 8 and summarized briefly below, are taken.

The TCSG emphasizes the critical importance of completing Segments 1 and 2 of Phase 1 as soon as possible. These segments must be completed before Phase 2 construction can commence. Phase 2 is essential for all projects because they require the additional south-of-Antelope transmission capacity that this phase will provide.

**Recommendations:**
**Accelerate the CPCN review process for the Tehachapi upgrades by taking all of the specific actions described in Chapter 8;**
**Direct the Energy Division, utilities and other TCSG parties to develop a detailed schedule of specific tasks and parties responsible (the "who, what, when") that must be achieved if the larger milestones shown in Chart 8.2 are to be met (moving the schedule back if it is determined in this process that the 2010 completion goal is infeasible);**
**Direct the Energy Division to work with SCE to ensure that complete CPCN applications for Phases 2 and 3 be filed as soon as possible;**
**Expedite the CPCN approval process for future phases by proposing, on the Commission's own motion, without evidentiary hearings, a finding that Phases 2 and 3 are needed to facilitate the achievement of RPS goals.**

## Summary of Recommendations

**Recommendation #1**
**The TCSG recommends that additional study of all Phase 3 and 4 alternatives discussed herein be conducted expeditiously under the auspices of the CAISO in a forum that is open and collaborative, similar to the TCSG process to date.**

**TCSG Recommendation #2**
**The TCSG urges the Commission to adopt a decision implementing the provisions of P.U. Code §399.25, by May, 2006, as scheduled in I.05-09-005, and ensure that all utility investments related to construction of Tehachapi transmission facilities will be recovered.**

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**TCSG urges the CPUC to consider and implement recommended streamlining approaches to the existing CPUC transmission permitting process.**

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**The CPUC should work with the CEC, the legislature and key stakeholders to identify candidates for the position of Tehachapi Power Project manager. The project manager would engage stakeholders to establish a schedule for project implementation and work plan addressing every element of the transmission and generation development. The project manager would report progress to state agencies, stakeholders and the public quarterly.**

**Recommendation # 5**
**All aggressive actions to complete the Tehachapi transmission upgrades by December 2010 should be taken now. It is critical to complete Segments 1 and 2 of Phase 1 as soon as possible because they must be completed before Phase 2 construction can commence. Phase 2 is essential for all projects because they require the additional south-of-Antelope transmission capacity that this phase will provide.**

# CHAPTER 1 - INTRODUCTION

## 1.1 Background

On June 9, 2004, as part of Proceeding I.00-11-001, the administrative law judge issued Decision 04-06-010 entitled “Interim Opinion on Transmission Needs in the Tehachapi Wind Resource Area”. It called for “a collaborative study group to develop a comprehensive transmission development plan for the phased expansion of the transmission capabilities in the Tehachapi area.” The plan was to be incorporated in a report to be submitted on March 9, 2005. The submittal date was later changed to March 16, 2005.

## 1.2 The Tehachapi Collaborative Study Group (TCSG)

The Decision cited above further stipulated that the plan was to be the product of a study group, coordinated by Commission staff, assisted by the CAISO with SCE, PG&E, wind developers and other interested parties “…to participate in the collaborative study process.” In compliance with this order, the Tehachapi Collaborative Study Group (TCSG) was formed.

## 1.3 The March 16, 2005 Report

The underlying assumption guiding this stage of the planning was that approximately one half of the output from Tehachapi would flow to PG&E and the other half to SCE.

A second assumption was made that the average capacity added by each of the three 500 kV lines is approximately 1,500 MW. Based on these two principles, the transmission planning departments at PG&E and SCE produced alternatives for delivering 4,000 MW of incremental generation from Tehachapi proper and 500 MW from the adjoining Antelope Valley, with 2,000 MW going to PG&E. The path to PG&E was either from Tehachapi to SCE’s Vincent Substation and thence over the existing three 500 kV circuits that comprise Path 26, or over a 500 kV line from Tehachapi to PG&E’s Midway Substation or Gregg Substation plus Tehachapi-Vincent-Path 26.

PG&E presented two alternatives: in one, a 500 kV line from Midway to Los Banos Substation (a fourth circuit on Path 15) plus a 500 kV line from Los Banos to Tesla Substation in the Bay Area, the Tehachapi generation to Midway is delivered over Path 26. And in the second, a 500 kV line from Tehachapi to Gregg Substation in the Fresno area to Tesla Substation, the Tehachapi generation is delivered in part directly to Gregg and in part to Midway over Path 26.

SCE presented four alternatives, designated 1, 2, 3 and 10, each with three 500 kV lines out of Tehachapi. Alternative 1 has a line from Tehachapi to Midway and two 500 kV lines from Tehachapi to SCE’s Antelope Substation, north of Vincent; Alternative 2 has all three 500 kV lines to the SCE grid, with two lines to Antelope and one directly to Vincent. Alternatives 3 and 10 are variations on Alternative 1 with internal differences on the SCE system.

In addition, a 230kV tie between the SCE and PG&E networks in the Fresno area was studied. The tie would deliver Tehachapi generation to PG&E from Tehachapi to Antelope and thence over existing 230 kV lines from Antelope to Big Creek Substation with a phase shifted tie from these lines to PG&E's Helms-Gregg lines. The capacity of the tie would be 300 MW or more, depending on the extent of upgrades to the SCE system. This alternative would supplement Path 26 flow and could deliver generation to PG&E with a minimum of transmission upgrades. It could be a feasible alternative if Tehachapi development did not exceed 2,000 MW.

A phased development of the transmission infrastructure was proposed, consisting of:

Phase 1: Antelope-Pardee, Antelope-Vincent and Tehachapi-Antelope 500 kV lines operated at 230 kV. Deliverability of Tehachapi and Antelope Valley generation is 700 MW.

Phase 2: Upgrade Antelope-Mesa 230 kV line to 500 kV with connection to Vincent Substation, operated at 230kV. Deliverability of Tehachapi and Antelope Valley generation increases to 1,600 MW.

Phase 3a: A second 500 kV line between Tehachapi and Antelope Substations operated at 230 kV. Deliverability of Tehachapi and Antelope Valley generation increases to 2,350 MW.

Phase 3b: 500kV yards are added at Tehachapi, Pardee and in Alternatives 1 and 2 at Antelope Substations and the 500 kV lines previously operated at 230 kV are operated at rated voltage. Deliverability of Tehachapi and Antelope Valley generation increases to 3,300 MW.

Phase 4: A 500 kV line from Tehachapi to Midway and the first of PG&E's alternatives is implemented, or the second PG&E alternative is implemented. Deliverability of Tehachapi and Antelope Valley generation increases to 4,500 MW.

The capital cost of every transmission component was estimated and the cost of the alternatives was calculated. A schedule for implementation of the Tehachapi infrastructure in time to meet the Energy Action Plan 2010 target was prepared.

When all this material had been put together, the study group ran out of time. The information was presented in the report with the conclusion "The TCSG was unable to formulate a definitive transmission plan in the time available. Alternatives for the connection of Tehachapi generation to the network and alternative network upgrades to transmit the generation to load centers in the PG&E and SCE service areas have been defined. Further study is required to select among these alternatives a definitive plan for implementation."

## 1.4 Start of Second TCSG Study

The recommendation above was implemented by means of letters dated March 30, 2005 from the Director of the Energy Division of the CPUC to PG&E, SCE and the CAISO. The letters requested that the representatives from these agencies to the TCSG continue to work on to the second phase of the study and established a deadline for a second report on March 1, 2006. The request for personnel participation was granted and TCSG members

from CEERT, CalWEA, and the wind industry have also stayed on, so that the original team has been maintained virtually intact.

## 1.5 Study Plan # 2

Highlights of the plan, as reproduced in Appendix A, for the second stage of the study include:

- Refinement of power flow studies, particularly for the Fresno Tie project
- PG&E revised its second alternative from Tehachapi-Gregg-Tesla to Tehachapi-Midway-Gregg-Tesla (SCE's Alternative 1 contains Tehachapi-Midway).
- The CAISO committed to doing a production simulation study of the alternatives in which Tehachapi wind would be dispatched in accordance with recorded wind flow patterns for the area and other generation based on economics. Tehachapi generation would flow into the system as determined by network configuration and the non-Tehachapi generation that was dispatched, rather than assigning a set proportion of Tehachapi generation to a given area. That is, the requirement that 2,000 MW be transmitted to PG&E would no longer hold. In addition, the new 500 kV lines could be loaded up to 3,400 MW, the thermal rating of Edison's 500 kV lines.
- The recommended alternative, or set of alternatives would be selected based on economics: from the capital costs, the utilities' revenue requirements would be calculated, to which would be added the present value over the life of the projects of the O & M costs and, as obtained from the production simulation study, the present value over the life of the projects of the incremental cost over the cost of the alternative, or set of alternatives, whose cost was the least. A spread sheet would be made showing all the cost elements for each of the alternatives, or set of alternatives, and the ranking of the set based on least cost.

# CHAPTER 2 - PROCESS TO EVALUATE ALTERNATIVES

## 2.1 Introduction

The power flow studies done by PG&E and SCE have defined a number of alternatives equally capable of delivering the full incremental 4,500 MW of Tehachapi generation to load centers. To choose among them the principal criterion is economics: which alternative or combination of alternatives will do the job for the least cost. Since this cost is on the order of $1 billion, a careful evaluation is justified.

The recommended alternative, or set of alternatives would be selected based on economics: from the capital costs, the utilities' revenue requirements would be calculated, to which would be added the present value over the life of the projects of the O & M costs and, as obtained from the production simulation study, the present value over the life of the projects of the incremental cost over the cost of the alternative, or set of alternatives, whose cost was the least. A spread sheet would be made showing all the cost elements for each of the alternatives, or set of alternatives, and the ranking of the set based on least cost.

## 2.2 Calculation of Project Cost

There are three components to the cost of each project or alternative or combination of alternatives: the utility's revenue requirement for the construction of the facility, the operation and maintenance costs for the facility over the life of the project and the electric system operating costs over the life of the project. This third component consists of network losses, congestion payments and generation, not including Tehachapi generation, which is assumed to be taken as available (as the wind blows) and is therefore the same for all projects. The present value of the operation and maintenance costs and the present value of the production costs are added to the revenue requirement to obtain the total cost of the project over its economic life. If only economics are taken into consideration, the least-cost project is preferred.

## 2.3 Elements of Economic Evaluation

Capital Cost: The actual amount paid for engineering, construction, interest during construction. These costs were estimated by the utilities and are given in Appendices 2 and 3. An exception is the cost of the Tehachapi-Midway transmission line, which was estimated by the TCSG Cost Subgroup, whose report is contained in Appendix 8. It should be emphasized that these estimates are preliminary. Facilities selected for construction will require further study in order to obtain firm estimates. The cost of acquisition of rights-of-way is especially uncertain, since routes cannot be finalized until environmental reviews have been completed. Moreover, some routes must pass through regions undergoing rapid urbanization, making future acquisition costs difficult to predict. In addition, the two utilities use different methodologies for making their estimates, making comparison difficult. Nevertheless, the TCSG believes that the capital cost estimates are adequate for the purposes of comparison of alternatives.

To cover the capital cost, the utilities have a "revenue requirement", which is obtained by applying a multiplier to the capital cost to take into account return on capital, taxes, insurance, administration and depreciation. This multiplier was calculated as follows. In the CAISO Board Report of 2/24/05 on the PVD2 project, SCE's "real economic carrying charge for transmission" is 10.43%, which is a value applicable to a capital cost to obtain stream of annual costs. To convert this to a multiplier applicable to a single cost, its present value based on SCE's assumed rate of return of 7.16%[11] and a project life of 50 years was calculated to be 1.41.

The transmission facility is assumed to go on line in 2010, but all costs are calculated for 2005, therefore the present value of the revenue requirement for 2010 is calculated for 2005, based on the 7.16% rate of return and 5 years, which yields a multiplier of 0.708.

Annual operating and maintenance is assumed to be 1% of the capital cost. Its present value is based on a project life of 50 years starting in 2010 and projected to 2005 with a 7.16% discount rate.

The production costs were calculated by the CAISO using a production cost simulation program, described in Chapter 3, below. For the purpose of comparing projects, the incremental costs over the lowest cost project or scenario were used. The present value of the annual incremental cost based on a 50 year project life beginning in 2010 and projected to 2005 with an interest rate of 7.16% was calculated.

## 2.4 Study Scenarios

The scenarios designated on TABLE 2.1 below, are a subset of those analyzed in Chapter 3. Each of the scenarios below would accommodate the full Tehachapi projected output. See FIGURES 2.1 through 2.6 below.

| | |
|---|---|
| Scenario E, FIGURE 2.1: SCE Alternative 1 | 500kV lines, two from Tehachapi to Antelope to Vincent, one from Antelope to Pardee, one from Tehachapi to Midway. |
| Scenario F, FIGURE 2.2: SCE Alternative 1 with PG&E Alternative 4 | 500kV lines, two from Tehachapi to Antelope to Vincent, one from Antelope to Pardee, one from Tehachapi to Midway to Los Banos to Tesla. |
| Scenario G, FIGURE 2.3: SCE Alternative 2, PG&E Alternative 4 | 500kV lines, two from Tehachapi to Antelope to Vincent, one from Antelope to Pardee, one from Tehachapi to Vincent, one from Midway to Los Banos to Tesla. |
| Scenario G-NNM, FIGURE 2.4: SCE alternative 2 | 500kV lines, two from Tehachapi to Antelope to Vincent, one from Antelope |

[11] See Note 2 of TABLE 2.1

| | |
|---|---|
| | to Pardee, one from Tehachapi to Vincent. |
| Scenario I, FIGURE 2.5: SCE Alternative 1 with PG&E Alternative 5 | 500kV lines, two from Tehachapi to Antelope to Vincent, one from Antelope to Pardee, one from Tehachapi to Gregg to Tesla. |
| Scenario J, FIGURE 2.6: SCE Alternative 2 with PG&E Alternative 6 | 500kV lines, two from Tehachapi to Antelope to Vincent, one from Antelope to Pardee, one from Tehachapi to Vincent, one from Midway to Gregg to Tesla. |

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## 2.5 RESULTS

The results given in TABLE 2.1 provide a cost comparison of the transmission alternatives examined to integrate the full incremental 4,500 MW of Tehachapi wind generation. As can be seen, the production cost simulations differ slightly when comparing simulations that take into account the full WECC area with those that consider only the CAISO controlled area. These differences are minimal. Noteworthy is the fact that the projects with the lower production costs (F, G, I, J) have large infrastructure investments which make them more costly overall than the low infrastructure investment projects, E and G-NM. Based on the cost comparison, SCE's Alternative 2 with PG&E's Alternative 1 (shown on TABLE as Scenario G-NM) was found to be the alternative with the lowest total cost. SCE's Alternative 1 with PG&E's Alternative 1 (shown on TABLE as Scenario E) was found to be the alternative with the second lowest total cost. The total cost of these two is probably within the accuracy of the calculations and can therefore be considered equal on an economic basis. The remaining alternatives resulted in a total cost increase ranging from $870 million to $1.22 billion as compared to the lowest cost alternative.

# TABLE 2.1 COST COMPONENTS OF TRANSMISSION ALTERNATIVES

PRODUCTION COST COMPONENT FOR ALL WECC AREA COMPARED TO CAISO AREA ONLY

| COST COMPONENT | MULTIPLIER | CAISO PRODUCTION COST RUN | | | | | |
|---|---|---|---|---|---|---|---|
| | | E F | | G | G-NM (10) | I | J |
| SINGLE LINE DIAGRAM | | 2.1 | 2.2 | 2.3 | 2.4 | 2.5 | 2.6 |
| CAPITAL $1,090 | | | $2,015 | $1,863 | $938 | $2,060 | $1,908 |
| COST (1) | | | | | | | |
| REVENUE 1.41 REQUIREMENT (2) | | $1,538 | $2,843 | $2,628 | $1,323 | $2,907 | $2,692 |
| PV REVENUE | 0.708 | $1,089 | $2,012 | $1,860 | $937 | $2,057 | $1,905 |
| REQUIREMENT (3) | | | | | | | |
| ANNUAL O & M | CAPITAL COST *0.01 | $11 | $20 | $19 | $9 | $21 | $19 |
| PV ANNUAL | 12.61 | $137 | $254 | $235 | $118 | $260 | $241 |
| O & M (4) | | | | | | | |
| INCREMENTAL PRODUCTION COST (5) | | | | | | | |
| ALL WECC AREA | | $8 | $8 | $3 | $16 | $13 | $0 |
| ISO AREA ONLY | | $16 | $0 | $15 | $27 | $11 | $15 |
| PV INCREMENTAL PRODUCTION COST (6) | | | | | | | |
| ALL WECC AREA | 12.61 | $101 | $101 | $38 | $202 | $164 | $0 |
| ISO AREA ONLY | 12.61 | $202 | $0 | $189 | $340 | $139 | $189 |
| TOTAL COST (7) | | | | | | | |
| ALL WECC AREA | | $1,327 | $2,366 | $2,132 | $1,257 | $2,481 | $2,145 |
| ISO AREA ONLY | | $1,428 | $2,266 | $2,283 | $1,395 | $2,455 | $2,335 |
| DIFFERENCE FROM LOWEST COST (9) | | | | | | | |
| ALL WECC AREA | | $70 | $1,110 | $876 | $0 | $1,224 | $889 |
| ISO AREA ONLY | | $33 | $870 | $888 | $0 | $1,060 | $939 |
| RANK (8) | | | | | | | |
| ALL WECC AREA | | 2 | 5 | 3 | 1 | 6 | 4 |
| ISO AREA ONLY | | 2 | 3 | 4 | 1 | 6 | 5 |

# NOTES TO TABLE 2.1

NOTES

1: Construction cost estimated by SCE or PG&E in 2005 M$, includes AFUDC.

2: Construction cost plus taxes, insurance, administration and depreciation (2005 M$) based on PVD2 CAISO 2/24/05 Board Report: rate of return = 7.16%, "'real economic carrying charge rate for transmission" = 10.43%. Present value in 2010 of 10.43% at 7.16% discount rate for 50 years is 1.41 per formula shown below. (((1+0.0716)^50-1)/((1+0.0716)^50*0.0716)*0.1043

3: Present value in 2005 of annual revenue requirement in 2010, discount rate at 7.16% per formula shown below. 1/(1+0.0716)^5

4: Present value in 2005 of annual O & M for 50-year project life starting in 2010 at 7.16% discount rate, inflation assumed at 2% per year per formula shown below. (((1+0.0716-0.0200)^50-1)/((1+0.0716-0.200)^50*(0.0716-0.0200)))*(1/(1+0.0716)^5)

5: WECC-wide annual production cost (2005 M$) minus annual production cost of lowest cost alternative (Run J),

6: Present value in 2005 of annual incremental production cost for 50-year project life starting in 2010 at 7.16% discount rate, inflation assumed at 2% per year per formula shown below. (((1+0.0716-0.0200)^50-1)/((1+0.0716-0.200)^50*(0.0716-0.0200)))*(1/(1+0.0716)^5)

7: Sum of present value of revenue requirement plus present value of O &M plus present value of incremental production cost.

8: Cost ranking starting with lowest cost alternative

9: Increase of total cost over total cost of lowest cost alternative.

10. Tehachapi-Midway rated 3400MW.

11. Same as G, except no PG&E upgrade.

## CAPITAL COSTS

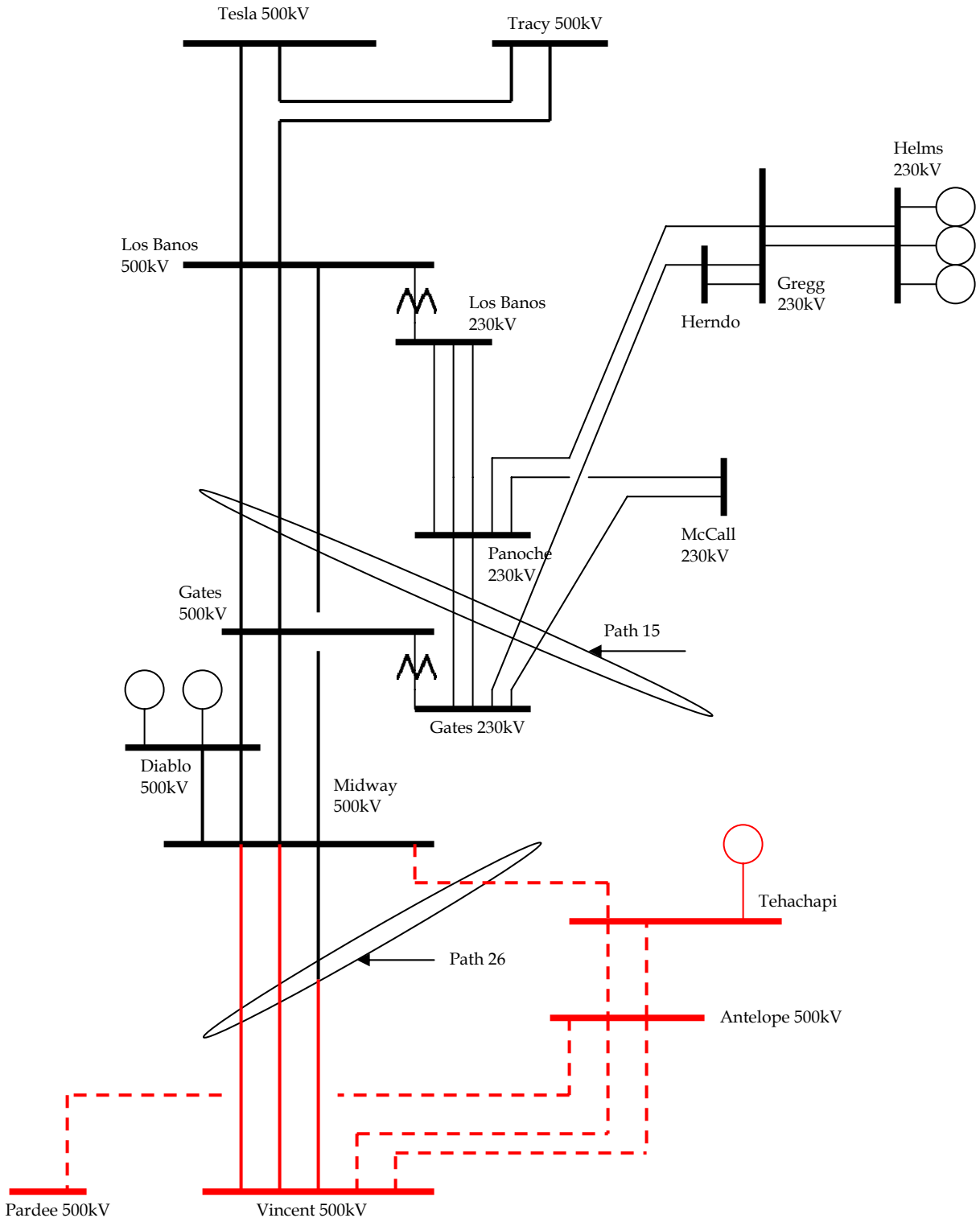
2005 M$, includes AFUDC

| COST COMPONENT | CAPITAL COS |
|---|---|
| Antelope-Pardee 500kV line | 80.3 |
| Antelope-Vincent 500kV line | 63.6 |
| Antelope-Tehachapi 500kV line | 99.5 |
| Upgrade Antelope to 500kV: one 1000MVA, 500-230kV transformer | 37.5 |
| Upgrade Pardee to 500kV: one 1000MVA, 500-230kV transformer | 37.5 |
| Upgrade Tehachapi to 500kV: four 1000MVA, 500-230kV transformers | 150 |
| Sum of Phase 1 additions at 500kV | 468.4 |
| Phase 2: Upgrade Antelope-Mesa line with Antelope-Vincent segment at 500kV | 145 |
| Upgrade Vincent Substation: add 500kV transformer bank and terminations and shunt capacitors | 62.1 |
| Tehachapi-Vincent 500kV line | 163.1 |
| Tehachapi-Midway 500kV line at 3400MVA | 315.4 |
| Tesla-Los Banos-Midway 500kV line | 924.4 |
| Tesla-Gregg-Midway 500kV line | 969.8 |

| CAISO ALTERNATIVE | |
|---|---|
| E1: Phase 1 at 500kV, Phase 2, Upgrade Vincent Substation, Second Antelope-Tehachapi 500kV line, Tehachapi-Midway 500kV line at 3400MVA | 1090.4 |
| F: Phase 1 at 500kV, Phase 2, Second Antelope-Tehachapi 500kV line, Tesla-Los Banos-Midway 500kV line, Upgrade Vincent Substation, Tehachapi-Midway 500kV line at 3400MVA | 2014.8 |
| G: Phase 1 at 500kV, Phase 2, Second Antelope-Tehachapi 500kV line, Tesla-Los Banos-Midway 500kV line, Upgrade Vincent Substation, Tehachapi-Vincent 500kV line | 1862.5 |
| GNNM: Phase 1 at 500kV, Phase 2, Second Antelope-Tehachapi 500kV line, Upgrade Vincent Substation, Tehachapi-Vincent 500kV line | 938.1 |
| I: Phase 1 at 500kV, Phase 2, Second Antelope-Tehachapi 500kV line, Tesla-Gregg-Midway 500kV line, Upgrade Vincent Substation, Tehachapi-Midway 500kV line | 2060.2 |
| J: Phase 1 at 500kV, Phase 2, Second Antelope-Tehachapi 500kV line, Tehachapi-Vincent 500kV line, Upgrade Vincent Substation, Tesla-Gregg-Midway 500kV line | 1907.9 |

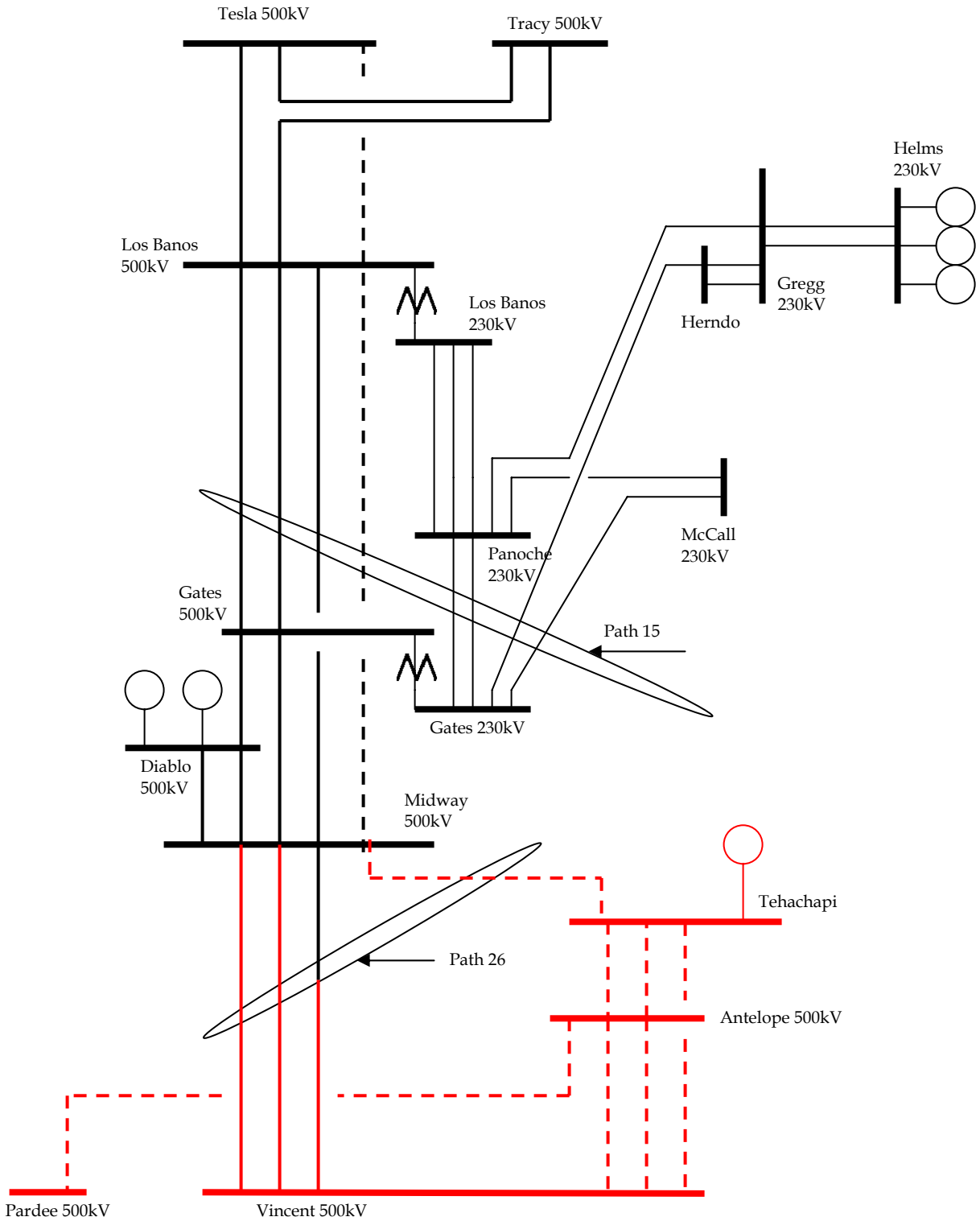
## FIGURE 2.1: Scenario E

Existing: solid lines
New: dotted lines
PG&E: black
SCE: red



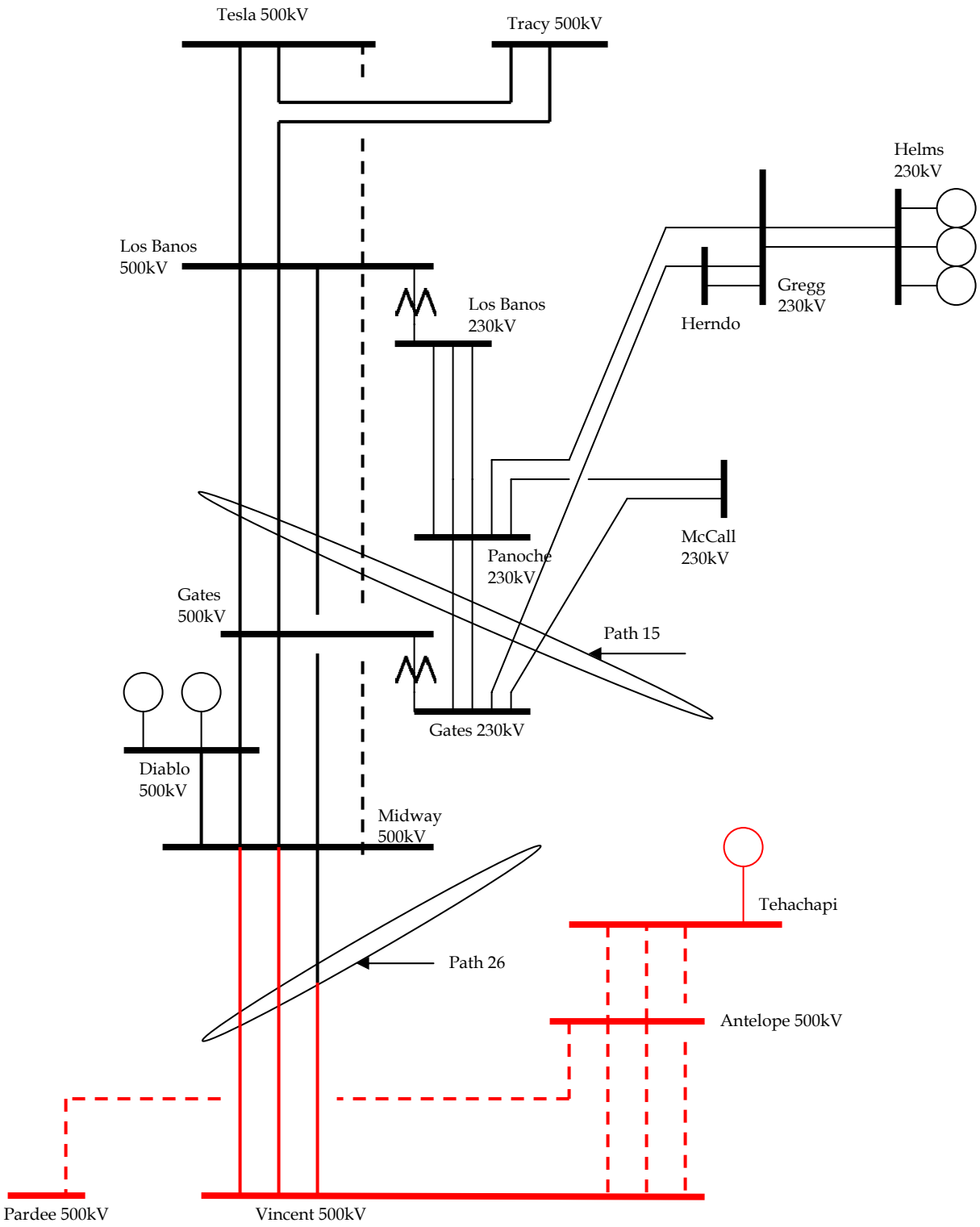
## FIGURE 2.2: Scenario F

Existing: solid lines
New: dotted lines
PG&E: black
SCE: red



## FIGURE 2.3: Scenario G

Existing: solid lines
New: dotted lines
PG&E: black
SCE: red



## FIGURE 2.4: Scenario G-NM

Existing: solid lines
New: dotted lines
PG&E: black
SCE: red

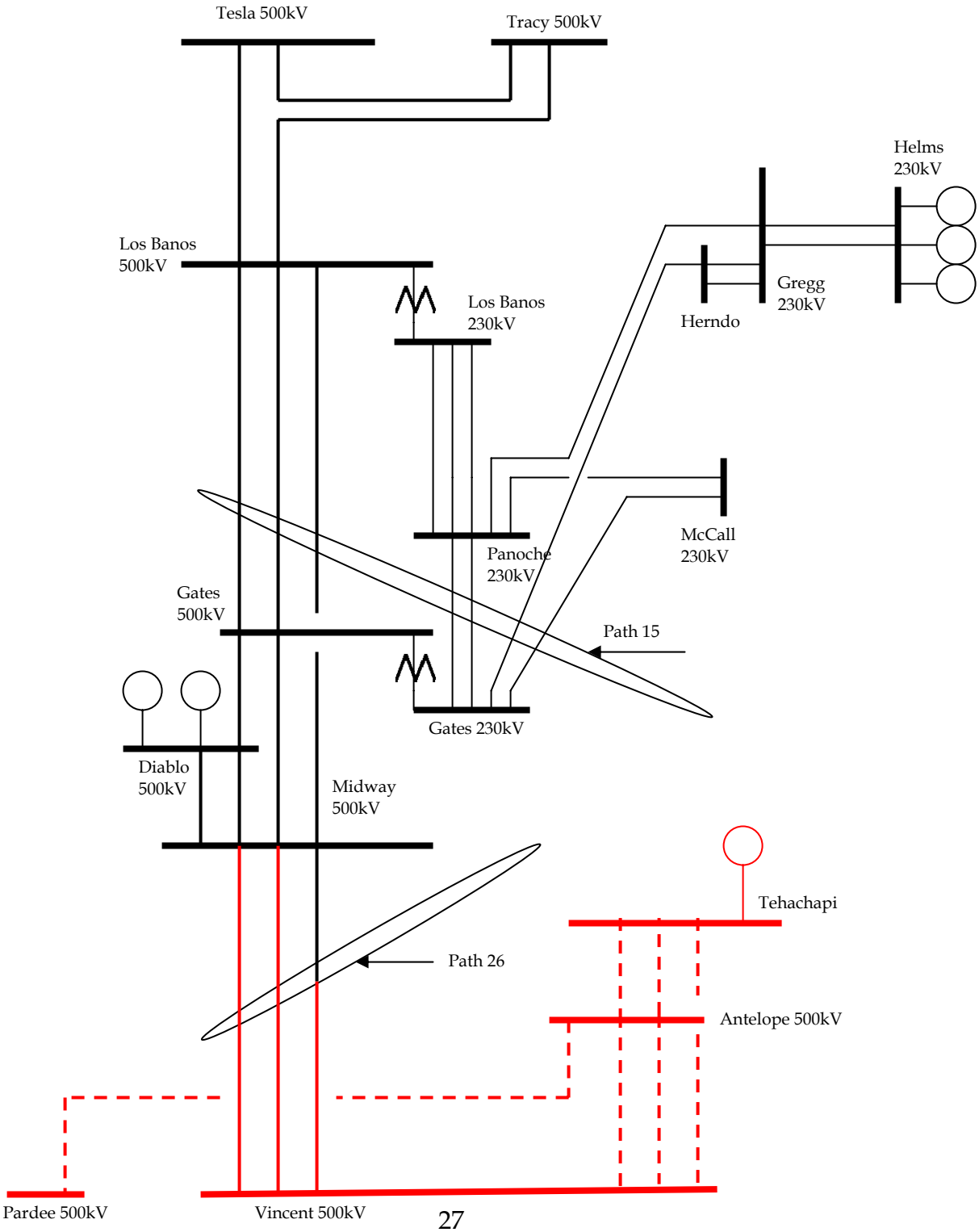


**FIGURE 2.5: Scenario I**

Existing: solid lines
New: dotted lines
PG&E: black
SCE: red

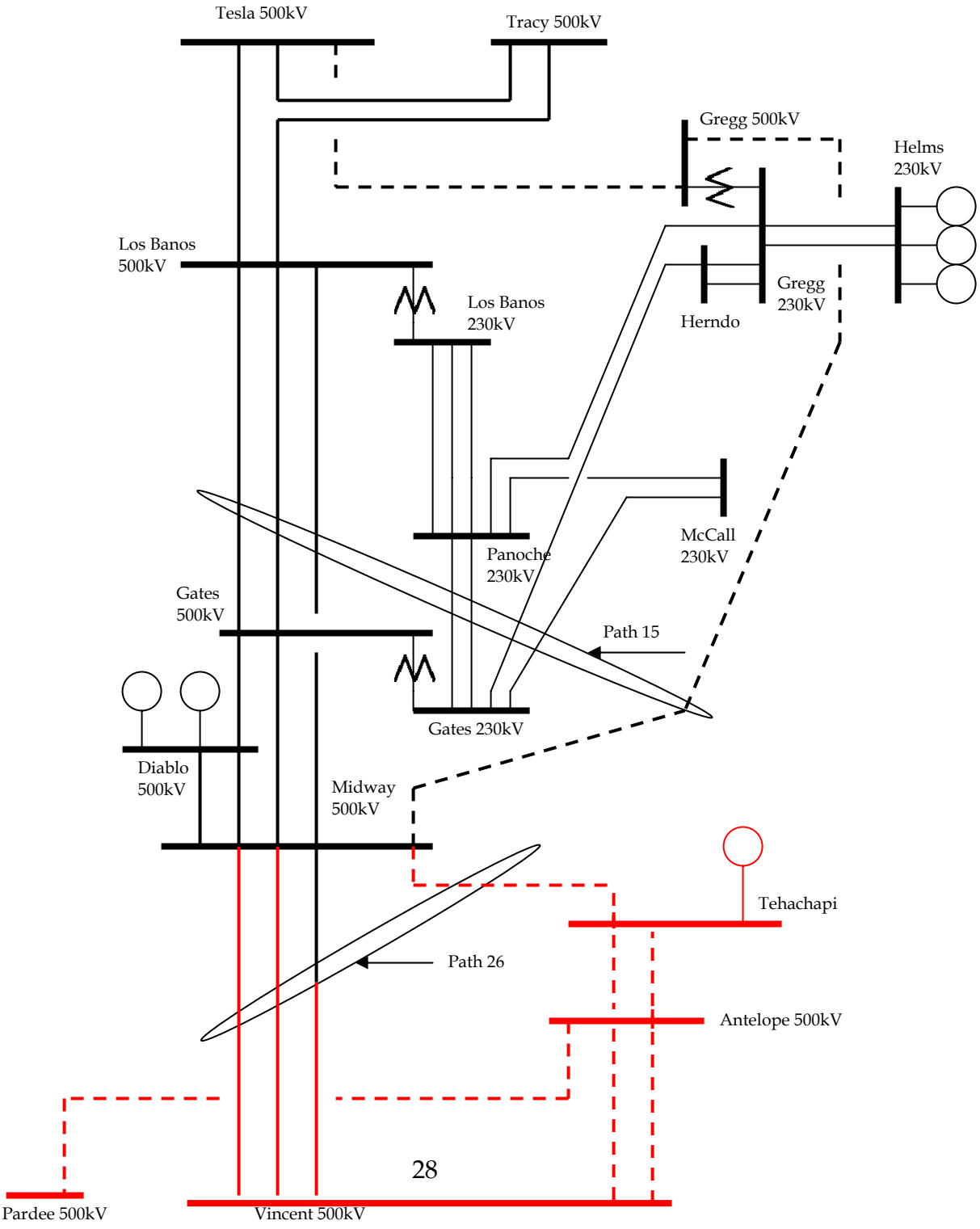
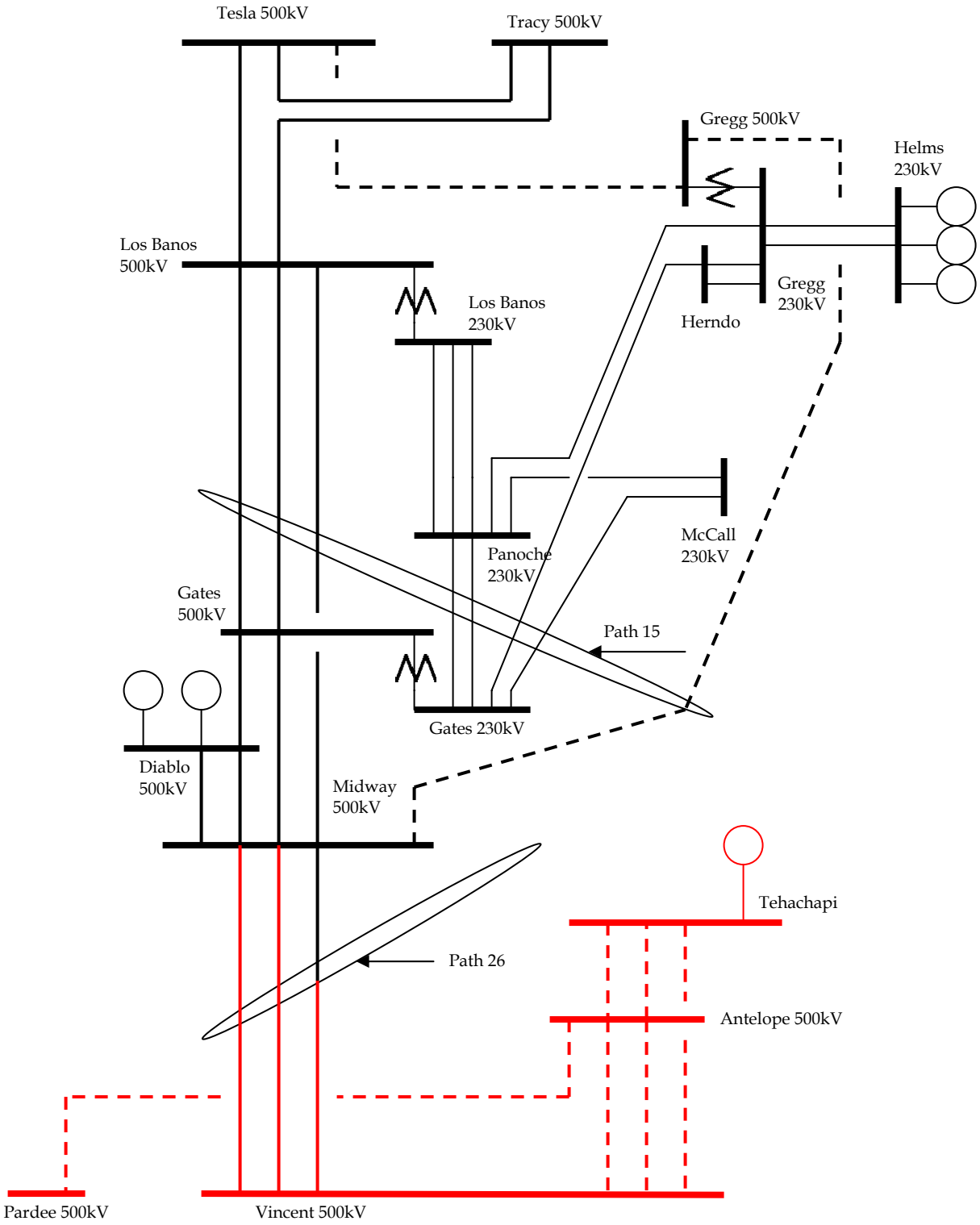


**FIGURE 2.6: Scenario J**

Existing: solid lines
New: dotted lines
PG&E: black
SCE: red



# CHAPTER 3 - PRODUCTION SIMULATION STUDIES BY CAISO

## 3.1 Background

As part of the TCSG study plan, the CAISO was requested to perform production cost modeling to determine production costs, congestion costs and system losses associated with the various transmission alternatives. The production cost simulation software provides an economic optimization of generation dispatches to minimize the total hourly production cost for the transmission system that is subject to generation, transmission and operational constraints modeled. The output of the production simulation tool was processed to estimate the comparative production cost, and any loss and congestion savings of each of the alternatives. The purpose of this portion of the study was to help determine any significant differences and provide a relative ranking of the transmission alternatives developed by the TSCG.

Productions cost simulations were performed to determine the annual production costs of the entire WECC system for the various alternatives being considered to incorporate 4,500 MW of incremental wind potential in the Tehachapi area. In addition, the annual results for California participants were determined to provide a California area perspective. The analysis was used to compare differences in the WECC production costs, power losses and congestion hours resulting from the alternative transmission configurations being considered. The analysis did not consider other potential benefits such as reduction in reliability-must-run generation cost, reduction in emission and increased operational flexibility. It should also be noted that potential concerns involved with the intermittency of wind and its potential impacts on system operation such as regulation and reserve are not part of this evaluation.

The 2008 SSG-WI (Seams Steering Group-Western Interconnection) base case developed by SSG-WI Planning Work Group (PWG) and also used in the recent Imperial Valley Study[12] was used as a starting case to maintain consistent assumptions between similar studies. The SSG-WI base case was modified with the CAISO load level to reflect forecasted 2010 conditions. In addition, new transmission projects in southern California that are approved and planned to be online by 2010 were included in the model. The analysis is based on all lines in service and does not consider any contingency or loss of facility conditions. Appendix 4 summarizes the study assumptions used, including the transmission and operational constraints applied in the simulations to optimize system operations.

## 3.2 Study Scenario Descriptions

CAISO evaluated the study scenarios provided by the TCSG which are described in the Study Plan #2 of Appendix 1 and based on the Tehachapi transmission alternatives documented in the TCSG March 16, 2005 report. Various levels of incremental Tehachapi wind output from 0 MW, 1,600 MW, 3,300 MW and 4,500 MW were modeled to assess the differences in the annual production costs and were used to help determine a relative ranking of the transmission configurations proposed. Sensitivities to combining PG&E alternatives with SCE alternatives

[12] Development Plan for the Phased Expansion of Transmission to Access Renewable Resource in the Imperial Valley, dated September 30,2005

were performed to determine if additional reinforcements on the PG&E system north of Midway would be economic and what optimum combination, if any, could be identified. The analysis also considered a 300 MW, 500 MW and a 600 MW 230 kV phase shifted tie (Phase angle regulator – PAR) in the Fresno area interconnecting SCE's Big Creek 230 kV transmission system with PG&E's Helms 230 kV transmission and was based on thermal analytical analysis discussed in Chapter 4. The Fresno tie was analyzed to see if it could provide any potential incremental benefits with coordinating the Tehachapi wind generation and the existing Helms pumped storage facility. Not all sizes of the Fresno PAR were investigated for the scenarios.

TABLE 3.1 summarizes the scenarios[13] based on the progressive phases of the conceptual transmission plans and combinations of transmission alternatives developed to accommodate a potential of up to 4,500 MW of incremental wind in the Tehachapi and Antelope Valleys.

Chapter 2 and Appendix 4 provide figures to illustrate the transmission configurations.

## TABLE 3.1 Study Scenarios Reviewed

| **Alternative** | | | |
|---|---|---|---|
| **PG&E** | **SCE** | | |
| **0 MW Incremental Tehachapi Area Wind Generation** | | | |
| SCE Phase 1 Facilities | | A | Existing system after completion of SCE's Phase 1 Facilities (Segments 1, 2 & 3: Antelope-Vincent, Antelope-Pardee). Build at 500 kV operate at 230 kV |
| | | B | Scenario A with a Fresno phase shifter (+/- 600 MW capability assumed) |
| **1600 MW Incremental Tehachapi Area Wind Generation** | | | |
| SCE Phase 1 & 2 Facilities | | C | Scenario A with Phase 2 Facility Upgrades (Vincent-Mesa 230 kV, Antelope-Vincent built at 500 kV operate at 230 kV) |
| | | D | Scenario C with Fresno 230 kV tie (Phase shifter, +300, +500, +600 MW, +/-600 MW capabilities) |
| **Alternative** | | | |
| **PG&E** | | | |
| **3300 MW Incremental Tehachapi Area Wind Generation** | | | |
| 4 1 | | K | 500 kV Tesla-Los Banos-Gates-Midway-Tehachapi with 2 Tehachapi-Antelope, Antelope-Vincent, Antelope-Pardee |
| 5 - Phase 1 | 1 | L | 500 kV Tesla-Gregg-Tehachapi with 2 Tehachapi-Antelope, Antelope-Vincent, Antelope-Pardee |
| 4 1 | | M | Tesla-Los Banos-Gates-Midway 500 kV with Fresno 230 kV tie, two 500 kV lines Tehachapi-Antelope |

[13] Scenario lettering corresponds to Study Scenarios outlined in Chapter 2 and in Study Plan #2.

| | | | |
|---|---|---|---|
| 5C 1 | | N | Tesla-Gregg 500 kV with Fresno 230 kV tie, two 500 kV lines Tehachapi-Antelope |
| **4500 MW Incremental Tehachapi Area Wind Generation, Without Fresno 230 kV Tie**<br>**No North of Midway Reinforcements** | | | |
| - | 1 E | | Scenario C with Tehachapi-Midway 500 kV, SCE Phase 1 & 2 Facilities operated at 500 kV |
| - | 2 | G-NM | 500 kV lines -3 Tehachapi-Antelope, 2 Antelope-Vincent, Antelope-Pardee |
| **4500 MW Incremental Tehachapi Area Wind Generation, Without Fresno 230 kV Tie**<br>**With North of Midway Reinforcements** | | | |
| 4 1 | | F | 500 kV Tesla-Los Banos-Gates-Midway-Tehachapi with 2 Tehachapi-Antelope, Antelope-Vincent, Antelope-Pardee |
| 4 2 | | G | Scenario F with 500 kV Tehachapi-Midway replaced with 500 kV Tehachapi-Vincent |
| 5 - Phase 1 | 1 | H | 500 kV Tesla-Gregg-Tehachapi with 2 Tehachapi-Antelope, Antelope-Vincent, Antelope-Pardee |
| 5 1 | | I | 500 kV Tesla-Gregg-Midway-Tehachapi with 2 Tehachapi-Antelope, Antelope-Vincent, Antelope-Pardee |
| 5 2 | | J | Scenario F with 500 kV Tehachapi-Midway replaced with 500 kV Tehachapi-Vincent |
| **Additional Sensitivities With**<br>**4500 MW lincremental Tehachapi Area Wind Generation** | | | |
| - | 2 O | | 230 kV Fresno Tie with 2 Tehachapi-Antelope, Tehachapi-Vincent, Antelope-Vincent, Antelope-Pardee 500 kV |
| 4 3 | | P | 500 kV Tesla-Los Banos-Gates-Midway-Tehachapi with 2 Tehachapi-Vincent and 230 kV Antelope-Vincent, Antelope-Pardee |
| 5 3 | | | 500 kV Tesla-Los Banos-Gates-Midway-Tehachapi with 2 Tehachapi-Vincent and 230 kV Antelope-Vincent, Antelope-Pardee |
| 4 | 10 | Q | 500 kV Tesla-Gregg-Midway-Tehachapi, Tehachapi-Vincent, Tehachapi-Pardee |
| 5 10 | | | 500 kV Tesla-Gregg-Midway-Tehachapi, Tehachapi-Vincent, Tehachapi-Pardee |

## 3.3 Local Area Transmission Interfaces

There are two major transmission pathways in the vicinity of the Tehachapi area that may be impacted by integrating a large amount of new resources into the 500 kV bulk power system. The Path 15 and Path 26 interfaces measure the power flows north and south of the PG&E's Midway area. Path 15 measures power flow north of Midway through the Los Banos area and Path 26 the flow imported or exported south of the Midway area. Path 26 is comprised of the three 500 kV lines between PG&E's Midway Substation and SCE's Vincent Substation and currently forms the only existing transmission link between both PG&E and SCE, but also northern and southern California. The SCE alternatives developed would inject over 4000 MW of Tehachapi wind into the Vincent area at the southern end of the existing Path 26 lines under SCE Alternative 2 or into the middle of the Path 26 if the 500 kV system is reinforced from Midway through the Tehachapi area to the Vincent area as provided by SCE Alternatives 1, 3 or 10. PG&E alternatives would provide reinforcement across Path 15.

## 3.4 RESULTS

### 3.4.1 Annual Production Costs

The simulations of hourly production runs optimized the system with sufficient generation resources to meet hourly demand and transmission losses subject to transmission and operational constraints for the conditions studied. Monitored transmission lines and interfaces were found congested for various time periods for all the scenarios studied.

TABLE 3.2 provides a summary of the annual results comparing each of the study scenarios based on the entire WECC system. While there may be some inefficiencies of system operation as shown occurring by the number of congestion hours of Path 15, Path 26, or the entire WECC system, the resulting annual production cost for the WECC system demonstrates the overall efficiency and impact on system operation of the alternative transmission configurations. Additional details of the results and annual flow duration curves for select scenarios studied are provided in Appendix 4.

The annual benefits of reinforcing Path 26 and/or Path 15 can be seen by the reduction in congestion of those interfaces paths and the resulting incremental cost difference between the alternatives.

# TABLE 3.2 Summary of WECC Results

| Alternative | | | | | | | |
|---|---|---|---|---|---|---|---|
| PG&E | SCE | Scenario | WECC Transmission Losses (TWH) | WECC System Congestion (Hrs) | Path 26 Congestion (Hrs) | Path 15 Congestion (Hrs) | WECC Annual Production Cost (M$) |
| **0 MW Tehachapi Area Incremental Wind Generation** | | | | | | | |
| SCE Phase 1 Facilities | | A 34.751 | | 147375 | 350 | 1403 | 15690 |
| | | B(+/-600[1] 34.644 | | 147968 | 284 | 1282 | 15692 |
| | | B(+300)[1] 34.673 | | 152720 | 269 | 1253 | 15686 |
| **1600 MW Tehachapi Area Incremental Wind Generation** | | | | | | | |
| SCE Phase 1 & 2 Facilities | | C 34.825 | | 145671 | 397 | 1546 | 15422 |
| | | D(+/-600)[1] 34.717 | | 145646 | 335 | 1421 | 15429 |
| | | D(+600)[1] 34.705 | | 148719 | 317 | 1338 | 15433 |
| | | D(+500)[1] 34.737 | | 149077 | 299 | 1357 | 15431 |
| | | D(+300)[1] 34.705 | | 151500 | 347 | 1410 | 15418 |
| **3300 MW Tehachapi Area Incremental Wind Generation** | | | | | | | |
| 4 1 | | K | 34.647 | 143115 | 176 | 1 | 15135 |
| 5 - Phase 1 | 1 | L | 34.469 | 143808 | 41 | 110 | 15143 |
| 4 1 | | M(+/-600)[1] 34.450 | | 144546 | 446 | 1505 | 15134 |
| 5C 1 | | N(+/-600)[1] 34.502 | | 146426 | 1904 | 0 | 15120 |
| **4500 MW Tehachapi Area Incremental Wind Generation, Without Fresno 230 kV Tie No North of Midway Reinforcements** | | | | | | | |
| - 1 | | E | 34.782 | 144227 | 2 | 2573 | 14934 |
| - | 2 | G-NM 34.762 | | 144276 | 803 | 1986 | 14942 |
| **4500 MW Tehachapi Area Incremental Wind Generation, Without Fresno 230 kV Tie With North of Midway Reinforcements** | | | | | | | |
| 4 1 | | F | 34.719 | 142507 | 757 | 0 | 14934 |
| 4 | 2 | G 34.737 | | 145563 | 2691 | 0 | 14929 |
| 5 - Phase 1 | 1 | H 34.486 | | 142914 | 85 | 0 | 14961 |
| 5 1 | | I | 34.491 | 143246 | 137 | 0 | 14938 |
| 5 | 2 | J 34.553 | | 146198 | 2577 | 0 | 14926 |
| **Additional Sensitivities With 4500 MW Incremental Tehachapi Area Wind Generation** | | | | | | | |

## TABLE 3.2 Summary of WECC Results (Cont.)

| Alternative | | Scenario | WECC Transmission Losses (TWH) | WECC System Congestion (Hrs) | Path 26 Congestion (Hrs) | Path 15 Congestion (Hrs) | WECC Annual Production Cost (M$) |
|---|---|---|---|---|---|---|---|
| - | 2 | O(+/-600)[1] | 34.601 | 144944 | 695 | 1722 | 14948 |
| - 2 | | O(+300)[1] | 34.615 | 150878 | 2391 | 0 | 14931 |
| 4 | 3 | P | 34.778 14309 | 2 | 953 | 0 | 14940 |
| 5 | 3 | | 34.580 14418 | 8 | 911 | 0 | 14938 |
| 4 10 | | Q | 34.751 | 142764 | 879 | 0 | 14940 |
| 5 | 10 | | 34.533 14330 | 1 | 821 | 0 | 14937 |

Notes:

1) Fresno PAR +/- 600 MW, +600 MW, +500 MW or +300 MW SCE to PGE direction.
2) New Midway-Tehachapi line rating 3421 MVA.

TABLE 3.3 provides a summary of the annual cost difference results comparing the WECC system with the California Participants[14] for each of the study scenarios. The incremental annual cost differences are referenced from the lowest annual cost result within each of the 0 MW, 1600 MW, 3300 MW and 4500 MW Incremental Tehachapi output levels. As an example within the 1600 MW Incremental Tehachapi output level, Scenario D(+300 MW) is used as the reference with the lowest annual production cost and Scenario D(+600 MW) would result in $15 million higher annual operating costs for the WECC system. Similarly, within the 4500 MW Incremental Tehachapi output level, Scenario J (SCE Alternative 2 with PG&E Alternative 5) is used as the reference with the lowest annual production cost and Scenario E (SCE Alternative 1) results in $8 million higher annual operating costs for the WECC system. A similar comparison of Scenario J and E based on the CAISO Participant results shows only a $1 million annual savings

## TABLE 3.3 Comparison of Incremental Annual Cost Differences

| Alternative | | Scenario | WECC | | California Participants[3] | |
|---|---|---|---|---|---|---|
| PG&E | SCE | | Annual Production Cost (M$) | Cost Difference[2] (M$) | Annual Cost (M$) | Cost Difference[2] (M$) |
| **0 MW Incremental Tehachapi Area Wind Generation** | | | | | | |
| SCE Phase 1 Facilities | | A 15690 | | 4 | 4271 | 11 |
| | | B(+/-600[1] 15692 | | 6 | 4260 | **0** |
| | | B(+300)[1] 15686 | | **0** | 4263 3 | |
| **Alternative** | | | **WECC** | | **California Participants[3]** | |

[14] California Participants Annual results are the sum of PG&E, SCE and SD&E annual results. Includes all generation (including IPPs) modeled within PG&E, SCE and SDG&E

| PG&E | SCE | Scenario | Annual Production Cost (M$) | Cost Difference[2] (M$) | Annual Cost (M$) | Cost Difference[2] (M$) |
|---|---|---|---|---|---|---|
| **1600 MW Incremental Tehachapi Area Wind Generation** | | | | | | |
| SCE Phase 1 & 2 Facilities | | C 15422 | | 3 | 4108 | 11 |
| | | D(+/-600)[1] 15429 | | 11 | 4103 | 5 |
| | | D(+600)[1] 15433 | | 15 | 4108 | 11 |
| | | D(+500)[1] 15431 | | 13 | 4106 | 8 |
| | | D(+300)[1] 15418 | | **0** | 4097 | **0** |
| **3300 MW Incremental Tehachapi Area Wind Generation** | | | | | | |
| 4 1 | | K | 15135 15 | | 3923 | 6 |
| 5 - Phase 1 | 1 | L | 15143 23 | | 3917 | **0** |
| 4 1 | | M(+/-600)[1] | 15134 14 | | 3937 | 20 |
| 5C 1 | | N(+/-600)[1] | 15120 | **0** | 3921 4 | |
| **4500 MW Incremental Tehachapi Area Wind Generation, Without Fresno 230 kV Tie No North of Midway Reinforcements** | | | | | | |
| - 1 | | E | 14934 | 8 | 3818 | 16 |
| - 2 | | G-NM | 14942 | 16 | 3829 | 27 |
| **4500 MW Incremental Tehachapi Area Wind Generation, Without Fresno 230 kV Tie With North of Midway Reinforcements** | | | | | | |
| 4 1 | | F | 14934 | 8 | 3802 | **0** |
| 4 2 | | G | 14929 | 3 | 3817 | 15 |
| 5 – Phase 1 | 1 | H | 14961 | 35 381 | 7 | 15 |
| 5 1 | | I | 14938 | 13 | 3813 | 11 |
| 5 2 | | J | 14926 | **0** | 3817 15 | |
| **Additional Sensitivities With 4500 MW Incremental Tehachapi Area Wind Generation** | | | | | | |
| - 2 | | O(+/-600)[1] | 14948 22 | | 3816 | 12 |
| - 2 | | O(+300)[1] | 14931 5 | | 3813 | 11 |
| 4 3 | | P | 14940 | 14 | 3801 | -1 |
| 5 3 | | | 14938 12 | | 3806 | 4 |
| 4 10 | | Q | 14940 | 14 | 3811 | 9 |
| 5 10 | | | 14937 11 | | 3813 | 11 |

Notes:

1) Fresno PAR +/- 600 MW, +600 MW, +500 MW or 300 MW SCE to PGE direction.
2) Cost difference reference is based on the lowest annual cost within of each of the 0 MW, 1600 MW, 3300 MW and 4500 MW Tehachapi output levels.
3) California Participants Annual results are the sum of PG&E, SCE and SD&E annual results. Includes all generation (including IPPs) modeled within PG&E, SCE and SDG&E
4) New Midway-Tehachapi 500 kV line normal rating of 3950 Amps assumed.

For the conditions studied and assumptions used, these results do not show significant cost benefits and result in differences of less than 1% in annual savings between the alternative transmission configurations. The WECC annual savings are within about 0.25% difference and California Participant results are within a 0.7% difference for the alternatives to incorporate 4,500 MW of Incremental Tehachapi wind. Differences between the WECC and California Participant results are due to internal California congestion that may be overshadowed when considering the overall WECC system optimization compared with the results within the California area only.

### 3.4.2 G19 With and Without North of Midway Reinforcement

To incorporate the expected Tehachapi full output to be developed, SCE Alternative 1 (Scenario E – without reinforcements north of Midway) shows about $ 8 million to $11 million lower annual savings compared to SCE Alternative 2 (Scenario G-NM, without reinforcements north of Midway). The incremental annual savings resulting from reinforcing north of Midway with the PG&E Alternative 4 or 5 in combination with the SCE Alternatives 1 or 2 are summarized in the TABLE 3.4.

## TABLE 3.4 North of Midway Reinforcement Annual Savings

4500 MW Incremental Tehachapi Wind Output

| Alternative | | Incremental Annual Saving (M$) | |
|---|---|---|---|
| PG&E | SCE | WECC | California Participant |
| 4 1 | | 0 | 16 |
| 5 1 | | -4 | 5 |
| 4 2 | | 13 | 12 |
| 5 2 | | 16 | 12 |

### 3.4.3 Helms Pumped Storage Coordination with Tehachapi Wind

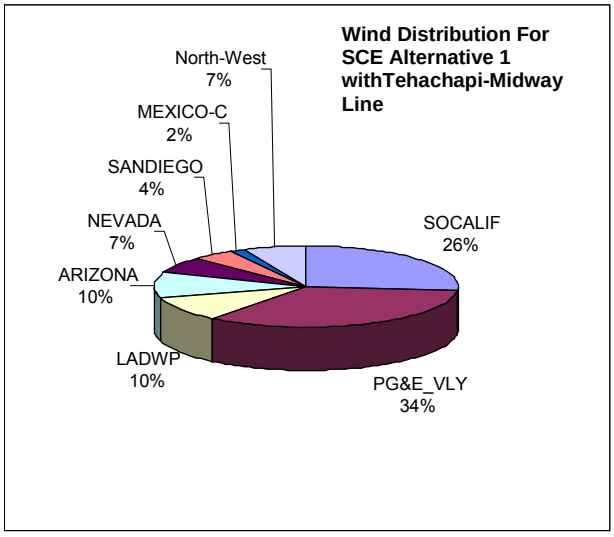
The production cost simulations did not demonstrate any difference in the operation of the Helms pumped storage facility with or without a Fresno 230 kV tie model. This is a result of how the pump storage facility schedules are determined. Schedules developed are based on the load level within a region and estimated generating and pumping thresholds for the facility. The schedule of the pumped storage facilities cannot be coordinated with the assumed hourly wind profile without a significant effort and would result in a fixed scheduled that would be separate from the optimization of the system resources. Therefore this was not investigated further under this study.

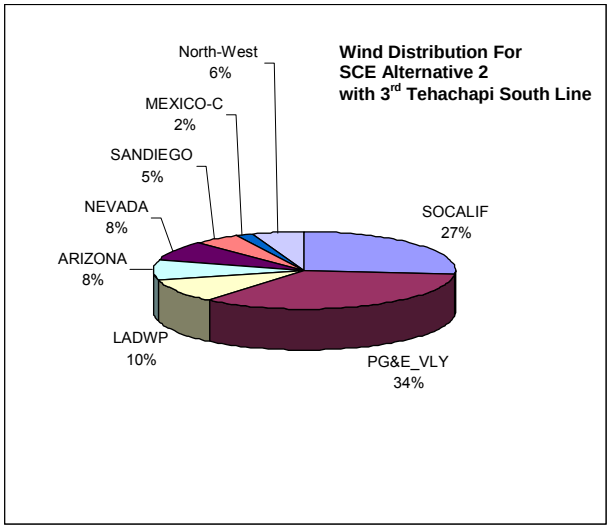
### 3.4.4 Fresno 230 kV Tie Operation

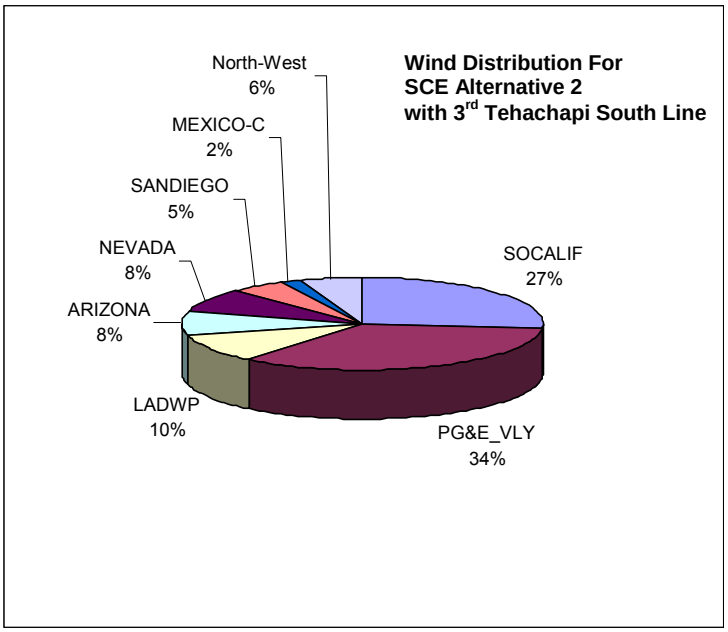
The Fresno phased-shift tie modeled in this analysis assumed a capability up to +/-600 MW and with an angle range of +/-45 degrees. Simulations found the tie frequently changed schedule and angle from hour to hour and suggested that control of the facility may require constant intervention by operators. It was also found that a 300 MW tie resulted in lower system operational costs than no tie or higher rated ties of 500 MW or 600 MW and is influenced by the available Midway and Bay area generation for hourly dispatch with the Tehachapi wind.

### 3.4.5 Distribution of Tehachapi Wind

The Tehachapi wind was modeled as an hourly resource that must be taken if available and would be used to displace high cost inefficient generation on the system. Although there is a general assumption that the Tehachapi power would be equally split between PG&E and SCE the production simulation program will dispatch the system with wind for the most efficient low cost WECC system operation. The following Figures compare the annual energy distribution with and without Tehachapi wind to illustrate the potential recipients of the power based on SCE Alternative 1 and SCE Alternative 2. There is no significant difference in the annual energy distribution between the two alternatives.



It is important to note that subsequent to completion of this production cost analysis, it was determined through thermal analytical studies discussed in Appendix 7, that Path 26 thermal transfer capability in the north to south direction may be less than the 4000 MW assumed for SCE Alternatives 1, 3 or 10 that include a new 500 kV Midway-Tehachapi-Vincent path that would parallel the existing Path 26. Based on the incremental differences between the alternatives, it is not expected that there would be any significant change in the results and savings would be within the ranges shown. Additional detailed thermal, voltage and stability studies would be required to determine the actual Path 26 transfer capability.

These production cost study results alone do not provide an adequate basis for making investment decisions. These production cost simulation study results, the results of the power flow and stability studies, and the cost of implementing the individual projects will all influence the choice of upgrade ultimately selected (see Chapter 2). It is also important to note that this production cost simulation study was developed solely for comparing transmission alternatives required to incorporate a large amount of wind resources in the Tehachapi area and should not interpreted as a determination of wind as a preferred renewable resource.

# CHAPTER 4 - POWER FLOW STUDIES AND FACILITY COST STUDIES

The evaluation described in Chapter 2 shows that the upgrades studied for north of Midway (including the 230 kV tie to transmit power to PG&E in the Fresno Area) would not be economic for the sole purpose of transferring Tehachapi generation to load centers in Northern California at this time. The material in Section 4.1 describes the studies done by PG&E, on which this conclusion is based.

## 4.1 PG&E Transmission Alternatives

Under summer peak conditions, the import of Tehachapi wind generation to serve the Bay Area loads would schedule power flow in the south-to-north direction (counter to the prevalent flow) on Path 15 and Path 26 and is not expected to cause normal or emergency overloads on the existing PG&E system. Power flow studies show that under summer on-peak operating conditions when the prevalent power transfer is typically from north to south on Path 26, addition of generation south of Midway would tend to decrease power transfer into Southern California. Even in those instances when it may be necessary for the CAISO to increase the power transfer into Southern California by an amount equal to this expected decrease, it would only bring the north to south power transfer at Midway back to the original amount, resulting in a net change of zero MW on Path 26. In addition, since La Paloma, Elk Hill, and Sun Rise combined-cycle plants were released for commercial operation in 2003, Path 15 power flow is typically lightly loaded under summer peak conditions. (See TABLE 2-1, Appendix 2.)

Accordingly, all PG&E alternatives investigated for North of Midway are for mitigating expected off-peak transmission problems when the prevalent power transfer is in the south to north direction (see TABLES 2-2 and 2-3, Appendix 2). In the Study completed for the TCSG Report filed on March 16, 2005 PG&E had investigated three alternatives in addition to the status quo (Alternative 1) to mitigate the impacts of scheduling and delivering 2,000 MW of Tehachapi generation (Alternatives 4 and 5) and two alternatives to mitigate the impact of scheduling and delivering 300 MW of Tehachapi area renewable generation (Alternatives 2 and 3) to PG&E. Alternative 3 to deliver 300 MW to PG&E was subsequently dropped because it could not provide the intended 300 MW of transfer capability. In this study PG&E performed further investigation on Alternatives 1, 2, 4 and 5. In addition, Alternative 2 was expanded to investigate the impact of scheduling and delivering 300 MW, 600 MW and 1,200 MW of Tehachapi area renewable generation. (See Appendix 2 for further discussion on Alternatives 1, 2, 4 and 5.)

PG&E's conceptual transmission alternatives are listed below (see TABLES 4.1.1 and 4.1.2). These include the status quo base case with no or minimum transmission upgrades to the PG&E system added. The study results, possible phasing and technical requirements associated with each alternative are further discussed in Appendix 2. Note that the PG&E alternatives include placeholders only for shunt

voltage support devices because no voltage stability studies, which are required for this determination, were performed. Further studies will be needed to explore opportunities to adjust each remaining alternative before the plan of service can be determined.

## TABLE 4.1.1 Summary of Conceptual Transmission Plan and Planning Level Cost Estimates [15] for PG&E Alternative 2 [16] (see FIGURE 4.1.2)

| Cumulative Import Level | Plan "A" (100% at Switching Station #1) | Plan "B" (50% at Switching Station #1 and 50% at Switching Station #2) |
|---|---|---|
| 300 MW | Build Switching Station #1 with a 300 MVA phase shifter<br>**Other Reinforcement in PG&E Area:**<br>•Upgrade Borden-Gregg 230kV line (peak)<br>**Conceptual Cost Estimate: $85 million**. | N/A |
| 600 MW | Same as 300 MW import level, except with one 600MVA phase shifter and building a new 230kV line between Switching Station #1 and Gregg.<br>**Other Reinforcement in PG&E Area:**<br>•Upgrade Borden-Gregg 230 kV line (peak)<br>•Upgrade Storey 1 – Gregg 230kV line (peak)<br>**Conceptual Cost Estimate: $222 million** | Build Switching Station #1 and #2 with a 300 MVA phase shifter at each station.<br>**Other Reinforcement in PG&E Area:**<br>•Upgrade Hass-McCall and Balch-McCall 230 kV lines (peak & off-peak)<br>•Upgrade Borden-Gregg 230kV line (peak)<br>**Conceptual Cost Estimate: $179 million** |
| 1200 MW (Peak) | **Not feasible** (Due to the maximum phase angle range of +/-45 degree) | **Not feasible** (Due to the maximum phase angle range of +/-45 degree) |
| 1200 MW (Off-peak) [17] | Same as 600 MW import level, except with two 600MVA phase shifters.<br>**Other Reinforcement in PG&E Area:**<br>•Install 450 MVAR of voltage support.<br>•Restrict the import level to Helms operation at 600 MW or more of pumping.<br>**Conceptual Cost Estimate: $326 million** | Same as 600 MW import level, except with a 600 MVA phase shifter at each station.<br>**Other Reinforcement in PG&E Area:**<br>•Upgrade Hass-McCall and Balch-McCall 230 kV lines.<br>•Restrict the import level to Helms operation at 600 MW or more of pumping.<br>**Conceptual Cost Estimate: $380 million** |

15 These planning-level cost estimates are preliminary, unit cost-based estimates and do not reflect project-specific engineering, environmental mitigation requirements, or permit, land acquisition, and legal costs and assumes all over-head line construction. All estimates include 30% contingency and are subject to change based on final engineering and design as well as the requirements of any CPUC or other required permit processes.

16 The cost estimates are for PG&E's portion of the Alternative only and include the UPC(s) for controlling power flows from SCE to PG&E

17 The import capability would depend upon the Helms pumping operation. This alternative could support 1200 MW of import only under the off-peak conditions with at least two Helms units in pumping operation.

## TABLE 4.1.2 Summary of Conceptual Transmission Plan and Planning Level Cost Estimates[1] for PG&E Alternatives 1, 4 and 5

| Cumulative Import Level | PG&E Alternative 1 (See 4.1.1) | PG&E Alternative 4 (See FIGURE 4.1.3) | PG&E Alternative 5 (See FIGURE 4.1.4) |
|---|---|---|---|
| 500 MW | **Network upgrade not determined (see discussion on above)**<br><br>**Conceptual Cost Estimate: Not determined** | **Phase 4A**:<br>Build a new Los Banos-Midway 500kV line operated at 230kV.<br>**Other Reinforcements in PG&E Area:**<br>None<br>**Conceptual Cost Estimate: $533 million** | **Phase 5A:**<br>Build a new Gregg-Midway 500kV line operated at 230kV.<br>**Other Reinforcements in PG&E Area:**<br>None<br>**Conceptual Cost Estimate: $406 million** |
| 1100 MW | **Network upgrade not determined (see discussion on above)**<br><br>**Conceptual Cost Estimate: Not determined** | **Phase 4B:**<br>Same as 4A, except also reconnecting the new line to 500kV and installing 65% series compensation.<br>**Other Reinforcements in PG&E Area:**<br>Upgrade Los Banos – Westley 230 kV line and Los Banos 500/230 kV bank<br>**Conceptual Cost Estimate: $137 million** | **Phase 5B:**<br>Same as 5A, except also building Gregg 500kV Substation with a 500/230kV, 1122/1350 MVA bank and reconnecting the new line.<br>**Other Reinforcements in PG&E Area:**<br>None<br><br>**Conceptual Cost Estimate: $76 million** |
| 2000 MW | **Network upgrade not determined (see discussion on above)**<br><br>**Conceptual Cost Estimate: Not determined** | **Phase 4C:**<br>Same as 4B, except, also building Tesla – Los Banos 500 kV line.<br><br>**Other Reinforcements in PG&E Area:**<br>Install additional RAS<br>**Note:** This Phase would increase the OTC from 5000 MW to 7000 MW. However, it may ***not*** be feasible to increase Path 15 Rating to 7,400 MW from the existing Rating of 5,400 MW[18]<br>**Conceptual Cost Estimate: $254 million** | **Phase 5C:**<br>Same as 5B, except also installing series comp on Gregg -Midway line (31%), and Tesla-Gregg line (62%).<br>**Other Reinforcements in PG&E Area:**<br>None<br><br>**Conceptual Cost Estimate: $451 million** |

[18] The Path 15 south-to-north flow was modeled at the Operating Transfer Capability (OTC) limit of 5000 MW in the pre project base case. This alternative would be able to import additional 2000 MW of generation at Midway by tripping 4319 MW of generation/pumps/load using the Remedial Action Scheme (RAS) for the simultaneous loss of Los Banos-Midway 500 kV and the new Los Banos-Midway 500 kV line in Phases 4A and 4B). The additional import would result in the Path 15 south-to-north flow at 7000 MW. However, unlike the findings in the previous study, this alternative would not be able to increase the Path 15 south-to-north Path Rating from 5400 MW to 7400 MW without increases in load shedding via RAS. Such increases may not be accepTABLE.

### 4.1.1 PG&E Alternative 1: Status quo

This Alternative investigates the possibility of installing no or minimum transmission upgrade and instead accommodating 2,000 MW of Tehachapi wind generation through curtailment of generation under normal conditions. Power flow study to date shows overloads, ranging from 3% to 48% over the ratings (or allowable limit) of eight transmission facilities under normal (all facilities in service) operating conditions (see TABLE 2-3, Appendix 2). As a result, this alternative would expand the times and conditions under which curtailment of generation would be required. It would also require installation of Remedial Action Schemes (RAS) to trip additional generation immediately after a disturbance and/or reduction in existing Path 15 transfer capability.

If existing generation in areas around Midway Substation is curtailed to allow transfer of Tehachapi power, Path 15 south to north transfer capability will have to be reduced. This is because the existing Path 15 south-to-north transfer capability under normal conditions can only be supported with operation of the Remedial Action Scheme (RAS) immediately following identified outages. If Midway area generation that is connected to the existing RAS were dispatched off-line or kept at minimum generating levels (assuming that the FERC open access rules were somehow satisfied), there would be no effective way of reducing power flow on Path 15 immediately following a double line outage and before the operator can intervene. As a result, Path 15 would have to be operated under normal conditions at a reduced level[19].

Connecting Tehachapi generation to the RAS to support Path 15 is neither effective nor is it practical even assuming installation of a new type of RAS controller and other equipment so it can predict the amount of wind generation available to trip if the outage occurs. For wind turbines to be part of generation RAS to replace the Midway generation RAS, the new RAS controller would need to ensure that sufficient generation was available to trip regardless of the wind output. At this time, no solution has been identified that will not in turn require tripping a higher amount of load commensurate with the increased amount of generation tripped to keep the net amount of net generation to be tripped within the allowable limit. The need for facility upgrades can be triggered by transient stability and post-transient voltage study results or the determination that the use of special protection systems is ineffective, violates criteria or otherwise could not be utilized.

In addition, Compliance with FERC Open Access rules, WECC approval and agreement from the CAISO, among other requirements would also be needed.

[19] Curtailing all Midway area generation that can be curtailed (about 2,600 MW) would reduce Path 15 south to north transfer capability from 5,000 MW to about 3,600 MW. This would enable Path 26 to load to about 2,700 MW.

### 4.1.2 PG&E Alternative 2: Fresno 230 kV Phase-Shifted Tie

PG&E Alternative 2 is to establish a new 230 kV connection between PG&E and SCE by constructing a switching station at the crossing of PG&E-owned and SCE-owned transmission lines and installing a phase-shifting transformer to "push" power from SCE's Big Creek corridor into the PG&E system. This study investigated impacts on the PG&E system, and the possible mitigation measures for the connection. This study evaluated "pushing" 300 MW, 600 MW, and 1,200 MW by the following two Plans:

Plan A (PG&E Alt 2A):
Establish one 230 kV tie between PG&E and SCE. Build Switching Station #1 at the crossing of PG&E's Helms – Gregg 230 kV lines and SCE's Big Creek – Rector 230 kV lines. Install one phase shifter or power flow controller to control the tie line flow

Plan B (PG&E Alt 2B):
Same as Plan "A", except, also building Switching Station #2 at the crossing of PG&E's Haas-McCall and Balch-McCall 230 kV lines and SCE's Big Creek – Rector 230 kV lines. Install a phase shifter or power flow controller at both switching stations to control the tie line flow.

### 4.1.3 PG&E Alternative 4: Tesla – Los Banos - Midway 500 kV line

PG&E Alternative 4 is to build a new Tesla – Los Banos 500 kV line and a new Los Banos – Midway 500 kV line. This alternative could be implemented in the following three phases:

Phase A (PG&E Alt 4A): Build a new Los Banos – Midway 500kV line operated at 230 kV.

Phase B (PG&E Alt 4B): Same as 4A, except, re-connecting the new Los Banos – Midway line to 500kV bus and installing 65% series compensation.

Phase C (PG&E Alt 4C): Same as 4B, except, also building a new Tesla - Los Banos 500kV line without series compensation.

### 4.1.4 PG&E Alternative 5: Tesla –Gregg – Midway 500 kV line

PG&E Alternative 5 is to build a new Tesla – Gregg 500 kV line and a new Gregg – Midway 500 kV line. This alternative could be implemented in the following three phases:

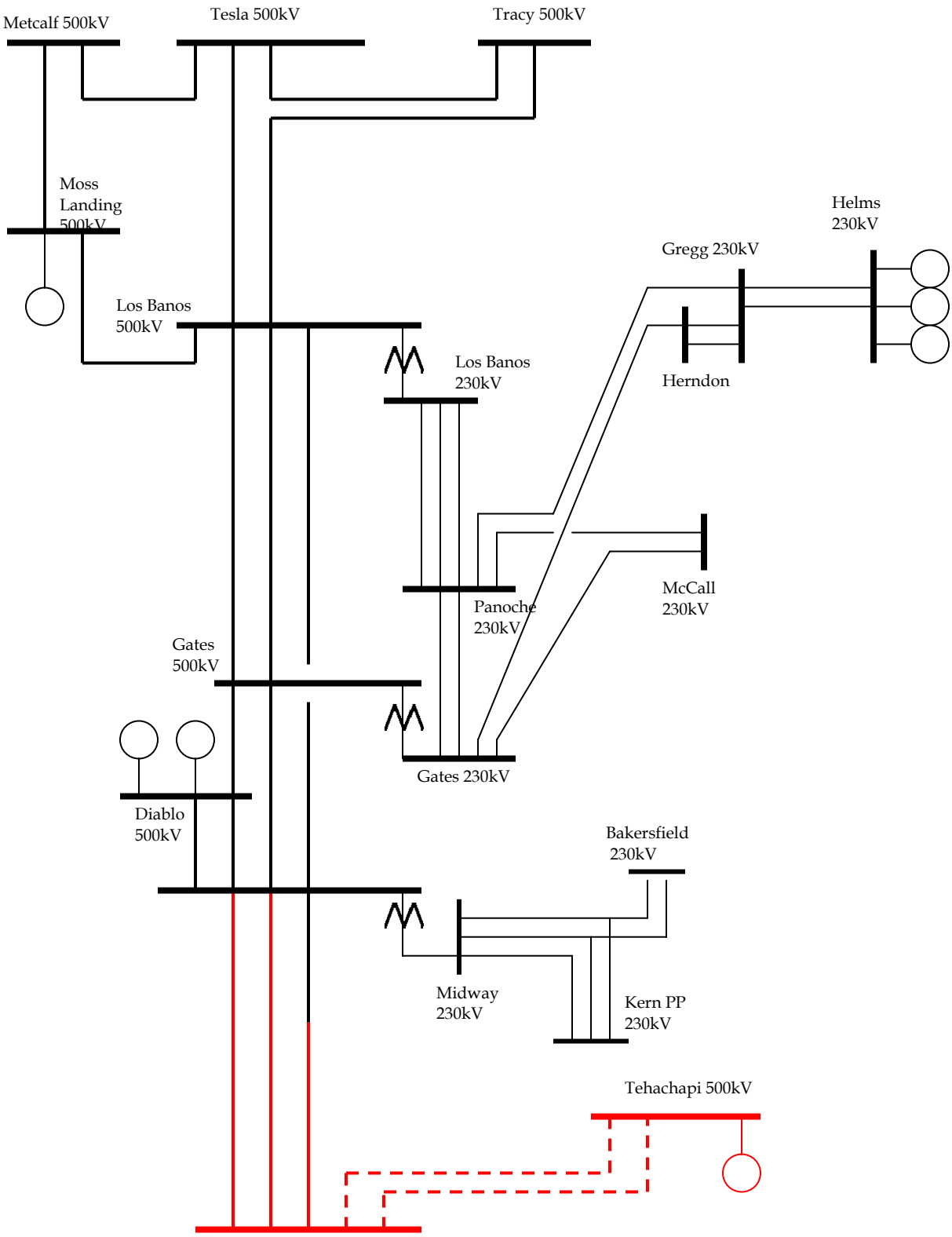
Phase A (PG&E Alt 5A): Build a new Gregg - Midway 500kV line operated at 230 kV.

Phase B (PG&E Alt 5B): Same as 5A, except also building a Gregg 500 kV Substation with a 500/230 kV transformer bank and re-connecting the new Gregg - Midway 500kV line.

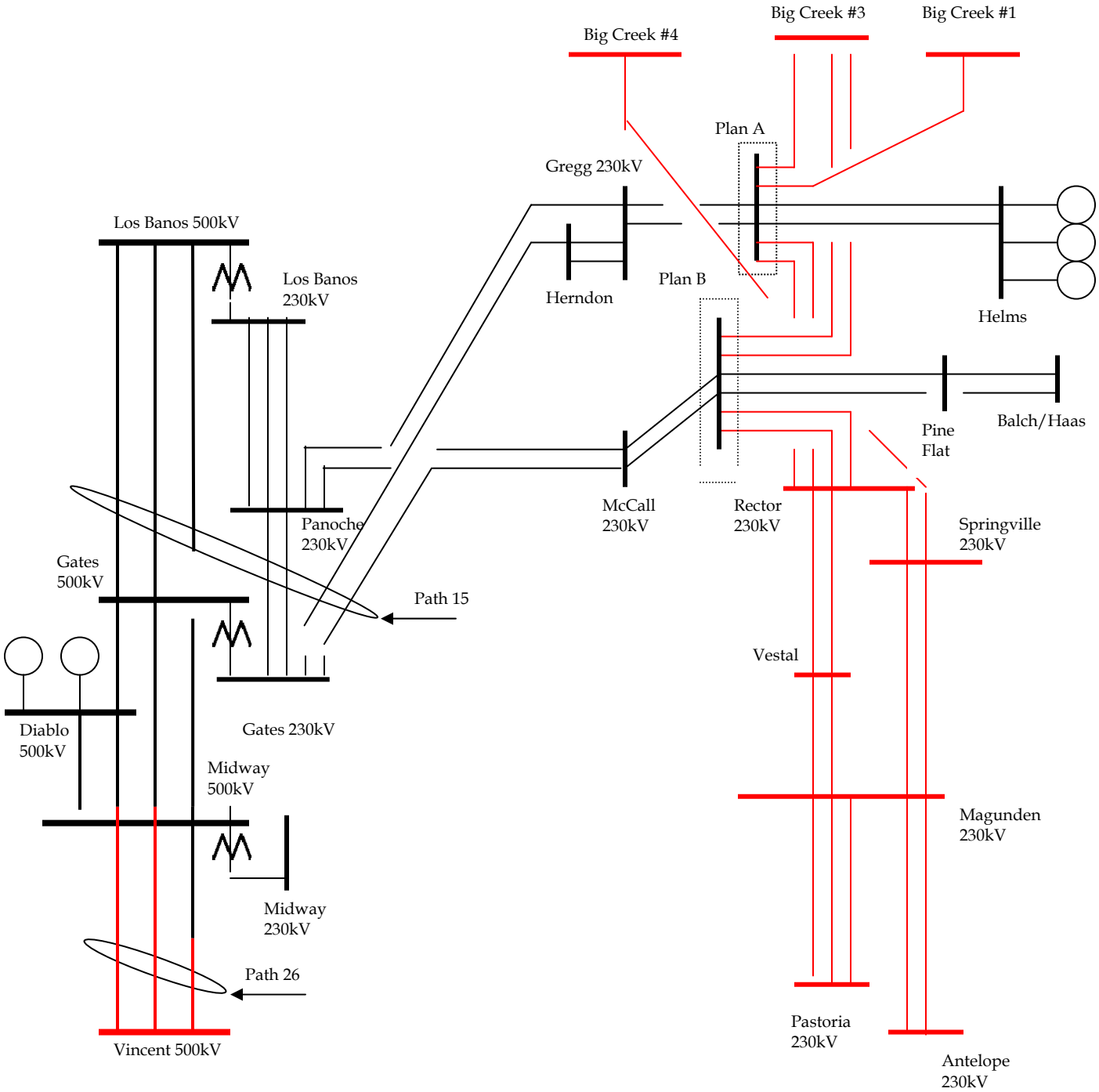
Phase C (PG&E Alt 5C): Same as 5B, except also building a new Tesla - Gregg 500kV line with 62% series compensation and installing 31% series compensation on the Gregg – Midway 500 kV line.

The impact of balancing and integrating the initial 1,100 MW of an intermittent energy such as wind generation in Phase A on the Fresno area customers and resolution of any physical limitation of Helms PSP would also need to be addressed.

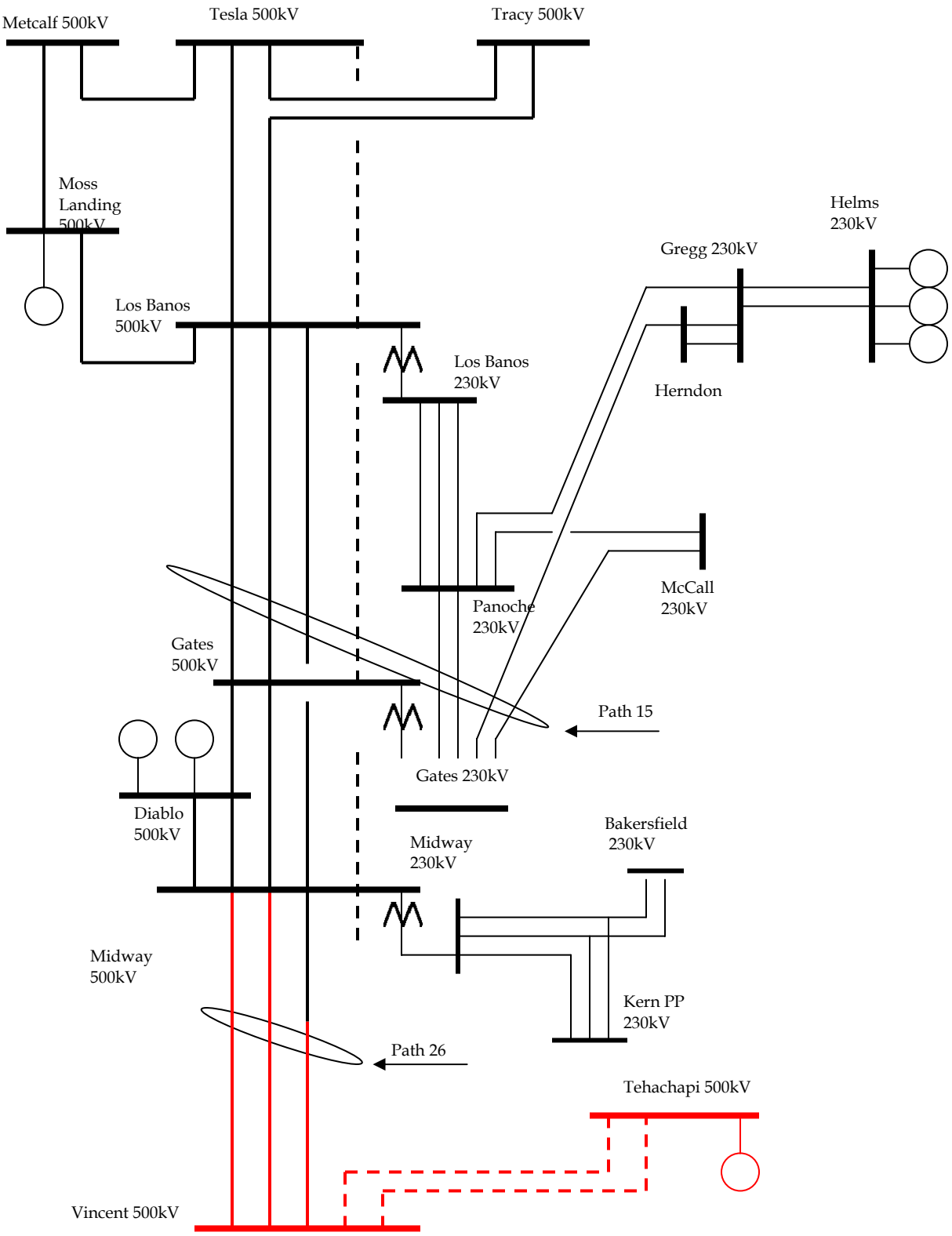
## FIGURE 4.1.1 - PG&E Existing System



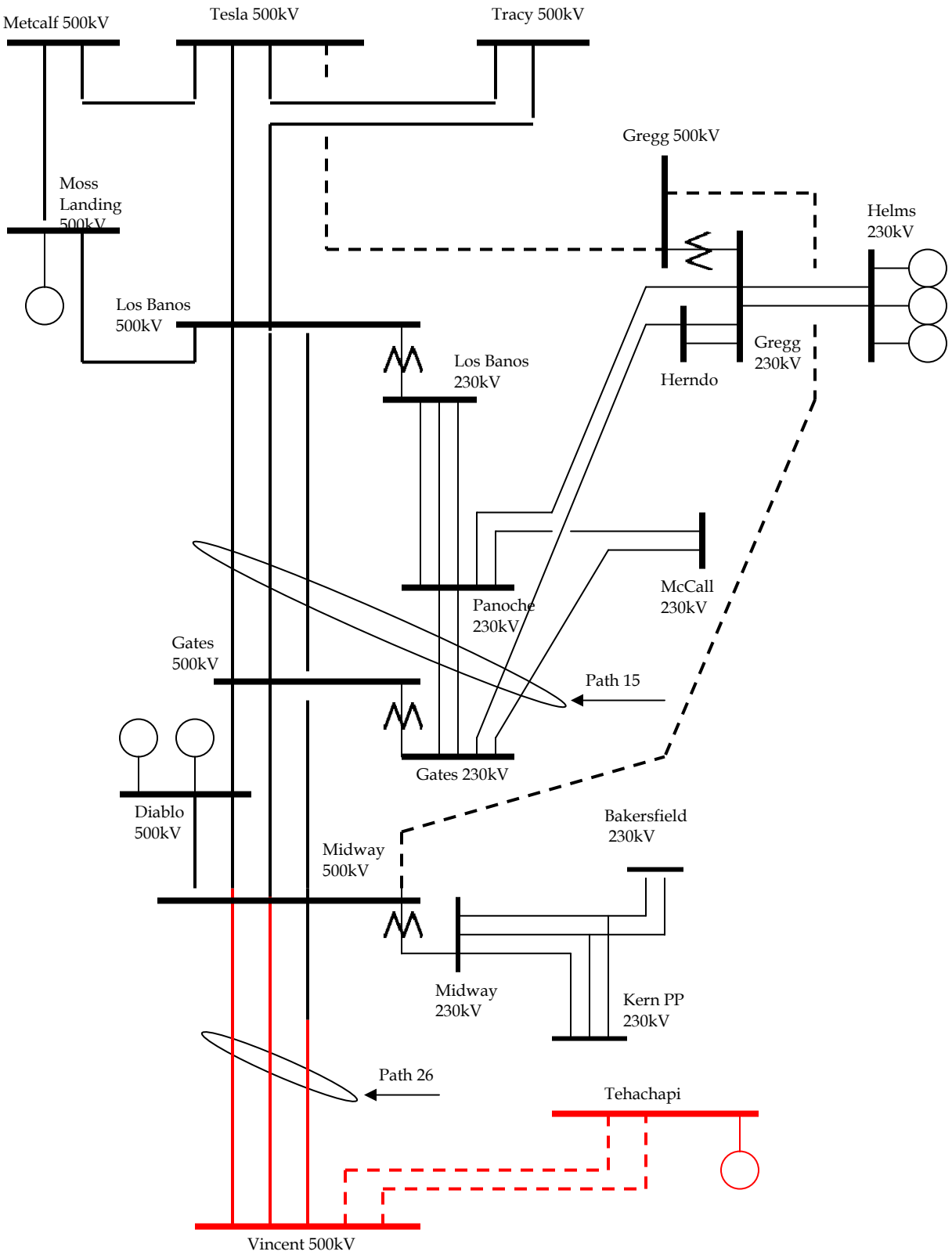
## FIGURE 4.1.2 - PG&E Alternative 2: Fresno 230 kV Tie



## FIGURE 4.1.3 - PG&E Alternative 4: Tesla – Los Banos – Midway 500 kV Line



## FIGURE 4.1.4 - PG&E Alternative 5: Tesla – Gregg – Midway 500 kV Line



## 4.2 Southern California Edison Studies

**SCE Transmission Alternatives**

Under summer peak conditions, scheduling the Tehachapi wind generation to serve the Los Angeles Basin Area loads would result in power flow in the north-to-south direction adding to the total south of Vincent and south of Lugo flow (Path 26, imports from southern Nevada Area, and SCE Northern Area). Such flows are expected to cause normal or emergency overloads on the existing SCE Bulk Power system. Scheduling power north to PG&E to serve the Bay Area loads would result in decreasing power flow on Path 26 (counter to the prevalent flow). It should be noted that such a "scheduling" reduction on Path 26 may not actually result in a real-time reduction on Path 26 since the CAISO could reschedule additional power on Path 26 thereby effectively transmitting all of the Tehachapi wind generation to the south.

Power flow studies show that under summer on-peak operating conditions when the prevalent power transfer is typically from north to south on Path 26, and all generation resources in the SCE Northern area are anticipated to be dispatched to serve SCE load, the addition of generation resources located in Tehachapi would increase power transfer into the Los Angeles Basin Area. Accordingly, all SCE alternatives investigated options for integrating Tehachapi wind generation into the existing system and for increasing the power transfers south of the SCE Antelope and Vincent substations.

In the study completed for the TCSG Report filed on March 16, 2005 SCE had investigated two fundamental alternatives for integrating Tehachapi wind generation into the existing system. The first alternative involved constructing all facilities south from Tehachapi to SCE's Antelope and Vincent substations. The second alternative involved constructing facilities both to SCE and to PG&E. The conceptual transmission plans were developed with the assumption that 2,000 MW of Tehachapi wind generation would be scheduled to SCE and an additional 2,000 MW would be scheduled to PG&E. In addition, SCE evaluated alternatives that delivered power from the SCE San Joaquin Valley via the Big Creek Corridor to the PG&E Fresno Area via the Gregg-Helms 230 kV transmission lines. As part of this study, SCE performed detailed parametric studies to further investigate a potential phase-shifted system tie with an intended purpose of delivering up to 1,200 MW from the SCE San Joaquin Valley to the PG&E Fresno Area utilizing phase-shift technology. This alternative has been subsequently dropped due to significant operational issues and significant cost associated with the alternative (see Appendix 3 for further discussion on the Big Creek-Fresno System Tie alternative).

SCE's conceptual transmission alternatives derived under heavy summer load conditions are listed below in TABLE 4.2.1. SCE is in the process of formalizing the complete project description for Phase 2, which will be the subject of a CPCN filing with the Commission as required per CPUC Resolution E-3969. Based on recent generation interconnection studies underway, the integration plan involves conversion of the existing Mesa Substation to 500 kV instead of utilizing the Rio Hondo substation as previously conceptualized. As a result, cost estimates for Phase 2 are conceptual

and do not include estimates for converting the Mesa substation to 500 kV. SCE will provide complete cost estimates and a detail scope of work as part of the CPCN application. It should also be noted that no shunt voltage support devices were included into the Summary because no voltage stability studies, which are required for this determination, have been conducted. Further studies will be needed to explore opportunities to adjust each of the elements of the conceptual transmission alternative before the final plan of service can be determined. With the recent submittal of interconnection requests for additional wind generation projects in the area made to the CAISO, SCE anticipates finalizing the exact plan of service as part of the detailed Feasibility, System Impact, and Facilities Studies. Results of these more detailed studies will provide sufficient information to identify triggering thresholds for phasing of transmission facilities and may identify the need for additional facility upgrades not addressed in these conceptual studies. The need for such facility upgrades can be triggered by transient stability and post-transient voltage study results or the determination that the use of special protection systems is ineffective, violates criteria or otherwise could not be utilized.

## TABLE 4.2.1 Summary of Conceptual Transmission Plan and Planning Level Cost Estimates[20] for SCE

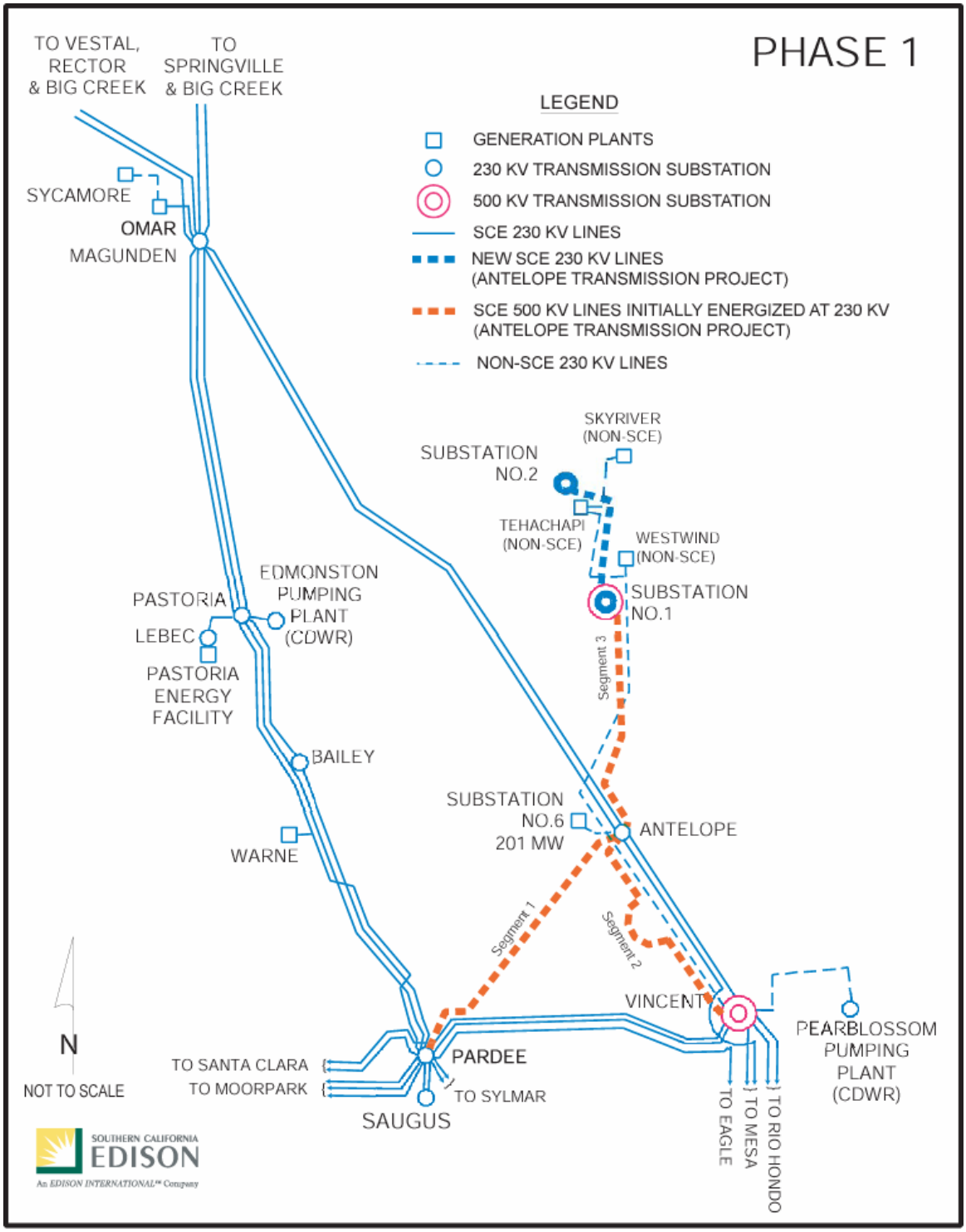
| Cummlative Generation | Alternative 1 | Alternative 2 |
|---|---|---|
| 700 MW | Antelope Transmission Project<br>•Antelope-Pardee 500kV line (energized at 230 kV)<br>•Antelope-Vincent 500kV line (energized at 230 kV)<br>•Antelope-Tehachapi 500kV line (energized at 230 kV)<br>**Conceptual Cost Estimate: $243.4 million** | Same Alternative 1 |
| 1,600 MW | Tehachapi Transmission Plan Phase 2<br>•New Substation #5 230 kV Substation[21]<br>•Antelope-Substation#5 230 kV (double-circuit)<br>•Antelope-Mesa Corridor Upgrade (500 kV) ($145 M)<br>•Mesa Substation Conversion to 500 kV ($150 M)<br>•Vincent-Mira Loma 500 kV[22]<br>**Conceptual Cost Estimate: $ 349 million** | Same Alternative 1 |
| 3,000 MW | Tehachapi Transmission Plan Phase 3<br>•Second Antelope-Substation#5 230 kV (double-circuit)<br>•Second Antelope-Tehachapi 500kV line ($99.5)<br>•Increase Antelope Operating Voltage to 500 kV<br>•Increase Pardee Operating Voltage to 500 kV<br>•Increase Tehachapi Operating Voltage to 500 kV<br>**Conceptual Cost Estimate: $341 million** | Same Alternative 1 |
| 4,500 MW | Tehachapi Transmission Plan Phase 4A<br>•Midway-Tehachapi 500kV line<br>•Expand Midway Substation<br>•Increase Tehachapi 500 kV Capability<br>**Conceptual Cost Estimate: $390.4 million** | Tehachapi Transmission Plan Phase 4B<br>•Vincent-Tehachapi 500kV line<br>•Increase Tehachapi 500 kV Capability<br>**nceptual Cost Estimate: $238.1 million** |

[20] These planning-level cost estimates are preliminary, unit cost-based estimates and do not reflect project-specific engineering, environmental mitigation requirements, or permit, land acquisition, and legal costs and assumes all over-head line construction. All estimates include a 30% contingency and are subject to change based on final engineering and design as well as the requirements of any CPUC or other required permit process.

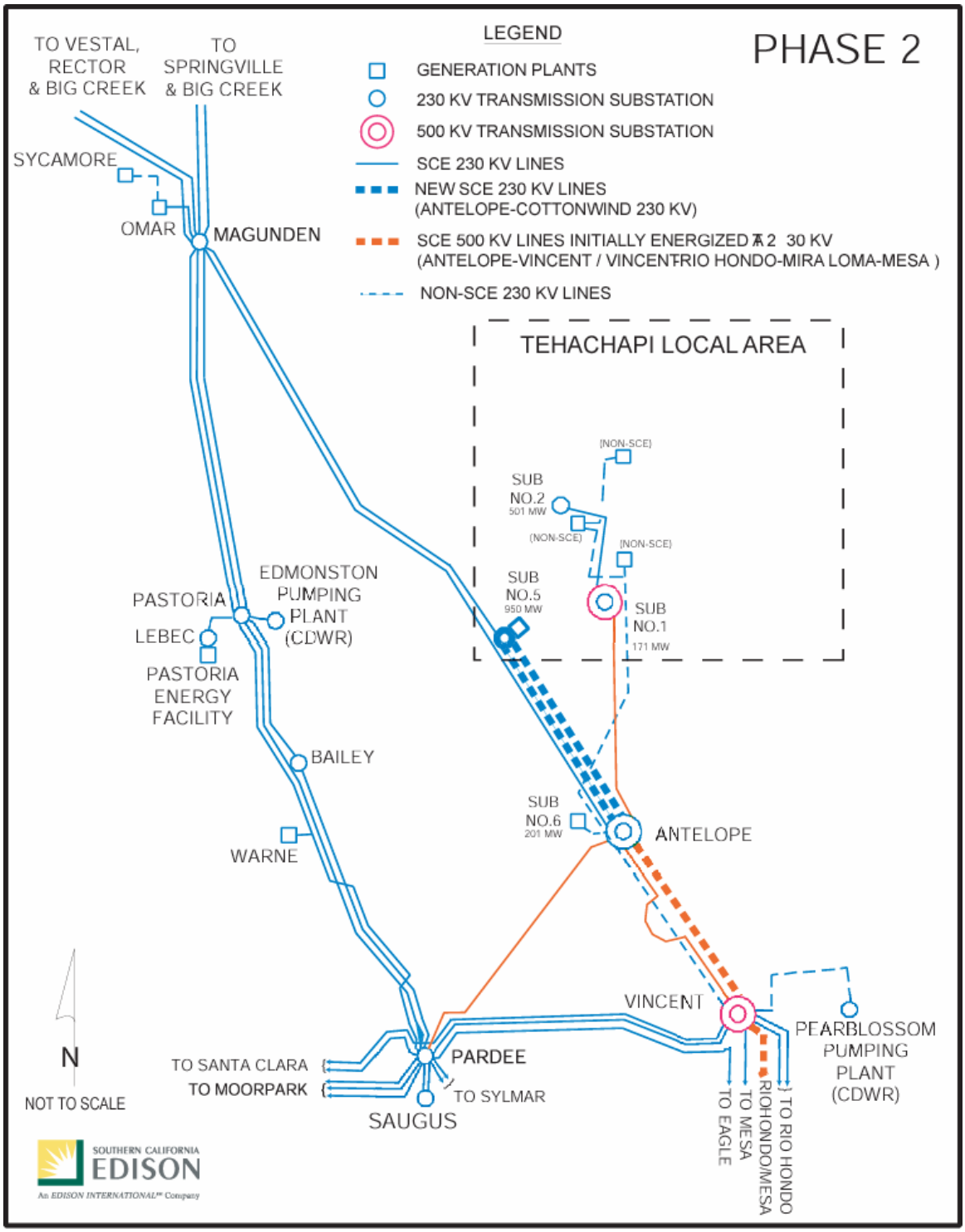
[21] A wind developer with a 300 MW project is evaluating permitting this substation as part of their wind project through Kern County. Considering only this first project and assuming a temporary operating solution is approved, the PTC could allow a portion of the first project to be in service outside of Phase 2. If it is later determined that the substation permitting should be undertaken by SCE, or the wind developer does not permit an adequate substation site as part of the wind project sufficient to accommodate all other wind projects requesting interconnection, or a temporary operating solution is not authorized, SCE will undertake the permitting of this substation with timelines consistent to those of Phase 2 or Phase 3.

[22] Cost for the Mira Loma-Vincent 500 kV transmission line not assigned to Tehachapi.

## FIGURE 4.2.1 Tehachapi Conceptual Transmission Plan Phase 1



## FIGURE 4.2.2 Tehachapi Conceptual Transmission Plan Phase 2



## FIGURE 4.2.3 Tehachapi Conceptual Transmission Plan Phase 3

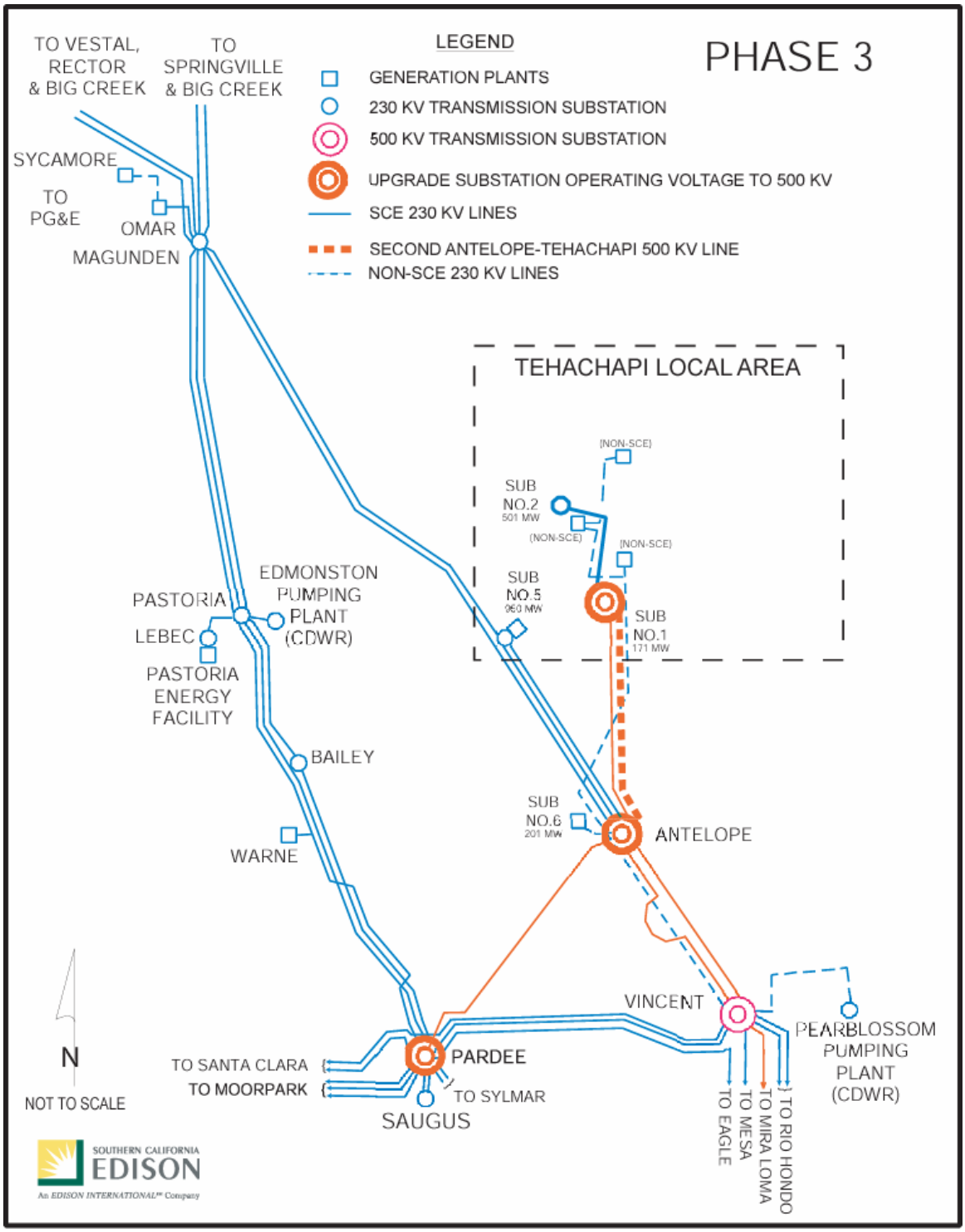


**FIGURE 4.2.4 Midway-Tehachapi 500 kV Transmission Line**

Tehachapi Conceptual Transmission Plan Phase 4

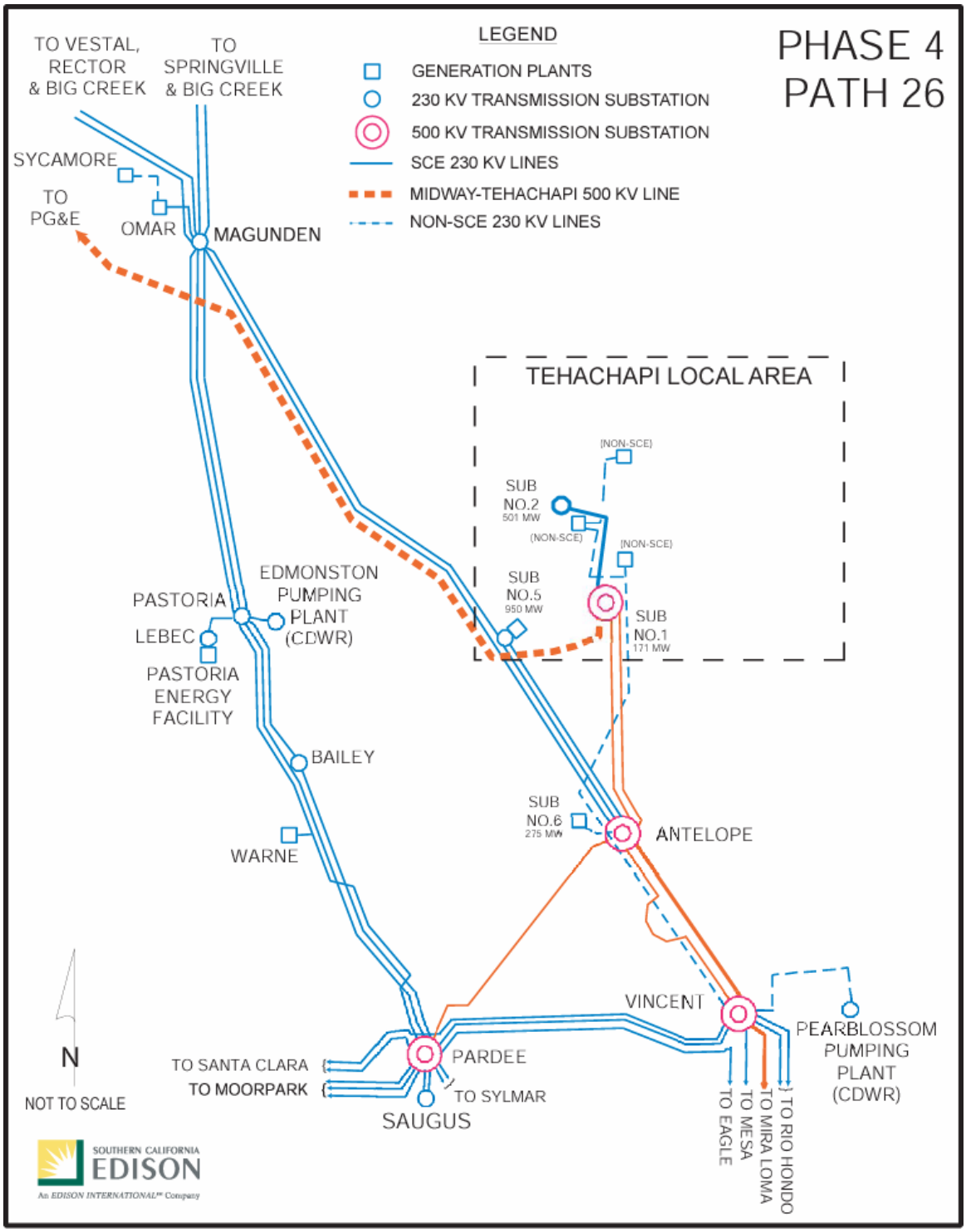
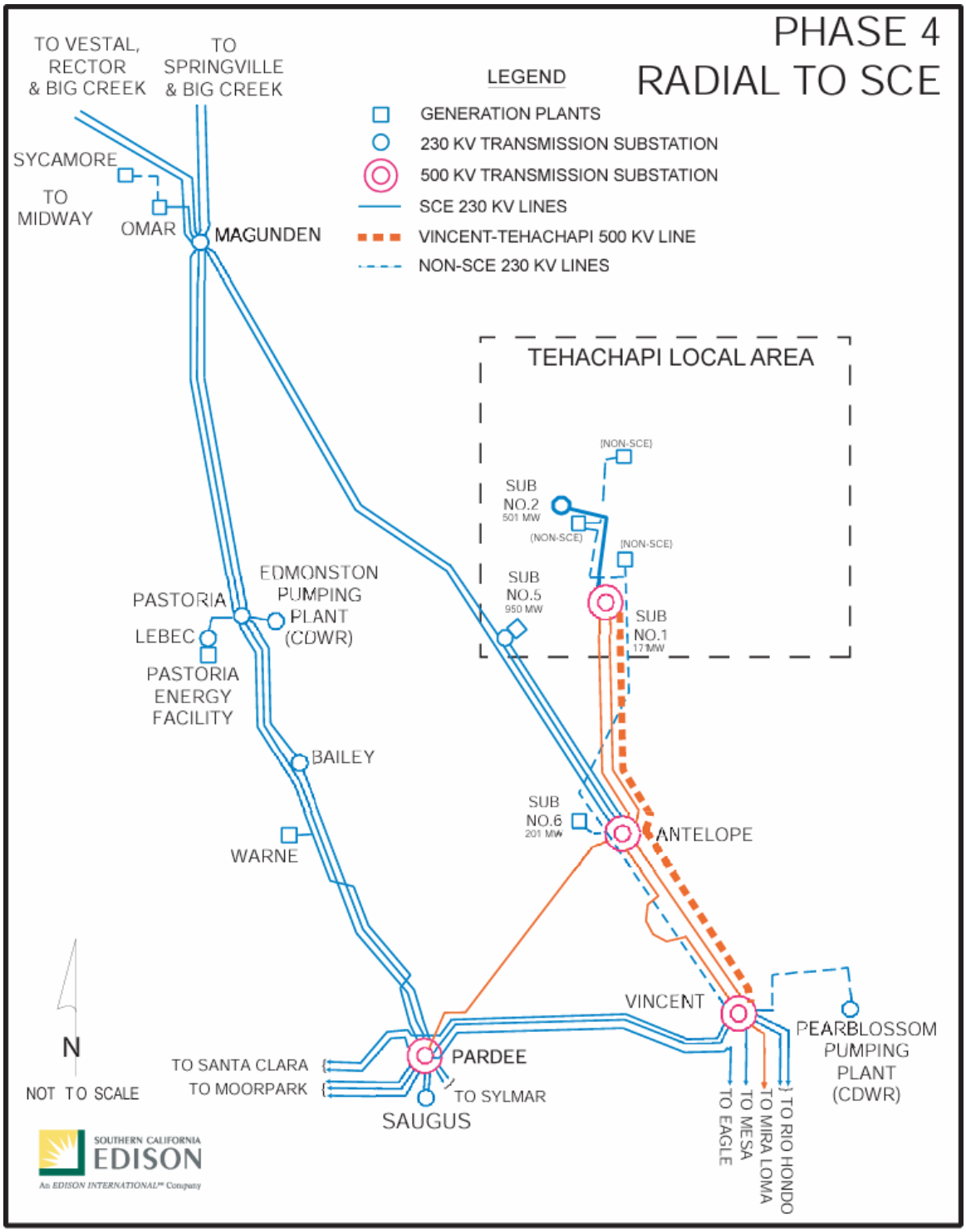


**FIGURE 4.2.5 Vincent-Tehachapi 500 kV Transmission Line**

Tehachapi Conceptual Transmission Plan Phase 4



# CHAPTER 5 - OPERATIONS ANALYSIS OF 5,200 MW OF WIND GENERATION IN THE TEHACHAPI AREA

## 5.1 Introduction and Background

The California ISO (CAISO) has significant operating experience with managing the impact of over 2,200 MW of wind generation in our control area. The CAISO control area is one of the largest in the Western Interconnection and it covers approximately 70% of the State of California. The advantage of a large control area is that 2,200 MW of wind generation is still only 4% of the total generation resources in this area. The other advantage is the wind generation is spread throughout the state in five different geographic areas with different weather patterns and different power production patterns. When one area has increasing energy production, one of the other areas may have decreasing production and the result is a smoother and more manageable energy production pattern. Tehachapi and San Gorgonio are the two largest wind generation areas today and their energy production has the largest impact on CAISO Grid Operations.

Currently the Tehachapi area has 740 MW of installed wind generation capacity. The plan is to add more 4500 MW of generation in this area in a series of phases. Although the transmission expansion plan is focused on the additional amount of generation, the operational impact must look at the impact from the total amount of generation in this area.

### TABLE 5.1 - Planned Capacity Additions

| | Installation of Additional MW | Cumulative Additional MW Capacity | Total Generation MW Capacity |
|---|---|---|---|
| Phase 1 | 700 | 700 | 1,440 MWs |
| Phase 2 | 900 MW | 1,600 MW | 2,300 MWs |
| Phase 3 | 1,700 MW | 3,300 MW | 4,000 MWs |
| Phase 4 | 1,200 MW | 4,500 MW | 5,200 MWs |

The exact timing for all the new generation construction in these phases is not firm but the goal is to complete all of these generation additions by 2010 for the utilities to meet their RPS goals. The addition of 4,500 MW of new wind generation over the next 5 years in the Tehachapi area will have significant impact on both the transmission system and the real-time operation of the California power grid.

## 5.2 Market Issues

There are market issues that need to be solved for the consumers in the State to receive the maximum benefit from the use of renewable resources. Wind generation energy must be accurately forecasted and scheduled in the Day-Ahead market. Accurately forecasted wind energy should displace the most expensive energy that

would normally be produced by fossil fueled generators. Accurate Day-Ahead energy production forecasts are essential for unit commitment decisions and optimum procurement of ancillary services.

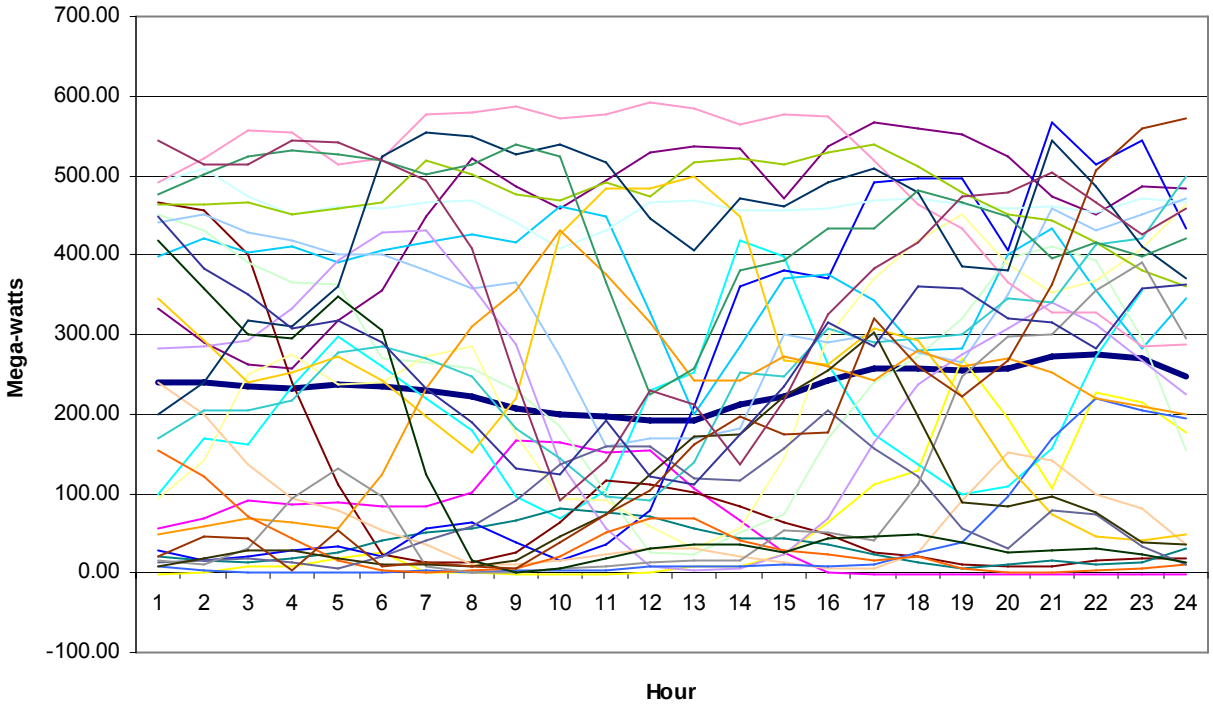



FIGURE 5.1 - Daily Wind Generation Energy Production in Tehachapi for April 2005

FIGURE 5.1 shows the hourly wind generation energy production in Tehachapi for April 2005. Although the average production is approximately 200 Megawatts, the hourly pattern for any specific day shows how extremely variable the energy production is on any specific day. This picture illustrates the difficulty of forecasting the daily and hourly power production for this area. The January through April period is probably one of the more difficult sets of months to accurately forecast daily energy production due to the variability of the weather patterns. The summer weather patterns for the Tehachapi area are more predicTABLE and the energy production forecasts are more accurate.

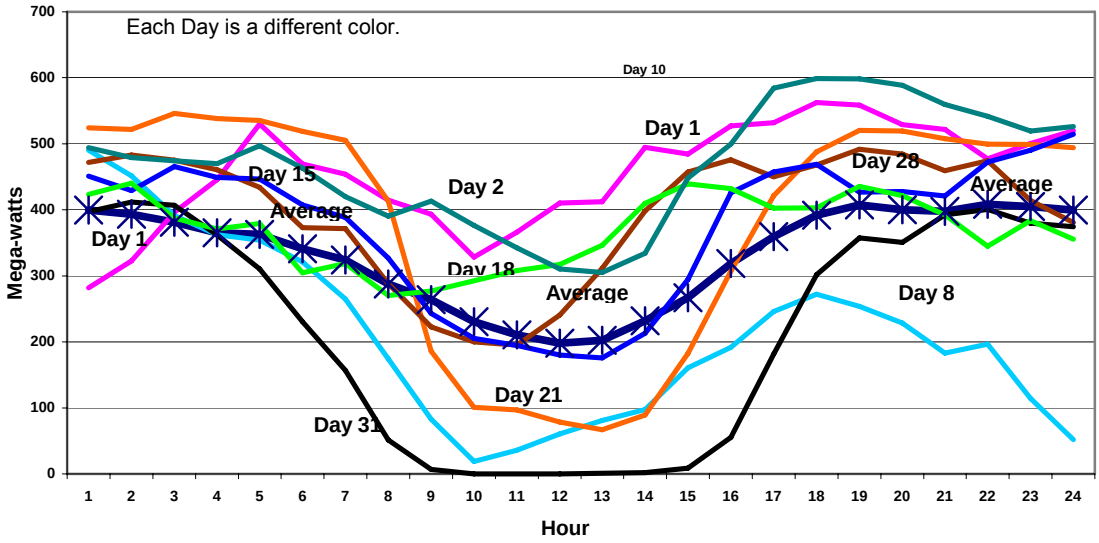



FIGURE 5.2 – Daily Wind Generation Production in Tehachapi for May 2005

FIGURE 5.2 shows the hourly production for the existing 740 MWs of wind generation in Tehachapi for May 2005. The average production has increased to approximately 300 Megawatts and the hourly energy production patterns exhibit more of the typical summer energy production patterns for this area.

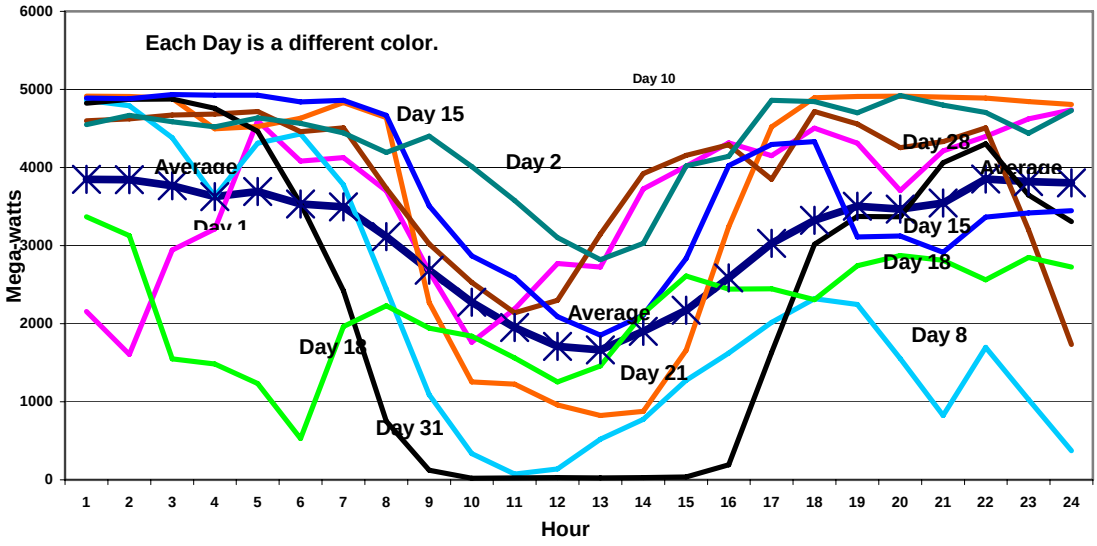



FIGURE 5.3 – Model of the Predicted Daily Wind Generation Production for Tehachapi with 5200 Megawatts of Installed Wind Generation Capacity

FIGURE 5.3 shows what the typical daily energy production could look like for a high production month like May when the amount of wind generation capacity has been increased to a total of 5200 Megawatts. The average production has increased to approximately 3000 Megawatts. The major operational concern will be the large daily energy ramps, both up and down, that could exceed 1800 Megawatts in an hour. These large ramps will require new ramp forecasting tools and new strategies to insure reliable operation of the grid.

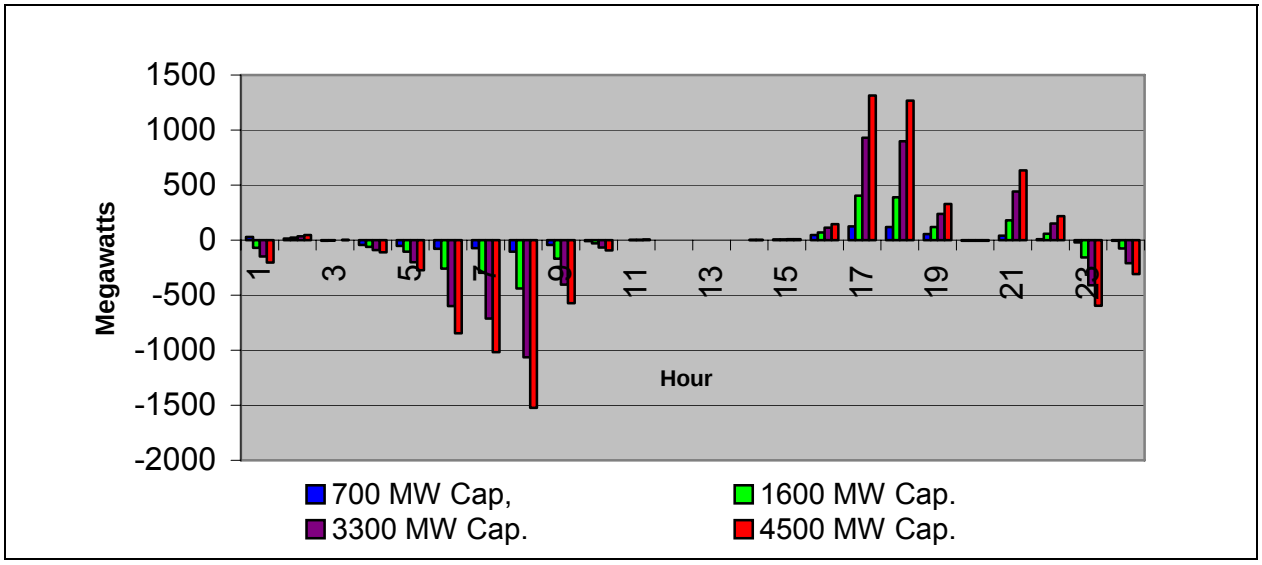



FIGURE 5.4 – Hour Ramps as new Generation in Added in Tehachapi

FIGURE 5.4 shows some of the expected energy ramps with up to 4500 Megawatts of generation capacity. With 5200 Megawatts of generation capacity, the energy ramps can be as high as 1800 to 2000 Megawatts in an hour. Unfortunately the large ramps down between 6 AM and 9 AM are the opposite of the morning ramp up of loads. From a Control Area Operators perspective, they will have to ramp up as much as 2000 to 3000 Megawatts in an hour to rebalance the system and control frequency.

Scheduling of the Tehachapi energy production in the Day-Ahead market will also help to mitigate transmission congestion issues and insure there are feasible schedules for delivery of the energy to the load centers. The new CAISO market system is expected to be operational by November 2007. Under the new market rules, the Tehachapi energy will have to be scheduled as a source and the load area (sink) will have to be identified for the energy schedules. This information will be used to verify that sufficient transmission capacity is available for the delivery of the energy. Transmission congestion issues will be resolved in the Day-Ahead market with feasible schedules for all generators in the control area.

In addition, accurate energy production forecasts will be needed five hours ahead of the real-time operating hour for the CAISO to send the correct dispatch notices to quick start units that may be required to replace wind generation energy. Ideally the forecasted hourly wind generation energy production will be scheduled in the Day-Ahead and Hour-Ahead energy markets. The CAISO is working with the CEC and their consultants to develop improved wind generation energy forecasting

methodologies that can improve the scheduling of energy from these wind generation resources.

## 5.3 Operational Issues

The operational issues that must be addressed to accommodate this large amount of new wind generation in the Tehachapi area are:

1. Low Voltage Ride-Through (LVRT) Capability
2. Reactive Power supply and voltage control
3. Supervisory Control and Data Acquisition (SCADA) Capability
4. Impact on Regulation Resources
5. Load Following –Supplemental Energy Dispatch
6. Ramps and Ramp Rates
7. Frequency Response Issues
8. Operating Reserves
9. Energy Production Fit with Daily Load Pattern
10. Capacity factor for meeting summer peak loads

### 5.3 1 Low Voltage Ride-Through (LVRT) Capability

The WECC LVRT Standard requires wind generating plants to remain in-service during 3-phase faults with normal clearing times (4-9 cycles or 0.15 sec) and single line to ground faults with delayed clearing, and subsequent post-fault recovery to prefault voltage unless clearing the fault effectively disconnects the generator from the system. (Minimum voltage of 0.15 per unit as measured on the high side of the wind generating plant step up transformer)

All new wind generation built in the Tehachapi area should have a Low Voltage Ride Through Capability that meets the WECC planning standards. The existing 740 MWs of generation in the Tehachapi area does not have this capability and it is probably not practical to retrofit these existing units to bring them into compliance with the new standard. The net result is there will be some risk of a loss of 740 MWs of generation due to a three-phase fault in the Tehachapi, Antelope, or Vincent areas. 740 MWs is still below the CAISO's MSSC (Most Severe Single Contingency event), which is typically the loss of 1100 MW unit. As long as all the new generation built in the Tehachapi area meets the WECC LVRT standard, the loss of ALL the generation (4500 MWs) in the Tehachapi area should be a very low probability event.

### 5.3.2 Reactive Power Supply and Voltage Control

The CAISO standard is that a wind generating plant shall operate with a power factor within the range of 0.95 leading to 0.95 lagging, measured at the Point of Interconnection as specified in the LGIA (Large Generator Interconnection Agreement) in order to maintain a specified voltage schedule, if the Interconnection System Impact Study shows that such a requirement is necessary to ensure safety or reliability. The key requirement is the ability to control the generation facilities to meet the required voltage schedule at the interconnection point.

### 5.3.3 Supervisory Control and Data Acquisition (SCADA) CAPABILITY

The CAISO needs real-time (4 second) SCADA data from the wind generation facilities and from metrological data associated with this facility. The detailed specification for the SCADA data and metrological data will be the same or similar to the current requirements for the CAISO's PIRP (Participating Intermittent Resources Program) and these requirements are published on the CAISO Web site.

### 5.3.4 Impact on Regulation Resources

Regulation Resources are used to automatically rebalance the system on a minute-to-minute basis within a specified tolerance band. The tolerance band for the CAISO is approximately plus and minus 110 MWs. The Automatic Generation Control (AGC) system sends control signals every 4 seconds to the generating units on regulation to increase or decrease generation to match the changes in system load and changes in other generating units. The CAISO typically procures between 600 MWs and 800 MWS of regulation per hour.

The currently 740 MWs of installed capacity in Tehachapi does not make a noticeable impact on the CAISO procurement and use of regulation resources. The minute-to-minute changes in the Tehachapi Wind Generation energy production are well within the control capability of the CAISO systems.

Increased generation capacity to Phase 2 – 1,600 MW; Phase 3 – 3,300 MW and Phase 4 – 4500 MWs is expected to have an impact on the amount of regulation resources required. Certainly Phase 3 and 4 will have an impact. Studies are still in progress to determine the magnitude of these impacts and these results should be available by summer 2006.

### 5.3.5 Load Following Supplemental Energy Dispatch

Load following or Supplemental Energy Dispatches are used to rebalance the system every 5 minutes. The CAISO market based systems do an automatic supplemental energy dispatch every 5 minutes to follow increases/decreases in load and generation. These supplemental energy dispatches are often several hundred megawatts per hour. Generators typically have block hourly schedules or Preferred Operating Point (POP). Load however can vary by hundreds of megawatts in an hour so the supplemental energy dispatches are used to increment or decrement the generator schedules to make their energy production match the changes in system load. The Supplemental Dispatches change the real-time market-clearing price.

As can be seen in FIGURE 5.1 above, the Tehachapi energy production can vary from minimum to maximum or from maximum to minimum within a couple of hours. The existing 740 MW of Tehachapi wind generation can result in 50 to 250 MW of Supplement Energy Dispatch per hours during periods of major changes.

As the amount of wind generation increases in Tehachapi in Phases 1, 2, 3, and 4, there will be major increases in the amount of Supplemental Energy Dispatches. FIGURE 5.4 illustrates the size of the increases such as 200, 400, 500, 1,000 and even 1,500 MW per hour of supplemental energy dispatches, both increases and

decreases[23]. FIGURE 5.4 also shows that the Tehachapi wind generation typically has major decreases in energy production morning load pickup period (6 AM to 10 AM). This will require the CAISO to send dispatch notices to other generation resources to either INC of DEC 2,000 to 3,000 MW of supplemental energy during some of these periods. The INC notices increase generation to make up for the decrease in wind generation energy production during the morning load pickup. The opposite situation will be true in the evening hours as the temperature sensitive load (air conditioning) is dropping off at the same time as the wind generation is increasing.

To successfully integrate the planned increase in Tehachapi wind generation, the CAISO will need many generating units to increase and decrease their supplemental energy bids. This will provide the flexibility needed to move the production of many units to keep the system in balance and meet frequency and control performance standards.

### 5.3.6 Ramps and Ramp Rates

A serious issue with the large amount of wind generation in the Tehachapi area is the hourly energy ramps, both positive and negative. To successfully integrate this large amount of generation into the control area will require a ramp-forecasting tool. This type of forecasting tool is different from the market energy-forecasting tool as its objective is to forecast the hourly energy ramps for the next day. This will enable the operator to get the system set up to handle the large ramps. The ISO will also need a real-time metrological forecasting tool that enables the operator to see large weather fronts that are approaching the Tehachapi area that will drive these large energy production ramps. The CAISO will work with the state agencies, the IOU's and the wind generation developers in the Tehachapi area to determine the best ramp-forecasting tool that would benefit all parties. Such a tool would assist the CAISO to integrate this much wind generation into daily operations.

### 5.3.7 Frequency Response Issues

The WECC[24] has decided to move ahead with a new Frequency Response Standard for the Western Interconnection. The WECC is considering adoption of the recommendations of the FRR[25] task force as published in their White Paper. The FRR standard will be written by the WECC MORC[26] Work Group and the goal is to have it reviewed and approved by the NERC[27] Board of Directors by the end of 2006.

The major issue for the CAISO is that the wind generators do not have a governor or any frequency response capability. Therefore, the ISO will have to have many other units on line that can provide the frequency response that will be required by the new WECC Standard in 2007.

[23] Figure 5.2 is based upon preliminary analysis and scale-up of historic data. Further investigation of new technology and its impacts is required.

[24] Western Electricity Coordination Council

[25] Frequency Response Reserve

[26] Minimum Operation Reliability Criteria

[27] North American Electric Reliability Council

### 5.3.8. Operating Reserves

The amount of operating reserves the CAISO procures today is not driven by the amount of wind generation. However, with the concentration 4,500 MW in the Tehachapi area, this may change.

If this generation is carried on two transmission lines, and it is producing at its maximum capability, the ISO would have to plan for the loss of as much as 2,300 MW of generation due to the loss of one line. This could become the ISO's MSSC[28]. A remedial action scheme may be required to trip wind generation in the event of a transmission line outage.

The CAISO's operating reserve requirement could increase by as much as 1,000 MW. This may not be a serious operating problem, as this would most likely occur at night and not during peak hours. Reserves would probably be available but added procurement would t increase costs.

### 5.3.9. Energy Production Fit with Daily Load Pattern

The wind generation energy production pattern for the Tehachapi area tends not to fit the daily load pattern and have a minimum amount of energy production across the afternoon peak load periods in the hot summer days. Morning load ramps tend to coincide with wind generation ramp-downs. The ideal solution is to have a large energy storage capability such as a new pumped storage system or other types of energy storage that can be used to shift the off-peak energy production to delivery during peak load periods. Unfortunately current energy storage technology is still too expensive to provide this capability and unless we have a national or state tax credit plan for storage investments, it will be hard to finance investments in storage technology.

### 5.3.10. Potential Over-Generation Conditions

An issue that Operations encounters today with the current fleet of wind generation is the fact that the wind generation often peaks at night when the system is at minimum load. During off-peak hours in April, May and June, the ISO can experience over generation conditions when off-peak hydro generation levels are high due to heavy runoff and off-peak wind generation is high. Additional wind generation will increase the frequency and magnitude of over generation conditions.

### 5.3.11. Capacity Factor for Meeting Summer Peak Loads

The CAISO is calculating the actual capacity factor the Tehachapi wind generation for the past three years based upon the CPUC's formula for calculating the capacity factor. [29]

[28]

[29] *[Cite to this document: This information should be available later by March 2006.]*

## 5.4. Additional Issues

The following list of actions is currently being studied by the CAISO in conjunction with the Intermittency Analysis Project at the CEC. Significant results are expected by December 2006.

1. Determine the best methodology for calculating the amount of regulation and load following resources that are needed on a month-to-month basis.
2. Determine the attributes required for new generation that can complement the production characteristics of wind generation and other renewable resources. Every type of generator has some type of limitation so we should determine the best mix of future generation types that meets operational requirements and energy reliability at reasonable cost.
3. Develop new concepts for automatic generation control and dispatch of controllable loads to assist with mitigating the impact of the variability of wind generation energy production.
4. Explore changes in interconnection scheduling protocols, policies and procedures to remove one of the barriers to moving wind generation energy between control areas.
5. Wind generators currently cannot increase energy output in response to frequency dips during system disturbances. What should be done to ensure the operator can meet interconnect performance standards.
6. There are over-generation problems during light load periods. What can be done to increase the flexibility for reducing power output from all generation resources, including wind generation, during minimum load periods?
7. Explore the feasibility of using energy storage technology to shift off-peak energy production to delivery during peak load periods.
8. Improve wind energy forecasting tools and weather forecasting.
9. Develop procedures and protocols with wind generators for controlling large ramps up and down during periods of high wind variability such as major storms.

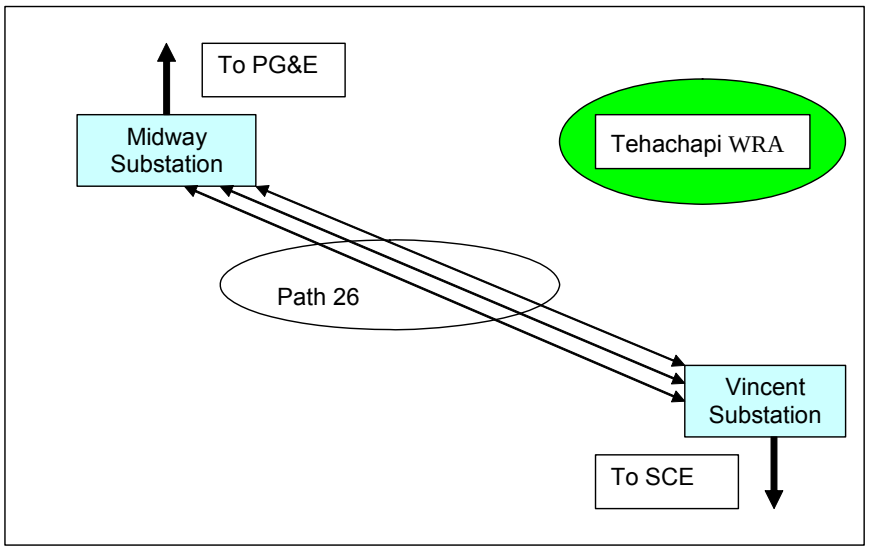
# CHAPTER 6 - RECOMMENDED FACILITIES FOR EACH PHASE OF DEVELOPMENT

Since its first report to the CPUC, the TCSG has continued to examine various potential transmission lines to reliably connect the Tehachapi WRA to the California grid. This chapter summarizes the TCSG findings, describes the current status of the Tehachapi plan and recommends actions to complete the plan.

## 6.1 Key Considerations for Connecting Tehachapi to the Grid

The northern and southern sections of California's electricity grid currently are connected by three high voltage transmission lines known collectively as Path 26. The northern terminus of Path 26 is PG&E's Midway substation at the southern end of Path 15. SCE's Vincent substation, which connects to several lines feeding southern California, is the southern terminus of Path 26. The Tehachapi WRA lies east of Path 26, as shown in FIGURE 6.1, and connections from Tehachapi to the grid can be made either to Northern or Southern California or to both regions.

### FIGURE 6.1 – Location of Tehachapi WRA




Based on the direction of the CPUC in D.04-06-010, the TCSG uses 4,500 MW as the total projected output in the Tehachapi WRA[30]. As of the date of this

[30] As described in Chapter 1, the 4,500 MW was initially made up of approximately 4,000 MW develop in the Tehachapi region proper and 500 MW in the Antelope Valley region. As of the date of this report, projects totaling approximately 1,300 MW have requested interconnection to the CAISO Grid in the Antelope Valley region. There is also 740 MWof existing wind generation connected to the SCE grid over either SCE 66 kV lines or over the privately owned Sagebrush line.

report, Tehachapi wind projects totaling about 3,600 MW have submitted interconnection requests to the CAISO for processing. The ultimate eventual generation capacity from Tehachapi is unknown, of course, and may be more or less than the assumed 4,500 MW. Nevertheless, the TCSG continues to believe that 4,500 MW remains the appropriate planning target.

TCSG identified three 500 kV connections as being needed to reliably export Tehachapi generation to the grid. An alternative approach of connecting Tehachapi with only two high-capacity 500 kV lines is reported in Section 6.8 below. [31]

Prior to the inception of the TCSG, SCE had developed a conceptual transmission plan that included one 500 kV connection between Tehachapi and Southern California via the SCE Vincent substation.[32] This SCE plan became the basis for TCSG Phases 1 & 2 as described in its earlier report. An updated description of Phase 1 and 2 facilities is included below.

Since issuing its March 16, 2005 report, the primary effort of the TCSG has been to examine feasible connections for the second and third 500 kV lines connecting Tehachapi to the grid. The overriding issue has been whether or not to connect to both Northern and Southern California. While the TCSG has roughly estimated the costs of this option, it could not fully evaluate the benefits to the state's electricity network or the impact of the options on grid operations. The TCSG therefore does not now have a consensus recommendation for whether the second and third major Tehachapi connections should include a new 500 kV line from Tehachapi to Midway, and if so, whether that line should be built before or after a second 500 kV line connection from Tehachapi to Southern California.

The California Independent System Operator (CAISO) has developed a Transmission Economic Assessment Methodology (TEAM) which is used to evaluate the costs and benefits of transmission proposals. The TEAM analyzes how proposed facilities affect physical flows and market prices (i.e., reliable operation of the grid, congestion relief, access to new (lower cost) generation). In addition, CAISO grid operations experts can evaluate the impacts of new transmission options on grid management. The TCSG therefore recommends that further development of the Tehachapi conceptual transmission plan be conducted under the auspices of the CAISO.

[31] There is also a possibility that power lines in the region owned by the Los Angeles Department of Water and Power and by a private corporation could be utilized to export some Tehachapi generation. If so, these lines might serve as the third connection between Tehachapi and the EHV grid.
[32] SCE Renewable Conceptual Transmission Plan, filed August 29, 2003.

## 6.2 Phase 1: First 500 kV Connection to Southern California

Phase 1 development consists of three segments, with all facilities to be built by SCE:

Segment 1, the "Antelope to Pardee Transmission Project," consists of a new 25.6 mile, 500 kV transmission line connecting the Antelope and Pardee substations. This line would initially be operated at 220 kV.

Segment 2, the "Antelope to Vincent Transmission Project," includes the construction of a new 21.5 mile, 500 kV transmission line to connect SCE's existing Antelope Substation, located in Lancaster, with SCE's existing Vincent Substation located near Acton. This line would be built on new right-of-way to be acquired over private land between the two existing substations, both in Los Angeles County. This line would be initially operated at 220 kV.

Segment 3, the "Antelope to Tehachapi Transmission Project," includes four elements:

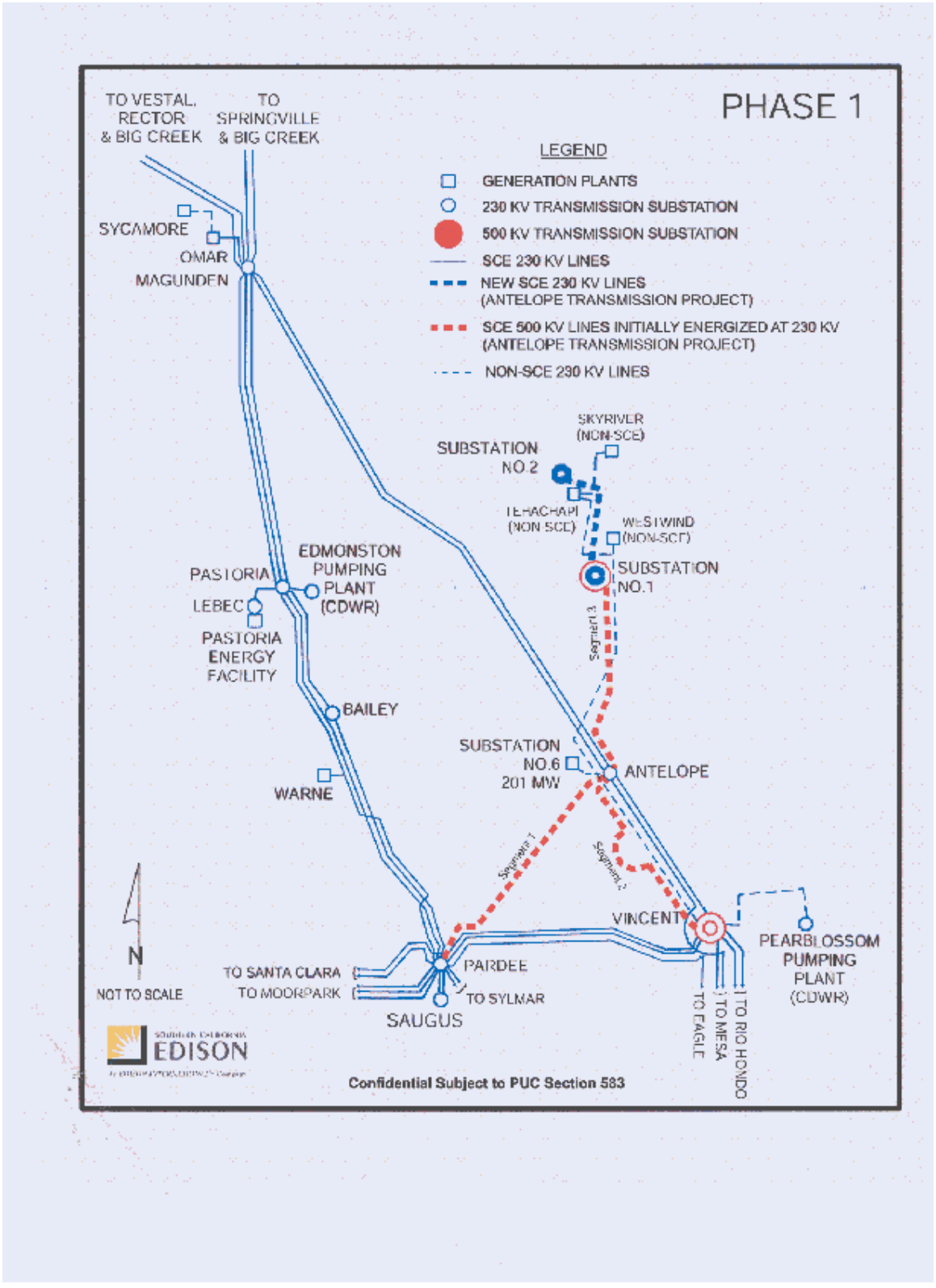
- A new 26.1 mile, 500 kV transmission line to connect SCE's Antelope Substation with a new Tehachapi Substation One to be located near Cal Cement. This line would be initially operated at 220 kV.
- A new 500/220/66 kV substation (Tehachapi Substation One).
- A new 220/66 kV substation (Tehachapi Substation Two) near Monolith.
- A new 9.4 mile, 220 kV transmission line to connect Substation One with Substation Two.

SCE refers to Segments 1-3 collectively as the Antelope Transmission Project. It submitted separate CPCN applications for Segment 1 (A.04-12-007) and for Segments 2 & 3 (A.04-12-008) on December 9, 2004, and filed an amended application for Segments 2 & 3 on September 30, 2005.

The total wind generation able to be exported with Phase 1 upgrades is 700 MW. These upgrades are shown in FIGURE 6.2.

The environmental documents for Segment 1 (Antelope-Pardee) are scheduled to be released for public review by August 30, 2006. The CPUC could thus act to approve Segment 1 in October 2006.

## FIGURE 6.2 PHASE 1 UPGRADES



In March 2006, the CPUC hired its environmental consultant to review the environmental studies conducted by SCE for Segments 2 & 3. The CPUC expects to have draft environmental documents for these segments available for public review by December 2006. The CPUC is expected to rule on Segments 2 & 3 in mid-2007.

## 6.3 Phase 2A: Antelope to Substation No. 5

The intent to construct new transmission evidenced by the Phase 1 CPCN filings made it possible for wind generation companies to advance their projects in the region. Since those filings, more than 1,100 MW of wind projects have entered the CAISO queue requesting interconnection to Substation No. 5. A developer proposing the first 300 MW of the total is evaluating permitting Substation No. 5. Assuming a temporary operating solution is approved, a Permit to Construct (PTC) could potentially allow a portion of the project to be in service before construction of additional network facilities is complete.

The remainder of the generation resources connecting at Substation No. 5 may require construction of at least one new 18.6 mile, double circuit 230 kV transmission line from the Antelope Substation to the new 230 kV Substation No. 5. This transmission line and new 230 kV Substation No. 5 were identified as part of Phase 2 development facilities in the TCSG March 2005 report. It is the TCSG's understanding is that the construction of these facilities may be permitted as a Permit to Construct (PTC), while the new lines might require a CPCN. Facilities to be located north of Antelope/Vincent may be permitted separately from the facilities to be located south of Antelope/Vincent.

## 6.4 Phase 2B: Network Upgrades of the SCE System

The second phase of Tehachapi transmission development consists of network upgrades of the SCE system needed to enable power to flow from the Antelope-Vincent substation area to Southern California load centers. In the TCSG March 2005 report, these were identified collectively as the Antelope-Mesa upgrades. Part of the cost of these upgrades may be in common or shared with SCE's planned Vincent-Mira Loma 500 kV transmission line (T/L) project. These upgrades will increase cumulative Tehachapi export capacity to 1,600 MW. The major components of these upgrades include:

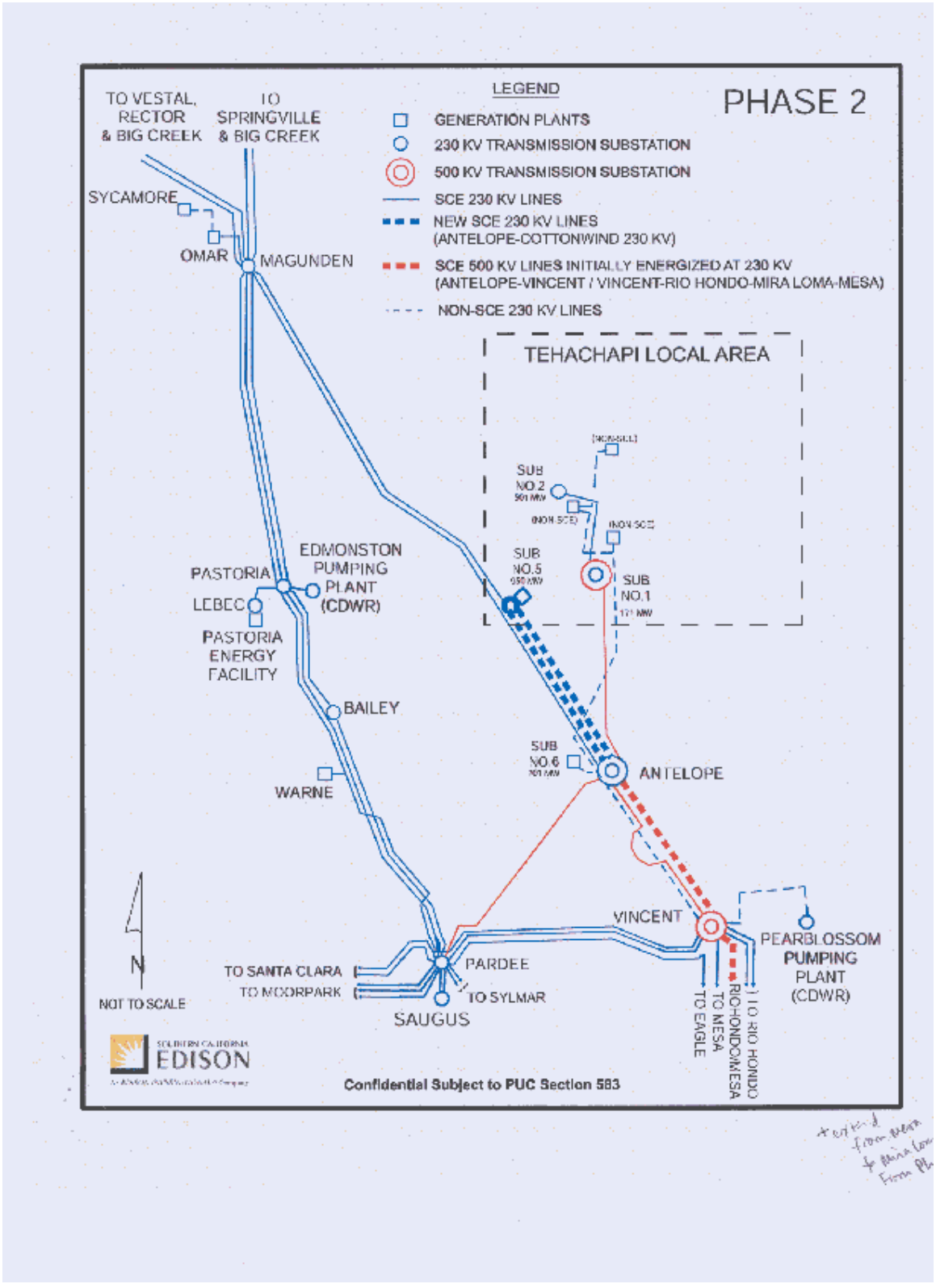
- Tear down and rebuild the Antelope-Mesa and Antelope-Vincent 230 kV T/L between Antelope and Vincent with a second new 500 kV T/L. (The first new Antelope-Vincent 500 kV T/L is to be built in Phase 1, Segment 2).
- Tear down and rebuild the section of the existing Antelope-Mesa 230 kV T/L between Vincent and Rio Hondo with a third Vincent-Rio Hondo 500 kV T/L, initially operated at 230 kV.

- Tear down and rebuild the section of the existing Antelope-Mesa 230 kV T/L between Rio Hondo and Mesa with a second Rio Hondo-Mesa 230 kV T/L.

CPUC Resolution E-3969 (February 16, 2006) ordered SCE to perform the studies necessary for the preparation of PEAs and the filing of CPCNs by the end of 2006 for these Antelope-Mesa upgrades and for the Antelope-Tehachapi Substation 5 230 kV transmission line.

Phase 2 upgrades are shown on FIGURE 6.3 below.

## FIGURE 6.3 PHASE 2 UPGRADES



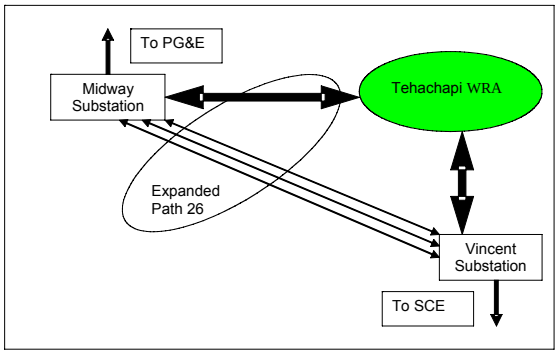
## 6.5 Alternatives for the Second and Third Tehachapi Connections

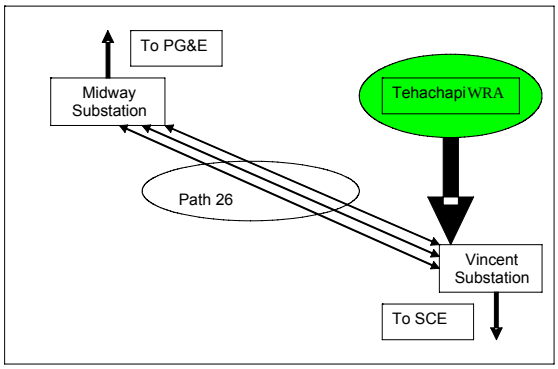
Following the Phase 2 network upgrades, two additional 500 kV connections will be needed, one in each of Phase 3 and Phase 4. These lines could be configured as two lines from Tehachapi to the south/SCE system; or alternatively, as one line to the north/PG&E system and one line to the south.

In the first TCSG report to the CPUC, Phase 3 consisted of a second 500 kV transmission line connecting Tehachapi with the Southern California grid. Phase 4 of that plan considered a connection to Northern California. It must be emphasized that the phase numbering was for identification purposes only and was not meant to imply that construction of the phases occur in the numbered order.

A connection between Tehachapi and Northern California, together with one or more connections to Southern California, would constitute an additional link in Path 26, the major transmission artery connecting Northern and Southern California. The TCSG refers to this alternative (FIGURE 6.4 below) as the Expanded Path 26 option. This configuration is expected to be considered a "network facility" which would provide two important benefits to the California grid, namely additional reliability, operating flexibility and additional import capacity into Southern California[33] when Tehachapi generation is low.[34]

## FIGURE 6.4 Expanded Path 26 Option FIGURE 6.5. Gen-tie Option




The Gen-Tie Option (see FIGURE 6.5) would provide Tehachapi with access to the grid only at substations in Southern California.[35] In this option, all three of the 500 kV lines necessary to export Tehachapi power would extend south from

[33] Additional transmission facilities will be needed to transmit power to the SDG&E system.

[34] A frequent criticism of wind power is that "the wind doesn't blow all the time." A transmission plan that enables additional power transfers during periods of low wind generation would allow the CAISO to manage the variability of wind generation more easily.

[35] SCE's Antelope substation lies between Tehachapi and Vincent. Power exported south from Tehachapi might enter the grid either at Antelope or at Vincent substations.

Tehachapi. Providing access to Tehachapi wind power would be the primary benefit of this alternative. Power lines which serve only to connect generation to the grid are referred to as generation tie lines or “gen-ties”, and the TCSG calls this the Gen-tie option. The feasibility of constructing a third 500 kV line from the Tehachapi area to Vincent in the Gen-tie option may be complicated, however, due to the rapid urbanization of the Antelope Valley which lies between the Tehachapi and Vincent substations.

The Expanded Path 26 option could complicate grid management, however, since some power from Tehachapi would flow on existing Path 26 lines and use some of the path transfer capacity. This could complicate grid operations as operators must consider these variable flows when scheduling power into Path 26. Under the Gen-tie option, management of Path 26 flows would be simpler. Further study of these alternatives from a grid operations standpoint will be required. The TCSG does not have the data to conduct these studies.

The results of production cost simulations comparing the two alternatives are discussed in Chapter 3. Costs for the two configurations appear comparable, estimated to be in the neighborhood of $1 billion. A choice between the two alternatives hinges on benefits of each that the TCSG has not yet been able to quantify.

Issues related to reliability, grid operations and network benefits are beyond the expertise of the TCSG. Resolving these issues will require both more active assistance from the CAISO and more active involvement of the CPUC. The TCSG therefore makes the following recommendation:

> Recommendation #1
> The TCSG recommends that additional study of all Phases 3 and 4 alternatives discussed herein be conducted expeditiously under the auspices of the CAISO in a forum that is open and collaborative, similar to the TCSG process to date.

To resolve which facilities should be built in Phase 3, CPUC Resolution E-3969 orders SCE to submit a recommendation by 12/31/06, for preferred and alternate routes for three options: Tehachapi Substation One to Midway Substation; Tehachapi Substation One to Vincent Substation; or other alternative. Together with the CAISO analysis of the Expanded Path 26 option (Tehachapi-Midway) and the Gen-Tie option (Tehachapi-Vincent), this will determine which facilities should be built first.[36]

The component facilities of Phase 3 and Phase 4, regardless of which is built first, are described in the following sections.

[36] The CAISO may identify other connection alternatives and/or other network upgrades necessary to accommodate the very significant amount of Tehachapi energy as well.

## 6.6 Phase 3: Second 500 kV Connection to the Grid

Phase 3 will bring cumulative Tehachapi export capacity to 3,300 MW. As noted above, the numbering of phases 3 and 4 is not intended to indicate development or construction priority.

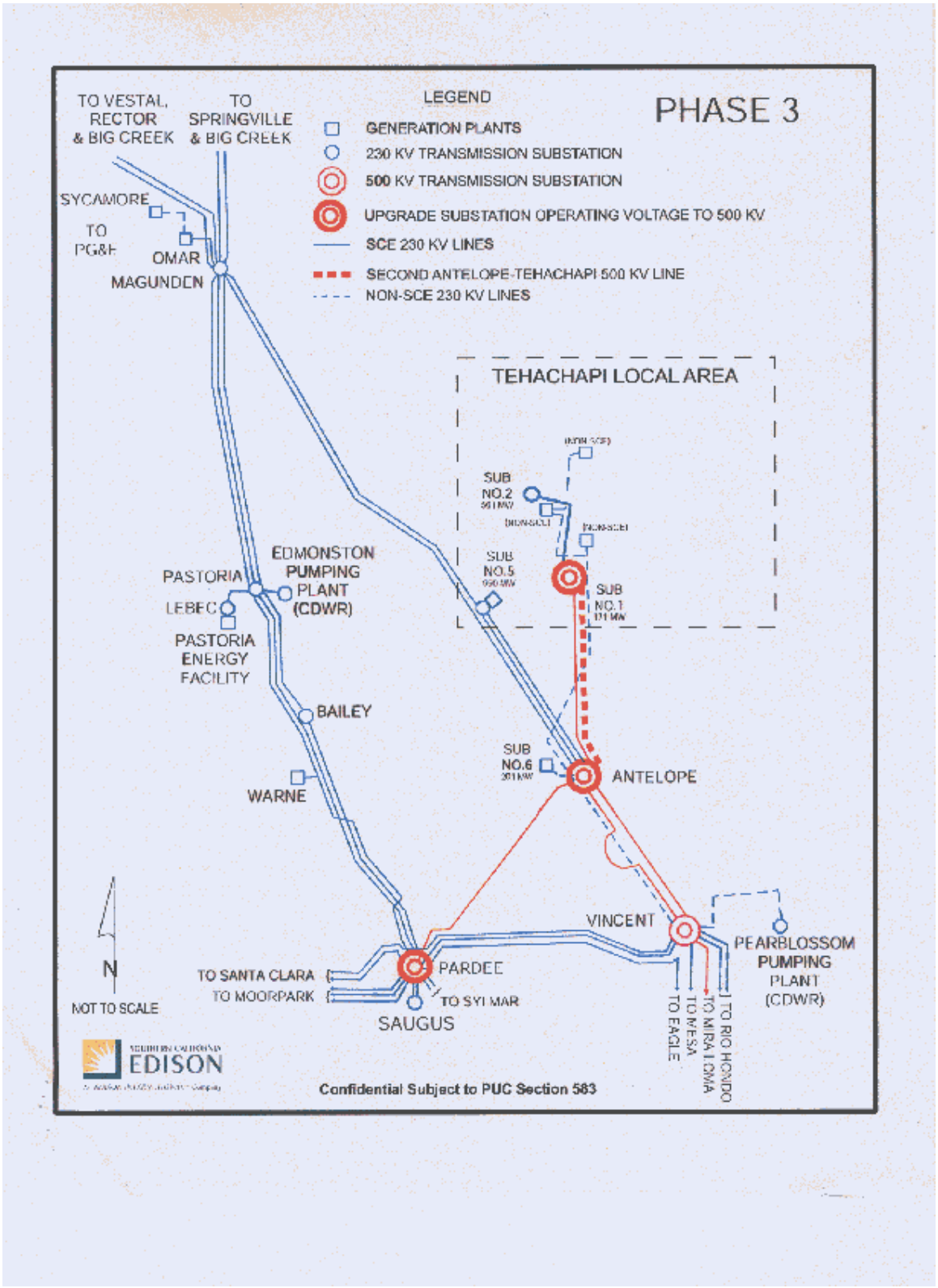
Phase 3 upgrades, as presented on FIGURE 6.6, shows the Antelope-Tehachapi #2 500 kV line added to Phase 1 and Phase 2 upgrades. In its first report, the TCSG contemplated that the second southern line would connect to the grid through the Vincent substation. Given the Phase 2 upgrades of the SCE system south of Antelope, the TCSG now believes that a second 500 kV line will be required only between Tehachapi and the SCE Antelope substation.

In Phase 3, all of the 500 kV facilities built in Phases 1 and 2 but energized initially at 230 kV will then be operated at 500 kV. This will entail the conversion of the Antelope, Pardee, Tehachapi and Vincent substations to 500 kV. More specifically, this will require adding one 500 kV transformer bank to the Antelope Substation, and to the Pardee Substation; adding three 500 kV transformer banks to the Tehachapi Substation One; and adding and equipping a breaker-and-a-half 500 kV bay at the Vincent 500 kV Substation.

Operating the Tehachapi transmission facilities at 500 kV will also require additional reactive support equipment throughout the SCE service territory.

CPUC Resolution E-3969 orders SCE to immediately pursue further environmental, engineering and other studies necessary to support approval of all the transmission facilities included in planning Phases 1, 2 and 3 of the 2005 report. The Resolution states further that the CPUC will order the preparation of a PEA and the filing of a CPCN for the preferred second 500 kV connection from Tehachapi to the EHV grid by 12/31/07. The TCSG recommends that the Commission direct its Energy Division to work with SCE to ensure that complete CPCN applications for Phases 2 and 3 are filed as soon as possible.

## FIGURE 6.6. Phase 3 Upgrades



## 6.7 Phase 4: Possible Third 500 kV Connection to the Grid

Phase 4 adds a third 500 kV connection between Tehachapi and the EHV grid. This would increase the cumulative export capacity to 4,500 MW. As noted, the numbering of phases 3 and 4 is not intended to indicate development or construction priority. Further study will identify the least cost interconnection configuration, and determine the need for three lines.

Phase 4 can be configured in either of two alternative ways:

- as an expansion of Path 26, with a new 500 kV line from Tehachapi Substation One to the PG&E Midway Substation. This configuration is shown on FIGURE 6.7 below. The TCSG calls this the Expanded Path 26 option.
- with a third 500 kV line from Tehachapi Substation One to the SCE Vincent Substation. FIGURE 6.8 diagrams this configuration, which is labeled, “Radial to SCE.” The TCSG refers to this as the Gen-Tie option.

In the latter case, all three 500 kV lines would connect Tehachapi generation to the SCE system; there would be no direct connection to the PG&E system/Northern California.

The TCSG anticipates that the CAISO studies necessary to identify the relative grid impacts and costs/benefits of these two alternative configurations will be completed later in 2006. Given that 3,600 MW of wind projects have already applied for interconnection in the Tehachapi region, environmental studies and permitting for Phase 4 should begin immediately after the choice of routing for the third 500 kV connection is made.

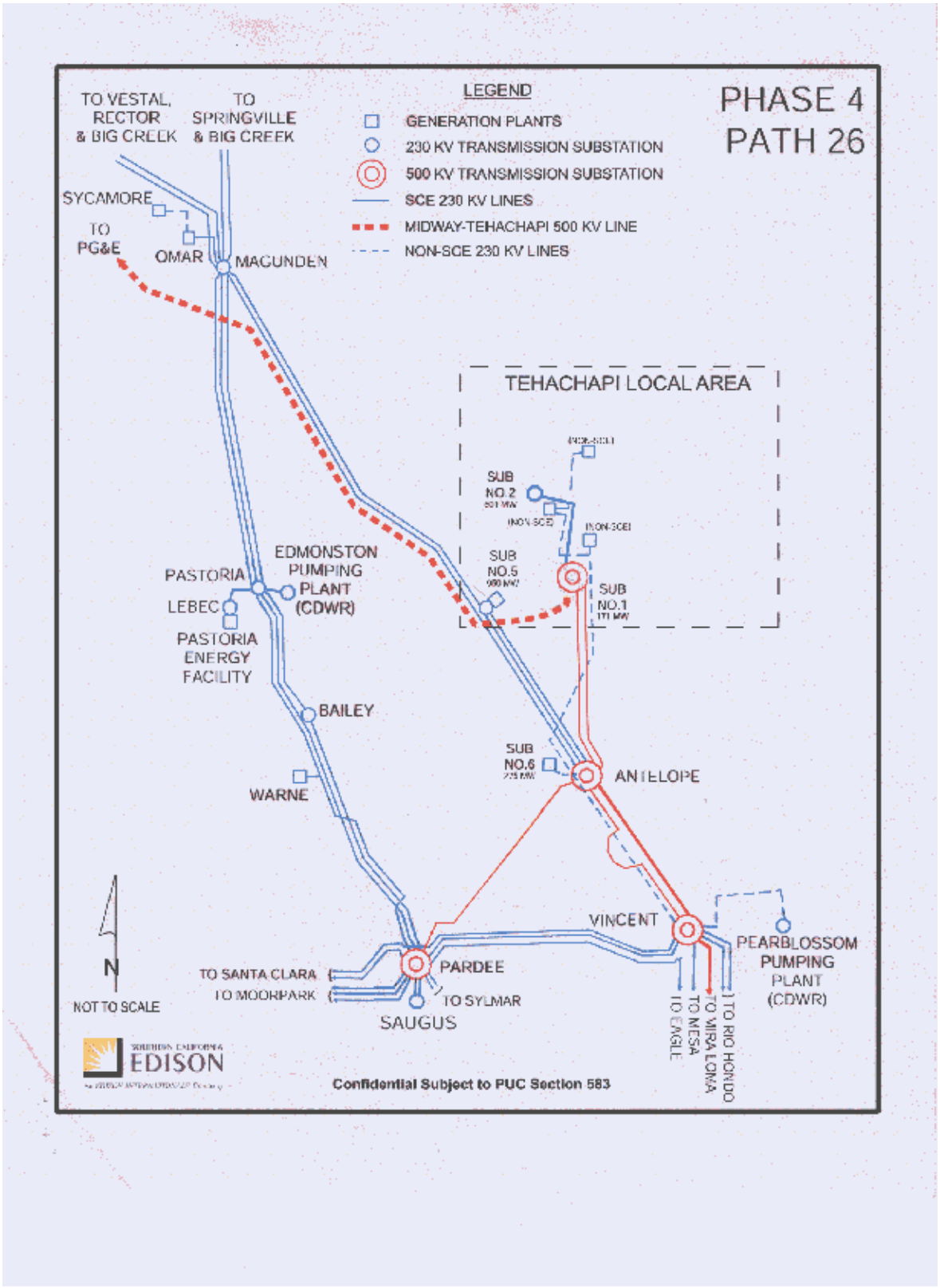
## 6.8 4,000 MW from Tehachapi Over Two Circuits

The possibility of using only two not three circuits emerged after studies of three lines were well under way. Although few collaborators could support the alternative at this late date the CPUC Energy Division staff, due to potential substantial capital cost savings, urges the CAISO to assess the two-circuit alternative within its further study of Phases 3 and 4.

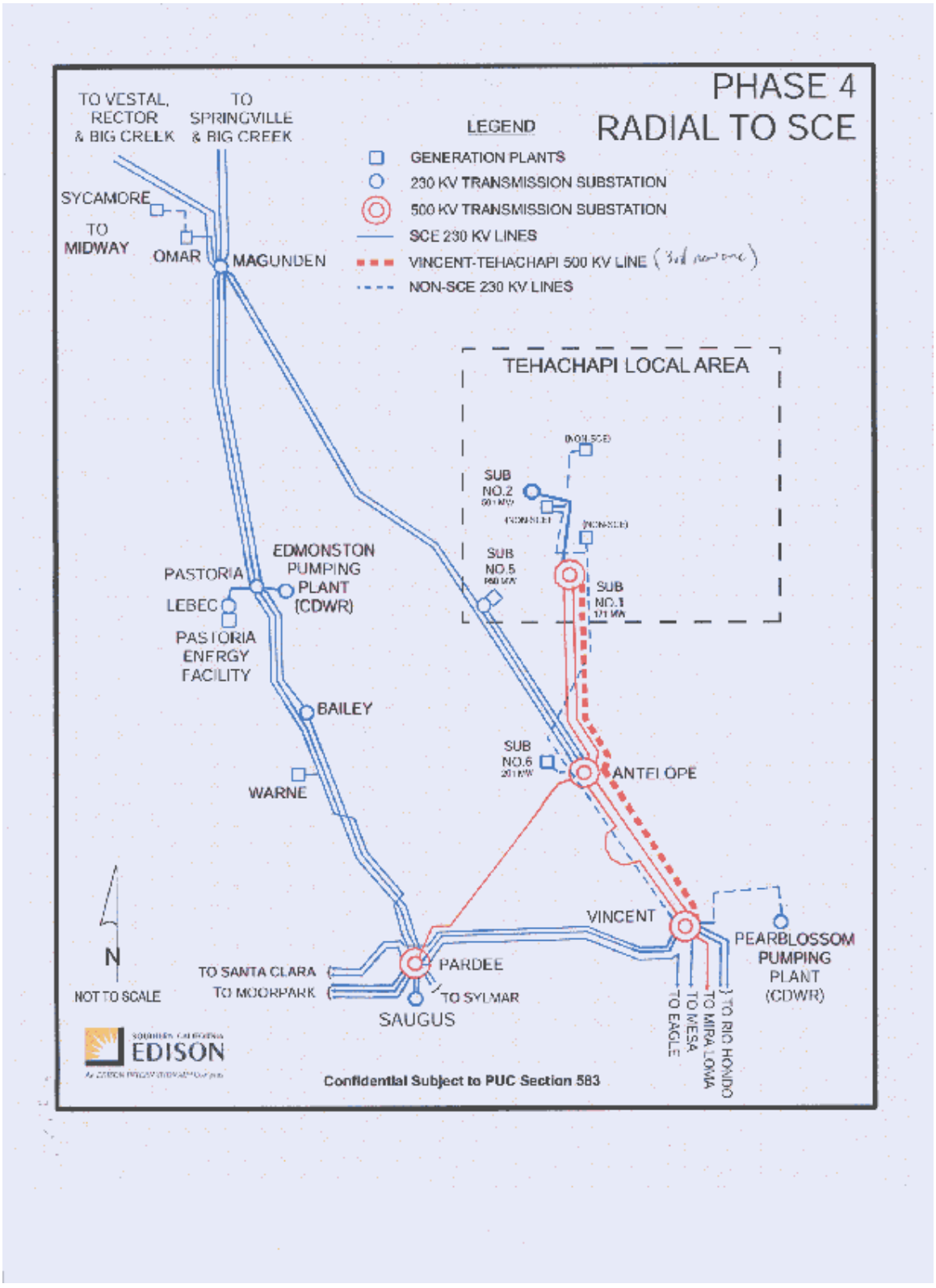
In the July 14, 2004 Tehachapi Study Plan, and results as presented in the 2005 report, all transmission alternatives to interconnect Tehachapi generation assumed conventional capacity (well under 2000 MW) for each of three 500 kV circuits. However, it has since been learned that for its Phase 1 segments the thermal limit of SCE’s standard design 500kV circuit is 3400 MW. Staff’s initial analysis indicates that only two such circuits could potentially deliver 4,000 MW from Tehachapi Substation 1 to the existing network and that a single circuit may suffice under emergency conditions. System performance for specific contingencies must still be assessed, and there could be problems with voltage support and possibly stability under the N-1 condition. The CAISO should

identify the problems, formulate measures to mitigate them, and compare the cost of mitigation to the cost of the third circuit to Antelope or to Midway.

## FIGURE 6.7 Phase 4 Upgrades, Expanded Path 26



## FIGURE 6.8. Phase 4 Upgrades, Gen-Tie Option



# CHAPTER 7 - POLICY AND IMPLEMENTATION ISSUES

## 7.1 Cost Recovery Issues

This chapter explains the necessity of using the P.U. Code Section 399.25 backstop provisions regardless of the type of transmission upgrade. It also explains the uniqueness of the Tehachapi transmission project: there is at present no pre-construction assurance of cost recovery for construction costs. Finally, it explains that the cost-recovery backstop provided by Section 399.25 is necessary to solve the problem.

### 7.1.1 The Uniqueness of Tehachapi: Why Advance Assurance of Cost Recovery is Required

The Tehachapi transmission project differs from most major transmission projects because of its relationship to the interconnected generating units. This difference affects the principles and process by which cost recovery certainty is obtained for Tehachapi's sponsor.

In the customary situation, a major transmission upgrade is constructed to accommodate a known, large generating plant. In this case, the generating facility can plan and pay for an appropriately sized interconnection facility with the in-service dates of each facility coinciding. In addition, traditional generation facilities can be located in areas that minimize the need for transmission facility upgrades.

The Tehachapi project, in contrast, is spawned by the anticipated construction of a large number of small wind generation projects to support the state's RPS mandate. These projects must be located in the relatively remote area where the renewable resource exists. Constructing interconnection facilities to support each project as it materializes would lead to numerous gen-tie facilities from Tehachapi to Antelope and other low-voltage facilities that would have to be replaced with higher-voltage facilities later -- an environmentally and economically irresponsible approach. Yet, no single wind project can bid a project that includes the cost of an upgrade that will efficiently accommodate the other projects in the resource area. This is due in part to the long lead time required for large transmission projects; developers cannot reliably price power from a project that cannot be built for several years due to lack of transmission capacity.[37]

The solution for the Tehachapi WRA is for the utility to plan, finance and construct transmission facilities that are sized to accommodate the expected

[37] A developer will not place its equipment order without knowing the in-operation date. Absent placement of equipment orders, equipment prices -- which can be affected by currency exchange rates, primary resource costs, and turbine supply/demand issues -- are unpredicTABLE. Compounding the problem is uncertainty in future federal tax benefits. On the other side of the TABLE, the purchasing utility is unlikely to sign a bid whose price is uncertain. For the same reasons, it is difficult for developers to sign interconnection agreements.

wind generation projects. This, in turn, requires the utility to be assured of cost recovery in the absence of firm generator commitments to utilize 100% of the upgrade capacity.

### 7.1.2 The Source of Assurance of Cost Recovery: P.U. Code Section 399.25

California utilities will not begin construction without assurance of cost recovery. Section 399.25 authorizes the PUC to offer that assurance, if the costs are prudent.

Such assurances must be made whether the upgrade is "network" or "non-network." For a **network upgrade**, built before interconnection agreements, FERC will protect the utility from disallowance due to insufficient demand, if certain criteria are met.[38] This protection does not translate into advance assurance of cost recovery. Pursuant to customary FERC practice, the utility may not seek cost recovery until construction is complete. For this reason, in its recent Resolution E-3969, the CPUC has provided backstop cost recovery assurances for Tehachapi planning and permitting costs for various but not all elements of the recommended plan contained in this report.. This same assurance will be necessary for construction costs, at the time that the CPUC approves each CPCN application. This assurance is truly backstop, since a facility's network status, and FERC's announced protection from disallowance in the event of excess capacity, will translate into cost recovery through FERC-jurisdictional transmission rates. However, there remains a possibility that FERC's view of what should have been built will differ from the Commission's; the backstop is also necessary to cover these potential instances.

> For a **non-network upgrade**, the cost cannot be expected to be recovered in FERC-jurisdictional transmission rates.[39] In this non-network context, Section 399.25 provides the only path to cost recovery assurance; all planning and construction costs will be recovered from retail ratepayers and/or from generators on a pro-rata basis after each generator comes on line.

The details of how these cost recovery provisions should be implemented are being addressed in I.05-09-005, where the parties have submitted briefs and reply briefs and a final decision is expected in May 2006.

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[38] With respect to interconnection-related network upgrades, the TCSG expects that utilities can be encouraged to exercise their discretion to provide up-front funding if FERC provides early assurances of cost recovery, including 100% recovery for abandoned plant. FERC has already indicated its willingness to work with California utilities in this regard. See *Southern California Edison Company*, 112 FERC ¶ 61,014 (2005) at para. 61. The TCSG hopes FERC would grant similar relief to all California utilities proposing to make similar investments in network upgrades needed to help facilitate the development of renewable resources.

[39] SCE petitioned FERC to allow the multiple-generator Tehachapi "trunk line" to be rolled into rates, but its petition was rejected on the basis of SCE's and the ISO's assertion that the upgrade would be devoid of network benefits; for FERC to have enabled roll-in, network benefits are required under the FERC's precedents.

### 7.1.3 Cost Recovery Recommendations

A. The Commission should issue a final decision on cost recovery policy according to the schedule set forth in I.05-09-005, resulting in a final decision by May 2006. That decision should be applied to the Tehachapi case based on these principles:

a.) The individual generator would be responsible for construction of an individual gen-tie from its project site to a designated new substation(s) identified in this plan whose function is to be a collection point for shared transfer of multiple projects to the common grid. Presumably the generator would recover this cost in the price it charged for the project's energy output. The recovery risk for the cost of this gen-tie is solely on the generator.

b.) For transmission projects that are needed for reliability or to promote economic efficiency within the meaning of the CAISO Tariff, but are also needed to facilitate achievement of RPS goals, "all feasible [CPUC] actions" should include, at a minimum: (1) supporting Participating Transmission Owner (PTO) requests for CAISO approval for addition of the project to the CAISO-controlled grid; (2) supporting utility requests for the recovery of the prudently-incurred costs of such projects within FERC-jurisdictional rates; and (3) allowing recovery in retail rates of the costs of any such projects that are not approved for inclusion in FERC rates.

c.) For projects that are not needed for reliability or to promote economic efficiency within the meaning of the CAISO Tariff, and therefore would not be needed but for the interconnection of new generation, but *are* "network upgrades" for which a utility may be willing to exercise its discretion to provide up-front funding under federal interconnection policy, the Commission's actions should include: (1) supporting utility requests to FERC for early cost recovery assurances, including exceptions to abandoned plant policy, as well as reasonable arguments that the facilities in question are "network facilities" rather than "direct assignment facilities" or "gen-ties"; (2) after the facilities are placed in service, supporting utility requests for the recovery of prudently-incurred costs within FERC jurisdictional rates; and (3) allowing recovery in retail rates of any such costs that are not approved for inclusion in FERC rates.

d.) Finally, for high-voltage, bulk transfer generation-tie lines serving multiple RPS generators that are not needed but for

the interconnection of new renewable generation and also do not qualify as network facilities, the Commission should allow full recovery of prudently-incurred costs. These costs would be recovered in retail rates and/or from generators. For the Tehachapi plan, the utility would exercise the option to fund and construct such facilities built in advance of generation. The exact locations/sizes/construction timing of these collection points would be determined as individual generation projects matured.

B. The Commission should provide cost recovery assurances for planning and permitting costs to all elements related to integration of Tehachapi WRA generation.

While this chapter has focused on providing cost recovery assurance for utilities, the TCSG points out that an essential purpose of this assurance is also to provide reasonable regulatory certainty to generators as to what costs they will be responsible for before committing to a fixed-price bid and securing financing for a project Therefore, the TCSG further recommends the following:

C. The Commission should provide generators with reasonable certainty concerning the transmission costs they will be responsible for before the generator is required to make a binding price bid. The CPUC should require the utility to develop a estimate of the pro-rated facilities charge it will assess to generators interconnecting to the authorized facilities before construction of the transmission facilities commences.[40] Various solutions may be possible. For example: any costs exceeding this amount could be recoverable through the ratepayer backstop;[41] or, the generator could be allowed to adjust its PPA according to actual costs.

## 7.2 CPUC Transmission Permitting Process

### 7.2.1. Existing Permitting Process

The CPUC reviews regulated utility transmission projects under the present requirements of PUC Section 1001 and 1002, General Order 131-D, Rule 17.1 and the CPUC Decision 89905 Appendix B Information and Criteria List (Criteria List) for the Proponent's Environmental Assessment (PEA) filings. In addition, to the requirements and practices of the proceeding process, the CPUC, as Lead Agency, must comply with the CEQA process. Further, if the project has not been determined to be exempt, the CPUC ED staff must also conduct a contract

[40] That charge will be a component of the standard interconnection agreement that the parties file at FERC.

[41] Potentially charging ratepayers for a share of costs may be particularly appropriate when the upgrade provides system benefits (though short of what is required to achieve "network" status) or when the upgrade is expected eventually to become part of a larger network configuration.

process for an environmental consultant under the requirements of state contracting and General Order 163A.

***Processing Non-Exempt 131-D PTC and CPCN Projects***

The CPUC transmission review for a Permit to Construct (PTC) or a Certificate of Public Convenience Necessity (CPCN) is generally conducted in the following steps with the ALJ general proceeding and the CEQA process in somewhat parallel tracks:

**CEQA Process**

1. Application and PEA is filed with the CPUC.

2. If the project is not 131-D or CEQA exempt, a contract process must be initiated for an environmental consultant. Completing the contract process takes 3 to 4 months and has taken place either before or after the filing of the application. It requires the completion of the contract request process, advertisement of the Request for Qualifications (RFQ) for at least 4 weeks; review of the Statement of Qualifications (SOQs); consultant interviews; completion of evaluations; contract package preparation; and Department of General Services (DGS) approval.

3. Contractor and the CPUC Project Manager (PM) review the application using the PEA Information and Criteria List and generally do 1 to 2 rounds of PEA deficiency reviews with the first required in 30 days per GO 131-D and CEQA Guideline15101.

4. After the application is deemed complete, a determination must be made on whether an Environmental Impact Report (EIR) or Mitigated Negative Declaration/Negative Declaration (MND/ND) is necessary. This is usually based on the conclusions of a consultant prepared initial study that utilizes the PEA information.

5. Environmental Document Preparation for EIR or MND

***Draft Environmental Impact Report (DEIR) Major Tasks***

- DEIR preparation involves site visits; incorporating and supplementing, as necessary, PEA information; clarifying the project description; developing and screening alternatives; consulting with applicable agencies; conducting public scoping meetings; preparing of any scoping report; working with applicant on data requests; preparing a draft mitigation and monitoring report; completing any required biological or cultural surveys if not done by the applicant or can be done prior to construction; and preparing and reviewing administrative draft documents. Public review of the DEIR is normally 45 days.

- Workshops are conducted during the public review period. ALJ may hold public participation hearings (PPHs) in this same time frame which is separate from the CEQA public meeting requirements.

- The EIR is finalized after draft review. The Energy Division (ED) PM works with consultants to complete responses to comments on DEIR. Per the Permit Streamlining Act, CEQA 21151.5, and Rule 17.1, the final EIR must be completed and certified within a year after the application is deemed complete.

***Draft Mitigated Negative Declaration (DMND) Tasks***

- Utilizing and supplementing PEA information, the consultant prepares the initial study and draft MND. This usually requires site visits, agency consultations, data requests with the applicant, and ED review of the administrative draft MND.

- In coordination with the consultant and legal the PM discusses the proposed mitigation measures with the applicant to reach agreement for publishing a MND; otherwise an EIR would be required without applicant agreement on mitigation measures.

- Draft MND is released for a 30 day public review period. Scoping meetings and agency consultations may be scheduled during this time period.
- The consultant in coordination with the ED PM prepares the response to comments and finalizes the MND. Per the Permit Streamlining Act, CEQA 21151.5, and Rule 17.1, a final MND must be completed and adopted within 180 days of deeming the application complete.

**ALJ Proceeding Process**

1. After the application and PEA is filed in the docket office, the ALJ has generally started the proceeding process during the above discussed EIR or MND preparation activities. The ALJ conducts a prehearing conference and prepares a scoping memo outlining the issues and schedule for testimony, briefs, and possible hearings. The EIR or MND process and schedule is included in the memo. Certain issues including need may be bifurcated and proceed ahead of the final EIR/MND completion.

2. The ALJ may conclude all proceeding activities prior to or at the time the EIR or MND is finalized by the ED; or the ALJ may continue the proceeding process focusing on routing issues after the EIR or MND has been finalized by the ED.

3. At the conclusion of the proceedings, the ALJ will prepare the proposed decision that involves certification of the EIR or the adoption of the MND and the decision.

4. The Commission votes on the proposed decision.

5. The Notice of Determination must be sent to the State Clearinghouse (SCH) within 5 days of the effective date of a final Commission decision approving a project in order to preserve the CEQA statute of limitations of 30 days for filing a

civil challenge. If the five days is missed an entity has 180 days to challenge [CEQA Guidelines 15094 (g) 15112(c)].

6. After the CPUC decision process is completed and the project is approved, the ED staff and the consultant prepare a mitigation monitoring compliance and reporting program (MMCRP). Throughout the construction period, the consultant and ED staff coordinate with the applicant on the implementation of mitigation measures and monitoring construction activities. The ED staff works with the consultant on notices to proceed for construction and any necessary variances.

***Processing Exempt 131-D Projects***

GO 131-D III (B) (1) allows exemptions from PTC or CPCN requirements. The process is generally as follows:

1. The utility must file a notice/advice letter for the exemption not less than 30 days before the date when construction is intended to begin per 131-D. If no protests are filed, the utility may proceed with construction 45 days after first publication of the notice.

2. Within 20 days after the notice is mailed or published, an individual can object to the exemption.

3. The utility has five business days upon receipt of the protest to respond. Construction can't commence until the Executive Director has issued an Executive Resolution.

4. Within 30 days of the utility's response, the Executive Director must issue an Executive Resolution on whether the utility must file a PTC or the protest is dismissed for the lack of a valid reason. Also, the Executive Director must state the reasons for granting or denying the protest.

### 7.2.2 Policy Issues Associated With The Existing CPUC Permitting Process and Streamlining

In the I.05-09-005 proceeding, the utilities and other interested parties have raised issues regarding the existing CPUC transmission permitting process. As part of the proceeding, parties were directed by Commissioner Grueneich to file comments identifying the top six issues that the CPUC should address in 2006 and in 2007. Parties filed comments on November 15, 2005. A subsequent workshop was held on December 6, 2005. One of the top six priority items identified by the parties in the briefings and at the workshop was streamlining the siting and permitting process for transmission. The parties identified the following issues in their November briefings and at the December workshop:

- CPUC consultants should not duplicate applicant's environmental analysis.
- CPUC should focus only on the requirements of CEQA.
- EMF policy should not be relitigated in every proceeding.
- CPUC needs to follow the required time frames for handling protests to 131-D exempt projects.
- Utility should be able to use an existing environmental document in lieu of a PEA where applicable.
- CPUC should avoid time consuming EIRs when a mitigated negative declaration would be appropriate with up-front negotiated mitigation measures.
- CPUC needs to start contract process prior to application filing to avoid review delays.
- CPUC needs to fully utilize PEA for preparing a MND or EIR and not duplicate efforts.
- CPUC should consider ways to consolidate NEPA/CEQA reviews.
- There needs to be more up front collaboration and cooperation.
- CPUC needs to adopt internal procedures to ensure compliance with Permit Streamlining Act and 131-D timeframes.
- CPUC should consider general changes in process to streamline and expedite the CPCN/PTC approval process.
- CPUC should consider separating the approval of a transmission corridor from the approval of the detailed siting and engineering of the transmission towers within the corridor.

The CPUC Energy Division has also found that the process has not always gone as smoothly and expeditiously as possible. There are numerous reasons for this situation including the following:

- The existing mandated state contract process takes 3 to 4 months, and is often not initiated prior to the application filing. This tends to extend out the time for PEA deficiency review and consultant preparation of the EIR or MND documentation.
- The contract process was not conducted in a reasonable amount of time.
- At the time of filing, the PEA has numerous deficiencies.
- In a joint EIR/EIS (environmental Impact statement), the memorandum of understanding (MOU) agreement was not done up front in a timely manner which allows co-lead agency issues to go unresolved for long periods of time.
- At the time of filing, up-front strategic planning was not done for handling and resolving known issues between ED and their consultant and, if applicable, with co-lead agency.
- The applicant is not timely with responses to PEA deficiencies or data requests as required by ED staff and consultant to maintain schedule.

- The ED staff and/or consultant do not adhere to the agreed upon schedule or there was not an up front commitment to a schedule by all parties.
- There was higher than anticipated public and agency controversy which in turn required more meetings, more alternative analysis, more required documentation on impacts and mitigation, and a longer proceeding with hearings, briefings, etc.
- Ed staff, their consultant, and/or the applicant did not anticipate issues that later seriously impacted the schedule.
- The ALJ proceeding schedule is longer for any number of reasons.

In light of the above proceeding comments and the identified issues with the existing permitting process, the CPUC Energy Division CEQA Unit staff prepared a memo to Commissioner Grueneich's office responding to the parties' comments and provided preliminary recommendations on streamlining the transmission permitting process.

At the direction of Commissioner Grueneich, Energy Division staff then scheduled a workshop for March 23, 2006 to further discuss permitting issues and to allow comments on the Energy Division staff's preliminary recommendations on streamlining the permit process. Prior to the workshop, staff's recommendations and their detailed responses to parties' 11/15/05 briefs and 12/6/05 workshop comments were sent to the parties for their review and comment. Energy Division staff's preliminary recommendations specifically included the following for exempt and non- exempt transmission projects:

1. Exempt Projects Under 131-D III (B) (1), Rule 17.1 and/or CEQA

Applicant needs to provide specific information for ED to quickly determine exempt projects by providing adequate justifications and clearly identifying the appropriate exemption. In addition, applicant needs to strictly adhere to exemption language to avoid protest and lengthy resolution of issues or the possible decision that a MND or EIR is required by the CPUC. ED staff must adhere to CPUC time frames for handling protests and preparing resolutions.

2. Processing Steps for Non-exempt Projects

Pre-Filing Steps

CPUC/ED Staff

1. At 6 months before utility filing, ED staff/Contracts Office/DGS initiates and completes contract process within 3 months.
2. At 3 months before filing the PEA, ED staff along with the consultant awarded contract, review the administrative draft of the PEA and provides and completes input to the utility within 2 months of filing.

Utility/Applicant

1. Utility develops specific project based on the procurement process.
2. Notifies ED staff within 6 months of filing of the project.
3. Conducts open houses and consultations with the public and agencies to discuss and assess any issues.
4. At not later than 6 months before filing, the utility should be making a concerted effort to resolve any issues (public, agencies, and others) or have strategic plan for doing so prior to filing or early on after filing.
5. At ED contract completion or at 3 months before filing, the utility develops an administrative draft PEA or equivalent information that fully adheres to 131-D and the PEA Information and Criteria List and addresses all issues to the maximum extent possible.
6. Utility works with ED staff on their administrative draft PEA input.

Application Filed and Deemed Complete

CPUC/ED Staff

1. Assuming PEA has been revised with all ED input, the application and PEA can be deemed compete within 30 days of filing.
2. Within 30 days of deeming the application complete, ED must decide whether to prepare ND or EIR. Utilizing the PEA and any supplemental information, ED prepares an initial study to make this determination; or decides that an EIR is clearly required and does not formally prepare an initial study.
3. If MND initially determined, ED and consultant works with the utility to develop project modifications/or mitigation measures that would allow for the public release of a MND instead of an EIR.
4. If an EIR is determined in 1 above, ED and consultant must immediately address unresolved issues internally and/or in concert with the applicant. For any unresolved issues, a strategic approach for resolution needs to be developed in writing and agreed to by all applicable parties including the applicant.
5. In accordance with the Permit Streamlining Act, a schedule for the MND or EIR completion must be developed at the early stages of deeming the application complete. It must be adhered to by all parties including ED, its consultants, applicant, and any other agency if a joint document.

Utility

1. Utility files PEA as revised by ED input after 6 months of project notification.
2. Utility works with ED and its consultant on project modifications and/or mitigation measures that will allow for a MND.
3. Utility responds expeditiously to any data requests submitted by CPUC ED staff and its consultants during the preparation of EIR or MND.

ALJ

1. After 30 days from filing the application, the ALJ should schedule a prehearing conference to address issues and schedule for the proceeding and the CEQA process.
2. A scoping memo outlining the issues and schedule should be prepared as soon as possible after the prehearing conference.
3. The ALJ should consider scheduling parts of the proceeding prior to the environmental document being finalized by ED staff and consultant.
4. ALJ should prepare the proposed decision as soon as possible after the environmental document is finalized by ED staff and consultant.

OTHER CONSIDERATIONS FOR STREAMLINING THE PROCESS POSSIBLY REQUIRING CHANGES TO REQUIREMENTS AND PROCEDURES

In addition to activating the above procedural steps in the near term, there are other overall considerations for streamlining the process.

Contract Process

1. Consider going back to the use of On-Call consultants by utility service areas and some other geographic delineation. Need to work with legal and Contracts Office.
2. ED could re-evaluate the "Round Robin" format of contracting. ED could develop a pool of consultants that could be utilize throughout the state, This format along with the one above will require Contracts Office and Legal Division support and input to successfully implement at the CPUC.

Personnel Issues

1. In addition to fully utilizing existing staff, management needs to support hiring additional staff at a sufficient level to make a 100% commitment to a more efficient streamline process.
2. CEQA Unit needs consistent legal support for exemption determinations, contract questions, and assisting in issue resolutions and developing a successful approach to legal questions on CEQA as ED is conducting the MND or EIR process.
3. CEQA Unit should be trained in the proper use of project management methods (scope, schedule, quality control), such as anticipating impacts that could affect the schedule and resolving them before they happen.

On March 23, 2006 the workshop was held to further discuss the permitting process and to comment on staff's preliminary recommendations. There were over 25 participants. A number of comments were presented on the existing process and on the staff' s recommendations including a project management approach to the Tehachapi development. The Energy Division is presently preparing a workshop report that will be finalized by mid April 2006. This report will present all the workshop comments and provide for next steps in implementing streamlining measures.

## 7.3 A Project Management Approach to Tehachapi Development

The TCSG joins the parties in I.05-09-005 in recommending that the CPUC implement the proposals in section 7.5 above to streamline and shorten CPUC permit approval processes. But streamlining the state's current approach to renewable energy and transmission development is inadequate to the opportunity at hand.

The need to build new generation in the state, the Loading Order adopted by the Commission, and the Energy Action Plan goal of having renewables supply 20% of our electricity by the end of 2010 combine to give Tehachapi development special urgency. Wind energy is less expensive than gas-fired generation, and every year of delay in Tehachapi development imposes real economic costs on California ratepayers. With 3,600 MW of projects already in the CAISO queue, wind companies have demonstrated the ability to meet the full build-out target for Tehachapi development on a schedule to meet the EAP 2010 goal. Streamlining the current permit application and approval process is essential, but by itself is unlikely to bring the necessary transmission into service in time. The current approach puts the CPUC in a largely reactive posture, at a time when proactive CPUC leadership is called for.

D.04-06-010 outlines an agenda of developing transmission in advance of interconnection requests.[42] With this decision, the Commission demonstrated its understanding that a business-as-usual approach to transmission development would not meet the goals indicated in state law and adopted, in concert with the CEC and the Governor, as its own policies. Adopting a project management approach to Tehachapi transmission development would better enable the Commission to follow through on the vision outlined in D.04-06-010.

In this approach, the CPUC would act as the project manager for the development of all Tehachapi transmission facilities. It would establish a detailed work plan and milestone schedule for all phases of the proposed development, and act to ensure achievement of the milestones.

If feasible, the schedule should be geared to a December 31, 2010 in-service date for the transmission facilities necessary to export 4,500 MW of wind generation from the Tehachapi region. The schedule and accompanying work plan would identify interim milestones and the supporting tasks necessary to complete each phase of the development in the optimum sequence.

The schedule and work plan will thus clarify exactly when the Commission must order the IOUs to complete studies and file applications; and the dates by which the Commission itself must approve applications. It will also identify other

[42] Interim Opinion on Transmission Needs in the Tehachapi Wind Resource Area, June 9, 2004, in I.00-11-001.

Commission actions, including coordinating procurement activities with the transmission development schedule, and providing cost recovery assurances. As discussed in sections 7.1 through 7.3 above, ensuring cost recovery at least cost to ratepayers may advise working with the CAISO to amend provisions of its tariff, and to establish cost recovery in transmission rates through a coordinated Section 205 Federal Power Act filing at FERC.

Members of the TCSG are prepared to assist the Commission in establishing such a milestone schedule and work plan to guide Tehachapi transmission development.

Organizing Tehachapi transmission development as one integrated project to be completed in phases over four years may make a Programmatic EIR the most effective permitting vehicle. Determining whether or not to develop a P-EIR for the inter-related phases of Tehachapi development should be one of the first tasks of the work plan.

### 7.3.1 CPUC Project Manager

This approach requires the Commission to appoint a project manager to lead this effort. The project manager will have responsibility for ensuring that all elements of the transmission development are completed on schedule. S/he will:

- coordinate the development of the milestone schedule and project work plan;
- monitor progress on each element of the schedule;
- anticipate problems and delays;
- work with CPUC staff and consultants, IOU staff, and state, federal and local agency staff to solve all problems necessary to keep the overall development on schedule;
- establish a stakeholder working group to assist in solving problems;
- ensure that the Commission is informed and prepared to take action, by issuing orders or otherwise, necessary to meet schedule milestones.

To this end, the project manager must have the authority to mobilize the full resources of the Commission, without regard to departmental boundaries.

### 7.3.2 CEQA Considerations of the Project Management Approach

CEQA does not preclude the CPUC from being the lead agency in charge of a Tehachapi EIR while also being the project proponent. Government entities commonly serve as lead agency on infrastructure projects that they intend to fund, build, own and/or operate. The key proviso in such cases is that the agency (i.e., the CPUC) prepare the EIR before making the decision to proceed with the project. The dual role of project proponent and lead agency also requires that CEQA provisions be scrupulously observed.

In sum, a project management approach gives the Commission powerful new tools with which to lead transmission development. It will enable the Commission to know the status of every major component of the overall project at all times, and so to anticipate problems and delays.

### 7.3.3 The Tehachapi Power Project

Building 4,500 MW of new generation at Tehachapi and the transmission to access it is the largest power project undertaken in California since Diablo Canyon. The TCSG believes that it is appropriate to consider the combined $10 billion generation and transmission development as one integrated project. Expediting its completion meets important state economic development, fuel diversity, rate stabilization, environmental and climate goals.

The wind generating plants, which represent the great bulk of the investment required, are expected to be built by private companies. Publicly owned utilities and private entities over which the CPUC has no jurisdiction may supply some of the transmission needed to export Tehachapi generation. POU's are also expected to purchase significant quantities of Tehachapi generation.

Getting the Tehachapi Power Project built at least cost and on the Energy Action Plan schedule will thus require coordinating the activities of a range of power purchasers, wind generating companies and their bankers and suppliers, transmission owners, the CAISO, the CPUC, and local, state and federal permitting agencies. Appointing a project manager invested with the mandate to get the project built can help ensure timely completion of the project.

The TCSG accordingly recommends that the CPUC work with the CEC, the legislature and key stakeholders to identify candidates for the position of Tehachapi Power Project manager. Candidates should have experience overseeing large scale infrastructure projects. The project manager would engage stakeholders to establish a milestone schedule and work plan addressing every element of the generation and transmission development. The small staff necessary to support this project manager role could be drawn from the CPUC, CEC IOUs and/or other stakeholders. The project manager would report progress to state agencies, stakeholders and the public quarterly.

# CHAPTER 8 - CONCEPTUAL SCHEDULE FOR COMPLETING TEHACHAPI PLAN & NECESSARY RELATED ACTIONS

## 8.1 Updated Conceptual Schedule

The March 2005 Report of the TCSG included a conceptual schedule for completing the Tehachapi transmission upgrades by December 2010. Chart 8.1 updates this schedule based on what has actually occurred since that report was issued, and shows that the March 2005 timeline for completion has now slipped to 2011. Chart 8.2 presents a revised schedule that would now be required to complete the plan by 2010.

The 2005 schedule assumed that the CPCN applications for Phase 1 would be processed and approved by June 2006. It now appears that various delays in the CPCN approval process will cause those applications to be approved no earlier than December 2006. Although the 2005 conceptual schedule was described as "the fastest practicable schedule" for completing the plan by 2010, and time has been lost since, the TCSG believes that it may still be possible to meet the 2010 completion goal if all of a number of aggressive actions to accelerate the process, as described in this chapter, are taken.

The TCSG emphasizes the critical importance of completing Segments 1 and 2 of Phase 1 as soon as possible. These segments must be completed before Phase 2 construction can commence. Phase 2 is essential for all projects because they require the additional south-of-Antelope transmission capacity that this phase will provide. Without Phases 1 and 2, the contributions from the potential Tehachapi wind generations to help meet the RPS mandated state goal is severely hindered.

Completing the goal by 2010, as shown in Chart 8.2, is very ambitious when compared to the timelines that are normally expected for major transmission projects. Accelerating the process is, however, necessary to preserve the opportunity for the Tehachapi region to meet its promise, as stated in Finding of Fact 3 of D. 04-06-010, to provide "a significant portion of the goals for renewable energy development in California." If the state is to reach its ambitious RPS goal of 20% renewable generation by 2010 with wind generated from Tehachapi, the time and process required to permit and build major new transmission facilities to access Tehachapi wind must be streamlined.

In addition to providing the infrastructure necessary to meet the state's RPS goals, accelerating the schedule is important also because the schedule will affect developers' ability to obtain temporary interconnections to enable their projects to come on line (with some curtailment) before the planned transmission facilities are operational. This is because the CAISO may approve a temporary

interconnection on a case by case basis only if the permanent facilities are "planned." The filing and processing of a CPCN (or PTC) provides clear evidence of those plans.

The balance of this chapter describes the actions that are necessary to accelerate every phase in order to complete construction by 2010, and the additional particular actions that are necessary in specific phases. In summary, we recommend that the Commission take the following actions:

### Recommendations:

- Accelerate the CPCN review process for the Tehachapi upgrades by taking all of the specific actions described in this chapter;

- Direct the Energy Division, utilities and other TCSG parties to develop a detailed schedule of specific tasks and parties responsible (the "who, what, when") that must be achieved if the larger milestones shown in FIGURE 8.2 are to be met (moving the schedule back if it is determined in this process that the 2010 completion goal is infeasible);

- Direct the Energy Division to work with SCE to ensure that complete CPCN applications for Phases 2 and 3 be filed as soon as possible;

- Expedite the CPCN approval process for future phases by proposing, on the Commission's own motion, without evidentiary hearings, a finding that Phases 2 and 3 are needed to facilitate the achievement of RPS goals.

In addition, as discussed in Chapter 7, the TCSG recommends that the Commission identify a Tehachapi project manager who would be responsible for ensuring that all of these recommendations are carried out in a timely fashion, in order to maximize the opportunity to complete the upgrades by 2010.

## 8.2 Actions Necessary in Every Phase to Complete Construction By 2010

To complete the Tehachapi plan by 2010, the Commission will need to complete the CPUC review and approval process for each application within twelve months or less in most cases. Although this same recommendation was made in the March 2005 TCSG report (Section 6.3.1), the process for each segment of Phase 1 will have taken at least two years, a significant source of delay in the overall plan. To accomplish review of CPCN applications within 12 months, each of the three phases of the Commission's approval process: consulting contracting, preparation of the CEQA document, and preparation of the Commission's Proposed Decision requires significant reform. These issues are being discussed and addressed presently as part of I.05-09-005 as outlined above in

Chapter 7. The TCSG believes that, to create the possibility of completing the Tehachapi plan by 2010, it will be necessary for the CPUC to implement a number of those reforms in the processing of the Tehachapi CPCN applications, including the following:

- Acquire additional CPUC staff capabilities in the CEQA Unit and direct the utilities to acquire additional staffing capabilities as necessary to meet the milestones in the 2010 schedule;

- Consultants should be in place for each phase of the Tehachapi development plan three months before the CPCN application is filed. For phases 2 and 3, if the CPUC clarifies that the applications are due by the end of December 2006, this would be September 30, 2006;

- The Energy Division, the utility and the CPUC's consultant should conduct pre-filing meetings to (a) determine the appropriate scope for the application (limiting the scope to what is required under CEQA), (b) enable the utility to anticipate and address all issues in its application, and (c) ensure that all necessary data is supplied in the application. The consultant should conduct its independent review in parallel with the utility's preparation of the application;

- The application should be deemed complete within a week of its filing (given the pre-filing communication and coordination, which should result in a complete application);

- Direct the consultants to expedite review of the application to meet adopted milestones for the project phase;

- Direct the assigned ALJ to quickly establish in a scoping memo an expedited calendar of activities (briefs, testimony, hearings, etc.) to ensure that the final EIR is certified within one year of an application being deemed complete as required under CEQA; and

- Direct the ALJ to adopt the findings of the Energy Division's review without further litigation of EMF, routing, and other issues that were addressed in the review process.

Additional actions that the CPUC can take to expedite the schedule are:

- Re-conceive the application process as a collaborative endeavor between the Commission and the utility, given the state's interest in meeting the RPS goals;

- Anticipate the permits that will be required by other agencies and closely coordinate with those agencies to minimize post-CPUC permitting delays (see discussion in subsection 8.3);

- Direct SCE to plan for construction, e.g., arrange for equipment, in anticipation of receiving all necessary permits so that construction can begin immediately after those permits are granted.

- Ensure that adequate staffing is in place to handle protests to projects that are exempted from CPCN or PTC requirements, and ensure that the CPUC Executive Director's Resolution is issued within 30 days as required. Late protests should automatically be deemed denied.

## 8.3 Post-CPUC Permitting -- Resource Agency and Local Permitting

In addition to meeting CPUC permit requirements, utilities proposing to construct Tehachapi transmission facilities must also obtain all required federal and state resource agency permits as well as local (ministerial) permits. The specific permits required will depend on the exact routing and design of each project, and cannot be known with certainty until detailed routing, environmental, and engineering studies are completed (and, where required, after the CPUC has selected the approved route). Such permits and approvals may include those issued under the federal and state Endangered Species Acts (U.S.F.W.S. and California Department of Fish and Game), the Clean Water Act (U.S. Army Corps of Engineers), the Porter-Cologne Water Quality Control Act (California Regional Water Quality Control Boards), regulations governing use of federally managed lands (e.g., Forest Service, BLM), or local land use regulations. (Although the CPUC preempts all discretionary local authority over the Tehachapi transmission projects, ministerial permits such as encroachment permits may be required.)

In order to minimize the timeline impact of the non-CPUC permitting, the CPUC must closely coordinate with all applicable responsible agencies throughout its project approval process. Where impacts to federal jurisdictional resources are significant enough to trigger full NEPA review, the Commission should consider preparation of a joint EIR/EIS in order to minimize post-CPCN delays. Even where no major issues exist, obtaining resource agency and local permits can be time-consuming in light of limited agency staffing, applicable procedural requirements, and other factors. In selecting the approved routes for Tehachapi transmission projects, the Commission should (1) strive to minimize impacts to jurisdictional resources, (2) closely coordinate with other responsible agencies, and (3) expedite its own processes. These steps will help reduce the time needed to obtain non-CPUC permits, and leave the utilities with adequate time to do so.

## 8.4 Specific Actions That Must Be Taken to Accelerate Particular Phases

**Phase 1.** Construction of Segments 1, 2 and 3 could occur within the same 18-month time period, provided human and material resources are available and CPCN applications have been approved.

Expediting Phase 1 is urgent because load-serving requirements will prevent the commencement of construction for Phase 2 until Segments 1 and 2 of Phase 1 are completed.

**Phase 2A (Antelope-Substation 5).** There are over 1,100 MW currently in the CAISO queue at Substation 5. A 300 MW project is advancing through the permitting process with Kern County and several other projects will soon follow. There is an opportunity presently for a temporary interconnection at Tehachapi Substation 5 that would enable the development of the first project in the queue (with some delivery constraints) in advance of construction of Antelope-Substation 5. CAISO's approval of a temporary interconnection would be contingent on the approval of (or exemption from) a CPCN or PTC for the Antelope-Sub 5 upgrade and the level of facilities required for such a temporary interconnection. The CPUC can help realize this opportunity by exempting Antelope-Substation 5 from a CPCN and instead require a less complex and time-consuming permit-to-construct (PTC) (or provide an exemption from both). A PTC would be reasonable if this upgrade can take place within the existing transmission corridor and does not involve any new route or alternative routing. The schedule assumes that the Commission exempts the upgrade from a CPCN and instead requires a PTC.

Quickly approving and constructing the Antelope-Substation 5 upgrade could also be important because once it is completed, along with Segments 1 and 2 of Phase 1, it may be possible to temporarily interconnect some of the other projects in the queue in advance of the completion of Phase 1: Segment 3 and Phase 2. If so, development of these projects, including local permitting, could commence as soon as the CAISO approved the temporary interconnection, which would be conditioned upon the completion of transmission facilities for Antelope-Sub 5 and for Segments 1 and 2 of Phase 1.

The feasibility of bringing on line some amount of capacity in advance of the completion of Phases 1 and 2 requires additional consideration by all parties. For example, the logistics of completing upgrades that require transmission to be taken out of service may limit the level or the timeframe that temporary interconnection may be feasible. Considering the possibility of temporary interconnections is important, however, given the time that will be required to complete Phases 1 and 2.

**Phase 2B (Antelope-Mesa).** SCE is planning to submit applications for Phase 2B and Phase 3 by spring and summer of 2007, respectively. The Energy

Division should work with SCE to ensure that complete CPCN applications for Phases 2 and 3 are filed no later than these dates (and earlier if possible). The Commission should be prepared to immediately begin processing those applications so that they may be approved by December 2007 (Phase 3) and June 2008 (Phase 2, which has forest land complications). It will speed the process if the Commission makes a need finding prior to or early in the CPCN process on its own initiative, rather than requiring the utility to prove need. This is discussed further in subsection 8.4.

Phase 2B would be located, in part, on land subject to the jurisdiction of the United States Forest Service (USFS), Angeles National Forest, which complicates the review process and requires a joint EIR/EIS. In order to begin construction of Phase 2B as soon as Segments 1 and 2 are completed, therefore, it will also be necessary for SCE and the CPUC to work with the Forest Service in advance of the Phase 2B CPCN filing to ensure that the application review process can be completed within the 18-month timeframe shown in the timeline. As indicated in the December 12, 2005, Assigned Commissioner's Ruling in A.04-12-007, we have learned in the CPCN application process for Phase 1: Segment 1 that early coordination is essential to avoid delays.

**Phase 3.** As stated above, the Energy Division should work with SCE to ensure that a complete CPCN application for Phase 3 is filed no later than summer 2007, and the Commission should adopt a need finding on its own initiative, no later than the initial stages of the CPCN application process. Phase 1: Segment 3 environmental work should be used to the extent applicable.

## 8.5 Proactive Finding of Need for Phases 2 and 3

The Commission can speed the CPCN approval process for future phases by proposing, on its own motion, a finding that Phases 2 and 3 are needed to facilitate the achievement of RPS goals. The Commission can propose such a statement either (1) in I. 05-09-005, after a review of this report and an opportunity for comments, or (2) in the CPCN dockets for Phases 2 and 3, shortly after the filing of those applications. The Commission also should anticipate taking this action with regard to Phase 4 at the appropriate time.

Adopting a need statement on the Commission's own initiative before or early in the CPCN approval process is necessary and appropriate for the following reasons:

1. A Need Statement for Phases 2 and 3 Follows the Process Used for Phase I in D. 04-06-010.

In D. 04-06-010, the Commission found that the "magnitude and concentration" of Tehachapi wind resources, as identified in the CEC's Renewable Resources

Report,[43] justified a finding that the first phase of Tehachapi transmission upgrades was needed to facilitate achievement of RPS goals.[44] The Commission noted that this need determination was "separate and severable" from the need finding that would be made in individual CPCN proceedings for specific transmission projects.[45] That individual need determination would examine alternatives to the proposed project, as required under G.O. 131-D, and would examine whether the specific project was likely to further RPS goals based on the results of the RPS process to date. The Scoping Memo for Edison's CPCN application for Segment 1 of Phase I re-affirmed this more limited scope of the need determination in individual CPCN proceedings.[46] In other words, the individual CPCN proceedings for the Phase 1 segments will determine whether additional transmission access to the Tehachapi region is needed based on whether or not it aids in meeting RPS goals. The remaining focus of the individual CPCN cases will be to assure that the specific proposed projects are the best projects among the alternatives and will continue to further RPS goals.

At this time, the TCSG believes that Phases 2 and 3 of the Tehachapi transmission plan also would benefit from an advance Commission finding that they are needed to achieve RPS goals. The TCSG has reached a consensus on the Phase 2 and 3 facilities that should be built to provide access to 3,300 MW of new wind generation in the region—an amount of transmission less than would be required by the Tehachapi wind generation projects already in the CAISO interconnection queue.

2. Substantial evidence of the need for Phases 2 and 3 exists now.
There are numerous indications that wind projects under development in the Tehachapi region will substantially fill the Phase 2 and 3 capacity:

- As of March 17, 2006, the CAISO's interconnection queue included 3,583 MW of wind projects in the Tehachapi region. These projects are listed on FIGURE 8.3. As shown on the FIGURE, these projects expect to be on-line by 2010. These queue positions exceed the combined carrying capacity of Phases 1, 2 and 3, estimated to be 3,300 MW. Developers who take queue positions must make significant financial commitments to interconnection studies, indicating that the projects in the queue are likely to be "real" projects.

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[43] "Renewable Resources Development Report," CEC Publication Number 500-03-080F, November 2003. In this study, the CEC estimated that the Tehachapi area contains the largest wind resource in California, with undeveloped potential of about 14,000 gigawatt-hours per year, representing the single largest cost-competitive renewable resource potential in the state. The CEC's two scenarios for the state to achieve 20% renewable generation by 2010 both assume 4,060 MW of new wind generation would be installed in the Tehachapis, and would supply 40% of the renewable generation needed to meet the RPS goals.

[44] D.04-06-010, *mimeo*., p. 44 and Conclusion of Law 11.

[45] *Id.*, p. 16 - 17.

[46] *See* A. 04-12-007, "Scoping Memo And Ruling Of Assigned Commissioner" (June 7, 2005), at 5.

- Developers have responded strongly and positively to the initial plans for transmission development. While Tehachapi developers have many potential projects in their portfolios, they generally do not make substantial financial commitments for a particular project until they are confident that the necessary transmission capacity will be built. The pent-up demand for Tehachapi transmission has recently been demonstrated by (a) the three additional wind projects totaling 860 MW that entered the queue at Substation 5 within 18 months of an interconnection request being filed by an initial 250 MW project at that location, and (b) the 10 Tehachapi wind projects totaling 2,882 MWs that entered the queue in the year since SCE filed its Phase 1 CPCN applications in December of 2004. This strong response shows that, as developers gain confidence that the necessary transmission capacity will be built, they will enter the interconnection queue. It is reasonable to expect that most if not all of these projects will show up sooner or later on IOUs' (or other retail sellers' or municipal utilities') short-lists and under signed contracts.

- In the initial 2003 and 2004 RPS solicitations, SCE and SDG&E have signed RPS contracts for 500 MW of Tehachapi wind generation. Additional Tehachapi wind projects are expected to be short-listed in the IOUs' 2005 RPS solicitations, the results of which will be known in the next several months. Thus, it is now clear that the 700 MW of capacity in Phase I will be fully utilized.

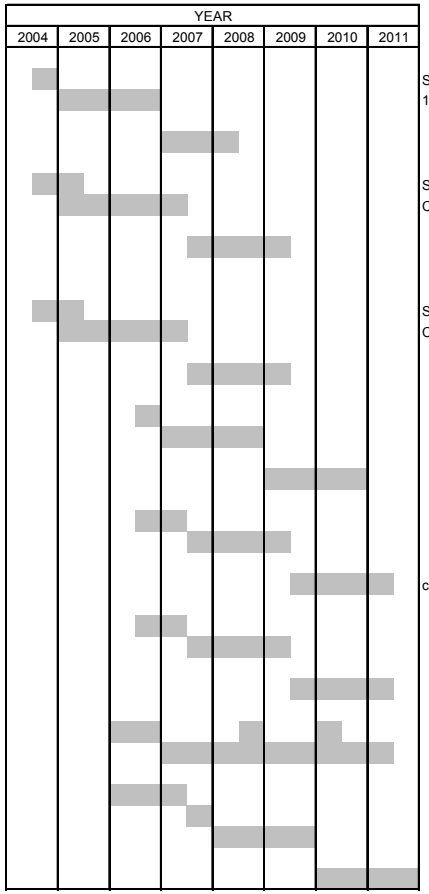
Today, it is apparent that the Phase 1 capacity will be fully utilized for RPS-eligible generation, and developers clearly are pursuing enough new wind generation in the Tehachapi region to more than fill the capacity of Phases 2 and 3. Accordingly, the Commission should find that these next phases are needed to achieve RPS goals. Such a finding would allow the CPCN proceedings for Phases 2 and 3 to focus on the environmental impacts and specific alternative routes for these projects.

The Commission should avoid reading the "necessary" language of Section 399.25(a) as requiring certainty. It is unreasonable for the Commission to expect projects to have executed power purchase contracts and signed interconnection agreements early in the transmission facility permitting stage. The Commission should be looking for an array of evidence which, taken as a whole, demonstrates that, without the transmission facility, achievement of the state's RPS goals would be unlikely to occur. The Commission must be prepared to make a judgment that there is reasonable assurance that the resource area will be developed if transmission capacity is provided, and that substantial progress toward that end has occurred and is continuing. Based on the evidence presented above, the TCSG believes that the Commission should reach the judgment that Phases 2 and 3 are needed for the state to reach its RPS goals.

# FIGURE 8.1 SCHEDULE TO 2011

**CHART 8.1**
**TEHACHAPI CONCEPTUAL DEVELOPMENT SCHEDULE**
**ACCELERATED TO COMPLETE PLAN BY 2011**

| PROJECT PHASE | CUMULATIVE CAPACITY MW | PROJECT ELEMENT | TASK | NOTES |
|---|---|---|---|---|
| 1 | 700 | ANTELOPE-PARDEE 500kV LINE Segment 1 | CPCN APPLICATION<br>CPCN APPROVAL<br>POST-CPUC PERMITTING<br>ROW ACQ & CONSTRUCT | SCE filed 12/04<br>12/12/05 ACR says December 2006 |
| 1 | | ANTELOPE-VINCENT & ANTELOPE-TEHACHAPI 500KV LINES Segments 2&3 | CPCN APPLICATION<br>CPCN APPROVAL<br>POST-CPUC PERMITTING<br>ROW ACQ & CONSTRUCT | SCE filed 12/04; supplement 9/05<br>CPUC currently aiming for 2007 Q2 |
| 1 | | TEHACHAPI SUBSTATIONS & 230KV LINES Segment 3 | CPCN APPLICATION<br>CPCN APPROVAL<br>POST-CPUC PERMITTING<br>ROW ACQ & CONSTRUCT | SCE filed 12/04; supplement 9/05<br>CPUC currently aiming for 2007 Q2 |
| 2A | | ANTELOPE-SUBSTATION 5 | CPCN APPLICATION<br>CPCN APPROVAL<br>POST-CPUC PERMITTING<br>ROW ACQ & CONSTRUCT | |
| 2B | 1600 | UPGRADE ANTELOPE-MESA 230KV | CPCN APPLICATION<br>CPCN APPROVAL<br>POST-CPUC PERMITTING<br>ROW ACQ & CONSTRUCT | can't start until Ph1/Segs 1&2 complete |
| 3A | 2350 | TEHACHAPI-ANTELOPE 500KV LINE | CPCN APPLICATION<br>CPCN APPROVAL<br>POST-CPUC PERMITTING<br>ROW ACQ & CONSTRUCT | |
| 3B<br>V | 3300 | INCREASE OPERATING OLTAGE TO 500KV | TRANSM PLANNING STUDIES<br>CONSTRUCT | |
| 4 | 4500 | ISO-APPROVED TR ALTERNATIVE TBD | ANSM PLANNING STUDIES<br>CPCN APPLICATION<br>CPCN APPROVAL<br>POST-CPUC PERMITTING<br>ROW ACQ & CONSTRUCT | |

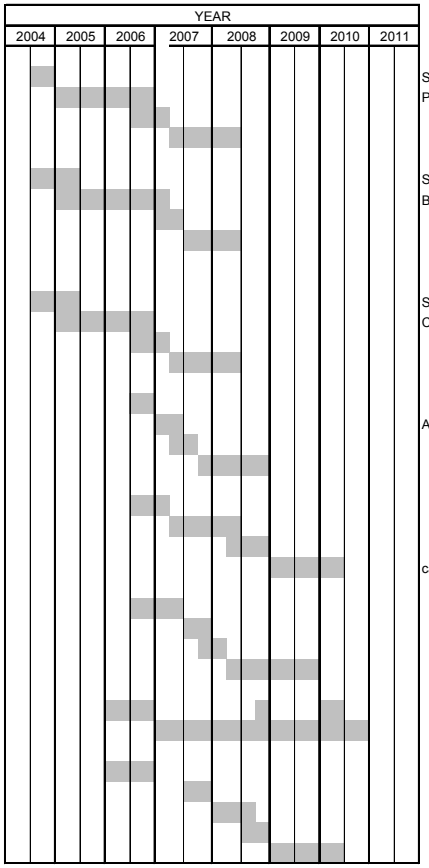



NOTE: TEHACHAPI AREA COLLECTOR LOOP WILL BE DEVELOPED AS REAL PROJECTS MATERIALIZE

# FIGURE. 8.2 SCHEDULE TO 2010

**CHART 8.2**
**TEHACHAPI CONCEPTUAL DEVELOPMENT SCHEDULE**
**ACCELERATED TO COMPLETE PLAN BY 2010**

| PROJECT PHASE | CUMULATIVE CAPACITY MW | PROJECT ELEMENT | TASK | NOTES |
|---|---|---|---|---|
| 1 | 700 | ANTELOPE-PARDEE 500kV LINE Segment 1 | CPCN APPLICATION | SCE filed 12/04 |
| | | | CPCN APPROVAL | Possible approval by Oct 2006 |
| | | | POST-CPUC PERMITTING | |
| | | | ROW ACQ & CONSTRUCT | |
| 1 | | ANTELOPE-VINCENT & ANTELOPE-TEHACHAPI 500KV LINES Segments 2&3 | CPCN APPLICATION | SCE filed 12/04; supplement 9/05 |
| | | | CPCN APPROVAL | By March 2007 |
| | | | POST-CPUC PERMITTING | |
| | | | ROW ACQ & CONSTRUCT | |
| 1 | | TEHACHAPI SUBSTATIONS & 230KV LINES Segment 3 | CPCN APPLICATION | SCE filed 12/04; supplement 9/05 |
| | | | CPCN APPROVAL | CPUC currently aiming for 2007 Q2 |
| | | | POST-CPUC PERMITTING | |
| | | | ROW ACQ & CONSTRUCT | |
| 2A | AN | TELOPE-SUBSTATION 5 | CPCN APPLICATION | |
| | | | CPCN APPROVAL | Assumes exemption from CPCN |
| | | | POST-CPUC PERMITTING | |
| | | | ROW ACQ & CONSTRUCT | |
| 2B | 1600 | UPGRADE ANTELOPE-MESA 230KV | CPCN APPLICATION | |
| | | | CPCN APPROVAL | |
| | | | POST-CPUC PERMITTING | |
| | | | ROW ACQ & CONSTRUCT | can't start until Ph1/Segs 1&2 complete |
| 3A | 2350 | TEHACHAPI-ANTELOPE 500KV LINE | CPCN APPLICATION | |
| | | | CPCN APPROVAL | |
| | | | POST-CPUC PERMITTING | |
| | | | ROW ACQ & CONSTRUCT | |
| 3B VOL | 3300 | INCREASE OPERATING TAGE TO 500KV | TRANSM PLANNING STUDIES | |
| | | | CONSTRUCT | |
| 4 | 4500 | ISO-APPROVED TRANSM ALTERNATIVE TBD | PLANNING STUDIES | |
| | | | CPCN APPLICATION | |
| | | | CPCN APPROVAL | |
| | | | POST-CPUC PERMITTING | |
| | | | ROW ACQ & CONSTRUCT | |




NOTE: TEHACHAPI AREA COLLECTOR LOOP WILL BE DEVELOPED AS REAL PROJECTS MATERIALIZE

## FIGURE. 8.3 CAISO Queue March 17, 2006

### Chart 7.3. Tehachapi Region Active Wind Projects in the CAISO Generation Queue as of March 17, 2006

| Request Status | | | Max MW | Location | | Point of Interconnection | On-line Date | |
|---|---|---|---|---|---|---|---|---|
| Queue Position | Interconnection Request Receive Date | Queue Date | Summer | County | Utility | Station or Transmission Line | Proposed On-line Date | Current On-line Date |
| 18 | 4/15/2003 | 4/15/2003 | **200** | Los Angeles | SCE | Antelope | 12/31/2005 | 12/12/2007 |
| 20 | 8/19/2003 | 9/4/2003 | **300** | Kern | SCE | Antelope | 12/31/2006 | 12/31/2008 |
| 31 | 4/12/2004 | 5/11/2004 | **201** | Kern | SCE | Monolith Substation | 12/31/2007 | 12/31/2009 |
| 34 | 7/19/2004 | 7/19/2004 | **300** | Kern | SCE | Monolith Substation | 7/1/2007 | 12/31/2009 |
| 73 | 6/6/2005 | 6/27/2005 | **250** | Kern | SCE | Antelope | 12/31/2007 | 12/31/2008 |
| 77 | 8/19/2005 | 8/22/2005 | **300** | Kern | SCE/PGE | TBD Bakersfield | 11/15/2007 | 11/15/2007 |
| 79 | 5/24/2005 | 9/7/2005 | **51** | Kern | SCE | Proposed New Dutchwind Sub | 6/1/2006 | 12/15/2009 |
| 84 | 11/22/2005 | 121/1/2005 | **400** | Kern | SCE | Cottonwind Substation | 12/31/2009 | 12/31/2009 |
| 85 | 12/28/2005 | 12/28/2005 | **120** | Kern | SCE | Segment 3 230 Collector Loop Tehachapi | 9/30/2007 | 9/30/2007 |
| 93 | 2/22/2006 | 2/22/2006 | **51** | Kern | SCE | Segment 3 of Antelope Transmission Project | 3/31/2010 | 3/31/2010 |
| 94 | 2/24/2006 | 2/24/2006 | **220** | Kern | SCE | Tehachapi Conceptual Station 1 | 12/31/2008 | 12/31/2008 |
| 95 | 3/1/2006 | 3/1/2006 | **180** | Kern | SCE | Tehachapi Conceptual Station 2 | 12/31/2008 | 12/31/2008 |
| 96 | 3/1/2006 | 3/1/2006 | **550** | Kern | SCE | Tehachapi Conceptual Station 1 | 12/31/2009 | 12/31/2009 |
| 97 | 3/1/2006 | 3/1/2006 | **600** | Kern | SCE | Tehachapi Conceptual Station 1 | 12/31/2009 | 12/31/2009 |
| 98 | 3/9/2006 | 3/9/2006 | **160** | Kern | SCE | Tehachapi Conceptual Station 5 | 12/31/2009 | 12/31/2009 |
| **Total** | | | **3,883** | | | | | |

# APPENDIX B - 3

Tehachapi Second Report Appendices

Development Plan for the
Phased Expansion of

# Electric Power Transmission Facilities

in the

# Tehachapi Wind Resource Area

# Second Report

of the

## Tehachapi Collaborative Study Group

Volume 2: Appendices

California Public Utilities Commission

OII 05-09-005
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April 19, 2006

# APPENDIX 1

**APPENDIX 1**

# Continuation of Tehachapi Collaborative Study

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## Study Plan #2

### Purpose

The purpose of this continuation of the Tehachapi Collaborative Study is to formulate a plan for the transmission of 4,000MW of wind generation at Tehachapi and 500MW in the Antelope Valley to load centers in the PG&E and SCE service areas. It is assumed that half the 4,000 MW at Tehachapi will go to PG&E and half will go to SCE. The plan resulting from this study will be sufficient to initiate the preparation of Proponent's Environmental Assessments (PEAs) which will form the basis of CPCN applications for the facilities defined in the plan. The plan covers only the facilities from Tehachapi Substation 1 to the load centers and does not include the Tehachapi collector system. It is envisioned that this transmission plan may be fine-tuned to accommodate each (or each group of) specific wind plant projects as they move through the ISO Interconnection Process and as the Tehachapi collector loop beyond Tehachapi Substation 1 becomes more precisely defined.

### Background

Pursuant to CPUC Decision 04-06-010, the Tehachapi Collaborative Study Group (TCSG) was formed to develop a comprehensive transmission development plan for the phased expansion of transmission capabilities in the Tehachapi area. The CPUC Staff coordinated the collaborative study group. As directed by the decision, TCSG completed a study that assumed there would be more than 4,000 MW of wind resources at Tehachapi Wind Area[1]. To conduct the study the TCGS further assumed that 50% of the 4,000 MW would be delivered to load centers in the transmission system North of Path 26 and the remaining 50% would be delivered to load centers in the system south of Path 26[2]. The Executive Director extended the original due date for filing the report, by one week by letter dated March 4, 2005. The report entitled, "Development Plan for the Phased Expansion of Transmission in the Tehachapi Wind Resource Area" (Report), was filed by Southern California Edison (SCE) on March 16, 2005.

As stated in the Report, the development plan prepared by the TCSG is a conceptual roadmap to the eventual Tehachapi transmission system rather than a definitive plan[3].

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[1] Decision 04-06-010, at 6
[2] Study Plan, date July 14, 2004, at 18
[3] Report, at 3

The Report recommended that further study be performed to select among the alternatives identified in the Report (and referred to herein with the same identification numbers as in the Report). These alternatives require further planning evaluation in order to formulate a single plan for implementation. To do this, additional studies (specific rather than generic) need to be performed and facility cost estimates refined. The final plan for the Tehachapi collector system requires information concerning actual wind project locations and capacities which are not available at this time, and therefore is not covered in the study. However, it is envisioned that the transmission plan may be fine-tuned in the future as each (or each group of) specific wind plant projects moves through the ISO Interconnection Process and the Tehachapi collector loop beyond Tehachapi Substation 1 becomes more precisely defined.

The CPUC Energy Division convened a study group consisting of CPUC Staff, CAISO, SCE and PG&E. The study group will be coordinated by the CPUC Staff. This new study plan will build on the earlier TCSG Study Plan, dated July 14, 2004 (Attachment A), and utilizes essentially the same study assumptions. As such, only exceptions to those earlier assumptions will be noted in this study plan.

## 1. Fresno 230 kV Tie: Big Creek – Fresno Interconnection

Establish a new 230 kV connection between PG&E and SCE by constructing a switching station at the crossing of PG&E-owned and SCE-owned transmission lines and installing a phase-shifting transformer to "push" power from the Big Creek corridor into the PG&E system. This study will investigate impacts on the SCE system and the PG&E system, the possible mitigation measures, and provide cost estimates for the connection and the mitigation measures associated with the amounts of power that would be "pushed" into the PG&E system. The studies will evaluate "pushing" 300 MW to 1,200 MW in successive increments. The study will consider PG&E Alternative 2, Plan A alone and in conjunction with PG&E Alternative 2, Plan B.

The cost per megawatt transferred will be evaluated to determine the optimum capacity of the connection.

### 1.1. Alternative 2: PG&E and SCE Fresno 230 kV Tie Plan A.

Build a switching station at the crossing of PG&E's Helms – Gregg 230 kV lines and SCE's Big Creek – Rector 230 kV lines. Establish a 230 kV tie between PG&E and SCE. A phase shifter or power flow controller may be needed to control the tie line flow.

### 1.2. Alternative 2: PG&E and SCE Fresno 230 kV Tie Plan B.

Build a switching station at the crossing of PG&E's Haas-McCall and Balch-McCall 230 kV lines and SCE's Big Creek – Rector 230 kV lines. Establish a 230 kV tie between PG&E and SCE. A phase shifter or power flow controller may be needed to control the tie line flow.

## A. SCE Studies

### Base Case Assumptions

SCE will utilize the load forecast currently under development for the upcoming CAISO Controlled SCE Transmission Expansion Plan. Studies for evaluating the two plans will be conducted assuming both heavy summer and spring load forecast in order to ensure that system performance is maintained within allowable thermal limits. Heavy summer load forecast will include a 1-in-10 year heat wave adjustment consistent with CAISO Planning Standards. Light Spring conditions will be modeled with load at 50% of summer peak consistent with study assumptions utilized in performing generation interconnection studies in the Big Creek Corridor.

### Power Flow Studies

Power flow studies will be conducted by systematically increasing the power transfer from SCE to PG&E through the phase-shifted system tie. The increment step size will be 100 MW.

a. North of Magunden study

   i. Increase power transfer into the PG&E system at the Fresno 230kV tie (Plan A and Plan A in conjunction with Plan B); investigate system performance under normal (all facilities in service) conditions and under NERC/WECC Category B (N-1) contingencies and 230 kV common corridor lines in the Big Creek Corridor. (See Appendix A for a list of contingencies to be studied.) Where the system does not meet the Planning Standards, develop mitigation measures, such as the addition of a transmission upgrade.

   ii. Repeat step 1 until the power transfer reaches between 1,000 MW to 1,200 MW.

   iii. Develop cost estimates corresponding to each power transfer level

b. South of Magunden study

   i. Repeat the North of Magunden Study, for transmission system south of Magunden.

## B. PG&E Studies

The study will include two different scenarios, namely, summer peak and off-peak conditions. The objectives for developing summer peak and off-peak cases are to identify transmission import and reliability concerns during both conditions. The following Table 1 describes the critical study assumption for the two scenarios proposed for this study.

### Base Case Assumptions

For summer peak studies PG&E will use the summer peak base case developed for the 2005 PG&E Transmission Grid Assessment Study. This case is being developed. PG&E will send the PG&E case to the ISO for approval, but PG&E's work will not be delayed pending this approval. For the summer off peak case, the load for the Greater Fresno Area will be modeled at 50 % of the peak load from summer peak base case for the study area.

### Study Scenarios

| 1.3. Study Scenarios | 1.4. Summer peak | 1.5. Summer Off peak |
|---|---|---|
| Starting base case | 2005 PG&E Grid Expansion Study, 2010 Heavy Summer North Peak case | 2005 PG&E Grid Expansion Study, 2010 Summer Off-peak case |
| Fresno load level | PG&E 1 in 5 year adverse weather load forecast for 500 kV system studies, and 1 in 10 year adverse weather load forecast for Greater Fresno Area for 230 kV system studies | 50 % of 2010 summer peak case for the area. |
| Helms units | 3 units generation | 3 units pumping depending on the import level to find boundary conditions |
| Hydro dispatch | Summer peak average hydro level | Summer off-peak average hydro level |
| COI | 4800 MW (n to s) | 3650 MW (s to n) |
| Path 15 flow | | 5400 MW (s to n) or other relevant operating limit(s) |
| Path 26 flow | 3700 MW (n to s) | <3000 MW (s to n) |
| Sensitive study | 1. Spring hydro spill condition | Spring light load case with |

| | | |
|---|---|---|
| | 2. Path 26 4000 MW N-S | Helms PGP units Off line |

Sensitivities may be run depending on the initial results.

### 1.6. Generation Assumptions in addition to those used in the earlier TCSG Study

Kingsburg and Sanger Qualifying Facility units will be assumed off for the summer off peak case as per the existing contracts for these units.

SCE will furnish the model to be used for the Tehachapi collector system in the absence of firm wind developer commitments. GE Wind generators will be used for the wind plant model and SVCs (at various locations) will be sized as required to provide voltage and transient stability.

### 1.7. Fresno 230 kV Tie Assumptions

SCE and CAISO will provide the necessary data for SCE load, network topology, generation level and pattern for the Big Creek facility. The data provided and approved by CAISO for the SCE system will be used in the base case. ISO will provide data on expected wind generation variations, such as, expected wind generation changes in MW/sec.

### 1.8. Technical Analyses

The technical analysis will include the following:

a. For each of the base case and study alternatives, Power Flow simulations will be carried out for the following CAISO contingency Categories in the Greater Fresno Area:

   i. ISO Category "B": B1, B2, B3 and overlapping line and generator outage in the study area. (See Appendix B for a list of contingencies).

   ii. ISO Category "C" list for 500 KV outages, 230 kV common tower line outages in the Greater Fresno Area, and 230 kV common corridor lines in the Big Creek Corridor, also listed in Appendix B.

b. Run Post Transient and Voltage Stability simulations for critical Categories B and C contingencies to assess the reactive support requirements and potential facility overloads on the more promising alternatives.
c. Run Transient stability simulations of critical Categories B and C contingencies .

## 2. Further Studies on PG&E Alternatives 4 and 5

The earlier conceptual study results show that the cost estimates for PG&E Alternatives 4 and 5 are practically the same. To select the preferred alternative, more detailed studies using more specific information are needed.

### A. PG&E Alternative 4

No voltage Stability study or transient stability study was conducted in the conceptual study. To form a more definitive selection of the alternatives, these studies need to be run based on selected Categories B and C contingencies in Appendix B.

### B. PG&E Alternative 5

In the earlier conceptual study, Alternative 5 included a 500 kV line between Tehachapi and Gregg. This study will investigate if this Gregg – Tehachapi 500 kV line can be separated into two sections:

- Gregg – Midway 500 kV line
- Tehachapi – Midway 500 kV line

a. Run Power flow simulations for normal and single and double contingencies based on the list of ISO Categories B and C contingencies. (See Appendix B).

b. Run Post Transient and Voltage Stability simulations for critical Categories B and C contingencies to assess the reactive support requirements and potential facility overloads on the most promising alternatives..

c. Run Transient stability simulations critical Categories B and C contingencies on the most promising alternatives.

## 3. Further Studies on SCE Alternatives

SCE's Alternatives 1, 2, 3 and 10 will be studied as described above for PG&E Alternatives 4 and 5.

## 4. Production Simulation Study

The CAISO will run production simulation models to determine the production costs, congestion costs and system losses associated with the various transmission alternatives using the SSG-WI data base for study year 2008 after it is updated. The purpose of this portion of the study is to help in answering the following questions:

a. How would the Fresno 230 kV Tie be operated? How frequently would the angle change and how large would the flow be across the phase shifter?
b. How would the Helms pumped storage plant operation change with the addition of the Tehachapi generation?
c. Would the potential line additions north of Midway provide a substantial economic benefit?
d. If a line is constructed north of Midway, what is to preferred termination?
e. How would the addition of the Tehachapi generation impact the operation of the generators connected at Midway and in other areas of the system?
f. What is the optimum combination of the Fresno 230 kV Tie, PG&E's Alternatives 4 and 5 and SCE's Alternatives 1, 2, 3 and 10.
g. Would the adding a line between Tehachapi and Midway instead of from Tehachapi south help transmit Tehachapi generation to PG&E? If so, at what level of Tehachapi generation?
h. Would adding a line between Tehachapi and Midway benefit the transmission system more than adding a line from Tehachapi south? If so, identify the party or parties that benefit(s).

A. Assumptions:

Hydro conditions: Initially average and high hydro will be studied. Additional studies to examine high and low hydro scenarios will be conducted as necessary. For Fresno 230 kV Tie, PG&E will need to consider high hydro conditions, since this alternative would inject power into a generating system. SCE considers all hydro conditions as valid conditions that need to be explored.

Gas cost: Modeled per SSG-WI base case assumptions.

Coal cost: Modeled per SSG-WI base case assumptions.

Wind modeling: The wind generation will be modeled as non-dispatchable, fixed hourly generation quantities. Two wind generation output models will be studied. One that has been developed by NREL and others and a second that is simply a scaling up of the existing Tehachapi historical output. The production simulation runs will determine the megawatthours of wind generation used. The cost assigned to wind generation will be determined as part of this study and will be applied to the wind generation quantity determined in each run to yield the total production cost.

New resources will be included as modeled by SSG-WI, which will be consistent with each LSE's filed Long Term Plans.

Path ratings, line ratings, and nomograms: Modeled per SSG-WI base case assumptions.

Selected non-simultaneous Ratings:
COI: 4,800 MW N-S; 3,675 MW S-N
Path 15: 3,265 MW N-S; 5,400 MW S-N

Path 26: 3,700 MW N-S; 3,000 MW S-N

**Additional limits to be modeled:**

*a.* Path 26: Power flow between 3,000 MW and 3,700 MW N-S is supported by a RAS that trips Midway area generation. The Path 26 limit will be decreased by 1 MW for every 1 MW decrease in Midway generation (La Paloma, Sunrise, Elk Hills)

b. Path 15: 5,400 MW S-N is supported by RAS that trips generation connected to Midway. The Path 15 limit will be decreased by 1 MW for every 2 MW decrease in Midway generation (La Paloma, Sunrise, Elk Hills).

c. Run power flow and stability studies to see if there is a simultaneous interaction between the Fresno 230 kV Tie and Path 26. If there is, model the nomogram in the production simulation.

d. SCIT nomogram: Either from existing SCIT nomogram studies or assume no more than 60% of SCE's load would be supplied from imports into Southern California.

B. Study Scenarios

**Tehachapi and Antelope Valley wind generation = 0 MW**

a. Existing system after completion of SCE's Phase 1 Facilities, Segments 1, 2 and 3

b. Same as (a) but with the Fresno 230 kV Tie
Phase shifter setting to be determined.

**Tehachapi and Antelope Valley wind generation = 1600 MW**

c. Existing system plus SCE Phase 1 and Phase 2 facilities.

d. Same as a, but with the Fresno 230 kV Tie.

**Tehachapi and Antelope Valley wind generation = 4,500 MW without Fresno 230kV tie**

e. Existing System after completion of SCE's Phase 1 and Phase 2 facilities.

f. PG&E Alternative 4 with SCE Alternative 1, i.e., Tesla-Los Banos-Gates-Midway-Tehachapi, Tehachapi-Antelope, Antelope-Vincent and Antelope-Pardee. (Total of two lines between Tehachapi-Antelope)

g. PG&E Alternative 4, modified to remove Tehachapi-Midway line, and SCE Alternative 2, i.e., Tesla-Los Banos-Gates-Midway, and Tehachapi-Antelope-Vincent, Tehachapi-Vincent and Antelope-Pardee (Two lines between Tehachapi-Antelope and one Tehachapi-Vincent)

h. PG&E Alternative 5 with SCE Alternaitve 1

i. PG&E Alternative 5 modified to replace Gregg-Tehachapi with Gregg-Midway with SCE Alternative 1, i.e., Tesla-Los Banos-Gregg-Midway-Tehachapi-Antelope–Vincent and Antelope-Pardee. (Total of two lines between Tehachapi-Antelope)
j. PG&E Alternative 5, modified to replace Gregg-Tehachapi with Gregg-Midway line and SCE Alternative 2, i.e., Tesla-Los Banos-Gregg-Midway; and Tehachapi-Antelope-Vincent, Tehachapi-Vincent and Antelope-Pardee (Total of two lines between Tehachapi-Antelope).

**Tehachapi and Antelope Valley wind generation = 3,300 MW**

k. Same as f, above.
l. Same as h, above.
m. Tesla-Gregg, with Fresno 230kV tie, two 500kV lines Tehachapi-Antelope.
n. Tesla-Los Banos-Gates-Midway, with Fresno 230kV tie, two 500kV lines Tehachapi-Antelope

Based on the above, choose the best PG&E alternative.

o. Fresno 230 kV Tie with SCE Alternative 2

p. Best PG&E alternative with SCE Alternative 3

q. Best PG&E alternative with SCE Alternative 10

## 5. Cost Estimation of Facilities

All costs associated with the Fresno 230 kV Tie, PG&E Alternatives 4 and 5 and SCE Alternatives 1, 2, 3 and 10, including engineering and permitting, purchase of equipment and rights-of way, construction, interest during construction, contract administration, etc. will be estimated in 2005 dollars

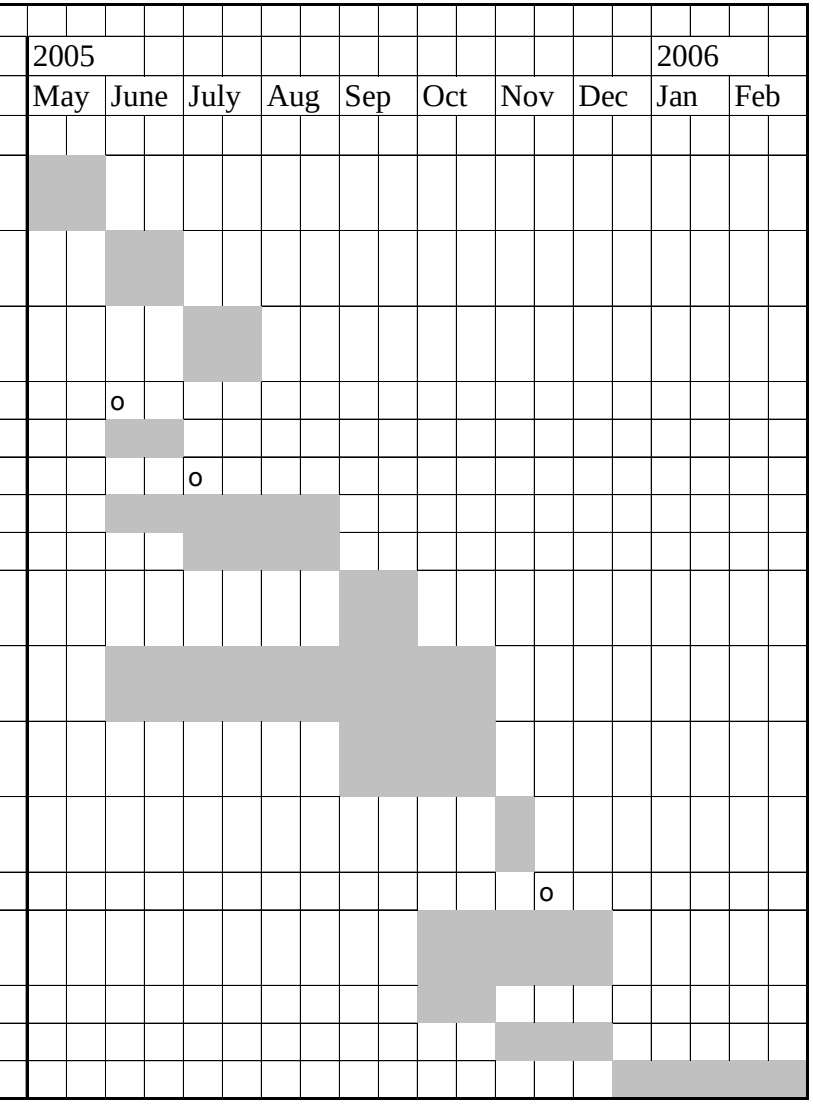
## 6. Determination of Recommended Plan

The present value of the costs given by the production simulation runs in Section 4, above, plus the wind generation costs, over 30 years, at a discount rate to be established in the study, will be added to the costs of the facilities, determined in Section 5, above, to obtain the least cost combination of alternatives. This total present value cost will also be expressed as a series of annual costs.

This combination of alternatives will be the recommended plan.

## 7. Study Schedule

| WORK ITEM | START | FINISH |
|---|---|---|
| SCE: Fresno 230 kV Tie PG&E Plan A, N of Magunden power flow | 5/1/05 | 6/1/05 |
| SCE: Fresno 230 kV Tie PG&E Plan A, S of Magunden power flow | 6/1/05 | 7/1/05 |
| SCE: Fresno 230 kV Tie PG&E Plan A with Plan B power flow | 7/1/05 | 8/1/05 |
| PG&E: Base Case Available | 6/1/05 | |
| PG&E: Fresno 230 kV Tie power flow | 6/1/05 | 7/1/05 |
| Meeting of Participants at PG&E | 6/28/05 | |
| SCE & PG&E: Fresno facilities cost estimate | 6/1/05 | 9/1/05 |
| CA ISO: first results of production simulations | 7/1/05 | 9/1/05 |
| All: determine optimum capacity of Fresno Tie: Plan A or A & B | 9/1/05 | 10/1/05 |
| SCE & PG&E: cost of facilities for all alternatives | 6/1/05 | 11/1/05 |
| CA ISO final report on results of production simulations | 9/1/05 | 11/1/05 |
| CPUC: calculates ranking of combinations of alternatives | 11/1/05 | 11/15/05 |
| Meeting of Participants | 11/15/05 | |
| CA ISO operator report on compatibility of Fresno Intertie | 10/1/05 | 12/15/05 |
| CPUC: Develop Table of Contents | 10/1/05 | 11/1/05 |
| ALL: draft report | 11/1/05 | 12/15/05 |
| CPUC: Final Report | 12/15/05 | 3/1/06 |




**ERRATA:** CAISO 12/15/05 operator report topic should read “system operability with 4500MW of wind generation at Tehachapi/Antelope Valley”.

# Appendix A
# SCE list of on Contingencies

Table 1
Single Contingency Outage List

| Outage Number | From Bus No. | To Bus No. | From Bus | | To Bus | | Circuit ID |
|---|---|---|---|---|---|---|---|
| | | | Name | Voltage | Name | Voltage | |
| N1-1 | 24301 | 24302 | BIG CRK1 | 230 | BIG CRK2 | 230 | 1 |
| N1-2 | 24301 | 24320 | BIG CRK1 | 230 | EASTWOOD | 230 | 1 |
| N1-3 | 24302 | 24303 | BIG CRK2 | 230 | BIG CRK3 | 230 | 1 |
| N1-4 | 24302 | 24305 | BIG CRK2 | 230 | BIG CRK8 | 230 | 1 |
| N1-5 | 24304 | 24303 | BIG CRK4 | 230 | BIG CRK3 | 230 | 1 |
| N1-6 | 24305 | 24303 | BIG CRK8 | 230 | BIG CRK3 | 230 | 1 |
| N1-7 | 2431 6 | 24303 | MAMMOTH | 230 | BIG CRK3 | 230 | 1 |
| N1-8 | 2430 3 | 24235 | BIG CRK3 | 230 | RECTOR | 230 | 2 |
| N1-9 | 2430 1 | 25900 | BIG CRK1 | 230 | FRSNOSCE | 230 | 1 |
| N1-10 | 2430 3 | 25900 | BIG CRK3 | 230 | FRSNOSCE | 230 | 1 |
| N1-11 | 3082 0 | 39000 | HELMS PP | 230 | FRSNOPGE | 230 | 1 |
| N1-12 | 3082 0 | 39000 | HELMS PP | 230 | FRSNOPGE | 230 | 2 |
| N1-13 | 3081 0 | 39000 | GREGG | 230 | FRSNOPGE | 230 | 1 |
| N1-14 | 3081 0 | 39000 | GREGG | 230 | FRSNOPGE | 230 | 2 |
| N1-15 | 2423 5 | 25900 | RECTOR | 230 | FRSNOSCE | 230 | 1 |
| N1-16 | 2423 5 | 25900 | RECTOR | 230 | FRSNOSCE | 230 | 2 |
| N1-17 | 2414 1 | 24304 | SPRINGVL | 230 | BIG CRK4 | 230 | 1 |
| N1-18 | 2414 1 | 24235 | SPRINGVL | 230 | RECTOR | 230 | 1 |
| N1-19 | 24153 | 24235 | VESTAL | 230 | RECTOR | 230 | 1 |
| N1-20 | 24235 | 24153 | RECTOR | 230 | VESTAL | 230 | 2 |
| N1-21 | 2423 5 | 24087 | RECTOR | 230 | MAGUNDEN | 230 | 1 |
| N1-22 | 2408 7 | 24141 | MAGUNDEN | 230 | SPRINGVL | 230 | 1 |
| N1-23 | 2408 7 | 24141 | MAGUNDEN | 230 | SPRINGVL | 230 | 2 |
| N1-24 | 24087 | 24153 | MAGUNDEN | 230 | VESTAL | 230 | 1 |
| N1-25 | 24087 | 24153 | MAGUNDEN | 230 | VESTAL | 230 | 2 |
| N1-26 | 2414 2 | 24101 | SYC CYN | 230 | OMAR | 230 | 1 |
| N1-27 | 2408 7 | 24101 | MAGUNDEN | 230 | OMAR | 230 | 1 |
| N1-28 | 24087 | 24115 | MAGUNDEN | 230 | PASTORIA | 230 | 1 |
| N1-29 | 24087 | 24115 | MAGUNDEN | 230 | PASTORIA | 230 | 2 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| N1-30 | 24087 | | 24115 | MAGUNDEN | 230 | PASTORIA | 230 | 3 |
| N1-31 | 2408 | 7 | 24401 | MAGUNDEN | 230 | ANTELOPE | 230 | 2 |
| N1-32 | 2408 | 7 | 27020 | MAGUNDEN | 230 | TEHACH_5 | 230 | 1 |
| N1-33 | 2440 | 1 | 27020 | ANTELOPE | 230 | TEHACH_5 | 230 | 1 |
| N1-34 | 2440 | 1 | 27000 | ANTELOPE | 230 | TEHACH_6 | 230 | 1 |
| N1-35 | 24115 | | 25613 | PASTORIA | 230 | EDMONSTN | 230 | 1 |
| N1-36 | 24115 | | 28050 | PASTORIA | 230 | LEBEC | 230 | 1 |
| N1-37 | 24114 | | 24115 | PARDEE | 230 | PASTORIA | 230 | 1 |
| N1-38 | 2411 | 4 | 24217 | PARDEE | 230 | WARNETAP | 230 | 1 |
| | 24115 | | 24217 | PASTORIA | 230 | WARNETAP | 230 | 1 |
| | 2421 | 8 | 24217 | WARNE | 230 | WARNETAP | 230 | 1 |
| N1-39 | 24403 | | 24115 | BAILEY | 230 | PASTORIA | 230 | 1 |
| N1-40 | 2411 | 4 | 24403 | PARDEE | 230 | BAILEY | 230 | 1 |
| N1-41 | 2411 | 4 | 24155 | PARDEE | 230 | VINCENT | 230 | 1 |
| N1-42 | 24155 | | 24091 | VINCENT | 230 | MESA CAL | 230 | 1 |
| N1-43 | 2415 | 5 | 24126 | VINCENT | 230 | RIOHONDO | 230 | 1 |
| N1-44 | 2415 | 5 | 24126 | VINCENT | 230 | RIOHONDO | 230 | 3 |
| N1-45 | 24091 | | 24126 | MESA CAL | 230 | RIOHONDO | 230 | 1 |
| N1-46 | 24091 | | 24126 | MESA CAL | 230 | RIOHONDO | 230 | 2 |
| N1-47 | 2407 | 6 | 24126 | LAGUBELL | 230 | RIOHONDO | 230 | 1 |
| N1-48 | 2411 | 4 | 24147 | PARDEE | 230 | SYLMAR S | 230 | 1 |
| N1-49 | 2411 | 4 | 24147 | PARDEE | 230 | SYLMAR S | 230 | 2 |
| N1-50 | 2403 | 6 | 24114 | EAGLROCK | 230 | PARDEE | 230 | 1 |
| N1-51 | 2414 | 7 | 24089 | SYLMAR S | 230 | GOULD | 230 | 1 |
| N1-52 | 2403 | 6 | 24147 | EAGLROCK | 230 | SYLMAR S | 230 | 1 |
| N1-53 | 2408 | 6 | 24156 | LUGO | 500 | VINCENT | 500 | 1 |
| N1-54 | 2408 | 6 | 24156 | LUGO | 500 | VINCENT | 500 | 2 |
| N1-55 | 2415 | 6 | 24092 | VINCENT | 500 | MIRALOMA | 500 | 1 |
| N1-56 | 2450 | 0 | 24156 | ANTELOPE | 500 | VINCENT | 500 | 1 |
| N1-57 | 2450 | 0 | 24156 | ANTELOPE | 500 | VINCENT | 500 | 2 |
| N1-58 | 2450 | 0 | 24510 | ANTELOPE | 500 | PARDEE | 500 | 1 |
| N1-59 | 2452 | 0 | 24500 | TEHACHPI | 500 | ANTELOPE | 500 | 1 |
| N1-60 | 2452 | 0 | 24500 | TEHACHPI | 500 | ANTELOPE | 500 | 2 |
| N1-61 | 2452 | 0 | 30060 | TEHACHPI | 500 | MIDWAY | 500 | 1 |
| N1-62 | 3006 | 0 | 24156 | MIDWAY | 500 | VINCENT | 500 | 1 |
| N1-63 | 3006 | 0 | 24156 | MIDWAY | 500 | VINCENT | 500 | 2 |
| N1-64 | 3006 | 0 | 24156 | MIDWAY | 500 | VINCENT | 500 | 3 |
| T1-1 | 2590 | 0 | 39000 | FRSNOSCE | 230 | FRSNOPGE | 230 | 1 |
| T1-2 | 24156 | | 24155 | VINCENT 500 | | VINCENT 230 | | 1 |
| T1-3 | 24092 | | 24093 | MIRALOMA 500 | | MIRALOMA 230 | | 1 |
| T1-4 | 24500 | | 24401 | ANTELOPE 500 | | ANTELOPE 230 | | 1 |
| T1-5 | 24510 | | 24114 | PARDEE 500 | | PARDEE 230 | | 1 |

Table 2
Double Contingency Outage List

| Outage Number | From Bus No. | To Bus No. | From Bus | | To Bus | | Circuit ID |
|---|---|---|---|---|---|---|---|
| | | | Name | Voltage | Name | Voltage | |
| N2-1 | 2430 | 1 | 25900 | BIG CRK1 | 230 | FRSNOSCE | 230 | 1 |
| | 2430 | 3 | 25900 | BIG CRK3 | 230 | FRSNOSCE | 230 | 1 |
| N2-2 | 2423 | 5 | 25900 | RECTOR | 230 | FRSNOSCE | 230 | 1 |
| | 2423 | 5 | 25900 | RECTOR | 230 | FRSNOSCE | 230 | 2 |
| N2-3 | 2430 | 3 | 24235 | BIG CRK3 | 230 | RECTOR | 230 | 2 |
| | 2414 | 1 | 24304 | SPRINGVL | 230 | BIG CRK4 | 230 | 1 |
| N2-4 | 2430 | 3 | 24235 | BIG CRK3 | 230 | RECTOR | 230 | 2 |
| | 2414 | 1 | 24235 | SPRINGVL | 230 | RECTOR | 230 | 1 |
| N2-5 | 2414 | 1 | 24304 | SPRINGVL | 230 | BIG CRK4 | 230 | 1 |
| | 2414 | 1 | 24235 | SPRINGVL | 230 | RECTOR | 230 | 1 |
| N2-6 | 3082 | 0 | 39000 | HELMS PP | 230 | FRSNOPGE | 230 | 1 |
| | 3082 | 0 | 39000 | HELMS PP | 230 | FRSNOPGE | 230 | 2 |
| N2-7 | 3081 | 0 | 39000 | GREGG | 230 | FRSNOPGE | 230 | 1 |
| | 3081 | 0 | 39000 | GREGG | 230 | FRSNOPGE | 230 | 2 |
| N2-8 | 24153 | | 24235 | VESTAL | 230 | RECTOR | 230 | 1 |
| | 24235 | | 24153 | RECTOR | 230 | VESTAL | 230 | 2 |
| N2-9 | 24153 | | 24235 | VESTAL | 230 | RECTOR | 230 | 1 |
| | 2423 | 5 | 24087 | RECTOR | 230 | MAGUNDEN | 230 | 1 |
| N2-10 | 24235 | | 24153 | RECTOR | 230 | VESTAL | 230 | 2 |
| | 2423 | 5 | 24087 | RECTOR | 230 | MAGUNDEN | 230 | 1 |
| N2-11 | 2408 | 7 | 24141 | MAGUNDEN | 230 | SPRINGVL | 230 | 1 |
| | 2408 | 7 | 24141 | MAGUNDEN | 230 | SPRINGVL | 230 | 2 |
| N2-12 | 24087 | | 24153 | MAGUNDEN | 230 | VESTAL | 230 | 1 |
| | 24087 | | 24153 | MAGUNDEN | 230 | VESTAL | 230 | 2 |
| N2-13 | 24087 | | 24115 | MAGUNDEN | 230 | PASTORIA | 230 | 1 |
| | 24087 | | 24115 | MAGUNDEN | 230 | PASTORIA | 230 | 2 |
| N2-14 | 24087 | | 24115 | MAGUNDEN | 230 | PASTORIA | 230 | 1 |
| | 24087 | | 24115 | MAGUNDEN | 230 | PASTORIA | 230 | 3 |
| N2-15 | 24087 | | 24115 | MAGUNDEN | 230 | PASTORIA | 230 | 2 |
| | 24087 | | 24115 | MAGUNDEN | 230 | PASTORIA | 230 | 3 |
| N2-16 | 2408 | 7 | 24401 | MAGUNDEN | 230 | ANTELOPE | 230 | 2 |
| | 2408 | 7 | 27020 | MAGUNDEN | 230 | TEHACH_5 | 230 | 1 |
| N2-17 | 2408 | 7 | 24401 | MAGUNDEN | 230 | ANTELOPE | 230 | 2 |
| | 2440 | 1 | 27020 | ANTELOPE | 230 | TEHACH_5 | 230 | 1 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| N2-18 24403 | | 24115 | BAILEY | 230 | PASTORIA | 230 | 1 |
| 2411 | 4 | 24217 | PARDEE | 230 | WARNETAP | 230 | 1 |
| 24115 | | 24217 | PASTORIA | 230 | WARNETAP | 230 | 1 |
| 2421 | 8 | 24217 | WARNE | 230 | WARNETAP | 230 | 1 |
| N2-19 24403 | | 24115 | BAILEY | 230 | PASTORIA | 230 | 1 |
| 2411 | 4 | 24217 | PARDEE | 230 | WARNETAP | 230 | 1 |
| 24115 | | 24217 | PASTORIA | 230 | WARNETAP | 230 | 1 |
| 2421 | 8 | 24217 | WARNE | 230 | WARNETAP | 230 | 1 |
| N2-20 24114 | | 24115 | PARDEE | 230 | PASTORIA | 230 | 1 |
| 2411 | 4 | 24217 | PARDEE | 230 | WARNETAP | 230 | 1 |
| 24115 | | 24217 | PASTORIA | 230 | WARNETAP | 230 | 1 |
| 2421 | 8 | 24217 | WARNE | 230 | WARNETAP | 230 | 1 |
| N2-21 2411 | 4 | 24403 | PARDEE | 230 | BAILEY | 230 | 1 |
| 2411 | 4 | 24217 | PARDEE | 230 | WARNETAP | 230 | 1 |
| 24115 | | 24217 | PASTORIA | 230 | WARNETAP | 230 | 1 |
| 2421 | 8 | 24217 | WARNE | 230 | WARNETAP | 230 | 1 |
| N2-22 2411 | 4 | 24155 | PARDEE | 230 | VINCENT | 230 | 1 |
| 2403 | 6 | 24114 | EAGLROCK | 230 | PARDEE | 230 | 1 |
| N2-23 2411 | 4 | 24147 | PARDEE | 230 | SYLMAR S | 230 | 1 |
| 2411 | 4 | 24147 | PARDEE | 230 | SYLMAR S | 230 | 2 |
| N2-24 2414 | 7 | 24089 | SYLMAR S | 230 | GOULD | 230 | 1 |
| 2403 | 6 | 24147 | EAGLROCK | 230 | SYLMAR S | 230 | 1 |
| N2-25 2415 | 5 | 24126 | VINCENT | 230 | RIOHONDO | 230 | 1 |
| 2415 | 5 | 24126 | VINCENT | 230 | RIOHONDO | 230 | 3 |
| N2-26 2415 | 6 | 24092 | VINCENT | 500 | MIRALOMA | 500 | 1 |
| 2415 | 5 | 24126 | VINCENT | 230 | RIOHONDO | 230 | 1 |
| N2-27 2415 | 6 | 24092 | VINCENT | 500 | MIRALOMA | 500 | 1 |
| 2415 | 5 | 24126 | VINCENT | 230 | RIOHONDO | 230 | 3 |
| N2-28 24091 | | 24126 | MESA CAL 230 | | RIOHONDO | 230 | 1 |
| 24091 | | 24126 | MESA CAL | 230 | RIOHONDO | 230 | 2 |
| N2-29 24091 | | 24126 | MESA CAL 230 | | RIOHONDO | 230 | 1 |
| 2407 | 6 | 24126 | LAGUBELL | 230 | RIOHONDO | 230 | 1 |
| N2-30 24091 | | 24126 | MESA CAL 230 | | RIOHONDO | 230 | 2 |
| 2407 | 6 | 24126 | LAGUBELL | 230 | RIOHONDO | 230 | 1 |
| N2-31 2408 | 6 | 24156 | LUGO | 500 | VINCENT | 500 | 1 |
| 2408 | 6 | 24156 | LUGO | 500 | VINCENT | 500 | 2 |
| N2-32 2450 | 0 | 24156 | ANTELOPE | 500 | VINCENT | 500 | 1 |
| 2450 | 0 | 24156 | ANTELOPE | 500 | VINCENT | 500 | 2 |
| N2-33 2452 | 0 | 24500 | TEHACHPI | 500 | ANTELOPE | 500 | 1 |
| 2452 | 0 | 24500 | TEHACHPI | 500 | ANTELOPE | 500 | 2 |
| N2-34 3006 | 0 | 24156 | MIDWAY | 500 | VINCENT | 500 | 1 |
| 3006 | 0 | 24156 | MIDWAY | 500 | VINCENT | 500 | 2 |

# Appendix B
# PG&E list of Contingencies

### 1.2.1. "B" contingencies for 500 kV system:

- Tesla – Los Banos 500 kV line outage,
- Los Banos – Gates 500 kV line outage,
- Los Banos – Midway 500 kV line outage,
- Gates – Midway 500 kV line outage,
- Tesla – Gregg 500 kV line outage (Alt. 5),
- Gregg – Midway 500 kV line outage (Alt. 5),
- PDCI Bi-pole Outage.

### 1.2.2. "C" contingencies for 500 kV system:

- Tesla – Los Banos and Tracy – Los Banos 500 kV double line outage (Los Banos north),
- Los Banos – Midway and Los Banos – Gates #3 500 kV double line outage (Los Banos south),
- Los Banos – Midway and Gates – Midway 500 kV double line outage (Midway north),
- Los Banos – Midway #1 and #2 (new) 500 kV double line outage (Midway north for Alt. 4),
- Tesla – Los Banos and Tesla – Gregg (new) 500 kV double line outage (Alt. 5),
- Two Palo Verde generation units outage,
- Two Diablo Canyon generation units outage.

**Attachment C**
**July 14, 2004 Study Plan**

# Phased Transmission Development Plan for Interconnecting Over 4,000 MW of Wind Generation In North Los Angeles and Kern Counties Referred to as the "Tehachapi Area"

## Study Plan

July 14, 2004

For information or questions regarding this Study Plan, please contact Jorge Chacon via phone at (626) 302-9637 or e-mail at jorge.chacon@sce.com

## Summary of Revisions

A number of participants provided comments to the Tehachapi Collaborative Study Plan date June 21, 2004. The following is a summary of the revision made to the Study Plan.

A new section that discusses the purpose of the Tehachapi Conceptual Transmission Plan was added.

Objective No.2 was expanded to include the goal of a single phased conceptual transmission plan and what happens if consensus is not reached.

Objective No.7e was expanded to include determination of how much spacing between transmission lines is required to consider the lines to be on "separate" right-of-way.

Objective No.9 was added to address whether regional transmission approach should be adopted for other renewable areas in the State.

CPUC Staff responsibilities were added to the responsibility section.

The section covering currently proposed projects was expanded to include electrical characteristics and thermal ratings so that the collaborative group can effectively model these projects into any study case.

A new section was added to cover electrical characteristics and thermal ratings for each of the Alternative Tehachapi Area Conceptual Plans.

A new element was added to the power flow base case assumptions section to cover the generation displacement assumptions as provided by the CAISO

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## Introduction

The Tehachapi area has been categorized as the largest wind resource area in the State of California. This area, if more fully developed, could meet a significant portion of the goals for the renewable energy development in California. In order to tap this energy resource area, large-scale transmission upgrades are required as the existing transmission facilities in the area, the Antelope-Bailey 66-kV subtransmission network and the Big Creek 230-kV Corridor, are already fully utilized.

Transmission constraints into the Tehachapi area have been discussed as part of the ongoing Assembly Bill (AB) 970 Investigation 00-11-001 with Phase 6 of the proceeding devoted to Tehachapi. The outcome of AB 970 Phase 6 is an Interim Opinion on Transmission Needs in the Tehachapi Wind Resource Area which orders (CPUC Decision 04-06-010) the formation of a collaborative study group to be convened to develop a comprehensive transmission development plan for the phased expansion of transmission capabilities into the Tehachapi area.

The CPUC Staff will coordinate the collaborative study group with assistance by the California Independent System Operator (CAISO) as needed. The collaborative study group will include participation by Southern California Edison Company (SCE), Pacific Gas and Electric Company (PG&E), wind developers, and any other interested parties including the California Energy Resources Conservation and Development Commission (CEC), Department of Defense, the counties of Kern and Los Angeles, the Los Angeles Department of Water and Power (LADWP), and the owners of the independently owned Sagebrush line. It is envisioned that the collaborative study group will function in a manner similar to the Southwest Transmission Expansion Plan (STEP) process.

This Study Plan provides a proposed guideline for the Tehachapi Comprehensive Transmission Development Assessment. The study plan is divided into fourteen sections: (1) Introduction, (2) Background, (3) Purpose of Tehachapi Conceptual Transmission Plan, (4) Objectives, (5) Responsibilities, (6) Currently Proposed Projects in Area, (7) Alternative Tehachapi Area Conceptual Plans, (8) Electrical Characteristics and Thermal Ratings of Alternate Conceptual Plans, (9) Assessment Process Outline, (10) Study Areas and Study Conditions, (11) Power Flow Base Case Assumptions, (12) Power Flow Screening Level Preliminary Assessment, (13) Final Report, and (14) Schedule of Major Milestones. The study plan will be followed by the Collaborative Study Group in completing the order set forth which requires Edison, acting on behalf of the study group, to file a report in the AB 970 proceeding containing the study group's findings and recommendations within nine months of the effective date of CPUC Decision 04-06-010 which is March 9, 2005.

## Background

Southern California Edison has performed a number of conceptual studies for interconnecting renewable wind generation in the Tehachapi area. These conceptual

studies were performed for the purpose of identifying conceptual transmission facilities necessary to meet future delivery needs for wind generation in the Tehachapi area. The initial conceptual study was done with participation of ten wind developers who collectively identified, on a conceptual basis, a total of 2,500 MW of potential wind development in the Tehachapi area.

A subsequent conceptual study (Phase 2) was performed with participation of eight wind developers. The purpose for this subsequent conceptual study was to perform preliminary substation site selection studies in the Cal Cement, Monolith, and Jawbone areas as well as identify potential line routes for new transmission into the Tehachapi area. Total wind generation considered was unchanged at the 2,500 MW level. Testimony was filed by SCE in the AB 970 Phase VI proceeding based on the study results of this conceptual study. The CAISO interjected testimony suggesting a different project alternative to interconnect Tehachapi area wind generation.

A third conceptual study (Phase 3) was performed to evaluate an additional 770 MW of wind generation development increasing the total Tehachapi wind generation potential from 2,500 MW to 3,270 MW. This conceptual study resulted in two conceptual transmission alternatives (230-kV and 500-kV conceptual alternative) for integrating Tehachapi area wind generation. The 500-kV transmission alternative plan was further refined to accommodate increased Tehachapi area wind generation potential as identified by the CEC in their Electric Transmission Plan for Renewable Resources in California Report to the Legislature dated December 1, 2003. The new Tehachapi area wind generation potential as identified by the CEC is now in excess of 4,000 MW. The CPUC adopted the 500-kV transmission alternative in their report to the Legislature for interconnecting over 4,000 MW of wind generation.

This increased MW potential and the identification of a 500-kV transmission alternative has resulted in the presentation of yet another transmission alternative to the SCE Conceptual Study Plan. The alternative, as presented by Oak Creek Energy Systems and CalWea, includes the development of a fourth Midway-Vincent (via Tehachapi) 500-kV transmission line.

These project alternatives resulted in a number of outstanding issues that need to be addressed by the Tehachapi Collaborative Study Group. The outstanding issues include the determination if the CAISO proposed PG&E-SCE interconnection alternative provides statewide benefits and allow wind generation development to proceed, identification of expected demarcation between gen-ties and network transmission facilities, and consideration of regional benefits when developing revised Tehachapi Phased Conceptual Transmission plan.

Purpose of Tehachapi Conceptual Plan

Conceptual studies are no substitute for System Impact or Facilities Studies, which will be required prior to interconnecting any new wind generation in the area. The results of the conceptual studies are to be used as a roadmap in developing transmission facilities

into the Tehachapi area. The roadmap will serve as a means to avoid the piecemeal transmission additions associated with construction of facilities to interconnect only each year's winning RPS bidders or to interconnect only the projects which request interconnection (incremental requests). The actual timing of construction of transmission facilities will be driven by actual interconnection requests. However, instead of sizing the facility to accommodate the requested interconnection amount, the facilities will be developed in a way that is consistent with the conceptual transmission plan.

It should be noted that conceptual transmission plans should not be viewed as a permanent plan. Modifications to the conceptual transmission plan may be necessary as a result of actual need. In other words, the plan needs to be flexible so that future changes can be made if actual generation locations turn out to be different than what is assumed in developing this conceptual transmission plan.

Objectives

Edison, PG&E and the collaborative study group, in coordination with the CPUC Staff and the CAISO, will:

a. assess the amount of resources available in the Tehachapi Area that can be accommodated using existing transmission system capacity

b. develop a comprehensive Tehachapi transmission development plan in order for upgrades in the Tehachapi area to be most cost effective, least environmentally disruptive, orderly, and logical based on the magnitude of the wind resource identified by the CEC

   i. The study group should cooperatively work on developing a single phased conceptual transmission plan, at least for the initial portions of the phased upgrades

   ii. If consensus among the participants is not reached, the study group should explain clearly factors that would influence a choice among any alternative proposals

c. incorporate the transmission facilities for the Tehachapi Upgrades necessary to interconnect the PPM Project into the conceptual plan

   i. the PPM Project has completed the System Impact and Facilities Studies, has priority over conceptual projects, is ready to pursue as a Market Participant, and should not be held-up by the Collaborative Study Group

   ii. approval of System Impact and Facilities Studies should follow the FERC Interconnection Process

d. identify viable transmission alternatives, taking a statewide approach, for systematically phasing transmission into the Tehachapi area to ultimately interconnect the full Tehachapi wind resource potential identified by the CEC (over 4,000 MW)

e. assess the extent to which each transmission alternative configuration would assist in the transport of power to companies other than Edison in order to meet their corresponding RPS goals

f. develop phasing and priority of each transmission alternative

i. develop a list of short lead time transmission upgrades can be pursued on a fast-track schedule

ii. identify phase development of each transmission alternative in an orderly, rational and cost effective manner

iii. determine the amount of wind generation that can be accommodated with each phase of each transmission alternative

iv. determine if any additional transmission elements should be included into a subsequent CPCN filing

v. identify all new conceptual transmission facilities (e.g. lines, substations, and upgrades to existing lines and substations) required to transmit the power from Tehachapi to the various load centers (PG&E, Edison, and SDG&E)

vi. identify the expected demarcation between gen-ties and network transmission facilities to the extent feasible

vii. develop recommendations regarding the procedures whereby each phase of the upgrades would be trigger after the first phase

g. perform preliminary feasibility analysis for the transmission facilities identified

i. perform preliminary “screening-level” power flow analysis

ii. perform preliminary engineering review to identify transmission elements that may be problematic

iii. perform preliminary environmental review of transmission facilities based on available information contained in currently available environmental data bases in order to identify potential significant environmental constraints

iv. develop a preliminary list of licensing and environmental requirements for the transmission line right-of-way and potential substation sites

v. resolve with the Department of Defense any critical issues surrounding transmission line routes and heights and minimum distance between lines to consider lines as different corridor

vi. address how long it would take for the anticipated transmission owner to prepare and file each of the needed certificate applications based on the study group recommendations

vii. identify the maximum reasonably foreseeable build-out for the utility-owned assets in order to comply with CEQA requirements

h. identify estimates of the transmission costs, including substation costs and land acquisition costs, based on standard, off-the-shelf, general unit cost basis

i. determine if the regional transmission planning approach should be adopted for other renewable areas in the State

Responsibilities

The following are assignments for the supply of information to the Study Group to facilitate the development of a Collaborative Transmission Development Plan

a. The CPUC Staff will coordinate the collaborative study group with assistance by the California Independent System Operator (CAISO) as needed.

b. Edison is responsible for completing the aforementioned objectives for identifying

a. conceptual facilities required within SCE's service territory to interconnect additional Tehachapi wind generation into SCE's existing network

b. potential transmission upgrades needed to deliver energy to SCE's load center or to the first interconnection point with PG&E and/or SDG&E,

c. potential impacts to SCE's network as a result of new facilities that are proposed to interconnect the SCE system with the PG&E system,

d. potential impacts to SCE's existing network as a result of implementing third party transmission expansion.

c. PG&E is responsible for completing the aforementioned objectives for

a. Identifying new facilities within PG&E's service territory required to deliver Tehachapi wind generation from SCE's first interconnection point to PG&E's load center in the Bay area,

b. evaluating new facilities that are proposed to directly interconnect additional Tehachapi wind generation into PG&E's existing network

c. evaluating potential impact to PG&E's network as a result of new facilities that are proposed to interconnect the SCE system with the PG&E system

d. potential impacts to SCE's existing network as a result of implementing third party transmission expansion

d. The CAISO is responsible for conducting cost analysis for

a. quantifying any new RMR exposure identified in either SCE's or PG&E's system as a result of the proposed alternatives,

b. quantifying any additional congestion exposure on Path 26, Path 15, and other parts of the ISO Grid as a result of either connecting the SCE system with the PG&E system, delivering Tehachapi area wind generation to SDG&E, or delivering Tehachapi area wind generation to PG&E

e. Third Parties who may wish to participate (such as LADWP and the Sagebrush Owners) in the study process are responsible for

a. identifying whether they are interested in participating in conceptual studies to support Tehachapi,

b. providing the specifics on how any facilities currently owned by those entities or new proposed facilities to be owned by those entities can be used to integrate additional Tehachapi area wind generation

If active participation of these third parties does not evolve or is of limited input, the study group should dispense in evaluating how these non-CAISO controlled assets could be utilized since they are outside the jurisdiction of the CAISO and CPUC and therefore should not be rolled into the final plan.

<u>Currently Proposed Projects in the Area</u>

The following are transmission projects that have been identified in a different forum and should be included into the starting base cases. The Collaborative Tehachapi Study Group should base transmission development plans with these projects included into the starting cases.

1. Transmission requirements to interconnect the 201 MW PPM project (Antelope-Pardee)

I. transmission requirements to interconnect the PPM project includes a new transmission line from the SCE Antelope substation to the SCE Pardee substation and substation expansions at Pardee and Antelope to accommodate the new line

II. the CAISO has reviewed the System Impact and Facilities studies for this project and will present to their governing board on July 29 for approval

III. electrical characteristics (per-unit) for this transmission line are as follows:

| | | | | |
|---|---|---|---|---|
| a. | 100 MVA / 230-kV base | R=0.00124 | X=0.02812 | B=2.0699 |
| b. | 100 MVA / 500-kV base | R=0.00026 | X=0.00595 | B=0.4380 |

IV. transmission ratings are as follows:

a. Normal Rating = 3950 amps
b. Long-Term Emergency Rating = 4540 amps
c. Short-Term Emergency Rating = 5330 amps

2. Pastoria-Pardee Transmission Line Reconductor

This project is an infrastructure replacement project which was identified in the 2004-2008, 2013 CAISO Controlled SCE Transmission Expansion plan. The scope of the project is to replace the existing 605 ACSR conductor on the Pastoria-Bailey, Pastoria-Pardee, and Bailey-Pardee 230-kV transmission lines with 666.6 ACSS/TW. This conductor type is the largest conductor that can be utilized on the existing transmission towers without requiring tear-down and rebuild. The project is not driven by Tehachapi wind generation needs.

The CAISO has reviewed the studies for this project and provided conditional concurrence pending receiving any input from the Collaborative Study Group.

SCE has presented this project to the Collaborative Study Group for informational purposes only and did not receive any opposition

V. electrical characteristics (per-unit) for this upgrade provided on 100 MVA / 230-kV base are as follows:

| | | | | |
|---|---|---|---|---|
| a. | Pastoria-Pardee | R=0.0109 | X=0.0587 | B=0.1085 |
| b. | Pastoria-Bailey | R=0.0035 | X=0.0187 | B=0.0346 |
| c. | Pardee-Bailey | R=0.0073 | X=0.0398 | B=0.0737 |

VI. ratings for the Pastoria-Bailey and Pardee-Bailey lines are as follows:

a. Normal Rating = 1240 amps
b. Long-Term Emergency Rating = 1426 amps
c. Short-Term Emergency Rating = 1500 amps

VII. ratings for the Pastoria- Pardee line is 1500 amps under all conditions

3. San Joaquin Valley Rector Loop and SVC

This project is a reliability driven project first identified in the 2002-2006, 2011 CAISO Controlled SCE Transmission Expansion plan and validated over the last two expansion plans. The project consists of constructing a new 15-20 mile double-circuit 230-kV transmission line so that the existing Big Creek3-Springville 230-kV line can be looped in and out of the Rector 230-kV substation and adding a 175 MVAR static VAR compensator (SVC) at Rector. This project has been approved by the CAISO governing board on June 24, 2004.

electrical characteristics (per-unit) for this upgrade provided on 100 MVA / 230-kV base are as follows:

| | | | | |
|---|---|---|---|---|
| a. | New Big Creek3-Rector | R=0.0106 | X=0.0889 | B=0.1711 |
| b. | New Rector-Springville | R=0.0079 | X=0.0660 | B=0.1277 |

ratings for the New Big Creek3-Rector line will be as follows:

c. Normal Rating = 1200 amps (wave trap)
d. Long-Term Emergency Rating = 1200 amps (wave trap)
e. Short-Term Emergency Rating = 1284 amps (wave trap)

ratings for the New Rector-Springville line will be as follows:

f. Normal Rating = 1200 amps (wave trap)
g. Long-Term Emergency Rating = 1200 amps (wave trap)
h. Short-Term Emergency Rating = 1284 amps (wave trap)

Alternative Tehachapi Area Conceptual Plans

The following is a discussion of the currently proposed Tehachapi Area Conceptual Transmission Alternatives:

Revised SCE Conceptual Transmission Plan

New 500-kV Transmission line from Pardee to the Tehachapi area via Antelope. The line section between Antelope and Pardee (25 miles) should be included into the starting cases (initially energized at 230-kV) for reasons identified above. This line section will replace an existing 66-kV transmission line between Antelope and Pardee requiring expansion of existing right-of-way (ROW). New ROW will be required between Tehachapi and Antelope (30 miles).

New 500-kV Transmission line from Vincent to the Tehachapi area via Antelope. The line section between Vincent and Antelope will replace existing 230-kV transmission line(s). New ROW will be required between Tehachapi and Antelope that is distinct from the ROW required above (30 miles).

Second new 500-kV Transmission line from Vincent to the Tehachapi area via different route due to right-of-way restrictions. This line will require new ROW between Vincent and Tehachapi.

Additional capacity between Vincent and the Los Angeles Basin in order to deliver output from the Tehachapi area wind generation to the SCE or SDG&E load centers.

New 500/230-kV substation(s) located near the Tehachapi Pass with several (up to four) 230/66-kV substations located in the various wind regimes.

220-kV transmission lines from the new 500/230-kV substation(s) to the 230/66-kV substations.

66-kV transmission lines from the new 230/66-kV substation(s) to the windfarms to collect the wind generation from the various sites.

Substation Expansion at Pardee and Vincent.

SCE-PG&E Phase-shifted System-Tie (CAISO Suggestions)

New phase-shifted system-tie in the Fresno Area

New phase-shifted system-tie in the Bakersfield Area

New 500-kV or 230-kV transmission line from the Tehachapi area to existing transmission facilities (to be determined). New ROW will be required between Tehachapi and the existing transmission facilities.

New 500/230-kV substation(s) located near the Tehachapi Pass with several (up to four) 230/66-kV substations located in the various wind regimes.

220-kV transmission lines from the new 500/230-kV substation(s) to the 230/66-kV substations.

66-kV transmission lines from the new 230/66-kV substation(s) to the windfarms to collect the wind generation from the various sites.

Midway-Vincent No.4 via Tehachapi

New 500-kV Transmission line from Midway to the Tehachapi area. Some new ROW may be required.

New 500-kV Transmission line from Vincent to the Tehachapi area via Antelope. This line will replace existing 230-kV transmission line(s) between Vincent and Antelope. New ROW will be required between Tehachapi and Antelope.

New 500/230-kV substation(s) located near the Tehachapi Pass with several (up to four) 230/66-kV substations located in the various wind regimes.

220-kV transmission lines from the new 500/230-kV substation(s) to the 230/66-kV substations.

66-kV transmission lines from the new 230/66-kV substation(s) to the windfarms to collect the wind generation from the various sites.

Substation Expansion at Midway and Vincent.

Electrical Characteristics and Thermal Ratings of Alternative Conceptual Plans

The following are the corresponding electrical characteristics and corresponding thermal ratings for each Tehachapi Area Conceptual Transmission Alternative. The transmission line parameters are provided in percent per mile and the transformer parameters are provided in percent.

Revised SCE Conceptual Transmission Plan

New 500-kV Transmission lines based on 100 MVA / 230-kV Base
Bundled 2156 ACSR R=0.00496 X=0.11250 B=8.2798

New 500-kV Transmission lines based on 100 MVA / 500-kV Base
Bundled 2156 ACSR R=0.00105 X=0.02380 B=1.7520

New 230-kV Transmission lines based on 100 MVA / 230-kV Base
Bundled 1590 ACSR R=0.00627 X=0.10330 B=0.4060

New 66-kV Transmission lines based on 100 MVA / 66-kV Base
954 SAC R=0.28 X=1.49 B=0.0280

Transmission Line Ratings (amps)
500-kV: Normal-3,950 Long-Term Emergency-4,540 Short-Term Emergency-5,330
230-kV: Normal-3,230 Long-Term Emergency-3,710 Short-Term Emergency-4,360
66-kV: Normal-1,090 Long-Term Emergency-1,470 Short-Term Emergency-1,470

Transformer Parameters
500/230-kV : 15.0 percent based on 1120 MVA with $V_{from}$ of 525 and $V_{to}$ of 230
230/66-kV : 19.7 percent based on 280 MVA with $V_{from}$ of 230 and $V_{to}$ of 70.5
230/34.5-kV : 11.5 percent based on 100 MVA with $V_{from}$ of 230 and $V_{to}$ of 34.5
34.5/0.545kV : 5.75 percent based on 1.5 MVA with $V_{from}$ of 34.5 and $V_{to}$ of 0.545
Transformer Ratings
500/230-kV : 1120 MVA
230/66-kV : 280 MVA
230/34.5-kV : 100 MVA
34.5/0.545kV : 1.5 MVA

SCE-PG&E Phase-shifted System-Tie (CAISO Suggestions)

New switching station north of Rector at the crossing of Helms/Big Creek lines

Loop existing Big Creek-Rector lines into new switching station (FresnoTie)

| | | | | |
|---|---|---|---|---|
| i. | Big Creek1-FresnoTie | R=0.0079 | X=0.0403 | B=0.0760 |
| j. | Big Creek3-FresnoTie | R=0.0049 | X=0.0250 | B=0.0470 |
| k. | Rector-FresnoTie No.1 | R=0.0139 | X=0.0707 | B=0.1330 |
| l. | Rector-FresnoTie No.2 | R=0.0139 | X=0.0707 | B=0.1330 |
| m. | Normal Rating = 885 amps | Emergency Rating = 936 amps on all lines | | |

Loop existing Gregg-Helms lines into new switching station (FresnoTie)

| | | | | |
|---|---|---|---|---|
| n. | Helms-FresnoTie No.1 | R=0.0025 | X=0.0313 | B=0.1110 |
| o. | Helms-FresnoTie No.2 | R=0.0025 | X=0.0313 | B=0.1110 |
| p. | Gregg-FresnoTie No.1 | R=0.0025 | X=0.0313 | B=0.1110 |
| q. | Gregg-FresnoTie No.2 | R=0.0025 | X=0.0313 | B=0.1110 |
| r. | Normal Rating = 1,910 amps | Emergency Rating = 2,264 amps on all lines | | |

Assume SCE 230-kV transmission line characteristics provided above for new line from Bakersfield (PG&E) to Magunden (SCE)

Assume same electrical parameters as the Crystal 230-kV phase-shifter shown in WECC Base Case for new phase shifters at Bakersfield and new switching station

Midway-Vincent No.4 via Tehachapi

SCE 500-kV transmission lines are discussed above in Item 1b

PG&E 500-kV transmission lines (100 MVA / 500-kV Base)
Bundled 2300 AAL R=0.00102 X=0.02470 B=1.7440

Transmission Line Ratings (amps)
Summer Normal-2,478 Summer Emergency-2,964

Assume parameters discussed above in item for Tehachapi localized 230-kV and 66-kV Facilities

Assessment Process Outline

The following is the process outline for developing the phased Tehachapi Transmission Plan.

Develop Tehachapi conceptual transmission plans for the various alternatives in order to interconnect the magnitude of the wind resource identified by the CEC.

From each conceptual transmission plan, identify the short-lead time project elements that can be pursued on a fast-track schedule

Determine if any of the short-lead time project elements should be included into a Phase 1b CPCN filing so that SCE can amend CPCN filing as needed

Perform necessary conceptual studies in order to identify phase development of each transmission alternative in an orderly, rational and cost effective manner

determine the amount of wind generation that can be accommodated with each phase of each transmission alternative on a conceptual basis

identify all new conceptual transmission facilities (e.g. lines, substations, and upgrades to existing lines and substations) required to transmit the power from Tehachapi to the various load centers (PG&E, Edison, and SDG&E)

validate potential impacts associated with (a) and (b) above by performing screening level power flow studies and determine if project element(s) should be further evaluated

Perform preliminary feasibility analysis for the transmission facilities identified in the various alternatives that pass the screening level study

i. perform preliminary engineering review to identify transmission elements that may be problematic

ii. perform preliminary environmental review of transmission facilities based on available information contained in currently available environmental data bases in order to identify potential significant environmental constraints

iii. resolve with the Department of Defense any critical issues surrounding transmission line routes and heights

Determine how long it would take for the anticipated transmission owner to prepare and file each of the certificate applications based on the outcome of the preferred alternative

develop a preliminary list of licensing and environmental requirements for the transmission line right-of-way and potential substation sites

identify the maximum reasonably foreseeable buildout for the utility-owned assets in order to comply with CEQA requirements

Develop appropriate transmission cost estimates, including substation costs and land acquisition costs, based on standard, off-the-shelf, general unit cost basis

Study Areas and Study Conditions

Edison proposes the following study areas and study conditions in developing the transmission facilities necessary to interconnect the full potential of renewable resources in the Tehachapi area as identified by the CEC:

CAISO Controlled SCE Transmission System Areas

Edison will utilize the latest heavy summer and light spring power flow cases developed for the 2004-2008, 2013 Annual CAISO Assessment recently completed. The cases will be adjusted as necessary to accommodate the additional wind generation modeled in the Tehachapi area in order to reflect maximum anticipated stress conditions on SCE transmission facilities consistent with the ISO Grid Planning Criteria assuming delivery of wind generation to either PG&E or SCE/SDG&E. The adjustment will be made by displacing either import generation into SCE from the north to capture delivery of wind generation to PG&E via Path 26 or displacing SCE and/or SDG&E internal generation to capture delivery into SCE and/or SDG&E. The displacement will be made as identified in Section XI Item 6. The cases will include transmission projects identified and approved by the CAISO as part of the annual expansion plan.

4. Main 500-kV and 230-kV System – Heavy Summer Load Conditions

Summer peak load conditions requiring high internal SCE generation dispatch and high imports result in maximum stress on the system. Although historical data indicates that under peak load conditions the Tehachapi area wind generation levels are relatively low, the study will be performed assuming maximum wind generation dispatch to cover those instances when wind generation actually produces at a high generation levels during high system load conditions.

Studies will be performed to cover fifty percent delivery to the north and remaining fifty percent delivered to the south. These studies will address the conditions where power from wind generation resources are partially delivered to the north with remaining output delivered to the south. Sensitivity studies may be performed to evaluate full deliveries to the south and full deliveries to the north. Actual deliveries resulting from actual RPS contracts may be

different and therefore additional transmission facilities not identified by this study may be required to deliver to the load centers.

5. Main 500-kV and 230-kV System – Spring Peak Load Conditions

Spring peak load conditions, with high import levels, high Big Creek corridor generation and reduced main system generation (sufficient generation on-line to maintain adequate voltages in the Los Angeles Basin) will be examined. Studies will be performed to cover fifty percent delivery to the north and remaining fifty percent delivered to the south. These studies will address the conditions where power from wind generation resources are partially delivered to the north with remaining output delivered to the south. Sensitivity studies may be performed to evaluate full deliveries to the south and full deliveries to the north. Actual deliveries resulting from actual RPS contracts may be different and therefore additional transmission facilities not identified by this study may be required to deliver to the load centers.

6. Big Creek and San Joaquin Valley 230-kV System – Under heavy summer load with maximum generation, light spring load with maximum generation, and off-peak load summer with maximum hydro pumping conditions

This portion of the system, which is served practically radial from the Main Transmission system, has been identified to be transmission deficient under both maximum load with maximum generation and minimum load with maximum generation. The system includes two Special Protection Schemes (Big Creek and Pastoria Energy Facility) that could be affected by additional wind generation. Studies will be performed to evaluate corridor under both heavy summer load and light spring load conditions.

CAISO Controlled PG&E Transmission System Areas

PG&E will utilize the latest heavy summer and light autumn power flow cases developed for the 2004-2008, 2013 Annual CAISO Assessment recently completed. The cases will be adjusted as necessary to accommodate the additional wind generation modeled in the Tehachapi area in order to reflect maximum anticipated stress conditions on the PG&E transmission facilities consistent with the ISO Grid Planning Criteria assuming delivery of wind generation at the existing Midway substation or the proposed new 230 kV tie at Big Creek and Magunden. Old and less efficient generation units in the NP15 will be displaced to accommodate the

import of wind generation into the PG&E system. The cases will include transmission projects identified and approved by the CAISO as part of the annual expansion plan

Heavy Summer Load Conditions

Summer peak load conditions with maximum North to South flow on Path 26 will be evaluated to assess impact of delivering Tehachapi area wind generation to the Bay area via Path 26 and Path 15

Autumn or Winter Off-Peak Load Conditions

Autumn or Winter Off-peak load conditions, with maximum South to North flow on Path 15 will be evaluated to assess impact of delivering Tehachapi area wind generation to the Bay area via Path 26 and Path 15.

Fresno and Bakersfield Area Studies

Studies will be performed to evaluate the impact of the proposed Big Creek-Helms Interconnection on the Fresno area transmission system. The studies will be based on the Fresno area summer peak base cases modeling three Helms units generating and Fresno area summer off-peak base cases modeling two Helms units pumping.

Studies will also be performed to evaluate the impact of the proposed Magunden Interconnection on the Kern area transmission system. The studies will be based on the summer peak base cases modeling 3400 MW of north-to-south flow on Path 26 and the autumn off-peak base cases modeling 5400 MW of south-to-north flow on Path 15.

Power Flow Base Case Assumptions

Edison proposes the following key assumptions in developing the conceptual transmission facilities necessary to interconnect the full potential of renewable resources in the Tehachapi area as identified by the CEC:

Load Related Assumptions

Loads will be modeled in load flow studies as follows:

Peak summer load conditions for SCE or PG&E will represent maximum anticipated loads based on a coincident load forecast, which will include consideration of a one-in-ten-year heat wave. Three cases will be used to

represent coincident Control Area Peak, Northern California Peak and Southern California Peak.

Peak summer load conditions for RMR analysis within SCE and PG&E will represent maximum anticipated loads based on a localized coincident load forecast, which will include consideration of a one-in-five-year heat wave.

Spring Peak representing typical daily Spring Season load will be assumed for the main SCE 500-kV and 230-kV system. This load assumption represents approximately 65% of the summer normal peak loads through the main SCE network and approximately 50% of the summer normal peak for the Big Creek Corridor.

Autumn or Winter Off-Peak load will be assumed for the main SCE 500-kV and 230-kV system. This load assumption represents approximately 50% of the summer normal peak loads through the main SCE network and approximately 40% of the summer normal peak for the Big Creek Corridor. For PG&E, this load assumption represents approximately 45% of the summer normal peak. Both systems experience maximum pumping under this load condition.

Loads located within the service area of a Non-Participating Transmission Owner that is directly interconnected to a transmission or distribution facility owned by SCE or PG&E will be modeled based on the most recent forecast that the Non-Participating TO has provided.

Reactive load WATT/VAR ratios for the transmission substation loads represented in the base cases will reflect reasonable values for the operating conditions being studied.

Generation Related Assumptions

a. Edison and PG&E will incorporate the generation resources required to meet the WECC Minimum Operating Reliability Criteria (MORC): 1% for regulation plus 7% or the largest generation unit. The required generation will include all existing generation: 2004 Reliability Must Run (RMR), regulatory must-take resources (QF), Hydro, and Nuclear and all existing market generation resources.

b. Future market generation proposed through the FERC Interconnection Process for which has an active request will be incorporated into the completed phased development plan if those projects can impact the study results since these projects have priority over conceptual resources.

c. Hydro generation located within the Edison and PG&E CAISO Controlled Grid will be modeled at an output level that provides the maximum anticipated stress conditions on the corresponding transmission systems.

d. Nuclear generation will be assumed at the maximum capability consistent with the ISO Grid Planning Criteria.

e. All QF generation will be modeled in the base case consistent with the ISO Grid Planning Criteria and study practices for transient stability analysis, provided data is available to simulate actual machine characteristics.

f. All QF generation explicitly represented in the power flow base cases will have their reactive capabilities modeled according to contractual requirements, otherwise historical operating data will be used. Actual reactive power capabilities (i.e. manufacturer data or field test data) will be modeled for dynamic stability analysis as available.

g. All generation connected to Edison's or PG&E's distribution system (at 12, 16, or 33-kV) will be netted with the transmission substation loads on the low side of the transformers. Other generation connected to the subtransmission systems will be represented with equivalent generators at the low side of the transmission substation transformers, when these systems are not CAISO controlled.

Imports into SCE

The generation import for SCE will be scheduled at the present 2004 maximum Southern California Import Transfer limit (SCIT), 14,300 MW for the summer and 13,600 MW for the spring, with Path 26 (Midway-Vincent) north-to-south flows modeled at maximum (3,400 MW) in order to stress the SCE 500-kV system and the 500/230-kV transformer banks

Edison will perform studies for delivering wind generation output to either SCE and/or SDG&E by assuming maximum north-to-south flow on Path 26 (Midway-Vincent). Edison will perform studies for delivering wind generation output to PG&E by reducing exchanges between Edison and PG&E, which will result in lowering north-to-south flow on Path 26 (Midway-Vincent).

Imports into PG&E

The generation import for PG&E in the Autumn/Winter off-peak cases will be scheduled at the maximum allowable south-to-north flow on Path 26 (Midway-Vincent). Path 15 will be stressed to the south-to-north rating of 5400 MW.

PG&E will perform studies for receiving wind generation output at Midway by increasing exchanges between Edison and PG&E and displacing older and less efficient generation units in the NP15, which will result in increasing south-to-north flow on Path 26 (Midway-Vincent) and Path 15.

Generation Displacement

In order to assess the impacts on the bulk system when performing the power flow simulations it is important to schedule the 4,000+ MW to "reasonable" locations. To perform the necessary conceptual studies which would identify the facilities necessary to interconnect and deliver renewable resources to the load centers, 50% of the Tehachapi area wind generation will be assumed to be delivered to the system north of Path 26 and the remaining 50% delivered to the system south of Path 26. This will be accomplished by reducing generation as follows:

COI by 7.5 % (import north of Path 26)
NP-15 by 42.5% (north of Path 26)
SCE by 17.5% (south of Path 26)
SDG&E by 17.5% (south of Path 26)
CFE by 2.5% (south of Path 26)
West-of-River by 12.5% (import south of Path 26)

These estimates are subject to change based on feedback from the study group. The feedback should be provided no later than the second meeting (August 18th) since last minute changes to the assumptions will result in failure to meet the scheduled milestones.

Other Assumptions

The Tehachapi Comprehensive Transmission Development Assessment will comply with the CAISO Grid Planning Standards which incorporate the NERC/WECC Planning Standards.

Existing or proposed special protection schemes in the Big Creek Corridor will be operational.

Comply with the CAISO guidelines on the use of Special Protection Schemes to integrated Tehachapi area generation. In particular, limit the tripping of generation to 1,150 MW for the loss of one transmission line and 1,400 MW for the loss of two transmission lines.

Major Path Flows will be modeled at reasonable and expected patterns.

For the long-term, include the generation projects identified by the CEC.

The existing Path 15 RAS and Path 26 RAS will be modeled in the studies.

Power Flow Screening Level Preliminary Assessment

To assess the performance of the CAISO Controlled Grid owned by Edison and PG&E, screening-level preliminary power flow analysis will be performed under base case and contingency conditions for both summer and spring/autumn/winter load assumptions. Contingency analysis will follow the requirements of the ISO Grid Planning Criteria.

Contingency evaluation will include selective single contingencies (e.g. loss of a transmission line, generating unit, or transformer bank) and selective multiple-contingencies (e.g. overlapping outage of two transmission lines), consistent with the ISO Grid Planning Criteria.

If the loading of a transmission component of the CAISO Controlled Grid owned by Edison is determined to exceed its thermal rating during normal or contingency conditions, Edison will identify the corrective action(s) necessary to address the reliability concern (e.g. facility addition, special protection scheme, etc.) and will provide one project alternative. There may be other alternative solutions that may not be identified in these conceptual studies which would be evaluated in the future system impact studies.

If the loading of a transmission component of the CAISO Controlled Grid owned by PG&E is determined to exceed its thermal rating during normal or contingency conditions, PG&E will identify the corrective action(s) necessary to address the reliability concern (e.g. facility addition, special protection scheme, etc.) and will provide one project alternative. There may be other alternative solutions that may not be identified in these conceptual studies which would be evaluated in the future system impact studies.

Final Report

The final report, to be filed by SCE with the CPUC, will contain all criteria, assumptions, methodologies, simulation results, conclusion, and recommendations for "master plan", and any other pertinent information necessary to comply with CPUC Order #04-06-010. A draft report will be made available for comments to the Collaborative Study Group four weeks prior to filing with the CPUC. The results and recommendations will be presented to all interested parties for discussion three weeks prior to filing with the CPUC. Final comments are due one week prior to filing with the CPUC.

Schedule of Major Milestones

The schedule of the Major Milestones of the Tehachapi Comprehensive Transmission Development Assessment is as follows:

| Ref. # | Milestone | Target Date |
|---|---|---|
| 1. | **Milestone Meeting #1** at CPUC for presentation and discussion of the Tehachapi Comprehensive Transmission Development Assessment Study Plan | 06/23/2004 |
| 2. | Written comments on Tehachapi Comprehensive Transmission Assessment Study Plan including identification of additional project alternatives are due to Edison via e-mail (jorge.chacon@sce.com) | 07/06/2004 |
| 3. | Edison posts revised Study Plan | 07/12/2004 |
| 4. | Development of preliminary conceptual transmission plans for the various transmission alternatives and identification of additional fast-track project elements using the top-down approach | 07/21/2004 to 08/11/2004 |
| 5. | **Milestone Meeting #2** at CPUC to discuss fast-track project elements, additional project alternatives (if any), and progress of the phased assessment and solicit input | 08/18/2004 |
| 6. | Written comments on project alternatives and requests for sensitivity studies due to Edison via e-mail (jorge.chacon@sce.com) | 08/25/2004 |
| 7. | Commence development of transmission phasing prioritization for each conceptual transmission plan (Edison, PG&E, CAISO, and other project alternatives) | 08/26/2004 |
| 8. | **Milestone Meeting #3** at CPUC to discuss progress of the phased assessment | 10/27/2004 |
| 9. | Written comments on progress of the phased assessment and requests for last sensitivity studies due to Edison via e-mail (jorge.chacon@sce.com) | 11/03/2004 |
| 10. | Finalize development of transmission phasing prioritization for each conceptual transmission plan (Edison, PG&E, CAISO, and other project alternatives) | 11/05/2004 |
| 11. | Commence preliminary feasibility analysis for the conceptual transmission facilities identified in finalized transmission alternative | 11/08/2005 |
| | **NOTE: Edison Files CPCN for Phase 1** | 12/09/2004 |
| | **VACATION ANYONE?** | 12/18/2004 to 01/02/2004 |
| 12. | **Milestone Meeting #4** at CPUC to discuss progress of the preliminary feasibility analysis for the conceptual transmission facilities identified in finalized transmission alternative | 01/05/2004 |
| 13. | Written comments on preliminary feasibility analysis due to Edison via e-mail (jorge.chacon@sce.com) | 01/11/2005 |
| 14. | Finalize preliminary feasibility analysis | 01/25/2004 |
| 15. | Commence draft report of complete Tehachapi Transmission Phased Development Plan | 01/26/2005 |
| 16. | Edison makes draft report of complete Tehachapi Transmission Phased Development available | 02/09/2005 |
| 17. | **Milestone Meeting #5** at CPUC for study group to present final study report of complete transmission phased development | 02/16/2005 |
| 18. | Final comments due to Edison via e-mail (jorge.chacon@sce.com) | 02/23/2005 |
| 19. | Edison files final draft report of complete Tehachapi Transmission Phase Development Plan with Commission | 03/09/2005 |

# APPENDIX 2

# Appendix 2

# Preliminary Power Flow Study Report
# PG&E Area Conceptual Transmission Plan
# Continuation of Tehachapi Collaborative Study

### 1.12. Purpose

The purpose of this continuation of the Tehachapi Collaborative Study is to formulate a plan for the transmission of 4,000MW of wind generation at Tehachapi and 500MW in the Antelope Valley to load centers in the PG&E and SCE service areas. It is assumed that half the 4,000 MW at Tehachapi will go to PG&E and half will go to SCE. The plan resulting from this study will be sufficient to initiate the preparation of Proponent's Environmental Assessments (PEAs) which would form the basis of CPCN applications for the facilities defined in the plan. The plan covers only the facilities from Tehachapi Substation 1 to the load centers and does not include the Tehachapi collector system. It is envisioned that this transmission plan will be updated in the future as each (or each group of) specific wind plant project moves through the ISO Interconnection Process and the Tehachapi collector loop beyond Tehachapi Substation 1 becomes more definitive.

### 1.13. Background

Pursuant to CPUC Decision 04-06-010, the Tehachapi Collaborative Study Group (TCSG) was formed to develop a comprehensive transmission development plan for the phased expansion of transmission capabilities in the Tehachapi area. The CPUC Staff coordinated the collaborative study group. As directed by the decision, TCSG completed a study that assumed there would be more than 4,000 MW of wind resources at Tehachapi Wind Area[4]. To conduct the study the TCGS further assumed that 50% of the 4,000 MW would be delivered to load centers in the transmission system North of Path 26 and the remaining 50% would be delivered to load centers in the system south of Path 26[5]. The Executive Director extended the original due date for filing the report by one week in a letter dated March 4, 2005. A report entitled, "Development Plan for the Phased Expansion of Transmission in the Tehachapi Wind Resource Area" (Report), was filed by Southern California Edison (SCE) on March 16, 2005.

As stated in that Report, the development plan prepared by the TCSG is a conceptual roadmap to the eventual Tehachapi transmission system rather than a definitive plan[6]. The Report recommended that further study be performed to select among the alternatives identified in the Report (and referred to herein with the same identification numbers as in the Report). These alternatives require further planning evaluation in order to formulate a single plan for implementation. To do this, additional studies (specific rather than generic) need to be performed and facility cost estimates refined. The final plan for the Tehachapi collector system requires information concerning actual wind project locations, capacities and characteristics which are not available at this time, and therefore is not covered in the study. However, since the Tehachapi collector system and actual wind projects would impact the utilities' transmission plan, it is envisioned that the

[4] Decision 04-06-010, at 6
[5] Study Plan, date July 14, 2004, at 18
[6] Tehachapi Collaborative Study Report, at 3

utilities' transmission systems would be updated in the future as each (or each group of) specific wind plant project moves through the ISO Interconnection Process and the Tehachapi collector loop beyond Tehachapi Substation 1 becomes more definitive. This flexible approach will allow the study to move forward at this time.

PG&E had investigated three alternatives in addition to the status quo (Alternative 1) to mitigate the impacts of scheduling and delivering 2,000 MW of Tehachapi generation (Alternatives 4 and 5) and two alternatives to mitigate the impact of scheduling and delivering 300 MW of Tehachapi area renewable generation (Alternatives 2 and 3) to PG&E. Alternative 3 to deliver 300 MW to PG&E was subsequently dropped because it could not provide the intended 300 MW of transfer capability. In this study PG&E performed further investigation on Alternatives 1, 2, 4 and 5. In addition, Alternative 2 was expanded to investigate the impact of scheduling and delivering 300 MW, 600 MW and 1,200 MW of Tehachapi area renewable generation.

### 1.14. Study Objective

The objective of this study is to evaluate the impact of importing 2000 MW (half of potential 4,000 MW, which is assumed to be technically available) of Tehachapi wind generation on the bulk transmission system in Northern California. This study evaluated the summer peak conditions with north-to-south transfer over Path 26 and the summer off-peak conditions with south-to-north transfer over Path 15 and Path 26.

### 1.15. Study Conclusion

The study conclusion is summarized in the following Tables 2-1 through 2-5. This study confirms the findings of the earlier study that determined: 1) the additional 2,000 MW of import at Midway, under system peak conditions with the Path 26 flow in the North to South direction, is not expected to require upgrades in the PG&E system (see Table 2-1); and 2) there is no spare transmission capacity for additional power import at Midway under system off-peak conditions with the Path 26 flow in the South to North direction (see Tables 2-2 and 2-3).

Table 2-1
2010 Summer Peak Base Case

| Descriptions | Existing Transfer | Import 2,000 MW at Midway w/o Upgrade |
|---|---|---|
| Path 66 Flow (north to south) | 4,793 | 4,503 |
| Path 15 Flow (north to south) | -29 | -1,958 |
| Path 26 Flow (north to south) | 3,394 | 1,397 |
| PDCI Flow (north to south) | 3,104 | 3,104 |
| PG&E Area Load plus Losses | 28,358 | 28,390 |
| PG&E Area Generation | 26,910 | 25,239 |
| Fresno/Yosemite Division Loads | 2,923 | 2,923 |
| Helms PSP Generation | 1,218 | 1,218 |
| Imports from Tehachapi Generation | 0 | 2,000 |
| Generation Reduction in the Bay Area | 0 | 1,700 |

Table 2-2
2010 Summer Off-Peak Base Case

| Descriptions | Existing Transfer | Import 2,000 MW at Midway w/o Upgrade |
|---|---|---|
| Path 66 Flow (south to north) | 3,666 | 3,614 |
| Path 15 Flow (south to north) | 4,999 | 7,005 |
| Path 26 Flow (south to north) | 1,624 | 3,752 |
| PDCI Flow (south to north) | 1,845 | 1,845 |
| PG&E Area Load plus Losses | 13,430 | 13,620 |
| PG&E Area Generation | 15,478 | 13,487 |
| Fresno/Yosemite Division Loads | 1,409 | 1,409 |
| Helms PSP Generation* | -600 | -600 |
| Imports from Tehachapi Generation | 0 | 2,000 |
| Gen Reduction in Bay Area | 0 | 2,000 |

* Note: Positive values denote operation in the generating mode. Negative values denote operations in the pumping mode

Table 2-3
2010 Summer Off-peak Base Case without Contingency

| Transmission Facilities | SN Rating | Existing Transfer | | Import 2,000 MW at Midway w/o Upgrade | |
|---|---|---|---|---|---|
| | (Amps) | (Amps) | (%) | (Amps) | (%) |
| Gates - Midway #1 500 kV line | 2230 | 2088 | 93.6 | 3299 | ***147.9*** |
| Los Banos - Midway 500 kV line | 2230 | 1805 | 80.9 | 2814 | ***126.2*** |
| Los Banos - Gates #1 500kV line | 2230 | 1605 | 72 | 2466 | ***110.6*** |
| Los Banos - Gates #3 500kV line | 4332 | 800 | 18.5 | 1216 | 28.1 |
| Gates - Panoche #1 230kV line | 742 | 491 | 66.1 | 765 | ***103.1*** |
| Gates - Panoche #2 230kV line | 742 | 491 | 66.1 | 765 | ***103.1*** |
| McCall - Henrietta tap2 230kV line | 825 | 781 | 94.6 | 941 | ***114.1*** |
| Gates - Henrietta tap1 230kV line | 1600 | 1376 | 86 | 1642 | ***102.6*** |
| Gates - Midway 230kV line | 742 | 617 | 83.2 | 826 | ***111.3*** |
| Los Banos - Westley 230 kV line | 1484 | 783 | 52.7 | 1296 | 87.3 |

Note: Potential problems in the 115 kV and 69 kV systems are not included.

Since Path 15 does not have spare capacity for transporting additional generation from Midway to the Bay Area under certain off-peak conditions, this study evaluated several alternatives and explored potential phasing development for importing 2,000 MW of Tehachapi wind generation into PG&E. The results are summarized in Tables 2-4 and 2-5 below:

Table 2-4
Study Conclusions for PG&E Alternative 2 (Figure A2.1)

| Import Level | Plan "A" (100% at Switching Station #1) | Plan "B" (50% at Switching Station #1 and 50% at Switching Station #2) |
|---|---|---|
| 300 MW | Build Switching Station #1 with a 300 MVA phase shifter<br>**Other Reinforcement in PG&E Area:**<br>• Upgrade Borden-Gregg 230kV line (peak). | N/A |
| 600 MW | Same as 300MW import level, except, with one 600MVA phase shifter and building a new 230kV line between Switching Station #1 and Gregg.<br>**Other Reinforcement in PG&E Area:**<br>• Upgrade Borden-Gregg 230 kV line (peak)<br>• Upgrade Storey 1 – Gregg 230kV line (peak) | Build Switching Station #1 and #2 with a 300 MVA phase shifter at each station.<br>**Other Reinforcement in PG&E Area:**<br>• Upgrade Hass-McCall and Balch-McCall 230 kV lines (peak & off-peak)<br>• Upgrade Borden-Gregg 230kV line (peak) |
| 1200MW (Peak) | Not feasible (Due to the maximum phase angle range of +/-45 degree) | Not feasible (Due to the maximum phase angle range of +/-45 degree) |
| 1200MW (Off-peak) | Same as 600 MW import level, except, with two 600MVA phase shifters.<br>**Other Reinforcement in PG&E Area:**<br>• Install 450 MVAR of voltage support.<br>• Restrict the import level to Helms operation at 600 MW or more of pumping. | Same as 600 MW import level, except, with a 600 MVA phase shifter at each station.<br>**Other Reinforcement in PG&E Area:**<br>• Upgrade Hass-McCall and Balch-McCall 230 kV lines.<br>• Restrict the import level to Helms operation at 600 MW or more of pumping. |

Table 2-5
Study Conclusion for PG&E Alternatives 1, 4 and 5

| Import Level | PG&E Alternative 1 | PG&E Alternative 4 (Figure A2.2) | PG&E Alternative 5 (Figure A2.3) |
|---|---|---|---|
| **500MW** | Network upgrade not determined (see discussion above) | **Phase 4A**:<br>Build a new Los Banos-Midway 500kV line operated at 230kV.<br>**Other Reinforcements in PG&E Area:**<br>None | **Phase 5A:**<br>Build a new Gregg-Midway 500kV line operated at 230kV.<br>**Other Reinforcements in PG&E Area:**<br>None |
| **1100MW** | **Network upgrade not determined** (see discussion above) | **Phase 4B:**<br>Same as 4A, except, re-connecting the new line to 500kV and installing 65% series compensation.<br><br>**Other Reinforcements in PG&E Area:**<br>Upgrade Los Banos – Westley 230 kV line and Los Banos 500/230 kV bank | **Phase 5B:**<br>Same as 5A, except, building Gregg 500kV Substation with a 500/230kV, 1122/1350 MVA bank and re-connecting the new line.<br>**Other Reinforcements in PG&E Area:**<br>None |
| **2000MW** | **Network upgrade not determined** (see discussion above) | **Phase 4C:**<br>Same as 4B, except, also building Tesla – Los Banos 500 kV line. This Phase would increase the OTC from 5000 MW to 7000 MW. However, it may ***not*** be feasible to increase Path 15 Rating to 7,400 MW from the existing Rating of 5,400 MW[7]<br>**Other Reinforcements in PG&E Area:**<br>Install additional RAS | **Phase 5C:**<br>Same as 5C, except, installing series comp on Gregg -Midway line (31%), and Tesla-Gregg line (62%).<br><br>**Other Reinforcements in PG&E Area:**<br>None |

[7] The Path 15 south-to-north flow was modeled at the Operating Transfer Capability (OTC) limit of 5000 MW in the pre project base case. This alternative would be able to import additional 2000 MW of generation at Midway by tripping 4319 MW of generation/pumps/load using the Remedial Action Scheme (RAS) for the simultaneous loss of Los Banos-Midway 500 kV and the new Los Banos-Midway 500 kV line in Phases 4A and 4B). The additional import would result in the Path 15 south-to-north flow at 7000 MW. However, unlike the findings in the previous study, this alternative would not be able to increase the Path 15 south-to-north Path Rating from 5400 MW to 7400 MW without increases in load shedding via RAS. Such increases may not be acceptable.

### 1.16. PG&E Area Transmission Alternatives

This study evaluated the following four transmission alternatives:

**(1) PG&E Alternative 1 (Status Quo):**

This Alternative investigates the possibility of installing no or minimum transmission upgrade and instead accommodating 2,000 MW of Tehachapi wind generation through curtailment of generation under normal conditions. Power flow study to date shows overloads, ranging from 3% to 48% over the ratings (or allowable limit) of eight transmission facilities under normal (all facilities in service) operating conditions (see Table 2-3). As a result, this alternative would expand the times and conditions under which curtailment of generation would be required. It could also require installation of Remedial Action Schemes (RAS) to trip additional generation immediately after a disturbance and/or reduction in existing Path 15 transfer capability.

If existing generation in areas around Midway Substation is curtailed to allow transfer of Tehachapi power, Path 15 south to north transfer capability will have to be reduced. This is because the existing Path 15 south-to-north transfer capability under normal conditions can only be supported with operation of the Remedial Action Scheme (RAS) immediately following identified outages. If Midway area generation that is connected to the existing RAS were dispatched off-line or kept at minimum generating levels (assuming that the FERC open access rules were somehow satisfied), there would be no effective way of reducing power flow on Path 15 immediately following a double line outage and before the operator can intervene. As a result, Path 15 would have to be operated under normal conditions at a reduced level. Study shows that curtailing all Midway area generation that can be curtailed (about 2,600 MW) would reduce Path 15 south to north transfer capability from 5,000 MW to about 3,600 MW. This would enable Path 26 to load to about 2,700 MW.

Connecting Tehachapi generation to the RAS to support Path 15 is neither effective nor is it practical even assuming installation of a new type of RAS controller and other equipment so it can predict the amount of wind generation available to trip if the outage occurs. For wind turbines to be part of generation RAS to replace the Midway generation RAS, the new RAS controller would need to also arm those generators that are on-line to provide regulation for the Tehachapi wind generation to the extent they are connected to systems south of Midway. It is also less effective because of the system configuration, a larger amount of generation from Tehachapi generators and these “regulating” generators will need to be tripped to provide the same relief on Path 15. This will in turn require tripping a higher amount of load commensurate with the increased amount of generation tripped to keep the net amount of net generation to be tripped within the allowable limit. Such a RAS would also increase by many folds the complexity of the existing Path 15 RAS and increase the probability of RAS misoperation.

In addition, Compliance with FERC Open Access rules, and agreement from the CAISO, approval from WECC, among other requirements would also be needed.

**(2) PG&E Alternative 2 (Figure A2.1):**

PG&E Alternative 2 is to establish a new 230 kV connection between PG&E and SCE by constructing a switching station at the crossing of PG&E-owned and SCE-owned transmission lines and installing a phase-shifting transformer to "push" power from SCE's Big Creek corridor into the PG&E system. This study investigated impacts on the PG&E system, and the possible mitigation measures for the connection. This study evaluated "pushing" 300 MW, 600 MW, and 1,200 MW by the following two Plans:

Plan A (PG&E_Alt-2A):

Establish one 230 kV tie between PG&E and SCE. Build Switching Station #1 at the crossing of PG&E's Helms – Gregg 230 kV lines and SCE's Big Creek – Rector 230 kV lines. Install one phase shifter or power flow controller to control the tie line flow.

Plan B (PG&E_Alt-2B):

Same as Plan "A", except, also building Switching Station #2 at the crossing of PG&E's Haas-McCall and Balch-McCall 230 kV lines and SCE's Big Creek – Rector 230 kV lines. Install a phase shifter or power flow controller at both switching stations to control the tie line flow.

**(3) PG&E Alternative 4 (Figure A2.2):**

PG&E Alternative 4 is to build a new Tesla – Los Banos 500 kV line and a new Los Banos – Midway 500 kV line. This alternative could be implemented in the following three phases:

Phase A (PG&E_Alt-4A):

Build a new Los Banos – Midway 500kV line operated at 230 kV.

Phase B (PG&E_Alt-4B):

Same as 4A, except, re-connecting the new Los Banos – Midway line to 500kV bus and installing 65% series compensation.

Phase C (PG&E_Alt-4C):

Same as 4B, except, also building a new Tesla - Los Banos 500kV line without series compensation.

**(4) PG&E Alternative 5 (Figure A2.3):**

PG&E Alternative 5 is to build a new Tesla – Gregg 500 kV line and a new Gregg – Midway 500 kV line. This alternative could be implemented in the following three phases:

Phase A (PG&E_Alt-5A):

Build a new Gregg - Midway 500kV line operated at 230 kV.

Phase B (PG&E_Alt-5B):

Same as 5A, except, also building a Gregg 500 kV Substation with a 500/230 kV transformer bank and re-connecting the new Gregg - Midway 500kV line.

Phase C (PG&E_Alt-5C):

Same as 5B, except, also building a new Tesla - Gregg 500kV line with 62% series compensation and installing 31% series compensation on the Gregg – Midway 500 kV line.

### 1.17. Power Flow Base Case Assumptions

Post-transient power flow studies for 500 kV system were based on the 2010 summer peak and 2010 summer off-peak WECC full loop system base cases developed for PG&E's 2005 Electric Transmission Grid Expansion Plan Study (a05sum2010.sav and a05sumopk2010.sav). The summer peak system base cases model 1-in-5 year load forecasts for the Northern California Area.

Contingency power flow studies for 230, 115 and 70 kV system were based on the 2010 summer peak and 2010 summer off-peak area base cases (a05sum2010_pge_a6.sav, and a05sumopk2010_pge.sav). The summer peak area base cases model 1-in-10 year load forecasts for Area 6 that includes the Yosemite, Fresno and Kern Divisions.

Since this study is to evaluate the impact of importing 2000 MW (half of potential 4,000 MW) of Tehachapi wind generation on the bulk transmission system in Northern California, only the PG&E portion of the Tehachapi wind generation (up to 2000 MW) was modeled on line and scheduled to PG&E at Midway and SCE portion of the Tehachapi wind generation was modeled off line in the study base cases. This would not impact the results of studies on system performance north of Midway since SCE's portion, which, if on line, would be scheduled to SCE would therefore not flow to PG&E.

These study base cases were reviewed and approved by CAISO and other stakeholders. Table 2-6 summarized the PG&E area loads, generation, and the major path flow assumptions modeled in the 2010 summer peak and 2010 summer off-peak system base cases. The study assumptions used for this study differs somewhat from that used in PG&E's 2005 Electric Transmission Grid Expansion Plan studies because the assumptions developed in the Grid Expansion Plan studies are meant to be starting cases, from which modifications would be made to simulate case-specific system conditions. These system conditions are indicated in Table 2-6 below.

Table 2-6
Area Loads/Generation and Major Path Flow

| | Descriptions | Summer Peak System Base Case | Summer Off-peak System Base Case |
|---|---|---|---|
| 1 | Path 66 Flow (north_to_south) | 4800 | -3670 |
| 2 | Path 15 flow (north_to_south) | <500 | -5000 |
| 3 | Path 26flow (north_to_south) | 3400 | -1625 |
| 4 | PDCI flow (north_to_south) | 3100 | -1848 |
| 5 | PG&E Area Loads plus Losses | 28441 | 13402 |
| 6 | PG&E Area Generation | 26294 | 14453 |
| 7 | Fresno/Yosemite Division Loads | 2923 | 1409 |
| 8 | Helms Generation | 1200[8] | -900[9] |

* Note: Positive values denote operation in the generating mode. Negative values denote operations in the pumping mode

### 1.18. Power Flow Studies for Pre-Transmission Project Conditions

Power flow studies were conducted to evaluate the potential thermal violations before the transmission alternatives for importing Tehachapi wind generation. The power flow studies were based on the 2010 summer peak area base case modeling the three Helms units on line at 1200 MW of generation, and the 2010 summer off-peak area base case modeling the three Helms units off-line. It is important to note that PG&E's 2005 Electric Transmission Grid Expansion Plan studies only model 930 MW of Helms generation in the 2010 summer peak area base case. Therefore, this study shows additional thermal overloaded facilities that were not identified in the Expansion Plan studies. The study results were summarized in Table A3-3 of Attachment 3 for summer peak conditions and in Table A4-2 of Attachment 4 for summer off-peak conditions. The study results show emergency overloads on the following facilities:

[8] The Helms generation may be outside the current Fresno Area Generation Nomogram. See CAISO Operating Procedure T-129. Helms generation was modeled at 930 MW in PG&E's 2005 Electric Transmission Grid Expansion Plan studies base case for Fresno area.

[9] In order to simulate a reasonably stressed summer off-peak conditions, Helms units were modeled off line for PG&E_Alt-2 analyses, on-line at -600MW of pumping for PG&E_Alt-4 analyses, and on-line at -900MW of pumping for PG&E_Alt-5 analyses.

**(1) 2010 Summer Peak Conditions[10]**

- Herndon 230/115kV Bank-1 and Bank-2.
- Atwater Jct-Cressey Jct 115kV line
- Herndon - Woodward 115kV line
- Merced-Atwater Jct 115kV line
- Wilson A-Merced 115kV line
- Wilson B-Merced 115kV line

### 1.2.1. 2010 Summer Off-peak Conditions

- Helm-McCall 230kV line
- Henrietta-GWF_HEP 115kV line
- Henrietta-McCall 230kV line

## 1.19. Power Flow Studies Results for PG&E Alternative 2

Power flow studies for PG&E Alternative 2 were based on the 2010 summer peak base case modeling three Helms units on-line with a total of 1200 MW generation and the 2010 summer off-peak base case modeling three Helms units off-line.

**(1) 2010 Summer Peak Conditions with Helms at 1200 MW of Generation**

The power flow study results for 2010 summer peak conditions were summarized in Attachment 3.

(1.1) Import 300 MW with Plan "A"

This alternative would build the Switching Station #1 and import 300 MW of generation. The study results show that the Borden – Gregg 230 kV line could load up to 108.8% of summer normal rating of 675 amperes under the summer peak conditions studied. (See Table A3-1, Attachment 3.) The import would not cause emergency overload for "B" or "C" contingencies studied. The following transmission facilities would need upgrading:

- Borden – Gregg 230 kV line

(1.2) Import 600 MW with Plan "A"

This alternative would build the Switching Station #1 and import 600 MW of generation. The existing Helms – Gregg #1 and #2 230 kV lines do not have spare capacity for importing additional 600 MW under summer peak conditions with three Helms units on

[10] Most of the emergency overloads were due to Helms generation operated outside Fresno Area Generation Nomogram.

line at 1200 MW of generation. This study assumes that this alternative would also build an additional 230 kV line between the proposed Switching Station #1 and Gregg Substation.

The study results show that the Borden – Gregg 230 kV line could load up to 127.7% of summer normal rating of 675 amperes. (See Table A3-1, Attachment 3.) In addition, the import could also cause emergency overload on the Storey 1 – Gregg 230 kV line for loss of the Wilson – Storey 2 – Borden 230 kV line with Melones #1 offline (Category "B" contingency; G-1/L-1). (See Case F-B213, Table A3-3, Attachment 3.) The following transmission facilities would need upgrading:

- Borden – Gregg 230 kV line, and
- Storey 1 – Gregg 230 kV line.

The following transmission facilities would be needed:

- A new 230 kV line between Switching Station #1 and Gregg,

(1.3) Import 600 MW with Plan "B"

This alternative would build both Switching Station #1 and #2, and import 300 MW of generation at each stations (total 600 MW). The study results show that the import could cause normal overload on the Borden – Gregg 230 kV line. In addition, the import could also cause normal overloads on the Haas – McCall and Balch – McCall 230 kV lines between the proposed Switching Station #2 and Mc Call Substation while the hydro power houses on Kings River were dispatched at the maximum generation of 520 MW. (See Table A3-1 and 2, Attachment 3.) The following transmission facilities would need upgrading:

- Borden – Gregg 230 kV line, and
- Haas – McCall and Balch – McCall 230 kV lines between Switching Station #2 and McCall Substation.

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(1.4) Import 1200 MW with Plan "A" or "B"

The power transfer capability of a phase shifter is determined by the MVA rating and the maximum phase angle range. This study assumes the maximum phase angle range of +/- 45 degree, which is the same as most phase-shifters in the WECC system. The study results show that, due to the phase angle limitation, this Alternative would only be able to transfer 600 MW from SCE's Big Creek system to PG&E's Fresno area under the summer peak conditions with all three Helms units dispatched online at 1200 MW of generation.

### 1.2.1. Summer Off-peak Conditions with Helms off line

The power flow study results for 2010 summer off-peak conditions were summarized in Attachment 4.

(2.1) Import 600 MW with Plan "A" or "B"

The study results show that the existing transmission system has adequate capacity for importing 600 MW of generation with either Plan "A" or "B" under 2010 summer off-peak conditions studied. The import would not cause normal or emergency overloads. (See Attachment 4.)

(2.2) Import 1200 MW with Plan "A"

This alternative would build the Switching Station #1 and import 1200 MW of generation. The power flow studies results show that the voltage at Switching Station #1 230 kV bus could be as low as 217.8 kV (0.947 pu) under the 2010 summer off-peak conditions with all facilities in service. The study results also show that the Big Creek/Fresno area could experience voltage collapse following a Midway north 500 kV double-line outage[11]. This alternative would need a 150 MVAR of shunt capacitor bank at Switching Station #1 to improve steady state bus voltage and another 300 MVAR of switchable shunt capacitors to avoid voltage collapse following a Midway north 500 kV double-line outage.

The study results show that the import could cause normal overload on the Cottle B – Warnerville 230 kV line under summer off-peak conditions studied. (See Table A4-1, Attachment 4.) The import could also cause emergency overloads on the following lines (see Table A4-2, Attachment 4):

- Borden – Gregg 230kV line,
- Storey 2 – Borden 230 kV line,
- Storey 1 – Gregg 230 kV line, and
- Wilson – Storey 1 230 kV line. .

The study results also show that the Gates – Midway 500 kV line could load up to 3598 amperes (101.2% of 30-minute emergency rating of 3556A) following the Los Banos – Midway 500 kV single line outage. (See Case OPK-B3, Table A4-3, Attachment 4.) The Los Banos – Westley 230 kV line could also load up to 2276 amperes (113.8% of emergency rating of 2000A) for the Los Banos north 500 kV double-line outage[12]. (See Case OPK-C1, Table A4-4, Attachment 4.)

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[11] Simultaneous loss of Midway – Gates 500 kV line and Midway – Los Banos 500 kV line
[12] Simultaneous loss of Tesla – Los Banos 500 kV line and Tracy – Los Banos 500 kV line

There is an operational solution for the above described normal and emergency overloads. The study results show that the import of 1200 MW would not cause normal or emergency overloads if two of the three Helms units were dispatched on line with 600 MW of pumping during summer off-peak conditions studied. The study results show the following facilities would still be needed for voltage support:

- 450 MVAR of 230 kV shunt capacitor banks.

(2.3) Import 1200 MW with Plan "B"

This alternative would build both Switching Station #1 and #2, and import 600 MW of generation at each stations (total 1200 MW). The study results show that the import could cause normal overload on the Haas – McCall and Balch – McCall 230 kV lines between the Switching Station #2 and McCall Substation under summer off-peak conditions. (See Table A4-1, Attachment 4.)

The study results also show emergency overload on the Cattle B – Warnerville 230 kV line for the Pacific DC Intertie bipolar outage (Category "B" contingency). (See Case OPK-B5, Table A4-3, Attachment 4.) The Los Banos – Westley 230 kV lines could also experience emergency overload for the Los Banos north 500 kV double-line outage with 3360 MW of RAS (Category "C" contingency). (See Case OPK-C1, Table A4-4, Attachment 4.)

The study results also show that the import would not cause the emergency overloads if two of the three Helms units were dispatched on line with 600 MW of pumping during summer off-peak conditions studied. The following transmission facilities would still need upgrading:

- Haas – McCall and Balch – McCall 230 kV lines between Switching Station #2 and McCall Substation.

### 1.20. Power Flow Studies Results for PG&E Alternative 4

The power flow studies were based on the 2010 summer off-peak base case modeling two Helms units on line with a total of 600 MW pumping. The preliminary power flow study results for PG&E Alternative 4 are summarized in Attachment 5. The study results show that this alternative would have adverse impact on Helms pumping operation. This alternative would increase loading on the Gates – Gregg and Gates – McCall 230 kV lines that would results in emergency overloads following a PDCI bipolar outage (Category "B" contingency). See Case B7, Table A5-2, Attachment 5.

**(1) Phase A (PG&E_Alt-4A): Import 500 MW**

Phase A is to build a new Los Banos – Midway 500 kV line operated at 230 kV. This alternative would increase the existing Path 15 south-to-north transfer capability by about 500 MW. The most limiting facility is the Gates – Midway 500 kV line for the Los

Banos – Midway 500 kV single line outage (Category "B" contingency). (See Case B3, Table A5-2, Attachment 5.)

### 1.2.1. Phase B (PG&E_Alt-4B): Import 1100 MW

Phase B is same as Phase A, except, re-connecting the new Los Banos – Midway line to the 500 kV buses and operate at 500 kV and installing 65% of series compensation on the new 500 kV line. This alternative would increase the existing Path 15 south-to-north transfer capability by about 1100 MW.

The study results show that the Los Banos – Westley 230 kV line could load up to 105.3% of its short-term emergency rating of 2000 amperes and the Los Banos 500/230 kV transformer bank could also load up to 102.2% of its 1-hour emergency rating of 1050 MVA after loss of Tesla – Los Banos and Tracy – Los Banos 500 kV lines with 3369 MW of RAS under the 2010 summer off-peak conditions studied. (See Case C1, Table A5-3, Attachment 5.)

The Gates – Henrietta section of the Gates – Gregg 230 kV line could also load up to 101.5% of its emergency rating of 1600 amperes after the PDCI bipolar outage. Helms pumping operation could be decreased to relieve the emergency overload. (See Case B7 in Table A5-2, Attachment 5.) The following transmission facilities would need upgrading:

- Los Banos – Westley 230 kV line
- Los Banos 500/230 kV transformer bank

### 1.2.2. Phase C (PG&E_Alt-4C): Import 2000 MW

Phase C is same as Phase B, except, also building a new Tesla – Los Banos 500 kV line without series compensation. This alternative would increase the existing Path 15 south-to-north transfer capability by 2000 MW up to about 7000 MW. The study results show that the Gates – Midway 500 kV line could load up to 98.7% of its short-term emergency rating of 3556 amperes after loss of the existing Los Banos – Midway #1 500 kV line and the new Los Banos – Midway #2 500 kV line (Category "C" contingency) with 4319 MW of load and resources tripped through Remedial Action Scheme (RAS) under the 2010 summer off-peak conditions studied. The RAS includes 2578 MW of generation at Midway, 691 MW of pumps and 1050 MW of loads. (See Case C3 in Table A5-3, Attachment 5.) The following reinforcements would be needed:

- Install additional RAS.

The Gates – Henrietta section of the Gates – Gregg 230 kV line could also load up to 102.2% of its emergency rating of 1600 amperes after the PDCI bipolar outage (Category "B" contingency). Helms pumping operation could be decreased to relieve the emergency overload. (See Case B7 in Table A5-2, Attachment 5.)

### 1.21. Power Flow Studies Results for PG&E Alternative 5

The power flow studies were based on the 2010 summer off-peak base case modeling three Helms units on line with a total of 900 MW pumping. Attachment 6 summarizes the study results. This alternative would increase the Fresno area import capability and improve Helms pumping operation.

**(1) Phase A (PG&E_Alt-5A): Import 500 MW**

Phase A is to build a new Gregg – Midway 500 kV line operated at 230 kV. This alternative would increase the existing Path 15 south-to-north transfer capability by about 500 MW. The most limiting facility is the Gates – Midway 500 kV line for the Los Banos – Midway 500 kV single line contingency (Category "B" contingency). (See Case B3, Table A6-2, Attachment 6.)

#### 1.2.1. Phase B (PG&E_Alt-5B): Import 1100 MW

Phase B is same as Phase A, except, also building a new Gregg 500 kV Substation with a 500/230 kV 1122 MVA transformer bank and re-connecting the new Gregg - Midway 500kV line to the 500 kV buses to operate at 500 kV. This alternative would increase the existing Path 15 south-to-north transfer capability by about 1100 MW. The most limiting facility is the Gregg 500/230 kV transformer bank that could load up to 99.2% of its normal rating of 1122 MVA. (See Table A6-1, Attachment 6.) Gregg 500/230 kV transformer bank would also load up to 102.5% of its emergency rating of 1260 MVA for the Gates – Midway 500 kV single line outage (Category "B" contingency). The Gregg 500/230 kV transformer bank would need the normal and emergency ratings of at least 1122 and 1350 MVA, respectively.

In addition, the Panoche – Kearney, Warnerville – Wilson, and Gates – Gregg 230 kV lines would also load above their respective emergency ratings for loss of the new Gregg – Midway 500 kV line (Category "B" contingency). (See Cases B6 at Table A6-2, Attachment 6.) Helms pumping operation could be decreased to relieve the emergency overload.

#### 1.2.2. Phase C (PG&E_Alt-5C): Import 2000 MW

Phase C is same as Phase B, except, also building a new Tesla - Gregg 500kV line with 62% series compensation and installing 31% series compensation on the Gregg – Midway 500 kV line. This alternative would increase the existing Path 15 south-to-north transfer capability by about 2000 MW. The most limiting facility is the Gregg 500/230 kV transformer bank that could load up to 106.4% of its emergency rating of 1260 MVA for the Tesla – Gregg 500 kV single line outage (Category "B" contingency). (See Case B5, Table A6-2, Attachment 6.) The Gregg 500/230 kV transformer bank would need to have a normal rating of 1122 MVA and a summer emergency rating of at least 1350 MVA.

### 1.22. Future Studies

Additional sensitivity studies of Helms units off line need to be conducted for PG&E Alternative 4 and 5. The sensitivity studies may discover additional restrictions on the import capability for each phase of the Alternative 4 and 5.

Transient stability studies and post-transient voltage studies also need to be conducted for PG&E alternatives 1, 2, 4 and 5.

### 1.23. Attachment list

1. Contingency List
2. One-line Diagrams
3. 2010 Summer Peak Power Flow Study Results for PG&E Alternative 2
4. 2010 Summer Off-peak Power Flow Study Results for PG&E Alternative 2
5. Preliminary Power Flow Study Results for PG&E Alternative 4
6. Preliminary Power Flow Study Results for PG&E Alternative 5

## Attachment 1
## Contingency List

### 1.24. 500 kV Contingencies

The following "B" contingencies for 500kV lines were studied:

- Tesla – Los Banos 500 kV line outage,
- Los Banos – Midway 500 kV line outage,
- Los Banos – Gates #3 500 kV line outage,
- Gates – Midway 500 kV line outage,
- PDCI Bi-pole Outage.

The following "C" contingencies for 500 kV lines were studied:

- Tesla – Los Banos and Tracy – Los Banos 500 kV double line outage (Los Banos north),
- Los Banos – Midway and Los Banos – Gates #3 500 kV double line outage (Los Banos south),
- Los Banos – Midway and Gates – Midway 500 kV double line outage (Midway north),
- Two Palo Verde generation units outage,
- Two Diablo Canyon generation units outage.

### 1.25. 230, 115 and 70 kV Contingencies:

Additional "B" and "C" contingencies for 230, 115 and 70 kV system in the Fresno/Yosemite area were also run. Attachment 3 lists the contingencies.

Attachment 2

Figure A2.1 - PG&E Alternative 2: Fresno 230 kV Tie

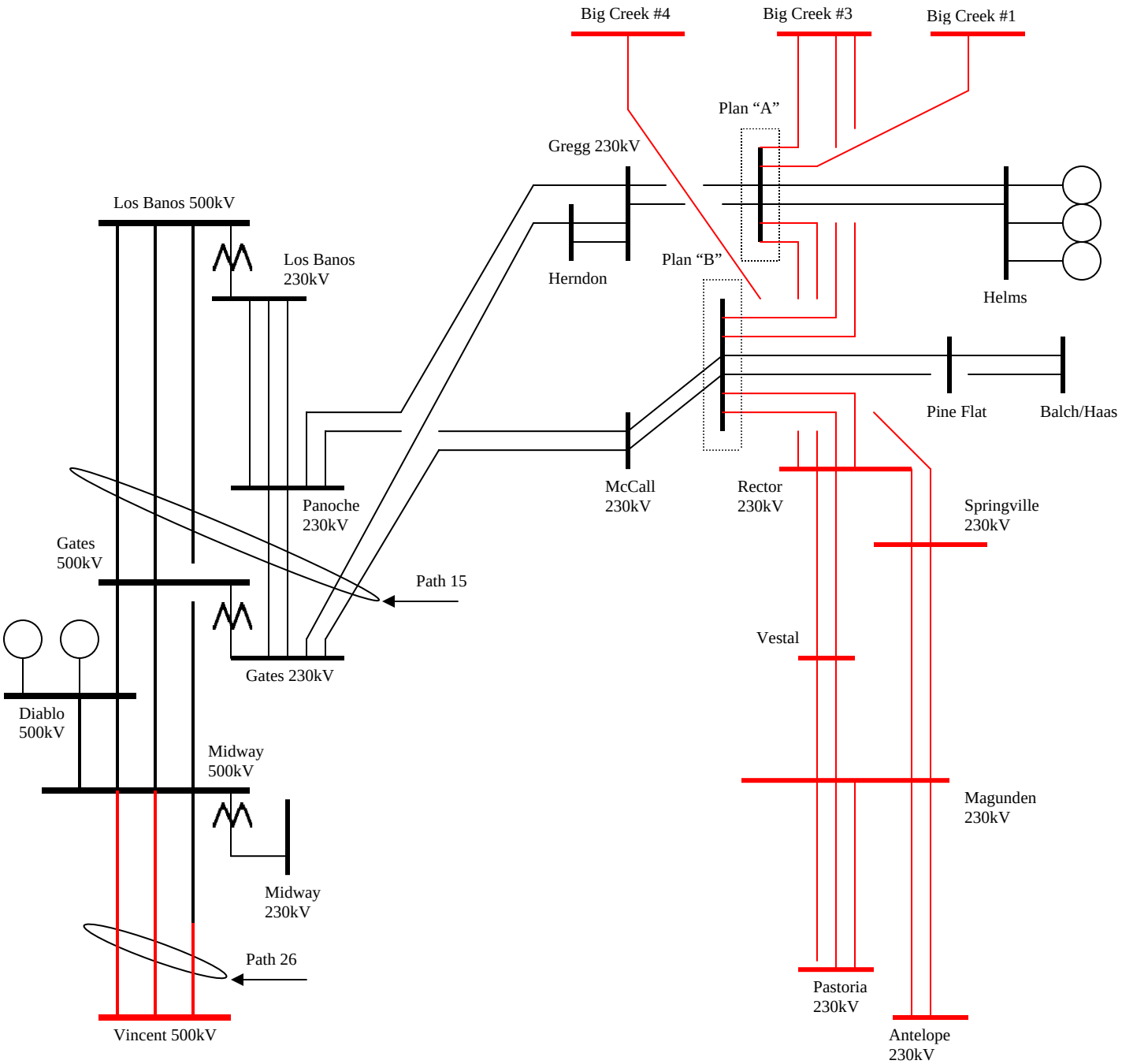


Figure A2.2 - PG&E Alternative 4: Tesla – Los Banos – Midway 500 kV line

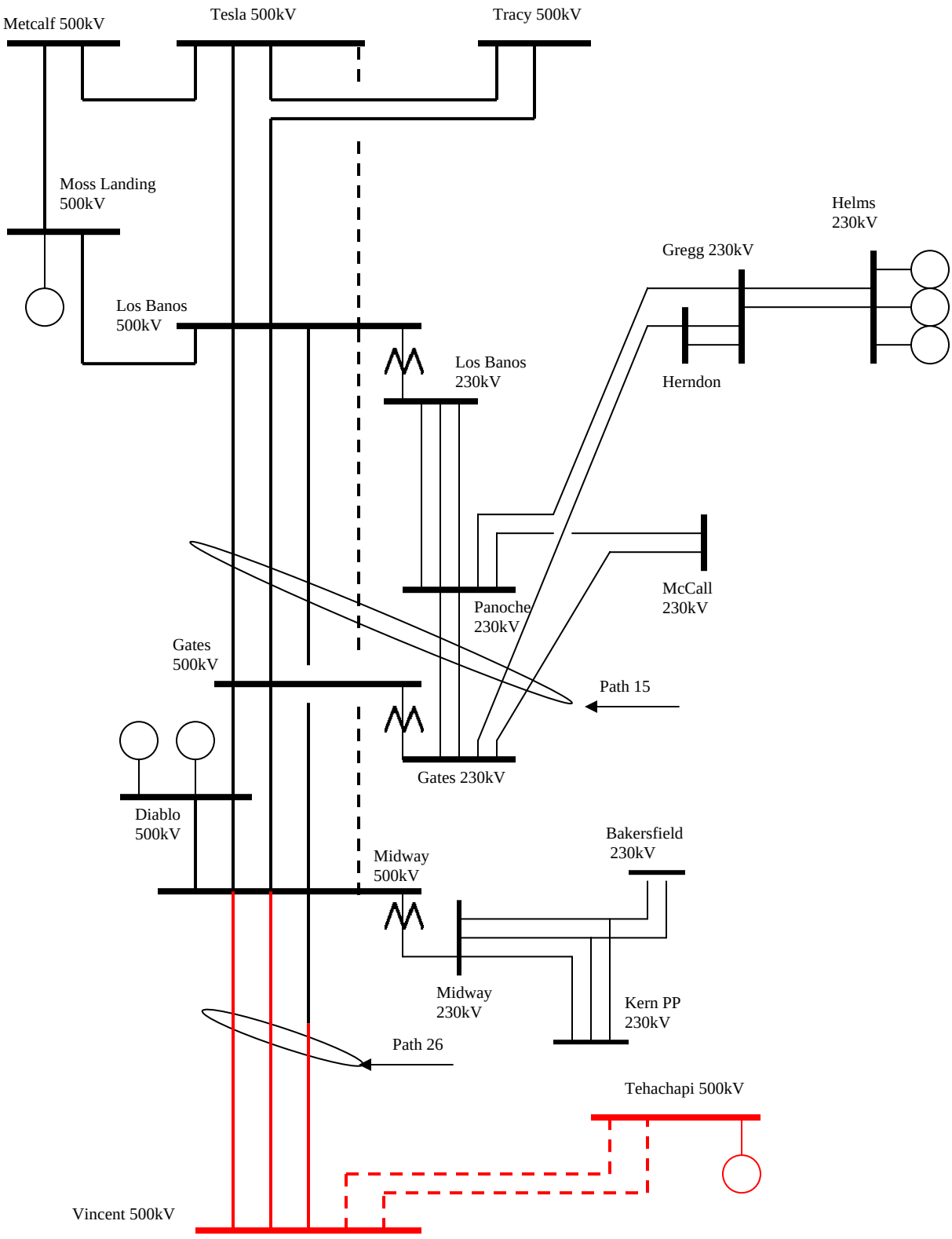
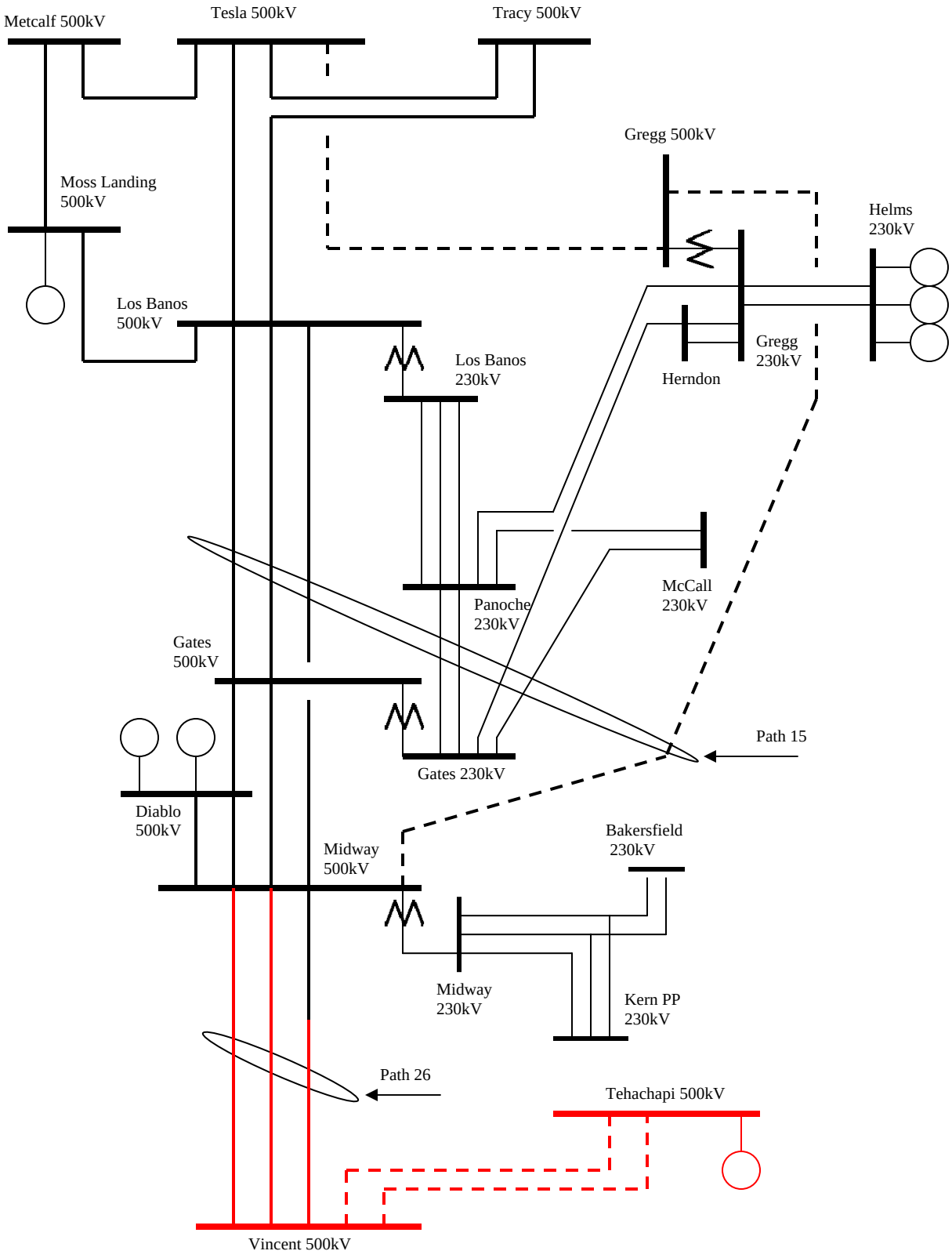


Figure A2.3 - PG&E Alternative 5: Tesla – Gregg – Midway 500 kV line



**Attachment 3**
**Preliminary Power Flow Study Results for PG&E Alternative 2**
**(2010 Summer Peak conditions with Helms Generation = 1200 MW)**

Table A3-1
Steady State Power Flow Study Results for PG&E Alternative 2
(2010 Summer Peak Conditions with Helms Generation = 1200 MW)

| | Transmission Facilities | | Base (sumpk_alt2.sav) | | Alt 2A (pk_3g2a-300.sav) | | Alt 2A (pk_alt2a-600.sav) | | Alt 2B (pk_3g2b-600.sav) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | SN Rating | Import = 0 MW | | Import = 300 MW | | Import=600MW | | Import = 600 MW | |
| | | (Amps) | (Amps) | (%) | (Amps) | (%) | (Amps) | (%) | (Amps) | (%) |
| 1 | GREGG-PGE_1_W #1 230KV LINE | 1907.8 | 1502.4 | 78.8% | 1879 | 98.5% | 1512 | 79.3% | 1889 | 99.0% |
| 2 | GREGG-PGE_1_W-1 #2 230KV LINE | 1907.8 | 1502.4 | 78.8% | 1879 | 98.5% | 1512 | 79.3% | 1889 | 99.0% |
| 3 | GREGG-PGE_1_W #3 230KV LINE (1) | 1907.8 | n/a | n/a | n/a | n/a | 1512 | 79.3% | n/a | n/a |
| 4 | BORDEN - GREGG 230KV LINE | 675.2 | 558.1 | 82.7% | 734 | **108.8%** | 862 | **127.7%** | 779 | **115.4%** |
| 5 | STOREY 1 - GREGG 230KV LINE | 675.2 | 302.3 | 44.8% | n/a | <95% | 673 | 99.6% | n/a | <95% |
| 8 | HERNDON - CHLDHOSP 115KV LINE | 823.4 | 692.0 | 84.0% | n/a | <95% | n/a | <95% | n/a | <95% |
| 9 | WOODWARD - CHLDHOSP 115KV LINE | 823.4 | 673.8 | 81.8% | n/a | <95% | n/a | <95% | n/a | <95% |
| 10 | MC CALL-PGE_2_W #1 230KV LINE | 753.1 | 378.7 | 50.3% | n/a | <95% | n/a | <95% | 740 | 98.2% |
| 11 | MC CALL-PGE_2_W #2 230KV LINE | 753.1 | 378.7 | 50.3% | n/a | <95% | n/a | <95% | 740 | 98.2% |

(1) A new Gregg – PGE_1_W #3 230 kV line was modeled in the base case to avoid an 18.7% normal overload for Alt. 2A importing 600MW.
(2) This study assumes +/-45 degree is the maximum phase angle range for the phase shifters installed at the Fresno Switching Station that would be able to import about 600 MW from SCE to PG&E under summer peak conditions studied.

Table A3-2
Steady State Power Flow Study Results for PG&E Alternative 2
Sensitivity Study for Kings River Generation at Pmax = 520 MW
(2010 Summer Peak Conditions with Helms Generation = 1200 MW)

| | Transmission Facilities | SN Rating | Base (pk_3g2b-0_kings.sav) | | Alt 2B (pk_3g2b-600_kings.sav) | |
|---|---|---|---|---|---|---|
| | | | Import = 0 MW | | Import = 600 MW | |
| | MC CALL - PGE_2_W #1 230KV LINE | 753 | 540 | 71.6% | 913 | **121.2%** |
| | MC CALL - PGE_2_W #2 230KV LINE | 753 | 540 | 71.6% | 913 | **121.2%** |

Table A3-3
230 and 115 kV Contingencies for PG&E Alternative 2
(2010 Summer Peak Conditions with Helms Generation = 1200 MW)

| Case # | Overloaded Transmission Facilities | Worst "B" and "C" Contingency | SE Rating | Base (sumpk_alt 2.sav) | Alt 2A (pk_3g2a-300.sav) | Alt 2A (pk_3g2a-600.sav) | Alt 2B (pk_3g2b-600.sav) |
|---|---|---|---|---|---|---|---|
| | | | | Impor t= 0MW | Impor t= 300MW | Impor t= 600MW | Impor t= 600MW |
| | | | (Amps) | (%) | (%) | (%) | (%) |
| F-B214 | Borden - Gregg 230kV line | Melones #1; Wilson - Storey 1 - Gregg 230kV line | 793.2 | <95% | <95% | **108.9%** | <95% |
| F-B61 | Corcoran 115/70KV BK-2 (MVA) | Guernsey - Henrietta 70kV line | 33.8 | 120.4% | 120.4% | 120.4% | 120.4% |
| F-B151 | Henrietta - Jacob Corner 70kV line | GWF- Hanford (lose 23 MW) | 346.4 | 107.9% | 108.0% | 107.7% | 107.9% |
| F-B123 | Herndon - Woodward 115kV line | Kerckhoff #2 PH (lose 129 MW) | 823.4 | 105.0% | 110.1% | 117.7% | 100.3% |
| F-B112 | Herndon 230/115kV Bk-1 | Herndon 230/115kV Bk-2 | 462 | 108.8% | 117.0% | 128.6% | 103.1% |
| F-B111 | Herndon 230/115kV Bk-2 | Herndon 230/115kV Bk-1 | 463.7 | 108.6% | 116.0% | 128.2% | 102.4% |
| F-B138 | McCall - Wahtoke 115kV line | Kings River PH (lose 47 MW) | 492 | 100.6% | <95% | | <95% | 102.9% |
| F-B36 | McCall - Wahtoke 115kV line | Kings River - Sanger - Reedley 115kV line | 562.3 | 106.0% | 104.2% | 101.2% | 107.5% |
| F-B106 | McCall 230/115 kV Bk-1 (MVA) | McCall 230/115 kV Bk-2 | 133 | 108.3% | 103.8% | 97.0% | 114.1% |
| F-B213 | Storey 1 - Gregg 230kV line | Melones #1; Wilson - Storey 2 - Borden 230kV line | 793.2 | <95% | <95% | **105.8%** | <95% |
| Y-C1 | Atwater Jct-Cressey Jct 115kV line | Wilson-Atwater and El Capitan-Wilson 115kV Lines | 512 | 166.3% | 166.7% | 165.4% | 167.0% |
| F-C20 | Borden - Gregg 230kV line | Herndon-Kearney and Herndon-Ashlan 230kV lines | 793.2 | <95% | <95% | **111.9%** | <95% |
| F-C19 | Gregg-Ashlan 230kV line | Gregg-Herndon #1 and #2 230kV lines | 850 | 182.0% | 209.3% | 233.0% | 195.6% |
| F-C3 | Herndon - Woodward 115kV line | Herndon-Barton and Herndon-Manchester 115kV lines | 974 | 106.6% | 116.9% | 129.9% | | <95% |
| F-C19 | Herndon-Ashlan 230kV line | Gregg-Herndon #1 and #2 230kV lines | 850 | 115.3% | 141.3% | 167.1% | 127.9% |
| F-C6 | Le Grand-Chowchilla 115kV line | Kerckhoff-Clovis-Sanger #1 and #2 115kV lines | 396.6 | 110.9% | <95% | <95% | <95% |
| F-C8 | McCall-Wahtoke 115kV line | Kings R-Sanger-Reedley and Balch-Sanger 115kV lines | 562.3 | 106.3% | 104.6% | 101.5% | 107.8% |
| Y-C1 | Merced-Atwater Jct 115kV line | Wilson-Atwater and El Capitan-Wilson 115kV Lines | 738 | 138.2% | 138.6% | 137.5% | 138.8% |
| Y-C1 | Wilson A-Merced 115kV line | Wilson-Atwater and El Capitan-Wilson 115kV Lines | 471.9 | 137.2% | 137.0% | 122.7% | 137.0% |
| Y-C1 | Wilson B-Merced 115kV line | Wilson-Atwater and El Capitan-Wilson 115kV Lines | 471.9 | 124.0% | 123.5% | 136.2% | 123.4% |

Notes:

1. Case # F-B61 should be modified to reflect that Guernsey – Henrietta 70 kV line will not close circuit breaker No. 52 follow this outage. As a result, the Corcoran 115/70 kV transformer loading should reduce to within its ratings for the base alternative.

2. Case # F-B151 should use the emergency rating of the Henrietta – Jacobs Corner 70 kV line, which is 395 Amps. As a result, the Henrietta – Jacobs Corner 70 kV line will not overload for the base alternative.

3. Case # F-B123 should use the emergency rating of the Herndon – Woodward 115 kV line, which is 974 Amps. As a result, the Herndon – Woodward 115 kV line will not overload for the base alternative.

4. Cases #F-B138, F-B36 and F-C8, the Mc Call-Wahtoke 115 kV line is comprised of 1113 AAC with (SN/SE) 825/975 amps. As a result, the Mc Call-Wahtoke 115 kV line is not projected to overload for the base alternative.

5. Case #F-B106, Mc Call 230/115 kV Transformer No. 2 was re-rated for 150 MVA emergency. Therefore, Mc Call 230/115 kV Transformer No. 2 is not expected to overload for the base alternative.

6. Case #F-C19 and C6, there are existing SPS' that are in place to mitigate thermal overloads on the identified transmission lines.

Table A3-4
500 kV Contingencies for PG&E Alternative 2
(2010 Summer Peak Conditions with Helms Generation = 1200 MW)

| | | | | | Base (pk_alt2-0.sav) | | Alt 2A (pk_alt2a-300.sav) | | Alt 2A (pk_alt2a-600.sav) | | Alt 2B (pk_alt2b-600.sav) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | IMPORT = 300 MW | | IMPORT = 600 MW | | IMPORT = 600 MW | |
| | Outages Facilities | Overloaded Facilities | RAS | SE Rating | post-outag Flow | | post-outag Flow | | post-outag Flow | | post-outag Flow | |
| | **Single Contingency (Category "B")** (MW) | | | (A) | (A) | (%) | (A) | (%) | (A) | (%) | (A) | (%) |
| PK-B1 | Tesla-Los Banos 500kV line | Borden-Gregg 230kV line | none | 793 | 612 | 77.2% | 733 | 92.5% | 868 | **109.4%** | 785 | **99.0%** |
| PK-B2 | Los Banos-Gates #3 500kV line | Borden-Gregg 230kV line | none | 793 | 613 | 77.3% | 733 | 92.4% | 865 | **109.0%** | 782 | 98.6% |
| PK-B3 | Los Banos-Midway 500kV Line | Borden-Gregg 230kV line | none | 793 | 608 | 76.6% | 725 | 91.4% | 857 | **108.1%** | 775 | 97.7% |
| PK-B4 | Gates-Midway #1 500kV Line | Borden-Gregg 230kV line | none | 793 | 614 | 77.5% | 725 | 91.5% | 856 | **107.9%** | 775 | 97.8% |
| PK-B5 PDCI | Bipole | Borden-Gregg 230kV line | none | 793 | 533 | 67.2% | 610 | 76.9% | 735 | 92.7% | 665 | 83.9% |
| | **Double contingency (Category "C")** | | | | | | | | | | | |
| PK-C1 | Tesla-Los Banos, Tracy-Los Banos 500kV lines | Borden-Gregg 230kV line | none | 793 | 608 | 76.6% | 735 | 92.6% | 877 | **110.6%** | 795 | **100.3%** |
| PK-C2 | Los Banos-Gates #3, Los Banos-Midway #1 500kV lines | Borden-Gregg 230kV line | none | 793 | 607 | 76.5% | 725 | 91.4% | 859 | **108.3%** | 777 | 98.0% |
| PK-C3 | Gates-Midway, Los Banos-Midway 500kV lines | Borden-Gregg 230kV line | none | 793 | 611 | 77.0% | 713 | 89.9% | 845 | **106.6%** | 768 | 96.8% |
| PK-C4 | Diablo Canyon G-2 | Borden-Gregg 230kV line | none | 793 | 549 | 69.3% | 665 | 83.8% | 794 | **100.1%** | 711 | 89.7% |
| PK-C5 | Palo Verde G-2 | Borden-Gregg 230kV line | none | 793 | 550 | 69.4% | 647 | 81.6% | 777 | 98.0% | 700 | 88.3% |

**Attachment 4**
**Preliminary Power Flow Study Results for PG&E Alternative 2**
**(2010 Summer Off-Peak Conditions with Helms off-line)**

Table A4-1
Steady State Power Flow Study Results for PG&E Alternative 2
(2010 Summer Off-peak Conditions with Helms Offline)

| T | ransmission Facilities | SN Rating | Base (sumopk_r2.sav) | | Alt 2A (opk_alt2a-600.sav) | | Alt 2A (opk_alt2a-1200.sav) | | Alt 2B (opk_alt2b-600.sav) | | Alt 2B (opk_0p2b-1200.sav) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Import = 0 MW | | Import = 600 MW | | Import = 1200 MW | | Import = 600 MW | | Import = 1200 MW | |
| | | (Amps) | (Amps) | (%) | (Amps) | (%) | (Amps) | (%) | (Amps) | (%) | (Amps) | (%) |
| 1 | WARNERVL - COTTLE B 230KV LINE | 675.2 | 290.6 | 43.0% | 473 | 70.1% | 692 | **102.5%** | 432 | 63.9% | 611 | 90.5% |
| 2 | BELLOTA - COTTLE B 230KV LINE | 675.2 | 261.2 | 38.7% | 444 | 65.7% | 661 | 98.0% | 403 | 59.6% | 581 | 86.1% |
| 3 | McCall-PGE_2_W #1 230kV line | 753.1 | 27.4 | 3.6% | n/a | <95% | n/a | <95% | 403 | 53.5% | 770 | **102.2%** |
| 4 | McCall-PGE_2_W #1 230kV line | 753.1 | 27.4 | 3.6% | n/a | <95% | n/a | <95% | 403 | 53.5% | 770 | **102.2%** |

Table A4-2
230 and 115 kV Contingencies for PG&E Alternative 2
(2010 Summer Off-Peak Conditions with Helms Offline)

| Case # | Overloaded Transmission Facilities Worst | Contingency | SE Rating | Base (opk_op2a -0.sav) | Alt 2A (opk_0p2a -300.sav) | Alt 2A (opk_0p2a -600.sav) | Alt 2A (opk_0p2a -1200.sav) | Alt 2B (opk_0p2b -600.sav) | Alt 2B (opk_0p2b -1200.sav) |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | Import = 300MW | Import = 600MW | Import = 1200MW | Import = 600MW | Import = 1200MW |
| | | | (Amps) | (%) | (%) | (%) | (%) | (%) | (%) |
| F-B207 | Borden - Gregg 230kV line | Exchequer PH; Wilson - Storey 1 - Gregg 230kV line | 793.2 | <95% | <95% | <95% | **121.7%** | <95% | <95% |
| F-B146 | Borden - Gregg 230kV line | Friant PP (22.5 MW) | 675.3 (1) | <95% | <95% | <95% | **101.3%** | <95% | <95% |
| F-B100 | Gates – Midway 230kV line | Gates 500/230kV bank | 1390 | <95% | <95% | <95% | <95% | <95% | <95% |
| F-B6 | Storey 1 – Gregg 230kV line | Borden – Gregg 230kV line | 793.2 | <95% | <95% | <95% | **119.9%** | <95% | <95% |
| F-B207 | Storey 2 – Borden 230kV line | Exchequer PH; Wilson – Storey 1 – Gregg 230kV line | 793.2 | <95% | <95% | <95% | **102.9%** | <95% | <95% |
| F-B6 | Wilson – Storey 1 230kV line | Borden – Gregg 230kV line | 851 | <95% | <95% | <95% | **106.9%** | <95% | <95% |
| | | | | | | | | | |
| F-C12 | Helm-McCall 230kV line | Gates-Gregg and Gates-McCall 230kV lines | 850 | **106.3%** | <95% | <95% | **138.7%** | <95% | <95% |
| F-C16 | Henrietta-GWF_HEP 115kV line | Gates-McCall and Helm-McCall 230kV lines | 743 | **105.0%** | <95% | <95% | <95% | <95% | <95% |
| F-C13 | Henrietta-McCall 230kV line | Gates-Gregg and Panoche-Kearney 230kV lines | 975 | **107.9%** | <95% | <95% | <95% | <95% | <95% |

(1) Summer normal rating for G-1 contingency.

Table A4-3
500 kV "B" Contingencies for PG&E Alternative 2
(2010 Summer Off-Peak Conditions with Helms Offline)

| | | | | | Base (sumopk_r2.sav) | | Alt 2A (opk_alt2a-600.sav) | | Alt 2A (opk_alt2a-00.sav) | | Alt 2B (opk_alt2b-600.sav) | | Alt 2B (opk_alt2b-200.sav) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Import=600 MW | | Import =1200 MW | | Import=600 MW | | Import =1200 MW | |
| | | | | | Post-outage Flow | | Post-outage Flow | | Post-outage Flow | | Post-outage Flow | | Post-outage Flow | |
| | Outages Facilities | Overloaded Facilities | RAS (MW) | SE (A) | (A) | (%) (A) | | (%) (A | ) | (%) (A) | | (%) (A) | | (%) |
| OPK-B1 | Tesla-Los Banos 500kV line | Cottle B-Warnerville 230kV line | none | 793 | 395 | 49.8% | 596 | 75.2% | 819 | **103.2%** | 555 | 69.9% 745 | 94.0% | |
| OPK-B2 | Los Banos-Gates #3 500kV line | Warnervill-Wilson 230kV line | none | 793 | n/a | <95% | 119 | 15.0% | 447 | 56.3% 70 | | 8.8% 309 | | 39.0% |
| OPK-B3 | Los Banos-Midway 500kV Line | Gates-Midway 500kV Line | none | 3556 | 3489 | 98.1% | 3504 | 98.5% | 3598 | **101.2%** | 3493 | 98.2% 3543 | | **99.6%** |
| OPK-B3 | Los Banos-Midway 500kV Line | Gates-Midway 230kV line | none | 1390 | 736 | 52.9% 684 | | 49.2% | 653 | 47.0% 676 | 48.6% 627 | 45.1% | | |
| OPK-B3 | Los Banos-Midway 500kV Line | Arco-Midway 230kV line | none | 1390 | 668 | 48.1% 627 | | 45.1% | 602 | 43.3% 619 | 44.5% 580 | 41.7% | | |
| OPK-B4 | Gates-Midway #1 500kV Line | Los Banos-Midway 500kV Line | none | 3556 | 2922 | 82.2% 2948 | | 82.9% | 3058 | 86.0% 2940 | 82.7% 3021 | 85.0% | | |
| OPK-B4 | Gates-Midway #1 500kV Line | Gates-Midway 230kV line | none | 1390 | 886 | 63.7% 819 | | 58.9% | 785 | 56.4% 807 | 58.1% 751 | 54.0% | | |
| OPK-B4 | Gates-Midway #1 500kV Line | Arco-Midway 230kV line | none | 1390 | 791 | 56.9% 737 | | 53.0% | 709 | 51.0% 726 | 52.3% 681 | 49.0% | | |
| OPK-B5 PDCI | Bipole | Cottle B-Warnerville 230kV line | none | 793 | 431 | 54.4% | 675 | 85.1% | 875 | **110.4%** | 630 | 79.4% 815 | | **102.8%** |
| OPK-B5 | PDCI Bipole | Borden-Gregg 230kV line | none | 793 | 220 | 27.7% | 547 | 69.0% | 836 | **105.4%** | 452 | 57.0% 637 | 80.3% | |
| OPK-B5 | PDCI Bipole | Storey 1-Gregg 230kV line | none | 793 | 166 | 21.0% | 490 | 61.8% | 800 | **100.9%** | 403 | 50.8% 614 | 77.4% | |

Table A4-4
500 kV "C" Contingencies for PG&E Alternative 2
(2010 Summer Off-Peak Conditions with Helms Offline)

| | | | | | Base (sumopk_r2.sav) | | Alt 2A (opk_alt2a-00.sav) | | Alt 2A (opk_alt2a-00.sav) | | Alt 2B (opk_alt2b600.sav) | | Alt 2B (opk_alt2b-00.sav) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Import=600 MW | | Import =1200 MW | | Import=600 MW | | Import =1200 MW | |
| | | | | | Post-outage Flow | | Post-outage Flow | | Post-outage Flow | | Post-outage Flow | | Post-outage Flow | |
| | Outages Facilities | Overloaded Facilities | RAS (MW) | SE (A) | (A) (%) | (A) | | (%) (A | ) | (A) (%) | | (A) (%) | | (A) |
| OPK -C1 | TSL-LSB, TCY-LSB 500kV line | Cottle B-Warnerville 230kV line | 3369 | 793 | 384 | 48.4% 585 | | 73.8% 834 | | **105.2%** | 545 | 68.8% | 761 | 96.0% |
| OPK -C1 | TSL-LSB, TCY-LSB 500kV line | Los Banos-Panoche #1 230kV line | 3369 | 825 | 75 | 9.1% | 34 | 4.2% 121 | | 14.7% 50 | | 6.1% 144 | | 17.5% |
| OPK -C1 | TSL-LSB, TCY-LSB 500kV line | Los Banos-Panoche #2 230kV line | 3369 | 742 | 71 | 9.6% | 34 | 4.6% 112 | | 15.1% 48 | | 6.5% 134 | | 18.0% |
| OPK -C1 | TSL-LSB, TCY-LSB 500kV line | Los Banos-Panoche #3 230kV line | 3369 | 742 | 72 | 9.7% | 33 | 4.5% 114 | | 15.3% 48 | | 6.5% 136 | | 18.3% |
| OPK -C1 | TSL-LSB, TCY-LSB 500kV line | Los Banos-Westley 230kV line | 3369 | 2000 | 1731 | 86.6% 1926 | | 96.3% 2276 | | **113.8%** | 1970 | 98.5% | 2345 | **117.3%** |
| OPK -C1 | TSL-LSB, TCY-LSB 500kV line | Los Banos 500/230kV bk | 3369 | 1050 | 749 | 71.3% 719 | | 68.5% 718 | | 68.4% 722 | | 68.8% 722 | | 68.8% |
| OPK -C2 | LSB-GTS #3, LSB-MDY #1 500kV lines | Los Banos-Gates #1 500kV line | 1832 | 3556 | 3068 | 86.3% 3264 | | 91.8% 3531 | | 99.3% 3277 | | 92.2% 3547 | | 99.7% |
| OPK -C3 | GTS-MDW, LSB-MDW #1 500kV lines | Gates-Midway 230kV line | 2057 | 1390 | 1329 | 95.6% 1176 | | 84.6% 1195 | | 86.0% 1144 | | 82.3% 1107 | | 79.7% |
| OPK -C3 | GTS-MDW, LSB-MDW #1 500kV lines | Arco-Midway 230kV line | 2057 | 1390 | 1157 | 83.2% 1031 | | 74.2% 1048 | | 75.4% 1003 | | 72.2% | 975 | 70.2% |
| OPK -C4 | Diablo Canyon G-2 None | | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| OPK -C5 | Palo Verde G-2 | None | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |

Attachment 5
Preliminary Power flow Study Results for PG&E Alternative 4

Table A5-1
Steady State Power Flow Study Results for PGE Alternative 4
(2010 Summer Off-Peak Conditions with Helms = -600 MW)

| T | ransmission Facilities | SN Rating (1) | Base (sumopk_r1_2p.sav) | | Alt 4A (opk_alt4c-500.sav) | | Alt 4B (opk_alt4a-1100.sav) | | Alt 4C (opk_alt4b-2k.sav) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Import = 0 MW | | Import=500MW | | Import=1100MW | | Import=2000MW | |
| | | (Amp) | (Amp) | (%) | (Amp) | (%) | (Amp) | (%) | (Amp) | (%) |
| 1 | Gates - Midway #1 500 kV line | 2230 | 2088 | 93.6% | 2197 | **98.5%** | 1844 | 82.7% | **2173** | **97.4%** |
| 2 | Los Banos - Midway #1 500 kV line | 2230 | 1805 | 80.9% | 1895 | 85.0% | 1561 | 70.0% | 1858 | 83.3% |
| 3 | Los Banos - Gates #1 500kV line | 2230 | 1605 | 72.0% | 1678 | 75.2% | 1370 | 61.4% | 1631 | 73.1% |
| 4 | Los Banos-Gates #3 500kV line | 4332 | 800 | 18.5% | 832 | 19.2% | 690 | 15.9% | 811 | 18.7% |
| 5 | Panoche-McMulln1 230kV line | 825 | 785 | 95.2% | 797 | 96.6% | 816 | 98.9% | 792 | 96.0% |
| 6 | McMulln1 - Kearney 230kV line | 825 | 765 | 92.8% | 779 | 94.4% | 795 | 96.4% | 771 | 93.4% |
| 7 | McCall - Hentap2 230kV line (1) | 825 | 780 | 94.6% | 777 | 94.2% | 808 | 97.9% | **822** | **99.6%** |
| 8 | Los Banos - Westley 230 kV line | 1484 | 784 | 52.8% | 1001 | 67.4% | 1056 | 71.1% | 895 | 60.3% |
| 9 | Tesla-Los Banos #2 500kV line (new) | 2230 | n/a | n/a | n/a | n/a | n/a | n/a | 1563 | 70.1% |
| 10 | LosBanos-Midway #2 500kV line (new) | 2230 | n/a | n/a | n/a | n/a | 1802 | 80.8% | 2134 | 95.7% |
| 11 | LosBanos-Midway #2 500kV line operate at 230kV (new) | 2230 | n/a | n/a | 1723 | 69.5% | n/a | n/a | n/a | n/a |

(1) The SN ratings are in ampere for line and MVA for transformer.

Table A5-2
500 kV Category "B" Contingencies for PG&E Alternative 4
(2010 Summer Off-Peak Conditions with Helms = -600MW)

| | | | | Base | | Alt 4A | | Alt 4B | | Alt 4C | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Import = 0 MW | | Import=500MW | | Import=1100MW | | Import=2000MW | |
| | Outages Facilities | Overloaded Facilities | SE Rating (A) | post-outag Flow (A) | post-outag Flow (%) | post-outag Flow (A) | post-outag Flow (%) | post-outag Flow (A) | post-outag Flow (%) | post-outag Flow (A) | post-outag Flow (%) |
| B1 | Tesla-Los Banos 500kV line | Gates-Henrietta Tap1 230kV line | 1600 | n/a | <95% | n/a | <95% | 1564 | 97.7% | n/a | <95% |
| B2 | Los Banos-Gates #3 500kV line | Gates-Henrietta Tap1 230kV line | 1600 | n/a | <95% | n/a | <95% | n/a | <95% | n/a | <95% |
| B2 | Los Banos-Gates #3 500kV line | Los Banos-Midway #2 500kV Line operate at 230 kV (new) | 3556 | n/a | n/a | 1718 | 48.3% | n/a | n/a | n/a | n/a |
| B3 | Los Banos-Midway 500kV Line | Gates-Midway 500kV Line | 3556 | 3433 | 96.5% | 3556 | **100%** | n/a | <95% | n/a | <95% |
| B3 | Los Banos-Midway 500kV Line | Gates-Henrietta Tap1 230kV line | 1600 | n/a | <95% | n/a | <95% | n/a | <95% | 1530 | 95.7% |
| B3 | Los Banos-Midway 500kV Line | Los Banos-Midway #2 500kV Line operate at 230 kV (new) | 3556 | n/a | n/a | 1713 | 48.2% | n/a | n/a | n/a | n/a |
| B3 | Los Banos-Midway 500kV Line | Los Banos-Midway #2 500kV Line (new) | 3556 | n/a | n/a | n/a | n/a | | <95% | n/a | n/a |
| B4 | Gates-Midway #1 500kV Line | Los Banos-Midway 500kV Line | 3556 | 2847 | 80.1% | n/a | <95% | n/a | <95% | n/a | <95% |
| B4 | Gates-Midway #1 500kV Line | Los Banos-Midway #2 500kV Line operate at 230 kV (new) | 3556 | n/a | n/a | 1717 | 48.3% | n/a | n/a | n/a | n/a |
| B4 | Gates-Midway #1 500kV Line | Los Banos-Midway #2 500kV Line (new) | 3556 | n/a | n/a | n/a | n/a | | <95% | n/a | <95% |
| B7 | PDCI Bipole | Gates-Henrietta Tap1 230kV line | 1600 | 1573 | 98.3% | 1575 | 98.4% | 1624 | **101.5 %** | **1635** | **102.2 %** |

Table A5-3
500 kV Category "C" Contingencies for PG&E Alternative 4
(2010 Summer Off-Peak Conditions with Helms = -600 MW)

| | | | | Base | | | Alt 4A | | | Alt 4B | | | Alt 4C | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Import = 0 MW | | | Import=500MW | | | Import=1100MW | | | Import=2000MW | | |
| O | utages Facilities | Overloaded Facilities | SE (A) | post-outage Flow (A) | post-outage Flow (%) | RAS (MW) | | | | post-outage Flow (A) | post-outage Flow (%) | RAS (MW) | post-outage Flow (A) | post-outage Flow (%) | RAS (MW) |
| C1 | Tesla-Los Banos, Tracy-Los Banos 500kV lines | Los Banos-Westley 230kV line | 2000 | 1378 | 68.9% | 3369 | 1671 | 83.6% | 3368 | 2106 | **105.3 % (1)** | 3369 | n/a | <95% | 1985 |
| C1 | Tesla-Los Banos, Tracy-Los Banos 500kV lines | Los Banos 500/230kV xfr bank | 1050 | n/a | n/a | 3369 | 989 | 94.2% | 3368 | 1073 | **102.2 % (1)** | 3369 | n/a | <95% | 1985 |
| C2 | Los Banos-Gates #3, Los Banos-Midway #1 500kV lines | Los Banos-Gates #1 500kV line | 3556 | 3324 | 93.5% | 1532 | 3458 | **97.3%** | 1532 | 2255 | 63.4% | 1532 | n/a | <95% | 1532 |
| C3 | Los Banos-Midway #1 and #2 500kV lines (Alt 4) | Gates-Midway 500kV line | 3556 | n/a | n/a | 2648 | n/a | n/a | n/a | 3362 | 94.5% | 2648 | 3511 | **98.7%** | **4319 (2)** |
| C3 | Los Banos-Midway #1 and #2 500kV lines (new) | Los Banos-Gates #1 500kV line | 3556 | n/a | n/a | 2648 | n/a | n/a | n/a | n/a | <95% | 2648 | 2758 | 77.6% | **4319 (2)** |
| C4 | Gates-Midway, Los Banos-Midway 500kV lines | Gates-Midway 230kV line | 1390 | 1216 | 87.5% | 2648 | 1208 | 86.9% | 2648 | 707 | 50.9% | 2648 | 817 | 58.8% | 2984 |
| C4 | Gates-Midway, Los Banos-Midway 500kV lines | Los Banos-Midway #2 500kV Line (new) | 3556 | n/a | n/a | 2648 | n/a | n/a | 2648 | 2917 | 82.0% | 2648 | 3519 | **99.0%** | 2984 |
| C5 | Palo Verde G-2 | none | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| C6 | Diablo Canyon G-2 | none | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |

(1) Upgrade the Los Banos 500/230 kV transformer bank and the Los Banos – Westley 230 kV lines to relieve the emergency overloads.
(2) The RAS includes 2578 MW of generation, 691 MW of pumps and 1050 MW of loads. The net generation drop is 837 MW.

Attachment 6
Preliminary Power flow Study Results for PG&E Alternative 5

Table A6-1
Steady State Power Flow Study Results for PGE Alternative 5
(2010 Summer Off-Peak Conditions with Helms = -900MW)

| T | ransmission Facilities | SN Rating (1) | Base (sumopk_r1_2p.sav) | | Alt 5A (opk_alt5a-500.sav) | | Alt 5B1 (opk_alt5b1-1100.sav) | | Alt 5C1 (opk_alt5c1-2k.sav) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Import = 0 MW Helms=-600MW | | Import=500MW | | Import=1100MW | | Import=2000MW | |
| | | (Amp) | (Amp) | (%) | (Amp) | (%) | (Amp) | (%) | (Amp) | (%) |
| 1 | Gates - Midway #1 500 kV line | 2230 | 2088 | 93.6% | **2124** | **95.3%** | 2085 | 93.5% | 2152 | 96.5% |
| 2 | Los Banos - Midway #1 500 kV line | 2230 | 1805 | 80.9% | 1838 | 82.4% | 1907 | 85.5% | 1943 | 87.1% |
| 3 | Los Banos - Gates #1 500kV line | 2230 | 1605 | 72.0% | 1637 | 73.4% | 1767 | 79.2% | 1781 | 79.8% |
| 4 | Los Banos-Gates #3 500kV line | 4332 | 800 | 18.5% | 816 | 18.8% | 879 | 20.3% | 884 | 20.4% |
| 5 | Panoche-McMulln1 230kV line | 825 | 785 | 95.2% | 701 | 85.0% | 350 | 42.4% | 369 | 44.7% |
| 6 | McMulln1 - Kearney 230kV line | 825 | 765 | 92.8% | 680 | 82.4% | 331 | 40.2% | 347 | 42.1% |
| 7 | McCall - Hentap2 230kV line | 825 | 780 | 94.6% | 746 | 90.4% | 609 | 73.8% | 652 | 79.1% |
| 8 | Los Banos - Westley 230 kV line | 1484 | 784 | 52.8% | 806 | 54.3% | 1036 | 69.8% | 984 | 66.3% |
| 11 | Tesla-Gregg 500kV line (new) | 2230 | n/a | n/a | n/a | n/a | n/a | n/a | 1042 | 46.7% |
| 12 | Gregg-Midway 500kV line (new) | 2230 | n/a | n/a | n/a | n/a | 1238 | 55.5% | **2195** | **98.4%** |
| 13 | Gregg-Midway 500kV line operate at 230kV (new) | 2478 | n/a | n/a | 1304 | 52.6% | n/a | n/a | n/a | n/a |
| 14 | Gregg 500/230kV Transformer (new) | 1122 | n/a | n/a | n/a | n/a | **1113** | **99.2%** | 990 | 88.2% |

(1) The SN ratings are in ampere for line and MVA for transformer.

Table A6-2
500 kV Category "B" Contingencies for PG&E Alternative 5
(2010 Summer Off-Peak Conditions with Helms = -900MW)

| | | | | Base | | Alt 5A | | Alt 5B1 | | Alt 5C1 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Import = 0 MW Helms=-600MW | | Import=500MW | | Import=1100MW | | Import=2000MW | |
| | Outages Facilities | Overloaded Facilities | SE Rating (A) | post-outag Flow (A) | post-outag Flow (%) | post-outag Flow (A) | post-outag Flow (%) | post-outag Flow (A) | post-outag Flow (%) | post-outag Flow (A) | post-outag Flow (%) |
| B1 | Tesla-Los Banos 500kV line | Gates-Henrietta Tap1 230kV line | 1600 | n/a | <95% | 1368 | 85.5% | n/a | <95% | n/a | <95% |
| | | Gregg 500/230kV bank (new) | 1260 | n/a | <95% | n/a | n/a | 1170 | 92.8% | n/a | <95% |
| | | Gregg-Midway 500kV line (new) | 3556 | n/a | <95% | n/a | n/a | n/a | <95% | n/a | <95% |
| B2 | Los Banos-Gates #3 500kV line | Gates-Henrietta Tap1 230kV line | 1600 | n/a | <95% | 1331 | 83.2% | n/a | <95% | n/a | <95% |
| | | Gregg 500/230kV bank (new) | 1260 | n/a | n/a | n/a | n/a | 1134 | 90.0% | n/a | <95% |
| B3 | Los Banos-Midway 500kV Line | Gates-Midway 500kV Line | 3556 | 3433 | 96.5% | 3457[13] | **97.2%** | 3390 | 95.3% | 3312 | 93.1% |
| | | Gates-Henrietta Tap1 230kV line | 1600 | n/a | <95% | 1374 | 85.9% | n/a | <95% | n/a | <95% |
| | | Gregg 500/230kV bank (new) | 1260 | n/a | n/a | n/a | n/a | 1259 | **100.0 %** | n/a | <95% |
| | | Tesla-Gregg 500kV line (new) | 3556 | n/a | n/a | n/a | n/a | | <95% | n/a | <95% |
| | | Gregg-Midway 500kV line (new) | 3556 | n/a | n/a | n/a | n/a | | <95% | n/a | <95% |
| | | Gregg-Midway 500kV line operate at 230kv (new) | 2962 | n/a | n/a | 1383 | 46.7% | n/a | <95% | n/a | <95% |

[13] A sensitivity case modeling the import of 600 MW was run. The Gates-Midway 500 kV line would load up to 3550 amperes (99.8% of SE rating of 3556A) for the Los Banos – Midway 500 kV line outage.

Table A6-2 (continue)
500 kV Category "B" Contingencies for PG&E Alternative 5
(2010 Summer Off-Peak Conditions with Helms = -900 MW)

| | | | | Base | | Alt 5A | | Alt 5B1 | | Alt 5C1 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Import = 0 MW Helms=-600MW | | Import=500MW | | Import=1100MW | | Import=2000MW | |
| | Outages Facilities | Overloaded Facilities | SE Rating (A) | post-outag Flow (A) | post-outag Flow (%) | post-outag Flow (A) | post-outag Flow (%) | post-outag Flow (A) | post-outag Flow (%) | post-outag Flow (A) | post-outag Flow (%) |
| B4 | Gates-Midway #1 500kV Line | Los Banos-Midway 500kV Line | 3556 | 2847 | 80.1% | 2863 | 80.5% | 2840 | 79.9% | n/a | <95% |
| | | Gregg 500/230kV bank new) | 1260 | n/a | n/a | n/a | n/a | 1292 | 102.5 % | n/a | <95% |
| | | Gregg-Midway 500kV line (new) | 3556 | n/a | n/a | n/a | n/a | | <95% | n/a | <95% |
| | | Gregg-Midway 500kV line operate at 230kV (new) | 2962 | n/a | n/a | 1403 | 47.4% | n/a | <95% | n/a | n/a |
| B5 | Tesla-Gregg 500kV line | Gregg 500/230kV bank (new) | 1260 | n/a | n/a | n/a | n/a | n/a | n/a | 1341 | 106.4 % |
| B6 | Gregg-Midway 500kV line | McCall-Hentap2 230kV line | 975 | n/a | n/a | n/a | <95% | 972 | 99.7% | n/a | <95% |
| | | Panoche-McNulln1 230kV line | 975 | n/a | n/a | n/a | <95% | 1050 | 107.7 % | n/a | <95% |
| | | McMUlln1-Kearney 230kV line | 975 | n/a | n/a | n/a | <95% | 1031 | 105.7 % | n/a | <95% |
| | | Warnerville-Wilson 230kV line | 793 | n/a | n/a | n/a | <95% | 801 | 101.0 % | n/a | <95% |
| | | Gates-Henrietta Tap1 230kV line | 1600 | n/a | n/a | n/a | <95% | 1785 | 111.5 % | 1558 | 97.4% |
| B7 | PDCI Bipole | Gates-Henrietta Tap1 230kV line | 1600 | 1573 | 98.3% | 1442 | 90.1% | n/a | <95% | n/a | <95% |
| | | McCall-Hentap2 230kV line | 975 | n/a | <95% | 845 | 86.7% | n/a | <95% | n/a | <95% |
| | | Gregg 500/230kV bank (new) | 1260 | n/a | <95% | n/a | n/a | 1262 | 100.1 % | 988 | 78.4% |

Table A6-3
500 kV Category "C" Contingencies for PG&E Alternative 5
(2010 Summer Off-Peak Conditions with Helms = -900 MW)

| | | | | Alt 5a | | | Atl 5b | | | Alt 5c | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Import = 500 MW | | | Import=1100MW | | | Import=2000MW | | |
| | Outages Facilities | Overloaded Facilities | SE Rating (A) | post-outag Flow (A) | post-outag Flow (%) | RAS (MW) | post-outag Flow (A) | post-outag Flow (%) | RAS (MW) | post-outag Flow (A) | post-outag Flow (%) | RAS (MW) |
| C1 | Tesla-Los Banos, Tracy-Los Banos 500kV lines | Los Banos-Westley 230kV line | 2000 | 1879 | 93.9% | 1951 | 1815 | 90.8% | 3369 | 1837 | 91.8% | 1951 |
| C1 | Tesla-Los Banos, Tracy-Los Banos 500kV lines | Tesla-Gregg 500kV line (new) | 3556 | n/a | n/a | n/a | n/a | n/a | n/a | | <95% | 1951 |
| C1 | Tesla-Los Banos, Tracy-Los Banos 500kV lines | Gregg-Midway 500kV line (new) | 3556 | n/a | n/a | n/a | n/a | <95% | 3369 | n/a | <95% | 1951 |
| C2 | Los Banos-Gates #3, Los Banos-Midway #1 500kV lines | Los Banos-Gates #1 500kV line | 3556 | 3424 | **96.3%** | 1832 | 3276 | 92.1% | 2948 | 3378 | 95.0% | 1832 |
| C2 | Los Banos-Gates #3, Los Banos-Midway #1 500kV lines | Gates-Midway 500kV line | 3556 | 2865 | 80.6% | 1832 | 2591 | 72.9% | 2948 | n/a | <95% | 1832 |
| C2 | Los Banos-Gates #3, Los Banos-Midway #1 500kV lines | Tesla-Gregg 500kV line (new) | 3556 | n/a | n/a | n/a | n/a | n/a | n/a | n/a | <95% | 1832 |
| C2 | Los Banos-Gates #3, Los Banos-Midway #1 500kV lines | Gregg-Midway 500kV line (new) | 3556 | n/a | n/a | | | <95% | 2948 | n/a | <95% | 1832 |
| C4 | Gates-Midway, Los Banos-Midway 500kV lines | Gates-Midway 230kV line | 1390 | 1298 | 93.4% | 2057 | 1061 | 76.3% | 2948 | 1108 | 79.7% | 2057 |
| C4 | Gates-Midway, Los Banos-Midway 500kV lines | Tesla-Gregg 500kV line (new) | 3556 | n/a | n/a | n/a | n/a | n/a | n/a | n/a | <95% | 2057 |
| C4 | Gates-Midway, Los Banos-Midway 500kV lines | Gregg-Midway 500kV line (new) | 3556 | n/a | n/a | n/a | n/a | <95% | 2948 | 3222 | 90.6% | 2057 |
| C4 | Gates-Midway, Los Banos-Midway 500kV lines | Gregg 500/230kV bank (new) | 1260 | n/a | n/a | n/a | 1251 | **99.3%** | 2948 | 715 | 56.7% | 2057 |
| C5 | Palo Verde G-2 | Panoche-Kearney 230kV line | 975 | n/a | <95% | None | n/a | <95% | None | n/a | <95% | None |
| C5 | Palo Verde G-2 | Warnerville-Wilson 230kV line | 793 | n/a | <95% | None | n/a | <95% | None | n/a | <95% | None |
| C6 | Diablo Canyon G-2 | Panoche-Kearney 230kV line | 975 | n/a | <95% | None | n/a | <95% | None | n/a | <95% | None |
| C6 | Diablo Canyon G-2 | Warnerville-Wilson 230kV line | 793 | n/a | <95% | none | n/a | <95% | None | n/a | <95% | None |

# APPENDIX 3

## APPENDIX 3

# SCE Study Alternatives

SCE filed a report titled "Development Plan for the Phased Expansion of Transmission in the Tehachapi Wind Resource" (Report) on behalf of the TCSG in March 16, 2005 as directed by the Commission. The Report presented alternative transmission concepts for interconnecting and delivering Tehachapi wind generation to various load centers. The Report recommended that the study be continued in order to select the best alternative from the four candidate options and to further evaluate the potential for a new interconnect between SCE and PG&E in the Fresno area. This section provides SCE's modifications to these four alternatives plus the results of the SCE-PG&E Fresno area connection study.

It was assumed that a local Tehachapi Area 230 kV system would be developed to support the large amount of wind generation potential identified in the CEC Report. These facilities are common to all project alternatives and can only be developed once more information is made available as to exact wind generation locations and amounts. It is therefore impossible to properly develop the local area network at this point in time.

## 1. TRANSMISSION PLANS INTERCONNECTING WIND RESOURCES IN THE TEHACHAPI AREA TO THE GRID

The four alternatives that remained open from the original TCSG share the same Tehachapi local area wind collector facilities as discussed in Chapter 2, Section 2.2 of the March 16, 2005 TCSG Final Report and differed slightly in the facilities identified to be necessary to connect the wind resource areas to the main bulk power system. These four Tehachapi Interconnection facilities were summarized in Section 1 of Appendix A of the March 16, 2005 TCSG Final Report. SCE has conducted further review of these alternatives and has concluded that modifications are needed to these alternatives due to lack of available undeveloped land to support additional right-of-way requirements. As an example, SCE found it necessary to reroute Segment 2 of the Antelope Transmission Project (Phase 1) in the supplemental CPCN Application (A.04-12-008) filing submitted to the CPUC on September 2005. This reroute was needed to accommodate new housing projects developing adjacent to the existing Antelope-Vincent right-of-way. The following sections provide a detailed discussing of impacts to the four alternatives that were to be further reviewed.

### 1.1. Discussion of Modifications to Proposed Alternatives

### 1.1.1. Antelope-Substation #5 Transmission Section

The conceptual transmission plans identified in the March 16, 2005 TCSG Final Report were based on the assumption that only 300 MW of wind generation was to be located in the Cottonwood Creek area and connected to a proposed Cottonwind 230 kV Switching Station (a.k.a. Substation #5). All four alternatives included a reconductor of the existing Antelope-Magunden No.2 230 kV transmission line section between Antelope and the new switching station assuming the use of a Special Protection System (SPS) could be implemented and approved by the CAISO.

The use of an SPS was found to be unacceptable based on the study results obtained in a system impact study (SIS) performed for the 300 MW wind generation project. The SIS identified that the amount of monitoring points, number of outages, and the total amount of generation tripping required to maintain system reliability violated established CAISO Guidelines for implementing an SPS. Consequently, the recommended upgrade involves replacing an existing single circuit transmission line with a new double-circuit 230 kV transmission line. In addition, recent generation interconnections have been submitted which identify this substation as the point of interconnection. The total amount of wind generation proceeding through the CAISO interconnection process totals 1,110 MW. As a result, both existing single-circuit 230 kV transmission lines will need to be replaced with two double-circuit
230 kV transmission lines. It may be necessary to include additional transmission upgrades due to the large amount of generation interconnection requests in this area.

### 1.1.2. Antelope-Vincent Transmission Section

A detailed review of available land in the area was performed in support of the Antelope Transmission Project Segment 2 and 3 CPCN Supplemental Application. This detailed review concluded that only two 500 kV transmission facilities can be accommodated between Antelope and Vincent without significant impacts to existing residential owners or housing developments currently under construction. Alternative one shown below in Figure 3-1 included one 500 kV and two 230 kV transmission lines between Antelope and Vincent. Alternatives two and three shown below in Figure 3-2 and 3-3 respectively included two 500 kV and two 230 kV transmission lines between Antelope and Vincent. Alternative four included one 500 kV and three 230 kV transmission lines between Antelope and Vincent. In order to maximize capability between Antelope and Vincent, it is recommended that the conceptual transmission plan be modified to include an alternative with two 500 kV transmission lines.

### 1.1.3. Vincent-Rio Hondo/Mesa Transmission Section

SCE has been conducting studies in support of a new Mira Loma-Vincent 500 kV transmission line. The need for this new 500 kV line into the Mira Loma area was identified as part of the SCE CAISO Annual Expansion Program and is required to serve growing load demand in the Mira Loma area. This new line will provide an added benefit of supporting delivery of Tehachapi area wind generation to the SCE load center.

Since last year's report, SCE has integrated this line with the Phase 2 of last year's TCSG Final Report, rebuild of the Antelope-Mesa 230 kV transmission line, in order to minimize the number of facilities and amount of new land disturbance that would otherwise result with building separate transmission projects.

In order to integrate the Vincent-Mira Loma 500 kV transmission line with the Antelope-Mesa Upgrades, the following upgrades are required:

- Rebuild the portion of the existing Antelope-Mesa 230 kV single circuit transmission line between Vincent and the southern boundary of the Angeles National Forest (City of Duarte) with single circuit 500 kV transmission line

- Replace a small section of the existing Vincent-Rio Hondo 230 kV transmission line outside of the Vincent Substation (approximately five miles) with single circuit 500 kV transmission (part of the Mira Loma-Vincent 500 kV transmission line project) to allow operation of this line at 500 kV

- Rebuild the portion of the existing Antelope-Mesa 230 kV single circuit transmission line between the City of Duarte and the Mesa Substation with double-circuit 500 kV transmission line

- Develop and permit a new Mesa 500 kV substation

Previous conceptual studies identified the utilization of the Rio Hondo substation as the 500 kV entry point to the Los Angeles Basin. Further review of this substation site has concluded that insufficient property is available to increase the underlying 230 kV capability needed to support a 500 kV substation. As a result, SCE is currently evaluating the Mesa substation for converting it to 500 kV. This substation site provides sufficient 230 kV transmission capacity to support a 500 kV substation. The substation site could provide for up to twelve 230 kV transmission lines, which serve the Los Angeles Basin, if necessary, without the need to construct new transmission on new right-of-way. In comparison, the Rio Hondo substation site allowed for only three 230 kV transmission lines to serve the Los Angeles Basin load center. Additional 230 kV transmission lines in new right-of-way would be necessary to support a Rio Hondo 500 kV substation site. These new 230 kV transmission lines would be extremely difficult, if not impossible, to construct given the land right-of-way restrictions that exist in the area (i.e. no available land). The new Mesa 500 kV substation will require three 500/230 kV transformers initially due to the large amount of load demand in the area.

### 1.1.4. Mesa-Chino Transmission Section

As part of the Mira Loma-Vincent 500 kV transmission line project, SCE had been evaluating requirements to bring the new 500 kV line all the way into the Mira Loma 500 kV Substation. With the integration of the Mira Loma-Vincent and Antelope-Mesa, SCE is now evaluating the utilization of an existing Mira Loma-Serrano 500 kV transmission line to avoid having to construct the new Mira Loma-Vincent 500 kV transmission line

all the way into Mira Loma. This requirement is supported by preliminary study results, which have identified that outage of the new Mesa-Vincent 500 kV transmission line (part of the Antelope-Mesa Upgrade) results in rerouting a significant amount of power flow towards Mira Loma via Lugo through the step-down transformers at Mira Loma and finally through the underlying 230 kV network towards the Mesa area. As a result, the potential for a voltage collapse and thermal overloads were identified with high deliveries from the north (Path 26, Big Creek Corridor, Ventura area and the Tehachapi area) under loss of the new Mesa-Vincent 500 kV transmission line.

In order to provide continued reliable service to the Mesa local area loads, a second line to Mesa will be required. This line can be added by constructing the Mira Loma-Vincent 500 kV transmission line with double circuit 500 kV standard transmission design from the Mesa area to the Chino area (Mira Loma-Serrano right-of-way). The existing Mira Loma-Serrano 500 kV line can be "cut" and at the point where the new double circuit line joins the existing Mira Loma-Serrano 500 kV transmission line. Utilizing the Mira Loma section of the existing Mira Loma-Serrano 500 kV transmission line can then form the Mira Loma-Vincent 500 kV transmission line. The Mesa-Serrano 500 kV transmission line can be formed by adding a second circuit on the double-circuit 500 kV transmission line between the Mesa area and the Chino area and utilizing the Serrano section of the existing Mira Loma-Serrano 500 kV transmission line.

#### 1.1.5. Second Mesa-Vincent Transmission Section

Depending on the overall increase of power deliveries to the south (i.e. SCE, SDG&E, LADWP, CFE, or Arizona utilities) and corresponding study results under loss of both the new Mesa-Vincent and Mira Loma-Vincent 500 kV transmission lines (same corridor through the Angeles National Forest and same tower from the City of Duarte to the Mesa substation), a second 500 kV transmission line from Vincent may be required in a separate right-of-way. Feasibility studies for the recent batch of interconnection requests will commence shortly (Study Agreement provided to customer), which will result in clarifying timing need for this additional upgrade. As a conceptual plan, SCE envisions utilizing the existing 500 kV transmission line section on the existing Vincent-Santa Clara 230 kV transmission line between Pardee and Vincent and operating it at 500 kV by sectionalizing line and terminating 230 kV section at the Pardee 230 kV bus and 500 kV section at the Pardee and Vincent 500 kV buses. The second 500 kV transmission line to Mesa can then be added by replacing a portion of the existing Pardee-Eagle Rock 230 kV transmission line (second smallest line south of Vincent) towards the Gould area and ultimately down to Mesa. This upgrade could also minimize the amount of loop flow from SCE to LADWP resulting from the addition of significant levels of Tehachapi wind generation.

### 1.2. Common Facilities in Alternatives (Not Modified)

#### 1.2.1.500 kV Transmission Line between Antelope and Pardee

This 500 kV transmission line is also referred to as Segment 1 of the Antelope Transmission Project (Phase 1). The CPCN Application (A.04-12-007) for this transmission line has been filed with the CPUC since December 9, 2004. The application is currently under review by the CPUC with approval anticipated before the end of the year.

### 1.2.2.500 kV Transmission Line between Antelope and Vincent

This 500 kV transmission line is also referred to as Segment 2 of the Antelope Transmission Project (Phase 1). The CPCN Application (A.04-12-008) for this transmission line has been filed with the CPUC since December 9, 2004. A supplemental filing was made by SCE on September 2005 in order to augment environmental information. The application review has recently been initiated by the CPUC and as such SCE does not currently have an anticipated approval date.

### 1.2.3.Initial Transmission Facilities between Antelope and Tehachapi

A new 500 kV transmission line from Antelope to a new Tehachapi area substation site, two new Tehachapi area substations, and a 230 kV transmission line connecting the two new substations collectively are referred to as Segment 3 of the Antelope Transmission Project (Phase 1). The CPCN Application (A.04-12-008) for this transmission line has been filed with the CPUC since December 9, 2004. A supplemental filing was made by SCE on September 2005 in order to augment environmental information. The application review has recently been initiated by the CPUC and as such SCE does not currently have an anticipated approval date.

### 1.2.4.Second 500 kV Transmission Line between Antelope and Tehachapi

This 500 kV transmission line is similar to the 500 kV transmission line identified in Segment 3 of the Antelope Transmission Project but would utilize a separate right-of-way to provide sufficient separation thus avoiding conditions which could result in simultaneous loss of both transmission lines. Putting the second Antelope-Tehachapi 500 kV transmission line on the same right-of-way would limit the amount of Tehachapi area wind generation that can be supported to 1,400 MW due to CAISO Spinning Reserve requirements.

### 1.2.5. Additional Reactive Resources

Additional reactive resources may need to be added throughout the network in order to restore bus voltages to levels identified prior to adding and dispatching the Tehachapi area wind resources. With all the transmission upgrades needed to support the Tehachapi area and new Mira Loma-Vincent 500 kV transmission line, it is unclear exactly how much and where such reactive support should be located. Therefore, these resources where not included into this conceptual transmission plan. SCE will identify how much and where such reactive support should be installed as part of the detailed interconnection

studies currently underway. If additional permitting is required, due to the need for substation expansion to support additional reactive resources, SCE will identify such requirements as part of the CPCN Applications to be submitted as required per CPUC Resolution E-3969.

## 1.3. Uncommon Facilities in Alternatives (Not Modified)

### 1.3.1. Third 500 kV Transmission Line between Antelope and Tehachapi

Alternative 2 included a third 500 kV transmission line between Antelope and Tehachapi. This line is similar to the 500 kV transmission line identified in Segment 3 of the Antelope Transmission Project Separation would only be required if the amount of generation tripping under loss of both 500 kV lines in the same right-of-way exceeds 1,400 MW. Without the benefit of detailed studies (power flow, post-transient voltage, and transient stability), the assumption can be made that this third line could potentially be placed in the same right-of-way as the second 500kV transmission line between Antelope and Tehachapi.

### 1.3.2. New 500 kV Transmission Line from Tehachapi to PG&E

SCE's Alternatives 1, 3, and 10 included a new 500 kV transmission line north of Tehachapi towards PG&E. For evaluation of the SCE network, Alternatives that involve a 500 kV transmission line to the north from Tehachapi were assumed to terminate at Midway. However, evaluation of the PG&E network considered terminating the transmission line further north due to anticipated potential transmission problems North of Midway Substation. Such an increase is likely to occur for two reasons:

1. The first involves transferring 2,000 MW more power on an already constrained path if Tehachapi area wind generation is to displace existing generation resources located in northern and central PG&E system.

2. The second is attributed to reduction in Path 15 transfer capability from 5,400 MW down to 4,100 MW if Tehachapi area wind generation is to displace existing generation resources located in the Midway area. Such reduction is necessary since the 5,400 MW rating can only be supported when the Midway area generation is dispatched as part of the Path 15 Remedial Action Scheme (RAS). Displacing this generation in order to accommodate the Tehachapi wind resource will result in reducing the support provided in the RAS, thus adversely impacting Path 15 transfer capability and will lead to increased congestion.

From an SCE perspective, conceptual study results are not anticipated to differ much regardless of where PG&E ultimately terminates the new 500 kV transmission line, or whether there would be a new PG&E 500 kV line, since study results from all parts of the systems will be overlaid to develop the integrated conceptual plans.

Figure 3.1.1
TCSG Alternative 1 Identified in the March 16, 2005 TCSG Final Report

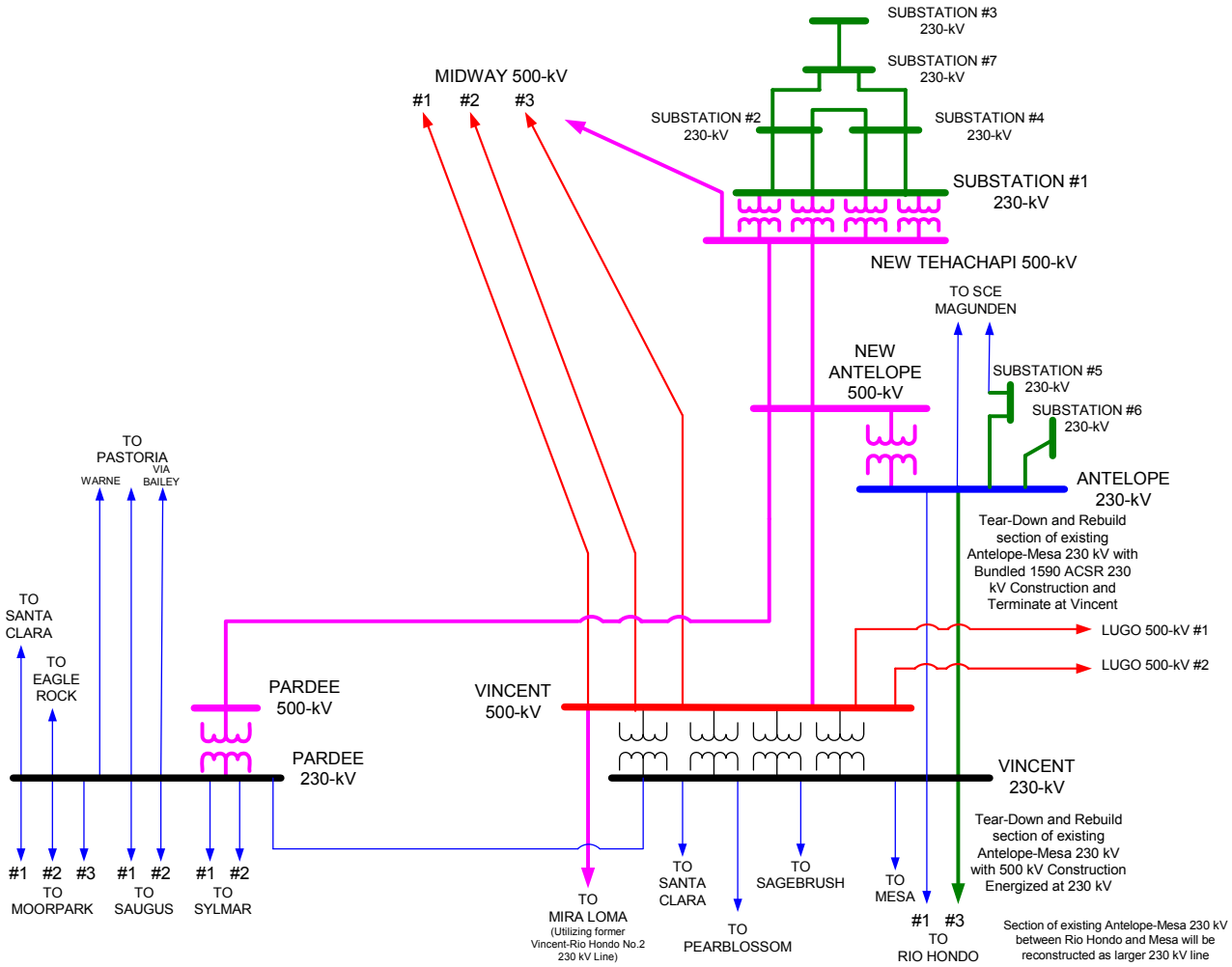


Figure 3.1.2
TCSG Alternative 2 Identified in the March 16, 2005 TCSG Final Report

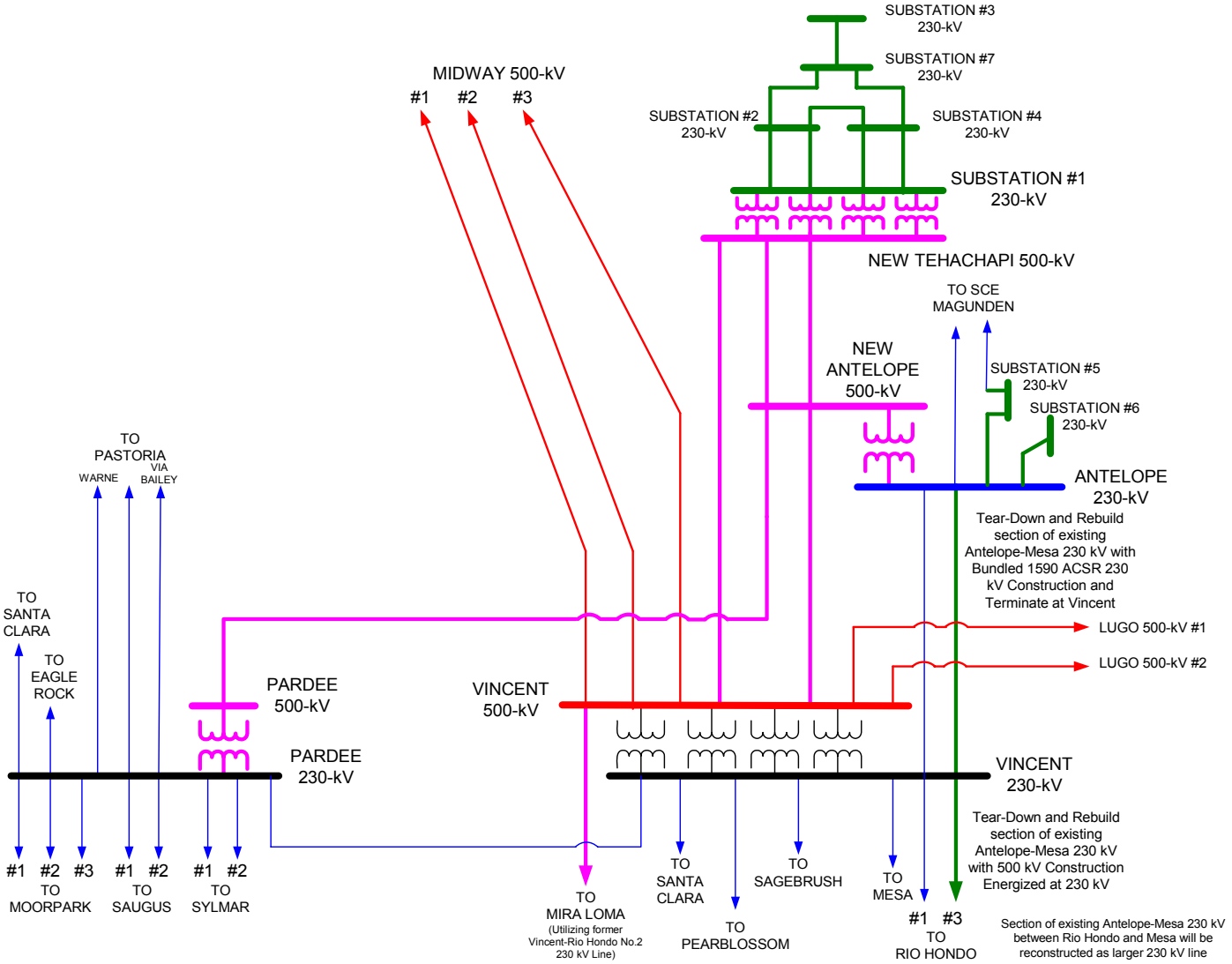


Figure 3.1.3
TCSG Alternative 3 Identified in the March 16, 2005 TCSG Final Report

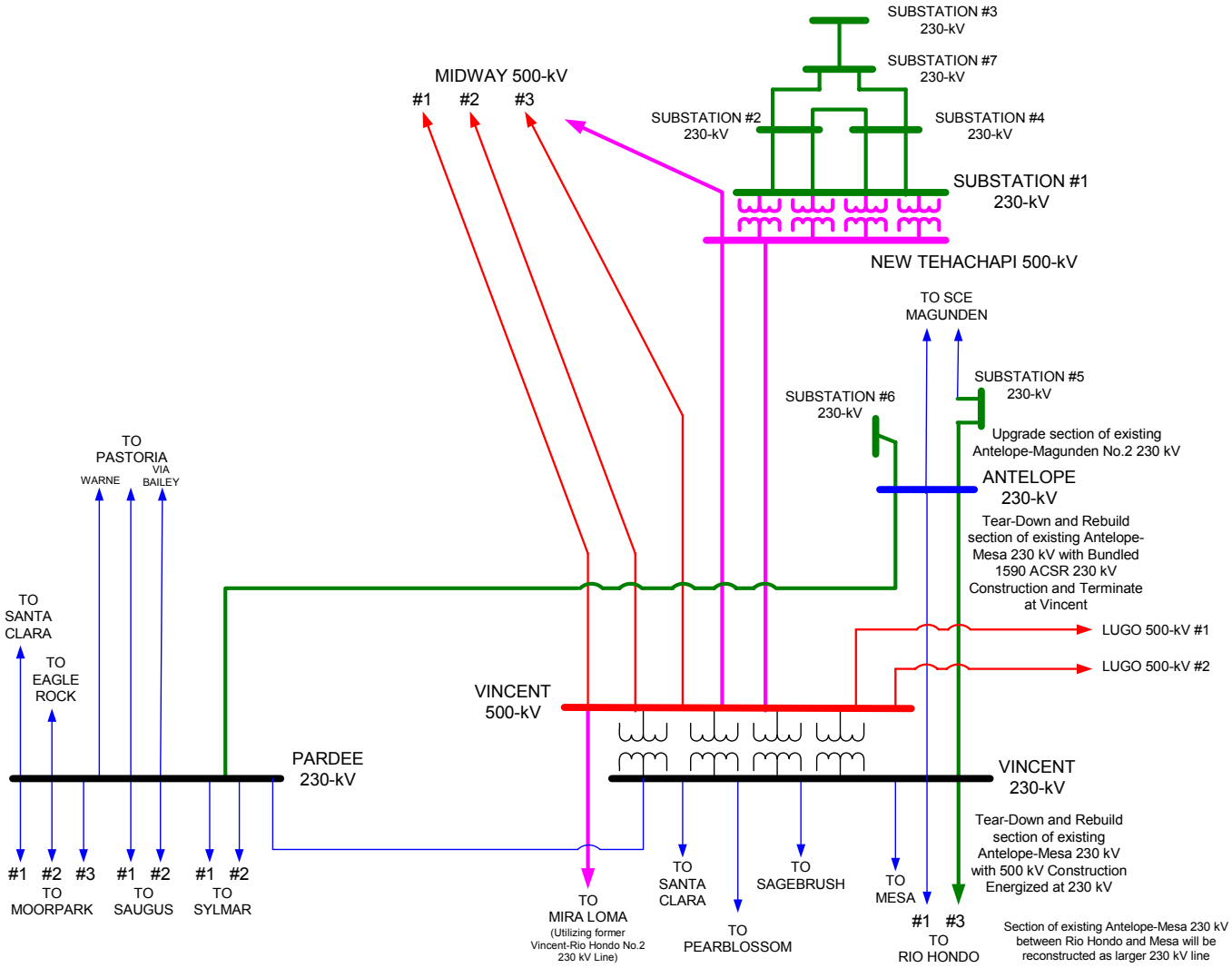


Figure 3.1.4
TCSG Alternative 10 Identified in the March 16, 2005 TCSG Final Report

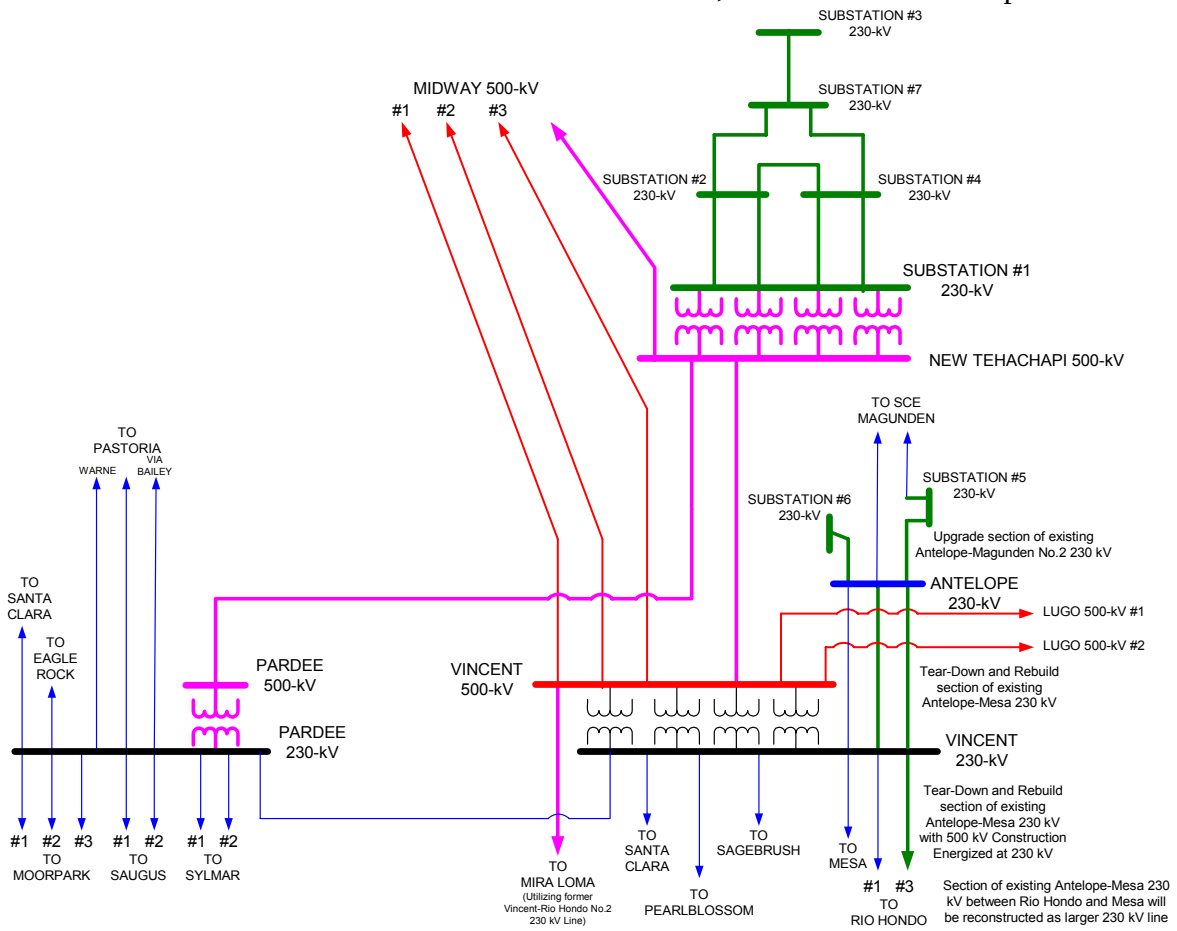
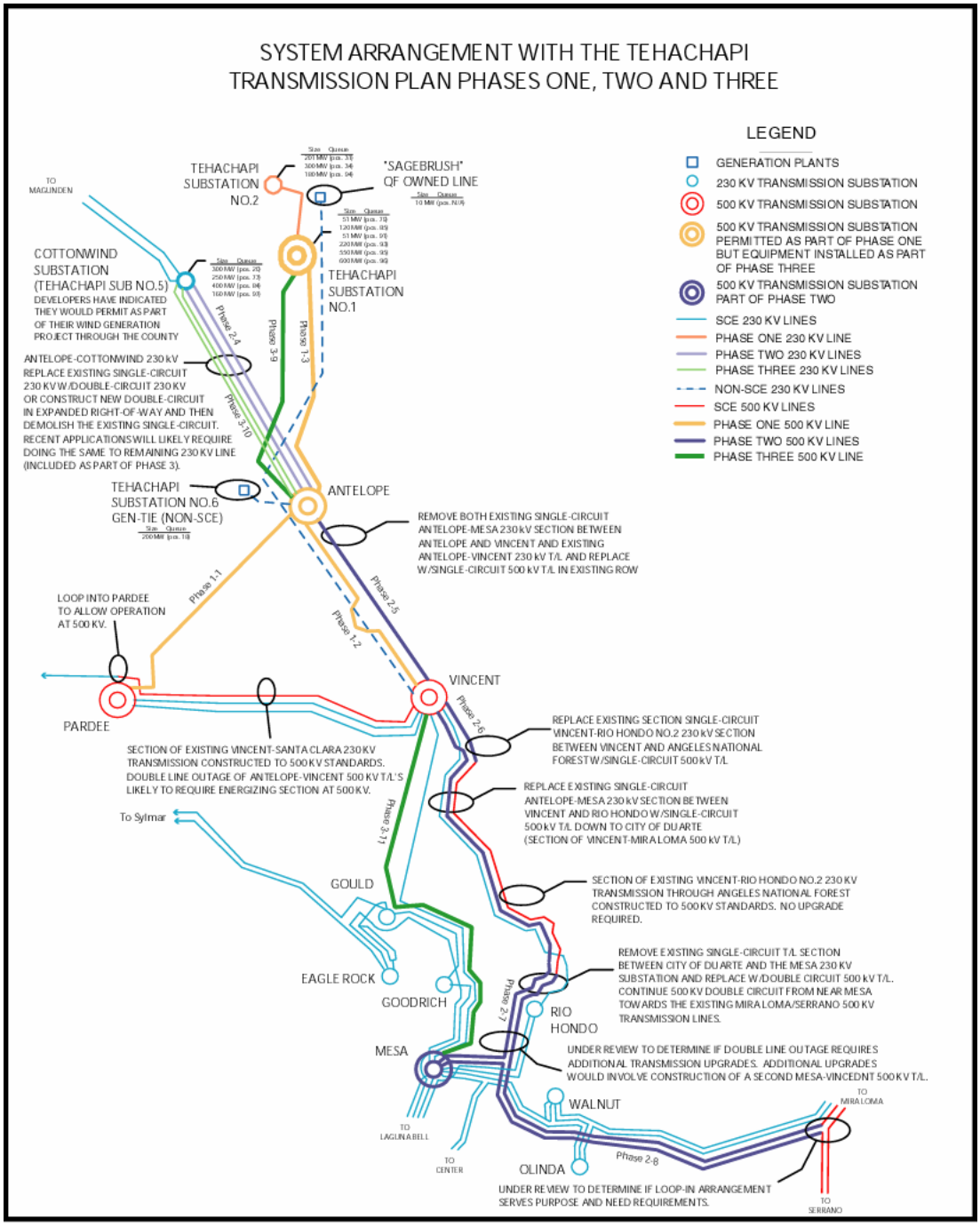


Figure 3.1.5
Revised Tehachapi Transmission Plan



## 2. GRID UPGRADES TO DELIVER TEHACHAPI WIND RESOURCES – STUDY RESULTS

SCE is in the process of performing Feasibility, System Impact, and Facilities Studies for a number of wind generation projects proceeding through the interconnection process. As a result, SCE did not revisit the previous conceptual power flow studies associated with the four alternatives remaining on the table. Instead, SCE utilized the study results from a limited number of Feasibility studies conducted to modify the previous transmission plans as presented above in Section 1.

With the modification included into the study case, SCE identified a few additional impacts that may need additional upgrades. The first is that increase power deliveries into the Cottonwind Substation (i.e. Substation #5) results in power flow "loop flow" up towards the SCE Magunden Substation and down the west leg of the corridor towards the Pastoria and Pardee Substations. The second is the potential for "loop flow" to impact three LADWP 230 kV transmission lines from Sylmar to Rinaldi.

### 2.1. Loop Flow on the Magunden-Pastoria-Pardee and Sylmar-Rinaldi Transmission Corridors

#### 2.1.1. Loop Flow on the Magunden-Pastoria-Pardee Corridor

Depending on which generation resources are displaced, the amount of "loop-flow" increases loading on the three Magunden-Pastoria 230 kV transmission lines as well as the three transmission lines south of Pastoria. Two of the three transmission lines between Magunden and Pastoria are small conductored lines, which have a limited capability of 825 amps (approximately 325 MVA). The third line is a larger conductored line with a 1240 amp capability (approximately 490 MVA). As far as transmission south of Pastoria, two of these three lines are in the process of being reconductored with a trapezoidal ACSS conductor in order to increase capacity from 885 amps (approximately 350 MVA) up to 1,500 amps (approximately 600 MVA). The remaining line is conductored with 1240 amp capability (approximately 490 MVA) and is not being reconductored at this time. Reconductoring of the two smaller Magunden-Pastoria 230 kV and the Pastoria-Pardee-Warne 230 kV transmission lines may be required to support the large amount of generation interconnection at the Cottowind Substation. Such determination will be made as part of the detailed studies currently underway.

#### 2.1.2. Loop Flow on Los Angeles Department of Water and Power (LADWP) Sylmar-Rinaldi Transmission Corridor

Imports from the north to the main Los Angeles Basin is delivered by a number of 500 and 230 kV transmission lines as well as through the Pacific DC Intertie. Since the network is an integrated network, schedules and actual flows may not coincide. This is

due to the fact that there exist certain amounts of "loop-flow." In other words, power deliveries will follow the path of least resistance (impedance) from the source to the load.

The addition of significant amounts of Tehachapi wind generation results in increasing deliveries from the north to the Los Angeles Basin. This increase in deliveries from the north increases loadings on the following transmission lines:

- 500 kV transmission lines from Vincent to Lugo and ultimately down to Mira Loma
- 230 kV transmission lines from Pardee to Sylmar and from Pardee to Gould
- 230 kV transmission lines from Vincent to Rio Hondo and from Vincent to Mesa
- 230 kV transmission lines from Sylmar to Rinaldi (LADWP) due to loop flow
- 500 kV transmission line from Rinaldi to Victorville (LADWP) and ultimately to Lugo due to loop flow.

These increases in flow results in the potential to overload the 230 kV transmission lines between Sylmar and Rinaldi (LADWP). SCE does not know exact nature of transmission limitation, as LADWP did not actively participate in the collaborative study process. Consequently, mitigation requirements within the LADWP electrical system were not explored. However, SCE has identified the need for adding a second Vincent-Mesa 500 kV transmission line and operating transmission between Pardee and Vincent at 500 kV. SCE envisions utilizing the existing 500 kV transmission line section on the existing Vincent-Santa Clara 230 kV transmission line between Pardee and Vincent and operating it at 500 kV by sectionalizing line and terminating 230 kV section at the Pardee 230 kV bus and 500 kV section at the Pardee and Vincent 500 kV buses. The second 500 kV transmission line to Mesa can then be added by replacing a portion of the existing Pardee-Eagle Rock 230 kV transmission line (second smallest line south of Vincent) towards the Gould area and ultimately down to Mesa. It is expected that this upgrade would minimize the amount of loop flow through the Sylmar-Rinaldi 230 kV transmission lines.

## 2.2. Big Creek-Fresno Tie Evaluation

The CPUC and PG&E demonstrated interest in determining if this interconnection can supplement capability to move power from SCE to PG&E or possibly eliminate the need for transmission upgrades from PG&E to the Tehachapi area. The interconnection involves constructing a new 230 kV switching station at the crossing of the PG&E-owned and SCE-owned transmission lines. The existing SCE-owned Big Creek-Rector 230 kV and PG&E-owned Gregg-Helms 230 kV transmission lines are proposed to be looped into this new switching station as shown below in Figure 3.2.1. Power flow control devices such as phase-shifting transformers or unified power flow controllers (UPFC) will be required to "push" power from the SCE network to the PG&E network thereby appearing as additional load in the SCE Big Creek 230 kV corridor north of Magunden.

To evaluate the north of Magunden portion of the Big Creek Corridor, parametric studies covering 8,760 hourly load and generation conditions based on historical data were conducted. These studies were performed utilizing a simplified equivalent power flow case reflecting only the north of Magunden SCE facilities and the facilities from PG&E's Gregg Substation to the Helms Pump Storage Facilities. These facilities are all connected radial and can therefore be "cut-out" to examine local area problems. Complete WECC base cases were subsequently utilized to examine overall system performance and validate the local area problems identified in the parametric studies. Two methods were used in examining the local area. The fist method involved modeling a fixed power flow from the SCE network to the PG&E network throughout the entire calendar year while the second method involved modeling a fixed tap setting.

Fixed Tap Setting Model

This model reflects the use of traditional phase-shift transformers to connect the PG&E and SCE systems together. Several limitations exist with use of traditional phase-shift transformers that affect system operations. The limitations are summarized as follows:

- Phase-shift transformers have mechanical moving load taps that are used to adjust amount of flow through the transformer
- These load taps are generally set and adjusted on a seasonal basis
- Load taps are slow moving and thus do not respond well to system dynamics
- Load taps require frequent maintenance if they are constantly used.
- Phase-shift transformers increase reactive losses on the system adversely affecting system voltages

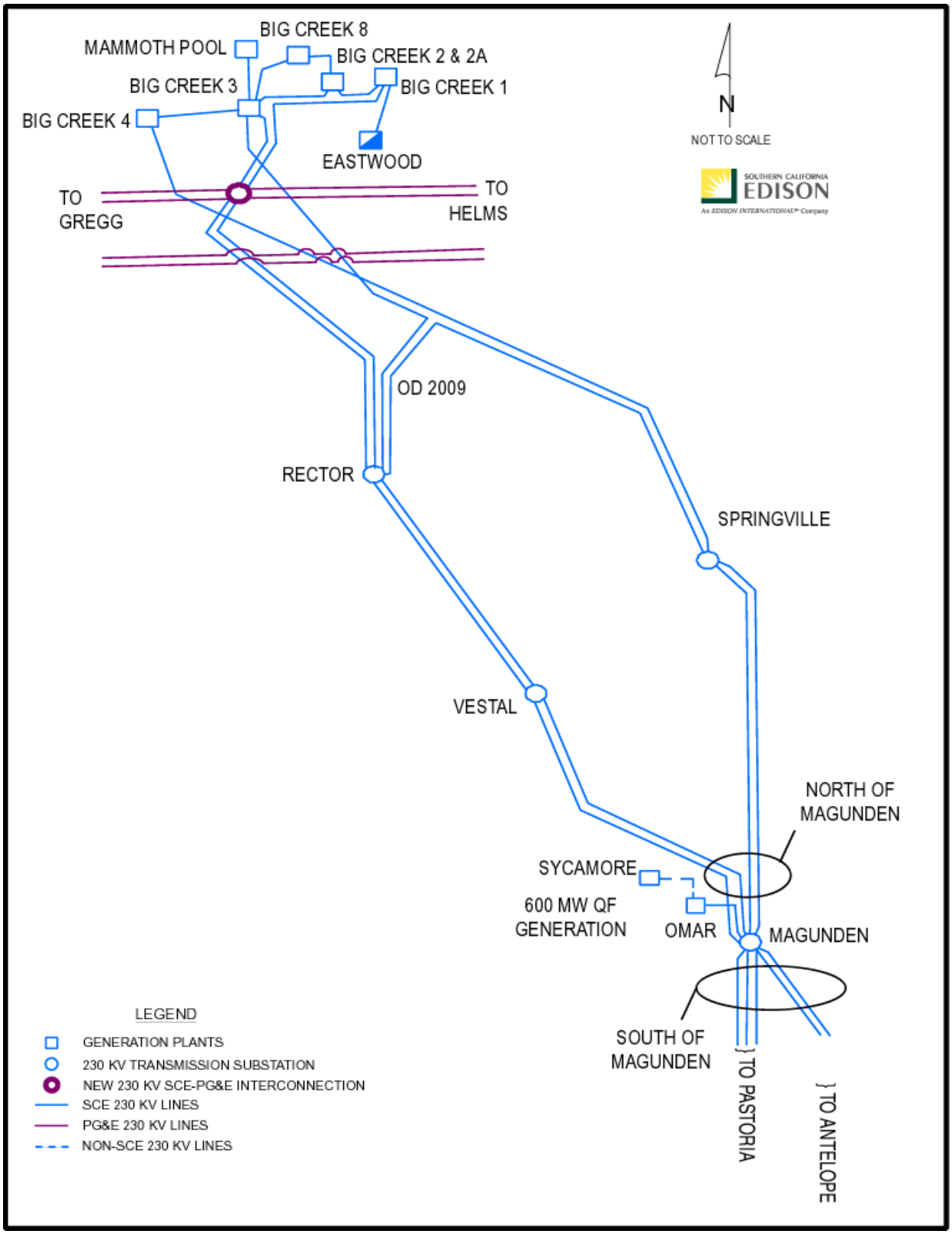
These limitations can subject the system to unintended performance. As a result, a robust transmission system is required to support a transformer phase-shifted system.

Fixed Power Flow Model

This model reflects the use of Flexible AC Transmission System (FACTS) technology to connect the PG&E and SCE systems together. Implementing a system tie with a FACTS device eliminates all of the limitations identified above. The benefits of utilizing a FACTS device are summarized as follows:

- Power electronics eliminate all mechanical moving parts
- The absence of mechanical moving parts allows for dynamic settings not possible with a phase-shift transformer
- FACTS devices respond well to system dynamics
- FACTS devices can be developed as to provide reactive resources improving system voltages

Figure 3.2.1
Big Creek-Fresno System Tie



### 2.2.1. Big Creek-Fresno Tie Study Results – Fixed Power Flow Model

#### 2.2.1.1. Impacts to South of Magunden Line Flows

The addition of a new system tie between SCE and PG&E with a device to "push" fixed power from SCE to PG&E has the equivalent effect of increasing load in the San Joaquin Valley. This increase is graphically illustrated below in Figures R-1 through R-6. Figure R-1 illustrates the hourly South of Magunden line flows prior to adding the new system tie with adjusted San Joaquin Valley load to reflect 2014 forecast. Figures 3.2.2 through 3.2.5 illustrate the hourly South of Magunden line flows with the inclusion of a 300 MW, 500 MW, 1,000 MW, and 1,200 MW new system tie. Figure 3.2.7 provides the corresponding load duration curves for various system tie levels. SCE notes that adding a 300 MW system tie has the equivalent effect as 30 years of local load growth.

Figure 3.2.2
South of Magunden Flow Patterns Adjusted for 2014 Load

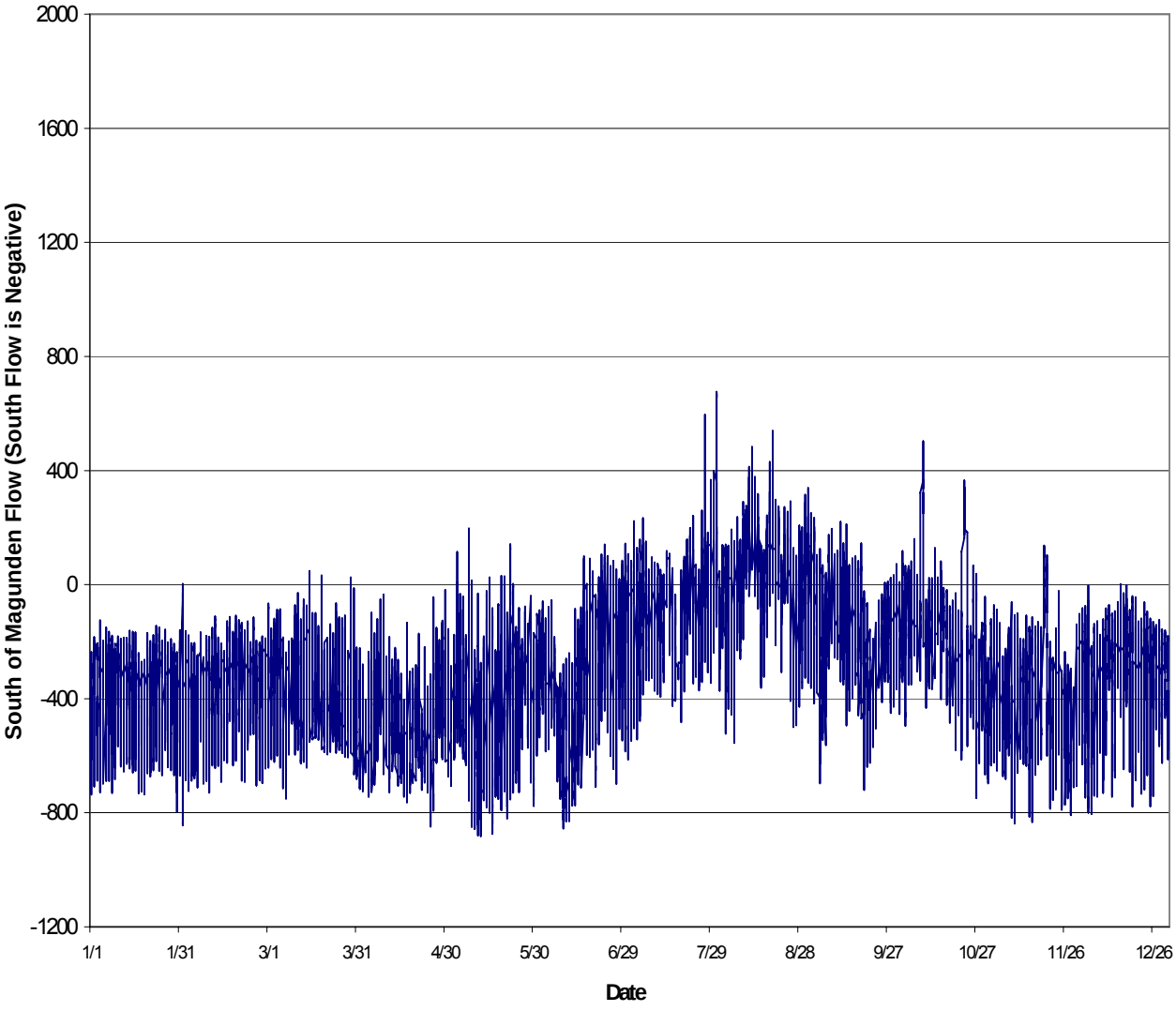


Figure 3.2.3
South of Magunden Flow Patterns with 300 MW System Tie

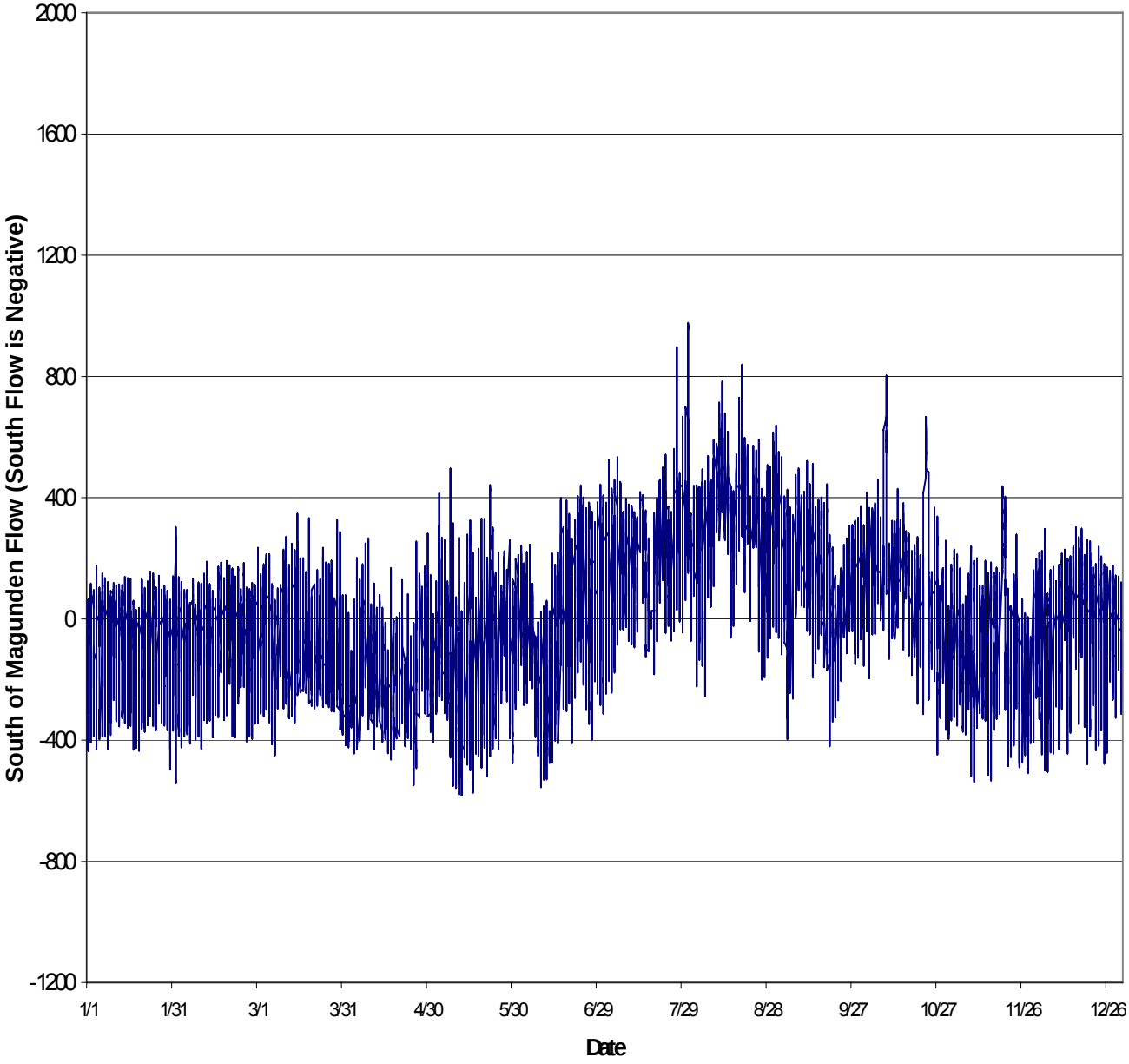


Figure 3.2.4
South of Magunden Flow Patterns with 500 MW System Tie

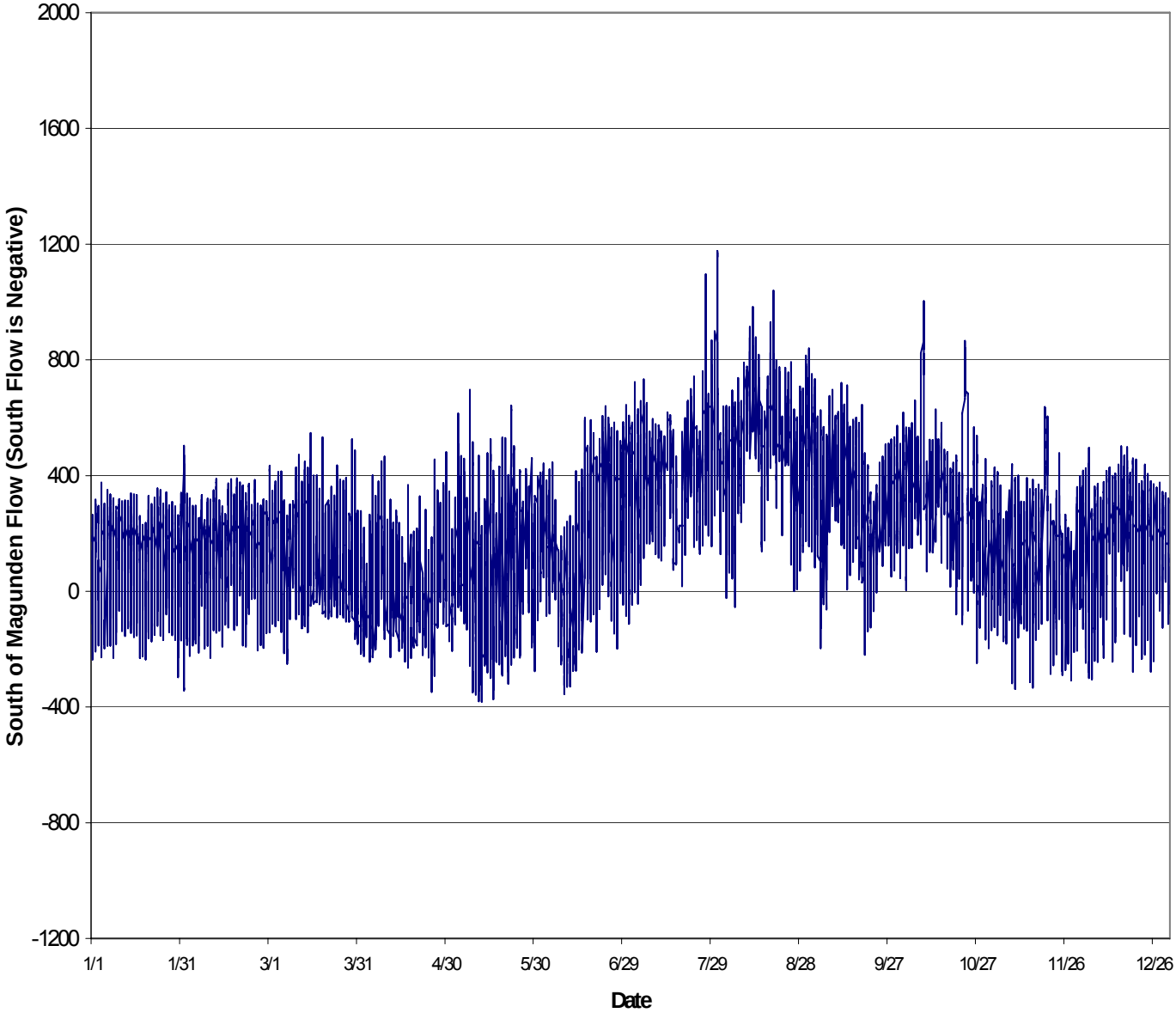


Figure 3.2.5
South of Magunden Flow Patterns with 1,000 MW System Tie

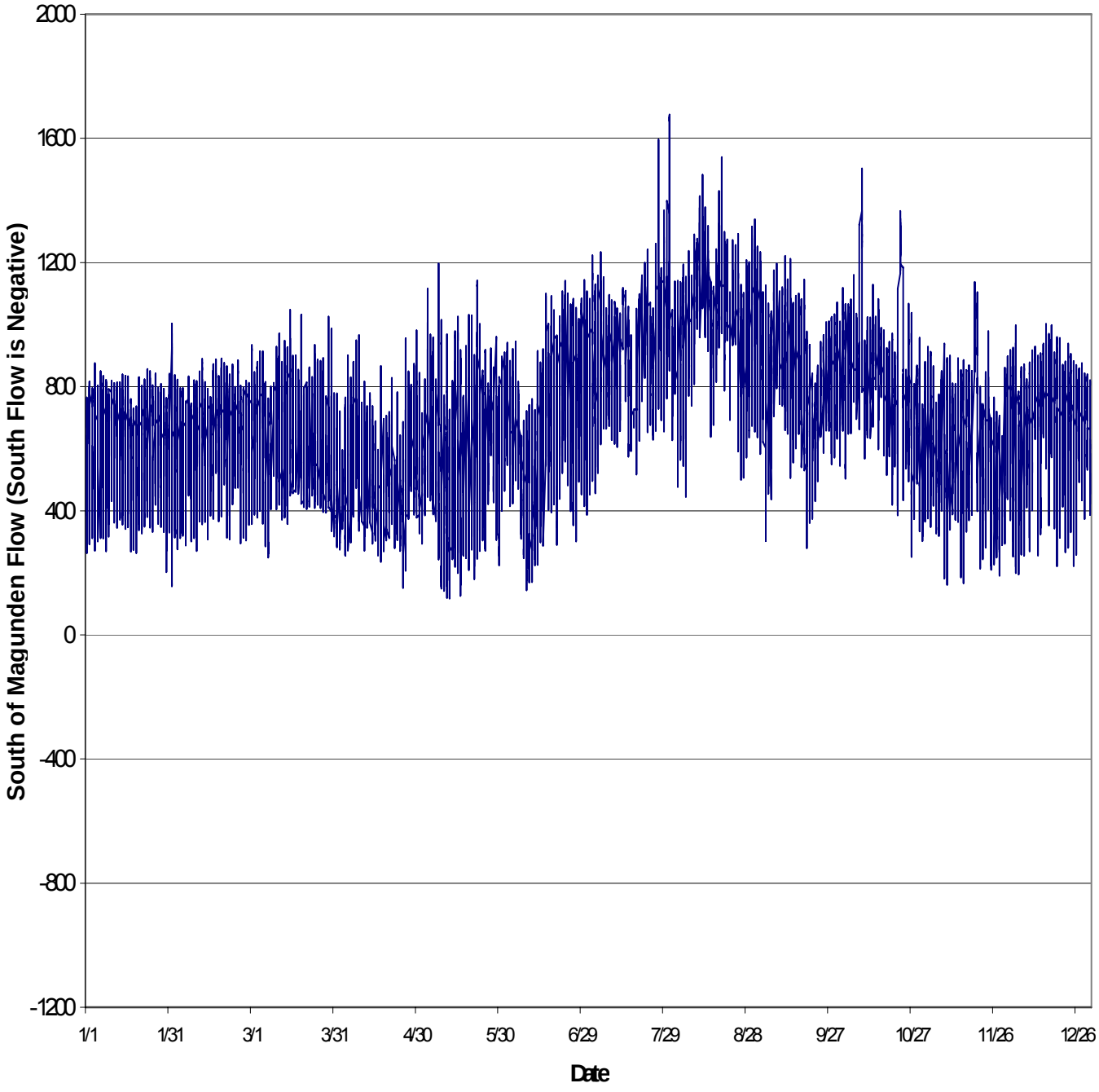


Figure 3.2.6
South of Magunden Flow Patterns with 1,200 MW System Tie

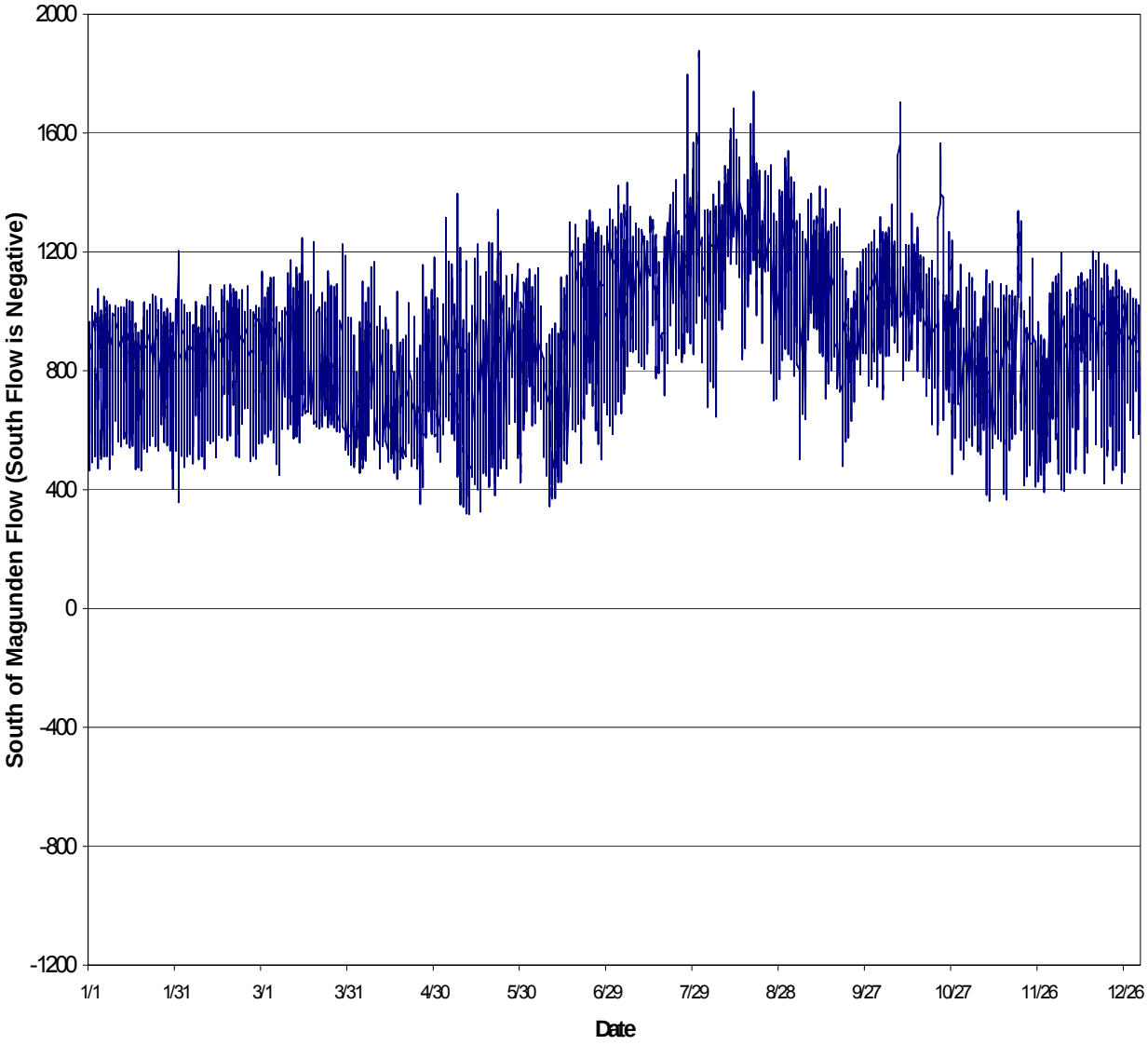
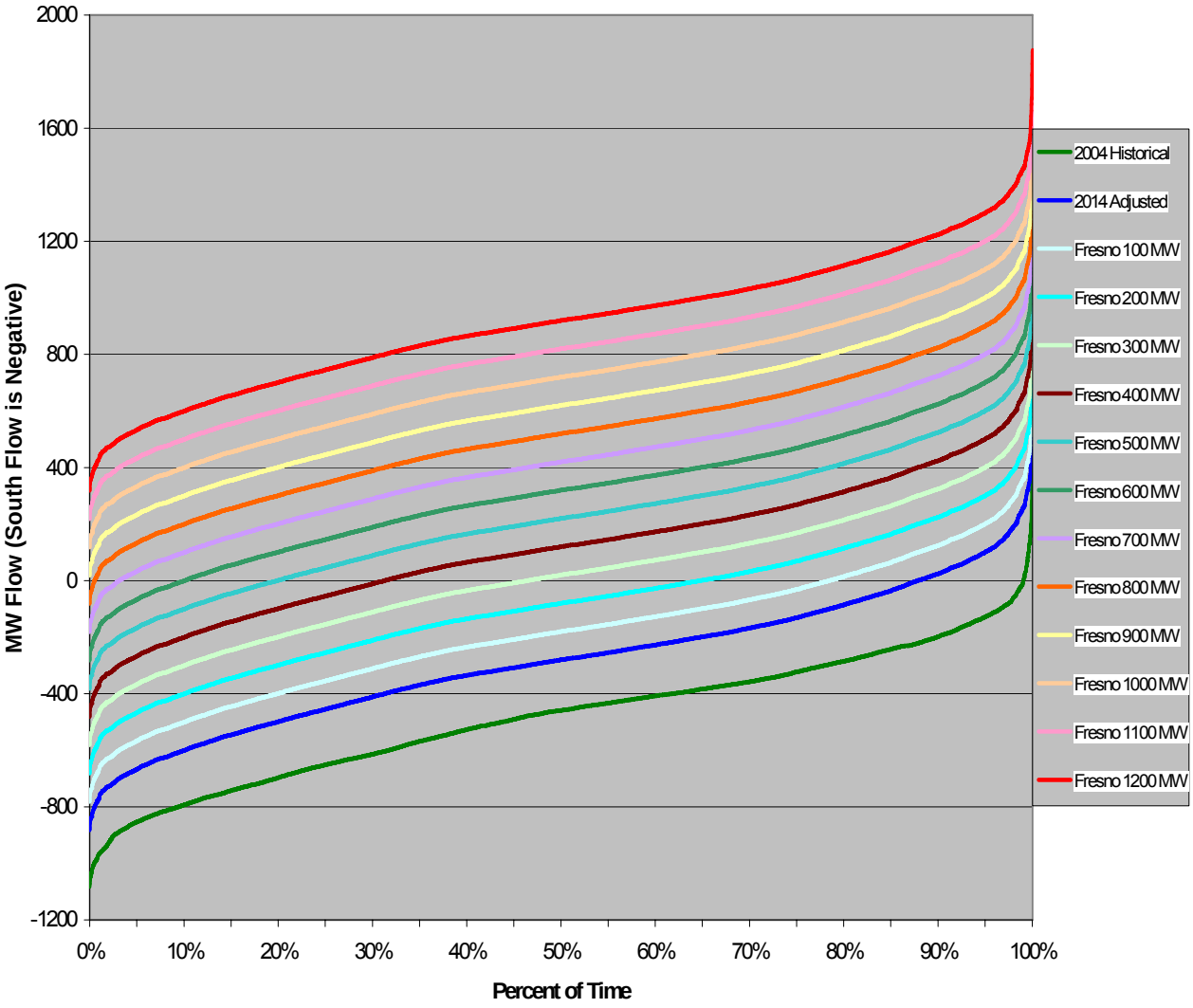


Figure 3.2.7
South of Magunden Flow Patterns with 1,200 MW System Tie

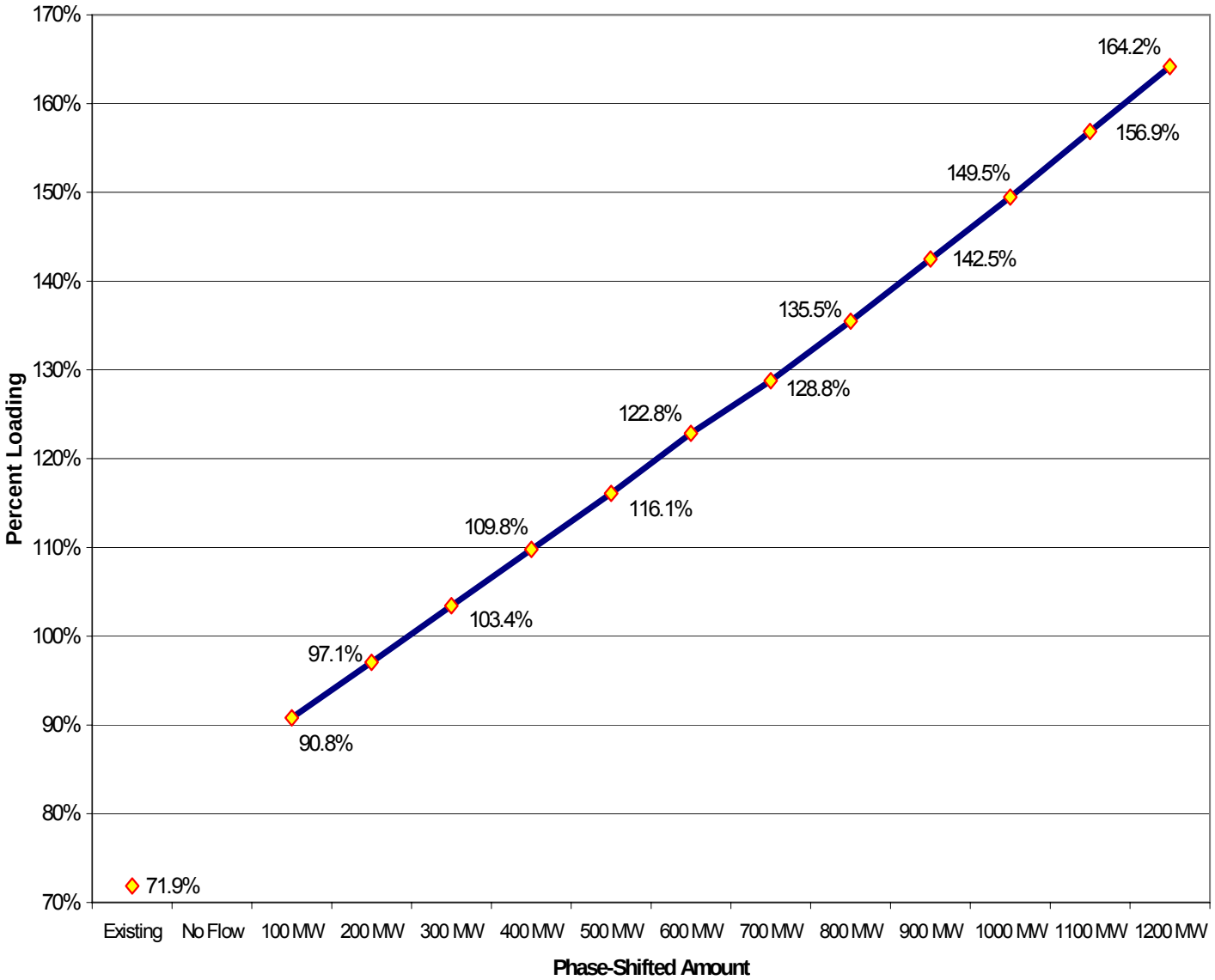



### 2.2.1.2. North of Magunden 230 kV Transmission Line Loadings Under Base Case Conditions

Four 230 kV transmission lines connect the Big Creek hydro complex, located in northern Fresno County, to the rest of the SCE network. Two of the four lines connect Big Creek to the SCE Rector 230 kV Substation, continue south towards the SCE Vestal 230 kV Substation and finally connect to the SCE Magunden 230 kV Substation. The other two lines connect Big Creek to the SCE Springville 230 kV Substation and continue south to the SCE Magunden 230 kV Substation.

The new system tie is proposed to connect to the two SCE 230 kV transmission lines heading towards the SCE Rector Substation, as shown above in Figure 3.2.1. Power flow study results indicate that additional system upgrades will be necessary to mitigate thermal overload problems identified with the addition of the new system tie represented as a fixed power flow model. Loading on the section of the existing Big Creek3-Rector 230 kV line between Big Creek 3 and the new system tie was found to exceed the maximum allowable thermal limits with all facilities in-service. Depending on the amount of power "pushed" from SCE to PG&E, thermal loading was identified to increase from 91% of the normal conductor limit up to 164% as shown below in Figure 3.2.8. To mitigate this overload, rebuild of a section of the existing Big Creek3-Rector 230 kV transmission line will be necessary to support a larger conductor.

Figure 3.2.8
Section of Existing Big Creek3-Rector 230 kV (BC to Fresno Tie)
Line Loading with All Facilities In-Service



Figures 3.2.9 through Figure 3.2.13 illustrate loading on the other transmission facilities in the Big Creek Corridor north of the SCE Magunden 230 kV Substation.

Figure 3.2.9
Section of Existing Big Creek1-Rector 230 kV (BC to Fresno Tie)
Line Loading with All Facilities In-Service

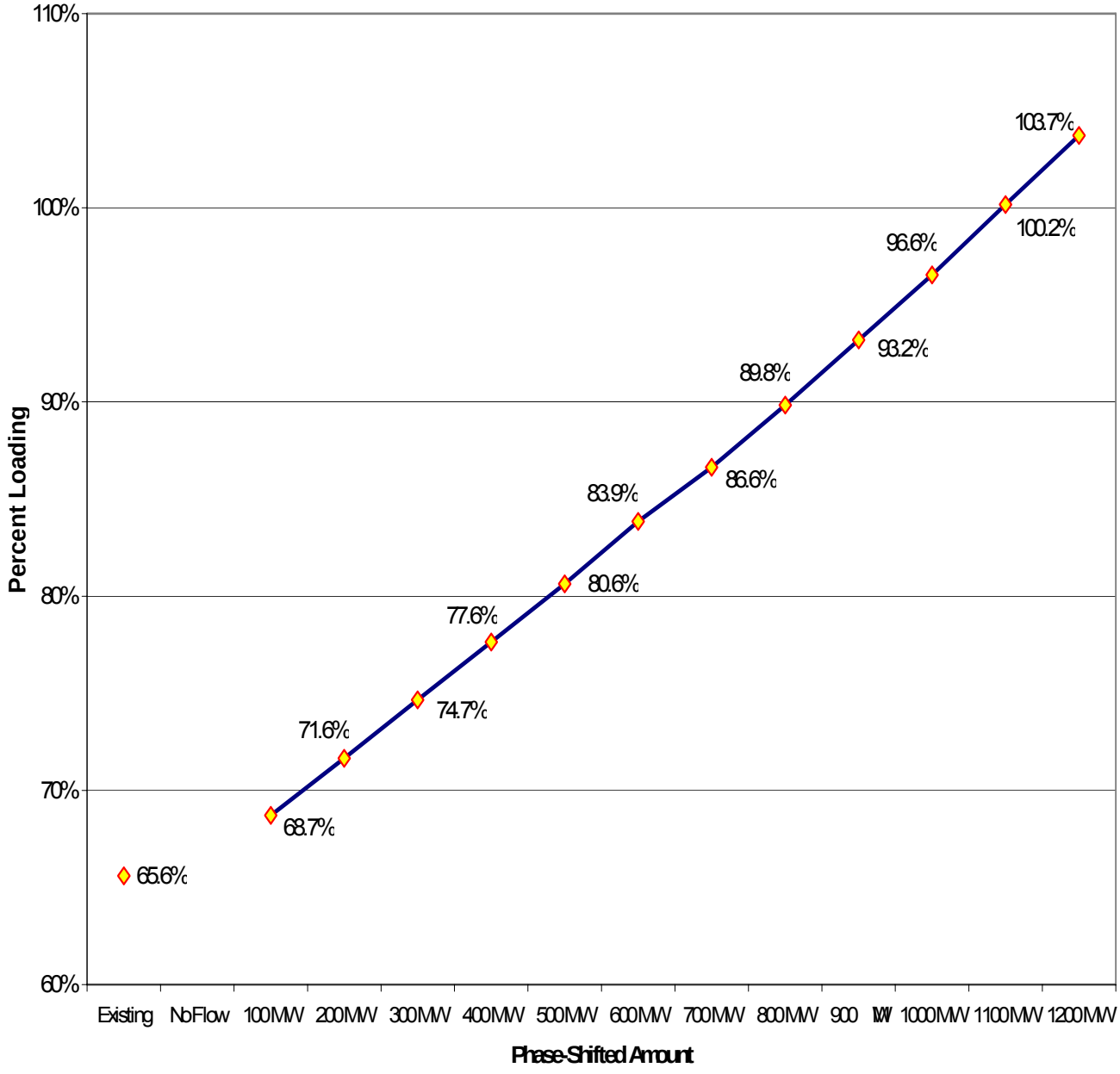


Figure 3.2.10
Section of Both Existing Big Creek-Rector 230 kV (Rector to Fresno Tie)
Line Loading with All Facilities In-Service

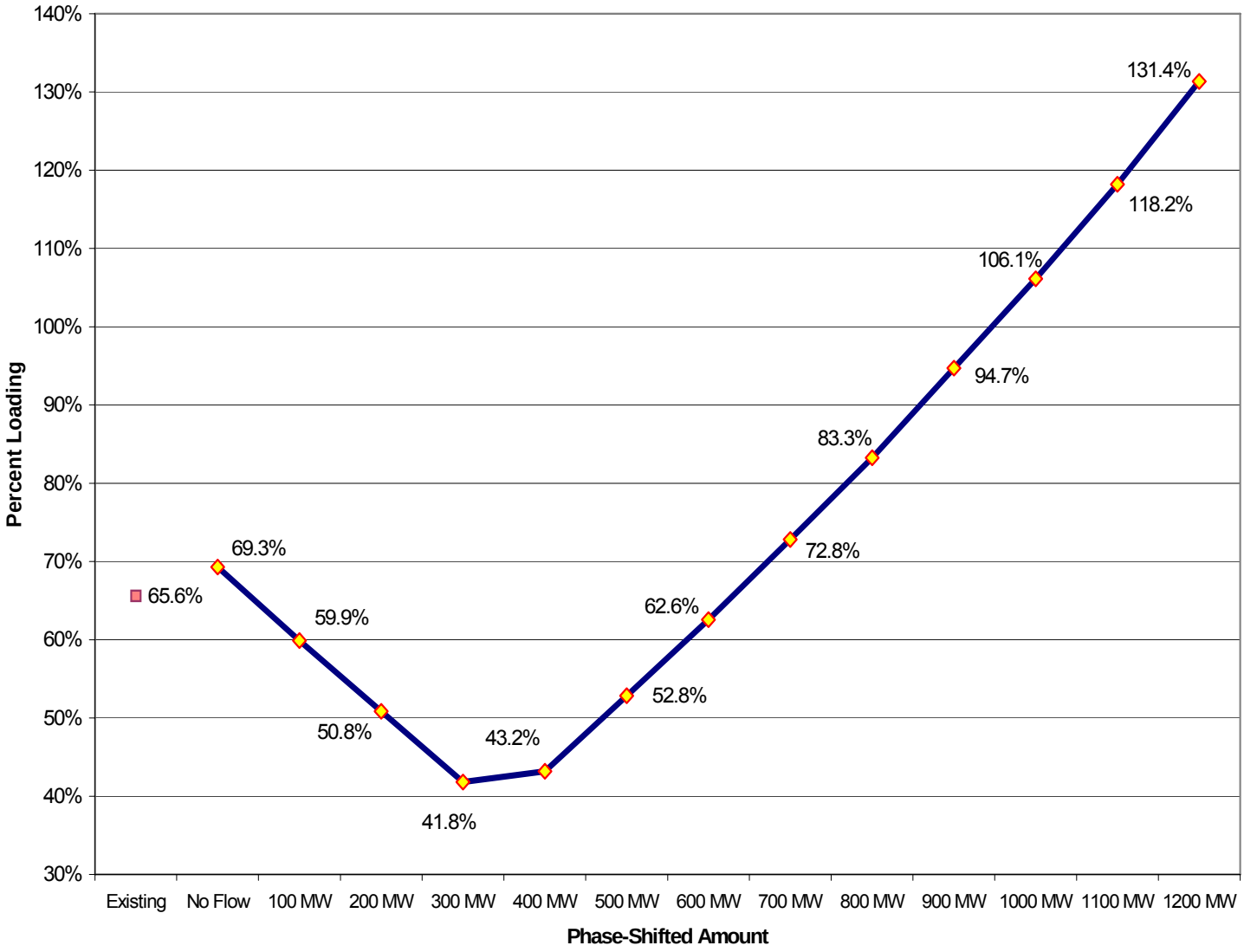


Figure 3.2.12
Both Existing Vestal-Rector 230 kV
Line Loading with All Facilities In-Service

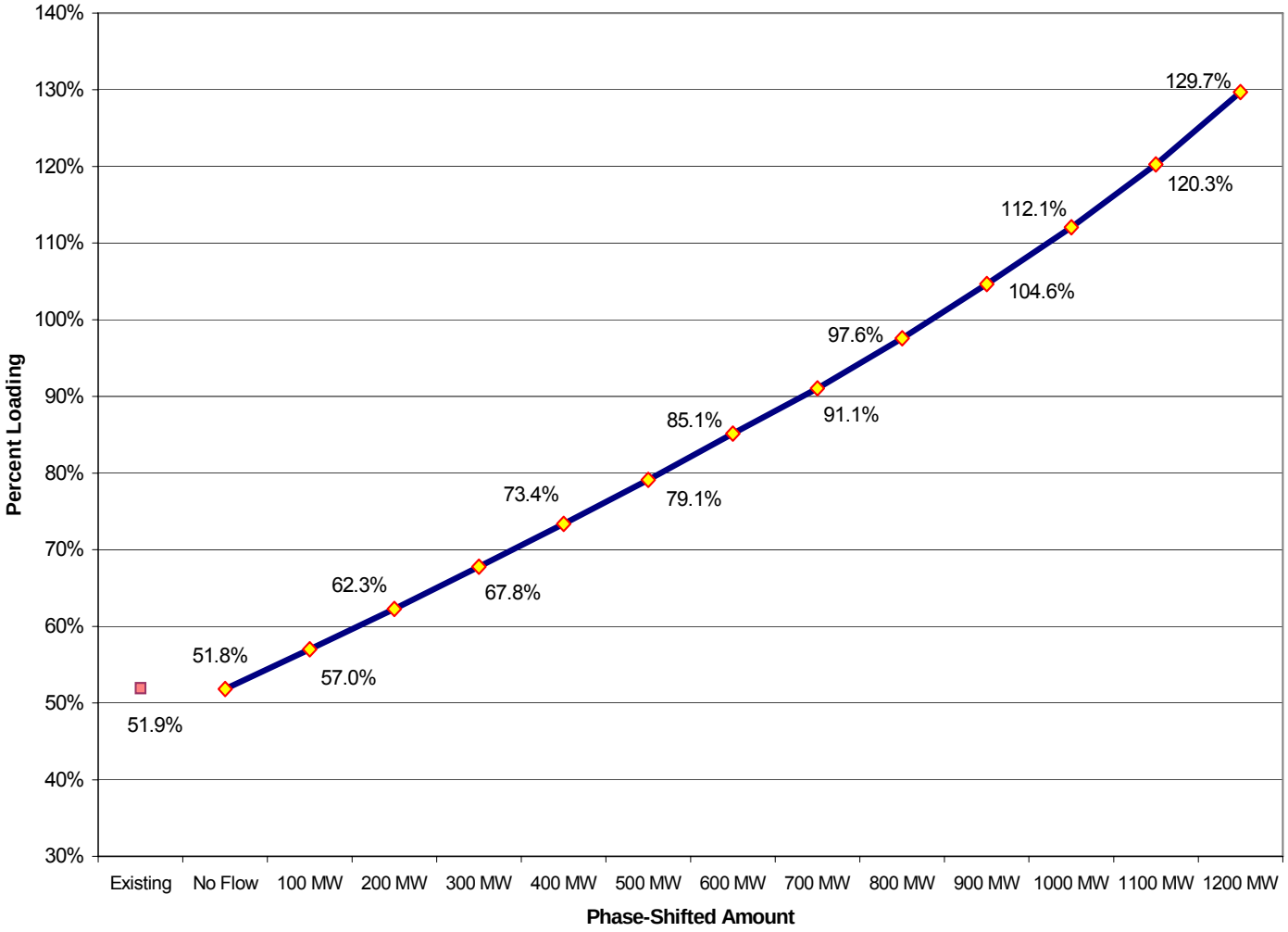
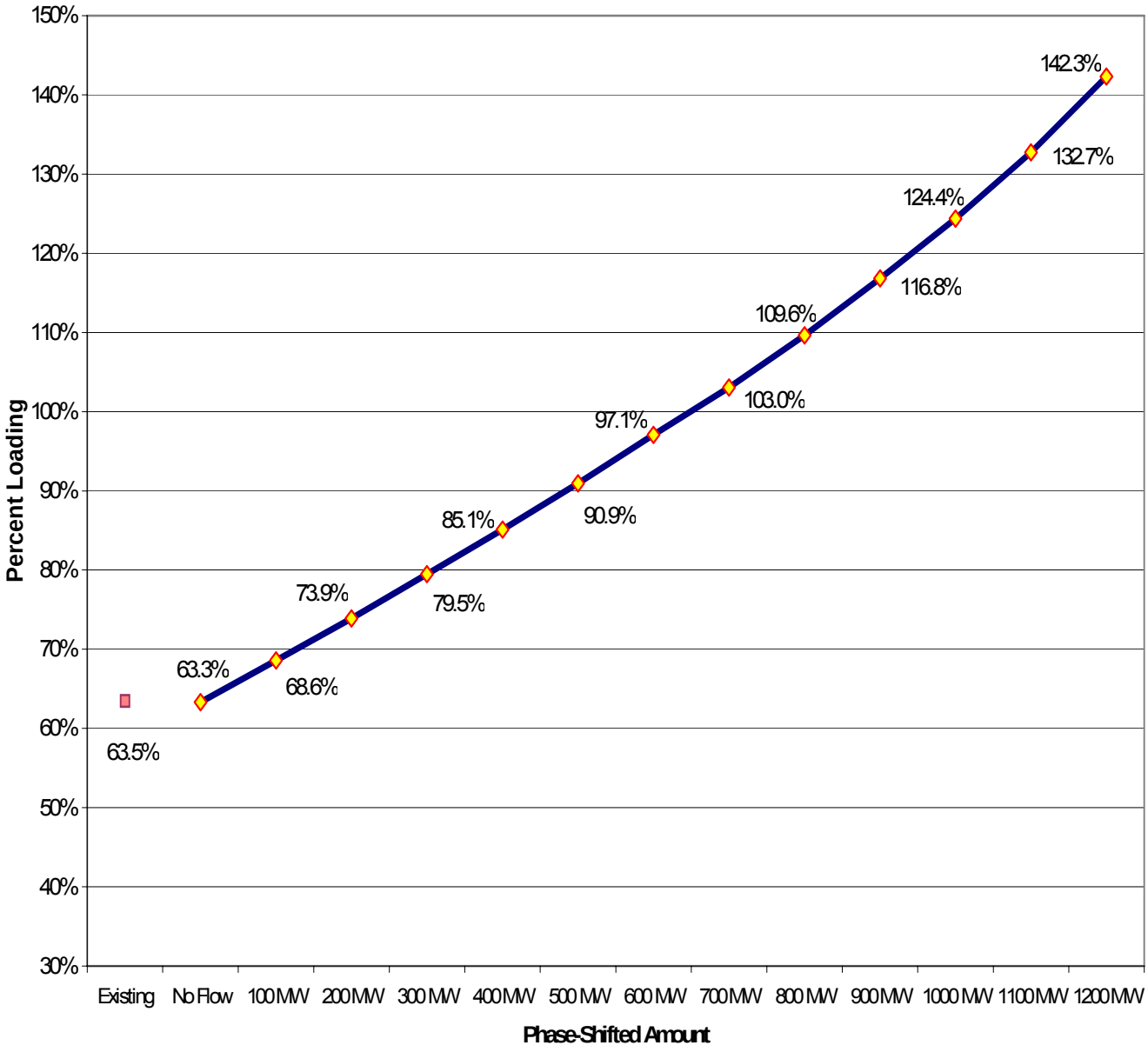


Figure 3.2.13
Both Existing Magunden-Vestal 230 kV
Line Loading with All Facilities In-Service

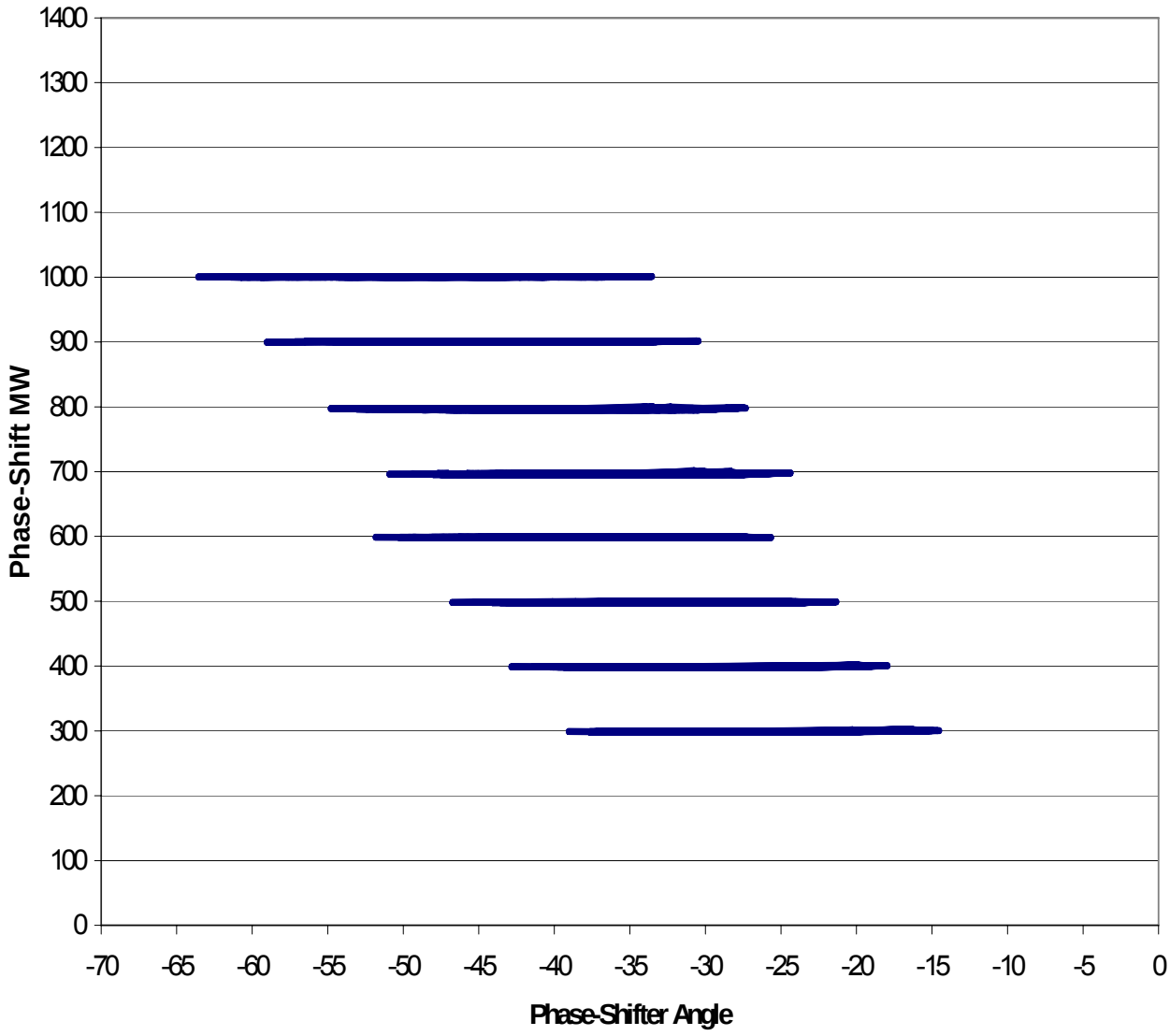



### 2.2.1.3. Phase-Shift Angle Requirements

Detailed system studies indicate a wide range of phase-shift operation in order to maintain the specified power level. Such operation is indicative of a need to install a unified power flow controller which utilizes power electronics to maintain the specified power flow instead of a traditional phase-shift transformer which cannot be manage to

maintain a constant flow. The amount of phase-shift angle capability required depends on numerous factors. These factors involve SCE local area load and generation conditions (San Joaquin Valley load demand and Big Creek hydro generation output), PG&E local area load and generation conditions (Fresno area load demand and Helms operations), as well as major path flows (Pacific Intertie, Path 26, Path 15, etc.). For purposes of identifying potential angle bandwidth requirements, SCE performed parametric studies, which adjusted only the SCE local area load and generation. All other system conditions were held constant. Based on these studies, SCE determined that a phase-shift capability in excess of 60 degrees would be needed to support such a phase-shifted system tie. A summary of these findings is provided below in Figure 3.2.14.

Figure 3.2.14
Constant Power Phase-Shift Requirements



### 2.2.1.4. Reactive Resource Requirements

With the inclusion of the new phase-shifted system tie, loadings on the existing transmission lines are increased resulting in additional reactive losses, which adversely impact local system voltage performance. To determine the amount of additional reactive resources required under base case conditions to maintain pre-existing voltage levels, bus voltages at the Rector, Magunden and the new Fresno Tie Substations were maintained at unity by adding an assumed synchronous condenser at each location. Studies were then conducted for each hour of the year based on historical performance. The studies captured output of the synchronous condensers without the new phase-shifted system tie and with the new phase-shifted system tie so that an adequate comparison could be made. Reactive requirements identified without the addition of the new phase-shifted system tie were subtracted from the reactive requirements identified with the addition of the new phase-shifted tie in order to properly capture the incremental reactive resource required due to the addition of the new phase-shifted system tie. Study results for a 200 MW phase-shifted system tie are shown below in Figure 3.2.15. The 600 MW phase shift analysis was conducted with and without a new 230 kV transmission line from Magunden to Rector and is provided in Figure 3.2.16. As can be seen, the reactive requirements needed to support a 200 MW system tie is approximately 125 MVARs while the requirements needed to support a 600 MW system tie is approximately 500 MVARs. With the inclusion of a new line, the reactive requirement needed to support the 600 MW system tie is reduced down to approximately 200 MVARs. Additional resources may be required to maintain adequate voltages under outage conditions.

Figure 3.2.15
Reactive Requirements to Support a 200 MW Phase-Shifted System Tie

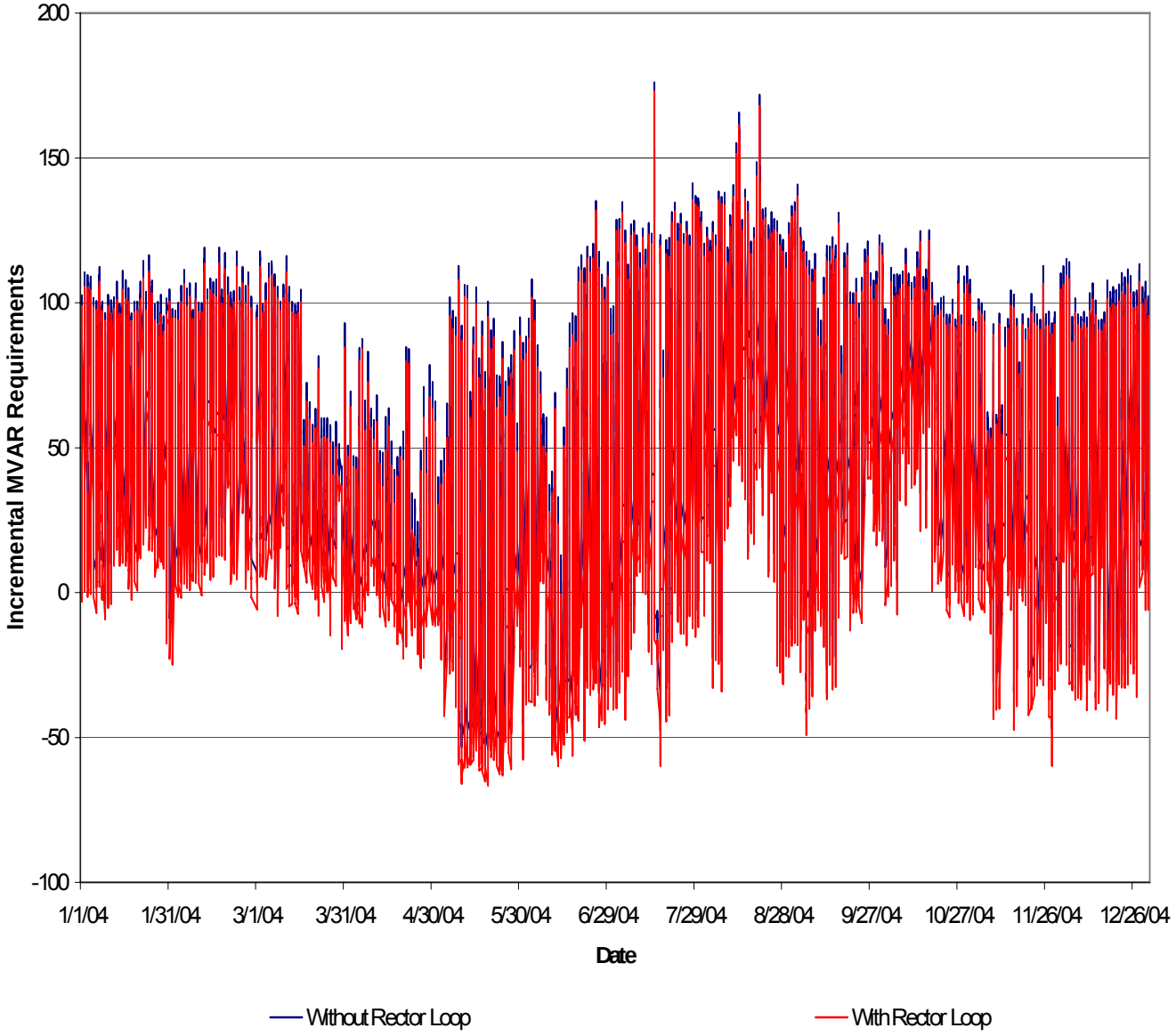
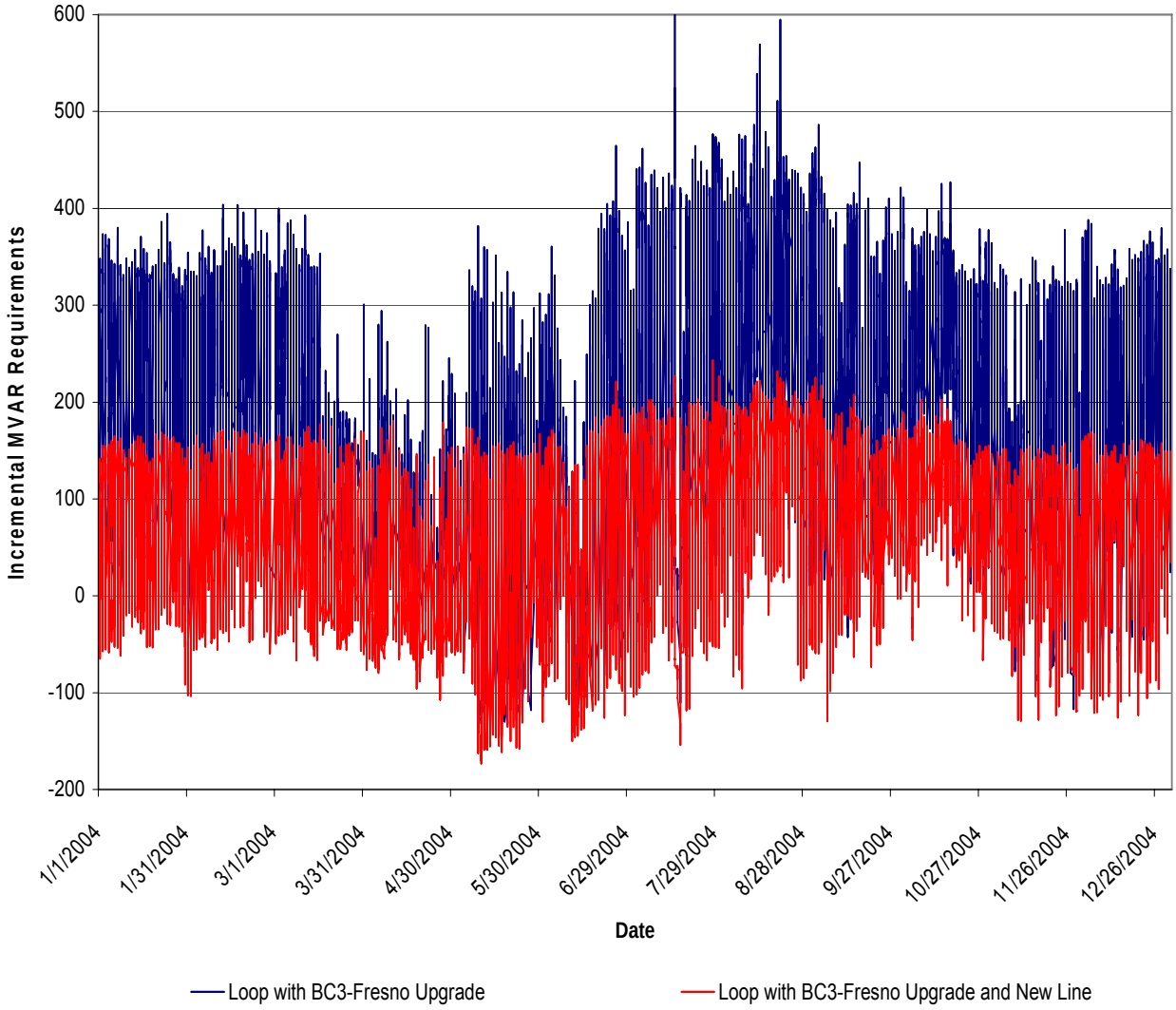


Figure 3.2.16
Reactive Requirements to Support a 600 MW Phase-Shifted System Tie

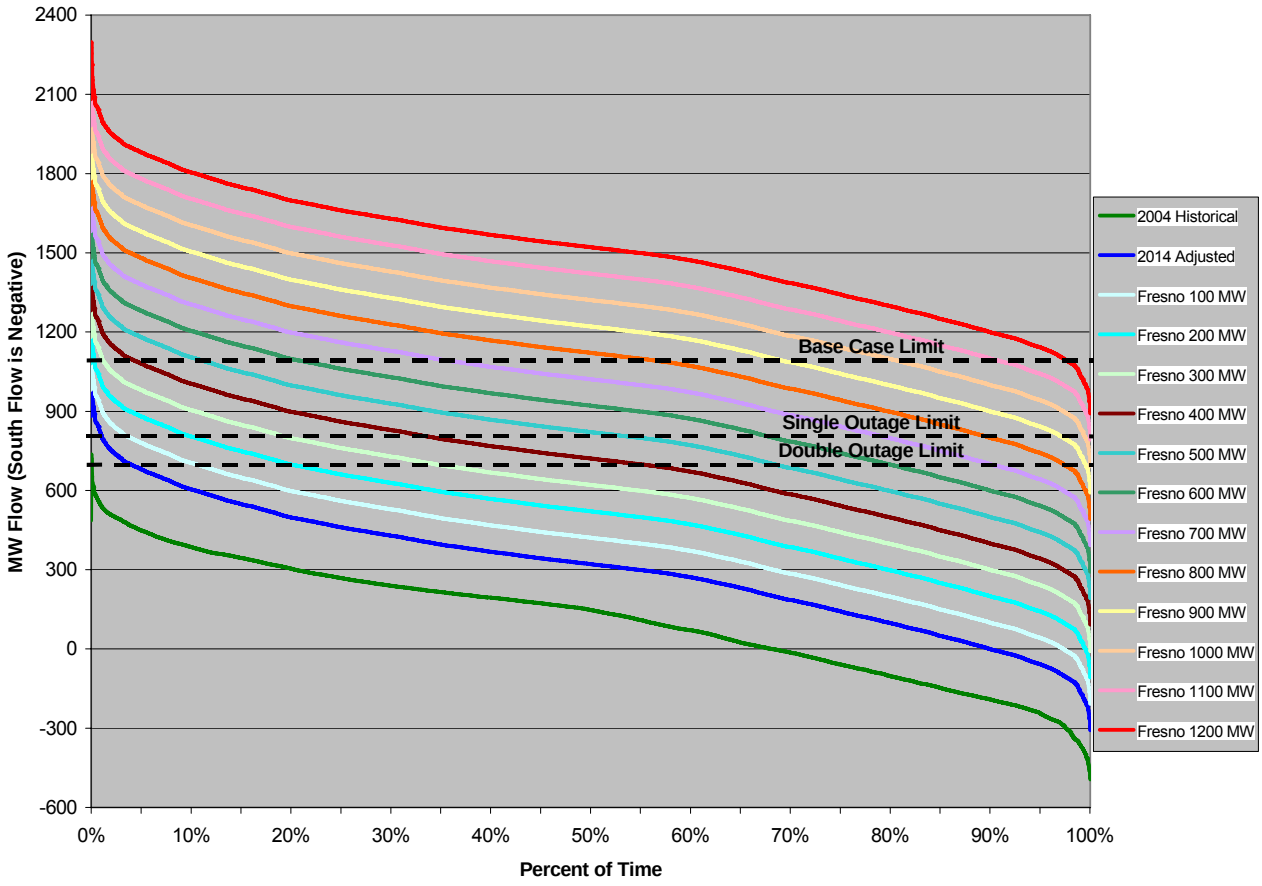



### 2.2.1.5. Study Results Under Loss of One Transmission Line

As previously discussed, adding a new system tie to "push" power from SCE to PG&E has the equivalent effect of increasing load in the San Joaquin Valley. With this increase in load, base case and outage conditions will result in higher thermal overload problems than are currently anticipated. Currently, the existing 230 kV transmission lines north of Magunden are anticipated to be fully utilized to support forecast load demand. Without new facilities, the existing system cannot support the new system tie at any level. Figure 3.2.17 provides the north of Magunden flow duration curves for various system tie levels and includes system limitations. As can be seen, adding a 300 MW system tie results in potentially exposing the system to thermal loading levels above the current single

contingency limit for approximately 20 percent of the time. Increasing the system tie from 300 MW up to 600 MW will result in further increasing the overload exposure from 20 percent to 55 percent.

Figure 3.2.17
North of Magunden Flow Duration Curve




A proposed solution of opening the system tie under outage conditions may not be a workable solution. Generally, WECC supports the establishment of Operating Nomograms developed to limit the amount of power that can be scheduled through a WECC Path. In other words, the Path rating will be established based on limiting elements during outage conditions. As a result, upgrades will be required to support a new Phase-Shifted System Tie. These upgrades will involve adding a new transmission line(s) between Magunden and Big Creek. The exact amount of system tie capability that can be accommodated with this transmission in-service is unknown at this time. Detailed WECC Path Rating studies will be required to make this determination. Conceptually, SCE anticipates a maximum constrained capability (Operating Nomogram) of 400 MW with the addition of a new line. This value is derived by considering the existing base case limitation of 1,150 MW, which is expected to be the new limit under loss of the new

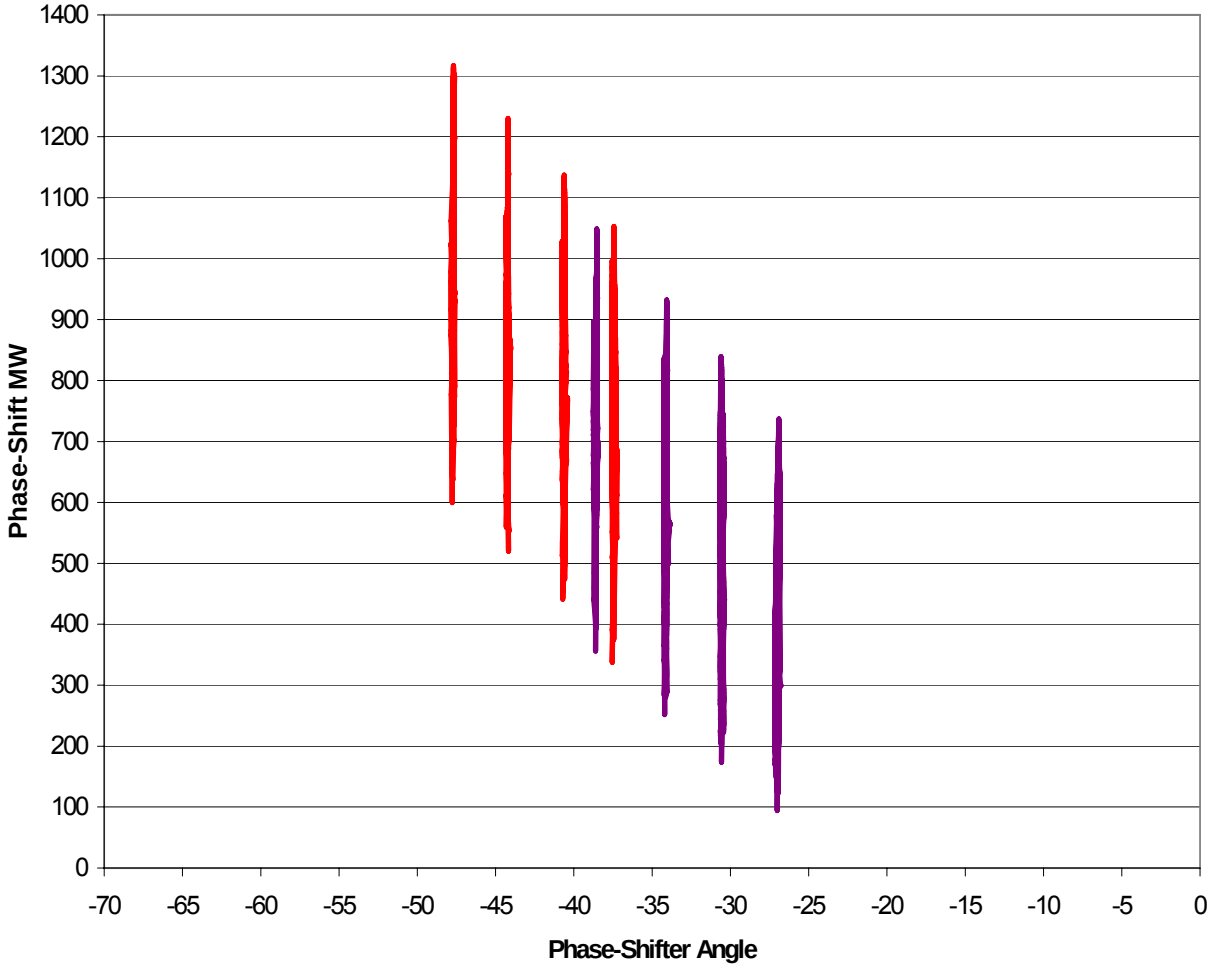
line. The total north of Magunden flows under non-summer conditions will exceed the 1,150 MW limit when considering higher phase-shift transfer levels. The CAISO should review all other conditions where the use of the system tie could result in loadings that exceed the 1,150 MW limit. This should be done to determine if the use of congestion management (i.e. use of an Operating Nomogram) is an acceptable means for limiting flows on a system tie that is actively managed (i.e. constant power flow model).

### 2.2.2. Big Creek-Fresno Tie Study Results – Fixed Tap Setting Model

#### 2.2.2.1. Impacts to Power Flows

The fixed power flow model results for each phase-shift level examined were used as the basis for conducting the fixed tap setting power flow studies. Resulting angles were examined and an average value was selected for each phase-shift capacity scenario to represent the "best" tap setting to use for that scenario. This assumption, while not perfect, captures system behavior when selecting a particular tap setting. Results of this study indicate that any given tap setting has the potential to operate within a 700 MW bandwidth as shown below in Figure 3.2-18. As an example, the curve corresponding to an angle of approximately 30 degrees can result in phase-shifting anywhere between 200 MW and 850 MW.

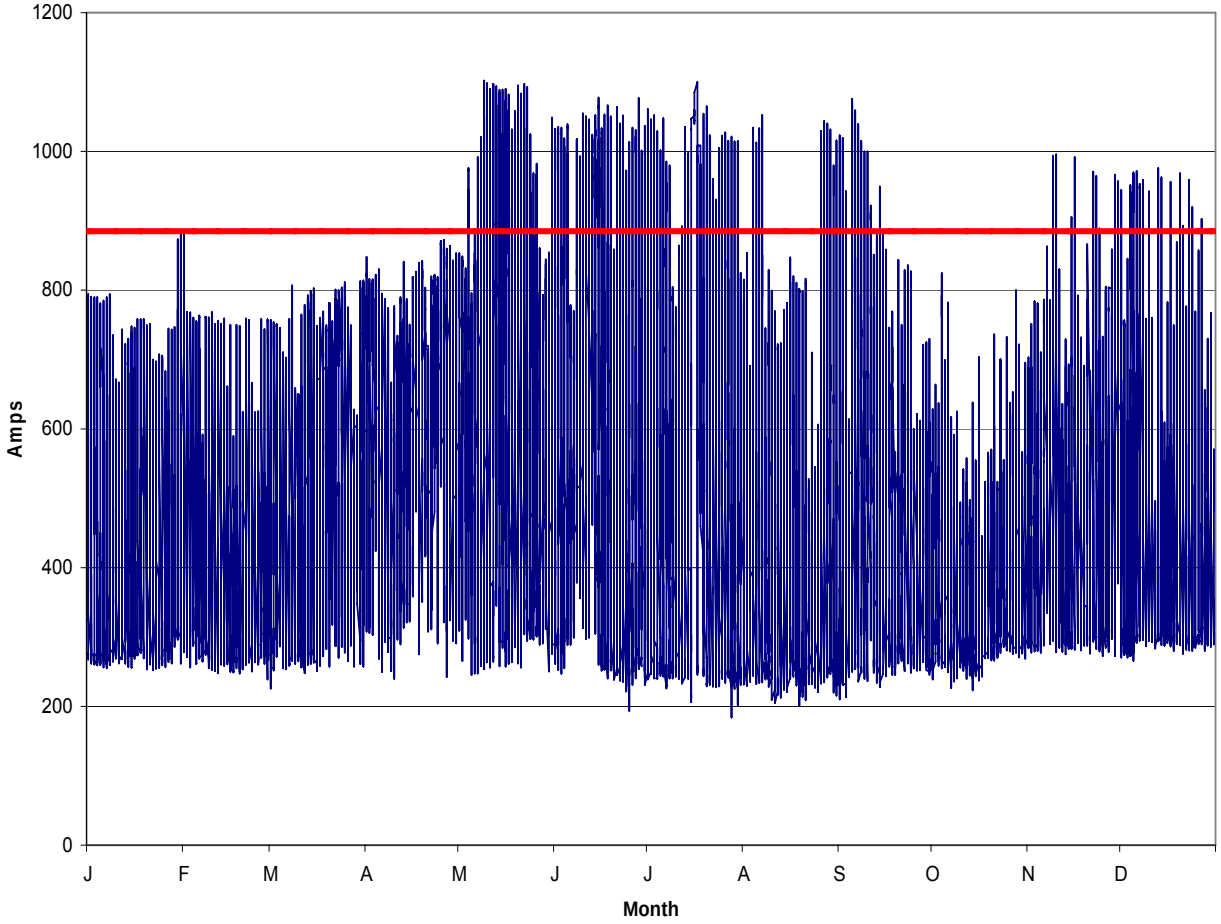
Figure 3.2.18
Fixed Angle Phase-Shifted Power




### 2.2.2.2. North of Magunden 230 kV Transmission Line Loadings Under Base Case Conditions

As shown below in Figure 3.2.19, loading on a section of the existing Big Creek3-Rector 230 kV line (between Big Creek and the Fresno System Tie) was identified to exceed the maximum allowable limit under base case conditions with a fixed tap setting of 30 degrees. Complete tear-down and rebuild of this transmission facility will be necessary as the current infrastructure does not support use of a larger conductor. This tear-down and rebuild will necessitate environmental review to comply with both the California Environmental Quality Act (CEQA) and the National Environmental Policy Act (NEPA) since the line traverses the Sierra National Forest.

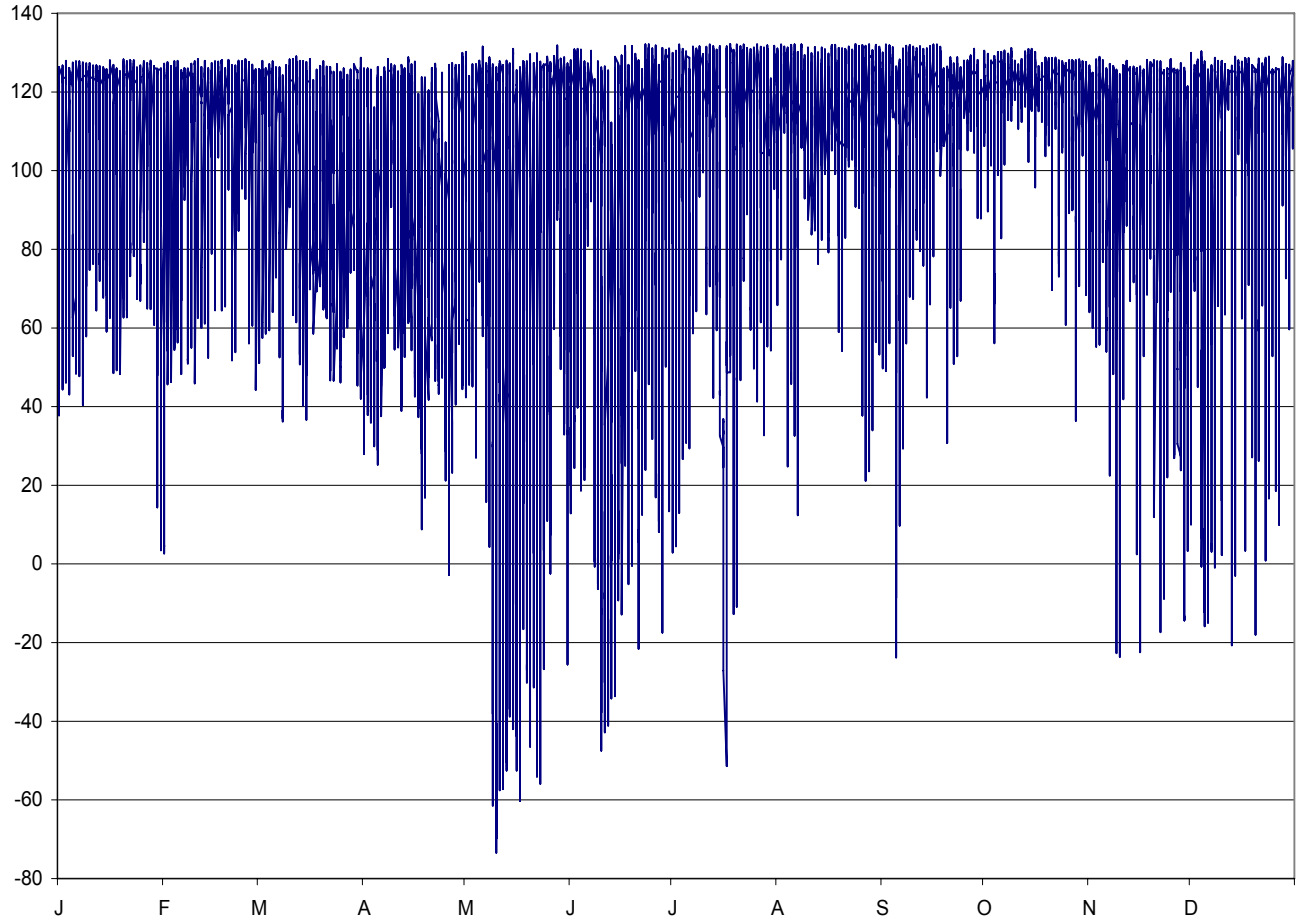
Figure 3.2.19
Loading on the Big Creek3-Rector 230 kV Transmission Line




### 2.2.2.3. Reactive Resource Requirements

With the inclusion of the new fixed tap phase-shifted system tie set to 30 degrees, loadings on the existing transmission lines are increased resulting in additional reactive losses, which adversely impact local system voltage performance. The same methodology utilized above for a fixed power level was used to determine the amount of additional reactive resources required under base case conditions. Study results for a fixed tap phase-shifted system tie set to 30 degrees are shown below in Figure 3.2.20. As can be seen, the reactive requirements needed to support a fixed tap phase-shifted system tie set to 30 degrees is approximately 130 MVARs. Additional resources may be required to maintain adequate voltages under outage conditions

Figure 3.2.20
Reactive Requirements to Support a Fixed Tap Phase-Shifted System Tie
Tap Setting Set to 30 Degrees




### 2.2.2.4. Fixed Power Flow Model Under Loss of One Transmission Line

As discussed above in the assumptions section, the fixed tap setting model does not respond well to system outage conditions. As a result, it is extremely difficult to forecast system behavior during faulted conditions. What can be said is that a surge of power through phase-shift transformer is likely due to system impedance change under the outage conditions and very slow moving load tap changers (if automated). This surge in power could lead to additional thermal overloads on the existing Big Creek 230 kV transmission lines that have not been identified under the base case conditions. System upgrades needed to support the full range of flow patterns as identified above for base case conditions should include sufficient capability to accommodate outage conditions. Detailed WECC Path Rating studies will be required to make an exact determination as to how much capacity can be made available with the addition one or more 230 kV transmission lines. Conceptually, SCE estimates that use of a fixed tap setting model will

require complete upgrade of the western side of the Big Creek corridor which includes adding two new 230 kV transmission lines.

### 2.2.3. Big Creek-Fresno Tie Study Points of Discussion

*Study Assumptions*

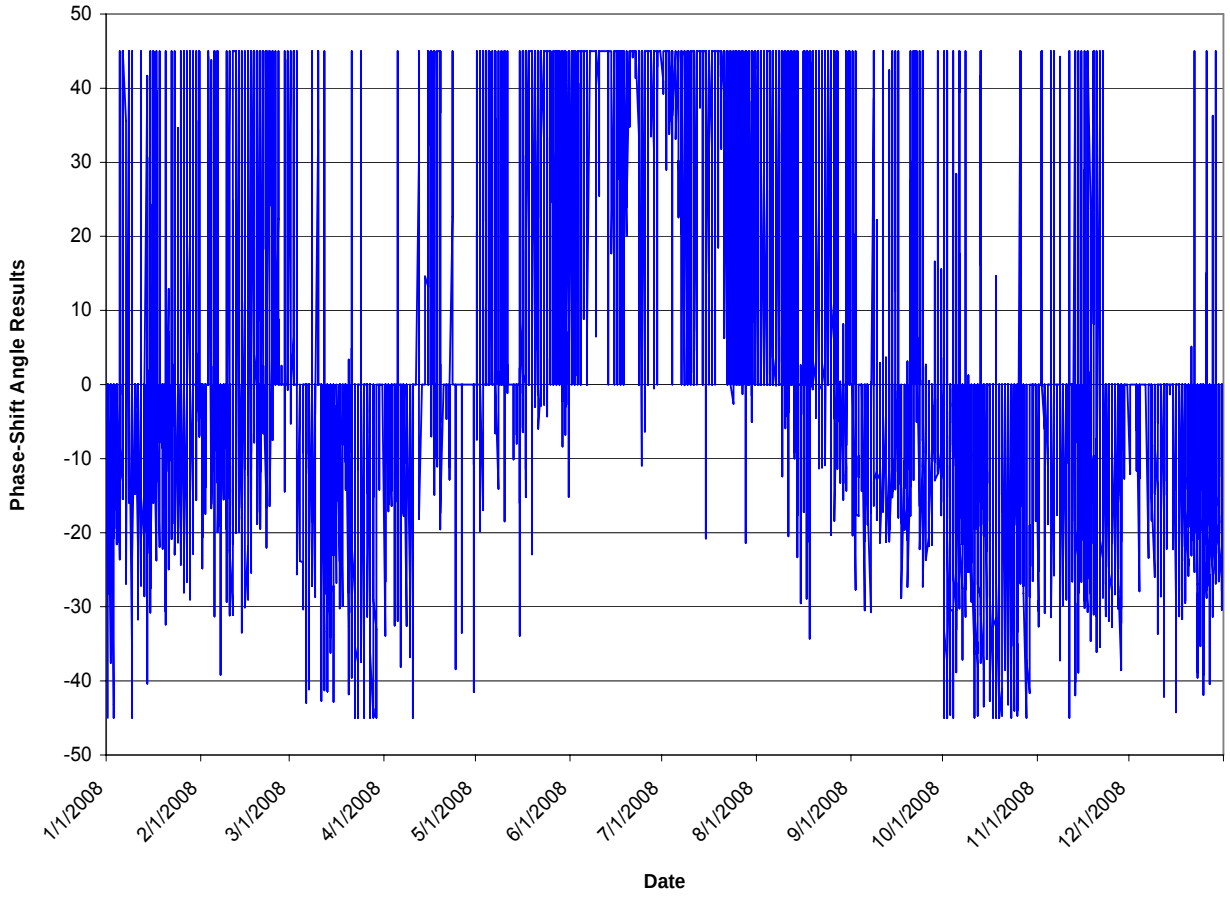
The CPUC Energy Division staff participating in the collaborative study has expressed concerns with the study assumptions implemented in performing this study. Specifically, the concerns centered on modeling of proper operating conditions for the new system tie assuming power flows could be managed. In a letter from the CPUC Energy Division to SCE dated July 9, 2005, the following was expressed:

> "From our recollection of the presentation [June 28, 2005], it consisted largely of a determination of the characteristics of a phase shifting transformer to deliver power to PG&E in a Northerly direction from the Big Creek-Rector lines under conditions of summer peak load. It is our understanding that under these conditions the flow across Path 26 is in the opposite direction, from North to South, which would explain the high angle shift required of the transformer. Forcing flow from SCE to PG&E under these conditions appears to us to be undesirable. More relevant to the study are the off-peak conditions under which the Path 26 flow is from South to North. Under off-peak conditions a phase-shifting transformer or flow controller is needed only to augment existing South to North flow in Path 26 to accommodate delivery of Tehachapi generation to the grid."

The study assumptions utilized in conducting these parametric studies included all operating conditions by simulating an entire year using historical metered data. Based on the results of the study, the phase-shift angle problems identified are not limited to summer peak conditions. With minimal flows on the new system tie, the phase-shift angle problems were also identified under spring run-off conditions (April and May) when Big Creek hydro is at maximum. With greater flows on the new system tie, the problems were found to occur year round. The reason for this is that local area loads and generation dispatch patterns play a dominant role in defining the phase-shift angle requirements necessary to deliver power from SCE to PG&E. In other words, the flow direction of the Pacific intertie does not necessarily dictate local phase-shift angle requirements.

This conclusion has been validated by the CAISO in the economic dispatch studies performed to evaluate system performance with the inclusion of a 600 MW phase-shifted system tie. SCE requested and reviewed the data supporting the study results presented by the CAISO at the September 19, 2005 Tehachapi Collaborative Study Meeting. Based on SCE's review of the data, the phase-shift angle problems identified are anticipated to occur throughout the year as shown below in Figure 3.2.21.

Figure 3.2.21
CAISO Economic Dispatch Study Results
600 MW Fresno Phase-Shift System Tie

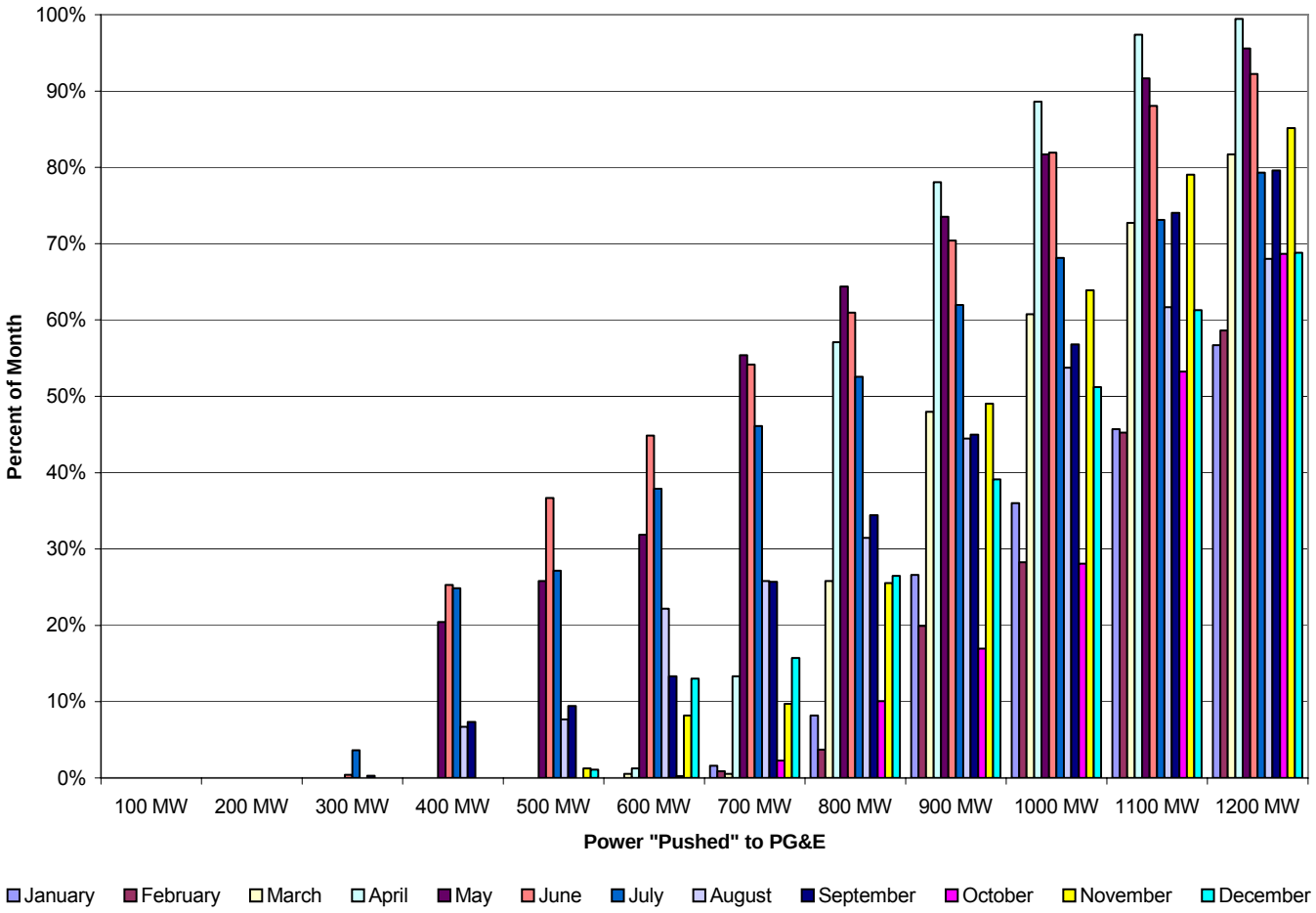



*Power Flow Validation*

Several of the Tehachapi Collaborative Study Group participants have expressed concerns with the study results portraying loadings that would not occur when the phase-shift transformer would be in service or would be "pushing" power from SCE to PG&E.

To determine when such overloads would occur, output data obtained from the thousands of power flow studies conducted was reviewed. The results of this data review are presented below in Figure 3.2.22. As can be seen, exposure to the thermal overload problem identified on the section of Big Creek3-Rector 230 kV transmission line between Big Creek and the Fresno system tie begin when the system tie is at 300 MW. This overload problem initially occurs during May, June and August but extends out for the entire year as the system tie is increased. Based on these results, SCE will require upgrades to mitigate this identified base case overload.

Figure 3.2.22
Section of Existing Big Creek3-Rector 230 kV (BC to Fresno Tie)
Overload Frequency




*Operating Procedure to Open System Tie*

Several participants suggested that an Operating Procedure be implemented to open the system tie anytime the Big Creek3-Rector 230 kV transmission section between Big Creek and the Fresno Tie is thermally overloaded.

The proposed solution of opening the system tie anytime there is an overload is not a workable solution. Since the system tie will be a new established WECC Path, the tie will need to remain in service under all normal operating conditions. A thermal overloads caused by the daily dispatch of the system does not constitute an abnormal operating condition. The CAISO has provided their comments on this subject matter in an e-mail issued on September 9, 2005. The CAISO states the following:

> "Generally, in regard to operation of a new phase-angle regulator, it would not be advisable to propose a new facility that would need to be periodically taken out-of-service to limit flows."

In addition, a Special Protection Scheme is currently in place which runs back Big Creek generation whenever either of the Big Creek-Rector 230 kV transmission lines is overloaded. Adding this system tie without upgrades can lead to unintended operation of this run-back scheme. WECC RAS Task Force requires that impacts to special protection schemes resulting from the addition of new facilities be mitigated. In this case, the mitigation would be the upgrade to the overloaded facility and operate the system within the limits of the next limiting component. Additional transmission upgrades will be necessary to accommodate a larger fixed power model.

*Reasons for Power Flow Patterns*

One of the participants questioned why the transmission section between Big Creek and the Fresno Tie would thermally overload.

As can be seen in Figure 3.2.1, the distance from the Big Creek 1,000 MW hydro facility to the new system tie is relatively short. "Pushing" power from SCE towards PG&E will result in increasing Big Creek hydro generation flows on the two lines from Big Creek to the Fresno Tie. The reason for this can be explained by applying Ohm's Law, which basically states that current is inversely proportional to the apparent impedance. In other words, current follows the path of least resistance (i.e. Big Creek generation is a shorter distance to the new system tie as compared to Tehachapi generation and therefore has a much smaller impedance). For this reason, the Fresno phase-shifted system tie cannot be directly linked to Tehachapi since Tehachapi power will never flow on the system tie unless the size of the tie is in excess of the total Big Creek hydro generation.

### 2.2.4. Big Creek-Fresno Tie Study Conclusions

Because of the complexities associated with the use of a traditional phase-shift transformer, design of a system tie with such facility, while cheaper than a FACTS device, will require significantly much more transmission line upgrades to allow for reliable operation. The use of a FACTS device on the other hand reduces the amount of transmission line upgrades required and improves overall operability of the system tie. The CAISO should be consulted as to which alternative can be supported from an operations perspective considering scheduling difficulties as well as hour-to-hour operations.

Conceptually, the study results indicate that the use of a traditional phase-shift transformer needed to "push" 200 MW needs to be designed sufficient to accommodate 850 MW. In comparison, the use of a FACTS device to "push" 200 MW requires sufficient upgrades to accommodate only 200 MW. Table 1 below summarizes the facilities needed to accommodate each type of system tie.

Table 3.1
Transmission Facilities Needed to Support New System Tie

| **Fixed Power System Tie FACT Device Designed for 200 MW** | **Traditional Phase-Shift Transformer Fixed Tap System Tie Designed for 850 MW** |
|---|---|
| Currently Planned San Joaquin Valley Rector Loop 230 kV Project | Currently Planned San Joaquin Valley Rector Loop 230 kV Project |
| New 60 mile Antelope-Magunden 230 kV Transmission Line | New 60 mile Antelope-Magunden 230 kV Transmission Line |
| New 135 mile Magunden-Vestal-Rector-FresnoTie-Big Creek Transmission Line with connections to each of the substations | New 135 mile Magunden-Vestal-Rector-FresnoTie-Big Creek Transmission Line with connections to each of the substations |
| Magunden, Vestal, Rector, and Big Creek Substation Expansion | Magunden, Vestal, Rector, and Big Creek Substation Expansion |
| Supplemental Shunt Capacitor Banks since most dynamic supply can be provided by the FACTS device | Dynamic Reactive Resources such as SVC |
| | Second new 135 mile Magunden-Vestal-Rector-FresnoTie-Big Creek Transmission Line with connections to each of the substations |
| | Additional Magunden, Vestal, Rector, and Big Creek Substation Expansion |

SCE notes that regardless of which facility is ultimately selected, much more study work is required to support establishment of an official path rating. This study work will include short-circuit duty analysis as well as transient stability review. This study should only be undertaken if this alternative appears to be cost effective when compared against other Conceptual plans and with formal approval from the CAISO Operations Group. Conceptually, the cost estimate for this new system intertie is in excess of $450 million.

# APPENDIX 4

# APPENDIX 4

# CAISO STUDIES

Production Cost Simulation Methodology and Tool

ABB's GridView production cost simulation software was used to evaluate the relative ranking of the transmission alternatives under consideration. This tool provides an economic optimization of the generation dispatches to minimize the total hourly production cost for the transmission system that is subject to generation, transmission and operational constraints. The output of the production simulation tool is processed to estimate the comparative production cost, loss and congestion savings of each of the alternatives, to assist in determining differences, if any, of the transmission alternatives.

The program input data includes:

- Generation data such as capacity, fuel costs, heat rates, maintenance schedule, start up cost, shut down cost, up time, down time, forced outage rate and outage duration.
- Transmission data such as network topology, thermal limits and operational constraints.
- Hourly demand data and distribution.
- Hourly hydro and wind dispatch.

The program output result includes hourly dispatch for each generation unit, hourly production cost, hourly transmission line flows and Locational Marginal Prices (LMP) at each node.

The production cost simulation was performed to determine annual production costs of the entire WECC system for the various alternatives being considered to incorporate over 4000 MW of wind potential in the Tehachapi area. These simulations provide both economic and operational information to assist in determining a relative ranking of the transmission alternatives. The analysis was used to compare differences in the WECC production cost, power losses and congestion hours resulting from the alternative transmission configurations being considered. The analysis did not consider other potential benefits such as reduction in reliability-must-run generation cost, reduction in emission and increased operational flexibility. It should also be noted that potential concerns involved with the intermittency of wind and its potential impacts on system operation such as regulation and reserve are not part of this evaluation. The analysis is based on all lines in-service and does not consider any contingency or loss of facility conditions.

Base Case Assumptions

The 2008-SSG-WI (Seams Steering Group-Western Interconnection) base case developed by SSG-WI Planning Work Group (PWG) and also used in the recent is Imperial Valley Study[14] was used as a starting case to maintain consistent assumption between similar studies. Summarized below are the assumptions used in the starting base case that are common to both the Tehachapi and the Imperial Valley studies:

- The base case included the generation and transmission infrastructure that may be assumed to be in place by 2008. Generation units with official retirement dates prior to 2008 were modeled out of service.
- SSG-WI PWG developed approximate industrial figures for variable and non-variable operation and maintenance costs, minimum and incremental heat rates, forced outage rate and outage duration for different generation units based on fuel type, technology, size and age. SSG-WI generation assumptions also include start up/shut down costs, minimum up time/down time and maintenance duration for different generation units. Table 1 summarizes SSG-WI generation assumptions.
- SSG-WI base case assumed average hydro conditions. Hydro generation outputs were modeled as an hourly resource. Similarly, all wind generators were modeled as an hourly resource. Hourly resources are considered as must-take resource and are therefore not optimized. The existing wind generation dispatch was based on historical data.
- SSG-WI base case transmission representation model is based on the WECC 2008 HS2-SA approved case, dated February 2004. An updated case developed by the SSG-WI received 8/5/2005 was used for the analysis.
- SSG-WI PWG used publicly available data including WECC load and resources report to construct 2008 monthly peak and energy amounts for each of the power flow area. The area loads were then spatially spread to the entire WECC network using load distribution factors as used in power flow model.
- Average monthly fuel (Gas, Coal, Uranium) prices for generation plants were forecasted for 2008. The prices were adjusted to account for the cost of delivering the fuel to the generation plant. Detailed description of SSG-WI fuel pricing assumptions is available at http://www.ssg-wi.com/documents/.

The Tehachapi wind generation dispatch profile shown in Figure 3 was provided by National Renewable Energy Laboratory (NREL) and is based on 70 meter rotors, 7.5 m/s wind speed and a 2% unavailability (45% capacity factor). Based on a potential of 4500 MW in the area, this wind profile was scaled and assumed a total annual production of 17,209,942 MWH from the Tehachapi and Antelope wind. For simplicity the 4500 MW was modeled at the Tehachapi bus. The Tehachapi wind was dispatched as base load generation - modeled hourly and represented no fuel or maintenance cost.

[14] Development Plan for the Phased Expansion of Transmission to Access Renewable Resource in the Imperial Valley, dated September 30,2005

## Table 1 SSG-WI Generation Assumptions

| Fuel Type | Technology | Size/MW | Vintage | Min. Heat Rate (Btu/kWh) | Variable O&M Cost ($/MWh) | Forced Outage Rate | Forced Outage Duration (hrs) |
|---|---|---|---|---|---|---|---|
| Gas/Oil | Steam | <100 | <1960 | 12,194 | 5.001 | 0.071 | 55 |
| | | >100 | | 9,125 | | | |
| | | <100 | >1960 | 9,214 | | | |
| | | >100 | | 6,856 | 3.001 | | |
| Gas | SCCT | - | <1985 | 11,403 | 8.001 | 0.036 | 89 |
| | CCCT | - | | 9,600 | 5.001 | 0.055 | 22 |
| | SCCT | <70 | >1985 | 14,114 | | 0.036 | 89 |
| | SCCT | >70 | | 12,106 | | | |
| | CCCT | - | >1985 | 8,815 | 2.000 | 0.055 | 22 |
| Gas/Oil | CCCT-Frame F | - | >2001 | 3,620 | 2.000 | | |
| Gas | DT | - | <1985 | 9,600 | 5.001 | | |
| | | | >1985 | 10,695 | | | |
| Oil | IC | - | - | 9,125 | 13.250 | 0.036 | 55 |
| | SCCT | - | - | 11,403 | 8.001 | | |
| Coal | Steam | <100 | <1960 | 12,000 | 4.000 | 0.066 | 38 |
| | | >100 | | 11,500 | 2.000 | | |
| | | <100 | >1960 | 11,000 | 3.001 | | |
| | | >100 | | 10,500 | 2.000 | | |
| Bio/WH/Wood | Steam | - | - | 12,194 | 5.001 | 0.071 | |
| Geothermal | GE | - | - | - | 4.000 | 0.071 | 16 |
| Uranium | Nuclear | - | - | - | - | 0.070 | 298 |

The SSG-WI base case was modified with the CAISO load level to reflect forecasted 2010 conditions. In addition, the following new transmission projects in southern California that are approved and planned to be online by 2010 were included in the model:

- Harquahala-Devers 500 kV line
- New 500 kV Substation to be located at the Midpoint of Palo Verde- Devers and Harquahala-Devers 500 kV lines
- Blythe I and II Combined Cycle plant (1000 MW) connecting to Midpoint Substation
- Reconductoring of four West of Devers 230 kV lines

Table 2 provides specific non-simultaneous interface limits enforced in the production cost optimization runs for interfaces within the immediate area of the study.

**Table 2: Non-Simultaneous Interface Limits**

| Interface | North-South Flow (MW) | South-North Flow (MW) |
|---|---|---|
| COI | 4800 | 3675 |
| Path 15 | 3265 | 5000[1] |
| Path 26 | 3700[2] | 3000 |

**Notes:**
1) Path 15: 5,000 MW S-N is supported by RAS that trips generation connected to Midway. The Path 15 limit will be decreased by 1 MW for every 2 MW decrease in Midway generation (La Paloma, Sunrise, Elk Hills).
2) Path 26: Power flow between 3,000 MW and 3,700 MW N-S is supported by a RAS that trips Midway area generation. The Path 26 limit will be decreased by 1 MW for every 2 MW decrease in Midway generation (La Paloma, Sunrise, Elk Hills). Assumed Path 26 capability N-S increased to for 4000 MW as provided SCE for Alternatives 1, 3 and 10 that include a new 500 kV Tehachapi-Midway line. Detail studies are required to determine actual capability with the new transmission.

In addition, the following transmission facility assumptions were simulated as part of the study.

- Transmission models and ratings used for alternatives were provided by SCE and PG&E.
- With a new Midway-Tehachapi 500 kV line, the Path 26 N-S thermal capability was assumed to be 4000 MW for production cost simulation studies.
- All WECC transmission paths were modeled according to 2005 Path rating catalog
- Limits for all 500 kV transmission facilities were enforced.
- Lower voltage (230 kV and below) limits were not enforced.
- SCIT limit was modeled at 17900 MW
- EOR limit was modeled at 9255 MW
- WOR limit was modeled at 11318 MW
- All AC transmission lines monitored were limited to 95% of their thermal capacity or applicable rating in order to accommodate reactive flows which are absent in this production simulation studies.
- Nomograms were used to reflect transmission system constraints.
- Transmission losses were modeled.
- Transmission line/Path limit violation penalty of $1000 per MWh was applied.

The following figures supplement the productions cost simulation analysis and are provided for informational purposes.

Figure 1 - Interface Definitions
Figure 2 - Path 15 and Path 26 Historical Flows
Figure 3 – Tehachapi Wind Load Duration Curve
Figure 4 – Flows During a Peak Summer Day With Tehachapi Wind
Figure 5 – Flows During a Off-Peak Summer Day With Tehachapi Wind
Figure 6 – Comparison of Path 26 Flows With 4500 MW Tehachapi Wind
Figure 7 – Comparison of Path 15 Flows With 4500 MW Tehachapi Wind
Figure 8 – 600 MW Fresno Phase Shifter Power Flow With 1600 MW Tehachapi Wind
Figure 9 – 600 MW Fresno Phase Shifter Angle Range With 1600 MW Tehachapi Wind
Figure 10 – Scenario E Oneline
Figure 11 – Scenario F Oneline
Figure 12 – Scenario G Oneline
Figure 13 – Scenario H Oneline
Figure 14 – Scenario H Oneline
Figure 15 – Scenario J Oneline

The following Figure 1 illustrates the Path 15 and Path 26 interfaces with the existing and new transmission under the various alternatives Path 15 includes additional underlying 230 kV transmission not shown.

Figure 1 – Interface Definitions

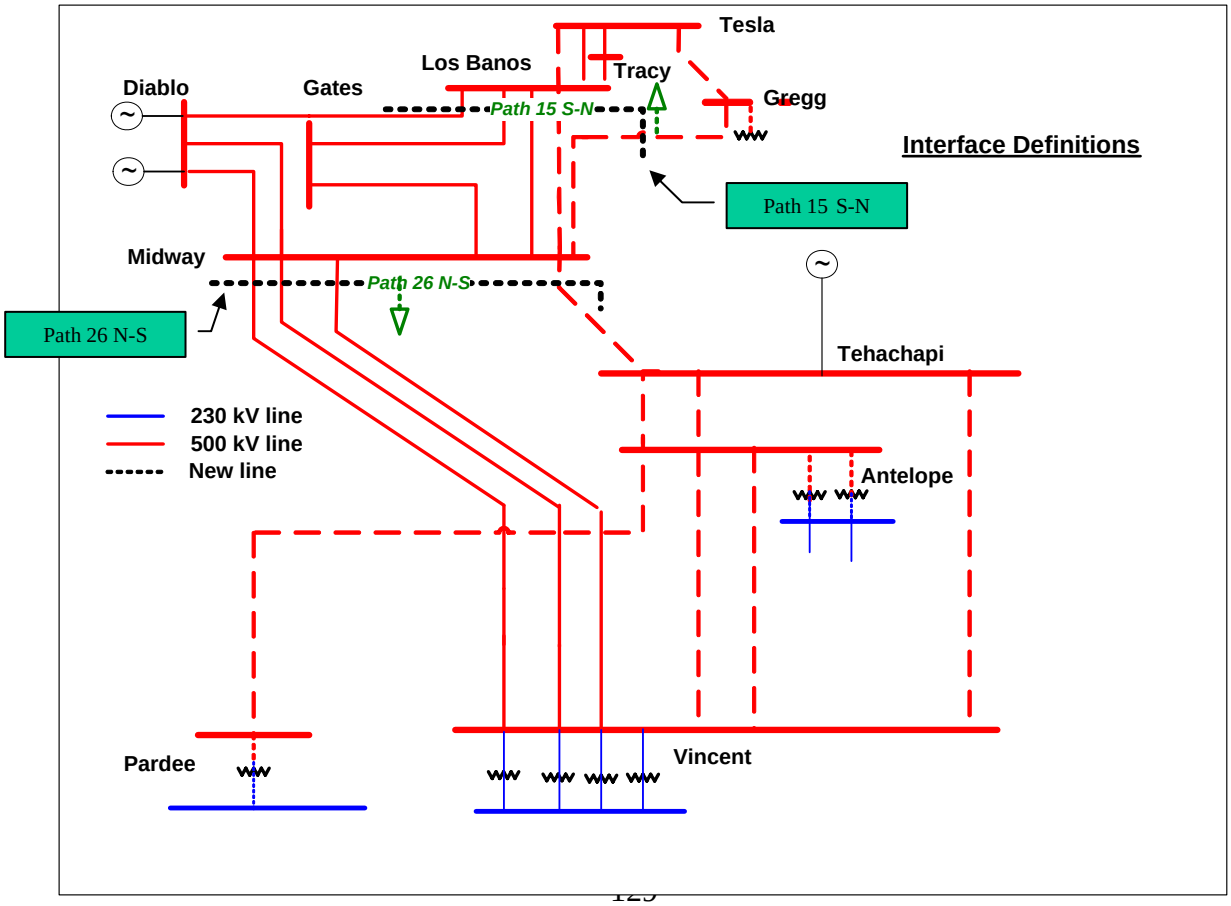


Figure 2 – Path 15 and Path 26 Historical

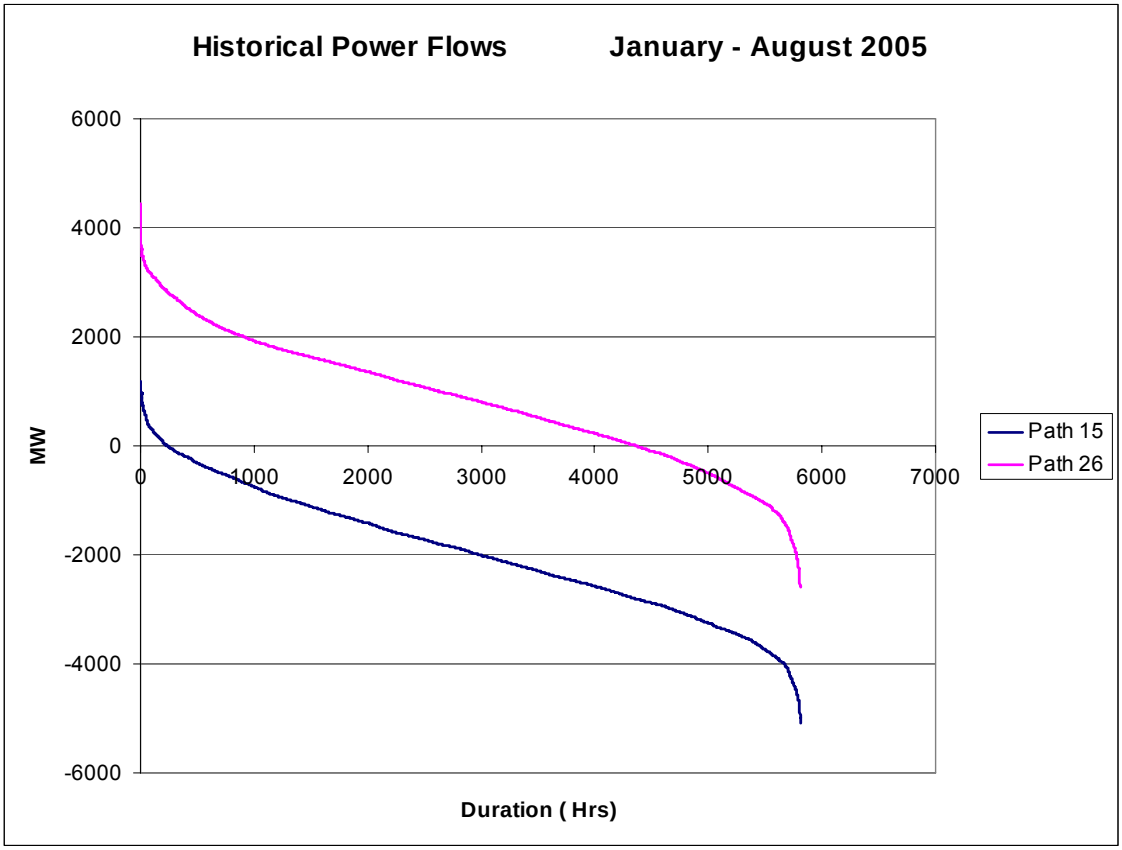



Figure 3 – Tehachapi Wind Load Duration Curve

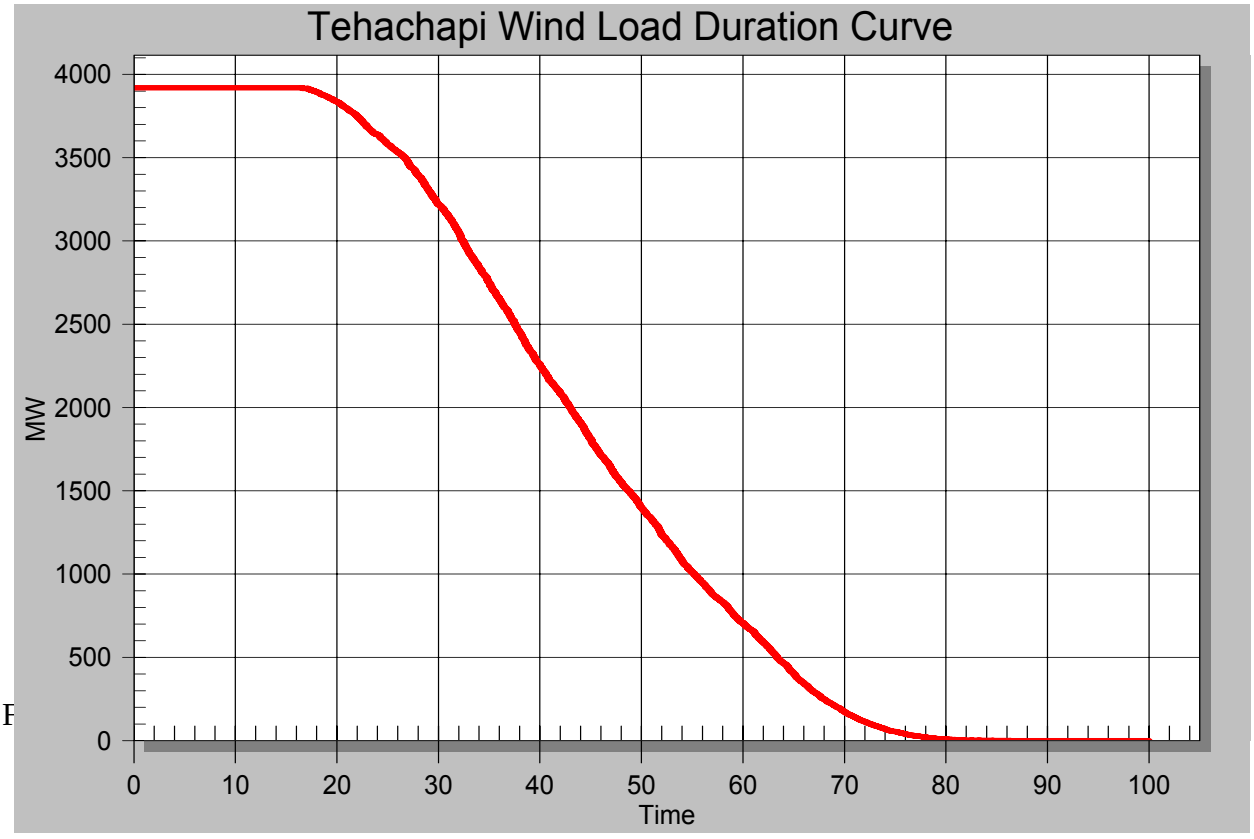


Figure 4 – Flows During a Peak Summer Day With Techachapi Wind

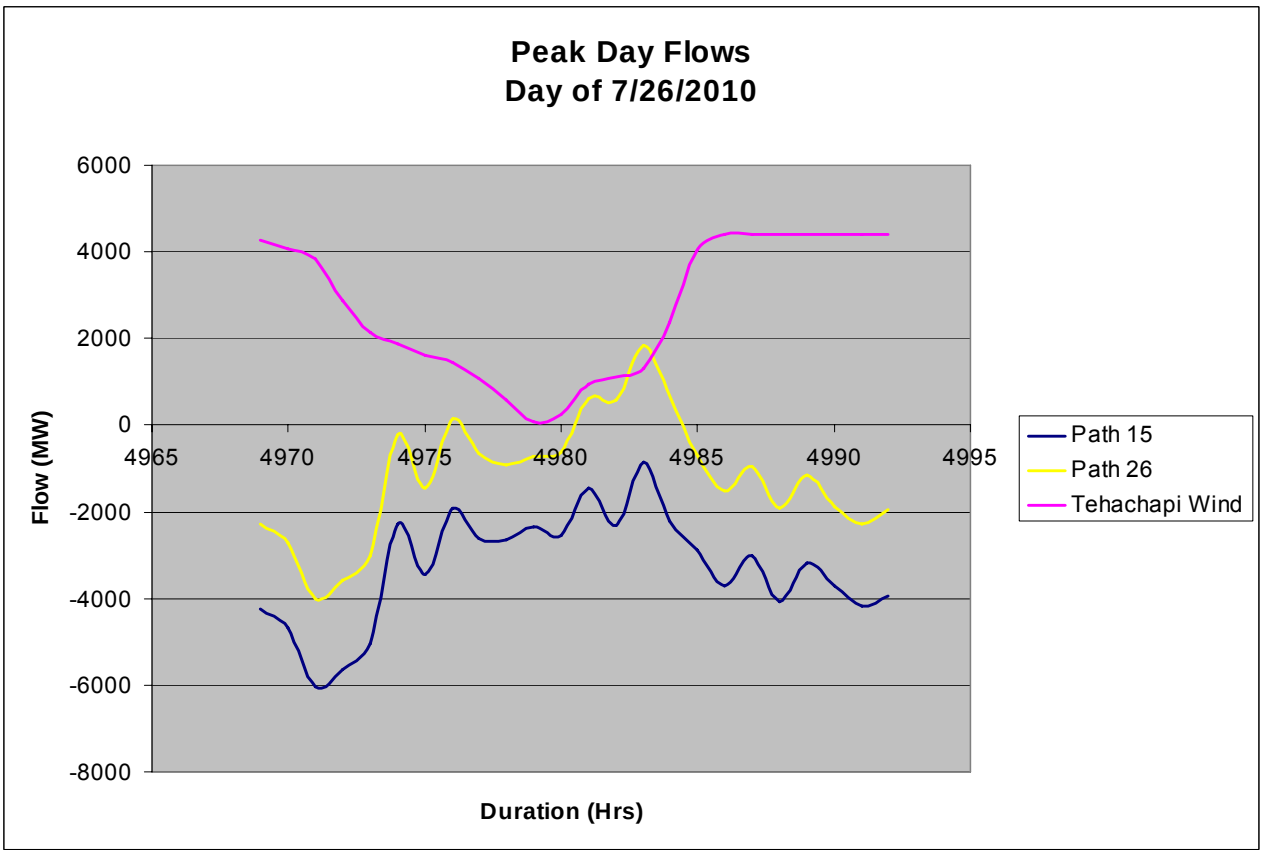



Figure 5 – Flows During a Off-Peak Summer Day With Tehachapi Wind

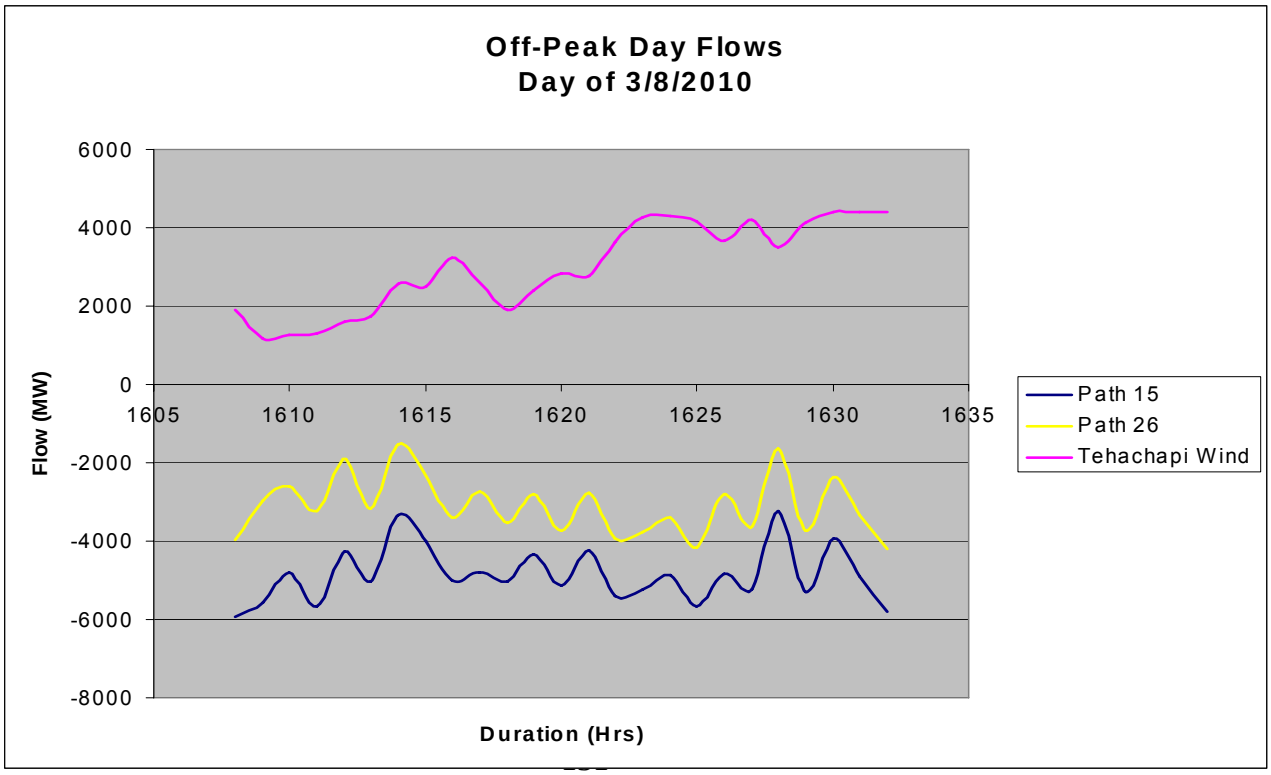


Figure 6 – Comparison of Path 26 Flows With 4500 MW Tehachapi Wind

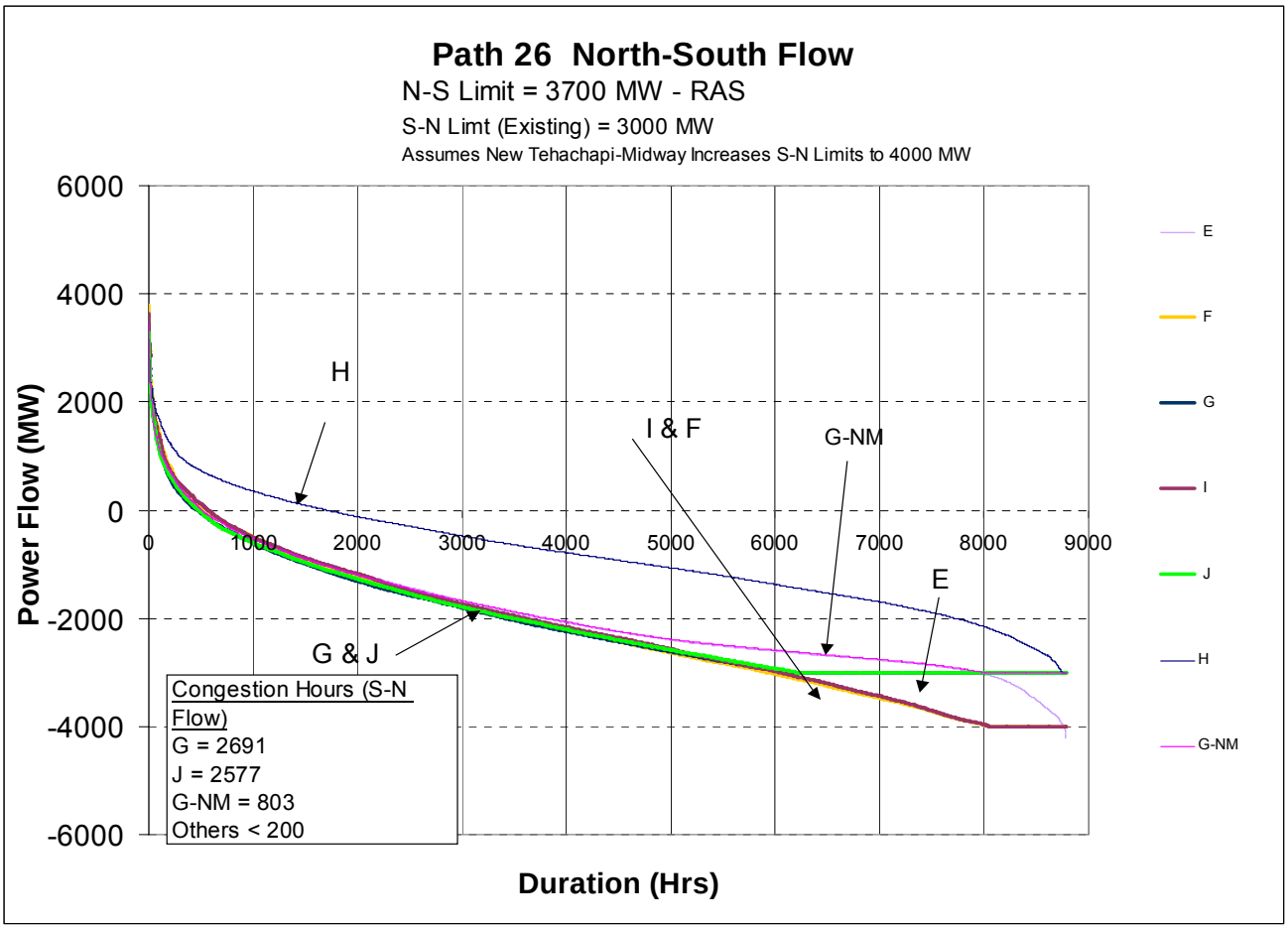


Figure 7 – Comparison of Path 15 Flows With 4500 MW Tehachapi Wind

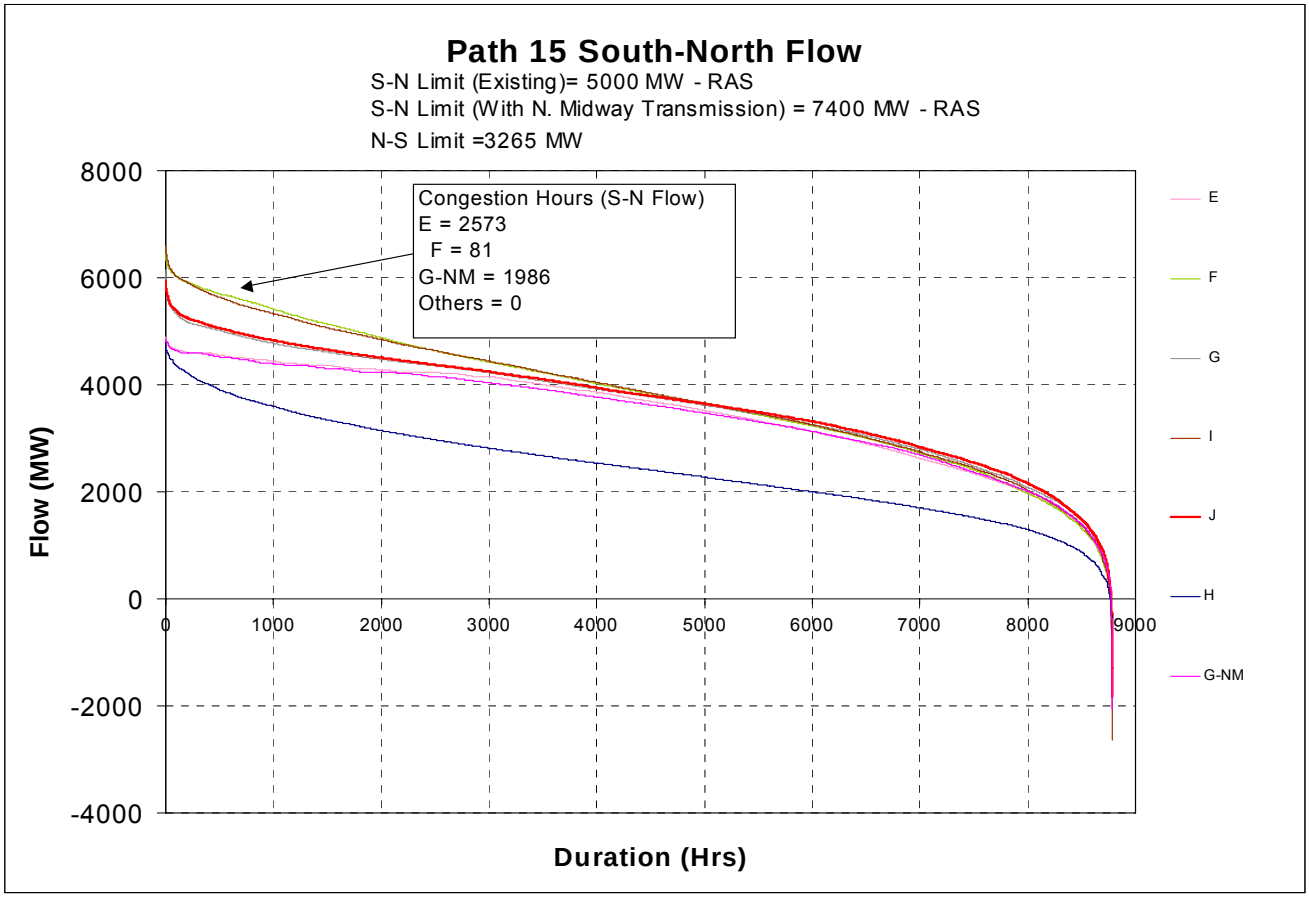


Figure 8 – +/- 600 MW Fresno Phase Shifter Power Flow With 1600 MW Tehachapi Wind

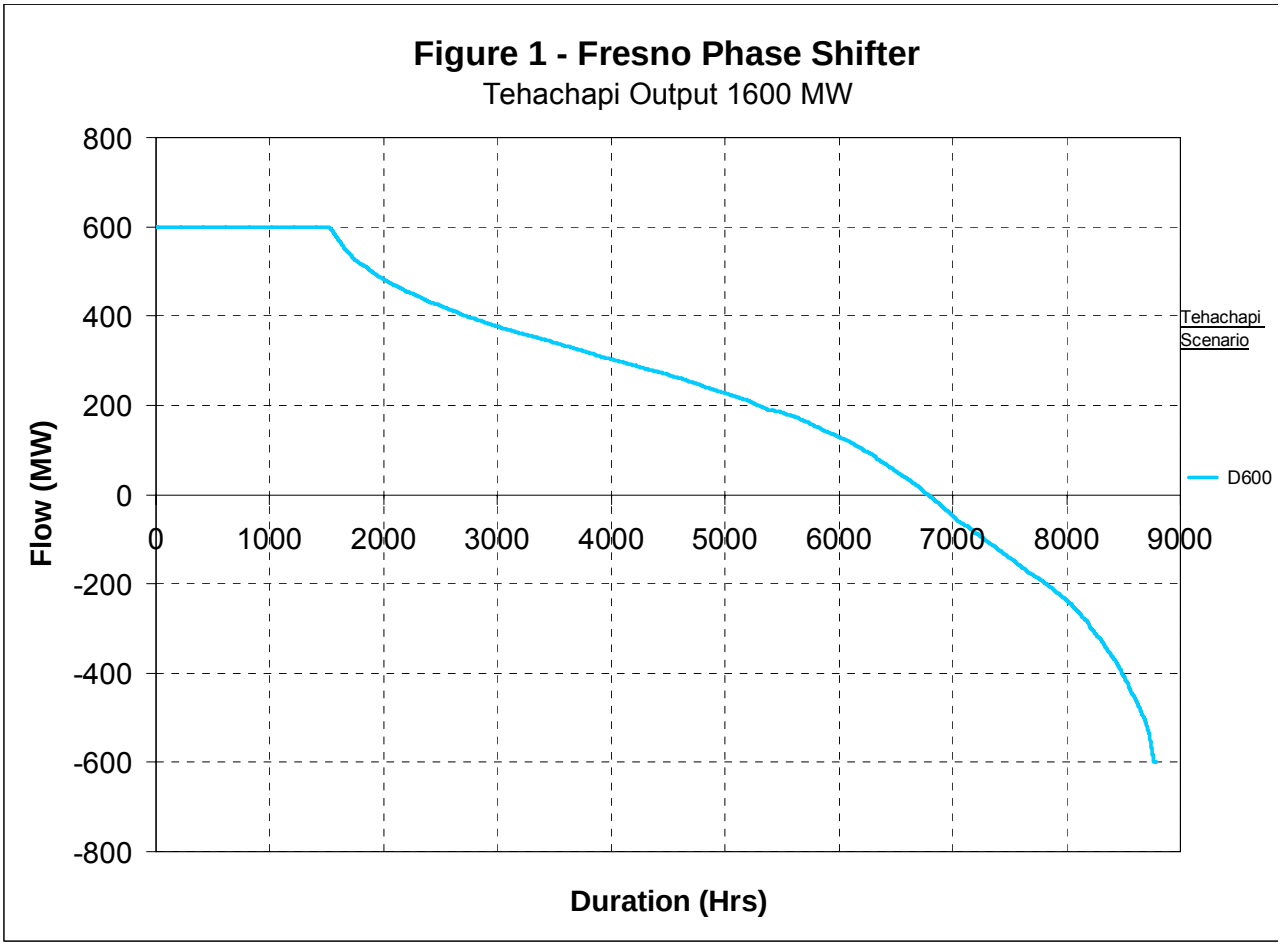


Figure 9 – +/- 600 MW Fresno Phase Shifter Angle Range With 1600 MW Tehachapi Wind

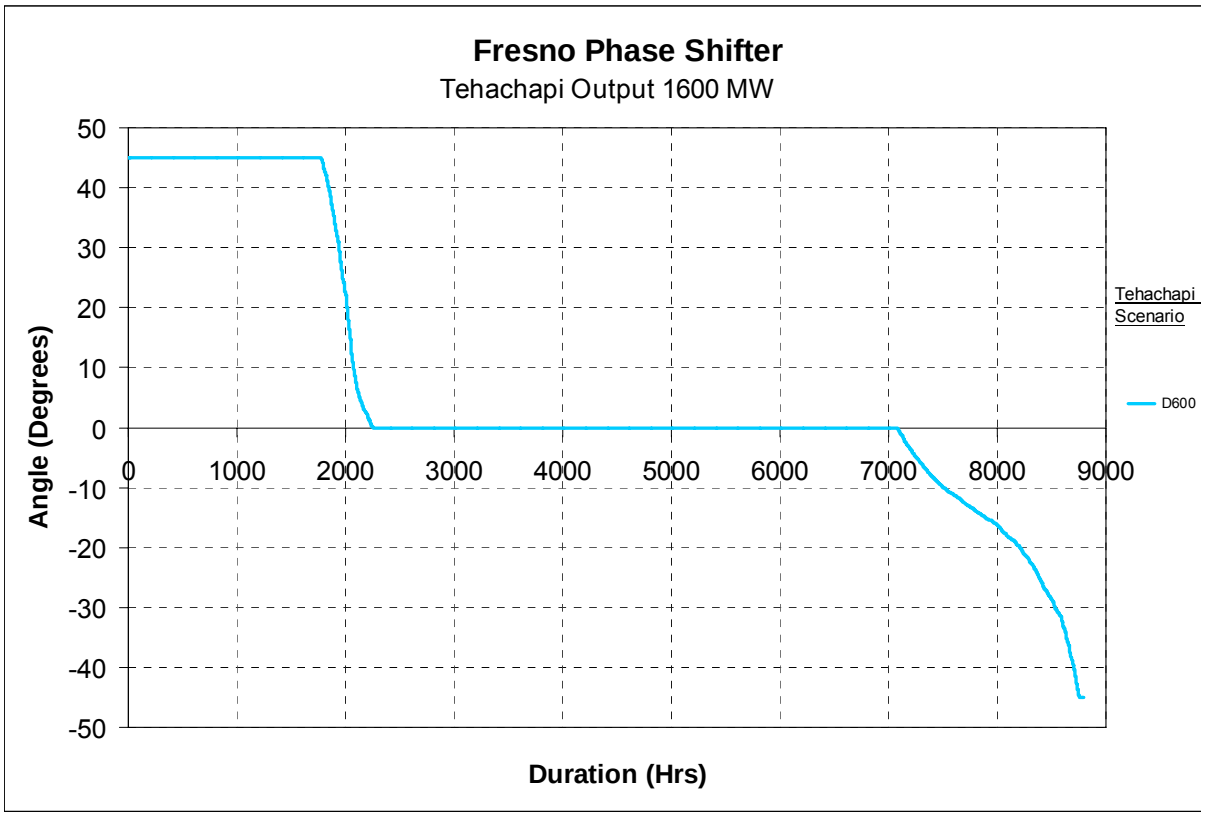


Figure 10 – Scenario E Oneline

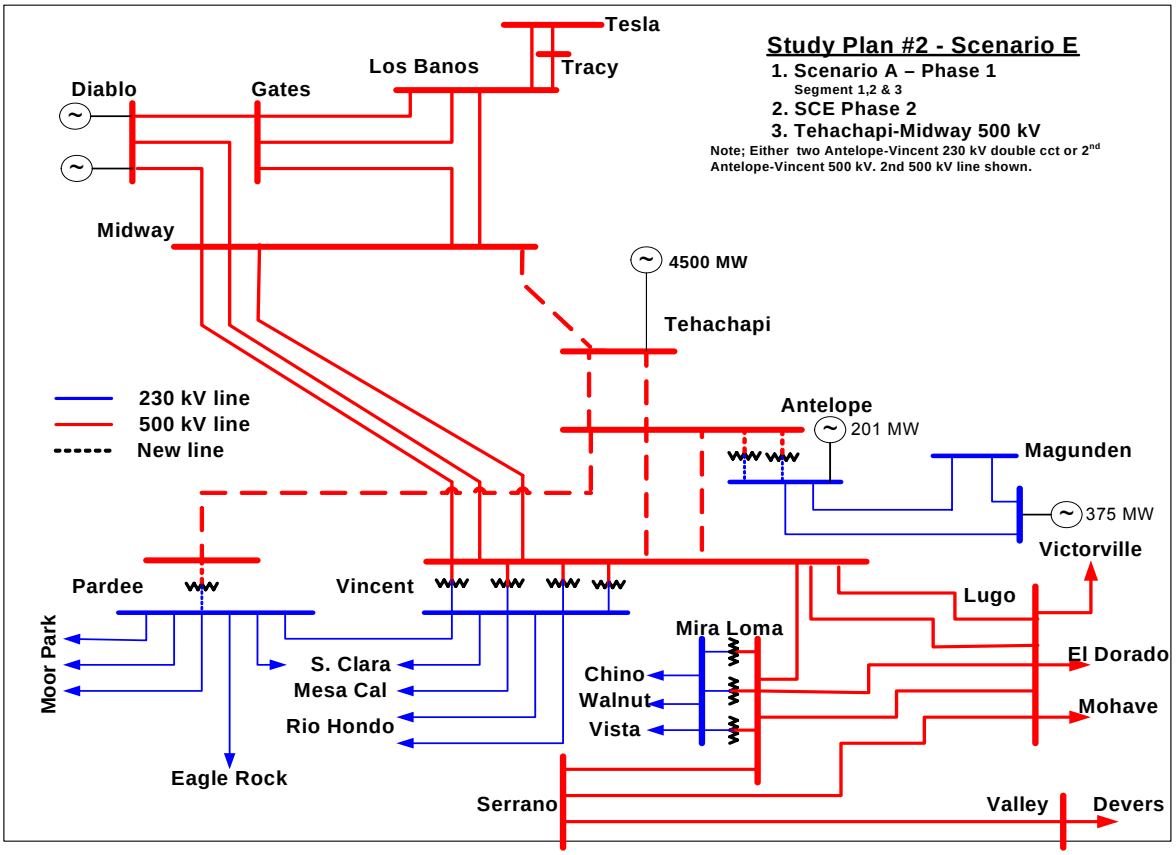



Figure 11 – Scenario F Oneline

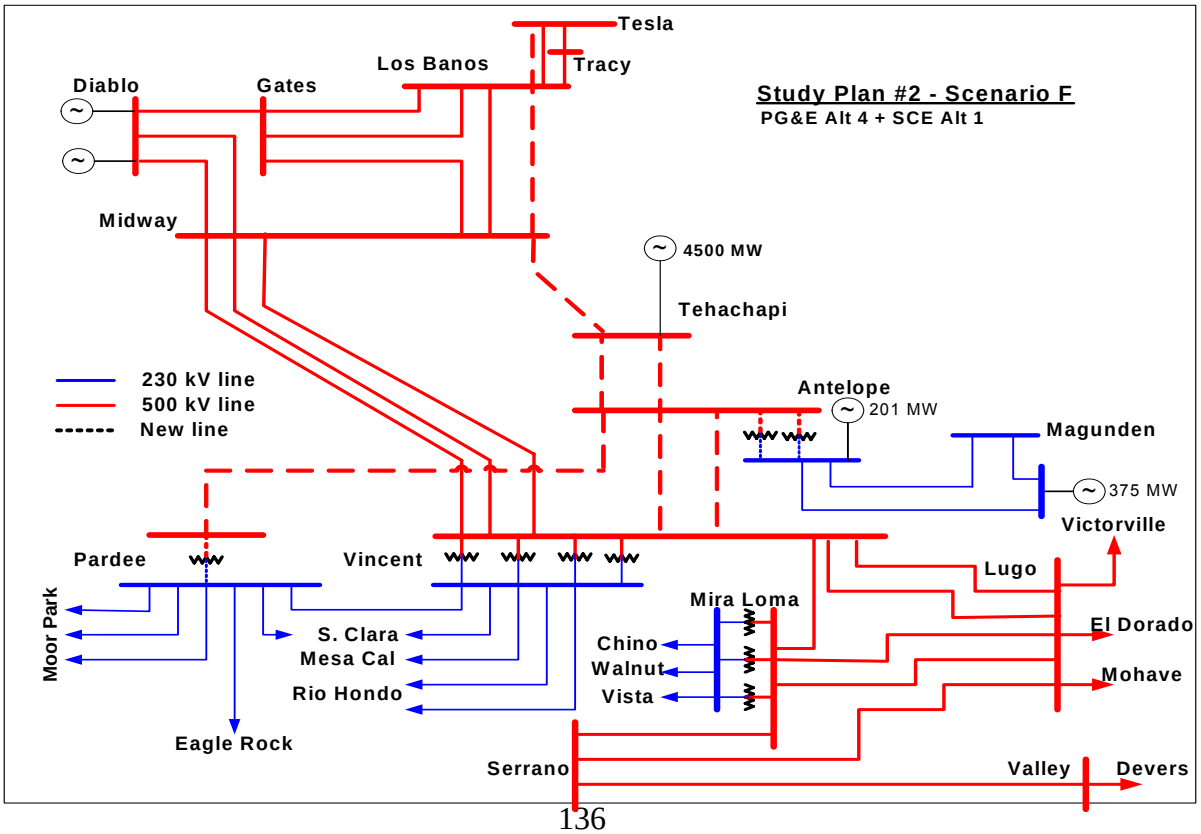


Figure 12 – Scenario G Oneline

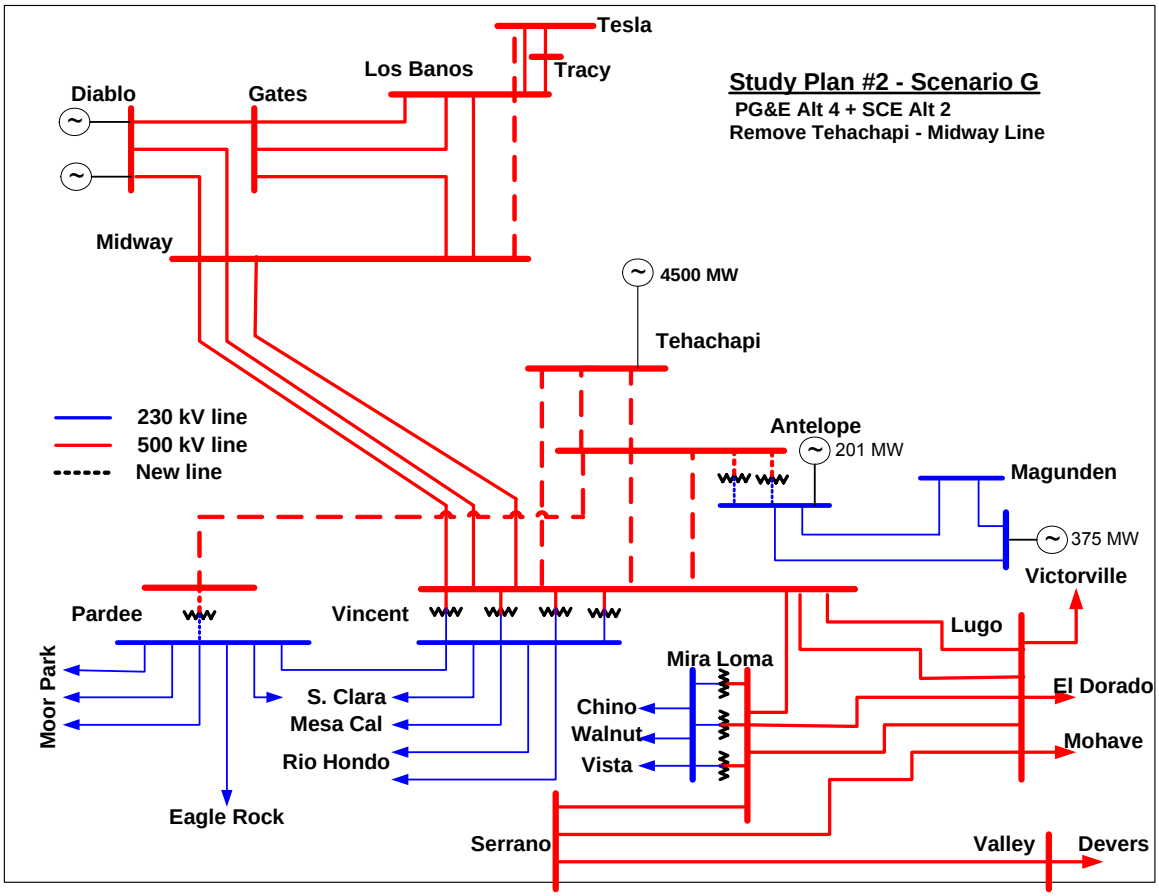



Figure 13 – Scenario H Oneline

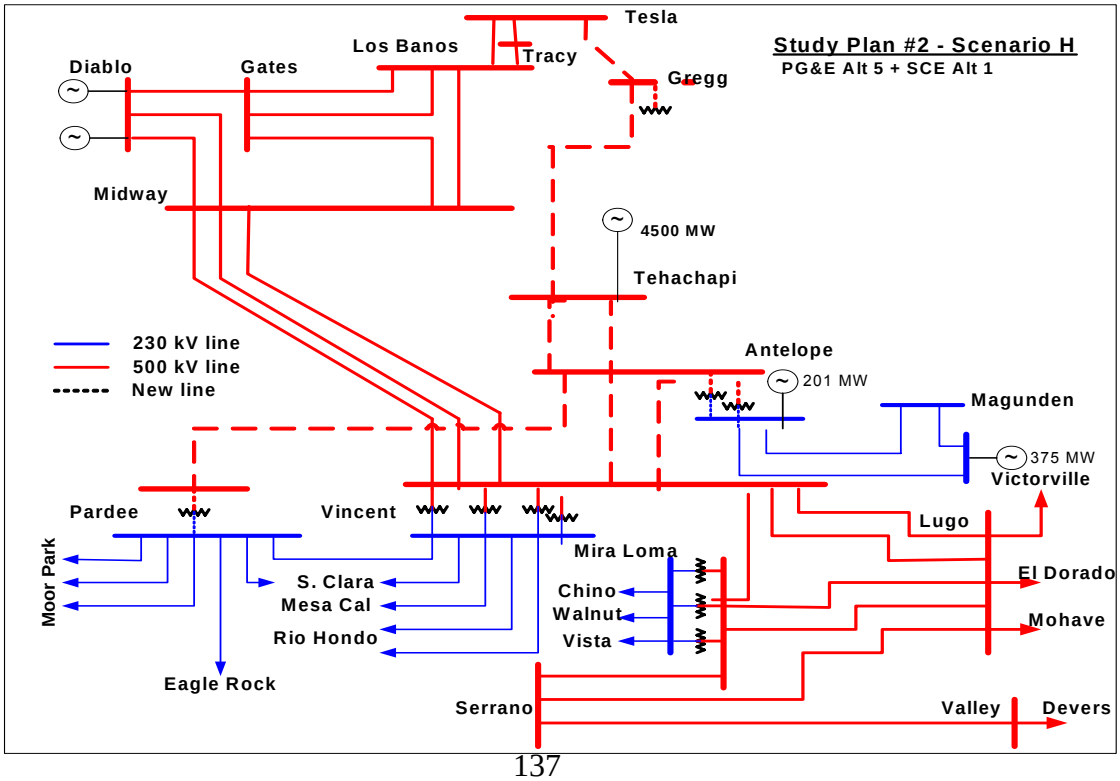


Figure 14 – Scenario I Oneline

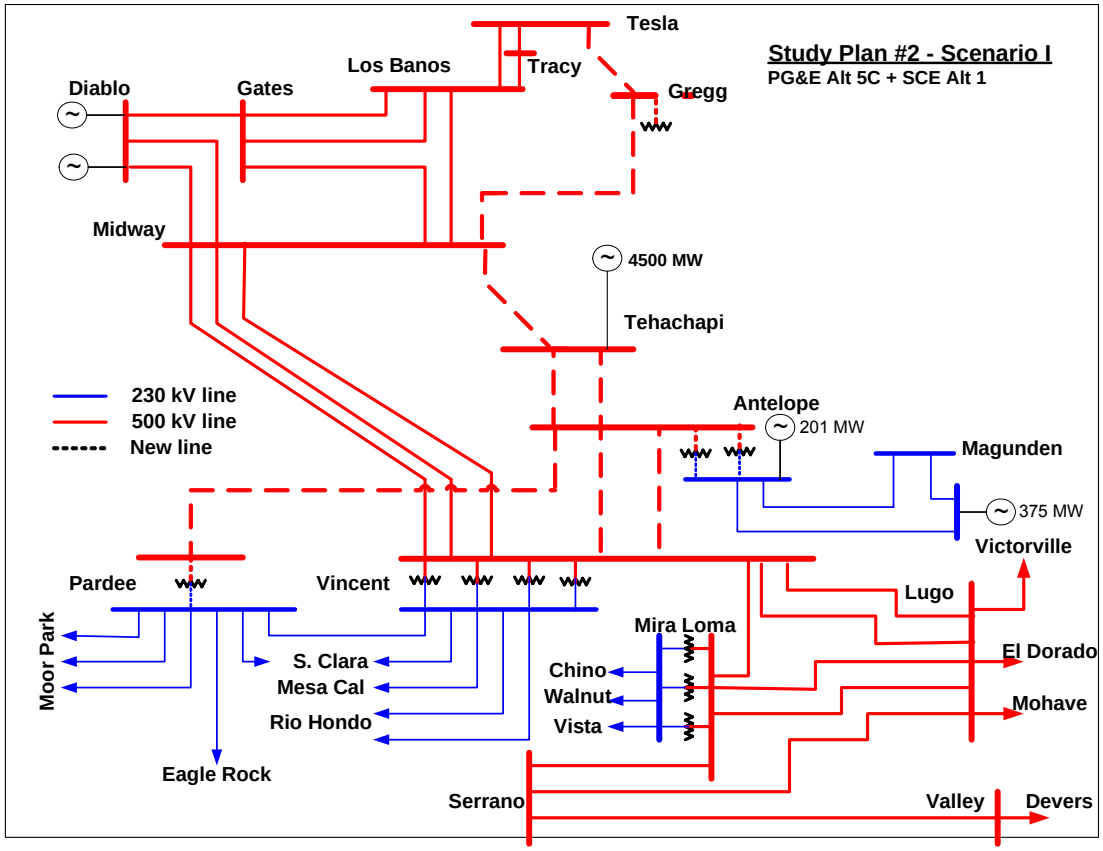
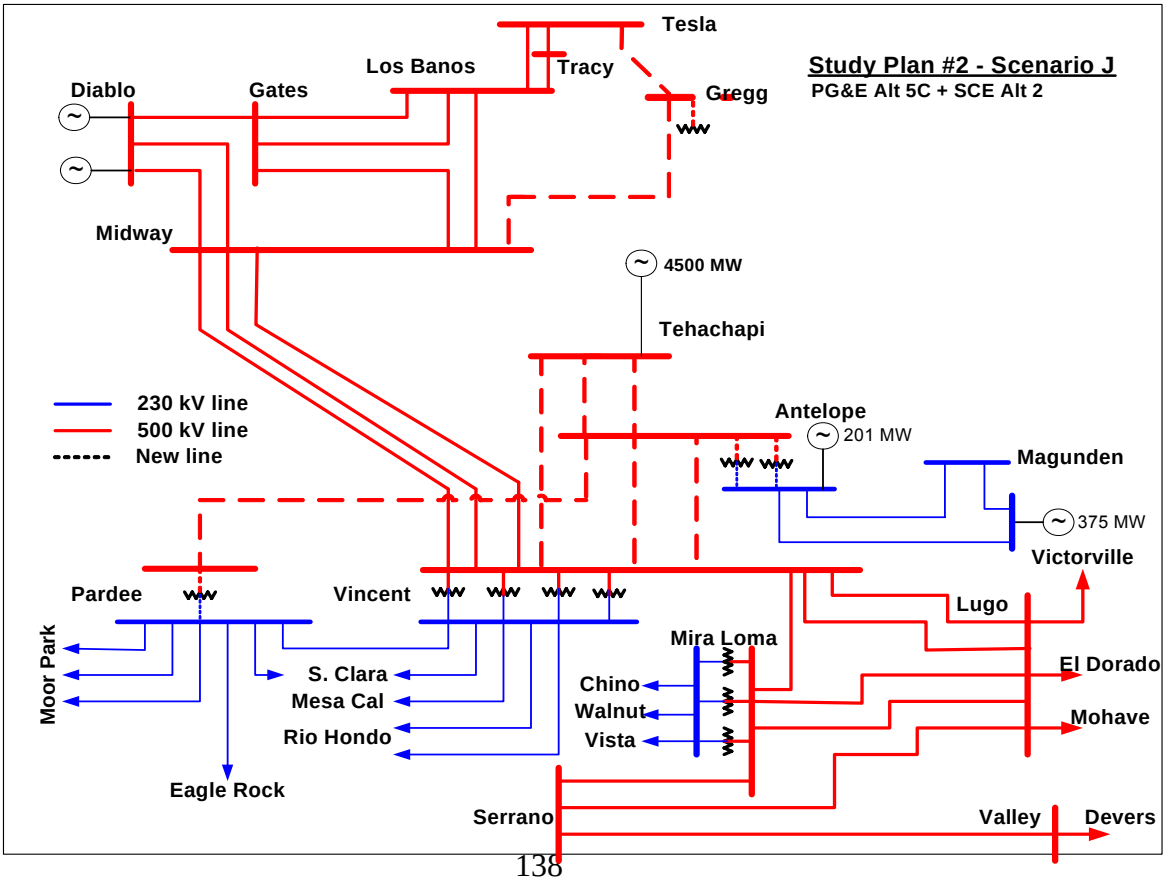



Figure 15 – Scenario J Oneline



# APPENDIX 5

# APPENDIX 5

## Fresno 230kV Tie

A5.1 Purpose

If the output of the Tehachapi Wind Farm were to be in the order of 2000MW with half of that to be transmitted to PG&E, a low cost tie that would require a minimum investment, supplemented by flow over Path 26 would be cheaper than any EHV alternative. As indicated in the Executive Summary, the likely development of Tehachapi is now in the order of 3600MW and, as shown in Chapter 1, power bought by PG&E does not have to be delivered into the PG&E service area. The evaluation of the Fresno 230kV Tie was a blind alley which the TCSG went up and the following description is presented for academic interest only.

A5.2 Description, Figure A5.1

Two 230kV lines connect SCE's Antelope Substation with Magunden and four such circuits connect Magunden with the Big Creek hydroelectric plants. Two 230kV circuits connect PG&E's Helms pumped storage plant with Gregg Substation. These lines run west to east and cross the four Magunden to Big Creek lines which run south to north. A connection between the Helms-Gregg lines and two of the Magunden-Big Creek lines would transmit Tehachapi generation to PG&E with little modification to the grids. Because of the difference in the power angle between the two systems in this area, the connection would have to include a phase shifter, which could be a fixed or variable phase shifting transformer, or a solid state device. With a capacity of 300MW, no upgrade of the networks would have to be made other than voltage support. At higher capacities, varying levels of upgrade to the highly loaded SCE network would be needed depending on the incremental capacity of the tie and the loading of the lines at the time the Tehachapi generation was available. Power flow computer runs to determine the relationship between the amount of Tehachapi power flowing over the lines to the tie and line loading due to loads in the Fresno area were not made, so that it was not possible to determine the optimum capacity of the tie.

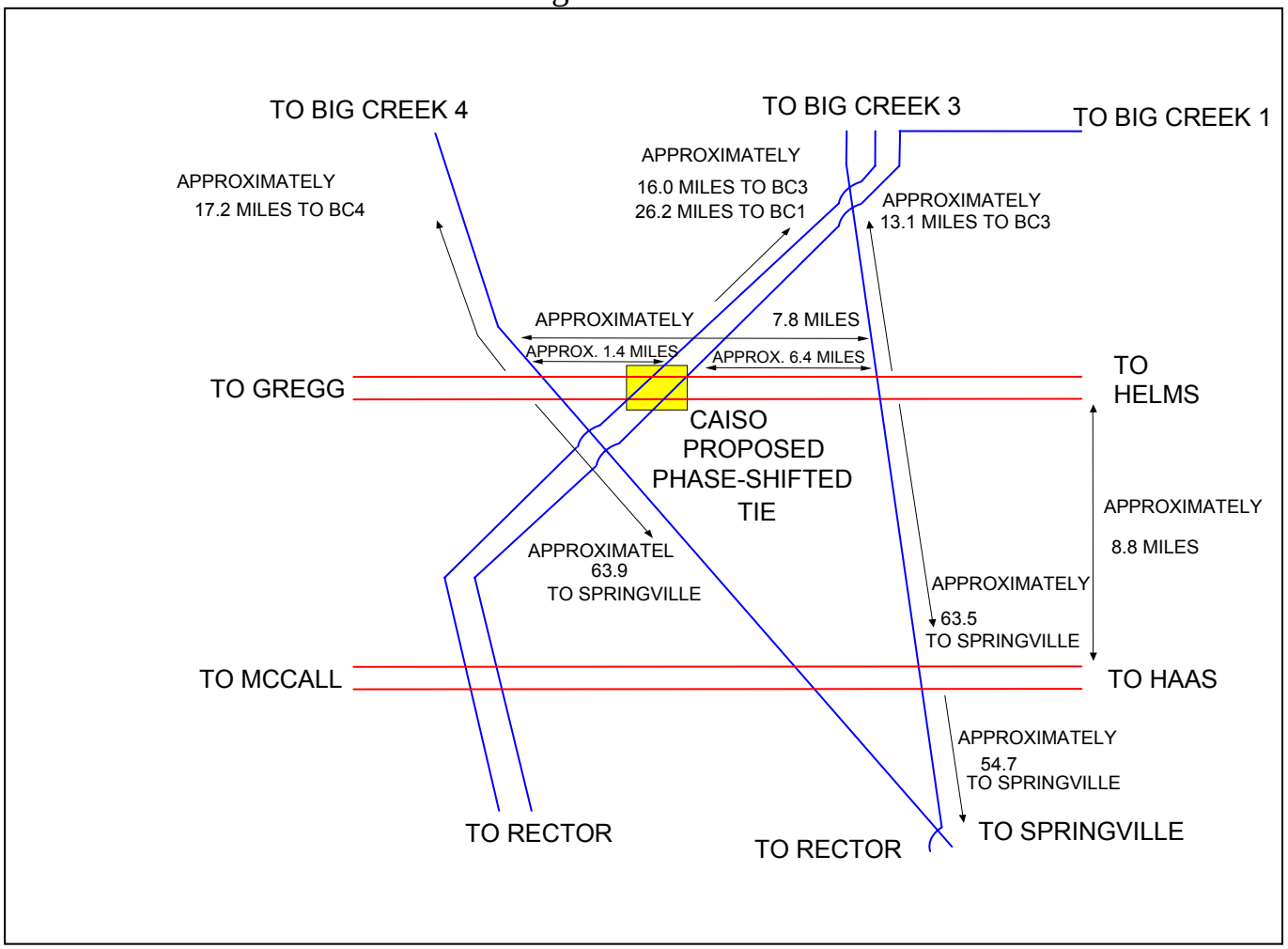
A5.3 Production Cost Study

Production cost simulation runs were made modeling variable phase shifting transformers of 300MW, 500MW and 1000MW capacities. The 300MW transformer reduced the production cost by a small amount, but with the two larger capacities the cost actually increased over the cost of identical conditions without the tie. The fact that the addition of a network component would increase production cost is hard to understand and leads to the question of whether the program is correctly modeling the device. The limitations of the program in modeling the performance of the pumped storage, which in the real world would be coordinated with the wind generation, also contributes to the perception that the effect of the phase shifting transformer was short shrifted by the program.

A5.4 Conclusions

1. With the level of production presently expected from Tehachapi and the fact that it does not need to be delivered into the PG&E system, the 230kV tie is not needed.
2. The ABB GridView production simulation program needs to be improved to correctly simulate the phase shifting transformer and to optimize the performance of pumped storage.

Figure A5.1



# APPENDIX 6

## Path 26 Impacts

### Introduction

When wind generation in Tehachapi is connected to the grid with new transmission lines, wind power will flow on existing lines as well. Since Path 26 is a vital transmission link between Northern and Southern California, the TCSG investigated how power flows from Tehachapi will affect Path 26 and submitted the report reproduced below.

The ability of Southern California to import power from the North through Path 26 on hot summer days, when air conditioning loads are highest, is especially important. The TCSG's analysis therefore focused on Path 26 flows and Southern California imports during this peak period.

Since wind generation is variable, the amount of Tehachapi power flowing on Path 26 will also be variable. As discussed in Chapter 5, grid operators will have be able to adjust other flows on Path 26 to ensure reliability limits will not be exceeded. However, the TCSG did not attempt to analyze the impact of Tehachapi wind generation on grid operations for any of the alternatives studied.

### Summary of findings

The TCSG examined the effects on Path 26 for two alternative ways of connecting Tehachapi to the grid: the Expanded Path 26 option (Alternative 1) and the Gen-tie option (Alternative 2). The Expanded Path 26 option adds a fourth 500 kV tie between Northern and Southern California; the Gen-tie configuration connects Tehachapi only to Southern California and provides no additional connection between the regions.

In combination with Tehachapi generation both the expanded Path 26 option and the Gen-Tie option increase the capacity into the south above the amount existing today.

### Alternative 2 (Gen-tie option) – south-to-north flows.

When power is flowing from Southern California to Northern California, i.e., south-to-north on Path 26 (generally during off-peak periods), some power from Tehachapi will also flow north on this path. At the present time, south-to-north flows are limited by the capacity of Path 15 (north of PG&E's Midway substation) rather than by the capacity of Path 26. Therefore, although some of the capacity of Path 26 will be used by Tehachapi generation, system impacts are minimal.

### Alternative 2 (Gen-tie option) –north-to-south flows

When Southern California is importing power, i.e., power is flowing north-to-south on Path 26 (generally during on-peak periods), this path is unaffected by Tehachapi generation. Power from Tehachapi simply adds to power flowing south on Path 26.

### Alternative 1 (Expanded Path 26 option) – south-to-north flows

When power is flowing south-to-north in the Expanded Path 26 configuration, Tehachapi generation flows on Path 26, but as mentioned above, south-to-north flows are limited by the capacity of Path 15 at the present time. The system impacts of Tehachapi generation therefore are expected to be minimal, as with the Gen-tie option.

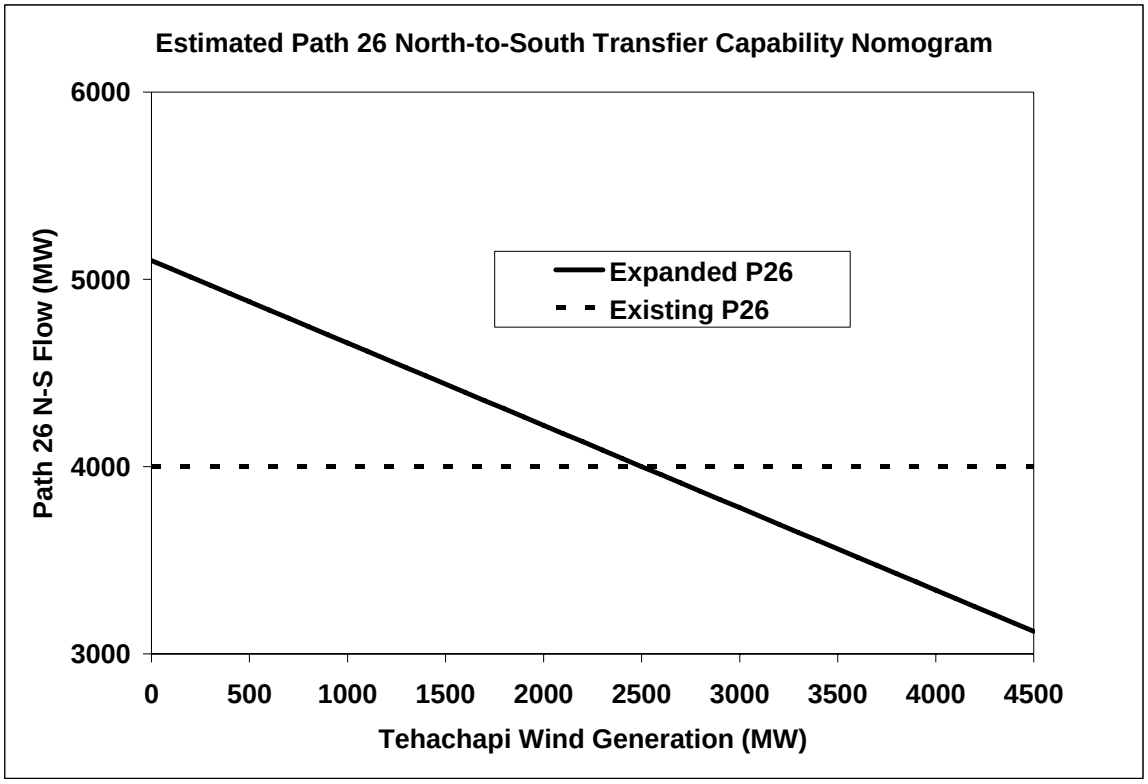
### Alternative 1 (Expanded Path 26 option) – north-to-south flows

When Southern California is importing power and flows are north-to-south on Path 26, the effects of Tehachapi generation on Path 26 become important. As described below in a report by the TCSG Path 26 subcommittee, these effects differ depending on whether Tehachapi generation is high or low, i.e., whether the wind is blowing hard in Tehachapi or not.

When Tehachapi wind generation is low, the additional link between Northern and Southern California provided by the Expanded Path 26 configuration allows more power to flow between the regions than can be accommodated today. Even though some Tehachapi power flows north-to-south on Path 26 (see figure 4 in the subcommittee report below), there is a net increase in transfer capability due to the additional 500 kV link. When Tehachapi wind generation is high, the power transfer from Northern California to Southern California is less than when wind generation is low. This is because the amount of Tehachapi power flowing on Path 26 is enough to reduce the net transfer capacity of the Path. Even in this case, however, the net power delivered to Southern California is higher than is possible today, because of the new generation added at Tehachapi. The transfer capacity of Path 26 as a function of Tehachapi generation is shown on Figure A6.1[15].

[15] The data shown in this chart assumes 70% series compensation on the Midway-Tehachapi line.

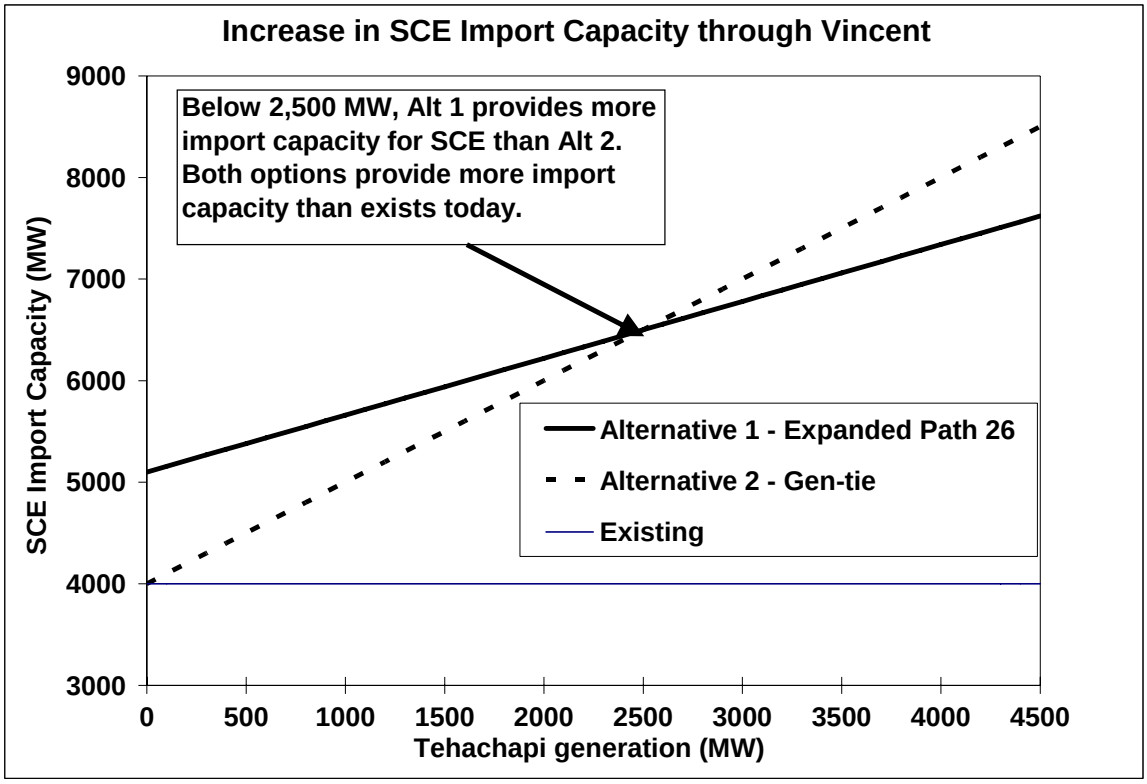
Figure A6.1




The decline in Path 26 transfer capability for the Expanded Path 26 shown above indicates that as Tehachapi wind generation increases and uses some of the capacity in Path 26, the amount of power that can be exported from Northern California south through Path 26 decreases.

However, the import capacity into Southern California *increases* over existing levels for both options, as shown on Figure A6.2.

Figure A6.2




Concerns over the variability of wind generation are often expressed as "What happens when the wind doesn't blow?" As the above chart indicates, even when Tehachapi wind generation is zero, the Expanded Path 26 option provides Southern California with additional import capacity while the Gen-tie option does not. When Tehachapi generation is above 2,500 MW, the Gen-tie option provides Southern California with more import capacity than does the Expanded Path 26 option.

The key conclusion is that both alternatives provide more import capacity than exists at present, because of the addition of new generation at Tehachapi and new 500 kV lines to connect it.

**TCSG Path 26 Subcommittee Report Is Reproduced Below.**

## Comparison of the Effects on the Transfer Capability of Path 26 of Alternatives 1 and 2 for Delivering Tehachapi Power to the Grid Taking Into Account the Variability of Wind Generation

The evaluation of the effects of the proposed Tehachapi wind development on Path 26[16] is based on the following two alternatives considered:

Alternative 1 – consists of one 500kV line between Tehachapi and Midway, and two 500kV lines between Tehachapi and Antelope, see Figure 1.

Alternative 2 - consists of three 500kV lines between Tehachapi and Antelope, see Figure 2.

### Conclusions

1. South-to-North Capability: During off-peak hours when the power flow is from South to North (S-N) across Path 26, Path 26 transfer capability is limited by Path 15 capability, therefore there is no difference between Alternative 1 and Alternative 2 under this condition.
2. North-to-South Capability with No Wind: During peak hours when the power flow is from North to South (N-S), when Tehachapi wind generation is zero, the thermal transfer capability with Alternative 1 will be increased from 4000MW[17] to 5100MW and 4500MW given 70% and no series compensation, respectively, on the Tehachapi- Midway line. However, the usefulness of this capability is dependent on an increase in generation North of Midway. With Alternative 2, the transfer capability is unchanged by the level of generation at Tehachapi and remains at 4000MW.
3. North-to-South Capability with Wind: During peak hours when the power flow is from N-S and the wind is generating maximum output, the thermal transfer capability of Path 26 with Alternative 1 and 4000MW at Tehachapi will decrease from 4000MW to 3400MW and 3700MW with 70% and no series compensation, respectively, see Figure 3 for the case of 70% series compensation. The transfer capability as a function of varying levels of Tehachapi generation is shown on

---

[16] The existing Path 26 transfer capabilities are determined by power flow and stability studies. The new values provided in this evaluation are estimated thermal transfer capabilities based on power flow analysis only. Detailed thermal, voltage and stability studies are needed to determine actual capabilities.

[17] The existing Path 26 North-to-South capability is 3700 MW. This is expected to increase to 4000 MW by Summer 2006, pending final approval. This increase to 4000 MW is currently in Phase II of the WECC Path Rating Process. WECC Procedure for Project Rating Review requires projects that have achieved a Phase II status be considered in the study of all project potential projects, therefore, this analysis assumes a 4000 MW N-S transfer capability for Path 26.

Figure 4. With Alternative 2, the transfer capability remains at 4000MW and is unchanged by the level of Tehachapi generation.

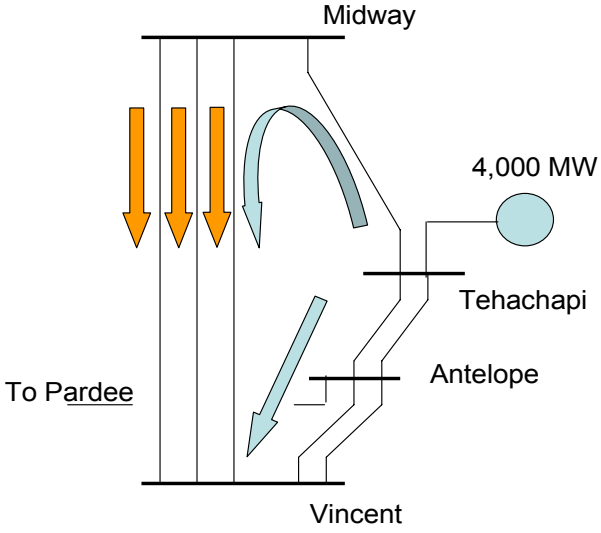
4. Alternative 1 would provide benefit during scheduling clearance for maintenance by providing additional transmission facilities over the interface assuming wind generation at Tehachapi are off-line compared to the existing system or Alternative 2.

BOTTOM LINE: The estimated Path 26 thermal transfer capability is impacted only by Alternative 1 (with the Tehachapi-Midway line) and only in the North-to-South direction. The North-to-South thermal transfer capability is increased for Tehachapi generation up to about 2500MW; above this value, the line would degrade the thermal transfer capability. South-to-North thermal transfer capability would remain unchanged because it is limited by the Path 15 South-to-North transfer capability. Alternative 2 would not impact the Path 26 thermal transfer capability.

## Figure 1

Alternative 1

Power flow with One Tehachapi-Midway and Two Tehachapi – Antelope lines




## Figure 2

Alternative 2

Power flow with Three Tehachapi – Antelope lines

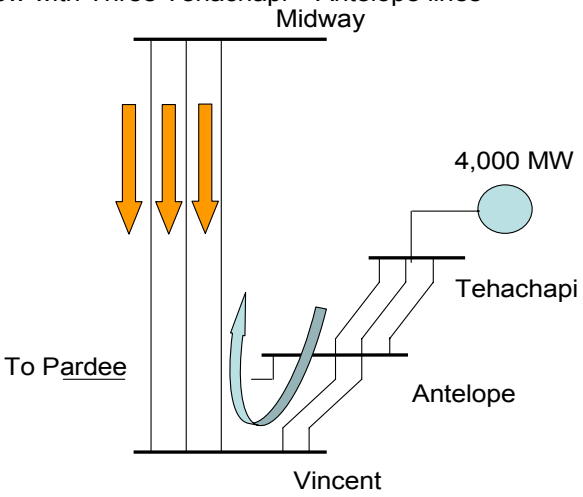


**Figure 3**

PF Plot: 2010 Summer Peak; P26 N-S=3400MW, Tehachapi Gen = 4000MW
Midway-Tehachapi 500 kV line with 70% series compensation

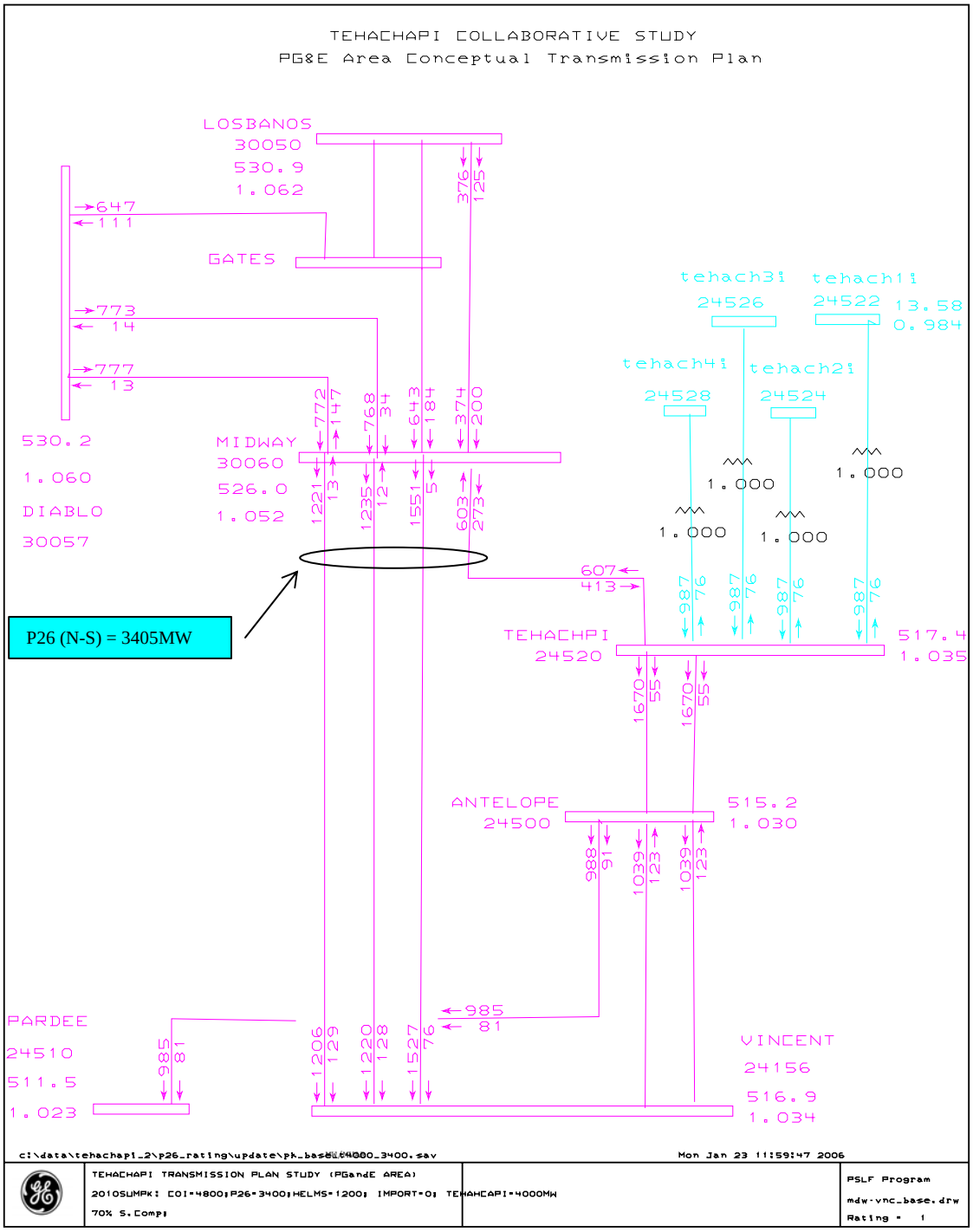
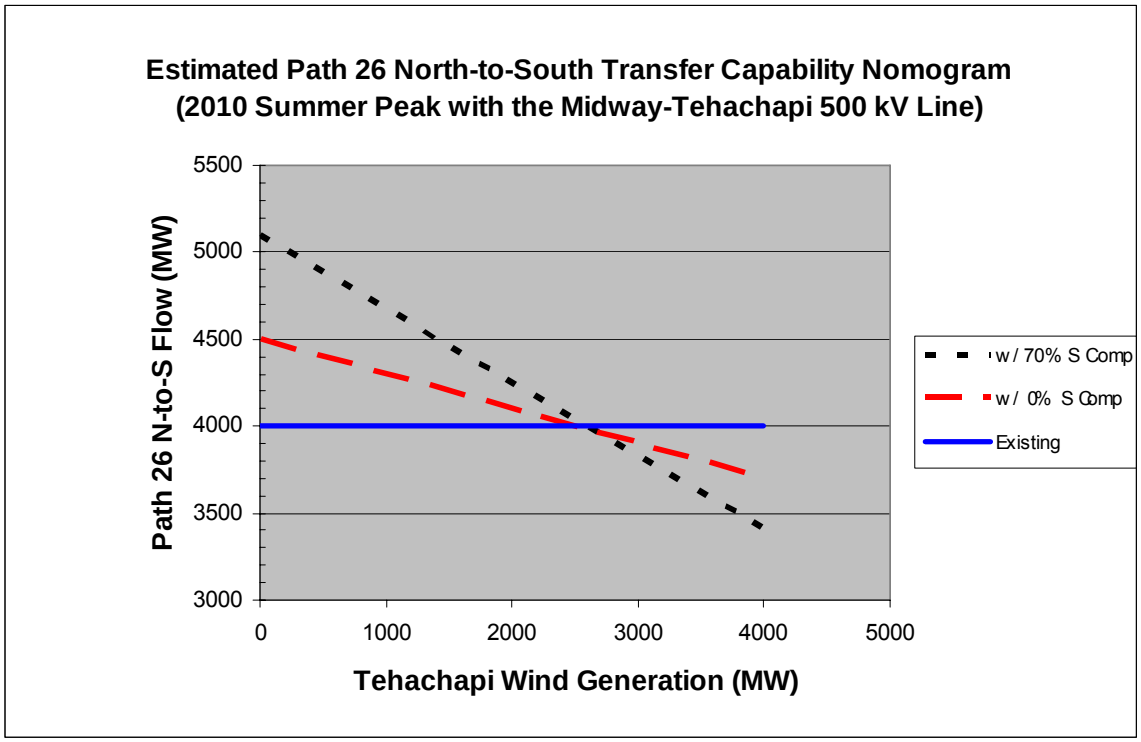


**Figure 4**




## The Alternatives

The only existing transmission link between northern and southern California are the three 500 kV lines between PG&E's Midway Substation and SCE's Vincent Substation which define the Path 26 interface. The existing non-simulataneoussimultaneous Path 26 transfer capability in either the North to South (N-S) or South to North (S-N) direction is determined by normal and emergency loading on the Midway – Vincent #3 500 kV line or voltage criteria violations. The limiting facilities are the 1736A summer normal rating of the #3 line conductors and the existing 3500 A emergency rating of the series capacitor banks on the Midway-Vincent #3 line. The most limiting credible contingency is the loss of both the Midway-Vincent #1 and #2 lines.

The existing maximum Path 26 N-S transfer limit of 4000 MW is based on heavy summer conditions and requires a Remedial Action Scheme (RAS) to trip 1400 MW[18] of Midway area generation and 500 MW of load in Southern California following the loss of the Midway-Vincent #1 and #2 lines. Without the RAS, existing maximum Path 26 N-S transfer limit is 3000 MW. The maximum existing Path 26 S-N transfer limit is 3000 MW and does not require RAS to support this limit. Path 26 S-N flows are typically limited to below 3000 MW due to congestion on Path 15.

[18] Maximum amount of generation rejection for loss or two elements under CAISO planning guidelines.

With the Tehachapi wind generation electrically near the Path 26 interface, there is a potential to impact the transfer capability depending on the 500 kV transmission reinforcements selected. Figure 1 shows SCE's proposed Alternative 1, which provides two 500kV circuits from Tehachapi Substation 1 to Antelope Substation and a 500 kV line from Midway to Tehachapi, thereby creating a 4th path from Midway to Vincent in parallel with the existing Path 26 interface. As such, the Path 26 interface would need to be redefined to include this new transmission path. The transfer capability of this path would be dependent on the level of Tehachapi wind power injected into the new Midway-Tehachapi-Vincent line at Tehachapi and also by the level of series compensation on the line. Due to the variability of the wind, the wind generation output may range from 0 to the maximum of 4000 MW. Under peak load conditions, when the prevailing power flow is from North to South, part of the Tehachapi power would flow North to Midway, then use the existing North-to-South transfer capability to flow back South over the existing Path 26 lines. That would decrease the available North-to-South transfer capability for transporting power from North of Midway to Southern California.

Figure 2 shows SCE's proposed Alternative 2, which consists of three 500kV lines from Tehachapi Substation 1 to Antelope/Vincent. This alternative would not affect the present Path 26 thermal transfer capability in either the North-to-South or South-to-North direction.

**Comparison of the Effects of the Alternatives**

The following table provides a comparison of the estimated Path 26 thermal transfer capability. Detailed thermal, voltage and stability studies are needed to definitively determine actual capabilities.

Estimated Path 26 Thermal Transfer Capability

| SCE Alternative | Tehachapi Wind Output (MW) | Path 26 | |
|---|---|---|---|
| | | N-S (MW) | S-N (MW) |
| Existing System | - | 4000[1] | 3000[2] |
| Alt. 1 – 500 kV, one Midway-Tehachapi, two Tehachapi-Antelope-Vincent | 0 | 4500[1] –5100[3] | 3000[2] |
| | 4000 | 3400-3700[1] | 3000[2] |
| Alt. 2 – Three 500 kV Tehachapi-Antelope-Vincent | 0 | 4000[1] | 3000[2] |
| | 4000 | 4000[1] | 3000[2] |

Notes:

1) Path 26 RAS will trip 1400 MW of Midway generation and 500 MW of Southern California load for Midway – Vincent #1 and #2 500 kV double-line outage.
2) No RAS required. Path 26 S-N transfers may be limited by Path 15 capability.
3) Range indicates without series compensation and with a high level of series compensation (70%) on the Midway-Tehachapi 500 kV line. Appropriate series compensation needs to be determined through additional studies.

4) Does not consider any limitation resulting from SCIT transfer capability.

Alternative 1 would provide a significant increase in the North-to-South transfer capability of Path 26 when there is no generation at Tehachapi. However, it would also decrease the existing N-S capability when Tehachapi is at full output, see Figure 3 for the transfer capability as a function of varying levels of Tehachapi generation. However, in order to take advantage of any increased capability, CAISO Operations would need sufficient advance forecast of the wind generation output to allow for rescheduling of Path 26 power flow. This may be problematic until better forecasting methods are implemented.
The upper range of this capability depends on use of the Midway RAS. Since the existing Path 26 interface RAS arms the maximum amount of generation for rejection for the limiting N-2 contingency plus 500MW of load rejection, no additional generation, such as Tehachapi wind, may be armed unless it is accompanied with a further equivalent amount of load rejection on the SCE system.

Alternative 1 S-N: Without an upgrade of Path 15, there will be no increase in Path 26 S-N capability since Path 26 would be limited by the existing Path 15 capability
Alternative 1 would provide benefit by increased flexibility during scheduling clearance for maintenance by providing additional transmission facilities over the interface assuming wind generation at Tehachapi are off-line compared to the existing system or Alternative 2.

Alternative 2 would not provide any new transfer capability for Path 26, as it does not involve reinforcement or upgrade of the existing path.

Comparison of the Effects on the Transfer Capability of Path 26 of Alternatives 1 and 2 for Delivering Tehachapi Power to the Grid Taking Into Account the Variability of Wind Generation

## APPENDIX

### Study Plan

I. Purpose: To determine the effect of the variability of wind generation and a Tehachapi-Midway 3,400MVA line on the non-simultaneous thermal transfer capability of Path 26.

II. Introduction: In the December 19, 2005 TCSG meeting it was decided that a subgroup be formed to develop a collaborative statement on variability of wind and its impact and that of the Tehachapi-Midway line on Path 26 transfer capability. Power flow studies will be performed to provide the supporting data for this statement by establishing the approximate nomogram relationship between Tehachapi wind generation and Path 26 thermal transfer capability.

III. Limitations: It should be noted that Transfer Capability must be determined based on power flow, transient dynamic stability studies and post-transient voltage stability studies taking into account relationships with other interfaces such as SCIT, as well as the non-simultaneous power flow studies undertaken here. Such stability studies and studies to account for simultaneous transfer will not be performed here due to the lack of time and specific generator data. In addition, further studies with more detailed information may identify other more limiting contingencies. As such, the "thermal transfer capabilities" determined in this study must be adjusted when more specific information becomes available.

IV. Assumptions:
1. Starting Base Cases (same as the TCS Phase 2 study plan):
    a. 2005 PG&E Grid Expansion Study, 2010 Heavy Summer North Peak case
    b. 2005 PG&E Grid Expansion Study, 2010 Summer Off-peak case
2. Loss of Midway – Vincent 500 kV lines # 1 and #2 is the most limiting contingency.
3. Existing RAS are available to support 3700 MW of existing North-to-South power transfer on Path 26, and to support the existing 5,400 MW (or the most recent Operating Transfer Capability as determine by the WECC) of South-to-North power transfer on Path 15.
4. Decreasing generation that provide RAS to support the power transfer will be accompanied by:
    a. Decreasing Path 26 operating limit in the North-to-South direction at the rate of 1 MW for every 2 MW decrease in generation in the vicinity of Midway Substation

b. Decreasing Path 15 operating limit in the South-to-North direction at the rate of 1 MW for every 2 MW decrease in generation in the vicinity of Midway Substation

V. Criteria: NERC/WECC Planning Standards and CAISO Planning Standards.

VI. System Operating Scenarios: The following reasonably adverse operating scenarios will be examined:

2. Peak conditions with 3700 MW of normal power flow in a North-to-South direction on Path 26 and 0 MW of PG&E's import at Midway from Southern California:
    a. Existing system with Tehachapi wind generation at 0 MW to establish benchmark case.
    b. Case E1-New Rating (i.e., SCE Alternative 1 with Tehachapi – Midway 500 kV line rated at 3,400 MVA without series compensation)
        i. Tehachapi wind generation at 0 MW
        ii. Tehachapi wind generation at 4,000 MW
    c. Case G-NNM (i.e., SCE Alternative 2)
        i. Tehachapi wind generation at 0 MW
        ii. Tehachapi wind generation at 4,000 MW

3. Off-Peak conditions with normal power flow in a South-to-North direction on Path 15 and Path 26, and with Path 26 loading increased (in the South-to-North direction) by 50% of Tehachapi generation.
    a. Existing system with Tehachapi wind generation at 0 MW to establish benchmark case.
    b. Case E1-New Rating (i.e., SCE Alternative 1 with Tehachapi – Midway 500 kV line rated at 3,400 MVA without series compensation)
        i. Tehachapi wind generation at 0 MW
        ii. Tehachapi wind generation at 4,000 MW
    c. Case G-NNM (i.e., SCE Alternative 2)
        i. Tehachapi wind generation at 0 MW
        ii. Tehachapi wind generation at 4,000 MW

4. Repeat Steps 1.b and 2.b with Tehachapi – Midway 500 kV line series compensated at 70%

VII. Methodology:

1. Examine each scenario above and run power flow program to determine the thermal transfer capability allowable on Path 26 under normal operating conditions by adjusting the power schedule under normal conditions at Midway until a transmission facility on Path 26 or Path 15 is loaded to 100% of its normal rating.

For each scenario above run Governor Power Flow program to simulate Midway – Vincent #1 and #2 double line outage to examine system

2. conditions after the transient oscillations have subsided, all automatic actions are completed but before operator intervention.
3. Determine the thermal transfer capability of Path 26 by adjusting the power schedule under normal conditions at Midway until a transmission facility on Path 26 or Path 15 is loaded to 100% of its emergency rating after the Midway – Vincent 500 kV lines #1 and #2 double line outage. Record this power schedule at Midway. (To the extent applicable, the most recent Operating Transfer Capability as determined by the WECC can be used for the benchmark cases.)
4. Repeat for the remaining system scenarios
5. Develop nomogram relating Path 26

# APPENDIX 7

# APPENDIX 7

Tehachapi-Midway Cost Estimate

for TCSG Report, April 7, 2006

One major export path for Tehachapi generation is to connect to the state backbone grid at the Vincent substation at the southern end of Path 26. The TCSG has relied on the cost estimates for the Tehachapi-Vincent connections contained in SCE's CPCN Applications for the Antelope-Pardee (Application No. 04-12-007), and Antelope-Vincent and Antelope-Tehachapi Transmission Projects (Application No. 04-12-008).

Another major transmission alternative for connecting Tehachapi generation to the grid considered by the TCSG, outside of Tehachapi-Vincent corridor routings, is a line from Tehachapi to the Midway substation, at the southern end of Path 15, west of Bakersfield.

The Midway substation is roughly 90 miles west of the proposed Tehachapi substation #1. At this point, Tehachapi-Midway is only a conceptual routing. Neither SCE nor PG&E has yet identified any physical routings for such a connection. Without a physical routing, line distance can only be roughly estimated; no environmental studies have been performed. With so many factors unknown, any such conceptual cost estimate can only be roughly approximate.

PG&E estimates the cost of acquiring the land, doing the permitting work and building the line to be $508 million. SCE estimates this cost to be $315 million. This large disparity in conceptual cost estimates led the TCSG to appoint a subcommittee to better understand the basis of each company's estimate. The subcommittee held several meetings via conference call with the land and permitting experts of both utilities. Notes of the subcommittee conference call meeting of January 10, 2006 explain the components of each, and document the basis for cost estimate. These notes are available from the CPUC coordinator of the TCSG.

For purposes of evaluating a Tehachapi-Midway conceptual routing, the subcommittee recommended that the TCSG use the SCE estimate of $315 million for the 90-mile project.

The SCE estimate is in line with the cost estimates of the other components of the Tehachapi transmission projects proposed to date.

Tehachapi-Midway Conceptual Cost Estimates
$, millions

| | PG&E | SCE |
|---|---|---|
| Land Acquisition, Planning and Permitting (includes PEA, CPUC CPCN process) | $245.9 | $90.4 |
| Construction | $262.1 | $225.0 |
| Total Conceptual Cost Estimate | $508.0 | $315.4 |

# APPENDIX C

Development Plan for the Phased Expansion of the Transmission to Access Renewable Resources in the Imperial Valley

# APPENDIX C - 1

Development Plan for the Phased Expansion of the Transmission to Access Renewable Resources in the Imperial Valley

# Development Plan for the Phased Expansion of Transmission to Access Renewable Resources in the Imperial Valley

## Report
of the
## Imperial Valley Study Group

Presented to the California Energy Commission

2005 Integrated Energy Policy Report

September 30, 2005

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## APPENDICES

(separately bound volumes/separate electronic files)

**Appendix A**. Transmission Planning Studies, Volume 1: Heavy Summer Power Flow Results (file size: 4 MB)

1. Flows at Regional Buses

2. Dispatch Schedules

3. Outage Lists
   - 3.1. N-1
   - 3.2. N-2

4. PSLF Maps and Data Tables
   - 4.1. Heavy Summer Rev 4 (Base Case)
   - 4.2. Alternative 1, Dispatch 1
   - 4.3. Alternative 1, Dispatch 2
   - 4.4. Alt 2 D 1
   - 4.5. Alt 2 D 2
   - 4.6. Alt 3a D 1
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   - 4.8. Alt 3b D 1
   - 4.9. Alt 3b D 2
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5. Pivot Table

**Appendix B**. Transmission Planning Studies, Volume 2: Light Autumn Power Flow Results (file size: 2 MB)

1. PSLF Maps and Data Tables
   - 1.1. Light Autumn Rev 5 (Base Case)
   - 1.2. Alt 2 D3
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   - 1.6. Alt 3b D 3
   - 1.7. Alt 3b D 4

2. Sensitivity Cases
   - 2.1. Power Flow Diagrams and Contingency Tables
   - 2.2. Light Autumn-Alt 2 D 3, S-Central to SerVal
   - 2.3. Light Autumn-Alt 2 D 3, S-East of the River

3. Pivot Tables

**Appendix C**. Transmission Planning Studies, Volume 3: Stability Study Results (file size: 5.3 MB)

1. Stability Plots
   - 1.1. Heavy Summer
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2. Switch Decks
   - 2.1. Heavy Summer
   - 2.2. Light Autumn

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   - 1.1. Study Assumptions
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## Summary of Transmission Planning Studies

| | Power Flow | | Transient Stability | | Post-Transient | | |
|---|---|---|---|---|---|---|---|
| Alternative/ Dispatch | Heavy Summer | Light Autumn | Heavy Summer | Light Autumn | Heavy Summer | Light Autumn | Production Cost |
| Base | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Base Sensitivity | | | | | | | ✓ |
| Alt. 1/D1 | ✓ | | | | | | |
| Alt. 1/D2 | ✓ | | | | | | |
| Alt. 2/D1 | ✓ | | ✓ | | ✓ | | |
| Alt. 2/D2 | ✓ | | ✓ | | | | |
| Alt. 2/D3 | | ✓ | | ✓ | | ✓ | ✓ |
| Alt. 2/D4 | | ✓ | | ✓ | | | |
| Alt. 2 Sensitivity | | | | | | | ✓ |
| Alt. 2a/D3 | | ✓ | | ✓ | | ✓ | ✓ |
| Alt. 2a/D4 | | ✓ | | ✓ | | | |
| Alt. 3a/D1 | ✓ | | | | | | |
| Alt. 3a/D2 | ✓ | | | | | | |
| Alt. 3b/D1 | ✓ | | ✓ | | ✓ | | |
| Alt. 3b/D2 | ✓ | | ✓ | | | | |
| Alt. 3b/D3 | | ✓ | | ✓ | | ✓ | ✓ |
| Alt. 3b/D4 | | ✓ | | ✓ | | | |
| Alt. 4a/D1 | ✓ | | | | | | |
| Alt. 4a/D2 | ✓ | | | | | | |
| Alt. 4b/D1 | ✓ | | | | | | |
| Alt. 4b/D2 | ✓ | | | | | | |
| Alt. 5/D1 | ✓ | | | | | | |
| Alt. 5/D2 | ✓ | | | | | | |
| Phase 1 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | |
| Phase 2 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | |

# Glossary

| | |
|---|---|
| APS | Arizona Public Service Company |
| CAISO | California Independent System Operator |
| CEC | California Energy Commission |
| CEQA | California Environmental Quality Act |
| CFE | Comisión Federal de Electricidad |
| CEERT | Center for Energy Efficiency and Renewable Technologies |
| CPCN | Certificate of Public Convenience and Necessity |
| CPUC | California Public Utilities Commission |
| CSP | Concentrating Solar Power |
| Definitive Plan | Transmission facilities specified in sufficient detail to be approved by regulatory agencies for ratemaking and construction |
| EIR | Environmental Impact Report |
| FERC | Federal Energy Regulatory Commission |
| FS | Facilities Study |
| Gen-tie | Transmission line connecting a generator to the grid |
| IID | Imperial Irrigation District |
| IOU | Investor Owned Utility |
| IVSG | Imperial Valley Study Group |
| KGRA | Known Geothermal Resource Area |
| kWh | Kilowatt-hour |
| LADWP | Los Angeles Department of Water and Power |
| MW | Megawatt (1,000 kW) |
| MWD | Metropolitan Water District |
| NERC | North American Electricity Reliability Council |
| SP 15 | South of Path 15 |
| PEA | Proponent's Environmental Assessment |
| PG&E | Pacific Gas & Electric |
| PPA | Power Purchase Agreement |
| PWG | IVSG Permitting Work Group |
| RAS | Remedial Action Scheme |
| RMR | Reliability Must Run |
| ROW | Right Of Way |
| SCE | Southern California Edison Company |
| SCPPA | Southern California Public Power Authority |
| SDG&E | San Diego Gas & Electric Company |
| Sec. 399.25 | Section of California Public Utilities Code implementing RPS statutes |
| SIS | System Impact Study |
| SPS | Special Protection System |
| SRP | Salt River Project |
| STEP | Southwest Transmission Expansion Plan |
| SWPL | Southwest Power Link |
| TCSG | Tehachapi Collaborative Study Group |
| TO | Transmission Owner |
| TWG | IVSG Technical Work Group |
| WAPA | Western Area Power Administration |
| WECC | Western Electricity Coordinating Council |

## Executive Summary

California's Imperial Valley contains 1,950 MW of geothermal power reserves and one-quarter of the state's entire solar generation potential. This is in addition to the more than 500 MW of renewable resources that the Imperial Irrigation District (IID) delivers across its system today. Meeting the state's renewable energy goals requires access to these new resources. Very little transmission capacity is currently available to export such additional generation.

The Imperial Valley Study Group (IVSG) was formed to recommend a phased plan for the development of the transmission necessary to export 2,200 MW of renewable generation from the region. As with the Tehachapi Collaborative Study Group, the development of transmission solutions to access renewable resources has been sought by the California Public Utilities Commission (CPUC) and by the California Energy Commission (CEC) in its 2005 Integrated Energy Policy Report proceeding.

The IVSG is a voluntary planning collaborative made up of regional stakeholders. Participants include all regional Transmission Owners, the California Independent System Operator (CAISO), CPUC, CEC, generation developers, local, state and federal agencies, environmental and consumer groups and other interested parties. Its work has been led by the Imperial Irrigation District (IID), San Diego Gas & Electric (SDG&E) and Southern California Edison (SCE), and is fully supported by Los Angeles Department of Water and Power (LADWP). Its mission is to evaluate and recommend regional transmission solutions that meet threshold requirements for reliability, least cost development and for minimizing environmental impact. These solutions cross control area boundaries and require coordination among several transmission owners, Load Serving Entities, regulatory and government agencies and other interests.

Given this fundamental need for regional cooperation, the IVSG did not promote the interests of any one organization. It identified alternative solutions for study based on its own independent evaluation of the existing transmission infrastructure. IVSG planning work does, however, build on IID's proposed Green Path Initiative. As presented at CEC workshops in 2004 and 2005, this is an on-going program to upgrade the IID transmission system to support the export of additional renewable generation from the Imperial Valley to multiple delivery points. IVSG planning has also built on SDG&E's Transmission Comparison study of a new 500 kV connection to San Diego. This enabled the Study Group, among other things, to evaluate the deliverability of Imperial Valley generation to the CAISO grid much more quickly than it otherwise would have been able to do. The IVSG regularly presented status reports on its work at STEP meetings during the course of its study. This brought the IVSG's own studies of power flows from the Imperial Valley to the attention of planners from the entire southwest region who are not directly involved in the IVSG.

IID and LADWP operate their own control areas, distinct from the CAISO; both are independent of regulation by the CPUC and FERC. The IVSG development plan respects their regulatory independence, while also establishing a basis for the cooperation necessary

to support such a large-scale development involving publicly owned and investor-owned utilities operating across multiple control areas.[1]

The recommendations in this report flow from detailed transmission planning studies conducted by the participants. The IVSG first identified a range of transmission alternatives capable of exporting 2,200 MW of new generation from the Imperial Valley area to regional load serving entities. Initial power flow screening analysis led the group to select three of these alternatives for additional, extensive study. Power flow, voltage stability and post-transient studies considered single and double contingencies at key facilities in the region. Production simulations were performed to estimate the savings in production cost and the impact on congestion on major lines with 2,200 MW of new generation added. To determine the optimal way of phasing this development, the IVSG re-studied the upgrades required for delivering the new generation in smaller increments. This report includes a full description of the study assumptions, methodology and results. In addition to export paths, SCE and SDG&E evaluated network upgrades on their systems necessary to make Imperial Valley generation deliverable to load centers.

Independent of the IVSG, LADWP has also conducted transmission planning activities to develop a transmission plan to access Imperial Valley geothermal resources to serve LADWP customers. This IVSG report takes note of LADWP's transmission development plan.

The transmission solutions presented in this report are conceptual and do not constitute a detailed plan of service. The IVSG had neither the time nor the resources necessary to complete the kind of analysis typically required for System Impact Studies or Facilities Studies. Additional studies will therefore be required before any of the proposed facilities could be approved for interconnection by the transmission owner, or by regulatory agencies (in the case of the Investor Owned Utilities) for ratemaking and construction, or for increasing WECC Path Ratings. This report explains the limitations of the studies on which its development recommendations are based, and identifies the further studies needed.

**Phasing of Transmission Development**

The IVSG transmission plan consists of three development phases, designed to provide market access for 2,200 MW of renewable resources, primarily geothermal and solar, in the Imperial Valley region. These resources are identified in the CEC Renewable Resources Development Report.[2] After IVSG transmission planning work had been completed, SDG&E announced a major purchase of solar power from the Imperial Valley. No wind power projects have yet been proposed to IID or the Imperial County Planning and Development Services Department, but the IVSG plan readily supports interconnection of any renewable generating technology to the IID system.

[1] Arizona Public Service (APS), the Western Area Power Administration (WAPA) and the Comisión Federal de Electricidad (CFE) also operate separate control areas in the region; all have participated in the IVSG.
[2] The CEC Renewable Resources Development Report (RRDR) was adopted by the CEC and sent to the Legislature on November 19, 2003. SB 1038 required the CEC to prepare this plan for the development of California's renewable resources.

**Phase 1** would accommodate three new geothermal plants (or equivalent resources), 645 MW total, capable of being in service by the end of 2010. The size and timing of Phase 1 is based on CalEnergy's estimate of its work to conclude Power Purchase Agreements for three such plants. These generating units at the southern end of the Salton Sea would connect to the existing IID system at IID's Midway substation, which would be expanded to accommodate the additional lines from the new resources. Upgrades of the IID transmission system would be required from its Highline substation to El Centro substation (approximately 20 miles), and from El Centro to the Imperial Valley substation (approximately 18 miles), where the power would be delivered to the CAISO grid. These upgrades to existing facilities would be constructed to accommodate the ultimate capacity anticipated by IID to be capable to deliver additional future resources. These upgrades would take advantage of existing facilities to minimize cost and environmental impact; they would be constructed, owned and operated by IID.

The other major component of Phase 1 is a new 500 kV line from the Imperial Valley (IV) substation to San Diego County, with 230kV connections to SDG&E's load center.[3] IVSG studies established that a line from the IV substation to San Diego County would make Imperial Valley generation deliverable to load centers in San Diego and to other load centers in Southern California and to the north. SDG&E's project to accomplish this is called the Sunrise Powerlink.

**Phase 2** would accommodate an additional three geothermal plants (or equivalent), or 645 MW of incremental generation, bringing the cumulative new export capacity total to 1,290 MW. Based on CalEnergy's development schedule, Phase 2 upgrades should be timed to be available by approximately the end of 2016. These upgrades would also provide market access for Concentrating Solar Power (CSP) generation projects, and/or other renewable generation projects developed in that timeframe, in place of or in addition to new geothermal units. Phase 2 would upgrade IID's existing El Centro-Avenue 58 transmission line, from its El Centro substation to its planned Bannister substation west of the Salton Sea geothermal field. The El Centro-Bannister upgrade to 230 kV, approximately 25 miles, would utilize existing ROW. IID would also construct a new 230 kV line from the Bannister substation to a new San Felipe 500/230 kV substation to interconnect to the Imperial Valley to San Diego 500 kV line. This San Felipe substation could potentially provide an additional interconnection between the IID and CAISO systems, and thus another point for the delivery of renewable resources to Southern California loads. IID would construct, own and operate these upgrades.

**Phase 3** upgrades would make an additional 910 MW of Imperial Valley generation deliverable to the CAISO grid, bringing cumulative incremental export capacity to 2,200 MW. As with Phases 1 and 2, most of the new Imperial Valley generation would be scheduled to SDG&E, to minimize congestion at Devers. Additional upgrades of the IID transmission system would support delivery of renewable resources to the Mirage/Devers

[3] SDG&E has proposed building and owning this line and is in the process of planning this project, which was studied as part of the IVSG effort. Alternatively, portions of that line or another 500 kV line in Imperial County could be built and owned by IID.

230 kV system, and/or accommodate unintended flow across Path 42. These additional upgrades of the IID system in Path 42 take advantage of existing facilities and ROW to minimize cost and environmental impact. Upgrades of the SCE portion of Path 42, from Mirage to Devers, and to SCE's west of Devers Substation may also be required.

Multiple Interconnections

In practice, the size and timing of the phases will be determined by where the renewable power is sold via power purchase agreements (PPAs). Phases 1-3, as studied by the IVSG, anticipate power sales to customers able to take delivery from the CAISO. The LADWP, Western and APS systems also interconnect to the IID Control Area, and the upgrades of the IID network recommended in this report support power sales to customers on those systems. Several Load Serving Entities who would not take delivery from CAISO interconnections have expressed interest in obtaining Imperial Valley geothermal power. Power sales to LADWP, and/or to entities in Arizona could require construction of the proposed Indian Hills substation, and/or upgrades of IID's connections to the WAPA and/or APS systems. It is also possible that power sales could require the identified Phase 1-2 upgrades (for deliveries to the CAISO grid) and upgrades of other IID interconnections.

Generation additions in the IID system were found to increase loading on the IID-APS interconnection at Yucca by approximately 1%. This increase is significant because the interconnection is only rated 135 MVA. Today, the APS load serving capability in the Yuma Area is limited by contingency flow on this tie, primarily for the loss of the Hassayampa-North Gila 500 kV line. As renewable resources are added to the IID system associated with any phases of this project, this tie will need to be reviewed for potential impacts and mitigation.

LADWP and IID have recently announced that they are exploring a 500 kV tie between their systems, at the proposed Indian Hills 500/230 kV substation, as described more fully below. The IVSG studied a connection of the IID system to SCE's Devers-Palo Verde No. 2 500 kV line as an alternative, but did not study such a connection to the LADWP system, and so could not include it in the development phases defined in this report. If the new LADWP 500 kV line is proposed to connect to SCE's Devers-Palo Verde No. 2 500 kV line, LADWP would need to submit an interconnection request to SCE to perform system impact studies for this proposed connection. Construction of such a line could alter the size, timing and transmission upgrades proposed for each development phase. Study of the effect of this LADWP-IID connection on Imperial Valley development is anticipated to begin in fall 2005.

The major components of each phase include:

Phase 1
Export capacity: 645 MW
In Service Year: 2010
Estimated cost, IID Upgrades: $ 72 million
(cost of the 500 kV line into San Diego not included)

| | |
|---|---|
| Lines: | Upgrade Highline to El Centro and to IV substations, 40 miles<br>New Geo Collector substation 1 to Midway, approx. 15 miles<br>New IV to San Diego-Central, approx. 90 miles, 500 kV; with 230 kV lines into SDG&E load center |
| Substations: | New Geothermal Collector substation 1, 230 kV<br>Expand El Centro substation; expand Midway substation |

Phase 2
Export capacity: 645 MW (1,290 MW cumulative)
In Service Year: 2016
Estimated cost, IID Upgrades: $ 60 million

| | |
|---|---|
| Lines: | New Bannister to San Felipe substation, 20 miles, 230 kV<br>Upgrade existing El Centro to Bannister, approx. 25 miles<br>New IID Collector substation 2 to Bannister, 230 kV |
| Substations: | New IID Collector substation 2, 230 kV<br>New IID San Felipe 500/230 kV substation |

Phase 3
Export capacity: 910 MW (2,200 MW cumulative)
In Service Year: 2020
Estimated cost, IID Upgrades: $ 105 million

| | |
|---|---|
| Lines: | Upgrade existing Coachella Valley to Mirage/Devers, 40 miles<br>Upgrade existing Bannister to Coachella Valley, 55 miles<br>Tie Bannister to Collector substations to Midway, 1 mile |
| Substations: | Expand Coachella Valley substation<br>(Upgrades to west of Devers Substation not included) |

## LADWP Transmission Development

The LADWP transmission plan consists of the development of a new 500 kV transmission line from IID to LADWP associated with the development of 400 MW renewable resources, primarily geothermal, in the Imperial Valley region. The IID-LADWP transmission line is planned to be connected to a new IID Indian Hills substation and a new LADWP Upland substation. The Indian Hills substation is envisioned to interconnect the planned Devers-Palo Verde– No. 2 500 kV line. The proposed Upland substation would be constructed along the existing 287 kV Victorville–Century transmission line. The transmission plan also includes upgrading a section of the Victorville–Century line from 287 kV to 500 kV, and 230 kV line upgrades within the IID system.

The IID-LADWP transmission line would also be used to deliver about 400 MW of LADWP Palo Verde power which is currently delivered on the existing Devers-Palo Verde Transmission Line 1.

The major components of the LADWP transmission plan include:

| LADWP Transmission Plan<br>Estimated renewable export capacity: 400+ MW | |
|---|---|
| Lines: | New Indian Hills to Upland, 500 kV, 100 miles<br>Upgrade existing Upland to Victorville line to 500 kV, 34 miles<br>New Coachella to Indian Hills, approx. 5 miles |
| Substations: | New Indian Hills 500/230 kV substation<br>New Upland 500 kV substation |

## Permitting and Approval

The IVSG approached the 2,000+MW development as one large project, divided into phases extending across several years. This approach was intended to identify opportunities for consolidating all necessary approvals, in order to support development on a schedule responsive to California's Energy Action Plan goals for the addition of both renewable generation and new transmission capacity. The report presents several recommendations to this end.

The permitting plan is divided into sections addressing IID upgrades, SCE upgrades, SDG&E upgrades and LADWP upgrades, with strategies for expediting the required permitting. The report also proposes a comprehensive plan for consolidating the permitting of all components of the multi-phase project, and for streamlining the study and approval processes necessary.

The IVSG Permitting Work Group (PWG) has informed local, state and federal organizations and agencies that will be involved in any aspect of review and approval of the development, or could be affected by it, of the potential build-out. The agencies have requested that the environmental review and approval process be consolidated across the multi-phase project to avoid unnecessary re-study and to make the most efficient use of agency staff time dedicated to the overall project.

The IVSG recommends that permitting work for the overall development be organized as follows:

- Structure a broad, Programmatic EIR (P-EIR) to review the overall, multi-phase project under the California Environmental Quality Act (CEQA). A programmatic approach provides the best vehicle to address all of the environmental concerns from the different phases. The P-EIR would take its project description from the development plan drafted by the IVSG.

- Develop a Memorandum of Understanding among IID, SDG&E, LADWP and CalEnergy, to share the costs for the P-EIR and the work of writing the descriptions of each entity's development plans. IID would be the lead agency to prepare the P-EIR; the CPUC and CEC will be invited to participate from the beginning.

- IID, SDG&E, LADWP and SCE will work to identify the location of necessary transmission corridors being proposed for their individual phase components so that the Programmatic EIR can reflect all necessary plans. With respect to federal lands, the environmental documents under the National Environmental Policy Act (NEPA) to amend the California Desert Conservation Area Plan should be developed in conjunction with the EIRs or EAs for the second tier of Imperial Valley generation/transmission development. The Imperial County Geothermal and Transmission Element will be revised and adopted by the County Board of Supervisors in Phase 1.

The IVSG has developed this conceptual plan with the advice and cooperation of regulatory and agency staff.[4] The MOU parties will seek to continue this cooperation as they undertake the required environmental studies. The IVSG can attempt to bring the overall project to all state and federal regulators at the same time. State and federal agency staffs have heavy workloads. One method of assisting them in review of this project, which could also speed up the review process, would be to involve their environmental consultants earlier in the review process. Currently, the CPUC cannot retain consultants until a jurisdictional utility files a CPCN application. The subsequent retention of consultants adds considerable time to its review and approval process. Additional recommendations for streamlining and expediting the review and approval process are included in Chapter 4.

[4] The IVSG Permitting Work Group appreciates the cooperation and involvement of the BLM, CPUC, Imperial County Planning and Development Services Department, Imperial County Air Pollution Control District, and the California Department of Parks & Recreation.

# 1.0 Background and Purpose of the Imperial Valley Study Group

## 1.1 State Renewable Energy Goals and Imperial Valley Resources

California law requires investor-owned utilities, starting in 2003, to increase procurement of power from renewable resources by 1% per year until it comprises 20% of their supply mix, by no later than the end of 2017.[5] Most of California's publicly owned utilities, although not bound legally by this requirement, have adopted resolutions committing them to achieve this 20% target as well. The California Energy Commission estimates that meeting the SB 1078 20% goal will require 30,160 GWh/year of additional renewables generation in 2017.[6] Imperial Valley geothermal resources are estimated to be able to supply more than 50% of this amount. Imperial County is also estimated to have one-quarter of the state's entire solar generation potential, as well as small amounts of wind and biomass resources. Figure 1.1 below shows the location of Known Geothermal Resource Areas (KGRAs) in Imperial County.

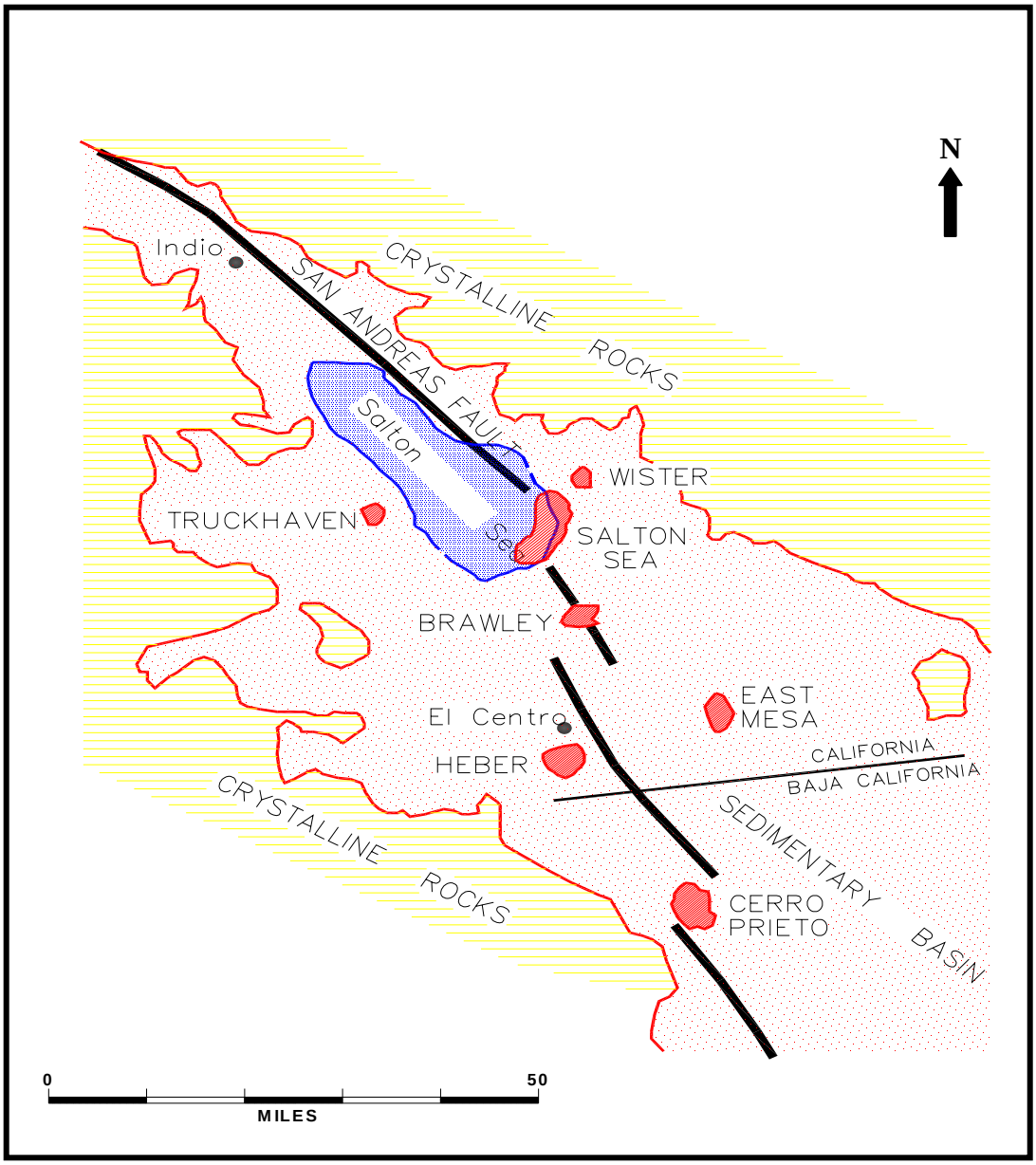
In 2003, the Energy Commission, the CPUC and the Consumer Power and Conservation Financing Authority jointly adopted, and the Governor subsequently endorsed, a state Energy Action Plan. This plan accelerates achievement of the 20% procurement goal to 2010. To reach this goal, a total of about 6,600MW of renewables generation is needed. The CEC identified Imperial Valley geothermal power as a potential source of approximately one-third, 2,142 MW, of this requirement.[7]

Achieving these goals requires new and upgraded transmission infrastructure capable of delivering power from major renewable resource areas, including the Imperial Valley and the Tehachapi region, to the load centers. In June 2004, CPUC Decision 04-06-010, "Interim Opinion on the Transmission Needs in the Tehachapi Wind Resource Area,"[8] convened a collaborative study group to develop a comprehensive development plan for the phased expansion of transmission capabilities in the Tehachapi area. The study group was to be coordinated by the CPUC with assistance from the CAISO, and with the participation of the IOUs, wind power developers and other stakeholders. The Tehachapi Collaborative Study Group (TCSG) filed its initial report with the CPUC as required on March 16, 2005. This report presents a preliminary recommendation for the phased development of transmission facilities to access Tehachapi wind resources.

This CPUC decision also required the TCSG to consider whether to form additional planning collaboratives to develop transmission solutions for other renewable resource areas of the

[5] Senate Bill 1078, Sher, Chapter 516, Statutes of 2002; and SB 1038, Sher, Chapter 515, Statutes of 2002.
[6] CEC, Renewable Resources Development Report, p. 139.
[7] Ibid., Appendix C-12. In 2005, a GeoThermex study for the CEC classified the "Most Likely" Imperial Valley geothermal development potential to be 1,950 MW. Roughly two-thirds of this is estimated to be currently available for development; access to the remainder may require the Salton Sea to recede, as is forecast, or advances in drilling technology.
[8] D.04-06-010 was issued in CPUC proceeding I.00-11-001. Phase 6 of this proceeding focuses on transmission constraints affecting development of renewable resources in the state.

Figure 1.1 Imperial Valley Geothermal Areas




state. In response, the TCSG established a committee and directed it to explore the formation of a study group to develop a phased development plan capable of accessing new Imperial Valley geothermal resources. At the same time, the CEC Integrated Energy Policy Report proceeding calls for the development of transmission solutions capable of accessing renewable resources, including Imperial Valley geothermal resources. The Imperial Valley Study Group (IVSG) was formed in response to these policy directives, with the goal of supporting achievement of the renewable energy goals of the Energy Action Plan and state law.

## 1.2 Mission of the Study Group

At its first meeting in November 2004, IVSG participants established a goal of specifying a phased development plan for the construction of transmission upgrades capable of exporting 2,200 MW of geothermal power from the Imperial Valley. In view of the very large solar generation potential in Imperial County, the IVSG subsequently decided to address the export of power generated by any renewable resource technology rather than focusing exclusively on geothermal power. In Phase 1 of the IVSG plan (the period to 2010), however, geothermal power is likely to be the predominant resource developed, and the transmission planning studies were completed using the electrical characteristics of geothermal generating units.

IVSG participants also set a goal of having its development plan represent the consensus recommendation of the stakeholder group to the extent possible. A joint planning process was intended to bring the knowledge and interests of key stakeholders together into an upgrade plan capable of providing the greatest statewide benefit at the least cost. The group recognized the support of key stakeholders for this plan to be essential if the recommended upgrades are to survive the challenges to final siting approval. Laying a foundation for approval and construction of physical transmission upgrades was seen as an essential part of the work of the study group.

## 1.3 Study Group Process and Participants

At its first meeting the Study Group adopted ground rules for cooperative group interaction. These were intended to make its work and decision-making as transparent as possible. Minutes of each meeting, reviewed and adopted by participants, have established a written record of the group's (and each committee's) progress. Meeting agendas, minutes and presentation materials are available on the IVSG website, www.energy.ca.gov/ivsg. Minutes of the IVSG Technical Work Group discuss study assumptions and the results of the technical transmission planning studies performed. This on-going study work has been reviewed at each meeting of the full Study Group. Overall, the study group has pursued its technical work in ways that help build stakeholder support for its recommended development plan. Participants recognize collaboration as essential to the development of this broad support.

The plenary Study Group established three committees to pursue its planning work:

- A Steering Committee, to direct the overall effort. The Steering Committee has lead responsibility for compiling the group's work into a recommended development plan. Members include IID, SDG&E, SCE, CPUC, CAISO, CalEnergy, and CEC/CEERT.

- A Technical Work Group (TWG) performs detailed transmission planning studies. TWG members include all the Transmission Owners in the region: IID, SDG&E, SCE, CFE, WAPA, Arizona Public Service (APS), Metropolitan Water District (MWD); and CalEnergy, CAISO, CPUC, and CEC/CEERT.

- The Permitting Work Group has the responsibility for identifying all required permits, and for designing a plan for consolidating and expediting the permitting of the entire 2,200 MW generation-transmission development. The PWG has worked to inform many local, state and federal agencies and organizations that may be involved in or affected by the development. PWG members include: Border Power Plant Working Group, CalEnergy, California Dept. of Parks and Recreation, Environmental Planning Group, IID, Imperial County Planning and Development Services Dept., Imperial County Air Pollution Control District, Los Angeles Dept. of Water and Power, SDG&E, Sempra, Sierra Club, SCE, and US Bureau of Land Management.

After discussion, the IVSG adopted an initial study plan proposed by IID, CalEnergy, CEERT and SDG&E at its first meeting. The IVSG subsequently approved amendments to this plan, as it evolved to incorporate the results of completed studies. IVSG transmission study assumptions, methodologies and results are outlined in Chapter 3. As discussed there, power flow and other transmission planning studies have been performed by the major transmission owners and the CAISO. As agreed, each participant has paid its own costs.

IVSG ground rules commit study group participants to work in good faith toward consensus support for a recommended development plan. The ground rules also specify that if it proves impossible to arrive at a consensus recommendation, participants disagreeing with the majority plan are encouraged to submit their written critique of that plan, and/or to submit an alternative development plan. The Border Power Plant Working Group and the Utility Consumers Action Network have indicated that they intend to prepare such an alternative plan.

A draft of this report was written by the Steering Committee and sent to the entire IVSG distribution list and the STEP (Southwest Transmission Expansion Plan) distribution list with a request for comment. The comments were then reviewed by the Steering Committee and incorporated into the report as deemed appropriate.

The plenary Study Group met five times between November 2004 and the submittal of this report on September 30, 2005. The Technical Work Group met bi-weekly during this period to accommodate the substantial workload of transmission planning studies required. The Permitting Work Group met six times, beginning in April 2005 to involve county, state and federal agencies in designing a plan for consolidating and expediting permitting and approvals. The following organizations have participated in study group meetings:

Arizona Public Service Company
Aspen Environmental Group
R.W. Beck
Border Power Plant Working Group
CalEnergy/MidAmerican Energy Company
California Department of Parks and Recreation
California Energy Resources Conservation and Development Commission
California Independent System Operator

California Public Utilities Commission
Center for Energy Efficiency and Renewable Technologies
City of San Diego
Colorado River Transmission Committee
Comisión Federal de Electricidad
Coral Power LLC/Shell Gas & Trading
Davis Power Consultants
Debenham Energy LLC
Desert Southwest Transmission
Environmental Planning Group
Imperial County Air Pollution Control District
Imperial County Planning and Development Services Department
Imperial Irrigation District
K.R. Saline & Associates
Kritikson & Associates
Lake Elsinore Advanced Pumped Storage
Lewis Brisbois Bisgaarad & Smith LLP
Los Angeles Department of Water & Power
Metropolitan Water District
Ormat Technologies, Inc.
PPM Energy
Salt River Project
San Diego Gas & Electric Company
San Diego Renewable Energy Office
Sandia National Laboratory
Sempra Energy
Sierra Club
Solargenix
Southern California Edison Company
Stirling Energy Systems, Inc.
Theroux Environmental
US Bureau of Land Management
US Bureau of Reclamation
Western Area Power Administration

# 2.0 Recommended Development Plan

This chapter outlines the development plan recommended by the IVSG, its impact on regional flows and existing and planned facilities, and discusses the considerations that led to the compilation of the plan. This plan may be modified to accommodate future additions, such as the recently-proposed interconnection of the IID and LADWP systems. The IVSG, however, did not study the 500 kV line now proposed by LADWP, as it was announced after the IVSG had completed its technical work. That line is thus not included in the development phases recommended here.

The plan has two major elements: upgrades of the existing IID system; and construction of a new 500 kV line from the Imperial Valley (IV) substation to San Diego County, with 230kV connections to SDG&E's load center. SDG&E's project to accomplish this is called the Sunrise Powerlink. IVSG studies established that a line from the IV substation to San Diego County would make Imperial Valley generation deliverable to load centers in San Diego and to other load centers in Southern California and to the north.

The plan is divided into three phases, corresponding roughly to an anticipated schedule for selling the power from Imperial Valley renewable resources. The detailed studies performed to identify plan components and qualify the electrical performance of the plan are described in Chapter 3.

## 2.1 Development Phases

The IVSG recommends that the overall Imperial Valley generation-transmission development project be approached in these three phases:

| | Year | New Generation | Cumulative | Power Flow |
|---|---|---|---|---|
| Phase 1 | 2010 | 645 MW | 645 MW | IID to IV sub to new San Diego-Central, 500 kV |
| Phase 2 | 2016 | 645 MW | 1,290 MW | IID to new San Felipe sub to San Diego-Central |
| Phase 3 | 2020 | 910 MW | 2,200 MW | Increased flows on Phase 1-2 paths, plus upgrade Path 42 |

The detailed components of the upgrades required for each phase are described in section 2.2. Schematic depictions of these proposed upgrades are included below in Figures 2.1-2.3.

This recommended plan seeks both to maximize the use of the proposed IV-San Diego 500 kV line for renewables, and to avoid adding to the very large volume of power flows

forecasted for delivery to SCE's Devers substation. The Devers-Palo Verde #2 500 kV line (planned in-service 2009) is expected to bring large amounts of existing gas-fired generation from Arizona and new gas-fired generation from the Blythe area to an already-congested hub at Devers. A substantial amount of new thermal generation is also planned to be built adjacent to Devers. Plans to upgrade the SCE system west of Devers are costly and complex. In the timeframe of the IVSG development plan, it was not possible to adequately study the network upgrades necessary to make Imperial Valley generation deliverable west of Devers. The IVSG plan does, however, take account of the unintended flows likely across Path 42 from the Imperial Valley to Devers even when all Imperial Valley generation is scheduled to the CAISO across the proposed SDG&E 500 kV line into San Diego County.

In Phases 1 and 2, geothermal and solar power are the most likely renewable resources to be developed. The size and timing of these phases is based on the development and construction of three 215 MW geothermal power plants proposed to be built by CalEnergy at the Salton Sea KGRA. Plant construction requires 26 months. CalEnergy estimates that, subject to securing Power Purchase Agreements for each plant's output and financing, it can have three plants (645 MW) in service by the end of 2010; and that it could have an additional three plants of the same size in service every other year (2012, 2014, 2016). The phases can accommodate solar development and geothermal development by other companies in addition to, or instead of, geothermal development at the Salton Sea.

The total transfer capacity to be built in each phase is considerably greater than the amount indicated here, for several reasons. SDG&E studies show that it requires the new 500 kV line to maintain reliable operation of its system, as well as to access renewable resources and lower cost power. The 500 kV line required for Phase 1 provides enough capacity for all three phases of the IVSG development, even though Phases 2 and 3 are likely to be built several years after the 500 kV line goes into service. The upgrades of the IID system will add 1,000 MW of total transfer capacity to the present rating of those paths, more than is needed to export the 645 MW of renewable power in both Phases 1 and 2. It minimizes environmental impact and is more cost-effective to build facilities sufficient for several years' needs, rather than building in smaller increments. Transfer capacity not used by new geothermal projects in Phases 1 and 2 will be available to export solar and/or other power from the Imperial Valley.

In practice, the size and timing of the phases will be determined by where the renewable power is sold. Phases 1-3 support power sales to customers able to take delivery from the CAISO system, for example at the Imperial Valley substation. The proposed tie between the LADWP and IID systems at Indian Hills could require upgrade of IID's Coachella system sooner than anticipated in the IVSG plan. Power sales to purchasers in Arizona could also defer the need for the Phase 1 or Phase 2 upgrades of the IID system, and instead might require upgrades of IID's connections to the WAPA and/or APS systems (at the Buck/Blvd. Substation in Riverside County), and/or to APS, at the Pilot Knob substation. Flows across these upgrades to purchasers to the east of IID would offset flows from Arizona into California, potentially reducing congestion on key east-west paths. It is also possible that power sales could require the identified Phase 1-2 upgrades (for deliveries to the CAISO grid) and upgrades of other IID interconnections.

Figure 2.1 Diagram of Phase 1 Upgrades

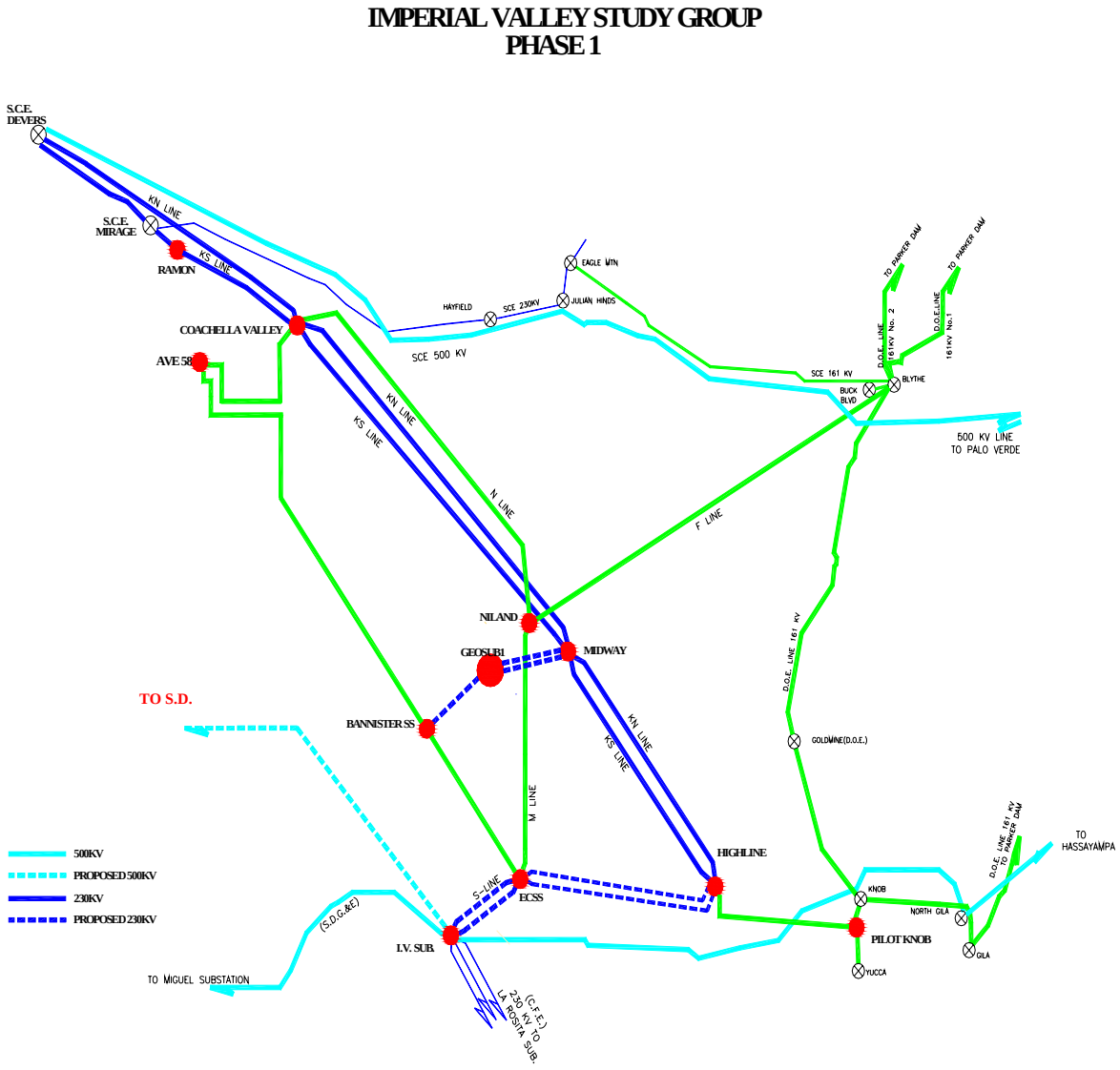


Figure 2.2 Diagram of Phase 2 Upgrades

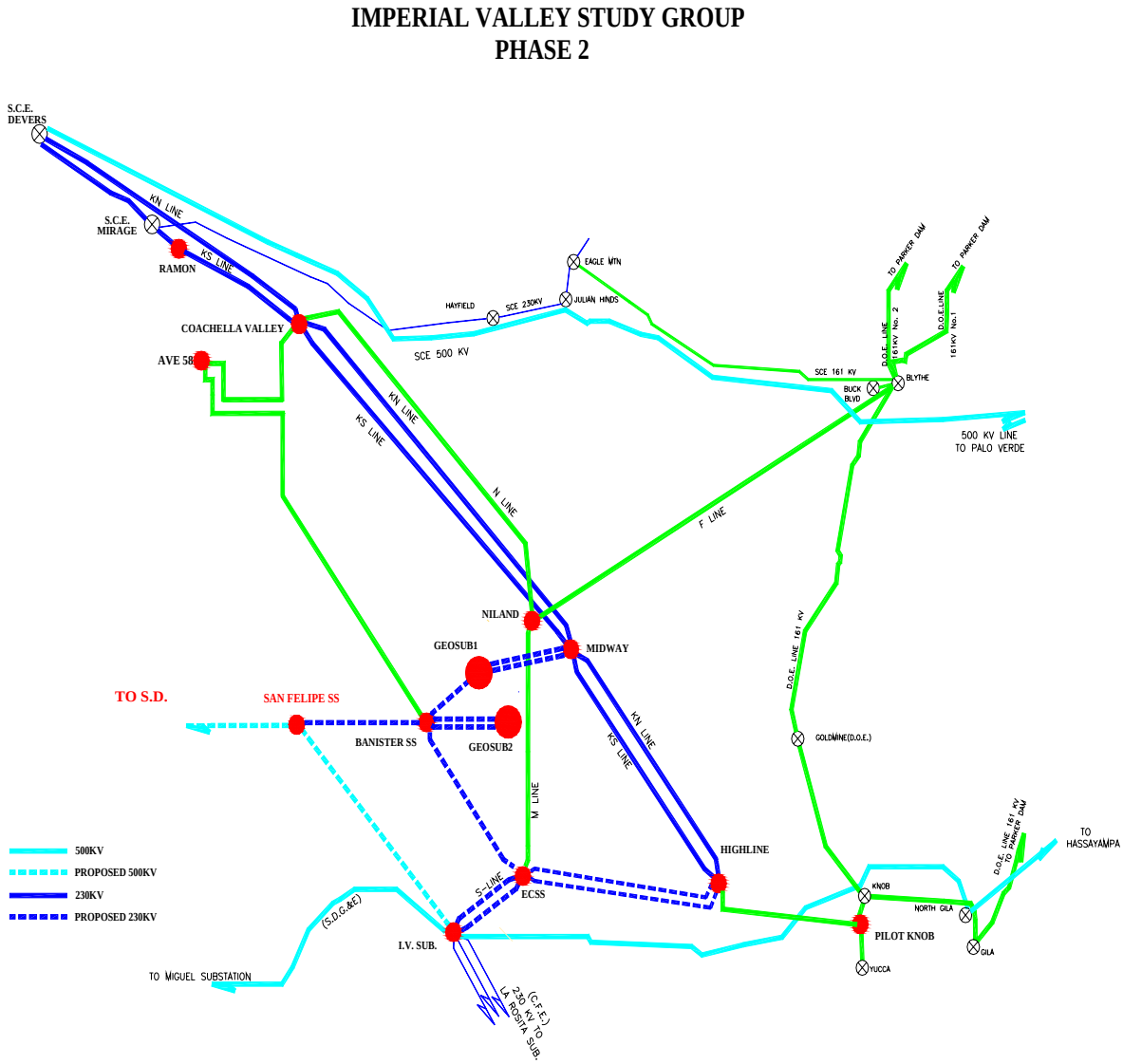
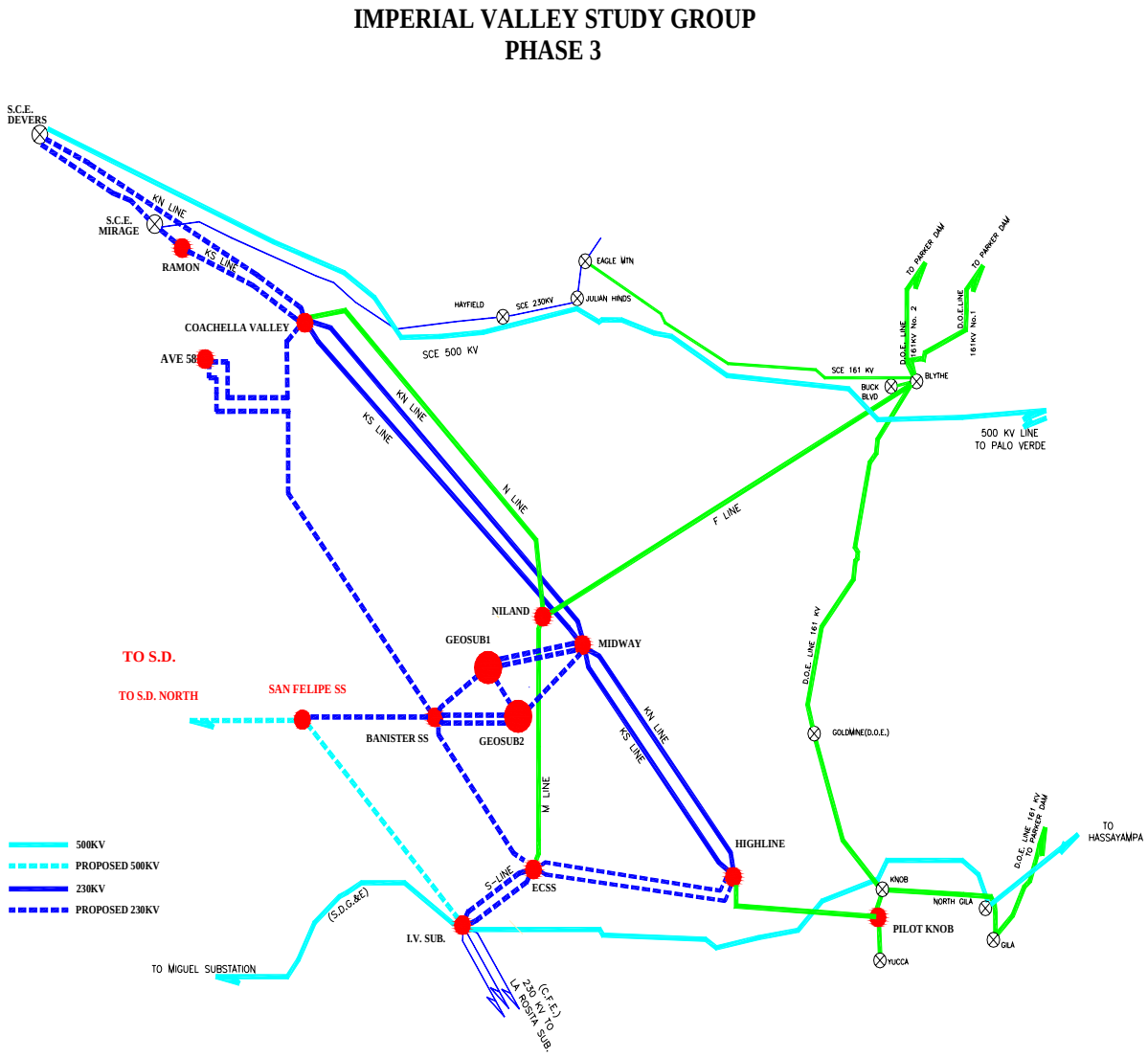


Figure 2.3 Diagram of Phase 3 Upgrades



## 2.2 Major Components of Each Phase and Conceptual Cost Estimates

### Phase 1 Components

Upgrades of the IID system and a 500 kV line to export power from the Imperial Valley to San Diego are the two major components of Phase 1. IID upgrades include the facilities anticipated to deliver from the existing Midway 230 kV substation to the existing Imperial Valley 230 kV substation. To initially establish this delivery path, an existing double circuit (161 kV and 92 kV) transmission line between IID's Highline and El Centro substations is proposed to be upgraded to double circuit 230 kV by utilizing existing towers insulated to 230 kV and higher strength (ACSS, ACCC or equivalent) conductor to minimize the clearance issues under emergency conditions. To further deliver the anticipated path requirements for Phase 1, IID proposes to upgrade the existing El Centro to Imperial Valley 230 kV line to double circuit 230 kV, with each circuit capable of a maximum of 800 MW capacity. The upgrade to this transmission line will require that IID first construct the proposed Imperial Valley to Dixieland 230 kV line to provide a path for Palo Verde area schedules (i.e., SWPL rights) to be delivered to IID loads.

The 500 kV line from Imperial Valley to San Diego will also be constructed in this phase.

IID estimates the total cost to provide the facilities proposed for its system in Phase 1 to be $72,000,000. No costs for the 500 kV line are included. SDG&E, for its part, will release cost estimates for the Sunrise Powerlink when it files the CPCN application for this line in the fourth quarter of 2005.

### Phase 2 Components

Phase 2 includes the facilities anticipated to deliver from the existing Bannister 230 kV substation to both the Imperial Valley substation and IID's proposed San Felipe 500 kV substation. To provide for these contract paths, the existing Bannister to El Centro 161 kV line will be upgraded to 230 kV, providing a maximum capacity of 800 MW. In addition, IID will construct a new 20-mile, 230 kV line from Bannister to the proposed San Felipe substation, also capable of a maximum capacity of 800 MW.

IID estimates the total costs to provide the facilities proposed for Phase 2 to be $60,000,000.

### Phase 3 Components

Phase 3 includes the facilities needed to deliver additional resources beyond 2016 to the regional transmission system. These are upgrades of existing IID facilities. They include the Bannister to Coachella Valley 161 kV line; the Highline to Midway 230 kV lines; and the Coachella Valley to Mirage and Devers 230 kV lines. The Bannister to Coachella Valley 161 kV line will be upgraded to 230 kV and capable of a maximum capacity of 800 MW. The existing Highline to Midway 230 kV line will add an additional conductor "per phase" to

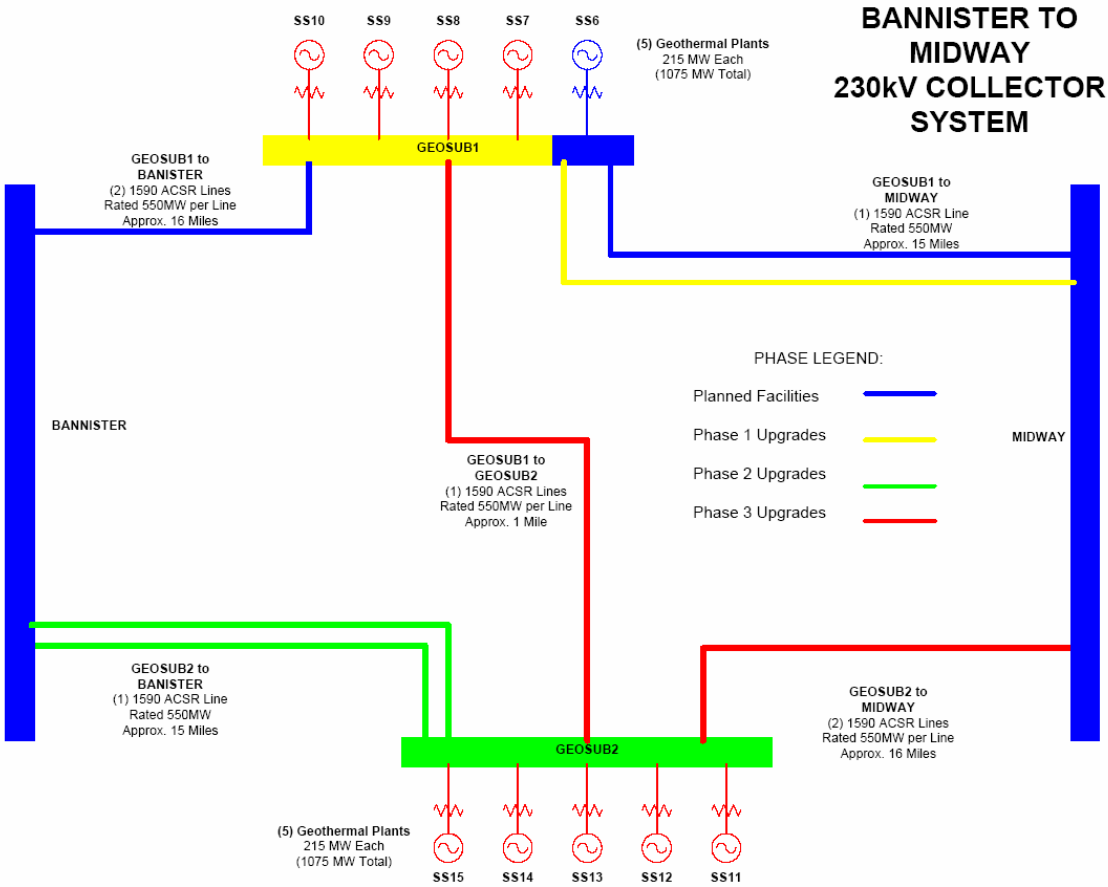
bundle this segment, providing a maximum capacity of 1,600 MW. The Coachella Valley to Mirage and Devers 230 kV lines are also facilities that will utilize existing towers with new high strength conductor to minimize clearance issues, in order to obtain a maximum capacity for this segment of 1,600 MW. With Phase 3, IID will also determine the need for rebuilding the Highline to El Centro 230 kV double circuit line with newer structures and conductor, in order to provide a maximum capacity of 1,600 MW in that path.

IID estimates the total costs to provide the facilities proposed for Phase 3 to be $105,000,000.

Salton Sea area Collector System

To interconnect individual generation facilities, IID proposes to construct a 230 kV transmission system consisting of two primary collector substations, and three transmission lines connected to both the Midway and Bannister substations. This collector system also will be constructed in phases as described for the other IID upgrades and required delivery points. Figure 2.4 depicts the proposed IID Salton Sea area collector system.

Figure 2.4 Proposed IID Collector System



Path 42 Upgrades

Path 42 is a 230 kV transmission path between Southern California Edison (SCE) and the Imperial Irrigation District (IID). The path has a WECC rating of 600 MW and includes the Coachella-Ramon-Mirage 230 kV and Coachella-Devers 230 kV lines. A developer's request to secure a Power Purchase Agreement with SCE for the amount of power greater than the 600 MW rating would trigger upgrades of this path. Such an upgrade would be based on the best technical and economic solution and would depend on the amount of resource delivery to the CAISO grid. IID may also choose to upgrade its portion of this path to serve its local load, and/or to connect to the proposed LADWP 500 kV line.

If the generation-transmission development follows the three phases outlined in this Report, Path 42 upgrade would not be required until 2020. IID upgrades of this path, however, could be required sooner. If congestion occurs on Path 42 due to inadvertent flow resulting from delivery schedules to SDG&E's system, than the upgrade of Path 42 would become an economically driven project to reduce congestion costs.

WECC Rating Studies would be needed to determine the achievable higher rating after the upgrade of Path 42. The Path 42 rating would be dependent on downstream impacts on the SCE west of Devers system, in addition to the technical performance of the re-conductor lines within Path 42. The impacts on the SCE's west of Devers Substation system could be significant when considering the large amount of existing generation and transmission interconnection requests in the queue for the Devers Substation area.

Pilot Knob 161 kV and Yucca 69 kV Stations

APS has expressed concerned that generation additions in the IID service territory could cause congestion on the system between IID's Pilot Knob 161 kV and APS's Yucca 69 kV switching stations. Excessive southbound flows on this system can reduce the load serving capability of APS's Yuma load pocket. Historically, schedules on this line have been northbound into IID's service area from its Yucca steam unit. However, recent generation additions have produced loop flow into the Yuma area and have restricted import capability into the area. APS proposes to have this system upgraded or have the loop flow mitigated if any of the phases of the geothermal development proposed in IID's service area proceed in the future.

## 2.3 Feasibility and Synergies with Regional Projects

Power flow, stability and post-transient analysis studies performed by the IVSG show the proposed plan to be capable of delivering 2,200 MW of new Imperial Valley generation to major regional buses without negative effect on reliability or grid operation across the region. All regional transmission owners having facilities that could be affected by the proposed plan participated in these studies; the studies themselves are described in Chapter 3. Production simulations performed by the CAISO indicate that implementation of the plan could potentially reduce wholesale power costs by several hundred million dollars/year.

The recommended plan takes advantage of two major projects proposed for the region: IID system upgrades; and a new 500 kV line from the Imperial Valley (IV) substation to San Diego County, with 230kV connections to SDG&E's load center. SDG&E's project to accomplish this is called the Sunrise Powerlink. SDG&E has proposed building and owning this line and is in the process of planning this project, which was studied as part of the IVSG effort. Alternatively, portions of that line or another 500 kV line in Imperial County could be built and owned by IID.

Prior to the formation of the IVSG, the Imperial Irrigation District identified a comprehensive set of upgrades of its existing system that would enable it to export significant amounts of new generation from renewable resources in the Imperial Valley. It has presented this upgrade plan in CEC workshops and other fora as its Green Path initiative. It has completed many of the electrical studies, and has identified the environmental and permitting work necessary for these upgrades. The IVSG plan utilizes several (but not all) of these upgrades of the IID system.

The IID upgrades minimize environmental impact and appear cost effective because they upgrade existing facilities and require little new Right of Way (ROW). In many cases, higher capacity conductors can be mounted on existing towers, with little or no widening of ROW required. For purposes of the IVSG development plan, IID's planned Bannister substation is treated as an existing facility, because IID has committed contractually to build it under the terms of its agreement to purchase the output of CalEnergy's 215 MW Salton Sea Unit 6 geothermal plant, which is expected on-line in 2008. The IVSG plan does require IID to add new facilities as well as upgrades, including a collector substation at the Salton Sea geothermal field, to which most of the projected new geothermal power capacity would connect; and a new 230 kV line from the Bannister substation to a new 500/230 kV San Felipe substation, to allow connection to the proposed 500 kV line into central San Diego.

The IVSG plan also takes advantage of a new 500 kV line from the Imperial Valley substation to San Diego County, which has been independently studied by SDG&E and STEP, a stakeholder review group made up of transmission planners from the larger southwest region. STEP reviewed studies of 18 alternative routings/connections SDG&E considered for this 500 kV line, and assisted in narrowing these to two final alternatives. SDG&E studies show this connection is required to ensure the reliable operation of its system after 2010. This line will also help the company meet its RPS requirements for the purchase of renewable energy, and will provide access to lower cost power sources. Ownership and operation of the portion of this line in Imperial County has not yet been determined.

The IVSG did not assume that the 500 kV line would be a component of its recommended plan. Instead, that line was one of a number of alternatives evaluated. The IVSG concluded after study that a 500 kV connection to the CAISO would be most effective. Connections at 230 kV were shown not to be as effective electrically, given the goal of exporting 2,200 MW of power, and alternative paths for multiple 230 kV connections are limited in the region. However, depending on the renewable delivery requirements, some components may be

constructed at 500 kV standards and operated initially at 230 kV. The extensive studies of the Southern California region performed by SDG&E for its 500 kV Comparison Study provided both data and insight into regional needs and constraints. The IVSG was able to leverage this work in its own transmission planning studies.

The IVSG development plan anticipates scheduling most new Imperial Valley generation (except purchases by LADWP or Arizona LSEs) to SDG&E, to the extent possible. This avoids adding flows across Path 42 to the Devers substation. The very large volume of new flows expected at Devers are likely to require expensive network upgrades which, given the complexity of problem, may take several years to resolve. An export plan that relied on making Imperial Valley generation deliverable through Devers accordingly would risk delaying Imperial Valley development until a regional plan for resolving west of Devers issues, including additional 500 kV facilities, is identified and approved.

When the amount of new generation connected in the Imperial Valley becomes substantial, this will likely create some unintended flow across Path 42, even with all the generation scheduled to SDG&E. IVSG studies found that in Phase 2, with 1,290 MW of renewable output scheduled to San Diego, inadvertent flow across Path 42 was 60 MW. In Phase 3, with 2,200 MW of new generation added, unscheduled flow across Path 42 was 210 MW. This flow may require the upgrades of Path 42 described above, depending on the congestion cost the CAISO observes on this path.

## 2.4 Production Cost, Congestion and Losses

The CAISO performed production cost simulations to estimate the economic and physical performance of the final three configurations of the IVSG generation/transmission development plan. These studies are described in detail in section 3.5 of this report. They indicate that adding 2,200 MW of new geothermal generation and the associated transmission in each of the various alternatives reduces WECC annual production cost, and congestion, by significant amounts. Each of the project alternatives reduced the hours of transmission congestion across the WECC by, on average, 4,400 hours/year (3%), as the new transmission capacity supported greater power flows. Losses increased, because generation in the Imperial Valley displaced more expensive generation closer to load. Adding the renewable generation reduced the total variable cost of generation WECC-wide by more than $500 million/year.

These simulations, however, were designed to compare transmission alternatives, not to justify investment decisions. Renewable generators have low marginal costs. Adding them to the generation mix will displace higher cost resources, thus reducing system-wide production cost. The simulations performed to date, however, were not designed to produce a reliable forecast of the potential savings. A full economic evaluation would have to model, among other things, a current forecast of gas prices, regional differences in gas prices, a range of hydro conditions, and the capital cost of the new generation and new transmission. The IVSG did not have the time to complete this work.

The IVSG determined that this report did not need to include a full economic evaluation of its recommended development plan, for several reasons: 1) full economic evaluation, which would entail significant additional work, is not expected of a conceptual plan. 2) with a connection to LADWP now being considered, the structure and timing of the phasing could change, making economic analysis premature. 3) SDG&E is working on an economic analysis of the 500 kV project, a major component of the IVSG plan, using the TEAM methodology; this includes the addition of 2,200 MW of geothermal generation in 2015. The results of that analysis, expected to be competed in October 2005, may help indicate the costs and benefits of the IVSG development plan.

## 2.5 Anticipated Development Schedule

Today, 523 MW of geothermal generating capacity is in operation in the Imperial Valley. Additional generation will be added before Phase 1 of this plan. In 2005, SCPPA contracted to buy 20 MW of new geothermal generation from Ormat's Heber facilities. As described above, IID and CalEnergy have signed a Power Purchase Agreement under which IID will buy the output of Salton Sea Unit 6, a 215 MW generator expected to be on-line in 2008. As part of the Power Purchase Agreement, IID will build a new Bannister substation to accommodate the new plant. IID plans to use the plant output to serve its own load, and transmission to export Salton Sea Unit 6 power out of the Imperial Valley is not required.

CalEnergy is in active discussions with potential power purchasers for sale of the output of three additional plants, Salton Sea Units 7-9. Like Salton Sea Unit 6, each will be 215 MW. The IVSG Phase 1development schedule depends in part on CalEnergy signing Power Purchase Agreements for these three plants, 645 MW total output. There is no guarantee that CalEnergy will be able to complete the development of these plants on the Phase 1schedule developed by the IVSG.

The permitting of each 215 MW plant requires 18 months. Construction requires an additional 26 months. Meeting the Phase 1 development target of 2010 would require permitting work to begin in the next two years. CalEnergy has stated that, given executed PPAs, it has the ability to construct these plants at the same time, or on overlapping schedules.

Concentrating Solar Power (CSP) could make up some portion of Phase 1 power exports, replacing part of the anticipated geothermal development, or adding to it, thus increasing Phase 1 development beyond 645 MW in the 2010 timeframe.

To support this generation development, Phase 1 upgrades of IID's system include a new Geothermal Collector Substation, expansions to the El Centro and Midway Substations and upgrades to the Highline – El Centro – Imperial Valley lines. IID has already begun design and preliminary work for these upgrades, which are needed by 2010 both to export new renewable resources and to serve anticipated growth within the Imperial Valley.

The other major component of Phase 1 development is a new 500 kV line from the Imperial Valley substation to San Diego County, with 230 kV connections to SDG&E's load center. SDG&E's project to accomplish this is called the Sunrise Power Link. As shown by this IVSG study effort, a new 500 kV line into SDG&E's system is needed for the ultimate development of renewable resources in the Imperial Valley. However, because it needs this new line by 2010 for reliability reasons, as well as to access renewables and lower cost power, SDG&E is pursuing this new line independent of renewable resource development in the Imperial Valley. SDG&E anticipates filing the purpose and need portion of its CPCN application for this line by the end of 2005. SDG&E will also pursue CAISO and WECC approval. The company anticipates an environmental filing with the CPUC by mid-2006. The current anticipated in-service date for the Sunrise Power Link is mid-year 2010.

In Phase 2 (to 2016), CalEnergy expects to develop at least one additional 215 MW geothermal plant. The development of Concentrating Solar Power projects is expected to accelerate in this period, and to make up a significant portion of Imperial Valley renewable resource exports.

To support the export of an additional 645 MW of renewables in Phase 2, IID plans further upgrades to its system, including a new San Felipe 500/230 kV substation, interconnecting to the proposed Imperial Valley to San Diego 500 kV line; a new 230 kV line from Bannister to San Felipe; and upgrades to the existing El Centro – Bannister 230 kV line.

Phase 3 anticipates the build-out of any Imperial Valley geothermal potential not already developed. Depending on the amount of geothermal development in Phases 1-2, this could represent an incremental 660 MW to 910 MW (of the 1,950 MW total geothermal resource). CSP development is also expected to contribute substantially to renewable power exports in this phase.

Transmission development associated with Phase 3 includes upgrades of the IID and SCE systems in Path 42, from Coachella Valley to Mirage/Devers; and upgrades to existing lines from Bannister to Coachella Valley. Phase 3 transmission upgrades can be moved earlier if renewable resource development warrants doing so.

## 2.6 Relation of the IID Green Path to IVSG Development Phases

IID intends to develop its Green Path Project as a mechanism for staging long-term upgrades of the IID transmission system in a much shorter term (five years or less) than contemplated in Phases 1-3 of the IVSG development plan. This Project will pursue first the development and pre-design of all the upgrades in the long-term plan, and the proposed San Felipe and Indian Hills facilities. IID has also taken steps to ensure that the Salton Sea area collector system can be staged to accommodate additional generation as ultimately discussed in this report. While the staging of the Green Path is still in draft form, the following describes the potential construction sequence and triggers that will support IVSG development phases:

Stage 1 will consist of constructing the Highline to El Centro 230 kV double circuit line and associated substation facilities. This stage will accommodate additional power schedules towards the Imperial Valley substation.

Stage 2 will consist of constructing the upgrades of the El Centro to Imperial Valley 230kV line to a new double circuit 230 kV line. The associated substation facilities will also be constructed to terminate the lines. Green Path Stages 1 and 2 correspond to IVSG Phase 1 development.

Stage 3 will consist of constructing the upgrade of the existing El Centro to Bannister 161 kV line to new 230 kV standards, and will also include the necessary substation facilities to terminate the upgraded line.

Stage 4 will consist of constructing the new Bannister to San Felipe 230 kV line and associated substation facilities. Depending on the level of the build out of the renewable resources, this segment could deliver the resources towards the San Diego area prior to the construction of the 500 kV line from Imperial Valley. However, as the additional renewable resources are constructed (as described in Phase 1 of the geothermal development), the 500 kV line also provides additional delivery capability into SP15, primarily to SDG&E. Green Path Stages 3 and 4 correspond approximately to IVSG Phase 2 development.

Stage 5 will consist of upgrading the Bannister to Avenue 58 and to Coachella Valley 161 kV line to 230 kV, including the necessary substation upgrades to accommodate the 230 kV terminations.

Stage 6 will consist of completing the additional upgrades as required to the Coachella Valley to Mirage and Devers 230 kV system. Green Path stages 5 and 6 correspond to IVSG Phase 3 development.

The Indian Hills connection to both LADWP and DPV2 may also occur simultaneously with the development of this Green Path project, in Phase 1 or Phase 2 of the IVSG development plan.

# 3.0 IVSG Transmission Studies

The conceptual development plan recommended by the IVSG is based on ten months of detailed transmission studies. These studies provide the basis for the development plan. This chapter describes the alternatives selected for evaluation, and the process used to study them.

## 3.1 Selection of Initial Export Path Study Alternatives

The IVSG was charged with identifying transmission solutions capable of exporting 2,200 MW of new renewable resources from the Imperial Valley. IID, SDG&E, CalEnergy and CEERT first developed an initial list of export paths for study, consistent with this requirement: all alternatives had to be capable of delivering the full 2,200 MW. Other initial considerations were planned upgrades to the southwest regional grid being pursued through STEP; IID's plans to upgrade its own transmission system in order to support larger exports of renewable power from its control area and reinforce its system reliability; CalEnergy's development schedule for new geothermal generating units at the Salton Sea; and SDG&E's reliability-driven need for new EHV transmission by 2010 and its on-going Transmission Comparison Study.

Both 230 kV and 500 kV solutions were considered as study alternatives; upgrades at lower voltages were judged impractical for such a large-scale development. Upgrade of Path 45 through Mexico was considered; this would potentially enable flows from the Imperial Valley to Miguel, via Mexicali and Tijuana. This was abandoned because it would worsen the already-intractable transmission bottlenecks at the Imperial Valley and Miguel substations; would require ~80 miles of new transmission construction/new ROW through mountainous terrain in Baja Norte; and would involve US-Mexico treaty negotiations and export licensing for flows from Mexico into California.

At its first meeting in November 2004, the IVSG discussed and unanimously adopted seven transmission alternatives for study, based on a list of routings suggested by IID, SDG&E and CalEnergy. Upgrades of the IID system were common to all the alternatives. The fact that the IID system extends around much of Imperial County makes it possible for renewable resources, including wind and solar, to connect in many locations, at workable voltages. The upgraded IID network would also directly access all KGRAs in the county. The key components of each alternative were:

1. **Alternative 1**: Imperial Valley (IV) substation to a new San Diego Central substation, at 230 kV; a new 230 kV connection from the IID Bannister substation to the proposed 230 kV, IV-SD Central line; and upgrades to the IID system (Midway–Parker; Midway-Highline; El Centro-Highline; El Centro-IV; Blythe-Knob; Knob-Pilot Knob).

2. **Alternative 2**: same as Alt 1, but with Imperial Valley substation to a new San Diego Central substation, at 500 kV.

3. **Alternative 3a**: same as Alt 2, but with a 500 kV connection from IV to a new San Diego North substation (instead of a San Diego Central substation location).

4. **Alternative 3b**: same as Alt 3a, but with a connection to the SCE system from a new San Diego North substation across the Lake Elsinore Advanced Pumped Storage Project (LEAPS) route.

5. **Alternative 4a**: North Gila to Imperial Valley (IV) substation to a new San Diego Central substation, at 500 kV; plus all IID system upgrades.

6. **Alternative 4b**: same as Alt 4a, but with the proposed IID/APS Palo Verde-Yuma project added.

7. **Alternative 5**: same as Alt 2 (500 kV line, IV-SD Central), but with an additional 500 kV connection from the Imperial Valley substation north to the Palo-Verde-Devers #1 line, at a new Indian Hills substation; and a 230 kV connection from the IID Coachella Valley substation to the new Indian Hills substation.

Figure 3.1 Study Alternative 1

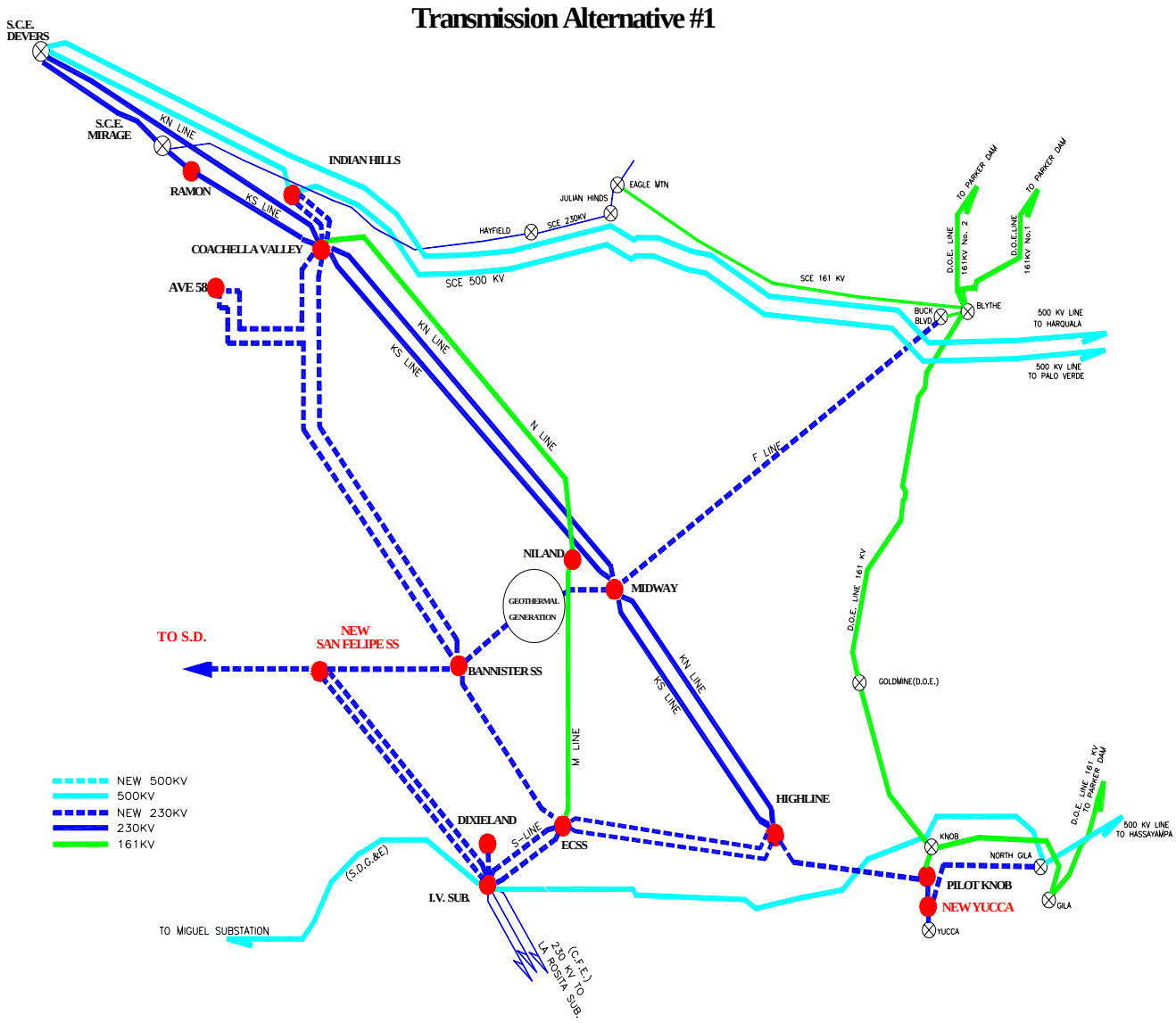


Figure 3.2 Study Alternative 2

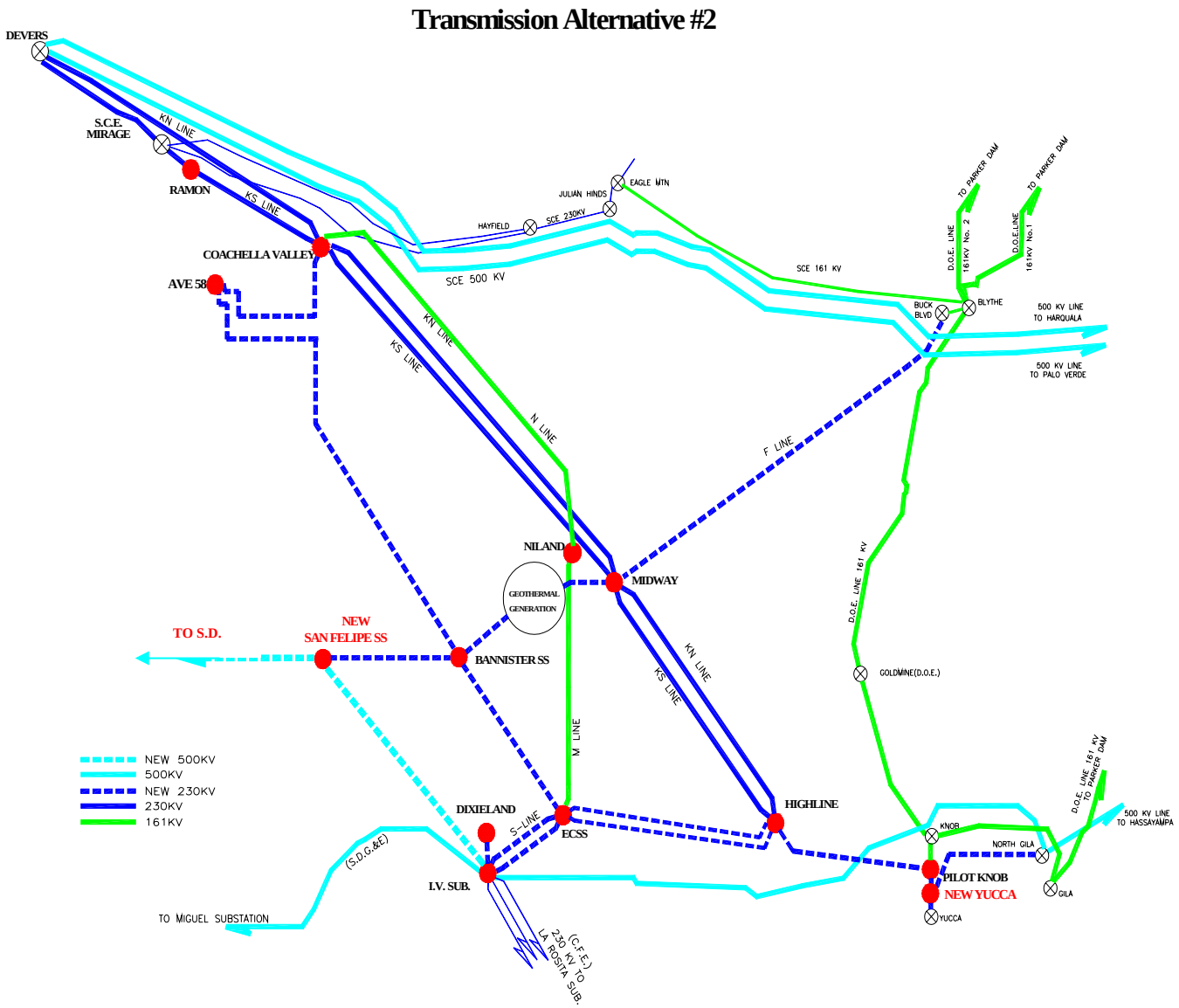


Figure 3.3 Study Alternative 3a

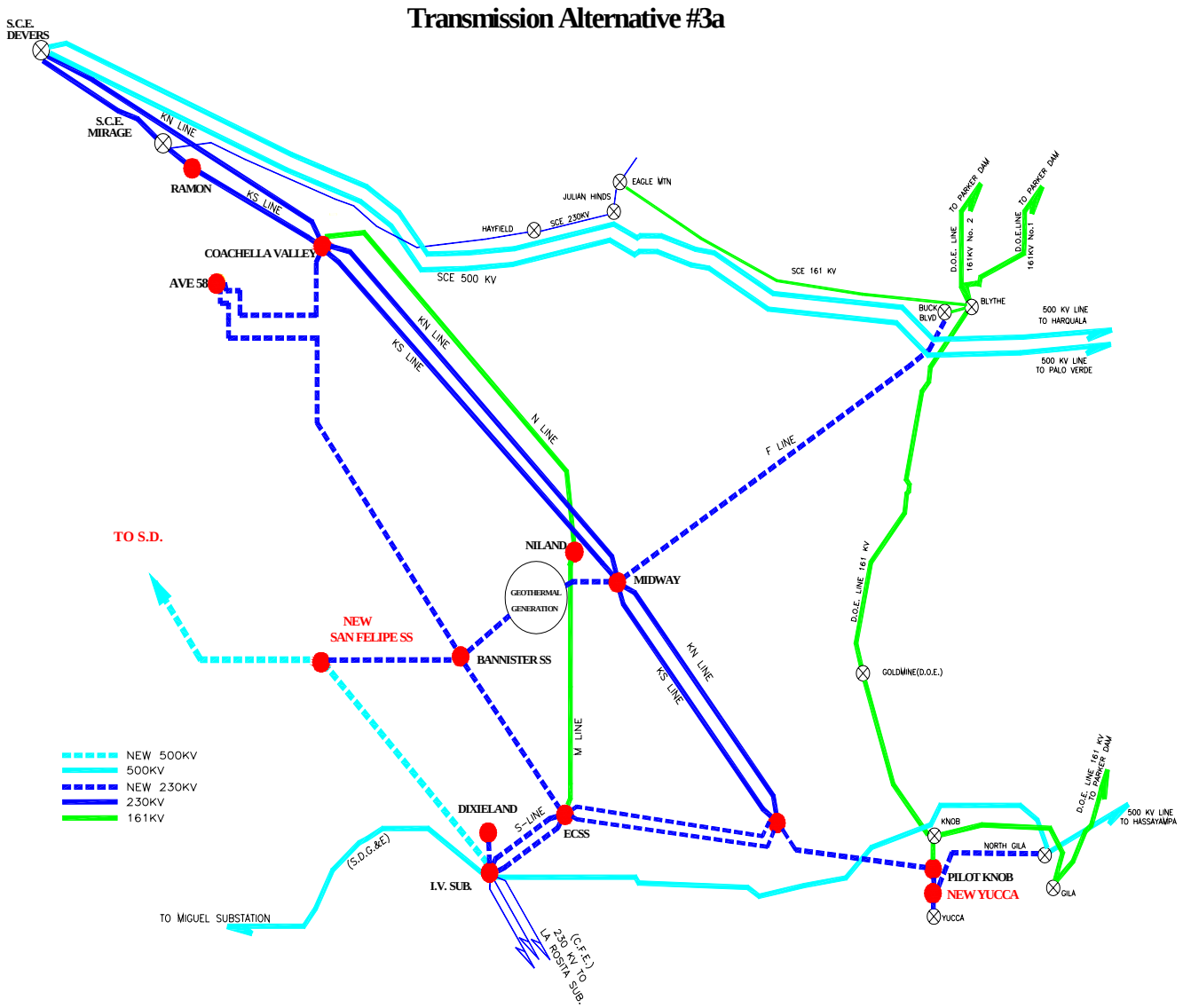


Figure 3.4 Study Alternative 3b

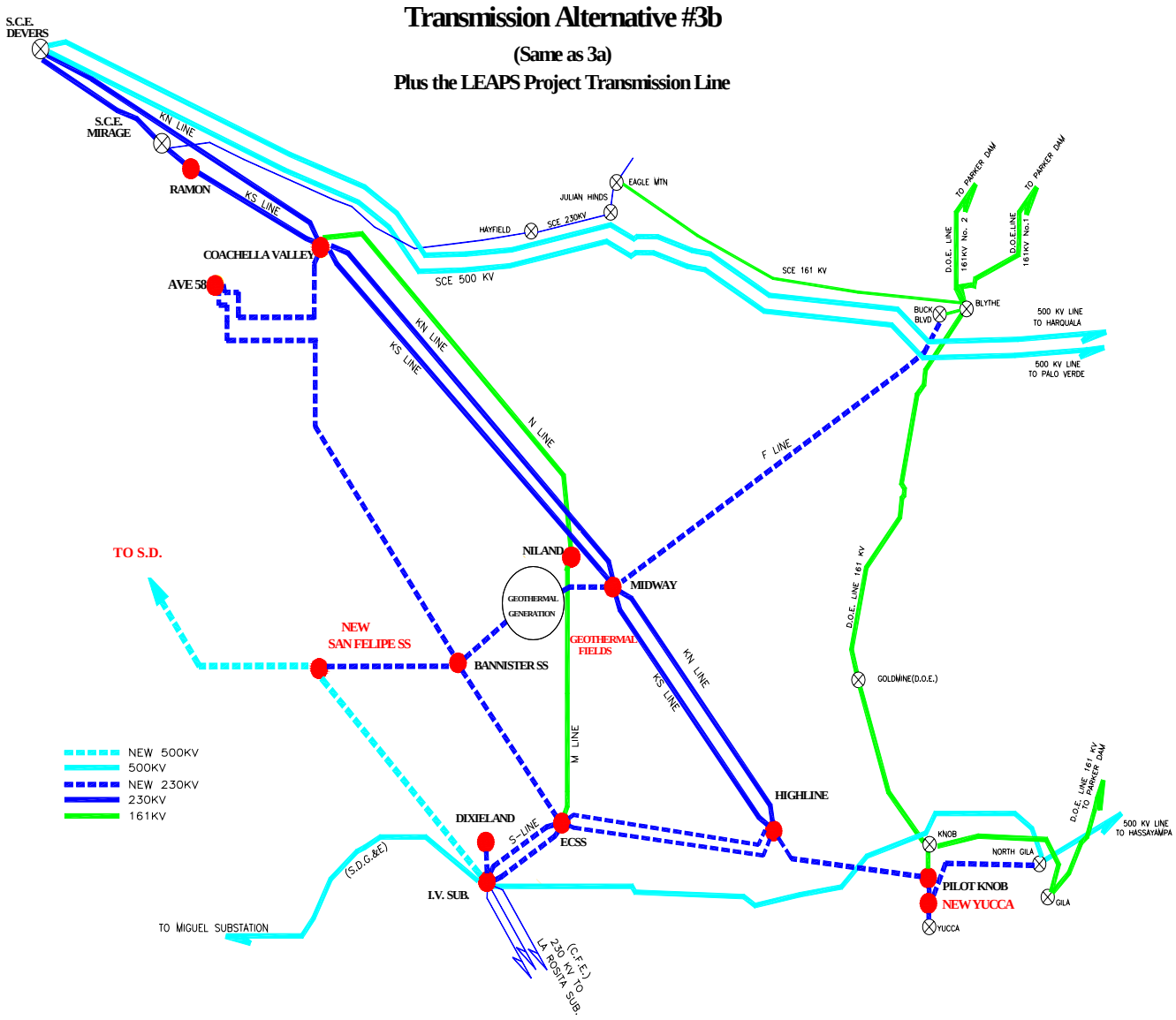


Figure 3.5 Study Alternative 4a

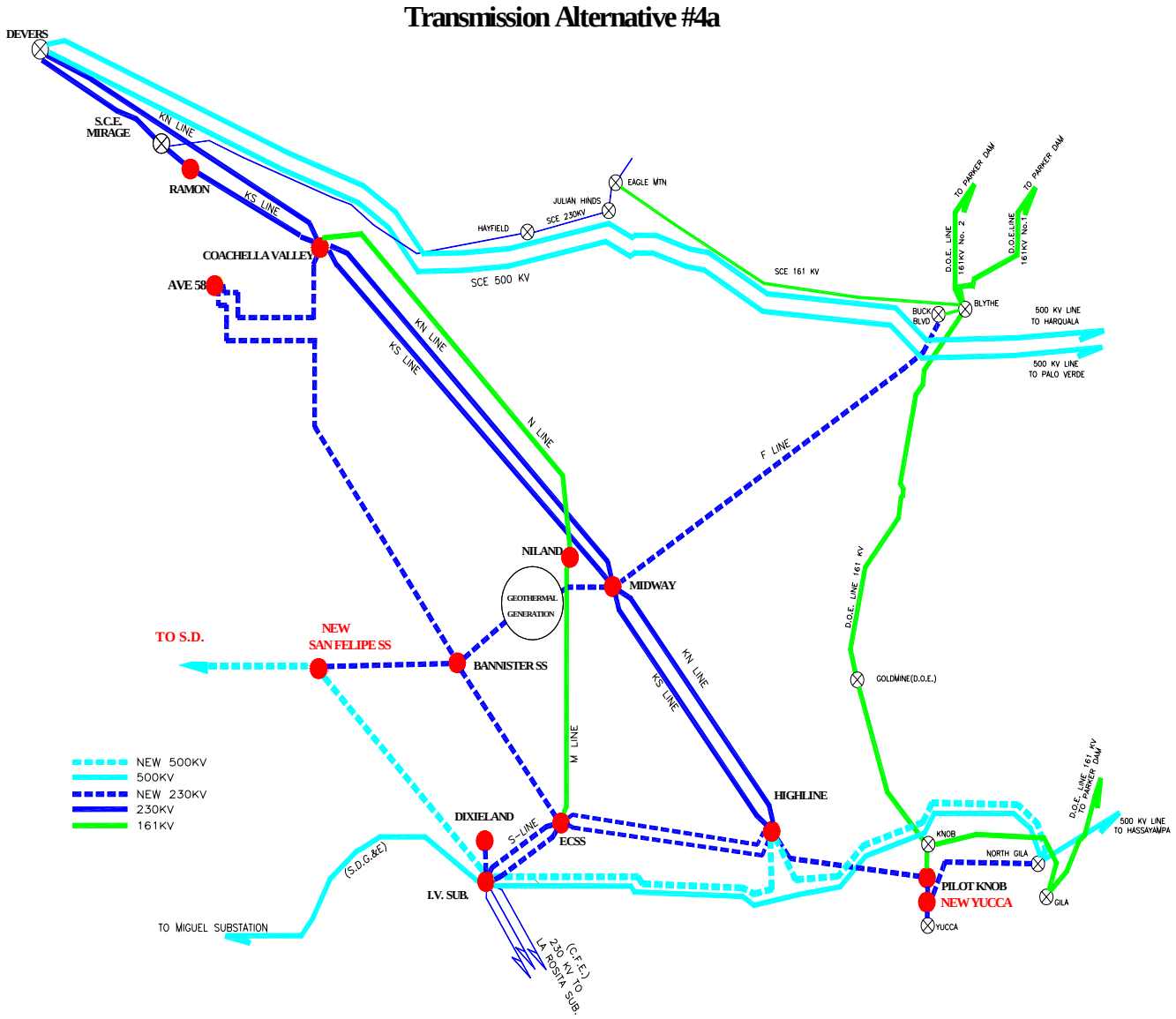


Figure 3.6 Study Alternative 4b

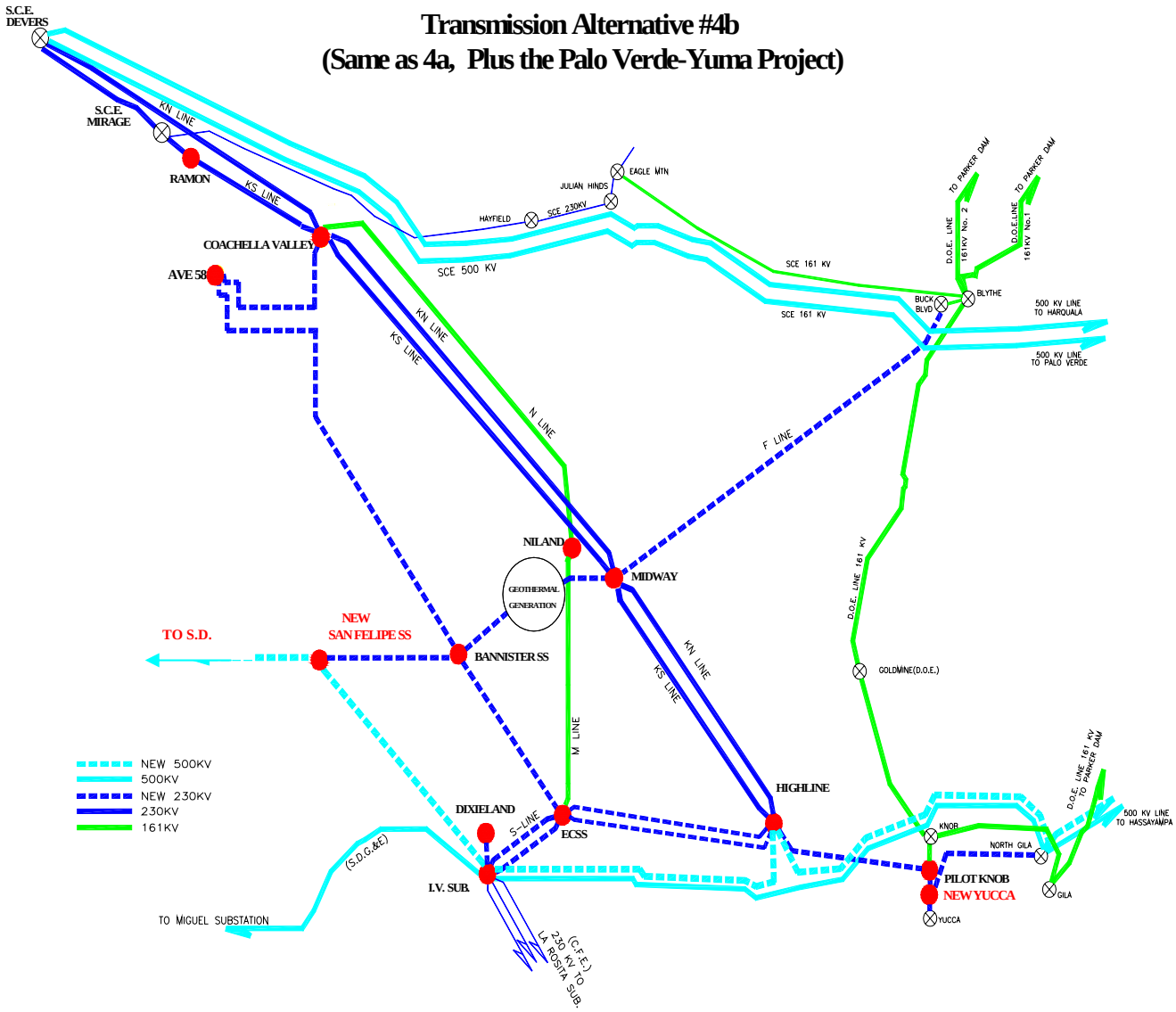
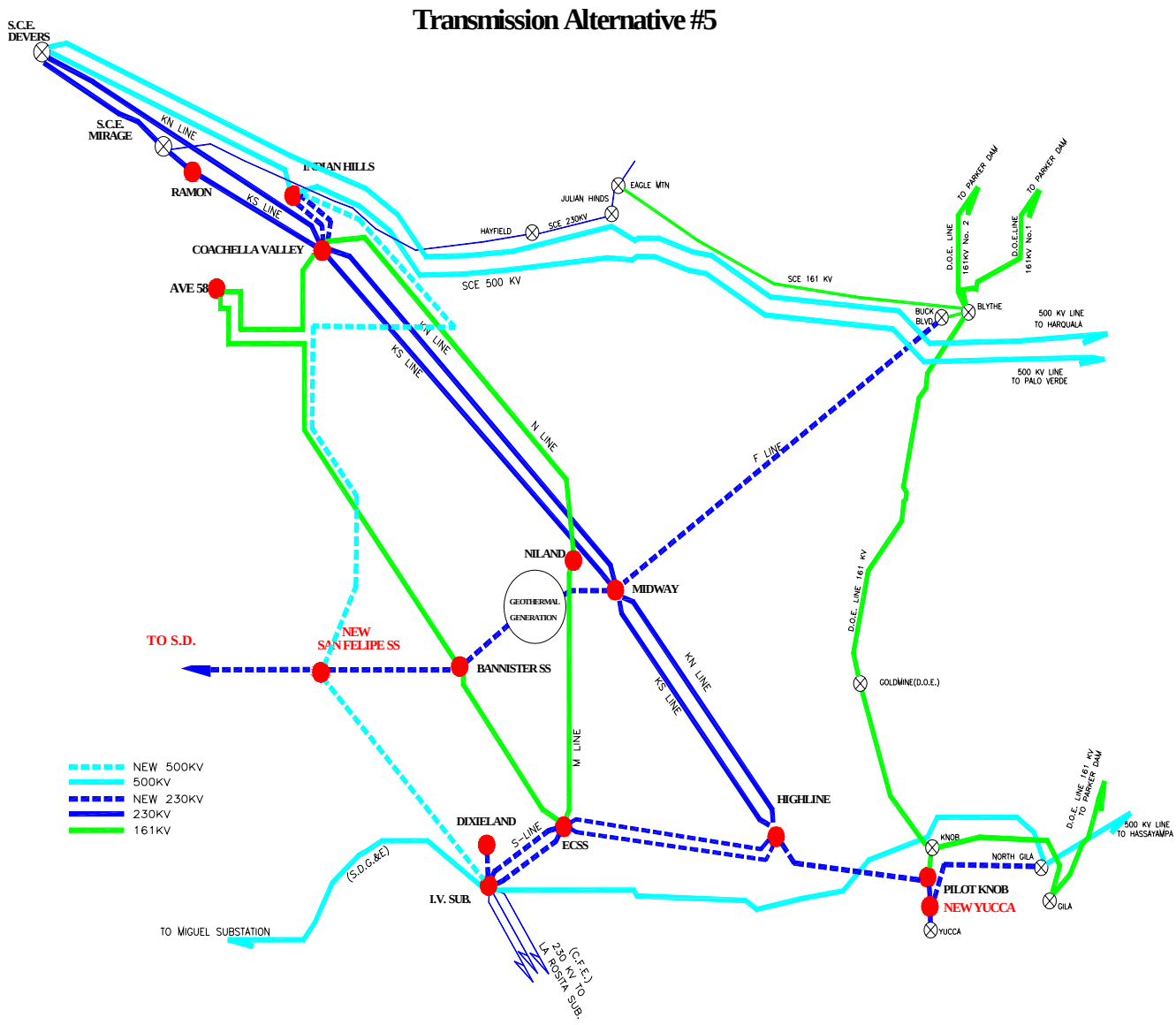


Figure 3.7 Study Alternative 5



## 3.2 Power Flow Studies

All IVSG power flow studies have been conducted using PSLF version 13.1. The IVSG Technical Work Group (TWG) first constructed base cases to represent the flows on the regional transmission system before adding any incremental Imperial Valley generation or any transmission upgrades, for Heavy Summer (maximum flows) and for Light Autumn (minimum flow conditions). It adopted a forecast of loads and resources for 2014, agreed on contingencies to consider, and developed a dispatch schedule to explore the export of Imperial Valley generation to different power customers. It then ran the 2014 Heavy Summer and Light Autumn cases with increments of new Imperial Valley generation added against the base cases, to evaluate the impacts and the upgrades needed.

Standard power flow planning criteria were employed.[9] Loading criteria were based on the normal or continuous rating (Rating 1) as identified in the cases.

### 3.2.1 Development of Base Cases

The IVSG chose 2014 as its study year, for two reasons: it could represent a plausible midpoint in the contemplated 2,200 MW generation-transmission development; and there was a WECC-approved Heavy Summer case for that planning year. There was, however, no WECC-approved Light Autumn base case for 2014. Instead, the TWG began with the WECC-approved 2009 Light Autumn case, and modified it to represent 2014 loads and resources.

The CAISO supplied an initial dataset of 2014 loads, resources and flows, for both Heavy Summer and Light Autumn periods. Each TWG Transmission Owner modified/updated this pre-project model in turn, to ensure that the loads, resources and flows on its system were accurately represented. This was essential, as the ISO does not have data on the IID, WAPA or CFE systems.

Imperial Valley area geothermal plants operating today were included as existing generation in the base cases. These include 80 MW at the Heber KGRA; 90 MW operated by Ormesa, also at Heber; 60 MW recently acquired by Ormat from Covanta; and 310 MW at the Salton Sea KGRA operated by CalEnergy. These existing facilities total over 500 MW of resources scheduled to SCE. The base cases also include Salton Sea Unit 6, a 215 MW geothermal plant whose output IID has contracted to buy from CalEnergy. The base cases include the STEP Short-Term

[9] These criteria include:

- Pre-disturbance bus voltage must be between 0.95 per unit and 1.05 per unit.
- Allowable voltage deviation of five (5) percent for N-1 Contingencies (deviation from pre-disturbance voltage).
- Allowable voltage deviation of ten (10) percent for N-2 contingencies (deviation from pre disturbance voltage).
- Post transient bus voltage must be at least 0.90 per unit.
- Pre and post disturbance loading to remain within the emergency ratings of all equipment and line conductors. The emergency ratings are determined by the owner/operator of each equipment item.

Upgrades (i.e., Path 49 is modeled with a 8,055 MW path rating), and a new Vincent-Mira Loma 500 kV line added in the LA Basin. The Devers-Palo Verde 2 line is included, and is modeled as on-line in all cases.

### 3.2.2 Dispatch Scenarios

The study used CAISO Generation Retirement assumptions, to identify units on the ISO grid likely not to be running in 2014. Consistent with ISO planning criteria, new geothermal/renewable generation, which has very low marginal cost, was assumed to displace higher cost generation around the region. Generating units assumed to be displaced are listed in the "Offset" column in Appendix A.2, Dispatch Scenarios.

The TWG developed different dispatch scenarios for each of the Heavy Summer and Light Autumn cases. These were designed to stress the regional transmission system under maximum and minimum flow conditions, in order to evaluate worst-case possibilities. The dispatch scenarios were also selected to represent likely or possible sales of power from Imperial Valley resources. The dispatch scenarios are listed in Table 3.1 below.

Table 3.1 Dispatch Scenarios

| AREA | D1 (HS) Dispatch | D2 (HS) Dispatch | D3 (LA) Dispatch | D4 (LA) Dispatch |
|---|---|---|---|---|
| IID | 200 | 200 | 200 | 200 |
| SDGE | 1000 | 200 | 200 | 400 |
| SCE | 400 | 300 | 1000 | 600 |
| LADWP | 200 | 200 | 200 | 200 |
| PG&E | 400 | 600 | 0 | 800 |
| WAPA | 0 | 100 | 100 | 0 |
| ARIZONA | 0 | 500 | 500 | 0 |
| NPC | 0 | 100 | 0 | 0 |
| Total | 2,200 | 2,200 | 2,200 | 2,200 |

### 3.2.3 Contingencies

Transmission Owners ("TO") each provided a transmission element outage list covering key facilities on their systems. These were compiled to form a master contingency list. This contingency list included N-1 (one single transmission

component out of service) and N-2 contingencies (two transmission components out of service). The list also included transmission component forced outage to model events such as a circuit breaker failing to open. This master contingency list was run in each study to evaluate system reliability, feasibility and impact.

### 3.2.4 Heavy Summer Cases

The initial power flow modeling included 14 runs for the Heavy Summer cases (seven alternatives for each of the two dispatch scenarios shown on Table 3.1). Key findings of the Heavy Summer runs included:

- The IID 230 kV and 500 kV alternatives were found to be effective (no overloads within the IID controlled network) at delivering 2,200 MW of new resources out of the IID controlled network.

- The Salton Sea area collector system developed for this analysis is adequate to deliver approximately 2,000 MW of geothermal resources (the full potential of the Salton Sea KGRA) to the Midway and Bannister 230 kV substations.

- Of the new alternatives, the 500 kV alternatives provided a higher level of deliverability to the regional system when compared to the 230 kV alternatives. However, depending on the magnitude of the new resources developed, initial deliveries can be made via 230 kV system (e.g. new facilities constructed at 500 kV but operated initially at 230 kV). Also note that only approximately 30 miles of new ROW is required for all of the alternatives.

- Delivery constraints were noted at Miguel, Sycamore, Mirage, and Valley substations. Additional review of delivering the new resources beyond these facilities will be required by SDGE and SCE.

- The Imperial Valley – Miguel 500 kV line outage was found to be the most severe outage impacting the regional system with 2,200 MW of additional resources added within the IID transmission system.

- The Bannister – San Felipe, and Bannister – El Centro – Imperial Valley – San Felipe loop provides for added reliability of delivering higher amounts of geothermal resources to the SDG&E area loads (either at San Diego Central or San Diego North) under contingency conditions.

- The upgrades on Path 42 (both Coachella to Devers 230 kV lines) and an interconnection to the Palo Verde–Devers 500 kV line provides for added reliability of delivering higher amounts of renewable resources to the SCE area loads under contingency conditions. However, the impact on the west of Devers system was not comprehensively evaluated.

### 3.2.5 Selection of Final Study Alternatives

The results of the Heavy Summer cases showed that all of the initial alternatives were able to export 2,200 MW from the IID system. Some of the alternatives performed better than others, and some were found to be unnecessary for the export of 2,200 MW. This thermal analysis led the TWG to eliminate some of the alternatives from further study:

Alternative 1 was dropped, because it did not meet objectives for reliability, access to renewable resources and low overall transmission costs as well as any of the 500 kV alternatives.

Alternative 3a was eliminated because it did perform as well as Alternative 3b, which provided a connection between the SDG&E and SCE systems and thus supported regional flows back to the east.

Alternative 4a was dropped because the connection to North Gila was found to be unnecessary for the export of new generation from the Imperial Valley.

Alternative 4b was eliminated because a second 500 kV connection was found to be unnecessary for the export of 2,200 MW, and because Alternatives 2 and 3 offered better electrical performance.

Alternative 5 was also dropped because a second 500 kV connection was found to be unnecessary.

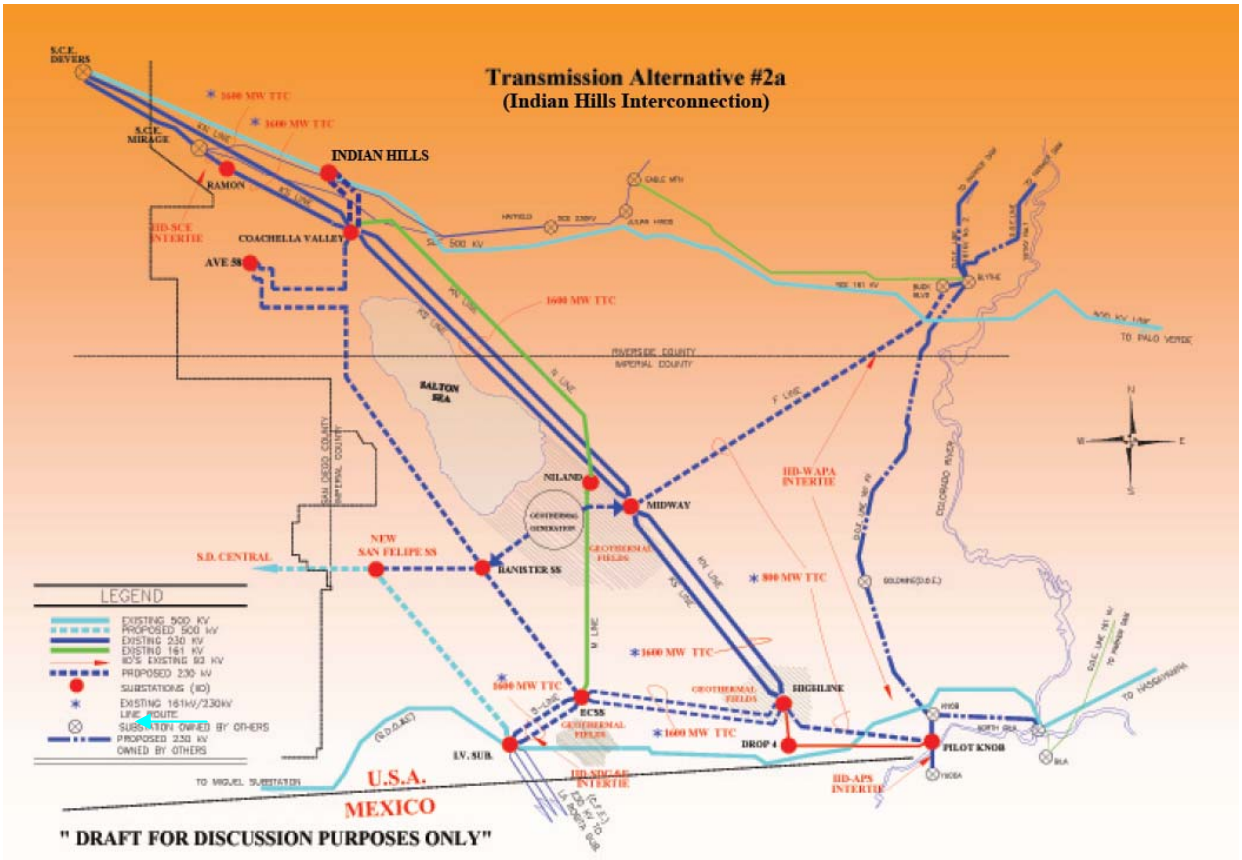
Two of the original alternatives were selected for further evaluation based on the results of this screening analysis, and a variant on Alternative 2 was added:

1. Alternative 2: A new 500 kV line from Imperial Valley to San Diego Central, with 50 percent series compensation added to the San Felipe-to-San Diego Central portion of the line. Alt 2 is outlined in Figure 3.2.
2. Alternative 2a: This variant on Alt 2 was added to evaluate the effect of adding a new 230 kV tie between IID and the CAISO at a new Indian Hills substation on the Devers-Palo Verde 1 line. It is the same as Alternative 2 except for this tie. A diagram of Alt 2a is included in Figure 3.8 below.
3. Alternative 3b: A new 500 kV Imperial Valley to San Diego North to (SCE) Serrano-Valley transmission line, with 50 percent series compensation added to the San Felipe-to-San Diego North portion of the line.[10] Figure 3.4 shows Alt 3b.

Power flow studies were then performed on these three alternatives under Light Autumn load conditions. Stability studies and post-transient studies were later performed on these alternatives as well.

[10] SDG&E determined in August 2005 that the best routing for a 500 kV connection to its system from the east would extend to a San Diego-Central substation, rather than to a San Diego-North location (as studied by the IVSG in its Alternative 3b).

Figure 3.8 Alternative 2a



### 3.2.6 Light Autumn Cases

Additional power flow studies were performed for Alternatives 2, 2a and 3b under Light Autumn load conditions. The TWG developed two additional dispatch scenarios, as shown on Table 3.1, in order to stress the regional transmission system under Light Autumn load conditions. Six cases were studied (the three Alternatives, for each of two dispatch scenarios). Key findings of the Light Autumn runs included:

- The IID transmission system alternatives were found to be effective (no overloads within the IID controlled network) at delivering 2,200 MW of new resources out of the IID controlled network.

- The Salton Sea area collector system developed for this analysis is adequate to deliver approximately 2,000 MW of geothermal resources (from the Salton Sea KGRA) to the Midway and Bannister 230kV substations.

- Delivery constraints were noted at Miguel, Sycamore, Mirage, and Valley substations. Additional review of delivering the new resources beyond these facilities will be required by SDG&E and SCE.

- The Imperial Valley – Miguel 500 kV and Devers – Valley 500 kV line outages were found to be the most severe outages impacting the regional system with 2,200 MW of additional resources added within the IID transmission system.

- The upgrades on Path 42 (both Coachella to Devers 230 kV lines) and an interconnection to the Palo Verde – Devers 500 kV line provides for added reliability of delivering higher amounts of geothermal resources to the SCE area loads under contingency conditions.

Taken together, these power flow studies enabled the IVSG to develop a thorough understanding of the impact of adding 2,200 MW of new Imperial Valley generation on the flows at major regional buses. These flows are summarized in the table in Appendix A.1.

## 3.3 Stability Studies

Transient stability studies were conducted to test the alternatives under faulted conditions and system response to the faults with the additional resources connected to the system. The transient stability analysis was conducted on cases for both Heavy Summer and Light Autumn. For the Heavy Summer, stability analysis was conducted on Alternative 2 and Alternative 3b. For the Light Autumn, stability analysis was conducted on Alternatives 2 and 2a (with the interconnection to Indian Hills) and Alternative 3b.

The additional 2,200 MW of generation was analyzed using the generator models employed for the Salton Sea #6 (geothermal plan) System Impact Study (200 MW each). These models will have to be verified with updated models as part of the Salton Sea #6 interconnection

requirements. But for the purposes of this feasibility analysis, the modeling for the additional resources was proven adequate and acceptable.

Appendix C.2 lists the specific transient stability faults that were conducted for this analysis.

Key findings of the stability analysis included:

- The IID transmission system alternatives were found to be effective and stable under the conditions and faults taken for this analysis.
- The most critical single contingencies were found to be the loss of Devers-Valley 500 kV line or the Imperial Valley-Miguel 500 kV line. These results were consistent with the power flow (thermal) analysis.
- The lowest transient voltage (first swing voltage dip) was noted at the SCE Vista 230 kV bus for loss of the Devers-Valley 500 kV line.
- The addition of the Serrano/Valley to San Diego North 500 kV line was found to reduce the magnitude of the voltage dip at Vista 230 kV by providing an alternate source to Valley for loss of the Devers-Valley 500 kV line.

## 3.4 Post-Transient Analysis

The IVSG performed a Post-Transient analysis on the cases listed below, using the Reactive Power Margin Requirement criteria under the WECC Guidelines (NERC/WECC Planning Standards, I.D. WECC-G2) as a proxy for the WECC Standards I.D. WECC-S1, S2 and S3. In other words, this study was not performed using the WECC method of the increasing load or import by 105% or 102.5% (depending upon contingency) and then if the case solves, using that as proof of Post-Transient stability. Rather, this study was performed using the Reactive Power Margin Requirement (also know as V-Q Methodology developed by the Technical Studies Subcommittee of the WECC). The Reactive Power Margin Requirement provides a clearer, more accurate and definitive means to compare alternatives.

Appendix D.1 lists the study assumptions for the post-transient analysis, the contingencies run, buses monitored and the reactive margin criteria applied. Appendix D.2 shows the Q-V curves for critical contingencies; Appendix D.3, the tables of reactive margin values.

### Cases Analyzed

The Post-Transient analysis was performed on seven cases: two Benchmark cases and five scenario cases using the GE PSLF Version 13.1 program. The benchmark cases represent Heavy Summer 2014 and Light Autumn 2014. There are two Heavy Summer alternative cases and three Light Autumn alternative cases. These seven cases were as follows:

1) Heavy Summer Benchmark (ivsg_hs_rev4)
2) HS, Imperial Valley – Central, Dispatch 1 (ivsg_hs_alt2d1_s1)
3) HS, Imperial Valley – Northern – Ser/Val, Dispatch 1 (ivsg_hs_alt3bd1_s1)
4) Light Autumn Benchmark (ivsg_la_rev5)

5) LA, Imperial Valley – Central, Dispatch 3 (ivsg_la_alt2d3_s1)
6) LA, Imperial Valley – Central & Coachella Valley – Indian Hills, Dispatch 3 (ivsg_la_alt2ad3_s1)
7) LA, Imperial Valley – Northern – Ser/Val, Dispatch 3 (ivsg_la_alt3bd3_s1)

Eighteen contingencies were run for this analysis, two of which did not apply to the two Benchmark cases. These included twelve single and six double contingencies.

In the analysis, 25 buses were monitored, including nine buses in SCE, seven buses in SDG&E, four in IID, four in CFE and one in MWD.

The Reactive Margin Criteria used in this study for SCE, SDG&E, CFE and IID was as follows: SCE - 300 MVAR (single element outage) and 150 MVAR (double element outage); SDG&E - 150 MVAR (single element outage) and 75 MVAR (double element outage); CFE - 100 MVAR (single element outage) and 50 MVAR (double element outage); IID - 100 MVAR (single element outage) and 50 MVAR (double element outage). It should be noted that the Reactive Margin Criteria used in this study are applicable only to this study and that they do not necessarily represent any utility's standard or policy.

This Post-Transient analysis considered the period of time after the power and voltage transient oscillations have damped out and before operator intervention can take place. This time frame is approximately one and half (1.5) to three (3) minutes subsequent to a disturbance.

Post-Transient Results

This analysis resulted in approximately 2,928 reactive margin values. Some of these reactive margin values are shown as Q-V curves which were produced for the most critical contingency for each case, with a representative assortment of buses included.

The most critical single contingencies were Imperial Valley – Miguel 500 kV and Devers – Valley 500 kV. Note the shift from the historic critical single contingency of Palo Verde – Devers to Devers – Valley 500 kV with the addition of Palo Verde – Devers #2. The most critical double contingency is the loss of Palo Verde – Devers 500 kV #1 and #2.[11]

The reactive margin values contained in the tables include shunt capacitor additions as indicated in the footnotes of the tables in Appendix D.1.3. With these additions, all buses met, or in most cases exceeded, the Reactive Margin Criteria. There is insufficient differentiation among margins, cases or seasons to strongly support one alternative over another.

In most cases, the shunt capacitor additions ranged from 150 MVAR to about 400 MVAR of increased reactive margin. Some of these additions will likely be part of other projects in the area, including the Sunrise Powerlink. The exception to needing no more than about 400 MVAR were some of the Light Autumn alternatives for the double contingency of Palo

[11] Note that the eastern termination of the Palo Verde – Devers #2 line is at Harquahala, not Palo Verde.

Verde – Devers 500 kV #1 and #2, which required as much as 1870 MVAR. However, this does not represent the real amount of reactive additions that would be required, as this Post-Transient study did not include the load dropping and/or other Special Protection Schemes (SPS) or Remedial Action Schemes (RAS) which will be associated with this double contingency.

## 3.5 Production Cost Simulations

At the request of the IVSG, the CAISO performed production cost simulations to estimate the economic and physical performance of three final transmission configurations (Alternatives 2, 2a and 3b, as described in Section 3.2.5). The production cost simulation tool creates an economic generation dispatch that minimizes the total hourly production cost for the entire WECC transmission system, subject to generation, transmission and operational constraints. The output of the production simulation tool is processed to estimate the comparative production cost, loss and congestion savings of each of the alternatives. These results are useful in evaluating the viability of the transmission alternatives.

This study looked at comparative savings in WECC production cost, power losses and congestion hours due to the transmission projects. Other potential benefits such as market power mitigation, reduction in reliability-must-run generation cost, reduction in emissions and increased operational flexibility were not analyzed.

### Study Description

The SSG-WI 2008 base case[12] was used as starting case. This base case includes generation and transmission infrastructure which are likely to be in place by 2008. The SSG-WI base case was updated to reflect forecasted 2010 load conditions in the study area (IID, SCE, SDG&E, CFE, LADWP and Arizona). New transmission and generation projects that are approved and planned to be online by 2010 in the Southwest area were modeled. These projects include:

- Harquahala-Devers 500 kV line
- New 500 kV Substation to be located at the Midpoint of Palo Verde-Devers and Harquahala-Devers 500 kV lines
- Blythe I and II Combined Cycle plant (1,000 MW) connecting to Midpoint Substation
- Reconductoring of four West of Devers 230 kV lines
- Four new simple cycle plants at CFE (340 MW)

The Benchmark base case used for the study modeled all the above projects. The project cases (Alternative 2, 2a and 3b) modeled the individual projects in addition to the 2,200 MW geothermal generation units. The geothermal units were considered to be base-load generators with must-run status. Startup/shut down cost, operation and maintenance costs, force outage rate and outage duration were modeled using typical values.

[12] SSG-WI, the Seams Steering Group-Western Interconnection, coordinates transmission expansion planning across the WECC. The base case was developed by the SSG-WI Planning Work Group.

The following transmission facility assumptions were simulated as part of the study.

- All WECC transmission paths were modeled according to 2005 Path rating catalog
- Limits for all 500 kV transmission facilities were enforced.
- Lower voltage (230 kV and below) limits were not enforced.
- SDG&E Simultaneous import limit was not enforced.
- SCIT limit was modeled at 17900 MW
- EOR limit was modeled at 9255 MW
- WOR limit was modeled at 11318 MW
- Path 42 (IID-SCE) was limited to 600 MW in the benchmark case and 1600 MW in the project cases
- All AC transmission lines monitored were limited to 95% of their thermal capacity or applicable rating in order to accommodate reactive flows which are absent in this production simulation studies.
- Nomograms were used to reflect transmission system constraints.
- Transmission losses were modeled.
- Transmission line/Path limit violation penalty of $1000 per MWh was applied.

Production Cost optimization runs were performed using production cost tool to predict both the economic and physical performance of entire WECC transmission network with and without the projects on an hourly basis for 2010.

Sensitivity Studies

A sensitivity study was run to evaluate the addition of 2,200 MW of geothermal generation to the Benchmark case without any new or upgraded transmission facilities (Benchmark-Sensitivity). This study was designed to quantify the proportion of the 2,200 MW of geothermal power that could be delivered without transmission upgrade, and the corresponding economic and physical performance of the system. This study assumed all the transmission facility limitations modeled in the Benchmark case. The limits for all 230 kV transmission lines in the IID area were also enforced.

In addition, a sensitivity on IVSG Project Alternative 2 was performed. This sensitivity case evaluates the economic and physical performance of extending the Imperial Valley-San Diego Central 500 kV line to the midpoint of the Valley-Serrano 500 kV line.

Production Cost Tool

The IVSG production cost simulation study was conducted using ABB's Gridview, which simulates the electricity market under realistic transmission system constraints, in hourly intervals. It incorporates a detailed supply model, demand model and a transmission system model. It uses an optimization algorithm that tries to dispatch generation resources such that the total production cost is minimized. The dispatch algorithm matches generation to hourly load and losses while taking into consideration transmission and operational constraints. Gridview program input data includes:

- Generation data, including capacity, fuel costs, heat rates, maintenance schedules, start-up/shut-down cost, up time, down time, forced outage rates and outage durations.
- Transmission data, such as network topology, thermal limits and operational constraints.
- Hourly demand data and distribution.
- Hourly hydro and wind dispatch.

Simulation outputs includes hourly dispatch for each generation unit, hourly production cost, hourly transmission line flows and Locational Marginal Prices at each WECC node.

Study Results

The simulation produced successful hourly production runs with sufficient generation resources to meet hourly demand and transmission losses subject to transmission and operational constraints for the benchmark and the project cases studied. Various transmission lines and interfaces were found congested for time periods ranging from one hour to several hours for all the cases studied. Appendix D.2.3 displays annual flow duration curves for major transmission lines and interfaces for all the cases studied.

WECC Annual Production Cost in the table below represents the total variable cost of generation for the entire WECC, before the new Imperial Valley generation is added (in the Benchmark cases), and after the 2,200 MW of renewable output is added in the other cases. Other key study results are the total hours of congestion on transmission interfaces and lines, and the total annual losses (MWh) on the transmission system. Table 3.2 provides a summary of the study results.

Table 3.2 Summary of Production Simulation Study Results

| Study Cases | WECC Annual Production Cost (M$) | Total transmission Congested hours (hrs) | Total transmission losses (MWh) |
|---|---|---|---|
| Benchmark | 15,731.35 | 146,206 | 34,687,733 |
| Benchmark (Sensitivity) | 15,471.24 | 172,887 | 33,863,293 |
| Project Alternative 2 | 15,207.04 | 142,546 | 35,643,109 |
| Project Alternative 2 (Sensitivity) | 15,197.79 | 141,123 | 35,602,670 |
| Project Alternative 2a | 15,194.96 | 143,264 | 35,433,995 |
| Project Alternative 3b | 15,198.16 | 140,378 | 35,649,818 |

These study results indicate that Project Alternative 2a provides marginally greater savings in production cost and transmission losses. Looking at the congestion data, Project Alternative 3b provides a network that is least congested.

The sensitivity study results show that out of the 2,200 MW of geothermal units modeled in the Benchmark-Sensitivity case, only 800 MW could be delivered without new transmission facility additions. The hourly output profile of the geothermal units modeled in this sensitivity case is shown in Appendix D.2.2. The geothermal output might be substantially further reduced if transmission outage constraints were modeled. The results show that transmission congestion increased tremendously when new generation is added without transmission upgrades. Savings were nonetheless recorded in annual production cost and transmission losses with the geothermal units modeled. These savings might be eroded, however, if transmission outage constraints are included.

Project Alternative 2-Sensitivity study results showed a marginal saving in production cost, hours of congestion and transmission losses when compared to Project Alternative 2.

These production cost simulation study results, the results of the power flow and stability studies, and the cost of implementing the individual projects will all influence the choice of upgrade ultimately selected.

It is important to note that, as discussed in Chapter 2.4, this production cost simulation study was geared solely for comparing transmission alternatives. These study results do not provide an adequate basis for making investment decisions.

## 3.6 Further Study of Development Phases 1-3

The combination of thermal analysis, stability and post-transient analysis and production cost simulations established that each of the final alternatives were capable of exporting 2,200 MW of new Imperial Valley generation. The next task was to develop a plan for phasing this development. Three phases to accommodate the resource development were identified.

Phase 1: Transmission capability to export 645 MW of renewable resources by 2010.
Phase 2: Addition of 645 MW (1,290 MW of total development) by 2016.
Phase 3: Addition of 910 MW (2,200 MW of total development) by 2020.

Diagrams of the transmission upgrades in each phase are found on Figures 2.1- 2.3 in Chapter 2.

The phasing analysis is based on a conceptual build and delivery of the renewable resources to markets. The first phase assumes that the transmission must be capable of exporting 645 MW of new renewable resource development from the Imperial Valley by 2010. IID identified two alternative routings for Phase 1:

- Alternative A, for power flows from the Salton Sea geothermal field to the north: upgrades to Path 42,[13] increasing the export capability of that path by 1,000 MW (from 600 MW to 1,600 MW of total transfer capability). A diagram showing Alternative A is included in Figure 3.9 below.

- Alternative B, for power flows from the Salton Sea geothermal field to the south and west: upgrades of the existing lines from Highline substation to El Centro to Imperial Valley substation, increasing the total transfer capability in that path to 1,600 MW. Alternative B is represented on the diagrams of Phases 1-2, on Figures 2.1 and 2.2 in Chapter 2.

The Technical Work Group conducted power flow studies to evaluate the performance of Alternatives A and B with 645 MW of generation added in Phase 1; 1,290 MW added with Phase 2; and 2,200 MW added with Phase 3. Phase 1 was studied with forecasted 2010 loads for the IID, SCE and SDG&E planning areas; Phase 2 was studied with those loads increased by 11%, to approximate 2016 load levels.

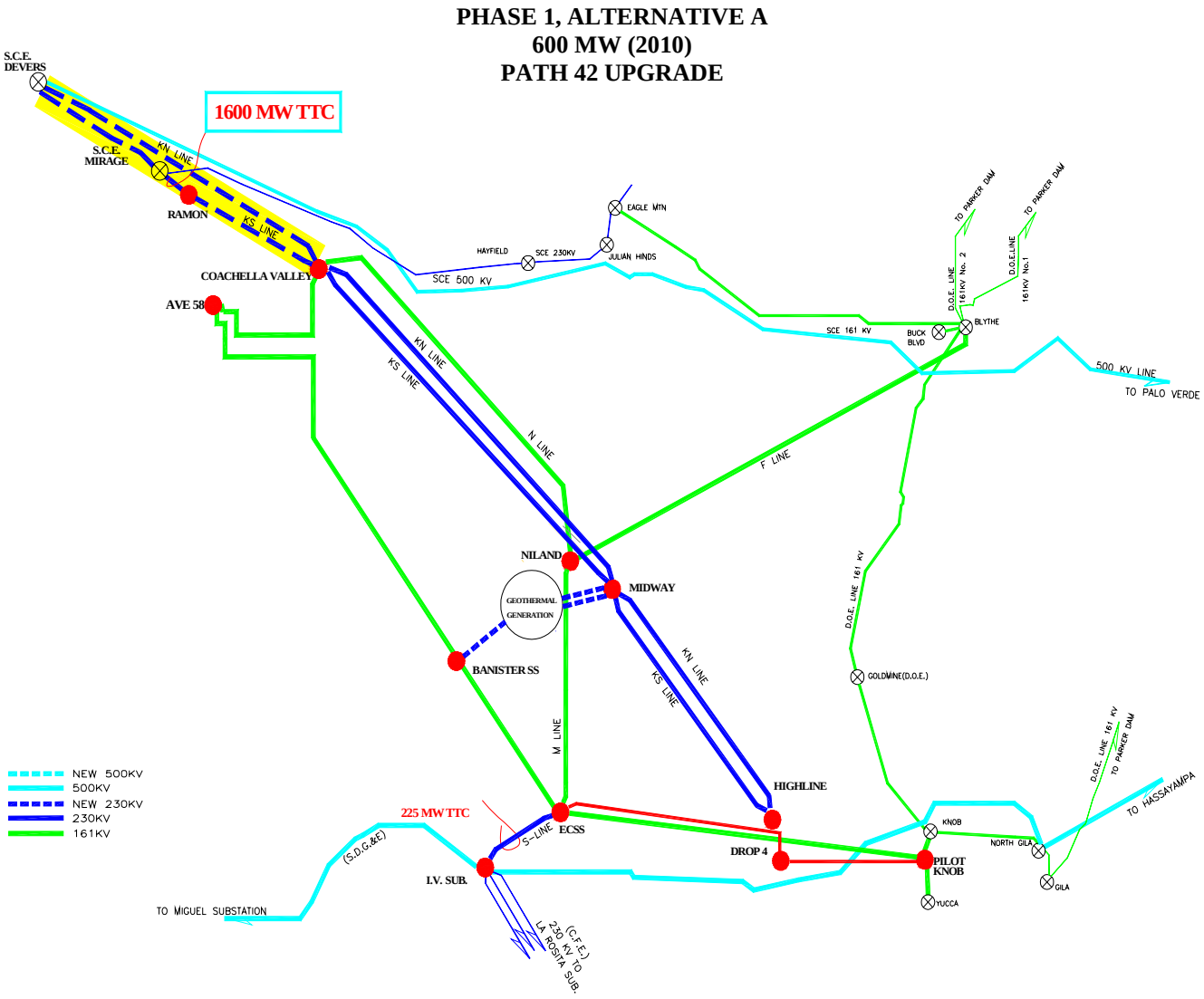
Alternative A would schedule new Imperial Valley flows across Path 42 to the CAISO at the SCE Devers substation. The IVSG study shows that additional transfers through Devers to the west would be problematic. More than 5,000 MW of new generation, located in both Arizona and California is expected to flow to Devers; much of this is already in the SCE interconnection queue. SCE is developing a West of Devers upgrade plan. The SCE system cannot accept 645 MW (Phase 1) at Devers Substation from the Imperial Valley. Doing so would require further, large-scale upgrades of the SCE system in that region, such as a 500 kV tie from Devers to Valley, in addition to SCE's current upgrade plan. An export plan that relied on making Imperial Valley generation deliverable through Devers accordingly would risk delaying Imperial Valley development until a regional plan for resolving west of Devers issues is identified and approved.

Utilization of the routing in Alternative B, by contrast, would minimize Imperial Valley flows at Devers. TWG studies show that Alternative B accommodates the export of at least 645 MW in Phase 1, with cost-effective upgrades of existing IID lines in that routing. Alternative B requires the Imperial Valley – San Diego 500 kV line to be in service.

For Phase 2, TWG studies show that getting the 1,290 MW to flow to San Diego County rather than to Devers requires connecting the incremental Imperial Valley generation directly to the west side of the IID system, at its Bannister substation, and with a new 230 kV line from Bannister to a new San Felipe substation that could interconnect to the proposed 500 kV line into San Diego. Phase 2/Alternative B further requires that the existing El Centro – Bannister 161 kV be upgraded to 230 kV.

[13] The IID Coachella-Ramon 230 kV line currently overloads with the loss of the Coachella-Mirage 230 kV line. As a result, action to correct this condition should be considered a pre-project upgrade (i.e., before Phase 1) since it is required to serve Coachella Valley load rather than for the export of renewable generation from the Imperial Valley.

Figure 3.9 Phase 1, Alternative A



For Phase 3, further upgrade of the (Alternative B) Highline-El Centro-IV path, in addition to the Phase 2 Bannister-San Felipe tie and the 500 kV line into San Diego County, accommodates 2,200 MW of export. TWG studies show that with this amount of generation connected to the IID system, unintended flow across Path 42 could be in the range of 200 MW, thus requiring upgrades of that path.

After evaluating the study results of Phases 1-3, the TWG and the Steering Committee both concluded that the IVSG development plan should be based on Alternative B. This will minimize flows to Devers, thus avoiding the uncertainty, potential delays and high cost of that routing and instead, work to maximize utilization of the proposed 500 kV line into San Diego County.

## 3.7 Limitations of this Plan; Further Studies Necessary

The recommended development plan presented in this report is based on conceptual studies. It presents a general framework for expanding transmission capacity in the region but does not contain sufficient detail to evaluate the connection of specific generating projects.

Some of the conceptual studies themselves also had limitations. In the SCE planning area, the power flow studies performed for heavy load conditions were stressed differently than those for light load conditions. As a result, not all of the same generating units were modeled as being on line in the Heavy Summer as in the Light Autumn cases.

The IVSG development recommendation does not constitute a plan of service for the interconnection of any specific generating projects. IVSG studies did not address all the impacts of the proposed generation and transmission alternatives on the existing transmission system. System Impact Studies and Facilities Studies will be required when individual generating projects request interconnection to the IID system. These detailed load flow, short circuit, stability and post-transient studies must be done on a regional basis; they must address how to mitigate any potential system problems so that system reliability is maintained and the plan of service is demonstrated capable of meeting CAISO/WECC/NERC reliability standards. Interconnecting generators planning to sell power into CAISO grid must submit a detailed TO Tariff application to the CAISO based on CAISO Tariff. Generators must also apply under IID's OATT for transmission service to the point of interconnection with the ISO. In addition, WECC path rating studies will be required for the IV to San Diego 500kV line and for any other WECC path (such as Path 42) whose rating must be increased.

The IVSG did not undertake a full economic evaluation of the proposed generation-transmission development. Such an evaluation, using the TEAM or equivalent methodology, will be necessary to support approval of the significant financial investment required to implement this plan. SDG&E's economic evaluation of the Sunrise Powerlink will include substantial export flows of renewable generation from the Imperial Valley. If this SDG&E evaluation does not provide enough information about the potential benefits and costs of the IVSG development, then an additional economic evaluation should be scheduled, to coincide

with the application to interconnect the first major increment of new Imperial Valley generation.

Most significantly, the IVSG did not consider a tie between the IID and LADWP systems, as this was not proposed by those parties until IVSG transmission planning had been completed. A 500/230 kV tie, as proposed at the Indian Hills substation, could alter the size, structure and timing of the development phases recommended in this plan. LADWP and IID have performed some studies of this link; additional power flow and other studies will be required to determine the effect of this connection on regional facilities, including the flow of new generation connected to the IID system.

# 4.0 Permitting and Approval Plan

The Permitting Work Group (PWG) met periodically over seven months to develop a plan for coordinating and expediting the environmental studies and permit approvals required for all phases of the planned Imperial Valley renewables/transmission development. Participants included SDG&E, SCE, CalEnergy, non-jurisdictional utilities IID and LADWP, US Bureau of Land Management (BLM), CPUC, California Department of Parks and Recreation ("State Parks"), and other interested groups such as the Sierra Club and Border Power Working Group. The PWG identified the coordination of environmental review and the length of time for CPUC and CEC permit approval as key concerns to be addressed.

## 4.1 Environmental Review Documents: CEQA/NEPA

The PWG first explored the potential to develop one master environmental document to address both the regional benefits and the impacts of exporting renewable energy from the Imperial Valley. As the three development phases became better defined, it became apparent that the environmental documents would need to analyze the impacts of the project along the same time frames as proposed in those phases.

The IVSG anticipates Phase 1 in 2010, and Phase 3 in 2020. This span of over 12 years raised concerns about surveys becoming stale and findings that might not adequately review the environmental affects of the upgrades at the time they would be constructed. Meanwhile, much of the proposed transmission would provide other benefits to the individual utilities in addition to access to renewables. If each entity just analyzed its own separate component of a larger transmission plan, there might be concerns that the effects of the project were not analyzed as a whole but divided into smaller components to avoid finding significant impacts. The PWG also grappled with who should be the lead agency for this high-level environmental review document, given the involvement of both jurisdictional and non-jurisdictional utilities.

The PWG concluded that a programmatic approach provided the best vehicle to address all of the above concerns. The first step would be a broad, Programmatic EIR (P-EIR) that would take its project description from the development plan drafted by the IVSG. It would include at a high level:

- Impacts from the development of renewable resources in the Imperial Valley;
- Impacts from the upgrades of the IID system necessary to deliver geothermal/ renewable energy out of the IID control area;
- Impacts of a 500 kV line from Imperial Valley to San Felipe and on to San Diego;

- Impacts of a 500 kV line from the proposed Indian Hills substation to Upland, possibly including a connection to the IID Coachella Valley substation.

In the P-EIR, each of the above listed projects would have its own separate environmental documentation, and different lead agencies. By cooperating on the P-EIR, and sharing the study results for each utility's component of the project, the parties could save time and cost. This would allow future specific projects to tier off of the prior "big picture" environmental review. Also, the PWG agreed that the resource and permitting agencies should be brought into the planning effort on the programmatic document, in order to identify all areas of concern for detailed analysis in the follow-on documents. These agencies include the CEC, CPUC, California Department of Fish & Game, California Department of Parks and Recreation, U.S. Fish &Wildlife Service, U.S. Bureau of Land Management, and the Imperial County Planning and Development Services Department. The involvement of representatives of these agencies will help identify all impacts early and hopefully expedite the follow-on documents.

### 4.1.1 Agreement to Work Cooperatively

To compile a joint programmatic document that could be used for tiering purposes, the PWG recommends that IID, SDG&E, LADWP and CalEnergy enter into a Memorandum of Understanding for the sharing of costs for the P-EIR and the work of writing the descriptions of each entity's development plans. IID, LADWP, and SDG&E have already begun the independent environmental planning and study work for their portions of the project. Ideally, the programmatic review would be conducted and the P-EIR approved prior to the more detailed environmental analysis for the individual project components.

Currently, CalEnergy is the only generator intending to participate in the P-EIR effort. Other renewable generators interested in using the programmatic document to expedite their permitting study work are welcome to join the MOU. Doing so can help insure that their projects are analyzed in the context of the overall generation/transmission development.

Resource agencies and permitting authorities will also be invited to participate in the P-EIR Working Group. They would not be parties to the MOU because they would not have cost responsibilities.

### 4.1.2 CEQA Lead Agency

The PWG recommends that IID act as the CEQA Lead Agency on the P-EIR. IID's discretionary action triggering CEQA would be the approval by its Board of Directors of the proposed construction of the IID Green Path transmission plan, as part of the utility's system reliability upgrades.

The group discussed having the CPUC participate in the planning process on the programmatic document, either on the steering group or as a responsible agency

under CEQA . This might enable the CPUC to utilize the P-EIR as the Proponent's Environmental Assessment (PEA) required in the CPCN application process for jurisdictional utilities. If the CPUC would be willing to do this, it could reduce the normal processing time of a CPCN application by several months.

#### 4.1.3 MOU/CEQA Cost

The PWG recommends that the costs of the Programmatic EIR be shared evenly among the MOU signatories. Details will be spelled out in the MOU. The costs to produce the document are estimated to be $300,000. Issues to be addressed in the MOU include:

- Composition and operational guidelines for the P-EIR Working Group
- Cost sharing
- Milestones
- Role Designations
- Responsible Parties

#### 4.1.4 Timeline

The advantage of a P-EIR with follow-on tiers is that the high-level framework is analyzed first. Future specific projects can then rely on the prior environmental assessment. Because some permitting work has already begun, the PWG believes the P-EIR needs to be complete within six months of signing the MOU and hiring an environmental contractor. This would match up with the time frames given by IID, SDG&E, and LADWP for their documents:

- SDG&E has begun study and environmental work for the Sunrise Powerlink, with the goal of construction start in January 2008 and completion in 2010.
- LADWP has begun environmental work on a 500 kV line, with a target for construction start in January 2008 and completion in January 2010.
- IID has completed planning work for its ten-year transmission plan and Green Path, and is prepared to request a major work authorization to start environmental and permitting work in fall 2005, with construction targeted to begin in 2007.
- CalEnergy has said it can build a geothermal plant every two years, contingent on signed PPAs for those plants. Meeting the 645 MW target for Phase 1 geothermal development by 2010 would require construction to begin in 2008 at the latest, with all three plants built simultaneously.

### 4.2 Rights of Way

The U.S. Bureau of Land Management (BLM)—both the El Centro and Palm Desert Field Offices—were instrumental in the PWG. The BLM identified the existing Utility Corridors that have been designated in the California Desert Conservation Plan areas in Riverside and

Imperial Counties. The PWG investigated the feasibility of doing one NEPA document with the BLM to designate new utility corridors, in which utility Rights of Way could be granted for the project, but a consensus could not be reached. While the location of system upgrades to existing lines could be identified, all utilities had concerns about corridors being placed in their service territories which might allow other utilities to build within existing systems. In addition, those utilities still investigating routing alternatives were unable to identify potentially workable corridor locations precisely enough. Consequently, the PWG abandoned the idea of developing one NEPA document to amend the Desert Plan for the purpose of adding utility corridors. However, all the utilities will work to identify the location of necessary corridors so that such corridors can be presented in the P-EIR. The actual NEPA documents to amend the Desert Plan will have to be developed in conjunction with the EIRs or EAs for the second tier of Imperial Valley generation/transmission development.

## 4.3 Permitting and Approval Processes

PWG members who have gone through state regulatory approval and permitting processes have many suggestions of ways to help expedite and coordinate them. State and federal agency staffs have heavy workloads. One method of assisting them is to find ways to bring in consultants earlier in the process. Currently, it is only after a utility files a CPCN application that the CPUC can retain an environmental consultant for the proposed project. In addition, a mechanism to involve responsible agencies from the very beginning could help insure that the environmental review addresses all agency concerns, thus producing documents that all responsible agencies can quickly adopt.. Similarly, the public and all interested environmental/stakeholder groups should be invited to identify concerns to be addressed at the beginning of the environmental review process. This would help insure that all concerns are being addressed in a public and open manner. If the P-EIR sufficiently outlines the regional benefits of the entire renewable effort, identifies environmental areas of concern, and directs the necessary follow-up, the CPUC could utilize it or portions of it for the applicant's PEA.

The federal agencies, while being able to be reimbursed for staff time, can only get involved when an applicant requests a permit or ROW. The PWG greatly appreciates the assistance of the El Centro and Palm Desert Field Offices of the BLM. They recommended that the utilities map out the necessary ROWs for all the phases and accomplish the Desert Plan amendments now, in anticipation of the need for the ROW, instead of doing separate NEPA documents and amendments for each phase. This is another way to cut down on regulatory agency staff work and time in order to speed up the process.

The Imperial County Planning and Development Services Department is in the midst of revising the Geothermal and Transmission Element in the County's General Plan. Their participation in the process enabled the PWG to understand the County's concerns. It highlighted the need for the utilities to comment on the Geothermal and Transmission Element, in order to assist the County in updating the plan based on the current geothermal

information being studied. Cooperative efforts such as this also help expedite the permitting process between the utilities and local agencies.

State Parks provided invaluable insight into the ROW through the park system and helped direct the planning efforts to look more effectively for routes through protected areas. The PWG recommends that State Parks be a participant in the planning effort for the P-EIR. Reluctance to further open park land for new utility corridors makes it a priority to utilize existing State Park ROW for the necessary upgrades.

## 4.4 Policy Recommendations

The IVSG Steering Committee discussed the following options for expediting permitting and project approvals processes:

CPUC:

- Request the CPUC to amend General Order 131-D to eliminate the current duplication of environmental study efforts, so that only one environmental report is required (rather than one produced by an applicant and one by the CPUC).

- Request the CPUC to employ on-call contracts for its environmental consultants.

- In the absence of on-call contracting ability, request the CPUC to hire its environmental consultant before the IOU files its CPCN application (or at the time the applicant files the purpose and need portion of the CPCN application).

- Allow the state Lead Agency to assign an environmental consultant to work with the utility's (or applicant's) environmental consultant concurrently. This would enable the state Lead Agency's environmental consultant to be involved during a project's route selection, to help shape the PEA during the final four to six months of its development so that it can quickly be converted into an EIR. This option promotes earlier resource agency involvement.

CEC:

- Use CEC public review of the IVSG report (e.g., in the IEPR proceeding) to be counted as one of the public meetings necessary in the CEC plant-siting approval process. This could save one month or more in this approval process.

- The CEC plant-siting process requires investigating alternative lines/connections. IVSG transmission studies, which have been rigorously conducted by expert stakeholders, should help expedite the CEC's investigation of such alternatives.

- Power Plant Permitting: In the case of Imperial Valley renewable resources, transfer licensing authority and CEQA responsibilities from the CEC to Imperial County.

Permitting Salton Sea Unit 6 required 15 months from the time the CEC found the Application for Certification (AFC) to be "data adequate" in September 2002 to the formal approval of the AFC in December 2003.[14] By contrast, CalEnergy's 49 MW Salton Sea Unit 5 was permitted by Imperial County in less than four months. Imperial County has approved a resolution authorizing its Planning and Building Department to obtain siting authority from the CEC for plants up to 200 megawatts. The County believes that its 35 years of experience in processing geothermal plant permits, in combination with appropriate land use ordinances mandated in its General Plan gives it the expertise to satisfy CEQA requirements and other concerns.[15]

Federal:

- Expedite the environmental review for transmission projects in designated utility corridors once they are established. This involves the consideration of contingent corridors that would be evaluated at a programmatic level, and then elevated to 'designated' status upon a more detailed review at a project level.

## 4.5 Next Steps

The PWG effort enabled all participants to better understand the regulatory approvals needed for the development of geothermal and other renewables in Imperial County. The major parties intend to negotiate an MOU for the joint production of a P-EIR. They will also establish a meeting schedule to insure coordinated review of the environmental documents to be produced in the next year for the tiers of the project. By continuing to meet and share study information, the environmental contractors will be better able to adequately address the cumulative effects in each phase, and avoid overwhelming the government staffs that must review the documentation.

[14] It should be noted that Salton Sea Unit 6 was the first geothermal power plant to be permitted by the CEC in more than 15 years. It is reasonable to assume that the staff's "learning curve" associated with this permitting effort significantly lengthened the overall permitting process.

[15] The Imperial County General Plan contains a "Geothermal Element" that was developed to provide guidelines for permitting geothermal energy plants. Imperial County has used those guidelines to permit more than 14 plants. In conjunction with the Geothermal Element, Imperial County also prepared a Master Environmental Impact Report for the Salton Sea KGRA. That EIR is updated regularly.

## 5.0 Tariff and Funding Issues

The IVSG development plan includes these major components: 1) network upgrades of the IID system; 2) the proposed 500 kV line into San Diego County; 3) in Phase 3, upgrades of the SCE Mirage–Devers tie and associated facilities on Path 42; and potentially, 4) a 500/230 kV connection between IID and LADWP.

IID and LADWP operate their own control areas, separate from the CAISO. The CPUC and FERC do not have jurisdiction over them. Both SDG&E and SCE are members of the CAISO, and fall under the jurisdiction of both the CPUC and FERC.

Renewable generators in the Imperial Valley will likely connect to the IID system, not the CAISO grid, even though much of their output is intended to be delivered to purchasers across the CAISO system.[16] They will thus be required to comply with the IID OATT and its corresponding interconnection procedures.

The proposed SDG&E 500 kV line into San Diego County is by definition a CAISO network upgrade, needed for both reliability and economic reasons. Upgrades of the SCE system on Path 42 triggered by inadvertent flow would likely be considered an economically driven project to reduce congestion costs. Many components of the IID build-out will be considered network upgrades of that system; other IID (and LADWP) upgrades may be considered the cost responsibility of interconnecting generators, in whole or in part. Cost allocation is a critical issue, and these realities make the allocation of the costs of the required upgrades complex.

CAISO tariff provisions allow the cost of network upgrades of its system to be spread broadly, across all users of the ISO grid. Upgrades of the IID (and LADWP) systems cannot be spread as broadly. Generators interconnecting to the IID/LADWP systems may be required to bear some portion of the cost of the upgrades required to make their output deliverable to the CAISO grid. The amount of this generator cost responsibility will greatly affect the ability of geothermal and solar developers to sell their power. High wheeling charges could limit renewable development for export. Resolution of these issues remains a priority for IVSG parties. Some of the considerations involved are discussed in this chapter.

### Transmission Cost Responsibility

Imperial Valley generators will bear the cost of building transmission ("gen-ties") from their projects to connect to the IID (or SDG&E) systems.

Some of the transmission upgrades on the IID system are required for the primary purpose of delivering geothermal energy to neighboring utilities. However, there are collateral benefits to IID's system as the overall capability and reliability of the IID transmission system will be

[16] The 300 MW solar project whose output will be purchased by SDG&E under a recently announced contract may connect directly to the CAISO grid.

enhanced by the identified upgrades. The majority of upgrades associated with geothermal development near the Salton Sea are anticipated to be network upgrades. IID would fund such upgrades and recover the cost through charges for transmission service across its system.

Some of the network upgrades may also be part of IID's grid assessment plan. To accommodate renewable resource development, some of these upgrades may need to be accelerated, on the schedule anticipated by the IVSG development plan. Interconnecting generators would in such cases pay the cost of completing the upgrade sooner than it would be required for load-serving or reliability reasons.

The SDG&E 500 kV line will likely be considered a network upgrade. Under the CAISO tariff, the cost of this upgrade will be spread among all users of the CAISO grid.

Cost Recovery

IID has stated it will secure financing either internally or from third party sources to complete its transmission system upgrades. IID's capital costs will be rolled into its rate base for transmission service across its grid. IID will obtain cost recovery through its OATT from generators connecting to its system through interconnection requests and transmission service requests.

The SDG&E 500 kV line in San Diego County and associated facilities is an essential component of the IVSG plan to export renewable resources, beginning in Phase 1. In Phase 3, upgrades of Path 42 on the SCE system may also be required, even though no Imperial Valley generation has been scheduled to SCE at its Devers substation. As mentioned above, these upgrades may be justified on reliability and economic grounds. To the extent that they are needed to comply with the state RPS mandate, special consideration by the CPUC and CAISO is indicated.

FERC must ultimately approve the SDG&E and SCE facilities as eligible for cost recovery in transmission rates. To ensure against possible disallowance at FERC, the State of California and the CPUC must establish an alternative mechanism, consistent with the Federal Power Act, to provide cost recovery certainty for the IOUs in order for this plan to be realized. To this end, the CPUC must find in the respective CPCN orders that the jurisdictional facilities discussed in this plan provide network benefits and take all other steps required under Public Utilities Code Sec. 399.25

In the CAISO, the cost of network upgrades is spread among all users of the grid. The cost of IID upgrades cannot be spread as widely. The IVSG Steering Committee fully understands that the development of renewable resources in the region is contingent on the ability of generators to sell their power at competitive rates, and that transmission service charges paid by renewable generators is a key component of that ability.

Operational Control

IID intends to own and operate all transmission facilities in its service territory.

SDG&E and SCE are Participating Transmission Owners (PTOs) of the grid operated by the CAISO. Any portion of a transmission upgrade, interconnection facilities, and associated facilities forming part of a PTO's transmission network will be transferred to CAISO operational control pursuant to the Transmission Control Agreement among the CAISO and PTOs.

Financing Options

During the course of the IVSG effort, IID determined that it would fund its system upgrades itself, either through bonding or third party financing options. In regards to the proposed 500 kV transmission line, interested parties could pursue transmission ownership contracts, such as the SDG&E-IID California Project Participation Agreement. In this model, each party's ownership share would be negotiated between the parties to be proportional to the amount of transmission capacity they had requested; each would bear a commensurate share of the construction costs. PTOs who transfer operational control of their transmission system to the CAISO could maintain the use of the transmission so financed, consistent with their PTO agreements with the CAISO.

The CAISO can direct its PTOs (in this case, SDG&E and SCE) to fund upgrades of their systems, and allow for recovery through the CAISO's High Voltage Access Charge. The CAISO may be able to direct such an action based on the need of its PTOs to meet state RPS goals.

# 6.0 Follow-On Work

The IVSG has provided a mechanism for key stakeholders to jointly create a planning framework for a complex, regional inter-utility, inter-control area development project. The agreement of IID, SDG&E, LADWP and CalEnergy to jointly produce a P-EIR addressing the overall generation-transmission development is one valuable outcome of the IVSG effort. Collaborative electrical planning among utilities is another. The parties should extend this cooperation to the next stages of work required to implement the proposed development.

## 6.1 Imperial Valley Implementation Group

This work includes transmission studies of the proposed IID-LADWP tie, and its effect on exports of Imperial Valley generation to CAISO (and other) delivery points. This connection, and the size of DWP acquisitions of Imperial Valley renewables, may require the size, timing and structure of the development phases recommended here to be reconfigured. Agreements among IID, LADWP and SDG&E as to the ownership and construction of proposed upgrades may also affect the structure and sequence of the overall development.

After the phases are better defined, on the basis of this new information, an economic evaluation of the costs and benefits of the overall development may be necessary. Some cost responsibility and cost recovery issues also remain to be resolved. But the largest and most important implementation tasks are building the widespread public support necessary to overcome opposition to the construction of new facilities, and the winning of permit approvals. This work can be facilitated by continued collaboration. The key parties may be able to achieve their objectives more effectively by attaching them to the larger effort of developing and exporting Imperial Valley renewable resources.

Some of the work required for discrete transmission additions will be done by individual entities; all of the stakeholders will need to follow the WECC process for transmission additions having regional impacts. Continued cooperation in those arenas, as well as on-going bilateral negotiations between the parties concerning the commercial terms for participation in the 500 kV lines being proposed, will aid in moving this effort forward.

To this end, key stakeholders could transform the IVSG into a smaller Imperial Valley Implementation Group focused on permit approval and construction. This would provide a vehicle for collaborating on common tasks, for working out agreements on key issues, and for expediting all aspects of the joint generation-transmission development. An IV Implementation Group could establish goals and target dates for the overall development, and take responsibility for ensuring progress toward construction. It would report its progress quarterly, to stakeholders, the CPUC, CEC and Governor. The IVSG Steering Committee discussed forming such a working group, but could not reach agreement on whether to do so.

# APPENDIX C - 2

Development Plan for the Phased Expansion of the Transmission to Access Renewable Resources in the Imperial Valley, Appendix A

# Imperial Valley Study Group

# Appendix A

## Transmission Planning Studies
## Vol. 1

Regional Flow Table
Dispatch Schedule
Contingency List
Heavy Summer Power Flow Data

# Imperial Valley Study Group

# Appendix A.1

## Flows at Regional Buses

FLOWS AT REGIONAL BUSES

*IVSG CASES - HEAVY SUMMER*

| *WECC Paths* | HS REV 4 | ALT1D1 | ALT1D2 | ALT2D1 | ALT2D2 | ALT3AD1 | ALT3AD2 | ALT3BD1 | ALT3BD2 | ALT4AD1 | ALT4AD2 | ALT4BD1 | ALT4BD2 | ALT5D1 | ALT5D2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Path 49 (EOR)** | 4765.5 | 4633.0 | 4182.0 | 4629.0 | 4183.0 | 4652.0 | 4198.0 | 4652.0 | 4208.0 | 4621.0 | 4048.0 | 4701.0 | 4245.0 | 4649.0 | 4189.0 |
| **Path 46 (WOR)** | 7707.5 | 6722.0 | 6167.8 | 7802.5 | 7145.4 | 7803.5 | 7144.7 | 7803.6 | 7143.7 | 7660.2 | 7068.2 | 7607.1 | 7034.9 | 6675.3 | 6156.7 |
| **Path 42** | 107.9 | 970.0 | 996.0 | 752.0 | 827.0 | 716.0 | 788.0 | 720.0 | 768.0 | 685.0 | 762.0 | 773.0 | 889.0 | 871.0 | 885.0 |
| **Path 45** | (178.0) | (327.3) | (262.0) | (282.2) | (228.1) | (302.9) | (248.3) | (300.2) | (249.6) | (269.7) | (216.4) | (285.4) | (225.1) | (273.7) | (219.7) |
| **IID Tie Lines** | | | | | | | | | | | | | | | |
| **Path 42** | 107.9 | 970.0 | 996.0 | 752.0 | 827.0 | 716.0 | 788.0 | 720.0 | 768.0 | 685.0 | 762.0 | 773.0 | 889.0 | 871.0 | 885.0 |
| **El Centro - I.V.** | (104.4) | 549.6 | 480.2 | 540.4 | 482.6 | 563.4 | 506.0 | 560.4 | 515.4 | 268.0 | 223.4 | 248.2 | 443.0 | 421.4 | 387.8 |
| **Bannister - San Felipe** | 0.0 | 425.3 | 374.5 | 553.4 | 514.1 | 570.5 | 532.0 | 569.4 | 547.0 | 458.9 | 423.0 | 441.3 | 492.5 | 709.4 | 690.6 |
| **C.V. - Indian Hills** | 0.0 | (112.4) | (31.0) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | (191.2) | (165.8) |
| **Niland - Blythe** | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Yucca - Yucca APS** | 69.6 | 20.0 | 20.0 | 20.0 | 20.0 | 20.0 | 20.0 | 20.0 | 20.0 | 20.0 | 20.0 | 20.0 | 20.0 | 20.0 | 20.0 |
| **Pilot Knob - Yucca** | 49.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Others** | | | | | | | | | | | | | | | |
| **San Felipe - Central** | 0.0 | 408.6 | 359.5 | 729.7 | 635.5 | 0.0 | 0.0 | 0.0 | 0.0 | 739.4 | 642.2 | 770.7 | 662.9 | 768.7 | 645.9 |
| **Central - Serval** | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Devers - Valley** | 1076.7 | 1354.9 | 1299.1 | 1328.9 | 1268.7 | 1342.9 | 1240.8 | 1351.6 | 1233.5 | 1312.3 | 1254.6 | 1288.7 | 1246.8 | 1296.4 | 1259.8 |
| **I.V. - Miguel** | 1359.7 | 1720.6 | 1514.4 | 1577.7 | 1397.9 | 1635.5 | 1453.7 | 1633.2 | 1457.1 | 1630.6 | 1443.1 | 1702.2 | 1467.8 | 1586.7 | 1393.4 |

*IVSG CASES - LIGHT AUTUMN*

| *WECC Paths* | REV 5 | ALT2D3 | ALT2D4 | ALT2AD3 | ALT2AD4 | ALT3BD3 | ALT3BD4 | ALT2D3_S CSV | ALT2D3_ S-EOR |
|---|---|---|---|---|---|---|---|---|---|
| **Path 49 (EOR)** | 7962.0 | 7427.0 | 7834.0 | 7427.0 | 7834.0 | 7459.0 | 7868.0 | 7469.0 | 9155.0 |
| **Path 46 (WOR)** | 6154.2 | 5607.2 | 5903.7 | 5611.5 | 5906.6 | 5722.2 | 6025.0 | 5628.2 | 6738.8 |
| **Path 42** | 327.0 | 836.0 | 875.0 | 851.0 | 865.0 | 715.0 | 751.0 | 749.0 | 871.0 |
| **Path 45** | 147.1 | 145.7 | 146.4 | 145.6 | 146.2 | 146.1 | 146.7 | 146.2 | 146.2 |
| **IID Tie Lines** | | | | | | | | | |
| **Path 42** | 327.0 | 836.0 | 875.0 | 851.0 | 895.0 | 715.0 | 751.0 | 749.0 | 871.0 |
| **El Centro - I.V.** | (100.9) | 633.6 | 599.6 | 637.8 | 605.2 | 681.0 | 649.2 | 662.4 | 631.6 |
| **Bannister - San Felipe** | 0.0 | 614.1 | 611.4 | 615.3 | 613.5 | 700.7 | 699.5 | 685.4 | 616.9 |
| **C.V. - Indian Hills** | 0.0 | 0.0 | 0.0 | (8.2) | (13.8) | 0.0 | 0.0 | 0.0 | 0.0 |
| **Niland - Blythe** | 26.0 | 50.7 | 54.5 | 52.1 | 56.1 | 42.9 | 46.8 | 43.7 | 44.7 |
| **Yucca - Yucca APS** | (30.4) | (11.2) | (12.0) | (10.8) | (11.6) | (11.0) | (11.8) | (11.0) | (13.8) |
| **Pilot Knob - Yucca** | (43.4) | (24.1) | (24.9) | (23.9) | (24.5) | (24.0) | (24.7) | (24.0) | (26.7) |
| **Others** | | | | | | | | | |
| **San Felipe - Central** | 0.0 | 1025.4 | 1055.4 | 1027.8 | 1057.7 | 0.0 | 0.0 | 1364.4 | 1119.7 |
| **Central - Serval** | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 617.1 | 0.0 |
| **Devers - Valley** | 2347.5 | 2457.3 | 2564.0 | 2455.8 | 2561.6 | 2294.4 | 2401.4 | 2510.8 | 2757.2 |
| **I.V. - Miguel** | 1673.6 | 1529.5 | 1569.2 | 1532.4 | 1572.2 | 1548.3 | 1592.9 | 1497.8 | 1688.7 |

# Imperial Valley Study Group

# Appendix A.2

## Dispatch Schedules

Imperial Valley Transmission Study
Proposed Dispatch for 2200MW
of New Geothermal Resources

| AREA | D1 (summer only) | | D2 (summer only) | | D3 (autumn only) | | D4R1 (autumn only) | |
|---|---|---|---|---|---|---|---|---|
| | Dispatch | Offset | Dispatch | Offset | Dispatch | Offset | Dispatch | Offset |
| IID | 200 | Elsteam 2,3<br>Repu2 | 200 | Elsteam 2,3<br>Repu2 | 200 | Increased Load<br>(200MW) | 0 | |
| SDGE | 1000 | Encina 2,3,5<br>Southby 1,2,3<br>Eppst 1<br>Envirepl | 200 | Encina 2,3<br>Envirepl | 200 | Envirepl<br>EPPCT2<br>Ramco_MR<br>EPPST1 | 500 | Eppct 1,2<br>Eppst 1<br>Envirepl<br>Otaymst1<br>Ramco_mr |
| SCE | 400 | Alamt 5,6 | 300 | Alamt 5,6 | 1000 | Alamt 1,3<br>Redon 7, 8 | 700 | Redon 7,8 |
| LADWP | 200 | Valley 6,7,8 | 200 | Valley 6,7,8 | 200 | Valley 6<br>SCATT1G | 200 | Valley 6<br>Scatt 1G |
| PG&E | 400 | Morro 3,4 | 600 | Morro 3,4 PTSB<br>5,6 | | | 800 | DecCtG<br>1,2,3<br>DecStG1 |
| WAPA 100 | | | | Griffth 1,2 | 100 | Griffth 1 | | |
| ARIZONA | | | 500 | WPCC5ST1,<br>WPCC5CT2<br>SANTN 5A, 6A<br>IRVTGE4 | 500 | WPCC5ST1,<br>WPCC5CT2<br>SANTN 5A, 5B<br>WPCC5CT1 | | |
| NPC | | | 100 | Clark 8,10 | | | | |
| | | | | | | | | |
| total | 2200 | | 2200 | | 2200 | | 2200 | |

# Imperial Valley Study Group

# Appendix A.3

Contingency Lists

# Imperial Valley Study Group

## Appendix A.3.1

N-1 Contingency List

```
# contingency selection : from area 8 to 8; 100 kV to 999 kV
# contingency selection : from area 8 to 8; 100 kV to 999 kV
line_1            "line YUCCA161 to PILOTKNB 161 ck 1"
 line "YUCCA161 161.00"  "PILOTKNB 161.00"  "1 "  1 0
0
line 2            "line BANTP2   to BANISTER 161 ck 1"
 line "BANTP2   161.00"  "BANISTER 161.00"  "1 "  1 0
0
line 3            "line BANTP1   to BANISTER 161 ck 1"
 line "BANTP1   161.00"  "BANISTER 161.00"  "1 "  1 0
0
line 4            "line PKNB230  to YUCCA230 230 ck 1"
 line "PKNB230  230.00"  "YUCCA230 230.00"  "1 "  1 0
0
line 5            "line YUCCA230 to NGILA230 230 ck 1"
 line "YUCCA230 230.00"  "NGILA230 230.00"  "1 "  1 0
0
line 6            "line BANIS230 to ELCENTSW 230 ck 1"
 line "BANIS230 230.00"  "ELCENTSW 230.00"  "1 "  1 0
0
line_7            "line BANIS230 to NEWSF230 230 ck 1"
 line "BANIS230 230.00"  "NEWSF230 230.00"  "1 "  1 0
0
line 8            "line BANIS230 to COLCT1   230 ck 1"
 line "BANIS230 230.00"  "COLCT1   230.00"  "1 "  1 0
0
line 9            "line COACHELA to BANIS230 230 ck 1"
 line "COACHELA 230.00"  "BANIS230 230.00"  "1 "  1 0
0
line 10           "line COACHELA to BANIS230 230 ck 2"
 line "COACHELA 230.00"  "BANIS230 230.00"  "2 "  1 0
0
line 11           "line COACHELA to RAMON    230 ck 1"
 line "COACHELA 230.00"  "RAMON    230.00"  "1 "  1 0
0
line 12           "line COACHELA to RAMON    230 ck 2"
 line "COACHELA 230.00"  "RAMON    230.00"  "2 "  1 0
0
line_13           "line COACHELA to MIDWAY   230 ck 1"
 line   8311    8699  "1 "  1 0
0
line 14           "line COACHELA to MIDWAY   230 ck 2"
 line   8311    8699  "2 "  1 0
0
line 15           "line ELCENTSW to BANTP1   161 ck 1"
 line "ELCENTSW 161.00"  "BANTP1   161.00"  "1 "  1 0
0
line 16           "line ELCENTSW to NILAND   161 ck 1"
 line "ELCENTSW 161.00"  "NILAND   161.00"  "1 "  1 0
0
line 17           "line ELCENTSW to PILOTKNB 161 ck 1"
 line "ELCENTSW 161.00"  "PILOTKNB 161.00"  "1 "  1 0
0
line 18           "line ELCENTSW to AV58TP1  161 ck 1"
 line "ELCENTSW 161.00"  "AV58TP1  161.00"  "1 "  1 0
0
line 19           "line ELCENTSW to IVECPS   230 ck 1"
 line "ELCENTSW 230.00"  "IVECPS   230.00"  "1 "  1 0
0
line 20           "line NILAND   to CVSUB161 161 ck 1"
 line "NILAND   161.00"  "CVSUB161 161.00"  "1 "  1 0
0
line 21           "line NILAND   to BLYTHE   161 ck 1"
 line "NILAND   161.00"  "BLYTHE   161.00"  "1 "  1 0
0
line 22           "line GEOSUB1  to BANIS230 230 ck 1"
 line "GEOSUB1  230.00"  "BANIS230 230.00"  "1 "  1 0
```

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0
line 23           "line GEOSUB1  to BANIS230 230 ck 2"
 line "GEOSUB1  230.00"  "BANIS230 230.00"  "2 "  1 0
0
line 24           "line GEOSUB1  to MIDWAY   230 ck 1"
 line   8600    8699  "1 "  1 0
0
line 25           "line HIGHLINE to ELCENTSW 230 ck 1"
 line "HIGHLINE 230.00"  "ELCENTSW 230.00"  "1 "  1 0
0
line 26           "line HIGHLINE to ELCENTSW 230 ck 2"
 line "HIGHLINE 230.00"  "ELCENTSW 230.00"  "2 "  1 0
0
line_27           "line HIGHLINE to MIDWAY   230 ck 1"
 line   8690    8699  "1 "  1 0
0
line 28           "line HIGHLINE to MIDWAY   230 ck 2"
 line   8690    8699  "2 "  1 0
0
line 29           "line HIGHLINE to COLCT3   230 ck 1"
 line "HIGHLINE 230.00"  "COLCT3   230.00"  "1 "  1 0
0
line 30           "line MIDWAY   to HIGHLINE 230 ck 3"
 line   8699    8690  "3 "  1 0
0
line 31           "line MIDWAY   to HIGHLINE 230 ck 4"
 line   8699    8690  "4 "  1 0
0
line 32           "line MIDWAY   to BUCKBLVD 230 ck 1"
 line   8699    80400  "1 "  1 0
0
line 33           "line MIDWAY   to COLCT2   230 ck 1"
 line   8699    80800  "1 "  1 0
0
line 34           "line AV58     to AV58TP1  161 ck 1"
 line "AV58     161.00"  "AV58TP1  161.00"  "1 "  1 0
0
line 35           "line AV58     to AV58TP2  161 ck 1"
 line "AV58     161.00"  "AV58TP2  161.00"  "1 "  1 0
0
line 36           "line AV58TP1  to BANTP2   161 ck 1"
 line "AV58TP1  161.00"  "BANTP2   161.00"  "1 "  1 0
0
line 37           "line AV58TP2  to CVSUB161 161 ck 1"
 line "AV58TP2  161.00"  "CVSUB161 161.00"  "1 "  1 0
0
line 38           "line IVECPS   to ELCENTSW 230 ck 2"
 line "IVECPS   230.00"  "ELCENTSW 230.00"  "2 "  1 0
0
line 39           "line KNOB     to PILOTKNB 161 ck 1"
 line "KNOB     161.00"  "PILOTKNB 161.00"  "1 "  1 0
0
line_40           "line IH230    to COACHELA 230 ck 1"
 line "IH230    230.00"  "COACHELA 230.00"  "1 "  1 0
0
line 41           "line IH230    to COACHELA 230 ck 2"
 line "IH230    230.00"  "COACHELA 230.00"  "2 "  1 0
0
line 42           "line PKNB230  to HIGHLINE 230 ck 1"
 line "PKNB230  230.00"  "HIGHLINE 230.00"  "1 "  1 0
0
line 43           "line COACHELA to DEVERS   230 ck 1"
 line "COACHELA 230.00"  "DEVERS   230.00"  "1 "  1 0
0
line 44           "line COACHELA to DEVERS   230 ck 2"
 line "COACHELA 230.00"  "DEVERS   230.00"  "2 "  1 0
0
```

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line 45           "line RAMON    to MIRAGE   230 ck 1"
 line "RAMON    230.00"  "MIRAGE   230.00"  "1 "  1 0
0
line 46           "line GEOSUB1  to GEOSUB2  230 ck 1"
 line "GEOSUB1  230.00"  "GEOSUB2  230.00"  "1 "  1 0
0
line 47           "line GEOSUB2  to BANIS230 230 ck 1"
 line "GEOSUB2  230.00"  "BANIS230 230.00"  "1 "  1 0
0
line 48           "line MIDWAY   to GEOSUB2  230 ck 1"
 line   8699    8601  "1 "  1 0
0
line 49           "line MIDWAY   to GEOSUB2  230 ck 2"
 line   8699    8601  "2 "  1 0
0
line 50           "line BANIS230 to AV58TP12 230 ck 1"
 line "BANIS230 230.00"  "AV58TP12 230.00"  "1 "  1 0
0
line 51           "line AV58TP12 to AVE58230 230 ck 1"
 line "AV58TP12 230.00"  "AVE58230 230.00"  "1 "  1 0
0
line 52           "line AVE58230 to AV58TP22 230 ck 1"
 line "AVE58230 230.00"  "AV58TP22 230.00"  "1 "  1 0
0
line 53           "line AV58TP22 to COACHELA 230 ck 1"
 line "AV58TP22 230.00"  "COACHELA 230.00"  "1 "  1 0
0
line_54           "line NEWSF230 to IMPRLVLY 230 ck 1"
 line "NEWSF230 230.00"  "IMPRLVLY 230.00"  "1 "  1 0
0
line 55           "line NEWSF230 to IMPRLVLY 230 ck 2"
 line "NEWSF230 230.00"  "IMPRLVLY 230.00"  "2 "  1 0
0
line 56           "line NEWSF500 to IMPRLVLY 500 ck 1"
 line "NEWSF500 500.00"  "IMPRLVLY 500.00"  "1 "  1 0
0
line 57           "line NEWSF500 to IH500    500 ck 1"
 line "NEWSF500 500.00"  "IH500    500.00"  "1 "  1 0
0
line 58           "line IMPRLVLY to HILNE500 500 ck 1"
 line "IMPRLVLY 500.00"  "HILNE500 500.00"  "1 "  1 0
0
line 59           "line HILNE500 to N.GILA   500 ck 1"
 line "HILNE500 500.00"  "N.GILA   500.00"  "1 "  1 0
0
line_60           "line ELCENTSW to IMPRLVLY 230 ck 1"
 line "ELCENTSW 230.00"  "IMPRLVLY 230.00"  "1 "  1 0
0
line 61           "line IMPRLVLY to ELCENTSW 230 ck 2"
 line "IMPRLVLY 230.00"  "ELCENTSW 230.00"  "2 "  1 0
0
line 62           "line IMPRLVLY to ELCENTSW 230 ck 3"
 line "IMPRLVLY 230.00"  "ELCENTSW 230.00"  "3 "  1 0
0
line 63           "line RAMON    to MIRAGE   230 ck 2"
 line "RAMON    230.00"  "MIRAGE   230.00"  "2 "  1 0
0
line 64           "line IMPRLVLY to DIXIE230 230 ck 1"
 line "IMPRLVLY 230.00"  "DIXIE230 230.00"  "1 "  1 0
0
line 65           "line MIRAGE   to DEVERS   230 ck 2"
 line "MIRAGE   230.00"  "DEVERS   230.00"  "2 "  1 0
0
line_66           "line CENTRALX to NEWSF500 500 ck 1"
 line "CENTRALX 500.00"  "NEWSF500 500.00"  "1 "  1 0
0
line_67           "line CENTRALX to NEWSF230 230 ck 1"
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 line "CENTRALX 230.00"  "NEWSF230 230.00"  "1 "  1 0
0
line_68           "line NORTHSD  to NEWSF500 500 ck 1"
 line "NORTHSD  500.00"  "NEWSF500 500.00"  "1 "  1 0
0
line 69           "line NORTHSD  to NEWSF230 230 ck 1"
 line "NORTHSD  230.00"  "NEWSF230 230.00"  "1 "  1 0
0
tran 70           "tran ELCENTSW 161 to ELCENTSW  230 ck 1"
 tran "ELCENTSW 161.00"  "ELCENTSW 230.00"  "1 "  0
0
tran 71           "tran BANISTER 161 to BANIS230  230 ck 1"
 tran "BANISTER 161.00"  "BANIS230 230.00"  "1 "  0
0
tran 72           "tran HIGHLINE 230 to HILNE500  500 ck 1"
 tran "HIGHLINE 230.00"  "HILNE500 500.00"  "1 "  0
0
tran 73           "tran N.GILA   500 to NGILA230  230 ck 1"
 tran "N.GILA   500.00"  "NGILA230 230.00"  "1 "  0
0
tran_74           "tran NEWSF230 230 to NEWSF500  500 ck 1"
 tran "NEWSF230 230.00"  "NEWSF500 500.00"  "1 "  0
0
tran 75           "tran BUCKBLVD 230 to BLYTHE    161 ck 1"
 tran "BUCKBLVD 230.00"  "BLYTHE   161.00"  "1 "  0
0
tran 76           "tran PKNB230  230 to PILOTKNB  161 ck 1"
 tran "PKNB230  230.00"  "PILOTKNB 161.00"  "1 "  0
0
tran 77           "tran IMPRLVLY 230 to IVECPS    230 ck 1"
 tran "IMPRLVLY 230.00"  "IVECPS   230.00"  "1 "  0
0
tran 78           "tran IH230    230 to IH500     500 ck 1"
 tran "IH230    230.00"  "IH500    500.00"  "1 "  0
0
B2_001 "HASSYAMP - N.GILA 1  500kV"
1  "HASSYAMP 500"  "N.GILA   500"  "1 "   1  0
0
B2_002 "IMPRLVLY - MIGUEL 1  500kV"
1  "IMPRLVLY 500"  "MIGUEL   500"  "1 "   1  0
0
B2_003 "N.GILA   - IMPRLVLY 1  500kV"
1  "N.GILA   500"  "IMPRLVLY 500"  "1 "   1  0
0
B2_004 "ESCNDIDO - TALEGA 1  230kV"
1  "ESCNDIDO 230"  "TALEGA   230"  "1 "   1  0
0
B2_005 "OLD TOWN - MISSION 1  230kV"
1  "OLD TOWN 230"  "MISSION  230"  "1 "   1  0
0
B2_006 "OLD TOWN - MISSION 2  230kV"
1  "OLD TOWN 230"  "MISSION  230"  "2 "   1  0
0
B2_007 "PENSQTOS - ENCINA 1  230kV"
1  "PENSQTOS 230"  "ENCINA   230"  "1 "   1  0
0
B2_008 "PENSQTOS - OLD TOWN 1  230kV"
1  "PENSQTOS 230"  "OLD TOWN 230"  "1 "   1  0
0
B2_009 "EPP      - ESCNDIDO 1  230kV"
1  "EPP      230"  "ESCNDIDO 230"  "1 "   1  0
0
B2_010 "SANLUSRY - ENCINA 1  230kV"
1  "SANLUSRY 230"  "ENCINA   230"  "1 "   1  0
0
B2_011 "SANLUSRY - MISSION 1  230kV"
1  "SANLUSRY 230"  "MISSION  230"  "1 "   1  0
```

```
0
B2_012 "SANLUSRY - MISSION 2  230kV"
1  "SANLUSRY 230"  "MISSION  230"  "2 "   1  0
0
B2_013 "EPP      - SYCAMORE 1  230kV"
1  "EPP      230"  "SYCAMORE 230"  "1 "   1  0
0
B2_014 "ENCINATP - ENCINA 1  230kV"
1  "ENCINATP 230"  "ENCINA   230"  "1 "   1  0
1  "ENCINATP 230"  "SANLUSRY 230"  "1 "   1  0
1  "ESCNDIDO 230"  "ENCINATP 230"  "1 "   1  0
7
0
B2_015 "MIGUEL   - MISSION 1  230kV"
1  "MIGUEL   230"  "MISSION  230"  "1 "   1  0
0
B2_016 "IV-GEN   - IMPRLVLY 1  230kV"
1  "IV-GEN   230"  "IMPRLVLY 230"  "1 "   1  0
0
B2_017 "IV-GEN   - IMPRLVLY 2  230kV"
1  "IV-GEN   230"  "IMPRLVLY 230"  "2 "   1  0
0
B2_018 "INTB     - IMPRLVLY 1  230kV"
1  "INTB     230"  "IMPRLVLY 230"  "1 "   1  0
0
B2_019 "INTB     - IMPRLVLY 2  230kV"
1  "INTB     230"  "IMPRLVLY 230"  "2 "   1  0
0
B2_020 "MIGUEL   - MISSION 2  230kV"
1  "MIGUEL   230"  "MISSION  230"  "2 "   1  0
0
B2_021 "IMPRLVLY - ROA-230 1  230kV"
1  "IMPRLVLY 230"  "ROA-230  230"  "1 "   1  0
0
B2_022 "OTAYMESA - TJI-230 1  230kV"
1  "OTAYMESA 230"  "TJI-230  230"  "1 "   1  0
0
B2_023 "SANLUSRY - S.ONOFRE 1  230kV"
1  "SANLUSRY 230"  "S.ONOFRE 230"  "1 "   1  0
0
B2_024 "SANLUSRY - S.ONOFRE 2  230kV"
1  "SANLUSRY 230"  "S.ONOFRE 230"  "2 "   1  0
0
B2_025 "SANLUSRY - S.ONOFRE 3  230kV"
1  "SANLUSRY 230"  "S.ONOFRE 230"  "3 "   1  0
0
B2_026 "TALEGA   - S.ONOFRE 1  230kV"
1  "TALEGA   230"  "S.ONOFRE 230"  "1 "   1  0
0
B2_027 "TALEGA   - S.ONOFRE 2  230kV"
1  "TALEGA   230"  "S.ONOFRE 230"  "2 "   1  0
0
B2_028 "MIGUEL   - SYCAMORE 1  230kV"
1  "MIGUEL   230"  "SYCAMORE 230"  "1 "   1  0
0
B2_029 "OTAYMESA - MLSXTAP 1  230kV"
1  "OTAYMESA 230"  "MLSXTAP  230"  "1 "   1  0
0
B2_030 "MIGUEL   - MLSXTAP 1  230kV"
1  "MIGUEL   230"  "MLSXTAP  230"  "1 "   1  0
0
B2_031 "SYCAMORE - MLSXTAP 1  230kV"
1  "SYCAMORE 230"  "MLSXTAP  230"  "1 "   1  0
0
B2_032 "OTAYMESA - MLMS3TAP 1  230kV"
1  "OTAYMESA 230"  "MLMS3TAP 230"  "1 "   1  0
0
```

```
B2_033 "MIGUEL   - MLMS3TAP 1  230kV"
1  "MIGUEL   230"  "MLMS3TAP 230"  "1 "   1  0
0
B2_034 "OLD TOWN - MLMS3TAP 1  230kV"
1  "OLD TOWN 230"  "MLMS3TAP 230"  "1 "   1  0
0
line 001          "line MOENKOPI to ELDORDO  500 ck 1"
 line     14002     24042   "1 "  1 0
0
line 002          "line PALOVRDE to DEVERS   500 ck 1"
 line     15021     24801   "1 "  1 0
0
line 003          "line MERCHANT to ELDORDO  230 ck 1"
 line     18620     24041   "1 "  1 0
0
line 004          "line MERCHANT to ELDORDO  230 ck 2"
 line     18620     24041   "2 "  1 0
0
line 005          "line MEAD S   to ELDORDO  230 ck 1"
 line     19012     24041   "1 "  1 0
0
line 006          "line MEAD S   to ELDORDO  230 ck 2"
 line     19012     24041   "2 "  1 0
0
line 007          "line BLYTHE   to BLYTHESC 161 ck 1"
 line     19020     24017   "1 "  1 0
0
line_008          "line PARKER   to GENE     230 ck 1"
 line     19042     25402   "1 "  1 0
0
line 011          "line SANLUSRY to S.ONOFRE 230 ck 1"
 line     22716     24131   "1 "  1 0
0
line 012          "line SANLUSRY to S.ONOFRE 230 ck 2"
 line     22716     24131   "2 "  1 0
0
line 013          "line SANLUSRY to S.ONOFRE 230 ck 3"
 line     22716     24131   "3 "  1 0
0
line 014          "line TALEGA   to S.ONOFRE 230 ck 1"
 line     22844     24131   "1 "  1 0
0
line 015          "line TALEGA   to S.ONOFRE 230 ck 2"
 line     22844     24131   "2 "  1 0
0
line_016          "line ALMITOSE to BARRE    230 ck 1"
 line     24006     24016   "1 "  1 0
0
line 017          "line ALMITOSE to CENTER S 230 ck 1"
 line     24006     24021   "1 "  1 0
0
line 018          "line ALMITOSW to ALMITOSE 230 ck 1"
 line     24008     24006   "1 "  1 0
0
line 019          "line ALMITOSW to BARRE    230 ck 2"
 line     24008     24016   "2 "  1 0
0
line 020          "line ALMITOSW to LITEHIPE 230 ck 1"
 line     24008     24084   "1 "  1 0
0
line 021          "line ARCO SC  to HINSON   230 ck 1"
 line     24015     24065   "1 "  1 0
0
line_022          "line ARCO SC  to HINSON   230 ck 2"
 line     24015     24065   "2 "  1 0
0
line_023          "line BARRE    to ELLIS    230 ck 1"
```

```
 line     24016     24044   "1 "  1 0
0
line_024          "line BARRE    to VILLA PK 230 ck 1"
 line     24016     24154   "1 "  1 0
0
line 025          "line BARRE    to LEWIS    230 ck 1"
 line     24016     25201   "1 "  1 0
0
line 026          "line BLYTHESC to EAGLEMTN 161 ck 1"
 line     24017     24035   "1 "  1 0
0
line 027          "line CAMINO   to MEAD S   230 ck E"
 line     24019     19012   "E "  1 0
0
line 028          "line CAMINO   to MEAD S   230 ck W"
 line     24019     19012   "W "  1 0
0
line 029          "line CAMINO   to GENE     230 ck 1"
 line     24019     25402   "1 "  1 0
0
line_030          "line CENTER S to MESA CAL 230 ck 1"
 line     24021     24091   "1 "  1 0
0
line 031          "line CENTER S to OLINDA   230 ck 1"
 line     24021     24100   "1 "  1 0
0
line 032          "line CHINO    to MIRALOMW 230 ck 1"
 line     24025     24093   "1 "  1 0
0
line 033          "line CHINO    to MIRALOMW 230 ck 2"
 line     24025     24093   "2 "  1 0
0
line 034          "line CHINO    to S.ONOFRE 230 ck 1"
 line     24025     24131   "1 "  1 0
0
line 035          "line CHINO    to SERRANO  230 ck 1"
 line     24025     24137   "1 "  1 0
0
line_036          "line CHINO    to MIRALOME 230 ck 3"
 line     24025     25656   "3 "  1 0
0
line 037          "line DELAMO   to CENTER S 230 ck 1"
 line     24029     24021   "1 "  1 0
0
line 038          "line DELAMO   to ELLIS    230 ck 1"
 line     24029     24044   "1 "  1 0
0
line 039          "line DELAMO   to LAGUBELL 230 ck 1"
 line     24029     24076   "1 "  1 0
0
line 040          "line EAGLROCK to MESA CAL 230 ck 1"
 line     24036     24091   "1 "  1 0
0
line 041          "line EAGLROCK to PARDEE   230 ck 1"
 line     24036     24114   "1 "  1 0
0
line 042          "line EAGLROCK to SYLMAR S 230 ck 1"
 line     24036     24147   "1 "  1 0
0
line 043          "line EL NIDO  to LA FRESA 230 ck 3"
 line     24040     24074   "3 "  1 0
0
line 044          "line EL NIDO  to LA FRESA 230 ck 4"
 line     24040     24074   "4 "  1 0
0
line 045          "line EL NIDO  to LCIENEGA 230 ck 1"
 line     24040     24082   "1 "  1 0
```

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0
line 046          "line EL NIDO  to CHEVMAIN 230 ck 1"
 line     24040     24198   "1 "  1 0
0
line 047          "line ELDORDO  to LUGO     500 ck 1"
 line     24042     24086   "1 "  1 0
0
line 048          "line ELDORDO  to MCCULLGH 500 ck 1"
 line     24042     26048   "1 "  1 0
0
line 049          "line ELLIS    to HUNTGBCH 230 ck 1"
 line     24044     24069   "1 "  1 0
0
line_050          "line ELLIS    to HUNTGBCH 230 ck 3"
 line     24044     24069   "3 "  1 0
0
line 051          "line ELLIS    to JOHANNA  230 ck 1"
 line     24044     24072   "1 "  1 0
0
line 052          "line ELLIS    to SANTIAGO 230 ck 1"
 line     24044     24134   "1 "  1 0
0
line 053          "line ELLIS    to HUNTBCH1 230 ck 2"
 line     24044     24369   "2 "  1 0
0
line 054          "line ELLIS    to HUNTBCH1 230 ck 4"
 line     24044     24369   "4 "  1 0
0
line 055          "line ELSEGNDO to EL NIDO  230 ck 1"
 line     24049     24040   "1 "  1 0
0
line 056          "line ELSEGNDO to CHEVMAIN 230 ck 1"
 line     24049     24198   "1 "  1 0
0
line 057          "line STGCOACH to PADUA    230 ck 1"
 line     24237     24112   "1 "  1 0
0
line 058          "line STGCOACH to PADUA    230 ck 2"
 line     24237     24112   "2 "  1 0
0
line 059          "line ETIWANDA to SANBRDNO 230 ck 1"
 line     24056     24132   "1 "  1 0
0
line 060          "line ETIWANDA to VSTA     230 ck 1"
 line     24056     24901   "1 "  1 0
0
line 061          "line ETIWANDA to MIRALOME 230 ck 1"
 line     24056     25656   "1 "  1 0
0
line 062          "line STGCOACH to MIRALOME 230 ck 1"
 line     24237     25656   "1 "  1 0
0
line_063          "line HARBOR   to HINSON   230 ck 1"
 line     24061     24065   "1 "  1 0
0
line 064          "line HARBOR   to LBEACH   230 ck 1"
 line     24061     24077   "1 "  1 0
0
line 065          "line HINSON   to DELAMO   230 ck 1"
 line     24065     24029   "1 "  1 0
0
line 066          "line HUNTGBCH to HUNTBCH1 230 ck 1"
 line     24069     24369   "1 "  1 0
0
line 067          "line JOHANNA  to SANTIAGO 230 ck 1"
 line     24072     24134   "1 "  1 0
0
```

```
line 068          "line LA FRESA to HINSON   230 ck 1"
 line     24074     24065   "1 "  1 0
0
line 069          "line LA FRESA to LAGUBELL 230 ck 1"
 line     24074     24076   "1 "  1 0
0
line 070          "line LA FRESA to REDONDO  230 ck 1"
 line     24074     24125   "1 "  1 0
0
line 071          "line LA FRESA to REDONDO  230 ck 2"
 line     24074     24125   "2 "  1 0
0
line 072          "line LAGUBELL to RIOHONDO 230 ck 1"
 line     24076     24126   "1 "  1 0
0
line 073          "line LBEACH   to LITEHIPE 230 ck 1"
 line     24077     24084   "1 "  1 0
0
line 074          "line LCIENEGA to LA FRESA 230 ck 1"
 line     24082     24074   "1 "  1 0
0
line 075          "line LITEHIPE to HINSON   230 ck 1"
 line     24084     24065   "1 "  1 0
0
line 076          "line LITEHIPE to MESA CAL 230 ck 1"
 line     24084     24091   "1 "  1 0
0
line_077          "line LUGO     to MIRALOMA 500 ck 2"
 line     24086     24092   "2 "  1 0
0
line 078          "line LUGO     to MIRALOMA 500 ck 3"
 line     24086     24092   "3 "  1 0
0
line 079          "line LUGO     to MOHAVE   500 ck 1"
 line     24086     24097   "1 "  1 0
0
line 080          "line LUGO     to SERRANO  500 ck 1"
 line     24086     24138   "1 "  1 0
0
line 081          "line STGCOACH to SERRANO  500 ck r1"
 line     24236     24138   "r1"  1 0
0
line 082          "line LUGO     to STGCOACH 500 ck r1"
 line     24086     24236   "r1"  1 0
0
line_083          "line LUGO     to VINCENT  500 ck 1"
 line     24086     24156   "1 "  1 0
0
line 084          "line LUGO     to VINCENT  500 ck 2"
 line     24086     24156   "2 "  1 0
0
line 085          "line LUGO     to VICTORVL 500 ck 1"
 line     24086     26105   "1 "  1 0
0
line 086          "line MAGUNDEN to OMAR     230 ck 1"
 line     24087     24101   "1 "  1 0
0
line 087          "line MAGUNDEN to PASTORIA 230 ck 1"
 line     24087     24115   "1 "  1 0
0
line 088          "line MAGUNDEN to PASTORIA 230 ck 2"
 line     24087     24115   "2 "  1 0
0
line_089          "line MAGUNDEN to PASTORIA 230 ck 3"
 line     24087     24115   "3 "  1 0
0
line_090          "line MAGUNDEN to SPRINGVL 230 ck 1"
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 line     24087     24141   "1 "  1 0
0
line_091          "line MAGUNDEN to SPRINGVL 230 ck 2"
 line     24087     24141   "2 "  1 0
0
line 092          "line MAGUNDEN to VESTAL   230 ck 1"
 line     24087     24153   "1 "  1 0
0
line 093          "line MAGUNDEN to VESTAL   230 ck 2"
 line     24087     24153   "2 "  1 0
0
line 094          "line MAGUNDEN to ANTELOPE 230 ck 1"
 line     24087     24401   "1 "  1 0
0
line 095          "line MAGUNDEN to ANTELOPE 230 ck 2"
 line     24087     24401   "2 "  1 0
0
line 096          "line MESA CAL to REDONDO  230 ck 1"
 line     24091     24125   "1 "  1 0
0
line_097          "line MESA CAL to RIOHONDO 230 ck 1"
 line     24091     24126   "1 "  1 0
0
line 098          "line MESA CAL to WALNUT   230 ck 1"
 line     24091     24158   "1 "  1 0
0
line 099          "line MESA CAL to ANTELOPE 230 ck 1"
 line     24091     24401   "1 "  1 0
0
line 100          "line MIRALOMA to SERRANO  500 ck 1"
 line     24092     24138   "1 "  1 0
0
line 101          "line MIRALOMW to WALNUT   230 ck 1"
 line     24093     24158   "1 "  1 0
0
line 102          "line MIRALOMW to VSTA     230 ck 1"
 line     24093     24901   "1 "  1 0
0
line_103          "line MOHAVE   to ELDORDO  500 ck 1"
 line     24097     24042   "1 "  1 0
0
line 104          "line MOORPARK to ORMOND   230 ck 1"
 line     24099     24106   "1 "  1 0
0
line 105          "line MOORPARK to ORMOND   230 ck 2"
 line     24099     24106   "2 "  1 0
0
line 106          "line MOORPARK to ORMOND   230 ck 3"
 line     24099     24106   "3 "  1 0
0
line 107          "line MOORPARK to ORMOND   230 ck 4"
 line     24099     24106   "4 "  1 0
0
line 108          "line OLINDA   to WALNUT   230 ck 1"
 line     24100     24158   "1 "  1 0
0
line 109          "line PARDEE   to MOORPARK 230 ck 1"
 line     24114     24099   "1 "  1 0
0
line 110          "line PARDEE   to MOORPARK 230 ck 2"
 line     24114     24099   "2 "  1 0
0
line 111          "line PARDEE   to MOORPARK 230 ck 3"
 line     24114     24099   "3 "  1 0
0
line 112          "line PARDEE   to PASTORIA 230 ck 1"
 line     24114     24115   "1 "  1 0
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0
line 113          "line PARDEE   to S.CLARA  230 ck 1"
 line     24114     24128   "1 "  1 0
0
line 114          "line PARDEE   to SYLMAR S 230 ck 1"
 line     24114     24147   "1 "  1 0
0
line 115          "line PARDEE   to SYLMAR S 230 ck 2"
 line     24114     24147   "2 "  1 0
0
line 116          "line PARDEE   to VINCENT  230 ck 1"
 line     24114     24155   "1 "  1 0
0
line_117          "line PARDEE   to SAUG TAP 230 ck 1"
 line     24114     24200   "1 "  1 0
0
line 118          "line PARDEE   to SAUG TAP 230 ck 2"
 line     24114     24200   "2 "  1 0
0
line 119          "line PARDEE   to WARNETAP 230 ck 1"
 line     24114     24217   "1 "  1 0
0
line 120          "line PARDEE   to BAILEY   230 ck 1"
 line     24114     24403   "1 "  1 0
0
line 121          "line PASTORIA to WARNETAP 230 ck 1"
 line     24115     24217   "1 "  1 0
0
line 122          "line PASTORIA to EDMONSTN 230 ck 1"
 line     24115     25613   "1 "  1 0
0
line 123          "line PASTORIA to PSTRIA   230 ck 1"
 line     24115     28050   "1 "  1 0
0
line 124          "line REDONDO  to LITEHIPE 230 ck 1"
 line     24125     24084   "1 "  1 0
0
line 125          "line RIOHONDO to VINCENT  230 ck 2"
 line     24126     24155   "2 "  1 0
0
line 126          "line S.CLARA  to GOLETA   230 ck 1"
 line     24128     24058   "1 "  1 0
0
line 127          "line S.CLARA  to GOLETA   230 ck 2"
 line     24128     24058   "2 "  1 0
0
line 128          "line S.CLARA  to MANDALAY 230 ck 1"
 line     24128     24088   "1 "  1 0
0
line 129          "line S.CLARA  to MANDALAY 230 ck 2"
 line     24128     24088   "2 "  1 0
0
line_130          "line S.CLARA  to MOORPARK 230 ck 1"
 line     24128     24099   "1 "  1 0
0
line 131          "line S.CLARA  to MOORPARK 230 ck 2"
 line     24128     24099   "2 "  1 0
0
line 132          "line S.ONOFRE to SANTIAGO 230 ck 1"
 line     24131     24134   "1 "  1 0
0
line 133          "line S.ONOFRE to SANTIAGO 230 ck 2"
 line     24131     24134   "2 "  1 0
0
line 134          "line S.ONOFRE to SERRANO  230 ck 1"
 line     24131     24137   "1 "  1 0
0
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line 135          "line SANBRDNO to DEVERS   230 ck 1"
 line     24132     24804   "1 "  1 0
0
line 136          "line SERRANO  to VILLA PK 230 ck 1"
 line     24137     24154   "1 "  1 0
0
line 137          "line SERRANO  to VILLA PK 230 ck 2"
 line     24137     24154   "2 "  1 0
0
line 138          "line SPRINGVL to BIG CRK3 230 ck 1"
 line     24141     24303   "1 "  1 0
0
line 139          "line SPRINGVL to BIG CRK4 230 ck 1"
 line     24141     24304   "1 "  1 0
0
line 140          "line SYC CYN  to OMAR     230 ck 1"
 line     24142     24101   "1 "  1 0
0
line 141          "line SYLMAR S to GOULD    230 ck 1"
 line     24147     24059   "1 "  1 0
0
line 142          "line VESTAL   to RECTOR   230 ck 1"
 line     24153     24235   "1 "  1 0
0
line 143          "line VINCENT  to MESA CAL 230 ck 1"
 line     24155     24091   "1 "  1 0
0
line_144          "line VINCENT  to RIOHONDO 230 ck 1"
 line     24155     24126   "1 "  1 0
0
line 145          "line VINCENT  to S.CLARA  230 ck 1"
 line     24155     24128   "1 "  1 0
0
line 146          "line VINCENT  to SEAWEST  230 ck 1"
 line     24155     24136   "1 "  1 0
0
line 147          "line VINCENT  to ANTELOPE 230 ck 1"
 line     24155     24401   "1 "  1 0
0
line 148          "line VINCENT  to PEARBLSM 230 ck 1"
 line     24155     25616   "1 "  1 0
0
line 149          "line WARNE    to WARNETAP 230 ck 1"
 line     24218     24217   "1 "  1 0
0
line_150          "line PISGAH   to ELDORDO  230 ck 2"
 line     24219     24041   "2 "  1 0
0
line 151          "line PISGAH   to LUGO     230 ck 1"
 line     24219     24085   "1 "  1 0
0
line 152          "line PISGAH   to LUGO     230 ck 2"
 line     24219     24085   "2 "  1 0
0
line 153          "line PISGAH   to CIMA     230 ck 1"
 line     24219     24627   "1 "  1 0
0
line 154          "line RECTOR   to VESTAL   230 ck 2"
 line     24235     24153   "2 "  1 0
0
line 155          "line BIG CRK1 to RECTOR   230 ck 1"
 line     24301     24235   "1 "  1 0
0
line_156          "line BIG CRK1 to BIG CRK2 230 ck 1"
 line     24301     24302   "1 "  1 0
0
line_157          "line BIG CRK1 to EASTWOOD 230 ck 1"
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 line     24301     24320   "1 "  1 0
0
line_158          "line BIG CRK2 to BIG CRK3 230 ck 1"
 line     24302     24303   "1 "  1 0
0
line 159          "line BIG CRK2 to BIG CRK8 230 ck 1"
 line     24302     24305   "1 "  1 0
0
line 160          "line BIG CRK3 to RECTOR   230 ck 1"
 line     24303     24235   "1 "  1 0
0
line 161          "line BIG CRK4 to BIG CRK3 230 ck 1"
 line     24304     24303   "1 "  1 0
0
line 162          "line BIG CRK8 to BIG CRK3 230 ck 1"
 line     24305     24303   "1 "  1 0
0
line 163          "line MAMMOTH  to BIG CRK3 230 ck 1"
 line     24316     24303   "1 "  1 0
0
line_164          "line HIDESERT to VICTOR   230 ck 1"
 line     24350     24601   "1 "  1 0
0
line 165          "line BAILEY   to PASTORIA 230 ck 1"
 line     24403     24115   "1 "  1 0
0
line 166          "line VICTOR   to LUGO     230 ck 1"
 line     24601     24085   "1 "  1 0
0
line 167          "line VICTOR   to LUGO     230 ck 2"
 line     24601     24085   "2 "  1 0
0
line 168          "line CIMA     to ELDORDO  230 ck 1"
 line     24627     24041   "1 "  1 0
0
line 169          "line KRAMER   to LUGO     230 ck 1"
 line     24701     24085   "1 "  1 0
0
line_170          "line KRAMER   to LUGO     230 ck 2"
 line     24701     24085   "2 "  1 0
0
line 171          "line KRAMER   to COLWATER 230 ck 1"
 line     24701     24717   "1 "  1 0
0
line 172          "line KRAMER   to COLWATER 230 ck 2"
 line     24701     24717   "2 "  1 0
0
line 173          "line BLM EAST to BLM WEST 230 ck 1"
 line     24706     24707   "1 "  1 0
0
line 174          "line BLM WEST to KRAMER   230 ck 1"
 line     24707     24701   "1 "  1 0
0
line 175          "line INYO     to COTTONWD 230 ck 1"
 line     24729     26136   "1 "  1 0
0
line 176          "line LUZ LSP  to KRAMER   230 ck 1"
 line     24736     24701   "1 "  1 0
0
line 177          "line OXBOW  B to OXBOW  A 230 ck 1"
 line     24760     24748   "1 "  1 0
0
line 178          "line LUZ8     to LUZ LSP  230 ck 1"
 line     24779     24736   "1 "  1 0
0
line 179          "line LUZ9     to LUZ LSP  230 ck 1"
 line     24780     24736   "1 "  1 0
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0
line 180          "line NAVYCOSO to BLM EAST 230 ck 1"
 line     24781     24706   "1 "  1 0
0
line 181          "line DEVERS   to SANBRDNO 230 ck 2"
 line     24804     24132   "2 "  1 0
0
line 182          "line DEVERS   to MIRAGE   230 ck 1"
 line     24804     24806   "1 "  1 0
0
line 183          "line DEVERS   to VSTA     230 ck 2"
 line     24804     24901   "2 "  1 0
0
line_184          "line VSTA     to SANBRDNO 230 ck 2"
 line     24901     24132   "2 "  1 0
0
line 185          "line VSTA     to DEVERS   230 ck 1"
 line     24901     24804   "1 "  1 0
0
line 186          "line GOODRICH to GOULD    230 ck 1"
 line     25001     24059   "1 "  1 0
0
line 187          "line GOODRICH to LAGUBELL 230 ck 1"
 line     25001     24076   "1 "  1 0
0
line 188          "line LEWIS    to SERRANO  230 ck 1"
 line     25201     24137   "1 "  1 0
0
line 189          "line LEWIS    to SERRANO  230 ck 2"
 line     25201     24137   "2 "  1 0
0
line 190          "line LEWIS    to VILLA PK 230 ck 1"
 line     25201     24154   "1 "  1 0
0
line 191          "line EAGLEMTN to IRON MTN 230 ck 1"
 line     25401     25405   "1 "  1 0
0
line 192          "line IRON MTN to CAMINO   230 ck 1"
 line     25405     24019   "1 "  1 0
0
line 193          "line J.HINDS  to MIRAGE   230 ck 1"
 line     25406     24806   "1 "  1 0
0
line 194          "line J.HINDS  to EAGLEMTN 230 ck 1"
 line     25406     25401   "1 "  1 0
0
line 195          "line VIEJOSC  to CHINO    230 ck 1"
 line     25654     24025   "1 "  1 0
0
line 196          "line VIEJOSC  to S.ONOFRE 230 ck 1"
 line     25654     24131   "1 "  1 0
0
line_197          "line MIRALOME to OLINDA   230 ck 1"
 line     25656     24100   "1 "  1 0
0
line 198          "line MIRALOME to PADUA    230 ck 1"
 line     25656     24112   "1 "  1 0
0
line 199          "line MIRALOME to VSTA     230 ck 2"
 line     25656     24901   "2 "  1 0
0
line 200          "line SYLMAR1  to SYLMAR S 230 ck 1"
 line     26097     24147   "1 "  1 0
0
line 201          "line SYLMAR3  to SYLMAR S 230 ck 1"
 line     26098     24147   "1 "  1 0
0
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line 202          "line OWENSCON to INYO     230 ck 1"
 line     26131     24729   "1 "  1 0
0
line 203          "line MIDWAY   to VINCENT  500 ck 1"
 line     30060     24156   "1 "  1 0
0
line 204          "line MIDWAY   to VINCENT  500 ck 2"
 line     30060     24156   "2 "  1 0
0
line 205          "line MIDWAY   to VINCENT  500 ck 3"
 line     30060     24156   "3 "  1 0
0
line 206          "line SERRANO  to VALLEYSC 500 ck 1"
 line     24138     24151   "1 "  1 0
0
line 207          "line DEVERS   to VALLEYSC 500 ck 1"
 line     24801     24151   "1 "  1 0
0
line 301          "line VINCENT  to MIRALOMA 500 ck 1"
 line     24156     24092   "1 "  1 0
0
line 302          "line DEVERS   to OAK_VLLY 230 ck 1"
 line     24804     25666   "1 "  1 0
0
line 303          "line HARQUAHA to DEVERS   500 ck 1"
 line     15093     24801   "1 "  1 0
0
tran_208          "tran ELDORDO  500 to ELDORDO   230 ck 1"
 tran     24042     24041   "1 "  0
0
tran 209          "tran ELDORDO  500 to ELDORDO   230 ck 2"
 tran     24042     24041   "2 "  0
0
tran 210          "tran LUGO     500 to LUGO      230 ck 1"
 tran     24086     24085   "1 "  0
0
tran 211          "tran LUGO     500 to LUGO      230 ck 2"
 tran     24086     24085   "2 "  0
0
tran 212          "tran MIRALOMA 500 to MIRALOMW  230 ck 1"
 tran     24092     24093   "1 "  0
0
tran 213          "tran MIRALOMA 500 to MIRALOMW  230 ck 2"
 tran     24092     24093   "2 "  0
0
tran_214          "tran MIRALOMA 500 to MIRALOME  230 ck 3"
 tran     24092     25656   "3 "  0
0
tran 215          "tran MIRALOMA 500 to MIRALOME  230 ck 4"
 tran     24092     25656   "4 "  0
0
tran 216          "tran STGCOACH 500 to STGCOACH  230 ck 1"
 tran     24236     24237   "1 "  0
0
tran 217          "tran STGCOACH 500 to STGCOACH  230 ck 2"
 tran     24236     24237   "2 "  0
0
tran 218          "tran SERRANO  500 to SERRANO   230 ck 1"
 tran     24138     24137   "1 "  0
0
tran 219          "tran SERRANO  500 to SERRANO   230 ck 2"
 tran     24138     24137   "2 "  0
0
tran_220          "tran SERRANO  500 to SERRANO   230 ck 3"
 tran     24138     24137   "3 "  0
0
tran_221          "tran VINCENT  500 to VINCENT   230 ck 1"
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 tran     24156     24155   "1 "  0
0
tran_222          "tran VINCENT  500 to VINCENT   230 ck 2"
 tran     24156     24155   "2 "  0
0
tran 223          "tran VINCENT  500 to VINCENT   230 ck 3"
 tran     24156     24155   "3 "  0
0
tran 224          "tran VINCENT  500 to VINCENT   230 ck 4"
 tran     24156     24155   "4 "  0
0
tran 225          "tran VICTOR   230 to VICTOR    115 ck 1"
 tran     24601     24602   "1 "  0
0
tran 226          "tran VICTOR   230 to VICTOR    115 ck 2"
 tran     24601     24602   "2 "  0
0
tran 227          "tran KRAMER   230 to KRAMER    115 ck 1"
 tran     24701     24702   "1 "  0
0
tran_228          "tran KRAMER   230 to KRAMER    115 ck 2"
 tran     24701     24702   "2 "  0
0
tran 229          "tran INYO     115 to INYO PS   115 ck 1"
 tran     24728     24730   "1 "  0
0
tran 230          "tran INYO     230 to INYO PS   115 ck 1"
 tran     24729     24730   "1 "  0
0
tran 231          "tran INYO     230 to INYO PS   115 ck 2"
 tran     24729     24730   "2 "  0
0
tran 232          "tran OXBOW  B 230 to OXBOW  B  115 ck 1"
 tran     24760     24724   "1 "  0
0
tran 233          "tran NAVYCOSO 230 to NAVY II   115 ck 1"
 tran     24781     24743   "1 "  0
0
tran_234          "tran DEVERS   500 to DEVERS    230 ck 1"
 tran     24801     24804   "1 "  0
0
tran 235          "tran DEVERS   115 to DEVERS    230 ck 1"
 tran     24805     24804   "1 "  0
0
tran 236          "tran DEVERS   115 to DEVERS    230 ck 3"
 tran     24805     24804   "3 "  0
0
tran 237          "tran DEVERS   115 to DEVERS    230 ck 4"
 tran     24805     24804   "4 "  0
0
tran 238          "tran MIRAGE   230 to MIRAGE    115 ck 1"
 tran     24806     24807   "1 "  0
0
tran 239          "tran VSTA     230 to VSTA      115 ck 5"
 tran     24901     24903   "5 "  0
0
tran 240          "tran VSTA     230 to VSTA      115 ck 6"
 tran     24901     24903   "6 "  0
0
tran 241          "tran EAGLEMTN 230 to EAGLEMTN  161 ck 1"
 tran     25401     24035   "1 "  0
0
tran 242          "tran SYLMARLA 230 to SYLMAR S  230 ck 1"
 tran     26094     24147   "1 "  0
0
tran 243          "tran SYLMARLA 230 to SYLMAR S  230 ck 2"
 tran     26094     24147   "2 "  0
```

```
0
tran 244          "tran SANBRDNO 230 to P120_A    230 ck 1"
 tran     24132     24214   "1 "  0
0
tran 245          "tran SANBRDNO 230 to P120_B    230 ck 1"
 tran     24132     24214   "2 "  0
0
tran 246          "tran SANBRDNO 230 to P120_C    230 ck 1"
 tran     24132     24214   "3 "  0
0
tran 247          "tran VALLEYSC 500 to VALLEYSC  115 ck 1"
 tran     24151     24160   "1 "  0
0
tran_248          "tran VALLEYSC 500 to VALLEYSC  115 ck 2"
 tran     24151     24160   "2 "  0
0
tran 249          "tran VALLEYSC 500 to VALLEY-S  115 ck 3"
 tran     24151     24229   "3 "  0
0
tran 250          "tran VALLEYSC 500 to VALLEY-S  115 ck 4"
 tran     24151     24229   "4 "  0
0
end
# End of contingency list, 101 continegncies added to list
```

# Imperial Valley Study Group

## Appendix A.3.2

N-2 Contingency Lists

```
line 2001                "ALMITOSE 230.00 - BARRE    230.00 1, ALMITOSW
230.00 - BARRE    230.00 2"
 line     24006     24016   "1 "  1 0
 line     24008     24016   "2 "  1 0
0
line 2002                "ALMITOSE 230.00 - BARRE    230.00 1, ALMITOSW
230.00 - LITEHIPE 230.00 1"
 line     24006     24016   "1 "  1 0
 line     24008     24084   "1 "  1 0
0
line 2003                "ALMITOSE 230.00 - BARRE    230.00 1, DELAMO
230.00 - ELLIS    230.00 1"
 line     24006     24016   "1 "  1 0
 line     24029     24044   "1 "  1 0
0
line 2004                "ALMITOSE 230.00 - CENTER S 230.00 1, ALMITOSW
230.00 - BARRE    230.00 2"
 line     24006     24021   "1 "  1 0
 line     24008     24016   "2 "  1 0
0
line_2005                "ALMITOSW 230.00 - BARRE    230.00 2, ALMITOSW
230.00 - LITEHIPE 230.00 1"
 line     24008     24016   "2 "  1 0
 line     24008     24084   "1 "  1 0
0
line 2006                "ALMITOSW 230.00 - BARRE    230.00 2, DELAMO
230.00 - ELLIS    230.00 1"
 line     24008     24016   "2 "  1 0
 line     24029     24044   "1 "  1 0
0
line 2007                "ALMITOSE 230.00 - CENTER S 230.00 1, ALMITOSW
230.00 - LITEHIPE 230.00 1"
 line     24006     24021   "1 "  1 0
 line     24008     24084   "1 "  1 0
0
line 2008                "ALMITOSE 230.00 - CENTER S 230.00 1, DELAMO
230.00 - CENTER S 230.00 1"
 line     24006     24021   "1 "  1 0
 line     24029     24021   "1 "  1 0
0
line 2009                "ALMITOSE 230.00 - CENTER S 230.00 1, DELAMO
230.00 - ELLIS    230.00 1"
 line     24006     24021   "1 "  1 0
 line     24029     24044   "1 "  1 0
0
line_2010                "ALMITOSE 230.00 - CENTER S 230.00 1, HINSON
230.00 - DELAMO   230.00 1"
 line     24006     24021   "1 "  1 0
 line     24065     24029   "1 "  1 0
0
line 2011                "ALMITOSW 230.00 - LITEHIPE 230.00 1, DELAMO
230.00 - LAGUBELL 230.00 1"
 line     24008     24084   "1 "  1 0
 line     24029     24076   "1 "  1 0
0
line 2012                "ALMITOSW 230.00 - LITEHIPE 230.00 1, HINSON
230.00 - DELAMO   230.00 1"
 line     24008     24084   "1 "  1 0
 line     24065     24029   "1 "  1 0
0
line 2013                "ARCO SC  230.00 - HINSON   230.00 1, ARCO SC
230.00 - HINSON   230.00 2"
 line     24015     24065   "1 "  1 0
 line     24015     24065   "2 "  1 0
0
line 2014                "DELAMO   230.00 - CENTER S 230.00 1, DELAMO
230.00 - LAGUBELL 230.00 1"
```

```
 line     24029     24021   "1 "  1 0
 line     24029     24076   "1 "  1 0
0
line 2015                "DELAMO   230.00 - LAGUBELL 230.00 1, HINSON
230.00 - DELAMO   230.00 1"
 line     24029     24076   "1 "  1 0
 line     24065     24029   "1 "  1 0
0
line 2016                "DELAMO   230.00 - LAGUBELL 230.00 1, LA FRESA
230.00 - LAGUBELL 230.00 1"
 line     24029     24076   "1 "  1 0
 line     24074     24076   "1 "  1 0
0
line_2017                "DELAMO   230.00 - LAGUBELL 230.00 1, LITEHIPE
230.00 - MESA CAL 230.00 1"
 line     24029     24076   "1 "  1 0
 line     24084     24091   "1 "  1 0
0
line 2018                "DELAMO   230.00 - LAGUBELL 230.00 1, MESA CAL
230.00 - REDONDO  230.00 1"
 line     24029     24076   "1 "  1 0
 line     24091     24125   "1 "  1 0
0
line 2019                "BARRE    230.00 - ELLIS    230.00 1, DELAMO
230.00 - ELLIS    230.00 1"
 line     24016     24044   "1 "  1 0
 line     24029     24044   "1 "  1 0
0
line 2020                "BARRE    230.00 - VILLA PK 230.00 1, DELAMO
230.00 - ELLIS    230.00 1"
 line     24016     24154   "1 "  1 0
 line     24029     24044   "1 "  1 0
0
line 2021                "BARRE    230.00 - LEWIS    230.00 1, DELAMO
230.00 - ELLIS    230.00 1"
 line     24016     25201   "1 "  1 0
 line     24029     24044   "1 "  1 0
0
line_2022                "BARRE    230.00 - VILLA PK 230.00 1, BARRE
230.00 - LEWIS    230.00 1"
 line     24016     24154   "1 "  1 0
 line     24016     25201   "1 "  1 0
0
line 2023                "BARRE    230.00 - VILLA PK 230.00 1, LEWIS
230.00 - SERRANO  230.00 1"
 line     24016     24154   "1 "  1 0
 line     25201     24137   "1 "  1 0
0
line 2024                "BARRE    230.00 - VILLA PK 230.00 1, LEWIS
230.00 - SERRANO  230.00 2"
 line     24016     24154   "1 "  1 0
 line     25201     24137   "2 "  1 0
0
line 2025                "BARRE    230.00 - VILLA PK 230.00 1, LEWIS
230.00 - VILLA PK 230.00 1"
 line     24016     24154   "1 "  1 0
 line     25201     24154   "1 "  1 0
0
line 2026                "LEWIS    230.00 - SERRANO  230.00 1, LEWIS
230.00 - VILLA PK 230.00 1"
 line     25201     24137   "1 "  1 0
 line     25201     24154   "1 "  1 0
0
line_2027                "LEWIS    230.00 - SERRANO  230.00 2, LEWIS
230.00 - VILLA PK 230.00 1"
 line     25201     24137   "2 "  1 0
 line     25201     24154   "1 "  1 0
```

```
0
line 2028                "LEWIS    230.00 - SERRANO  230.00 1, LEWIS
230.00 - SERRANO  230.00 2"
 line     25201     24137   "1 "  1 0
 line     25201     24137   "2 "  1 0
0
line 2029                "LEWIS    230.00 - SERRANO  230.00 1, SERRANO
230.00 - VILLA PK 230.00 1"
 line     25201     24137   "1 "  1 0
 line     24137     24154   "1 "  1 0
0
line 2030                "LEWIS    230.00 - SERRANO  230.00 1, SERRANO
230.00 - VILLA PK 230.00 2"
 line     25201     24137   "1 "  1 0
 line     24137     24154   "2 "  1 0
0
line 2031                "LEWIS    230.00 - SERRANO  230.00 2, SERRANO
230.00 - VILLA PK 230.00 1"
 line     25201     24137   "2 "  1 0
 line     24137     24154   "1 "  1 0
0
line 2032                "LEWIS    230.00 - SERRANO  230.00 2, SERRANO
230.00 - VILLA PK 230.00 2"
 line     25201     24137   "2 "  1 0
 line     24137     24154   "2 "  1 0
0
line 2033                "SERRANO  230.00 - VILLA PK 230.00 1, SERRANO
230.00 - VILLA PK 230.00 2"
 line     24137     24154   "1 "  1 0
 line     24137     24154   "2 "  1 0
0
line 2034                "HINSON   230.00 - DELAMO   230.00 1, LA FRESA
230.00 - HINSON   230.00 1"
 line     24065     24029   "1 "  1 0
 line     24074     24065   "1 "  1 0
0
line 2035                "HINSON   230.00 - DELAMO   230.00 1, LBEACH
230.00 - LITEHIPE 230.00 1"
 line     24065     24029   "1 "  1 0
 line     24077     24084   "1 "  1 0
0
line 2036                "HINSON   230.00 - DELAMO   230.00 1, LITEHIPE
230.00 - HINSON   230.00 1"
 line     24065     24029   "1 "  1 0
 line     24084     24065   "1 "  1 0
0
line 2037                "LA FRESA 230.00 - HINSON   230.00 1, LITEHIPE
230.00 - HINSON   230.00 1"
 line     24074     24065   "1 "  1 0
 line     24084     24065   "1 "  1 0
0
line 2038                "LBEACH   230.00 - LITEHIPE 230.00 1, LITEHIPE
230.00 - HINSON   230.00 1"
 line     24077     24084   "1 "  1 0
 line     24084     24065   "1 "  1 0
0
line 2039                "HARBOR   230.00 - HINSON   230.00 1, LBEACH
230.00 - LITEHIPE 230.00 1"
 line     24061     24065   "1 "  1 0
 line     24077     24084   "1 "  1 0
0
line 2040                "LA FRESA 230.00 - HINSON   230.00 1, LBEACH
230.00 - LITEHIPE 230.00 1"
 line     24074     24065   "1 "  1 0
 line     24077     24084   "1 "  1 0
0
line_2041                "HARBOR   230.00 - HINSON   230.00 1, HARBOR
```

```
230.00 - LBEACH   230.00 1"
 line     24061     24065   "1 "  1 0
 line     24061     24077   "1 "  1 0
0
line 2042                "LA FRESA 230.00 - HINSON   230.00 1, LA FRESA
230.00 - LAGUBELL 230.00 1"
 line     24074     24065   "1 "  1 0
 line     24074     24076   "1 "  1 0
0
line 2043                "LA FRESA 230.00 - HINSON   230.00 1, MESA CAL
230.00 - REDONDO  230.00 1"
 line     24074     24065   "1 "  1 0
 line     24091     24125   "1 "  1 0
0
line 2044                "LA FRESA 230.00 - HINSON   230.00 1, REDONDO
230.00 - LITEHIPE 230.00 1"
 line     24074     24065   "1 "  1 0
 line     24125     24084   "1 "  1 0
0
line 2045                "LA FRESA 230.00 - LAGUBELL 230.00 1, REDONDO
230.00 - LITEHIPE 230.00 1"
 line     24074     24076   "1 "  1 0
 line     24125     24084   "1 "  1 0
0
line 2046                "LA FRESA 230.00 - REDONDO  230.00 1, REDONDO
230.00 - LITEHIPE 230.00 1"
 line     24074     24125   "1 "  1 0
 line     24125     24084   "1 "  1 0
0
line 2047                "LA FRESA 230.00 - REDONDO  230.00 2, REDONDO
230.00 - LITEHIPE 230.00 1"
 line     24074     24125   "2 "  1 0
 line     24125     24084   "1 "  1 0
0
line 2048                "MESA CAL 230.00 - REDONDO  230.00 1, REDONDO
230.00 - LITEHIPE 230.00 1"
 line     24091     24125   "1 "  1 0
 line     24125     24084   "1 "  1 0
0
line 2049                "LA FRESA 230.00 - REDONDO  230.00 1, LCIENEGA
230.00 - LA FRESA 230.00 1"
 line     24074     24125   "1 "  1 0
 line     24082     24074   "1 "  1 0
0
line 2050                "LA FRESA 230.00 - REDONDO  230.00 2, LCIENEGA
230.00 - LA FRESA 230.00 1"
 line     24074     24125   "2 "  1 0
 line     24082     24074   "1 "  1 0
0
line 2051                "EL NIDO  230.00 - LA FRESA 230.00 3, LCIENEGA
230.00 - LA FRESA 230.00 1"
 line     24040     24074   "3 "  1 0
 line     24082     24074   "1 "  1 0
0
line 2052                "EL NIDO  230.00 - LA FRESA 230.00 4, LCIENEGA
230.00 - LA FRESA 230.00 1"
 line     24040     24074   "4 "  1 0
 line     24082     24074   "1 "  1 0
0
line 2053                "EL NIDO  230.00 - LCIENEGA 230.00 1, LCIENEGA
230.00 - LA FRESA 230.00 1"
 line     24040     24082   "1 "  1 0
 line     24082     24074   "1 "  1 0
0
line 2054                "EL NIDO  230.00 - CHEVMAIN 230.00 1, ELSEGNDO
230.00 - EL NIDO  230.00 1"
 line     24040     24198   "1 "  1 0
```

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 line     24049     24040   "1 "  1 0
0
line_2055                 "EL NIDO  230.00 - CHEVMAIN 230.00 1, ELSEGNDO
230.00 - CHEVMAIN 230.00 1"
 line     24040     24198   "1 "  1 0
 line     24049     24198   "1 "  1 0
0
line 2056                 "EL NIDO  230.00 - LA FRESA 230.00 3, EL NIDO
230.00 - LA FRESA 230.00 4"
 line     24040     24074   "3 "  1 0
 line     24040     24074   "4 "  1 0
0
line 2057                 "EL NIDO  230.00 - LA FRESA 230.00 3, LA FRESA
230.00 - REDONDO  230.00 1"
 line     24040     24074   "3 "  1 0
 line     24074     24125   "1 "  1 0
0
line 2058                 "EL NIDO  230.00 - LA FRESA 230.00 3, LA FRESA
230.00 - REDONDO  230.00 2"
 line     24040     24074   "3 "  1 0
 line     24074     24125   "2 "  1 0
0
line 2059                 "EL NIDO  230.00 - LA FRESA 230.00 4, LA FRESA
230.00 - REDONDO  230.00 1"
 line     24040     24074   "4 "  1 0
 line     24074     24125   "1 "  1 0
0
line_2060                 "EL NIDO  230.00 - LA FRESA 230.00 4, LA FRESA
230.00 - REDONDO  230.00 2"
 line     24040     24074   "4 "  1 0
 line     24074     24125   "2 "  1 0
0
line 2061                 "LA FRESA 230.00 - REDONDO  230.00 1, LA FRESA
230.00 - REDONDO  230.00 2"
 line     24074     24125   "1 "  1 0
 line     24074     24125   "2 "  1 0
0
line 2062                 "EL NIDO  230.00 - LA FRESA 230.00 3, MESA CAL
230.00 - REDONDO  230.00 1"
 line     24040     24074   "3 "  1 0
 line     24091     24125   "1 "  1 0
0
line 2063                 "EL NIDO  230.00 - LA FRESA 230.00 4, MESA CAL
230.00 - REDONDO  230.00 1"
 line     24040     24074   "4 "  1 0
 line     24091     24125   "1 "  1 0
0
line 2064                 "LA FRESA 230.00 - REDONDO  230.00 1, MESA CAL
230.00 - REDONDO  230.00 1"
 line     24074     24125   "1 "  1 0
 line     24091     24125   "1 "  1 0
0
line_2065                 "LA FRESA 230.00 - REDONDO  230.00 2, MESA CAL
230.00 - REDONDO  230.00 1"
 line     24074     24125   "2 "  1 0
 line     24091     24125   "1 "  1 0
0
line 2066                 "GOODRICH 230.00 - LAGUBELL 230.00 1, MESA CAL
230.00 - REDONDO  230.00 1"
 line     25001     24076   "1 "  1 0
 line     24091     24125   "1 "  1 0
0
line 2067                 "LA FRESA 230.00 - LAGUBELL 230.00 1, MESA CAL
230.00 - REDONDO  230.00 1"
 line     24074     24076   "1 "  1 0
 line     24091     24125   "1 "  1 0
0
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```
line 2068                "LAGUBELL 230.00 - RIOHONDO 230.00 1, MESA CAL
230.00 - REDONDO  230.00 1"
 line     24076     24126   "1 "  1 0
 line     24091     24125   "1 "  1 0
0
line 2069                "LITEHIPE 230.00 - MESA CAL 230.00 1, MESA CAL
230.00 - REDONDO  230.00 1"
 line     24084     24091   "1 "  1 0
 line     24091     24125   "1 "  1 0
0
line 2070                "LA FRESA 230.00 - LAGUBELL 230.00 1, LITEHIPE
230.00 - MESA CAL 230.00 1"
 line     24074     24076   "1 "  1 0
 line     24084     24091   "1 "  1 0
0
line 2071                "GOODRICH 230.00 - LAGUBELL 230.00 1, LITEHIPE
230.00 - MESA CAL 230.00 1"
 line     25001     24076   "1 "  1 0
 line     24084     24091   "1 "  1 0
0
line_2072                "LAGUBELL 230.00 - RIOHONDO 230.00 1, LITEHIPE
230.00 - MESA CAL 230.00 1"
 line     24076     24126   "1 "  1 0
 line     24084     24091   "1 "  1 0
0
line 2073                "GOODRICH 230.00 - GOULD    230.00 1, GOODRICH
230.00 - LAGUBELL 230.00 1"
 line     25001     24059   "1 "  1 0
 line     25001     24076   "1 "  1 0
0
line 2074                "GOODRICH 230.00 - LAGUBELL 230.00 1, LAGUBELL
230.00 - RIOHONDO 230.00 1"
 line     25001     24076   "1 "  1 0
 line     24076     24126   "1 "  1 0
0
line 2075                "EAGLROCK 230.00 - MESA CAL 230.00 1, GOODRICH
230.00 - LAGUBELL 230.00 1"
 line     24036     24091   "1 "  1 0
 line     25001     24076   "1 "  1 0
0
line 2076                "GOODRICH 230.00 - LAGUBELL 230.00 1, VINCENT
230.00 - MESA CAL 230.00 1"
 line     25001     24076   "1 "  1 0
 line     24155     24091   "1 "  1 0
0
line_2077                "CENTER S 230.00 - MESA CAL 230.00 1, LAGUBELL
230.00 - RIOHONDO 230.00 1"
 line     24021     24091   "1 "  1 0
 line     24076     24126   "1 "  1 0
0
line 2078                "LAGUBELL 230.00 - RIOHONDO 230.00 1, MESA CAL
230.00 - RIOHONDO 230.00 1"
 line     24076     24126   "1 "  1 0
 line     24091     24126   "1 "  1 0
0
line 2079                "LAGUBELL 230.00 - RIOHONDO 230.00 1, MESA CAL
230.00 - WALNUT   230.00 1"
 line     24076     24126   "1 "  1 0
 line     24091     24158   "1 "  1 0
0
line 2080                "LAGUBELL 230.00 - RIOHONDO 230.00 1, MESA CAL
230.00 - ANTELOPE 230.00 1"
 line     24076     24126   "1 "  1 0
 line     24091     24401   "1 "  1 0
0
line 2081                "MESA CAL 230.00 - RIOHONDO 230.00 1, MESA CAL
230.00 - WALNUT   230.00 1"
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```
 line     24091     24126   "1 "  1 0
 line     24091     24158   "1 "  1 0
0
line 2082                "MESA CAL 230.00 - RIOHONDO 230.00 1, MESA CAL
230.00 - ANTELOPE 230.00 1"
 line     24091     24126   "1 "  1 0
 line     24091     24401   "1 "  1 0
0
line 2083                "CENTER S 230.00 - MESA CAL 230.00 1, MESA CAL
230.00 - RIOHONDO 230.00 1"
 line     24021     24091   "1 "  1 0
 line     24091     24126   "1 "  1 0
0
line_2084                "CENTER S 230.00 - MESA CAL 230.00 1, CENTER S
230.00 - OLINDA   230.00 1"
 line     24021     24091   "1 "  1 0
 line     24021     24100   "1 "  1 0
0
line 2085                "CENTER S 230.00 - MESA CAL 230.00 1, MESA CAL
230.00 - WALNUT   230.00 1"
 line     24021     24091   "1 "  1 0
 line     24091     24158   "1 "  1 0
0
line 2086                "CENTER S 230.00 - MESA CAL 230.00 1, MESA CAL
230.00 - ANTELOPE 230.00 1"
 line     24021     24091   "1 "  1 0
 line     24091     24401   "1 "  1 0
0
line 2087                "MESA CAL 230.00 - WALNUT   230.00 1, MESA CAL
230.00 - ANTELOPE 230.00 1"
 line     24091     24158   "1 "  1 0
 line     24091     24401   "1 "  1 0
0
line 2088                "MESA CAL 230.00 - WALNUT   230.00 1, MIRALOMA
230.00 - WALNUT   230.00 1"
 line     24091     24158   "1 "  1 0
 line     24093     24158   "1 "  1 0
0
line_2089                "MESA CAL 230.00 - WALNUT   230.00 1, OLINDA
230.00 - WALNUT   230.00 1"
 line     24091     24158   "1 "  1 0
 line     24100     24158   "1 "  1 0
0
line 2090                "CENTER S 230.00 - OLINDA   230.00 1, MESA CAL
230.00 - WALNUT   230.00 1"
 line     24021     24100   "1 "  1 0
 line     24091     24158   "1 "  1 0
0
line 2091                "CENTER S 230.00 - OLINDA   230.00 1, MIRALOMA
230.00 - OLINDA   230.00 1"
 line     24021     24100   "1 "  1 0
 line     25656     24100   "1 "  1 0
0
line 2092                "CENTER S 230.00 - OLINDA   230.00 1, MIRALOMA
230.00 - WALNUT   230.00 1"
 line     24021     24100   "1 "  1 0
 line     24093     24158   "1 "  1 0
0
line 2093                "CENTER S 230.00 - OLINDA   230.00 1, OLINDA
230.00 - WALNUT   230.00 1"
 line     24021     24100   "1 "  1 0
 line     24100     24158   "1 "  1 0
0
line_2094                "MIRALOMA 230.00 - OLINDA   230.00 1, OLINDA
230.00 - WALNUT   230.00 1"
 line     25656     24100   "1 "  1 0
 line     24100     24158   "1 "  1 0
```

```
0
line 2095                "MIRALOMA 230.00 - WALNUT   230.00 1, OLINDA
230.00 - WALNUT   230.00 1"
 line     24093     24158   "1 "  1 0
 line     24100     24158   "1 "  1 0
0
line 2096                "EAGLROCK 230.00 - MESA CAL 230.00 1, GOODRICH
230.00 - GOULD    230.00 1"
 line     24036     24091   "1 "  1 0
 line     25001     24059   "1 "  1 0
0
line 2097                "GOODRICH 230.00 - GOULD    230.00 1, VINCENT
230.00 - MESA CAL 230.00 1"
 line     25001     24059   "1 "  1 0
 line     24155     24091   "1 "  1 0
0
line 2098                "EAGLROCK 230.00 - MESA CAL 230.00 1, EAGLROCK
230.00 - PARDEE   230.00 1"
 line     24036     24091   "1 "  1 0
 line     24036     24114   "1 "  1 0
0
line 2099                "EAGLROCK 230.00 - MESA CAL 230.00 1, EAGLROCK
230.00 - SYLMAR S 230.00 1"
 line     24036     24091   "1 "  1 0
 line     24036     24147   "1 "  1 0
0
line 2100                "EAGLROCK 230.00 - MESA CAL 230.00 1, SYLMAR S
230.00 - GOULD    230.00 1"
 line     24036     24091   "1 "  1 0
 line     24147     24059   "1 "  1 0
0
line 2101                "EAGLROCK 230.00 - MESA CAL 230.00 1, VINCENT
230.00 - MESA CAL 230.00 1"
 line     24036     24091   "1 "  1 0
 line     24155     24091   "1 "  1 0
0
line 2102                "EAGLROCK 230.00 - PARDEE   230.00 1, EAGLROCK
230.00 - SYLMAR S 230.00 1"
 line     24036     24114   "1 "  1 0
 line     24036     24147   "1 "  1 0
0
line 2103                "EAGLROCK 230.00 - SYLMAR S 230.00 1, SYLMAR S
230.00 - GOULD    230.00 1"
 line     24036     24147   "1 "  1 0
 line     24147     24059   "1 "  1 0
0
line 2104                "EAGLROCK 230.00 - SYLMAR S 230.00 1, PARDEE
230.00 - SYLMAR S 230.00 1"
 line     24036     24147   "1 "  1 0
 line     24114     24147   "1 "  1 0
0
line 2105                "EAGLROCK 230.00 - SYLMAR S 230.00 1, PARDEE
230.00 - SYLMAR S 230.00 2"
 line     24036     24147   "1 "  1 0
 line     24114     24147   "2 "  1 0
0
line 2106                "PARDEE   230.00 - SYLMAR S 230.00 1, SYLMAR S
230.00 - GOULD    230.00 1"
 line     24114     24147   "1 "  1 0
 line     24147     24059   "1 "  1 0
0
line 2107                "PARDEE   230.00 - SYLMAR S 230.00 2, SYLMAR S
230.00 - GOULD    230.00 1"
 line     24114     24147   "2 "  1 0
 line     24147     24059   "1 "  1 0
0
line_2108                "EAGLROCK 230.00 - PARDEE   230.00 1, SYLMAR S
```

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230.00 - GOULD    230.00 1"
 line     24036     24114   "1 "  1 0
 line     24147     24059   "1 "  1 0
0
line 2109                "PARDEE   230.00 - SYLMAR S 230.00 1, PARDEE
230.00 - SYLMAR S 230.00 2"
 line     24114     24147   "1 "  1 0
 line     24114     24147   "2 "  1 0
0
line 2110                "ELLIS    230.00 - HUNTGBCH 230.00 1, ELLIS
230.00 - HUNTBCH1 230.00 2"
 line     24044     24069   "1 "  1 0
 line     24044     24369   "2 "  1 0
0
line 2111                "ELLIS    230.00 - HUNTBCH1 230.00 2, ELLIS
230.00 - HUNTGBCH 230.00 3"
 line     24044     24369   "2 "  1 0
 line     24044     24069   "3 "  1 0
0
line 2112                "ELLIS    230.00 - HUNTGBCH 230.00 3, ELLIS
230.00 - HUNTBCH1 230.00 4"
 line     24044     24069   "3 "  1 0
 line     24044     24369   "4 "  1 0
0
line 2113                "ELLIS    230.00 - JOHANNA  230.00 1, ELLIS
230.00 - SANTIAGO 230.00 1"
 line     24044     24072   "1 "  1 0
 line     24044     24134   "1 "  1 0
0
line 2114                "ELLIS    230.00 - SANTIAGO 230.00 1, JOHANNA
230.00 - SANTIAGO 230.00 1"
 line     24044     24134   "1 "  1 0
 line     24072     24134   "1 "  1 0
0
line 2115                "S.ONOFRE 230.00 - SANTIAGO 230.00 1, S.ONOFRE
230.00 - SANTIAGO 230.00 2"
 line     24131     24134   "1 "  1 0
 line     24131     24134   "2 "  1 0
0
line 2116                "S.ONOFRE 230.00 - SANTIAGO 230.00 1, S.ONOFRE
230.00 - SERRANO  230.00 1"
 line     24131     24134   "1 "  1 0
 line     24131     24137   "1 "  1 0
0
line 2117                "CHINO    230.00 - S.ONOFRE 230.00 1, S.ONOFRE
230.00 - SANTIAGO 230.00 1"
 line     24025     24131   "1 "  1 0
 line     24131     24134   "1 "  1 0
0
line 2118                "S.ONOFRE 230.00 - SANTIAGO 230.00 2, S.ONOFRE
230.00 - SERRANO  230.00 1"
 line     24131     24134   "2 "  1 0
 line     24131     24137   "1 "  1 0
0
line 2119                "CHINO    230.00 - S.ONOFRE 230.00 1, S.ONOFRE
230.00 - SANTIAGO 230.00 2"
 line     24025     24131   "1 "  1 0
 line     24131     24134   "2 "  1 0
0
line 2120                "S.CLARA  230.00 - GOLETA   230.00 1, S.CLARA
230.00 - GOLETA   230.00 2"
 line     24128     24058   "1 "  1 0
 line     24128     24058   "2 "  1 0
0
line 2121                "S.CLARA  230.00 - MANDALAY 230.00 1, S.CLARA
230.00 - MANDALAY 230.00 2"
 line     24128     24088   "1 "  1 0
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 line     24128     24088   "2 "  1 0
0
line_2122                "MOORPARK 230.00 - ORMOND   230.00 1, MOORPARK
230.00 - ORMOND   230.00 2"
 line     24099     24106   "1 "  1 0
 line     24099     24106   "2 "  1 0
0
line 2123                "BAILEY   230.00 - PASTORIA 230.00 1, PARDEE
230.00 - PASTORIA 230.00 1"
 line     24403     24115   "1 "  1 0
 line     24114     24115   "1 "  1 0
0
line 2124                "PARDEE   230.00 - PASTORIA 230.00 1, PARDEE
230.00 - BAILEY   230.00 1"
 line     24114     24115   "1 "  1 0
 line     24114     24403   "1 "  1 0
0
line 2125                "PARDEE   230.00 - PASTORIA 230.00 1, VINCENT
230.00 - S.CLARA  230.00 1"
 line     24114     24115   "1 "  1 0
 line     24155     24128   "1 "  1 0
0
line 2126                "PARDEE   230.00 - BAILEY   230.00 1, VINCENT
230.00 - S.CLARA  230.00 1"
 line     24114     24403   "1 "  1 0
 line     24155     24128   "1 "  1 0
0
line_2127                "PARDEE   230.00 - MOORPARK 230.00 1, PARDEE
230.00 - MOORPARK 230.00 2"
 line     24114     24099   "1 "  1 0
 line     24114     24099   "2 "  1 0
0
line 2128                "PARDEE   230.00 - S.CLARA  230.00 1, S.CLARA
230.00 - MOORPARK 230.00 1"
 line     24114     24128   "1 "  1 0
 line     24128     24099   "1 "  1 0
0
line 2129                "PARDEE   230.00 - S.CLARA  230.00 1, VINCENT
230.00 - S.CLARA  230.00 1"
 line     24114     24128   "1 "  1 0
 line     24155     24128   "1 "  1 0
0
line 2130                "S.CLARA  230.00 - MOORPARK 230.00 1, S.CLARA
230.00 - MOORPARK 230.00 2"
 line     24128     24099   "1 "  1 0
 line     24128     24099   "2 "  1 0
0
line 2131                "S.CLARA  230.00 - MOORPARK 230.00 2, VINCENT
230.00 - S.CLARA  230.00 1"
 line     24128     24099   "2 "  1 0
 line     24155     24128   "1 "  1 0
0
line_2132                "MAGUNDEN 230.00 - PASTORIA 230.00 1, MAGUNDEN
230.00 - PASTORIA 230.00 2"
 line     24087     24115   "1 "  1 0
 line     24087     24115   "2 "  1 0
0
line 2133                "MAGUNDEN 230.00 - PASTORIA 230.00 2, MAGUNDEN
230.00 - PASTORIA 230.00 3"
 line     24087     24115   "2 "  1 0
 line     24087     24115   "3 "  1 0
0
line 2134                "MAGUNDEN 230.00 - ANTELOPE 230.00 1, MAGUNDEN
230.00 - ANTELOPE 230.00 2"
 line     24087     24401   "1 "  1 0
 line     24087     24401   "2 "  1 0
0
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line 2135                "MAGUNDEN 230.00 - SPRINGVL 230.00 1, MAGUNDEN
230.00 - SPRINGVL 230.00 2"
 line     24087     24141   "1 "  1 0
 line     24087     24141   "2 "  1 0
0
line 2136                "MAGUNDEN 230.00 - SPRINGVL 230.00 1, MAGUNDEN
230.00 - VESTAL   230.00 1"
 line     24087     24141   "1 "  1 0
 line     24087     24153   "1 "  1 0
0
line 2137                "MAGUNDEN 230.00 - SPRINGVL 230.00 1, MAGUNDEN
230.00 - VESTAL   230.00 2"
 line     24087     24141   "1 "  1 0
 line     24087     24153   "2 "  1 0
0
line 2138                "MAGUNDEN 230.00 - SPRINGVL 230.00 2, MAGUNDEN
230.00 - VESTAL   230.00 1"
 line     24087     24141   "2 "  1 0
 line     24087     24153   "1 "  1 0
0
line 2139                "MAGUNDEN 230.00 - SPRINGVL 230.00 2, MAGUNDEN
230.00 - VESTAL   230.00 2"
 line     24087     24141   "2 "  1 0
 line     24087     24153   "2 "  1 0
0
line 2140                "MAGUNDEN 230.00 - VESTAL   230.00 1, MAGUNDEN
230.00 - VESTAL   230.00 2"
 line     24087     24153   "1 "  1 0
 line     24087     24153   "2 "  1 0
0
line 2141                "RECTOR   230.00 - VESTAL   230.00 2, VESTAL
230.00 - RECTOR   230.00 1"
 line     24235     24153   "2 "  1 0
 line     24153     24235   "1 "  1 0
0
line 2142                "EAGLROCK 230.00 - PARDEE   230.00 1, MESA CAL
230.00 - ANTELOPE 230.00 1"
 line     24036     24114   "1 "  1 0
 line     24091     24401   "1 "  1 0
0
line 2143                "EAGLROCK 230.00 - PARDEE   230.00 1, PARDEE
230.00 - VINCENT  230.00 1"
 line     24036     24114   "1 "  1 0
 line     24114     24155   "1 "  1 0
0
line 2144                "EAGLROCK 230.00 - PARDEE   230.00 1, VINCENT
230.00 - MESA CAL 230.00 1"
 line     24036     24114   "1 "  1 0
 line     24155     24091   "1 "  1 0
0
line 2145                "EAGLROCK 230.00 - PARDEE   230.00 1, VINCENT
230.00 - S.CLARA  230.00 1"
 line     24036     24114   "1 "  1 0
 line     24155     24128   "1 "  1 0
0
line 2146                "MESA CAL 230.00 - ANTELOPE 230.00 1, VINCENT
230.00 - ANTELOPE 230.00 1"
 line     24091     24401   "1 "  1 0
 line     24155     24401   "1 "  1 0
0
line 2147                "PARDEE   230.00 - VINCENT  230.00 1, VINCENT
230.00 - S.CLARA  230.00 1"
 line     24114     24155   "1 "  1 0
 line     24155     24128   "1 "  1 0
0
line 2148                "MESA CAL 230.00 - ANTELOPE 230.00 1, VINCENT
230.00 - S.CLARA  230.00 1"
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 line     24091     24401   "1 "  1 0
 line     24155     24128   "1 "  1 0
0
line 2149                "MESA CAL 230.00 - ANTELOPE 230.00 1, RIOHONDO
230.00 - VINCENT  230.00 2"
 line     24091     24401   "1 "  1 0
 line     24126     24155   "2 "  1 0
0
line 2150                "MESA CAL 230.00 - ANTELOPE 230.00 1, VINCENT
230.00 - RIOHONDO 230.00 1"
 line     24091     24401   "1 "  1 0
 line     24155     24126   "1 "  1 0
0
line_2151                "RIOHONDO 230.00 - VINCENT  230.00 2, VINCENT
230.00 - RIOHONDO 230.00 1"
 line     24126     24155   "2 "  1 0
 line     24155     24126   "1 "  1 0
0
line 2152                "CHINO    230.00 - S.ONOFRE 230.00 1, S.ONOFRE
230.00 - SERRANO  230.00 1"
 line     24025     24131   "1 "  1 0
 line     24131     24137   "1 "  1 0
0
line 2153                "CHINO    230.00 - SERRANO  230.00 1, S.ONOFRE
230.00 - SERRANO  230.00 1"
 line     24025     24137   "1 "  1 0
 line     24131     24137   "1 "  1 0
0
line 2154                "MIRALOMA 230.00 - OLINDA   230.00 1, MIRALOMA
230.00 - WALNUT   230.00 1"
 line     25656     24100   "1 "  1 0
 line     24093     24158   "1 "  1 0
0
line 2155                "CHINO    230.00 - S.ONOFRE 230.00 1, MIRALOMA
230.00 - WALNUT   230.00 1"
 line     24025     24131   "1 "  1 0
 line     24093     24158   "1 "  1 0
0
line_2156                "CHINO    230.00 - SERRANO  230.00 1, MIRALOMA
230.00 - WALNUT   230.00 1"
 line     24025     24137   "1 "  1 0
 line     24093     24158   "1 "  1 0
0
line 2157                "CHINO    230.00 - S.ONOFRE 230.00 1, MIRALOMA
230.00 - OLINDA   230.00 1"
 line     24025     24131   "1 "  1 0
 line     25656     24100   "1 "  1 0
0
line 2158                "CHINO    230.00 - SERRANO  230.00 1, MIRALOMA
230.00 - OLINDA   230.00 1"
 line     24025     24137   "1 "  1 0
 line     25656     24100   "1 "  1 0
0
line 2159                "CHINO    230.00 - MIRALOMA 230.00 1, CHINO
230.00 - MIRALOMA 230.00 2"
 line     24025     24093   "1 "  1 0
 line     24025     24093   "2 "  1 0
0
line 2160                "CHINO    230.00 - MIRALOMA 230.00 2, CHINO
230.00 - MIRALOMA 230.00 3"
 line     24025     24093   "2 "  1 0
 line     24025     25656   "3 "  1 0
0
line_2161                "CHINO    230.00 - S.ONOFRE 230.00 1, CHINO
230.00 - SERRANO  230.00 1"
 line     24025     24131   "1 "  1 0
 line     24025     24137   "1 "  1 0
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0
line 2162                "ETIWANDA 230.00 - PADUA    230.00 1, MIRALOMA
230.00 - PADUA    230.00 1"
 line     24056     24112   "1 "  1 0
 line     25656     24112   "1 "  1 0
0
line 2163                "ETIWANDA 230.00 - MIRALOMA 230.00 1, MIRALOMA
230.00 - PADUA    230.00 1"
 line     24056     25656   "1 "  1 0
 line     25656     24112   "1 "  1 0
0
line 2164                "MIRALOMA 230.00 - VSTA     230.00 1, MIRALOMA
230.00 - VSTA     230.00 2"
 line     24093     24901   "1 "  1 0
 line     25656     24901   "2 "  1 0
0
line 2165                "ETIWANDA 230.00 - SANBRDNO 230.00 1, MIRALOMA
230.00 - VSTA     230.00 2"
 line     24056     24132   "1 "  1 0
 line     25656     24901   "2 "  1 0
0
line 2166                "ETIWANDA 230.00 - SANBRDNO 230.00 1, ETIWANDA
230.00 - VSTA     230.00 1"
 line     24056     24132   "1 "  1 0
 line     24056     24901   "1 "  1 0
0
line 2167                "DEVERS   230.00 - SANBRDNO 230.00 2, ETIWANDA
230.00 - SANBRDNO 230.00 1"
 line     24804     24132   "2 "  1 0
 line     24056     24132   "1 "  1 0
0
line 2168                "DEVERS   230.00 - VSTA     230.00 2, ETIWANDA
230.00 - SANBRDNO 230.00 1"
 line     24804     24901   "2 "  1 0
 line     24056     24132   "1 "  1 0
0
line 2169                "ETIWANDA 230.00 - SANBRDNO 230.00 1, SANBRDNO
230.00 - DEVERS   230.00 1"
 line     24056     24132   "1 "  1 0
 line     24132     24804   "1 "  1 0
0
line 2170                "ETIWANDA 230.00 - SANBRDNO 230.00 1, VSTA
230.00 - SANBRDNO 230.00 2"
 line     24056     24132   "1 "  1 0
 line     24901     24132   "2 "  1 0
0
line 2171                "ETIWANDA 230.00 - SANBRDNO 230.00 1, VSTA
230.00 - DEVERS   230.00 1"
 line     24056     24132   "1 "  1 0
 line     24901     24804   "1 "  1 0
0
line 2172                "VSTA     230.00 - SANBRDNO 230.00 2, VSTA
230.00 - DEVERS   230.00 1"
 line     24901     24132   "2 "  1 0
 line     24901     24804   "1 "  1 0
0
line 2173                "SANBRDNO 230.00 - DEVERS   230.00 1, VSTA
230.00 - SANBRDNO 230.00 2"
 line     24132     24804   "1 "  1 0
 line     24901     24132   "2 "  1 0
0
line 2174                "DEVERS   230.00 - SANBRDNO 230.00 2, VSTA
230.00 - SANBRDNO 230.00 2"
 line     24804     24132   "2 "  1 0
 line     24901     24132   "2 "  1 0
0
line_2175                "DEVERS   230.00 - SANBRDNO 230.00 2, DEVERS
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230.00 - VSTA     230.00 2"
 line     24804     24132   "2 "  1 0
 line     24804     24901   "2 "  1 0
0
line 2176                "DEVERS   230.00 - SANBRDNO 230.00 2, SANBRDNO
230.00 - DEVERS   230.00 1"
 line     24804     24132   "2 "  1 0
 line     24132     24804   "1 "  1 0
0
line 2177                "DEVERS   230.00 - SANBRDNO 230.00 2, VSTA
230.00 - DEVERS   230.00 1"
 line     24804     24132   "2 "  1 0
 line     24901     24804   "1 "  1 0
0
line 2178                "DEVERS   230.00 - VSTA     230.00 2, SANBRDNO
230.00 - DEVERS   230.00 1"
 line     24804     24901   "2 "  1 0
 line     24132     24804   "1 "  1 0
0
line 2179                "DEVERS   230.00 - VSTA     230.00 2, VSTA
230.00 - DEVERS   230.00 1"
 line     24804     24901   "2 "  1 0
 line     24901     24804   "1 "  1 0
0
line 2180                "SANBRDNO 230.00 - DEVERS   230.00 1, VSTA
230.00 - DEVERS   230.00 1"
 line     24132     24804   "1 "  1 0
 line     24901     24804   "1 "  1 0
0
line 2181                "DEVERS   230.00 - MIRAGE   230.00 1, RAMON
230.00 - MIRAGE   230.00 1"
 line     24804     24806   "1 "  1 0
 line     21076     24806   "1 "  1 0
0
line 2182                "DEVERS   230.00 - MIRAGE   230.00 1, COACHELV
230.00 - DEVERS   230.00 1"
 line     24804     24806   "1 "  1 0
 line     21007     24804   "1 "  1 0
0
line 2183                "DEVERS   230.00 - MIRAGE   230.00 1, J.HINDS
230.00 - MIRAGE   230.00 1"
 line     24804     24806   "1 "  1 0
 line     25406     24806   "1 "  1 0
0
line 2184                "VICTOR   230.00 - LUGO     230.00 1, VICTOR
230.00 - LUGO     230.00 2"
 line     24601     24085   "1 "  1 0
 line     24601     24085   "2 "  1 0
0
line 2185                "RAMON    230.00 - MIRAGE   230.00 1, J.HINDS
230.00 - MIRAGE   230.00 1"
 line     21076     24806   "1 "  1 0
 line     25406     24806   "1 "  1 0
0
line 2186                "COACHELV 230.00 - DEVERS   230.00 1, J.HINDS
230.00 - MIRAGE   230.00 1"
 line     21007     24804   "1 "  1 0
 line     25406     24806   "1 "  1 0
0
line 2187                "RAMON    230.00 - MIRAGE   230.00 1, COACHELV
230.00 - DEVERS   230.00 1"
 line     21076     24806   "1 "  1 0
 line     21007     24804   "1 "  1 0
0
line 2188                "MEAD S   230.00 - ELDORDO  230.00 1, MEAD S
230.00 - ELDORDO  230.00 2"
 line     19012     24041   "1 "  1 0
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 line     19012     24041   "2 "  1 0
0
line_2189                "CAMINO   230.00 - MEAD S   230.00 E, CAMINO
230.00 - MEAD S   230.00 W"
 line     24019     19012   "E "  1 0
 line     24019     19012   "W "  1 0
0
line 2190                "PISGAH   230.00 - LUGO     230.00 1, PISGAH
230.00 - LUGO     230.00 2"
 line     24219     24085   "1 "  1 0
 line     24219     24085   "2 "  1 0
0
line 2191                "ELDORDO  500.00 - LUGO     500.00 1, PISGAH
230.00 - ELDORDO  230.00 2"
 line     24042     24086   "1 "  1 0
 line     24219     24041   "2 "  1 0
0
line 2192                "ELDORDO  500.00 - LUGO     500.00 1, PISGAH
230.00 - LUGO     230.00 1"
 line     24042     24086   "1 "  1 0
 line     24219     24085   "1 "  1 0
0
line 2193                "ELDORDO  500.00 - LUGO     500.00 1, PISGAH
230.00 - LUGO     230.00 2"
 line     24042     24086   "1 "  1 0
 line     24219     24085   "2 "  1 0
0
line_2194                "LUGO     500.00 - MIRALOMA 500.00 2, LUGO
500.00 - MIRALOMA 500.00 3"
 line     24086     24092   "2 "  1 0
 line     24086     24092   "3 "  1 0
0
line 2195                "LUGO     500.00 - MIRALOMA 500.00 2, LUGO
500.00 - SERRANO  500.00 1"
 line     24086     24092   "2 "  1 0
 line     24086     24138   "1 "  1 0
0
line 2196                "ETIWANDA 230.00 - SANBRDNO 230.00 1, LUGO
500.00 - MIRALOMA 500.00 2"
 line     24056     24132   "1 "  1 0
 line     24086     24092   "2 "  1 0
0
line 2197                "ETIWANDA 230.00 - VSTA     230.00 1, LUGO
500.00 - MIRALOMA 500.00 2"
 line     24056     24901   "1 "  1 0
 line     24086     24092   "2 "  1 0
0
line 2198                "ETIWANDA 230.00 - SANBRDNO 230.00 1, LUGO
500.00 - MIRALOMA 500.00 3"
 line     24056     24132   "1 "  1 0
 line     24086     24092   "3 "  1 0
0
line_2199                "ETIWANDA 230.00 - VSTA     230.00 1, LUGO
500.00 - MIRALOMA 500.00 3"
 line     24056     24901   "1 "  1 0
 line     24086     24092   "3 "  1 0
0
line 2200                "LUGO     500.00 - MOHAVE   500.00 1, PISGAH
230.00 - LUGO     230.00 1"
 line     24086     24097   "1 "  1 0
 line     24219     24085   "1 "  1 0
0
line 2201                "LUGO     500.00 - MOHAVE   500.00 1, PISGAH
230.00 - LUGO     230.00 2"
 line     24086     24097   "1 "  1 0
 line     24219     24085   "2 "  1 0
0
```

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line 2202                "LUGO     500.00 - SERRANO  500.00 1, MIRALOMA
500.00 - SERRANO  500.00 1"
 line     24086     24138   "1 "  1 0
 line     24092     24138   "1 "  1 0
0
line 2203                "CHINO    230.00 - MIRALOMA 230.00 1, LUGO
500.00 - SERRANO  500.00 1"
 line     24025     24093   "1 "  1 0
 line     24086     24138   "1 "  1 0
0
line 2204                "CHINO    230.00 - MIRALOMA 230.00 2, LUGO
500.00 - SERRANO  500.00 1"
 line     24025     24093   "2 "  1 0
 line     24086     24138   "1 "  1 0
0
line 2205                "CHINO    230.00 - MIRALOMA 230.00 3, LUGO
500.00 - SERRANO  500.00 1"
 line     24025     25656   "3 "  1 0
 line     24086     24138   "1 "  1 0
0
line_2206                "CHINO    230.00 - S.ONOFRE 230.00 1, LUGO
500.00 - SERRANO  500.00 1"
 line     24025     24131   "1 "  1 0
 line     24086     24138   "1 "  1 0
0
line 2207                "CHINO    230.00 - SERRANO  230.00 1, LUGO
500.00 - SERRANO  500.00 1"
 line     24025     24137   "1 "  1 0
 line     24086     24138   "1 "  1 0
0
line 2208                "ETIWANDA 230.00 - MIRALOMA 230.00 1, LUGO
500.00 - SERRANO  500.00 1"
 line     24056     25656   "1 "  1 0
 line     24086     24138   "1 "  1 0
0
line 2209                "ETIWANDA 230.00 - SANBRDNO 230.00 1, LUGO
500.00 - SERRANO  500.00 1"
 line     24056     24132   "1 "  1 0
 line     24086     24138   "1 "  1 0
0
line 2210                "ETIWANDA 230.00 - VSTA     230.00 1, LUGO
500.00 - SERRANO  500.00 1"
 line     24056     24901   "1 "  1 0
 line     24086     24138   "1 "  1 0
0
line_2211                "MIRALOMA 230.00 - OLINDA   230.00 1, LUGO
500.00 - SERRANO  500.00 1"
 line     25656     24100   "1 "  1 0
 line     24086     24138   "1 "  1 0
0
line 2212                "MIRALOMA 230.00 - PADUA    230.00 1, LUGO
500.00 - SERRANO  500.00 1"
 line     25656     24112   "1 "  1 0
 line     24086     24138   "1 "  1 0
0
line 2213                "MIRALOMA 230.00 - WALNUT   230.00 1, LUGO
500.00 - SERRANO  500.00 1"
 line     24093     24158   "1 "  1 0
 line     24086     24138   "1 "  1 0
0
line 2214                "LUGO     500.00 - VINCENT  500.00 1, LUGO
500.00 - VINCENT  500.00 2"
 line     24086     24156   "1 "  1 0
 line     24086     24156   "2 "  1 0
0
line 2215                "MIDWAY   500.00 - VINCENT  500.00 1, MIDWAY
500.00 - VINCENT  500.00 2"
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 line     30060     24156   "1 "  1 0
 line     30060     24156   "2 "  1 0
0
line 2216                "VINCENT  230.00 - ANTELOPE 230.00 1, MIDWAY
500.00 - VINCENT  500.00 1"
 line     24155     24401   "1 "  1 0
 line     30060     24156   "1 "  1 0
0
line 2217                "PARDEE   230.00 - BAILEY   230.00 1, MIDWAY
500.00 - VINCENT  500.00 1"
 line     24114     24403   "1 "  1 0
 line     30060     24156   "1 "  1 0
0
line_2218                "PARDEE   230.00 - PASTORIA 230.00 1, MIDWAY
500.00 - VINCENT  500.00 1"
 line     24114     24115   "1 "  1 0
 line     30060     24156   "1 "  1 0
0
line 2219                "MESA CAL 230.00 - ANTELOPE 230.00 1, MIDWAY
500.00 - VINCENT  500.00 1"
 line     24091     24401   "1 "  1 0
 line     30060     24156   "1 "  1 0
0
line 2220                "MIDWAY   500.00 - VINCENT  500.00 2, MIDWAY
500.00 - VINCENT  500.00 3"
 line     30060     24156   "2 "  1 0
 line     30060     24156   "3 "  1 0
0
line 2221                "VINCENT  230.00 - ANTELOPE 230.00 1, MIDWAY
500.00 - VINCENT  500.00 2"
 line     24155     24401   "1 "  1 0
 line     30060     24156   "2 "  1 0
0
line 2222                "PARDEE   230.00 - BAILEY   230.00 1, MIDWAY
500.00 - VINCENT  500.00 2"
 line     24114     24403   "1 "  1 0
 line     30060     24156   "2 "  1 0
0
line_2223                "PARDEE   230.00 - PASTORIA 230.00 1, MIDWAY
500.00 - VINCENT  500.00 2"
 line     24114     24115   "1 "  1 0
 line     30060     24156   "2 "  1 0
0
line 2224                "MESA CAL 230.00 - ANTELOPE 230.00 1, MIDWAY
500.00 - VINCENT  500.00 2"
 line     24091     24401   "1 "  1 0
 line     30060     24156   "2 "  1 0
0
line 2225                "VINCENT  230.00 - ANTELOPE 230.00 1, MIDWAY
500.00 - VINCENT  500.00 3"
 line     24155     24401   "1 "  1 0
 line     30060     24156   "3 "  1 0
0
line 2226                "MAGUNDEN 230.00 - PASTORIA 230.00 2, MIDWAY
500.00 - VINCENT  500.00 3"
 line     24087     24115   "2 "  1 0
 line     30060     24156   "3 "  1 0
0
line 2227                "MAGUNDEN 230.00 - PASTORIA 230.00 3, MIDWAY
500.00 - VINCENT  500.00 3"
 line     24087     24115   "3 "  1 0
 line     30060     24156   "3 "  1 0
0
line_2228                "MAGUNDEN 230.00 - ANTELOPE 230.00 1, MIDWAY
500.00 - VINCENT  500.00 3"
 line     24087     24401   "1 "  1 0
 line     30060     24156   "3 "  1 0
```

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0
line 2229                "MAGUNDEN 230.00 - ANTELOPE 230.00 2, MIDWAY
500.00 - VINCENT  500.00 3"
 line     24087     24401   "2 "  1 0
 line     30060     24156   "3 "  1 0
0
line 2230                "MESA CAL 230.00 - ANTELOPE 230.00 1, MIDWAY
500.00 - VINCENT  500.00 3"
 line     24091     24401   "1 "  1 0
 line     30060     24156   "3 "  1 0
0
line 2231                "CHINO    230.00 - S.ONOFRE 230.00 1, MIRALOMA
500.00 - SERRANO  500.00 1"
 line     24025     24131   "1 "  1 0
 line     24092     24138   "1 "  1 0
0
line 2232                "CHINO    230.00 - SERRANO  230.00 1, MIRALOMA
500.00 - SERRANO  500.00 1"
 line     24025     24137   "1 "  1 0
 line     24092     24138   "1 "  1 0
0
line 2233                "MOENKOPI 500.00 - ELDORDO  500.00 1, PISGAH
230.00 - ELDORDO  230.00 2"
 line     14002     24042   "1 "  1 0
 line     24219     24041   "2 "  1 0
0
line 2234                "MOHAVE   500.00 - ELDORDO  500.00 1, PISGAH
230.00 - ELDORDO  230.00 2"
 line     24097     24042   "1 "  1 0
 line     24219     24041   "2 "  1 0
0
line 2235                "DEVERS   230.00 - MIRAGE   230.00 1, PALOVRDE
500.00 - DEVERS   500.00 1"
 line     24804     24806   "1 "  1 0
 line     15021     24801   "1 "  1 0
0
line 2236                "PALOVRDE 500.00 - DEVERS   500.00 1, COACHELV
230.00 - DEVERS   230.00 1"
 line     15021     24801   "1 "  1 0
 line     21007     24804   "1 "  1 0
0
line 2237                "PALOVRDE 500.00 - DEVERS   500.00 1, J.HINDS
230.00 - MIRAGE   230.00 1"
 line     15021     24801   "1 "  1 0
 line     25406     24806   "1 "  1 0
0
line 2238                "S.ONOFRE 230.00 - SERRANO  230.00 1, SERRANO
500.00 - VALLEYSC 500.00 1"
 line     24131     24137   "1 "  1 0
 line     24138     24151   "1 "  1 0
0
line 2239                "CHINO    230.00 - S.ONOFRE 230.00 1, SERRANO
500.00 - VALLEYSC 500.00 1"
 line     24025     24131   "1 "  1 0
 line     24138     24151   "1 "  1 0
0
line 2240                "CHINO    230.00 - SERRANO  230.00 1, SERRANO
500.00 - VALLEYSC 500.00 1"
 line     24025     24137   "1 "  1 0
 line     24138     24151   "1 "  1 0
0
line 2241                "MAGUNDEN 230.00 - PASTORIA 230.00 2, PARDEE
230.00 - PASTORIA 230.00 1"
 line     24087     24115   "2 "  1 0
 line     24114     24115   "1 "  1 0
0
line_2242                "BAILEY   230.00 - PASTORIA 230.00 1, MAGUNDEN
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230.00 - PASTORIA 230.00 1"
 line     24403     24115   "1 "  1 0
 line     24087     24115   "1 "  1 0
0
line 2243                "CHINO    230.00 - MIRALOMA 230.00 1, CHINO
230.00 - S.ONOFRE 230.00 1"
 line     24025     24093   "1 "  1 0
 line     24025     24131   "1 "  1 0
0
line 2244                "CHINO    230.00 - S.ONOFRE 230.00 1, CHINO
230.00 - SERRANO  230.00 1"
 line     24025     24131   "1 "  1 0
 line     24025     24137   "1 "  1 0
0
line 2245                "DEVERS   500.00 - VALLEYSC 500.00 1, PALOVRDE
500.00 - DEVERS   500.00 1"
 line     24801     24151   "1 "  1 0
 line     15021     24801   "1 "  1 0
0
line 2246                "VSTA     230.00 - DEVERS   230.00 1, COACHELV
230.00 - DEVERS   230.00 1"
 line     24901     24804   "1 "  1 0
 line     21007     24804   "1 "  1 0
0
line 2247                "DEVERS   230.00 - VSTA     230.00 2, SANBRDNO
230.00 - DEVERS   230.00 1"
 line     24804     24901   "2 "  1 0
 line     24132     24804   "1 "  1 0
0
line 2248                "DEVERS   230.00 - MIRAGE   230.00 1, RAMON
230.00 - MIRAGE   230.00 1"
 line     24804     24806   "1 "  1 0
 line     21076     24806   "1 "  1 0
0
line 2249                "MEAD S   230.00 - ELDORDO  230.00 2, PISGAH
230.00 - ELDORDO  230.00 2"
 line     19012     24041   "2 "  1 0
 line     24219     24041   "2 "  1 0
0
line 2250                "CIMA     230.00 - ELDORDO  230.00 1, MEAD S
230.00 - ELDORDO  230.00 1"
 line     24627     24041   "1 "  1 0
 line     19012     24041   "1 "  1 0
0
line 2251                "DELAMO   230.00 - ELLIS    230.00 1, ELLIS
230.00 - SANTIAGO 230.00 1"
 line     24029     24044   "1 "  1 0
 line     24044     24134   "1 "  1 0
0
line 2252                "BARRE    230.00 - ELLIS    230.00 1, ELLIS
230.00 - JOHANNA  230.00 1"
 line     24016     24044   "1 "  1 0
 line     24044     24072   "1 "  1 0
0
line 2253                "HARBOR   230.00 - HINSON   230.00 1, HARBOR
230.00 - LBEACH   230.00 1"
 line     24061     24065   "1 "  1 0
 line     24061     24077   "1 "  1 0
0
line 2254                "ARCO SC  230.00 - HINSON   230.00 2, HINSON
230.00 - DELAMO   230.00 1"
 line     24015     24065   "2 "  1 0
 line     24065     24029   "1 "  1 0
0
line 2255                "LUGO     500.00 - MIRALOMA 500.00 3, LUGO
500.00 - MOHAVE   500.00 1"
 line     24086     24092   "3 "  1 0
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 line     24086     24097   "1 "  1 0
0
line_2256                "ELDORDO  500.00 - LUGO     500.00 1, LUGO
500.00 - MIRALOMA 500.00 2"
 line     24042     24086   "1 "  1 0
 line     24086     24092   "2 "  1 0
0
line 2257                "LUGO     500.00 - SERRANO  500.00 1, LUGO
500.00 - VINCENT  500.00 1"
 line     24086     24138   "1 "  1 0
 line     24086     24156   "1 "  1 0
0
line 2258                "LUGO     500.00 - VINCENT  500.00 2, LUGO
500.00 - VICTORVL 500.00 1"
 line     24086     24156   "2 "  1 0
 line     24086     26105   "1 "  1 0
0
line 2259                "VICTOR   230.00 - LUGO     230.00 2, PISGAH
230.00 - LUGO     230.00 2"
 line     24601     24085   "2 "  1 0
 line     24219     24085   "2 "  1 0
0
line 2260                "KRAMER   230.00 - LUGO     230.00 1, PISGAH
230.00 - LUGO     230.00 1"
 line     24701     24085   "1 "  1 0
 line     24219     24085   "1 "  1 0
0
line_2261                "CHINO    230.00 - MIRALOMA 230.00 2, MIRALOMA
230.00 - WALNUT   230.00 1"
 line     24025     24093   "2 "  1 0
 line     24093     24158   "1 "  1 0
0
line 2262                "CHINO    230.00 - MIRALOMA 230.00 3, MIRALOMA
230.00 - OLINDA   230.00 1"
 line     24025     25656   "3 "  1 0
 line     25656     24100   "1 "  1 0
0
line 2263                "ETIWANDA 230.00 - MIRALOMA 230.00 1, MIRALOMA
230.00 - PADUA    230.00 1"
 line     24056     25656   "1 "  1 0
 line     25656     24112   "1 "  1 0
0
line 2264                "MOORPARK 230.00 - ORMOND   230.00 3, PARDEE
230.00 - MOORPARK 230.00 1"
 line     24099     24106   "3 "  1 0
 line     24114     24099   "1 "  1 0
0
line 2265                "MOORPARK 230.00 - ORMOND   230.00 4, S.CLARA
230.00 - MOORPARK 230.00 2"
 line     24099     24106   "4 "  1 0
 line     24128     24099   "2 "  1 0
0
line_2266                "MIRALOMA 230.00 - OLINDA   230.00 1, OLINDA
230.00 - WALNUT   230.00 1"
 line     25656     24100   "1 "  1 0
 line     24100     24158   "1 "  1 0
0
line 2267                "LAGUBELL 230.00 - RIOHONDO 230.00 1, RIOHONDO
230.00 - VINCENT  230.00 2"
 line     24076     24126   "1 "  1 0
 line     24126     24155   "2 "  1 0
0
line 2268                "ETIWANDA 230.00 - SANBRDNO 230.00 1, SANBRDNO
230.00 - DEVERS   230.00 1"
 line     24056     24132   "1 "  1 0
 line     24132     24804   "1 "  1 0
0
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line 2269                 "S.CLARA  230.00 - GOLETA   230.00 1, S.CLARA
230.00 - MOORPARK 230.00 1"
 line     24128     24058   "1 "  1 0
 line     24128     24099   "1 "  1 0
0
line 2270                 "S.CLARA  230.00 - GOLETA   230.00 2, S.CLARA
230.00 - MOORPARK 230.00 2"
 line     24128     24058   "2 "  1 0
 line     24128     24099   "2 "  1 0
0
line 2271                 "ELLIS    230.00 - SANTIAGO 230.00 1, S.ONOFRE
230.00 - SANTIAGO 230.00 2"
 line     24044     24134   "1 "  1 0
 line     24131     24134   "2 "  1 0
0
line 2272                 "PARDEE   230.00 - VINCENT  230.00 1, PARDEE
230.00 - BAILEY   230.00 1"
 line     24114     24155   "1 "  1 0
 line     24114     24403   "1 "  1 0
0
line 2273                 "EAGLROCK 230.00 - PARDEE   230.00 1, PARDEE
230.00 - PASTORIA 230.00 1"
 line     24036     24114   "1 "  1 0
 line     24114     24115   "1 "  1 0
0
line 2274                 "PARDEE   230.00 - MOORPARK 230.00 3, PARDEE
230.00 - SYLMAR S 230.00 1"
 line     24114     24099   "3 "  1 0
 line     24114     24147   "1 "  1 0
0
line 2275                 "LEWIS    230.00 - SERRANO  230.00 2, S.ONOFRE
230.00 - SERRANO  230.00 1"
 line     25201     24137   "2 "  1 0
 line     24131     24137   "1 "  1 0
0
line 2276                 "CHINO    230.00 - SERRANO  230.00 1, LEWIS
230.00 - SERRANO  230.00 2"
 line     24025     24137   "1 "  1 0
 line     25201     24137   "2 "  1 0
0
line 2277                 "CHINO    230.00 - SERRANO  230.00 1, SERRANO
230.00 - VILLA PK 230.00 2"
 line     24025     24137   "1 "  1 0
 line     24137     24154   "2 "  1 0
0
line 2278                 "LEWIS    230.00 - SERRANO  230.00 1, SERRANO
230.00 - VILLA PK 230.00 1"
 line     25201     24137   "1 "  1 0
 line     24137     24154   "1 "  1 0
0
line 2279                 "S.ONOFRE 230.00 - SERRANO  230.00 1, SERRANO
230.00 - VILLA PK 230.00 1"
 line     24131     24137   "1 "  1 0
 line     24137     24154   "1 "  1 0
0
line 2280                 "PARDEE   230.00 - SYLMAR S 230.00 1, SYLMAR S
230.00 - GOULD    230.00 1"
 line     24114     24147   "1 "  1 0
 line     24147     24059   "1 "  1 0
0
line 2281                 "EAGLROCK 230.00 - SYLMAR S 230.00 1, PARDEE
230.00 - SYLMAR S 230.00 2"
 line     24036     24147   "1 "  1 0
 line     24114     24147   "2 "  1 0
0
line 2282                 "LUGO     500.00 - VINCENT  500.00 2, MIDWAY
500.00 - VINCENT  500.00 3"
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 line     24086     24156   "2 "  1 0
 line     30060     24156   "3 "  1 0
0
line 2283                 "VINCENT  230.00 - S.CLARA  230.00 1, VINCENT
230.00 - ANTELOPE 230.00 1"
 line     24155     24128   "1 "  1 0
 line     24155     24401   "1 "  1 0
0
line 2284                 "PARDEE   230.00 - VINCENT  230.00 1, VINCENT
230.00 - MESA CAL 230.00 1"
 line     24114     24155   "1 "  1 0
 line     24155     24091   "1 "  1 0
0
line 2285                 "LEWIS    230.00 - SERRANO  230.00 1, LEWIS
230.00 - VILLA PK 230.00 1"
 line     25201     24137   "1 "  1 0
 line     25201     24154   "1 "  1 0
0
line 2286                 "BARRE    230.00 - LEWIS    230.00 1, LEWIS
230.00 - SERRANO  230.00 2"
 line     24016     25201   "1 "  1 0
 line     25201     24137   "2 "  1 0
0
line 2287                 "BARRE    230.00 - VILLA PK 230.00 1, SERRANO
230.00 - VILLA PK 230.00 1"
 line     24016     24154   "1 "  1 0
 line     24137     24154   "1 "  1 0
0
########################################
IID N-2 Outages
########################################
line N-201                "COACHELLA INDIAN HILLS 230 CKT 1&2"
 line     8311     80100   "1 "  1 0
 line     8311     80100   "2 "  1 0
0
line N-202                "COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 1"
 line     8311     24804   "1 "  1 0
 line     8695     24806   "1 "  1 0
0
line N-203                "COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2"
 line     8311     24804   "2 "  1 0
 line     8695     24806   "2 "  1 0
0
line N-204                "COACHELLA MIDWAY 230 CKT 1&2"
 line     8311     8699   "1 "  1 0
 line     8311     8699   "2 "  1 0
0
line N-205                "COACHELLA MIDWAY 230 CKT 3&4"
 line     8311     8699   "3 "  1 0
 line     8311     8699   "4 "  1 0
0
line N-206                "MIDWAY HIGHLINE 230 CKT 1&2"
 line     8699     8690   "1 "  1 0
 line     8699     8690   "2 "  1 0
0
line N-207                "MIDWAY HIGHLINE 230 CKT 3&4"
 line     8699     8690   "3 "  1 0
 line     8699     8690   "4 "  1 0
0
line N-208                "COACHELLA BANISTER/BANISTER AVE58 230"
 line     8311     8300   "1 "  1 0
 line     8311     8300   "2 "  1 0
 line     8300     8802   "1 "  1 0
0
line N-209                "EL CENTRO HIGHLINE 230 CKTS 1&2"
 line     8690     8332   "1 "  1 0
 line     8690     8332   "2 "  1 0
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0
line N-210                "EL CENTRO IMPERIAL VALLEY 230 CKTS 2&3"
 line     8332     22356   "2 "  1 0
 line     8332     22356   "3 "  1 0
0
line N-211                "IMPERIAL VALLEY NEW SAN FELIPE 230 CKTS 1&2"
 line     22356     80300   "1 "  1 0
 line     22356     80300   "2 "  1 0
0
line N-212                "GEOSUB1 BANISTER 230 CKTS 1&2"
 line     24086     24156   "2 "  1 0
 line     30060     24156   "3 "  1 0
0
line_N-213                "GEOSUB2 MIDWAY 230 CKTS 1&2"
 line     24155     24128   "1 "  1 0
 line     24155     24401   "1 "  1 0
0
line N-214                "GEOSUB1 MIDWAY/GEOSUB2 BANISTER 230"
 line     24114     24155   "1 "  1 0
 line     24155     24091   "1 "  1 0
0
line N-215                "GEOSUB1 MIDWAY/GEOSUB1 GEOSUB2 230"
 line     25201     24137   "1 "  1 0
 line     25201     24154   "1 "  1 0
0
line N-216                "GEOSUB2 BANISTER/GEOSUB1 GEOSUB2 230"
 line     24016     25201   "1 "  1 0
 line     25201     24137   "2 "  1 0
0
########################################
SDG&E N-2 OUTAGES
########################################
23052/23007 "TA-SO 1 + 2 230KV"  "N-2" "C"
         1 "TALEGA   230"  "S.ONOFRE 230"  "1 "   1  0
         1 "TALEGA   230"  "S.ONOFRE 230"  "2 "   1  0
         0
23051A/23011 "SX-EPP + ES-EA-SA 230KV"  "N-2" "C"
         1 "SYCAMORE 230"  "EPP      230"  "1 "   1  0
        #8 "ENCINATP 230"
         1 "ENCINATP 230"  "ENCINA   230"  "1 "   1  0
         1 "ENCINATP 230"  "SANLUSRY 230"  "1 "   1  0
         1 "ESCNDIDO 230"  "ENCINATP 230"  "1 "   1  0
         0
23051B/23011 "EPP-ES + ES-EA-SA 230KV"  "N-2" "C"
         1 "EPP      230"  "ESCNDIDO 230"  "1 "   1  0
        #8 "ENCINATP 230"
         1 "ENCINATP 230"  "ENCINA   230"  "1 "   1  0
         1 "ENCINATP 230"  "SANLUSRY 230"  "1 "   1  0
         1 "ESCNDIDO 230"  "ENCINATP 230"  "1 "   1  0
         0
23028/23027 "OT-MS 1&2 230KV"  "N-2" "C"
         1 "OLD TOWN 230"  "MISSION  230"  "1 "   1  0
         1 "OLD TOWN 230"  "MISSION  230"  "2 "   1  0
         0
23021/23041 "ML-SX + OM-SX 230KV"  "N-2" "C"
         1 "MIGUEL   230"  "SYCAMORE 230"  "1 "   1  0
         1 "SYCAMORE 230"  "MLSXTAP  230"  "1 "   1  0
         1 "OTAYMESA 230"  "MLSXTAP  230"  "1 "   1  0
         0
23022/23023 "ML-MS1+ ML-MS2 230KV"  "N-2" "C"
         1 "MIGUEL   230"  "MISSION  230"  "1 "   1  0
         1 "MIGUEL   230"  "MISSION  230"  "2 "   1  0
         0
23012/13808 "PQ-EA 230KV + NCW-PQ 138KV"  "N-2" "C"
         1 "PENSQTOS 230"  "ENCINA   230"  "1 "   1  0
         1 "NORTHCTY 138"  "PENSQTOS 138"  "1 "   1  0
         0
```

```
23012/13807 "PQ-EA 230KV + EA-NCW 138KV"  "N-2" "C"
         1 "PENSQTOS 230"  "ENCINA   230"  "1 "   1  0
         1 "ENCINA   138"  "NORTHCTY 138"  "1 "   1  0
         0
23011/23003 "SA-EA 230KV + SA-ES-EA 230KV"  "N-2" "C"
         1 "SANLUSRY 230"  "ENCINA   230"  "1 "   1  0
        #8 "ENCINATP 230"
         1 "ENCINATP 230"  "ENCINA   230"  "1 "   1  0
         1 "ENCINATP 230"  "SANLUSRY 230"  "1 "   1  0
         1 "ESCNDIDO 230"  "ENCINATP 230"  "1 "   1  0
         0
23011/13825 "ES-EA-SA 230KV + BQ-CC-ES-NCM 138KV"  "N-2" "C"
        #8 "ENCINATP 230"
         1 "ENCINATP 230"  "ENCINA   230"  "1 "   1  0
         1 "ENCINATP 230"  "SANLUSRY 230"  "1 "   1  0
         1 "ESCNDIDO 230"  "ENCINATP 230"  "1 "   1  0
        #8 "MDWLRKTP 138"
        #8 "NCMETRTP 138"
         1 "BATIQTOS 138"  "MDWLRKTP 138"  "1 "   1  0
         1 "CHCARITA 138"  "MDWLRKTP 138"  "1 "   1  0
         1 "MDWLRKTP 138"  "NCMETRTP 138"  "1 "   1  0
        #1 "ESCNDO51 138"  "NCMETRTP 138"  "1 "   1  0
         1 "NCMETER  138"  "NCMETRTP 138"  "1 "   1  0
         0
23010/23002 "SA-SO 2 + SO-SA 3 230KV"  "N-2" "C"
         1 "SANLUSRY 230"  "S.ONOFRE 230"  "2 "   1  0
         1 "SANLUSRY 230"  "S.ONOFRE 230"  "3 "   1  0
         0
23004/23001 "SA-MS 1 + SA-MS 2 230KV"  "N-2" "C"
         1 "SANLUSRY 230"  "MISSION  230"  "1 "   1  0
         1 "SANLUSRY 230"  "MISSION  230"  "2 "   1  0
         0
13821B/638 "CH-SX-SN 138KV + SAN VCNT-EL 69KV"  "N-2" "C"
        #8 "CARLTHTP 138"
         1 "CARLTNHS 138"  "CARLTHTP 138"  "1 "   1  0
         1 "SYCAMORE 138"  "CARLTHTP 138"  "1 "   1  0
         1 "CARLTHTP 138"  "SANTEE   138"  "1 "   1  0
         0
end
```

# Imperial Valley Study Group

# Appendix A.4

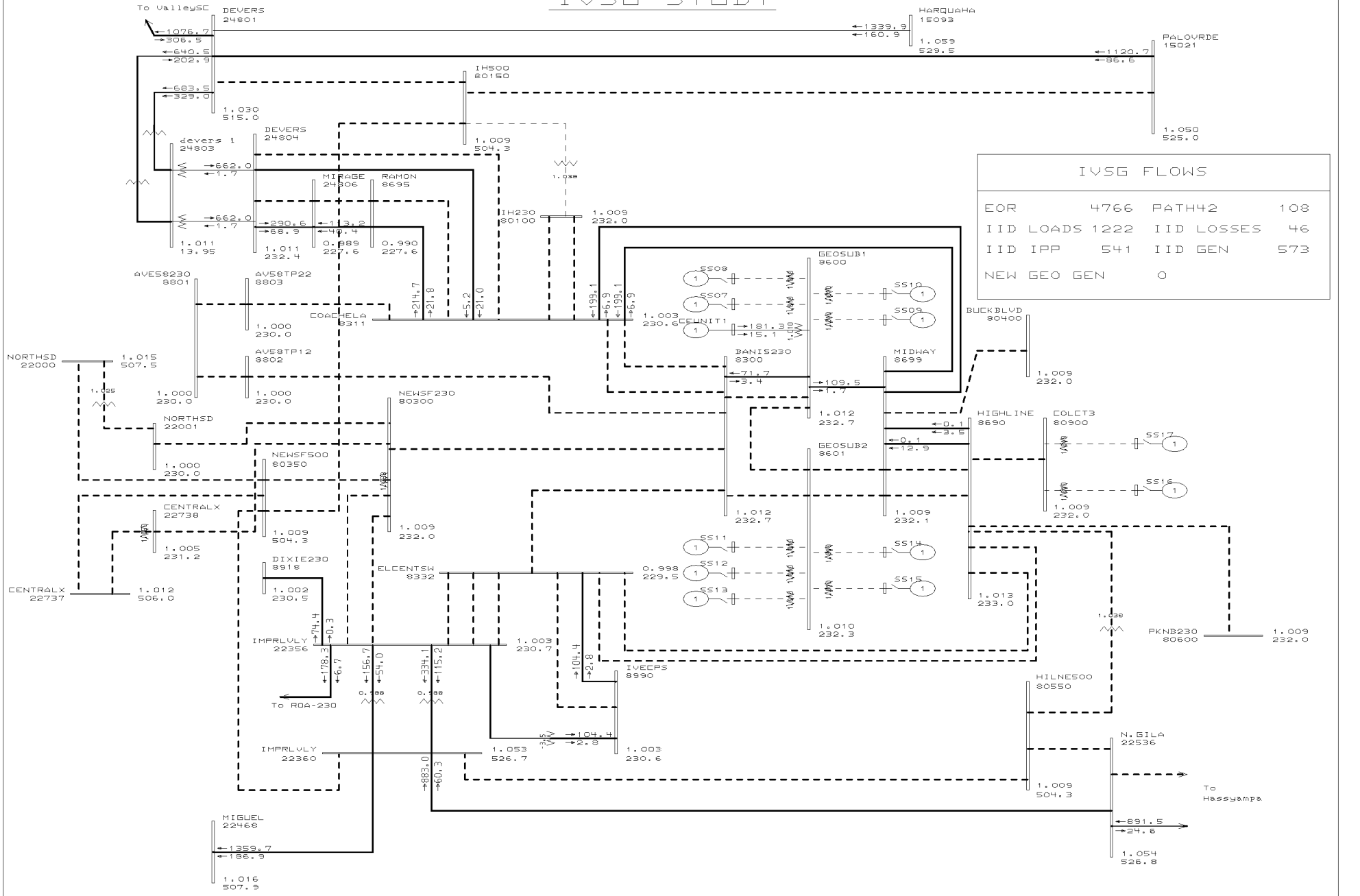
PSLF Maps and Data Tables

# Imperial Valley Study Group

## Appendix A.4.1

HS Rev 4
Heavy Summer
Base Case

# IVSG STUDY




| IVSG FLOWS | | | |
|---|---|---|---|
| EOR | 4766 | PATH42 | 108 |
| IID LOADS | 1222 | IID LOSSES | 46 |
| IID IPP | 541 | IID GEN | 573 |
| NEW GEO GEN | | 0 | |

General Electric International, Inc. PSLF Program MW/MVAR Mon Mar 28 14:36:24 2005

IVSG_HS_REV4.SAV from WECC 2014 HS1A MLE/IID 032205
IMPERIAL VALLEY STUDY GROUP = HEAVY SUMMER CASE
ALTERNATIVES AND ADDITIONAL GENERATION MODELED STATUS OFF

APPROVED HEAVY SUMMER BASE CASE

g:\iid\2005\ivgs\ivgsproject.d
g:\iid\2005\ivgs\cases\summer\
Rating = 1

ivsg_hs_rev4.sav
Voltage Summary
N-0 Outages

| Bus | Name | kV | Area | Zone | Outage | Case | Vbase | Vcont | DeltaV | Vmin | Vmax | Max-dv | Contingency Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24035 | EAGLEMTN | 161 | 24 | 248 | base | ivsg_hs_rev4 | 0.919 | 0.919 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 20077 | SIM-115 | 115 | 20 | 205 | base | ivsg_hs_rev4 | 0.934 | 0.934 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 20076 | SQN-115 | 115 | 20 | 205 | base | ivsg_hs_rev4 | 0.939 | 0.939 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14534 | N.GILA 4 | 100 | 14 | 847 | base | ivsg_hs_rev4 | 0.942 | 0.942 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15021 | PALOVRDE | 500 | 14 | 158 | base | ivsg_hs_rev4 | 1.05 | 1.05 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24775 | RUSH | 115 | 24 | 247 | base | ivsg_hs_rev4 | 1.05 | 1.05 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24627 | CIMA | 230 | 24 | 240 | base | ivsg_hs_rev4 | 1.05 | 1.05 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24229 | VALLEY-S | 115 | 24 | 240 | base | ivsg_hs_rev4 | 1.05 | 1.05 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 25991 | VALYSVC2 | 115 | 24 | 240 | base | ivsg_hs_rev4 | 1.05 | 1.05 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15051 | BROWNING | 500 | 14 | 158 | base | ivsg_hs_rev4 | 1.051 | 1.051 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15090 | HASSYAMP | 500 | 14 | 158 | base | ivsg_hs_rev4 | 1.052 | 1.052 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15092 | ARLINTON | 500 | 14 | 158 | base | ivsg_hs_rev4 | 1.053 | 1.053 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15094 | MESQUITE | 500 | 14 | 158 | base | ivsg_hs_rev4 | 1.053 | 1.053 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 22360 | IMPRLVLY | 500 | 22 | 227 | base | ivsg_hs_rev4 | 1.053 | 1.053 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14009 | REDHAWK | 500 | 14 | 141 | base | ivsg_hs_rev4 | 1.054 | 1.054 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 22536 | N.GILA | 500 | 22 | 227 | base | ivsg_hs_rev4 | 1.054 | 1.054 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 79043 | KAYENTA | 230 | 14 | 191 | base | ivsg_hs_rev4 | 1.055 | 1.055 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24086 | LUGO | 500 | 24 | 240 | base | ivsg_hs_rev4 | 1.055 | 1.055 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14010 | TS5 | 500 | 14 | 141 | base | ivsg_hs_rev4 | 1.056 | 1.056 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24151 | VALLEYSC | 500 | 24 | 240 | base | ivsg_hs_rev4 | 1.056 | 1.056 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24997 | VALYSVC1 | 500 | 24 | 240 | base | ivsg_hs_rev4 | 1.056 | 1.056 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 28040 | CALPINE | 500 | 24 | 240 | base | ivsg_hs_rev4 | 1.056 | 1.056 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14230 | VERDE N | 230 | 14 | 141 | base | ivsg_hs_rev4 | 1.057 | 1.057 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14247 | VERDE S | 230 | 14 | 141 | base | ivsg_hs_rev4 | 1.058 | 1.058 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14011 | RACEWAY | 500 | 14 | 141 | base | ivsg_hs_rev4 | 1.058 | 1.058 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24776 | LEE VINE | 115 | 24 | 247 | base | ivsg_hs_rev4 | 1.058 | 1.058 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15093 | HARQUAHA | 500 | 14 | 158 | base | ivsg_hs_rev4 | 1.059 | 1.059 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14205 | COCONINO | 230 | 14 | 141 | base | ivsg_hs_rev4 | 1.06 | 1.06 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15034 | PERKINS | 500 | 14 | 158 | base | ivsg_hs_rev4 | 1.061 | 1.061 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14008 | JOJOBA | 500 | 14 | 141 | base | ivsg_hs_rev4 | 1.061 | 1.061 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15041 | SILVERKG | 500 | 14 | 158 | base | ivsg_hs_rev4 | 1.062 | 1.062 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15061 | RUDD | 500 | 14 | 158 | base | ivsg_hs_rev4 | 1.062 | 1.062 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14234 | YAVAPAI | 230 | 14 | 141 | base | ivsg_hs_rev4 | 1.063 | 1.063 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24156 | VINCENT | 500 | 24 | 240 | base | ivsg_hs_rev4 | 1.063 | 1.063 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14355 | PRESCOTT | 115 | 14 | 141 | base | ivsg_hs_rev4 | 1.065 | 1.065 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14544 | PRESCOT2 | 100 | 14 | 141 | base | ivsg_hs_rev4 | 1.066 | 1.066 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14543 | PRESCOT1 | 100 | 14 | 141 | base | ivsg_hs_rev4 | 1.066 | 1.066 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14256 | FLAGSTAF | 230 | 14 | 141 | base | ivsg_hs_rev4 | 1.066 | 1.066 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14587 | FLAGSTF1 | 100 | 14 | 141 | base | ivsg_hs_rev4 | 1.067 | 1.067 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14001 | FOURCORN | 500 | 14 | 141 | base | ivsg_hs_rev4 | 1.068 | 1.068 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24729 | INYO | 230 | 24 | 247 | base | ivsg_hs_rev4 | 1.068 | 1.068 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14007 | GILARIVR | 500 | 14 | 141 | base | ivsg_hs_rev4 | 1.069 | 1.069 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14006 | YAVAPAI | 500 | 14 | 141 | base | ivsg_hs_rev4 | 1.07 | 1.07 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 79264 | PINAL_W | 500 | 14 | 141 | base | ivsg_hs_rev4 | 1.07 | 1.07 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14215 | LEUPP | 230 | 14 | 141 | base | ivsg_hs_rev4 | 1.074 | 1.074 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14004 | SAGUARO | 500 | 14 | 141 | base | ivsg_hs_rev4 | 1.075 | 1.075 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15992 | SEV | 500 | 14 | 158 | base | ivsg_hs_rev4 | 1.075 | 1.075 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 16000 | TORTOLIT | 500 | 14 | 160 | base | ivsg_hs_rev4 | 1.075 | 1.075 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 16001 | TORTLIT2 | 500 | 14 | 160 | base | ivsg_hs_rev4 | 1.075 | 1.075 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14100 | CHOLLA | 345 | 14 | 141 | base | ivsg_hs_rev4 | 1.076 | 1.076 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15001 | CORONADO | 500 | 14 | 158 | base | ivsg_hs_rev4 | 1.08 | 1.08 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14000 | CHOLLA | 500 | 14 | 141 | base | ivsg_hs_rev4 | 1.08 | 1.08 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 19038 | MEAD | 500 | 14 | 191 | base | ivsg_hs_rev4 | 1.085 | 1.085 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24042 | ELDORDO | 500 | 24 | 240 | base | ivsg_hs_rev4 | 1.086 | 1.086 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14204 | CHOLLA | 230 | 14 | 141 | base | ivsg_hs_rev4 | 1.087 | 1.087 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24097 | MOHAVE | 500 | 24 | 240 | base | ivsg_hs_rev4 | 1.088 | 1.088 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14509 | CHOLLA 7 | 100 | 14 | 141 | base | ivsg_hs_rev4 | 1.093 | 1.093 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14267 | SECDKNOL | 230 | 14 | 141 | base | ivsg_hs_rev4 | 1.098 | 1.098 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14003 | NAVAJO | 500 | 14 | 141 | base | ivsg_hs_rev4 | 1.102 | 1.102 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14002 | MOENKOPI | 500 | 14 | 141 | base | ivsg_hs_rev4 | 1.104 | 1.104 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |

ivsg_hs_rev4.sav
Flow Summary
N-0 Outages

| LEGEND | % of RATING 1 | |
|---|---|---|
| C_pu | 100% - 110% | |
| C_pu | 110% - 120% | P.U. of |
| C_pu | > 120% | Rate 1 |

| FROM | FR | BKV | TO | TO | BKV | CK | Outage_Name | Case | Rate-Mva | Pflow | Qflow | Amps | MVA | C_pu | B_pu | Contingency_Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 14248 | GLENDALW | 230 | 14212 | GLENDALE | 230 | 1 | base | ivsg_hs_rev4 | 457 | 572.1 | 33.4 | 1434.6 | 573.1 | 1.251 | 1.251 | Base system (n-0) |
| 14248 | GLENDALW | 230 | 15201 | AGUAFRIA | 230 | 1 | base | ivsg_hs_rev4 | 457 | -572.1 | -33.4 | 1434.6 | 573.1 | 1.251 | 1.251 | Base system (n-0) |
| 14221 | PNPKAPS | 230 | 19062 | PINPK | 230 | 1 | base | ivsg_hs_rev4 | 637.4 | -791.1 | -182.5 | 1999.5 | 811.9 | 1.25 | 1.25 | Base system (n-0) |
| 24910 | CAL ELEC | 115 | 24912 | SHANDIN | 115 | 1 | base | ivsg_hs_rev4 | 109.1 | -124.2 | 58.3 | 680.6 | 137.1 | 1.246 | 1.246 | Base system (n-0) |
| 24912 | SHANDIN | 115 | 24916 | TAP902 | 115 | 1 | base | ivsg_hs_rev4 | 109.1 | -119.2 | 33.5 | 611.5 | 123.8 | 1.118 | 1.118 | Base system (n-0) |
| 14212 | GLENDALE | 230 | 14270 | GRNDTRML | 230 | 1 | base | ivsg_hs_rev4 | 457 | 506.7 | 25.8 | 1270.2 | 507.4 | 1.11 | 1.11 | Base system (n-0) |
| 14206 | CTRYCLUB | 230 | 14270 | GRNDTRML | 230 | 1 | base | ivsg_hs_rev4 | 509.9 | -503.4 | -26.1 | 1273.7 | 504.1 | 0.995 | 0.995 | Base system (n-0) |
| 14202 | CACTUS | 230 | 14221 | PNPKAPS | 230 | 1 | base | ivsg_hs_rev4 | 371 | -365.1 | -47.8 | 924.5 | 368.2 | 0.993 | 0.993 | Base system (n-0) |
| 19051 | KNOB | 161 | 8367 | PILOTKNB | 161 | 1 | base | ivsg_hs_rev4 | 165 | 151.8 | -53.4 | 571.7 | 160.9 | 0.966 | 0.966 | Base system (n-0) |
| 24087 | MAGUNDEN | 230 | 24101 | OMAR | 230 | 1 | base | ivsg_hs_rev4 | 643 | -591.8 | 130.3 | 1533.3 | 606 | 0.951 | 0.951 | Base system (n-0) |
| 24806 | MIRAGE | 230 | 24807 | MIRAGE | 115 | 1 | base | ivsg_hs_rev4 | 280 | 265.7 | 27.7 | 677.6 | 267.1 | 0.95 | 0.95 | Base system (n-0) |
| 24806 | MIRAGE | 230 | 24807 | MIRAGE | 115 | 2 | base | ivsg_hs_rev4 | 280 | 265.7 | 27.7 | 677.6 | 267.1 | 0.95 | 0.95 | Base system (n-0) |
| 15230 | RUDD | 230 | 15218 | WHITETNK | 230 | 1 | base | ivsg_hs_rev4 | 725 | 683.4 | -17.5 | 1711.6 | 683.6 | 0.94 | 0.94 | Base system (n-0) |
| 24702 | KRAMER | 115 | 24753 | SUNGEN | 115 | 1 | base | ivsg_hs_rev4 | 183.3 | -170.5 | 32.5 | 863.8 | 173.6 | 0.939 | 0.939 | Base system (n-0) |
| 26098 | SYLMAR3 | 230 | 24147 | SYLMAR S | 230 | 1 | base | ivsg_hs_rev4 | 1100 | 840.7 | -522.8 | 2571.3 | 990 | 0.931 | 0.931 | Base system (n-0) |
| 14008 | JOJOBA | 500 | 15011 | KYRENE | 500 | 1 | base | ivsg_hs_rev4 | 1732 | 1685.6 | 130.6 | 1839.8 | 1690.7 | 0.922 | 0.922 | Base system (n-0) |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | base | ivsg_hs_rev4 | 204.1 | 187 | -9.6 | 774.1 | 187.3 | 0.907 | 0.907 | Base system (n-0) |
| 14207 | DEERVALY | 230 | 14231 | WESTWING | 230 | 1 | base | ivsg_hs_rev4 | 720 | -647.7 | -80.7 | 1635.5 | 652.7 | 0.905 | 0.905 | Base system (n-0) |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | base | ivsg_hs_rev4 | 56 | 48.8 | -10.8 | 247.3 | 50 | 0.9 | 0.9 | Base system (n-0) |

| Bus | Name | kV | Area | Zone | Outage | Case | Vbase | Vcont | DeltaV | Vmin | Vmax | Max-dv | Contingency Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24017 | BLYTHESC | 161 | 24 | 248 | line_007 | ivsg_hs_rev4 | 1.02 | 0.848 | -0.172 | 0.9 | 1.05 | 0.05 | line BLYTHE to BLYTHESC 161 ck 1 |
| 24806 | MIRAGE | 230 | 24 | 248 | line_182 | ivsg_hs_rev4 | 0.989 | 0.9 | -0.089 | 0.9 | 1.05 | 0.05 | line DEVERS to MIRAGE 230 ck 1 |
| 8695 | RAMON | 230 | 8 | 818 | line_182 | ivsg_hs_rev4 | 0.99 | 0.901 | -0.089 | 0.9 | 1.05 | 0.05 | line DEVERS to MIRAGE 230 ck 1 |
| 25406 | J.HINDS | 230 | 24 | 248 | line_182 | ivsg_hs_rev4 | 0.979 | 0.905 | -0.075 | 0.9 | 1.05 | 0.05 | line DEVERS to MIRAGE 230 ck 1 |
| 25401 | EAGLEMTN | 230 | 24 | 248 | line_182 | ivsg_hs_rev4 | 0.979 | 0.911 | -0.068 | 0.9 | 1.05 | 0.05 | line DEVERS to MIRAGE 230 ck 1 |
| 24822 | INDIAN W | 115 | 24 | 248 | line_182 | ivsg_hs_rev4 | 1.024 | 0.915 | -0.108 | 0.9 | 1.05 | 0.05 | line DEVERS to MIRAGE 230 ck 1 |
| 24819 | CONCHO | 115 | 24 | 248 | tran_238 | ivsg_hs_rev4 | 1.024 | 0.915 | -0.109 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 24822 | INDIAN W | 115 | 24 | 248 | tran_238 | ivsg_hs_rev4 | 1.024 | 0.915 | -0.109 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 24819 | CONCHO | 115 | 24 | 248 | line_182 | ivsg_hs_rev4 | 1.024 | 0.916 | -0.108 | 0.9 | 1.05 | 0.05 | line DEVERS to MIRAGE 230 ck 1 |
| 24816 | SANTA RO | 115 | 24 | 248 | line_182 | ivsg_hs_rev4 | 1.028 | 0.92 | -0.108 | 0.9 | 1.05 | 0.05 | line DEVERS to MIRAGE 230 ck 1 |
| 24816 | SANTA RO | 115 | 24 | 248 | tran_238 | ivsg_hs_rev4 | 1.028 | 0.92 | -0.109 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 24821 | TAMARISK | 115 | 24 | 248 | tran_238 | ivsg_hs_rev4 | 1.028 | 0.92 | -0.108 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 24821 | TAMARISK | 115 | 24 | 248 | line_182 | ivsg_hs_rev4 | 1.028 | 0.921 | -0.107 | 0.9 | 1.05 | 0.05 | line DEVERS to MIRAGE 230 ck 1 |
| 24827 | TAP823 | 115 | 24 | 248 | tran_238 | ivsg_hs_rev4 | 1.03 | 0.922 | -0.108 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 24827 | TAP823 | 115 | 24 | 248 | line_182 | ivsg_hs_rev4 | 1.03 | 0.923 | -0.107 | 0.9 | 1.05 | 0.05 | line DEVERS to MIRAGE 230 ck 1 |
| 25633 | CAPWIND | 115 | 24 | 248 | tran_238 | ivsg_hs_rev4 | 1.03 | 0.923 | -0.107 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 25622 | TAP806 | 115 | 24 | 248 | tran_238 | ivsg_hs_rev4 | 1.03 | 0.923 | -0.107 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 24829 | TAP821 | 115 | 24 | 248 | tran_238 | ivsg_hs_rev4 | 1.03 | 0.923 | -0.107 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 25633 | CAPWIND | 115 | 24 | 248 | line_182 | ivsg_hs_rev4 | 1.03 | 0.924 | -0.106 | 0.9 | 1.05 | 0.05 | line DEVERS to MIRAGE 230 ck 1 |
| 25622 | TAP806 | 115 | 24 | 248 | line_182 | ivsg_hs_rev4 | 1.03 | 0.924 | -0.106 | 0.9 | 1.05 | 0.05 | line DEVERS to MIRAGE 230 ck 1 |
| 24829 | TAP821 | 115 | 24 | 248 | line_182 | ivsg_hs_rev4 | 1.03 | 0.924 | -0.106 | 0.9 | 1.05 | 0.05 | line DEVERS to MIRAGE 230 ck 1 |
| 24731 | INYOKERN | 115 | 24 | 247 | line_175 | ivsg_hs_rev4 | 1 | 0.926 | -0.074 | 0.9 | 1.05 | 0.05 | line INYO to COTTONWD 230 ck 1 |
| 24807 | MIRAGE | 115 | 24 | 248 | line_182 | ivsg_hs_rev4 | 1.032 | 0.926 | -0.106 | 0.9 | 1.05 | 0.05 | line DEVERS to MIRAGE 230 ck 1 |
| 24807 | MIRAGE | 115 | 24 | 248 | tran_238 | ivsg_hs_rev4 | 1.032 | 0.926 | -0.106 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 25405 | IRON MTN | 230 | 24 | 248 | line_182 | ivsg_hs_rev4 | 0.991 | 0.937 | -0.054 | 0.9 | 1.05 | 0.05 | line DEVERS to MIRAGE 230 ck 1 |
| 25423 | ESRP MWD | 115 | 24 | 254 | tran_247 | ivsg_hs_rev4 | 1.027 | 0.94 | -0.087 | 0.9 | 1.05 | 0.05 | tran VALLEYSC 500 to VALLEYSC 115 ck 1 |
| 25423 | ESRP MWD | 115 | 24 | 254 | tran_248 | ivsg_hs_rev4 | 1.027 | 0.94 | -0.087 | 0.9 | 1.05 | 0.05 | tran VALLEYSC 500 to VALLEYSC 115 ck 2 |
| 22464 | MIGUEL | 230 | 22 | 222 | B2_002 | ivsg_hs_rev4 | 1.007 | 0.942 | -0.065 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22468 | MIGUEL | 500 | 22 | 227 | B2_002 | ivsg_hs_rev4 | 1.016 | 0.942 | -0.074 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22472 | MIGUELMP | 500 | 22 | 227 | B2_002 | ivsg_hs_rev4 | 1.009 | 0.942 | -0.067 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 25404 | GENE BK2 | 230 | 24 | 254 | line_008 | ivsg_hs_rev4 | 0.998 | 0.942 | -0.056 | 0.9 | 1.05 | 0.05 | line PARKER to GENE 230 ck 1 |
| 24160 | VALLEYSC | 115 | 24 | 240 | tran_247 | ivsg_hs_rev4 | 1.029 | 0.942 | -0.087 | 0.9 | 1.05 | 0.05 | tran VALLEYSC 500 to VALLEYSC 115 ck 1 |
| 25990 | VALYSVC1 | 115 | 24 | 240 | tran_247 | ivsg_hs_rev4 | 1.029 | 0.942 | -0.087 | 0.9 | 1.05 | 0.05 | tran VALLEYSC 500 to VALLEYSC 115 ck 1 |
| 24160 | VALLEYSC | 115 | 24 | 240 | tran_248 | ivsg_hs_rev4 | 1.029 | 0.942 | -0.087 | 0.9 | 1.05 | 0.05 | tran VALLEYSC 500 to VALLEYSC 115 ck 2 |
| 25990 | VALYSVC1 | 115 | 24 | 240 | tran_248 | ivsg_hs_rev4 | 1.029 | 0.942 | -0.087 | 0.9 | 1.05 | 0.05 | tran VALLEYSC 500 to VALLEYSC 115 ck 2 |
| 22412 | LOSCOCHS | 138 | 22 | 223 | B2_002 | ivsg_hs_rev4 | 1.003 | 0.944 | -0.058 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22424 | MAINST50 | 138 | 22 | 222 | B2_002 | ivsg_hs_rev4 | 1.003 | 0.945 | -0.058 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22428 | MAINST51 | 138 | 22 | 222 | B2_002 | ivsg_hs_rev4 | 1.003 | 0.945 | -0.058 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22734 | SANTEE | 138 | 22 | 223 | B2_002 | ivsg_hs_rev4 | 1.002 | 0.947 | -0.055 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22772 | SOUTHBAY | 138 | 22 | 222 | B2_002 | ivsg_hs_rev4 | 1.011 | 0.953 | -0.058 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22865 | UPTOWN | 138 | 22 | 221 | B2_002 | ivsg_hs_rev4 | 1.011 | 0.955 | -0.056 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22116 | CARLTHTP | 138 | 22 | 223 | B2_002 | ivsg_hs_rev4 | 1.008 | 0.956 | -0.051 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22120 | CARLTNHS | 138 | 22 | 223 | B2_002 | ivsg_hs_rev4 | 1.008 | 0.957 | -0.051 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 8640 | MIRAGTIE | 92 | 8 | 162 | line_182 | ivsg_hs_rev4 | 1.029 | 0.957 | -0.073 | 0.9 | 1.05 | 0.05 | line DEVERS to MIRAGE 230 ck 1 |
| 8330 | EDOM | 92 | 8 | 162 | line_182 | ivsg_hs_rev4 | 1.029 | 0.958 | -0.071 | 0.9 | 1.05 | 0.05 | line DEVERS to MIRAGE 230 ck 1 |
| 22500 | MISSION | 138 | 22 | 221 | B2_002 | ivsg_hs_rev4 | 1.012 | 0.961 | -0.051 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 25402 | GENE | 230 | 24 | 248 | line_008 | ivsg_hs_rev4 | 1.015 | 0.962 | -0.052 | 0.9 | 1.05 | 0.05 | line PARKER to GENE 230 ck 1 |
| 25403 | GENE BK1 | 230 | 24 | 254 | line_008 | ivsg_hs_rev4 | 1.015 | 0.962 | -0.052 | 0.9 | 1.05 | 0.05 | line PARKER to GENE 230 ck 1 |
| 22852 | TELECYN | 138 | 22 | 222 | B2_002 | ivsg_hs_rev4 | 1.023 | 0.963 | -0.06 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22672 | PRCTRVLY | 138 | 22 | 222 | B2_002 | ivsg_hs_rev4 | 1.026 | 0.964 | -0.061 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22460 | MIGUEL | 138 | 22 | 222 | B2_002 | ivsg_hs_rev4 | 1.028 | 0.966 | -0.062 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 8289 | N.VIEW | 92 | 8 | 162 | line_182 | ivsg_hs_rev4 | 1.037 | 0.977 | -0.06 | 0.9 | 1.05 | 0.05 | line DEVERS to MIRAGE 230 ck 1 |
| 24035 | EAGLEMTN | 161 | 24 | 248 | line_194 | ivsg_hs_rev4 | 0.919 | 0.978 | 0.059 | 0.9 | 1.05 | 0.05 | line J.HINDS to EAGLEMTN 230 ck 1 |
| 8292 | N.LAQUIN | 92 | 8 | 162 | line_182 | ivsg_hs_rev4 | 1.038 | 0.982 | -0.056 | 0.9 | 1.05 | 0.05 | line DEVERS to MIRAGE 230 ck 1 |
| 8286 | LAQUINTA | 92 | 8 | 162 | line_182 | ivsg_hs_rev4 | 1.038 | 0.982 | -0.056 | 0.9 | 1.05 | 0.05 | line DEVERS to MIRAGE 230 ck 1 |
| 8302 | CARREON | 92 | 8 | 162 | line_182 | ivsg_hs_rev4 | 1.037 | 0.982 | -0.055 | 0.9 | 1.05 | 0.05 | line DEVERS to MIRAGE 230 ck 1 |
| 8308 | CITP4 | 92 | 8 | 162 | line_182 | ivsg_hs_rev4 | 1.037 | 0.982 | -0.055 | 0.9 | 1.05 | 0.05 | line DEVERS to MIRAGE 230 ck 1 |
| 8357 | MONROE | 92 | 8 | 162 | line_182 | ivsg_hs_rev4 | 1.038 | 0.982 | -0.056 | 0.9 | 1.05 | 0.05 | line DEVERS to MIRAGE 230 ck 1 |
| 8309 | AVE42 | 92 | 8 | 162 | line_182 | ivsg_hs_rev4 | 1.039 | 0.983 | -0.057 | 0.9 | 1.05 | 0.05 | line DEVERS to MIRAGE 230 ck 1 |
| 8304 | CITP2 | 92 | 8 | 162 | line_182 | ivsg_hs_rev4 | 1.037 | 0.983 | -0.054 | 0.9 | 1.05 | 0.05 | line DEVERS to MIRAGE 230 ck 1 |
| 8316 | SHIELDS | 92 | 8 | 162 | line_182 | ivsg_hs_rev4 | 1.04 | 0.984 | -0.056 | 0.9 | 1.05 | 0.05 | line DEVERS to MIRAGE 230 ck 1 |
| 8349 | JACKSON | 92 | 8 | 162 | line_182 | ivsg_hs_rev4 | 1.037 | 0.984 | -0.053 | 0.9 | 1.05 | 0.05 | line DEVERS to MIRAGE 230 ck 1 |
| 8354 | MARSHALL | 92 | 8 | 162 | line_182 | ivsg_hs_rev4 | 1.04 | 0.985 | -0.054 | 0.9 | 1.05 | 0.05 | line DEVERS to MIRAGE 230 ck 1 |
| 8291 | AVE48 | 92 | 8 | 162 | line_182 | ivsg_hs_rev4 | 1.041 | 0.987 | -0.055 | 0.9 | 1.05 | 0.05 | line DEVERS to MIRAGE 230 ck 1 |
| 8307 | CMTAP2 | 92 | 8 | 162 | line_182 | ivsg_hs_rev4 | 1.04 | 0.989 | -0.051 | 0.9 | 1.05 | 0.05 | line DEVERS to MIRAGE 230 ck 1 |
| 8285 | JEFERSN | 92 | 8 | 162 | line_182 | ivsg_hs_rev4 | 1.043 | 0.99 | -0.053 | 0.9 | 1.05 | 0.05 | line DEVERS to MIRAGE 230 ck 1 |
| 8389 | VANBUREN | 92 | 8 | 162 | line_182 | ivsg_hs_rev4 | 1.041 | 0.991 | -0.05 | 0.9 | 1.05 | 0.05 | line DEVERS to MIRAGE 230 ck 1 |
| 8315 | CWTAP2 | 92 | 8 | 162 | line_182 | ivsg_hs_rev4 | 1.044 | 0.992 | -0.053 | 0.9 | 1.05 | 0.05 | line DEVERS to MIRAGE 230 ck 1 |
| 14534 | N.GILA 4 | 100 | 14 | 847 | NG500/69 | ivsg_hs_rev4 | 0.942 | 1 | 0.058 | 0.9 | 1.05 | 0.05 | tran N.GILA 500 to N.GILA 69 ck 1 |
| 24035 | EAGLEMTN | 161 | 24 | 248 | tran_241 | ivsg_hs_rev4 | 0.919 | 1.026 | 0.107 | 0.9 | 1.05 | 0.05 | tran EAGLEMTN 230 to EAGLEMTN 161 ck 1 |
| 25401 | EAGLEMTN | 230 | 24 | 248 | line_194 | ivsg_hs_rev4 | 0.979 | 1.032 | 0.053 | 0.9 | 1.05 | 0.05 | line J.HINDS to EAGLEMTN 230 ck 1 |
| 25405 | IRON MTN | 230 | 24 | 248 | line_191 | ivsg_hs_rev4 | 0.991 | 1.044 | 0.054 | 0.9 | 1.05 | 0.05 | line EAGLEMTN to IRON MTN 230 ck 1 |
| 24730 | INYO PS | 115 | 24 | 247 | tran_229 | ivsg_hs_rev4 | 1.026 | 1.078 | 0.051 | 0.9 | 1.05 | 0.05 | tran INYO 115 to INYO PS 115 ck 1 |
| 24142 | SYC CYN | 230 | 24 | 240 | line_086 | ivsg_hs_rev4 | 0.984 | 1.091 | 0.107 | 0.9 | 1.05 | 0.05 | line MAGUNDEN to OMAR 230 ck 1 |
| 25613 | EDMONSTN | 230 | 24 | 256 | line_122 | ivsg_hs_rev4 | 0.999 | 1.091 | 0.092 | 0.9 | 1.05 | 0.05 | line PASTORIA to EDMONSTN 230 ck 1 |
| 24142 | SYC CYN | 230 | 24 | 240 | line_140 | ivsg_hs_rev4 | 0.984 | 1.091 | 0.107 | 0.9 | 1.05 | 0.05 | line SYC CYN to OMAR 230 ck 1 |

ivsg_hs_rev4.sav
FLOW Summary
N-1 Outages

| LEGEND | % of RATING 1 | |
|---|---|---|
| C_pu | 100% - 110% | |
| C_pu | 110% - 120% | P.U. of |
| C_pu | > 120% | Rate 1 |

| FROM | FR | BKV | TO | TO | BKV | CK | Outage_Name | Case | Rate-Mva | Pflow | Qflow | Amps | MVA | C_pu | B_pu | Contingency_Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24142 | SYC CYN | 230 | 24101 | OMAR | 230 | 1 | line_086 | ivsg_hs_rev4 | 643 | 769.8 | 5511.1 | 12804.4 | 5564.6 | 7.934 | 0.471 | line MAGUNDEN to OMAR 230 ck 1 |
| 24781 | NAVYCOSO | 230 | 24706 | BLM EAST | 230 | 1 | line_173 | ivsg_hs_rev4 | 1287 | -153.7 | -3160.7 | 7943.3 | 3164.4 | 2.459 | 0.056 | line BLM EAST to BLM WEST 230 ck 1 |
| 24781 | NAVYCOSO | 230 | 24706 | BLM EAST | 230 | 1 | line_174 | ivsg_hs_rev4 | 1287 | -153.7 | -3160.7 | 7943.3 | 3164.4 | 2.459 | 0.056 | line BLM WEST to KRAMER 230 ck 1 |
| 24806 | MIRAGE | 230 | 24807 | MIRAGE | 115 | 2 | tran_238 | ivsg_hs_rev4 | 280 | 532.6 | 219.5 | 1511.2 | 576 | 2.06 | 0.95 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_175 | ivsg_hs_rev4 | 56 | -103.6 | -1.2 | 532.1 | 103.6 | 1.86 | 0.9 | line INYO to COTTONWD 230 ck 1 |
| 24151 | VALLEYSC | 500 | 24160 | VALLEYSC | 115 | 2 | tran_247 | ivsg_hs_rev4 | 560 | 853.2 | 359.4 | 1027.4 | 925.8 | 1.65 | 0.77 | tran VALLEYSC 500 to VALLEYSC 115 ck 1 |
| 24151 | VALLEYSC | 500 | 24160 | VALLEYSC | 115 | 1 | tran_248 | ivsg_hs_rev4 | 560 | 853.2 | 359.4 | 1027.4 | 925.8 | 1.65 | 0.77 | tran VALLEYSC 500 to VALLEYSC 115 ck 2 |
| 24151 | VALLEYSC | 500 | 24229 | VALLEY-S | 115 | 4 | tran_249 | ivsg_hs_rev4 | 560 | 830.6 | 205 | 946.1 | 855.6 | 1.53 | 0.75 | tran VALLEYSC 500 to VALLEY-S 115 ck 3 |
| 24151 | VALLEYSC | 500 | 24229 | VALLEY-S | 115 | 3 | tran_250 | ivsg_hs_rev4 | 560 | 830.6 | 205 | 946.1 | 855.6 | 1.53 | 0.75 | tran VALLEYSC 500 to VALLEY-S 115 ck 4 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_202 | ivsg_hs_rev4 | 56 | 76.3 | -7.8 | 387 | 76.7 | 1.38 | 0.9 | line OWENSCON to INYO 230 ck 1 |
| 19051 | KNOB | 161 | 8367 | PILOTKNB | 161 | 1 | line_007 | ivsg_hs_rev4 | 165 | 201.7 | -69.7 | 768.3 | 213.4 | 1.299 | 0.966 | line BLYTHE to BLYTHESC 161 ck 1 |
| 19051 | KNOB | 161 | 8367 | PILOTKNB | 161 | 1 | B2_003 | ivsg_hs_rev4 | 165 | 205.3 | -57.9 | 761.6 | 213.3 | 1.287 | 0.966 | N.GILA - IMPRLVLY 1 500kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_009 | ivsg_hs_rev4 | 204.1 | 251.2 | -18.8 | 1047.8 | 251.9 | 1.227 | 0.907 | EPP - ESCNDIDO 1 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_034 | ivsg_hs_rev4 | 204.1 | 249.2 | -13.9 | 1046.6 | 249.5 | 1.226 | 0.907 | OLD TOWN - MLMS3TAP 1 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_032 | ivsg_hs_rev4 | 204.1 | 249.1 | -14.7 | 1046.1 | 249.5 | 1.225 | 0.907 | OTAYMESA - MLMS3TAP 1 230kV |
| 8311 | COACHELA | 230 | 8695 | RAMON | 230 | 1 | line_182 | ivsg_hs_rev4 | 389 | 425.8 | 148.9 | 1187 | 451.1 | 1.219 | 0.555 | line DEVERS to MIRAGE 230 ck 1 |
| 24723 | CONTROL | 115 | 24731 | INYOKERN | 115 | 1 | line_175 | ivsg_hs_rev4 | 82.7 | 96 | -4.1 | 496.8 | 96.1 | 1.197 | 0.426 | line INYO to COTTONWD 230 ck 1 |
| 24723 | CONTROL | 115 | 24731 | INYOKERN | 115 | 2 | line_175 | ivsg_hs_rev4 | 82.7 | 96 | -4.1 | 496.8 | 96.1 | 1.197 | 0.426 | line INYO to COTTONWD 230 ck 1 |
| 19051 | KNOB | 161 | 8367 | PILOTKNB | 161 | 1 | line_026 | ivsg_hs_rev4 | 165 | 186.4 | -64.6 | 706.6 | 197.3 | 1.194 | 0.966 | line BLYTHESC to EAGLEMTN 161 ck 1 |
| 19051 | KNOB | 161 | 8367 | PILOTKNB | 161 | 1 | tran_241 | ivsg_hs_rev4 | 165 | 186.4 | -64.6 | 706.5 | 197.3 | 1.194 | 0.966 | tran EAGLEMTN 230 to EAGLEMTN 161 ck 1 |
| 20238 | HRD-230 | 230 | 20239 | HRD-115 | 115 | 1 | B2_002 | ivsg_hs_rev4 | 225 | 265.6 | -12.5 | 690.1 | 265.9 | 1.18 | 0.63 | IMPRLVLY - MIGUEL 1 500kV |
| 19020 | BLYTHE | 161 | 19105 | GLT TAP | 161 | 1 | line_007 | ivsg_hs_rev4 | 173 | 207.7 | 0 | 730.3 | 207.7 | 1.177 | 0.751 | line BLYTHE to BLYTHESC 161 ck 1 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | B2_002 | ivsg_hs_rev4 | 388 | -436.2 | -17.8 | 1125.5 | 436.6 | 1.156 | 0.444 | IMPRLVLY - MIGUEL 1 500kV |
| 8376 | RTAP2 | 92 | 8974 | RTP1 | 92 | 1 | B2_002 | ivsg_hs_rev4 | 57 | -61.7 | 19.5 | 409 | 64.7 | 1.148 | 0.838 | IMPRLVLY - MIGUEL 1 500kV |
| 19105 | GLT TAP | 161 | 19051 | KNOB | 161 | 1 | line_007 | ivsg_hs_rev4 | 173 | 189.4 | -47.9 | 710.2 | 195.4 | 1.145 | 0.718 | line BLYTHE to BLYTHESC 161 ck 1 |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_192 | ivsg_hs_rev4 | 169 | 188.8 | 50.3 | 687.1 | 195.4 | 1.139 | 0.865 | line IRON MTN to CAMINO 230 ck 1 |
| 22468 | MIGUEL | 500 | 22472 | MIGUELMP | 500 | 1 | ML81 | ivsg_hs_rev4 | 1120 | 1244.8 | 223.8 | 1437.4 | 1264.8 | 1.13 | 0.63 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 22464 | MIGUEL | 230 | 22468 | MIGUEL | 500 | 1 | ML80 | ivsg_hs_rev4 | 1120 | -1230.6 | -24.9 | 3096.4 | 1230.9 | 1.12 | 0.6 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 24729 | INYO | 230 | 24730 | INYO PS | 115 | 1 | line_175 | ivsg_hs_rev4 | 50 | 51.8 | 21.3 | 133 | 56 | 1.12 | 0.53 | line INYO to COTTONWD 230 ck 1 |
| 24729 | INYO | 230 | 24730 | INYO PS | 115 | 2 | line_175 | ivsg_hs_rev4 | 50 | 51.8 | 21.3 | 133 | 56 | 1.12 | 0.53 | line INYO to COTTONWD 230 ck 1 |
| 19051 | KNOB | 161 | 8367 | PILOTKNB | 161 | 1 | line_194 | ivsg_hs_rev4 | 165 | 175.8 | -59.9 | 662.9 | 185.7 | 1.12 | 0.966 | line J.HINDS to EAGLEMTN 230 ck 1 |
| 22464 | MIGUEL | 230 | 22472 | MIGUELMP | 500 | 1 | ML81 | ivsg_hs_rev4 | 1120 | -1242.8 | -28.1 | 3124.9 | 1243.1 | 1.11 | 0.63 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | SX70 | ivsg_hs_rev4 | 204.1 | 228.1 | 1.6 | 944.6 | 228.1 | 1.106 | 0.907 | tran SYCAMORE 230 to SYCAMORE 69 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_002 | ivsg_hs_rev4 | 204.1 | 217.1 | 8.3 | 940.2 | 217.2 | 1.101 | 0.907 | IMPRLVLY - MIGUEL 1 500kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | ML60 | ivsg_hs_rev4 | 204.1 | 225.7 | -7 | 937.5 | 225.8 | 1.098 | 0.907 | tran MIGUEL 230 to MIGUEL 138 ck 1 |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_191 | ivsg_hs_rev4 | 169 | 182.3 | 47.2 | 662.2 | 188.3 | 1.098 | 0.865 | line EAGLEMTN to IRON MTN 230 ck 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 2 | line_070 | ivsg_hs_rev4 | 956 | -1030.1 | -30.9 | 2620.8 | 1030.6 | 1.092 | 0.598 | line LA FRESA to REDONDO 230 ck 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 1 | line_071 | ivsg_hs_rev4 | 956 | -1030.1 | -30.9 | 2620.8 | 1030.6 | 1.092 | 0.598 | line LA FRESA to REDONDO 230 ck 2 |
| 8695 | RAMON | 230 | 24806 | MIRAGE | 230 | 1 | line_182 | ivsg_hs_rev4 | 392.8 | 360.6 | 135.1 | 1073.1 | 385.1 | 1.088 | 0.309 | line DEVERS to MIRAGE 230 ck 1 |
| 24701 | KRAMER | 230 | 24085 | LUGO | 230 | 2 | line_169 | ivsg_hs_rev4 | 478 | 525.5 | 2.2 | 1300.4 | 525.5 | 1.084 | 0.644 | line KRAMER to LUGO 230 ck 1 |
| 24701 | KRAMER | 230 | 24085 | LUGO | 230 | 1 | line_170 | ivsg_hs_rev4 | 478 | 525.5 | 2.2 | 1300.4 | 525.5 | 1.084 | 0.644 | line KRAMER to LUGO 230 ck 2 |
| 19051 | KNOB | 161 | 8367 | PILOTKNB | 161 | 1 | B2_001 | ivsg_hs_rev4 | 165 | 167.3 | -58.5 | 635.3 | 177.3 | 1.074 | 0.966 | HASSYAMP - N.GILA 1 500kV |
| 19051 | KNOB | 161 | 8367 | PILOTKNB | 161 | 1 | line_193 | ivsg_hs_rev4 | 165 | 167.4 | -57.7 | 630.9 | 177.1 | 1.066 | 0.966 | line J.HINDS to MIRAGE 230 ck 1 |
| 22504 | MISSION | 230 | 22500 | MISSION | 138 | 2 | MS60 | ivsg_hs_rev4 | 392 | 397.5 | 114.3 | 1043.2 | 413.6 | 1.06 | 0.71 | tran MISSION 230 to MISSION 138 ck 1 |
| 22504 | MISSION | 230 | 22500 | MISSION | 138 | 1 | MS61 | ivsg_hs_rev4 | 392 | 397.5 | 114.3 | 1043.2 | 413.6 | 1.06 | 0.71 | tran MISSION 230 to MISSION 138 ck 2 |
| 22609 | OTAYMESA | 230 | 20149 | TJI-230 | 230 | 1 | B2_002 | ivsg_hs_rev4 | 796.7 | -818.8 | 114.2 | 2104.4 | 826.7 | 1.053 | 0.428 | IMPRLVLY - MIGUEL 1 500kV |
| 22844 | TALEGA | 230 | 24131 | S.ONOFRE | 230 | 2 | B2_026 | ivsg_hs_rev4 | 456.1 | -480 | 30.2 | 1205.2 | 481 | 1.053 | 0.554 | TALEGA - S.ONOFRE 1 230kV |
| 22844 | TALEGA | 230 | 24131 | S.ONOFRE | 230 | 1 | B2_027 | ivsg_hs_rev4 | 456.1 | -480 | 30.2 | 1205.2 | 481 | 1.053 | 0.554 | TALEGA - S.ONOFRE 2 230kV |
| 22844 | TALEGA | 230 | 24131 | S.ONOFRE | 230 | 2 | line_014 | ivsg_hs_rev4 | 456.1 | -480 | 30.2 | 1205.2 | 481 | 1.053 | 0.554 | line TALEGA to S.ONOFRE 230 ck 1 |
| 22844 | TALEGA | 230 | 24131 | S.ONOFRE | 230 | 1 | line_015 | ivsg_hs_rev4 | 456.1 | -480 | 30.2 | 1205.2 | 481 | 1.053 | 0.554 | line TALEGA to S.ONOFRE 230 ck 2 |
| 19020 | BLYTHE | 161 | 24017 | BLYTHESC | 161 | 1 | line_192 | ivsg_hs_rev4 | 244 | 255.3 | 50.6 | 915.1 | 260.2 | 1.046 | 0.862 | line IRON MTN to CAMINO 230 ck 1 |
| 19020 | BLYTHE | 161 | 19105 | GLT TAP | 161 | 1 | line_026 | ivsg_hs_rev4 | 173 | 183.8 | -6 | 646.5 | 183.9 | 1.042 | 0.751 | line BLYTHESC to EAGLEMTN 161 ck 1 |
| 19020 | BLYTHE | 161 | 19105 | GLT TAP | 161 | 1 | tran_241 | ivsg_hs_rev4 | 173 | 183.8 | -6 | 646.4 | 183.9 | 1.042 | 0.751 | tran EAGLEMTN 230 to EAGLEMTN 161 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_169 | ivsg_hs_rev4 | 56 | 57 | -10 | 287.4 | 57.8 | 1.04 | 0.9 | line KRAMER to LUGO 230 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_170 | ivsg_hs_rev4 | 56 | 57 | -10 | 287.4 | 57.8 | 1.04 | 0.9 | line KRAMER to LUGO 230 ck 2 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20238 | HRD-230 | 230 | 20118 | ROA-230 | 230 | 1 | B2_002 | ivsg_hs_rev4 | 388 | -376.1 | 89.5 | 1003.4 | 386.6 | 1.033 | 0.323 | IMPRLVLY - MIGUEL 1 500kV |
| 24114 | PARDEE | 230 | 24200 | SAUG TAP | 230 | 2 | line_117 | ivsg_hs_rev4 | 494 | 501.7 | 27.5 | 1278.3 | 502.5 | 1.031 | 0.511 | line PARDEE to SAUG TAP 230 ck 1 |
| 24114 | PARDEE | 230 | 24200 | SAUG TAP | 230 | 1 | line_118 | ivsg_hs_rev4 | 494 | 501.7 | 27.4 | 1278.2 | 502.5 | 1.031 | 0.519 | line PARDEE to SAUG TAP 230 ck 2 |
| 19051 | KNOB | 161 | 8367 | PILOTKNB | 161 | 1 | line_19 | ivsg_hs_rev4 | 165 | 162.3 | -55.4 | 609.6 | 171.5 | 1.03 | 0.966 | line ELCENTSW to IVECPS 230 ck 1 |
| 19051 | KNOB | 161 | 8367 | PILOTKNB | 161 | 1 | tran_77 | ivsg_hs_rev4 | 165 | 162.3 | -55.4 | 609.6 | 171.5 | 1.03 | 0.966 | tran IMPRLVLY 230 to IVECPS 230 ck 1 |
| 19051 | KNOB | 161 | 8367 | PILOTKNB | 161 | 1 | line_303 | ivsg_hs_rev4 | 165 | 162 | -53.8 | 607 | 170.6 | 1.026 | 0.966 | line HARQUAHA to DEVERS 500 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | MS60 | ivsg_hs_rev4 | 204.1 | 210.7 | -4.3 | 874.1 | 210.7 | 1.024 | 0.907 | tran MISSION 230 to MISSION 138 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | MS61 | ivsg_hs_rev4 | 204.1 | 210.7 | -4.3 | 874.1 | 210.7 | 1.024 | 0.907 | tran MISSION 230 to MISSION 138 ck 2 |
| 19051 | KNOB | 161 | 8367 | PILOTKNB | 161 | 1 | line_085 | ivsg_hs_rev4 | 165 | 160.5 | -54.9 | 603.4 | 169.6 | 1.02 | 0.966 | line LUGO to VICTORVL 500 ck 1 |
| 19020 | BLYTHE | 161 | 24017 | BLYTHESC | 161 | 1 | line_191 | ivsg_hs_rev4 | 244 | 248.8 | 47.5 | 890.5 | 253.3 | 1.018 | 0.862 | line EAGLEMTN to IRON MTN 230 ck 1 |
| 19051 | KNOB | 161 | 8367 | PILOTKNB | 161 | 1 | line_002 | ivsg_hs_rev4 | 165 | 160.3 | -53.8 | 601.3 | 169.1 | 1.016 | 0.966 | line PALOVRDE to DEVERS 500 ck 1 |
| 19051 | KNOB | 161 | 8367 | PILOTKNB | 161 | 1 | line_008 | ivsg_hs_rev4 | 165 | 159.2 | -55 | 598.8 | 168.4 | 1.012 | 0.966 | line PARKER to GENE 230 ck 1 |
| 19051 | KNOB | 161 | 8367 | PILOTKNB | 161 | 1 | line_182 | ivsg_hs_rev4 | 165 | 159.8 | -51.9 | 598.2 | 168 | 1.011 | 0.966 | line DEVERS to MIRAGE 230 ck 1 |
| 24303 | BIG CRK3 | 230 | 24235 | RECTOR | 230 | 1 | line_155 | ivsg_hs_rev4 | 353 | 361.1 | 50.1 | 895.1 | 364.5 | 1.01 | 0.729 | line BIG CRK1 to RECTOR 230 ck 1 |
| 19105 | GLT TAP | 161 | 19051 | KNOB | 161 | 1 | line_026 | ivsg_hs_rev4 | 173 | 168.4 | -42.2 | 626.2 | 173.6 | 1.009 | 0.718 | line BLYTHESC to EAGLEMTN 161 ck 1 |
| 19105 | GLT TAP | 161 | 19051 | KNOB | 161 | 1 | tran_241 | ivsg_hs_rev4 | 173 | 168.4 | -42.2 | 626.1 | 173.6 | 1.009 | 0.718 | tran EAGLEMTN 230 to EAGLEMTN 161 ck 1 |
| 19051 | KNOB | 161 | 8367 | PILOTKNB | 161 | 1 | SO2 | ivsg_hs_rev4 | 165 | 158.2 | -54.8 | 595.7 | 167.4 | 1.007 | 0.966 | gen S.ONOFR2 22.00 |
| 8376 | RTAP2 | 92 | 8974 | RTP1 | 92 | 1 | line_182 | ivsg_hs_rev4 | 57 | -54.4 | 13.4 | 358.2 | 56 | 1.005 | 0.838 | line DEVERS to MIRAGE 230 ck 1 |
| 19051 | KNOB | 161 | 8367 | PILOTKNB | 161 | 1 | line_64 | ivsg_hs_rev4 | 165 | 157.8 | -54.6 | 593.5 | 167 | 1.003 | 0.966 | line IMPRLVLY to DIXIE230 230 ck 1 |
| 24301 | BIG CRK1 | 230 | 24235 | RECTOR | 230 | 1 | line_160 | ivsg_hs_rev4 | 329 | 334.9 | 48.2 | 826.7 | 338.4 | 1.001 | 0.727 | line BIG CRK3 to RECTOR 230 ck 1 |
| 19051 | KNOB | 161 | 8367 | PILOTKNB | 161 | 1 | line_22 | ivsg_hs_rev4 | 165 | 157 | -54.5 | 590.5 | 166.2 | 0.998 | 0.966 | line GEOSUB1 to BANIS230 230 ck 1 |
| 19051 | KNOB | 161 | 8367 | PILOTKNB | 161 | 1 | tran_71 | ivsg_hs_rev4 | 165 | 157 | -54.5 | 590.5 | 166.2 | 0.998 | 0.966 | tran BANISTER 161 to BANIS230 230 ck 1 |
| 24086 | LUGO | 500 | 24097 | MOHAVE | 500 | 1 | line_103 | ivsg_hs_rev4 | 1386 | -1426.8 | 90 | 1570.8 | 1429.6 | 0.991 | 0.682 | line MOHAVE to ELDORDO 500 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_201 | ivsg_hs_rev4 | 56 | 53.6 | -10.7 | 271.5 | 54.7 | 0.99 | 0.9 | line SYLMAR3 to SYLMAR S 230 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_007 | ivsg_hs_rev4 | 204.1 | 203.3 | -8 | 844.4 | 203.5 | 0.989 | 0.907 | PENSQTOS - ENCINA 1 230kV |
| 20238 | HRD-230 | 230 | 20102 | RUM-230 | 230 | 1 | B2_002 | ivsg_hs_rev4 | 388 | -357.1 | 85.8 | 953.2 | 367.2 | 0.983 | 0.279 | IMPRLVLY - MIGUEL 1 500kV |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_182 | ivsg_hs_rev4 | 169 | 158.8 | 53.1 | 588.9 | 167.4 | 0.98 | 0.865 | line DEVERS to MIRAGE 230 ck 1 |
| 24801 | DEVERS | 500 | 24804 | DEVERS | 230 | 2 | tran_234 | ivsg_hs_rev4 | 1120 | 1093.8 | 49.8 | 1218.1 | 1094.9 | 0.98 | 0.62 | tran DEVERS 500 to DEVERS 230 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | ML70 | ivsg_hs_rev4 | 204.1 | 200.9 | -5.6 | 833.8 | 200.9 | 0.976 | 0.907 | tran MIGUEL 69 to MIGUEL 230 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | ML71 | ivsg_hs_rev4 | 204.1 | 200.9 | -5.6 | 833.8 | 200.9 | 0.976 | 0.907 | tran MIGUEL 69 to MIGUEL 230 ck 2 |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_39 | ivsg_hs_rev4 | 169 | 164.3 | 31.9 | 588.7 | 167.4 | 0.975 | 0.865 | line KNOB to PILOTKNB 161 ck 1 |
| 19020 | BLYTHE | 161 | 19105 | GLT TAP | 161 | 1 | B2_001 | ivsg_hs_rev4 | 173 | 171.1 | -7.2 | 602.2 | 171.3 | 0.971 | 0.751 | HASSYAMP - N.GILA 1 500kV |
| 24807 | MIRAGE | 115 | 24819 | CONCHO | 115 | 1 | tran_238 | ivsg_hs_rev4 | 183 | 164.3 | -4.2 | 891.2 | 164.3 | 0.97 | 0.869 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 24807 | MIRAGE | 115 | 24819 | CONCHO | 115 | 1 | line_182 | ivsg_hs_rev4 | 183 | 164.3 | -4.2 | 890.5 | 164.3 | 0.969 | 0.869 | line DEVERS to MIRAGE 230 ck 1 |
| 8376 | RTAP2 | 92 | 8974 | RTP1 | 92 | 1 | line_303 | ivsg_hs_rev4 | 57 | -51.6 | 18.7 | 344.7 | 54.9 | 0.969 | 0.838 | line HARQUAHA to DEVERS 500 ck 1 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_079 | ivsg_hs_rev4 | 2400 | -2415.8 | -76.4 | 2678.3 | 2417 | 0.966 | 0.775 | line LUGO to MOHAVE 500 ck 1 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_047 | ivsg_hs_rev4 | 2400 | -2416.3 | -95.6 | 2670.6 | 2418.2 | 0.964 | 0.775 | line ELDORDO to LUGO 500 ck 1 |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_008 | ivsg_hs_rev4 | 169 | 162.2 | 32.5 | 581.7 | 165.4 | 0.963 | 0.865 | line PARKER to GENE 230 ck 1 |
| 8376 | RTAP2 | 92 | 8974 | RTP1 | 92 | 1 | line_2 | ivsg_hs_rev4 | 57 | -50.8 | 20.6 | 341.5 | 54.8 | 0.961 | 0.838 | line BANTP2 to BANISTER 161 ck 1 |
| 8376 | RTAP2 | 92 | 8974 | RTP1 | 92 | 1 | line_36 | ivsg_hs_rev4 | 57 | -50.9 | 20.1 | 341.1 | 54.7 | 0.96 | 0.838 | line AV58TP1 to BANTP2 161 ck 1 |
| 8376 | RTAP2 | 92 | 8974 | RTP1 | 92 | 1 | C_4pre | ivsg_hs_rev4 | 57 | -50.8 | 20 | 340.9 | 54.6 | 0.959 | 0.838 | C-ELCENTRO-AVE58 161KV |
| 8376 | RTAP2 | 92 | 8974 | RTP1 | 92 | 1 | line_34 | ivsg_hs_rev4 | 57 | -50.8 | 20 | 340.9 | 54.6 | 0.959 | 0.838 | line AV58 to AV58TP1 161 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | MS70 | ivsg_hs_rev4 | 204.1 | 197 | -3.3 | 817.8 | 197 | 0.958 | 0.907 | tran MISSION 230 to MISSION 69 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_015 | ivsg_hs_rev4 | 204.1 | 197.2 | -8.2 | 816.8 | 197.3 | 0.957 | 0.907 | MIGUEL - MISSION 1 230kV |
| 24807 | MIRAGE | 115 | 24816 | SANTA RO | 115 | 1 | line_182 | ivsg_hs_rev4 | 183.3 | 162.2 | -9.5 | 880.3 | 162.4 | 0.957 | 0.86 | line DEVERS to MIRAGE 230 ck 1 |
| 24807 | MIRAGE | 115 | 24816 | SANTA RO | 115 | 1 | tran_238 | ivsg_hs_rev4 | 183.3 | 162.2 | -9.5 | 881 | 162.4 | 0.957 | 0.86 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_020 | ivsg_hs_rev4 | 204.1 | 196.8 | -8.7 | 815.6 | 197 | 0.955 | 0.907 | MIGUEL - MISSION 2 230kV |
| 14008 | JOJOBA | 500 | 15011 | KYRENE | 500 | 1 | line_303 | ivsg_hs_rev4 | 1732 | 1740.3 | 138.5 | 1900.4 | 1745.8 | 0.952 | 0.922 | line HARQUAHA to DEVERS 500 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_123 | ivsg_hs_rev4 | 56 | 51.6 | -10.7 | 261.2 | 52.7 | 0.95 | 0.9 | line PASTORIA to PSTRIA 230 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_200 | ivsg_hs_rev4 | 56 | 51.6 | -10.8 | 261.3 | 52.7 | 0.95 | 0.9 | line SYLMAR1 to SYLMAR S 230 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | tran_210 | ivsg_hs_rev4 | 56 | 51.4 | -10.5 | 260 | 52.5 | 0.95 | 0.9 | tran LUGO 500 to LUGO 230 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | tran_211 | ivsg_hs_rev4 | 56 | 51.5 | -10.5 | 260.2 | 52.5 | 0.95 | 0.9 | tran LUGO 500 to LUGO 230 ck 2 |
| 8376 | RTAP2 | 92 | 8974 | RTP1 | 92 | 1 | C_4pst | ivsg_hs_rev4 | 57 | -50.3 | 19.8 | 337 | 54 | 0.948 | 0.838 | C-ELCENTRO-AVE58 161KV |
| 8376 | RTAP2 | 92 | 8974 | RTP1 | 92 | 1 | line_002 | ivsg_hs_rev4 | 57 | -50.3 | 18.6 | 336 | 53.7 | 0.945 | 0.838 | line PALOVRDE to DEVERS 500 ck 1 |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_303 | ivsg_hs_rev4 | 169 | 158.2 | 35.3 | 569.8 | 162 | 0.945 | 0.865 | line HARQUAHA to DEVERS 500 ck 1 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | B2_009 | ivsg_hs_rev4 | 392 | 369.2 | -5.8 | 930.8 | 369.2 | 0.94 | 0.67 | EPP - ESCNDIDO 1 230kV |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_086 | ivsg_hs_rev4 | 56 | 51 | -10.8 | 258.3 | 52.1 | 0.94 | 0.9 | line MAGUNDEN to OMAR 230 ck 1 |
| 19105 | GLT TAP | 161 | 19051 | KNOB | 161 | 1 | B2_001 | ivsg_hs_rev4 | 173 | 157.1 | -37.8 | 581.9 | 161.6 | 0.938 | 0.718 | HASSYAMP - N.GILA 1 500kV |
| 19020 | BLYTHE | 161 | 24017 | BLYTHESC | 161 | 1 | line_39 | ivsg_hs_rev4 | 244 | 230.8 | 32.2 | 819.4 | 233.1 | 0.937 | 0.862 | line KNOB to PILOTKNB 161 ck 1 |
| 19051 | KNOB | 161 | 8367 | PILOTKNB | 161 | 1 | C_4pre | ivsg_hs_rev4 | 165 | 146.7 | -51.8 | 552.7 | 155.6 | 0.934 | 0.966 | C-ELCENTRO-AVE58 161KV |
| 19051 | KNOB | 161 | 8367 | PILOTKNB | 161 | 1 | line_2 | ivsg_hs_rev4 | 165 | 146.8 | -51.5 | 552.5 | 155.5 | 0.934 | 0.966 | line BANTP2 to BANISTER 161 ck 1 |
| 19051 | KNOB | 161 | 8367 | PILOTKNB | 161 | 1 | line_34 | ivsg_hs_rev4 | 165 | 146.7 | -51.8 | 552.7 | 155.6 | 0.934 | 0.966 | line AV58 to AV58TP1 161 ck 1 |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 19051 | KNOB | 161 | 8367 | PILOTKNB | 161 | 1 | line_36 | ivsg_hs_rev4 | 165 | 146.8 | -51.5 | 552.4 | 155.5 | 0.934 | 0.966 | line AV58TP1 to BANTP2 161 ck 1 |
| 8374 | ROCKWOOD | 92 | 8980 | BRAW92 | 92 | 1 | line_16 | ivsg_hs_rev4 | 132 | 123.8 | -7.2 | 772.9 | 124 | 0.933 | 0.81 | line ELCENTSW to NILAND 161 ck 1 |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | B2_002 | ivsg_hs_rev4 | 169 | 156.7 | 32.3 | 562.7 | 160 | 0.932 | 0.865 | IMPRLVLY - MIGUEL 1 500kV |
| 19051 | KNOB | 161 | 8367 | PILOTKNB | 161 | 1 | IV81 | ivsg_hs_rev4 | 165 | 146.2 | -52.2 | 551.2 | 155.2 | 0.932 | 0.966 | tran IMPRLVLY 230 to IMPRLVLY 500 ck 2 |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_002 | ivsg_hs_rev4 | 169 | 156.1 | 33.6 | 561.5 | 159.7 | 0.931 | 0.865 | line PALOVRDE to DEVERS 500 ck 1 |
| 24804 | DEVERS | 230 | 24806 | MIRAGE | 230 | 1 | line_11 | ivsg_hs_rev4 | 494 | 447.3 | 112.7 | 1150.7 | 461.3 | 0.93 | 0.6 | line COACHELA to RAMON 230 ck 1 |
| 19051 | KNOB | 161 | 8367 | PILOTKNB | 161 | 1 | line_16 | ivsg_hs_rev4 | 165 | 146.2 | -51.2 | 550.4 | 154.9 | 0.93 | 0.966 | line ELCENTSW to NILAND 161 ck 1 |
| 19020 | BLYTHE | 161 | 24017 | BLYTHESC | 161 | 1 | line_182 | ivsg_hs_rev4 | 244 | 225.3 | 53.4 | 814.1 | 231.5 | 0.93 | 0.862 | line DEVERS to MIRAGE 230 ck 1 |
| 24801 | DEVERS | 500 | 24804 | DEVERS | 230 | 1 | line_207 | ivsg_hs_rev4 | 1120 | 986.6 | 327.7 | 1190.9 | 1039.6 | 0.93 | 0.68 | line DEVERS to VALLEYSC 500 ck 1 |
| 24303 | BIG CRK3 | 230 | 24235 | RECTOR | 230 | 1 | line_139 | ivsg_hs_rev4 | 353 | 335.6 | 45.4 | 822.8 | 338.7 | 0.929 | 0.729 | line SPRINGVL to BIG CRK4 230 ck 1 |
| 19051 | KNOB | 161 | 8367 | PILOTKNB | 161 | 1 | line_45 | ivsg_hs_rev4 | 165 | 145.4 | -52.9 | 548.9 | 154.7 | 0.928 | 0.966 | line RAMON to MIRAGE 230 ck 1 |
| 19020 | BLYTHE | 161 | 24017 | BLYTHESC | 161 | 1 | line_008 | ivsg_hs_rev4 | 244 | 228.7 | 32.7 | 812.3 | 231.1 | 0.928 | 0.862 | line PARKER to GENE 230 ck 1 |
| 19051 | KNOB | 161 | 8367 | PILOTKNB | 161 | 1 | line_13 | ivsg_hs_rev4 | 165 | 145.3 | -51.4 | 547.4 | 154.2 | 0.925 | 0.966 | line COACHELA to MIDWAY 230 ck 1 |
| 19051 | KNOB | 161 | 8367 | PILOTKNB | 161 | 1 | line_14 | ivsg_hs_rev4 | 165 | 145.3 | -51.4 | 547.4 | 154.2 | 0.925 | 0.966 | line COACHELA to MIDWAY 230 ck 2 |
| 24042 | ELDORDO | 500 | 24086 | LUGO | 500 | 1 | line_085 | ivsg_hs_rev4 | 1386 | 1359.6 | 237.9 | 1466.3 | 1380.3 | 0.923 | 0.611 | line LUGO to VICTORVL 500 ck 1 |
| 24614 | TAP601 | 115 | 24702 | KRAMER | 115 | 1 | line_169 | ivsg_hs_rev4 | 217.1 | -189.8 | 69.8 | 1003.7 | 202.2 | 0.923 | 0.717 | line KRAMER to LUGO 230 ck 1 |
| 24614 | TAP601 | 115 | 24702 | KRAMER | 115 | 1 | line_170 | ivsg_hs_rev4 | 217.1 | -189.8 | 69.8 | 1003.7 | 202.2 | 0.923 | 0.717 | line KRAMER to LUGO 230 ck 2 |
| 19051 | KNOB | 161 | 8367 | PILOTKNB | 161 | 1 | line_11 | ivsg_hs_rev4 | 165 | 143.9 | -51.7 | 542.5 | 152.9 | 0.917 | 0.966 | line COACHELA to RAMON 230 ck 1 |
| 19051 | KNOB | 161 | 8367 | PILOTKNB | 161 | 1 | line_24 | ivsg_hs_rev4 | 165 | 144.2 | -50.1 | 542.5 | 152.7 | 0.917 | 0.966 | line GEOSUB1 to MIDWAY 230 ck 1 |
| 20118 | ROA-230 | 230 | 22356 | IMPRLVLY | 230 | 1 | B2_002 | ivsg_hs_rev4 | 797 | -720.9 | -104.3 | 1833.7 | 728.4 | 0.917 | 0.223 | IMPRLVLY - MIGUEL 1 500kV |
| 19020 | BLYTHE | 161 | 19105 | GLT TAP | 161 | 1 | line_194 | ivsg_hs_rev4 | 173 | 161 | -10.1 | 567.2 | 161.4 | 0.914 | 0.751 | line J.HINDS to EAGLEMTN 230 ck 1 |
| 19020 | BLYTHE | 161 | 24017 | BLYTHESC | 161 | 1 | line_303 | ivsg_hs_rev4 | 244 | 224.7 | 35.5 | 799.7 | 227.5 | 0.914 | 0.862 | line HARQUAHA to DEVERS 500 ck 1 |
| 24301 | BIG CRK1 | 230 | 24235 | RECTOR | 230 | 1 | line_156 | ivsg_hs_rev4 | 329 | 305.6 | 4.3 | 752.1 | 305.6 | 0.911 | 0.727 | line BIG CRK1 to BIG CRK2 230 ck 1 |
| 15230 | RUDD | 230 | 15218 | WHITETNK | 230 | 1 | PV1 | ivsg_hs_rev4 | 725 | 663.6 | -11.6 | 1655.3 | 663.7 | 0.91 | 0.94 | gen PALOVRD1 24.00 |
| 24092 | MIRALOMA | 500 | 24093 | MIRALOMW | 230 | 1 | tran_213 | ivsg_hs_rev4 | 1120 | 1003.4 | 191.4 | 1130.4 | 1021.5 | 0.91 | 0.67 | tran MIRALOMA 500 to MIRALOMW 230 ck 2 |
| 24602 | VICTOR | 115 | 24702 | KRAMER | 115 | 1 | line_169 | ivsg_hs_rev4 | 217.1 | -185.2 | 79.9 | 987.7 | 201.6 | 0.909 | 0.703 | line KRAMER to LUGO 230 ck 1 |
| 24602 | VICTOR | 115 | 24702 | KRAMER | 115 | 1 | line_170 | ivsg_hs_rev4 | 217.1 | -185.2 | 79.9 | 987.7 | 201.6 | 0.909 | 0.703 | line KRAMER to LUGO 230 ck 2 |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | B2_003 | ivsg_hs_rev4 | 169 | 152.5 | 32 | 548 | 155.8 | 0.908 | 0.865 | N.GILA - IMPRLVLY 1 500kV |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_17 | ivsg_hs_rev4 | 169 | 153.2 | 27.9 | 547.6 | 155.7 | 0.907 | 0.865 | line ELCENTSW to PILOTKNB 161 ck 1 |
| 8376 | RTAP2 | 92 | 8974 | RTP1 | 92 | 1 | B2_022 | ivsg_hs_rev4 | 57 | -47.9 | 19.3 | 322 | 51.7 | 0.907 | 0.838 | OTAYMESA - TJI-230 1 230kV |
| 19020 | BLYTHE | 161 | 24017 | BLYTHESC | 161 | 1 | B2_002 | ivsg_hs_rev4 | 244 | 223.2 | 32.5 | 793.1 | 225.6 | 0.906 | 0.862 | IMPRLVLY - MIGUEL 1 500kV |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_11 | ivsg_hs_rev4 | 169 | 152 | 31.5 | 545.8 | 155.2 | 0.905 | 0.865 | line COACHELA to RAMON 230 ck 1 |
| 19020 | BLYTHE | 161 | 24017 | BLYTHESC | 161 | 1 | line_002 | ivsg_hs_rev4 | 244 | 222.6 | 33.8 | 791.6 | 225.2 | 0.905 | 0.862 | line PALOVRDE to DEVERS 500 ck 1 |
| 24301 | BIG CRK1 | 230 | 24302 | BIG CRK2 | 230 | 1 | line_155 | ivsg_hs_rev4 | 329 | 305.6 | -22.3 | 745.7 | 306.4 | 0.903 | 0.247 | line BIG CRK1 to RECTOR 230 ck 1 |
| 8376 | RTAP2 | 92 | 8974 | RTP1 | 92 | 1 | IV81 | ivsg_hs_rev4 | 57 | -47.9 | 19.1 | 320.3 | 51.6 | 0.902 | 0.838 | tran IMPRLVLY 230 to IMPRLVLY 500 ck 2 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_015 | ivsg_hs_rev4 | 392 | 349.9 | 39 | 877.1 | 352 | 0.9 | 0.82 | MIGUEL - MISSION 1 230kV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | ML70 | ivsg_hs_rev4 | 392 | 350.6 | 38.8 | 882.8 | 352.8 | 0.9 | 0.82 | tran MIGUEL 69 to MIGUEL 230 ck 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | ML71 | ivsg_hs_rev4 | 392 | 350.6 | 38.8 | 882.8 | 352.8 | 0.9 | 0.82 | tran MIGUEL 69 to MIGUEL 230 ck 2 |
| 24092 | MIRALOMA | 500 | 24093 | MIRALOMW | 230 | 2 | tran_212 | ivsg_hs_rev4 | 1120 | 994.2 | 190.3 | 1120.2 | 1012.3 | 0.9 | 0.66 | tran MIRALOMA 500 to MIRALOMW 230 ck 1 |
| 24805 | DEVERS | 115 | 24804 | DEVERS | 230 | 1 | tran_236 | ivsg_hs_rev4 | 280 | -246.1 | 52.4 | 1262.4 | 251.6 | 0.9 | 0.6 | tran DEVERS 115 to DEVERS 230 ck 3 |

| Bus | Name | kV | Area | Zone | Outage | Case | Vbase | Vcont | DeltaV | Vmin | Vmax | Max-dv | Contingency Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24035 | EAGLEMTN | 161 | 24 | 248 | line_2235 | ivsg_hs_rev4 | 0.919 | 0.857 | -0.063 | 0.9 | 1.05 | 0.05 | DEVERS 230.00 - MIRAGE 230.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 24806 | MIRAGE | 230 | 24 | 248 | line_2235 | ivsg_hs_rev4 | 0.989 | 0.886 | -0.103 | 0.9 | 1.05 | 0.05 | DEVERS 230.00 - MIRAGE 230.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 8695 | RAMON | 230 | 8 | 818 | line_2235 | ivsg_hs_rev4 | 0.99 | 0.887 | -0.103 | 0.9 | 1.05 | 0.05 | DEVERS 230.00 - MIRAGE 230.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 25406 | J.HINDS | 230 | 24 | 248 | line_2235 | ivsg_hs_rev4 | 0.979 | 0.888 | -0.092 | 0.9 | 1.05 | 0.05 | DEVERS 230.00 - MIRAGE 230.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 25401 | EAGLEMTN | 230 | 24 | 248 | line_2235 | ivsg_hs_rev4 | 0.979 | 0.895 | -0.084 | 0.9 | 1.05 | 0.05 | DEVERS 230.00 - MIRAGE 230.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 24822 | INDIAN W | 115 | 24 | 248 | line_2235 | ivsg_hs_rev4 | 1.024 | 0.898 | -0.126 | 0.9 | 1.05 | 0.05 | DEVERS 230.00 - MIRAGE 230.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 24819 | CONCHO | 115 | 24 | 248 | line_2235 | ivsg_hs_rev4 | 1.024 | 0.899 | -0.126 | 0.9 | 1.05 | 0.05 | DEVERS 230.00 - MIRAGE 230.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 24816 | SANTA RO | 115 | 24 | 248 | line_2235 | ivsg_hs_rev4 | 1.028 | 0.903 | -0.125 | 0.9 | 1.05 | 0.05 | DEVERS 230.00 - MIRAGE 230.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 24821 | TAMARISK | 115 | 24 | 248 | line_2235 | ivsg_hs_rev4 | 1.028 | 0.904 | -0.124 | 0.9 | 1.05 | 0.05 | DEVERS 230.00 - MIRAGE 230.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 24827 | TAP823 | 115 | 24 | 248 | line_2235 | ivsg_hs_rev4 | 1.03 | 0.906 | -0.124 | 0.9 | 1.05 | 0.05 | DEVERS 230.00 - MIRAGE 230.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 25633 | CAPWIND | 115 | 24 | 248 | line_2235 | ivsg_hs_rev4 | 1.03 | 0.907 | -0.123 | 0.9 | 1.05 | 0.05 | DEVERS 230.00 - MIRAGE 230.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 25622 | TAP806 | 115 | 24 | 248 | line_2235 | ivsg_hs_rev4 | 1.03 | 0.907 | -0.123 | 0.9 | 1.05 | 0.05 | DEVERS 230.00 - MIRAGE 230.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 24829 | TAP821 | 115 | 24 | 248 | line_2235 | ivsg_hs_rev4 | 1.03 | 0.907 | -0.123 | 0.9 | 1.05 | 0.05 | DEVERS 230.00 - MIRAGE 230.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 24807 | MIRAGE | 115 | 24 | 248 | line_2235 | ivsg_hs_rev4 | 1.032 | 0.909 | -0.123 | 0.9 | 1.05 | 0.05 | DEVERS 230.00 - MIRAGE 230.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 25405 | IRON MTN | 230 | 24 | 248 | line_2235 | ivsg_hs_rev4 | 0.991 | 0.923 | -0.068 | 0.9 | 1.05 | 0.05 | DEVERS 230.00 - MIRAGE 230.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 24058 | GOLETA | 230 | 24 | 240 | line_2269 | ivsg_hs_rev4 | 0.983 | 0.928 | -0.055 | 0.9 | 1.05 | 0.05 | S.CLARA 230.00 - GOLETA 230.00 1, S.CLARA 230.00 - MOORPARK 230.00 1 |
| 24058 | GOLETA | 230 | 24 | 240 | line_2270 | ivsg_hs_rev4 | 0.983 | 0.928 | -0.055 | 0.9 | 1.05 | 0.05 | S.CLARA 230.00 - GOLETA 230.00 2, S.CLARA 230.00 - MOORPARK 230.00 2 |
| 22734 | SANTEE | 138 | 22 | 223 | 23021/22/23/41 | ivsg_hs_rev4 | 1.002 | 0.943 | -0.06 | 0.9 | 1.05 | 0.05 | MIGUEL 230 CORRIDOR West of SN |
| 8311 | COACHELA | 230 | 8 | 164 | line_2235 | ivsg_hs_rev4 | 1.003 | 0.945 | -0.058 | 0.9 | 1.05 | 0.05 | DEVERS 230.00 - MIRAGE 230.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 8640 | MIRAGTIE | 92 | 8 | 162 | line_2235 | ivsg_hs_rev4 | 1.029 | 0.945 | -0.085 | 0.9 | 1.05 | 0.05 | DEVERS 230.00 - MIRAGE 230.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 8330 | EDOM | 92 | 8 | 162 | line_2235 | ivsg_hs_rev4 | 1.029 | 0.946 | -0.083 | 0.9 | 1.05 | 0.05 | DEVERS 230.00 - MIRAGE 230.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 22412 | LOSCOCHS | 138 | 22 | 223 | 23021/22/23/41 | ivsg_hs_rev4 | 1.003 | 0.948 | -0.055 | 0.9 | 1.05 | 0.05 | MIGUEL 230 CORRIDOR West of SN |
| 8289 | N.VIEW | 92 | 8 | 162 | line_2235 | ivsg_hs_rev4 | 1.037 | 0.966 | -0.071 | 0.9 | 1.05 | 0.05 | DEVERS 230.00 - MIRAGE 230.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 8378 | RTP4SLTN | 92 | 8 | 163 | line_2235 | ivsg_hs_rev4 | 1.022 | 0.97 | -0.052 | 0.9 | 1.05 | 0.05 | DEVERS 230.00 - MIRAGE 230.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 8806 | AV58TP1 | 161 | 8 | 162 | line_N-204 | ivsg_hs_rev4 | 1.028 | 0.97 | -0.058 | 0.9 | 1.05 | 0.05 | COACHELLA MIDWAY 230 CKT 1&2 |
| 8292 | N.LAQUIN | 92 | 8 | 162 | line_2235 | ivsg_hs_rev4 | 1.038 | 0.972 | -0.066 | 0.9 | 1.05 | 0.05 | DEVERS 230.00 - MIRAGE 230.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 8286 | LAQUINTA | 92 | 8 | 162 | line_2235 | ivsg_hs_rev4 | 1.038 | 0.972 | -0.066 | 0.9 | 1.05 | 0.05 | DEVERS 230.00 - MIRAGE 230.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 8302 | CARREON | 92 | 8 | 162 | line_2235 | ivsg_hs_rev4 | 1.037 | 0.972 | -0.065 | 0.9 | 1.05 | 0.05 | DEVERS 230.00 - MIRAGE 230.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 8357 | MONROE | 92 | 8 | 162 | line_2235 | ivsg_hs_rev4 | 1.038 | 0.972 | -0.066 | 0.9 | 1.05 | 0.05 | DEVERS 230.00 - MIRAGE 230.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 8308 | CITP4 | 92 | 8 | 162 | line_2235 | ivsg_hs_rev4 | 1.037 | 0.973 | -0.064 | 0.9 | 1.05 | 0.05 | DEVERS 230.00 - MIRAGE 230.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 8309 | AVE42 | 92 | 8 | 162 | line_2235 | ivsg_hs_rev4 | 1.039 | 0.973 | -0.067 | 0.9 | 1.05 | 0.05 | DEVERS 230.00 - MIRAGE 230.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 8304 | CITP2 | 92 | 8 | 162 | line_2235 | ivsg_hs_rev4 | 1.037 | 0.973 | -0.063 | 0.9 | 1.05 | 0.05 | DEVERS 230.00 - MIRAGE 230.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 8316 | SHIELDS | 92 | 8 | 162 | line_2235 | ivsg_hs_rev4 | 1.04 | 0.974 | -0.066 | 0.9 | 1.05 | 0.05 | DEVERS 230.00 - MIRAGE 230.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 8806 | AV58TP1 | 161 | 8 | 162 | line_2235 | ivsg_hs_rev4 | 1.028 | 0.975 | -0.053 | 0.9 | 1.05 | 0.05 | DEVERS 230.00 - MIRAGE 230.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 8349 | JACKSON | 92 | 8 | 162 | line_2235 | ivsg_hs_rev4 | 1.037 | 0.975 | -0.062 | 0.9 | 1.05 | 0.05 | DEVERS 230.00 - MIRAGE 230.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 8354 | MARSHALL | 92 | 8 | 162 | line_2235 | ivsg_hs_rev4 | 1.04 | 0.975 | -0.065 | 0.9 | 1.05 | 0.05 | DEVERS 230.00 - MIRAGE 230.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 8379 | RTP5DSTS | 92 | 8 | 162 | line_2235 | ivsg_hs_rev4 | 1.031 | 0.975 | -0.056 | 0.9 | 1.05 | 0.05 | DEVERS 230.00 - MIRAGE 230.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 8805 | AV58 | 161 | 8 | 162 | line_2235 | ivsg_hs_rev4 | 1.032 | 0.976 | -0.056 | 0.9 | 1.05 | 0.05 | DEVERS 230.00 - MIRAGE 230.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 8808 | CVSUB161 | 161 | 8 | 162 | line_2235 | ivsg_hs_rev4 | 1.029 | 0.976 | -0.052 | 0.9 | 1.05 | 0.05 | DEVERS 230.00 - MIRAGE 230.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 8807 | AV58TP2 | 161 | 8 | 162 | line_2235 | ivsg_hs_rev4 | 1.029 | 0.976 | -0.054 | 0.9 | 1.05 | 0.05 | DEVERS 230.00 - MIRAGE 230.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 8291 | AVE48 | 92 | 8 | 162 | line_2235 | ivsg_hs_rev4 | 1.041 | 0.977 | -0.065 | 0.9 | 1.05 | 0.05 | DEVERS 230.00 - MIRAGE 230.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 8363 | OASIS | 92 | 8 | 162 | line_2235 | ivsg_hs_rev4 | 1.035 | 0.977 | -0.057 | 0.9 | 1.05 | 0.05 | DEVERS 230.00 - MIRAGE 230.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 8380 | RTP6OASS | 92 | 8 | 162 | line_2235 | ivsg_hs_rev4 | 1.036 | 0.979 | -0.057 | 0.9 | 1.05 | 0.05 | DEVERS 230.00 - MIRAGE 230.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 8285 | JEFERSN | 92 | 8 | 162 | line_2235 | ivsg_hs_rev4 | 1.043 | 0.98 | -0.063 | 0.9 | 1.05 | 0.05 | DEVERS 230.00 - MIRAGE 230.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 8307 | CMTAP2 | 92 | 8 | 162 | line_2235 | ivsg_hs_rev4 | 1.04 | 0.98 | -0.06 | 0.9 | 1.05 | 0.05 | DEVERS 230.00 - MIRAGE 230.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 8805 | AV58 | 161 | 8 | 162 | line_N-204 | ivsg_hs_rev4 | 1.032 | 0.981 | -0.05 | 0.9 | 1.05 | 0.05 | COACHELLA MIDWAY 230 CKT 1&2 |
| 8315 | CWTAP2 | 92 | 8 | 162 | line_2235 | ivsg_hs_rev4 | 1.044 | 0.982 | -0.063 | 0.9 | 1.05 | 0.05 | DEVERS 230.00 - MIRAGE 230.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 8389 | VANBUREN | 92 | 8 | 162 | line_2235 | ivsg_hs_rev4 | 1.041 | 0.982 | -0.059 | 0.9 | 1.05 | 0.05 | DEVERS 230.00 - MIRAGE 230.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 8301 | CITAP1 | 92 | 8 | 162 | line_2235 | ivsg_hs_rev4 | 1.042 | 0.985 | -0.057 | 0.9 | 1.05 | 0.05 | DEVERS 230.00 - MIRAGE 230.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 8279 | CVSUB | 92 | 8 | 162 | line_2235 | ivsg_hs_rev4 | 1.04 | 0.988 | -0.052 | 0.9 | 1.05 | 0.05 | DEVERS 230.00 - MIRAGE 230.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 8303 | SKY VLY | 92 | 8 | 162 | line_2235 | ivsg_hs_rev4 | 1.042 | 0.989 | -0.053 | 0.9 | 1.05 | 0.05 | DEVERS 230.00 - MIRAGE 230.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 8385 | THERMAL | 92 | 8 | 162 | line_2235 | ivsg_hs_rev4 | 1.04 | 0.989 | -0.052 | 0.9 | 1.05 | 0.05 | DEVERS 230.00 - MIRAGE 230.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 8287 | RTAP8 | 92 | 8 | 162 | line_2235 | ivsg_hs_rev4 | 1.047 | 0.99 | -0.057 | 0.9 | 1.05 | 0.05 | DEVERS 230.00 - MIRAGE 230.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 8281 | AVE58 | 92 | 8 | 162 | line_2235 | ivsg_hs_rev4 | 1.049 | 0.99 | -0.059 | 0.9 | 1.05 | 0.05 | DEVERS 230.00 - MIRAGE 230.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 8306 | CMTAP1 | 92 | 8 | 162 | line_2235 | ivsg_hs_rev4 | 1.043 | 0.99 | -0.053 | 0.9 | 1.05 | 0.05 | DEVERS 230.00 - MIRAGE 230.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 8358 | AVE 52 | 92 | 8 | 162 | line_2235 | ivsg_hs_rev4 | 1.042 | 0.99 | -0.052 | 0.9 | 1.05 | 0.05 | DEVERS 230.00 - MIRAGE 230.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 8312 | COACHELA | 92 | 8 | 162 | line_2235 | ivsg_hs_rev4 | 1.043 | 0.991 | -0.053 | 0.9 | 1.05 | 0.05 | DEVERS 230.00 - MIRAGE 230.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 24015 | ARCO SC | 230 | 24 | 240 | line_2013 | ivsg_hs_rev4 | 0.986 | 1.036 | 0.051 | 0.9 | 1.05 | 0.05 | ARCO SC 230.00 - HINSON 230.00 1, ARCO SC 230.00 - HINSON 230.00 2 |
| 24061 | HARBOR | 230 | 24 | 240 | line_2039 | ivsg_hs_rev4 | 0.985 | 1.036 | 0.051 | 0.9 | 1.05 | 0.05 | HARBOR 230.00 - HINSON 230.00 1, LBEACH 230.00 - LITEHIPE 230.00 1 |
| 24077 | LBEACH | 230 | 24 | 240 | line_2039 | ivsg_hs_rev4 | 0.986 | 1.036 | 0.051 | 0.9 | 1.05 | 0.05 | HARBOR 230.00 - HINSON 230.00 1, LBEACH 230.00 - LITEHIPE 230.00 1 |
| 24061 | HARBOR | 230 | 24 | 240 | line_2041 | ivsg_hs_rev4 | 0.985 | 1.036 | 0.051 | 0.9 | 1.05 | 0.05 | HARBOR 230.00 - HINSON 230.00 1, HARBOR 230.00 - LBEACH 230.00 1 |
| 24061 | HARBOR | 230 | 24 | 240 | line_2253 | ivsg_hs_rev4 | 0.985 | 1.036 | 0.051 | 0.9 | 1.05 | 0.05 | HARBOR 230.00 - HINSON 230.00 1, HARBOR 230.00 - LBEACH 230.00 1 |
| 25001 | GOODRICH | 230 | 24 | 250 | line_2073 | ivsg_hs_rev4 | 0.958 | 1.044 | 0.086 | 0.9 | 1.05 | 0.05 | GOODRICH 230.00 - GOULD 230.00 1, GOODRICH 230.00 - LAGUBELL 230.00 1 |
| 24058 | GOLETA | 230 | 24 | 240 | line_2120 | ivsg_hs_rev4 | 0.983 | 1.044 | 0.062 | 0.9 | 1.05 | 0.05 | S.CLARA 230.00 - GOLETA 230.00 1, S.CLARA 230.00 - GOLETA 230.00 2 |

ivsg_hs_rev4.sav
FLOW Summary
N-2 Outages

| LEGEND | % of RATING 1 | |
|---|---|---|
| C_pu | 100% - 110% | |
| C_pu | 110% - 120% | P.U. of |
| C_pu | > 120% | Rate 1 |

| FROM | FR | BKV | TO | TO | BKV | CK | Outage_Name | Case | Rate-Mva | Pflow | Qflow | Amps | MVA | C_pu | B_pu | Contingency_Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_hs_rev4 | 392 | 544.9 | 95.2 | 1400.6 | 553.2 | 1.41 | 0.82 | MIGUEL 230 CORRIDOR West of SN |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_hs_rev4 | 392 | 537.3 | 89 | 1368.9 | 544.7 | 1.39 | 0.82 | MIGUEL 230 CORRIDOR West of LC |
| 30060 | MIDWAY | 500 | 24156 | VINCENT | 500 | 3 | line_2215 | ivsg_hs_rev4 | 1848.1 | 2604.9 | 142.2 | 2832.9 | 2608.7 | 1.328 | 0.515 | MIDWAY 500.00 - VINCENT 500.00 1, MIDWAY 500.00 - VINCENT 500.00 2 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_hs_rev4 | 408.3 | -536.4 | -14.6 | 2260.8 | 536.6 | 1.324 | 0.753 | MIGUEL 230 CORRIDOR West of SN |
| 30060 | MIDWAY | 500 | 24156 | VINCENT | 500 | 1 | line_2220 | ivsg_hs_rev4 | 1848.1 | 2577.4 | 168.7 | 2807.2 | 2583 | 1.318 | 0.41 | MIDWAY 500.00 - VINCENT 500.00 2, MIDWAY 500.00 - VINCENT 500.00 3 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_hs_rev4 | 392 | 503.9 | 89.2 | 1284.9 | 511.8 | 1.31 | 0.82 | MIGUEL 230 CORRIDOR North of ML |
| 8900 | PRUETTAP | 92 | 8691 | HIGHLINE | 92 | 1 | line_N-204 | ivsg_hs_rev4 | 86 | -110.9 | 23.1 | 702 | 113.3 | 1.301 | 0.352 | COACHELLA MIDWAY 230 CKT 1&2 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_hs_rev4 | 408.3 | -529.2 | -12.1 | 2209.6 | 529.3 | 1.293 | 0.753 | MIGUEL 230 CORRIDOR West of LC |
| 24086 | LUGO | 500 | 24236 | RANCHVST | 500 | 1 | line_2194 | ivsg_hs_rev4 | 2598 | 3267.8 | 569.9 | 3653.4 | 3317.1 | 1.219 | 0.681 | LUGO 500.00 - MIRALOMA 500.00 2, LUGO 500.00 - MIRALOMA 500.00 3 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_hs_rev4 | 408.3 | -496.7 | -21.5 | 2074 | 497.2 | 1.214 | 0.753 | MIGUEL 230 CORRIDOR North of ML |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23051B/23011 | ivsg_hs_rev4 | 204.1 | 245.7 | -17.5 | 1026.8 | 246.3 | 1.202 | 0.907 | EPP-ES + ES-EA-SA 230KV |
| 8311 | COACHELA | 230 | 8695 | RAMON | 230 | 1 | line_2235 | ivsg_hs_rev4 | 389 | 408.3 | 163 | 1168.3 | 439.7 | 1.201 | 0.555 | DEVERS 230.00 - MIRAGE 230.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 2 | line_2046 | ivsg_hs_rev4 | 956 | -1127.9 | -38.9 | 2868.8 | 1128.6 | 1.195 | 0.598 | LA FRESA 230.00 - REDONDO 230.00 1, REDONDO 230.00 - LITEHIPE 230.00 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 1 | line_2047 | ivsg_hs_rev4 | 956 | -1127.9 | -38.9 | 2868.8 | 1128.6 | 1.195 | 0.598 | LA FRESA 230.00 - REDONDO 230.00 2, REDONDO 230.00 - LITEHIPE 230.00 1 |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | 23021/22/23/41 | ivsg_hs_rev4 | 382.4 | 447 | 25.9 | 1896.4 | 447.7 | 1.185 | 0.589 | MIGUEL 230 CORRIDOR West of SN |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | 23021/22/23/41 | ivsg_hs_rev4 | 382.4 | 439.9 | 25.1 | 1848.3 | 440.6 | 1.155 | 0.589 | MIGUEL 230 CORRIDOR West of LC |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 2 | line_2064 | ivsg_hs_rev4 | 956 | -1080.5 | -43.9 | 2748.2 | 1081.4 | 1.145 | 0.598 | LA FRESA 230.00 - REDONDO 230.00 1, MESA CAL 230.00 - REDONDO 230.00 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 1 | line_2065 | ivsg_hs_rev4 | 956 | -1080.5 | -43.9 | 2748.2 | 1081.4 | 1.145 | 0.598 | LA FRESA 230.00 - REDONDO 230.00 2, MESA CAL 230.00 - REDONDO 230.00 1 |
| 19051 | KNOB | 161 | 8367 | PILOTKNB | 161 | 1 | line_2237 | ivsg_hs_rev4 | 165 | 179.8 | -58.8 | 675.4 | 189.2 | 1.141 | 0.966 | PALOVRDE 500.00 - DEVERS 500.00 1, J.HINDS 230.00 - MIRAGE 230.00 1 |
| 8806 | AV58TP1 | 161 | 8200 | BANTP2 | 161 | 1 | line_N-204 | ivsg_hs_rev4 | 165 | -170.1 | 51 | 656.7 | 177.6 | 1.116 | 0.55 | COACHELLA MIDWAY 230 CKT 1&2 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 2 | line_2049 | ivsg_hs_rev4 | 956 | -1030.5 | -37.8 | 2624.7 | 1031.2 | 1.094 | 0.598 | LA FRESA 230.00 - REDONDO 230.00 1, LCIENEGA 230.00 - LA FRESA 230.00 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 1 | line_2050 | ivsg_hs_rev4 | 956 | -1030.5 | -37.8 | 2624.7 | 1031.2 | 1.094 | 0.598 | LA FRESA 230.00 - REDONDO 230.00 2, LCIENEGA 230.00 - LA FRESA 230.00 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 2 | line_2057 | ivsg_hs_rev4 | 956 | -1030.1 | -34.5 | 2622.1 | 1030.6 | 1.093 | 0.598 | EL NIDO 230.00 - LA FRESA 230.00 3, LA FRESA 230.00 - REDONDO 230.00 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 1 | line_2058 | ivsg_hs_rev4 | 956 | -1030.1 | -34.5 | 2622.1 | 1030.6 | 1.093 | 0.598 | EL NIDO 230.00 - LA FRESA 230.00 3, LA FRESA 230.00 - REDONDO 230.00 2 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 2 | line_2059 | ivsg_hs_rev4 | 956 | -1030.1 | -34.5 | 2622.1 | 1030.6 | 1.093 | 0.598 | EL NIDO 230.00 - LA FRESA 230.00 4, LA FRESA 230.00 - REDONDO 230.00 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 1 | line_2060 | ivsg_hs_rev4 | 956 | -1030.1 | -34.5 | 2622.1 | 1030.6 | 1.093 | 0.598 | EL NIDO 230.00 - LA FRESA 230.00 4, LA FRESA 230.00 - REDONDO 230.00 2 |
| 8376 | RTAP2 | 92 | 8974 | RTP1 | 92 | 1 | line_2235 | ivsg_hs_rev4 | 57 | -58.9 | 13.3 | 389.6 | 60.3 | 1.092 | 0.838 | DEVERS 230.00 - MIRAGE 230.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 8695 | RAMON | 230 | 24806 | MIRAGE | 230 | 1 | line_2235 | ivsg_hs_rev4 | 392.8 | 346.4 | 152.9 | 1071.4 | 378.6 | 1.087 | 0.309 | DEVERS 230.00 - MIRAGE 230.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 24701 | KRAMER | 230 | 24085 | LUGO | 230 | 2 | line_2260 | ivsg_hs_rev4 | 478 | 525.7 | 3.8 | 1301.6 | 525.7 | 1.085 | 0.644 | KRAMER 230.00 - LUGO 230.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | 23021/22/23/41 | ivsg_hs_rev4 | 382.4 | 407.7 | 37 | 1717.2 | 409.4 | 1.073 | 0.589 | MIGUEL 230 CORRIDOR North of ML |
| 8682 | BANISTER | 161 | 8300 | BANIS230 | 230 | 1 | line_N-204 | ivsg_hs_rev4 | 225 | -237.8 | 36 | 867.8 | 240.5 | 1.07 | 0.32 | COACHELLA MIDWAY 230 CKT 1&2 |
| 19051 | KNOB | 161 | 8367 | PILOTKNB | 161 | 1 | line_2185 | ivsg_hs_rev4 | 165 | 167.4 | -57.7 | 630.9 | 177.1 | 1.066 | 0.966 | RAMON 230.00 - MIRAGE 230.00 2, J.HINDS 230.00 - MIRAGE 230.00 1 |
| 19051 | KNOB | 161 | 8367 | PILOTKNB | 161 | 1 | line_2186 | ivsg_hs_rev4 | 165 | 167.4 | -57.7 | 630.9 | 177.1 | 1.066 | 0.966 | COACHELV 230.00 - DEVERS 230.00 2, J.HINDS 230.00 - MIRAGE 230.00 1 |
| 22672 | PRCTRVLY | 138 | 22852 | TELECYN | 138 | 1 | 23021/22/23/41 | ivsg_hs_rev4 | 478 | 505.5 | 10.7 | 2130.4 | 505.7 | 1.065 | 0.58 | MIGUEL 230 CORRIDOR West of SN |
| 8690 | HIGHLINE | 230 | 8691 | HIGHLINE | 92 | 1 | line_N-204 | ivsg_hs_rev4 | 225 | 232.6 | -22 | 592.4 | 233.7 | 1.06 | 0.03 | COACHELLA MIDWAY 230 CKT 1&2 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23022/23023 | ivsg_hs_rev4 | 392 | 414 | 53.3 | 1038.7 | 417.4 | 1.06 | 0.82 | ML-MS1+ ML-MS2 230KV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23012/13807 | ivsg_hs_rev4 | 204.1 | 217.5 | -3.3 | 905.5 | 217.5 | 1.06 | 0.907 | PQ-EA 230KV + EA-NCW 138KV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23022/23023 | ivsg_hs_rev4 | 204.1 | 217.5 | -7.4 | 902.8 | 217.6 | 1.057 | 0.907 | ML-MS1+ ML-MS2 230KV |
| 19051 | KNOB | 161 | 8367 | PILOTKNB | 161 | 1 | line_2235 | ivsg_hs_rev4 | 165 | 167.4 | -52 | 624.7 | 175.3 | 1.056 | 0.966 | DEVERS 230.00 - MIRAGE 230.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 8376 | RTAP2 | 92 | 8974 | RTP1 | 92 | 1 | line_N-204 | ivsg_hs_rev4 | 57 | -56.3 | 15.8 | 374.2 | 58.5 | 1.05 | 0.838 | COACHELLA MIDWAY 230 CKT 1&2 |
| 24025 | CHINO | 230 | 24093 | MIRALOMW | 230 | 1 | line_2160 | ivsg_hs_rev4 | 705 | -716.6 | 28.9 | 1850.7 | 717.2 | 1.046 | 0.276 | CHINO 230.00 - MIRALOMA 230.00 2, CHINO 230.00 - MIRALOMA 230.00 3 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_2260 | ivsg_hs_rev4 | 56 | 56.8 | -10 | 286.7 | 57.7 | 1.04 | 0.9 | KRAMER 230.00 - LUGO 230.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 22672 | PRCTRVLY | 138 | 22852 | TELECYN | 138 | 1 | 23021/22/23/41 | ivsg_hs_rev4 | 478 | 498.3 | 8.2 | 2080.4 | 498.4 | 1.04 | 0.58 | MIGUEL 230 CORRIDOR West of LC |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23012/13808 | ivsg_hs_rev4 | 204.1 | 212.6 | -4.4 | 884.2 | 212.7 | 1.035 | 0.907 | PQ-EA 230KV + NCW-PQ 138KV |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_2235 | ivsg_hs_rev4 | 169 | 165 | 60.9 | 618.7 | 175.9 | 1.03 | 0.865 | DEVERS 230.00 - MIRAGE 230.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 22260 | ESCNDIDO | 230 | 22844 | TALEGA | 230 | 1 | 23052/23007 | ivsg_hs_rev4 | 456.1 | 470.5 | 27.5 | 1179 | 471.3 | 1.03 | 0.072 | TA-SO 1 + 2 230KV |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 2 | line_2029 | ivsg_hs_rev4 | 1195 | 1195.1 | -41.6 | 3082.7 | 1195.9 | 1.028 | 0.512 | LEWIS 230.00 - SERRANO 230.00 1, SERRANO 230.00 - VILLA PK 230.00 1 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 2 | line_2031 | ivsg_hs_rev4 | 1195 | 1195.1 | -41.6 | 3082.7 | 1195.9 | 1.028 | 0.512 | LEWIS 230.00 - SERRANO 230.00 2, SERRANO 230.00 - VILLA PK 230.00 1 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 2 | line_2278 | ivsg_hs_rev4 | 1195 | 1195.1 | -41.6 | 3082.7 | 1195.9 | 1.028 | 0.512 | LEWIS 230.00 - SERRANO 230.00 1, SERRANO 230.00 - VILLA PK 230.00 1 |
| 19051 | KNOB | 161 | 8367 | PILOTKNB | 161 | 1 | line_2194 | ivsg_hs_rev4 | 165 | 161.1 | -54.8 | 605.6 | 170.2 | 1.024 | 0.966 | LUGO 500.00 - MIRALOMA 500.00 2, LUGO 500.00 - MIRALOMA 500.00 3 |
| 19051 | KNOB | 161 | 8367 | PILOTKNB | 161 | 1 | line_2258 | ivsg_hs_rev4 | 165 | 160.7 | -54.9 | 604.3 | 169.8 | 1.021 | 0.966 | LUGO 500.00 - VINCENT 500.00 2, LUGO 500.00 - VICTORVL 500.00 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 13821C/25/23051A | ivsg_hs_rev4 | 204.1 | 209.1 | -18.1 | 870.8 | 209.9 | 1.02 | 0.907 | CH-ES-NCM-SX |
| 19051 | KNOB | 161 | 8367 | PILOTKNB | 161 | 1 | line_2236 | ivsg_hs_rev4 | 165 | 160.3 | -53.8 | 601.3 | 169.1 | 1.016 | 0.966 | PALOVRDE 500.00 - DEVERS 500.00 1, COACHELV 230.00 - DEVERS 230.00 2 |
| 24074 | LA FRESA | 230 | 24065 | HINSON | 230 | 1 | line_2061 | ivsg_hs_rev4 | 797 | -777.2 | 49.2 | 2029.6 | 778.7 | 1.014 | 0.144 | LA FRESA 230.00 - REDONDO 230.00 1, LA FRESA 230.00 - REDONDO 230.00 2 |
| 19051 | KNOB | 161 | 8367 | PILOTKNB | 161 | 1 | 23002/06/10 | ivsg_hs_rev4 | 165 | 159 | -55.5 | 599.7 | 168.5 | 1.014 | 0.966 | SANLUISREY 230 CORRIDOR |
| 19051 | KNOB | 161 | 8367 | PILOTKNB | 161 | 1 | line_2255 | ivsg_hs_rev4 | 165 | 158.8 | -54.5 | 597.1 | 167.9 | 1.009 | 0.966 | LUGO 500.00 - MIRALOMA 500.00 3, LUGO 500.00 - MOHAVE 500.00 1 |
| 19051 | KNOB | 161 | 8367 | PILOTKNB | 161 | 1 | line_2256 | ivsg_hs_rev4 | 165 | 158.5 | -54.5 | 596.1 | 167.6 | 1.007 | 0.966 | ELDORDO 500.00 - LUGO 500.00 1, LUGO 500.00 - MIRALOMA 500.00 2 |
| 19051 | KNOB | 161 | 8367 | PILOTKNB | 161 | 1 | line_2200 | ivsg_hs_rev4 | 165 | 156.8 | -54.2 | 589.8 | 165.9 | 0.997 | 0.966 | LUGO 500.00 - MOHAVE 500.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 19051 | KNOB | 161 | 8367 | PILOTKNB | 161 | 1 | line_2201 | ivsg_hs_rev4 | 165 | 156.8 | -54.2 | 589.8 | 165.9 | 0.997 | 0.966 | LUGO 500.00 - MOHAVE 500.00 1, PISGAH 230.00 - LUGO 230.00 2 |
| 24016 | BARRE | 230 | 24044 | ELLIS | 230 | 1 | line_2115 | ivsg_hs_rev4 | 988 | 950.8 | -43 | 2465.9 | 951.7 | 0.994 | 0.442 | S.ONOFRE 230.00 - SANTIAGO 230.00 1, S.ONOFRE 230.00 - SANTIAGO 230.00 2 |
| 8376 | RTAP2 | 92 | 8974 | RTP1 | 92 | 1 | line_2237 | ivsg_hs_rev4 | 57 | -52.9 | 19.1 | 353.3 | 56.2 | 0.993 | 0.838 | PALOVRDE 500.00 - DEVERS 500.00 1, J.HINDS 230.00 - MIRAGE 230.00 1 |
| 24086 | LUGO | 500 | 24097 | MOHAVE | 500 | 1 | line_2234 | ivsg_hs_rev4 | 1386 | -1426.9 | 89.8 | 1571.3 | 1429.7 | 0.991 | 0.682 | MOHAVE 500.00 - ELDORDO 500.00 1, PISGAH 230.00 - ELDORDO 230.00 2 |
| 24807 | MIRAGE | 115 | 24819 | CONCHO | 115 | 1 | line_2235 | ivsg_hs_rev4 | 183 | 164.3 | -3.3 | 907.4 | 164.4 | 0.988 | 0.869 | DEVERS 230.00 - MIRAGE 230.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 24126 | RIOHONDO | 230 | 24155 | VINCENT | 230 | 2 | line_2097 | ivsg_hs_rev4 | 988 | -926.5 | 112 | 2447.5 | 933.2 | 0.987 | 0.719 | GOODRICH 230.00 - GOULD 230.00 1, VINCENT 230.00 - MESA CAL 230.00 1 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2100 | ivsg_hs_rev4 | 2400 | -2460.9 | -233.4 | 2727.2 | 2471.9 | 0.984 | 0.775 | EAGLROCK 230.00 - MESA CAL 230.00 1, SYLMAR S 230.00 - GOULD 230.00 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23004/23001 | ivsg_hs_rev4 | 204.1 | 202.3 | -7.4 | 840 | 202.5 | 0.984 | 0.907 | SA-MS 1 + SA-MS 2 230KV |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23022/23023 | ivsg_hs_rev4 | 408.3 | -409.3 | -9.1 | 1676.6 | 409.4 | 0.982 | 0.753 | ML-MS1+ ML-MS2 230KV |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23002/06/10 | ivsg_hs_rev4 | 204.1 | 199 | -1.6 | 838.6 | 199 | 0.982 | 0.907 | SANLUISREY 230 CORRIDOR |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2191 | ivsg_hs_rev4 | 2400 | -2454.2 | -81 | 2712.5 | 2455.5 | 0.979 | 0.775 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - ELDORDO 230.00 2 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2200 | ivsg_hs_rev4 | 2400 | -2439.5 | -72 | 2706 | 2440.6 | 0.976 | 0.775 | LUGO 500.00 - MOHAVE 500.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2201 | ivsg_hs_rev4 | 2400 | -2439.3 | -72.1 | 2705.7 | 2440.4 | 0.976 | 0.775 | LUGO 500.00 - MOHAVE 500.00 1, PISGAH 230.00 - LUGO 230.00 2 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2192 | ivsg_hs_rev4 | 2400 | -2442.1 | -90.8 | 2700.4 | 2443.8 | 0.974 | 0.775 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2193 | ivsg_hs_rev4 | 2400 | -2441.9 | -90.9 | 2700.1 | 2443.6 | 0.974 | 0.775 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - LUGO 230.00 2 |
| 24807 | MIRAGE | 115 | 24816 | SANTA RO | 115 | 1 | line_2235 | ivsg_hs_rev4 | 183.3 | 162.2 | -8.4 | 896.8 | 162.4 | 0.974 | 0.86 | DEVERS 230.00 - MIRAGE 230.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 22672 | PRCTRVLY | 138 | 22852 | TELECYN | 138 | 1 | 23021/22/23/41 | ivsg_hs_rev4 | 478 | 465.9 | 17.6 | 1944.7 | 466.2 | 0.972 | 0.58 | MIGUEL 230 CORRIDOR North of ML |
| 22596 | OLD TOWN | 230 | 22466 | MLMS3TAP | 230 | 1 | 23021/22/23/41 | ivsg_hs_rev4 | 912 | -857.5 | 102 | 2219.1 | 863.5 | 0.97 | 0.572 | MIGUEL 230 CORRIDOR North of ML |
| 22596 | OLD TOWN | 230 | 22466 | MLMS3TAP | 230 | 1 | 23021/22/23/41 | ivsg_hs_rev4 | 912 | -854.9 | 93.3 | 2217.2 | 860 | 0.969 | 0.572 | MIGUEL 230 CORRIDOR West of SN |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2103 | ivsg_hs_rev4 | 2400 | -2418.4 | -219.7 | 2677.6 | 2428.4 | 0.966 | 0.775 | EAGLROCK 230.00 - SYLMAR S 230.00 1, SYLMAR S 230.00 - GOULD 230.00 1 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2096 | ivsg_hs_rev4 | 2400 | -2411.7 | -241.4 | 2669.5 | 2423.8 | 0.963 | 0.775 | EAGLROCK 230.00 - MESA CAL 230.00 1, GOODRICH 230.00 - GOULD 230.00 1 |
| 19020 | BLYTHE | 161 | 24017 | BLYTHESC | 161 | 1 | line_2235 | ivsg_hs_rev4 | 244 | 231.5 | 61.2 | 842.1 | 239.5 | 0.962 | 0.862 | DEVERS 230.00 - MIRAGE 230.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 22596 | OLD TOWN | 230 | 22466 | MLMS3TAP | 230 | 1 | 23021/22/23/41 | ivsg_hs_rev4 | 912 | -850.4 | 101.6 | 2198.5 | 856.5 | 0.961 | 0.572 | MIGUEL 230 CORRIDOR West of LC |
| 24126 | RIOHONDO | 230 | 24155 | VINCENT | 230 | 2 | line_2101 | ivsg_hs_rev4 | 988 | -902.5 | 113.7 | 2368.9 | 909.6 | 0.955 | 0.719 | EAGLROCK 230.00 - MESA CAL 230.00 1, VINCENT 230.00 - MESA CAL 230.00 1 |
| 14008 | JOJOBA | 500 | 15011 | KYRENE | 500 | 1 | line_2245 | ivsg_hs_rev4 | 1732 | 1745 | 136.9 | 1906.1 | 1750.4 | 0.955 | 0.922 | DEVERS 500.00 - VALLEYSC 500.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 1 | line_2030 | ivsg_hs_rev4 | 1287 | 1195.1 | -41.6 | 3082.7 | 1195.9 | 0.954 | 0.476 | LEWIS 230.00 - SERRANO 230.00 1, SERRANO 230.00 - VILLA PK 230.00 2 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 1 | line_2032 | ivsg_hs_rev4 | 1287 | 1195.1 | -41.6 | 3082.7 | 1195.9 | 0.954 | 0.476 | LEWIS 230.00 - SERRANO 230.00 2, SERRANO 230.00 - VILLA PK 230.00 2 |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_N-204 | ivsg_hs_rev4 | 169 | 159.7 | 34.6 | 574.5 | 163.4 | 0.952 | 0.865 | COACHELLA MIDWAY 230 CKT 1&2 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | 23051B/23011 | ivsg_hs_rev4 | 392 | 370.6 | -5.6 | 936.6 | 370.7 | 0.95 | 0.67 | EPP-ES + ES-EA-SA 230KV |
| 8376 | RTAP2 | 92 | 8974 | RTP1 | 92 | 1 | 23021/22/23/41 | ivsg_hs_rev4 | 57 | -50.5 | 19 | 337.3 | 54 | 0.949 | 0.838 | MIGUEL 230 CORRIDOR West of SN |
| 8376 | RTAP2 | 92 | 8974 | RTP1 | 92 | 1 | line_2236 | ivsg_hs_rev4 | 57 | -50.3 | 18.6 | 336 | 53.7 | 0.945 | 0.838 | PALOVRDE 500.00 - DEVERS 500.00 1, COACHELV 230.00 - DEVERS 230.00 2 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 13807/08/23013 | ivsg_hs_rev4 | 204.1 | 194.9 | -3.9 | 807.3 | 194.9 | 0.945 | 0.907 | PQ ENCINA |
| 8376 | RTAP2 | 92 | 8974 | RTP1 | 92 | 1 | 23021/22/23/41 | ivsg_hs_rev4 | 57 | -50.2 | 19.2 | 334.9 | 53.7 | 0.942 | 0.838 | MIGUEL 230 CORRIDOR North of ML |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_2194 | ivsg_hs_rev4 | 56 | 51 | -10.4 | 258 | 52.1 | 0.94 | 0.9 | LUGO 500.00 - MIRALOMA 500.00 2, LUGO 500.00 - MIRALOMA 500.00 3 |
| 24126 | RIOHONDO | 230 | 24155 | VINCENT | 230 | 2 | line_2100 | ivsg_hs_rev4 | 988 | -881.3 | 117.2 | 2329.7 | 889.1 | 0.939 | 0.719 | EAGLROCK 230.00 - MESA CAL 230.00 1, SYLMAR S 230.00 - GOULD 230.00 1 |
| 24042 | ELDORDO | 500 | 24086 | LUGO | 500 | 1 | line_2258 | ivsg_hs_rev4 | 1386 | 1374.7 | 262.8 | 1488 | 1399.6 | 0.938 | 0.611 | LUGO 500.00 - VINCENT 500.00 2, LUGO 500.00 - VICTORVL 500.00 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23013/27/28 | ivsg_hs_rev4 | 204.1 | 193.2 | -6 | 801.3 | 193.3 | 0.938 | 0.907 | OLD TOWN TO OLD TOWN JCT |
| 8376 | RTAP2 | 92 | 8974 | RTP1 | 92 | 1 | 23021/22/23/41 | ivsg_hs_rev4 | 57 | -49.7 | 19.1 | 332.1 | 53.3 | 0.935 | 0.838 | MIGUEL 230 CORRIDOR West of LC |
| 8374 | ROCKWOOD | 92 | 8980 | BRAW92 | 92 | 1 | line_N-204 | ivsg_hs_rev4 | 132 | 123.3 | 0.3 | 771.8 | 123.3 | 0.932 | 0.81 | COACHELLA MIDWAY 230 CKT 1&2 |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_2236 | ivsg_hs_rev4 | 169 | 156.1 | 33.6 | 561.5 | 159.7 | 0.931 | 0.865 | PALOVRDE 500.00 - DEVERS 500.00 1, COACHELV 230.00 - DEVERS 230.00 2 |
| 24006 | ALMITOSE | 230 | 24021 | CENTER S | 230 | 1 | line_2002 | ivsg_hs_rev4 | 988 | 898.9 | 144.7 | 2293.1 | 910.5 | 0.925 | 0.585 | ALMITOSE 230.00 - BARRE 230.00 1, ALMITOSW 230.00 - LITEHIPE 230.00 1 |
| 24614 | TAP601 | 115 | 24702 | KRAMER | 115 | 1 | line_2260 | ivsg_hs_rev4 | 217.1 | -189.9 | 69.4 | 1004.8 | 202.2 | 0.924 | 0.717 | KRAMER 230.00 - LUGO 230.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2255 | ivsg_hs_rev4 | 2400 | -2299 | -120.5 | 2559.3 | 2302.2 | 0.923 | 0.775 | LUGO 500.00 - MIRALOMA 500.00 3, LUGO 500.00 - MOHAVE 500.00 1 |
| 8376 | RTAP2 | 92 | 8974 | RTP1 | 92 | 1 | line_2115 | ivsg_hs_rev4 | 57 | -49.1 | 18.8 | 327.2 | 52.5 | 0.921 | 0.838 | S.ONOFRE 230.00 - SANTIAGO 230.00 1, S.ONOFRE 230.00 - SANTIAGO 230.00 2 |
| 22844 | TALEGA | 230 | 24131 | S.ONOFRE | 230 | 1 | 23002/06/10 | ivsg_hs_rev4 | 456.1 | -420.2 | 12.7 | 1054.7 | 420.4 | 0.921 | 0.554 | SANLUISREY 230 CORRIDOR |
| 22844 | TALEGA | 230 | 24131 | S.ONOFRE | 230 | 2 | 23002/06/10 | ivsg_hs_rev4 | 456.1 | -420.2 | 12.7 | 1054.7 | 420.4 | 0.921 | 0.554 | SANLUISREY 230 CORRIDOR |
| 24006 | ALMITOSE | 230 | 24021 | CENTER S | 230 | 1 | line_2001 | ivsg_hs_rev4 | 988 | 895.6 | 147.3 | 2280.9 | 907.6 | 0.92 | 0.585 | ALMITOSE 230.00 - BARRE 230.00 1, ALMITOSW 230.00 - BARRE 230.00 2 |
| 24126 | RIOHONDO | 230 | 24155 | VINCENT | 230 | 2 | line_2076 | ivsg_hs_rev4 | 988 | -872.9 | 105.3 | 2281.6 | 879.2 | 0.92 | 0.719 | GOODRICH 230.00 - LAGUBELL 230.00 1, VINCENT 230.00 - MESA CAL 230.00 1 |
| 19020 | BLYTHE | 161 | 24017 | BLYTHESC | 161 | 1 | line_N-204 | ivsg_hs_rev4 | 244 | 226.2 | 34.9 | 804.6 | 228.8 | 0.92 | 0.862 | COACHELLA MIDWAY 230 CKT 1&2 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23021/23041 | ivsg_hs_rev4 | 392 | 357.7 | 36.3 | 903 | 359.6 | 0.92 | 0.82 | ML-SX + OM-SX 230KV |
| 19051 | KNOB | 161 | 8367 | PILOTKNB | 161 | 1 | line_2189 | ivsg_hs_rev4 | 165 | 144.3 | -51.4 | 543.6 | 153.2 | 0.919 | 0.966 | CAMINO 230.00 - MEAD S 230.00 E, CAMINO 230.00 - MEAD S 230.00 W |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_N-202 | ivsg_hs_rev4 | 169 | 154 | 33.6 | 554.2 | 157.6 | 0.919 | 0.865 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 1 |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_2189 | ivsg_hs_rev4 | 169 | 154.9 | 29.5 | 554.4 | 157.7 | 0.918 | 0.865 | CAMINO 230.00 - MEAD S 230.00 E, CAMINO 230.00 - MEAD S 230.00 W |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2256 | ivsg_hs_rev4 | 2400 | -2289.9 | -140 | 2541.1 | 2294.2 | 0.917 | 0.775 | ELDORDO 500.00 - LUGO 500.00 1, LUGO 500.00 - MIRALOMA 500.00 2 |
| 25406 | J.HINDS | 230 | 24806 | MIRAGE | 230 | 1 | line_2235 | ivsg_hs_rev4 | 239 | 193 | -21.4 | 549 | 194.2 | 0.915 | 0.588 | DEVERS 230.00 - MIRAGE 230.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 24126 | RIOHONDO | 230 | 24155 | VINCENT | 230 | 2 | line_2096 | ivsg_hs_rev4 | 988 | -859.8 | 104.7 | 2267.2 | 866.2 | 0.914 | 0.719 | EAGLROCK 230.00 - MESA CAL 230.00 1, GOODRICH 230.00 - GOULD 230.00 1 |
| 24602 | VICTOR | 115 | 24702 | KRAMER | 115 | 1 | line_2260 | ivsg_hs_rev4 | 217.1 | -185.3 | 79.5 | 988.7 | 201.6 | 0.91 | 0.703 | KRAMER 230.00 - LUGO 230.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 13821B/638 | ivsg_hs_rev4 | 392 | 354.3 | 38.8 | 893.6 | 356.4 | 0.91 | 0.82 | CH-SX-SN 138KV + SAN VCNT-EL 69KV |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_2245 | ivsg_hs_rev4 | 169 | 151.8 | 34.6 | 547.5 | 155.7 | 0.908 | 0.865 | DEVERS 500.00 - VALLEYSC 500.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 24126 | RIOHONDO | 230 | 24155 | VINCENT | 230 | 2 | line_2103 | ivsg_hs_rev4 | 988 | -852.6 | 104.2 | 2249.8 | 858.9 | 0.907 | 0.719 | EAGLROCK 230.00 - SYLMAR S 230.00 1, SYLMAR S 230.00 - GOULD 230.00 1 |
| 19020 | BLYTHE | 161 | 24017 | BLYTHESC | 161 | 1 | line_2236 | ivsg_hs_rev4 | 244 | 222.6 | 33.8 | 791.6 | 225.2 | 0.905 | 0.862 | PALOVRDE 500.00 - DEVERS 500.00 1, COACHELV 230.00 - DEVERS 230.00 2 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2245 | ivsg_hs_rev4 | 2400 | -2260.3 | -112.8 | 2504.8 | 2263.1 | 0.904 | 0.775 | DEVERS 500.00 - VALLEYSC 500.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 24093 | MIRALOMW | 230 | 24158 | WALNUT | 230 | 1 | line_2089 | ivsg_hs_rev4 | 797 | 678.8 | 165.5 | 1801 | 698.7 | 0.902 | 0.47 | MESA CAL 230.00 - WALNUT 230.00 1, OLINDA 230.00 - WALNUT 230.00 1 |
| 24807 | MIRAGE | 115 | 24819 | CONCHO | 115 | 1 | line_2245 | ivsg_hs_rev4 | 183 | 163.9 | -7.8 | 828.4 | 164.1 | 0.902 | 0.869 | DEVERS 500.00 - VALLEYSC 500.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2075 | ivsg_hs_rev4 | 2400 | -2262.3 | -195.8 | 2494.2 | 2270.7 | 0.9 | 0.775 | EAGLROCK 230.00 - MESA CAL 230.00 1, GOODRICH 230.00 - LAGUBELL 230.00 1 |

ivsg_hs_rev4.sav
No Solve Summary
N-2 Outages

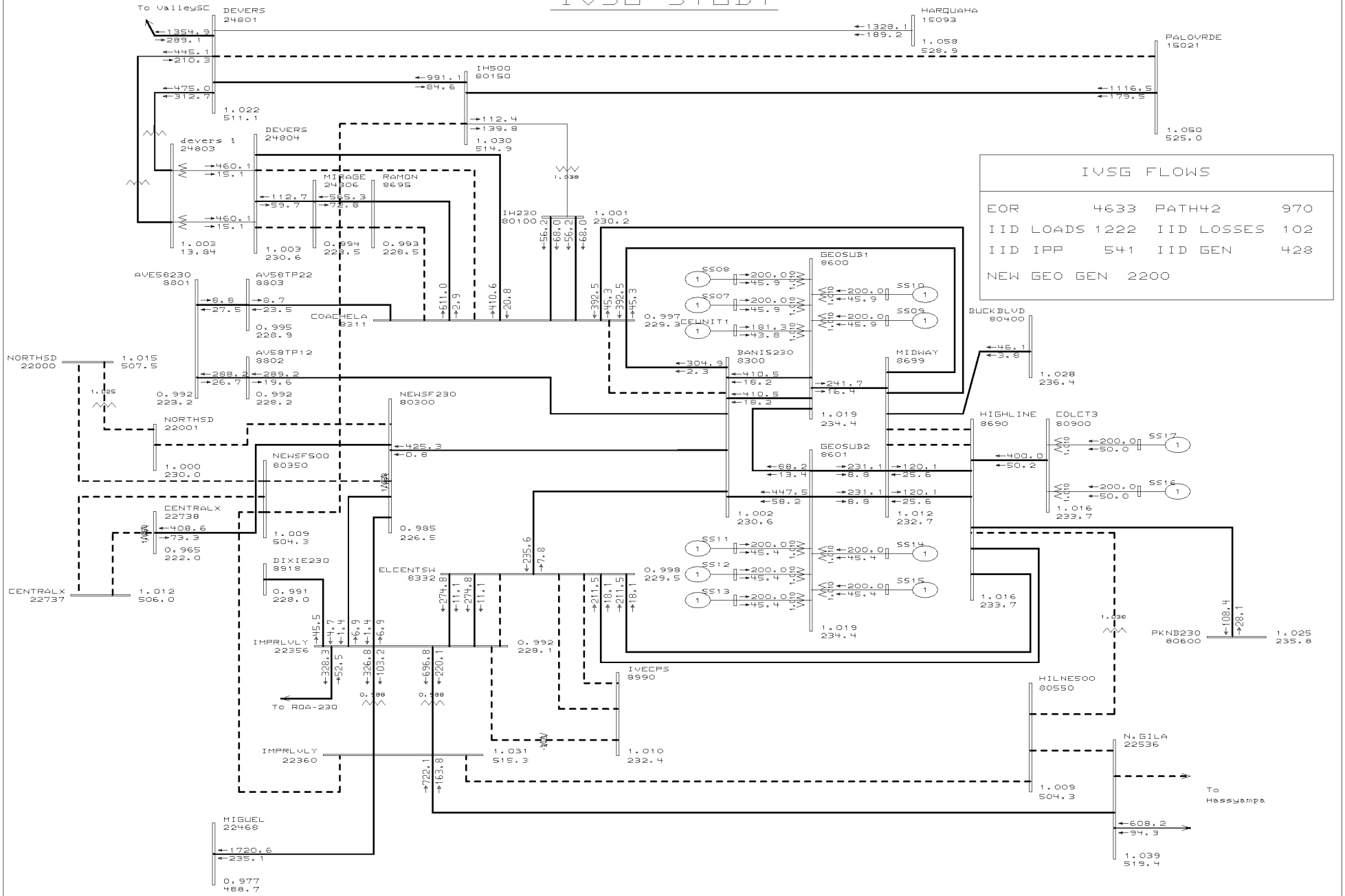
| Contingency-Description | Case | Problem-Description |
|---|---|---|
| DEVERS 230.00 - MIRAGE 230.00 1, J.HINDS 230.00 - MIRAGE 230.00 1 | ivsg_hs_rev4 | Pmis 8732 COLMAC 92.00 = -216.07 MW + j -3148.30 MVAR |
| VICTOR 230.00 - LUGO 230.00 1, VICTOR 230.00 - LUGO 230.00 2 | ivsg_hs_rev4 | Pmis 24602 VICTOR 115.00 = -317967.25 MW + j -248987.98 MVAR |

# Imperial Valley Study Group

## Appendix A.4.2

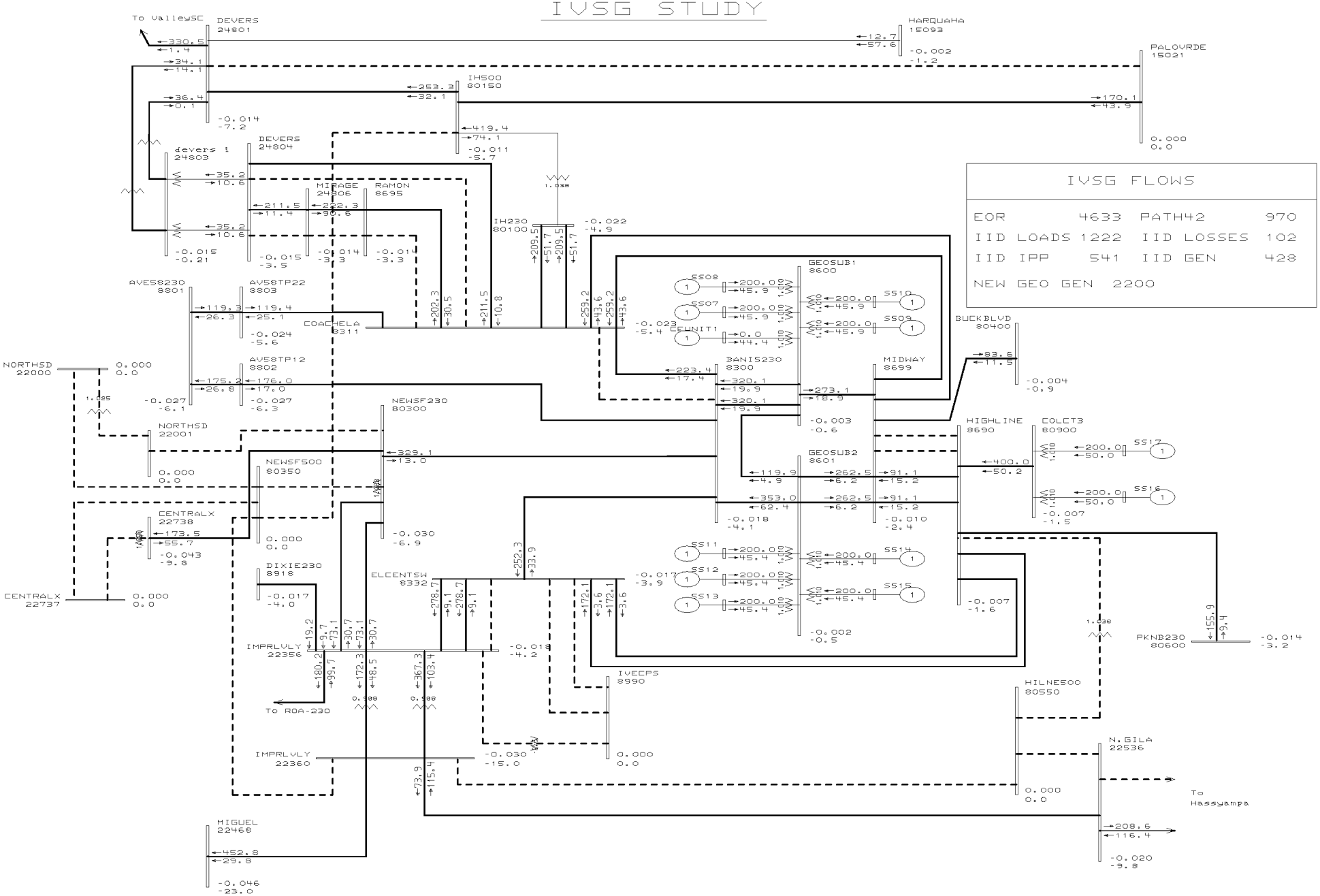
Alt 1 D1
Heavy Summer
Alternative 1
Dispatch 1

# IVSG STUDY




| IVSG FLOWS | | | |
|---|---|---|---|
| EOR | 4633 | PATH42 | 970 |
| IID LOADS | 1222 | IID LOSSES | 102 |
| IID IPP | 541 | IID GEN | 428 |
| NEW GEO GEN | 2200 | | |

# IVSG STUDY


To ValleySC
DEVERS 24801
HARQUAHA 15093
PALOVRDE 15021
IH500 80150
devers 1 24803
DEVERS 24804
MIRAGE 24806
RAMON 8695
IH230 80100
AVE58230 8801
AV58TP22 8803
AV58TP12 8802
COACHELA 8311
GEOSUB1 8600
BANIS230 8300
MIDWAY 8699
BUCKBLVD 80400
NORTHSD 22000
NORTHSD 22001
NEWSF230 80300
NEWSF500 80350
GEOSUB2 8601
HIGHLINE 8690
COLCT3 80900
CENTRALX 22738
CENTRALX 22737
DIXIE230 8918
ELCENTSW 8332
IMPRLVLY 22356
IMPRLVLY 22360
IVECPS 8990
HILNE500 80550
N.GILA 22536
PKNB230 80600
MIGUEL 22468
To ROA-230
To Hassyampa
IVSG FLOWS
EOR 4633 PATH42 970
IID LOADS 1222 IID LOSSES 102
IID IPP 541 IID GEN 428
NEW GEO GEN 2200

ivsg_hs_alt1d1.sav
Voltage Summary
N-0 Outages

| Bus | Name | kV | Area | Zone | Outage | Case | Vbase | Vcont | DeltaV | Vmin | Vmax | Max-dv | Contingency Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20077 | SIM-115 | 115 | 20 | 205 | base | ivsg_hs_alt1d1 | 0.931 | 0.931 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24035 | EAGLEMTN | 161 | 24 | 248 | base | ivsg_hs_alt1d1 | 0.932 | 0.932 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 20076 | SQN-115 | 115 | 20 | 205 | base | ivsg_hs_alt1d1 | 0.936 | 0.936 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14534 | N.GILA 4 | 100 | 14 | 847 | base | ivsg_hs_alt1d1 | 0.942 | 0.942 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15021 | PALOVRDE | 500 | 14 | 158 | base | ivsg_hs_alt1d1 | 1.05 | 1.05 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15051 | BROWNING | 500 | 14 | 158 | base | ivsg_hs_alt1d1 | 1.05 | 1.05 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24775 | RUSH | 115 | 24 | 247 | base | ivsg_hs_alt1d1 | 1.05 | 1.05 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15090 | HASSYAMP | 500 | 14 | 158 | base | ivsg_hs_alt1d1 | 1.052 | 1.052 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24086 | LUGO | 500 | 24 | 240 | base | ivsg_hs_alt1d1 | 1.052 | 1.052 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15092 | ARLINTON | 500 | 14 | 158 | base | ivsg_hs_alt1d1 | 1.053 | 1.053 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15094 | MESQUITE | 500 | 14 | 158 | base | ivsg_hs_alt1d1 | 1.053 | 1.053 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14009 | REDHAWK | 500 | 14 | 141 | base | ivsg_hs_alt1d1 | 1.054 | 1.054 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14010 | TS5 | 500 | 14 | 141 | base | ivsg_hs_alt1d1 | 1.056 | 1.056 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 79043 | KAYENTA | 230 | 14 | 191 | base | ivsg_hs_alt1d1 | 1.056 | 1.056 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15093 | HARQUAHA | 500 | 14 | 158 | base | ivsg_hs_alt1d1 | 1.058 | 1.058 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14230 | VERDE N | 230 | 14 | 141 | base | ivsg_hs_alt1d1 | 1.058 | 1.058 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14247 | VERDE S | 230 | 14 | 141 | base | ivsg_hs_alt1d1 | 1.058 | 1.058 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14011 | RACEWAY | 500 | 14 | 141 | base | ivsg_hs_alt1d1 | 1.058 | 1.058 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24776 | LEE VINE | 115 | 24 | 247 | base | ivsg_hs_alt1d1 | 1.058 | 1.058 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15034 | PERKINS | 500 | 14 | 158 | base | ivsg_hs_alt1d1 | 1.061 | 1.061 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14205 | COCONINO | 230 | 14 | 141 | base | ivsg_hs_alt1d1 | 1.061 | 1.061 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14008 | JOJOBA | 500 | 14 | 141 | base | ivsg_hs_alt1d1 | 1.061 | 1.061 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15041 | SILVERKG | 500 | 14 | 158 | base | ivsg_hs_alt1d1 | 1.062 | 1.062 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15061 | RUDD | 500 | 14 | 158 | base | ivsg_hs_alt1d1 | 1.062 | 1.062 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24156 | VINCENT | 500 | 24 | 240 | base | ivsg_hs_alt1d1 | 1.062 | 1.062 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14234 | YAVAPAI | 230 | 14 | 141 | base | ivsg_hs_alt1d1 | 1.063 | 1.063 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14355 | PRESCOTT | 115 | 14 | 141 | base | ivsg_hs_alt1d1 | 1.066 | 1.066 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14544 | PRESCOT2 | 100 | 14 | 141 | base | ivsg_hs_alt1d1 | 1.066 | 1.066 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14543 | PRESCOT1 | 100 | 14 | 141 | base | ivsg_hs_alt1d1 | 1.066 | 1.066 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14001 | FOURCORN | 500 | 14 | 141 | base | ivsg_hs_alt1d1 | 1.067 | 1.067 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14256 | FLAGSTAF | 230 | 14 | 141 | base | ivsg_hs_alt1d1 | 1.067 | 1.067 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14587 | FLAGSTF1 | 100 | 14 | 141 | base | ivsg_hs_alt1d1 | 1.068 | 1.068 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24729 | INYO | 230 | 24 | 247 | base | ivsg_hs_alt1d1 | 1.068 | 1.068 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14007 | GILARIVR | 500 | 14 | 141 | base | ivsg_hs_alt1d1 | 1.069 | 1.069 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 79264 | PINAL_W | 500 | 14 | 141 | base | ivsg_hs_alt1d1 | 1.07 | 1.07 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14006 | YAVAPAI | 500 | 14 | 141 | base | ivsg_hs_alt1d1 | 1.071 | 1.071 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14004 | SAGUARO | 500 | 14 | 141 | base | ivsg_hs_alt1d1 | 1.075 | 1.075 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14215 | LEUPP | 230 | 14 | 141 | base | ivsg_hs_alt1d1 | 1.075 | 1.075 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15992 | SEV | 500 | 14 | 158 | base | ivsg_hs_alt1d1 | 1.075 | 1.075 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 16000 | TORTOLIT | 500 | 14 | 160 | base | ivsg_hs_alt1d1 | 1.075 | 1.075 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 16001 | TORTLIT2 | 500 | 14 | 160 | base | ivsg_hs_alt1d1 | 1.075 | 1.075 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14100 | CHOLLA | 345 | 14 | 141 | base | ivsg_hs_alt1d1 | 1.077 | 1.077 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15001 | CORONADO | 500 | 14 | 158 | base | ivsg_hs_alt1d1 | 1.08 | 1.08 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14000 | CHOLLA | 500 | 14 | 141 | base | ivsg_hs_alt1d1 | 1.081 | 1.081 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 19038 | MEAD | 500 | 14 | 191 | base | ivsg_hs_alt1d1 | 1.083 | 1.083 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24042 | ELDORDO | 500 | 24 | 240 | base | ivsg_hs_alt1d1 | 1.083 | 1.083 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24097 | MOHAVE | 500 | 24 | 240 | base | ivsg_hs_alt1d1 | 1.086 | 1.086 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14204 | CHOLLA | 230 | 14 | 141 | base | ivsg_hs_alt1d1 | 1.088 | 1.088 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14509 | CHOLLA 7 | 100 | 14 | 141 | base | ivsg_hs_alt1d1 | 1.094 | 1.094 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14267 | SECDKNOL | 230 | 14 | 141 | base | ivsg_hs_alt1d1 | 1.099 | 1.099 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14003 | NAVAJO | 500 | 14 | 141 | base | ivsg_hs_alt1d1 | 1.101 | 1.101 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14002 | MOENKOPI | 500 | 14 | 141 | base | ivsg_hs_alt1d1 | 1.103 | 1.103 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |

ivsg_hs_alt1d1.sav
Flow Summary
N-0 Outages

| LEGEND | % of RATING 1 | |
|---|---|---|
| C_pu | 100% - 110% | |
| C_pu | 110% - 120% | P.U. of |
| C_pu | > 120% | Rate 1 |

| FROM | FR | BKV | TO | TO | BKV | CK | Outage_Name | Case | Rate-Mva | Pflow | Qflow | Amps | MVA | C_pu | B_pu | Contingency_Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24910 | CAL ELEC | 115 | 24912 | SHANDIN | 115 | 1 | base | ivsg_hs_alt1d1 | 109.1 | -124.1 | 58.4 | 685.3 | 137.2 | 1.254 | 1.254 | Base system (n-0) |
| 14248 | GLENDALW | 230 | 14212 | GLENDALE | 230 | 1 | base | ivsg_hs_alt1d1 | 457 | 571.5 | 32.4 | 1432.8 | 572.4 | 1.249 | 1.249 | Base system (n-0) |
| 14248 | GLENDALW | 230 | 15201 | AGUAFRIA | 230 | 1 | base | ivsg_hs_alt1d1 | 457 | -571.5 | -32.4 | 1432.8 | 572.4 | 1.249 | 1.249 | Base system (n-0) |
| 14221 | PNPKAPS | 230 | 19062 | PINPK | 230 | 1 | base | ivsg_hs_alt1d1 | 637.4 | -782.3 | -186.4 | 1979.8 | 804.2 | 1.237 | 1.237 | Base system (n-0) |
| 24912 | SHANDIN | 115 | 24916 | TAP902 | 115 | 1 | base | ivsg_hs_alt1d1 | 109.1 | -119.2 | 33.6 | 615.7 | 123.8 | 1.125 | 1.125 | Base system (n-0) |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | base | ivsg_hs_alt1d1 | 204.1 | 225.2 | -4.7 | 960.1 | 225.3 | 1.124 | 1.124 | Base system (n-0) |
| 14212 | GLENDALE | 230 | 14270 | GRNDTRML | 230 | 1 | base | ivsg_hs_alt1d1 | 457 | 506.1 | 24.9 | 1268.5 | 506.7 | 1.108 | 1.108 | Base system (n-0) |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | base | ivsg_hs_alt1d1 | 392 | 410.6 | 42 | 1070.9 | 412.8 | 1.05 | 1.05 | Base system (n-0) |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | base | ivsg_hs_alt1d1 | 408.3 | -405.6 | 5 | 1728.5 | 405.7 | 1.012 | 1.012 | Base system (n-0) |
| 14206 | CTRYCLUB | 230 | 14270 | GRNDTRML | 230 | 1 | base | ivsg_hs_alt1d1 | 509.9 | -502.8 | -25.3 | 1271.8 | 503.4 | 0.994 | 0.994 | Base system (n-0) |
| 14202 | CACTUS | 230 | 14221 | PNPKAPS | 230 | 1 | base | ivsg_hs_alt1d1 | 371 | -363.4 | -48.7 | 920.2 | 366.6 | 0.988 | 0.988 | Base system (n-0) |
| 15230 | RUDD | 230 | 15218 | WHITETNK | 230 | 1 | base | ivsg_hs_alt1d1 | 725 | 694.7 | -18.3 | 1740.2 | 694.9 | 0.956 | 0.956 | Base system (n-0) |
| 24087 | MAGUNDEN | 230 | 24101 | OMAR | 230 | 1 | base | ivsg_hs_alt1d1 | 643 | -591.8 | 130 | 1534.3 | 605.9 | 0.951 | 0.951 | Base system (n-0) |
| 24806 | MIRAGE | 230 | 24807 | MIRAGE | 115 | 1 | base | ivsg_hs_alt1d1 | 280 | 265.6 | 26.8 | 674.5 | 267 | 0.95 | 0.95 | Base system (n-0) |
| 24806 | MIRAGE | 230 | 24807 | MIRAGE | 115 | 2 | base | ivsg_hs_alt1d1 | 280 | 265.6 | 26.8 | 674.5 | 267 | 0.95 | 0.95 | Base system (n-0) |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | base | ivsg_hs_alt1d1 | 132 | 126.6 | -11.3 | 784.5 | 127.1 | 0.947 | 0.947 | Base system (n-0) |
| 24702 | KRAMER | 115 | 24753 | SUNGEN | 115 | 1 | base | ivsg_hs_alt1d1 | 183.3 | -170.5 | 31.2 | 863.6 | 173.4 | 0.939 | 0.939 | Base system (n-0) |
| 14008 | JOJOBA | 500 | 15011 | KYRENE | 500 | 1 | base | ivsg_hs_alt1d1 | 1732 | 1713.9 | 134.5 | 1871.1 | 1719.2 | 0.937 | 0.937 | Base system (n-0) |
| 26098 | SYLMAR3 | 230 | 24147 | SYLMAR S | 230 | 1 | base | ivsg_hs_alt1d1 | 1100 | 841.2 | -523.3 | 2578.8 | 990.6 | 0.934 | 0.934 | Base system (n-0) |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | base | ivsg_hs_alt1d1 | 56 | 50 | -10.6 | 253.3 | 51.1 | 0.92 | 0.92 | Base system (n-0) |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | base | ivsg_hs_alt1d1 | 392 | 357.2 | -7.3 | 923.4 | 357.2 | 0.91 | 0.91 | Base system (n-0) |
| 14207 | DEERVALY | 230 | 14231 | WESTWING | 230 | 1 | base | ivsg_hs_alt1d1 | 720 | -647.1 | -80.2 | 1633.5 | 652 | 0.904 | 0.904 | Base system (n-0) |

ivsg_hs_alt1d1.sav
VOLTAGE Summary
N-1 Outages

| Bus | Name | kV | Area | Zone | Outage | Case | Vbase | Vcont | DeltaV | Vmin | Vmax | Max-dv | Contingency Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24017 | BLYTHESC | 161 | 24 | 248 | line_007 | ivsg_hs_alt1d1 | 1.02 | 0.868 | -0.152 | 0.9 | 1.05 | 0.05 | line BLYTHE to BLYTHESC 161 ck 1 |
| 25423 | ESRP MWD | 115 | 24 | 254 | tran_247 | ivsg_hs_alt1d1 | 1.019 | 0.926 | -0.093 | 0.9 | 1.05 | 0.05 | tran VALLEYSC 500 to VALLEYSC 115 ck 1 |
| 25423 | ESRP MWD | 115 | 24 | 254 | tran_248 | ivsg_hs_alt1d1 | 1.019 | 0.926 | -0.093 | 0.9 | 1.05 | 0.05 | tran VALLEYSC 500 to VALLEYSC 115 ck 2 |
| 24731 | INYOKERN | 115 | 24 | 247 | line_175 | ivsg_hs_alt1d1 | 1 | 0.927 | -0.073 | 0.9 | 1.05 | 0.05 | line INYO to COTTONWD 230 ck 1 |
| 24160 | VALLEYSC | 115 | 24 | 240 | tran_247 | ivsg_hs_alt1d1 | 1.021 | 0.929 | -0.092 | 0.9 | 1.05 | 0.05 | tran VALLEYSC 500 to VALLEYSC 115 ck 1 |
| 25990 | VALYSVC1 | 115 | 24 | 240 | tran_247 | ivsg_hs_alt1d1 | 1.021 | 0.929 | -0.092 | 0.9 | 1.05 | 0.05 | tran VALLEYSC 500 to VALLEYSC 115 ck 1 |
| 24160 | VALLEYSC | 115 | 24 | 240 | tran_248 | ivsg_hs_alt1d1 | 1.021 | 0.929 | -0.092 | 0.9 | 1.05 | 0.05 | tran VALLEYSC 500 to VALLEYSC 115 ck 2 |
| 25990 | VALYSVC1 | 115 | 24 | 240 | tran_248 | ivsg_hs_alt1d1 | 1.021 | 0.929 | -0.092 | 0.9 | 1.05 | 0.05 | tran VALLEYSC 500 to VALLEYSC 115 ck 2 |
| 24819 | CONCHO | 115 | 24 | 248 | tran_238 | ivsg_hs_alt1d1 | 1.029 | 0.939 | -0.09 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 24822 | INDIAN W | 115 | 24 | 248 | tran_238 | ivsg_hs_alt1d1 | 1.029 | 0.939 | -0.09 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 24816 | SANTA RO | 115 | 24 | 248 | tran_238 | ivsg_hs_alt1d1 | 1.033 | 0.943 | -0.09 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 24821 | TAMARISK | 115 | 24 | 248 | tran_238 | ivsg_hs_alt1d1 | 1.033 | 0.944 | -0.089 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 24827 | TAP823 | 115 | 24 | 248 | tran_238 | ivsg_hs_alt1d1 | 1.035 | 0.946 | -0.089 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 25633 | CAPWIND | 115 | 24 | 248 | tran_238 | ivsg_hs_alt1d1 | 1.035 | 0.947 | -0.088 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 25622 | TAP806 | 115 | 24 | 248 | tran_238 | ivsg_hs_alt1d1 | 1.035 | 0.947 | -0.088 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 24829 | TAP821 | 115 | 24 | 248 | tran_238 | ivsg_hs_alt1d1 | 1.035 | 0.947 | -0.088 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 24807 | MIRAGE | 115 | 24 | 248 | tran_238 | ivsg_hs_alt1d1 | 1.037 | 0.949 | -0.088 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 14534 | N.GILA 4 | 100 | 14 | 847 | NG500/69 | ivsg_hs_alt1d1 | 0.942 | 1 | 0.058 | 0.9 | 1.05 | 0.05 | tran N.GILA 500 to N.GILA 69 ck 1 |
| 24035 | EAGLEMTN | 161 | 24 | 248 | tran_241 | ivsg_hs_alt1d1 | 0.932 | 1.026 | 0.094 | 0.9 | 1.05 | 0.05 | tran EAGLEMTN 230 to EAGLEMTN 161 ck 1 |
| 22472 | MIGUELMP | 500 | 22 | 227 | ML80 | ivsg_hs_alt1d1 | 0.97 | 1.05 | 0.08 | 0.9 | 1.05 | 0.05 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 24730 | INYO PS | 115 | 24 | 247 | tran_229 | ivsg_hs_alt1d1 | 1.026 | 1.077 | 0.052 | 0.9 | 1.05 | 0.05 | tran INYO 115 to INYO PS 115 ck 1 |
| 24142 | SYC CYN | 230 | 24 | 240 | line_086 | ivsg_hs_alt1d1 | 0.983 | 1.091 | 0.108 | 0.9 | 1.05 | 0.05 | line MAGUNDEN to OMAR 230 ck 1 |
| 25613 | EDMONSTN | 230 | 24 | 256 | line_122 | ivsg_hs_alt1d1 | 0.998 | 1.091 | 0.092 | 0.9 | 1.05 | 0.05 | line PASTORIA to EDMONSTN 230 ck 1 |
| 24142 | SYC CYN | 230 | 24 | 240 | line_140 | ivsg_hs_alt1d1 | 0.983 | 1.091 | 0.108 | 0.9 | 1.05 | 0.05 | line SYC CYN to OMAR 230 ck 1 |
| 24320 | EASTWOOD | 230 | 24 | 243 | line_157 | ivsg_hs_alt1d1 | 1.041 | 1.091 | 0.05 | 0.9 | 1.05 | 0.05 | line BIG CRK1 to EASTWOOD 230 ck 1 |

ivsg_hs_alt1d1.sav
FLOW Summary
N-1 Outages

| LEGEND | % of RATING 1 | |
|---|---|---|
| C_pu | 100% - 110% | |
| C_pu | 110% - 120% | P.U. of |
| C_pu | > 120% | Rate 1 |

| FROM | FR | BKV | TO | TO | BKV | CK | Outage_Name | Case | Rate-Mva | Pflow | Qflow | Amps | MVA | C_pu | B_pu | Contingency_Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24142 | SYC CYN | 230 | 24101 | OMAR | 230 | 1 | line_086 | ivsg_hs_alt1d1 | 643 | 770.3 | 5511.1 | 12804.5 | 5564.6 | 7.934 | 0.471 | line MAGUNDEN to OMAR 230 ck 1 |
| 24781 | NAVYCOSO | 230 | 24706 | BLM EAST | 230 | 1 | line_173 | ivsg_hs_alt1d1 | 1287 | -153.6 | -3160.7 | 7943.4 | 3164.4 | 2.459 | 0.056 | line BLM EAST to BLM WEST 230 ck 1 |
| 24781 | NAVYCOSO | 230 | 24706 | BLM EAST | 230 | 1 | line_174 | ivsg_hs_alt1d1 | 1287 | -153.6 | -3160.7 | 7943.4 | 3164.4 | 2.459 | 0.056 | line BLM WEST to KRAMER 230 ck 1 |
| 24806 | MIRAGE | 230 | 24807 | MIRAGE | 115 | 2 | tran_238 | ivsg_hs_alt1d1 | 280 | 532.3 | 203.3 | 1473.7 | 569.8 | 2.03 | 0.95 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_175 | ivsg_hs_alt1d1 | 56 | -103.6 | -1.1 | 531.9 | 103.6 | 1.86 | 0.92 | line INYO to COTTONWD 230 ck 1 |
| 24151 | VALLEYSC | 500 | 24160 | VALLEYSC | 115 | 2 | tran_247 | ivsg_hs_alt1d1 | 560 | 853.2 | 372.5 | 1042.2 | 931 | 1.66 | 0.77 | tran VALLEYSC 500 to VALLEYSC 115 ck 1 |
| 24151 | VALLEYSC | 500 | 24160 | VALLEYSC | 115 | 1 | tran_248 | ivsg_hs_alt1d1 | 560 | 853.2 | 372.5 | 1042.2 | 931 | 1.66 | 0.77 | tran VALLEYSC 500 to VALLEYSC 115 ck 2 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_034 | ivsg_hs_alt1d1 | 204.1 | 301.7 | -0.8 | 1330.1 | 301.7 | 1.558 | 1.124 | OLD TOWN - MLMS3TAP 1 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_032 | ivsg_hs_alt1d1 | 204.1 | 301.6 | -1.5 | 1329.1 | 301.6 | 1.557 | 1.124 | OTAYMESA - MLMS3TAP 1 230kV |
| 24151 | VALLEYSC | 500 | 24229 | VALLEY-S | 115 | 4 | tran_249 | ivsg_hs_alt1d1 | 560 | 830.7 | 211.8 | 955.4 | 857.2 | 1.53 | 0.75 | tran VALLEYSC 500 to VALLEY-S 115 ck 3 |
| 24151 | VALLEYSC | 500 | 24229 | VALLEY-S | 115 | 3 | tran_250 | ivsg_hs_alt1d1 | 560 | 830.6 | 211.8 | 955.4 | 857.2 | 1.53 | 0.75 | tran VALLEYSC 500 to VALLEY-S 115 ck 4 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_009 | ivsg_hs_alt1d1 | 204.1 | 283.3 | -6.7 | 1212.6 | 283.4 | 1.42 | 1.124 | EPP - ESCNDIDO 1 230kV |
| 22468 | MIGUEL | 500 | 22472 | MIGUELMP | 500 | 1 | ML81 | ivsg_hs_alt1d1 | 1120 | 1545 | 307.4 | 1865.7 | 1575.3 | 1.41 | 0.8 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_202 | ivsg_hs_alt1d1 | 56 | 77.5 | -7.1 | 393.1 | 77.8 | 1.4 | 0.92 | line OWENSCON to INYO 230 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | ML60 | ivsg_hs_alt1d1 | 204.1 | 276 | 2.2 | 1189.9 | 276.1 | 1.394 | 1.124 | tran MIGUEL 230 to MIGUEL 138 ck 1 |
| 22464 | MIGUEL | 230 | 22468 | MIGUEL | 500 | 1 | ML80 | ivsg_hs_alt1d1 | 1120 | -1523.4 | 26.3 | 4013.2 | 1523.7 | 1.39 | 0.75 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 22464 | MIGUEL | 230 | 22472 | MIGUELMP | 500 | 1 | ML81 | ivsg_hs_alt1d1 | 1120 | -1541.6 | 22.1 | 4055.8 | 1541.8 | 1.38 | 0.79 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | SX70 | ivsg_hs_alt1d1 | 204.1 | 271.2 | 10.4 | 1164.3 | 271.4 | 1.364 | 1.124 | tran SYCAMORE 230 to SYCAMORE 69 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_013 | ivsg_hs_alt1d1 | 204.1 | 255.3 | -15.8 | 1103.2 | 255.8 | 1.292 | 1.124 | EPP - SYCAMORE 1 230kV |
| 22356 | IMPRLVLY | 230 | 22360 | IMPRLVLY | 500 | 1 | IV81 | ivsg_hs_alt1d1 | 600 | 728.5 | 253.9 | 1946.1 | 771.4 | 1.29 | 0.57 | tran IMPRLVLY 230 to IMPRLVLY 500 ck 2 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | MS60 | ivsg_hs_alt1d1 | 204.1 | 250.5 | 2.4 | 1073.6 | 250.6 | 1.257 | 1.124 | tran MISSION 230 to MISSION 138 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | MS61 | ivsg_hs_alt1d1 | 204.1 | 250.5 | 2.4 | 1073.6 | 250.6 | 1.257 | 1.124 | tran MISSION 230 to MISSION 138 ck 2 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | ML70 | ivsg_hs_alt1d1 | 204.1 | 241.3 | 3.1 | 1036.2 | 241.3 | 1.213 | 1.124 | tran MIGUEL 69 to MIGUEL 230 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | ML71 | ivsg_hs_alt1d1 | 204.1 | 241.3 | 3.1 | 1036.2 | 241.3 | 1.213 | 1.124 | tran MIGUEL 69 to MIGUEL 230 ck 2 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_015 | ivsg_hs_alt1d1 | 204.1 | 240 | -4.7 | 1026.6 | 240.1 | 1.202 | 1.124 | MIGUEL - MISSION 1 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_020 | ivsg_hs_alt1d1 | 204.1 | 239.5 | -5.3 | 1024.3 | 239.5 | 1.2 | 1.124 | MIGUEL - MISSION 2 230kV |
| 24723 | CONTROL | 115 | 24731 | INYOKERN | 115 | 1 | line_175 | ivsg_hs_alt1d1 | 82.7 | 95.9 | -4.2 | 495.9 | 96 | 1.194 | 0.418 | line INYO to COTTONWD 230 ck 1 |
| 24723 | CONTROL | 115 | 24731 | INYOKERN | 115 | 2 | line_175 | ivsg_hs_alt1d1 | 82.7 | 95.9 | -4.2 | 495.9 | 96 | 1.194 | 0.418 | line INYO to COTTONWD 230 ck 1 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | B2_032 | ivsg_hs_alt1d1 | 392 | 464 | 2.4 | 1240 | 464 | 1.19 | 0.91 | OTAYMESA - MLMS3TAP 1 230kV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | B2_034 | ivsg_hs_alt1d1 | 392 | 464 | 3 | 1240.7 | 464 | 1.19 | 0.91 | OLD TOWN - MLMS3TAP 1 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_007 | ivsg_hs_alt1d1 | 204.1 | 235.6 | 2.7 | 1011.5 | 235.6 | 1.185 | 1.124 | PENSQTOS - ENCINA 1 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | MS70 | ivsg_hs_alt1d1 | 204.1 | 235.5 | 3.5 | 1010.1 | 235.5 | 1.183 | 1.124 | tran MISSION 230 to MISSION 69 ck 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_015 | ivsg_hs_alt1d1 | 392 | 454.2 | 52.1 | 1189.4 | 457.1 | 1.17 | 1.05 | MIGUEL - MISSION 1 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | ML80 | ivsg_hs_alt1d1 | 204.1 | 232.1 | -2.4 | 998.1 | 232.1 | 1.169 | 1.124 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | IV81 | ivsg_hs_alt1d1 | 204.1 | 232.3 | -4.2 | 997.4 | 232.4 | 1.168 | 1.124 | tran IMPRLVLY 230 to IMPRLVLY 500 ck 2 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | ML81 | ivsg_hs_alt1d1 | 204.1 | 231.5 | -2.5 | 994.6 | 231.5 | 1.165 | 1.124 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | SO2 | ivsg_hs_alt1d1 | 204.1 | 228.7 | 2.1 | 992.7 | 228.7 | 1.163 | 1.124 | gen S.ONOFR2 22.00 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | B2_009 | ivsg_hs_alt1d1 | 392 | 456 | 7 | 1181.5 | 456 | 1.16 | 0.91 | EPP - ESCNDIDO 1 230kV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_020 | ivsg_hs_alt1d1 | 392 | 452.4 | 50.2 | 1185.4 | 455.2 | 1.16 | 1.05 | MIGUEL - MISSION 2 230kV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | ML70 | ivsg_hs_alt1d1 | 392 | 445.9 | 57.3 | 1174.5 | 449.6 | 1.15 | 1.05 | tran MIGUEL 69 to MIGUEL 230 ck 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | ML71 | ivsg_hs_alt1d1 | 392 | 445.9 | 57.3 | 1174.5 | 449.6 | 1.15 | 1.05 | tran MIGUEL 69 to MIGUEL 230 ck 2 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | SX60 | ivsg_hs_alt1d1 | 392 | 448.4 | 49.6 | 1180.2 | 451.2 | 1.15 | 1.05 | tran SYCAMORE 230 to SYCAMORE 138 ck 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_032 | ivsg_hs_alt1d1 | 392 | 438.8 | 54.2 | 1189.7 | 442.1 | 1.13 | 1.05 | OTAYMESA - MLMS3TAP 1 230kV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_034 | ivsg_hs_alt1d1 | 392 | 438.7 | 54.7 | 1190.4 | 442.1 | 1.13 | 1.05 | OLD TOWN - MLMS3TAP 1 230kV |
| 22504 | MISSION | 230 | 22500 | MISSION | 138 | 2 | MS60 | ivsg_hs_alt1d1 | 392 | 424.1 | 128.4 | 1151.6 | 443.1 | 1.13 | 0.76 | tran MISSION 230 to MISSION 138 ck 1 |
| 22504 | MISSION | 230 | 22500 | MISSION | 138 | 1 | MS61 | ivsg_hs_alt1d1 | 392 | 424.1 | 128.4 | 1151.6 | 443.1 | 1.13 | 0.76 | tran MISSION 230 to MISSION 138 ck 2 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | B2_034 | ivsg_hs_alt1d1 | 408.3 | -432.5 | 3.5 | 1921.5 | 432.5 | 1.125 | 1.012 | OLD TOWN - MLMS3TAP 1 230kV |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | B2_015 | ivsg_hs_alt1d1 | 408.3 | -448 | 6 | 1919.8 | 448.1 | 1.124 | 1.012 | MIGUEL - MISSION 1 230kV |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | B2_032 | ivsg_hs_alt1d1 | 408.3 | -432.6 | 3.8 | 1920.3 | 432.6 | 1.124 | 1.012 | OTAYMESA - MLMS3TAP 1 230kV |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | B2_020 | ivsg_hs_alt1d1 | 408.3 | -446.3 | 7.5 | 1913.5 | 446.4 | 1.12 | 1.012 | MIGUEL - MISSION 2 230kV |
| 24729 | INYO | 230 | 24730 | INYO PS | 115 | 1 | line_175 | ivsg_hs_alt1d1 | 50 | 51.8 | 21.2 | 133 | 56 | 1.12 | 0.54 | line INYO to COTTONWD 230 ck 1 |
| 24729 | INYO | 230 | 24730 | INYO PS | 115 | 2 | line_175 | ivsg_hs_alt1d1 | 50 | 51.8 | 21.2 | 133 | 56 | 1.12 | 0.54 | line INYO to COTTONWD 230 ck 1 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | SX60 | ivsg_hs_alt1d1 | 408.3 | -442.4 | 7.5 | 1905 | 442.4 | 1.115 | 1.012 | tran SYCAMORE 230 to SYCAMORE 138 ck 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_022 | ivsg_hs_alt1d1 | 392 | 432.1 | 37.7 | 1151.1 | 433.7 | 1.11 | 1.05 | OTAYMESA - TJI-230 1 230kV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_028 | ivsg_hs_alt1d1 | 392 | 432.1 | 44.9 | 1130.1 | 434.4 | 1.11 | 1.05 | MIGUEL - SYCAMORE 1 230kV |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | ML70 | ivsg_hs_alt1d1 | 408.3 | -439.9 | -0.7 | 1895.9 | 439.9 | 1.11 | 1.012 | tran MIGUEL 69 to MIGUEL 230 ck 1 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | ML71 | ivsg_hs_alt1d1 | 408.3 | -439.9 | -0.7 | 1895.9 | 439.9 | 1.11 | 1.012 | tran MIGUEL 69 to MIGUEL 230 ck 2 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | MS60 | ivsg_hs_alt1d1 | 392 | 430.3 | 51.9 | 1128 | 433.4 | 1.11 | 1.05 | tran MISSION 230 to MISSION 138 ck 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | MS61 | ivsg_hs_alt1d1 | 392 | 430.3 | 51.9 | 1128 | 433.4 | 1.11 | 1.05 | tran MISSION 230 to MISSION 138 ck 2 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | OT70 | ivsg_hs_alt1d1 | 392 | 426.8 | 50.5 | 1120.7 | 429.8 | 1.1 | 1.05 | tran OLD TOWN 69 to OLD TOWN 230 ck 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | OT71 | ivsg_hs_alt1d1 | 392 | 426.8 | 50.5 | 1120.7 | 429.8 | 1.1 | 1.05 | tran OLD TOWN 69 to OLD TOWN 230 ck 2 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | SX70 | ivsg_hs_alt1d1 | 392 | 426.5 | 53.4 | 1124.8 | 429.8 | 1.1 | 1.05 | tran SYCAMORE 230 to SYCAMORE 69 ck 1 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | SX70 | ivsg_hs_alt1d1 | 392 | 429.3 | 21.3 | 1111.9 | 429.9 | 1.1 | 0.91 | tran SYCAMORE 230 to SYCAMORE 69 ck 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 2 | line_070 | ivsg_hs_alt1d1 | 956 | -1027.9 | -32.6 | 2617.6 | 1028.4 | 1.091 | 0.598 | line LA FRESA to REDONDO 230 ck 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 1 | line_071 | ivsg_hs_alt1d1 | 956 | -1027.9 | -32.6 | 2617.6 | 1028.4 | 1.091 | 0.598 | line LA FRESA to REDONDO 230 ck 2 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_009 | ivsg_hs_alt1d1 | 392 | 423.1 | 47.9 | 1107.4 | 425.8 | 1.09 | 1.05 | EPP - ESCNDIDO 1 230kV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_021 | ivsg_hs_alt1d1 | 392 | 424.6 | 38 | 1124.4 | 426.2 | 1.09 | 1.05 | IMPRLVLY - ROA-230 1 230kV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | SO2 | ivsg_hs_alt1d1 | 392 | 425.5 | 43.6 | 1138.4 | 427.7 | 1.09 | 1.05 | gen S.ONOFR2 22.00 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | line_7 | ivsg_hs_alt1d1 | 204.1 | 218.5 | -1.7 | 930 | 218.6 | 1.089 | 1.124 | line BANIS230 to NEWSF230 230 ck 1 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | B2_022 | ivsg_hs_alt1d1 | 408.3 | -426.3 | 16.7 | 1858 | 426.6 | 1.088 | 1.012 | OTAYMESA - TJI-230 1 230kV |
| 8601 | GEOSUB2 | 230 | 8300 | BANIS230 | 230 | 1 | line_22 | ivsg_hs_alt1d1 | 550 | 602 | 83.6 | 1498.6 | 607.8 | 1.086 | 0.806 | line GEOSUB1 to BANIS230 230 ck 1 |
| 8601 | GEOSUB2 | 230 | 8300 | BANIS230 | 230 | 1 | line_23 | ivsg_hs_alt1d1 | 550 | 602 | 83.6 | 1498.6 | 607.8 | 1.086 | 0.806 | line GEOSUB1 to BANIS230 230 ck 2 |
| 24701 | KRAMER | 230 | 24085 | LUGO | 230 | 2 | line_169 | ivsg_hs_alt1d1 | 478 | 525.6 | 6.7 | 1302.2 | 525.6 | 1.085 | 0.645 | line KRAMER to LUGO 230 ck 1 |
| 24701 | KRAMER | 230 | 24085 | LUGO | 230 | 1 | line_170 | ivsg_hs_alt1d1 | 478 | 525.6 | 6.7 | 1302.2 | 525.6 | 1.085 | 0.645 | line KRAMER to LUGO 230 ck 2 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_008 | ivsg_hs_alt1d1 | 204.1 | 215.7 | 2.5 | 923.1 | 215.7 | 1.081 | 1.124 | PENSQTOS - OLD TOWN 1 230kV |
| 22844 | TALEGA | 230 | 24131 | S.ONOFRE | 230 | 2 | B2_026 | ivsg_hs_alt1d1 | 456.1 | -489.7 | 50.1 | 1236.8 | 492.2 | 1.081 | 0.568 | TALEGA - S.ONOFRE 1 230kV |
| 22844 | TALEGA | 230 | 24131 | S.ONOFRE | 230 | 1 | B2_027 | ivsg_hs_alt1d1 | 456.1 | -489.7 | 50.1 | 1236.8 | 492.2 | 1.081 | 0.568 | TALEGA - S.ONOFRE 2 230kV |
| 22844 | TALEGA | 230 | 24131 | S.ONOFRE | 230 | 2 | line_014 | ivsg_hs_alt1d1 | 456.1 | -489.7 | 50.1 | 1236.8 | 492.2 | 1.081 | 0.568 | line TALEGA to S.ONOFRE 230 ck 1 |
| 22844 | TALEGA | 230 | 24131 | S.ONOFRE | 230 | 1 | line_015 | ivsg_hs_alt1d1 | 456.1 | -489.7 | 50.1 | 1236.8 | 492.2 | 1.081 | 0.568 | line TALEGA to S.ONOFRE 230 ck 2 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | SO2 | ivsg_hs_alt1d1 | 408.3 | -419.9 | 9.5 | 1837.4 | 420 | 1.076 | 1.012 | gen S.ONOFR2 22.00 |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | line_12 | ivsg_hs_alt1d1 | 132 | 142.1 | -8.6 | 886.4 | 142.3 | 1.07 | 0.947 | line COACHELA to RAMON 230 ck 2 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_169 | ivsg_hs_alt1d1 | 56 | 58.2 | -9.9 | 293.6 | 59 | 1.07 | 0.92 | line KRAMER to LUGO 230 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_170 | ivsg_hs_alt1d1 | 56 | 58.2 | -9.9 | 293.6 | 59 | 1.07 | 0.92 | line KRAMER to LUGO 230 ck 2 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | B2_028 | ivsg_hs_alt1d1 | 408.3 | -426.5 | 7.5 | 1824.1 | 426.6 | 1.068 | 1.012 | MIGUEL - SYCAMORE 1 230kV |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | MS60 | ivsg_hs_alt1d1 | 408.3 | -424.7 | 0.3 | 1820.7 | 424.7 | 1.066 | 1.012 | tran MISSION 230 to MISSION 138 ck 1 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | MS61 | ivsg_hs_alt1d1 | 408.3 | -424.7 | 0.3 | 1820.7 | 424.7 | 1.066 | 1.012 | tran MISSION 230 to MISSION 138 ck 2 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | SX70 | ivsg_hs_alt1d1 | 408.3 | -421 | -1.5 | 1815.5 | 421 | 1.063 | 1.012 | tran SYCAMORE 230 to SYCAMORE 69 ck 1 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | B2_021 | ivsg_hs_alt1d1 | 408.3 | -419.1 | 13.9 | 1814.9 | 419.3 | 1.062 | 1.012 | IMPRLVLY - ROA-230 1 230kV |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | OT70 | ivsg_hs_alt1d1 | 408.3 | -421.3 | 1 | 1808.9 | 421.3 | 1.059 | 1.012 | tran OLD TOWN 69 to OLD TOWN 230 ck 1 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | OT71 | ivsg_hs_alt1d1 | 408.3 | -421.3 | 1 | 1808.9 | 421.3 | 1.059 | 1.012 | tran OLD TOWN 69 to OLD TOWN 230 ck 2 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | line_207 | ivsg_hs_alt1d1 | 408.3 | -416.4 | 9.3 | 1803.3 | 416.5 | 1.056 | 1.012 | line DEVERS to VALLEYSC 500 ck 1 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | B2_013 | ivsg_hs_alt1d1 | 392 | 408.9 | -17.5 | 1074.3 | 409.2 | 1.05 | 0.91 | EPP - SYCAMORE 1 230kV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | ML60 | ivsg_hs_alt1d1 | 392 | 411.7 | 5.2 | 1074.3 | 411.8 | 1.05 | 0.91 | tran MIGUEL 230 to MIGUEL 138 ck 1 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | line_67 | ivsg_hs_alt1d1 | 408.3 | -415 | 12.2 | 1790.9 | 415.2 | 1.048 | 1.012 | line CENTRALX to NEWSF230 230 ck 1 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | B2_009 | ivsg_hs_alt1d1 | 408.3 | -417.7 | 2.4 | 1787.5 | 417.7 | 1.046 | 1.012 | EPP - ESCNDIDO 1 230kV |
| 8600 | GEOSUB1 | 230 | 8300 | BANIS230 | 230 | 1 | line_47 | ivsg_hs_alt1d1 | 550 | 577.3 | 79 | 1437.6 | 582.7 | 1.042 | 0.745 | line GEOSUB2 to BANIS230 230 ck 1 |
| 8600 | GEOSUB1 | 230 | 8300 | BANIS230 | 230 | 2 | line_47 | ivsg_hs_alt1d1 | 550 | 577.3 | 79 | 1437.6 | 582.7 | 1.042 | 0.745 | line GEOSUB2 to BANIS230 230 ck 1 |
| 8600 | GEOSUB1 | 230 | 8300 | BANIS230 | 230 | 2 | line_22 | ivsg_hs_alt1d1 | 550 | 572.1 | 79.7 | 1423.7 | 577.6 | 1.032 | 0.745 | line GEOSUB1 to BANIS230 230 ck 1 |
| 8600 | GEOSUB1 | 230 | 8300 | BANIS230 | 230 | 1 | line_23 | ivsg_hs_alt1d1 | 550 | 572.1 | 79.7 | 1423.7 | 577.6 | 1.032 | 0.745 | line GEOSUB1 to BANIS230 230 ck 2 |
| 24114 | PARDEE | 230 | 24200 | SAUG TAP | 230 | 2 | line_117 | ivsg_hs_alt1d1 | 494 | 501.8 | 27.7 | 1280.3 | 502.5 | 1.032 | 0.512 | line PARDEE to SAUG TAP 230 ck 1 |
| 24114 | PARDEE | 230 | 24200 | SAUG TAP | 230 | 1 | line_118 | ivsg_hs_alt1d1 | 494 | 501.7 | 27.6 | 1280.2 | 502.5 | 1.032 | 0.52 | line PARDEE to SAUG TAP 230 ck 2 |
| 22832 | SYCAMORE | 230 | 22467 | MLSXTAP | 230 | 1 | B2_034 | ivsg_hs_alt1d1 | 796.7 | -769 | 24.3 | 2057.3 | 769.4 | 1.029 | 0.432 | OLD TOWN - MLMS3TAP 1 230kV |
| 22832 | SYCAMORE | 230 | 22467 | MLSXTAP | 230 | 1 | B2_032 | ivsg_hs_alt1d1 | 796.7 | -768.9 | 25.5 | 2056.2 | 769.3 | 1.028 | 0.432 | OTAYMESA - MLMS3TAP 1 230kV |
| 22596 | OLD TOWN | 230 | 22466 | MLMS3TAP | 230 | 1 | B2_031 | ivsg_hs_alt1d1 | 912 | -884.3 | 71.8 | 2323.4 | 887.2 | 1.015 | 0.738 | SYCAMORE - MLSXTAP 1 230kV |
| 22596 | OLD TOWN | 230 | 22466 | MLMS3TAP | 230 | 1 | B2_029 | ivsg_hs_alt1d1 | 912 | -884.1 | 73.6 | 2321.8 | 887.1 | 1.014 | 0.738 | OTAYMESA - MLSXTAP 1 230kV |
| 24303 | BIG CRK3 | 230 | 24235 | RECTOR | 230 | 1 | line_155 | ivsg_hs_alt1d1 | 353 | 361.1 | 50.6 | 895.6 | 364.6 | 1.011 | 0.73 | line BIG CRK1 to RECTOR 230 ck 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | IV81 | ivsg_hs_alt1d1 | 392 | 394.7 | 37.3 | 1039.1 | 396.4 | 1.01 | 1.05 | tran IMPRLVLY 230 to IMPRLVLY 500 ck 2 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_201 | ivsg_hs_alt1d1 | 56 | 54.8 | -10.6 | 277.5 | 55.8 | 1.01 | 0.92 | line SYLMAR3 to SYLMAR S 230 ck 1 |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_192 | ivsg_hs_alt1d1 | 169 | 167.8 | 38 | 605.1 | 172.1 | 1.003 | 0.803 | line IRON MTN to CAMINO 230 ck 1 |
| 24301 | BIG CRK1 | 230 | 24235 | RECTOR | 230 | 1 | line_160 | ivsg_hs_alt1d1 | 329 | 335 | 48.7 | 827.2 | 338.5 | 1.002 | 0.728 | line BIG CRK3 to RECTOR 230 ck 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_001 | ivsg_hs_alt1d1 | 392 | 389.1 | 39.8 | 1008.1 | 391.1 | 1 | 1.05 | HASSYAMP - N.GILA 1 500kV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | ML80 | ivsg_hs_alt1d1 | 392 | 388.7 | 34.3 | 1027.7 | 390.2 | 1 | 1.05 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | ML81 | ivsg_hs_alt1d1 | 392 | 390.7 | 35 | 1031.8 | 392.2 | 1 | 1.05 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 24086 | LUGO | 500 | 24097 | MOHAVE | 500 | 1 | line_103 | ivsg_hs_alt1d1 | 1386 | -1427.4 | 85.7 | 1576.3 | 1429.9 | 0.993 | 0.709 | line MOHAVE to ELDORDO 500 ck 1 |
| 8311 | COACHELA | 230 | 8695 | RAMON | 230 | 2 | line_83 | ivsg_hs_alt1d1 | 800 | 783.3 | 33.4 | 1993 | 784 | 0.992 | 0.766 | line IH500 to DEVERS 500 ck 1 |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | line_303 | ivsg_hs_alt1d1 | 132 | 129 | -9.4 | 816.3 | 129.3 | 0.985 | 0.947 | line HARQUAHA to DEVERS 500 ck 1 |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | line_83 | ivsg_hs_alt1d1 | 132 | 130.4 | -9.7 | 815.1 | 130.8 | 0.984 | 0.947 | line IH500 to DEVERS 500 ck 1 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | IV81 | ivsg_hs_alt1d1 | 408.3 | -390 | 6.9 | 1677.2 | 390 | 0.982 | 1.012 | tran IMPRLVLY 230 to IMPRLVLY 500 ck 2 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_047 | ivsg_hs_alt1d1 | 2400 | -2451.6 | -48.7 | 2719.2 | 2452.1 | 0.981 | 0.779 | line ELDORDO to LUGO 500 ck 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_003 | ivsg_hs_alt1d1 | 392 | 381.8 | 35.9 | 997.6 | 383.4 | 0.98 | 1.05 | N.GILA - IMPRLVLY 1 500kV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | MS60 | ivsg_hs_alt1d1 | 392 | 383.3 | 2.1 | 994.4 | 383.3 | 0.98 | 0.91 | tran MISSION 230 to MISSION 138 ck 1 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | MS61 | ivsg_hs_alt1d1 | 392 | 383.3 | 2.1 | 994.4 | 383.3 | 0.98 | 0.91 | tran MISSION 230 to MISSION 138 ck 2 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | PV1 | ivsg_hs_alt1d1 | 408.3 | -396.8 | 1.3 | 1673.1 | 396.8 | 0.979 | 1.012 | gen PALOVRD1 24.00 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_079 | ivsg_hs_alt1d1 | 2400 | -2436.9 | -32.8 | 2712.2 | 2437.1 | 0.979 | 0.779 | line LUGO to MOHAVE 500 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_028 | ivsg_hs_alt1d1 | 204.1 | 195.8 | 1.3 | 834.6 | 195.8 | 0.977 | 1.124 | MIGUEL - SYCAMORE 1 230kV |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | ML81 | ivsg_hs_alt1d1 | 408.3 | -386.1 | 8.7 | 1665.5 | 386.2 | 0.975 | 1.012 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | ML80 | ivsg_hs_alt1d1 | 408.3 | -384.1 | 8.9 | 1658.8 | 384.2 | 0.971 | 1.012 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | B2_015 | ivsg_hs_alt1d1 | 392 | 379.1 | -5.5 | 983.2 | 379.1 | 0.97 | 0.91 | MIGUEL - MISSION 1 230kV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | B2_020 | ivsg_hs_alt1d1 | 392 | 378.3 | -6.2 | 981.3 | 378.3 | 0.97 | 0.91 | MIGUEL - MISSION 2 230kV |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_123 | ivsg_hs_alt1d1 | 56 | 52.8 | -10.6 | 267.2 | 53.8 | 0.97 | 0.92 | line PASTORIA to PSTRIA 230 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_200 | ivsg_hs_alt1d1 | 56 | 52.8 | -10.7 | 267.3 | 53.9 | 0.97 | 0.92 | line SYLMAR1 to SYLMAR S 230 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | tran_210 | ivsg_hs_alt1d1 | 56 | 52.7 | -10.4 | 266.3 | 53.7 | 0.97 | 0.92 | tran LUGO 500 to LUGO 230 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | tran_211 | ivsg_hs_alt1d1 | 56 | 52.7 | -10.4 | 266.5 | 53.7 | 0.97 | 0.92 | tran LUGO 500 to LUGO 230 ck 2 |
| 8695 | RAMON | 230 | 24806 | MIRAGE | 230 | 2 | line_83 | ivsg_hs_alt1d1 | 800 | 753 | -102.3 | 1945.7 | 760 | 0.969 | 0.717 | line IH500 to DEVERS 500 ck 1 |
| 24042 | ELDORDO | 500 | 24086 | LUGO | 500 | 1 | line_085 | ivsg_hs_alt1d1 | 1386 | 1423.6 | 259.6 | 1541.5 | 1447.1 | 0.968 | 0.653 | line LUGO to VICTORVL 500 ck 1 |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | B2_015 | ivsg_hs_alt1d1 | 382.4 | 359.4 | 10 | 1545.2 | 359.5 | 0.966 | 0.849 | MIGUEL - MISSION 1 230kV |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_191 | ivsg_hs_alt1d1 | 169 | 161.2 | 35.6 | 580.6 | 165.1 | 0.962 | 0.803 | line EAGLEMTN to IRON MTN 230 ck 1 |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | B2_020 | ivsg_hs_alt1d1 | 382.4 | 357.7 | 8.6 | 1538.2 | 357.8 | 0.961 | 0.849 | MIGUEL - MISSION 2 230kV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | ML70 | ivsg_hs_alt1d1 | 392 | 373.9 | 0.2 | 972.2 | 373.9 | 0.96 | 0.91 | tran MIGUEL 69 to MIGUEL 230 ck 1 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | ML71 | ivsg_hs_alt1d1 | 392 | 373.9 | 0.2 | 972.2 | 373.9 | 0.96 | 0.91 | tran MIGUEL 69 to MIGUEL 230 ck 2 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_086 | ivsg_hs_alt1d1 | 56 | 52.2 | -10.6 | 264.2 | 53.3 | 0.96 | 0.92 | line MAGUNDEN to OMAR 230 ck 1 |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | B2_032 | ivsg_hs_alt1d1 | 382.4 | 344 | 9.4 | 1532.4 | 344.1 | 0.958 | 0.849 | OTAYMESA - MLMS3TAP 1 230kV |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | B2_034 | ivsg_hs_alt1d1 | 382.4 | 343.9 | 9.7 | 1533.4 | 344 | 0.958 | 0.849 | OLD TOWN - MLMS3TAP 1 230kV |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | SX60 | ivsg_hs_alt1d1 | 382.4 | 353.7 | 8.3 | 1528.1 | 353.8 | 0.955 | 0.849 | tran SYCAMORE 230 to SYCAMORE 138 ck 1 |
| 19020 | BLYTHE | 161 | 24017 | BLYTHESC | 161 | 1 | line_192 | ivsg_hs_alt1d1 | 244 | 234.3 | 38.2 | 834.8 | 237.4 | 0.954 | 0.82 | line IRON MTN to CAMINO 230 ck 1 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | B2_001 | ivsg_hs_alt1d1 | 408.3 | -384.7 | 1.9 | 1627.3 | 384.7 | 0.953 | 1.012 | HASSYAMP - N.GILA 1 500kV |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | ML70 | ivsg_hs_alt1d1 | 382.4 | 351.3 | 16.6 | 1521.2 | 351.7 | 0.951 | 0.849 | tran MIGUEL 69 to MIGUEL 230 ck 1 |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | ML71 | ivsg_hs_alt1d1 | 382.4 | 351.3 | 16.6 | 1521.2 | 351.7 | 0.951 | 0.849 | tran MIGUEL 69 to MIGUEL 230 ck 2 |
| 22504 | MISSION | 230 | 22500 | MISSION | 138 | 1 | ML60 | ivsg_hs_alt1d1 | 392 | 361.3 | 86.3 | 978.6 | 371.5 | 0.95 | 0.76 | tran MIGUEL 230 to MIGUEL 138 ck 1 |
| 22504 | MISSION | 230 | 22500 | MISSION | 138 | 2 | ML60 | ivsg_hs_alt1d1 | 392 | 361.3 | 86.3 | 978.6 | 371.5 | 0.95 | 0.76 | tran MIGUEL 230 to MIGUEL 138 ck 1 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 2 | line_136 | ivsg_hs_alt1d1 | 1195 | 1100.3 | -50.3 | 2850.8 | 1101.4 | 0.95 | 0.572 | line SERRANO to VILLA PK 230 ck 1 |
| 24807 | MIRAGE | 115 | 24819 | CONCHO | 115 | 1 | tran_238 | ivsg_hs_alt1d1 | 183 | 164.1 | -5.5 | 868.8 | 164.2 | 0.946 | 0.865 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | line_67 | ivsg_hs_alt1d1 | 204.1 | 188.7 | 8.9 | 807 | 188.9 | 0.945 | 1.124 | line CENTRALX to NEWSF230 230 ck 1 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | B2_003 | ivsg_hs_alt1d1 | 408.3 | -377.4 | 4.9 | 1610.2 | 377.5 | 0.943 | 1.012 | N.GILA - IMPRLVLY 1 500kV |
| 22356 | IMPRLVLY | 230 | 22360 | IMPRLVLY | 500 | 2 | B2_003 | ivsg_hs_alt1d1 | 1120 | 1012.3 | 291.9 | 2704.2 | 1053.5 | 0.94 | 0.65 | N.GILA - IMPRLVLY 1 500kV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | B2_007 | ivsg_hs_alt1d1 | 392 | 369.3 | 0.3 | 960 | 369.3 | 0.94 | 0.91 | PENSQTOS - ENCINA 1 230kV |
| 24807 | MIRAGE | 115 | 24816 | SANTA RO | 115 | 1 | tran_238 | ivsg_hs_alt1d1 | 183.3 | 162.1 | -11 | 859.3 | 162.4 | 0.934 | 0.856 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 8311 | COACHELA | 230 | 8695 | RAMON | 230 | 2 | line_44 | ivsg_hs_alt1d1 | 800 | 741.8 | 20.1 | 1873.6 | 742 | 0.933 | 0.766 | line COACHELA to DEVERS 230 ck 2 |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_63 | ivsg_hs_alt1d1 | 169 | 157.5 | 29.5 | 563.5 | 160.3 | 0.933 | 0.803 | line RAMON to MIRAGE 230 ck 2 |
| 22504 | MISSION | 230 | 22500 | MISSION | 138 | 1 | MS70 | ivsg_hs_alt1d1 | 392 | 346.6 | 108.6 | 946.1 | 363.2 | 0.93 | 0.76 | tran MISSION 230 to MISSION 69 ck 1 |
| 22504 | MISSION | 230 | 22500 | MISSION | 138 | 2 | MS70 | ivsg_hs_alt1d1 | 392 | 346.6 | 108.6 | 946.1 | 363.2 | 0.93 | 0.76 | tran MISSION 230 to MISSION 69 ck 1 |
| 22504 | MISSION | 230 | 22500 | MISSION | 138 | 1 | SX60 | ivsg_hs_alt1d1 | 392 | 357.6 | 77.2 | 958.6 | 365.8 | 0.93 | 0.76 | tran SYCAMORE 230 to SYCAMORE 138 ck 1 |
| 22504 | MISSION | 230 | 22500 | MISSION | 138 | 2 | SX60 | ivsg_hs_alt1d1 | 392 | 357.6 | 77.2 | 958.6 | 365.8 | 0.93 | 0.76 | tran SYCAMORE 230 to SYCAMORE 138 ck 1 |
| 24303 | BIG CRK3 | 230 | 24235 | RECTOR | 230 | 1 | line_139 | ivsg_hs_alt1d1 | 353 | 335.6 | 46.3 | 823.6 | 338.8 | 0.93 | 0.73 | line SPRINGVL to BIG CRK4 230 ck 1 |
| 19020 | BLYTHE | 161 | 24017 | BLYTHESC | 161 | 1 | line_191 | ivsg_hs_alt1d1 | 244 | 227.7 | 35.9 | 810.5 | 230.5 | 0.926 | 0.82 | line EAGLEMTN to IRON MTN 230 ck 1 |
| 24614 | TAP601 | 115 | 24702 | KRAMER | 115 | 1 | line_169 | ivsg_hs_alt1d1 | 217.1 | -190 | 68.6 | 1005.5 | 202 | 0.925 | 0.717 | line KRAMER to LUGO 230 ck 1 |
| 24614 | TAP601 | 115 | 24702 | KRAMER | 115 | 1 | line_170 | ivsg_hs_alt1d1 | 217.1 | -190 | 68.6 | 1005.5 | 202 | 0.925 | 0.717 | line KRAMER to LUGO 230 ck 2 |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_12 | ivsg_hs_alt1d1 | 169 | 155.8 | 28.8 | 557 | 158.4 | 0.922 | 0.803 | line COACHELA to RAMON 230 ck 2 |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | B2_022 | ivsg_hs_alt1d1 | 382.4 | 337.8 | -1 | 1474.2 | 337.8 | 0.921 | 0.849 | OTAYMESA - TJI-230 1 230kV |
| 22360 | IMPRLVLY | 500 | 22468 | MIGUEL | 500 | 1 | B2_022 | ivsg_hs_alt1d1 | 2252 | 1985.8 | 503.6 | 2334.1 | 2048.6 | 0.916 | 0.789 | OTAYMESA - TJI-230 1 230kV |
| 8601 | GEOSUB2 | 230 | 8300 | BANIS230 | 230 | 1 | line_13 | ivsg_hs_alt1d1 | 550 | 505.8 | 74.9 | 1262.3 | 511.3 | 0.915 | 0.806 | line COACHELA to MIDWAY 230 ck 1 |
| 8601 | GEOSUB2 | 230 | 8300 | BANIS230 | 230 | 1 | line_14 | ivsg_hs_alt1d1 | 550 | 505.8 | 74.9 | 1262.3 | 511.3 | 0.915 | 0.806 | line COACHELA to MIDWAY 230 ck 2 |
| 24301 | BIG CRK1 | 230 | 24235 | RECTOR | 230 | 1 | line_156 | ivsg_hs_alt1d1 | 329 | 305.6 | 4.7 | 752.2 | 305.6 | 0.911 | 0.728 | line BIG CRK1 to BIG CRK2 230 ck 1 |
| 24602 | VICTOR | 115 | 24702 | KRAMER | 115 | 1 | line_169 | ivsg_hs_alt1d1 | 217.1 | -185.3 | 78.7 | 989.4 | 201.3 | 0.911 | 0.704 | line KRAMER to LUGO 230 ck 1 |
| 24602 | VICTOR | 115 | 24702 | KRAMER | 115 | 1 | line_170 | ivsg_hs_alt1d1 | 217.1 | -185.3 | 78.7 | 989.4 | 201.3 | 0.911 | 0.704 | line KRAMER to LUGO 230 ck 2 |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | SO2 | ivsg_hs_alt1d1 | 382.4 | 331.4 | 6.1 | 1454 | 331.4 | 0.909 | 0.849 | gen S.ONOFR2 22.00 |
| 19020 | BLYTHE | 161 | 24017 | BLYTHESC | 161 | 1 | line_63 | ivsg_hs_alt1d1 | 244 | 224 | 29.8 | 794.5 | 226 | 0.908 | 0.82 | line RAMON to MIRAGE 230 ck 2 |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | B2_028 | ivsg_hs_alt1d1 | 382.4 | 338.1 | 10.1 | 1450.3 | 338.2 | 0.907 | 0.849 | MIGUEL - SYCAMORE 1 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_029 | ivsg_hs_alt1d1 | 204.1 | 179.6 | -0.9 | 774.3 | 179.6 | 0.907 | 1.124 | OTAYMESA - MLSXTAP 1 230kV |

ivsg_hs_alt1d1.sav
FLOW Summary
N-1 Outages

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_031 | ivsg_hs_alt1d1 | 204.1 | 179.4 | -1.7 | 774.6 | 179.4 | 0.907 | 1.124 | SYCAMORE - MLSXTAP 1 230kV |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | MS60 | ivsg_hs_alt1d1 | 382.4 | 336.3 | 17.2 | 1448.3 | 336.7 | 0.905 | 0.849 | tran MISSION 230 to MISSION 138 ck 1 |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | MS61 | ivsg_hs_alt1d1 | 382.4 | 336.3 | 17.2 | 1448.3 | 336.7 | 0.905 | 0.849 | tran MISSION 230 to MISSION 138 ck 2 |
| 24086 | LUGO | 500 | 24097 | MOHAVE | 500 | 1 | line_085 | ivsg_hs_alt1d1 | 1386 | -1298.2 | -36.9 | 1446.4 | 1298.7 | 0.904 | 0.709 | line LUGO to VICTORVL 500 ck 1 |
| 8695 | RAMON | 230 | 24806 | MIRAGE | 230 | 2 | line_44 | ivsg_hs_alt1d1 | 800 | 707.4 | -98.3 | 1812.5 | 714.2 | 0.903 | 0.717 | line COACHELA to DEVERS 230 ck 2 |
| 22116 | CARLTHTP | 138 | 22734 | SANTEE | 138 | 1 | ML60 | ivsg_hs_alt1d1 | 273 | 236.8 | -2.6 | 1031.7 | 236.8 | 0.903 | 0.731 | tran MIGUEL 230 to MIGUEL 138 ck 1 |
| 24301 | BIG CRK1 | 230 | 24302 | BIG CRK2 | 230 | 1 | line_155 | ivsg_hs_alt1d1 | 329 | 305.6 | -21.7 | 745.7 | 306.4 | 0.903 | 0.247 | line BIG CRK1 to RECTOR 230 ck 1 |
| 19020 | BLYTHE | 161 | 24017 | BLYTHESC | 161 | 1 | line_12 | ivsg_hs_alt1d1 | 244 | 222.3 | 29 | 788.1 | 224.1 | 0.901 | 0.82 | line COACHELA to RAMON 230 ck 2 |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | SX70 | ivsg_hs_alt1d1 | 382.4 | 332.6 | 18.5 | 1441.4 | 333.1 | 0.901 | 0.849 | tran SYCAMORE 230 to SYCAMORE 69 ck 1 |
| 22464 | MIGUEL | 230 | 22472 | MIGUELMP | 500 | 1 | B2_022 | ivsg_hs_alt1d1 | 1120 | -1002.2 | 28.2 | 2660.9 | 1002.6 | 0.9 | 0.79 | OTAYMESA - TJI-230 1 230kV |
| 22468 | MIGUEL | 500 | 22472 | MIGUELMP | 500 | 1 | B2_022 | ivsg_hs_alt1d1 | 1120 | 1003.7 | 113.7 | 1224 | 1010.1 | 0.9 | 0.8 | OTAYMESA - TJI-230 1 230kV |
| 79064 | SHIPROCK | 345 | 79063 | SHIPROCK | 230 | 1 | line_001 | ivsg_hs_alt1d1 | 300 | 261.6 | -49.7 | 434 | 266.3 | 0.9 | 0.86 | line MOENKOPI to ELDORDO 500 ck 1 |
| 24729 | INYO | 230 | 24730 | INYO PS | 115 | 2 | tran_230 | ivsg_hs_alt1d1 | 50 | -42 | 15.9 | 105.4 | 44.9 | 0.9 | 0.54 | tran INYO 230 to INYO PS 115 ck 1 |
| 24729 | INYO | 230 | 24730 | INYO PS | 115 | 1 | tran_231 | ivsg_hs_alt1d1 | 50 | -42 | 15.9 | 105.4 | 44.9 | 0.9 | 0.54 | tran INYO 230 to INYO PS 115 ck 2 |
| 24805 | DEVERS | 115 | 24804 | DEVERS | 230 | 1 | tran_236 | ivsg_hs_alt1d1 | 280 | -246 | 53.4 | 1255.5 | 251.8 | 0.9 | 0.6 | tran DEVERS 115 to DEVERS 230 ck 3 |

ivsg_hs_alt1d1.sav
No Solve Summary
N-1 Outages

| Contingency-Description | Case | Problem-Description |
|---|---|---|
| IMPRLVLY - MIGUEL 1 500kV | ivsg_hs_alt1d1 | Pmis 22736 SANTYSBL 69.00 = -276101.13 MW + j -600635.06 MVAR |

ivsg_hs_alt1d1.sav
VOLTAGE Summary
N-2 Outages

| Bus | Name | kV | Area | Zone | Outage | Case | Vbase | Vcont | DeltaV | Vmin | Vmax | Max-dv | Contingency Descriptior |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22734 | SANTEE | 138 | 22 | 223 | 23021/22/23/41 | ivsg_hs_alt1d1 | 0.967 | 0.856 | -0.112 | 0.9 | 1.05 | 0.05 | MIGUEL 230 CORRIDOR West of SN |
| 22412 | LOSCOCHS | 138 | 22 | 223 | 23021/22/23/41 | ivsg_hs_alt1d1 | 0.965 | 0.861 | -0.104 | 0.9 | 1.05 | 0.05 | MIGUEL 230 CORRIDOR West of SN |
| 22428 | MAINST51 | 138 | 22 | 222 | 23021/22/23/41 | ivsg_hs_alt1d1 | 0.961 | 0.886 | -0.075 | 0.9 | 1.05 | 0.05 | MIGUEL 230 CORRIDOR West of SN |
| 22424 | MAINST50 | 138 | 22 | 222 | 23021/22/23/41 | ivsg_hs_alt1d1 | 0.962 | 0.887 | -0.075 | 0.9 | 1.05 | 0.05 | MIGUEL 230 CORRIDOR West of SN |
| 22412 | LOSCOCHS | 138 | 22 | 223 | 23021/22/23/41 | ivsg_hs_alt1d1 | 0.965 | 0.889 | -0.076 | 0.9 | 1.05 | 0.05 | MIGUEL 230 CORRIDOR West of LC |
| 22772 | SOUTHBAY | 138 | 22 | 222 | 23021/22/23/41 | ivsg_hs_alt1d1 | 0.97 | 0.895 | -0.075 | 0.9 | 1.05 | 0.05 | MIGUEL 230 CORRIDOR West of SN |
| 22852 | TELECYN | 138 | 22 | 222 | 23021/22/23/41 | ivsg_hs_alt1d1 | 0.979 | 0.901 | -0.078 | 0.9 | 1.05 | 0.05 | MIGUEL 230 CORRIDOR West of SN |
| 22428 | MAINST51 | 138 | 22 | 222 | 23021/22/23/41 | ivsg_hs_alt1d1 | 0.961 | 0.903 | -0.058 | 0.9 | 1.05 | 0.05 | MIGUEL 230 CORRIDOR West of LC |
| 22424 | MAINST50 | 138 | 22 | 222 | 23021/22/23/41 | ivsg_hs_alt1d1 | 0.962 | 0.904 | -0.058 | 0.9 | 1.05 | 0.05 | MIGUEL 230 CORRIDOR West of LC |
| 22672 | PRCTRVLY | 138 | 22 | 222 | 23021/22/23/41 | ivsg_hs_alt1d1 | 0.982 | 0.907 | -0.075 | 0.9 | 1.05 | 0.05 | MIGUEL 230 CORRIDOR West of SN |
| 22424 | MAINST50 | 138 | 22 | 222 | 23021/22/23/41 | ivsg_hs_alt1d1 | 0.962 | 0.908 | -0.054 | 0.9 | 1.05 | 0.05 | MIGUEL 230 CORRIDOR North of ML |
| 22428 | MAINST51 | 138 | 22 | 222 | 23021/22/23/41 | ivsg_hs_alt1d1 | 0.961 | 0.908 | -0.054 | 0.9 | 1.05 | 0.05 | MIGUEL 230 CORRIDOR North of ML |
| 22460 | MIGUEL | 138 | 22 | 222 | 23021/22/23/41 | ivsg_hs_alt1d1 | 0.984 | 0.911 | -0.073 | 0.9 | 1.05 | 0.05 | MIGUEL 230 CORRIDOR West of SN |
| 22772 | SOUTHBAY | 138 | 22 | 222 | 23021/22/23/41 | ivsg_hs_alt1d1 | 0.97 | 0.912 | -0.057 | 0.9 | 1.05 | 0.05 | MIGUEL 230 CORRIDOR West of LC |
| 22865 | UPTOWN | 138 | 22 | 221 | 23021/22/23/41 | ivsg_hs_alt1d1 | 0.974 | 0.915 | -0.059 | 0.9 | 1.05 | 0.05 | MIGUEL 230 CORRIDOR West of SN |
| 22772 | SOUTHBAY | 138 | 22 | 222 | 23021/22/23/41 | ivsg_hs_alt1d1 | 0.97 | 0.917 | -0.052 | 0.9 | 1.05 | 0.05 | MIGUEL 230 CORRIDOR North of ML |
| 22852 | TELECYN | 138 | 22 | 222 | 23021/22/23/41 | ivsg_hs_alt1d1 | 0.979 | 0.919 | -0.06 | 0.9 | 1.05 | 0.05 | MIGUEL 230 CORRIDOR West of LC |
| 22672 | PRCTRVLY | 138 | 22 | 222 | 23021/22/23/41 | ivsg_hs_alt1d1 | 0.982 | 0.924 | -0.058 | 0.9 | 1.05 | 0.05 | MIGUEL 230 CORRIDOR West of LC |
| 24058 | GOLETA | 230 | 24 | 240 | line_2269 | ivsg_hs_alt1d1 | 0.982 | 0.927 | -0.055 | 0.9 | 1.05 | 0.05 | S.CLARA 230.00 - GOLETA 230.00 1, S.CLARA 230.00 - MOORPARK 230.00 1 |
| 24058 | GOLETA | 230 | 24 | 240 | line_2270 | ivsg_hs_alt1d1 | 0.982 | 0.927 | -0.055 | 0.9 | 1.05 | 0.05 | S.CLARA 230.00 - GOLETA 230.00 2, S.CLARA 230.00 - MOORPARK 230.00 2 |
| 22852 | TELECYN | 138 | 22 | 222 | 23021/22/23/41 | ivsg_hs_alt1d1 | 0.979 | 0.927 | -0.053 | 0.9 | 1.05 | 0.05 | MIGUEL 230 CORRIDOR North of ML |
| 22460 | MIGUEL | 138 | 22 | 222 | 23021/22/23/41 | ivsg_hs_alt1d1 | 0.984 | 0.928 | -0.056 | 0.9 | 1.05 | 0.05 | MIGUEL 230 CORRIDOR West of LC |
| 24015 | ARCO SC | 230 | 24 | 240 | line_2013 | ivsg_hs_alt1d1 | 0.985 | 1.036 | 0.052 | 0.9 | 1.05 | 0.05 | ARCO SC 230.00 - HINSON 230.00 1, ARCO SC 230.00 - HINSON 230.00 2 |
| 24061 | HARBOR | 230 | 24 | 240 | line_2039 | ivsg_hs_alt1d1 | 0.984 | 1.036 | 0.052 | 0.9 | 1.05 | 0.05 | HARBOR 230.00 - HINSON 230.00 1, LBEACH 230.00 - LITEHIPE 230.00 1 |
| 24077 | LBEACH | 230 | 24 | 240 | line_2039 | ivsg_hs_alt1d1 | 0.985 | 1.036 | 0.052 | 0.9 | 1.05 | 0.05 | HARBOR 230.00 - HINSON 230.00 1, LBEACH 230.00 - LITEHIPE 230.00 1 |
| 24061 | HARBOR | 230 | 24 | 240 | line_2041 | ivsg_hs_alt1d1 | 0.984 | 1.036 | 0.052 | 0.9 | 1.05 | 0.05 | HARBOR 230.00 - HINSON 230.00 1, HARBOR 230.00 - LBEACH 230.00 1 |
| 24061 | HARBOR | 230 | 24 | 240 | line_2253 | ivsg_hs_alt1d1 | 0.984 | 1.036 | 0.052 | 0.9 | 1.05 | 0.05 | HARBOR 230.00 - HINSON 230.00 1, HARBOR 230.00 - LBEACH 230.00 1 |
| 25001 | GOODRICH | 230 | 24 | 250 | line_2073 | ivsg_hs_alt1d1 | 0.956 | 1.044 | 0.089 | 0.9 | 1.05 | 0.05 | GOODRICH 230.00 - GOULD 230.00 1, GOODRICH 230.00 - LAGUBELL 230.00 1 |
| 24058 | GOLETA | 230 | 24 | 240 | line_2120 | ivsg_hs_alt1d1 | 0.982 | 1.044 | 0.063 | 0.9 | 1.05 | 0.05 | S.CLARA 230.00 - GOLETA 230.00 1, S.CLARA 230.00 - GOLETA 230.00 2 |

ivsg_hs_alt1d1.sav
FLOW Summary
N-2 Outages

| LEGEND | % of RATING 1 | |
|---|---|---|
| C_pu | 100% - 110% | |
| C_pu | 110% - 120% | P.U. of |
| C_pu | > 120% | Rate 1 |

| FROM | FR | BKV | TO | TO | BKV | CK | Outage_Name | Case | Rate-Mva | Pflow | Qflow | Amps | MVA | C_pu | B_pu | Contingency_Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt1d1 | 408.3 | -644 | -4.2 | 2971.9 | 644 | 1.74 | 1.012 | MIGUEL 230 CORRIDOR West of SN |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt1d1 | 392 | 658.8 | 143.4 | 1841.2 | 674.2 | 1.72 | 1.05 | MIGUEL 230 CORRIDOR West of SN |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt1d1 | 392 | 650.3 | 132.6 | 1785.1 | 663.7 | 1.69 | 1.05 | MIGUEL 230 CORRIDOR West of LC |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt1d1 | 408.3 | -636.4 | -1.7 | 2881.3 | 636.4 | 1.687 | 1.012 | MIGUEL 230 CORRIDOR West of LC |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 13821C/25/23051A | ivsg_hs_alt1d1 | 204.1 | 319 | -27.1 | 1389 | 320.1 | 1.627 | 1.124 | CH-ES-NCM-SX |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt1d1 | 392 | 621 | 126.8 | 1692.3 | 633.8 | 1.62 | 1.05 | MIGUEL 230 CORRIDOR North of ML |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt1d1 | 382.4 | 552.6 | -6.9 | 2565.4 | 552.6 | 1.604 | 0.849 | MIGUEL 230 CORRIDOR West of SN |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt1d1 | 408.3 | -608.5 | -9.2 | 2731.6 | 608.6 | 1.599 | 1.012 | MIGUEL 230 CORRIDOR North of ML |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt1d1 | 382.4 | 545.3 | -5.8 | 2482.5 | 545.3 | 1.552 | 0.849 | MIGUEL 230 CORRIDOR West of LC |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt1d1 | 382.4 | 517.8 | 5.8 | 2338.2 | 517.8 | 1.461 | 0.849 | MIGUEL 230 CORRIDOR North of ML |
| 22672 | PRCTRVLY | 138 | 22852 | TELECYN | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt1d1 | 478 | 613.2 | 0.2 | 2829.4 | 613.2 | 1.415 | 0.799 | MIGUEL 230 CORRIDOR West of SN |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23051B/23011 | ivsg_hs_alt1d1 | 204.1 | 278.7 | -5.1 | 1196.8 | 278.7 | 1.402 | 1.124 | EPP-ES + ES-EA-SA 230KV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23022/23023 | ivsg_hs_alt1d1 | 392 | 540.2 | 75.4 | 1426.8 | 545.5 | 1.39 | 1.05 | ML-MS1+ ML-MS2 230KV |
| 22672 | PRCTRVLY | 138 | 22852 | TELECYN | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt1d1 | 478 | 605.6 | -2.3 | 2741.6 | 605.6 | 1.371 | 0.799 | MIGUEL 230 CORRIDOR West of LC |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23022/23023 | ivsg_hs_alt1d1 | 204.1 | 269 | -7.2 | 1158.4 | 269.1 | 1.357 | 1.124 | ML-MS1+ ML-MS2 230KV |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23022/23023 | ivsg_hs_alt1d1 | 408.3 | -531.4 | 8.2 | 2303.1 | 531.5 | 1.348 | 1.012 | ML-MS1+ ML-MS2 230KV |
| 22672 | PRCTRVLY | 138 | 22852 | TELECYN | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt1d1 | 478 | 577.7 | 5.3 | 2592.8 | 577.7 | 1.297 | 0.799 | MIGUEL 230 CORRIDOR North of ML |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23051A/23011 | ivsg_hs_alt1d1 | 204.1 | 252.4 | -14.2 | 1093.7 | 252.8 | 1.281 | 1.124 | SX-EPP + ES-EA-SA 230KV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23011/13825 | ivsg_hs_alt1d1 | 204.1 | 248.1 | -16.9 | 1069 | 248.6 | 1.252 | 1.124 | ES-EA-SA 230KV + BQ-CC-ES-NCM 138KV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23012/13807 | ivsg_hs_alt1d1 | 204.1 | 245.6 | 10.9 | 1059.8 | 245.9 | 1.241 | 1.124 | PQ-EA 230KV + EA-NCW 138KV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23012/13808 | ivsg_hs_alt1d1 | 204.1 | 240.8 | 9.3 | 1037.2 | 241 | 1.215 | 1.124 | PQ-EA 230KV + NCW-PQ 138KV |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 2 | line_2046 | ivsg_hs_alt1d1 | 956 | -1135.6 | -40.3 | 2890.8 | 1136.3 | 1.205 | 0.598 | LA FRESA 230.00 - REDONDO 230.00 1, REDONDO 230.00 - LITEHIPE 230.00 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 1 | line_2047 | ivsg_hs_alt1d1 | 956 | -1135.6 | -40.3 | 2890.8 | 1136.3 | 1.205 | 0.598 | LA FRESA 230.00 - REDONDO 230.00 2, REDONDO 230.00 - LITEHIPE 230.00 1 |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | 23022/23023 | ivsg_hs_alt1d1 | 382.4 | 441.9 | 0.2 | 1921.8 | 441.9 | 1.201 | 0.849 | ML-MS1+ ML-MS2 230KV |
| 22596 | OLD TOWN | 230 | 22466 | MLMS3TAP | 230 | 1 | 23021/22/23/41 | ivsg_hs_alt1d1 | 912 | -1004.9 | 84.4 | 2706.8 | 1008.4 | 1.182 | 0.738 | MIGUEL 230 CORRIDOR West of SN |
| 24086 | LUGO | 500 | 24236 | RANCHVST | 500 | 1 | line_2194 | ivsg_hs_alt1d1 | 2598 | 3140.3 | 564.3 | 3527.2 | 3190.6 | 1.177 | 0.651 | LUGO 500.00 - MIRALOMA 500.00 2, LUGO 500.00 - MIRALOMA 500.00 3 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23004/23001 | ivsg_hs_alt1d1 | 204.1 | 233.4 | 5.6 | 1003.4 | 233.5 | 1.175 | 1.124 | SA-MS 1 + SA-MS 2 230KV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | 23051B/23011 | ivsg_hs_alt1d1 | 392 | 458.2 | 8.1 | 1191.1 | 458.2 | 1.17 | 0.91 | EPP-ES + ES-EA-SA 230KV |
| 22596 | OLD TOWN | 230 | 22466 | MLMS3TAP | 230 | 1 | 23021/22/23/41 | ivsg_hs_alt1d1 | 912 | -998.2 | 100.1 | 2666.5 | 1003.2 | 1.165 | 0.738 | MIGUEL 230 CORRIDOR North of ML |
| 22596 | OLD TOWN | 230 | 22466 | MLMS3TAP | 230 | 1 | 23021/22/23/41 | ivsg_hs_alt1d1 | 912 | -995.2 | 96.6 | 2660.1 | 999.9 | 1.162 | 0.738 | MIGUEL 230 CORRIDOR West of LC |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 13821B/638 | ivsg_hs_alt1d1 | 392 | 449.7 | 58.2 | 1189.5 | 453.5 | 1.16 | 1.05 | CH-SX-SN 138KV + SAN VCNT-EL 69KV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23013/27/28 | ivsg_hs_alt1d1 | 204.1 | 230.7 | 2 | 990.3 | 230.7 | 1.16 | 1.124 | OLD TOWN TO OLD TOWN JCT |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 2 | line_2029 | ivsg_hs_alt1d1 | 1195 | 1332.4 | -56 | 3455.9 | 1333.6 | 1.152 | 0.572 | LEWIS 230.00 - SERRANO 230.00 1, SERRANO 230.00 - VILLA PK 230.00 1 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 2 | line_2031 | ivsg_hs_alt1d1 | 1195 | 1332.4 | -56 | 3455.9 | 1333.6 | 1.152 | 0.572 | LEWIS 230.00 - SERRANO 230.00 2, SERRANO 230.00 - VILLA PK 230.00 1 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 2 | line_2278 | ivsg_hs_alt1d1 | 1195 | 1332.4 | -56 | 3455.9 | 1333.6 | 1.152 | 0.572 | LEWIS 230.00 - SERRANO 230.00 1, SERRANO 230.00 - VILLA PK 230.00 1 |
| 30060 | MIDWAY | 500 | 24156 | VINCENT | 500 | 3 | line_2215 | ivsg_hs_alt1d1 | 1848.1 | 2245.5 | 152.1 | 2441.9 | 2250.6 | 1.149 | 0.45 | MIDWAY 500.00 - VINCENT 500.00 1, MIDWAY 500.00 - VINCENT 500.00 2 |
| 24025 | CHINO | 230 | 24093 | MIRALOMW | 230 | 1 | line_2160 | ivsg_hs_alt1d1 | 705 | -777 | 34.5 | 2019.1 | 777.8 | 1.141 | 0.302 | CHINO 230.00 - MIRALOMA 230.00 2, CHINO 230.00 - MIRALOMA 230.00 3 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 2 | line_2064 | ivsg_hs_alt1d1 | 956 | -1071.7 | -48 | 2728.1 | 1072.7 | 1.137 | 0.598 | LA FRESA 230.00 - REDONDO 230.00 1, MESA CAL 230.00 - REDONDO 230.00 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 1 | line_2065 | ivsg_hs_alt1d1 | 956 | -1071.7 | -48 | 2728.1 | 1072.7 | 1.137 | 0.598 | LA FRESA 230.00 - REDONDO 230.00 2, MESA CAL 230.00 - REDONDO 230.00 1 |
| 30060 | MIDWAY | 500 | 24156 | VINCENT | 500 | 1 | line_2220 | ivsg_hs_alt1d1 | 1848.1 | 2212.8 | 157.1 | 2406.9 | 2218.3 | 1.134 | 0.36 | MIDWAY 500.00 - VINCENT 500.00 2, MIDWAY 500.00 - VINCENT 500.00 3 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23021/23041 | ivsg_hs_alt1d1 | 392 | 441.6 | 51.1 | 1170.8 | 444.5 | 1.13 | 1.05 | ML-SX + OM-SX 230KV |
| 8601 | GEOSUB2 | 230 | 8300 | BANIS230 | 230 | 1 | line_N-204 | ivsg_hs_alt1d1 | 550 | 612.8 | 100.5 | 1557.5 | 621 | 1.129 | 0.806 | COACHELLA MIDWAY 230 CKT 1&2 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 13821B/638 | ivsg_hs_alt1d1 | 408.3 | -443.6 | -0.2 | 1920.1 | 443.6 | 1.124 | 1.012 | CH-SX-SN 138KV + SAN VCNT-EL 69KV |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23021/23041 | ivsg_hs_alt1d1 | 408.3 | -435.6 | 5.1 | 1889.8 | 435.7 | 1.106 | 1.012 | ML-SX + OM-SX 230KV |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 2 | line_2049 | ivsg_hs_alt1d1 | 956 | -1028.3 | -39.5 | 2621.5 | 1029.1 | 1.092 | 0.598 | LA FRESA 230.00 - REDONDO 230.00 1, LCIENEGA 230.00 - LA FRESA 230.00 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 1 | line_2050 | ivsg_hs_alt1d1 | 956 | -1028.3 | -39.5 | 2621.5 | 1029.1 | 1.092 | 0.598 | LA FRESA 230.00 - REDONDO 230.00 2, LCIENEGA 230.00 - LA FRESA 230.00 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 2 | line_2057 | ivsg_hs_alt1d1 | 956 | -1027.9 | -36.3 | 2619 | 1028.5 | 1.091 | 0.598 | EL NIDO 230.00 - LA FRESA 230.00 3, LA FRESA 230.00 - REDONDO 230.00 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 1 | line_2058 | ivsg_hs_alt1d1 | 956 | -1027.9 | -36.3 | 2619 | 1028.5 | 1.091 | 0.598 | EL NIDO 230.00 - LA FRESA 230.00 3, LA FRESA 230.00 - REDONDO 230.00 2 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 2 | line_2059 | ivsg_hs_alt1d1 | 956 | -1027.9 | -36.3 | 2619 | 1028.5 | 1.091 | 0.598 | EL NIDO 230.00 - LA FRESA 230.00 4, LA FRESA 230.00 - REDONDO 230.00 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 1 | line_2060 | ivsg_hs_alt1d1 | 956 | -1027.9 | -36.3 | 2619 | 1028.5 | 1.091 | 0.598 | EL NIDO 230.00 - LA FRESA 230.00 4, LA FRESA 230.00 - REDONDO 230.00 2 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23051B/23011 | ivsg_hs_alt1d1 | 392 | 424.3 | 49.5 | 1114.5 | 427.2 | 1.09 | 1.05 | EPP-ES + ES-EA-SA 230KV |
| 24701 | KRAMER | 230 | 24085 | LUGO | 230 | 2 | line_2260 | ivsg_hs_alt1d1 | 478 | 525.9 | 8.1 | 1303.6 | 526 | 1.086 | 0.645 | KRAMER 230.00 - LUGO 230.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 22672 | PRCTRVLY | 138 | 22852 | TELECYN | 138 | 1 | 23022/23023 | ivsg_hs_alt1d1 | 478 | 500.5 | -12.1 | 2169.7 | 500.7 | 1.085 | 0.799 | ML-MS1+ ML-MS2 230KV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | 23022/23023 | ivsg_hs_alt1d1 | 392 | 422.1 | -3.7 | 1102.3 | 422.2 | 1.08 | 0.91 | ML-MS1+ ML-MS2 230KV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23027/28/13810 | ivsg_hs_alt1d1 | 204.1 | 214.2 | 8.3 | 917.9 | 214.4 | 1.075 | 1.124 | OLD TOWN TO MISSION 1 |
| 8900 | PRUETTAP | 92 | 8691 | HIGHLINE | 92 | 1 | line_N-209 | ivsg_hs_alt1d1 | 86 | -93.7 | 6.1 | 579.3 | 93.9 | 1.073 | 0.765 | EL CENTRO HIGHLINE 230 CKTS 1&2 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 1 | line_2030 | ivsg_hs_alt1d1 | 1287 | 1332.4 | -56 | 3455.9 | 1333.6 | 1.07 | 0.531 | LEWIS 230.00 - SERRANO 230.00 1, SERRANO 230.00 - VILLA PK 230.00 2 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 1 | line_2032 | ivsg_hs_alt1d1 | 1287 | 1332.4 | -56 | 3455.9 | 1333.6 | 1.07 | 0.531 | LEWIS 230.00 - SERRANO 230.00 2, SERRANO 230.00 - VILLA PK 230.00 2 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_2260 | ivsg_hs_alt1d1 | 56 | 58 | -9.9 | 292.7 | 58.8 | 1.06 | 0.92 | KRAMER 230.00 - LUGO 230.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23052/23007 | ivsg_hs_alt1d1 | 204.1 | 209.4 | -1.7 | 902.6 | 209.4 | 1.057 | 1.124 | TA-SO 1 + 2 230KV |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | line_2245 | ivsg_hs_alt1d1 | 408.3 | -416.4 | 9.3 | 1803.3 | 416.5 | 1.056 | 1.012 | DEVERS 500.00 - VALLEYSC 500.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | line_2113 | ivsg_hs_alt1d1 | 408.3 | -415.3 | 7.8 | 1800.4 | 415.4 | 1.054 | 1.012 | ELLIS 230.00 - JOHANNA 230.00 1, ELLIS 230.00 - SANTIAGO 230.00 1 |
| 22260 | ESCNDIDO | 230 | 22844 | TALEGA | 230 | 1 | 23052/23007 | ivsg_hs_alt1d1 | 456.1 | 471.8 | 24.2 | 1205.1 | 472.5 | 1.053 | 0.075 | TA-SO 1 + 2 230KV |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23051B/23011 | ivsg_hs_alt1d1 | 408.3 | -418.9 | 1.4 | 1799 | 418.9 | 1.053 | 1.012 | EPP-ES + ES-EA-SA 230KV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | 23051A/23011 | ivsg_hs_alt1d1 | 392 | 410.1 | -17.1 | 1080.5 | 410.4 | 1.05 | 0.91 | SX-EPP + ES-EA-SA 230KV |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | line_N-203 | ivsg_hs_alt1d1 | 408.3 | -413.2 | 7.7 | 1780.5 | 413.3 | 1.042 | 1.012 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 8600 | GEOSUB1 | 230 | 8300 | BANIS230 | 230 | 1 | line_N-204 | ivsg_hs_alt1d1 | 550 | 560.6 | 89.3 | 1425.2 | 567.7 | 1.033 | 0.745 | COACHELLA MIDWAY 230 CKT 1&2 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8600 | GEOSUB1 | 230 | 8300 | BANIS230 | 230 | 2 | line_N-204 | ivsg_hs_alt1d1 | 550 | 560.6 | 89.3 | 1425.2 | 567.7 | 1.033 | 0.745 | COACHELLA MIDWAY 230 CKT 1&2 |
| 22596 | OLD TOWN | 230 | 22466 | MLMS3TAP | 230 | 1 | 23021/23041 | ivsg_hs_alt1d1 | 912 | -890.2 | 66.5 | 2346.9 | 892.6 | 1.025 | 0.738 | ML-SX + OM-SX 230KV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | line_2115 | ivsg_hs_alt1d1 | 392 | 396.3 | 42.2 | 1019.2 | 398.5 | 1.02 | 1.05 | S.ONOFRE 230.00 - SANTIAGO 230.00 1, S.ONOFRE 230.00 - SANTIAGO 230.00 2 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23013/27/28 | ivsg_hs_alt1d1 | 392 | 398.4 | 41.7 | 1048.2 | 400.6 | 1.02 | 1.05 | OLD TOWN TO OLD TOWN JCT |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_N-203 | ivsg_hs_alt1d1 | 169 | 169.9 | 36.1 | 611 | 173.7 | 1.012 | 0.803 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 24016 | BARRE | 230 | 24044 | ELLIS | 230 | 1 | line_2115 | ivsg_hs_alt1d1 | 988 | 961.7 | -57.6 | 2504.9 | 963.4 | 1.01 | 0.451 | S.ONOFRE 230.00 - SANTIAGO 230.00 1, S.ONOFRE 230.00 - SANTIAGO 230.00 2 |
| 24126 | RIOHONDO | 230 | 24155 | VINCENT | 230 | 2 | line_2097 | ivsg_hs_alt1d1 | 988 | -942.8 | 116.4 | 2499.3 | 950 | 1.008 | 0.733 | GOODRICH 230.00 - GOULD 230.00 1, VINCENT 230.00 - MESA CAL 230.00 1 |
| 24074 | LA FRESA | 230 | 24065 | HINSON | 230 | 1 | line_2061 | ivsg_hs_alt1d1 | 797 | -768.9 | 43.9 | 2011.1 | 770.1 | 1.005 | 0.136 | LA FRESA 230.00 - REDONDO 230.00 1, LA FRESA 230.00 - REDONDO 230.00 2 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23027/28/13827 | ivsg_hs_alt1d1 | 204.1 | 199.4 | 5.7 | 853.8 | 199.5 | 1 | 1.124 | OLD TOWN TO MISSION 2 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2191 | ivsg_hs_alt1d1 | 2400 | -2492.3 | -32.4 | 2764.8 | 2492.6 | 0.998 | 0.779 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - ELDORDO 230.00 2 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2100 | ivsg_hs_alt1d1 | 2400 | -2475.4 | -216 | 2752.4 | 2484.8 | 0.993 | 0.779 | EAGLROCK 230.00 - MESA CAL 230.00 1, SYLMAR S 230.00 - GOULD 230.00 1 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2192 | ivsg_hs_alt1d1 | 2400 | -2479.5 | -42.7 | 2751.5 | 2479.8 | 0.993 | 0.779 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2193 | ivsg_hs_alt1d1 | 2400 | -2479.2 | -42.8 | 2751.2 | 2479.6 | 0.993 | 0.779 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - LUGO 230.00 2 |
| 24086 | LUGO | 500 | 24097 | MOHAVE | 500 | 1 | line_2234 | ivsg_hs_alt1d1 | 1386 | -1427.5 | 85.5 | 1576.7 | 1430 | 0.993 | 0.709 | MOHAVE 500.00 - ELDORDO 500.00 1, PISGAH 230.00 - ELDORDO 230.00 2 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2200 | ivsg_hs_alt1d1 | 2400 | -2462.2 | -27.4 | 2742 | 2462.4 | 0.989 | 0.779 | LUGO 500.00 - MOHAVE 500.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2201 | ivsg_hs_alt1d1 | 2400 | -2462 | -27.5 | 2741.8 | 2462.1 | 0.989 | 0.779 | LUGO 500.00 - MOHAVE 500.00 1, PISGAH 230.00 - LUGO 230.00 2 |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | line_N-204 | ivsg_hs_alt1d1 | 132 | 128.7 | -12.1 | 816.5 | 129.3 | 0.986 | 0.947 | COACHELLA MIDWAY 230 CKT 1&2 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 13810B/23013 | ivsg_hs_alt1d1 | 204.1 | 195.8 | 7.6 | 839.5 | 196 | 0.983 | 1.124 | OT JCT TO PQ 1 |
| 24042 | ELDORDO | 500 | 24086 | LUGO | 500 | 1 | line_2258 | ivsg_hs_alt1d1 | 1386 | 1431.1 | 285.7 | 1556.1 | 1459.4 | 0.98 | 0.653 | LUGO 500.00 - VINCENT 500.00 2, LUGO 500.00 - VICTORVL 500.00 1 |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | line_2186 | ivsg_hs_alt1d1 | 132 | 130.2 | -10.5 | 809.7 | 130.6 | 0.977 | 0.947 | COACHELV 230.00 - DEVERS 230.00 2, J.HINDS 230.00 - MIRAGE 230.00 1 |
| 24126 | RIOHONDO | 230 | 24155 | VINCENT | 230 | 2 | line_2101 | ivsg_hs_alt1d1 | 988 | -918.7 | 117.8 | 2419.2 | 926.2 | 0.975 | 0.733 | EAGLROCK 230.00 - MESA CAL 230.00 1, VINCENT 230.00 - MESA CAL 230.00 1 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2103 | ivsg_hs_alt1d1 | 2400 | -2430.8 | -199.8 | 2699.7 | 2439 | 0.974 | 0.779 | EAGLROCK 230.00 - SYLMAR S 230.00 1, SYLMAR S 230.00 - GOULD 230.00 1 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2096 | ivsg_hs_alt1d1 | 2400 | -2426.4 | -221.9 | 2693.8 | 2436.6 | 0.972 | 0.779 | EAGLROCK 230.00 - MESA CAL 230.00 1, GOODRICH 230.00 - GOULD 230.00 1 |
| 8311 | COACHELA | 230 | 8695 | RAMON | 230 | 2 | line_2186 | ivsg_hs_alt1d1 | 800 | 771.8 | 20.8 | 1952.1 | 772.1 | 0.972 | 0.766 | COACHELV 230.00 - DEVERS 230.00 2, J.HINDS 230.00 - MIRAGE 230.00 1 |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | 13821B/638 | ivsg_hs_alt1d1 | 382.4 | 354.9 | 15.3 | 1543.3 | 355.3 | 0.965 | 0.849 | CH-SX-SN 138KV + SAN VCNT-EL 69KV |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | line_2115 | ivsg_hs_alt1d1 | 408.3 | -391.7 | 0.4 | 1645.1 | 391.7 | 0.963 | 1.012 | S.ONOFRE 230.00 - SANTIAGO 230.00 1, S.ONOFRE 230.00 - SANTIAGO 230.00 2 |
| 19020 | BLYTHE | 161 | 24017 | BLYTHESC | 161 | 1 | line_N-203 | ivsg_hs_alt1d1 | 244 | 236.4 | 36.4 | 841.1 | 239.2 | 0.961 | 0.82 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_2194 | ivsg_hs_alt1d1 | 56 | 52.2 | -10.3 | 263.5 | 53.2 | 0.96 | 0.92 | LUGO 500.00 - MIRALOMA 500.00 2, LUGO 500.00 - MIRALOMA 500.00 3 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | 23013/27/28 | ivsg_hs_alt1d1 | 392 | 374.5 | -3 | 974.1 | 374.5 | 0.96 | 0.91 | OLD TOWN TO OLD TOWN JCT |
| 24126 | RIOHONDO | 230 | 24155 | VINCENT | 230 | 2 | line_2100 | ivsg_hs_alt1d1 | 988 | -896.5 | 121.7 | 2378.6 | 904.8 | 0.959 | 0.733 | EAGLROCK 230.00 - MESA CAL 230.00 1, SYLMAR S 230.00 - GOULD 230.00 1 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 2 | line_2279 | ivsg_hs_alt1d1 | 1195 | 1103.5 | -64 | 2872.6 | 1105.3 | 0.958 | 0.572 | S.ONOFRE 230.00 - SERRANO 230.00 1, SERRANO 230.00 - VILLA PK 230.00 1 |
| 8695 | RAMON | 230 | 24806 | MIRAGE | 230 | 2 | line_2186 | ivsg_hs_alt1d1 | 800 | 740.7 | -109.8 | 1901.6 | 748.8 | 0.947 | 0.717 | COACHELV 230.00 - DEVERS 230.00 2, J.HINDS 230.00 - MIRAGE 230.00 1 |
| 22831 | SYCAMORE | 138 | 22124 | CHCARITA | 138 | 1 | 13821B/638 | ivsg_hs_alt1d1 | 204.1 | 186.3 | -31.7 | 806.5 | 189 | 0.945 | 0.675 | CH-SX-SN 138KV + SAN VCNT-EL 69KV |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | 23021/23041 | ivsg_hs_alt1d1 | 382.4 | 347 | 10.3 | 1510.8 | 347.2 | 0.944 | 0.849 | ML-SX + OM-SX 230KV |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_N-204 | ivsg_hs_alt1d1 | 169 | 159.4 | 28.4 | 569.3 | 161.9 | 0.942 | 0.803 | COACHELLA MIDWAY 230 CKT 1&2 |
| 24126 | RIOHONDO | 230 | 24155 | VINCENT | 230 | 2 | line_2076 | ivsg_hs_alt1d1 | 988 | -889.3 | 109.5 | 2331.5 | 896 | 0.94 | 0.733 | GOODRICH 230.00 - LAGUBELL 230.00 1, VINCENT 230.00 - MESA CAL 230.00 1 |
| 24126 | RIOHONDO | 230 | 24155 | VINCENT | 230 | 2 | line_2096 | ivsg_hs_alt1d1 | 988 | -875 | 109 | 2314.9 | 881.7 | 0.933 | 0.733 | EAGLROCK 230.00 - MESA CAL 230.00 1, GOODRICH 230.00 - GOULD 230.00 1 |
| 8311 | COACHELA | 230 | 8695 | RAMON | 230 | 2 | line_2236 | ivsg_hs_alt1d1 | 800 | 741.8 | 20.1 | 1873.6 | 742 | 0.933 | 0.766 | PALOVRDE 500.00 - DEVERS 500.00 1, COACHELV 230.00 - DEVERS 230.00 2 |
| 8601 | GEOSUB2 | 230 | 8300 | BANIS230 | 230 | 1 | line_N-209 | ivsg_hs_alt1d1 | 550 | 516.4 | 73.8 | 1286.8 | 521.7 | 0.933 | 0.806 | EL CENTRO HIGHLINE 230 CKTS 1&2 |
| 8900 | PRUETTAP | 92 | 8691 | HIGHLINE | 92 | 1 | line_N-204 | ivsg_hs_alt1d1 | 86 | -80.7 | 9.9 | 502.1 | 81.3 | 0.931 | 0.765 | COACHELLA MIDWAY 230 CKT 1&2 |
| 24614 | TAP601 | 115 | 24702 | KRAMER | 115 | 1 | line_2260 | ivsg_hs_alt1d1 | 217.1 | -190.1 | 68.2 | 1006.6 | 202 | 0.926 | 0.717 | KRAMER 230.00 - LUGO 230.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 24126 | RIOHONDO | 230 | 24155 | VINCENT | 230 | 2 | line_2103 | ivsg_hs_alt1d1 | 988 | -866.7 | 108.2 | 2295 | 873.4 | 0.925 | 0.733 | EAGLROCK 230.00 - SYLMAR S 230.00 1, SYLMAR S 230.00 - GOULD 230.00 1 |
| 24025 | CHINO | 230 | 25656 | MIRALOME | 230 | 3 | line_2159 | ivsg_hs_alt1d1 | 988 | -890.8 | -7.4 | 2288.3 | 890.8 | 0.923 | 0.657 | CHINO 230.00 - MIRALOMA 230.00 1, CHINO 230.00 - MIRALOMA 230.00 2 |
| 22609 | OTAYMESA | 230 | 22466 | MLMS3TAP | 230 | 1 | 23021/22/23/41 | ivsg_hs_alt1d1 | 1176 | 1037.6 | 257.2 | 2704.5 | 1069 | 0.917 | 0.572 | MIGUEL 230 CORRIDOR West of SN |
| 22831 | SYCAMORE | 138 | 22124 | CHCARITA | 138 | 1 | 23051B/23011 | ivsg_hs_alt1d1 | 204.1 | 178.1 | -37.7 | 781.8 | 182.1 | 0.916 | 0.675 | EPP-ES + ES-EA-SA 230KV |
| 19020 | BLYTHE | 161 | 24017 | BLYTHESC | 161 | 1 | line_N-204 | ivsg_hs_alt1d1 | 244 | 225.9 | 28.7 | 800.7 | 227.7 | 0.915 | 0.82 | COACHELLA MIDWAY 230 CKT 1&2 |
| 8311 | COACHELA | 230 | 8695 | RAMON | 230 | 2 | line_2246 | ivsg_hs_alt1d1 | 800 | 727.7 | 15.4 | 1834.7 | 727.8 | 0.914 | 0.766 | VSTA 230.00 - DEVERS 230.00 1, COACHELV 230.00 - DEVERS 230.00 2 |
| 24086 | LUGO | 500 | 24097 | MOHAVE | 500 | 1 | line_2258 | ivsg_hs_alt1d1 | 1386 | -1301.5 | -46.3 | 1460.1 | 1302.3 | 0.912 | 0.709 | LUGO 500.00 - VINCENT 500.00 2, LUGO 500.00 - VICTORVL 500.00 1 |
| 24602 | VICTOR | 115 | 24702 | KRAMER | 115 | 1 | line_2260 | ivsg_hs_alt1d1 | 217.1 | -185.4 | 78.4 | 990.5 | 201.3 | 0.912 | 0.704 | KRAMER 230.00 - LUGO 230.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 25656 | MIRALOME | 230 | 24100 | OLINDA | 230 | 1 | line_2088 | ivsg_hs_alt1d1 | 988 | 864.4 | 171 | 2254.7 | 881.2 | 0.91 | 0.598 | MESA CAL 230.00 - WALNUT 230.00 1, MIRALOMA 230.00 - WALNUT 230.00 1 |
| 24125 | REDONDO | 230 | 24084 | LITEHIPE | 230 | 1 | line_2061 | ivsg_hs_alt1d1 | 916 | 818.9 | 99.3 | 2088.2 | 824.9 | 0.908 | 0.116 | LA FRESA 230.00 - REDONDO 230.00 1, LA FRESA 230.00 - REDONDO 230.00 2 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2075 | ivsg_hs_alt1d1 | 2400 | -2276.8 | -173.1 | 2517.6 | 2283.4 | 0.908 | 0.779 | EAGLROCK 230.00 - MESA CAL 230.00 1, GOODRICH 230.00 - LAGUBELL 230.00 1 |
| 24093 | MIRALOMW | 230 | 24158 | WALNUT | 230 | 1 | line_2089 | ivsg_hs_alt1d1 | 797 | 678.9 | 168.9 | 1812.1 | 699.6 | 0.908 | 0.535 | MESA CAL 230.00 - WALNUT 230.00 1, OLINDA 230.00 - WALNUT 230.00 1 |
| 8601 | GEOSUB2 | 230 | 8300 | BANIS230 | 230 | 1 | line_N-207 | ivsg_hs_alt1d1 | 550 | 502.2 | 60.3 | 1252 | 505.8 | 0.907 | 0.806 | MIDWAY HIGHLINE 230 CKT 3&4 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2106 | ivsg_hs_alt1d1 | 2400 | -2261.5 | -148.8 | 2501.3 | 2266.4 | 0.903 | 0.779 | PARDEE 230.00 - SYLMAR S 230.00 1, SYLMAR S 230.00 - GOULD 230.00 1 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2107 | ivsg_hs_alt1d1 | 2400 | -2261.5 | -148.8 | 2501.3 | 2266.4 | 0.903 | 0.779 | PARDEE 230.00 - SYLMAR S 230.00 2, SYLMAR S 230.00 - GOULD 230.00 1 |
| 8695 | RAMON | 230 | 24806 | MIRAGE | 230 | 2 | line_2236 | ivsg_hs_alt1d1 | 800 | 707.4 | -98.3 | 1812.5 | 714.2 | 0.903 | 0.717 | PALOVRDE 500.00 - DEVERS 500.00 1, COACHELV 230.00 - DEVERS 230.00 2 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2280 | ivsg_hs_alt1d1 | 2400 | -2261.5 | -148.8 | 2501.3 | 2266.4 | 0.903 | 0.779 | PARDEE 230.00 - SYLMAR S 230.00 1, SYLMAR S 230.00 - GOULD 230.00 1 |
| 22609 | OTAYMESA | 230 | 22466 | MLMS3TAP | 230 | 1 | 23021/22/23/41 | ivsg_hs_alt1d1 | 1176 | 1029.9 | 231.1 | 2664.7 | 1055.5 | 0.903 | 0.572 | MIGUEL 230 CORRIDOR North of ML |
| 22609 | OTAYMESA | 230 | 22466 | MLMS3TAP | 230 | 1 | 23021/22/23/41 | ivsg_hs_alt1d1 | 1176 | 1026.7 | 232.9 | 2658.3 | 1052.8 | 0.901 | 0.572 | MIGUEL 230 CORRIDOR West of LC |
| 24044 | ELLIS | 230 | 24369 | HUNTBCH1 | 230 | 4 | line_2110 | ivsg_hs_alt1d1 | 494 | -428.6 | -86.6 | 1116.6 | 437.2 | 0.9 | 0.453 | ELLIS 230.00 - HUNTGBCH 230.00 1, ELLIS 230.00 - HUNTBCH1 230.00 2 |
| 24044 | ELLIS | 230 | 24369 | HUNTBCH1 | 230 | 4 | line_2111 | ivsg_hs_alt1d1 | 494 | -428.6 | -86.6 | 1116.6 | 437.2 | 0.9 | 0.453 | ELLIS 230.00 - HUNTBCH1 230.00 2, ELLIS 230.00 - HUNTGBCH 230.00 3 |
| 24044 | ELLIS | 230 | 24369 | HUNTBCH1 | 230 | 2 | line_2112 | ivsg_hs_alt1d1 | 494 | -428.6 | -86.6 | 1116.6 | 437.2 | 0.9 | 0.453 | ELLIS 230.00 - HUNTGBCH 230.00 3, ELLIS 230.00 - HUNTBCH1 230.00 4 |
| 79064 | SHIPROCK | 345 | 79063 | SHIPROCK | 230 | 1 | line_2233 | ivsg_hs_alt1d1 | 300 | 261.7 | -49.8 | 434.2 | 266.4 | 0.9 | 0.86 | MOENKOPI 500.00 - ELDORDO 500.00 1, PISGAH 230.00 - ELDORDO 230.00 2 |

ivsg_hs_alt1d1.sav
No Solve Summary
N-2 Outages

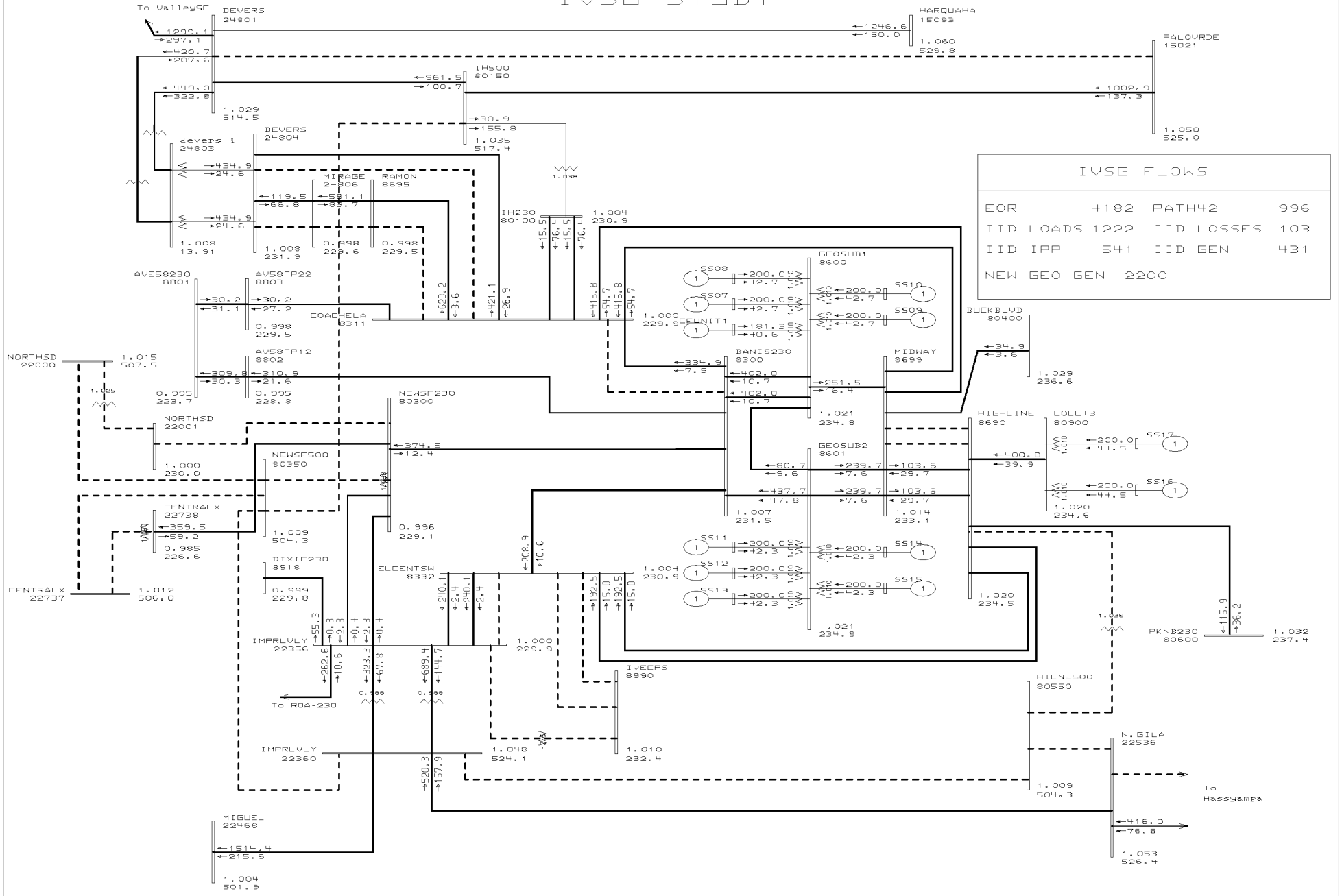
| Contingency-Description | Case | Problem-Description |
|---|---|---|
| DEVERS 230.00 - MIRAGE 230.00 2, RAMON 230.00 - MIRAGE 230.00 2 | ivsg_hs_alt1d1 | Pmis 24821 TAMARISK 115.00 = -668343.50 MW + j -1027321.75 MVAR |
| VICTOR 230.00 - LUGO 230.00 1, VICTOR 230.00 - LUGO 230.00 2 | ivsg_hs_alt1d1 | Pmis 24602 VICTOR 115.00 = -225494.77 MW + j -174226.17 MVAR |
| DEVERS 230.00 - MIRAGE 230.00 2, RAMON 230.00 - MIRAGE 230.00 2 | ivsg_hs_alt1d1 | Pmis 24821 TAMARISK 115.00 = -668343.50 MW + j -1027321.75 MVAR |
| LUGO 500.00 - MIRALOMA 500.00 3, LUGO 500.00 - MOHAVE 500.00 1 | ivsg_hs_alt1d1 | Pmis 65456 DIESELPP 69.00 = 0.01 MW + j 9.19 MVAR |
| ELDORDO 500.00 - LUGO 500.00 1, LUGO 500.00 - MIRALOMA 500.00 2 | ivsg_hs_alt1d1 | Pmis 65456 DIESELPP 69.00 = 0.00 MW + j 6.09 MVAR |
| SANLUISREY 230 CORRIDOR | ivsg_hs_alt1d1 | Pmis 22834 TALEGA 3.20 = -62040.45 MW + j -2240518.50 MVAR |

# Imperial Valley Study Group

## Appendix A.4.3

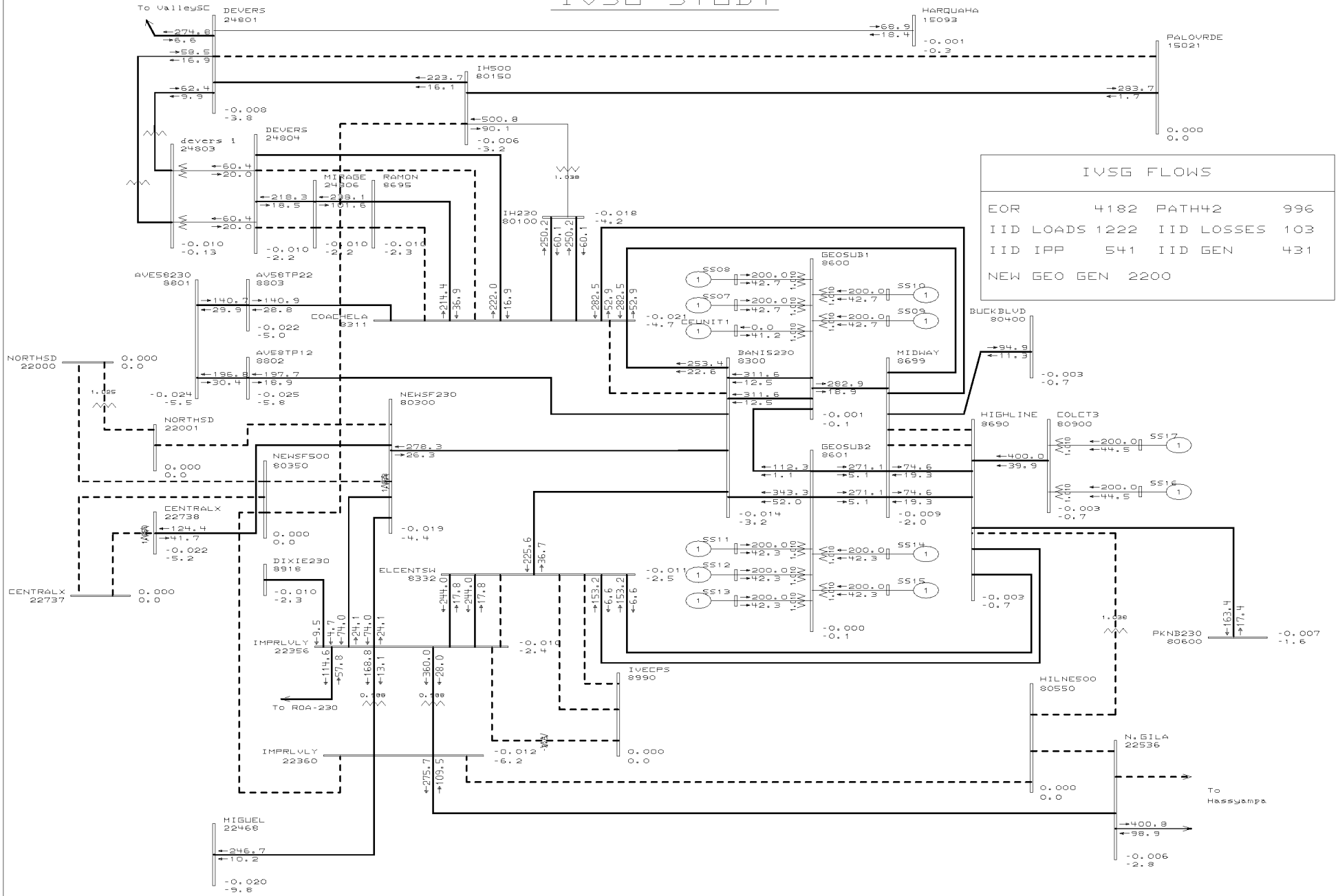
Alt 1 D2
Heavy Summer
Alternative 1
Dispatch 2

# IVSG STUDY




| IVSG FLOWS | | | |
|---|---|---|---|
| EOR | 4182 | PATH42 | 996 |
| IID LOADS | 1222 | IID LOSSES | 103 |
| IID IPP | 541 | IID GEN | 431 |
| NEW GEO GEN | 2200 | | |

# IVSG STUDY




## IVSG FLOWS

| | | | |
|---|---|---|---|
| EOR | 4182 | PATH42 | 996 |
| IID LOADS | 1222 | IID LOSSES | 103 |
| IID IPP | 541 | IID GEN | 431 |
| NEW GEO GEN | 2200 | | |

ivsg_hs_alt1d2.sav
Voltage Summary
N-0 Outages

| Bus | Name | kV | Area | Zone | Outage | Case | Vbase | Vcont | DeltaV | Vmin | Vmax | Max-dv | Contingency Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20077 | SIM-115 | 115 | 20 | 205 | base | ivsg_hs_alt1d2 | 0.933 | 0.933 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24035 | EAGLEMTN | 161 | 24 | 248 | base | ivsg_hs_alt1d2 | 0.934 | 0.934 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 20076 | SQN-115 | 115 | 20 | 205 | base | ivsg_hs_alt1d2 | 0.938 | 0.938 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14534 | N.GILA 4 | 100 | 14 | 847 | base | ivsg_hs_alt1d2 | 0.945 | 0.945 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15021 | PALOVRDE | 500 | 14 | 158 | base | ivsg_hs_alt1d2 | 1.05 | 1.05 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24236 | RANCHVST | 500 | 24 | 240 | base | ivsg_hs_alt1d2 | 1.05 | 1.05 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24219 | PISGAH | 230 | 24 | 240 | base | ivsg_hs_alt1d2 | 1.05 | 1.05 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24229 | VALLEY-S | 115 | 24 | 240 | base | ivsg_hs_alt1d2 | 1.05 | 1.05 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 25991 | VALYSVC2 | 115 | 24 | 240 | base | ivsg_hs_alt1d2 | 1.05 | 1.05 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24775 | RUSH | 115 | 24 | 247 | base | ivsg_hs_alt1d2 | 1.051 | 1.051 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24138 | SERRANO | 500 | 24 | 240 | base | ivsg_hs_alt1d2 | 1.051 | 1.051 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24627 | CIMA | 230 | 24 | 240 | base | ivsg_hs_alt1d2 | 1.051 | 1.051 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15090 | HASSYAMP | 500 | 14 | 158 | base | ivsg_hs_alt1d2 | 1.053 | 1.053 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15092 | ARLINTON | 500 | 14 | 158 | base | ivsg_hs_alt1d2 | 1.053 | 1.053 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15094 | MESQUITE | 500 | 14 | 158 | base | ivsg_hs_alt1d2 | 1.053 | 1.053 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 22536 | N.GILA | 500 | 22 | 227 | base | ivsg_hs_alt1d2 | 1.053 | 1.053 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14009 | REDHAWK | 500 | 14 | 141 | base | ivsg_hs_alt1d2 | 1.054 | 1.054 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14010 | TS5 | 500 | 14 | 141 | base | ivsg_hs_alt1d2 | 1.056 | 1.056 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 79043 | KAYENTA | 230 | 14 | 191 | base | ivsg_hs_alt1d2 | 1.056 | 1.056 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24151 | VALLEYSC | 500 | 24 | 240 | base | ivsg_hs_alt1d2 | 1.056 | 1.056 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24997 | VALYSVC1 | 500 | 24 | 240 | base | ivsg_hs_alt1d2 | 1.056 | 1.056 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 28040 | CALPINE | 500 | 24 | 240 | base | ivsg_hs_alt1d2 | 1.056 | 1.056 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14230 | VERDE N | 230 | 14 | 141 | base | ivsg_hs_alt1d2 | 1.057 | 1.057 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14247 | VERDE S | 230 | 14 | 141 | base | ivsg_hs_alt1d2 | 1.057 | 1.057 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14011 | RACEWAY | 500 | 14 | 141 | base | ivsg_hs_alt1d2 | 1.057 | 1.057 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24776 | LEE VINE | 115 | 24 | 247 | base | ivsg_hs_alt1d2 | 1.058 | 1.058 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24086 | LUGO | 500 | 24 | 240 | base | ivsg_hs_alt1d2 | 1.059 | 1.059 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15041 | SILVERKG | 500 | 14 | 158 | base | ivsg_hs_alt1d2 | 1.06 | 1.06 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15061 | RUDD | 500 | 14 | 158 | base | ivsg_hs_alt1d2 | 1.06 | 1.06 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15093 | HARQUAHA | 500 | 14 | 158 | base | ivsg_hs_alt1d2 | 1.06 | 1.06 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14205 | COCONINO | 230 | 14 | 141 | base | ivsg_hs_alt1d2 | 1.06 | 1.06 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14008 | JOJOBA | 500 | 14 | 141 | base | ivsg_hs_alt1d2 | 1.06 | 1.06 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15034 | PERKINS | 500 | 14 | 158 | base | ivsg_hs_alt1d2 | 1.061 | 1.061 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14234 | YAVAPAI | 230 | 14 | 141 | base | ivsg_hs_alt1d2 | 1.062 | 1.062 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14355 | PRESCOTT | 115 | 14 | 141 | base | ivsg_hs_alt1d2 | 1.065 | 1.065 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14256 | FLAGSTAF | 230 | 14 | 141 | base | ivsg_hs_alt1d2 | 1.065 | 1.065 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14544 | PRESCOT2 | 100 | 14 | 141 | base | ivsg_hs_alt1d2 | 1.066 | 1.066 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14543 | PRESCOT1 | 100 | 14 | 141 | base | ivsg_hs_alt1d2 | 1.066 | 1.066 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14587 | FLAGSTF1 | 100 | 14 | 141 | base | ivsg_hs_alt1d2 | 1.066 | 1.066 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24156 | VINCENT | 500 | 24 | 240 | base | ivsg_hs_alt1d2 | 1.067 | 1.067 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14001 | FOURCORN | 500 | 14 | 141 | base | ivsg_hs_alt1d2 | 1.068 | 1.068 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 79264 | PINAL_W | 500 | 14 | 141 | base | ivsg_hs_alt1d2 | 1.068 | 1.068 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24729 | INYO | 230 | 24 | 247 | base | ivsg_hs_alt1d2 | 1.068 | 1.068 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14007 | GILARIVR | 500 | 14 | 141 | base | ivsg_hs_alt1d2 | 1.069 | 1.069 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14006 | YAVAPAI | 500 | 14 | 141 | base | ivsg_hs_alt1d2 | 1.07 | 1.07 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15992 | SEV | 500 | 14 | 158 | base | ivsg_hs_alt1d2 | 1.072 | 1.072 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14004 | SAGUARO | 500 | 14 | 141 | base | ivsg_hs_alt1d2 | 1.073 | 1.073 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 16000 | TORTOLIT | 500 | 14 | 160 | base | ivsg_hs_alt1d2 | 1.073 | 1.073 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 16001 | TORTLIT2 | 500 | 14 | 160 | base | ivsg_hs_alt1d2 | 1.073 | 1.073 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14215 | LEUPP | 230 | 14 | 141 | base | ivsg_hs_alt1d2 | 1.074 | 1.074 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14100 | CHOLLA | 345 | 14 | 141 | base | ivsg_hs_alt1d2 | 1.075 | 1.075 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15001 | CORONADO | 500 | 14 | 158 | base | ivsg_hs_alt1d2 | 1.079 | 1.079 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14000 | CHOLLA | 500 | 14 | 141 | base | ivsg_hs_alt1d2 | 1.08 | 1.08 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 19038 | MEAD | 500 | 14 | 191 | base | ivsg_hs_alt1d2 | 1.085 | 1.085 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24042 | ELDORDO | 500 | 24 | 240 | base | ivsg_hs_alt1d2 | 1.086 | 1.086 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14204 | CHOLLA | 230 | 14 | 141 | base | ivsg_hs_alt1d2 | 1.087 | 1.087 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24097 | MOHAVE | 500 | 24 | 240 | base | ivsg_hs_alt1d2 | 1.089 | 1.089 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14509 | CHOLLA 7 | 100 | 14 | 141 | base | ivsg_hs_alt1d2 | 1.093 | 1.093 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14267 | SECDKNOL | 230 | 14 | 141 | base | ivsg_hs_alt1d2 | 1.098 | 1.098 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14003 | NAVAJO | 500 | 14 | 141 | base | ivsg_hs_alt1d2 | 1.102 | 1.102 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14002 | MOENKOPI | 500 | 14 | 141 | base | ivsg_hs_alt1d2 | 1.104 | 1.104 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |

ivsg_hs_alt1d2.sav
Flow Summary
N-0 Outages

| LEGEND | % of RATING 1 | |
|---|---|---|
| C_pu | 100% - 110% | |
| C_pu | 110% - 120% | P.U. of |
| C_pu | > 120% | Rate 1 |

| FROM | FR | BKV | TO | TO | BKV | CK | Outage_Name | Case | Rate-Mva | Pflow | Qflow | Amps | MVA | C_pu | B_pu | Contingency_Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 14248 | GLENDALW | 230 | 14212 | GLENDALE | 230 | 1 | base | ivsg_hs_alt1d2 | 457 | 605.6 | 29.2 | 1519.8 | 606.3 | 1.325 | 1.325 | Base system (n-0) |
| 14248 | GLENDALW | 230 | 15201 | AGUAFRIA | 230 | 1 | base | ivsg_hs_alt1d2 | 457 | -605.6 | -29.1 | 1519.8 | 606.3 | 1.325 | 1.325 | Base system (n-0) |
| 24910 | CAL ELEC | 115 | 24912 | SHANDIN | 115 | 1 | base | ivsg_hs_alt1d2 | 109.1 | -124.2 | 58.3 | 680.8 | 137.1 | 1.246 | 1.246 | Base system (n-0) |
| 14221 | PNPKAPS | 230 | 19062 | PINPK | 230 | 1 | base | ivsg_hs_alt1d2 | 637.4 | -783.8 | -184.2 | 1985.8 | 805.1 | 1.241 | 1.241 | Base system (n-0) |
| 14212 | GLENDALE | 230 | 14270 | GRNDTRML | 230 | 1 | base | ivsg_hs_alt1d2 | 457 | 540.2 | 21.5 | 1355.3 | 540.6 | 1.183 | 1.183 | Base system (n-0) |
| 24912 | SHANDIN | 115 | 24916 | TAP902 | 115 | 1 | base | ivsg_hs_alt1d2 | 109.1 | -119.2 | 33.5 | 611.7 | 123.8 | 1.118 | 1.118 | Base system (n-0) |
| 14206 | CTRYCLUB | 230 | 14270 | GRNDTRML | 230 | 1 | base | ivsg_hs_alt1d2 | 509.9 | -536.4 | -17.8 | 1357.7 | 536.7 | 1.061 | 1.061 | Base system (n-0) |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | base | ivsg_hs_alt1d2 | 204.1 | 213 | -13.3 | 893.2 | 213.5 | 1.046 | 1.046 | Base system (n-0) |
| 14202 | CACTUS | 230 | 14221 | PNPKAPS | 230 | 1 | base | ivsg_hs_alt1d2 | 371 | -366.4 | -47.3 | 929.2 | 369.5 | 0.998 | 0.998 | Base system (n-0) |
| 14008 | JOJOBA | 500 | 15011 | KYRENE | 500 | 1 | base | ivsg_hs_alt1d2 | 1732 | 1816.6 | 164.5 | 1987 | 1824 | 0.996 | 0.996 | Base system (n-0) |
| 15230 | RUDD | 230 | 15218 | WHITETNK | 230 | 1 | base | ivsg_hs_alt1d2 | 725 | 695.2 | -17.6 | 1743.8 | 695.4 | 0.958 | 0.958 | Base system (n-0) |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | base | ivsg_hs_alt1d2 | 132 | 127.7 | -11.7 | 789.3 | 128.2 | 0.953 | 0.953 | Base system (n-0) |
| 24087 | MAGUNDEN | 230 | 24101 | OMAR | 230 | 1 | base | ivsg_hs_alt1d2 | 643 | -591.8 | 130.9 | 1531.7 | 606.1 | 0.95 | 0.95 | Base system (n-0) |
| 24806 | MIRAGE | 230 | 24807 | MIRAGE | 115 | 1 | base | ivsg_hs_alt1d2 | 280 | 265.6 | 25.9 | 671.2 | 266.9 | 0.95 | 0.95 | Base system (n-0) |
| 24806 | MIRAGE | 230 | 24807 | MIRAGE | 115 | 2 | base | ivsg_hs_alt1d2 | 280 | 265.6 | 25.9 | 671.2 | 266.9 | 0.95 | 0.95 | Base system (n-0) |
| 24702 | KRAMER | 115 | 24753 | SUNGEN | 115 | 1 | base | ivsg_hs_alt1d2 | 183.3 | -170.5 | 33.8 | 864.1 | 173.8 | 0.939 | 0.939 | Base system (n-0) |
| 14207 | DEERVALY | 230 | 14231 | WESTWING | 230 | 1 | base | ivsg_hs_alt1d2 | 720 | -667 | -77.9 | 1685.3 | 671.5 | 0.932 | 0.932 | Base system (n-0) |
| 26098 | SYLMAR3 | 230 | 24147 | SYLMAR S | 230 | 1 | base | ivsg_hs_alt1d2 | 1100 | 840.2 | -522.3 | 2564.4 | 989.3 | 0.929 | 0.929 | Base system (n-0) |
| 17003 | AVRA | 115 | 17012 | MARANA | 115 | 1 | base | ivsg_hs_alt1d2 | 71.7 | -65 | -5.8 | 333.6 | 65.2 | 0.927 | 0.927 | Base system (n-0) |
| 19215 | SPOOKHIL | 230 | 19045 | COOLIDGE | 230 | 1 | base | ivsg_hs_alt1d2 | 352 | -317.9 | 46 | 808.2 | 321.2 | 0.917 | 0.917 | Base system (n-0) |
| 15212 | ROGERS | 230 | 19215 | SPOOKHIL | 230 | 1 | base | ivsg_hs_alt1d2 | 352 | -316.1 | 55.9 | 807.4 | 321 | 0.915 | 0.915 | Base system (n-0) |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | base | ivsg_hs_alt1d2 | 56 | 49.5 | -10.5 | 250.3 | 50.6 | 0.91 | 0.91 | Base system (n-0) |

ivsg_hs_alt1d2.sav
VOLTAGE Summary
N-1 Outages

| Bus | Name | kV | Area | Zone | Outage | Case | Vbase | Vcont | DeltaV | Vmin | Vmax | Max-dv | Contingency Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24017 | BLYTHESC | 161 | 24 | 248 | line_007 | ivsg_hs_alt1d2 | 1.02 | 0.874 | -0.146 | 0.9 | 1.05 | 0.05 | line BLYTHE to BLYTHESC 161 ck 1 |
| 22738 | CENTRALX | 230 | 22 | 225 | B2_002 | ivsg_hs_alt1d2 | 0.985 | 0.895 | -0.09 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22464 | MIGUEL | 230 | 22 | 222 | B2_002 | ivsg_hs_alt1d2 | 0.994 | 0.911 | -0.083 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22468 | MIGUEL | 500 | 22 | 227 | B2_002 | ivsg_hs_alt1d2 | 1.004 | 0.911 | -0.093 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22472 | MIGUELMP | 500 | 22 | 227 | B2_002 | ivsg_hs_alt1d2 | 0.996 | 0.911 | -0.085 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22412 | LOSCOCHS | 138 | 22 | 223 | B2_002 | ivsg_hs_alt1d2 | 0.989 | 0.912 | -0.078 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22424 | MAINST50 | 138 | 22 | 222 | B2_002 | ivsg_hs_alt1d2 | 0.99 | 0.915 | -0.075 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22428 | MAINST51 | 138 | 22 | 222 | B2_002 | ivsg_hs_alt1d2 | 0.99 | 0.915 | -0.075 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22734 | SANTEE | 138 | 22 | 223 | B2_002 | ivsg_hs_alt1d2 | 0.99 | 0.916 | -0.074 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22832 | SYCAMORE | 230 | 22 | 221 | B2_002 | ivsg_hs_alt1d2 | 0.989 | 0.919 | -0.07 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22772 | SOUTHBAY | 138 | 22 | 222 | B2_002 | ivsg_hs_alt1d2 | 0.998 | 0.923 | -0.075 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22504 | MISSION | 230 | 22 | 221 | B2_002 | ivsg_hs_alt1d2 | 0.985 | 0.925 | -0.061 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22116 | CARLTHTP | 138 | 22 | 223 | B2_002 | ivsg_hs_alt1d2 | 0.995 | 0.926 | -0.069 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 24731 | INYOKERN | 115 | 24 | 247 | line_175 | ivsg_hs_alt1d2 | 1.001 | 0.927 | -0.074 | 0.9 | 1.05 | 0.05 | line INYO to COTTONWD 230 ck 1 |
| 22120 | CARLTNHS | 138 | 22 | 223 | B2_002 | ivsg_hs_alt1d2 | 0.996 | 0.928 | -0.068 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22596 | OLD TOWN | 230 | 22 | 221 | B2_002 | ivsg_hs_alt1d2 | 0.988 | 0.928 | -0.059 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22865 | UPTOWN | 138 | 22 | 221 | B2_002 | ivsg_hs_alt1d2 | 0.999 | 0.928 | -0.071 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22852 | TELECYN | 138 | 22 | 222 | B2_002 | ivsg_hs_alt1d2 | 1.009 | 0.932 | -0.077 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22672 | PRCTRVLY | 138 | 22 | 222 | B2_002 | ivsg_hs_alt1d2 | 1.012 | 0.933 | -0.079 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22460 | MIGUEL | 138 | 22 | 222 | B2_002 | ivsg_hs_alt1d2 | 1.014 | 0.934 | -0.079 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22831 | SYCAMORE | 138 | 22 | 221 | B2_002 | ivsg_hs_alt1d2 | 1 | 0.934 | -0.066 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22500 | MISSION | 138 | 22 | 221 | B2_002 | ivsg_hs_alt1d2 | 1.001 | 0.936 | -0.065 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22300 | FRIARS | 138 | 22 | 221 | B2_002 | ivsg_hs_alt1d2 | 1 | 0.937 | -0.063 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 25423 | ESRP MWD | 115 | 24 | 254 | tran_247 | ivsg_hs_alt1d2 | 1.026 | 0.939 | -0.087 | 0.9 | 1.05 | 0.05 | tran VALLEYSC 500 to VALLEYSC 115 ck 1 |
| 25423 | ESRP MWD | 115 | 24 | 254 | tran_248 | ivsg_hs_alt1d2 | 1.026 | 0.939 | -0.087 | 0.9 | 1.05 | 0.05 | tran VALLEYSC 500 to VALLEYSC 115 ck 2 |
| 24160 | VALLEYSC | 115 | 24 | 240 | tran_247 | ivsg_hs_alt1d2 | 1.029 | 0.942 | -0.087 | 0.9 | 1.05 | 0.05 | tran VALLEYSC 500 to VALLEYSC 115 ck 1 |
| 25990 | VALYSVC1 | 115 | 24 | 240 | tran_247 | ivsg_hs_alt1d2 | 1.029 | 0.942 | -0.087 | 0.9 | 1.05 | 0.05 | tran VALLEYSC 500 to VALLEYSC 115 ck 1 |
| 24160 | VALLEYSC | 115 | 24 | 240 | tran_248 | ivsg_hs_alt1d2 | 1.029 | 0.942 | -0.087 | 0.9 | 1.05 | 0.05 | tran VALLEYSC 500 to VALLEYSC 115 ck 2 |
| 25990 | VALYSVC1 | 115 | 24 | 240 | tran_248 | ivsg_hs_alt1d2 | 1.029 | 0.942 | -0.087 | 0.9 | 1.05 | 0.05 | tran VALLEYSC 500 to VALLEYSC 115 ck 2 |
| 22652 | PENSQTOS | 230 | 22 | 221 | B2_002 | ivsg_hs_alt1d2 | 0.995 | 0.943 | -0.052 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22124 | CHCARITA | 138 | 22 | 225 | B2_002 | ivsg_hs_alt1d2 | 1.001 | 0.945 | -0.056 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22922 | MIRA SOR | 138 | 22 | 221 | B2_002 | ivsg_hs_alt1d2 | 0.995 | 0.945 | -0.051 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 24819 | CONCHO | 115 | 24 | 248 | tran_238 | ivsg_hs_alt1d2 | 1.035 | 0.948 | -0.086 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 24822 | INDIAN W | 115 | 24 | 248 | tran_238 | ivsg_hs_alt1d2 | 1.034 | 0.948 | -0.086 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 24816 | SANTA RO | 115 | 24 | 248 | tran_238 | ivsg_hs_alt1d2 | 1.039 | 0.952 | -0.086 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 24821 | TAMARISK | 115 | 24 | 248 | tran_238 | ivsg_hs_alt1d2 | 1.038 | 0.953 | -0.085 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 25633 | CAPWIND | 115 | 24 | 248 | tran_238 | ivsg_hs_alt1d2 | 1.04 | 0.955 | -0.085 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 24827 | TAP823 | 115 | 24 | 248 | tran_238 | ivsg_hs_alt1d2 | 1.04 | 0.955 | -0.085 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 25622 | TAP806 | 115 | 24 | 248 | tran_238 | ivsg_hs_alt1d2 | 1.04 | 0.955 | -0.085 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 24829 | TAP821 | 115 | 24 | 248 | tran_238 | ivsg_hs_alt1d2 | 1.04 | 0.955 | -0.085 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 24807 | MIRAGE | 115 | 24 | 248 | tran_238 | ivsg_hs_alt1d2 | 1.042 | 0.958 | -0.084 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 14534 | N.GILA 4 | 100 | 14 | 847 | NG500/69 | ivsg_hs_alt1d2 | 0.945 | 1 | 0.055 | 0.9 | 1.05 | 0.05 | tran N.GILA 500 to N.GILA 69 ck 1 |
| 24035 | EAGLEMTN | 161 | 24 | 248 | tran_241 | ivsg_hs_alt1d2 | 0.934 | 1.026 | 0.092 | 0.9 | 1.05 | 0.05 | tran EAGLEMTN 230 to EAGLEMTN 161 ck 1 |
| 22472 | MIGUELMP | 500 | 22 | 227 | ML80 | ivsg_hs_alt1d2 | 0.996 | 1.05 | 0.054 | 0.9 | 1.05 | 0.05 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 24730 | INYO PS | 115 | 24 | 247 | tran_229 | ivsg_hs_alt1d2 | 1.027 | 1.078 | 0.051 | 0.9 | 1.05 | 0.05 | tran INYO 115 to INYO PS 115 ck 1 |
| 24142 | SYC CYN | 230 | 24 | 240 | line_086 | ivsg_hs_alt1d2 | 0.985 | 1.091 | 0.106 | 0.9 | 1.05 | 0.05 | line MAGUNDEN to OMAR 230 ck 1 |
| 25613 | EDMONSTN | 230 | 24 | 256 | line_122 | ivsg_hs_alt1d2 | 1 | 1.091 | 0.091 | 0.9 | 1.05 | 0.05 | line PASTORIA to EDMONSTN 230 ck 1 |
| 24142 | SYC CYN | 230 | 24 | 240 | line_140 | ivsg_hs_alt1d2 | 0.985 | 1.091 | 0.106 | 0.9 | 1.05 | 0.05 | line SYC CYN to OMAR 230 ck 1 |

ivsg_hs_alt1d2.sav
FLOW Summary
N-1 Outages

| LEGEND | % of RATING 1 | |
|---|---|---|
| C_pu | 100% - 110% | |
| C_pu | 110% - 120% | P.U. of |
| C_pu | > 120% | Rate 1 |

| FROM | FR | BKV | TO | TO | BKV | CK | Outage_Name | Case | Rate-Mva | Pflow | Qflow | Amps | MVA | C_pu | B_pu | Contingency_Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24142 | SYC CYN | 230 | 24101 | OMAR | 230 | 1 | line_086 | ivsg_hs_alt1d2 | 643 | 769 | 5511.2 | 12804.3 | 5564.5 | 7.934 | 0.47 | line MAGUNDEN to OMAR 230 ck 1 |
| 24781 | NAVYCOSO | 230 | 24706 | BLM EAST | 230 | 1 | line_173 | ivsg_hs_alt1d2 | 1287 | -153.8 | -3160.7 | 7943.3 | 3164.4 | 2.459 | 0.056 | line BLM EAST to BLM WEST 230 ck 1 |
| 24781 | NAVYCOSO | 230 | 24706 | BLM EAST | 230 | 1 | line_174 | ivsg_hs_alt1d2 | 1287 | -153.8 | -3160.7 | 7943.3 | 3164.4 | 2.459 | 0.056 | line BLM WEST to KRAMER 230 ck 1 |
| 24806 | MIRAGE | 230 | 24807 | MIRAGE | 115 | 2 | tran_238 | ivsg_hs_alt1d2 | 280 | 532.1 | 197.5 | 1460.1 | 567.6 | 2.03 | 0.95 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_175 | ivsg_hs_alt1d2 | 56 | -103.6 | -1 | 531.6 | 103.6 | 1.86 | 0.91 | line INYO to COTTONWD 230 ck 1 |
| 24151 | VALLEYSC | 500 | 24160 | VALLEYSC | 115 | 2 | tran_247 | ivsg_hs_alt1d2 | 560 | 853.2 | 360 | 1028.1 | 926 | 1.65 | 0.77 | tran VALLEYSC 500 to VALLEYSC 115 ck 1 |
| 24151 | VALLEYSC | 500 | 24160 | VALLEYSC | 115 | 1 | tran_248 | ivsg_hs_alt1d2 | 560 | 853.2 | 360 | 1028.1 | 926 | 1.65 | 0.77 | tran VALLEYSC 500 to VALLEYSC 115 ck 2 |
| 24151 | VALLEYSC | 500 | 24229 | VALLEY-S | 115 | 4 | tran_249 | ivsg_hs_alt1d2 | 560 | 830.7 | 205.4 | 946.6 | 855.7 | 1.53 | 0.75 | tran VALLEYSC 500 to VALLEY-S 115 ck 3 |
| 24151 | VALLEYSC | 500 | 24229 | VALLEY-S | 115 | 3 | tran_250 | ivsg_hs_alt1d2 | 560 | 830.6 | 205.3 | 946.6 | 855.7 | 1.53 | 0.75 | tran VALLEYSC 500 to VALLEY-S 115 ck 4 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_009 | ivsg_hs_alt1d2 | 204.1 | 296.2 | -20.1 | 1256.5 | 296.9 | 1.472 | 1.046 | EPP - ESCNDIDO 1 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_034 | ivsg_hs_alt1d2 | 204.1 | 285.1 | -15.2 | 1222.4 | 285.5 | 1.432 | 1.046 | OLD TOWN - MLMS3TAP 1 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_032 | ivsg_hs_alt1d2 | 204.1 | 285.1 | -15.9 | 1221.8 | 285.5 | 1.431 | 1.046 | OTAYMESA - MLMS3TAP 1 230kV |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_202 | ivsg_hs_alt1d2 | 56 | 77 | -7.6 | 390.4 | 77.4 | 1.4 | 0.91 | line OWENSCON to INYO 230 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_002 | ivsg_hs_alt1d2 | 204.1 | 262.3 | -5.3 | 1174.9 | 262.3 | 1.376 | 1.046 | IMPRLVLY - MIGUEL 1 500kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | SX70 | ivsg_hs_alt1d2 | 204.1 | 257.9 | 0.2 | 1084.5 | 257.9 | 1.27 | 1.046 | tran SYCAMORE 230 to SYCAMORE 69 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | ML60 | ivsg_hs_alt1d2 | 204.1 | 255.5 | -10.2 | 1076.8 | 255.7 | 1.261 | 1.046 | tran MIGUEL 230 to MIGUEL 138 ck 1 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | B2_009 | ivsg_hs_alt1d2 | 392 | 488.1 | 4.1 | 1252.3 | 488.1 | 1.25 | 0.89 | EPP - ESCNDIDO 1 230kV |
| 22356 | IMPRLVLY | 230 | 22360 | IMPRLVLY | 500 | 1 | IV81 | ivsg_hs_alt1d2 | 600 | 724.1 | 179.6 | 1869.8 | 746 | 1.24 | 0.55 | tran IMPRLVLY 230 to IMPRLVLY 500 ck 2 |
| 22468 | MIGUEL | 500 | 22472 | MIGUELMP | 500 | 1 | ML81 | ivsg_hs_alt1d2 | 1120 | 1364.1 | 263.5 | 1598.8 | 1389.3 | 1.24 | 0.7 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 22464 | MIGUEL | 230 | 22468 | MIGUEL | 500 | 1 | ML80 | ivsg_hs_alt1d2 | 1120 | -1346 | -18.1 | 3439 | 1346.1 | 1.23 | 0.66 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 22464 | MIGUEL | 230 | 22472 | MIGUELMP | 500 | 1 | ML81 | ivsg_hs_alt1d2 | 1120 | -1361.6 | -21.5 | 3475.7 | 1361.7 | 1.22 | 0.7 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 24723 | CONTROL | 115 | 24731 | INYOKERN | 115 | 1 | line_175 | ivsg_hs_alt1d2 | 82.7 | 95.5 | -4.5 | 493.8 | 95.6 | 1.189 | 0.417 | line INYO to COTTONWD 230 ck 1 |
| 24723 | CONTROL | 115 | 24731 | INYOKERN | 115 | 2 | line_175 | ivsg_hs_alt1d2 | 82.7 | 95.5 | -4.5 | 493.8 | 95.6 | 1.189 | 0.417 | line INYO to COTTONWD 230 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | MS60 | ivsg_hs_alt1d2 | 204.1 | 236.4 | -6.9 | 994 | 236.5 | 1.164 | 1.046 | tran MISSION 230 to MISSION 138 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | MS61 | ivsg_hs_alt1d2 | 204.1 | 236.4 | -6.9 | 994 | 236.5 | 1.164 | 1.046 | tran MISSION 230 to MISSION 138 ck 2 |
| 20238 | HRD-230 | 230 | 20239 | HRD-115 | 115 | 1 | B2_002 | ivsg_hs_alt1d2 | 225 | 260.6 | -8.6 | 682.5 | 260.7 | 1.16 | 0.72 | IMPRLVLY - MIGUEL 1 500kV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | B2_032 | ivsg_hs_alt1d2 | 392 | 447.4 | -4.9 | 1162.2 | 447.4 | 1.15 | 0.89 | OTAYMESA - MLMS3TAP 1 230kV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | B2_034 | ivsg_hs_alt1d2 | 392 | 447.4 | -4.3 | 1162.8 | 447.4 | 1.15 | 0.89 | OLD TOWN - MLMS3TAP 1 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_013 | ivsg_hs_alt1d2 | 204.1 | 230.8 | -21.2 | 976.6 | 231.7 | 1.144 | 1.046 | EPP - SYCAMORE 1 230kV |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | B2_002 | ivsg_hs_alt1d2 | 388 | -425.7 | -20.7 | 1104.6 | 426.2 | 1.134 | 0.552 | IMPRLVLY - MIGUEL 1 500kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | ML70 | ivsg_hs_alt1d2 | 204.1 | 227.7 | -7.9 | 958.2 | 227.8 | 1.122 | 1.046 | tran MIGUEL 69 to MIGUEL 230 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | ML71 | ivsg_hs_alt1d2 | 204.1 | 227.7 | -7.9 | 958.2 | 227.8 | 1.122 | 1.046 | tran MIGUEL 69 to MIGUEL 230 ck 2 |
| 24729 | INYO | 230 | 24730 | INYO PS | 115 | 1 | line_175 | ivsg_hs_alt1d2 | 50 | 51.8 | 21.1 | 132.9 | 56 | 1.12 | 0.53 | line INYO to COTTONWD 230 ck 1 |
| 24729 | INYO | 230 | 24730 | INYO PS | 115 | 2 | line_175 | ivsg_hs_alt1d2 | 50 | 51.8 | 21.1 | 132.9 | 56 | 1.12 | 0.53 | line INYO to COTTONWD 230 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_015 | ivsg_hs_alt1d2 | 204.1 | 226.4 | -12.2 | 951.3 | 226.8 | 1.114 | 1.046 | MIGUEL - MISSION 1 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_020 | ivsg_hs_alt1d2 | 204.1 | 226 | -12.8 | 949.5 | 226.4 | 1.112 | 1.046 | MIGUEL - MISSION 2 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_007 | ivsg_hs_alt1d2 | 204.1 | 224.4 | -9.4 | 944 | 224.6 | 1.106 | 1.046 | PENSQTOS - ENCINA 1 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | MS70 | ivsg_hs_alt1d2 | 204.1 | 222.9 | -5.9 | 938 | 223 | 1.099 | 1.046 | tran MISSION 230 to MISSION 69 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | IV81 | ivsg_hs_alt1d2 | 204.1 | 220 | -13.9 | 926.6 | 220.4 | 1.085 | 1.046 | tran IMPRLVLY 230 to IMPRLVLY 500 ck 2 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 2 | line_070 | ivsg_hs_alt1d2 | 956 | -1025 | -29.4 | 2604.8 | 1025.4 | 1.085 | 0.595 | line LA FRESA to REDONDO 230 ck 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 1 | line_071 | ivsg_hs_alt1d2 | 956 | -1025 | -29.4 | 2604.8 | 1025.4 | 1.085 | 0.595 | line LA FRESA to REDONDO 230 ck 2 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | ML80 | ivsg_hs_alt1d2 | 204.1 | 219.1 | -11.6 | 924 | 219.4 | 1.082 | 1.046 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 24701 | KRAMER | 230 | 24085 | LUGO | 230 | 2 | line_169 | ivsg_hs_alt1d2 | 478 | 525.2 | -1.4 | 1298.4 | 525.2 | 1.082 | 0.643 | line KRAMER to LUGO 230 ck 1 |
| 24701 | KRAMER | 230 | 24085 | LUGO | 230 | 1 | line_170 | ivsg_hs_alt1d2 | 478 | 525.2 | -1.4 | 1298.4 | 525.2 | 1.082 | 0.643 | line KRAMER to LUGO 230 ck 2 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | ML81 | ivsg_hs_alt1d2 | 204.1 | 218.5 | -11.7 | 921.2 | 218.8 | 1.079 | 1.046 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | line_12 | ivsg_hs_alt1d2 | 132 | 143.4 | -9.1 | 892.5 | 143.7 | 1.077 | 0.953 | line COACHELA to RAMON 230 ck 2 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | SX70 | ivsg_hs_alt1d2 | 392 | 417.1 | 17.2 | 1059.2 | 417.4 | 1.06 | 0.89 | tran SYCAMORE 230 to SYCAMORE 69 ck 1 |
| 8601 | GEOSUB2 | 230 | 8300 | BANIS230 | 230 | 1 | line_22 | ivsg_hs_alt1d2 | 550 | 589.1 | 69.6 | 1459.9 | 593.2 | 1.058 | 0.785 | line GEOSUB1 to BANIS230 230 ck 1 |
| 8601 | GEOSUB2 | 230 | 8300 | BANIS230 | 230 | 1 | line_23 | ivsg_hs_alt1d2 | 550 | 589.1 | 69.6 | 1459.9 | 593.2 | 1.058 | 0.785 | line GEOSUB1 to BANIS230 230 ck 2 |
| 22504 | MISSION | 230 | 22500 | MISSION | 138 | 2 | MS60 | ivsg_hs_alt1d2 | 392 | 393.2 | 119.4 | 1047.2 | 410.9 | 1.05 | 0.7 | tran MISSION 230 to MISSION 138 ck 1 |
| 22504 | MISSION | 230 | 22500 | MISSION | 138 | 1 | MS61 | ivsg_hs_alt1d2 | 392 | 393.2 | 119.4 | 1047.2 | 410.9 | 1.05 | 0.7 | tran MISSION 230 to MISSION 138 ck 2 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_169 | ivsg_hs_alt1d2 | 56 | 57.6 | -9.8 | 290.3 | 58.4 | 1.05 | 0.91 | line KRAMER to LUGO 230 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_170 | ivsg_hs_alt1d2 | 56 | 57.6 | -9.8 | 290.3 | 58.4 | 1.05 | 0.91 | line KRAMER to LUGO 230 ck 2 |
| 22609 | OTAYMESA | 230 | 20149 | TJI-230 | 230 | 1 | B2_002 | ivsg_hs_alt1d2 | 796.7 | -803.2 | 41.7 | 2077.5 | 804.2 | 1.039 | 0.526 | IMPRLVLY - MIGUEL 1 500kV |
| 24114 | PARDEE | 230 | 24200 | SAUG TAP | 230 | 2 | line_117 | ivsg_hs_alt1d2 | 494 | 501.7 | 27.2 | 1275.8 | 502.5 | 1.029 | 0.51 | line PARDEE to SAUG TAP 230 ck 1 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24114 | PARDEE | 230 | 24200 | SAUG TAP | 230 | 1 | line_118 | ivsg_hs_alt1d2 | 494 | 501.7 | 27.1 | 1275.7 | 502.5 | 1.029 | 0.518 | line PARDEE to SAUG TAP 230 ck 2 |
| 8600 | GEOSUB1 | 230 | 8300 | BANIS230 | 230 | 1 | line_47 | ivsg_hs_alt1d2 | 550 | 565.2 | 65.7 | 1401 | 569 | 1.015 | 0.726 | line GEOSUB2 to BANIS230 230 ck 1 |
| 8600 | GEOSUB1 | 230 | 8300 | BANIS230 | 230 | 2 | line_47 | ivsg_hs_alt1d2 | 550 | 565.2 | 65.7 | 1401 | 569 | 1.015 | 0.726 | line GEOSUB2 to BANIS230 230 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | line_7 | ivsg_hs_alt1d2 | 204.1 | 206.9 | -11 | 865.7 | 207.2 | 1.014 | 1.046 | line BANIS230 to NEWSF230 230 ck 1 |
| 20238 | HRD-230 | 230 | 20118 | ROA-230 | 230 | 1 | B2_002 | ivsg_hs_alt1d2 | 388 | -366.1 | 81.8 | 982 | 375.2 | 1.01 | 0.431 | IMPRLVLY - MIGUEL 1 500kV |
| 24303 | BIG CRK3 | 230 | 24235 | RECTOR | 230 | 1 | line_155 | ivsg_hs_alt1d2 | 353 | 361 | 49.3 | 894.2 | 364.4 | 1.009 | 0.729 | line BIG CRK1 to RECTOR 230 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_008 | ivsg_hs_alt1d2 | 204.1 | 204.9 | -7.8 | 860.2 | 205 | 1.007 | 1.046 | PENSQTOS - OLD TOWN 1 230kV |
| 8600 | GEOSUB1 | 230 | 8300 | BANIS230 | 230 | 2 | line_22 | ivsg_hs_alt1d2 | 550 | 560.2 | 66.5 | 1387.8 | 564.1 | 1.006 | 0.726 | line GEOSUB1 to BANIS230 230 ck 1 |
| 8600 | GEOSUB1 | 230 | 8300 | BANIS230 | 230 | 1 | line_23 | ivsg_hs_alt1d2 | 550 | 560.2 | 66.5 | 1387.8 | 564.1 | 1.006 | 0.726 | line GEOSUB1 to BANIS230 230 ck 2 |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | B2_002 | ivsg_hs_alt1d2 | 132 | 130.9 | -9.7 | 829.3 | 131.3 | 1.001 | 0.953 | IMPRLVLY - MIGUEL 1 500kV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_015 | ivsg_hs_alt1d2 | 392 | 387.8 | 41.8 | 985.9 | 390 | 1 | 0.89 | MIGUEL - MISSION 1 230kV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | ML60 | ivsg_hs_alt1d2 | 392 | 392.5 | -0.8 | 1001.5 | 392.5 | 1 | 0.89 | tran MIGUEL 230 to MIGUEL 138 ck 1 |
| 24301 | BIG CRK1 | 230 | 24235 | RECTOR | 230 | 1 | line_160 | ivsg_hs_alt1d2 | 329 | 334.9 | 47.4 | 825.9 | 338.2 | 1 | 0.727 | line BIG CRK3 to RECTOR 230 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_201 | ivsg_hs_alt1d2 | 56 | 54.3 | -10.6 | 274.5 | 55.3 | 1 | 0.91 | line SYLMAR3 to SYLMAR S 230 ck 1 |
| 8311 | COACHELA | 230 | 8695 | RAMON | 230 | 2 | line_83 | ivsg_hs_alt1d2 | 800 | 789.8 | 25.2 | 2002.1 | 790.2 | 0.997 | 0.779 | line IH500 to DEVERS 500 ck 1 |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_192 | ivsg_hs_alt1d2 | 169 | 166.7 | 36 | 599.6 | 170.5 | 0.993 | 0.811 | line IRON MTN to CAMINO 230 ck 1 |
| 22596 | OLD TOWN | 230 | 22466 | MLMS3TAP | 230 | 1 | B2_002 | ivsg_hs_alt1d2 | 912 | -837.2 | 61.3 | 2270 | 839.5 | 0.992 | 0.685 | IMPRLVLY - MIGUEL 1 500kV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_020 | ivsg_hs_alt1d2 | 392 | 386.4 | 40.1 | 982.6 | 388.4 | 0.99 | 0.89 | MIGUEL - MISSION 2 230kV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | SX60 | ivsg_hs_alt1d2 | 392 | 385.3 | 37.6 | 984 | 387.1 | 0.99 | 0.89 | tran SYCAMORE 230 to SYCAMORE 138 ck 1 |
| 24086 | LUGO | 500 | 24097 | MOHAVE | 500 | 1 | line_103 | ivsg_hs_alt1d2 | 1386 | -1427.3 | 95.8 | 1566.2 | 1430.5 | 0.989 | 0.682 | line MOHAVE to ELDORDO 500 ck 1 |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | line_83 | ivsg_hs_alt1d2 | 132 | 131.4 | -10.1 | 818.6 | 131.8 | 0.988 | 0.953 | line IH500 to DEVERS 500 ck 1 |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | line_303 | ivsg_hs_alt1d2 | 132 | 130 | -9.8 | 817.6 | 130.3 | 0.987 | 0.953 | line HARQUAHA to DEVERS 500 ck 1 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | B2_002 | ivsg_hs_alt1d2 | 392 | 380.6 | -24.4 | 1042.2 | 381.4 | 0.98 | 0.89 | IMPRLVLY - MIGUEL 1 500kV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | ML70 | ivsg_hs_alt1d2 | 392 | 380.9 | 42.6 | 972.7 | 383.2 | 0.98 | 0.89 | tran MIGUEL 69 to MIGUEL 230 ck 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | ML71 | ivsg_hs_alt1d2 | 392 | 380.9 | 42.6 | 972.7 | 383.2 | 0.98 | 0.89 | tran MIGUEL 69 to MIGUEL 230 ck 2 |
| 8695 | RAMON | 230 | 24806 | MIRAGE | 230 | 2 | line_83 | ivsg_hs_alt1d2 | 800 | 762.6 | -113.4 | 1963.3 | 771 | 0.978 | 0.735 | line IH500 to DEVERS 500 ck 1 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | B2_013 | ivsg_hs_alt1d2 | 392 | 377.1 | -17.7 | 967.6 | 377.6 | 0.97 | 0.89 | EPP - SYCAMORE 1 230kV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_032 | ivsg_hs_alt1d2 | 392 | 376.8 | 39.2 | 979.4 | 378.8 | 0.97 | 0.89 | OTAYMESA - MLMS3TAP 1 230kV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_034 | ivsg_hs_alt1d2 | 392 | 376.7 | 39.7 | 979.9 | 378.8 | 0.97 | 0.89 | OLD TOWN - MLMS3TAP 1 230kV |
| 22261 | EPP | 230 | 22260 | ESCNDIDO | 230 | 1 | B2_032 | ivsg_hs_alt1d2 | 796.7 | 763 | -71.5 | 1934.3 | 766.3 | 0.967 | 0.792 | OTAYMESA - MLMS3TAP 1 230kV |
| 22261 | EPP | 230 | 22260 | ESCNDIDO | 230 | 1 | B2_034 | ivsg_hs_alt1d2 | 796.7 | 763 | -70.9 | 1934.6 | 766.3 | 0.967 | 0.792 | OLD TOWN - MLMS3TAP 1 230kV |
| 20238 | HRD-230 | 230 | 20102 | RUM-230 | 230 | 1 | B2_002 | ivsg_hs_alt1d2 | 388 | -347.2 | 78.3 | 931.7 | 356 | 0.96 | 0.386 | IMPRLVLY - MIGUEL 1 500kV |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_123 | ivsg_hs_alt1d2 | 56 | 52.2 | -10.6 | 264.4 | 53.3 | 0.96 | 0.91 | line PASTORIA to PSTRIA 230 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_200 | ivsg_hs_alt1d2 | 56 | 52.3 | -10.6 | 264.4 | 53.3 | 0.96 | 0.91 | line SYLMAR1 to SYLMAR S 230 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | tran_210 | ivsg_hs_alt1d2 | 56 | 52.1 | -10.3 | 263 | 53.1 | 0.96 | 0.91 | tran LUGO 500 to LUGO 230 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | tran_211 | ivsg_hs_alt1d2 | 56 | 52.1 | -10.3 | 263.2 | 53.1 | 0.96 | 0.91 | tran LUGO 500 to LUGO 230 ck 2 |
| 22831 | SYCAMORE | 138 | 22124 | CHCARITA | 138 | 1 | B2_009 | ivsg_hs_alt1d2 | 204.1 | 190.4 | -32 | 817.2 | 193.1 | 0.957 | 0.662 | EPP - ESCNDIDO 1 230kV |
| 14008 | JOJOBA | 500 | 15011 | KYRENE | 500 | 1 | PV1 | ivsg_hs_alt1d2 | 1732 | 1742.2 | 166.3 | 1899.6 | 1750.1 | 0.953 | 0.996 | gen PALOVRD1 24.00 |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_191 | ivsg_hs_alt1d2 | 169 | 160.1 | 33.8 | 575.3 | 163.6 | 0.953 | 0.811 | line EAGLEMTN to IRON MTN 230 ck 1 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | MS60 | ivsg_hs_alt1d2 | 392 | 371.1 | -0.5 | 944.3 | 371.1 | 0.95 | 0.89 | tran MISSION 230 to MISSION 138 ck 1 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | MS61 | ivsg_hs_alt1d2 | 392 | 371.1 | -0.5 | 944.3 | 371.1 | 0.95 | 0.89 | tran MISSION 230 to MISSION 138 ck 2 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_086 | ivsg_hs_alt1d2 | 56 | 51.6 | -10.6 | 261.3 | 52.7 | 0.95 | 0.91 | line MAGUNDEN to OMAR 230 ck 1 |
| 8311 | COACHELA | 230 | 8695 | RAMON | 230 | 2 | line_44 | ivsg_hs_alt1d2 | 800 | 756.8 | 12.7 | 1906.6 | 756.9 | 0.949 | 0.779 | line COACHELA to DEVERS 230 ck 2 |
| 19020 | BLYTHE | 161 | 24017 | BLYTHESC | 161 | 1 | line_192 | ivsg_hs_alt1d2 | 244 | 233.1 | 36.3 | 829.6 | 236 | 0.948 | 0.826 | line IRON MTN to CAMINO 230 ck 1 |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_63 | ivsg_hs_alt1d2 | 169 | 159.7 | 28.1 | 570.2 | 162.2 | 0.944 | 0.811 | line RAMON to MIRAGE 230 ck 2 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_009 | ivsg_hs_alt1d2 | 392 | 365.7 | 39.9 | 936.3 | 367.8 | 0.94 | 0.89 | EPP - ESCNDIDO 1 230kV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | B2_015 | ivsg_hs_alt1d2 | 392 | 366.7 | -6.1 | 932.8 | 366.8 | 0.94 | 0.89 | MIGUEL - MISSION 1 230kV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | B2_020 | ivsg_hs_alt1d2 | 392 | 366.1 | -6.8 | 931.3 | 366.1 | 0.94 | 0.89 | MIGUEL - MISSION 2 230kV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_022 | ivsg_hs_alt1d2 | 392 | 368.4 | 27.9 | 944 | 369.4 | 0.94 | 0.89 | OTAYMESA - TJI-230 1 230kV |
| 22844 | TALEGA | 230 | 24131 | S.ONOFRE | 230 | 2 | B2_026 | ivsg_hs_alt1d2 | 456.1 | -427.7 | 31 | 1075.9 | 428.9 | 0.94 | 0.494 | TALEGA - S.ONOFRE 1 230kV |
| 22844 | TALEGA | 230 | 24131 | S.ONOFRE | 230 | 1 | B2_027 | ivsg_hs_alt1d2 | 456.1 | -427.7 | 31 | 1075.9 | 428.9 | 0.94 | 0.494 | TALEGA - S.ONOFRE 2 230kV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | MS60 | ivsg_hs_alt1d2 | 392 | 366.2 | 40.9 | 932.8 | 368.5 | 0.94 | 0.89 | tran MISSION 230 to MISSION 138 ck 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | MS61 | ivsg_hs_alt1d2 | 392 | 366.2 | 40.9 | 932.8 | 368.5 | 0.94 | 0.89 | tran MISSION 230 to MISSION 138 ck 2 |
| 22844 | TALEGA | 230 | 24131 | S.ONOFRE | 230 | 2 | line_014 | ivsg_hs_alt1d2 | 456.1 | -427.7 | 31 | 1075.9 | 428.9 | 0.94 | 0.494 | line TALEGA to S.ONOFRE 230 ck 1 |
| 22844 | TALEGA | 230 | 24131 | S.ONOFRE | 230 | 1 | line_015 | ivsg_hs_alt1d2 | 456.1 | -427.7 | 31 | 1075.9 | 428.9 | 0.94 | 0.494 | line TALEGA to S.ONOFRE 230 ck 2 |
| 24807 | MIRAGE | 115 | 24819 | CONCHO | 115 | 1 | tran_238 | ivsg_hs_alt1d2 | 183 | 164.1 | -5.9 | 860.7 | 164.2 | 0.937 | 0.86 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 22832 | SYCAMORE | 230 | 22467 | MLSXTAP | 230 | 1 | B2_032 | ivsg_hs_alt1d2 | 796.7 | -718.3 | 53.7 | 1871.2 | 720.3 | 0.936 | 0.39 | OTAYMESA - MLMS3TAP 1 230kV |
| 22832 | SYCAMORE | 230 | 22467 | MLSXTAP | 230 | 1 | B2_034 | ivsg_hs_alt1d2 | 796.7 | -718.4 | 52.5 | 1871.9 | 720.3 | 0.936 | 0.39 | OLD TOWN - MLMS3TAP 1 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_028 | ivsg_hs_alt1d2 | 204.1 | 189.9 | -13.4 | 798 | 190.4 | 0.934 | 1.046 | MIGUEL - SYCAMORE 1 230kV |
| 22596 | OLD TOWN | 230 | 22466 | MLMS3TAP | 230 | 1 | B2_031 | ivsg_hs_alt1d2 | 912 | -828.8 | 96.1 | 2137.6 | 834.3 | 0.934 | 0.685 | SYCAMORE - MLSXTAP 1 230kV |
| 22596 | OLD TOWN | 230 | 22466 | MLMS3TAP | 230 | 1 | B2_029 | ivsg_hs_alt1d2 | 912 | -828.6 | 97.9 | 2136.5 | 834.3 | 0.933 | 0.685 | OTAYMESA - MLSXTAP 1 230kV |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_12 | ivsg_hs_alt1d2 | 169 | 157.8 | 27.3 | 563 | 160.1 | 0.932 | 0.811 | line COACHELA to RAMON 230 ck 2 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | B2_015 | ivsg_hs_alt1d2 | 408.3 | -383.6 | -1.9 | 1591.3 | 383.6 | 0.932 | 0.833 | MIGUEL - MISSION 1 230kV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_028 | ivsg_hs_alt1d2 | 392 | 364.6 | 36.4 | 924.8 | 366.4 | 0.93 | 0.89 | MIGUEL - SYCAMORE 1 230kV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | ML70 | ivsg_hs_alt1d2 | 392 | 362.2 | -3.5 | 922.9 | 362.2 | 0.93 | 0.89 | tran MIGUEL 69 to MIGUEL 230 ck 1 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | ML71 | ivsg_hs_alt1d2 | 392 | 362.2 | -3.5 | 922.9 | 362.2 | 0.93 | 0.89 | tran MIGUEL 69 to MIGUEL 230 ck 2 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | OT70 | ivsg_hs_alt1d2 | 392 | 363 | 37.8 | 924.9 | 365 | 0.93 | 0.89 | tran OLD TOWN 69 to OLD TOWN 230 ck 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | OT71 | ivsg_hs_alt1d2 | 392 | 363 | 37.8 | 924.9 | 365 | 0.93 | 0.89 | tran OLD TOWN 69 to OLD TOWN 230 ck 2 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | SX60 | ivsg_hs_alt1d2 | 408.3 | -381.1 | 2.1 | 1588.3 | 381.1 | 0.93 | 0.833 | tran SYCAMORE 230 to SYCAMORE 138 ck 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | SX70 | ivsg_hs_alt1d2 | 392 | 363.7 | 42.1 | 931 | 366.1 | 0.93 | 0.89 | tran SYCAMORE 230 to SYCAMORE 69 ck 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | SO2 | ivsg_hs_alt1d2 | 392 | 364.6 | 33 | 940.6 | 366.1 | 0.93 | 0.89 | gen S.ONOFR2 22.00 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | B2_020 | ivsg_hs_alt1d2 | 408.3 | -382.2 | -0.5 | 1586.1 | 382.2 | 0.929 | 0.833 | MIGUEL - MISSION 2 230kV |
| 24303 | BIG CRK3 | 230 | 24235 | RECTOR | 230 | 1 | line_139 | ivsg_hs_alt1d2 | 353 | 335.6 | 44.3 | 821.8 | 338.5 | 0.928 | 0.729 | line SPRINGVL to BIG CRK4 230 ck 1 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | B2_034 | ivsg_hs_alt1d2 | 408.3 | -372.5 | -0.3 | 1581.7 | 372.5 | 0.926 | 0.833 | OLD TOWN - MLMS3TAP 1 230kV |
| 8695 | RAMON | 230 | 24806 | MIRAGE | 230 | 2 | line_44 | ivsg_hs_alt1d2 | 800 | 726.3 | -112 | 1856.7 | 734.9 | 0.925 | 0.735 | line COACHELA to DEVERS 230 ck 2 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | B2_032 | ivsg_hs_alt1d2 | 408.3 | -372.6 | 0.1 | 1580.9 | 372.6 | 0.925 | 0.833 | OTAYMESA - MLMS3TAP 1 230kV |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_079 | ivsg_hs_alt1d2 | 2400 | -2321 | -37 | 2562.9 | 2321.3 | 0.925 | 0.733 | line LUGO to MOHAVE 500 ck 1 |
| 24807 | MIRAGE | 115 | 24816 | SANTA RO | 115 | 1 | tran_238 | ivsg_hs_alt1d2 | 183.3 | 162 | -11.6 | 851.5 | 162.4 | 0.925 | 0.852 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 22261 | EPP | 230 | 22260 | ESCNDIDO | 230 | 1 | SX60 | ivsg_hs_alt1d2 | 796.7 | 734.6 | -48.6 | 1843.3 | 736.2 | 0.922 | 0.792 | tran SYCAMORE 230 to SYCAMORE 138 ck 1 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_047 | ivsg_hs_alt1d2 | 2400 | -2322 | -54.9 | 2555.9 | 2322.6 | 0.922 | 0.733 | line ELDORDO to LUGO 500 ck 1 |
| 24614 | TAP601 | 115 | 24702 | KRAMER | 115 | 1 | line_169 | ivsg_hs_alt1d2 | 217.1 | -189.7 | 70.7 | 1001.9 | 202.4 | 0.921 | 0.716 | line KRAMER to LUGO 230 ck 1 |
| 24614 | TAP601 | 115 | 24702 | KRAMER | 115 | 1 | line_170 | ivsg_hs_alt1d2 | 217.1 | -189.7 | 70.7 | 1001.9 | 202.4 | 0.921 | 0.716 | line KRAMER to LUGO 230 ck 2 |
| 19020 | BLYTHE | 161 | 24017 | BLYTHESC | 161 | 1 | line_191 | ivsg_hs_alt1d2 | 244 | 226.5 | 34 | 805.5 | 229.1 | 0.921 | 0.826 | line EAGLEMTN to IRON MTN 230 ck 1 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | B2_007 | ivsg_hs_alt1d2 | 392 | 360.3 | -4.2 | 917.7 | 360.3 | 0.92 | 0.89 | PENSQTOS - ENCINA 1 230kV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_021 | ivsg_hs_alt1d2 | 392 | 360.6 | 29.9 | 921 | 361.9 | 0.92 | 0.89 | IMPRLVLY - ROA-230 1 230kV |
| 22261 | EPP | 230 | 22260 | ESCNDIDO | 230 | 1 | SX70 | ivsg_hs_alt1d2 | 796.7 | 733.3 | -22.2 | 1840.7 | 733.6 | 0.92 | 0.792 | tran SYCAMORE 230 to SYCAMORE 69 ck 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | line_207 | ivsg_hs_alt1d2 | 392 | 359.8 | 32.2 | 922.4 | 361.3 | 0.92 | 0.89 | line DEVERS to VALLEYSC 500 ck 1 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | ML70 | ivsg_hs_alt1d2 | 408.3 | -376.7 | -3.9 | 1570.1 | 376.8 | 0.919 | 0.833 | tran MIGUEL 69 to MIGUEL 230 ck 1 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | ML71 | ivsg_hs_alt1d2 | 408.3 | -376.7 | -3.9 | 1570.1 | 376.8 | 0.919 | 0.833 | tran MIGUEL 69 to MIGUEL 230 ck 2 |
| 19020 | BLYTHE | 161 | 24017 | BLYTHESC | 161 | 1 | line_63 | ivsg_hs_alt1d2 | 244 | 226.2 | 28.3 | 801.5 | 228 | 0.916 | 0.826 | line RAMON to MIRAGE 230 ck 2 |
| 24301 | BIG CRK1 | 230 | 24235 | RECTOR | 230 | 1 | line_156 | ivsg_hs_alt1d2 | 329 | 305.6 | 3.7 | 751.9 | 305.6 | 0.91 | 0.727 | line BIG CRK1 to BIG CRK2 230 ck 1 |
| 19020 | BLYTHE | 161 | 24017 | BLYTHESC | 161 | 1 | line_12 | ivsg_hs_alt1d2 | 244 | 224.3 | 27.6 | 794.4 | 225.9 | 0.908 | 0.826 | line COACHELA to RAMON 230 ck 2 |
| 24602 | VICTOR | 115 | 24702 | KRAMER | 115 | 1 | line_169 | ivsg_hs_alt1d2 | 217.1 | -185 | 80.8 | 985.9 | 201.9 | 0.908 | 0.702 | line KRAMER to LUGO 230 ck 1 |
| 24602 | VICTOR | 115 | 24702 | KRAMER | 115 | 1 | line_170 | ivsg_hs_alt1d2 | 217.1 | -185 | 80.8 | 985.9 | 201.9 | 0.908 | 0.702 | line KRAMER to LUGO 230 ck 2 |
| 24042 | ELDORDO | 500 | 24086 | LUGO | 500 | 1 | line_085 | ivsg_hs_alt1d2 | 1386 | 1342.4 | 212.1 | 1443.3 | 1359.1 | 0.907 | 0.612 | line LUGO to VICTORVL 500 ck 1 |
| 24301 | BIG CRK1 | 230 | 24302 | BIG CRK2 | 230 | 1 | line_155 | ivsg_hs_alt1d2 | 329 | 305.6 | -23.3 | 745.5 | 306.5 | 0.903 | 0.248 | line BIG CRK1 to RECTOR 230 ck 1 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 2 | line_136 | ivsg_hs_alt1d2 | 1195 | 1051.7 | -35.8 | 2706.2 | 1052.3 | 0.902 | 0.543 | line SERRANO to VILLA PK 230 ck 1 |
| 8601 | GEOSUB2 | 230 | 8300 | BANIS230 | 230 | 1 | line_13 | ivsg_hs_alt1d2 | 550 | 499.6 | 65.1 | 1241.3 | 503.8 | 0.9 | 0.785 | line COACHELA to MIDWAY 230 ck 1 |
| 8601 | GEOSUB2 | 230 | 8300 | BANIS230 | 230 | 1 | line_14 | ivsg_hs_alt1d2 | 550 | 499.6 | 65.1 | 1241.3 | 503.8 | 0.9 | 0.785 | line COACHELA to MIDWAY 230 ck 2 |
| 79064 | SHIPROCK | 345 | 79063 | SHIPROCK | 230 | 1 | line_001 | ivsg_hs_alt1d2 | 300 | 261.5 | -49.1 | 433.8 | 266.1 | 0.9 | 0.86 | line MOENKOPI to ELDORDO 500 ck 1 |
| 24805 | DEVERS | 115 | 24804 | DEVERS | 230 | 1 | tran_236 | ivsg_hs_alt1d2 | 280 | -246 | 53.2 | 1257 | 251.7 | 0.9 | 0.6 | tran DEVERS 115 to DEVERS 230 ck 3 |

ivsg_hs_alt1d2.sav
VOLTAGE Summary
N-2 Outages

| Bus | Name | kV | Area | Zone | Outage | Case | Vbase | Vcont | DeltaV | Vmin | Vmax | Max-dv | Contingency Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22734 | SANTEE | 138 | 22 | 223 | 23021/22/23/41 | ivsg_hs_alt1d2 | 0.99 | 0.92 | -0.07 | 0.9 | 1.05 | 0.05 | MIGUEL 230 CORRIDOR West of SN |
| 22412 | LOSCOCHS | 138 | 22 | 223 | 23021/22/23/41 | ivsg_hs_alt1d2 | 0.989 | 0.925 | -0.064 | 0.9 | 1.05 | 0.05 | MIGUEL 230 CORRIDOR West of SN |
| 24058 | GOLETA | 230 | 24 | 240 | line_2269 | ivsg_hs_alt1d2 | 0.984 | 0.93 | -0.055 | 0.9 | 1.05 | 0.05 | S.CLARA 230.00 - GOLETA 230.00 1, S.CLARA 230.00 - MOORPARK 230.00 1 |
| 24058 | GOLETA | 230 | 24 | 240 | line_2270 | ivsg_hs_alt1d2 | 0.984 | 0.93 | -0.055 | 0.9 | 1.05 | 0.05 | S.CLARA 230.00 - GOLETA 230.00 2, S.CLARA 230.00 - MOORPARK 230.00 2 |
| 25001 | GOODRICH | 230 | 24 | 250 | line_2073 | ivsg_hs_alt1d2 | 0.961 | 1.044 | 0.084 | 0.9 | 1.05 | 0.05 | GOODRICH 230.00 - GOULD 230.00 1, GOODRICH 230.00 - LAGUBELL 230.00 1 |
| 24058 | GOLETA | 230 | 24 | 240 | line_2120 | ivsg_hs_alt1d2 | 0.984 | 1.044 | 0.06 | 0.9 | 1.05 | 0.05 | S.CLARA 230.00 - GOLETA 230.00 1, S.CLARA 230.00 - GOLETA 230.00 2 |

ivsg_hs_alt1d2.sav
FLOW Summary
N-2 Outages

| LEGEND | % of RATING 1 | |
|---|---|---|
| C_pu | 100% - 110% | |
| C_pu | 110% - 120% | P.U. of |
| C_pu | > 120% | Rate 1 |

| FROM | FR | BKV | TO | TO | BKV | CK | Outage_Name | Case | Rate-Mva | Pflow | Qflow | Amps | MVA | C_pu | B_pu | Contingency_Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt1d2 | 392 | 580.2 | 109.2 | 1519.5 | 590.4 | 1.51 | 0.89 | MIGUEL 230 CORRIDOR West of SN |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt1d2 | 392 | 568.3 | 102.2 | 1473.9 | 577.5 | 1.47 | 0.89 | MIGUEL 230 CORRIDOR West of LC |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 13821C/25/23051A | ivsg_hs_alt1d2 | 204.1 | 292.4 | -29.2 | 1241.8 | 293.9 | 1.454 | 1.046 | CH-ES-NCM-SX |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23051B/23011 | ivsg_hs_alt1d2 | 204.1 | 290.8 | -18.7 | 1237.3 | 291.4 | 1.449 | 1.046 | EPP-ES + ES-EA-SA 230KV |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt1d2 | 408.3 | -570.1 | -14.4 | 2452.7 | 570.3 | 1.436 | 0.833 | MIGUEL 230 CORRIDOR West of SN |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt1d2 | 408.3 | -558.9 | -13 | 2379 | 559.1 | 1.393 | 0.833 | MIGUEL 230 CORRIDOR West of LC |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt1d2 | 392 | 533.7 | 100.8 | 1383.1 | 543.1 | 1.39 | 0.89 | MIGUEL 230 CORRIDOR North of ML |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt1d2 | 408.3 | -525.3 | -22.3 | 2232.6 | 525.8 | 1.307 | 0.833 | MIGUEL 230 CORRIDOR North of ML |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt1d2 | 382.4 | 480.2 | 20.2 | 2078.9 | 480.6 | 1.299 | 0.669 | MIGUEL 230 CORRIDOR West of SN |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt1d2 | 382.4 | 469.2 | 21.2 | 2009.5 | 469.6 | 1.256 | 0.669 | MIGUEL 230 CORRIDOR West of LC |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | 23051B/23011 | ivsg_hs_alt1d2 | 392 | 490.2 | 5.4 | 1261.5 | 490.2 | 1.25 | 0.89 | EPP-ES + ES-EA-SA 230KV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23022/23023 | ivsg_hs_alt1d2 | 204.1 | 252.9 | -12.5 | 1067.1 | 253.2 | 1.25 | 1.046 | ML-MS1+ ML-MS2 230KV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23011/13825 | ivsg_hs_alt1d2 | 204.1 | 246.2 | -22.2 | 1039.6 | 247.2 | 1.217 | 1.046 | ES-EA-SA 230KV + BQ-CC-ES-NCM 138KV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23022/23023 | ivsg_hs_alt1d2 | 392 | 467.7 | 61.7 | 1193.9 | 471.8 | 1.2 | 0.89 | ML-MS1+ ML-MS2 230KV |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 2 | line_2046 | ivsg_hs_alt1d2 | 956 | -1126.2 | -35.7 | 2861.2 | 1126.8 | 1.192 | 0.595 | LA FRESA 230.00 - REDONDO 230.00 1, REDONDO 230.00 - LITEHIPE 230.00 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 1 | line_2047 | ivsg_hs_alt1d2 | 956 | -1126.2 | -35.7 | 2861.2 | 1126.8 | 1.192 | 0.595 | LA FRESA 230.00 - REDONDO 230.00 2, REDONDO 230.00 - LITEHIPE 230.00 1 |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt1d2 | 382.4 | 436 | 33.4 | 1867.6 | 437.3 | 1.167 | 0.669 | MIGUEL 230 CORRIDOR North of ML |
| 22672 | PRCTRVLY | 138 | 22852 | TELECYN | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt1d2 | 478 | 539.3 | 10.4 | 2319.6 | 539.4 | 1.16 | 0.648 | MIGUEL 230 CORRIDOR West of SN |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23012/13807 | ivsg_hs_alt1d2 | 204.1 | 233.7 | -3.2 | 984.9 | 233.7 | 1.153 | 1.046 | PQ-EA 230KV + EA-NCW 138KV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23051A/23011 | ivsg_hs_alt1d2 | 204.1 | 230.2 | -20.2 | 974.6 | 231.1 | 1.141 | 1.046 | SX-EPP + ES-EA-SA 230KV |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 2 | line_2064 | ivsg_hs_alt1d2 | 956 | -1075.4 | -40.5 | 2732.1 | 1076.1 | 1.138 | 0.595 | LA FRESA 230.00 - REDONDO 230.00 1, MESA CAL 230.00 - REDONDO 230.00 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 1 | line_2065 | ivsg_hs_alt1d2 | 956 | -1075.4 | -40.5 | 2732.1 | 1076.1 | 1.138 | 0.595 | LA FRESA 230.00 - REDONDO 230.00 2, MESA CAL 230.00 - REDONDO 230.00 1 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23022/23023 | ivsg_hs_alt1d2 | 408.3 | -461.5 | -3.2 | 1927.1 | 461.6 | 1.128 | 0.833 | ML-MS1+ ML-MS2 230KV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23012/13808 | ivsg_hs_alt1d2 | 204.1 | 228.8 | -4.7 | 963.6 | 228.8 | 1.128 | 1.046 | PQ-EA 230KV + NCW-PQ 138KV |
| 22672 | PRCTRVLY | 138 | 22852 | TELECYN | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt1d2 | 478 | 528 | 9.1 | 2247.4 | 528.1 | 1.124 | 0.648 | MIGUEL 230 CORRIDOR West of LC |
| 8601 | GEOSUB2 | 230 | 8300 | BANIS230 | 230 | 1 | line_N-204 | ivsg_hs_alt1d2 | 550 | 613.6 | 99.6 | 1544.8 | 621.7 | 1.12 | 0.785 | COACHELLA MIDWAY 230 CKT 1&2 |
| 24086 | LUGO | 500 | 24236 | RANCHVST | 500 | 1 | line_2194 | ivsg_hs_alt1d2 | 2598 | 2958.8 | 496.2 | 3287.3 | 3000.1 | 1.097 | 0.608 | LUGO 500.00 - MIRALOMA 500.00 2, LUGO 500.00 - MIRALOMA 500.00 3 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23002/06/10 | ivsg_hs_alt1d2 | 204.1 | 220.5 | -6.6 | 935.9 | 220.6 | 1.096 | 1.046 | SANLUISREY 230 CORRIDOR |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 2 | line_2029 | ivsg_hs_alt1d2 | 1195 | 1271.7 | -38.7 | 3275.2 | 1272.3 | 1.092 | 0.543 | LEWIS 230.00 - SERRANO 230.00 1, SERRANO 230.00 - VILLA PK 230.00 1 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 2 | line_2031 | ivsg_hs_alt1d2 | 1195 | 1271.7 | -38.7 | 3275.2 | 1272.3 | 1.092 | 0.543 | LEWIS 230.00 - SERRANO 230.00 2, SERRANO 230.00 - VILLA PK 230.00 1 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 2 | line_2278 | ivsg_hs_alt1d2 | 1195 | 1271.7 | -38.7 | 3275.2 | 1272.3 | 1.092 | 0.543 | LEWIS 230.00 - SERRANO 230.00 1, SERRANO 230.00 - VILLA PK 230.00 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 2 | line_2049 | ivsg_hs_alt1d2 | 956 | -1025.4 | -36.2 | 2608.6 | 1026.1 | 1.087 | 0.595 | LA FRESA 230.00 - REDONDO 230.00 1, LCIENEGA 230.00 - LA FRESA 230.00 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 1 | line_2050 | ivsg_hs_alt1d2 | 956 | -1025.4 | -36.2 | 2608.6 | 1026.1 | 1.087 | 0.595 | LA FRESA 230.00 - REDONDO 230.00 2, LCIENEGA 230.00 - LA FRESA 230.00 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 2 | line_2057 | ivsg_hs_alt1d2 | 956 | -1025 | -32.9 | 2606.1 | 1025.5 | 1.086 | 0.595 | EL NIDO 230.00 - LA FRESA 230.00 3, LA FRESA 230.00 - REDONDO 230.00 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 1 | line_2058 | ivsg_hs_alt1d2 | 956 | -1025 | -32.9 | 2606.1 | 1025.5 | 1.086 | 0.595 | EL NIDO 230.00 - LA FRESA 230.00 3, LA FRESA 230.00 - REDONDO 230.00 2 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 2 | line_2059 | ivsg_hs_alt1d2 | 956 | -1025 | -32.9 | 2606.1 | 1025.5 | 1.086 | 0.595 | EL NIDO 230.00 - LA FRESA 230.00 4, LA FRESA 230.00 - REDONDO 230.00 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 1 | line_2060 | ivsg_hs_alt1d2 | 956 | -1025 | -32.9 | 2606.1 | 1025.5 | 1.086 | 0.595 | EL NIDO 230.00 - LA FRESA 230.00 4, LA FRESA 230.00 - REDONDO 230.00 2 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23013/27/28 | ivsg_hs_alt1d2 | 204.1 | 220.1 | -8.8 | 926.4 | 220.3 | 1.085 | 1.046 | OLD TOWN TO OLD TOWN JCT |
| 24701 | KRAMER | 230 | 24085 | LUGO | 230 | 2 | line_2260 | ivsg_hs_alt1d2 | 478 | 525.4 | 0 | 1299.6 | 525.4 | 1.083 | 0.643 | KRAMER 230.00 - LUGO 230.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23004/23001 | ivsg_hs_alt1d2 | 204.1 | 219.5 | -7.6 | 923.4 | 219.7 | 1.081 | 1.046 | SA-MS 1 + SA-MS 2 230KV |
| 22596 | OLD TOWN | 230 | 22466 | MLMS3TAP | 230 | 1 | 23021/22/23/41 | ivsg_hs_alt1d2 | 912 | -928 | 104.8 | 2433.4 | 933.9 | 1.063 | 0.685 | MIGUEL 230 CORRIDOR West of SN |
| 22596 | OLD TOWN | 230 | 22466 | MLMS3TAP | 230 | 1 | 23021/22/23/41 | ivsg_hs_alt1d2 | 912 | -924.7 | 111.5 | 2417.5 | 931.4 | 1.056 | 0.685 | MIGUEL 230 CORRIDOR North of ML |
| 22672 | PRCTRVLY | 138 | 22852 | TELECYN | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt1d2 | 478 | 494.5 | 18.3 | 2101 | 494.8 | 1.051 | 0.648 | MIGUEL 230 CORRIDOR North of ML |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_2260 | ivsg_hs_alt1d2 | 56 | 57.4 | -9.8 | 289.5 | 58.3 | 1.05 | 0.91 | KRAMER 230.00 - LUGO 230.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 22596 | OLD TOWN | 230 | 22466 | MLMS3TAP | 230 | 1 | 23021/22/23/41 | ivsg_hs_alt1d2 | 912 | -920.4 | 111.4 | 2404.3 | 927.1 | 1.05 | 0.685 | MIGUEL 230 CORRIDOR West of LC |
| 22260 | ESCNDIDO | 230 | 22844 | TALEGA | 230 | 1 | 23052/23007 | ivsg_hs_alt1d2 | 456.1 | 473.3 | 21.5 | 1192.8 | 473.8 | 1.042 | 0.068 | TA-SO 1 + 2 230KV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | 23022/23023 | ivsg_hs_alt1d2 | 392 | 406 | -2.2 | 1037 | 406 | 1.04 | 0.89 | ML-MS1+ ML-MS2 230KV |
| 30060 | MIDWAY | 500 | 24156 | VINCENT | 500 | 3 | line_2215 | ivsg_hs_alt1d2 | 1848.1 | 2039.5 | 75.6 | 2208.5 | 2040.9 | 1.037 | 0.407 | MIDWAY 500.00 - VINCENT 500.00 1, MIDWAY 500.00 - VINCENT 500.00 2 |
| 30060 | MIDWAY | 500 | 24156 | VINCENT | 500 | 1 | line_2220 | ivsg_hs_alt1d2 | 1848.1 | 2018.3 | 76.5 | 2185.4 | 2019.7 | 1.028 | 0.326 | MIDWAY 500.00 - VINCENT 500.00 2, MIDWAY 500.00 - VINCENT 500.00 3 |
| 8900 | PRUETTAP | 92 | 8691 | HIGHLINE | 92 | 1 | line_N-209 | ivsg_hs_alt1d2 | 86 | -89.9 | 4 | 554.9 | 90 | 1.028 | 0.751 | EL CENTRO HIGHLINE 230 CKTS 1&2 |
| 24016 | BARRE | 230 | 24044 | ELLIS | 230 | 1 | line_2115 | ivsg_hs_alt1d2 | 988 | 978.8 | -50.1 | 2543.4 | 980 | 1.026 | 0.329 | S.ONOFRE 230.00 - SANTIAGO 230.00 1, S.ONOFRE 230.00 - SANTIAGO 230.00 2 |
| 8600 | GEOSUB1 | 230 | 8300 | BANIS230 | 230 | 1 | line_N-204 | ivsg_hs_alt1d2 | 550 | 561.4 | 88.6 | 1413.5 | 568.4 | 1.025 | 0.726 | COACHELLA MIDWAY 230 CKT 1&2 |
| 8600 | GEOSUB1 | 230 | 8300 | BANIS230 | 230 | 2 | line_N-204 | ivsg_hs_alt1d2 | 550 | 561.4 | 88.6 | 1413.5 | 568.4 | 1.025 | 0.726 | COACHELLA MIDWAY 230 CKT 1&2 |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_N-203 | ivsg_hs_alt1d2 | 169 | 172.3 | 34.5 | 618.1 | 175.8 | 1.023 | 0.811 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 1 | line_2030 | ivsg_hs_alt1d2 | 1287 | 1271.7 | -38.7 | 3275.2 | 1272.3 | 1.014 | 0.504 | LEWIS 230.00 - SERRANO 230.00 1, SERRANO 230.00 - VILLA PK 230.00 2 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 1 | line_2032 | ivsg_hs_alt1d2 | 1287 | 1271.7 | -38.7 | 3275.2 | 1272.3 | 1.014 | 0.504 | LEWIS 230.00 - SERRANO 230.00 2, SERRANO 230.00 - VILLA PK 230.00 2 |
| 24074 | LA FRESA | 230 | 24065 | HINSON | 230 | 1 | line_2061 | ivsg_hs_alt1d2 | 797 | -776.9 | 53 | 2024.2 | 778.7 | 1.012 | 0.148 | LA FRESA 230.00 - REDONDO 230.00 1, LA FRESA 230.00 - REDONDO 230.00 2 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23027/28/13810 | ivsg_hs_alt1d2 | 204.1 | 203.2 | -6.5 | 853.2 | 203.3 | 0.999 | 1.046 | OLD TOWN TO MISSION 1 |
| 22831 | SYCAMORE | 138 | 22124 | CHCARITA | 138 | 1 | 23051B/23011 | ivsg_hs_alt1d2 | 204.1 | 197.8 | -33 | 851.8 | 200.6 | 0.997 | 0.662 | EPP-ES + ES-EA-SA 230KV |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | line_N-204 | ivsg_hs_alt1d2 | 132 | 130 | -12.6 | 820.6 | 130.6 | 0.991 | 0.953 | COACHELLA MIDWAY 230 CKT 1&2 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 13821B/638 | ivsg_hs_alt1d2 | 392 | 385.5 | 42.8 | 987 | 387.8 | 0.99 | 0.89 | CH-SX-SN 138KV + SAN VCNT-EL 69KV |
| 24086 | LUGO | 500 | 24097 | MOHAVE | 500 | 1 | line_2234 | ivsg_hs_alt1d2 | 1386 | -1427.4 | 95.6 | 1566.6 | 1430.6 | 0.989 | 0.682 | MOHAVE 500.00 - ELDORDO 500.00 1, PISGAH 230.00 - ELDORDO 230.00 2 |
| 8311 | COACHELA | 230 | 8695 | RAMON | 230 | 2 | line_2186 | ivsg_hs_alt1d2 | 800 | 783.4 | 13.4 | 1975.6 | 783.5 | 0.984 | 0.779 | COACHELV 230.00 - DEVERS 230.00 2, J.HINDS 230.00 - MIRAGE 230.00 1 |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | line_2186 | ivsg_hs_alt1d2 | 132 | 131.2 | -10.9 | 814.2 | 131.7 | 0.983 | 0.953 | COACHELV 230.00 - DEVERS 230.00 2, J.HINDS 230.00 - MIRAGE 230.00 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23052/23007 | ivsg_hs_alt1d2 | 204.1 | 199 | -11.5 | 839.5 | 199.3 | 0.983 | 1.046 | TA-SO 1 + 2 230KV |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | 23022/23023 | ivsg_hs_alt1d2 | 382.4 | 372.9 | 21.2 | 1565.2 | 373.5 | 0.978 | 0.669 | ML-MS1+ ML-MS2 230KV |
| 19020 | BLYTHE | 161 | 24017 | BLYTHESC | 161 | 1 | line_N-203 | ivsg_hs_alt1d2 | 244 | 238.8 | 34.8 | 848.6 | 241.4 | 0.97 | 0.826 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | 23051A/23011 | ivsg_hs_alt1d2 | 392 | 377.2 | -17.1 | 968.1 | 377.6 | 0.97 | 0.89 | SX-EPP + ES-EA-SA 230KV |
| 8695 | RAMON | 230 | 24806 | MIRAGE | 230 | 2 | line_2186 | ivsg_hs_alt1d2 | 800 | 755.6 | -122.2 | 1935 | 765.4 | 0.964 | 0.735 | COACHELV 230.00 - DEVERS 230.00 2, J.HINDS 230.00 - MIRAGE 230.00 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23021/23041 | ivsg_hs_alt1d2 | 392 | 373.7 | 40 | 955.9 | 375.9 | 0.96 | 0.89 | ML-SX + OM-SX 230KV |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_N-204 | ivsg_hs_alt1d2 | 169 | 161.9 | 27.3 | 577.5 | 164.2 | 0.955 | 0.811 | COACHELLA MIDWAY 230 CKT 1&2 |
| 24126 | RIOHONDO | 230 | 24155 | VINCENT | 230 | 2 | line_2097 | ivsg_hs_alt1d2 | 988 | -898.4 | 94.6 | 2360.2 | 903.4 | 0.952 | 0.695 | GOODRICH 230.00 - GOULD 230.00 1, VINCENT 230.00 - MESA CAL 230.00 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_2194 | ivsg_hs_alt1d2 | 56 | 51.5 | -10.2 | 259.9 | 52.5 | 0.95 | 0.91 | LUGO 500.00 - MIRALOMA 500.00 2, LUGO 500.00 - MIRALOMA 500.00 3 |
| 8311 | COACHELA | 230 | 8695 | RAMON | 230 | 2 | line_2236 | ivsg_hs_alt1d2 | 800 | 756.8 | 12.7 | 1906.6 | 756.9 | 0.949 | 0.779 | PALOVRDE 500.00 - DEVERS 500.00 1, COACHELV 230.00 - DEVERS 230.00 2 |
| 24025 | CHINO | 230 | 24093 | MIRALOMW | 230 | 1 | line_2160 | ivsg_hs_alt1d2 | 705 | -649.1 | 15.5 | 1671.1 | 649.3 | 0.944 | 0.229 | CHINO 230.00 - MIRALOMA 230.00 2, CHINO 230.00 - MIRALOMA 230.00 3 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23051B/23011 | ivsg_hs_alt1d2 | 392 | 366.6 | 41.4 | 941.5 | 368.9 | 0.94 | 0.89 | EPP-ES + ES-EA-SA 230KV |
| 22596 | OLD TOWN | 230 | 22466 | MLMS3TAP | 230 | 1 | 23021/23041 | ivsg_hs_alt1d2 | 912 | -833.2 | 93.7 | 2152.5 | 838.4 | 0.94 | 0.685 | ML-SX + OM-SX 230KV |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2191 | ivsg_hs_alt1d2 | 2400 | -2359.8 | -40.4 | 2597.8 | 2360.2 | 0.937 | 0.733 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - ELDORDO 230.00 2 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2200 | ivsg_hs_alt1d2 | 2400 | -2344.7 | -32.5 | 2590.4 | 2344.9 | 0.935 | 0.733 | LUGO 500.00 - MOHAVE 500.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2201 | ivsg_hs_alt1d2 | 2400 | -2344.5 | -32.6 | 2590.2 | 2344.7 | 0.935 | 0.733 | LUGO 500.00 - MOHAVE 500.00 1, PISGAH 230.00 - LUGO 230.00 2 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2100 | ivsg_hs_alt1d2 | 2400 | -2348.3 | -196.4 | 2588.6 | 2356.5 | 0.934 | 0.733 | EAGLROCK 230.00 - MESA CAL 230.00 1, SYLMAR S 230.00 - GOULD 230.00 1 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2192 | ivsg_hs_alt1d2 | 2400 | -2347.8 | -50.3 | 2585.7 | 2348.3 | 0.933 | 0.733 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2193 | ivsg_hs_alt1d2 | 2400 | -2347.6 | -50.4 | 2585.4 | 2348.1 | 0.933 | 0.733 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - LUGO 230.00 2 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 13821B/638 | ivsg_hs_alt1d2 | 408.3 | -381.2 | -2.9 | 1593.1 | 381.3 | 0.933 | 0.833 | CH-SX-SN 138KV + SAN VCNT-EL 69KV |
| 8311 | COACHELA | 230 | 8695 | RAMON | 230 | 2 | line_2246 | ivsg_hs_alt1d2 | 800 | 743.4 | 8.3 | 1869.6 | 743.4 | 0.931 | 0.779 | VSTA 230.00 - DEVERS 230.00 1, COACHELV 230.00 - DEVERS 230.00 2 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | 23002/06/10 | ivsg_hs_alt1d2 | 392 | 361.7 | -5.3 | 930.3 | 361.7 | 0.93 | 0.89 | SANLUISREY 230 CORRIDOR |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | 23013/27/28 | ivsg_hs_alt1d2 | 392 | 364.6 | -5.8 | 929.8 | 364.7 | 0.93 | 0.89 | OLD TOWN TO OLD TOWN JCT |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23027/28/13827 | ivsg_hs_alt1d2 | 204.1 | 188.5 | -8.8 | 791.5 | 188.7 | 0.927 | 1.046 | OLD TOWN TO MISSION 2 |
| 8695 | RAMON | 230 | 24806 | MIRAGE | 230 | 2 | line_2236 | ivsg_hs_alt1d2 | 800 | 726.3 | -112 | 1856.7 | 734.9 | 0.925 | 0.735 | PALOVRDE 500.00 - DEVERS 500.00 1, COACHELV 230.00 - DEVERS 230.00 2 |
| 19020 | BLYTHE | 161 | 24017 | BLYTHESC | 161 | 1 | line_N-204 | ivsg_hs_alt1d2 | 244 | 228.4 | 27.6 | 809.1 | 230.1 | 0.925 | 0.826 | COACHELLA MIDWAY 230 CKT 1&2 |
| 22261 | EPP | 230 | 22260 | ESCNDIDO | 230 | 1 | 23052/23007 | ivsg_hs_alt1d2 | 796.7 | 734.7 | -25.3 | 1850.6 | 735.1 | 0.925 | 0.792 | TA-SO 1 + 2 230KV |
| 8376 | RTAP2 | 92 | 8974 | RTP1 | 92 | 1 | line_N-208 | ivsg_hs_alt1d2 | 57 | -49.8 | 14.1 | 328.9 | 51.7 | 0.924 | 0.632 | COACHELLA BANISTER/BANISTER AVE58 230 |
| 24614 | TAP601 | 115 | 24702 | KRAMER | 115 | 1 | line_2260 | ivsg_hs_alt1d2 | 217.1 | -189.8 | 70.4 | 1002.9 | 202.4 | 0.922 | 0.716 | KRAMER 230.00 - LUGO 230.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 24126 | RIOHONDO | 230 | 24155 | VINCENT | 230 | 2 | line_2101 | ivsg_hs_alt1d2 | 988 | -873.6 | 96.4 | 2280.7 | 878.9 | 0.92 | 0.695 | EAGLROCK 230.00 - MESA CAL 230.00 1, VINCENT 230.00 - MESA CAL 230.00 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | line_2245 | ivsg_hs_alt1d2 | 392 | 359.8 | 32.2 | 922.4 | 361.3 | 0.92 | 0.89 | DEVERS 500.00 - VALLEYSC 500.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23002/06/10 | ivsg_hs_alt1d2 | 392 | 360.1 | 36.2 | 929.5 | 361.9 | 0.92 | 0.89 | SANLUISREY 230 CORRIDOR |
| 8900 | PRUETTAP | 92 | 8691 | HIGHLINE | 92 | 1 | line_N-204 | ivsg_hs_alt1d2 | 86 | -80.1 | 6.2 | 496 | 80.4 | 0.919 | 0.751 | COACHELLA MIDWAY 230 CKT 1&2 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2103 | ivsg_hs_alt1d2 | 2400 | -2309.9 | -183.2 | 2544.2 | 2317.1 | 0.918 | 0.733 | EAGLROCK 230.00 - SYLMAR S 230.00 1, SYLMAR S 230.00 - GOULD 230.00 1 |
| 24042 | ELDORDO | 500 | 24086 | LUGO | 500 | 1 | line_2258 | ivsg_hs_alt1d2 | 1386 | 1348.8 | 234 | 1454.9 | 1368.9 | 0.916 | 0.612 | LUGO 500.00 - VINCENT 500.00 2, LUGO 500.00 - VICTORVL 500.00 1 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2096 | ivsg_hs_alt1d2 | 2400 | -2299 | -204.2 | 2531.2 | 2308 | 0.913 | 0.733 | EAGLROCK 230.00 - MESA CAL 230.00 1, GOODRICH 230.00 - GOULD 230.00 1 |
| 22831 | SYCAMORE | 138 | 22124 | CHCARITA | 138 | 1 | 13821B/638 | ivsg_hs_alt1d2 | 204.1 | 184.2 | -24.2 | 779 | 185.8 | 0.912 | 0.662 | CH-SX-SN 138KV + SAN VCNT-EL 69KV |
| 24602 | VICTOR | 115 | 24702 | KRAMER | 115 | 1 | line_2260 | ivsg_hs_alt1d2 | 217.1 | -185.1 | 80.4 | 986.9 | 201.8 | 0.908 | 0.702 | KRAMER 230.00 - LUGO 230.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 24126 | RIOHONDO | 230 | 24155 | VINCENT | 230 | 2 | line_2100 | ivsg_hs_alt1d2 | 988 | -855.5 | 101.5 | 2248.4 | 861.5 | 0.907 | 0.695 | EAGLROCK 230.00 - MESA CAL 230.00 1, SYLMAR S 230.00 - GOULD 230.00 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 13810B/23013 | ivsg_hs_alt1d2 | 204.1 | 184.4 | -6.2 | 774.3 | 184.5 | 0.907 | 1.046 | OT JCT TO PQ 1 |
| 8695 | RAMON | 230 | 24806 | MIRAGE | 230 | 2 | line_2246 | ivsg_hs_alt1d2 | 800 | 711.2 | -111.2 | 1814.5 | 719.9 | 0.904 | 0.735 | VSTA 230.00 - DEVERS 230.00 1, COACHELV 230.00 - DEVERS 230.00 2 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23021/23041 | ivsg_hs_alt1d2 | 408.3 | -369.7 | -2.6 | 1543 | 369.7 | 0.903 | 0.833 | ML-SX + OM-SX 230KV |
| 24093 | MIRALOMW | 230 | 24158 | WALNUT | 230 | 1 | line_2089 | ivsg_hs_alt1d2 | 797 | 678.7 | 165.9 | 1795.9 | 698.7 | 0.9 | 0.522 | MESA CAL 230.00 - WALNUT 230.00 1, OLINDA 230.00 - WALNUT 230.00 1 |
| 79064 | SHIPROCK | 345 | 79063 | SHIPROCK | 230 | 1 | line_2233 | ivsg_hs_alt1d2 | 300 | 261.6 | -49.2 | 433.9 | 266.2 | 0.9 | 0.86 | MOENKOPI 500.00 - ELDORDO 500.00 1, PISGAH 230.00 - ELDORDO 230.00 2 |
| 8601 | GEOSUB2 | 230 | 8300 | BANIS230 | 230 | 1 | line_N-209 | ivsg_hs_alt1d2 | 550 | 500.5 | 60.5 | 1241.1 | 504.2 | 0.9 | 0.785 | EL CENTRO HIGHLINE 230 CKTS 1&2 |

ivsg_hs_alt1d2.sav
No Solve Summary
N-2 Outages

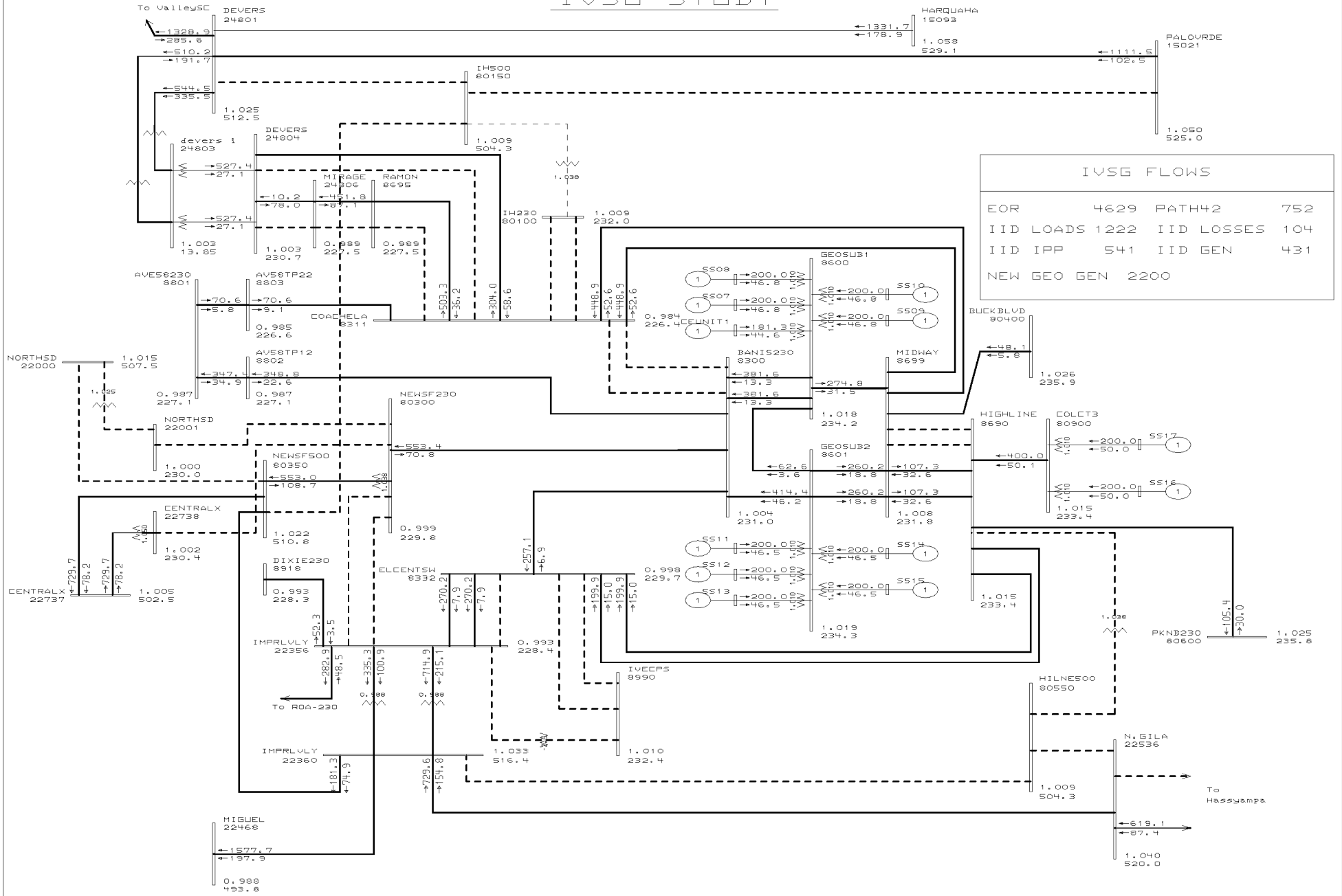
| Contingency-Description | Case | Problem-Description |
|---|---|---|
| DEVERS 230.00 - MIRAGE 230.00 2, RAMON 230.00 - MIRAGE 230.00 2 | ivsg_hs_alt1d2 | Pmis 25401 EAGLEMTN 230.00 = -50650.43 MW + j -175206.69 MVAR |
| VICTOR 230.00 - LUGO 230.00 1, VICTOR 230.00 - LUGO 230.00 2 | ivsg_hs_alt1d2 | Pmis 24602 VICTOR 115.00 = -1122759.50 MW + j -780954.06 MVAR |
| DEVERS 230.00 - MIRAGE 230.00 2, RAMON 230.00 - MIRAGE 230.00 2 | ivsg_hs_alt1d2 | Pmis 25401 EAGLEMTN 230.00 = -50650.43 MW + j -175206.69 MVAR |

# Imperial Valley Study Group

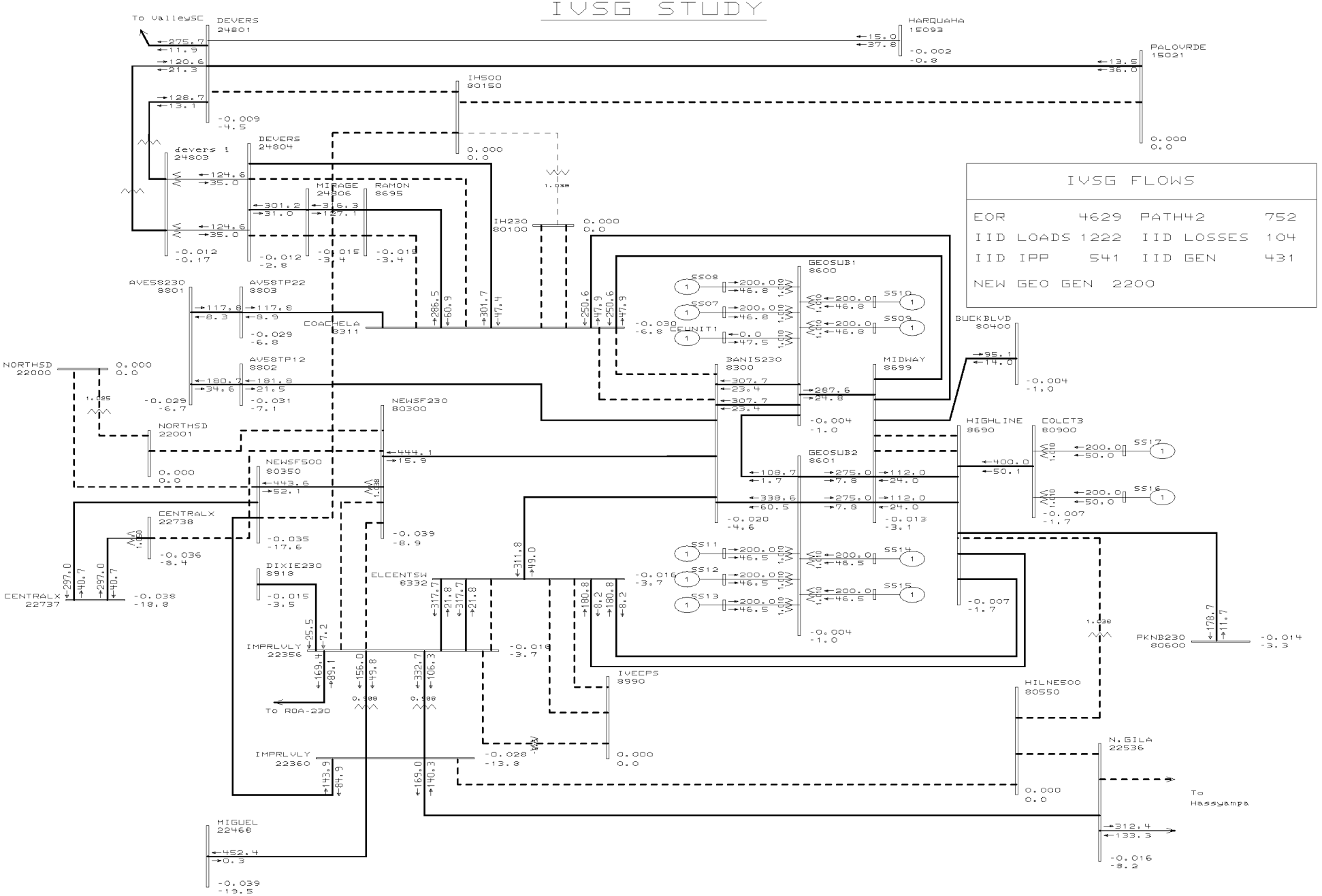
## Appendix A.4.4

Alt 2 D1
Heavy Summer
Alternative 2
Dispatch 1

# IVSG STUDY


To ValleySC
DEVERS 24801
HARQUAHA 15093
PALOVRDE 15021
IH500 80150
devers 1 24803
DEVERS 24804
MIRAGE 24806
RAMON 8695
IH230 80100
AVE58230 8801
AV58TP22 8803
AV58TP12 8802
COACHELA 8311
GEOSUB1 8600
BANIS230 8300
MIDWAY 8699
BUCKBLVD 80400
NORTHSD 22000
NORTHSD 22001
NEWSF230 80300
NEWSF500 80350
GEOSUB2 8601
HIGHLINE 8690
COLCT3 80900
CENTRALX 22738
CENTRALX 22737
DIXIE230 8918
ELCENTSW 8332
IMPRLVLY 22356
IMPRLVLY 22360
IVECPS 8990
HILNE500 80550
N.GILA 22536
PKNB230 80600
MIGUEL 22468
To ROA-230
To Hassyampa
IVSG FLOWS
EOR 4629 PATH42 752
IID LOADS 1222 IID LOSSES 104
IID IPP 541 IID GEN 431
NEW GEO GEN 2200

# IVSG STUDY


To ValleySC
DEVERS 24801
HARQUAHA 15093
PALOVRDE 15021
IH500 80150
DEVERS 24804
devers 1 24803
MIRAGE 24806
RAMON 8695
IH230 80100
AVE58230 8801
AV58TP22 8803
AV58TP12 8802
COACHELA 8311
GEOSUB1 8600
GEOSUB2 8601
BANIS230 8300
MIDWAY 8699
BUCKBLVD 80400
HIGHLINE 8690
COLCT3 80900
NORTHSD 22000
NORTHSD 22001
NEWSF230 80300
NEWSF500 80350
CENTRALX 22738
CENTRALX 22737
DIXIE230 8918
ELCENTSW 8332
IMPRLVLY 22356
IMPRLVLY 22360
IVECPS 8990
HILNE500 80550
N.GILA 22536
PKNB230 80600
MIGUEL 22468
To ROA-230
To Hassyampa
SS08
SS07
SS11
SS12
SS13
SS10
SS09
SS14
SS15
SS17
SS16
CELNIT1
IVSG FLOWS
EOR 4629 PATH42 752
IID LOADS 1222 IID LOSSES 104
IID IPP 541 IID GEN 431
NEW GEO GEN 2200

ivsg_hs_alt2d1.sav
Voltage Summary
N-0 Outages

| Bus | Name | kV | Area | Zone | Outage | Case | Vbase | Vcont | DeltaV | Vmin | Vmax | Max-dv | Contingency Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24035 | EAGLEMTN | 161 | 24 | 248 | base | ivsg_hs_alt2d1 | 0.927 | 0.927 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 20077 | SIM-115 | 115 | 20 | 205 | base | ivsg_hs_alt2d1 | 0.932 | 0.932 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 20076 | SQN-115 | 115 | 20 | 205 | base | ivsg_hs_alt2d1 | 0.937 | 0.937 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14534 | N.GILA 4 | 100 | 14 | 847 | base | ivsg_hs_alt2d1 | 0.942 | 0.942 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15021 | PALOVRDE | 500 | 14 | 158 | base | ivsg_hs_alt2d1 | 1.05 | 1.05 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15051 | BROWNING | 500 | 14 | 158 | base | ivsg_hs_alt2d1 | 1.05 | 1.05 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24775 | RUSH | 115 | 24 | 247 | base | ivsg_hs_alt2d1 | 1.05 | 1.05 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24151 | VALLEYSC | 500 | 24 | 240 | base | ivsg_hs_alt2d1 | 1.05 | 1.05 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24997 | VALYSVC1 | 500 | 24 | 240 | base | ivsg_hs_alt2d1 | 1.05 | 1.05 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 28040 | CALPINE | 500 | 24 | 240 | base | ivsg_hs_alt2d1 | 1.05 | 1.05 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15090 | HASSYAMP | 500 | 14 | 158 | base | ivsg_hs_alt2d1 | 1.052 | 1.052 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15092 | ARLINTON | 500 | 14 | 158 | base | ivsg_hs_alt2d1 | 1.053 | 1.053 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15094 | MESQUITE | 500 | 14 | 158 | base | ivsg_hs_alt2d1 | 1.053 | 1.053 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24086 | LUGO | 500 | 24 | 240 | base | ivsg_hs_alt2d1 | 1.053 | 1.053 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14009 | REDHAWK | 500 | 14 | 141 | base | ivsg_hs_alt2d1 | 1.054 | 1.054 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14010 | TS5 | 500 | 14 | 141 | base | ivsg_hs_alt2d1 | 1.056 | 1.056 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 79043 | KAYENTA | 230 | 14 | 191 | base | ivsg_hs_alt2d1 | 1.056 | 1.056 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15093 | HARQUAHA | 500 | 14 | 158 | base | ivsg_hs_alt2d1 | 1.058 | 1.058 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14230 | VERDE N | 230 | 14 | 141 | base | ivsg_hs_alt2d1 | 1.058 | 1.058 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14247 | VERDE S | 230 | 14 | 141 | base | ivsg_hs_alt2d1 | 1.058 | 1.058 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14011 | RACEWAY | 500 | 14 | 141 | base | ivsg_hs_alt2d1 | 1.058 | 1.058 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24776 | LEE VINE | 115 | 24 | 247 | base | ivsg_hs_alt2d1 | 1.058 | 1.058 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15034 | PERKINS | 500 | 14 | 158 | base | ivsg_hs_alt2d1 | 1.061 | 1.061 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14205 | COCONINO | 230 | 14 | 141 | base | ivsg_hs_alt2d1 | 1.061 | 1.061 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14008 | JOJOBA | 500 | 14 | 141 | base | ivsg_hs_alt2d1 | 1.061 | 1.061 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15041 | SILVERKG | 500 | 14 | 158 | base | ivsg_hs_alt2d1 | 1.062 | 1.062 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15061 | RUDD | 500 | 14 | 158 | base | ivsg_hs_alt2d1 | 1.062 | 1.062 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24156 | VINCENT | 500 | 24 | 240 | base | ivsg_hs_alt2d1 | 1.062 | 1.062 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14234 | YAVAPAI | 230 | 14 | 141 | base | ivsg_hs_alt2d1 | 1.063 | 1.063 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14355 | PRESCOTT | 115 | 14 | 141 | base | ivsg_hs_alt2d1 | 1.066 | 1.066 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14544 | PRESCOT2 | 100 | 14 | 141 | base | ivsg_hs_alt2d1 | 1.066 | 1.066 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14543 | PRESCOT1 | 100 | 14 | 141 | base | ivsg_hs_alt2d1 | 1.066 | 1.066 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14001 | FOURCORN | 500 | 14 | 141 | base | ivsg_hs_alt2d1 | 1.067 | 1.067 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14256 | FLAGSTAF | 230 | 14 | 141 | base | ivsg_hs_alt2d1 | 1.067 | 1.067 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14587 | FLAGSTF1 | 100 | 14 | 141 | base | ivsg_hs_alt2d1 | 1.068 | 1.068 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24729 | INYO | 230 | 24 | 247 | base | ivsg_hs_alt2d1 | 1.068 | 1.068 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14007 | GILARIVR | 500 | 14 | 141 | base | ivsg_hs_alt2d1 | 1.069 | 1.069 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 79264 | PINAL_W | 500 | 14 | 141 | base | ivsg_hs_alt2d1 | 1.07 | 1.07 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14006 | YAVAPAI | 500 | 14 | 141 | base | ivsg_hs_alt2d1 | 1.071 | 1.071 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14004 | SAGUARO | 500 | 14 | 141 | base | ivsg_hs_alt2d1 | 1.075 | 1.075 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14215 | LEUPP | 230 | 14 | 141 | base | ivsg_hs_alt2d1 | 1.075 | 1.075 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15992 | SEV | 500 | 14 | 158 | base | ivsg_hs_alt2d1 | 1.075 | 1.075 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 16000 | TORTOLIT | 500 | 14 | 160 | base | ivsg_hs_alt2d1 | 1.075 | 1.075 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 16001 | TORTLIT2 | 500 | 14 | 160 | base | ivsg_hs_alt2d1 | 1.075 | 1.075 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14100 | CHOLLA | 345 | 14 | 141 | base | ivsg_hs_alt2d1 | 1.077 | 1.077 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15001 | CORONADO | 500 | 14 | 158 | base | ivsg_hs_alt2d1 | 1.08 | 1.08 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14000 | CHOLLA | 500 | 14 | 141 | base | ivsg_hs_alt2d1 | 1.081 | 1.081 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 19038 | MEAD | 500 | 14 | 191 | base | ivsg_hs_alt2d1 | 1.083 | 1.083 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24042 | ELDORDO | 500 | 24 | 240 | base | ivsg_hs_alt2d1 | 1.083 | 1.083 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24097 | MOHAVE | 500 | 24 | 240 | base | ivsg_hs_alt2d1 | 1.086 | 1.086 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14204 | CHOLLA | 230 | 14 | 141 | base | ivsg_hs_alt2d1 | 1.088 | 1.088 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14509 | CHOLLA 7 | 100 | 14 | 141 | base | ivsg_hs_alt2d1 | 1.094 | 1.094 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14267 | SECDKNOL | 230 | 14 | 141 | base | ivsg_hs_alt2d1 | 1.099 | 1.099 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14003 | NAVAJO | 500 | 14 | 141 | base | ivsg_hs_alt2d1 | 1.101 | 1.101 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14002 | MOENKOPI | 500 | 14 | 141 | base | ivsg_hs_alt2d1 | 1.103 | 1.103 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |

ivsg_hs_alt2d1.sav
Flow Summary
N-0 Outages

| LEGEND | % of RATING 1 | |
|---|---|---|
| C_pu | 100% - 110% | |
| C_pu | 110% - 120% | P.U. of |
| C_pu | > 120% | Rate 1 |

| FROM | FR | BKV | TO | TO | BKV | CK | Outage_Name | Case | Rate-Mva | Pflow | Qflow | Amps | MVA | C_pu | B_pu | Contingency_Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | base | ivsg_hs_alt2d1 | 204.1 | 255.9 | -3 | 1077.5 | 255.9 | 1.262 | 1.262 | Base system (n-0) |
| 24910 | CAL ELEC | 115 | 24912 | SHANDIN | 115 | 1 | base | ivsg_hs_alt2d1 | 109.1 | -124.1 | 58.4 | 684.8 | 137.2 | 1.253 | 1.253 | Base system (n-0) |
| 14248 | GLENDALW | 230 | 14212 | GLENDALE | 230 | 1 | base | ivsg_hs_alt2d1 | 457 | 571.7 | 32.4 | 1433.2 | 572.6 | 1.249 | 1.249 | Base system (n-0) |
| 14248 | GLENDALW | 230 | 15201 | AGUAFRIA | 230 | 1 | base | ivsg_hs_alt2d1 | 457 | -571.7 | -32.4 | 1433.2 | 572.6 | 1.249 | 1.249 | Base system (n-0) |
| 14221 | PNPKAPS | 230 | 19062 | PINPK | 230 | 1 | base | ivsg_hs_alt2d1 | 637.4 | -783.5 | -185.8 | 1982.1 | 805.2 | 1.239 | 1.239 | Base system (n-0) |
| 24912 | SHANDIN | 115 | 24916 | TAP902 | 115 | 1 | base | ivsg_hs_alt2d1 | 109.1 | -119.2 | 33.6 | 615.2 | 123.8 | 1.124 | 1.124 | Base system (n-0) |
| 14212 | GLENDALE | 230 | 14270 | GRNDTRML | 230 | 1 | base | ivsg_hs_alt2d1 | 457 | 506.3 | 24.8 | 1268.9 | 506.9 | 1.108 | 1.108 | Base system (n-0) |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | base | ivsg_hs_alt2d1 | 392 | 402.7 | 41.3 | 1038.3 | 404.8 | 1.03 | 1.03 | Base system (n-0) |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | base | ivsg_hs_alt2d1 | 392 | 404.6 | 8.8 | 1030 | 404.7 | 1.03 | 1.03 | Base system (n-0) |
| 14206 | CTRYCLUB | 230 | 14270 | GRNDTRML | 230 | 1 | base | ivsg_hs_alt2d1 | 509.9 | -502.9 | -25.2 | 1272.2 | 503.6 | 0.994 | 0.994 | Base system (n-0) |
| 14202 | CACTUS | 230 | 14221 | PNPKAPS | 230 | 1 | base | ivsg_hs_alt2d1 | 371 | -363.4 | -48.7 | 920.3 | 366.7 | 0.988 | 0.988 | Base system (n-0) |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | base | ivsg_hs_alt2d1 | 408.3 | -398 | 2.9 | 1675.9 | 398 | 0.981 | 0.981 | Base system (n-0) |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | base | ivsg_hs_alt2d1 | 132 | 125.9 | -10.8 | 792.8 | 126.4 | 0.957 | 0.957 | Base system (n-0) |
| 15230 | RUDD | 230 | 15218 | WHITETNK | 230 | 1 | base | ivsg_hs_alt2d1 | 725 | 694.2 | -18.3 | 1738.9 | 694.4 | 0.955 | 0.955 | Base system (n-0) |
| 24087 | MAGUNDEN | 230 | 24101 | OMAR | 230 | 1 | base | ivsg_hs_alt2d1 | 643 | -591.8 | 130.1 | 1534 | 606 | 0.951 | 0.951 | Base system (n-0) |
| 24806 | MIRAGE | 230 | 24807 | MIRAGE | 115 | 1 | base | ivsg_hs_alt2d1 | 280 | 265.7 | 28.6 | 680.8 | 267.2 | 0.95 | 0.95 | Base system (n-0) |
| 24806 | MIRAGE | 230 | 24807 | MIRAGE | 115 | 2 | base | ivsg_hs_alt2d1 | 280 | 265.7 | 28.6 | 680.8 | 267.2 | 0.95 | 0.95 | Base system (n-0) |
| 24702 | KRAMER | 115 | 24753 | SUNGEN | 115 | 1 | base | ivsg_hs_alt2d1 | 183.3 | -170.5 | 31.5 | 863.7 | 173.4 | 0.939 | 0.939 | Base system (n-0) |
| 14008 | JOJOBA | 500 | 15011 | KYRENE | 500 | 1 | base | ivsg_hs_alt2d1 | 1732 | 1713.6 | 134.2 | 1870.7 | 1718.8 | 0.937 | 0.937 | Base system (n-0) |
| 26098 | SYLMAR3 | 230 | 24147 | SYLMAR S | 230 | 1 | base | ivsg_hs_alt2d1 | 1100 | 841 | -523.2 | 2576.9 | 990.5 | 0.933 | 0.933 | Base system (n-0) |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | base | ivsg_hs_alt2d1 | 56 | 50 | -10.7 | 253.2 | 51.1 | 0.92 | 0.92 | Base system (n-0) |
| 14207 | DEERVALY | 230 | 14231 | WESTWING | 230 | 1 | base | ivsg_hs_alt2d1 | 720 | -647.4 | -80.1 | 1634.2 | 652.3 | 0.904 | 0.904 | Base system (n-0) |

ivsg_hs_alt2d1.sav
VOLTAGE Summary
N-1 Outages

| Bus | Name | kV | Area | Zone | Outage | Case | Vbase | Vcont | DeltaV | Vmin | Vmax | Max-dv | Contingency Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24017 | BLYTHESC | 161 | 24 | 248 | line_007 | ivsg_hs_alt2d1 | 1.02 | 0.857 | -0.162 | 0.9 | 1.05 | 0.05 | line BLYTHE to BLYTHESC 161 ck 1 |
| 24819 | CONCHO | 115 | 24 | 248 | tran_238 | ivsg_hs_alt2d1 | 1.019 | 0.918 | -0.101 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 24822 | INDIAN W | 115 | 24 | 248 | tran_238 | ivsg_hs_alt2d1 | 1.019 | 0.918 | -0.101 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 24816 | SANTA RO | 115 | 24 | 248 | tran_238 | ivsg_hs_alt2d1 | 1.023 | 0.922 | -0.101 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 24821 | TAMARISK | 115 | 24 | 248 | tran_238 | ivsg_hs_alt2d1 | 1.023 | 0.923 | -0.1 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 24827 | TAP823 | 115 | 24 | 248 | tran_238 | ivsg_hs_alt2d1 | 1.025 | 0.925 | -0.1 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 25633 | CAPWIND | 115 | 24 | 248 | tran_238 | ivsg_hs_alt2d1 | 1.025 | 0.926 | -0.099 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 25622 | TAP806 | 115 | 24 | 248 | tran_238 | ivsg_hs_alt2d1 | 1.025 | 0.926 | -0.099 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 24829 | TAP821 | 115 | 24 | 248 | tran_238 | ivsg_hs_alt2d1 | 1.025 | 0.926 | -0.099 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 24731 | INYOKERN | 115 | 24 | 247 | line_175 | ivsg_hs_alt2d1 | 1 | 0.927 | -0.073 | 0.9 | 1.05 | 0.05 | line INYO to COTTONWD 230 ck 1 |
| 24807 | MIRAGE | 115 | 24 | 248 | tran_238 | ivsg_hs_alt2d1 | 1.027 | 0.929 | -0.099 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 25423 | ESRP MWD | 115 | 24 | 254 | tran_247 | ivsg_hs_alt2d1 | 1.02 | 0.929 | -0.092 | 0.9 | 1.05 | 0.05 | tran VALLEYSC 500 to VALLEYSC 115 ck 1 |
| 25423 | ESRP MWD | 115 | 24 | 254 | tran_248 | ivsg_hs_alt2d1 | 1.02 | 0.929 | -0.092 | 0.9 | 1.05 | 0.05 | tran VALLEYSC 500 to VALLEYSC 115 ck 2 |
| 24160 | VALLEYSC | 115 | 24 | 240 | tran_247 | ivsg_hs_alt2d1 | 1.023 | 0.932 | -0.091 | 0.9 | 1.05 | 0.05 | tran VALLEYSC 500 to VALLEYSC 115 ck 1 |
| 25990 | VALYSVC1 | 115 | 24 | 240 | tran_247 | ivsg_hs_alt2d1 | 1.023 | 0.932 | -0.091 | 0.9 | 1.05 | 0.05 | tran VALLEYSC 500 to VALLEYSC 115 ck 1 |
| 24160 | VALLEYSC | 115 | 24 | 240 | tran_248 | ivsg_hs_alt2d1 | 1.023 | 0.932 | -0.091 | 0.9 | 1.05 | 0.05 | tran VALLEYSC 500 to VALLEYSC 115 ck 2 |
| 25990 | VALYSVC1 | 115 | 24 | 240 | tran_248 | ivsg_hs_alt2d1 | 1.023 | 0.932 | -0.091 | 0.9 | 1.05 | 0.05 | tran VALLEYSC 500 to VALLEYSC 115 ck 2 |
| 25405 | IRON MTN | 230 | 24 | 248 | line_192 | ivsg_hs_alt2d1 | 0.999 | 0.948 | -0.051 | 0.9 | 1.05 | 0.05 | line IRON MTN to CAMINO 230 ck 1 |
| 24035 | EAGLEMTN | 161 | 24 | 248 | line_194 | ivsg_hs_alt2d1 | 0.927 | 0.977 | 0.05 | 0.9 | 1.05 | 0.05 | line J.HINDS to EAGLEMTN 230 ck 1 |
| 14534 | N.GILA 4 | 100 | 14 | 847 | NG500/69 | ivsg_hs_alt2d1 | 0.942 | 1 | 0.058 | 0.9 | 1.05 | 0.05 | tran N.GILA 500 to N.GILA 69 ck 1 |
| 24035 | EAGLEMTN | 161 | 24 | 248 | tran_241 | ivsg_hs_alt2d1 | 0.927 | 1.026 | 0.099 | 0.9 | 1.05 | 0.05 | tran EAGLEMTN 230 to EAGLEMTN 161 ck 1 |
| 22472 | MIGUELMP | 500 | 22 | 227 | ML80 | ivsg_hs_alt2d1 | 0.98 | 1.05 | 0.07 | 0.9 | 1.05 | 0.05 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 24730 | INYO PS | 115 | 24 | 247 | tran_229 | ivsg_hs_alt2d1 | 1.026 | 1.077 | 0.052 | 0.9 | 1.05 | 0.05 | tran INYO 115 to INYO PS 115 ck 1 |
| 24142 | SYC CYN | 230 | 24 | 240 | line_086 | ivsg_hs_alt2d1 | 0.984 | 1.091 | 0.107 | 0.9 | 1.05 | 0.05 | line MAGUNDEN to OMAR 230 ck 1 |
| 25613 | EDMONSTN | 230 | 24 | 256 | line_122 | ivsg_hs_alt2d1 | 0.999 | 1.091 | 0.092 | 0.9 | 1.05 | 0.05 | line PASTORIA to EDMONSTN 230 ck 1 |
| 24142 | SYC CYN | 230 | 24 | 240 | line_140 | ivsg_hs_alt2d1 | 0.984 | 1.091 | 0.107 | 0.9 | 1.05 | 0.05 | line SYC CYN to OMAR 230 ck 1 |
| 24320 | EASTWOOD | 230 | 24 | 243 | line_157 | ivsg_hs_alt2d1 | 1.041 | 1.091 | 0.05 | 0.9 | 1.05 | 0.05 | line BIG CRK1 to EASTWOOD 230 ck 1 |

ivsg_hs_alt2d1.sav
FLOW Summary
N-1 Outages

| LEGEND | % of RATING 1 | |
|---|---|---|
| C_pu | 100% - 110% | |
| C_pu | 110% - 120% | P.U. of |
| C_pu | > 120% | Rate 1 |

| FROM | FR | BKV | TO | TO | BKV | CK | Outage_Name | Case | Rate-Mva | Pflow | Qflow | Amps | MVA | C_pu | B_pu | Contingency_Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24142 | SYC CYN | 230 | 24101 | OMAR | 230 | 1 | line_086 | ivsg_hs_alt2d1 | 643 | 770.1 | 5511.1 | 12804.5 | 5564.6 | 7.934 | 0.471 | line MAGUNDEN to OMAR 230 ck 1 |
| 24781 | NAVYCOSO | 230 | 24706 | BLM EAST | 230 | 1 | line_173 | ivsg_hs_alt2d1 | 1287 | -153.7 | -3160.7 | 7943.3 | 3164.4 | 2.459 | 0.056 | line BLM EAST to BLM WEST 230 ck 1 |
| 24781 | NAVYCOSO | 230 | 24706 | BLM EAST | 230 | 1 | line_174 | ivsg_hs_alt2d1 | 1287 | -153.7 | -3160.7 | 7943.3 | 3164.4 | 2.459 | 0.056 | line BLM WEST to KRAMER 230 ck 1 |
| 24806 | MIRAGE | 230 | 24807 | MIRAGE | 115 | 2 | tran_238 | ivsg_hs_alt2d1 | 280 | 532.5 | 217.5 | 1506.5 | 575.2 | 2.05 | 0.95 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_175 | ivsg_hs_alt2d1 | 56 | -103.6 | -1.2 | 532 | 103.6 | 1.86 | 0.92 | line INYO to COTTONWD 230 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_034 | ivsg_hs_alt2d1 | 204.1 | 331.9 | 0.8 | 1444.2 | 331.9 | 1.691 | 1.262 | OLD TOWN - MLMS3TAP 1 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_032 | ivsg_hs_alt2d1 | 204.1 | 331.9 | 0 | 1443.2 | 331.9 | 1.69 | 1.262 | OTAYMESA - MLMS3TAP 1 230kV |
| 24151 | VALLEYSC | 500 | 24160 | VALLEYSC | 115 | 2 | tran_247 | ivsg_hs_alt2d1 | 560 | 853.2 | 369.6 | 1039 | 929.8 | 1.66 | 0.77 | tran VALLEYSC 500 to VALLEYSC 115 ck 1 |
| 24151 | VALLEYSC | 500 | 24160 | VALLEYSC | 115 | 1 | tran_248 | ivsg_hs_alt2d1 | 560 | 853.2 | 369.6 | 1039 | 929.8 | 1.66 | 0.77 | tran VALLEYSC 500 to VALLEYSC 115 ck 2 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_009 | ivsg_hs_alt2d1 | 204.1 | 318.8 | -2.6 | 1350.1 | 318.8 | 1.581 | 1.262 | EPP - ESCNDIDO 1 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | ML60 | ivsg_hs_alt2d1 | 204.1 | 307 | 4.4 | 1306.5 | 307 | 1.53 | 1.262 | tran MIGUEL 230 to MIGUEL 138 ck 1 |
| 24151 | VALLEYSC | 500 | 24229 | VALLEY-S | 115 | 4 | tran_249 | ivsg_hs_alt2d1 | 560 | 830.7 | 210.2 | 953.3 | 856.8 | 1.53 | 0.75 | tran VALLEYSC 500 to VALLEY-S 115 ck 3 |
| 24151 | VALLEYSC | 500 | 24229 | VALLEY-S | 115 | 3 | tran_250 | ivsg_hs_alt2d1 | 560 | 830.6 | 210.2 | 953.3 | 856.8 | 1.53 | 0.75 | tran VALLEYSC 500 to VALLEY-S 115 ck 4 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | SX70 | ivsg_hs_alt2d1 | 204.1 | 302.9 | 13.3 | 1285.8 | 303.2 | 1.506 | 1.262 | tran SYCAMORE 230 to SYCAMORE 69 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_013 | ivsg_hs_alt2d1 | 204.1 | 293.9 | -9.2 | 1248.8 | 294 | 1.462 | 1.262 | EPP - SYCAMORE 1 230kV |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_202 | ivsg_hs_alt2d1 | 56 | 77.5 | -7.2 | 392.9 | 77.8 | 1.4 | 0.92 | line OWENSCON to INYO 230 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | MS60 | ivsg_hs_alt2d1 | 204.1 | 280.4 | 4.1 | 1186.5 | 280.4 | 1.389 | 1.262 | tran MISSION 230 to MISSION 138 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | MS61 | ivsg_hs_alt2d1 | 204.1 | 280.4 | 4.1 | 1186.5 | 280.4 | 1.389 | 1.262 | tran MISSION 230 to MISSION 138 ck 2 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | ML70 | ivsg_hs_alt2d1 | 204.1 | 272.1 | 4.4 | 1153.8 | 272.2 | 1.351 | 1.262 | tran MIGUEL 69 to MIGUEL 230 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | ML71 | ivsg_hs_alt2d1 | 204.1 | 272.1 | 4.4 | 1153.8 | 272.2 | 1.351 | 1.262 | tran MIGUEL 69 to MIGUEL 230 ck 2 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_015 | ivsg_hs_alt2d1 | 204.1 | 271.3 | -2.5 | 1146.1 | 271.3 | 1.342 | 1.262 | MIGUEL - MISSION 1 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_020 | ivsg_hs_alt2d1 | 204.1 | 270.8 | -3.1 | 1143.9 | 270.8 | 1.34 | 1.262 | MIGUEL - MISSION 2 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | ML80 | ivsg_hs_alt2d1 | 204.1 | 266.9 | -2.1 | 1132.5 | 266.9 | 1.326 | 1.262 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | ML81 | ivsg_hs_alt2d1 | 204.1 | 265.9 | -2.1 | 1127.5 | 265.9 | 1.32 | 1.262 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | MS70 | ivsg_hs_alt2d1 | 204.1 | 266 | 5 | 1126.6 | 266 | 1.319 | 1.262 | tran MISSION 230 to MISSION 69 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_007 | ivsg_hs_alt2d1 | 204.1 | 265.3 | 2.9 | 1123.7 | 265.4 | 1.316 | 1.262 | PENSQTOS - ENCINA 1 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | SO2 | ivsg_hs_alt2d1 | 204.1 | 261.8 | 1.6 | 1121.6 | 261.8 | 1.314 | 1.262 | gen S.ONOFR2 22.00 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | B2_009 | ivsg_hs_alt2d1 | 392 | 513 | 29.6 | 1311.8 | 513.9 | 1.31 | 1.03 | EPP - ESCNDIDO 1 230kV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | B2_032 | ivsg_hs_alt2d1 | 392 | 511.1 | 20.6 | 1344.1 | 511.5 | 1.3 | 1.03 | OTAYMESA - MLMS3TAP 1 230kV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | B2_034 | ivsg_hs_alt2d1 | 392 | 511.1 | 21.2 | 1344.9 | 511.6 | 1.3 | 1.03 | OLD TOWN - MLMS3TAP 1 230kV |
| 22356 | IMPRLVLY | 230 | 22360 | IMPRLVLY | 500 | 1 | IV81 | ivsg_hs_alt2d1 | 600 | 741.6 | 250.8 | 1972.7 | 782.9 | 1.3 | 0.58 | tran IMPRLVLY 230 to IMPRLVLY 500 ck 2 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | line_207 | ivsg_hs_alt2d1 | 204.1 | 260.1 | -1.2 | 1106.3 | 260.1 | 1.296 | 1.262 | line DEVERS to VALLEYSC 500 ck 1 |
| 22468 | MIGUEL | 500 | 22472 | MIGUELMP | 500 | 1 | ML81 | ivsg_hs_alt2d1 | 1120 | 1392.7 | 249.9 | 1658.5 | 1415 | 1.26 | 0.73 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 22464 | MIGUEL | 230 | 22468 | MIGUEL | 500 | 1 | ML80 | ivsg_hs_alt2d1 | 1120 | -1371.2 | 13.3 | 3560.1 | 1371.3 | 1.25 | 0.69 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 22464 | MIGUEL | 230 | 22472 | MIGUELMP | 500 | 1 | ML81 | ivsg_hs_alt2d1 | 1120 | -1390 | 10.5 | 3605.4 | 1390 | 1.24 | 0.72 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | SX70 | ivsg_hs_alt2d1 | 392 | 478.8 | 40.7 | 1224.1 | 480.5 | 1.23 | 1.03 | tran SYCAMORE 230 to SYCAMORE 69 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_001 | ivsg_hs_alt2d1 | 204.1 | 250.1 | -3.7 | 1046.9 | 250.1 | 1.226 | 1.262 | HASSYAMP - N.GILA 1 500kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | line_7 | ivsg_hs_alt2d1 | 204.1 | 248 | 0.4 | 1041.8 | 248 | 1.22 | 1.262 | line BANIS230 to NEWSF230 230 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | tran_74 | ivsg_hs_alt2d1 | 204.1 | 248 | 0.4 | 1041.7 | 248 | 1.22 | 1.262 | tran NEWSF230 230 to NEWSF500 500 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_008 | ivsg_hs_alt2d1 | 204.1 | 246.3 | 3.7 | 1040.7 | 246.3 | 1.219 | 1.262 | PENSQTOS - OLD TOWN 1 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_028 | ivsg_hs_alt2d1 | 204.1 | 247.1 | 2 | 1040.3 | 247.1 | 1.218 | 1.262 | MIGUEL - SYCAMORE 1 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | line_56 | ivsg_hs_alt2d1 | 204.1 | 243.7 | -6 | 1033.7 | 243.7 | 1.211 | 1.262 | line NEWSF500 to IMPRLVLY 500 ck 1 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | B2_013 | ivsg_hs_alt2d1 | 392 | 470.4 | 9.9 | 1209.2 | 470.5 | 1.2 | 1.03 | EPP - SYCAMORE 1 230kV |
| 24723 | CONTROL | 115 | 24731 | INYOKERN | 115 | 1 | line_175 | ivsg_hs_alt2d1 | 82.7 | 95.9 | -4.2 | 496.1 | 96 | 1.195 | 0.419 | line INYO to COTTONWD 230 ck 1 |
| 24723 | CONTROL | 115 | 24731 | INYOKERN | 115 | 2 | line_175 | ivsg_hs_alt2d1 | 82.7 | 95.9 | -4.2 | 496.1 | 96 | 1.195 | 0.419 | line INYO to COTTONWD 230 ck 1 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | ML60 | ivsg_hs_alt2d1 | 392 | 460 | 23.2 | 1182 | 460.6 | 1.17 | 1.03 | tran MIGUEL 230 to MIGUEL 138 ck 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | SX60 | ivsg_hs_alt2d1 | 392 | 446.7 | 50.3 | 1164.1 | 449.5 | 1.15 | 1.03 | tran SYCAMORE 230 to SYCAMORE 138 ck 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_015 | ivsg_hs_alt2d1 | 392 | 444.5 | 51.3 | 1149.9 | 447.4 | 1.14 | 1.03 | MIGUEL - MISSION 1 230kV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_020 | ivsg_hs_alt2d1 | 392 | 442.9 | 49.5 | 1146.3 | 445.6 | 1.14 | 1.03 | MIGUEL - MISSION 2 230kV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | ML70 | ivsg_hs_alt2d1 | 392 | 437.6 | 55.4 | 1138.5 | 441.1 | 1.13 | 1.03 | tran MIGUEL 69 to MIGUEL 230 ck 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | ML71 | ivsg_hs_alt2d1 | 392 | 437.6 | 55.4 | 1138.5 | 441.1 | 1.13 | 1.03 | tran MIGUEL 69 to MIGUEL 230 ck 2 |
| 24729 | INYO | 230 | 24730 | INYO PS | 115 | 1 | line_175 | ivsg_hs_alt2d1 | 50 | 51.8 | 21.2 | 133 | 56 | 1.12 | 0.54 | line INYO to COTTONWD 230 ck 1 |
| 24729 | INYO | 230 | 24730 | INYO PS | 115 | 2 | line_175 | ivsg_hs_alt2d1 | 50 | 51.8 | 21.2 | 133 | 56 | 1.12 | 0.54 | line INYO to COTTONWD 230 ck 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_032 | ivsg_hs_alt2d1 | 392 | 433.2 | 52 | 1159.7 | 436.3 | 1.11 | 1.03 | OTAYMESA - MLMS3TAP 1 230kV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_034 | ivsg_hs_alt2d1 | 392 | 433.1 | 52.4 | 1160.4 | 436.3 | 1.11 | 1.03 | OLD TOWN - MLMS3TAP 1 230kV |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_029 | ivsg_hs_alt2d1 | 204.1 | 221.7 | 0.5 | 939.2 | 221.7 | 1.1 | 1.262 | OTAYMESA - MLSXTAP 1 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_031 | ivsg_hs_alt2d1 | 204.1 | 221.5 | -0.2 | 939.4 | 221.5 | 1.1 | 1.262 | SYCAMORE - MLSXTAP 1 230kV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | MS60 | ivsg_hs_alt2d1 | 392 | 429.9 | 18.7 | 1098.8 | 430.4 | 1.1 | 1.03 | tran MISSION 230 to MISSION 138 ck 1 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | MS61 | ivsg_hs_alt2d1 | 392 | 429.9 | 18.7 | 1098.8 | 430.4 | 1.1 | 1.03 | tran MISSION 230 to MISSION 138 ck 2 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | SX60 | ivsg_hs_alt2d1 | 408.3 | -440.8 | 5.3 | 1879 | 440.9 | 1.1 | 0.981 | tran SYCAMORE 230 to SYCAMORE 138 ck 1 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | B2_034 | ivsg_hs_alt2d1 | 408.3 | -427.3 | 2.8 | 1873.1 | 427.3 | 1.097 | 0.981 | OLD TOWN - MLMS3TAP 1 230kV |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | B2_032 | ivsg_hs_alt2d1 | 408.3 | -427.4 | 3.2 | 1871.9 | 427.4 | 1.096 | 0.981 | OTAYMESA - MLMS3TAP 1 230kV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | line_66 | ivsg_hs_alt2d1 | 392 | 426.3 | 38.4 | 1130.8 | 428 | 1.09 | 1.03 | line CENTRALX to NEWSF500 500 ck 1 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | B2_015 | ivsg_hs_alt2d1 | 392 | 427.4 | 11.9 | 1091.3 | 427.5 | 1.09 | 1.03 | MIGUEL - MISSION 1 230kV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | B2_020 | ivsg_hs_alt2d1 | 392 | 426.6 | 11.1 | 1089.5 | 426.7 | 1.09 | 1.03 | MIGUEL - MISSION 2 230kV |
| 22504 | MISSION | 230 | 22500 | MISSION | 138 | 2 | MS60 | ivsg_hs_alt2d1 | 392 | 407.8 | 123.4 | 1097.8 | 426 | 1.09 | 0.73 | tran MISSION 230 to MISSION 138 ck 1 |
| 22504 | MISSION | 230 | 22500 | MISSION | 138 | 1 | MS61 | ivsg_hs_alt2d1 | 392 | 407.8 | 123.4 | 1097.8 | 426 | 1.09 | 0.73 | tran MISSION 230 to MISSION 138 ck 2 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 2 | line_070 | ivsg_hs_alt2d1 | 956 | -1026.8 | -32.1 | 2614 | 1027.4 | 1.089 | 0.597 | line LA FRESA to REDONDO 230 ck 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 1 | line_071 | ivsg_hs_alt2d1 | 956 | -1026.8 | -32.1 | 2614 | 1027.4 | 1.089 | 0.597 | line LA FRESA to REDONDO 230 ck 2 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | B2_015 | ivsg_hs_alt2d1 | 408.3 | -438.7 | 3 | 1856.1 | 438.7 | 1.087 | 0.981 | MIGUEL - MISSION 1 230kV |
| 24701 | KRAMER | 230 | 24085 | LUGO | 230 | 2 | line_169 | ivsg_hs_alt2d1 | 478 | 525.6 | 5.7 | 1301.9 | 525.6 | 1.085 | 0.645 | line KRAMER to LUGO 230 ck 1 |
| 24701 | KRAMER | 230 | 24085 | LUGO | 230 | 1 | line_170 | ivsg_hs_alt2d1 | 478 | 525.6 | 5.7 | 1301.9 | 525.6 | 1.085 | 0.645 | line KRAMER to LUGO 230 ck 2 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | B2_020 | ivsg_hs_alt2d1 | 408.3 | -437.2 | 4.4 | 1850.3 | 437.2 | 1.083 | 0.981 | MIGUEL - MISSION 2 230kV |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | line_12 | ivsg_hs_alt2d1 | 132 | 141.3 | -9.4 | 895.4 | 141.6 | 1.081 | 0.957 | line COACHELA to RAMON 230 ck 2 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_009 | ivsg_hs_alt2d1 | 392 | 419.5 | 48.2 | 1088.4 | 422.3 | 1.08 | 1.03 | EPP - ESCNDIDO 1 230kV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_022 | ivsg_hs_alt2d1 | 392 | 420.9 | 37.1 | 1102.3 | 422.6 | 1.08 | 1.03 | OTAYMESA - TJI-230 1 230kV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | ML70 | ivsg_hs_alt2d1 | 392 | 421.7 | 16.6 | 1079.9 | 422 | 1.08 | 1.03 | tran MIGUEL 69 to MIGUEL 230 ck 1 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | ML71 | ivsg_hs_alt2d1 | 392 | 421.7 | 16.6 | 1079.9 | 422 | 1.08 | 1.03 | tran MIGUEL 69 to MIGUEL 230 ck 2 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | MS60 | ivsg_hs_alt2d1 | 392 | 421.6 | 50.6 | 1092.3 | 424.6 | 1.08 | 1.03 | tran MISSION 230 to MISSION 138 ck 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | MS61 | ivsg_hs_alt2d1 | 392 | 421.6 | 50.6 | 1092.3 | 424.6 | 1.08 | 1.03 | tran MISSION 230 to MISSION 138 ck 2 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | OT70 | ivsg_hs_alt2d1 | 392 | 419 | 49.1 | 1087 | 421.9 | 1.08 | 1.03 | tran OLD TOWN 69 to OLD TOWN 230 ck 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | OT71 | ivsg_hs_alt2d1 | 392 | 419 | 49.1 | 1087 | 421.9 | 1.08 | 1.03 | tran OLD TOWN 69 to OLD TOWN 230 ck 2 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | SX70 | ivsg_hs_alt2d1 | 392 | 420.9 | 53.3 | 1098 | 424.3 | 1.08 | 1.03 | tran SYCAMORE 230 to SYCAMORE 69 ck 1 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | ML70 | ivsg_hs_alt2d1 | 408.3 | -431.9 | -2.3 | 1837.7 | 432 | 1.076 | 0.981 | tran MIGUEL 69 to MIGUEL 230 ck 1 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | ML71 | ivsg_hs_alt2d1 | 408.3 | -431.9 | -2.3 | 1837.7 | 432 | 1.076 | 0.981 | tran MIGUEL 69 to MIGUEL 230 ck 2 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | SO2 | ivsg_hs_alt2d1 | 392 | 416.5 | 42.7 | 1098.5 | 418.7 | 1.07 | 1.03 | gen S.ONOFR2 22.00 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | SO2 | ivsg_hs_alt2d1 | 392 | 419.2 | 8.4 | 1086.5 | 419.3 | 1.07 | 1.03 | gen S.ONOFR2 22.00 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_169 | ivsg_hs_alt2d1 | 56 | 58.1 | -9.9 | 293.5 | 59 | 1.07 | 0.92 | line KRAMER to LUGO 230 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_170 | ivsg_hs_alt2d1 | 56 | 58.1 | -9.9 | 293.5 | 59 | 1.07 | 0.92 | line KRAMER to LUGO 230 ck 2 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | line_66 | ivsg_hs_alt2d1 | 408.3 | -420.7 | 14 | 1825.2 | 421 | 1.069 | 0.981 | line CENTRALX to NEWSF500 500 ck 1 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | B2_022 | ivsg_hs_alt2d1 | 408.3 | -415.6 | 12.7 | 1779.3 | 415.8 | 1.042 | 0.981 | OTAYMESA - TJI-230 1 230kV |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_192 | ivsg_hs_alt2d1 | 169 | 173 | 43.2 | 627.2 | 178.3 | 1.04 | 0.821 | line IRON MTN to CAMINO 230 ck 1 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | SX70 | ivsg_hs_alt2d1 | 408.3 | -415.7 | -3.8 | 1772.4 | 415.7 | 1.038 | 0.981 | tran SYCAMORE 230 to SYCAMORE 69 ck 1 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | SO2 | ivsg_hs_alt2d1 | 408.3 | -411.3 | 6.8 | 1773.2 | 411.4 | 1.038 | 0.981 | gen S.ONOFR2 22.00 |
| 22844 | TALEGA | 230 | 24131 | S.ONOFRE | 230 | 2 | B2_026 | ivsg_hs_alt2d1 | 456.1 | -469.1 | 42.8 | 1182.6 | 471.1 | 1.033 | 0.543 | TALEGA - S.ONOFRE 1 230kV |
| 22844 | TALEGA | 230 | 24131 | S.ONOFRE | 230 | 1 | B2_027 | ivsg_hs_alt2d1 | 456.1 | -469.1 | 42.8 | 1182.6 | 471.1 | 1.033 | 0.543 | TALEGA - S.ONOFRE 2 230kV |
| 22844 | TALEGA | 230 | 24131 | S.ONOFRE | 230 | 2 | line_014 | ivsg_hs_alt2d1 | 456.1 | -469.1 | 42.8 | 1182.6 | 471.1 | 1.033 | 0.543 | line TALEGA to S.ONOFRE 230 ck 1 |
| 22844 | TALEGA | 230 | 24131 | S.ONOFRE | 230 | 1 | line_015 | ivsg_hs_alt2d1 | 456.1 | -469.1 | 42.8 | 1182.6 | 471.1 | 1.033 | 0.543 | line TALEGA to S.ONOFRE 230 ck 2 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | MS60 | ivsg_hs_alt2d1 | 408.3 | -416.4 | -1.7 | 1763.1 | 416.4 | 1.032 | 0.981 | tran MISSION 230 to MISSION 138 ck 1 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | MS61 | ivsg_hs_alt2d1 | 408.3 | -416.4 | -1.7 | 1763.1 | 416.4 | 1.032 | 0.981 | tran MISSION 230 to MISSION 138 ck 2 |
| 24114 | PARDEE | 230 | 24200 | SAUG TAP | 230 | 2 | line_117 | ivsg_hs_alt2d1 | 494 | 501.7 | 27.7 | 1279.7 | 502.5 | 1.032 | 0.511 | line PARDEE to SAUG TAP 230 ck 1 |
| 24114 | PARDEE | 230 | 24200 | SAUG TAP | 230 | 1 | line_118 | ivsg_hs_alt2d1 | 494 | 501.7 | 27.6 | 1279.6 | 502.5 | 1.032 | 0.519 | line PARDEE to SAUG TAP 230 ck 2 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | B2_009 | ivsg_hs_alt2d1 | 408.3 | -414.4 | 0.3 | 1756.8 | 414.4 | 1.028 | 0.981 | EPP - ESCNDIDO 1 230kV |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | OT70 | ivsg_hs_alt2d1 | 408.3 | -413.9 | -0.7 | 1754.6 | 413.9 | 1.027 | 0.981 | tran OLD TOWN 69 to OLD TOWN 230 ck 1 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | OT71 | ivsg_hs_alt2d1 | 408.3 | -413.9 | -0.7 | 1754.6 | 413.9 | 1.027 | 0.981 | tran OLD TOWN 69 to OLD TOWN 230 ck 2 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | B2_021 | ivsg_hs_alt2d1 | 408.3 | -408.8 | 10 | 1743.6 | 409 | 1.021 | 0.981 | IMPRLVLY - ROA-230 1 230kV |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | line_207 | ivsg_hs_alt2d1 | 408.3 | -407.6 | 6.5 | 1740.7 | 407.7 | 1.019 | 0.981 | line DEVERS to VALLEYSC 500 ck 1 |
| 8601 | GEOSUB2 | 230 | 8300 | BANIS230 | 230 | 1 | line_22 | ivsg_hs_alt2d1 | 550 | 562.5 | 72 | 1401.6 | 567.1 | 1.016 | 0.746 | line GEOSUB1 to BANIS230 230 ck 1 |
| 8601 | GEOSUB2 | 230 | 8300 | BANIS230 | 230 | 1 | line_23 | ivsg_hs_alt2d1 | 550 | 562.5 | 72 | 1401.6 | 567.1 | 1.016 | 0.746 | line GEOSUB1 to BANIS230 230 ck 2 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | B2_013 | ivsg_hs_alt2d1 | 408.3 | -407.9 | 2.5 | 1729.8 | 407.9 | 1.013 | 0.981 | EPP - SYCAMORE 1 230kV |
| 24303 | BIG CRK3 | 230 | 24235 | RECTOR | 230 | 1 | line_155 | ivsg_hs_alt2d1 | 353 | 361.1 | 50.4 | 895.5 | 364.6 | 1.011 | 0.73 | line BIG CRK1 to RECTOR 230 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_201 | ivsg_hs_alt2d1 | 56 | 54.8 | -10.6 | 277.3 | 55.8 | 1.01 | 0.92 | line SYLMAR3 to SYLMAR S 230 ck 1 |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | line_52 | ivsg_hs_alt2d1 | 132 | 132.1 | -11.9 | 835 | 132.6 | 1.008 | 0.957 | line AVE58230 to AV58TP22 230 ck 1 |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | line_53 | ivsg_hs_alt2d1 | 132 | 132.2 | -11.7 | 834.6 | 132.7 | 1.007 | 0.957 | line AV58TP22 to COACHELA 230 ck 1 |
| 24301 | BIG CRK1 | 230 | 24235 | RECTOR | 230 | 1 | line_160 | ivsg_hs_alt2d1 | 329 | 335 | 48.5 | 827 | 338.5 | 1.001 | 0.727 | line BIG CRK3 to RECTOR 230 ck 1 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | line_7 | ivsg_hs_alt2d1 | 392 | 391.3 | 11.7 | 993.1 | 391.5 | 1 | 1.03 | line BANIS230 to NEWSF230 230 ck 1 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | tran_74 | ivsg_hs_alt2d1 | 392 | 391.3 | 11.7 | 993 | 391.5 | 1 | 1.03 | tran NEWSF230 230 to NEWSF500 500 ck 1 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | IV81 | ivsg_hs_alt2d1 | 392 | 391.2 | 37 | 1020.5 | 393 | 1 | 1.03 | tran IMPRLVLY 230 to IMPRLVLY 500 ck 2 |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_191 | ivsg_hs_alt2d1 | 169 | 166.4 | 40.6 | 602.2 | 171.2 | 0.999 | 0.821 | line EAGLEMTN to IRON MTN 230 ck 1 |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | line_7 | ivsg_hs_alt2d1 | 132 | 129 | -11.3 | 826 | 129.5 | 0.997 | 0.957 | line BANIS230 to NEWSF230 230 ck 1 |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | tran_74 | ivsg_hs_alt2d1 | 132 | 129.1 | -11.2 | 825.5 | 129.6 | 0.997 | 0.957 | tran NEWSF230 230 to NEWSF500 500 ck 1 |
| 24086 | LUGO | 500 | 24097 | MOHAVE | 500 | 1 | line_103 | ivsg_hs_alt2d1 | 1386 | -1427.3 | 86.9 | 1575 | 1430 | 0.993 | 0.707 | line MOHAVE to ELDORDO 500 ck 1 |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | line_303 | ivsg_hs_alt2d1 | 132 | 128.1 | -10.2 | 821.3 | 128.5 | 0.991 | 0.957 | line HARQUAHA to DEVERS 500 ck 1 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | line_56 | ivsg_hs_alt2d1 | 392 | 387.7 | -1.3 | 996.2 | 387.7 | 0.99 | 1.03 | line NEWSF500 to IMPRLVLY 500 ck 1 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | B2_001 | ivsg_hs_alt2d1 | 392 | 388.4 | 8.8 | 982.8 | 388.5 | 0.99 | 1.03 | HASSYAMP - N.GILA 1 500kV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | B2_003 | ivsg_hs_alt2d1 | 392 | 387.5 | 6.3 | 988 | 387.5 | 0.99 | 1.03 | N.GILA - IMPRLVLY 1 500kV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_001 | ivsg_hs_alt2d1 | 392 | 381.3 | 39.4 | 975.6 | 383.4 | 0.98 | 1.03 | HASSYAMP - N.GILA 1 500kV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | ML80 | ivsg_hs_alt2d1 | 392 | 380.9 | 34.7 | 993.1 | 382.5 | 0.98 | 1.03 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | ML81 | ivsg_hs_alt2d1 | 392 | 382.9 | 35.2 | 997.3 | 384.5 | 0.98 | 1.03 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 19020 | BLYTHE | 161 | 24017 | BLYTHESC | 161 | 1 | line_192 | ivsg_hs_alt2d1 | 244 | 239.5 | 43.5 | 856 | 243.4 | 0.978 | 0.832 | line IRON MTN to CAMINO 230 ck 1 |
| 8600 | GEOSUB1 | 230 | 8300 | BANIS230 | 230 | 1 | line_47 | ivsg_hs_alt2d1 | 550 | 541 | 68.1 | 1348.6 | 545.2 | 0.977 | 0.693 | line GEOSUB2 to BANIS230 230 ck 1 |
| 8600 | GEOSUB1 | 230 | 8300 | BANIS230 | 230 | 2 | line_47 | ivsg_hs_alt2d1 | 550 | 541 | 68.1 | 1348.6 | 545.2 | 0.977 | 0.693 | line GEOSUB2 to BANIS230 230 ck 1 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_047 | ivsg_hs_alt2d1 | 2400 | -2442.6 | -48.4 | 2706.6 | 2443.1 | 0.977 | 0.776 | line ELDORDO to LUGO 500 ck 1 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_079 | ivsg_hs_alt2d1 | 2400 | -2429.2 | -31.9 | 2700.9 | 2429.4 | 0.975 | 0.776 | line LUGO to MOHAVE 500 ck 1 |
| 22596 | OLD TOWN | 230 | 22466 | MLMS3TAP | 230 | 1 | B2_031 | ivsg_hs_alt2d1 | 912 | -854.8 | 84.7 | 2222.7 | 858.9 | 0.971 | 0.747 | SYCAMORE - MLSXTAP 1 230kV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_003 | ivsg_hs_alt2d1 | 392 | 376.6 | 35.7 | 973.1 | 378.3 | 0.97 | 1.03 | N.GILA - IMPRLVLY 1 500kV |
| 22596 | OLD TOWN | 230 | 22466 | MLMS3TAP | 230 | 1 | B2_029 | ivsg_hs_alt2d1 | 912 | -854.5 | 86.5 | 2221.2 | 858.8 | 0.97 | 0.747 | OTAYMESA - MLSXTAP 1 230kV |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_123 | ivsg_hs_alt2d1 | 56 | 52.7 | -10.6 | 267.1 | 53.8 | 0.97 | 0.92 | line PASTORIA to PSTRIA 230 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_200 | ivsg_hs_alt2d1 | 56 | 52.8 | -10.7 | 267.1 | 53.8 | 0.97 | 0.92 | line SYLMAR1 to SYLMAR S 230 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | tran_210 | ivsg_hs_alt2d1 | 56 | 52.7 | -10.4 | 266.2 | 53.7 | 0.97 | 0.92 | tran LUGO 500 to LUGO 230 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | tran_211 | ivsg_hs_alt2d1 | 56 | 52.7 | -10.4 | 266.4 | 53.7 | 0.97 | 0.92 | tran LUGO 500 to LUGO 230 ck 2 |
| 8600 | GEOSUB1 | 230 | 8300 | BANIS230 | 230 | 2 | line_22 | ivsg_hs_alt2d1 | 550 | 535.7 | 69.3 | 1334.4 | 540.2 | 0.967 | 0.693 | line GEOSUB1 to BANIS230 230 ck 1 |
| 8600 | GEOSUB1 | 230 | 8300 | BANIS230 | 230 | 1 | line_23 | ivsg_hs_alt2d1 | 550 | 535.7 | 69.3 | 1334.4 | 540.2 | 0.967 | 0.693 | line GEOSUB1 to BANIS230 230 ck 2 |
| 24807 | MIRAGE | 115 | 24819 | CONCHO | 115 | 1 | tran_238 | ivsg_hs_alt2d1 | 183 | 164.2 | -4.4 | 888.4 | 164.3 | 0.967 | 0.873 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 22831 | SYCAMORE | 138 | 22124 | CHCARITA | 138 | 1 | B2_009 | ivsg_hs_alt2d1 | 204.1 | 192.5 | -29.5 | 824.9 | 194.8 | 0.966 | 0.74 | EPP - ESCNDIDO 1 230kV |
| 24042 | ELDORDO | 500 | 24086 | LUGO | 500 | 1 | line_085 | ivsg_hs_alt2d1 | 1386 | 1417.1 | 254.6 | 1533.2 | 1439.8 | 0.963 | 0.649 | line LUGO to VICTORVL 500 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_086 | ivsg_hs_alt2d1 | 56 | 52.1 | -10.7 | 264.1 | 53.2 | 0.96 | 0.92 | line MAGUNDEN to OMAR 230 ck 1 |
| 22832 | SYCAMORE | 230 | 22467 | MLSXTAP | 230 | 1 | B2_034 | ivsg_hs_alt2d1 | 796.7 | -728.3 | 35.7 | 1917 | 729.2 | 0.959 | 0.352 | OLD TOWN - MLMS3TAP 1 230kV |
| 22832 | SYCAMORE | 230 | 22467 | MLSXTAP | 230 | 1 | B2_032 | ivsg_hs_alt2d1 | 796.7 | -728.2 | 37 | 1916 | 729.1 | 0.958 | 0.352 | OTAYMESA - MLMS3TAP 1 230kV |
| 24807 | MIRAGE | 115 | 24816 | SANTA RO | 115 | 1 | tran_238 | ivsg_hs_alt2d1 | 183.3 | 162.1 | -9.7 | 878.3 | 162.4 | 0.954 | 0.864 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 19020 | BLYTHE | 161 | 24017 | BLYTHESC | 161 | 1 | line_191 | ivsg_hs_alt2d1 | 244 | 232.8 | 40.8 | 831.2 | 236.4 | 0.95 | 0.832 | line EAGLEMTN to IRON MTN 230 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | line_66 | ivsg_hs_alt2d1 | 204.1 | 187.5 | 10.5 | 804.8 | 187.8 | 0.943 | 1.262 | line CENTRALX to NEWSF500 500 ck 1 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | ML81 | ivsg_hs_alt2d1 | 408.3 | -378.6 | 5.5 | 1609.8 | 378.6 | 0.942 | 0.981 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | SX60 | ivsg_hs_alt2d1 | 382.4 | 352.3 | 11.8 | 1506.8 | 352.5 | 0.942 | 0.819 | tran SYCAMORE 230 to SYCAMORE 138 ck 1 |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_63 | ivsg_hs_alt2d1 | 169 | 158.8 | 29.7 | 568.2 | 161.6 | 0.941 | 0.821 | line RAMON to MIRAGE 230 ck 2 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 2 | line_136 | ivsg_hs_alt2d1 | 1195 | 1090.2 | -48.2 | 2820.9 | 1091.2 | 0.94 | 0.566 | line SERRANO to VILLA PK 230 ck 1 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | ML80 | ivsg_hs_alt2d1 | 408.3 | -376.6 | 5.7 | 1603 | 376.7 | 0.938 | 0.981 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | B2_034 | ivsg_hs_alt2d1 | 382.4 | 338.7 | 12.1 | 1490.7 | 338.9 | 0.932 | 0.819 | OLD TOWN - MLMS3TAP 1 230kV |
| 22831 | SYCAMORE | 138 | 22124 | CHCARITA | 138 | 1 | B2_034 | ivsg_hs_alt2d1 | 204.1 | 177.4 | -44.4 | 795.9 | 182.9 | 0.932 | 0.74 | OLD TOWN - MLMS3TAP 1 230kV |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_12 | ivsg_hs_alt2d1 | 169 | 157.1 | 29.4 | 562.1 | 159.8 | 0.931 | 0.821 | line COACHELA to RAMON 230 ck 2 |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | B2_032 | ivsg_hs_alt2d1 | 382.4 | 338.8 | 11.8 | 1489.8 | 339 | 0.931 | 0.819 | OTAYMESA - MLMS3TAP 1 230kV |
| 22831 | SYCAMORE | 138 | 22124 | CHCARITA | 138 | 1 | B2_032 | ivsg_hs_alt2d1 | 204.1 | 177.4 | -44.2 | 795.2 | 182.9 | 0.931 | 0.74 | OTAYMESA - MLMS3TAP 1 230kV |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | B2_015 | ivsg_hs_alt2d1 | 382.4 | 350.2 | 15 | 1487.7 | 350.5 | 0.93 | 0.819 | MIGUEL - MISSION 1 230kV |
| 22504 | MISSION | 230 | 22500 | MISSION | 138 | 1 | SX60 | ivsg_hs_alt2d1 | 392 | 356.1 | 75.5 | 947.2 | 364 | 0.93 | 0.73 | tran SYCAMORE 230 to SYCAMORE 138 ck 1 |
| 22504 | MISSION | 230 | 22500 | MISSION | 138 | 2 | SX60 | ivsg_hs_alt2d1 | 392 | 356.1 | 75.5 | 947.2 | 364 | 0.93 | 0.73 | tran SYCAMORE 230 to SYCAMORE 138 ck 1 |
| 24303 | BIG CRK3 | 230 | 24235 | RECTOR | 230 | 1 | line_139 | ivsg_hs_alt2d1 | 353 | 335.6 | 45.7 | 823 | 338.7 | 0.929 | 0.73 | line SPRINGVL to BIG CRK4 230 ck 1 |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | B2_020 | ivsg_hs_alt2d1 | 382.4 | 348.6 | 13.7 | 1481.3 | 348.9 | 0.926 | 0.819 | MIGUEL - MISSION 2 230kV |
| 15230 | RUDD | 230 | 15218 | WHITETNK | 230 | 1 | PV1 | ivsg_hs_alt2d1 | 725 | 674.3 | -13.2 | 1682.9 | 674.5 | 0.925 | 0.955 | gen PALOVRD1 24.00 |
| 24614 | TAP601 | 115 | 24702 | KRAMER | 115 | 1 | line_169 | ivsg_hs_alt2d1 | 217.1 | -190 | 68.8 | 1005.1 | 202 | 0.924 | 0.717 | line KRAMER to LUGO 230 ck 1 |
| 24614 | TAP601 | 115 | 24702 | KRAMER | 115 | 1 | line_170 | ivsg_hs_alt2d1 | 217.1 | -190 | 68.8 | 1005.1 | 202 | 0.924 | 0.717 | line KRAMER to LUGO 230 ck 2 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | B2_001 | ivsg_hs_alt2d1 | 408.3 | -377.2 | -0.4 | 1574.8 | 377.2 | 0.922 | 0.981 | HASSYAMP - N.GILA 1 500kV |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | B2_003 | ivsg_hs_alt2d1 | 408.3 | -372.5 | 3.1 | 1570.8 | 372.5 | 0.92 | 0.981 | N.GILA - IMPRLVLY 1 500kV |
| 22116 | CARLTHTP | 138 | 22734 | SANTEE | 138 | 1 | ML60 | ivsg_hs_alt2d1 | 273 | 244.1 | -5.1 | 1051.1 | 244.1 | 0.92 | 0.752 | tran MIGUEL 230 to MIGUEL 138 ck 1 |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | ML70 | ivsg_hs_alt2d1 | 382.4 | 343.5 | 20.1 | 1469 | 344 | 0.918 | 0.819 | tran MIGUEL 69 to MIGUEL 230 ck 1 |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | ML71 | ivsg_hs_alt2d1 | 382.4 | 343.5 | 20.1 | 1469 | 344 | 0.918 | 0.819 | tran MIGUEL 69 to MIGUEL 230 ck 2 |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | B2_001 | ivsg_hs_alt2d1 | 132 | 121.7 | -10.8 | 759.3 | 122.2 | 0.917 | 0.957 | HASSYAMP - N.GILA 1 500kV |
| 22360 | IMPRLVLY | 500 | 22468 | MIGUEL | 500 | 1 | line_66 | ivsg_hs_alt2d1 | 2252 | 1994.5 | 506.4 | 2333.2 | 2057.7 | 0.916 | 0.715 | line CENTRALX to NEWSF500 500 ck 1 |
| 19020 | BLYTHE | 161 | 24017 | BLYTHESC | 161 | 1 | line_63 | ivsg_hs_alt2d1 | 244 | 225.3 | 29.9 | 799.2 | 227.3 | 0.913 | 0.832 | line RAMON to MIRAGE 230 ck 2 |
| 24807 | MIRAGE | 115 | 24819 | CONCHO | 115 | 1 | line_65 | ivsg_hs_alt2d1 | 183 | 164 | -7.3 | 837.5 | 164.1 | 0.912 | 0.873 | line MIRAGE to DEVERS 230 ck 2 |

ivsg_hs_alt2d1.sav
FLOW Summary
N-1 Outages

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24301 | BIG CRK1 | 230 | 24235 | RECTOR | 230 | 1 | line_156 | ivsg_hs_alt2d1 | 329 | 305.6 | 4.5 | 752.2 | 305.6 | 0.911 | 0.727 | line BIG CRK1 to BIG CRK2 230 ck 1 |
| 22468 | MIGUEL | 500 | 22472 | MIGUELMP | 500 | 1 | line_66 | ivsg_hs_alt2d1 | 1120 | 1008.1 | 116 | 1223.7 | 1014.8 | 0.91 | 0.73 | line CENTRALX to NEWSF500 500 ck 1 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | B2_029 | ivsg_hs_alt2d1 | 392 | 356.2 | 1.4 | 913.3 | 356.2 | 0.91 | 1.03 | OTAYMESA - MLSXTAP 1 230kV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | B2_031 | ivsg_hs_alt2d1 | 392 | 355.9 | -0.2 | 914 | 355.9 | 0.91 | 1.03 | SYCAMORE - MLSXTAP 1 230kV |
| 22504 | MISSION | 230 | 22500 | MISSION | 138 | 1 | ML60 | ivsg_hs_alt2d1 | 392 | 348.4 | 83.7 | 934.8 | 358.3 | 0.91 | 0.73 | tran MIGUEL 230 to MIGUEL 138 ck 1 |
| 22504 | MISSION | 230 | 22500 | MISSION | 138 | 2 | ML60 | ivsg_hs_alt2d1 | 392 | 348.4 | 83.7 | 934.8 | 358.3 | 0.91 | 0.73 | tran MIGUEL 230 to MIGUEL 138 ck 1 |
| 24602 | VICTOR | 115 | 24702 | KRAMER | 115 | 1 | line_169 | ivsg_hs_alt2d1 | 217.1 | -185.3 | 78.9 | 989.1 | 201.4 | 0.91 | 0.704 | line KRAMER to LUGO 230 ck 1 |
| 24602 | VICTOR | 115 | 24702 | KRAMER | 115 | 1 | line_170 | ivsg_hs_alt2d1 | 217.1 | -185.3 | 78.9 | 989.1 | 201.4 | 0.91 | 0.704 | line KRAMER to LUGO 230 ck 2 |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_008 | ivsg_hs_alt2d1 | 169 | 153.6 | 27.9 | 549.1 | 156.1 | 0.909 | 0.821 | line PARKER to GENE 230 ck 1 |
| 19020 | BLYTHE | 161 | 24017 | BLYTHESC | 161 | 1 | line_12 | ivsg_hs_alt2d1 | 244 | 223.6 | 29.6 | 793.1 | 225.6 | 0.906 | 0.832 | line COACHELA to RAMON 230 ck 2 |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | line_66 | ivsg_hs_alt2d1 | 382.4 | 332.3 | 2.5 | 1444 | 332.3 | 0.903 | 0.819 | line CENTRALX to NEWSF500 500 ck 1 |
| 24301 | BIG CRK1 | 230 | 24302 | BIG CRK2 | 230 | 1 | line_155 | ivsg_hs_alt2d1 | 329 | 305.6 | -21.9 | 745.7 | 306.4 | 0.903 | 0.247 | line BIG CRK1 to RECTOR 230 ck 1 |
| 24807 | MIRAGE | 115 | 24816 | SANTA RO | 115 | 1 | line_65 | ivsg_hs_alt2d1 | 183.3 | 161.9 | -13.3 | 829.1 | 162.5 | 0.901 | 0.864 | line MIRAGE to DEVERS 230 ck 2 |
| 22464 | MIGUEL | 230 | 22472 | MIGUELMP | 500 | 1 | line_66 | ivsg_hs_alt2d1 | 1120 | -1006.7 | 25.8 | 2660.3 | 1007 | 0.9 | 0.72 | line CENTRALX to NEWSF500 500 ck 1 |
| 22356 | IMPRLVLY | 230 | 22360 | IMPRLVLY | 500 | 2 | IV80 | ivsg_hs_alt2d1 | 1120 | 963 | 299.8 | 2548 | 1008.6 | 0.9 | 0.67 | tran IMPRLVLY 230 to IMPRLVLY 500 ck 1 |
| 24086 | LUGO | 500 | 24097 | MOHAVE | 500 | 1 | line_085 | ivsg_hs_alt2d1 | 1386 | -1294.4 | -37.4 | 1440.7 | 1294.9 | 0.9 | 0.707 | line LUGO to VICTORVL 500 ck 1 |
| 24729 | INYO | 230 | 24730 | INYO PS | 115 | 2 | tran_230 | ivsg_hs_alt2d1 | 50 | -42 | 15.8 | 105.3 | 44.9 | 0.9 | 0.54 | tran INYO 230 to INYO PS 115 ck 1 |
| 24729 | INYO | 230 | 24730 | INYO PS | 115 | 1 | tran_231 | ivsg_hs_alt2d1 | 50 | -42 | 15.8 | 105.3 | 44.9 | 0.9 | 0.54 | tran INYO 230 to INYO PS 115 ck 2 |
| 24805 | DEVERS | 115 | 24804 | DEVERS | 230 | 1 | tran_236 | ivsg_hs_alt2d1 | 280 | -246.1 | 51.9 | 1265.4 | 251.5 | 0.9 | 0.6 | tran DEVERS 115 to DEVERS 230 ck 3 |

ivsg_hs_alt2d1.sav
No Solve Summary
N-1 Outages

| Contingency-Description | Case | Problem-Description | |
|---|---|---|---|
| IMPRLVLY - MIGUEL 1 500kV | ivsg_hs_alt2d1 | Pmis 8912 GEM23 | 92.00 = -32459.22 MW + j -203722.63 MVAR |

| Bus | Name | kV | Area | Zone | Outage | Case | Vbase | Vcont | DeltaV | Vmin | Vmax | Max-dv | Contingency Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22734 | SANTEE | 138 | 22 | 223 | 23021/22/23/41 | ivsg_hs_alt2d1 | 0.978 | 0.891 | -0.088 | 0.9 | 1.05 | 0.05 | MIGUEL 230 CORRIDOR West of SN |
| 22412 | LOSCOCHS | 138 | 22 | 223 | 23021/22/23/41 | ivsg_hs_alt2d1 | 0.976 | 0.896 | -0.081 | 0.9 | 1.05 | 0.05 | MIGUEL 230 CORRIDOR West of SN |
| 22424 | MAINST50 | 138 | 22 | 222 | 23021/22/23/41 | ivsg_hs_alt2d1 | 0.973 | 0.916 | -0.056 | 0.9 | 1.05 | 0.05 | MIGUEL 230 CORRIDOR West of SN |
| 22428 | MAINST51 | 138 | 22 | 222 | 23021/22/23/41 | ivsg_hs_alt2d1 | 0.972 | 0.916 | -0.056 | 0.9 | 1.05 | 0.05 | MIGUEL 230 CORRIDOR West of SN |
| 22424 | MAINST50 | 138 | 22 | 222 | 23002/06/10 | ivsg_hs_alt2d1 | 0.973 | 0.92 | -0.053 | 0.9 | 1.05 | 0.05 | SANLUISREY 230 CORRIDOR |
| 22428 | MAINST51 | 138 | 22 | 222 | 23002/06/10 | ivsg_hs_alt2d1 | 0.972 | 0.92 | -0.053 | 0.9 | 1.05 | 0.05 | SANLUISREY 230 CORRIDOR |
| 8802 | AV58TP12 | 230 | 8 | 818 | line_N-204 | ivsg_hs_alt2d1 | 0.978 | 0.921 | -0.057 | 0.9 | 1.05 | 0.05 | COACHELLA MIDWAY 230 CKT 1&2 |
| 22412 | LOSCOCHS | 138 | 22 | 223 | 23021/22/23/41 | ivsg_hs_alt2d1 | 0.976 | 0.923 | -0.053 | 0.9 | 1.05 | 0.05 | MIGUEL 230 CORRIDOR West of LC |
| 22772 | SOUTHBAY | 138 | 22 | 222 | 23021/22/23/41 | ivsg_hs_alt2d1 | 0.981 | 0.924 | -0.056 | 0.9 | 1.05 | 0.05 | MIGUEL 230 CORRIDOR West of SN |
| 22412 | LOSCOCHS | 138 | 22 | 223 | 23002/06/10 | ivsg_hs_alt2d1 | 0.976 | 0.925 | -0.052 | 0.9 | 1.05 | 0.05 | SANLUISREY 230 CORRIDOR |
| 24058 | GOLETA | 230 | 24 | 240 | line_2269 | ivsg_hs_alt2d1 | 0.982 | 0.927 | -0.055 | 0.9 | 1.05 | 0.05 | S.CLARA 230.00 - GOLETA 230.00 1, S.CLARA 230.00 - MOORPARK 230.00 1 |
| 24058 | GOLETA | 230 | 24 | 240 | line_2270 | ivsg_hs_alt2d1 | 0.982 | 0.927 | -0.055 | 0.9 | 1.05 | 0.05 | S.CLARA 230.00 - GOLETA 230.00 2, S.CLARA 230.00 - MOORPARK 230.00 2 |
| 22772 | SOUTHBAY | 138 | 22 | 222 | 23002/06/10 | ivsg_hs_alt2d1 | 0.981 | 0.929 | -0.052 | 0.9 | 1.05 | 0.05 | SANLUISREY 230 CORRIDOR |
| 22852 | TELECYN | 138 | 22 | 222 | 23021/22/23/41 | ivsg_hs_alt2d1 | 0.991 | 0.931 | -0.059 | 0.9 | 1.05 | 0.05 | MIGUEL 230 CORRIDOR West of SN |
| 22672 | PRCTRVLY | 138 | 22 | 222 | 23021/22/23/41 | ivsg_hs_alt2d1 | 0.994 | 0.936 | -0.058 | 0.9 | 1.05 | 0.05 | MIGUEL 230 CORRIDOR West of SN |
| 22852 | TELECYN | 138 | 22 | 222 | 23002/06/10 | ivsg_hs_alt2d1 | 0.991 | 0.938 | -0.053 | 0.9 | 1.05 | 0.05 | SANLUISREY 230 CORRIDOR |
| 22460 | MIGUEL | 138 | 22 | 222 | 23021/22/23/41 | ivsg_hs_alt2d1 | 0.996 | 0.939 | -0.056 | 0.9 | 1.05 | 0.05 | MIGUEL 230 CORRIDOR West of SN |
| 22672 | PRCTRVLY | 138 | 22 | 222 | 23002/06/10 | ivsg_hs_alt2d1 | 0.994 | 0.941 | -0.052 | 0.9 | 1.05 | 0.05 | SANLUISREY 230 CORRIDOR |
| 22460 | MIGUEL | 138 | 22 | 222 | 23002/06/10 | ivsg_hs_alt2d1 | 0.996 | 0.944 | -0.052 | 0.9 | 1.05 | 0.05 | SANLUISREY 230 CORRIDOR |
| 24822 | INDIAN W | 115 | 24 | 248 | line_2182 | ivsg_hs_alt2d1 | 1.019 | 0.962 | -0.056 | 0.9 | 1.05 | 0.05 | DEVERS 230.00 - MIRAGE 230.00 2, COACHELV 230.00 - DEVERS 230.00 2 |
| 24819 | CONCHO | 115 | 24 | 248 | line_2182 | ivsg_hs_alt2d1 | 1.019 | 0.963 | -0.056 | 0.9 | 1.05 | 0.05 | DEVERS 230.00 - MIRAGE 230.00 2, COACHELV 230.00 - DEVERS 230.00 2 |
| 24816 | SANTA RO | 115 | 24 | 248 | line_2182 | ivsg_hs_alt2d1 | 1.023 | 0.967 | -0.056 | 0.9 | 1.05 | 0.05 | DEVERS 230.00 - MIRAGE 230.00 2, COACHELV 230.00 - DEVERS 230.00 2 |
| 24821 | TAMARISK | 115 | 24 | 248 | line_2182 | ivsg_hs_alt2d1 | 1.023 | 0.967 | -0.056 | 0.9 | 1.05 | 0.05 | DEVERS 230.00 - MIRAGE 230.00 2, COACHELV 230.00 - DEVERS 230.00 2 |
| 24827 | TAP823 | 115 | 24 | 248 | line_2182 | ivsg_hs_alt2d1 | 1.025 | 0.969 | -0.056 | 0.9 | 1.05 | 0.05 | DEVERS 230.00 - MIRAGE 230.00 2, COACHELV 230.00 - DEVERS 230.00 2 |
| 25633 | CAPWIND | 115 | 24 | 248 | line_2182 | ivsg_hs_alt2d1 | 1.025 | 0.97 | -0.055 | 0.9 | 1.05 | 0.05 | DEVERS 230.00 - MIRAGE 230.00 2, COACHELV 230.00 - DEVERS 230.00 2 |
| 25622 | TAP806 | 115 | 24 | 248 | line_2182 | ivsg_hs_alt2d1 | 1.025 | 0.97 | -0.055 | 0.9 | 1.05 | 0.05 | DEVERS 230.00 - MIRAGE 230.00 2, COACHELV 230.00 - DEVERS 230.00 2 |
| 24829 | TAP821 | 115 | 24 | 248 | line_2182 | ivsg_hs_alt2d1 | 1.025 | 0.97 | -0.055 | 0.9 | 1.05 | 0.05 | DEVERS 230.00 - MIRAGE 230.00 2, COACHELV 230.00 - DEVERS 230.00 2 |
| 24807 | MIRAGE | 115 | 24 | 248 | line_2182 | ivsg_hs_alt2d1 | 1.027 | 0.972 | -0.055 | 0.9 | 1.05 | 0.05 | DEVERS 230.00 - MIRAGE 230.00 2, COACHELV 230.00 - DEVERS 230.00 2 |
| 24015 | ARCO SC | 230 | 24 | 240 | line_2013 | ivsg_hs_alt2d1 | 0.985 | 1.036 | 0.051 | 0.9 | 1.05 | 0.05 | ARCO SC 230.00 - HINSON 230.00 1, ARCO SC 230.00 - HINSON 230.00 2 |
| 24061 | HARBOR | 230 | 24 | 240 | line_2039 | ivsg_hs_alt2d1 | 0.985 | 1.036 | 0.052 | 0.9 | 1.05 | 0.05 | HARBOR 230.00 - HINSON 230.00 1, LBEACH 230.00 - LITEHIPE 230.00 1 |
| 24077 | LBEACH | 230 | 24 | 240 | line_2039 | ivsg_hs_alt2d1 | 0.985 | 1.036 | 0.051 | 0.9 | 1.05 | 0.05 | HARBOR 230.00 - HINSON 230.00 1, LBEACH 230.00 - LITEHIPE 230.00 1 |
| 24061 | HARBOR | 230 | 24 | 240 | line_2041 | ivsg_hs_alt2d1 | 0.985 | 1.036 | 0.052 | 0.9 | 1.05 | 0.05 | HARBOR 230.00 - HINSON 230.00 1, HARBOR 230.00 - LBEACH 230.00 1 |
| 24061 | HARBOR | 230 | 24 | 240 | line_2253 | ivsg_hs_alt2d1 | 0.985 | 1.036 | 0.052 | 0.9 | 1.05 | 0.05 | HARBOR 230.00 - HINSON 230.00 1, HARBOR 230.00 - LBEACH 230.00 1 |
| 25001 | GOODRICH | 230 | 24 | 250 | line_2073 | ivsg_hs_alt2d1 | 0.956 | 1.044 | 0.088 | 0.9 | 1.05 | 0.05 | GOODRICH 230.00 - GOULD 230.00 1, GOODRICH 230.00 - LAGUBELL 230.00 1 |
| 24058 | GOLETA | 230 | 24 | 240 | line_2120 | ivsg_hs_alt2d1 | 0.982 | 1.044 | 0.062 | 0.9 | 1.05 | 0.05 | S.CLARA 230.00 - GOLETA 230.00 1, S.CLARA 230.00 - GOLETA 230.00 2 |

ivsg_hs_alt2d1.sav
FLOW Summary
N-2 Outages

| LEGEND | % of RATING 1 | |
|---|---|---|
| C_pu | 100% - 110% | |
| C_pu | 110% - 120% | P.U. of |
| C_pu | > 120% | Rate 1 |

| FROM | FR | BKV | TO | TO | BKV | CK | Outage_Name | Case | Rate-Mva | Pflow | Qflow | Amps | MVA | C_pu | B_pu | Contingency_Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 13821C/25/23051A | ivsg_hs_alt2d1 | 204.1 | 366.5 | -14.4 | 1563.1 | 366.8 | 1.831 | 1.262 | CH-ES-NCM-SX |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt2d1 | 392 | 606.6 | 108.7 | 1647.5 | 616.3 | 1.57 | 1.03 | MIGUEL 230 CORRIDOR West of SN |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt2d1 | 408.3 | -594.8 | 2.8 | 2659.3 | 594.9 | 1.557 | 0.981 | MIGUEL 230 CORRIDOR West of SN |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt2d1 | 392 | 588.4 | 96.5 | 1572.4 | 596.3 | 1.52 | 1.03 | MIGUEL 230 CORRIDOR West of LC |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23022/23023 | ivsg_hs_alt2d1 | 204.1 | 301.5 | -4.1 | 1281.1 | 301.5 | 1.5 | 1.262 | ML-MS1+ ML-MS2 230KV |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt2d1 | 408.3 | -577.7 | 5 | 2538.1 | 577.7 | 1.486 | 0.981 | MIGUEL 230 CORRIDOR West of LC |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23051A/23011 | ivsg_hs_alt2d1 | 204.1 | 291.3 | -7.9 | 1240.6 | 291.4 | 1.453 | 1.262 | SX-EPP + ES-EA-SA 230KV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23011/13825 | ivsg_hs_alt2d1 | 204.1 | 290.5 | -11.3 | 1231.2 | 290.7 | 1.442 | 1.262 | ES-EA-SA 230KV + BQ-CC-ES-NCM 138KV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt2d1 | 392 | 558.1 | 92.7 | 1482.6 | 565.7 | 1.44 | 1.03 | MIGUEL 230 CORRIDOR North of ML |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt2d1 | 382.4 | 504.3 | -4.2 | 2265.6 | 504.4 | 1.416 | 0.819 | MIGUEL 230 CORRIDOR West of SN |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23002/06/10 | ivsg_hs_alt2d1 | 204.1 | 274.9 | 13.2 | 1207.5 | 275.2 | 1.414 | 1.262 | SANLUISREY 230 CORRIDOR |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt2d1 | 408.3 | -548.5 | -2.4 | 2393.1 | 548.5 | 1.401 | 0.981 | MIGUEL 230 CORRIDOR North of ML |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23012/13807 | ivsg_hs_alt2d1 | 204.1 | 275 | 10.5 | 1169.5 | 275.2 | 1.37 | 1.262 | PQ-EA 230KV + EA-NCW 138KV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23022/23023 | ivsg_hs_alt2d1 | 392 | 526.7 | 73.5 | 1371.6 | 531.8 | 1.36 | 1.03 | ML-MS1+ ML-MS2 230KV |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt2d1 | 382.4 | 487.5 | -2.5 | 2151.2 | 487.5 | 1.345 | 0.819 | MIGUEL 230 CORRIDOR West of LC |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23012/13808 | ivsg_hs_alt2d1 | 204.1 | 270.2 | 8.8 | 1147.4 | 270.3 | 1.344 | 1.262 | PQ-EA 230KV + NCW-PQ 138KV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | line_N-203 | ivsg_hs_alt2d1 | 204.1 | 264.2 | -1.3 | 1131.7 | 264.2 | 1.325 | 1.262 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | line_N-204 | ivsg_hs_alt2d1 | 204.1 | 260.5 | -1.5 | 1115 | 260.5 | 1.306 | 1.262 | COACHELLA MIDWAY 230 CKT 1&2 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23004/23001 | ivsg_hs_alt2d1 | 204.1 | 262.5 | 5.6 | 1113 | 262.6 | 1.303 | 1.262 | SA-MS 1 + SA-MS 2 230KV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | line_2245 | ivsg_hs_alt2d1 | 204.1 | 260.4 | -0.4 | 1111.3 | 260.4 | 1.301 | 1.262 | DEVERS 500.00 - VALLEYSC 500.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23013/27/28 | ivsg_hs_alt2d1 | 204.1 | 261.9 | 2.7 | 1110.2 | 261.9 | 1.3 | 1.262 | OLD TOWN TO OLD TOWN JCT |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23022/23023 | ivsg_hs_alt2d1 | 408.3 | -518.5 | 3.7 | 2214 | 518.5 | 1.296 | 0.981 | ML-MS1+ ML-MS2 230KV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23011/23003 | ivsg_hs_alt2d1 | 204.1 | 262.1 | -0.6 | 1104.9 | 262.1 | 1.294 | 1.262 | SA-EA 230KV + SA-ES-EA 230KV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | line_2113 | ivsg_hs_alt2d1 | 204.1 | 259.6 | 0 | 1104.2 | 259.6 | 1.293 | 1.262 | ELLIS 230.00 - JOHANNA 230.00 1, ELLIS 230.00 - SANTIAGO 230.00 1 |
| 22672 | PRCTRVLY | 138 | 22852 | TELECYN | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt2d1 | 478 | 564 | -6.7 | 2521.5 | 564 | 1.261 | 0.773 | MIGUEL 230 CORRIDOR West of SN |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt2d1 | 382.4 | 458.7 | 8.4 | 2011.2 | 458.8 | 1.257 | 0.819 | MIGUEL 230 CORRIDOR North of ML |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | line_2115 | ivsg_hs_alt2d1 | 204.1 | 250.3 | -4.5 | 1043.9 | 250.3 | 1.223 | 1.262 | S.ONOFRE 230.00 - SANTIAGO 230.00 1, S.ONOFRE 230.00 - SANTIAGO 230.00 2 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23027/28/13810 | ivsg_hs_alt2d1 | 204.1 | 246 | 7.1 | 1040.3 | 246.1 | 1.218 | 1.262 | OLD TOWN TO MISSION 1 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | 23051A/23011 | ivsg_hs_alt2d1 | 392 | 471.9 | 10.5 | 1216 | 472 | 1.21 | 1.03 | SX-EPP + ES-EA-SA 230KV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | 23022/23023 | ivsg_hs_alt2d1 | 392 | 472.1 | 16.4 | 1212.6 | 472.4 | 1.21 | 1.03 | ML-MS1+ ML-MS2 230KV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23052/23007 | ivsg_hs_alt2d1 | 204.1 | 242.2 | -1.2 | 1029 | 242.2 | 1.205 | 1.262 | TA-SO 1 + 2 230KV |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 2 | line_2046 | ivsg_hs_alt2d1 | 956 | -1133.8 | -39.5 | 2885.4 | 1134.5 | 1.202 | 0.597 | LA FRESA 230.00 - REDONDO 230.00 1, REDONDO 230.00 - LITEHIPE 230.00 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 1 | line_2047 | ivsg_hs_alt2d1 | 956 | -1133.8 | -39.5 | 2885.4 | 1134.5 | 1.202 | 0.597 | LA FRESA 230.00 - REDONDO 230.00 2, REDONDO 230.00 - LITEHIPE 230.00 1 |
| 22672 | PRCTRVLY | 138 | 22852 | TELECYN | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt2d1 | 478 | 546.8 | -8.9 | 2402.7 | 546.9 | 1.201 | 0.773 | MIGUEL 230 CORRIDOR West of LC |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt2d1 | 204.1 | 233.7 | 0.6 | 1004.9 | 233.7 | 1.177 | 1.262 | MIGUEL 230 CORRIDOR North of ML |
| 24086 | LUGO | 500 | 24236 | RANCHVST | 500 | 1 | line_2194 | ivsg_hs_alt2d1 | 2598 | 3138.7 | 556.9 | 3520.8 | 3187.8 | 1.175 | 0.65 | LUGO 500.00 - MIRALOMA 500.00 2, LUGO 500.00 - MIRALOMA 500.00 3 |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | 23022/23023 | ivsg_hs_alt2d1 | 382.4 | 429.2 | 7.5 | 1839.8 | 429.2 | 1.15 | 0.819 | ML-MS1+ ML-MS2 230KV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 13821B/638 | ivsg_hs_alt2d1 | 392 | 446 | 57.2 | 1166 | 449.7 | 1.15 | 1.03 | CH-SX-SN 138KV + SAN VCNT-EL 69KV |
| 30060 | MIDWAY | 500 | 24156 | VINCENT | 500 | 3 | line_2215 | ivsg_hs_alt2d1 | 1848.1 | 2249.1 | 144.1 | 2444.5 | 2253.7 | 1.149 | 0.45 | MIDWAY 500.00 - VINCENT 500.00 1, MIDWAY 500.00 - VINCENT 500.00 2 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23027/28/13827 | ivsg_hs_alt2d1 | 204.1 | 231.3 | 4.3 | 977.7 | 231.4 | 1.145 | 1.262 | OLD TOWN TO MISSION 2 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 2 | line_2029 | ivsg_hs_alt2d1 | 1195 | 1319.8 | -53.5 | 3418.5 | 1320.9 | 1.14 | 0.566 | LEWIS 230.00 - SERRANO 230.00 1, SERRANO 230.00 - VILLA PK 230.00 1 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 2 | line_2031 | ivsg_hs_alt2d1 | 1195 | 1319.8 | -53.5 | 3418.5 | 1320.9 | 1.14 | 0.566 | LEWIS 230.00 - SERRANO 230.00 2, SERRANO 230.00 - VILLA PK 230.00 1 |
| 30060 | MIDWAY | 500 | 24156 | VINCENT | 500 | 1 | line_2220 | ivsg_hs_alt2d1 | 1848.1 | 2225.8 | 150.2 | 2420 | 2230.9 | 1.14 | 0.36 | MIDWAY 500.00 - VINCENT 500.00 2, MIDWAY 500.00 - VINCENT 500.00 3 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 2 | line_2278 | ivsg_hs_alt2d1 | 1195 | 1319.8 | -53.5 | 3418.5 | 1320.9 | 1.14 | 0.566 | LEWIS 230.00 - SERRANO 230.00 1, SERRANO 230.00 - VILLA PK 230.00 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 2 | line_2064 | ivsg_hs_alt2d1 | 956 | -1071.7 | -46.8 | 2727.3 | 1072.7 | 1.136 | 0.597 | LA FRESA 230.00 - REDONDO 230.00 1, MESA CAL 230.00 - REDONDO 230.00 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 1 | line_2065 | ivsg_hs_alt2d1 | 956 | -1071.7 | -46.8 | 2727.3 | 1072.7 | 1.136 | 0.597 | LA FRESA 230.00 - REDONDO 230.00 2, MESA CAL 230.00 - REDONDO 230.00 1 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | 23002/06/10 | ivsg_hs_alt2d1 | 392 | 440.6 | 18 | 1168.3 | 441 | 1.13 | 1.03 | SANLUISREY 230 CORRIDOR |
| 22672 | PRCTRVLY | 138 | 22852 | TELECYN | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt2d1 | 478 | 517.6 | -1.5 | 2258.4 | 517.6 | 1.129 | 0.773 | MIGUEL 230 CORRIDOR North of ML |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 13810B/23013 | ivsg_hs_alt2d1 | 204.1 | 226.5 | 7.1 | 958.4 | 226.6 | 1.122 | 1.262 | OT JCT TO PQ 1 |
| 8376 | RTAP2 | 92 | 8974 | RTP1 | 92 | 1 | line_N-204 | ivsg_hs_alt2d1 | 57 | -59.1 | 10.9 | 396.8 | 60.1 | 1.112 | 0.657 | COACHELLA MIDWAY 230 CKT 1&2 |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_N-203 | ivsg_hs_alt2d1 | 169 | 185.7 | 41.7 | 669.3 | 190.3 | 1.108 | 0.821 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 22596 | OLD TOWN | 230 | 22466 | MLMS3TAP | 230 | 1 | 23021/22/23/41 | ivsg_hs_alt2d1 | 912 | -951.7 | 88.5 | 2524.1 | 955.8 | 1.103 | 0.747 | MIGUEL 230 CORRIDOR West of SN |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 13821B/638 | ivsg_hs_alt2d1 | 408.3 | -440.1 | -1.4 | 1882.2 | 440.1 | 1.102 | 0.981 | CH-SX-SN 138KV + SAN VCNT-EL 69KV |
| 8601 | GEOSUB2 | 230 | 8300 | BANIS230 | 230 | 1 | line_N-204 | ivsg_hs_alt2d1 | 550 | 587.6 | 106.2 | 1518.1 | 597.1 | 1.1 | 0.746 | COACHELLA MIDWAY 230 CKT 1&2 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 2 | line_2049 | ivsg_hs_alt2d1 | 956 | -1027.3 | -39 | 2617.8 | 1028 | 1.091 | 0.597 | LA FRESA 230.00 - REDONDO 230.00 1, LCIENEGA 230.00 - LA FRESA 230.00 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 1 | line_2050 | ivsg_hs_alt2d1 | 956 | -1027.3 | -39 | 2617.8 | 1028 | 1.091 | 0.597 | LA FRESA 230.00 - REDONDO 230.00 2, LCIENEGA 230.00 - LA FRESA 230.00 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 2 | line_2057 | ivsg_hs_alt2d1 | 956 | -1026.8 | -35.8 | 2615.3 | 1027.4 | 1.09 | 0.597 | EL NIDO 230.00 - LA FRESA 230.00 3, LA FRESA 230.00 - REDONDO 230.00 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 1 | line_2058 | ivsg_hs_alt2d1 | 956 | -1026.8 | -35.8 | 2615.3 | 1027.4 | 1.09 | 0.597 | EL NIDO 230.00 - LA FRESA 230.00 3, LA FRESA 230.00 - REDONDO 230.00 2 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 2 | line_2059 | ivsg_hs_alt2d1 | 956 | -1026.8 | -35.8 | 2615.3 | 1027.4 | 1.09 | 0.597 | EL NIDO 230.00 - LA FRESA 230.00 4, LA FRESA 230.00 - REDONDO 230.00 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 1 | line_2060 | ivsg_hs_alt2d1 | 956 | -1026.8 | -35.8 | 2615.3 | 1027.4 | 1.09 | 0.597 | EL NIDO 230.00 - LA FRESA 230.00 4, LA FRESA 230.00 - REDONDO 230.00 2 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23002/06/10 | ivsg_hs_alt2d1 | 392 | 423.8 | 51.7 | 1151.1 | 427 | 1.09 | 1.03 | SANLUISREY 230 CORRIDOR |
| 24025 | CHINO | 230 | 24093 | MIRALOMW | 230 | 1 | line_2160 | ivsg_hs_alt2d1 | 705 | -742.9 | 32.6 | 1926.9 | 743.6 | 1.089 | 0.284 | CHINO 230.00 - MIRALOMA 230.00 2, CHINO 230.00 - MIRALOMA 230.00 3 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23002/06/10 | ivsg_hs_alt2d1 | 408.3 | -418.1 | 2.6 | 1858 | 418.1 | 1.088 | 0.981 | SANLUISREY 230 CORRIDOR |
| 24701 | KRAMER | 230 | 24085 | LUGO | 230 | 2 | line_2260 | ivsg_hs_alt2d1 | 478 | 525.9 | 7.2 | 1303.2 | 525.9 | 1.086 | 0.645 | KRAMER 230.00 - LUGO 230.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 22596 | OLD TOWN | 230 | 22466 | MLMS3TAP | 230 | 1 | 23021/22/23/41 | ivsg_hs_alt2d1 | 912 | -940.2 | 103.6 | 2473.6 | 945.9 | 1.081 | 0.747 | MIGUEL 230 CORRIDOR North of ML |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | line_N-203 | ivsg_hs_alt2d1 | 392 | 423.4 | 5.4 | 1098.1 | 423.4 | 1.08 | 1.03 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | 23013/27/28 | ivsg_hs_alt2d1 | 392 | 422.9 | 13.1 | 1083.3 | 423.1 | 1.08 | 1.03 | OLD TOWN TO OLD TOWN JCT |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22596 | OLD TOWN | 230 | 22466 | MLMS3TAP | 230 | 1 | 23021/22/23/41 | ivsg_hs_alt2d1 | 912 | -937.8 | 99.5 | 2469.4 | 943 | 1.079 | 0.747 | MIGUEL 230 CORRIDOR West of LC |
| 8900 | PRUETTAP | 92 | 8691 | HIGHLINE | 92 | 1 | line_N-209 | ivsg_hs_alt2d1 | 86 | -93.7 | 7.6 | 580.1 | 94 | 1.075 | 0.773 | EL CENTRO HIGHLINE 230 CKTS 1&2 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | line_N-203 | ivsg_hs_alt2d1 | 392 | 417.1 | 41.5 | 1099.3 | 419.1 | 1.07 | 1.03 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_2260 | ivsg_hs_alt2d1 | 56 | 58 | -9.9 | 292.6 | 58.8 | 1.06 | 0.92 | KRAMER 230.00 - LUGO 230.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 13821C/25/23051A | ivsg_hs_alt2d1 | 392 | 414 | 47.2 | 1075.7 | 416.7 | 1.06 | 1.03 | CH-ES-NCM-SX |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 1 | line_2030 | ivsg_hs_alt2d1 | 1287 | 1319.8 | -53.5 | 3418.5 | 1320.9 | 1.058 | 0.526 | LEWIS 230.00 - SERRANO 230.00 1, SERRANO 230.00 - VILLA PK 230.00 2 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 1 | line_2032 | ivsg_hs_alt2d1 | 1287 | 1319.8 | -53.5 | 3418.5 | 1320.9 | 1.058 | 0.526 | LEWIS 230.00 - SERRANO 230.00 2, SERRANO 230.00 - VILLA PK 230.00 2 |
| 22260 | ESCNDIDO | 230 | 22844 | TALEGA | 230 | 1 | 23052/23007 | ivsg_hs_alt2d1 | 456.1 | 472.3 | 16.8 | 1195.9 | 472.5 | 1.045 | 0.037 | TA-SO 1 + 2 230KV |
| 22831 | SYCAMORE | 138 | 22124 | CHCARITA | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt2d1 | 204.1 | 205.2 | -32.4 | 891.7 | 207.7 | 1.044 | 0.74 | MIGUEL 230 CORRIDOR West of SN |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_N-204 | ivsg_hs_alt2d1 | 169 | 174.7 | 39.5 | 629.9 | 179.1 | 1.043 | 0.821 | COACHELLA MIDWAY 230 CKT 1&2 |
| 22672 | PRCTRVLY | 138 | 22852 | TELECYN | 138 | 1 | 23022/23023 | ivsg_hs_alt2d1 | 478 | 487.6 | -7.6 | 2082.4 | 487.7 | 1.041 | 0.773 | ML-MS1+ ML-MS2 230KV |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | line_N-203 | ivsg_hs_alt2d1 | 408.3 | -411.8 | 8.1 | 1774.3 | 411.9 | 1.039 | 0.981 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 22831 | SYCAMORE | 138 | 22124 | CHCARITA | 138 | 1 | 13821B/638 | ivsg_hs_alt2d1 | 204.1 | 209.4 | -23 | 887.2 | 210.7 | 1.039 | 0.74 | CH-SX-SN 138KV + SAN VCNT-EL 69KV |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | line_2245 | ivsg_hs_alt2d1 | 408.3 | -408.9 | 7.9 | 1755.1 | 409 | 1.027 | 0.981 | DEVERS 500.00 - VALLEYSC 500.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 19020 | BLYTHE | 161 | 24017 | BLYTHESC | 161 | 1 | line_N-203 | ivsg_hs_alt2d1 | 244 | 252.2 | 42 | 898.9 | 255.6 | 1.027 | 0.832 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 8900 | PRUETTAP | 92 | 8691 | HIGHLINE | 92 | 1 | line_N-204 | ivsg_hs_alt2d1 | 86 | -88.1 | 15.2 | 553.4 | 89.4 | 1.026 | 0.773 | COACHELLA MIDWAY 230 CKT 1&2 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | line_N-204 | ivsg_hs_alt2d1 | 408.3 | -405.2 | 8.5 | 1744.1 | 405.3 | 1.021 | 0.981 | COACHELLA MIDWAY 230 CKT 1&2 |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | line_2236 | ivsg_hs_alt2d1 | 132 | 131.3 | -9.6 | 845.1 | 131.6 | 1.02 | 0.957 | PALOVRDE 500.00 - DEVERS 500.00 1, COACHELV 230.00 - DEVERS 230.00 2 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23051A/23011 | ivsg_hs_alt2d1 | 408.3 | -408.4 | 1.7 | 1736.8 | 408.4 | 1.017 | 0.981 | SX-EPP + ES-EA-SA 230KV |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 13821C/25/23051A | ivsg_hs_alt2d1 | 408.3 | -409 | 0.2 | 1736.3 | 409 | 1.016 | 0.981 | CH-ES-NCM-SX |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | line_2113 | ivsg_hs_alt2d1 | 408.3 | -406.4 | 4.8 | 1734.6 | 406.4 | 1.015 | 0.981 | ELLIS 230.00 - JOHANNA 230.00 1, ELLIS 230.00 - SANTIAGO 230.00 1 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23021/23041 | ivsg_hs_alt2d1 | 408.3 | -406.7 | 5.1 | 1732.4 | 406.7 | 1.014 | 0.981 | ML-SX + OM-SX 230KV |
| 24016 | BARRE | 230 | 24044 | ELLIS | 230 | 1 | line_2115 | ivsg_hs_alt2d1 | 988 | 964.5 | -56.9 | 2511.6 | 966.2 | 1.013 | 0.419 | S.ONOFRE 230.00 - SANTIAGO 230.00 1, S.ONOFRE 230.00 - SANTIAGO 230.00 2 |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | line_N-204 | ivsg_hs_alt2d1 | 132 | 127.2 | -14.5 | 835.6 | 128 | 1.009 | 0.957 | COACHELLA MIDWAY 230 CKT 1&2 |
| 8600 | GEOSUB1 | 230 | 8300 | BANIS230 | 230 | 1 | line_N-204 | ivsg_hs_alt2d1 | 550 | 538.2 | 94.5 | 1390.7 | 546.5 | 1.008 | 0.693 | COACHELLA MIDWAY 230 CKT 1&2 |
| 8600 | GEOSUB1 | 230 | 8300 | BANIS230 | 230 | 2 | line_N-204 | ivsg_hs_alt2d1 | 550 | 538.2 | 94.5 | 1390.7 | 546.5 | 1.008 | 0.693 | COACHELLA MIDWAY 230 CKT 1&2 |
| 24074 | LA FRESA | 230 | 24065 | HINSON | 230 | 1 | line_2061 | ivsg_hs_alt2d1 | 797 | -769.7 | 45.4 | 2012 | 771.1 | 1.006 | 0.138 | LA FRESA 230.00 - REDONDO 230.00 1, LA FRESA 230.00 - REDONDO 230.00 2 |
| 24126 | RIOHONDO | 230 | 24155 | VINCENT | 230 | 2 | line_2097 | ivsg_hs_alt2d1 | 988 | -937.5 | 114.2 | 2482 | 944.4 | 1.001 | 0.729 | GOODRICH 230.00 - GOULD 230.00 1, VINCENT 230.00 - MESA CAL 230.00 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | line_2115 | ivsg_hs_alt2d1 | 392 | 388.5 | 41.4 | 989 | 390.7 | 1 | 1.03 | S.ONOFRE 230.00 - SANTIAGO 230.00 1, S.ONOFRE 230.00 - SANTIAGO 230.00 2 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | line_2115 | ivsg_hs_alt2d1 | 392 | 390.7 | 10.1 | 984.7 | 390.9 | 1 | 1.03 | S.ONOFRE 230.00 - SANTIAGO 230.00 1, S.ONOFRE 230.00 - SANTIAGO 230.00 2 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23013/27/28 | ivsg_hs_alt2d1 | 392 | 390.2 | 41 | 1014.2 | 392.3 | 1 | 1.03 | OLD TOWN TO OLD TOWN JCT |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | line_2237 | ivsg_hs_alt2d1 | 132 | 128.9 | -10.3 | 826 | 129.3 | 0.997 | 0.957 | PALOVRDE 500.00 - DEVERS 500.00 1, J.HINDS 230.00 - MIRAGE 230.00 1 |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | line_2186 | ivsg_hs_alt2d1 | 132 | 129.6 | -10.3 | 823.1 | 130 | 0.994 | 0.957 | COACHELV 230.00 - DEVERS 230.00 2, J.HINDS 230.00 - MIRAGE 230.00 1 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2191 | ivsg_hs_alt2d1 | 2400 | -2483.1 | -32.3 | 2751.9 | 2483.3 | 0.993 | 0.776 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - ELDORDO 230.00 2 |
| 24086 | LUGO | 500 | 24097 | MOHAVE | 500 | 1 | line_2234 | ivsg_hs_alt2d1 | 1386 | -1427.5 | 86.7 | 1575.5 | 1430.1 | 0.993 | 0.707 | MOHAVE 500.00 - ELDORDO 500.00 1, PISGAH 230.00 - ELDORDO 230.00 2 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | 23052/23007 | ivsg_hs_alt2d1 | 392 | 388.2 | 4.1 | 997.9 | 388.3 | 0.99 | 1.03 | TA-SO 1 + 2 230KV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | 13807/08/23013 | ivsg_hs_alt2d1 | 392 | 389.4 | 10.4 | 994 | 389.5 | 0.99 | 1.03 | PQ ENCINA |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2100 | ivsg_hs_alt2d1 | 2400 | -2465.4 | -211.5 | 2737.8 | 2474.4 | 0.988 | 0.776 | EAGLROCK 230.00 - MESA CAL 230.00 1, SYLMAR S 230.00 - GOULD 230.00 1 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2192 | ivsg_hs_alt2d1 | 2400 | -2470.2 | -42.5 | 2738.7 | 2470.6 | 0.988 | 0.776 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2193 | ivsg_hs_alt2d1 | 2400 | -2469.9 | -42.7 | 2738.4 | 2470.3 | 0.988 | 0.776 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - LUGO 230.00 2 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2200 | ivsg_hs_alt2d1 | 2400 | -2454.4 | -26.4 | 2730.5 | 2454.5 | 0.985 | 0.776 | LUGO 500.00 - MOHAVE 500.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2201 | ivsg_hs_alt2d1 | 2400 | -2454.2 | -26.5 | 2730.3 | 2454.3 | 0.985 | 0.776 | LUGO 500.00 - MOHAVE 500.00 1, PISGAH 230.00 - LUGO 230.00 2 |
| 19020 | BLYTHE | 161 | 24017 | BLYTHESC | 161 | 1 | line_N-204 | ivsg_hs_alt2d1 | 244 | 241.2 | 39.8 | 859.7 | 244.5 | 0.982 | 0.832 | COACHELLA MIDWAY 230 CKT 1&2 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23021/23041 | ivsg_hs_alt2d1 | 204.1 | 196.1 | 6.5 | 832.3 | 196.2 | 0.975 | 1.262 | ML-SX + OM-SX 230KV |
| 14008 | JOJOBA | 500 | 15011 | KYRENE | 500 | 1 | line_2245 | ivsg_hs_alt2d1 | 1732 | 1780.1 | 143.1 | 1945.2 | 1785.8 | 0.974 | 0.937 | DEVERS 500.00 - VALLEYSC 500.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 24042 | ELDORDO | 500 | 24086 | LUGO | 500 | 1 | line_2258 | ivsg_hs_alt2d1 | 1386 | 1425.1 | 279.9 | 1548 | 1452.4 | 0.974 | 0.649 | LUGO 500.00 - VINCENT 500.00 2, LUGO 500.00 - VICTORVL 500.00 1 |
| 22596 | OLD TOWN | 230 | 22466 | MLMS3TAP | 230 | 1 | 23021/23041 | ivsg_hs_alt2d1 | 912 | -855.8 | 80.6 | 2229.4 | 859.6 | 0.974 | 0.747 | ML-SX + OM-SX 230KV |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_N-203 | ivsg_hs_alt2d1 | 800 | 769.5 | 94.6 | 1952.6 | 775.3 | 0.972 | 0.701 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 24126 | RIOHONDO | 230 | 24155 | VINCENT | 230 | 2 | line_2101 | ivsg_hs_alt2d1 | 988 | -913.3 | 115.6 | 2402.3 | 920.6 | 0.969 | 0.729 | EAGLROCK 230.00 - MESA CAL 230.00 1, VINCENT 230.00 - MESA CAL 230.00 1 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2103 | ivsg_hs_alt2d1 | 2400 | -2421.5 | -196.4 | 2686.4 | 2429.4 | 0.969 | 0.776 | EAGLROCK 230.00 - SYLMAR S 230.00 1, SYLMAR S 230.00 - GOULD 230.00 1 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2096 | ivsg_hs_alt2d1 | 2400 | -2416.1 | -218.7 | 2679.5 | 2425.9 | 0.967 | 0.776 | EAGLROCK 230.00 - MESA CAL 230.00 1, GOODRICH 230.00 - GOULD 230.00 1 |
| 8311 | COACHELA | 230 | 8695 | RAMON | 230 | 2 | line_2236 | ivsg_hs_alt2d1 | 800 | 734.9 | -30.7 | 1940.6 | 735.6 | 0.966 | 0.643 | PALOVRDE 500.00 - DEVERS 500.00 1, COACHELV 230.00 - DEVERS 230.00 2 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_2194 | ivsg_hs_alt2d1 | 56 | 52.1 | -10.3 | 263.4 | 53.1 | 0.96 | 0.92 | LUGO 500.00 - MIRALOMA 500.00 2, LUGO 500.00 - MIRALOMA 500.00 3 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_N-210 | ivsg_hs_alt2d1 | 800 | 758 | 44.8 | 1928.2 | 759.3 | 0.96 | 0.701 | EL CENTRO IMPERIAL VALLEY 230 CKTS 2&3 |
| 24126 | RIOHONDO | 230 | 24155 | VINCENT | 230 | 2 | line_2100 | ivsg_hs_alt2d1 | 988 | -891.4 | 119.5 | 2361.7 | 899.4 | 0.952 | 0.729 | EAGLROCK 230.00 - MESA CAL 230.00 1, SYLMAR S 230.00 - GOULD 230.00 1 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt2d1 | 392 | 371.1 | -3.2 | 967.1 | 371.1 | 0.95 | 1.03 | MIGUEL 230 CORRIDOR North of ML |
| 8695 | RAMON | 230 | 24806 | MIRAGE | 230 | 2 | line_2236 | ivsg_hs_alt2d1 | 800 | 706 | -164.5 | 1895 | 724.9 | 0.944 | 0.584 | PALOVRDE 500.00 - DEVERS 500.00 1, COACHELV 230.00 - DEVERS 230.00 2 |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | 13821B/638 | ivsg_hs_alt2d1 | 382.4 | 351.5 | 18.1 | 1510.8 | 352 | 0.944 | 0.819 | CH-SX-SN 138KV + SAN VCNT-EL 69KV |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 2 | line_2279 | ivsg_hs_alt2d1 | 1195 | 1085.4 | -62.5 | 2822.2 | 1087.2 | 0.941 | 0.566 | S.ONOFRE 230.00 - SERRANO 230.00 1, SERRANO 230.00 - VILLA PK 230.00 1 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | 13821C/25/23051A | ivsg_hs_alt2d1 | 392 | 367.4 | 17.7 | 945 | 367.8 | 0.94 | 1.03 | CH-ES-NCM-SX |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | line_2115 | ivsg_hs_alt2d1 | 408.3 | -384.2 | -1.4 | 1596.3 | 384.2 | 0.935 | 0.981 | S.ONOFRE 230.00 - SANTIAGO 230.00 1, S.ONOFRE 230.00 - SANTIAGO 230.00 2 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2255 | ivsg_hs_alt2d1 | 2400 | -2320.4 | -75.4 | 2590.2 | 2321.6 | 0.935 | 0.776 | LUGO 500.00 - MIRALOMA 500.00 3, LUGO 500.00 - MOHAVE 500.00 1 |
| 24126 | RIOHONDO | 230 | 24155 | VINCENT | 230 | 2 | line_2076 | ivsg_hs_alt2d1 | 988 | -883.9 | 107.3 | 2315 | 890.4 | 0.933 | 0.729 | GOODRICH 230.00 - LAGUBELL 230.00 1, VINCENT 230.00 - MESA CAL 230.00 1 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2256 | ivsg_hs_alt2d1 | 2400 | -2320.4 | -91.9 | 2580.3 | 2322.3 | 0.931 | 0.776 | ELDORDO 500.00 - LUGO 500.00 1, LUGO 500.00 - MIRALOMA 500.00 2 |
| 24126 | RIOHONDO | 230 | 24155 | VINCENT | 230 | 2 | line_2096 | ivsg_hs_alt2d1 | 988 | -869.9 | 106.9 | 2298.7 | 876.4 | 0.927 | 0.729 | EAGLROCK 230.00 - MESA CAL 230.00 1, GOODRICH 230.00 - GOULD 230.00 1 |
| 24614 | TAP601 | 115 | 24702 | KRAMER | 115 | 1 | line_2260 | ivsg_hs_alt2d1 | 217.1 | -190.1 | 68.5 | 1006.2 | 202 | 0.925 | 0.717 | KRAMER 230.00 - LUGO 230.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 24807 | MIRAGE | 115 | 24819 | CONCHO | 115 | 1 | line_2182 | ivsg_hs_alt2d1 | 183 | 164 | -6.7 | 848 | 164.2 | 0.923 | 0.873 | DEVERS 230.00 - MIRAGE 230.00 2, COACHELV 230.00 - DEVERS 230.00 2 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2245 | ivsg_hs_alt2d1 | 2400 | -2291 | -69.4 | 2549.6 | 2292 | 0.92 | 0.776 | DEVERS 500.00 - VALLEYSC 500.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 24126 | RIOHONDO | 230 | 24155 | VINCENT | 230 | 2 | line_2103 | ivsg_hs_alt2d1 | 988 | -862 | 106.2 | 2279.5 | 868.5 | 0.919 | 0.729 | EAGLROCK 230.00 - SYLMAR S 230.00 1, SYLMAR S 230.00 - GOULD 230.00 1 |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | 23002/06/10 | ivsg_hs_alt2d1 | 382.4 | 329.5 | 11.5 | 1470.4 | 329.7 | 0.919 | 0.819 | SANLUISREY 230 CORRIDOR |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt2d1 | 204.1 | 181.7 | 2.4 | 780.5 | 181.7 | 0.914 | 1.262 | MIGUEL 230 CORRIDOR West of LC |
| 24807 | MIRAGE | 115 | 24816 | SANTA RO | 115 | 1 | line_2182 | ivsg_hs_alt2d1 | 183.3 | 162 | -12.5 | 839.2 | 162.5 | 0.912 | 0.864 | DEVERS 230.00 - MIRAGE 230.00 2, COACHELV 230.00 - DEVERS 230.00 2 |
| 24602 | VICTOR | 115 | 24702 | KRAMER | 115 | 1 | line_2260 | ivsg_hs_alt2d1 | 217.1 | -185.4 | 78.6 | 990.2 | 201.4 | 0.911 | 0.704 | KRAMER 230.00 - LUGO 230.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 8332 | ELCENTSW | 230 | 8335 | ELSTEAMP | 92 | 1 | line_N-210 | ivsg_hs_alt2d1 | 225 | 205.3 | 11 | 517.8 | 205.6 | 0.91 | 0.52 | EL CENTRO IMPERIAL VALLEY 230 CKTS 2&3 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22831 | SYCAMORE | 138 | 22124 | CHCARITA | 138 | 1 | 23051A/23011 | ivsg_hs_alt2d1 | 204.1 | 179.2 | -34.6 | 777 | 182.5 | 0.91 | 0.74 | SX-EPP + ES-EA-SA 230KV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | 23011/13825 | ivsg_hs_alt2d1 | 392 | 354.9 | 26.8 | 906.9 | 355.9 | 0.91 | 1.03 | ES-EA-SA 230KV + BQ-CC-ES-NCM 138KV |
| 24086 | LUGO | 500 | 24097 | MOHAVE | 500 | 1 | line_2258 | ivsg_hs_alt2d1 | 1386 | -1298 | -46.3 | 1454.3 | 1298.8 | 0.909 | 0.707 | LUGO 500.00 - VINCENT 500.00 2, LUGO 500.00 - VICTORVL 500.00 1 |
| 24807 | MIRAGE | 115 | 24819 | CONCHO | 115 | 1 | line_2245 | ivsg_hs_alt2d1 | 183 | 164 | -7.5 | 834.5 | 164.1 | 0.908 | 0.873 | DEVERS 500.00 - VALLEYSC 500.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 24125 | REDONDO | 230 | 24084 | LITEHIPE | 230 | 1 | line_2061 | ivsg_hs_alt2d1 | 916 | 817.2 | 97.7 | 2082.6 | 823 | 0.906 | 0.115 | LA FRESA 230.00 - REDONDO 230.00 1, LA FRESA 230.00 - REDONDO 230.00 2 |
| 24093 | MIRALOMW | 230 | 24158 | WALNUT | 230 | 1 | line_2089 | ivsg_hs_alt2d1 | 797 | 678.9 | 168 | 1809.4 | 699.4 | 0.906 | 0.53 | MESA CAL 230.00 - WALNUT 230.00 1, OLINDA 230.00 - WALNUT 230.00 1 |
| 22831 | SYCAMORE | 138 | 22124 | CHCARITA | 138 | 1 | 13810B/23013 | ivsg_hs_alt2d1 | 204.1 | 179.5 | -33.5 | 772.3 | 182.6 | 0.904 | 0.74 | OT JCT TO PQ 1 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2075 | ivsg_hs_alt2d1 | 2400 | -2266.6 | -170.4 | 2503.8 | 2273 | 0.903 | 0.776 | EAGLROCK 230.00 - MESA CAL 230.00 1, GOODRICH 230.00 - LAGUBELL 230.00 1 |
| 25656 | MIRALOME | 230 | 24100 | OLINDA | 230 | 1 | line_2088 | ivsg_hs_alt2d1 | 988 | 857 | 170.6 | 2233.8 | 873.9 | 0.902 | 0.59 | MESA CAL 230.00 - WALNUT 230.00 1, MIRALOMA 230.00 - WALNUT 230.00 1 |

ivsg_hs_alt2d1.sav
No Solve Summary
N-2 Outages

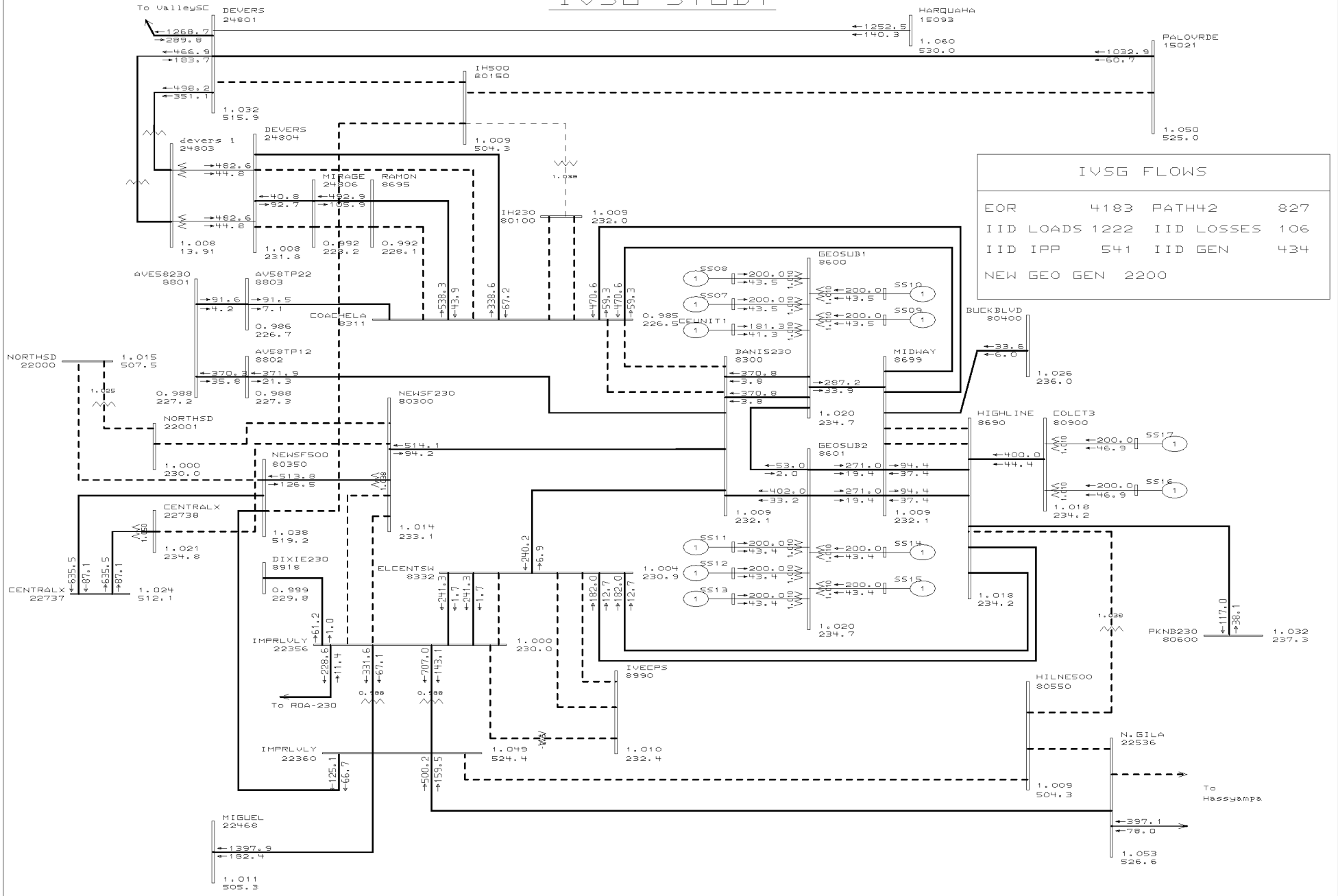
| Contingency-Description | Case | Problem-Description |
|---|---|---|
| DEVERS 230.00 - MIRAGE 230.00 2, RAMON 230.00 - MIRAGE 230.00 2 | ivsg_hs_alt2d1 | Pmis 25405 IRON MTN 230.00 = -1288.44 MW + j -48480.28 MVAR |
| VICTOR 230.00 - LUGO 230.00 1, VICTOR 230.00 - LUGO 230.00 2 | ivsg_hs_alt2d1 | Pmis 24702 KRAMER 115.00 = -344900.34 MW + j -783651.56 MVAR |
| DEVERS 230.00 - MIRAGE 230.00 2, RAMON 230.00 - MIRAGE 230.00 2 | ivsg_hs_alt2d1 | Pmis 25405 IRON MTN 230.00 = -1288.44 MW + j -48480.28 MVAR |
| EPP-ES + ES-EA-SA 230KV | ivsg_hs_alt2d1 | BAD Qgen: 22626 LkHodG2 17.3 MVAr |

# Imperial Valley Study Group

## Appendix A.4.5

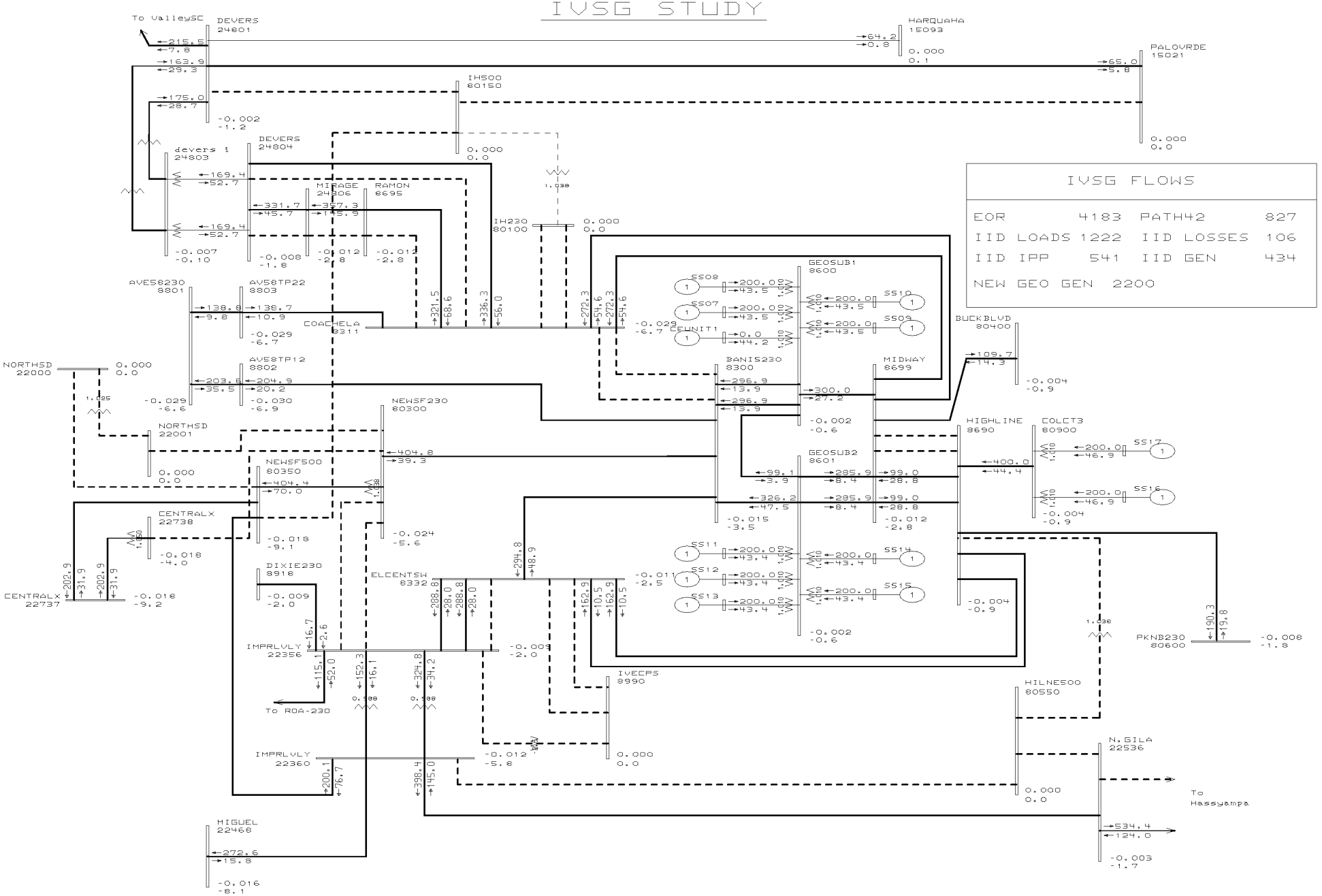
Alt 2 D2
Heavy Summer
Alternative 2
Dispatch 2

# IVSG STUDY




| IVSG FLOWS | | | |
|---|---|---|---|
| EOR | 4183 | PATH42 | 827 |
| IID LOADS | 1222 | IID LOSSES | 106 |
| IID IPP | 541 | IID GEN | 434 |
| NEW GEO GEN | 2200 | | |

# IVSG STUDY




## IVSG FLOWS

| | | | |
|---|---|---|---|
| EOR | 4183 | PATH42 | 827 |
| IID LOADS | 1222 | IID LOSSES | 106 |
| IID IPP | 541 | IID GEN | 434 |
| NEW GEO GEN | 2200 | | |

ivsg_hs_alt2d2.sav
Voltage Summary
N-0 Outages

| Bus | Name | kV | Area | Zone | Outage | Case | Vbase | Vcont | DeltaV | Vmin | Vmax | Max-dv | Contingency Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24035 | EAGLEMTN | 161 | 24 | 248 | base | ivsg_hs_alt2d2_t | 0.928 | 0.928 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 20077 | SIM-115 | 115 | 20 | 205 | base | ivsg_hs_alt2d2_t | 0.934 | 0.934 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 20076 | SQN-115 | 115 | 20 | 205 | base | ivsg_hs_alt2d2_t | 0.939 | 0.939 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14534 | N.GILA 4 | 100 | 14 | 847 | base | ivsg_hs_alt2d2_t | 0.945 | 0.945 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15021 | PALOVRDE | 500 | 14 | 158 | base | ivsg_hs_alt2d2_t | 1.05 | 1.05 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24236 | RANCHVST | 500 | 24 | 240 | base | ivsg_hs_alt2d2_t | 1.05 | 1.05 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24219 | PISGAH | 230 | 24 | 240 | base | ivsg_hs_alt2d2_t | 1.05 | 1.05 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24775 | RUSH | 115 | 24 | 247 | base | ivsg_hs_alt2d2_t | 1.05 | 1.05 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24138 | SERRANO | 500 | 24 | 240 | base | ivsg_hs_alt2d2_t | 1.051 | 1.051 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24627 | CIMA | 230 | 24 | 240 | base | ivsg_hs_alt2d2_t | 1.051 | 1.051 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24229 | VALLEY-S | 115 | 24 | 240 | base | ivsg_hs_alt2d2_t | 1.051 | 1.051 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 25991 | VALYSVC2 | 115 | 24 | 240 | base | ivsg_hs_alt2d2_t | 1.051 | 1.051 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15090 | HASSYAMP | 500 | 14 | 158 | base | ivsg_hs_alt2d2_t | 1.053 | 1.053 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15092 | ARLINTON | 500 | 14 | 158 | base | ivsg_hs_alt2d2_t | 1.053 | 1.053 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15094 | MESQUITE | 500 | 14 | 158 | base | ivsg_hs_alt2d2_t | 1.053 | 1.053 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 22536 | N.GILA | 500 | 22 | 227 | base | ivsg_hs_alt2d2_t | 1.053 | 1.053 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14009 | REDHAWK | 500 | 14 | 141 | base | ivsg_hs_alt2d2_t | 1.054 | 1.054 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 79043 | KAYENTA | 230 | 14 | 191 | base | ivsg_hs_alt2d2_t | 1.055 | 1.055 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14010 | TS5 | 500 | 14 | 141 | base | ivsg_hs_alt2d2_t | 1.056 | 1.056 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14230 | VERDE N | 230 | 14 | 141 | base | ivsg_hs_alt2d2_t | 1.057 | 1.057 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14247 | VERDE S | 230 | 14 | 141 | base | ivsg_hs_alt2d2_t | 1.057 | 1.057 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14011 | RACEWAY | 500 | 14 | 141 | base | ivsg_hs_alt2d2_t | 1.057 | 1.057 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24151 | VALLEYSC | 500 | 24 | 240 | base | ivsg_hs_alt2d2_t | 1.057 | 1.057 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24997 | VALYSVC1 | 500 | 24 | 240 | base | ivsg_hs_alt2d2_t | 1.057 | 1.057 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 28040 | CALPINE | 500 | 24 | 240 | base | ivsg_hs_alt2d2_t | 1.057 | 1.057 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24776 | LEE VINE | 115 | 24 | 247 | base | ivsg_hs_alt2d2_t | 1.058 | 1.058 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24086 | LUGO | 500 | 24 | 240 | base | ivsg_hs_alt2d2_t | 1.059 | 1.059 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15041 | SILVERKG | 500 | 14 | 158 | base | ivsg_hs_alt2d2_t | 1.06 | 1.06 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15061 | RUDD | 500 | 14 | 158 | base | ivsg_hs_alt2d2_t | 1.06 | 1.06 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15093 | HARQUAHA | 500 | 14 | 158 | base | ivsg_hs_alt2d2_t | 1.06 | 1.06 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14205 | COCONINO | 230 | 14 | 141 | base | ivsg_hs_alt2d2_t | 1.06 | 1.06 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14008 | JOJOBA | 500 | 14 | 141 | base | ivsg_hs_alt2d2_t | 1.06 | 1.06 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15034 | PERKINS | 500 | 14 | 158 | base | ivsg_hs_alt2d2_t | 1.061 | 1.061 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14234 | YAVAPAI | 230 | 14 | 141 | base | ivsg_hs_alt2d2_t | 1.062 | 1.062 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14355 | PRESCOTT | 115 | 14 | 141 | base | ivsg_hs_alt2d2_t | 1.065 | 1.065 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14543 | PRESCOT1 | 100 | 14 | 141 | base | ivsg_hs_alt2d2_t | 1.065 | 1.065 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14256 | FLAGSTAF | 230 | 14 | 141 | base | ivsg_hs_alt2d2_t | 1.065 | 1.065 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14544 | PRESCOT2 | 100 | 14 | 141 | base | ivsg_hs_alt2d2_t | 1.066 | 1.066 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14587 | FLAGSTF1 | 100 | 14 | 141 | base | ivsg_hs_alt2d2_t | 1.066 | 1.066 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24156 | VINCENT | 500 | 24 | 240 | base | ivsg_hs_alt2d2_t | 1.067 | 1.067 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14001 | FOURCORN | 500 | 14 | 141 | base | ivsg_hs_alt2d2_t | 1.068 | 1.068 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 79264 | PINAL_W | 500 | 14 | 141 | base | ivsg_hs_alt2d2_t | 1.068 | 1.068 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24729 | INYO | 230 | 24 | 247 | base | ivsg_hs_alt2d2_t | 1.068 | 1.068 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14007 | GILARIVR | 500 | 14 | 141 | base | ivsg_hs_alt2d2_t | 1.069 | 1.069 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14006 | YAVAPAI | 500 | 14 | 141 | base | ivsg_hs_alt2d2_t | 1.07 | 1.07 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15992 | SEV | 500 | 14 | 158 | base | ivsg_hs_alt2d2_t | 1.072 | 1.072 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14004 | SAGUARO | 500 | 14 | 141 | base | ivsg_hs_alt2d2_t | 1.073 | 1.073 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 16000 | TORTOLIT | 500 | 14 | 160 | base | ivsg_hs_alt2d2_t | 1.073 | 1.073 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 16001 | TORTLIT2 | 500 | 14 | 160 | base | ivsg_hs_alt2d2_t | 1.073 | 1.073 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14215 | LEUPP | 230 | 14 | 141 | base | ivsg_hs_alt2d2_t | 1.074 | 1.074 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14100 | CHOLLA | 345 | 14 | 141 | base | ivsg_hs_alt2d2_t | 1.075 | 1.075 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15001 | CORONADO | 500 | 14 | 158 | base | ivsg_hs_alt2d2_t | 1.079 | 1.079 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14000 | CHOLLA | 500 | 14 | 141 | base | ivsg_hs_alt2d2_t | 1.08 | 1.08 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 19038 | MEAD | 500 | 14 | 191 | base | ivsg_hs_alt2d2_t | 1.085 | 1.085 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24042 | ELDORDO | 500 | 24 | 240 | base | ivsg_hs_alt2d2_t | 1.086 | 1.086 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14204 | CHOLLA | 230 | 14 | 141 | base | ivsg_hs_alt2d2_t | 1.087 | 1.087 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24097 | MOHAVE | 500 | 24 | 240 | base | ivsg_hs_alt2d2_t | 1.089 | 1.089 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14509 | CHOLLA 7 | 100 | 14 | 141 | base | ivsg_hs_alt2d2_t | 1.092 | 1.092 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14267 | SECDKNOL | 230 | 14 | 141 | base | ivsg_hs_alt2d2_t | 1.098 | 1.098 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14003 | NAVAJO | 500 | 14 | 141 | base | ivsg_hs_alt2d2_t | 1.102 | 1.102 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14002 | MOENKOPI | 500 | 14 | 141 | base | ivsg_hs_alt2d2_t | 1.104 | 1.104 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |

ivsg_hs_alt2d2.sav
Flow Summary
N-0 Outages

| LEGEND | % of RATING 1 | |
|---|---|---|
| C_pu | 100% - 110% | |
| C_pu | 110% - 120% | P.U. of |
| C_pu | > 120% | Rate 1 |

| FROM | FR | BKV | TO | TO | BKV | CK | Outage_Name | Case | Rate-Mva | Pflow | Qflow | Amps | MVA | C_pu | B_pu | Contingency_Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 14248 | GLENDALW | 230 | 14212 | GLENDALE | 230 | 1 | base | ivsg_hs_alt2d2_t | 457 | 605.4 | 29.1 | 1519.4 | 606.1 | 1.324 | 1.324 | Base system (n-0) |
| 14248 | GLENDALW | 230 | 15201 | AGUAFRIA | 230 | 1 | base | ivsg_hs_alt2d2_t | 457 | -605.4 | -29.2 | 1519.4 | 606.1 | 1.324 | 1.324 | Base system (n-0) |
| 24910 | CAL ELEC | 115 | 24912 | SHANDIN | 115 | 1 | base | ivsg_hs_alt2d2_t | 109.1 | -124.1 | 58.3 | 681 | 137.1 | 1.246 | 1.246 | Base system (n-0) |
| 14221 | PNPKAPS | 230 | 19062 | PINPK | 230 | 1 | base | ivsg_hs_alt2d2_t | 637.4 | -784.2 | -184.1 | 1987 | 805.6 | 1.242 | 1.242 | Base system (n-0) |
| 14212 | GLENDALE | 230 | 14270 | GRNDTRML | 230 | 1 | base | ivsg_hs_alt2d2_t | 457 | 540 | 21.5 | 1354.9 | 540.4 | 1.183 | 1.183 | Base system (n-0) |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | base | ivsg_hs_alt2d2_t | 204.1 | 240.3 | -8.9 | 995.8 | 240.5 | 1.166 | 1.166 | Base system (n-0) |
| 24912 | SHANDIN | 115 | 24916 | TAP902 | 115 | 1 | base | ivsg_hs_alt2d2_t | 109.1 | -119.2 | 33.5 | 611.9 | 123.8 | 1.118 | 1.118 | Base system (n-0) |
| 14206 | CTRYCLUB | 230 | 14270 | GRNDTRML | 230 | 1 | base | ivsg_hs_alt2d2_t | 509.9 | -536.2 | -17.8 | 1357.3 | 536.5 | 1.06 | 1.06 | Base system (n-0) |
| 14202 | CACTUS | 230 | 14221 | PNPKAPS | 230 | 1 | base | ivsg_hs_alt2d2_t | 371 | -366.6 | -47.3 | 929.4 | 369.6 | 0.998 | 0.998 | Base system (n-0) |
| 14008 | JOJOBA | 500 | 15011 | KYRENE | 500 | 1 | base | ivsg_hs_alt2d2_t | 1732 | 1815.2 | 164.4 | 1985.5 | 1822.6 | 0.995 | 0.995 | Base system (n-0) |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | base | ivsg_hs_alt2d2_t | 392 | 388.4 | 8.4 | 972.2 | 388.4 | 0.99 | 0.99 | Base system (n-0) |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | base | ivsg_hs_alt2d2_t | 132 | 127.6 | -11.1 | 803.1 | 128 | 0.969 | 0.969 | Base system (n-0) |
| 15230 | RUDD | 230 | 15218 | WHITETNK | 230 | 1 | base | ivsg_hs_alt2d2_t | 725 | 694.8 | -17.5 | 1742.8 | 695 | 0.958 | 0.958 | Base system (n-0) |
| 24087 | MAGUNDEN | 230 | 24101 | OMAR | 230 | 1 | base | ivsg_hs_alt2d2_t | 643 | -591.8 | 130.8 | 1532.1 | 606.1 | 0.95 | 0.95 | Base system (n-0) |
| 24806 | MIRAGE | 230 | 24807 | MIRAGE | 115 | 1 | base | ivsg_hs_alt2d2_t | 280 | 265.7 | 28.1 | 678.8 | 267.1 | 0.95 | 0.95 | Base system (n-0) |
| 24806 | MIRAGE | 230 | 24807 | MIRAGE | 115 | 2 | base | ivsg_hs_alt2d2_t | 280 | 265.7 | 28.1 | 678.8 | 267.1 | 0.95 | 0.95 | Base system (n-0) |
| 24702 | KRAMER | 115 | 24753 | SUNGEN | 115 | 1 | base | ivsg_hs_alt2d2_t | 183.3 | -170.5 | 30.9 | 863.6 | 173.3 | 0.939 | 0.939 | Base system (n-0) |
| 14207 | DEERVALY | 230 | 14231 | WESTWING | 230 | 1 | base | ivsg_hs_alt2d2_t | 720 | -667.1 | -77.9 | 1685.6 | 671.6 | 0.933 | 0.933 | Base system (n-0) |
| 26098 | SYLMAR3 | 230 | 24147 | SYLMAR S | 230 | 1 | base | ivsg_hs_alt2d2_t | 1100 | 840.3 | -522.4 | 2565.7 | 989.5 | 0.929 | 0.929 | Base system (n-0) |
| 17003 | AVRA | 115 | 17012 | MARANA | 115 | 1 | base | ivsg_hs_alt2d2_t | 71.7 | -64.9 | -5.8 | 333.5 | 65.2 | 0.927 | 0.927 | Base system (n-0) |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | base | ivsg_hs_alt2d2_t | 56 | 49.9 | -10.8 | 253.1 | 51.1 | 0.92 | 0.92 | Base system (n-0) |
| 19215 | SPOOKHIL | 230 | 19045 | COOLIDGE | 230 | 1 | base | ivsg_hs_alt2d2_t | 352 | -317.9 | 45.9 | 808.2 | 321.2 | 0.916 | 0.916 | Base system (n-0) |
| 15212 | ROGERS | 230 | 19215 | SPOOKHIL | 230 | 1 | base | ivsg_hs_alt2d2_t | 352 | -316.1 | 55.9 | 807.4 | 321 | 0.915 | 0.915 | Base system (n-0) |

ivsg_hs_alt2d2.sav
VOLTAGE Summary
N-1 Outages

| Bus | Name | kV | Area | Zone | Outage | Case | Vbase | Vcont | DeltaV | Vmin | Vmax | Max-dv | Contingency Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24017 | BLYTHESC | 161 | 24 | 248 | line_007 | ivsg_hs_alt2d2_t | 1.02 | 0.863 | -0.156 | 0.9 | 1.05 | 0.05 | line BLYTHE to BLYTHESC 161 ck 1 |
| 24822 | INDIAN W | 115 | 24 | 248 | tran_238 | ivsg_hs_alt2d2_t | 1.022 | 0.925 | -0.097 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 24731 | INYOKERN | 115 | 24 | 247 | line_175 | ivsg_hs_alt2d2_t | 1 | 0.926 | -0.074 | 0.9 | 1.05 | 0.05 | line INYO to COTTONWD 230 ck 1 |
| 24819 | CONCHO | 115 | 24 | 248 | tran_238 | ivsg_hs_alt2d2_t | 1.022 | 0.926 | -0.097 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 24816 | SANTA RO | 115 | 24 | 248 | tran_238 | ivsg_hs_alt2d2_t | 1.026 | 0.93 | -0.097 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 24821 | TAMARISK | 115 | 24 | 248 | tran_238 | ivsg_hs_alt2d2_t | 1.026 | 0.93 | -0.096 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 24827 | TAP823 | 115 | 24 | 248 | tran_238 | ivsg_hs_alt2d2_t | 1.028 | 0.932 | -0.096 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 25633 | CAPWIND | 115 | 24 | 248 | tran_238 | ivsg_hs_alt2d2_t | 1.028 | 0.933 | -0.095 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 25622 | TAP806 | 115 | 24 | 248 | tran_238 | ivsg_hs_alt2d2_t | 1.028 | 0.933 | -0.095 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 24829 | TAP821 | 115 | 24 | 248 | tran_238 | ivsg_hs_alt2d2_t | 1.028 | 0.933 | -0.095 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 22464 | MIGUEL | 230 | 22 | 222 | B2_002 | ivsg_hs_alt2d2_t | 1.002 | 0.934 | -0.067 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22468 | MIGUEL | 500 | 22 | 227 | B2_002 | ivsg_hs_alt2d2_t | 1.01 | 0.934 | -0.076 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22472 | MIGUELMP | 500 | 22 | 227 | B2_002 | ivsg_hs_alt2d2_t | 1.004 | 0.934 | -0.069 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 24807 | MIRAGE | 115 | 24 | 248 | tran_238 | ivsg_hs_alt2d2_t | 1.03 | 0.936 | -0.095 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 22412 | LOSCOCHS | 138 | 22 | 223 | B2_002 | ivsg_hs_alt2d2_t | 0.998 | 0.937 | -0.061 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22428 | MAINST51 | 138 | 22 | 222 | B2_002 | ivsg_hs_alt2d2_t | 0.998 | 0.939 | -0.059 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22424 | MAINST50 | 138 | 22 | 222 | B2_002 | ivsg_hs_alt2d2_t | 0.998 | 0.94 | -0.059 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22734 | SANTEE | 138 | 22 | 223 | B2_002 | ivsg_hs_alt2d2_t | 0.998 | 0.94 | -0.059 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 25423 | ESRP MWD | 115 | 24 | 254 | tran_247 | ivsg_hs_alt2d2_t | 1.027 | 0.941 | -0.086 | 0.9 | 1.05 | 0.05 | tran VALLEYSC 500 to VALLEYSC 115 ck 1 |
| 25423 | ESRP MWD | 115 | 24 | 254 | tran_248 | ivsg_hs_alt2d2_t | 1.027 | 0.941 | -0.086 | 0.9 | 1.05 | 0.05 | tran VALLEYSC 500 to VALLEYSC 115 ck 2 |
| 24160 | VALLEYSC | 115 | 24 | 240 | tran_247 | ivsg_hs_alt2d2_t | 1.03 | 0.944 | -0.086 | 0.9 | 1.05 | 0.05 | tran VALLEYSC 500 to VALLEYSC 115 ck 1 |
| 25990 | VALYSVC1 | 115 | 24 | 240 | tran_247 | ivsg_hs_alt2d2_t | 1.03 | 0.944 | -0.086 | 0.9 | 1.05 | 0.05 | tran VALLEYSC 500 to VALLEYSC 115 ck 1 |
| 24160 | VALLEYSC | 115 | 24 | 240 | tran_248 | ivsg_hs_alt2d2_t | 1.03 | 0.944 | -0.086 | 0.9 | 1.05 | 0.05 | tran VALLEYSC 500 to VALLEYSC 115 ck 2 |
| 25990 | VALYSVC1 | 115 | 24 | 240 | tran_248 | ivsg_hs_alt2d2_t | 1.03 | 0.944 | -0.086 | 0.9 | 1.05 | 0.05 | tran VALLEYSC 500 to VALLEYSC 115 ck 2 |
| 22832 | SYCAMORE | 230 | 22 | 221 | B2_002 | ivsg_hs_alt2d2_t | 1.003 | 0.946 | -0.057 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22772 | SOUTHBAY | 138 | 22 | 222 | B2_002 | ivsg_hs_alt2d2_t | 1.006 | 0.947 | -0.058 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22116 | CARLTHTP | 138 | 22 | 223 | B2_002 | ivsg_hs_alt2d2_t | 1.004 | 0.949 | -0.055 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22120 | CARLTNHS | 138 | 22 | 223 | B2_002 | ivsg_hs_alt2d2_t | 1.004 | 0.95 | -0.054 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22865 | UPTOWN | 138 | 22 | 221 | B2_002 | ivsg_hs_alt2d2_t | 1.006 | 0.951 | -0.055 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 25405 | IRON MTN | 230 | 24 | 248 | line_192 | ivsg_hs_alt2d2_t | 1.002 | 0.951 | -0.051 | 0.9 | 1.05 | 0.05 | line IRON MTN to CAMINO 230 ck 1 |
| 22852 | TELECYN | 138 | 22 | 222 | B2_002 | ivsg_hs_alt2d2_t | 1.017 | 0.956 | -0.061 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22672 | PRCTRVLY | 138 | 22 | 222 | B2_002 | ivsg_hs_alt2d2_t | 1.02 | 0.957 | -0.063 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22831 | SYCAMORE | 138 | 22 | 221 | B2_002 | ivsg_hs_alt2d2_t | 1.01 | 0.957 | -0.053 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22460 | MIGUEL | 138 | 22 | 222 | B2_002 | ivsg_hs_alt2d2_t | 1.022 | 0.958 | -0.064 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22500 | MISSION | 138 | 22 | 221 | B2_002 | ivsg_hs_alt2d2_t | 1.008 | 0.958 | -0.05 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22738 | CENTRALX | 230 | 22 | 225 | B2_002 | ivsg_hs_alt2d2_t | 1.02 | 0.958 | -0.062 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22737 | CENTRALX | 500 | 22 | 225 | B2_002 | ivsg_hs_alt2d2_t | 1.024 | 0.963 | -0.06 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 14534 | N.GILA 4 | 100 | 14 | 847 | NG500/69 | ivsg_hs_alt2d2_t | 0.945 | 1 | 0.055 | 0.9 | 1.05 | 0.05 | tran N.GILA 500 to N.GILA 69 ck 1 |
| 24035 | EAGLEMTN | 161 | 24 | 248 | tran_241 | ivsg_hs_alt2d2_t | 0.928 | 1.026 | 0.098 | 0.9 | 1.05 | 0.05 | tran EAGLEMTN 230 to EAGLEMTN 161 ck 1 |
| 24730 | INYO PS | 115 | 24 | 247 | tran_229 | ivsg_hs_alt2d2_t | 1.026 | 1.078 | 0.052 | 0.9 | 1.05 | 0.05 | tran INYO 115 to INYO PS 115 ck 1 |
| 24142 | SYC CYN | 230 | 24 | 240 | line_086 | ivsg_hs_alt2d2_t | 0.985 | 1.091 | 0.106 | 0.9 | 1.05 | 0.05 | line MAGUNDEN to OMAR 230 ck 1 |
| 25613 | EDMONSTN | 230 | 24 | 256 | line_122 | ivsg_hs_alt2d2_t | 1 | 1.091 | 0.091 | 0.9 | 1.05 | 0.05 | line PASTORIA to EDMONSTN 230 ck 1 |
| 24142 | SYC CYN | 230 | 24 | 240 | line_140 | ivsg_hs_alt2d2_t | 0.985 | 1.091 | 0.106 | 0.9 | 1.05 | 0.05 | line SYC CYN to OMAR 230 ck 1 |

ivsg_hs_alt2d2.sav
FLOW Summary
N-1 Outages

| LEGEND | % of RATING 1 | |
|---|---|---|
| C_pu | 100% - 110% | |
| C_pu | 110% - 120% | P.U. of |
| C_pu | > 120% | Rate 1 |

| FROM | FR | BKV | TO | TO | BKV | CK | Outage_Name | Case | Rate-Mva | Pflow | Qflow | Amps | MVA | C_pu | B_pu | Contingency_Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24142 | SYC CYN | 230 | 24101 | OMAR | 230 | 1 | line_086 | ivsg_hs_alt2d2_t | 643 | 769.2 | 5511.1 | 12804.3 | 5564.6 | 7.934 | 0.47 | line MAGUNDEN to OMAR 230 ck 1 |
| 24781 | NAVYCOSO | 230 | 24706 | BLM EAST | 230 | 1 | line_173 | ivsg_hs_alt2d2_t | 1287 | -153.8 | -3160.7 | 7943.3 | 3164.4 | 2.459 | 0.056 | line BLM EAST to BLM WEST 230 ck 1 |
| 24781 | NAVYCOSO | 230 | 24706 | BLM EAST | 230 | 1 | line_174 | ivsg_hs_alt2d2_t | 1287 | -153.8 | -3160.7 | 7943.3 | 3164.4 | 2.459 | 0.056 | line BLM WEST to KRAMER 230 ck 1 |
| 24806 | MIRAGE | 230 | 24807 | MIRAGE | 115 | 2 | tran_238 | ivsg_hs_alt2d2_t | 280 | 532.4 | 212.5 | 1495 | 573.3 | 2.05 | 0.95 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_175 | ivsg_hs_alt2d2_t | 56 | -103.6 | -1.2 | 532.2 | 103.6 | 1.86 | 0.92 | line INYO to COTTONWD 230 ck 1 |
| 24151 | VALLEYSC | 500 | 24160 | VALLEYSC | 115 | 2 | tran_247 | ivsg_hs_alt2d2_t | 560 | 853.2 | 358.4 | 1026.2 | 925.4 | 1.65 | 0.77 | tran VALLEYSC 500 to VALLEYSC 115 ck 1 |
| 24151 | VALLEYSC | 500 | 24160 | VALLEYSC | 115 | 1 | tran_248 | ivsg_hs_alt2d2_t | 560 | 853.2 | 358.4 | 1026.2 | 925.4 | 1.65 | 0.77 | tran VALLEYSC 500 to VALLEYSC 115 ck 2 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_002 | ivsg_hs_alt2d2_t | 204.1 | 312.5 | -8.6 | 1366.9 | 312.7 | 1.601 | 1.166 | IMPRLVLY - MIGUEL 1 500kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_009 | ivsg_hs_alt2d2_t | 204.1 | 324.8 | -13 | 1363.1 | 325.1 | 1.596 | 1.166 | EPP - ESCNDIDO 1 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_032 | ivsg_hs_alt2d2_t | 204.1 | 312.4 | -11.7 | 1322.4 | 312.6 | 1.549 | 1.166 | OTAYMESA - MLMS3TAP 1 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_034 | ivsg_hs_alt2d2_t | 204.1 | 312.4 | -11 | 1323.1 | 312.6 | 1.549 | 1.166 | OLD TOWN - MLMS3TAP 1 230kV |
| 24151 | VALLEYSC | 500 | 24229 | VALLEY-S | 115 | 4 | tran_249 | ivsg_hs_alt2d2_t | 560 | 830.7 | 204.5 | 945.4 | 855.5 | 1.53 | 0.75 | tran VALLEYSC 500 to VALLEY-S 115 ck 3 |
| 24151 | VALLEYSC | 500 | 24229 | VALLEY-S | 115 | 3 | tran_250 | ivsg_hs_alt2d2_t | 560 | 830.6 | 204.5 | 945.4 | 855.4 | 1.53 | 0.75 | tran VALLEYSC 500 to VALLEY-S 115 ck 4 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_202 | ivsg_hs_alt2d2_t | 56 | 77.4 | -7.5 | 392.5 | 77.7 | 1.4 | 0.92 | line OWENSCON to INYO 230 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | SX70 | ivsg_hs_alt2d2_t | 204.1 | 286 | 5.6 | 1190.6 | 286 | 1.394 | 1.166 | tran SYCAMORE 230 to SYCAMORE 69 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | ML60 | ivsg_hs_alt2d2_t | 204.1 | 283.2 | -5.7 | 1179.9 | 283.3 | 1.382 | 1.166 | tran MIGUEL 230 to MIGUEL 138 ck 1 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | B2_009 | ivsg_hs_alt2d2_t | 392 | 534 | 27.8 | 1352.6 | 534.7 | 1.36 | 0.99 | EPP - ESCNDIDO 1 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_013 | ivsg_hs_alt2d2_t | 204.1 | 266 | -13.1 | 1107.1 | 266.3 | 1.297 | 1.166 | EPP - SYCAMORE 1 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | MS60 | ivsg_hs_alt2d2_t | 204.1 | 262.9 | -2.8 | 1093.1 | 263 | 1.28 | 1.166 | tran MISSION 230 to MISSION 138 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | MS61 | ivsg_hs_alt2d2_t | 204.1 | 262.9 | -2.8 | 1093.1 | 263 | 1.28 | 1.166 | tran MISSION 230 to MISSION 138 ck 2 |
| 22356 | IMPRLVLY | 230 | 22360 | IMPRLVLY | 500 | 1 | IV81 | ivsg_hs_alt2d2_t | 600 | 736 | 180.9 | 1898.6 | 758 | 1.26 | 0.56 | tran IMPRLVLY 230 to IMPRLVLY 500 ck 2 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | B2_032 | ivsg_hs_alt2d2_t | 392 | 489.1 | 14.2 | 1251.6 | 489.3 | 1.25 | 0.99 | OTAYMESA - MLMS3TAP 1 230kV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | B2_034 | ivsg_hs_alt2d2_t | 392 | 489.1 | 14.9 | 1252.2 | 489.4 | 1.25 | 0.99 | OLD TOWN - MLMS3TAP 1 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | ML70 | ivsg_hs_alt2d2_t | 204.1 | 255.2 | -4 | 1061.6 | 255.2 | 1.243 | 1.166 | tran MIGUEL 69 to MIGUEL 230 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | ML71 | ivsg_hs_alt2d2_t | 204.1 | 255.2 | -4 | 1061.6 | 255.2 | 1.243 | 1.166 | tran MIGUEL 69 to MIGUEL 230 ck 2 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_015 | ivsg_hs_alt2d2_t | 204.1 | 254.4 | -7.8 | 1056.3 | 254.5 | 1.237 | 1.166 | MIGUEL - MISSION 1 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_020 | ivsg_hs_alt2d2_t | 204.1 | 254 | -8.4 | 1054.5 | 254.1 | 1.235 | 1.166 | MIGUEL - MISSION 2 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_007 | ivsg_hs_alt2d2_t | 204.1 | 250.7 | -6.4 | 1042 | 250.8 | 1.22 | 1.166 | PENSQTOS - ENCINA 1 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | ML80 | ivsg_hs_alt2d2_t | 204.1 | 250.2 | -8.5 | 1042.1 | 250.3 | 1.22 | 1.166 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | MS70 | ivsg_hs_alt2d2_t | 204.1 | 250.1 | -2 | 1040.4 | 250.1 | 1.218 | 1.166 | tran MISSION 230 to MISSION 69 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | ML81 | ivsg_hs_alt2d2_t | 204.1 | 249.3 | -8.5 | 1037.9 | 249.4 | 1.215 | 1.166 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | SO2 | ivsg_hs_alt2d2_t | 204.1 | 246.3 | -6.2 | 1031.7 | 246.3 | 1.208 | 1.166 | gen S.ONOFR2 22.00 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_014 | ivsg_hs_alt2d2_t | 204.1 | 248.4 | -7.3 | 1028 | 248.5 | 1.204 | 1.166 | ENCINATP - ENCINA 1 230kV |
| 24723 | CONTROL | 115 | 24731 | INYOKERN | 115 | 1 | line_175 | ivsg_hs_alt2d2_t | 82.7 | 96.2 | -4 | 497.6 | 96.3 | 1.198 | 0.421 | line INYO to COTTONWD 230 ck 1 |
| 24723 | CONTROL | 115 | 24731 | INYOKERN | 115 | 2 | line_175 | ivsg_hs_alt2d2_t | 82.7 | 96.2 | -4 | 497.6 | 96.3 | 1.198 | 0.421 | line INYO to COTTONWD 230 ck 1 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | B2_002 | ivsg_hs_alt2d2_t | 392 | 462.8 | -2.4 | 1228.5 | 462.8 | 1.19 | 0.99 | IMPRLVLY - MIGUEL 1 500kV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | SX70 | ivsg_hs_alt2d2_t | 392 | 460.2 | 37.3 | 1155.1 | 461.7 | 1.18 | 0.99 | tran SYCAMORE 230 to SYCAMORE 69 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | line_56 | ivsg_hs_alt2d2_t | 204.1 | 231.3 | -13 | 964.5 | 231.6 | 1.13 | 1.166 | line NEWSF500 to IMPRLVLY 500 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_008 | ivsg_hs_alt2d2_t | 204.1 | 231.9 | -4.1 | 962.6 | 231.9 | 1.127 | 1.166 | PENSQTOS - OLD TOWN 1 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | line_7 | ivsg_hs_alt2d2_t | 204.1 | 232.9 | -5.7 | 961.7 | 233 | 1.126 | 1.166 | line BANIS230 to NEWSF230 230 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | tran_74 | ivsg_hs_alt2d2_t | 204.1 | 232.9 | -5.7 | 961.7 | 233 | 1.126 | 1.166 | tran NEWSF230 230 to NEWSF500 500 ck 1 |
| 22468 | MIGUEL | 500 | 22472 | MIGUELMP | 500 | 1 | ML81 | ivsg_hs_alt2d2_t | 1120 | 1237.5 | 216 | 1436.4 | 1256.2 | 1.12 | 0.65 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 24729 | INYO | 230 | 24730 | INYO PS | 115 | 1 | line_175 | ivsg_hs_alt2d2_t | 50 | 51.8 | 21.3 | 133.1 | 56 | 1.12 | 0.54 | line INYO to COTTONWD 230 ck 1 |
| 24729 | INYO | 230 | 24730 | INYO PS | 115 | 2 | line_175 | ivsg_hs_alt2d2_t | 50 | 51.8 | 21.3 | 133.1 | 56 | 1.12 | 0.54 | line INYO to COTTONWD 230 ck 1 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | ML60 | ivsg_hs_alt2d2_t | 392 | 434.9 | 17.6 | 1094.3 | 435.3 | 1.11 | 0.99 | tran MIGUEL 230 to MIGUEL 138 ck 1 |
| 22464 | MIGUEL | 230 | 22468 | MIGUEL | 500 | 1 | ML80 | ivsg_hs_alt2d2_t | 1120 | -1219 | -18.4 | 3083.1 | 1219.1 | 1.11 | 0.61 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 22464 | MIGUEL | 230 | 22472 | MIGUELMP | 500 | 1 | ML81 | ivsg_hs_alt2d2_t | 1120 | -1235.4 | -20.7 | 3122.5 | 1235.6 | 1.11 | 0.64 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | line_12 | ivsg_hs_alt2d2_t | 132 | 143.9 | -9.5 | 912.4 | 144.3 | 1.101 | 0.969 | line COACHELA to RAMON 230 ck 2 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | B2_013 | ivsg_hs_alt2d2_t | 392 | 432.6 | 8.9 | 1087.6 | 432.6 | 1.1 | 0.99 | EPP - SYCAMORE 1 230kV |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 2 | line_070 | ivsg_hs_alt2d2_t | 956 | -1024.4 | -32.9 | 2606.3 | 1024.9 | 1.086 | 0.595 | line LA FRESA to REDONDO 230 ck 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 1 | line_071 | ivsg_hs_alt2d2_t | 956 | -1024.4 | -32.9 | 2606.3 | 1024.9 | 1.086 | 0.595 | line LA FRESA to REDONDO 230 ck 2 |
| 24701 | KRAMER | 230 | 24085 | LUGO | 230 | 2 | line_169 | ivsg_hs_alt2d2_t | 478 | 526.3 | 0.8 | 1299.1 | 526.3 | 1.083 | 0.643 | line KRAMER to LUGO 230 ck 1 |
| 24701 | KRAMER | 230 | 24085 | LUGO | 230 | 1 | line_170 | ivsg_hs_alt2d2_t | 478 | 526.3 | 0.8 | 1299.1 | 526.3 | 1.083 | 0.643 | line KRAMER to LUGO 230 ck 2 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | B2_002 | ivsg_hs_alt2d2_t | 1120 | -1197 | -76.7 | 3142 | 1199.5 | 1.08 | 0.57 | IMPRLVLY - MIGUEL 1 500kV |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_169 | ivsg_hs_alt2d2_t | 56 | 58 | -10 | 293 | 58.9 | 1.06 | 0.92 | line KRAMER to LUGO 230 ck 1 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_170 | ivsg_hs_alt2d2_t | 56 | 58 | -10 | 293 | 58.9 | 1.06 | 0.92 | line KRAMER to LUGO 230 ck 2 |
| 22261 | EPP | 230 | 22260 | ESCNDIDO | 230 | 1 | B2_034 | ivsg_hs_alt2d2_t | 796.7 | 835.7 | -62.3 | 2105.3 | 838 | 1.053 | 0.877 | OLD TOWN - MLMS3TAP 1 230kV |
| 22261 | EPP | 230 | 22260 | ESCNDIDO | 230 | 1 | B2_032 | ivsg_hs_alt2d2_t | 796.7 | 835.7 | -62.9 | 2104.8 | 838 | 1.052 | 0.877 | OTAYMESA - MLMS3TAP 1 230kV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | MS60 | ivsg_hs_alt2d2_t | 392 | 411.9 | 16.9 | 1034 | 412.2 | 1.05 | 0.99 | tran MISSION 230 to MISSION 138 ck 1 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | MS61 | ivsg_hs_alt2d2_t | 392 | 411.9 | 16.9 | 1034 | 412.2 | 1.05 | 0.99 | tran MISSION 230 to MISSION 138 ck 2 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | B2_015 | ivsg_hs_alt2d2_t | 392 | 409.2 | 12 | 1026.2 | 409.4 | 1.04 | 0.99 | MIGUEL - MISSION 1 230kV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | B2_020 | ivsg_hs_alt2d2_t | 392 | 408.5 | 11.3 | 1024.6 | 408.7 | 1.04 | 0.99 | MIGUEL - MISSION 2 230kV |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | line_52 | ivsg_hs_alt2d2_t | 132 | 135.7 | -12.1 | 857.4 | 136.2 | 1.035 | 0.969 | line AVE58230 to AV58TP22 230 ck 1 |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | line_53 | ivsg_hs_alt2d2_t | 132 | 135.8 | -11.8 | 856.9 | 136.3 | 1.034 | 0.969 | line AV58TP22 to COACHELA 230 ck 1 |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_192 | ivsg_hs_alt2d2_t | 169 | 171.9 | 41.8 | 622.1 | 176.9 | 1.031 | 0.833 | line IRON MTN to CAMINO 230 ck 1 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | ML70 | ivsg_hs_alt2d2_t | 392 | 404.1 | 13.9 | 1015.4 | 404.3 | 1.03 | 0.99 | tran MIGUEL 69 to MIGUEL 230 ck 1 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | ML71 | ivsg_hs_alt2d2_t | 392 | 404.1 | 13.9 | 1015.4 | 404.3 | 1.03 | 0.99 | tran MIGUEL 69 to MIGUEL 230 ck 2 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | SO2 | ivsg_hs_alt2d2_t | 392 | 403.2 | 7.9 | 1021.2 | 403.3 | 1.03 | 0.99 | gen S.ONOFR2 22.00 |
| 24114 | PARDEE | 230 | 24200 | SAUG TAP | 230 | 2 | line_117 | ivsg_hs_alt2d2_t | 494 | 501.7 | 27.2 | 1276.3 | 502.5 | 1.029 | 0.51 | line PARDEE to SAUG TAP 230 ck 1 |
| 24114 | PARDEE | 230 | 24200 | SAUG TAP | 230 | 1 | line_118 | ivsg_hs_alt2d2_t | 494 | 501.7 | 27.2 | 1276.2 | 502.5 | 1.029 | 0.518 | line PARDEE to SAUG TAP 230 ck 2 |
| 22831 | SYCAMORE | 138 | 22124 | CHCARITA | 138 | 1 | B2_009 | ivsg_hs_alt2d2_t | 204.1 | 207.4 | -24.8 | 875.7 | 208.8 | 1.026 | 0.718 | EPP - ESCNDIDO 1 230kV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | B2_007 | ivsg_hs_alt2d2_t | 392 | 400.7 | 12 | 1005.8 | 400.9 | 1.02 | 0.99 | PENSQTOS - ENCINA 1 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_029 | ivsg_hs_alt2d2_t | 204.1 | 208.4 | -3.8 | 865.2 | 208.5 | 1.013 | 1.166 | OTAYMESA - MLSXTAP 1 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_031 | ivsg_hs_alt2d2_t | 204.1 | 208.2 | -4.7 | 865.4 | 208.3 | 1.013 | 1.166 | SYCAMORE - MLSXTAP 1 230kV |
| 22261 | EPP | 230 | 22260 | ESCNDIDO | 230 | 1 | SX60 | ivsg_hs_alt2d2_t | 796.7 | 811 | -36.7 | 2023.9 | 811.9 | 1.012 | 0.877 | tran SYCAMORE 230 to SYCAMORE 138 ck 1 |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | B2_002 | ivsg_hs_alt2d2_t | 132 | 130.4 | -10.6 | 836.6 | 130.8 | 1.01 | 0.969 | IMPRLVLY - MIGUEL 1 500kV |
| 22504 | MISSION | 230 | 22500 | MISSION | 138 | 2 | MS60 | ivsg_hs_alt2d2_t | 392 | 378.1 | 114.3 | 1000.3 | 395 | 1.01 | 0.67 | tran MISSION 230 to MISSION 138 ck 1 |
| 22504 | MISSION | 230 | 22500 | MISSION | 138 | 1 | MS61 | ivsg_hs_alt2d2_t | 392 | 378.1 | 114.3 | 1000.3 | 395 | 1.01 | 0.67 | tran MISSION 230 to MISSION 138 ck 2 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_201 | ivsg_hs_alt2d2_t | 56 | 54.7 | -10.7 | 276.8 | 55.7 | 1.01 | 0.92 | line SYLMAR3 to SYLMAR S 230 ck 1 |
| 22261 | EPP | 230 | 22260 | ESCNDIDO | 230 | 1 | SX70 | ivsg_hs_alt2d2_t | 796.7 | 807.6 | -11.5 | 2017.8 | 807.6 | 1.009 | 0.877 | tran SYCAMORE 230 to SYCAMORE 69 ck 1 |
| 24303 | BIG CRK3 | 230 | 24235 | RECTOR | 230 | 1 | line_155 | ivsg_hs_alt2d2_t | 353 | 361 | 49.5 | 894.4 | 364.4 | 1.009 | 0.729 | line BIG CRK1 to RECTOR 230 ck 1 |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | line_7 | ivsg_hs_alt2d2_t | 132 | 130.4 | -11.4 | 833.6 | 130.9 | 1.006 | 0.969 | line BANIS230 to NEWSF230 230 ck 1 |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | tran_74 | ivsg_hs_alt2d2_t | 132 | 130.5 | -11.4 | 833.2 | 131 | 1.006 | 0.969 | tran NEWSF230 230 to NEWSF500 500 ck 1 |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | line_44 | ivsg_hs_alt2d2_t | 132 | 130.9 | -10.4 | 828.9 | 131.3 | 1.001 | 0.969 | line COACHELA to DEVERS 230 ck 2 |
| 24301 | BIG CRK1 | 230 | 24235 | RECTOR | 230 | 1 | line_160 | ivsg_hs_alt2d2_t | 329 | 334.9 | 47.6 | 826.1 | 338.3 | 1 | 0.727 | line BIG CRK3 to RECTOR 230 ck 1 |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | line_303 | ivsg_hs_alt2d2_t | 132 | 129.7 | -10.3 | 828.3 | 130.1 | 1 | 0.969 | line HARQUAHA to DEVERS 500 ck 1 |
| 20238 | HRD-230 | 230 | 20239 | HRD-115 | 115 | 1 | B2_002 | ivsg_hs_alt2d2_t | 225 | 222.7 | 0.3 | 571.1 | 222.7 | 0.99 | 0.69 | IMPRLVLY - MIGUEL 1 500kV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | SX60 | ivsg_hs_alt2d2_t | 392 | 384.6 | 38.5 | 975.5 | 386.5 | 0.99 | 0.87 | tran SYCAMORE 230 to SYCAMORE 138 ck 1 |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_191 | ivsg_hs_alt2d2_t | 169 | 165.2 | 39.3 | 597.2 | 169.8 | 0.99 | 0.833 | line EAGLEMTN to IRON MTN 230 ck 1 |
| 24086 | LUGO | 500 | 24097 | MOHAVE | 500 | 1 | line_103 | ivsg_hs_alt2d2_t | 1386 | -1427.2 | 95.8 | 1566.1 | 1430.4 | 0.989 | 0.68 | line MOHAVE to ELDORDO 500 ck 1 |
| 8601 | GEOSUB2 | 230 | 8300 | BANIS230 | 230 | 1 | line_22 | ivsg_hs_alt2d2_t | 550 | 546.1 | 54.9 | 1353.3 | 548.9 | 0.981 | 0.72 | line GEOSUB1 to BANIS230 230 ck 1 |
| 8601 | GEOSUB2 | 230 | 8300 | BANIS230 | 230 | 1 | line_23 | ivsg_hs_alt2d2_t | 550 | 546.1 | 54.9 | 1353.3 | 548.9 | 0.981 | 0.72 | line GEOSUB1 to BANIS230 230 ck 2 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_015 | ivsg_hs_alt2d2_t | 392 | 380.2 | 41.4 | 958.3 | 382.4 | 0.98 | 0.87 | MIGUEL - MISSION 1 230kV |
| 22261 | EPP | 230 | 22260 | ESCNDIDO | 230 | 1 | SO2 | ivsg_hs_alt2d2_t | 796.7 | 776.4 | -41.9 | 1945.6 | 777.5 | 0.973 | 0.877 | gen S.ONOFR2 22.00 |
| 19020 | BLYTHE | 161 | 24017 | BLYTHESC | 161 | 1 | line_192 | ivsg_hs_alt2d2_t | 244 | 238.4 | 42.1 | 851.1 | 242.1 | 0.973 | 0.841 | line IRON MTN to CAMINO 230 ck 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_020 | ivsg_hs_alt2d2_t | 392 | 378.8 | 39.8 | 955.3 | 380.9 | 0.97 | 0.87 | MIGUEL - MISSION 2 230kV |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_123 | ivsg_hs_alt2d2_t | 56 | 52.6 | -10.7 | 266.7 | 53.7 | 0.97 | 0.92 | line PASTORIA to PSTRIA 230 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_200 | ivsg_hs_alt2d2_t | 56 | 52.7 | -10.8 | 266.8 | 53.8 | 0.97 | 0.92 | line SYLMAR1 to SYLMAR S 230 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | tran_210 | ivsg_hs_alt2d2_t | 56 | 52.5 | -10.5 | 265.7 | 53.6 | 0.97 | 0.92 | tran LUGO 500 to LUGO 230 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | tran_211 | ivsg_hs_alt2d2_t | 56 | 52.6 | -10.5 | 265.9 | 53.6 | 0.97 | 0.92 | tran LUGO 500 to LUGO 230 ck 2 |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_63 | ivsg_hs_alt2d2_t | 169 | 162.9 | 29.1 | 581.9 | 165.5 | 0.963 | 0.833 | line RAMON to MIRAGE 230 ck 2 |
| 22596 | OLD TOWN | 230 | 22466 | MLMS3TAP | 230 | 1 | B2_002 | ivsg_hs_alt2d2_t | 912 | -829.6 | 61.6 | 2200.9 | 831.9 | 0.961 | 0.697 | IMPRLVLY - MIGUEL 1 500kV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | line_7 | ivsg_hs_alt2d2_t | 392 | 376.1 | 12 | 937.7 | 376.3 | 0.96 | 0.99 | line BANIS230 to NEWSF230 230 ck 1 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | line_56 | ivsg_hs_alt2d2_t | 392 | 375.9 | -1.5 | 948.1 | 375.9 | 0.96 | 0.99 | line NEWSF500 to IMPRLVLY 500 ck 1 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | tran_74 | ivsg_hs_alt2d2_t | 392 | 376.1 | 12 | 937.7 | 376.3 | 0.96 | 0.99 | tran NEWSF230 230 to NEWSF500 500 ck 1 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | B2_003 | ivsg_hs_alt2d2_t | 392 | 376.5 | 5.9 | 944.6 | 376.6 | 0.96 | 0.99 | N.GILA - IMPRLVLY 1 500kV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_032 | ivsg_hs_alt2d2_t | 392 | 372.6 | 37.9 | 959.9 | 374.5 | 0.96 | 0.87 | OTAYMESA - MLMS3TAP 1 230kV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_034 | ivsg_hs_alt2d2_t | 392 | 372.5 | 38.3 | 960.4 | 374.5 | 0.96 | 0.87 | OLD TOWN - MLMS3TAP 1 230kV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | ML70 | ivsg_hs_alt2d2_t | 392 | 374.1 | 41.4 | 947.4 | 376.4 | 0.96 | 0.87 | tran MIGUEL 69 to MIGUEL 230 ck 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | ML71 | ivsg_hs_alt2d2_t | 392 | 374.1 | 41.4 | 947.4 | 376.4 | 0.96 | 0.87 | tran MIGUEL 69 to MIGUEL 230 ck 2 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_086 | ivsg_hs_alt2d2_t | 56 | 52 | -10.7 | 263.7 | 53.1 | 0.96 | 0.92 | line MAGUNDEN to OMAR 230 ck 1 |
| 24807 | MIRAGE | 115 | 24819 | CONCHO | 115 | 1 | tran_238 | ivsg_hs_alt2d2_t | 183 | 164.2 | -4.7 | 881.5 | 164.3 | 0.959 | 0.87 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 8376 | RTAP2 | 92 | 8974 | RTP1 | 92 | 1 | line_50 | ivsg_hs_alt2d2_t | 57 | -51.8 | 11.5 | 340.4 | 53 | 0.955 | 0.715 | line BANIS230 to AV58TP12 230 ck 1 |
| 8376 | RTAP2 | 92 | 8974 | RTP1 | 92 | 1 | line_51 | ivsg_hs_alt2d2_t | 57 | -51.8 | 11.3 | 340.4 | 53 | 0.955 | 0.715 | line AV58TP12 to AVE58230 230 ck 1 |
| 14008 | JOJOBA | 500 | 15011 | KYRENE | 500 | 1 | PV1 | ivsg_hs_alt2d2_t | 1732 | 1740 | 168.9 | 1895.3 | 1748.2 | 0.951 | 0.995 | gen PALOVRD1 24.00 |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_12 | ivsg_hs_alt2d2_t | 169 | 160.6 | 28.7 | 573.7 | 163.2 | 0.949 | 0.833 | line COACHELA to RAMON 230 ck 2 |
| 24807 | MIRAGE | 115 | 24816 | SANTA RO | 115 | 1 | tran_238 | ivsg_hs_alt2d2_t | 183.3 | 162.1 | -10.1 | 871.7 | 162.4 | 0.947 | 0.861 | tran MIRAGE 230 to MIRAGE 115 ck 1 |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 19020 | BLYTHE | 161 | 24017 | BLYTHESC | 161 | 1 | line_191 | ivsg_hs_alt2d2_t | 244 | 231.7 | 39.5 | 826.5 | 235.1 | 0.945 | 0.841 | line EAGLEMTN to IRON MTN 230 ck 1 |
| 8600 | GEOSUB1 | 230 | 8300 | BANIS230 | 230 | 1 | line_47 | ivsg_hs_alt2d2_t | 550 | 525.5 | 52.4 | 1302.6 | 528.1 | 0.944 | 0.669 | line GEOSUB2 to BANIS230 230 ck 1 |
| 8600 | GEOSUB1 | 230 | 8300 | BANIS230 | 230 | 2 | line_47 | ivsg_hs_alt2d2_t | 550 | 525.5 | 52.4 | 1302.6 | 528.1 | 0.944 | 0.669 | line GEOSUB2 to BANIS230 230 ck 1 |
| 22261 | EPP | 230 | 22260 | ESCNDIDO | 230 | 1 | line_207 | ivsg_hs_alt2d2_t | 796.7 | 754.9 | -46.9 | 1886.3 | 756.3 | 0.943 | 0.877 | line DEVERS to VALLEYSC 500 ck 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_009 | ivsg_hs_alt2d2_t | 392 | 364.4 | 39.9 | 927.9 | 366.6 | 0.94 | 0.87 | EPP - ESCNDIDO 1 230kV |
| 8600 | GEOSUB1 | 230 | 8300 | BANIS230 | 230 | 2 | line_22 | ivsg_hs_alt2d2_t | 550 | 520.6 | 53.2 | 1289.6 | 523.3 | 0.935 | 0.669 | line GEOSUB1 to BANIS230 230 ck 1 |
| 8600 | GEOSUB1 | 230 | 8300 | BANIS230 | 230 | 1 | line_23 | ivsg_hs_alt2d2_t | 550 | 520.6 | 53.2 | 1289.6 | 523.3 | 0.935 | 0.669 | line GEOSUB1 to BANIS230 230 ck 2 |
| 8311 | COACHELA | 230 | 8695 | RAMON | 230 | 2 | line_44 | ivsg_hs_alt2d2_t | 800 | 720.8 | -47.9 | 1870.2 | 722.4 | 0.931 | 0.688 | line COACHELA to DEVERS 230 ck 2 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | line_66 | ivsg_hs_alt2d2_t | 392 | 364.1 | 28.9 | 934.5 | 365.2 | 0.93 | 0.87 | line CENTRALX to NEWSF500 500 ck 1 |
| 19020 | BLYTHE | 161 | 24017 | BLYTHESC | 161 | 1 | line_63 | ivsg_hs_alt2d2_t | 244 | 229.4 | 29.4 | 813.1 | 231.2 | 0.929 | 0.841 | line RAMON to MIRAGE 230 ck 2 |
| 24303 | BIG CRK3 | 230 | 24235 | RECTOR | 230 | 1 | line_139 | ivsg_hs_alt2d2_t | 353 | 335.6 | 45.4 | 822.7 | 338.7 | 0.929 | 0.729 | line SPRINGVL to BIG CRK4 230 ck 1 |
| 15230 | RUDD | 230 | 15218 | WHITETNK | 230 | 1 | PV1 | ivsg_hs_alt2d2_t | 725 | 675.2 | -12.2 | 1687.1 | 675.3 | 0.927 | 0.958 | gen PALOVRD1 24.00 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | SX60 | ivsg_hs_alt2d2_t | 408.3 | -380.4 | 0.5 | 1574.6 | 380.4 | 0.922 | 0.812 | tran SYCAMORE 230 to SYCAMORE 138 ck 1 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_079 | ivsg_hs_alt2d2_t | 2400 | -2313.6 | -38.7 | 2554.4 | 2314 | 0.922 | 0.731 | line LUGO to MOHAVE 500 ck 1 |
| 24614 | TAP601 | 115 | 24702 | KRAMER | 115 | 1 | line_169 | ivsg_hs_alt2d2_t | 217.1 | -189.2 | 71.6 | 1002.3 | 202.3 | 0.922 | 0.716 | line KRAMER to LUGO 230 ck 1 |
| 24614 | TAP601 | 115 | 24702 | KRAMER | 115 | 1 | line_170 | ivsg_hs_alt2d2_t | 217.1 | -189.2 | 71.6 | 1002.3 | 202.3 | 0.922 | 0.716 | line KRAMER to LUGO 230 ck 2 |
| 19020 | BLYTHE | 161 | 24017 | BLYTHESC | 161 | 1 | line_12 | ivsg_hs_alt2d2_t | 244 | 227.1 | 29 | 805 | 228.9 | 0.92 | 0.841 | line COACHELA to RAMON 230 ck 2 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_022 | ivsg_hs_alt2d2_t | 392 | 358.9 | 27.9 | 909.5 | 360 | 0.92 | 0.87 | OTAYMESA - TJI-230 1 230kV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | MS60 | ivsg_hs_alt2d2_t | 392 | 359.2 | 39.9 | 907.3 | 361.4 | 0.92 | 0.87 | tran MISSION 230 to MISSION 138 ck 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | MS61 | ivsg_hs_alt2d2_t | 392 | 359.2 | 39.9 | 907.3 | 361.4 | 0.92 | 0.87 | tran MISSION 230 to MISSION 138 ck 2 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | OT70 | ivsg_hs_alt2d2_t | 392 | 356.8 | 36.8 | 901.4 | 358.7 | 0.92 | 0.87 | tran OLD TOWN 69 to OLD TOWN 230 ck 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | OT71 | ivsg_hs_alt2d2_t | 392 | 356.8 | 36.8 | 901.4 | 358.7 | 0.92 | 0.87 | tran OLD TOWN 69 to OLD TOWN 230 ck 2 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | SX70 | ivsg_hs_alt2d2_t | 392 | 359.6 | 42.3 | 913.5 | 362 | 0.92 | 0.87 | tran SYCAMORE 230 to SYCAMORE 69 ck 1 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_047 | ivsg_hs_alt2d2_t | 2400 | -2313.6 | -56.8 | 2546.3 | 2314.3 | 0.919 | 0.731 | line ELDORDO to LUGO 500 ck 1 |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_008 | ivsg_hs_alt2d2_t | 169 | 155.2 | 27.1 | 554.2 | 157.6 | 0.917 | 0.833 | line PARKER to GENE 230 ck 1 |
| 22261 | EPP | 230 | 22260 | ESCNDIDO | 230 | 1 | B2_008 | ivsg_hs_alt2d2_t | 796.7 | 735.2 | -51.5 | 1831.6 | 737 | 0.916 | 0.877 | PENSQTOS - OLD TOWN 1 230kV |
| 22261 | EPP | 230 | 22260 | ESCNDIDO | 230 | 1 | B2_015 | ivsg_hs_alt2d2_t | 796.7 | 732.9 | -40.4 | 1826.4 | 734 | 0.913 | 0.877 | MIGUEL - MISSION 1 230kV |
| 22261 | EPP | 230 | 22260 | ESCNDIDO | 230 | 1 | B2_020 | ivsg_hs_alt2d2_t | 796.7 | 732.2 | -41.1 | 1824.6 | 733.3 | 0.912 | 0.877 | MIGUEL - MISSION 2 230kV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | SO2 | ivsg_hs_alt2d2_t | 392 | 356.9 | 32.7 | 911.5 | 358.4 | 0.91 | 0.87 | gen S.ONOFR2 22.00 |
| 24301 | BIG CRK1 | 230 | 24235 | RECTOR | 230 | 1 | line_156 | ivsg_hs_alt2d2_t | 329 | 305.6 | 3.9 | 751.9 | 305.6 | 0.91 | 0.727 | line BIG CRK1 to BIG CRK2 230 ck 1 |
| 22261 | EPP | 230 | 22260 | ESCNDIDO | 230 | 1 | line_63 | ivsg_hs_alt2d2_t | 796.7 | 729.4 | -43.5 | 1818.8 | 730.7 | 0.909 | 0.877 | line RAMON to MIRAGE 230 ck 2 |
| 22261 | EPP | 230 | 22260 | ESCNDIDO | 230 | 1 | line_303 | ivsg_hs_alt2d2_t | 796.7 | 728.5 | -41.9 | 1817.1 | 729.7 | 0.909 | 0.877 | line HARQUAHA to DEVERS 500 ck 1 |
| 24807 | MIRAGE | 115 | 24819 | CONCHO | 115 | 1 | line_65 | ivsg_hs_alt2d2_t | 183 | 164 | -7.5 | 834.4 | 164.1 | 0.908 | 0.87 | line MIRAGE to DEVERS 230 ck 2 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | B2_034 | ivsg_hs_alt2d2_t | 408.3 | -368.5 | -0.5 | 1550.2 | 368.5 | 0.908 | 0.812 | OLD TOWN - MLMS3TAP 1 230kV |
| 24602 | VICTOR | 115 | 24702 | KRAMER | 115 | 1 | line_169 | ivsg_hs_alt2d2_t | 217.1 | -184.6 | 81.7 | 986.3 | 201.8 | 0.908 | 0.703 | line KRAMER to LUGO 230 ck 1 |
| 24602 | VICTOR | 115 | 24702 | KRAMER | 115 | 1 | line_170 | ivsg_hs_alt2d2_t | 217.1 | -184.6 | 81.7 | 986.3 | 201.8 | 0.908 | 0.703 | line KRAMER to LUGO 230 ck 2 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | B2_032 | ivsg_hs_alt2d2_t | 408.3 | -368.6 | -0.2 | 1549.4 | 368.6 | 0.907 | 0.812 | OTAYMESA - MLMS3TAP 1 230kV |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | B2_015 | ivsg_hs_alt2d2_t | 408.3 | -376.2 | -3.8 | 1546.9 | 376.2 | 0.906 | 0.812 | MIGUEL - MISSION 1 230kV |
| 8695 | RAMON | 230 | 24806 | MIRAGE | 230 | 2 | line_44 | ivsg_hs_alt2d2_t | 800 | 689.1 | -174.3 | 1818.3 | 710.9 | 0.905 | 0.638 | line COACHELA to DEVERS 230 ck 2 |
| 22596 | OLD TOWN | 230 | 22466 | MLMS3TAP | 230 | 1 | B2_029 | ivsg_hs_alt2d2_t | 912 | -806.9 | 109.2 | 2067.6 | 814.3 | 0.904 | 0.697 | OTAYMESA - MLSXTAP 1 230kV |
| 22596 | OLD TOWN | 230 | 22466 | MLMS3TAP | 230 | 1 | B2_031 | ivsg_hs_alt2d2_t | 912 | -807.2 | 107.5 | 2068.6 | 814.3 | 0.904 | 0.697 | SYCAMORE - MLSXTAP 1 230kV |
| 8301 | CITAP1 | 92 | 8312 | COACHELA | 92 | 1 | line_12 | ivsg_hs_alt2d2_t | 152 | -135.9 | 14.1 | 861 | 136.6 | 0.903 | 0.698 | line COACHELA to RAMON 230 ck 2 |
| 8301 | CITAP1 | 92 | 8389 | VANBUREN | 92 | 1 | line_12 | ivsg_hs_alt2d2_t | 152 | 135.9 | -14.1 | 861 | 136.6 | 0.903 | 0.698 | line COACHELA to RAMON 230 ck 2 |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_13 | ivsg_hs_alt2d2_t | 169 | 152.9 | 26.3 | 545.6 | 155.2 | 0.903 | 0.833 | line COACHELA to MIDWAY 230 ck 1 |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_14 | ivsg_hs_alt2d2_t | 169 | 152.9 | 26.3 | 545.6 | 155.2 | 0.903 | 0.833 | line COACHELA to MIDWAY 230 ck 2 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | B2_020 | ivsg_hs_alt2d2_t | 408.3 | -374.8 | -2.4 | 1542 | 374.9 | 0.903 | 0.812 | MIGUEL - MISSION 2 230kV |
| 24042 | ELDORDO | 500 | 24086 | LUGO | 500 | 1 | line_085 | ivsg_hs_alt2d2_t | 1386 | 1336.4 | 210.2 | 1436.6 | 1352.9 | 0.903 | 0.608 | line LUGO to VICTORVL 500 ck 1 |
| 24301 | BIG CRK1 | 230 | 24302 | BIG CRK2 | 230 | 1 | line_155 | ivsg_hs_alt2d2_t | 329 | 305.6 | -23 | 745.6 | 306.5 | 0.903 | 0.247 | line BIG CRK1 to RECTOR 230 ck 1 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | B2_002 | ivsg_hs_alt2d2_t | 388 | -342.3 | 1.5 | 876.3 | 342.3 | 0.9 | 0.51 | IMPRLVLY - MIGUEL 1 500kV |
| 79064 | SHIPROCK | 345 | 79063 | SHIPROCK | 230 | 1 | line_001 | ivsg_hs_alt2d2_t | 300 | 261.5 | -49 | 433.7 | 266.1 | 0.9 | 0.86 | line MOENKOPI to ELDORDO 500 ck 1 |
| 24729 | INYO | 230 | 24730 | INYO PS | 115 | 2 | tran_230 | ivsg_hs_alt2d2_t | 50 | -42 | 15.9 | 105.2 | 44.9 | 0.9 | 0.54 | tran INYO 230 to INYO PS 115 ck 1 |
| 24729 | INYO | 230 | 24730 | INYO PS | 115 | 1 | tran_231 | ivsg_hs_alt2d2_t | 50 | -42 | 15.9 | 105.2 | 44.9 | 0.9 | 0.54 | tran INYO 230 to INYO PS 115 ck 2 |
| 24805 | DEVERS | 115 | 24804 | DEVERS | 230 | 1 | tran_236 | ivsg_hs_alt2d2_t | 280 | -246.1 | 51.5 | 1268.1 | 251.5 | 0.9 | 0.6 | tran DEVERS 115 to DEVERS 230 ck 3 |

ivsg_hs_alt2d2.sav
No Solve Summary
N-1 Outages

| Contingency-Description | Case | Problem-Description |
|---|---|---|
| line BIG CRK4 to BIG CRK3 230 ck 1 | ivsg_hs_alt2d2_t | BAD Qgen: 24314 B CRK 4 18.8 MVAr |

ivsg_hs_alt2d2.sav
VOLTAGE Summary
N-2 Outages

| Bus | Name | kV | Area | Zone | Outage | Case | Vbase | Vcont | DeltaV | Vmin | Vmax | Max-dv | Contingency Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8802 | AV58TP12 | 230 | 8 | 818 | line_N-204 | ivsg_hs_alt2d2_t | 0.978 | 0.924 | -0.055 | 0.9 | 1.05 | 0.05 | COACHELLA MIDWAY 230 CKT 1&2 |
| 24058 | GOLETA | 230 | 24 | 240 | line_2269 | ivsg_hs_alt2d2_t | 0.984 | 0.929 | -0.055 | 0.9 | 1.05 | 0.05 | S.CLARA 230.00 - GOLETA 230.00 1, S.CLARA 230.00 - MOORPARK 230.00 1 |
| 24058 | GOLETA | 230 | 24 | 240 | line_2270 | ivsg_hs_alt2d2_t | 0.984 | 0.929 | -0.055 | 0.9 | 1.05 | 0.05 | S.CLARA 230.00 - GOLETA 230.00 2, S.CLARA 230.00 - MOORPARK 230.00 2 |
| 22734 | SANTEE | 138 | 22 | 223 | 23021/22/23/41 | ivsg_hs_alt2d2_t | 0.998 | 0.94 | -0.058 | 0.9 | 1.05 | 0.05 | MIGUEL 230 CORRIDOR West of SN |
| 22412 | LOSCOCHS | 138 | 22 | 223 | 23021/22/23/41 | ivsg_hs_alt2d2_t | 0.998 | 0.945 | -0.053 | 0.9 | 1.05 | 0.05 | MIGUEL 230 CORRIDOR West of SN |
| 24015 | ARCO SC | 230 | 24 | 240 | line_2013 | ivsg_hs_alt2d2_t | 0.986 | 1.036 | 0.051 | 0.9 | 1.05 | 0.05 | ARCO SC 230.00 - HINSON 230.00 1, ARCO SC 230.00 - HINSON 230.00 2 |
| 24061 | HARBOR | 230 | 24 | 240 | line_2039 | ivsg_hs_alt2d2_t | 0.986 | 1.036 | 0.051 | 0.9 | 1.05 | 0.05 | HARBOR 230.00 - HINSON 230.00 1, LBEACH 230.00 - LITEHIPE 230.00 1 |
| 24077 | LBEACH | 230 | 24 | 240 | line_2039 | ivsg_hs_alt2d2_t | 0.986 | 1.036 | 0.05 | 0.9 | 1.05 | 0.05 | HARBOR 230.00 - HINSON 230.00 1, LBEACH 230.00 - LITEHIPE 230.00 1 |
| 24061 | HARBOR | 230 | 24 | 240 | line_2041 | ivsg_hs_alt2d2_t | 0.986 | 1.036 | 0.051 | 0.9 | 1.05 | 0.05 | HARBOR 230.00 - HINSON 230.00 1, HARBOR 230.00 - LBEACH 230.00 1 |
| 24061 | HARBOR | 230 | 24 | 240 | line_2253 | ivsg_hs_alt2d2_t | 0.986 | 1.036 | 0.051 | 0.9 | 1.05 | 0.05 | HARBOR 230.00 - HINSON 230.00 1, HARBOR 230.00 - LBEACH 230.00 1 |
| 25001 | GOODRICH | 230 | 24 | 250 | line_2073 | ivsg_hs_alt2d2_t | 0.959 | 1.044 | 0.086 | 0.9 | 1.05 | 0.05 | GOODRICH 230.00 - GOULD 230.00 1, GOODRICH 230.00 - LAGUBELL 230.00 1 |
| 24058 | GOLETA | 230 | 24 | 240 | line_2120 | ivsg_hs_alt2d2_t | 0.984 | 1.044 | 0.06 | 0.9 | 1.05 | 0.05 | S.CLARA 230.00 - GOLETA 230.00 1, S.CLARA 230.00 - GOLETA 230.00 2 |

ivsg_hs_alt2d2.sav
FLOW Summary
N-2 Outages

| LEGEND | % of RATING 1 | |
|---|---|---|
| C_pu | 100% - 110% | |
| C_pu | 110% - 120% | P.U. of |
| C_pu | > 120% | Rate 1 |

| FROM | FR | BKV | TO | TO | BKV | CK | Outage_Name | Case | Rate-Mva | Pflow | Qflow | Amps | MVA | C_pu | B_pu | Contingency_Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 13821C/25/23051A | ivsg_hs_alt2d2_t | 204.1 | 335.4 | -15.6 | 1396.2 | 335.8 | 1.635 | 1.166 | CH-ES-NCM-SX |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23051B/23011 | ivsg_hs_alt2d2_t | 204.1 | 319.8 | -11.7 | 1345.7 | 320 | 1.576 | 1.166 | EPP-ES + ES-EA-SA 230KV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt2d2_t | 392 | 533.2 | 86.9 | 1377.2 | 540.2 | 1.38 | 0.87 | MIGUEL 230 CORRIDOR West of SN |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23022/23023 | ivsg_hs_alt2d2_t | 204.1 | 282.2 | -7.4 | 1176.4 | 282.3 | 1.378 | 1.166 | ML-MS1+ ML-MS2 230KV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23011/13825 | ivsg_hs_alt2d2_t | 204.1 | 282.9 | -14.2 | 1176.5 | 283.3 | 1.378 | 1.166 | ES-EA-SA 230KV + BQ-CC-ES-NCM 138KV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | 23051B/23011 | ivsg_hs_alt2d2_t | 392 | 536.5 | 29.2 | 1362.9 | 537.3 | 1.37 | 0.99 | EPP-ES + ES-EA-SA 230KV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt2d2_t | 392 | 513.2 | 77.6 | 1311.7 | 519 | 1.32 | 0.87 | MIGUEL 230 CORRIDOR West of LC |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt2d2_t | 408.3 | -524.9 | -9 | 2223 | 525 | 1.301 | 0.812 | MIGUEL 230 CORRIDOR West of SN |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23051A/23011 | ivsg_hs_alt2d2_t | 204.1 | 265.5 | -12.1 | 1105.5 | 265.8 | 1.295 | 1.166 | SX-EPP + ES-EA-SA 230KV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23012/13807 | ivsg_hs_alt2d2_t | 204.1 | 259.8 | -0.7 | 1082 | 259.8 | 1.267 | 1.166 | PQ-EA 230KV + EA-NCW 138KV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23012/13808 | ivsg_hs_alt2d2_t | 204.1 | 255 | -2.1 | 1061 | 255 | 1.242 | 1.166 | PQ-EA 230KV + NCW-PQ 138KV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt2d2_t | 392 | 478 | 77.1 | 1221.1 | 484.2 | 1.24 | 0.87 | MIGUEL 230 CORRIDOR North of ML |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt2d2_t | 408.3 | -505.7 | -7 | 2117.3 | 505.7 | 1.24 | 0.812 | MIGUEL 230 CORRIDOR West of LC |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | line_N-203 | ivsg_hs_alt2d2_t | 204.1 | 249.7 | -7.8 | 1050.7 | 249.8 | 1.23 | 1.166 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23013/27/28 | ivsg_hs_alt2d2_t | 204.1 | 247.8 | -5.4 | 1031.2 | 247.8 | 1.208 | 1.166 | OLD TOWN TO OLD TOWN JCT |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | line_N-204 | ivsg_hs_alt2d2_t | 204.1 | 245.5 | -8.3 | 1030.4 | 245.7 | 1.207 | 1.166 | COACHELLA MIDWAY 230 CKT 1&2 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23002/06/10 | ivsg_hs_alt2d2_t | 204.1 | 246.2 | -5.4 | 1027.8 | 246.2 | 1.204 | 1.166 | SANLUISREY 230 CORRIDOR |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | line_2245 | ivsg_hs_alt2d2_t | 204.1 | 244.7 | -7.5 | 1022.7 | 244.9 | 1.198 | 1.166 | DEVERS 500.00 - VALLEYSC 500.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 2 | line_2046 | ivsg_hs_alt2d2_t | 956 | -1124.7 | -39.8 | 2860.8 | 1125.4 | 1.192 | 0.595 | LA FRESA 230.00 - REDONDO 230.00 1, REDONDO 230.00 - LITEHIPE 230.00 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 1 | line_2047 | ivsg_hs_alt2d2_t | 956 | -1124.7 | -39.8 | 2860.8 | 1125.4 | 1.192 | 0.595 | LA FRESA 230.00 - REDONDO 230.00 2, REDONDO 230.00 - LITEHIPE 230.00 1 |
| 8376 | RTAP2 | 92 | 8974 | RTP1 | 92 | 1 | line_N-204 | ivsg_hs_alt2d2_t | 57 | -63.1 | 11.5 | 423.4 | 64.1 | 1.186 | 0.715 | COACHELLA MIDWAY 230 CKT 1&2 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23022/23023 | ivsg_hs_alt2d2_t | 392 | 456.9 | 60.9 | 1155.3 | 460.9 | 1.18 | 0.87 | ML-MS1+ ML-MS2 230KV |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt2d2_t | 382.4 | 435.6 | 20.7 | 1855.3 | 436.1 | 1.16 | 0.648 | MIGUEL 230 CORRIDOR West of SN |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt2d2_t | 408.3 | -471.5 | -15.9 | 1971.1 | 471.8 | 1.154 | 0.812 | MIGUEL 230 CORRIDOR North of ML |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | 23022/23023 | ivsg_hs_alt2d2_t | 392 | 450.3 | 17.9 | 1133.7 | 450.6 | 1.15 | 0.99 | ML-MS1+ ML-MS2 230KV |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_N-203 | ivsg_hs_alt2d2_t | 169 | 191.9 | 42.2 | 691.2 | 196.5 | 1.144 | 0.833 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 2 | line_2064 | ivsg_hs_alt2d2_t | 956 | -1075.8 | -45.5 | 2736.3 | 1076.8 | 1.14 | 0.595 | LA FRESA 230.00 - REDONDO 230.00 1, MESA CAL 230.00 - REDONDO 230.00 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 1 | line_2065 | ivsg_hs_alt2d2_t | 956 | -1075.8 | -45.5 | 2736.3 | 1076.8 | 1.14 | 0.595 | LA FRESA 230.00 - REDONDO 230.00 2, MESA CAL 230.00 - REDONDO 230.00 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23027/28/13810 | ivsg_hs_alt2d2_t | 204.1 | 231.6 | -4.3 | 961.3 | 231.6 | 1.126 | 1.166 | OLD TOWN TO MISSION 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | line_2115 | ivsg_hs_alt2d2_t | 204.1 | 233.3 | -8.7 | 959.5 | 233.5 | 1.124 | 1.166 | S.ONOFRE 230.00 - SANTIAGO 230.00 1, S.ONOFRE 230.00 - SANTIAGO 230.00 2 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23052/23007 | ivsg_hs_alt2d2_t | 204.1 | 228.3 | -8.2 | 950.9 | 228.4 | 1.114 | 1.166 | TA-SO 1 + 2 230KV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt2d2_t | 204.1 | 225.7 | -4.2 | 948.2 | 225.8 | 1.11 | 1.166 | MIGUEL 230 CORRIDOR North of ML |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | 23051A/23011 | ivsg_hs_alt2d2_t | 392 | 432.5 | 9.5 | 1087.9 | 432.6 | 1.1 | 0.99 | SX-EPP + ES-EA-SA 230KV |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt2d2_t | 382.4 | 416.6 | 21.5 | 1754.2 | 417.1 | 1.097 | 0.648 | MIGUEL 230 CORRIDOR West of LC |
| 24086 | LUGO | 500 | 24236 | RANCHVST | 500 | 1 | line_2194 | ivsg_hs_alt2d2_t | 2598 | 2957.1 | 493.4 | 3284.5 | 2998 | 1.096 | 0.609 | LUGO 500.00 - MIRALOMA 500.00 2, LUGO 500.00 - MIRALOMA 500.00 3 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23022/23023 | ivsg_hs_alt2d2_t | 408.3 | -451.1 | -6.1 | 1864.8 | 451.1 | 1.092 | 0.812 | ML-MS1+ ML-MS2 230KV |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 2 | line_2049 | ivsg_hs_alt2d2_t | 956 | -1024.8 | -39.7 | 2610.1 | 1025.6 | 1.088 | 0.595 | LA FRESA 230.00 - REDONDO 230.00 1, LCIENEGA 230.00 - LA FRESA 230.00 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 1 | line_2050 | ivsg_hs_alt2d2_t | 956 | -1024.8 | -39.7 | 2610.1 | 1025.6 | 1.088 | 0.595 | LA FRESA 230.00 - REDONDO 230.00 2, LCIENEGA 230.00 - LA FRESA 230.00 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 2 | line_2057 | ivsg_hs_alt2d2_t | 956 | -1024.3 | -36.5 | 2607.6 | 1025 | 1.087 | 0.595 | EL NIDO 230.00 - LA FRESA 230.00 3, LA FRESA 230.00 - REDONDO 230.00 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 1 | line_2058 | ivsg_hs_alt2d2_t | 956 | -1024.3 | -36.5 | 2607.6 | 1025 | 1.087 | 0.595 | EL NIDO 230.00 - LA FRESA 230.00 3, LA FRESA 230.00 - REDONDO 230.00 2 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 2 | line_2059 | ivsg_hs_alt2d2_t | 956 | -1024.3 | -36.5 | 2607.6 | 1025 | 1.087 | 0.595 | EL NIDO 230.00 - LA FRESA 230.00 4, LA FRESA 230.00 - REDONDO 230.00 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 1 | line_2060 | ivsg_hs_alt2d2_t | 956 | -1024.3 | -36.5 | 2607.6 | 1025 | 1.087 | 0.595 | EL NIDO 230.00 - LA FRESA 230.00 4, LA FRESA 230.00 - REDONDO 230.00 2 |
| 24701 | KRAMER | 230 | 24085 | LUGO | 230 | 2 | line_2260 | ivsg_hs_alt2d2_t | 478 | 526.5 | 2.2 | 1300.3 | 526.5 | 1.084 | 0.643 | KRAMER 230.00 - LUGO 230.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 8601 | GEOSUB2 | 230 | 8300 | BANIS230 | 230 | 1 | line_N-204 | ivsg_hs_alt2d2_t | 550 | 585.3 | 102.7 | 1493.1 | 594.2 | 1.082 | 0.72 | COACHELLA MIDWAY 230 CKT 1&2 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 2 | line_2029 | ivsg_hs_alt2d2_t | 1195 | 1259.7 | -35.7 | 3243.3 | 1260.2 | 1.081 | 0.538 | LEWIS 230.00 - SERRANO 230.00 1, SERRANO 230.00 - VILLA PK 230.00 1 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 2 | line_2031 | ivsg_hs_alt2d2_t | 1195 | 1259.7 | -35.7 | 3243.3 | 1260.2 | 1.081 | 0.538 | LEWIS 230.00 - SERRANO 230.00 2, SERRANO 230.00 - VILLA PK 230.00 1 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 2 | line_2278 | ivsg_hs_alt2d2_t | 1195 | 1259.7 | -35.7 | 3243.3 | 1260.2 | 1.081 | 0.538 | LEWIS 230.00 - SERRANO 230.00 1, SERRANO 230.00 - VILLA PK 230.00 1 |
| 22831 | SYCAMORE | 138 | 22124 | CHCARITA | 138 | 1 | 23051B/23011 | ivsg_hs_alt2d2_t | 204.1 | 214.9 | -25.7 | 910.3 | 216.5 | 1.066 | 0.718 | EPP-ES + ES-EA-SA 230KV |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_N-204 | ivsg_hs_alt2d2_t | 169 | 178.1 | 38.8 | 641 | 182.2 | 1.061 | 0.833 | COACHELLA MIDWAY 230 CKT 1&2 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_2260 | ivsg_hs_alt2d2_t | 56 | 57.9 | -10 | 292.3 | 58.7 | 1.06 | 0.92 | KRAMER 230.00 - LUGO 230.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23027/28/13827 | ivsg_hs_alt2d2_t | 204.1 | 217 | -6.6 | 900.7 | 217.1 | 1.055 | 1.166 | OLD TOWN TO MISSION 2 |
| 19020 | BLYTHE | 161 | 24017 | BLYTHESC | 161 | 1 | line_N-203 | ivsg_hs_alt2d2_t | 244 | 258.4 | 42.6 | 921 | 261.9 | 1.053 | 0.841 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | line_N-203 | ivsg_hs_alt2d2_t | 392 | 409.7 | 4.8 | 1042.5 | 409.7 | 1.05 | 0.99 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 22672 | PRCTRVLY | 138 | 22852 | TELECYN | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt2d2_t | 478 | 494.1 | 5.1 | 2092.1 | 494.1 | 1.046 | 0.63 | MIGUEL 230 CORRIDOR West of SN |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | 23013/27/28 | ivsg_hs_alt2d2_t | 392 | 407.1 | 11.3 | 1023.6 | 407.2 | 1.04 | 0.99 | OLD TOWN TO OLD TOWN JCT |
| 22260 | ESCNDIDO | 230 | 22844 | TALEGA | 230 | 1 | 23052/23007 | ivsg_hs_alt2d2_t | 456.1 | 473.7 | 27.3 | 1188.2 | 474.5 | 1.038 | 0.11 | TA-SO 1 + 2 230KV |
| 30060 | MIDWAY | 500 | 24156 | VINCENT | 500 | 3 | line_2215 | ivsg_hs_alt2d2_t | 1848.1 | 2037.6 | 78.7 | 2206.9 | 2039.2 | 1.037 | 0.407 | MIDWAY 500.00 - VINCENT 500.00 1, MIDWAY 500.00 - VINCENT 500.00 2 |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | line_2236 | ivsg_hs_alt2d2_t | 132 | 133.2 | -9.5 | 854 | 133.5 | 1.031 | 0.969 | PALOVRDE 500.00 - DEVERS 500.00 1, COACHELV 230.00 - DEVERS 230.00 2 |
| 24016 | BARRE | 230 | 24044 | ELLIS | 230 | 1 | line_2115 | ivsg_hs_alt2d2_t | 988 | 982.6 | -49.4 | 2555.4 | 983.8 | 1.03 | 0.299 | S.ONOFRE 230.00 - SANTIAGO 230.00 1, S.ONOFRE 230.00 - SANTIAGO 230.00 2 |
| 14008 | JOJOBA | 500 | 15011 | KYRENE | 500 | 1 | line_2245 | ivsg_hs_alt2d2_t | 1732 | 1877.1 | 173.5 | 2055 | 1885.1 | 1.03 | 0.995 | DEVERS 500.00 - VALLEYSC 500.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 8900 | PRUETTAP | 92 | 8691 | HIGHLINE | 92 | 1 | line_N-209 | ivsg_hs_alt2d2_t | 86 | -90 | 5.3 | 556 | 90.2 | 1.03 | 0.76 | EL CENTRO HIGHLINE 230 CKTS 1&2 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 13810B/23013 | ivsg_hs_alt2d2_t | 204.1 | 211.6 | -3.8 | 878.5 | 211.6 | 1.029 | 1.166 | OT JCT TO PQ 1 |
| 30060 | MIDWAY | 500 | 24156 | VINCENT | 500 | 1 | line_2220 | ivsg_hs_alt2d2_t | 1848.1 | 2016.4 | 79.2 | 2183.7 | 2018 | 1.027 | 0.326 | MIDWAY 500.00 - VINCENT 500.00 2, MIDWAY 500.00 - VINCENT 500.00 3 |
| 8311 | COACHELA | 230 | 8695 | RAMON | 230 | 2 | line_2236 | ivsg_hs_alt2d2_t | 800 | 783.9 | -30.2 | 2060.7 | 784.5 | 1.026 | 0.688 | PALOVRDE 500.00 - DEVERS 500.00 1, COACHELV 230.00 - DEVERS 230.00 2 |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | line_N-204 | ivsg_hs_alt2d2_t | 132 | 128.8 | -14.9 | 844.7 | 129.7 | 1.02 | 0.969 | COACHELLA MIDWAY 230 CKT 1&2 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | line_N-204 | ivsg_hs_alt2d2_t | 392 | 400.4 | 3.9 | 1016.4 | 400.4 | 1.02 | 0.99 | COACHELLA MIDWAY 230 CKT 1&2 |
| 24074 | LA FRESA | 230 | 24065 | HINSON | 230 | 1 | line_2061 | ivsg_hs_alt2d2_t | 797 | -778.7 | 47.2 | 2033.2 | 780.1 | 1.016 | 0.15 | LA FRESA 230.00 - REDONDO 230.00 1, LA FRESA 230.00 - REDONDO 230.00 2 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8695 | RAMON | 230 | 24806 | MIRAGE | 230 | 2 | line_2236 | ivsg_hs_alt2d2_t | 800 | 761.3 | -183.8 | 2036.4 | 783.1 | 1.014 | 0.638 | PALOVRDE 500.00 - DEVERS 500.00 1, COACHELV 230.00 - DEVERS 230.00 2 |
| 8900 | PRUETTAP | 92 | 8691 | HIGHLINE | 92 | 1 | line_N-204 | ivsg_hs_alt2d2_t | 86 | -87.6 | 12.1 | 546.9 | 88.5 | 1.014 | 0.76 | COACHELLA MIDWAY 230 CKT 1&2 |
| 22596 | OLD TOWN | 230 | 22466 | MLMS3TAP | 230 | 1 | 23021/22/23/41 | ivsg_hs_alt2d2_t | 912 | -889.1 | 107.3 | 2311.3 | 895.6 | 1.01 | 0.697 | MIGUEL 230 CORRIDOR West of SN |
| 22261 | EPP | 230 | 22260 | ESCNDIDO | 230 | 1 | 23052/23007 | ivsg_hs_alt2d2_t | 796.7 | 805.9 | -19 | 2018.6 | 806.2 | 1.009 | 0.877 | TA-SO 1 + 2 230KV |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | line_2186 | ivsg_hs_alt2d2_t | 132 | 131.5 | -10.3 | 834.6 | 131.9 | 1.008 | 0.969 | COACHELV 230.00 - DEVERS 230.00 2, J.HINDS 230.00 - MIRAGE 230.00 1 |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt2d2_t | 382.4 | 382.8 | 33 | 1612.9 | 384.2 | 1.008 | 0.648 | MIGUEL 230 CORRIDOR North of ML |
| 22261 | EPP | 230 | 22260 | ESCNDIDO | 230 | 1 | line_N-203 | ivsg_hs_alt2d2_t | 796.7 | 801.2 | -57.9 | 2012.1 | 803.3 | 1.006 | 0.877 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | line_2237 | ivsg_hs_alt2d2_t | 132 | 130.3 | -10.4 | 832.1 | 130.7 | 1.005 | 0.969 | PALOVRDE 500.00 - DEVERS 500.00 1, J.HINDS 230.00 - MIRAGE 230.00 1 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 1 | line_2030 | ivsg_hs_alt2d2_t | 1287 | 1259.7 | -35.7 | 3243.3 | 1260.2 | 1.004 | 0.5 | LEWIS 230.00 - SERRANO 230.00 1, SERRANO 230.00 - VILLA PK 230.00 2 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 1 | line_2032 | ivsg_hs_alt2d2_t | 1287 | 1259.7 | -35.7 | 3243.3 | 1260.2 | 1.004 | 0.5 | LEWIS 230.00 - SERRANO 230.00 2, SERRANO 230.00 - VILLA PK 230.00 2 |
| 22596 | OLD TOWN | 230 | 22466 | MLMS3TAP | 230 | 1 | 23021/22/23/41 | ivsg_hs_alt2d2_t | 912 | -880.4 | 116.1 | 2279.3 | 888.1 | 0.996 | 0.697 | MIGUEL 230 CORRIDOR North of ML |
| 19020 | BLYTHE | 161 | 24017 | BLYTHESC | 161 | 1 | line_N-204 | ivsg_hs_alt2d2_t | 244 | 244.6 | 39.1 | 871 | 247.7 | 0.995 | 0.841 | COACHELLA MIDWAY 230 CKT 1&2 |
| 22672 | PRCTRVLY | 138 | 22852 | TELECYN | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt2d2_t | 478 | 474.8 | 3 | 1988 | 474.8 | 0.994 | 0.63 | MIGUEL 230 CORRIDOR West of LC |
| 22831 | SYCAMORE | 138 | 22124 | CHCARITA | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt2d2_t | 204.1 | 201.6 | -20 | 848.4 | 202.6 | 0.994 | 0.718 | MIGUEL 230 CORRIDOR West of SN |
| 22831 | SYCAMORE | 138 | 22124 | CHCARITA | 138 | 1 | 13821B/638 | ivsg_hs_alt2d2_t | 204.1 | 204 | -15.2 | 847.6 | 204.6 | 0.993 | 0.718 | CH-SX-SN 138KV + SAN VCNT-EL 69KV |
| 8600 | GEOSUB1 | 230 | 8300 | BANIS230 | 230 | 1 | line_N-204 | ivsg_hs_alt2d2_t | 550 | 536.2 | 91.6 | 1368 | 543.9 | 0.992 | 0.669 | COACHELLA MIDWAY 230 CKT 1&2 |
| 8600 | GEOSUB1 | 230 | 8300 | BANIS230 | 230 | 2 | line_N-204 | ivsg_hs_alt2d2_t | 550 | 536.2 | 91.6 | 1368 | 543.9 | 0.992 | 0.669 | COACHELLA MIDWAY 230 CKT 1&2 |
| 22596 | OLD TOWN | 230 | 22466 | MLMS3TAP | 230 | 1 | 23021/22/23/41 | ivsg_hs_alt2d2_t | 912 | -877.2 | 115 | 2270.4 | 884.7 | 0.992 | 0.697 | MIGUEL 230 CORRIDOR West of LC |
| 24086 | LUGO | 500 | 24097 | MOHAVE | 500 | 1 | line_2234 | ivsg_hs_alt2d2_t | 1386 | -1427.3 | 95.7 | 1566.5 | 1430.5 | 0.989 | 0.68 | MOHAVE 500.00 - ELDORDO 500.00 1, PISGAH 230.00 - ELDORDO 230.00 2 |
| 22261 | EPP | 230 | 22260 | ESCNDIDO | 230 | 1 | 23022/23023 | ivsg_hs_alt2d2_t | 796.7 | 788.6 | -46.3 | 1969.7 | 789.9 | 0.985 | 0.877 | ML-MS1+ ML-MS2 230KV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 13821B/638 | ivsg_hs_alt2d2_t | 392 | 382.9 | 42.4 | 972.6 | 385.2 | 0.98 | 0.87 | CH-SX-SN 138KV + SAN VCNT-EL 69KV |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_2194 | ivsg_hs_alt2d2_t | 56 | 51.9 | -10.5 | 262.6 | 53 | 0.96 | 0.92 | LUGO 500.00 - MIRALOMA 500.00 2, LUGO 500.00 - MIRALOMA 500.00 3 |
| 8311 | COACHELA | 230 | 8695 | RAMON | 230 | 2 | line_2186 | ivsg_hs_alt2d2_t | 800 | 740.2 | -48.1 | 1924.5 | 741.8 | 0.958 | 0.688 | COACHELV 230.00 - DEVERS 230.00 2, J.HINDS 230.00 - MIRAGE 230.00 1 |
| 22261 | EPP | 230 | 22260 | ESCNDIDO | 230 | 1 | line_N-204 | ivsg_hs_alt2d2_t | 796.7 | 761.6 | -53.5 | 1909.6 | 763.5 | 0.955 | 0.877 | COACHELLA MIDWAY 230 CKT 1&2 |
| 8376 | RTAP2 | 92 | 8974 | RTP1 | 92 | 1 | line_N-208 | ivsg_hs_alt2d2_t | 57 | -51.8 | 11.5 | 340.4 | 53 | 0.955 | 0.715 | COACHELLA BANISTER/BANISTER AVE58 230 |
| 22261 | EPP | 230 | 22260 | ESCNDIDO | 230 | 1 | line_2245 | ivsg_hs_alt2d2_t | 796.7 | 761.7 | -47.8 | 1905.3 | 763.2 | 0.953 | 0.877 | DEVERS 500.00 - VALLEYSC 500.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | line_2115 | ivsg_hs_alt2d2_t | 392 | 370.9 | 10.6 | 920.8 | 371 | 0.95 | 0.99 | S.ONOFRE 230.00 - SANTIAGO 230.00 1, S.ONOFRE 230.00 - SANTIAGO 230.00 2 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | 23052/23007 | ivsg_hs_alt2d2_t | 392 | 374 | 4.2 | 941.7 | 374 | 0.95 | 0.99 | TA-SO 1 + 2 230KV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | 13807/08/23013 | ivsg_hs_alt2d2_t | 392 | 373.7 | 9.1 | 936.8 | 373.8 | 0.95 | 0.99 | PQ ENCINA |
| 22261 | EPP | 230 | 22260 | ESCNDIDO | 230 | 1 | 23013/27/28 | ivsg_hs_alt2d2_t | 796.7 | 761 | -56.4 | 1898.6 | 763.1 | 0.949 | 0.877 | OLD TOWN TO OLD TOWN JCT |
| 24126 | RIOHONDO | 230 | 24155 | VINCENT | 230 | 2 | line_2097 | ivsg_hs_alt2d2_t | 988 | -888.7 | 76 | 2346.9 | 891.9 | 0.946 | 0.691 | GOODRICH 230.00 - GOULD 230.00 1, VINCENT 230.00 - MESA CAL 230.00 1 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_N-203 | ivsg_hs_alt2d2_t | 800 | 753.9 | 59.5 | 1892.8 | 756.3 | 0.943 | 0.649 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | 23022/23023 | ivsg_hs_alt2d2_t | 382.4 | 362.5 | 25.9 | 1508.2 | 363.4 | 0.943 | 0.648 | ML-MS1+ ML-MS2 230KV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23051B/23011 | ivsg_hs_alt2d2_t | 392 | 365.1 | 41.3 | 932.3 | 367.5 | 0.94 | 0.87 | EPP-ES + ES-EA-SA 230KV |
| 8695 | RAMON | 230 | 24806 | MIRAGE | 230 | 2 | line_2186 | ivsg_hs_alt2d2_t | 800 | 711 | -182.8 | 1880.7 | 734.1 | 0.937 | 0.638 | COACHELV 230.00 - DEVERS 230.00 2, J.HINDS 230.00 - MIRAGE 230.00 1 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2191 | ivsg_hs_alt2d2_t | 2400 | -2351.2 | -42.4 | 2588 | 2351.6 | 0.934 | 0.731 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - ELDORDO 230.00 2 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2200 | ivsg_hs_alt2d2_t | 2400 | -2337.2 | -34.4 | 2581.8 | 2337.5 | 0.932 | 0.731 | LUGO 500.00 - MOHAVE 500.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2201 | ivsg_hs_alt2d2_t | 2400 | -2337 | -34.5 | 2581.6 | 2337.3 | 0.932 | 0.731 | LUGO 500.00 - MOHAVE 500.00 1, PISGAH 230.00 - LUGO 230.00 2 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2100 | ivsg_hs_alt2d2_t | 2400 | -2339.1 | -197.5 | 2578 | 2347.4 | 0.93 | 0.731 | EAGLROCK 230.00 - MESA CAL 230.00 1, SYLMAR S 230.00 - GOULD 230.00 1 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt2d2_t | 392 | 363.5 | 2.6 | 923.9 | 363.6 | 0.93 | 0.99 | MIGUEL 230 CORRIDOR North of ML |
| 22261 | EPP | 230 | 22260 | ESCNDIDO | 230 | 1 | line_2182 | ivsg_hs_alt2d2_t | 796.7 | 744.1 | -47.6 | 1858.2 | 745.6 | 0.929 | 0.877 | DEVERS 230.00 - MIRAGE 230.00 2, COACHELV 230.00 - DEVERS 230.00 2 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2192 | ivsg_hs_alt2d2_t | 2400 | -2339.3 | -52.3 | 2575.9 | 2339.9 | 0.929 | 0.731 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2193 | ivsg_hs_alt2d2_t | 2400 | -2339 | -52.4 | 2575.6 | 2339.6 | 0.929 | 0.731 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - LUGO 230.00 2 |
| 22261 | EPP | 230 | 22260 | ESCNDIDO | 230 | 1 | 13821B/638 | ivsg_hs_alt2d2_t | 796.7 | 745.2 | -34.9 | 1858.3 | 746 | 0.929 | 0.877 | CH-SX-SN 138KV + SAN VCNT-EL 69KV |
| 22261 | EPP | 230 | 22260 | ESCNDIDO | 230 | 1 | line_2236 | ivsg_hs_alt2d2_t | 796.7 | 743.3 | -45.3 | 1856.4 | 744.7 | 0.928 | 0.877 | PALOVRDE 500.00 - DEVERS 500.00 1, COACHELV 230.00 - DEVERS 230.00 2 |
| 22261 | EPP | 230 | 22260 | ESCNDIDO | 230 | 1 | 13810B/23013 | ivsg_hs_alt2d2_t | 796.7 | 744.1 | -50.6 | 1854.1 | 745.8 | 0.927 | 0.877 | OT JCT TO PQ 1 |
| 24614 | TAP601 | 115 | 24702 | KRAMER | 115 | 1 | line_2260 | ivsg_hs_alt2d2_t | 217.1 | -189.3 | 71.2 | 1003.3 | 202.3 | 0.923 | 0.716 | KRAMER 230.00 - LUGO 230.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 22672 | PRCTRVLY | 138 | 22852 | TELECYN | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt2d2_t | 478 | 440.7 | 12 | 1841.7 | 440.8 | 0.921 | 0.63 | MIGUEL 230 CORRIDOR North of ML |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | line_N-203 | ivsg_hs_alt2d2_t | 392 | 358.6 | 31.3 | 920.2 | 360 | 0.92 | 0.87 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 13821B/638 | ivsg_hs_alt2d2_t | 408.3 | -378.8 | -3.7 | 1569.9 | 378.8 | 0.919 | 0.812 | CH-SX-SN 138KV + SAN VCNT-EL 69KV |
| 22261 | EPP | 230 | 22260 | ESCNDIDO | 230 | 1 | 13807/08/23013 | ivsg_hs_alt2d2_t | 796.7 | 736.8 | -51.3 | 1835.2 | 738.6 | 0.918 | 0.877 | PQ ENCINA |
| 8311 | COACHELA | 230 | 8695 | RAMON | 230 | 2 | line_2246 | ivsg_hs_alt2d2_t | 800 | 710.7 | -51 | 1841.2 | 712.5 | 0.917 | 0.688 | VSTA 230.00 - DEVERS 230.00 1, COACHELV 230.00 - DEVERS 230.00 2 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2103 | ivsg_hs_alt2d2_t | 2400 | -2301.4 | -184.4 | 2534.6 | 2308.8 | 0.915 | 0.731 | EAGLROCK 230.00 - SYLMAR S 230.00 1, SYLMAR S 230.00 - GOULD 230.00 1 |
| 22261 | EPP | 230 | 22260 | ESCNDIDO | 230 | 1 | line_2113 | ivsg_hs_alt2d2_t | 796.7 | 732.7 | -33.9 | 1829.8 | 733.5 | 0.915 | 0.877 | ELLIS 230.00 - JOHANNA 230.00 1, ELLIS 230.00 - SANTIAGO 230.00 1 |
| 24126 | RIOHONDO | 230 | 24155 | VINCENT | 230 | 2 | line_2101 | ivsg_hs_alt2d2_t | 988 | -864 | 77.5 | 2267 | 867.4 | 0.914 | 0.691 | EAGLROCK 230.00 - MESA CAL 230.00 1, VINCENT 230.00 - MESA CAL 230.00 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23021/23041 | ivsg_hs_alt2d2_t | 204.1 | 187.7 | -1.4 | 780.3 | 187.7 | 0.914 | 1.166 | ML-SX + OM-SX 230KV |
| 8335 | ELSTEAMP | 92 | 8720 | WSTBIOTP | 92 | 2 | line_N-204 | ivsg_hs_alt2d2_t | 91 | 84.5 | 2 | 521.5 | 84.6 | 0.913 | 0.702 | COACHELLA MIDWAY 230 CKT 1&2 |
| 24807 | MIRAGE | 115 | 24819 | CONCHO | 115 | 1 | line_2182 | ivsg_hs_alt2d2_t | 183 | 164 | -7.3 | 837.7 | 164.1 | 0.912 | 0.87 | DEVERS 230.00 - MIRAGE 230.00 2, COACHELV 230.00 - DEVERS 230.00 2 |
| 22261 | EPP | 230 | 22260 | ESCNDIDO | 230 | 1 | line_2185 | ivsg_hs_alt2d2_t | 796.7 | 731.5 | -43.9 | 1824.6 | 732.8 | 0.912 | 0.877 | RAMON 230.00 - MIRAGE 230.00 2, J.HINDS 230.00 - MIRAGE 230.00 1 |
| 24042 | ELDORDO | 500 | 24086 | LUGO | 500 | 1 | line_2258 | ivsg_hs_alt2d2_t | 1386 | 1343.1 | 231.9 | 1448.4 | 1363 | 0.912 | 0.608 | LUGO 500.00 - VINCENT 500.00 2, LUGO 500.00 - VICTORVL 500.00 1 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2096 | ivsg_hs_alt2d2_t | 2400 | -2289.7 | -205.6 | 2520.7 | 2298.9 | 0.91 | 0.731 | EAGLROCK 230.00 - MESA CAL 230.00 1, GOODRICH 230.00 - GOULD 230.00 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | line_2245 | ivsg_hs_alt2d2_t | 392 | 353.9 | 31.6 | 900.9 | 355.3 | 0.91 | 0.87 | DEVERS 500.00 - VALLEYSC 500.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 24602 | VICTOR | 115 | 24702 | KRAMER | 115 | 1 | line_2260 | ivsg_hs_alt2d2_t | 217.1 | -184.7 | 81.3 | 987.3 | 201.8 | 0.909 | 0.703 | KRAMER 230.00 - LUGO 230.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 22261 | EPP | 230 | 22260 | ESCNDIDO | 230 | 1 | 23021/22/23/41 | ivsg_hs_alt2d2_t | 796.7 | 725 | -33.5 | 1818.3 | 725.8 | 0.909 | 0.877 | MIGUEL 230 CORRIDOR West of SN |
| 22596 | OLD TOWN | 230 | 22466 | MLMS3TAP | 230 | 1 | 23021/23041 | ivsg_hs_alt2d2_t | 912 | -807.9 | 105.2 | 2072.3 | 814.7 | 0.906 | 0.697 | ML-SX + OM-SX 230KV |
| 24126 | RIOHONDO | 230 | 24155 | VINCENT | 230 | 2 | line_2100 | ivsg_hs_alt2d2_t | 988 | -846.3 | 82.9 | 2235.3 | 850.3 | 0.901 | 0.691 | EAGLROCK 230.00 - MESA CAL 230.00 1, SYLMAR S 230.00 - GOULD 230.00 1 |
| 24807 | MIRAGE | 115 | 24816 | SANTA RO | 115 | 1 | line_2182 | ivsg_hs_alt2d2_t | 183.3 | 161.9 | -13.3 | 829.2 | 162.5 | 0.901 | 0.861 | DEVERS 230.00 - MIRAGE 230.00 2, COACHELV 230.00 - DEVERS 230.00 2 |
| 79064 | SHIPROCK | 345 | 79063 | SHIPROCK | 230 | 1 | line_2233 | ivsg_hs_alt2d2_t | 300 | 261.6 | -49.1 | 433.9 | 266.2 | 0.9 | 0.86 | MOENKOPI 500.00 - ELDORDO 500.00 1, PISGAH 230.00 - ELDORDO 230.00 2 |

ivsg_hs_alt2d2.sav
No Solve Summary
N-2 Outages

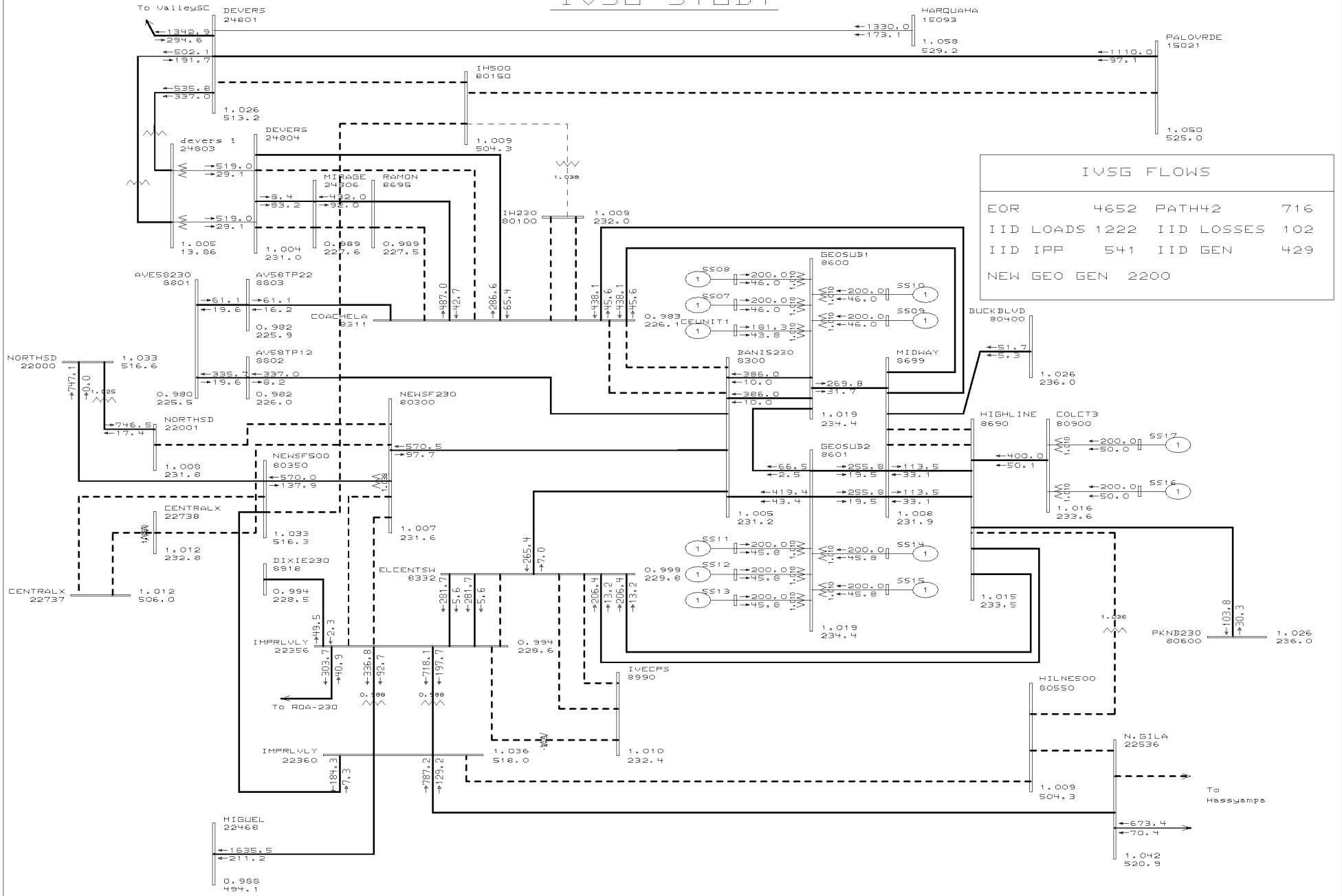
| Contingency-Description | Case | Problem-Description |
|---|---|---|
| DEVERS 230.00 - MIRAGE 230.00 2, RAMON 230.00 - MIRAGE 230.00 2 | ivsg_hs_alt2d2_t | Pmis 19324 BLYENG3 16.00 = -10158.48 MW + j -102034.88 MVAR |
| VICTOR 230.00 - LUGO 230.00 1, VICTOR 230.00 - LUGO 230.00 2 | ivsg_hs_alt2d2_t | Pmis 24614 TAP601 115.00 = -113645.20 MW + j -75583.67 MVAR |
| DEVERS 230.00 - MIRAGE 230.00 2, RAMON 230.00 - MIRAGE 230.00 2 | ivsg_hs_alt2d2_t | Pmis 19324 BLYENG3 16.00 = -10158.48 MW + j -102034.88 MVAR |

# Imperial Valley Study Group

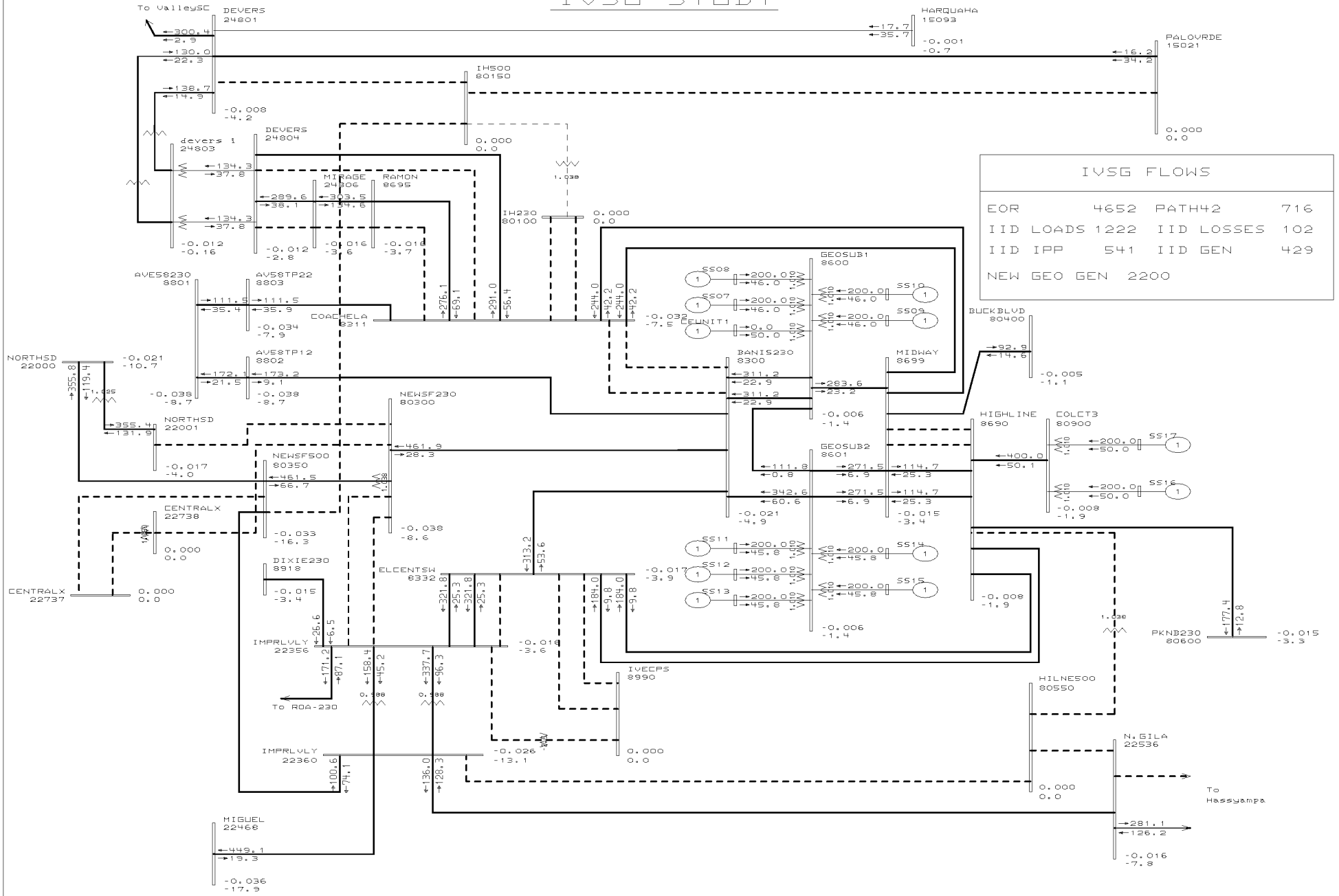
## Appendix A.4.6

Alt 3a D1
Heavy Summer
Alternative 3a
Dispatch 1

# IVSG STUDY


To ValleySC
DEVERS 24801
HARQUAHA 15093
PALOVRDE 15021
IH500 80150
DEVERS 24804
devers 1 24803
MIRAGE 24806
RAMON 8695
IH230 80100
GEOSUB1 8600
AVES8230 8801
AV58TP22 8803
AV58TP12 8802
COACHELA 8311
CELNIT1
BANIS230 8300
MIDWAY 8699
BUCKBLVD 80400
NORTHSD 22000
NORTHSD 22001
NEWSF230 80300
NEWSF500 80350
GEOSUB2 8601
HIGHLINE 8690
COLCT3 80900
CENTRALX 22738
CENTRALX 22737
DIXIE230 8918
ELCENTSW 8332
IMPRLVLY 22356
IMPRLVLY 22360
IVECPS 8990
HILNE500 80550
N.GILA 22536
PKNB230 80600
MIGUEL 22468
To ROA-230
To Hassyampa
IVSG FLOWS
EOR 4652 PATH42 716
IID LOADS 1222 IID LOSSES 102
IID IPP 541 IID GEN 429
NEW GEO GEN 2200

# IVSG STUDY


To ValleySC
DEVERS 24801
HARQUAHA 15093
PALOVRDE 15021
IH500 80150
DEVERS 24804
devers 1 24803
MIRAGE 24806
RAMON 8695
IH230 80100
AVE58230 8801
AV58TP22 8803
AV58TP12 8802
COACHELA 8211
GEOSUB1 8600
BANIS230 8300
MIDWAY 8699
BUCKBLVD 80400
NORTHSD 22000
NORTHSD 22001
NEWSF230 80300
NEWSF500 80350
GEOSUB2 8601
HIGHLINE 8690
COLCT3 80900
CENTRALX 22738
CENTRALX 22737
DIXIE230 8918
ELCENTSW 8332
IMPRLVLY 22356
IMPRLVLY 22360
IVECPS 8990
To ROA-230
MIGUEL 22468
HILNE500 80550
N.GILA 22536
To Hassyampa
PKNB230 80600
IVSG FLOWS
EOR 4652 PATH42 716
IID LOADS 1222 IID LOSSES 102
IID IPP 541 IID GEN 429
NEW GEO GEN 2200

ivsg_hs_alt3ad1.sav
Voltage Summary
N-0 Outages

| Bus | Name | kV | Area | Zone | Outage | Case | Vbase | Vcont | DeltaV | Vmin | Vmax | Max-dv | Contingency Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24035 | EAGLEMTN | 161 | 24 | 248 | base | ivsg_hs_alt3ad1 | 0.929 | 0.929 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 20077 | SIM-115 | 115 | 20 | 205 | base | ivsg_hs_alt3ad1 | 0.932 | 0.932 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 20076 | SQN-115 | 115 | 20 | 205 | base | ivsg_hs_alt3ad1 | 0.937 | 0.937 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14534 | N.GILA 4 | 100 | 14 | 847 | base | ivsg_hs_alt3ad1 | 0.942 | 0.942 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15021 | PALOVRDE | 500 | 14 | 158 | base | ivsg_hs_alt3ad1 | 1.05 | 1.05 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24775 | RUSH | 115 | 24 | 247 | base | ivsg_hs_alt3ad1 | 1.05 | 1.05 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15051 | BROWNING | 500 | 14 | 158 | base | ivsg_hs_alt3ad1 | 1.051 | 1.051 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15090 | HASSYAMP | 500 | 14 | 158 | base | ivsg_hs_alt3ad1 | 1.052 | 1.052 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24940 | SERVAL | 500 | 24 | 240 | base | ivsg_hs_alt3ad1 | 1.052 | 1.052 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15092 | ARLINTON | 500 | 14 | 158 | base | ivsg_hs_alt3ad1 | 1.053 | 1.053 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15094 | MESQUITE | 500 | 14 | 158 | base | ivsg_hs_alt3ad1 | 1.053 | 1.053 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24151 | VALLEYSC | 500 | 24 | 240 | base | ivsg_hs_alt3ad1 | 1.053 | 1.053 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24997 | VALYSVC1 | 500 | 24 | 240 | base | ivsg_hs_alt3ad1 | 1.053 | 1.053 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 28040 | CALPINE | 500 | 24 | 240 | base | ivsg_hs_alt3ad1 | 1.053 | 1.053 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14009 | REDHAWK | 500 | 14 | 141 | base | ivsg_hs_alt3ad1 | 1.054 | 1.054 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24086 | LUGO | 500 | 24 | 240 | base | ivsg_hs_alt3ad1 | 1.055 | 1.055 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14010 | TS5 | 500 | 14 | 141 | base | ivsg_hs_alt3ad1 | 1.056 | 1.056 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 79043 | KAYENTA | 230 | 14 | 191 | base | ivsg_hs_alt3ad1 | 1.056 | 1.056 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15093 | HARQUAHA | 500 | 14 | 158 | base | ivsg_hs_alt3ad1 | 1.058 | 1.058 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14230 | VERDE N | 230 | 14 | 141 | base | ivsg_hs_alt3ad1 | 1.058 | 1.058 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14247 | VERDE S | 230 | 14 | 141 | base | ivsg_hs_alt3ad1 | 1.058 | 1.058 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14011 | RACEWAY | 500 | 14 | 141 | base | ivsg_hs_alt3ad1 | 1.058 | 1.058 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24776 | LEE VINE | 115 | 24 | 247 | base | ivsg_hs_alt3ad1 | 1.058 | 1.058 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15034 | PERKINS | 500 | 14 | 158 | base | ivsg_hs_alt3ad1 | 1.061 | 1.061 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14205 | COCONINO | 230 | 14 | 141 | base | ivsg_hs_alt3ad1 | 1.061 | 1.061 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14008 | JOJOBA | 500 | 14 | 141 | base | ivsg_hs_alt3ad1 | 1.061 | 1.061 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15041 | SILVERKG | 500 | 14 | 158 | base | ivsg_hs_alt3ad1 | 1.062 | 1.062 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15061 | RUDD | 500 | 14 | 158 | base | ivsg_hs_alt3ad1 | 1.062 | 1.062 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14234 | YAVAPAI | 230 | 14 | 141 | base | ivsg_hs_alt3ad1 | 1.063 | 1.063 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24156 | VINCENT | 500 | 24 | 240 | base | ivsg_hs_alt3ad1 | 1.064 | 1.064 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14355 | PRESCOTT | 115 | 14 | 141 | base | ivsg_hs_alt3ad1 | 1.066 | 1.066 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14544 | PRESCOT2 | 100 | 14 | 141 | base | ivsg_hs_alt3ad1 | 1.066 | 1.066 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14543 | PRESCOT1 | 100 | 14 | 141 | base | ivsg_hs_alt3ad1 | 1.066 | 1.066 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14001 | FOURCORN | 500 | 14 | 141 | base | ivsg_hs_alt3ad1 | 1.067 | 1.067 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14256 | FLAGSTAF | 230 | 14 | 141 | base | ivsg_hs_alt3ad1 | 1.067 | 1.067 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14587 | FLAGSTF1 | 100 | 14 | 141 | base | ivsg_hs_alt3ad1 | 1.068 | 1.068 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24729 | INYO | 230 | 24 | 247 | base | ivsg_hs_alt3ad1 | 1.068 | 1.068 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14007 | GILARIVR | 500 | 14 | 141 | base | ivsg_hs_alt3ad1 | 1.069 | 1.069 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 79264 | PINAL_W | 500 | 14 | 141 | base | ivsg_hs_alt3ad1 | 1.07 | 1.07 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14006 | YAVAPAI | 500 | 14 | 141 | base | ivsg_hs_alt3ad1 | 1.071 | 1.071 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14004 | SAGUARO | 500 | 14 | 141 | base | ivsg_hs_alt3ad1 | 1.075 | 1.075 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14215 | LEUPP | 230 | 14 | 141 | base | ivsg_hs_alt3ad1 | 1.075 | 1.075 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15992 | SEV | 500 | 14 | 158 | base | ivsg_hs_alt3ad1 | 1.075 | 1.075 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 16000 | TORTOLIT | 500 | 14 | 160 | base | ivsg_hs_alt3ad1 | 1.075 | 1.075 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 16001 | TORTLIT2 | 500 | 14 | 160 | base | ivsg_hs_alt3ad1 | 1.075 | 1.075 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14100 | CHOLLA | 345 | 14 | 141 | base | ivsg_hs_alt3ad1 | 1.077 | 1.077 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15001 | CORONADO | 500 | 14 | 158 | base | ivsg_hs_alt3ad1 | 1.08 | 1.08 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14000 | CHOLLA | 500 | 14 | 141 | base | ivsg_hs_alt3ad1 | 1.081 | 1.081 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 19038 | MEAD | 500 | 14 | 191 | base | ivsg_hs_alt3ad1 | 1.084 | 1.084 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24042 | ELDORDO | 500 | 24 | 240 | base | ivsg_hs_alt3ad1 | 1.084 | 1.084 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24097 | MOHAVE | 500 | 24 | 240 | base | ivsg_hs_alt3ad1 | 1.087 | 1.087 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14204 | CHOLLA | 230 | 14 | 141 | base | ivsg_hs_alt3ad1 | 1.088 | 1.088 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14509 | CHOLLA 7 | 100 | 14 | 141 | base | ivsg_hs_alt3ad1 | 1.094 | 1.094 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14267 | SECDKNOL | 230 | 14 | 141 | base | ivsg_hs_alt3ad1 | 1.099 | 1.099 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14003 | NAVAJO | 500 | 14 | 141 | base | ivsg_hs_alt3ad1 | 1.102 | 1.102 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14002 | MOENKOPI | 500 | 14 | 141 | base | ivsg_hs_alt3ad1 | 1.104 | 1.104 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |

ivsg_hs_alt3ad1.sav
Flow Summary
N-0 Outages

| LEGEND | % of RATING 1 | |
|---|---|---|
| C_pu | 100% - 110% | |
| C_pu | 110% - 120% | P.U. of |
| C_pu | > 120% | Rate 1 |

| FROM | FR | BKV | TO | TO | BKV | CK | Outage_Name | Case | Rate-Mva | Pflow | Qflow | Amps | MVA | C_pu | B_pu | Contingency_Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 14248 | GLENDALW | 230 | 14212 | GLENDALE | 230 | 1 | base | ivsg_hs_alt3ad1 | 457 | 571.8 | 32.6 | 1433.5 | 572.7 | 1.25 | 1.25 | Base system (n-0) |
| 14248 | GLENDALW | 230 | 15201 | AGUAFRIA | 230 | 1 | base | ivsg_hs_alt3ad1 | 457 | -571.8 | -32.6 | 1433.4 | 572.7 | 1.25 | 1.25 | Base system (n-0) |
| 24910 | CAL ELEC | 115 | 24912 | SHANDIN | 115 | 1 | base | ivsg_hs_alt3ad1 | 109.1 | -124.1 | 58.3 | 682.6 | 137.1 | 1.249 | 1.249 | Base system (n-0) |
| 14221 | PNPKAPS | 230 | 19062 | PINPK | 230 | 1 | base | ivsg_hs_alt3ad1 | 637.4 | -784.7 | -185.4 | 1984.9 | 806.3 | 1.241 | 1.241 | Base system (n-0) |
| 24912 | SHANDIN | 115 | 24916 | TAP902 | 115 | 1 | base | ivsg_hs_alt3ad1 | 109.1 | -119.2 | 33.5 | 613.2 | 123.8 | 1.121 | 1.121 | Base system (n-0) |
| 14212 | GLENDALE | 230 | 14270 | GRNDTRML | 230 | 1 | base | ivsg_hs_alt3ad1 | 457 | 506.4 | 25 | 1269.1 | 507 | 1.109 | 1.109 | Base system (n-0) |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | base | ivsg_hs_alt3ad1 | 392 | 394.2 | 39.6 | 1015.6 | 396.2 | 1.01 | 1.01 | Base system (n-0) |
| 14206 | CTRYCLUB | 230 | 14270 | GRNDTRML | 230 | 1 | base | ivsg_hs_alt3ad1 | 509.9 | -503 | -25.4 | 1272.5 | 503.7 | 0.994 | 0.994 | Base system (n-0) |
| 14202 | CACTUS | 230 | 14221 | PNPKAPS | 230 | 1 | base | ivsg_hs_alt3ad1 | 371 | -363.7 | -48.5 | 921 | 367 | 0.989 | 0.989 | Base system (n-0) |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | base | ivsg_hs_alt3ad1 | 204.1 | 199.5 | -1.5 | 840.5 | 199.5 | 0.984 | 0.984 | Base system (n-0) |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | base | ivsg_hs_alt3ad1 | 408.3 | -389.7 | 2.7 | 1639.3 | 389.8 | 0.96 | 0.96 | Base system (n-0) |
| 15230 | RUDD | 230 | 15218 | WHITETNK | 230 | 1 | base | ivsg_hs_alt3ad1 | 725 | 692.3 | -18.2 | 1734 | 692.5 | 0.953 | 0.953 | Base system (n-0) |
| 24087 | MAGUNDEN | 230 | 24101 | OMAR | 230 | 1 | base | ivsg_hs_alt3ad1 | 643 | -591.8 | 130.4 | 1533.2 | 606 | 0.951 | 0.951 | Base system (n-0) |
| 24806 | MIRAGE | 230 | 24807 | MIRAGE | 115 | 1 | base | ivsg_hs_alt3ad1 | 280 | 265.7 | 27.7 | 677.7 | 267.1 | 0.95 | 0.95 | Base system (n-0) |
| 24806 | MIRAGE | 230 | 24807 | MIRAGE | 115 | 2 | base | ivsg_hs_alt3ad1 | 280 | 265.7 | 27.7 | 677.7 | 267.1 | 0.95 | 0.95 | Base system (n-0) |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | base | ivsg_hs_alt3ad1 | 132 | 125.2 | -11.1 | 784.7 | 125.7 | 0.947 | 0.947 | Base system (n-0) |
| 24702 | KRAMER | 115 | 24753 | SUNGEN | 115 | 1 | base | ivsg_hs_alt3ad1 | 183.3 | -170.5 | 32.5 | 863.8 | 173.6 | 0.939 | 0.939 | Base system (n-0) |
| 14008 | JOJOBA | 500 | 15011 | KYRENE | 500 | 1 | base | ivsg_hs_alt3ad1 | 1732 | 1708.4 | 133.4 | 1865 | 1713.6 | 0.934 | 0.934 | Base system (n-0) |
| 26098 | SYLMAR3 | 230 | 24147 | SYLMAR S | 230 | 1 | base | ivsg_hs_alt3ad1 | 1100 | 840.7 | -522.9 | 2572.4 | 990.1 | 0.932 | 0.932 | Base system (n-0) |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | base | ivsg_hs_alt3ad1 | 56 | 49.9 | -10.6 | 252.7 | 51 | 0.92 | 0.92 | Base system (n-0) |
| 14207 | DEERVALY | 230 | 14231 | WESTWING | 230 | 1 | base | ivsg_hs_alt3ad1 | 720 | -647.6 | -80.3 | 1634.7 | 652.5 | 0.904 | 0.904 | Base system (n-0) |

ivsg_hs_alt3ad1.sav
VOLTAGE Summary
N-1 Outages

| Bus | Name | kV | Area | Zone | Outage | Case | Vbase | Vcont | DeltaV | Vmin | Vmax | Max-dv | Contingency Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24017 | BLYTHESC | 161 | 24 | 248 | line_007 | ivsg_hs_alt3ad1 | 1.02 | 0.861 | -0.159 | 0.9 | 1.05 | 0.05 | line BLYTHE to BLYTHESC 161 ck 1 |
| 24731 | INYOKERN | 115 | 24 | 247 | line_175 | ivsg_hs_alt3ad1 | 1 | 0.926 | -0.075 | 0.9 | 1.05 | 0.05 | line INYO to COTTONWD 230 ck 1 |
| 24822 | INDIAN W | 115 | 24 | 248 | tran_238 | ivsg_hs_alt3ad1 | 1.024 | 0.927 | -0.097 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 24819 | CONCHO | 115 | 24 | 248 | tran_238 | ivsg_hs_alt3ad1 | 1.024 | 0.928 | -0.096 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 24816 | SANTA RO | 115 | 24 | 248 | tran_238 | ivsg_hs_alt3ad1 | 1.028 | 0.932 | -0.096 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 24821 | TAMARISK | 115 | 24 | 248 | tran_238 | ivsg_hs_alt3ad1 | 1.028 | 0.933 | -0.095 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 25633 | CAPWIND | 115 | 24 | 248 | tran_238 | ivsg_hs_alt3ad1 | 1.03 | 0.935 | -0.095 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 24827 | TAP823 | 115 | 24 | 248 | tran_238 | ivsg_hs_alt3ad1 | 1.03 | 0.935 | -0.095 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 25622 | TAP806 | 115 | 24 | 248 | tran_238 | ivsg_hs_alt3ad1 | 1.03 | 0.935 | -0.095 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 24829 | TAP821 | 115 | 24 | 248 | tran_238 | ivsg_hs_alt3ad1 | 1.03 | 0.935 | -0.095 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 24807 | MIRAGE | 115 | 24 | 248 | tran_238 | ivsg_hs_alt3ad1 | 1.032 | 0.938 | -0.094 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 25423 | ESRP MWD | 115 | 24 | 254 | tran_247 | ivsg_hs_alt3ad1 | 1.024 | 0.94 | -0.084 | 0.9 | 1.05 | 0.05 | tran VALLEYSC 500 to VALLEYSC 115 ck 1 |
| 25423 | ESRP MWD | 115 | 24 | 254 | tran_248 | ivsg_hs_alt3ad1 | 1.024 | 0.94 | -0.084 | 0.9 | 1.05 | 0.05 | tran VALLEYSC 500 to VALLEYSC 115 ck 2 |
| 24160 | VALLEYSC | 115 | 24 | 240 | tran_247 | ivsg_hs_alt3ad1 | 1.026 | 0.942 | -0.084 | 0.9 | 1.05 | 0.05 | tran VALLEYSC 500 to VALLEYSC 115 ck 1 |
| 25990 | VALYSVC1 | 115 | 24 | 240 | tran_247 | ivsg_hs_alt3ad1 | 1.026 | 0.942 | -0.084 | 0.9 | 1.05 | 0.05 | tran VALLEYSC 500 to VALLEYSC 115 ck 1 |
| 24160 | VALLEYSC | 115 | 24 | 240 | tran_248 | ivsg_hs_alt3ad1 | 1.026 | 0.942 | -0.084 | 0.9 | 1.05 | 0.05 | tran VALLEYSC 500 to VALLEYSC 115 ck 2 |
| 25990 | VALYSVC1 | 115 | 24 | 240 | tran_248 | ivsg_hs_alt3ad1 | 1.026 | 0.942 | -0.084 | 0.9 | 1.05 | 0.05 | tran VALLEYSC 500 to VALLEYSC 115 ck 2 |
| 24768 | RANDSBRG | 115 | 24 | 247 | line_175 | ivsg_hs_alt3ad1 | 1.001 | 0.951 | -0.05 | 0.9 | 1.05 | 0.05 | line INYO to COTTONWD 230 ck 1 |
| 24761 | TAP701 | 115 | 24 | 247 | line_175 | ivsg_hs_alt3ad1 | 1.001 | 0.951 | -0.05 | 0.9 | 1.05 | 0.05 | line INYO to COTTONWD 230 ck 1 |
| 14534 | N.GILA 4 | 100 | 14 | 847 | NG500/69 | ivsg_hs_alt3ad1 | 0.942 | 1 | 0.058 | 0.9 | 1.05 | 0.05 | tran N.GILA 500 to N.GILA 69 ck 1 |
| 24035 | EAGLEMTN | 161 | 24 | 248 | tran_241 | ivsg_hs_alt3ad1 | 0.929 | 1.026 | 0.097 | 0.9 | 1.05 | 0.05 | tran EAGLEMTN 230 to EAGLEMTN 161 ck 1 |
| 22472 | MIGUELMP | 500 | 22 | 227 | ML80 | ivsg_hs_alt3ad1 | 0.981 | 1.05 | 0.069 | 0.9 | 1.05 | 0.05 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 24730 | INYO PS | 115 | 24 | 247 | tran_229 | ivsg_hs_alt3ad1 | 1.026 | 1.078 | 0.052 | 0.9 | 1.05 | 0.05 | tran INYO 115 to INYO PS 115 ck 1 |
| 24142 | SYC CYN | 230 | 24 | 240 | line_086 | ivsg_hs_alt3ad1 | 0.984 | 1.091 | 0.107 | 0.9 | 1.05 | 0.05 | line MAGUNDEN to OMAR 230 ck 1 |
| 25613 | EDMONSTN | 230 | 24 | 256 | line_122 | ivsg_hs_alt3ad1 | 0.999 | 1.091 | 0.092 | 0.9 | 1.05 | 0.05 | line PASTORIA to EDMONSTN 230 ck 1 |
| 24142 | SYC CYN | 230 | 24 | 240 | line_140 | ivsg_hs_alt3ad1 | 0.984 | 1.091 | 0.107 | 0.9 | 1.05 | 0.05 | line SYC CYN to OMAR 230 ck 1 |

ivsg_hs_alt3ad1.sav
FLOW Summary
N-1 Outages

| LEGEND | % of RATING 1 | |
|---|---|---|
| C_pu | 100% - 110% | |
| C_pu | 110% - 120% | P.U. of |
| C_pu | > 120% | Rate 1 |

| FROM | FR | BKV | TO | TO | BKV | CK | Outage_Name | Case | Rate-Mva | Pflow | Qflow | Amps | MVA | C_pu | B_pu | Contingency_Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24142 | SYC CYN | 230 | 24101 | OMAR | 230 | 1 | line_086 | ivsg_hs_alt3ad1 | 643 | 769.7 | 5511.1 | 12804.4 | 5564.6 | 7.934 | 0.471 | line MAGUNDEN to OMAR 230 ck 1 |
| 24781 | NAVYCOSO | 230 | 24706 | BLM EAST | 230 | 1 | line_173 | ivsg_hs_alt3ad1 | 1287 | -153.7 | -3160.7 | 7943.3 | 3164.4 | 2.459 | 0.056 | line BLM EAST to BLM WEST 230 ck 1 |
| 24781 | NAVYCOSO | 230 | 24706 | BLM EAST | 230 | 1 | line_174 | ivsg_hs_alt3ad1 | 1287 | -153.7 | -3160.7 | 7943.3 | 3164.4 | 2.459 | 0.056 | line BLM WEST to KRAMER 230 ck 1 |
| 24806 | MIRAGE | 230 | 24807 | MIRAGE | 115 | 2 | tran_238 | ivsg_hs_alt3ad1 | 280 | 532.4 | 211 | 1491.5 | 572.7 | 2.05 | 0.95 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_175 | ivsg_hs_alt3ad1 | 56 | -103.6 | -1.2 | 532 | 103.6 | 1.86 | 0.92 | line INYO to COTTONWD 230 ck 1 |
| 24151 | VALLEYSC | 500 | 24160 | VALLEYSC | 115 | 2 | tran_247 | ivsg_hs_alt3ad1 | 560 | 853.2 | 359.4 | 1027.4 | 925.8 | 1.65 | 0.77 | tran VALLEYSC 500 to VALLEYSC 115 ck 1 |
| 24151 | VALLEYSC | 500 | 24160 | VALLEYSC | 115 | 1 | tran_248 | ivsg_hs_alt3ad1 | 560 | 853.2 | 359.4 | 1027.4 | 925.8 | 1.65 | 0.77 | tran VALLEYSC 500 to VALLEYSC 115 ck 2 |
| 24151 | VALLEYSC | 500 | 24229 | VALLEY-S | 115 | 4 | tran_249 | ivsg_hs_alt3ad1 | 560 | 830.6 | 205.6 | 946.9 | 855.7 | 1.53 | 0.75 | tran VALLEYSC 500 to VALLEY-S 115 ck 3 |
| 24151 | VALLEYSC | 500 | 24229 | VALLEY-S | 115 | 3 | tran_250 | ivsg_hs_alt3ad1 | 560 | 830.6 | 205.6 | 946.9 | 855.7 | 1.53 | 0.75 | tran VALLEYSC 500 to VALLEY-S 115 ck 4 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_202 | ivsg_hs_alt3ad1 | 56 | 77.4 | -7.3 | 392.6 | 77.8 | 1.4 | 0.92 | line OWENSCON to INYO 230 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_034 | ivsg_hs_alt3ad1 | 204.1 | 270.7 | -1.4 | 1170.1 | 270.7 | 1.37 | 0.984 | OLD TOWN - MLMS3TAP 1 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_032 | ivsg_hs_alt3ad1 | 204.1 | 270.7 | -2.1 | 1169.2 | 270.7 | 1.369 | 0.984 | OTAYMESA - MLMS3TAP 1 230kV |
| 22468 | MIGUEL | 500 | 22472 | MIGUELMP | 500 | 1 | ML81 | ivsg_hs_alt3ad1 | 1120 | 1455.2 | 268.3 | 1732 | 1479.8 | 1.32 | 0.76 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 22464 | MIGUEL | 230 | 22468 | MIGUEL | 500 | 1 | ML80 | ivsg_hs_alt3ad1 | 1120 | -1433.8 | 19.2 | 3721.2 | 1434 | 1.31 | 0.72 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 22356 | IMPRLVLY | 230 | 22360 | IMPRLVLY | 500 | 1 | IV81 | ivsg_hs_alt3ad1 | 600 | 745.2 | 229.8 | 1960.9 | 779.8 | 1.3 | 0.58 | tran IMPRLVLY 230 to IMPRLVLY 500 ck 2 |
| 22464 | MIGUEL | 230 | 22472 | MIGUELMP | 500 | 1 | ML81 | ivsg_hs_alt3ad1 | 1120 | -1452.3 | 15.7 | 3765.3 | 1452.3 | 1.3 | 0.75 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | ML60 | ivsg_hs_alt3ad1 | 204.1 | 248.4 | 5.1 | 1057.2 | 248.5 | 1.238 | 0.984 | tran MIGUEL 230 to MIGUEL 138 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | SX70 | ivsg_hs_alt3ad1 | 204.1 | 242.9 | 12.1 | 1029.1 | 243.2 | 1.205 | 0.984 | tran SYCAMORE 230 to SYCAMORE 69 ck 1 |
| 24723 | CONTROL | 115 | 24731 | INYOKERN | 115 | 1 | line_175 | ivsg_hs_alt3ad1 | 82.7 | 95.9 | -4.2 | 496 | 96 | 1.195 | 0.419 | line INYO to COTTONWD 230 ck 1 |
| 24723 | CONTROL | 115 | 24731 | INYOKERN | 115 | 2 | line_175 | ivsg_hs_alt3ad1 | 82.7 | 95.9 | -4.2 | 496 | 96 | 1.195 | 0.419 | line INYO to COTTONWD 230 ck 1 |
| 22504 | MISSION | 230 | 22500 | MISSION | 138 | 2 | MS60 | ivsg_hs_alt3ad1 | 392 | 443.2 | 123.2 | 1185.4 | 460 | 1.17 | 0.78 | tran MISSION 230 to MISSION 138 ck 1 |
| 22504 | MISSION | 230 | 22500 | MISSION | 138 | 1 | MS61 | ivsg_hs_alt3ad1 | 392 | 443.2 | 123.2 | 1185.4 | 460 | 1.17 | 0.78 | tran MISSION 230 to MISSION 138 ck 2 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | MS60 | ivsg_hs_alt3ad1 | 204.1 | 226.1 | 4.8 | 957.6 | 226.1 | 1.121 | 0.984 | tran MISSION 230 to MISSION 138 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | MS61 | ivsg_hs_alt3ad1 | 204.1 | 226.1 | 4.8 | 957.6 | 226.1 | 1.121 | 0.984 | tran MISSION 230 to MISSION 138 ck 2 |
| 24729 | INYO | 230 | 24730 | INYO PS | 115 | 1 | line_175 | ivsg_hs_alt3ad1 | 50 | 51.8 | 21.3 | 133 | 56 | 1.12 | 0.54 | line INYO to COTTONWD 230 ck 1 |
| 24729 | INYO | 230 | 24730 | INYO PS | 115 | 2 | line_175 | ivsg_hs_alt3ad1 | 50 | 51.8 | 21.3 | 133 | 56 | 1.12 | 0.54 | line INYO to COTTONWD 230 ck 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_015 | ivsg_hs_alt3ad1 | 392 | 430.6 | 47.9 | 1112.2 | 433.3 | 1.11 | 1.01 | MIGUEL - MISSION 1 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_009 | ivsg_hs_alt3ad1 | 204.1 | 223.5 | -3.8 | 942.2 | 223.5 | 1.103 | 0.984 | EPP - ESCNDIDO 1 230kV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_020 | ivsg_hs_alt3ad1 | 392 | 429.2 | 46.3 | 1109.1 | 431.7 | 1.1 | 1.01 | MIGUEL - MISSION 2 230kV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | ML70 | ivsg_hs_alt3ad1 | 392 | 428.7 | 53.3 | 1114 | 432 | 1.1 | 1.01 | tran MIGUEL 69 to MIGUEL 230 ck 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | ML71 | ivsg_hs_alt3ad1 | 392 | 428.7 | 53.3 | 1114 | 432 | 1.1 | 1.01 | tran MIGUEL 69 to MIGUEL 230 ck 2 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | SX60 | ivsg_hs_alt3ad1 | 392 | 427.6 | 46.6 | 1109.1 | 430.1 | 1.1 | 1.01 | tran SYCAMORE 230 to SYCAMORE 138 ck 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | line_68 | ivsg_hs_alt3ad1 | 392 | 425.5 | 38.4 | 1127.7 | 427.3 | 1.09 | 1.01 | line NORTHSD to NEWSF500 500 ck 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 2 | line_070 | ivsg_hs_alt3ad1 | 956 | -1026 | -31 | 2609.8 | 1026.4 | 1.088 | 0.596 | line LA FRESA to REDONDO 230 ck 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 1 | line_071 | ivsg_hs_alt3ad1 | 956 | -1026 | -31 | 2609.8 | 1026.4 | 1.088 | 0.596 | line LA FRESA to REDONDO 230 ck 2 |
| 24701 | KRAMER | 230 | 24085 | LUGO | 230 | 2 | line_169 | ivsg_hs_alt3ad1 | 478 | 525.6 | 2.6 | 1300.8 | 525.6 | 1.084 | 0.644 | line KRAMER to LUGO 230 ck 1 |
| 24701 | KRAMER | 230 | 24085 | LUGO | 230 | 1 | line_170 | ivsg_hs_alt3ad1 | 478 | 525.6 | 2.6 | 1300.8 | 525.6 | 1.084 | 0.644 | line KRAMER to LUGO 230 ck 2 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_028 | ivsg_hs_alt3ad1 | 392 | 419.6 | 42.2 | 1084 | 421.7 | 1.08 | 1.01 | MIGUEL - SYCAMORE 1 230kV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_032 | ivsg_hs_alt3ad1 | 392 | 419.9 | 49.2 | 1112.2 | 422.7 | 1.08 | 1.01 | OTAYMESA - MLMS3TAP 1 230kV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_034 | ivsg_hs_alt3ad1 | 392 | 419.8 | 49.6 | 1112.9 | 422.7 | 1.08 | 1.01 | OLD TOWN - MLMS3TAP 1 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | ML70 | ivsg_hs_alt3ad1 | 204.1 | 215.3 | 5.5 | 913.5 | 215.4 | 1.07 | 0.984 | tran MIGUEL 69 to MIGUEL 230 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | ML71 | ivsg_hs_alt3ad1 | 204.1 | 215.3 | 5.5 | 913.5 | 215.4 | 1.07 | 0.984 | tran MIGUEL 69 to MIGUEL 230 ck 2 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | MS60 | ivsg_hs_alt3ad1 | 392 | 415.1 | 48.9 | 1074.6 | 418 | 1.07 | 1.01 | tran MISSION 230 to MISSION 138 ck 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | MS61 | ivsg_hs_alt3ad1 | 392 | 415.1 | 48.9 | 1074.6 | 418 | 1.07 | 1.01 | tran MISSION 230 to MISSION 138 ck 2 |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | line_12 | ivsg_hs_alt3ad1 | 132 | 140.1 | -9.6 | 883.7 | 140.4 | 1.067 | 0.947 | line COACHELA to RAMON 230 ck 2 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | line_68 | ivsg_hs_alt3ad1 | 408.3 | -420 | 13.7 | 1820.3 | 420.2 | 1.066 | 0.96 | line NORTHSD to NEWSF500 500 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_007 | ivsg_hs_alt3ad1 | 204.1 | 213.9 | 4.7 | 908.5 | 214 | 1.064 | 0.984 | PENSQTOS - ENCINA 1 230kV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_022 | ivsg_hs_alt3ad1 | 392 | 414.2 | 34.8 | 1082.8 | 415.6 | 1.06 | 1.01 | OTAYMESA - TJI-230 1 230kV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | OT70 | ivsg_hs_alt3ad1 | 392 | 411.1 | 47.3 | 1065.6 | 413.8 | 1.06 | 1.01 | tran OLD TOWN 69 to OLD TOWN 230 ck 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | OT71 | ivsg_hs_alt3ad1 | 392 | 411.1 | 47.3 | 1065.6 | 413.8 | 1.06 | 1.01 | tran OLD TOWN 69 to OLD TOWN 230 ck 2 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_169 | ivsg_hs_alt3ad1 | 56 | 58 | -9.9 | 292.9 | 58.9 | 1.06 | 0.92 | line KRAMER to LUGO 230 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_170 | ivsg_hs_alt3ad1 | 56 | 58 | -9.9 | 292.9 | 58.9 | 1.06 | 0.92 | line KRAMER to LUGO 230 ck 2 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | ML70 | ivsg_hs_alt3ad1 | 408.3 | -423.3 | -2.5 | 1798.2 | 423.3 | 1.053 | 0.96 | tran MIGUEL 69 to MIGUEL 230 ck 1 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | ML71 | ivsg_hs_alt3ad1 | 408.3 | -423.3 | -2.5 | 1798.2 | 423.3 | 1.053 | 0.96 | tran MIGUEL 69 to MIGUEL 230 ck 2 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | B2_034 | ivsg_hs_alt3ad1 | 408.3 | -414.4 | 1.2 | 1796.3 | 414.4 | 1.052 | 0.96 | OLD TOWN - MLMS3TAP 1 230kV |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | B2_015 | ivsg_hs_alt3ad1 | 408.3 | -425.2 | 2.8 | 1795.2 | 425.3 | 1.051 | 0.96 | MIGUEL - MISSION 1 230kV |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | B2_032 | ivsg_hs_alt3ad1 | 408.3 | -414.5 | 1.6 | 1795.2 | 414.5 | 1.051 | 0.96 | OTAYMESA - MLMS3TAP 1 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_015 | ivsg_hs_alt3ad1 | 204.1 | 212.2 | -1.1 | 896.3 | 212.2 | 1.05 | 0.984 | MIGUEL - MISSION 1 230kV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | B2_032 | ivsg_hs_alt3ad1 | 392 | 410.8 | -0.6 | 1075.5 | 410.8 | 1.05 | 0.8 | OTAYMESA - MLMS3TAP 1 230kV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | B2_034 | ivsg_hs_alt3ad1 | 392 | 410.9 | 0 | 1076.1 | 410.9 | 1.05 | 0.8 | OLD TOWN - MLMS3TAP 1 230kV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | SX70 | ivsg_hs_alt3ad1 | 392 | 408.4 | 49.6 | 1060.9 | 411.4 | 1.05 | 1.01 | tran SYCAMORE 230 to SYCAMORE 69 ck 1 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | B2_020 | ivsg_hs_alt3ad1 | 408.3 | -423.9 | 4.1 | 1790.2 | 423.9 | 1.048 | 0.96 | MIGUEL - MISSION 2 230kV |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | SX60 | ivsg_hs_alt3ad1 | 408.3 | -422.2 | 3.8 | 1790.2 | 422.3 | 1.048 | 0.96 | tran SYCAMORE 230 to SYCAMORE 138 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_020 | ivsg_hs_alt3ad1 | 204.1 | 211.8 | -1.5 | 894.4 | 211.8 | 1.047 | 0.984 | MIGUEL - MISSION 2 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | MS70 | ivsg_hs_alt3ad1 | 204.1 | 210 | 6.2 | 890.7 | 210.1 | 1.043 | 0.984 | tran MISSION 230 to MISSION 69 ck 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_021 | ivsg_hs_alt3ad1 | 392 | 407.1 | 36 | 1059.7 | 408.7 | 1.04 | 1.01 | IMPRLVLY - ROA-230 1 230kV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | SO2 | ivsg_hs_alt3ad1 | 392 | 406.1 | 39.5 | 1065.2 | 408 | 1.04 | 1.01 | gen S.ONOFR2 22.00 |
| 24114 | PARDEE | 230 | 24200 | SAUG TAP | 230 | 2 | line_117 | ivsg_hs_alt3ad1 | 494 | 501.7 | 27.5 | 1278.3 | 502.5 | 1.031 | 0.511 | line PARDEE to SAUG TAP 230 ck 1 |
| 24114 | PARDEE | 230 | 24200 | SAUG TAP | 230 | 1 | line_118 | ivsg_hs_alt3ad1 | 494 | 501.7 | 27.4 | 1278.2 | 502.5 | 1.031 | 0.519 | line PARDEE to SAUG TAP 230 ck 2 |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_192 | ivsg_hs_alt3ad1 | 169 | 171.9 | 41.3 | 621.8 | 176.8 | 1.031 | 0.809 | line IRON MTN to CAMINO 230 ck 1 |
| 8601 | GEOSUB2 | 230 | 8300 | BANIS230 | 230 | 1 | line_22 | ivsg_hs_alt3ad1 | 550 | 569.3 | 64.7 | 1413.3 | 573 | 1.024 | 0.753 | line GEOSUB1 to BANIS230 230 ck 1 |
| 8601 | GEOSUB2 | 230 | 8300 | BANIS230 | 230 | 1 | line_23 | ivsg_hs_alt3ad1 | 550 | 569.3 | 64.7 | 1413.3 | 573 | 1.024 | 0.753 | line GEOSUB1 to BANIS230 230 ck 2 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | B2_028 | ivsg_hs_alt3ad1 | 408.3 | -414.5 | 5.9 | 1749.8 | 414.5 | 1.024 | 0.96 | MIGUEL - SYCAMORE 1 230kV |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | B2_022 | ivsg_hs_alt3ad1 | 408.3 | -409.1 | 13.3 | 1747.7 | 409.3 | 1.023 | 0.96 | OTAYMESA - TJI-230 1 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | ML80 | ivsg_hs_alt3ad1 | 204.1 | 204.7 | 1.5 | 868.6 | 204.7 | 1.017 | 0.984 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | MS60 | ivsg_hs_alt3ad1 | 408.3 | -410.1 | -1.5 | 1734.5 | 410.1 | 1.015 | 0.96 | tran MISSION 230 to MISSION 138 ck 1 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | MS61 | ivsg_hs_alt3ad1 | 408.3 | -410.1 | -1.5 | 1734.5 | 410.1 | 1.015 | 0.96 | tran MISSION 230 to MISSION 138 ck 2 |
| 24303 | BIG CRK3 | 230 | 24235 | RECTOR | 230 | 1 | line_155 | ivsg_hs_alt3ad1 | 353 | 361.1 | 50.1 | 895 | 364.5 | 1.01 | 0.729 | line BIG CRK1 to RECTOR 230 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_201 | ivsg_hs_alt3ad1 | 56 | 54.7 | -10.6 | 276.8 | 55.7 | 1.01 | 0.92 | line SYLMAR3 to SYLMAR S 230 ck 1 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | OT70 | ivsg_hs_alt3ad1 | 408.3 | -406.2 | -0.8 | 1720 | 406.2 | 1.007 | 0.96 | tran OLD TOWN 69 to OLD TOWN 230 ck 1 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | OT71 | ivsg_hs_alt3ad1 | 408.3 | -406.2 | -0.8 | 1720 | 406.2 | 1.007 | 0.96 | tran OLD TOWN 69 to OLD TOWN 230 ck 2 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | SO2 | ivsg_hs_alt3ad1 | 408.3 | -401.2 | 7 | 1719.4 | 401.2 | 1.007 | 0.96 | gen S.ONOFR2 22.00 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | SX70 | ivsg_hs_alt3ad1 | 408.3 | -403.5 | -3.5 | 1712.5 | 403.5 | 1.003 | 0.96 | tran SYCAMORE 230 to SYCAMORE 69 ck 1 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | B2_021 | ivsg_hs_alt3ad1 | 408.3 | -402.2 | 10 | 1710.5 | 402.3 | 1.001 | 0.96 | IMPRLVLY - ROA-230 1 230kV |
| 24301 | BIG CRK1 | 230 | 24235 | RECTOR | 230 | 1 | line_160 | ivsg_hs_alt3ad1 | 329 | 334.9 | 48.1 | 826.6 | 338.4 | 1.001 | 0.727 | line BIG CRK3 to RECTOR 230 ck 1 |
| 22832 | SYCAMORE | 230 | 22467 | MLSXTAP | 230 | 1 | B2_034 | ivsg_hs_alt3ad1 | 796.7 | -760.4 | 57.2 | 1997.4 | 762.6 | 0.999 | 0.465 | OLD TOWN - MLMS3TAP 1 230kV |
| 22832 | SYCAMORE | 230 | 22467 | MLSXTAP | 230 | 1 | B2_032 | ivsg_hs_alt3ad1 | 796.7 | -760.3 | 58.4 | 1996.5 | 762.6 | 0.998 | 0.465 | OTAYMESA - MLMS3TAP 1 230kV |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | line_52 | ivsg_hs_alt3ad1 | 132 | 130.6 | -12.2 | 821.5 | 131.2 | 0.992 | 0.947 | line AVE58230 to AV58TP22 230 ck 1 |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | line_53 | ivsg_hs_alt3ad1 | 132 | 130.7 | -12 | 821 | 131.3 | 0.991 | 0.947 | line AV58TP22 to COACHELA 230 ck 1 |
| 24086 | LUGO | 500 | 24097 | MOHAVE | 500 | 1 | line_103 | ivsg_hs_alt3ad1 | 1386 | -1427.3 | 91 | 1571 | 1430.2 | 0.991 | 0.7 | line MOHAVE to ELDORDO 500 ck 1 |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | line_7 | ivsg_hs_alt3ad1 | 132 | 128.6 | -11.3 | 820.1 | 129.1 | 0.99 | 0.947 | line BANIS230 to NEWSF230 230 ck 1 |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_191 | ivsg_hs_alt3ad1 | 169 | 165.3 | 38.7 | 596.9 | 169.7 | 0.99 | 0.809 | line EAGLEMTN to IRON MTN 230 ck 1 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | line_207 | ivsg_hs_alt3ad1 | 408.3 | -398 | 6.4 | 1691.7 | 398.1 | 0.99 | 0.96 | line DEVERS to VALLEYSC 500 ck 1 |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | tran_74 | ivsg_hs_alt3ad1 | 132 | 128.7 | -11.3 | 819.6 | 129.2 | 0.989 | 0.947 | tran NEWSF230 230 to NEWSF500 500 ck 1 |
| 8600 | GEOSUB1 | 230 | 8300 | BANIS230 | 230 | 1 | line_47 | ivsg_hs_alt3ad1 | 550 | 547.4 | 61.5 | 1359.3 | 550.8 | 0.985 | 0.698 | line GEOSUB2 to BANIS230 230 ck 1 |
| 8600 | GEOSUB1 | 230 | 8300 | BANIS230 | 230 | 2 | line_47 | ivsg_hs_alt3ad1 | 550 | 547.4 | 61.5 | 1359.3 | 550.8 | 0.985 | 0.698 | line GEOSUB2 to BANIS230 230 ck 1 |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | line_68 | ivsg_hs_alt3ad1 | 132 | 127.8 | -10.7 | 812.1 | 128.2 | 0.98 | 0.947 | line NORTHSD to NEWSF500 500 ck 1 |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | line_303 | ivsg_hs_alt3ad1 | 132 | 127.4 | -10.2 | 810.4 | 127.8 | 0.978 | 0.947 | line HARQUAHA to DEVERS 500 ck 1 |
| 8600 | GEOSUB1 | 230 | 8300 | BANIS230 | 230 | 2 | line_22 | ivsg_hs_alt3ad1 | 550 | 542 | 62.3 | 1345 | 545.5 | 0.975 | 0.698 | line GEOSUB1 to BANIS230 230 ck 1 |
| 8600 | GEOSUB1 | 230 | 8300 | BANIS230 | 230 | 1 | line_23 | ivsg_hs_alt3ad1 | 550 | 542 | 62.3 | 1345 | 545.5 | 0.975 | 0.698 | line GEOSUB1 to BANIS230 230 ck 2 |
| 22596 | OLD TOWN | 230 | 22466 | MLMS3TAP | 230 | 1 | B2_031 | ivsg_hs_alt3ad1 | 912 | -854.4 | 77.5 | 2226.6 | 857.9 | 0.973 | 0.671 | SYCAMORE - MLSXTAP 1 230kV |
| 19020 | BLYTHE | 161 | 24017 | BLYTHESC | 161 | 1 | line_192 | ivsg_hs_alt3ad1 | 244 | 238.4 | 41.6 | 850.9 | 242 | 0.973 | 0.824 | line IRON MTN to CAMINO 230 ck 1 |
| 22596 | OLD TOWN | 230 | 22466 | MLMS3TAP | 230 | 1 | B2_029 | ivsg_hs_alt3ad1 | 912 | -854.2 | 79.4 | 2225.3 | 857.9 | 0.972 | 0.671 | OTAYMESA - MLSXTAP 1 230kV |
| 22504 | MISSION | 230 | 22500 | MISSION | 138 | 1 | ML60 | ivsg_hs_alt3ad1 | 392 | 370.9 | 83.1 | 991 | 380.1 | 0.97 | 0.78 | tran MIGUEL 230 to MIGUEL 138 ck 1 |
| 22504 | MISSION | 230 | 22500 | MISSION | 138 | 2 | ML60 | ivsg_hs_alt3ad1 | 392 | 370.9 | 83.1 | 991 | 380.1 | 0.97 | 0.78 | tran MIGUEL 230 to MIGUEL 138 ck 1 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | SX70 | ivsg_hs_alt3ad1 | 392 | 379.6 | 21.3 | 969.5 | 380.2 | 0.97 | 0.8 | tran SYCAMORE 230 to SYCAMORE 69 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_123 | ivsg_hs_alt3ad1 | 56 | 52.7 | -10.6 | 266.6 | 53.7 | 0.97 | 0.92 | line PASTORIA to PSTRIA 230 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_200 | ivsg_hs_alt3ad1 | 56 | 52.7 | -10.7 | 266.7 | 53.7 | 0.97 | 0.92 | line SYLMAR1 to SYLMAR S 230 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | tran_210 | ivsg_hs_alt3ad1 | 56 | 52.6 | -10.4 | 265.6 | 53.6 | 0.97 | 0.92 | tran LUGO 500 to LUGO 230 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | tran_211 | ivsg_hs_alt3ad1 | 56 | 52.6 | -10.4 | 265.8 | 53.6 | 0.97 | 0.92 | tran LUGO 500 to LUGO 230 ck 2 |
| 14008 | JOJOBA | 500 | 15011 | KYRENE | 500 | 1 | line_303 | ivsg_hs_alt3ad1 | 1732 | 1762.6 | 142 | 1925.1 | 1768.3 | 0.964 | 0.934 | line HARQUAHA to DEVERS 500 ck 1 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_047 | ivsg_hs_alt3ad1 | 2400 | -2412 | -40.2 | 2664.4 | 2412.3 | 0.961 | 0.765 | line ELDORDO to LUGO 500 ck 1 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_079 | ivsg_hs_alt3ad1 | 2400 | -2401.8 | -23.8 | 2662.1 | 2402 | 0.961 | 0.765 | line LUGO to MOHAVE 500 ck 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_001 | ivsg_hs_alt3ad1 | 392 | 374.8 | 39.2 | 958.6 | 376.8 | 0.96 | 1.01 | HASSYAMP - N.GILA 1 500kV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | ML81 | ivsg_hs_alt3ad1 | 392 | 373.5 | 33.3 | 972.2 | 375 | 0.96 | 1.01 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 22504 | MISSION | 230 | 22500 | MISSION | 138 | 1 | MS70 | ivsg_hs_alt3ad1 | 392 | 360.5 | 104.3 | 968.9 | 375.3 | 0.96 | 0.78 | tran MISSION 230 to MISSION 69 ck 1 |
| 22504 | MISSION | 230 | 22500 | MISSION | 138 | 2 | MS70 | ivsg_hs_alt3ad1 | 392 | 360.5 | 104.3 | 968.9 | 375.3 | 0.96 | 0.78 | tran MISSION 230 to MISSION 69 ck 1 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_086 | ivsg_hs_alt3ad1 | 56 | 52.1 | -10.7 | 263.6 | 53.1 | 0.96 | 0.92 | line MAGUNDEN to OMAR 230 ck 1 |
| 24807 | MIRAGE | 115 | 24819 | CONCHO | 115 | 1 | tran_238 | ivsg_hs_alt3ad1 | 183 | 164.2 | -4.9 | 879.4 | 164.3 | 0.957 | 0.869 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | line_68 | ivsg_hs_alt3ad1 | 204.1 | 189.2 | 8.5 | 811.9 | 189.4 | 0.951 | 0.984 | line NORTHSD to NEWSF500 500 ck 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_003 | ivsg_hs_alt3ad1 | 392 | 370.6 | 36.1 | 955.1 | 372.4 | 0.95 | 1.01 | N.GILA - IMPRLVLY 1 500kV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | ML80 | ivsg_hs_alt3ad1 | 392 | 371.4 | 32.7 | 967.6 | 372.9 | 0.95 | 1.01 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 24042 | ELDORDO | 500 | 24086 | LUGO | 500 | 1 | line_085 | ivsg_hs_alt3ad1 | 1386 | 1395.3 | 237.7 | 1505.6 | 1415.4 | 0.945 | 0.639 | line LUGO to VICTORVL 500 ck 1 |
| 24807 | MIRAGE | 115 | 24816 | SANTA RO | 115 | 1 | tran_238 | ivsg_hs_alt3ad1 | 183.3 | 162.1 | -10.3 | 869.6 | 162.4 | 0.945 | 0.86 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 19020 | BLYTHE | 161 | 24017 | BLYTHESC | 161 | 1 | line_191 | ivsg_hs_alt3ad1 | 244 | 231.8 | 39 | 826.4 | 235 | 0.944 | 0.824 | line EAGLEMTN to IRON MTN 230 ck 1 |
| 22504 | MISSION | 230 | 22500 | MISSION | 138 | 1 | SX60 | ivsg_hs_alt3ad1 | 392 | 361.2 | 75.3 | 957 | 369 | 0.94 | 0.78 | tran SYCAMORE 230 to SYCAMORE 138 ck 1 |
| 22504 | MISSION | 230 | 22500 | MISSION | 138 | 2 | SX60 | ivsg_hs_alt3ad1 | 392 | 361.2 | 75.3 | 957 | 369 | 0.94 | 0.78 | tran SYCAMORE 230 to SYCAMORE 138 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_022 | ivsg_hs_alt3ad1 | 204.1 | 189.1 | 5.8 | 801.6 | 189.1 | 0.939 | 0.984 | OTAYMESA - TJI-230 1 230kV |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 2 | line_136 | ivsg_hs_alt3ad1 | 1195 | 1085.4 | -38.5 | 2797.8 | 1086.1 | 0.933 | 0.562 | line SERRANO to VILLA PK 230 ck 1 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | ML60 | ivsg_hs_alt3ad1 | 392 | 364.2 | 7.2 | 936.8 | 364.3 | 0.93 | 0.8 | tran MIGUEL 230 to MIGUEL 138 ck 1 |
| 24303 | BIG CRK3 | 230 | 24235 | RECTOR | 230 | 1 | line_139 | ivsg_hs_alt3ad1 | 353 | 335.6 | 45.4 | 822.7 | 338.7 | 0.929 | 0.729 | line SPRINGVL to BIG CRK4 230 ck 1 |
| 15230 | RUDD | 230 | 15218 | WHITETNK | 230 | 1 | PV1 | ivsg_hs_alt3ad1 | 725 | 673 | -13.1 | 1679.1 | 673.1 | 0.923 | 0.953 | gen PALOVRD1 24.00 |
| 24614 | TAP601 | 115 | 24702 | KRAMER | 115 | 1 | line_169 | ivsg_hs_alt3ad1 | 217.1 | -189.9 | 69.7 | 1004.1 | 202.3 | 0.923 | 0.717 | line KRAMER to LUGO 230 ck 1 |
| 24614 | TAP601 | 115 | 24702 | KRAMER | 115 | 1 | line_170 | ivsg_hs_alt3ad1 | 217.1 | -189.9 | 69.7 | 1004.1 | 202.3 | 0.923 | 0.717 | line KRAMER to LUGO 230 ck 2 |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_63 | ivsg_hs_alt3ad1 | 169 | 155.9 | 27.8 | 556.9 | 158.4 | 0.922 | 0.809 | line RAMON to MIRAGE 230 ck 2 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | ML81 | ivsg_hs_alt3ad1 | 408.3 | -369.4 | 5.5 | 1569.2 | 369.4 | 0.919 | 0.96 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_12 | ivsg_hs_alt3ad1 | 169 | 154.5 | 27.7 | 551.9 | 156.9 | 0.914 | 0.809 | line COACHELA to RAMON 230 ck 2 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | ML80 | ivsg_hs_alt3ad1 | 408.3 | -367.4 | 5.6 | 1561.8 | 367.4 | 0.914 | 0.96 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 24301 | BIG CRK1 | 230 | 24235 | RECTOR | 230 | 1 | line_156 | ivsg_hs_alt3ad1 | 329 | 305.6 | 4.3 | 752.1 | 305.6 | 0.911 | 0.727 | line BIG CRK1 to BIG CRK2 230 ck 1 |
| 22360 | IMPRLVLY | 500 | 22468 | MIGUEL | 500 | 1 | line_68 | ivsg_hs_alt3ad1 | 2252 | 1982.7 | 502.1 | 2317.1 | 2045.2 | 0.91 | 0.741 | line NORTHSD to NEWSF500 500 ck 1 |
| 24602 | VICTOR | 115 | 24702 | KRAMER | 115 | 1 | line_169 | ivsg_hs_alt3ad1 | 217.1 | -185.2 | 79.8 | 988 | 201.7 | 0.909 | 0.703 | line KRAMER to LUGO 230 ck 1 |
| 24602 | VICTOR | 115 | 24702 | KRAMER | 115 | 1 | line_170 | ivsg_hs_alt3ad1 | 217.1 | -185.2 | 79.8 | 988 | 201.7 | 0.909 | 0.703 | line KRAMER to LUGO 230 ck 2 |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | B2_001 | ivsg_hs_alt3ad1 | 132 | 121 | -11 | 752.3 | 121.5 | 0.908 | 0.947 | HASSYAMP - N.GILA 1 500kV |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | B2_001 | ivsg_hs_alt3ad1 | 408.3 | -370.8 | -1.6 | 1547.3 | 370.8 | 0.906 | 0.96 | HASSYAMP - N.GILA 1 500kV |
| 24807 | MIRAGE | 115 | 24819 | CONCHO | 115 | 1 | line_65 | ivsg_hs_alt3ad1 | 183 | 163.9 | -7.6 | 831.7 | 164.1 | 0.905 | 0.869 | line MIRAGE to DEVERS 230 ck 2 |
| 24301 | BIG CRK1 | 230 | 24302 | BIG CRK2 | 230 | 1 | line_155 | ivsg_hs_alt3ad1 | 329 | 305.6 | -22.4 | 745.7 | 306.4 | 0.903 | 0.247 | line BIG CRK1 to RECTOR 230 ck 1 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | B2_003 | ivsg_hs_alt3ad1 | 408.3 | -366.7 | 1.3 | 1541.6 | 366.7 | 0.902 | 0.96 | N.GILA - IMPRLVLY 1 500kV |
| 19020 | BLYTHE | 161 | 24017 | BLYTHESC | 161 | 1 | line_63 | ivsg_hs_alt3ad1 | 244 | 222.4 | 28 | 788.2 | 224.2 | 0.901 | 0.824 | line RAMON to MIRAGE 230 ck 2 |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | line_68 | ivsg_hs_alt3ad1 | 382.4 | 331.6 | 3 | 1439.5 | 331.6 | 0.9 | 0.797 | line NORTHSD to NEWSF500 500 ck 1 |
| 22468 | MIGUEL | 500 | 22472 | MIGUELMP | 500 | 1 | line_68 | ivsg_hs_alt3ad1 | 1120 | 1002.3 | 116.9 | 1215.4 | 1009.1 | 0.9 | 0.76 | line NORTHSD to NEWSF500 500 ck 1 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | B2_009 | ivsg_hs_alt3ad1 | 392 | 351.7 | -1 | 897.5 | 351.7 | 0.9 | 0.8 | EPP - ESCNDIDO 1 230kV |
| 22356 | IMPRLVLY | 230 | 22360 | IMPRLVLY | 500 | 2 | IV80 | ivsg_hs_alt3ad1 | 1120 | 966.9 | 274.8 | 2535.5 | 1005.2 | 0.9 | 0.67 | tran IMPRLVLY 230 to IMPRLVLY 500 ck 1 |
| 24729 | INYO | 230 | 24730 | INYO PS | 115 | 2 | tran_230 | ivsg_hs_alt3ad1 | 50 | -41.9 | 15.8 | 105.1 | 44.8 | 0.9 | 0.54 | tran INYO 230 to INYO PS 115 ck 1 |
| 24729 | INYO | 230 | 24730 | INYO PS | 115 | 1 | tran_231 | ivsg_hs_alt3ad1 | 50 | -41.9 | 15.8 | 105.1 | 44.8 | 0.9 | 0.54 | tran INYO 230 to INYO PS 115 ck 2 |
| 24805 | DEVERS | 115 | 24804 | DEVERS | 230 | 1 | tran_236 | ivsg_hs_alt3ad1 | 280 | -246.1 | 51.3 | 1269.8 | 251.4 | 0.9 | 0.6 | tran DEVERS 115 to DEVERS 230 ck 3 |

ivsg_hs_alt3ad1.sav
No Solve Summary
N-1 Outages

| Contingency-Description | Case | Problem-Description | | | | |
|---|---|---|---|---|---|---|
| IMPRLVLY - MIGUEL 1 500kV | ivsg_hs_alt3ad1 | Pmis 20421 JOV-U1 | 18.00 = | -1.00 MW + j | -41.92 MVAR | |

| Bus | Name | kV | Area | Zone | Outage | Case | Vbase | Vcont | DeltaV | Vmin | Vmax | Max-dv | Contingency Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22734 | SANTEE | 138 | 22 | 223 | 23021/22/23/41 | ivsg_hs_alt3ad1 | 0.979 | 0.89 | -0.089 | 0.9 | 1.05 | 0.05 | MIGUEL 230 CORRIDOR West of SN |
| 22412 | LOSCOCHS | 138 | 22 | 223 | 23021/22/23/41 | ivsg_hs_alt3ad1 | 0.977 | 0.895 | -0.082 | 0.9 | 1.05 | 0.05 | MIGUEL 230 CORRIDOR West of SN |
| 22428 | MAINST51 | 138 | 22 | 222 | 23021/22/23/41 | ivsg_hs_alt3ad1 | 0.974 | 0.916 | -0.057 | 0.9 | 1.05 | 0.05 | MIGUEL 230 CORRIDOR West of SN |
| 22424 | MAINST50 | 138 | 22 | 222 | 23021/22/23/41 | ivsg_hs_alt3ad1 | 0.974 | 0.917 | -0.058 | 0.9 | 1.05 | 0.05 | MIGUEL 230 CORRIDOR West of SN |
| 22412 | LOSCOCHS | 138 | 22 | 223 | 23021/22/23/41 | ivsg_hs_alt3ad1 | 0.977 | 0.918 | -0.059 | 0.9 | 1.05 | 0.05 | MIGUEL 230 CORRIDOR West of LC |
| 22772 | SOUTHBAY | 138 | 22 | 222 | 23021/22/23/41 | ivsg_hs_alt3ad1 | 0.982 | 0.924 | -0.057 | 0.9 | 1.05 | 0.05 | MIGUEL 230 CORRIDOR West of SN |
| 24058 | GOLETA | 230 | 24 | 240 | line_2269 | ivsg_hs_alt3ad1 | 0.983 | 0.928 | -0.055 | 0.9 | 1.05 | 0.05 | S.CLARA 230.00 - GOLETA 230.00 1, S.CLARA 230.00 - MOORPARK 230.00 1 |
| 24058 | GOLETA | 230 | 24 | 240 | line_2270 | ivsg_hs_alt3ad1 | 0.983 | 0.928 | -0.055 | 0.9 | 1.05 | 0.05 | S.CLARA 230.00 - GOLETA 230.00 2, S.CLARA 230.00 - MOORPARK 230.00 2 |
| 8802 | AV58TP12 | 230 | 8 | 818 | line_N-204 | ivsg_hs_alt3ad1 | 0.982 | 0.932 | -0.05 | 0.9 | 1.05 | 0.05 | COACHELLA MIDWAY 230 CKT 1&2 |
| 22852 | TELECYN | 138 | 22 | 222 | 23021/22/23/41 | ivsg_hs_alt3ad1 | 0.992 | 0.933 | -0.059 | 0.9 | 1.05 | 0.05 | MIGUEL 230 CORRIDOR West of SN |
| 22672 | PRCTRVLY | 138 | 22 | 222 | 23021/22/23/41 | ivsg_hs_alt3ad1 | 0.995 | 0.938 | -0.056 | 0.9 | 1.05 | 0.05 | MIGUEL 230 CORRIDOR West of SN |
| 22460 | MIGUEL | 138 | 22 | 222 | 23021/22/23/41 | ivsg_hs_alt3ad1 | 0.997 | 0.942 | -0.054 | 0.9 | 1.05 | 0.05 | MIGUEL 230 CORRIDOR West of SN |
| 24822 | INDIAN W | 115 | 24 | 248 | line_2182 | ivsg_hs_alt3ad1 | 1.024 | 0.97 | -0.053 | 0.9 | 1.05 | 0.05 | DEVERS 230.00 - MIRAGE 230.00 2, COACHELV 230.00 - DEVERS 230.00 2 |
| 24819 | CONCHO | 115 | 24 | 248 | line_2182 | ivsg_hs_alt3ad1 | 1.024 | 0.971 | -0.053 | 0.9 | 1.05 | 0.05 | DEVERS 230.00 - MIRAGE 230.00 2, COACHELV 230.00 - DEVERS 230.00 2 |
| 24816 | SANTA RO | 115 | 24 | 248 | line_2182 | ivsg_hs_alt3ad1 | 1.028 | 0.975 | -0.053 | 0.9 | 1.05 | 0.05 | DEVERS 230.00 - MIRAGE 230.00 2, COACHELV 230.00 - DEVERS 230.00 2 |
| 24821 | TAMARISK | 115 | 24 | 248 | line_2182 | ivsg_hs_alt3ad1 | 1.028 | 0.975 | -0.053 | 0.9 | 1.05 | 0.05 | DEVERS 230.00 - MIRAGE 230.00 2, COACHELV 230.00 - DEVERS 230.00 2 |
| 24827 | TAP823 | 115 | 24 | 248 | line_2182 | ivsg_hs_alt3ad1 | 1.03 | 0.977 | -0.053 | 0.9 | 1.05 | 0.05 | DEVERS 230.00 - MIRAGE 230.00 2, COACHELV 230.00 - DEVERS 230.00 2 |
| 25633 | CAPWIND | 115 | 24 | 248 | line_2182 | ivsg_hs_alt3ad1 | 1.03 | 0.978 | -0.052 | 0.9 | 1.05 | 0.05 | DEVERS 230.00 - MIRAGE 230.00 2, COACHELV 230.00 - DEVERS 230.00 2 |
| 25622 | TAP806 | 115 | 24 | 248 | line_2182 | ivsg_hs_alt3ad1 | 1.03 | 0.978 | -0.052 | 0.9 | 1.05 | 0.05 | DEVERS 230.00 - MIRAGE 230.00 2, COACHELV 230.00 - DEVERS 230.00 2 |
| 24829 | TAP821 | 115 | 24 | 248 | line_2182 | ivsg_hs_alt3ad1 | 1.03 | 0.978 | -0.052 | 0.9 | 1.05 | 0.05 | DEVERS 230.00 - MIRAGE 230.00 2, COACHELV 230.00 - DEVERS 230.00 2 |
| 24807 | MIRAGE | 115 | 24 | 248 | line_2182 | ivsg_hs_alt3ad1 | 1.032 | 0.98 | -0.052 | 0.9 | 1.05 | 0.05 | DEVERS 230.00 - MIRAGE 230.00 2, COACHELV 230.00 - DEVERS 230.00 2 |
| 24015 | ARCO SC | 230 | 24 | 240 | line_2013 | ivsg_hs_alt3ad1 | 0.986 | 1.036 | 0.051 | 0.9 | 1.05 | 0.05 | ARCO SC 230.00 - HINSON 230.00 1, ARCO SC 230.00 - HINSON 230.00 2 |
| 24061 | HARBOR | 230 | 24 | 240 | line_2039 | ivsg_hs_alt3ad1 | 0.986 | 1.036 | 0.051 | 0.9 | 1.05 | 0.05 | HARBOR 230.00 - HINSON 230.00 1, LBEACH 230.00 - LITEHIPE 230.00 1 |
| 24077 | LBEACH | 230 | 24 | 240 | line_2039 | ivsg_hs_alt3ad1 | 0.986 | 1.036 | 0.05 | 0.9 | 1.05 | 0.05 | HARBOR 230.00 - HINSON 230.00 1, LBEACH 230.00 - LITEHIPE 230.00 1 |
| 24061 | HARBOR | 230 | 24 | 240 | line_2041 | ivsg_hs_alt3ad1 | 0.986 | 1.036 | 0.051 | 0.9 | 1.05 | 0.05 | HARBOR 230.00 - HINSON 230.00 1, HARBOR 230.00 - LBEACH 230.00 1 |
| 24061 | HARBOR | 230 | 24 | 240 | line_2253 | ivsg_hs_alt3ad1 | 0.986 | 1.036 | 0.051 | 0.9 | 1.05 | 0.05 | HARBOR 230.00 - HINSON 230.00 1, HARBOR 230.00 - LBEACH 230.00 1 |
| 25001 | GOODRICH | 230 | 24 | 250 | line_2073 | ivsg_hs_alt3ad1 | 0.958 | 1.044 | 0.087 | 0.9 | 1.05 | 0.05 | GOODRICH 230.00 - GOULD 230.00 1, GOODRICH 230.00 - LAGUBELL 230.00 1 |
| 24058 | GOLETA | 230 | 24 | 240 | line_2120 | ivsg_hs_alt3ad1 | 0.983 | 1.044 | 0.061 | 0.9 | 1.05 | 0.05 | S.CLARA 230.00 - GOLETA 230.00 1, S.CLARA 230.00 - GOLETA 230.00 2 |

ivsg_hs_alt3ad1.sav
FLOW Summary
N-2 Outages

| LEGEND | % of RATING 1 | |
|---|---|---|
| C_pu | 100% - 110% | |
| C_pu | 110% - 120% | P.U. of |
| C_pu | > 120% | Rate 1 |

| FROM | FR | BKV | TO | TO | BKV | CK | Outage_Name | Case | Rate-Mva | Pflow | Qflow | Amps | MVA | C_pu | B_pu | Contingency_Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt3ad1 | 392 | 613.8 | 118 | 1662.6 | 625.1 | 1.59 | 1.01 | MIGUEL 230 CORRIDOR West of SN |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt3ad1 | 392 | 608.3 | 109.1 | 1627.3 | 618 | 1.58 | 1.01 | MIGUEL 230 CORRIDOR West of LC |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt3ad1 | 408.3 | -601.8 | -4.5 | 2683.7 | 601.8 | 1.571 | 0.96 | MIGUEL 230 CORRIDOR West of SN |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt3ad1 | 408.3 | -596.8 | -0.4 | 2626.7 | 596.8 | 1.538 | 0.96 | MIGUEL 230 CORRIDOR West of LC |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt3ad1 | 392 | 576.8 | 104.7 | 1536.2 | 586.2 | 1.5 | 1.01 | MIGUEL 230 CORRIDOR North of ML |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt3ad1 | 408.3 | -566.5 | -7.8 | 2479.6 | 566.6 | 1.452 | 0.96 | MIGUEL 230 CORRIDOR North of ML |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt3ad1 | 382.4 | 511.3 | 2.7 | 2292.2 | 511.3 | 1.433 | 0.797 | MIGUEL 230 CORRIDOR West of SN |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt3ad1 | 382.4 | 506.4 | 0.8 | 2239.8 | 506.4 | 1.4 | 0.797 | MIGUEL 230 CORRIDOR West of LC |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt3ad1 | 382.4 | 476.5 | 11.8 | 2097.3 | 476.7 | 1.311 | 0.797 | MIGUEL 230 CORRIDOR North of ML |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23022/23023 | ivsg_hs_alt3ad1 | 392 | 501 | 65.5 | 1300.2 | 505.3 | 1.29 | 1.01 | ML-MS1+ ML-MS2 230KV |
| 22672 | PRCTRVLY | 138 | 22852 | TELECYN | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt3ad1 | 478 | 571 | 0.6 | 2546 | 571 | 1.273 | 0.755 | MIGUEL 230 CORRIDOR West of SN |
| 22672 | PRCTRVLY | 138 | 22852 | TELECYN | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt3ad1 | 478 | 565.9 | -3.6 | 2490.9 | 565.9 | 1.246 | 0.755 | MIGUEL 230 CORRIDOR West of LC |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23022/23023 | ivsg_hs_alt3ad1 | 408.3 | -493.7 | 3.9 | 2098.7 | 493.7 | 1.229 | 0.96 | ML-MS1+ ML-MS2 230KV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 13821C/25/23051A | ivsg_hs_alt3ad1 | 204.1 | 240.9 | -20.8 | 1031.4 | 241.8 | 1.208 | 0.984 | CH-ES-NCM-SX |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 2 | line_2046 | ivsg_hs_alt3ad1 | 956 | -1132.1 | -37.6 | 2879 | 1132.7 | 1.2 | 0.596 | LA FRESA 230.00 - REDONDO 230.00 1, REDONDO 230.00 - LITEHIPE 230.00 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 1 | line_2047 | ivsg_hs_alt3ad1 | 956 | -1132.1 | -37.6 | 2879 | 1132.7 | 1.2 | 0.596 | LA FRESA 230.00 - REDONDO 230.00 2, REDONDO 230.00 - LITEHIPE 230.00 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23022/23023 | ivsg_hs_alt3ad1 | 204.1 | 236.7 | -2.3 | 1003.7 | 236.7 | 1.175 | 0.984 | ML-MS1+ ML-MS2 230KV |
| 22672 | PRCTRVLY | 138 | 22852 | TELECYN | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt3ad1 | 478 | 535.6 | 3.9 | 2344.4 | 535.7 | 1.172 | 0.755 | MIGUEL 230 CORRIDOR North of ML |
| 24086 | LUGO | 500 | 24236 | RANCHVST | 500 | 1 | line_2194 | ivsg_hs_alt3ad1 | 2598 | 3108.9 | 521.2 | 3470 | 3152.3 | 1.158 | 0.643 | LUGO 500.00 - MIRALOMA 500.00 2, LUGO 500.00 - MIRALOMA 500.00 3 |
| 30060 | MIDWAY | 500 | 24156 | VINCENT | 500 | 3 | line_2215 | ivsg_hs_alt3ad1 | 1848.1 | 2240.4 | 119.9 | 2431.3 | 2243.6 | 1.142 | 0.447 | MIDWAY 500.00 - VINCENT 500.00 1, MIDWAY 500.00 - VINCENT 500.00 2 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 2 | line_2064 | ivsg_hs_alt3ad1 | 956 | -1071.9 | -44.4 | 2725.8 | 1072.8 | 1.136 | 0.596 | LA FRESA 230.00 - REDONDO 230.00 1, MESA CAL 230.00 - REDONDO 230.00 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 1 | line_2065 | ivsg_hs_alt3ad1 | 956 | -1071.9 | -44.4 | 2725.8 | 1072.8 | 1.136 | 0.596 | LA FRESA 230.00 - REDONDO 230.00 2, MESA CAL 230.00 - REDONDO 230.00 1 |
| 30060 | MIDWAY | 500 | 24156 | VINCENT | 500 | 1 | line_2220 | ivsg_hs_alt3ad1 | 1848.1 | 2217.1 | 127.3 | 2406.9 | 2220.7 | 1.132 | 0.357 | MIDWAY 500.00 - VINCENT 500.00 2, MIDWAY 500.00 - VINCENT 500.00 3 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 2 | line_2029 | ivsg_hs_alt3ad1 | 1195 | 1313.8 | -41.4 | 3389.6 | 1314.4 | 1.13 | 0.562 | LEWIS 230.00 - SERRANO 230.00 2, SERRANO 230.00 - VILLA PK 230.00 1 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 2 | line_2031 | ivsg_hs_alt3ad1 | 1195 | 1313.8 | -41.4 | 3389.6 | 1314.4 | 1.13 | 0.562 | LEWIS 230.00 - SERRANO 230.00 2, SERRANO 230.00 - VILLA PK 230.00 1 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 2 | line_2278 | ivsg_hs_alt3ad1 | 1195 | 1313.8 | -41.4 | 3389.6 | 1314.4 | 1.13 | 0.562 | LEWIS 230.00 - SERRANO 230.00 1, SERRANO 230.00 - VILLA PK 230.00 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23012/13807 | ivsg_hs_alt3ad1 | 204.1 | 224.4 | 11.9 | 957.3 | 224.7 | 1.121 | 0.984 | PQ-EA 230KV + EA-NCW 138KV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23002/06/10 | ivsg_hs_alt3ad1 | 204.1 | 219.3 | 13.3 | 956 | 219.7 | 1.12 | 0.984 | SANLUISREY 230 CORRIDOR |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23021/23041 | ivsg_hs_alt3ad1 | 392 | 431.6 | 47.7 | 1129.9 | 434.3 | 1.11 | 1.01 | ML-SX + OM-SX 230KV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 13821B/638 | ivsg_hs_alt3ad1 | 392 | 431.6 | 54.3 | 1125.3 | 435 | 1.11 | 1.01 | CH-SX-SN 138KV + SAN VCNT-EL 69KV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23011/13825 | ivsg_hs_alt3ad1 | 204.1 | 222.6 | -11.7 | 945.5 | 222.9 | 1.107 | 0.984 | ES-EA-SA 230KV + BQ-CC-ES-NCM 138KV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23051B/23011 | ivsg_hs_alt3ad1 | 204.1 | 223.6 | -3.2 | 942.7 | 223.6 | 1.104 | 0.984 | EPP-ES + ES-EA-SA 230KV |
| 22596 | OLD TOWN | 230 | 22466 | MLMS3TAP | 230 | 1 | 23021/22/23/41 | ivsg_hs_alt3ad1 | 912 | -949.4 | 80.7 | 2523.6 | 952.8 | 1.102 | 0.671 | MIGUEL 230 CORRIDOR West of SN |
| 8601 | GEOSUB2 | 230 | 8300 | BANIS230 | 230 | 1 | line_N-204 | ivsg_hs_alt3ad1 | 550 | 590.7 | 101.5 | 1510.3 | 599.4 | 1.095 | 0.753 | COACHELLA MIDWAY 230 CKT 1&2 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23012/13808 | ivsg_hs_alt3ad1 | 204.1 | 219.5 | 10.5 | 935.1 | 219.7 | 1.095 | 0.984 | PQ-EA 230KV + NCW-PQ 138KV |
| 22596 | OLD TOWN | 230 | 22466 | MLMS3TAP | 230 | 1 | 23021/22/23/41 | ivsg_hs_alt3ad1 | 912 | -948.4 | 95.1 | 2506.7 | 953.1 | 1.095 | 0.671 | MIGUEL 230 CORRIDOR North of ML |
| 22596 | OLD TOWN | 230 | 22466 | MLMS3TAP | 230 | 1 | 23021/22/23/41 | ivsg_hs_alt3ad1 | 912 | -945.1 | 92.8 | 2498.3 | 949.6 | 1.091 | 0.671 | MIGUEL 230 CORRIDOR West of LC |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 2 | line_2049 | ivsg_hs_alt3ad1 | 956 | -1026.4 | -37.9 | 2613.6 | 1027.1 | 1.089 | 0.596 | LA FRESA 230.00 - REDONDO 230.00 1, LCIENEGA 230.00 - LA FRESA 230.00 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 1 | line_2050 | ivsg_hs_alt3ad1 | 956 | -1026.4 | -37.9 | 2613.6 | 1027.1 | 1.089 | 0.596 | LA FRESA 230.00 - REDONDO 230.00 2, LCIENEGA 230.00 - LA FRESA 230.00 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 2 | line_2057 | ivsg_hs_alt3ad1 | 956 | -1025.9 | -34.6 | 2611.1 | 1026.5 | 1.088 | 0.596 | EL NIDO 230.00 - LA FRESA 230.00 3, LA FRESA 230.00 - REDONDO 230.00 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 1 | line_2058 | ivsg_hs_alt3ad1 | 956 | -1025.9 | -34.6 | 2611.1 | 1026.5 | 1.088 | 0.596 | EL NIDO 230.00 - LA FRESA 230.00 3, LA FRESA 230.00 - REDONDO 230.00 2 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 2 | line_2059 | ivsg_hs_alt3ad1 | 956 | -1025.9 | -34.6 | 2611.1 | 1026.5 | 1.088 | 0.596 | EL NIDO 230.00 - LA FRESA 230.00 4, LA FRESA 230.00 - REDONDO 230.00 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 1 | line_2060 | ivsg_hs_alt3ad1 | 956 | -1025.9 | -34.6 | 2611.1 | 1026.5 | 1.088 | 0.596 | EL NIDO 230.00 - LA FRESA 230.00 4, LA FRESA 230.00 - REDONDO 230.00 2 |
| 24701 | KRAMER | 230 | 24085 | LUGO | 230 | 2 | line_2260 | ivsg_hs_alt3ad1 | 478 | 525.9 | 4.1 | 1302.1 | 525.9 | 1.085 | 0.644 | KRAMER 230.00 - LUGO 230.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 8900 | PRUETTAP | 92 | 8691 | HIGHLINE | 92 | 1 | line_N-209 | ivsg_hs_alt3ad1 | 86 | -94.6 | 7.1 | 585.4 | 94.9 | 1.085 | 0.776 | EL CENTRO HIGHLINE 230 CKTS 1&2 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23002/06/10 | ivsg_hs_alt3ad1 | 392 | 420.3 | 48.5 | 1129.9 | 423.1 | 1.08 | 1.01 | SANLUISREY 230 CORRIDOR |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | 23022/23023 | ivsg_hs_alt3ad1 | 382.4 | 404.6 | 9.7 | 1726.8 | 404.7 | 1.079 | 0.797 | ML-MS1+ ML-MS2 230KV |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_N-203 | ivsg_hs_alt3ad1 | 169 | 180.2 | 38.2 | 647.9 | 184.2 | 1.072 | 0.809 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23021/23041 | ivsg_hs_alt3ad1 | 408.3 | -426.1 | 4.6 | 1823.8 | 426.1 | 1.068 | 0.96 | ML-SX + OM-SX 230KV |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23002/06/10 | ivsg_hs_alt3ad1 | 408.3 | -414.7 | 3.9 | 1823.7 | 414.7 | 1.068 | 0.96 | SANLUISREY 230 CORRIDOR |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23004/23001 | ivsg_hs_alt3ad1 | 204.1 | 213.6 | 6.3 | 907.4 | 213.7 | 1.063 | 0.984 | SA-MS 1 + SA-MS 2 230KV |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 13821B/638 | ivsg_hs_alt3ad1 | 408.3 | -426.1 | -2.4 | 1816.3 | 426.1 | 1.063 | 0.96 | CH-SX-SN 138KV + SAN VCNT-EL 69KV |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_2260 | ivsg_hs_alt3ad1 | 56 | 57.9 | -9.9 | 292.1 | 58.7 | 1.06 | 0.92 | KRAMER 230.00 - LUGO 230.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 8376 | RTAP2 | 92 | 8974 | RTP1 | 92 | 1 | line_N-204 | ivsg_hs_alt3ad1 | 57 | -56.6 | 11.3 | 377.5 | 57.7 | 1.058 | 0.629 | COACHELLA MIDWAY 230 CKT 1&2 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 1 | line_2030 | ivsg_hs_alt3ad1 | 1287 | 1313.8 | -41.4 | 3389.6 | 1314.4 | 1.049 | 0.521 | LEWIS 230.00 - SERRANO 230.00 1, SERRANO 230.00 - VILLA PK 230.00 2 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 1 | line_2032 | ivsg_hs_alt3ad1 | 1287 | 1313.8 | -41.4 | 3389.6 | 1314.4 | 1.049 | 0.521 | LEWIS 230.00 - SERRANO 230.00 2, SERRANO 230.00 - VILLA PK 230.00 2 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23011/23003 | ivsg_hs_alt3ad1 | 204.1 | 211.4 | 1.1 | 893.6 | 211.4 | 1.046 | 0.984 | SA-EA 230KV + SA-ES-EA 230KV |
| 24025 | CHINO | 230 | 24093 | MIRALOMW | 230 | 1 | line_2160 | ivsg_hs_alt3ad1 | 705 | -712.9 | 26.6 | 1842 | 713.4 | 1.041 | 0.268 | CHINO 230.00 - MIRALOMA 230.00 2, CHINO 230.00 - MIRALOMA 230.00 3 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23013/27/28 | ivsg_hs_alt3ad1 | 204.1 | 205.9 | 4.2 | 872.2 | 205.9 | 1.021 | 0.984 | OLD TOWN TO OLD TOWN JCT |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_N-204 | ivsg_hs_alt3ad1 | 169 | 171 | 36.7 | 615.2 | 174.9 | 1.019 | 0.809 | COACHELLA MIDWAY 230 CKT 1&2 |
| 8900 | PRUETTAP | 92 | 8691 | HIGHLINE | 92 | 1 | line_N-204 | ivsg_hs_alt3ad1 | 86 | -87.5 | 13.6 | 547.8 | 88.6 | 1.016 | 0.776 | COACHELLA MIDWAY 230 CKT 1&2 |
| 24016 | BARRE | 230 | 24044 | ELLIS | 230 | 1 | line_2115 | ivsg_hs_alt3ad1 | 988 | 968.6 | -47.7 | 2516.7 | 969.8 | 1.015 | 0.391 | S.ONOFRE 230.00 - SANTIAGO 230.00 1, S.ONOFRE 230.00 - SANTIAGO 230.00 2 |
| 24074 | LA FRESA | 230 | 24065 | HINSON | 230 | 1 | line_2061 | ivsg_hs_alt3ad1 | 797 | -770.8 | 47.8 | 2011.9 | 772.3 | 1.006 | 0.139 | LA FRESA 230.00 - REDONDO 230.00 1, LA FRESA 230.00 - REDONDO 230.00 2 |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | line_2236 | ivsg_hs_alt3ad1 | 132 | 130.3 | -9.7 | 831.7 | 130.6 | 1.004 | 0.947 | PALOVRDE 500.00 - DEVERS 500.00 1, COACHELV 230.00 - DEVERS 230.00 2 |
| 19020 | BLYTHE | 161 | 24017 | BLYTHESC | 161 | 1 | line_N-203 | ivsg_hs_alt3ad1 | 244 | 246.7 | 38.5 | 878.1 | 249.7 | 1.004 | 0.824 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | line_N-203 | ivsg_hs_alt3ad1 | 408.3 | -400.8 | 7.9 | 1713 | 400.8 | 1.003 | 0.96 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 8600 | GEOSUB1 | 230 | 8300 | BANIS230 | 230 | 1 | line_N-204 | ivsg_hs_alt3ad1 | 550 | 541 | 90.4 | 1383.5 | 548.6 | 1.003 | 0.698 | COACHELLA MIDWAY 230 CKT 1&2 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8600 | GEOSUB1 | 230 | 8300 | BANIS230 | 230 | 2 | line_N-204 | ivsg_hs_alt3ad1 | 550 | 541 | 90.4 | 1383.5 | 548.6 | 1.003 | 0.698 | COACHELLA MIDWAY 230 CKT 1&2 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23012/13807 | ivsg_hs_alt3ad1 | 408.3 | -398.5 | -3.4 | 1704.4 | 398.5 | 0.998 | 0.96 | PQ-EA 230KV + EA-NCW 138KV |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | line_2245 | ivsg_hs_alt3ad1 | 408.3 | -399.1 | 7.8 | 1703.1 | 399.2 | 0.997 | 0.96 | DEVERS 500.00 - VALLEYSC 500.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | line_N-204 | ivsg_hs_alt3ad1 | 132 | 126.6 | -14.2 | 823.9 | 127.4 | 0.995 | 0.947 | COACHELLA MIDWAY 230 CKT 1&2 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23012/13808 | ivsg_hs_alt3ad1 | 408.3 | -397.8 | -2.5 | 1698.4 | 397.8 | 0.994 | 0.96 | PQ-EA 230KV + NCW-PQ 138KV |
| 24126 | RIOHONDO | 230 | 24155 | VINCENT | 230 | 2 | line_2097 | ivsg_hs_alt3ad1 | 988 | -930.6 | 109.9 | 2457.5 | 937.1 | 0.991 | 0.722 | GOODRICH 230.00 - GOULD 230.00 1, VINCENT 230.00 - MESA CAL 230.00 1 |
| 24086 | LUGO | 500 | 24097 | MOHAVE | 500 | 1 | line_2234 | ivsg_hs_alt3ad1 | 1386 | -1427.5 | 90.8 | 1571.4 | 1430.4 | 0.991 | 0.7 | MOHAVE 500.00 - ELDORDO 500.00 1, PISGAH 230.00 - ELDORDO 230.00 2 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | line_N-204 | ivsg_hs_alt3ad1 | 408.3 | -395.9 | 8 | 1691.1 | 395.9 | 0.99 | 0.96 | COACHELLA MIDWAY 230 CKT 1&2 |
| 22596 | OLD TOWN | 230 | 22466 | MLMS3TAP | 230 | 1 | 23021/23041 | ivsg_hs_alt3ad1 | 912 | -863.4 | 71.9 | 2258.9 | 866.4 | 0.987 | 0.671 | ML-SX + OM-SX 230KV |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_N-203 | ivsg_hs_alt3ad1 | 800 | 785 | 68.2 | 1977.6 | 788 | 0.985 | 0.72 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | line_2237 | ivsg_hs_alt3ad1 | 132 | 128.2 | -10.4 | 815.2 | 128.6 | 0.984 | 0.947 | PALOVRDE 500.00 - DEVERS 500.00 1, J.HINDS 230.00 - MIRAGE 230.00 1 |
| 22672 | PRCTRVLY | 138 | 22852 | TELECYN | 138 | 1 | 23022/23023 | ivsg_hs_alt3ad1 | 478 | 462.8 | -7.8 | 1967.7 | 462.9 | 0.984 | 0.755 | ML-MS1+ ML-MS2 230KV |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | line_2186 | ivsg_hs_alt3ad1 | 132 | 128.8 | -10.4 | 813.4 | 129.2 | 0.982 | 0.947 | COACHELV 230.00 - DEVERS 230.00 2, J.HINDS 230.00 - MIRAGE 230.00 1 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_N-210 | ivsg_hs_alt3ad1 | 800 | 781.1 | 33.4 | 1971.1 | 781.8 | 0.982 | 0.72 | EL CENTRO IMPERIAL VALLEY 230 CKTS 2&3 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | line_2115 | ivsg_hs_alt3ad1 | 392 | 381.8 | 40.8 | 972.9 | 383.9 | 0.98 | 1.01 | S.ONOFRE 230.00 - SANTIAGO 230.00 1, S.ONOFRE 230.00 - SANTIAGO 230.00 2 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2191 | ivsg_hs_alt3ad1 | 2400 | -2451.5 | -24.5 | 2708.4 | 2451.6 | 0.977 | 0.765 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - ELDORDO 230.00 2 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2100 | ivsg_hs_alt3ad1 | 2400 | -2437.7 | -197.2 | 2697.3 | 2445.7 | 0.973 | 0.765 | EAGLROCK 230.00 - MESA CAL 230.00 1, SYLMAR S 230.00 - GOULD 230.00 1 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2192 | ivsg_hs_alt3ad1 | 2400 | -2438.9 | -34.7 | 2695.6 | 2439.2 | 0.973 | 0.765 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2193 | ivsg_hs_alt3ad1 | 2400 | -2438.7 | -34.8 | 2695.3 | 2438.9 | 0.973 | 0.765 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - LUGO 230.00 2 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2200 | ivsg_hs_alt3ad1 | 2400 | -2426.5 | -18.7 | 2691 | 2426.6 | 0.971 | 0.765 | LUGO 500.00 - MOHAVE 500.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2201 | ivsg_hs_alt3ad1 | 2400 | -2426.3 | -18.8 | 2690.7 | 2426.4 | 0.971 | 0.765 | LUGO 500.00 - MOHAVE 500.00 1, PISGAH 230.00 - LUGO 230.00 2 |
| 14008 | JOJOBA | 500 | 15011 | KYRENE | 500 | 1 | line_2245 | ivsg_hs_alt3ad1 | 1732 | 1773.9 | 141.8 | 1938.3 | 1779.6 | 0.971 | 0.934 | DEVERS 500.00 - VALLEYSC 500.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 19020 | BLYTHE | 161 | 24017 | BLYTHESC | 161 | 1 | line_N-204 | ivsg_hs_alt3ad1 | 244 | 237.5 | 37 | 845.3 | 240.4 | 0.966 | 0.824 | COACHELLA MIDWAY 230 CKT 1&2 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_2194 | ivsg_hs_alt3ad1 | 56 | 52 | -10.3 | 263 | 53.1 | 0.96 | 0.92 | LUGO 500.00 - MIRALOMA 500.00 2, LUGO 500.00 - MIRALOMA 500.00 3 |
| 24126 | RIOHONDO | 230 | 24155 | VINCENT | 230 | 2 | line_2101 | ivsg_hs_alt3ad1 | 988 | -906.5 | 111.5 | 2378.5 | 913.3 | 0.959 | 0.722 | EAGLROCK 230.00 - MESA CAL 230.00 1, VINCENT 230.00 - MESA CAL 230.00 1 |
| 24042 | ELDORDO | 500 | 24086 | LUGO | 500 | 1 | line_2258 | ivsg_hs_alt3ad1 | 1386 | 1403.7 | 261 | 1519.9 | 1427.8 | 0.956 | 0.639 | LUGO 500.00 - VINCENT 500.00 2, LUGO 500.00 - VICTORVL 500.00 1 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2103 | ivsg_hs_alt3ad1 | 2400 | -2395.2 | -182.7 | 2647.8 | 2402.2 | 0.955 | 0.765 | EAGLROCK 230.00 - SYLMAR S 230.00 1, SYLMAR S 230.00 - GOULD 230.00 1 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2096 | ivsg_hs_alt3ad1 | 2400 | -2388.7 | -204.5 | 2639.6 | 2397.4 | 0.952 | 0.765 | EAGLROCK 230.00 - MESA CAL 230.00 1, GOODRICH 230.00 - GOULD 230.00 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23027/28/13810 | ivsg_hs_alt3ad1 | 204.1 | 192 | 8.9 | 812.9 | 192.2 | 0.952 | 0.984 | OLD TOWN TO MISSION 1 |
| 24126 | RIOHONDO | 230 | 24155 | VINCENT | 230 | 2 | line_2100 | ivsg_hs_alt3ad1 | 988 | -884.7 | 115.4 | 2337.7 | 892.2 | 0.943 | 0.722 | EAGLROCK 230.00 - MESA CAL 230.00 1, SYLMAR S 230.00 - GOULD 230.00 1 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | 23022/23023 | ivsg_hs_alt3ad1 | 392 | 366 | -0.1 | 939.8 | 366 | 0.94 | 0.8 | ML-MS1+ ML-MS2 230KV |
| 22504 | MISSION | 230 | 22500 | MISSION | 138 | 1 | 23021/23041 | ivsg_hs_alt3ad1 | 392 | 356.8 | 72 | 951.6 | 364 | 0.93 | 0.78 | ML-SX + OM-SX 230KV |
| 22504 | MISSION | 230 | 22500 | MISSION | 138 | 2 | 23021/23041 | ivsg_hs_alt3ad1 | 392 | 356.8 | 72 | 951.6 | 364 | 0.93 | 0.78 | ML-SX + OM-SX 230KV |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 2 | line_2279 | ivsg_hs_alt3ad1 | 1195 | 1074.5 | -51.7 | 2781.7 | 1075.8 | 0.927 | 0.562 | S.ONOFRE 230.00 - SERRANO 230.00 1, SERRANO 230.00 - VILLA PK 230.00 1 |
| 24126 | RIOHONDO | 230 | 24155 | VINCENT | 230 | 2 | line_2076 | ivsg_hs_alt3ad1 | 988 | -877 | 103.4 | 2291.5 | 883.1 | 0.924 | 0.722 | GOODRICH 230.00 - LAGUBELL 230.00 1, VINCENT 230.00 - MESA CAL 230.00 1 |
| 24614 | TAP601 | 115 | 24702 | KRAMER | 115 | 1 | line_2260 | ivsg_hs_alt3ad1 | 217.1 | -190 | 69.3 | 1005.1 | 202.3 | 0.924 | 0.717 | KRAMER 230.00 - LUGO 230.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 8311 | COACHELA | 230 | 8695 | RAMON | 230 | 2 | line_2236 | ivsg_hs_alt3ad1 | 800 | 706.7 | -31.3 | 1848.8 | 707.4 | 0.921 | 0.622 | PALOVRDE 500.00 - DEVERS 500.00 1, COACHELV 230.00 - DEVERS 230.00 2 |
| 8332 | ELCENTSW | 230 | 8335 | ELSTEAMP | 92 | 1 | line_N-210 | ivsg_hs_alt3ad1 | 225 | 205.9 | 17.9 | 518 | 206.7 | 0.92 | 0.51 | EL CENTRO IMPERIAL VALLEY 230 CKTS 2&3 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | line_2115 | ivsg_hs_alt3ad1 | 408.3 | -377.7 | -2 | 1570.4 | 377.7 | 0.919 | 0.96 | S.ONOFRE 230.00 - SANTIAGO 230.00 1, S.ONOFRE 230.00 - SANTIAGO 230.00 2 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2255 | ivsg_hs_alt3ad1 | 2400 | -2288.8 | -66.3 | 2545.5 | 2289.8 | 0.919 | 0.765 | LUGO 500.00 - MIRALOMA 500.00 3, LUGO 500.00 - MOHAVE 500.00 1 |
| 24126 | RIOHONDO | 230 | 24155 | VINCENT | 230 | 2 | line_2096 | ivsg_hs_alt3ad1 | 988 | -863.2 | 103 | 2275.2 | 869.4 | 0.917 | 0.722 | EAGLROCK 230.00 - MESA CAL 230.00 1, GOODRICH 230.00 - GOULD 230.00 1 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2256 | ivsg_hs_alt3ad1 | 2400 | -2289.8 | -82.7 | 2537.6 | 2291.3 | 0.916 | 0.765 | ELDORDO 500.00 - LUGO 500.00 1, LUGO 500.00 - MIRALOMA 500.00 2 |
| 24807 | MIRAGE | 115 | 24819 | CONCHO | 115 | 1 | line_2182 | ivsg_hs_alt3ad1 | 183 | 164 | -7.1 | 841 | 164.1 | 0.915 | 0.869 | DEVERS 230.00 - MIRAGE 230.00 2, COACHELV 230.00 - DEVERS 230.00 2 |
| 24126 | RIOHONDO | 230 | 24155 | VINCENT | 230 | 2 | line_2103 | ivsg_hs_alt3ad1 | 988 | -855.9 | 102.5 | 2257.6 | 862 | 0.91 | 0.722 | EAGLROCK 230.00 - SYLMAR S 230.00 1, SYLMAR S 230.00 - GOULD 230.00 1 |
| 24602 | VICTOR | 115 | 24702 | KRAMER | 115 | 1 | line_2260 | ivsg_hs_alt3ad1 | 217.1 | -185.3 | 79.5 | 989.1 | 201.7 | 0.91 | 0.703 | KRAMER 230.00 - LUGO 230.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | 23021/23041 | ivsg_hs_alt3ad1 | 382.4 | 337.6 | 12.9 | 1450.5 | 337.9 | 0.907 | 0.797 | ML-SX + OM-SX 230KV |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2245 | ivsg_hs_alt3ad1 | 2400 | -2268.5 | -46.2 | 2511 | 2269 | 0.906 | 0.765 | DEVERS 500.00 - VALLEYSC 500.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 24807 | MIRAGE | 115 | 24816 | SANTA RO | 115 | 1 | line_2182 | ivsg_hs_alt3ad1 | 183.3 | 162 | -13 | 832.4 | 162.5 | 0.905 | 0.86 | DEVERS 230.00 - MIRAGE 230.00 2, COACHELV 230.00 - DEVERS 230.00 2 |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | 13821B/638 | ivsg_hs_alt3ad1 | 382.4 | 337.7 | 20.4 | 1447.1 | 338.3 | 0.905 | 0.797 | CH-SX-SN 138KV + SAN VCNT-EL 69KV |
| 24125 | REDONDO | 230 | 24084 | LITEHIPE | 230 | 1 | line_2061 | ivsg_hs_alt3ad1 | 916 | 815.3 | 94.2 | 2075.4 | 820.7 | 0.903 | 0.113 | LA FRESA 230.00 - REDONDO 230.00 1, LA FRESA 230.00 - REDONDO 230.00 2 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_N-204 | ivsg_hs_alt3ad1 | 800 | 700.9 | -6.9 | 1812.8 | 700.9 | 0.903 | 0.72 | COACHELLA MIDWAY 230 CKT 1&2 |
| 24093 | MIRALOMW | 230 | 24158 | WALNUT | 230 | 1 | line_2089 | ivsg_hs_alt3ad1 | 797 | 678.8 | 165.5 | 1801 | 698.7 | 0.902 | 0.526 | MESA CAL 230.00 - WALNUT 230.00 1, OLINDA 230.00 - WALNUT 230.00 1 |
| 24807 | MIRAGE | 115 | 24819 | CONCHO | 115 | 1 | line_2245 | ivsg_hs_alt3ad1 | 183 | 163.9 | -8 | 826.4 | 164.1 | 0.9 | 0.869 | DEVERS 500.00 - VALLEYSC 500.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | 23051B/23011 | ivsg_hs_alt3ad1 | 392 | 351.6 | -0.6 | 897.5 | 351.6 | 0.9 | 0.8 | EPP-ES + ES-EA-SA 230KV |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | 23002/06/10 | ivsg_hs_alt3ad1 | 382.4 | 326.3 | 11.6 | 1440.1 | 326.5 | 0.9 | 0.797 | SANLUISREY 230 CORRIDOR |

ivsg_hs_alt3ad1.sav
No Solve Summary
N-2 Outages

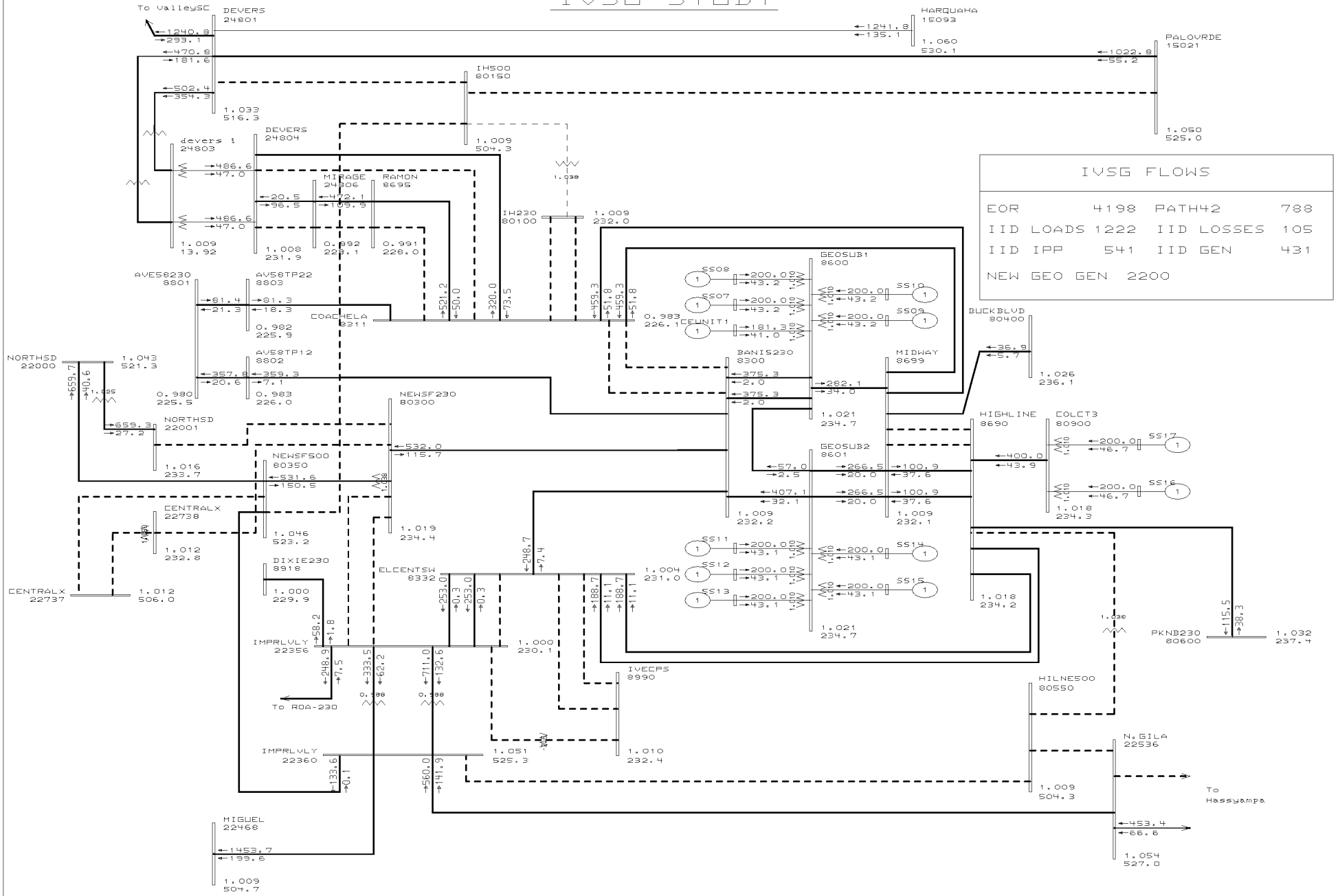
| Contingency-Description | Case | Problem-Description |
|---|---|---|
| DEVERS 230.00 - MIRAGE 230.00 2, RAMON 230.00 - MIRAGE 230.00 2 | ivsg_hs_alt3ad1 | Pmis 24807 MIRAGE 115.00 = -82420.03 MW + j -218339.34 MVAR |
| VICTOR 230.00 - LUGO 230.00 1, VICTOR 230.00 - LUGO 230.00 2 | ivsg_hs_alt3ad1 | BAD Qgen: 24758 SUNGEN7G 17.0 MVAr |
| DEVERS 230.00 - MIRAGE 230.00 2, RAMON 230.00 - MIRAGE 230.00 2 | ivsg_hs_alt3ad1 | Pmis 24807 MIRAGE 115.00 = -82420.03 MW + j -218339.34 MVAR |

# Imperial Valley Study Group

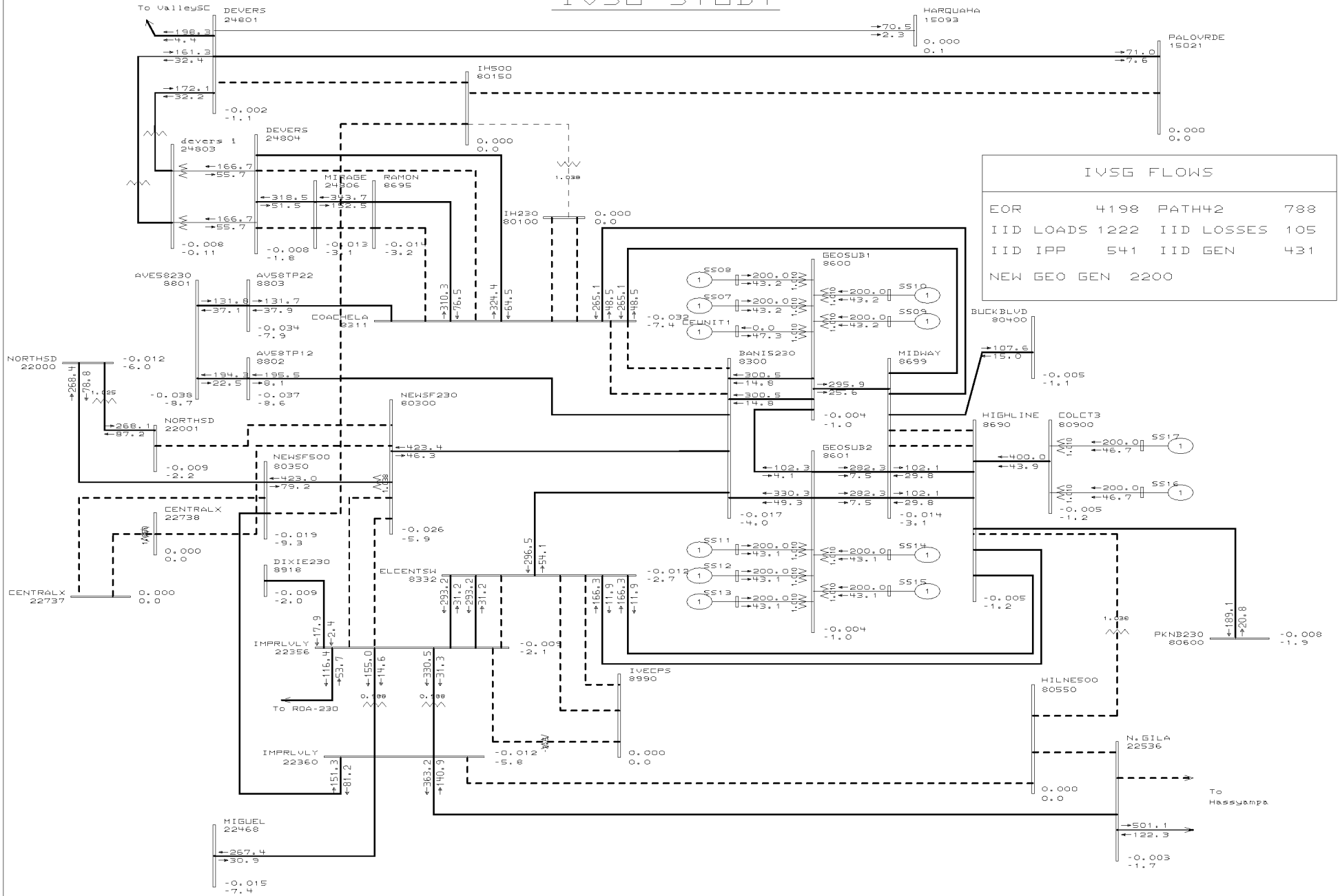
## Appendix A.4.7

Alt 3a D2
Heavy Summer
Alternative 3a
Dispatch 2

# IVSG STUDY


To ValleySC
DEVERS 24801
HARQUAHA 15093
PALOVRDE 15021
IH500 80150
DEVERS 24804
devers 1 24803
MIRAGE 24806
RAMON 8695
IH230 80100
GEOSUB1 8600
AVE58230 8801
AV58TP22 8803
COACHELA 8211
BUCKBLVD 80400
AV58TP12 8802
BANIS230 8300
MIDWAY 8699
NORTHSD 22000
NORTHSD 22001
NEWSF230 80300
HIGHLINE 8690
COLCT3 80900
GEOSUB2 8601
NEWSF500 80350
CENTRALX 22738
CENTRALX 22737
DIXIE230 8918
ELCENTSW 8332
IMPRLVLY 22356
IMPRLVLY 22360
IVECPS 8990
HILNE500 80550
N.GILA 22536
PKNB230 80600
MIGUEL 22468
To ROA-230
To Hassyampa
IVSG FLOWS
EOR 4198 PATH42 788
IID LOADS 1222 IID LOSSES 105
IID IPP 541 IID GEN 431
NEW GEO GEN 2200

# IVSG STUDY




| IVSG FLOWS | | | |
|---|---|---|---|
| EOR | 4198 | PATH42 | 788 |
| IID LOADS | 1222 | IID LOSSES | 105 |
| IID IPP | 541 | IID GEN | 431 |
| NEW GEO GEN | 2200 | | |

ivsg_hs_alt3ad2.sav
Voltage Summary
N-0 Outages

| Bus | Name | kV | Area | Zone | Outage | Case | Vbase | Vcont | DeltaV | Vmin | Vmax | Max-dv | Contingency Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24035 | EAGLEMTN | 161 | 24 | 248 | base | ivsg_hs_alt3ad2_ | 0.93 | 0.93 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 20077 | SIM-115 | 115 | 20 | 205 | base | ivsg_hs_alt3ad2_ | 0.933 | 0.933 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 20076 | SQN-115 | 115 | 20 | 205 | base | ivsg_hs_alt3ad2_ | 0.938 | 0.938 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14534 | N.GILA 4 | 100 | 14 | 847 | base | ivsg_hs_alt3ad2_ | 0.945 | 0.945 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15021 | PALOVRDE | 500 | 14 | 158 | base | ivsg_hs_alt3ad2_ | 1.05 | 1.05 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24775 | RUSH | 115 | 24 | 247 | base | ivsg_hs_alt3ad2_ | 1.05 | 1.05 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 22360 | IMPRLVLY | 500 | 22 | 227 | base | ivsg_hs_alt3ad2_ | 1.051 | 1.051 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24219 | PISGAH | 230 | 24 | 240 | base | ivsg_hs_alt3ad2_ | 1.051 | 1.051 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24236 | RANCHVST | 500 | 24 | 240 | base | ivsg_hs_alt3ad2_ | 1.052 | 1.052 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24627 | CIMA | 230 | 24 | 240 | base | ivsg_hs_alt3ad2_ | 1.052 | 1.052 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15090 | HASSYAMP | 500 | 14 | 158 | base | ivsg_hs_alt3ad2_ | 1.053 | 1.053 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15092 | ARLINTON | 500 | 14 | 158 | base | ivsg_hs_alt3ad2_ | 1.053 | 1.053 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15094 | MESQUITE | 500 | 14 | 158 | base | ivsg_hs_alt3ad2_ | 1.053 | 1.053 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24138 | SERRANO | 500 | 24 | 240 | base | ivsg_hs_alt3ad2_ | 1.053 | 1.053 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24229 | VALLEY-S | 115 | 24 | 240 | base | ivsg_hs_alt3ad2_ | 1.053 | 1.053 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 25991 | VALYSVC2 | 115 | 24 | 240 | base | ivsg_hs_alt3ad2_ | 1.053 | 1.053 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14009 | REDHAWK | 500 | 14 | 141 | base | ivsg_hs_alt3ad2_ | 1.054 | 1.054 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 22536 | N.GILA | 500 | 22 | 227 | base | ivsg_hs_alt3ad2_ | 1.054 | 1.054 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 79043 | KAYENTA | 230 | 14 | 191 | base | ivsg_hs_alt3ad2_ | 1.055 | 1.055 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14010 | TS5 | 500 | 14 | 141 | base | ivsg_hs_alt3ad2_ | 1.056 | 1.056 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14230 | VERDE N | 230 | 14 | 141 | base | ivsg_hs_alt3ad2_ | 1.057 | 1.057 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14247 | VERDE S | 230 | 14 | 141 | base | ivsg_hs_alt3ad2_ | 1.057 | 1.057 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14011 | RACEWAY | 500 | 14 | 141 | base | ivsg_hs_alt3ad2_ | 1.057 | 1.057 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24776 | LEE VINE | 115 | 24 | 247 | base | ivsg_hs_alt3ad2_ | 1.058 | 1.058 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24151 | VALLEYSC | 500 | 24 | 240 | base | ivsg_hs_alt3ad2_ | 1.058 | 1.058 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24997 | VALYSVC1 | 500 | 24 | 240 | base | ivsg_hs_alt3ad2_ | 1.058 | 1.058 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 28040 | CALPINE | 500 | 24 | 240 | base | ivsg_hs_alt3ad2_ | 1.058 | 1.058 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15041 | SILVERKG | 500 | 14 | 158 | base | ivsg_hs_alt3ad2_ | 1.06 | 1.06 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15061 | RUDD | 500 | 14 | 158 | base | ivsg_hs_alt3ad2_ | 1.06 | 1.06 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15093 | HARQUAHA | 500 | 14 | 158 | base | ivsg_hs_alt3ad2_ | 1.06 | 1.06 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14205 | COCONINO | 230 | 14 | 141 | base | ivsg_hs_alt3ad2_ | 1.06 | 1.06 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14008 | JOJOBA | 500 | 14 | 141 | base | ivsg_hs_alt3ad2_ | 1.06 | 1.06 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24086 | LUGO | 500 | 24 | 240 | base | ivsg_hs_alt3ad2_ | 1.06 | 1.06 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15034 | PERKINS | 500 | 14 | 158 | base | ivsg_hs_alt3ad2_ | 1.061 | 1.061 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14234 | YAVAPAI | 230 | 14 | 141 | base | ivsg_hs_alt3ad2_ | 1.062 | 1.062 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14355 | PRESCOTT | 115 | 14 | 141 | base | ivsg_hs_alt3ad2_ | 1.065 | 1.065 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14543 | PRESCOT1 | 100 | 14 | 141 | base | ivsg_hs_alt3ad2_ | 1.065 | 1.065 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14256 | FLAGSTAF | 230 | 14 | 141 | base | ivsg_hs_alt3ad2_ | 1.065 | 1.065 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14544 | PRESCOT2 | 100 | 14 | 141 | base | ivsg_hs_alt3ad2_ | 1.066 | 1.066 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14587 | FLAGSTF1 | 100 | 14 | 141 | base | ivsg_hs_alt3ad2_ | 1.066 | 1.066 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14001 | FOURCORN | 500 | 14 | 141 | base | ivsg_hs_alt3ad2_ | 1.068 | 1.068 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 79264 | PINAL_W | 500 | 14 | 141 | base | ivsg_hs_alt3ad2_ | 1.068 | 1.068 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24729 | INYO | 230 | 24 | 247 | base | ivsg_hs_alt3ad2_ | 1.068 | 1.068 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24156 | VINCENT | 500 | 24 | 240 | base | ivsg_hs_alt3ad2_ | 1.068 | 1.068 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14007 | GILARIVR | 500 | 14 | 141 | base | ivsg_hs_alt3ad2_ | 1.069 | 1.069 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14006 | YAVAPAI | 500 | 14 | 141 | base | ivsg_hs_alt3ad2_ | 1.07 | 1.07 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15992 | SEV | 500 | 14 | 158 | base | ivsg_hs_alt3ad2_ | 1.072 | 1.072 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14004 | SAGUARO | 500 | 14 | 141 | base | ivsg_hs_alt3ad2_ | 1.073 | 1.073 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 16000 | TORTOLIT | 500 | 14 | 160 | base | ivsg_hs_alt3ad2_ | 1.073 | 1.073 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 16001 | TORTLIT2 | 500 | 14 | 160 | base | ivsg_hs_alt3ad2_ | 1.073 | 1.073 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14215 | LEUPP | 230 | 14 | 141 | base | ivsg_hs_alt3ad2_ | 1.074 | 1.074 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14100 | CHOLLA | 345 | 14 | 141 | base | ivsg_hs_alt3ad2_ | 1.075 | 1.075 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15001 | CORONADO | 500 | 14 | 158 | base | ivsg_hs_alt3ad2_ | 1.079 | 1.079 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14000 | CHOLLA | 500 | 14 | 141 | base | ivsg_hs_alt3ad2_ | 1.08 | 1.08 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 19038 | MEAD | 500 | 14 | 191 | base | ivsg_hs_alt3ad2_ | 1.086 | 1.086 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14204 | CHOLLA | 230 | 14 | 141 | base | ivsg_hs_alt3ad2_ | 1.087 | 1.087 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24042 | ELDORDO | 500 | 24 | 240 | base | ivsg_hs_alt3ad2_ | 1.087 | 1.087 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24097 | MOHAVE | 500 | 24 | 240 | base | ivsg_hs_alt3ad2_ | 1.089 | 1.089 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14509 | CHOLLA 7 | 100 | 14 | 141 | base | ivsg_hs_alt3ad2_ | 1.093 | 1.093 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14267 | SECDKNOL | 230 | 14 | 141 | base | ivsg_hs_alt3ad2_ | 1.098 | 1.098 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14003 | NAVAJO | 500 | 14 | 141 | base | ivsg_hs_alt3ad2_ | 1.102 | 1.102 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14002 | MOENKOPI | 500 | 14 | 141 | base | ivsg_hs_alt3ad2_ | 1.105 | 1.105 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |

ivsg_hs_alt3ad2.sav
Flow Summary
N-0 Outages

| LEGEND | % of RATING 1 | |
|---|---|---|
| C_pu | 100% - 110% | |
| C_pu | 110% - 120% | P.U. of |
| C_pu | > 120% | Rate 1 |

| FROM | FR | BKV | TO | TO | BKV | CK | Outage_Name | Case | Rate-Mva | Pflow | Qflow | Amps | MVA | C_pu | B_pu | Contingency_Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 14248 | GLENDALW | 230 | 14212 | GLENDALE | 230 | 1 | base | ivsg_hs_alt3ad2_ | 457 | 605.5 | 29.2 | 1519.7 | 606.2 | 1.325 | 1.325 | Base system (n-0) |
| 14248 | GLENDALW | 230 | 15201 | AGUAFRIA | 230 | 1 | base | ivsg_hs_alt3ad2_ | 457 | -605.5 | -29.2 | 1519.7 | 606.2 | 1.325 | 1.325 | Base system (n-0) |
| 14221 | PNPKAPS | 230 | 19062 | PINPK | 230 | 1 | base | ivsg_hs_alt3ad2_ | 637.4 | -786 | -183.2 | 1990.7 | 807.1 | 1.244 | 1.244 | Base system (n-0) |
| 24910 | CAL ELEC | 115 | 24912 | SHANDIN | 115 | 1 | base | ivsg_hs_alt3ad2_ | 109.1 | -124.2 | 58.2 | 679.9 | 137.1 | 1.244 | 1.244 | Base system (n-0) |
| 14212 | GLENDALE | 230 | 14270 | GRNDTRML | 230 | 1 | base | ivsg_hs_alt3ad2_ | 457 | 540.1 | 21.5 | 1355.1 | 540.5 | 1.183 | 1.183 | Base system (n-0) |
| 24912 | SHANDIN | 115 | 24916 | TAP902 | 115 | 1 | base | ivsg_hs_alt3ad2_ | 109.1 | -119.2 | 33.5 | 610.9 | 123.8 | 1.116 | 1.116 | Base system (n-0) |
| 14206 | CTRYCLUB | 230 | 14270 | GRNDTRML | 230 | 1 | base | ivsg_hs_alt3ad2_ | 509.9 | -536.3 | -17.8 | 1357.5 | 536.6 | 1.061 | 1.061 | Base system (n-0) |
| 14202 | CACTUS | 230 | 14221 | PNPKAPS | 230 | 1 | base | ivsg_hs_alt3ad2_ | 371 | -366.8 | -47.2 | 929.9 | 369.8 | 0.998 | 0.998 | Base system (n-0) |
| 14008 | JOJOBA | 500 | 15011 | KYRENE | 500 | 1 | base | ivsg_hs_alt3ad2_ | 1732 | 1812.3 | 163.7 | 1982.2 | 1819.7 | 0.993 | 0.993 | Base system (n-0) |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | base | ivsg_hs_alt3ad2_ | 132 | 126.9 | -11.3 | 795 | 127.4 | 0.96 | 0.96 | Base system (n-0) |
| 15230 | RUDD | 230 | 15218 | WHITETNK | 230 | 1 | base | ivsg_hs_alt3ad2_ | 725 | 693.7 | -17.4 | 1740 | 693.9 | 0.956 | 0.956 | Base system (n-0) |
| 24087 | MAGUNDEN | 230 | 24101 | OMAR | 230 | 1 | base | ivsg_hs_alt3ad2_ | 643 | -591.8 | 130.9 | 1531.7 | 606.1 | 0.95 | 0.95 | Base system (n-0) |
| 24806 | MIRAGE | 230 | 24807 | MIRAGE | 115 | 1 | base | ivsg_hs_alt3ad2_ | 280 | 265.6 | 27.2 | 676 | 267 | 0.95 | 0.95 | Base system (n-0) |
| 24806 | MIRAGE | 230 | 24807 | MIRAGE | 115 | 2 | base | ivsg_hs_alt3ad2_ | 280 | 265.6 | 27.2 | 676 | 267 | 0.95 | 0.95 | Base system (n-0) |
| 24702 | KRAMER | 115 | 24753 | SUNGEN | 115 | 1 | base | ivsg_hs_alt3ad2_ | 183.3 | -170.5 | 31.3 | 863.6 | 173.4 | 0.939 | 0.939 | Base system (n-0) |
| 14207 | DEERVALY | 230 | 14231 | WESTWING | 230 | 1 | base | ivsg_hs_alt3ad2_ | 720 | -667.6 | -77.8 | 1686.7 | 672.1 | 0.933 | 0.933 | Base system (n-0) |
| 26098 | SYLMAR3 | 230 | 24147 | SYLMAR S | 230 | 1 | base | ivsg_hs_alt3ad2_ | 1100 | 840.2 | -522.3 | 2563.5 | 989.2 | 0.928 | 0.928 | Base system (n-0) |
| 17003 | AVRA | 115 | 17012 | MARANA | 115 | 1 | base | ivsg_hs_alt3ad2_ | 71.7 | -65 | -5.8 | 333.5 | 65.2 | 0.927 | 0.927 | Base system (n-0) |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | base | ivsg_hs_alt3ad2_ | 56 | 49.9 | -10.8 | 253 | 51.1 | 0.92 | 0.92 | Base system (n-0) |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | base | ivsg_hs_alt3ad2_ | 204.1 | 188.2 | -9.8 | 783.5 | 188.4 | 0.918 | 0.918 | Base system (n-0) |
| 19215 | SPOOKHIL | 230 | 19045 | COOLIDGE | 230 | 1 | base | ivsg_hs_alt3ad2_ | 352 | -317.8 | 45.9 | 807.9 | 321.1 | 0.916 | 0.916 | Base system (n-0) |
| 15212 | ROGERS | 230 | 19215 | SPOOKHIL | 230 | 1 | base | ivsg_hs_alt3ad2_ | 352 | -316 | 55.8 | 807.1 | 320.9 | 0.914 | 0.914 | Base system (n-0) |

ivsg_hs_alt3ad2.sav
VOLTAGE Summary
N-1 Outages

| Bus | Name | kV | Area | Zone | Outage | Case | Vbase | Vcont | DeltaV | Vmin | Vmax | Max-dv | Contingency Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24017 | BLYTHESC | 161 | 24 | 248 | line_007 | ivsg_hs_alt3ad2_ | 1.02 | 0.866 | -0.154 | 0.9 | 1.05 | 0.05 | line BLYTHE to BLYTHESC 161 ck 1 |
| 24731 | INYOKERN | 115 | 24 | 247 | line_175 | ivsg_hs_alt3ad2_ | 1 | 0.926 | -0.074 | 0.9 | 1.05 | 0.05 | line INYO to COTTONWD 230 ck 1 |
| 24819 | CONCHO | 115 | 24 | 248 | tran_238 | ivsg_hs_alt3ad2_ | 1.027 | 0.932 | -0.094 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 24822 | INDIAN W | 115 | 24 | 248 | tran_238 | ivsg_hs_alt3ad2_ | 1.026 | 0.932 | -0.095 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 22464 | MIGUEL | 230 | 22 | 222 | B2_002 | ivsg_hs_alt3ad2_ | 1 | 0.936 | -0.064 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22468 | MIGUEL | 500 | 22 | 227 | B2_002 | ivsg_hs_alt3ad2_ | 1.009 | 0.936 | -0.074 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22472 | MIGUELMP | 500 | 22 | 227 | B2_002 | ivsg_hs_alt3ad2_ | 1.002 | 0.936 | -0.066 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 24816 | SANTA RO | 115 | 24 | 248 | tran_238 | ivsg_hs_alt3ad2_ | 1.031 | 0.937 | -0.094 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 24821 | TAMARISK | 115 | 24 | 248 | tran_238 | ivsg_hs_alt3ad2_ | 1.031 | 0.937 | -0.093 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 22412 | LOSCOCHS | 138 | 22 | 223 | B2_002 | ivsg_hs_alt3ad2_ | 0.996 | 0.938 | -0.059 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22424 | MAINST50 | 138 | 22 | 222 | B2_002 | ivsg_hs_alt3ad2_ | 0.997 | 0.939 | -0.058 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22428 | MAINST51 | 138 | 22 | 222 | B2_002 | ivsg_hs_alt3ad2_ | 0.997 | 0.939 | -0.058 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 24827 | TAP823 | 115 | 24 | 248 | tran_238 | ivsg_hs_alt3ad2_ | 1.032 | 0.939 | -0.093 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 25633 | CAPWIND | 115 | 24 | 248 | tran_238 | ivsg_hs_alt3ad2_ | 1.033 | 0.94 | -0.093 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 25622 | TAP806 | 115 | 24 | 248 | tran_238 | ivsg_hs_alt3ad2_ | 1.033 | 0.94 | -0.093 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 24829 | TAP821 | 115 | 24 | 248 | tran_238 | ivsg_hs_alt3ad2_ | 1.033 | 0.94 | -0.093 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 22734 | SANTEE | 138 | 22 | 223 | B2_002 | ivsg_hs_alt3ad2_ | 0.996 | 0.941 | -0.055 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 24807 | MIRAGE | 115 | 24 | 248 | tran_238 | ivsg_hs_alt3ad2_ | 1.035 | 0.942 | -0.092 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 25423 | ESRP MWD | 115 | 24 | 254 | tran_247 | ivsg_hs_alt3ad2_ | 1.029 | 0.943 | -0.086 | 0.9 | 1.05 | 0.05 | tran VALLEYSC 500 to VALLEYSC 115 ck 1 |
| 25423 | ESRP MWD | 115 | 24 | 254 | tran_248 | ivsg_hs_alt3ad2_ | 1.029 | 0.943 | -0.086 | 0.9 | 1.05 | 0.05 | tran VALLEYSC 500 to VALLEYSC 115 ck 2 |
| 24160 | VALLEYSC | 115 | 24 | 240 | tran_247 | ivsg_hs_alt3ad2_ | 1.031 | 0.946 | -0.085 | 0.9 | 1.05 | 0.05 | tran VALLEYSC 500 to VALLEYSC 115 ck 1 |
| 25990 | VALYSVC1 | 115 | 24 | 240 | tran_247 | ivsg_hs_alt3ad2_ | 1.031 | 0.946 | -0.085 | 0.9 | 1.05 | 0.05 | tran VALLEYSC 500 to VALLEYSC 115 ck 1 |
| 24160 | VALLEYSC | 115 | 24 | 240 | tran_248 | ivsg_hs_alt3ad2_ | 1.031 | 0.946 | -0.085 | 0.9 | 1.05 | 0.05 | tran VALLEYSC 500 to VALLEYSC 115 ck 2 |
| 25990 | VALYSVC1 | 115 | 24 | 240 | tran_248 | ivsg_hs_alt3ad2_ | 1.031 | 0.946 | -0.085 | 0.9 | 1.05 | 0.05 | tran VALLEYSC 500 to VALLEYSC 115 ck 2 |
| 22772 | SOUTHBAY | 138 | 22 | 222 | B2_002 | ivsg_hs_alt3ad2_ | 1.005 | 0.947 | -0.058 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22116 | CARLTHTP | 138 | 22 | 223 | B2_002 | ivsg_hs_alt3ad2_ | 1.002 | 0.95 | -0.051 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22865 | UPTOWN | 138 | 22 | 221 | B2_002 | ivsg_hs_alt3ad2_ | 1.005 | 0.95 | -0.055 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22120 | CARLTNHS | 138 | 22 | 223 | B2_002 | ivsg_hs_alt3ad2_ | 1.002 | 0.951 | -0.051 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22500 | MISSION | 138 | 22 | 221 | B2_002 | ivsg_hs_alt3ad2_ | 1.006 | 0.956 | -0.051 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22852 | TELECYN | 138 | 22 | 222 | B2_002 | ivsg_hs_alt3ad2_ | 1.016 | 0.956 | -0.06 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22672 | PRCTRVLY | 138 | 22 | 222 | B2_002 | ivsg_hs_alt3ad2_ | 1.019 | 0.958 | -0.061 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22460 | MIGUEL | 138 | 22 | 222 | B2_002 | ivsg_hs_alt3ad2_ | 1.021 | 0.959 | -0.061 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 14534 | N.GILA 4 | 100 | 14 | 847 | NG500/69 | ivsg_hs_alt3ad2_ | 0.945 | 1 | 0.055 | 0.9 | 1.05 | 0.05 | tran N.GILA 500 to N.GILA 69 ck 1 |
| 24035 | EAGLEMTN | 161 | 24 | 248 | tran_241 | ivsg_hs_alt3ad2_ | 0.93 | 1.026 | 0.096 | 0.9 | 1.05 | 0.05 | tran EAGLEMTN 230 to EAGLEMTN 161 ck 1 |
| 24730 | INYO PS | 115 | 24 | 247 | tran_229 | ivsg_hs_alt3ad2_ | 1.026 | 1.078 | 0.052 | 0.9 | 1.05 | 0.05 | tran INYO 115 to INYO PS 115 ck 1 |
| 24142 | SYC CYN | 230 | 24 | 240 | line_086 | ivsg_hs_alt3ad2_ | 0.985 | 1.091 | 0.106 | 0.9 | 1.05 | 0.05 | line MAGUNDEN to OMAR 230 ck 1 |
| 25613 | EDMONSTN | 230 | 24 | 256 | line_122 | ivsg_hs_alt3ad2_ | 1 | 1.091 | 0.091 | 0.9 | 1.05 | 0.05 | line PASTORIA to EDMONSTN 230 ck 1 |
| 24142 | SYC CYN | 230 | 24 | 240 | line_140 | ivsg_hs_alt3ad2_ | 0.985 | 1.091 | 0.106 | 0.9 | 1.05 | 0.05 | line SYC CYN to OMAR 230 ck 1 |

ivsg_hs_alt3ad2.sav
FLOW Summary
N-1 Outages

| LEGEND | % of RATING 1 | |
|---|---|---|
| C_pu | 100% - 110% | |
| C_pu | 110% - 120% | P.U. of |
| C_pu | > 120% | Rate 1 |

| FROM | FR | BKV | TO | TO | BKV | CK | Outage_Name | Case | Rate-Mva | Pflow | Qflow | Amps | MVA | C_pu | B_pu | Contingency_Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24142 | SYC CYN | 230 | 24101 | OMAR | 230 | 1 | line_086 | ivsg_hs_alt3ad2_ | 643 | 769 | 5511.1 | 12804.3 | 5564.5 | 7.934 | 0.47 | line MAGUNDEN to OMAR 230 ck 1 |
| 24781 | NAVYCOSO | 230 | 24706 | BLM EAST | 230 | 1 | line_173 | ivsg_hs_alt3ad2_ | 1287 | -153.8 | -3160.7 | 7943.3 | 3164.4 | 2.459 | 0.056 | line BLM EAST to BLM WEST 230 ck 1 |
| 24781 | NAVYCOSO | 230 | 24706 | BLM EAST | 230 | 1 | line_174 | ivsg_hs_alt3ad2_ | 1287 | -153.8 | -3160.7 | 7943.3 | 3164.4 | 2.459 | 0.056 | line BLM WEST to KRAMER 230 ck 1 |
| 24806 | MIRAGE | 230 | 24807 | MIRAGE | 115 | 2 | tran_238 | ivsg_hs_alt3ad2_ | 280 | 532.4 | 207.8 | 1484.2 | 571.5 | 2.04 | 0.95 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_175 | ivsg_hs_alt3ad2_ | 56 | -103.6 | -1.2 | 532.2 | 103.6 | 1.86 | 0.92 | line INYO to COTTONWD 230 ck 1 |
| 24151 | VALLEYSC | 500 | 24160 | VALLEYSC | 115 | 2 | tran_247 | ivsg_hs_alt3ad2_ | 560 | 853.2 | 355.9 | 1023.4 | 924.5 | 1.65 | 0.77 | tran VALLEYSC 500 to VALLEYSC 115 ck 1 |
| 24151 | VALLEYSC | 500 | 24160 | VALLEYSC | 115 | 1 | tran_248 | ivsg_hs_alt3ad2_ | 560 | 853.2 | 355.9 | 1023.4 | 924.5 | 1.65 | 0.77 | tran VALLEYSC 500 to VALLEYSC 115 ck 2 |
| 24151 | VALLEYSC | 500 | 24229 | VALLEY-S | 115 | 4 | tran_249 | ivsg_hs_alt3ad2_ | 560 | 830.7 | 203 | 943.4 | 855.1 | 1.53 | 0.75 | tran VALLEYSC 500 to VALLEY-S 115 ck 3 |
| 24151 | VALLEYSC | 500 | 24229 | VALLEY-S | 115 | 3 | tran_250 | ivsg_hs_alt3ad2_ | 560 | 830.6 | 203 | 943.4 | 855.1 | 1.53 | 0.75 | tran VALLEYSC 500 to VALLEY-S 115 ck 4 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_202 | ivsg_hs_alt3ad2_ | 56 | 77.4 | -7.5 | 392.4 | 77.7 | 1.4 | 0.92 | line OWENSCON to INYO 230 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_032 | ivsg_hs_alt3ad2_ | 204.1 | 255.7 | -14.6 | 1084.3 | 256.1 | 1.27 | 0.918 | OTAYMESA - MLMS3TAP 1 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_034 | ivsg_hs_alt3ad2_ | 204.1 | 255.8 | -13.9 | 1084.8 | 256.2 | 1.27 | 0.918 | OLD TOWN - MLMS3TAP 1 230kV |
| 22356 | IMPRLVLY | 230 | 22360 | IMPRLVLY | 500 | 1 | IV81 | ivsg_hs_alt3ad2_ | 600 | 740.1 | 169.1 | 1900.4 | 759.2 | 1.27 | 0.57 | tran IMPRLVLY 230 to IMPRLVLY 500 ck 2 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_009 | ivsg_hs_alt3ad2_ | 204.1 | 246.7 | -19.6 | 1035 | 247.4 | 1.212 | 0.918 | EPP - ESCNDIDO 1 230kV |
| 24723 | CONTROL | 115 | 24731 | INYOKERN | 115 | 1 | line_175 | ivsg_hs_alt3ad2_ | 82.7 | 96.2 | -4 | 497.7 | 96.3 | 1.199 | 0.421 | line INYO to COTTONWD 230 ck 1 |
| 24723 | CONTROL | 115 | 24731 | INYOKERN | 115 | 2 | line_175 | ivsg_hs_alt3ad2_ | 82.7 | 96.2 | -4 | 497.7 | 96.3 | 1.199 | 0.421 | line INYO to COTTONWD 230 ck 1 |
| 22468 | MIGUEL | 500 | 22472 | MIGUELMP | 500 | 1 | ML81 | ivsg_hs_alt3ad2_ | 1120 | 1296.8 | 237.8 | 1508.5 | 1318.5 | 1.18 | 0.67 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 22464 | MIGUEL | 230 | 22468 | MIGUEL | 500 | 1 | ML80 | ivsg_hs_alt3ad2_ | 1120 | -1278.5 | -19.5 | 3240.9 | 1278.6 | 1.16 | 0.64 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 22464 | MIGUEL | 230 | 22472 | MIGUELMP | 500 | 1 | ML81 | ivsg_hs_alt3ad2_ | 1120 | -1294.6 | -22.4 | 3279.3 | 1294.8 | 1.16 | 0.67 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_002 | ivsg_hs_alt3ad2_ | 204.1 | 225.1 | 6 | 981.2 | 225.2 | 1.149 | 0.918 | IMPRLVLY - MIGUEL 1 500kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | SX70 | ivsg_hs_alt3ad2_ | 204.1 | 230.8 | 2.4 | 962.8 | 230.8 | 1.128 | 0.918 | tran SYCAMORE 230 to SYCAMORE 69 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | ML60 | ivsg_hs_alt3ad2_ | 204.1 | 228.9 | -6.9 | 957.7 | 229 | 1.122 | 0.918 | tran MIGUEL 230 to MIGUEL 138 ck 1 |
| 24729 | INYO | 230 | 24730 | INYO PS | 115 | 1 | line_175 | ivsg_hs_alt3ad2_ | 50 | 51.8 | 21.3 | 133.1 | 56 | 1.12 | 0.54 | line INYO to COTTONWD 230 ck 1 |
| 24729 | INYO | 230 | 24730 | INYO PS | 115 | 2 | line_175 | ivsg_hs_alt3ad2_ | 50 | 51.8 | 21.3 | 133.1 | 56 | 1.12 | 0.54 | line INYO to COTTONWD 230 ck 1 |
| 22504 | MISSION | 230 | 22500 | MISSION | 138 | 2 | MS60 | ivsg_hs_alt3ad2_ | 392 | 411.8 | 115.9 | 1085.1 | 427.8 | 1.09 | 0.73 | tran MISSION 230 to MISSION 138 ck 1 |
| 22504 | MISSION | 230 | 22500 | MISSION | 138 | 1 | MS61 | ivsg_hs_alt3ad2_ | 392 | 411.8 | 115.9 | 1085.1 | 427.8 | 1.09 | 0.73 | tran MISSION 230 to MISSION 138 ck 2 |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | line_12 | ivsg_hs_alt3ad2_ | 132 | 142.7 | -9.7 | 900.8 | 143 | 1.087 | 0.96 | line COACHELA to RAMON 230 ck 2 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 2 | line_070 | ivsg_hs_alt3ad2_ | 956 | -1023.6 | -32.5 | 2603.4 | 1024.1 | 1.085 | 0.594 | line LA FRESA to REDONDO 230 ck 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 1 | line_071 | ivsg_hs_alt3ad2_ | 956 | -1023.6 | -32.5 | 2603.4 | 1024.1 | 1.085 | 0.594 | line LA FRESA to REDONDO 230 ck 2 |
| 24701 | KRAMER | 230 | 24085 | LUGO | 230 | 2 | line_169 | ivsg_hs_alt3ad2_ | 478 | 526.2 | -0.5 | 1298.6 | 526.2 | 1.082 | 0.643 | line KRAMER to LUGO 230 ck 1 |
| 24701 | KRAMER | 230 | 24085 | LUGO | 230 | 1 | line_170 | ivsg_hs_alt3ad2_ | 478 | 526.2 | -0.5 | 1298.6 | 526.2 | 1.082 | 0.643 | line KRAMER to LUGO 230 ck 2 |
| 20238 | HRD-230 | 230 | 20239 | HRD-115 | 115 | 1 | B2_002 | ivsg_hs_alt3ad2_ | 225 | 242.7 | -5.6 | 626.1 | 242.8 | 1.08 | 0.71 | IMPRLVLY - MIGUEL 1 500kV |
| 22001 | NORTHSD | 230 | 22000 | NORTHSD | 500 | 1 | B2_002 | ivsg_hs_alt3ad2_ | 1120 | -1190.2 | 103.3 | 3040.1 | 1194.6 | 1.07 | 0.59 | IMPRLVLY - MIGUEL 1 500kV |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_169 | ivsg_hs_alt3ad2_ | 56 | 58 | -10 | 292.9 | 58.9 | 1.06 | 0.92 | line KRAMER to LUGO 230 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_170 | ivsg_hs_alt3ad2_ | 56 | 58 | -10 | 292.9 | 58.9 | 1.06 | 0.92 | line KRAMER to LUGO 230 ck 2 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | MS60 | ivsg_hs_alt3ad2_ | 204.1 | 212.7 | -4.2 | 888.2 | 212.8 | 1.04 | 0.918 | tran MISSION 230 to MISSION 138 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | MS61 | ivsg_hs_alt3ad2_ | 204.1 | 212.7 | -4.2 | 888.2 | 212.8 | 1.04 | 0.918 | tran MISSION 230 to MISSION 138 ck 2 |
| 24114 | PARDEE | 230 | 24200 | SAUG TAP | 230 | 2 | line_117 | ivsg_hs_alt3ad2_ | 494 | 501.7 | 27.2 | 1275.7 | 502.5 | 1.029 | 0.51 | line PARDEE to SAUG TAP 230 ck 1 |
| 24114 | PARDEE | 230 | 24200 | SAUG TAP | 230 | 1 | line_118 | ivsg_hs_alt3ad2_ | 494 | 501.7 | 27.1 | 1275.6 | 502.4 | 1.029 | 0.518 | line PARDEE to SAUG TAP 230 ck 2 |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_192 | ivsg_hs_alt3ad2_ | 169 | 170.6 | 40.1 | 616.2 | 175.2 | 1.021 | 0.821 | line IRON MTN to CAMINO 230 ck 1 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | B2_009 | ivsg_hs_alt3ad2_ | 392 | 399.9 | -7.4 | 1015 | 400 | 1.02 | 0.78 | EPP - ESCNDIDO 1 230kV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | B2_032 | ivsg_hs_alt3ad2_ | 392 | 397.5 | -7.5 | 1021.2 | 397.5 | 1.02 | 0.78 | OTAYMESA - MLMS3TAP 1 230kV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | B2_034 | ivsg_hs_alt3ad2_ | 392 | 397.5 | -6.9 | 1021.7 | 397.6 | 1.02 | 0.78 | OLD TOWN - MLMS3TAP 1 230kV |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | line_52 | ivsg_hs_alt3ad2_ | 132 | 134.1 | -12.4 | 843.5 | 134.7 | 1.018 | 0.96 | line AVE58230 to AV58TP22 230 ck 1 |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | line_53 | ivsg_hs_alt3ad2_ | 132 | 134.2 | -12.1 | 843 | 134.8 | 1.018 | 0.96 | line AV58TP22 to COACHELA 230 ck 1 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | B2_002 | ivsg_hs_alt3ad2_ | 388 | -385.9 | -5.8 | 991.7 | 385.9 | 1.018 | 0.535 | IMPRLVLY - MIGUEL 1 500kV |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_201 | ivsg_hs_alt3ad2_ | 56 | 54.6 | -10.7 | 276.7 | 55.7 | 1.01 | 0.92 | line SYLMAR3 to SYLMAR S 230 ck 1 |
| 24303 | BIG CRK3 | 230 | 24235 | RECTOR | 230 | 1 | line_155 | ivsg_hs_alt3ad2_ | 353 | 361 | 49.4 | 894.2 | 364.4 | 1.009 | 0.729 | line BIG CRK1 to RECTOR 230 ck 1 |
| 24301 | BIG CRK1 | 230 | 24235 | RECTOR | 230 | 1 | line_160 | ivsg_hs_alt3ad2_ | 329 | 334.9 | 47.4 | 825.9 | 338.2 | 1 | 0.727 | line BIG CRK3 to RECTOR 230 ck 1 |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | line_7 | ivsg_hs_alt3ad2_ | 132 | 130 | -11.5 | 827.7 | 130.5 | 0.999 | 0.96 | line BANIS230 to NEWSF230 230 ck 1 |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | tran_74 | ivsg_hs_alt3ad2_ | 132 | 130 | -11.4 | 827.2 | 130.5 | 0.999 | 0.96 | tran NEWSF230 230 to NEWSF500 500 ck 1 |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | B2_002 | ivsg_hs_alt3ad2_ | 132 | 130 | -10.4 | 827.8 | 130.4 | 0.999 | 0.96 | IMPRLVLY - MIGUEL 1 500kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_007 | ivsg_hs_alt3ad2_ | 204.1 | 202.9 | -6.7 | 848.3 | 203 | 0.993 | 0.918 | PENSQTOS - ENCINA 1 230kV |
| 8601 | GEOSUB2 | 230 | 8300 | BANIS230 | 230 | 1 | line_22 | ivsg_hs_alt3ad2_ | 550 | 553 | 49.3 | 1367.2 | 555.2 | 0.991 | 0.728 | line GEOSUB1 to BANIS230 230 ck 1 |
| 8601 | GEOSUB2 | 230 | 8300 | BANIS230 | 230 | 1 | line_23 | ivsg_hs_alt3ad2_ | 550 | 553 | 49.3 | 1367.2 | 555.2 | 0.991 | 0.728 | line GEOSUB1 to BANIS230 230 ck 2 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | ML70 | ivsg_hs_alt3ad2_ | 204.1 | 202.6 | -5 | 846.3 | 202.6 | 0.991 | 0.918 | tran MIGUEL 69 to MIGUEL 230 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | ML71 | ivsg_hs_alt3ad2_ | 204.1 | 202.6 | -5 | 846.3 | 202.6 | 0.991 | 0.918 | tran MIGUEL 69 to MIGUEL 230 ck 2 |
| 24086 | LUGO | 500 | 24097 | MOHAVE | 500 | 1 | line_103 | ivsg_hs_alt3ad2_ | 1386 | -1427.1 | 97.4 | 1564.5 | 1430.5 | 0.988 | 0.675 | line MOHAVE to ELDORDO 500 ck 1 |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_191 | ivsg_hs_alt3ad2_ | 169 | 163.9 | 37.6 | 591.4 | 168.2 | 0.98 | 0.821 | line EAGLEMTN to IRON MTN 230 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_015 | ivsg_hs_alt3ad2_ | 204.1 | 199.8 | -8.7 | 833.1 | 200 | 0.976 | 0.918 | MIGUEL - MISSION 1 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_020 | ivsg_hs_alt3ad2_ | 204.1 | 199.5 | -9.2 | 831.6 | 199.7 | 0.974 | 0.918 | MIGUEL - MISSION 2 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | MS70 | ivsg_hs_alt3ad2_ | 204.1 | 198.3 | -2.9 | 828.7 | 198.4 | 0.971 | 0.918 | tran MISSION 230 to MISSION 69 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_123 | ivsg_hs_alt3ad2_ | 56 | 52.6 | -10.7 | 266.6 | 53.7 | 0.97 | 0.92 | line PASTORIA to PSTRIA 230 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_200 | ivsg_hs_alt3ad2_ | 56 | 52.7 | -10.8 | 266.7 | 53.7 | 0.97 | 0.92 | line SYLMAR1 to SYLMAR S 230 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | tran_210 | ivsg_hs_alt3ad2_ | 56 | 52.5 | -10.5 | 265.6 | 53.5 | 0.97 | 0.92 | tran LUGO 500 to LUGO 230 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | tran_211 | ivsg_hs_alt3ad2_ | 56 | 52.5 | -10.5 | 265.7 | 53.6 | 0.97 | 0.92 | tran LUGO 500 to LUGO 230 ck 2 |
| 19020 | BLYTHE | 161 | 24017 | BLYTHESC | 161 | 1 | line_192 | ivsg_hs_alt3ad2_ | 244 | 237.1 | 40.4 | 845.6 | 240.5 | 0.966 | 0.833 | line IRON MTN to CAMINO 230 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_086 | ivsg_hs_alt3ad2_ | 56 | 52 | -10.8 | 263.6 | 53.1 | 0.96 | 0.92 | line MAGUNDEN to OMAR 230 ck 1 |
| 8600 | GEOSUB1 | 230 | 8300 | BANIS230 | 230 | 1 | line_47 | ivsg_hs_alt3ad2_ | 550 | 532 | 47 | 1315.7 | 534.1 | 0.953 | 0.676 | line GEOSUB2 to BANIS230 230 ck 1 |
| 8600 | GEOSUB1 | 230 | 8300 | BANIS230 | 230 | 2 | line_47 | ivsg_hs_alt3ad2_ | 550 | 532 | 47 | 1315.7 | 534.1 | 0.953 | 0.676 | line GEOSUB2 to BANIS230 230 ck 1 |
| 24807 | MIRAGE | 115 | 24819 | CONCHO | 115 | 1 | tran_238 | ivsg_hs_alt3ad2_ | 183 | 164.2 | -5.1 | 875.1 | 164.3 | 0.952 | 0.867 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | SX70 | ivsg_hs_alt3ad2_ | 392 | 370.1 | 16.1 | 932.1 | 370.5 | 0.95 | 0.78 | tran SYCAMORE 230 to SYCAMORE 69 ck 1 |
| 14008 | JOJOBA | 500 | 15011 | KYRENE | 500 | 1 | PV1 | ivsg_hs_alt3ad2_ | 1732 | 1737.6 | 169 | 1892.4 | 1745.8 | 0.949 | 0.993 | gen PALOVRD1 24.00 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_014 | ivsg_hs_alt3ad2_ | 204.1 | 194.7 | -8.7 | 809.9 | 194.9 | 0.948 | 0.918 | ENCINATP - ENCINA 1 230kV |
| 8600 | GEOSUB1 | 230 | 8300 | BANIS230 | 230 | 2 | line_22 | ivsg_hs_alt3ad2_ | 550 | 526.9 | 47.8 | 1302.4 | 529.1 | 0.944 | 0.676 | line GEOSUB1 to BANIS230 230 ck 1 |
| 8600 | GEOSUB1 | 230 | 8300 | BANIS230 | 230 | 1 | line_23 | ivsg_hs_alt3ad2_ | 550 | 526.9 | 47.8 | 1302.4 | 529.1 | 0.944 | 0.676 | line GEOSUB1 to BANIS230 230 ck 2 |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_63 | ivsg_hs_alt3ad2_ | 169 | 159.9 | 27.4 | 570.4 | 162.2 | 0.944 | 0.821 | line RAMON to MIRAGE 230 ck 2 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_015 | ivsg_hs_alt3ad2_ | 392 | 367.8 | 39.1 | 928.1 | 369.8 | 0.94 | 0.86 | MIGUEL - MISSION 1 230kV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_020 | ivsg_hs_alt3ad2_ | 392 | 366.6 | 37.7 | 925.5 | 368.5 | 0.94 | 0.86 | MIGUEL - MISSION 2 230kV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | ML70 | ivsg_hs_alt3ad2_ | 392 | 366.2 | 40.3 | 928.8 | 368.4 | 0.94 | 0.86 | tran MIGUEL 69 to MIGUEL 230 ck 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | ML71 | ivsg_hs_alt3ad2_ | 392 | 366.2 | 40.3 | 928.8 | 368.4 | 0.94 | 0.86 | tran MIGUEL 69 to MIGUEL 230 ck 2 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | SX60 | ivsg_hs_alt3ad2_ | 392 | 367 | 35.9 | 929.8 | 368.7 | 0.94 | 0.86 | tran SYCAMORE 230 to SYCAMORE 138 ck 1 |
| 24807 | MIRAGE | 115 | 24816 | SANTA RO | 115 | 1 | tran_238 | ivsg_hs_alt3ad2_ | 183.3 | 162.1 | -10.6 | 865.4 | 162.4 | 0.94 | 0.858 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 19020 | BLYTHE | 161 | 24017 | BLYTHESC | 161 | 1 | line_191 | ivsg_hs_alt3ad2_ | 244 | 230.4 | 37.8 | 821 | 233.5 | 0.938 | 0.833 | line EAGLEMTN to IRON MTN 230 ck 1 |
| 22609 | OTAYMESA | 230 | 20149 | TJI-230 | 230 | 1 | B2_002 | ivsg_hs_alt3ad2_ | 796.7 | -731.3 | 79.5 | 1870.7 | 735.7 | 0.936 | 0.511 | IMPRLVLY - MIGUEL 1 500kV |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_12 | ivsg_hs_alt3ad2_ | 169 | 157.9 | 27.2 | 563.5 | 160.2 | 0.932 | 0.821 | line COACHELA to RAMON 230 ck 2 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | line_68 | ivsg_hs_alt3ad2_ | 392 | 363.9 | 28.9 | 935 | 365.1 | 0.93 | 0.86 | line NORTHSD to NEWSF500 500 ck 1 |
| 24303 | BIG CRK3 | 230 | 24235 | RECTOR | 230 | 1 | line_139 | ivsg_hs_alt3ad2_ | 353 | 335.6 | 44.3 | 821.8 | 338.5 | 0.928 | 0.729 | line SPRINGVL to BIG CRK4 230 ck 1 |
| 22832 | SYCAMORE | 230 | 22467 | MLSXTAP | 230 | 1 | B2_032 | ivsg_hs_alt3ad2_ | 796.7 | -717 | 75.4 | 1851.9 | 720.9 | 0.926 | 0.429 | OTAYMESA - MLMS3TAP 1 230kV |
| 22832 | SYCAMORE | 230 | 22467 | MLSXTAP | 230 | 1 | B2_034 | ivsg_hs_alt3ad2_ | 796.7 | -717.1 | 74.2 | 1852.4 | 720.9 | 0.926 | 0.429 | OLD TOWN - MLMS3TAP 1 230kV |
| 15230 | RUDD | 230 | 15218 | WHITETNK | 230 | 1 | PV1 | ivsg_hs_alt3ad2_ | 725 | 674.3 | -12 | 1684.5 | 674.4 | 0.926 | 0.956 | gen PALOVRD1 24.00 |
| 24614 | TAP601 | 115 | 24702 | KRAMER | 115 | 1 | line_169 | ivsg_hs_alt3ad2_ | 217.1 | -189.2 | 71.9 | 1001.8 | 202.4 | 0.921 | 0.716 | line KRAMER to LUGO 230 ck 1 |
| 24614 | TAP601 | 115 | 24702 | KRAMER | 115 | 1 | line_170 | ivsg_hs_alt3ad2_ | 217.1 | -189.2 | 71.9 | 1001.8 | 202.4 | 0.921 | 0.716 | line KRAMER to LUGO 230 ck 2 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_032 | ivsg_hs_alt3ad2_ | 392 | 359.8 | 36.6 | 924.4 | 361.7 | 0.92 | 0.86 | OTAYMESA - MLMS3TAP 1 230kV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_034 | ivsg_hs_alt3ad2_ | 392 | 359.8 | 37 | 924.9 | 361.7 | 0.92 | 0.86 | OLD TOWN - MLMS3TAP 1 230kV |
| 8376 | RTAP2 | 92 | 8974 | RTP1 | 92 | 1 | line_50 | ivsg_hs_alt3ad2_ | 57 | -49.8 | 11.4 | 326.4 | 51.1 | 0.916 | 0.686 | line BANIS230 to AV58TP12 230 ck 1 |
| 8376 | RTAP2 | 92 | 8974 | RTP1 | 92 | 1 | line_51 | ivsg_hs_alt3ad2_ | 57 | -49.8 | 11.3 | 326.4 | 51.1 | 0.916 | 0.686 | line AV58TP12 to AVE58230 230 ck 1 |
| 19020 | BLYTHE | 161 | 24017 | BLYTHESC | 161 | 1 | line_63 | ivsg_hs_alt3ad2_ | 244 | 226.4 | 27.6 | 801.8 | 228 | 0.916 | 0.833 | line RAMON to MIRAGE 230 ck 2 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_079 | ivsg_hs_alt3ad2_ | 2400 | -2293 | -40.9 | 2528.5 | 2293.3 | 0.912 | 0.723 | line LUGO to MOHAVE 500 ck 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_028 | ivsg_hs_alt3ad2_ | 392 | 355.5 | 34.9 | 896.2 | 357.2 | 0.91 | 0.86 | MIGUEL - SYCAMORE 1 230kV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | MS60 | ivsg_hs_alt3ad2_ | 392 | 353.6 | 38.9 | 894.7 | 355.7 | 0.91 | 0.86 | tran MISSION 230 to MISSION 138 ck 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | MS61 | ivsg_hs_alt3ad2_ | 392 | 353.6 | 38.9 | 894.7 | 355.7 | 0.91 | 0.86 | tran MISSION 230 to MISSION 138 ck 2 |
| 24301 | BIG CRK1 | 230 | 24235 | RECTOR | 230 | 1 | line_156 | ivsg_hs_alt3ad2_ | 329 | 305.6 | 3.8 | 751.9 | 305.6 | 0.91 | 0.727 | line BIG CRK1 to BIG CRK2 230 ck 1 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_047 | ivsg_hs_alt3ad2_ | 2400 | -2290.5 | -58.9 | 2517.9 | 2291.3 | 0.909 | 0.723 | line ELDORDO to LUGO 500 ck 1 |
| 19020 | BLYTHE | 161 | 24017 | BLYTHESC | 161 | 1 | line_12 | ivsg_hs_alt3ad2_ | 244 | 224.4 | 27.4 | 794.9 | 226.1 | 0.908 | 0.833 | line COACHELA to RAMON 230 ck 2 |
| 22596 | OLD TOWN | 230 | 22466 | MLMS3TAP | 230 | 1 | B2_031 | ivsg_hs_alt3ad2_ | 912 | -808.4 | 97.8 | 2077.1 | 814.3 | 0.908 | 0.631 | SYCAMORE - MLSXTAP 1 230kV |
| 24602 | VICTOR | 115 | 24702 | KRAMER | 115 | 1 | line_169 | ivsg_hs_alt3ad2_ | 217.1 | -184.5 | 82 | 985.8 | 201.9 | 0.908 | 0.703 | line KRAMER to LUGO 230 ck 1 |
| 24602 | VICTOR | 115 | 24702 | KRAMER | 115 | 1 | line_170 | ivsg_hs_alt3ad2_ | 217.1 | -184.5 | 82 | 985.8 | 201.9 | 0.908 | 0.703 | line KRAMER to LUGO 230 ck 2 |
| 22596 | OLD TOWN | 230 | 22466 | MLMS3TAP | 230 | 1 | B2_029 | ivsg_hs_alt3ad2_ | 912 | -808.3 | 99.7 | 2076.2 | 814.4 | 0.907 | 0.631 | OTAYMESA - MLSXTAP 1 230kV |
| 24807 | MIRAGE | 115 | 24819 | CONCHO | 115 | 1 | line_65 | ivsg_hs_alt3ad2_ | 183 | 163.9 | -7.7 | 830.6 | 164.1 | 0.904 | 0.867 | line MIRAGE to DEVERS 230 ck 2 |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_008 | ivsg_hs_alt3ad2_ | 169 | 153.1 | 25.7 | 546 | 155.3 | 0.904 | 0.821 | line PARKER to GENE 230 ck 1 |
| 24301 | BIG CRK1 | 230 | 24302 | BIG CRK2 | 230 | 1 | line_155 | ivsg_hs_alt3ad2_ | 329 | 305.6 | -23.3 | 745.5 | 306.5 | 0.903 | 0.248 | line BIG CRK1 to RECTOR 230 ck 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_022 | ivsg_hs_alt3ad2_ | 392 | 353 | 26.2 | 896.4 | 354 | 0.9 | 0.86 | OTAYMESA - TJI-230 1 230kV |
| 22504 | MISSION | 230 | 22500 | MISSION | 138 | 1 | MS70 | ivsg_hs_alt3ad2_ | 392 | 337.6 | 98.7 | 893.8 | 351.7 | 0.9 | 0.73 | tran MISSION 230 to MISSION 69 ck 1 |
| 22504 | MISSION | 230 | 22500 | MISSION | 138 | 2 | MS70 | ivsg_hs_alt3ad2_ | 392 | 337.6 | 98.7 | 893.8 | 351.7 | 0.9 | 0.73 | tran MISSION 230 to MISSION 69 ck 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | OT70 | ivsg_hs_alt3ad2_ | 392 | 349.9 | 35.9 | 885.3 | 351.7 | 0.9 | 0.86 | tran OLD TOWN 69 to OLD TOWN 230 ck 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | OT71 | ivsg_hs_alt3ad2_ | 392 | 349.9 | 35.9 | 885.3 | 351.7 | 0.9 | 0.86 | tran OLD TOWN 69 to OLD TOWN 230 ck 2 |

ivsg_hs_alt3ad2.sav
FLOW Summary
N-1 Outages

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24729 | INYO | 230 | 24730 | INYO PS | 115 | 2 | tran_230 | ivsg_hs_alt3ad2_ | 50 | -41.9 | 15.9 | 105.2 | 44.8 | 0.9 | 0.54 | tran INYO 230 to INYO PS 115 ck 1 |
| 24729 | INYO | 230 | 24730 | INYO PS | 115 | 1 | tran_231 | ivsg_hs_alt3ad2_ | 50 | -41.9 | 15.9 | 105.2 | 44.8 | 0.9 | 0.54 | tran INYO 230 to INYO PS 115 ck 2 |
| 24805 | DEVERS | 115 | 24804 | DEVERS | 230 | 1 | tran_236 | ivsg_hs_alt3ad2_ | 280 | -246.1 | 52 | 1264.9 | 251.5 | 0.9 | 0.6 | tran DEVERS 115 to DEVERS 230 ck 3 |

ivsg_hs_alt3ad2.sav
VOLTAGE Summary
N-2 Outages

| Bus | Name | kV | Area | Zone | Outage | Case | Vbase | Vcont | DeltaV | Vmin | Vmax | Max-dv | Contingency Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24058 | GOLETA | 230 | 24 | 240 | line_2269 | ivsg_hs_alt3ad2_ | 0.984 | 0.93 | -0.055 | 0.9 | 1.05 | 0.05 | S.CLARA 230.00 - GOLETA 230.00 1, S.CLARA 230.00 - MOORPARK 230.00 1 |
| 24058 | GOLETA | 230 | 24 | 240 | line_2270 | ivsg_hs_alt3ad2_ | 0.984 | 0.93 | -0.055 | 0.9 | 1.05 | 0.05 | S.CLARA 230.00 - GOLETA 230.00 2, S.CLARA 230.00 - MOORPARK 230.00 2 |
| 22734 | SANTEE | 138 | 22 | 223 | 23021/22/23/41 | ivsg_hs_alt3ad2_ | 0.996 | 0.934 | -0.062 | 0.9 | 1.05 | 0.05 | MIGUEL 230 CORRIDOR West of SN |
| 22412 | LOSCOCHS | 138 | 22 | 223 | 23021/22/23/41 | ivsg_hs_alt3ad2_ | 0.996 | 0.94 | -0.057 | 0.9 | 1.05 | 0.05 | MIGUEL 230 CORRIDOR West of SN |
| 24015 | ARCO SC | 230 | 24 | 240 | line_2013 | ivsg_hs_alt3ad2_ | 0.986 | 1.036 | 0.05 | 0.9 | 1.05 | 0.05 | ARCO SC 230.00 - HINSON 230.00 1, ARCO SC 230.00 - HINSON 230.00 2 |
| 24061 | HARBOR | 230 | 24 | 240 | line_2039 | ivsg_hs_alt3ad2_ | 0.986 | 1.036 | 0.051 | 0.9 | 1.05 | 0.05 | HARBOR 230.00 - HINSON 230.00 1, LBEACH 230.00 - LITEHIPE 230.00 1 |
| 24077 | LBEACH | 230 | 24 | 240 | line_2039 | ivsg_hs_alt3ad2_ | 0.986 | 1.036 | 0.05 | 0.9 | 1.05 | 0.05 | HARBOR 230.00 - HINSON 230.00 1, LBEACH 230.00 - LITEHIPE 230.00 1 |
| 24061 | HARBOR | 230 | 24 | 240 | line_2041 | ivsg_hs_alt3ad2_ | 0.986 | 1.036 | 0.051 | 0.9 | 1.05 | 0.05 | HARBOR 230.00 - HINSON 230.00 1, HARBOR 230.00 - LBEACH 230.00 1 |
| 24061 | HARBOR | 230 | 24 | 240 | line_2253 | ivsg_hs_alt3ad2_ | 0.986 | 1.036 | 0.051 | 0.9 | 1.05 | 0.05 | HARBOR 230.00 - HINSON 230.00 1, HARBOR 230.00 - LBEACH 230.00 1 |
| 25001 | GOODRICH | 230 | 24 | 250 | line_2073 | ivsg_hs_alt3ad2_ | 0.959 | 1.044 | 0.085 | 0.9 | 1.05 | 0.05 | GOODRICH 230.00 - GOULD 230.00 1, GOODRICH 230.00 - LAGUBELL 230.00 1 |
| 24058 | GOLETA | 230 | 24 | 240 | line_2120 | ivsg_hs_alt3ad2_ | 0.984 | 1.044 | 0.06 | 0.9 | 1.05 | 0.05 | S.CLARA 230.00 - GOLETA 230.00 1, S.CLARA 230.00 - GOLETA 230.00 2 |

ivsg_hs_alt3ad2.sav
FLOW Summary
N-2 Outages

| LEGEND | % of RATING 1 | |
|---|---|---|
| C_pu | 100% - 110% | |
| C_pu | 110% - 120% | P.U. of |
| C_pu | > 120% | Rate 1 |

| FROM | FR | BKV | TO | TO | BKV | CK | Outage_Name | Case | Rate-Mva | Pflow | Qflow | Amps | MVA | C_pu | B_pu | Contingency_Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt3ad2_ | 392 | 539.9 | 95 | 1397.4 | 548.2 | 1.4 | 0.86 | MIGUEL 230 CORRIDOR West of SN |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt3ad2_ | 392 | 532.3 | 88.5 | 1366.4 | 539.6 | 1.38 | 0.86 | MIGUEL 230 CORRIDOR West of LC |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt3ad2_ | 408.3 | -531.4 | -14.9 | 2255.6 | 531.6 | 1.32 | 0.795 | MIGUEL 230 CORRIDOR West of SN |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt3ad2_ | 408.3 | -524.2 | -11.9 | 2205.6 | 524.3 | 1.291 | 0.795 | MIGUEL 230 CORRIDOR West of LC |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt3ad2_ | 392 | 496.4 | 87.4 | 1274.7 | 504.1 | 1.29 | 0.86 | MIGUEL 230 CORRIDOR North of ML |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23051B/23011 | ivsg_hs_alt3ad2_ | 204.1 | 245.5 | -19 | 1030.2 | 246.3 | 1.206 | 0.918 | EPP-ES + ES-EA-SA 230KV |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt3ad2_ | 408.3 | -489.4 | -20.8 | 2057.5 | 489.8 | 1.204 | 0.795 | MIGUEL 230 CORRIDOR North of ML |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 2 | line_2046 | ivsg_hs_alt3ad2_ | 956 | -1123.4 | -39.2 | 2856.5 | 1124 | 1.19 | 0.594 | LA FRESA 230.00 - REDONDO 230.00 1, REDONDO 230.00 - LITEHIPE 230.00 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 1 | line_2047 | ivsg_hs_alt3ad2_ | 956 | -1123.4 | -39.2 | 2856.5 | 1124 | 1.19 | 0.594 | LA FRESA 230.00 - REDONDO 230.00 2, REDONDO 230.00 - LITEHIPE 230.00 1 |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt3ad2_ | 382.4 | 442 | 25.7 | 1888.6 | 442.8 | 1.181 | 0.631 | MIGUEL 230 CORRIDOR West of SN |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt3ad2_ | 382.4 | 434.9 | 24.3 | 1841.4 | 435.6 | 1.151 | 0.631 | MIGUEL 230 CORRIDOR West of LC |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 2 | line_2064 | ivsg_hs_alt3ad2_ | 956 | -1075.8 | -44.5 | 2735.7 | 1076.8 | 1.14 | 0.594 | LA FRESA 230.00 - REDONDO 230.00 1, MESA CAL 230.00 - REDONDO 230.00 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 1 | line_2065 | ivsg_hs_alt3ad2_ | 956 | -1075.8 | -44.5 | 2735.7 | 1076.8 | 1.14 | 0.594 | LA FRESA 230.00 - REDONDO 230.00 2, MESA CAL 230.00 - REDONDO 230.00 1 |
| 8376 | RTAP2 | 92 | 8974 | RTP1 | 92 | 1 | line_N-204 | ivsg_hs_alt3ad2_ | 57 | -60.6 | 11.8 | 404.3 | 61.7 | 1.133 | 0.686 | COACHELLA MIDWAY 230 CKT 1&2 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23022/23023 | ivsg_hs_alt3ad2_ | 392 | 433.5 | 55.1 | 1096.4 | 437 | 1.11 | 0.86 | ML-MS1+ ML-MS2 230KV |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_N-203 | ivsg_hs_alt3ad2_ | 169 | 186.5 | 38.8 | 669.9 | 190.5 | 1.108 | 0.821 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 13821C/25/23051A | ivsg_hs_alt3ad2_ | 204.1 | 223.4 | -23.1 | 940.5 | 224.5 | 1.101 | 0.918 | CH-ES-NCM-SX |
| 24086 | LUGO | 500 | 24236 | RANCHVST | 500 | 1 | line_2194 | ivsg_hs_alt3ad2_ | 2598 | 2939.6 | 485.3 | 3260 | 2979.4 | 1.088 | 0.605 | LUGO 500.00 - MIRALOMA 500.00 2, LUGO 500.00 - MIRALOMA 500.00 3 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23022/23023 | ivsg_hs_alt3ad2_ | 204.1 | 222.3 | -8.2 | 929.4 | 222.5 | 1.088 | 0.918 | ML-MS1+ ML-MS2 230KV |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 2 | line_2049 | ivsg_hs_alt3ad2_ | 956 | -1024 | -39.3 | 2607.3 | 1024.7 | 1.086 | 0.594 | LA FRESA 230.00 - REDONDO 230.00 1, LCIENEGA 230.00 - LA FRESA 230.00 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 1 | line_2050 | ivsg_hs_alt3ad2_ | 956 | -1024 | -39.3 | 2607.3 | 1024.7 | 1.086 | 0.594 | LA FRESA 230.00 - REDONDO 230.00 2, LCIENEGA 230.00 - LA FRESA 230.00 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 2 | line_2057 | ivsg_hs_alt3ad2_ | 956 | -1023.5 | -36 | 2604.8 | 1024.2 | 1.085 | 0.594 | EL NIDO 230.00 - LA FRESA 230.00 3, LA FRESA 230.00 - REDONDO 230.00 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 1 | line_2058 | ivsg_hs_alt3ad2_ | 956 | -1023.5 | -36 | 2604.8 | 1024.2 | 1.085 | 0.594 | EL NIDO 230.00 - LA FRESA 230.00 3, LA FRESA 230.00 - REDONDO 230.00 2 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 2 | line_2059 | ivsg_hs_alt3ad2_ | 956 | -1023.5 | -36 | 2604.8 | 1024.2 | 1.085 | 0.594 | EL NIDO 230.00 - LA FRESA 230.00 4, LA FRESA 230.00 - REDONDO 230.00 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 1 | line_2060 | ivsg_hs_alt3ad2_ | 956 | -1023.5 | -36 | 2604.8 | 1024.2 | 1.085 | 0.594 | EL NIDO 230.00 - LA FRESA 230.00 4, LA FRESA 230.00 - REDONDO 230.00 2 |
| 24701 | KRAMER | 230 | 24085 | LUGO | 230 | 2 | line_2260 | ivsg_hs_alt3ad2_ | 478 | 526.5 | 0.9 | 1299.7 | 526.5 | 1.083 | 0.643 | KRAMER 230.00 - LUGO 230.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 8601 | GEOSUB2 | 230 | 8300 | BANIS230 | 230 | 1 | line_N-204 | ivsg_hs_alt3ad2_ | 550 | 587.9 | 99 | 1487.8 | 596.2 | 1.078 | 0.728 | COACHELLA MIDWAY 230 CKT 1&2 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 2 | line_2029 | ivsg_hs_alt3ad2_ | 1195 | 1249.9 | -32.4 | 3214.6 | 1250.4 | 1.072 | 0.533 | LEWIS 230.00 - SERRANO 230.00 1, SERRANO 230.00 - VILLA PK 230.00 1 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 2 | line_2031 | ivsg_hs_alt3ad2_ | 1195 | 1249.9 | -32.4 | 3214.6 | 1250.4 | 1.072 | 0.533 | LEWIS 230.00 - SERRANO 230.00 2, SERRANO 230.00 - VILLA PK 230.00 1 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 2 | line_2278 | ivsg_hs_alt3ad2_ | 1195 | 1249.9 | -32.4 | 3214.6 | 1250.4 | 1.072 | 0.533 | LEWIS 230.00 - SERRANO 230.00 1, SERRANO 230.00 - VILLA PK 230.00 1 |
| 22672 | PRCTRVLY | 138 | 22852 | TELECYN | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt3ad2_ | 478 | 500.6 | 11 | 2124.3 | 500.7 | 1.062 | 0.616 | MIGUEL 230 CORRIDOR West of SN |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23011/13825 | ivsg_hs_alt3ad2_ | 204.1 | 216.2 | -17.8 | 905.6 | 216.9 | 1.061 | 0.918 | ES-EA-SA 230KV + BQ-CC-ES-NCM 138KV |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt3ad2_ | 382.4 | 400.4 | 35.9 | 1697.9 | 402 | 1.061 | 0.631 | MIGUEL 230 CORRIDOR North of ML |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_2260 | ivsg_hs_alt3ad2_ | 56 | 57.9 | -10.1 | 292.2 | 58.7 | 1.06 | 0.92 | KRAMER 230.00 - LUGO 230.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 8900 | PRUETTAP | 92 | 8691 | HIGHLINE | 92 | 1 | line_N-209 | ivsg_hs_alt3ad2_ | 86 | -91.1 | 5.3 | 562.8 | 91.3 | 1.043 | 0.764 | EL CENTRO HIGHLINE 230 CKTS 1&2 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23012/13807 | ivsg_hs_alt3ad2_ | 204.1 | 212.6 | -1.1 | 890.6 | 212.6 | 1.043 | 0.918 | PQ-EA 230KV + EA-NCW 138KV |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_N-204 | ivsg_hs_alt3ad2_ | 169 | 174.5 | 36.3 | 626.8 | 178.2 | 1.038 | 0.821 | COACHELLA MIDWAY 230 CKT 1&2 |
| 22672 | PRCTRVLY | 138 | 22852 | TELECYN | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt3ad2_ | 478 | 493.3 | 7.9 | 2075.5 | 493.4 | 1.038 | 0.616 | MIGUEL 230 CORRIDOR West of LC |
| 30060 | MIDWAY | 500 | 24156 | VINCENT | 500 | 3 | line_2215 | ivsg_hs_alt3ad2_ | 1848.1 | 2040.2 | 69.6 | 2208.6 | 2041.4 | 1.037 | 0.407 | MIDWAY 500.00 - VINCENT 500.00 1, MIDWAY 500.00 - VINCENT 500.00 2 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23022/23023 | ivsg_hs_alt3ad2_ | 408.3 | -428.3 | -5.8 | 1769.8 | 428.3 | 1.036 | 0.795 | ML-MS1+ ML-MS2 230KV |
| 24016 | BARRE | 230 | 24044 | ELLIS | 230 | 1 | line_2115 | ivsg_hs_alt3ad2_ | 988 | 984.1 | -49.2 | 2559.1 | 985.4 | 1.032 | 0.271 | S.ONOFRE 230.00 - SANTIAGO 230.00 1, S.ONOFRE 230.00 - SANTIAGO 230.00 2 |
| 19020 | BLYTHE | 161 | 24017 | BLYTHESC | 161 | 1 | line_N-203 | ivsg_hs_alt3ad2_ | 244 | 253 | 39.1 | 900.1 | 256 | 1.029 | 0.833 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 30060 | MIDWAY | 500 | 24156 | VINCENT | 500 | 1 | line_2220 | ivsg_hs_alt3ad2_ | 1848.1 | 2018.9 | 71 | 2185.5 | 2020.2 | 1.027 | 0.326 | MIDWAY 500.00 - VINCENT 500.00 2, MIDWAY 500.00 - VINCENT 500.00 3 |
| 14008 | JOJOBA | 500 | 15011 | KYRENE | 500 | 1 | line_2245 | ivsg_hs_alt3ad2_ | 1732 | 1872 | 172.2 | 2049.2 | 1879.9 | 1.027 | 0.993 | DEVERS 500.00 - VALLEYSC 500.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | 23051B/23011 | ivsg_hs_alt3ad2_ | 392 | 399.1 | -7.1 | 1013.1 | 399.2 | 1.02 | 0.78 | EPP-ES + ES-EA-SA 230KV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23012/13808 | ivsg_hs_alt3ad2_ | 204.1 | 207.7 | -2.4 | 869.3 | 207.7 | 1.018 | 0.918 | PQ-EA 230KV + NCW-PQ 138KV |
| 24074 | LA FRESA | 230 | 24065 | HINSON | 230 | 1 | line_2061 | ivsg_hs_alt3ad2_ | 797 | -779.5 | 48.4 | 2034.1 | 781 | 1.017 | 0.152 | LA FRESA 230.00 - REDONDO 230.00 1, LA FRESA 230.00 - REDONDO 230.00 2 |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | line_2236 | ivsg_hs_alt3ad2_ | 132 | 132.2 | -9.7 | 842.8 | 132.5 | 1.017 | 0.96 | PALOVRDE 500.00 - DEVERS 500.00 1, COACHELV 230.00 - DEVERS 230.00 2 |
| 22596 | OLD TOWN | 230 | 22466 | MLMS3TAP | 230 | 1 | 23021/22/23/41 | ivsg_hs_alt3ad2_ | 912 | -889.6 | 96.9 | 2320.1 | 894.9 | 1.014 | 0.631 | MIGUEL 230 CORRIDOR West of SN |
| 22596 | OLD TOWN | 230 | 22466 | MLMS3TAP | 230 | 1 | 23021/22/23/41 | ivsg_hs_alt3ad2_ | 912 | -890.1 | 104.6 | 2315.9 | 896.2 | 1.012 | 0.631 | MIGUEL 230 CORRIDOR North of ML |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | line_N-204 | ivsg_hs_alt3ad2_ | 132 | 128.2 | -14.6 | 833.9 | 129.1 | 1.007 | 0.96 | COACHELLA MIDWAY 230 CKT 1&2 |
| 8900 | PRUETTAP | 92 | 8691 | HIGHLINE | 92 | 1 | line_N-204 | ivsg_hs_alt3ad2_ | 86 | -87.3 | 10.3 | 542.8 | 87.9 | 1.006 | 0.764 | COACHELLA MIDWAY 230 CKT 1&2 |
| 22596 | OLD TOWN | 230 | 22466 | MLMS3TAP | 230 | 1 | 23021/22/23/41 | ivsg_hs_alt3ad2_ | 912 | -886 | 104.9 | 2303.3 | 892.2 | 1.006 | 0.631 | MIGUEL 230 CORRIDOR West of LC |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | line_2186 | ivsg_hs_alt3ad2_ | 132 | 130.6 | -10.5 | 825.4 | 131 | 0.996 | 0.96 | COACHELV 230.00 - DEVERS 230.00 2, J.HINDS 230.00 - MIRAGE 230.00 1 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 1 | line_2030 | ivsg_hs_alt3ad2_ | 1287 | 1249.9 | -32.4 | 3214.6 | 1250.4 | 0.995 | 0.495 | LEWIS 230.00 - SERRANO 230.00 1, SERRANO 230.00 - VILLA PK 230.00 2 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 1 | line_2032 | ivsg_hs_alt3ad2_ | 1287 | 1249.9 | -32.4 | 3214.6 | 1250.4 | 0.995 | 0.495 | LEWIS 230.00 - SERRANO 230.00 2, SERRANO 230.00 - VILLA PK 230.00 2 |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | line_2237 | ivsg_hs_alt3ad2_ | 132 | 129.6 | -10.5 | 823.5 | 130 | 0.994 | 0.96 | PALOVRDE 500.00 - DEVERS 500.00 1, J.HINDS 230.00 - MIRAGE 230.00 1 |
| 24086 | LUGO | 500 | 24097 | MOHAVE | 500 | 1 | line_2234 | ivsg_hs_alt3ad2_ | 1386 | -1427.3 | 97.2 | 1564.9 | 1430.6 | 0.989 | 0.675 | MOHAVE 500.00 - ELDORDO 500.00 1, PISGAH 230.00 - ELDORDO 230.00 2 |
| 8600 | GEOSUB1 | 230 | 8300 | BANIS230 | 230 | 1 | line_N-204 | ivsg_hs_alt3ad2_ | 550 | 538.5 | 88.3 | 1363.1 | 545.7 | 0.988 | 0.676 | COACHELLA MIDWAY 230 CKT 1&2 |
| 8600 | GEOSUB1 | 230 | 8300 | BANIS230 | 230 | 2 | line_N-204 | ivsg_hs_alt3ad2_ | 550 | 538.5 | 88.3 | 1363.1 | 545.7 | 0.988 | 0.676 | COACHELLA MIDWAY 230 CKT 1&2 |
| 8311 | COACHELA | 230 | 8695 | RAMON | 230 | 2 | line_2236 | ivsg_hs_alt3ad2_ | 800 | 756.3 | -32.5 | 1975.7 | 757 | 0.984 | 0.666 | PALOVRDE 500.00 - DEVERS 500.00 1, COACHELV 230.00 - DEVERS 230.00 2 |
| 19020 | BLYTHE | 161 | 24017 | BLYTHESC | 161 | 1 | line_N-204 | ivsg_hs_alt3ad2_ | 244 | 241 | 36.6 | 857 | 243.7 | 0.979 | 0.833 | COACHELLA MIDWAY 230 CKT 1&2 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23004/23001 | ivsg_hs_alt3ad2_ | 204.1 | 200.1 | -5.8 | 835.8 | 200.2 | 0.979 | 0.918 | SA-MS 1 + SA-MS 2 230KV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23002/06/10 | ivsg_hs_alt3ad2_ | 204.1 | 198 | -4.8 | 832.7 | 198.1 | 0.975 | 0.918 | SANLUISREY 230 CORRIDOR |
| 8695 | RAMON | 230 | 24806 | MIRAGE | 230 | 2 | line_2236 | ivsg_hs_alt3ad2_ | 800 | 729.9 | -172.8 | 1939 | 750.1 | 0.966 | 0.611 | PALOVRDE 500.00 - DEVERS 500.00 1, COACHELV 230.00 - DEVERS 230.00 2 |
| 22672 | PRCTRVLY | 138 | 22852 | TELECYN | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt3ad2_ | 478 | 458.5 | 16.8 | 1927.3 | 458.8 | 0.964 | 0.616 | MIGUEL 230 CORRIDOR North of ML |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_2194 | ivsg_hs_alt3ad2_ | 56 | 51.9 | -10.5 | 262.4 | 52.9 | 0.96 | 0.92 | LUGO 500.00 - MIRALOMA 500.00 2, LUGO 500.00 - MIRALOMA 500.00 3 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23013/27/28 | ivsg_hs_alt3ad2_ | 204.1 | 196 | -6.1 | 818.3 | 196.1 | 0.958 | 0.918 | OLD TOWN TO OLD TOWN JCT |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_N-203 | ivsg_hs_alt3ad2_ | 800 | 769 | 40.1 | 1922.6 | 770.1 | 0.957 | 0.67 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 13821B/638 | ivsg_hs_alt3ad2_ | 392 | 369.7 | 40.7 | 939.5 | 371.9 | 0.95 | 0.86 | CH-SX-SN 138KV + SAN VCNT-EL 69KV |
| 24126 | RIOHONDO | 230 | 24155 | VINCENT | 230 | 2 | line_2097 | ivsg_hs_alt3ad2_ | 988 | -883.5 | 73.4 | 2330.5 | 886.5 | 0.94 | 0.687 | GOODRICH 230.00 - GOULD 230.00 1, VINCENT 230.00 - MESA CAL 230.00 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23021/23041 | ivsg_hs_alt3ad2_ | 392 | 367.1 | 38.1 | 933.9 | 369.1 | 0.94 | 0.86 | ML-SX + OM-SX 230KV |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2191 | ivsg_hs_alt3ad2_ | 2400 | -2327.6 | -44.9 | 2558.9 | 2328 | 0.923 | 0.723 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - ELDORDO 230.00 2 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2200 | ivsg_hs_alt3ad2_ | 2400 | -2316.3 | -36.4 | 2555.5 | 2316.6 | 0.922 | 0.723 | LUGO 500.00 - MOHAVE 500.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2201 | ivsg_hs_alt3ad2_ | 2400 | -2316.1 | -36.5 | 2555.3 | 2316.4 | 0.922 | 0.723 | LUGO 500.00 - MOHAVE 500.00 1, PISGAH 230.00 - LUGO 230.00 2 |
| 24614 | TAP601 | 115 | 24702 | KRAMER | 115 | 1 | line_2260 | ivsg_hs_alt3ad2_ | 217.1 | -189.3 | 71.6 | 1002.8 | 202.4 | 0.922 | 0.716 | KRAMER 230.00 - LUGO 230.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 8311 | COACHELA | 230 | 8695 | RAMON | 230 | 2 | line_2186 | ivsg_hs_alt3ad2_ | 800 | 714.4 | -51 | 1849.8 | 716.2 | 0.921 | 0.666 | COACHELV 230.00 - DEVERS 230.00 2, J.HINDS 230.00 - MIRAGE 230.00 1 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2100 | ivsg_hs_alt3ad2_ | 2400 | -2317.1 | -195.7 | 2550.5 | 2325.4 | 0.92 | 0.723 | EAGLROCK 230.00 - MESA CAL 230.00 1, SYLMAR S 230.00 - GOULD 230.00 1 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2192 | ivsg_hs_alt3ad2_ | 2400 | -2315.8 | -54.6 | 2547 | 2316.5 | 0.919 | 0.723 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2193 | ivsg_hs_alt3ad2_ | 2400 | -2315.6 | -54.7 | 2546.8 | 2316.2 | 0.919 | 0.723 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - LUGO 230.00 2 |
| 22596 | OLD TOWN | 230 | 22466 | MLMS3TAP | 230 | 1 | 23021/23041 | ivsg_hs_alt3ad2_ | 912 | -815.8 | 94.6 | 2101 | 821.3 | 0.918 | 0.631 | ML-SX + OM-SX 230KV |
| 8376 | RTAP2 | 92 | 8974 | RTP1 | 92 | 1 | line_N-208 | ivsg_hs_alt3ad2_ | 57 | -49.8 | 11.4 | 326.4 | 51.1 | 0.916 | 0.686 | COACHELLA BANISTER/BANISTER AVE58 230 |
| 24807 | MIRAGE | 115 | 24819 | CONCHO | 115 | 1 | line_2182 | ivsg_hs_alt3ad2_ | 183 | 164 | -7.4 | 835.5 | 164.1 | 0.909 | 0.867 | DEVERS 230.00 - MIRAGE 230.00 2, COACHELV 230.00 - DEVERS 230.00 2 |
| 24126 | RIOHONDO | 230 | 24155 | VINCENT | 230 | 2 | line_2101 | ivsg_hs_alt3ad2_ | 988 | -858.9 | 75.1 | 2251.2 | 862.1 | 0.908 | 0.687 | EAGLROCK 230.00 - MESA CAL 230.00 1, VINCENT 230.00 - MESA CAL 230.00 1 |
| 24602 | VICTOR | 115 | 24702 | KRAMER | 115 | 1 | line_2260 | ivsg_hs_alt3ad2_ | 217.1 | -184.6 | 81.7 | 986.8 | 201.9 | 0.908 | 0.703 | KRAMER 230.00 - LUGO 230.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2103 | ivsg_hs_alt3ad2_ | 2400 | -2280.4 | -182.8 | 2508.2 | 2287.7 | 0.905 | 0.723 | EAGLROCK 230.00 - SYLMAR S 230.00 1, SYLMAR S 230.00 - GOULD 230.00 1 |
| 24042 | ELDORDO | 500 | 24086 | LUGO | 500 | 1 | line_2258 | ivsg_hs_alt3ad2 | 1386 | 1328.5 | 224 | 1430.8 | 1347.2 | 0.901 | 0.601 | LUGO 500.00 - VINCENT 500.00 2, LUGO 500.00 - VICTORVL 500.00 1 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_N-210 | ivsg_hs_alt3ad2_ | 800 | 723.6 | -4.4 | 1810 | 723.6 | 0.901 | 0.67 | EL CENTRO IMPERIAL VALLEY 230 CKTS 2&3 |
| 8332 | ELCENTSW | 230 | 8335 | ELSTEAMP | 92 | 1 | line_N-210 | ivsg_hs_alt3ad2_ | 225 | 200.9 | 25.1 | 504.6 | 202.5 | 0.9 | 0.54 | EL CENTRO IMPERIAL VALLEY 230 CKTS 2&3 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | 23022/23023 | ivsg_hs_alt3ad2_ | 392 | 353.4 | -0.8 | 893.9 | 353.4 | 0.9 | 0.78 | ML-MS1+ ML-MS2 230KV |

ivsg_hs_alt3ad2.sav
No Solve Summary
N-2 Outages

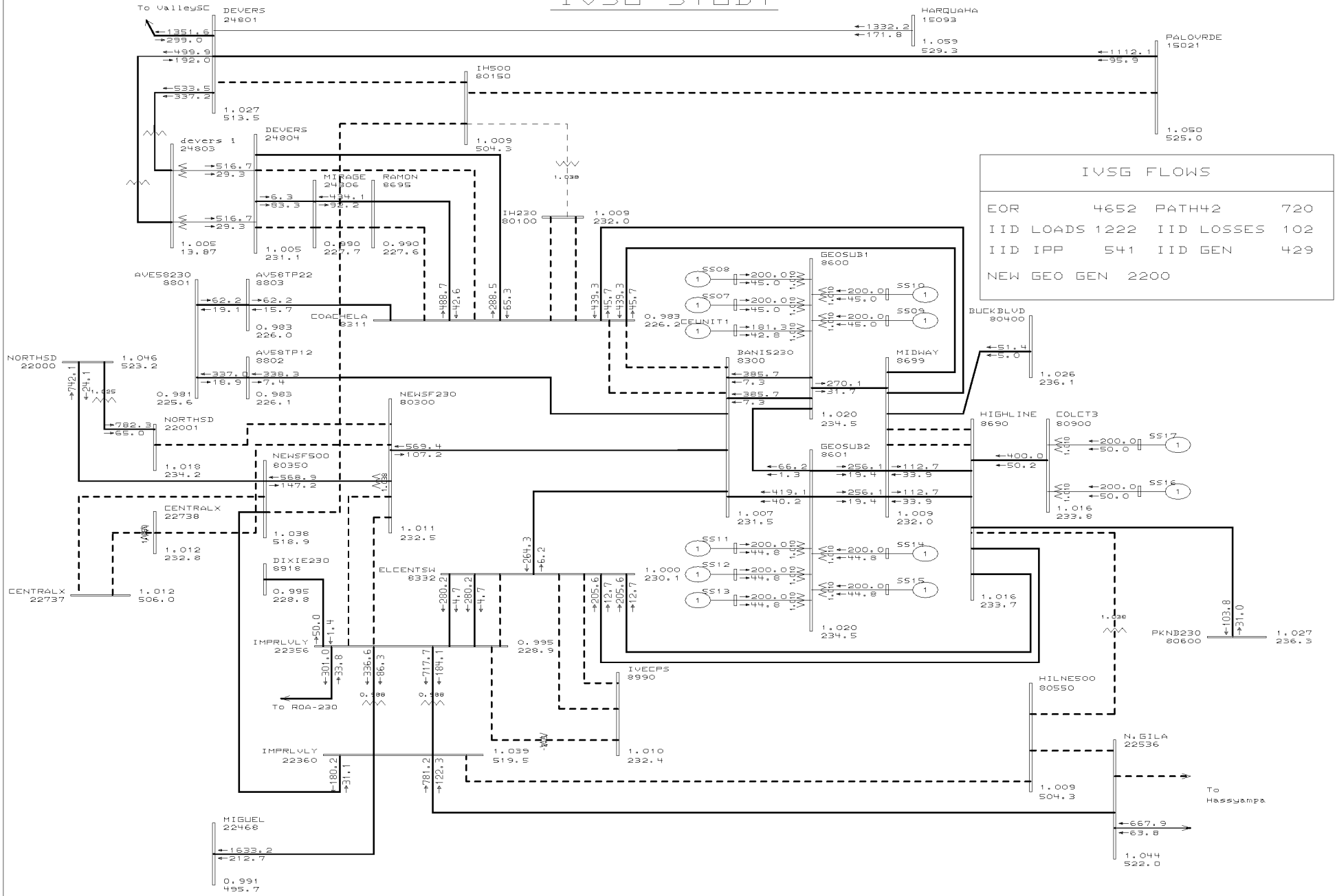
| Contingency-Description | Case | Problem-Description |
|---|---|---|
| MIRALOMA 230.00 - OLINDA 230.00 1, MIRALOMA 230.00 - WALNUT 230.00 1 | ivsg_hs_alt3ad2_ | Pmis 24709 BSPHYD26 2.20 = 0.00 MW + j 7.00 MVAR |
| DEVERS 230.00 - MIRAGE 230.00 2, RAMON 230.00 - MIRAGE 230.00 2 | ivsg_hs_alt3ad2_ | Pmis 24019 CAMINO 230.00 = 65312.91 MW + j -643471.38 MVAR |
| VICTOR 230.00 - LUGO 230.00 1, VICTOR 230.00 - LUGO 230.00 2 | ivsg_hs_alt3ad2_ | Pmis 26132 PINETRCY 230.00 = 517124.94 MW + j -870001.88 MVAR |
| DEVERS 230.00 - MIRAGE 230.00 2, RAMON 230.00 - MIRAGE 230.00 2 | ivsg_hs_alt3ad2_ | Pmis 24019 CAMINO 230.00 = 65312.91 MW + j -643471.38 MVAR |

# Imperial Valley Study Group

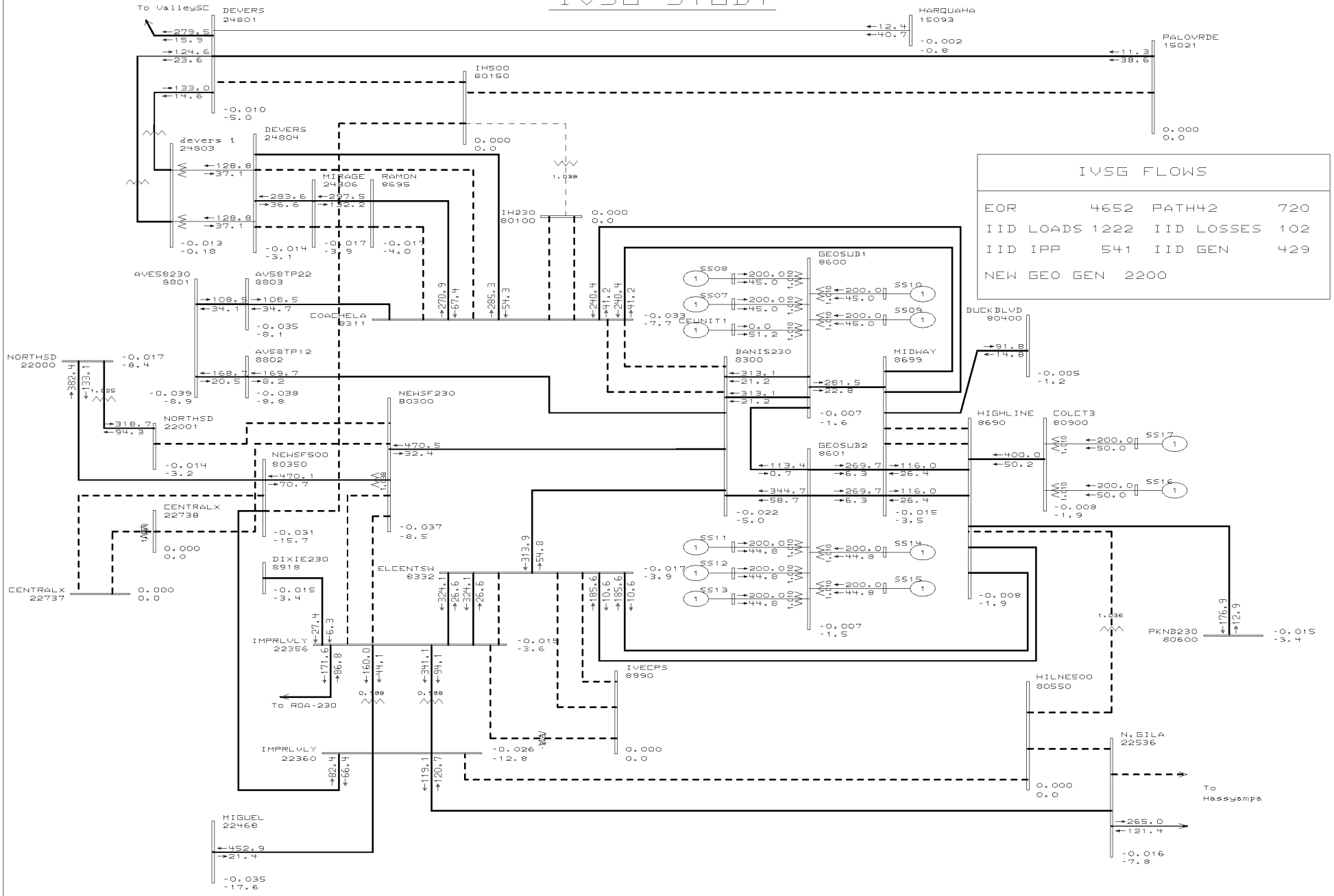
## Appendix A.4.8

Alt 3b D1
Heavy Summer
Alternative 3b
Dispatch 1

# IVSG STUDY


To ValleySC
DEVERS 24801
HARQUAHA 15093
PALOVRDE 15021
IH500 80150
DEVERS 24804
devers 1 24803
MIRAGE 24806
RAMON 8695
IH230 80100
GEOSUB1 8600
AVES8230 8801
AV58TP22 8803
COACHELA 8311
BUCKBLVD 80400
NORTHSD 22000
AV58TP12 8802
BANIS230 8300
MIDWAY 8699
NEWSF230 80300
NORTHSD 22001
HIGHLINE 8690
COLCT3 80900
NEWSF500 80350
GEOSUB2 8601
CENTRALX 22738
CENTRALX 22737
DIXIE230 8918
ELCENTSW 8332
IMPRLVLY 22356
IMPRLVLY 22360
IVECPS 8990
HILNE500 80550
N.GILA 22536
MIGUEL 22468
PKNB230 80600
To ROA-230
To Hassyampa
IVSG FLOWS
EOR 4652 PATH42 720
IID LOADS 1222 IID LOSSES 102
IID IPP 541 IID GEN 429
NEW GEO GEN 2200

# IVSG STUDY




## IVSG FLOWS

| | | | |
|---|---|---|---|
| EOR | 4652 | PATH42 | 720 |
| IID LOADS | 1222 | IID LOSSES | 102 |
| IID IPP | 541 | IID GEN | 429 |
| NEW GEO GEN | 2200 | | |

ivsg_hs_alt3bd1.sav
Voltage Summary
N-0 Outages

| Bus | Name | kV | Area | Zone | Outage | Case | Vbase | Vcont | DeltaV | Vmin | Vmax | Max-dv | Contingency Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24035 | EAGLEMTN | 161 | 24 | 248 | base | ivsg_hs_alt3bd1 | 0.929 | 0.929 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 20077 | SIM-115 | 115 | 20 | 205 | base | ivsg_hs_alt3bd1 | 0.932 | 0.932 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 20076 | SQN-115 | 115 | 20 | 205 | base | ivsg_hs_alt3bd1 | 0.937 | 0.937 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14534 | N.GILA 4 | 100 | 14 | 847 | base | ivsg_hs_alt3bd1 | 0.943 | 0.943 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15021 | PALOVRDE | 500 | 14 | 158 | base | ivsg_hs_alt3bd1 | 1.05 | 1.05 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24775 | RUSH | 115 | 24 | 247 | base | ivsg_hs_alt3bd1 | 1.05 | 1.05 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24138 | SERRANO | 500 | 24 | 240 | base | ivsg_hs_alt3bd1 | 1.05 | 1.05 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15051 | BROWNING | 500 | 14 | 158 | base | ivsg_hs_alt3bd1 | 1.051 | 1.051 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15090 | HASSYAMP | 500 | 14 | 158 | base | ivsg_hs_alt3bd1 | 1.052 | 1.052 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15092 | ARLINTON | 500 | 14 | 158 | base | ivsg_hs_alt3bd1 | 1.053 | 1.053 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15094 | MESQUITE | 500 | 14 | 158 | base | ivsg_hs_alt3bd1 | 1.053 | 1.053 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24940 | SERVAL | 500 | 24 | 240 | base | ivsg_hs_alt3bd1 | 1.053 | 1.053 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14009 | REDHAWK | 500 | 14 | 141 | base | ivsg_hs_alt3bd1 | 1.054 | 1.054 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24151 | VALLEYSC | 500 | 24 | 240 | base | ivsg_hs_alt3bd1 | 1.054 | 1.054 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24997 | VALYSVC1 | 500 | 24 | 240 | base | ivsg_hs_alt3bd1 | 1.054 | 1.054 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 28040 | CALPINE | 500 | 24 | 240 | base | ivsg_hs_alt3bd1 | 1.054 | 1.054 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14010 | TS5 | 500 | 14 | 141 | base | ivsg_hs_alt3bd1 | 1.056 | 1.056 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 79043 | KAYENTA | 230 | 14 | 191 | base | ivsg_hs_alt3bd1 | 1.056 | 1.056 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24086 | LUGO | 500 | 24 | 240 | base | ivsg_hs_alt3bd1 | 1.056 | 1.056 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14230 | VERDE N | 230 | 14 | 141 | base | ivsg_hs_alt3bd1 | 1.058 | 1.058 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14247 | VERDE S | 230 | 14 | 141 | base | ivsg_hs_alt3bd1 | 1.058 | 1.058 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14011 | RACEWAY | 500 | 14 | 141 | base | ivsg_hs_alt3bd1 | 1.058 | 1.058 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24776 | LEE VINE | 115 | 24 | 247 | base | ivsg_hs_alt3bd1 | 1.058 | 1.058 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15093 | HARQUAHA | 500 | 14 | 158 | base | ivsg_hs_alt3bd1 | 1.059 | 1.059 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15034 | PERKINS | 500 | 14 | 158 | base | ivsg_hs_alt3bd1 | 1.061 | 1.061 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14205 | COCONINO | 230 | 14 | 141 | base | ivsg_hs_alt3bd1 | 1.061 | 1.061 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14008 | JOJOBA | 500 | 14 | 141 | base | ivsg_hs_alt3bd1 | 1.061 | 1.061 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15041 | SILVERKG | 500 | 14 | 158 | base | ivsg_hs_alt3bd1 | 1.062 | 1.062 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15061 | RUDD | 500 | 14 | 158 | base | ivsg_hs_alt3bd1 | 1.062 | 1.062 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14234 | YAVAPAI | 230 | 14 | 141 | base | ivsg_hs_alt3bd1 | 1.063 | 1.063 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24156 | VINCENT | 500 | 24 | 240 | base | ivsg_hs_alt3bd1 | 1.065 | 1.065 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14355 | PRESCOTT | 115 | 14 | 141 | base | ivsg_hs_alt3bd1 | 1.066 | 1.066 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14544 | PRESCOT2 | 100 | 14 | 141 | base | ivsg_hs_alt3bd1 | 1.066 | 1.066 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14543 | PRESCOT1 | 100 | 14 | 141 | base | ivsg_hs_alt3bd1 | 1.066 | 1.066 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14001 | FOURCORN | 500 | 14 | 141 | base | ivsg_hs_alt3bd1 | 1.067 | 1.067 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14256 | FLAGSTAF | 230 | 14 | 141 | base | ivsg_hs_alt3bd1 | 1.067 | 1.067 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14587 | FLAGSTF1 | 100 | 14 | 141 | base | ivsg_hs_alt3bd1 | 1.068 | 1.068 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24729 | INYO | 230 | 24 | 247 | base | ivsg_hs_alt3bd1 | 1.068 | 1.068 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14007 | GILARIVR | 500 | 14 | 141 | base | ivsg_hs_alt3bd1 | 1.069 | 1.069 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 79264 | PINAL_W | 500 | 14 | 141 | base | ivsg_hs_alt3bd1 | 1.07 | 1.07 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14006 | YAVAPAI | 500 | 14 | 141 | base | ivsg_hs_alt3bd1 | 1.071 | 1.071 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14004 | SAGUARO | 500 | 14 | 141 | base | ivsg_hs_alt3bd1 | 1.075 | 1.075 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14215 | LEUPP | 230 | 14 | 141 | base | ivsg_hs_alt3bd1 | 1.075 | 1.075 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15992 | SEV | 500 | 14 | 158 | base | ivsg_hs_alt3bd1 | 1.075 | 1.075 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 16000 | TORTOLIT | 500 | 14 | 160 | base | ivsg_hs_alt3bd1 | 1.075 | 1.075 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 16001 | TORTLIT2 | 500 | 14 | 160 | base | ivsg_hs_alt3bd1 | 1.075 | 1.075 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14100 | CHOLLA | 345 | 14 | 141 | base | ivsg_hs_alt3bd1 | 1.077 | 1.077 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15001 | CORONADO | 500 | 14 | 158 | base | ivsg_hs_alt3bd1 | 1.08 | 1.08 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14000 | CHOLLA | 500 | 14 | 141 | base | ivsg_hs_alt3bd1 | 1.081 | 1.081 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 19038 | MEAD | 500 | 14 | 191 | base | ivsg_hs_alt3bd1 | 1.084 | 1.084 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24042 | ELDORDO | 500 | 24 | 240 | base | ivsg_hs_alt3bd1 | 1.084 | 1.084 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24097 | MOHAVE | 500 | 24 | 240 | base | ivsg_hs_alt3bd1 | 1.087 | 1.087 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14204 | CHOLLA | 230 | 14 | 141 | base | ivsg_hs_alt3bd1 | 1.088 | 1.088 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14509 | CHOLLA 7 | 100 | 14 | 141 | base | ivsg_hs_alt3bd1 | 1.094 | 1.094 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14267 | SECDKNOL | 230 | 14 | 141 | base | ivsg_hs_alt3bd1 | 1.099 | 1.099 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14003 | NAVAJO | 500 | 14 | 141 | base | ivsg_hs_alt3bd1 | 1.102 | 1.102 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14002 | MOENKOPI | 500 | 14 | 141 | base | ivsg_hs_alt3bd1 | 1.104 | 1.104 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |

ivsg_hs_alt3bd1.sav
Flow Summary
N-0 Outages

| LEGEND | % of RATING 1 | |
|---|---|---|
| C_pu | 100% - 110% | |
| C_pu | 110% - 120% | P.U. of |
| C_pu | > 120% | Rate 1 |

| FROM | FR | BKV | TO | TO | BKV | CK | Outage_Name | Case | Rate-Mva | Pflow | Qflow | Amps | MVA | C_pu | B_pu | Contingency_Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 14248 | GLENDALW | 230 | 14212 | GLENDALE | 230 | 1 | base | ivsg_hs_alt3bd1 | 457 | 571.8 | 32.6 | 1433.4 | 572.7 | 1.25 | 1.25 | Base system (n-0) |
| 14248 | GLENDALW | 230 | 15201 | AGUAFRIA | 230 | 1 | base | ivsg_hs_alt3bd1 | 457 | -571.8 | -32.6 | 1433.4 | 572.7 | 1.25 | 1.25 | Base system (n-0) |
| 24910 | CAL ELEC | 115 | 24912 | SHANDIN | 115 | 1 | base | ivsg_hs_alt3bd1 | 109.1 | -124.1 | 58.3 | 682.2 | 137.1 | 1.248 | 1.248 | Base system (n-0) |
| 14221 | PNPKAPS | 230 | 19062 | PINPK | 230 | 1 | base | ivsg_hs_alt3bd1 | 637.4 | -784.6 | -185.5 | 1984.8 | 806.3 | 1.24 | 1.24 | Base system (n-0) |
| 24912 | SHANDIN | 115 | 24916 | TAP902 | 115 | 1 | base | ivsg_hs_alt3bd1 | 109.1 | -119.2 | 33.5 | 612.9 | 123.8 | 1.12 | 1.12 | Base system (n-0) |
| 14212 | GLENDALE | 230 | 14270 | GRNDTRML | 230 | 1 | base | ivsg_hs_alt3bd1 | 457 | 506.4 | 25 | 1269.1 | 507 | 1.109 | 1.109 | Base system (n-0) |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | base | ivsg_hs_alt3bd1 | 392 | 394.2 | 39.6 | 1012.3 | 396.1 | 1.01 | 1.01 | Base system (n-0) |
| 14206 | CTRYCLUB | 230 | 14270 | GRNDTRML | 230 | 1 | base | ivsg_hs_alt3bd1 | 509.9 | -503 | -25.4 | 1272.5 | 503.7 | 0.994 | 0.994 | Base system (n-0) |
| 14202 | CACTUS | 230 | 14221 | PNPKAPS | 230 | 1 | base | ivsg_hs_alt3bd1 | 371 | -363.7 | -48.6 | 921 | 366.9 | 0.989 | 0.989 | Base system (n-0) |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | base | ivsg_hs_alt3bd1 | 204.1 | 199.8 | -2.1 | 839.9 | 199.8 | 0.984 | 0.984 | Base system (n-0) |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | base | ivsg_hs_alt3bd1 | 408.3 | -389.7 | 2.4 | 1634 | 389.7 | 0.957 | 0.957 | Base system (n-0) |
| 15230 | RUDD | 230 | 15218 | WHITETNK | 230 | 1 | base | ivsg_hs_alt3bd1 | 725 | 692.3 | -18.2 | 1734.1 | 692.6 | 0.953 | 0.953 | Base system (n-0) |
| 24087 | MAGUNDEN | 230 | 24101 | OMAR | 230 | 1 | base | ivsg_hs_alt3bd1 | 643 | -591.8 | 130.4 | 1533 | 606 | 0.951 | 0.951 | Base system (n-0) |
| 24806 | MIRAGE | 230 | 24807 | MIRAGE | 115 | 1 | base | ivsg_hs_alt3bd1 | 280 | 265.7 | 27.6 | 677.3 | 267.1 | 0.95 | 0.95 | Base system (n-0) |
| 24806 | MIRAGE | 230 | 24807 | MIRAGE | 115 | 2 | base | ivsg_hs_alt3bd1 | 280 | 265.7 | 27.6 | 677.3 | 267.1 | 0.95 | 0.95 | Base system (n-0) |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | base | ivsg_hs_alt3bd1 | 132 | 125.3 | -11.2 | 784.9 | 125.8 | 0.947 | 0.947 | Base system (n-0) |
| 24702 | KRAMER | 115 | 24753 | SUNGEN | 115 | 1 | base | ivsg_hs_alt3bd1 | 183.3 | -170.5 | 32.6 | 863.8 | 173.6 | 0.939 | 0.939 | Base system (n-0) |
| 14008 | JOJOBA | 500 | 15011 | KYRENE | 500 | 1 | base | ivsg_hs_alt3bd1 | 1732 | 1708.6 | 133.5 | 1865.1 | 1713.8 | 0.934 | 0.934 | Base system (n-0) |
| 26098 | SYLMAR3 | 230 | 24147 | SYLMAR S | 230 | 1 | base | ivsg_hs_alt3bd1 | 1100 | 840.7 | -522.8 | 2571.8 | 990 | 0.931 | 0.931 | Base system (n-0) |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | base | ivsg_hs_alt3bd1 | 56 | 49.9 | -10.6 | 252.6 | 51 | 0.92 | 0.92 | Base system (n-0) |
| 14207 | DEERVALY | 230 | 14231 | WESTWING | 230 | 1 | base | ivsg_hs_alt3bd1 | 720 | -647.6 | -80.3 | 1634.7 | 652.5 | 0.904 | 0.904 | Base system (n-0) |

ivsg_hs_alt3bd1.sav
VOLTAGE Summary
N-1 Outages

| Bus | Name | kV | Area | Zone | Outage | Case | Vbase | Vcont | DeltaV | Vmin | Vmax | Max-dv | Contingency Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24017 | BLYTHESC | 161 | 24 | 248 | line_007 | ivsg_hs_alt3bd1 | 1.02 | 0.862 | -0.158 | 0.9 | 1.05 | 0.05 | line BLYTHE to BLYTHESC 161 ck 1 |
| 22428 | MAINST51 | 138 | 22 | 222 | B2_002 | ivsg_hs_alt3bd1 | 0.977 | 0.888 | -0.088 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22424 | MAINST50 | 138 | 22 | 222 | B2_002 | ivsg_hs_alt3bd1 | 0.977 | 0.889 | -0.088 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22412 | LOSCOCHS | 138 | 22 | 223 | B2_002 | ivsg_hs_alt3bd1 | 0.98 | 0.89 | -0.09 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22464 | MIGUEL | 230 | 22 | 222 | B2_002 | ivsg_hs_alt3bd1 | 0.982 | 0.893 | -0.089 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22468 | MIGUEL | 500 | 22 | 227 | B2_002 | ivsg_hs_alt3bd1 | 0.991 | 0.893 | -0.098 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22472 | MIGUELMP | 500 | 22 | 227 | B2_002 | ivsg_hs_alt3bd1 | 0.984 | 0.893 | -0.091 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22734 | SANTEE | 138 | 22 | 223 | B2_002 | ivsg_hs_alt3bd1 | 0.982 | 0.897 | -0.085 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22772 | SOUTHBAY | 138 | 22 | 222 | B2_002 | ivsg_hs_alt3bd1 | 0.985 | 0.898 | -0.087 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22504 | MISSION | 230 | 22 | 221 | B2_002 | ivsg_hs_alt3bd1 | 0.977 | 0.903 | -0.074 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22865 | UPTOWN | 138 | 22 | 221 | B2_002 | ivsg_hs_alt3bd1 | 0.988 | 0.904 | -0.084 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22596 | OLD TOWN | 230 | 22 | 221 | B2_002 | ivsg_hs_alt3bd1 | 0.98 | 0.907 | -0.073 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22852 | TELECYN | 138 | 22 | 222 | B2_002 | ivsg_hs_alt3bd1 | 0.995 | 0.908 | -0.087 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22116 | CARLTHTP | 138 | 22 | 223 | B2_002 | ivsg_hs_alt3bd1 | 0.989 | 0.91 | -0.079 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22120 | CARLTNHS | 138 | 22 | 223 | B2_002 | ivsg_hs_alt3bd1 | 0.989 | 0.91 | -0.079 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22672 | PRCTRVLY | 138 | 22 | 222 | B2_002 | ivsg_hs_alt3bd1 | 0.998 | 0.91 | -0.088 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22460 | MIGUEL | 138 | 22 | 222 | B2_002 | ivsg_hs_alt3bd1 | 1 | 0.912 | -0.088 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22500 | MISSION | 138 | 22 | 221 | B2_002 | ivsg_hs_alt3bd1 | 0.993 | 0.915 | -0.078 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22300 | FRIARS | 138 | 22 | 221 | B2_002 | ivsg_hs_alt3bd1 | 0.992 | 0.916 | -0.076 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22832 | SYCAMORE | 230 | 22 | 221 | B2_002 | ivsg_hs_alt3bd1 | 0.986 | 0.917 | -0.069 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22652 | PENSQTOS | 230 | 22 | 221 | B2_002 | ivsg_hs_alt3bd1 | 0.988 | 0.922 | -0.067 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22831 | SYCAMORE | 138 | 22 | 221 | B2_002 | ivsg_hs_alt3bd1 | 0.995 | 0.925 | -0.07 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 24731 | INYOKERN | 115 | 24 | 247 | line_175 | ivsg_hs_alt3bd1 | 1 | 0.926 | -0.075 | 0.9 | 1.05 | 0.05 | line INYO to COTTONWD 230 ck 1 |
| 22922 | MIRA SOR | 138 | 22 | 221 | B2_002 | ivsg_hs_alt3bd1 | 0.99 | 0.927 | -0.062 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 24822 | INDIAN W | 115 | 24 | 248 | tran_238 | ivsg_hs_alt3bd1 | 1.024 | 0.928 | -0.096 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 24819 | CONCHO | 115 | 24 | 248 | tran_238 | ivsg_hs_alt3bd1 | 1.025 | 0.929 | -0.096 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 22184 | DOUBLET | 138 | 22 | 221 | B2_002 | ivsg_hs_alt3bd1 | 0.991 | 0.932 | -0.059 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22192 | DOUBLTTP | 138 | 22 | 221 | B2_002 | ivsg_hs_alt3bd1 | 0.991 | 0.932 | -0.059 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22648 | PENSQTOS | 138 | 22 | 221 | B2_002 | ivsg_hs_alt3bd1 | 0.991 | 0.933 | -0.058 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 24816 | SANTA RO | 115 | 24 | 248 | tran_238 | ivsg_hs_alt3bd1 | 1.029 | 0.933 | -0.096 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 24821 | TAMARISK | 115 | 24 | 248 | tran_238 | ivsg_hs_alt3bd1 | 1.028 | 0.934 | -0.095 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 22124 | CHCARITA | 138 | 22 | 225 | B2_002 | ivsg_hs_alt3bd1 | 0.997 | 0.936 | -0.061 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 25633 | CAPWIND | 115 | 24 | 248 | tran_238 | ivsg_hs_alt3bd1 | 1.031 | 0.936 | -0.094 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 24827 | TAP823 | 115 | 24 | 248 | tran_238 | ivsg_hs_alt3bd1 | 1.03 | 0.936 | -0.095 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 25622 | TAP806 | 115 | 24 | 248 | tran_238 | ivsg_hs_alt3bd1 | 1.031 | 0.936 | -0.094 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 24829 | TAP821 | 115 | 24 | 248 | tran_238 | ivsg_hs_alt3bd1 | 1.031 | 0.936 | -0.094 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 22466 | MLMS3TAP | 230 | 22 | 222 | B2_002 | ivsg_hs_alt3bd1 | 0.994 | 0.939 | -0.055 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 24807 | MIRAGE | 115 | 24 | 248 | tran_238 | ivsg_hs_alt3bd1 | 1.032 | 0.939 | -0.094 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 22580 | NORTHCTY | 138 | 22 | 224 | B2_002 | ivsg_hs_alt3bd1 | 0.995 | 0.941 | -0.054 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22254 | ENVIREPL | 69 | 22 | 225 | B2_002 | ivsg_hs_alt3bd1 | 0.994 | 0.941 | -0.053 | 0 | 0 | 0 | IMPRLVLY - MIGUEL 1 500kV |
| 25423 | ESRP MWD | 115 | 24 | 254 | tran_247 | ivsg_hs_alt3bd1 | 1.025 | 0.943 | -0.082 | 0.9 | 1.05 | 0.05 | tran VALLEYSC 500 to VALLEYSC 115 ck 1 |
| 25423 | ESRP MWD | 115 | 24 | 254 | tran_248 | ivsg_hs_alt3bd1 | 1.025 | 0.943 | -0.082 | 0.9 | 1.05 | 0.05 | tran VALLEYSC 500 to VALLEYSC 115 ck 2 |
| 24160 | VALLEYSC | 115 | 24 | 240 | tran_247 | ivsg_hs_alt3bd1 | 1.027 | 0.946 | -0.082 | 0.9 | 1.05 | 0.05 | tran VALLEYSC 500 to VALLEYSC 115 ck 1 |
| 25990 | VALYSVC1 | 115 | 24 | 240 | tran_247 | ivsg_hs_alt3bd1 | 1.027 | 0.946 | -0.082 | 0.9 | 1.05 | 0.05 | tran VALLEYSC 500 to VALLEYSC 115 ck 1 |
| 24160 | VALLEYSC | 115 | 24 | 240 | tran_248 | ivsg_hs_alt3bd1 | 1.027 | 0.946 | -0.082 | 0.9 | 1.05 | 0.05 | tran VALLEYSC 500 to VALLEYSC 115 ck 2 |
| 25990 | VALYSVC1 | 115 | 24 | 240 | tran_248 | ivsg_hs_alt3bd1 | 1.027 | 0.946 | -0.082 | 0.9 | 1.05 | 0.05 | tran VALLEYSC 500 to VALLEYSC 115 ck 2 |
| 22467 | MLSXTAP | 230 | 22 | 222 | B2_002 | ivsg_hs_alt3bd1 | 0.999 | 0.947 | -0.051 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 24768 | RANDSBRG | 115 | 24 | 247 | line_175 | ivsg_hs_alt3bd1 | 1.001 | 0.951 | -0.05 | 0.9 | 1.05 | 0.05 | line INYO to COTTONWD 230 ck 1 |
| 24761 | TAP701 | 115 | 24 | 247 | line_175 | ivsg_hs_alt3bd1 | 1.001 | 0.951 | -0.05 | 0.9 | 1.05 | 0.05 | line INYO to COTTONWD 230 ck 1 |
| 14534 | N.GILA 4 | 100 | 14 | 847 | NG500/69 | ivsg_hs_alt3bd1 | 0.943 | 1 | 0.057 | 0.9 | 1.05 | 0.05 | tran N.GILA 500 to N.GILA 69 ck 1 |
| 24035 | EAGLEMTN | 161 | 24 | 248 | tran_241 | ivsg_hs_alt3bd1 | 0.929 | 1.026 | 0.097 | 0.9 | 1.05 | 0.05 | tran EAGLEMTN 230 to EAGLEMTN 161 ck 1 |
| 22472 | MIGUELMP | 500 | 22 | 227 | ML80 | ivsg_hs_alt3bd1 | 0.984 | 1.05 | 0.066 | 0.9 | 1.05 | 0.05 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 24730 | INYO PS | 115 | 24 | 247 | tran_229 | ivsg_hs_alt3bd1 | 1.026 | 1.078 | 0.052 | 0.9 | 1.05 | 0.05 | tran INYO 115 to INYO PS 115 ck 1 |
| 24142 | SYC CYN | 230 | 24 | 240 | line_086 | ivsg_hs_alt3bd1 | 0.984 | 1.091 | 0.107 | 0.9 | 1.05 | 0.05 | line MAGUNDEN to OMAR 230 ck 1 |
| 25613 | EDMONSTN | 230 | 24 | 256 | line_122 | ivsg_hs_alt3bd1 | 0.999 | 1.091 | 0.092 | 0.9 | 1.05 | 0.05 | line PASTORIA to EDMONSTN 230 ck 1 |
| 24142 | SYC CYN | 230 | 24 | 240 | line_140 | ivsg_hs_alt3bd1 | 0.984 | 1.091 | 0.107 | 0.9 | 1.05 | 0.05 | line SYC CYN to OMAR 230 ck 1 |

ivsg_hs_alt3bd1.sav
FLOW Summary
N-1 Outages

| LEGEND | % of RATING 1 | |
|---|---|---|
| C_pu | 100% - 110% | |
| C_pu | 110% - 120% | P.U. of |
| C_pu | > 120% | Rate 1 |

| FROM | FR | BKV | TO | TO | BKV | CK | Outage_Name | Case | Rate-Mva | Pflow | Qflow | Amps | MVA | C_pu | B_pu | Contingency_Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24142 | SYC CYN | 230 | 24101 | OMAR | 230 | 1 | line_086 | ivsg_hs_alt3bd1 | 643 | 769.7 | 5511.1 | 12804.4 | 5564.6 | 7.934 | 0.471 | line MAGUNDEN to OMAR 230 ck 1 |
| 24781 | NAVYCOSO | 230 | 24706 | BLM EAST | 230 | 1 | line_173 | ivsg_hs_alt3bd1 | 1287 | -153.7 | -3160.7 | 7943.3 | 3164.4 | 2.459 | 0.056 | line BLM EAST to BLM WEST 230 ck 1 |
| 24781 | NAVYCOSO | 230 | 24706 | BLM EAST | 230 | 1 | line_174 | ivsg_hs_alt3bd1 | 1287 | -153.7 | -3160.7 | 7943.3 | 3164.4 | 2.459 | 0.056 | line BLM WEST to KRAMER 230 ck 1 |
| 24806 | MIRAGE | 230 | 24807 | MIRAGE | 115 | 2 | tran_238 | ivsg_hs_alt3bd1 | 280 | 532.4 | 210.3 | 1490 | 572.4 | 2.04 | 0.95 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_175 | ivsg_hs_alt3bd1 | 56 | -103.6 | -1.2 | 532 | 103.6 | 1.86 | 0.92 | line INYO to COTTONWD 230 ck 1 |
| 24151 | VALLEYSC | 500 | 24160 | VALLEYSC | 115 | 2 | tran_247 | ivsg_hs_alt3bd1 | 560 | 853.2 | 356.5 | 1024 | 924.7 | 1.65 | 0.77 | tran VALLEYSC 500 to VALLEYSC 115 ck 1 |
| 24151 | VALLEYSC | 500 | 24160 | VALLEYSC | 115 | 1 | tran_248 | ivsg_hs_alt3bd1 | 560 | 853.2 | 356.5 | 1024 | 924.7 | 1.65 | 0.77 | tran VALLEYSC 500 to VALLEYSC 115 ck 2 |
| 24151 | VALLEYSC | 500 | 24229 | VALLEY-S | 115 | 4 | tran_249 | ivsg_hs_alt3bd1 | 560 | 830.7 | 204.1 | 944.9 | 855.4 | 1.53 | 0.75 | tran VALLEYSC 500 to VALLEY-S 115 ck 3 |
| 24151 | VALLEYSC | 500 | 24229 | VALLEY-S | 115 | 3 | tran_250 | ivsg_hs_alt3bd1 | 560 | 830.7 | 204.1 | 944.9 | 855.4 | 1.53 | 0.75 | tran VALLEYSC 500 to VALLEY-S 115 ck 4 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_202 | ivsg_hs_alt3bd1 | 56 | 77.4 | -7.3 | 392.5 | 77.7 | 1.4 | 0.92 | line OWENSCON to INYO 230 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_034 | ivsg_hs_alt3bd1 | 204.1 | 271 | -2.8 | 1166.5 | 271 | 1.366 | 0.984 | OLD TOWN - MLMS3TAP 1 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_032 | ivsg_hs_alt3bd1 | 204.1 | 270.9 | -3.5 | 1165.7 | 270.9 | 1.365 | 0.984 | OTAYMESA - MLMS3TAP 1 230kV |
| 22001 | NORTHSD | 230 | 22000 | NORTHSD | 500 | 1 | B2_002 | ivsg_hs_alt3bd1 | 1120 | -1487.5 | 11.4 | 3803.2 | 1487.5 | 1.33 | 0.7 | IMPRLVLY - MIGUEL 1 500kV |
| 22468 | MIGUEL | 500 | 22472 | MIGUELMP | 500 | 1 | ML81 | ivsg_hs_alt3bd1 | 1120 | 1452.9 | 269.1 | 1723.3 | 1477.6 | 1.32 | 0.76 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 22464 | MIGUEL | 230 | 22468 | MIGUEL | 500 | 1 | ML80 | ivsg_hs_alt3bd1 | 1120 | -1431.6 | 15.5 | 3702.2 | 1431.6 | 1.3 | 0.71 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 22464 | MIGUEL | 230 | 22472 | MIGUELMP | 500 | 1 | ML81 | ivsg_hs_alt3bd1 | 1120 | -1450 | 12.1 | 3746.3 | 1450 | 1.3 | 0.75 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_002 | ivsg_hs_alt3bd1 | 204.1 | 242.9 | 24 | 1103.3 | 244 | 1.292 | 0.984 | IMPRLVLY - MIGUEL 1 500kV |
| 22356 | IMPRLVLY | 230 | 22360 | IMPRLVLY | 500 | 1 | IV81 | ivsg_hs_alt3bd1 | 600 | 744.4 | 214.9 | 1946.3 | 774.8 | 1.29 | 0.58 | tran IMPRLVLY 230 to IMPRLVLY 500 ck 2 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | ML60 | ivsg_hs_alt3bd1 | 204.1 | 248.8 | 4.4 | 1055.7 | 248.8 | 1.236 | 0.984 | tran MIGUEL 230 to MIGUEL 138 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | SX70 | ivsg_hs_alt3bd1 | 204.1 | 243.2 | 11.4 | 1027.6 | 243.5 | 1.203 | 0.984 | tran SYCAMORE 230 to SYCAMORE 69 ck 1 |
| 24723 | CONTROL | 115 | 24731 | INYOKERN | 115 | 1 | line_175 | ivsg_hs_alt3bd1 | 82.7 | 95.9 | -4.2 | 496 | 96 | 1.195 | 0.419 | line INYO to COTTONWD 230 ck 1 |
| 24723 | CONTROL | 115 | 24731 | INYOKERN | 115 | 2 | line_175 | ivsg_hs_alt3bd1 | 82.7 | 95.9 | -4.2 | 496 | 96 | 1.195 | 0.419 | line INYO to COTTONWD 230 ck 1 |
| 22504 | MISSION | 230 | 22500 | MISSION | 138 | 2 | MS60 | ivsg_hs_alt3bd1 | 392 | 442.6 | 122.5 | 1180.4 | 459.3 | 1.17 | 0.78 | tran MISSION 230 to MISSION 138 ck 1 |
| 22504 | MISSION | 230 | 22500 | MISSION | 138 | 1 | MS61 | ivsg_hs_alt3bd1 | 392 | 442.6 | 122.5 | 1180.4 | 459.3 | 1.17 | 0.78 | tran MISSION 230 to MISSION 138 ck 2 |
| 20238 | HRD-230 | 230 | 20239 | HRD-115 | 115 | 1 | B2_002 | ivsg_hs_alt3bd1 | 225 | 261.8 | -7 | 691.6 | 261.9 | 1.16 | 0.76 | IMPRLVLY - MIGUEL 1 500kV |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | B2_002 | ivsg_hs_alt3bd1 | 388 | -428.8 | -26.5 | 1118.9 | 429.6 | 1.149 | 0.603 | IMPRLVLY - MIGUEL 1 500kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | MS60 | ivsg_hs_alt3bd1 | 204.1 | 226.4 | 4.1 | 956.3 | 226.4 | 1.12 | 0.984 | tran MISSION 230 to MISSION 138 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | MS61 | ivsg_hs_alt3bd1 | 204.1 | 226.4 | 4.1 | 956.3 | 226.4 | 1.12 | 0.984 | tran MISSION 230 to MISSION 138 ck 2 |
| 24729 | INYO | 230 | 24730 | INYO PS | 115 | 1 | line_175 | ivsg_hs_alt3bd1 | 50 | 51.8 | 21.3 | 133 | 56 | 1.12 | 0.54 | line INYO to COTTONWD 230 ck 1 |
| 24729 | INYO | 230 | 24730 | INYO PS | 115 | 2 | line_175 | ivsg_hs_alt3bd1 | 50 | 51.8 | 21.3 | 133 | 56 | 1.12 | 0.54 | line INYO to COTTONWD 230 ck 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_015 | ivsg_hs_alt3bd1 | 392 | 430.6 | 48 | 1108.4 | 433.2 | 1.11 | 1.01 | MIGUEL - MISSION 1 230kV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_020 | ivsg_hs_alt3bd1 | 392 | 429.2 | 46.5 | 1105.3 | 431.7 | 1.1 | 1.01 | MIGUEL - MISSION 2 230kV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | ML70 | ivsg_hs_alt3bd1 | 392 | 428.6 | 53.2 | 1110.1 | 431.9 | 1.1 | 1.01 | tran MIGUEL 69 to MIGUEL 230 ck 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | ML71 | ivsg_hs_alt3bd1 | 392 | 428.6 | 53.2 | 1110.1 | 431.9 | 1.1 | 1.01 | tran MIGUEL 69 to MIGUEL 230 ck 2 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | SX60 | ivsg_hs_alt3bd1 | 392 | 427.6 | 46.6 | 1105.5 | 430.1 | 1.1 | 1.01 | tran SYCAMORE 230 to SYCAMORE 138 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_009 | ivsg_hs_alt3bd1 | 204.1 | 223.2 | -5.3 | 938.8 | 223.2 | 1.099 | 0.984 | EPP - ESCNDIDO 1 230kV |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 2 | line_070 | ivsg_hs_alt3bd1 | 956 | -1025.7 | -30.7 | 2608.7 | 1026.1 | 1.087 | 0.596 | line LA FRESA to REDONDO 230 ck 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 1 | line_071 | ivsg_hs_alt3bd1 | 956 | -1025.7 | -30.7 | 2608.7 | 1026.1 | 1.087 | 0.596 | line LA FRESA to REDONDO 230 ck 2 |
| 24701 | KRAMER | 230 | 24085 | LUGO | 230 | 2 | line_169 | ivsg_hs_alt3bd1 | 478 | 525.6 | 2.2 | 1300.7 | 525.6 | 1.084 | 0.644 | line KRAMER to LUGO 230 ck 1 |
| 24701 | KRAMER | 230 | 24085 | LUGO | 230 | 1 | line_170 | ivsg_hs_alt3bd1 | 478 | 525.6 | 2.2 | 1300.7 | 525.6 | 1.084 | 0.644 | line KRAMER to LUGO 230 ck 2 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | line_68 | ivsg_hs_alt3bd1 | 392 | 419.9 | 38.4 | 1101.4 | 421.7 | 1.08 | 1.01 | line NORTHSD to NEWSF500 500 ck 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_028 | ivsg_hs_alt3bd1 | 392 | 419.3 | 42.3 | 1079.6 | 421.4 | 1.08 | 1.01 | MIGUEL - SYCAMORE 1 230kV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_032 | ivsg_hs_alt3bd1 | 392 | 419.9 | 48.7 | 1106.8 | 422.7 | 1.08 | 1.01 | OTAYMESA - MLMS3TAP 1 230kV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_034 | ivsg_hs_alt3bd1 | 392 | 419.9 | 49.2 | 1107.5 | 422.7 | 1.08 | 1.01 | OLD TOWN - MLMS3TAP 1 230kV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | MS60 | ivsg_hs_alt3bd1 | 392 | 415 | 48.8 | 1070.9 | 417.9 | 1.07 | 1.01 | tran MISSION 230 to MISSION 138 ck 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | MS61 | ivsg_hs_alt3bd1 | 392 | 415 | 48.8 | 1070.9 | 417.9 | 1.07 | 1.01 | tran MISSION 230 to MISSION 138 ck 2 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | ML70 | ivsg_hs_alt3bd1 | 204.1 | 215.7 | 4.8 | 912.4 | 215.7 | 1.069 | 0.984 | tran MIGUEL 69 to MIGUEL 230 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | ML71 | ivsg_hs_alt3bd1 | 204.1 | 215.7 | 4.8 | 912.4 | 215.7 | 1.069 | 0.984 | tran MIGUEL 69 to MIGUEL 230 ck 2 |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | line_12 | ivsg_hs_alt3bd1 | 132 | 140 | -9.6 | 882.7 | 140.3 | 1.066 | 0.947 | line COACHELA to RAMON 230 ck 2 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_007 | ivsg_hs_alt3bd1 | 204.1 | 214.3 | 3.9 | 907.3 | 214.3 | 1.063 | 0.984 | PENSQTOS - ENCINA 1 230kV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_022 | ivsg_hs_alt3bd1 | 392 | 414.1 | 34.9 | 1077.3 | 415.6 | 1.06 | 1.01 | OTAYMESA - TJI-230 1 230kV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | OT70 | ivsg_hs_alt3bd1 | 392 | 411.1 | 47.2 | 1061.9 | 413.8 | 1.06 | 1.01 | tran OLD TOWN 69 to OLD TOWN 230 ck 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | OT71 | ivsg_hs_alt3bd1 | 392 | 411.1 | 47.2 | 1061.9 | 413.8 | 1.06 | 1.01 | tran OLD TOWN 69 to OLD TOWN 230 ck 2 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_169 | ivsg_hs_alt3bd1 | 56 | 58 | -9.9 | 292.8 | 58.9 | 1.06 | 0.92 | line KRAMER to LUGO 230 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_170 | ivsg_hs_alt3bd1 | 56 | 58 | -9.9 | 292.8 | 58.9 | 1.06 | 0.92 | line KRAMER to LUGO 230 ck 2 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22609 | OTAYMESA | 230 | 20149 | TJI-230 | 230 | 1 | B2_002 | ivsg_hs_alt3bd1 | 796.7 | -810 | 27.8 | 2114.7 | 810.4 | 1.057 | 0.572 | IMPRLVLY - MIGUEL 1 500kV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | B2_032 | ivsg_hs_alt3bd1 | 392 | 411 | -0.5 | 1071.6 | 411 | 1.05 | 0.8 | OTAYMESA - MLMS3TAP 1 230kV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | B2_034 | ivsg_hs_alt3bd1 | 392 | 411.1 | 0.1 | 1072.2 | 411.1 | 1.05 | 0.8 | OLD TOWN - MLMS3TAP 1 230kV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | SX70 | ivsg_hs_alt3bd1 | 392 | 408.3 | 49.5 | 1057.2 | 411.3 | 1.05 | 1.01 | tran SYCAMORE 230 to SYCAMORE 69 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_015 | ivsg_hs_alt3bd1 | 204.1 | 212.6 | -1.6 | 895.5 | 212.6 | 1.049 | 0.984 | MIGUEL - MISSION 1 230kV |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | ML70 | ivsg_hs_alt3bd1 | 408.3 | -423.3 | -2.6 | 1791.9 | 423.3 | 1.049 | 0.957 | tran MIGUEL 69 to MIGUEL 230 ck 1 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | ML71 | ivsg_hs_alt3bd1 | 408.3 | -423.3 | -2.6 | 1791.9 | 423.3 | 1.049 | 0.957 | tran MIGUEL 69 to MIGUEL 230 ck 2 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | B2_015 | ivsg_hs_alt3bd1 | 408.3 | -425.2 | 2.3 | 1789.1 | 425.2 | 1.047 | 0.957 | MIGUEL - MISSION 1 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_020 | ivsg_hs_alt3bd1 | 204.1 | 212.1 | -2.1 | 893.6 | 212.1 | 1.047 | 0.984 | MIGUEL - MISSION 2 230kV |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | B2_032 | ivsg_hs_alt3bd1 | 408.3 | -414.6 | 1.5 | 1786.6 | 414.6 | 1.046 | 0.957 | OTAYMESA - MLMS3TAP 1 230kV |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | B2_034 | ivsg_hs_alt3bd1 | 408.3 | -414.5 | 1.1 | 1787.6 | 414.5 | 1.046 | 0.957 | OLD TOWN - MLMS3TAP 1 230kV |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | SX60 | ivsg_hs_alt3bd1 | 408.3 | -422.3 | 3.5 | 1784.5 | 422.3 | 1.045 | 0.957 | tran SYCAMORE 230 to SYCAMORE 138 ck 1 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | B2_020 | ivsg_hs_alt3bd1 | 408.3 | -423.9 | 3.6 | 1784.1 | 423.9 | 1.044 | 0.957 | MIGUEL - MISSION 2 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | MS70 | ivsg_hs_alt3bd1 | 204.1 | 210.4 | 5.6 | 889.6 | 210.5 | 1.042 | 0.984 | tran MISSION 230 to MISSION 69 ck 1 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | line_68 | ivsg_hs_alt3bd1 | 408.3 | -414.7 | 11.4 | 1777.8 | 414.8 | 1.041 | 0.957 | line NORTHSD to NEWSF500 500 ck 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_021 | ivsg_hs_alt3bd1 | 392 | 407.1 | 36.3 | 1054.9 | 408.7 | 1.04 | 1.01 | IMPRLVLY - ROA-230 1 230kV |
| 24114 | PARDEE | 230 | 24200 | SAUG TAP | 230 | 2 | line_117 | ivsg_hs_alt3bd1 | 494 | 501.7 | 27.5 | 1278.1 | 502.5 | 1.031 | 0.511 | line PARDEE to SAUG TAP 230 ck 1 |
| 24114 | PARDEE | 230 | 24200 | SAUG TAP | 230 | 1 | line_118 | ivsg_hs_alt3bd1 | 494 | 501.7 | 27.4 | 1278 | 502.5 | 1.031 | 0.519 | line PARDEE to SAUG TAP 230 ck 2 |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_192 | ivsg_hs_alt3bd1 | 169 | 172 | 41.2 | 622.2 | 176.9 | 1.031 | 0.81 | line IRON MTN to CAMINO 230 ck 1 |
| 20238 | HRD-230 | 230 | 20118 | ROA-230 | 230 | 1 | B2_002 | ivsg_hs_alt3bd1 | 388 | -368.7 | 79.5 | 996 | 377.2 | 1.024 | 0.481 | IMPRLVLY - MIGUEL 1 500kV |
| 8601 | GEOSUB2 | 230 | 8300 | BANIS230 | 230 | 1 | line_22 | ivsg_hs_alt3bd1 | 550 | 568.7 | 60.4 | 1409.8 | 571.9 | 1.022 | 0.751 | line GEOSUB1 to BANIS230 230 ck 1 |
| 8601 | GEOSUB2 | 230 | 8300 | BANIS230 | 230 | 1 | line_23 | ivsg_hs_alt3bd1 | 550 | 568.7 | 60.4 | 1409.8 | 571.9 | 1.022 | 0.751 | line GEOSUB1 to BANIS230 230 ck 2 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | B2_028 | ivsg_hs_alt3bd1 | 408.3 | -414.2 | 5.5 | 1742.7 | 414.3 | 1.02 | 0.957 | MIGUEL - SYCAMORE 1 230kV |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | B2_022 | ivsg_hs_alt3bd1 | 408.3 | -409.1 | 12.7 | 1738.9 | 409.3 | 1.018 | 0.957 | OTAYMESA - TJI-230 1 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | ML80 | ivsg_hs_alt3bd1 | 204.1 | 205.2 | 0.8 | 868.1 | 205.2 | 1.017 | 0.984 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | ML81 | ivsg_hs_alt3bd1 | 204.1 | 204.7 | 0.6 | 865.5 | 204.7 | 1.014 | 0.984 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | MS60 | ivsg_hs_alt3bd1 | 408.3 | -410 | -1.8 | 1728.6 | 410 | 1.012 | 0.957 | tran MISSION 230 to MISSION 138 ck 1 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | MS61 | ivsg_hs_alt3bd1 | 408.3 | -410 | -1.8 | 1728.6 | 410 | 1.012 | 0.957 | tran MISSION 230 to MISSION 138 ck 2 |
| 24303 | BIG CRK3 | 230 | 24235 | RECTOR | 230 | 1 | line_155 | ivsg_hs_alt3bd1 | 353 | 361.1 | 50 | 895 | 364.5 | 1.01 | 0.729 | line BIG CRK1 to RECTOR 230 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_201 | ivsg_hs_alt3bd1 | 56 | 54.7 | -10.6 | 276.7 | 55.7 | 1.01 | 0.92 | line SYLMAR3 to SYLMAR S 230 ck 1 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | OT70 | ivsg_hs_alt3bd1 | 408.3 | -406.2 | -1 | 1714.1 | 406.2 | 1.003 | 0.957 | tran OLD TOWN 69 to OLD TOWN 230 ck 1 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | OT71 | ivsg_hs_alt3bd1 | 408.3 | -406.2 | -1 | 1714.1 | 406.2 | 1.003 | 0.957 | tran OLD TOWN 69 to OLD TOWN 230 ck 2 |
| 24301 | BIG CRK1 | 230 | 24235 | RECTOR | 230 | 1 | line_160 | ivsg_hs_alt3bd1 | 329 | 334.9 | 48 | 826.5 | 338.4 | 1.001 | 0.727 | line BIG CRK3 to RECTOR 230 ck 1 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | SO2 | ivsg_hs_alt3bd1 | 408.3 | -401 | 5.6 | 1707.7 | 401 | 1 | 0.957 | gen S.ONOFR2 22.00 |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | B2_002 | ivsg_hs_alt3bd1 | 132 | 129.3 | -9.9 | 827.2 | 129.7 | 0.999 | 0.947 | IMPRLVLY - MIGUEL 1 500kV |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | SX70 | ivsg_hs_alt3bd1 | 408.3 | -403.5 | -3.7 | 1706.4 | 403.5 | 0.999 | 0.957 | tran SYCAMORE 230 to SYCAMORE 69 ck 1 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | B2_021 | ivsg_hs_alt3bd1 | 408.3 | -402.2 | 9.3 | 1702.8 | 402.3 | 0.997 | 0.957 | IMPRLVLY - ROA-230 1 230kV |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | line_7 | ivsg_hs_alt3bd1 | 132 | 128.9 | -11.3 | 822 | 129.4 | 0.992 | 0.947 | line BANIS230 to NEWSF230 230 ck 1 |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | line_52 | ivsg_hs_alt3bd1 | 132 | 130.8 | -12.2 | 822 | 131.4 | 0.992 | 0.947 | line AVE58230 to AV58TP22 230 ck 1 |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | line_53 | ivsg_hs_alt3bd1 | 132 | 130.9 | -11.9 | 821.6 | 131.4 | 0.992 | 0.947 | line AV58TP22 to COACHELA 230 ck 1 |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | tran_74 | ivsg_hs_alt3bd1 | 132 | 129 | -11.3 | 821.5 | 129.5 | 0.992 | 0.947 | tran NEWSF230 230 to NEWSF500 500 ck 1 |
| 22832 | SYCAMORE | 230 | 22467 | MLSXTAP | 230 | 1 | B2_032 | ivsg_hs_alt3bd1 | 796.7 | -758.1 | 64.9 | 1983.9 | 760.9 | 0.992 | 0.462 | OTAYMESA - MLMS3TAP 1 230kV |
| 22832 | SYCAMORE | 230 | 22467 | MLSXTAP | 230 | 1 | B2_034 | ivsg_hs_alt3bd1 | 796.7 | -758.2 | 63.7 | 1984.7 | 760.9 | 0.992 | 0.462 | OLD TOWN - MLMS3TAP 1 230kV |
| 24086 | LUGO | 500 | 24097 | MOHAVE | 500 | 1 | line_103 | ivsg_hs_alt3bd1 | 1386 | -1427.4 | 91.7 | 1570.4 | 1430.3 | 0.991 | 0.7 | line MOHAVE to ELDORDO 500 ck 1 |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_191 | ivsg_hs_alt3bd1 | 169 | 165.4 | 38.6 | 597.3 | 169.8 | 0.99 | 0.81 | line EAGLEMTN to IRON MTN 230 ck 1 |
| 22260 | ESCNDIDO | 230 | 22001 | NORTHSD | 230 | 1A | B2_002 | ivsg_hs_alt3bd1 | 456 | -430.9 | 41.6 | 1132.1 | 432.9 | 0.989 | 0.46 | IMPRLVLY - MIGUEL 1 500kV |
| 22260 | ESCNDIDO | 230 | 22001 | NORTHSD | 230 | 2A | B2_002 | ivsg_hs_alt3bd1 | 456 | -430.9 | 41.6 | 1132.1 | 432.9 | 0.989 | 0.46 | IMPRLVLY - MIGUEL 1 500kV |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | line_207 | ivsg_hs_alt3bd1 | 408.3 | -398 | 7 | 1687.7 | 398.1 | 0.988 | 0.957 | line DEVERS to VALLEYSC 500 ck 1 |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | line_68 | ivsg_hs_alt3bd1 | 132 | 128.5 | -10.6 | 817.3 | 128.9 | 0.987 | 0.947 | line NORTHSD to NEWSF500 500 ck 1 |
| 8600 | GEOSUB1 | 230 | 8300 | BANIS230 | 230 | 1 | line_47 | ivsg_hs_alt3bd1 | 550 | 546.8 | 57.5 | 1355.9 | 549.8 | 0.982 | 0.697 | line GEOSUB2 to BANIS230 230 ck 1 |
| 8600 | GEOSUB1 | 230 | 8300 | BANIS230 | 230 | 2 | line_47 | ivsg_hs_alt3bd1 | 550 | 546.8 | 57.5 | 1355.9 | 549.8 | 0.982 | 0.697 | line GEOSUB2 to BANIS230 230 ck 1 |
| 20238 | HRD-230 | 230 | 20102 | RUM-230 | 230 | 1 | B2_002 | ivsg_hs_alt3bd1 | 388 | -349.9 | 76 | 945.3 | 358 | 0.974 | 0.436 | IMPRLVLY - MIGUEL 1 500kV |
| 19020 | BLYTHE | 161 | 24017 | BLYTHESC | 161 | 1 | line_192 | ivsg_hs_alt3bd1 | 244 | 238.5 | 41.5 | 851.4 | 242.1 | 0.973 | 0.824 | line IRON MTN to CAMINO 230 ck 1 |
| 8600 | GEOSUB1 | 230 | 8300 | BANIS230 | 230 | 2 | line_22 | ivsg_hs_alt3bd1 | 550 | 541.4 | 58.2 | 1341.8 | 544.5 | 0.972 | 0.697 | line GEOSUB1 to BANIS230 230 ck 1 |
| 8600 | GEOSUB1 | 230 | 8300 | BANIS230 | 230 | 1 | line_23 | ivsg_hs_alt3bd1 | 550 | 541.4 | 58.2 | 1341.8 | 544.5 | 0.972 | 0.697 | line GEOSUB1 to BANIS230 230 ck 2 |
| 22504 | MISSION | 230 | 22500 | MISSION | 138 | 1 | ML60 | ivsg_hs_alt3bd1 | 392 | 370.4 | 82.6 | 986.7 | 379.5 | 0.97 | 0.78 | tran MIGUEL 230 to MIGUEL 138 ck 1 |
| 22504 | MISSION | 230 | 22500 | MISSION | 138 | 2 | ML60 | ivsg_hs_alt3bd1 | 392 | 370.4 | 82.6 | 986.7 | 379.5 | 0.97 | 0.78 | tran MIGUEL 230 to MIGUEL 138 ck 1 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | SX70 | ivsg_hs_alt3bd1 | 392 | 380 | 21.7 | 967.7 | 380.6 | 0.97 | 0.8 | tran SYCAMORE 230 to SYCAMORE 69 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_123 | ivsg_hs_alt3bd1 | 56 | 52.6 | -10.6 | 266.5 | 53.7 | 0.97 | 0.92 | line PASTORIA to PSTRIA 230 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_200 | ivsg_hs_alt3bd1 | 56 | 52.7 | -10.7 | 266.6 | 53.7 | 0.97 | 0.92 | line SYLMAR1 to SYLMAR S 230 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | tran_210 | ivsg_hs_alt3bd1 | 56 | 52.5 | -10.4 | 265.5 | 53.6 | 0.97 | 0.92 | tran LUGO 500 to LUGO 230 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | tran_211 | ivsg_hs_alt3bd1 | 56 | 52.6 | -10.4 | 265.7 | 53.6 | 0.97 | 0.92 | tran LUGO 500 to LUGO 230 ck 2 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22596 | OLD TOWN | 230 | 22466 | MLMS3TAP | 230 | 1 | B2_031 | ivsg_hs_alt3bd1 | 912 | -852 | 83.4 | 2215.2 | 856.1 | 0.968 | 0.669 | SYCAMORE - MLSXTAP 1 230kV |
| 22596 | OLD TOWN | 230 | 22466 | MLMS3TAP | 230 | 1 | B2_029 | ivsg_hs_alt3bd1 | 912 | -851.9 | 85.2 | 2214 | 856.1 | 0.967 | 0.669 | OTAYMESA - MLSXTAP 1 230kV |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_047 | ivsg_hs_alt3bd1 | 2400 | -2413.4 | -35.2 | 2664.3 | 2413.7 | 0.961 | 0.765 | line ELDORDO to LUGO 500 ck 1 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_079 | ivsg_hs_alt3bd1 | 2400 | -2403.4 | -18.6 | 2662 | 2403.4 | 0.961 | 0.765 | line LUGO to MOHAVE 500 ck 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_001 | ivsg_hs_alt3bd1 | 392 | 375.6 | 39.7 | 958 | 377.7 | 0.96 | 1.01 | HASSYAMP - N.GILA 1 500kV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | ML81 | ivsg_hs_alt3bd1 | 392 | 373.5 | 33.3 | 968.7 | 375 | 0.96 | 1.01 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 22504 | MISSION | 230 | 22500 | MISSION | 138 | 1 | MS70 | ivsg_hs_alt3bd1 | 392 | 360 | 103.7 | 964.8 | 374.7 | 0.96 | 0.78 | tran MISSION 230 to MISSION 69 ck 1 |
| 22504 | MISSION | 230 | 22500 | MISSION | 138 | 2 | MS70 | ivsg_hs_alt3bd1 | 392 | 360 | 103.7 | 964.8 | 374.7 | 0.96 | 0.78 | tran MISSION 230 to MISSION 69 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_086 | ivsg_hs_alt3bd1 | 56 | 52 | -10.7 | 263.5 | 53.1 | 0.96 | 0.92 | line MAGUNDEN to OMAR 230 ck 1 |
| 24807 | MIRAGE | 115 | 24819 | CONCHO | 115 | 1 | tran_238 | ivsg_hs_alt3bd1 | 183 | 164.2 | -4.9 | 878.5 | 164.3 | 0.956 | 0.868 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_003 | ivsg_hs_alt3bd1 | 392 | 371.7 | 36.8 | 954.1 | 373.5 | 0.95 | 1.01 | N.GILA - IMPRLVLY 1 500kV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | ML80 | ivsg_hs_alt3bd1 | 392 | 371.4 | 32.8 | 964.2 | 372.8 | 0.95 | 1.01 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 22001 | NORTHSD | 230 | 22000 | NORTHSD | 500 | 1 | SO2 | ivsg_hs_alt3bd1 | 1120 | -1059.4 | -20 | 2638.3 | 1059.6 | 0.95 | 0.7 | gen S.ONOFR2 22.00 |
| 19020 | BLYTHE | 161 | 24017 | BLYTHESC | 161 | 1 | line_191 | ivsg_hs_alt3bd1 | 244 | 231.9 | 38.9 | 826.8 | 235.1 | 0.945 | 0.824 | line EAGLEMTN to IRON MTN 230 ck 1 |
| 24042 | ELDORDO | 500 | 24086 | LUGO | 500 | 1 | line_085 | ivsg_hs_alt3bd1 | 1386 | 1394.6 | 234.9 | 1504.1 | 1414.2 | 0.944 | 0.639 | line LUGO to VICTORVL 500 ck 1 |
| 24807 | MIRAGE | 115 | 24816 | SANTA RO | 115 | 1 | tran_238 | ivsg_hs_alt3bd1 | 183.3 | 162.1 | -10.3 | 868.7 | 162.4 | 0.944 | 0.859 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 22596 | OLD TOWN | 230 | 22466 | MLMS3TAP | 230 | 1 | B2_002 | ivsg_hs_alt3bd1 | 912 | -778 | 10.5 | 2153.1 | 778.1 | 0.94 | 0.669 | IMPRLVLY - MIGUEL 1 500kV |
| 22504 | MISSION | 230 | 22500 | MISSION | 138 | 1 | SX60 | ivsg_hs_alt3bd1 | 392 | 360.9 | 75 | 953.5 | 368.6 | 0.94 | 0.78 | tran SYCAMORE 230 to SYCAMORE 138 ck 1 |
| 22504 | MISSION | 230 | 22500 | MISSION | 138 | 2 | SX60 | ivsg_hs_alt3bd1 | 392 | 360.9 | 75 | 953.5 | 368.6 | 0.94 | 0.78 | tran SYCAMORE 230 to SYCAMORE 138 ck 1 |
| 22116 | CARLTHTP | 138 | 22734 | SANTEE | 138 | 1 | B2_002 | ivsg_hs_alt3bd1 | 273 | 232.8 | 15.5 | 1072.9 | 233.3 | 0.939 | 0.709 | IMPRLVLY - MIGUEL 1 500kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_022 | ivsg_hs_alt3bd1 | 204.1 | 189.7 | 4.7 | 801.1 | 189.8 | 0.938 | 0.984 | OTAYMESA - TJI-230 1 230kV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | ML60 | ivsg_hs_alt3bd1 | 392 | 364.6 | 7.8 | 935 | 364.7 | 0.93 | 0.8 | tran MIGUEL 230 to MIGUEL 138 ck 1 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 2 | line_136 | ivsg_hs_alt3bd1 | 1195 | 1081.4 | -37 | 2785.3 | 1082.1 | 0.929 | 0.559 | line SERRANO to VILLA PK 230 ck 1 |
| 24303 | BIG CRK3 | 230 | 24235 | RECTOR | 230 | 1 | line_139 | ivsg_hs_alt3bd1 | 353 | 335.6 | 45.3 | 822.7 | 338.7 | 0.929 | 0.729 | line SPRINGVL to BIG CRK4 230 ck 1 |
| 15230 | RUDD | 230 | 15218 | WHITETNK | 230 | 1 | PV1 | ivsg_hs_alt3bd1 | 725 | 673.2 | -13.1 | 1679.4 | 673.3 | 0.923 | 0.953 | gen PALOVRD1 24.00 |
| 24614 | TAP601 | 115 | 24702 | KRAMER | 115 | 1 | line_169 | ivsg_hs_alt3bd1 | 217.1 | -189.9 | 69.8 | 1004 | 202.3 | 0.923 | 0.717 | line KRAMER to LUGO 230 ck 1 |
| 24614 | TAP601 | 115 | 24702 | KRAMER | 115 | 1 | line_170 | ivsg_hs_alt3bd1 | 217.1 | -189.9 | 69.8 | 1004 | 202.3 | 0.923 | 0.717 | line KRAMER to LUGO 230 ck 2 |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_63 | ivsg_hs_alt3bd1 | 169 | 155.6 | 27.6 | 555.8 | 158.1 | 0.92 | 0.81 | line RAMON to MIRAGE 230 ck 2 |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | B2_001 | ivsg_hs_alt3bd1 | 132 | 122.1 | -10.9 | 759.6 | 122.5 | 0.917 | 0.947 | HASSYAMP - N.GILA 1 500kV |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | ML81 | ivsg_hs_alt3bd1 | 408.3 | -369.4 | 5.1 | 1563.6 | 369.4 | 0.915 | 0.957 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_12 | ivsg_hs_alt3bd1 | 169 | 154.3 | 27.5 | 551.1 | 156.7 | 0.912 | 0.81 | line COACHELA to RAMON 230 ck 2 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | ML80 | ivsg_hs_alt3bd1 | 408.3 | -367.4 | 5.3 | 1556.3 | 367.4 | 0.911 | 0.957 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 24301 | BIG CRK1 | 230 | 24235 | RECTOR | 230 | 1 | line_156 | ivsg_hs_alt3bd1 | 329 | 305.6 | 4.2 | 752 | 305.6 | 0.911 | 0.727 | line BIG CRK1 to BIG CRK2 230 ck 1 |
| 24602 | VICTOR | 115 | 24702 | KRAMER | 115 | 1 | line_169 | ivsg_hs_alt3bd1 | 217.1 | -185.2 | 79.9 | 988 | 201.7 | 0.909 | 0.703 | line KRAMER to LUGO 230 ck 1 |
| 24602 | VICTOR | 115 | 24702 | KRAMER | 115 | 1 | line_170 | ivsg_hs_alt3bd1 | 217.1 | -185.2 | 79.9 | 988 | 201.7 | 0.909 | 0.703 | line KRAMER to LUGO 230 ck 2 |
| 24807 | MIRAGE | 115 | 24819 | CONCHO | 115 | 1 | line_65 | ivsg_hs_alt3bd1 | 183 | 163.9 | -7.7 | 831.1 | 164.1 | 0.905 | 0.868 | line MIRAGE to DEVERS 230 ck 2 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | B2_001 | ivsg_hs_alt3bd1 | 408.3 | -371.6 | -2.1 | 1546.3 | 371.6 | 0.905 | 0.957 | HASSYAMP - N.GILA 1 500kV |
| 24301 | BIG CRK1 | 230 | 24302 | BIG CRK2 | 230 | 1 | line_155 | ivsg_hs_alt3bd1 | 329 | 305.6 | -22.4 | 745.6 | 306.4 | 0.903 | 0.247 | line BIG CRK1 to RECTOR 230 ck 1 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | B2_003 | ivsg_hs_alt3bd1 | 408.3 | -367.7 | 0.5 | 1540 | 367.7 | 0.902 | 0.957 | N.GILA - IMPRLVLY 1 500kV |
| 19020 | BLYTHE | 161 | 24017 | BLYTHESC | 161 | 1 | line_63 | ivsg_hs_alt3bd1 | 244 | 222.1 | 27.8 | 787.1 | 223.9 | 0.9 | 0.824 | line RAMON to MIRAGE 230 ck 2 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | B2_009 | ivsg_hs_alt3bd1 | 392 | 350.9 | -2 | 893.7 | 350.9 | 0.9 | 0.8 | EPP - ESCNDIDO 1 230kV |
| 24729 | INYO | 230 | 24730 | INYO PS | 115 | 2 | tran_230 | ivsg_hs_alt3bd1 | 50 | -41.9 | 15.8 | 105.1 | 44.8 | 0.9 | 0.54 | tran INYO 230 to INYO PS 115 ck 1 |
| 24729 | INYO | 230 | 24730 | INYO PS | 115 | 1 | tran_231 | ivsg_hs_alt3bd1 | 50 | -41.9 | 15.8 | 105.1 | 44.8 | 0.9 | 0.54 | tran INYO 230 to INYO PS 115 ck 2 |
| 24805 | DEVERS | 115 | 24804 | DEVERS | 230 | 1 | tran_236 | ivsg_hs_alt3bd1 | 280 | -246.1 | 51.4 | 1269.3 | 251.4 | 0.9 | 0.6 | tran DEVERS 115 to DEVERS 230 ck 3 |

| Bus | Name | kV | Area | Zone | Outage | Case | Vbase | Vcont | DeltaV | Vmin | Vmax | Max-dv | Contingency Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22734 | SANTEE | 138 | 22 | 223 | 23021/22/23/41 | ivsg_hs_alt3bd1 | 0.982 | 0.897 | -0.085 | 0.9 | 1.05 | 0.05 | MIGUEL 230 CORRIDOR West of SN |
| 22412 | LOSCOCHS | 138 | 22 | 223 | 23021/22/23/41 | ivsg_hs_alt3bd1 | 0.98 | 0.903 | -0.078 | 0.9 | 1.05 | 0.05 | MIGUEL 230 CORRIDOR West of SN |
| 22424 | MAINST50 | 138 | 22 | 222 | 23021/22/23/41 | ivsg_hs_alt3bd1 | 0.977 | 0.923 | -0.054 | 0.9 | 1.05 | 0.05 | MIGUEL 230 CORRIDOR West of SN |
| 22428 | MAINST51 | 138 | 22 | 222 | 23021/22/23/41 | ivsg_hs_alt3bd1 | 0.977 | 0.923 | -0.054 | 0.9 | 1.05 | 0.05 | MIGUEL 230 CORRIDOR West of SN |
| 22412 | LOSCOCHS | 138 | 22 | 223 | 23021/22/23/41 | ivsg_hs_alt3bd1 | 0.98 | 0.926 | -0.054 | 0.9 | 1.05 | 0.05 | MIGUEL 230 CORRIDOR West of LC |
| 24058 | GOLETA | 230 | 24 | 240 | line_2269 | ivsg_hs_alt3bd1 | 0.983 | 0.928 | -0.055 | 0.9 | 1.05 | 0.05 | S.CLARA 230.00 - GOLETA 230.00 1, S.CLARA 230.00 - MOORPARK 230.00 1 |
| 24058 | GOLETA | 230 | 24 | 240 | line_2270 | ivsg_hs_alt3bd1 | 0.983 | 0.928 | -0.055 | 0.9 | 1.05 | 0.05 | S.CLARA 230.00 - GOLETA 230.00 2, S.CLARA 230.00 - MOORPARK 230.00 2 |
| 22772 | SOUTHBAY | 138 | 22 | 222 | 23021/22/23/41 | ivsg_hs_alt3bd1 | 0.985 | 0.931 | -0.054 | 0.9 | 1.05 | 0.05 | MIGUEL 230 CORRIDOR West of SN |
| 22852 | TELECYN | 138 | 22 | 222 | 23021/22/23/41 | ivsg_hs_alt3bd1 | 0.995 | 0.94 | -0.055 | 0.9 | 1.05 | 0.05 | MIGUEL 230 CORRIDOR West of SN |
| 22672 | PRCTRVLY | 138 | 22 | 222 | 23021/22/23/41 | ivsg_hs_alt3bd1 | 0.998 | 0.945 | -0.053 | 0.9 | 1.05 | 0.05 | MIGUEL 230 CORRIDOR West of SN |
| 22460 | MIGUEL | 138 | 22 | 222 | 23021/22/23/41 | ivsg_hs_alt3bd1 | 1 | 0.949 | -0.051 | 0.9 | 1.05 | 0.05 | MIGUEL 230 CORRIDOR West of SN |
| 24819 | CONCHO | 115 | 24 | 248 | line_2182 | ivsg_hs_alt3bd1 | 1.025 | 0.974 | -0.051 | 0.9 | 1.05 | 0.05 | DEVERS 230.00 - MIRAGE 230.00 2, COACHELV 230.00 - DEVERS 230.00 2 |
| 24822 | INDIAN W | 115 | 24 | 248 | line_2182 | ivsg_hs_alt3bd1 | 1.024 | 0.974 | -0.051 | 0.9 | 1.05 | 0.05 | DEVERS 230.00 - MIRAGE 230.00 2, COACHELV 230.00 - DEVERS 230.00 2 |
| 24816 | SANTA RO | 115 | 24 | 248 | line_2182 | ivsg_hs_alt3bd1 | 1.029 | 0.978 | -0.05 | 0.9 | 1.05 | 0.05 | DEVERS 230.00 - MIRAGE 230.00 2, COACHELV 230.00 - DEVERS 230.00 2 |
| 24821 | TAMARISK | 115 | 24 | 248 | line_2182 | ivsg_hs_alt3bd1 | 1.028 | 0.978 | -0.05 | 0.9 | 1.05 | 0.05 | DEVERS 230.00 - MIRAGE 230.00 2, COACHELV 230.00 - DEVERS 230.00 2 |
| 24015 | ARCO SC | 230 | 24 | 240 | line_2013 | ivsg_hs_alt3bd1 | 0.986 | 1.036 | 0.05 | 0.9 | 1.05 | 0.05 | ARCO SC 230.00 - HINSON 230.00 1, ARCO SC 230.00 - HINSON 230.00 2 |
| 24061 | HARBOR | 230 | 24 | 240 | line_2039 | ivsg_hs_alt3bd1 | 0.986 | 1.036 | 0.051 | 0.9 | 1.05 | 0.05 | HARBOR 230.00 - HINSON 230.00 1, LBEACH 230.00 - LITEHIPE 230.00 1 |
| 24077 | LBEACH | 230 | 24 | 240 | line_2039 | ivsg_hs_alt3bd1 | 0.986 | 1.036 | 0.05 | 0.9 | 1.05 | 0.05 | HARBOR 230.00 - HINSON 230.00 1, LBEACH 230.00 - LITEHIPE 230.00 1 |
| 24061 | HARBOR | 230 | 24 | 240 | line_2041 | ivsg_hs_alt3bd1 | 0.986 | 1.036 | 0.051 | 0.9 | 1.05 | 0.05 | HARBOR 230.00 - HINSON 230.00 1, HARBOR 230.00 - LBEACH 230.00 1 |
| 24061 | HARBOR | 230 | 24 | 240 | line_2253 | ivsg_hs_alt3bd1 | 0.986 | 1.036 | 0.051 | 0.9 | 1.05 | 0.05 | HARBOR 230.00 - HINSON 230.00 1, HARBOR 230.00 - LBEACH 230.00 1 |
| 25001 | GOODRICH | 230 | 24 | 250 | line_2073 | ivsg_hs_alt3bd1 | 0.958 | 1.044 | 0.086 | 0.9 | 1.05 | 0.05 | GOODRICH 230.00 - GOULD 230.00 1, GOODRICH 230.00 - LAGUBELL 230.00 1 |
| 24058 | GOLETA | 230 | 24 | 240 | line_2120 | ivsg_hs_alt3bd1 | 0.983 | 1.044 | 0.061 | 0.9 | 1.05 | 0.05 | S.CLARA 230.00 - GOLETA 230.00 1, S.CLARA 230.00 - GOLETA 230.00 2 |

ivsg_hs_alt3bd1.sav
FLOW Summary
N-2 Outages

| LEGEND | % of RATING 1 | |
|---|---|---|
| C_pu | 100% - 110% | |
| C_pu | 110% - 120% | P.U. of |
| C_pu | > 120% | Rate 1 |

| FROM | FR | BKV | TO | TO | BKV | CK | Outage_Name | Case | Rate-Mva | Pflow | Qflow | Amps | MVA | C_pu | B_pu | Contingency_Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt3bd1 | 392 | 614 | 117.6 | 1651.2 | 625.2 | 1.59 | 1.01 | MIGUEL 230 CORRIDOR West of SN |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt3bd1 | 392 | 607.8 | 108.6 | 1614.6 | 617.4 | 1.58 | 1.01 | MIGUEL 230 CORRIDOR West of LC |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt3bd1 | 408.3 | -602.2 | -5.6 | 2665.2 | 602.2 | 1.56 | 0.957 | MIGUEL 230 CORRIDOR West of SN |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt3bd1 | 408.3 | -596.5 | -1.6 | 2606.2 | 596.5 | 1.526 | 0.957 | MIGUEL 230 CORRIDOR West of LC |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt3bd1 | 392 | 576.1 | 104.7 | 1524.4 | 585.5 | 1.49 | 1.01 | MIGUEL 230 CORRIDOR North of ML |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt3bd1 | 408.3 | -566 | -9.3 | 2460.5 | 566.1 | 1.44 | 0.957 | MIGUEL 230 CORRIDOR North of ML |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt3bd1 | 382.4 | 511.6 | 4.8 | 2277 | 511.7 | 1.423 | 0.794 | MIGUEL 230 CORRIDOR West of SN |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt3bd1 | 382.4 | 506.1 | 3 | 2222.5 | 506.1 | 1.389 | 0.794 | MIGUEL 230 CORRIDOR West of LC |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt3bd1 | 382.4 | 476 | 14.2 | 2081.3 | 476.2 | 1.301 | 0.794 | MIGUEL 230 CORRIDOR North of ML |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23022/23023 | ivsg_hs_alt3bd1 | 392 | 501 | 65.9 | 1295.4 | 505.3 | 1.29 | 1.01 | ML-MS1+ ML-MS2 230KV |
| 22672 | PRCTRVLY | 138 | 22852 | TELECYN | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt3bd1 | 478 | 571.3 | 1.7 | 2528.5 | 571.3 | 1.264 | 0.752 | MIGUEL 230 CORRIDOR West of SN |
| 22672 | PRCTRVLY | 138 | 22852 | TELECYN | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt3bd1 | 478 | 565.6 | -2.3 | 2471.4 | 565.6 | 1.236 | 0.752 | MIGUEL 230 CORRIDOR West of LC |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23022/23023 | ivsg_hs_alt3bd1 | 408.3 | -493.7 | 3 | 2091 | 493.7 | 1.224 | 0.957 | ML-MS1+ ML-MS2 230KV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 13821C/25/23051A | ivsg_hs_alt3bd1 | 204.1 | 240.6 | -21.3 | 1028.1 | 241.6 | 1.204 | 0.984 | CH-ES-NCM-SX |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 2 | line_2046 | ivsg_hs_alt3bd1 | 956 | -1131.7 | -37.1 | 2877.5 | 1132.3 | 1.199 | 0.596 | LA FRESA 230.00 - REDONDO 230.00 1, REDONDO 230.00 - LITEHIPE 230.00 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 1 | line_2047 | ivsg_hs_alt3bd1 | 956 | -1131.7 | -37.1 | 2877.5 | 1132.3 | 1.199 | 0.596 | LA FRESA 230.00 - REDONDO 230.00 2, REDONDO 230.00 - LITEHIPE 230.00 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23022/23023 | ivsg_hs_alt3bd1 | 204.1 | 237.1 | -2.6 | 1002.6 | 237.1 | 1.174 | 0.984 | ML-MS1+ ML-MS2 230KV |
| 22672 | PRCTRVLY | 138 | 22852 | TELECYN | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt3bd1 | 478 | 535.1 | 5.4 | 2326.2 | 535.1 | 1.163 | 0.752 | MIGUEL 230 CORRIDOR North of ML |
| 24086 | LUGO | 500 | 24236 | RANCHVST | 500 | 1 | line_2194 | ivsg_hs_alt3bd1 | 2598 | 3108.7 | 506.1 | 3463.9 | 3149.6 | 1.156 | 0.644 | LUGO 500.00 - MIRALOMA 500.00 2, LUGO 500.00 - MIRALOMA 500.00 3 |
| 30060 | MIDWAY | 500 | 24156 | VINCENT | 500 | 3 | line_2215 | ivsg_hs_alt3bd1 | 1848.1 | 2239.2 | 114.2 | 2429.2 | 2242.1 | 1.141 | 0.447 | MIDWAY 500.00 - VINCENT 500.00 1, MIDWAY 500.00 - VINCENT 500.00 2 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 2 | line_2064 | ivsg_hs_alt3bd1 | 956 | -1071.9 | -43.9 | 2725.3 | 1072.8 | 1.136 | 0.596 | LA FRESA 230.00 - REDONDO 230.00 1, MESA CAL 230.00 - REDONDO 230.00 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 1 | line_2065 | ivsg_hs_alt3bd1 | 956 | -1071.9 | -43.9 | 2725.3 | 1072.8 | 1.136 | 0.596 | LA FRESA 230.00 - REDONDO 230.00 2, MESA CAL 230.00 - REDONDO 230.00 1 |
| 30060 | MIDWAY | 500 | 24156 | VINCENT | 500 | 1 | line_2220 | ivsg_hs_alt3bd1 | 1848.1 | 2215.9 | 121.8 | 2404.8 | 2219.3 | 1.131 | 0.357 | MIDWAY 500.00 - VINCENT 500.00 2, MIDWAY 500.00 - VINCENT 500.00 3 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 2 | line_2029 | ivsg_hs_alt3bd1 | 1195 | 1308.2 | -39.6 | 3372.4 | 1308.8 | 1.124 | 0.559 | LEWIS 230.00 - SERRANO 230.00 1, SERRANO 230.00 - VILLA PK 230.00 1 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 2 | line_2031 | ivsg_hs_alt3bd1 | 1195 | 1308.2 | -39.6 | 3372.4 | 1308.8 | 1.124 | 0.559 | LEWIS 230.00 - SERRANO 230.00 2, SERRANO 230.00 - VILLA PK 230.00 1 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 2 | line_2278 | ivsg_hs_alt3bd1 | 1195 | 1308.2 | -39.6 | 3372.4 | 1308.8 | 1.124 | 0.559 | LEWIS 230.00 - SERRANO 230.00 1, SERRANO 230.00 - VILLA PK 230.00 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23012/13807 | ivsg_hs_alt3bd1 | 204.1 | 224.7 | 10.9 | 955.7 | 225 | 1.119 | 0.984 | PQ-EA 230KV + EA-NCW 138KV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23021/23041 | ivsg_hs_alt3bd1 | 392 | 431.1 | 47.5 | 1123.3 | 433.7 | 1.11 | 1.01 | ML-SX + OM-SX 230KV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 13821B/638 | ivsg_hs_alt3bd1 | 392 | 431.6 | 54 | 1121.4 | 435 | 1.11 | 1.01 | CH-SX-SN 138KV + SAN VCNT-EL 69KV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23002/06/10 | ivsg_hs_alt3bd1 | 204.1 | 219.5 | 9.8 | 948.1 | 219.7 | 1.11 | 0.984 | SANLUISREY 230 CORRIDOR |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23011/13825 | ivsg_hs_alt3bd1 | 204.1 | 223.5 | -11.3 | 946.1 | 223.7 | 1.108 | 0.984 | ES-EA-SA 230KV + BQ-CC-ES-NCM 138KV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23051B/23011 | ivsg_hs_alt3bd1 | 204.1 | 223.4 | -4.6 | 940 | 223.4 | 1.101 | 0.984 | EPP-ES + ES-EA-SA 230KV |
| 8601 | GEOSUB2 | 230 | 8300 | BANIS230 | 230 | 1 | line_N-204 | ivsg_hs_alt3bd1 | 550 | 592 | 100.2 | 1508.7 | 600.4 | 1.094 | 0.751 | COACHELLA MIDWAY 230 CKT 1&2 |
| 22596 | OLD TOWN | 230 | 22466 | MLMS3TAP | 230 | 1 | 23021/22/23/41 | ivsg_hs_alt3bd1 | 912 | -945.2 | 86.8 | 2504.2 | 949.2 | 1.094 | 0.669 | MIGUEL 230 CORRIDOR West of SN |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23012/13808 | ivsg_hs_alt3bd1 | 204.1 | 219.8 | 9.5 | 933.5 | 220 | 1.093 | 0.984 | PQ-EA 230KV + NCW-PQ 138KV |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 2 | line_2049 | ivsg_hs_alt3bd1 | 956 | -1026.1 | -37.6 | 2612.5 | 1026.8 | 1.089 | 0.596 | LA FRESA 230.00 - REDONDO 230.00 1, LCIENEGA 230.00 - LA FRESA 230.00 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 1 | line_2050 | ivsg_hs_alt3bd1 | 956 | -1026.1 | -37.6 | 2612.5 | 1026.8 | 1.089 | 0.596 | LA FRESA 230.00 - REDONDO 230.00 2, LCIENEGA 230.00 - LA FRESA 230.00 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 2 | line_2057 | ivsg_hs_alt3bd1 | 956 | -1025.6 | -34.3 | 2610 | 1026.2 | 1.088 | 0.596 | EL NIDO 230.00 - LA FRESA 230.00 3, LA FRESA 230.00 - REDONDO 230.00 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 1 | line_2058 | ivsg_hs_alt3bd1 | 956 | -1025.6 | -34.3 | 2610 | 1026.2 | 1.088 | 0.596 | EL NIDO 230.00 - LA FRESA 230.00 3, LA FRESA 230.00 - REDONDO 230.00 2 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 2 | line_2059 | ivsg_hs_alt3bd1 | 956 | -1025.6 | -34.3 | 2610 | 1026.2 | 1.088 | 0.596 | EL NIDO 230.00 - LA FRESA 230.00 4, LA FRESA 230.00 - REDONDO 230.00 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 1 | line_2060 | ivsg_hs_alt3bd1 | 956 | -1025.6 | -34.3 | 2610 | 1026.2 | 1.088 | 0.596 | EL NIDO 230.00 - LA FRESA 230.00 4, LA FRESA 230.00 - REDONDO 230.00 2 |
| 22596 | OLD TOWN | 230 | 22466 | MLMS3TAP | 230 | 1 | 23021/22/23/41 | ivsg_hs_alt3bd1 | 912 | -943.7 | 100.8 | 2486.7 | 949.1 | 1.086 | 0.669 | MIGUEL 230 CORRIDOR North of ML |
| 24701 | KRAMER | 230 | 24085 | LUGO | 230 | 2 | line_2260 | ivsg_hs_alt3bd1 | 478 | 525.9 | 3.6 | 1302 | 525.9 | 1.085 | 0.644 | KRAMER 230.00 - LUGO 230.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 8900 | PRUETTAP | 92 | 8691 | HIGHLINE | 92 | 1 | line_N-209 | ivsg_hs_alt3bd1 | 86 | -94.4 | 6.9 | 583.6 | 94.6 | 1.082 | 0.776 | EL CENTRO HIGHLINE 230 CKTS 1&2 |
| 22596 | OLD TOWN | 230 | 22466 | MLMS3TAP | 230 | 1 | 23021/22/23/41 | ivsg_hs_alt3bd1 | 912 | -940.4 | 98.6 | 2478 | 945.6 | 1.082 | 0.669 | MIGUEL 230 CORRIDOR West of LC |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23002/06/10 | ivsg_hs_alt3bd1 | 392 | 419.2 | 47.5 | 1114.8 | 421.9 | 1.08 | 1.01 | SANLUISREY 230 CORRIDOR |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | 23022/23023 | ivsg_hs_alt3bd1 | 382.4 | 404.7 | 11.1 | 1720.7 | 404.8 | 1.076 | 0.794 | ML-MS1+ ML-MS2 230KV |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23021/23041 | ivsg_hs_alt3bd1 | 408.3 | -425.6 | 4.2 | 1813.2 | 425.7 | 1.061 | 0.957 | ML-SX + OM-SX 230KV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23004/23001 | ivsg_hs_alt3bd1 | 204.1 | 214 | 5.4 | 906 | 214 | 1.061 | 0.984 | SA-MS 1 + SA-MS 2 230KV |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_2260 | ivsg_hs_alt3bd1 | 56 | 57.8 | -9.9 | 291.9 | 58.7 | 1.06 | 0.92 | KRAMER 230.00 - LUGO 230.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 13821B/638 | ivsg_hs_alt3bd1 | 408.3 | -426.2 | -2.5 | 1810.1 | 426.2 | 1.06 | 0.957 | CH-SX-SN 138KV + SAN VCNT-EL 69KV |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_N-203 | ivsg_hs_alt3bd1 | 169 | 177.8 | 36.8 | 638.5 | 181.5 | 1.057 | 0.81 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23002/06/10 | ivsg_hs_alt3bd1 | 408.3 | -413.8 | 3.5 | 1799.4 | 413.9 | 1.053 | 0.957 | SANLUISREY 230 CORRIDOR |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23011/23003 | ivsg_hs_alt3bd1 | 204.1 | 212.3 | 0.9 | 894.5 | 212.3 | 1.047 | 0.984 | SA-EA 230KV + SA-ES-EA 230KV |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 1 | line_2030 | ivsg_hs_alt3bd1 | 1287 | 1308.2 | -39.6 | 3372.4 | 1308.8 | 1.044 | 0.519 | LEWIS 230.00 - SERRANO 230.00 1, SERRANO 230.00 - VILLA PK 230.00 2 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 1 | line_2032 | ivsg_hs_alt3bd1 | 1287 | 1308.2 | -39.6 | 3372.4 | 1308.8 | 1.044 | 0.519 | LEWIS 230.00 - SERRANO 230.00 2, SERRANO 230.00 - VILLA PK 230.00 2 |
| 8376 | RTAP2 | 92 | 8974 | RTP1 | 92 | 1 | line_N-204 | ivsg_hs_alt3bd1 | 57 | -55.9 | 11.3 | 372.2 | 57 | 1.043 | 0.632 | COACHELLA MIDWAY 230 CKT 1&2 |
| 24025 | CHINO | 230 | 24093 | MIRALOMW | 230 | 1 | line_2160 | ivsg_hs_alt3bd1 | 705 | -702.8 | 27.7 | 1814.8 | 703.4 | 1.026 | 0.264 | CHINO 230.00 - MIRALOMA 230.00 2, CHINO 230.00 - MIRALOMA 230.00 3 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23013/27/28 | ivsg_hs_alt3bd1 | 204.1 | 206.3 | 3.4 | 871.2 | 206.3 | 1.02 | 0.984 | OLD TOWN TO OLD TOWN JCT |
| 24016 | BARRE | 230 | 24044 | ELLIS | 230 | 1 | line_2115 | ivsg_hs_alt3bd1 | 988 | 969.7 | -42.6 | 2515 | 970.6 | 1.014 | 0.382 | S.ONOFRE 230.00 - SANTIAGO 230.00 1, S.ONOFRE 230.00 - SANTIAGO 230.00 2 |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_N-204 | ivsg_hs_alt3bd1 | 169 | 169.9 | 36 | 610.8 | 173.7 | 1.012 | 0.81 | COACHELLA MIDWAY 230 CKT 1&2 |
| 8900 | PRUETTAP | 92 | 8691 | HIGHLINE | 92 | 1 | line_N-204 | ivsg_hs_alt3bd1 | 86 | -87.3 | 12.8 | 545.4 | 88.2 | 1.011 | 0.776 | COACHELLA MIDWAY 230 CKT 1&2 |
| 24074 | LA FRESA | 230 | 24065 | HINSON | 230 | 1 | line_2061 | ivsg_hs_alt3bd1 | 797 | -771 | 48.3 | 2011.6 | 772.5 | 1.005 | 0.14 | LA FRESA 230.00 - REDONDO 230.00 1, LA FRESA 230.00 - REDONDO 230.00 2 |
| 8600 | GEOSUB1 | 230 | 8300 | BANIS230 | 230 | 1 | line_N-204 | ivsg_hs_alt3bd1 | 550 | 542.2 | 89.3 | 1381.9 | 549.5 | 1.002 | 0.697 | COACHELLA MIDWAY 230 CKT 1&2 |
| 8600 | GEOSUB1 | 230 | 8300 | BANIS230 | 230 | 2 | line_N-204 | ivsg_hs_alt3bd1 | 550 | 542.2 | 89.3 | 1381.9 | 549.5 | 1.002 | 0.697 | COACHELLA MIDWAY 230 CKT 1&2 |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | line_2236 | ivsg_hs_alt3bd1 | 132 | 130 | -9.7 | 828.1 | 130.4 | 1 | 0.947 | PALOVRDE 500.00 - DEVERS 500.00 1, COACHELV 230.00 - DEVERS 230.00 2 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | line_N-203 | ivsg_hs_alt3bd1 | 408.3 | -400.8 | 8.2 | 1707.4 | 400.9 | 1 | 0.957 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_N-203 | ivsg_hs_alt3bd1 | 800 | 795 | 62 | 1999.7 | 797.4 | 0.996 | 0.718 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | line_2245 | ivsg_hs_alt3bd1 | 408.3 | -399.2 | 8.3 | 1699 | 399.2 | 0.995 | 0.957 | DEVERS 500.00 - VALLEYSC 500.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23012/13807 | ivsg_hs_alt3bd1 | 408.3 | -398.5 | -3.5 | 1698 | 398.6 | 0.994 | 0.957 | PQ-EA 230KV + EA-NCW 138KV |
| 19020 | BLYTHE | 161 | 24017 | BLYTHESC | 161 | 1 | line_N-203 | ivsg_hs_alt3bd1 | 244 | 244.3 | 37.1 | 868.8 | 247.1 | 0.993 | 0.824 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 24086 | LUGO | 500 | 24097 | MOHAVE | 500 | 1 | line_2234 | ivsg_hs_alt3bd1 | 1386 | -1427.5 | 91.5 | 1570.8 | 1430.4 | 0.991 | 0.7 | MOHAVE 500.00 - ELDORDO 500.00 1, PISGAH 230.00 - ELDORDO 230.00 2 |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | line_N-204 | ivsg_hs_alt3bd1 | 132 | 126.4 | -14.1 | 820.5 | 127.2 | 0.991 | 0.947 | COACHELLA MIDWAY 230 CKT 1&2 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23012/13808 | ivsg_hs_alt3bd1 | 408.3 | -397.8 | -2.6 | 1692.1 | 397.8 | 0.991 | 0.957 | PQ-EA 230KV + NCW-PQ 138KV |
| 24126 | RIOHONDO | 230 | 24155 | VINCENT | 230 | 2 | line_2097 | ivsg_hs_alt3bd1 | 988 | -928.5 | 109 | 2450.5 | 934.9 | 0.988 | 0.721 | GOODRICH 230.00 - GOULD 230.00 1, VINCENT 230.00 - MESA CAL 230.00 1 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | line_N-204 | ivsg_hs_alt3bd1 | 408.3 | -396.1 | 8 | 1686.1 | 396.2 | 0.987 | 0.957 | COACHELLA MIDWAY 230 CKT 1&2 |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | line_2186 | ivsg_hs_alt3bd1 | 132 | 128.8 | -10.4 | 812.7 | 129.2 | 0.981 | 0.947 | COACHELV 230.00 - DEVERS 230.00 2, J.HINDS 230.00 - MIRAGE 230.00 1 |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | line_2237 | ivsg_hs_alt3bd1 | 132 | 128.1 | -10.4 | 813 | 128.5 | 0.981 | 0.947 | PALOVRDE 500.00 - DEVERS 500.00 1, J.HINDS 230.00 - MIRAGE 230.00 1 |
| 22596 | OLD TOWN | 230 | 22466 | MLMS3TAP | 230 | 1 | 23021/23041 | ivsg_hs_alt3bd1 | 912 | -860.5 | 78.2 | 2245 | 864 | 0.981 | 0.669 | ML-SX + OM-SX 230KV |
| 22672 | PRCTRVLY | 138 | 22852 | TELECYN | 138 | 1 | 23022/23023 | ivsg_hs_alt3bd1 | 478 | 462.8 | -6.9 | 1960.4 | 462.9 | 0.98 | 0.752 | ML-MS1+ ML-MS2 230KV |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2191 | ivsg_hs_alt3bd1 | 2400 | -2452.8 | -19.5 | 2708.2 | 2452.9 | 0.977 | 0.765 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - ELDORDO 230.00 2 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2100 | ivsg_hs_alt3bd1 | 2400 | -2441.9 | -190.8 | 2699.6 | 2449.4 | 0.974 | 0.765 | EAGLROCK 230.00 - MESA CAL 230.00 1, SYLMAR S 230.00 - GOULD 230.00 1 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2192 | ivsg_hs_alt3bd1 | 2400 | -2440.3 | -29.6 | 2695.4 | 2440.5 | 0.973 | 0.765 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2193 | ivsg_hs_alt3bd1 | 2400 | -2440.1 | -29.7 | 2695.1 | 2440.3 | 0.973 | 0.765 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - LUGO 230.00 2 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2200 | ivsg_hs_alt3bd1 | 2400 | -2428 | -13.3 | 2690.7 | 2428 | 0.971 | 0.765 | LUGO 500.00 - MOHAVE 500.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2201 | ivsg_hs_alt3bd1 | 2400 | -2427.7 | -13.4 | 2690.5 | 2427.8 | 0.971 | 0.765 | LUGO 500.00 - MOHAVE 500.00 1, PISGAH 230.00 - LUGO 230.00 2 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_N-210 | ivsg_hs_alt3bd1 | 800 | 774.8 | 21.8 | 1948.1 | 775.1 | 0.97 | 0.718 | EL CENTRO IMPERIAL VALLEY 230 CKTS 2&3 |
| 14008 | JOJOBA | 500 | 15011 | KYRENE | 500 | 1 | line_2245 | ivsg_hs_alt3bd1 | 1732 | 1770.2 | 141.2 | 1934.1 | 1775.8 | 0.969 | 0.934 | DEVERS 500.00 - VALLEYSC 500.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 19020 | BLYTHE | 161 | 24017 | BLYTHESC | 161 | 1 | line_N-204 | ivsg_hs_alt3bd1 | 244 | 236.4 | 36.3 | 841 | 239.2 | 0.961 | 0.824 | COACHELLA MIDWAY 230 CKT 1&2 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_2194 | ivsg_hs_alt3bd1 | 56 | 52 | -10.3 | 262.8 | 53 | 0.96 | 0.92 | LUGO 500.00 - MIRALOMA 500.00 2, LUGO 500.00 - MIRALOMA 500.00 3 |
| 24126 | RIOHONDO | 230 | 24155 | VINCENT | 230 | 2 | line_2101 | ivsg_hs_alt3bd1 | 988 | -904.6 | 110.7 | 2372.2 | 911.3 | 0.956 | 0.721 | EAGLROCK 230.00 - MESA CAL 230.00 1, VINCENT 230.00 - MESA CAL 230.00 1 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2103 | ivsg_hs_alt3bd1 | 2400 | -2399.4 | -176.6 | 2650.3 | 2405.9 | 0.956 | 0.765 | EAGLROCK 230.00 - SYLMAR S 230.00 1, SYLMAR S 230.00 - GOULD 230.00 1 |
| 24042 | ELDORDO | 500 | 24086 | LUGO | 500 | 1 | line_2258 | ivsg_hs_alt3bd1 | 1386 | 1403 | 257.3 | 1518.2 | 1426.4 | 0.955 | 0.639 | LUGO 500.00 - VINCENT 500.00 2, LUGO 500.00 - VICTORVL 500.00 1 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2096 | ivsg_hs_alt3bd1 | 2400 | -2392.5 | -198.5 | 2641.6 | 2400.8 | 0.953 | 0.765 | EAGLROCK 230.00 - MESA CAL 230.00 1, GOODRICH 230.00 - GOULD 230.00 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23027/28/13810 | ivsg_hs_alt3bd1 | 204.1 | 192.3 | 7.7 | 812.1 | 192.5 | 0.951 | 0.984 | OLD TOWN TO MISSION 1 |
| 24126 | RIOHONDO | 230 | 24155 | VINCENT | 230 | 2 | line_2100 | ivsg_hs_alt3bd1 | 988 | -882.8 | 114.5 | 2331.1 | 890.2 | 0.94 | 0.721 | EAGLROCK 230.00 - MESA CAL 230.00 1, SYLMAR S 230.00 - GOULD 230.00 1 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | 23022/23023 | ivsg_hs_alt3bd1 | 392 | 366.5 | 0.9 | 938 | 366.5 | 0.94 | 0.8 | ML-MS1+ ML-MS2 230KV |
| 22001 | NORTHSD | 230 | 22000 | NORTHSD | 500 | 1 | 23021/22/23/41 | ivsg_hs_alt3bd1 | 1120 | -1055.4 | -24.9 | 2629.2 | 1055.7 | 0.94 | 0.7 | MIGUEL 230 CORRIDOR North of ML |
| 22504 | MISSION | 230 | 22500 | MISSION | 138 | 1 | 23021/23041 | ivsg_hs_alt3bd1 | 392 | 355.6 | 71.1 | 944.7 | 362.6 | 0.93 | 0.78 | ML-SX + OM-SX 230KV |
| 22504 | MISSION | 230 | 22500 | MISSION | 138 | 2 | 23021/23041 | ivsg_hs_alt3bd1 | 392 | 355.6 | 71.1 | 944.7 | 362.6 | 0.93 | 0.78 | ML-SX + OM-SX 230KV |
| 22001 | NORTHSD | 230 | 22000 | NORTHSD | 500 | 1 | 23021/22/23/41 | ivsg_hs_alt3bd1 | 1120 | -1041.3 | -25.6 | 2593.4 | 1041.6 | 0.93 | 0.7 | MIGUEL 230 CORRIDOR West of LC |
| 24614 | TAP601 | 115 | 24702 | KRAMER | 115 | 1 | line_2260 | ivsg_hs_alt3bd1 | 217.1 | -190 | 69.5 | 1005 | 202.3 | 0.924 | 0.717 | KRAMER 230.00 - LUGO 230.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | line_2115 | ivsg_hs_alt3bd1 | 408.3 | -379 | -0.9 | 1576.8 | 379 | 0.923 | 0.957 | S.ONOFRE 230.00 - SANTIAGO 230.00 1, S.ONOFRE 230.00 - SANTIAGO 230.00 2 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 2 | line_2279 | ivsg_hs_alt3bd1 | 1195 | 1070.4 | -49.8 | 2768.2 | 1071.5 | 0.923 | 0.559 | S.ONOFRE 230.00 - SERRANO 230.00 1, SERRANO 230.00 - VILLA PK 230.00 1 |
| 24126 | RIOHONDO | 230 | 24155 | VINCENT | 230 | 2 | line_2076 | ivsg_hs_alt3bd1 | 988 | -875.1 | 102.6 | 2285.4 | 881.1 | 0.922 | 0.721 | GOODRICH 230.00 - LAGUBELL 230.00 1, VINCENT 230.00 - MESA CAL 230.00 1 |
| 8332 | ELCENTSW | 230 | 8335 | ELSTEAMP | 92 | 1 | line_N-210 | ivsg_hs_alt3bd1 | 225 | 205.2 | 20.8 | 515.9 | 206.3 | 0.92 | 0.51 | EL CENTRO IMPERIAL VALLEY 230 CKTS 2&3 |
| 22001 | NORTHSD | 230 | 22000 | NORTHSD | 500 | 1 | 23021/22/23/41 | ivsg_hs_alt3bd1 | 1120 | -1026.2 | -10.8 | 2561.6 | 1026.3 | 0.92 | 0.7 | MIGUEL 230 CORRIDOR West of SN |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2255 | ivsg_hs_alt3bd1 | 2400 | -2289.7 | -60.5 | 2544.3 | 2290.5 | 0.918 | 0.765 | LUGO 500.00 - MIRALOMA 500.00 3, LUGO 500.00 - MOHAVE 500.00 1 |
| 24126 | RIOHONDO | 230 | 24155 | VINCENT | 230 | 2 | line_2096 | ivsg_hs_alt3bd1 | 988 | -861.4 | 102.2 | 2268.9 | 867.4 | 0.915 | 0.721 | EAGLROCK 230.00 - MESA CAL 230.00 1, GOODRICH 230.00 - GOULD 230.00 1 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2256 | ivsg_hs_alt3bd1 | 2400 | -2290.6 | -77.3 | 2536.4 | 2291.9 | 0.915 | 0.765 | ELDORDO 500.00 - LUGO 500.00 1, LUGO 500.00 - MIRALOMA 500.00 2 |
| 24807 | MIRAGE | 115 | 24819 | CONCHO | 115 | 1 | line_2182 | ivsg_hs_alt3bd1 | 183 | 164 | -7.2 | 838.3 | 164.1 | 0.912 | 0.868 | DEVERS 230.00 - MIRAGE 230.00 2, COACHELV 230.00 - DEVERS 230.00 2 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_N-204 | ivsg_hs_alt3bd1 | 800 | 710.5 | -11.2 | 1832 | 710.6 | 0.912 | 0.718 | COACHELLA MIDWAY 230 CKT 1&2 |
| 24602 | VICTOR | 115 | 24702 | KRAMER | 115 | 1 | line_2260 | ivsg_hs_alt3bd1 | 217.1 | -185.3 | 79.6 | 989 | 201.7 | 0.91 | 0.703 | KRAMER 230.00 - LUGO 230.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 24126 | RIOHONDO | 230 | 24155 | VINCENT | 230 | 2 | line_2103 | ivsg_hs_alt3bd1 | 988 | -854.2 | 101.7 | 2251.6 | 860.2 | 0.908 | 0.721 | EAGLROCK 230.00 - SYLMAR S 230.00 1, SYLMAR S 230.00 - GOULD 230.00 1 |
| 8311 | COACHELA | 230 | 8695 | RAMON | 230 | 2 | line_2236 | ivsg_hs_alt3bd1 | 800 | 698.8 | -31.1 | 1823.5 | 699.5 | 0.908 | 0.624 | PALOVRDE 500.00 - DEVERS 500.00 1, COACHELV 230.00 - DEVERS 230.00 2 |
| 24125 | REDONDO | 230 | 24084 | LITEHIPE | 230 | 1 | line_2061 | ivsg_hs_alt3bd1 | 916 | 814.9 | 93.3 | 2073.9 | 820.2 | 0.902 | 0.112 | LA FRESA 230.00 - REDONDO 230.00 1, LA FRESA 230.00 - REDONDO 230.00 2 |
| 24807 | MIRAGE | 115 | 24816 | SANTA RO | 115 | 1 | line_2182 | ivsg_hs_alt3bd1 | 183.3 | 161.9 | -13.2 | 829.8 | 162.5 | 0.902 | 0.859 | DEVERS 230.00 - MIRAGE 230.00 2, COACHELV 230.00 - DEVERS 230.00 2 |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | 13821B/638 | ivsg_hs_alt3bd1 | 382.4 | 337.7 | 20.8 | 1442.3 | 338.4 | 0.902 | 0.794 | CH-SX-SN 138KV + SAN VCNT-EL 69KV |
| 24093 | MIRALOMW | 230 | 24158 | WALNUT | 230 | 1 | line_2089 | ivsg_hs_alt3bd1 | 797 | 678.8 | 165.1 | 1799.5 | 698.6 | 0.901 | 0.526 | MESA CAL 230.00 - WALNUT 230.00 1, OLINDA 230.00 - WALNUT 230.00 1 |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | 23021/23041 | ivsg_hs_alt3bd1 | 382.4 | 337.2 | 13.9 | 1442 | 337.5 | 0.901 | 0.794 | ML-SX + OM-SX 230KV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | 23051B/23011 | ivsg_hs_alt3bd1 | 392 | 350.8 | -1.5 | 893.7 | 350.9 | 0.9 | 0.8 | EPP-ES + ES-EA-SA 230KV |

ivsg_hs_alt3bd1.sav
No Solve Summary
N-2 Outages

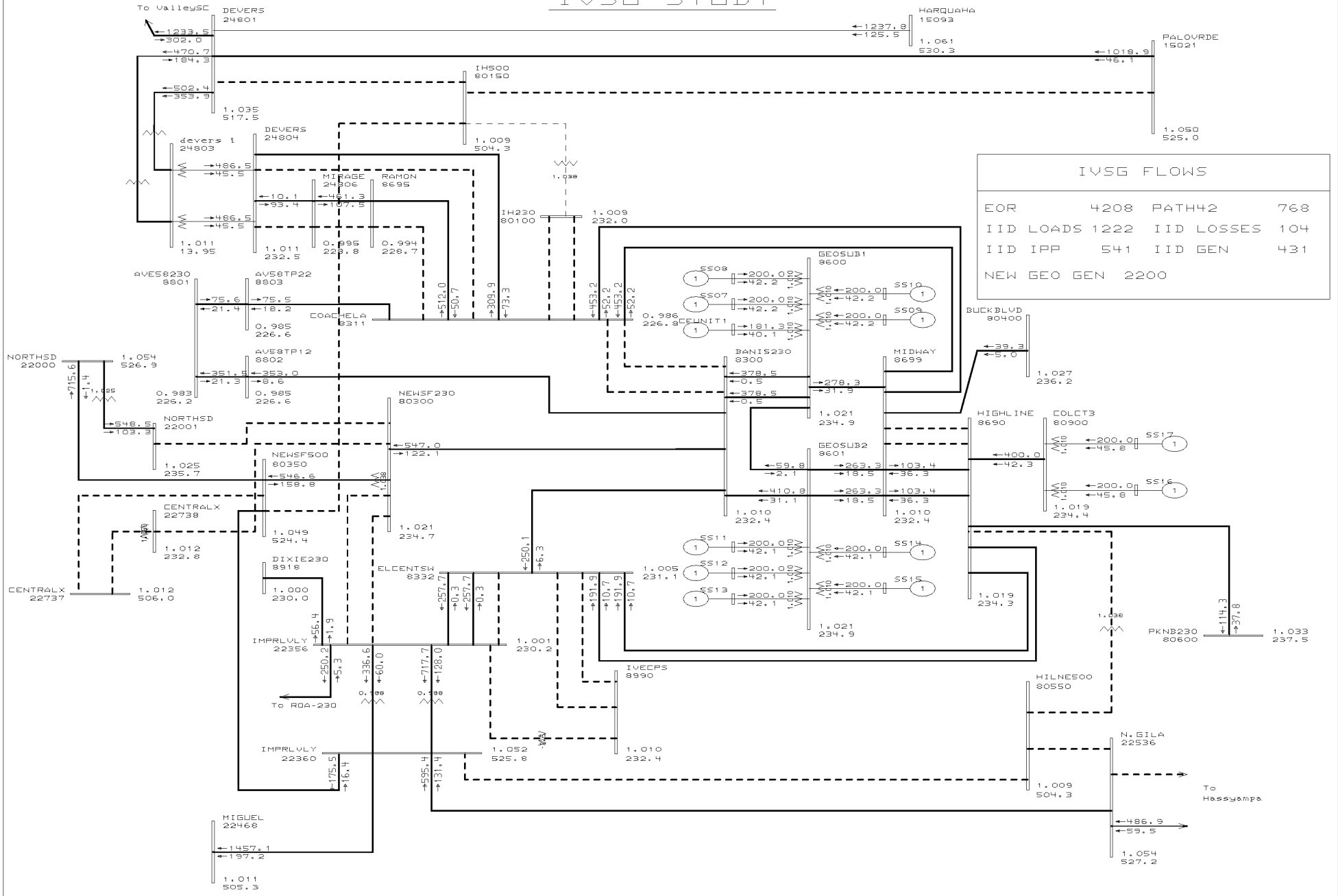
| Contingency-Description | Case | Problem-Description |
|---|---|---|
| DEVERS 230.00 - MIRAGE 230.00 2, RAMON 230.00 - MIRAGE 230.00 2 | ivsg_hs_alt3bd1 | Pmis 25407 GENE69 N 69.00 = 16320436.00 MW + j -45005924.00 MVAR |
| VICTOR 230.00 - LUGO 230.00 1, VICTOR 230.00 - LUGO 230.00 2 | ivsg_hs_alt3bd1 | Pmis 24618 TAP605 115.00 = -105866992.00 MW + j -32972392.00 MVAR |
| DEVERS 230.00 - MIRAGE 230.00 2, RAMON 230.00 - MIRAGE 230.00 2 | ivsg_hs_alt3bd1 | Pmis 25407 GENE69 N 69.00 = 16320436.00 MW + j -45005924.00 MVAR |

# Imperial Valley Study Group

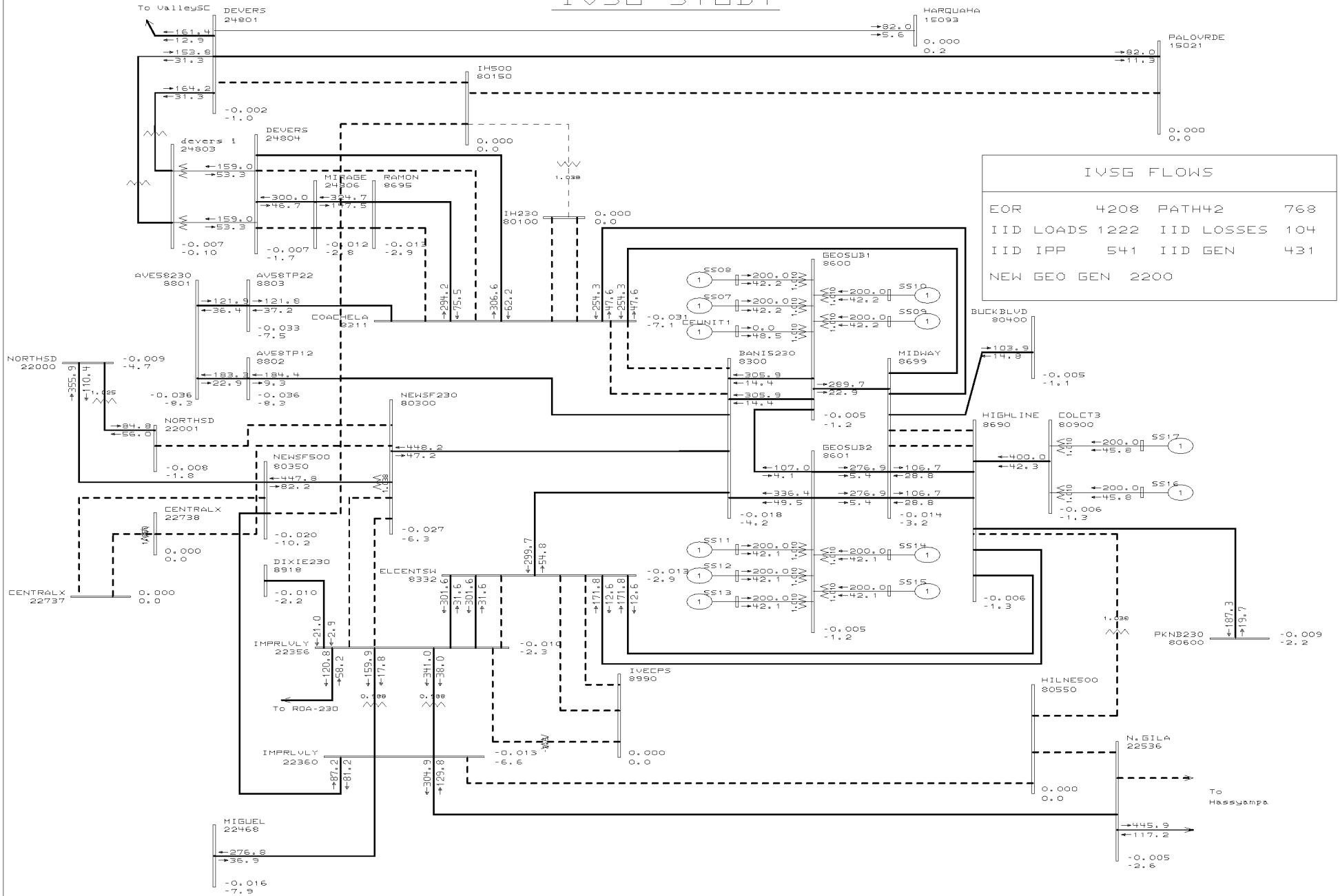
## Appendix A.4.9

Alt 3b D2
Heavy Summer
Alternative 3b
Dispatch 2

# IVSG STUDY


To ValleySC
DEVERS 24801
HARQUAHA 15093
PALOVRDE 15021
IH500 80150
devers 1 24803
DEVERS 24804
MIRAGE 24806
RAMON 8695
IH230 80100
AVE58230 8801
AVE58TP22 8803
AVE58TP12 8802
COACHELA 8311
GEOSUB1 8600
GEOSUB2 8601
BANIS230 8300
MIDWAY 8699
BUCKBLVD 80400
HIGHLINE 8690
COLCT3 80900
NORTHSD 22000
NORTHSD 22001
NEWSF230 80300
NEWSF500 80350
CENTRALX 22738
CENTRALX 22737
DIXIE230 8918
ELCENTSW 8332
IMPRLVLY 22356
IMPRLVLY 22360
IVECPS 8990
To ROA-230
MIGUEL 22468
HILNE500 80550
N.GILA 22536
To Hassyampa
PKNB230 80600
IVSG FLOWS
EOR 4208 PATH42 768
IID LOADS 1222 IID LOSSES 104
IID IPP 541 IID GEN 431
NEW GEO GEN 2200

# IVSG STUDY




| IVSG FLOWS | | | |
|---|---|---|---|
| EOR | 4208 | PATH42 | 768 |
| IID LOADS | 1222 | IID LOSSES | 104 |
| IID IPP | 541 | IID GEN | 431 |
| NEW GEO GEN | 2200 | | |

ivsg_hs_alt3bd2.sav
Voltage Summary
N-0 Outages

| Bus | Name | kV | Area | Zone | Outage | Case | Vbase | Vcont | DeltaV | Vmin | Vmax | Max-dv | Contingency Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24035 | EAGLEMTN | 161 | 24 | 248 | base | ivsg_hs_alt3bd2 | 0.932 | 0.932 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 20077 | SIM-115 | 115 | 20 | 205 | base | ivsg_hs_alt3bd2 | 0.933 | 0.933 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 20076 | SQN-115 | 115 | 20 | 205 | base | ivsg_hs_alt3bd2 | 0.938 | 0.938 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14534 | N.GILA 4 | 100 | 14 | 847 | base | ivsg_hs_alt3bd2 | 0.945 | 0.945 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15021 | PALOVRDE | 500 | 14 | 158 | base | ivsg_hs_alt3bd2 | 1.05 | 1.05 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24775 | RUSH | 115 | 24 | 247 | base | ivsg_hs_alt3bd2 | 1.05 | 1.05 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24622 | PERMANTE | 115 | 24 | 246 | base | ivsg_hs_alt3bd2 | 1.05 | 1.05 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24623 | GOLDHILS | 115 | 24 | 246 | base | ivsg_hs_alt3bd2 | 1.05 | 1.05 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24613 | COTNWD | 115 | 24 | 246 | base | ivsg_hs_alt3bd2 | 1.051 | 1.051 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 22360 | IMPRLVLY | 500 | 22 | 227 | base | ivsg_hs_alt3bd2 | 1.052 | 1.052 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24092 | MIRALOMA | 500 | 24 | 240 | base | ivsg_hs_alt3bd2 | 1.052 | 1.052 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24219 | PISGAH | 230 | 24 | 240 | base | ivsg_hs_alt3bd2 | 1.052 | 1.052 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15090 | HASSYAMP | 500 | 14 | 158 | base | ivsg_hs_alt3bd2 | 1.053 | 1.053 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15092 | ARLINTON | 500 | 14 | 158 | base | ivsg_hs_alt3bd2 | 1.053 | 1.053 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15094 | MESQUITE | 500 | 14 | 158 | base | ivsg_hs_alt3bd2 | 1.053 | 1.053 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24627 | CIMA | 230 | 24 | 240 | base | ivsg_hs_alt3bd2 | 1.053 | 1.053 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14009 | REDHAWK | 500 | 14 | 141 | base | ivsg_hs_alt3bd2 | 1.054 | 1.054 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 22536 | N.GILA | 500 | 22 | 227 | base | ivsg_hs_alt3bd2 | 1.054 | 1.054 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 22000 | NORTHSD | 500 | 22 | 227 | base | ivsg_hs_alt3bd2 | 1.054 | 1.054 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 79043 | KAYENTA | 230 | 14 | 191 | base | ivsg_hs_alt3bd2 | 1.055 | 1.055 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24236 | RANCHVST | 500 | 24 | 240 | base | ivsg_hs_alt3bd2 | 1.055 | 1.055 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14010 | TS5 | 500 | 14 | 141 | base | ivsg_hs_alt3bd2 | 1.056 | 1.056 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24229 | VALLEY-S | 115 | 24 | 240 | base | ivsg_hs_alt3bd2 | 1.056 | 1.056 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 25991 | VALYSVC2 | 115 | 24 | 240 | base | ivsg_hs_alt3bd2 | 1.056 | 1.056 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14230 | VERDE N | 230 | 14 | 141 | base | ivsg_hs_alt3bd2 | 1.057 | 1.057 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14247 | VERDE S | 230 | 14 | 141 | base | ivsg_hs_alt3bd2 | 1.057 | 1.057 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14011 | RACEWAY | 500 | 14 | 141 | base | ivsg_hs_alt3bd2 | 1.057 | 1.057 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24138 | SERRANO | 500 | 24 | 240 | base | ivsg_hs_alt3bd2 | 1.057 | 1.057 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24776 | LEE VINE | 115 | 24 | 247 | base | ivsg_hs_alt3bd2 | 1.058 | 1.058 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15041 | SILVERKG | 500 | 14 | 158 | base | ivsg_hs_alt3bd2 | 1.06 | 1.06 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14205 | COCONINO | 230 | 14 | 141 | base | ivsg_hs_alt3bd2 | 1.06 | 1.06 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14008 | JOJOBA | 500 | 14 | 141 | base | ivsg_hs_alt3bd2 | 1.06 | 1.06 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24940 | SERVAL | 500 | 24 | 240 | base | ivsg_hs_alt3bd2 | 1.06 | 1.06 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15034 | PERKINS | 500 | 14 | 158 | base | ivsg_hs_alt3bd2 | 1.061 | 1.061 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15061 | RUDD | 500 | 14 | 158 | base | ivsg_hs_alt3bd2 | 1.061 | 1.061 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15093 | HARQUAHA | 500 | 14 | 158 | base | ivsg_hs_alt3bd2 | 1.061 | 1.061 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24151 | VALLEYSC | 500 | 24 | 240 | base | ivsg_hs_alt3bd2 | 1.061 | 1.061 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24997 | VALYSVC1 | 500 | 24 | 240 | base | ivsg_hs_alt3bd2 | 1.061 | 1.061 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 28040 | CALPINE | 500 | 24 | 240 | base | ivsg_hs_alt3bd2 | 1.061 | 1.061 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14234 | YAVAPAI | 230 | 14 | 141 | base | ivsg_hs_alt3bd2 | 1.062 | 1.062 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24086 | LUGO | 500 | 24 | 240 | base | ivsg_hs_alt3bd2 | 1.062 | 1.062 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14355 | PRESCOTT | 115 | 14 | 141 | base | ivsg_hs_alt3bd2 | 1.065 | 1.065 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14543 | PRESCOT1 | 100 | 14 | 141 | base | ivsg_hs_alt3bd2 | 1.065 | 1.065 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14256 | FLAGSTAF | 230 | 14 | 141 | base | ivsg_hs_alt3bd2 | 1.065 | 1.065 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14544 | PRESCOT2 | 100 | 14 | 141 | base | ivsg_hs_alt3bd2 | 1.066 | 1.066 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14587 | FLAGSTF1 | 100 | 14 | 141 | base | ivsg_hs_alt3bd2 | 1.066 | 1.066 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14001 | FOURCORN | 500 | 14 | 141 | base | ivsg_hs_alt3bd2 | 1.068 | 1.068 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 79264 | PINAL_W | 500 | 14 | 141 | base | ivsg_hs_alt3bd2 | 1.068 | 1.068 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24729 | INYO | 230 | 24 | 247 | base | ivsg_hs_alt3bd2 | 1.068 | 1.068 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14007 | GILARIVR | 500 | 14 | 141 | base | ivsg_hs_alt3bd2 | 1.069 | 1.069 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24156 | VINCENT | 500 | 24 | 240 | base | ivsg_hs_alt3bd2 | 1.069 | 1.069 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14006 | YAVAPAI | 500 | 14 | 141 | base | ivsg_hs_alt3bd2 | 1.07 | 1.07 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15992 | SEV | 500 | 14 | 158 | base | ivsg_hs_alt3bd2 | 1.072 | 1.072 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14004 | SAGUARO | 500 | 14 | 141 | base | ivsg_hs_alt3bd2 | 1.073 | 1.073 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 16000 | TORTOLIT | 500 | 14 | 160 | base | ivsg_hs_alt3bd2 | 1.073 | 1.073 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 16001 | TORTLIT2 | 500 | 14 | 160 | base | ivsg_hs_alt3bd2 | 1.073 | 1.073 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14215 | LEUPP | 230 | 14 | 141 | base | ivsg_hs_alt3bd2 | 1.074 | 1.074 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14100 | CHOLLA | 345 | 14 | 141 | base | ivsg_hs_alt3bd2 | 1.075 | 1.075 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15001 | CORONADO | 500 | 14 | 158 | base | ivsg_hs_alt3bd2 | 1.079 | 1.079 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14000 | CHOLLA | 500 | 14 | 141 | base | ivsg_hs_alt3bd2 | 1.08 | 1.08 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 19038 | MEAD | 500 | 14 | 191 | base | ivsg_hs_alt3bd2 | 1.086 | 1.086 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14204 | CHOLLA | 230 | 14 | 141 | base | ivsg_hs_alt3bd2 | 1.087 | 1.087 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24042 | ELDORDO | 500 | 24 | 240 | base | ivsg_hs_alt3bd2 | 1.088 | 1.088 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24097 | MOHAVE | 500 | 24 | 240 | base | ivsg_hs_alt3bd2 | 1.09 | 1.09 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14509 | CHOLLA 7 | 100 | 14 | 141 | base | ivsg_hs_alt3bd2 | 1.092 | 1.092 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14267 | SECDKNOL | 230 | 14 | 141 | base | ivsg_hs_alt3bd2 | 1.098 | 1.098 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14003 | NAVAJO | 500 | 14 | 141 | base | ivsg_hs_alt3bd2 | 1.102 | 1.102 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14002 | MOENKOPI | 500 | 14 | 141 | base | ivsg_hs_alt3bd2 | 1.105 | 1.105 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |

ivsg_hs_alt3bd2.sav
Flow Summary
N-0 Outages

| LEGEND | % of RATING 1 | |
|---|---|---|
| C_pu | 100% - 110% | |
| C_pu | 110% - 120% | P.U. of |
| C_pu | > 120% | Rate 1 |

| FROM | FR | BKV | TO | TO | BKV | CK | Outage_Name | Case | Rate-Mva | Pflow | Qflow | Amps | MVA | C_pu | B_pu | Contingency_Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 14248 | GLENDALW | 230 | 14212 | GLENDALE | 230 | 1 | base | ivsg_hs_alt3bd2 | 457 | 605.5 | 29.3 | 1519.5 | 606.2 | 1.325 | 1.325 | Base system (n-0) |
| 14248 | GLENDALW | 230 | 15201 | AGUAFRIA | 230 | 1 | base | ivsg_hs_alt3bd2 | 457 | -605.5 | -29.3 | 1519.5 | 606.2 | 1.325 | 1.325 | Base system (n-0) |
| 14221 | PNPKAPS | 230 | 19062 | PINPK | 230 | 1 | base | ivsg_hs_alt3bd2 | 637.4 | -786.7 | -183 | 1992.2 | 807.7 | 1.245 | 1.245 | Base system (n-0) |
| 24910 | CAL ELEC | 115 | 24912 | SHANDIN | 115 | 1 | base | ivsg_hs_alt3bd2 | 109.1 | -124.2 | 58.2 | 678.3 | 137.1 | 1.241 | 1.241 | Base system (n-0) |
| 14212 | GLENDALE | 230 | 14270 | GRNDTRML | 230 | 1 | base | ivsg_hs_alt3bd2 | 457 | 540.1 | 21.6 | 1355 | 540.5 | 1.183 | 1.183 | Base system (n-0) |
| 24912 | SHANDIN | 115 | 24916 | TAP902 | 115 | 1 | base | ivsg_hs_alt3bd2 | 109.1 | -119.2 | 33.4 | 609.4 | 123.8 | 1.114 | 1.114 | Base system (n-0) |
| 14206 | CTRYCLUB | 230 | 14270 | GRNDTRML | 230 | 1 | base | ivsg_hs_alt3bd2 | 509.9 | -536.3 | -17.9 | 1357.4 | 536.6 | 1.06 | 1.06 | Base system (n-0) |
| 14202 | CACTUS | 230 | 14221 | PNPKAPS | 230 | 1 | base | ivsg_hs_alt3bd2 | 371 | -366.9 | -47.2 | 930.3 | 369.9 | 0.999 | 0.999 | Base system (n-0) |
| 14008 | JOJOBA | 500 | 15011 | KYRENE | 500 | 1 | base | ivsg_hs_alt3bd2 | 1732 | 1809.8 | 163.3 | 1979.4 | 1817.1 | 0.992 | 0.992 | Base system (n-0) |
| 15230 | RUDD | 230 | 15218 | WHITETNK | 230 | 1 | base | ivsg_hs_alt3bd2 | 725 | 692.9 | -17.4 | 1737.9 | 693.1 | 0.955 | 0.955 | Base system (n-0) |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | base | ivsg_hs_alt3bd2 | 132 | 126.4 | -11.6 | 789.8 | 126.9 | 0.953 | 0.953 | Base system (n-0) |
| 24806 | MIRAGE | 230 | 24807 | MIRAGE | 115 | 1 | base | ivsg_hs_alt3bd2 | 280 | 265.6 | 26.6 | 673.8 | 267 | 0.95 | 0.95 | Base system (n-0) |
| 24806 | MIRAGE | 230 | 24807 | MIRAGE | 115 | 2 | base | ivsg_hs_alt3bd2 | 280 | 265.6 | 26.6 | 673.8 | 267 | 0.95 | 0.95 | Base system (n-0) |
| 24087 | MAGUNDEN | 230 | 24101 | OMAR | 230 | 1 | base | ivsg_hs_alt3bd2 | 643 | -591.8 | 131.1 | 1531.3 | 606.2 | 0.949 | 0.949 | Base system (n-0) |
| 24702 | KRAMER | 115 | 24753 | SUNGEN | 115 | 1 | base | ivsg_hs_alt3bd2 | 183.3 | -170.5 | 32 | 863.8 | 173.5 | 0.939 | 0.939 | Base system (n-0) |
| 14207 | DEERVALY | 230 | 14231 | WESTWING | 230 | 1 | base | ivsg_hs_alt3bd2 | 720 | -667.7 | -77.9 | 1687.1 | 672.3 | 0.933 | 0.933 | Base system (n-0) |
| 26098 | SYLMAR3 | 230 | 24147 | SYLMAR S | 230 | 1 | base | ivsg_hs_alt3bd2 | 1100 | 840 | -522.1 | 2561 | 989 | 0.927 | 0.927 | Base system (n-0) |
| 17003 | AVRA | 115 | 17012 | MARANA | 115 | 1 | base | ivsg_hs_alt3bd2 | 71.7 | -64.9 | -5.8 | 333.4 | 65.2 | 0.926 | 0.926 | Base system (n-0) |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | base | ivsg_hs_alt3bd2 | 56 | 49.9 | -10.8 | 252.9 | 51.1 | 0.92 | 0.92 | Base system (n-0) |
| 19215 | SPOOKHIL | 230 | 19045 | COOLIDGE | 230 | 1 | base | ivsg_hs_alt3bd2 | 352 | -317.7 | 45.9 | 807.8 | 321 | 0.916 | 0.916 | Base system (n-0) |
| 15212 | ROGERS | 230 | 19215 | SPOOKHIL | 230 | 1 | base | ivsg_hs_alt3bd2 | 352 | -316 | 55.8 | 807 | 320.9 | 0.914 | 0.914 | Base system (n-0) |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | base | ivsg_hs_alt3bd2 | 204.1 | 186.9 | -9.7 | 776.9 | 187.2 | 0.91 | 0.91 | Base system (n-0) |

ivsg_hs_alt3bd2.sav
VOLTAGE Summary
N-1 Outages

| Bus | Name | kV | Area | Zone | Outage | Case | Vbase | Vcont | DeltaV | Vmin | Vmax | Max-dv | Contingency Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24017 | BLYTHESC | 161 | 24 | 248 | line_007 | ivsg_hs_alt3bd2 | 1.02 | 0.869 | -0.151 | 0.9 | 1.05 | 0.05 | line BLYTHE to BLYTHESC 161 ck 1 |
| 24731 | INYOKERN | 115 | 24 | 247 | line_175 | ivsg_hs_alt3bd2 | 1 | 0.925 | -0.075 | 0.9 | 1.05 | 0.05 | line INYO to COTTONWD 230 ck 1 |
| 24822 | INDIAN W | 115 | 24 | 248 | tran_238 | ivsg_hs_alt3bd2 | 1.03 | 0.937 | -0.093 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 24819 | CONCHO | 115 | 24 | 248 | tran_238 | ivsg_hs_alt3bd2 | 1.03 | 0.938 | -0.093 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 22464 | MIGUEL | 230 | 22 | 222 | B2_002 | ivsg_hs_alt3bd2 | 1.002 | 0.94 | -0.061 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22468 | MIGUEL | 500 | 22 | 227 | B2_002 | ivsg_hs_alt3bd2 | 1.011 | 0.94 | -0.071 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22472 | MIGUELMP | 500 | 22 | 227 | B2_002 | ivsg_hs_alt3bd2 | 1.004 | 0.94 | -0.064 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 24816 | SANTA RO | 115 | 24 | 248 | tran_238 | ivsg_hs_alt3bd2 | 1.034 | 0.942 | -0.092 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 22412 | LOSCOCHS | 138 | 22 | 223 | B2_002 | ivsg_hs_alt3bd2 | 0.998 | 0.943 | -0.056 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22428 | MAINST51 | 138 | 22 | 222 | B2_002 | ivsg_hs_alt3bd2 | 0.998 | 0.943 | -0.055 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 24821 | TAMARISK | 115 | 24 | 248 | tran_238 | ivsg_hs_alt3bd2 | 1.034 | 0.943 | -0.091 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 22424 | MAINST50 | 138 | 22 | 222 | B2_002 | ivsg_hs_alt3bd2 | 0.999 | 0.944 | -0.055 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 24827 | TAP823 | 115 | 24 | 248 | tran_238 | ivsg_hs_alt3bd2 | 1.036 | 0.944 | -0.091 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 25633 | CAPWIND | 115 | 24 | 248 | tran_238 | ivsg_hs_alt3bd2 | 1.036 | 0.945 | -0.091 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 25622 | TAP806 | 115 | 24 | 248 | tran_238 | ivsg_hs_alt3bd2 | 1.036 | 0.945 | -0.091 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 24829 | TAP821 | 115 | 24 | 248 | tran_238 | ivsg_hs_alt3bd2 | 1.036 | 0.945 | -0.091 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 22734 | SANTEE | 138 | 22 | 223 | B2_002 | ivsg_hs_alt3bd2 | 0.998 | 0.946 | -0.052 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 24807 | MIRAGE | 115 | 24 | 248 | tran_238 | ivsg_hs_alt3bd2 | 1.038 | 0.948 | -0.09 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 24768 | RANDSBRG | 115 | 24 | 247 | line_175 | ivsg_hs_alt3bd2 | 1 | 0.95 | -0.05 | 0.9 | 1.05 | 0.05 | line INYO to COTTONWD 230 ck 1 |
| 24761 | TAP701 | 115 | 24 | 247 | line_175 | ivsg_hs_alt3bd2 | 1 | 0.95 | -0.05 | 0.9 | 1.05 | 0.05 | line INYO to COTTONWD 230 ck 1 |
| 22772 | SOUTHBAY | 138 | 22 | 222 | B2_002 | ivsg_hs_alt3bd2 | 1.006 | 0.952 | -0.055 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 25423 | ESRP MWD | 115 | 24 | 254 | tran_247 | ivsg_hs_alt3bd2 | 1.032 | 0.953 | -0.079 | 0.9 | 1.05 | 0.05 | tran VALLEYSC 500 to VALLEYSC 115 ck 1 |
| 25423 | ESRP MWD | 115 | 24 | 254 | tran_248 | ivsg_hs_alt3bd2 | 1.032 | 0.953 | -0.079 | 0.9 | 1.05 | 0.05 | tran VALLEYSC 500 to VALLEYSC 115 ck 2 |
| 22865 | UPTOWN | 138 | 22 | 221 | B2_002 | ivsg_hs_alt3bd2 | 1.006 | 0.954 | -0.052 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 24160 | VALLEYSC | 115 | 24 | 240 | tran_247 | ivsg_hs_alt3bd2 | 1.035 | 0.956 | -0.078 | 0.9 | 1.05 | 0.05 | tran VALLEYSC 500 to VALLEYSC 115 ck 1 |
| 25990 | VALYSVC1 | 115 | 24 | 240 | tran_247 | ivsg_hs_alt3bd2 | 1.035 | 0.956 | -0.078 | 0.9 | 1.05 | 0.05 | tran VALLEYSC 500 to VALLEYSC 115 ck 1 |
| 24160 | VALLEYSC | 115 | 24 | 240 | tran_248 | ivsg_hs_alt3bd2 | 1.035 | 0.956 | -0.078 | 0.9 | 1.05 | 0.05 | tran VALLEYSC 500 to VALLEYSC 115 ck 2 |
| 25990 | VALYSVC1 | 115 | 24 | 240 | tran_248 | ivsg_hs_alt3bd2 | 1.035 | 0.956 | -0.078 | 0.9 | 1.05 | 0.05 | tran VALLEYSC 500 to VALLEYSC 115 ck 2 |
| 22852 | TELECYN | 138 | 22 | 222 | B2_002 | ivsg_hs_alt3bd2 | 1.017 | 0.961 | -0.057 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22672 | PRCTRVLY | 138 | 22 | 222 | B2_002 | ivsg_hs_alt3bd2 | 1.02 | 0.963 | -0.058 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22460 | MIGUEL | 138 | 22 | 222 | B2_002 | ivsg_hs_alt3bd2 | 1.022 | 0.964 | -0.058 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 14534 | N.GILA 4 | 100 | 14 | 847 | NG500/69 | ivsg_hs_alt3bd2 | 0.945 | 1 | 0.055 | 0.9 | 1.05 | 0.05 | tran N.GILA 500 to N.GILA 69 ck 1 |
| 24035 | EAGLEMTN | 161 | 24 | 248 | tran_241 | ivsg_hs_alt3bd2 | 0.932 | 1.026 | 0.094 | 0.9 | 1.05 | 0.05 | tran EAGLEMTN 230 to EAGLEMTN 161 ck 1 |
| 24730 | INYO PS | 115 | 24 | 247 | tran_229 | ivsg_hs_alt3bd2 | 1.026 | 1.078 | 0.052 | 0.9 | 1.05 | 0.05 | tran INYO 115 to INYO PS 115 ck 1 |
| 24142 | SYC CYN | 230 | 24 | 240 | line_086 | ivsg_hs_alt3bd2 | 0.986 | 1.091 | 0.105 | 0.9 | 1.05 | 0.05 | line MAGUNDEN to OMAR 230 ck 1 |
| 25613 | EDMONSTN | 230 | 24 | 256 | line_122 | ivsg_hs_alt3bd2 | 1 | 1.091 | 0.09 | 0.9 | 1.05 | 0.05 | line PASTORIA to EDMONSTN 230 ck 1 |
| 24142 | SYC CYN | 230 | 24 | 240 | line_140 | ivsg_hs_alt3bd2 | 0.986 | 1.091 | 0.105 | 0.9 | 1.05 | 0.05 | line SYC CYN to OMAR 230 ck 1 |

ivsg_hs_alt3bd2.sav
FLOW Summary
N-1 Outages

| LEGEND | % of RATING 1 | |
|---|---|---|
| C_pu | 100% - 110% | |
| C_pu | 110% - 120% | P.U. of |
| C_pu | > 120% | Rate 1 |

| FROM | FR | BKV | TO | TO | BKV | CK | Outage_Name | Case | Rate-Mva | Pflow | Qflow | Amps | MVA | C_pu | B_pu | Contingency_Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24142 | SYC CYN | 230 | 24101 | OMAR | 230 | 1 | line_086 | ivsg_hs_alt3bd2 | 643 | 768.8 | 5511.2 | 12804.3 | 5564.5 | 7.934 | 0.47 | line MAGUNDEN to OMAR 230 ck 1 |
| 24781 | NAVYCOSO | 230 | 24706 | BLM EAST | 230 | 1 | line_173 | ivsg_hs_alt3bd2 | 1287 | -153.9 | -3160.7 | 7943.3 | 3164.4 | 2.459 | 0.056 | line BLM EAST to BLM WEST 230 ck 1 |
| 24781 | NAVYCOSO | 230 | 24706 | BLM EAST | 230 | 1 | line_174 | ivsg_hs_alt3bd2 | 1287 | -153.9 | -3160.7 | 7943.3 | 3164.4 | 2.459 | 0.056 | line BLM WEST to KRAMER 230 ck 1 |
| 24806 | MIRAGE | 230 | 24807 | MIRAGE | 115 | 2 | tran_238 | ivsg_hs_alt3bd2 | 280 | 532.3 | 204.3 | 1476 | 570.1 | 2.04 | 0.95 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_175 | ivsg_hs_alt3bd2 | 56 | -103.6 | -1.3 | 532.3 | 103.6 | 1.86 | 0.92 | line INYO to COTTONWD 230 ck 1 |
| 24151 | VALLEYSC | 500 | 24160 | VALLEYSC | 115 | 2 | tran_247 | ivsg_hs_alt3bd2 | 560 | 853.2 | 346.5 | 1012.6 | 920.9 | 1.64 | 0.77 | tran VALLEYSC 500 to VALLEYSC 115 ck 1 |
| 24151 | VALLEYSC | 500 | 24160 | VALLEYSC | 115 | 1 | tran_248 | ivsg_hs_alt3bd2 | 560 | 853.2 | 346.5 | 1012.6 | 920.9 | 1.64 | 0.77 | tran VALLEYSC 500 to VALLEYSC 115 ck 2 |
| 24151 | VALLEYSC | 500 | 24229 | VALLEY-S | 115 | 4 | tran_249 | ivsg_hs_alt3bd2 | 560 | 830.6 | 198.3 | 936.8 | 854 | 1.52 | 0.75 | tran VALLEYSC 500 to VALLEY-S 115 ck 3 |
| 24151 | VALLEYSC | 500 | 24229 | VALLEY-S | 115 | 3 | tran_250 | ivsg_hs_alt3bd2 | 560 | 830.7 | 198.3 | 936.8 | 854 | 1.52 | 0.75 | tran VALLEYSC 500 to VALLEY-S 115 ck 4 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_202 | ivsg_hs_alt3bd2 | 56 | 77.4 | -7.6 | 392.4 | 77.7 | 1.4 | 0.92 | line OWENSCON to INYO 230 ck 1 |
| 22356 | IMPRLVLY | 230 | 22360 | IMPRLVLY | 500 | 1 | IV81 | ivsg_hs_alt3bd2 | 600 | 746.4 | 163.9 | 1912.1 | 764.2 | 1.27 | 0.57 | tran IMPRLVLY 230 to IMPRLVLY 500 ck 2 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_032 | ivsg_hs_alt3bd2 | 204.1 | 254.3 | -15.1 | 1075.6 | 254.8 | 1.26 | 0.91 | OTAYMESA - MLMS3TAP 1 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_034 | ivsg_hs_alt3bd2 | 204.1 | 254.4 | -14.5 | 1076.2 | 254.8 | 1.26 | 0.91 | OLD TOWN - MLMS3TAP 1 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_009 | ivsg_hs_alt3bd2 | 204.1 | 246.4 | -20.8 | 1032.8 | 247.3 | 1.21 | 0.91 | EPP - ESCNDIDO 1 230kV |
| 24723 | CONTROL | 115 | 24731 | INYOKERN | 115 | 1 | line_175 | ivsg_hs_alt3bd2 | 82.7 | 96.2 | -3.9 | 497.7 | 96.3 | 1.199 | 0.421 | line INYO to COTTONWD 230 ck 1 |
| 24723 | CONTROL | 115 | 24731 | INYOKERN | 115 | 2 | line_175 | ivsg_hs_alt3bd2 | 82.7 | 96.2 | -3.9 | 497.7 | 96.3 | 1.199 | 0.421 | line INYO to COTTONWD 230 ck 1 |
| 22468 | MIGUEL | 500 | 22472 | MIGUELMP | 500 | 1 | ML81 | ivsg_hs_alt3bd2 | 1120 | 1299.3 | 235.2 | 1508.4 | 1320.4 | 1.18 | 0.67 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 22464 | MIGUEL | 230 | 22468 | MIGUEL | 500 | 1 | ML80 | ivsg_hs_alt3bd2 | 1120 | -1280.9 | -17 | 3240.5 | 1281 | 1.17 | 0.64 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 22464 | MIGUEL | 230 | 22472 | MIGUELMP | 500 | 1 | ML81 | ivsg_hs_alt3bd2 | 1120 | -1297.1 | -19.8 | 3279.1 | 1297.2 | 1.16 | 0.67 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_002 | ivsg_hs_alt3bd2 | 204.1 | 225 | 5.3 | 976.3 | 225 | 1.143 | 0.91 | IMPRLVLY - MIGUEL 1 500kV |
| 24729 | INYO | 230 | 24730 | INYO PS | 115 | 1 | line_175 | ivsg_hs_alt3bd2 | 50 | 51.8 | 21.3 | 133.1 | 56 | 1.12 | 0.54 | line INYO to COTTONWD 230 ck 1 |
| 24729 | INYO | 230 | 24730 | INYO PS | 115 | 2 | line_175 | ivsg_hs_alt3bd2 | 50 | 51.8 | 21.3 | 133.1 | 56 | 1.12 | 0.54 | line INYO to COTTONWD 230 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | SX70 | ivsg_hs_alt3bd2 | 204.1 | 229.5 | 2.2 | 955.3 | 229.5 | 1.119 | 0.91 | tran SYCAMORE 230 to SYCAMORE 69 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | ML60 | ivsg_hs_alt3bd2 | 204.1 | 227.7 | -7.1 | 950.6 | 227.8 | 1.113 | 0.91 | tran MIGUEL 230 to MIGUEL 138 ck 1 |
| 22504 | MISSION | 230 | 22500 | MISSION | 138 | 2 | MS60 | ivsg_hs_alt3bd2 | 392 | 413 | 115.6 | 1085.9 | 428.9 | 1.09 | 0.73 | tran MISSION 230 to MISSION 138 ck 1 |
| 22504 | MISSION | 230 | 22500 | MISSION | 138 | 1 | MS61 | ivsg_hs_alt3bd2 | 392 | 413 | 115.6 | 1085.9 | 428.9 | 1.09 | 0.73 | tran MISSION 230 to MISSION 138 ck 2 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 2 | line_070 | ivsg_hs_alt3bd2 | 956 | -1024.3 | -31.6 | 2604 | 1024.8 | 1.085 | 0.595 | line LA FRESA to REDONDO 230 ck 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 1 | line_071 | ivsg_hs_alt3bd2 | 956 | -1024.3 | -31.6 | 2604 | 1024.8 | 1.085 | 0.595 | line LA FRESA to REDONDO 230 ck 2 |
| 24701 | KRAMER | 230 | 24085 | LUGO | 230 | 2 | line_169 | ivsg_hs_alt3bd2 | 478 | 526.2 | -2.8 | 1297.9 | 526.2 | 1.082 | 0.643 | line KRAMER to LUGO 230 ck 1 |
| 24701 | KRAMER | 230 | 24085 | LUGO | 230 | 1 | line_170 | ivsg_hs_alt3bd2 | 478 | 526.2 | -2.8 | 1297.9 | 526.2 | 1.082 | 0.643 | line KRAMER to LUGO 230 ck 2 |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | line_12 | ivsg_hs_alt3bd2 | 132 | 141.7 | -10 | 892 | 142.1 | 1.077 | 0.953 | line COACHELA to RAMON 230 ck 2 |
| 20238 | HRD-230 | 230 | 20239 | HRD-115 | 115 | 1 | B2_002 | ivsg_hs_alt3bd2 | 225 | 241.4 | -5.1 | 622.1 | 241.5 | 1.07 | 0.71 | IMPRLVLY - MIGUEL 1 500kV |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_169 | ivsg_hs_alt3bd2 | 56 | 58 | -10 | 292.8 | 58.8 | 1.06 | 0.92 | line KRAMER to LUGO 230 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_170 | ivsg_hs_alt3bd2 | 56 | 58 | -10 | 292.8 | 58.8 | 1.06 | 0.92 | line KRAMER to LUGO 230 ck 2 |
| 22001 | NORTHSD | 230 | 22000 | NORTHSD | 500 | 1 | B2_002 | ivsg_hs_alt3bd2 | 1120 | -1175.4 | -20.1 | 2943.4 | 1175.5 | 1.05 | 0.5 | IMPRLVLY - MIGUEL 1 500kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | MS60 | ivsg_hs_alt3bd2 | 204.1 | 211.5 | -4.3 | 881.6 | 211.6 | 1.032 | 0.91 | tran MISSION 230 to MISSION 138 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | MS61 | ivsg_hs_alt3bd2 | 204.1 | 211.5 | -4.3 | 881.6 | 211.6 | 1.032 | 0.91 | tran MISSION 230 to MISSION 138 ck 2 |
| 24114 | PARDEE | 230 | 24200 | SAUG TAP | 230 | 2 | line_117 | ivsg_hs_alt3bd2 | 494 | 501.7 | 27.1 | 1274.9 | 502.5 | 1.028 | 0.51 | line PARDEE to SAUG TAP 230 ck 1 |
| 24114 | PARDEE | 230 | 24200 | SAUG TAP | 230 | 1 | line_118 | ivsg_hs_alt3bd2 | 494 | 501.7 | 27 | 1274.8 | 502.4 | 1.028 | 0.517 | line PARDEE to SAUG TAP 230 ck 2 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | B2_009 | ivsg_hs_alt3bd2 | 392 | 399.7 | -8.5 | 1013.2 | 399.7 | 1.02 | 0.77 | EPP - ESCNDIDO 1 230kV |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_192 | ivsg_hs_alt3bd2 | 169 | 169.8 | 38.8 | 612.6 | 174.2 | 1.015 | 0.814 | line IRON MTN to CAMINO 230 ck 1 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | B2_002 | ivsg_hs_alt3bd2 | 388 | -383.1 | -5.2 | 983.3 | 383.1 | 1.01 | 0.536 | IMPRLVLY - MIGUEL 1 500kV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | B2_032 | ivsg_hs_alt3bd2 | 392 | 395.5 | -7.5 | 1013.3 | 395.6 | 1.01 | 0.77 | OTAYMESA - MLMS3TAP 1 230kV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | B2_034 | ivsg_hs_alt3bd2 | 392 | 395.6 | -6.9 | 1013.8 | 395.6 | 1.01 | 0.77 | OLD TOWN - MLMS3TAP 1 230kV |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_201 | ivsg_hs_alt3bd2 | 56 | 54.6 | -10.7 | 276.6 | 55.7 | 1.01 | 0.92 | line SYLMAR3 to SYLMAR S 230 ck 1 |
| 24303 | BIG CRK3 | 230 | 24235 | RECTOR | 230 | 1 | line_155 | ivsg_hs_alt3bd2 | 353 | 361 | 49.1 | 894 | 364.3 | 1.009 | 0.729 | line BIG CRK1 to RECTOR 230 ck 1 |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | line_52 | ivsg_hs_alt3bd2 | 132 | 133.1 | -12.7 | 834.7 | 133.7 | 1.008 | 0.953 | line AVE58230 to AV58TP22 230 ck 1 |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | line_53 | ivsg_hs_alt3bd2 | 132 | 133.2 | -12.4 | 834.2 | 133.8 | 1.007 | 0.953 | line AV58TP22 to COACHELA 230 ck 1 |
| 24301 | BIG CRK1 | 230 | 24235 | RECTOR | 230 | 1 | line_160 | ivsg_hs_alt3bd2 | 329 | 334.9 | 47.2 | 825.7 | 338.2 | 1 | 0.727 | line BIG CRK3 to RECTOR 230 ck 1 |
| 8601 | GEOSUB2 | 230 | 8300 | BANIS230 | 230 | 1 | line_22 | ivsg_hs_alt3bd2 | 550 | 557.8 | 48 | 1377.8 | 559.8 | 0.998 | 0.734 | line GEOSUB1 to BANIS230 230 ck 1 |
| 8601 | GEOSUB2 | 230 | 8300 | BANIS230 | 230 | 1 | line_23 | ivsg_hs_alt3bd2 | 550 | 557.8 | 48 | 1377.8 | 559.8 | 0.998 | 0.734 | line GEOSUB1 to BANIS230 230 ck 2 |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | B2_002 | ivsg_hs_alt3bd2 | 132 | 129.9 | -10.4 | 826.2 | 130.3 | 0.997 | 0.953 | IMPRLVLY - MIGUEL 1 500kV |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | line_7 | ivsg_hs_alt3bd2 | 132 | 129.8 | -11.6 | 825.3 | 130.4 | 0.996 | 0.953 | line BANIS230 to NEWSF230 230 ck 1 |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | tran_74 | ivsg_hs_alt3bd2 | 132 | 129.9 | -11.5 | 824.9 | 130.4 | 0.996 | 0.953 | tran NEWSF230 230 to NEWSF500 500 ck 1 |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | line_68 | ivsg_hs_alt3bd2 | 132 | 129.4 | -10.9 | 820.6 | 129.8 | 0.991 | 0.953 | line NORTHSD to NEWSF500 500 ck 1 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24086 | LUGO | 500 | 24097 | MOHAVE | 500 | 1 | line_103 | ivsg_hs_alt3bd2 | 1386 | -1427.2 | 100.7 | 1561.4 | 1430.7 | 0.987 | 0.671 | line MOHAVE to ELDORDO 500 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_007 | ivsg_hs_alt3bd2 | 204.1 | 201.7 | -6.7 | 841.6 | 201.8 | 0.986 | 0.91 | PENSQTOS - ENCINA 1 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | ML70 | ivsg_hs_alt3bd2 | 204.1 | 201.3 | -5.1 | 839.4 | 201.4 | 0.983 | 0.91 | tran MIGUEL 69 to MIGUEL 230 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | ML71 | ivsg_hs_alt3bd2 | 204.1 | 201.3 | -5.1 | 839.4 | 201.4 | 0.983 | 0.91 | tran MIGUEL 69 to MIGUEL 230 ck 2 |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_191 | ivsg_hs_alt3bd2 | 169 | 163.2 | 36.3 | 587.9 | 167.2 | 0.974 | 0.814 | line EAGLEMTN to IRON MTN 230 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_123 | ivsg_hs_alt3bd2 | 56 | 52.6 | -10.7 | 266.5 | 53.7 | 0.97 | 0.92 | line PASTORIA to PSTRIA 230 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_200 | ivsg_hs_alt3bd2 | 56 | 52.7 | -10.8 | 266.7 | 53.7 | 0.97 | 0.92 | line SYLMAR1 to SYLMAR S 230 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | tran_210 | ivsg_hs_alt3bd2 | 56 | 52.5 | -10.5 | 265.5 | 53.5 | 0.97 | 0.92 | tran LUGO 500 to LUGO 230 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | tran_211 | ivsg_hs_alt3bd2 | 56 | 52.5 | -10.5 | 265.6 | 53.6 | 0.97 | 0.92 | tran LUGO 500 to LUGO 230 ck 2 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_015 | ivsg_hs_alt3bd2 | 204.1 | 198.5 | -8.7 | 826.2 | 198.7 | 0.968 | 0.91 | MIGUEL - MISSION 1 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_020 | ivsg_hs_alt3bd2 | 204.1 | 198.2 | -9.2 | 824.7 | 198.4 | 0.966 | 0.91 | MIGUEL - MISSION 2 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | MS70 | ivsg_hs_alt3bd2 | 204.1 | 197.1 | -3 | 821.9 | 197.1 | 0.963 | 0.91 | tran MISSION 230 to MISSION 69 ck 1 |
| 19020 | BLYTHE | 161 | 24017 | BLYTHESC | 161 | 1 | line_192 | ivsg_hs_alt3bd2 | 244 | 236.3 | 39.1 | 842.3 | 239.6 | 0.963 | 0.828 | line IRON MTN to CAMINO 230 ck 1 |
| 8600 | GEOSUB1 | 230 | 8300 | BANIS230 | 230 | 1 | line_47 | ivsg_hs_alt3bd2 | 550 | 536.5 | 45.7 | 1325.6 | 538.4 | 0.96 | 0.681 | line GEOSUB2 to BANIS230 230 ck 1 |
| 8600 | GEOSUB1 | 230 | 8300 | BANIS230 | 230 | 2 | line_47 | ivsg_hs_alt3bd2 | 550 | 536.5 | 45.7 | 1325.6 | 538.4 | 0.96 | 0.681 | line GEOSUB2 to BANIS230 230 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_086 | ivsg_hs_alt3bd2 | 56 | 52 | -10.7 | 263.5 | 53.1 | 0.96 | 0.92 | line MAGUNDEN to OMAR 230 ck 1 |
| 8600 | GEOSUB1 | 230 | 8300 | BANIS230 | 230 | 2 | line_22 | ivsg_hs_alt3bd2 | 550 | 531.3 | 46.5 | 1312.1 | 533.3 | 0.951 | 0.681 | line GEOSUB1 to BANIS230 230 ck 1 |
| 8600 | GEOSUB1 | 230 | 8300 | BANIS230 | 230 | 1 | line_23 | ivsg_hs_alt3bd2 | 550 | 531.3 | 46.5 | 1312.1 | 533.3 | 0.951 | 0.681 | line GEOSUB1 to BANIS230 230 ck 2 |
| 14008 | JOJOBA | 500 | 15011 | KYRENE | 500 | 1 | PV1 | ivsg_hs_alt3bd2 | 1732 | 1736.9 | 169.4 | 1891.2 | 1745.1 | 0.949 | 0.992 | gen PALOVRD1 24.00 |
| 24807 | MIRAGE | 115 | 24819 | CONCHO | 115 | 1 | tran_238 | ivsg_hs_alt3bd2 | 183 | 164.1 | -5.4 | 870.2 | 164.2 | 0.947 | 0.864 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_015 | ivsg_hs_alt3bd2 | 392 | 367.8 | 38.7 | 926.6 | 369.8 | 0.94 | 0.86 | MIGUEL - MISSION 1 230kV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_020 | ivsg_hs_alt3bd2 | 392 | 366.6 | 37.3 | 924 | 368.5 | 0.94 | 0.86 | MIGUEL - MISSION 2 230kV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | ML70 | ivsg_hs_alt3bd2 | 392 | 366.3 | 39.7 | 927.3 | 368.5 | 0.94 | 0.86 | tran MIGUEL 69 to MIGUEL 230 ck 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | ML71 | ivsg_hs_alt3bd2 | 392 | 366.3 | 39.7 | 927.3 | 368.5 | 0.94 | 0.86 | tran MIGUEL 69 to MIGUEL 230 ck 2 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | SX60 | ivsg_hs_alt3bd2 | 392 | 366.9 | 35.4 | 927.8 | 368.6 | 0.94 | 0.86 | tran SYCAMORE 230 to SYCAMORE 138 ck 1 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | SX70 | ivsg_hs_alt3bd2 | 392 | 368.2 | 16.4 | 925.4 | 368.6 | 0.94 | 0.77 | tran SYCAMORE 230 to SYCAMORE 69 ck 1 |
| 19020 | BLYTHE | 161 | 24017 | BLYTHESC | 161 | 1 | line_191 | ivsg_hs_alt3bd2 | 244 | 229.7 | 36.6 | 817.7 | 232.6 | 0.935 | 0.828 | line EAGLEMTN to IRON MTN 230 ck 1 |
| 24807 | MIRAGE | 115 | 24816 | SANTA RO | 115 | 1 | tran_238 | ivsg_hs_alt3bd2 | 183.3 | 162.1 | -10.9 | 860.6 | 162.4 | 0.935 | 0.855 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_63 | ivsg_hs_alt3bd2 | 169 | 157.7 | 26 | 562 | 159.8 | 0.93 | 0.814 | line RAMON to MIRAGE 230 ck 2 |
| 22609 | OTAYMESA | 230 | 20149 | TJI-230 | 230 | 1 | B2_002 | ivsg_hs_alt3bd2 | 796.7 | -726.3 | 85.8 | 1857.2 | 731.3 | 0.929 | 0.514 | IMPRLVLY - MIGUEL 1 500kV |
| 22832 | SYCAMORE | 230 | 22467 | MLSXTAP | 230 | 1 | B2_034 | ivsg_hs_alt3bd2 | 796.7 | -718.6 | 80.4 | 1852.9 | 723.1 | 0.927 | 0.432 | OLD TOWN - MLMS3TAP 1 230kV |
| 24303 | BIG CRK3 | 230 | 24235 | RECTOR | 230 | 1 | line_139 | ivsg_hs_alt3bd2 | 353 | 335.6 | 44.1 | 821.6 | 338.5 | 0.927 | 0.729 | line SPRINGVL to BIG CRK4 230 ck 1 |
| 22832 | SYCAMORE | 230 | 22467 | MLSXTAP | 230 | 1 | B2_032 | ivsg_hs_alt3bd2 | 796.7 | -718.5 | 81.6 | 1852.4 | 723.1 | 0.926 | 0.432 | OTAYMESA - MLMS3TAP 1 230kV |
| 24614 | TAP601 | 115 | 24702 | KRAMER | 115 | 1 | line_169 | ivsg_hs_alt3bd2 | 217.1 | -189.1 | 72.6 | 1001 | 202.6 | 0.921 | 0.716 | line KRAMER to LUGO 230 ck 1 |
| 24614 | TAP601 | 115 | 24702 | KRAMER | 115 | 1 | line_170 | ivsg_hs_alt3bd2 | 217.1 | -189.1 | 72.6 | 1001 | 202.6 | 0.921 | 0.716 | line KRAMER to LUGO 230 ck 2 |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_12 | ivsg_hs_alt3bd2 | 169 | 156 | 25.9 | 556.1 | 158.2 | 0.92 | 0.814 | line COACHELA to RAMON 230 ck 2 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | line_68 | ivsg_hs_alt3bd2 | 392 | 360.7 | 28.5 | 922.1 | 361.8 | 0.92 | 0.86 | line NORTHSD to NEWSF500 500 ck 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_032 | ivsg_hs_alt3bd2 | 392 | 359.9 | 35.9 | 921.9 | 361.6 | 0.92 | 0.86 | OTAYMESA - MLMS3TAP 1 230kV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_034 | ivsg_hs_alt3bd2 | 392 | 359.8 | 36.3 | 922.4 | 361.6 | 0.92 | 0.86 | OLD TOWN - MLMS3TAP 1 230kV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_028 | ivsg_hs_alt3bd2 | 392 | 355.9 | 34.7 | 896 | 357.6 | 0.91 | 0.86 | MIGUEL - SYCAMORE 1 230kV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | MS60 | ivsg_hs_alt3bd2 | 392 | 353.7 | 38.5 | 893.5 | 355.8 | 0.91 | 0.86 | tran MISSION 230 to MISSION 138 ck 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | MS61 | ivsg_hs_alt3bd2 | 392 | 353.7 | 38.5 | 893.5 | 355.8 | 0.91 | 0.86 | tran MISSION 230 to MISSION 138 ck 2 |
| 24301 | BIG CRK1 | 230 | 24235 | RECTOR | 230 | 1 | line_156 | ivsg_hs_alt3bd2 | 329 | 305.6 | 3.6 | 751.8 | 305.6 | 0.91 | 0.727 | line BIG CRK1 to BIG CRK2 230 ck 1 |
| 19020 | BLYTHE | 161 | 24017 | BLYTHESC | 161 | 1 | line_63 | ivsg_hs_alt3bd2 | 244 | 224.2 | 26.2 | 793.6 | 225.7 | 0.907 | 0.828 | line RAMON to MIRAGE 230 ck 2 |
| 22596 | OLD TOWN | 230 | 22466 | MLMS3TAP | 230 | 1 | B2_031 | ivsg_hs_alt3bd2 | 912 | -808.6 | 102.7 | 2075.2 | 815.1 | 0.907 | 0.629 | SYCAMORE - MLSXTAP 1 230kV |
| 24602 | VICTOR | 115 | 24702 | KRAMER | 115 | 1 | line_169 | ivsg_hs_alt3bd2 | 217.1 | -184.5 | 82.6 | 985.1 | 202.1 | 0.907 | 0.703 | line KRAMER to LUGO 230 ck 1 |
| 24602 | VICTOR | 115 | 24702 | KRAMER | 115 | 1 | line_170 | ivsg_hs_alt3bd2 | 217.1 | -184.5 | 82.6 | 985.1 | 202.1 | 0.907 | 0.703 | line KRAMER to LUGO 230 ck 2 |
| 22596 | OLD TOWN | 230 | 22466 | MLMS3TAP | 230 | 1 | B2_029 | ivsg_hs_alt3bd2 | 912 | -808.5 | 104.6 | 2074.3 | 815.2 | 0.906 | 0.629 | OTAYMESA - MLSXTAP 1 230kV |
| 24301 | BIG CRK1 | 230 | 24302 | BIG CRK2 | 230 | 1 | line_155 | ivsg_hs_alt3bd2 | 329 | 305.6 | -23.6 | 745.5 | 306.5 | 0.903 | 0.248 | line BIG CRK1 to RECTOR 230 ck 1 |
| 24807 | MIRAGE | 115 | 24819 | CONCHO | 115 | 1 | line_65 | ivsg_hs_alt3bd2 | 183 | 163.9 | -7.8 | 828.3 | 164.1 | 0.902 | 0.864 | line MIRAGE to DEVERS 230 ck 2 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_079 | ivsg_hs_alt3bd2 | 2400 | -2271.2 | -28.1 | 2498 | 2271.3 | 0.901 | 0.715 | line LUGO to MOHAVE 500 ck 1 |
| 19020 | BLYTHE | 161 | 24017 | BLYTHESC | 161 | 1 | line_12 | ivsg_hs_alt3bd2 | 244 | 222.5 | 26.2 | 787.8 | 224.1 | 0.9 | 0.828 | line COACHELA to RAMON 230 ck 2 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_022 | ivsg_hs_alt3bd2 | 392 | 353.1 | 25.7 | 894.5 | 354 | 0.9 | 0.86 | OTAYMESA - TJI-230 1 230kV |
| 22504 | MISSION | 230 | 22500 | MISSION | 138 | 1 | MS70 | ivsg_hs_alt3bd2 | 392 | 338.5 | 98.4 | 894.1 | 352.5 | 0.9 | 0.73 | tran MISSION 230 to MISSION 69 ck 1 |
| 22504 | MISSION | 230 | 22500 | MISSION | 138 | 2 | MS70 | ivsg_hs_alt3bd2 | 392 | 338.5 | 98.4 | 894.1 | 352.5 | 0.9 | 0.73 | tran MISSION 230 to MISSION 69 ck 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | OT70 | ivsg_hs_alt3bd2 | 392 | 350 | 35.3 | 883.9 | 351.8 | 0.9 | 0.86 | tran OLD TOWN 69 to OLD TOWN 230 ck 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | OT71 | ivsg_hs_alt3bd2 | 392 | 350 | 35.3 | 883.9 | 351.8 | 0.9 | 0.86 | tran OLD TOWN 69 to OLD TOWN 230 ck 2 |
| 24729 | INYO | 230 | 24730 | INYO PS | 115 | 2 | tran_230 | ivsg_hs_alt3bd2 | 50 | -41.9 | 15.9 | 105.2 | 44.8 | 0.9 | 0.54 | tran INYO 230 to INYO PS 115 ck 1 |
| 24729 | INYO | 230 | 24730 | INYO PS | 115 | 1 | tran_231 | ivsg_hs_alt3bd2 | 50 | -41.9 | 15.9 | 105.2 | 44.8 | 0.9 | 0.54 | tran INYO 230 to INYO PS 115 ck 2 |
| 24805 | DEVERS | 115 | 24804 | DEVERS | 230 | 1 | tran_236 | ivsg_hs_alt3bd2 | 280 | -246.1 | 52.5 | 1261.9 | 251.6 | 0.9 | 0.6 | tran DEVERS 115 to DEVERS 230 ck 3 |

ivsg_hs_alt3bd2.sav
VOLTAGE Summary
N-2 Outages

| Bus | Name | kV | Area | Zone | Outage | Case | Vbase | Vcont | DeltaV | Vmin | Vmax | Max-dv | Contingency Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24058 | GOLETA | 230 | 24 | 240 | line_2269 | ivsg_hs_alt3bd2 | 0.985 | 0.93 | -0.054 | 0.9 | 1.05 | 0.05 | S.CLARA 230.00 - GOLETA 230.00 1, S.CLARA 230.00 - MOORPARK 230.00 1 |
| 24058 | GOLETA | 230 | 24 | 240 | line_2270 | ivsg_hs_alt3bd2 | 0.985 | 0.93 | -0.054 | 0.9 | 1.05 | 0.05 | S.CLARA 230.00 - GOLETA 230.00 2, S.CLARA 230.00 - MOORPARK 230.00 2 |
| 22734 | SANTEE | 138 | 22 | 223 | 23021/22/23/41 | ivsg_hs_alt3bd2 | 0.998 | 0.938 | -0.06 | 0.9 | 1.05 | 0.05 | MIGUEL 230 CORRIDOR West of SN |
| 22412 | LOSCOCHS | 138 | 22 | 223 | 23021/22/23/41 | ivsg_hs_alt3bd2 | 0.998 | 0.943 | -0.055 | 0.9 | 1.05 | 0.05 | MIGUEL 230 CORRIDOR West of SN |
| 24819 | CONCHO | 115 | 24 | 248 | line_2182 | ivsg_hs_alt3bd2 | 1.03 | 0.978 | -0.052 | 0.9 | 1.05 | 0.05 | DEVERS 230.00 - MIRAGE 230.00 2, COACHELV 230.00 - DEVERS 230.00 2 |
| 24822 | INDIAN W | 115 | 24 | 248 | line_2182 | ivsg_hs_alt3bd2 | 1.03 | 0.978 | -0.052 | 0.9 | 1.05 | 0.05 | DEVERS 230.00 - MIRAGE 230.00 2, COACHELV 230.00 - DEVERS 230.00 2 |
| 24816 | SANTA RO | 115 | 24 | 248 | line_2182 | ivsg_hs_alt3bd2 | 1.034 | 0.982 | -0.052 | 0.9 | 1.05 | 0.05 | DEVERS 230.00 - MIRAGE 230.00 2, COACHELV 230.00 - DEVERS 230.00 2 |
| 24821 | TAMARISK | 115 | 24 | 248 | line_2182 | ivsg_hs_alt3bd2 | 1.034 | 0.983 | -0.051 | 0.9 | 1.05 | 0.05 | DEVERS 230.00 - MIRAGE 230.00 2, COACHELV 230.00 - DEVERS 230.00 2 |
| 24827 | TAP823 | 115 | 24 | 248 | line_2182 | ivsg_hs_alt3bd2 | 1.036 | 0.984 | -0.051 | 0.9 | 1.05 | 0.05 | DEVERS 230.00 - MIRAGE 230.00 2, COACHELV 230.00 - DEVERS 230.00 2 |
| 25633 | CAPWIND | 115 | 24 | 248 | line_2182 | ivsg_hs_alt3bd2 | 1.036 | 0.985 | -0.051 | 0.9 | 1.05 | 0.05 | DEVERS 230.00 - MIRAGE 230.00 2, COACHELV 230.00 - DEVERS 230.00 2 |
| 25622 | TAP806 | 115 | 24 | 248 | line_2182 | ivsg_hs_alt3bd2 | 1.036 | 0.985 | -0.051 | 0.9 | 1.05 | 0.05 | DEVERS 230.00 - MIRAGE 230.00 2, COACHELV 230.00 - DEVERS 230.00 2 |
| 24829 | TAP821 | 115 | 24 | 248 | line_2182 | ivsg_hs_alt3bd2 | 1.036 | 0.985 | -0.051 | 0.9 | 1.05 | 0.05 | DEVERS 230.00 - MIRAGE 230.00 2, COACHELV 230.00 - DEVERS 230.00 2 |
| 24807 | MIRAGE | 115 | 24 | 248 | line_2182 | ivsg_hs_alt3bd2 | 1.038 | 0.987 | -0.051 | 0.9 | 1.05 | 0.05 | DEVERS 230.00 - MIRAGE 230.00 2, COACHELV 230.00 - DEVERS 230.00 2 |
| 25001 | GOODRICH | 230 | 24 | 250 | line_2073 | ivsg_hs_alt3bd2 | 0.96 | 1.044 | 0.084 | 0.9 | 1.05 | 0.05 | GOODRICH 230.00 - GOULD 230.00 1, GOODRICH 230.00 - LAGUBELL 230.00 1 |
| 24058 | GOLETA | 230 | 24 | 240 | line_2120 | ivsg_hs_alt3bd2 | 0.985 | 1.044 | 0.06 | 0.9 | 1.05 | 0.05 | S.CLARA 230.00 - GOLETA 230.00 1, S.CLARA 230.00 - GOLETA 230.00 2 |

ivsg_hs_alt3bd2.sav
FLOW Summary
N-2 Outages

| LEGEND | % of RATING 1 | |
|---|---|---|
| C_pu | 100% - 110% | |
| C_pu | 110% - 120% | P.U. of |
| C_pu | > 120% | Rate 1 |

| FROM | FR | BKV | TO | TO | BKV | CK | Outage_Name | Case | Rate-Mva | Pflow | Qflow | Amps | MVA | C_pu | B_pu | Contingency_Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt3bd2 | 392 | 539.8 | 94 | 1393.2 | 547.9 | 1.4 | 0.86 | MIGUEL 230 CORRIDOR West of SN |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt3bd2 | 392 | 532.4 | 87.6 | 1362.4 | 539.5 | 1.38 | 0.86 | MIGUEL 230 CORRIDOR West of LC |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt3bd2 | 408.3 | -531.4 | -14.3 | 2248.9 | 531.6 | 1.317 | 0.794 | MIGUEL 230 CORRIDOR West of SN |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt3bd2 | 392 | 496.4 | 86.8 | 1270.6 | 503.9 | 1.29 | 0.86 | MIGUEL 230 CORRIDOR North of ML |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt3bd2 | 408.3 | -524.3 | -11.4 | 2199.1 | 524.4 | 1.287 | 0.794 | MIGUEL 230 CORRIDOR West of LC |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23051B/23011 | ivsg_hs_alt3bd2 | 204.1 | 245 | -20 | 1026.9 | 245.8 | 1.203 | 0.91 | EPP-ES + ES-EA-SA 230KV |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt3bd2 | 408.3 | -489.3 | -20.5 | 2051 | 489.8 | 1.201 | 0.794 | MIGUEL 230 CORRIDOR North of ML |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 2 | line_2046 | ivsg_hs_alt3bd2 | 956 | -1124.1 | -37.6 | 2857.1 | 1124.7 | 1.191 | 0.595 | LA FRESA 230.00 - REDONDO 230.00 1, REDONDO 230.00 - LITEHIPE 230.00 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 1 | line_2047 | ivsg_hs_alt3bd2 | 956 | -1124.1 | -37.6 | 2857.1 | 1124.7 | 1.191 | 0.595 | LA FRESA 230.00 - REDONDO 230.00 2, REDONDO 230.00 - LITEHIPE 230.00 1 |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt3bd2 | 382.4 | 442 | 25.5 | 1882.8 | 442.7 | 1.177 | 0.63 | MIGUEL 230 CORRIDOR West of SN |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt3bd2 | 382.4 | 435 | 24.3 | 1836 | 435.7 | 1.148 | 0.63 | MIGUEL 230 CORRIDOR West of LC |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 2 | line_2064 | ivsg_hs_alt3bd2 | 956 | -1076.1 | -43.1 | 2735.1 | 1077 | 1.14 | 0.595 | LA FRESA 230.00 - REDONDO 230.00 1, MESA CAL 230.00 - REDONDO 230.00 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 1 | line_2065 | ivsg_hs_alt3bd2 | 956 | -1076.1 | -43.1 | 2735.1 | 1077 | 1.14 | 0.595 | LA FRESA 230.00 - REDONDO 230.00 2, MESA CAL 230.00 - REDONDO 230.00 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23022/23023 | ivsg_hs_alt3bd2 | 392 | 433.4 | 54.4 | 1094 | 436.8 | 1.11 | 0.86 | ML-MS1+ ML-MS2 230KV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 13821C/25/23051A | ivsg_hs_alt3bd2 | 204.1 | 223.4 | -23.7 | 939.7 | 224.6 | 1.1 | 0.91 | CH-ES-NCM-SX |
| 8376 | RTAP2 | 92 | 8974 | RTP1 | 92 | 1 | line_N-204 | ivsg_hs_alt3bd2 | 57 | -58.4 | 12 | 388.7 | 59.6 | 1.089 | 0.67 | COACHELLA MIDWAY 230 CKT 1&2 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 2 | line_2049 | ivsg_hs_alt3bd2 | 956 | -1024.7 | -38.4 | 2607.8 | 1025.4 | 1.087 | 0.595 | LA FRESA 230.00 - REDONDO 230.00 1, LCIENEGA 230.00 - LA FRESA 230.00 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 1 | line_2050 | ivsg_hs_alt3bd2 | 956 | -1024.7 | -38.4 | 2607.8 | 1025.4 | 1.087 | 0.595 | LA FRESA 230.00 - REDONDO 230.00 2, LCIENEGA 230.00 - LA FRESA 230.00 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 2 | line_2057 | ivsg_hs_alt3bd2 | 956 | -1024.2 | -35.1 | 2605.3 | 1024.8 | 1.086 | 0.595 | EL NIDO 230.00 - LA FRESA 230.00 3, LA FRESA 230.00 - REDONDO 230.00 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 1 | line_2058 | ivsg_hs_alt3bd2 | 956 | -1024.2 | -35.1 | 2605.3 | 1024.8 | 1.086 | 0.595 | EL NIDO 230.00 - LA FRESA 230.00 3, LA FRESA 230.00 - REDONDO 230.00 2 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 2 | line_2059 | ivsg_hs_alt3bd2 | 956 | -1024.2 | -35.1 | 2605.3 | 1024.8 | 1.086 | 0.595 | EL NIDO 230.00 - LA FRESA 230.00 4, LA FRESA 230.00 - REDONDO 230.00 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 1 | line_2060 | ivsg_hs_alt3bd2 | 956 | -1024.2 | -35.1 | 2605.3 | 1024.8 | 1.086 | 0.595 | EL NIDO 230.00 - LA FRESA 230.00 4, LA FRESA 230.00 - REDONDO 230.00 2 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 2 | line_2029 | ivsg_hs_alt3bd2 | 1195 | 1268.8 | -21.3 | 3252.6 | 1269 | 1.084 | 0.54 | LEWIS 230.00 - SERRANO 230.00 1, SERRANO 230.00 - VILLA PK 230.00 1 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 2 | line_2031 | ivsg_hs_alt3bd2 | 1195 | 1268.8 | -21.3 | 3252.6 | 1269 | 1.084 | 0.54 | LEWIS 230.00 - SERRANO 230.00 2, SERRANO 230.00 - VILLA PK 230.00 1 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 2 | line_2278 | ivsg_hs_alt3bd2 | 1195 | 1268.8 | -21.3 | 3252.6 | 1269 | 1.084 | 0.54 | LEWIS 230.00 - SERRANO 230.00 1, SERRANO 230.00 - VILLA PK 230.00 1 |
| 24701 | KRAMER | 230 | 24085 | LUGO | 230 | 2 | line_2260 | ivsg_hs_alt3bd2 | 478 | 526.5 | -1.4 | 1299 | 526.5 | 1.083 | 0.643 | KRAMER 230.00 - LUGO 230.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 8601 | GEOSUB2 | 230 | 8300 | BANIS230 | 230 | 1 | line_N-204 | ivsg_hs_alt3bd2 | 550 | 590.3 | 97.9 | 1490.1 | 598.3 | 1.08 | 0.734 | COACHELLA MIDWAY 230 CKT 1&2 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23022/23023 | ivsg_hs_alt3bd2 | 204.1 | 221 | -8.2 | 922.2 | 221.2 | 1.08 | 0.91 | ML-MS1+ ML-MS2 230KV |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_N-203 | ivsg_hs_alt3bd2 | 169 | 181.1 | 35.5 | 649.1 | 184.6 | 1.074 | 0.814 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 24086 | LUGO | 500 | 24236 | RANCHVST | 500 | 1 | line_2194 | ivsg_hs_alt3bd2 | 2598 | 2907.9 | 451.1 | 3212.4 | 2942.7 | 1.072 | 0.597 | LUGO 500.00 - MIRALOMA 500.00 2, LUGO 500.00 - MIRALOMA 500.00 3 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_2260 | ivsg_hs_alt3bd2 | 56 | 57.8 | -10 | 292.1 | 58.7 | 1.06 | 0.92 | KRAMER 230.00 - LUGO 230.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 22672 | PRCTRVLY | 138 | 22852 | TELECYN | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt3bd2 | 478 | 500.5 | 10.4 | 2117.9 | 500.6 | 1.059 | 0.615 | MIGUEL 230 CORRIDOR West of SN |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt3bd2 | 382.4 | 400.4 | 36.1 | 1692.6 | 402 | 1.058 | 0.63 | MIGUEL 230 CORRIDOR North of ML |
| 8900 | PRUETTAP | 92 | 8691 | HIGHLINE | 92 | 1 | line_N-209 | ivsg_hs_alt3bd2 | 86 | -91.4 | 5.2 | 564.7 | 91.6 | 1.046 | 0.764 | EL CENTRO HIGHLINE 230 CKTS 1&2 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23011/13825 | ivsg_hs_alt3bd2 | 204.1 | 213 | -16.8 | 890.3 | 213.7 | 1.043 | 0.91 | ES-EA-SA 230KV + BQ-CC-ES-NCM 138KV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23012/13807 | ivsg_hs_alt3bd2 | 204.1 | 211.4 | -1.3 | 883.7 | 211.4 | 1.035 | 0.91 | PQ-EA 230KV + EA-NCW 138KV |
| 22672 | PRCTRVLY | 138 | 22852 | TELECYN | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt3bd2 | 478 | 493.4 | 7.5 | 2069.4 | 493.5 | 1.035 | 0.615 | MIGUEL 230 CORRIDOR West of LC |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23022/23023 | ivsg_hs_alt3bd2 | 408.3 | -428.2 | -5.4 | 1765.8 | 428.2 | 1.034 | 0.794 | ML-MS1+ ML-MS2 230KV |
| 30060 | MIDWAY | 500 | 24156 | VINCENT | 500 | 3 | line_2215 | ivsg_hs_alt3bd2 | 1848.1 | 2035 | 50.9 | 2200.8 | 2035.6 | 1.032 | 0.405 | MIDWAY 500.00 - VINCENT 500.00 1, MIDWAY 500.00 - VINCENT 500.00 2 |
| 24016 | BARRE | 230 | 24044 | ELLIS | 230 | 1 | line_2115 | ivsg_hs_alt3bd2 | 988 | 987.8 | -35.1 | 2556.7 | 988.5 | 1.031 | 0.301 | S.ONOFRE 230.00 - SANTIAGO 230.00 1, S.ONOFRE 230.00 - SANTIAGO 230.00 2 |
| 30060 | MIDWAY | 500 | 24156 | VINCENT | 500 | 1 | line_2220 | ivsg_hs_alt3bd2 | 1848.1 | 2013.7 | 53.5 | 2177.8 | 2014.4 | 1.023 | 0.324 | MIDWAY 500.00 - VINCENT 500.00 2, MIDWAY 500.00 - VINCENT 500.00 3 |
| 14008 | JOJOBA | 500 | 15011 | KYRENE | 500 | 1 | line_2245 | ivsg_hs_alt3bd2 | 1732 | 1865.3 | 170.8 | 2041.8 | 1873.1 | 1.023 | 0.992 | DEVERS 500.00 - VALLEYSC 500.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | 23051B/23011 | ivsg_hs_alt3bd2 | 392 | 398.6 | -8 | 1010.6 | 398.7 | 1.02 | 0.77 | EPP-ES + ES-EA-SA 230KV |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_N-204 | ivsg_hs_alt3bd2 | 169 | 171.5 | 34.3 | 615 | 174.9 | 1.018 | 0.814 | COACHELLA MIDWAY 230 CKT 1&2 |
| 24074 | LA FRESA | 230 | 24065 | HINSON | 230 | 1 | line_2061 | ivsg_hs_alt3bd2 | 797 | -779.3 | 49.5 | 2031.8 | 780.9 | 1.016 | 0.15 | LA FRESA 230.00 - REDONDO 230.00 1, LA FRESA 230.00 - REDONDO 230.00 2 |
| 22596 | OLD TOWN | 230 | 22466 | MLMS3TAP | 230 | 1 | 23021/22/23/41 | ivsg_hs_alt3bd2 | 912 | -888.8 | 101.7 | 2314.1 | 894.6 | 1.011 | 0.629 | MIGUEL 230 CORRIDOR West of SN |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23012/13808 | ivsg_hs_alt3bd2 | 204.1 | 206.5 | -2.5 | 862.5 | 206.5 | 1.01 | 0.91 | PQ-EA 230KV + NCW-PQ 138KV |
| 22596 | OLD TOWN | 230 | 22466 | MLMS3TAP | 230 | 1 | 23021/22/23/41 | ivsg_hs_alt3bd2 | 912 | -889.1 | 109.8 | 2309.2 | 895.8 | 1.009 | 0.629 | MIGUEL 230 CORRIDOR North of ML |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 1 | line_2030 | ivsg_hs_alt3bd2 | 1287 | 1268.8 | -21.3 | 3252.6 | 1269 | 1.007 | 0.501 | LEWIS 230.00 - SERRANO 230.00 1, SERRANO 230.00 - VILLA PK 230.00 2 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 1 | line_2032 | ivsg_hs_alt3bd2 | 1287 | 1268.8 | -21.3 | 3252.6 | 1269 | 1.007 | 0.501 | LEWIS 230.00 - SERRANO 230.00 2, SERRANO 230.00 - VILLA PK 230.00 2 |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | line_2236 | ivsg_hs_alt3bd2 | 132 | 131.1 | -10 | 832.4 | 131.5 | 1.005 | 0.953 | PALOVRDE 500.00 - DEVERS 500.00 1, COACHELV 230.00 - DEVERS 230.00 2 |
| 19020 | BLYTHE | 161 | 24017 | BLYTHESC | 161 | 1 | line_N-203 | ivsg_hs_alt3bd2 | 244 | 247.6 | 35.8 | 879.7 | 250.2 | 1.005 | 0.828 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 22596 | OLD TOWN | 230 | 22466 | MLMS3TAP | 230 | 1 | 23021/22/23/41 | ivsg_hs_alt3bd2 | 912 | -885.1 | 110.1 | 2296.9 | 891.9 | 1.004 | 0.629 | MIGUEL 230 CORRIDOR West of LC |
| 8900 | PRUETTAP | 92 | 8691 | HIGHLINE | 92 | 1 | line_N-204 | ivsg_hs_alt3bd2 | 86 | -86.7 | 9.6 | 538.9 | 87.3 | 0.999 | 0.764 | COACHELLA MIDWAY 230 CKT 1&2 |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | line_N-204 | ivsg_hs_alt3bd2 | 132 | 127.5 | -14.5 | 824.7 | 128.3 | 0.996 | 0.953 | COACHELLA MIDWAY 230 CKT 1&2 |
| 8600 | GEOSUB1 | 230 | 8300 | BANIS230 | 230 | 1 | line_N-204 | ivsg_hs_alt3bd2 | 550 | 540.6 | 87.3 | 1365 | 547.6 | 0.99 | 0.681 | COACHELLA MIDWAY 230 CKT 1&2 |
| 8600 | GEOSUB1 | 230 | 8300 | BANIS230 | 230 | 2 | line_N-204 | ivsg_hs_alt3bd2 | 550 | 540.6 | 87.3 | 1365 | 547.6 | 0.99 | 0.681 | COACHELLA MIDWAY 230 CKT 1&2 |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | line_2186 | ivsg_hs_alt3bd2 | 132 | 129.9 | -10.7 | 818.9 | 130.3 | 0.989 | 0.953 | COACHELV 230.00 - DEVERS 230.00 2, J.HINDS 230.00 - MIRAGE 230.00 1 |
| 24086 | LUGO | 500 | 24097 | MOHAVE | 500 | 1 | line_2234 | ivsg_hs_alt3bd2 | 1386 | -1427.3 | 100.6 | 1561.8 | 1430.8 | 0.987 | 0.671 | MOHAVE 500.00 - ELDORDO 500.00 1, PISGAH 230.00 - ELDORDO 230.00 2 |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | line_2237 | ivsg_hs_alt3bd2 | 132 | 128.8 | -10.7 | 815.5 | 129.3 | 0.984 | 0.953 | PALOVRDE 500.00 - DEVERS 500.00 1, J.HINDS 230.00 - MIRAGE 230.00 1 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_N-203 | ivsg_hs_alt3bd2 | 800 | 788.1 | 41.3 | 1970.8 | 789.2 | 0.981 | 0.688 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23004/23001 | ivsg_hs_alt3bd2 | 204.1 | 199.1 | -5.9 | 830 | 199.1 | 0.972 | 0.91 | SA-MS 1 + SA-MS 2 230KV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23002/06/10 | ivsg_hs_alt3bd2 | 204.1 | 197.7 | -5.2 | 829.3 | 197.8 | 0.971 | 0.91 | SANLUISREY 230 CORRIDOR |
| 19020 | BLYTHE | 161 | 24017 | BLYTHESC | 161 | 1 | line_N-204 | ivsg_hs_alt3bd2 | 244 | 238 | 34.6 | 845.6 | 240.5 | 0.966 | 0.828 | COACHELLA MIDWAY 230 CKT 1&2 |
| 22672 | PRCTRVLY | 138 | 22852 | TELECYN | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt3bd2 | 478 | 458.5 | 16.6 | 1921.2 | 458.8 | 0.961 | 0.615 | MIGUEL 230 CORRIDOR North of ML |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_2194 | ivsg_hs_alt3bd2 | 56 | 51.9 | -10.5 | 262.3 | 52.9 | 0.96 | 0.92 | LUGO 500.00 - MIRALOMA 500.00 2, LUGO 500.00 - MIRALOMA 500.00 3 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 13821B/638 | ivsg_hs_alt3bd2 | 392 | 369.7 | 40 | 937.5 | 371.8 | 0.95 | 0.86 | CH-SX-SN 138KV + SAN VCNT-EL 69KV |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23013/27/28 | ivsg_hs_alt3bd2 | 204.1 | 194.6 | -6.2 | 811.1 | 194.7 | 0.95 | 0.91 | OLD TOWN TO OLD TOWN JCT |
| 8311 | COACHELA | 230 | 8695 | RAMON | 230 | 2 | line_2236 | ivsg_hs_alt3bd2 | 800 | 728 | -38.9 | 1893.5 | 729.1 | 0.943 | 0.652 | PALOVRDE 500.00 - DEVERS 500.00 1, COACHELV 230.00 - DEVERS 230.00 2 |
| 24126 | RIOHONDO | 230 | 24155 | VINCENT | 230 | 2 | line_2097 | ivsg_hs_alt3bd2 | 988 | -884.9 | 72.9 | 2331.5 | 887.9 | 0.94 | 0.688 | GOODRICH 230.00 - GOULD 230.00 1, VINCENT 230.00 - MESA CAL 230.00 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23021/23041 | ivsg_hs_alt3bd2 | 392 | 367.5 | 37.5 | 932.6 | 369.4 | 0.94 | 0.86 | ML-SX + OM-SX 230KV |
| 24614 | TAP601 | 115 | 24702 | KRAMER | 115 | 1 | line_2260 | ivsg_hs_alt3bd2 | 217.1 | -189.2 | 72.2 | 1002 | 202.5 | 0.922 | 0.716 | KRAMER 230.00 - LUGO 230.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 8695 | RAMON | 230 | 24806 | MIRAGE | 230 | 2 | line_2236 | ivsg_hs_alt3bd2 | 800 | 697.6 | -167.3 | 1844.4 | 717.4 | 0.918 | 0.595 | PALOVRDE 500.00 - DEVERS 500.00 1, COACHELV 230.00 - DEVERS 230.00 2 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_N-210 | ivsg_hs_alt3bd2 | 800 | 737.6 | -6.8 | 1843.8 | 737.7 | 0.918 | 0.688 | EL CENTRO IMPERIAL VALLEY 230 CKTS 2&3 |
| 22596 | OLD TOWN | 230 | 22466 | MLMS3TAP | 230 | 1 | 23021/23041 | ivsg_hs_alt3bd2 | 912 | -815.8 | 99.6 | 2098 | 821.8 | 0.917 | 0.629 | ML-SX + OM-SX 230KV |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2100 | ivsg_hs_alt3bd2 | 2400 | -2302.8 | -180.8 | 2527.5 | 2309.8 | 0.912 | 0.715 | EAGLROCK 230.00 - MESA CAL 230.00 1, SYLMAR S 230.00 - GOULD 230.00 1 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2191 | ivsg_hs_alt3bd2 | 2400 | -2303.1 | -32.8 | 2525.7 | 2303.4 | 0.911 | 0.715 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - ELDORDO 230.00 2 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2200 | ivsg_hs_alt3bd2 | 2400 | -2294 | -24 | 2524.4 | 2294.1 | 0.911 | 0.715 | LUGO 500.00 - MOHAVE 500.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2201 | ivsg_hs_alt3bd2 | 2400 | -2293.8 | -24.1 | 2524.2 | 2293.9 | 0.911 | 0.715 | LUGO 500.00 - MOHAVE 500.00 1, PISGAH 230.00 - LUGO 230.00 2 |
| 24807 | MIRAGE | 115 | 24819 | CONCHO | 115 | 1 | line_2182 | ivsg_hs_alt3bd2 | 183 | 164 | -7.5 | 834.8 | 164.1 | 0.909 | 0.864 | DEVERS 230.00 - MIRAGE 230.00 2, COACHELV 230.00 - DEVERS 230.00 2 |
| 24126 | RIOHONDO | 230 | 24155 | VINCENT | 230 | 2 | line_2101 | ivsg_hs_alt3bd2 | 988 | -860.3 | 74.7 | 2252.4 | 863.6 | 0.908 | 0.688 | EAGLROCK 230.00 - MESA CAL 230.00 1, VINCENT 230.00 - MESA CAL 230.00 1 |
| 24602 | VICTOR | 115 | 24702 | KRAMER | 115 | 1 | line_2260 | ivsg_hs_alt3bd2 | 217.1 | -184.6 | 82.3 | 986.1 | 202.1 | 0.908 | 0.703 | KRAMER 230.00 - LUGO 230.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2192 | ivsg_hs_alt3bd2 | 2400 | -2291.6 | -42.4 | 2514 | 2292 | 0.907 | 0.715 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2193 | ivsg_hs_alt3bd2 | 2400 | -2291.3 | -42.5 | 2513.7 | 2291.7 | 0.907 | 0.715 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - LUGO 230.00 2 |
| 8332 | ELCENTSW | 230 | 8335 | ELSTEAMP | 92 | 1 | line_N-210 | ivsg_hs_alt3bd2 | 225 | 200.7 | 25.8 | 504 | 202.3 | 0.9 | 0.53 | EL CENTRO IMPERIAL VALLEY 230 CKTS 2&3 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | 23022/23023 | ivsg_hs_alt3bd2 | 392 | 351.6 | -0.3 | 887.4 | 351.6 | 0.9 | 0.77 | ML-MS1+ ML-MS2 230KV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23002/06/10 | ivsg_hs_alt3bd2 | 392 | 349.6 | 33.5 | 891.6 | 351.2 | 0.9 | 0.86 | SANLUISREY 230 CORRIDOR |

ivsg_hs_alt3bd2.sav
No Solve Summary
N-2 Outages

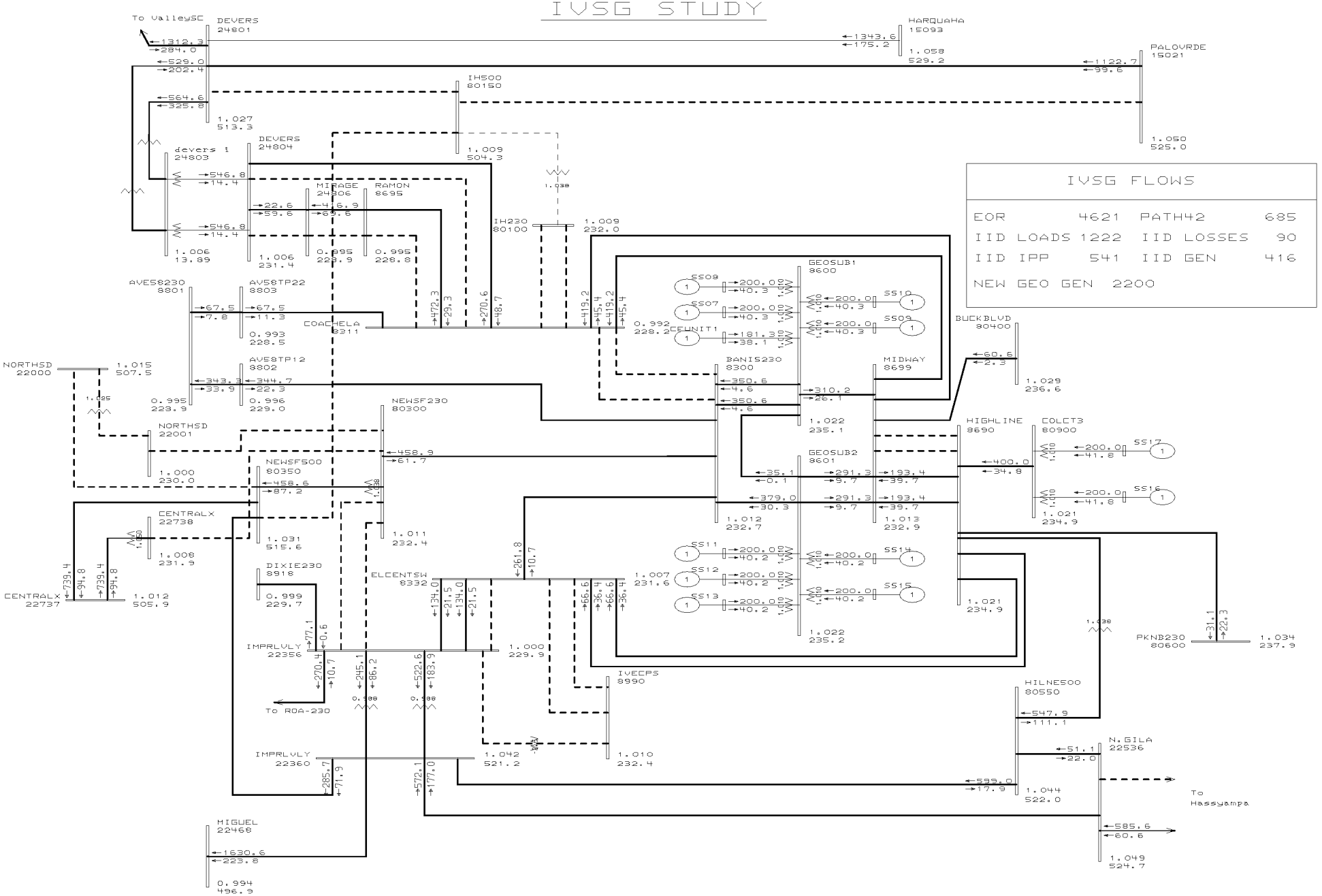
| Contingency-Description | Case | Problem-Description |
|---|---|---|
| DEVERS 230.00 - MIRAGE 230.00 2, RAMON 230.00 - MIRAGE 230.00 2 | ivsg_hs_alt3bd2 | Pmis 24019 CAMINO 230.00 = -18332208.00 MW + j -130439944.00 MVAR |
| VICTOR 230.00 - LUGO 230.00 1, VICTOR 230.00 - LUGO 230.00 2 | ivsg_hs_alt3bd2 | Pmis 24602 VICTOR 115.00 = 10722.33 MW + j -44269.71 MVAR |
| DEVERS 230.00 - MIRAGE 230.00 2, RAMON 230.00 - MIRAGE 230.00 2 | ivsg_hs_alt3bd2 | Pmis 24019 CAMINO 230.00 = -18332208.00 MW + j -130439944.00 MVAR |

# Imperial Valley Study Group

## Appendix A.4.10

Alt 4a D1
Heavy Summer
Alternative 4a
Dispatch 1

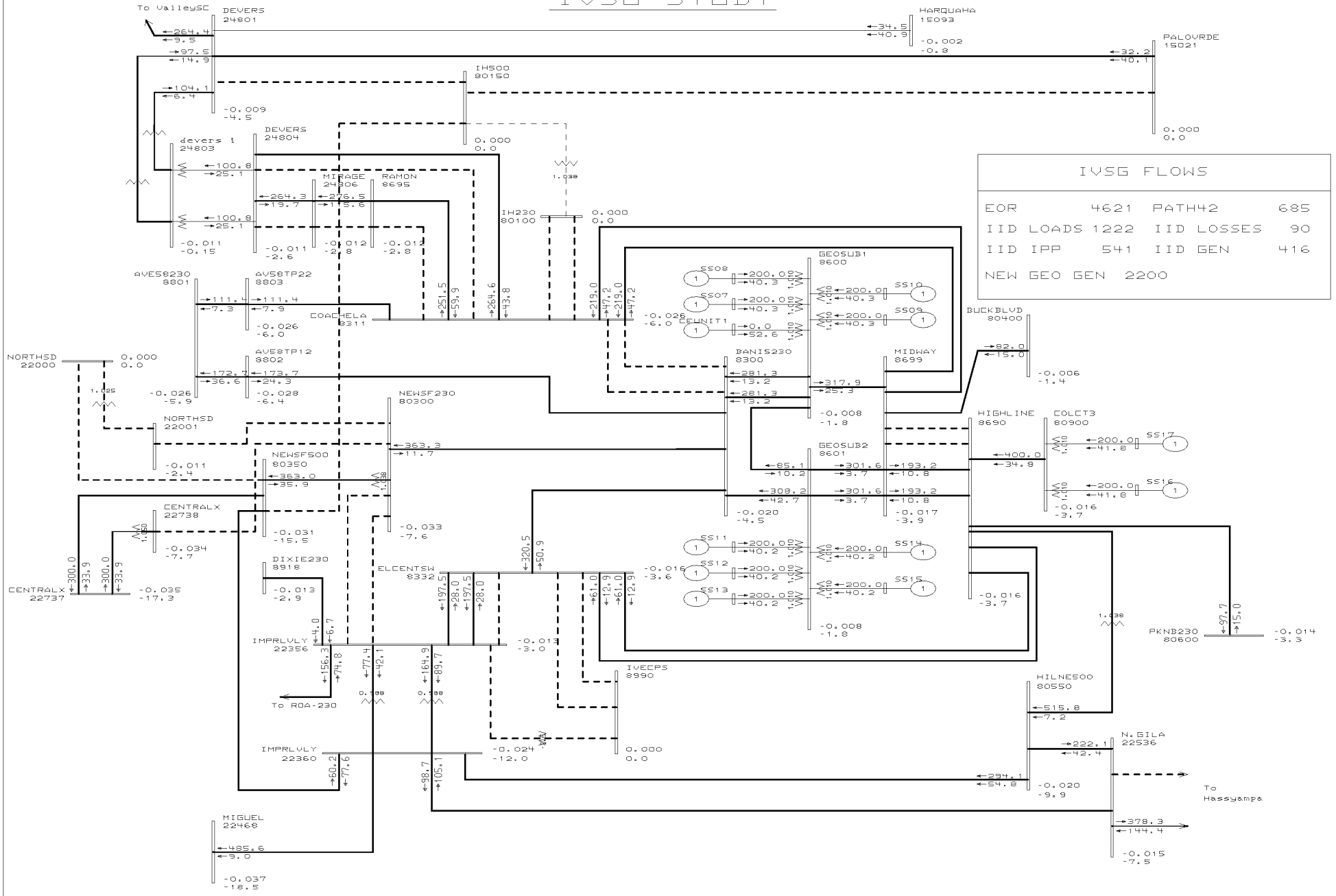
# IVSG STUDY




## IVSG FLOWS

| | | | |
|---|---|---|---|
| EOR | 4621 | PATH42 | 685 |
| IID LOADS | 1222 | IID LOSSES | 90 |
| IID IPP | 541 | IID GEN | 416 |
| NEW GEO GEN | 2200 | | |

# IVSG STUDY




## IVSG FLOWS

| | | | |
|---|---|---|---|
| EOR | 4621 | PATH42 | 685 |
| IID LOADS | 1222 | IID LOSSES | 90 |
| IID IPP | 541 | IID GEN | 416 |
| NEW GEO GEN | 2200 | | |

ivsg_hs_alt4a_D1.sav
Voltage Summary
N-0 Outages

| Bus | Name | kV | Area | Zone | Outage | Case | Vbase | Vcont | DeltaV | Vmin | Vmax | Max-dv | Contingency Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24035 | EAGLEMTN | 161 | 24 | 248 | base | ivsg_hs_alt4ad1 | 0.93 | 0.93 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 20077 | SIM-115 | 115 | 20 | 205 | base | ivsg_hs_alt4ad1 | 0.932 | 0.932 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 20076 | SQN-115 | 115 | 20 | 205 | base | ivsg_hs_alt4ad1 | 0.937 | 0.937 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14534 | N.GILA 4 | 100 | 14 | 847 | base | ivsg_hs_alt4ad1 | 0.944 | 0.944 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15051 | BROWNING | 500 | 14 | 158 | base | ivsg_hs_alt4ad1 | 1.051 | 1.051 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24151 | VALLEYSC | 500 | 24 | 240 | base | ivsg_hs_alt4ad1 | 1.051 | 1.051 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24997 | VALYSVC1 | 500 | 24 | 240 | base | ivsg_hs_alt4ad1 | 1.051 | 1.051 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 28040 | CALPINE | 500 | 24 | 240 | base | ivsg_hs_alt4ad1 | 1.051 | 1.051 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15090 | HASSYAMP | 500 | 14 | 158 | base | ivsg_hs_alt4ad1 | 1.052 | 1.052 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15092 | ARLINTON | 500 | 14 | 158 | base | ivsg_hs_alt4ad1 | 1.053 | 1.053 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15094 | MESQUITE | 500 | 14 | 158 | base | ivsg_hs_alt4ad1 | 1.053 | 1.053 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24086 | LUGO | 500 | 24 | 240 | base | ivsg_hs_alt4ad1 | 1.053 | 1.053 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14009 | REDHAWK | 500 | 14 | 141 | base | ivsg_hs_alt4ad1 | 1.054 | 1.054 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14010 | TS5 | 500 | 14 | 141 | base | ivsg_hs_alt4ad1 | 1.056 | 1.056 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 79043 | KAYENTA | 230 | 14 | 191 | base | ivsg_hs_alt4ad1 | 1.056 | 1.056 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15093 | HARQUAHA | 500 | 14 | 158 | base | ivsg_hs_alt4ad1 | 1.058 | 1.058 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14230 | VERDE N | 230 | 14 | 141 | base | ivsg_hs_alt4ad1 | 1.058 | 1.058 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14247 | VERDE S | 230 | 14 | 141 | base | ivsg_hs_alt4ad1 | 1.058 | 1.058 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14011 | RACEWAY | 500 | 14 | 141 | base | ivsg_hs_alt4ad1 | 1.058 | 1.058 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24776 | LEE VINE | 115 | 24 | 247 | base | ivsg_hs_alt4ad1 | 1.058 | 1.058 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15034 | PERKINS | 500 | 14 | 158 | base | ivsg_hs_alt4ad1 | 1.061 | 1.061 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14205 | COCONINO | 230 | 14 | 141 | base | ivsg_hs_alt4ad1 | 1.061 | 1.061 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14008 | JOJOBA | 500 | 14 | 141 | base | ivsg_hs_alt4ad1 | 1.061 | 1.061 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15041 | SILVERKG | 500 | 14 | 158 | base | ivsg_hs_alt4ad1 | 1.062 | 1.062 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15061 | RUDD | 500 | 14 | 158 | base | ivsg_hs_alt4ad1 | 1.062 | 1.062 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14234 | YAVAPAI | 230 | 14 | 141 | base | ivsg_hs_alt4ad1 | 1.063 | 1.063 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24156 | VINCENT | 500 | 24 | 240 | base | ivsg_hs_alt4ad1 | 1.063 | 1.063 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14355 | PRESCOTT | 115 | 14 | 141 | base | ivsg_hs_alt4ad1 | 1.066 | 1.066 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14544 | PRESCOT2 | 100 | 14 | 141 | base | ivsg_hs_alt4ad1 | 1.066 | 1.066 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14543 | PRESCOT1 | 100 | 14 | 141 | base | ivsg_hs_alt4ad1 | 1.066 | 1.066 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14001 | FOURCORN | 500 | 14 | 141 | base | ivsg_hs_alt4ad1 | 1.067 | 1.067 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14256 | FLAGSTAF | 230 | 14 | 141 | base | ivsg_hs_alt4ad1 | 1.067 | 1.067 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14587 | FLAGSTF1 | 100 | 14 | 141 | base | ivsg_hs_alt4ad1 | 1.068 | 1.068 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24729 | INYO | 230 | 24 | 247 | base | ivsg_hs_alt4ad1 | 1.068 | 1.068 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14007 | GILARIVR | 500 | 14 | 141 | base | ivsg_hs_alt4ad1 | 1.069 | 1.069 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 79264 | PINAL_W | 500 | 14 | 141 | base | ivsg_hs_alt4ad1 | 1.07 | 1.07 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14006 | YAVAPAI | 500 | 14 | 141 | base | ivsg_hs_alt4ad1 | 1.071 | 1.071 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14004 | SAGUARO | 500 | 14 | 141 | base | ivsg_hs_alt4ad1 | 1.075 | 1.075 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14215 | LEUPP | 230 | 14 | 141 | base | ivsg_hs_alt4ad1 | 1.075 | 1.075 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15992 | SEV | 500 | 14 | 158 | base | ivsg_hs_alt4ad1 | 1.075 | 1.075 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 16000 | TORTOLIT | 500 | 14 | 160 | base | ivsg_hs_alt4ad1 | 1.075 | 1.075 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 16001 | TORTLIT2 | 500 | 14 | 160 | base | ivsg_hs_alt4ad1 | 1.075 | 1.075 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14100 | CHOLLA | 345 | 14 | 141 | base | ivsg_hs_alt4ad1 | 1.077 | 1.077 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15001 | CORONADO | 500 | 14 | 158 | base | ivsg_hs_alt4ad1 | 1.08 | 1.08 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14000 | CHOLLA | 500 | 14 | 141 | base | ivsg_hs_alt4ad1 | 1.081 | 1.081 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 19038 | MEAD | 500 | 14 | 191 | base | ivsg_hs_alt4ad1 | 1.083 | 1.083 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24042 | ELDORDO | 500 | 24 | 240 | base | ivsg_hs_alt4ad1 | 1.083 | 1.083 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24097 | MOHAVE | 500 | 24 | 240 | base | ivsg_hs_alt4ad1 | 1.086 | 1.086 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14204 | CHOLLA | 230 | 14 | 141 | base | ivsg_hs_alt4ad1 | 1.088 | 1.088 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14509 | CHOLLA 7 | 100 | 14 | 141 | base | ivsg_hs_alt4ad1 | 1.094 | 1.094 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14267 | SECDKNOL | 230 | 14 | 141 | base | ivsg_hs_alt4ad1 | 1.1 | 1.1 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14003 | NAVAJO | 500 | 14 | 141 | base | ivsg_hs_alt4ad1 | 1.101 | 1.101 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14002 | MOENKOPI | 500 | 14 | 141 | base | ivsg_hs_alt4ad1 | 1.103 | 1.103 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |

ivsg_hs_alt4a_D1.sav
Flow Summary
N-0 Outages

| LEGEND | % of RATING 1 | |
|---|---|---|
| C_pu | 100% - 110% | |
| C_pu | 110% - 120% | P.U. of |
| C_pu | > 120% | Rate 1 |

| FROM | FR | BKV | TO | TO | BKV | CK | Outage_Name | Case | Rate-Mva | Pflow | Qflow | Amps | MVA | C_pu | B_pu | Contingency_Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | base | ivsg_hs_alt4ad1 | 204.1 | 256 | -3.1 | 1074.1 | 256 | 1.258 | 1.258 | Base system (n-0) |
| 24910 | CAL ELEC | 115 | 24912 | SHANDIN | 115 | 1 | base | ivsg_hs_alt4ad1 | 109.1 | -124.1 | 58.4 | 683.7 | 137.2 | 1.251 | 1.251 | Base system (n-0) |
| 14248 | GLENDALW | 230 | 14212 | GLENDALE | 230 | 1 | base | ivsg_hs_alt4ad1 | 457 | 571.5 | 32.4 | 1432.8 | 572.4 | 1.249 | 1.249 | Base system (n-0) |
| 14248 | GLENDALW | 230 | 15201 | AGUAFRIA | 230 | 1 | base | ivsg_hs_alt4ad1 | 457 | -571.5 | -32.4 | 1432.8 | 572.4 | 1.249 | 1.249 | Base system (n-0) |
| 14221 | PNPKAPS | 230 | 19062 | PINPK | 230 | 1 | base | ivsg_hs_alt4ad1 | 637.4 | -783.4 | -185.9 | 1982 | 805.2 | 1.239 | 1.239 | Base system (n-0) |
| 24912 | SHANDIN | 115 | 24916 | TAP902 | 115 | 1 | base | ivsg_hs_alt4ad1 | 109.1 | -119.2 | 33.5 | 614.3 | 123.8 | 1.123 | 1.123 | Base system (n-0) |
| 14212 | GLENDALE | 230 | 14270 | GRNDTRML | 230 | 1 | base | ivsg_hs_alt4ad1 | 457 | 506.1 | 24.8 | 1268.4 | 506.7 | 1.108 | 1.108 | Base system (n-0) |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | base | ivsg_hs_alt4ad1 | 392 | 409.1 | 43.7 | 1050.2 | 411.5 | 1.05 | 1.05 | Base system (n-0) |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | base | ivsg_hs_alt4ad1 | 392 | 406.5 | 10.7 | 1031 | 406.6 | 1.04 | 1.04 | Base system (n-0) |
| 14206 | CTRYCLUB | 230 | 14270 | GRNDTRML | 230 | 1 | base | ivsg_hs_alt4ad1 | 509.9 | -502.8 | -25.2 | 1271.8 | 503.4 | 0.994 | 0.994 | Base system (n-0) |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | base | ivsg_hs_alt4ad1 | 408.3 | -404.4 | 1.5 | 1695.2 | 404.4 | 0.992 | 0.992 | Base system (n-0) |
| 14202 | CACTUS | 230 | 14221 | PNPKAPS | 230 | 1 | base | ivsg_hs_alt4ad1 | 371 | -363.4 | -48.7 | 920.3 | 366.7 | 0.988 | 0.988 | Base system (n-0) |
| 15230 | RUDD | 230 | 15218 | WHITETNK | 230 | 1 | base | ivsg_hs_alt4ad1 | 725 | 694.1 | -18.2 | 1738.5 | 694.3 | 0.955 | 0.955 | Base system (n-0) |
| 24087 | MAGUNDEN | 230 | 24101 | OMAR | 230 | 1 | base | ivsg_hs_alt4ad1 | 643 | -591.8 | 130.2 | 1533.8 | 606 | 0.951 | 0.951 | Base system (n-0) |
| 24806 | MIRAGE | 230 | 24807 | MIRAGE | 115 | 1 | base | ivsg_hs_alt4ad1 | 280 | 265.6 | 27.4 | 676.4 | 267.1 | 0.95 | 0.95 | Base system (n-0) |
| 24806 | MIRAGE | 230 | 24807 | MIRAGE | 115 | 2 | base | ivsg_hs_alt4ad1 | 280 | 265.6 | 27.4 | 676.4 | 267.1 | 0.95 | 0.95 | Base system (n-0) |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | base | ivsg_hs_alt4ad1 | 132 | 125.3 | -11.2 | 782.4 | 125.8 | 0.945 | 0.945 | Base system (n-0) |
| 24702 | KRAMER | 115 | 24753 | SUNGEN | 115 | 1 | base | ivsg_hs_alt4ad1 | 183.3 | -170.5 | 31.7 | 863.7 | 173.4 | 0.939 | 0.939 | Base system (n-0) |
| 14008 | JOJOBA | 500 | 15011 | KYRENE | 500 | 1 | base | ivsg_hs_alt4ad1 | 1732 | 1714.5 | 134.6 | 1871.7 | 1719.8 | 0.938 | 0.938 | Base system (n-0) |
| 26098 | SYLMAR3 | 230 | 24147 | SYLMAR S | 230 | 1 | base | ivsg_hs_alt4ad1 | 1100 | 841 | -523.1 | 2575.8 | 990.4 | 0.933 | 0.933 | Base system (n-0) |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | base | ivsg_hs_alt4ad1 | 56 | 50 | -10.7 | 253 | 51.1 | 0.92 | 0.92 | Base system (n-0) |
| 14207 | DEERVALY | 230 | 14231 | WESTWING | 230 | 1 | base | ivsg_hs_alt4ad1 | 720 | -647.5 | -80.1 | 1634.4 | 652.4 | 0.904 | 0.904 | Base system (n-0) |

| Bus | Name | kV | Area | Zone | Outage | Case | Vbase | Vcont | DeltaV | Vmin | Vmax | Max-dv | Contingency Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24017 | BLYTHESC | 161 | 24 | 248 | line_007 | ivsg_hs_alt4ad1 | 1.02 | 0.862 | -0.158 | 0.9 | 1.05 | 0.05 | line BLYTHE to BLYTHESC 161 ck 1 |
| 24731 | INYOKERN | 115 | 24 | 247 | line_175 | ivsg_hs_alt4ad1 | 1 | 0.927 | -0.073 | 0.9 | 1.05 | 0.05 | line INYO to COTTONWD 230 ck 1 |
| 24819 | CONCHO | 115 | 24 | 248 | tran_238 | ivsg_hs_alt4ad1 | 1.026 | 0.93 | -0.096 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 24822 | INDIAN W | 115 | 24 | 248 | tran_238 | ivsg_hs_alt4ad1 | 1.026 | 0.93 | -0.096 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 25423 | ESRP MWD | 115 | 24 | 254 | tran_247 | ivsg_hs_alt4ad1 | 1.022 | 0.931 | -0.091 | 0.9 | 1.05 | 0.05 | tran VALLEYSC 500 to VALLEYSC 115 ck 1 |
| 25423 | ESRP MWD | 115 | 24 | 254 | tran_248 | ivsg_hs_alt4ad1 | 1.022 | 0.931 | -0.091 | 0.9 | 1.05 | 0.05 | tran VALLEYSC 500 to VALLEYSC 115 ck 2 |
| 24816 | SANTA RO | 115 | 24 | 248 | tran_238 | ivsg_hs_alt4ad1 | 1.03 | 0.934 | -0.096 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 24160 | VALLEYSC | 115 | 24 | 240 | tran_247 | ivsg_hs_alt4ad1 | 1.024 | 0.934 | -0.09 | 0.9 | 1.05 | 0.05 | tran VALLEYSC 500 to VALLEYSC 115 ck 1 |
| 25990 | VALYSVC1 | 115 | 24 | 240 | tran_247 | ivsg_hs_alt4ad1 | 1.024 | 0.934 | -0.09 | 0.9 | 1.05 | 0.05 | tran VALLEYSC 500 to VALLEYSC 115 ck 1 |
| 24160 | VALLEYSC | 115 | 24 | 240 | tran_248 | ivsg_hs_alt4ad1 | 1.024 | 0.934 | -0.09 | 0.9 | 1.05 | 0.05 | tran VALLEYSC 500 to VALLEYSC 115 ck 2 |
| 25990 | VALYSVC1 | 115 | 24 | 240 | tran_248 | ivsg_hs_alt4ad1 | 1.024 | 0.934 | -0.09 | 0.9 | 1.05 | 0.05 | tran VALLEYSC 500 to VALLEYSC 115 ck 2 |
| 24821 | TAMARISK | 115 | 24 | 248 | tran_238 | ivsg_hs_alt4ad1 | 1.03 | 0.935 | -0.095 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 24827 | TAP823 | 115 | 24 | 248 | tran_238 | ivsg_hs_alt4ad1 | 1.032 | 0.937 | -0.095 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 25633 | CAPWIND | 115 | 24 | 248 | tran_238 | ivsg_hs_alt4ad1 | 1.032 | 0.938 | -0.094 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 25622 | TAP806 | 115 | 24 | 248 | tran_238 | ivsg_hs_alt4ad1 | 1.032 | 0.938 | -0.094 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 24829 | TAP821 | 115 | 24 | 248 | tran_238 | ivsg_hs_alt4ad1 | 1.032 | 0.938 | -0.094 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 24807 | MIRAGE | 115 | 24 | 248 | tran_238 | ivsg_hs_alt4ad1 | 1.034 | 0.94 | -0.094 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 14534 | N.GILA 4 | 100 | 14 | 847 | NG500/69 | ivsg_hs_alt4ad1 | 0.944 | 1 | 0.056 | 0.9 | 1.05 | 0.05 | tran N.GILA 500 to N.GILA 69 ck 1 |
| 24035 | EAGLEMTN | 161 | 24 | 248 | tran_241 | ivsg_hs_alt4ad1 | 0.93 | 1.026 | 0.096 | 0.9 | 1.05 | 0.05 | tran EAGLEMTN 230 to EAGLEMTN 161 ck 1 |
| 22472 | MIGUELMP | 500 | 22 | 227 | ML80 | ivsg_hs_alt4ad1 | 0.986 | 1.05 | 0.064 | 0.9 | 1.05 | 0.05 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 24730 | INYO PS | 115 | 24 | 247 | tran_229 | ivsg_hs_alt4ad1 | 1.026 | 1.078 | 0.052 | 0.9 | 1.05 | 0.05 | tran INYO 115 to INYO PS 115 ck 1 |
| 24142 | SYC CYN | 230 | 24 | 240 | line_086 | ivsg_hs_alt4ad1 | 0.984 | 1.091 | 0.107 | 0.9 | 1.05 | 0.05 | line MAGUNDEN to OMAR 230 ck 1 |
| 25613 | EDMONSTN | 230 | 24 | 256 | line_122 | ivsg_hs_alt4ad1 | 0.999 | 1.091 | 0.092 | 0.9 | 1.05 | 0.05 | line PASTORIA to EDMONSTN 230 ck 1 |
| 24142 | SYC CYN | 230 | 24 | 240 | line_140 | ivsg_hs_alt4ad1 | 0.984 | 1.091 | 0.107 | 0.9 | 1.05 | 0.05 | line SYC CYN to OMAR 230 ck 1 |
| 24320 | EASTWOOD | 230 | 24 | 243 | line_157 | ivsg_hs_alt4ad1 | 1.041 | 1.091 | 0.05 | 0.9 | 1.05 | 0.05 | line BIG CRK1 to EASTWOOD 230 ck 1 |

ivsg_hs_alt4a_D1.sav
FLOW Summary
N-1 Outages

| LEGEND | % of RATING 1 | |
|---|---|---|
| C_pu | 100% - 110% | |
| C_pu | 110% - 120% | P.U. of |
| C_pu | > 120% | Rate 1 |

| FROM | FR | BKV | TO | TO | BKV | CK | Outage_Name | Case | Rate-Mva | Pflow | Qflow | Amps | MVA | C_pu | B_pu | Contingency_Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24142 | SYC CYN | 230 | 24101 | OMAR | 230 | 1 | line_086 | ivsg_hs_alt4ad1 | 643 | 770 | 5511.1 | 12804.5 | 5564.6 | 7.934 | 0.471 | line MAGUNDEN to OMAR 230 ck 1 |
| 24781 | NAVYCOSO | 230 | 24706 | BLM EAST | 230 | 1 | line_173 | ivsg_hs_alt4ad1 | 1287 | -153.7 | -3160.7 | 7943.4 | 3164.4 | 2.459 | 0.056 | line BLM EAST to BLM WEST 230 ck 1 |
| 24781 | NAVYCOSO | 230 | 24706 | BLM EAST | 230 | 1 | line_174 | ivsg_hs_alt4ad1 | 1287 | -153.7 | -3160.7 | 7943.4 | 3164.4 | 2.459 | 0.056 | line BLM WEST to KRAMER 230 ck 1 |
| 24806 | MIRAGE | 230 | 24807 | MIRAGE | 115 | 2 | tran_238 | ivsg_hs_alt4ad1 | 280 | 532.4 | 209.3 | 1487.6 | 572.1 | 2.04 | 0.95 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_175 | ivsg_hs_alt4ad1 | 56 | -103.6 | -1.2 | 532 | 103.6 | 1.86 | 0.92 | line INYO to COTTONWD 230 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_034 | ivsg_hs_alt4ad1 | 204.1 | 331.5 | -0.6 | 1432.2 | 331.5 | 1.677 | 1.258 | OLD TOWN - MLMS3TAP 1 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_032 | ivsg_hs_alt4ad1 | 204.1 | 331.5 | -1.3 | 1431.3 | 331.5 | 1.676 | 1.258 | OTAYMESA - MLMS3TAP 1 230kV |
| 24151 | VALLEYSC | 500 | 24160 | VALLEYSC | 115 | 2 | tran_247 | ivsg_hs_alt4ad1 | 560 | 853.2 | 367.6 | 1036.7 | 929 | 1.66 | 0.77 | tran VALLEYSC 500 to VALLEYSC 115 ck 1 |
| 24151 | VALLEYSC | 500 | 24160 | VALLEYSC | 115 | 1 | tran_248 | ivsg_hs_alt4ad1 | 560 | 853.2 | 367.6 | 1036.7 | 929 | 1.66 | 0.77 | tran VALLEYSC 500 to VALLEYSC 115 ck 2 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_009 | ivsg_hs_alt4ad1 | 204.1 | 320.4 | -2.5 | 1352.3 | 320.4 | 1.584 | 1.258 | EPP - ESCNDIDO 1 230kV |
| 24151 | VALLEYSC | 500 | 24229 | VALLEY-S | 115 | 4 | tran_249 | ivsg_hs_alt4ad1 | 560 | 830.6 | 209.1 | 951.7 | 856.6 | 1.53 | 0.75 | tran VALLEYSC 500 to VALLEY-S 115 ck 3 |
| 24151 | VALLEYSC | 500 | 24229 | VALLEY-S | 115 | 3 | tran_250 | ivsg_hs_alt4ad1 | 560 | 830.6 | 209.1 | 951.7 | 856.6 | 1.53 | 0.75 | tran VALLEYSC 500 to VALLEY-S 115 ck 4 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | ML60 | ivsg_hs_alt4ad1 | 204.1 | 307.9 | 4.2 | 1305.5 | 307.9 | 1.529 | 1.258 | tran MIGUEL 230 to MIGUEL 138 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | SX70 | ivsg_hs_alt4ad1 | 204.1 | 303.3 | 13.2 | 1282.5 | 303.6 | 1.502 | 1.258 | tran SYCAMORE 230 to SYCAMORE 69 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_013 | ivsg_hs_alt4ad1 | 204.1 | 295.7 | -8.6 | 1251.2 | 295.9 | 1.465 | 1.258 | EPP - SYCAMORE 1 230kV |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_202 | ivsg_hs_alt4ad1 | 56 | 77.5 | -7.2 | 392.8 | 77.8 | 1.4 | 0.92 | line OWENSCON to INYO 230 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | MS60 | ivsg_hs_alt4ad1 | 204.1 | 280.3 | 3.8 | 1181.9 | 280.3 | 1.384 | 1.258 | tran MISSION 230 to MISSION 138 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | MS61 | ivsg_hs_alt4ad1 | 204.1 | 280.3 | 3.8 | 1181.9 | 280.3 | 1.384 | 1.258 | tran MISSION 230 to MISSION 138 ck 2 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | ML70 | ivsg_hs_alt4ad1 | 204.1 | 272.4 | 4.2 | 1150.6 | 272.4 | 1.347 | 1.258 | tran MIGUEL 69 to MIGUEL 230 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | ML71 | ivsg_hs_alt4ad1 | 204.1 | 272.4 | 4.2 | 1150.6 | 272.4 | 1.347 | 1.258 | tran MIGUEL 69 to MIGUEL 230 ck 2 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_015 | ivsg_hs_alt4ad1 | 204.1 | 272 | -2.5 | 1145.3 | 272 | 1.341 | 1.258 | MIGUEL - MISSION 1 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_020 | ivsg_hs_alt4ad1 | 204.1 | 271.5 | -3.1 | 1143 | 271.5 | 1.339 | 1.258 | MIGUEL - MISSION 2 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | ML80 | ivsg_hs_alt4ad1 | 204.1 | 267.4 | -2.1 | 1130.9 | 267.4 | 1.324 | 1.258 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | B2_009 | ivsg_hs_alt4ad1 | 392 | 517.4 | 32.4 | 1318.2 | 518.4 | 1.32 | 1.04 | EPP - ESCNDIDO 1 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | ML81 | ivsg_hs_alt4ad1 | 204.1 | 266.3 | -2.1 | 1125.8 | 266.3 | 1.318 | 1.258 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | MS70 | ivsg_hs_alt4ad1 | 204.1 | 266.1 | 4.7 | 1122.7 | 266.1 | 1.315 | 1.258 | tran MISSION 230 to MISSION 69 ck 1 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | B2_032 | ivsg_hs_alt4ad1 | 392 | 512.3 | 22.3 | 1337.3 | 512.8 | 1.31 | 1.04 | OTAYMESA - MLMS3TAP 1 230kV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | B2_034 | ivsg_hs_alt4ad1 | 392 | 512.4 | 23 | 1338 | 512.9 | 1.31 | 1.04 | OLD TOWN - MLMS3TAP 1 230kV |
| 22468 | MIGUEL | 500 | 22472 | MIGUELMP | 500 | 1 | ML81 | ivsg_hs_alt4ad1 | 1120 | 1437.2 | 275.5 | 1704 | 1463.4 | 1.31 | 0.76 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | SO2 | ivsg_hs_alt4ad1 | 204.1 | 262.1 | 1.1 | 1116.8 | 262.1 | 1.308 | 1.258 | gen S.ONOFR2 22.00 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_007 | ivsg_hs_alt4ad1 | 204.1 | 264.7 | 2.1 | 1116.3 | 264.7 | 1.307 | 1.258 | PENSQTOS - ENCINA 1 230kV |
| 22464 | MIGUEL | 230 | 22468 | MIGUEL | 500 | 1 | ML80 | ivsg_hs_alt4ad1 | 1120 | -1414.7 | 2.5 | 3657.4 | 1414.7 | 1.29 | 0.71 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | line_207 | ivsg_hs_alt4ad1 | 204.1 | 260.3 | -1.5 | 1101.9 | 260.3 | 1.29 | 1.258 | line DEVERS to VALLEYSC 500 ck 1 |
| 22464 | MIGUEL | 230 | 22472 | MIGUELMP | 500 | 1 | ML81 | ivsg_hs_alt4ad1 | 1120 | -1434.3 | -0.7 | 3704.3 | 1434.3 | 1.28 | 0.75 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | SX70 | ivsg_hs_alt4ad1 | 392 | 481.1 | 42.9 | 1225.4 | 483 | 1.23 | 1.04 | tran SYCAMORE 230 to SYCAMORE 69 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | line_7 | ivsg_hs_alt4ad1 | 204.1 | 249.8 | -0.5 | 1046 | 249.8 | 1.225 | 1.258 | line BANIS230 to NEWSF230 230 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | tran_74 | ivsg_hs_alt4ad1 | 204.1 | 249.8 | -0.5 | 1045.9 | 249.8 | 1.225 | 1.258 | tran NEWSF230 230 to NEWSF500 500 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_001 | ivsg_hs_alt4ad1 | 204.1 | 250.5 | -4.1 | 1044.5 | 250.6 | 1.223 | 1.258 | HASSYAMP - N.GILA 1 500kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_008 | ivsg_hs_alt4ad1 | 204.1 | 245.8 | 3.2 | 1034.9 | 245.8 | 1.212 | 1.258 | PENSQTOS - OLD TOWN 1 230kV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | B2_013 | ivsg_hs_alt4ad1 | 392 | 475.2 | 13.8 | 1215.5 | 475.4 | 1.21 | 1.04 | EPP - SYCAMORE 1 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_028 | ivsg_hs_alt4ad1 | 204.1 | 245 | 1.5 | 1028 | 245 | 1.204 | 1.258 | MIGUEL - SYCAMORE 1 230kV |
| 24723 | CONTROL | 115 | 24731 | INYOKERN | 115 | 1 | line_175 | ivsg_hs_alt4ad1 | 82.7 | 95.9 | -4.2 | 496.1 | 96 | 1.195 | 0.419 | line INYO to COTTONWD 230 ck 1 |
| 24723 | CONTROL | 115 | 24731 | INYOKERN | 115 | 2 | line_175 | ivsg_hs_alt4ad1 | 82.7 | 95.9 | -4.2 | 496.1 | 96 | 1.195 | 0.419 | line INYO to COTTONWD 230 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | line_56 | ivsg_hs_alt4ad1 | 204.1 | 239.7 | -4 | 1011.9 | 239.7 | 1.185 | 1.258 | line NEWSF500 to IMPRLVLY 500 ck 1 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | ML60 | ivsg_hs_alt4ad1 | 392 | 462.7 | 25.2 | 1184.5 | 463.4 | 1.18 | 1.04 | tran MIGUEL 230 to MIGUEL 138 ck 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_015 | ivsg_hs_alt4ad1 | 392 | 452.7 | 54.7 | 1165.8 | 456 | 1.16 | 1.05 | MIGUEL - MISSION 1 230kV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_020 | ivsg_hs_alt4ad1 | 392 | 451 | 52.9 | 1162 | 454.1 | 1.16 | 1.05 | MIGUEL - MISSION 2 230kV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | SX60 | ivsg_hs_alt4ad1 | 392 | 453.5 | 53.1 | 1176.1 | 456.6 | 1.16 | 1.05 | tran SYCAMORE 230 to SYCAMORE 138 ck 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | ML70 | ivsg_hs_alt4ad1 | 392 | 444.4 | 57.9 | 1150.8 | 448.2 | 1.14 | 1.05 | tran MIGUEL 69 to MIGUEL 230 ck 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | ML71 | ivsg_hs_alt4ad1 | 392 | 444.4 | 57.9 | 1150.8 | 448.2 | 1.14 | 1.05 | tran MIGUEL 69 to MIGUEL 230 ck 2 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_032 | ivsg_hs_alt4ad1 | 392 | 440.4 | 54.6 | 1167.8 | 443.7 | 1.13 | 1.05 | OTAYMESA - MLMS3TAP 1 230kV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_034 | ivsg_hs_alt4ad1 | 392 | 440.3 | 55.1 | 1168.5 | 443.7 | 1.13 | 1.05 | OLD TOWN - MLMS3TAP 1 230kV |
| 24729 | INYO | 230 | 24730 | INYO PS | 115 | 1 | line_175 | ivsg_hs_alt4ad1 | 50 | 51.8 | 21.2 | 133 | 56 | 1.12 | 0.54 | line INYO to COTTONWD 230 ck 1 |
| 24729 | INYO | 230 | 24730 | INYO PS | 115 | 2 | line_175 | ivsg_hs_alt4ad1 | 50 | 51.8 | 21.2 | 133 | 56 | 1.12 | 0.54 | line INYO to COTTONWD 230 ck 1 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | SX60 | ivsg_hs_alt4ad1 | 408.3 | -447.5 | 3.6 | 1898.4 | 447.5 | 1.111 | 0.992 | tran SYCAMORE 230 to SYCAMORE 138 ck 1 |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | line_66 | ivsg_hs_alt4ad1 | 392 | 433.4 | 41.6 | 1143.2 | 435.4 | 1.11 | 1.05 | line CENTRALX to NEWSF500 500 ck 1 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | B2_034 | ivsg_hs_alt4ad1 | 408.3 | -434.3 | 0.9 | 1886.1 | 434.3 | 1.104 | 0.992 | OLD TOWN - MLMS3TAP 1 230kV |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | B2_032 | ivsg_hs_alt4ad1 | 408.3 | -434.4 | 1.3 | 1885 | 434.4 | 1.103 | 0.992 | OTAYMESA - MLMS3TAP 1 230kV |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | B2_015 | ivsg_hs_alt4ad1 | 408.3 | -446.8 | 1 | 1881.7 | 446.8 | 1.102 | 0.992 | MIGUEL - MISSION 1 230kV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | B2_015 | ivsg_hs_alt4ad1 | 392 | 430.2 | 14.2 | 1094.5 | 430.4 | 1.1 | 1.04 | MIGUEL - MISSION 1 230kV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | B2_020 | ivsg_hs_alt4ad1 | 392 | 429.4 | 13.3 | 1092.6 | 429.6 | 1.1 | 1.04 | MIGUEL - MISSION 2 230kV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_022 | ivsg_hs_alt4ad1 | 392 | 427.6 | 40.3 | 1110.7 | 429.5 | 1.1 | 1.05 | OTAYMESA - TJI-230 1 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_029 | ivsg_hs_alt4ad1 | 204.1 | 222.8 | 0.6 | 939.4 | 222.8 | 1.1 | 1.258 | OTAYMESA - MLSXTAP 1 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_031 | ivsg_hs_alt4ad1 | 204.1 | 222.5 | -0.2 | 939.6 | 222.5 | 1.1 | 1.258 | SYCAMORE - MLSXTAP 1 230kV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | MS60 | ivsg_hs_alt4ad1 | 392 | 428 | 53 | 1103.6 | 431.3 | 1.1 | 1.05 | tran MISSION 230 to MISSION 138 ck 1 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | MS60 | ivsg_hs_alt4ad1 | 392 | 431.7 | 20.5 | 1099.1 | 432.2 | 1.1 | 1.04 | tran MISSION 230 to MISSION 138 ck 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | MS61 | ivsg_hs_alt4ad1 | 392 | 428 | 53 | 1103.6 | 431.3 | 1.1 | 1.05 | tran MISSION 230 to MISSION 138 ck 2 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | MS61 | ivsg_hs_alt4ad1 | 392 | 431.7 | 20.5 | 1099.1 | 432.2 | 1.1 | 1.04 | tran MISSION 230 to MISSION 138 ck 2 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | SX70 | ivsg_hs_alt4ad1 | 392 | 427.5 | 55.8 | 1109.9 | 431.1 | 1.1 | 1.05 | tran SYCAMORE 230 to SYCAMORE 69 ck 1 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | B2_020 | ivsg_hs_alt4ad1 | 408.3 | -445.2 | 2.5 | 1875.7 | 445.2 | 1.098 | 0.992 | MIGUEL - MISSION 2 230kV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_009 | ivsg_hs_alt4ad1 | 392 | 426.1 | 50.9 | 1100.9 | 429.2 | 1.09 | 1.05 | EPP - ESCNDIDO 1 230kV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | OT70 | ivsg_hs_alt4ad1 | 392 | 425.5 | 51.3 | 1098.4 | 428.6 | 1.09 | 1.05 | tran OLD TOWN 69 to OLD TOWN 230 ck 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | OT71 | ivsg_hs_alt4ad1 | 392 | 425.5 | 51.3 | 1098.4 | 428.6 | 1.09 | 1.05 | tran OLD TOWN 69 to OLD TOWN 230 ck 2 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | SO2 | ivsg_hs_alt4ad1 | 392 | 424.2 | 45.9 | 1110.7 | 426.7 | 1.09 | 1.05 | gen S.ONOFR2 22.00 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 2 | line_070 | ivsg_hs_alt4ad1 | 956 | -1026.4 | -31.8 | 2612.3 | 1026.9 | 1.089 | 0.596 | line LA FRESA to REDONDO 230 ck 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 1 | line_071 | ivsg_hs_alt4ad1 | 956 | -1026.4 | -31.8 | 2612.3 | 1026.9 | 1.089 | 0.596 | line LA FRESA to REDONDO 230 ck 2 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | ML70 | ivsg_hs_alt4ad1 | 408.3 | -438.6 | -3.6 | 1857.5 | 438.7 | 1.087 | 0.992 | tran MIGUEL 69 to MIGUEL 230 ck 1 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | ML71 | ivsg_hs_alt4ad1 | 408.3 | -438.6 | -3.6 | 1857.5 | 438.7 | 1.087 | 0.992 | tran MIGUEL 69 to MIGUEL 230 ck 2 |
| 24701 | KRAMER | 230 | 24085 | LUGO | 230 | 2 | line_169 | ivsg_hs_alt4ad1 | 478 | 525.6 | 5 | 1301.7 | 525.6 | 1.085 | 0.644 | line KRAMER to LUGO 230 ck 1 |
| 24701 | KRAMER | 230 | 24085 | LUGO | 230 | 1 | line_170 | ivsg_hs_alt4ad1 | 478 | 525.6 | 5 | 1301.7 | 525.6 | 1.085 | 0.644 | line KRAMER to LUGO 230 ck 2 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | line_66 | ivsg_hs_alt4ad1 | 408.3 | -427.7 | 12 | 1845.2 | 427.9 | 1.08 | 0.992 | line CENTRALX to NEWSF500 500 ck 1 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | ML70 | ivsg_hs_alt4ad1 | 392 | 423.8 | 18.5 | 1081 | 424.2 | 1.08 | 1.04 | tran MIGUEL 69 to MIGUEL 230 ck 1 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | ML71 | ivsg_hs_alt4ad1 | 392 | 423.8 | 18.5 | 1081 | 424.2 | 1.08 | 1.04 | tran MIGUEL 69 to MIGUEL 230 ck 2 |
| 22504 | MISSION | 230 | 22500 | MISSION | 138 | 2 | MS60 | ivsg_hs_alt4ad1 | 392 | 405.3 | 122.2 | 1087.4 | 423.3 | 1.08 | 0.72 | tran MISSION 230 to MISSION 138 ck 1 |
| 22504 | MISSION | 230 | 22500 | MISSION | 138 | 1 | MS61 | ivsg_hs_alt4ad1 | 392 | 405.3 | 122.2 | 1087.4 | 423.3 | 1.08 | 0.72 | tran MISSION 230 to MISSION 138 ck 2 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | SO2 | ivsg_hs_alt4ad1 | 392 | 421.7 | 10.9 | 1086.6 | 421.8 | 1.08 | 1.04 | gen S.ONOFR2 22.00 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | ML80 | ivsg_hs_alt4ad1 | 392 | 418.4 | 10.1 | 1070.1 | 418.5 | 1.07 | 1.04 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_169 | ivsg_hs_alt4ad1 | 56 | 58.1 | -9.9 | 293.3 | 59 | 1.06 | 0.92 | line KRAMER to LUGO 230 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_170 | ivsg_hs_alt4ad1 | 56 | 58.1 | -9.9 | 293.3 | 59 | 1.06 | 0.92 | line KRAMER to LUGO 230 ck 2 |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | line_12 | ivsg_hs_alt4ad1 | 132 | 139.6 | -9.5 | 877.1 | 139.9 | 1.059 | 0.945 | line COACHELA to RAMON 230 ck 2 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | B2_022 | ivsg_hs_alt4ad1 | 408.3 | -422.3 | 10.3 | 1792.9 | 422.4 | 1.05 | 0.992 | OTAYMESA - TJI-230 1 230kV |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | SX70 | ivsg_hs_alt4ad1 | 408.3 | -422.2 | -5.3 | 1791.6 | 422.2 | 1.049 | 0.992 | tran SYCAMORE 230 to SYCAMORE 69 ck 1 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | SO2 | ivsg_hs_alt4ad1 | 408.3 | -418.8 | 4.7 | 1792.7 | 418.9 | 1.049 | 0.992 | gen S.ONOFR2 22.00 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | MS60 | ivsg_hs_alt4ad1 | 408.3 | -422.7 | -3 | 1781.4 | 422.7 | 1.043 | 0.992 | tran MISSION 230 to MISSION 138 ck 1 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | MS61 | ivsg_hs_alt4ad1 | 408.3 | -422.7 | -3 | 1781.4 | 422.7 | 1.043 | 0.992 | tran MISSION 230 to MISSION 138 ck 2 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | B2_009 | ivsg_hs_alt4ad1 | 408.3 | -420.9 | -1.2 | 1777 | 420.9 | 1.04 | 0.992 | EPP - ESCNDIDO 1 230kV |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | OT70 | ivsg_hs_alt4ad1 | 408.3 | -420.2 | -1.9 | 1772.9 | 420.2 | 1.038 | 0.992 | tran OLD TOWN 69 to OLD TOWN 230 ck 1 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | OT71 | ivsg_hs_alt4ad1 | 408.3 | -420.2 | -1.9 | 1772.9 | 420.2 | 1.038 | 0.992 | tran OLD TOWN 69 to OLD TOWN 230 ck 2 |
| 24114 | PARDEE | 230 | 24200 | SAUG TAP | 230 | 2 | line_117 | ivsg_hs_alt4ad1 | 494 | 501.7 | 27.6 | 1279.3 | 502.5 | 1.032 | 0.511 | line PARDEE to SAUG TAP 230 ck 1 |
| 24114 | PARDEE | 230 | 24200 | SAUG TAP | 230 | 1 | line_118 | ivsg_hs_alt4ad1 | 494 | 501.7 | 27.5 | 1279.3 | 502.5 | 1.032 | 0.519 | line PARDEE to SAUG TAP 230 ck 2 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | line_207 | ivsg_hs_alt4ad1 | 408.3 | -414.7 | 4.6 | 1759.9 | 414.7 | 1.03 | 0.992 | line DEVERS to VALLEYSC 500 ck 1 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | B2_021 | ivsg_hs_alt4ad1 | 408.3 | -415.7 | 6.9 | 1757 | 415.8 | 1.029 | 0.992 | IMPRLVLY - ROA-230 1 230kV |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_192 | ivsg_hs_alt4ad1 | 169 | 171.2 | 40.5 | 618.7 | 175.9 | 1.025 | 0.801 | line IRON MTN to CAMINO 230 ck 1 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | B2_013 | ivsg_hs_alt4ad1 | 408.3 | -414.6 | 0.9 | 1749.6 | 414.6 | 1.024 | 0.992 | EPP - SYCAMORE 1 230kV |
| 22844 | TALEGA | 230 | 24131 | S.ONOFRE | 230 | 2 | B2_026 | ivsg_hs_alt4ad1 | 456.1 | -463.3 | 40.3 | 1167.2 | 465.1 | 1.02 | 0.536 | TALEGA - S.ONOFRE 1 230kV |
| 22844 | TALEGA | 230 | 24131 | S.ONOFRE | 230 | 1 | B2_027 | ivsg_hs_alt4ad1 | 456.1 | -463.3 | 40.3 | 1167.2 | 465.1 | 1.02 | 0.536 | TALEGA - S.ONOFRE 2 230kV |
| 22844 | TALEGA | 230 | 24131 | S.ONOFRE | 230 | 2 | line_014 | ivsg_hs_alt4ad1 | 456.1 | -463.3 | 40.3 | 1167.2 | 465.1 | 1.02 | 0.536 | line TALEGA to S.ONOFRE 230 ck 1 |
| 22844 | TALEGA | 230 | 24131 | S.ONOFRE | 230 | 1 | line_015 | ivsg_hs_alt4ad1 | 456.1 | -463.3 | 40.3 | 1167.2 | 465.1 | 1.02 | 0.536 | line TALEGA to S.ONOFRE 230 ck 2 |
| 24303 | BIG CRK3 | 230 | 24235 | RECTOR | 230 | 1 | line_155 | ivsg_hs_alt4ad1 | 353 | 361.1 | 50.3 | 895.4 | 364.6 | 1.01 | 0.73 | line BIG CRK1 to RECTOR 230 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_201 | ivsg_hs_alt4ad1 | 56 | 54.8 | -10.6 | 277.2 | 55.8 | 1.01 | 0.92 | line SYLMAR3 to SYLMAR S 230 ck 1 |
| 24301 | BIG CRK1 | 230 | 24235 | RECTOR | 230 | 1 | line_160 | ivsg_hs_alt4ad1 | 329 | 335 | 48.4 | 826.9 | 338.4 | 1.001 | 0.727 | line BIG CRK3 to RECTOR 230 ck 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_001 | ivsg_hs_alt4ad1 | 392 | 390.7 | 42.3 | 994.1 | 392.9 | 1 | 1.05 | HASSYAMP - N.GILA 1 500kV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | B2_001 | ivsg_hs_alt4ad1 | 392 | 391.8 | 11.1 | 986.8 | 391.9 | 1 | 1.04 | HASSYAMP - N.GILA 1 500kV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | B2_028 | ivsg_hs_alt4ad1 | 392 | 391.8 | 13.4 | 993 | 392.1 | 1 | 1.04 | MIGUEL - SYCAMORE 1 230kV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | ML81 | ivsg_hs_alt4ad1 | 392 | 388.4 | 37 | 1007.6 | 390.2 | 1 | 1.05 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | line_52 | ivsg_hs_alt4ad1 | 132 | 131.2 | -12.3 | 822.3 | 131.8 | 0.993 | 0.945 | line AVE58230 to AV58TP22 230 ck 1 |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | line_53 | ivsg_hs_alt4ad1 | 132 | 131.3 | -12 | 821.8 | 131.9 | 0.992 | 0.945 | line AV58TP22 to COACHELA 230 ck 1 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24086 | LUGO | 500 | 24097 | MOHAVE | 500 | 1 | line_103 | ivsg_hs_alt4ad1 | 1386 | -1427.3 | 87.8 | 1574.1 | 1430 | 0.992 | 0.706 | line MOHAVE to ELDORDO 500 ck 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | ML80 | ivsg_hs_alt4ad1 | 392 | 386.3 | 36.5 | 1003.2 | 388.1 | 0.99 | 1.05 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_191 | ivsg_hs_alt4ad1 | 169 | 164.5 | 37.9 | 593.9 | 168.9 | 0.984 | 0.801 | line EAGLEMTN to IRON MTN 230 ck 1 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | line_56 | ivsg_hs_alt4ad1 | 392 | 383.9 | 2.6 | 980.8 | 383.9 | 0.98 | 1.04 | line NEWSF500 to IMPRLVLY 500 ck 1 |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | line_303 | ivsg_hs_alt4ad1 | 132 | 127.8 | -10 | 811.5 | 128.2 | 0.98 | 0.945 | line HARQUAHA to DEVERS 500 ck 1 |
| 22831 | SYCAMORE | 138 | 22124 | CHCARITA | 138 | 1 | B2_009 | ivsg_hs_alt4ad1 | 204.1 | 195.3 | -27.5 | 832.4 | 197.2 | 0.975 | 0.744 | EPP - ESCNDIDO 1 230kV |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_047 | ivsg_hs_alt4ad1 | 2400 | -2440.3 | -45.5 | 2702.3 | 2440.7 | 0.975 | 0.775 | line ELDORDO to LUGO 500 ck 1 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_079 | ivsg_hs_alt4ad1 | 2400 | -2427.3 | -29.1 | 2697 | 2427.5 | 0.973 | 0.775 | line LUGO to MOHAVE 500 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_123 | ivsg_hs_alt4ad1 | 56 | 52.7 | -10.6 | 266.9 | 53.8 | 0.97 | 0.92 | line PASTORIA to PSTRIA 230 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_200 | ivsg_hs_alt4ad1 | 56 | 52.7 | -10.7 | 267 | 53.8 | 0.97 | 0.92 | line SYLMAR1 to SYLMAR S 230 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | tran_210 | ivsg_hs_alt4ad1 | 56 | 52.6 | -10.4 | 266 | 53.7 | 0.97 | 0.92 | tran LUGO 500 to LUGO 230 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | tran_211 | ivsg_hs_alt4ad1 | 56 | 52.7 | -10.4 | 266.2 | 53.7 | 0.97 | 0.92 | tran LUGO 500 to LUGO 230 ck 2 |
| 19020 | BLYTHE | 161 | 24017 | BLYTHESC | 161 | 1 | line_192 | ivsg_hs_alt4ad1 | 244 | 237.7 | 40.8 | 848 | 241.2 | 0.969 | 0.818 | line IRON MTN to CAMINO 230 ck 1 |
| 24042 | ELDORDO | 500 | 24086 | LUGO | 500 | 1 | line_085 | ivsg_hs_alt4ad1 | 1386 | 1414.9 | 251.4 | 1530 | 1437 | 0.961 | 0.648 | line LUGO to VICTORVL 500 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_086 | ivsg_hs_alt4ad1 | 56 | 52.1 | -10.7 | 263.9 | 53.2 | 0.96 | 0.92 | line MAGUNDEN to OMAR 230 ck 1 |
| 22596 | OLD TOWN | 230 | 22466 | MLMS3TAP | 230 | 1 | B2_031 | ivsg_hs_alt4ad1 | 912 | -845 | 88.2 | 2190.6 | 849.6 | 0.957 | 0.74 | SYCAMORE - MLSXTAP 1 230kV |
| 22596 | OLD TOWN | 230 | 22466 | MLMS3TAP | 230 | 1 | B2_029 | ivsg_hs_alt4ad1 | 912 | -844.7 | 89.9 | 2189.3 | 849.5 | 0.956 | 0.74 | OTAYMESA - MLSXTAP 1 230kV |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | SX60 | ivsg_hs_alt4ad1 | 382.4 | 358.9 | 13.5 | 1528.4 | 359.1 | 0.955 | 0.833 | tran SYCAMORE 230 to SYCAMORE 138 ck 1 |
| 24807 | MIRAGE | 115 | 24819 | CONCHO | 115 | 1 | tran_238 | ivsg_hs_alt4ad1 | 183 | 164.2 | -5 | 877.1 | 164.3 | 0.955 | 0.867 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | ML81 | ivsg_hs_alt4ad1 | 408.3 | -384 | 4.6 | 1626.5 | 384 | 0.952 | 0.992 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | ML80 | ivsg_hs_alt4ad1 | 408.3 | -382 | 4.8 | 1619.4 | 382 | 0.948 | 0.992 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | B2_015 | ivsg_hs_alt4ad1 | 382.4 | 358.2 | 17 | 1515.4 | 358.6 | 0.947 | 0.833 | MIGUEL - MISSION 1 230kV |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | B2_020 | ivsg_hs_alt4ad1 | 382.4 | 356.6 | 15.5 | 1508.8 | 356.9 | 0.943 | 0.833 | MIGUEL - MISSION 2 230kV |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | B2_034 | ivsg_hs_alt4ad1 | 382.4 | 345.8 | 14.5 | 1508 | 346.1 | 0.943 | 0.833 | OLD TOWN - MLMS3TAP 1 230kV |
| 24807 | MIRAGE | 115 | 24816 | SANTA RO | 115 | 1 | tran_238 | ivsg_hs_alt4ad1 | 183.3 | 162.1 | -10.4 | 867.4 | 162.4 | 0.943 | 0.858 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | B2_032 | ivsg_hs_alt4ad1 | 382.4 | 345.9 | 14.2 | 1507.1 | 346.1 | 0.942 | 0.833 | OTAYMESA - MLMS3TAP 1 230kV |
| 19020 | BLYTHE | 161 | 24017 | BLYTHESC | 161 | 1 | line_191 | ivsg_hs_alt4ad1 | 244 | 231.1 | 38.2 | 823.4 | 234.2 | 0.941 | 0.818 | line EAGLEMTN to IRON MTN 230 ck 1 |
| 22468 | MIGUEL | 500 | 22472 | MIGUELMP | 500 | 1 | line_66 | ivsg_hs_alt4ad1 | 1120 | 1038.4 | 136.7 | 1252.4 | 1047.3 | 0.94 | 0.76 | line CENTRALX to NEWSF500 500 ck 1 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | B2_001 | ivsg_hs_alt4ad1 | 408.3 | -386.4 | -1.8 | 1604.6 | 386.4 | 0.939 | 0.992 | HASSYAMP - N.GILA 1 500kV |
| 22360 | IMPRLVLY | 500 | 22468 | MIGUEL | 500 | 1 | line_66 | ivsg_hs_alt4ad1 | 2252 | 2054.7 | 563.4 | 2385.3 | 2130.6 | 0.937 | 0.736 | line CENTRALX to NEWSF500 500 ck 1 |
| 22832 | SYCAMORE | 230 | 22467 | MLSXTAP | 230 | 1 | B2_032 | ivsg_hs_alt4ad1 | 796.7 | -717.1 | 45.9 | 1874 | 718.6 | 0.937 | 0.342 | OTAYMESA - MLMS3TAP 1 230kV |
| 22832 | SYCAMORE | 230 | 22467 | MLSXTAP | 230 | 1 | B2_034 | ivsg_hs_alt4ad1 | 796.7 | -717.2 | 44.7 | 1874.8 | 718.6 | 0.937 | 0.342 | OLD TOWN - MLMS3TAP 1 230kV |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 2 | line_136 | ivsg_hs_alt4ad1 | 1195 | 1085.9 | -46.4 | 2807.3 | 1086.9 | 0.936 | 0.563 | line SERRANO to VILLA PK 230 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | line_66 | ivsg_hs_alt4ad1 | 204.1 | 186.3 | 9 | 796.8 | 186.5 | 0.933 | 1.258 | line CENTRALX to NEWSF500 500 ck 1 |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | ML70 | ivsg_hs_alt4ad1 | 382.4 | 350.1 | 21.5 | 1490.9 | 350.8 | 0.932 | 0.833 | tran MIGUEL 69 to MIGUEL 230 ck 1 |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | ML71 | ivsg_hs_alt4ad1 | 382.4 | 350.1 | 21.5 | 1490.9 | 350.8 | 0.932 | 0.833 | tran MIGUEL 69 to MIGUEL 230 ck 2 |
| 22464 | MIGUEL | 230 | 22472 | MIGUELMP | 500 | 1 | line_66 | ivsg_hs_alt4ad1 | 1120 | -1036.8 | 11.8 | 2722.7 | 1036.9 | 0.93 | 0.75 | line CENTRALX to NEWSF500 500 ck 1 |
| 22831 | SYCAMORE | 138 | 22124 | CHCARITA | 138 | 1 | B2_034 | ivsg_hs_alt4ad1 | 204.1 | 179.1 | -40.7 | 793.4 | 183.7 | 0.929 | 0.744 | OLD TOWN - MLMS3TAP 1 230kV |
| 24303 | BIG CRK3 | 230 | 24235 | RECTOR | 230 | 1 | line_139 | ivsg_hs_alt4ad1 | 353 | 335.6 | 45.6 | 822.9 | 338.7 | 0.929 | 0.73 | line SPRINGVL to BIG CRK4 230 ck 1 |
| 22831 | SYCAMORE | 138 | 22124 | CHCARITA | 138 | 1 | B2_032 | ivsg_hs_alt4ad1 | 204.1 | 179.1 | -40.5 | 792.8 | 183.6 | 0.928 | 0.744 | OTAYMESA - MLMS3TAP 1 230kV |
| 15230 | RUDD | 230 | 15218 | WHITETNK | 230 | 1 | PV1 | ivsg_hs_alt4ad1 | 725 | 674.3 | -13 | 1682 | 674.4 | 0.924 | 0.955 | gen PALOVRD1 24.00 |
| 24614 | TAP601 | 115 | 24702 | KRAMER | 115 | 1 | line_169 | ivsg_hs_alt4ad1 | 217.1 | -189.9 | 69 | 1004.9 | 202.1 | 0.924 | 0.717 | line KRAMER to LUGO 230 ck 1 |
| 24614 | TAP601 | 115 | 24702 | KRAMER | 115 | 1 | line_170 | ivsg_hs_alt4ad1 | 217.1 | -189.9 | 69 | 1004.9 | 202.1 | 0.924 | 0.717 | line KRAMER to LUGO 230 ck 2 |
| 8601 | GEOSUB2 | 230 | 8300 | BANIS230 | 230 | 1 | line_22 | ivsg_hs_alt4ad1 | 550 | 513.4 | 49.8 | 1269.1 | 515.8 | 0.92 | 0.678 | line GEOSUB1 to BANIS230 230 ck 1 |
| 8601 | GEOSUB2 | 230 | 8300 | BANIS230 | 230 | 1 | line_23 | ivsg_hs_alt4ad1 | 550 | 513.4 | 49.8 | 1269.1 | 515.8 | 0.92 | 0.678 | line GEOSUB1 to BANIS230 230 ck 2 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | B2_029 | ivsg_hs_alt4ad1 | 392 | 359.6 | 4.5 | 917.1 | 359.6 | 0.92 | 1.04 | OTAYMESA - MLSXTAP 1 230kV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | B2_031 | ivsg_hs_alt4ad1 | 392 | 359.3 | 2.9 | 917.7 | 359.3 | 0.92 | 1.04 | SYCAMORE - MLSXTAP 1 230kV |
| 22504 | MISSION | 230 | 22500 | MISSION | 138 | 1 | SX60 | ivsg_hs_alt4ad1 | 392 | 354.7 | 75.1 | 940.6 | 362.6 | 0.92 | 0.72 | tran SYCAMORE 230 to SYCAMORE 138 ck 1 |
| 22504 | MISSION | 230 | 22500 | MISSION | 138 | 2 | SX60 | ivsg_hs_alt4ad1 | 392 | 354.7 | 75.1 | 940.6 | 362.6 | 0.92 | 0.72 | tran SYCAMORE 230 to SYCAMORE 138 ck 1 |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | line_66 | ivsg_hs_alt4ad1 | 382.4 | 339.2 | 4.7 | 1466.6 | 339.2 | 0.917 | 0.833 | line CENTRALX to NEWSF500 500 ck 1 |
| 22116 | CARLTHTP | 138 | 22734 | SANTEE | 138 | 1 | ML60 | ivsg_hs_alt4ad1 | 273 | 243.6 | -6 | 1045.4 | 243.7 | 0.915 | 0.745 | tran MIGUEL 230 to MIGUEL 138 ck 1 |
| 24301 | BIG CRK1 | 230 | 24235 | RECTOR | 230 | 1 | line_156 | ivsg_hs_alt4ad1 | 329 | 305.6 | 4.5 | 752.1 | 305.6 | 0.911 | 0.727 | line BIG CRK1 to BIG CRK2 230 ck 1 |
| 22504 | MISSION | 230 | 22500 | MISSION | 138 | 1 | ML60 | ivsg_hs_alt4ad1 | 392 | 347.8 | 83 | 930.1 | 357.6 | 0.91 | 0.72 | tran MIGUEL 230 to MIGUEL 138 ck 1 |
| 22504 | MISSION | 230 | 22500 | MISSION | 138 | 2 | ML60 | ivsg_hs_alt4ad1 | 392 | 347.8 | 83 | 930.1 | 357.6 | 0.91 | 0.72 | tran MIGUEL 230 to MIGUEL 138 ck 1 |
| 24602 | VICTOR | 115 | 24702 | KRAMER | 115 | 1 | line_169 | ivsg_hs_alt4ad1 | 217.1 | -185.3 | 79.1 | 988.9 | 201.5 | 0.91 | 0.704 | line KRAMER to LUGO 230 ck 1 |
| 24602 | VICTOR | 115 | 24702 | KRAMER | 115 | 1 | line_170 | ivsg_hs_alt4ad1 | 217.1 | -185.3 | 79.1 | 988.9 | 201.5 | 0.91 | 0.704 | line KRAMER to LUGO 230 ck 2 |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_63 | ivsg_hs_alt4ad1 | 169 | 153.5 | 27.2 | 548.1 | 155.9 | 0.907 | 0.801 | line RAMON to MIRAGE 230 ck 2 |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | B2_001 | ivsg_hs_alt4ad1 | 132 | 121.2 | -11.1 | 750.4 | 121.7 | 0.906 | 0.945 | HASSYAMP - N.GILA 1 500kV |
| 24301 | BIG CRK1 | 230 | 24302 | BIG CRK2 | 230 | 1 | line_155 | ivsg_hs_alt4ad1 | 329 | 305.6 | -22 | 745.7 | 306.4 | 0.903 | 0.247 | line BIG CRK1 to RECTOR 230 ck 1 |
| 24807 | MIRAGE | 115 | 24819 | CONCHO | 115 | 1 | line_65 | ivsg_hs_alt4ad1 | 183 | 163.9 | -7.9 | 828 | 164.1 | 0.901 | 0.867 | line MIRAGE to DEVERS 230 ck 2 |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_12 | ivsg_hs_alt4ad1 | 169 | 152.3 | 27.1 | 543.9 | 154.7 | 0.9 | 0.801 | line COACHELA to RAMON 230 ck 2 |
| 24801 | DEVERS | 500 | 24804 | DEVERS | 230 | 1 | line_207 | ivsg_hs_alt4ad1 | 1120 | 948.9 | 348 | 1160.9 | 1010.7 | 0.9 | 0.58 | line DEVERS to VALLEYSC 500 ck 1 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24729 | INYO | 230 | 24730 | INYO PS | 115 | 2 | tran_230 | ivsg_hs_alt4ad1 | 50 | -42 | 15.8 | 105.3 | 44.9 | 0.9 | 0.54 | tran INYO 230 to INYO PS 115 ck 1 |
| 24729 | INYO | 230 | 24730 | INYO PS | 115 | 1 | tran_231 | ivsg_hs_alt4ad1 | 50 | -42 | 15.8 | 105.3 | 44.9 | 0.9 | 0.54 | tran INYO 230 to INYO PS 115 ck 2 |
| 24805 | DEVERS | 115 | 24804 | DEVERS | 230 | 1 | tran_236 | ivsg_hs_alt4ad1 | 280 | -246.1 | 52.5 | 1261.7 | 251.6 | 0.9 | 0.6 | tran DEVERS 115 to DEVERS 230 ck 3 |

ivsg_hs_alt4a_D1.sav
No Solve Summary
N-1 Outages

| Contingency-Description | Case | Problem-Description |
|---|---|---|
| IMPRLVLY - MIGUEL 1 500kV | ivsg_hs_alt4ad1 | BAD Qgen: 25649 DVLCYN2G 30.0 MVAr |

| Bus | Name | kV | Area | Zone | Outage | Case | Vbase | Vcont | DeltaV | Vmin | Vmax | Max-dv | Contingency Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22734 | SANTEE | 138 | 22 | 223 | 23021/22/23/41 | ivsg_hs_alt4ad1 | 0.982 | 0.899 | -0.082 | 0.9 | 1.05 | 0.05 | MIGUEL 230 CORRIDOR West of SN |
| 22412 | LOSCOCHS | 138 | 22 | 223 | 23021/22/23/41 | ivsg_hs_alt4ad1 | 0.98 | 0.905 | -0.076 | 0.9 | 1.05 | 0.05 | MIGUEL 230 CORRIDOR West of SN |
| 22424 | MAINST50 | 138 | 22 | 222 | 23021/22/23/41 | ivsg_hs_alt4ad1 | 0.977 | 0.924 | -0.053 | 0.9 | 1.05 | 0.05 | MIGUEL 230 CORRIDOR West of SN |
| 22428 | MAINST51 | 138 | 22 | 222 | 23021/22/23/41 | ivsg_hs_alt4ad1 | 0.976 | 0.924 | -0.053 | 0.9 | 1.05 | 0.05 | MIGUEL 230 CORRIDOR West of SN |
| 24058 | GOLETA | 230 | 24 | 240 | line_2269 | ivsg_hs_alt4ad1 | 0.982 | 0.927 | -0.055 | 0.9 | 1.05 | 0.05 | S.CLARA 230.00 - GOLETA 230.00 1, S.CLARA 230.00 - MOORPARK 230.00 1 |
| 24058 | GOLETA | 230 | 24 | 240 | line_2270 | ivsg_hs_alt4ad1 | 0.982 | 0.927 | -0.055 | 0.9 | 1.05 | 0.05 | S.CLARA 230.00 - GOLETA 230.00 2, S.CLARA 230.00 - MOORPARK 230.00 2 |
| 22772 | SOUTHBAY | 138 | 22 | 222 | 23021/22/23/41 | ivsg_hs_alt4ad1 | 0.984 | 0.932 | -0.053 | 0.9 | 1.05 | 0.05 | MIGUEL 230 CORRIDOR West of SN |
| 22852 | TELECYN | 138 | 22 | 222 | 23021/22/23/41 | ivsg_hs_alt4ad1 | 0.995 | 0.941 | -0.054 | 0.9 | 1.05 | 0.05 | MIGUEL 230 CORRIDOR West of SN |
| 22672 | PRCTRVLY | 138 | 22 | 222 | 23021/22/23/41 | ivsg_hs_alt4ad1 | 0.998 | 0.946 | -0.052 | 0.9 | 1.05 | 0.05 | MIGUEL 230 CORRIDOR West of SN |
| 22460 | MIGUEL | 138 | 22 | 222 | 23021/22/23/41 | ivsg_hs_alt4ad1 | 1 | 0.95 | -0.05 | 0.9 | 1.05 | 0.05 | MIGUEL 230 CORRIDOR West of SN |
| 24015 | ARCO SC | 230 | 24 | 240 | line_2013 | ivsg_hs_alt4ad1 | 0.985 | 1.036 | 0.051 | 0.9 | 1.05 | 0.05 | ARCO SC 230.00 - HINSON 230.00 1, ARCO SC 230.00 - HINSON 230.00 2 |
| 24061 | HARBOR | 230 | 24 | 240 | line_2039 | ivsg_hs_alt4ad1 | 0.985 | 1.036 | 0.051 | 0.9 | 1.05 | 0.05 | HARBOR 230.00 - HINSON 230.00 1, LBEACH 230.00 - LITEHIPE 230.00 1 |
| 24077 | LBEACH | 230 | 24 | 240 | line_2039 | ivsg_hs_alt4ad1 | 0.985 | 1.036 | 0.051 | 0.9 | 1.05 | 0.05 | HARBOR 230.00 - HINSON 230.00 1, LBEACH 230.00 - LITEHIPE 230.00 1 |
| 24061 | HARBOR | 230 | 24 | 240 | line_2041 | ivsg_hs_alt4ad1 | 0.985 | 1.036 | 0.051 | 0.9 | 1.05 | 0.05 | HARBOR 230.00 - HINSON 230.00 1, HARBOR 230.00 - LBEACH 230.00 1 |
| 24061 | HARBOR | 230 | 24 | 240 | line_2253 | ivsg_hs_alt4ad1 | 0.985 | 1.036 | 0.051 | 0.9 | 1.05 | 0.05 | HARBOR 230.00 - HINSON 230.00 1, HARBOR 230.00 - LBEACH 230.00 1 |
| 25001 | GOODRICH | 230 | 24 | 250 | line_2073 | ivsg_hs_alt4ad1 | 0.957 | 1.044 | 0.088 | 0.9 | 1.05 | 0.05 | GOODRICH 230.00 - GOULD 230.00 1, GOODRICH 230.00 - LAGUBELL 230.00 1 |
| 24058 | GOLETA | 230 | 24 | 240 | line_2120 | ivsg_hs_alt4ad1 | 0.982 | 1.044 | 0.062 | 0.9 | 1.05 | 0.05 | S.CLARA 230.00 - GOLETA 230.00 1, S.CLARA 230.00 - GOLETA 230.00 2 |

ivsg_hs_alt4a_D1.sav
FLOW Summary
N-2 Outages

| LEGEND | % of RATING 1 | |
|---|---|---|
| C_pu | 100% - 110% | |
| C_pu | 110% - 120% | P.U. of |
| C_pu | > 120% | Rate 1 |

| FROM | FR | BKV | TO | TO | BKV | CK | Outage_Name | Case | Rate-Mva | Pflow | Qflow | Amps | MVA | C_pu | B_pu | Contingency_Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 13821C/25/23051A | ivsg_hs_alt4ad1 | 204.1 | 369.8 | -12.6 | 1569.1 | 370 | 1.838 | 1.258 | CH-ES-NCM-SX |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt4ad1 | 392 | 624.3 | 119.3 | 1677.6 | 635.6 | 1.62 | 1.05 | MIGUEL 230 CORRIDOR West of SN |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt4ad1 | 408.3 | -612.1 | -3.7 | 2707.9 | 612.1 | 1.585 | 0.992 | MIGUEL 230 CORRIDOR West of SN |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt4ad1 | 392 | 605.3 | 106.3 | 1603.3 | 614.6 | 1.57 | 1.05 | MIGUEL 230 CORRIDOR West of LC |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23051B/23011 | ivsg_hs_alt4ad1 | 204.1 | 316.1 | -1.2 | 1338.2 | 316.1 | 1.567 | 1.258 | EPP-ES + ES-EA-SA 230KV |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt4ad1 | 408.3 | -594.1 | -0.8 | 2587.9 | 594.1 | 1.515 | 0.992 | MIGUEL 230 CORRIDOR West of LC |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23022/23023 | ivsg_hs_alt4ad1 | 204.1 | 303.4 | -3.7 | 1285.3 | 303.4 | 1.505 | 1.258 | ML-MS1+ ML-MS2 230KV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt4ad1 | 392 | 574 | 102.3 | 1513.4 | 583 | 1.49 | 1.05 | MIGUEL 230 CORRIDOR North of ML |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23051A/23011 | ivsg_hs_alt4ad1 | 204.1 | 293.1 | -7.2 | 1243 | 293.2 | 1.456 | 1.258 | SX-EPP + ES-EA-SA 230KV |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt4ad1 | 382.4 | 521.4 | 2 | 2319.3 | 521.5 | 1.45 | 0.833 | MIGUEL 230 CORRIDOR West of SN |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23011/13825 | ivsg_hs_alt4ad1 | 204.1 | 292.2 | -10.5 | 1233.3 | 292.4 | 1.444 | 1.258 | ES-EA-SA 230KV + BQ-CC-ES-NCM 138KV |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt4ad1 | 408.3 | -564 | -8.3 | 2442.8 | 564.1 | 1.43 | 0.992 | MIGUEL 230 CORRIDOR North of ML |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23022/23023 | ivsg_hs_alt4ad1 | 392 | 538 | 79.3 | 1394.8 | 543.8 | 1.39 | 1.05 | ML-MS1+ ML-MS2 230KV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23002/06/10 | ivsg_hs_alt4ad1 | 204.1 | 273.3 | 8.8 | 1182.5 | 273.4 | 1.385 | 1.258 | SANLUISREY 230 CORRIDOR |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt4ad1 | 382.4 | 503.8 | 2.9 | 2205.3 | 503.8 | 1.378 | 0.833 | MIGUEL 230 CORRIDOR West of LC |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23012/13807 | ivsg_hs_alt4ad1 | 204.1 | 274.2 | 9.3 | 1160.5 | 274.4 | 1.359 | 1.258 | PQ-EA 230KV + EA-NCW 138KV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23012/13808 | ivsg_hs_alt4ad1 | 204.1 | 269.4 | 7.7 | 1138.7 | 269.5 | 1.334 | 1.258 | PQ-EA 230KV + NCW-PQ 138KV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | 23051B/23011 | ivsg_hs_alt4ad1 | 392 | 520.1 | 33.6 | 1328.8 | 521.1 | 1.33 | 1.04 | EPP-ES + ES-EA-SA 230KV |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23022/23023 | ivsg_hs_alt4ad1 | 408.3 | -529.6 | 0.6 | 2251.3 | 529.6 | 1.318 | 0.992 | ML-MS1+ ML-MS2 230KV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | line_N-203 | ivsg_hs_alt4ad1 | 204.1 | 263.2 | -1.7 | 1118.5 | 263.2 | 1.31 | 1.258 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | line_2245 | ivsg_hs_alt4ad1 | 204.1 | 260.6 | -0.8 | 1106.2 | 260.6 | 1.295 | 1.258 | DEVERS 500.00 - VALLEYSC 500.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | line_N-204 | ivsg_hs_alt4ad1 | 204.1 | 260.4 | -1.9 | 1104.7 | 260.4 | 1.294 | 1.258 | COACHELLA MIDWAY 230 CKT 1&2 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23004/23001 | ivsg_hs_alt4ad1 | 204.1 | 261.4 | 4.6 | 1103.2 | 261.4 | 1.292 | 1.258 | SA-MS 1 + SA-MS 2 230KV |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt4ad1 | 382.4 | 474.1 | 13.8 | 2064.9 | 474.3 | 1.291 | 0.833 | MIGUEL 230 CORRIDOR North of ML |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23013/27/28 | ivsg_hs_alt4ad1 | 204.1 | 261.2 | 2.2 | 1102.6 | 261.2 | 1.291 | 1.258 | OLD TOWN TO OLD TOWN JCT |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23011/23003 | ivsg_hs_alt4ad1 | 204.1 | 262.3 | -0.8 | 1101.5 | 262.3 | 1.29 | 1.258 | SA-EA 230KV + SA-ES-EA 230KV |
| 22672 | PRCTRVLY | 138 | 22852 | TELECYN | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt4ad1 | 478 | 581.2 | -0.2 | 2571.4 | 581.2 | 1.286 | 0.783 | MIGUEL 230 CORRIDOR West of SN |
| 22672 | PRCTRVLY | 138 | 22852 | TELECYN | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt4ad1 | 478 | 563.3 | -3.2 | 2453.5 | 563.3 | 1.227 | 0.783 | MIGUEL 230 CORRIDOR West of LC |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | 23051A/23011 | ivsg_hs_alt4ad1 | 392 | 476.7 | 14.5 | 1222.2 | 476.9 | 1.22 | 1.04 | SX-EPP + ES-EA-SA 230KV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | 23022/23023 | ivsg_hs_alt4ad1 | 392 | 476.6 | 19.2 | 1220 | 476.9 | 1.22 | 1.04 | ML-MS1+ ML-MS2 230KV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | line_2115 | ivsg_hs_alt4ad1 | 204.1 | 250.1 | -4.6 | 1040 | 250.1 | 1.218 | 1.258 | S.ONOFRE 230.00 - SANTIAGO 230.00 1, S.ONOFRE 230.00 - SANTIAGO 230.00 2 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23027/28/13810 | ivsg_hs_alt4ad1 | 204.1 | 244.4 | 6 | 1029.5 | 244.5 | 1.206 | 1.258 | OLD TOWN TO MISSION 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 2 | line_2046 | ivsg_hs_alt4ad1 | 956 | -1133.1 | -38.9 | 2882.9 | 1133.7 | 1.201 | 0.596 | LA FRESA 230.00 - REDONDO 230.00 1, REDONDO 230.00 - LITEHIPE 230.00 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 1 | line_2047 | ivsg_hs_alt4ad1 | 956 | -1133.1 | -38.9 | 2882.9 | 1133.7 | 1.201 | 0.596 | LA FRESA 230.00 - REDONDO 230.00 2, REDONDO 230.00 - LITEHIPE 230.00 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23052/23007 | ivsg_hs_alt4ad1 | 204.1 | 242.5 | -1.6 | 1025.9 | 242.5 | 1.201 | 1.258 | TA-SO 1 + 2 230KV |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | 23022/23023 | ivsg_hs_alt4ad1 | 382.4 | 440.1 | 10.3 | 1879.5 | 440.3 | 1.175 | 0.833 | ML-MS1+ ML-MS2 230KV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt4ad1 | 204.1 | 234.3 | 0.7 | 1002.8 | 234.3 | 1.174 | 1.258 | MIGUEL 230 CORRIDOR North of ML |
| 24086 | LUGO | 500 | 24236 | RANCHVST | 500 | 1 | line_2194 | ivsg_hs_alt4ad1 | 2598 | 3137.4 | 548.6 | 3515.3 | 3185 | 1.173 | 0.65 | LUGO 500.00 - MIRALOMA 500.00 2, LUGO 500.00 - MIRALOMA 500.00 3 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 13821B/638 | ivsg_hs_alt4ad1 | 392 | 452.5 | 59.4 | 1176.8 | 456.4 | 1.16 | 1.05 | CH-SX-SN 138KV + SAN VCNT-EL 69KV |
| 22672 | PRCTRVLY | 138 | 22852 | TELECYN | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt4ad1 | 478 | 533.2 | 4.3 | 2309 | 533.2 | 1.155 | 0.783 | MIGUEL 230 CORRIDOR North of ML |
| 30060 | MIDWAY | 500 | 24156 | VINCENT | 500 | 3 | line_2215 | ivsg_hs_alt4ad1 | 1848.1 | 2248.1 | 139 | 2442.7 | 2252.4 | 1.148 | 0.45 | MIDWAY 500.00 - VINCENT 500.00 1, MIDWAY 500.00 - VINCENT 500.00 2 |
| 30060 | MIDWAY | 500 | 24156 | VINCENT | 500 | 1 | line_2220 | ivsg_hs_alt4ad1 | 1848.1 | 2224.8 | 145.2 | 2418 | 2229.5 | 1.138 | 0.36 | MIDWAY 500.00 - VINCENT 500.00 2, MIDWAY 500.00 - VINCENT 500.00 3 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 2 | line_2064 | ivsg_hs_alt4ad1 | 956 | -1071.7 | -46.1 | 2726.7 | 1072.7 | 1.136 | 0.596 | LA FRESA 230.00 - REDONDO 230.00 1, MESA CAL 230.00 - REDONDO 230.00 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 1 | line_2065 | ivsg_hs_alt4ad1 | 956 | -1071.7 | -46.1 | 2726.7 | 1072.7 | 1.136 | 0.596 | LA FRESA 230.00 - REDONDO 230.00 2, MESA CAL 230.00 - REDONDO 230.00 1 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 2 | line_2029 | ivsg_hs_alt4ad1 | 1195 | 1314.4 | -51.4 | 3401.5 | 1315.4 | 1.134 | 0.563 | LEWIS 230.00 - SERRANO 230.00 1, SERRANO 230.00 - VILLA PK 230.00 1 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 2 | line_2031 | ivsg_hs_alt4ad1 | 1195 | 1314.4 | -51.4 | 3401.5 | 1315.4 | 1.134 | 0.563 | LEWIS 230.00 - SERRANO 230.00 2, SERRANO 230.00 - VILLA PK 230.00 1 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 2 | line_2278 | ivsg_hs_alt4ad1 | 1195 | 1314.4 | -51.4 | 3401.5 | 1315.4 | 1.134 | 0.563 | LEWIS 230.00 - SERRANO 230.00 1, SERRANO 230.00 - VILLA PK 230.00 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23027/28/13827 | ivsg_hs_alt4ad1 | 204.1 | 229.8 | 3.3 | 967.2 | 229.8 | 1.133 | 1.258 | OLD TOWN TO MISSION 2 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | 23002/06/10 | ivsg_hs_alt4ad1 | 392 | 439.5 | 18.3 | 1148.3 | 439.8 | 1.12 | 1.04 | SANLUISREY 230 CORRIDOR |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 13821B/638 | ivsg_hs_alt4ad1 | 408.3 | -446.5 | -2.6 | 1899.6 | 446.5 | 1.112 | 0.992 | CH-SX-SN 138KV + SAN VCNT-EL 69KV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 13810B/23013 | ivsg_hs_alt4ad1 | 204.1 | 225.2 | 6.1 | 949.2 | 225.3 | 1.112 | 1.258 | OT JCT TO PQ 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23002/06/10 | ivsg_hs_alt4ad1 | 392 | 430.2 | 52.6 | 1147.1 | 433.5 | 1.11 | 1.05 | SANLUISREY 230 CORRIDOR |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23051B/23011 | ivsg_hs_alt4ad1 | 392 | 427.2 | 52.3 | 1106.9 | 430.4 | 1.1 | 1.05 | EPP-ES + ES-EA-SA 230KV |
| 22596 | OLD TOWN | 230 | 22466 | MLMS3TAP | 230 | 1 | 23021/22/23/41 | ivsg_hs_alt4ad1 | 912 | -945.1 | 93.6 | 2497.3 | 949.7 | 1.091 | 0.74 | MIGUEL 230 CORRIDOR West of SN |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 2 | line_2049 | ivsg_hs_alt4ad1 | 956 | -1026.8 | -38.7 | 2616.1 | 1027.5 | 1.09 | 0.596 | LA FRESA 230.00 - REDONDO 230.00 1, LCIENEGA 230.00 - LA FRESA 230.00 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 1 | line_2050 | ivsg_hs_alt4ad1 | 956 | -1026.8 | -38.7 | 2616.1 | 1027.5 | 1.09 | 0.596 | LA FRESA 230.00 - REDONDO 230.00 2, LCIENEGA 230.00 - LA FRESA 230.00 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | line_N-203 | ivsg_hs_alt4ad1 | 392 | 423.7 | 44.8 | 1104.9 | 426.1 | 1.09 | 1.05 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 2 | line_2057 | ivsg_hs_alt4ad1 | 956 | -1026.4 | -35.4 | 2613.6 | 1027 | 1.089 | 0.596 | EL NIDO 230.00 - LA FRESA 230.00 3, LA FRESA 230.00 - REDONDO 230.00 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 1 | line_2058 | ivsg_hs_alt4ad1 | 956 | -1026.4 | -35.4 | 2613.6 | 1027 | 1.089 | 0.596 | EL NIDO 230.00 - LA FRESA 230.00 3, LA FRESA 230.00 - REDONDO 230.00 2 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 2 | line_2059 | ivsg_hs_alt4ad1 | 956 | -1026.4 | -35.4 | 2613.6 | 1027 | 1.089 | 0.596 | EL NIDO 230.00 - LA FRESA 230.00 4, LA FRESA 230.00 - REDONDO 230.00 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 1 | line_2060 | ivsg_hs_alt4ad1 | 956 | -1026.4 | -35.4 | 2613.6 | 1027 | 1.089 | 0.596 | EL NIDO 230.00 - LA FRESA 230.00 4, LA FRESA 230.00 - REDONDO 230.00 2 |
| 24701 | KRAMER | 230 | 24085 | LUGO | 230 | 2 | line_2260 | ivsg_hs_alt4ad1 | 478 | 525.9 | 6.5 | 1303 | 525.9 | 1.086 | 0.644 | KRAMER 230.00 - LUGO 230.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23002/06/10 | ivsg_hs_alt4ad1 | 408.3 | -424.5 | 1.4 | 1851.6 | 424.5 | 1.084 | 0.992 | SANLUISREY 230 CORRIDOR |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | line_2245 | ivsg_hs_alt4ad1 | 392 | 421.4 | 43.9 | 1098.1 | 423.7 | 1.08 | 1.05 | DEVERS 500.00 - VALLEYSC 500.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | line_N-203 | ivsg_hs_alt4ad1 | 392 | 423.4 | 8.9 | 1088.2 | 423.5 | 1.08 | 1.04 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 13821C/25/23051A | ivsg_hs_alt4ad1 | 392 | 420.8 | 49.9 | 1087.7 | 423.7 | 1.08 | 1.05 | CH-ES-NCM-SX |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | 23013/27/28 | ivsg_hs_alt4ad1 | 392 | 424.2 | 14.8 | 1082.2 | 424.5 | 1.08 | 1.04 | OLD TOWN TO OLD TOWN JCT |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22596 | OLD TOWN | 230 | 22466 | MLMS3TAP | 230 | 1 | 23021/22/23/41 | ivsg_hs_alt4ad1 | 912 | -934.2 | 106.9 | 2451.1 | 940.3 | 1.071 | 0.74 | MIGUEL 230 CORRIDOR North of ML |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | line_2245 | ivsg_hs_alt4ad1 | 392 | 418.4 | 9.6 | 1073.7 | 418.5 | 1.07 | 1.04 | DEVERS 500.00 - VALLEYSC 500.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 22596 | OLD TOWN | 230 | 22466 | MLMS3TAP | 230 | 1 | 23021/22/23/41 | ivsg_hs_alt4ad1 | 912 | -931.6 | 103.5 | 2445.6 | 937.3 | 1.068 | 0.74 | MIGUEL 230 CORRIDOR West of LC |
| 24025 | CHINO | 230 | 24093 | MIRALOMW | 230 | 1 | line_2160 | ivsg_hs_alt4ad1 | 705 | -729.1 | 30.4 | 1888.9 | 729.7 | 1.067 | 0.277 | CHINO 230.00 - MIRALOMA 230.00 2, CHINO 230.00 - MIRALOMA 230.00 3 |
| 8376 | RTAP2 | 92 | 8974 | RTP1 | 92 | 1 | line_N-204 | ivsg_hs_alt4ad1 | 57 | -57.2 | 11.6 | 379.2 | 58.4 | 1.063 | 0.662 | COACHELLA MIDWAY 230 CKT 1&2 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_2260 | ivsg_hs_alt4ad1 | 56 | 57.9 | -9.9 | 292.5 | 58.8 | 1.06 | 0.92 | KRAMER 230.00 - LUGO 230.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 22672 | PRCTRVLY | 138 | 22852 | TELECYN | 138 | 1 | 23022/23023 | ivsg_hs_alt4ad1 | 478 | 498.7 | -4.5 | 2120.2 | 498.7 | 1.06 | 0.783 | ML-MS1+ ML-MS2 230KV |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 1 | line_2030 | ivsg_hs_alt4ad1 | 1287 | 1314.4 | -51.4 | 3401.5 | 1315.4 | 1.053 | 0.523 | LEWIS 230.00 - SERRANO 230.00 1, SERRANO 230.00 - VILLA PK 230.00 2 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 1 | line_2032 | ivsg_hs_alt4ad1 | 1287 | 1314.4 | -51.4 | 3401.5 | 1315.4 | 1.053 | 0.523 | LEWIS 230.00 - SERRANO 230.00 2, SERRANO 230.00 - VILLA PK 230.00 2 |
| 22831 | SYCAMORE | 138 | 22124 | CHCARITA | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt4ad1 | 204.1 | 207.4 | -29.1 | 893.9 | 209.4 | 1.047 | 0.744 | MIGUEL 230 CORRIDOR West of SN |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23051B/23011 | ivsg_hs_alt4ad1 | 408.3 | -421.9 | -2.1 | 1786.6 | 421.9 | 1.046 | 0.992 | EPP-ES + ES-EA-SA 230KV |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | line_N-203 | ivsg_hs_alt4ad1 | 408.3 | -418.4 | 5.2 | 1783.5 | 418.5 | 1.044 | 0.992 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 22831 | SYCAMORE | 138 | 22124 | CHCARITA | 138 | 1 | 13821B/638 | ivsg_hs_alt4ad1 | 204.1 | 211.1 | -20.8 | 890.2 | 212.2 | 1.043 | 0.744 | CH-SX-SN 138KV + SAN VCNT-EL 69KV |
| 22260 | ESCNDIDO | 230 | 22844 | TALEGA | 230 | 1 | 23052/23007 | ivsg_hs_alt4ad1 | 456.1 | 472.3 | 17.9 | 1193.5 | 472.6 | 1.042 | 0.031 | TA-SO 1 + 2 230KV |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_N-203 | ivsg_hs_alt4ad1 | 169 | 175 | 36.6 | 628.8 | 178.8 | 1.041 | 0.801 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | line_2245 | ivsg_hs_alt4ad1 | 408.3 | -416.2 | 5.5 | 1772.5 | 416.2 | 1.038 | 0.992 | DEVERS 500.00 - VALLEYSC 500.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | line_N-204 | ivsg_hs_alt4ad1 | 408.3 | -413.4 | 5.2 | 1758.3 | 413.5 | 1.029 | 0.992 | COACHELLA MIDWAY 230 CKT 1&2 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23051A/23011 | ivsg_hs_alt4ad1 | 408.3 | -415.1 | 0.1 | 1756.4 | 415.1 | 1.028 | 0.992 | SX-EPP + ES-EA-SA 230KV |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23021/23041 | ivsg_hs_alt4ad1 | 408.3 | -414.8 | 3.3 | 1756.3 | 414.8 | 1.028 | 0.992 | ML-SX + OM-SX 230KV |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 13821C/25/23051A | ivsg_hs_alt4ad1 | 408.3 | -415.6 | -1.4 | 1755.8 | 415.7 | 1.028 | 0.992 | CH-ES-NCM-SX |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | line_2113 | ivsg_hs_alt4ad1 | 408.3 | -413 | 3 | 1752.2 | 413 | 1.026 | 0.992 | ELLIS 230.00 - JOHANNA 230.00 1, ELLIS 230.00 - SANTIAGO 230.00 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23013/27/28 | ivsg_hs_alt4ad1 | 392 | 396.8 | 43.4 | 1026 | 399.2 | 1.02 | 1.05 | OLD TOWN TO OLD TOWN JCT |
| 24016 | BARRE | 230 | 24044 | ELLIS | 230 | 1 | line_2115 | ivsg_hs_alt4ad1 | 988 | 965.6 | -56.2 | 2513.5 | 967.2 | 1.013 | 0.405 | S.ONOFRE 230.00 - SANTIAGO 230.00 1, S.ONOFRE 230.00 - SANTIAGO 230.00 2 |
| 22831 | SYCAMORE | 138 | 22124 | CHCARITA | 138 | 1 | 23051B/23011 | ivsg_hs_alt4ad1 | 204.1 | 202.2 | -28.5 | 864.5 | 204.2 | 1.012 | 0.744 | EPP-ES + ES-EA-SA 230KV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | line_2115 | ivsg_hs_alt4ad1 | 392 | 393.8 | 43.3 | 998.7 | 396.2 | 1.01 | 1.05 | S.ONOFRE 230.00 - SANTIAGO 230.00 1, S.ONOFRE 230.00 - SANTIAGO 230.00 2 |
| 24074 | LA FRESA | 230 | 24065 | HINSON | 230 | 1 | line_2061 | ivsg_hs_alt4ad1 | 797 | -770.1 | 46.2 | 2012 | 771.5 | 1.006 | 0.138 | LA FRESA 230.00 - REDONDO 230.00 1, LA FRESA 230.00 - REDONDO 230.00 2 |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | line_2236 | ivsg_hs_alt4ad1 | 132 | 130.6 | -9.5 | 830.3 | 130.9 | 1.002 | 0.945 | PALOVRDE 500.00 - DEVERS 500.00 1, COACHELV 230.00 - DEVERS 230.00 2 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | line_2115 | ivsg_hs_alt4ad1 | 392 | 391.9 | 11.8 | 984.4 | 392.1 | 1 | 1.04 | S.ONOFRE 230.00 - SANTIAGO 230.00 1, S.ONOFRE 230.00 - SANTIAGO 230.00 2 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | 23052/23007 | ivsg_hs_alt4ad1 | 392 | 390.5 | 6 | 999.1 | 390.5 | 1 | 1.04 | TA-SO 1 + 2 230KV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | 13807/08/23013 | ivsg_hs_alt4ad1 | 392 | 391.1 | 12.1 | 994.6 | 391.3 | 1 | 1.04 | PQ ENCINA |
| 24126 | RIOHONDO | 230 | 24155 | VINCENT | 230 | 2 | line_2097 | ivsg_hs_alt4ad1 | 988 | -935 | 113.1 | 2473.7 | 941.9 | 0.997 | 0.726 | GOODRICH 230.00 - GOULD 230.00 1, VINCENT 230.00 - MESA CAL 230.00 1 |
| 24086 | LUGO | 500 | 24097 | MOHAVE | 500 | 1 | line_2234 | ivsg_hs_alt4ad1 | 1386 | -1427.5 | 87.6 | 1574.6 | 1430.2 | 0.992 | 0.706 | MOHAVE 500.00 - ELDORDO 500.00 1, PISGAH 230.00 - ELDORDO 230.00 2 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2191 | ivsg_hs_alt4ad1 | 2400 | -2480.6 | -29.3 | 2747.3 | 2480.7 | 0.991 | 0.775 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - ELDORDO 230.00 2 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2192 | ivsg_hs_alt4ad1 | 2400 | -2467.8 | -39.6 | 2734.1 | 2468.1 | 0.987 | 0.775 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | line_N-204 | ivsg_hs_alt4ad1 | 132 | 126.7 | -13.4 | 817.5 | 127.5 | 0.987 | 0.945 | COACHELLA MIDWAY 230 CKT 1&2 |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_N-204 | ivsg_hs_alt4ad1 | 169 | 166 | 34.4 | 596.1 | 169.5 | 0.987 | 0.801 | COACHELLA MIDWAY 230 CKT 1&2 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2100 | ivsg_hs_alt4ad1 | 2400 | -2462.4 | -207.7 | 2732.4 | 2471.2 | 0.986 | 0.775 | EAGLROCK 230.00 - MESA CAL 230.00 1, SYLMAR S 230.00 - GOULD 230.00 1 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2193 | ivsg_hs_alt4ad1 | 2400 | -2467.5 | -39.7 | 2733.9 | 2467.9 | 0.986 | 0.775 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - LUGO 230.00 2 |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | line_2237 | ivsg_hs_alt4ad1 | 132 | 128.6 | -10.2 | 815.9 | 129 | 0.985 | 0.945 | PALOVRDE 500.00 - DEVERS 500.00 1, J.HINDS 230.00 - MIRAGE 230.00 1 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2200 | ivsg_hs_alt4ad1 | 2400 | -2452.4 | -23.7 | 2726.5 | 2452.5 | 0.984 | 0.775 | LUGO 500.00 - MOHAVE 500.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2201 | ivsg_hs_alt4ad1 | 2400 | -2452.2 | -23.8 | 2726.2 | 2452.3 | 0.984 | 0.775 | LUGO 500.00 - MOHAVE 500.00 1, PISGAH 230.00 - LUGO 230.00 2 |
| 19020 | BLYTHE | 161 | 24017 | BLYTHESC | 161 | 1 | line_N-203 | ivsg_hs_alt4ad1 | 244 | 241.5 | 36.8 | 859.1 | 244.3 | 0.982 | 0.818 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | line_2186 | ivsg_hs_alt4ad1 | 132 | 128.7 | -10.5 | 809.4 | 129.1 | 0.977 | 0.945 | COACHELV 230.00 - DEVERS 230.00 2, J.HINDS 230.00 - MIRAGE 230.00 1 |
| 14008 | JOJOBA | 500 | 15011 | KYRENE | 500 | 1 | line_2245 | ivsg_hs_alt4ad1 | 1732 | 1779.9 | 143.4 | 1944.8 | 1785.7 | 0.974 | 0.938 | DEVERS 500.00 - VALLEYSC 500.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 24042 | ELDORDO | 500 | 24086 | LUGO | 500 | 1 | line_2258 | ivsg_hs_alt4ad1 | 1386 | 1423 | 276 | 1544.5 | 1449.5 | 0.972 | 0.648 | LUGO 500.00 - VINCENT 500.00 2, LUGO 500.00 - VICTORVL 500.00 1 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2103 | ivsg_hs_alt4ad1 | 2400 | -2419 | -192.7 | 2681.5 | 2426.6 | 0.968 | 0.775 | EAGLROCK 230.00 - SYLMAR S 230.00 1, SYLMAR S 230.00 - GOULD 230.00 1 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2096 | ivsg_hs_alt4ad1 | 2400 | -2413.2 | -214.8 | 2674.2 | 2422.8 | 0.965 | 0.775 | EAGLROCK 230.00 - MESA CAL 230.00 1, GOODRICH 230.00 - GOULD 230.00 1 |
| 24126 | RIOHONDO | 230 | 24155 | VINCENT | 230 | 2 | line_2101 | ivsg_hs_alt4ad1 | 988 | -910.9 | 114.5 | 2394.3 | 918.1 | 0.965 | 0.726 | EAGLROCK 230.00 - MESA CAL 230.00 1, VINCENT 230.00 - MESA CAL 230.00 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23021/23041 | ivsg_hs_alt4ad1 | 204.1 | 194.9 | 6.5 | 823.3 | 195 | 0.964 | 1.258 | ML-SX + OM-SX 230KV |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_2194 | ivsg_hs_alt4ad1 | 56 | 52.1 | -10.3 | 263.2 | 53.1 | 0.96 | 0.92 | LUGO 500.00 - MIRALOMA 500.00 2, LUGO 500.00 - MIRALOMA 500.00 3 |
| 22596 | OLD TOWN | 230 | 22466 | MLMS3TAP | 230 | 1 | 23021/23041 | ivsg_hs_alt4ad1 | 912 | -846.1 | 84.3 | 2197 | 850.3 | 0.96 | 0.74 | ML-SX + OM-SX 230KV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt4ad1 | 392 | 373.8 | -0.4 | 969 | 373.8 | 0.96 | 1.04 | MIGUEL 230 CORRIDOR North of ML |
| 8601 | GEOSUB2 | 230 | 8300 | BANIS230 | 230 | 1 | line_N-204 | ivsg_hs_alt4ad1 | 550 | 526.7 | 89.3 | 1321.2 | 534.2 | 0.958 | 0.678 | COACHELLA MIDWAY 230 CKT 1&2 |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | 13821B/638 | ivsg_hs_alt4ad1 | 382.4 | 357.9 | 19.4 | 1530.5 | 358.4 | 0.957 | 0.833 | CH-SX-SN 138KV + SAN VCNT-EL 69KV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | 13821C/25/23051A | ivsg_hs_alt4ad1 | 392 | 370.7 | 19.7 | 948.7 | 371.2 | 0.95 | 1.04 | CH-ES-NCM-SX |
| 24126 | RIOHONDO | 230 | 24155 | VINCENT | 230 | 2 | line_2100 | ivsg_hs_alt4ad1 | 988 | -889.1 | 118.4 | 2353.8 | 896.9 | 0.949 | 0.726 | EAGLROCK 230.00 - MESA CAL 230.00 1, SYLMAR S 230.00 - GOULD 230.00 1 |
| 19020 | BLYTHE | 161 | 24017 | BLYTHESC | 161 | 1 | line_N-204 | ivsg_hs_alt4ad1 | 244 | 232.5 | 34.6 | 826.5 | 235.1 | 0.945 | 0.818 | COACHELLA MIDWAY 230 CKT 1&2 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | line_2115 | ivsg_hs_alt4ad1 | 408.3 | -389.5 | -2.5 | 1612 | 389.5 | 0.944 | 0.992 | S.ONOFRE 230.00 - SANTIAGO 230.00 1, S.ONOFRE 230.00 - SANTIAGO 230.00 2 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2255 | ivsg_hs_alt4ad1 | 2400 | -2318.4 | -71.6 | 2585.7 | 2319.5 | 0.933 | 0.775 | LUGO 500.00 - MIRALOMA 500.00 3, LUGO 500.00 - MOHAVE 500.00 1 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 2 | line_2279 | ivsg_hs_alt4ad1 | 1195 | 1077.8 | -60.8 | 2800 | 1079.5 | 0.933 | 0.563 | S.ONOFRE 230.00 - SERRANO 230.00 1, SERRANO 230.00 - VILLA PK 230.00 1 |
| 24126 | RIOHONDO | 230 | 24155 | VINCENT | 230 | 2 | line_2076 | ivsg_hs_alt4ad1 | 988 | -881.4 | 106.2 | 2306.9 | 887.8 | 0.93 | 0.726 | GOODRICH 230.00 - LAGUBELL 230.00 1, VINCENT 230.00 - MESA CAL 230.00 1 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2256 | ivsg_hs_alt4ad1 | 2400 | -2317.9 | -88.5 | 2575.5 | 2319.6 | 0.929 | 0.775 | ELDORDO 500.00 - LUGO 500.00 1, LUGO 500.00 - MIRALOMA 500.00 2 |
| 24614 | TAP601 | 115 | 24702 | KRAMER | 115 | 1 | line_2260 | ivsg_hs_alt4ad1 | 217.1 | -190.1 | 68.7 | 1006 | 202.1 | 0.925 | 0.717 | KRAMER 230.00 - LUGO 230.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 24126 | RIOHONDO | 230 | 24155 | VINCENT | 230 | 2 | line_2096 | ivsg_hs_alt4ad1 | 988 | -867.5 | 105.8 | 2290.9 | 874 | 0.924 | 0.726 | EAGLROCK 230.00 - MESA CAL 230.00 1, GOODRICH 230.00 - GOULD 230.00 1 |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | 23002/06/10 | ivsg_hs_alt4ad1 | 382.4 | 336 | 14.3 | 1471.8 | 336.3 | 0.92 | 0.833 | SANLUISREY 230 CORRIDOR |
| 22831 | SYCAMORE | 138 | 22124 | CHCARITA | 138 | 1 | 23051A/23011 | ivsg_hs_alt4ad1 | 204.1 | 182.1 | -31.9 | 783.8 | 184.9 | 0.918 | 0.744 | SX-EPP + ES-EA-SA 230KV |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2245 | ivsg_hs_alt4ad1 | 2400 | -2285.2 | -65.3 | 2540.1 | 2286.2 | 0.917 | 0.775 | DEVERS 500.00 - VALLEYSC 500.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 24126 | RIOHONDO | 230 | 24155 | VINCENT | 230 | 2 | line_2103 | ivsg_hs_alt4ad1 | 988 | -859.8 | 105.2 | 2272.2 | 866.2 | 0.916 | 0.726 | EAGLROCK 230.00 - SYLMAR S 230.00 1, SYLMAR S 230.00 - GOULD 230.00 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt4ad1 | 204.1 | 182.8 | 3 | 782 | 182.9 | 0.916 | 1.258 | MIGUEL 230 CORRIDOR West of LC |
| 22831 | SYCAMORE | 138 | 22124 | CHCARITA | 138 | 1 | 13810B/23013 | ivsg_hs_alt4ad1 | 204.1 | 182.7 | -30.9 | 780.7 | 185.3 | 0.914 | 0.744 | OT JCT TO PQ 1 |
| 24602 | VICTOR | 115 | 24702 | KRAMER | 115 | 1 | line_2260 | ivsg_hs_alt4ad1 | 217.1 | -185.4 | 78.8 | 990 | 201.5 | 0.911 | 0.704 | KRAMER 230.00 - LUGO 230.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | 23011/13825 | ivsg_hs_alt4ad1 | 392 | 356.6 | 27.5 | 907.5 | 357.7 | 0.91 | 1.04 | ES-EA-SA 230KV + BQ-CC-ES-NCM 138KV |
| 24807 | MIRAGE | 115 | 24819 | CONCHO | 115 | 1 | line_2182 | ivsg_hs_alt4ad1 | 183 | 164 | -7.5 | 833.3 | 164.1 | 0.907 | 0.867 | DEVERS 230.00 - MIRAGE 230.00 2, COACHELV 230.00 - DEVERS 230.00 2 |
| 24086 | LUGO | 500 | 24097 | MOHAVE | 500 | 1 | line_2258 | ivsg_hs_alt4ad1 | 1386 | -1296.8 | -45.4 | 1451.4 | 1297.6 | 0.907 | 0.706 | LUGO 500.00 - VINCENT 500.00 2, LUGO 500.00 - VICTORVL 500.00 1 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24125 | REDONDO | 230 | 24084 | LITEHIPE | 230 | 1 | line_2061 | ivsg_hs_alt4ad1 | 916 | 816.4 | 96.7 | 2080.1 | 822.1 | 0.905 | 0.114 | LA FRESA 230.00 - REDONDO 230.00 1, LA FRESA 230.00 - REDONDO 230.00 2 |
| 24093 | MIRALOMW | 230 | 24158 | WALNUT | 230 | 1 | line_2089 | ivsg_hs_alt4ad1 | 797 | 678.9 | 167.3 | 1806.9 | 699.2 | 0.905 | 0.528 | MESA CAL 230.00 - WALNUT 230.00 1, OLINDA 230.00 - WALNUT 230.00 1 |
| 22831 | SYCAMORE | 138 | 22124 | CHCARITA | 138 | 1 | 23027/28/13827 | ivsg_hs_alt4ad1 | 204.1 | 181.1 | -27.2 | 770.8 | 183.1 | 0.903 | 0.744 | OLD TOWN TO MISSION 2 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2075 | ivsg_hs_alt4ad1 | 2400 | -2263.8 | -166.6 | 2498.8 | 2269.9 | 0.902 | 0.775 | EAGLROCK 230.00 - MESA CAL 230.00 1, GOODRICH 230.00 - LAGUBELL 230.00 1 |

ivsg_hs_alt4a_D1.sav
No Solve Summary
N-2 Outages

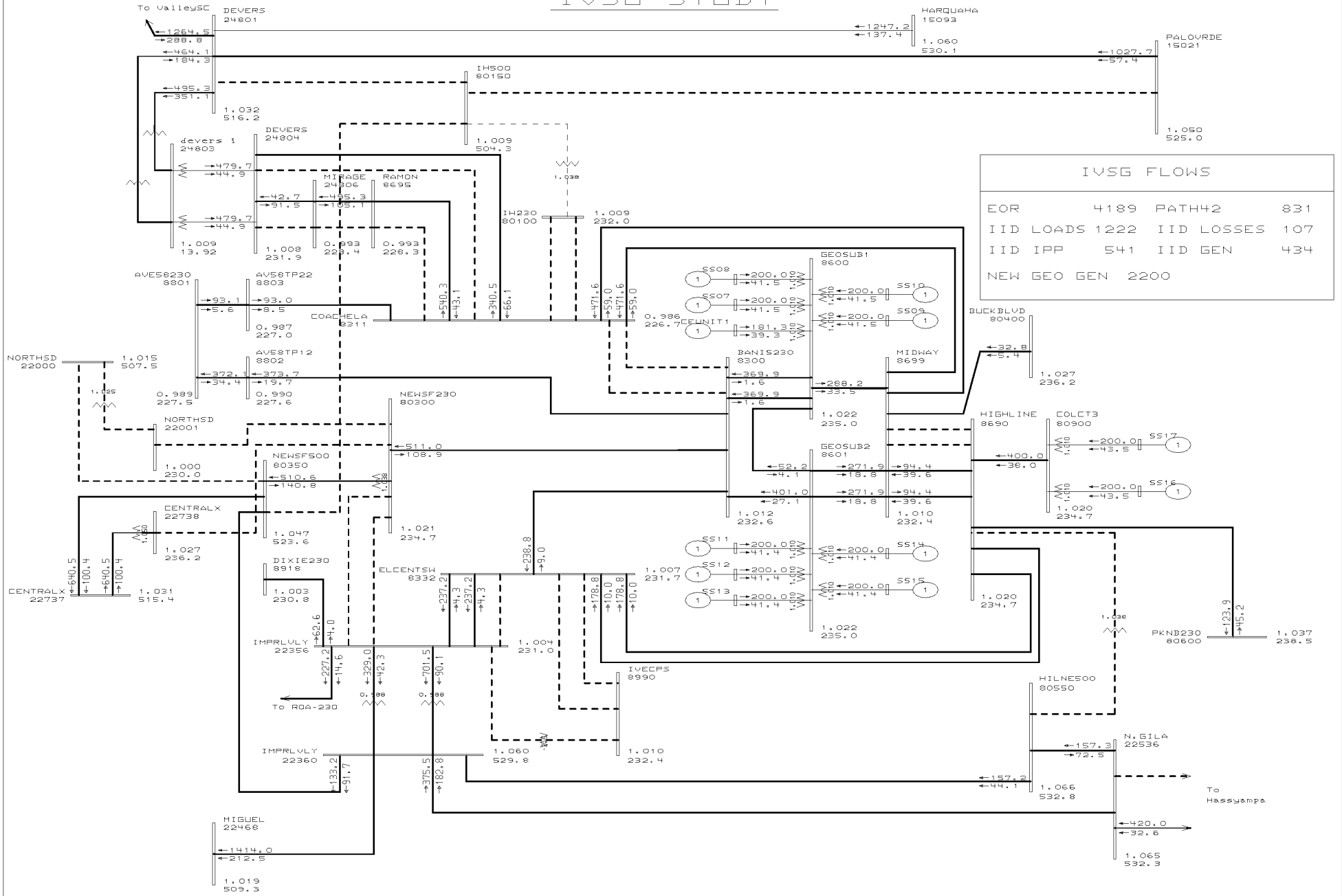
| Contingency-Description | Case | Problem-Description |
|---|---|---|
| DEVERS 230.00 - MIRAGE 230.00 2, RAMON 230.00 - MIRAGE 230.00 2 | ivsg_hs_alt4ad1 | Pmis 25401 EAGLEMTN 230.00 = -233007.25 MW + j -1018428.56 MVAR |
| VICTOR 230.00 - LUGO 230.00 1, VICTOR 230.00 - LUGO 230.00 2 | ivsg_hs_alt4ad1 | Pmis 24612 SOPPORT 115.00 = -4743093.00 MW + j 717570.19 MVAR |
| DEVERS 230.00 - MIRAGE 230.00 2, RAMON 230.00 - MIRAGE 230.00 2 | ivsg_hs_alt4ad1 | Pmis 25401 EAGLEMTN 230.00 = -233007.25 MW + j -1018428.56 MVAR |

# Imperial Valley Study Group

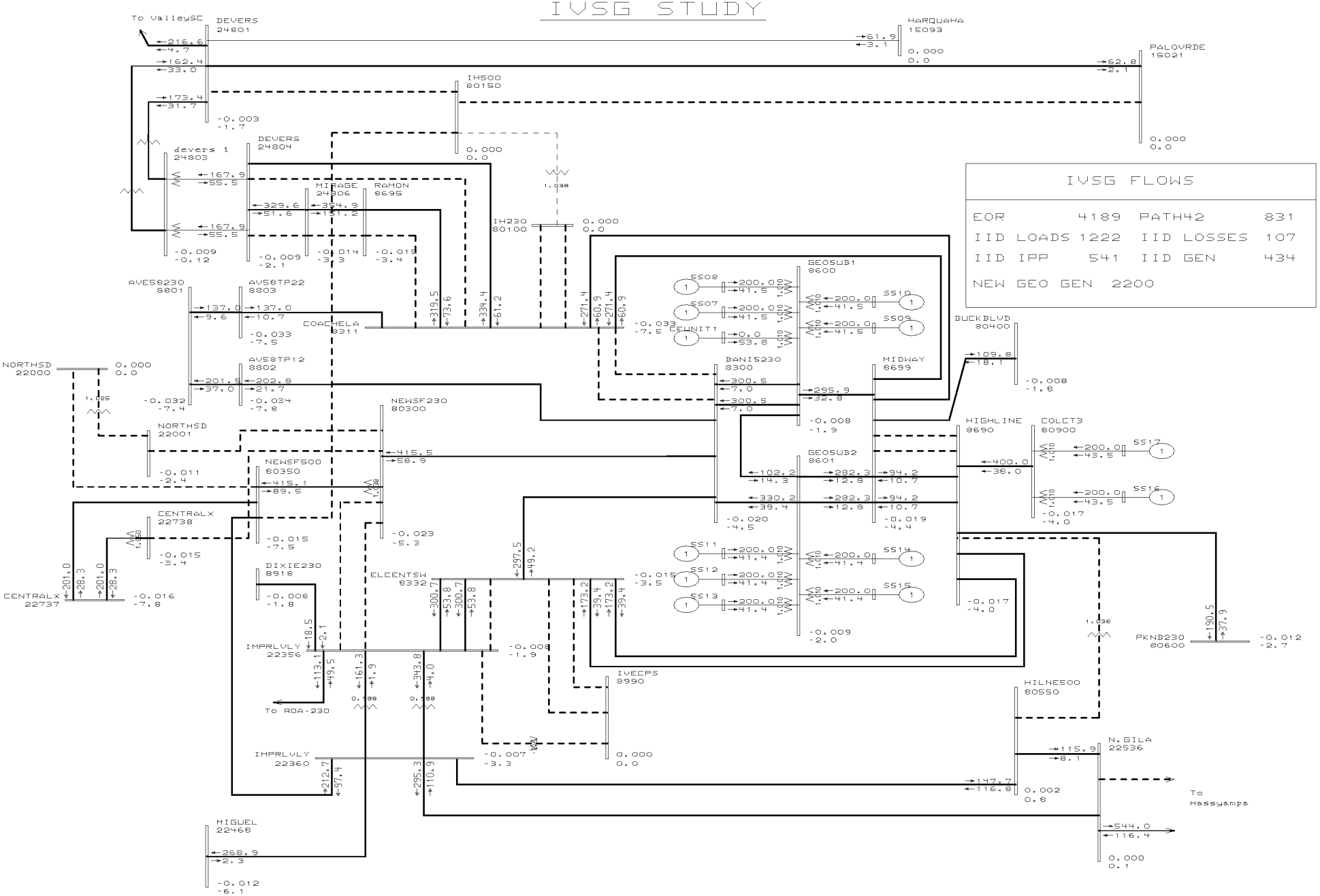
## Appendix A.4.11

Alt 4a D2
Heavy Summer
Alternative 4a
Dispatch 2

# IVSG STUDY


To ValleySC
DEVERS 24801
HARQUAHA 15093
PALOVRDE 15021
IH500 80150
DEVERS 24804
devers 1 24803
MIRAGE 24806
RAMON 8695
IH230 80100
GEOSUB1 8600
AVE58230 8801
AV58TP22 8803
AV58TP12 8802
COACHELA 8211
CELUNIT1
BUCKBLVD 80400
NORTHSD 22000
NORTHSD 22001
BANIS230 8300
MIDWAY 8699
NEWSF230 80300
NEWSF500 80350
GEOSUB2 8601
HIGHLINE 8690
COLCT3 80900
CENTRALX 22738
CENTRALX 22737
DIXIE230 8918
ELCENTSW 8332
IMPRLVLY 22356
IMPRLVLY 22360
IVECPS 8990
HILNE500 80550
N.GILA 22536
PKNB230 80600
MIGUEL 22468
To ROA-230
To Hassyampa
IVSG FLOWS
EOR 4189 PATH42 831
IID LOADS 1222 IID LOSSES 107
IID IPP 541 IID GEN 434
NEW GEO GEN 2200

# IVSG STUDY




| IVSG FLOWS | | | |
|---|---|---|---|
| EOR | 4189 | PATH42 | 831 |
| IID LOADS | 1222 | IID LOSSES | 107 |
| IID IPP | 541 | IID GEN | 434 |
| NEW GEO GEN | 2200 | | |

ivsg_hs_alt4d2_r1.sav
Voltage Summary
N-0 Outages

| Bus | Name | kV | Area | Zone | Outage | Case | Vbase | Vcont | DeltaV | Vmin | Vmax | Max-dv | Contingency Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24035 | EAGLEMTN | 161 | 24 | 248 | base | ivsg_hs_alt4ad2_ | 0.933 | 0.933 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 20077 | SIM-115 | 115 | 20 | 205 | base | ivsg_hs_alt4ad2_ | 0.934 | 0.934 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 20076 | SQN-115 | 115 | 20 | 205 | base | ivsg_hs_alt4ad2_ | 0.939 | 0.939 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14534 | N.GILA 4 | 100 | 14 | 847 | base | ivsg_hs_alt4ad2_ | 0.947 | 0.947 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15021 | PALOVRDE | 500 | 14 | 158 | base | ivsg_hs_alt4ad2_ | 1.05 | 1.05 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14213 | TS8 | 230 | 14 | 847 | base | ivsg_hs_alt4ad2_ | 1.05 | 1.05 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24219 | PISGAH | 230 | 24 | 240 | base | ivsg_hs_alt4ad2_ | 1.05 | 1.05 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24775 | RUSH | 115 | 24 | 247 | base | ivsg_hs_alt4ad2_ | 1.05 | 1.05 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24236 | RANCHVST | 500 | 24 | 240 | base | ivsg_hs_alt4ad2_ | 1.051 | 1.051 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24627 | CIMA | 230 | 24 | 240 | base | ivsg_hs_alt4ad2_ | 1.051 | 1.051 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24138 | SERRANO | 500 | 24 | 240 | base | ivsg_hs_alt4ad2_ | 1.052 | 1.052 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15090 | HASSYAMP | 500 | 14 | 158 | base | ivsg_hs_alt4ad2_ | 1.053 | 1.053 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15092 | ARLINTON | 500 | 14 | 158 | base | ivsg_hs_alt4ad2_ | 1.053 | 1.053 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15094 | MESQUITE | 500 | 14 | 158 | base | ivsg_hs_alt4ad2_ | 1.053 | 1.053 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 80750 | NGILA230 | 230 | 8 | 800 | base | ivsg_hs_alt4ad2_ | 1.053 | 1.053 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24229 | VALLEY-S | 115 | 24 | 240 | base | ivsg_hs_alt4ad2_ | 1.053 | 1.053 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 25991 | VALYSVC2 | 115 | 24 | 240 | base | ivsg_hs_alt4ad2_ | 1.053 | 1.053 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14009 | REDHAWK | 500 | 14 | 141 | base | ivsg_hs_alt4ad2_ | 1.054 | 1.054 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 80550 | HILNE500 | 500 | 8 | 800 | base | ivsg_hs_alt4ad2_ | 1.055 | 1.055 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14010 | TS5 | 500 | 14 | 141 | base | ivsg_hs_alt4ad2_ | 1.056 | 1.056 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 79043 | KAYENTA | 230 | 14 | 191 | base | ivsg_hs_alt4ad2_ | 1.056 | 1.056 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 22360 | IMPRLVLY | 500 | 22 | 227 | base | ivsg_hs_alt4ad2_ | 1.056 | 1.056 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14230 | VERDE N | 230 | 14 | 141 | base | ivsg_hs_alt4ad2_ | 1.057 | 1.057 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14247 | VERDE S | 230 | 14 | 141 | base | ivsg_hs_alt4ad2_ | 1.057 | 1.057 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14011 | RACEWAY | 500 | 14 | 141 | base | ivsg_hs_alt4ad2_ | 1.057 | 1.057 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24776 | LEE VINE | 115 | 24 | 247 | base | ivsg_hs_alt4ad2_ | 1.058 | 1.058 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24151 | VALLEYSC | 500 | 24 | 240 | base | ivsg_hs_alt4ad2_ | 1.058 | 1.058 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24997 | VALYSVC1 | 500 | 24 | 240 | base | ivsg_hs_alt4ad2_ | 1.058 | 1.058 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 28040 | CALPINE | 500 | 24 | 240 | base | ivsg_hs_alt4ad2_ | 1.058 | 1.058 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15041 | SILVERKG | 500 | 14 | 158 | base | ivsg_hs_alt4ad2_ | 1.06 | 1.06 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15061 | RUDD | 500 | 14 | 158 | base | ivsg_hs_alt4ad2_ | 1.06 | 1.06 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15093 | HARQUAHA | 500 | 14 | 158 | base | ivsg_hs_alt4ad2_ | 1.06 | 1.06 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14205 | COCONINO | 230 | 14 | 141 | base | ivsg_hs_alt4ad2_ | 1.06 | 1.06 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14008 | JOJOBA | 500 | 14 | 141 | base | ivsg_hs_alt4ad2_ | 1.06 | 1.06 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 22536 | N.GILA | 500 | 22 | 227 | base | ivsg_hs_alt4ad2_ | 1.06 | 1.06 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24086 | LUGO | 500 | 24 | 240 | base | ivsg_hs_alt4ad2_ | 1.06 | 1.06 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15034 | PERKINS | 500 | 14 | 158 | base | ivsg_hs_alt4ad2_ | 1.061 | 1.061 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14234 | YAVAPAI | 230 | 14 | 141 | base | ivsg_hs_alt4ad2_ | 1.062 | 1.062 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14355 | PRESCOTT | 115 | 14 | 141 | base | ivsg_hs_alt4ad2_ | 1.065 | 1.065 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14544 | PRESCOT2 | 100 | 14 | 141 | base | ivsg_hs_alt4ad2_ | 1.066 | 1.066 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14543 | PRESCOT1 | 100 | 14 | 141 | base | ivsg_hs_alt4ad2_ | 1.066 | 1.066 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14256 | FLAGSTAF | 230 | 14 | 141 | base | ivsg_hs_alt4ad2_ | 1.066 | 1.066 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14587 | FLAGSTF1 | 100 | 14 | 141 | base | ivsg_hs_alt4ad2_ | 1.066 | 1.066 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24156 | VINCENT | 500 | 24 | 240 | base | ivsg_hs_alt4ad2_ | 1.067 | 1.067 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14001 | FOURCORN | 500 | 14 | 141 | base | ivsg_hs_alt4ad2_ | 1.068 | 1.068 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 79264 | PINAL_W | 500 | 14 | 141 | base | ivsg_hs_alt4ad2_ | 1.068 | 1.068 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24729 | INYO | 230 | 24 | 247 | base | ivsg_hs_alt4ad2_ | 1.068 | 1.068 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14007 | GILARIVR | 500 | 14 | 141 | base | ivsg_hs_alt4ad2_ | 1.069 | 1.069 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14006 | YAVAPAI | 500 | 14 | 141 | base | ivsg_hs_alt4ad2_ | 1.07 | 1.07 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15992 | SEV | 500 | 14 | 158 | base | ivsg_hs_alt4ad2_ | 1.072 | 1.072 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14004 | SAGUARO | 500 | 14 | 141 | base | ivsg_hs_alt4ad2_ | 1.073 | 1.073 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 16000 | TORTOLIT | 500 | 14 | 160 | base | ivsg_hs_alt4ad2_ | 1.073 | 1.073 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 16001 | TORTLIT2 | 500 | 14 | 160 | base | ivsg_hs_alt4ad2_ | 1.073 | 1.073 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14215 | LEUPP | 230 | 14 | 141 | base | ivsg_hs_alt4ad2_ | 1.074 | 1.074 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14100 | CHOLLA | 345 | 14 | 141 | base | ivsg_hs_alt4ad2_ | 1.076 | 1.076 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15001 | CORONADO | 500 | 14 | 158 | base | ivsg_hs_alt4ad2_ | 1.079 | 1.079 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14000 | CHOLLA | 500 | 14 | 141 | base | ivsg_hs_alt4ad2_ | 1.08 | 1.08 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 19038 | MEAD | 500 | 14 | 191 | base | ivsg_hs_alt4ad2_ | 1.086 | 1.086 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14204 | CHOLLA | 230 | 14 | 141 | base | ivsg_hs_alt4ad2_ | 1.087 | 1.087 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24042 | ELDORDO | 500 | 24 | 240 | base | ivsg_hs_alt4ad2_ | 1.087 | 1.087 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24097 | MOHAVE | 500 | 24 | 240 | base | ivsg_hs_alt4ad2_ | 1.089 | 1.089 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14509 | CHOLLA 7 | 100 | 14 | 141 | base | ivsg_hs_alt4ad2_ | 1.093 | 1.093 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14267 | SECDKNOL | 230 | 14 | 141 | base | ivsg_hs_alt4ad2_ | 1.098 | 1.098 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14003 | NAVAJO | 500 | 14 | 141 | base | ivsg_hs_alt4ad2_ | 1.102 | 1.102 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14002 | MOENKOPI | 500 | 14 | 141 | base | ivsg_hs_alt4ad2_ | 1.104 | 1.104 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |

ivsg_hs_alt4ad2_r1.sav
Flow Summary
N-0 Outages

| LEGEND | % of RATING 1 | |
|---|---|---|
| C_pu | 100% - 110% | |
| C_pu | 110% - 120% | P.U. of |
| C_pu | > 120% | Rate 1 |

| FROM | FR | BKV | TO | TO | BKV | CK | Outage_Name | Case | Rate-Mva | Pflow | Qflow | Amps | MVA | C_pu | B_pu | Contingency_Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 14248 | GLENDALW | 230 | 14212 | GLENDALE | 230 | 1 | base | ivsg_hs_alt4ad2_ | 457 | 605.4 | 29 | 1519.3 | 606.1 | 1.324 | 1.324 | Base system (n-0) |
| 14248 | GLENDALW | 230 | 15201 | AGUAFRIA | 230 | 1 | base | ivsg_hs_alt4ad2_ | 457 | -605.4 | -29.1 | 1519.3 | 606.1 | 1.324 | 1.324 | Base system (n-0) |
| 24910 | CAL ELEC | 115 | 24912 | SHANDIN | 115 | 1 | base | ivsg_hs_alt4ad2_ | 109.1 | -124.2 | 58.2 | 679.6 | 137.1 | 1.244 | 1.244 | Base system (n-0) |
| 14221 | PNPKAPS | 230 | 19062 | PINPK | 230 | 1 | base | ivsg_hs_alt4ad2_ | 637.4 | -785 | -183.7 | 1988.4 | 806.2 | 1.243 | 1.243 | Base system (n-0) |
| 14212 | GLENDALE | 230 | 14270 | GRNDTRML | 230 | 1 | base | ivsg_hs_alt4ad2_ | 457 | 540 | 21.4 | 1354.8 | 540.4 | 1.183 | 1.183 | Base system (n-0) |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | base | ivsg_hs_alt4ad2_ | 204.1 | 240.2 | -8.4 | 992.7 | 240.3 | 1.163 | 1.163 | Base system (n-0) |
| 24912 | SHANDIN | 115 | 24916 | TAP902 | 115 | 1 | base | ivsg_hs_alt4ad2_ | 109.1 | -119.2 | 33.5 | 610.6 | 123.8 | 1.116 | 1.116 | Base system (n-0) |
| 14206 | CTRYCLUB | 230 | 14270 | GRNDTRML | 230 | 1 | base | ivsg_hs_alt4ad2_ | 509.9 | -536.2 | -17.7 | 1357.1 | 536.5 | 1.06 | 1.06 | Base system (n-0) |
| 14202 | CACTUS | 230 | 14221 | PNPKAPS | 230 | 1 | base | ivsg_hs_alt4ad2_ | 371 | -366.5 | -47.4 | 929.3 | 369.6 | 0.998 | 0.998 | Base system (n-0) |
| 14008 | JOJOBA | 500 | 15011 | KYRENE | 500 | 1 | base | ivsg_hs_alt4ad2_ | 1732 | 1817.3 | 164.7 | 1987.7 | 1824.7 | 0.996 | 0.996 | Base system (n-0) |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | base | ivsg_hs_alt4ad2_ | 392 | 389.5 | 10.5 | 972.1 | 389.6 | 0.99 | 0.99 | Base system (n-0) |
| 15230 | RUDD | 230 | 15218 | WHITETNK | 230 | 1 | base | ivsg_hs_alt4ad2_ | 725 | 695 | -17.5 | 1743.1 | 695.2 | 0.958 | 0.958 | Base system (n-0) |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | base | ivsg_hs_alt4ad2_ | 132 | 127.3 | -10.9 | 786.8 | 127.8 | 0.95 | 0.95 | Base system (n-0) |
| 24087 | MAGUNDEN | 230 | 24101 | OMAR | 230 | 1 | base | ivsg_hs_alt4ad2_ | 643 | -591.8 | 130.8 | 1531.9 | 606.1 | 0.95 | 0.95 | Base system (n-0) |
| 24806 | MIRAGE | 230 | 24807 | MIRAGE | 115 | 1 | base | ivsg_hs_alt4ad2_ | 280 | 265.6 | 25.9 | 671.1 | 266.9 | 0.95 | 0.95 | Base system (n-0) |
| 24806 | MIRAGE | 230 | 24807 | MIRAGE | 115 | 2 | base | ivsg_hs_alt4ad2_ | 280 | 265.6 | 25.9 | 671.1 | 266.9 | 0.95 | 0.95 | Base system (n-0) |
| 24702 | KRAMER | 115 | 24753 | SUNGEN | 115 | 1 | base | ivsg_hs_alt4ad2_ | 183.3 | -170.5 | 31.2 | 863.6 | 173.3 | 0.939 | 0.939 | Base system (n-0) |
| 14207 | DEERVALY | 230 | 14231 | WESTWING | 230 | 1 | base | ivsg_hs_alt4ad2_ | 720 | -667.4 | -77.8 | 1686.4 | 672 | 0.933 | 0.933 | Base system (n-0) |
| 26098 | SYLMAR3 | 230 | 24147 | SYLMAR S | 230 | 1 | base | ivsg_hs_alt4ad2_ | 1100 | 840.2 | -522.3 | 2564.5 | 989.3 | 0.929 | 0.929 | Base system (n-0) |
| 17003 | AVRA | 115 | 17012 | MARANA | 115 | 1 | base | ivsg_hs_alt4ad2_ | 71.7 | -65 | -5.7 | 333.8 | 65.3 | 0.927 | 0.927 | Base system (n-0) |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | base | ivsg_hs_alt4ad2_ | 56 | 49.9 | -10.8 | 253.1 | 51.1 | 0.92 | 0.92 | Base system (n-0) |
| 19215 | SPOOKHIL | 230 | 19045 | COOLIDGE | 230 | 1 | base | ivsg_hs_alt4ad2_ | 352 | -317.8 | 45.9 | 807.8 | 321.1 | 0.916 | 0.916 | Base system (n-0) |
| 15212 | ROGERS | 230 | 19215 | SPOOKHIL | 230 | 1 | base | ivsg_hs_alt4ad2_ | 352 | -316 | 55.9 | 807 | 320.9 | 0.914 | 0.914 | Base system (n-0) |

ivsg_hs_alt4d2_r1.sav
VOLTAGE Summary
N-1 Outages

| Bus | Name | kV | Area | Zone | Outage | Case | Vbase | Vcont | DeltaV | Vmin | Vmax | Max-dv | Contingency Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24017 | BLYTHESC | 161 | 24 | 248 | line_007 | ivsg_hs_alt4ad2_ | 1.02 | 0.871 | -0.149 | 0.9 | 1.05 | 0.05 | line BLYTHE to BLYTHESC 161 ck 1 |
| 24731 | INYOKERN | 115 | 24 | 247 | line_175 | ivsg_hs_alt4ad2_ | 1 | 0.926 | -0.074 | 0.9 | 1.05 | 0.05 | line INYO to COTTONWD 230 ck 1 |
| 22464 | MIGUEL | 230 | 22 | 222 | B2_002 | ivsg_hs_alt4ad2_ | 1.005 | 0.936 | -0.069 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22468 | MIGUEL | 500 | 22 | 227 | B2_002 | ivsg_hs_alt4ad2_ | 1.015 | 0.936 | -0.079 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22472 | MIGUELMP | 500 | 22 | 227 | B2_002 | ivsg_hs_alt4ad2_ | 1.007 | 0.936 | -0.072 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22412 | LOSCOCHS | 138 | 22 | 223 | B2_002 | ivsg_hs_alt4ad2_ | 1.001 | 0.939 | -0.062 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22424 | MAINST50 | 138 | 22 | 222 | B2_002 | ivsg_hs_alt4ad2_ | 1.001 | 0.941 | -0.059 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22428 | MAINST51 | 138 | 22 | 222 | B2_002 | ivsg_hs_alt4ad2_ | 1 | 0.941 | -0.059 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22734 | SANTEE | 138 | 22 | 223 | B2_002 | ivsg_hs_alt4ad2_ | 1.001 | 0.941 | -0.06 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 24822 | INDIAN W | 115 | 24 | 248 | tran_238 | ivsg_hs_alt4ad2_ | 1.034 | 0.943 | -0.091 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 25423 | ESRP MWD | 115 | 24 | 254 | tran_247 | ivsg_hs_alt4ad2_ | 1.029 | 0.943 | -0.086 | 0.9 | 1.05 | 0.05 | tran VALLEYSC 500 to VALLEYSC 115 ck 1 |
| 25423 | ESRP MWD | 115 | 24 | 254 | tran_248 | ivsg_hs_alt4ad2_ | 1.029 | 0.943 | -0.086 | 0.9 | 1.05 | 0.05 | tran VALLEYSC 500 to VALLEYSC 115 ck 2 |
| 24819 | CONCHO | 115 | 24 | 248 | tran_238 | ivsg_hs_alt4ad2_ | 1.035 | 0.944 | -0.091 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 24160 | VALLEYSC | 115 | 24 | 240 | tran_247 | ivsg_hs_alt4ad2_ | 1.031 | 0.946 | -0.085 | 0.9 | 1.05 | 0.05 | tran VALLEYSC 500 to VALLEYSC 115 ck 1 |
| 25990 | VALYSVC1 | 115 | 24 | 240 | tran_247 | ivsg_hs_alt4ad2_ | 1.031 | 0.946 | -0.085 | 0.9 | 1.05 | 0.05 | tran VALLEYSC 500 to VALLEYSC 115 ck 1 |
| 24160 | VALLEYSC | 115 | 24 | 240 | tran_248 | ivsg_hs_alt4ad2_ | 1.031 | 0.946 | -0.085 | 0.9 | 1.05 | 0.05 | tran VALLEYSC 500 to VALLEYSC 115 ck 2 |
| 25990 | VALYSVC1 | 115 | 24 | 240 | tran_248 | ivsg_hs_alt4ad2_ | 1.031 | 0.946 | -0.085 | 0.9 | 1.05 | 0.05 | tran VALLEYSC 500 to VALLEYSC 115 ck 2 |
| 22832 | SYCAMORE | 230 | 22 | 221 | B2_002 | ivsg_hs_alt4ad2_ | 1.006 | 0.948 | -0.058 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 24816 | SANTA RO | 115 | 24 | 248 | tran_238 | ivsg_hs_alt4ad2_ | 1.039 | 0.948 | -0.091 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 24821 | TAMARISK | 115 | 24 | 248 | tran_238 | ivsg_hs_alt4ad2_ | 1.038 | 0.948 | -0.09 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 22772 | SOUTHBAY | 138 | 22 | 222 | B2_002 | ivsg_hs_alt4ad2_ | 1.008 | 0.949 | -0.059 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22116 | CARLTHTP | 138 | 22 | 223 | B2_002 | ivsg_hs_alt4ad2_ | 1.006 | 0.95 | -0.056 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 24827 | TAP823 | 115 | 24 | 248 | tran_238 | ivsg_hs_alt4ad2_ | 1.04 | 0.95 | -0.09 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 25633 | CAPWIND | 115 | 24 | 248 | tran_238 | ivsg_hs_alt4ad2_ | 1.04 | 0.951 | -0.089 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 25622 | TAP806 | 115 | 24 | 248 | tran_238 | ivsg_hs_alt4ad2_ | 1.04 | 0.951 | -0.089 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 24829 | TAP821 | 115 | 24 | 248 | tran_238 | ivsg_hs_alt4ad2_ | 1.04 | 0.951 | -0.089 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 22120 | CARLTNHS | 138 | 22 | 223 | B2_002 | ivsg_hs_alt4ad2_ | 1.007 | 0.952 | -0.055 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22865 | UPTOWN | 138 | 22 | 221 | B2_002 | ivsg_hs_alt4ad2_ | 1.008 | 0.953 | -0.056 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 24807 | MIRAGE | 115 | 24 | 248 | tran_238 | ivsg_hs_alt4ad2_ | 1.042 | 0.953 | -0.089 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 22852 | TELECYN | 138 | 22 | 222 | B2_002 | ivsg_hs_alt4ad2_ | 1.02 | 0.957 | -0.063 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22500 | MISSION | 138 | 22 | 221 | B2_002 | ivsg_hs_alt4ad2_ | 1.01 | 0.959 | -0.051 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22672 | PRCTRVLY | 138 | 22 | 222 | B2_002 | ivsg_hs_alt4ad2_ | 1.023 | 0.959 | -0.064 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22831 | SYCAMORE | 138 | 22 | 221 | B2_002 | ivsg_hs_alt4ad2_ | 1.013 | 0.959 | -0.054 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22460 | MIGUEL | 138 | 22 | 222 | B2_002 | ivsg_hs_alt4ad2_ | 1.025 | 0.96 | -0.065 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22738 | CENTRALX | 230 | 22 | 225 | B2_002 | ivsg_hs_alt4ad2_ | 1.026 | 0.963 | -0.063 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22737 | CENTRALX | 500 | 22 | 225 | B2_002 | ivsg_hs_alt4ad2_ | 1.029 | 0.968 | -0.061 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 14534 | N.GILA 4 | 100 | 14 | 847 | NG500/69 | ivsg_hs_alt4ad2_ | 0.947 | 1 | 0.053 | 0.9 | 1.05 | 0.05 | tran N.GILA 500 to N.GILA 69 ck 1 |
| 24035 | EAGLEMTN | 161 | 24 | 248 | tran_241 | ivsg_hs_alt4ad2_ | 0.933 | 1.026 | 0.093 | 0.9 | 1.05 | 0.05 | tran EAGLEMTN 230 to EAGLEMTN 161 ck 1 |
| 24730 | INYO PS | 115 | 24 | 247 | tran_229 | ivsg_hs_alt4ad2_ | 1.026 | 1.078 | 0.052 | 0.9 | 1.05 | 0.05 | tran INYO 115 to INYO PS 115 ck 1 |
| 24142 | SYC CYN | 230 | 24 | 240 | line_086 | ivsg_hs_alt4ad2_ | 0.985 | 1.091 | 0.106 | 0.9 | 1.05 | 0.05 | line MAGUNDEN to OMAR 230 ck 1 |
| 25613 | EDMONSTN | 230 | 24 | 256 | line_122 | ivsg_hs_alt4ad2_ | 1 | 1.091 | 0.091 | 0.9 | 1.05 | 0.05 | line PASTORIA to EDMONSTN 230 ck 1 |
| 24142 | SYC CYN | 230 | 24 | 240 | line_140 | ivsg_hs_alt4ad2_ | 0.985 | 1.091 | 0.106 | 0.9 | 1.05 | 0.05 | line SYC CYN to OMAR 230 ck 1 |

ivsg_hs_alt4ad2_r1.sav
FLOW Summary
N-1 Outages

| LEGEND | % of RATING 1 | |
|---|---|---|
| C_pu | 100% - 110% | |
| C_pu | 110% - 120% | P.U. of |
| C_pu | > 120% | Rate 1 |

| FROM | FR | BKV | TO | TO | BKV | CK | Outage_Name | Case | Rate-Mva | Pflow | Qflow | Amps | MVA | C_pu | B_pu | Contingency_Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24142 | SYC CYN | 230 | 24101 | OMAR | 230 | 1 | line_086 | ivsg_hs_alt4ad2_ | 643 | 769.1 | 5511.1 | 12804.3 | 5564.5 | 7.934 | 0.47 | line MAGUNDEN to OMAR 230 ck 1 |
| 24781 | NAVYCOSO | 230 | 24706 | BLM EAST | 230 | 1 | line_173 | ivsg_hs_alt4ad2_ | 1287 | -153.8 | -3160.7 | 7943.3 | 3164.4 | 2.459 | 0.056 | line BLM EAST to BLM WEST 230 ck 1 |
| 24781 | NAVYCOSO | 230 | 24706 | BLM EAST | 230 | 1 | line_174 | ivsg_hs_alt4ad2_ | 1287 | -153.8 | -3160.7 | 7943.3 | 3164.4 | 2.459 | 0.056 | line BLM WEST to KRAMER 230 ck 1 |
| 24806 | MIRAGE | 230 | 24807 | MIRAGE | 115 | 2 | tran_238 | ivsg_hs_alt4ad2_ | 280 | 532.2 | 200.5 | 1467 | 568.7 | 2.03 | 0.95 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_175 | ivsg_hs_alt4ad2_ | 56 | -103.6 | -1.3 | 532.3 | 103.6 | 1.86 | 0.92 | line INYO to COTTONWD 230 ck 1 |
| 24151 | VALLEYSC | 500 | 24160 | VALLEYSC | 115 | 2 | tran_247 | ivsg_hs_alt4ad2_ | 560 | 853.2 | 355.9 | 1023.4 | 924.5 | 1.65 | 0.77 | tran VALLEYSC 500 to VALLEYSC 115 ck 1 |
| 24151 | VALLEYSC | 500 | 24160 | VALLEYSC | 115 | 1 | tran_248 | ivsg_hs_alt4ad2_ | 560 | 853.2 | 355.9 | 1023.4 | 924.5 | 1.65 | 0.77 | tran VALLEYSC 500 to VALLEYSC 115 ck 2 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_002 | ivsg_hs_alt4ad2_ | 204.1 | 314 | -8.3 | 1370.7 | 314.1 | 1.605 | 1.163 | IMPRLVLY - MIGUEL 1 500kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_009 | ivsg_hs_alt4ad2_ | 204.1 | 325.7 | -12.7 | 1362.9 | 326 | 1.596 | 1.163 | EPP - ESCNDIDO 1 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_032 | ivsg_hs_alt4ad2_ | 204.1 | 311.7 | -12 | 1313.7 | 311.9 | 1.539 | 1.163 | OTAYMESA - MLMS3TAP 1 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_034 | ivsg_hs_alt4ad2_ | 204.1 | 311.7 | -11.3 | 1314.4 | 311.9 | 1.539 | 1.163 | OLD TOWN - MLMS3TAP 1 230kV |
| 24151 | VALLEYSC | 500 | 24229 | VALLEY-S | 115 | 4 | tran_249 | ivsg_hs_alt4ad2_ | 560 | 830.6 | 203 | 943.4 | 855.1 | 1.53 | 0.75 | tran VALLEYSC 500 to VALLEY-S 115 ck 3 |
| 24151 | VALLEYSC | 500 | 24229 | VALLEY-S | 115 | 3 | tran_250 | ivsg_hs_alt4ad2_ | 560 | 830.7 | 203 | 943.4 | 855.1 | 1.53 | 0.75 | tran VALLEYSC 500 to VALLEY-S 115 ck 4 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_202 | ivsg_hs_alt4ad2_ | 56 | 77.4 | -7.5 | 392.5 | 77.8 | 1.4 | 0.92 | line OWENSCON to INYO 230 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | SX70 | ivsg_hs_alt4ad2_ | 204.1 | 286.1 | 5.8 | 1187.4 | 286.1 | 1.391 | 1.163 | tran SYCAMORE 230 to SYCAMORE 69 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | ML60 | ivsg_hs_alt4ad2_ | 204.1 | 283.7 | -5.6 | 1178.8 | 283.8 | 1.381 | 1.163 | tran MIGUEL 230 to MIGUEL 138 ck 1 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | B2_009 | ivsg_hs_alt4ad2_ | 392 | 536.7 | 30.2 | 1355.1 | 537.5 | 1.37 | 0.99 | EPP - ESCNDIDO 1 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_013 | ivsg_hs_alt4ad2_ | 204.1 | 267.2 | -12 | 1108.3 | 267.5 | 1.298 | 1.163 | EPP - SYCAMORE 1 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | MS60 | ivsg_hs_alt4ad2_ | 204.1 | 262.7 | -2.6 | 1089.1 | 262.7 | 1.276 | 1.163 | tran MISSION 230 to MISSION 138 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | MS61 | ivsg_hs_alt4ad2_ | 204.1 | 262.7 | -2.6 | 1089.1 | 262.7 | 1.276 | 1.163 | tran MISSION 230 to MISSION 138 ck 2 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | B2_032 | ivsg_hs_alt4ad2_ | 392 | 489.3 | 15.9 | 1246.4 | 489.6 | 1.25 | 0.99 | OTAYMESA - MLMS3TAP 1 230kV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | B2_034 | ivsg_hs_alt4ad2_ | 392 | 489.4 | 16.5 | 1247 | 489.7 | 1.25 | 0.99 | OLD TOWN - MLMS3TAP 1 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | ML70 | ivsg_hs_alt4ad2_ | 204.1 | 255.2 | -3.9 | 1058.6 | 255.2 | 1.24 | 1.163 | tran MIGUEL 69 to MIGUEL 230 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | ML71 | ivsg_hs_alt4ad2_ | 204.1 | 255.2 | -3.9 | 1058.6 | 255.2 | 1.24 | 1.163 | tran MIGUEL 69 to MIGUEL 230 ck 2 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_015 | ivsg_hs_alt4ad2_ | 204.1 | 254.8 | -7.3 | 1055.3 | 254.9 | 1.236 | 1.163 | MIGUEL - MISSION 1 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_020 | ivsg_hs_alt4ad2_ | 204.1 | 254.4 | -7.8 | 1053.5 | 254.5 | 1.234 | 1.163 | MIGUEL - MISSION 2 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | ML80 | ivsg_hs_alt4ad2_ | 204.1 | 250.4 | -8.4 | 1040.2 | 250.5 | 1.218 | 1.163 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | MS70 | ivsg_hs_alt4ad2_ | 204.1 | 250 | -2 | 1036.8 | 250 | 1.214 | 1.163 | tran MISSION 230 to MISSION 69 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_007 | ivsg_hs_alt4ad2_ | 204.1 | 250.1 | -6.6 | 1036.2 | 250.2 | 1.213 | 1.163 | PENSQTOS - ENCINA 1 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | ML81 | ivsg_hs_alt4ad2_ | 204.1 | 249.4 | -8.4 | 1035.9 | 249.6 | 1.213 | 1.163 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | SO2 | ivsg_hs_alt4ad2_ | 204.1 | 246.3 | -6.2 | 1028.4 | 246.4 | 1.204 | 1.163 | gen S.ONOFR2 22.00 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_014 | ivsg_hs_alt4ad2_ | 204.1 | 248.7 | -6.8 | 1026.6 | 248.8 | 1.202 | 1.163 | ENCINATP - ENCINA 1 230kV |
| 24723 | CONTROL | 115 | 24731 | INYOKERN | 115 | 1 | line_175 | ivsg_hs_alt4ad2_ | 82.7 | 96.2 | -4 | 497.8 | 96.3 | 1.199 | 0.421 | line INYO to COTTONWD 230 ck 1 |
| 24723 | CONTROL | 115 | 24731 | INYOKERN | 115 | 2 | line_175 | ivsg_hs_alt4ad2_ | 82.7 | 96.2 | -4 | 497.8 | 96.3 | 1.199 | 0.421 | line INYO to COTTONWD 230 ck 1 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | B2_002 | ivsg_hs_alt4ad2_ | 392 | 465.1 | -0.8 | 1231.8 | 465.1 | 1.19 | 0.99 | IMPRLVLY - MIGUEL 1 500kV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | SX70 | ivsg_hs_alt4ad2_ | 392 | 461.6 | 39.3 | 1155.1 | 463.3 | 1.18 | 0.99 | tran SYCAMORE 230 to SYCAMORE 69 ck 1 |
| 22468 | MIGUEL | 500 | 22472 | MIGUELMP | 500 | 1 | ML81 | ivsg_hs_alt4ad2_ | 1120 | 1274.7 | 235.4 | 1474.8 | 1296.3 | 1.16 | 0.67 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 22464 | MIGUEL | 230 | 22468 | MIGUEL | 500 | 1 | ML80 | ivsg_hs_alt4ad2_ | 1120 | -1255.5 | -26.9 | 3165.2 | 1255.7 | 1.14 | 0.63 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 22464 | MIGUEL | 230 | 22472 | MIGUELMP | 500 | 1 | ML81 | ivsg_hs_alt4ad2_ | 1120 | -1272.6 | -29.5 | 3206 | 1272.9 | 1.14 | 0.66 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | line_7 | ivsg_hs_alt4ad2_ | 204.1 | 234.5 | -5.9 | 966.5 | 234.6 | 1.132 | 1.163 | line BANIS230 to NEWSF230 230 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | tran_74 | ivsg_hs_alt4ad2_ | 204.1 | 234.5 | -5.9 | 966.4 | 234.6 | 1.132 | 1.163 | tran NEWSF230 230 to NEWSF500 500 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_028 | ivsg_hs_alt4ad2_ | 204.1 | 232.7 | -7.4 | 961.9 | 232.8 | 1.127 | 1.163 | MIGUEL - SYCAMORE 1 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_008 | ivsg_hs_alt4ad2_ | 204.1 | 231.4 | -4 | 957.7 | 231.4 | 1.122 | 1.163 | PENSQTOS - OLD TOWN 1 230kV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | ML60 | ivsg_hs_alt4ad2_ | 392 | 436.7 | 19.6 | 1095.5 | 437.2 | 1.12 | 0.99 | tran MIGUEL 230 to MIGUEL 138 ck 1 |
| 24729 | INYO | 230 | 24730 | INYO PS | 115 | 1 | line_175 | ivsg_hs_alt4ad2_ | 50 | 51.8 | 21.3 | 133.1 | 56 | 1.12 | 0.54 | line INYO to COTTONWD 230 ck 1 |
| 24729 | INYO | 230 | 24730 | INYO PS | 115 | 2 | line_175 | ivsg_hs_alt4ad2_ | 50 | 51.8 | 21.3 | 133.1 | 56 | 1.12 | 0.54 | line INYO to COTTONWD 230 ck 1 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | B2_013 | ivsg_hs_alt4ad2_ | 392 | 435.8 | 12.5 | 1091.6 | 436 | 1.11 | 0.99 | EPP - SYCAMORE 1 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | line_56 | ivsg_hs_alt4ad2_ | 204.1 | 227 | -10.8 | 943.5 | 227.3 | 1.105 | 1.163 | line NEWSF500 to IMPRLVLY 500 ck 1 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | B2_002 | ivsg_hs_alt4ad2_ | 1120 | -1212.6 | -91.5 | 3171.3 | 1216.1 | 1.09 | 0.58 | IMPRLVLY - MIGUEL 1 500kV |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 2 | line_070 | ivsg_hs_alt4ad2_ | 956 | -1024 | -32.6 | 2604.9 | 1024.6 | 1.085 | 0.595 | line LA FRESA to REDONDO 230 ck 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 1 | line_071 | ivsg_hs_alt4ad2_ | 956 | -1024 | -32.6 | 2604.9 | 1024.6 | 1.085 | 0.595 | line LA FRESA to REDONDO 230 ck 2 |
| 24701 | KRAMER | 230 | 24085 | LUGO | 230 | 2 | line_169 | ivsg_hs_alt4ad2_ | 478 | 526.3 | 0 | 1298.9 | 526.3 | 1.083 | 0.643 | line KRAMER to LUGO 230 ck 1 |
| 24701 | KRAMER | 230 | 24085 | LUGO | 230 | 1 | line_170 | ivsg_hs_alt4ad2_ | 478 | 526.3 | 0 | 1298.9 | 526.3 | 1.083 | 0.643 | line KRAMER to LUGO 230 ck 2 |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | line_12 | ivsg_hs_alt4ad2_ | 132 | 142.9 | -8.9 | 888.3 | 143.2 | 1.072 | 0.95 | line COACHELA to RAMON 230 ck 2 |
| 22261 | EPP | 230 | 22260 | ESCNDIDO | 230 | 1 | B2_034 | ivsg_hs_alt4ad2_ | 796.7 | 843.8 | -60.6 | 2121 | 846 | 1.061 | 0.888 | OLD TOWN - MLMS3TAP 1 230kV |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22261 | EPP | 230 | 22260 | ESCNDIDO | 230 | 1 | B2_032 | ivsg_hs_alt4ad2_ | 796.7 | 843.8 | -61.2 | 2120.5 | 846 | 1.06 | 0.888 | OTAYMESA - MLMS3TAP 1 230kV |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_169 | ivsg_hs_alt4ad2_ | 56 | 58 | -10 | 293.1 | 58.9 | 1.06 | 0.92 | line KRAMER to LUGO 230 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_170 | ivsg_hs_alt4ad2_ | 56 | 58 | -10 | 293.1 | 58.9 | 1.06 | 0.92 | line KRAMER to LUGO 230 ck 2 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | B2_015 | ivsg_hs_alt4ad2_ | 392 | 411.1 | 14.3 | 1028 | 411.3 | 1.05 | 0.99 | MIGUEL - MISSION 1 230kV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | B2_020 | ivsg_hs_alt4ad2_ | 392 | 410.4 | 13.5 | 1026.4 | 410.6 | 1.05 | 0.99 | MIGUEL - MISSION 2 230kV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | MS60 | ivsg_hs_alt4ad2_ | 392 | 412.9 | 18.8 | 1033.4 | 413.3 | 1.05 | 0.99 | tran MISSION 230 to MISSION 138 ck 1 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | MS61 | ivsg_hs_alt4ad2_ | 392 | 412.9 | 18.8 | 1033.4 | 413.3 | 1.05 | 0.99 | tran MISSION 230 to MISSION 138 ck 2 |
| 22831 | SYCAMORE | 138 | 22124 | CHCARITA | 138 | 1 | B2_009 | ivsg_hs_alt4ad2_ | 204.1 | 209.2 | -22.9 | 879.8 | 210.4 | 1.03 | 0.721 | EPP - ESCNDIDO 1 230kV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | ML70 | ivsg_hs_alt4ad2_ | 392 | 405.3 | 15.7 | 1015.4 | 405.6 | 1.03 | 0.99 | tran MIGUEL 69 to MIGUEL 230 ck 1 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | ML71 | ivsg_hs_alt4ad2_ | 392 | 405.3 | 15.7 | 1015.4 | 405.6 | 1.03 | 0.99 | tran MIGUEL 69 to MIGUEL 230 ck 2 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | SO2 | ivsg_hs_alt4ad2_ | 392 | 404.7 | 9.9 | 1021.3 | 404.9 | 1.03 | 0.99 | gen S.ONOFR2 22.00 |
| 24114 | PARDEE | 230 | 24200 | SAUG TAP | 230 | 2 | line_117 | ivsg_hs_alt4ad2_ | 494 | 501.7 | 27.2 | 1276 | 502.5 | 1.029 | 0.51 | line PARDEE to SAUG TAP 230 ck 1 |
| 24114 | PARDEE | 230 | 24200 | SAUG TAP | 230 | 1 | line_118 | ivsg_hs_alt4ad2_ | 494 | 501.7 | 27.1 | 1275.9 | 502.5 | 1.029 | 0.518 | line PARDEE to SAUG TAP 230 ck 2 |
| 22261 | EPP | 230 | 22260 | ESCNDIDO | 230 | 1 | SX60 | ivsg_hs_alt4ad2_ | 796.7 | 820.6 | -35 | 2044.9 | 821.4 | 1.022 | 0.888 | tran SYCAMORE 230 to SYCAMORE 138 ck 1 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | B2_007 | ivsg_hs_alt4ad2_ | 392 | 401.2 | 13.6 | 1003.8 | 401.5 | 1.02 | 0.99 | PENSQTOS - ENCINA 1 230kV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | B2_014 | ivsg_hs_alt4ad2_ | 392 | 401.2 | 14.9 | 999.9 | 401.5 | 1.02 | 0.99 | ENCINATP - ENCINA 1 230kV |
| 22261 | EPP | 230 | 22260 | ESCNDIDO | 230 | 1 | SX70 | ivsg_hs_alt4ad2_ | 796.7 | 817.4 | -10.1 | 2039.5 | 817.4 | 1.02 | 0.888 | tran SYCAMORE 230 to SYCAMORE 69 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_029 | ivsg_hs_alt4ad2_ | 204.1 | 209.2 | -3.2 | 865.6 | 209.3 | 1.014 | 1.163 | OTAYMESA - MLSXTAP 1 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_031 | ivsg_hs_alt4ad2_ | 204.1 | 209 | -4.1 | 865.7 | 209.1 | 1.014 | 1.163 | SYCAMORE - MLSXTAP 1 230kV |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_192 | ivsg_hs_alt4ad2_ | 169 | 170 | 37.7 | 612.3 | 174.1 | 1.014 | 0.812 | line IRON MTN to CAMINO 230 ck 1 |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | line_52 | ivsg_hs_alt4ad2_ | 132 | 136.1 | -9.8 | 836.7 | 136.4 | 1.01 | 0.95 | line AVE58230 to AV58TP22 230 ck 1 |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | line_53 | ivsg_hs_alt4ad2_ | 132 | 136.2 | -9.6 | 836.2 | 136.5 | 1.01 | 0.95 | line AV58TP22 to COACHELA 230 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_201 | ivsg_hs_alt4ad2_ | 56 | 54.7 | -10.7 | 276.8 | 55.7 | 1.01 | 0.92 | line SYLMAR3 to SYLMAR S 230 ck 1 |
| 24303 | BIG CRK3 | 230 | 24235 | RECTOR | 230 | 1 | line_155 | ivsg_hs_alt4ad2_ | 353 | 361 | 49.4 | 894.3 | 364.4 | 1.009 | 0.729 | line BIG CRK1 to RECTOR 230 ck 1 |
| 22504 | MISSION | 230 | 22500 | MISSION | 138 | 2 | MS60 | ivsg_hs_alt4ad2_ | 392 | 376.1 | 113.5 | 992.5 | 392.8 | 1 | 0.67 | tran MISSION 230 to MISSION 138 ck 1 |
| 22504 | MISSION | 230 | 22500 | MISSION | 138 | 1 | MS61 | ivsg_hs_alt4ad2_ | 392 | 376.1 | 113.5 | 992.5 | 392.8 | 1 | 0.67 | tran MISSION 230 to MISSION 138 ck 2 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | SX60 | ivsg_hs_alt4ad2_ | 392 | 390.1 | 40.7 | 985.8 | 392.2 | 1 | 0.89 | tran SYCAMORE 230 to SYCAMORE 138 ck 1 |
| 24301 | BIG CRK1 | 230 | 24235 | RECTOR | 230 | 1 | line_160 | ivsg_hs_alt4ad2_ | 329 | 334.9 | 47.5 | 826 | 338.3 | 1 | 0.727 | line BIG CRK3 to RECTOR 230 ck 1 |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | B2_002 | ivsg_hs_alt4ad2_ | 132 | 130.5 | -9.5 | 823.1 | 130.8 | 0.994 | 0.95 | IMPRLVLY - MIGUEL 1 500kV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_015 | ivsg_hs_alt4ad2_ | 392 | 386.8 | 44.5 | 971.9 | 389.3 | 0.99 | 0.89 | MIGUEL - MISSION 1 230kV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_020 | ivsg_hs_alt4ad2_ | 392 | 385.4 | 42.9 | 968.8 | 387.8 | 0.99 | 0.89 | MIGUEL - MISSION 2 230kV |
| 24086 | LUGO | 500 | 24097 | MOHAVE | 500 | 1 | line_103 | ivsg_hs_alt4ad2_ | 1386 | -1427.2 | 96.9 | 1565.1 | 1430.5 | 0.989 | 0.679 | line MOHAVE to ELDORDO 500 ck 1 |
| 22261 | EPP | 230 | 22260 | ESCNDIDO | 230 | 1 | SO2 | ivsg_hs_alt4ad2_ | 796.7 | 788.1 | -40.7 | 1971.7 | 789.1 | 0.986 | 0.888 | gen S.ONOFR2 22.00 |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | line_303 | ivsg_hs_alt4ad2_ | 132 | 129.7 | -9.3 | 815.7 | 130 | 0.985 | 0.95 | line HARQUAHA to DEVERS 500 ck 1 |
| 20238 | HRD-230 | 230 | 20239 | HRD-115 | 115 | 1 | B2_002 | ivsg_hs_alt4ad2_ | 225 | 221.5 | 1.6 | 567.5 | 221.5 | 0.98 | 0.67 | IMPRLVLY - MIGUEL 1 500kV |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_191 | ivsg_hs_alt4ad2_ | 169 | 163.4 | 35.3 | 587.7 | 167.1 | 0.974 | 0.812 | line EAGLEMTN to IRON MTN 230 ck 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_032 | ivsg_hs_alt4ad2_ | 392 | 377.9 | 39.9 | 968.5 | 380 | 0.97 | 0.89 | OTAYMESA - MLMS3TAP 1 230kV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_034 | ivsg_hs_alt4ad2_ | 392 | 377.9 | 40.3 | 969 | 380 | 0.97 | 0.89 | OLD TOWN - MLMS3TAP 1 230kV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | ML70 | ivsg_hs_alt4ad2_ | 392 | 379.7 | 43.4 | 958 | 382.2 | 0.97 | 0.89 | tran MIGUEL 69 to MIGUEL 230 ck 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | ML71 | ivsg_hs_alt4ad2_ | 392 | 379.7 | 43.4 | 958 | 382.2 | 0.97 | 0.89 | tran MIGUEL 69 to MIGUEL 230 ck 2 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_123 | ivsg_hs_alt4ad2_ | 56 | 52.6 | -10.7 | 266.7 | 53.7 | 0.97 | 0.92 | line PASTORIA to PSTRIA 230 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_200 | ivsg_hs_alt4ad2_ | 56 | 52.7 | -10.8 | 266.8 | 53.8 | 0.97 | 0.92 | line SYLMAR1 to SYLMAR S 230 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | tran_210 | ivsg_hs_alt4ad2_ | 56 | 52.5 | -10.5 | 265.8 | 53.6 | 0.97 | 0.92 | tran LUGO 500 to LUGO 230 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | tran_211 | ivsg_hs_alt4ad2_ | 56 | 52.6 | -10.5 | 265.9 | 53.6 | 0.97 | 0.92 | tran LUGO 500 to LUGO 230 ck 2 |
| 19020 | BLYTHE | 161 | 24017 | BLYTHESC | 161 | 1 | line_192 | ivsg_hs_alt4ad2_ | 244 | 236.5 | 37.9 | 842.1 | 239.5 | 0.962 | 0.826 | line IRON MTN to CAMINO 230 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_086 | ivsg_hs_alt4ad2_ | 56 | 52 | -10.8 | 263.7 | 53.1 | 0.96 | 0.92 | line MAGUNDEN to OMAR 230 ck 1 |
| 22596 | OLD TOWN | 230 | 22466 | MLMS3TAP | 230 | 1 | B2_002 | ivsg_hs_alt4ad2_ | 912 | -828.7 | 62.4 | 2195.7 | 831 | 0.959 | 0.69 | IMPRLVLY - MIGUEL 1 500kV |
| 22261 | EPP | 230 | 22260 | ESCNDIDO | 230 | 1 | line_207 | ivsg_hs_alt4ad2_ | 796.7 | 765.2 | -44.9 | 1909.1 | 766.5 | 0.955 | 0.888 | line DEVERS to VALLEYSC 500 ck 1 |
| 14008 | JOJOBA | 500 | 15011 | KYRENE | 500 | 1 | PV1 | ivsg_hs_alt4ad2_ | 1732 | 1742.4 | 170.4 | 1897 | 1750.7 | 0.952 | 0.996 | gen PALOVRD1 24.00 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | line_56 | ivsg_hs_alt4ad2_ | 392 | 371.3 | 1.9 | 932.7 | 371.3 | 0.95 | 0.99 | line NEWSF500 to IMPRLVLY 500 ck 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | line_66 | ivsg_hs_alt4ad2_ | 392 | 369.6 | 31.2 | 945.1 | 370.9 | 0.95 | 0.89 | line CENTRALX to NEWSF500 500 ck 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_009 | ivsg_hs_alt4ad2_ | 392 | 369.7 | 42 | 938.2 | 372.1 | 0.95 | 0.89 | EPP - ESCNDIDO 1 230kV |
| 8376 | RTAP2 | 92 | 8974 | RTP1 | 92 | 1 | line_50 | ivsg_hs_alt4ad2_ | 57 | -51.4 | 13.8 | 337.6 | 53.2 | 0.948 | 0.715 | line BANIS230 to AV58TP12 230 ck 1 |
| 8376 | RTAP2 | 92 | 8974 | RTP1 | 92 | 1 | line_51 | ivsg_hs_alt4ad2_ | 57 | -51.4 | 13.7 | 337.6 | 53.2 | 0.948 | 0.715 | line AV58TP12 to AVE58230 230 ck 1 |
| 24807 | MIRAGE | 115 | 24819 | CONCHO | 115 | 1 | tran_238 | ivsg_hs_alt4ad2_ | 183 | 164.1 | -5.7 | 864.8 | 164.2 | 0.941 | 0.86 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | MS60 | ivsg_hs_alt4ad2_ | 392 | 364.4 | 42.1 | 917.3 | 366.8 | 0.94 | 0.89 | tran MISSION 230 to MISSION 138 ck 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | MS61 | ivsg_hs_alt4ad2_ | 392 | 364.4 | 42.1 | 917.3 | 366.8 | 0.94 | 0.89 | tran MISSION 230 to MISSION 138 ck 2 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | SX70 | ivsg_hs_alt4ad2_ | 392 | 365 | 44.3 | 923.8 | 367.6 | 0.94 | 0.89 | tran SYCAMORE 230 to SYCAMORE 69 ck 1 |
| 19020 | BLYTHE | 161 | 24017 | BLYTHESC | 161 | 1 | line_191 | ivsg_hs_alt4ad2_ | 244 | 229.9 | 35.5 | 817.8 | 232.6 | 0.935 | 0.826 | line EAGLEMTN to IRON MTN 230 ck 1 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | SX60 | ivsg_hs_alt4ad2_ | 408.3 | -385.9 | -0.9 | 1591.2 | 385.9 | 0.932 | 0.822 | tran SYCAMORE 230 to SYCAMORE 138 ck 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_022 | ivsg_hs_alt4ad2_ | 392 | 363.9 | 30.5 | 917.9 | 365.1 | 0.93 | 0.89 | OTAYMESA - TJI-230 1 230kV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | OT70 | ivsg_hs_alt4ad2_ | 392 | 362 | 39.1 | 911.4 | 364.1 | 0.93 | 0.89 | tran OLD TOWN 69 to OLD TOWN 230 ck 1 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | OT71 | ivsg_hs_alt4ad2_ | 392 | 362 | 39.1 | 911.4 | 364.1 | 0.93 | 0.89 | tran OLD TOWN 69 to OLD TOWN 230 ck 2 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | SO2 | ivsg_hs_alt4ad2_ | 392 | 363 | 34.9 | 923 | 364.7 | 0.93 | 0.89 | gen S.ONOFR2 22.00 |
| 24807 | MIRAGE | 115 | 24816 | SANTA RO | 115 | 1 | tran_238 | ivsg_hs_alt4ad2_ | 183.3 | 162.1 | -11.3 | 855.5 | 162.4 | 0.93 | 0.852 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 24303 | BIG CRK3 | 230 | 24235 | RECTOR | 230 | 1 | line_139 | ivsg_hs_alt4ad2_ | 353 | 335.6 | 45.3 | 822.7 | 338.7 | 0.929 | 0.729 | line SPRINGVL to BIG CRK4 230 ck 1 |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_63 | ivsg_hs_alt4ad2_ | 169 | 157.4 | 26.3 | 561.1 | 159.6 | 0.928 | 0.812 | line RAMON to MIRAGE 230 ck 2 |
| 22261 | EPP | 230 | 22260 | ESCNDIDO | 230 | 1 | B2_008 | ivsg_hs_alt4ad2_ | 796.7 | 745.9 | -49.7 | 1855.5 | 747.5 | 0.928 | 0.888 | PENSQTOS - OLD TOWN 1 230kV |
| 15230 | RUDD | 230 | 15218 | WHITETNK | 230 | 1 | PV1 | ivsg_hs_alt4ad2_ | 725 | 675.5 | -12 | 1686.9 | 675.6 | 0.927 | 0.958 | gen PALOVRD1 24.00 |
| 22261 | EPP | 230 | 22260 | ESCNDIDO | 230 | 1 | B2_015 | ivsg_hs_alt4ad2_ | 796.7 | 743.2 | -38.7 | 1849.6 | 744.2 | 0.925 | 0.888 | MIGUEL - MISSION 1 230kV |
| 22261 | EPP | 230 | 22260 | ESCNDIDO | 230 | 1 | B2_020 | ivsg_hs_alt4ad2_ | 796.7 | 742.4 | -39.5 | 1847.8 | 743.5 | 0.924 | 0.888 | MIGUEL - MISSION 2 230kV |
| 24614 | TAP601 | 115 | 24702 | KRAMER | 115 | 1 | line_169 | ivsg_hs_alt4ad2_ | 217.1 | -189.2 | 71.8 | 1002.1 | 202.4 | 0.922 | 0.716 | line KRAMER to LUGO 230 ck 1 |
| 24614 | TAP601 | 115 | 24702 | KRAMER | 115 | 1 | line_170 | ivsg_hs_alt4ad2_ | 217.1 | -189.2 | 71.8 | 1002.1 | 202.4 | 0.922 | 0.716 | line KRAMER to LUGO 230 ck 2 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_079 | ivsg_hs_alt4ad2_ | 2400 | -2311.5 | -35.6 | 2550.3 | 2311.8 | 0.92 | 0.73 | line LUGO to MOHAVE 500 ck 1 |
| 22261 | EPP | 230 | 22260 | ESCNDIDO | 230 | 1 | line_303 | ivsg_hs_alt4ad2_ | 796.7 | 738.5 | -40.4 | 1839.7 | 739.6 | 0.92 | 0.888 | line HARQUAHA to DEVERS 500 ck 1 |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_12 | ivsg_hs_alt4ad2_ | 169 | 155.7 | 25.9 | 554.8 | 157.8 | 0.918 | 0.812 | line COACHELA to RAMON 230 ck 2 |
| 22261 | EPP | 230 | 22260 | ESCNDIDO | 230 | 1 | line_63 | ivsg_hs_alt4ad2_ | 796.7 | 737.7 | -41.1 | 1836.4 | 738.8 | 0.918 | 0.888 | line RAMON to MIRAGE 230 ck 2 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | B2_015 | ivsg_hs_alt4ad2_ | 408.3 | -382.7 | -5.8 | 1568.8 | 382.7 | 0.918 | 0.822 | MIGUEL - MISSION 1 230kV |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_047 | ivsg_hs_alt4ad2_ | 2400 | -2311.1 | -53.5 | 2541.7 | 2311.7 | 0.917 | 0.73 | line ELDORDO to LUGO 500 ck 1 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | B2_034 | ivsg_hs_alt4ad2_ | 408.3 | -373.8 | -1.8 | 1564 | 373.8 | 0.916 | 0.822 | OLD TOWN - MLMS3TAP 1 230kV |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | B2_020 | ivsg_hs_alt4ad2_ | 408.3 | -381.3 | -4.4 | 1563.8 | 381.3 | 0.915 | 0.822 | MIGUEL - MISSION 2 230kV |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | B2_032 | ivsg_hs_alt4ad2_ | 408.3 | -373.9 | -1.4 | 1563.3 | 373.9 | 0.915 | 0.822 | OTAYMESA - MLMS3TAP 1 230kV |
| 24301 | BIG CRK1 | 230 | 24235 | RECTOR | 230 | 1 | line_156 | ivsg_hs_alt4ad2_ | 329 | 305.6 | 3.8 | 751.9 | 305.6 | 0.91 | 0.727 | line BIG CRK1 to BIG CRK2 230 ck 1 |
| 24602 | VICTOR | 115 | 24702 | KRAMER | 115 | 1 | line_169 | ivsg_hs_alt4ad2_ | 217.1 | -184.6 | 81.9 | 986.1 | 201.9 | 0.908 | 0.703 | line KRAMER to LUGO 230 ck 1 |
| 24602 | VICTOR | 115 | 24702 | KRAMER | 115 | 1 | line_170 | ivsg_hs_alt4ad2_ | 217.1 | -184.6 | 81.9 | 986.1 | 201.9 | 0.908 | 0.703 | line KRAMER to LUGO 230 ck 2 |
| 19020 | BLYTHE | 161 | 24017 | BLYTHESC | 161 | 1 | line_63 | ivsg_hs_alt4ad2_ | 244 | 223.9 | 26.5 | 792.7 | 225.5 | 0.906 | 0.826 | line RAMON to MIRAGE 230 ck 2 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | ML70 | ivsg_hs_alt4ad2_ | 408.3 | -375.7 | -5.8 | 1546.4 | 375.8 | 0.905 | 0.822 | tran MIGUEL 69 to MIGUEL 230 ck 1 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | ML71 | ivsg_hs_alt4ad2_ | 408.3 | -375.7 | -5.8 | 1546.4 | 375.8 | 0.905 | 0.822 | tran MIGUEL 69 to MIGUEL 230 ck 2 |
| 24301 | BIG CRK1 | 230 | 24302 | BIG CRK2 | 230 | 1 | line_155 | ivsg_hs_alt4ad2_ | 329 | 305.6 | -23.2 | 745.5 | 306.5 | 0.903 | 0.248 | line BIG CRK1 to RECTOR 230 ck 1 |
| 24042 | ELDORDO | 500 | 24086 | LUGO | 500 | 1 | line_085 | ivsg_hs_alt4ad2_ | 1386 | 1334.2 | 207.3 | 1433.4 | 1350.2 | 0.901 | 0.607 | line LUGO to VICTORVL 500 ck 1 |
| 24729 | INYO | 230 | 24730 | INYO PS | 115 | 2 | tran_230 | ivsg_hs_alt4ad2_ | 50 | -42 | 15.9 | 105.2 | 44.9 | 0.9 | 0.54 | tran INYO 230 to INYO PS 115 ck 1 |
| 24729 | INYO | 230 | 24730 | INYO PS | 115 | 1 | tran_231 | ivsg_hs_alt4ad2_ | 50 | -42 | 15.9 | 105.2 | 44.9 | 0.9 | 0.54 | tran INYO 230 to INYO PS 115 ck 2 |
| 24805 | DEVERS | 115 | 24804 | DEVERS | 230 | 1 | tran_236 | ivsg_hs_alt4ad2_ | 280 | -246.1 | 52.5 | 1261.9 | 251.6 | 0.9 | 0.6 | tran DEVERS 115 to DEVERS 230 ck 3 |

| Bus | Name | kV | Area | Zone | Outage | Case | Vbase | Vcont | DeltaV | Vmin | Vmax | Max-dv | Contingency Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24058 | GOLETA | 230 | 24 | 240 | line_2269 | ivsg_hs_alt4ad2_ | 0.984 | 0.93 | -0.055 | 0.9 | 1.05 | 0.05 | S.CLARA 230.00 - GOLETA 230.00 1, S.CLARA 230.00 - MOORPARK 230.00 1 |
| 24058 | GOLETA | 230 | 24 | 240 | line_2270 | ivsg_hs_alt4ad2_ | 0.984 | 0.93 | -0.055 | 0.9 | 1.05 | 0.05 | S.CLARA 230.00 - GOLETA 230.00 2, S.CLARA 230.00 - MOORPARK 230.00 2 |
| 22734 | SANTEE | 138 | 22 | 223 | 23021/22/23/41 | ivsg_hs_alt4ad2_ | 1.001 | 0.945 | -0.056 | 0.9 | 1.05 | 0.05 | MIGUEL 230 CORRIDOR West of SN |
| 22412 | LOSCOCHS | 138 | 22 | 223 | 23021/22/23/41 | ivsg_hs_alt4ad2_ | 1.001 | 0.95 | -0.051 | 0.9 | 1.05 | 0.05 | MIGUEL 230 CORRIDOR West of SN |
| 24015 | ARCO SC | 230 | 24 | 240 | line_2013 | ivsg_hs_alt4ad2_ | 0.986 | 1.036 | 0.05 | 0.9 | 1.05 | 0.05 | ARCO SC 230.00 - HINSON 230.00 1, ARCO SC 230.00 - HINSON 230.00 2 |
| 24061 | HARBOR | 230 | 24 | 240 | line_2039 | ivsg_hs_alt4ad2_ | 0.986 | 1.036 | 0.051 | 0.9 | 1.05 | 0.05 | HARBOR 230.00 - HINSON 230.00 1, LBEACH 230.00 - LITEHIPE 230.00 1 |
| 24077 | LBEACH | 230 | 24 | 240 | line_2039 | ivsg_hs_alt4ad2_ | 0.986 | 1.036 | 0.05 | 0.9 | 1.05 | 0.05 | HARBOR 230.00 - HINSON 230.00 1, LBEACH 230.00 - LITEHIPE 230.00 1 |
| 24061 | HARBOR | 230 | 24 | 240 | line_2041 | ivsg_hs_alt4ad2_ | 0.986 | 1.036 | 0.051 | 0.9 | 1.05 | 0.05 | HARBOR 230.00 - HINSON 230.00 1, HARBOR 230.00 - LBEACH 230.00 1 |
| 24061 | HARBOR | 230 | 24 | 240 | line_2253 | ivsg_hs_alt4ad2_ | 0.986 | 1.036 | 0.051 | 0.9 | 1.05 | 0.05 | HARBOR 230.00 - HINSON 230.00 1, HARBOR 230.00 - LBEACH 230.00 1 |
| 25001 | GOODRICH | 230 | 24 | 250 | line_2073 | ivsg_hs_alt4ad2_ | 0.959 | 1.044 | 0.085 | 0.9 | 1.05 | 0.05 | GOODRICH 230.00 - GOULD 230.00 1, GOODRICH 230.00 - LAGUBELL 230.00 1 |
| 24058 | GOLETA | 230 | 24 | 240 | line_2120 | ivsg_hs_alt4ad2_ | 0.984 | 1.044 | 0.06 | 0.9 | 1.05 | 0.05 | S.CLARA 230.00 - GOLETA 230.00 1, S.CLARA 230.00 - GOLETA 230.00 2 |

ivsg_hs_alt4ad2_r1.sav
FLOW Summary
N-2 Outages

| LEGEND | % of RATING 1 | |
|---|---|---|
| C_pu | 100% - 110% | |
| C_pu | 110% - 120% | P.U. of Rate 1 |
| C_pu | > 120% | |

| FROM | FR | BKV | TO | TO | BKV | CK | Outage_Name | Case | Rate-Mva | Pflow | Qflow | Amps | MVA | C_pu | B_pu | Contingency_Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 13821C/25/23051A | ivsg_hs_alt4ad2_ | 204.1 | 337.6 | -13.6 | 1399.7 | 337.8 | 1.639 | 1.163 | CH-ES-NCM-SX |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23051B/23011 | ivsg_hs_alt4ad2_ | 204.1 | 320.7 | -11.5 | 1345.3 | 320.9 | 1.575 | 1.163 | EPP-ES + ES-EA-SA 230KV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt4ad2_ | 392 | 546.6 | 93.9 | 1404.6 | 554.6 | 1.41 | 0.89 | MIGUEL 230 CORRIDOR West of SN |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23022/23023 | ivsg_hs_alt4ad2_ | 204.1 | 283.6 | -6.9 | 1179.2 | 283.6 | 1.381 | 1.163 | ML-MS1+ ML-MS2 230KV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | 23051B/23011 | ivsg_hs_alt4ad2_ | 392 | 539.2 | 31.6 | 1365.2 | 540.1 | 1.38 | 0.99 | EPP-ES + ES-EA-SA 230KV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23011/13825 | ivsg_hs_alt4ad2_ | 204.1 | 284 | -13 | 1177 | 284.3 | 1.378 | 1.163 | ES-EA-SA 230KV + BQ-CC-ES-NCM 138KV |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt4ad2_ | 408.3 | -538 | -12.9 | 2267.3 | 538.1 | 1.327 | 0.822 | MIGUEL 230 CORRIDOR West of SN |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23051A/23011 | ivsg_hs_alt4ad2_ | 204.1 | 266.7 | -11.1 | 1106.5 | 266.9 | 1.296 | 1.163 | SX-EPP + ES-EA-SA 230KV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23012/13807 | ivsg_hs_alt4ad2_ | 204.1 | 259.1 | -1.3 | 1075 | 259.1 | 1.259 | 1.163 | PQ-EA 230KV + EA-NCW 138KV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23012/13808 | ivsg_hs_alt4ad2_ | 204.1 | 254.2 | -2.7 | 1054.1 | 254.2 | 1.235 | 1.163 | PQ-EA 230KV + NCW-PQ 138KV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | line_N-203 | ivsg_hs_alt4ad2_ | 204.1 | 248.5 | -7.7 | 1038.6 | 248.7 | 1.216 | 1.163 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23022/23023 | ivsg_hs_alt4ad2_ | 392 | 466.1 | 65.2 | 1174.6 | 470.7 | 1.2 | 0.89 | ML-MS1+ ML-MS2 230KV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23013/27/28 | ivsg_hs_alt4ad2_ | 204.1 | 246.9 | -5.5 | 1024.3 | 247 | 1.2 | 1.163 | OLD TOWN TO OLD TOWN JCT |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | line_N-204 | ivsg_hs_alt4ad2_ | 204.1 | 245.1 | -8.1 | 1021.7 | 245.2 | 1.197 | 1.163 | COACHELLA MIDWAY 230 CKT 1&2 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | line_2245 | ivsg_hs_alt4ad2_ | 204.1 | 244.7 | -7.4 | 1019.2 | 244.8 | 1.194 | 1.163 | DEVERS 500.00 - VALLEYSC 500.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 2 | line_2046 | ivsg_hs_alt4ad2_ | 956 | -1124.2 | -39.3 | 2858.9 | 1124.9 | 1.191 | 0.595 | LA FRESA 230.00 - REDONDO 230.00 1, REDONDO 230.00 - LITEHIPE 230.00 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 1 | line_2047 | ivsg_hs_alt4ad2_ | 956 | -1124.2 | -39.3 | 2858.9 | 1124.9 | 1.191 | 0.595 | LA FRESA 230.00 - REDONDO 230.00 2, REDONDO 230.00 - LITEHIPE 230.00 1 |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt4ad2_ | 382.4 | 448.5 | 24.1 | 1902.3 | 449.2 | 1.189 | 0.66 | MIGUEL 230 CORRIDOR West of SN |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | 23022/23023 | ivsg_hs_alt4ad2_ | 392 | 453.5 | 20.4 | 1138.7 | 454 | 1.16 | 0.99 | ML-MS1+ ML-MS2 230KV |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 2 | line_2064 | ivsg_hs_alt4ad2_ | 956 | -1075.8 | -44.9 | 2735.8 | 1076.7 | 1.14 | 0.595 | LA FRESA 230.00 - REDONDO 230.00 1, MESA CAL 230.00 - REDONDO 230.00 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 1 | line_2065 | ivsg_hs_alt4ad2_ | 956 | -1075.8 | -44.9 | 2735.8 | 1076.7 | 1.14 | 0.595 | LA FRESA 230.00 - REDONDO 230.00 2, MESA CAL 230.00 - REDONDO 230.00 1 |
| 8376 | RTAP2 | 92 | 8974 | RTP1 | 92 | 1 | line_N-204 | ivsg_hs_alt4ad2_ | 57 | -60.9 | 13.5 | 404.4 | 62.4 | 1.133 | 0.715 | COACHELLA MIDWAY 230 CKT 1&2 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | line_2115 | ivsg_hs_alt4ad2_ | 204.1 | 232.9 | -8.3 | 955.8 | 233.1 | 1.119 | 1.163 | S.ONOFRE 230.00 - SANTIAGO 230.00 1, S.ONOFRE 230.00 - SANTIAGO 230.00 2 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23027/28/13810 | ivsg_hs_alt4ad2_ | 204.1 | 230.1 | -4.5 | 952.4 | 230.1 | 1.115 | 1.163 | OLD TOWN TO MISSION 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23052/23007 | ivsg_hs_alt4ad2_ | 204.1 | 228.3 | -8.2 | 948.1 | 228.5 | 1.11 | 1.163 | TA-SO 1 + 2 230KV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | 23051A/23011 | ivsg_hs_alt4ad2_ | 392 | 435.7 | 13.1 | 1091.7 | 435.9 | 1.11 | 0.99 | SX-EPP + ES-EA-SA 230KV |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23022/23023 | ivsg_hs_alt4ad2_ | 408.3 | -460.1 | -8.6 | 1896 | 460.2 | 1.11 | 0.822 | ML-MS1+ ML-MS2 230KV |
| 24086 | LUGO | 500 | 24236 | RANCHVST | 500 | 1 | line_2194 | ivsg_hs_alt4ad2_ | 2598 | 2958.4 | 486.3 | 3282.8 | 2998.1 | 1.096 | 0.609 | LUGO 500.00 - MIRALOMA 500.00 2, LUGO 500.00 - MIRALOMA 500.00 3 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 2 | line_2049 | ivsg_hs_alt4ad2_ | 956 | -1024.5 | -39.5 | 2608.8 | 1025.2 | 1.087 | 0.595 | LA FRESA 230.00 - REDONDO 230.00 1, LCIENEGA 230.00 - LA FRESA 230.00 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 1 | line_2050 | ivsg_hs_alt4ad2_ | 956 | -1024.5 | -39.5 | 2608.8 | 1025.2 | 1.087 | 0.595 | LA FRESA 230.00 - REDONDO 230.00 2, LCIENEGA 230.00 - LA FRESA 230.00 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 2 | line_2057 | ivsg_hs_alt4ad2_ | 956 | -1024 | -36.2 | 2606.2 | 1024.6 | 1.086 | 0.595 | EL NIDO 230.00 - LA FRESA 230.00 3, LA FRESA 230.00 - REDONDO 230.00 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 1 | line_2058 | ivsg_hs_alt4ad2_ | 956 | -1024 | -36.2 | 2606.2 | 1024.6 | 1.086 | 0.595 | EL NIDO 230.00 - LA FRESA 230.00 3, LA FRESA 230.00 - REDONDO 230.00 2 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 2 | line_2059 | ivsg_hs_alt4ad2_ | 956 | -1024 | -36.2 | 2606.2 | 1024.6 | 1.086 | 0.595 | EL NIDO 230.00 - LA FRESA 230.00 4, LA FRESA 230.00 - REDONDO 230.00 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 1 | line_2060 | ivsg_hs_alt4ad2_ | 956 | -1024 | -36.2 | 2606.2 | 1024.6 | 1.086 | 0.595 | EL NIDO 230.00 - LA FRESA 230.00 4, LA FRESA 230.00 - REDONDO 230.00 2 |
| 24701 | KRAMER | 230 | 24085 | LUGO | 230 | 2 | line_2260 | ivsg_hs_alt4ad2_ | 478 | 526.6 | 1.5 | 1300.1 | 526.6 | 1.084 | 0.643 | KRAMER 230.00 - LUGO 230.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 2 | line_2029 | ivsg_hs_alt4ad2_ | 1195 | 1255.6 | -32.9 | 3229.8 | 1256 | 1.077 | 0.536 | LEWIS 230.00 - SERRANO 230.00 1, SERRANO 230.00 - VILLA PK 230.00 1 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 2 | line_2031 | ivsg_hs_alt4ad2_ | 1195 | 1255.6 | -32.9 | 3229.8 | 1256 | 1.077 | 0.536 | LEWIS 230.00 - SERRANO 230.00 2, SERRANO 230.00 - VILLA PK 230.00 1 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 2 | line_2278 | ivsg_hs_alt4ad2_ | 1195 | 1255.6 | -32.9 | 3229.8 | 1256 | 1.077 | 0.536 | LEWIS 230.00 - SERRANO 230.00 1, SERRANO 230.00 - VILLA PK 230.00 1 |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_N-203 | ivsg_hs_alt4ad2_ | 169 | 181.2 | 36.9 | 650.4 | 184.9 | 1.076 | 0.812 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 22831 | SYCAMORE | 138 | 22124 | CHCARITA | 138 | 1 | 23051B/23011 | ivsg_hs_alt4ad2_ | 204.1 | 216.7 | -23.8 | 914.2 | 218 | 1.071 | 0.721 | EPP-ES + ES-EA-SA 230KV |
| 22672 | PRCTRVLY | 138 | 22852 | TELECYN | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt4ad2_ | 478 | 507.1 | 9 | 2136.9 | 507.2 | 1.069 | 0.639 | MIGUEL 230 CORRIDOR West of SN |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_2260 | ivsg_hs_alt4ad2_ | 56 | 57.9 | -10.1 | 292.3 | 58.7 | 1.06 | 0.92 | KRAMER 230.00 - LUGO 230.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23027/28/13827 | ivsg_hs_alt4ad2_ | 204.1 | 215.5 | -6.8 | 892 | 215.6 | 1.045 | 1.163 | OLD TOWN TO MISSION 2 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | line_N-203 | ivsg_hs_alt4ad2_ | 392 | 408.8 | 8.3 | 1032.5 | 408.9 | 1.04 | 0.99 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | 23013/27/28 | ivsg_hs_alt4ad2_ | 392 | 407.6 | 13 | 1021.5 | 407.8 | 1.04 | 0.99 | OLD TOWN TO OLD TOWN JCT |
| 30060 | MIDWAY | 500 | 24156 | VINCENT | 500 | 3 | line_2215 | ivsg_hs_alt4ad2_ | 1848.1 | 2043.3 | 73.6 | 2212.4 | 2044.6 | 1.039 | 0.408 | MIDWAY 500.00 - VINCENT 500.00 1, MIDWAY 500.00 - VINCENT 500.00 2 |
| 22260 | ESCNDIDO | 230 | 22844 | TALEGA | 230 | 1 | 23052/23007 | ivsg_hs_alt4ad2_ | 456.1 | 473.7 | 28.8 | 1186.7 | 474.6 | 1.037 | 0.12 | TA-SO 1 + 2 230KV |
| 24016 | BARRE | 230 | 24044 | ELLIS | 230 | 1 | line_2115 | ivsg_hs_alt4ad2_ | 988 | 983.2 | -48.4 | 2556 | 984.3 | 1.031 | 0.288 | S.ONOFRE 230.00 - SANTIAGO 230.00 1, S.ONOFRE 230.00 - SANTIAGO 230.00 2 |
| 14008 | JOJOBA | 500 | 15011 | KYRENE | 500 | 1 | line_2245 | ivsg_hs_alt4ad2_ | 1732 | 1878.4 | 173.7 | 2056.3 | 1886.4 | 1.03 | 0.996 | DEVERS 500.00 - VALLEYSC 500.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 30060 | MIDWAY | 500 | 24156 | VINCENT | 500 | 1 | line_2220 | ivsg_hs_alt4ad2_ | 1848.1 | 2021.6 | 74.5 | 2188.8 | 2022.9 | 1.029 | 0.326 | MIDWAY 500.00 - VINCENT 500.00 2, MIDWAY 500.00 - VINCENT 500.00 3 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 13810B/23013 | ivsg_hs_alt4ad2_ | 204.1 | 210.5 | -4 | 871.4 | 210.5 | 1.021 | 1.163 | OT JCT TO PQ 1 |
| 22261 | EPP | 230 | 22260 | ESCNDIDO | 230 | 1 | 23052/23007 | ivsg_hs_alt4ad2_ | 796.7 | 815.2 | -18 | 2038.7 | 815.4 | 1.019 | 0.888 | TA-SO 1 + 2 230KV |
| 24074 | LA FRESA | 230 | 24065 | HINSON | 230 | 1 | line_2061 | ivsg_hs_alt4ad2_ | 797 | -778.9 | 47.8 | 2033 | 780.4 | 1.016 | 0.151 | LA FRESA 230.00 - REDONDO 230.00 1, LA FRESA 230.00 - REDONDO 230.00 2 |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | line_2236 | ivsg_hs_alt4ad2_ | 132 | 132.8 | -8.6 | 836.5 | 133.1 | 1.01 | 0.95 | PALOVRDE 500.00 - DEVERS 500.00 1, COACHELV 230.00 - DEVERS 230.00 2 |
| 19020 | BLYTHE | 161 | 24017 | BLYTHESC | 161 | 1 | line_N-203 | ivsg_hs_alt4ad2_ | 244 | 247.7 | 37.2 | 880.8 | 250.5 | 1.007 | 0.826 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_N-204 | ivsg_hs_alt4ad2_ | 169 | 169.7 | 33.1 | 608.1 | 172.9 | 1.006 | 0.812 | COACHELLA MIDWAY 230 CKT 1&2 |
| 22261 | EPP | 230 | 22260 | ESCNDIDO | 230 | 1 | line_N-203 | ivsg_hs_alt4ad2_ | 796.7 | 802.7 | -52.5 | 2008.6 | 804.4 | 1.004 | 0.888 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 1 | line_2030 | ivsg_hs_alt4ad2_ | 1287 | 1255.6 | -32.9 | 3229.8 | 1256 | 1 | 0.498 | LEWIS 230.00 - SERRANO 230.00 1, SERRANO 230.00 - VILLA PK 230.00 2 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 1 | line_2032 | ivsg_hs_alt4ad2_ | 1287 | 1255.6 | -32.9 | 3229.8 | 1256 | 1 | 0.498 | LEWIS 230.00 - SERRANO 230.00 2, SERRANO 230.00 - VILLA PK 230.00 2 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 13821B/638 | ivsg_hs_alt4ad2_ | 392 | 388.2 | 44.3 | 982.2 | 390.7 | 1 | 0.89 | CH-SX-SN 138KV + SAN VCNT-EL 69KV |
| 22596 | OLD TOWN | 230 | 22466 | MLMS3TAP | 230 | 1 | 23021/22/23/41 | ivsg_hs_alt4ad2_ | 912 | -882.4 | 108.9 | 2289.5 | 889.1 | 1 | 0.69 | MIGUEL 230 CORRIDOR West of SN |
| 22261 | EPP | 230 | 22260 | ESCNDIDO | 230 | 1 | 23022/23023 | ivsg_hs_alt4ad2_ | 796.7 | 800.1 | -44.8 | 1996 | 801.4 | 0.998 | 0.888 | ML-MS1+ ML-MS2 230KV |
| 22831 | SYCAMORE | 138 | 22124 | CHCARITA | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt4ad2_ | 204.1 | 203.1 | -17.8 | 850.9 | 203.8 | 0.996 | 0.721 | MIGUEL 230 CORRIDOR West of SN |
| 22831 | SYCAMORE | 138 | 22124 | CHCARITA | 138 | 1 | 13821B/638 | ivsg_hs_alt4ad2_ | 204.1 | 205.2 | -13.3 | 849.2 | 205.6 | 0.995 | 0.721 | CH-SX-SN 138KV + SAN VCNT-EL 69KV |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | line_N-204 | ivsg_hs_alt4ad2_ | 132 | 128.7 | -13.1 | 822.5 | 129.4 | 0.993 | 0.95 | COACHELLA MIDWAY 230 CKT 1&2 |
| 24086 | LUGO | 500 | 24097 | MOHAVE | 500 | 1 | line_2234 | ivsg_hs_alt4ad2_ | 1386 | -1427.3 | 96.7 | 1565.5 | 1430.6 | 0.989 | 0.679 | MOHAVE 500.00 - ELDORDO 500.00 1, PISGAH 230.00 - ELDORDO 230.00 2 |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | line_2237 | ivsg_hs_alt4ad2_ | 132 | 130.3 | -9.6 | 819 | 130.7 | 0.989 | 0.95 | PALOVRDE 500.00 - DEVERS 500.00 1, J.HINDS 230.00 - MIRAGE 230.00 1 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | line_2186 | ivsg_hs_alt4ad2_ | 132 | 131 | -10.1 | 814.7 | 131.4 | 0.984 | 0.95 | COACHELV 230.00 - DEVERS 230.00 2, J.HINDS 230.00 - MIRAGE 230.00 1 |
| 22261 | EPP | 230 | 22260 | ESCNDIDO | 230 | 1 | line_2245 | ivsg_hs_alt4ad2_ | 796.7 | 772.1 | -45.8 | 1928.1 | 773.5 | 0.964 | 0.888 | DEVERS 500.00 - VALLEYSC 500.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | 23022/23023 | ivsg_hs_alt4ad2_ | 382.4 | 371.5 | 28.2 | 1541.3 | 372.6 | 0.963 | 0.66 | ML-MS1+ ML-MS2 230KV |
| 22261 | EPP | 230 | 22260 | ESCNDIDO | 230 | 1 | line_N-204 | ivsg_hs_alt4ad2_ | 796.7 | 769.6 | -48.7 | 1922.8 | 771.1 | 0.961 | 0.888 | COACHELLA MIDWAY 230 CKT 1&2 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_2194 | ivsg_hs_alt4ad2_ | 56 | 51.9 | -10.5 | 262.7 | 53 | 0.96 | 0.92 | LUGO 500.00 - MIRALOMA 500.00 2, LUGO 500.00 - MIRALOMA 500.00 3 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | 23052/23007 | ivsg_hs_alt4ad2_ | 392 | 375.4 | 6.2 | 941.9 | 375.5 | 0.96 | 0.99 | TA-SO 1 + 2 230KV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | 13807/08/23013 | ivsg_hs_alt4ad2_ | 392 | 374.7 | 10.9 | 936.3 | 374.8 | 0.96 | 0.99 | PQ ENCINA |
| 22261 | EPP | 230 | 22260 | ESCNDIDO | 230 | 1 | 23013/27/28 | ivsg_hs_alt4ad2_ | 796.7 | 771 | -54.4 | 1920.4 | 772.9 | 0.96 | 0.888 | OLD TOWN TO OLD TOWN JCT |
| 19020 | BLYTHE | 161 | 24017 | BLYTHESC | 161 | 1 | line_N-204 | ivsg_hs_alt4ad2_ | 244 | 236.2 | 33.3 | 838.8 | 238.6 | 0.959 | 0.826 | COACHELLA MIDWAY 230 CKT 1&2 |
| 8311 | COACHELA | 230 | 8695 | RAMON | 230 | 2 | line_2236 | ivsg_hs_alt4ad2_ | 800 | 742.7 | -17.7 | 1918.8 | 742.9 | 0.956 | 0.641 | PALOVRDE 500.00 - DEVERS 500.00 1, COACHELV 230.00 - DEVERS 230.00 2 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | line_2115 | ivsg_hs_alt4ad2_ | 392 | 371.3 | 12.4 | 919.6 | 371.5 | 0.95 | 0.99 | S.ONOFRE 230.00 - SANTIAGO 230.00 1, S.ONOFRE 230.00 - SANTIAGO 230.00 2 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23051B/23011 | ivsg_hs_alt4ad2_ | 392 | 370.5 | 43.4 | 942.5 | 373 | 0.95 | 0.89 | EPP-ES + ES-EA-SA 230KV |
| 8376 | RTAP2 | 92 | 8974 | RTP1 | 92 | 1 | line_N-208 | ivsg_hs_alt4ad2_ | 57 | -51.4 | 13.8 | 337.6 | 53.2 | 0.948 | 0.715 | COACHELLA BANISTER/BANISTER AVE58 230 |
| 8601 | GEOSUB2 | 230 | 8300 | BANIS230 | 230 | 1 | line_N-204 | ivsg_hs_alt4ad2_ | 550 | 524.5 | 78.6 | 1306 | 530.4 | 0.947 | 0.654 | COACHELLA MIDWAY 230 CKT 1&2 |
| 24126 | RIOHONDO | 230 | 24155 | VINCENT | 230 | 2 | line_2097 | ivsg_hs_alt4ad2_ | 988 | -887 | 75.2 | 2341.3 | 890.2 | 0.944 | 0.69 | GOODRICH 230.00 - GOULD 230.00 1, VINCENT 230.00 - MESA CAL 230.00 1 |
| 22261 | EPP | 230 | 22260 | ESCNDIDO | 230 | 1 | 13821B/638 | ivsg_hs_alt4ad2_ | 796.7 | 754.8 | -33.5 | 1879.3 | 755.5 | 0.94 | 0.888 | CH-SX-SN 138KV + SAN VCNT-EL 69KV |
| 22261 | EPP | 230 | 22260 | ESCNDIDO | 230 | 1 | 13810B/23013 | ivsg_hs_alt4ad2_ | 796.7 | 754.9 | -48.7 | 1878.4 | 756.5 | 0.939 | 0.888 | OT JCT TO PQ 1 |
| 22261 | EPP | 230 | 22260 | ESCNDIDO | 230 | 1 | line_2236 | ivsg_hs_alt4ad2_ | 796.7 | 752.3 | -43 | 1875.5 | 753.5 | 0.938 | 0.888 | PALOVRDE 500.00 - DEVERS 500.00 1, COACHELV 230.00 - DEVERS 230.00 2 |
| 8695 | RAMON | 230 | 24806 | MIRAGE | 230 | 2 | line_2236 | ivsg_hs_alt4ad2_ | 800 | 716.4 | -146.9 | 1879.4 | 731.3 | 0.936 | 0.585 | PALOVRDE 500.00 - DEVERS 500.00 1, COACHELV 230.00 - DEVERS 230.00 2 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2191 | ivsg_hs_alt4ad2_ | 2400 | -2348.6 | -39.1 | 2583.3 | 2348.9 | 0.932 | 0.73 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - ELDORDO 230.00 2 |
| 22261 | EPP | 230 | 22260 | ESCNDIDO | 230 | 1 | line_2182 | ivsg_hs_alt4ad2_ | 796.7 | 747.3 | -43.8 | 1862.1 | 748.6 | 0.931 | 0.888 | DEVERS 230.00 - MIRAGE 230.00 2, COACHELV 230.00 - DEVERS 230.00 2 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2200 | ivsg_hs_alt4ad2_ | 2400 | -2335.1 | -31 | 2577.6 | 2335.3 | 0.93 | 0.73 | LUGO 500.00 - MOHAVE 500.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2201 | ivsg_hs_alt4ad2_ | 2400 | -2334.9 | -31.1 | 2577.3 | 2335.1 | 0.93 | 0.73 | LUGO 500.00 - MOHAVE 500.00 1, PISGAH 230.00 - LUGO 230.00 2 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | line_N-203 | ivsg_hs_alt4ad2_ | 392 | 364.1 | 34.3 | 926.1 | 365.7 | 0.93 | 0.89 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 22261 | EPP | 230 | 22260 | ESCNDIDO | 230 | 1 | 13807/08/23013 | ivsg_hs_alt4ad2_ | 796.7 | 747.3 | -49.5 | 1858.7 | 748.9 | 0.929 | 0.888 | PQ ENCINA |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2100 | ivsg_hs_alt4ad2_ | 2400 | -2336.4 | -193.5 | 2572.9 | 2344.4 | 0.928 | 0.73 | EAGLROCK 230.00 - MESA CAL 230.00 1, SYLMAR S 230.00 - GOULD 230.00 1 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2192 | ivsg_hs_alt4ad2_ | 2400 | -2336.7 | -49 | 2571.2 | 2337.2 | 0.928 | 0.73 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2193 | ivsg_hs_alt4ad2_ | 2400 | -2336.4 | -49 | 2570.9 | 2337 | 0.928 | 0.73 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - LUGO 230.00 2 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 13821B/638 | ivsg_hs_alt4ad2_ | 408.3 | -384 | -4.8 | 1585.4 | 384 | 0.928 | 0.822 | CH-SX-SN 138KV + SAN VCNT-EL 69KV |
| 22261 | EPP | 230 | 22260 | ESCNDIDO | 230 | 1 | line_2113 | ivsg_hs_alt4ad2_ | 796.7 | 741.7 | -32.2 | 1849.3 | 742.4 | 0.925 | 0.888 | ELLIS 230.00 - JOHANNA 230.00 1, ELLIS 230.00 - SANTIAGO 230.00 1 |
| 24614 | TAP601 | 115 | 24702 | KRAMER | 115 | 1 | line_2260 | ivsg_hs_alt4ad2_ | 217.1 | -189.3 | 71.5 | 1003.1 | 202.4 | 0.923 | 0.716 | KRAMER 230.00 - LUGO 230.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 22261 | EPP | 230 | 22260 | ESCNDIDO | 230 | 1 | line_2185 | ivsg_hs_alt4ad2_ | 796.7 | 739.8 | -41.5 | 1842.1 | 741 | 0.921 | 0.888 | RAMON 230.00 - MIRAGE 230.00 2, J.HINDS 230.00 - MIRAGE 230.00 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | line_2245 | ivsg_hs_alt4ad2_ | 392 | 359.6 | 33.8 | 911.4 | 361.2 | 0.92 | 0.89 | DEVERS 500.00 - VALLEYSC 500.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 22261 | EPP | 230 | 22260 | ESCNDIDO | 230 | 1 | 23021/22/23/41 | ivsg_hs_alt4ad2_ | 796.7 | 734.5 | -31.5 | 1839.3 | 735.2 | 0.92 | 0.888 | MIGUEL 230 CORRIDOR West of SN |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2103 | ivsg_hs_alt4ad2_ | 2400 | -2299 | -180.3 | 2529.8 | 2306 | 0.913 | 0.73 | EAGLROCK 230.00 - SYLMAR S 230.00 1, SYLMAR S 230.00 - GOULD 230.00 1 |
| 24126 | RIOHONDO | 230 | 24155 | VINCENT | 230 | 2 | line_2101 | ivsg_hs_alt4ad2_ | 988 | -862.4 | 76.8 | 2261.7 | 865.8 | 0.912 | 0.69 | EAGLROCK 230.00 - MESA CAL 230.00 1, VINCENT 230.00 - MESA CAL 230.00 1 |
| 24042 | ELDORDO | 500 | 24086 | LUGO | 500 | 1 | line_2258 | ivsg_hs_alt4ad2_ | 1386 | 1341 | 228.6 | 1445.3 | 1360.4 | 0.91 | 0.607 | LUGO 500.00 - VINCENT 500.00 2, LUGO 500.00 - VICTORVL 500.00 1 |
| 24602 | VICTOR | 115 | 24702 | KRAMER | 115 | 1 | line_2260 | ivsg_hs_alt4ad2_ | 217.1 | -184.7 | 81.5 | 987.1 | 201.9 | 0.909 | 0.703 | KRAMER 230.00 - LUGO 230.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2096 | ivsg_hs_alt4ad2_ | 2400 | -2287.1 | -201.2 | 2515.6 | 2295.9 | 0.908 | 0.73 | EAGLROCK 230.00 - MESA CAL 230.00 1, GOODRICH 230.00 - GOULD 230.00 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23021/23041 | ivsg_hs_alt4ad2_ | 204.1 | 186.5 | -1 | 772.8 | 186.5 | 0.905 | 1.163 | ML-SX + OM-SX 230KV |

ivsg_hs_alt4ad2_r1.sav
No Solve Summary
N-2 Outages

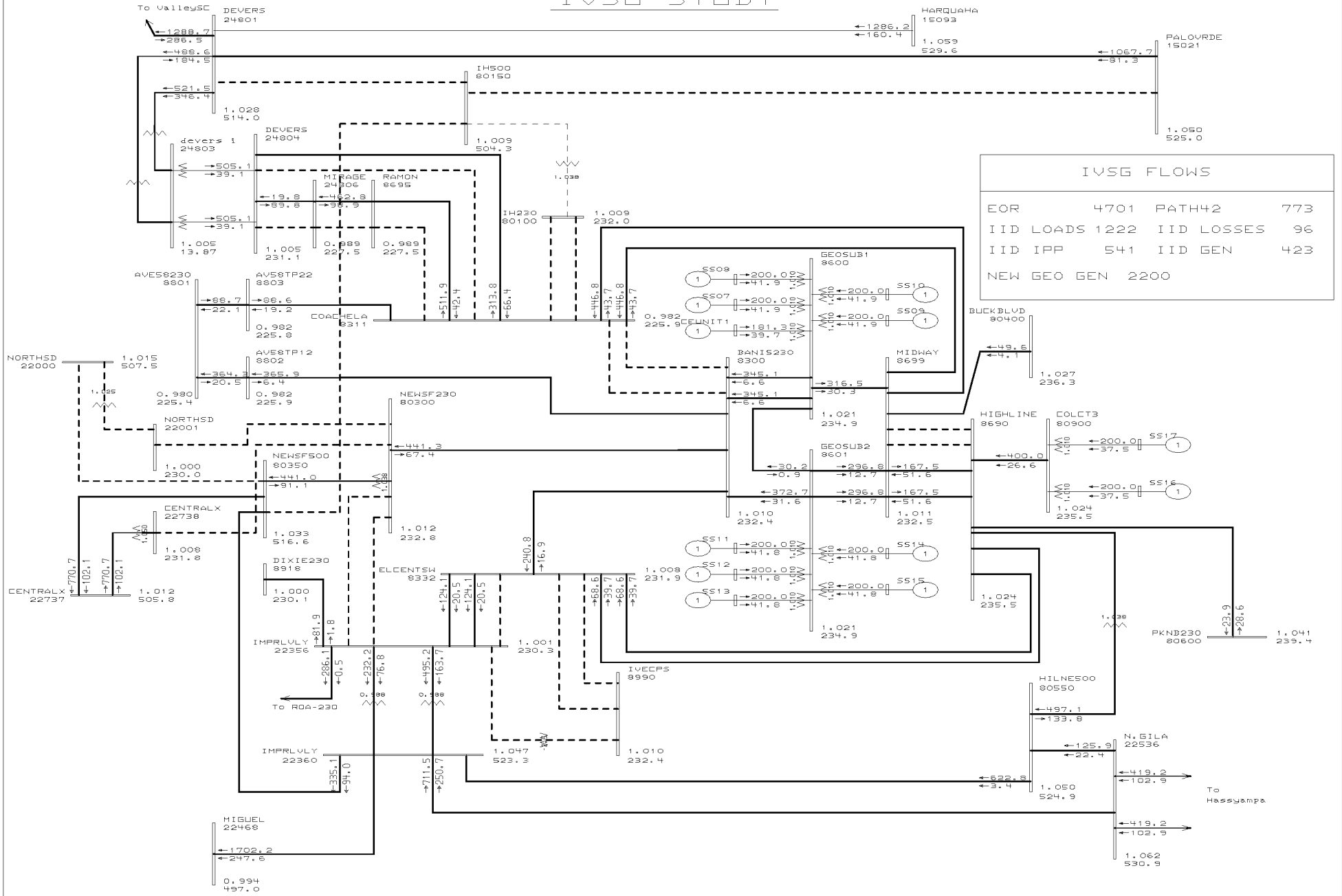
| Contingency-Description | Case | Problem-Description |
|---|---|---|
| DEVERS 230.00 - MIRAGE 230.00 2, RAMON 230.00 - MIRAGE 230.00 2 | ivsg_hs_alt4ad2_ | Pmis 24819 CONCHO 115.00 = -5907834.00 MW + j -19810358.00 MVAR |
| VICTOR 230.00 - LUGO 230.00 1, VICTOR 230.00 - LUGO 230.00 2 | ivsg_hs_alt4ad2_ | BAD Qgen: 24758 SUNGEN7G 17.0 MVAr |
| DEVERS 230.00 - MIRAGE 230.00 2, RAMON 230.00 - MIRAGE 230.00 2 | ivsg_hs_alt4ad2_ | Pmis 24819 CONCHO 115.00 = -5907834.00 MW + j -19810358.00 MVAR |

# Imperial Valley Study Group

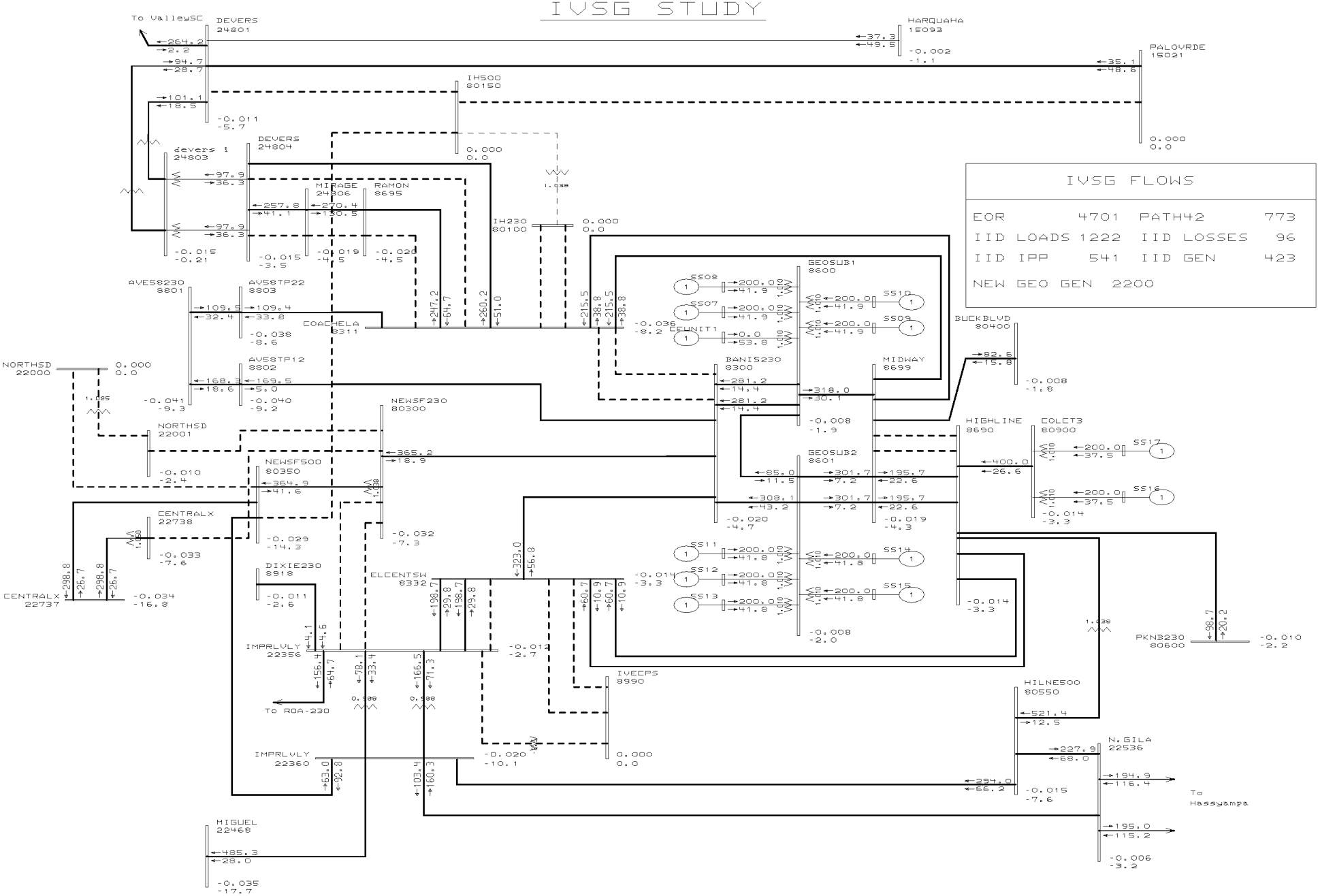
## Appendix A.4.12

Alt 4b D1
Heavy Summer
Alternative 4b
Dispatch 1

# IVSG STUDY


To ValleySC
DEVERS 24801
HARQUAHA 15093
PALOVRDE 15021
IH500 80150
devers 1 24803
DEVERS 24804
MIRAGE 24806
RAMON 8695
IH230 80100
AVES8230 8801
AVES8TP22 8803
AVES8TP12 8802
COACHELLA 8311
GEOSUB1 8600
GEOSUB2 8601
BANIS230 8300
MIDWAY 8699
BUCKBLVD 80400
HIGHLINE 8690
COLCT3 80900
NORTHSD 22000
NORTHSD 22001
NEWSF230 80300
NEWSF500 80350
CENTRALX 22738
CENTRALX 22737
DIXIE230 8918
ELCENTSW 8332
IMPRLVLY 22356
IMPRLVLY 22360
IVECPS 8990
MIGUEL 22468
HILNE500 80550
N.GILA 22536
PKNB230 80600
To ROA-230
To Hassyampa
IVSG FLOWS
EOR 4701 PATH42 773
IID LOADS 1222 IID LOSSES 96
IID IPP 541 IID GEN 423
NEW GEO GEN 2200

# IVSG STUDY


To ValleySC
DEVERS 24801
HARQUAHA 15093
PALOVRDE 15021
IH500 80150
devers 1 24803
DEVERS 24804
MIRAGE 24806
RAMON 8695
IH230 80100
AVES8230 8801
AVES8TP22 8803
AVES8TP12 8802
COACHELA 8311
NORTHSD 22000
NORTHSD 22001
NEWSF230 80300
NEWSF500 80350
CENTRALX 22738
CENTRALX 22737
DIXIE230 8918
ELCENTSW 8332
IMPRLVLY 22356
IMPRLVLY 22360
MIGUEL 22468
To ROA-230
IVECPS 8990
GEOSUB1 8600
GEOSUB2 8601
BANIS230 8300
MIDWAY 8699
BUCKBLVD 80400
HIGHLINE 8690
COLCT3 80900
HILNE500 80550
N.GILA 22536
PKNB230 80600
To Hassyampa
IVSG FLOWS
EOR 4701 PATH42 773
IID LOADS 1222 IID LOSSES 96
IID IPP 541 IID GEN 423
NEW GEO GEN 2200

ivsg_hs_alt4b_d1.sav
Voltage Summary
N-0 Outages

| Bus | Name | kV | Area | Zone | Outage | Case | Vbase | Vcont | DeltaV | Vmin | Vmax | Max-dv | Contingency Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24035 | EAGLEMTN | 161 | 24 | 248 | base | ivsg_hs_alt4bd1 | 0.928 | 0.928 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 20077 | SIM-115 | 115 | 20 | 205 | base | ivsg_hs_alt4bd1 | 0.932 | 0.932 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 20076 | SQN-115 | 115 | 20 | 205 | base | ivsg_hs_alt4bd1 | 0.937 | 0.937 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14534 | N.GILA 4 | 100 | 14 | 847 | base | ivsg_hs_alt4bd1 | 0.947 | 0.947 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15051 | BROWNING | 500 | 14 | 158 | base | ivsg_hs_alt4bd1 | 1.051 | 1.051 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14213 | TS8 | 230 | 14 | 847 | base | ivsg_hs_alt4bd1 | 1.051 | 1.051 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15090 | HASSYAMP | 500 | 14 | 158 | base | ivsg_hs_alt4bd1 | 1.053 | 1.053 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15092 | ARLINTON | 500 | 14 | 158 | base | ivsg_hs_alt4bd1 | 1.053 | 1.053 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15094 | MESQUITE | 500 | 14 | 158 | base | ivsg_hs_alt4bd1 | 1.053 | 1.053 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14009 | REDHAWK | 500 | 14 | 141 | base | ivsg_hs_alt4bd1 | 1.054 | 1.054 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 80750 | NGILA230 | 230 | 8 | 800 | base | ivsg_hs_alt4bd1 | 1.054 | 1.054 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24151 | VALLEYSC | 500 | 24 | 240 | base | ivsg_hs_alt4bd1 | 1.054 | 1.054 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24997 | VALYSVC1 | 500 | 24 | 240 | base | ivsg_hs_alt4bd1 | 1.054 | 1.054 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 28040 | CALPINE | 500 | 24 | 240 | base | ivsg_hs_alt4bd1 | 1.054 | 1.054 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24086 | LUGO | 500 | 24 | 240 | base | ivsg_hs_alt4bd1 | 1.055 | 1.055 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14010 | TS5 | 500 | 14 | 141 | base | ivsg_hs_alt4bd1 | 1.056 | 1.056 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 79043 | KAYENTA | 230 | 14 | 191 | base | ivsg_hs_alt4bd1 | 1.056 | 1.056 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14230 | VERDE N | 230 | 14 | 141 | base | ivsg_hs_alt4bd1 | 1.058 | 1.058 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14247 | VERDE S | 230 | 14 | 141 | base | ivsg_hs_alt4bd1 | 1.058 | 1.058 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14011 | RACEWAY | 500 | 14 | 141 | base | ivsg_hs_alt4bd1 | 1.058 | 1.058 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24776 | LEE VINE | 115 | 24 | 247 | base | ivsg_hs_alt4bd1 | 1.058 | 1.058 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15093 | HARQUAHA | 500 | 14 | 158 | base | ivsg_hs_alt4bd1 | 1.059 | 1.059 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15034 | PERKINS | 500 | 14 | 158 | base | ivsg_hs_alt4bd1 | 1.061 | 1.061 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14205 | COCONINO | 230 | 14 | 141 | base | ivsg_hs_alt4bd1 | 1.061 | 1.061 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14008 | JOJOBA | 500 | 14 | 141 | base | ivsg_hs_alt4bd1 | 1.061 | 1.061 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15041 | SILVERKG | 500 | 14 | 158 | base | ivsg_hs_alt4bd1 | 1.062 | 1.062 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15061 | RUDD | 500 | 14 | 158 | base | ivsg_hs_alt4bd1 | 1.062 | 1.062 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 22536 | N.GILA | 500 | 22 | 227 | base | ivsg_hs_alt4bd1 | 1.062 | 1.062 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14234 | YAVAPAI | 230 | 14 | 141 | base | ivsg_hs_alt4bd1 | 1.063 | 1.063 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24156 | VINCENT | 500 | 24 | 240 | base | ivsg_hs_alt4bd1 | 1.064 | 1.064 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14355 | PRESCOTT | 115 | 14 | 141 | base | ivsg_hs_alt4bd1 | 1.066 | 1.066 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14544 | PRESCOT2 | 100 | 14 | 141 | base | ivsg_hs_alt4bd1 | 1.066 | 1.066 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14543 | PRESCOT1 | 100 | 14 | 141 | base | ivsg_hs_alt4bd1 | 1.066 | 1.066 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14001 | FOURCORN | 500 | 14 | 141 | base | ivsg_hs_alt4bd1 | 1.067 | 1.067 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14256 | FLAGSTAF | 230 | 14 | 141 | base | ivsg_hs_alt4bd1 | 1.067 | 1.067 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14587 | FLAGSTF1 | 100 | 14 | 141 | base | ivsg_hs_alt4bd1 | 1.068 | 1.068 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24729 | INYO | 230 | 24 | 247 | base | ivsg_hs_alt4bd1 | 1.068 | 1.068 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14007 | GILARIVR | 500 | 14 | 141 | base | ivsg_hs_alt4bd1 | 1.07 | 1.07 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14006 | YAVAPAI | 500 | 14 | 141 | base | ivsg_hs_alt4bd1 | 1.071 | 1.071 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 79264 | PINAL_W | 500 | 14 | 141 | base | ivsg_hs_alt4bd1 | 1.071 | 1.071 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14215 | LEUPP | 230 | 14 | 141 | base | ivsg_hs_alt4bd1 | 1.075 | 1.075 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15992 | SEV | 500 | 14 | 158 | base | ivsg_hs_alt4bd1 | 1.075 | 1.075 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 16000 | TORTOLIT | 500 | 14 | 160 | base | ivsg_hs_alt4bd1 | 1.075 | 1.075 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 16001 | TORTLIT2 | 500 | 14 | 160 | base | ivsg_hs_alt4bd1 | 1.075 | 1.075 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14004 | SAGUARO | 500 | 14 | 141 | base | ivsg_hs_alt4bd1 | 1.076 | 1.076 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14100 | CHOLLA | 345 | 14 | 141 | base | ivsg_hs_alt4bd1 | 1.077 | 1.077 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15001 | CORONADO | 500 | 14 | 158 | base | ivsg_hs_alt4bd1 | 1.08 | 1.08 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14000 | CHOLLA | 500 | 14 | 141 | base | ivsg_hs_alt4bd1 | 1.081 | 1.081 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 19038 | MEAD | 500 | 14 | 191 | base | ivsg_hs_alt4bd1 | 1.084 | 1.084 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24042 | ELDORDO | 500 | 24 | 240 | base | ivsg_hs_alt4bd1 | 1.085 | 1.085 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24097 | MOHAVE | 500 | 24 | 240 | base | ivsg_hs_alt4bd1 | 1.087 | 1.087 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14204 | CHOLLA | 230 | 14 | 141 | base | ivsg_hs_alt4bd1 | 1.088 | 1.088 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14509 | CHOLLA 7 | 100 | 14 | 141 | base | ivsg_hs_alt4bd1 | 1.094 | 1.094 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14267 | SECDKNOL | 230 | 14 | 141 | base | ivsg_hs_alt4bd1 | 1.099 | 1.099 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14003 | NAVAJO | 500 | 14 | 141 | base | ivsg_hs_alt4bd1 | 1.102 | 1.102 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14002 | MOENKOPI | 500 | 14 | 141 | base | ivsg_hs_alt4bd1 | 1.104 | 1.104 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |

ivsg_hs_alt4b_d1.sav
Flow Summary
N-0 Outages

| LEGEND | % of RATING 1 | |
|---|---|---|
| C_pu | 100% - 110% | |
| C_pu | 110% - 120% | P.U. of |
| C_pu | > 120% | Rate 1 |

| FROM | FR | BKV | TO | TO | BKV | CK | Outage_Name | Case | Rate-Mva | Pflow | Qflow | Amps | MVA | C_pu | B_pu | Contingency_Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | base | ivsg_hs_alt4bd1 | 204.1 | 258.7 | -3.1 | 1086.6 | 258.7 | 1.273 | 1.273 | Base system (n-0) |
| 24910 | CAL ELEC | 115 | 24912 | SHANDIN | 115 | 1 | base | ivsg_hs_alt4bd1 | 109.1 | -124.1 | 58.3 | 682.8 | 137.1 | 1.25 | 1.25 | Base system (n-0) |
| 14248 | GLENDALW | 230 | 14212 | GLENDALE | 230 | 1 | base | ivsg_hs_alt4bd1 | 457 | 571.6 | 32.6 | 1433 | 572.5 | 1.249 | 1.249 | Base system (n-0) |
| 14248 | GLENDALW | 230 | 15201 | AGUAFRIA | 230 | 1 | base | ivsg_hs_alt4bd1 | 457 | -571.6 | -32.6 | 1433 | 572.5 | 1.249 | 1.249 | Base system (n-0) |
| 14221 | PNPKAPS | 230 | 19062 | PINPK | 230 | 1 | base | ivsg_hs_alt4bd1 | 637.4 | -786 | -184.9 | 1987.7 | 807.4 | 1.242 | 1.242 | Base system (n-0) |
| 24912 | SHANDIN | 115 | 24916 | TAP902 | 115 | 1 | base | ivsg_hs_alt4bd1 | 109.1 | -119.2 | 33.5 | 613.5 | 123.8 | 1.121 | 1.121 | Base system (n-0) |
| 14212 | GLENDALE | 230 | 14270 | GRNDTRML | 230 | 1 | base | ivsg_hs_alt4bd1 | 457 | 506.2 | 25.1 | 1268.6 | 506.8 | 1.108 | 1.108 | Base system (n-0) |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | base | ivsg_hs_alt4bd1 | 392 | 417.9 | 45.8 | 1073.5 | 420.4 | 1.07 | 1.07 | Base system (n-0) |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | base | ivsg_hs_alt4bd1 | 392 | 411.7 | 11.2 | 1045.2 | 411.9 | 1.05 | 1.05 | Base system (n-0) |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | base | ivsg_hs_alt4bd1 | 408.3 | -412.9 | 1.4 | 1732.7 | 412.9 | 1.014 | 1.014 | Base system (n-0) |
| 14206 | CTRYCLUB | 230 | 14270 | GRNDTRML | 230 | 1 | base | ivsg_hs_alt4bd1 | 509.9 | -502.8 | -25.4 | 1272 | 503.5 | 0.994 | 0.994 | Base system (n-0) |
| 14202 | CACTUS | 230 | 14221 | PNPKAPS | 230 | 1 | base | ivsg_hs_alt4bd1 | 371 | -364 | -48.4 | 921.6 | 367.2 | 0.99 | 0.99 | Base system (n-0) |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | base | ivsg_hs_alt4bd1 | 132 | 127.1 | -11.1 | 797.1 | 127.6 | 0.962 | 0.962 | Base system (n-0) |
| 15230 | RUDD | 230 | 15218 | WHITETNK | 230 | 1 | base | ivsg_hs_alt4bd1 | 725 | 692 | -18 | 1733.3 | 692.2 | 0.952 | 0.952 | Base system (n-0) |
| 24087 | MAGUNDEN | 230 | 24101 | OMAR | 230 | 1 | base | ivsg_hs_alt4bd1 | 643 | -591.8 | 130.4 | 1533.2 | 606 | 0.951 | 0.951 | Base system (n-0) |
| 24806 | MIRAGE | 230 | 24807 | MIRAGE | 115 | 1 | base | ivsg_hs_alt4bd1 | 280 | 265.7 | 27.8 | 677.9 | 267.1 | 0.95 | 0.95 | Base system (n-0) |
| 24806 | MIRAGE | 230 | 24807 | MIRAGE | 115 | 2 | base | ivsg_hs_alt4bd1 | 280 | 265.7 | 27.8 | 677.9 | 267.1 | 0.95 | 0.95 | Base system (n-0) |
| 24702 | KRAMER | 115 | 24753 | SUNGEN | 115 | 1 | base | ivsg_hs_alt4bd1 | 183.3 | -170.5 | 32.4 | 863.8 | 173.6 | 0.939 | 0.939 | Base system (n-0) |
| 26098 | SYLMAR3 | 230 | 24147 | SYLMAR S | 230 | 1 | base | ivsg_hs_alt4bd1 | 1100 | 840.7 | -522.9 | 2572.2 | 990.1 | 0.932 | 0.932 | Base system (n-0) |
| 14008 | JOJOBA | 500 | 15011 | KYRENE | 500 | 1 | base | ivsg_hs_alt4bd1 | 1732 | 1702.9 | 134 | 1858.5 | 1708.1 | 0.931 | 0.931 | Base system (n-0) |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | base | ivsg_hs_alt4bd1 | 56 | 49.9 | -10.6 | 252.6 | 51 | 0.92 | 0.92 | Base system (n-0) |
| 14207 | DEERVALY | 230 | 14231 | WESTWING | 230 | 1 | base | ivsg_hs_alt4bd1 | 720 | -647.7 | -80.3 | 1634.9 | 652.6 | 0.905 | 0.905 | Base system (n-0) |

| Bus | Name | kV | Area | Zone | Outage | Case | Vbase | Vcont | DeltaV | Vmin | Vmax | Max-dv | Contingency Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22412 | LOSCOCHS | 138 | 22 | 223 | B2_002 | ivsg_hs_alt4bd1 | 0.979 | 0.858 | -0.121 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22428 | MAINST51 | 138 | 22 | 222 | B2_002 | ivsg_hs_alt4bd1 | 0.975 | 0.859 | -0.116 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22424 | MAINST50 | 138 | 22 | 222 | B2_002 | ivsg_hs_alt4bd1 | 0.976 | 0.86 | -0.116 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 24017 | BLYTHESC | 161 | 24 | 248 | line_007 | ivsg_hs_alt4bd1 | 1.02 | 0.862 | -0.158 | 0.9 | 1.05 | 0.05 | line BLYTHE to BLYTHESC 161 ck 1 |
| 22464 | MIGUEL | 230 | 22 | 222 | B2_002 | ivsg_hs_alt4bd1 | 0.983 | 0.864 | -0.119 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22468 | MIGUEL | 500 | 22 | 227 | B2_002 | ivsg_hs_alt4bd1 | 0.994 | 0.864 | -0.13 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22472 | MIGUELMP | 500 | 22 | 227 | B2_002 | ivsg_hs_alt4bd1 | 0.985 | 0.864 | -0.122 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22734 | SANTEE | 138 | 22 | 223 | B2_002 | ivsg_hs_alt4bd1 | 0.981 | 0.866 | -0.115 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22772 | SOUTHBAY | 138 | 22 | 222 | B2_002 | ivsg_hs_alt4bd1 | 0.983 | 0.869 | -0.114 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22852 | TELECYN | 138 | 22 | 222 | B2_002 | ivsg_hs_alt4bd1 | 0.994 | 0.878 | -0.116 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22865 | UPTOWN | 138 | 22 | 221 | B2_002 | ivsg_hs_alt4bd1 | 0.987 | 0.878 | -0.109 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22116 | CARLTHTP | 138 | 22 | 223 | B2_002 | ivsg_hs_alt4bd1 | 0.988 | 0.88 | -0.108 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22672 | PRCTRVLY | 138 | 22 | 222 | B2_002 | ivsg_hs_alt4bd1 | 0.997 | 0.88 | -0.117 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22120 | CARLTNHS | 138 | 22 | 223 | B2_002 | ivsg_hs_alt4bd1 | 0.988 | 0.882 | -0.106 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22460 | MIGUEL | 138 | 22 | 222 | B2_002 | ivsg_hs_alt4bd1 | 0.999 | 0.882 | -0.117 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22832 | SYCAMORE | 230 | 22 | 221 | B2_002 | ivsg_hs_alt4bd1 | 0.989 | 0.885 | -0.104 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22504 | MISSION | 230 | 22 | 221 | B2_002 | ivsg_hs_alt4bd1 | 0.977 | 0.886 | -0.091 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22596 | OLD TOWN | 230 | 22 | 221 | B2_002 | ivsg_hs_alt4bd1 | 0.979 | 0.89 | -0.089 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22500 | MISSION | 138 | 22 | 221 | B2_002 | ivsg_hs_alt4bd1 | 0.992 | 0.892 | -0.1 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22300 | FRIARS | 138 | 22 | 221 | B2_002 | ivsg_hs_alt4bd1 | 0.991 | 0.893 | -0.098 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22831 | SYCAMORE | 138 | 22 | 221 | B2_002 | ivsg_hs_alt4bd1 | 0.996 | 0.894 | -0.102 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22738 | CENTRALX | 230 | 22 | 225 | B2_002 | ivsg_hs_alt4bd1 | 1.008 | 0.901 | -0.107 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22922 | MIRA SOR | 138 | 22 | 221 | B2_002 | ivsg_hs_alt4bd1 | 0.989 | 0.906 | -0.083 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22124 | CHCARITA | 138 | 22 | 225 | B2_002 | ivsg_hs_alt4bd1 | 0.997 | 0.907 | -0.09 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22652 | PENSQTOS | 230 | 22 | 221 | B2_002 | ivsg_hs_alt4bd1 | 0.988 | 0.909 | -0.079 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22737 | CENTRALX | 500 | 22 | 225 | B2_002 | ivsg_hs_alt4bd1 | 1.012 | 0.909 | -0.103 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22184 | DOUBLET | 138 | 22 | 221 | B2_002 | ivsg_hs_alt4bd1 | 0.99 | 0.912 | -0.078 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22192 | DOUBLTTP | 138 | 22 | 221 | B2_002 | ivsg_hs_alt4bd1 | 0.99 | 0.912 | -0.078 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22648 | PENSQTOS | 138 | 22 | 221 | B2_002 | ivsg_hs_alt4bd1 | 0.99 | 0.913 | -0.077 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22580 | NORTHCTY | 138 | 22 | 224 | B2_002 | ivsg_hs_alt4bd1 | 0.994 | 0.921 | -0.073 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22466 | MLMS3TAP | 230 | 22 | 222 | B2_002 | ivsg_hs_alt4bd1 | 0.993 | 0.921 | -0.072 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 24731 | INYOKERN | 115 | 24 | 247 | line_175 | ivsg_hs_alt4bd1 | 1 | 0.926 | -0.075 | 0.9 | 1.05 | 0.05 | line INYO to COTTONWD 230 ck 1 |
| 24819 | CONCHO | 115 | 24 | 248 | tran_238 | ivsg_hs_alt4bd1 | 1.024 | 0.927 | -0.096 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 24822 | INDIAN W | 115 | 24 | 248 | tran_238 | ivsg_hs_alt4bd1 | 1.023 | 0.927 | -0.097 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 22467 | MLSXTAP | 230 | 22 | 222 | B2_002 | ivsg_hs_alt4bd1 | 1 | 0.931 | -0.07 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 24816 | SANTA RO | 115 | 24 | 248 | tran_238 | ivsg_hs_alt4bd1 | 1.028 | 0.932 | -0.096 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 24821 | TAMARISK | 115 | 24 | 248 | tran_238 | ivsg_hs_alt4bd1 | 1.028 | 0.932 | -0.095 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 22254 | ENVIREPL | 69 | 22 | 225 | B2_002 | ivsg_hs_alt4bd1 | 0.994 | 0.934 | -0.06 | 0 | 0 | 0 | IMPRLVLY - MIGUEL 1 500kV |
| 24827 | TAP823 | 115 | 24 | 248 | tran_238 | ivsg_hs_alt4bd1 | 1.029 | 0.934 | -0.095 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 25633 | CAPWIND | 115 | 24 | 248 | tran_238 | ivsg_hs_alt4bd1 | 1.03 | 0.935 | -0.095 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 25622 | TAP806 | 115 | 24 | 248 | tran_238 | ivsg_hs_alt4bd1 | 1.03 | 0.935 | -0.095 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 24829 | TAP821 | 115 | 24 | 248 | tran_238 | ivsg_hs_alt4bd1 | 1.03 | 0.935 | -0.095 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 25423 | ESRP MWD | 115 | 24 | 254 | tran_247 | ivsg_hs_alt4bd1 | 1.024 | 0.935 | -0.089 | 0.9 | 1.05 | 0.05 | tran VALLEYSC 500 to VALLEYSC 115 ck 1 |
| 25423 | ESRP MWD | 115 | 24 | 254 | tran_248 | ivsg_hs_alt4bd1 | 1.024 | 0.935 | -0.089 | 0.9 | 1.05 | 0.05 | tran VALLEYSC 500 to VALLEYSC 115 ck 2 |
| 24807 | MIRAGE | 115 | 24 | 248 | tran_238 | ivsg_hs_alt4bd1 | 1.032 | 0.937 | -0.094 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 24160 | VALLEYSC | 115 | 24 | 240 | tran_247 | ivsg_hs_alt4bd1 | 1.027 | 0.938 | -0.088 | 0.9 | 1.05 | 0.05 | tran VALLEYSC 500 to VALLEYSC 115 ck 1 |
| 25990 | VALYSVC1 | 115 | 24 | 240 | tran_247 | ivsg_hs_alt4bd1 | 1.027 | 0.938 | -0.088 | 0.9 | 1.05 | 0.05 | tran VALLEYSC 500 to VALLEYSC 115 ck 1 |
| 24160 | VALLEYSC | 115 | 24 | 240 | tran_248 | ivsg_hs_alt4bd1 | 1.027 | 0.938 | -0.088 | 0.9 | 1.05 | 0.05 | tran VALLEYSC 500 to VALLEYSC 115 ck 2 |
| 25990 | VALYSVC1 | 115 | 24 | 240 | tran_248 | ivsg_hs_alt4bd1 | 1.027 | 0.938 | -0.088 | 0.9 | 1.05 | 0.05 | tran VALLEYSC 500 to VALLEYSC 115 ck 2 |
| 22436 | MDWLRKTP | 138 | 22 | 225 | B2_002 | ivsg_hs_alt4bd1 | 1.008 | 0.943 | -0.064 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22568 | NCMETER | 138 | 22 | 225 | B2_002 | ivsg_hs_alt4bd1 | 1.008 | 0.943 | -0.064 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22572 | NCMETRTP | 138 | 22 | 225 | B2_002 | ivsg_hs_alt4bd1 | 1.008 | 0.943 | -0.064 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22268 | ESCNDO51 | 138 | 22 | 225 | B2_002 | ivsg_hs_alt4bd1 | 1.008 | 0.944 | -0.064 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 20238 | HRD-230 | 230 | 20 | 203 | B2_002 | ivsg_hs_alt4bd1 | 0.996 | 0.944 | -0.051 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 20392 | TOY-230 | 230 | 20 | 203 | B2_002 | ivsg_hs_alt4bd1 | 0.997 | 0.946 | -0.051 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22609 | OTAYMESA | 230 | 22 | 222 | B2_002 | ivsg_hs_alt4bd1 | 1.004 | 0.947 | -0.058 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22048 | BATIQTOS | 138 | 22 | 224 | B2_002 | ivsg_hs_alt4bd1 | 1.01 | 0.95 | -0.06 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22052 | BATIQTP | 138 | 22 | 224 | B2_002 | ivsg_hs_alt4bd1 | 1.01 | 0.95 | -0.06 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 24768 | RANDSBRG | 115 | 24 | 247 | line_175 | ivsg_hs_alt4bd1 | 1.001 | 0.951 | -0.05 | 0.9 | 1.05 | 0.05 | line INYO to COTTONWD 230 ck 1 |
| 24761 | TAP701 | 115 | 24 | 247 | line_175 | ivsg_hs_alt4bd1 | 1.001 | 0.951 | -0.05 | 0.9 | 1.05 | 0.05 | line INYO to COTTONWD 230 ck 1 |
| 22264 | ESCNDO50 | 138 | 22 | 225 | B2_002 | ivsg_hs_alt4bd1 | 1.008 | 0.954 | -0.055 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 20233 | TCT-115 | 115 | 20 | 203 | B2_002 | ivsg_hs_alt4bd1 | 1.006 | 0.954 | -0.051 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 20240 | FLO-115 | 115 | 20 | 203 | B2_002 | ivsg_hs_alt4bd1 | 1.007 | 0.956 | -0.051 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 20234 | TCD-115 | 115 | 20 | 203 | B2_002 | ivsg_hs_alt4bd1 | 1.007 | 0.956 | -0.051 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 20235 | TCR-115 | 115 | 20 | 203 | B2_002 | ivsg_hs_alt4bd1 | 1.007 | 0.956 | -0.051 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22632 | PALOMAR | 138 | 22 | 224 | B2_002 | ivsg_hs_alt4bd1 | 1.014 | 0.957 | -0.057 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 20236 | FCO-115 | 115 | 20 | 203 | B2_002 | ivsg_hs_alt4bd1 | 1.011 | 0.96 | -0.051 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 20230 | FRO-115 | 115 | 20 | 203 | B2_002 | ivsg_hs_alt4bd1 | 1.012 | 0.961 | -0.051 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 20239 | HRD-115 | 115 | 20 | 203 | B2_002 | ivsg_hs_alt4bd1 | 1.012 | 0.961 | -0.051 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22108 | CANNON | 138 | 22 | 224 | B2_002 | ivsg_hs_alt4bd1 | 1.016 | 0.963 | -0.053 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22228 | ENCINA | 138 | 22 | 224 | B2_002 | ivsg_hs_alt4bd1 | 1.016 | 0.963 | -0.053 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 20229 | TJI-115 | 115 | 20 | 203 | B2_002 | ivsg_hs_alt4bd1 | 1.014 | 0.963 | -0.05 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22760 | SHADOWR | 138 | 22 | 224 | B2_002 | ivsg_hs_alt4bd1 | 1.022 | 0.968 | -0.054 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22100 | CALAVRTP | 138 | 22 | 224 | B2_002 | ivsg_hs_alt4bd1 | 1.022 | 0.969 | -0.054 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22712 | SANLUSRY | 138 | 22 | 224 | B2_002 | ivsg_hs_alt4bd1 | 1.03 | 0.977 | -0.053 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 14534 | N.GILA 4 | 100 | 14 | 847 | NG500/69 | ivsg_hs_alt4bd1 | 0.947 | 1 | 0.053 | 0.9 | 1.05 | 0.05 | tran N.GILA 500 to N.GILA 69 ck 1 |
| 24035 | EAGLEMTN | 161 | 24 | 248 | tran_241 | ivsg_hs_alt4bd1 | 0.928 | 1.026 | 0.098 | 0.9 | 1.05 | 0.05 | tran EAGLEMTN 230 to EAGLEMTN 161 ck 1 |
| 22472 | MIGUELMP | 500 | 22 | 227 | ML80 | ivsg_hs_alt4bd1 | 0.985 | 1.05 | 0.065 | 0.9 | 1.05 | 0.05 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 24730 | INYO PS | 115 | 24 | 247 | tran_229 | ivsg_hs_alt4bd1 | 1.026 | 1.078 | 0.052 | 0.9 | 1.05 | 0.05 | tran INYO 115 to INYO PS 115 ck 1 |
| 24142 | SYC CYN | 230 | 24 | 240 | line_086 | ivsg_hs_alt4bd1 | 0.984 | 1.091 | 0.107 | 0.9 | 1.05 | 0.05 | line MAGUNDEN to OMAR 230 ck 1 |
| 25613 | EDMONSTN | 230 | 24 | 256 | line_122 | ivsg_hs_alt4bd1 | 0.999 | 1.091 | 0.092 | 0.9 | 1.05 | 0.05 | line PASTORIA to EDMONSTN 230 ck 1 |
| 24142 | SYC CYN | 230 | 24 | 240 | line_140 | ivsg_hs_alt4bd1 | 0.984 | 1.091 | 0.107 | 0.9 | 1.05 | 0.05 | line SYC CYN to OMAR 230 ck 1 |

ivsg_hs_alt4b_d1.sav
FLOW Summary
N-1 Outages

| LEGEND | % of RATING 1 | |
|---|---|---|
| C_pu | 100% - 110% | |
| C_pu | 110% - 120% | P.U. of |
| C_pu | > 120% | Rate 1 |

| FROM | FR | BKV | TO | TO | BKV | CK | Outage_Name | Case | Rate-Mva | Pflow | Qflow | Amps | MVA | C_pu | B_pu | Contingency_Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24142 | SYC CYN | 230 | 24101 | OMAR | 230 | 1 | line_086 | ivsg_hs_alt4bd1 | 643 | 769.7 | 5511.1 | 12804.4 | 5564.6 | 7.934 | 0.471 | line MAGUNDEN to OMAR 230 ck 1 |
| 24781 | NAVYCOSO | 230 | 24706 | BLM EAST | 230 | 1 | line_173 | ivsg_hs_alt4bd1 | 1287 | -153.7 | -3160.7 | 7943.4 | 3164.4 | 2.459 | 0.056 | line BLM EAST to BLM WEST 230 ck 1 |
| 24781 | NAVYCOSO | 230 | 24706 | BLM EAST | 230 | 1 | line_174 | ivsg_hs_alt4bd1 | 1287 | -153.7 | -3160.7 | 7943.4 | 3164.4 | 2.459 | 0.056 | line BLM WEST to KRAMER 230 ck 1 |
| 24806 | MIRAGE | 230 | 24807 | MIRAGE | 115 | 2 | tran_238 | ivsg_hs_alt4bd1 | 280 | 532.4 | 211.2 | 1492 | 572.8 | 2.05 | 0.95 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_175 | ivsg_hs_alt4bd1 | 56 | -103.6 | -1.2 | 532 | 103.6 | 1.86 | 0.92 | line INYO to COTTONWD 230 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_002 | ivsg_hs_alt4bd1 | 204.1 | 334.9 | 11.2 | 1568.1 | 335.1 | 1.836 | 1.273 | IMPRLVLY - MIGUEL 1 500kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_034 | ivsg_hs_alt4bd1 | 204.1 | 335.3 | -1 | 1449.1 | 335.3 | 1.697 | 1.273 | OLD TOWN - MLMS3TAP 1 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_032 | ivsg_hs_alt4bd1 | 204.1 | 335.3 | -1.7 | 1448.2 | 335.3 | 1.696 | 1.273 | OTAYMESA - MLMS3TAP 1 230kV |
| 24151 | VALLEYSC | 500 | 24160 | VALLEYSC | 115 | 2 | tran_247 | ivsg_hs_alt4bd1 | 560 | 853.2 | 363.4 | 1031.9 | 927.4 | 1.66 | 0.77 | tran VALLEYSC 500 to VALLEYSC 115 ck 1 |
| 24151 | VALLEYSC | 500 | 24160 | VALLEYSC | 115 | 1 | tran_248 | ivsg_hs_alt4bd1 | 560 | 853.2 | 363.4 | 1031.9 | 927.4 | 1.66 | 0.77 | tran VALLEYSC 500 to VALLEYSC 115 ck 2 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_009 | ivsg_hs_alt4bd1 | 204.1 | 326.7 | -2 | 1380.3 | 326.7 | 1.616 | 1.273 | EPP - ESCNDIDO 1 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | ML60 | ivsg_hs_alt4bd1 | 204.1 | 311.5 | 4.2 | 1322.3 | 311.5 | 1.549 | 1.273 | tran MIGUEL 230 to MIGUEL 138 ck 1 |
| 24151 | VALLEYSC | 500 | 24229 | VALLEY-S | 115 | 4 | tran_249 | ivsg_hs_alt4bd1 | 560 | 830.6 | 207 | 948.9 | 856.1 | 1.53 | 0.75 | tran VALLEYSC 500 to VALLEY-S 115 ck 3 |
| 24151 | VALLEYSC | 500 | 24229 | VALLEY-S | 115 | 3 | tran_250 | ivsg_hs_alt4bd1 | 560 | 830.6 | 207 | 948.9 | 856.1 | 1.53 | 0.75 | tran VALLEYSC 500 to VALLEY-S 115 ck 4 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | SX70 | ivsg_hs_alt4bd1 | 204.1 | 306.6 | 13.4 | 1297.6 | 306.9 | 1.52 | 1.273 | tran SYCAMORE 230 to SYCAMORE 69 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_013 | ivsg_hs_alt4bd1 | 204.1 | 302.2 | -8.3 | 1279.9 | 302.4 | 1.499 | 1.273 | EPP - SYCAMORE 1 230kV |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_202 | ivsg_hs_alt4bd1 | 56 | 77.3 | -7.4 | 392.2 | 77.7 | 1.4 | 0.92 | line OWENSCON to INYO 230 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | MS60 | ivsg_hs_alt4bd1 | 204.1 | 282.7 | 3.9 | 1192.9 | 282.7 | 1.397 | 1.273 | tran MISSION 230 to MISSION 138 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | MS61 | ivsg_hs_alt4bd1 | 204.1 | 282.7 | 3.9 | 1192.9 | 282.7 | 1.397 | 1.273 | tran MISSION 230 to MISSION 138 ck 2 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | ML70 | ivsg_hs_alt4bd1 | 204.1 | 275.3 | 4.2 | 1163.8 | 275.3 | 1.363 | 1.273 | tran MIGUEL 69 to MIGUEL 230 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | ML71 | ivsg_hs_alt4bd1 | 204.1 | 275.3 | 4.2 | 1163.8 | 275.3 | 1.363 | 1.273 | tran MIGUEL 69 to MIGUEL 230 ck 2 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_015 | ivsg_hs_alt4bd1 | 204.1 | 275.6 | -2.5 | 1161.6 | 275.6 | 1.36 | 1.273 | MIGUEL - MISSION 1 230kV |
| 22468 | MIGUEL | 500 | 22472 | MIGUELMP | 500 | 1 | ML81 | ivsg_hs_alt4bd1 | 1120 | 1494.5 | 302.4 | 1773.4 | 1524.8 | 1.36 | 0.79 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_020 | ivsg_hs_alt4bd1 | 204.1 | 275.1 | -3.1 | 1159.2 | 275.1 | 1.358 | 1.273 | MIGUEL - MISSION 2 230kV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | B2_009 | ivsg_hs_alt4bd1 | 392 | 528.5 | 35.4 | 1347.6 | 529.7 | 1.35 | 1.05 | EPP - ESCNDIDO 1 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | ML80 | ivsg_hs_alt4bd1 | 204.1 | 270.3 | -2.2 | 1144.6 | 270.3 | 1.34 | 1.273 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 22464 | MIGUEL | 230 | 22468 | MIGUEL | 500 | 1 | ML80 | ivsg_hs_alt4bd1 | 1120 | -1470.5 | -1.2 | 3805.1 | 1470.5 | 1.34 | 0.75 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 22464 | MIGUEL | 230 | 22472 | MIGUELMP | 500 | 1 | ML81 | ivsg_hs_alt4bd1 | 1120 | -1491.4 | -4.6 | 3855.3 | 1491.4 | 1.34 | 0.78 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | ML81 | ivsg_hs_alt4bd1 | 204.1 | 269.3 | -2.2 | 1139.3 | 269.3 | 1.334 | 1.273 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | B2_034 | ivsg_hs_alt4bd1 | 392 | 518.8 | 24 | 1355.5 | 519.4 | 1.33 | 1.05 | OLD TOWN - MLMS3TAP 1 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | MS70 | ivsg_hs_alt4bd1 | 204.1 | 268.7 | 4.7 | 1134.9 | 268.8 | 1.329 | 1.273 | tran MISSION 230 to MISSION 69 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | SO2 | ivsg_hs_alt4bd1 | 204.1 | 265.4 | 1.4 | 1133 | 265.4 | 1.327 | 1.273 | gen S.ONOFR2 22.00 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | B2_032 | ivsg_hs_alt4bd1 | 392 | 518.8 | 23.4 | 1354.8 | 519.3 | 1.32 | 1.05 | OTAYMESA - MLMS3TAP 1 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_007 | ivsg_hs_alt4bd1 | 204.1 | 265.9 | 2 | 1121.9 | 265.9 | 1.314 | 1.273 | PENSQTOS - ENCINA 1 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | line_207 | ivsg_hs_alt4bd1 | 204.1 | 263.2 | -1.3 | 1116 | 263.2 | 1.307 | 1.273 | line DEVERS to VALLEYSC 500 ck 1 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | SX70 | ivsg_hs_alt4bd1 | 392 | 487.2 | 44.1 | 1241.9 | 489.2 | 1.25 | 1.05 | tran SYCAMORE 230 to SYCAMORE 69 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | line_7 | ivsg_hs_alt4bd1 | 204.1 | 253.1 | -0.6 | 1060.5 | 253.1 | 1.242 | 1.273 | line BANIS230 to NEWSF230 230 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | tran_74 | ivsg_hs_alt4bd1 | 204.1 | 253.1 | -0.6 | 1060.5 | 253.1 | 1.242 | 1.273 | tran NEWSF230 230 to NEWSF500 500 ck 1 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | B2_002 | ivsg_hs_alt4bd1 | 392 | 484.1 | 11.7 | 1373.7 | 484.3 | 1.24 | 1.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | B2_013 | ivsg_hs_alt4bd1 | 392 | 486.8 | 16.3 | 1246 | 487 | 1.24 | 1.05 | EPP - SYCAMORE 1 230kV |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | B2_002 | ivsg_hs_alt4bd1 | 1120 | -1357.5 | -134.4 | 3800.2 | 1364.1 | 1.23 | 0.69 | IMPRLVLY - MIGUEL 1 500kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_008 | ivsg_hs_alt4bd1 | 204.1 | 247.2 | 3.3 | 1041.9 | 247.2 | 1.22 | 1.273 | PENSQTOS - OLD TOWN 1 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_028 | ivsg_hs_alt4bd1 | 204.1 | 245.6 | 1.5 | 1031.3 | 245.6 | 1.208 | 1.273 | MIGUEL - SYCAMORE 1 230kV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | ML60 | ivsg_hs_alt4bd1 | 392 | 468.8 | 26 | 1201.2 | 469.5 | 1.2 | 1.05 | tran MIGUEL 230 to MIGUEL 138 ck 1 |
| 24723 | CONTROL | 115 | 24731 | INYOKERN | 115 | 1 | line_175 | ivsg_hs_alt4bd1 | 82.7 | 95.9 | -4.2 | 495.9 | 96 | 1.194 | 0.419 | line INYO to COTTONWD 230 ck 1 |
| 24723 | CONTROL | 115 | 24731 | INYOKERN | 115 | 2 | line_175 | ivsg_hs_alt4bd1 | 82.7 | 95.9 | -4.2 | 495.9 | 96 | 1.194 | 0.419 | line INYO to COTTONWD 230 ck 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_015 | ivsg_hs_alt4bd1 | 392 | 463.6 | 58 | 1195 | 467.3 | 1.19 | 1.07 | MIGUEL - MISSION 1 230kV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_020 | ivsg_hs_alt4bd1 | 392 | 461.9 | 56 | 1191.1 | 465.3 | 1.19 | 1.07 | MIGUEL - MISSION 2 230kV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | SX60 | ivsg_hs_alt4bd1 | 392 | 462.6 | 55.7 | 1200.4 | 465.9 | 1.19 | 1.07 | tran SYCAMORE 230 to SYCAMORE 138 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | line_56 | ivsg_hs_alt4bd1 | 204.1 | 239.8 | -3.8 | 1013.8 | 239.9 | 1.187 | 1.273 | line NEWSF500 to IMPRLVLY 500 ck 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | ML70 | ivsg_hs_alt4bd1 | 392 | 453.4 | 60.6 | 1175 | 457.5 | 1.17 | 1.07 | tran MIGUEL 69 to MIGUEL 230 ck 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | ML71 | ivsg_hs_alt4bd1 | 392 | 453.4 | 60.6 | 1175 | 457.5 | 1.17 | 1.07 | tran MIGUEL 69 to MIGUEL 230 ck 2 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_032 | ivsg_hs_alt4bd1 | 392 | 449.1 | 57.5 | 1190.8 | 452.8 | 1.16 | 1.07 | OTAYMESA - MLMS3TAP 1 230kV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_034 | ivsg_hs_alt4bd1 | 392 | 449 | 58 | 1191.4 | 452.7 | 1.15 | 1.07 | OLD TOWN - MLMS3TAP 1 230kV |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | SX60 | ivsg_hs_alt4bd1 | 408.3 | -456.3 | 3.4 | 1937.6 | 456.3 | 1.134 | 1.014 | tran SYCAMORE 230 to SYCAMORE 138 ck 1 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | line_66 | ivsg_hs_alt4bd1 | 392 | 441.5 | 44 | 1165.1 | 443.7 | 1.13 | 1.07 | line CENTRALX to NEWSF500 500 ck 1 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | B2_015 | ivsg_hs_alt4bd1 | 408.3 | -457.4 | 0.6 | 1929 | 457.4 | 1.129 | 1.014 | MIGUEL - MISSION 1 230kV |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | B2_020 | ivsg_hs_alt4bd1 | 408.3 | -455.7 | 2.2 | 1922.6 | 455.7 | 1.126 | 1.014 | MIGUEL - MISSION 2 230kV |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | B2_034 | ivsg_hs_alt4bd1 | 408.3 | -442.8 | 0.2 | 1923.2 | 442.8 | 1.126 | 1.014 | OLD TOWN - MLMS3TAP 1 230kV |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | B2_032 | ivsg_hs_alt4bd1 | 408.3 | -442.9 | 0.6 | 1922.1 | 442.9 | 1.125 | 1.014 | OTAYMESA - MLMS3TAP 1 230kV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_009 | ivsg_hs_alt4bd1 | 392 | 434.9 | 53.8 | 1124.5 | 438.2 | 1.12 | 1.07 | EPP - ESCNDIDO 1 230kV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_022 | ivsg_hs_alt4bd1 | 392 | 436.3 | 42.7 | 1133.3 | 438.4 | 1.12 | 1.07 | OTAYMESA - TJI-230 1 230kV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | MS60 | ivsg_hs_alt4bd1 | 392 | 436.5 | 55.3 | 1126.2 | 439.9 | 1.12 | 1.07 | tran MISSION 230 to MISSION 138 ck 1 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | MS60 | ivsg_hs_alt4bd1 | 392 | 436.6 | 21.1 | 1112.4 | 437.1 | 1.12 | 1.05 | tran MISSION 230 to MISSION 138 ck 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | MS61 | ivsg_hs_alt4bd1 | 392 | 436.5 | 55.3 | 1126.2 | 439.9 | 1.12 | 1.07 | tran MISSION 230 to MISSION 138 ck 2 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | MS61 | ivsg_hs_alt4bd1 | 392 | 436.6 | 21.1 | 1112.4 | 437.1 | 1.12 | 1.05 | tran MISSION 230 to MISSION 138 ck 2 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | OT70 | ivsg_hs_alt4bd1 | 392 | 434 | 53.7 | 1121.3 | 437.3 | 1.12 | 1.07 | tran OLD TOWN 69 to OLD TOWN 230 ck 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | OT71 | ivsg_hs_alt4bd1 | 392 | 434 | 53.7 | 1121.3 | 437.3 | 1.12 | 1.07 | tran OLD TOWN 69 to OLD TOWN 230 ck 2 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | SX70 | ivsg_hs_alt4bd1 | 392 | 436.2 | 58.4 | 1133.5 | 440.1 | 1.12 | 1.07 | tran SYCAMORE 230 to SYCAMORE 69 ck 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | SO2 | ivsg_hs_alt4bd1 | 392 | 434.8 | 48.9 | 1140.8 | 437.6 | 1.12 | 1.07 | gen S.ONOFR2 22.00 |
| 24729 | INYO | 230 | 24730 | INYO PS | 115 | 1 | line_175 | ivsg_hs_alt4bd1 | 50 | 51.8 | 21.3 | 133 | 56 | 1.12 | 0.54 | line INYO to COTTONWD 230 ck 1 |
| 24729 | INYO | 230 | 24730 | INYO PS | 115 | 2 | line_175 | ivsg_hs_alt4bd1 | 50 | 51.8 | 21.3 | 133 | 56 | 1.12 | 0.54 | line INYO to COTTONWD 230 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_029 | ivsg_hs_alt4bd1 | 204.1 | 225.4 | 0.6 | 951.5 | 225.4 | 1.114 | 1.273 | OTAYMESA - MLSXTAP 1 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_031 | ivsg_hs_alt4bd1 | 204.1 | 225.2 | -0.3 | 951.6 | 225.2 | 1.114 | 1.273 | SYCAMORE - MLSXTAP 1 230kV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | B2_015 | ivsg_hs_alt4bd1 | 392 | 436.5 | 14.9 | 1111.8 | 436.8 | 1.11 | 1.05 | MIGUEL - MISSION 1 230kV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | B2_020 | ivsg_hs_alt4bd1 | 392 | 435.7 | 14 | 1109.7 | 435.9 | 1.11 | 1.05 | MIGUEL - MISSION 2 230kV |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | ML70 | ivsg_hs_alt4bd1 | 408.3 | -447.4 | -4 | 1896.6 | 447.4 | 1.11 | 1.014 | tran MIGUEL 69 to MIGUEL 230 ck 1 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | ML71 | ivsg_hs_alt4bd1 | 408.3 | -447.4 | -4 | 1896.6 | 447.4 | 1.11 | 1.014 | tran MIGUEL 69 to MIGUEL 230 ck 2 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | line_66 | ivsg_hs_alt4bd1 | 408.3 | -435.6 | 11.7 | 1880.5 | 435.8 | 1.101 | 1.014 | line CENTRALX to NEWSF500 500 ck 1 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | ML70 | ivsg_hs_alt4bd1 | 392 | 429.2 | 19.1 | 1095.6 | 429.6 | 1.1 | 1.05 | tran MIGUEL 69 to MIGUEL 230 ck 1 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | ML71 | ivsg_hs_alt4bd1 | 392 | 429.2 | 19.1 | 1095.6 | 429.6 | 1.1 | 1.05 | tran MIGUEL 69 to MIGUEL 230 ck 2 |
| 22596 | OLD TOWN | 230 | 22466 | MLMS3TAP | 230 | 1 | B2_002 | ivsg_hs_alt4bd1 | 912 | -888.2 | 58.9 | 2510.2 | 890.2 | 1.096 | 0.756 | IMPRLVLY - MIGUEL 1 500kV |
| 20238 | HRD-230 | 230 | 20239 | HRD-115 | 115 | 1 | B2_002 | ivsg_hs_alt4bd1 | 225 | 244.8 | 4.9 | 650.9 | 244.9 | 1.09 | 0.74 | IMPRLVLY - MIGUEL 1 500kV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | SO2 | ivsg_hs_alt4bd1 | 392 | 428.5 | 11.7 | 1106.2 | 428.7 | 1.09 | 1.05 | gen S.ONOFR2 22.00 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 2 | line_070 | ivsg_hs_alt4bd1 | 956 | -1025.5 | -31.1 | 2608.7 | 1025.9 | 1.087 | 0.596 | line LA FRESA to REDONDO 230 ck 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 1 | line_071 | ivsg_hs_alt4bd1 | 956 | -1025.5 | -31.1 | 2608.7 | 1025.9 | 1.087 | 0.596 | line LA FRESA to REDONDO 230 ck 2 |
| 24701 | KRAMER | 230 | 24085 | LUGO | 230 | 2 | line_169 | ivsg_hs_alt4bd1 | 478 | 525.5 | 2.9 | 1300.7 | 525.5 | 1.084 | 0.644 | line KRAMER to LUGO 230 ck 1 |
| 24701 | KRAMER | 230 | 24085 | LUGO | 230 | 1 | line_170 | ivsg_hs_alt4bd1 | 478 | 525.5 | 2.9 | 1300.7 | 525.5 | 1.084 | 0.644 | line KRAMER to LUGO 230 ck 2 |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | line_12 | ivsg_hs_alt4bd1 | 132 | 142.2 | -9.3 | 896.5 | 142.5 | 1.082 | 0.962 | line COACHELA to RAMON 230 ck 2 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | SO2 | ivsg_hs_alt4bd1 | 408.3 | -429.2 | 4.4 | 1841.4 | 429.2 | 1.078 | 1.014 | gen S.ONOFR2 22.00 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | B2_022 | ivsg_hs_alt4bd1 | 408.3 | -430.7 | 10 | 1829.3 | 430.8 | 1.071 | 1.014 | OTAYMESA - TJI-230 1 230kV |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | SX70 | ivsg_hs_alt4bd1 | 408.3 | -430.7 | -5.7 | 1829.6 | 430.7 | 1.071 | 1.014 | tran SYCAMORE 230 to SYCAMORE 69 ck 1 |
| 22504 | MISSION | 230 | 22500 | MISSION | 138 | 2 | MS60 | ivsg_hs_alt4bd1 | 392 | 399.4 | 122.4 | 1073.9 | 417.7 | 1.07 | 0.71 | tran MISSION 230 to MISSION 138 ck 1 |
| 22504 | MISSION | 230 | 22500 | MISSION | 138 | 1 | MS61 | ivsg_hs_alt4bd1 | 392 | 399.4 | 122.4 | 1073.9 | 417.7 | 1.07 | 0.71 | tran MISSION 230 to MISSION 138 ck 2 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | MS60 | ivsg_hs_alt4bd1 | 408.3 | -430.9 | -3.3 | 1817.8 | 431 | 1.064 | 1.014 | tran MISSION 230 to MISSION 138 ck 1 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | MS61 | ivsg_hs_alt4bd1 | 408.3 | -430.9 | -3.3 | 1817.8 | 431 | 1.064 | 1.014 | tran MISSION 230 to MISSION 138 ck 2 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | B2_009 | ivsg_hs_alt4bd1 | 408.3 | -429.4 | -1.9 | 1815.1 | 429.4 | 1.063 | 1.014 | EPP - ESCNDIDO 1 230kV |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | OT70 | ivsg_hs_alt4bd1 | 408.3 | -428.6 | -2.1 | 1809.9 | 428.6 | 1.06 | 1.014 | tran OLD TOWN 69 to OLD TOWN 230 ck 1 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | OT71 | ivsg_hs_alt4bd1 | 408.3 | -428.6 | -2.1 | 1809.9 | 428.6 | 1.06 | 1.014 | tran OLD TOWN 69 to OLD TOWN 230 ck 2 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_169 | ivsg_hs_alt4bd1 | 56 | 58 | -9.9 | 292.8 | 58.9 | 1.06 | 0.92 | line KRAMER to LUGO 230 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_170 | ivsg_hs_alt4bd1 | 56 | 58 | -9.9 | 292.8 | 58.9 | 1.06 | 0.92 | line KRAMER to LUGO 230 ck 2 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | line_207 | ivsg_hs_alt4bd1 | 408.3 | -424.1 | 4.2 | 1802.6 | 424.1 | 1.055 | 1.014 | line DEVERS to VALLEYSC 500 ck 1 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | B2_021 | ivsg_hs_alt4bd1 | 408.3 | -424.5 | 6.7 | 1794.7 | 424.5 | 1.051 | 1.014 | IMPRLVLY - ROA-230 1 230kV |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | B2_002 | ivsg_hs_alt4bd1 | 388 | -391.5 | -30.2 | 1021.3 | 392.7 | 1.049 | 0.582 | IMPRLVLY - MIGUEL 1 500kV |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | B2_013 | ivsg_hs_alt4bd1 | 408.3 | -423.5 | 0.3 | 1789 | 423.5 | 1.047 | 1.014 | EPP - SYCAMORE 1 230kV |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_192 | ivsg_hs_alt4bd1 | 169 | 173.8 | 42.3 | 629 | 178.8 | 1.043 | 0.829 | line IRON MTN to CAMINO 230 ck 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_003 | ivsg_hs_alt4bd1 | 392 | 406.1 | 41 | 1049.8 | 408.2 | 1.04 | 1.07 | N.GILA - IMPRLVLY 1 500kV |
| 22116 | CARLTHTP | 138 | 22734 | SANTEE | 138 | 1 | B2_002 | ivsg_hs_alt4bd1 | 273 | 247.5 | 18.3 | 1180 | 248.1 | 1.033 | 0.742 | IMPRLVLY - MIGUEL 1 500kV |
| 24114 | PARDEE | 230 | 24200 | SAUG TAP | 230 | 2 | line_117 | ivsg_hs_alt4bd1 | 494 | 501.7 | 27.5 | 1278.3 | 502.5 | 1.031 | 0.511 | line PARDEE to SAUG TAP 230 ck 1 |
| 24114 | PARDEE | 230 | 24200 | SAUG TAP | 230 | 1 | line_118 | ivsg_hs_alt4bd1 | 494 | 501.7 | 27.4 | 1278.2 | 502.5 | 1.031 | 0.519 | line PARDEE to SAUG TAP 230 ck 2 |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | line_52 | ivsg_hs_alt4bd1 | 132 | 135 | -12.1 | 849.4 | 135.5 | 1.025 | 0.962 | line AVE58230 to AV58TP22 230 ck 1 |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | line_53 | ivsg_hs_alt4bd1 | 132 | 135.1 | -11.9 | 849 | 135.6 | 1.025 | 0.962 | line AV58TP22 to COACHELA 230 ck 1 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | B2_028 | ivsg_hs_alt4bd1 | 392 | 394.2 | 13.3 | 999.9 | 394.4 | 1.01 | 1.05 | MIGUEL - SYCAMORE 1 230kV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | ML80 | ivsg_hs_alt4bd1 | 392 | 393.3 | 37.9 | 1022.4 | 395.1 | 1.01 | 1.07 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | ML81 | ivsg_hs_alt4bd1 | 392 | 395.5 | 38.5 | 1027.2 | 397.4 | 1.01 | 1.07 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 24303 | BIG CRK3 | 230 | 24235 | RECTOR | 230 | 1 | line_155 | ivsg_hs_alt4bd1 | 353 | 361.1 | 50.1 | 895 | 364.5 | 1.01 | 0.729 | line BIG CRK1 to RECTOR 230 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_201 | ivsg_hs_alt4bd1 | 56 | 54.7 | -10.6 | 276.7 | 55.7 | 1.01 | 0.92 | line SYLMAR3 to SYLMAR S 230 ck 1 |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | B2_002 | ivsg_hs_alt4bd1 | 132 | 129.7 | -10.2 | 831.5 | 130.1 | 1.004 | 0.962 | IMPRLVLY - MIGUEL 1 500kV |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | line_303 | ivsg_hs_alt4bd1 | 132 | 130 | -10.2 | 829.7 | 130.4 | 1.002 | 0.962 | line HARQUAHA to DEVERS 500 ck 1 |
| 24301 | BIG CRK1 | 230 | 24235 | RECTOR | 230 | 1 | line_160 | ivsg_hs_alt4bd1 | 329 | 334.9 | 48.1 | 826.6 | 338.4 | 1.001 | 0.727 | line BIG CRK3 to RECTOR 230 ck 1 |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_191 | ivsg_hs_alt4bd1 | 169 | 167.1 | 39.7 | 604 | 171.7 | 1.001 | 0.829 | line EAGLEMTN to IRON MTN 230 ck 1 |
| 22831 | SYCAMORE | 138 | 22124 | CHCARITA | 138 | 1 | B2_009 | ivsg_hs_alt4bd1 | 204.1 | 200 | -27.8 | 853.2 | 202 | 0.999 | 0.757 | EPP - ESCNDIDO 1 230kV |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | line_002 | ivsg_hs_alt4bd1 | 132 | 129.4 | -10.3 | 823.8 | 129.8 | 0.994 | 0.962 | line PALOVRDE to DEVERS 500 ck 1 |
| 24086 | LUGO | 500 | 24097 | MOHAVE | 500 | 1 | line_103 | ivsg_hs_alt4bd1 | 1386 | -1427.3 | 90.2 | 1571.6 | 1430.1 | 0.991 | 0.697 | line MOHAVE to ELDORDO 500 ck 1 |
| 22844 | TALEGA | 230 | 24131 | S.ONOFRE | 230 | 2 | B2_026 | ivsg_hs_alt4bd1 | 456.1 | -449.2 | 38.5 | 1131.7 | 450.9 | 0.989 | 0.52 | TALEGA - S.ONOFRE 1 230kV |
| 22844 | TALEGA | 230 | 24131 | S.ONOFRE | 230 | 1 | B2_027 | ivsg_hs_alt4bd1 | 456.1 | -449.2 | 38.5 | 1131.7 | 450.9 | 0.989 | 0.52 | TALEGA - S.ONOFRE 2 230kV |
| 22844 | TALEGA | 230 | 24131 | S.ONOFRE | 230 | 2 | line_014 | ivsg_hs_alt4bd1 | 456.1 | -449.2 | 38.5 | 1131.7 | 450.9 | 0.989 | 0.52 | line TALEGA to S.ONOFRE 230 ck 1 |
| 22844 | TALEGA | 230 | 24131 | S.ONOFRE | 230 | 1 | line_015 | ivsg_hs_alt4bd1 | 456.1 | -449.2 | 38.5 | 1131.7 | 450.9 | 0.989 | 0.52 | line TALEGA to S.ONOFRE 230 ck 2 |
| 22609 | OTAYMESA | 230 | 20149 | TJI-230 | 230 | 1 | B2_002 | ivsg_hs_alt4bd1 | 796.7 | -740.2 | -30.2 | 1964.1 | 740.8 | 0.982 | 0.552 | IMPRLVLY - MIGUEL 1 500kV |
| 19020 | BLYTHE | 161 | 24017 | BLYTHESC | 161 | 1 | line_192 | ivsg_hs_alt4bd1 | 244 | 240.3 | 42.6 | 858 | 244 | 0.981 | 0.837 | line IRON MTN to CAMINO 230 ck 1 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | line_56 | ivsg_hs_alt4bd1 | 392 | 385.3 | 2.4 | 985.6 | 385.3 | 0.98 | 1.05 | line NEWSF500 to IMPRLVLY 500 ck 1 |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | SX60 | ivsg_hs_alt4bd1 | 382.4 | 367.6 | 13 | 1567.1 | 367.8 | 0.98 | 0.856 | tran SYCAMORE 230 to SYCAMORE 138 ck 1 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | PV1 | ivsg_hs_alt4bd1 | 408.3 | -402.7 | -2.4 | 1670.2 | 402.7 | 0.978 | 1.014 | gen PALOVRD1 24.00 |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | B2_015 | ivsg_hs_alt4bd1 | 382.4 | 368.8 | 16.5 | 1562.1 | 369.1 | 0.976 | 0.856 | MIGUEL - MISSION 1 230kV |
| 22596 | OLD TOWN | 230 | 22466 | MLMS3TAP | 230 | 1 | B2_029 | ivsg_hs_alt4bd1 | 912 | -858.2 | 94.1 | 2226.6 | 863.4 | 0.973 | 0.756 | OTAYMESA - MLSXTAP 1 230kV |
| 22596 | OLD TOWN | 230 | 22466 | MLMS3TAP | 230 | 1 | B2_031 | ivsg_hs_alt4bd1 | 912 | -858.5 | 92.4 | 2227.9 | 863.4 | 0.973 | 0.756 | SYCAMORE - MLSXTAP 1 230kV |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | B2_020 | ivsg_hs_alt4bd1 | 382.4 | 367.1 | 15 | 1555.1 | 367.4 | 0.972 | 0.856 | MIGUEL - MISSION 2 230kV |
| 22360 | IMPRLVLY | 500 | 22468 | MIGUEL | 500 | 1 | line_66 | ivsg_hs_alt4bd1 | 2252 | 2130.2 | 627.9 | 2469.5 | 2220.8 | 0.971 | 0.768 | line CENTRALX to NEWSF500 500 ck 1 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | ML81 | ivsg_hs_alt4bd1 | 408.3 | -390.9 | 4.8 | 1658.1 | 391 | 0.971 | 1.014 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 22468 | MIGUEL | 500 | 22472 | MIGUELMP | 500 | 1 | line_66 | ivsg_hs_alt4bd1 | 1120 | 1075.9 | 154 | 1297.4 | 1086.8 | 0.97 | 0.79 | line CENTRALX to NEWSF500 500 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_123 | ivsg_hs_alt4bd1 | 56 | 52.6 | -10.6 | 266.5 | 53.7 | 0.97 | 0.92 | line PASTORIA to PSTRIA 230 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_200 | ivsg_hs_alt4bd1 | 56 | 52.7 | -10.7 | 266.6 | 53.7 | 0.97 | 0.92 | line SYLMAR1 to SYLMAR S 230 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | tran_210 | ivsg_hs_alt4bd1 | 56 | 52.5 | -10.4 | 265.5 | 53.6 | 0.97 | 0.92 | tran LUGO 500 to LUGO 230 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | tran_211 | ivsg_hs_alt4bd1 | 56 | 52.6 | -10.4 | 265.7 | 53.6 | 0.97 | 0.92 | tran LUGO 500 to LUGO 230 ck 2 |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | B2_034 | ivsg_hs_alt4bd1 | 382.4 | 354.2 | 14.6 | 1545 | 354.5 | 0.966 | 0.856 | OLD TOWN - MLMS3TAP 1 230kV |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | ML80 | ivsg_hs_alt4bd1 | 408.3 | -388.8 | 5 | 1650.4 | 388.8 | 0.966 | 1.014 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | B2_032 | ivsg_hs_alt4bd1 | 382.4 | 354.3 | 14.3 | 1544.1 | 354.6 | 0.965 | 0.856 | OTAYMESA - MLMS3TAP 1 230kV |
| 22464 | MIGUEL | 230 | 22472 | MIGUELMP | 500 | 1 | line_66 | ivsg_hs_alt4bd1 | 1120 | -1074.2 | 5.3 | 2820.4 | 1074.2 | 0.96 | 0.78 | line CENTRALX to NEWSF500 500 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_086 | ivsg_hs_alt4bd1 | 56 | 52 | -10.7 | 263.5 | 53.1 | 0.96 | 0.92 | line MAGUNDEN to OMAR 230 ck 1 |
| 24807 | MIRAGE | 115 | 24819 | CONCHO | 115 | 1 | tran_238 | ivsg_hs_alt4bd1 | 183 | 164.2 | -4.8 | 879.7 | 164.3 | 0.958 | 0.869 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | ML70 | ivsg_hs_alt4bd1 | 382.4 | 358.8 | 21.2 | 1529.4 | 359.4 | 0.956 | 0.856 | tran MIGUEL 69 to MIGUEL 230 ck 1 |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | ML71 | ivsg_hs_alt4bd1 | 382.4 | 358.8 | 21.2 | 1529.4 | 359.4 | 0.956 | 0.856 | tran MIGUEL 69 to MIGUEL 230 ck 2 |
| 8376 | RTAP2 | 92 | 8974 | RTP1 | 92 | 1 | line_50 | ivsg_hs_alt4bd1 | 57 | -51.8 | 11.8 | 340.1 | 53.1 | 0.954 | 0.727 | line BANIS230 to AV58TP12 230 ck 1 |
| 8376 | RTAP2 | 92 | 8974 | RTP1 | 92 | 1 | line_51 | ivsg_hs_alt4bd1 | 57 | -51.8 | 11.7 | 340.1 | 53.1 | 0.954 | 0.727 | line AV58TP12 to AVE58230 230 ck 1 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_047 | ivsg_hs_alt4bd1 | 2400 | -2392 | -53.1 | 2643.3 | 2392.6 | 0.954 | 0.759 | line ELDORDO to LUGO 500 ck 1 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_079 | ivsg_hs_alt4bd1 | 2400 | -2383.6 | -36.2 | 2642.8 | 2383.8 | 0.954 | 0.759 | line LUGO to MOHAVE 500 ck 1 |
| 19020 | BLYTHE | 161 | 24017 | BLYTHESC | 161 | 1 | line_191 | ivsg_hs_alt4bd1 | 244 | 233.6 | 40 | 833.2 | 237 | 0.952 | 0.837 | line EAGLEMTN to IRON MTN 230 ck 1 |
| 22832 | SYCAMORE | 230 | 22467 | MLSXTAP | 230 | 1 | B2_032 | ivsg_hs_alt4bd1 | 796.7 | -725.2 | 48.6 | 1896.2 | 726.9 | 0.948 | 0.343 | OTAYMESA - MLMS3TAP 1 230kV |
| 22832 | SYCAMORE | 230 | 22467 | MLSXTAP | 230 | 1 | B2_034 | ivsg_hs_alt4bd1 | 796.7 | -725.3 | 47.5 | 1896.9 | 726.9 | 0.948 | 0.343 | OLD TOWN - MLMS3TAP 1 230kV |
| 24807 | MIRAGE | 115 | 24816 | SANTA RO | 115 | 1 | tran_238 | ivsg_hs_alt4bd1 | 183.3 | 162.1 | -10.3 | 869.9 | 162.4 | 0.945 | 0.86 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 22831 | SYCAMORE | 138 | 22124 | CHCARITA | 138 | 1 | B2_034 | ivsg_hs_alt4bd1 | 204.1 | 181.8 | -40.9 | 805.2 | 186.3 | 0.943 | 0.757 | OLD TOWN - MLMS3TAP 1 230kV |
| 22831 | SYCAMORE | 138 | 22124 | CHCARITA | 138 | 1 | B2_032 | ivsg_hs_alt4bd1 | 204.1 | 181.8 | -40.8 | 804.6 | 186.3 | 0.942 | 0.757 | OTAYMESA - MLMS3TAP 1 230kV |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_63 | ivsg_hs_alt4bd1 | 169 | 159.1 | 28.8 | 568.4 | 161.6 | 0.941 | 0.829 | line RAMON to MIRAGE 230 ck 2 |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | line_66 | ivsg_hs_alt4bd1 | 382.4 | 347.1 | 4.4 | 1501.6 | 347.1 | 0.939 | 0.856 | line CENTRALX to NEWSF500 500 ck 1 |
| 24042 | ELDORDO | 500 | 24086 | LUGO | 500 | 1 | line_085 | ivsg_hs_alt4bd1 | 1386 | 1383 | 236.2 | 1492 | 1403 | 0.937 | 0.634 | line LUGO to VICTORVL 500 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | line_66 | ivsg_hs_alt4bd1 | 204.1 | 186.2 | 9 | 796.7 | 186.4 | 0.933 | 1.273 | line CENTRALX to NEWSF500 500 ck 1 |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_12 | ivsg_hs_alt4bd1 | 169 | 157.5 | 28.5 | 562.7 | 160 | 0.932 | 0.829 | line COACHELA to RAMON 230 ck 2 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | B2_029 | ivsg_hs_alt4bd1 | 392 | 364.8 | 4.8 | 931.1 | 364.8 | 0.93 | 1.05 | OTAYMESA - MLSXTAP 1 230kV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | B2_031 | ivsg_hs_alt4bd1 | 392 | 364.5 | 3.2 | 931.6 | 364.5 | 0.93 | 1.05 | SYCAMORE - MLSXTAP 1 230kV |
| 24303 | BIG CRK3 | 230 | 24235 | RECTOR | 230 | 1 | line_139 | ivsg_hs_alt4bd1 | 353 | 335.6 | 45.4 | 822.7 | 338.7 | 0.929 | 0.729 | line SPRINGVL to BIG CRK4 230 ck 1 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 2 | line_136 | ivsg_hs_alt4bd1 | 1195 | 1078.5 | -42.7 | 2783.8 | 1079.4 | 0.928 | 0.559 | line SERRANO to VILLA PK 230 ck 1 |
| 20238 | HRD-230 | 230 | 20118 | ROA-230 | 230 | 1 | B2_002 | ivsg_hs_alt4bd1 | 388 | -333.8 | 54.1 | 898.7 | 338.1 | 0.923 | 0.46 | IMPRLVLY - MIGUEL 1 500kV |
| 24614 | TAP601 | 115 | 24702 | KRAMER | 115 | 1 | line_169 | ivsg_hs_alt4bd1 | 217.1 | -189.9 | 69.6 | 1004 | 202.2 | 0.923 | 0.717 | line KRAMER to LUGO 230 ck 1 |
| 24614 | TAP601 | 115 | 24702 | KRAMER | 115 | 1 | line_170 | ivsg_hs_alt4bd1 | 217.1 | -189.9 | 69.6 | 1004 | 202.2 | 0.923 | 0.717 | line KRAMER to LUGO 230 ck 2 |
| 15230 | RUDD | 230 | 15218 | WHITETNK | 230 | 1 | PV1 | ivsg_hs_alt4bd1 | 725 | 672.9 | -12.4 | 1675.8 | 673 | 0.921 | 0.952 | gen PALOVRD1 24.00 |
| 22464 | MIGUEL | 230 | 22468 | MIGUEL | 500 | 1 | line_66 | ivsg_hs_alt4bd1 | 1120 | -1016.5 | 2.8 | 2669 | 1016.5 | 0.92 | 0.75 | line CENTRALX to NEWSF500 500 ck 1 |
| 22831 | SYCAMORE | 138 | 22124 | CHCARITA | 138 | 1 | B2_013 | ivsg_hs_alt4bd1 | 204.1 | 183 | -31.1 | 785.8 | 185.6 | 0.92 | 0.757 | EPP - SYCAMORE 1 230kV |
| 22504 | MISSION | 230 | 22500 | MISSION | 138 | 1 | SX60 | ivsg_hs_alt4bd1 | 392 | 351.9 | 75.1 | 934.1 | 359.8 | 0.92 | 0.71 | tran SYCAMORE 230 to SYCAMORE 138 ck 1 |
| 22504 | MISSION | 230 | 22500 | MISSION | 138 | 2 | SX60 | ivsg_hs_alt4bd1 | 392 | 351.9 | 75.1 | 934.1 | 359.8 | 0.92 | 0.71 | tran SYCAMORE 230 to SYCAMORE 138 ck 1 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | SO2 | ivsg_hs_alt4bd1 | 382.4 | 340.7 | 12.7 | 1467.2 | 340.9 | 0.917 | 0.856 | gen S.ONOFR2 22.00 |
| 22116 | CARLTHTP | 138 | 22734 | SANTEE | 138 | 1 | ML60 | ivsg_hs_alt4bd1 | 273 | 243.6 | -5.9 | 1046.3 | 243.6 | 0.916 | 0.742 | tran MIGUEL 230 to MIGUEL 138 ck 1 |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_008 | ivsg_hs_alt4bd1 | 169 | 154.9 | 27.3 | 553.1 | 157.3 | 0.915 | 0.829 | line PARKER to GENE 230 ck 1 |
| 19020 | BLYTHE | 161 | 24017 | BLYTHESC | 161 | 1 | line_63 | ivsg_hs_alt4bd1 | 244 | 225.6 | 29 | 799.6 | 227.4 | 0.914 | 0.837 | line RAMON to MIRAGE 230 ck 2 |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | SX70 | ivsg_hs_alt4bd1 | 382.4 | 342.2 | 23.7 | 1462.7 | 343 | 0.914 | 0.856 | tran SYCAMORE 230 to SYCAMORE 69 ck 1 |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | B2_022 | ivsg_hs_alt4bd1 | 382.4 | 342.3 | 8.2 | 1457.4 | 342.4 | 0.911 | 0.856 | OTAYMESA - TJI-230 1 230kV |
| 24301 | BIG CRK1 | 230 | 24235 | RECTOR | 230 | 1 | line_156 | ivsg_hs_alt4bd1 | 329 | 305.6 | 4.3 | 752.1 | 305.6 | 0.911 | 0.727 | line BIG CRK1 to BIG CRK2 230 ck 1 |
| 22504 | MISSION | 230 | 22500 | MISSION | 138 | 1 | ML60 | ivsg_hs_alt4bd1 | 392 | 345.5 | 83.1 | 925.2 | 355.3 | 0.91 | 0.71 | tran MIGUEL 230 to MIGUEL 138 ck 1 |
| 22504 | MISSION | 230 | 22500 | MISSION | 138 | 2 | ML60 | ivsg_hs_alt4bd1 | 392 | 345.5 | 83.1 | 925.2 | 355.3 | 0.91 | 0.71 | tran MIGUEL 230 to MIGUEL 138 ck 1 |
| 24602 | VICTOR | 115 | 24702 | KRAMER | 115 | 1 | line_169 | ivsg_hs_alt4bd1 | 217.1 | -185.2 | 79.7 | 987.9 | 201.6 | 0.909 | 0.703 | line KRAMER to LUGO 230 ck 1 |
| 24602 | VICTOR | 115 | 24702 | KRAMER | 115 | 1 | line_170 | ivsg_hs_alt4bd1 | 217.1 | -185.2 | 79.7 | 987.9 | 201.6 | 0.909 | 0.703 | line KRAMER to LUGO 230 ck 2 |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | MS60 | ivsg_hs_alt4bd1 | 382.4 | 342.5 | 22.1 | 1452.9 | 343.2 | 0.908 | 0.856 | tran MISSION 230 to MISSION 138 ck 1 |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | MS61 | ivsg_hs_alt4bd1 | 382.4 | 342.5 | 22.1 | 1452.9 | 343.2 | 0.908 | 0.856 | tran MISSION 230 to MISSION 138 ck 2 |
| 19020 | BLYTHE | 161 | 24017 | BLYTHESC | 161 | 1 | line_12 | ivsg_hs_alt4bd1 | 244 | 224 | 28.8 | 793.9 | 225.8 | 0.907 | 0.837 | line COACHELA to RAMON 230 ck 2 |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | B2_009 | ivsg_hs_alt4bd1 | 382.4 | 340.9 | 20.6 | 1448.9 | 341.6 | 0.906 | 0.856 | EPP - ESCNDIDO 1 230kV |
| 8601 | GEOSUB2 | 230 | 8300 | BANIS230 | 230 | 1 | line_22 | ivsg_hs_alt4bd1 | 550 | 505.2 | 46.8 | 1248.1 | 507.3 | 0.904 | 0.666 | line GEOSUB1 to BANIS230 230 ck 1 |
| 8601 | GEOSUB2 | 230 | 8300 | BANIS230 | 230 | 1 | line_23 | ivsg_hs_alt4bd1 | 550 | 505.2 | 46.8 | 1248.1 | 507.3 | 0.904 | 0.666 | line GEOSUB1 to BANIS230 230 ck 2 |
| 24807 | MIRAGE | 115 | 24819 | CONCHO | 115 | 1 | line_65 | ivsg_hs_alt4bd1 | 183 | 163.9 | -7.7 | 830.5 | 164.1 | 0.904 | 0.869 | line MIRAGE to DEVERS 230 ck 2 |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | OT70 | ivsg_hs_alt4bd1 | 382.4 | 340.1 | 20.9 | 1444.2 | 340.8 | 0.903 | 0.856 | tran OLD TOWN 69 to OLD TOWN 230 ck 1 |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | OT71 | ivsg_hs_alt4bd1 | 382.4 | 340.1 | 20.9 | 1444.2 | 340.8 | 0.903 | 0.856 | tran OLD TOWN 69 to OLD TOWN 230 ck 2 |
| 22672 | PRCTRVLY | 138 | 22852 | TELECYN | 138 | 1 | SX60 | ivsg_hs_alt4bd1 | 478 | 425.4 | -7.3 | 1806.8 | 425.5 | 0.903 | 0.802 | tran SYCAMORE 230 to SYCAMORE 138 ck 1 |
| 24301 | BIG CRK1 | 230 | 24302 | BIG CRK2 | 230 | 1 | line_155 | ivsg_hs_alt4bd1 | 329 | 305.6 | -22.4 | 745.7 | 306.4 | 0.903 | 0.247 | line BIG CRK1 to RECTOR 230 ck 1 |
| 22672 | PRCTRVLY | 138 | 22852 | TELECYN | 138 | 1 | B2_015 | ivsg_hs_alt4bd1 | 478 | 426.6 | -4.5 | 1798.9 | 426.6 | 0.9 | 0.802 | MIGUEL - MISSION 1 230kV |
| 24729 | INYO | 230 | 24730 | INYO PS | 115 | 2 | tran_230 | ivsg_hs_alt4bd1 | 50 | -41.9 | 15.8 | 105.1 | 44.8 | 0.9 | 0.54 | tran INYO 230 to INYO PS 115 ck 1 |
| 24729 | INYO | 230 | 24730 | INYO PS | 115 | 1 | tran_231 | ivsg_hs_alt4bd1 | 50 | -41.9 | 15.8 | 105.1 | 44.8 | 0.9 | 0.54 | tran INYO 230 to INYO PS 115 ck 2 |
| 24805 | DEVERS | 115 | 24804 | DEVERS | 230 | 1 | tran_236 | ivsg_hs_alt4bd1 | 280 | -246.1 | 51.3 | 1269.4 | 251.4 | 0.9 | 0.6 | tran DEVERS 115 to DEVERS 230 ck 3 |

| Bus | Name | kV | Area | Zone | Outage | Case | Vbase | Vcont | DeltaV | Vmin | Vmax | Max-dv | Contingency Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22734 | SANTEE | 138 | 22 | 223 | 23021/22/23/41 | ivsg_hs_alt4bd1 | 0.981 | 0.898 | -0.083 | 0.9 | 1.05 | 0.05 | MIGUEL 230 CORRIDOR West of SN |
| 22412 | LOSCOCHS | 138 | 22 | 223 | 23021/22/23/41 | ivsg_hs_alt4bd1 | 0.979 | 0.903 | -0.076 | 0.9 | 1.05 | 0.05 | MIGUEL 230 CORRIDOR West of SN |
| 22428 | MAINST51 | 138 | 22 | 222 | 23021/22/23/41 | ivsg_hs_alt4bd1 | 0.975 | 0.922 | -0.053 | 0.9 | 1.05 | 0.05 | MIGUEL 230 CORRIDOR West of SN |
| 22424 | MAINST50 | 138 | 22 | 222 | 23021/22/23/41 | ivsg_hs_alt4bd1 | 0.976 | 0.923 | -0.053 | 0.9 | 1.05 | 0.05 | MIGUEL 230 CORRIDOR West of SN |
| 24058 | GOLETA | 230 | 24 | 240 | line_2269 | ivsg_hs_alt4bd1 | 0.983 | 0.928 | -0.055 | 0.9 | 1.05 | 0.05 | S.CLARA 230.00 - GOLETA 230.00 1, S.CLARA 230.00 - MOORPARK 230.00 1 |
| 24058 | GOLETA | 230 | 24 | 240 | line_2270 | ivsg_hs_alt4bd1 | 0.983 | 0.928 | -0.055 | 0.9 | 1.05 | 0.05 | S.CLARA 230.00 - GOLETA 230.00 2, S.CLARA 230.00 - MOORPARK 230.00 2 |
| 22412 | LOSCOCHS | 138 | 22 | 223 | 23021/22/23/41 | ivsg_hs_alt4bd1 | 0.979 | 0.929 | -0.05 | 0.9 | 1.05 | 0.05 | MIGUEL 230 CORRIDOR West of LC |
| 22772 | SOUTHBAY | 138 | 22 | 222 | 23021/22/23/41 | ivsg_hs_alt4bd1 | 0.983 | 0.931 | -0.053 | 0.9 | 1.05 | 0.05 | MIGUEL 230 CORRIDOR West of SN |
| 22852 | TELECYN | 138 | 22 | 222 | 23021/22/23/41 | ivsg_hs_alt4bd1 | 0.994 | 0.94 | -0.054 | 0.9 | 1.05 | 0.05 | MIGUEL 230 CORRIDOR West of SN |
| 22672 | PRCTRVLY | 138 | 22 | 222 | 23021/22/23/41 | ivsg_hs_alt4bd1 | 0.997 | 0.945 | -0.052 | 0.9 | 1.05 | 0.05 | MIGUEL 230 CORRIDOR West of SN |
| 24015 | ARCO SC | 230 | 24 | 240 | line_2013 | ivsg_hs_alt4bd1 | 0.986 | 1.036 | 0.051 | 0.9 | 1.05 | 0.05 | ARCO SC 230.00 - HINSON 230.00 1, ARCO SC 230.00 - HINSON 230.00 2 |
| 24061 | HARBOR | 230 | 24 | 240 | line_2039 | ivsg_hs_alt4bd1 | 0.985 | 1.036 | 0.051 | 0.9 | 1.05 | 0.05 | HARBOR 230.00 - HINSON 230.00 1, LBEACH 230.00 - LITEHIPE 230.00 1 |
| 24077 | LBEACH | 230 | 24 | 240 | line_2039 | ivsg_hs_alt4bd1 | 0.986 | 1.036 | 0.051 | 0.9 | 1.05 | 0.05 | HARBOR 230.00 - HINSON 230.00 1, LBEACH 230.00 - LITEHIPE 230.00 1 |
| 24061 | HARBOR | 230 | 24 | 240 | line_2041 | ivsg_hs_alt4bd1 | 0.985 | 1.036 | 0.051 | 0.9 | 1.05 | 0.05 | HARBOR 230.00 - HINSON 230.00 1, HARBOR 230.00 - LBEACH 230.00 1 |
| 24061 | HARBOR | 230 | 24 | 240 | line_2253 | ivsg_hs_alt4bd1 | 0.985 | 1.036 | 0.051 | 0.9 | 1.05 | 0.05 | HARBOR 230.00 - HINSON 230.00 1, HARBOR 230.00 - LBEACH 230.00 1 |
| 25001 | GOODRICH | 230 | 24 | 250 | line_2073 | ivsg_hs_alt4bd1 | 0.958 | 1.044 | 0.086 | 0.9 | 1.05 | 0.05 | GOODRICH 230.00 - GOULD 230.00 1, GOODRICH 230.00 - LAGUBELL 230.00 1 |
| 24058 | GOLETA | 230 | 24 | 240 | line_2120 | ivsg_hs_alt4bd1 | 0.983 | 1.044 | 0.061 | 0.9 | 1.05 | 0.05 | S.CLARA 230.00 - GOLETA 230.00 1, S.CLARA 230.00 - GOLETA 230.00 2 |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 13821C/25/23051A | ivsg_hs_alt4bd1 | 204.1 | 378.1 | -11.8 | 1605.5 | 378.3 | 1.88 | 1.273 | CH-ES-NCM-SX |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt4bd1 | 392 | 643.7 | 130.5 | 1729.7 | 656.8 | 1.68 | 1.07 | MIGUEL 230 CORRIDOR West of SN |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt4bd1 | 408.3 | -630.7 | -7.6 | 2792 | 630.8 | 1.634 | 1.014 | MIGUEL 230 CORRIDOR West of SN |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt4bd1 | 392 | 624 | 116.5 | 1652.4 | 634.8 | 1.62 | 1.07 | MIGUEL 230 CORRIDOR West of LC |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23051B/23011 | ivsg_hs_alt4bd1 | 204.1 | 322.4 | -0.8 | 1366.2 | 322.4 | 1.6 | 1.273 | EPP-ES + ES-EA-SA 230KV |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt4bd1 | 408.3 | -612.1 | -4.4 | 2667.3 | 612.1 | 1.561 | 1.014 | MIGUEL 230 CORRIDOR West of LC |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt4bd1 | 392 | 592.1 | 112 | 1561.1 | 602.6 | 1.54 | 1.07 | MIGUEL 230 CORRIDOR North of ML |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23022/23023 | ivsg_hs_alt4bd1 | 204.1 | 308.4 | -3.9 | 1307.9 | 308.4 | 1.532 | 1.273 | ML-MS1+ ML-MS2 230KV |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt4bd1 | 382.4 | 539.8 | 3.8 | 2403.6 | 539.8 | 1.502 | 0.856 | MIGUEL 230 CORRIDOR West of SN |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23051A/23011 | ivsg_hs_alt4bd1 | 204.1 | 299.6 | -7 | 1271.6 | 299.7 | 1.489 | 1.273 | SX-EPP + ES-EA-SA 230KV |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt4bd1 | 408.3 | -581.5 | -11.9 | 2519.8 | 581.6 | 1.475 | 1.014 | MIGUEL 230 CORRIDOR North of ML |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23011/13825 | ivsg_hs_alt4bd1 | 204.1 | 297.7 | -10.6 | 1257.6 | 297.9 | 1.473 | 1.273 | ES-EA-SA 230KV + BQ-CC-ES-NCM 138KV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23022/23023 | ivsg_hs_alt4bd1 | 392 | 552.7 | 85.1 | 1434.1 | 559.2 | 1.43 | 1.07 | ML-MS1+ ML-MS2 230KV |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt4bd1 | 382.4 | 521.6 | 4.7 | 2284.9 | 521.6 | 1.428 | 0.856 | MIGUEL 230 CORRIDOR West of LC |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23002/06/10 | ivsg_hs_alt4bd1 | 204.1 | 272.6 | 7.5 | 1174 | 272.7 | 1.375 | 1.273 | SANLUISREY 230 CORRIDOR |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23012/13807 | ivsg_hs_alt4bd1 | 204.1 | 275.3 | 9.2 | 1165.7 | 275.5 | 1.365 | 1.273 | PQ-EA 230KV + EA-NCW 138KV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | 23051B/23011 | ivsg_hs_alt4bd1 | 392 | 531.2 | 36.6 | 1358.3 | 532.4 | 1.36 | 1.05 | EPP-ES + ES-EA-SA 230KV |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23022/23023 | ivsg_hs_alt4bd1 | 408.3 | -543.7 | -0.7 | 2314.9 | 543.7 | 1.355 | 1.014 | ML-MS1+ ML-MS2 230KV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23012/13808 | ivsg_hs_alt4bd1 | 204.1 | 270.5 | 7.6 | 1143.9 | 270.6 | 1.34 | 1.273 | PQ-EA 230KV + NCW-PQ 138KV |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt4bd1 | 382.4 | 491.4 | 15.8 | 2142.1 | 491.6 | 1.339 | 0.856 | MIGUEL 230 CORRIDOR North of ML |
| 22672 | PRCTRVLY | 138 | 22852 | TELECYN | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt4bd1 | 478 | 599.9 | 3.7 | 2655.3 | 599.9 | 1.328 | 0.802 | MIGUEL 230 CORRIDOR West of SN |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | line_N-203 | ivsg_hs_alt4bd1 | 204.1 | 265 | -2.2 | 1124 | 265 | 1.316 | 1.273 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | line_2245 | ivsg_hs_alt4bd1 | 204.1 | 264 | -0.4 | 1123 | 264 | 1.315 | 1.273 | DEVERS 500.00 - VALLEYSC 500.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23011/23003 | ivsg_hs_alt4bd1 | 204.1 | 265.5 | -1 | 1115.4 | 265.5 | 1.306 | 1.273 | SA-EA 230KV + SA-ES-EA 230KV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23013/27/28 | ivsg_hs_alt4bd1 | 204.1 | 263.4 | 2.1 | 1113 | 263.4 | 1.303 | 1.273 | OLD TOWN TO OLD TOWN JCT |
| 22672 | PRCTRVLY | 138 | 22852 | TELECYN | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt4bd1 | 478 | 581.2 | 0.5 | 2532.7 | 581.2 | 1.266 | 0.802 | MIGUEL 230 CORRIDOR West of LC |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | 23051A/23011 | ivsg_hs_alt4bd1 | 392 | 488.2 | 17 | 1252.6 | 488.5 | 1.25 | 1.05 | SX-EPP + ES-EA-SA 230KV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | 23022/23023 | ivsg_hs_alt4bd1 | 392 | 484.7 | 20.2 | 1242.3 | 485.1 | 1.24 | 1.05 | ML-MS1+ ML-MS2 230KV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | line_2115 | ivsg_hs_alt4bd1 | 204.1 | 252 | -4.9 | 1047.4 | 252 | 1.227 | 1.273 | S.ONOFRE 230.00 - SANTIAGO 230.00 1, S.ONOFRE 230.00 - SANTIAGO 230.00 2 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23052/23007 | ivsg_hs_alt4bd1 | 204.1 | 245.8 | -1.9 | 1040.7 | 245.8 | 1.219 | 1.273 | TA-SO 1 + 2 230KV |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | 23022/23023 | ivsg_hs_alt4bd1 | 382.4 | 454.2 | 10.2 | 1942.4 | 454.3 | 1.214 | 0.856 | ML-MS1+ ML-MS2 230KV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23027/28/13810 | ivsg_hs_alt4bd1 | 204.1 | 246 | 6.1 | 1036.7 | 246 | 1.214 | 1.273 | OLD TOWN TO MISSION 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 2 | line_2046 | ivsg_hs_alt4bd1 | 956 | -1131.4 | -37.8 | 2877.4 | 1132 | 1.199 | 0.596 | LA FRESA 230.00 - REDONDO 230.00 1, REDONDO 230.00 - LITEHIPE 230.00 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 1 | line_2047 | ivsg_hs_alt4bd1 | 956 | -1131.4 | -37.8 | 2877.4 | 1132 | 1.199 | 0.596 | LA FRESA 230.00 - REDONDO 230.00 2, REDONDO 230.00 - LITEHIPE 230.00 1 |
| 22672 | PRCTRVLY | 138 | 22852 | TELECYN | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt4bd1 | 478 | 550.6 | 8 | 2385.8 | 550.7 | 1.193 | 0.802 | MIGUEL 230 CORRIDOR North of ML |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 13821B/638 | ivsg_hs_alt4bd1 | 392 | 461.3 | 62 | 1200.5 | 465.5 | 1.19 | 1.07 | CH-SX-SN 138KV + SAN VCNT-EL 69KV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt4bd1 | 204.1 | 236.2 | 0.2 | 1012.1 | 236.2 | 1.185 | 1.273 | MIGUEL 230 CORRIDOR North of ML |
| 24086 | LUGO | 500 | 24236 | RANCHVST | 500 | 1 | line_2194 | ivsg_hs_alt4bd1 | 2598 | 3089.5 | 532.4 | 3450.8 | 3135.1 | 1.152 | 0.64 | LUGO 500.00 - MIRALOMA 500.00 2, LUGO 500.00 - MIRALOMA 500.00 3 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23027/28/13827 | ivsg_hs_alt4bd1 | 204.1 | 231.3 | 3.4 | 974.5 | 231.3 | 1.141 | 1.273 | OLD TOWN TO MISSION 2 |
| 30060 | MIDWAY | 500 | 24156 | VINCENT | 500 | 3 | line_2215 | ivsg_hs_alt4bd1 | 1848.1 | 2236.3 | 123.2 | 2427.3 | 2239.7 | 1.14 | 0.446 | MIDWAY 500.00 - VINCENT 500.00 1, MIDWAY 500.00 - VINCENT 500.00 2 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 2 | line_2064 | ivsg_hs_alt4bd1 | 956 | -1071.8 | -44.5 | 2725.8 | 1072.8 | 1.136 | 0.596 | LA FRESA 230.00 - REDONDO 230.00 1, MESA CAL 230.00 - REDONDO 230.00 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 1 | line_2065 | ivsg_hs_alt4bd1 | 956 | -1071.8 | -44.5 | 2725.8 | 1072.8 | 1.136 | 0.596 | LA FRESA 230.00 - REDONDO 230.00 2, MESA CAL 230.00 - REDONDO 230.00 1 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 13821B/638 | ivsg_hs_alt4bd1 | 408.3 | -455.1 | -2.9 | 1937.8 | 455.1 | 1.134 | 1.014 | CH-SX-SN 138KV + SAN VCNT-EL 69KV |
| 30060 | MIDWAY | 500 | 24156 | VINCENT | 500 | 1 | line_2220 | ivsg_hs_alt4bd1 | 1848.1 | 2213.1 | 130 | 2402.9 | 2216.9 | 1.131 | 0.357 | MIDWAY 500.00 - VINCENT 500.00 2, MIDWAY 500.00 - VINCENT 500.00 3 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 2 | line_2029 | ivsg_hs_alt4bd1 | 1195 | 1305.2 | -46.9 | 3372.1 | 1306 | 1.124 | 0.559 | LEWIS 230.00 - SERRANO 230.00 1, SERRANO 230.00 - VILLA PK 230.00 1 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 2 | line_2031 | ivsg_hs_alt4bd1 | 1195 | 1305.2 | -46.9 | 3372.1 | 1306 | 1.124 | 0.559 | LEWIS 230.00 - SERRANO 230.00 2, SERRANO 230.00 - VILLA PK 230.00 1 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 2 | line_2278 | ivsg_hs_alt4bd1 | 1195 | 1305.2 | -46.9 | 3372.1 | 1306 | 1.124 | 0.559 | LEWIS 230.00 - SERRANO 230.00 1, SERRANO 230.00 - VILLA PK 230.00 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23051B/23011 | ivsg_hs_alt4bd1 | 392 | 435.9 | 55.3 | 1130.4 | 439.4 | 1.12 | 1.07 | EPP-ES + ES-EA-SA 230KV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23002/06/10 | ivsg_hs_alt4bd1 | 392 | 436 | 54.6 | 1155 | 439.4 | 1.12 | 1.07 | SANLUISREY 230 CORRIDOR |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | 23002/06/10 | ivsg_hs_alt4bd1 | 392 | 438.6 | 18.5 | 1140.8 | 439 | 1.12 | 1.05 | SANLUISREY 230 CORRIDOR |
| 8376 | RTAP2 | 92 | 8974 | RTP1 | 92 | 1 | line_N-204 | ivsg_hs_alt4bd1 | 57 | -60.1 | 11.9 | 399.3 | 61.3 | 1.119 | 0.727 | COACHELLA MIDWAY 230 CKT 1&2 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 13810B/23013 | ivsg_hs_alt4bd1 | 204.1 | 225.6 | 6.1 | 951.7 | 225.7 | 1.115 | 1.273 | OT JCT TO PQ 1 |
| 22596 | OLD TOWN | 230 | 22466 | MLMS3TAP | 230 | 1 | 23021/22/23/41 | ivsg_hs_alt4bd1 | 912 | -961.2 | 100.9 | 2542.6 | 966.5 | 1.111 | 0.756 | MIGUEL 230 CORRIDOR West of SN |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | line_2245 | ivsg_hs_alt4bd1 | 392 | 432.4 | 47 | 1129.2 | 434.9 | 1.11 | 1.07 | DEVERS 500.00 - VALLEYSC 500.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23051A/23011 | ivsg_hs_alt4bd1 | 392 | 429.3 | 51.3 | 1112.4 | 432.4 | 1.1 | 1.07 | SX-EPP + ES-EA-SA 230KV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23021/23041 | ivsg_hs_alt4bd1 | 392 | 430.2 | 48.2 | 1115.1 | 432.9 | 1.1 | 1.07 | ML-SX + OM-SX 230KV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 13821C/25/23051A | ivsg_hs_alt4bd1 | 392 | 429.6 | 52.8 | 1111.3 | 432.8 | 1.1 | 1.07 | CH-ES-NCM-SX |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | 23013/27/28 | ivsg_hs_alt4bd1 | 392 | 429.9 | 15.3 | 1097.8 | 430.2 | 1.1 | 1.05 | OLD TOWN TO OLD TOWN JCT |
| 22672 | PRCTRVLY | 138 | 22852 | TELECYN | 138 | 1 | 23022/23023 | ivsg_hs_alt4bd1 | 478 | 512.9 | -3.3 | 2183.6 | 512.9 | 1.092 | 0.802 | ML-MS1+ ML-MS2 230KV |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23002/06/10 | ivsg_hs_alt4bd1 | 408.3 | -430.2 | 0.1 | 1864.3 | 430.2 | 1.091 | 1.014 | SANLUISREY 230 CORRIDOR |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | line_2245 | ivsg_hs_alt4bd1 | 392 | 425.4 | 10.5 | 1094.2 | 425.6 | 1.09 | 1.05 | DEVERS 500.00 - VALLEYSC 500.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | line_N-203 | ivsg_hs_alt4bd1 | 392 | 425.8 | 9.7 | 1092.4 | 425.9 | 1.09 | 1.05 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 2 | line_2049 | ivsg_hs_alt4bd1 | 956 | -1025.9 | -37.9 | 2612.5 | 1026.6 | 1.089 | 0.596 | LA FRESA 230.00 - REDONDO 230.00 1, LCIENEGA 230.00 - LA FRESA 230.00 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 1 | line_2050 | ivsg_hs_alt4bd1 | 956 | -1025.9 | -37.9 | 2612.5 | 1026.6 | 1.089 | 0.596 | LA FRESA 230.00 - REDONDO 230.00 2, LCIENEGA 230.00 - LA FRESA 230.00 1 |
| 22596 | OLD TOWN | 230 | 22466 | MLMS3TAP | 230 | 1 | 23021/22/23/41 | ivsg_hs_alt4bd1 | 912 | -949.3 | 113.2 | 2493.7 | 956.1 | 1.089 | 0.756 | MIGUEL 230 CORRIDOR North of ML |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 2 | line_2057 | ivsg_hs_alt4bd1 | 956 | -1025.4 | -34.7 | 2610 | 1026 | 1.088 | 0.596 | EL NIDO 230.00 - LA FRESA 230.00 3, LA FRESA 230.00 - REDONDO 230.00 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 1 | line_2058 | ivsg_hs_alt4bd1 | 956 | -1025.4 | -34.7 | 2610 | 1026 | 1.088 | 0.596 | EL NIDO 230.00 - LA FRESA 230.00 3, LA FRESA 230.00 - REDONDO 230.00 2 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 2 | line_2059 | ivsg_hs_alt4bd1 | 956 | -1025.4 | -34.7 | 2610 | 1026 | 1.088 | 0.596 | EL NIDO 230.00 - LA FRESA 230.00 4, LA FRESA 230.00 - REDONDO 230.00 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 1 | line_2060 | ivsg_hs_alt4bd1 | 956 | -1025.4 | -34.7 | 2610 | 1026 | 1.088 | 0.596 | EL NIDO 230.00 - LA FRESA 230.00 4, LA FRESA 230.00 - REDONDO 230.00 2 |
| 22596 | OLD TOWN | 230 | 22466 | MLMS3TAP | 230 | 1 | 23021/22/23/41 | ivsg_hs_alt4bd1 | 912 | -947 | 110.2 | 2488.8 | 953.4 | 1.087 | 0.756 | MIGUEL 230 CORRIDOR West of LC |
| 24701 | KRAMER | 230 | 24085 | LUGO | 230 | 2 | line_2260 | ivsg_hs_alt4bd1 | 478 | 525.8 | 4.4 | 1301.9 | 525.8 | 1.085 | 0.644 | KRAMER 230.00 - LUGO 230.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23051B/23011 | ivsg_hs_alt4bd1 | 408.3 | -430.4 | -2.9 | 1824.6 | 430.4 | 1.068 | 1.014 | EPP-ES + ES-EA-SA 230KV |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | line_2245 | ivsg_hs_alt4bd1 | 408.3 | -426.8 | 5.3 | 1822.7 | 426.9 | 1.067 | 1.014 | DEVERS 500.00 - VALLEYSC 500.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_N-203 | ivsg_hs_alt4bd1 | 169 | 178.7 | 37.8 | 642.4 | 182.7 | 1.063 | 0.829 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22831 | SYCAMORE | 138 | 22124 | CHCARITA | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt4bd1 | 204.1 | 209.9 | -29.7 | 906 | 212 | 1.061 | 0.757 | MIGUEL 230 CORRIDOR West of SN |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_2260 | ivsg_hs_alt4bd1 | 56 | 57.9 | -9.9 | 292 | 58.7 | 1.06 | 0.92 | KRAMER 230.00 - LUGO 230.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 22831 | SYCAMORE | 138 | 22124 | CHCARITA | 138 | 1 | 13821B/638 | ivsg_hs_alt4bd1 | 204.1 | 214.4 | -21 | 904.5 | 215.4 | 1.059 | 0.757 | CH-SX-SN 138KV + SAN VCNT-EL 69KV |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | line_N-203 | ivsg_hs_alt4bd1 | 408.3 | -423.6 | 3.7 | 1800.6 | 423.6 | 1.054 | 1.014 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23021/23041 | ivsg_hs_alt4bd1 | 408.3 | -424.8 | 2.8 | 1799.9 | 424.8 | 1.054 | 1.014 | ML-SX + OM-SX 230KV |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23051A/23011 | ivsg_hs_alt4bd1 | 408.3 | -424 | -0.6 | 1795.6 | 424 | 1.051 | 1.014 | SX-EPP + ES-EA-SA 230KV |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 13821C/25/23051A | ivsg_hs_alt4bd1 | 408.3 | -424.2 | -2.2 | 1793.8 | 424.2 | 1.05 | 1.014 | CH-ES-NCM-SX |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | line_2113 | ivsg_hs_alt4bd1 | 408.3 | -421.4 | 2.6 | 1789.2 | 421.5 | 1.047 | 1.014 | ELLIS 230.00 - JOHANNA 230.00 1, ELLIS 230.00 - SANTIAGO 230.00 1 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | line_2236 | ivsg_hs_alt4bd1 | 408.3 | -421.6 | 3.9 | 1788.6 | 421.7 | 1.047 | 1.014 | PALOVRDE 500.00 - DEVERS 500.00 1, COACHELV 230.00 - DEVERS 230.00 2 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 1 | line_2030 | ivsg_hs_alt4bd1 | 1287 | 1305.2 | -46.9 | 3372.1 | 1306 | 1.044 | 0.519 | LEWIS 230.00 - SERRANO 230.00 1, SERRANO 230.00 - VILLA PK 230.00 2 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 1 | line_2032 | ivsg_hs_alt4bd1 | 1287 | 1305.2 | -46.9 | 3372.1 | 1306 | 1.044 | 0.519 | LEWIS 230.00 - SERRANO 230.00 2, SERRANO 230.00 - VILLA PK 230.00 2 |
| 22260 | ESCNDIDO | 230 | 22844 | TALEGA | 230 | 1 | 23052/23007 | ivsg_hs_alt4bd1 | 456.1 | 472.6 | 17.7 | 1194.7 | 472.9 | 1.043 | 0.027 | TA-SO 1 + 2 230KV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23013/27/28 | ivsg_hs_alt4bd1 | 392 | 404.5 | 45.6 | 1046.4 | 407 | 1.04 | 1.07 | OLD TOWN TO OLD TOWN JCT |
| 22831 | SYCAMORE | 138 | 22124 | CHCARITA | 138 | 1 | 23051B/23011 | ivsg_hs_alt4bd1 | 204.1 | 207 | -28.7 | 885.3 | 208.9 | 1.037 | 0.757 | EPP-ES + ES-EA-SA 230KV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | line_2115 | ivsg_hs_alt4bd1 | 392 | 399.8 | 44.9 | 1013 | 402.3 | 1.03 | 1.07 | S.ONOFRE 230.00 - SANTIAGO 230.00 1, S.ONOFRE 230.00 - SANTIAGO 230.00 2 |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | line_2236 | ivsg_hs_alt4bd1 | 132 | 132.9 | -9.4 | 849.3 | 133.3 | 1.025 | 0.962 | PALOVRDE 500.00 - DEVERS 500.00 1, COACHELV 230.00 - DEVERS 230.00 2 |
| 24025 | CHINO | 230 | 24093 | MIRALOMW | 230 | 1 | line_2160 | ivsg_hs_alt4bd1 | 705 | -698.9 | 25 | 1806.7 | 699.3 | 1.021 | 0.259 | CHINO 230.00 - MIRALOMA 230.00 2, CHINO 230.00 - MIRALOMA 230.00 3 |
| 24016 | BARRE | 230 | 24044 | ELLIS | 230 | 1 | line_2115 | ivsg_hs_alt4bd1 | 988 | 968.6 | -52.6 | 2520.7 | 970.1 | 1.016 | 0.371 | S.ONOFRE 230.00 - SANTIAGO 230.00 1, S.ONOFRE 230.00 - SANTIAGO 230.00 2 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | line_2115 | ivsg_hs_alt4bd1 | 392 | 394.8 | 12.2 | 991.4 | 395 | 1.01 | 1.05 | S.ONOFRE 230.00 - SANTIAGO 230.00 1, S.ONOFRE 230.00 - SANTIAGO 230.00 2 |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_N-204 | ivsg_hs_alt4bd1 | 169 | 169.7 | 35.6 | 609.9 | 173.4 | 1.01 | 0.829 | COACHELLA MIDWAY 230 CKT 1&2 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | 23052/23007 | ivsg_hs_alt4bd1 | 392 | 396.7 | 6.3 | 1015.8 | 396.7 | 1.01 | 1.05 | TA-SO 1 + 2 230KV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | 13807/08/23013 | ivsg_hs_alt4bd1 | 392 | 395.7 | 12.6 | 1007.1 | 395.9 | 1.01 | 1.05 | PQ ENCINA |
| 24074 | LA FRESA | 230 | 24065 | HINSON | 230 | 1 | line_2061 | ivsg_hs_alt4bd1 | 797 | -771.2 | 48 | 2013.2 | 772.7 | 1.006 | 0.14 | LA FRESA 230.00 - REDONDO 230.00 1, LA FRESA 230.00 - REDONDO 230.00 2 |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | line_2237 | ivsg_hs_alt4bd1 | 132 | 130.6 | -10.3 | 833 | 131 | 1.006 | 0.962 | PALOVRDE 500.00 - DEVERS 500.00 1, J.HINDS 230.00 - MIRAGE 230.00 1 |
| 19020 | BLYTHE | 161 | 24017 | BLYTHESC | 161 | 1 | line_N-203 | ivsg_hs_alt4bd1 | 244 | 245.2 | 38.2 | 872.5 | 248.1 | 0.997 | 0.837 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | line_N-204 | ivsg_hs_alt4bd1 | 132 | 127.8 | -13.6 | 825.9 | 128.5 | 0.997 | 0.962 | COACHELLA MIDWAY 230 CKT 1&2 |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | line_2186 | ivsg_hs_alt4bd1 | 132 | 130.6 | -10.3 | 824.8 | 131 | 0.996 | 0.962 | COACHELV 230.00 - DEVERS 230.00 2, J.HINDS 230.00 - MIRAGE 230.00 1 |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | line_2235 | ivsg_hs_alt4bd1 | 132 | 129.4 | -10.3 | 823.8 | 129.8 | 0.994 | 0.962 | DEVERS 230.00 - MIRAGE 230.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 24086 | LUGO | 500 | 24097 | MOHAVE | 500 | 1 | line_2234 | ivsg_hs_alt4bd1 | 1386 | -1427.4 | 90.1 | 1572 | 1430.2 | 0.991 | 0.697 | MOHAVE 500.00 - ELDORDO 500.00 1, PISGAH 230.00 - ELDORDO 230.00 2 |
| 8311 | COACHELA | 230 | 8695 | RAMON | 230 | 2 | line_2236 | ivsg_hs_alt4bd1 | 800 | 760.2 | -21.4 | 1988.3 | 760.5 | 0.99 | 0.654 | PALOVRDE 500.00 - DEVERS 500.00 1, COACHELV 230.00 - DEVERS 230.00 2 |
| 24126 | RIOHONDO | 230 | 24155 | VINCENT | 230 | 2 | line_2097 | ivsg_hs_alt4bd1 | 988 | -927.4 | 108.8 | 2448.9 | 933.8 | 0.987 | 0.72 | GOODRICH 230.00 - GOULD 230.00 1, VINCENT 230.00 - MESA CAL 230.00 1 |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | 13821B/638 | ivsg_hs_alt4bd1 | 382.4 | 366.4 | 19.1 | 1568.2 | 366.9 | 0.98 | 0.856 | CH-SX-SN 138KV + SAN VCNT-EL 69KV |
| 22596 | OLD TOWN | 230 | 22466 | MLMS3TAP | 230 | 1 | 23021/23041 | ivsg_hs_alt4bd1 | 912 | -859.3 | 88.5 | 2233.8 | 863.9 | 0.976 | 0.756 | ML-SX + OM-SX 230KV |
| 8695 | RAMON | 230 | 24806 | MIRAGE | 230 | 2 | line_2236 | ivsg_hs_alt4bd1 | 800 | 735.7 | -162.6 | 1956.4 | 753.5 | 0.974 | 0.598 | PALOVRDE 500.00 - DEVERS 500.00 1, COACHELV 230.00 - DEVERS 230.00 2 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2191 | ivsg_hs_alt4bd1 | 2400 | -2431.2 | -37.6 | 2686.9 | 2431.4 | 0.97 | 0.759 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - ELDORDO 230.00 2 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | 13821C/25/23051A | ivsg_hs_alt4bd1 | 392 | 379 | 22 | 970.7 | 379.6 | 0.97 | 1.05 | CH-ES-NCM-SX |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2100 | ivsg_hs_alt4bd1 | 2400 | -2418.3 | -207.8 | 2677.8 | 2427.2 | 0.966 | 0.759 | EAGLROCK 230.00 - MESA CAL 230.00 1, SYLMAR S 230.00 - GOULD 230.00 1 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2192 | ivsg_hs_alt4bd1 | 2400 | -2418.7 | -47.7 | 2674.2 | 2419.2 | 0.965 | 0.759 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2193 | ivsg_hs_alt4bd1 | 2400 | -2418.5 | -47.8 | 2674 | 2418.9 | 0.965 | 0.759 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - LUGO 230.00 2 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23021/23041 | ivsg_hs_alt4bd1 | 204.1 | 194.9 | 6.4 | 824.1 | 195 | 0.965 | 1.273 | ML-SX + OM-SX 230KV |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2200 | ivsg_hs_alt4bd1 | 2400 | -2408 | -31.2 | 2671.3 | 2408.2 | 0.964 | 0.759 | LUGO 500.00 - MOHAVE 500.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2201 | ivsg_hs_alt4bd1 | 2400 | -2407.8 | -31.3 | 2671.1 | 2408 | 0.964 | 0.759 | LUGO 500.00 - MOHAVE 500.00 1, PISGAH 230.00 - LUGO 230.00 2 |
| 14008 | JOJOBA | 500 | 15011 | KYRENE | 500 | 1 | line_2245 | ivsg_hs_alt4bd1 | 1732 | 1761.2 | 141.1 | 1923.6 | 1766.8 | 0.964 | 0.931 | DEVERS 500.00 - VALLEYSC 500.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_2194 | ivsg_hs_alt4bd1 | 56 | 52 | -10.3 | 262.8 | 53 | 0.96 | 0.92 | LUGO 500.00 - MIRALOMA 500.00 2, LUGO 500.00 - MIRALOMA 500.00 3 |
| 19020 | BLYTHE | 161 | 24017 | BLYTHESC | 161 | 1 | line_N-204 | ivsg_hs_alt4bd1 | 244 | 236.2 | 35.8 | 840.2 | 239 | 0.96 | 0.837 | COACHELLA MIDWAY 230 CKT 1&2 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt4bd1 | 392 | 377.3 | -0.9 | 979.5 | 377.3 | 0.96 | 1.05 | MIGUEL 230 CORRIDOR North of ML |
| 8601 | GEOSUB2 | 230 | 8300 | BANIS230 | 230 | 1 | line_N-204 | ivsg_hs_alt4bd1 | 550 | 528.7 | 89.4 | 1322.5 | 536.2 | 0.959 | 0.666 | COACHELLA MIDWAY 230 CKT 1&2 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | line_2115 | ivsg_hs_alt4bd1 | 408.3 | -395.3 | -2.9 | 1635.1 | 395.3 | 0.957 | 1.014 | S.ONOFRE 230.00 - SANTIAGO 230.00 1, S.ONOFRE 230.00 - SANTIAGO 230.00 2 |
| 24126 | RIOHONDO | 230 | 24155 | VINCENT | 230 | 2 | line_2101 | ivsg_hs_alt4bd1 | 988 | -903.3 | 110.4 | 2370.1 | 910 | 0.956 | 0.72 | EAGLROCK 230.00 - MESA CAL 230.00 1, VINCENT 230.00 - MESA CAL 230.00 1 |
| 8376 | RTAP2 | 92 | 8974 | RTP1 | 92 | 1 | line_N-208 | ivsg_hs_alt4bd1 | 57 | -51.8 | 11.8 | 340.1 | 53.1 | 0.954 | 0.727 | COACHELLA BANISTER/BANISTER AVE58 230 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2103 | ivsg_hs_alt4bd1 | 2400 | -2376.5 | -193.2 | 2629 | 2384.4 | 0.949 | 0.759 | EAGLROCK 230.00 - SYLMAR S 230.00 1, SYLMAR S 230.00 - GOULD 230.00 1 |
| 24042 | ELDORDO | 500 | 24086 | LUGO | 500 | 1 | line_2258 | ivsg_hs_alt4bd1 | 1386 | 1391.3 | 259.7 | 1506.3 | 1415.3 | 0.948 | 0.634 | LUGO 500.00 - VINCENT 500.00 2, LUGO 500.00 - VICTORVL 500.00 1 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2096 | ivsg_hs_alt4bd1 | 2400 | -2369.5 | -214.9 | 2620.3 | 2379.2 | 0.946 | 0.759 | EAGLROCK 230.00 - MESA CAL 230.00 1, GOODRICH 230.00 - GOULD 230.00 1 |
| 22831 | SYCAMORE | 138 | 22124 | CHCARITA | 138 | 1 | 23051A/23011 | ivsg_hs_alt4bd1 | 204.1 | 187.1 | -32.2 | 805.5 | 189.8 | 0.943 | 0.757 | SX-EPP + ES-EA-SA 230KV |
| 24126 | RIOHONDO | 230 | 24155 | VINCENT | 230 | 2 | line_2100 | ivsg_hs_alt4bd1 | 988 | -881.7 | 114.2 | 2329.5 | 889.1 | 0.939 | 0.72 | EAGLROCK 230.00 - MESA CAL 230.00 1, SYLMAR S 230.00 - GOULD 230.00 1 |
| 22831 | SYCAMORE | 138 | 22124 | CHCARITA | 138 | 1 | 13810B/23013 | ivsg_hs_alt4bd1 | 204.1 | 187.3 | -31.5 | 800.8 | 189.9 | 0.938 | 0.757 | OT JCT TO PQ 1 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | 23011/13825 | ivsg_hs_alt4bd1 | 392 | 362.2 | 28.5 | 922.3 | 363.3 | 0.93 | 1.05 | ES-EA-SA 230KV + BQ-CC-ES-NCM 138KV |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | 23002/06/10 | ivsg_hs_alt4bd1 | 382.4 | 341.6 | 15.8 | 1487.3 | 342 | 0.93 | 0.856 | SANLUISREY 230 CORRIDOR |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt4bd1 | 204.1 | 185.5 | 2.4 | 794.1 | 185.5 | 0.93 | 1.273 | MIGUEL 230 CORRIDOR West of LC |
| 24614 | TAP601 | 115 | 24702 | KRAMER | 115 | 1 | line_2260 | ivsg_hs_alt4bd1 | 217.1 | -190 | 69.2 | 1005 | 202.2 | 0.924 | 0.717 | KRAMER 230.00 - LUGO 230.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 24126 | RIOHONDO | 230 | 24155 | VINCENT | 230 | 2 | line_2076 | ivsg_hs_alt4bd1 | 988 | -873.8 | 102.3 | 2283 | 879.8 | 0.921 | 0.72 | GOODRICH 230.00 - LAGUBELL 230.00 1, VINCENT 230.00 - MESA CAL 230.00 1 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 2 | line_2279 | ivsg_hs_alt4bd1 | 1195 | 1062.8 | -56.8 | 2756 | 1064.3 | 0.919 | 0.559 | S.ONOFRE 230.00 - SERRANO 230.00 1, SERRANO 230.00 - VILLA PK 230.00 1 |
| 22831 | SYCAMORE | 138 | 22124 | CHCARITA | 138 | 1 | 23027/28/13827 | ivsg_hs_alt4bd1 | 204.1 | 184.3 | -27.7 | 784.9 | 186.3 | 0.919 | 0.757 | OLD TOWN TO MISSION 2 |
| 24126 | RIOHONDO | 230 | 24155 | VINCENT | 230 | 2 | line_2096 | ivsg_hs_alt4bd1 | 988 | -860.2 | 101.8 | 2267 | 866.2 | 0.914 | 0.72 | EAGLROCK 230.00 - MESA CAL 230.00 1, GOODRICH 230.00 - GOULD 230.00 1 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2255 | ivsg_hs_alt4bd1 | 2400 | -2270.7 | -77.8 | 2526.2 | 2272 | 0.912 | 0.759 | LUGO 500.00 - MIRALOMA 500.00 3, LUGO 500.00 - MOHAVE 500.00 1 |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | 23051B/23011 | ivsg_hs_alt4bd1 | 382.4 | 341.9 | 21.2 | 1457.6 | 342.6 | 0.911 | 0.856 | EPP-ES + ES-EA-SA 230KV |
| 24602 | VICTOR | 115 | 24702 | KRAMER | 115 | 1 | line_2260 | ivsg_hs_alt4bd1 | 217.1 | -185.3 | 79.4 | 989 | 201.6 | 0.91 | 0.703 | KRAMER 230.00 - LUGO 230.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | 23021/22/23/41 | ivsg_hs_alt4bd1 | 1120 | -1011.4 | -74.2 | 2591.3 | 1014.1 | 0.91 | 0.69 | MIGUEL 230 CORRIDOR North of ML |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2256 | ivsg_hs_alt4bd1 | 2400 | -2270 | -94.5 | 2516.6 | 2272 | 0.908 | 0.759 | ELDORDO 500.00 - LUGO 500.00 1, LUGO 500.00 - MIRALOMA 500.00 2 |
| 24126 | RIOHONDO | 230 | 24155 | VINCENT | 230 | 2 | line_2103 | ivsg_hs_alt4bd1 | 988 | -853.1 | 101.5 | 2250 | 859.1 | 0.907 | 0.72 | EAGLROCK 230.00 - SYLMAR S 230.00 1, SYLMAR S 230.00 - GOULD 230.00 1 |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | line_2245 | ivsg_hs_alt4bd1 | 382.4 | 338.4 | 12.5 | 1450.2 | 338.6 | 0.906 | 0.856 | DEVERS 500.00 - VALLEYSC 500.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 24807 | MIRAGE | 115 | 24819 | CONCHO | 115 | 1 | line_2182 | ivsg_hs_alt4bd1 | 183 | 163.9 | -7.6 | 831.6 | 164.1 | 0.905 | 0.869 | DEVERS 230.00 - MIRAGE 230.00 2, COACHELV 230.00 - DEVERS 230.00 2 |
| 24093 | MIRALOMW | 230 | 24158 | WALNUT | 230 | 1 | line_2089 | ivsg_hs_alt4bd1 | 797 | 678.8 | 166 | 1802.7 | 698.8 | 0.903 | 0.527 | MESA CAL 230.00 - WALNUT 230.00 1, OLINDA 230.00 - WALNUT 230.00 1 |
| 22672 | PRCTRVLY | 138 | 22852 | TELECYN | 138 | 1 | 13821B/638 | ivsg_hs_alt4bd1 | 478 | 424.2 | -1 | 1806.3 | 424.2 | 0.903 | 0.802 | CH-SX-SN 138KV + SAN VCNT-EL 69KV |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24125 | REDONDO | 230 | 24084 | LITEHIPE | 230 | 1 | line_2061 | ivsg_hs_alt4bd1 | 916 | 814.7 | 94.6 | 2074.1 | 820.1 | 0.902 | 0.113 | LA FRESA 230.00 - REDONDO 230.00 1, LA FRESA 230.00 - REDONDO 230.00 2 |
| 22596 | OLD TOWN | 230 | 22466 | MLMS3TAP | 230 | 1 | 23022/23023 | ivsg_hs_alt4bd1 | 912 | -795.6 | 83 | 2062.9 | 799.9 | 0.901 | 0.756 | ML-MS1+ ML-MS2 230KV |

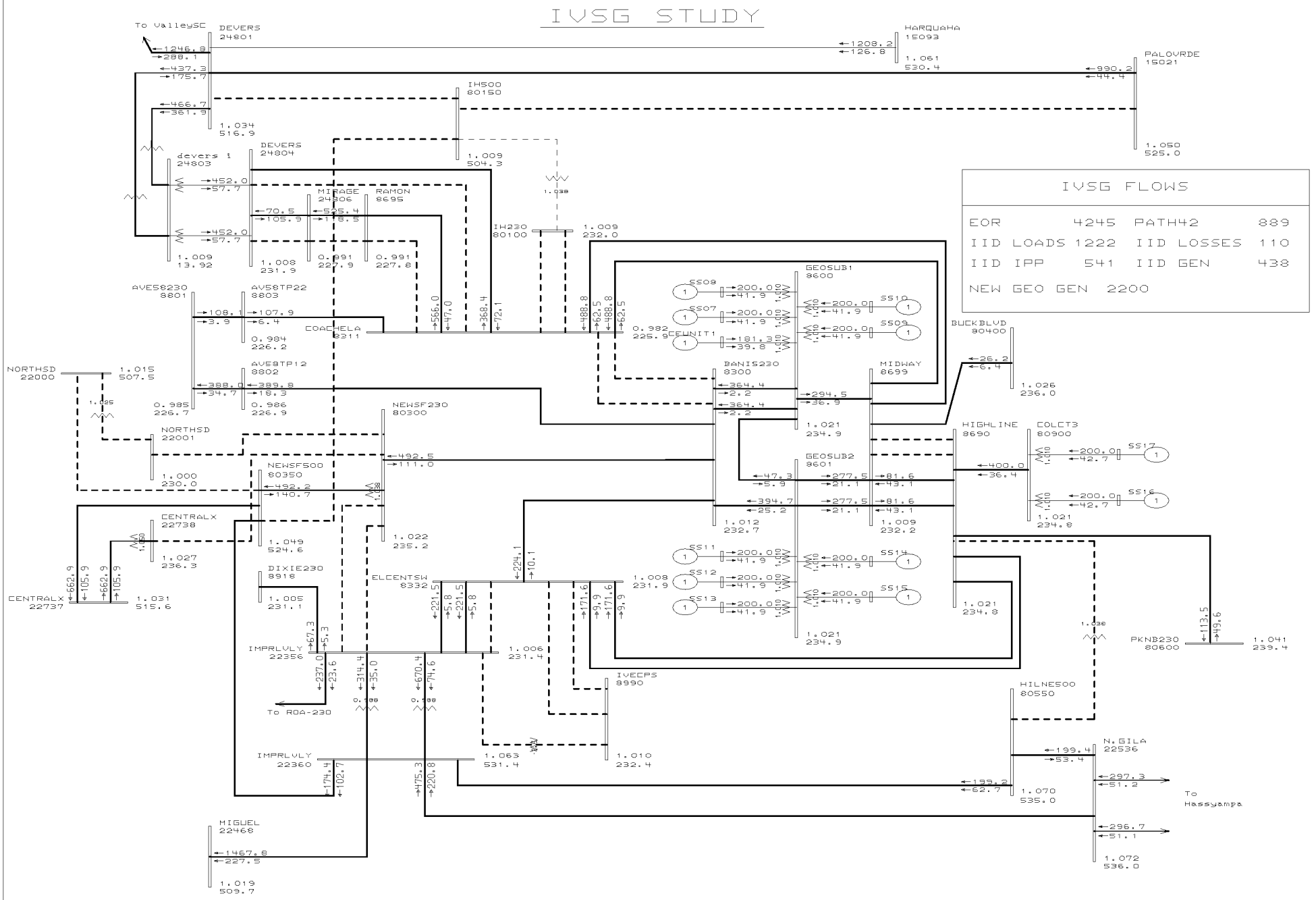
ivsg_hs_alt4b_d1.sav
No Solve Summary
N-2 Outages

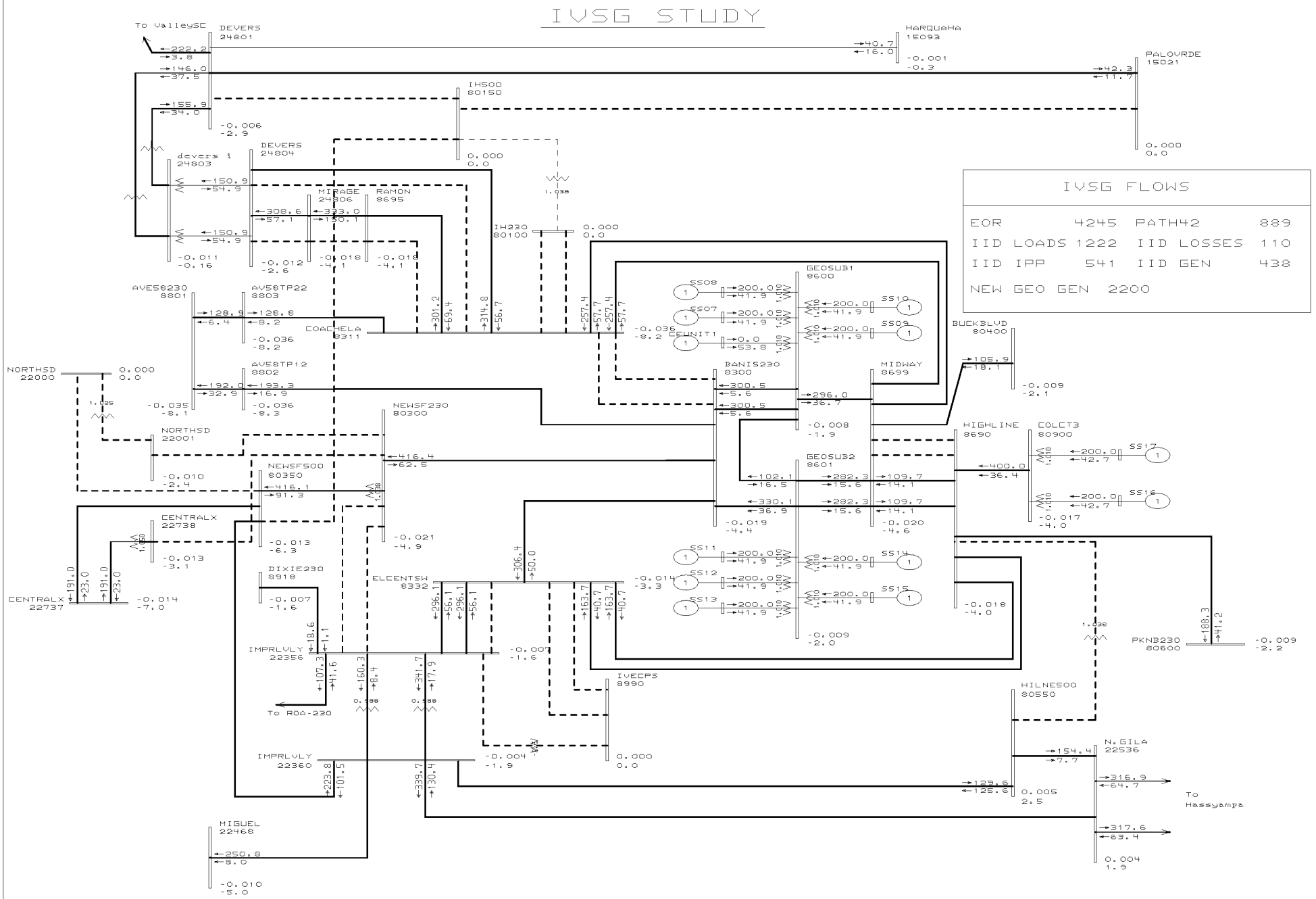
| Contingency-Description | Case | Problem-Description |
|---|---|---|
| DEVERS 230.00 - MIRAGE 230.00 2, RAMON 230.00 - MIRAGE 230.00 2 | ivsg_hs_alt4bd1 | Pmis 19324 BLYENG3 16.00 = -301740.31 MW + j -6542217.00 MVAR |
| VICTOR 230.00 - LUGO 230.00 1, VICTOR 230.00 - LUGO 230.00 2 | ivsg_hs_alt4bd1 | BAD Qgen: 24758 SUNGEN7G 17.0 MVAr |
| DEVERS 230.00 - MIRAGE 230.00 2, RAMON 230.00 - MIRAGE 230.00 2 | ivsg_hs_alt4bd1 | Pmis 19324 BLYENG3 16.00 = -301740.31 MW + j -6542217.00 MVAR |

# Imperial Valley Study Group

## Appendix A.4.13

Alt 4b D2
Heavy Summer
Alternative 4b
Dispatch 2


IVSG STUDY
To ValleySC
DEVERS
24801
HARQUAHA
15093
PALOVRDE
15021
IH500
80150
devers 1
24803
DEVERS
24804
MIRAGE
24806
RAMON
8695
IH230
80100
AVE58230
8801
AV58TP22
8803
AV58TP12
8802
COACHELA
8311
GEOSUB1
8600
BANIS230
8300
MIDWAY
8699
BUCKBLVD
80400
NORTHSD
22000
NORTHSD
22001
NEWSF230
80300
NEWSF500
80350
HIGHLINE
8690
COLCT3
80900
GEOSUB2
8601
CENTRALX
22738
CENTRALX
22737
DIXIE230
8918
ELCENTSW
8332
IMPRLVLY
22356
IMPRLVLY
22360
IVECPS
8990
HILNE500
80550
N.GILA
22536
PKNB230
80600
MIGUEL
22468
To ROA-230
To Hassyampa
IVSG FLOWS
EOR 4245 PATH42 889
IID LOADS 1222 IID LOSSES 110
IID IPP 541 IID GEN 438
NEW GEO GEN 2200




General Electric International, Inc. PSLF Program MW/MVAR Mon Mar 28 15:02:01 2005

Differences between base case d:\pslf\ivsg_hs_alt4bbase.sav
and delta case d:\pslf\ivsg_hs_alt4bd2_test.sav

g:\iid\2005\ivgs\ivgsproject.d

ivsg_hs_alt4b_D2.sav
Voltage Summary
N-0 Outages

| Bus | Name | kV | Area | Zone | Outage | Case | Vbase | Vcont | DeltaV | Vmin | Vmax | Max-dv | Contingency Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24035 | EAGLEMTN | 161 | 24 | 248 | base | ivsg_hs_alt4bd2_ | 0.926 | 0.926 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 20077 | SIM-115 | 115 | 20 | 205 | base | ivsg_hs_alt4bd2_ | 0.934 | 0.934 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 20076 | SQN-115 | 115 | 20 | 205 | base | ivsg_hs_alt4bd2_ | 0.939 | 0.939 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14534 | N.GILA 4 | 100 | 14 | 847 | base | ivsg_hs_alt4bd2_ | 0.948 | 0.948 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24219 | PISGAH | 230 | 24 | 240 | base | ivsg_hs_alt4bd2_ | 1.051 | 1.051 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24236 | RANCHVST | 500 | 24 | 240 | base | ivsg_hs_alt4bd2_ | 1.052 | 1.052 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24627 | CIMA | 230 | 24 | 240 | base | ivsg_hs_alt4bd2_ | 1.052 | 1.052 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15090 | HASSYAMP | 500 | 14 | 158 | base | ivsg_hs_alt4bd2_ | 1.053 | 1.053 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15092 | ARLINTON | 500 | 14 | 158 | base | ivsg_hs_alt4bd2_ | 1.053 | 1.053 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14213 | TS8 | 230 | 14 | 847 | base | ivsg_hs_alt4bd2_ | 1.053 | 1.053 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24138 | SERRANO | 500 | 24 | 240 | base | ivsg_hs_alt4bd2_ | 1.053 | 1.053 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24229 | VALLEY-S | 115 | 24 | 240 | base | ivsg_hs_alt4bd2_ | 1.053 | 1.053 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 25991 | VALYSVC2 | 115 | 24 | 240 | base | ivsg_hs_alt4bd2_ | 1.053 | 1.053 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15094 | MESQUITE | 500 | 14 | 158 | base | ivsg_hs_alt4bd2_ | 1.054 | 1.054 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14009 | REDHAWK | 500 | 14 | 141 | base | ivsg_hs_alt4bd2_ | 1.054 | 1.054 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 79043 | KAYENTA | 230 | 14 | 191 | base | ivsg_hs_alt4bd2_ | 1.055 | 1.055 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14010 | TS5 | 500 | 14 | 141 | base | ivsg_hs_alt4bd2_ | 1.056 | 1.056 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14230 | VERDE N | 230 | 14 | 141 | base | ivsg_hs_alt4bd2_ | 1.057 | 1.057 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14247 | VERDE S | 230 | 14 | 141 | base | ivsg_hs_alt4bd2_ | 1.057 | 1.057 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14011 | RACEWAY | 500 | 14 | 141 | base | ivsg_hs_alt4bd2_ | 1.057 | 1.057 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24776 | LEE VINE | 115 | 24 | 247 | base | ivsg_hs_alt4bd2_ | 1.058 | 1.058 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24151 | VALLEYSC | 500 | 24 | 240 | base | ivsg_hs_alt4bd2_ | 1.058 | 1.058 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24997 | VALYSVC1 | 500 | 24 | 240 | base | ivsg_hs_alt4bd2_ | 1.058 | 1.058 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 28040 | CALPINE | 500 | 24 | 240 | base | ivsg_hs_alt4bd2_ | 1.058 | 1.058 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 80750 | NGILA230 | 230 | 8 | 800 | base | ivsg_hs_alt4bd2_ | 1.059 | 1.059 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15041 | SILVERKG | 500 | 14 | 158 | base | ivsg_hs_alt4bd2_ | 1.06 | 1.06 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14205 | COCONINO | 230 | 14 | 141 | base | ivsg_hs_alt4bd2_ | 1.06 | 1.06 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14008 | JOJOBA | 500 | 14 | 141 | base | ivsg_hs_alt4bd2_ | 1.06 | 1.06 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15034 | PERKINS | 500 | 14 | 158 | base | ivsg_hs_alt4bd2_ | 1.061 | 1.061 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15061 | RUDD | 500 | 14 | 158 | base | ivsg_hs_alt4bd2_ | 1.061 | 1.061 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15093 | HARQUAHA | 500 | 14 | 158 | base | ivsg_hs_alt4bd2_ | 1.061 | 1.061 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24086 | LUGO | 500 | 24 | 240 | base | ivsg_hs_alt4bd2_ | 1.061 | 1.061 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14234 | YAVAPAI | 230 | 14 | 141 | base | ivsg_hs_alt4bd2_ | 1.062 | 1.062 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 22360 | IMPRLVLY | 500 | 22 | 227 | base | ivsg_hs_alt4bd2_ | 1.062 | 1.062 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14355 | PRESCOTT | 115 | 14 | 141 | base | ivsg_hs_alt4bd2_ | 1.065 | 1.065 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14544 | PRESCOT2 | 100 | 14 | 141 | base | ivsg_hs_alt4bd2_ | 1.065 | 1.065 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14543 | PRESCOT1 | 100 | 14 | 141 | base | ivsg_hs_alt4bd2_ | 1.065 | 1.065 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14256 | FLAGSTAF | 230 | 14 | 141 | base | ivsg_hs_alt4bd2_ | 1.065 | 1.065 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14587 | FLAGSTF1 | 100 | 14 | 141 | base | ivsg_hs_alt4bd2_ | 1.066 | 1.066 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14001 | FOURCORN | 500 | 14 | 141 | base | ivsg_hs_alt4bd2_ | 1.068 | 1.068 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24729 | INYO | 230 | 24 | 247 | base | ivsg_hs_alt4bd2_ | 1.068 | 1.068 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24156 | VINCENT | 500 | 24 | 240 | base | ivsg_hs_alt4bd2_ | 1.068 | 1.068 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14007 | GILARIVR | 500 | 14 | 141 | base | ivsg_hs_alt4bd2_ | 1.069 | 1.069 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 79264 | PINAL_W | 500 | 14 | 141 | base | ivsg_hs_alt4bd2_ | 1.069 | 1.069 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14006 | YAVAPAI | 500 | 14 | 141 | base | ivsg_hs_alt4bd2_ | 1.07 | 1.07 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 80550 | HILNE500 | 500 | 8 | 800 | base | ivsg_hs_alt4bd2_ | 1.07 | 1.07 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 22536 | N.GILA | 500 | 22 | 227 | base | ivsg_hs_alt4bd2_ | 1.072 | 1.072 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14004 | SAGUARO | 500 | 14 | 141 | base | ivsg_hs_alt4bd2_ | 1.073 | 1.073 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15992 | SEV | 500 | 14 | 158 | base | ivsg_hs_alt4bd2_ | 1.073 | 1.073 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 16000 | TORTOLIT | 500 | 14 | 160 | base | ivsg_hs_alt4bd2_ | 1.073 | 1.073 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 16001 | TORTLIT2 | 500 | 14 | 160 | base | ivsg_hs_alt4bd2_ | 1.073 | 1.073 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14215 | LEUPP | 230 | 14 | 141 | base | ivsg_hs_alt4bd2_ | 1.074 | 1.074 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14100 | CHOLLA | 345 | 14 | 141 | base | ivsg_hs_alt4bd2_ | 1.075 | 1.075 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15001 | CORONADO | 500 | 14 | 158 | base | ivsg_hs_alt4bd2_ | 1.079 | 1.079 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14000 | CHOLLA | 500 | 14 | 141 | base | ivsg_hs_alt4bd2_ | 1.08 | 1.08 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 19038 | MEAD | 500 | 14 | 191 | base | ivsg_hs_alt4bd2_ | 1.086 | 1.086 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14204 | CHOLLA | 230 | 14 | 141 | base | ivsg_hs_alt4bd2_ | 1.087 | 1.087 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24042 | ELDORDO | 500 | 24 | 240 | base | ivsg_hs_alt4bd2_ | 1.087 | 1.087 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24097 | MOHAVE | 500 | 24 | 240 | base | ivsg_hs_alt4bd2_ | 1.089 | 1.089 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14509 | CHOLLA 7 | 100 | 14 | 141 | base | ivsg_hs_alt4bd2_ | 1.092 | 1.092 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14267 | SECDKNOL | 230 | 14 | 141 | base | ivsg_hs_alt4bd2_ | 1.098 | 1.098 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14003 | NAVAJO | 500 | 14 | 141 | base | ivsg_hs_alt4bd2_ | 1.102 | 1.102 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14002 | MOENKOPI | 500 | 14 | 141 | base | ivsg_hs_alt4bd2_ | 1.105 | 1.105 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |

ivsg_hs_alt4b_D2.sav
Flow Summary
N-0 Outages

| LEGEND | % of RATING 1 | |
|---|---|---|
| C_pu | 100% - 110% | |
| C_pu | 110% - 120% | P.U. of |
| C_pu | > 120% | Rate 1 |

| FROM | FR | BKV | TO | TO | BKV | CK | Outage_Name | Case | Rate-Mva | Pflow | Qflow | Amps | MVA | C_pu | B_pu | Contingency_Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 14248 | GLENDALW | 230 | 14212 | GLENDALE | 230 | 1 | base | ivsg_hs_alt4bd2_ | 457 | 605.7 | 29.2 | 1520 | 606.4 | 1.325 | 1.325 | Base system (n-0) |
| 14248 | GLENDALW | 230 | 15201 | AGUAFRIA | 230 | 1 | base | ivsg_hs_alt4bd2_ | 457 | -605.7 | -29.2 | 1520 | 606.4 | 1.325 | 1.325 | Base system (n-0) |
| 14221 | PNPKAPS | 230 | 19062 | PINPK | 230 | 1 | base | ivsg_hs_alt4bd2_ | 637.4 | -787.1 | -182.7 | 1993 | 808 | 1.246 | 1.246 | Base system (n-0) |
| 24910 | CAL ELEC | 115 | 24912 | SHANDIN | 115 | 1 | base | ivsg_hs_alt4bd2_ | 109.1 | -124.2 | 58.2 | 680.3 | 137.1 | 1.245 | 1.245 | Base system (n-0) |
| 14212 | GLENDALE | 230 | 14270 | GRNDTRML | 230 | 1 | base | ivsg_hs_alt4bd2_ | 457 | 540.3 | 21.5 | 1355.5 | 540.7 | 1.183 | 1.183 | Base system (n-0) |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | base | ivsg_hs_alt4bd2_ | 204.1 | 242.4 | -9.3 | 1001.2 | 242.6 | 1.173 | 1.173 | Base system (n-0) |
| 24912 | SHANDIN | 115 | 24916 | TAP902 | 115 | 1 | base | ivsg_hs_alt4bd2_ | 109.1 | -119.2 | 33.5 | 611.2 | 123.8 | 1.117 | 1.117 | Base system (n-0) |
| 14206 | CTRYCLUB | 230 | 14270 | GRNDTRML | 230 | 1 | base | ivsg_hs_alt4bd2_ | 509.9 | -536.5 | -17.8 | 1357.9 | 536.8 | 1.061 | 1.061 | Base system (n-0) |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | base | ivsg_hs_alt4bd2_ | 392 | 393.5 | 10.7 | 981.3 | 393.6 | 1 | 1 | Base system (n-0) |
| 14202 | CACTUS | 230 | 14221 | PNPKAPS | 230 | 1 | base | ivsg_hs_alt4bd2_ | 371 | -366.9 | -47.1 | 930.3 | 370 | 0.999 | 0.999 | Base system (n-0) |
| 14008 | JOJOBA | 500 | 15011 | KYRENE | 500 | 1 | base | ivsg_hs_alt4bd2_ | 1732 | 1807 | 164.4 | 1975.8 | 1814.5 | 0.99 | 0.99 | Base system (n-0) |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | base | ivsg_hs_alt4bd2_ | 132 | 128.9 | -10.9 | 813.2 | 129.3 | 0.982 | 0.982 | Base system (n-0) |
| 15230 | RUDD | 230 | 15218 | WHITETNK | 230 | 1 | base | ivsg_hs_alt4bd2_ | 725 | 693.1 | -17.4 | 1738.3 | 693.3 | 0.955 | 0.955 | Base system (n-0) |
| 24087 | MAGUNDEN | 230 | 24101 | OMAR | 230 | 1 | base | ivsg_hs_alt4bd2_ | 643 | -591.8 | 130.9 | 1531.7 | 606.2 | 0.95 | 0.95 | Base system (n-0) |
| 24806 | MIRAGE | 230 | 24807 | MIRAGE | 115 | 1 | base | ivsg_hs_alt4bd2_ | 280 | 265.7 | 28.3 | 679.6 | 267.2 | 0.95 | 0.95 | Base system (n-0) |
| 24806 | MIRAGE | 230 | 24807 | MIRAGE | 115 | 2 | base | ivsg_hs_alt4bd2_ | 280 | 265.7 | 28.3 | 679.6 | 267.2 | 0.95 | 0.95 | Base system (n-0) |
| 24702 | KRAMER | 115 | 24753 | SUNGEN | 115 | 1 | base | ivsg_hs_alt4bd2_ | 183.3 | -170.5 | 31.4 | 863.7 | 173.4 | 0.939 | 0.939 | Base system (n-0) |
| 14207 | DEERVALY | 230 | 14231 | WESTWING | 230 | 1 | base | ivsg_hs_alt4bd2_ | 720 | -667.4 | -77.9 | 1686.4 | 672 | 0.933 | 0.933 | Base system (n-0) |
| 26098 | SYLMAR3 | 230 | 24147 | SYLMAR S | 230 | 1 | base | ivsg_hs_alt4bd2_ | 1100 | 840.1 | -522.2 | 2563 | 989.2 | 0.928 | 0.928 | Base system (n-0) |
| 17003 | AVRA | 115 | 17012 | MARANA | 115 | 1 | base | ivsg_hs_alt4bd2_ | 71.7 | -64.9 | -5.8 | 333.3 | 65.2 | 0.926 | 0.926 | Base system (n-0) |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | base | ivsg_hs_alt4bd2_ | 56 | 49.9 | -10.8 | 252.9 | 51.1 | 0.92 | 0.92 | Base system (n-0) |
| 19215 | SPOOKHIL | 230 | 19045 | COOLIDGE | 230 | 1 | base | ivsg_hs_alt4bd2_ | 352 | -318.1 | 46 | 808.6 | 321.4 | 0.917 | 0.917 | Base system (n-0) |
| 15212 | ROGERS | 230 | 19215 | SPOOKHIL | 230 | 1 | base | ivsg_hs_alt4bd2_ | 352 | -316.3 | 56 | 807.8 | 321.2 | 0.915 | 0.915 | Base system (n-0) |
| 22261 | EPP | 230 | 22260 | ESCNDIDO | 230 | 1 | base | ivsg_hs_alt4bd2_ | 796.7 | 734.6 | -38.9 | 1825.9 | 735.7 | 0.913 | 0.913 | Base system (n-0) |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | base | ivsg_hs_alt4bd2_ | 392 | 350.2 | 37.9 | 877.3 | 352.3 | 0.9 | 0.9 | Base system (n-0) |

| Bus | Name | kV | Area | Zone | Outage | Case | Vbase | Vcont | DeltaV | Vmin | Vmax | Max-dv | Contingency Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24017 | BLYTHESC | 161 | 24 | 248 | line_007 | ivsg_hs_alt4bd2_ | 1.02 | 0.864 | -0.156 | 0.9 | 1.05 | 0.05 | line BLYTHE to BLYTHESC 161 ck 1 |
| 24822 | INDIAN W | 115 | 24 | 248 | tran_238 | ivsg_hs_alt4bd2_ | 1.021 | 0.923 | -0.097 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 24819 | CONCHO | 115 | 24 | 248 | tran_238 | ivsg_hs_alt4bd2_ | 1.021 | 0.924 | -0.097 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 24731 | INYOKERN | 115 | 24 | 247 | line_175 | ivsg_hs_alt4bd2_ | 1 | 0.926 | -0.074 | 0.9 | 1.05 | 0.05 | line INYO to COTTONWD 230 ck 1 |
| 24816 | SANTA RO | 115 | 24 | 248 | tran_238 | ivsg_hs_alt4bd2_ | 1.025 | 0.928 | -0.097 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 24821 | TAMARISK | 115 | 24 | 248 | tran_238 | ivsg_hs_alt4bd2_ | 1.025 | 0.929 | -0.096 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 25633 | CAPWIND | 115 | 24 | 248 | tran_238 | ivsg_hs_alt4bd2_ | 1.027 | 0.931 | -0.096 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 24827 | TAP823 | 115 | 24 | 248 | tran_238 | ivsg_hs_alt4bd2_ | 1.027 | 0.931 | -0.096 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 25622 | TAP806 | 115 | 24 | 248 | tran_238 | ivsg_hs_alt4bd2_ | 1.027 | 0.931 | -0.096 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 24829 | TAP821 | 115 | 24 | 248 | tran_238 | ivsg_hs_alt4bd2_ | 1.027 | 0.931 | -0.096 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 24807 | MIRAGE | 115 | 24 | 248 | tran_238 | ivsg_hs_alt4bd2_ | 1.029 | 0.934 | -0.095 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 22464 | MIGUEL | 230 | 22 | 222 | B2_002 | ivsg_hs_alt4bd2_ | 1.008 | 0.937 | -0.071 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22468 | MIGUEL | 500 | 22 | 227 | B2_002 | ivsg_hs_alt4bd2_ | 1.019 | 0.937 | -0.082 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22472 | MIGUELMP | 500 | 22 | 227 | B2_002 | ivsg_hs_alt4bd2_ | 1.011 | 0.937 | -0.073 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22412 | LOSCOCHS | 138 | 22 | 223 | B2_002 | ivsg_hs_alt4bd2_ | 1.002 | 0.94 | -0.062 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22428 | MAINST51 | 138 | 22 | 222 | B2_002 | ivsg_hs_alt4bd2_ | 1.001 | 0.942 | -0.059 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22424 | MAINST50 | 138 | 22 | 222 | B2_002 | ivsg_hs_alt4bd2_ | 1.002 | 0.943 | -0.059 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22734 | SANTEE | 138 | 22 | 223 | B2_002 | ivsg_hs_alt4bd2_ | 1.002 | 0.943 | -0.059 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 25423 | ESRP MWD | 115 | 24 | 254 | tran_247 | ivsg_hs_alt4bd2_ | 1.029 | 0.943 | -0.085 | 0.9 | 1.05 | 0.05 | tran VALLEYSC 500 to VALLEYSC 115 ck 1 |
| 25423 | ESRP MWD | 115 | 24 | 254 | tran_248 | ivsg_hs_alt4bd2_ | 1.029 | 0.943 | -0.085 | 0.9 | 1.05 | 0.05 | tran VALLEYSC 500 to VALLEYSC 115 ck 2 |
| 24160 | VALLEYSC | 115 | 24 | 240 | tran_247 | ivsg_hs_alt4bd2_ | 1.031 | 0.946 | -0.085 | 0.9 | 1.05 | 0.05 | tran VALLEYSC 500 to VALLEYSC 115 ck 1 |
| 25990 | VALYSVC1 | 115 | 24 | 240 | tran_247 | ivsg_hs_alt4bd2_ | 1.031 | 0.946 | -0.085 | 0.9 | 1.05 | 0.05 | tran VALLEYSC 500 to VALLEYSC 115 ck 1 |
| 24160 | VALLEYSC | 115 | 24 | 240 | tran_248 | ivsg_hs_alt4bd2_ | 1.031 | 0.946 | -0.085 | 0.9 | 1.05 | 0.05 | tran VALLEYSC 500 to VALLEYSC 115 ck 2 |
| 25990 | VALYSVC1 | 115 | 24 | 240 | tran_248 | ivsg_hs_alt4bd2_ | 1.031 | 0.946 | -0.085 | 0.9 | 1.05 | 0.05 | tran VALLEYSC 500 to VALLEYSC 115 ck 2 |
| 25405 | IRON MTN | 230 | 24 | 248 | line_192 | ivsg_hs_alt4bd2_ | 1.002 | 0.949 | -0.052 | 0.9 | 1.05 | 0.05 | line IRON MTN to CAMINO 230 ck 1 |
| 22772 | SOUTHBAY | 138 | 22 | 222 | B2_002 | ivsg_hs_alt4bd2_ | 1.01 | 0.95 | -0.059 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22832 | SYCAMORE | 230 | 22 | 221 | B2_002 | ivsg_hs_alt4bd2_ | 1.007 | 0.95 | -0.057 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22116 | CARLTHTP | 138 | 22 | 223 | B2_002 | ivsg_hs_alt4bd2_ | 1.007 | 0.952 | -0.056 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22120 | CARLTNHS | 138 | 22 | 223 | B2_002 | ivsg_hs_alt4bd2_ | 1.008 | 0.953 | -0.055 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22865 | UPTOWN | 138 | 22 | 221 | B2_002 | ivsg_hs_alt4bd2_ | 1.01 | 0.954 | -0.056 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22852 | TELECYN | 138 | 22 | 222 | B2_002 | ivsg_hs_alt4bd2_ | 1.022 | 0.959 | -0.063 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22500 | MISSION | 138 | 22 | 221 | B2_002 | ivsg_hs_alt4bd2_ | 1.011 | 0.96 | -0.051 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22672 | PRCTRVLY | 138 | 22 | 222 | B2_002 | ivsg_hs_alt4bd2_ | 1.025 | 0.96 | -0.065 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22831 | SYCAMORE | 138 | 22 | 221 | B2_002 | ivsg_hs_alt4bd2_ | 1.014 | 0.96 | -0.053 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22460 | MIGUEL | 138 | 22 | 222 | B2_002 | ivsg_hs_alt4bd2_ | 1.027 | 0.961 | -0.066 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22738 | CENTRALX | 230 | 22 | 225 | B2_002 | ivsg_hs_alt4bd2_ | 1.027 | 0.967 | -0.06 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22737 | CENTRALX | 500 | 22 | 225 | B2_002 | ivsg_hs_alt4bd2_ | 1.031 | 0.973 | -0.058 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 14534 | N.GILA 4 | 100 | 14 | 847 | NG500/69 | ivsg_hs_alt4bd2_ | 0.948 | 1 | 0.052 | 0.9 | 1.05 | 0.05 | tran N.GILA 500 to N.GILA 69 ck 1 |
| 24035 | EAGLEMTN | 161 | 24 | 248 | tran_241 | ivsg_hs_alt4bd2_ | 0.926 | 1.026 | 0.1 | 0.9 | 1.05 | 0.05 | tran EAGLEMTN 230 to EAGLEMTN 161 ck 1 |
| 24730 | INYO PS | 115 | 24 | 247 | tran_229 | ivsg_hs_alt4bd2_ | 1.026 | 1.078 | 0.052 | 0.9 | 1.05 | 0.05 | tran INYO 115 to INYO PS 115 ck 1 |
| 24142 | SYC CYN | 230 | 24 | 240 | line_086 | ivsg_hs_alt4bd2_ | 0.985 | 1.091 | 0.106 | 0.9 | 1.05 | 0.05 | line MAGUNDEN to OMAR 230 ck 1 |
| 25613 | EDMONSTN | 230 | 24 | 256 | line_122 | ivsg_hs_alt4bd2_ | 1 | 1.091 | 0.091 | 0.9 | 1.05 | 0.05 | line PASTORIA to EDMONSTN 230 ck 1 |
| 24142 | SYC CYN | 230 | 24 | 240 | line_140 | ivsg_hs_alt4bd2_ | 0.985 | 1.091 | 0.106 | 0.9 | 1.05 | 0.05 | line SYC CYN to OMAR 230 ck 1 |

ivsg_hs_alt4b_D2.sav
FLOW Summary
N-1 Outages

| LEGEND | % of RATING 1 | |
|---|---|---|
| C_pu | 100% - 110% | |
| C_pu | 110% - 120% | P.U. of |
| C_pu | > 120% | Rate 1 |

| FROM | FR | BKV | TO | TO | BKV | CK | Outage_Name | Case | Rate-Mva | Pflow | Qflow | Amps | MVA | C_pu | B_pu | Contingency_Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24142 | SYC CYN | 230 | 24101 | OMAR | 230 | 1 | line_086 | ivsg_hs_alt4bd2_ | 643 | 769 | 5511.2 | 12804.3 | 5564.5 | 7.934 | 0.47 | line MAGUNDEN to OMAR 230 ck 1 |
| 24781 | NAVYCOSO | 230 | 24706 | BLM EAST | 230 | 1 | line_173 | ivsg_hs_alt4bd2_ | 1287 | -153.8 | -3160.7 | 7943.3 | 3164.4 | 2.459 | 0.056 | line BLM EAST to BLM WEST 230 ck 1 |
| 24781 | NAVYCOSO | 230 | 24706 | BLM EAST | 230 | 1 | line_174 | ivsg_hs_alt4bd2_ | 1287 | -153.8 | -3160.7 | 7943.3 | 3164.4 | 2.459 | 0.056 | line BLM WEST to KRAMER 230 ck 1 |
| 24806 | MIRAGE | 230 | 24807 | MIRAGE | 115 | 2 | tran_238 | ivsg_hs_alt4bd2_ | 280 | 532.5 | 213.7 | 1497.7 | 573.7 | 2.05 | 0.95 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_175 | ivsg_hs_alt4bd2_ | 56 | -103.6 | -1.2 | 532.2 | 103.6 | 1.86 | 0.92 | line INYO to COTTONWD 230 ck 1 |
| 24151 | VALLEYSC | 500 | 24160 | VALLEYSC | 115 | 2 | tran_247 | ivsg_hs_alt4bd2_ | 560 | 853.2 | 355.8 | 1023.3 | 924.4 | 1.65 | 0.77 | tran VALLEYSC 500 to VALLEYSC 115 ck 1 |
| 24151 | VALLEYSC | 500 | 24160 | VALLEYSC | 115 | 1 | tran_248 | ivsg_hs_alt4bd2_ | 560 | 853.2 | 355.8 | 1023.3 | 924.4 | 1.65 | 0.77 | tran VALLEYSC 500 to VALLEYSC 115 ck 2 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_009 | ivsg_hs_alt4bd2_ | 204.1 | 329.4 | -13.6 | 1376.6 | 329.7 | 1.612 | 1.173 | EPP - ESCNDIDO 1 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_002 | ivsg_hs_alt4bd2_ | 204.1 | 314.9 | -7.8 | 1372.2 | 315 | 1.607 | 1.173 | IMPRLVLY - MIGUEL 1 500kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_034 | ivsg_hs_alt4bd2_ | 204.1 | 315.1 | -13.3 | 1327.4 | 315.4 | 1.555 | 1.173 | OLD TOWN - MLMS3TAP 1 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_032 | ivsg_hs_alt4bd2_ | 204.1 | 315.1 | -14 | 1326.8 | 315.4 | 1.554 | 1.173 | OTAYMESA - MLMS3TAP 1 230kV |
| 24151 | VALLEYSC | 500 | 24229 | VALLEY-S | 115 | 4 | tran_249 | ivsg_hs_alt4bd2_ | 560 | 830.7 | 203 | 943.4 | 855.1 | 1.53 | 0.75 | tran VALLEYSC 500 to VALLEY-S 115 ck 3 |
| 24151 | VALLEYSC | 500 | 24229 | VALLEY-S | 115 | 3 | tran_250 | ivsg_hs_alt4bd2_ | 560 | 830.7 | 203 | 943.4 | 855.1 | 1.53 | 0.75 | tran VALLEYSC 500 to VALLEY-S 115 ck 4 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | SX70 | ivsg_hs_alt4bd2_ | 204.1 | 288.6 | 4.8 | 1196.7 | 288.7 | 1.401 | 1.173 | tran SYCAMORE 230 to SYCAMORE 69 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_202 | ivsg_hs_alt4bd2_ | 56 | 77.4 | -7.5 | 392.3 | 77.7 | 1.4 | 0.92 | line OWENSCON to INYO 230 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | ML60 | ivsg_hs_alt4bd2_ | 204.1 | 286.3 | -6.4 | 1188.3 | 286.3 | 1.392 | 1.173 | tran MIGUEL 230 to MIGUEL 138 ck 1 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | B2_009 | ivsg_hs_alt4bd2_ | 392 | 542.8 | 31.6 | 1368.7 | 543.7 | 1.39 | 1 | EPP - ESCNDIDO 1 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_013 | ivsg_hs_alt4bd2_ | 204.1 | 271.6 | -12.7 | 1125.5 | 271.9 | 1.318 | 1.173 | EPP - SYCAMORE 1 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | MS60 | ivsg_hs_alt4bd2_ | 204.1 | 264.8 | -3.5 | 1096.6 | 264.8 | 1.284 | 1.173 | tran MISSION 230 to MISSION 138 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | MS61 | ivsg_hs_alt4bd2_ | 204.1 | 264.8 | -3.5 | 1096.6 | 264.8 | 1.284 | 1.173 | tran MISSION 230 to MISSION 138 ck 2 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | B2_032 | ivsg_hs_alt4bd2_ | 392 | 494.8 | 15.6 | 1258.8 | 495 | 1.26 | 1 | OTAYMESA - MLMS3TAP 1 230kV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | B2_034 | ivsg_hs_alt4bd2_ | 392 | 494.8 | 16.2 | 1259.4 | 495.1 | 1.26 | 1 | OLD TOWN - MLMS3TAP 1 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | ML70 | ivsg_hs_alt4bd2_ | 204.1 | 257.4 | -5 | 1067 | 257.5 | 1.25 | 1.173 | tran MIGUEL 69 to MIGUEL 230 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | ML71 | ivsg_hs_alt4bd2_ | 204.1 | 257.4 | -5 | 1067 | 257.5 | 1.25 | 1.173 | tran MIGUEL 69 to MIGUEL 230 ck 2 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_015 | ivsg_hs_alt4bd2_ | 204.1 | 257.3 | -7.9 | 1064.8 | 257.5 | 1.247 | 1.173 | MIGUEL - MISSION 1 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_020 | ivsg_hs_alt4bd2_ | 204.1 | 256.9 | -8.5 | 1063 | 257 | 1.245 | 1.173 | MIGUEL - MISSION 2 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | ML80 | ivsg_hs_alt4bd2_ | 204.1 | 252.5 | -9.3 | 1048.4 | 252.7 | 1.228 | 1.173 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | MS70 | ivsg_hs_alt4bd2_ | 204.1 | 252.1 | -2.9 | 1044.9 | 252.2 | 1.224 | 1.173 | tran MISSION 230 to MISSION 69 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | ML81 | ivsg_hs_alt4bd2_ | 204.1 | 251.6 | -9.2 | 1044.1 | 251.8 | 1.223 | 1.173 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_007 | ivsg_hs_alt4bd2_ | 204.1 | 251.5 | -7.7 | 1040.8 | 251.6 | 1.219 | 1.173 | PENSQTOS - ENCINA 1 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | SO2 | ivsg_hs_alt4bd2_ | 204.1 | 249 | -7.1 | 1040 | 249.1 | 1.218 | 1.173 | gen S.ONOFR2 22.00 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_014 | ivsg_hs_alt4bd2_ | 204.1 | 251.8 | -7.7 | 1038.5 | 251.9 | 1.216 | 1.173 | ENCINATP - ENCINA 1 230kV |
| 24723 | CONTROL | 115 | 24731 | INYOKERN | 115 | 1 | line_175 | ivsg_hs_alt4bd2_ | 82.7 | 96.2 | -4 | 497.6 | 96.3 | 1.199 | 0.421 | line INYO to COTTONWD 230 ck 1 |
| 24723 | CONTROL | 115 | 24731 | INYOKERN | 115 | 2 | line_175 | ivsg_hs_alt4bd2_ | 82.7 | 96.2 | -4 | 497.6 | 96.3 | 1.199 | 0.421 | line INYO to COTTONWD 230 ck 1 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | B2_002 | ivsg_hs_alt4bd2_ | 392 | 465.7 | 0.8 | 1230.8 | 465.7 | 1.19 | 1 | IMPRLVLY - MIGUEL 1 500kV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | SX70 | ivsg_hs_alt4bd2_ | 392 | 466.1 | 39.7 | 1165 | 467.7 | 1.19 | 1 | tran SYCAMORE 230 to SYCAMORE 69 ck 1 |
| 22468 | MIGUEL | 500 | 22472 | MIGUELMP | 500 | 1 | ML81 | ivsg_hs_alt4bd2_ | 1120 | 1294 | 257.9 | 1493.8 | 1319.4 | 1.18 | 0.68 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 22356 | IMPRLVLY | 230 | 22360 | IMPRLVLY | 500 | 1 | IV81 | ivsg_hs_alt4bd2_ | 600 | 696 | 105.4 | 1755 | 703.9 | 1.17 | 0.53 | tran IMPRLVLY 230 to IMPRLVLY 500 ck 2 |
| 22464 | MIGUEL | 230 | 22468 | MIGUEL | 500 | 1 | ML80 | ivsg_hs_alt4bd2_ | 1120 | -1274.1 | -43.6 | 3205.2 | 1274.8 | 1.16 | 0.64 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 22464 | MIGUEL | 230 | 22472 | MIGUELMP | 500 | 1 | ML81 | ivsg_hs_alt4bd2_ | 1120 | -1291.7 | -46.7 | 3247.4 | 1292.6 | 1.16 | 0.68 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | line_7 | ivsg_hs_alt4bd2_ | 204.1 | 236 | -6.1 | 970.7 | 236.1 | 1.137 | 1.173 | line BANIS230 to NEWSF230 230 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | tran_74 | ivsg_hs_alt4bd2_ | 204.1 | 236 | -6.1 | 970.7 | 236.1 | 1.137 | 1.173 | tran NEWSF230 230 to NEWSF500 500 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_028 | ivsg_hs_alt4bd2_ | 204.1 | 234.4 | -9.2 | 969 | 234.6 | 1.135 | 1.173 | MIGUEL - SYCAMORE 1 230kV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | B2_013 | ivsg_hs_alt4bd2_ | 392 | 443.4 | 14 | 1109.3 | 443.7 | 1.13 | 1 | EPP - SYCAMORE 1 230kV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | ML60 | ivsg_hs_alt4bd2_ | 392 | 440.9 | 20 | 1105 | 441.4 | 1.13 | 1 | tran MIGUEL 230 to MIGUEL 138 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_008 | ivsg_hs_alt4bd2_ | 204.1 | 232.8 | -5 | 963.1 | 232.9 | 1.128 | 1.173 | PENSQTOS - OLD TOWN 1 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | line_56 | ivsg_hs_alt4bd2_ | 204.1 | 230.3 | -14.3 | 958.6 | 230.8 | 1.123 | 1.173 | line NEWSF500 to IMPRLVLY 500 ck 1 |
| 24729 | INYO | 230 | 24730 | INYO PS | 115 | 1 | line_175 | ivsg_hs_alt4bd2_ | 50 | 51.8 | 21.3 | 133 | 56 | 1.12 | 0.54 | line INYO to COTTONWD 230 ck 1 |
| 24729 | INYO | 230 | 24730 | INYO PS | 115 | 2 | line_175 | ivsg_hs_alt4bd2_ | 50 | 51.8 | 21.3 | 133 | 56 | 1.12 | 0.54 | line INYO to COTTONWD 230 ck 1 |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | line_12 | ivsg_hs_alt4bd2_ | 132 | 145.6 | -9.2 | 924.2 | 145.9 | 1.116 | 0.982 | line COACHELA to RAMON 230 ck 2 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | B2_002 | ivsg_hs_alt4bd2_ | 1120 | -1216.7 | -104.5 | 3171.1 | 1221.2 | 1.1 | 0.6 | IMPRLVLY - MIGUEL 1 500kV |
| 22261 | EPP | 230 | 22260 | ESCNDIDO | 230 | 1 | B2_032 | ivsg_hs_alt4bd2_ | 796.7 | 863.6 | -64.1 | 2169.6 | 866 | 1.085 | 0.913 | OTAYMESA - MLMS3TAP 1 230kV |
| 22261 | EPP | 230 | 22260 | ESCNDIDO | 230 | 1 | B2_034 | ivsg_hs_alt4bd2_ | 796.7 | 863.6 | -63.4 | 2170.1 | 865.9 | 1.085 | 0.913 | OLD TOWN - MLMS3TAP 1 230kV |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 2 | line_070 | ivsg_hs_alt4bd2_ | 956 | -1023.6 | -32.4 | 2603.4 | 1024.1 | 1.085 | 0.594 | line LA FRESA to REDONDO 230 ck 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 1 | line_071 | ivsg_hs_alt4bd2_ | 956 | -1023.6 | -32.4 | 2603.4 | 1024.1 | 1.085 | 0.594 | line LA FRESA to REDONDO 230 ck 2 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24701 | KRAMER | 230 | 24085 | LUGO | 230 | 2 | line_169 | ivsg_hs_alt4bd2_ | 478 | 526.2 | -0.8 | 1298.3 | 526.2 | 1.082 | 0.643 | line KRAMER to LUGO 230 ck 1 |
| 24701 | KRAMER | 230 | 24085 | LUGO | 230 | 1 | line_170 | ivsg_hs_alt4bd2_ | 478 | 526.2 | -0.8 | 1298.3 | 526.2 | 1.082 | 0.643 | line KRAMER to LUGO 230 ck 2 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | B2_015 | ivsg_hs_alt4bd2_ | 392 | 415.4 | 14.9 | 1037.8 | 415.6 | 1.06 | 1 | MIGUEL - MISSION 1 230kV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | B2_020 | ivsg_hs_alt4bd2_ | 392 | 414.7 | 14.1 | 1036.2 | 414.9 | 1.06 | 1 | MIGUEL - MISSION 2 230kV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | MS60 | ivsg_hs_alt4bd2_ | 392 | 416.7 | 19 | 1042 | 417.1 | 1.06 | 1 | tran MISSION 230 to MISSION 138 ck 1 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | MS61 | ivsg_hs_alt4bd2_ | 392 | 416.7 | 19 | 1042 | 417.1 | 1.06 | 1 | tran MISSION 230 to MISSION 138 ck 2 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_169 | ivsg_hs_alt4bd2_ | 56 | 58 | -10 | 292.8 | 58.9 | 1.06 | 0.92 | line KRAMER to LUGO 230 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_170 | ivsg_hs_alt4bd2_ | 56 | 58 | -10 | 292.8 | 58.9 | 1.06 | 0.92 | line KRAMER to LUGO 230 ck 2 |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | line_52 | ivsg_hs_alt4bd2_ | 132 | 138.5 | -11.8 | 876.1 | 139 | 1.058 | 0.982 | line AVE58230 to AV58TP22 230 ck 1 |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | line_53 | ivsg_hs_alt4bd2_ | 132 | 138.6 | -11.5 | 875.7 | 139.1 | 1.057 | 0.982 | line AV58TP22 to COACHELA 230 ck 1 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | SO2 | ivsg_hs_alt4bd2_ | 392 | 410.2 | 10 | 1035.3 | 410.4 | 1.05 | 1 | gen S.ONOFR2 22.00 |
| 22261 | EPP | 230 | 22260 | ESCNDIDO | 230 | 1 | SX60 | ivsg_hs_alt4bd2_ | 796.7 | 841 | -36.8 | 2095 | 841.8 | 1.048 | 0.913 | tran SYCAMORE 230 to SYCAMORE 138 ck 1 |
| 22261 | EPP | 230 | 22260 | ESCNDIDO | 230 | 1 | SX70 | ivsg_hs_alt4bd2_ | 796.7 | 837.8 | -12.1 | 2089.8 | 837.9 | 1.045 | 0.913 | tran SYCAMORE 230 to SYCAMORE 69 ck 1 |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_192 | ivsg_hs_alt4bd2_ | 169 | 173.3 | 42.9 | 628 | 178.6 | 1.041 | 0.851 | line IRON MTN to CAMINO 230 ck 1 |
| 22831 | SYCAMORE | 138 | 22124 | CHCARITA | 138 | 1 | B2_009 | ivsg_hs_alt4bd2_ | 204.1 | 211.6 | -22 | 888.2 | 212.7 | 1.04 | 0.729 | EPP - ESCNDIDO 1 230kV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | B2_014 | ivsg_hs_alt4bd2_ | 392 | 406.4 | 15.5 | 1011.8 | 406.7 | 1.04 | 1 | ENCINATP - ENCINA 1 230kV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | ML70 | ivsg_hs_alt4bd2_ | 392 | 409.3 | 15.9 | 1024.3 | 409.6 | 1.04 | 1 | tran MIGUEL 69 to MIGUEL 230 ck 1 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | ML71 | ivsg_hs_alt4bd2_ | 392 | 409.3 | 15.9 | 1024.3 | 409.6 | 1.04 | 1 | tran MIGUEL 69 to MIGUEL 230 ck 2 |
| 24114 | PARDEE | 230 | 24200 | SAUG TAP | 230 | 2 | line_117 | ivsg_hs_alt4bd2_ | 494 | 501.7 | 27.1 | 1275.5 | 502.5 | 1.029 | 0.51 | line PARDEE to SAUG TAP 230 ck 1 |
| 24114 | PARDEE | 230 | 24200 | SAUG TAP | 230 | 1 | line_118 | ivsg_hs_alt4bd2_ | 494 | 501.7 | 27.1 | 1275.4 | 502.4 | 1.029 | 0.518 | line PARDEE to SAUG TAP 230 ck 2 |
| 22261 | EPP | 230 | 22260 | ESCNDIDO | 230 | 1 | SO2 | ivsg_hs_alt4bd2_ | 796.7 | 816.3 | -43.9 | 2042.9 | 817.4 | 1.022 | 0.913 | gen S.ONOFR2 22.00 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_029 | ivsg_hs_alt4bd2_ | 204.1 | 210.9 | -3.7 | 871.4 | 210.9 | 1.021 | 1.173 | OTAYMESA - MLSXTAP 1 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_031 | ivsg_hs_alt4bd2_ | 204.1 | 210.7 | -4.6 | 871.5 | 210.7 | 1.021 | 1.173 | SYCAMORE - MLSXTAP 1 230kV |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | line_7 | ivsg_hs_alt4bd2_ | 132 | 131.7 | -11.4 | 843.8 | 132.2 | 1.019 | 0.982 | line BANIS230 to NEWSF230 230 ck 1 |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | tran_74 | ivsg_hs_alt4bd2_ | 132 | 131.7 | -11.4 | 843.4 | 132.2 | 1.018 | 0.982 | tran NEWSF230 230 to NEWSF500 500 ck 1 |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | line_303 | ivsg_hs_alt4bd2_ | 132 | 131.4 | -10.3 | 842 | 131.8 | 1.016 | 0.982 | line HARQUAHA to DEVERS 500 ck 1 |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | line_44 | ivsg_hs_alt4bd2_ | 132 | 132.2 | -10.2 | 838.5 | 132.6 | 1.012 | 0.982 | line COACHELA to DEVERS 230 ck 2 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_015 | ivsg_hs_alt4bd2_ | 392 | 391.4 | 48 | 981.3 | 394.3 | 1.01 | 0.9 | MIGUEL - MISSION 1 230kV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | SX60 | ivsg_hs_alt4bd2_ | 392 | 394.2 | 43.1 | 993.8 | 396.6 | 1.01 | 0.9 | tran SYCAMORE 230 to SYCAMORE 138 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_201 | ivsg_hs_alt4bd2_ | 56 | 54.6 | -10.7 | 276.6 | 55.7 | 1.01 | 0.92 | line SYLMAR3 to SYLMAR S 230 ck 1 |
| 24303 | BIG CRK3 | 230 | 24235 | RECTOR | 230 | 1 | line_155 | ivsg_hs_alt4bd2_ | 353 | 361 | 49.3 | 894.2 | 364.4 | 1.009 | 0.729 | line BIG CRK1 to RECTOR 230 ck 1 |
| 8376 | RTAP2 | 92 | 8974 | RTP1 | 92 | 1 | line_50 | ivsg_hs_alt4bd2_ | 57 | -54.6 | 11.5 | 358.9 | 55.8 | 1.006 | 0.765 | line BANIS230 to AV58TP12 230 ck 1 |
| 8376 | RTAP2 | 92 | 8974 | RTP1 | 92 | 1 | line_51 | ivsg_hs_alt4bd2_ | 57 | -54.7 | 11.4 | 359 | 55.8 | 1.006 | 0.765 | line AV58TP12 to AVE58230 230 ck 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_020 | ivsg_hs_alt4bd2_ | 392 | 390 | 46.3 | 978.1 | 392.7 | 1 | 0.9 | MIGUEL - MISSION 2 230kV |
| 24301 | BIG CRK1 | 230 | 24235 | RECTOR | 230 | 1 | line_160 | ivsg_hs_alt4bd2_ | 329 | 334.9 | 47.3 | 825.9 | 338.2 | 1 | 0.727 | line BIG CRK3 to RECTOR 230 ck 1 |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_191 | ivsg_hs_alt4bd2_ | 169 | 166.7 | 40.2 | 603 | 171.4 | 1 | 0.851 | line EAGLEMTN to IRON MTN 230 ck 1 |
| 20238 | HRD-230 | 230 | 20239 | HRD-115 | 115 | 1 | B2_002 | ivsg_hs_alt4bd2_ | 225 | 222.9 | 1.4 | 570.8 | 222.9 | 0.99 | 0.7 | IMPRLVLY - MIGUEL 1 500kV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | ML70 | ivsg_hs_alt4bd2_ | 392 | 383.7 | 45.9 | 965.8 | 386.4 | 0.99 | 0.9 | tran MIGUEL 69 to MIGUEL 230 ck 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | ML71 | ivsg_hs_alt4bd2_ | 392 | 383.7 | 45.9 | 965.8 | 386.4 | 0.99 | 0.9 | tran MIGUEL 69 to MIGUEL 230 ck 2 |
| 22504 | MISSION | 230 | 22500 | MISSION | 138 | 2 | MS60 | ivsg_hs_alt4bd2_ | 392 | 373 | 113.3 | 984 | 389.9 | 0.99 | 0.67 | tran MISSION 230 to MISSION 138 ck 1 |
| 22504 | MISSION | 230 | 22500 | MISSION | 138 | 1 | MS61 | ivsg_hs_alt4bd2_ | 392 | 373 | 113.3 | 984 | 389.9 | 0.99 | 0.67 | tran MISSION 230 to MISSION 138 ck 2 |
| 24086 | LUGO | 500 | 24097 | MOHAVE | 500 | 1 | line_103 | ivsg_hs_alt4bd2_ | 1386 | -1427.1 | 97.6 | 1564.2 | 1430.4 | 0.988 | 0.672 | line MOHAVE to ELDORDO 500 ck 1 |
| 22261 | EPP | 230 | 22260 | ESCNDIDO | 230 | 1 | line_207 | ivsg_hs_alt4bd2_ | 796.7 | 789 | -46.9 | 1968.5 | 790.4 | 0.984 | 0.913 | line DEVERS to VALLEYSC 500 ck 1 |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_63 | ivsg_hs_alt4bd2_ | 169 | 166 | 30 | 593.2 | 168.7 | 0.982 | 0.851 | line RAMON to MIRAGE 230 ck 2 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_032 | ivsg_hs_alt4bd2_ | 392 | 381.9 | 42.2 | 975.5 | 384.2 | 0.98 | 0.9 | OTAYMESA - MLMS3TAP 1 230kV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_034 | ivsg_hs_alt4bd2_ | 392 | 381.8 | 42.6 | 976 | 384.2 | 0.98 | 0.9 | OLD TOWN - MLMS3TAP 1 230kV |
| 8311 | COACHELA | 230 | 8695 | RAMON | 230 | 2 | line_44 | ivsg_hs_alt4bd2_ | 800 | 756.8 | -46.3 | 1966.2 | 758.2 | 0.979 | 0.725 | line COACHELA to DEVERS 230 ck 2 |
| 19020 | BLYTHE | 161 | 24017 | BLYTHESC | 161 | 1 | line_192 | ivsg_hs_alt4bd2_ | 244 | 239.8 | 43.1 | 856.8 | 243.7 | 0.979 | 0.853 | line IRON MTN to CAMINO 230 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_123 | ivsg_hs_alt4bd2_ | 56 | 52.6 | -10.7 | 266.5 | 53.7 | 0.97 | 0.92 | line PASTORIA to PSTRIA 230 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_200 | ivsg_hs_alt4bd2_ | 56 | 52.6 | -10.8 | 266.7 | 53.7 | 0.97 | 0.92 | line SYLMAR1 to SYLMAR S 230 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | tran_210 | ivsg_hs_alt4bd2_ | 56 | 52.5 | -10.5 | 265.5 | 53.5 | 0.97 | 0.92 | tran LUGO 500 to LUGO 230 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | tran_211 | ivsg_hs_alt4bd2_ | 56 | 52.5 | -10.5 | 265.7 | 53.6 | 0.97 | 0.92 | tran LUGO 500 to LUGO 230 ck 2 |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_12 | ivsg_hs_alt4bd2_ | 169 | 163.6 | 29.5 | 584.5 | 166.2 | 0.967 | 0.851 | line COACHELA to RAMON 230 ck 2 |
| 22596 | OLD TOWN | 230 | 22466 | MLMS3TAP | 230 | 1 | B2_002 | ivsg_hs_alt4bd2_ | 912 | -831.9 | 65.4 | 2202.7 | 834.5 | 0.962 | 0.706 | IMPRLVLY - MIGUEL 1 500kV |
| 8695 | RAMON | 230 | 24806 | MIRAGE | 230 | 2 | line_44 | ivsg_hs_alt4bd2_ | 800 | 730 | -187.5 | 1930 | 753.7 | 0.961 | 0.682 | line COACHELA to DEVERS 230 ck 2 |
| 24807 | MIRAGE | 115 | 24819 | CONCHO | 115 | 1 | tran_238 | ivsg_hs_alt4bd2_ | 183 | 164.2 | -4.7 | 883.1 | 164.3 | 0.961 | 0.871 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 8601 | GEOSUB2 | 230 | 8300 | BANIS230 | 230 | 1 | line_22 | ivsg_hs_alt4bd2_ | 550 | 536.2 | 43.9 | 1325.3 | 538 | 0.96 | 0.705 | line GEOSUB1 to BANIS230 230 ck 1 |
| 8601 | GEOSUB2 | 230 | 8300 | BANIS230 | 230 | 1 | line_23 | ivsg_hs_alt4bd2_ | 550 | 536.2 | 43.9 | 1325.3 | 538 | 0.96 | 0.705 | line GEOSUB1 to BANIS230 230 ck 2 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | line_56 | ivsg_hs_alt4bd2_ | 392 | 376.7 | -1.5 | 947.6 | 376.7 | 0.96 | 1 | line NEWSF500 to IMPRLVLY 500 ck 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | line_66 | ivsg_hs_alt4bd2_ | 392 | 373 | 33.6 | 950.6 | 374.5 | 0.96 | 0.9 | line CENTRALX to NEWSF500 500 ck 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_009 | ivsg_hs_alt4bd2_ | 392 | 372.9 | 44.7 | 943.6 | 375.6 | 0.96 | 0.9 | EPP - ESCNDIDO 1 230kV |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_086 | ivsg_hs_alt4bd2_ | 56 | 52 | -10.7 | 263.6 | 53.1 | 0.96 | 0.92 | line MAGUNDEN to OMAR 230 ck 1 |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22261 | EPP | 230 | 22260 | ESCNDIDO | 230 | 1 | line_303 | ivsg_hs_alt4bd2_ | 796.7 | 769.1 | -43.3 | 1916.4 | 770.4 | 0.958 | 0.913 | line HARQUAHA to DEVERS 500 ck 1 |
| 22261 | EPP | 230 | 22260 | ESCNDIDO | 230 | 1 | B2_008 | ivsg_hs_alt4bd2_ | 796.7 | 767.5 | -51.3 | 1908.7 | 769.2 | 0.954 | 0.913 | PENSQTOS - OLD TOWN 1 230kV |
| 19020 | BLYTHE | 161 | 24017 | BLYTHESC | 161 | 1 | line_191 | ivsg_hs_alt4bd2_ | 244 | 233.2 | 40.5 | 832.1 | 236.7 | 0.951 | 0.853 | line EAGLEMTN to IRON MTN 230 ck 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | MS60 | ivsg_hs_alt4bd2_ | 392 | 368 | 44.8 | 924.6 | 370.7 | 0.95 | 0.9 | tran MISSION 230 to MISSION 138 ck 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | MS61 | ivsg_hs_alt4bd2_ | 392 | 368 | 44.8 | 924.6 | 370.7 | 0.95 | 0.9 | tran MISSION 230 to MISSION 138 ck 2 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | SX70 | ivsg_hs_alt4bd2_ | 392 | 368.8 | 46.7 | 931.3 | 371.8 | 0.95 | 0.9 | tran SYCAMORE 230 to SYCAMORE 69 ck 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | SO2 | ivsg_hs_alt4bd2_ | 392 | 368.8 | 37.5 | 936.8 | 370.8 | 0.95 | 0.9 | gen S.ONOFR2 22.00 |
| 22261 | EPP | 230 | 22260 | ESCNDIDO | 230 | 1 | B2_015 | ivsg_hs_alt4bd2_ | 796.7 | 762.9 | -40 | 1898.2 | 763.9 | 0.949 | 0.913 | MIGUEL - MISSION 1 230kV |
| 22261 | EPP | 230 | 22260 | ESCNDIDO | 230 | 1 | line_002 | ivsg_hs_alt4bd2_ | 796.7 | 762 | -42.4 | 1897.6 | 763.2 | 0.949 | 0.913 | line PALOVRDE to DEVERS 500 ck 1 |
| 24807 | MIRAGE | 115 | 24816 | SANTA RO | 115 | 1 | tran_238 | ivsg_hs_alt4bd2_ | 183.3 | 162.1 | -10 | 873.2 | 162.4 | 0.949 | 0.862 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 22261 | EPP | 230 | 22260 | ESCNDIDO | 230 | 1 | B2_020 | ivsg_hs_alt4bd2_ | 796.7 | 762.1 | -40.9 | 1896.3 | 763.2 | 0.948 | 0.913 | MIGUEL - MISSION 2 230kV |
| 14008 | JOJOBA | 500 | 15011 | KYRENE | 500 | 1 | PV1 | ivsg_hs_alt4bd2_ | 1732 | 1734.9 | 176.4 | 1884.7 | 1743.8 | 0.946 | 0.99 | gen PALOVRD1 24.00 |
| 19020 | BLYTHE | 161 | 24017 | BLYTHESC | 161 | 1 | line_63 | ivsg_hs_alt4bd2_ | 244 | 232.5 | 30.2 | 824.4 | 234.5 | 0.942 | 0.853 | line RAMON to MIRAGE 230 ck 2 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_022 | ivsg_hs_alt4bd2_ | 392 | 367.8 | 33.1 | 925.6 | 369.3 | 0.94 | 0.9 | OTAYMESA - TJI-230 1 230kV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | OT70 | ivsg_hs_alt4bd2_ | 392 | 365.7 | 41.8 | 918.8 | 368.1 | 0.94 | 0.9 | tran OLD TOWN 69 to OLD TOWN 230 ck 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | OT71 | ivsg_hs_alt4bd2_ | 392 | 365.7 | 41.8 | 918.8 | 368.1 | 0.94 | 0.9 | tran OLD TOWN 69 to OLD TOWN 230 ck 2 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | SX60 | ivsg_hs_alt4bd2_ | 408.3 | -389.9 | -2.6 | 1604.1 | 389.9 | 0.939 | 0.829 | tran SYCAMORE 230 to SYCAMORE 138 ck 1 |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_008 | ivsg_hs_alt4bd2_ | 169 | 158 | 28 | 564.2 | 160.4 | 0.934 | 0.851 | line PARKER to GENE 230 ck 1 |
| 19020 | BLYTHE | 161 | 24017 | BLYTHESC | 161 | 1 | line_12 | ivsg_hs_alt4bd2_ | 244 | 230.1 | 29.8 | 815.7 | 232 | 0.932 | 0.853 | line COACHELA to RAMON 230 ck 2 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | line_207 | ivsg_hs_alt4bd2_ | 392 | 362.6 | 36.6 | 915.2 | 364.4 | 0.93 | 0.9 | line DEVERS to VALLEYSC 500 ck 1 |
| 24303 | BIG CRK3 | 230 | 24235 | RECTOR | 230 | 1 | line_139 | ivsg_hs_alt4bd2_ | 353 | 335.6 | 44.3 | 821.7 | 338.5 | 0.928 | 0.729 | line SPRINGVL to BIG CRK4 230 ck 1 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | B2_015 | ivsg_hs_alt4bd2_ | 408.3 | -387.2 | -8.6 | 1583.9 | 387.3 | 0.927 | 0.829 | MIGUEL - MISSION 1 230kV |
| 8600 | GEOSUB1 | 230 | 8300 | BANIS230 | 230 | 1 | line_47 | ivsg_hs_alt4bd2_ | 550 | 516.2 | 41.9 | 1276.1 | 517.9 | 0.925 | 0.656 | line GEOSUB2 to BANIS230 230 ck 1 |
| 8600 | GEOSUB1 | 230 | 8300 | BANIS230 | 230 | 2 | line_47 | ivsg_hs_alt4bd2_ | 550 | 516.2 | 41.9 | 1276.1 | 517.9 | 0.925 | 0.656 | line GEOSUB2 to BANIS230 230 ck 1 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | B2_020 | ivsg_hs_alt4bd2_ | 408.3 | -385.8 | -7.2 | 1578.8 | 385.9 | 0.924 | 0.829 | MIGUEL - MISSION 2 230kV |
| 15230 | RUDD | 230 | 15218 | WHITETNK | 230 | 1 | PV1 | ivsg_hs_alt4bd2_ | 725 | 674.2 | -11.4 | 1680.1 | 674.3 | 0.923 | 0.955 | gen PALOVRD1 24.00 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | B2_032 | ivsg_hs_alt4bd2_ | 408.3 | -377.7 | -3.2 | 1574.6 | 377.8 | 0.922 | 0.829 | OTAYMESA - MLMS3TAP 1 230kV |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | B2_034 | ivsg_hs_alt4bd2_ | 408.3 | -377.7 | -3.6 | 1575.4 | 377.7 | 0.922 | 0.829 | OLD TOWN - MLMS3TAP 1 230kV |
| 8301 | CITAP1 | 92 | 8312 | COACHELA | 92 | 1 | line_12 | ivsg_hs_alt4bd2_ | 152 | -138.4 | 14.2 | 878.3 | 139.1 | 0.921 | 0.711 | line COACHELA to RAMON 230 ck 2 |
| 8301 | CITAP1 | 92 | 8389 | VANBUREN | 92 | 1 | line_12 | ivsg_hs_alt4bd2_ | 152 | 138.4 | -14.2 | 878.3 | 139.1 | 0.921 | 0.711 | line COACHELA to RAMON 230 ck 2 |
| 24614 | TAP601 | 115 | 24702 | KRAMER | 115 | 1 | line_169 | ivsg_hs_alt4bd2_ | 217.1 | -189.1 | 72 | 1001.6 | 202.4 | 0.921 | 0.716 | line KRAMER to LUGO 230 ck 1 |
| 24614 | TAP601 | 115 | 24702 | KRAMER | 115 | 1 | line_170 | ivsg_hs_alt4bd2_ | 217.1 | -189.1 | 72 | 1001.6 | 202.4 | 0.921 | 0.716 | line KRAMER to LUGO 230 ck 2 |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_13 | ivsg_hs_alt4bd2_ | 169 | 155.5 | 27 | 555.1 | 157.9 | 0.919 | 0.851 | line COACHELA to MIDWAY 230 ck 1 |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_14 | ivsg_hs_alt4bd2_ | 169 | 155.5 | 27 | 555.1 | 157.9 | 0.919 | 0.851 | line COACHELA to MIDWAY 230 ck 2 |
| 8600 | GEOSUB1 | 230 | 8300 | BANIS230 | 230 | 2 | line_22 | ivsg_hs_alt4bd2_ | 550 | 511.5 | 42.8 | 1263.8 | 513.3 | 0.916 | 0.656 | line GEOSUB1 to BANIS230 230 ck 1 |
| 8600 | GEOSUB1 | 230 | 8300 | BANIS230 | 230 | 1 | line_23 | ivsg_hs_alt4bd2_ | 550 | 511.5 | 42.8 | 1263.8 | 513.3 | 0.916 | 0.656 | line GEOSUB1 to BANIS230 230 ck 2 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | ML70 | ivsg_hs_alt4bd2_ | 408.3 | -379.6 | -7.7 | 1558.9 | 379.7 | 0.913 | 0.829 | tran MIGUEL 69 to MIGUEL 230 ck 1 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | ML71 | ivsg_hs_alt4bd2_ | 408.3 | -379.6 | -7.7 | 1558.9 | 379.7 | 0.913 | 0.829 | tran MIGUEL 69 to MIGUEL 230 ck 2 |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_303 | ivsg_hs_alt4bd2_ | 169 | 153.9 | 29.7 | 551.2 | 156.7 | 0.913 | 0.851 | line HARQUAHA to DEVERS 500 ck 1 |
| 22596 | OLD TOWN | 230 | 22466 | MLMS3TAP | 230 | 1 | B2_029 | ivsg_hs_alt4bd2_ | 912 | -814.6 | 120 | 2084 | 823.4 | 0.911 | 0.706 | OTAYMESA - MLSXTAP 1 230kV |
| 22596 | OLD TOWN | 230 | 22466 | MLMS3TAP | 230 | 1 | B2_031 | ivsg_hs_alt4bd2_ | 912 | -814.8 | 118.5 | 2084.8 | 823.4 | 0.911 | 0.706 | SYCAMORE - MLSXTAP 1 230kV |
| 24807 | MIRAGE | 115 | 24819 | CONCHO | 115 | 1 | line_65 | ivsg_hs_alt4bd2_ | 183 | 164 | -7.4 | 835.8 | 164.1 | 0.91 | 0.871 | line MIRAGE to DEVERS 230 ck 2 |
| 24301 | BIG CRK1 | 230 | 24235 | RECTOR | 230 | 1 | line_156 | ivsg_hs_alt4bd2_ | 329 | 305.6 | 3.7 | 751.9 | 305.6 | 0.91 | 0.727 | line BIG CRK1 to BIG CRK2 230 ck 1 |
| 19020 | BLYTHE | 161 | 24017 | BLYTHESC | 161 | 1 | line_008 | ivsg_hs_alt4bd2_ | 244 | 224.5 | 28.3 | 795.5 | 226.3 | 0.909 | 0.853 | line PARKER to GENE 230 ck 1 |
| 24602 | VICTOR | 115 | 24702 | KRAMER | 115 | 1 | line_169 | ivsg_hs_alt4bd2_ | 217.1 | -184.5 | 82.1 | 985.6 | 201.9 | 0.907 | 0.703 | line KRAMER to LUGO 230 ck 1 |
| 24602 | VICTOR | 115 | 24702 | KRAMER | 115 | 1 | line_170 | ivsg_hs_alt4bd2_ | 217.1 | -184.5 | 82.1 | 985.6 | 201.9 | 0.907 | 0.703 | line KRAMER to LUGO 230 ck 2 |
| 8376 | RTAP2 | 92 | 8974 | RTP1 | 92 | 1 | line_13 | ivsg_hs_alt4bd2_ | 57 | -49.4 | 10 | 322.7 | 50.4 | 0.905 | 0.765 | line COACHELA to MIDWAY 230 ck 1 |
| 8376 | RTAP2 | 92 | 8974 | RTP1 | 92 | 1 | line_14 | ivsg_hs_alt4bd2_ | 57 | -49.4 | 10 | 322.7 | 50.4 | 0.905 | 0.765 | line COACHELA to MIDWAY 230 ck 2 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_079 | ivsg_hs_alt4bd2_ | 2400 | -2275.3 | -45.6 | 2508.2 | 2275.8 | 0.905 | 0.718 | line LUGO to MOHAVE 500 ck 1 |
| 24301 | BIG CRK1 | 230 | 24302 | BIG CRK2 | 230 | 1 | line_155 | ivsg_hs_alt4bd2_ | 329 | 305.6 | -23.4 | 745.5 | 306.5 | 0.903 | 0.248 | line BIG CRK1 to RECTOR 230 ck 1 |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_002 | ivsg_hs_alt4bd2_ | 169 | 152.1 | 28.3 | 543.9 | 154.7 | 0.901 | 0.851 | line PALOVRDE to DEVERS 500 ck 1 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_047 | ivsg_hs_alt4bd2_ | 2400 | -2271.4 | -64.2 | 2496.2 | 2272.3 | 0.901 | 0.718 | line ELDORDO to LUGO 500 ck 1 |
| 24729 | INYO | 230 | 24730 | INYO PS | 115 | 2 | tran_230 | ivsg_hs_alt4bd2_ | 50 | -41.9 | 15.9 | 105.2 | 44.8 | 0.9 | 0.54 | tran INYO 230 to INYO PS 115 ck 1 |
| 24729 | INYO | 230 | 24730 | INYO PS | 115 | 1 | tran_231 | ivsg_hs_alt4bd2_ | 50 | -41.9 | 15.9 | 105.2 | 44.8 | 0.9 | 0.54 | tran INYO 230 to INYO PS 115 ck 2 |
| 24805 | DEVERS | 115 | 24804 | DEVERS | 230 | 1 | tran_236 | ivsg_hs_alt4bd2_ | 280 | -246.1 | 51.7 | 1267.2 | 251.5 | 0.9 | 0.6 | tran DEVERS 115 to DEVERS 230 ck 3 |

ivsg_hs_alt4b_D2.sav
VOLTAGE Summary
N-2 Outages

| Bus | Name | kV | Area | Zone | Outage | Case | Vbase | Vcont | DeltaV | Vmin | Vmax | Max-dv | Contingency Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24058 | GOLETA | 230 | 24 | 240 | line_2269 | ivsg_hs_alt4bd2_ | 0.984 | 0.93 | -0.055 | 0.9 | 1.05 | 0.05 | S.CLARA 230.00 - GOLETA 230.00 1, S.CLARA 230.00 - MOORPARK 230.00 1 |
| 24058 | GOLETA | 230 | 24 | 240 | line_2270 | ivsg_hs_alt4bd2_ | 0.984 | 0.93 | -0.055 | 0.9 | 1.05 | 0.05 | S.CLARA 230.00 - GOLETA 230.00 2, S.CLARA 230.00 - MOORPARK 230.00 2 |
| 22734 | SANTEE | 138 | 22 | 223 | 23021/22/23/41 | ivsg_hs_alt4bd2_ | 1.002 | 0.948 | -0.054 | 0.9 | 1.05 | 0.05 | MIGUEL 230 CORRIDOR West of SN |
| 24015 | ARCO SC | 230 | 24 | 240 | line_2013 | ivsg_hs_alt4bd2_ | 0.986 | 1.036 | 0.05 | 0.9 | 1.05 | 0.05 | ARCO SC 230.00 - HINSON 230.00 1, ARCO SC 230.00 - HINSON 230.00 2 |
| 24061 | HARBOR | 230 | 24 | 240 | line_2039 | ivsg_hs_alt4bd2_ | 0.986 | 1.036 | 0.051 | 0.9 | 1.05 | 0.05 | HARBOR 230.00 - HINSON 230.00 1, LBEACH 230.00 - LITEHIPE 230.00 1 |
| 24077 | LBEACH | 230 | 24 | 240 | line_2039 | ivsg_hs_alt4bd2_ | 0.986 | 1.036 | 0.05 | 0.9 | 1.05 | 0.05 | HARBOR 230.00 - HINSON 230.00 1, LBEACH 230.00 - LITEHIPE 230.00 1 |
| 24061 | HARBOR | 230 | 24 | 240 | line_2041 | ivsg_hs_alt4bd2_ | 0.986 | 1.036 | 0.051 | 0.9 | 1.05 | 0.05 | HARBOR 230.00 - HINSON 230.00 1, HARBOR 230.00 - LBEACH 230.00 1 |
| 24061 | HARBOR | 230 | 24 | 240 | line_2253 | ivsg_hs_alt4bd2_ | 0.986 | 1.036 | 0.051 | 0.9 | 1.05 | 0.05 | HARBOR 230.00 - HINSON 230.00 1, HARBOR 230.00 - LBEACH 230.00 1 |
| 25001 | GOODRICH | 230 | 24 | 250 | line_2073 | ivsg_hs_alt4bd2_ | 0.96 | 1.044 | 0.085 | 0.9 | 1.05 | 0.05 | GOODRICH 230.00 - GOULD 230.00 1, GOODRICH 230.00 - LAGUBELL 230.00 1 |
| 24058 | GOLETA | 230 | 24 | 240 | line_2120 | ivsg_hs_alt4bd2_ | 0.984 | 1.044 | 0.06 | 0.9 | 1.05 | 0.05 | S.CLARA 230.00 - GOLETA 230.00 1, S.CLARA 230.00 - GOLETA 230.00 2 |

ivsg_hs_alt4b_D2.sav
FLOW Summary
N-2 Outages

| LEGEND | % of RATING 1 | |
|---|---|---|
| C_pu | 100% - 110% | |
| C_pu | 110% - 120% | P.U. of |
| C_pu | > 120% | Rate 1 |

| FROM | FR | BKV | TO | TO | BKV | CK | Outage_Name | Case | Rate-Mva | Pflow | Qflow | Amps | MVA | C_pu | B_pu | Contingency_Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 13821C/25/23051A | ivsg_hs_alt4bd2_ | 204.1 | 343.1 | -13.6 | 1420.6 | 343.4 | 1.664 | 1.173 | CH-ES-NCM-SX |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23051B/23011 | ivsg_hs_alt4bd2_ | 204.1 | 324.3 | -12.4 | 1359 | 324.6 | 1.592 | 1.173 | EPP-ES + ES-EA-SA 230KV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt4bd2_ | 392 | 554.4 | 101.1 | 1417.5 | 563.6 | 1.44 | 0.9 | MIGUEL 230 CORRIDOR West of SN |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23011/13825 | ivsg_hs_alt4bd2_ | 204.1 | 287.9 | -13.6 | 1192.2 | 288.3 | 1.396 | 1.173 | ES-EA-SA 230KV + BQ-CC-ES-NCM 138KV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23022/23023 | ivsg_hs_alt4bd2_ | 204.1 | 286.4 | -7.4 | 1189.8 | 286.5 | 1.393 | 1.173 | ML-MS1+ ML-MS2 230KV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | 23051B/23011 | ivsg_hs_alt4bd2_ | 392 | 545.3 | 33 | 1378.6 | 546.3 | 1.39 | 1 | EPP-ES + ES-EA-SA 230KV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt4bd2_ | 392 | 533.2 | 91.1 | 1349.7 | 541 | 1.38 | 0.9 | MIGUEL 230 CORRIDOR West of LC |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt4bd2_ | 408.3 | -545.7 | -18.6 | 2288.1 | 546 | 1.339 | 0.829 | MIGUEL 230 CORRIDOR West of SN |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23051A/23011 | ivsg_hs_alt4bd2_ | 204.1 | 271.1 | -11.7 | 1123.5 | 271.3 | 1.316 | 1.173 | SX-EPP + ES-EA-SA 230KV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt4bd2_ | 392 | 497 | 90.6 | 1258.2 | 505.2 | 1.29 | 0.9 | MIGUEL 230 CORRIDOR North of ML |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt4bd2_ | 408.3 | -525.3 | -16.4 | 2178.6 | 525.6 | 1.275 | 0.829 | MIGUEL 230 CORRIDOR West of LC |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23012/13807 | ivsg_hs_alt4bd2_ | 204.1 | 260.3 | -2.8 | 1078.9 | 260.3 | 1.263 | 1.173 | PQ-EA 230KV + EA-NCW 138KV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23012/13808 | ivsg_hs_alt4bd2_ | 204.1 | 255.5 | -4.1 | 1058.2 | 255.5 | 1.239 | 1.173 | PQ-EA 230KV + NCW-PQ 138KV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | line_N-203 | ivsg_hs_alt4bd2_ | 204.1 | 250.2 | -9.7 | 1044.4 | 250.4 | 1.223 | 1.173 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23022/23023 | ivsg_hs_alt4bd2_ | 392 | 472.1 | 70.1 | 1186.1 | 477.3 | 1.22 | 0.9 | ML-MS1+ ML-MS2 230KV |
| 8376 | RTAP2 | 92 | 8974 | RTP1 | 92 | 1 | line_N-204 | ivsg_hs_alt4bd2_ | 57 | -64.6 | 11.6 | 432.5 | 65.7 | 1.211 | 0.765 | COACHELLA MIDWAY 230 CKT 1&2 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23013/27/28 | ivsg_hs_alt4bd2_ | 204.1 | 249.3 | -7 | 1033.2 | 249.4 | 1.21 | 1.173 | OLD TOWN TO OLD TOWN JCT |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | line_2245 | ivsg_hs_alt4bd2_ | 204.1 | 247.6 | -8.2 | 1031.1 | 247.7 | 1.208 | 1.173 | DEVERS 500.00 - VALLEYSC 500.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | line_N-204 | ivsg_hs_alt4bd2_ | 204.1 | 246.8 | -10 | 1027.9 | 247 | 1.204 | 1.173 | COACHELLA MIDWAY 230 CKT 1&2 |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt4bd2_ | 382.4 | 456.2 | 29.8 | 1926.6 | 457.2 | 1.204 | 0.669 | MIGUEL 230 CORRIDOR West of SN |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 2 | line_2046 | ivsg_hs_alt4bd2_ | 956 | -1123.3 | -39.1 | 2856.3 | 1124 | 1.19 | 0.594 | LA FRESA 230.00 - REDONDO 230.00 1, REDONDO 230.00 - LITEHIPE 230.00 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 1 | line_2047 | ivsg_hs_alt4bd2_ | 956 | -1123.3 | -39.1 | 2856.3 | 1124 | 1.19 | 0.594 | LA FRESA 230.00 - REDONDO 230.00 2, REDONDO 230.00 - LITEHIPE 230.00 1 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt4bd2_ | 408.3 | -490.1 | -25.7 | 2031 | 490.8 | 1.189 | 0.829 | MIGUEL 230 CORRIDOR North of ML |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | 23022/23023 | ivsg_hs_alt4bd2_ | 392 | 458.2 | 21.6 | 1148.9 | 458.7 | 1.17 | 1 | ML-MS1+ ML-MS2 230KV |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_N-203 | ivsg_hs_alt4bd2_ | 169 | 191.7 | 42 | 690.2 | 196.2 | 1.142 | 0.851 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 2 | line_2064 | ivsg_hs_alt4bd2_ | 956 | -1075.9 | -44.4 | 2735.7 | 1076.8 | 1.14 | 0.594 | LA FRESA 230.00 - REDONDO 230.00 1, MESA CAL 230.00 - REDONDO 230.00 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 1 | line_2065 | ivsg_hs_alt4bd2_ | 956 | -1075.9 | -44.4 | 2735.7 | 1076.8 | 1.14 | 0.594 | LA FRESA 230.00 - REDONDO 230.00 2, MESA CAL 230.00 - REDONDO 230.00 1 |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt4bd2_ | 382.4 | 436.1 | 30.6 | 1821.5 | 437.1 | 1.139 | 0.669 | MIGUEL 230 CORRIDOR West of LC |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | 23051A/23011 | ivsg_hs_alt4bd2_ | 392 | 443.3 | 14.6 | 1109.2 | 443.5 | 1.13 | 1 | SX-EPP + ES-EA-SA 230KV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | line_2115 | ivsg_hs_alt4bd2_ | 204.1 | 234.4 | -9.2 | 960.1 | 234.6 | 1.124 | 1.173 | S.ONOFRE 230.00 - SANTIAGO 230.00 1, S.ONOFRE 230.00 - SANTIAGO 230.00 2 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23027/28/13810 | ivsg_hs_alt4bd2_ | 204.1 | 232.2 | -6.1 | 960.2 | 232.3 | 1.124 | 1.173 | OLD TOWN TO MISSION 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23052/23007 | ivsg_hs_alt4bd2_ | 204.1 | 230.9 | -9.2 | 958.3 | 231.1 | 1.122 | 1.173 | TA-SO 1 + 2 230KV |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23022/23023 | ivsg_hs_alt4bd2_ | 408.3 | -466 | -12.4 | 1914.5 | 466.2 | 1.121 | 0.829 | ML-MS1+ ML-MS2 230KV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt4bd2_ | 204.1 | 227.2 | -5.1 | 950.6 | 227.2 | 1.113 | 1.173 | MIGUEL 230 CORRIDOR North of ML |
| 8311 | COACHELA | 230 | 8695 | RAMON | 230 | 2 | line_2236 | ivsg_hs_alt4bd2_ | 800 | 830.7 | -26.5 | 2187.9 | 831.2 | 1.089 | 0.725 | PALOVRDE 500.00 - DEVERS 500.00 1, COACHELV 230.00 - DEVERS 230.00 2 |
| 8695 | RAMON | 230 | 24806 | MIRAGE | 230 | 2 | line_2236 | ivsg_hs_alt4bd2_ | 800 | 814.2 | -201.8 | 2184.4 | 838.8 | 1.088 | 0.682 | PALOVRDE 500.00 - DEVERS 500.00 1, COACHELV 230.00 - DEVERS 230.00 2 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 2 | line_2049 | ivsg_hs_alt4bd2_ | 956 | -1024 | -39.3 | 2607.3 | 1024.8 | 1.086 | 0.594 | LA FRESA 230.00 - REDONDO 230.00 1, LCIENEGA 230.00 - LA FRESA 230.00 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 1 | line_2050 | ivsg_hs_alt4bd2_ | 956 | -1024 | -39.3 | 2607.3 | 1024.8 | 1.086 | 0.594 | LA FRESA 230.00 - REDONDO 230.00 2, LCIENEGA 230.00 - LA FRESA 230.00 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 2 | line_2057 | ivsg_hs_alt4bd2_ | 956 | -1023.5 | -36 | 2604.7 | 1024.2 | 1.085 | 0.594 | EL NIDO 230.00 - LA FRESA 230.00 3, LA FRESA 230.00 - REDONDO 230.00 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 1 | line_2058 | ivsg_hs_alt4bd2_ | 956 | -1023.5 | -36 | 2604.7 | 1024.2 | 1.085 | 0.594 | EL NIDO 230.00 - LA FRESA 230.00 3, LA FRESA 230.00 - REDONDO 230.00 2 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 2 | line_2059 | ivsg_hs_alt4bd2_ | 956 | -1023.5 | -36 | 2604.7 | 1024.2 | 1.085 | 0.594 | EL NIDO 230.00 - LA FRESA 230.00 4, LA FRESA 230.00 - REDONDO 230.00 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 1 | line_2060 | ivsg_hs_alt4bd2_ | 956 | -1023.5 | -36 | 2604.7 | 1024.2 | 1.085 | 0.594 | EL NIDO 230.00 - LA FRESA 230.00 4, LA FRESA 230.00 - REDONDO 230.00 2 |
| 24701 | KRAMER | 230 | 24085 | LUGO | 230 | 2 | line_2260 | ivsg_hs_alt4bd2_ | 478 | 526.4 | 0.6 | 1299.5 | 526.4 | 1.083 | 0.643 | KRAMER 230.00 - LUGO 230.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 24086 | LUGO | 500 | 24236 | RANCHVST | 500 | 1 | line_2194 | ivsg_hs_alt4bd2_ | 2598 | 2918 | 484.2 | 3234.7 | 2957.9 | 1.08 | 0.601 | LUGO 500.00 - MIRALOMA 500.00 2, LUGO 500.00 - MIRALOMA 500.00 3 |
| 22831 | SYCAMORE | 138 | 22124 | CHCARITA | 138 | 1 | 23051B/23011 | ivsg_hs_alt4bd2_ | 204.1 | 219.1 | -22.8 | 922.4 | 220.3 | 1.08 | 0.729 | EPP-ES + ES-EA-SA 230KV |
| 22672 | PRCTRVLY | 138 | 22852 | TELECYN | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt4bd2_ | 478 | 514.8 | 14.7 | 2158.3 | 515 | 1.079 | 0.645 | MIGUEL 230 CORRIDOR West of SN |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 2 | line_2029 | ivsg_hs_alt4bd2_ | 1195 | 1250.8 | -32.2 | 3216.7 | 1251.2 | 1.072 | 0.534 | LEWIS 230.00 - SERRANO 230.00 1, SERRANO 230.00 - VILLA PK 230.00 1 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 2 | line_2031 | ivsg_hs_alt4bd2_ | 1195 | 1250.8 | -32.2 | 3216.7 | 1251.2 | 1.072 | 0.534 | LEWIS 230.00 - SERRANO 230.00 2, SERRANO 230.00 - VILLA PK 230.00 1 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 2 | line_2278 | ivsg_hs_alt4bd2_ | 1195 | 1250.8 | -32.2 | 3216.7 | 1251.2 | 1.072 | 0.534 | LEWIS 230.00 - SERRANO 230.00 1, SERRANO 230.00 - VILLA PK 230.00 1 |
| 8601 | GEOSUB2 | 230 | 8300 | BANIS230 | 230 | 1 | line_N-204 | ivsg_hs_alt4bd2_ | 550 | 586.2 | 100.7 | 1478.5 | 594.8 | 1.072 | 0.705 | COACHELLA MIDWAY 230 CKT 1&2 |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_N-204 | ivsg_hs_alt4bd2_ | 169 | 179.1 | 38.8 | 644.5 | 183.3 | 1.067 | 0.851 | COACHELLA MIDWAY 230 CKT 1&2 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_2260 | ivsg_hs_alt4bd2_ | 56 | 57.8 | -10 | 292.1 | 58.7 | 1.06 | 0.92 | KRAMER 230.00 - LUGO 230.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23027/28/13827 | ivsg_hs_alt4bd2_ | 204.1 | 217.6 | -8.4 | 900 | 217.7 | 1.054 | 1.173 | OLD TOWN TO MISSION 2 |
| 19020 | BLYTHE | 161 | 24017 | BLYTHESC | 161 | 1 | line_N-203 | ivsg_hs_alt4bd2_ | 244 | 258.2 | 42.3 | 920 | 261.6 | 1.051 | 0.853 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | line_N-203 | ivsg_hs_alt4bd2_ | 392 | 410.4 | 7.2 | 1035.2 | 410.4 | 1.05 | 1 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt4bd2_ | 382.4 | 401.2 | 42.5 | 1679.1 | 403.5 | 1.05 | 0.669 | MIGUEL 230 CORRIDOR North of ML |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | 23013/27/28 | ivsg_hs_alt4bd2_ | 392 | 412.3 | 12.8 | 1032.3 | 412.5 | 1.05 | 1 | OLD TOWN TO OLD TOWN JCT |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | line_2236 | ivsg_hs_alt4bd2_ | 132 | 134.9 | -9.2 | 866.7 | 135.2 | 1.046 | 0.982 | PALOVRDE 500.00 - DEVERS 500.00 1, COACHELV 230.00 - DEVERS 230.00 2 |
| 22261 | EPP | 230 | 22260 | ESCNDIDO | 230 | 1 | 23052/23007 | ivsg_hs_alt4bd2_ | 796.7 | 835.3 | -20.7 | 2088.5 | 835.5 | 1.044 | 0.913 | TA-SO 1 + 2 230KV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | line_2245 | ivsg_hs_alt4bd2_ | 392 | 406.9 | 9.5 | 1023.9 | 407 | 1.04 | 1 | DEVERS 500.00 - VALLEYSC 500.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 22260 | ESCNDIDO | 230 | 22844 | TALEGA | 230 | 1 | 23052/23007 | ivsg_hs_alt4bd2_ | 456.1 | 473.9 | 29.2 | 1186.9 | 474.8 | 1.037 | 0.137 | TA-SO 1 + 2 230KV |
| 30060 | MIDWAY | 500 | 24156 | VINCENT | 500 | 3 | line_2215 | ivsg_hs_alt4bd2_ | 1848.1 | 2036.1 | 67.5 | 2203.9 | 2037.2 | 1.035 | 0.406 | MIDWAY 500.00 - VINCENT 500.00 1, MIDWAY 500.00 - VINCENT 500.00 2 |
| 24016 | BARRE | 230 | 24044 | ELLIS | 230 | 1 | line_2115 | ivsg_hs_alt4bd2_ | 988 | 984.5 | -49.3 | 2560.1 | 985.7 | 1.032 | 0.27 | S.ONOFRE 230.00 - SANTIAGO 230.00 1, S.ONOFRE 230.00 - SANTIAGO 230.00 2 |
| 30060 | MIDWAY | 500 | 24156 | VINCENT | 500 | 1 | line_2220 | ivsg_hs_alt4bd2_ | 1848.1 | 2014.9 | 68.8 | 2180.8 | 2016 | 1.025 | 0.325 | MIDWAY 500.00 - VINCENT 500.00 2, MIDWAY 500.00 - VINCENT 500.00 3 |
| 22672 | PRCTRVLY | 138 | 22852 | TELECYN | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt4bd2_ | 478 | 494.5 | 12.4 | 2050.2 | 494.6 | 1.025 | 0.645 | MIGUEL 230 CORRIDOR West of LC |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 13810B/23013 | ivsg_hs_alt4bd2_ | 204.1 | 211.4 | -5.3 | 874.3 | 211.4 | 1.024 | 1.173 | OT JCT TO PQ 1 |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | line_N-204 | ivsg_hs_alt4bd2_ | 132 | 129.6 | -14.8 | 847.3 | 130.4 | 1.023 | 0.982 | COACHELLA MIDWAY 230 CKT 1&2 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 14008 | JOJOBA | 500 | 15011 | KYRENE | 500 | 1 | line_2245 | ivsg_hs_alt4bd2_ | 1732 | 1862.2 | 172 | 2037.7 | 1870.1 | 1.021 | 0.99 | DEVERS 500.00 - VALLEYSC 500.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 22261 | EPP | 230 | 22260 | ESCNDIDO | 230 | 1 | 23022/23023 | ivsg_hs_alt4bd2_ | 796.7 | 818.5 | -45.5 | 2041.1 | 819.8 | 1.021 | 0.913 | ML-MS1+ ML-MS2 230KV |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | line_2237 | ivsg_hs_alt4bd2_ | 132 | 131.9 | -10.4 | 844.7 | 132.3 | 1.02 | 0.982 | PALOVRDE 500.00 - DEVERS 500.00 1, J.HINDS 230.00 - MIRAGE 230.00 1 |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | line_2186 | ivsg_hs_alt4bd2_ | 132 | 132.9 | -10.2 | 844.2 | 133.2 | 1.019 | 0.982 | COACHELV 230.00 - DEVERS 230.00 2, J.HINDS 230.00 - MIRAGE 230.00 1 |
| 22596 | OLD TOWN | 230 | 22466 | MLMS3TAP | 230 | 1 | 23021/22/23/41 | ivsg_hs_alt4bd2_ | 912 | -898.3 | 118.7 | 2331.1 | 906.1 | 1.019 | 0.706 | MIGUEL 230 CORRIDOR West of SN |
| 24074 | LA FRESA | 230 | 24065 | HINSON | 230 | 1 | line_2061 | ivsg_hs_alt4bd2_ | 797 | -779.7 | 48.5 | 2034.5 | 781.2 | 1.017 | 0.152 | LA FRESA 230.00 - REDONDO 230.00 1, LA FRESA 230.00 - REDONDO 230.00 2 |
| 22261 | EPP | 230 | 22260 | ESCNDIDO | 230 | 1 | line_N-203 | ivsg_hs_alt4bd2_ | 796.7 | 807.6 | -53.3 | 2019.8 | 809.4 | 1.01 | 0.913 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 13821B/638 | ivsg_hs_alt4bd2_ | 392 | 392.2 | 46.4 | 989.9 | 395 | 1.01 | 0.9 | CH-SX-SN 138KV + SAN VCNT-EL 69KV |
| 8311 | COACHELA | 230 | 8695 | RAMON | 230 | 2 | line_2186 | ivsg_hs_alt4bd2_ | 800 | 775.7 | -46.2 | 2019.6 | 777.1 | 1.006 | 0.725 | COACHELV 230.00 - DEVERS 230.00 2, J.HINDS 230.00 - MIRAGE 230.00 1 |
| 8376 | RTAP2 | 92 | 8974 | RTP1 | 92 | 1 | line_N-208 | ivsg_hs_alt4bd2_ | 57 | -54.6 | 11.5 | 358.9 | 55.8 | 1.006 | 0.765 | COACHELLA BANISTER/BANISTER AVE58 230 |
| 8900 | PRUETTAP | 92 | 8691 | HIGHLINE | 92 | 1 | line_N-209 | ivsg_hs_alt4bd2_ | 86 | -87.8 | 3.9 | 541.7 | 87.9 | 1.004 | 0.753 | EL CENTRO HIGHLINE 230 CKTS 1&2 |
| 22831 | SYCAMORE | 138 | 22124 | CHCARITA | 138 | 1 | 13821B/638 | ivsg_hs_alt4bd2_ | 204.1 | 207.4 | -12.8 | 857.5 | 207.8 | 1.004 | 0.729 | CH-SX-SN 138KV + SAN VCNT-EL 69KV |
| 22596 | OLD TOWN | 230 | 22466 | MLMS3TAP | 230 | 1 | 23021/22/23/41 | ivsg_hs_alt4bd2_ | 912 | -888.9 | 126.4 | 2297.9 | 897.8 | 1.004 | 0.706 | MIGUEL 230 CORRIDOR North of ML |
| 8900 | PRUETTAP | 92 | 8691 | HIGHLINE | 92 | 1 | line_N-204 | ivsg_hs_alt4bd2_ | 86 | -87.3 | 8.1 | 541 | 87.6 | 1.003 | 0.753 | COACHELLA MIDWAY 230 CKT 1&2 |
| 22831 | SYCAMORE | 138 | 22124 | CHCARITA | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt4bd2_ | 204.1 | 204.5 | -17.5 | 856 | 205.2 | 1.002 | 0.729 | MIGUEL 230 CORRIDOR West of SN |
| 22261 | EPP | 230 | 22260 | ESCNDIDO | 230 | 1 | line_2245 | ivsg_hs_alt4bd2_ | 796.7 | 801.7 | -48.5 | 2002.8 | 803.2 | 1.001 | 0.913 | DEVERS 500.00 - VALLEYSC 500.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 22596 | OLD TOWN | 230 | 22466 | MLMS3TAP | 230 | 1 | 23021/22/23/41 | ivsg_hs_alt4bd2_ | 912 | -885.9 | 125.8 | 2289.4 | 894.8 | 1 | 0.706 | MIGUEL 230 CORRIDOR West of LC |
| 19020 | BLYTHE | 161 | 24017 | BLYTHESC | 161 | 1 | line_N-204 | ivsg_hs_alt4bd2_ | 244 | 245.6 | 39.1 | 874.5 | 248.7 | 0.999 | 0.853 | COACHELLA MIDWAY 230 CKT 1&2 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 1 | line_2030 | ivsg_hs_alt4bd2_ | 1287 | 1250.8 | -32.2 | 3216.7 | 1251.2 | 0.996 | 0.496 | LEWIS 230.00 - SERRANO 230.00 1, SERRANO 230.00 - VILLA PK 230.00 2 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 1 | line_2032 | ivsg_hs_alt4bd2_ | 1287 | 1250.8 | -32.2 | 3216.7 | 1251.2 | 0.996 | 0.496 | LEWIS 230.00 - SERRANO 230.00 2, SERRANO 230.00 - VILLA PK 230.00 2 |
| 8695 | RAMON | 230 | 24806 | MIRAGE | 230 | 2 | line_2186 | ivsg_hs_alt4bd2_ | 800 | 751.3 | -196 | 1991.5 | 776.5 | 0.992 | 0.682 | COACHELV 230.00 - DEVERS 230.00 2, J.HINDS 230.00 - MIRAGE 230.00 1 |
| 24086 | LUGO | 500 | 24097 | MOHAVE | 500 | 1 | line_2234 | ivsg_hs_alt4bd2_ | 1386 | -1427.2 | 97.5 | 1564.5 | 1430.5 | 0.988 | 0.672 | MOHAVE 500.00 - ELDORDO 500.00 1, PISGAH 230.00 - ELDORDO 230.00 2 |
| 22261 | EPP | 230 | 22260 | ESCNDIDO | 230 | 1 | 23013/27/28 | ivsg_hs_alt4bd2_ | 796.7 | 793.3 | -56.5 | 1975.6 | 795.3 | 0.988 | 0.913 | OLD TOWN TO OLD TOWN JCT |
| 8600 | GEOSUB1 | 230 | 8300 | BANIS230 | 230 | 1 | line_N-204 | ivsg_hs_alt4bd2_ | 550 | 537 | 89.8 | 1354.6 | 544.5 | 0.982 | 0.656 | COACHELLA MIDWAY 230 CKT 1&2 |
| 8600 | GEOSUB1 | 230 | 8300 | BANIS230 | 230 | 2 | line_N-204 | ivsg_hs_alt4bd2_ | 550 | 537 | 89.8 | 1354.6 | 544.5 | 0.982 | 0.656 | COACHELLA MIDWAY 230 CKT 1&2 |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | 23022/23023 | ivsg_hs_alt4bd2_ | 382.4 | 377.4 | 31.9 | 1562.2 | 378.7 | 0.977 | 0.669 | ML-MS1+ ML-MS2 230KV |
| 22261 | EPP | 230 | 22260 | ESCNDIDO | 230 | 1 | line_N-204 | ivsg_hs_alt4bd2_ | 796.7 | 778.2 | -49.7 | 1943.6 | 779.8 | 0.972 | 0.913 | COACHELLA MIDWAY 230 CKT 1&2 |
| 22261 | EPP | 230 | 22260 | ESCNDIDO | 230 | 1 | line_2236 | ivsg_hs_alt4bd2_ | 796.7 | 778.8 | -45.6 | 1942 | 780.1 | 0.971 | 0.913 | PALOVRDE 500.00 - DEVERS 500.00 1, COACHELV 230.00 - DEVERS 230.00 2 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | 23052/23007 | ivsg_hs_alt4bd2_ | 392 | 380.1 | 6.3 | 953 | 380.1 | 0.97 | 1 | TA-SO 1 + 2 230KV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | 13807/08/23013 | ivsg_hs_alt4bd2_ | 392 | 378.2 | 11 | 944.2 | 378.3 | 0.97 | 1 | PQ ENCINA |
| 22261 | EPP | 230 | 22260 | ESCNDIDO | 230 | 1 | 13810B/23013 | ivsg_hs_alt4bd2_ | 796.7 | 776.5 | -50.3 | 1931.6 | 778.1 | 0.966 | 0.913 | OT JCT TO PQ 1 |
| 8311 | COACHELA | 230 | 8695 | RAMON | 230 | 2 | line_2246 | ivsg_hs_alt4bd2_ | 800 | 747.1 | -49.5 | 1938 | 748.8 | 0.965 | 0.725 | VSTA 230.00 - DEVERS 230.00 1, COACHELV 230.00 - DEVERS 230.00 2 |
| 22261 | EPP | 230 | 22260 | ESCNDIDO | 230 | 1 | 13821B/638 | ivsg_hs_alt4bd2_ | 796.7 | 775.3 | -35.3 | 1929.9 | 776.1 | 0.965 | 0.913 | CH-SX-SN 138KV + SAN VCNT-EL 69KV |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_2194 | ivsg_hs_alt4bd2_ | 56 | 51.9 | -10.5 | 262.3 | 52.9 | 0.96 | 0.92 | LUGO 500.00 - MIRALOMA 500.00 2, LUGO 500.00 - MIRALOMA 500.00 3 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23051B/23011 | ivsg_hs_alt4bd2_ | 392 | 373.6 | 46.1 | 947.8 | 376.5 | 0.96 | 0.9 | EPP-ES + ES-EA-SA 230KV |
| 22261 | EPP | 230 | 22260 | ESCNDIDO | 230 | 1 | line_2182 | ivsg_hs_alt4bd2_ | 796.7 | 766.8 | -45.9 | 1910.6 | 768.2 | 0.955 | 0.913 | DEVERS 230.00 - MIRAGE 230.00 2, COACHELV 230.00 - DEVERS 230.00 2 |
| 22261 | EPP | 230 | 22260 | ESCNDIDO | 230 | 1 | 13807/08/23013 | ivsg_hs_alt4bd2_ | 796.7 | 768.2 | -51 | 1910.1 | 769.9 | 0.955 | 0.913 | PQ ENCINA |
| 22672 | PRCTRVLY | 138 | 22852 | TELECYN | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt4bd2_ | 478 | 459.3 | 21.7 | 1902.6 | 459.8 | 0.951 | 0.645 | MIGUEL 230 CORRIDOR North of ML |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | line_2115 | ivsg_hs_alt4bd2_ | 392 | 373.1 | 12.8 | 922.4 | 373.4 | 0.95 | 1 | S.ONOFRE 230.00 - SANTIAGO 230.00 1, S.ONOFRE 230.00 - SANTIAGO 230.00 2 |
| 22261 | EPP | 230 | 22260 | ESCNDIDO | 230 | 1 | line_2237 | ivsg_hs_alt4bd2_ | 796.7 | 762.6 | -42.4 | 1899.4 | 763.8 | 0.95 | 0.913 | PALOVRDE 500.00 - DEVERS 500.00 1, J.HINDS 230.00 - MIRAGE 230.00 1 |
| 22261 | EPP | 230 | 22260 | ESCNDIDO | 230 | 1 | line_2113 | ivsg_hs_alt4bd2_ | 796.7 | 761.6 | -34 | 1898.4 | 762.3 | 0.949 | 0.913 | ELLIS 230.00 - JOHANNA 230.00 1, ELLIS 230.00 - SANTIAGO 230.00 1 |
| 22261 | EPP | 230 | 22260 | ESCNDIDO | 230 | 1 | line_2235 | ivsg_hs_alt4bd2_ | 796.7 | 762 | -42.4 | 1897.6 | 763.2 | 0.949 | 0.913 | DEVERS 230.00 - MIRAGE 230.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 22261 | EPP | 230 | 22260 | ESCNDIDO | 230 | 1 | line_2194 | ivsg_hs_alt4bd2_ | 796.7 | 760.7 | -40.2 | 1894.7 | 761.8 | 0.947 | 0.913 | LUGO 500.00 - MIRALOMA 500.00 2, LUGO 500.00 - MIRALOMA 500.00 3 |
| 8695 | RAMON | 230 | 24806 | MIRAGE | 230 | 2 | line_2246 | ivsg_hs_alt4bd2_ | 800 | 719 | -186.7 | 1897.8 | 742.8 | 0.945 | 0.682 | VSTA 230.00 - DEVERS 230.00 1, COACHELV 230.00 - DEVERS 230.00 2 |
| 22261 | EPP | 230 | 22260 | ESCNDIDO | 230 | 1 | line_2258 | ivsg_hs_alt4bd2_ | 796.7 | 757.9 | -40.9 | 1887 | 759 | 0.944 | 0.913 | LUGO 500.00 - VINCENT 500.00 2, LUGO 500.00 - VICTORVL 500.00 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | line_2245 | ivsg_hs_alt4bd2_ | 392 | 365.9 | 36.5 | 926.2 | 367.7 | 0.94 | 0.9 | DEVERS 500.00 - VALLEYSC 500.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt4bd2_ | 392 | 367.4 | 4.5 | 929.6 | 367.5 | 0.94 | 1 | MIGUEL 230 CORRIDOR North of ML |
| 24126 | RIOHONDO | 230 | 24155 | VINCENT | 230 | 2 | line_2097 | ivsg_hs_alt4bd2_ | 988 | -882.4 | 72.7 | 2327.2 | 885.4 | 0.938 | 0.687 | GOODRICH 230.00 - GOULD 230.00 1, VINCENT 230.00 - MESA CAL 230.00 1 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_N-203 | ivsg_hs_alt4bd2_ | 800 | 756 | 30.5 | 1883.5 | 756.6 | 0.938 | 0.622 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 13821B/638 | ivsg_hs_alt4bd2_ | 408.3 | -388 | -6.3 | 1597.8 | 388 | 0.935 | 0.829 | CH-SX-SN 138KV + SAN VCNT-EL 69KV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | line_N-203 | ivsg_hs_alt4bd2_ | 392 | 362.5 | 36.3 | 919 | 364.4 | 0.93 | 0.9 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 8335 | ELSTEAMP | 92 | 8720 | WSTBIOTP | 92 | 2 | line_N-204 | ivsg_hs_alt4bd2_ | 91 | 85.4 | 2.2 | 527 | 85.5 | 0.923 | 0.72 | COACHELLA MIDWAY 230 CKT 1&2 |
| 24614 | TAP601 | 115 | 24702 | KRAMER | 115 | 1 | line_2260 | ivsg_hs_alt4bd2_ | 217.1 | -189.3 | 71.7 | 1002.5 | 202.4 | 0.922 | 0.716 | KRAMER 230.00 - LUGO 230.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2191 | ivsg_hs_alt4bd2_ | 2400 | -2308 | -50.3 | 2536.5 | 2308.5 | 0.915 | 0.718 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - ELDORDO 230.00 2 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2200 | ivsg_hs_alt4bd2_ | 2400 | -2298.3 | -41.6 | 2534.8 | 2298.7 | 0.915 | 0.718 | LUGO 500.00 - MOHAVE 500.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2201 | ivsg_hs_alt4bd2_ | 2400 | -2298.1 | -41.6 | 2534.6 | 2298.5 | 0.915 | 0.718 | LUGO 500.00 - MOHAVE 500.00 1, PISGAH 230.00 - LUGO 230.00 2 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2100 | ivsg_hs_alt4bd2_ | 2400 | -2300.7 | -198.7 | 2531.9 | 2309.3 | 0.914 | 0.718 | EAGLROCK 230.00 - MESA CAL 230.00 1, SYLMAR S 230.00 - GOULD 230.00 1 |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_2236 | ivsg_hs_alt4bd2_ | 169 | 154 | 30.1 | 551.9 | 156.9 | 0.914 | 0.851 | PALOVRDE 500.00 - DEVERS 500.00 1, COACHELV 230.00 - DEVERS 230.00 2 |
| 22596 | OLD TOWN | 230 | 22466 | MLMS3TAP | 230 | 1 | 23021/23041 | ivsg_hs_alt4bd2_ | 912 | -815.3 | 116.8 | 2087.6 | 823.6 | 0.912 | 0.706 | ML-SX + OM-SX 230KV |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2192 | ivsg_hs_alt4bd2_ | 2400 | -2296.3 | -60 | 2524.8 | 2297.1 | 0.911 | 0.718 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2193 | ivsg_hs_alt4bd2_ | 2400 | -2296.1 | -60.1 | 2524.6 | 2296.9 | 0.911 | 0.718 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - LUGO 230.00 2 |
| 24807 | MIRAGE | 115 | 24819 | CONCHO | 115 | 1 | line_2182 | ivsg_hs_alt4bd2_ | 183 | 164 | -7.4 | 835 | 164.1 | 0.909 | 0.871 | DEVERS 230.00 - MIRAGE 230.00 2, COACHELV 230.00 - DEVERS 230.00 2 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23021/23041 | ivsg_hs_alt4bd2_ | 204.1 | 187.4 | -2.5 | 775.9 | 187.4 | 0.909 | 1.173 | ML-SX + OM-SX 230KV |
| 24602 | VICTOR | 115 | 24702 | KRAMER | 115 | 1 | line_2260 | ivsg_hs_alt4bd2_ | 217.1 | -184.6 | 81.7 | 986.6 | 201.9 | 0.908 | 0.703 | KRAMER 230.00 - LUGO 230.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 24126 | RIOHONDO | 230 | 24155 | VINCENT | 230 | 2 | line_2101 | ivsg_hs_alt4bd2_ | 988 | -857.7 | 74.4 | 2247.9 | 861 | 0.906 | 0.687 | EAGLROCK 230.00 - MESA CAL 230.00 1, VINCENT 230.00 - MESA CAL 230.00 1 |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_2235 | ivsg_hs_alt4bd2_ | 169 | 152.1 | 28.3 | 543.9 | 154.7 | 0.901 | 0.851 | DEVERS 230.00 - MIRAGE 230.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | 23011/13825 | ivsg_hs_alt4bd2_ | 392 | 352.3 | 22.7 | 879.2 | 353.1 | 0.9 | 1 | ES-EA-SA 230KV + BQ-CC-ES-NCM 138KV |

ivsg_hs_alt4b_D2.sav
No Solve Summary
N-2 Outages

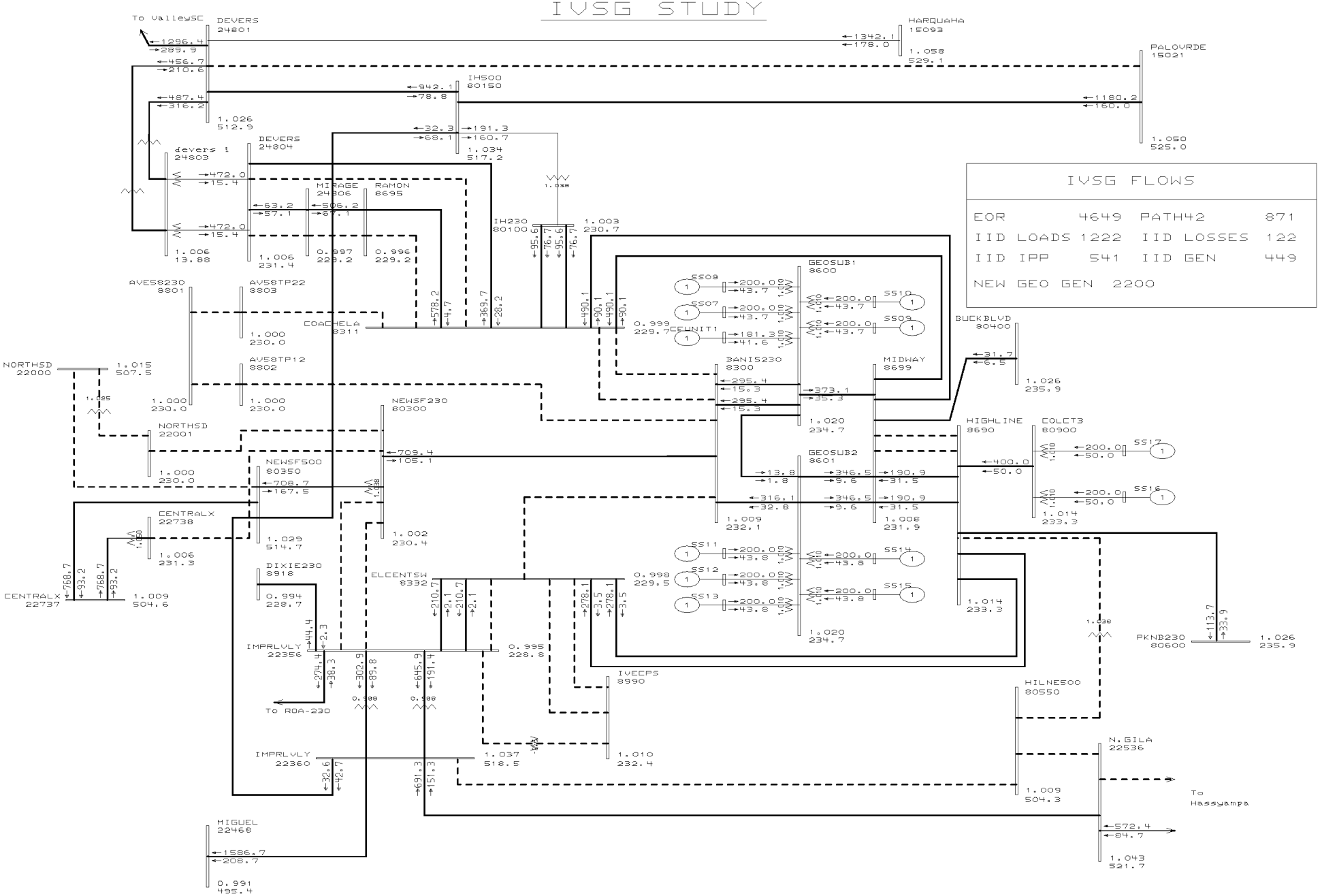
| Contingency-Description | Case | Problem-Description |
|---|---|---|
| DEVERS 230.00 - MIRAGE 230.00 2, RAMON 230.00 - MIRAGE 230.00 2 | ivsg_hs_alt4bd2_ | Pmis 24807 MIRAGE 115.00 = -124460.81 MW + j -103331.42 MVAR |
| VICTOR 230.00 - LUGO 230.00 1, VICTOR 230.00 - LUGO 230.00 2 | ivsg_hs_alt4bd2_ | Pmis 24702 KRAMER 115.00 = 5.07 MW + j 0.69 MVAR |
| DEVERS 230.00 - MIRAGE 230.00 2, RAMON 230.00 - MIRAGE 230.00 2 | ivsg_hs_alt4bd2_ | Pmis 24807 MIRAGE 115.00 = -124460.81 MW + j -103331.42 MVAR |

# Imperial Valley Study Group

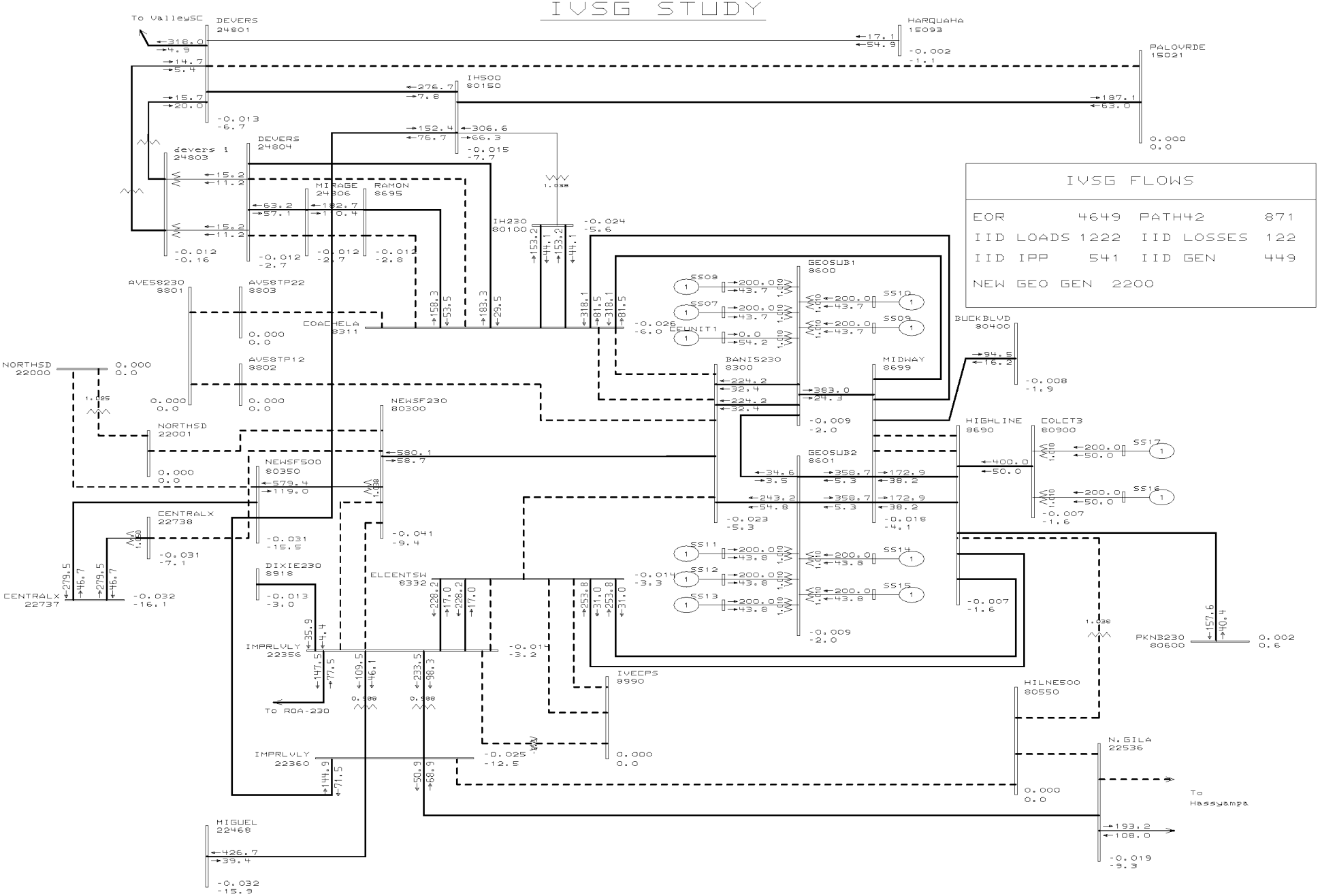
## Appendix A.4.14

Alt 5 D1
Heavy Summer
Alternative 5
Dispatch 1

# IVSG STUDY


To ValleySC
DEVERS
24801
HARQUAHA
15093
PALOVRDE
15021
IH500
80150
devers 1
24803
DEVERS
24804
MIRAGE
24806
RAMON
8695
IH230
80100
GEOSUB1
8600
AVES8230
8801
AVES8TP22
8803
COACHELA
8311
AVES8TP12
8802
BANIS230
8300
MIDWAY
8699
BUCKBLVD
80400
NORTHSD
22000
NORTHSD
22001
NEWSF230
80300
NEWSF500
80350
GEOSUB2
8601
HIGHLINE
8690
COLCT3
80900
CENTRALX
22738
CENTRALX
22737
DIXIE230
8918
ELCENTSW
8332
IMPRLVLY
22356
IVECPS
8990
HILNE500
80550
IMPRLVLY
22360
N.GILA
22536
MIGUEL
22468
PKNB230
80600
To RDA-230
To Hassyampa
IVSG FLOWS
EOR 4649 PATH42 871
IID LOADS 1222 IID LOSSES 122
IID IPP 541 IID GEN 449
NEW GEO GEN 2200

# IVSG STUDY




## IVSG FLOWS

| | | | |
|---|---|---|---|
| EOR | 4649 | PATH42 | 871 |
| IID LOADS | 1222 | IID LOSSES | 122 |
| IID IPP | 541 | IID GEN | 449 |
| NEW GEO GEN | 2200 | | |

ivsg_hs_alt5d1.sav
Voltage Summary
N-0 Outages

| Bus | Name | kV | Area | Zone | Outage | Case | Vbase | Vcont | DeltaV | Vmin | Vmax | Max-dv | Contingency Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24035 | EAGLEMTN | 161 | 24 | 248 | base | ivsg_hs_alt5d | 0.928 | 0.928 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 20077 | SIM-115 | 115 | 20 | 205 | base | ivsg_hs_alt5d | 0.932 | 0.932 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 20076 | SQN-115 | 115 | 20 | 205 | base | ivsg_hs_alt5d | 0.937 | 0.937 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14534 | N.GILA 4 | 100 | 14 | 847 | base | ivsg_hs_alt5d | 0.943 | 0.943 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15021 | PALOVRDE | 500 | 14 | 158 | base | ivsg_hs_alt5d | 1.05 | 1.05 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24775 | RUSH | 115 | 24 | 247 | base | ivsg_hs_alt5d | 1.05 | 1.05 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15051 | BROWNING | 500 | 14 | 158 | base | ivsg_hs_alt5d | 1.051 | 1.051 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24151 | VALLEYSC | 500 | 24 | 240 | base | ivsg_hs_alt5d | 1.051 | 1.051 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24997 | VALYSVC1 | 500 | 24 | 240 | base | ivsg_hs_alt5d | 1.051 | 1.051 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 28040 | CALPINE | 500 | 24 | 240 | base | ivsg_hs_alt5d | 1.051 | 1.051 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15090 | HASSYAMP | 500 | 14 | 158 | base | ivsg_hs_alt5d | 1.052 | 1.052 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15092 | ARLINTON | 500 | 14 | 158 | base | ivsg_hs_alt5d | 1.053 | 1.053 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15094 | MESQUITE | 500 | 14 | 158 | base | ivsg_hs_alt5d | 1.053 | 1.053 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24086 | LUGO | 500 | 24 | 240 | base | ivsg_hs_alt5d | 1.053 | 1.053 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14009 | REDHAWK | 500 | 14 | 141 | base | ivsg_hs_alt5d | 1.054 | 1.054 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14010 | TS5 | 500 | 14 | 141 | base | ivsg_hs_alt5d | 1.056 | 1.056 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 79043 | KAYENTA | 230 | 14 | 191 | base | ivsg_hs_alt5d | 1.056 | 1.056 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15093 | HARQUAHA | 500 | 14 | 158 | base | ivsg_hs_alt5d | 1.058 | 1.058 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14230 | VERDE N | 230 | 14 | 141 | base | ivsg_hs_alt5d | 1.058 | 1.058 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14247 | VERDE S | 230 | 14 | 141 | base | ivsg_hs_alt5d | 1.058 | 1.058 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14011 | RACEWAY | 500 | 14 | 141 | base | ivsg_hs_alt5d | 1.058 | 1.058 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24776 | LEE VINE | 115 | 24 | 247 | base | ivsg_hs_alt5d | 1.058 | 1.058 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15034 | PERKINS | 500 | 14 | 158 | base | ivsg_hs_alt5d | 1.061 | 1.061 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14205 | COCONINO | 230 | 14 | 141 | base | ivsg_hs_alt5d | 1.061 | 1.061 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14008 | JOJOBA | 500 | 14 | 141 | base | ivsg_hs_alt5d | 1.061 | 1.061 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15041 | SILVERKG | 500 | 14 | 158 | base | ivsg_hs_alt5d | 1.062 | 1.062 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15061 | RUDD | 500 | 14 | 158 | base | ivsg_hs_alt5d | 1.062 | 1.062 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14234 | YAVAPAI | 230 | 14 | 141 | base | ivsg_hs_alt5d | 1.063 | 1.063 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24156 | VINCENT | 500 | 24 | 240 | base | ivsg_hs_alt5d | 1.063 | 1.063 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14355 | PRESCOTT | 115 | 14 | 141 | base | ivsg_hs_alt5d | 1.066 | 1.066 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14544 | PRESCOT2 | 100 | 14 | 141 | base | ivsg_hs_alt5d | 1.066 | 1.066 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14543 | PRESCOT1 | 100 | 14 | 141 | base | ivsg_hs_alt5d | 1.066 | 1.066 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14001 | FOURCORN | 500 | 14 | 141 | base | ivsg_hs_alt5d | 1.067 | 1.067 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14256 | FLAGSTAF | 230 | 14 | 141 | base | ivsg_hs_alt5d | 1.067 | 1.067 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14587 | FLAGSTF1 | 100 | 14 | 141 | base | ivsg_hs_alt5d | 1.068 | 1.068 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24729 | INYO | 230 | 24 | 247 | base | ivsg_hs_alt5d | 1.068 | 1.068 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14007 | GILARIVR | 500 | 14 | 141 | base | ivsg_hs_alt5d | 1.069 | 1.069 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 79264 | PINAL_W | 500 | 14 | 141 | base | ivsg_hs_alt5d | 1.07 | 1.07 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14006 | YAVAPAI | 500 | 14 | 141 | base | ivsg_hs_alt5d | 1.071 | 1.071 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14004 | SAGUARO | 500 | 14 | 141 | base | ivsg_hs_alt5d | 1.075 | 1.075 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14215 | LEUPP | 230 | 14 | 141 | base | ivsg_hs_alt5d | 1.075 | 1.075 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15992 | SEV | 500 | 14 | 158 | base | ivsg_hs_alt5d | 1.075 | 1.075 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 16000 | TORTOLIT | 500 | 14 | 160 | base | ivsg_hs_alt5d | 1.075 | 1.075 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 16001 | TORTLIT2 | 500 | 14 | 160 | base | ivsg_hs_alt5d | 1.075 | 1.075 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14100 | CHOLLA | 345 | 14 | 141 | base | ivsg_hs_alt5d | 1.077 | 1.077 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15001 | CORONADO | 500 | 14 | 158 | base | ivsg_hs_alt5d | 1.08 | 1.08 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14000 | CHOLLA | 500 | 14 | 141 | base | ivsg_hs_alt5d | 1.081 | 1.081 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24042 | ELDORDO | 500 | 24 | 240 | base | ivsg_hs_alt5d | 1.083 | 1.083 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 19038 | MEAD | 500 | 14 | 191 | base | ivsg_hs_alt5d | 1.084 | 1.084 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24097 | MOHAVE | 500 | 24 | 240 | base | ivsg_hs_alt5d | 1.086 | 1.086 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14204 | CHOLLA | 230 | 14 | 141 | base | ivsg_hs_alt5d | 1.088 | 1.088 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14509 | CHOLLA 7 | 100 | 14 | 141 | base | ivsg_hs_alt5d | 1.094 | 1.094 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14267 | SECDKNOL | 230 | 14 | 141 | base | ivsg_hs_alt5d | 1.099 | 1.099 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14003 | NAVAJO | 500 | 14 | 141 | base | ivsg_hs_alt5d | 1.101 | 1.101 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14002 | MOENKOPI | 500 | 14 | 141 | base | ivsg_hs_alt5d | 1.103 | 1.103 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |

ivsg_hs_alt5d1.sav
Flow Summary
N-0 Outages

| LEGEND | % of RATING 1 | |
|---|---|---|
| C_pu | 100% - 110% | |
| C_pu | 110% - 120% | P.U. of |
| C_pu | > 120% | Rate 1 |

| FROM | FR | BKV | TO | TO | BKV | CK | Outage_Name | Case | Rate-Mva | Pflow | Qflow | Amps | MVA | C_pu | B_pu | Contingency_Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | base | ivsg_hs_alt5d1 | 204.1 | 259.2 | -3.6 | 1089.8 | 259.2 | 1.276 | 1.276 | Base system (n-0) |
| 24910 | CAL ELEC | 115 | 24912 | SHANDIN | 115 | 1 | base | ivsg_hs_alt5d1 | 109.1 | -124.1 | 58.4 | 683.9 | 137.2 | 1.251 | 1.251 | Base system (n-0) |
| 14248 | GLENDALW | 230 | 14212 | GLENDALE | 230 | 1 | base | ivsg_hs_alt5d1 | 457 | 571.7 | 32.4 | 1433.2 | 572.6 | 1.249 | 1.249 | Base system (n-0) |
| 14248 | GLENDALW | 230 | 15201 | AGUAFRIA | 230 | 1 | base | ivsg_hs_alt5d1 | 457 | -571.7 | -32.4 | 1433.2 | 572.6 | 1.249 | 1.249 | Base system (n-0) |
| 14221 | PNPKAPS | 230 | 19062 | PINPK | 230 | 1 | base | ivsg_hs_alt5d1 | 637.4 | -784 | -185.7 | 1983.3 | 805.7 | 1.24 | 1.24 | Base system (n-0) |
| 24912 | SHANDIN | 115 | 24916 | TAP902 | 115 | 1 | base | ivsg_hs_alt5d1 | 109.1 | -119.2 | 33.5 | 614.4 | 123.8 | 1.123 | 1.123 | Base system (n-0) |
| 14212 | GLENDALE | 230 | 14270 | GRNDTRML | 230 | 1 | base | ivsg_hs_alt5d1 | 457 | 506.3 | 24.9 | 1268.9 | 506.9 | 1.108 | 1.108 | Base system (n-0) |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | base | ivsg_hs_alt5d1 | 392 | 409.9 | 9.9 | 1041.8 | 410 | 1.05 | 1.05 | Base system (n-0) |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | base | ivsg_hs_alt5d1 | 392 | 404.7 | 42.5 | 1041.1 | 407 | 1.04 | 1.04 | Base system (n-0) |
| 14206 | CTRYCLUB | 230 | 14270 | GRNDTRML | 230 | 1 | base | ivsg_hs_alt5d1 | 509.9 | -502.9 | -25.2 | 1272.2 | 503.6 | 0.994 | 0.994 | Base system (n-0) |
| 14202 | CACTUS | 230 | 14221 | PNPKAPS | 230 | 1 | base | ivsg_hs_alt5d1 | 371 | -363.5 | -48.6 | 920.5 | 366.7 | 0.988 | 0.988 | Base system (n-0) |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | base | ivsg_hs_alt5d1 | 408.3 | -400 | 1.9 | 1680.5 | 400 | 0.984 | 0.984 | Base system (n-0) |
| 15230 | RUDD | 230 | 15218 | WHITETNK | 230 | 1 | base | ivsg_hs_alt5d1 | 725 | 694 | -18.3 | 1738.4 | 694.2 | 0.955 | 0.955 | Base system (n-0) |
| 24087 | MAGUNDEN | 230 | 24101 | OMAR | 230 | 1 | base | ivsg_hs_alt5d1 | 643 | -591.8 | 130.2 | 1533.8 | 606 | 0.951 | 0.951 | Base system (n-0) |
| 24806 | MIRAGE | 230 | 24807 | MIRAGE | 115 | 1 | base | ivsg_hs_alt5d1 | 280 | 265.6 | 26.9 | 674.8 | 267 | 0.95 | 0.95 | Base system (n-0) |
| 24806 | MIRAGE | 230 | 24807 | MIRAGE | 115 | 2 | base | ivsg_hs_alt5d1 | 280 | 265.6 | 26.9 | 674.8 | 267 | 0.95 | 0.95 | Base system (n-0) |
| 24702 | KRAMER | 115 | 24753 | SUNGEN | 115 | 1 | base | ivsg_hs_alt5d1 | 183.3 | -170.5 | 31.7 | 863.7 | 173.4 | 0.939 | 0.939 | Base system (n-0) |
| 14008 | JOJOBA | 500 | 15011 | KYRENE | 500 | 1 | base | ivsg_hs_alt5d1 | 1732 | 1711.5 | 134.1 | 1868.3 | 1716.7 | 0.936 | 0.936 | Base system (n-0) |
| 26098 | SYLMAR3 | 230 | 24147 | SYLMAR S | 230 | 1 | base | ivsg_hs_alt5d1 | 1100 | 841 | -523.1 | 2575.8 | 990.4 | 0.933 | 0.933 | Base system (n-0) |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | base | ivsg_hs_alt5d1 | 56 | 50 | -10.7 | 253 | 51.1 | 0.92 | 0.92 | Base system (n-0) |
| 14207 | DEERVALY | 230 | 14231 | WESTWING | 230 | 1 | base | ivsg_hs_alt5d1 | 720 | -647.4 | -80.2 | 1634.1 | 652.3 | 0.904 | 0.904 | Base system (n-0) |

ivsg_hs_alt5d1.sav
VOLTAGE Summary
N-1 Outages

| Bus | Name | kV | Area | Zone | Outage | Case | Vbase | Vcont | DeltaV | Vmin | Vmax | Max-dv | Contingency Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24017 | BLYTHESC | 161 | 24 | 248 | line_007 | ivsg_hs_alt5d1 | 1.02 | 0.866 | -0.154 | 0.9 | 1.05 | 0.05 | line BLYTHE to BLYTHESC 161 ck 1 |
| 22412 | LOSCOCHS | 138 | 22 | 223 | B2_002 | ivsg_hs_alt5d1 | 0.978 | 0.884 | -0.095 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22424 | MAINST50 | 138 | 22 | 222 | B2_002 | ivsg_hs_alt5d1 | 0.975 | 0.884 | -0.09 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22428 | MAINST51 | 138 | 22 | 222 | B2_002 | ivsg_hs_alt5d1 | 0.974 | 0.884 | -0.091 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22464 | MIGUEL | 230 | 22 | 222 | B2_002 | ivsg_hs_alt5d1 | 0.981 | 0.886 | -0.095 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22468 | MIGUEL | 500 | 22 | 227 | B2_002 | ivsg_hs_alt5d1 | 0.99 | 0.886 | -0.105 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22472 | MIGUELMP | 500 | 22 | 227 | B2_002 | ivsg_hs_alt5d1 | 0.983 | 0.886 | -0.097 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22734 | SANTEE | 138 | 22 | 223 | B2_002 | ivsg_hs_alt5d1 | 0.98 | 0.89 | -0.09 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22772 | SOUTHBAY | 138 | 22 | 222 | B2_002 | ivsg_hs_alt5d1 | 0.983 | 0.893 | -0.089 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22865 | UPTOWN | 138 | 22 | 221 | B2_002 | ivsg_hs_alt5d1 | 0.986 | 0.901 | -0.085 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22116 | CARLTHTP | 138 | 22 | 223 | B2_002 | ivsg_hs_alt5d1 | 0.987 | 0.902 | -0.085 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22852 | TELECYN | 138 | 22 | 222 | B2_002 | ivsg_hs_alt5d1 | 0.993 | 0.902 | -0.091 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22120 | CARLTNHS | 138 | 22 | 223 | B2_002 | ivsg_hs_alt5d1 | 0.988 | 0.904 | -0.083 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22672 | PRCTRVLY | 138 | 22 | 222 | B2_002 | ivsg_hs_alt5d1 | 0.996 | 0.904 | -0.092 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22832 | SYCAMORE | 230 | 22 | 221 | B2_002 | ivsg_hs_alt5d1 | 0.988 | 0.904 | -0.084 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22460 | MIGUEL | 138 | 22 | 222 | B2_002 | ivsg_hs_alt5d1 | 0.998 | 0.905 | -0.093 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22504 | MISSION | 230 | 22 | 221 | B2_002 | ivsg_hs_alt5d1 | 0.976 | 0.905 | -0.071 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22596 | OLD TOWN | 230 | 22 | 221 | B2_002 | ivsg_hs_alt5d1 | 0.979 | 0.909 | -0.069 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22500 | MISSION | 138 | 22 | 221 | B2_002 | ivsg_hs_alt5d1 | 0.991 | 0.913 | -0.078 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22300 | FRIARS | 138 | 22 | 221 | B2_002 | ivsg_hs_alt5d1 | 0.99 | 0.914 | -0.076 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22831 | SYCAMORE | 138 | 22 | 221 | B2_002 | ivsg_hs_alt5d1 | 0.995 | 0.915 | -0.081 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22738 | CENTRALX | 230 | 22 | 225 | B2_002 | ivsg_hs_alt5d1 | 1.005 | 0.917 | -0.088 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22737 | CENTRALX | 500 | 22 | 225 | B2_002 | ivsg_hs_alt5d1 | 1.009 | 0.924 | -0.084 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22922 | MIRA SOR | 138 | 22 | 221 | B2_002 | ivsg_hs_alt5d1 | 0.988 | 0.926 | -0.062 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22124 | CHCARITA | 138 | 22 | 225 | B2_002 | ivsg_hs_alt5d1 | 0.996 | 0.927 | -0.069 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22652 | PENSQTOS | 230 | 22 | 221 | B2_002 | ivsg_hs_alt5d1 | 0.988 | 0.927 | -0.061 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 24731 | INYOKERN | 115 | 24 | 247 | line_175 | ivsg_hs_alt5d1 | 1 | 0.927 | -0.073 | 0.9 | 1.05 | 0.05 | line INYO to COTTONWD 230 ck 1 |
| 22184 | DOUBLET | 138 | 22 | 221 | B2_002 | ivsg_hs_alt5d1 | 0.989 | 0.931 | -0.058 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22192 | DOUBLTTP | 138 | 22 | 221 | B2_002 | ivsg_hs_alt5d1 | 0.989 | 0.931 | -0.058 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 25423 | ESRP MWD | 115 | 24 | 254 | tran_247 | ivsg_hs_alt5d1 | 1.021 | 0.931 | -0.091 | 0.9 | 1.05 | 0.05 | tran VALLEYSC 500 to VALLEYSC 115 ck 1 |
| 25423 | ESRP MWD | 115 | 24 | 254 | tran_248 | ivsg_hs_alt5d1 | 1.021 | 0.931 | -0.091 | 0.9 | 1.05 | 0.05 | tran VALLEYSC 500 to VALLEYSC 115 ck 2 |
| 22648 | PENSQTOS | 138 | 22 | 221 | B2_002 | ivsg_hs_alt5d1 | 0.989 | 0.932 | -0.057 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 24160 | VALLEYSC | 115 | 24 | 240 | tran_247 | ivsg_hs_alt5d1 | 1.024 | 0.934 | -0.09 | 0.9 | 1.05 | 0.05 | tran VALLEYSC 500 to VALLEYSC 115 ck 1 |
| 25990 | VALYSVC1 | 115 | 24 | 240 | tran_247 | ivsg_hs_alt5d1 | 1.024 | 0.934 | -0.09 | 0.9 | 1.05 | 0.05 | tran VALLEYSC 500 to VALLEYSC 115 ck 1 |
| 24160 | VALLEYSC | 115 | 24 | 240 | tran_248 | ivsg_hs_alt5d1 | 1.024 | 0.934 | -0.09 | 0.9 | 1.05 | 0.05 | tran VALLEYSC 500 to VALLEYSC 115 ck 2 |
| 25990 | VALYSVC1 | 115 | 24 | 240 | tran_248 | ivsg_hs_alt5d1 | 1.024 | 0.934 | -0.09 | 0.9 | 1.05 | 0.05 | tran VALLEYSC 500 to VALLEYSC 115 ck 2 |
| 24819 | CONCHO | 115 | 24 | 248 | tran_238 | ivsg_hs_alt5d1 | 1.029 | 0.938 | -0.09 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 24822 | INDIAN W | 115 | 24 | 248 | tran_238 | ivsg_hs_alt5d1 | 1.028 | 0.938 | -0.091 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 22580 | NORTHCTY | 138 | 22 | 224 | B2_002 | ivsg_hs_alt5d1 | 0.993 | 0.94 | -0.054 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22466 | MLMS3TAP | 230 | 22 | 222 | B2_002 | ivsg_hs_alt5d1 | 0.993 | 0.94 | -0.053 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 24816 | SANTA RO | 115 | 24 | 248 | tran_238 | ivsg_hs_alt5d1 | 1.033 | 0.942 | -0.09 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 24821 | TAMARISK | 115 | 24 | 248 | tran_238 | ivsg_hs_alt5d1 | 1.032 | 0.943 | -0.089 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 24827 | TAP823 | 115 | 24 | 248 | tran_238 | ivsg_hs_alt5d1 | 1.034 | 0.945 | -0.089 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 25633 | CAPWIND | 115 | 24 | 248 | tran_238 | ivsg_hs_alt5d1 | 1.035 | 0.946 | -0.089 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 25622 | TAP806 | 115 | 24 | 248 | tran_238 | ivsg_hs_alt5d1 | 1.035 | 0.946 | -0.089 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 24829 | TAP821 | 115 | 24 | 248 | tran_238 | ivsg_hs_alt5d1 | 1.035 | 0.946 | -0.089 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 24807 | MIRAGE | 115 | 24 | 248 | tran_238 | ivsg_hs_alt5d1 | 1.036 | 0.948 | -0.088 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 22467 | MLSXTAP | 230 | 22 | 222 | B2_002 | ivsg_hs_alt5d1 | 1 | 0.949 | -0.051 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 14534 | N.GILA 4 | 100 | 14 | 847 | NG500/69 | ivsg_hs_alt5d1 | 0.943 | 1 | 0.057 | 0.9 | 1.05 | 0.05 | tran N.GILA 500 to N.GILA 69 ck 1 |
| 24035 | EAGLEMTN | 161 | 24 | 248 | tran_241 | ivsg_hs_alt5d1 | 0.928 | 1.026 | 0.098 | 0.9 | 1.05 | 0.05 | tran EAGLEMTN 230 to EAGLEMTN 161 ck 1 |
| 22472 | MIGUELMP | 500 | 22 | 227 | ML80 | ivsg_hs_alt5d1 | 0.983 | 1.05 | 0.067 | 0.9 | 1.05 | 0.05 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 24730 | INYO PS | 115 | 24 | 247 | tran_229 | ivsg_hs_alt5d1 | 1.026 | 1.078 | 0.052 | 0.9 | 1.05 | 0.05 | tran INYO 115 to INYO PS 115 ck 1 |
| 24142 | SYC CYN | 230 | 24 | 240 | line_086 | ivsg_hs_alt5d1 | 0.984 | 1.091 | 0.107 | 0.9 | 1.05 | 0.05 | line MAGUNDEN to OMAR 230 ck 1 |
| 25613 | EDMONSTN | 230 | 24 | 256 | line_122 | ivsg_hs_alt5d1 | 0.999 | 1.091 | 0.092 | 0.9 | 1.05 | 0.05 | line PASTORIA to EDMONSTN 230 ck 1 |
| 24142 | SYC CYN | 230 | 24 | 240 | line_140 | ivsg_hs_alt5d1 | 0.984 | 1.091 | 0.107 | 0.9 | 1.05 | 0.05 | line SYC CYN to OMAR 230 ck 1 |
| 24320 | EASTWOOD | 230 | 24 | 243 | line_157 | ivsg_hs_alt5d1 | 1.041 | 1.091 | 0.05 | 0.9 | 1.05 | 0.05 | line BIG CRK1 to EASTWOOD 230 ck 1 |

ivsg_hs_alt5d1.sav
FLOW Summary
N-1 Outages

| LEGEND | % of RATING 1 | |
|---|---|---|
| C_pu | 100% - 110% | |
| C_pu | 110% - 120% | P.U. of |
| C_pu | > 120% | Rate 1 |

| FROM | FR | BKV | TO | TO | BKV | CK | Outage_Name | Case | Rate-Mva | Pflow | Qflow | Amps | MVA | C_pu | B_pu | Contingency_Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24142 | SYC CYN | 230 | 24101 | OMAR | 230 | 1 | line_086 | ivsg_hs_alt5d1 | 643 | 770 | 5511.1 | 12804.5 | 5564.6 | 7.934 | 0.471 | line MAGUNDEN to OMAR 230 ck 1 |
| 24781 | NAVYCOSO | 230 | 24706 | BLM EAST | 230 | 1 | line_173 | ivsg_hs_alt5d1 | 1287 | -153.7 | -3160.7 | 7943.3 | 3164.4 | 2.459 | 0.056 | line BLM EAST to BLM WEST 230 ck 1 |
| 24781 | NAVYCOSO | 230 | 24706 | BLM EAST | 230 | 1 | line_174 | ivsg_hs_alt5d1 | 1287 | -153.7 | -3160.7 | 7943.3 | 3164.4 | 2.459 | 0.056 | line BLM WEST to KRAMER 230 ck 1 |
| 24806 | MIRAGE | 230 | 24807 | MIRAGE | 115 | 2 | tran_238 | ivsg_hs_alt5d1 | 280 | 532.3 | 204 | 1475.2 | 570 | 2.04 | 0.95 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_175 | ivsg_hs_alt5d1 | 56 | -103.6 | -1.1 | 531.9 | 103.6 | 1.86 | 0.92 | line INYO to COTTONWD 230 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_002 | ivsg_hs_alt5d1 | 204.1 | 333.7 | 5 | 1526.8 | 333.8 | 1.788 | 1.276 | IMPRLVLY - MIGUEL 1 500kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_034 | ivsg_hs_alt5d1 | 204.1 | 334.7 | -0.4 | 1448.7 | 334.7 | 1.697 | 1.276 | OLD TOWN - MLMS3TAP 1 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_032 | ivsg_hs_alt5d1 | 204.1 | 334.7 | -1.1 | 1447.8 | 334.7 | 1.696 | 1.276 | OTAYMESA - MLMS3TAP 1 230kV |
| 24151 | VALLEYSC | 500 | 24160 | VALLEYSC | 115 | 2 | tran_247 | ivsg_hs_alt5d1 | 560 | 853.2 | 368 | 1037.1 | 929.2 | 1.66 | 0.77 | tran VALLEYSC 500 to VALLEYSC 115 ck 1 |
| 24151 | VALLEYSC | 500 | 24160 | VALLEYSC | 115 | 1 | tran_248 | ivsg_hs_alt5d1 | 560 | 853.2 | 368 | 1037.1 | 929.2 | 1.66 | 0.77 | tran VALLEYSC 500 to VALLEYSC 115 ck 2 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_009 | ivsg_hs_alt5d1 | 204.1 | 322.1 | -2.9 | 1361.8 | 322.1 | 1.595 | 1.276 | EPP - ESCNDIDO 1 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | ML60 | ivsg_hs_alt5d1 | 204.1 | 310.4 | 3.9 | 1318.2 | 310.4 | 1.544 | 1.276 | tran MIGUEL 230 to MIGUEL 138 ck 1 |
| 24151 | VALLEYSC | 500 | 24229 | VALLEY-S | 115 | 4 | tran_249 | ivsg_hs_alt5d1 | 560 | 830.6 | 209.3 | 952 | 856.6 | 1.53 | 0.75 | tran VALLEYSC 500 to VALLEY-S 115 ck 3 |
| 24151 | VALLEYSC | 500 | 24229 | VALLEY-S | 115 | 3 | tran_250 | ivsg_hs_alt5d1 | 560 | 830.7 | 209.3 | 952 | 856.6 | 1.53 | 0.75 | tran VALLEYSC 500 to VALLEY-S 115 ck 4 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | SX70 | ivsg_hs_alt5d1 | 204.1 | 306.4 | 12.9 | 1298.1 | 306.7 | 1.52 | 1.276 | tran SYCAMORE 230 to SYCAMORE 69 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_013 | ivsg_hs_alt5d1 | 204.1 | 298 | -9.2 | 1263.3 | 298.1 | 1.479 | 1.276 | EPP - SYCAMORE 1 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | MS60 | ivsg_hs_alt5d1 | 204.1 | 283.5 | 3.5 | 1197.6 | 283.5 | 1.403 | 1.276 | tran MISSION 230 to MISSION 138 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | MS61 | ivsg_hs_alt5d1 | 204.1 | 283.5 | 3.5 | 1197.6 | 283.5 | 1.403 | 1.276 | tran MISSION 230 to MISSION 138 ck 2 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_202 | ivsg_hs_alt5d1 | 56 | 77.5 | -7.2 | 392.8 | 77.8 | 1.4 | 0.92 | line OWENSCON to INYO 230 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | ML70 | ivsg_hs_alt5d1 | 204.1 | 275.5 | 3.9 | 1165.6 | 275.5 | 1.365 | 1.276 | tran MIGUEL 69 to MIGUEL 230 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | ML71 | ivsg_hs_alt5d1 | 204.1 | 275.5 | 3.9 | 1165.6 | 275.5 | 1.365 | 1.276 | tran MIGUEL 69 to MIGUEL 230 ck 2 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_015 | ivsg_hs_alt5d1 | 204.1 | 274.6 | -2.9 | 1158.1 | 274.6 | 1.356 | 1.276 | MIGUEL - MISSION 1 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_020 | ivsg_hs_alt5d1 | 204.1 | 274.1 | -3.5 | 1155.9 | 274.1 | 1.354 | 1.276 | MIGUEL - MISSION 2 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | ML80 | ivsg_hs_alt5d1 | 204.1 | 269.9 | -2.5 | 1143.3 | 269.9 | 1.339 | 1.276 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | SO2 | ivsg_hs_alt5d1 | 204.1 | 266.9 | 0.6 | 1141 | 266.9 | 1.336 | 1.276 | gen S.ONOFR2 22.00 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | ML81 | ivsg_hs_alt5d1 | 204.1 | 269 | -2.6 | 1138.4 | 269 | 1.333 | 1.276 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | MS70 | ivsg_hs_alt5d1 | 204.1 | 269.3 | 4.4 | 1138.5 | 269.3 | 1.333 | 1.276 | tran MISSION 230 to MISSION 69 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_007 | ivsg_hs_alt5d1 | 204.1 | 268.4 | 2 | 1134 | 268.4 | 1.328 | 1.276 | PENSQTOS - ENCINA 1 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | line_207 | ivsg_hs_alt5d1 | 204.1 | 265.5 | -2.3 | 1128.2 | 265.5 | 1.321 | 1.276 | line DEVERS to VALLEYSC 500 ck 1 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | B2_009 | ivsg_hs_alt5d1 | 392 | 518.2 | 31.4 | 1322.5 | 519.1 | 1.32 | 1.05 | EPP - ESCNDIDO 1 230kV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | B2_032 | ivsg_hs_alt5d1 | 392 | 515.5 | 22.6 | 1348.2 | 516 | 1.32 | 1.05 | OTAYMESA - MLMS3TAP 1 230kV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | B2_034 | ivsg_hs_alt5d1 | 392 | 515.5 | 23.2 | 1348.9 | 516 | 1.32 | 1.05 | OLD TOWN - MLMS3TAP 1 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | line_83 | ivsg_hs_alt5d1 | 204.1 | 263.9 | -3.5 | 1116 | 263.9 | 1.307 | 1.276 | line IH500 to DEVERS 500 ck 1 |
| 22468 | MIGUEL | 500 | 22472 | MIGUELMP | 500 | 1 | ML81 | ivsg_hs_alt5d1 | 1120 | 1399.3 | 259.3 | 1661.7 | 1423.1 | 1.27 | 0.73 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 8682 | BANISTER | 161 | 8300 | BANIS230 | 230 | 1 | line_7 | ivsg_hs_alt5d1 | 225 | -278.8 | 35.5 | 1021.7 | 281 | 1.26 | 0.81 | line BANIS230 to NEWSF230 230 ck 1 |
| 8682 | BANISTER | 161 | 8300 | BANIS230 | 230 | 1 | tran_74 | ivsg_hs_alt5d1 | 225 | -279.1 | 33.8 | 1020.2 | 281.1 | 1.26 | 0.81 | tran NEWSF230 230 to NEWSF500 500 ck 1 |
| 22464 | MIGUEL | 230 | 22468 | MIGUEL | 500 | 1 | ML80 | ivsg_hs_alt5d1 | 1120 | -1377.6 | 4.9 | 3566.8 | 1377.6 | 1.25 | 0.69 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 22464 | MIGUEL | 230 | 22472 | MIGUELMP | 500 | 1 | ML81 | ivsg_hs_alt5d1 | 1120 | -1396.6 | 2.1 | 3612.5 | 1396.6 | 1.25 | 0.73 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | line_7 | ivsg_hs_alt5d1 | 204.1 | 253 | -0.4 | 1062 | 253 | 1.244 | 1.276 | line BANIS230 to NEWSF230 230 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | tran_74 | ivsg_hs_alt5d1 | 204.1 | 253 | -0.4 | 1061.9 | 253 | 1.244 | 1.276 | tran NEWSF230 230 to NEWSF500 500 ck 1 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | B2_002 | ivsg_hs_alt5d1 | 392 | 483.3 | 4.2 | 1342.2 | 483.3 | 1.24 | 1.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | SX70 | ivsg_hs_alt5d1 | 392 | 484.3 | 42.3 | 1236 | 486.2 | 1.24 | 1.05 | tran SYCAMORE 230 to SYCAMORE 69 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_028 | ivsg_hs_alt5d1 | 204.1 | 251.1 | 0.9 | 1055.5 | 251.1 | 1.236 | 1.276 | MIGUEL - SYCAMORE 1 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_008 | ivsg_hs_alt5d1 | 204.1 | 249.1 | 3 | 1050.8 | 249.1 | 1.231 | 1.276 | PENSQTOS - OLD TOWN 1 230kV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | B2_013 | ivsg_hs_alt5d1 | 392 | 477 | 12.5 | 1222.7 | 477.1 | 1.22 | 1.05 | EPP - SYCAMORE 1 230kV |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | B2_002 | ivsg_hs_alt5d1 | 1120 | -1341.6 | -110.7 | 3683.8 | 1346.2 | 1.21 | 0.69 | IMPRLVLY - MIGUEL 1 500kV |
| 22356 | IMPRLVLY | 230 | 22360 | IMPRLVLY | 500 | 1 | IV81 | ivsg_hs_alt5d1 | 600 | 685 | 214.3 | 1803.2 | 717.8 | 1.2 | 0.53 | tran IMPRLVLY 230 to IMPRLVLY 500 ck 2 |
| 24723 | CONTROL | 115 | 24731 | INYOKERN | 115 | 1 | line_175 | ivsg_hs_alt5d1 | 82.7 | 95.9 | -4.2 | 496.1 | 96 | 1.195 | 0.419 | line INYO to COTTONWD 230 ck 1 |
| 24723 | CONTROL | 115 | 24731 | INYOKERN | 115 | 2 | line_175 | ivsg_hs_alt5d1 | 82.7 | 95.9 | -4.2 | 496.1 | 96 | 1.195 | 0.419 | line INYO to COTTONWD 230 ck 1 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | ML60 | ivsg_hs_alt5d1 | 392 | 465.2 | 24.7 | 1193 | 465.9 | 1.19 | 1.05 | tran MIGUEL 230 to MIGUEL 138 ck 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_015 | ivsg_hs_alt5d1 | 392 | 447 | 52.9 | 1153.5 | 450.1 | 1.15 | 1.04 | MIGUEL - MISSION 1 230kV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | SX60 | ivsg_hs_alt5d1 | 392 | 449.1 | 51.5 | 1167.2 | 452 | 1.15 | 1.04 | tran SYCAMORE 230 to SYCAMORE 138 ck 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_020 | ivsg_hs_alt5d1 | 392 | 445.4 | 51 | 1149.8 | 448.3 | 1.14 | 1.04 | MIGUEL - MISSION 2 230kV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | ML70 | ivsg_hs_alt5d1 | 392 | 439.8 | 56.6 | 1141.1 | 443.4 | 1.13 | 1.04 | tran MIGUEL 69 to MIGUEL 230 ck 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | ML71 | ivsg_hs_alt5d1 | 392 | 439.8 | 56.6 | 1141.1 | 443.4 | 1.13 | 1.04 | tran MIGUEL 69 to MIGUEL 230 ck 2 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_029 | ivsg_hs_alt5d1 | 204.1 | 226.3 | 0 | 956.3 | 226.3 | 1.12 | 1.276 | OTAYMESA - MLSXTAP 1 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_031 | ivsg_hs_alt5d1 | 204.1 | 226.1 | -0.8 | 956.5 | 226.1 | 1.12 | 1.276 | SYCAMORE - MLSXTAP 1 230kV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_032 | ivsg_hs_alt5d1 | 392 | 435.5 | 53.2 | 1157.9 | 438.8 | 1.12 | 1.04 | OTAYMESA - MLMS3TAP 1 230kV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_034 | ivsg_hs_alt5d1 | 392 | 435.5 | 53.6 | 1158.6 | 438.8 | 1.12 | 1.04 | OLD TOWN - MLMS3TAP 1 230kV |
| 24729 | INYO | 230 | 24730 | INYO PS | 115 | 1 | line_175 | ivsg_hs_alt5d1 | 50 | 51.8 | 21.2 | 133 | 56 | 1.12 | 0.54 | line INYO to COTTONWD 230 ck 1 |
| 24729 | INYO | 230 | 24730 | INYO PS | 115 | 2 | line_175 | ivsg_hs_alt5d1 | 50 | 51.8 | 21.2 | 133 | 56 | 1.12 | 0.54 | line INYO to COTTONWD 230 ck 1 |
| 8600 | GEOSUB1 | 230 | 8699 | MIDWAY | 230 | 1 | line_7 | ivsg_hs_alt5d1 | 550 | 600.1 | 71.3 | 1535.8 | 604.4 | 1.113 | 0.67 | line BANIS230 to NEWSF230 230 ck 1 |
| 8600 | GEOSUB1 | 230 | 8699 | MIDWAY | 230 | 1 | tran_74 | ivsg_hs_alt5d1 | 550 | 600 | 74.6 | 1532.3 | 604.6 | 1.11 | 0.67 | tran NEWSF230 230 to NEWSF500 500 ck 1 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | MS60 | ivsg_hs_alt5d1 | 392 | 435.2 | 19.9 | 1110 | 435.6 | 1.11 | 1.05 | tran MISSION 230 to MISSION 138 ck 1 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | MS61 | ivsg_hs_alt5d1 | 392 | 435.2 | 19.9 | 1110 | 435.6 | 1.11 | 1.05 | tran MISSION 230 to MISSION 138 ck 2 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | SX60 | ivsg_hs_alt5d1 | 408.3 | -443.1 | 4.4 | 1884 | 443.2 | 1.103 | 0.984 | tran SYCAMORE 230 to SYCAMORE 138 ck 1 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | B2_015 | ivsg_hs_alt5d1 | 392 | 432.6 | 13.3 | 1102.7 | 432.8 | 1.1 | 1.05 | MIGUEL - MISSION 1 230kV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | B2_020 | ivsg_hs_alt5d1 | 392 | 431.8 | 12.5 | 1100.8 | 432 | 1.1 | 1.05 | MIGUEL - MISSION 2 230kV |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | B2_034 | ivsg_hs_alt5d1 | 408.3 | -429.6 | 1.4 | 1870.1 | 429.6 | 1.095 | 0.984 | OLD TOWN - MLMS3TAP 1 230kV |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | B2_032 | ivsg_hs_alt5d1 | 408.3 | -429.7 | 1.8 | 1869 | 429.7 | 1.094 | 0.984 | OTAYMESA - MLMS3TAP 1 230kV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | line_66 | ivsg_hs_alt5d1 | 392 | 425.9 | 39.3 | 1124.8 | 427.7 | 1.09 | 1.04 | line CENTRALX to NEWSF500 500 ck 1 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | B2_015 | ivsg_hs_alt5d1 | 408.3 | -441.2 | 1.7 | 1861.9 | 441.2 | 1.09 | 0.984 | MIGUEL - MISSION 1 230kV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | ML70 | ivsg_hs_alt5d1 | 392 | 427 | 17.9 | 1091.3 | 427.4 | 1.09 | 1.05 | tran MIGUEL 69 to MIGUEL 230 ck 1 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | ML71 | ivsg_hs_alt5d1 | 392 | 427 | 17.9 | 1091.3 | 427.4 | 1.09 | 1.05 | tran MIGUEL 69 to MIGUEL 230 ck 2 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | MS60 | ivsg_hs_alt5d1 | 392 | 423.6 | 51.7 | 1094.6 | 426.8 | 1.09 | 1.04 | tran MISSION 230 to MISSION 138 ck 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | MS61 | ivsg_hs_alt5d1 | 392 | 423.6 | 51.7 | 1094.6 | 426.8 | 1.09 | 1.04 | tran MISSION 230 to MISSION 138 ck 2 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | SX70 | ivsg_hs_alt5d1 | 392 | 422.9 | 54.4 | 1100.6 | 426.4 | 1.09 | 1.04 | tran SYCAMORE 230 to SYCAMORE 69 ck 1 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | SO2 | ivsg_hs_alt5d1 | 392 | 428 | 10.1 | 1106.6 | 428.2 | 1.09 | 1.05 | gen S.ONOFR2 22.00 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 2 | line_070 | ivsg_hs_alt5d1 | 956 | -1026.5 | -31.8 | 2612.7 | 1027 | 1.089 | 0.597 | line LA FRESA to REDONDO 230 ck 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 1 | line_071 | ivsg_hs_alt5d1 | 956 | -1026.5 | -31.8 | 2612.7 | 1027 | 1.089 | 0.597 | line LA FRESA to REDONDO 230 ck 2 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | B2_020 | ivsg_hs_alt5d1 | 408.3 | -439.6 | 3.2 | 1856 | 439.7 | 1.087 | 0.984 | MIGUEL - MISSION 2 230kV |
| 24701 | KRAMER | 230 | 24085 | LUGO | 230 | 2 | line_169 | ivsg_hs_alt5d1 | 478 | 525.6 | 5 | 1301.7 | 525.6 | 1.085 | 0.644 | line KRAMER to LUGO 230 ck 1 |
| 24701 | KRAMER | 230 | 24085 | LUGO | 230 | 1 | line_170 | ivsg_hs_alt5d1 | 478 | 525.6 | 5 | 1301.7 | 525.6 | 1.085 | 0.644 | line KRAMER to LUGO 230 ck 2 |
| 20238 | HRD-230 | 230 | 20239 | HRD-115 | 115 | 1 | B2_002 | ivsg_hs_alt5d1 | 225 | 242.3 | -1.4 | 633.9 | 242.3 | 1.08 | 0.73 | IMPRLVLY - MIGUEL 1 500kV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_009 | ivsg_hs_alt5d1 | 392 | 420.8 | 49.2 | 1089.3 | 423.7 | 1.08 | 1.04 | EPP - ESCNDIDO 1 230kV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_022 | ivsg_hs_alt5d1 | 392 | 423.2 | 38.9 | 1101.7 | 424.9 | 1.08 | 1.04 | OTAYMESA - TJI-230 1 230kV |
| 22504 | MISSION | 230 | 22500 | MISSION | 138 | 2 | MS60 | ivsg_hs_alt5d1 | 392 | 404.5 | 123 | 1087.6 | 422.8 | 1.08 | 0.72 | tran MISSION 230 to MISSION 138 ck 1 |
| 22504 | MISSION | 230 | 22500 | MISSION | 138 | 1 | MS61 | ivsg_hs_alt5d1 | 392 | 404.5 | 123 | 1087.6 | 422.8 | 1.08 | 0.72 | tran MISSION 230 to MISSION 138 ck 2 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | OT70 | ivsg_hs_alt5d1 | 392 | 421.1 | 50.2 | 1089.5 | 424.1 | 1.08 | 1.04 | tran OLD TOWN 69 to OLD TOWN 230 ck 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | OT71 | ivsg_hs_alt5d1 | 392 | 421.1 | 50.2 | 1089.5 | 424.1 | 1.08 | 1.04 | tran OLD TOWN 69 to OLD TOWN 230 ck 2 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | SO2 | ivsg_hs_alt5d1 | 392 | 420.7 | 44.8 | 1105.4 | 423.1 | 1.08 | 1.04 | gen S.ONOFR2 22.00 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | line_207 | ivsg_hs_alt5d1 | 392 | 424.2 | 8.5 | 1090.4 | 424.3 | 1.08 | 1.05 | line DEVERS to VALLEYSC 500 ck 1 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | ML70 | ivsg_hs_alt5d1 | 408.3 | -434.1 | -3.2 | 1842 | 434.1 | 1.078 | 0.984 | tran MIGUEL 69 to MIGUEL 230 ck 1 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | ML71 | ivsg_hs_alt5d1 | 408.3 | -434.1 | -3.2 | 1842 | 434.1 | 1.078 | 0.984 | tran MIGUEL 69 to MIGUEL 230 ck 2 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | line_207 | ivsg_hs_alt5d1 | 392 | 416.7 | 43.2 | 1086.4 | 418.9 | 1.07 | 1.04 | line DEVERS to VALLEYSC 500 ck 1 |
| 22596 | OLD TOWN | 230 | 22466 | MLMS3TAP | 230 | 1 | B2_002 | ivsg_hs_alt5d1 | 912 | -882.8 | 49.2 | 2440.4 | 884.2 | 1.066 | 0.747 | IMPRLVLY - MIGUEL 1 500kV |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | line_66 | ivsg_hs_alt5d1 | 408.3 | -420.4 | 12.6 | 1815.6 | 420.6 | 1.063 | 0.984 | line CENTRALX to NEWSF500 500 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_169 | ivsg_hs_alt5d1 | 56 | 58.1 | -9.9 | 293.3 | 59 | 1.06 | 0.92 | line KRAMER to LUGO 230 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_170 | ivsg_hs_alt5d1 | 56 | 58.1 | -9.9 | 293.3 | 59 | 1.06 | 0.92 | line KRAMER to LUGO 230 ck 2 |
| 8279 | CVSUB | 92 | 8311 | COACHELA | 230 | 1 | C_4pst | ivsg_hs_alt5d1 | 150 | -155.1 | 1.5 | 972.5 | 155.1 | 1.05 | 0.75 | C-ELCENTRO-AVE58 161KV |
| 8279 | CVSUB | 92 | 8311 | COACHELA | 230 | 2 | C_4pst | ivsg_hs_alt5d1 | 150 | -155.1 | 1.5 | 972.5 | 155.1 | 1.05 | 0.75 | C-ELCENTRO-AVE58 161KV |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_192 | ivsg_hs_alt5d1 | 169 | 174.9 | 41.3 | 632.1 | 179.7 | 1.047 | 0.84 | line IRON MTN to CAMINO 230 ck 1 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | SO2 | ivsg_hs_alt5d1 | 408.3 | -415.4 | 5.3 | 1784.2 | 415.4 | 1.044 | 0.984 | gen S.ONOFR2 22.00 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | B2_022 | ivsg_hs_alt5d1 | 408.3 | -417.9 | 10.9 | 1778.3 | 418 | 1.041 | 0.984 | OTAYMESA - TJI-230 1 230kV |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | SX70 | ivsg_hs_alt5d1 | 408.3 | -417.7 | -4.8 | 1776.5 | 417.7 | 1.04 | 0.984 | tran SYCAMORE 230 to SYCAMORE 69 ck 1 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_13 | ivsg_hs_alt5d1 | 800 | 826.6 | 59.8 | 2083.5 | 828.7 | 1.038 | 0.898 | line COACHELA to MIDWAY 230 ck 1 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_14 | ivsg_hs_alt5d1 | 800 | 826.6 | 59.8 | 2083.5 | 828.7 | 1.038 | 0.898 | line COACHELA to MIDWAY 230 ck 2 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | MS60 | ivsg_hs_alt5d1 | 408.3 | -418.4 | -2.6 | 1766.8 | 418.4 | 1.034 | 0.984 | tran MISSION 230 to MISSION 138 ck 1 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | MS61 | ivsg_hs_alt5d1 | 408.3 | -418.4 | -2.6 | 1766.8 | 418.4 | 1.034 | 0.984 | tran MISSION 230 to MISSION 138 ck 2 |
| 24114 | PARDEE | 230 | 24200 | SAUG TAP | 230 | 2 | line_117 | ivsg_hs_alt5d1 | 494 | 501.7 | 27.6 | 1279.4 | 502.5 | 1.032 | 0.511 | line PARDEE to SAUG TAP 230 ck 1 |
| 24114 | PARDEE | 230 | 24200 | SAUG TAP | 230 | 1 | line_118 | ivsg_hs_alt5d1 | 494 | 501.7 | 27.5 | 1279.3 | 502.5 | 1.032 | 0.519 | line PARDEE to SAUG TAP 230 ck 2 |
| 8376 | RTAP2 | 92 | 8974 | RTP1 | 92 | 1 | C_4pre | ivsg_hs_alt5d1 | 57 | -55.4 | 13.1 | 367.5 | 56.9 | 1.031 | 0.798 | C-ELCENTRO-AVE58 161KV |
| 8376 | RTAP2 | 92 | 8974 | RTP1 | 92 | 1 | line_34 | ivsg_hs_alt5d1 | 57 | -55.4 | 13.1 | 367.7 | 57 | 1.031 | 0.798 | line AV58 to AV58TP1 161 ck 1 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | OT70 | ivsg_hs_alt5d1 | 408.3 | -415.9 | -1.5 | 1758.7 | 416 | 1.03 | 0.984 | tran OLD TOWN 69 to OLD TOWN 230 ck 1 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | OT71 | ivsg_hs_alt5d1 | 408.3 | -415.9 | -1.5 | 1758.7 | 416 | 1.03 | 0.984 | tran OLD TOWN 69 to OLD TOWN 230 ck 2 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | B2_009 | ivsg_hs_alt5d1 | 408.3 | -415.7 | -0.6 | 1758.3 | 415.7 | 1.029 | 0.984 | EPP - ESCNDIDO 1 230kV |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | line_207 | ivsg_hs_alt5d1 | 408.3 | -411.6 | 5.2 | 1753.5 | 411.6 | 1.027 | 0.984 | line DEVERS to VALLEYSC 500 ck 1 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | B2_002 | ivsg_hs_alt5d1 | 388 | -385.6 | -14.5 | 999.8 | 385.9 | 1.026 | 0.569 | IMPRLVLY - MIGUEL 1 500kV |
| 8699 | MIDWAY | 230 | 8601 | GEOSUB2 | 230 | 1 | line_7 | ivsg_hs_alt5d1 | 550 | -544.1 | 6.1 | 1409.6 | 544.1 | 1.021 | 0.626 | line BANIS230 to NEWSF230 230 ck 1 |
| 8699 | MIDWAY | 230 | 8601 | GEOSUB2 | 230 | 2 | line_7 | ivsg_hs_alt5d1 | 550 | -544.1 | 6.1 | 1409.6 | 544.1 | 1.021 | 0.626 | line BANIS230 to NEWSF230 230 ck 1 |
| 22844 | TALEGA | 230 | 24131 | S.ONOFRE | 230 | 2 | B2_026 | ivsg_hs_alt5d1 | 456.1 | -463.8 | 41 | 1168.8 | 465.6 | 1.021 | 0.537 | TALEGA - S.ONOFRE 1 230kV |
| 22844 | TALEGA | 230 | 24131 | S.ONOFRE | 230 | 1 | B2_027 | ivsg_hs_alt5d1 | 456.1 | -463.8 | 41 | 1168.8 | 465.6 | 1.021 | 0.537 | TALEGA - S.ONOFRE 2 230kV |
| 22844 | TALEGA | 230 | 24131 | S.ONOFRE | 230 | 2 | line_014 | ivsg_hs_alt5d1 | 456.1 | -463.8 | 41 | 1168.8 | 465.6 | 1.021 | 0.537 | line TALEGA to S.ONOFRE 230 ck 1 |
| 22844 | TALEGA | 230 | 24131 | S.ONOFRE | 230 | 1 | line_015 | ivsg_hs_alt5d1 | 456.1 | -463.8 | 41 | 1168.8 | 465.6 | 1.021 | 0.537 | line TALEGA to S.ONOFRE 230 ck 2 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | B2_021 | ivsg_hs_alt5d1 | 408.3 | -411.2 | 7.9 | 1743.1 | 411.2 | 1.02 | 0.984 | IMPRLVLY - ROA-230 1 230kV |
| 8699 | MIDWAY | 230 | 8601 | GEOSUB2 | 230 | 1 | tran_74 | ivsg_hs_alt5d1 | 550 | -544 | 2.8 | 1406.4 | 544 | 1.019 | 0.626 | tran NEWSF230 230 to NEWSF500 500 ck 1 |
| 8699 | MIDWAY | 230 | 8601 | GEOSUB2 | 230 | 2 | tran_74 | ivsg_hs_alt5d1 | 550 | -544 | 2.8 | 1406.4 | 544 | 1.019 | 0.626 | tran NEWSF230 230 to NEWSF500 500 ck 1 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | B2_013 | ivsg_hs_alt5d1 | 408.3 | -409.7 | 1.4 | 1732.5 | 409.7 | 1.014 | 0.984 | EPP - SYCAMORE 1 230kV |
| 8376 | RTAP2 | 92 | 8974 | RTP1 | 92 | 1 | C_4pst | ivsg_hs_alt5d1 | 57 | -54.5 | 13.1 | 361 | 56 | 1.013 | 0.798 | C-ELCENTRO-AVE58 161KV |
| 8279 | CVSUB | 92 | 8311 | COACHELA | 230 | 1 | C_4pre | ivsg_hs_alt5d1 | 150 | -149.4 | -1.7 | 937 | 149.4 | 1.01 | 0.75 | C-ELCENTRO-AVE58 161KV |
| 8279 | CVSUB | 92 | 8311 | COACHELA | 230 | 2 | C_4pre | ivsg_hs_alt5d1 | 150 | -149.4 | -1.7 | 937 | 149.4 | 1.01 | 0.75 | C-ELCENTRO-AVE58 161KV |
| 8279 | CVSUB | 92 | 8311 | COACHELA | 230 | 1 | line_34 | ivsg_hs_alt5d1 | 150 | -148.8 | -1.8 | 933.4 | 148.8 | 1.01 | 0.75 | line AV58 to AV58TP1 161 ck 1 |
| 8279 | CVSUB | 92 | 8311 | COACHELA | 230 | 2 | line_34 | ivsg_hs_alt5d1 | 150 | -148.8 | -1.8 | 933.4 | 148.8 | 1.01 | 0.75 | line AV58 to AV58TP1 161 ck 1 |
| 24303 | BIG CRK3 | 230 | 24235 | RECTOR | 230 | 1 | line_155 | ivsg_hs_alt5d1 | 353 | 361.1 | 50.4 | 895.4 | 364.6 | 1.01 | 0.73 | line BIG CRK1 to RECTOR 230 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_201 | ivsg_hs_alt5d1 | 56 | 54.8 | -10.6 | 277.2 | 55.8 | 1.01 | 0.92 | line SYLMAR3 to SYLMAR S 230 ck 1 |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_191 | ivsg_hs_alt5d1 | 169 | 168.3 | 38.8 | 607.5 | 172.8 | 1.007 | 0.84 | line EAGLEMTN to IRON MTN 230 ck 1 |
| 22116 | CARLTHTP | 138 | 22734 | SANTEE | 138 | 1 | B2_002 | ivsg_hs_alt5d1 | 273 | 247.3 | 12.2 | 1148.2 | 247.6 | 1.005 | 0.752 | IMPRLVLY - MIGUEL 1 500kV |
| 24301 | BIG CRK1 | 230 | 24235 | RECTOR | 230 | 1 | line_160 | ivsg_hs_alt5d1 | 329 | 335 | 48.4 | 826.9 | 338.4 | 1.001 | 0.727 | line BIG CRK3 to RECTOR 230 ck 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_001 | ivsg_hs_alt5d1 | 392 | 391.2 | 40.5 | 1004 | 393.3 | 1 | 1.04 | HASSYAMP - N.GILA 1 500kV |
| 24086 | LUGO | 500 | 24097 | MOHAVE | 500 | 1 | line_103 | ivsg_hs_alt5d1 | 1386 | -1427.4 | 87.8 | 1574.2 | 1430.1 | 0.992 | 0.705 | line MOHAVE to ELDORDO 500 ck 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_003 | ivsg_hs_alt5d1 | 392 | 387 | 37.8 | 999.9 | 388.8 | 0.99 | 1.04 | N.GILA - IMPRLVLY 1 500kV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | ML81 | ivsg_hs_alt5d1 | 392 | 384.6 | 36.2 | 999.3 | 386.3 | 0.99 | 1.04 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 19020 | BLYTHE | 161 | 24017 | BLYTHESC | 161 | 1 | line_192 | ivsg_hs_alt5d1 | 244 | 241.4 | 41.6 | 861.4 | 245 | 0.984 | 0.845 | line IRON MTN to CAMINO 230 ck 1 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | C_4pst | ivsg_hs_alt5d1 | 800 | 789.5 | 57.9 | 1972.9 | 791.6 | 0.982 | 0.898 | C-ELCENTRO-AVE58 161KV |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | tran_71 | ivsg_hs_alt5d1 | 800 | 788.7 | 56.7 | 1969.4 | 790.8 | 0.981 | 0.898 | tran BANISTER 161 to BANIS230 230 ck 1 |
| 8279 | CVSUB | 92 | 8311 | COACHELA | 230 | 1 | line_12 | ivsg_hs_alt5d1 | 150 | -143.6 | -3.1 | 899 | 143.6 | 0.98 | 0.75 | line COACHELA to RAMON 230 ck 2 |
| 8279 | CVSUB | 92 | 8311 | COACHELA | 230 | 2 | line_12 | ivsg_hs_alt5d1 | 150 | -143.6 | -3.1 | 899 | 143.6 | 0.98 | 0.75 | line COACHELA to RAMON 230 ck 2 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | ML80 | ivsg_hs_alt5d1 | 392 | 382.6 | 35.7 | 995 | 384.3 | 0.98 | 1.04 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | B2_003 | ivsg_hs_alt5d1 | 800 | 780 | 68.2 | 1961.3 | 783 | 0.977 | 0.898 | N.GILA - IMPRLVLY 1 500kV |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_047 | ivsg_hs_alt5d1 | 2400 | -2437.4 | -46.7 | 2699.1 | 2437.9 | 0.974 | 0.774 | line ELDORDO to LUGO 500 ck 1 |
| 22831 | SYCAMORE | 138 | 22124 | CHCARITA | 138 | 1 | B2_009 | ivsg_hs_alt5d1 | 204.1 | 194.4 | -28.5 | 830.4 | 196.4 | 0.972 | 0.747 | EPP - ESCNDIDO 1 230kV |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_079 | ivsg_hs_alt5d1 | 2400 | -2424.6 | -30.1 | 2694 | 2424.8 | 0.972 | 0.774 | line LUGO to MOHAVE 500 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_123 | ivsg_hs_alt5d1 | 56 | 52.7 | -10.6 | 267 | 53.8 | 0.97 | 0.92 | line PASTORIA to PSTRIA 230 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_200 | ivsg_hs_alt5d1 | 56 | 52.7 | -10.7 | 267 | 53.8 | 0.97 | 0.92 | line SYLMAR1 to SYLMAR S 230 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | tran_210 | ivsg_hs_alt5d1 | 56 | 52.6 | -10.4 | 266 | 53.7 | 0.97 | 0.92 | tran LUGO 500 to LUGO 230 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | tran_211 | ivsg_hs_alt5d1 | 56 | 52.7 | -10.4 | 266.2 | 53.7 | 0.97 | 0.92 | tran LUGO 500 to LUGO 230 ck 2 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | IV81 | ivsg_hs_alt5d1 | 800 | 773.8 | 64.2 | 1942.8 | 776.4 | 0.967 | 0.898 | tran IMPRLVLY 230 to IMPRLVLY 500 ck 2 |
| 22596 | OLD TOWN | 230 | 22466 | MLMS3TAP | 230 | 1 | B2_029 | ivsg_hs_alt5d1 | 912 | -849.4 | 89 | 2204 | 854 | 0.963 | 0.747 | OTAYMESA - MLSXTAP 1 230kV |
| 22596 | OLD TOWN | 230 | 22466 | MLMS3TAP | 230 | 1 | B2_031 | ivsg_hs_alt5d1 | 912 | -849.6 | 87.3 | 2205.3 | 854.1 | 0.963 | 0.747 | SYCAMORE - MLSXTAP 1 230kV |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_24 | ivsg_hs_alt5d1 | 800 | 770.6 | 44.7 | 1928.1 | 771.9 | 0.96 | 0.898 | line GEOSUB1 to MIDWAY 230 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_086 | ivsg_hs_alt5d1 | 56 | 52.1 | -10.7 | 263.9 | 53.2 | 0.96 | 0.92 | line MAGUNDEN to OMAR 230 ck 1 |
| 24042 | ELDORDO | 500 | 24086 | LUGO | 500 | 1 | line_085 | ivsg_hs_alt5d1 | 1386 | 1411.9 | 250.5 | 1526.6 | 1434 | 0.959 | 0.647 | line LUGO to VICTORVL 500 ck 1 |
| 19020 | BLYTHE | 161 | 24017 | BLYTHESC | 161 | 1 | line_191 | ivsg_hs_alt5d1 | 244 | 234.8 | 39.1 | 837.1 | 238.1 | 0.957 | 0.845 | line EAGLEMTN to IRON MTN 230 ck 1 |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_63 | ivsg_hs_alt5d1 | 169 | 160.9 | 30.2 | 575.6 | 163.7 | 0.953 | 0.84 | line RAMON to MIRAGE 230 ck 2 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | PV1 | ivsg_hs_alt5d1 | 408.3 | -391.5 | -1.5 | 1627.5 | 391.5 | 0.953 | 0.984 | gen PALOVRD1 24.00 |
| 22609 | OTAYMESA | 230 | 20149 | TJI-230 | 230 | 1 | B2_002 | ivsg_hs_alt5d1 | 796.7 | -731.1 | -21.2 | 1902.3 | 731.4 | 0.951 | 0.538 | IMPRLVLY - MIGUEL 1 500kV |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_12 | ivsg_hs_alt5d1 | 169 | 160.3 | 30.6 | 574 | 163.2 | 0.95 | 0.84 | line COACHELA to RAMON 230 ck 2 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_48 | ivsg_hs_alt5d1 | 800 | 763.1 | 42.7 | 1908.7 | 764.3 | 0.95 | 0.898 | line MIDWAY to GEOSUB2 230 ck 1 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_49 | ivsg_hs_alt5d1 | 800 | 763.1 | 42.7 | 1908.7 | 764.3 | 0.95 | 0.898 | line MIDWAY to GEOSUB2 230 ck 2 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | B2_001 | ivsg_hs_alt5d1 | 408.3 | -386.8 | 0.8 | 1620.6 | 386.8 | 0.949 | 0.984 | HASSYAMP - N.GILA 1 500kV |
| 24807 | MIRAGE | 115 | 24819 | CONCHO | 115 | 1 | tran_238 | ivsg_hs_alt5d1 | 183 | 164.1 | -5.4 | 869.7 | 164.2 | 0.947 | 0.865 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | SX60 | ivsg_hs_alt5d1 | 382.4 | 354.6 | 12.8 | 1513.1 | 354.8 | 0.946 | 0.823 | tran SYCAMORE 230 to SYCAMORE 138 ck 1 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | B2_003 | ivsg_hs_alt5d1 | 408.3 | -382.6 | 3.2 | 1614 | 382.6 | 0.945 | 0.984 | N.GILA - IMPRLVLY 1 500kV |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | ML81 | ivsg_hs_alt5d1 | 408.3 | -380.3 | 4.7 | 1613 | 380.3 | 0.944 | 0.984 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 22832 | SYCAMORE | 230 | 22467 | MLSXTAP | 230 | 1 | B2_034 | ivsg_hs_alt5d1 | 796.7 | -720 | 42.5 | 1885.3 | 721.2 | 0.943 | 0.341 | OLD TOWN - MLMS3TAP 1 230kV |
| 22832 | SYCAMORE | 230 | 22467 | MLSXTAP | 230 | 1 | B2_032 | ivsg_hs_alt5d1 | 796.7 | -719.9 | 43.7 | 1884.5 | 721.2 | 0.942 | 0.341 | OTAYMESA - MLMS3TAP 1 230kV |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | ML80 | ivsg_hs_alt5d1 | 408.3 | -378.3 | 4.9 | 1606 | 378.3 | 0.94 | 0.984 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | line_66 | ivsg_hs_alt5d1 | 204.1 | 187.2 | 9.3 | 801 | 187.4 | 0.938 | 1.276 | line CENTRALX to NEWSF500 500 ck 1 |
| 8600 | GEOSUB1 | 230 | 8699 | MIDWAY | 230 | 1 | line_48 | ivsg_hs_alt5d1 | 550 | 521.1 | 53.3 | 1291.5 | 523.8 | 0.936 | 0.67 | line MIDWAY to GEOSUB2 230 ck 1 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8600 | GEOSUB1 | 230 | 8699 | MIDWAY | 230 | 1 | line_49 | ivsg_hs_alt5d1 | 550 | 521.1 | 53.3 | 1291.5 | 523.8 | 0.936 | 0.67 | line MIDWAY to GEOSUB2 230 ck 2 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 2 | line_136 | ivsg_hs_alt5d1 | 1195 | 1086.3 | -46.6 | 2808.7 | 1087.3 | 0.936 | 0.564 | line SERRANO to VILLA PK 230 ck 1 |
| 8301 | CITAP1 | 92 | 8312 | COACHELA | 92 | 1 | line_12 | ivsg_hs_alt5d1 | 152 | -141 | 15.9 | 891.9 | 141.9 | 0.935 | 0.747 | line COACHELA to RAMON 230 ck 2 |
| 8301 | CITAP1 | 92 | 8389 | VANBUREN | 92 | 1 | line_12 | ivsg_hs_alt5d1 | 152 | 141 | -15.9 | 891.9 | 141.9 | 0.935 | 0.747 | line COACHELA to RAMON 230 ck 2 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_30 | ivsg_hs_alt5d1 | 800 | 751.1 | 37.8 | 1878.1 | 752.1 | 0.935 | 0.898 | line MIDWAY to HIGHLINE 230 ck 3 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_31 | ivsg_hs_alt5d1 | 800 | 751.1 | 37.8 | 1878.1 | 752.1 | 0.935 | 0.898 | line MIDWAY to HIGHLINE 230 ck 4 |
| 24807 | MIRAGE | 115 | 24816 | SANTA RO | 115 | 1 | tran_238 | ivsg_hs_alt5d1 | 183.3 | 162.1 | -11 | 860.2 | 162.4 | 0.935 | 0.856 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | B2_015 | ivsg_hs_alt5d1 | 382.4 | 352.7 | 16.4 | 1494.8 | 353.1 | 0.934 | 0.823 | MIGUEL - MISSION 1 230kV |
| 8376 | RTAP2 | 92 | 8974 | RTP1 | 92 | 1 | B2_002 | ivsg_hs_alt5d1 | 57 | -50.6 | 10.7 | 332.7 | 51.7 | 0.933 | 0.798 | IMPRLVLY - MIGUEL 1 500kV |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_25 | ivsg_hs_alt5d1 | 800 | 749.3 | 40.3 | 1871.8 | 750.3 | 0.932 | 0.898 | line HIGHLINE to ELCENTSW 230 ck 1 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_26 | ivsg_hs_alt5d1 | 800 | 749.3 | 40.3 | 1871.8 | 750.3 | 0.932 | 0.898 | line HIGHLINE to ELCENTSW 230 ck 2 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_63 | ivsg_hs_alt5d1 | 800 | 749.4 | 45.2 | 1871.2 | 750.8 | 0.932 | 0.898 | line RAMON to MIRAGE 230 ck 2 |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | B2_034 | ivsg_hs_alt5d1 | 382.4 | 341.1 | 14 | 1491 | 341.4 | 0.932 | 0.823 | OLD TOWN - MLMS3TAP 1 230kV |
| 22831 | SYCAMORE | 138 | 22124 | CHCARITA | 138 | 1 | B2_034 | ivsg_hs_alt5d1 | 204.1 | 179 | -41.7 | 795.7 | 183.8 | 0.932 | 0.747 | OLD TOWN - MLMS3TAP 1 230kV |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | B2_032 | ivsg_hs_alt5d1 | 382.4 | 341.2 | 13.7 | 1490.1 | 341.4 | 0.931 | 0.823 | OTAYMESA - MLMS3TAP 1 230kV |
| 22831 | SYCAMORE | 138 | 22124 | CHCARITA | 138 | 1 | B2_032 | ivsg_hs_alt5d1 | 204.1 | 179 | -41.5 | 795 | 183.8 | 0.931 | 0.747 | OTAYMESA - MLMS3TAP 1 230kV |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | B2_020 | ivsg_hs_alt5d1 | 382.4 | 351.1 | 15 | 1488.3 | 351.4 | 0.93 | 0.823 | MIGUEL - MISSION 2 230kV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | B2_029 | ivsg_hs_alt5d1 | 392 | 363.5 | 3.3 | 929.3 | 363.5 | 0.93 | 1.05 | OTAYMESA - MLSXTAP 1 230kV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | B2_031 | ivsg_hs_alt5d1 | 392 | 363.2 | 1.7 | 929.9 | 363.2 | 0.93 | 1.05 | SYCAMORE - MLSXTAP 1 230kV |
| 22504 | MISSION | 230 | 22500 | MISSION | 138 | 1 | SX60 | ivsg_hs_alt5d1 | 392 | 355 | 75.3 | 942.8 | 362.9 | 0.93 | 0.72 | tran SYCAMORE 230 to SYCAMORE 138 ck 1 |
| 22504 | MISSION | 230 | 22500 | MISSION | 138 | 2 | SX60 | ivsg_hs_alt5d1 | 392 | 355 | 75.3 | 942.8 | 362.9 | 0.93 | 0.72 | tran SYCAMORE 230 to SYCAMORE 138 ck 1 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | C_4pre | ivsg_hs_alt5d1 | 800 | 748.2 | 46 | 1865.8 | 749.6 | 0.929 | 0.898 | C-ELCENTRO-AVE58 161KV |
| 8311 | COACHELA | 230 | 8695 | RAMON | 230 | 2 | line_83 | ivsg_hs_alt5d1 | 800 | 731.7 | 16.1 | 1865.5 | 731.8 | 0.929 | 0.726 | line IH500 to DEVERS 500 ck 1 |
| 24303 | BIG CRK3 | 230 | 24235 | RECTOR | 230 | 1 | line_139 | ivsg_hs_alt5d1 | 353 | 335.6 | 45.6 | 822.9 | 338.7 | 0.929 | 0.73 | line SPRINGVL to BIG CRK4 230 ck 1 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_12 | ivsg_hs_alt5d1 | 800 | 745.5 | 43.1 | 1863.5 | 746.8 | 0.928 | 0.898 | line COACHELA to RAMON 230 ck 2 |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_008 | ivsg_hs_alt5d1 | 169 | 157.1 | 27 | 560.4 | 159.4 | 0.927 | 0.84 | line PARKER to GENE 230 ck 1 |
| 24614 | TAP601 | 115 | 24702 | KRAMER | 115 | 1 | line_169 | ivsg_hs_alt5d1 | 217.1 | -189.9 | 69 | 1004.9 | 202.1 | 0.924 | 0.717 | line KRAMER to LUGO 230 ck 1 |
| 24614 | TAP601 | 115 | 24702 | KRAMER | 115 | 1 | line_170 | ivsg_hs_alt5d1 | 217.1 | -189.9 | 69 | 1004.9 | 202.1 | 0.924 | 0.717 | line KRAMER to LUGO 230 ck 2 |
| 8806 | AV58TP1 | 161 | 8200 | BANTP2 | 161 | 1 | line_7 | ivsg_hs_alt5d1 | 165 | -141.4 | 28.8 | 543.5 | 144.3 | 0.922 | 0.701 | line BANIS230 to NEWSF230 230 ck 1 |
| 19020 | BLYTHE | 161 | 24017 | BLYTHESC | 161 | 1 | line_63 | ivsg_hs_alt5d1 | 244 | 227.4 | 30.4 | 806.6 | 229.4 | 0.922 | 0.845 | line RAMON to MIRAGE 230 ck 2 |
| 8806 | AV58TP1 | 161 | 8200 | BANTP2 | 161 | 1 | tran_74 | ivsg_hs_alt5d1 | 165 | -141.6 | 28.2 | 543.2 | 144.3 | 0.922 | 0.701 | tran NEWSF230 230 to NEWSF500 500 ck 1 |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | ML70 | ivsg_hs_alt5d1 | 382.4 | 345.6 | 21.1 | 1474.6 | 346.3 | 0.922 | 0.823 | tran MIGUEL 69 to MIGUEL 230 ck 1 |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | ML71 | ivsg_hs_alt5d1 | 382.4 | 345.6 | 21.1 | 1474.6 | 346.3 | 0.922 | 0.823 | tran MIGUEL 69 to MIGUEL 230 ck 2 |
| 8279 | CVSUB | 92 | 8312 | COACHELA | 92 | 1 | C_4pst | ivsg_hs_alt5d1 | 132 | 120.9 | -12.2 | 761.7 | 121.5 | 0.92 | 0.772 | C-ELCENTRO-AVE58 161KV |
| 8279 | CVSUB | 92 | 8312 | COACHELA | 92 | 2 | C_4pst | ivsg_hs_alt5d1 | 132 | 120.9 | -12.2 | 761.7 | 121.5 | 0.92 | 0.772 | C-ELCENTRO-AVE58 161KV |
| 19020 | BLYTHE | 161 | 24017 | BLYTHESC | 161 | 1 | line_12 | ivsg_hs_alt5d1 | 244 | 226.8 | 30.9 | 804.9 | 228.9 | 0.92 | 0.845 | line COACHELA to RAMON 230 ck 2 |
| 8682 | BANISTER | 161 | 8300 | BANIS230 | 230 | 1 | line_13 | ivsg_hs_alt5d1 | 225 | -204.4 | 18.1 | 731.4 | 205.2 | 0.92 | 0.81 | line COACHELA to MIDWAY 230 ck 1 |
| 8682 | BANISTER | 161 | 8300 | BANIS230 | 230 | 1 | line_14 | ivsg_hs_alt5d1 | 225 | -204.4 | 18.1 | 731.4 | 205.2 | 0.92 | 0.81 | line COACHELA to MIDWAY 230 ck 2 |
| 22116 | CARLTHTP | 138 | 22734 | SANTEE | 138 | 1 | ML60 | ivsg_hs_alt5d1 | 273 | 244.6 | -5.8 | 1051.2 | 244.6 | 0.92 | 0.752 | tran MIGUEL 230 to MIGUEL 138 ck 1 |
| 8279 | CVSUB | 92 | 8312 | COACHELA | 92 | 1 | line_12 | ivsg_hs_alt5d1 | 132 | 121.1 | -11.3 | 761.1 | 121.6 | 0.919 | 0.772 | line COACHELA to RAMON 230 ck 2 |
| 8279 | CVSUB | 92 | 8312 | COACHELA | 92 | 2 | line_12 | ivsg_hs_alt5d1 | 132 | 121.1 | -11.3 | 761.1 | 121.6 | 0.919 | 0.772 | line COACHELA to RAMON 230 ck 2 |
| 24301 | BIG CRK1 | 230 | 24235 | RECTOR | 230 | 1 | line_156 | ivsg_hs_alt5d1 | 329 | 305.6 | 4.5 | 752.1 | 305.6 | 0.911 | 0.727 | line BIG CRK1 to BIG CRK2 230 ck 1 |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_13 | ivsg_hs_alt5d1 | 169 | 154.3 | 25.4 | 549.8 | 156.3 | 0.91 | 0.84 | line COACHELA to MIDWAY 230 ck 1 |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_14 | ivsg_hs_alt5d1 | 169 | 154.3 | 25.4 | 549.8 | 156.3 | 0.91 | 0.84 | line COACHELA to MIDWAY 230 ck 2 |
| 22504 | MISSION | 230 | 22500 | MISSION | 138 | 1 | ML60 | ivsg_hs_alt5d1 | 392 | 346.6 | 83.5 | 928.7 | 356.6 | 0.91 | 0.72 | tran MIGUEL 230 to MIGUEL 138 ck 1 |
| 22504 | MISSION | 230 | 22500 | MISSION | 138 | 2 | ML60 | ivsg_hs_alt5d1 | 392 | 346.6 | 83.5 | 928.7 | 356.6 | 0.91 | 0.72 | tran MIGUEL 230 to MIGUEL 138 ck 1 |
| 24602 | VICTOR | 115 | 24702 | KRAMER | 115 | 1 | line_169 | ivsg_hs_alt5d1 | 217.1 | -185.3 | 79.1 | 988.9 | 201.5 | 0.91 | 0.704 | line KRAMER to LUGO 230 ck 1 |
| 24602 | VICTOR | 115 | 24702 | KRAMER | 115 | 1 | line_170 | ivsg_hs_alt5d1 | 217.1 | -185.3 | 79.1 | 988.9 | 201.5 | 0.91 | 0.704 | line KRAMER to LUGO 230 ck 2 |
| 22360 | IMPRLVLY | 500 | 22468 | MIGUEL | 500 | 1 | line_66 | ivsg_hs_alt5d1 | 2252 | 1987.8 | 507.3 | 2314.1 | 2051.5 | 0.909 | 0.718 | line CENTRALX to NEWSF500 500 ck 1 |
| 8699 | MIDWAY | 230 | 8601 | GEOSUB2 | 230 | 1 | line_24 | ivsg_hs_alt5d1 | 550 | -499.9 | 2.7 | 1252.1 | 499.9 | 0.907 | 0.626 | line GEOSUB1 to MIDWAY 230 ck 1 |
| 8699 | MIDWAY | 230 | 8601 | GEOSUB2 | 230 | 2 | line_24 | ivsg_hs_alt5d1 | 550 | -499.9 | 2.7 | 1252.1 | 499.9 | 0.907 | 0.626 | line GEOSUB1 to MIDWAY 230 ck 1 |
| 8376 | RTAP2 | 92 | 8974 | RTP1 | 92 | 1 | IV81 | ivsg_hs_alt5d1 | 57 | -49.2 | 12.1 | 323.2 | 50.7 | 0.907 | 0.798 | tran IMPRLVLY 230 to IMPRLVLY 500 ck 2 |
| 19020 | BLYTHE | 161 | 24017 | BLYTHESC | 161 | 1 | line_008 | ivsg_hs_alt5d1 | 244 | 223.6 | 27.3 | 791.9 | 225.2 | 0.905 | 0.845 | line PARKER to GENE 230 ck 1 |
| 8279 | CVSUB | 92 | 8312 | COACHELA | 92 | 1 | C_4pre | ivsg_hs_alt5d1 | 132 | 118.7 | -10.8 | 747.7 | 119.2 | 0.903 | 0.772 | C-ELCENTRO-AVE58 161KV |
| 8279 | CVSUB | 92 | 8312 | COACHELA | 92 | 2 | C_4pre | ivsg_hs_alt5d1 | 132 | 118.7 | -10.8 | 747.7 | 119.2 | 0.903 | 0.772 | C-ELCENTRO-AVE58 161KV |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_7 | ivsg_hs_alt5d1 | 169 | 152.7 | 27.3 | 545.4 | 155.1 | 0.903 | 0.84 | line BANIS230 to NEWSF230 230 ck 1 |
| 8376 | RTAP2 | 92 | 8974 | RTP1 | 92 | 1 | line_36 | ivsg_hs_alt5d1 | 57 | -48.8 | 12.3 | 321.5 | 50.3 | 0.903 | 0.798 | line AV58TP1 to BANTP2 161 ck 1 |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | B2_002 | ivsg_hs_alt5d1 | 169 | 152.4 | 28.5 | 545.4 | 155.1 | 0.903 | 0.84 | IMPRLVLY - MIGUEL 1 500kV |
| 24301 | BIG CRK1 | 230 | 24302 | BIG CRK2 | 230 | 1 | line_155 | ivsg_hs_alt5d1 | 329 | 305.6 | -22 | 745.7 | 306.4 | 0.903 | 0.247 | line BIG CRK1 to RECTOR 230 ck 1 |
| 8376 | RTAP2 | 92 | 8974 | RTP1 | 92 | 1 | line_2 | ivsg_hs_alt5d1 | 57 | -48.7 | 12.8 | 321.4 | 50.4 | 0.902 | 0.798 | line BANTP2 to BANISTER 161 ck 1 |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | tran_74 | ivsg_hs_alt5d1 | 169 | 152.6 | 27.2 | 545.1 | 155 | 0.902 | 0.84 | tran NEWSF230 230 to NEWSF500 500 ck 1 |
| 20238 | HRD-230 | 230 | 20118 | ROA-230 | 230 | 1 | B2_002 | ivsg_hs_alt5d1 | 388 | -328.6 | 65.3 | 876.5 | 335 | 0.902 | 0.448 | IMPRLVLY - MIGUEL 1 500kV |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8279 | CVSUB | 92 | 8312 | COACHELA | 92 | 1 | line_34 | ivsg_hs_alt5d1 | 132 | 118.5 | -10.8 | 746.3 | 119 | 0.901 | 0.772 | line AV58 to AV58TP1 161 ck 1 |
| 8279 | CVSUB | 92 | 8312 | COACHELA | 92 | 2 | line_34 | ivsg_hs_alt5d1 | 132 | 118.5 | -10.8 | 746.3 | 119 | 0.901 | 0.772 | line AV58 to AV58TP1 161 ck 1 |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | line_12 | ivsg_hs_alt5d1 | 132 | 117.7 | -9.7 | 745.9 | 118.1 | 0.9 | 0.82 | line COACHELA to RAMON 230 ck 2 |
| 22464 | MIGUEL | 230 | 22472 | MIGUELMP | 500 | 1 | line_66 | ivsg_hs_alt5d1 | 1120 | -1003.5 | 18.9 | 2639.5 | 1003.7 | 0.9 | 0.73 | line CENTRALX to NEWSF500 500 ck 1 |
| 22468 | MIGUEL | 500 | 22472 | MIGUELMP | 500 | 1 | line_66 | ivsg_hs_alt5d1 | 1120 | 1005 | 120.7 | 1214.2 | 1012.2 | 0.9 | 0.73 | line CENTRALX to NEWSF500 500 ck 1 |
| 24729 | INYO | 230 | 24730 | INYO PS | 115 | 2 | tran_230 | ivsg_hs_alt5d1 | 50 | -42 | 15.8 | 105.3 | 44.9 | 0.9 | 0.54 | tran INYO 230 to INYO PS 115 ck 1 |
| 24729 | INYO | 230 | 24730 | INYO PS | 115 | 1 | tran_231 | ivsg_hs_alt5d1 | 50 | -42 | 15.8 | 105.3 | 44.9 | 0.9 | 0.54 | tran INYO 230 to INYO PS 115 ck 2 |
| 24805 | DEVERS | 115 | 24804 | DEVERS | 230 | 1 | tran_236 | ivsg_hs_alt5d1 | 280 | -246.1 | 52.5 | 1261.6 | 251.6 | 0.9 | 0.6 | tran DEVERS 115 to DEVERS 230 ck 3 |

| Bus | Name | kV | Area | Zone | Outage | Case | Vbase | Vcont | DeltaV | Vmin | Vmax | Max-dv | Contingency Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22734 | SANTEE | 138 | 22 | 223 | 23021/22/23/41 | ivsg_hs_alt5d1 | 0.98 | 0.898 | -0.082 | 0.9 | 1.05 | 0.05 | MIGUEL 230 CORRIDOR West of SN |
| 22412 | LOSCOCHS | 138 | 22 | 223 | 23021/22/23/41 | ivsg_hs_alt5d1 | 0.978 | 0.903 | -0.075 | 0.9 | 1.05 | 0.05 | MIGUEL 230 CORRIDOR West of SN |
| 22424 | MAINST50 | 138 | 22 | 222 | 23021/22/23/41 | ivsg_hs_alt5d1 | 0.975 | 0.923 | -0.052 | 0.9 | 1.05 | 0.05 | MIGUEL 230 CORRIDOR West of SN |
| 22428 | MAINST51 | 138 | 22 | 222 | 23021/22/23/41 | ivsg_hs_alt5d1 | 0.974 | 0.923 | -0.052 | 0.9 | 1.05 | 0.05 | MIGUEL 230 CORRIDOR West of SN |
| 24058 | GOLETA | 230 | 24 | 240 | line_2269 | ivsg_hs_alt5d1 | 0.982 | 0.927 | -0.055 | 0.9 | 1.05 | 0.05 | S.CLARA 230.00 - GOLETA 230.00 1, S.CLARA 230.00 - MOORPARK 230.00 1 |
| 24058 | GOLETA | 230 | 24 | 240 | line_2270 | ivsg_hs_alt5d1 | 0.982 | 0.927 | -0.055 | 0.9 | 1.05 | 0.05 | S.CLARA 230.00 - GOLETA 230.00 2, S.CLARA 230.00 - MOORPARK 230.00 2 |
| 22772 | SOUTHBAY | 138 | 22 | 222 | 23021/22/23/41 | ivsg_hs_alt5d1 | 0.983 | 0.931 | -0.052 | 0.9 | 1.05 | 0.05 | MIGUEL 230 CORRIDOR West of SN |
| 8806 | AV58TP1 | 161 | 8 | 162 | line_N-204 | ivsg_hs_alt5d1 | 0.984 | 0.932 | -0.052 | 0.9 | 1.05 | 0.05 | COACHELLA MIDWAY 230 CKT 1&2 |
| 22852 | TELECYN | 138 | 22 | 222 | 23021/22/23/41 | ivsg_hs_alt5d1 | 0.993 | 0.939 | -0.054 | 0.9 | 1.05 | 0.05 | MIGUEL 230 CORRIDOR West of SN |
| 80300 | NEWSF230 | 230 | 8 | 800 | line_N-204 | ivsg_hs_alt5d1 | 1.001 | 0.943 | -0.057 | 0.9 | 1.05 | 0.05 | COACHELLA MIDWAY 230 CKT 1&2 |
| 22672 | PRCTRVLY | 138 | 22 | 222 | 23021/22/23/41 | ivsg_hs_alt5d1 | 0.996 | 0.944 | -0.052 | 0.9 | 1.05 | 0.05 | MIGUEL 230 CORRIDOR West of SN |
| 22460 | MIGUEL | 138 | 22 | 222 | 23021/22/23/41 | ivsg_hs_alt5d1 | 0.998 | 0.948 | -0.05 | 0.9 | 1.05 | 0.05 | MIGUEL 230 CORRIDOR West of SN |
| 8300 | BANIS230 | 230 | 8 | 163 | line_N-204 | ivsg_hs_alt5d1 | 1.008 | 0.949 | -0.059 | 0.9 | 1.05 | 0.05 | COACHELLA MIDWAY 230 CKT 1&2 |
| 8200 | BANTP2 | 161 | 8 | 163 | line_N-204 | ivsg_hs_alt5d1 | 1.016 | 0.964 | -0.052 | 0.9 | 1.05 | 0.05 | COACHELLA MIDWAY 230 CKT 1&2 |
| 8682 | BANISTER | 161 | 8 | 163 | line_N-204 | ivsg_hs_alt5d1 | 1.017 | 0.965 | -0.052 | 0.9 | 1.05 | 0.05 | COACHELLA MIDWAY 230 CKT 1&2 |
| 8250 | BANTP1 | 161 | 8 | 163 | line_N-204 | ivsg_hs_alt5d1 | 1.017 | 0.967 | -0.05 | 0.9 | 1.05 | 0.05 | COACHELLA MIDWAY 230 CKT 1&2 |
| 24015 | ARCO SC | 230 | 24 | 240 | line_2013 | ivsg_hs_alt5d1 | 0.985 | 1.036 | 0.051 | 0.9 | 1.05 | 0.05 | ARCO SC 230.00 - HINSON 230.00 1, ARCO SC 230.00 - HINSON 230.00 2 |
| 24061 | HARBOR | 230 | 24 | 240 | line_2039 | ivsg_hs_alt5d1 | 0.985 | 1.036 | 0.051 | 0.9 | 1.05 | 0.05 | HARBOR 230.00 - HINSON 230.00 1, LBEACH 230.00 - LITEHIPE 230.00 1 |
| 24077 | LBEACH | 230 | 24 | 240 | line_2039 | ivsg_hs_alt5d1 | 0.985 | 1.036 | 0.051 | 0.9 | 1.05 | 0.05 | HARBOR 230.00 - HINSON 230.00 1, LBEACH 230.00 - LITEHIPE 230.00 1 |
| 24061 | HARBOR | 230 | 24 | 240 | line_2041 | ivsg_hs_alt5d1 | 0.985 | 1.036 | 0.051 | 0.9 | 1.05 | 0.05 | HARBOR 230.00 - HINSON 230.00 1, HARBOR 230.00 - LBEACH 230.00 1 |
| 24061 | HARBOR | 230 | 24 | 240 | line_2253 | ivsg_hs_alt5d1 | 0.985 | 1.036 | 0.051 | 0.9 | 1.05 | 0.05 | HARBOR 230.00 - HINSON 230.00 1, HARBOR 230.00 - LBEACH 230.00 1 |
| 25001 | GOODRICH | 230 | 24 | 250 | line_2073 | ivsg_hs_alt5d1 | 0.957 | 1.044 | 0.088 | 0.9 | 1.05 | 0.05 | GOODRICH 230.00 - GOULD 230.00 1, GOODRICH 230.00 - LAGUBELL 230.00 1 |
| 24058 | GOLETA | 230 | 24 | 240 | line_2120 | ivsg_hs_alt5d1 | 0.982 | 1.044 | 0.062 | 0.9 | 1.05 | 0.05 | S.CLARA 230.00 - GOLETA 230.00 1, S.CLARA 230.00 - GOLETA 230.00 2 |

ivsg_hs_alt5d1.sav
FLOW Summary
N-2 Outages

| LEGEND | % of RATING 1 | |
|---|---|---|
| C_pu | 100% - 110% | |
| C_pu | 110% - 120% | P.U. of |
| C_pu | > 120% | Rate 1 |

| FROM | FR | BKV | TO | TO | BKV | CK | Outage_Name | Case | Rate-Mva | Pflow | Qflow | Amps | MVA | C_pu | B_pu | Contingency_Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 13821C/25/23051A | ivsg_hs_alt5d1 | 204.1 | 370.9 | -13.6 | 1577.3 | 371.2 | 1.847 | 1.276 | CH-ES-NCM-SX |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt5d1 | 392 | 611.9 | 112.6 | 1647.9 | 622.2 | 1.59 | 1.04 | MIGUEL 230 CORRIDOR West of SN |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt5d1 | 408.3 | -600.1 | -1.1 | 2660 | 600.1 | 1.557 | 0.984 | MIGUEL 230 CORRIDOR West of SN |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt5d1 | 392 | 593 | 100.3 | 1572.9 | 601.4 | 1.53 | 1.04 | MIGUEL 230 CORRIDOR West of LC |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23022/23023 | ivsg_hs_alt5d1 | 204.1 | 304.6 | -4.2 | 1291.9 | 304.6 | 1.513 | 1.276 | ML-MS1+ ML-MS2 230KV |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt5d1 | 408.3 | -582.2 | 1.3 | 2538.8 | 582.2 | 1.486 | 0.984 | MIGUEL 230 CORRIDOR West of LC |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23051A/23011 | ivsg_hs_alt5d1 | 204.1 | 295.5 | -7.8 | 1255.4 | 295.6 | 1.47 | 1.276 | SX-EPP + ES-EA-SA 230KV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23011/13825 | ivsg_hs_alt5d1 | 204.1 | 295.4 | -11.3 | 1249.7 | 295.6 | 1.464 | 1.276 | ES-EA-SA 230KV + BQ-CC-ES-NCM 138KV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt5d1 | 392 | 562.1 | 96.5 | 1483.8 | 570.4 | 1.46 | 1.04 | MIGUEL 230 CORRIDOR North of ML |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt5d1 | 382.4 | 509.6 | 0.3 | 2270.3 | 509.6 | 1.419 | 0.823 | MIGUEL 230 CORRIDOR West of SN |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23002/06/10 | ivsg_hs_alt5d1 | 204.1 | 278.2 | 8.5 | 1206.4 | 278.3 | 1.413 | 1.276 | SANLUISREY 230 CORRIDOR |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt5d1 | 408.3 | -552.6 | -6.2 | 2395 | 552.6 | 1.402 | 0.984 | MIGUEL 230 CORRIDOR North of ML |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23012/13807 | ivsg_hs_alt5d1 | 204.1 | 278 | 9.4 | 1179.1 | 278.2 | 1.381 | 1.276 | PQ-EA 230KV + EA-NCW 138KV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23022/23023 | ivsg_hs_alt5d1 | 392 | 529.7 | 75.9 | 1375.5 | 535.1 | 1.37 | 1.04 | ML-MS1+ ML-MS2 230KV |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_N-204 | ivsg_hs_alt5d1 | 800 | 1033.3 | 102.6 | 2745.9 | 1038.4 | 1.367 | 0.898 | COACHELLA MIDWAY 230 CKT 1&2 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23012/13808 | ivsg_hs_alt5d1 | 204.1 | 273.2 | 7.7 | 1157.2 | 273.3 | 1.355 | 1.276 | PQ-EA 230KV + NCW-PQ 138KV |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt5d1 | 382.4 | 492.1 | 1.8 | 2155.6 | 492.1 | 1.347 | 0.823 | MIGUEL 230 CORRIDOR West of LC |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | line_2245 | ivsg_hs_alt5d1 | 204.1 | 265.5 | -2.3 | 1128.2 | 265.5 | 1.321 | 1.276 | DEVERS 500.00 - VALLEYSC 500.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23004/23001 | ivsg_hs_alt5d1 | 204.1 | 265.2 | 4.6 | 1121.5 | 265.2 | 1.313 | 1.276 | SA-MS 1 + SA-MS 2 230KV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | line_2113 | ivsg_hs_alt5d1 | 204.1 | 263.9 | -0.9 | 1119.8 | 263.9 | 1.311 | 1.276 | ELLIS 230.00 - JOHANNA 230.00 1, ELLIS 230.00 - SANTIAGO 230.00 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23011/23003 | ivsg_hs_alt5d1 | 204.1 | 266 | -1.2 | 1119.3 | 266 | 1.311 | 1.276 | SA-EA 230KV + SA-ES-EA 230KV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23013/27/28 | ivsg_hs_alt5d1 | 204.1 | 264.7 | 2 | 1119.7 | 264.7 | 1.311 | 1.276 | OLD TOWN TO OLD TOWN JCT |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | line_N-204 | ivsg_hs_alt5d1 | 204.1 | 260.7 | -1.3 | 1116.1 | 260.7 | 1.307 | 1.276 | COACHELLA MIDWAY 230 CKT 1&2 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23022/23023 | ivsg_hs_alt5d1 | 408.3 | -521.5 | 1.8 | 2220.3 | 521.5 | 1.3 | 0.984 | ML-MS1+ ML-MS2 230KV |
| 8900 | PRUETTAP | 92 | 8691 | HIGHLINE | 92 | 1 | line_N-209 | ivsg_hs_alt5d1 | 86 | -111.7 | 15.3 | 696.6 | 112.7 | 1.291 | 0.754 | EL CENTRO HIGHLINE 230 CKTS 1&2 |
| 22672 | PRCTRVLY | 138 | 22852 | TELECYN | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt5d1 | 478 | 569.2 | -2.9 | 2523.2 | 569.2 | 1.262 | 0.776 | MIGUEL 230 CORRIDOR West of SN |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt5d1 | 382.4 | 462.8 | 12.6 | 2016.6 | 463 | 1.26 | 0.823 | MIGUEL 230 CORRIDOR North of ML |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23027/28/13810 | ivsg_hs_alt5d1 | 204.1 | 248.9 | 5.9 | 1050.3 | 249 | 1.23 | 1.276 | OLD TOWN TO MISSION 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | line_2115 | ivsg_hs_alt5d1 | 204.1 | 251.7 | -4.9 | 1048.4 | 251.7 | 1.228 | 1.276 | S.ONOFRE 230.00 - SANTIAGO 230.00 1, S.ONOFRE 230.00 - SANTIAGO 230.00 2 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23052/23007 | ivsg_hs_alt5d1 | 204.1 | 246.4 | -2.1 | 1044.6 | 246.5 | 1.223 | 1.276 | TA-SO 1 + 2 230KV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | 23051A/23011 | ivsg_hs_alt5d1 | 392 | 478.6 | 13.3 | 1229.8 | 478.8 | 1.22 | 1.05 | SX-EPP + ES-EA-SA 230KV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | 23022/23023 | ivsg_hs_alt5d1 | 392 | 476.8 | 18.2 | 1222.4 | 477.2 | 1.22 | 1.05 | ML-MS1+ ML-MS2 230KV |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 2 | line_2046 | ivsg_hs_alt5d1 | 956 | -1133.3 | -39 | 2883.6 | 1134 | 1.202 | 0.597 | LA FRESA 230.00 - REDONDO 230.00 1, REDONDO 230.00 - LITEHIPE 230.00 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 1 | line_2047 | ivsg_hs_alt5d1 | 956 | -1133.3 | -39 | 2883.6 | 1134 | 1.202 | 0.597 | LA FRESA 230.00 - REDONDO 230.00 2, REDONDO 230.00 - LITEHIPE 230.00 1 |
| 22672 | PRCTRVLY | 138 | 22852 | TELECYN | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt5d1 | 478 | 551.4 | -5.3 | 2404.4 | 551.4 | 1.202 | 0.776 | MIGUEL 230 CORRIDOR West of LC |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt5d1 | 204.1 | 238.8 | 0 | 1022.7 | 238.8 | 1.198 | 1.276 | MIGUEL 230 CORRIDOR North of ML |
| 24086 | LUGO | 500 | 24236 | RANCHVST | 500 | 1 | line_2194 | ivsg_hs_alt5d1 | 2598 | 3133 | 548.7 | 3510.3 | 3180.7 | 1.172 | 0.649 | LUGO 500.00 - MIRALOMA 500.00 2, LUGO 500.00 - MIRALOMA 500.00 3 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23027/28/13827 | ivsg_hs_alt5d1 | 204.1 | 234.2 | 3.2 | 987.8 | 234.2 | 1.157 | 1.276 | OLD TOWN TO MISSION 2 |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | 23022/23023 | ivsg_hs_alt5d1 | 382.4 | 432.2 | 9.5 | 1847.7 | 432.3 | 1.155 | 0.823 | ML-MS1+ ML-MS2 230KV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 13821B/638 | ivsg_hs_alt5d1 | 392 | 448.4 | 58.1 | 1168.9 | 452.2 | 1.15 | 1.04 | CH-SX-SN 138KV + SAN VCNT-EL 69KV |
| 30060 | MIDWAY | 500 | 24156 | VINCENT | 500 | 3 | line_2215 | ivsg_hs_alt5d1 | 1848.1 | 2244.8 | 138.9 | 2439.1 | 2249.1 | 1.147 | 0.449 | MIDWAY 500.00 - VINCENT 500.00 1, MIDWAY 500.00 - VINCENT 500.00 2 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | 23002/06/10 | ivsg_hs_alt5d1 | 392 | 445.9 | 18.4 | 1167.8 | 446.3 | 1.14 | 1.05 | SANLUISREY 230 CORRIDOR |
| 30060 | MIDWAY | 500 | 24156 | VINCENT | 500 | 1 | line_2220 | ivsg_hs_alt5d1 | 1848.1 | 2221.6 | 144.9 | 2414.5 | 2226.3 | 1.137 | 0.359 | MIDWAY 500.00 - VINCENT 500.00 2, MIDWAY 500.00 - VINCENT 500.00 3 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 2 | line_2064 | ivsg_hs_alt5d1 | 956 | -1071.7 | -46.2 | 2726.8 | 1072.7 | 1.136 | 0.597 | LA FRESA 230.00 - REDONDO 230.00 1, MESA CAL 230.00 - REDONDO 230.00 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 1 | line_2065 | ivsg_hs_alt5d1 | 956 | -1071.7 | -46.2 | 2726.8 | 1072.7 | 1.136 | 0.597 | LA FRESA 230.00 - REDONDO 230.00 2, MESA CAL 230.00 - REDONDO 230.00 1 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 2 | line_2029 | ivsg_hs_alt5d1 | 1195 | 1314.8 | -51.7 | 3403.1 | 1315.8 | 1.134 | 0.564 | LEWIS 230.00 - SERRANO 230.00 1, SERRANO 230.00 - VILLA PK 230.00 1 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 2 | line_2031 | ivsg_hs_alt5d1 | 1195 | 1314.8 | -51.7 | 3403.1 | 1315.8 | 1.134 | 0.564 | LEWIS 230.00 - SERRANO 230.00 2, SERRANO 230.00 - VILLA PK 230.00 1 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 2 | line_2278 | ivsg_hs_alt5d1 | 1195 | 1314.8 | -51.7 | 3403.1 | 1315.8 | 1.134 | 0.564 | LEWIS 230.00 - SERRANO 230.00 1, SERRANO 230.00 - VILLA PK 230.00 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 13810B/23013 | ivsg_hs_alt5d1 | 204.1 | 229.1 | 6 | 967.4 | 229.2 | 1.133 | 1.276 | OT JCT TO PQ 1 |
| 22672 | PRCTRVLY | 138 | 22852 | TELECYN | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt5d1 | 478 | 521.7 | 2.2 | 2261.1 | 521.7 | 1.131 | 0.776 | MIGUEL 230 CORRIDOR North of ML |
| 8682 | BANISTER | 161 | 8300 | BANIS230 | 230 | 1 | line_N-204 | ivsg_hs_alt5d1 | 225 | -251.1 | 40.9 | 945.5 | 254.4 | 1.13 | 0.81 | COACHELLA MIDWAY 230 CKT 1&2 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 13821B/638 | ivsg_hs_alt5d1 | 408.3 | -442.5 | -2.1 | 1886.8 | 442.5 | 1.105 | 0.984 | CH-SX-SN 138KV + SAN VCNT-EL 69KV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23002/06/10 | ivsg_hs_alt5d1 | 392 | 426.5 | 51.8 | 1139.8 | 429.6 | 1.1 | 1.04 | SANLUISREY 230 CORRIDOR |
| 22596 | OLD TOWN | 230 | 22466 | MLMS3TAP | 230 | 1 | 23021/22/23/41 | ivsg_hs_alt5d1 | 912 | -945.6 | 92.4 | 2500.5 | 950.1 | 1.092 | 0.747 | MIGUEL 230 CORRIDOR West of SN |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 2 | line_2049 | ivsg_hs_alt5d1 | 956 | -1027 | -38.7 | 2616.5 | 1027.7 | 1.09 | 0.597 | LA FRESA 230.00 - REDONDO 230.00 1, LCIENEGA 230.00 - LA FRESA 230.00 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 1 | line_2050 | ivsg_hs_alt5d1 | 956 | -1027 | -38.7 | 2616.5 | 1027.7 | 1.09 | 0.597 | LA FRESA 230.00 - REDONDO 230.00 2, LCIENEGA 230.00 - LA FRESA 230.00 1 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | 23013/27/28 | ivsg_hs_alt5d1 | 392 | 427.7 | 14.3 | 1093.1 | 427.9 | 1.09 | 1.05 | OLD TOWN TO OLD TOWN JCT |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 2 | line_2057 | ivsg_hs_alt5d1 | 956 | -1026.5 | -35.5 | 2614 | 1027.1 | 1.089 | 0.597 | EL NIDO 230.00 - LA FRESA 230.00 3, LA FRESA 230.00 - REDONDO 230.00 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 1 | line_2058 | ivsg_hs_alt5d1 | 956 | -1026.5 | -35.5 | 2614 | 1027.1 | 1.089 | 0.597 | EL NIDO 230.00 - LA FRESA 230.00 3, LA FRESA 230.00 - REDONDO 230.00 2 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 2 | line_2059 | ivsg_hs_alt5d1 | 956 | -1026.5 | -35.5 | 2614 | 1027.1 | 1.089 | 0.597 | EL NIDO 230.00 - LA FRESA 230.00 4, LA FRESA 230.00 - REDONDO 230.00 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 1 | line_2060 | ivsg_hs_alt5d1 | 956 | -1026.5 | -35.5 | 2614 | 1027.1 | 1.089 | 0.597 | EL NIDO 230.00 - LA FRESA 230.00 4, LA FRESA 230.00 - REDONDO 230.00 2 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_N-207 | ivsg_hs_alt5d1 | 800 | 849.5 | 26 | 2186.7 | 849.9 | 1.089 | 0.898 | MIDWAY HIGHLINE 230 CKT 3&4 |
| 24701 | KRAMER | 230 | 24085 | LUGO | 230 | 2 | line_2260 | ivsg_hs_alt5d1 | 478 | 525.9 | 6.5 | 1303 | 525.9 | 1.086 | 0.644 | KRAMER 230.00 - LUGO 230.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 8376 | RTAP2 | 92 | 8974 | RTP1 | 92 | 1 | line_N-204 | ivsg_hs_alt5d1 | 57 | -57.1 | 12.8 | 385.4 | 58.5 | 1.081 | 0.798 | COACHELLA MIDWAY 230 CKT 1&2 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | line_2245 | ivsg_hs_alt5d1 | 392 | 424.2 | 8.5 | 1090.4 | 424.3 | 1.08 | 1.05 | DEVERS 500.00 - VALLEYSC 500.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23002/06/10 | ivsg_hs_alt5d1 | 408.3 | -420.8 | 1.5 | 1839.8 | 420.8 | 1.077 | 0.984 | SANLUISREY 230 CORRIDOR |
| 24025 | CHINO | 230 | 24093 | MIRALOMW | 230 | 1 | line_2160 | ivsg_hs_alt5d1 | 705 | -733.5 | 30.7 | 1900.7 | 734.1 | 1.074 | 0.279 | CHINO 230.00 - MIRALOMA 230.00 2, CHINO 230.00 - MIRALOMA 230.00 3 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22596 | OLD TOWN | 230 | 22466 | MLMS3TAP | 230 | 1 | 23021/22/23/41 | ivsg_hs_alt5d1 | 912 | -934.4 | 106.4 | 2452.5 | 940.4 | 1.071 | 0.747 | MIGUEL 230 CORRIDOR North of ML |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | line_2245 | ivsg_hs_alt5d1 | 392 | 416.7 | 43.2 | 1086.4 | 418.9 | 1.07 | 1.04 | DEVERS 500.00 - VALLEYSC 500.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_N-204 | ivsg_hs_alt5d1 | 169 | 180.1 | 36 | 646.2 | 183.7 | 1.069 | 0.84 | COACHELLA MIDWAY 230 CKT 1&2 |
| 22596 | OLD TOWN | 230 | 22466 | MLMS3TAP | 230 | 1 | 23021/22/23/41 | ivsg_hs_alt5d1 | 912 | -931.8 | 102.8 | 2447.3 | 937.4 | 1.069 | 0.747 | MIGUEL 230 CORRIDOR West of LC |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_2260 | ivsg_hs_alt5d1 | 56 | 57.9 | -9.9 | 292.5 | 58.8 | 1.06 | 0.92 | KRAMER 230.00 - LUGO 230.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 22831 | SYCAMORE | 138 | 22124 | CHCARITA | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt5d1 | 204.1 | 209.1 | -29.7 | 902.6 | 211.2 | 1.057 | 0.747 | MIGUEL 230 CORRIDOR West of SN |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 1 | line_2030 | ivsg_hs_alt5d1 | 1287 | 1314.8 | -51.7 | 3403.1 | 1315.8 | 1.053 | 0.523 | LEWIS 230.00 - SERRANO 230.00 1, SERRANO 230.00 - VILLA PK 230.00 2 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 1 | line_2032 | ivsg_hs_alt5d1 | 1287 | 1314.8 | -51.7 | 3403.1 | 1315.8 | 1.053 | 0.523 | LEWIS 230.00 - SERRANO 230.00 2, SERRANO 230.00 - VILLA PK 230.00 2 |
| 22831 | SYCAMORE | 138 | 22124 | CHCARITA | 138 | 1 | 13821B/638 | ivsg_hs_alt5d1 | 204.1 | 212.1 | -21.9 | 896.4 | 213.2 | 1.05 | 0.747 | CH-SX-SN 138KV + SAN VCNT-EL 69KV |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_N-209 | ivsg_hs_alt5d1 | 800 | 835.1 | 57.8 | 2106 | 837.1 | 1.049 | 0.898 | EL CENTRO HIGHLINE 230 CKTS 1&2 |
| 22672 | PRCTRVLY | 138 | 22852 | TELECYN | 138 | 1 | 23022/23023 | ivsg_hs_alt5d1 | 478 | 490.6 | -5.7 | 2089 | 490.7 | 1.045 | 0.776 | ML-MS1+ ML-MS2 230KV |
| 22260 | ESCNDIDO | 230 | 22844 | TALEGA | 230 | 1 | 23052/23007 | ivsg_hs_alt5d1 | 456.1 | 472.4 | 17 | 1194.8 | 472.7 | 1.044 | 0.029 | TA-SO 1 + 2 230KV |
| 8806 | AV58TP1 | 161 | 8200 | BANTP2 | 161 | 1 | line_N-204 | ivsg_hs_alt5d1 | 165 | -153.2 | 38 | 607.3 | 157.9 | 1.031 | 0.701 | COACHELLA MIDWAY 230 CKT 1&2 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_N-210 | ivsg_hs_alt5d1 | 800 | 824.7 | 60.8 | 2070.7 | 826.9 | 1.031 | 0.898 | EL CENTRO IMPERIAL VALLEY 230 CKTS 2&3 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | line_2245 | ivsg_hs_alt5d1 | 408.3 | -411.6 | 5.2 | 1753.5 | 411.6 | 1.027 | 0.984 | DEVERS 500.00 - VALLEYSC 500.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 8900 | PRUETTAP | 92 | 8691 | HIGHLINE | 92 | 1 | line_N-204 | ivsg_hs_alt5d1 | 86 | -87.6 | 13.7 | 551.1 | 88.7 | 1.022 | 0.754 | COACHELLA MIDWAY 230 CKT 1&2 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | line_N-204 | ivsg_hs_alt5d1 | 408.3 | -404.4 | 8.9 | 1741.6 | 404.5 | 1.02 | 0.984 | COACHELLA MIDWAY 230 CKT 1&2 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | line_2113 | ivsg_hs_alt5d1 | 408.3 | -409.3 | 3.4 | 1740.5 | 409.3 | 1.019 | 0.984 | ELLIS 230.00 - JOHANNA 230.00 1, ELLIS 230.00 - SANTIAGO 230.00 1 |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_N-203 | ivsg_hs_alt5d1 | 169 | 171.3 | 35.8 | 615.6 | 175 | 1.019 | 0.84 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23051A/23011 | ivsg_hs_alt5d1 | 408.3 | -410.3 | 0.7 | 1739.5 | 410.3 | 1.018 | 0.984 | SX-EPP + ES-EA-SA 230KV |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 13821C/25/23051A | ivsg_hs_alt5d1 | 408.3 | -410.4 | -0.8 | 1737.2 | 410.4 | 1.017 | 0.984 | CH-ES-NCM-SX |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23021/23041 | ivsg_hs_alt5d1 | 408.3 | -408.5 | 3.7 | 1733.3 | 408.6 | 1.015 | 0.984 | ML-SX + OM-SX 230KV |
| 24016 | BARRE | 230 | 24044 | ELLIS | 230 | 1 | line_2115 | ivsg_hs_alt5d1 | 988 | 964.6 | -56 | 2510.9 | 966.3 | 1.012 | 0.407 | S.ONOFRE 230.00 - SANTIAGO 230.00 1, S.ONOFRE 230.00 - SANTIAGO 230.00 2 |
| 8682 | BANISTER | 161 | 8300 | BANIS230 | 230 | 1 | line_N-207 | ivsg_hs_alt5d1 | 225 | -224 | 37.5 | 816.7 | 227.2 | 1.01 | 0.81 | MIDWAY HIGHLINE 230 CKT 3&4 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | 23052/23007 | ivsg_hs_alt5d1 | 392 | 395.1 | 5.4 | 1013.2 | 395.2 | 1.01 | 1.05 | TA-SO 1 + 2 230KV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | 13807/08/23013 | ivsg_hs_alt5d1 | 392 | 394 | 11.5 | 1003.9 | 394.2 | 1.01 | 1.05 | PQ ENCINA |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23013/27/28 | ivsg_hs_alt5d1 | 392 | 392 | 42.1 | 1015.9 | 394.3 | 1.01 | 1.04 | OLD TOWN TO OLD TOWN JCT |
| 24074 | LA FRESA | 230 | 24065 | HINSON | 230 | 1 | line_2061 | ivsg_hs_alt5d1 | 797 | -770 | 46.1 | 2012 | 771.4 | 1.006 | 0.138 | LA FRESA 230.00 - REDONDO 230.00 1, LA FRESA 230.00 - REDONDO 230.00 2 |
| 19020 | BLYTHE | 161 | 24017 | BLYTHESC | 161 | 1 | line_N-204 | ivsg_hs_alt5d1 | 244 | 246.6 | 36.3 | 876.7 | 249.3 | 1.002 | 0.845 | COACHELLA MIDWAY 230 CKT 1&2 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23021/23041 | ivsg_hs_alt5d1 | 204.1 | 202 | 5.3 | 855 | 202.1 | 1.001 | 1.276 | ML-SX + OM-SX 230KV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | line_2115 | ivsg_hs_alt5d1 | 392 | 388.5 | 41.9 | 987.6 | 390.8 | 1 | 1.04 | S.ONOFRE 230.00 - SANTIAGO 230.00 1, S.ONOFRE 230.00 - SANTIAGO 230.00 2 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | line_2115 | ivsg_hs_alt5d1 | 392 | 392.4 | 10.7 | 987.8 | 392.6 | 1 | 1.05 | S.ONOFRE 230.00 - SANTIAGO 230.00 1, S.ONOFRE 230.00 - SANTIAGO 230.00 2 |
| 8690 | HIGHLINE | 230 | 8691 | HIGHLINE | 92 | 1 | line_N-209 | ivsg_hs_alt5d1 | 225 | 222.7 | -0.8 | 550.2 | 222.7 | 1 | 0.45 | EL CENTRO HIGHLINE 230 CKTS 1&2 |
| 24126 | RIOHONDO | 230 | 24155 | VINCENT | 230 | 2 | line_2097 | ivsg_hs_alt5d1 | 988 | -935.1 | 113 | 2473.9 | 941.9 | 0.997 | 0.727 | GOODRICH 230.00 - GOULD 230.00 1, VINCENT 230.00 - MESA CAL 230.00 1 |
| 24086 | LUGO | 500 | 24097 | MOHAVE | 500 | 1 | line_2234 | ivsg_hs_alt5d1 | 1386 | -1427.5 | 87.6 | 1574.6 | 1430.2 | 0.992 | 0.705 | MOHAVE 500.00 - ELDORDO 500.00 1, PISGAH 230.00 - ELDORDO 230.00 2 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2191 | ivsg_hs_alt5d1 | 2400 | -2477.7 | -30.5 | 2744 | 2477.8 | 0.99 | 0.774 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - ELDORDO 230.00 2 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_N-203 | ivsg_hs_alt5d1 | 800 | 790.8 | 62.9 | 1980.6 | 793.3 | 0.986 | 0.898 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2100 | ivsg_hs_alt5d1 | 2400 | -2459.9 | -208.7 | 2729.6 | 2468.7 | 0.985 | 0.774 | EAGLROCK 230.00 - MESA CAL 230.00 1, SYLMAR S 230.00 - GOULD 230.00 1 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2192 | ivsg_hs_alt5d1 | 2400 | -2464.9 | -40.7 | 2730.9 | 2465.2 | 0.985 | 0.774 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2193 | ivsg_hs_alt5d1 | 2400 | -2464.6 | -40.8 | 2730.6 | 2465 | 0.985 | 0.774 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - LUGO 230.00 2 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2200 | ivsg_hs_alt5d1 | 2400 | -2449.7 | -24.7 | 2723.4 | 2449.9 | 0.983 | 0.774 | LUGO 500.00 - MOHAVE 500.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2201 | ivsg_hs_alt5d1 | 2400 | -2449.5 | -24.8 | 2723.2 | 2449.6 | 0.983 | 0.774 | LUGO 500.00 - MOHAVE 500.00 1, PISGAH 230.00 - LUGO 230.00 2 |
| 24042 | ELDORDO | 500 | 24086 | LUGO | 500 | 1 | line_2258 | ivsg_hs_alt5d1 | 1386 | 1421.3 | 275.6 | 1542.6 | 1447.8 | 0.971 | 0.647 | LUGO 500.00 - VINCENT 500.00 2, LUGO 500.00 - VICTORVL 500.00 1 |
| 8682 | BANISTER | 161 | 8300 | BANIS230 | 230 | 1 | line_N-209 | ivsg_hs_alt5d1 | 225 | -217.4 | 23.9 | 777.7 | 218.7 | 0.97 | 0.81 | EL CENTRO HIGHLINE 230 CKTS 1&2 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt5d1 | 392 | 378.8 | -0.5 | 983 | 378.8 | 0.97 | 1.05 | MIGUEL 230 CORRIDOR North of ML |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2103 | ivsg_hs_alt5d1 | 2400 | -2416.5 | -193.7 | 2678.8 | 2424.2 | 0.967 | 0.774 | EAGLROCK 230.00 - SYLMAR S 230.00 1, SYLMAR S 230.00 - GOULD 230.00 1 |
| 19020 | BLYTHE | 161 | 24017 | BLYTHESC | 161 | 1 | line_N-203 | ivsg_hs_alt5d1 | 244 | 237.8 | 36.1 | 845.9 | 240.6 | 0.967 | 0.845 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 22596 | OLD TOWN | 230 | 22466 | MLMS3TAP | 230 | 1 | 23021/23041 | ivsg_hs_alt5d1 | 912 | -850.6 | 83.8 | 2211.4 | 854.8 | 0.966 | 0.747 | ML-SX + OM-SX 230KV |
| 24126 | RIOHONDO | 230 | 24155 | VINCENT | 230 | 2 | line_2101 | ivsg_hs_alt5d1 | 988 | -910.9 | 114.4 | 2394.4 | 918.1 | 0.965 | 0.727 | EAGLROCK 230.00 - MESA CAL 230.00 1, VINCENT 230.00 - MESA CAL 230.00 1 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2096 | ivsg_hs_alt5d1 | 2400 | -2410.7 | -215.8 | 2671.5 | 2420.4 | 0.964 | 0.774 | EAGLROCK 230.00 - MESA CAL 230.00 1, GOODRICH 230.00 - GOULD 230.00 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_2194 | ivsg_hs_alt5d1 | 56 | 52.1 | -10.3 | 263.2 | 53.1 | 0.96 | 0.92 | LUGO 500.00 - MIRALOMA 500.00 2, LUGO 500.00 - MIRALOMA 500.00 3 |
| 80300 | NEWSF230 | 230 | 80350 | NEWSF500 | 500 | 1 | line_N-204 | ivsg_hs_alt5d1 | 1120 | 1003.7 | -236.1 | 2744.5 | 1031.1 | 0.96 | 0.65 | COACHELLA MIDWAY 230 CKT 1&2 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | 13821C/25/23051A | ivsg_hs_alt5d1 | 392 | 371.8 | 19.1 | 953.6 | 372.3 | 0.95 | 1.05 | CH-ES-NCM-SX |
| 24126 | RIOHONDO | 230 | 24155 | VINCENT | 230 | 2 | line_2100 | ivsg_hs_alt5d1 | 988 | -889.1 | 118.3 | 2353.9 | 896.9 | 0.949 | 0.727 | EAGLROCK 230.00 - MESA CAL 230.00 1, SYLMAR S 230.00 - GOULD 230.00 1 |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | 13821B/638 | ivsg_hs_alt5d1 | 382.4 | 353.9 | 18.9 | 1516.8 | 354.4 | 0.948 | 0.823 | CH-SX-SN 138KV + SAN VCNT-EL 69KV |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_2182 | ivsg_hs_alt5d1 | 800 | 756.5 | 46.5 | 1892.2 | 758 | 0.942 | 0.898 | DEVERS 230.00 - MIRAGE 230.00 2, COACHELV 230.00 - DEVERS 230.00 2 |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | line_N-204 | ivsg_hs_alt5d1 | 132 | 119 | -17.2 | 777.2 | 120.3 | 0.938 | 0.82 | COACHELLA MIDWAY 230 CKT 1&2 |
| 8805 | AV58 | 161 | 8806 | AV58TP1 | 161 | 1 | line_N-204 | ivsg_hs_alt5d1 | 265 | -225.6 | 58.8 | 890.4 | 233.1 | 0.938 | 0.636 | COACHELLA MIDWAY 230 CKT 1&2 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_2185 | ivsg_hs_alt5d1 | 800 | 752.8 | 46.8 | 1881.1 | 754.2 | 0.937 | 0.898 | RAMON 230.00 - MIRAGE 230.00 2, J.HINDS 230.00 - MIRAGE 230.00 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt5d1 | 204.1 | 186.6 | 2.4 | 798.8 | 186.7 | 0.935 | 1.276 | MIGUEL 230 CORRIDOR West of LC |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 2 | line_2279 | ivsg_hs_alt5d1 | 1195 | 1078.9 | -61 | 2803.1 | 1080.6 | 0.934 | 0.564 | S.ONOFRE 230.00 - SERRANO 230.00 1, SERRANO 230.00 - VILLA PK 230.00 1 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | line_2115 | ivsg_hs_alt5d1 | 408.3 | -384.3 | -1.9 | 1594.1 | 384.3 | 0.933 | 0.984 | S.ONOFRE 230.00 - SANTIAGO 230.00 1, S.ONOFRE 230.00 - SANTIAGO 230.00 2 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2255 | ivsg_hs_alt5d1 | 2400 | -2315.7 | -72.4 | 2582.6 | 2316.9 | 0.932 | 0.774 | LUGO 500.00 - MIRALOMA 500.00 3, LUGO 500.00 - MOHAVE 500.00 1 |
| 24126 | RIOHONDO | 230 | 24155 | VINCENT | 230 | 2 | line_2076 | ivsg_hs_alt5d1 | 988 | -881.5 | 106.2 | 2307.2 | 887.8 | 0.93 | 0.727 | GOODRICH 230.00 - LAGUBELL 230.00 1, VINCENT 230.00 - MESA CAL 230.00 1 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | 23002/06/10 | ivsg_hs_alt5d1 | 800 | 742.6 | 72.3 | 1867.8 | 746.1 | 0.93 | 0.898 | SANLUISREY 230 CORRIDOR |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2256 | ivsg_hs_alt5d1 | 2400 | -2315.1 | -89.5 | 2572.2 | 2316.8 | 0.928 | 0.774 | ELDORDO 500.00 - LUGO 500.00 1, LUGO 500.00 - MIRALOMA 500.00 2 |
| 8311 | COACHELA | 230 | 8695 | RAMON | 230 | 2 | line_2186 | ivsg_hs_alt5d1 | 800 | 733.5 | 6 | 1858.5 | 733.5 | 0.925 | 0.726 | COACHELV 230.00 - DEVERS 230.00 2, J.HINDS 230.00 - MIRAGE 230.00 1 |
| 24614 | TAP601 | 115 | 24702 | KRAMER | 115 | 1 | line_2260 | ivsg_hs_alt5d1 | 217.1 | -190.1 | 68.7 | 1006 | 202.1 | 0.925 | 0.717 | KRAMER 230.00 - LUGO 230.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 24126 | RIOHONDO | 230 | 24155 | VINCENT | 230 | 2 | line_2096 | ivsg_hs_alt5d1 | 988 | -867.6 | 105.8 | 2291.1 | 874 | 0.924 | 0.727 | EAGLROCK 230.00 - MESA CAL 230.00 1, GOODRICH 230.00 - GOULD 230.00 1 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | 23011/13825 | ivsg_hs_alt5d1 | 392 | 359.9 | 27.4 | 917.7 | 360.9 | 0.92 | 1.05 | ES-EA-SA 230KV + BQ-CC-ES-NCM 138KV |
| 22831 | SYCAMORE | 138 | 22124 | CHCARITA | 138 | 1 | 23051A/23011 | ivsg_hs_alt5d1 | 204.1 | 181.6 | -33.1 | 784.3 | 184.6 | 0.918 | 0.747 | SX-EPP + ES-EA-SA 230KV |
| 24126 | RIOHONDO | 230 | 24155 | VINCENT | 230 | 2 | line_2103 | ivsg_hs_alt5d1 | 988 | -859.9 | 105.1 | 2272.3 | 866.3 | 0.916 | 0.727 | EAGLROCK 230.00 - SYLMAR S 230.00 1, SYLMAR S 230.00 - GOULD 230.00 1 |
| 22831 | SYCAMORE | 138 | 22124 | CHCARITA | 138 | 1 | 13810B/23013 | ivsg_hs_alt5d1 | 204.1 | 181.8 | -32.2 | 779.4 | 184.6 | 0.913 | 0.747 | OT JCT TO PQ 1 |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | 23002/06/10 | ivsg_hs_alt5d1 | 382.4 | 332.3 | 14.2 | 1459.2 | 332.6 | 0.912 | 0.823 | SANLUISREY 230 CORRIDOR |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24602 | VICTOR | 115 | 24702 | KRAMER | 115 | 1 | line_2260 | ivsg_hs_alt5d1 | 217.1 | -185.4 | 78.8 | 989.9 | 201.5 | 0.911 | 0.704 | KRAMER 230.00 - LUGO 230.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 8281 | AVE58 | 92 | 8805 | AV58 | 161 | 1 | line_N-204 | ivsg_hs_alt5d1 | 125 | -110.7 | 24.2 | 732 | 113.3 | 0.91 | 0.73 | COACHELLA MIDWAY 230 CKT 1&2 |
| 8281 | AVE58 | 92 | 8805 | AV58 | 161 | 2 | line_N-204 | ivsg_hs_alt5d1 | 125 | -110.7 | 24.2 | 732 | 113.3 | 0.91 | 0.73 | COACHELLA MIDWAY 230 CKT 1&2 |
| 24086 | LUGO | 500 | 24097 | MOHAVE | 500 | 1 | line_2258 | ivsg_hs_alt5d1 | 1386 | -1295.8 | -45.9 | 1450.3 | 1296.6 | 0.906 | 0.705 | LUGO 500.00 - VINCENT 500.00 2, LUGO 500.00 - VICTORVL 500.00 1 |
| 24125 | REDONDO | 230 | 24084 | LITEHIPE | 230 | 1 | line_2061 | ivsg_hs_alt5d1 | 916 | 816.7 | 96.8 | 2080.7 | 822.4 | 0.905 | 0.114 | LA FRESA 230.00 - REDONDO 230.00 1, LA FRESA 230.00 - REDONDO 230.00 2 |
| 24093 | MIRALOMW | 230 | 24158 | WALNUT | 230 | 1 | line_2089 | ivsg_hs_alt5d1 | 797 | 678.9 | 167.4 | 1807.2 | 699.2 | 0.905 | 0.529 | MESA CAL 230.00 - WALNUT 230.00 1, OLINDA 230.00 - WALNUT 230.00 1 |
| 22831 | SYCAMORE | 138 | 22124 | CHCARITA | 138 | 1 | 23027/28/13827 | ivsg_hs_alt5d1 | 204.1 | 180.4 | -28.5 | 770.4 | 182.7 | 0.902 | 0.747 | OLD TOWN TO MISSION 2 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2075 | ivsg_hs_alt5d1 | 2400 | -2261.4 | -167.6 | 2496.3 | 2267.6 | 0.901 | 0.774 | EAGLROCK 230.00 - MESA CAL 230.00 1, GOODRICH 230.00 - LAGUBELL 230.00 1 |
| 25656 | MIRALOME | 230 | 24100 | OLINDA | 230 | 1 | line_2088 | ivsg_hs_alt5d1 | 988 | 856.3 | 171.1 | 2230.4 | 873.3 | 0.9 | 0.589 | MESA CAL 230.00 - WALNUT 230.00 1, MIRALOMA 230.00 - WALNUT 230.00 1 |

ivsg_hs_alt5d1.sav
No Solve Summary
N-2 Outages

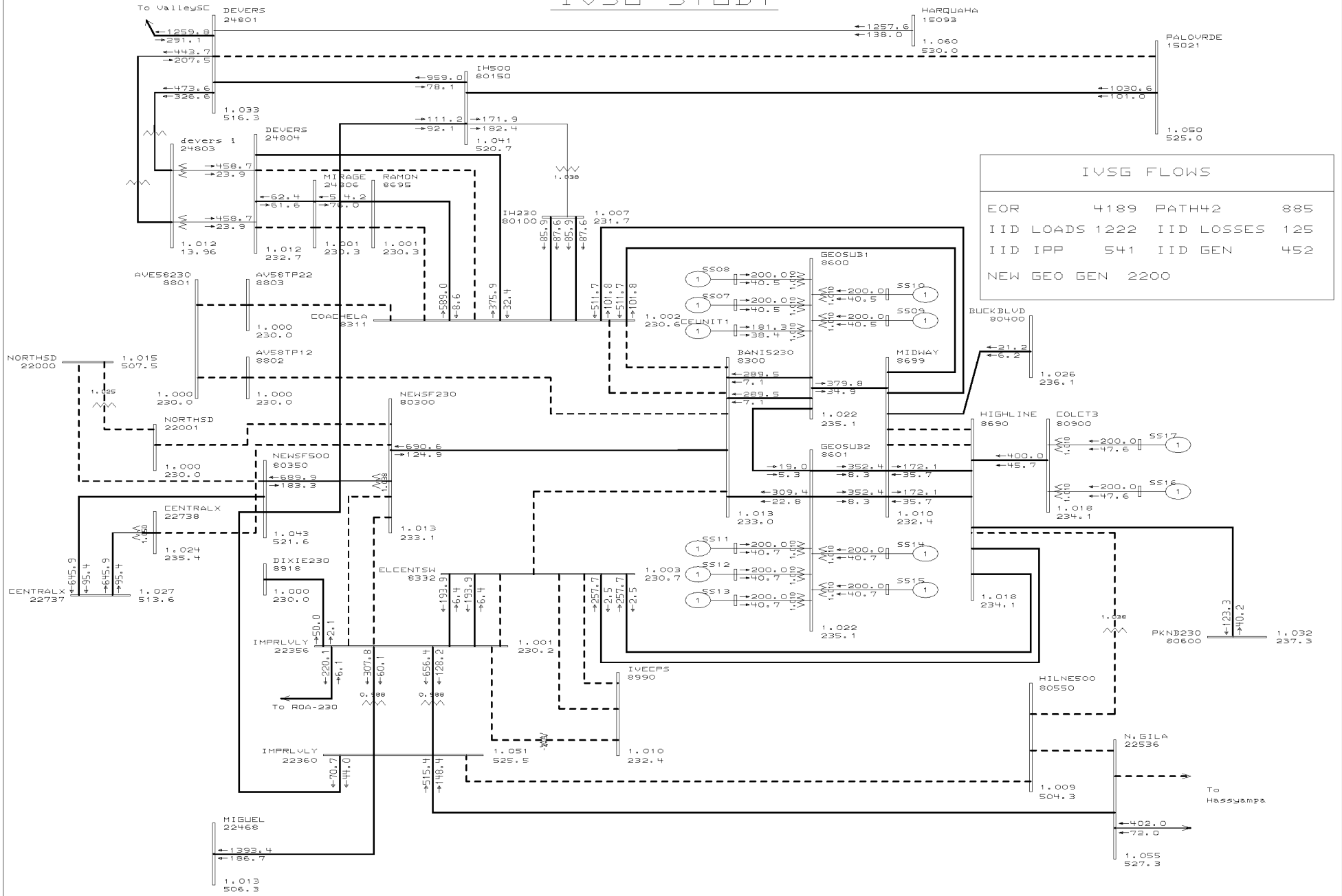
| Contingency-Description | Case | Problem-Description |
|---|---|---|
| DEVERS 230.00 - MIRAGE 230.00 2, RAMON 230.00 - MIRAGE 230.00 2 | ivsg_hs_alt5d1 | Pmis 24807 MIRAGE 115.00 = -624342.50 MW + j -887608.50 MVAR |
| VICTOR 230.00 - LUGO 230.00 1, VICTOR 230.00 - LUGO 230.00 2 | ivsg_hs_alt5d1 | Pmis 24042 ELDORDO 500.00 = 38.57 MW + j -16378.77 MVAR |
| DEVERS 230.00 - MIRAGE 230.00 2, RAMON 230.00 - MIRAGE 230.00 2 | ivsg_hs_alt5d1 | Pmis 24807 MIRAGE 115.00 = -624342.50 MW + j -887608.50 MVAR |
| EPP-ES + ES-EA-SA 230KV | ivsg_hs_alt5d1 | BAD Qgen: 22626 LkHodG2 17.1 MVAr |

# Imperial Valley Study Group

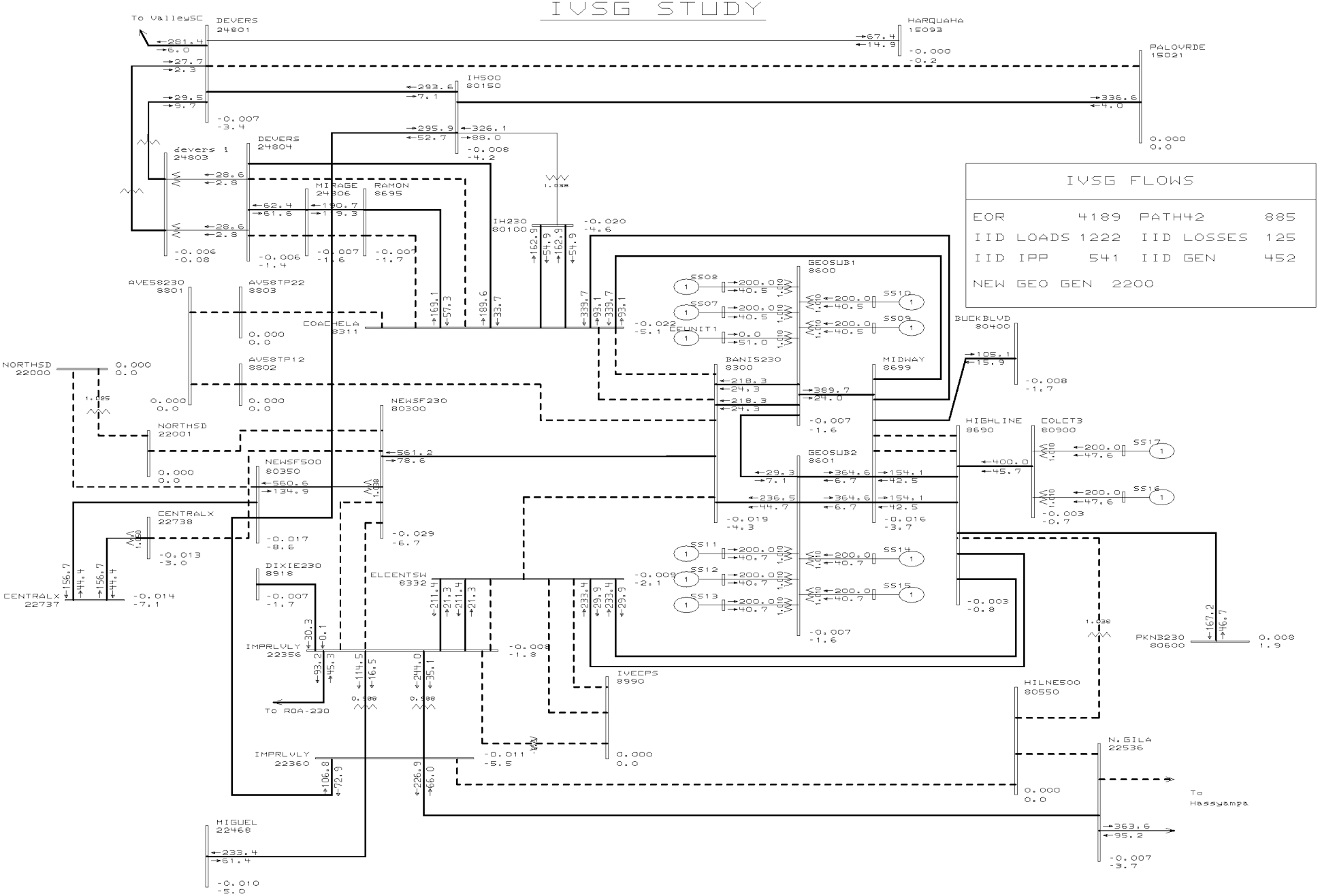
## Appendix A.4.15

Alt 5 D2
Heavy Summer
Alternative 5
Dispatch 2

# IVSG STUDY


To ValleySC
DEVERS
24801
HARQUAHA
15093
PALOVRDE
15021
IH500
80150
devers 1
24803
DEVERS
24804
MIRAGE
24806
RAMON
8695
IH230
80100
AVES8230
8801
AVES8TP22
8803
AVES8TP12
8802
COACHELA
8311
GEOSUB1
8600
CELNIT1
BANIS230
8300
MIDWAY
8699
BUCKBLVD
80400
NORTHSD
22000
NORTHSD
22001
NEWSF230
80300
NEWSF500
80350
HIGHLINE
8690
COLCT3
80900
GEOSUB2
8601
CENTRALX
22738
CENTRALX
22737
DIXIE230
8918
ELCENTSW
8332
IMPRLVLY
22356
IMPRLVLY
22360
IVECPS
8990
HILNE500
80550
N.GILA
22536
MIGUEL
22468
PKNB230
80600
To ROA-230
To Hassyampa
IVSG FLOWS
EOR 4189 PATH42 885
IID LOADS 1222 IID LOSSES 125
IID IPP 541 IID GEN 452
NEW GEO GEN 2200

# IVSG STUDY


To ValleySC
DEVERS 24801
HARQUAHA 15093
PALOVRDE 15021
IH500 80150
devers 1 24803
DEVERS 24804
MIRAGE 24806
RAMON 8695
IH230 80100
GEOSUB1 8600
SS08
SS07
SS10
SS09
CELNIT1
BUCKBLVD 80400
AVE58230 8801
AV58TP22 8803
COACHELA 8311
BANIS230 8300
MIDWAY 8699
NORTHSD 22000
AV58TP12 8802
NEWSF230 80300
NORTHSD 22001
HIGHLINE 8690
COLCT3 80900
SS17
SS16
NEWSF500 80350
GEOSUB2 8601
CENTRALX 22738
SS11
SS14
SS12
SS15
SS13
CENTRALX 22737
DIXIE230 8918
ELCENTSW 8332
IMPRLVLY 22356
To ROA-230
IVECPS 8990
HILNE500 80550
IMPRLVLY 22360
N.GILA 22536
To Hassyampa
MIGUEL 22468
PKNB230 80600
IVSG FLOWS
EOR 4189 PATH42 885
IID LOADS 1222 IID LOSSES 125
IID IPP 541 IID GEN 452
NEW GEO GEN 2200

ivsg_hs_alt5d2.sav
Voltage Summary
N-0 Outages

| Bus | Name | kV | Area | Zone | Outage | Case | Vbase | Vcont | DeltaV | Vmin | Vmax | Max-dv | Contingency Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24035 | EAGLEMTN | 161 | 24 | 248 | base | ivsg_hs_alt5d2_t | 0.929 | 0.929 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 20077 | SIM-115 | 115 | 20 | 205 | base | ivsg_hs_alt5d2_t | 0.934 | 0.934 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 20076 | SQN-115 | 115 | 20 | 205 | base | ivsg_hs_alt5d2_t | 0.939 | 0.939 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14534 | N.GILA 4 | 100 | 14 | 847 | base | ivsg_hs_alt5d2_t | 0.945 | 0.945 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15021 | PALOVRDE | 500 | 14 | 158 | base | ivsg_hs_alt5d2_t | 1.05 | 1.05 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24613 | COTNWD | 115 | 24 | 246 | base | ivsg_hs_alt5d2_t | 1.05 | 1.05 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24219 | PISGAH | 230 | 24 | 240 | base | ivsg_hs_alt5d2_t | 1.05 | 1.05 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24775 | RUSH | 115 | 24 | 247 | base | ivsg_hs_alt5d2_t | 1.05 | 1.05 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 22360 | IMPRLVLY | 500 | 22 | 227 | base | ivsg_hs_alt5d2_t | 1.051 | 1.051 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24236 | RANCHVST | 500 | 24 | 240 | base | ivsg_hs_alt5d2_t | 1.051 | 1.051 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24627 | CIMA | 230 | 24 | 240 | base | ivsg_hs_alt5d2_t | 1.051 | 1.051 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24138 | SERRANO | 500 | 24 | 240 | base | ivsg_hs_alt5d2_t | 1.052 | 1.052 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24229 | VALLEY-S | 115 | 24 | 240 | base | ivsg_hs_alt5d2_t | 1.052 | 1.052 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 25991 | VALYSVC2 | 115 | 24 | 240 | base | ivsg_hs_alt5d2_t | 1.052 | 1.052 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15090 | HASSYAMP | 500 | 14 | 158 | base | ivsg_hs_alt5d2_t | 1.053 | 1.053 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15092 | ARLINTON | 500 | 14 | 158 | base | ivsg_hs_alt5d2_t | 1.053 | 1.053 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15094 | MESQUITE | 500 | 14 | 158 | base | ivsg_hs_alt5d2_t | 1.053 | 1.053 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14009 | REDHAWK | 500 | 14 | 141 | base | ivsg_hs_alt5d2_t | 1.054 | 1.054 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 22536 | N.GILA | 500 | 22 | 227 | base | ivsg_hs_alt5d2_t | 1.054 | 1.054 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14010 | TS5 | 500 | 14 | 141 | base | ivsg_hs_alt5d2_t | 1.056 | 1.056 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 79043 | KAYENTA | 230 | 14 | 191 | base | ivsg_hs_alt5d2_t | 1.056 | 1.056 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14230 | VERDE N | 230 | 14 | 141 | base | ivsg_hs_alt5d2_t | 1.057 | 1.057 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14247 | VERDE S | 230 | 14 | 141 | base | ivsg_hs_alt5d2_t | 1.057 | 1.057 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14011 | RACEWAY | 500 | 14 | 141 | base | ivsg_hs_alt5d2_t | 1.057 | 1.057 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24151 | VALLEYSC | 500 | 24 | 240 | base | ivsg_hs_alt5d2_t | 1.057 | 1.057 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24997 | VALYSVC1 | 500 | 24 | 240 | base | ivsg_hs_alt5d2_t | 1.057 | 1.057 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 28040 | CALPINE | 500 | 24 | 240 | base | ivsg_hs_alt5d2_t | 1.057 | 1.057 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24776 | LEE VINE | 115 | 24 | 247 | base | ivsg_hs_alt5d2_t | 1.058 | 1.058 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15041 | SILVERKG | 500 | 14 | 158 | base | ivsg_hs_alt5d2_t | 1.06 | 1.06 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15061 | RUDD | 500 | 14 | 158 | base | ivsg_hs_alt5d2_t | 1.06 | 1.06 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15093 | HARQUAHA | 500 | 14 | 158 | base | ivsg_hs_alt5d2_t | 1.06 | 1.06 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14205 | COCONINO | 230 | 14 | 141 | base | ivsg_hs_alt5d2_t | 1.06 | 1.06 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14008 | JOJOBA | 500 | 14 | 141 | base | ivsg_hs_alt5d2_t | 1.06 | 1.06 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24086 | LUGO | 500 | 24 | 240 | base | ivsg_hs_alt5d2_t | 1.06 | 1.06 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15034 | PERKINS | 500 | 14 | 158 | base | ivsg_hs_alt5d2_t | 1.061 | 1.061 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14234 | YAVAPAI | 230 | 14 | 141 | base | ivsg_hs_alt5d2_t | 1.062 | 1.062 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14355 | PRESCOTT | 115 | 14 | 141 | base | ivsg_hs_alt5d2_t | 1.065 | 1.065 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14544 | PRESCOT2 | 100 | 14 | 141 | base | ivsg_hs_alt5d2_t | 1.066 | 1.066 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14543 | PRESCOT1 | 100 | 14 | 141 | base | ivsg_hs_alt5d2_t | 1.066 | 1.066 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14256 | FLAGSTAF | 230 | 14 | 141 | base | ivsg_hs_alt5d2_t | 1.066 | 1.066 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14587 | FLAGSTF1 | 100 | 14 | 141 | base | ivsg_hs_alt5d2_t | 1.066 | 1.066 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14001 | FOURCORN | 500 | 14 | 141 | base | ivsg_hs_alt5d2_t | 1.068 | 1.068 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 79264 | PINAL_W | 500 | 14 | 141 | base | ivsg_hs_alt5d2_t | 1.068 | 1.068 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24729 | INYO | 230 | 24 | 247 | base | ivsg_hs_alt5d2_t | 1.068 | 1.068 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24156 | VINCENT | 500 | 24 | 240 | base | ivsg_hs_alt5d2_t | 1.068 | 1.068 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14007 | GILARIVR | 500 | 14 | 141 | base | ivsg_hs_alt5d2_t | 1.069 | 1.069 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14006 | YAVAPAI | 500 | 14 | 141 | base | ivsg_hs_alt5d2_t | 1.07 | 1.07 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15992 | SEV | 500 | 14 | 158 | base | ivsg_hs_alt5d2_t | 1.072 | 1.072 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14004 | SAGUARO | 500 | 14 | 141 | base | ivsg_hs_alt5d2_t | 1.073 | 1.073 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 16000 | TORTOLIT | 500 | 14 | 160 | base | ivsg_hs_alt5d2_t | 1.073 | 1.073 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 16001 | TORTLIT2 | 500 | 14 | 160 | base | ivsg_hs_alt5d2_t | 1.073 | 1.073 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14215 | LEUPP | 230 | 14 | 141 | base | ivsg_hs_alt5d2_t | 1.074 | 1.074 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14100 | CHOLLA | 345 | 14 | 141 | base | ivsg_hs_alt5d2_t | 1.076 | 1.076 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15001 | CORONADO | 500 | 14 | 158 | base | ivsg_hs_alt5d2_t | 1.079 | 1.079 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14000 | CHOLLA | 500 | 14 | 141 | base | ivsg_hs_alt5d2_t | 1.08 | 1.08 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 19038 | MEAD | 500 | 14 | 191 | base | ivsg_hs_alt5d2_t | 1.086 | 1.086 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14204 | CHOLLA | 230 | 14 | 141 | base | ivsg_hs_alt5d2_t | 1.087 | 1.087 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24042 | ELDORDO | 500 | 24 | 240 | base | ivsg_hs_alt5d2_t | 1.087 | 1.087 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24097 | MOHAVE | 500 | 24 | 240 | base | ivsg_hs_alt5d2_t | 1.089 | 1.089 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14509 | CHOLLA 7 | 100 | 14 | 141 | base | ivsg_hs_alt5d2_t | 1.093 | 1.093 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14267 | SECDKNOL | 230 | 14 | 141 | base | ivsg_hs_alt5d2_t | 1.098 | 1.098 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14003 | NAVAJO | 500 | 14 | 141 | base | ivsg_hs_alt5d2_t | 1.102 | 1.102 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14002 | MOENKOPI | 500 | 14 | 141 | base | ivsg_hs_alt5d2_t | 1.104 | 1.104 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |

ivsg_hs_alt5d2.sav
Flow Summary
N-0 Outages

| LEGEND | % of RATING 1 | |
|---|---|---|
| C_pu | 100% - 110% | |
| C_pu | 110% - 120% | P.U. of |
| C_pu | > 120% | Rate 1 |

| FROM | FR | BKV | TO | TO | BKV | CK | Outage_Name | Case | Rate-Mva | Pflow | Qflow | Amps | MVA | C_pu | B_pu | Contingency_Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 14248 | GLENDALW | 230 | 14212 | GLENDALE | 230 | 1 | base | ivsg_hs_alt5d2_t | 457 | 605.8 | 29.1 | 1520.2 | 606.5 | 1.325 | 1.325 | Base system (n-0) |
| 14248 | GLENDALW | 230 | 15201 | AGUAFRIA | 230 | 1 | base | ivsg_hs_alt5d2_t | 457 | -605.8 | -29.1 | 1520.2 | 606.5 | 1.325 | 1.325 | Base system (n-0) |
| 24910 | CAL ELEC | 115 | 24912 | SHANDIN | 115 | 1 | base | ivsg_hs_alt5d2_t | 109.1 | -124.2 | 58.2 | 679.8 | 137.1 | 1.244 | 1.244 | Base system (n-0) |
| 14221 | PNPKAPS | 230 | 19062 | PINPK | 230 | 1 | base | ivsg_hs_alt5d2_t | 637.4 | -785.1 | -183.6 | 1988.6 | 806.3 | 1.243 | 1.243 | Base system (n-0) |
| 14212 | GLENDALE | 230 | 14270 | GRNDTRML | 230 | 1 | base | ivsg_hs_alt5d2_t | 457 | 540.4 | 21.4 | 1355.7 | 540.8 | 1.183 | 1.183 | Base system (n-0) |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | base | ivsg_hs_alt5d2_t | 204.1 | 241.1 | -8.8 | 997.7 | 241.3 | 1.168 | 1.168 | Base system (n-0) |
| 24912 | SHANDIN | 115 | 24916 | TAP902 | 115 | 1 | base | ivsg_hs_alt5d2_t | 109.1 | -119.2 | 33.5 | 610.8 | 123.8 | 1.116 | 1.116 | Base system (n-0) |
| 14206 | CTRYCLUB | 230 | 14270 | GRNDTRML | 230 | 1 | base | ivsg_hs_alt5d2_t | 509.9 | -536.6 | -17.7 | 1358.1 | 536.8 | 1.061 | 1.061 | Base system (n-0) |
| 14202 | CACTUS | 230 | 14221 | PNPKAPS | 230 | 1 | base | ivsg_hs_alt5d2_t | 371 | -366.5 | -47.3 | 929.3 | 369.6 | 0.998 | 0.998 | Base system (n-0) |
| 14008 | JOJOBA | 500 | 15011 | KYRENE | 500 | 1 | base | ivsg_hs_alt5d2_t | 1732 | 1815.4 | 164.1 | 1985.6 | 1822.8 | 0.995 | 0.995 | Base system (n-0) |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | base | ivsg_hs_alt5d2_t | 392 | 389.5 | 9.4 | 973.4 | 389.6 | 0.99 | 0.99 | Base system (n-0) |
| 15230 | RUDD | 230 | 15218 | WHITETNK | 230 | 1 | base | ivsg_hs_alt5d2_t | 725 | 694.9 | -17.6 | 1742.9 | 695.1 | 0.958 | 0.958 | Base system (n-0) |
| 24087 | MAGUNDEN | 230 | 24101 | OMAR | 230 | 1 | base | ivsg_hs_alt5d2_t | 643 | -591.8 | 131 | 1531.4 | 606.2 | 0.95 | 0.95 | Base system (n-0) |
| 24806 | MIRAGE | 230 | 24807 | MIRAGE | 115 | 1 | base | ivsg_hs_alt5d2_t | 280 | 265.6 | 25.9 | 671.3 | 266.9 | 0.95 | 0.95 | Base system (n-0) |
| 24806 | MIRAGE | 230 | 24807 | MIRAGE | 115 | 2 | base | ivsg_hs_alt5d2_t | 280 | 265.6 | 25.9 | 671.3 | 266.9 | 0.95 | 0.95 | Base system (n-0) |
| 24702 | KRAMER | 115 | 24753 | SUNGEN | 115 | 1 | base | ivsg_hs_alt5d2_t | 183.3 | -170.5 | 34 | 864.1 | 173.9 | 0.939 | 0.939 | Base system (n-0) |
| 14207 | DEERVALY | 230 | 14231 | WESTWING | 230 | 1 | base | ivsg_hs_alt5d2_t | 720 | -667.3 | -77.8 | 1686 | 671.8 | 0.933 | 0.933 | Base system (n-0) |
| 26098 | SYLMAR3 | 230 | 24147 | SYLMAR S | 230 | 1 | base | ivsg_hs_alt5d2_t | 1100 | 840.1 | -522.2 | 2562.6 | 989.2 | 0.928 | 0.928 | Base system (n-0) |
| 17003 | AVRA | 115 | 17012 | MARANA | 115 | 1 | base | ivsg_hs_alt5d2_t | 71.7 | -65 | -5.7 | 333.8 | 65.3 | 0.927 | 0.927 | Base system (n-0) |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | base | ivsg_hs_alt5d2_t | 56 | 50 | -10.7 | 253 | 51.1 | 0.92 | 0.92 | Base system (n-0) |
| 19215 | SPOOKHIL | 230 | 19045 | COOLIDGE | 230 | 1 | base | ivsg_hs_alt5d2_t | 352 | -317.9 | 46 | 808.3 | 321.2 | 0.917 | 0.917 | Base system (n-0) |
| 15212 | ROGERS | 230 | 19215 | SPOOKHIL | 230 | 1 | base | ivsg_hs_alt5d2_t | 352 | -316.2 | 55.9 | 807.5 | 321.1 | 0.915 | 0.915 | Base system (n-0) |

ivsg_hs_alt5d2.sav
VOLTAGE Summary
N-1 Outages

| Bus | Name | kV | Area | Zone | Outage | Case | Vbase | Vcont | DeltaV | Vmin | Vmax | Max-dv | Contingency Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24017 | BLYTHESC | 161 | 24 | 248 | line_007 | ivsg_hs_alt5d2_t | 1.02 | 0.872 | -0.148 | 0.9 | 1.05 | 0.05 | line BLYTHE to BLYTHESC 161 ck 1 |
| 24731 | INYOKERN | 115 | 24 | 247 | line_175 | ivsg_hs_alt5d2_t | 1.001 | 0.926 | -0.075 | 0.9 | 1.05 | 0.05 | line INYO to COTTONWD 230 ck 1 |
| 22464 | MIGUEL | 230 | 22 | 222 | B2_002 | ivsg_hs_alt5d2_t | 1.003 | 0.939 | -0.065 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22468 | MIGUEL | 500 | 22 | 227 | B2_002 | ivsg_hs_alt5d2_t | 1.012 | 0.939 | -0.074 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22472 | MIGUELMP | 500 | 22 | 227 | B2_002 | ivsg_hs_alt5d2_t | 1.006 | 0.939 | -0.067 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22412 | LOSCOCHS | 138 | 22 | 223 | B2_002 | ivsg_hs_alt5d2_t | 1 | 0.942 | -0.058 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 25423 | ESRP MWD | 115 | 24 | 254 | tran_247 | ivsg_hs_alt5d2_t | 1.028 | 0.942 | -0.086 | 0.9 | 1.05 | 0.05 | tran VALLEYSC 500 to VALLEYSC 115 ck 1 |
| 25423 | ESRP MWD | 115 | 24 | 254 | tran_248 | ivsg_hs_alt5d2_t | 1.028 | 0.942 | -0.086 | 0.9 | 1.05 | 0.05 | tran VALLEYSC 500 to VALLEYSC 115 ck 2 |
| 22428 | MAINST51 | 138 | 22 | 222 | B2_002 | ivsg_hs_alt5d2_t | 0.999 | 0.943 | -0.056 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22424 | MAINST50 | 138 | 22 | 222 | B2_002 | ivsg_hs_alt5d2_t | 0.999 | 0.944 | -0.056 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22734 | SANTEE | 138 | 22 | 223 | B2_002 | ivsg_hs_alt5d2_t | 1 | 0.944 | -0.055 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 24160 | VALLEYSC | 115 | 24 | 240 | tran_247 | ivsg_hs_alt5d2_t | 1.03 | 0.945 | -0.085 | 0.9 | 1.05 | 0.05 | tran VALLEYSC 500 to VALLEYSC 115 ck 1 |
| 25990 | VALYSVC1 | 115 | 24 | 240 | tran_247 | ivsg_hs_alt5d2_t | 1.03 | 0.945 | -0.085 | 0.9 | 1.05 | 0.05 | tran VALLEYSC 500 to VALLEYSC 115 ck 1 |
| 24160 | VALLEYSC | 115 | 24 | 240 | tran_248 | ivsg_hs_alt5d2_t | 1.03 | 0.945 | -0.085 | 0.9 | 1.05 | 0.05 | tran VALLEYSC 500 to VALLEYSC 115 ck 2 |
| 25990 | VALYSVC1 | 115 | 24 | 240 | tran_248 | ivsg_hs_alt5d2_t | 1.03 | 0.945 | -0.085 | 0.9 | 1.05 | 0.05 | tran VALLEYSC 500 to VALLEYSC 115 ck 2 |
| 24819 | CONCHO | 115 | 24 | 248 | tran_238 | ivsg_hs_alt5d2_t | 1.034 | 0.947 | -0.087 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 24822 | INDIAN W | 115 | 24 | 248 | tran_238 | ivsg_hs_alt5d2_t | 1.034 | 0.947 | -0.087 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 22832 | SYCAMORE | 230 | 22 | 221 | B2_002 | ivsg_hs_alt5d2_t | 1.005 | 0.951 | -0.053 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 24768 | RANDSBRG | 115 | 24 | 247 | line_175 | ivsg_hs_alt5d2_t | 1.002 | 0.951 | -0.05 | 0.9 | 1.05 | 0.05 | line INYO to COTTONWD 230 ck 1 |
| 24761 | TAP701 | 115 | 24 | 247 | line_175 | ivsg_hs_alt5d2_t | 1.002 | 0.951 | -0.05 | 0.9 | 1.05 | 0.05 | line INYO to COTTONWD 230 ck 1 |
| 22772 | SOUTHBAY | 138 | 22 | 222 | B2_002 | ivsg_hs_alt5d2_t | 1.007 | 0.952 | -0.055 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 24816 | SANTA RO | 115 | 24 | 248 | tran_238 | ivsg_hs_alt5d2_t | 1.038 | 0.952 | -0.087 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 24821 | TAMARISK | 115 | 24 | 248 | tran_238 | ivsg_hs_alt5d2_t | 1.038 | 0.952 | -0.086 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 22116 | CARLTHTP | 138 | 22 | 223 | B2_002 | ivsg_hs_alt5d2_t | 1.005 | 0.953 | -0.052 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 24827 | TAP823 | 115 | 24 | 248 | tran_238 | ivsg_hs_alt5d2_t | 1.04 | 0.954 | -0.086 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 22120 | CARLTNHS | 138 | 22 | 223 | B2_002 | ivsg_hs_alt5d2_t | 1.006 | 0.955 | -0.051 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22865 | UPTOWN | 138 | 22 | 221 | B2_002 | ivsg_hs_alt5d2_t | 1.007 | 0.955 | -0.052 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 25633 | CAPWIND | 115 | 24 | 248 | tran_238 | ivsg_hs_alt5d2_t | 1.04 | 0.955 | -0.085 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 25622 | TAP806 | 115 | 24 | 248 | tran_238 | ivsg_hs_alt5d2_t | 1.04 | 0.955 | -0.085 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 24829 | TAP821 | 115 | 24 | 248 | tran_238 | ivsg_hs_alt5d2_t | 1.04 | 0.955 | -0.085 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 24807 | MIRAGE | 115 | 24 | 248 | tran_238 | ivsg_hs_alt5d2_t | 1.042 | 0.957 | -0.085 | 0.9 | 1.05 | 0.05 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 22852 | TELECYN | 138 | 22 | 222 | B2_002 | ivsg_hs_alt5d2_t | 1.019 | 0.96 | -0.058 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22672 | PRCTRVLY | 138 | 22 | 222 | B2_002 | ivsg_hs_alt5d2_t | 1.021 | 0.962 | -0.06 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22460 | MIGUEL | 138 | 22 | 222 | B2_002 | ivsg_hs_alt5d2_t | 1.023 | 0.963 | -0.061 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22738 | CENTRALX | 230 | 22 | 225 | B2_002 | ivsg_hs_alt5d2_t | 1.023 | 0.967 | -0.056 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22737 | CENTRALX | 500 | 22 | 225 | B2_002 | ivsg_hs_alt5d2_t | 1.027 | 0.973 | -0.054 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 14534 | N.GILA 4 | 100 | 14 | 847 | NG500/69 | ivsg_hs_alt5d2_t | 0.945 | 1 | 0.055 | 0.9 | 1.05 | 0.05 | tran N.GILA 500 to N.GILA 69 ck 1 |
| 24035 | EAGLEMTN | 161 | 24 | 248 | tran_241 | ivsg_hs_alt5d2_t | 0.929 | 1.026 | 0.097 | 0.9 | 1.05 | 0.05 | tran EAGLEMTN 230 to EAGLEMTN 161 ck 1 |
| 8806 | AV58TP1 | 161 | 8 | 162 | C_4pre | ivsg_hs_alt5d2_t | 0.976 | 1.037 | 0.061 | 0.9 | 1.05 | 0.05 | C-ELCENTRO-AVE58 161KV |
| 8806 | AV58TP1 | 161 | 8 | 162 | line_34 | ivsg_hs_alt5d2_t | 0.976 | 1.037 | 0.061 | 0.9 | 1.05 | 0.05 | line AV58 to AV58TP1 161 ck 1 |
| 24730 | INYO PS | 115 | 24 | 247 | tran_229 | ivsg_hs_alt5d2_t | 1.026 | 1.078 | 0.052 | 0.9 | 1.05 | 0.05 | tran INYO 115 to INYO PS 115 ck 1 |
| 24142 | SYC CYN | 230 | 24 | 240 | line_086 | ivsg_hs_alt5d2_t | 0.986 | 1.091 | 0.105 | 0.9 | 1.05 | 0.05 | line MAGUNDEN to OMAR 230 ck 1 |
| 25613 | EDMONSTN | 230 | 24 | 256 | line_122 | ivsg_hs_alt5d2_t | 1 | 1.091 | 0.091 | 0.9 | 1.05 | 0.05 | line PASTORIA to EDMONSTN 230 ck 1 |
| 24142 | SYC CYN | 230 | 24 | 240 | line_140 | ivsg_hs_alt5d2_t | 0.986 | 1.091 | 0.105 | 0.9 | 1.05 | 0.05 | line SYC CYN to OMAR 230 ck 1 |

ivsg_hs_alt5d2.sav
FLOW Summary
N-1 Outages

| LEGEND | % of RATING 1 | |
|---|---|---|
| C_pu | 100% - 110% | |
| C_pu | 110% - 120% | P.U. of |
| C_pu | > 120% | Rate 1 |

| FROM | FR | BKV | TO | TO | BKV | CK | Outage_Name | Case | Rate-Mva | Pflow | Qflow | Amps | MVA | C_pu | B_pu | Contingency_Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24142 | SYC CYN | 230 | 24101 | OMAR | 230 | 1 | line_086 | ivsg_hs_alt5d2_t | 643 | 768.8 | 5511.2 | 12804.3 | 5564.5 | 7.934 | 0.47 | line MAGUNDEN to OMAR 230 ck 1 |
| 24781 | NAVYCOSO | 230 | 24706 | BLM EAST | 230 | 1 | line_173 | ivsg_hs_alt5d2_t | 1287 | -153.8 | -3160.7 | 7943.3 | 3164.4 | 2.459 | 0.056 | line BLM EAST to BLM WEST 230 ck 1 |
| 24781 | NAVYCOSO | 230 | 24706 | BLM EAST | 230 | 1 | line_174 | ivsg_hs_alt5d2_t | 1287 | -153.8 | -3160.7 | 7943.3 | 3164.4 | 2.459 | 0.056 | line BLM WEST to KRAMER 230 ck 1 |
| 24806 | MIRAGE | 230 | 24807 | MIRAGE | 115 | 2 | tran_238 | ivsg_hs_alt5d2_t | 280 | 532.2 | 198 | 1461.4 | 567.8 | 2.03 | 0.95 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_175 | ivsg_hs_alt5d2_t | 56 | -103.6 | -1.3 | 532.2 | 103.6 | 1.86 | 0.92 | line INYO to COTTONWD 230 ck 1 |
| 24151 | VALLEYSC | 500 | 24160 | VALLEYSC | 115 | 2 | tran_247 | ivsg_hs_alt5d2_t | 560 | 853.2 | 357.1 | 1024.7 | 924.9 | 1.65 | 0.77 | tran VALLEYSC 500 to VALLEYSC 115 ck 1 |
| 24151 | VALLEYSC | 500 | 24160 | VALLEYSC | 115 | 1 | tran_248 | ivsg_hs_alt5d2_t | 560 | 853.2 | 357.1 | 1024.7 | 924.9 | 1.65 | 0.77 | tran VALLEYSC 500 to VALLEYSC 115 ck 2 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_002 | ivsg_hs_alt5d2_t | 204.1 | 311.3 | -7.4 | 1354.7 | 311.4 | 1.587 | 1.168 | IMPRLVLY - MIGUEL 1 500kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_009 | ivsg_hs_alt5d2_t | 204.1 | 323.1 | -13.1 | 1353 | 323.4 | 1.585 | 1.168 | EPP - ESCNDIDO 1 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_032 | ivsg_hs_alt5d2_t | 204.1 | 312.2 | -12 | 1317.4 | 312.4 | 1.543 | 1.168 | OTAYMESA - MLMS3TAP 1 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_034 | ivsg_hs_alt5d2_t | 204.1 | 312.2 | -11.3 | 1318 | 312.4 | 1.543 | 1.168 | OLD TOWN - MLMS3TAP 1 230kV |
| 24151 | VALLEYSC | 500 | 24229 | VALLEY-S | 115 | 4 | tran_249 | ivsg_hs_alt5d2_t | 560 | 830.7 | 203.8 | 944.4 | 855.3 | 1.53 | 0.75 | tran VALLEYSC 500 to VALLEY-S 115 ck 3 |
| 24151 | VALLEYSC | 500 | 24229 | VALLEY-S | 115 | 3 | tran_250 | ivsg_hs_alt5d2_t | 560 | 830.6 | 203.8 | 944.4 | 855.3 | 1.53 | 0.75 | tran VALLEYSC 500 to VALLEY-S 115 ck 4 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_202 | ivsg_hs_alt5d2_t | 56 | 77.4 | -7.5 | 392.6 | 77.8 | 1.4 | 0.92 | line OWENSCON to INYO 230 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | SX70 | ivsg_hs_alt5d2_t | 204.1 | 286.6 | 5.5 | 1191.2 | 286.7 | 1.395 | 1.168 | tran SYCAMORE 230 to SYCAMORE 69 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | ML60 | ivsg_hs_alt5d2_t | 204.1 | 283.8 | -5.8 | 1180.4 | 283.8 | 1.382 | 1.168 | tran MIGUEL 230 to MIGUEL 138 ck 1 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | B2_009 | ivsg_hs_alt5d2_t | 392 | 530.6 | 27.8 | 1340.8 | 531.3 | 1.36 | 0.99 | EPP - ESCNDIDO 1 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_013 | ivsg_hs_alt5d2_t | 204.1 | 266.1 | -12.7 | 1105.4 | 266.4 | 1.295 | 1.168 | EPP - SYCAMORE 1 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | MS60 | ivsg_hs_alt5d2_t | 204.1 | 263.8 | -3 | 1094.7 | 263.8 | 1.282 | 1.168 | tran MISSION 230 to MISSION 138 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | MS61 | ivsg_hs_alt5d2_t | 204.1 | 263.8 | -3 | 1094.7 | 263.8 | 1.282 | 1.168 | tran MISSION 230 to MISSION 138 ck 2 |
| 8682 | BANISTER | 161 | 8300 | BANIS230 | 230 | 1 | line_7 | ivsg_hs_alt5d2_t | 225 | -276.2 | 30.6 | 1009.5 | 277.9 | 1.25 | 0.82 | line BANIS230 to NEWSF230 230 ck 1 |
| 8682 | BANISTER | 161 | 8300 | BANIS230 | 230 | 1 | tran_74 | ivsg_hs_alt5d2_t | 225 | -276.5 | 28.9 | 1008.1 | 278 | 1.25 | 0.82 | tran NEWSF230 230 to NEWSF500 500 ck 1 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | B2_032 | ivsg_hs_alt5d2_t | 392 | 488.6 | 15.3 | 1246 | 488.8 | 1.25 | 0.99 | OTAYMESA - MLMS3TAP 1 230kV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | B2_034 | ivsg_hs_alt5d2_t | 392 | 488.6 | 15.9 | 1246.5 | 488.9 | 1.25 | 0.99 | OLD TOWN - MLMS3TAP 1 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | ML70 | ivsg_hs_alt5d2_t | 204.1 | 255.9 | -4.2 | 1063 | 256 | 1.245 | 1.168 | tran MIGUEL 69 to MIGUEL 230 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | ML71 | ivsg_hs_alt5d2_t | 204.1 | 255.9 | -4.2 | 1063 | 256 | 1.245 | 1.168 | tran MIGUEL 69 to MIGUEL 230 ck 2 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_015 | ivsg_hs_alt5d2_t | 204.1 | 254.9 | -7.7 | 1056.9 | 255 | 1.238 | 1.168 | MIGUEL - MISSION 1 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_020 | ivsg_hs_alt5d2_t | 204.1 | 254.5 | -8.2 | 1055.2 | 254.6 | 1.236 | 1.168 | MIGUEL - MISSION 2 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_007 | ivsg_hs_alt5d2_t | 204.1 | 251.8 | -6.8 | 1044.7 | 251.9 | 1.224 | 1.168 | PENSQTOS - ENCINA 1 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | ML80 | ivsg_hs_alt5d2_t | 204.1 | 250.6 | -8.6 | 1042.3 | 250.8 | 1.221 | 1.168 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | MS70 | ivsg_hs_alt5d2_t | 204.1 | 250.9 | -2.2 | 1042.1 | 250.9 | 1.22 | 1.168 | tran MISSION 230 to MISSION 69 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | SO2 | ivsg_hs_alt5d2_t | 204.1 | 248.9 | -6.7 | 1041.4 | 249 | 1.22 | 1.168 | gen S.ONOFR2 22.00 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | ML81 | ivsg_hs_alt5d2_t | 204.1 | 249.8 | -8.6 | 1038.2 | 249.9 | 1.216 | 1.168 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | line_207 | ivsg_hs_alt5d2_t | 204.1 | 247.5 | -8.5 | 1031.7 | 247.6 | 1.208 | 1.168 | line DEVERS to VALLEYSC 500 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_014 | ivsg_hs_alt5d2_t | 204.1 | 249 | -7.3 | 1029.1 | 249.1 | 1.205 | 1.168 | ENCINATP - ENCINA 1 230kV |
| 24723 | CONTROL | 115 | 24731 | INYOKERN | 115 | 1 | line_175 | ivsg_hs_alt5d2_t | 82.7 | 96.2 | -4 | 497.8 | 96.3 | 1.199 | 0.421 | line INYO to COTTONWD 230 ck 1 |
| 24723 | CONTROL | 115 | 24731 | INYOKERN | 115 | 2 | line_175 | ivsg_hs_alt5d2_t | 82.7 | 96.2 | -4 | 497.8 | 96.3 | 1.199 | 0.421 | line INYO to COTTONWD 230 ck 1 |
| 22356 | IMPRLVLY | 230 | 22360 | IMPRLVLY | 500 | 1 | IV81 | ivsg_hs_alt5d2_t | 600 | 699.2 | 158.7 | 1793.6 | 716.9 | 1.19 | 0.52 | tran IMPRLVLY 230 to IMPRLVLY 500 ck 2 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | B2_002 | ivsg_hs_alt5d2_t | 392 | 460.5 | 0.6 | 1215.2 | 460.5 | 1.18 | 0.99 | IMPRLVLY - MIGUEL 1 500kV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | SX70 | ivsg_hs_alt5d2_t | 392 | 460.9 | 38.2 | 1155 | 462.5 | 1.18 | 0.99 | tran SYCAMORE 230 to SYCAMORE 69 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | line_7 | ivsg_hs_alt5d2_t | 204.1 | 234.8 | -5.9 | 969.5 | 234.9 | 1.135 | 1.168 | line BANIS230 to NEWSF230 230 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | tran_74 | ivsg_hs_alt5d2_t | 204.1 | 234.9 | -5.9 | 969.5 | 234.9 | 1.135 | 1.168 | tran NEWSF230 230 to NEWSF500 500 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_008 | ivsg_hs_alt5d2_t | 204.1 | 232.6 | -4.3 | 964.2 | 232.7 | 1.129 | 1.168 | PENSQTOS - OLD TOWN 1 230kV |
| 22468 | MIGUEL | 500 | 22472 | MIGUELMP | 500 | 1 | ML81 | ivsg_hs_alt5d2_t | 1120 | 1232 | 218.4 | 1427 | 1251.2 | 1.12 | 0.65 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 24729 | INYO | 230 | 24730 | INYO PS | 115 | 1 | line_175 | ivsg_hs_alt5d2_t | 50 | 51.8 | 21.3 | 133.1 | 56 | 1.12 | 0.54 | line INYO to COTTONWD 230 ck 1 |
| 24729 | INYO | 230 | 24730 | INYO PS | 115 | 2 | line_175 | ivsg_hs_alt5d2_t | 50 | 51.8 | 21.3 | 133.1 | 56 | 1.12 | 0.54 | line INYO to COTTONWD 230 ck 1 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | ML60 | ivsg_hs_alt5d2_t | 392 | 435.7 | 18.6 | 1094.3 | 436.1 | 1.11 | 0.99 | tran MIGUEL 230 to MIGUEL 138 ck 1 |
| 8600 | GEOSUB1 | 230 | 8699 | MIDWAY | 230 | 1 | line_7 | ivsg_hs_alt5d2_t | 550 | 601.1 | 71.2 | 1530.3 | 605.3 | 1.109 | 0.68 | line BANIS230 to NEWSF230 230 ck 1 |
| 8600 | GEOSUB1 | 230 | 8699 | MIDWAY | 230 | 1 | tran_74 | ivsg_hs_alt5d2_t | 550 | 601 | 74.5 | 1526.9 | 605.6 | 1.106 | 0.68 | tran NEWSF230 230 to NEWSF500 500 ck 1 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | B2_013 | ivsg_hs_alt5d2_t | 392 | 432.4 | 10.3 | 1084.8 | 432.5 | 1.1 | 0.99 | EPP - SYCAMORE 1 230kV |
| 22464 | MIGUEL | 230 | 22468 | MIGUEL | 500 | 1 | ML80 | ivsg_hs_alt5d2_t | 1120 | -1213.5 | -23.2 | 3062.8 | 1213.7 | 1.1 | 0.61 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 22464 | MIGUEL | 230 | 22472 | MIGUELMP | 500 | 1 | ML81 | ivsg_hs_alt5d2_t | 1120 | -1230 | -25.6 | 3102.2 | 1230.2 | 1.1 | 0.64 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 2 | line_070 | ivsg_hs_alt5d2_t | 956 | -1024.1 | -29 | 2601.6 | 1024.5 | 1.084 | 0.594 | line LA FRESA to REDONDO 230 ck 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 1 | line_071 | ivsg_hs_alt5d2_t | 956 | -1024.1 | -29 | 2601.6 | 1024.5 | 1.084 | 0.594 | line LA FRESA to REDONDO 230 ck 2 |
| 24701 | KRAMER | 230 | 24085 | LUGO | 230 | 2 | line_169 | ivsg_hs_alt5d2_t | 478 | 525.3 | -2.5 | 1298.5 | 525.3 | 1.082 | 0.643 | line KRAMER to LUGO 230 ck 1 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24701 | KRAMER | 230 | 24085 | LUGO | 230 | 1 | line_170 | ivsg_hs_alt5d2_t | 478 | 525.3 | -2.5 | 1298.5 | 525.3 | 1.082 | 0.643 | line KRAMER to LUGO 230 ck 2 |
| 8376 | RTAP2 | 92 | 8974 | RTP1 | 92 | 1 | C_4pre | ivsg_hs_alt5d2_t | 57 | -57.9 | 13.7 | 384.1 | 59.5 | 1.077 | 0.889 | C-ELCENTRO-AVE58 161KV |
| 8376 | RTAP2 | 92 | 8974 | RTP1 | 92 | 1 | line_2 | ivsg_hs_alt5d2_t | 57 | -57.9 | 14.3 | 384 | 59.6 | 1.077 | 0.889 | line BANTP2 to BANISTER 161 ck 1 |
| 8376 | RTAP2 | 92 | 8974 | RTP1 | 92 | 1 | line_34 | ivsg_hs_alt5d2_t | 57 | -57.9 | 13.7 | 384.1 | 59.5 | 1.077 | 0.889 | line AV58 to AV58TP1 161 ck 1 |
| 8376 | RTAP2 | 92 | 8974 | RTP1 | 92 | 1 | line_36 | ivsg_hs_alt5d2_t | 57 | -57.9 | 13.8 | 384.1 | 59.5 | 1.077 | 0.889 | line AV58TP1 to BANTP2 161 ck 1 |
| 8376 | RTAP2 | 92 | 8974 | RTP1 | 92 | 1 | C_4pst | ivsg_hs_alt5d2_t | 57 | -57.1 | 13.6 | 378 | 58.7 | 1.06 | 0.889 | C-ELCENTRO-AVE58 161KV |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | B2_002 | ivsg_hs_alt5d2_t | 1120 | -1181.4 | -94.3 | 3076 | 1185.2 | 1.06 | 0.58 | IMPRLVLY - MIGUEL 1 500kV |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_169 | ivsg_hs_alt5d2_t | 56 | 58.1 | -10 | 293.1 | 58.9 | 1.06 | 0.92 | line KRAMER to LUGO 230 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_170 | ivsg_hs_alt5d2_t | 56 | 58.1 | -10 | 293.1 | 58.9 | 1.06 | 0.92 | line KRAMER to LUGO 230 ck 2 |
| 8806 | AV58TP1 | 161 | 8200 | BANTP2 | 161 | 1 | line_7 | ivsg_hs_alt5d2_t | 165 | -160.4 | 33.2 | 622.8 | 163.8 | 1.056 | 0.844 | line BANIS230 to NEWSF230 230 ck 1 |
| 8806 | AV58TP1 | 161 | 8200 | BANTP2 | 161 | 1 | tran_74 | ivsg_hs_alt5d2_t | 165 | -160.6 | 32.7 | 622.5 | 163.9 | 1.055 | 0.844 | tran NEWSF230 230 to NEWSF500 500 ck 1 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | B2_015 | ivsg_hs_alt5d2_t | 392 | 409.8 | 13.1 | 1026.1 | 410 | 1.05 | 0.99 | MIGUEL - MISSION 1 230kV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | MS60 | ivsg_hs_alt5d2_t | 392 | 413 | 17.8 | 1035.1 | 413.4 | 1.05 | 0.99 | tran MISSION 230 to MISSION 138 ck 1 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | MS61 | ivsg_hs_alt5d2_t | 392 | 413 | 17.8 | 1035.1 | 413.4 | 1.05 | 0.99 | tran MISSION 230 to MISSION 138 ck 2 |
| 22261 | EPP | 230 | 22260 | ESCNDIDO | 230 | 1 | B2_032 | ivsg_hs_alt5d2_t | 796.7 | 831.7 | -60.6 | 2091 | 833.9 | 1.046 | 0.877 | OTAYMESA - MLMS3TAP 1 230kV |
| 22261 | EPP | 230 | 22260 | ESCNDIDO | 230 | 1 | B2_034 | ivsg_hs_alt5d2_t | 796.7 | 831.7 | -59.9 | 2091.4 | 833.8 | 1.046 | 0.877 | OLD TOWN - MLMS3TAP 1 230kV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | B2_020 | ivsg_hs_alt5d2_t | 392 | 409.2 | 12.3 | 1024.6 | 409.4 | 1.04 | 0.99 | MIGUEL - MISSION 2 230kV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | SO2 | ivsg_hs_alt5d2_t | 392 | 407.8 | 9 | 1031.1 | 407.9 | 1.04 | 0.99 | gen S.ONOFR2 22.00 |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_192 | ivsg_hs_alt5d2_t | 169 | 173.7 | 39.3 | 626.2 | 178.1 | 1.037 | 0.847 | line IRON MTN to CAMINO 230 ck 1 |
| 8279 | CVSUB | 92 | 8311 | COACHELA | 230 | 1 | C_4pst | ivsg_hs_alt5d2_t | 150 | -152.3 | -1.8 | 952.5 | 152.3 | 1.03 | 0.77 | C-ELCENTRO-AVE58 161KV |
| 8279 | CVSUB | 92 | 8311 | COACHELA | 230 | 2 | C_4pst | ivsg_hs_alt5d2_t | 150 | -152.3 | -1.8 | 952.5 | 152.3 | 1.03 | 0.77 | C-ELCENTRO-AVE58 161KV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | B2_007 | ivsg_hs_alt5d2_t | 392 | 402.3 | 12.8 | 1008 | 402.5 | 1.03 | 0.99 | PENSQTOS - ENCINA 1 230kV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | ML70 | ivsg_hs_alt5d2_t | 392 | 405.1 | 14.8 | 1016.1 | 405.4 | 1.03 | 0.99 | tran MIGUEL 69 to MIGUEL 230 ck 1 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | ML71 | ivsg_hs_alt5d2_t | 392 | 405.1 | 14.8 | 1016.1 | 405.4 | 1.03 | 0.99 | tran MIGUEL 69 to MIGUEL 230 ck 2 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | line_207 | ivsg_hs_alt5d2_t | 392 | 403.8 | 7.9 | 1017.3 | 403.9 | 1.03 | 0.99 | line DEVERS to VALLEYSC 500 ck 1 |
| 24114 | PARDEE | 230 | 24200 | SAUG TAP | 230 | 2 | line_117 | ivsg_hs_alt5d2_t | 494 | 501.7 | 27.1 | 1275.2 | 502.5 | 1.028 | 0.51 | line PARDEE to SAUG TAP 230 ck 1 |
| 24114 | PARDEE | 230 | 24200 | SAUG TAP | 230 | 1 | line_118 | ivsg_hs_alt5d2_t | 494 | 501.7 | 27 | 1275.1 | 502.4 | 1.028 | 0.518 | line PARDEE to SAUG TAP 230 ck 2 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_029 | ivsg_hs_alt5d2_t | 204.1 | 210 | -3.7 | 870.1 | 210.1 | 1.019 | 1.168 | OTAYMESA - MLSXTAP 1 230kV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_031 | ivsg_hs_alt5d2_t | 204.1 | 209.8 | -4.6 | 870.2 | 209.9 | 1.019 | 1.168 | SYCAMORE - MLSXTAP 1 230kV |
| 8699 | MIDWAY | 230 | 8601 | GEOSUB2 | 230 | 1 | line_7 | ivsg_hs_alt5d2_t | 550 | -545 | 5.5 | 1404.6 | 545 | 1.017 | 0.636 | line BANIS230 to NEWSF230 230 ck 1 |
| 8699 | MIDWAY | 230 | 8601 | GEOSUB2 | 230 | 2 | line_7 | ivsg_hs_alt5d2_t | 550 | -545 | 5.5 | 1404.6 | 545 | 1.017 | 0.636 | line BANIS230 to NEWSF230 230 ck 1 |
| 8699 | MIDWAY | 230 | 8601 | GEOSUB2 | 230 | 1 | tran_74 | ivsg_hs_alt5d2_t | 550 | -544.9 | 2.2 | 1401.5 | 544.9 | 1.015 | 0.636 | tran NEWSF230 230 to NEWSF500 500 ck 1 |
| 8699 | MIDWAY | 230 | 8601 | GEOSUB2 | 230 | 2 | tran_74 | ivsg_hs_alt5d2_t | 550 | -544.9 | 2.2 | 1401.5 | 544.9 | 1.015 | 0.636 | tran NEWSF230 230 to NEWSF500 500 ck 1 |
| 22831 | SYCAMORE | 138 | 22124 | CHCARITA | 138 | 1 | B2_009 | ivsg_hs_alt5d2_t | 204.1 | 205.7 | -23.5 | 866.1 | 207 | 1.014 | 0.718 | EPP - ESCNDIDO 1 230kV |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_13 | ivsg_hs_alt5d2_t | 800 | 813.3 | 32.6 | 2035.2 | 814 | 1.013 | 0.869 | line COACHELA to MIDWAY 230 ck 1 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_14 | ivsg_hs_alt5d2_t | 800 | 813.3 | 32.6 | 2035.2 | 814 | 1.013 | 0.869 | line COACHELA to MIDWAY 230 ck 2 |
| 8279 | CVSUB | 92 | 8311 | COACHELA | 230 | 1 | line_12 | ivsg_hs_alt5d2_t | 150 | -147.5 | -6.5 | 924.5 | 147.7 | 1.01 | 0.77 | line COACHELA to RAMON 230 ck 2 |
| 8279 | CVSUB | 92 | 8311 | COACHELA | 230 | 2 | line_12 | ivsg_hs_alt5d2_t | 150 | -147.5 | -6.5 | 924.5 | 147.7 | 1.01 | 0.77 | line COACHELA to RAMON 230 ck 2 |
| 22504 | MISSION | 230 | 22500 | MISSION | 138 | 2 | MS60 | ivsg_hs_alt5d2_t | 392 | 377.6 | 113.8 | 997.4 | 394.4 | 1.01 | 0.67 | tran MISSION 230 to MISSION 138 ck 1 |
| 22504 | MISSION | 230 | 22500 | MISSION | 138 | 1 | MS61 | ivsg_hs_alt5d2_t | 392 | 377.6 | 113.8 | 997.4 | 394.4 | 1.01 | 0.67 | tran MISSION 230 to MISSION 138 ck 2 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_201 | ivsg_hs_alt5d2_t | 56 | 54.7 | -10.7 | 276.8 | 55.7 | 1.01 | 0.92 | line SYLMAR3 to SYLMAR S 230 ck 1 |
| 8376 | RTAP2 | 92 | 8974 | RTP1 | 92 | 1 | B2_002 | ivsg_hs_alt5d2_t | 57 | -54.7 | 11.6 | 359.8 | 55.9 | 1.009 | 0.889 | IMPRLVLY - MIGUEL 1 500kV |
| 22261 | EPP | 230 | 22260 | ESCNDIDO | 230 | 1 | SX60 | ivsg_hs_alt5d2_t | 796.7 | 809.3 | -35.4 | 2017.8 | 810.1 | 1.009 | 0.877 | tran SYCAMORE 230 to SYCAMORE 138 ck 1 |
| 24303 | BIG CRK3 | 230 | 24235 | RECTOR | 230 | 1 | line_155 | ivsg_hs_alt5d2_t | 353 | 361 | 49.2 | 894 | 364.3 | 1.009 | 0.729 | line BIG CRK1 to RECTOR 230 ck 1 |
| 22261 | EPP | 230 | 22260 | ESCNDIDO | 230 | 1 | SX70 | ivsg_hs_alt5d2_t | 796.7 | 806.3 | -10.3 | 2013 | 806.4 | 1.007 | 0.877 | tran SYCAMORE 230 to SYCAMORE 69 ck 1 |
| 8376 | RTAP2 | 92 | 8974 | RTP1 | 92 | 1 | IV81 | ivsg_hs_alt5d2_t | 57 | -54.5 | 12.7 | 358.5 | 55.9 | 1.006 | 0.889 | tran IMPRLVLY 230 to IMPRLVLY 500 ck 2 |
| 8279 | CVSUB | 92 | 8311 | COACHELA | 230 | 1 | C_4pre | ivsg_hs_alt5d2_t | 150 | -146.5 | -4.8 | 917.3 | 146.6 | 1 | 0.77 | C-ELCENTRO-AVE58 161KV |
| 8279 | CVSUB | 92 | 8311 | COACHELA | 230 | 2 | C_4pre | ivsg_hs_alt5d2_t | 150 | -146.5 | -4.8 | 917.3 | 146.6 | 1 | 0.77 | C-ELCENTRO-AVE58 161KV |
| 8279 | CVSUB | 92 | 8311 | COACHELA | 230 | 1 | line_2 | ivsg_hs_alt5d2_t | 150 | -146.8 | -3 | 916.4 | 146.8 | 1 | 0.77 | line BANTP2 to BANISTER 161 ck 1 |
| 8279 | CVSUB | 92 | 8311 | COACHELA | 230 | 2 | line_2 | ivsg_hs_alt5d2_t | 150 | -146.8 | -3 | 916.4 | 146.8 | 1 | 0.77 | line BANTP2 to BANISTER 161 ck 1 |
| 8279 | CVSUB | 92 | 8311 | COACHELA | 230 | 1 | line_34 | ivsg_hs_alt5d2_t | 150 | -146.5 | -4.8 | 917.3 | 146.6 | 1 | 0.77 | line AV58 to AV58TP1 161 ck 1 |
| 8279 | CVSUB | 92 | 8311 | COACHELA | 230 | 2 | line_34 | ivsg_hs_alt5d2_t | 150 | -146.5 | -4.8 | 917.3 | 146.6 | 1 | 0.77 | line AV58 to AV58TP1 161 ck 1 |
| 8279 | CVSUB | 92 | 8311 | COACHELA | 230 | 1 | line_36 | ivsg_hs_alt5d2_t | 150 | -146.6 | -4.6 | 917.6 | 146.7 | 1 | 0.77 | line AV58TP1 to BANTP2 161 ck 1 |
| 8279 | CVSUB | 92 | 8311 | COACHELA | 230 | 2 | line_36 | ivsg_hs_alt5d2_t | 150 | -146.6 | -4.6 | 917.6 | 146.7 | 1 | 0.77 | line AV58TP1 to BANTP2 161 ck 1 |
| 24301 | BIG CRK1 | 230 | 24235 | RECTOR | 230 | 1 | line_160 | ivsg_hs_alt5d2_t | 329 | 334.9 | 47.2 | 825.8 | 338.2 | 1 | 0.727 | line BIG CRK3 to RECTOR 230 ck 1 |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_191 | ivsg_hs_alt5d2_t | 169 | 167.1 | 36.8 | 601.8 | 171.1 | 0.997 | 0.847 | line EAGLEMTN to IRON MTN 230 ck 1 |
| 8376 | RTAP2 | 92 | 8974 | RTP1 | 92 | 1 | line_13 | ivsg_hs_alt5d2_t | 57 | -53.4 | 12.4 | 352.4 | 54.8 | 0.989 | 0.889 | line COACHELA to MIDWAY 230 ck 1 |
| 8376 | RTAP2 | 92 | 8974 | RTP1 | 92 | 1 | line_14 | ivsg_hs_alt5d2_t | 57 | -53.4 | 12.4 | 352.4 | 54.8 | 0.989 | 0.889 | line COACHELA to MIDWAY 230 ck 2 |
| 24086 | LUGO | 500 | 24097 | MOHAVE | 500 | 1 | line_103 | ivsg_hs_alt5d2_t | 1386 | -1427.2 | 97.1 | 1564.9 | 1430.5 | 0.989 | 0.679 | line MOHAVE to ELDORDO 500 ck 1 |
| 22261 | EPP | 230 | 22260 | ESCNDIDO | 230 | 1 | SO2 | ivsg_hs_alt5d2_t | 796.7 | 788.1 | -42.5 | 1973.7 | 789.3 | 0.987 | 0.877 | gen S.ONOFR2 22.00 |
| 20238 | HRD-230 | 230 | 20239 | HRD-115 | 115 | 1 | B2_002 | ivsg_hs_alt5d2_t | 225 | 219.4 | 1.5 | 561.8 | 219.4 | 0.98 | 0.68 | IMPRLVLY - MIGUEL 1 500kV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | SX60 | ivsg_hs_alt5d2_t | 392 | 384.1 | 38.9 | 972.4 | 386.1 | 0.98 | 0.87 | tran SYCAMORE 230 to SYCAMORE 138 ck 1 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 19020 | BLYTHE | 161 | 24017 | BLYTHESC | 161 | 1 | line_192 | ivsg_hs_alt5d2_t | 244 | 240.2 | 39.6 | 855.9 | 243.4 | 0.978 | 0.851 | line IRON MTN to CAMINO 230 ck 1 |
| 8806 | AV58TP1 | 161 | 8200 | BANTP2 | 161 | 1 | line_13 | ivsg_hs_alt5d2_t | 165 | -151.2 | 25.6 | 572.5 | 153.4 | 0.97 | 0.844 | line COACHELA to MIDWAY 230 ck 1 |
| 8806 | AV58TP1 | 161 | 8200 | BANTP2 | 161 | 1 | line_14 | ivsg_hs_alt5d2_t | 165 | -151.2 | 25.6 | 572.5 | 153.4 | 0.97 | 0.844 | line COACHELA to MIDWAY 230 ck 2 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_015 | ivsg_hs_alt5d2_t | 392 | 379.5 | 42.2 | 955.1 | 381.9 | 0.97 | 0.87 | MIGUEL - MISSION 1 230kV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_020 | ivsg_hs_alt5d2_t | 392 | 378.2 | 40.6 | 952.1 | 380.4 | 0.97 | 0.87 | MIGUEL - MISSION 2 230kV |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_123 | ivsg_hs_alt5d2_t | 56 | 52.6 | -10.7 | 266.6 | 53.7 | 0.97 | 0.92 | line PASTORIA to PSTRIA 230 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_200 | ivsg_hs_alt5d2_t | 56 | 52.7 | -10.7 | 266.8 | 53.8 | 0.97 | 0.92 | line SYLMAR1 to SYLMAR S 230 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | tran_210 | ivsg_hs_alt5d2_t | 56 | 52.5 | -10.5 | 265.7 | 53.6 | 0.97 | 0.92 | tran LUGO 500 to LUGO 230 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | tran_211 | ivsg_hs_alt5d2_t | 56 | 52.6 | -10.5 | 265.9 | 53.6 | 0.97 | 0.92 | tran LUGO 500 to LUGO 230 ck 2 |
| 8376 | RTAP2 | 92 | 8974 | RTP1 | 92 | 1 | line_303 | ivsg_hs_alt5d2_t | 57 | -52.2 | 11.2 | 343.4 | 53.4 | 0.963 | 0.889 | line HARQUAHA to DEVERS 500 ck 1 |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_63 | ivsg_hs_alt5d2_t | 169 | 162.6 | 28.5 | 580.4 | 165.1 | 0.96 | 0.847 | line RAMON to MIRAGE 230 ck 2 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | ML70 | ivsg_hs_alt5d2_t | 392 | 373.8 | 41.8 | 944.7 | 376.2 | 0.96 | 0.87 | tran MIGUEL 69 to MIGUEL 230 ck 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | ML71 | ivsg_hs_alt5d2_t | 392 | 373.8 | 41.8 | 944.7 | 376.2 | 0.96 | 0.87 | tran MIGUEL 69 to MIGUEL 230 ck 2 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_086 | ivsg_hs_alt5d2_t | 56 | 52.1 | -10.7 | 263.7 | 53.1 | 0.96 | 0.92 | line MAGUNDEN to OMAR 230 ck 1 |
| 22261 | EPP | 230 | 22260 | ESCNDIDO | 230 | 1 | line_207 | ivsg_hs_alt5d2_t | 796.7 | 768.5 | -48.2 | 1920.1 | 770 | 0.96 | 0.877 | line DEVERS to VALLEYSC 500 ck 1 |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_12 | ivsg_hs_alt5d2_t | 169 | 162.1 | 29.2 | 579.2 | 164.7 | 0.958 | 0.847 | line COACHELA to RAMON 230 ck 2 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | C_4pst | ivsg_hs_alt5d2_t | 800 | 771 | 28.1 | 1913.8 | 771.6 | 0.953 | 0.869 | C-ELCENTRO-AVE58 161KV |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | tran_71 | ivsg_hs_alt5d2_t | 800 | 770.4 | 27.2 | 1911 | 770.9 | 0.952 | 0.869 | tran BANISTER 161 to BANIS230 230 ck 1 |
| 14008 | JOJOBA | 500 | 15011 | KYRENE | 500 | 1 | PV1 | ivsg_hs_alt5d2_t | 1732 | 1741.3 | 167.2 | 1897.7 | 1749.3 | 0.952 | 0.995 | gen PALOVRD1 24.00 |
| 19020 | BLYTHE | 161 | 24017 | BLYTHESC | 161 | 1 | line_191 | ivsg_hs_alt5d2_t | 244 | 233.6 | 37.1 | 831.7 | 236.5 | 0.951 | 0.851 | line EAGLEMTN to IRON MTN 230 ck 1 |
| 8376 | RTAP2 | 92 | 8974 | RTP1 | 92 | 1 | line_20 | ivsg_hs_alt5d2_t | 57 | -51.4 | 12.9 | 338.6 | 53 | 0.95 | 0.889 | line NILAND to CVSUB161 161 ck 1 |
| 8600 | GEOSUB1 | 230 | 8699 | MIDWAY | 230 | 1 | line_48 | ivsg_hs_alt5d2_t | 550 | 530.3 | 52.6 | 1311.2 | 532.9 | 0.95 | 0.68 | line MIDWAY to GEOSUB2 230 ck 1 |
| 8600 | GEOSUB1 | 230 | 8699 | MIDWAY | 230 | 1 | line_49 | ivsg_hs_alt5d2_t | 550 | 530.3 | 52.6 | 1311.2 | 532.9 | 0.95 | 0.68 | line MIDWAY to GEOSUB2 230 ck 2 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_032 | ivsg_hs_alt5d2_t | 392 | 371.9 | 38.3 | 954.5 | 373.9 | 0.95 | 0.87 | OTAYMESA - MLMS3TAP 1 230kV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_034 | ivsg_hs_alt5d2_t | 392 | 371.9 | 38.7 | 955 | 373.9 | 0.95 | 0.87 | OLD TOWN - MLMS3TAP 1 230kV |
| 8301 | CITAP1 | 92 | 8312 | COACHELA | 92 | 1 | line_12 | ivsg_hs_alt5d2_t | 152 | -142.9 | 16.7 | 904.9 | 143.9 | 0.949 | 0.758 | line COACHELA to RAMON 230 ck 2 |
| 8301 | CITAP1 | 92 | 8389 | VANBUREN | 92 | 1 | line_12 | ivsg_hs_alt5d2_t | 152 | 142.9 | -16.7 | 904.9 | 143.9 | 0.949 | 0.758 | line COACHELA to RAMON 230 ck 2 |
| 8376 | RTAP2 | 92 | 8974 | RTP1 | 92 | 1 | line_82 | ivsg_hs_alt5d2_t | 57 | -51.4 | 12 | 338.3 | 52.8 | 0.949 | 0.889 | line PALOVERDE to IH500 ck 1 |
| 22596 | OLD TOWN | 230 | 22466 | MLMS3TAP | 230 | 1 | B2_002 | ivsg_hs_alt5d2_t | 912 | -819.5 | 61.4 | 2166.9 | 821.8 | 0.947 | 0.692 | IMPRLVLY - MIGUEL 1 500kV |
| 8376 | RTAP2 | 92 | 8974 | RTP1 | 92 | 1 | tran_71 | ivsg_hs_alt5d2_t | 57 | -51.2 | 13.6 | 337 | 52.9 | 0.946 | 0.889 | tran BANISTER 161 to BANIS230 230 ck 1 |
| 8376 | RTAP2 | 92 | 8974 | RTP1 | 92 | 1 | B2_022 | ivsg_hs_alt5d2_t | 57 | -51.1 | 12.5 | 337 | 52.7 | 0.946 | 0.889 | OTAYMESA - TJI-230 1 230kV |
| 8376 | RTAP2 | 92 | 8974 | RTP1 | 92 | 1 | line_16 | ivsg_hs_alt5d2_t | 57 | -51.1 | 12.8 | 336.4 | 52.7 | 0.944 | 0.889 | line ELCENTSW to NILAND 161 ck 1 |
| 8311 | COACHELA | 230 | 8695 | RAMON | 230 | 2 | line_83 | ivsg_hs_alt5d2_t | 800 | 744.5 | 13.4 | 1890.5 | 744.6 | 0.941 | 0.736 | line IH500 to DEVERS 500 ck 1 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | IV81 | ivsg_hs_alt5d2_t | 800 | 756.5 | 28.1 | 1885.3 | 757 | 0.939 | 0.869 | tran IMPRLVLY 230 to IMPRLVLY 500 ck 2 |
| 8806 | AV58TP1 | 161 | 8200 | BANTP2 | 161 | 1 | line_16 | ivsg_hs_alt5d2_t | 165 | -147.8 | 25.2 | 553.4 | 149.9 | 0.938 | 0.844 | line ELCENTSW to NILAND 161 ck 1 |
| 24807 | MIRAGE | 115 | 24819 | CONCHO | 115 | 1 | tran_238 | ivsg_hs_alt5d2_t | 183 | 164.1 | -5.9 | 861.5 | 164.2 | 0.938 | 0.861 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 8376 | RTAP2 | 92 | 8974 | RTP1 | 92 | 1 | tran_78 | ivsg_hs_alt5d2_t | 57 | -50.8 | 10.5 | 332.8 | 51.8 | 0.933 | 0.889 | tran IH230 230 to IH500 500 ck 1 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_24 | ivsg_hs_alt5d2_t | 800 | 752.5 | 14.7 | 1872.4 | 752.7 | 0.932 | 0.869 | line GEOSUB1 to MIDWAY 230 ck 1 |
| 8279 | CVSUB | 92 | 8312 | COACHELA | 92 | 1 | line_12 | ivsg_hs_alt5d2_t | 132 | 122.8 | -9.7 | 771.3 | 123.2 | 0.931 | 0.781 | line COACHELA to RAMON 230 ck 2 |
| 8279 | CVSUB | 92 | 8312 | COACHELA | 92 | 2 | line_12 | ivsg_hs_alt5d2_t | 132 | 122.8 | -9.7 | 771.3 | 123.2 | 0.931 | 0.781 | line COACHELA to RAMON 230 ck 2 |
| 22261 | EPP | 230 | 22260 | ESCNDIDO | 230 | 1 | line_83 | ivsg_hs_alt5d2_t | 796.7 | 746.6 | -44.8 | 1861.8 | 748 | 0.931 | 0.877 | line IH500 to DEVERS 500 ck 1 |
| 8682 | BANISTER | 161 | 8300 | BANIS230 | 230 | 1 | line_13 | ivsg_hs_alt5d2_t | 225 | -206.4 | 12.7 | 737.2 | 206.8 | 0.93 | 0.82 | line COACHELA to MIDWAY 230 ck 1 |
| 8682 | BANISTER | 161 | 8300 | BANIS230 | 230 | 1 | line_14 | ivsg_hs_alt5d2_t | 225 | -206.4 | 12.7 | 737.2 | 206.8 | 0.93 | 0.82 | line COACHELA to MIDWAY 230 ck 2 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_009 | ivsg_hs_alt5d2_t | 392 | 362.6 | 39.8 | 921 | 364.8 | 0.93 | 0.87 | EPP - ESCNDIDO 1 230kV |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_008 | ivsg_hs_alt5d2_t | 169 | 157.9 | 25.7 | 562.5 | 160 | 0.93 | 0.847 | line PARKER to GENE 230 ck 1 |
| 19020 | BLYTHE | 161 | 24017 | BLYTHESC | 161 | 1 | line_63 | ivsg_hs_alt5d2_t | 244 | 229.1 | 28.8 | 811.7 | 230.9 | 0.928 | 0.851 | line RAMON to MIRAGE 230 ck 2 |
| 24303 | BIG CRK3 | 230 | 24235 | RECTOR | 230 | 1 | line_139 | ivsg_hs_alt5d2_t | 353 | 335.6 | 44.2 | 821.6 | 338.5 | 0.928 | 0.729 | line SPRINGVL to BIG CRK4 230 ck 1 |
| 8376 | RTAP2 | 92 | 8974 | RTP1 | 92 | 1 | B2_032 | ivsg_hs_alt5d2_t | 57 | -50.1 | 12.3 | 330.2 | 51.6 | 0.927 | 0.889 | OTAYMESA - MLMS3TAP 1 230kV |
| 8376 | RTAP2 | 92 | 8974 | RTP1 | 92 | 1 | B2_034 | ivsg_hs_alt5d2_t | 57 | -50.1 | 12.3 | 330.2 | 51.6 | 0.927 | 0.889 | OLD TOWN - MLMS3TAP 1 230kV |
| 19020 | BLYTHE | 161 | 24017 | BLYTHESC | 161 | 1 | line_12 | ivsg_hs_alt5d2_t | 244 | 228.6 | 29.5 | 810.4 | 230.5 | 0.926 | 0.851 | line COACHELA to RAMON 230 ck 2 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | B2_003 | ivsg_hs_alt5d2_t | 800 | 745.9 | 29.8 | 1858.8 | 746.4 | 0.926 | 0.869 | N.GILA - IMPRLVLY 1 500kV |
| 24807 | MIRAGE | 115 | 24816 | SANTA RO | 115 | 1 | tran_238 | ivsg_hs_alt5d2_t | 183.3 | 162 | -11.5 | 852.2 | 162.4 | 0.926 | 0.852 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 8311 | COACHELA | 230 | 8699 | MIDWAY | 230 | 2 | line_13 | ivsg_hs_alt5d2_t | 779 | -690.1 | 187.6 | 1803.2 | 715.1 | 0.924 | 0.67 | line COACHELA to MIDWAY 230 ck 1 |
| 8311 | COACHELA | 230 | 8699 | MIDWAY | 230 | 1 | line_14 | ivsg_hs_alt5d2_t | 779 | -690.1 | 187.6 | 1803.2 | 715.1 | 0.924 | 0.67 | line COACHELA to MIDWAY 230 ck 2 |
| 8806 | AV58TP1 | 161 | 8200 | BANTP2 | 161 | 1 | line_20 | ivsg_hs_alt5d2_t | 165 | -145.6 | 24.4 | 544.4 | 147.7 | 0.923 | 0.844 | line NILAND to CVSUB161 161 ck 1 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_48 | ivsg_hs_alt5d2_t | 800 | 744.8 | 12.7 | 1852.5 | 744.9 | 0.923 | 0.869 | line MIDWAY to GEOSUB2 230 ck 1 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_49 | ivsg_hs_alt5d2_t | 800 | 744.8 | 12.7 | 1852.5 | 744.9 | 0.923 | 0.869 | line MIDWAY to GEOSUB2 230 ck 2 |
| 8376 | RTAP2 | 92 | 8974 | RTP1 | 92 | 1 | B2_021 | ivsg_hs_alt5d2_t | 57 | -50 | 12.5 | 328.8 | 51.5 | 0.923 | 0.889 | IMPRLVLY - ROA-230 1 230kV |
| 8806 | AV58TP1 | 161 | 8200 | BANTP2 | 161 | 1 | line_3 | ivsg_hs_alt5d2_t | 165 | -144.9 | 26 | 543.8 | 147.2 | 0.922 | 0.844 | line BANTP1 to BANISTER 161 ck 1 |
| 8806 | AV58TP1 | 161 | 8200 | BANTP2 | 161 | 1 | line_15 | ivsg_hs_alt5d2_t | 165 | -145 | 25.8 | 544 | 147.2 | 0.922 | 0.844 | line ELCENTSW to BANTP1 161 ck 1 |
| 8335 | ELSTEAMP | 92 | 8720 | WSTBIOTP | 92 | 2 | line_16 | ivsg_hs_alt5d2_t | 91 | 85.4 | -0.1 | 526.6 | 85.4 | 0.922 | 0.715 | line ELCENTSW to NILAND 161 ck 1 |
| 8376 | RTAP2 | 92 | 8974 | RTP1 | 92 | 1 | IV80 | ivsg_hs_alt5d2_t | 57 | -50 | 12.5 | 328.4 | 51.5 | 0.922 | 0.889 | tran IMPRLVLY 230 to IMPRLVLY 500 ck 1 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_079 | ivsg_hs_alt5d2_t | 2400 | -2313.1 | -35.6 | 2551.6 | 2313.3 | 0.921 | 0.73 | line LUGO to MOHAVE 500 ck 1 |
| 24614 | TAP601 | 115 | 24702 | KRAMER | 115 | 1 | line_169 | ivsg_hs_alt5d2_t | 217.1 | -189.7 | 71 | 1001.9 | 202.5 | 0.921 | 0.716 | line KRAMER to LUGO 230 ck 1 |
| 24614 | TAP601 | 115 | 24702 | KRAMER | 115 | 1 | line_170 | ivsg_hs_alt5d2_t | 217.1 | -189.7 | 71 | 1001.9 | 202.5 | 0.921 | 0.716 | line KRAMER to LUGO 230 ck 2 |
| 8699 | MIDWAY | 230 | 8601 | GEOSUB2 | 230 | 1 | line_24 | ivsg_hs_alt5d2_t | 550 | -508.3 | 5.3 | 1270.6 | 508.4 | 0.92 | 0.636 | line GEOSUB1 to MIDWAY 230 ck 1 |
| 8699 | MIDWAY | 230 | 8601 | GEOSUB2 | 230 | 2 | line_24 | ivsg_hs_alt5d2_t | 550 | -508.3 | 5.3 | 1270.6 | 508.4 | 0.92 | 0.636 | line GEOSUB1 to MIDWAY 230 ck 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | line_66 | ivsg_hs_alt5d2_t | 392 | 360.9 | 29.3 | 922.9 | 362 | 0.92 | 0.87 | line CENTRALX to NEWSF500 500 ck 1 |
| 8279 | CVSUB | 92 | 8311 | COACHELA | 230 | 1 | tran_71 | ivsg_hs_alt5d2_t | 150 | -136.3 | 0.6 | 844.9 | 136.3 | 0.92 | 0.77 | tran BANISTER 161 to BANIS230 230 ck 1 |
| 8279 | CVSUB | 92 | 8311 | COACHELA | 230 | 2 | tran_71 | ivsg_hs_alt5d2_t | 150 | -136.3 | 0.6 | 844.9 | 136.3 | 0.92 | 0.77 | tran BANISTER 161 to BANIS230 230 ck 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_022 | ivsg_hs_alt5d2_t | 392 | 358.4 | 28.8 | 905.4 | 359.5 | 0.92 | 0.87 | OTAYMESA - TJI-230 1 230kV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | MS60 | ivsg_hs_alt5d2_t | 392 | 358.9 | 40.4 | 905 | 361.2 | 0.92 | 0.87 | tran MISSION 230 to MISSION 138 ck 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | MS61 | ivsg_hs_alt5d2_t | 392 | 358.9 | 40.4 | 905 | 361.2 | 0.92 | 0.87 | tran MISSION 230 to MISSION 138 ck 2 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | SX70 | ivsg_hs_alt5d2_t | 392 | 359.1 | 42.7 | 910.6 | 361.7 | 0.92 | 0.87 | tran SYCAMORE 230 to SYCAMORE 69 ck 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | SO2 | ivsg_hs_alt5d2_t | 392 | 358.5 | 33.6 | 913.6 | 360 | 0.92 | 0.87 | gen S.ONOFR2 22.00 |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_13 | ivsg_hs_alt5d2_t | 169 | 156.2 | 24.4 | 556 | 158.1 | 0.919 | 0.847 | line COACHELA to MIDWAY 230 ck 1 |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_14 | ivsg_hs_alt5d2_t | 169 | 156.2 | 24.4 | 556 | 158.1 | 0.919 | 0.847 | line COACHELA to MIDWAY 230 ck 2 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | SX60 | ivsg_hs_alt5d2_t | 408.3 | -380 | -0.2 | 1569.6 | 380 | 0.919 | 0.81 | tran SYCAMORE 230 to SYCAMORE 138 ck 1 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_047 | ivsg_hs_alt5d2_t | 2400 | -2313 | -53 | 2543.3 | 2313.6 | 0.918 | 0.73 | line ELDORDO to LUGO 500 ck 1 |
| 22261 | EPP | 230 | 22260 | ESCNDIDO | 230 | 1 | B2_008 | ivsg_hs_alt5d2_t | 796.7 | 734 | -50 | 1827 | 735.7 | 0.914 | 0.877 | PENSQTOS - OLD TOWN 1 230kV |
| 22261 | EPP | 230 | 22260 | ESCNDIDO | 230 | 1 | B2_015 | ivsg_hs_alt5d2_t | 796.7 | 731.6 | -39.1 | 1821.6 | 732.6 | 0.911 | 0.877 | MIGUEL - MISSION 1 230kV |
| 22261 | EPP | 230 | 22260 | ESCNDIDO | 230 | 1 | B2_020 | ivsg_hs_alt5d2_t | 796.7 | 730.9 | -39.8 | 1819.8 | 731.9 | 0.91 | 0.877 | MIGUEL - MISSION 2 230kV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | OT70 | ivsg_hs_alt5d2_t | 392 | 356.6 | 37.5 | 899.1 | 358.5 | 0.91 | 0.87 | tran OLD TOWN 69 to OLD TOWN 230 ck 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | OT71 | ivsg_hs_alt5d2_t | 392 | 356.6 | 37.5 | 899.1 | 358.5 | 0.91 | 0.87 | tran OLD TOWN 69 to OLD TOWN 230 ck 2 |
| 24301 | BIG CRK1 | 230 | 24235 | RECTOR | 230 | 1 | line_156 | ivsg_hs_alt5d2_t | 329 | 305.6 | 3.6 | 751.8 | 305.6 | 0.91 | 0.727 | line BIG CRK1 to BIG CRK2 230 ck 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | line_207 | ivsg_hs_alt5d2_t | 392 | 353.7 | 32.7 | 897.2 | 355.2 | 0.91 | 0.87 | line DEVERS to VALLEYSC 500 ck 1 |
| 8279 | CVSUB | 92 | 8312 | COACHELA | 92 | 1 | C_4pst | ivsg_hs_alt5d2_t | 132 | 119.6 | -11.9 | 751.9 | 120.2 | 0.908 | 0.781 | C-ELCENTRO-AVE58 161KV |
| 8279 | CVSUB | 92 | 8312 | COACHELA | 92 | 2 | C_4pst | ivsg_hs_alt5d2_t | 132 | 119.6 | -11.9 | 751.9 | 120.2 | 0.908 | 0.781 | C-ELCENTRO-AVE58 161KV |
| 8699 | MIDWAY | 230 | 8601 | GEOSUB2 | 230 | 2 | line_48 | ivsg_hs_alt5d2_t | 550 | -501.9 | 3 | 1253.9 | 501.9 | 0.908 | 0.636 | line MIDWAY to GEOSUB2 230 ck 1 |
| 8699 | MIDWAY | 230 | 8601 | GEOSUB2 | 230 | 1 | line_49 | ivsg_hs_alt5d2_t | 550 | -501.9 | 3 | 1253.9 | 501.9 | 0.908 | 0.636 | line MIDWAY to GEOSUB2 230 ck 2 |
| 19020 | BLYTHE | 161 | 24017 | BLYTHESC | 161 | 1 | line_008 | ivsg_hs_alt5d2_t | 244 | 224.4 | 26 | 794.2 | 225.9 | 0.908 | 0.851 | line PARKER to GENE 230 ck 1 |
| 24602 | VICTOR | 115 | 24702 | KRAMER | 115 | 1 | line_169 | ivsg_hs_alt5d2_t | 217.1 | -185 | 81.1 | 985.9 | 202 | 0.908 | 0.702 | line KRAMER to LUGO 230 ck 1 |
| 24602 | VICTOR | 115 | 24702 | KRAMER | 115 | 1 | line_170 | ivsg_hs_alt5d2_t | 217.1 | -185 | 81.1 | 985.9 | 202 | 0.908 | 0.702 | line KRAMER to LUGO 230 ck 2 |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_7 | ivsg_hs_alt5d2_t | 169 | 153.7 | 25.9 | 548.3 | 155.9 | 0.907 | 0.847 | line BANIS230 to NEWSF230 230 ck 1 |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | tran_74 | ivsg_hs_alt5d2_t | 169 | 153.7 | 25.8 | 548 | 155.8 | 0.907 | 0.847 | tran NEWSF230 230 to NEWSF500 500 ck 1 |
| 8806 | AV58TP1 | 161 | 8200 | BANTP2 | 161 | 1 | B2_002 | ivsg_hs_alt5d2_t | 165 | -142.2 | 19 | 535.4 | 143.4 | 0.907 | 0.844 | IMPRLVLY - MIGUEL 1 500kV |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_30 | ivsg_hs_alt5d2_t | 800 | 729.4 | 7.3 | 1814.1 | 729.4 | 0.903 | 0.869 | line MIDWAY to HIGHLINE 230 ck 3 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_31 | ivsg_hs_alt5d2_t | 800 | 729.4 | 7.3 | 1814.1 | 729.4 | 0.903 | 0.869 | line MIDWAY to HIGHLINE 230 ck 4 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_63 | ivsg_hs_alt5d2_t | 800 | 730.7 | 15 | 1813.9 | 730.8 | 0.903 | 0.869 | line RAMON to MIRAGE 230 ck 2 |
| 24301 | BIG CRK1 | 230 | 24302 | BIG CRK2 | 230 | 1 | line_155 | ivsg_hs_alt5d2_t | 329 | 305.6 | -23.5 | 745.5 | 306.5 | 0.903 | 0.248 | line BIG CRK1 to RECTOR 230 ck 1 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | B2_015 | ivsg_hs_alt5d2_t | 408.3 | -375.6 | -4.8 | 1541.6 | 375.6 | 0.902 | 0.81 | MIGUEL - MISSION 1 230kV |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | B2_032 | ivsg_hs_alt5d2_t | 408.3 | -368 | -0.9 | 1540.8 | 368 | 0.902 | 0.81 | OTAYMESA - MLMS3TAP 1 230kV |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | B2_034 | ivsg_hs_alt5d2_t | 408.3 | -367.9 | -1.3 | 1541.5 | 367.9 | 0.902 | 0.81 | OLD TOWN - MLMS3TAP 1 230kV |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | C_4pre | ivsg_hs_alt5d2_t | 800 | 729.8 | 16.8 | 1808.8 | 730 | 0.901 | 0.869 | C-ELCENTRO-AVE58 161KV |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_2 | ivsg_hs_alt5d2_t | 800 | 729.9 | 16.1 | 1809.4 | 730.1 | 0.901 | 0.869 | line BANTP2 to BANISTER 161 ck 1 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_25 | ivsg_hs_alt5d2_t | 800 | 728.2 | 9.8 | 1809.3 | 728.3 | 0.901 | 0.869 | line HIGHLINE to ELCENTSW 230 ck 1 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_26 | ivsg_hs_alt5d2_t | 800 | 728.2 | 9.8 | 1809.3 | 728.3 | 0.901 | 0.869 | line HIGHLINE to ELCENTSW 230 ck 2 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_34 | ivsg_hs_alt5d2_t | 800 | 729.8 | 16.8 | 1808.8 | 730 | 0.901 | 0.869 | line AV58 to AV58TP1 161 ck 1 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_36 | ivsg_hs_alt5d2_t | 800 | 729.9 | 16.2 | 1809.7 | 730.1 | 0.901 | 0.869 | line AV58TP1 to BANTP2 161 ck 1 |
| 24042 | ELDORDO | 500 | 24086 | LUGO | 500 | 1 | line_085 | ivsg_hs_alt5d2_t | 1386 | 1335.5 | 207.1 | 1434.7 | 1351.5 | 0.901 | 0.608 | line LUGO to VICTORVL 500 ck 1 |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_303 | ivsg_hs_alt5d2_t | 169 | 152.3 | 27.4 | 544.2 | 154.8 | 0.901 | 0.847 | line HARQUAHA to DEVERS 500 ck 1 |
| 19020 | BLYTHE | 161 | 24017 | BLYTHESC | 161 | 1 | line_13 | ivsg_hs_alt5d2_t | 244 | 222.7 | 24.6 | 787.9 | 224.1 | 0.9 | 0.851 | line COACHELA to MIDWAY 230 ck 1 |
| 19020 | BLYTHE | 161 | 24017 | BLYTHESC | 161 | 1 | line_14 | ivsg_hs_alt5d2_t | 244 | 222.7 | 24.6 | 787.9 | 224.1 | 0.9 | 0.851 | line COACHELA to MIDWAY 230 ck 2 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | B2_020 | ivsg_hs_alt5d2_t | 408.3 | -374.3 | -3.5 | 1536.8 | 374.3 | 0.9 | 0.81 | MIGUEL - MISSION 2 230kV |
| 24729 | INYO | 230 | 24730 | INYO PS | 115 | 2 | tran_230 | ivsg_hs_alt5d2_t | 50 | -42 | 15.9 | 105.2 | 44.9 | 0.9 | 0.54 | tran INYO 230 to INYO PS 115 ck 1 |
| 24729 | INYO | 230 | 24730 | INYO PS | 115 | 1 | tran_231 | ivsg_hs_alt5d2_t | 50 | -42 | 15.9 | 105.2 | 44.9 | 0.9 | 0.54 | tran INYO 230 to INYO PS 115 ck 2 |
| 24805 | DEVERS | 115 | 24804 | DEVERS | 230 | 1 | tran_236 | ivsg_hs_alt5d2_t | 280 | -246.1 | 52.3 | 1263.2 | 251.6 | 0.9 | 0.6 | tran DEVERS 115 to DEVERS 230 ck 3 |

ivsg_hs_alt5d2.sav
VOLTAGE Summary
N-2 Outages

| Bus | Name | kV | Area | Zone | Outage | Case | Vbase | Vcont | DeltaV | Vmin | Vmax | Max-dv | Contingency Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8806 | AV58TP1 | 161 | 8 | 162 | line_N-204 | ivsg_hs_alt5d2_t | 0.976 | 0.926 | -0.05 | 0.9 | 1.05 | 0.05 | COACHELLA MIDWAY 230 CKT 1&2 |
| 24058 | GOLETA | 230 | 24 | 240 | line_2269 | ivsg_hs_alt5d2_t | 0.985 | 0.93 | -0.055 | 0.9 | 1.05 | 0.05 | S.CLARA 230.00 - GOLETA 230.00 1, S.CLARA 230.00 - MOORPARK 230.00 1 |
| 24058 | GOLETA | 230 | 24 | 240 | line_2270 | ivsg_hs_alt5d2_t | 0.985 | 0.93 | -0.055 | 0.9 | 1.05 | 0.05 | S.CLARA 230.00 - GOLETA 230.00 2, S.CLARA 230.00 - MOORPARK 230.00 2 |
| 22734 | SANTEE | 138 | 22 | 223 | 23021/22/23/41 | ivsg_hs_alt5d2_t | 1 | 0.944 | -0.056 | 0.9 | 1.05 | 0.05 | MIGUEL 230 CORRIDOR West of SN |
| 22412 | LOSCOCHS | 138 | 22 | 223 | 23021/22/23/41 | ivsg_hs_alt5d2_t | 1 | 0.949 | -0.051 | 0.9 | 1.05 | 0.05 | MIGUEL 230 CORRIDOR West of SN |
| 80300 | NEWSF230 | 230 | 8 | 800 | line_N-204 | ivsg_hs_alt5d2_t | 1.012 | 0.961 | -0.052 | 0.9 | 1.05 | 0.05 | COACHELLA MIDWAY 230 CKT 1&2 |
| 25001 | GOODRICH | 230 | 24 | 250 | line_2073 | ivsg_hs_alt5d2_t | 0.961 | 1.044 | 0.083 | 0.9 | 1.05 | 0.05 | GOODRICH 230.00 - GOULD 230.00 1, GOODRICH 230.00 - LAGUBELL 230.00 1 |
| 24058 | GOLETA | 230 | 24 | 240 | line_2120 | ivsg_hs_alt5d2_t | 0.985 | 1.044 | 0.06 | 0.9 | 1.05 | 0.05 | S.CLARA 230.00 - GOLETA 230.00 1, S.CLARA 230.00 - GOLETA 230.00 2 |

ivsg_hs_alt5d2.sav
FLOW Summary
N-2 Outages

| LEGEND | % of RATING 1 | |
|---|---|---|
| C_pu | 100% - 110% | |
| C_pu | 110% - 120% | P.U. of |
| C_pu | > 120% | Rate 1 |

| FROM | FR | BKV | TO | TO | BKV | CK | Outage_Name | Case | Rate-Mva | Pflow | Qflow | Amps | MVA | C_pu | B_pu | Contingency_Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 13821C/25/23051A | ivsg_hs_alt5d2_t | 204.1 | 334.6 | -14.8 | 1389.5 | 334.9 | 1.627 | 1.168 | CH-ES-NCM-SX |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23051B/23011 | ivsg_hs_alt5d2_t | 204.1 | 318.2 | -11.8 | 1335.8 | 318.4 | 1.564 | 1.168 | EPP-ES + ES-EA-SA 230KV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23011/13825 | ivsg_hs_alt5d2_t | 204.1 | 283.6 | -13.8 | 1177.2 | 283.9 | 1.379 | 1.168 | ES-EA-SA 230KV + BQ-CC-ES-NCM 138KV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23022/23023 | ivsg_hs_alt5d2_t | 204.1 | 282 | -7.2 | 1173.7 | 282.1 | 1.375 | 1.168 | ML-MS1+ ML-MS2 230KV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt5d2_t | 392 | 531.6 | 87.3 | 1368.2 | 538.7 | 1.37 | 0.87 | MIGUEL 230 CORRIDOR West of SN |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | 23051B/23011 | ivsg_hs_alt5d2_t | 392 | 533.3 | 29.3 | 1351.2 | 534.1 | 1.36 | 0.99 | EPP-ES + ES-EA-SA 230KV |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_N-204 | ivsg_hs_alt5d2_t | 800 | 1035.2 | 87.2 | 2705.8 | 1038.9 | 1.347 | 0.869 | COACHELLA MIDWAY 230 CKT 1&2 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt5d2_t | 392 | 511.6 | 78.2 | 1303 | 517.6 | 1.32 | 0.87 | MIGUEL 230 CORRIDOR West of LC |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt5d2_t | 408.3 | -523.4 | -10.5 | 2208.5 | 523.5 | 1.293 | 0.81 | MIGUEL 230 CORRIDOR West of SN |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23051A/23011 | ivsg_hs_alt5d2_t | 204.1 | 265.6 | -11.8 | 1103.5 | 265.8 | 1.292 | 1.168 | SX-EPP + ES-EA-SA 230KV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23012/13807 | ivsg_hs_alt5d2_t | 204.1 | 260.9 | -1.2 | 1084.5 | 260.9 | 1.27 | 1.168 | PQ-EA 230KV + EA-NCW 138KV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23012/13808 | ivsg_hs_alt5d2_t | 204.1 | 256.1 | -2.6 | 1063.5 | 256.1 | 1.245 | 1.168 | PQ-EA 230KV + NCW-PQ 138KV |
| 8806 | AV58TP1 | 161 | 8200 | BANTP2 | 161 | 1 | line_N-204 | ivsg_hs_alt5d2_t | 165 | -182.9 | 48.6 | 732.8 | 189.2 | 1.242 | 0.844 | COACHELLA MIDWAY 230 CKT 1&2 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt5d2_t | 408.3 | -504.3 | -8.6 | 2103.2 | 504.3 | 1.231 | 0.81 | MIGUEL 230 CORRIDOR West of LC |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt5d2_t | 392 | 476.4 | 77.9 | 1212.7 | 482.7 | 1.23 | 0.87 | MIGUEL 230 CORRIDOR North of ML |
| 8900 | PRUETTAP | 92 | 8691 | HIGHLINE | 92 | 1 | line_N-209 | ivsg_hs_alt5d2_t | 86 | -105.8 | 11.9 | 657.5 | 106.5 | 1.219 | 0.725 | EL CENTRO HIGHLINE 230 CKTS 1&2 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | line_2245 | ivsg_hs_alt5d2_t | 204.1 | 247.5 | -8.5 | 1031.7 | 247.6 | 1.208 | 1.168 | DEVERS 500.00 - VALLEYSC 500.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23002/06/10 | ivsg_hs_alt5d2_t | 204.1 | 247.5 | -6 | 1031.1 | 247.6 | 1.208 | 1.168 | SANLUISREY 230 CORRIDOR |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23013/27/28 | ivsg_hs_alt5d2_t | 204.1 | 248.2 | -5.6 | 1030.9 | 248.3 | 1.207 | 1.168 | OLD TOWN TO OLD TOWN JCT |
| 8376 | RTAP2 | 92 | 8974 | RTP1 | 92 | 1 | line_N-204 | ivsg_hs_alt5d2_t | 57 | -63.8 | 13.2 | 430.2 | 65.1 | 1.205 | 0.889 | COACHELLA MIDWAY 230 CKT 1&2 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 2 | line_2046 | ivsg_hs_alt5d2_t | 956 | -1124.6 | -35 | 2856.3 | 1125.2 | 1.19 | 0.594 | LA FRESA 230.00 - REDONDO 230.00 1, REDONDO 230.00 - LITEHIPE 230.00 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 1 | line_2047 | ivsg_hs_alt5d2_t | 956 | -1124.6 | -35 | 2856.3 | 1125.2 | 1.19 | 0.594 | LA FRESA 230.00 - REDONDO 230.00 2, REDONDO 230.00 - LITEHIPE 230.00 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23022/23023 | ivsg_hs_alt5d2_t | 392 | 455.3 | 61.4 | 1148.8 | 459.5 | 1.17 | 0.87 | ML-MS1+ ML-MS2 230KV |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt5d2_t | 382.4 | 434.1 | 22.7 | 1842.9 | 434.7 | 1.152 | 0.647 | MIGUEL 230 CORRIDOR West of SN |
| 8682 | BANISTER | 161 | 8300 | BANIS230 | 230 | 1 | line_N-204 | ivsg_hs_alt5d2_t | 225 | -255.5 | 32.5 | 951.9 | 257.5 | 1.15 | 0.82 | COACHELLA MIDWAY 230 CKT 1&2 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | 23022/23023 | ivsg_hs_alt5d2_t | 392 | 449.8 | 19 | 1130.2 | 450.2 | 1.15 | 0.99 | ML-MS1+ ML-MS2 230KV |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt5d2_t | 408.3 | -470 | -17.6 | 1957.5 | 470.3 | 1.146 | 0.81 | MIGUEL 230 CORRIDOR North of ML |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 2 | line_2064 | ivsg_hs_alt5d2_t | 956 | -1075.4 | -39.5 | 2731.4 | 1076.2 | 1.138 | 0.594 | LA FRESA 230.00 - REDONDO 230.00 1, MESA CAL 230.00 - REDONDO 230.00 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 1 | line_2065 | ivsg_hs_alt5d2_t | 956 | -1075.4 | -39.5 | 2731.4 | 1076.2 | 1.138 | 0.594 | LA FRESA 230.00 - REDONDO 230.00 2, MESA CAL 230.00 - REDONDO 230.00 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23027/28/13810 | ivsg_hs_alt5d2_t | 204.1 | 232.3 | -4.6 | 962.7 | 232.3 | 1.127 | 1.168 | OLD TOWN TO MISSION 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23052/23007 | ivsg_hs_alt5d2_t | 204.1 | 229.8 | -8.5 | 955.3 | 229.9 | 1.119 | 1.168 | TA-SO 1 + 2 230KV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | line_2115 | ivsg_hs_alt5d2_t | 204.1 | 231.8 | -8.5 | 952.8 | 232 | 1.116 | 1.168 | S.ONOFRE 230.00 - SANTIAGO 230.00 1, S.ONOFRE 230.00 - SANTIAGO 230.00 2 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt5d2_t | 204.1 | 226.9 | -4 | 950.8 | 227 | 1.114 | 1.168 | MIGUEL 230 CORRIDOR North of ML |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | 23051A/23011 | ivsg_hs_alt5d2_t | 392 | 432.2 | 10.9 | 1084.8 | 432.4 | 1.1 | 0.99 | SX-EPP + ES-EA-SA 230KV |
| 24086 | LUGO | 500 | 24236 | RANCHVST | 500 | 1 | line_2194 | ivsg_hs_alt5d2_t | 2598 | 2956.3 | 487.9 | 3280 | 2996.3 | 1.095 | 0.608 | LUGO 500.00 - MIRALOMA 500.00 2, LUGO 500.00 - MIRALOMA 500.00 3 |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt5d2_t | 382.4 | 415.2 | 23.6 | 1742.2 | 415.9 | 1.089 | 0.647 | MIGUEL 230 CORRIDOR West of LC |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 2 | line_2049 | ivsg_hs_alt5d2_t | 956 | -1024.5 | -35.8 | 2605.4 | 1025.1 | 1.086 | 0.594 | LA FRESA 230.00 - REDONDO 230.00 1, LCIENEGA 230.00 - LA FRESA 230.00 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 1 | line_2050 | ivsg_hs_alt5d2_t | 956 | -1024.5 | -35.8 | 2605.4 | 1025.1 | 1.086 | 0.594 | LA FRESA 230.00 - REDONDO 230.00 2, LCIENEGA 230.00 - LA FRESA 230.00 1 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23022/23023 | ivsg_hs_alt5d2_t | 408.3 | -449.6 | -7.3 | 1854.3 | 449.7 | 1.086 | 0.81 | ML-MS1+ ML-MS2 230KV |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 2 | line_2057 | ivsg_hs_alt5d2_t | 956 | -1024 | -32.5 | 2602.9 | 1024.5 | 1.085 | 0.594 | EL NIDO 230.00 - LA FRESA 230.00 3, LA FRESA 230.00 - REDONDO 230.00 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 1 | line_2058 | ivsg_hs_alt5d2_t | 956 | -1024 | -32.5 | 2602.9 | 1024.5 | 1.085 | 0.594 | EL NIDO 230.00 - LA FRESA 230.00 3, LA FRESA 230.00 - REDONDO 230.00 2 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 2 | line_2059 | ivsg_hs_alt5d2_t | 956 | -1024 | -32.5 | 2602.9 | 1024.5 | 1.085 | 0.594 | EL NIDO 230.00 - LA FRESA 230.00 4, LA FRESA 230.00 - REDONDO 230.00 1 |
| 24074 | LA FRESA | 230 | 24125 | REDONDO | 230 | 1 | line_2060 | ivsg_hs_alt5d2_t | 956 | -1024 | -32.5 | 2602.9 | 1024.5 | 1.085 | 0.594 | EL NIDO 230.00 - LA FRESA 230.00 4, LA FRESA 230.00 - REDONDO 230.00 2 |
| 24701 | KRAMER | 230 | 24085 | LUGO | 230 | 2 | line_2260 | ivsg_hs_alt5d2_t | 478 | 525.6 | -1 | 1299.7 | 525.6 | 1.083 | 0.643 | KRAMER 230.00 - LUGO 230.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_N-204 | ivsg_hs_alt5d2_t | 169 | 182.6 | 35 | 654.1 | 186 | 1.082 | 0.847 | COACHELLA MIDWAY 230 CKT 1&2 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 2 | line_2029 | ivsg_hs_alt5d2_t | 1195 | 1258.9 | -35.6 | 3238.1 | 1259.4 | 1.079 | 0.537 | LEWIS 230.00 - SERRANO 230.00 1, SERRANO 230.00 - VILLA PK 230.00 1 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 2 | line_2031 | ivsg_hs_alt5d2_t | 1195 | 1258.9 | -35.6 | 3238.1 | 1259.4 | 1.079 | 0.537 | LEWIS 230.00 - SERRANO 230.00 2, SERRANO 230.00 - VILLA PK 230.00 1 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 2 | line_2278 | ivsg_hs_alt5d2_t | 1195 | 1258.9 | -35.6 | 3238.1 | 1259.4 | 1.079 | 0.537 | LEWIS 230.00 - SERRANO 230.00 1, SERRANO 230.00 - VILLA PK 230.00 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_2260 | ivsg_hs_alt5d2_t | 56 | 57.9 | -10 | 292.3 | 58.8 | 1.06 | 0.92 | KRAMER 230.00 - LUGO 230.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23027/28/13827 | ivsg_hs_alt5d2_t | 204.1 | 217.6 | -6.9 | 902.1 | 217.8 | 1.057 | 1.168 | OLD TOWN TO MISSION 2 |
| 22831 | SYCAMORE | 138 | 22124 | CHCARITA | 138 | 1 | 23051B/23011 | ivsg_hs_alt5d2_t | 204.1 | 213.3 | -24.4 | 900.7 | 214.7 | 1.055 | 0.718 | EPP-ES + ES-EA-SA 230KV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | 23013/27/28 | ivsg_hs_alt5d2_t | 392 | 407.4 | 12.1 | 1022.3 | 407.6 | 1.04 | 0.99 | OLD TOWN TO OLD TOWN JCT |
| 22672 | PRCTRVLY | 138 | 22852 | TELECYN | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt5d2_t | 478 | 492.6 | 6.5 | 2078.1 | 492.6 | 1.039 | 0.629 | MIGUEL 230 CORRIDOR West of SN |
| 30060 | MIDWAY | 500 | 24156 | VINCENT | 500 | 3 | line_2215 | ivsg_hs_alt5d2_t | 1848.1 | 2043 | 67.6 | 2211.4 | 2044.2 | 1.038 | 0.407 | MIDWAY 500.00 - VINCENT 500.00 1, MIDWAY 500.00 - VINCENT 500.00 2 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_N-207 | ivsg_hs_alt5d2_t | 800 | 821.4 | 4.8 | 2083.7 | 821.4 | 1.038 | 0.869 | MIDWAY HIGHLINE 230 CKT 3&4 |
| 22260 | ESCNDIDO | 230 | 22844 | TALEGA | 230 | 1 | 23052/23007 | ivsg_hs_alt5d2_t | 456.1 | 473.7 | 28.2 | 1187.3 | 474.5 | 1.037 | 0.11 | TA-SO 1 + 2 230KV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 13810B/23013 | ivsg_hs_alt5d2_t | 204.1 | 212.4 | -4.2 | 880.6 | 212.5 | 1.031 | 1.168 | OT JCT TO PQ 1 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | line_2245 | ivsg_hs_alt5d2_t | 392 | 403.8 | 7.9 | 1017.3 | 403.9 | 1.03 | 0.99 | DEVERS 500.00 - VALLEYSC 500.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 30060 | MIDWAY | 500 | 24156 | VINCENT | 500 | 1 | line_2220 | ivsg_hs_alt5d2_t | 1848.1 | 2021.8 | 69.4 | 2188.4 | 2023 | 1.029 | 0.326 | MIDWAY 500.00 - VINCENT 500.00 2, MIDWAY 500.00 - VINCENT 500.00 3 |
| 24016 | BARRE | 230 | 24044 | ELLIS | 230 | 1 | line_2115 | ivsg_hs_alt5d2_t | 988 | 980.3 | -49.3 | 2546.7 | 981.6 | 1.027 | 0.299 | S.ONOFRE 230.00 - SANTIAGO 230.00 1, S.ONOFRE 230.00 - SANTIAGO 230.00 2 |
| 24017 | BLYTHESC | 161 | 24035 | EAGLEMTN | 161 | 1 | line_N-203 | ivsg_hs_alt5d2_t | 169 | 173.1 | 34 | 620.5 | 176.4 | 1.027 | 0.847 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | 23002/06/10 | ivsg_hs_alt5d2_t | 392 | 401.6 | 11.6 | 1010.5 | 401.7 | 1.02 | 0.99 | SANLUISREY 230 CORRIDOR |
| 22261 | EPP | 230 | 22260 | ESCNDIDO | 230 | 1 | 23052/23007 | ivsg_hs_alt5d2_t | 796.7 | 809.8 | -18.5 | 2026.5 | 810 | 1.013 | 0.877 | TA-SO 1 + 2 230KV |
| 24074 | LA FRESA | 230 | 24065 | HINSON | 230 | 1 | line_2061 | ivsg_hs_alt5d2_t | 797 | -777.7 | 54.1 | 2025.2 | 779.6 | 1.012 | 0.149 | LA FRESA 230.00 - REDONDO 230.00 1, LA FRESA 230.00 - REDONDO 230.00 2 |
| 19020 | BLYTHE | 161 | 24017 | BLYTHESC | 161 | 1 | line_N-204 | ivsg_hs_alt5d2_t | 244 | 249.1 | 35.3 | 885 | 251.6 | 1.011 | 0.851 | COACHELLA MIDWAY 230 CKT 1&2 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_N-209 | ivsg_hs_alt5d2_t | 800 | 809.5 | 27 | 2024.2 | 810 | 1.008 | 0.869 | EL CENTRO HIGHLINE 230 CKTS 1&2 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 1 | line_2030 | ivsg_hs_alt5d2_t | 1287 | 1258.9 | -35.6 | 3238.1 | 1259.4 | 1.002 | 0.499 | LEWIS 230.00 - SERRANO 230.00 1, SERRANO 230.00 - VILLA PK 230.00 2 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 1 | line_2032 | ivsg_hs_alt5d2_t | 1287 | 1258.9 | -35.6 | 3238.1 | 1259.4 | 1.002 | 0.499 | LEWIS 230.00 - SERRANO 230.00 2, SERRANO 230.00 - VILLA PK 230.00 2 |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt5d2_t | 382.4 | 381.3 | 35.3 | 1601.5 | 382.9 | 1.001 | 0.647 | MIGUEL 230 CORRIDOR North of ML |
| 22596 | OLD TOWN | 230 | 22466 | MLMS3TAP | 230 | 1 | 23021/22/23/41 | ivsg_hs_alt5d2_t | 912 | -881.1 | 107.3 | 2287.1 | 887.7 | 0.999 | 0.692 | MIGUEL 230 CORRIDOR West of SN |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_N-210 | ivsg_hs_alt5d2_t | 800 | 798.6 | 26.6 | 1992.1 | 799.1 | 0.992 | 0.869 | EL CENTRO IMPERIAL VALLEY 230 CKTS 2&3 |
| 22831 | SYCAMORE | 138 | 22124 | CHCARITA | 138 | 1 | 13821B/638 | ivsg_hs_alt5d2_t | 204.1 | 204.4 | -14.2 | 847.4 | 204.9 | 0.992 | 0.718 | CH-SX-SN 138KV + SAN VCNT-EL 69KV |
| 22831 | SYCAMORE | 138 | 22124 | CHCARITA | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt5d2_t | 204.1 | 202 | -18.3 | 847.4 | 202.9 | 0.992 | 0.718 | MIGUEL 230 CORRIDOR West of SN |
| 8682 | BANISTER | 161 | 8300 | BANIS230 | 230 | 1 | line_N-207 | ivsg_hs_alt5d2_t | 225 | -220.6 | 27.5 | 795.2 | 222.3 | 0.99 | 0.82 | MIDWAY HIGHLINE 230 CKT 3&4 |
| 24086 | LUGO | 500 | 24097 | MOHAVE | 500 | 1 | line_2234 | ivsg_hs_alt5d2_t | 1386 | -1427.4 | 97 | 1565.3 | 1430.6 | 0.989 | 0.679 | MOHAVE 500.00 - ELDORDO 500.00 1, PISGAH 230.00 - ELDORDO 230.00 2 |
| 22672 | PRCTRVLY | 138 | 22852 | TELECYN | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt5d2_t | 478 | 473.4 | 4.6 | 1974.3 | 473.4 | 0.987 | 0.629 | MIGUEL 230 CORRIDOR West of LC |
| 8900 | PRUETTAP | 92 | 8691 | HIGHLINE | 92 | 1 | line_N-204 | ivsg_hs_alt5d2_t | 86 | -84.8 | 14.5 | 532.1 | 86 | 0.986 | 0.725 | COACHELLA MIDWAY 230 CKT 1&2 |
| 22596 | OLD TOWN | 230 | 22466 | MLMS3TAP | 230 | 1 | 23021/22/23/41 | ivsg_hs_alt5d2_t | 912 | -872.4 | 116.4 | 2255.1 | 880.2 | 0.985 | 0.692 | MIGUEL 230 CORRIDOR North of ML |
| 22596 | OLD TOWN | 230 | 22466 | MLMS3TAP | 230 | 1 | 23021/22/23/41 | ivsg_hs_alt5d2_t | 912 | -869.2 | 115.3 | 2246.2 | 876.8 | 0.981 | 0.692 | MIGUEL 230 CORRIDOR West of LC |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 13821B/638 | ivsg_hs_alt5d2_t | 392 | 382.7 | 42.8 | 970.1 | 385.1 | 0.98 | 0.87 | CH-SX-SN 138KV + SAN VCNT-EL 69KV |
| 22261 | EPP | 230 | 22260 | ESCNDIDO | 230 | 1 | 23022/23023 | ivsg_hs_alt5d2_t | 796.7 | 784.1 | -44.3 | 1956.7 | 785.4 | 0.978 | 0.877 | ML-MS1+ ML-MS2 230KV |
| 19020 | BLYTHE | 161 | 24017 | BLYTHESC | 161 | 1 | line_N-203 | ivsg_hs_alt5d2_t | 244 | 239.6 | 34.3 | 851.1 | 242 | 0.973 | 0.851 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 8682 | BANISTER | 161 | 8300 | BANIS230 | 230 | 1 | line_N-209 | ivsg_hs_alt5d2_t | 225 | -215.4 | 18 | 767.2 | 216.1 | 0.97 | 0.82 | EL CENTRO HIGHLINE 230 CKTS 1&2 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_2194 | ivsg_hs_alt5d2_t | 56 | 52 | -10.4 | 262.6 | 53 | 0.96 | 0.92 | LUGO 500.00 - MIRALOMA 500.00 2, LUGO 500.00 - MIRALOMA 500.00 3 |
| 22261 | EPP | 230 | 22260 | ESCNDIDO | 230 | 1 | line_2245 | ivsg_hs_alt5d2_t | 796.7 | 768.5 | -48.2 | 1920.1 | 770 | 0.96 | 0.877 | DEVERS 500.00 - VALLEYSC 500.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 80300 | NEWSF230 | 230 | 80350 | NEWSF500 | 500 | 1 | line_N-204 | ivsg_hs_alt5d2_t | 1120 | 1006.5 | -241.1 | 2704.2 | 1035 | 0.96 | 0.64 | COACHELLA MIDWAY 230 CKT 1&2 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | 23052/23007 | ivsg_hs_alt5d2_t | 392 | 376.4 | 5.3 | 945.7 | 376.4 | 0.96 | 0.99 | TA-SO 1 + 2 230KV |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_N-203 | ivsg_hs_alt5d2_t | 800 | 773.3 | 31.8 | 1923.9 | 774 | 0.958 | 0.869 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | 13807/08/23013 | ivsg_hs_alt5d2_t | 392 | 374.2 | 9.9 | 936.5 | 374.4 | 0.95 | 0.99 | PQ ENCINA |
| 8376 | RTAP2 | 92 | 8974 | RTP1 | 92 | 1 | line_2115 | ivsg_hs_alt5d2_t | 57 | -51.6 | 11.8 | 338.4 | 52.9 | 0.949 | 0.889 | S.ONOFRE 230.00 - SANTIAGO 230.00 1, S.ONOFRE 230.00 - SANTIAGO 230.00 2 |
| 24126 | RIOHONDO | 230 | 24155 | VINCENT | 230 | 2 | line_2097 | ivsg_hs_alt5d2_t | 988 | -893.1 | 92.4 | 2343.5 | 897.9 | 0.945 | 0.69 | GOODRICH 230.00 - GOULD 230.00 1, VINCENT 230.00 - MESA CAL 230.00 1 |
| 22261 | EPP | 230 | 22260 | ESCNDIDO | 230 | 1 | 23013/27/28 | ivsg_hs_alt5d2_t | 796.7 | 758.6 | -54.6 | 1890.6 | 760.6 | 0.945 | 0.877 | OLD TOWN TO OLD TOWN JCT |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | line_2115 | ivsg_hs_alt5d2_t | 392 | 367.9 | 10.7 | 912.8 | 368 | 0.94 | 0.99 | S.ONOFRE 230.00 - SANTIAGO 230.00 1, S.ONOFRE 230.00 - SANTIAGO 230.00 2 |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | 23022/23023 | ivsg_hs_alt5d2_t | 382.4 | 361.1 | 27.4 | 1499.1 | 362.1 | 0.937 | 0.647 | ML-MS1+ ML-MS2 230KV |
| 22261 | EPP | 230 | 22260 | ESCNDIDO | 230 | 1 | line_N-204 | ivsg_hs_alt5d2_t | 796.7 | 744.7 | -53.1 | 1867.2 | 746.6 | 0.934 | 0.877 | COACHELLA MIDWAY 230 CKT 1&2 |
| 8376 | RTAP2 | 92 | 8974 | RTP1 | 92 | 1 | 23021/22/23/41 | ivsg_hs_alt5d2_t | 57 | -50.6 | 11.8 | 332.8 | 52 | 0.934 | 0.889 | MIGUEL 230 CORRIDOR West of SN |
| 8311 | COACHELA | 230 | 8695 | RAMON | 230 | 2 | line_2186 | ivsg_hs_alt5d2_t | 800 | 742.4 | 1.5 | 1874.5 | 742.4 | 0.933 | 0.736 | COACHELV 230.00 - DEVERS 230.00 2, J.HINDS 230.00 - MIRAGE 230.00 1 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2191 | ivsg_hs_alt5d2_t | 2400 | -2350.6 | -38.6 | 2584.9 | 2350.9 | 0.933 | 0.73 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - ELDORDO 230.00 2 |
| 8376 | RTAP2 | 92 | 8974 | RTP1 | 92 | 1 | line_N-201 | ivsg_hs_alt5d2_t | 57 | -50.8 | 10.4 | 332.8 | 51.8 | 0.933 | 0.889 | COACHELLA INDIAN HILLS 230 CKT 1&2 |
| 8376 | RTAP2 | 92 | 8974 | RTP1 | 92 | 1 | 23021/22/23/41 | ivsg_hs_alt5d2_t | 57 | -50.6 | 12.1 | 332.5 | 52 | 0.933 | 0.889 | MIGUEL 230 CORRIDOR North of ML |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2200 | ivsg_hs_alt5d2_t | 2400 | -2336.7 | -31 | 2579 | 2336.9 | 0.931 | 0.73 | LUGO 500.00 - MOHAVE 500.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2201 | ivsg_hs_alt5d2_t | 2400 | -2336.5 | -31.1 | 2578.7 | 2336.7 | 0.931 | 0.73 | LUGO 500.00 - MOHAVE 500.00 1, PISGAH 230.00 - LUGO 230.00 2 |
| 8690 | HIGHLINE | 230 | 8691 | HIGHLINE | 92 | 1 | line_N-209 | ivsg_hs_alt5d2_t | 225 | 208.7 | -0.5 | 514.1 | 208.8 | 0.93 | 0.43 | EL CENTRO HIGHLINE 230 CKTS 1&2 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23051B/23011 | ivsg_hs_alt5d2_t | 392 | 363.4 | 41.2 | 925.5 | 365.8 | 0.93 | 0.87 | EPP-ES + ES-EA-SA 230KV |
| 22832 | SYCAMORE | 230 | 22831 | SYCAMORE | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt5d2_t | 392 | 365.1 | 4.6 | 925 | 365.1 | 0.93 | 0.99 | MIGUEL 230 CORRIDOR North of ML |
| 8376 | RTAP2 | 92 | 8974 | RTP1 | 92 | 1 | 23021/22/23/41 | ivsg_hs_alt5d2_t | 57 | -50.4 | 12.2 | 331.3 | 51.9 | 0.93 | 0.889 | MIGUEL 230 CORRIDOR West of LC |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2100 | ivsg_hs_alt5d2_t | 2400 | -2338.3 | -192.1 | 2574.4 | 2346.1 | 0.929 | 0.73 | EAGLROCK 230.00 - MESA CAL 230.00 1, SYLMAR S 230.00 - GOULD 230.00 1 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2192 | ivsg_hs_alt5d2_t | 2400 | -2338.6 | -48.5 | 2572.8 | 2339.1 | 0.928 | 0.73 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2193 | ivsg_hs_alt5d2_t | 2400 | -2338.4 | -48.6 | 2572.6 | 2338.9 | 0.928 | 0.73 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - LUGO 230.00 2 |
| 22261 | EPP | 230 | 22260 | ESCNDIDO | 230 | 1 | 13821B/638 | ivsg_hs_alt5d2_t | 796.7 | 745 | -33.9 | 1856.1 | 745.8 | 0.928 | 0.877 | CH-SX-SN 138KV + SAN VCNT-EL 69KV |
| 22261 | EPP | 230 | 22260 | ESCNDIDO | 230 | 1 | line_N-203 | ivsg_hs_alt5d2_t | 796.7 | 742.4 | -44.5 | 1851.6 | 743.7 | 0.926 | 0.877 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 23021/23041 | ivsg_hs_alt5d2_t | 204.1 | 190.1 | -1.6 | 788.9 | 190.1 | 0.924 | 1.168 | ML-SX + OM-SX 230KV |
| 22261 | EPP | 230 | 22260 | ESCNDIDO | 230 | 1 | 13810B/23013 | ivsg_hs_alt5d2_t | 796.7 | 742.5 | -49.1 | 1848.6 | 744.2 | 0.924 | 0.877 | OT JCT TO PQ 1 |
| 24614 | TAP601 | 115 | 24702 | KRAMER | 115 | 1 | line_2260 | ivsg_hs_alt5d2_t | 217.1 | -189.8 | 70.7 | 1002.9 | 202.5 | 0.922 | 0.716 | KRAMER 230.00 - LUGO 230.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 22261 | EPP | 230 | 22260 | ESCNDIDO | 230 | 1 | line_2113 | ivsg_hs_alt5d2_t | 796.7 | 737.4 | -33.1 | 1839.8 | 738.1 | 0.92 | 0.877 | ELLIS 230.00 - JOHANNA 230.00 1, ELLIS 230.00 - SANTIAGO 230.00 1 |
| 8376 | RTAP2 | 92 | 8974 | RTP1 | 92 | 1 | line_2116 | ivsg_hs_alt5d2_t | 57 | -49.9 | 12.1 | 327.4 | 51.4 | 0.919 | 0.889 | S.ONOFRE 230.00 - SANTIAGO 230.00 1, S.ONOFRE 230.00 - SERRANO 230.00 1 |
| 8376 | RTAP2 | 92 | 8974 | RTP1 | 92 | 1 | line_2118 | ivsg_hs_alt5d2_t | 57 | -49.9 | 12.1 | 327.4 | 51.4 | 0.919 | 0.889 | S.ONOFRE 230.00 - SANTIAGO 230.00 2, S.ONOFRE 230.00 - SERRANO 230.00 1 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 13821B/638 | ivsg_hs_alt5d2_t | 408.3 | -378.6 | -4.2 | 1565.8 | 378.6 | 0.917 | 0.81 | CH-SX-SN 138KV + SAN VCNT-EL 69KV |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_2182 | ivsg_hs_alt5d2_t | 800 | 738 | 16.1 | 1835.1 | 738.1 | 0.914 | 0.869 | DEVERS 230.00 - MIRAGE 230.00 2, COACHELV 230.00 - DEVERS 230.00 2 |
| 22672 | PRCTRVLY | 138 | 22852 | TELECYN | 138 | 1 | 23021/22/23/41 | ivsg_hs_alt5d2_t | 478 | 439.1 | 13.7 | 1828.6 | 439.3 | 0.914 | 0.629 | MIGUEL 230 CORRIDOR North of ML |
| 22261 | EPP | 230 | 22260 | ESCNDIDO | 230 | 1 | 13807/08/23013 | ivsg_hs_alt5d2_t | 796.7 | 734.6 | -49.8 | 1828 | 736.3 | 0.914 | 0.877 | PQ ENCINA |
| 24126 | RIOHONDO | 230 | 24155 | VINCENT | 230 | 2 | line_2101 | ivsg_hs_alt5d2_t | 988 | -868.4 | 94.3 | 2264.6 | 873.5 | 0.913 | 0.69 | EAGLROCK 230.00 - MESA CAL 230.00 1, VINCENT 230.00 - MESA CAL 230.00 1 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2103 | ivsg_hs_alt5d2_t | 2400 | -2300.8 | -179.3 | 2531.3 | 2307.7 | 0.913 | 0.73 | EAGLROCK 230.00 - SYLMAR S 230.00 1, SYLMAR S 230.00 - GOULD 230.00 1 |
| 8281 | AVE58 | 92 | 8285 | JEFERSN | 92 | 1 | line_N-204 | ivsg_hs_alt5d2_t | 132 | 115.3 | -18.6 | 755.1 | 116.7 | 0.912 | 0.806 | COACHELLA MIDWAY 230 CKT 1&2 |
| 24042 | ELDORDO | 500 | 24086 | LUGO | 500 | 1 | line_2258 | ivsg_hs_alt5d2_t | 1386 | 1342.2 | 228.6 | 1446.4 | 1361.5 | 0.911 | 0.608 | LUGO 500.00 - VINCENT 500.00 2, LUGO 500.00 - VICTORVL 500.00 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | line_2245 | ivsg_hs_alt5d2_t | 392 | 353.7 | 32.7 | 897.2 | 355.2 | 0.91 | 0.87 | DEVERS 500.00 - VALLEYSC 500.00 1, PALOVRDE 500.00 - DEVERS 500.00 1 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2096 | ivsg_hs_alt5d2_t | 2400 | -2289.2 | -199.9 | 2517.4 | 2297.9 | 0.908 | 0.73 | EAGLROCK 230.00 - MESA CAL 230.00 1, GOODRICH 230.00 - GOULD 230.00 1 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_2185 | ivsg_hs_alt5d2_t | 800 | 733.8 | 16.4 | 1822.9 | 734 | 0.908 | 0.869 | RAMON 230.00 - MIRAGE 230.00 2, J.HINDS 230.00 - MIRAGE 230.00 1 |
| 22261 | EPP | 230 | 22260 | ESCNDIDO | 230 | 1 | line_2194 | ivsg_hs_alt5d2_t | 796.7 | 728.1 | -39.7 | 1815.3 | 729.2 | 0.908 | 0.877 | LUGO 500.00 - MIRALOMA 500.00 2, LUGO 500.00 - MIRALOMA 500.00 3 |
| 24602 | VICTOR | 115 | 24702 | KRAMER | 115 | 1 | line_2260 | ivsg_hs_alt5d2_t | 217.1 | -185.1 | 80.8 | 986.9 | 202 | 0.908 | 0.702 | KRAMER 230.00 - LUGO 230.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 8806 | AV58TP1 | 161 | 8200 | BANTP2 | 161 | 1 | line_N-210 | ivsg_hs_alt5d2_t | 165 | -142.8 | 20.5 | 536 | 144.3 | 0.908 | 0.844 | EL CENTRO IMPERIAL VALLEY 230 CKTS 2&3 |
| 24126 | RIOHONDO | 230 | 24155 | VINCENT | 230 | 2 | line_2100 | ivsg_hs_alt5d2_t | 988 | -850.5 | 99.3 | 2232.3 | 856.2 | 0.9 | 0.69 | EAGLROCK 230.00 - MESA CAL 230.00 1, SYLMAR S 230.00 - GOULD 230.00 1 |

ivsg_hs_alt5d2.sav
No Solve Summary
N-2 Outages

| Contingency-Description | Case | Problem-Description |
|---|---|---|
| DEVERS 230.00 - MIRAGE 230.00 2, RAMON 230.00 - MIRAGE 230.00 2 | ivsg_hs_alt5d2_t | Pmis 25405 IRON MTN 230.00 = -321933.53 MW + j -1975622.13 MVAR |
| VICTOR 230.00 - LUGO 230.00 1, VICTOR 230.00 - LUGO 230.00 2 | ivsg_hs_alt5d2_t | Pmis 24042 ELDORDO 500.00 = 42.49 MW + j -17274.85 MVAR |
| DEVERS 230.00 - MIRAGE 230.00 2, RAMON 230.00 - MIRAGE 230.00 2 | ivsg_hs_alt5d2_t | Pmis 25405 IRON MTN 230.00 = -321933.53 MW + j -1975622.13 MVAR |

# Imperial Valley Study Group

## Appendix A.5

Pivot Table

IVSG Study
Contingency Per Unit Comparison
LA Cases

| | | | | | | | Case | | |
|---|---|---|---|---|---|---|---|---|---|
| **FROM Bus** | **BKV** | **TO Bus** | **BKV2** | **Rate-Mva** | **Rate-Amp** | **Contingency_Description** | **ivsg_hs_alt2d1_s** | **ivsg_hs_alt3bd1_** | **ivsg_hs_rev4** |
| **SYCAMORE** | **138** | CARLTHTP | **138** | 204.1 | **855** | EPP - ESCNDIDO 1 230kV | 1.022 | 1.083 | 1.227 |
| | | | | | | EPP - SYCAMORE 1 230kV | 0.973 | 0.952 | |
| | | | | | | IMPRLVLY - MIGUEL 1 500kV | 1.362 | | 1.101 |
| | | | | | | MIGUEL - MISSION 1 230kV | 0.955 | 1.049 | 0.957 |
| | | | | | | MIGUEL - MISSION 2 230kV | 0.954 | 1.047 | 0.955 |
| | | | | | | OLD TOWN - MLMS3TAP 1 230kV | 1.124 | 1.362 | 1.226 |
| | | | | | | OTAYMESA - MLMS3TAP 1 230kV | 1.123 | 1.361 | 1.225 |
| | | | | | | PENSQTOS - ENCINA 1 230kV | | 1.07 | 0.989 |
| | | | | | | SANLUSRY - MISSION 1 230kV | | 1.019 | |
| | | | | | | SANLUSRY - MISSION 2 230kV | | 1.019 | |
| | | | | | | SYCAMORE - PENSQTOS 1 230kV | 1.118 | | |
| | | | | | | tran MIGUEL 69 to MIGUEL 230 ck 1 | 0.961 | 1.071 | 0.976 |
| | | | | | | tran MIGUEL 69 to MIGUEL 230 ck 2 | 0.961 | 1.071 | 0.976 |
| | | | | | | tran MIGUEL 230 to MIGUEL 138 ck 1 | 1.119 | 1.235 | 1.098 |
| | | | | | | tran MIGUEL 230 to MIGUELMP 500 ck 1 | 1.951 | 1.019 | |
| | | | | | | tran MISSION 230 to MISSION 69 ck 1 | 0.97 | 1.045 | 0.958 |
| | | | | | | tran MISSION 230 to MISSION 138 ck 1 | 1.041 | 1.123 | 1.024 |
| | | | | | | tran MISSION 230 to MISSION 138 ck 2 | 1.041 | 1.123 | 1.024 |
| | | | | | | tran SYCAMORE 230 to SYCAMORE 69 ck 1 | 0.956 | 1.206 | 1.106 |
| | | | | | | tran SYCAMORE 230 to SYCAMORE 69 ck 2 | 0.957 | | |
| | **230** | MLSXTAP | **230** | 796.7 | **2002** | OLD TOWN - MLMS3TAP 1 230kV | 0.954 | 0.966 | |
| | | | | | | OTAYMESA - MLMS3TAP 1 230kV | 0.953 | 0.966 | |
| | | SYCAMORE | **138** | 392 | | EPP - ESCNDIDO 1 230kV | | | 0.94 |
| | | | | | | IMPRLVLY - MIGUEL 1 500kV | 0.95 | | |
| | | | | | | OLD TOWN - MLMS3TAP 1 230kV | | 1.04 | |
| | | | | | | OTAYMESA - MLMS3TAP 1 230kV | | 1.04 | |
| | | | | | | tran SYCAMORE 230 to SYCAMORE 69 ck 1 | | 0.96 | |
| **MIGUEL** | **230** | MIGUEL | **138** | 392 | | gen S.ONOFR2 22.00 | 0.95 | | |
| | | | | | | HASSYAMP - N.GILA 1 500kV | | 0.95 | |
| | | | | | | line CENTRALX to NEWSF500 500 ck 1 | 1.01 | | |
| | | | | | | line NORTHSD to NEWSF500 500 ck 1 | | 1.08 | |
| | | | | | | MIGUEL - MISSION 1 230kV | 0.99 | 1.08 | 0.9 |
| | | | | | | MIGUEL - MISSION 2 230kV | 0.99 | 1.08 | |
| | | | | | | MIGUEL - SYCAMORE 1 230kV | 0.95 | 1.05 | |
| | | | | | | OLD TOWN - MLMS3TAP 1 230kV | 0.96 | 1.06 | |
| | | | | | | OTAYMESA - MLMS3TAP 1 230kV | 0.96 | 1.06 | |
| | | | | | | OTAYMESA - TJI-230 1 230kV | 0.96 | 1.04 | |
| | | | | | | tran MIGUEL 69 to MIGUEL 230 ck 1 | 0.96 | 1.08 | 0.9 |
| | | | | | | tran MIGUEL 69 to MIGUEL 230 ck 2 | 0.96 | 1.08 | 0.9 |
| | | | | | | tran MISSION 230 to MISSION 138 ck 1 | 0.96 | 1.05 | |
| | | | | | | tran MISSION 230 to MISSION 138 ck 2 | 0.96 | 1.05 | |
| | | | | | | tran OLD TOWN 69 to OLD TOWN 230 ck 1 | 0.95 | 1.04 | |
| | | | | | | tran OLD TOWN 69 to OLD TOWN 230 ck 2 | 0.95 | 1.04 | |
| | | | | | | tran SYCAMORE 230 to SYCAMORE 69 ck 1 | | 1.03 | |
| | | | | | | tran SYCAMORE 230 to SYCAMORE 138 ck 1 | 0.98 | 1.08 | |
| | | | **500** | 1120 | | tran MIGUEL 230 to MIGUELMP 500 ck 1 | 1.18 | 1.24 | 1.12 |
| | | MIGUELMP | **500** | 1120 | | tran MIGUEL 230 to MIGUELMP 500 ck 1 | 1.18 | 1.24 | 1.11 |
| | **500** | MIGUELMP | **500** | 1120 | **1295** | tran MIGUEL 230 to MIGUELMP 500 ck 1 | 1.2 | 1.26 | 1.13 |
| **INYO** | **115** | INYO PS | **115** | 56 | **281** | line INYO to COTTONWD 230 ck 1 | 1.86 | 1.86 | 1.86 |

IVSG Study
Contingency Per Unit Comparison
LA Cases

| FROM Bus | BKV | TO Bus | BKV2 | Rate-Mva | Rate-Amp | Contingency_Description | ivsg_hs_alt2d1_s | ivsg_hs_alt3bd1_ | ivsg_hs_rev4 |
|---|---|---|---|---|---|---|---|---|---|
| INYO | 115 | INYO PS | 115 | 56 | 281 | line KRAMER to LUGO 230 ck 1 | 1.07 | 1.07 | 1.04 |
| | | | | | | line KRAMER to LUGO 230 ck 2 | 1.07 | 1.07 | 1.04 |
| | | | | | | line MAGUNDEN to OMAR 230 ck 1 | 0.96 | 0.96 | 0.94 |
| | | | | | | line OWENSCON to INYO 230 ck 1 | 1.41 | 1.4 | 1.38 |
| | | | | | | line PASTORIA to PSTRIA 230 ck 1 | 0.97 | 0.97 | 0.95 |
| | | | | | | line SYLMAR1 to SYLMAR S 230 ck 1 | 0.97 | 0.97 | 0.95 |
| | | | | | | line SYLMAR3 to SYLMAR S 230 ck 1 | 1.01 | 1.01 | 0.99 |
| | | | | | | tran LUGO 500 to LUGO 230 ck 1 | 0.97 | 0.97 | 0.95 |
| | | | | | | tran LUGO 500 to LUGO 230 ck 2 | 0.97 | 0.97 | 0.95 |
| | 230 | INYO PS | 115 | 50 | | line INYO to COTTONWD 230 ck 1 | 2.24 | 2.24 | 2.24 |
| KNOB | 161 | PILOTKNB | 161 | 165 | 592 | C-ELCENTRO-AVE58 161KV | | | 0.934 |
| | | | | | | gen S.ONOFR2 22.00 | | | 1.007 |
| | | | | | | HASSYAMP - N.GILA 1 500kV | | | 1.074 |
| | | | | | | line AV58 to AV58TP1 161 ck 1 | | | 0.934 |
| | | | | | | line AV58TP1 to BANTP2 161 ck 1 | | | 0.934 |
| | | | | | | line BANTP2 to BANISTER 161 ck 1 | | | 0.934 |
| | | | | | | line BLYTHE to BLYTHESC 161 ck 1 | | | 1.299 |
| | | | | | | line BLYTHESC to EAGLEMTN 161 ck 1 | | | 1.194 |
| | | | | | | line COACHELA to MIDWAY 230 ck 1 | | | 0.925 |
| | | | | | | line COACHELA to MIDWAY 230 ck 2 | | | 0.925 |
| | | | | | | line COACHELA to RAMON 230 ck 1 | | | 0.917 |
| | | | | | | line DEVERS to MIRAGE 230 ck 1 | | | 1.011 |
| | | | | | | line ELCENTSW to IVECPS 230 ck 1 | | | 1.03 |
| | | | | | | line ELCENTSW to NILAND 161 ck 1 | | | 0.93 |
| | | | | | | line GEOSUB1 to BANIS230 230 ck 1 | | | 0.998 |
| | | | | | | line GEOSUB1 to MIDWAY 230 ck 1 | | | 0.917 |
| | | | | | | line HARQUAHA to DEVERS 500 ck 1 | | | 1.026 |
| | | | | | | line IMPRLVLY to DIXIE230 230 ck 1 | | | 1.003 |
| | | | | | | line J.HINDS to EAGLEMTN 230 ck 1 | | | 1.12 |
| | | | | | | line J.HINDS to MIRAGE 230 ck 1 | | | 1.066 |
| | | | | | | line LUGO to VICTORVL 500 ck 1 | | | 1.02 |
| | | | | | | line PALOVRDE to DEVERS 500 ck 1 | | | 1.016 |
| | | | | | | line PARKER to GENE 230 ck 1 | | | 1.012 |
| | | | | | | line RAMON to MIRAGE 230 ck 1 | | | 0.928 |
| | | | | | | N.GILA - IMPRLVLY 1 500kV | | | 1.287 |
| | | | | | | tran BANISTER 161 to BANIS230 230 ck 1 | | | 0.998 |
| | | | | | | tran EAGLEMTN 230 to EAGLEMTN 161 ck 1 | | | 1.194 |
| | | | | | | tran IMPRLVLY 230 to IMPRLVLY 500 ck 2 | | | 0.932 |
| | | | | | | tran IMPRLVLY 230 to IVECPS 230 ck 1 | | | 1.03 |
| SYC CYN | 230 | OMAR | 230 | 643 | 1616 | line MAGUNDEN to OMAR 230 ck 1 | 7.934 | 7.934 | 7.934 |
| PRCTRVLY | 138 | MIGUEL | 138 | 408.3 | 1710 | gen S.ONOFR2 22.00 | | 0.976 | |
| | | | | | | IMPRLVLY - ROA-230 1 230kV | | 0.969 | |
| | | | | | | line CENTRALX to NEWSF500 500 ck 1 | 0.972 | | |
| | | | | | | line NEWSF500 to IMPRLVLY 500 ck 1 | | 0.966 | |
| | | | | | | line NORTHSD to NEWSF500 500 ck 1 | | 1.042 | |
| | | | | | | MIGUEL - MISSION 1 230kV | | 1.018 | |
| | | | | | | MIGUEL - MISSION 2 230kV | | 1.015 | |
| | | | | | | MIGUEL - SYCAMORE 1 230kV | | 0.989 | |
| | | | | | | OLD TOWN - MLMS3TAP 1 230kV | | 1.021 | |
| | | | | | | OTAYMESA - MLMS3TAP 1 230kV | | 1.02 | |
| | | | | | | OTAYMESA - TJI-230 1 230kV | | 0.989 | |

IVSG Study
Contingency Per Unit Comparison
LA Cases

| FROM Bus | BKV | TO Bus | BKV2 | Rate-Mva | Rate-Amp | Contingency_Description | ivsg_hs_alt2d1_s | ivsg_hs_alt3bd1_ | ivsg_hs_rev4 |
|---|---|---|---|---|---|---|---|---|---|
| PRCTRVLY | 138 | MIGUEL | 138 | 408.3 | 1710 | PENSQTOS - ENCINA 1 230kV | | 0.965 | |
| | | | | | | tran MIGUEL 69 to MIGUEL 230 ck 1 | | 1.025 | |
| | | | | | | tran MIGUEL 69 to MIGUEL 230 ck 2 | | 1.025 | |
| | | | | | | tran MISSION 230 to MISSION 138 ck 1 | | 0.99 | |
| | | | | | | tran MISSION 230 to MISSION 138 ck 2 | | 0.99 | |
| | | | | | | tran OLD TOWN 69 to OLD TOWN 230 ck 1 | | 0.981 | |
| | | | | | | tran OLD TOWN 69 to OLD TOWN 230 ck 2 | | 0.981 | |
| | | | | | | tran SYCAMORE 230 to SYCAMORE 69 ck 1 | | 0.977 | |
| | | | | | | tran SYCAMORE 230 to SYCAMORE 138 ck 1 | | 1.021 | |
| VALLEYSC | 500 | VALLEY-S | 115 | 560 | | tran VALLEYSC 500 to VALLEY-S 115 ck 3 | 1.53 | 1.53 | 1.53 |
| | | | | | | tran VALLEYSC 500 to VALLEY-S 115 ck 4 | 1.53 | 1.53 | 1.53 |
| | | VALLEYSC | 115 | 560 | | tran VALLEYSC 500 to VALLEYSC 115 ck 1 | 1.66 | 1.66 | 1.65 |
| | | | | | | tran VALLEYSC 500 to VALLEYSC 115 ck 2 | 1.66 | 1.66 | 1.65 |
| NAVYCOSO | 230 | BLM EAST | 230 | 1287 | 3234 | line BLM EAST to BLM WEST 230 ck 1 | 2.459 | 2.459 | 2.459 |
| | | | | | | line BLM WEST to KRAMER 230 ck 1 | 2.459 | 2.459 | 2.459 |
| BLYTHESC | 161 | EAGLEMTN | 161 | 169 | 607 | IMPRLVLY - MIGUEL 1 500kV | | | 0.932 |
| | | | | | | line COACHELA to RAMON 230 ck 1 | | | 0.905 |
| | | | | | | line DEVERS to MIRAGE 230 ck 1 | | | 0.98 |
| | | | | | | line EAGLEMTN to IRON MTN 230 ck 1 | 0.985 | 0.977 | 1.098 |
| | | | | | | line ELCENTSW to PILOTKNB 161 ck 1 | | | 0.907 |
| | | | | | | line HARQUAHA to DEVERS 500 ck 1 | | | 0.945 |
| | | | | | | line IRON MTN to CAMINO 230 ck 1 | 1.026 | 1.018 | 1.139 |
| | | | | | | line KNOB to PILOTKNB 161 ck 1 | | | 0.975 |
| | | | | | | line PALOVRDE to DEVERS 500 ck 1 | | | 0.931 |
| | | | | | | line PARKER to GENE 230 ck 1 | | | 0.963 |
| | | | | | | N.GILA - IMPRLVLY 1 500kV | | | 0.908 |
| BLYTHE | 161 | BLYTHESC | 161 | 244 | 876 | IMPRLVLY - MIGUEL 1 500kV | | | 0.906 |
| | | | | | | line DEVERS to MIRAGE 230 ck 1 | | | 0.93 |
| | | | | | | line EAGLEMTN to IRON MTN 230 ck 1 | | | 1.018 |
| | | | | | | line HARQUAHA to DEVERS 500 ck 1 | | | 0.914 |
| | | | | | | line IRON MTN to CAMINO 230 ck 1 | 0.97 | 0.964 | 1.046 |
| | | | | | | line KNOB to PILOTKNB 161 ck 1 | | | 0.937 |
| | | | | | | line PALOVRDE to DEVERS 500 ck 1 | | | 0.905 |
| | | | | | | line PARKER to GENE 230 ck 1 | | | 0.928 |
| | | GLT TAP | 161 | 173 | 621 | HASSYAMP - N.GILA 1 500kV | | | 0.971 |
| | | | | | | line BLYTHE to BLYTHESC 161 ck 1 | | | 1.177 |
| | | | | | | line BLYTHESC to EAGLEMTN 161 ck 1 | | | 1.042 |
| | | | | | | line J.HINDS to EAGLEMTN 230 ck 1 | | | 0.914 |
| | | | | | | tran EAGLEMTN 230 to EAGLEMTN 161 ck 1 | | | 1.042 |
| AVE58 | 92 | JEFERSN | 92 | 132 | 829 | IMPRLVLY - MIGUEL 1 500kV | 0.983 | | |
| | | | | | | line AV58TP22 to COACHELA 230 ck 1 | 0.98 | 0.97 | |
| | | | | | | line AVE58230 to AV58TP22 230 ck 1 | 0.981 | 0.97 | |
| | | | | | | line BANIS230 to NEWSF230 230 ck 1 | 0.983 | 0.985 | |
| | | | | | | line COACHELA to RAMON 230 ck 2 | 1.06 | 1.047 | |
| | | | | | | line HARQUAHA to DEVERS 500 ck 1 | 0.974 | | |
| | | | | | | line NORTHSD to NEWSF500 500 ck 1 | | 0.987 | |
| | | | | | | tran NEWSF230 230 to NEWSF500 500 ck 1 | 0.983 | 0.984 | |
| MIRAGE | 115 | CONCHO | 115 | 183 | 920 | line DEVERS to MIRAGE 230 ck 1 | | | 0.969 |

IVSG Study
Contingency Per Unit Comparison
LA Cases

| FROM Bus | BKV | TO Bus | BKV2 | Rate-Mva | Rate-Amp | Contingency_Description | ivsg_hs_alt2d1_s | ivsg_hs_alt3bd1_ | ivsg_hs_rev4 |
|---|---|---|---|---|---|---|---|---|---|
| MIRAGE | 115 | CONCHO | 115 | 183 | 920 | tran MIRAGE 230 to MIRAGE 115 ck 1 | 0.951 | 0.951 | 0.97 |
| | | SANTA RO | 115 | 183.3 | 921 | line DEVERS to MIRAGE 230 ck 1 | | | 0.957 |
| | | | | | | tran MIRAGE 230 to MIRAGE 115 ck 1 | | | 0.957 |
| | 230 | MIRAGE | 115 | 280 | | tran MIRAGE 230 to MIRAGE 115 ck 1 | 2.04 | 2.04 | 2.06 |
| RTAP2 | 92 | RTP1 | 92 | 57 | 358 | C-ELCENTRO-AVE58 161KV | | | 1.907 |
| | | | | | | IMPRLVLY - MIGUEL 1 500kV | | | 1.148 |
| | | | | | | line AV58 to AV58TP1 161 ck 1 | | | 0.959 |
| | | | | | | line AV58TP1 to BANTP2 161 ck 1 | | | 0.96 |
| | | | | | | line BANTP2 to BANISTER 161 ck 1 | | | 0.961 |
| | | | | | | line DEVERS to MIRAGE 230 ck 1 | | | 1.005 |
| | | | | | | line HARQUAHA to DEVERS 500 ck 1 | | | 0.969 |
| | | | | | | line PALOVRDE to DEVERS 500 ck 1 | | | 0.945 |
| | | | | | | OTAYMESA - TJI-230 1 230kV | | | 0.907 |
| | | | | | | tran IMPRLVLY 230 to IMPRLVLY 500 ck 2 | | | 0.902 |
| MISSION | 230 | MISSION | 138 | 392 | | tran MIGUEL 230 to MIGUEL 138 ck 1 | | 1.94 | |
| | | | | | | tran MISSION 230 to MISSION 69 ck 1 | | 1.92 | |
| | | | | | | tran MISSION 230 to MISSION 138 ck 1 | 1 | 1.17 | 1.06 |
| | | | | | | tran MISSION 230 to MISSION 138 ck 2 | 1 | 1.17 | 1.06 |
| LUGO | 500 | MOHAVE | 500 | 1386 | 1602 | line MOHAVE to ELDORDO 500 ck 1 | 0.991 | 0.991 | 0.991 |
| | | VICTORVL | 500 | 2400 | 2775 | line ELDORDO to LUGO 500 ck 1 | 0.964 | 0.952 | 0.964 |
| | | | | | | line LUGO to MOHAVE 500 ck 1 | 0.963 | 0.952 | 0.966 |
| TALEGA | 230 | S.ONOFRE | 230 | 456.1 | 1146 | line TALEGA to S.ONOFRE 230 ck 1 | 1.022 | | 1.053 |
| | | | | | | line TALEGA to S.ONOFRE 230 ck 2 | 1.022 | | 1.053 |
| | | | | | | TALEGA - S.ONOFRE 1 230kV | 1.022 | | 1.053 |
| | | | | | | TALEGA - S.ONOFRE 2 230kV | 1.022 | | 1.053 |
| GEOSUB1 | 230 | BANIS230 | 230 | 550 | 1382 | line GEOSUB1 to BANIS230 230 ck 1 | 0.98 | 0.992 | |
| | | | | | | line GEOSUB1 to BANIS230 230 ck 2 | 0.98 | 0.992 | |
| | | | | | | line GEOSUB2 to BANIS230 230 ck 1 | 1.98 | 2.006 | |
| CONTROL | 115 | INYOKERN | 115 | 82.7 | 416 | line INYO to COTTONWD 230 ck 1 | 2.396 | 2.396 | 2.394 |
| LA FRESA | 230 | REDONDO | 230 | 956 | 2403 | line LA FRESA to REDONDO 230 ck 1 | 1.088 | 1.087 | 1.092 |
| | | | | | | line LA FRESA to REDONDO 230 ck 2 | 1.088 | 1.087 | 1.092 |
| KRAMER | 230 | LUGO | 230 | 478 | 1201 | line KRAMER to LUGO 230 ck 1 | 1.084 | 1.084 | 1.084 |
| | | | | | | line KRAMER to LUGO 230 ck 2 | 1.084 | 1.084 | 1.084 |
| PARDEE | 230 | SAUG TAP | 230 | 494 | 1242 | line PARDEE to SAUG TAP 230 ck 1 | 1.031 | 1.031 | 1.031 |
| | | | | | | line PARDEE to SAUG TAP 230 ck 2 | 1.031 | 1.031 | 1.031 |
| BIG CRK1 | 230 | BIG CRK2 | 230 | 329 | 827 | line BIG CRK1 to RECTOR 230 ck 1 | | | 0.903 |
| | | RECTOR | 230 | 329 | 826.8409148 | line BIG CRK1 to BIG CRK2 230 ck 1 | | | 0.911 |
| | | | | | | line BIG CRK3 to RECTOR 230 ck 1 | 1.001 | 1.001 | 1.001 |
| HRD-230 | 230 | HRD-115 | 115 | 225 | | IMPRLVLY - MIGUEL 1 500kV | 1.02 | | 1.18 |
| | | ROA-230 | 230 | 388 | 975 | IMPRLVLY - MIGUEL 1 500kV | | | 1.033 |
| | | RUM-230 | 230 | 388 | 975.1193767 | IMPRLVLY - MIGUEL 1 500kV | | | 0.983 |
| GEOSUB2 | 230 | BANIS230 | 230 | 550 | 1382 | line GEOSUB1 to BANIS230 230 ck 1 | 1.03 | 1.043 | |

IVSG Study
Contingency Per Unit Comparison
LA Cases

| FROM Bus | BKV | TO Bus | BKV2 | Rate-Mva | Rate-Amp | Contingency_Description | ivsg_hs_alt2d1_s | ivsg_hs_alt3bd1_ | ivsg_hs_rev4 |
|---|---|---|---|---|---|---|---|---|---|
| GEOSUB2 | 230 | BANIS230 | 230 | 550 | 1382 | line GEOSUB1 to BANIS230 230 ck 2 | 1.03 | 1.043 | |
| GLT TAP | 161 | KNOB | 161 | 173 | 621 | HASSYAMP - N.GILA 1 500kV | | | 0.938 |
| | | | | | | line BLYTHE to BLYTHESC 161 ck 1 | | | 1.145 |
| | | | | | | line BLYTHESC to EAGLEMTN 161 ck 1 | | | 1.009 |
| | | | | | | tran EAGLEMTN 230 to EAGLEMTN 161 ck 1 | | | 1.009 |
| BIG CRK3 | 230 | RECTOR | 230 | 353 | 887 | line BIG CRK1 to RECTOR 230 ck 1 | 1.01 | 1.01 | 1.01 |
| | | | | | | line SPRINGVL to BIG CRK4 230 ck 1 | | | 0.929 |
| DEVERS | 115 | DEVERS | 230 | 280 | | tran DEVERS 115 to DEVERS 230 ck 3 | | | 0.9 |
| | 230 | MIRAGE | 230 | 494 | 1242 | line COACHELA to RAMON 230 ck 1 | | | 0.93 |
| | 500 | DEVERS | 230 | 1120 | | line DEVERS to VALLEYSC 500 ck 1 | | | 0.93 |
| | | | | | | tran DEVERS 500 to DEVERS 230 ck 1 | | | 0.98 |
| IMPRLVLY | 230 | IMPRLVLY | 500 | 600 | | tran IMPRLVLY 230 to IMPRLVLY 500 ck 2 | 1.32 | 1.32 | |
| TAP601 | 115 | KRAMER | 115 | 217.1 | 1091 | line KRAMER to LUGO 230 ck 1 | | | 0.923 |
| | | | | | | line KRAMER to LUGO 230 ck 2 | | | 0.923 |
| VICTOR | 115 | KRAMER | 115 | 217.1 | 1091 | line KRAMER to LUGO 230 ck 1 | | | 0.909 |
| | | | | | | line KRAMER to LUGO 230 ck 2 | | | 0.909 |
| MIRALOMA | 500 | MIRALOMW | 230 | 1120 | | tran MIRALOMA 500 to MIRALOMW 230 ck 1 | | | 0.9 |
| | | | | | | tran MIRALOMA 500 to MIRALOMW 230 ck 2 | | | 0.91 |
| CENTRALX | 230 | CENTRALX | 500 | 1120 | | IMPRLVLY - MIGUEL 1 500kV | 1.44 | | |
| COACHELA | 230 | RAMON | 230 | 389 | 978 | line DEVERS to MIRAGE 230 ck 1 | | | 1.219 |
| RUM-230 | 230 | ROA-230 | 230 | 388 | 975 | IMPRLVLY - MIGUEL 1 500kV | | | 1.156 |
| RAMON | 230 | MIRAGE | 230 | 392.8 | 987 | line DEVERS to MIRAGE 230 ck 1 | | | 1.088 |
| NORTHSD | 230 | NORTHSD | 500 | 1120 | | gen S.ONOFR2 22.00 | | 1.06 | |
| OTAYMESA | 230 | TJI-230 | 230 | 796.7 | 2002 | IMPRLVLY - MIGUEL 1 500kV | | | 1.053 |
| JOJOBA | 500 | KYRENE | 500 | 1732 | 2002 | line HARQUAHA to DEVERS 500 ck 1 | | | 0.952 |
| ROCKWOOD | 92 | BRAW92 | 92 | 132 | 829 | line ELCENTSW to NILAND 161 ck 1 | | | 0.933 |
| ELDORDO | 500 | LUGO | 500 | 1386 | 1602 | line LUGO to VICTORVL 500 ck 1 | | | 0.923 |
| ROA-230 | 230 | IMPRLVLY | 230 | 797 | 2003 | IMPRLVLY - MIGUEL 1 500kV | | | 0.917 |
| RUDD | 230 | WHITETNK | 230 | 725 | 1822 | gen PALOVRD1 24.00 | | | 0.91 |

# APPENDIX C - 3

Development Plan for the Phased Expansion of the Transmission to Access Renewable Resources in the Imperial Valley, Appendix B

Imperial Valley Study Group

# Appendix B

## Transmission Planning Studies
## Vol. 2

Light Autumn Power Flow Data

# Imperial Valley Study Group

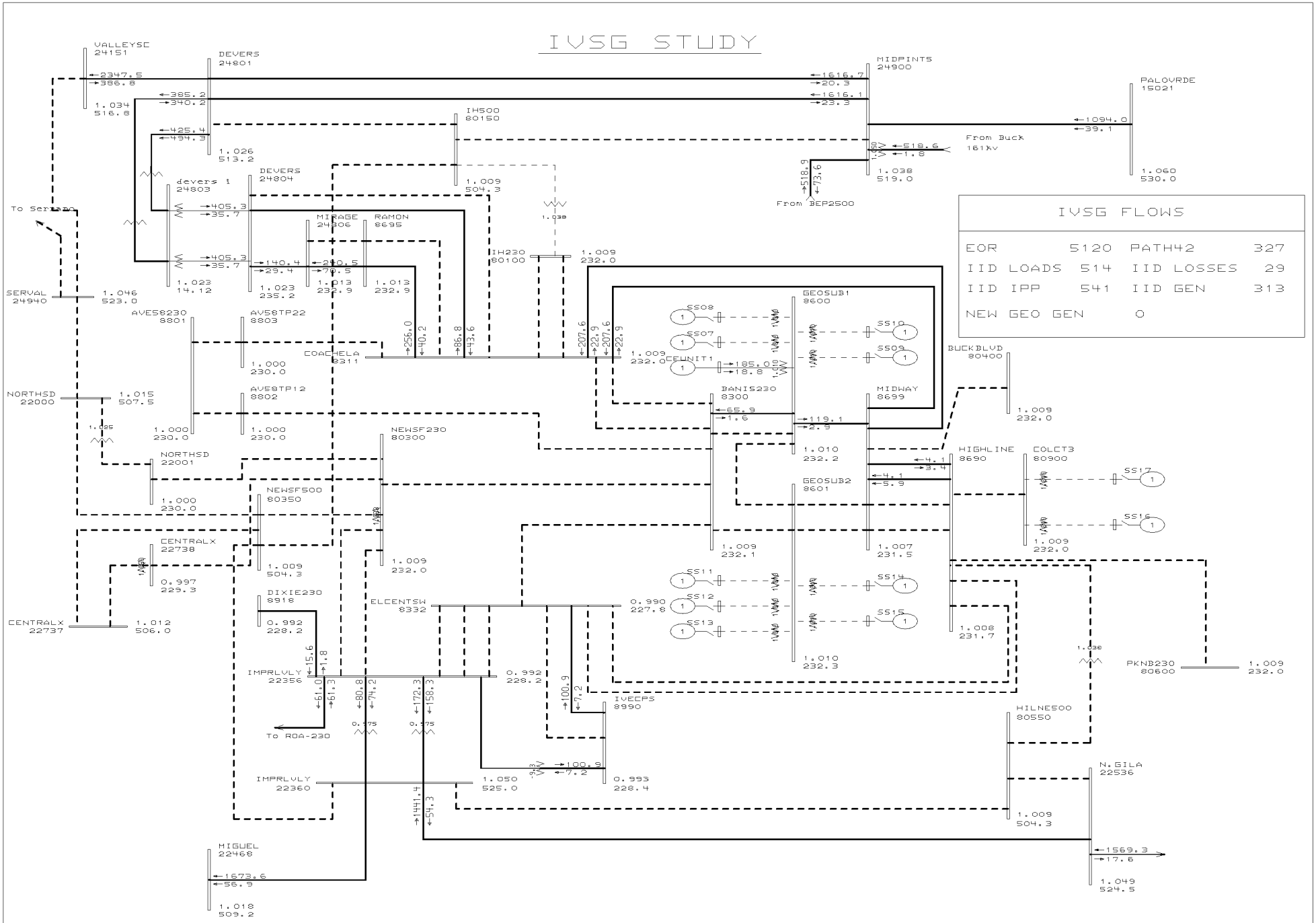
## Appendix B.1

PSLF Maps and Data Tables

# Imperial Valley Study Group

## Appendix B.1.1

LA Rev5
Light Autumn
Base Case


IVSG STUDY
VALLEYSC 24151
DEVERS 24801
MIDPINTS 24900
PALOVRDE 15021
IH500 80150
From Buck 161kV
From BEP2500
devers 1 24803
DEVERS 24804
MIRAGE 24806
RAMON 8695
IH230 80100
To Serrano
SERVAL 24940
AVE58230 8801
AVE58TP22 8803
AVE58TP12 8802
COACHELA 8311
GEOSUB1 8600
GEOSUB2 8601
CELUNIT1
BANIS230 8300
MIDWAY 8699
BUCKBLVD 80400
HIGHLINE 8690
COLCT3 80900
NORTHSD 22000
NORTHSD 22001
NEWSF230 80300
NEWSF500 80350
CENTRALX 22738
CENTRALX 22737
DIXIE230 8918
ELCENTSW 8332
IMPRLVLY 22356
IMPRLVLY 22360
IVECPS 8990
To ROA-230
HILNE500 80550
N.GILA 22536
PKNB230 80600
MIGUEL 22468
SS08
SS07
SS10
SS09
SS11
SS12
SS13
SS14
SS15
SS16
SS17
IVSG FLOWS
EOR 5120 PATH42 327
IID LOADS 514 IID LOSSES 29
IID IPP 541 IID GEN 313
NEW GEO GEN 0
General Electric International, Inc. PSLF Program
MW/MVAR
Wed Apr 20 15:07:52 2005
IVSG_LA_Rev5.sav from IVSG_LA_REV4.SAV IID/MLE 041305
IMPERIAL VALLEY STUDY GROUP LIGHT AUTUMN
BASE CASE WITH ALTERNATIVES STATUS OFF
REV5 BASE CASE
g:\iid\2005\ivgs\ivgsprojectla cases\ivsg_la_rev5.sav
Rating = 1

ivsg_la_rev5.sav
Voltage Summary
N-0 Outages

| Bus | Name | kV | Area | Zone | Outage | Case | Vbase | Vcont | DeltaV | Vmin | Vmax | Max-dv | Contingency Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 14534 | N.GILA 4 | 100 | 14 | 847 | base | ivsg_la_rev5 | 0.944 | 0.944 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14606 | N.GILA 3 | 100 | 14 | 847 | base | ivsg_la_rev5 | 0.944 | 0.944 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 22360 | IMPRLVLY | 500 | 22 | 227 | base | ivsg_la_rev5 | 1.05 | 1.05 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14234 | YAVAPAI | 230 | 14 | 141 | base | ivsg_la_rev5 | 1.051 | 1.051 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14355 | PRESCOTT | 115 | 14 | 141 | base | ivsg_la_rev5 | 1.051 | 1.051 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14543 | PRESCOT1 | 100 | 14 | 141 | base | ivsg_la_rev5 | 1.051 | 1.051 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14544 | PRESCOT2 | 100 | 14 | 141 | base | ivsg_la_rev5 | 1.051 | 1.051 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14608 | OCOTIL 1 | 100 | 14 | 141 | base | ivsg_la_rev5 | 1.051 | 1.051 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24086 | LUGO | 500 | 24 | 240 | base | ivsg_la_rev5 | 1.052 | 1.052 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14007 | GILARIVR | 500 | 14 | 141 | base | ivsg_la_rev5 | 1.054 | 1.054 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15093 | HARQUAHA | 500 | 14 | 158 | base | ivsg_la_rev5 | 1.055 | 1.055 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14001 | FOURCORN | 500 | 14 | 141 | base | ivsg_la_rev5 | 1.055 | 1.055 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15089 | JOJOBA | 500 | 14 | 158 | base | ivsg_la_rev5 | 1.055 | 1.055 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24042 | ELDORDO | 500 | 24 | 240 | base | ivsg_la_rev5 | 1.055 | 1.055 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24748 | OXBOW A | 230 | 24 | 247 | base | ivsg_la_rev5 | 1.055 | 1.055 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14000 | CHOLLA | 500 | 14 | 141 | base | ivsg_la_rev5 | 1.056 | 1.056 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 16310 | NL.3WP2 | 100 | 14 | 160 | base | ivsg_la_rev5 | 1.057 | 1.057 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24775 | RUSH | 115 | 24 | 247 | base | ivsg_la_rev5 | 1.057 | 1.057 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24729 | INYO | 230 | 24 | 247 | base | ivsg_la_rev5 | 1.058 | 1.058 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15092 | ARLINTON | 500 | 14 | 158 | base | ivsg_la_rev5 | 1.059 | 1.059 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15094 | MESQUITE | 500 | 14 | 158 | base | ivsg_la_rev5 | 1.059 | 1.059 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14005 | WESTWING | 500 | 14 | 141 | base | ivsg_la_rev5 | 1.059 | 1.059 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14009 | REDHAWK | 500 | 14 | 158 | base | ivsg_la_rev5 | 1.059 | 1.059 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24141 | SPRINGVL | 230 | 24 | 240 | base | ivsg_la_rev5 | 1.059 | 1.059 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15021 | PALOVRDE | 500 | 14 | 158 | base | ivsg_la_rev5 | 1.06 | 1.06 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15031 | PERK PS1 | 500 | 14 | 158 | base | ivsg_la_rev5 | 1.06 | 1.06 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15032 | PERK PS2 | 500 | 14 | 158 | base | ivsg_la_rev5 | 1.06 | 1.06 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15033 | PERKINPS | 500 | 14 | 158 | base | ivsg_la_rev5 | 1.06 | 1.06 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15090 | HASSYAMP | 500 | 14 | 158 | base | ivsg_la_rev5 | 1.06 | 1.06 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14100 | CHOLLA | 345 | 14 | 141 | base | ivsg_la_rev5 | 1.06 | 1.06 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24153 | VESTAL | 230 | 24 | 240 | base | ivsg_la_rev5 | 1.06 | 1.06 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15061 | RUDD | 500 | 14 | 158 | base | ivsg_la_rev5 | 1.061 | 1.061 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14010 | TS5 | 500 | 14 | 840 | base | ivsg_la_rev5 | 1.061 | 1.061 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 19038 | MEAD | 500 | 14 | 191 | base | ivsg_la_rev5 | 1.062 | 1.062 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24776 | LEE VINE | 115 | 24 | 247 | base | ivsg_la_rev5 | 1.064 | 1.064 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14006 | YAVAPAI | 500 | 14 | 141 | base | ivsg_la_rev5 | 1.066 | 1.066 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24156 | VINCENT | 500 | 24 | 240 | base | ivsg_la_rev5 | 1.066 | 1.066 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15034 | PERKINS | 500 | 14 | 158 | base | ivsg_la_rev5 | 1.067 | 1.067 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15087 | SNTAROSA | 500 | 14 | 158 | base | ivsg_la_rev5 | 1.067 | 1.067 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 16302 | NL.3WP | 100 | 14 | 160 | base | ivsg_la_rev5 | 1.067 | 1.067 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15088 | PINAL_W | 500 | 14 | 158 | base | ivsg_la_rev5 | 1.069 | 1.069 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 25633 | CAPWIND | 115 | 24 | 248 | base | ivsg_la_rev5 | 1.069 | 1.069 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24822 | INDIAN W | 115 | 24 | 248 | base | ivsg_la_rev5 | 1.069 | 1.069 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 25622 | TAP806 | 115 | 24 | 248 | base | ivsg_la_rev5 | 1.069 | 1.069 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15001 | CORONADO | 500 | 14 | 140 | base | ivsg_la_rev5 | 1.07 | 1.07 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24819 | CONCHO | 115 | 24 | 248 | base | ivsg_la_rev5 | 1.07 | 1.07 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24821 | TAMARISK | 115 | 24 | 248 | base | ivsg_la_rev5 | 1.07 | 1.07 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24829 | TAP821 | 115 | 24 | 248 | base | ivsg_la_rev5 | 1.07 | 1.07 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24827 | TAP823 | 115 | 24 | 248 | base | ivsg_la_rev5 | 1.071 | 1.071 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24807 | MIRAGE | 115 | 24 | 248 | base | ivsg_la_rev5 | 1.071 | 1.071 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24235 | RECTOR | 230 | 24 | 240 | base | ivsg_la_rev5 | 1.071 | 1.071 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24234 | RECTRSVC | 230 | 24 | 240 | base | ivsg_la_rev5 | 1.071 | 1.071 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24097 | MOHAVE | 500 | 24 | 240 | base | ivsg_la_rev5 | 1.072 | 1.072 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24816 | SANTA RO | 115 | 24 | 248 | base | ivsg_la_rev5 | 1.073 | 1.073 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14002 | MOENKOPI | 500 | 14 | 141 | base | ivsg_la_rev5 | 1.083 | 1.083 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14003 | NAVAJO | 500 | 14 | 141 | base | ivsg_la_rev5 | 1.087 | 1.087 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24304 | BIG CRK4 | 230 | 24 | 243 | base | ivsg_la_rev5 | 1.091 | 1.091 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24301 | BIG CRK1 | 230 | 24 | 243 | base | ivsg_la_rev5 | 1.092 | 1.092 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24320 | EASTWOOD | 230 | 24 | 243 | base | ivsg_la_rev5 | 1.092 | 1.092 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24302 | BIG CRK2 | 230 | 24 | 243 | base | ivsg_la_rev5 | 1.093 | 1.093 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24305 | BIG CRK8 | 230 | 24 | 243 | base | ivsg_la_rev5 | 1.093 | 1.093 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24316 | MAMMOTH | 230 | 24 | 243 | base | ivsg_la_rev5 | 1.093 | 1.093 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24303 | BIG CRK3 | 230 | 24 | 243 | base | ivsg_la_rev5 | 1.094 | 1.094 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |

ivsg_la_rev5.sav
Flow Summary
N-0 Outages

| LEGEND | % of RATING 1 | |
|---|---|---|
| C_pu | 100% - 110% | |
| C_pu | 110% - 120% | P.U. of |
| C_pu | > 120% | Rate 1 |

| FROM | FR | BKV | TO | TO | BKV | CK | Outage_Name | Case | Rate-Mva | Pflow | Qflow | Amps | MVA | C_pu | B_pu | Contingency_Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24900 | MIDPINTS | 500 | 19399 | BUCK161 | 161 | 1 | base | ivsg_la_rev5 | 250 | -514.1 | 89.2 | 580.4 | 521.8 | 2.09 | 2.09 | Base system (n-0) |
| 19400 | BUCK230 | 230 | 19399 | BUCK161 | 161 | 1 | base | ivsg_la_rev5 | 280 | 339.2 | 41.8 | 870 | 341.8 | 1.22 | 1.22 | Base system (n-0) |
| 16900 | COPPERVR | 345 | 16901 | COPPERVR | 230 | 1 | base | ivsg_la_rev5 | 200 | 202.2 | 98.4 | 370.8 | 224.9 | 1.12 | 1.12 | Base system (n-0) |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | base | ivsg_la_rev5 | 1411.6 | 1664.3 | 88.5 | 1770.1 | 1666.7 | 1.096 | 1.096 | Base system (n-0) |
| 24999 | DEVRSVC1 | 500 | 24801 | DEVERS | 500 | 1 | base | ivsg_la_rev5 | 387.5 | 0 | 400.1 | 450.1 | 400.1 | 1.006 | 1.006 | Base system (n-0) |
| 14206 | CTRYCLUB | 230 | 14216 | LINCSTRT | 230 | 1 | base | ivsg_la_rev5 | 462.1 | -452 | -88.6 | 1147.2 | 460.6 | 0.989 | 0.989 | Base system (n-0) |
| 24912 | SHANDIN | 115 | 24916 | TAP902 | 115 | 1 | base | ivsg_la_rev5 | 109.1 | -104.4 | 32.4 | 538 | 109.3 | 0.984 | 0.984 | Base system (n-0) |
| 25641 | TAP816 | 115 | 25664 | TAP998 | 115 | 1 | base | ivsg_la_rev5 | 107.6 | -96.4 | 41.6 | 531.4 | 105 | 0.984 | 0.984 | Base system (n-0) |
| 25641 | TAP816 | 115 | 25644 | TAP818 | 115 | 1 | base | ivsg_la_rev5 | 107.6 | 96.4 | -40.8 | 529.9 | 104.7 | 0.981 | 0.981 | Base system (n-0) |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | base | ivsg_la_rev5 | 1645.4 | 1703.8 | 100.7 | 1819.4 | 1706.8 | 0.958 | 0.958 | Base system (n-0) |
| 24805 | DEVERS | 115 | 25644 | TAP818 | 115 | 1 | base | ivsg_la_rev5 | 217 | -183.7 | 96.9 | 1040.4 | 207.7 | 0.955 | 0.955 | Base system (n-0) |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | base | ivsg_la_rev5 | 458 | 433.8 | 46.1 | 1070.6 | 436.2 | 0.932 | 0.932 | Base system (n-0) |
| 25629 | TAP813 | 115 | 25630 | TAP814 | 115 | 1 | base | ivsg_la_rev5 | 82.7 | 69.9 | -28.2 | 380.2 | 75.4 | 0.916 | 0.916 | Base system (n-0) |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | base | ivsg_la_rev5 | 56 | 50.3 | -5.1 | 248 | 50.6 | 0.91 | 0.91 | Base system (n-0) |

ivsg_la_rev5.sav
VOLTAGE Summary
N-1 Outages

| Bus | Name | kV | Area | Zone | Outage | Case | Vbase | Vcont | DeltaV | Vmin | Vmax | Max-dv | Contingency Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20238 | HRD-230 | 230 | 20 | 203 | B2_002 | ivsg_la_rev5 | 0.996 | 0.92 | -0.076 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 24731 | INYOKERN | 115 | 24 | 247 | line_175 | ivsg_la_rev5 | 1.016 | 0.924 | -0.092 | 0.9 | 1.05 | 0.05 | line INYO to COTTONWD 230 ck 1 |
| 20392 | TOY-230 | 230 | 20 | 203 | B2_002 | ivsg_la_rev5 | 0.998 | 0.927 | -0.071 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 20102 | RUM-230 | 230 | 20 | 204 | B2_002 | ivsg_la_rev5 | 0.989 | 0.93 | -0.059 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 24017 | BLYTHESC | 161 | 24 | 248 | line_007 | ivsg_la_rev5 | 1.017 | 0.934 | -0.083 | 0.9 | 1.05 | 0.05 | line BLYTHE to BLYTHESC 161 ck 1 |
| 20240 | FLO-115 | 115 | 20 | 203 | B2_002 | ivsg_la_rev5 | 1.003 | 0.941 | -0.062 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 20234 | TCD-115 | 115 | 20 | 203 | B2_002 | ivsg_la_rev5 | 1.006 | 0.943 | -0.062 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 20233 | TCT-115 | 115 | 20 | 203 | B2_002 | ivsg_la_rev5 | 1.005 | 0.943 | -0.062 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 20235 | TCR-115 | 115 | 20 | 203 | B2_002 | ivsg_la_rev5 | 1.006 | 0.943 | -0.062 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 20239 | HRD-115 | 115 | 20 | 203 | B2_002 | ivsg_la_rev5 | 1.007 | 0.946 | -0.062 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 25666 | OAK_VLLY | 230 | 24 | 248 | line_207 | ivsg_la_rev5 | 0.998 | 0.946 | -0.051 | 0.9 | 1.05 | 0.05 | line DEVERS to VALLEYSC 500 ck 1 |
| 20236 | FCO-115 | 115 | 20 | 203 | B2_002 | ivsg_la_rev5 | 1.007 | 0.95 | -0.057 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 24739 | MC GEN | 115 | 24 | 247 | line_175 | ivsg_la_rev5 | 1.036 | 0.95 | -0.086 | 0.9 | 1.05 | 0.05 | line INYO to COTTONWD 230 ck 1 |
| 24749 | SEARLES | 115 | 24 | 247 | line_175 | ivsg_la_rev5 | 1.036 | 0.95 | -0.086 | 0.9 | 1.05 | 0.05 | line INYO to COTTONWD 230 ck 1 |
| 24762 | TAP702 | 115 | 24 | 247 | line_175 | ivsg_la_rev5 | 1.036 | 0.95 | -0.086 | 0.9 | 1.05 | 0.05 | line INYO to COTTONWD 230 ck 1 |
| 24763 | TAP703 | 115 | 24 | 247 | line_175 | ivsg_la_rev5 | 1.036 | 0.95 | -0.086 | 0.9 | 1.05 | 0.05 | line INYO to COTTONWD 230 ck 1 |
| 20432 | ENC-115 | 115 | 20 | 203 | B2_002 | ivsg_la_rev5 | 1.007 | 0.951 | -0.056 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 24768 | RANDSBRG | 115 | 24 | 247 | line_175 | ivsg_la_rev5 | 1.013 | 0.952 | -0.06 | 0.9 | 1.05 | 0.05 | line INYO to COTTONWD 230 ck 1 |
| 24761 | TAP701 | 115 | 24 | 247 | line_175 | ivsg_la_rev5 | 1.013 | 0.952 | -0.06 | 0.9 | 1.05 | 0.05 | line INYO to COTTONWD 230 ck 1 |
| 20230 | FRO-115 | 115 | 20 | 203 | B2_002 | ivsg_la_rev5 | 1.008 | 0.955 | -0.053 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 20404 | SEM-115 | 115 | 20 | 203 | B2_002 | ivsg_la_rev5 | 1.006 | 0.955 | -0.05 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 20407 | HYN-115 | 115 | 20 | 203 | B2_002 | ivsg_la_rev5 | 1.008 | 0.955 | -0.053 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 20408 | SPB-115 | 115 | 20 | 203 | B2_002 | ivsg_la_rev5 | 1.007 | 0.955 | -0.053 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 20237 | MTP-115 | 115 | 20 | 203 | B2_002 | ivsg_la_rev5 | 1.009 | 0.956 | -0.053 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 20405 | DRA-115 | 115 | 20 | 203 | B2_002 | ivsg_la_rev5 | 1.006 | 0.956 | -0.05 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 20229 | TJI-115 | 115 | 20 | 203 | B2_002 | ivsg_la_rev5 | 1.01 | 0.957 | -0.053 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 25667 | OAK_VLLY | 115 | 24 | 248 | line_207 | ivsg_la_rev5 | 1.042 | 0.988 | -0.054 | 0.9 | 1.05 | 0.05 | line DEVERS to VALLEYSC 500 ck 1 |
| 14534 | N.GILA 4 | 100 | 14 | 847 | NG500/69 | ivsg_la_rev5 | 0.944 | 1 | 0.056 | 0.9 | 1.05 | 0.05 | tran N.GILA 500 to N.GILA 69 ck 1 |
| 24748 | OXBOW A | 230 | 24 | 247 | line_175 | ivsg_la_rev5 | 1.055 | 1.005 | -0.051 | 0.9 | 1.05 | 0.05 | line INYO to COTTONWD 230 ck 1 |
| 24035 | EAGLEMTN | 161 | 24 | 248 | tran_241 | ivsg_la_rev5 | 0.985 | 1.038 | 0.053 | 0.9 | 1.05 | 0.05 | tran EAGLEMTN 230 to EAGLEMTN 161 ck 1 |
| 22468 | MIGUEL | 500 | 22 | 227 | B2_001 | ivsg_la_rev5 | 1.018 | 1.071 | 0.053 | 0.9 | 1.05 | 0.05 | HASSYAMP - N.GILA 1 500kV |
| 25613 | EDMONSTN | 230 | 24 | 256 | line_122 | ivsg_la_rev5 | 1.029 | 1.091 | 0.062 | 0.9 | 1.05 | 0.05 | line PASTORIA to EDMONSTN 230 ck 1 |

ivsg_la_rev5.sav
FLOW Summary
N-1 Outages

| LEGEND | % of RATING 1 | |
|---|---|---|
| C_pu | 100% - 110% | |
| C_pu | 110% - 120% | P.U. of |
| C_pu | > 120% | Rate 1 |

| FROM | FR | BKV | TO | TO | BKV | CK | Outage_Name | Case | Rate-Mva | Pflow | Qflow | Amps | MVA | C_pu | B_pu | Contingency_Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24142 | SYC CYN | 230 | 24101 | OMAR | 230 | 1 | line_086 | ivsg_la_rev5 | 643 | 716.9 | 5515 | 12797 | 5561.4 | 7.929 | 0.42 | line MAGUNDEN to OMAR 230 ck 1 |
| 24781 | NAVYCOSO | 230 | 24706 | BLM EAST | 230 | 1 | line_173 | ivsg_la_rev5 | 1287 | -153 | -3160.7 | 7943.4 | 3164.4 | 2.459 | 0.056 | line BLM EAST to BLM WEST 230 ck 1 |
| 24781 | NAVYCOSO | 230 | 24706 | BLM EAST | 230 | 1 | line_174 | ivsg_la_rev5 | 1287 | -153 | -3160.7 | 7943.4 | 3164.4 | 2.459 | 0.056 | line BLM WEST to KRAMER 230 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_175 | ivsg_la_rev5 | 56 | -106.6 | 5.4 | 544.6 | 106.8 | 1.91 | 0.91 | line INYO to COTTONWD 230 ck 1 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | B2_002 | ivsg_la_rev5 | 388 | -608.4 | -78.5 | 1655.6 | 613.4 | 1.7 | 0.823 | IMPRLVLY - MIGUEL 1 500kV |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_001 | ivsg_la_rev5 | 1411.6 | 2526.8 | 319.1 | 2716.8 | 2546.9 | 1.683 | 1.096 | line MOENKOPI to ELDORDO 500 ck 1 |
| 20238 | HRD-230 | 230 | 20118 | ROA-230 | 230 | 1 | B2_002 | ivsg_la_rev5 | 388 | -529.5 | 187 | 1531.4 | 561.5 | 1.573 | 0.702 | IMPRLVLY - MIGUEL 1 500kV |
| 20238 | HRD-230 | 230 | 20102 | RUM-230 | 230 | 1 | B2_002 | ivsg_la_rev5 | 388 | -509.7 | 179.9 | 1474.2 | 540.5 | 1.517 | 0.655 | IMPRLVLY - MIGUEL 1 500kV |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_207 | ivsg_la_rev5 | 458 | 651.9 | 113.5 | 1679.7 | 661.7 | 1.462 | 0.932 | line DEVERS to VALLEYSC 500 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_202 | ivsg_la_rev5 | 56 | 79.4 | -11.8 | 399.3 | 80.2 | 1.45 | 0.91 | line OWENSCON to INYO 230 ck 1 |
| 20238 | HRD-230 | 230 | 20239 | HRD-115 | 115 | 1 | B2_002 | ivsg_la_rev5 | 225 | 313 | -63.6 | 871 | 319.4 | 1.44 | 0.82 | IMPRLVLY - MIGUEL 1 500kV |
| 22464 | MIGUEL | 230 | 22472 | MIGUELMP | 500 | 1 | ML81 | ivsg_la_rev5 | 1120 | -1526.5 | 261.2 | 3987.5 | 1548.7 | 1.38 | 0.77 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 22468 | MIGUEL | 500 | 22472 | MIGUELMP | 500 | 1 | ML81 | ivsg_la_rev5 | 1120 | 1529.6 | 27.7 | 1746.9 | 1529.8 | 1.38 | 0.77 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 22464 | MIGUEL | 230 | 22468 | MIGUEL | 500 | 1 | ML80 | ivsg_la_rev5 | 1120 | -1511.5 | 262.6 | 3950.5 | 1534.2 | 1.37 | 0.73 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 8319 | DIXIELAN | 92 | 8946 | DIXPRI2 | 92 | 1 | B2_003 | ivsg_la_rev5 | 54 | -68.4 | 16.3 | 448.6 | 70.3 | 1.324 | 0.281 | N.GILA - IMPRLVLY 1 500kV |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_207 | ivsg_la_rev5 | 1411.6 | 1834.3 | 187.3 | 1980.6 | 1843.9 | 1.228 | 1.096 | line DEVERS to VALLEYSC 500 ck 1 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | B2_001 | ivsg_la_rev5 | 1411.6 | 1831.5 | 186.6 | 1977.6 | 1841 | 1.227 | 1.096 | HASSYAMP - N.GILA 1 500kV |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_206 | ivsg_la_rev5 | 458 | 559.5 | 86.8 | 1397.3 | 566.2 | 1.216 | 0.932 | line SERRANO to VALLEYSC 500 ck 1 |
| 24801 | DEVERS | 500 | 24804 | DEVERS | 230 | 1 | line_207 | ivsg_la_rev5 | 1120 | 1119.4 | 761.6 | 1535.8 | 1353.9 | 1.21 | 0.58 | line DEVERS to VALLEYSC 500 ck 1 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | B2_003 | ivsg_la_rev5 | 1411.6 | 1807.6 | 168.5 | 1946.3 | 1815.5 | 1.207 | 1.096 | N.GILA - IMPRLVLY 1 500kV |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_135 | ivsg_la_rev5 | 458 | 550.7 | 71.3 | 1364.8 | 555.3 | 1.188 | 0.932 | line SANBRDNO to DEVERS 230 ck 1 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | B2_002 | ivsg_la_rev5 | 1411.6 | 1779 | 160.1 | 1912.6 | 1786.2 | 1.186 | 1.096 | IMPRLVLY - MIGUEL 1 500kV |
| 20238 | HRD-230 | 230 | 20017 | MTP-230 | 230 | 1 | B2_002 | ivsg_la_rev5 | 388 | 389.5 | -165.5 | 1154.3 | 423.2 | 1.185 | 0.466 | IMPRLVLY - MIGUEL 1 500kV |
| 24900 | MIDPINTS | 500 | 24801 | DEVERS | 500 | 1 | line_85 | ivsg_la_rev5 | 2338 | 2786.1 | 242 | 3146.9 | 2796.6 | 1.166 | 0.666 | line MIDPINTS to DEVERS 500 ck 2 |
| 24900 | MIDPINTS | 500 | 24801 | DEVERS | 500 | 2 | line_84 | ivsg_la_rev5 | 2338 | 2785.8 | 240.9 | 3146.2 | 2796.2 | 1.165 | 0.666 | line MIDPINTS to DEVERS 500 ck 1 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_206 | ivsg_la_rev5 | 1411.6 | 1754.7 | 129.1 | 1877.8 | 1759.4 | 1.163 | 1.096 | line SERRANO to VALLEYSC 500 ck 1 |
| 24806 | MIRAGE | 230 | 24807 | MIRAGE | 115 | 2 | tran_238 | ivsg_la_rev5 | 280 | 319.6 | 14.8 | 798.1 | 320 | 1.16 | 0.58 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_84 | ivsg_la_rev5 | 1411.6 | 1728 | 113.8 | 1845 | 1731.8 | 1.143 | 1.096 | line MIDPINTS to DEVERS 500 ck 1 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_85 | ivsg_la_rev5 | 1411.6 | 1728 | 113.8 | 1845 | 1731.7 | 1.143 | 1.096 | line MIDPINTS to DEVERS 500 ck 2 |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_207 | ivsg_la_rev5 | 458 | 489.8 | -57.5 | 1308.1 | 493.1 | 1.138 | 0.623 | line DEVERS to VALLEYSC 500 ck 1 |
| 24729 | INYO | 230 | 24730 | INYO PS | 115 | 1 | line_175 | ivsg_la_rev5 | 50 | 53.3 | 18.9 | 136.1 | 56.6 | 1.13 | 0.52 | line INYO to COTTONWD 230 ck 1 |
| 24729 | INYO | 230 | 24730 | INYO PS | 115 | 2 | line_175 | ivsg_la_rev5 | 50 | 53.3 | 18.9 | 136.1 | 56.6 | 1.13 | 0.52 | line INYO to COTTONWD 230 ck 1 |
| 24723 | CONTROL | 115 | 24731 | INYOKERN | 115 | 1 | line_175 | ivsg_la_rev5 | 82.7 | 89.5 | -7.2 | 460.6 | 89.8 | 1.109 | 0.32 | line INYO to COTTONWD 230 ck 1 |
| 24723 | CONTROL | 115 | 24731 | INYOKERN | 115 | 2 | line_175 | ivsg_la_rev5 | 82.7 | 89.5 | -7.2 | 460.6 | 89.8 | 1.109 | 0.32 | line INYO to COTTONWD 230 ck 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_183 | ivsg_la_rev5 | 458 | 510.6 | 67.6 | 1264.6 | 515.1 | 1.101 | 0.932 | line DEVERS to VSTA 230 ck 2 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_185 | ivsg_la_rev5 | 458 | 510.6 | 67.6 | 1264.6 | 515.1 | 1.101 | 0.932 | line VSTA to DEVERS 230 ck 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_207 | ivsg_la_rev5 | 1645.4 | 1903.1 | 197.5 | 2071 | 1913.3 | 1.09 | 0.958 | line DEVERS to VALLEYSC 500 ck 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | B2_001 | ivsg_la_rev5 | 1645.4 | 1895.2 | 195.4 | 2062.3 | 1905.2 | 1.085 | 0.958 | HASSYAMP - N.GILA 1 500kV |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | B2_003 | ivsg_la_rev5 | 1645.4 | 1868.4 | 184.7 | 2027.2 | 1877.5 | 1.067 | 0.958 | N.GILA - IMPRLVLY 1 500kV |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | B2_002 | ivsg_la_rev5 | 458 | 476.1 | 44.9 | 1213.3 | 478.2 | 1.055 | 0.932 | IMPRLVLY - MIGUEL 1 500kV |
| 24999 | DEVRSVC1 | 500 | 24801 | DEVERS | 500 | 1 | B2_001 | ivsg_la_rev5 | 387.5 | 0 | 400.1 | 470.9 | 400.1 | 1.052 | 1.006 | HASSYAMP - N.GILA 1 500kV |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_085 | ivsg_la_rev5 | 1411.6 | 1593.7 | 97.3 | 1695.8 | 1596.7 | 1.051 | 1.096 | line LUGO to VICTORVL 500 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_169 | ivsg_la_rev5 | 56 | 58.1 | -5.3 | 288.4 | 58.3 | 1.05 | 0.91 | line KRAMER to LUGO 230 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_170 | ivsg_la_rev5 | 56 | 58.1 | -5.3 | 288.4 | 58.3 | 1.05 | 0.91 | line KRAMER to LUGO 230 ck 2 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | B2_002 | ivsg_la_rev5 | 1645.4 | 1836.6 | 177.4 | 1988.9 | 1845.2 | 1.047 | 0.958 | IMPRLVLY - MIGUEL 1 500kV |
| 24999 | DEVRSVC1 | 500 | 24801 | DEVERS | 500 | 1 | B2_003 | ivsg_la_rev5 | 387.5 | 0 | 400.1 | 468.2 | 400.1 | 1.046 | 1.006 | N.GILA - IMPRLVLY 1 500kV |
| 24999 | DEVRSVC1 | 500 | 24801 | DEVERS | 500 | 1 | B2_002 | ivsg_la_rev5 | 387.5 | 0 | 400.1 | 467.3 | 400.1 | 1.044 | 1.006 | IMPRLVLY - MIGUEL 1 500kV |
| 24805 | DEVERS | 115 | 24804 | DEVERS | 230 | 1 | tran_236 | ivsg_la_rev5 | 280 | 254.2 | -95.1 | 1362.7 | 271.5 | 1.03 | 0.67 | tran DEVERS 115 to DEVERS 230 ck 3 |
| 24805 | DEVERS | 115 | 24804 | DEVERS | 230 | 1 | tran_237 | ivsg_la_rev5 | 280 | 252.8 | -94.5 | 1353.8 | 269.9 | 1.03 | 0.67 | tran DEVERS 115 to DEVERS 230 ck 4 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_206 | ivsg_la_rev5 | 1645.4 | 1810.3 | 142.9 | 1948.8 | 1815.9 | 1.026 | 0.958 | line SERRANO to VALLEYSC 500 ck 1 |
| 24805 | DEVERS | 115 | 24804 | DEVERS | 230 | 3 | tran_235 | ivsg_la_rev5 | 280 | 251.3 | -94.3 | 1348.9 | 268.4 | 1.02 | 0.66 | tran DEVERS 115 to DEVERS 230 ck 1 |
| 20238 | HRD-230 | 230 | 20392 | TOY-230 | 230 | 2 | B2_002 | ivsg_la_rev5 | 388 | 336.7 | -137.7 | 992.1 | 363.8 | 1.019 | 0.411 | IMPRLVLY - MIGUEL 1 500kV |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8319 | DIXIELAN | 92 | 8946 | DIXPRI2 | 92 | 1 | B2_001 | ivsg_la_rev5 | 54 | -53.2 | 13.6 | 344.4 | 54.9 | 1.017 | 0.281 | HASSYAMP - N.GILA 1 500kV |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | B2_002 | ivsg_la_rev5 | 2598 | 2598.7 | 191 | 3043.3 | 2605.8 | 1.014 | 0.888 | IMPRLVLY - MIGUEL 1 500kV |
| 24805 | DEVERS | 115 | 24804 | DEVERS | 230 | 4 | tran_235 | ivsg_la_rev5 | 280 | 248.3 | -93.2 | 1333.2 | 265.2 | 1.01 | 0.65 | tran DEVERS 115 to DEVERS 230 ck 1 |
| 24701 | KRAMER | 230 | 24085 | LUGO | 230 | 2 | line_169 | ivsg_la_rev5 | 478 | 480 | 56.1 | 1209 | 483.3 | 1.008 | 0.601 | line KRAMER to LUGO 230 ck 1 |
| 24701 | KRAMER | 230 | 24085 | LUGO | 230 | 1 | line_170 | ivsg_la_rev5 | 478 | 480 | 56.1 | 1209 | 483.3 | 1.008 | 0.601 | line KRAMER to LUGO 230 ck 2 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | B2_003 | ivsg_la_rev5 | 458 | 455.8 | 40.7 | 1157.8 | 457.6 | 1.007 | 0.932 | N.GILA - IMPRLVLY 1 500kV |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_84 | ivsg_la_rev5 | 1645.4 | 1778.5 | 126.5 | 1908.8 | 1783 | 1.005 | 0.958 | line MIDPINTS to DEVERS 500 ck 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_85 | ivsg_la_rev5 | 1645.4 | 1778.4 | 126.4 | 1908.8 | 1782.9 | 1.005 | 0.958 | line MIDPINTS to DEVERS 500 ck 2 |
| 22609 | OTAYMESA | 230 | 20149 | TJI-230 | 230 | 1 | B2_002 | ivsg_la_rev5 | 796.7 | -721.5 | 300.4 | 2006.7 | 781.5 | 1.004 | 0.265 | IMPRLVLY - MIGUEL 1 500kV |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | PV1 | ivsg_la_rev5 | 1411.6 | 1532.5 | 39.9 | 1620.1 | 1533.1 | 1.002 | 1.096 | gen PALOVRD1 24.00 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | B2_001 | ivsg_la_rev5 | 2598 | 2547.8 | 145.7 | 3003.3 | 2552 | 1.001 | 0.888 | HASSYAMP - N.GILA 1 500kV |
| 24805 | DEVERS | 115 | 24804 | DEVERS | 230 | 4 | tran_236 | ivsg_la_rev5 | 280 | 245.4 | -91.8 | 1315.2 | 262 | 1 | 0.65 | tran DEVERS 115 to DEVERS 230 ck 3 |
| 24805 | DEVERS | 115 | 24804 | DEVERS | 230 | 3 | tran_237 | ivsg_la_rev5 | 280 | 246.8 | -92.3 | 1322 | 263.5 | 1 | 0.66 | tran DEVERS 115 to DEVERS 230 ck 4 |
| 24151 | VALLEYSC | 500 | 24160 | VALLEYSC | 115 | 2 | tran_247 | ivsg_la_rev5 | 560 | 541 | 152.5 | 632.6 | 562.1 | 1 | 0.49 | tran VALLEYSC 500 to VALLEYSC 115 ck 1 |
| 24151 | VALLEYSC | 500 | 24160 | VALLEYSC | 115 | 1 | tran_248 | ivsg_la_rev5 | 560 | 541 | 152.5 | 632.6 | 562.1 | 1 | 0.49 | tran VALLEYSC 500 to VALLEYSC 115 ck 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | B2_003 | ivsg_la_rev5 | 2598 | 2553.6 | 154.2 | 2993.8 | 2558.3 | 0.998 | 0.888 | N.GILA - IMPRLVLY 1 500kV |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | B2_001 | ivsg_la_rev5 | 458 | 449.7 | 36.5 | 1145.8 | 451.1 | 0.997 | 0.932 | HASSYAMP - N.GILA 1 500kV |
| 20017 | MTP-230 | 230 | 20392 | TOY-230 | 230 | 1 | B2_002 | ivsg_la_rev5 | 388 | -320.8 | 181.3 | 964.4 | 368.5 | 0.996 | 0.388 | IMPRLVLY - MIGUEL 1 500kV |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_085 | ivsg_la_rev5 | 458 | 452.5 | 44.6 | 1124.9 | 454.7 | 0.979 | 0.932 | line LUGO to VICTORVL 500 ck 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_001 | ivsg_la_rev5 | 458 | 450.6 | 44.1 | 1120.9 | 452.8 | 0.975 | 0.932 | line MOENKOPI to ELDORDO 500 ck 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_047 | ivsg_la_rev5 | 458 | 445.8 | 46.8 | 1108.7 | 448.3 | 0.965 | 0.932 | line ELDORDO to LUGO 500 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | tran_210 | ivsg_la_rev5 | 56 | 53.3 | -5.2 | 263.4 | 53.6 | 0.96 | 0.91 | tran LUGO 500 to LUGO 230 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | tran_211 | ivsg_la_rev5 | 56 | 53.3 | -5.2 | 263.6 | 53.6 | 0.96 | 0.91 | tran LUGO 500 to LUGO 230 ck 2 |
| 24042 | ELDORDO | 500 | 24086 | LUGO | 500 | 1 | line_085 | ivsg_la_rev5 | 1386 | 1391.2 | 21.5 | 1529.3 | 1391.3 | 0.956 | 0.683 | line LUGO to VICTORVL 500 ck 1 |
| 24804 | DEVERS | 230 | 24901 | VSTA | 230 | 2 | line_207 | ivsg_la_rev5 | 988 | 904.3 | 211.7 | 2357.7 | 928.7 | 0.951 | 0.58 | line DEVERS to VALLEYSC 500 ck 1 |
| 24901 | VSTA | 230 | 24804 | DEVERS | 230 | 1 | line_207 | ivsg_la_rev5 | 988 | -866.5 | 186.6 | 2358.3 | 886.3 | 0.951 | 0.58 | line DEVERS to VALLEYSC 500 ck 1 |
| 24801 | DEVERS | 500 | 24804 | DEVERS | 230 | 1 | line_206 | ivsg_la_rev5 | 1120 | 825 | 669.7 | 1183 | 1062.6 | 0.95 | 0.58 | line SERRANO to VALLEYSC 500 ck 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_183 | ivsg_la_rev5 | 2598 | 2509.2 | 121.8 | 2829.5 | 2512.2 | 0.943 | 0.888 | line DEVERS to VSTA 230 ck 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_185 | ivsg_la_rev5 | 2598 | 2509.2 | 121.8 | 2829.5 | 2512.2 | 0.943 | 0.888 | line VSTA to DEVERS 230 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_086 | ivsg_la_rev5 | 56 | 52.2 | -5.6 | 258.3 | 52.5 | 0.94 | 0.91 | line MAGUNDEN to OMAR 230 ck 1 |
| 24151 | VALLEYSC | 500 | 24229 | VALLEY-S | 115 | 4 | tran_249 | ivsg_la_rev5 | 560 | 518.5 | 88.1 | 591.1 | 525.9 | 0.94 | 0.46 | tran VALLEYSC 500 to VALLEY-S 115 ck 3 |
| 24151 | VALLEYSC | 500 | 24229 | VALLEY-S | 115 | 3 | tran_250 | ivsg_la_rev5 | 560 | 518.5 | 88.1 | 591.1 | 525.9 | 0.94 | 0.46 | tran VALLEYSC 500 to VALLEY-S 115 ck 4 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_001 | ivsg_la_rev5 | 2598 | 2472.8 | 70.1 | 2814.8 | 2473.8 | 0.938 | 0.888 | line MOENKOPI to ELDORDO 500 ck 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_085 | ivsg_la_rev5 | 2598 | 2475.9 | 68 | 2814.9 | 2476.8 | 0.938 | 0.888 | line LUGO to VICTORVL 500 ck 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_135 | ivsg_la_rev5 | 2598 | 2486.5 | 107.3 | 2804.2 | 2488.8 | 0.935 | 0.888 | line SANBRDNO to DEVERS 230 ck 1 |
| 24801 | DEVERS | 500 | 24804 | DEVERS | 230 | 2 | line_207 | ivsg_la_rev5 | 1120 | 1013.7 | -85.2 | 1153.8 | 1017.2 | 0.93 | 0.48 | line DEVERS to VALLEYSC 500 ck 1 |
| 15090 | HASSYAMP | 500 | 22536 | N.GILA | 500 | 1 | line_207 | ivsg_la_rev5 | 1905.3 | 1824.2 | 390.8 | 2033.4 | 1865.6 | 0.924 | 0.798 | line DEVERS to VALLEYSC 500 ck 1 |
| 8695 | RAMON | 230 | 24806 | MIRAGE | 230 | 1 | line_182 | ivsg_la_rev5 | 389 | 350.8 | -39.9 | 900.8 | 353.1 | 0.923 | 0.636 | line DEVERS to MIRAGE 230 ck 1 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | line_207 | ivsg_la_rev5 | 388 | -350.8 | 13.6 | 899 | 351.1 | 0.923 | 0.823 | line DEVERS to VALLEYSC 500 ck 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_302 | ivsg_la_rev5 | 2598 | 2456.8 | 91.7 | 2770 | 2458.5 | 0.923 | 0.888 | line DEVERS to OAK_VLLY 230 ck 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_047 | ivsg_la_rev5 | 2598 | 2434.3 | 82.3 | 2765.2 | 2435.7 | 0.922 | 0.888 | line ELDORDO to LUGO 500 ck 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_047 | ivsg_la_rev5 | 1645.4 | 1633.2 | 131.9 | 1749.8 | 1638.5 | 0.922 | 0.958 | line ELDORDO to LUGO 500 ck 1 |
| 8918 | DIXIE230 | 230 | 8319 | DIXIELAN | 92 | 1 | B2_003 | ivsg_la_rev5 | 225 | -192.7 | 73.7 | 519.9 | 206.3 | 0.92 | 0.07 | N.GILA - IMPRLVLY 1 500kV |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | tran_234 | ivsg_la_rev5 | 2598 | 2475 | 133.4 | 2759.4 | 2478.6 | 0.92 | 0.888 | tran DEVERS 500 to DEVERS 230 ck 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_085 | ivsg_la_rev5 | 1645.4 | 1634.1 | 118.7 | 1746.3 | 1638.4 | 0.919 | 0.958 | line LUGO to VICTORVL 500 ck 1 |
| 8282 | USNAF | 92 | 8337 | ELTERMIN | 92 | 1 | B2_003 | ivsg_la_rev5 | 132 | -118.6 | 11.9 | 757.9 | 119.2 | 0.915 | 0.248 | N.GILA - IMPRLVLY 1 500kV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_015 | ivsg_la_rev5 | 392 | 354.8 | 11.5 | 916.2 | 355 | 0.91 | 0.79 | MIGUEL - MISSION 1 230kV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_028 | ivsg_la_rev5 | 392 | 358.2 | 10.8 | 927.3 | 358.4 | 0.91 | 0.79 | MIGUEL - SYCAMORE 1 230kV |
| 8311 | COACHELA | 230 | 8695 | RAMON | 230 | 1 | line_182 | ivsg_la_rev5 | 389 | 351.6 | 1.6 | 889.1 | 351.6 | 0.91 | 0.66 | line DEVERS to MIRAGE 230 ck 1 |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_206 | ivsg_la_rev5 | 458 | 403.7 | -30.3 | 1037 | 404.8 | 0.902 | 0.623 | line SERRANO to VALLEYSC 500 ck 1 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | ML80 | ivsg_la_rev5 | 388 | -344.3 | 13.7 | 877.7 | 344.6 | 0.901 | 0.823 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 8331 | ELCENTSW | 161 | 8335 | ELSTEAMP | 92 | 1 | B2_003 | ivsg_la_rev5 | 125 | 112.6 | -4.2 | 405.3 | 112.7 | 0.9 | 0.41 | N.GILA - IMPRLVLY 1 500kV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_020 | ivsg_la_rev5 | 392 | 352.9 | 9.8 | 911.9 | 353 | 0.9 | 0.79 | MIGUEL - MISSION 2 230kV |
| 20238 | HRD-230 | 230 | 20239 | HRD-115 | 115 | 1 | line_207 | ivsg_la_rev5 | 225 | 200.8 | -16.1 | 511.6 | 201.4 | 0.9 | 0.82 | line DEVERS to VALLEYSC 500 ck 1 |

ivsg_la_rev5.sav
VOLTAGE Summary
N-2 Outages

| Bus | Name | kV | Area | Zone | Outage | Case | Vbase | Vcont | DeltaV | Vmin | Vmax | Max-dv | Contingency Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8806 | AV58TP1 | 161 | 8 | 162 | line_N-204 | ivsg_la_rev5 | 1.002 | 0.943 | -0.059 | 0.9 | 1.05 | 0.05 | COACHELLA MIDWAY 230 CKT 1&2 |
| 8300 | BANIS230 | 230 | 8 | 163 | line_N-204 | ivsg_la_rev5 | 1.009 | 0.944 | -0.066 | 0.9 | 1.05 | 0.05 | COACHELLA MIDWAY 230 CKT 1&2 |
| 8690 | HIGHLINE | 230 | 8 | 164 | line_N-204 | ivsg_la_rev5 | 1.008 | 0.952 | -0.055 | 0.9 | 1.05 | 0.05 | COACHELLA MIDWAY 230 CKT 1&2 |
| 8600 | GEOSUB1 | 230 | 8 | 800 | line_N-204 | ivsg_la_rev5 | 1.01 | 0.955 | -0.055 | 0.9 | 1.05 | 0.05 | COACHELLA MIDWAY 230 CKT 1&2 |
| 22852 | TELECYN | 138 | 22 | 222 | 23021/22/23/ | ivsg_la_rev5 | 1.013 | 0.96 | -0.053 | 0.9 | 1.05 | 0.05 | MIGUEL 230 CORRIDOR North of ML |
| 22852 | TELECYN | 138 | 22 | 222 | 23021/22/23/ | ivsg_la_rev5 | 1.013 | 0.96 | -0.053 | 0.9 | 1.05 | 0.05 | MIGUEL 230 CORRIDOR West of SN |
| 22672 | PRCTRVLY | 138 | 22 | 222 | 23021/22/23/ | ivsg_la_rev5 | 1.014 | 0.962 | -0.052 | 0.9 | 1.05 | 0.05 | MIGUEL 230 CORRIDOR West of SN |
| 22672 | PRCTRVLY | 138 | 22 | 222 | 23021/22/23/ | ivsg_la_rev5 | 1.014 | 0.963 | -0.051 | 0.9 | 1.05 | 0.05 | MIGUEL 230 CORRIDOR North of ML |
| 22460 | MIGUEL | 138 | 22 | 222 | 23021/22/23/ | ivsg_la_rev5 | 1.015 | 0.964 | -0.051 | 0.9 | 1.05 | 0.05 | MIGUEL 230 CORRIDOR West of SN |
| 8682 | BANISTER | 161 | 8 | 163 | line_N-204 | ivsg_la_rev5 | 1.025 | 0.968 | -0.057 | 0.9 | 1.05 | 0.05 | COACHELLA MIDWAY 230 CKT 1&2 |
| 8200 | BANTP2 | 161 | 8 | 163 | line_N-204 | ivsg_la_rev5 | 1.025 | 0.968 | -0.057 | 0.9 | 1.05 | 0.05 | COACHELLA MIDWAY 230 CKT 1&2 |
| 8250 | BANTP1 | 161 | 8 | 163 | line_N-204 | ivsg_la_rev5 | 1.026 | 0.971 | -0.055 | 0.9 | 1.05 | 0.05 | COACHELLA MIDWAY 230 CKT 1&2 |

ivsg_la_rev5.sav
FLOW Summary
N-2 Outages

| LEGEND | % of RATING 1 | |
|---|---|---|
| C_pu | 100% - 110% | |
| C_pu | 110% - 120% | P.U. of Rate 1 |
| C_pu | > 120% | |

| FROM | FR | BKV | TO | TO | BKV | CK | Outage_Name | Case | Rate-Mva | Pflow | Qflow | Amps | MVA | C_pu | B_pu | Contingency_Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_2233 | ivsg_la_rev5 | 1411.6 | 2523.6 | 321.4 | 2713.9 | 2544 | 1.681 | 1.096 | MOENKOPI 500.00 - ELDORDO 500.00 1, PISGAH 230.00 - ELDORDO 230.00 2 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_la_rev5 | 392 | 618.6 | 71.2 | 1652.6 | 622.7 | 1.59 | 0.79 | MIGUEL 230 CORRIDOR West of LC |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_la_rev5 | 392 | 620.4 | 74.4 | 1663.4 | 624.8 | 1.59 | 0.79 | MIGUEL 230 CORRIDOR West of SN |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_la_rev5 | 392 | 605.9 | 81 | 1622.2 | 611.3 | 1.56 | 0.79 | MIGUEL 230 CORRIDOR North of ML |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_la_rev5 | 408.3 | -608.6 | 36.5 | 2651.8 | 609.7 | 1.552 | 0.742 | MIGUEL 230 CORRIDOR West of SN |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_la_rev5 | 408.3 | -607 | 38.2 | 2634.5 | 608.2 | 1.542 | 0.742 | MIGUEL 230 CORRIDOR West of LC |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | 23021/22/23/41 | ivsg_la_rev5 | 382.4 | 557.2 | -31.8 | 2432.3 | 558.1 | 1.52 | 0.669 | MIGUEL 230 CORRIDOR West of SN |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_la_rev5 | 408.3 | -594.7 | 24.4 | 2586.2 | 595.2 | 1.514 | 0.742 | MIGUEL 230 CORRIDOR North of ML |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | 23021/22/23/41 | ivsg_la_rev5 | 382.4 | 555.6 | -32.8 | 2415.5 | 556.6 | 1.51 | 0.669 | MIGUEL 230 CORRIDOR West of LC |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | 23021/22/23/41 | ivsg_la_rev5 | 382.4 | 543.5 | -18.3 | 2369.7 | 543.8 | 1.481 | 0.669 | MIGUEL 230 CORRIDOR North of ML |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2175 | ivsg_la_rev5 | 458 | 672 | 112.6 | 1675.1 | 681.4 | 1.458 | 0.932 | DEVERS 230.00 - SANBRDNO 230.00 1, DEVERS 230.00 - VSTA 230.00 2 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2177 | ivsg_la_rev5 | 458 | 672 | 112.6 | 1675.1 | 681.4 | 1.458 | 0.932 | DEVERS 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2178 | ivsg_la_rev5 | 458 | 672 | 112.6 | 1675.1 | 681.4 | 1.458 | 0.932 | DEVERS 230.00 - VSTA 230.00 2, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2180 | ivsg_la_rev5 | 458 | 672 | 112.6 | 1675.1 | 681.4 | 1.458 | 0.932 | SANBRDNO 230.00 - DEVERS 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2247 | ivsg_la_rev5 | 458 | 672 | 112.6 | 1675.1 | 681.4 | 1.458 | 0.932 | DEVERS 230.00 - VSTA 230.00 2, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2179 | ivsg_la_rev5 | 458 | 633.3 | 110.7 | 1577.8 | 642.9 | 1.373 | 0.932 | DEVERS 230.00 - VSTA 230.00 2, VSTA 230.00 - DEVERS 230.00 1 |
| 8900 | PRUETTAP | 92 | 8691 | HIGHLINE | 92 | 1 | line_N-204 | ivsg_la_rev5 | 86 | -104.6 | 43 | 722.1 | 113.1 | 1.339 | 0.256 | COACHELLA MIDWAY 230 CKT 1&2 |
| 22672 | PRCTRVLY | 138 | 22852 | TELECYN | 138 | 1 | 23021/22/23/41 | ivsg_la_rev5 | 478 | 591.7 | -38.6 | 2579 | 593 | 1.29 | 0.599 | MIGUEL 230 CORRIDOR West of SN |
| 22672 | PRCTRVLY | 138 | 22852 | TELECYN | 138 | 1 | 23021/22/23/41 | ivsg_la_rev5 | 478 | 590.1 | -40.4 | 2562 | 591.5 | 1.281 | 0.599 | MIGUEL 230 CORRIDOR West of LC |
| 22672 | PRCTRVLY | 138 | 22852 | TELECYN | 138 | 1 | 23021/22/23/41 | ivsg_la_rev5 | 478 | 577.8 | -26.6 | 2513.1 | 578.4 | 1.257 | 0.599 | MIGUEL 230 CORRIDOR North of ML |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2238 | ivsg_la_rev5 | 458 | 560.8 | 88.3 | 1401.9 | 567.8 | 1.22 | 0.932 | S.ONOFRE 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2239 | ivsg_la_rev5 | 458 | 559.5 | 86.8 | 1397.3 | 566.2 | 1.216 | 0.932 | CHINO 230.00 - S.ONOFRE 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2240 | ivsg_la_rev5 | 458 | 558.4 | 86.5 | 1394.4 | 565.1 | 1.214 | 0.932 | CHINO 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2176 | ivsg_la_rev5 | 458 | 550.7 | 71.3 | 1364.8 | 555.3 | 1.188 | 0.932 | DEVERS 230.00 - SANBRDNO 230.00 1, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_2238 | ivsg_la_rev5 | 1411.6 | 1756.7 | 132.1 | 1880.8 | 1761.7 | 1.165 | 1.096 | S.ONOFRE 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 24900 | MIDPINTS | 500 | 24801 | DEVERS | 500 | 2 | line_N-217 | ivsg_la_rev5 | 2338 | 2785.8 | 240.9 | 3146.2 | 2796.2 | 1.165 | 0.666 | line MIDPINTS to IH500/MIDPOINTS DEVERS 500 ck 1 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_2240 | ivsg_la_rev5 | 1411.6 | 1755 | 129.7 | 1878.3 | 1759.8 | 1.164 | 1.096 | CHINO 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_2239 | ivsg_la_rev5 | 1411.6 | 1754.7 | 129.1 | 1877.8 | 1759.4 | 1.163 | 1.096 | CHINO 230.00 - S.ONOFRE 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_2175 | ivsg_la_rev5 | 458 | 510 | -56.5 | 1315.7 | 513.1 | 1.144 | 0.623 | DEVERS 230.00 - SANBRDNO 230.00 1, DEVERS 230.00 - VSTA 230.00 2 |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_2177 | ivsg_la_rev5 | 458 | 510 | -56.5 | 1315.7 | 513.1 | 1.144 | 0.623 | DEVERS 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_2178 | ivsg_la_rev5 | 458 | 510 | -56.5 | 1315.7 | 513.1 | 1.144 | 0.623 | DEVERS 230.00 - VSTA 230.00 2, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_2180 | ivsg_la_rev5 | 458 | 510 | -56.5 | 1315.7 | 513.1 | 1.144 | 0.623 | SANBRDNO 230.00 - DEVERS 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_2247 | ivsg_la_rev5 | 458 | 510 | -56.5 | 1315.7 | 513.1 | 1.144 | 0.623 | DEVERS 230.00 - VSTA 230.00 2, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_N-217 | ivsg_la_rev5 | 1411.6 | 1728 | 113.8 | 1845 | 1731.8 | 1.143 | 1.096 | line MIDPINTS to IH500/MIDPOINTS DEVERS 500 ck 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2167 | ivsg_la_rev5 | 458 | 526.3 | 65.3 | 1303.1 | 530.3 | 1.134 | 0.932 | DEVERS 230.00 - SANBRDNO 230.00 1, ETIWANDA 230.00 - SANBRDNO 230.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2169 | ivsg_la_rev5 | 458 | 526.3 | 65.3 | 1303.1 | 530.3 | 1.134 | 0.932 | ETIWANDA 230.00 - SANBRDNO 230.00 1, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2268 | ivsg_la_rev5 | 458 | 526.3 | 65.3 | 1303.1 | 530.3 | 1.134 | 0.932 | ETIWANDA 230.00 - SANBRDNO 230.00 1, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23022/23023 | ivsg_la_rev5 | 392 | 444.2 | 17.7 | 1158.8 | 444.5 | 1.13 | 0.79 | ML-MS1+ ML-MS2 230KV |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | 23021/22/23/41 | ivsg_la_rev5 | 1411.6 | 1706.9 | 112.5 | 1821.7 | 1710.6 | 1.128 | 1.096 | MIGUEL 230 CORRIDOR North of ML |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_2179 | ivsg_la_rev5 | 1411.6 | 1705.1 | 112.5 | 1819.8 | 1708.8 | 1.127 | 1.096 | DEVERS 230.00 - VSTA 230.00 2, VSTA 230.00 - DEVERS 230.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2173 | ivsg_la_rev5 | 458 | 522.4 | 49.1 | 1290.8 | 524.7 | 1.123 | 0.932 | SANBRDNO 230.00 - DEVERS 230.00 1, VSTA 230.00 - SANBRDNO 230.00 2 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2174 | ivsg_la_rev5 | 458 | 522.4 | 49.1 | 1290.8 | 524.7 | 1.123 | 0.932 | DEVERS 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - SANBRDNO 230.00 2 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2246 | ivsg_la_rev5 | 458 | 510.6 | 67.6 | 1264.6 | 515.1 | 1.101 | 0.932 | VSTA 230.00 - DEVERS 230.00 1, COACHELV 230.00 - DEVERS 230.00 2 |
| 8682 | BANISTER | 161 | 8300 | BANIS230 | 230 | 1 | line_N-204 | ivsg_la_rev5 | 225 | -240.3 | 46.7 | 906.5 | 244.8 | 1.09 | 0.29 | COACHELLA MIDWAY 230 CKT 1&2 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23022/23023 | ivsg_la_rev5 | 408.3 | -438.5 | 36 | 1847.3 | 439.9 | 1.081 | 0.742 | ML-MS1+ ML-MS2 230KV |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_2179 | ivsg_la_rev5 | 458 | 473.6 | -39.1 | 1217.8 | 475.2 | 1.059 | 0.623 | DEVERS 230.00 - VSTA 230.00 2, VSTA 230.00 - DEVERS 230.00 1 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_2258 | ivsg_la_rev5 | 1411.6 | 1592 | 102.8 | 1695 | 1595.4 | 1.05 | 1.096 | LUGO 500.00 - VINCENT 500.00 2, LUGO 500.00 - VICTORVL 500.00 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_2260 | ivsg_la_rev5 | 56 | 57.9 | -5.3 | 287.5 | 58.2 | 1.05 | 0.91 | KRAMER 230.00 - LUGO 230.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 8690 | HIGHLINE | 230 | 8691 | HIGHLINE | 92 | 1 | line_N-204 | ivsg_la_rev5 | 225 | 233.1 | -8.6 | 615 | 233.3 | 1.05 | 0.05 | COACHELLA MIDWAY 230 CKT 1&2 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | 23021/22/23/41 | ivsg_la_rev5 | 388 | -394.6 | 6 | 1011.9 | 394.7 | 1.039 | 0.823 | MIGUEL 230 CORRIDOR North of ML |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2168 | ivsg_la_rev5 | 458 | 480 | 62 | 1187.7 | 484 | 1.034 | 0.932 | DEVERS 230.00 - VSTA 230.00 2, ETIWANDA 230.00 - SANBRDNO 230.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2171 | ivsg_la_rev5 | 458 | 480 | 62 | 1187.7 | 484 | 1.034 | 0.932 | ETIWANDA 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2179 | ivsg_la_rev5 | 2598 | 2731.6 | 249.5 | 3095.9 | 2743 | 1.032 | 0.888 | DEVERS 230.00 - VSTA 230.00 2, VSTA 230.00 - DEVERS 230.00 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_2238 | ivsg_la_rev5 | 1645.4 | 1812.4 | 146.3 | 1952.2 | 1818.3 | 1.028 | 0.958 | S.ONOFRE 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | 23021/22/23/41 | ivsg_la_rev5 | 388 | -390 | 7.1 | 999.8 | 390.1 | 1.027 | 0.823 | MIGUEL 230 CORRIDOR West of SN |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_2239 | ivsg_la_rev5 | 1645.4 | 1810.3 | 142.9 | 1948.8 | 1815.9 | 1.026 | 0.958 | CHINO 230.00 - S.ONOFRE 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_2240 | ivsg_la_rev5 | 1645.4 | 1810.5 | 143.6 | 1949.3 | 1816.2 | 1.026 | 0.958 | CHINO 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | 23021/22/23/41 | ivsg_la_rev5 | 388 | -389.3 | 7.2 | 997.5 | 389.3 | 1.024 | 0.823 | MIGUEL 230 CORRIDOR West of LC |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | 23022/23023 | ivsg_la_rev5 | 382.4 | 389 | -13 | 1635.9 | 389.3 | 1.023 | 0.669 | ML-MS1+ ML-MS2 230KV |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2175 | ivsg_la_rev5 | 2598 | 2683.7 | 218.5 | 3040.4 | 2692.5 | 1.014 | 0.888 | DEVERS 230.00 - SANBRDNO 230.00 1, DEVERS 230.00 - VSTA 230.00 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2177 | ivsg_la_rev5 | 2598 | 2683.7 | 218.5 | 3040.4 | 2692.5 | 1.014 | 0.888 | DEVERS 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2178 | ivsg_la_rev5 | 2598 | 2683.7 | 218.5 | 3040.4 | 2692.5 | 1.014 | 0.888 | DEVERS 230.00 - VSTA 230.00 2, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2180 | ivsg_la_rev5 | 2598 | 2683.7 | 218.5 | 3040.4 | 2692.5 | 1.014 | 0.888 | SANBRDNO 230.00 - DEVERS 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2247 | ivsg_la_rev5 | 2598 | 2683.7 | 218.5 | 3040.4 | 2692.5 | 1.014 | 0.888 | DEVERS 230.00 - VSTA 230.00 2, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 24701 | KRAMER | 230 | 24085 | LUGO | 230 | 2 | line_2260 | ivsg_la_rev5 | 478 | 480.4 | 57.8 | 1211.2 | 483.8 | 1.009 | 0.601 | KRAMER 230.00 - LUGO 230.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_N-217 | ivsg_la_rev5 | 1645.4 | 1778.5 | 126.5 | 1908.8 | 1783 | 1.005 | 0.958 | line MIDPINTS to IH500/MIDPOINTS DEVERS 500 ck 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | 23021/22/23/41 | ivsg_la_rev5 | 1645.4 | 1753.6 | 126.2 | 1881.1 | 1758.1 | 0.99 | 0.958 | MIGUEL 230 CORRIDOR North of ML |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20238 | HRD-230 | 230 | 20239 | HRD-115 | 115 | 1 | 23021/22/23/41 | ivsg_la_rev5 | 225 | 220.8 | -22 | 565.3 | 221.9 | 0.99 | 0.82 | MIGUEL 230 CORRIDOR North of ML |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_2179 | ivsg_la_rev5 | 1645.4 | 1751.7 | 126.6 | 1879 | 1756.3 | 0.989 | 0.958 | DEVERS 230.00 - VSTA 230.00 2, VSTA 230.00 - DEVERS 230.00 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | 23021/22/23/41 | ivsg_la_rev5 | 1645.4 | 1750.5 | 124.5 | 1877.1 | 1754.9 | 0.988 | 0.958 | MIGUEL 230 CORRIDOR West of LC |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2258 | ivsg_la_rev5 | 458 | 451.9 | 46.3 | 1125.8 | 454.3 | 0.98 | 0.932 | LUGO 500.00 - VINCENT 500.00 2, LUGO 500.00 - VICTORVL 500.00 1 |
| 20238 | HRD-230 | 230 | 20239 | HRD-115 | 115 | 1 | 23021/22/23/41 | ivsg_la_rev5 | 225 | 218.4 | -21.3 | 558.4 | 219.4 | 0.98 | 0.82 | MIGUEL 230 CORRIDOR West of LC |
| 20238 | HRD-230 | 230 | 20239 | HRD-115 | 115 | 1 | 23021/22/23/41 | ivsg_la_rev5 | 225 | 218.7 | -21.5 | 559.5 | 219.7 | 0.98 | 0.82 | MIGUEL 230 CORRIDOR West of SN |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2233 | ivsg_la_rev5 | 458 | 451.3 | 44.2 | 1123.1 | 453.4 | 0.977 | 0.932 | MOENKOPI 500.00 - ELDORDO 500.00 1, PISGAH 230.00 - ELDORDO 230.00 2 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | 23021/22/23/41 | ivsg_la_rev5 | 458 | 450.1 | 46.6 | 1122 | 452.5 | 0.976 | 0.932 | MIGUEL 230 CORRIDOR North of ML |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | 23021/22/23/41 | ivsg_la_rev5 | 458 | 449.1 | 46.6 | 1118.7 | 451.5 | 0.974 | 0.932 | MIGUEL 230 CORRIDOR West of LC |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2170 | ivsg_la_rev5 | 2598 | 2579.5 | 173.8 | 2917.1 | 2585.3 | 0.972 | 0.888 | ETIWANDA 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - SANBRDNO 230.00 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2172 | ivsg_la_rev5 | 2598 | 2582.2 | 172.6 | 2916.6 | 2588 | 0.972 | 0.888 | VSTA 230.00 - SANBRDNO 230.00 2, VSTA 230.00 - DEVERS 230.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2256 | ivsg_la_rev5 | 458 | 448 | 47.5 | 1116.6 | 450.5 | 0.972 | 0.932 | ELDORDO 500.00 - LUGO 500.00 1, LUGO 500.00 - MIRALOMA 500.00 2 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2191 | ivsg_la_rev5 | 458 | 446.9 | 46.9 | 1112.1 | 449.4 | 0.968 | 0.932 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - ELDORDO 230.00 2 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2192 | ivsg_la_rev5 | 458 | 446.6 | 47 | 1111.2 | 449 | 0.967 | 0.932 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2193 | ivsg_la_rev5 | 458 | 446.6 | 47 | 1111.2 | 449 | 0.967 | 0.932 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - LUGO 230.00 2 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_2214 | ivsg_la_rev5 | 56 | 53.1 | -4.9 | 262 | 53.3 | 0.96 | 0.91 | LUGO 500.00 - VINCENT 500.00 1, LUGO 500.00 - VINCENT 500.00 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2168 | ivsg_la_rev5 | 2598 | 2548.1 | 144.8 | 2874.7 | 2552.2 | 0.958 | 0.888 | DEVERS 230.00 - VSTA 230.00 2, ETIWANDA 230.00 - SANBRDNO 230.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2171 | ivsg_la_rev5 | 2598 | 2548.1 | 144.8 | 2874.7 | 2552.2 | 0.958 | 0.888 | ETIWANDA 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 24801 | DEVERS | 500 | 24804 | DEVERS | 230 | 1 | line_2238 | ivsg_la_rev5 | 1120 | 827 | 674.3 | 1187.9 | 1067 | 0.95 | 0.58 | S.ONOFRE 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 24801 | DEVERS | 500 | 24804 | DEVERS | 230 | 1 | line_2239 | ivsg_la_rev5 | 1120 | 825 | 669.7 | 1183 | 1062.6 | 0.95 | 0.58 | CHINO 230.00 - S.ONOFRE 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 24801 | DEVERS | 500 | 24804 | DEVERS | 230 | 1 | line_2240 | ivsg_la_rev5 | 1120 | 822.3 | 668.3 | 1179.7 | 1059.6 | 0.95 | 0.58 | CHINO 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 24016 | BARRE | 230 | 24044 | ELLIS | 230 | 1 | line_2115 | ivsg_la_rev5 | 988 | 907 | -78.8 | 2351.4 | 910.4 | 0.948 | 0.432 | S.ONOFRE 230.00 - SANTIAGO 230.00 1, S.ONOFRE 230.00 - SANTIAGO 230.00 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | 23021/22/23/41 | ivsg_la_rev5 | 2598 | 2499.9 | 90.4 | 2844.8 | 2501.5 | 0.948 | 0.888 | MIGUEL 230 CORRIDOR West of SN |
| 8806 | AV58TP1 | 161 | 8200 | BANTP2 | 161 | 1 | line_N-204 | ivsg_la_rev5 | 165 | -141.8 | 35.9 | 556.5 | 146.3 | 0.946 | 0.352 | COACHELLA MIDWAY 230 CKT 1&2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2246 | ivsg_la_rev5 | 2598 | 2509.2 | 121.8 | 2829.5 | 2512.2 | 0.943 | 0.888 | VSTA 230.00 - DEVERS 230.00 1, COACHELV 230.00 - DEVERS 230.00 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2167 | ivsg_la_rev5 | 2598 | 2503.8 | 118.4 | 2824.4 | 2506.6 | 0.941 | 0.888 | DEVERS 230.00 - SANBRDNO 230.00 1, ETIWANDA 230.00 - SANBRDNO 230.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2169 | ivsg_la_rev5 | 2598 | 2503.8 | 118.4 | 2824.4 | 2506.6 | 0.941 | 0.888 | ETIWANDA 230.00 - SANBRDNO 230.00 1, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2268 | ivsg_la_rev5 | 2598 | 2503.8 | 118.4 | 2824.4 | 2506.6 | 0.941 | 0.888 | ETIWANDA 230.00 - SANBRDNO 230.00 1, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 2 | line_2029 | ivsg_la_rev5 | 1195 | 1092.2 | -88.9 | 2819.1 | 1095.9 | 0.94 | 0.464 | LEWIS 230.00 - SERRANO 230.00 1, SERRANO 230.00 - VILLA PK 230.00 1 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 2 | line_2031 | ivsg_la_rev5 | 1195 | 1092.2 | -88.9 | 2819.1 | 1095.9 | 0.94 | 0.464 | LEWIS 230.00 - SERRANO 230.00 2, SERRANO 230.00 - VILLA PK 230.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2233 | ivsg_la_rev5 | 2598 | 2476.2 | 72.3 | 2820.2 | 2477.2 | 0.94 | 0.888 | MOENKOPI 500.00 - ELDORDO 500.00 1, PISGAH 230.00 - ELDORDO 230.00 2 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 2 | line_2278 | ivsg_la_rev5 | 1195 | 1092.2 | -88.9 | 2819.1 | 1095.9 | 0.94 | 0.464 | LEWIS 230.00 - SERRANO 230.00 1, SERRANO 230.00 - VILLA PK 230.00 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23021/23041 | ivsg_la_rev5 | 392 | 367.9 | 13 | 956.2 | 368.1 | 0.94 | 0.79 | ML-SX + OM-SX 230KV |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2258 | ivsg_la_rev5 | 2598 | 2469 | 86.4 | 2813 | 2470.5 | 0.938 | 0.888 | LUGO 500.00 - VINCENT 500.00 2, LUGO 500.00 - VICTORVL 500.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2173 | ivsg_la_rev5 | 2598 | 2489.9 | 113.9 | 2810.8 | 2492.5 | 0.937 | 0.888 | SANBRDNO 230.00 - DEVERS 230.00 1, VSTA 230.00 - SANBRDNO 230.00 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2174 | ivsg_la_rev5 | 2598 | 2489.9 | 113.9 | 2810.8 | 2492.5 | 0.937 | 0.888 | DEVERS 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - SANBRDNO 230.00 2 |
| 24901 | VSTA | 230 | 24132 | SANBRDNO | 230 | 2 | line_2179 | ivsg_la_rev5 | 916 | -837.8 | 44.8 | 2155.4 | 839 | 0.937 | 0.446 | DEVERS 230.00 - VSTA 230.00 2, VSTA 230.00 - DEVERS 230.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2176 | ivsg_la_rev5 | 2598 | 2486.5 | 107.3 | 2804.2 | 2488.8 | 0.935 | 0.888 | DEVERS 230.00 - SANBRDNO 230.00 1, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 24042 | ELDORDO | 500 | 24086 | LUGO | 500 | 1 | line_2258 | ivsg_la_rev5 | 1386 | 1357.5 | 34.9 | 1495 | 1358 | 0.934 | 0.683 | LUGO 500.00 - VINCENT 500.00 2, LUGO 500.00 - VICTORVL 500.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | 23021/22/23/41 | ivsg_la_rev5 | 2598 | 2459.9 | 96.3 | 2802.7 | 2461.8 | 0.934 | 0.888 | MIGUEL 230 CORRIDOR North of ML |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | 23021/22/23/41 | ivsg_la_rev5 | 2598 | 2454.3 | 93 | 2793.8 | 2456 | 0.931 | 0.888 | MIGUEL 230 CORRIDOR West of LC |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2256 | ivsg_la_rev5 | 2598 | 2448.1 | 95.5 | 2788.6 | 2449.9 | 0.93 | 0.888 | ELDORDO 500.00 - LUGO 500.00 1, LUGO 500.00 - MIRALOMA 500.00 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2164 | ivsg_la_rev5 | 2598 | 2471.7 | 101.1 | 2781.9 | 2473.8 | 0.927 | 0.888 | MIRALOMA 230.00 - VSTA 230.00 1, MIRALOMA 230.00 - VSTA 230.00 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2191 | ivsg_la_rev5 | 2598 | 2440 | 85.2 | 2774.1 | 2441.5 | 0.925 | 0.888 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - ELDORDO 230.00 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2192 | ivsg_la_rev5 | 2598 | 2438 | 85.3 | 2771.4 | 2439.5 | 0.924 | 0.888 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2193 | ivsg_la_rev5 | 2598 | 2438 | 85.3 | 2771.4 | 2439.5 | 0.924 | 0.888 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - LUGO 230.00 2 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_2192 | ivsg_la_rev5 | 1645.4 | 1630.7 | 133.6 | 1747.4 | 1636.1 | 0.921 | 0.958 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_2193 | ivsg_la_rev5 | 1645.4 | 1630.7 | 133.5 | 1747.4 | 1636.2 | 0.921 | 0.958 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - LUGO 230.00 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2166 | ivsg_la_rev5 | 2598 | 2451.1 | 90.6 | 2759.4 | 2452.8 | 0.92 | 0.888 | ETIWANDA 230.00 - SANBRDNO 230.00 1, ETIWANDA 230.00 - VSTA 230.00 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_2191 | ivsg_la_rev5 | 1645.4 | 1629.4 | 135.2 | 1746.4 | 1635 | 0.92 | 0.958 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - ELDORDO 230.00 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2194 | ivsg_la_rev5 | 2598 | 2428.7 | 89 | 2759.6 | 2430.4 | 0.92 | 0.888 | LUGO 500.00 - MIRALOMA 500.00 2, LUGO 500.00 - MIRALOMA 500.00 3 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | 23022/23023 | ivsg_la_rev5 | 388 | -351.1 | 12.4 | 895.6 | 351.3 | 0.92 | 0.823 | ML-MS1+ ML-MS2 230KV |
| 8345 | HOLTVILL | 92 | 8691 | HIGHLINE | 92 | 1 | line_N-204 | ivsg_la_rev5 | 132 | -113.1 | 36.4 | 760.3 | 118.8 | 0.919 | 0.25 | COACHELLA MIDWAY 230 CKT 1&2 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_2258 | ivsg_la_rev5 | 1645.4 | 1629.5 | 125.4 | 1742.8 | 1634.3 | 0.918 | 0.958 | LUGO 500.00 - VINCENT 500.00 2, LUGO 500.00 - VICTORVL 500.00 1 |
| 20238 | HRD-230 | 230 | 20118 | ROA-230 | 230 | 1 | 23021/22/23/41 | ivsg_la_rev5 | 388 | -337.5 | 88 | 888.8 | 348.8 | 0.918 | 0.702 | MIGUEL 230 CORRIDOR North of ML |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_2256 | ivsg_la_rev5 | 1645.4 | 1623.6 | 132.6 | 1739.5 | 1629 | 0.917 | 0.958 | ELDORDO 500.00 - LUGO 500.00 1, LUGO 500.00 - MIRALOMA 500.00 2 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2191 | ivsg_la_rev5 | 2400 | -2223.7 | 450.3 | 2516 | 2268.9 | 0.91 | 0.676 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - ELDORDO 230.00 2 |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_2238 | ivsg_la_rev5 | 458 | 404.9 | -29.5 | 1041.1 | 406 | 0.906 | 0.623 | S.ONOFRE 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2192 | ivsg_la_rev5 | 2400 | -2211.5 | 440.1 | 2501 | 2254.9 | 0.905 | 0.676 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2193 | ivsg_la_rev5 | 2400 | -2211.3 | 440 | 2500.7 | 2254.6 | 0.905 | 0.676 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - LUGO 230.00 2 |
| 20238 | HRD-230 | 230 | 20118 | ROA-230 | 230 | 1 | 23021/22/23/41 | ivsg_la_rev5 | 388 | -333.2 | 86.5 | 876.6 | 344.2 | 0.905 | 0.702 | MIGUEL 230 CORRIDOR West of SN |
| 20238 | HRD-230 | 230 | 20118 | ROA-230 | 230 | 1 | 23021/22/23/41 | ivsg_la_rev5 | 388 | -332.5 | 86.2 | 874.3 | 343.5 | 0.903 | 0.702 | MIGUEL 230 CORRIDOR West of LC |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_2239 | ivsg_la_rev5 | 458 | 403.7 | -30.3 | 1037 | 404.8 | 0.902 | 0.623 | CHINO 230.00 - S.ONOFRE 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 8672 | LEATHERS | 92 | 8700 | MIDWAY | 92 | 1 | line_N-204 | ivsg_la_rev5 | 132 | 119.3 | 25 | 746.7 | 121.9 | 0.902 | 0.869 | COACHELLA MIDWAY 230 CKT 1&2 |
| 20238 | HRD-230 | 230 | 20239 | HRD-115 | 115 | 1 | 23022/23023 | ivsg_la_rev5 | 225 | 201 | -15.3 | 510.3 | 201.6 | 0.9 | 0.82 | ML-MS1+ ML-MS2 230KV |

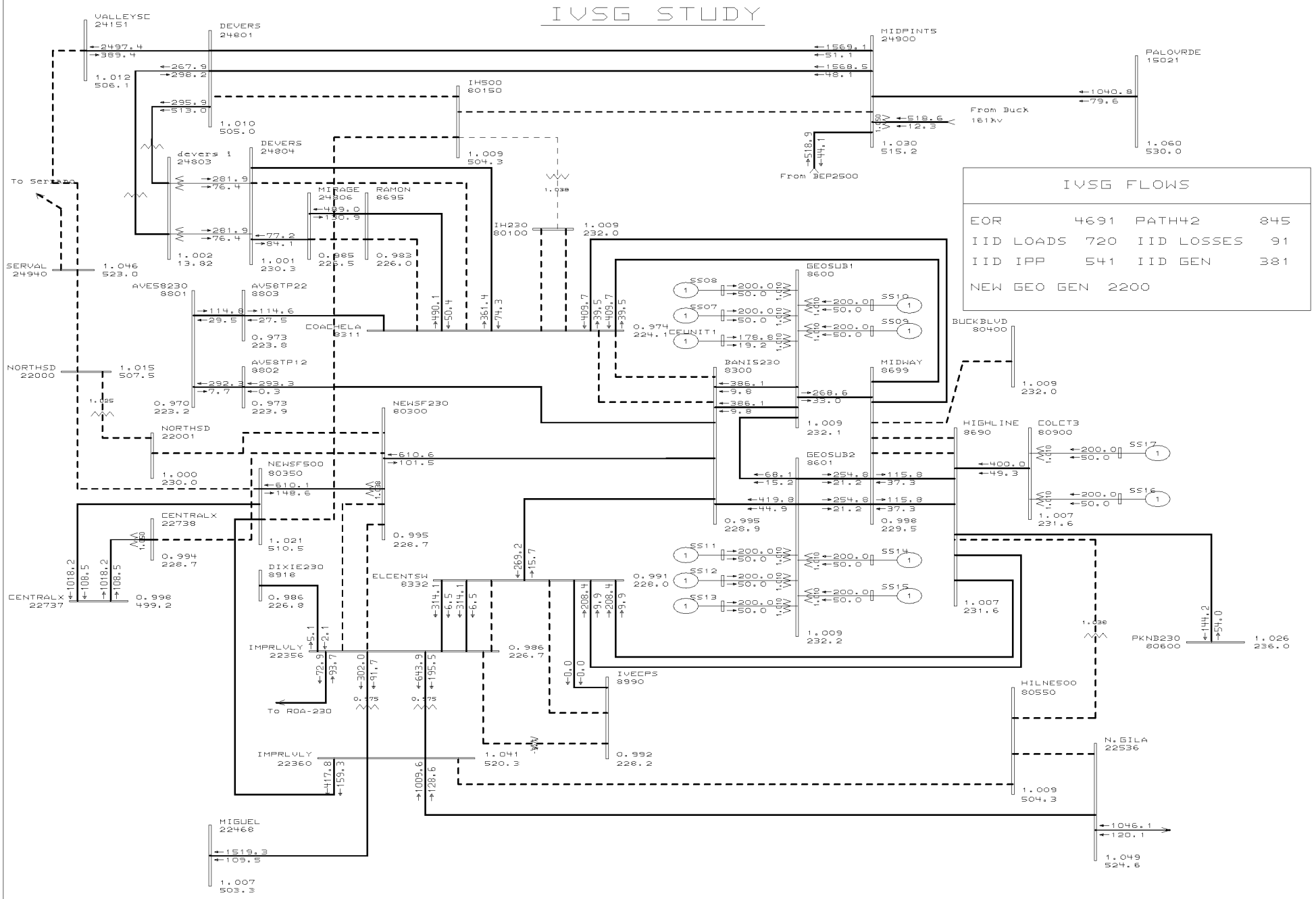
ivsg_la_rev5.sav
No Solve Summary
N-2 Outages

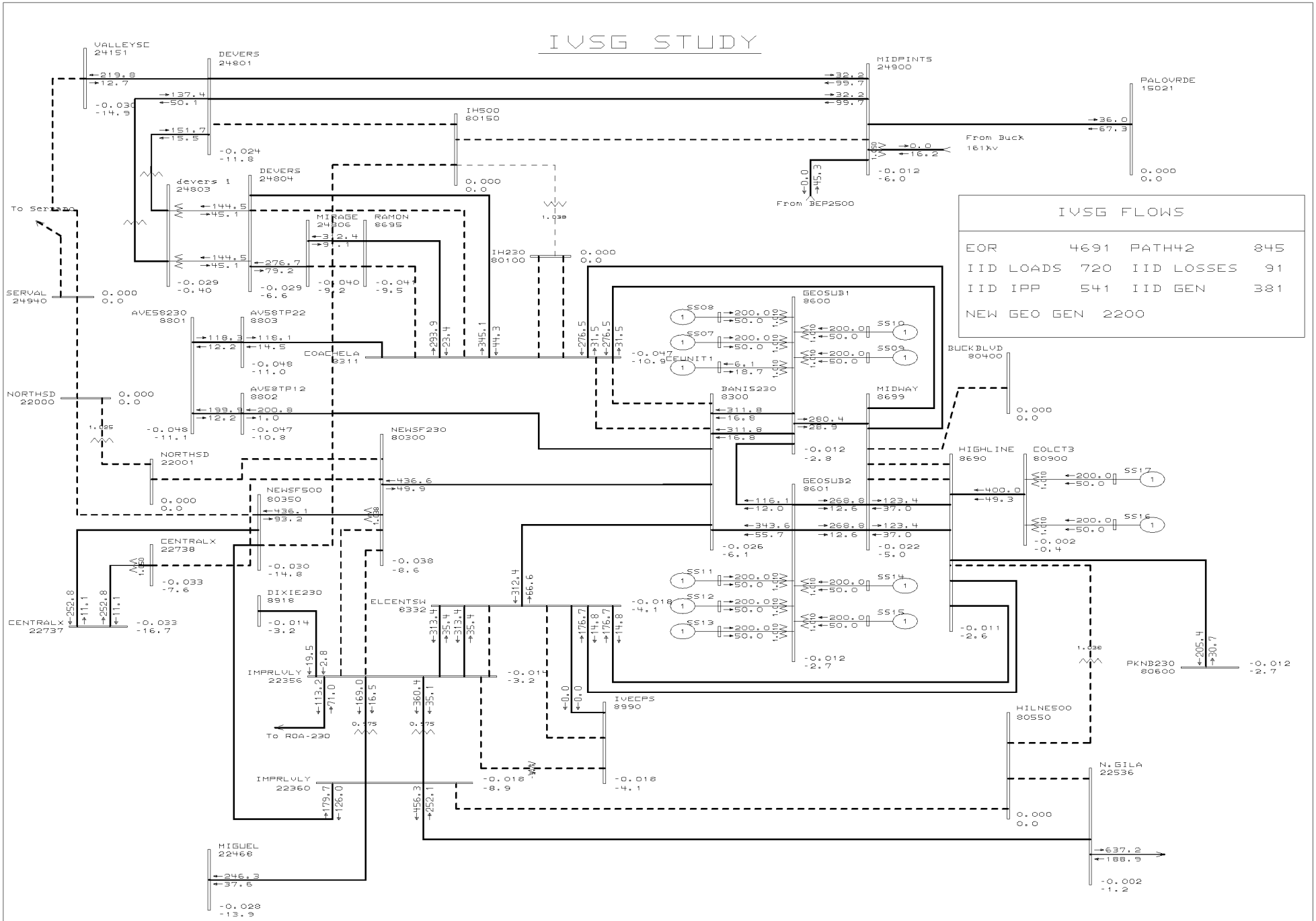
| Contingency-Description | | Case | Problem-Description | | | |
|---|---|---|---|---|---|---|
| line MIDPINTS to DEVERS | 500 ck 1&2 | ivsg_la_rev5 | Pmis | 26114 INTERMTX 345.00 = | -2.00 MW + j | -66.76 MVAR |

# Imperial Valley Study Group

## Appendix B.1.2

Alt 2 D3
Light Autumn
Alternative 2
Dispatch 3


IVSG STUDY
VALLEYSC 24151
DEVERS 24801
MIDPINTS 24900
PALOVRDE 15021
IH500 80150
From Buck 161kV
From BEP2500
devers 1 24803
DEVERS 24804
To Serrano
MIRAGE 24806
RAMON 8695
IH230 80100
SERVAL 24940
AVES8230 8801
AV58TP22 8803
AV58TP12 8802
COACHELA 8311
GEOSUB1 8600
BANIS230 8300
MIDWAY 8699
BUCKBLVD 80400
NORTHSD 22000
NORTHSD 22001
NEWSF230 80300
NEWSF500 80350
GEOSUB2 8601
HIGHLINE 8690
COLCT3 80900
CENTRALX 22738
CENTRALX 22737
DIXIE230 8918
ELCENTSW 8332
IMPRLVLY 22356
IMPRLVLY 22360
IVECPS 8990
To ROA-230
MIGUEL 22468
HILNE500 80550
N.GILA 22536
PKNB230 80600
IVSG FLOWS
EOR 4691 PATH42 845
IID LOADS 720 IID LOSSES 91
IID IPP 541 IID GEN 381
NEW GEO GEN 2200


IVSG STUDY
VALLEYSC 24151
DEVERS 24801
MIDPINTS 24900
PALOVRDE 15021
IH500 80150
From Buck 161kV
From BEP2500
devers 1 24803
DEVERS 24804
To Serrano
MIRAGE 24806
RAMON 8695
IH230 80100
SERVAL 24940
AVE58230 8801
AV58TP22 8803
AV58TP12 8802
COACHELA 8311
GEOSUB1 8600
GEOSUB2 8601
BANIS230 8300
MIDWAY 8699
BUCKBLVD 80400
HIGHLINE 8690
COLCT3 80900
NORTHSD 22000
NORTHSD 22001
NEWSF230 80300
NEWSF500 80350
CENTRALX 22738
CENTRALX 22737
DIXIE230 8918
ELCENTSW 8332
IMPRLVLY 22356
IMPRLVLY 22360
To ROA-230
IVECPS 8990
HILNE500 80550
N.GILA 22536
PKNB230 80600
MIGUEL 22468
IVSG FLOWS
EOR 4691 PATH42 845
IID LOADS 720 IID LOSSES 91
IID IPP 541 IID GEN 381
NEW GEO GEN 2200

ivsg_la_alt2d3.sav
Voltage Summary
N-0 Outages

| Bus | Name | kV | Area | Zone | Outage | Case | Vbase | Vcont | DeltaV | Vmin | Vmax | Max-dv | Contingency Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 14534 | N.GILA 4 | 100 | 14 | 847 | base | ivsg_la_alt2d3 | 0.939 | 0.939 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14606 | N.GILA 3 | 100 | 14 | 847 | base | ivsg_la_alt2d3 | 0.939 | 0.939 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14608 | OCOTIL 1 | 100 | 14 | 141 | base | ivsg_la_alt2d3 | 1.05 | 1.05 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24748 | OXBOW A | 230 | 24 | 247 | base | ivsg_la_alt2d3 | 1.052 | 1.052 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14007 | GILARIVR | 500 | 14 | 141 | base | ivsg_la_alt2d3 | 1.053 | 1.053 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15093 | HARQUAHA | 500 | 14 | 158 | base | ivsg_la_alt2d3 | 1.054 | 1.054 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15089 | JOJOBA | 500 | 14 | 158 | base | ivsg_la_alt2d3 | 1.054 | 1.054 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14000 | CHOLLA | 500 | 14 | 141 | base | ivsg_la_alt2d3 | 1.055 | 1.055 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14001 | FOURCORN | 500 | 14 | 141 | base | ivsg_la_alt2d3 | 1.055 | 1.055 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24141 | SPRINGVL | 230 | 24 | 240 | base | ivsg_la_alt2d3 | 1.055 | 1.055 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24153 | VESTAL | 230 | 24 | 240 | base | ivsg_la_alt2d3 | 1.055 | 1.055 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24775 | RUSH | 115 | 24 | 247 | base | ivsg_la_alt2d3 | 1.056 | 1.056 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24156 | VINCENT | 500 | 24 | 240 | base | ivsg_la_alt2d3 | 1.056 | 1.056 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15031 | PERK PS1 | 500 | 14 | 158 | base | ivsg_la_alt2d3 | 1.057 | 1.057 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15032 | PERK PS2 | 500 | 14 | 158 | base | ivsg_la_alt2d3 | 1.057 | 1.057 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15033 | PERKINPS | 500 | 14 | 158 | base | ivsg_la_alt2d3 | 1.057 | 1.057 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14005 | WESTWING | 500 | 14 | 141 | base | ivsg_la_alt2d3 | 1.057 | 1.057 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 16310 | NL.3WP2 | 100 | 14 | 160 | base | ivsg_la_alt2d3 | 1.057 | 1.057 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 19038 | MEAD | 500 | 14 | 191 | base | ivsg_la_alt2d3 | 1.057 | 1.057 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24729 | INYO | 230 | 24 | 247 | base | ivsg_la_alt2d3 | 1.057 | 1.057 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15092 | ARLINTON | 500 | 14 | 158 | base | ivsg_la_alt2d3 | 1.059 | 1.059 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15094 | MESQUITE | 500 | 14 | 158 | base | ivsg_la_alt2d3 | 1.059 | 1.059 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14009 | REDHAWK | 500 | 14 | 158 | base | ivsg_la_alt2d3 | 1.059 | 1.059 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15021 | PALOVRDE | 500 | 14 | 158 | base | ivsg_la_alt2d3 | 1.06 | 1.06 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15061 | RUDD | 500 | 14 | 158 | base | ivsg_la_alt2d3 | 1.06 | 1.06 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15090 | HASSYAMP | 500 | 14 | 158 | base | ivsg_la_alt2d3 | 1.06 | 1.06 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14100 | CHOLLA | 345 | 14 | 141 | base | ivsg_la_alt2d3 | 1.06 | 1.06 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14010 | TS5 | 500 | 14 | 840 | base | ivsg_la_alt2d3 | 1.061 | 1.061 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15034 | PERKINS | 500 | 14 | 158 | base | ivsg_la_alt2d3 | 1.063 | 1.063 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14006 | YAVAPAI | 500 | 14 | 141 | base | ivsg_la_alt2d3 | 1.063 | 1.063 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24776 | LEE VINE | 115 | 24 | 247 | base | ivsg_la_alt2d3 | 1.063 | 1.063 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24097 | MOHAVE | 500 | 24 | 240 | base | ivsg_la_alt2d3 | 1.063 | 1.063 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15087 | SNTAROSA | 500 | 14 | 158 | base | ivsg_la_alt2d3 | 1.067 | 1.067 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 16302 | NL.3WP | 100 | 14 | 160 | base | ivsg_la_alt2d3 | 1.067 | 1.067 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15088 | PINAL_W | 500 | 14 | 158 | base | ivsg_la_alt2d3 | 1.068 | 1.068 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24235 | RECTOR | 230 | 24 | 240 | base | ivsg_la_alt2d3 | 1.068 | 1.068 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24234 | RECTRSVC | 230 | 24 | 240 | base | ivsg_la_alt2d3 | 1.068 | 1.068 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15001 | CORONADO | 500 | 14 | 140 | base | ivsg_la_alt2d3 | 1.07 | 1.07 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14002 | MOENKOPI | 500 | 14 | 141 | base | ivsg_la_alt2d3 | 1.079 | 1.079 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14003 | NAVAJO | 500 | 14 | 141 | base | ivsg_la_alt2d3 | 1.084 | 1.084 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24304 | BIG CRK4 | 230 | 24 | 243 | base | ivsg_la_alt2d3 | 1.089 | 1.089 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24301 | BIG CRK1 | 230 | 24 | 243 | base | ivsg_la_alt2d3 | 1.09 | 1.09 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24320 | EASTWOOD | 230 | 24 | 243 | base | ivsg_la_alt2d3 | 1.09 | 1.09 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24302 | BIG CRK2 | 230 | 24 | 243 | base | ivsg_la_alt2d3 | 1.091 | 1.091 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24303 | BIG CRK3 | 230 | 24 | 243 | base | ivsg_la_alt2d3 | 1.091 | 1.091 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24305 | BIG CRK8 | 230 | 24 | 243 | base | ivsg_la_alt2d3 | 1.091 | 1.091 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24316 | MAMMOTH | 230 | 24 | 243 | base | ivsg_la_alt2d3 | 1.091 | 1.091 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |

ivsg_la_alt2d3.sav
Flow Summary
N-0 Outages

| LEGEND | % of RATING 1 | |
|---|---|---|
| C_pu | 100% - 110% | |
| C_pu | 110% - 120% | P.U. of |
| C_pu | > 120% | Rate 1 |

| FROM | FR | BKV | TO | TO | BKV | CK | Outage_Name | Case | Rate-Mva | Pflow | Qflow | Amps | MVA | C_pu | B_pu | Contingency_Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24900 | MIDPINTS | 500 | 19399 | BUCK161 | 161 | 1 | base | ivsg_la_alt2d3 | 250 | -514.1 | 79.4 | 583 | 520.2 | 2.08 | 2.08 | Base system (n-0) |
| 19400 | BUCK230 | 230 | 19399 | BUCK161 | 161 | 1 | base | ivsg_la_alt2d3 | 280 | 339.2 | 46.1 | 872.8 | 342.3 | 1.22 | 1.22 | Base system (n-0) |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | base | ivsg_la_alt2d3 | 1411.6 | 1702.4 | 114 | 1817.1 | 1706.2 | 1.126 | 1.126 | Base system (n-0) |
| 16900 | COPPERVR | 345 | 16901 | COPPERVR | 230 | 1 | base | ivsg_la_alt2d3 | 200 | 202.2 | 98.4 | 370.8 | 224.9 | 1.12 | 1.12 | Base system (n-0) |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | base | ivsg_la_alt2d3 | 458 | 478.2 | 48 | 1204.6 | 480.6 | 1.048 | 1.048 | Base system (n-0) |
| 24999 | DEVRSVC1 | 500 | 24801 | DEVERS | 500 | 1 | base | ivsg_la_alt2d3 | 387.5 | 0 | 400.1 | 457.4 | 400.1 | 1.022 | 1.022 | Base system (n-0) |
| 24912 | SHANDIN | 115 | 24916 | TAP902 | 115 | 1 | base | ivsg_la_alt2d3 | 109.1 | -104.3 | 31.6 | 545.1 | 109 | 0.997 | 0.997 | Base system (n-0) |
| 25641 | TAP816 | 115 | 25664 | TAP998 | 115 | 1 | base | ivsg_la_alt2d3 | 107.6 | -96.4 | 41.6 | 537.5 | 105 | 0.996 | 0.996 | Base system (n-0) |
| 25641 | TAP816 | 115 | 25644 | TAP818 | 115 | 1 | base | ivsg_la_alt2d3 | 107.6 | 96.4 | -40.8 | 536 | 104.7 | 0.992 | 0.992 | Base system (n-0) |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | base | ivsg_la_alt2d3 | 1645.4 | 1743.7 | 128 | 1870.7 | 1748.4 | 0.985 | 0.985 | Base system (n-0) |
| 24805 | DEVERS | 115 | 25644 | TAP818 | 115 | 1 | base | ivsg_la_alt2d3 | 217 | -183.7 | 97.6 | 1053.2 | 208 | 0.967 | 0.967 | Base system (n-0) |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | base | ivsg_la_alt2d3 | 2598 | 2522.5 | 141.3 | 2888.4 | 2526.5 | 0.963 | 0.963 | Base system (n-0) |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | base | ivsg_la_alt2d3 | 56 | 51.8 | -5.1 | 255.7 | 52 | 0.94 | 0.94 | Base system (n-0) |
| 25629 | TAP813 | 115 | 25630 | TAP814 | 115 | 1 | base | ivsg_la_alt2d3 | 82.7 | 69.9 | -28.4 | 384.7 | 75.4 | 0.927 | 0.927 | Base system (n-0) |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | base | ivsg_la_alt2d3 | 1120 | -1017.1 | -73.3 | 2574.8 | 1019.7 | 0.91 | 0.91 | Base system (n-0) |

ivsg_la_alt2d3.sav
VOLTAGE Summary
N-1 Outages

| Bus | Name | kV | Area | Zone | Outage | Case | Vbase | Vcont | DeltaV | Vmin | Vmax | Max-dv | Contingency Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22464 | MIGUEL | 230 | 22 | 222 | B2_002 | ivsg_la_alt2d3 | 0.963 | 0.91 | -0.053 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 24017 | BLYTHESC | 161 | 24 | 248 | line_007 | ivsg_la_alt2d3 | 1.001 | 0.913 | -0.088 | 0.9 | 1.05 | 0.05 | line BLYTHE to BLYTHESC 161 ck 1 |
| 22412 | LOSCOCHS | 138 | 22 | 223 | B2_002 | ivsg_la_alt2d3 | 0.97 | 0.918 | -0.053 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22738 | CENTRALX | 230 | 22 | 225 | B2_002 | ivsg_la_alt2d3 | 0.994 | 0.918 | -0.076 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22832 | SYCAMORE | 230 | 22 | 221 | B2_002 | ivsg_la_alt2d3 | 0.979 | 0.92 | -0.059 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22734 | SANTEE | 138 | 22 | 223 | B2_002 | ivsg_la_alt2d3 | 0.973 | 0.92 | -0.053 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22116 | CARLTHTP | 138 | 22 | 223 | B2_002 | ivsg_la_alt2d3 | 0.977 | 0.925 | -0.052 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22737 | CENTRALX | 500 | 22 | 225 | B2_002 | ivsg_la_alt2d3 | 0.998 | 0.925 | -0.073 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 24731 | INYOKERN | 115 | 24 | 247 | line_175 | ivsg_la_alt2d3 | 1.012 | 0.925 | -0.087 | 0.9 | 1.05 | 0.05 | line INYO to COTTONWD 230 ck 1 |
| 22120 | CARLTNHS | 138 | 22 | 223 | B2_002 | ivsg_la_alt2d3 | 0.977 | 0.926 | -0.051 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22124 | CHCARITA | 138 | 22 | 225 | B2_002 | ivsg_la_alt2d3 | 0.982 | 0.929 | -0.052 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22831 | SYCAMORE | 138 | 22 | 221 | B2_002 | ivsg_la_alt2d3 | 0.984 | 0.929 | -0.055 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22424 | MAINST50 | 138 | 22 | 222 | B2_002 | ivsg_la_alt2d3 | 0.98 | 0.93 | -0.05 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22428 | MAINST51 | 138 | 22 | 222 | B2_002 | ivsg_la_alt2d3 | 0.98 | 0.93 | -0.05 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22772 | SOUTHBAY | 138 | 22 | 222 | B2_002 | ivsg_la_alt2d3 | 0.98 | 0.93 | -0.05 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22852 | TELECYN | 138 | 22 | 222 | B2_002 | ivsg_la_alt2d3 | 0.992 | 0.941 | -0.051 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 80300 | NEWSF230 | 230 | 8 | 800 | line_56 | ivsg_la_alt2d3 | 0.995 | 0.943 | -0.052 | 0.9 | 1.05 | 0.05 | line NEWSF500 to IMPRLVLY 500 ck 1 |
| 22672 | PRCTRVLY | 138 | 22 | 222 | B2_002 | ivsg_la_alt2d3 | 0.994 | 0.943 | -0.051 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22460 | MIGUEL | 138 | 22 | 222 | B2_002 | ivsg_la_alt2d3 | 0.996 | 0.944 | -0.052 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22468 | MIGUEL | 500 | 22 | 227 | B2_002 | ivsg_la_alt2d3 | 1.007 | 0.948 | -0.058 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 24739 | MC GEN | 115 | 24 | 247 | line_175 | ivsg_la_alt2d3 | 1.032 | 0.95 | -0.081 | 0.9 | 1.05 | 0.05 | line INYO to COTTONWD 230 ck 1 |
| 24749 | SEARLES | 115 | 24 | 247 | line_175 | ivsg_la_alt2d3 | 1.032 | 0.95 | -0.081 | 0.9 | 1.05 | 0.05 | line INYO to COTTONWD 230 ck 1 |
| 24762 | TAP702 | 115 | 24 | 247 | line_175 | ivsg_la_alt2d3 | 1.032 | 0.95 | -0.081 | 0.9 | 1.05 | 0.05 | line INYO to COTTONWD 230 ck 1 |
| 24763 | TAP703 | 115 | 24 | 247 | line_175 | ivsg_la_alt2d3 | 1.032 | 0.95 | -0.081 | 0.9 | 1.05 | 0.05 | line INYO to COTTONWD 230 ck 1 |
| 24768 | RANDSBRG | 115 | 24 | 247 | line_175 | ivsg_la_alt2d3 | 1.007 | 0.952 | -0.055 | 0.9 | 1.05 | 0.05 | line INYO to COTTONWD 230 ck 1 |
| 24761 | TAP701 | 115 | 24 | 247 | line_175 | ivsg_la_alt2d3 | 1.007 | 0.952 | -0.055 | 0.9 | 1.05 | 0.05 | line INYO to COTTONWD 230 ck 1 |
| 22472 | MIGUELMP | 500 | 22 | 227 | B2_002 | ivsg_la_alt2d3 | 1.009 | 0.953 | -0.056 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 80350 | NEWSF500 | 500 | 8 | 800 | line_56 | ivsg_la_alt2d3 | 1.021 | 0.964 | -0.057 | 0.9 | 1.05 | 0.05 | line NEWSF500 to IMPRLVLY 500 ck 1 |
| 14534 | N.GILA 4 | 100 | 14 | 847 | NG500/69 | ivsg_la_alt2d3 | 0.939 | 1 | 0.061 | 0.9 | 1.05 | 0.05 | tran N.GILA 500 to N.GILA 69 ck 1 |
| 24035 | EAGLEMTN | 161 | 24 | 248 | tran_241 | ivsg_la_alt2d3 | 0.964 | 1.023 | 0.058 | 0.9 | 1.05 | 0.05 | tran EAGLEMTN 230 to EAGLEMTN 161 ck 1 |
| 24142 | SYC CYN | 230 | 24 | 240 | line_086 | ivsg_la_alt2d3 | 1.037 | 1.091 | 0.054 | 0.9 | 1.05 | 0.05 | line MAGUNDEN to OMAR 230 ck 1 |
| 25613 | EDMONSTN | 230 | 24 | 256 | line_122 | ivsg_la_alt2d3 | 1.024 | 1.091 | 0.067 | 0.9 | 1.05 | 0.05 | line PASTORIA to EDMONSTN 230 ck 1 |
| 24142 | SYC CYN | 230 | 24 | 240 | line_140 | ivsg_la_alt2d3 | 1.037 | 1.091 | 0.054 | 0.9 | 1.05 | 0.05 | line SYC CYN to OMAR 230 ck 1 |

ivsg_la_alt2d3.sav
FLOW Summary
N-1 Outages

| LEGEND | % of RATING 1 | |
|---|---|---|
| C_pu | 100% - 110% | |
| C_pu | 110% - 120% | P.U. of |
| C_pu | > 120% | Rate 1 |

| FROM | FR | BKV | TO | TO | BKV | CK | Outage_Name | Case | Rate-Mva | Pflow | Qflow | Amps | MVA | C_pu | B_pu | Contingency_Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24142 | SYC CYN | 230 | 24101 | OMAR | 230 | 1 | line_086 | ivsg_la_alt2d3 | 643 | 720 | 5514.8 | 12797.4 | 5561.6 | 7.929 | 0.422 | line MAGUNDEN to OMAR 230 ck 1 |
| 24781 | NAVYCOSO | 230 | 24706 | BLM EAST | 230 | 1 | line_173 | ivsg_la_alt2d3 | 1287 | -152.8 | -3160.7 | 7943.4 | 3164.4 | 2.459 | 0.056 | line BLM EAST to BLM WEST 230 ck 1 |
| 24781 | NAVYCOSO | 230 | 24706 | BLM EAST | 230 | 1 | line_174 | ivsg_la_alt2d3 | 1287 | -152.8 | -3160.7 | 7943.4 | 3164.4 | 2.459 | 0.056 | line BLM WEST to KRAMER 230 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_175 | ivsg_la_alt2d3 | 56 | -106.6 | 5.5 | 544.3 | 106.8 | 1.91 | 0.94 | line INYO to COTTONWD 230 ck 1 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_001 | ivsg_la_alt2d3 | 1411.6 | 2582.5 | 379.5 | 2793 | 2610.2 | 1.731 | 1.126 | line MOENKOPI to ELDORDO 500 ck 1 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | B2_002 | ivsg_la_alt2d3 | 1120 | -1668.2 | -79.8 | 4564.8 | 1670.1 | 1.5 | 0.91 | IMPRLVLY - MIGUEL 1 500kV |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_202 | ivsg_la_alt2d3 | 56 | 80.7 | -10 | 406.1 | 81.3 | 1.47 | 0.94 | line OWENSCON to INYO 230 ck 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_206 | ivsg_la_alt2d3 | 458 | 615.6 | 109.2 | 1565.1 | 625.2 | 1.362 | 1.048 | line SERRANO to VALLEYSC 500 ck 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_135 | ivsg_la_alt2d3 | 458 | 606.7 | 77.8 | 1538 | 611.7 | 1.338 | 1.048 | line SANBRDNO to DEVERS 230 ck 1 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | B2_002 | ivsg_la_alt2d3 | 388 | -465 | -22.5 | 1224.4 | 465.5 | 1.257 | 0.841 | IMPRLVLY - MIGUEL 1 500kV |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_183 | ivsg_la_alt2d3 | 458 | 561.7 | 74.3 | 1422 | 566.6 | 1.237 | 1.048 | line DEVERS to VSTA 230 ck 2 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_185 | ivsg_la_alt2d3 | 458 | 561.7 | 74.3 | 1422 | 566.6 | 1.237 | 1.048 | line VSTA to DEVERS 230 ck 1 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | B2_001 | ivsg_la_alt2d3 | 1411.6 | 1805.7 | 162 | 1942.4 | 1813 | 1.204 | 1.126 | HASSYAMP - N.GILA 1 500kV |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_206 | ivsg_la_alt2d3 | 1411.6 | 1802.3 | 162.9 | 1939 | 1809.7 | 1.202 | 1.126 | line SERRANO to VALLEYSC 500 ck 1 |
| 22464 | MIGUEL | 230 | 22472 | MIGUELMP | 500 | 1 | ML81 | ivsg_la_alt2d3 | 1120 | -1338.8 | 167.7 | 3532.2 | 1349.2 | 1.2 | 0.7 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 22468 | MIGUEL | 500 | 22472 | MIGUELMP | 500 | 1 | ML81 | ivsg_la_alt2d3 | 1120 | 1341.1 | 59 | 1547.5 | 1342.4 | 1.2 | 0.7 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 22464 | MIGUEL | 230 | 22468 | MIGUEL | 500 | 1 | ML80 | ivsg_la_alt2d3 | 1120 | -1320.9 | 167.9 | 3486.6 | 1331.5 | 1.19 | 0.66 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | B2_003 | ivsg_la_alt2d3 | 1411.6 | 1776 | 151.1 | 1906.8 | 1782.4 | 1.182 | 1.126 | N.GILA - IMPRLVLY 1 500kV |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | B2_002 | ivsg_la_alt2d3 | 1411.6 | 1760.7 | 156.1 | 1891.4 | 1767.6 | 1.173 | 1.126 | IMPRLVLY - MIGUEL 1 500kV |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_84 | ivsg_la_alt2d3 | 1411.6 | 1763 | 142.6 | 1890.3 | 1768.7 | 1.172 | 1.126 | line MIDPINTS to DEVERS 500 ck 1 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_85 | ivsg_la_alt2d3 | 1411.6 | 1762.9 | 142.5 | 1890.2 | 1768.7 | 1.172 | 1.126 | line MIDPINTS to DEVERS 500 ck 2 |
| 22356 | IMPRLVLY | 230 | 22360 | IMPRLVLY | 500 | 1 | IV81 | ivsg_la_alt2d3 | 600 | 669.5 | 217.9 | 1784.7 | 704.1 | 1.17 | 0.53 | tran IMPRLVLY 230 to IMPRLVLY 500 ck 2 |
| 24806 | MIRAGE | 230 | 24807 | MIRAGE | 115 | 2 | tran_238 | ivsg_la_alt2d3 | 280 | 319.8 | 24.2 | 823 | 320.7 | 1.15 | 0.58 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 24900 | MIDPINTS | 500 | 24801 | DEVERS | 500 | 2 | line_84 | ivsg_la_alt2d3 | 2338 | 2678.6 | 363.1 | 3061.3 | 2703.1 | 1.137 | 0.653 | line MIDPINTS to DEVERS 500 ck 1 |
| 24900 | MIDPINTS | 500 | 24801 | DEVERS | 500 | 1 | line_85 | ivsg_la_alt2d3 | 2338 | 2678.9 | 363.9 | 3062 | 2703.5 | 1.137 | 0.654 | line MIDPINTS to DEVERS 500 ck 2 |
| 20238 | HRD-230 | 230 | 20118 | ROA-230 | 230 | 1 | B2_002 | ivsg_la_alt2d3 | 388 | -402.1 | 109.4 | 1100.1 | 416.8 | 1.132 | 0.72 | IMPRLVLY - MIGUEL 1 500kV |
| 20238 | HRD-230 | 230 | 20239 | HRD-115 | 115 | 1 | B2_002 | ivsg_la_alt2d3 | 225 | 251.7 | -29.7 | 669.1 | 253.5 | 1.13 | 0.83 | IMPRLVLY - MIGUEL 1 500kV |
| 24729 | INYO | 230 | 24730 | INYO PS | 115 | 1 | line_175 | ivsg_la_alt2d3 | 50 | 53.3 | 18.9 | 136.1 | 56.5 | 1.13 | 0.54 | line INYO to COTTONWD 230 ck 1 |
| 24729 | INYO | 230 | 24730 | INYO PS | 115 | 2 | line_175 | ivsg_la_alt2d3 | 50 | 53.3 | 18.9 | 136.1 | 56.5 | 1.13 | 0.54 | line INYO to COTTONWD 230 ck 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | B2_002 | ivsg_la_alt2d3 | 458 | 499.6 | 40.2 | 1294.6 | 501.2 | 1.126 | 1.048 | IMPRLVLY - MIGUEL 1 500kV |
| 24723 | CONTROL | 115 | 24731 | INYOKERN | 115 | 1 | line_175 | ivsg_la_alt2d3 | 82.7 | 88.9 | -7.5 | 457.5 | 89.3 | 1.102 | 0.305 | line INYO to COTTONWD 230 ck 1 |
| 24723 | CONTROL | 115 | 24731 | INYOKERN | 115 | 2 | line_175 | ivsg_la_alt2d3 | 82.7 | 88.9 | -7.5 | 457.5 | 89.3 | 1.102 | 0.305 | line INYO to COTTONWD 230 ck 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_001 | ivsg_la_alt2d3 | 458 | 495 | 44.5 | 1263.5 | 497 | 1.099 | 1.048 | line MOENKOPI to ELDORDO 500 ck 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_085 | ivsg_la_alt2d3 | 458 | 495 | 45.6 | 1259.8 | 497.1 | 1.096 | 1.048 | line LUGO to VICTORVL 500 ck 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_66 | ivsg_la_alt2d3 | 458 | 492.3 | 45.1 | 1256.9 | 494.3 | 1.093 | 1.048 | line CENTRALX to NEWSF500 500 ck 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_047 | ivsg_la_alt2d3 | 458 | 489.8 | 47.5 | 1248.2 | 492.1 | 1.086 | 1.048 | line ELDORDO to LUGO 500 ck 1 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_085 | ivsg_la_alt2d3 | 1411.6 | 1637.5 | 123.8 | 1749.1 | 1642.2 | 1.084 | 1.126 | line LUGO to VICTORVL 500 ck 1 |
| 20238 | HRD-230 | 230 | 20102 | RUM-230 | 230 | 1 | B2_002 | ivsg_la_alt2d3 | 388 | -382.9 | 105.2 | 1048.1 | 397.1 | 1.08 | 0.672 | IMPRLVLY - MIGUEL 1 500kV |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_169 | ivsg_la_alt2d3 | 56 | 59.5 | -5 | 295.7 | 59.8 | 1.07 | 0.94 | line KRAMER to LUGO 230 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_170 | ivsg_la_alt2d3 | 56 | 59.5 | -5 | 295.7 | 59.8 | 1.07 | 0.94 | line KRAMER to LUGO 230 ck 2 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | line_66 | ivsg_la_alt2d3 | 388 | -402.4 | 2.4 | 1041.6 | 402.4 | 1.069 | 0.841 | line CENTRALX to NEWSF500 500 ck 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | B2_001 | ivsg_la_alt2d3 | 1645.4 | 1861.9 | 177 | 2017.5 | 1870.2 | 1.062 | 0.985 | HASSYAMP - N.GILA 1 500kV |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_206 | ivsg_la_alt2d3 | 1645.4 | 1860.6 | 178.9 | 2016.4 | 1869.2 | 1.061 | 0.985 | line SERRANO to VALLEYSC 500 ck 1 |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_206 | ivsg_la_alt2d3 | 458 | 456.2 | -38.7 | 1197.6 | 457.8 | 1.042 | 0.734 | line SERRANO to VALLEYSC 500 ck 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | B2_003 | ivsg_la_alt2d3 | 1645.4 | 1828.6 | 166.6 | 1976.6 | 1836.2 | 1.04 | 0.985 | N.GILA - IMPRLVLY 1 500kV |
| 24805 | DEVERS | 115 | 24804 | DEVERS | 230 | 1 | tran_236 | ivsg_la_alt2d3 | 280 | 254.2 | -95.2 | 1363.1 | 271.5 | 1.04 | 0.68 | tran DEVERS 115 to DEVERS 230 ck 3 |
| 8601 | GEOSUB2 | 230 | 8300 | BANIS230 | 230 | 1 | line_22 | ivsg_la_alt2d3 | 550 | 570.4 | 63.5 | 1433.3 | 574 | 1.039 | 0.761 | line GEOSUB1 to BANIS230 230 ck 1 |
| 8601 | GEOSUB2 | 230 | 8300 | BANIS230 | 230 | 1 | line_23 | ivsg_la_alt2d3 | 550 | 570.4 | 63.5 | 1433.3 | 574 | 1.039 | 0.761 | line GEOSUB1 to BANIS230 230 ck 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | B2_002 | ivsg_la_alt2d3 | 2598 | 2636.6 | 222 | 3108.6 | 2645.9 | 1.036 | 0.963 | IMPRLVLY - MIGUEL 1 500kV |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | B2_002 | ivsg_la_alt2d3 | 1645.4 | 1810.9 | 173.4 | 1958.9 | 1819.1 | 1.031 | 0.985 | IMPRLVLY - MIGUEL 1 500kV |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_84 | ivsg_la_alt2d3 | 1645.4 | 1814.1 | 157.5 | 1957.6 | 1821 | 1.03 | 0.985 | line MIDPINTS to DEVERS 500 ck 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_85 | ivsg_la_alt2d3 | 1645.4 | 1814.1 | 157.4 | 1957.6 | 1820.9 | 1.03 | 0.985 | line MIDPINTS to DEVERS 500 ck 2 |
| 24805 | DEVERS | 115 | 24804 | DEVERS | 230 | 3 | tran_235 | ivsg_la_alt2d3 | 280 | 251.3 | -93 | 1337.5 | 268 | 1.03 | 0.66 | tran DEVERS 115 to DEVERS 230 ck 1 |
| 24805 | DEVERS | 115 | 24804 | DEVERS | 230 | 1 | tran_237 | ivsg_la_alt2d3 | 280 | 252.8 | -94.5 | 1354.1 | 269.9 | 1.03 | 0.68 | tran DEVERS 115 to DEVERS 230 ck 4 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | PV1 | ivsg_la_alt2d3 | 1411.6 | 1570.3 | 57.8 | 1663.7 | 1571.4 | 1.029 | 1.126 | gen PALOVRD1 24.00 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_183 | ivsg_la_alt2d3 | 2598 | 2670.5 | 230.6 | 3072.6 | 2680.4 | 1.024 | 0.963 | line DEVERS to VSTA 230 ck 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_185 | ivsg_la_alt2d3 | 2598 | 2670.5 | 230.6 | 3072.6 | 2680.4 | 1.024 | 0.963 | line VSTA to DEVERS 230 ck 1 |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_135 | ivsg_la_alt2d3 | 458 | 447.9 | -64.8 | 1174.9 | 452.6 | 1.022 | 0.734 | line SANBRDNO to DEVERS 230 ck 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_001 | ivsg_la_alt2d3 | 2598 | 2622.6 | 176.9 | 3052.7 | 2628.6 | 1.018 | 0.963 | line MOENKOPI to ELDORDO 500 ck 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_135 | ivsg_la_alt2d3 | 2598 | 2646.6 | 213.2 | 3046 | 2655.2 | 1.015 | 0.963 | line SANBRDNO to DEVERS 230 ck 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_29 | ivsg_la_alt2d3 | 458 | 465.6 | 48.1 | 1164.8 | 468.1 | 1.014 | 1.048 | line HIGHLINE to COLCT3 230 ck 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | B2_001 | ivsg_la_alt2d3 | 2598 | 2599.4 | 183.9 | 3041.1 | 2605.9 | 1.014 | 0.963 | HASSYAMP - N.GILA 1 500kV |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_085 | ivsg_la_alt2d3 | 2598 | 2616.7 | 168.1 | 3034.5 | 2622.1 | 1.012 | 0.963 | line LUGO to VICTORVL 500 ck 1 |
| 24701 | KRAMER | 230 | 24085 | LUGO | 230 | 2 | line_169 | ivsg_la_alt2d3 | 478 | 479 | 67.6 | 1214.5 | 483.7 | 1.012 | 0.607 | line KRAMER to LUGO 230 ck 1 |
| 24701 | KRAMER | 230 | 24085 | LUGO | 230 | 1 | line_170 | ivsg_la_alt2d3 | 478 | 479 | 67.6 | 1214.5 | 483.7 | 1.012 | 0.607 | line KRAMER to LUGO 230 ck 2 |
| 20238 | HRD-230 | 230 | 20239 | HRD-115 | 115 | 1 | line_66 | ivsg_la_alt2d3 | 225 | 224.1 | -22.9 | 579.9 | 225.3 | 1.01 | 0.83 | line CENTRALX to NEWSF500 500 ck 1 |
| 24805 | DEVERS | 115 | 24804 | DEVERS | 230 | 4 | tran_235 | ivsg_la_alt2d3 | 280 | 248.4 | -91.9 | 1321.9 | 264.8 | 1.01 | 0.65 | tran DEVERS 115 to DEVERS 230 ck 1 |
| 24805 | DEVERS | 115 | 24804 | DEVERS | 230 | 3 | tran_237 | ivsg_la_alt2d3 | 280 | 246.8 | -92.3 | 1322.2 | 263.5 | 1.01 | 0.66 | tran DEVERS 115 to DEVERS 230 ck 4 |
| 24151 | VALLEYSC | 500 | 24160 | VALLEYSC | 115 | 2 | tran_247 | ivsg_la_alt2d3 | 560 | 541 | 163.9 | 650.7 | 565.3 | 1.01 | 0.49 | tran VALLEYSC 500 to VALLEYSC 115 ck 1 |
| 24151 | VALLEYSC | 500 | 24160 | VALLEYSC | 115 | 1 | tran_248 | ivsg_la_alt2d3 | 560 | 541 | 163.9 | 650.7 | 565.3 | 1.01 | 0.49 | tran VALLEYSC 500 to VALLEYSC 115 ck 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | B2_003 | ivsg_la_alt2d3 | 2598 | 2594 | 182.1 | 3022.2 | 2600.4 | 1.007 | 0.963 | N.GILA - IMPRLVLY 1 500kV |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_66 | ivsg_la_alt2d3 | 2598 | 2591.1 | 184.3 | 3008.1 | 2597.6 | 1.003 | 0.963 | line CENTRALX to NEWSF500 500 ck 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_302 | ivsg_la_alt2d3 | 2598 | 2614.1 | 193.9 | 3005.8 | 2621.3 | 1.002 | 0.963 | line DEVERS to OAK_VLLY 230 ck 1 |
| 24805 | DEVERS | 115 | 24804 | DEVERS | 230 | 4 | tran_236 | ivsg_la_alt2d3 | 280 | 245.4 | -91.9 | 1315.5 | 262 | 1 | 0.65 | tran DEVERS 115 to DEVERS 230 ck 3 |
| 8600 | GEOSUB1 | 230 | 8300 | BANIS230 | 230 | 1 | line_47 | ivsg_la_alt2d3 | 550 | 548.4 | 59.9 | 1378.8 | 551.7 | 0.999 | 0.706 | line GEOSUB2 to BANIS230 230 ck 1 |
| 8600 | GEOSUB1 | 230 | 8300 | BANIS230 | 230 | 2 | line_47 | ivsg_la_alt2d3 | 550 | 548.4 | 59.9 | 1378.8 | 551.7 | 0.999 | 0.706 | line GEOSUB2 to BANIS230 230 ck 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_84 | ivsg_la_alt2d3 | 458 | 448.9 | 26.9 | 1148 | 449.7 | 0.999 | 1.048 | line MIDPINTS to DEVERS 500 ck 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_047 | ivsg_la_alt2d3 | 2598 | 2583.1 | 187 | 2998.2 | 2589.9 | 0.999 | 0.963 | line ELDORDO to LUGO 500 ck 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_85 | ivsg_la_alt2d3 | 458 | 449 | 27 | 1148 | 449.8 | 0.998 | 1.048 | line MIDPINTS to DEVERS 500 ck 2 |
| 22738 | CENTRALX | 230 | 22832 | SYCAMORE | 230 | 2 | B2_002 | ivsg_la_alt2d3 | 912 | 834.1 | 39.9 | 2282.4 | 835.1 | 0.997 | 0.562 | IMPRLVLY - MIGUEL 1 500kV |
| 22738 | CENTRALX | 230 | 22832 | SYCAMORE | 230 | 1 | B2_002 | ivsg_la_alt2d3 | 912 | 834.1 | 39.9 | 2282.4 | 835.1 | 0.997 | 0.562 | IMPRLVLY - MIGUEL 1 500kV |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | ML80 | ivsg_la_alt2d3 | 1120 | -1106.8 | -65.6 | 2817.7 | 1108.7 | 0.99 | 0.91 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | ML81 | ivsg_la_alt2d3 | 1120 | -1098.5 | -66.5 | 2795.2 | 1100.5 | 0.99 | 0.91 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | tran_210 | ivsg_la_alt2d3 | 56 | 54.8 | -5 | 270.9 | 55 | 0.99 | 0.94 | tran LUGO 500 to LUGO 230 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | tran_211 | ivsg_la_alt2d3 | 56 | 54.8 | -5 | 271.1 | 55 | 0.99 | 0.94 | tran LUGO 500 to LUGO 230 ck 2 |
| 8600 | GEOSUB1 | 230 | 8300 | BANIS230 | 230 | 2 | line_22 | ivsg_la_alt2d3 | 550 | 542.8 | 60.6 | 1363.6 | 546.2 | 0.988 | 0.706 | line GEOSUB1 to BANIS230 230 ck 1 |
| 8600 | GEOSUB1 | 230 | 8300 | BANIS230 | 230 | 1 | line_23 | ivsg_la_alt2d3 | 550 | 542.8 | 60.6 | 1363.6 | 546.2 | 0.988 | 0.706 | line GEOSUB1 to BANIS230 230 ck 2 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_56 | ivsg_la_alt2d3 | 800 | 756.6 | 127.5 | 1975.8 | 767.2 | 0.984 | 0.779 | line NEWSF500 to IMPRLVLY 500 ck 1 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | B2_003 | ivsg_la_alt2d3 | 800 | 773.8 | 33.7 | 1974.8 | 774.5 | 0.983 | 0.779 | N.GILA - IMPRLVLY 1 500kV |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | SO2 | ivsg_la_alt2d3 | 1120 | -1086.5 | -93.4 | 2857.8 | 1090.5 | 0.98 | 0.91 | gen S.ONOFR2 22.00 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | B2_022 | ivsg_la_alt2d3 | 1120 | -1083.8 | -64.3 | 2768.4 | 1085.7 | 0.97 | 0.91 | OTAYMESA - TJI-230 1 230kV |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | B2_028 | ivsg_la_alt2d3 | 1120 | -1084.8 | -56.5 | 2747.5 | 1086.3 | 0.97 | 0.91 | MIGUEL - SYCAMORE 1 230kV |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_086 | ivsg_la_alt2d3 | 56 | 53.7 | -5.6 | 266.3 | 54 | 0.97 | 0.94 | line MAGUNDEN to OMAR 230 ck 1 |
| 24801 | DEVERS | 500 | 24804 | DEVERS | 230 | 1 | line_206 | ivsg_la_alt2d3 | 1120 | 756.2 | 772.7 | 1205 | 1081.2 | 0.97 | 0.53 | line SERRANO to VALLEYSC 500 ck 1 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | line_206 | ivsg_la_alt2d3 | 1120 | -1083 | -71.8 | 2791.5 | 1085.4 | 0.97 | 0.91 | line SERRANO to VALLEYSC 500 ck 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_059 | ivsg_la_alt2d3 | 458 | 442.1 | 41.2 | 1112.3 | 444 | 0.968 | 1.048 | line ETIWANDA to SANBRDNO 230 ck 1 |
| 24016 | BARRE | 230 | 25201 | LEWIS | 230 | 1 | line_024 | ivsg_la_alt2d3 | 1195 | -1083.8 | 279.5 | 2892 | 1119.3 | 0.964 | 0.628 | line BARRE to VILLA PK 230 ck 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | PV1 | ivsg_la_alt2d3 | 458 | 442.4 | 46 | 1092.7 | 444.8 | 0.951 | 1.048 | gen PALOVRD1 24.00 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_047 | ivsg_la_alt2d3 | 1645.4 | 1672.8 | 161.4 | 1801.7 | 1680.6 | 0.95 | 0.985 | line ELDORDO to LUGO 500 ck 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_085 | ivsg_la_alt2d3 | 1645.4 | 1679.6 | 147 | 1804 | 1686 | 0.95 | 0.985 | line LUGO to VICTORVL 500 ck 1 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | IV81 | ivsg_la_alt2d3 | 388 | -361.2 | 8.1 | 923.8 | 361.3 | 0.948 | 0.841 | tran IMPRLVLY 230 to IMPRLVLY 500 ck 2 |
| 20238 | HRD-230 | 230 | 20118 | ROA-230 | 230 | 1 | line_66 | ivsg_la_alt2d3 | 388 | -344.7 | 90.9 | 917.5 | 356.4 | 0.947 | 0.72 | line CENTRALX to NEWSF500 500 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_002 | ivsg_la_alt2d3 | 204.1 | 179.2 | -10.4 | 808 | 179.5 | 0.946 | 0.55 | IMPRLVLY - MIGUEL 1 500kV |
| 24042 | ELDORDO | 500 | 24086 | LUGO | 500 | 1 | line_085 | ivsg_la_alt2d3 | 1386 | 1366.1 | 44.9 | 1513.1 | 1366.8 | 0.945 | 0.691 | line LUGO to VICTORVL 500 ck 1 |
| 22360 | IMPRLVLY | 500 | 22468 | MIGUEL | 500 | 1 | line_66 | ivsg_la_alt2d3 | 2252 | 2083.8 | 471.5 | 2406.3 | 2136.5 | 0.942 | 0.672 | line CENTRALX to NEWSF500 500 ck 1 |
| 22464 | MIGUEL | 230 | 22472 | MIGUELMP | 500 | 1 | line_66 | ivsg_la_alt2d3 | 1120 | -1051.4 | 118.1 | 2865.7 | 1058 | 0.94 | 0.7 | line CENTRALX to NEWSF500 500 ck 1 |
| 22468 | MIGUEL | 500 | 22472 | MIGUELMP | 500 | 1 | line_66 | ivsg_la_alt2d3 | 1120 | 1052.9 | 31.1 | 1255.5 | 1053.4 | 0.94 | 0.7 | line CENTRALX to NEWSF500 500 ck 1 |
| 24151 | VALLEYSC | 500 | 24229 | VALLEY-S | 115 | 4 | tran_249 | ivsg_la_alt2d3 | 560 | 518.5 | 94.8 | 605.6 | 527.1 | 0.94 | 0.46 | tran VALLEYSC 500 to VALLEY-S 115 ck 3 |
| 24151 | VALLEYSC | 500 | 24229 | VALLEY-S | 115 | 3 | tran_250 | ivsg_la_alt2d3 | 560 | 518.5 | 94.8 | 605.6 | 527.1 | 0.94 | 0.46 | tran VALLEYSC 500 to VALLEY-S 115 ck 4 |
| 20238 | HRD-230 | 230 | 20239 | HRD-115 | 115 | 1 | IV81 | ivsg_la_alt2d3 | 225 | 205.5 | -15.3 | 524.6 | 206.1 | 0.92 | 0.83 | tran IMPRLVLY 230 to IMPRLVLY 500 ck 2 |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_183 | ivsg_la_alt2d3 | 458 | 405.4 | -47.3 | 1058.2 | 408.1 | 0.92 | 0.734 | line DEVERS to VSTA 230 ck 2 |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_185 | ivsg_la_alt2d3 | 458 | 405.4 | -47.3 | 1058.2 | 408.1 | 0.92 | 0.734 | line VSTA to DEVERS 230 ck 1 |
| 8695 | RAMON | 230 | 24806 | MIRAGE | 230 | 2 | line_44 | ivsg_la_alt2d3 | 800 | 688 | -181.4 | 1832.7 | 711.5 | 0.913 | 0.643 | line COACHELA to DEVERS 230 ck 2 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | SO2 | ivsg_la_alt2d3 | 388 | -344.8 | 10 | 888.3 | 345 | 0.912 | 0.841 | gen S.ONOFR2 22.00 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | B2_001 | ivsg_la_alt2d3 | 800 | 725.1 | 3.4 | 1827.8 | 725.1 | 0.91 | 0.779 | HASSYAMP - N.GILA 1 500kV |
| 22832 | SYCAMORE | 230 | 22652 | PENSQTOS | 230 | 1 | B2_009 | ivsg_la_alt2d3 | 796.7 | 700.4 | -41 | 1806 | 701.6 | 0.903 | 0.617 | EPP - ESCNDIDO 1 230kV |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_122 | ivsg_la_alt2d3 | 56 | 49.6 | -4.8 | 244 | 49.8 | 0.9 | 0.94 | line PASTORIA to EDMONSTN 230 ck 1 |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24729 | INYO | 230 | 24730 | INYO PS | 115 | 2 | tran_230 | ivsg_la_alt2d3 | 50 | -43.4 | 12.5 | 107.2 | 45.2 | 0.9 | 0.54 | tran INYO 230 to INYO PS 115 ck 1 |
| 24729 | INYO | 230 | 24730 | INYO PS | 115 | 1 | tran_231 | ivsg_la_alt2d3 | 50 | -43.4 | 12.5 | 107.2 | 45.2 | 0.9 | 0.54 | tran INYO 230 to INYO PS 115 ck 2 |

ivsg_la_alt2d3.sav
No Solve Summary
N-1 Outages

| Contingency-Description | Case | Problem-Description |
|---|---|---|
| line DEVERS to VALLEYSC 500 ck 1 | ivsg_la_alt2d3 | Pmis 24801 DEVERS 500.00 = -0.00 MW + j -400.10 MVAR |

ivsg_la_alt2d3.sav
VOLTAGE Summary
N-2 Outages

| Bus | Name | kV | Area | Zone | Outage | Case | Vbase | Vcont | DeltaV | Vmin | Vmax | Max-dv | Contingency Descriptior |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22734 | SANTEE | 138 | 22 | 223 | 23021/22/23/41 | ivsg_la_alt2d3 | 0.973 | 0.92 | -0.053 | 0.9 | 1.05 | 0.05 | MIGUEL 230 CORRIDOR West of SN |
| 8802 | AV58TP12 | 230 | 8 | 818 | line_N-204 | ivsg_la_alt2d3 | 0.973 | 0.921 | -0.053 | 0.9 | 1.05 | 0.05 | COACHELLA MIDWAY 230 CKT 1&2 |
| 24237 | RANCHVST | 230 | 24 | 240 | 23021/22/23/41 | ivsg_la_alt2d3 | 0.975 | 1.029 | 0.054 | 0.9 | 1.05 | 0.05 | MIGUEL 230 CORRIDOR West of SN |
| 25001 | GOODRICH | 230 | 24 | 250 | line_2073 | ivsg_la_alt2d3 | 0.99 | 1.044 | 0.055 | 0.9 | 1.05 | 0.05 | GOODRICH 230.00 - GOULD 230.00 1, GOODRICH 230.00 - LAGUBELL 230.00 1 |

ivsg_la_alt2d3.sav
FLOW Summary
N-2 Outages

| LEGEND | % of RATING 1 | |
|---|---|---|
| C_pu | 100% - 110% | |
| C_pu | 110% - 120% | P.U. of |
| C_pu | > 120% | Rate 1 |

| FROM | FR | BKV | TO | TO | BKV | CK | Outage_Name | Case | Rate-Mva | Pflow | Qflow | Amps | MVA | C_pu | B_pu | Contingency_Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_2233 | ivsg_la_alt2d3 | 1411.6 | 2579.1 | 382.9 | 2790.4 | 2607.4 | 1.73 | 1.126 | MOENKOPI 500.00 - ELDORDO 500.00 1, PISGAH 230.00 - ELDORDO 230.00 2 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2175 | ivsg_la_alt2d3 | 458 | 736.7 | 128.3 | 1884.4 | 747.8 | 1.64 | 1.048 | DEVERS 230.00 - SANBRDNO 230.00 1, DEVERS 230.00 - VSTA 230.00 2 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2177 | ivsg_la_alt2d3 | 458 | 736.7 | 128.3 | 1884.4 | 747.8 | 1.64 | 1.048 | DEVERS 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2178 | ivsg_la_alt2d3 | 458 | 736.7 | 128.3 | 1884.4 | 747.8 | 1.64 | 1.048 | DEVERS 230.00 - VSTA 230.00 2, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2180 | ivsg_la_alt2d3 | 458 | 736.7 | 128.3 | 1884.4 | 747.8 | 1.64 | 1.048 | SANBRDNO 230.00 - DEVERS 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2247 | ivsg_la_alt2d3 | 458 | 736.7 | 128.3 | 1884.4 | 747.8 | 1.64 | 1.048 | DEVERS 230.00 - VSTA 230.00 2, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2179 | ivsg_la_alt2d3 | 458 | 693 | 127 | 1770.2 | 704.6 | 1.541 | 1.048 | DEVERS 230.00 - VSTA 230.00 2, VSTA 230.00 - DEVERS 230.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2238 | ivsg_la_alt2d3 | 458 | 620 | 111.6 | 1581.5 | 630 | 1.377 | 1.048 | S.ONOFRE 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2239 | ivsg_la_alt2d3 | 458 | 615.6 | 109.2 | 1565.1 | 625.2 | 1.362 | 1.048 | CHINO 230.00 - S.ONOFRE 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2240 | ivsg_la_alt2d3 | 458 | 614.4 | 109.2 | 1561.4 | 624 | 1.359 | 1.048 | CHINO 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2176 | ivsg_la_alt2d3 | 458 | 606.7 | 77.8 | 1538 | 611.7 | 1.338 | 1.048 | DEVERS 230.00 - SANBRDNO 230.00 1, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_la_alt2d3 | 392 | 517.7 | 59.5 | 1403.5 | 521.1 | 1.33 | 0.76 | MIGUEL 230 CORRIDOR West of SN |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_2175 | ivsg_la_alt2d3 | 458 | 569.4 | -86.9 | 1517.1 | 576 | 1.32 | 0.734 | DEVERS 230.00 - SANBRDNO 230.00 1, DEVERS 230.00 - VSTA 230.00 2 |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_2177 | ivsg_la_alt2d3 | 458 | 569.4 | -86.9 | 1517.1 | 576 | 1.32 | 0.734 | DEVERS 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_2178 | ivsg_la_alt2d3 | 458 | 569.4 | -86.9 | 1517.1 | 576 | 1.32 | 0.734 | DEVERS 230.00 - VSTA 230.00 2, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_2180 | ivsg_la_alt2d3 | 458 | 569.4 | -86.9 | 1517.1 | 576 | 1.32 | 0.734 | SANBRDNO 230.00 - DEVERS 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_2247 | ivsg_la_alt2d3 | 458 | 569.4 | -86.9 | 1517.1 | 576 | 1.32 | 0.734 | DEVERS 230.00 - VSTA 230.00 2, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_la_alt2d3 | 392 | 508.9 | 58.2 | 1378.8 | 512.3 | 1.31 | 0.76 | MIGUEL 230 CORRIDOR West of LC |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_la_alt2d3 | 408.3 | -509.3 | 19.4 | 2237.5 | 509.7 | 1.31 | 0.728 | MIGUEL 230 CORRIDOR West of SN |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_la_alt2d3 | 408.3 | -500.9 | 17.9 | 2198 | 501.2 | 1.287 | 0.728 | MIGUEL 230 CORRIDOR West of LC |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2167 | ivsg_la_alt2d3 | 458 | 577.5 | 69 | 1461.5 | 581.6 | 1.271 | 1.048 | DEVERS 230.00 - SANBRDNO 230.00 1, ETIWANDA 230.00 - SANBRDNO 230.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2169 | ivsg_la_alt2d3 | 458 | 577.5 | 69 | 1461.5 | 581.6 | 1.271 | 1.048 | ETIWANDA 230.00 - SANBRDNO 230.00 1, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2268 | ivsg_la_alt2d3 | 458 | 577.5 | 69 | 1461.5 | 581.6 | 1.271 | 1.048 | ETIWANDA 230.00 - SANBRDNO 230.00 1, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_la_alt2d3 | 392 | 495.7 | 59.8 | 1341.3 | 499.3 | 1.27 | 0.76 | MIGUEL 230 CORRIDOR North of ML |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2173 | ivsg_la_alt2d3 | 458 | 576.8 | 47.9 | 1457 | 578.8 | 1.267 | 1.048 | SANBRDNO 230.00 - DEVERS 230.00 1, VSTA 230.00 - SANBRDNO 230.00 2 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2174 | ivsg_la_alt2d3 | 458 | 576.8 | 47.9 | 1457 | 578.8 | 1.267 | 1.048 | DEVERS 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - SANBRDNO 230.00 2 |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | 23021/22/23/41 | ivsg_la_alt2d3 | 382.4 | 459 | -6.9 | 2021 | 459.1 | 1.263 | 0.657 | MIGUEL 230 CORRIDOR West of SN |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_la_alt2d3 | 408.3 | -488.1 | 12.2 | 2138.2 | 488.3 | 1.252 | 0.728 | MIGUEL 230 CORRIDOR North of ML |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | 23021/22/23/41 | ivsg_la_alt2d3 | 382.4 | 450.7 | -4.6 | 1982.2 | 450.7 | 1.239 | 0.657 | MIGUEL 230 CORRIDOR West of LC |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_2179 | ivsg_la_alt2d3 | 458 | 528.7 | -62.8 | 1401.6 | 532.4 | 1.219 | 0.734 | DEVERS 230.00 - VSTA 230.00 2, VSTA 230.00 - DEVERS 230.00 1 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_2238 | ivsg_la_alt2d3 | 1411.6 | 1809.8 | 171 | 1949.4 | 1817.9 | 1.209 | 1.126 | S.ONOFRE 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2246 | ivsg_la_alt2d3 | 458 | 549.7 | 73.1 | 1386.5 | 554.5 | 1.207 | 1.048 | VSTA 230.00 - DEVERS 230.00 1, COACHELV 230.00 - DEVERS 230.00 2 |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | 23021/22/23/41 | ivsg_la_alt2d3 | 382.4 | 438.1 | 2.3 | 1924.7 | 438.1 | 1.203 | 0.657 | MIGUEL 230 CORRIDOR North of ML |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_2239 | ivsg_la_alt2d3 | 1411.6 | 1802.3 | 162.9 | 1939 | 1809.7 | 1.202 | 1.126 | CHINO 230.00 - S.ONOFRE 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_2240 | ivsg_la_alt2d3 | 1411.6 | 1802.6 | 164 | 1939.5 | 1810 | 1.202 | 1.126 | CHINO 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | 23021/22/23/41 | ivsg_la_alt2d3 | 1120 | -1309.8 | -60.1 | 3407.1 | 1311.2 | 1.18 | 0.91 | MIGUEL 230 CORRIDOR North of ML |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_N-217 | ivsg_la_alt2d3 | 1411.6 | 1763 | 142.6 | 1890.3 | 1768.7 | 1.172 | 1.126 | line MIDPINTS to IH500/MIDPOINTS DEVERS 500 ck 1 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_2179 | ivsg_la_alt2d3 | 1411.6 | 1751.3 | 145.1 | 1878.1 | 1757.3 | 1.164 | 1.126 | DEVERS 230.00 - VSTA 230.00 2, VSTA 230.00 - DEVERS 230.00 1 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_2175 | ivsg_la_alt2d3 | 1411.6 | 1745.7 | 141.8 | 1871.1 | 1751.4 | 1.16 | 1.126 | DEVERS 230.00 - SANBRDNO 230.00 1, DEVERS 230.00 - VSTA 230.00 2 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_2177 | ivsg_la_alt2d3 | 1411.6 | 1745.7 | 141.8 | 1871.1 | 1751.4 | 1.16 | 1.126 | DEVERS 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_2178 | ivsg_la_alt2d3 | 1411.6 | 1745.7 | 141.8 | 1871.1 | 1751.4 | 1.16 | 1.126 | DEVERS 230.00 - VSTA 230.00 2, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_2180 | ivsg_la_alt2d3 | 1411.6 | 1745.7 | 141.8 | 1871.1 | 1751.4 | 1.16 | 1.126 | SANBRDNO 230.00 - DEVERS 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_2247 | ivsg_la_alt2d3 | 1411.6 | 1745.7 | 141.8 | 1871.1 | 1751.4 | 1.16 | 1.126 | DEVERS 230.00 - VSTA 230.00 2, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | 23021/22/23/41 | ivsg_la_alt2d3 | 1120 | -1292.8 | -55.6 | 3354.7 | 1294 | 1.16 | 0.91 | MIGUEL 230 CORRIDOR West of LC |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | 23021/22/23/41 | ivsg_la_alt2d3 | 1120 | -1287 | -51.4 | 3332.1 | 1288 | 1.16 | 0.91 | MIGUEL 230 CORRIDOR West of SN |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2168 | ivsg_la_alt2d3 | 458 | 525.9 | 66.5 | 1328.9 | 530 | 1.156 | 1.048 | DEVERS 230.00 - VSTA 230.00 2, ETIWANDA 230.00 - SANBRDNO 230.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2171 | ivsg_la_alt2d3 | 458 | 525.9 | 66.5 | 1328.9 | 530 | 1.156 | 1.048 | ETIWANDA 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 24900 | MIDPINTS | 500 | 24801 | DEVERS | 500 | 2 | line_N-217 | ivsg_la_alt2d3 | 2338 | 2678.6 | 363.1 | 3061.3 | 2703.1 | 1.137 | 0.653 | line MIDPINTS to IH500/MIDPOINTS DEVERS 500 ck 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2179 | ivsg_la_alt2d3 | 2598 | 2900.6 | 383.5 | 3369 | 2925.8 | 1.123 | 0.963 | DEVERS 230.00 - VSTA 230.00 2, VSTA 230.00 - DEVERS 230.00 1 |
| 8601 | GEOSUB2 | 230 | 8300 | BANIS230 | 230 | 1 | line_N-204 | ivsg_la_alt2d3 | 550 | 591.5 | 93.2 | 1547 | 598.8 | 1.121 | 0.761 | COACHELLA MIDWAY 230 CKT 1&2 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_N-203 | ivsg_la_alt2d3 | 800 | 857.8 | 82.3 | 2244.1 | 861.7 | 1.117 | 0.779 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2175 | ivsg_la_alt2d3 | 2598 | 2851.3 | 346.7 | 3310.3 | 2872.3 | 1.103 | 0.963 | DEVERS 230.00 - SANBRDNO 230.00 1, DEVERS 230.00 - VSTA 230.00 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2177 | ivsg_la_alt2d3 | 2598 | 2851.3 | 346.7 | 3310.3 | 2872.3 | 1.103 | 0.963 | DEVERS 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2178 | ivsg_la_alt2d3 | 2598 | 2851.3 | 346.7 | 3310.3 | 2872.3 | 1.103 | 0.963 | DEVERS 230.00 - VSTA 230.00 2, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2180 | ivsg_la_alt2d3 | 2598 | 2851.3 | 346.7 | 3310.3 | 2872.3 | 1.103 | 0.963 | SANBRDNO 230.00 - DEVERS 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2247 | ivsg_la_alt2d3 | 2598 | 2851.3 | 346.7 | 3310.3 | 2872.3 | 1.103 | 0.963 | DEVERS 230.00 - VSTA 230.00 2, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2233 | ivsg_la_alt2d3 | 458 | 495.6 | 44.3 | 1266.2 | 497.6 | 1.101 | 1.048 | MOENKOPI 500.00 - ELDORDO 500.00 1, PISGAH 230.00 - ELDORDO 230.00 2 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2258 | ivsg_la_alt2d3 | 458 | 494 | 46.6 | 1261.9 | 496.2 | 1.098 | 1.048 | LUGO 500.00 - VINCENT 500.00 2, LUGO 500.00 - VICTORVL 500.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | 23002/06/10 | ivsg_la_alt2d3 | 458 | 494.8 | 46.2 | 1262.7 | 497 | 1.098 | 1.048 | SANLUISREY 230 CORRIDOR |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2115 | ivsg_la_alt2d3 | 458 | 489.7 | 47.9 | 1257.2 | 492 | 1.094 | 1.048 | S.ONOFRE 230.00 - SANTIAGO 230.00 1, S.ONOFRE 230.00 - SANTIAGO 230.00 2 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2256 | ivsg_la_alt2d3 | 458 | 491.5 | 47.2 | 1256.9 | 493.8 | 1.093 | 1.048 | ELDORDO 500.00 - LUGO 500.00 1, LUGO 500.00 - MIRALOMA 500.00 2 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_N-210 | ivsg_la_alt2d3 | 800 | 848.1 | 46 | 2194.8 | 849.4 | 1.093 | 0.779 | EL CENTRO IMPERIAL VALLEY 230 CKTS 2&3 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2191 | ivsg_la_alt2d3 | 458 | 490.8 | 47.2 | 1252.2 | 493.1 | 1.089 | 1.048 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - ELDORDO 230.00 2 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2192 | ivsg_la_alt2d3 | 458 | 490.5 | 47.3 | 1251.1 | 492.7 | 1.088 | 1.048 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2193 | ivsg_la_alt2d3 | 458 | 490.5 | 47.4 | 1251.1 | 492.7 | 1.088 | 1.048 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - LUGO 230.00 2 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_2258 | ivsg_la_alt2d3 | 1411.6 | 1636 | 131.4 | 1749.1 | 1641.2 | 1.085 | 1.126 | LUGO 500.00 - VINCENT 500.00 2, LUGO 500.00 - VICTORVL 500.00 1 |
| 22672 | PRCTRVLY | 138 | 22852 | TELECYN | 138 | 1 | 23021/22/23/41 | ivsg_la_alt2d3 | 478 | 492.4 | -21.6 | 2163.7 | 492.9 | 1.082 | 0.587 | MIGUEL 230 CORRIDOR West of SN |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24016 | BARRE | 230 | 24044 | ELLIS | 230 | 1 | line_2115 | ivsg_la_alt2d3 | 988 | 995.1 | -137.7 | 2678.8 | 1004.6 | 1.08 | 0.309 | S.ONOFRE 230.00 - SANTIAGO 230.00 1, S.ONOFRE 230.00 - SANTIAGO 230.00 2 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2255 | ivsg_la_alt2d3 | 458 | 486.9 | 48.4 | 1241.8 | 489.3 | 1.08 | 1.048 | LUGO 500.00 - MIRALOMA 500.00 3, LUGO 500.00 - MOHAVE 500.00 1 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 2 | line_2029 | ivsg_la_alt2d3 | 1195 | 1225.6 | -83.6 | 3213.9 | 1228.4 | 1.071 | 0.527 | LEWIS 230.00 - SERRANO 230.00 1, SERRANO 230.00 - VILLA PK 230.00 1 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 2 | line_2031 | ivsg_la_alt2d3 | 1195 | 1225.6 | -83.6 | 3213.9 | 1228.4 | 1.071 | 0.527 | LEWIS 230.00 - SERRANO 230.00 2, SERRANO 230.00 - VILLA PK 230.00 1 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 2 | line_2278 | ivsg_la_alt2d3 | 1195 | 1225.6 | -83.6 | 3213.9 | 1228.4 | 1.071 | 0.527 | LEWIS 230.00 - SERRANO 230.00 1, SERRANO 230.00 - VILLA PK 230.00 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_2260 | ivsg_la_alt2d3 | 56 | 59.4 | -5 | 294.9 | 59.6 | 1.07 | 0.94 | KRAMER 230.00 - LUGO 230.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_2238 | ivsg_la_alt2d3 | 1645.4 | 1868.9 | 187.7 | 2028.6 | 1878.3 | 1.068 | 0.985 | S.ONOFRE 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_2240 | ivsg_la_alt2d3 | 1645.4 | 1860.8 | 180.1 | 2017 | 1869.5 | 1.062 | 0.985 | CHINO 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 22672 | PRCTRVLY | 138 | 22852 | TELECYN | 138 | 1 | 23021/22/23/41 | ivsg_la_alt2d3 | 478 | 484 | -20.1 | 2124.2 | 484.4 | 1.062 | 0.587 | MIGUEL 230 CORRIDOR West of LC |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2170 | ivsg_la_alt2d3 | 2598 | 2751.7 | 304.7 | 3181.5 | 2768.6 | 1.061 | 0.963 | ETIWANDA 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - SANBRDNO 230.00 2 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_2239 | ivsg_la_alt2d3 | 1645.4 | 1860.6 | 178.9 | 2016.4 | 1869.2 | 1.061 | 0.985 | CHINO 230.00 - S.ONOFRE 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2172 | ivsg_la_alt2d3 | 2598 | 2746.5 | 293.5 | 3169.5 | 2762.2 | 1.057 | 0.963 | VSTA 230.00 - SANBRDNO 230.00 2, VSTA 230.00 - DEVERS 230.00 1 |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_2238 | ivsg_la_alt2d3 | 458 | 460.3 | -39.5 | 1212.7 | 462 | 1.055 | 0.734 | S.ONOFRE 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 24901 | VSTA | 230 | 24132 | SANBRDNO | 230 | 2 | line_2179 | ivsg_la_alt2d3 | 916 | -920.3 | 74.1 | 2416.8 | 923.3 | 1.051 | 0.511 | DEVERS 230.00 - VSTA 230.00 2, VSTA 230.00 - DEVERS 230.00 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23022/23023 | ivsg_la_alt2d3 | 392 | 409.6 | 31.6 | 1085.8 | 410.8 | 1.05 | 0.76 | ML-MS1+ ML-MS2 230KV |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2168 | ivsg_la_alt2d3 | 2598 | 2713.4 | 260.1 | 3124.8 | 2725.8 | 1.042 | 0.963 | DEVERS 230.00 - VSTA 230.00 2, ETIWANDA 230.00 - SANBRDNO 230.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2171 | ivsg_la_alt2d3 | 2598 | 2713.4 | 260.1 | 3124.8 | 2725.8 | 1.042 | 0.963 | ETIWANDA 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_2239 | ivsg_la_alt2d3 | 458 | 456.2 | -38.7 | 1197.6 | 457.8 | 1.042 | 0.734 | CHINO 230.00 - S.ONOFRE 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_2240 | ivsg_la_alt2d3 | 458 | 455.1 | -38 | 1194 | 456.6 | 1.039 | 0.734 | CHINO 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 22672 | PRCTRVLY | 138 | 22852 | TELECYN | 138 | 1 | 23021/22/23/41 | ivsg_la_alt2d3 | 478 | 471.2 | -14.4 | 2064.5 | 471.4 | 1.032 | 0.587 | MIGUEL 230 CORRIDOR North of ML |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_N-217 | ivsg_la_alt2d3 | 1645.4 | 1814.1 | 157.5 | 1957.6 | 1821 | 1.03 | 0.985 | line MIDPINTS to IH500/MIDPOINTS DEVERS 500 ck 1 |
| 8600 | GEOSUB1 | 230 | 8300 | BANIS230 | 230 | 1 | line_N-204 | ivsg_la_alt2d3 | 550 | 541.7 | 82.9 | 1416.8 | 548 | 1.027 | 0.706 | COACHELLA MIDWAY 230 CKT 1&2 |
| 8600 | GEOSUB1 | 230 | 8300 | BANIS230 | 230 | 2 | line_N-204 | ivsg_la_alt2d3 | 550 | 541.7 | 82.9 | 1416.8 | 548 | 1.027 | 0.706 | COACHELLA MIDWAY 230 CKT 1&2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2167 | ivsg_la_alt2d3 | 2598 | 2666.3 | 228.1 | 3070.1 | 2676.1 | 1.023 | 0.963 | DEVERS 230.00 - SANBRDNO 230.00 1, ETIWANDA 230.00 - SANBRDNO 230.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2169 | ivsg_la_alt2d3 | 2598 | 2666.3 | 228.1 | 3070.1 | 2676.1 | 1.023 | 0.963 | ETIWANDA 230.00 - SANBRDNO 230.00 1, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_2179 | ivsg_la_alt2d3 | 1645.4 | 1800.6 | 161.4 | 1943.5 | 1807.8 | 1.023 | 0.985 | DEVERS 230.00 - VSTA 230.00 2, VSTA 230.00 - DEVERS 230.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2268 | ivsg_la_alt2d3 | 2598 | 2666.3 | 228.1 | 3070.1 | 2676.1 | 1.023 | 0.963 | ETIWANDA 230.00 - SANBRDNO 230.00 1, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_2176 | ivsg_la_alt2d3 | 458 | 447.9 | -64.8 | 1174.9 | 452.6 | 1.022 | 0.734 | DEVERS 230.00 - SANBRDNO 230.00 1, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 24901 | VSTA | 230 | 24132 | SANBRDNO | 230 | 2 | line_2168 | ivsg_la_alt2d3 | 916 | -899.9 | -11.6 | 2346.9 | 899.9 | 1.021 | 0.511 | DEVERS 230.00 - VSTA 230.00 2, ETIWANDA 230.00 - SANBRDNO 230.00 1 |
| 24901 | VSTA | 230 | 24132 | SANBRDNO | 230 | 2 | line_2171 | ivsg_la_alt2d3 | 916 | -899.9 | -11.6 | 2346.9 | 899.9 | 1.021 | 0.511 | ETIWANDA 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2233 | ivsg_la_alt2d3 | 2598 | 2625.6 | 180 | 3059.2 | 2631.8 | 1.02 | 0.963 | MOENKOPI 500.00 - ELDORDO 500.00 1, PISGAH 230.00 - ELDORDO 230.00 2 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_2175 | ivsg_la_alt2d3 | 1645.4 | 1794.1 | 157.9 | 1935.2 | 1801 | 1.019 | 0.985 | DEVERS 230.00 - SANBRDNO 230.00 1, DEVERS 230.00 - VSTA 230.00 2 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_2177 | ivsg_la_alt2d3 | 1645.4 | 1794.1 | 157.9 | 1935.2 | 1801 | 1.019 | 0.985 | DEVERS 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_2178 | ivsg_la_alt2d3 | 1645.4 | 1794.1 | 157.9 | 1935.2 | 1801 | 1.019 | 0.985 | DEVERS 230.00 - VSTA 230.00 2, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_2180 | ivsg_la_alt2d3 | 1645.4 | 1794.1 | 157.9 | 1935.2 | 1801 | 1.019 | 0.985 | SANBRDNO 230.00 - DEVERS 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_2247 | ivsg_la_alt2d3 | 1645.4 | 1794.1 | 157.9 | 1935.2 | 1801 | 1.019 | 0.985 | DEVERS 230.00 - VSTA 230.00 2, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2173 | ivsg_la_alt2d3 | 2598 | 2649.9 | 222.3 | 3054.1 | 2659.3 | 1.018 | 0.963 | SANBRDNO 230.00 - DEVERS 230.00 1, VSTA 230.00 - SANBRDNO 230.00 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2174 | ivsg_la_alt2d3 | 2598 | 2649.9 | 222.3 | 3054.1 | 2659.3 | 1.018 | 0.963 | DEVERS 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - SANBRDNO 230.00 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2176 | ivsg_la_alt2d3 | 2598 | 2646.6 | 213.2 | 3046 | 2655.2 | 1.015 | 0.963 | DEVERS 230.00 - SANBRDNO 230.00 1, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 24701 | KRAMER | 230 | 24085 | LUGO | 230 | 2 | line_2260 | ivsg_la_alt2d3 | 478 | 479.3 | 69.5 | 1216.8 | 484.3 | 1.014 | 0.607 | KRAMER 230.00 - LUGO 230.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23022/23023 | ivsg_la_alt2d3 | 408.3 | -404.6 | 15.5 | 1730.9 | 404.9 | 1.013 | 0.728 | ML-MS1+ ML-MS2 230KV |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2258 | ivsg_la_alt2d3 | 2598 | 2607.3 | 190.4 | 3034.9 | 2614.2 | 1.012 | 0.963 | LUGO 500.00 - VINCENT 500.00 2, LUGO 500.00 - VICTORVL 500.00 1 |
| 19051 | KNOB | 161 | 8367 | PILOTKNB | 161 | 1 | line_N-203 | ivsg_la_alt2d3 | 165 | -166.5 | 17 | 598.3 | 167.3 | 1.011 | 0.802 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2246 | ivsg_la_alt2d3 | 2598 | 2639.6 | 215.4 | 3031 | 2648.3 | 1.01 | 0.963 | VSTA 230.00 - DEVERS 230.00 1, COACHELV 230.00 - DEVERS 230.00 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2164 | ivsg_la_alt2d3 | 2598 | 2637.6 | 210.2 | 3024.4 | 2645.9 | 1.008 | 0.963 | MIRALOMA 230.00 - VSTA 230.00 1, MIRALOMA 230.00 - VSTA 230.00 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | 23002/06/10 | ivsg_la_alt2d3 | 2598 | 2605.1 | 186.8 | 3024.8 | 2611.8 | 1.008 | 0.963 | SANLUISREY 230 CORRIDOR |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2115 | ivsg_la_alt2d3 | 2598 | 2582.5 | 242.8 | 3021.5 | 2593.9 | 1.007 | 0.963 | S.ONOFRE 230.00 - SANTIAGO 230.00 1, S.ONOFRE 230.00 - SANTIAGO 230.00 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2256 | ivsg_la_alt2d3 | 2598 | 2593.6 | 201.6 | 3022.2 | 2601.4 | 1.007 | 0.963 | ELDORDO 500.00 - LUGO 500.00 1, LUGO 500.00 - MIRALOMA 500.00 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | 23021/22/23/41 | ivsg_la_alt2d3 | 2598 | 2623.5 | 150.1 | 3016.2 | 2627.8 | 1.005 | 0.963 | MIGUEL 230 CORRIDOR West of SN |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2191 | ivsg_la_alt2d3 | 2598 | 2588.4 | 190.4 | 3008.2 | 2595.4 | 1.003 | 0.963 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - ELDORDO 230.00 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2192 | ivsg_la_alt2d3 | 2598 | 2586.5 | 190.3 | 3005.3 | 2593.5 | 1.002 | 0.963 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2193 | ivsg_la_alt2d3 | 2598 | 2586.4 | 190.3 | 3005.3 | 2593.4 | 1.002 | 0.963 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - LUGO 230.00 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2166 | ivsg_la_alt2d3 | 2598 | 2616.5 | 198 | 3000.5 | 2623.9 | 1 | 0.963 | ETIWANDA 230.00 - SANBRDNO 230.00 1, ETIWANDA 230.00 - VSTA 230.00 1 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | line_N-203 | ivsg_la_alt2d3 | 1120 | -1115 | -37.9 | 2921.1 | 1115.6 | 1 | 0.91 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | 23021/23041 | ivsg_la_alt2d3 | 1120 | -1108.5 | -69.2 | 2831.9 | 1110.7 | 1 | 0.91 | ML-SX + OM-SX 230KV |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_N-217 | ivsg_la_alt2d3 | 458 | 448.9 | 26.9 | 1148 | 449.7 | 0.999 | 1.048 | line MIDPINTS to IH500/MIDPOINTS DEVERS 500 ck 1 |
| 24016 | BARRE | 230 | 25201 | LEWIS | 230 | 1 | line_2115 | ivsg_la_alt2d3 | 1195 | -1100.6 | 221.9 | 2993.9 | 1122.8 | 0.998 | 0.628 | S.ONOFRE 230.00 - SANTIAGO 230.00 1, S.ONOFRE 230.00 - SANTIAGO 230.00 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2165 | ivsg_la_alt2d3 | 2598 | 2612.2 | 195.9 | 2995.4 | 2619.6 | 0.998 | 0.963 | ETIWANDA 230.00 - SANBRDNO 230.00 1, MIRALOMA 230.00 - VSTA 230.00 2 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 1 | line_2030 | ivsg_la_alt2d3 | 1287 | 1225.6 | -83.6 | 3213.9 | 1228.4 | 0.995 | 0.49 | LEWIS 230.00 - SERRANO 230.00 1, SERRANO 230.00 - VILLA PK 230.00 2 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 1 | line_2032 | ivsg_la_alt2d3 | 1287 | 1225.6 | -83.6 | 3213.9 | 1228.4 | 0.995 | 0.49 | LEWIS 230.00 - SERRANO 230.00 2, SERRANO 230.00 - VILLA PK 230.00 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2194 | ivsg_la_alt2d3 | 2598 | 2571.2 | 191 | 2981.9 | 2578.3 | 0.994 | 0.963 | LUGO 500.00 - MIRALOMA 500.00 2, LUGO 500.00 - MIRALOMA 500.00 3 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2255 | ivsg_la_alt2d3 | 2598 | 2566.7 | 198 | 2981.3 | 2574.3 | 0.994 | 0.963 | LUGO 500.00 - MIRALOMA 500.00 3, LUGO 500.00 - MOHAVE 500.00 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_2214 | ivsg_la_alt2d3 | 56 | 54.8 | -4.6 | 271.1 | 55 | 0.99 | 0.94 | LUGO 500.00 - VINCENT 500.00 1, LUGO 500.00 - VINCENT 500.00 2 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | 23022/23023 | ivsg_la_alt2d3 | 1120 | -1098.4 | -77.4 | 2806.4 | 1101.2 | 0.99 | 0.91 | ML-MS1+ ML-MS2 230KV |
| 19051 | KNOB | 161 | 8367 | PILOTKNB | 161 | 1 | line_N-204 | ivsg_la_alt2d3 | 165 | -163 | 20.1 | 584.9 | 164.2 | 0.989 | 0.802 | COACHELLA MIDWAY 230 CKT 1&2 |
| 24901 | VSTA | 230 | 24804 | DEVERS | 230 | 1 | line_2175 | ivsg_la_alt2d3 | 988 | -908 | 220 | 2448.7 | 934.3 | 0.987 | 0.66 | DEVERS 230.00 - SANBRDNO 230.00 1, DEVERS 230.00 - VSTA 230.00 2 |
| 24804 | DEVERS | 230 | 24901 | VSTA | 230 | 2 | line_2177 | ivsg_la_alt2d3 | 988 | 948.8 | 210.5 | 2448.9 | 971.9 | 0.987 | 0.66 | DEVERS 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 24901 | VSTA | 230 | 24804 | DEVERS | 230 | 1 | line_2178 | ivsg_la_alt2d3 | 988 | -908 | 220 | 2448.7 | 934.3 | 0.987 | 0.66 | DEVERS 230.00 - VSTA 230.00 2, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 24804 | DEVERS | 230 | 24901 | VSTA | 230 | 2 | line_2180 | ivsg_la_alt2d3 | 988 | 948.8 | 210.5 | 2448.9 | 971.9 | 0.987 | 0.66 | SANBRDNO 230.00 - DEVERS 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 24901 | VSTA | 230 | 24804 | DEVERS | 230 | 1 | line_2247 | ivsg_la_alt2d3 | 988 | -908 | 220 | 2448.7 | 934.3 | 0.987 | 0.66 | DEVERS 230.00 - VSTA 230.00 2, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2164 | ivsg_la_alt2d3 | 458 | 450.4 | 47.7 | 1132.6 | 452.9 | 0.986 | 1.048 | MIRALOMA 230.00 - VSTA 230.00 1, MIRALOMA 230.00 - VSTA 230.00 2 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2172 | ivsg_la_alt2d3 | 458 | 449.9 | 37.4 | 1131.8 | 451.4 | 0.985 | 1.048 | VSTA 230.00 - SANBRDNO 230.00 2, VSTA 230.00 - DEVERS 230.00 1 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | line_2240 | ivsg_la_alt2d3 | 1120 | -1085 | -72 | 2798.9 | 1087.4 | 0.98 | 0.91 | CHINO 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_N-204 | ivsg_la_alt2d3 | 458 | 447.5 | 38.4 | 1126.9 | 449.1 | 0.98 | 1.048 | COACHELLA MIDWAY 230 CKT 1&2 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_N-204 | ivsg_la_alt2d3 | 800 | 740.9 | 1.1 | 1962.2 | 740.9 | 0.977 | 0.779 | COACHELLA MIDWAY 230 CKT 1&2 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2196 | ivsg_la_alt2d3 | 458 | 444.6 | 41.3 | 1121.8 | 446.5 | 0.976 | 1.048 | ETIWANDA 230.00 - SANBRDNO 230.00 1, LUGO 500.00 - MIRALOMA 500.00 2 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2198 | ivsg_la_alt2d3 | 458 | 444.5 | 41.3 | 1121.5 | 446.4 | 0.976 | 1.048 | ETIWANDA 230.00 - SANBRDNO 230.00 1, LUGO 500.00 - MIRALOMA 500.00 3 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_2022 | ivsg_la_alt2d3 | 56 | 53.5 | -5.2 | 264.8 | 53.8 | 0.97 | 0.94 | BARRE 230.00 - VILLA PK 230.00 1, BARRE 230.00 - LEWIS 230.00 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_2121 | ivsg_la_alt2d3 | 56 | 53.5 | -5.5 | 264.9 | 53.7 | 0.97 | 0.94 | S.CLARA 230.00 - MANDALAY 230.00 1, S.CLARA 230.00 - MANDALAY 230.00 2 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_2154 | ivsg_la_alt2d3 | 56 | 53.6 | -5.2 | 265.4 | 53.9 | 0.97 | 0.94 | MIRALOMA 230.00 - OLINDA 230.00 1, MIRALOMA 230.00 - WALNUT 230.00 1 |
| 24801 | DEVERS | 500 | 24804 | DEVERS | 230 | 1 | line_2238 | ivsg_la_alt2d3 | 1120 | 758.6 | 776.3 | 1212.2 | 1085.4 | 0.97 | 0.53 | S.ONOFRE 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 24801 | DEVERS | 500 | 24804 | DEVERS | 230 | 1 | line_2239 | ivsg_la_alt2d3 | 1120 | 756.2 | 772.7 | 1205 | 1081.2 | 0.97 | 0.53 | CHINO 230.00 - S.ONOFRE 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | line_2239 | ivsg_la_alt2d3 | 1120 | -1083 | -71.8 | 2791.5 | 1085.4 | 0.97 | 0.91 | CHINO 230.00 - S.ONOFRE 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2209 | ivsg_la_alt2d3 | 458 | 442.1 | 41.2 | 1112.3 | 444 | 0.968 | 1.048 | ETIWANDA 230.00 - SANBRDNO 230.00 1, LUGO 500.00 - SERRANO 500.00 1 |
| 24912 | SHANDIN | 115 | 24916 | TAP902 | 115 | 1 | line_2238 | ivsg_la_alt2d3 | 109.1 | -104.4 | 11.2 | 528.4 | 105 | 0.965 | 0.997 | S.ONOFRE 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 24801 | DEVERS | 500 | 24804 | DEVERS | 230 | 1 | line_2240 | ivsg_la_alt2d3 | 1120 | 753.9 | 772.6 | 1202.6 | 1079.5 | 0.96 | 0.53 | CHINO 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_2167 | ivsg_la_alt2d3 | 458 | 420.3 | -59.5 | 1099.1 | 424.5 | 0.956 | 0.734 | DEVERS 230.00 - SANBRDNO 230.00 1, ETIWANDA 230.00 - SANBRDNO 230.00 1 |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_2169 | ivsg_la_alt2d3 | 458 | 420.3 | -59.5 | 1099.1 | 424.5 | 0.956 | 0.734 | ETIWANDA 230.00 - SANBRDNO 230.00 1, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_2173 | ivsg_la_alt2d3 | 458 | 419.8 | -79.7 | 1099 | 427.3 | 0.956 | 0.734 | SANBRDNO 230.00 - DEVERS 230.00 1, VSTA 230.00 - SANBRDNO 230.00 2 |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_2174 | ivsg_la_alt2d3 | 458 | 419.8 | -79.7 | 1099 | 427.3 | 0.956 | 0.734 | DEVERS 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - SANBRDNO 230.00 2 |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_2268 | ivsg_la_alt2d3 | 458 | 420.3 | -59.5 | 1099.1 | 424.5 | 0.956 | 0.734 | ETIWANDA 230.00 - SANBRDNO 230.00 1, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | 23022/23023 | ivsg_la_alt2d3 | 382.4 | 355.4 | 7.7 | 1523.1 | 355.5 | 0.952 | 0.657 | ML-MS1+ ML-MS2 230KV |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | 23021/22/23/41 | ivsg_la_alt2d3 | 388 | -361 | 12 | 926.6 | 361.2 | 0.951 | 0.841 | MIGUEL 230 CORRIDOR North of ML |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | line_2175 | ivsg_la_alt2d3 | 1120 | -1053.9 | -73.1 | 2695.2 | 1056.4 | 0.95 | 0.91 | DEVERS 230.00 - SANBRDNO 230.00 1, DEVERS 230.00 - VSTA 230.00 2 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | line_2177 | ivsg_la_alt2d3 | 1120 | -1053.9 | -73.1 | 2695.2 | 1056.4 | 0.95 | 0.91 | DEVERS 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | line_2178 | ivsg_la_alt2d3 | 1120 | -1053.9 | -73.1 | 2695.2 | 1056.4 | 0.95 | 0.91 | DEVERS 230.00 - VSTA 230.00 2, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | line_2179 | ivsg_la_alt2d3 | 1120 | -1059.1 | -73.5 | 2711.9 | 1061.7 | 0.95 | 0.91 | DEVERS 230.00 - VSTA 230.00 2, VSTA 230.00 - DEVERS 230.00 1 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | line_2180 | ivsg_la_alt2d3 | 1120 | -1053.9 | -73.1 | 2695.2 | 1056.4 | 0.95 | 0.91 | SANBRDNO 230.00 - DEVERS 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | line_2238 | ivsg_la_alt2d3 | 1120 | -1061.2 | -72.6 | 2718.7 | 1063.7 | 0.95 | 0.91 | S.ONOFRE 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | line_2247 | ivsg_la_alt2d3 | 1120 | -1053.9 | -73.1 | 2695.2 | 1056.4 | 0.95 | 0.91 | DEVERS 230.00 - VSTA 230.00 2, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 24016 | BARRE | 230 | 25201 | LEWIS | 230 | 1 | line_2287 | ivsg_la_alt2d3 | 1195 | -1065.3 | 280.5 | 2847.5 | 1101.6 | 0.95 | 0.628 | BARRE 230.00 - VILLA PK 230.00 1, SERRANO 230.00 - VILLA PK 230.00 1 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | line_N-204 | ivsg_la_alt2d3 | 1120 | -1064.7 | -33.2 | 2767.2 | 1065.2 | 0.95 | 0.91 | COACHELLA MIDWAY 230 CKT 1&2 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_2191 | ivsg_la_alt2d3 | 1645.4 | 1669 | 165 | 1798.4 | 1677.1 | 0.949 | 0.985 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - ELDORDO 230.00 2 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_2192 | ivsg_la_alt2d3 | 1645.4 | 1670.3 | 163.2 | 1799.4 | 1678.3 | 0.949 | 0.985 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_2193 | ivsg_la_alt2d3 | 1645.4 | 1670.3 | 163.2 | 1799.4 | 1678.3 | 0.949 | 0.985 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - LUGO 230.00 2 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_2258 | ivsg_la_alt2d3 | 1645.4 | 1674.7 | 156 | 1801 | 1682 | 0.949 | 0.985 | LUGO 500.00 - VINCENT 500.00 2, LUGO 500.00 - VICTORVL 500.00 1 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | 23021/22/23/41 | ivsg_la_alt2d3 | 388 | -359.8 | 12.5 | 923 | 360 | 0.948 | 0.841 | MIGUEL 230 CORRIDOR West of SN |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_2256 | ivsg_la_alt2d3 | 1645.4 | 1664.7 | 162.2 | 1793 | 1672.6 | 0.946 | 0.985 | ELDORDO 500.00 - LUGO 500.00 1, LUGO 500.00 - MIRALOMA 500.00 2 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | 23021/22/23/41 | ivsg_la_alt2d3 | 388 | -358.5 | 12.6 | 919.9 | 358.7 | 0.944 | 0.841 | MIGUEL 230 CORRIDOR West of LC |
| 24056 | ETIWANDA | 230 | 24132 | SANBRDNO | 230 | 1 | line_2172 | ivsg_la_alt2d3 | 797 | -723 | 56.2 | 1886.5 | 725.2 | 0.943 | 0.446 | VSTA 230.00 - SANBRDNO 230.00 2, VSTA 230.00 - DEVERS 230.00 1 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | line_2246 | ivsg_la_alt2d3 | 1120 | -1051.2 | -67.5 | 2686.2 | 1053.4 | 0.94 | 0.91 | VSTA 230.00 - DEVERS 230.00 1, COACHELV 230.00 - DEVERS 230.00 2 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | line_N-203 | ivsg_la_alt2d3 | 388 | -353.8 | 12.9 | 914.7 | 354 | 0.939 | 0.841 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 24804 | DEVERS | 230 | 24901 | VSTA | 230 | 2 | line_2172 | ivsg_la_alt2d3 | 988 | 901.8 | 210.6 | 2321.7 | 926 | 0.936 | 0.66 | VSTA 230.00 - SANBRDNO 230.00 2, VSTA 230.00 - DEVERS 230.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2165 | ivsg_la_alt2d3 | 458 | 426.7 | 40.1 | 1072.7 | 428.6 | 0.933 | 1.048 | ETIWANDA 230.00 - SANBRDNO 230.00 1, MIRALOMA 230.00 - VSTA 230.00 2 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2166 | ivsg_la_alt2d3 | 458 | 425.6 | 40.1 | 1069.9 | 427.4 | 0.931 | 1.048 | ETIWANDA 230.00 - SANBRDNO 230.00 1, ETIWANDA 230.00 - VSTA 230.00 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 13821C/25/23051A | ivsg_la_alt2d3 | 204.1 | 185.3 | -0.9 | 793.3 | 185.3 | 0.929 | 0.55 | CH-ES-NCM-SX |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_N-203 | ivsg_la_alt2d3 | 458 | 428.2 | 45.5 | 1065.4 | 430.6 | 0.927 | 1.048 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2022 | ivsg_la_alt2d3 | 2598 | 2427.4 | 139.9 | 2779 | 2431.4 | 0.926 | 0.963 | BARRE 230.00 - VILLA PK 230.00 1, BARRE 230.00 - LEWIS 230.00 1 |
| 24132 | SANBRDNO | 230 | 24804 | DEVERS | 230 | 1 | line_2179 | ivsg_la_alt2d3 | 988 | -862.1 | 178.3 | 2295.6 | 880.3 | 0.926 | 0.606 | DEVERS 230.00 - VSTA 230.00 2, VSTA 230.00 - DEVERS 230.00 1 |
| 24042 | ELDORDO | 500 | 24086 | LUGO | 500 | 1 | line_2258 | ivsg_la_alt2d3 | 1386 | 1329.2 | 61.7 | 1476.3 | 1330.6 | 0.924 | 0.691 | LUGO 500.00 - VINCENT 500.00 2, LUGO 500.00 - VICTORVL 500.00 1 |
| 8601 | GEOSUB2 | 230 | 8300 | BANIS230 | 230 | 1 | line_N-203 | ivsg_la_alt2d3 | 550 | 492.1 | 75.7 | 1269.2 | 497.9 | 0.92 | 0.761 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 20238 | HRD-230 | 230 | 20239 | HRD-115 | 115 | 1 | 23021/22/23/41 | ivsg_la_alt2d3 | 225 | 205.4 | -17.5 | 524.7 | 206.2 | 0.92 | 0.83 | MIGUEL 230 CORRIDOR North of ML |
| 20238 | HRD-230 | 230 | 20239 | HRD-115 | 115 | 1 | 23021/22/23/41 | ivsg_la_alt2d3 | 225 | 204.9 | -17.5 | 523 | 205.6 | 0.92 | 0.83 | MIGUEL 230 CORRIDOR West of SN |
| 24016 | BARRE | 230 | 25201 | LEWIS | 230 | 1 | line_2020 | ivsg_la_alt2d3 | 1195 | -1029.9 | 264.8 | 2750.8 | 1063.4 | 0.917 | 0.628 | BARRE 230.00 - VILLA PK 230.00 1, DELAMO 230.00 - ELLIS 230.00 1 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | 23022/23023 | ivsg_la_alt2d3 | 388 | -347.7 | 11.9 | 889.9 | 347.9 | 0.914 | 0.841 | ML-MS1+ ML-MS2 230KV |
| 24016 | BARRE | 230 | 25201 | LEWIS | 230 | 1 | line_2023 | ivsg_la_alt2d3 | 1195 | -1021.5 | 275.3 | 2734.7 | 1057.9 | 0.912 | 0.628 | BARRE 230.00 - VILLA PK 230.00 1, LEWIS 230.00 - SERRANO 230.00 1 |
| 24016 | BARRE | 230 | 25201 | LEWIS | 230 | 1 | line_2024 | ivsg_la_alt2d3 | 1195 | -1021.5 | 275.3 | 2734.7 | 1057.9 | 0.912 | 0.628 | BARRE 230.00 - VILLA PK 230.00 1, LEWIS 230.00 - SERRANO 230.00 2 |
| 24016 | BARRE | 230 | 25201 | LEWIS | 230 | 1 | line_2025 | ivsg_la_alt2d3 | 1195 | -1023.1 | 269.9 | 2733.2 | 1058.1 | 0.912 | 0.628 | BARRE 230.00 - VILLA PK 230.00 1, LEWIS 230.00 - VILLA PK 230.00 1 |
| 20238 | HRD-230 | 230 | 20239 | HRD-115 | 115 | 1 | 23021/22/23/41 | ivsg_la_alt2d3 | 225 | 204.3 | -17.3 | 521.5 | 205 | 0.91 | 0.83 | MIGUEL 230 CORRIDOR West of LC |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_N-203 | ivsg_la_alt2d3 | 2598 | 2387.1 | 78.5 | 2722.4 | 2388.4 | 0.907 | 0.963 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 19051 | KNOB | 161 | 8367 | PILOTKNB | 161 | 1 | line_N-210 | ivsg_la_alt2d3 | 165 | -150 | 18.6 | 535.8 | 151.2 | 0.906 | 0.802 | EL CENTRO IMPERIAL VALLEY 230 CKTS 2&3 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | line_N-204 | ivsg_la_alt2d3 | 388 | -340.5 | 15.4 | 878.1 | 340.8 | 0.902 | 0.841 | COACHELLA MIDWAY 230 CKT 1&2 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_2096 | ivsg_la_alt2d3 | 56 | 49.7 | -5.2 | 244.7 | 49.9 | 0.9 | 0.94 | EAGLROCK 230.00 - MESA CAL 230.00 1, GOODRICH 230.00 - GOULD 230.00 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_2106 | ivsg_la_alt2d3 | 56 | 49.9 | -5.1 | 245.9 | 50.1 | 0.9 | 0.94 | PARDEE 230.00 - SYLMAR S 230.00 1, SYLMAR S 230.00 - GOULD 230.00 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_2107 | ivsg_la_alt2d3 | 56 | 49.9 | -5.1 | 245.9 | 50.1 | 0.9 | 0.94 | PARDEE 230.00 - SYLMAR S 230.00 2, SYLMAR S 230.00 - GOULD 230.00 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_2109 | ivsg_la_alt2d3 | 56 | 49.7 | -5 | 245.1 | 50 | 0.9 | 0.94 | PARDEE 230.00 - SYLMAR S 230.00 1, PARDEE 230.00 - SYLMAR S 230.00 2 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_2280 | ivsg_la_alt2d3 | 56 | 49.9 | -5.1 | 245.9 | 50.1 | 0.9 | 0.94 | PARDEE 230.00 - SYLMAR S 230.00 1, SYLMAR S 230.00 - GOULD 230.00 1 |
| 20238 | HRD-230 | 230 | 20239 | HRD-115 | 115 | 1 | line_N-203 | ivsg_la_alt2d3 | 225 | 202 | -16.9 | 519.1 | 202.7 | 0.9 | 0.83 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |

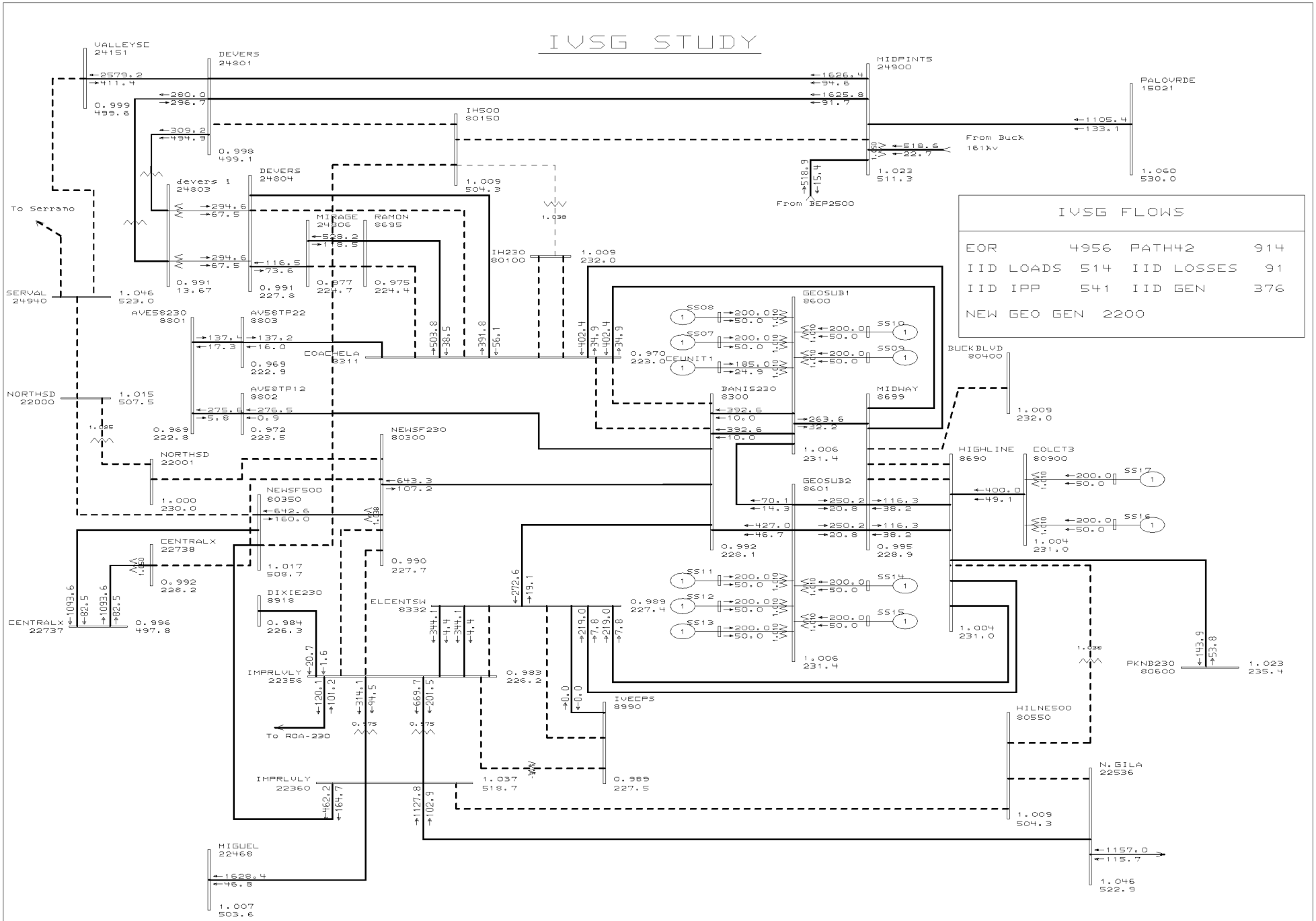
ivsg_la_alt2d3.sav
No Solve Summary
N-2 Outages

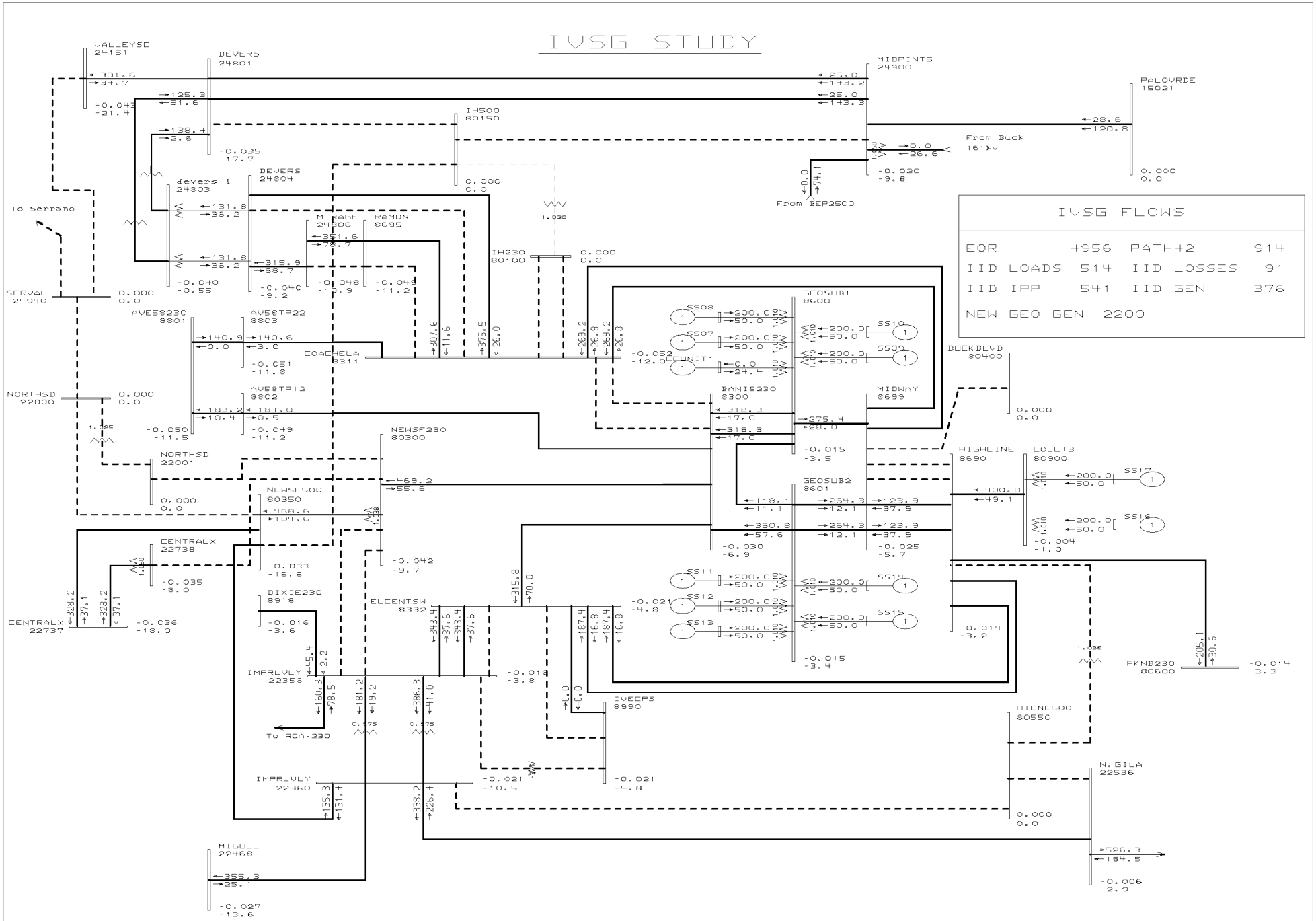
| Contingency-Description | | Case | Problem-Description |
|---|---|---|---|
| line MIDPINTS to DEVERS | 500 ck 1&2 | ivsg_la_alt2d3 | Pmis 15021 PALOVRDE 500.00 = -12159.45 MW + j -130448.73 MVAR |

# Imperial Valley Study Group

## Appendix B.1.3

Alt 2 D4
Light Autumn
Alternative 2
Dispatch 4


IVSG STUDY
VALLEYSC 24151
DEVERS 24801
MIDPINTS 24900
PALOVRDE 15021
IH500 80150
From Buck 161kV
From BEP2500
devers 1 24803
DEVERS 24804
To Serrano
MIRAGE 24806
RAMON 8695
IH230 80100
SERVAL 24940
AVES8230 8801
AVES8TP22 8803
AVES8TP12 8802
COACHELA 8211
GEOSUB1 8600
SS08
SS07
SS10
SS09
CELUNIT1
BUCKBLVD 80400
NORTHSD 22000
NORTHSD 22001
BANIS230 8300
MIDWAY 8699
NEWSF230 80300
NEWSF500 80350
GEOSUB2 8601
HIGHLINE 8690
COLCT3 80900
SS17
SS16
CENTRALX 22738
CENTRALX 22737
DIXIE230 8918
ELCENTSW 8332
SS11
SS12
SS13
SS14
SS15
IMPRLVLY 22356
IMPRLVLY 22360
IVECPS 8990
To ROA-230
HILNE500 80550
N.GILA 22536
PKNB230 80600
MIGUEL 22468
IVSG FLOWS
EOR 4956 PATH42 914
IID LOADS 514 IID LOSSES 91
IID IPP 541 IID GEN 376
NEW GEO GEN 2200


IVSG STUDY
VALLEYSC 24151
DEVERS 24801
MIDPINTS 24900
PALOVRDE 15021
IH500 80150
From Buck 161kV
From BEP2500
devers 1 24803
DEVERS 24804
To Serrano
MIRAGE 24806
RAMON 8695
IH230 80100
SERVAL 24940
AVE58230 8801
AVE58TP22 8803
AVE58TP12 8802
COACHELA 8311
GEOSUB1 8600
SS08
SS07
CELUNIT1
SS10
SS09
BUCKBLVD 80400
NORTHSD 22000
NORTHSD 22001
BANIS230 8300
MIDWAY 8699
NEWSF230 80300
NEWSF500 80350
GEOSUB2 8601
HIGHLINE 8690
COLCT3 80900
SS17
SS16
CENTRALX 22738
CENTRALX 22737
DIXIE230 8918
ELCENTSW 8332
SS11
SS12
SS13
SS14
SS15
IMPRLVLY 22356
IVECPS 8990
To ROA-230
HILNE500 80550
PKNB230 80600
IMPRLVLY 22360
N.GILA 22536
MIGUEL 22468
IVSG FLOWS
EOR 4956 PATH42 914
IID LOADS 514 IID LOSSES 91
IID IPP 541 IID GEN 376
NEW GEO GEN 2200

ivsg_la_alt2d4r1.sav
Voltage Summary
N-0 Outages

| Bus | Name | kV | Area | Zone | Outage | Case | Vbase | Vcont | DeltaV | Vmin | Vmax | Max-dv | Contingency Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 14534 | N.GILA 4 | 100 | 14 | 847 | base | ivsg_la_alt2d4r1 | 0.937 | 0.937 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14606 | N.GILA 3 | 100 | 14 | 847 | base | ivsg_la_alt2d4r1 | 0.937 | 0.937 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 19038 | MEAD | 500 | 14 | 191 | base | ivsg_la_alt2d4r1 | 1.05 | 1.05 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14608 | OCOTIL 1 | 100 | 14 | 141 | base | ivsg_la_alt2d4r1 | 1.051 | 1.051 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24748 | OXBOW A | 230 | 24 | 247 | base | ivsg_la_alt2d4r1 | 1.051 | 1.051 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15093 | HARQUAHA | 500 | 14 | 158 | base | ivsg_la_alt2d4r1 | 1.052 | 1.052 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24141 | SPRINGVL | 230 | 24 | 240 | base | ivsg_la_alt2d4r1 | 1.052 | 1.052 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24153 | VESTAL | 230 | 24 | 240 | base | ivsg_la_alt2d4r1 | 1.052 | 1.052 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14007 | GILARIVR | 500 | 14 | 141 | base | ivsg_la_alt2d4r1 | 1.053 | 1.053 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24097 | MOHAVE | 500 | 24 | 240 | base | ivsg_la_alt2d4r1 | 1.053 | 1.053 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14001 | FOURCORN | 500 | 14 | 141 | base | ivsg_la_alt2d4r1 | 1.054 | 1.054 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15089 | JOJOBA | 500 | 14 | 158 | base | ivsg_la_alt2d4r1 | 1.054 | 1.054 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24775 | RUSH | 115 | 24 | 247 | base | ivsg_la_alt2d4r1 | 1.055 | 1.055 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14005 | WESTWING | 500 | 14 | 141 | base | ivsg_la_alt2d4r1 | 1.056 | 1.056 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24729 | INYO | 230 | 24 | 247 | base | ivsg_la_alt2d4r1 | 1.056 | 1.056 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15031 | PERK PS1 | 500 | 14 | 158 | base | ivsg_la_alt2d4r1 | 1.057 | 1.057 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15032 | PERK PS2 | 500 | 14 | 158 | base | ivsg_la_alt2d4r1 | 1.057 | 1.057 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15033 | PERKINPS | 500 | 14 | 158 | base | ivsg_la_alt2d4r1 | 1.057 | 1.057 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14000 | CHOLLA | 500 | 14 | 141 | base | ivsg_la_alt2d4r1 | 1.057 | 1.057 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 16310 | NL.3WP2 | 100 | 14 | 160 | base | ivsg_la_alt2d4r1 | 1.058 | 1.058 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15092 | ARLINTON | 500 | 14 | 158 | base | ivsg_la_alt2d4r1 | 1.059 | 1.059 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15094 | MESQUITE | 500 | 14 | 158 | base | ivsg_la_alt2d4r1 | 1.059 | 1.059 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14009 | REDHAWK | 500 | 14 | 158 | base | ivsg_la_alt2d4r1 | 1.059 | 1.059 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15021 | PALOVRDE | 500 | 14 | 158 | base | ivsg_la_alt2d4r1 | 1.06 | 1.06 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15034 | PERKINS | 500 | 14 | 158 | base | ivsg_la_alt2d4r1 | 1.06 | 1.06 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15061 | RUDD | 500 | 14 | 158 | base | ivsg_la_alt2d4r1 | 1.06 | 1.06 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15090 | HASSYAMP | 500 | 14 | 158 | base | ivsg_la_alt2d4r1 | 1.06 | 1.06 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14006 | YAVAPAI | 500 | 14 | 141 | base | ivsg_la_alt2d4r1 | 1.061 | 1.061 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14010 | TS5 | 500 | 14 | 840 | base | ivsg_la_alt2d4r1 | 1.061 | 1.061 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14100 | CHOLLA | 345 | 14 | 141 | base | ivsg_la_alt2d4r1 | 1.062 | 1.062 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24776 | LEE VINE | 115 | 24 | 247 | base | ivsg_la_alt2d4r1 | 1.063 | 1.063 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24235 | RECTOR | 230 | 24 | 240 | base | ivsg_la_alt2d4r1 | 1.065 | 1.065 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24234 | RECTRSVC | 230 | 24 | 240 | base | ivsg_la_alt2d4r1 | 1.065 | 1.065 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15087 | SNTAROSA | 500 | 14 | 158 | base | ivsg_la_alt2d4r1 | 1.067 | 1.067 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15088 | PINAL_W | 500 | 14 | 158 | base | ivsg_la_alt2d4r1 | 1.068 | 1.068 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 16302 | NL.3WP | 100 | 14 | 160 | base | ivsg_la_alt2d4r1 | 1.068 | 1.068 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15001 | CORONADO | 500 | 14 | 140 | base | ivsg_la_alt2d4r1 | 1.071 | 1.071 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14002 | MOENKOPI | 500 | 14 | 141 | base | ivsg_la_alt2d4r1 | 1.074 | 1.074 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14003 | NAVAJO | 500 | 14 | 141 | base | ivsg_la_alt2d4r1 | 1.081 | 1.081 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24304 | BIG CRK4 | 230 | 24 | 243 | base | ivsg_la_alt2d4r1 | 1.087 | 1.087 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24301 | BIG CRK1 | 230 | 24 | 243 | base | ivsg_la_alt2d4r1 | 1.089 | 1.089 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24320 | EASTWOOD | 230 | 24 | 243 | base | ivsg_la_alt2d4r1 | 1.089 | 1.089 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24316 | MAMMOTH | 230 | 24 | 243 | base | ivsg_la_alt2d4r1 | 1.089 | 1.089 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24302 | BIG CRK2 | 230 | 24 | 243 | base | ivsg_la_alt2d4r1 | 1.09 | 1.09 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24303 | BIG CRK3 | 230 | 24 | 243 | base | ivsg_la_alt2d4r1 | 1.09 | 1.09 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24305 | BIG CRK8 | 230 | 24 | 243 | base | ivsg_la_alt2d4r1 | 1.09 | 1.09 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |

ivsg_la_alt2d4r1.sav
Flow Summary
N-0 Outages

| LEGEND | % of RATING 1 | |
|---|---|---|
| C_pu | 100% - 110% | |
| C_pu | 110% - 120% | P.U. of |
| C_pu | > 120% | Rate 1 |

| FROM | FR | BKV | TO | TO | BKV | CK | Outage_Name | Case | Rate-Mva | Pflow | Qflow | Amps | MVA | C_pu | B_pu | Contingency_Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24900 | MIDPINTS | 500 | 19399 | BUCK161 | 161 | 1 | base | ivsg_la_alt2d4r1 | 250 | -514 | 70 | 585.8 | 518.8 | 2.08 | 2.08 | Base system (n-0) |
| 19400 | BUCK230 | 230 | 19399 | BUCK161 | 161 | 1 | base | ivsg_la_alt2d4r1 | 280 | 339.2 | 50.4 | 875.7 | 342.9 | 1.22 | 1.22 | Base system (n-0) |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | base | ivsg_la_alt2d4r1 | 1411.6 | 1771.1 | 146.8 | 1899.1 | 1777.2 | 1.177 | 1.177 | Base system (n-0) |
| 16900 | COPPERVR | 345 | 16901 | COPPERVR | 230 | 1 | base | ivsg_la_alt2d4r1 | 200 | 202.2 | 98.4 | 370.5 | 224.9 | 1.12 | 1.12 | Base system (n-0) |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | base | ivsg_la_alt2d4r1 | 458 | 495.6 | 48.3 | 1262 | 498 | 1.098 | 1.098 | Base system (n-0) |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | base | ivsg_la_alt2d4r1 | 1645.4 | 1821.9 | 163.2 | 1965.9 | 1829.2 | 1.035 | 1.035 | Base system (n-0) |
| 24999 | DEVRSVC1 | 500 | 24801 | DEVERS | 500 | 1 | base | ivsg_la_alt2d4r1 | 387.5 | 0 | 400.1 | 462.9 | 400.1 | 1.034 | 1.034 | Base system (n-0) |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | base | ivsg_la_alt2d4r1 | 2598 | 2606.7 | 181 | 3022.9 | 2613 | 1.008 | 1.008 | Base system (n-0) |
| 14206 | CTRYCLUB | 230 | 14216 | LINCSTRT | 230 | 1 | base | ivsg_la_alt2d4r1 | 462.1 | -457.7 | -89.3 | 1162.3 | 466.3 | 1.002 | 1.002 | Base system (n-0) |
| 25641 | TAP816 | 115 | 25664 | TAP998 | 115 | 1 | base | ivsg_la_alt2d4r1 | 107.6 | -96.4 | 41.6 | 533.4 | 105 | 0.988 | 0.988 | Base system (n-0) |
| 25641 | TAP816 | 115 | 25644 | TAP818 | 115 | 1 | base | ivsg_la_alt2d4r1 | 107.6 | 96.4 | -40.8 | 531.8 | 104.7 | 0.985 | 0.985 | Base system (n-0) |
| 24912 | SHANDIN | 115 | 24916 | TAP902 | 115 | 1 | base | ivsg_la_alt2d4r1 | 109.1 | -104.4 | 23.5 | 536.3 | 107 | 0.98 | 0.98 | Base system (n-0) |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | base | ivsg_la_alt2d4r1 | 1120 | -1092.3 | -42 | 2765 | 1093.1 | 0.98 | 0.98 | Base system (n-0) |
| 24805 | DEVERS | 115 | 25644 | TAP818 | 115 | 1 | base | ivsg_la_alt2d4r1 | 217 | -183.7 | 97.1 | 1044.6 | 207.8 | 0.959 | 0.959 | Base system (n-0) |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | base | ivsg_la_alt2d4r1 | 56 | 51.8 | -5.2 | 256 | 52 | 0.94 | 0.94 | Base system (n-0) |
| 25629 | TAP813 | 115 | 25630 | TAP814 | 115 | 1 | base | ivsg_la_alt2d4r1 | 82.7 | 69.9 | -28.3 | 381.6 | 75.4 | 0.919 | 0.919 | Base system (n-0) |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | base | ivsg_la_alt2d4r1 | 388 | -343.8 | 12.2 | 880 | 344 | 0.904 | 0.904 | Base system (n-0) |

| Bus | Name | kV | Area | Zone | Outage | Case | Vbase | Vcont | DeltaV | Vmin | Vmax | Max-dv | Contingency Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22464 | MIGUEL | 230 | 22 | 222 | SO2 | ivsg_la_alt2d4r1 | 0.968 | 0.906 | -0.062 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 24017 | BLYTHESC | 161 | 24 | 248 | line_007 | ivsg_la_alt2d4r1 | 0.998 | 0.906 | -0.093 | 0.9 | 1.05 | 0.05 | line BLYTHE to BLYTHESC 161 ck 1 |
| 22184 | DOUBLET | 138 | 22 | 221 | SO2 | ivsg_la_alt2d4r1 | 0.982 | 0.912 | -0.07 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22192 | DOUBLTTP | 138 | 22 | 221 | SO2 | ivsg_la_alt2d4r1 | 0.982 | 0.912 | -0.07 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22648 | PENSQTOS | 138 | 22 | 221 | SO2 | ivsg_la_alt2d4r1 | 0.982 | 0.912 | -0.07 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22922 | MIRA SOR | 138 | 22 | 221 | SO2 | ivsg_la_alt2d4r1 | 0.982 | 0.912 | -0.07 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22580 | NORTHCTY | 138 | 22 | 224 | SO2 | ivsg_la_alt2d4r1 | 0.984 | 0.914 | -0.07 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22832 | SYCAMORE | 230 | 22 | 221 | SO2 | ivsg_la_alt2d4r1 | 0.983 | 0.918 | -0.064 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22300 | FRIARS | 138 | 22 | 221 | SO2 | ivsg_la_alt2d4r1 | 0.988 | 0.919 | -0.069 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22734 | SANTEE | 138 | 22 | 223 | SO2 | ivsg_la_alt2d4r1 | 0.99 | 0.919 | -0.071 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22500 | MISSION | 138 | 22 | 221 | SO2 | ivsg_la_alt2d4r1 | 0.989 | 0.92 | -0.069 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22116 | CARLTHTP | 138 | 22 | 223 | SO2 | ivsg_la_alt2d4r1 | 0.991 | 0.921 | -0.069 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22120 | CARLTNHS | 138 | 22 | 223 | SO2 | ivsg_la_alt2d4r1 | 0.99 | 0.921 | -0.069 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22124 | CHCARITA | 138 | 22 | 225 | SO2 | ivsg_la_alt2d4r1 | 0.991 | 0.921 | -0.069 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22412 | LOSCOCHS | 138 | 22 | 223 | SO2 | ivsg_la_alt2d4r1 | 0.993 | 0.921 | -0.072 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22268 | ESCNDO51 | 138 | 22 | 225 | SO2 | ivsg_la_alt2d4r1 | 0.994 | 0.922 | -0.071 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22436 | MDWLRKTP | 138 | 22 | 225 | SO2 | ivsg_la_alt2d4r1 | 0.994 | 0.922 | -0.071 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22504 | MISSION | 230 | 22 | 221 | SO2 | ivsg_la_alt2d4r1 | 0.987 | 0.922 | -0.066 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22568 | NCMETER | 138 | 22 | 225 | SO2 | ivsg_la_alt2d4r1 | 0.994 | 0.922 | -0.071 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22572 | NCMETRTP | 138 | 22 | 225 | SO2 | ivsg_la_alt2d4r1 | 0.994 | 0.922 | -0.071 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22052 | BATIQTP | 138 | 22 | 224 | SO2 | ivsg_la_alt2d4r1 | 0.995 | 0.923 | -0.071 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22424 | MAINST50 | 138 | 22 | 222 | SO2 | ivsg_la_alt2d4r1 | 0.995 | 0.923 | -0.072 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22428 | MAINST51 | 138 | 22 | 222 | SO2 | ivsg_la_alt2d4r1 | 0.995 | 0.923 | -0.072 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22772 | SOUTHBAY | 138 | 22 | 222 | SO2 | ivsg_la_alt2d4r1 | 0.994 | 0.923 | -0.071 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22048 | BATIQTOS | 138 | 22 | 224 | SO2 | ivsg_la_alt2d4r1 | 0.995 | 0.924 | -0.071 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22596 | OLD TOWN | 230 | 22 | 221 | SO2 | ivsg_la_alt2d4r1 | 0.99 | 0.925 | -0.065 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22652 | PENSQTOS | 230 | 22 | 221 | SO2 | ivsg_la_alt2d4r1 | 0.992 | 0.925 | -0.066 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22831 | SYCAMORE | 138 | 22 | 221 | SO2 | ivsg_la_alt2d4r1 | 0.992 | 0.925 | -0.068 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22108 | CANNON | 138 | 22 | 224 | SO2 | ivsg_la_alt2d4r1 | 0.998 | 0.926 | -0.071 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22228 | ENCINA | 138 | 22 | 224 | SO2 | ivsg_la_alt2d4r1 | 0.997 | 0.926 | -0.071 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22632 | PALOMAR | 138 | 22 | 224 | SO2 | ivsg_la_alt2d4r1 | 0.997 | 0.926 | -0.071 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 24731 | INYOKERN | 115 | 24 | 247 | line_175 | ivsg_la_alt2d4r1 | 1.011 | 0.926 | -0.085 | 0.9 | 1.05 | 0.05 | line INYO to COTTONWD 230 ck 1 |
| 22264 | ESCNDO50 | 138 | 22 | 225 | SO2 | ivsg_la_alt2d4r1 | 0.998 | 0.927 | -0.071 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22232 | ENCINA | 230 | 22 | 224 | SO2 | ivsg_la_alt2d4r1 | 0.995 | 0.929 | -0.066 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22227 | ENCINATP | 230 | 22 | 224 | SO2 | ivsg_la_alt2d4r1 | 0.996 | 0.93 | -0.066 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22716 | SANLUSRY | 230 | 22 | 224 | SO2 | ivsg_la_alt2d4r1 | 0.995 | 0.93 | -0.065 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22852 | TELECYN | 138 | 22 | 222 | SO2 | ivsg_la_alt2d4r1 | 1.002 | 0.932 | -0.07 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 80300 | NEWSF230 | 230 | 8 | 800 | line_56 | ivsg_la_alt2d4r1 | 0.99 | 0.933 | -0.056 | 0.9 | 1.05 | 0.05 | line NEWSF500 to IMPRLVLY 500 ck 1 |
| 22100 | CALAVRTP | 138 | 22 | 224 | SO2 | ivsg_la_alt2d4r1 | 1.004 | 0.933 | -0.072 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22260 | ESCNDIDO | 230 | 22 | 225 | SO2 | ivsg_la_alt2d4r1 | 1.001 | 0.933 | -0.067 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22261 | EPP | 230 | 22 | 225 | SO2 | ivsg_la_alt2d4r1 | 1 | 0.933 | -0.067 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22738 | CENTRALX | 230 | 22 | 225 | SO2 | ivsg_la_alt2d4r1 | 0.992 | 0.934 | -0.058 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22672 | PRCTRVLY | 138 | 22 | 222 | SO2 | ivsg_la_alt2d4r1 | 1.004 | 0.935 | -0.069 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22760 | SHADOWR | 138 | 22 | 224 | SO2 | ivsg_la_alt2d4r1 | 1.007 | 0.935 | -0.072 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22254 | ENVIREPL | 69 | 22 | 225 | SO2 | ivsg_la_alt2d4r1 | 1.007 | 0.935 | -0.072 | 0 | 0 | 0 | gen S.ONOFR2 22.00 |
| 22460 | MIGUEL | 138 | 22 | 222 | SO2 | ivsg_la_alt2d4r1 | 1.005 | 0.936 | -0.068 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 24131 | S.ONOFRE | 230 | 24 | 240 | SO2 | ivsg_la_alt2d4r1 | 0.999 | 0.937 | -0.062 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22712 | SANLUSRY | 138 | 22 | 224 | SO2 | ivsg_la_alt2d4r1 | 1.01 | 0.938 | -0.072 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22737 | CENTRALX | 500 | 22 | 225 | SO2 | ivsg_la_alt2d4r1 | 0.996 | 0.939 | -0.056 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22844 | TALEGA | 230 | 22 | 226 | SO2 | ivsg_la_alt2d4r1 | 0.998 | 0.941 | -0.058 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22468 | MIGUEL | 500 | 22 | 227 | SO2 | ivsg_la_alt2d4r1 | 1.007 | 0.95 | -0.058 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22472 | MIGUELMP | 500 | 22 | 227 | SO2 | ivsg_la_alt2d4r1 | 1.013 | 0.95 | -0.063 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 24739 | MC GEN | 115 | 24 | 247 | line_175 | ivsg_la_alt2d4r1 | 1.031 | 0.952 | -0.079 | 0.9 | 1.05 | 0.05 | line INYO to COTTONWD 230 ck 1 |
| 24749 | SEARLES | 115 | 24 | 247 | line_175 | ivsg_la_alt2d4r1 | 1.031 | 0.952 | -0.079 | 0.9 | 1.05 | 0.05 | line INYO to COTTONWD 230 ck 1 |
| 24762 | TAP702 | 115 | 24 | 247 | line_175 | ivsg_la_alt2d4r1 | 1.031 | 0.952 | -0.079 | 0.9 | 1.05 | 0.05 | line INYO to COTTONWD 230 ck 1 |
| 24763 | TAP703 | 115 | 24 | 247 | line_175 | ivsg_la_alt2d4r1 | 1.031 | 0.952 | -0.079 | 0.9 | 1.05 | 0.05 | line INYO to COTTONWD 230 ck 1 |
| 24768 | RANDSBRG | 115 | 24 | 247 | line_175 | ivsg_la_alt2d4r1 | 1.006 | 0.954 | -0.052 | 0.9 | 1.05 | 0.05 | line INYO to COTTONWD 230 ck 1 |
| 24761 | TAP701 | 115 | 24 | 247 | line_175 | ivsg_la_alt2d4r1 | 1.006 | 0.954 | -0.052 | 0.9 | 1.05 | 0.05 | line INYO to COTTONWD 230 ck 1 |
| 80350 | NEWSF500 | 500 | 8 | 800 | line_56 | ivsg_la_alt2d4r1 | 1.017 | 0.956 | -0.061 | 0.9 | 1.05 | 0.05 | line NEWSF500 to IMPRLVLY 500 ck 1 |
| 22472 | MIGUELMP | 500 | 22 | 227 | line_66 | ivsg_la_alt2d4r1 | 1.013 | 0.963 | -0.051 | 0.9 | 1.05 | 0.05 | line CENTRALX to NEWSF500 500 ck 1 |
| 22396 | LAGNA NL | 138 | 22 | 226 | SO2 | ivsg_la_alt2d4r1 | 1.02 | 0.97 | -0.05 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22112 | CAPSTRNO | 138 | 22 | 226 | SO2 | ivsg_la_alt2d4r1 | 1.021 | 0.971 | -0.05 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22432 | MARGARTA | 138 | 22 | 226 | SO2 | ivsg_la_alt2d4r1 | 1.021 | 0.971 | -0.05 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22860 | TRABUCO | 138 | 22 | 226 | SO2 | ivsg_la_alt2d4r1 | 1.021 | 0.971 | -0.05 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22930 | MSNVIEJO | 138 | 22 | 226 | SO2 | ivsg_la_alt2d4r1 | 1.021 | 0.971 | -0.05 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 14534 | N.GILA 4 | 100 | 14 | 847 | NG500/69 | ivsg_la_alt2d4r1 | 0.937 | 1 | 0.063 | 0.9 | 1.05 | 0.05 | tran N.GILA 500 to N.GILA 69 ck 1 |
| 24035 | EAGLEMTN | 161 | 24 | 248 | tran_241 | ivsg_la_alt2d4r1 | 0.959 | 1.021 | 0.063 | 0.9 | 1.05 | 0.05 | tran EAGLEMTN 230 to EAGLEMTN 161 ck 1 |
| 24142 | SYC CYN | 230 | 24 | 240 | line_086 | ivsg_la_alt2d4r1 | 1.033 | 1.091 | 0.057 | 0.9 | 1.05 | 0.05 | line MAGUNDEN to OMAR 230 ck 1 |
| 25613 | EDMONSTN | 230 | 24 | 256 | line_122 | ivsg_la_alt2d4r1 | 1.021 | 1.091 | 0.07 | 0.9 | 1.05 | 0.05 | line PASTORIA to EDMONSTN 230 ck 1 |
| 24142 | SYC CYN | 230 | 24 | 240 | line_140 | ivsg_la_alt2d4r1 | 1.033 | 1.091 | 0.057 | 0.9 | 1.05 | 0.05 | line SYC CYN to OMAR 230 ck 1 |

ivsg_la_alt2d4r1.sav
FLOW Summary
N-1 Outages

| LEGEND | % of RATING 1 | |
|---|---|---|
| C_pu | 100% - 110% | |
| C_pu | 110% - 120% | P.U. of |
| C_pu | > 120% | Rate 1 |

| FROM | FR | BKV | TO | TO | BKV | CK | Outage_Name | Case | Rate-Mva | Pflow | Qflow | Amps | MVA | C_pu | B_pu | Contingency_Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24142 | SYC CYN | 230 | 24101 | OMAR | 230 | 1 | line_086 | ivsg_la_alt2d4r1 | 643 | 721.9 | 5514.6 | 12797.7 | 5561.7 | 7.929 | 0.423 | line MAGUNDEN to OMAR 230 ck 1 |
| 24781 | NAVYCOSO | 230 | 24706 | BLM EAST | 230 | 1 | line_173 | ivsg_la_alt2d4r1 | 1287 | -152.6 | -3160.7 | 7943.4 | 3164.4 | 2.459 | 0.057 | line BLM EAST to BLM WEST 230 ck 1 |
| 24781 | NAVYCOSO | 230 | 24706 | BLM EAST | 230 | 1 | line_174 | ivsg_la_alt2d4r1 | 1287 | -152.6 | -3160.7 | 7943.4 | 3164.4 | 2.459 | 0.057 | line BLM WEST to KRAMER 230 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_175 | ivsg_la_alt2d4r1 | 56 | -106.6 | 5.6 | 544 | 106.8 | 1.91 | 0.94 | line INYO to COTTONWD 230 ck 1 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_001 | ivsg_la_alt2d4r1 | 1411.6 | 2689.5 | 457 | 2930.5 | 2728 | 1.817 | 1.177 | line MOENKOPI to ELDORDO 500 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_202 | ivsg_la_alt2d4r1 | 56 | 80.6 | -8.9 | 406.2 | 81.1 | 1.47 | 0.94 | line OWENSCON to INYO 230 ck 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_206 | ivsg_la_alt2d4r1 | 458 | 641.1 | 116.3 | 1654.2 | 651.6 | 1.44 | 1.098 | line SERRANO to VALLEYSC 500 ck 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_135 | ivsg_la_alt2d4r1 | 458 | 629 | 79.1 | 1615 | 633.9 | 1.405 | 1.098 | line SANBRDNO to DEVERS 230 ck 1 |
| 22464 | MIGUEL | 230 | 22472 | MIGUELMP | 500 | 1 | ML81 | ivsg_la_alt2d4r1 | 1120 | -1435.1 | 246.7 | 3791 | 1456.2 | 1.3 | 0.75 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_183 | ivsg_la_alt2d4r1 | 458 | 582.2 | 76.1 | 1492 | 587.2 | 1.298 | 1.098 | line DEVERS to VSTA 230 ck 2 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_185 | ivsg_la_alt2d4r1 | 458 | 582.2 | 76.1 | 1492 | 587.2 | 1.298 | 1.098 | line VSTA to DEVERS 230 ck 1 |
| 22468 | MIGUEL | 500 | 22472 | MIGUELMP | 500 | 1 | ML81 | ivsg_la_alt2d4r1 | 1120 | 1437.9 | 14.5 | 1660.8 | 1437.9 | 1.29 | 0.75 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 22464 | MIGUEL | 230 | 22468 | MIGUEL | 500 | 1 | ML80 | ivsg_la_alt2d4r1 | 1120 | -1416 | 246.2 | 3742.4 | 1437.3 | 1.28 | 0.71 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | B2_001 | ivsg_la_alt2d4r1 | 1411.6 | 1884.4 | 224.3 | 2046.6 | 1897.7 | 1.27 | 1.177 | HASSYAMP - N.GILA 1 500kV |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_206 | ivsg_la_alt2d4r1 | 1411.6 | 1875.9 | 218.3 | 2034.7 | 1888.6 | 1.263 | 1.177 | line SERRANO to VALLEYSC 500 ck 1 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | B2_003 | ivsg_la_alt2d4r1 | 1411.6 | 1852.2 | 206 | 2004.6 | 1863.6 | 1.244 | 1.177 | N.GILA - IMPRLVLY 1 500kV |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_84 | ivsg_la_alt2d4r1 | 1411.6 | 1833.5 | 190.1 | 1979.4 | 1843.4 | 1.228 | 1.177 | line MIDPINTS to DEVERS 500 ck 1 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_85 | ivsg_la_alt2d4r1 | 1411.6 | 1833.5 | 190 | 1979.3 | 1843.3 | 1.228 | 1.177 | line MIDPINTS to DEVERS 500 ck 2 |
| 22356 | IMPRLVLY | 230 | 22360 | IMPRLVLY | 500 | 1 | IV81 | ivsg_la_alt2d4r1 | 600 | 696.8 | 230 | 1865 | 733.8 | 1.22 | 0.55 | tran IMPRLVLY 230 to IMPRLVLY 500 ck 2 |
| 24900 | MIDPINTS | 500 | 24801 | DEVERS | 500 | 2 | line_84 | ivsg_la_alt2d4r1 | 2338 | 2770.8 | 461.6 | 3207.4 | 2809 | 1.193 | 0.685 | line MIDPINTS to DEVERS 500 ck 1 |
| 24900 | MIDPINTS | 500 | 24801 | DEVERS | 500 | 1 | line_85 | ivsg_la_alt2d4r1 | 2338 | 2771.1 | 462.4 | 3208.1 | 2809.4 | 1.193 | 0.685 | line MIDPINTS to DEVERS 500 ck 2 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | line_66 | ivsg_la_alt2d4r1 | 388 | -431.3 | -8 | 1127.7 | 431.3 | 1.158 | 0.904 | line CENTRALX to NEWSF500 500 ck 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_001 | ivsg_la_alt2d4r1 | 458 | 512.4 | 42.3 | 1328.9 | 514.2 | 1.156 | 1.098 | line MOENKOPI to ELDORDO 500 ck 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_085 | ivsg_la_alt2d4r1 | 458 | 513.2 | 44.1 | 1325.4 | 515.1 | 1.153 | 1.098 | line LUGO to VICTORVL 500 ck 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_66 | ivsg_la_alt2d4r1 | 458 | 510.2 | 42.9 | 1324.2 | 512 | 1.152 | 1.098 | line CENTRALX to NEWSF500 500 ck 1 |
| 24806 | MIRAGE | 230 | 24807 | MIRAGE | 115 | 2 | tran_238 | ivsg_la_alt2d4r1 | 280 | 319.8 | 27.1 | 830.7 | 320.9 | 1.15 | 0.58 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_047 | ivsg_la_alt2d4r1 | 458 | 507.4 | 46.2 | 1311.5 | 509.5 | 1.141 | 1.098 | line ELDORDO to LUGO 500 ck 1 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_085 | ivsg_la_alt2d4r1 | 1411.6 | 1702.2 | 156.4 | 1826.7 | 1709.4 | 1.133 | 1.177 | line LUGO to VICTORVL 500 ck 1 |
| 24729 | INYO | 230 | 24730 | INYO PS | 115 | 1 | line_175 | ivsg_la_alt2d4r1 | 50 | 53.3 | 18.8 | 136 | 56.5 | 1.13 | 0.54 | line INYO to COTTONWD 230 ck 1 |
| 24729 | INYO | 230 | 24730 | INYO PS | 115 | 2 | line_175 | ivsg_la_alt2d4r1 | 50 | 53.3 | 18.8 | 136 | 56.5 | 1.13 | 0.54 | line INYO to COTTONWD 230 ck 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | B2_001 | ivsg_la_alt2d4r1 | 1645.4 | 1949.4 | 236.3 | 2136.8 | 1963.7 | 1.125 | 1.035 | HASSYAMP - N.GILA 1 500kV |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_206 | ivsg_la_alt2d4r1 | 1645.4 | 1943.6 | 231.1 | 2127 | 1957.3 | 1.12 | 1.035 | line SERRANO to VALLEYSC 500 ck 1 |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_206 | ivsg_la_alt2d4r1 | 458 | 479.6 | -49.5 | 1281.4 | 482.2 | 1.115 | 0.781 | line SERRANO to VALLEYSC 500 ck 1 |
| 24723 | CONTROL | 115 | 24731 | INYOKERN | 115 | 1 | line_175 | ivsg_la_alt2d4r1 | 82.7 | 89 | -7.7 | 457.5 | 89.3 | 1.102 | 0.306 | line INYO to COTTONWD 230 ck 1 |
| 24723 | CONTROL | 115 | 24731 | INYOKERN | 115 | 2 | line_175 | ivsg_la_alt2d4r1 | 82.7 | 89 | -7.7 | 457.5 | 89.3 | 1.102 | 0.306 | line INYO to COTTONWD 230 ck 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | B2_003 | ivsg_la_alt2d4r1 | 1645.4 | 1914.9 | 218.5 | 2089.6 | 1927.3 | 1.1 | 1.035 | N.GILA - IMPRLVLY 1 500kV |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_135 | ivsg_la_alt2d4r1 | 458 | 468.4 | -78.6 | 1248.5 | 475 | 1.086 | 0.781 | line SANBRDNO to DEVERS 230 ck 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_84 | ivsg_la_alt2d4r1 | 1645.4 | 1894.4 | 201.3 | 2060.8 | 1905.1 | 1.085 | 1.035 | line MIDPINTS to DEVERS 500 ck 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_85 | ivsg_la_alt2d4r1 | 1645.4 | 1894.4 | 201.2 | 2060.7 | 1905 | 1.085 | 1.035 | line MIDPINTS to DEVERS 500 ck 2 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_169 | ivsg_la_alt2d4r1 | 56 | 59.6 | -5 | 296.3 | 59.8 | 1.08 | 0.94 | line KRAMER to LUGO 230 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_170 | ivsg_la_alt2d4r1 | 56 | 59.6 | -5 | 296.3 | 59.8 | 1.08 | 0.94 | line KRAMER to LUGO 230 ck 2 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | PV1 | ivsg_la_alt2d4r1 | 1411.6 | 1639.7 | 83.3 | 1742.5 | 1641.8 | 1.079 | 1.177 | gen PALOVRD1 24.00 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_183 | ivsg_la_alt2d4r1 | 2598 | 2758.8 | 277 | 3219.5 | 2772.7 | 1.073 | 1.008 | line DEVERS to VSTA 230 ck 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_185 | ivsg_la_alt2d4r1 | 2598 | 2758.8 | 277 | 3219.5 | 2772.7 | 1.073 | 1.008 | line VSTA to DEVERS 230 ck 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | B2_001 | ivsg_la_alt2d4r1 | 2598 | 2680.2 | 239.4 | 3205.8 | 2690.9 | 1.069 | 1.008 | HASSYAMP - N.GILA 1 500kV |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_001 | ivsg_la_alt2d4r1 | 2598 | 2706 | 219.9 | 3206.1 | 2714.9 | 1.069 | 1.008 | line MOENKOPI to ELDORDO 500 ck 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_44 | ivsg_la_alt2d4r1 | 458 | 483.5 | 47.2 | 1226.8 | 485.8 | 1.067 | 1.098 | line COACHELA to DEVERS 230 ck 2 |
| 24999 | DEVRSVC1 | 500 | 24801 | DEVERS | 500 | 1 | line_84 | ivsg_la_alt2d4r1 | 387.5 | 0 | 400.1 | 476.9 | 400.1 | 1.066 | 1.034 | line MIDPINTS to DEVERS 500 ck 1 |
| 24999 | DEVRSVC1 | 500 | 24801 | DEVERS | 500 | 1 | line_85 | ivsg_la_alt2d4r1 | 387.5 | 0 | 400.1 | 476.8 | 400.1 | 1.066 | 1.034 | line MIDPINTS to DEVERS 500 ck 2 |
| 24999 | DEVRSVC1 | 500 | 24801 | DEVERS | 500 | 1 | B2_001 | ivsg_la_alt2d4r1 | 387.5 | 0 | 400.1 | 476.7 | 400.1 | 1.065 | 1.034 | HASSYAMP - N.GILA 1 500kV |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_135 | ivsg_la_alt2d4r1 | 2598 | 2734 | 257.9 | 3192.6 | 2746.1 | 1.064 | 1.008 | line SANBRDNO to DEVERS 230 ck 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_085 | ivsg_la_alt2d4r1 | 2598 | 2704.1 | 212 | 3188.2 | 2712.4 | 1.063 | 1.008 | line LUGO to VICTORVL 500 ck 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_29 | ivsg_la_alt2d4r1 | 458 | 483.8 | 50.1 | 1220.7 | 486.4 | 1.062 | 1.098 | line HIGHLINE to COLCT3 230 ck 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | B2_003 | ivsg_la_alt2d4r1 | 2598 | 2680.4 | 230.7 | 3182.3 | 2690.3 | 1.061 | 1.008 | N.GILA - IMPRLVLY 1 500kV |
| 8601 | GEOSUB2 | 230 | 8300 | BANIS230 | 230 | 1 | line_22 | ivsg_la_alt2d4r1 | 550 | 580.1 | 66.2 | 1462.7 | 583.9 | 1.06 | 0.777 | line GEOSUB1 to BANIS230 230 ck 1 |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8601 | GEOSUB2 | 230 | 8300 | BANIS230 | 230 | 1 | line_23 | ivsg_la_alt2d4r1 | 550 | 580.1 | 66.2 | 1462.7 | 583.9 | 1.06 | 0.777 | line GEOSUB1 to BANIS230 230 ck 2 |
| 20238 | HRD-230 | 230 | 20239 | HRD-115 | 115 | 1 | line_66 | ivsg_la_alt2d4r1 | 225 | 236.9 | -26.2 | 621.7 | 238.3 | 1.06 | 0.88 | line CENTRALX to NEWSF500 500 ck 1 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | ML80 | ivsg_la_alt2d4r1 | 1120 | -1187.3 | -31.5 | 3028.6 | 1187.7 | 1.06 | 0.98 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | ML81 | ivsg_la_alt2d4r1 | 1120 | -1178.6 | -32.7 | 3004.2 | 1179 | 1.06 | 0.98 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | B2_003 | ivsg_la_alt2d4r1 | 800 | 826.3 | 40.9 | 2121.8 | 827.3 | 1.057 | 0.824 | N.GILA - IMPRLVLY 1 500kV |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_66 | ivsg_la_alt2d4r1 | 2598 | 2677.9 | 230.6 | 3164.7 | 2687.8 | 1.055 | 1.008 | line CENTRALX to NEWSF500 500 ck 1 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_56 | ivsg_la_alt2d4r1 | 800 | 802.9 | 144.9 | 2115.6 | 815.9 | 1.054 | 0.824 | line NEWSF500 to IMPRLVLY 500 ck 1 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | B2_022 | ivsg_la_alt2d4r1 | 1120 | -1169.8 | -38.2 | 3012.2 | 1170.4 | 1.05 | 0.98 | OTAYMESA - TJI-230 1 230kV |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | B2_028 | ivsg_la_alt2d4r1 | 1120 | -1166.8 | -25.3 | 2959.6 | 1167 | 1.05 | 0.98 | MIGUEL - SYCAMORE 1 230kV |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_302 | ivsg_la_alt2d4r1 | 2598 | 2700 | 237 | 3149 | 2710.4 | 1.05 | 1.008 | line DEVERS to OAK_VLLY 230 ck 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_84 | ivsg_la_alt2d4r1 | 458 | 464.5 | 23.3 | 1206 | 465.1 | 1.049 | 1.098 | line MIDPINTS to DEVERS 500 ck 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_85 | ivsg_la_alt2d4r1 | 458 | 464.6 | 23.4 | 1205.9 | 465.1 | 1.049 | 1.098 | line MIDPINTS to DEVERS 500 ck 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_047 | ivsg_la_alt2d4r1 | 2598 | 2667.9 | 229.7 | 3146.6 | 2677.8 | 1.049 | 1.008 | line ELDORDO to LUGO 500 ck 1 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | line_206 | ivsg_la_alt2d4r1 | 1120 | -1158.2 | -46.8 | 3010.8 | 1159.1 | 1.04 | 0.98 | line SERRANO to VALLEYSC 500 ck 1 |
| 24805 | DEVERS | 115 | 24804 | DEVERS | 230 | 1 | tran_236 | ivsg_la_alt2d4r1 | 280 | 254.3 | -94.2 | 1354.5 | 271.2 | 1.04 | 0.68 | tran DEVERS 115 to DEVERS 230 ck 3 |
| 20238 | HRD-230 | 230 | 20118 | ROA-230 | 230 | 1 | line_66 | ivsg_la_alt2d4r1 | 388 | -371.3 | 100 | 1003.1 | 384.5 | 1.034 | 0.782 | line CENTRALX to NEWSF500 500 ck 1 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | SO2 | ivsg_la_alt2d4r1 | 1120 | -1142 | -93.4 | 3079.8 | 1145.8 | 1.03 | 0.98 | gen S.ONOFR2 22.00 |
| 24805 | DEVERS | 115 | 24804 | DEVERS | 230 | 3 | tran_235 | ivsg_la_alt2d4r1 | 280 | 251.3 | -93.4 | 1341.2 | 268.1 | 1.03 | 0.66 | tran DEVERS 115 to DEVERS 230 ck 1 |
| 24805 | DEVERS | 115 | 24804 | DEVERS | 230 | 1 | tran_237 | ivsg_la_alt2d4r1 | 280 | 252.8 | -94.9 | 1357.7 | 270 | 1.03 | 0.68 | tran DEVERS 115 to DEVERS 230 ck 4 |
| 8600 | GEOSUB1 | 230 | 8300 | BANIS230 | 230 | 1 | line_47 | ivsg_la_alt2d4r1 | 550 | 557.7 | 62.6 | 1407 | 561.2 | 1.02 | 0.72 | line GEOSUB2 to BANIS230 230 ck 1 |
| 8600 | GEOSUB1 | 230 | 8300 | BANIS230 | 230 | 2 | line_47 | ivsg_la_alt2d4r1 | 550 | 557.7 | 62.6 | 1407 | 561.2 | 1.02 | 0.72 | line GEOSUB2 to BANIS230 230 ck 1 |
| 24805 | DEVERS | 115 | 24804 | DEVERS | 230 | 4 | tran_235 | ivsg_la_alt2d4r1 | 280 | 248.4 | -92.3 | 1325.6 | 265 | 1.02 | 0.65 | tran DEVERS 115 to DEVERS 230 ck 1 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | IV81 | ivsg_la_alt2d4r1 | 388 | -386 | 3 | 992 | 386 | 1.019 | 0.904 | tran IMPRLVLY 230 to IMPRLVLY 500 ck 2 |
| 24701 | KRAMER | 230 | 24085 | LUGO | 230 | 2 | line_169 | ivsg_la_alt2d4r1 | 478 | 478.2 | 75 | 1221 | 484.1 | 1.018 | 0.611 | line KRAMER to LUGO 230 ck 1 |
| 24701 | KRAMER | 230 | 24085 | LUGO | 230 | 1 | line_170 | ivsg_la_alt2d4r1 | 478 | 478.2 | 75 | 1221 | 484.1 | 1.018 | 0.611 | line KRAMER to LUGO 230 ck 2 |
| 22360 | IMPRLVLY | 500 | 22468 | MIGUEL | 500 | 1 | line_66 | ivsg_la_alt2d4r1 | 2252 | 2227 | 505 | 2597.1 | 2283.5 | 1.016 | 0.718 | line CENTRALX to NEWSF500 500 ck 1 |
| 24042 | ELDORDO | 500 | 24086 | LUGO | 500 | 1 | line_085 | ivsg_la_alt2d4r1 | 1386 | 1451.1 | 90.8 | 1622.8 | 1453.9 | 1.014 | 0.735 | line LUGO to VICTORVL 500 ck 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_059 | ivsg_la_alt2d4r1 | 458 | 457.7 | 40.7 | 1163.3 | 459.5 | 1.012 | 1.098 | line ETIWANDA to SANBRDNO 230 ck 1 |
| 22464 | MIGUEL | 230 | 22472 | MIGUELMP | 500 | 1 | line_66 | ivsg_la_alt2d4r1 | 1120 | -1121.8 | 163.4 | 3092 | 1133.6 | 1.01 | 0.75 | line CENTRALX to NEWSF500 500 ck 1 |
| 22468 | MIGUEL | 500 | 22472 | MIGUELMP | 500 | 1 | line_66 | ivsg_la_alt2d4r1 | 1120 | 1123.6 | 10.3 | 1354.6 | 1123.6 | 1.01 | 0.75 | line CENTRALX to NEWSF500 500 ck 1 |
| 24805 | DEVERS | 115 | 24804 | DEVERS | 230 | 3 | tran_237 | ivsg_la_alt2d4r1 | 280 | 246.8 | -92.7 | 1325.7 | 263.6 | 1.01 | 0.66 | tran DEVERS 115 to DEVERS 230 ck 4 |
| 24151 | VALLEYSC | 500 | 24160 | VALLEYSC | 115 | 2 | tran_247 | ivsg_la_alt2d4r1 | 560 | 541 | 171.4 | 662.5 | 567.5 | 1.01 | 0.49 | tran VALLEYSC 500 to VALLEYSC 115 ck 1 |
| 24151 | VALLEYSC | 500 | 24160 | VALLEYSC | 115 | 1 | tran_248 | ivsg_la_alt2d4r1 | 560 | 541 | 171.4 | 662.5 | 567.5 | 1.01 | 0.49 | tran VALLEYSC 500 to VALLEYSC 115 ck 2 |
| 8600 | GEOSUB1 | 230 | 8300 | BANIS230 | 230 | 2 | line_22 | ivsg_la_alt2d4r1 | 550 | 552 | 63.3 | 1391.5 | 555.6 | 1.008 | 0.72 | line GEOSUB1 to BANIS230 230 ck 1 |
| 8600 | GEOSUB1 | 230 | 8300 | BANIS230 | 230 | 1 | line_23 | ivsg_la_alt2d4r1 | 550 | 552 | 63.3 | 1391.5 | 555.6 | 1.008 | 0.72 | line GEOSUB1 to BANIS230 230 ck 2 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_047 | ivsg_la_alt2d4r1 | 1645.4 | 1747.2 | 200 | 1894.4 | 1758.6 | 1 | 1.035 | line ELDORDO to LUGO 500 ck 1 |
| 24801 | DEVERS | 500 | 24804 | DEVERS | 230 | 1 | line_206 | ivsg_la_alt2d4r1 | 1120 | 795.6 | 782.6 | 1258 | 1116 | 1 | 0.52 | line SERRANO to VALLEYSC 500 ck 1 |
| 24805 | DEVERS | 115 | 24804 | DEVERS | 230 | 4 | tran_236 | ivsg_la_alt2d4r1 | 280 | 245.4 | -90.9 | 1307.3 | 261.7 | 1 | 0.65 | tran DEVERS 115 to DEVERS 230 ck 3 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_085 | ivsg_la_alt2d4r1 | 1645.4 | 1754 | 183.6 | 1895.3 | 1763.6 | 0.999 | 1.035 | line LUGO to VICTORVL 500 ck 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | PV1 | ivsg_la_alt2d4r1 | 458 | 460.9 | 48 | 1145.9 | 463.4 | 0.997 | 1.098 | gen PALOVRD1 24.00 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | tran_210 | ivsg_la_alt2d4r1 | 56 | 54.9 | -5.1 | 271.7 | 55.1 | 0.99 | 0.94 | tran LUGO 500 to LUGO 230 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | tran_211 | ivsg_la_alt2d4r1 | 56 | 54.9 | -5.1 | 271.9 | 55.2 | 0.99 | 0.94 | tran LUGO 500 to LUGO 230 ck 2 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | SO2 | ivsg_la_alt2d4r1 | 388 | -367.9 | -7.9 | 960.9 | 368 | 0.987 | 0.904 | gen S.ONOFR2 22.00 |
| 8695 | RAMON | 230 | 24806 | MIRAGE | 230 | 2 | line_44 | ivsg_la_alt2d4r1 | 800 | 744.9 | -163.9 | 1978.4 | 762.7 | 0.985 | 0.693 | line COACHELA to DEVERS 230 ck 2 |
| 20238 | HRD-230 | 230 | 20102 | RUM-230 | 230 | 1 | line_66 | ivsg_la_alt2d4r1 | 388 | -352.1 | 96.3 | 952.4 | 365.1 | 0.983 | 0.734 | line CENTRALX to NEWSF500 500 ck 1 |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_183 | ivsg_la_alt2d4r1 | 458 | 424.4 | -58.3 | 1124.6 | 428.4 | 0.978 | 0.781 | line DEVERS to VSTA 230 ck 2 |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_185 | ivsg_la_alt2d4r1 | 458 | 424.4 | -58.3 | 1124.6 | 428.4 | 0.978 | 0.781 | line VSTA to DEVERS 230 ck 1 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | B2_001 | ivsg_la_alt2d4r1 | 800 | 772.9 | 8.8 | 1950.4 | 772.9 | 0.971 | 0.824 | HASSYAMP - N.GILA 1 500kV |
| 20238 | HRD-230 | 230 | 20239 | HRD-115 | 115 | 1 | IV81 | ivsg_la_alt2d4r1 | 225 | 216.7 | -18.5 | 557.3 | 217.5 | 0.97 | 0.88 | tran IMPRLVLY 230 to IMPRLVLY 500 ck 2 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_086 | ivsg_la_alt2d4r1 | 56 | 53.7 | -5.6 | 266.5 | 54 | 0.97 | 0.94 | line MAGUNDEN to OMAR 230 ck 1 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | line_56 | ivsg_la_alt2d4r1 | 388 | -366 | 6.2 | 939.9 | 366.1 | 0.965 | 0.904 | line NEWSF500 to IMPRLVLY 500 ck 1 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | line_206 | ivsg_la_alt2d4r1 | 388 | -364.3 | 7.1 | 940.2 | 364.3 | 0.965 | 0.904 | line SERRANO to VALLEYSC 500 ck 1 |
| 22464 | MIGUEL | 230 | 22468 | MIGUEL | 500 | 1 | line_66 | ivsg_la_alt2d4r1 | 1120 | -1061.9 | 152.3 | 2925.9 | 1072.7 | 0.96 | 0.71 | line CENTRALX to NEWSF500 500 ck 1 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | ML80 | ivsg_la_alt2d4r1 | 388 | -363.3 | 9.3 | 933 | 363.4 | 0.958 | 0.904 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | ML81 | ivsg_la_alt2d4r1 | 388 | -361.5 | 9.5 | 928.1 | 361.6 | 0.953 | 0.904 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | line_7 | ivsg_la_alt2d4r1 | 388 | -358.8 | 14.3 | 925 | 359.1 | 0.95 | 0.904 | line BANIS230 to NEWSF230 230 ck 1 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | line_29 | ivsg_la_alt2d4r1 | 1120 | -1054.9 | -45 | 2648.7 | 1055.9 | 0.95 | 0.98 | line HIGHLINE to COLCT3 230 ck 1 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | IV81 | ivsg_la_alt2d4r1 | 1120 | -1058.2 | -16.3 | 2713.2 | 1058.4 | 0.95 | 0.98 | tran IMPRLVLY 230 to IMPRLVLY 500 ck 2 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | tran_74 | ivsg_la_alt2d4r1 | 388 | -358.7 | 14.2 | 924.6 | 359 | 0.949 | 0.904 | tran NEWSF230 230 to NEWSF500 500 ck 1 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_6 | ivsg_la_alt2d4r1 | 800 | 745.7 | 28.3 | 1901.7 | 746.2 | 0.947 | 0.824 | line BANIS230 to ELCENTSW 230 ck 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | PV1 | ivsg_la_alt2d4r1 | 1645.4 | 1675.2 | 95.6 | 1787.1 | 1677.9 | 0.941 | 1.035 | gen PALOVRD1 24.00 |
| 24151 | VALLEYSC | 500 | 24229 | VALLEY-S | 115 | 4 | tran_249 | ivsg_la_alt2d4r1 | 560 | 518.5 | 99.2 | 615 | 527.9 | 0.94 | 0.46 | tran VALLEYSC 500 to VALLEY-S 115 ck 3 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24151 | VALLEYSC | 500 | 24229 | VALLEY-S | 115 | 3 | tran_250 | ivsg_la_alt2d4r1 | 560 | 518.5 | 99.2 | 615 | 527.9 | 0.94 | 0.46 | tran VALLEYSC 500 to VALLEY-S 115 ck 4 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | IV81 | ivsg_la_alt2d4r1 | 800 | 737 | 51.3 | 1885.8 | 738.8 | 0.939 | 0.824 | tran IMPRLVLY 230 to IMPRLVLY 500 ck 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_84 | ivsg_la_alt2d4r1 | 2598 | 2358 | 21.3 | 2810.8 | 2358.1 | 0.937 | 1.008 | line MIDPINTS to DEVERS 500 ck 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_85 | ivsg_la_alt2d4r1 | 2598 | 2358.3 | 21.7 | 2810.6 | 2358.4 | 0.937 | 1.008 | line MIDPINTS to DEVERS 500 ck 2 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | IV80 | ivsg_la_alt2d4r1 | 388 | -355.8 | 9.8 | 911.8 | 356 | 0.936 | 0.904 | tran IMPRLVLY 230 to IMPRLVLY 500 ck 1 |
| 24804 | DEVERS | 230 | 24901 | VSTA | 230 | 2 | line_206 | ivsg_la_alt2d4r1 | 988 | 886.7 | 218.2 | 2318.1 | 913.1 | 0.935 | 0.694 | line SERRANO to VALLEYSC 500 ck 1 |
| 24901 | VSTA | 230 | 24804 | DEVERS | 230 | 1 | line_206 | ivsg_la_alt2d4r1 | 988 | -850.1 | 166.5 | 2319.4 | 866.2 | 0.935 | 0.694 | line SERRANO to VALLEYSC 500 ck 1 |
| 20238 | HRD-230 | 230 | 20239 | HRD-115 | 115 | 1 | line_56 | ivsg_la_alt2d4r1 | 225 | 207.7 | -15.6 | 532.6 | 208.2 | 0.93 | 0.88 | line NEWSF500 to IMPRLVLY 500 ck 1 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | B2_009 | ivsg_la_alt2d4r1 | 1120 | -1039.4 | -63.2 | 2638.6 | 1041.3 | 0.93 | 0.98 | EPP - ESCNDIDO 1 230kV |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | B2_013 | ivsg_la_alt2d4r1 | 1120 | -1038.5 | -65.5 | 2639.4 | 1040.6 | 0.93 | 0.98 | EPP - SYCAMORE 1 230kV |
| 20238 | HRD-230 | 230 | 20239 | HRD-115 | 115 | 1 | SO2 | ivsg_la_alt2d4r1 | 225 | 208.2 | -10.1 | 547.3 | 208.4 | 0.93 | 0.88 | gen S.ONOFR2 22.00 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | PV1 | ivsg_la_alt2d4r1 | 1120 | -1035.9 | -46.7 | 2586.6 | 1036.9 | 0.93 | 0.98 | gen PALOVRD1 24.00 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_047 | ivsg_la_alt2d4r1 | 2400 | -2195.1 | 438.6 | 2546.5 | 2238.4 | 0.921 | 0.682 | line ELDORDO to LUGO 500 ck 1 |
| 20238 | HRD-230 | 230 | 20239 | HRD-115 | 115 | 1 | line_7 | ivsg_la_alt2d4r1 | 225 | 204.4 | -18.5 | 523.4 | 205.2 | 0.92 | 0.88 | line BANIS230 to NEWSF230 230 ck 1 |
| 20238 | HRD-230 | 230 | 20239 | HRD-115 | 115 | 1 | ML80 | ivsg_la_alt2d4r1 | 225 | 206.5 | -16.6 | 528.5 | 207.1 | 0.92 | 0.88 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 20238 | HRD-230 | 230 | 20239 | HRD-115 | 115 | 1 | ML81 | ivsg_la_alt2d4r1 | 225 | 205.6 | -16.3 | 526.2 | 206.3 | 0.92 | 0.88 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | B2_036 | ivsg_la_alt2d4r1 | 1120 | -1022.1 | -66.5 | 2597.1 | 1024.3 | 0.92 | 0.98 | SYCAMORE - PENSQTOS 1 230kV |
| 20238 | HRD-230 | 230 | 20239 | HRD-115 | 115 | 1 | line_206 | ivsg_la_alt2d4r1 | 225 | 206.8 | -16 | 532.6 | 207.4 | 0.92 | 0.88 | line SERRANO to VALLEYSC 500 ck 1 |
| 8311 | COACHELA | 230 | 8695 | RAMON | 230 | 2 | line_44 | ivsg_la_alt2d4r1 | 800 | 705.4 | -24.9 | 1842.5 | 705.9 | 0.918 | 0.651 | line COACHELA to DEVERS 230 ck 2 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_63 | ivsg_la_alt2d4r1 | 800 | 719.3 | 31.1 | 1834.2 | 719.9 | 0.913 | 0.824 | line RAMON to MIRAGE 230 ck 2 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | line_66 | ivsg_la_alt2d4r1 | 392 | 355.4 | 4.9 | 969.6 | 355.5 | 0.91 | 0.79 | line CENTRALX to NEWSF500 500 ck 1 |
| 20238 | HRD-230 | 230 | 20239 | HRD-115 | 115 | 1 | tran_74 | ivsg_la_alt2d4r1 | 225 | 204.4 | -18.5 | 523.3 | 205.2 | 0.91 | 0.88 | tran NEWSF230 230 to NEWSF500 500 ck 1 |
| 22356 | IMPRLVLY | 230 | 22360 | IMPRLVLY | 500 | 2 | B2_003 | ivsg_la_alt2d4r1 | 1120 | 1000.3 | 201.3 | 2635.2 | 1020.4 | 0.91 | 0.62 | N.GILA - IMPRLVLY 1 500kV |
| 24729 | INYO | 230 | 24730 | INYO PS | 115 | 2 | tran_230 | ivsg_la_alt2d4r1 | 50 | -43.5 | 12.6 | 107.4 | 45.3 | 0.91 | 0.54 | tran INYO 230 to INYO PS 115 ck 1 |
| 24729 | INYO | 230 | 24730 | INYO PS | 115 | 1 | tran_231 | ivsg_la_alt2d4r1 | 50 | -43.5 | 12.6 | 107.4 | 45.3 | 0.91 | 0.54 | tran INYO 230 to INYO PS 115 ck 2 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | line_66 | ivsg_la_alt2d4r1 | 408.3 | -351.4 | 32.7 | 1545.6 | 353 | 0.905 | 0.75 | line CENTRALX to NEWSF500 500 ck 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | PV1 | ivsg_la_alt2d4r1 | 2598 | 2407.9 | 81.1 | 2708.4 | 2409.3 | 0.903 | 1.008 | gen PALOVRD1 24.00 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_184 | ivsg_la_alt2d4r1 | 458 | 409 | 16.3 | 1037.6 | 409.4 | 0.902 | 1.098 | line VSTA to SANBRDNO 230 ck 2 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_50 | ivsg_la_alt2d4r1 | 800 | 712.7 | 29.8 | 1808.9 | 713.3 | 0.901 | 0.824 | line BANIS230 to AV58TP12 230 ck 1 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_51 | ivsg_la_alt2d4r1 | 800 | 713.4 | 33.4 | 1806.6 | 714.2 | 0.9 | 0.824 | line AV58TP12 to AVE58230 230 ck 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_015 | ivsg_la_alt2d4r1 | 392 | 352.1 | 10.9 | 920 | 352.3 | 0.9 | 0.79 | MIGUEL - MISSION 1 230kV |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_122 | ivsg_la_alt2d4r1 | 56 | 49.6 | -4.8 | 244.4 | 49.9 | 0.9 | 0.94 | line PASTORIA to EDMONSTN 230 ck 1 |

ivsg_la_alt2d4r1.sav
No Solve Summary
N-1 Outages

| Contingency-Description | Case | Problem-Description |
|---|---|---|
| IMPRLVLY - MIGUEL 1 500kV | ivsg_la_alt2d4r1 | Pmis 20070 GLL-115 115.00 = -106113.03 MW + j -2000657.75 MVAR |
| line DEVERS to VALLEYSC 500 ck 1 | ivsg_la_alt2d4r1 | Pmis 25640 PANAERO 115.00 = -54041.83 MW + j -19849.01 MVAR |

| Bus | Name | kV | Area | Zone | Outage | Case | Vbase | Vcont | DeltaV | Vmin | Vmax | Max-dv | Contingency Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8802 | AV58TP12 | 230 | 8 | 818 | line_N-204 | ivsg_la_alt2d4r1 | 0.972 | 0.918 | -0.053 | 0.9 | 1.05 | 0.05 | COACHELLA MIDWAY 230 CKT 1&2 |
| 80300 | NEWSF230 | 230 | 8 | 800 | line_N-203 | ivsg_la_alt2d4r1 | 0.99 | 0.931 | -0.059 | 0.9 | 1.05 | 0.05 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 22738 | CENTRALX | 230 | 22 | 225 | line_N-203 | ivsg_la_alt2d4r1 | 0.992 | 0.94 | -0.052 | 0.9 | 1.05 | 0.05 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 22737 | CENTRALX | 500 | 22 | 225 | line_N-203 | ivsg_la_alt2d4r1 | 0.996 | 0.943 | -0.052 | 0.9 | 1.05 | 0.05 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 80350 | NEWSF500 | 500 | 8 | 800 | line_N-203 | ivsg_la_alt2d4r1 | 1.017 | 0.967 | -0.05 | 0.9 | 1.05 | 0.05 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 24237 | RANCHVST | 230 | 24 | 240 | 23021/22/23/41 | ivsg_la_alt2d4r1 | 0.967 | 1.029 | 0.062 | 0.9 | 1.05 | 0.05 | MIGUEL 230 CORRIDOR West of SN |
| 24219 | PISGAH | 230 | 24 | 240 | line_2190 | ivsg_la_alt2d4r1 | 0.99 | 1.04 | 0.05 | 0.9 | 1.05 | 0.05 | PISGAH 230.00 - LUGO 230.00 1, PISGAH 230.00 - LUGO 230.00 2 |
| 25001 | GOODRICH | 230 | 24 | 250 | line_2073 | ivsg_la_alt2d4r1 | 0.987 | 1.044 | 0.058 | 0.9 | 1.05 | 0.05 | GOODRICH 230.00 - GOULD 230.00 1, GOODRICH 230.00 - LAGUBELL 230.00 1 |

ivsg_la_alt2d4r1.sav
FLOW Summary
N-2 Outages

| LEGEND | % of RATING 1 | |
|---|---|---|
| C_pu | 100% - 110% | |
| C_pu | 110% - 120% | P.U. of |
| C_pu | > 120% | Rate 1 |

| FROM | FR | BKV | TO | TO | BKV | CK | Outage_Name | Case | Rate-Mva | Pflow | Qflow | Amps | MVA | C_pu | B_pu | Contingency_Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_2233 | ivsg_la_alt2d4r1 | 1411.6 | 2683.7 | 471.8 | 2929.2 | 2724.8 | 1.817 | 1.177 | MOENKOPI 500.00 - ELDORDO 500.00 1, PISGAH 230.00 - ELDORDO 230.00 2 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2175 | ivsg_la_alt2d4r1 | 458 | 763.6 | 134 | 1983.8 | 775.2 | 1.726 | 1.098 | DEVERS 230.00 - SANBRDNO 230.00 1, DEVERS 230.00 - VSTA 230.00 2 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2177 | ivsg_la_alt2d4r1 | 458 | 763.6 | 134 | 1983.8 | 775.2 | 1.726 | 1.098 | DEVERS 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2178 | ivsg_la_alt2d4r1 | 458 | 763.6 | 134 | 1983.8 | 775.2 | 1.726 | 1.098 | DEVERS 230.00 - VSTA 230.00 2, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2180 | ivsg_la_alt2d4r1 | 458 | 763.6 | 134 | 1983.8 | 775.2 | 1.726 | 1.098 | SANBRDNO 230.00 - DEVERS 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2247 | ivsg_la_alt2d4r1 | 458 | 763.6 | 134 | 1983.8 | 775.2 | 1.726 | 1.098 | DEVERS 230.00 - VSTA 230.00 2, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2179 | ivsg_la_alt2d4r1 | 458 | 718.1 | 133.2 | 1862.4 | 730.4 | 1.621 | 1.098 | DEVERS 230.00 - VSTA 230.00 2, VSTA 230.00 - DEVERS 230.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2238 | ivsg_la_alt2d4r1 | 458 | 644 | 120.1 | 1671.5 | 655.1 | 1.455 | 1.098 | S.ONOFRE 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2239 | ivsg_la_alt2d4r1 | 458 | 641.1 | 116.3 | 1654.2 | 651.6 | 1.44 | 1.098 | CHINO 230.00 - S.ONOFRE 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2240 | ivsg_la_alt2d4r1 | 458 | 639.7 | 117.4 | 1652.3 | 650.3 | 1.438 | 1.098 | CHINO 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2176 | ivsg_la_alt2d4r1 | 458 | 629 | 79.1 | 1615 | 633.9 | 1.405 | 1.098 | DEVERS 230.00 - SANBRDNO 230.00 1, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_2175 | ivsg_la_alt2d4r1 | 458 | 593.4 | -105.1 | 1612.2 | 602.6 | 1.402 | 0.781 | DEVERS 230.00 - SANBRDNO 230.00 1, DEVERS 230.00 - VSTA 230.00 2 |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_2177 | ivsg_la_alt2d4r1 | 458 | 593.4 | -105.1 | 1612.2 | 602.6 | 1.402 | 0.781 | DEVERS 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_2178 | ivsg_la_alt2d4r1 | 458 | 593.4 | -105.1 | 1612.2 | 602.6 | 1.402 | 0.781 | DEVERS 230.00 - VSTA 230.00 2, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_2180 | ivsg_la_alt2d4r1 | 458 | 593.4 | -105.1 | 1612.2 | 602.6 | 1.402 | 0.781 | SANBRDNO 230.00 - DEVERS 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_2247 | ivsg_la_alt2d4r1 | 458 | 593.4 | -105.1 | 1612.2 | 602.6 | 1.402 | 0.781 | DEVERS 230.00 - VSTA 230.00 2, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_la_alt2d4r1 | 392 | 548.6 | 48.4 | 1480 | 550.8 | 1.4 | 0.79 | MIGUEL 230 CORRIDOR West of SN |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_la_alt2d4r1 | 408.3 | -539.3 | 39.3 | 2359.4 | 540.8 | 1.381 | 0.75 | MIGUEL 230 CORRIDOR West of SN |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | 23021/22/23/41 | ivsg_la_alt2d4r1 | 382.4 | 488.7 | -28.6 | 2138.8 | 489.5 | 1.337 | 0.676 | MIGUEL 230 CORRIDOR West of SN |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2167 | ivsg_la_alt2d4r1 | 458 | 598.1 | 69.1 | 1532.6 | 602.1 | 1.333 | 1.098 | DEVERS 230.00 - SANBRDNO 230.00 1, ETIWANDA 230.00 - SANBRDNO 230.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2169 | ivsg_la_alt2d4r1 | 458 | 598.1 | 69.1 | 1532.6 | 602.1 | 1.333 | 1.098 | ETIWANDA 230.00 - SANBRDNO 230.00 1, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2173 | ivsg_la_alt2d4r1 | 458 | 598.9 | 45.7 | 1532.5 | 600.6 | 1.333 | 1.098 | SANBRDNO 230.00 - DEVERS 230.00 1, VSTA 230.00 - SANBRDNO 230.00 2 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2174 | ivsg_la_alt2d4r1 | 458 | 598.9 | 45.7 | 1532.5 | 600.6 | 1.333 | 1.098 | DEVERS 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - SANBRDNO 230.00 2 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2268 | ivsg_la_alt2d4r1 | 458 | 598.1 | 69.1 | 1532.6 | 602.1 | 1.333 | 1.098 | ETIWANDA 230.00 - SANBRDNO 230.00 1, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_2179 | ivsg_la_alt2d4r1 | 458 | 551.4 | -77.4 | 1489 | 556.8 | 1.295 | 0.781 | DEVERS 230.00 - VSTA 230.00 2, VSTA 230.00 - DEVERS 230.00 1 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_2238 | ivsg_la_alt2d4r1 | 1411.6 | 1882.5 | 230.7 | 2045.9 | 1896.6 | 1.27 | 1.177 | S.ONOFRE 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_2240 | ivsg_la_alt2d4r1 | 1411.6 | 1876.2 | 221.9 | 2036.1 | 1889.3 | 1.264 | 1.177 | CHINO 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2246 | ivsg_la_alt2d4r1 | 458 | 569.2 | 74 | 1453.2 | 574 | 1.264 | 1.098 | VSTA 230.00 - DEVERS 230.00 1, COACHELV 230.00 - DEVERS 230.00 2 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_2239 | ivsg_la_alt2d4r1 | 1411.6 | 1875.9 | 218.3 | 2034.7 | 1888.6 | 1.263 | 1.177 | CHINO 230.00 - S.ONOFRE 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | 23021/22/23/41 | ivsg_la_alt2d4r1 | 1120 | -1372.9 | -23.2 | 3572.7 | 1373.1 | 1.23 | 0.98 | MIGUEL 230 CORRIDOR West of SN |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_N-217 | ivsg_la_alt2d4r1 | 1411.6 | 1833.5 | 190.1 | 1979.4 | 1843.4 | 1.228 | 1.177 | line MIDPINTS to IH500/MIDPOINTS DEVERS 500 ck 1 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_2179 | ivsg_la_alt2d4r1 | 1411.6 | 1821.9 | 193.6 | 1967.3 | 1832.1 | 1.221 | 1.177 | DEVERS 230.00 - VSTA 230.00 2, VSTA 230.00 - DEVERS 230.00 1 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_2175 | ivsg_la_alt2d4r1 | 1411.6 | 1816.2 | 189.4 | 1959.9 | 1826.1 | 1.216 | 1.177 | DEVERS 230.00 - SANBRDNO 230.00 1, DEVERS 230.00 - VSTA 230.00 2 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_2177 | ivsg_la_alt2d4r1 | 1411.6 | 1816.2 | 189.4 | 1959.9 | 1826.1 | 1.216 | 1.177 | DEVERS 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_2178 | ivsg_la_alt2d4r1 | 1411.6 | 1816.2 | 189.4 | 1959.9 | 1826.1 | 1.216 | 1.177 | DEVERS 230.00 - VSTA 230.00 2, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_2180 | ivsg_la_alt2d4r1 | 1411.6 | 1816.2 | 189.4 | 1959.9 | 1826.1 | 1.216 | 1.177 | SANBRDNO 230.00 - DEVERS 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_2247 | ivsg_la_alt2d4r1 | 1411.6 | 1816.2 | 189.4 | 1959.9 | 1826.1 | 1.216 | 1.177 | DEVERS 230.00 - VSTA 230.00 2, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2168 | ivsg_la_alt2d4r1 | 458 | 544.7 | 67.4 | 1392.6 | 548.9 | 1.212 | 1.098 | DEVERS 230.00 - VSTA 230.00 2, ETIWANDA 230.00 - SANBRDNO 230.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2171 | ivsg_la_alt2d4r1 | 458 | 544.7 | 67.4 | 1392.6 | 548.9 | 1.212 | 1.098 | ETIWANDA 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_N-203 | ivsg_la_alt2d4r1 | 800 | 902.4 | 111.8 | 2405.1 | 909.3 | 1.198 | 0.824 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 24900 | MIDPINTS | 500 | 24801 | DEVERS | 500 | 2 | line_N-217 | ivsg_la_alt2d4r1 | 2338 | 2770.8 | 461.6 | 3207.4 | 2809 | 1.193 | 0.685 | line MIDPINTS to IH500/MIDPOINTS DEVERS 500 ck 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2179 | ivsg_la_alt2d4r1 | 2598 | 2994.4 | 446.6 | 3539.2 | 3027.5 | 1.18 | 1.008 | DEVERS 230.00 - VSTA 230.00 2, VSTA 230.00 - DEVERS 230.00 1 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_N-210 | ivsg_la_alt2d4r1 | 800 | 901.6 | 58.7 | 2368.1 | 903.5 | 1.179 | 0.824 | EL CENTRO IMPERIAL VALLEY 230 CKTS 2&3 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2175 | ivsg_la_alt2d4r1 | 2598 | 2943.8 | 405.8 | 3478 | 2971.6 | 1.159 | 1.008 | DEVERS 230.00 - SANBRDNO 230.00 1, DEVERS 230.00 - VSTA 230.00 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2177 | ivsg_la_alt2d4r1 | 2598 | 2943.8 | 405.8 | 3478 | 2971.6 | 1.159 | 1.008 | DEVERS 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2178 | ivsg_la_alt2d4r1 | 2598 | 2943.8 | 405.8 | 3478 | 2971.6 | 1.159 | 1.008 | DEVERS 230.00 - VSTA 230.00 2, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2180 | ivsg_la_alt2d4r1 | 2598 | 2943.8 | 405.8 | 3478 | 2971.6 | 1.159 | 1.008 | SANBRDNO 230.00 - DEVERS 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2233 | ivsg_la_alt2d4r1 | 458 | 513.2 | 42.2 | 1332.8 | 514.9 | 1.159 | 1.098 | MOENKOPI 500.00 - ELDORDO 500.00 1, PISGAH 230.00 - ELDORDO 230.00 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2247 | ivsg_la_alt2d4r1 | 2598 | 2943.8 | 405.8 | 3478 | 2971.6 | 1.159 | 1.008 | DEVERS 230.00 - VSTA 230.00 2, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2258 | ivsg_la_alt2d4r1 | 458 | 511.5 | 45.4 | 1329.8 | 513.5 | 1.157 | 1.098 | LUGO 500.00 - VINCENT 500.00 2, LUGO 500.00 - VICTORVL 500.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2256 | ivsg_la_alt2d4r1 | 458 | 508.8 | 46 | 1322.7 | 510.9 | 1.151 | 1.098 | ELDORDO 500.00 - LUGO 500.00 1, LUGO 500.00 - MIRALOMA 500.00 2 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2115 | ivsg_la_alt2d4r1 | 458 | 505.8 | 47.3 | 1317 | 508 | 1.146 | 1.098 | S.ONOFRE 230.00 - SANTIAGO 230.00 1, S.ONOFRE 230.00 - SANTIAGO 230.00 2 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | 23002/06/10 | ivsg_la_alt2d4r1 | 458 | 510.4 | 45.7 | 1318 | 512.4 | 1.146 | 1.098 | SANLUISREY 230 CORRIDOR |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2191 | ivsg_la_alt2d4r1 | 458 | 508.6 | 45.9 | 1316.8 | 510.6 | 1.145 | 1.098 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - ELDORDO 230.00 2 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2192 | ivsg_la_alt2d4r1 | 458 | 508.1 | 46.3 | 1316.9 | 510.2 | 1.145 | 1.098 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2193 | ivsg_la_alt2d4r1 | 458 | 508.1 | 46.3 | 1316.9 | 510.2 | 1.145 | 1.098 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - LUGO 230.00 2 |
| 22672 | PRCTRVLY | 138 | 22852 | TELECYN | 138 | 1 | 23021/22/23/41 | ivsg_la_alt2d4r1 | 478 | 522.4 | -41.5 | 2286.5 | 524.1 | 1.143 | 0.606 | MIGUEL 230 CORRIDOR West of SN |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2255 | ivsg_la_alt2d4r1 | 458 | 504.1 | 47.6 | 1305.3 | 506.3 | 1.135 | 1.098 | LUGO 500.00 - MIRALOMA 500.00 3, LUGO 500.00 - MOHAVE 500.00 1 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_2258 | ivsg_la_alt2d4r1 | 1411.6 | 1701 | 167.7 | 1828.2 | 1709.3 | 1.135 | 1.177 | LUGO 500.00 - VINCENT 500.00 2, LUGO 500.00 - VICTORVL 500.00 1 |
| 8601 | GEOSUB2 | 230 | 8300 | BANIS230 | 230 | 1 | line_N-204 | ivsg_la_alt2d4r1 | 550 | 594.9 | 94.9 | 1565.3 | 602.5 | 1.134 | 0.777 | COACHELLA MIDWAY 230 CKT 1&2 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2200 | ivsg_la_alt2d4r1 | 458 | 503 | 47.7 | 1299.1 | 505.3 | 1.13 | 1.098 | LUGO 500.00 - MOHAVE 500.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2201 | ivsg_la_alt2d4r1 | 458 | 503 | 47.7 | 1299.1 | 505.3 | 1.13 | 1.098 | LUGO 500.00 - MOHAVE 500.00 1, PISGAH 230.00 - LUGO 230.00 2 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_N-210 | ivsg_la_alt2d4r1 | 458 | 502.6 | 39.6 | 1297.7 | 504.2 | 1.129 | 1.098 | EL CENTRO IMPERIAL VALLEY 230 CKTS 2&3 |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_2238 | ivsg_la_alt2d4r1 | 458 | 482.1 | -49.4 | 1296.4 | 484.6 | 1.128 | 0.781 | S.ONOFRE 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_2238 | ivsg_la_alt2d4r1 | 1645.4 | 1950 | 245 | 2139.3 | 1965.3 | 1.127 | 1.035 | S.ONOFRE 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_2240 | ivsg_la_alt2d4r1 | 1645.4 | 1943.4 | 235.3 | 2128.2 | 1957.6 | 1.121 | 1.035 | CHINO 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_2239 | ivsg_la_alt2d4r1 | 1645.4 | 1943.6 | 231.1 | 2127 | 1957.3 | 1.12 | 1.035 | CHINO 230.00 - S.ONOFRE 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_2239 | ivsg_la_alt2d4r1 | 458 | 479.6 | -49.5 | 1281.4 | 482.2 | 1.115 | 0.781 | CHINO 230.00 - S.ONOFRE 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2170 | ivsg_la_alt2d4r1 | 2598 | 2845.6 | 363.9 | 3341 | 2868.8 | 1.114 | 1.008 | ETIWANDA 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - SANBRDNO 230.00 2 |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_2240 | ivsg_la_alt2d4r1 | 458 | 478.2 | -48.1 | 1279 | 480.6 | 1.113 | 0.781 | CHINO 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2172 | ivsg_la_alt2d4r1 | 2598 | 2837.5 | 346.6 | 3322.1 | 2858.6 | 1.107 | 1.008 | VSTA 230.00 - SANBRDNO 230.00 2, VSTA 230.00 - DEVERS 230.00 1 |
| 24901 | VSTA | 230 | 24132 | SANBRDNO | 230 | 2 | line_2179 | ivsg_la_alt2d4r1 | 916 | -954.1 | 93.8 | 2533.9 | 958.7 | 1.102 | 0.537 | DEVERS 230.00 - VSTA 230.00 2, VSTA 230.00 - DEVERS 230.00 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23022/23023 | ivsg_la_alt2d4r1 | 392 | 429.7 | 16.3 | 1135.9 | 430 | 1.1 | 0.79 | ML-MS1+ ML-MS2 230KV |
| 8319 | DIXIELAN | 92 | 8946 | DIXPRI2 | 92 | 1 | line_N-210 | ivsg_la_alt2d4r1 | 54 | -57.7 | 8.7 | 371.1 | 58.3 | 1.096 | 0.307 | EL CENTRO IMPERIAL VALLEY 230 CKTS 2&3 |
| 24016 | BARRE | 230 | 24044 | ELLIS | 230 | 1 | line_2115 | ivsg_la_alt2d4r1 | 988 | 1007.9 | -135.4 | 2709.1 | 1016.9 | 1.092 | 0.351 | S.ONOFRE 230.00 - SANTIAGO 230.00 1, S.ONOFRE 230.00 - SANTIAGO 230.00 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2168 | ivsg_la_alt2d4r1 | 2598 | 2803.8 | 310.4 | 3275.3 | 2820.9 | 1.092 | 1.008 | DEVERS 230.00 - VSTA 230.00 2, ETIWANDA 230.00 - SANBRDNO 230.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2171 | ivsg_la_alt2d4r1 | 2598 | 2803.8 | 310.4 | 3275.3 | 2820.9 | 1.092 | 1.008 | ETIWANDA 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_2176 | ivsg_la_alt2d4r1 | 458 | 468.4 | -78.6 | 1248.5 | 475 | 1.086 | 0.781 | DEVERS 230.00 - SANBRDNO 230.00 1, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_N-217 | ivsg_la_alt2d4r1 | 1645.4 | 1894.4 | 201.3 | 2060.8 | 1905.1 | 1.085 | 1.035 | line MIDPINTS to IH500/MIDPOINTS DEVERS 500 ck 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_2179 | ivsg_la_alt2d4r1 | 1645.4 | 1881 | 206.3 | 2046.8 | 1892.2 | 1.078 | 1.035 | DEVERS 230.00 - VSTA 230.00 2, VSTA 230.00 - DEVERS 230.00 1 |
| 24901 | VSTA | 230 | 24132 | SANBRDNO | 230 | 2 | line_2168 | ivsg_la_alt2d4r1 | 916 | -941.1 | -6 | 2477.5 | 941.1 | 1.077 | 0.537 | DEVERS 230.00 - VSTA 230.00 2, ETIWANDA 230.00 - SANBRDNO 230.00 1 |
| 24901 | VSTA | 230 | 24132 | SANBRDNO | 230 | 2 | line_2171 | ivsg_la_alt2d4r1 | 916 | -941.1 | -6 | 2477.5 | 941.1 | 1.077 | 0.537 | ETIWANDA 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2167 | ivsg_la_alt2d4r1 | 2598 | 2754.9 | 274.7 | 3218.3 | 2768.5 | 1.073 | 1.008 | DEVERS 230.00 - SANBRDNO 230.00 1, ETIWANDA 230.00 - SANBRDNO 230.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2169 | ivsg_la_alt2d4r1 | 2598 | 2754.9 | 274.7 | 3218.3 | 2768.5 | 1.073 | 1.008 | ETIWANDA 230.00 - SANBRDNO 230.00 1, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_2175 | ivsg_la_alt2d4r1 | 1645.4 | 1874.5 | 202 | 2038.1 | 1885.4 | 1.073 | 1.035 | DEVERS 230.00 - SANBRDNO 230.00 1, DEVERS 230.00 - VSTA 230.00 2 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_2177 | ivsg_la_alt2d4r1 | 1645.4 | 1874.5 | 202 | 2038.1 | 1885.4 | 1.073 | 1.035 | DEVERS 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_2178 | ivsg_la_alt2d4r1 | 1645.4 | 1874.5 | 202 | 2038.1 | 1885.4 | 1.073 | 1.035 | DEVERS 230.00 - VSTA 230.00 2, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_2180 | ivsg_la_alt2d4r1 | 1645.4 | 1874.5 | 202 | 2038.1 | 1885.4 | 1.073 | 1.035 | SANBRDNO 230.00 - DEVERS 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_2247 | ivsg_la_alt2d4r1 | 1645.4 | 1874.5 | 202 | 2038.1 | 1885.4 | 1.073 | 1.035 | DEVERS 230.00 - VSTA 230.00 2, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2268 | ivsg_la_alt2d4r1 | 2598 | 2754.9 | 274.7 | 3218.3 | 2768.5 | 1.073 | 1.008 | ETIWANDA 230.00 - SANBRDNO 230.00 1, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2233 | ivsg_la_alt2d4r1 | 2598 | 2709.2 | 225 | 3215.3 | 2718.5 | 1.072 | 1.008 | MOENKOPI 500.00 - ELDORDO 500.00 1, PISGAH 230.00 - ELDORDO 230.00 2 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_2260 | ivsg_la_alt2d4r1 | 56 | 59.4 | -4.9 | 295.2 | 59.6 | 1.07 | 0.94 | KRAMER 230.00 - LUGO 230.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2173 | ivsg_la_alt2d4r1 | 2598 | 2737.2 | 267.4 | 3202 | 2750.2 | 1.067 | 1.008 | SANBRDNO 230.00 - DEVERS 230.00 1, VSTA 230.00 - SANBRDNO 230.00 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2174 | ivsg_la_alt2d4r1 | 2598 | 2737.2 | 267.4 | 3202 | 2750.2 | 1.067 | 1.008 | DEVERS 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - SANBRDNO 230.00 2 |
| 24999 | DEVRSVC1 | 500 | 24801 | DEVERS | 500 | 1 | line_N-217 | ivsg_la_alt2d4r1 | 387.5 | 0 | 400.1 | 476.9 | 400.1 | 1.066 | 1.034 | line MIDPINTS to IH500/MIDPOINTS DEVERS 500 ck 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2176 | ivsg_la_alt2d4r1 | 2598 | 2734 | 257.9 | 3192.6 | 2746.1 | 1.064 | 1.008 | DEVERS 230.00 - SANBRDNO 230.00 1, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2258 | ivsg_la_alt2d4r1 | 2598 | 2688.5 | 247.4 | 3191.7 | 2699.8 | 1.064 | 1.008 | LUGO 500.00 - VINCENT 500.00 2, LUGO 500.00 - VICTORVL 500.00 1 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | line_N-203 | ivsg_la_alt2d4r1 | 1120 | -1183.6 | -15.4 | 3159.8 | 1183.7 | 1.06 | 0.98 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | 23021/23041 | ivsg_la_alt2d4r1 | 1120 | -1186 | -35.6 | 3029.5 | 1186.6 | 1.06 | 0.98 | ML-SX + OM-SX 230KV |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23022/23023 | ivsg_la_alt2d4r1 | 408.3 | -424.3 | 35.3 | 1810.9 | 425.7 | 1.06 | 0.75 | ML-MS1+ ML-MS2 230KV |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | 23022/23023 | ivsg_la_alt2d4r1 | 1120 | -1178.1 | -48 | 3019.2 | 1179.1 | 1.06 | 0.98 | ML-MS1+ ML-MS2 230KV |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2246 | ivsg_la_alt2d4r1 | 2598 | 2725.5 | 259.4 | 3174.7 | 2737.8 | 1.058 | 1.008 | VSTA 230.00 - DEVERS 230.00 1, COACHELV 230.00 - DEVERS 230.00 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2256 | ivsg_la_alt2d4r1 | 2598 | 2674.8 | 252.7 | 3174.8 | 2686.8 | 1.058 | 1.008 | ELDORDO 500.00 - LUGO 500.00 1, LUGO 500.00 - MIRALOMA 500.00 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2164 | ivsg_la_alt2d4r1 | 2598 | 2727.9 | 258.3 | 3168.3 | 2740.1 | 1.056 | 1.008 | MIRALOMA 230.00 - VSTA 230.00 1, MIRALOMA 230.00 - VSTA 230.00 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2115 | ivsg_la_alt2d4r1 | 2598 | 2658.2 | 285.1 | 3159.6 | 2673.4 | 1.053 | 1.008 | S.ONOFRE 230.00 - SANTIAGO 230.00 1, S.ONOFRE 230.00 - SANTIAGO 230.00 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2191 | ivsg_la_alt2d4r1 | 2598 | 2673.6 | 235.4 | 3159.7 | 2684 | 1.053 | 1.008 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - ELDORDO 230.00 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2192 | ivsg_la_alt2d4r1 | 2598 | 2669.5 | 241.6 | 3158.2 | 2680.4 | 1.053 | 1.008 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2193 | ivsg_la_alt2d4r1 | 2598 | 2669.5 | 241.5 | 3158.1 | 2680.4 | 1.053 | 1.008 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - LUGO 230.00 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | 23021/22/23/41 | ivsg_la_alt2d4r1 | 2598 | 2713.3 | 184.7 | 3156.6 | 2719.6 | 1.052 | 1.008 | MIGUEL 230 CORRIDOR West of SN |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | 23002/06/10 | ivsg_la_alt2d4r1 | 2598 | 2678.8 | 224.6 | 3152.8 | 2688.2 | 1.051 | 1.008 | SANLUISREY 230 CORRIDOR |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_N-217 | ivsg_la_alt2d4r1 | 458 | 464.5 | 23.3 | 1206 | 465.1 | 1.049 | 1.098 | line MIDPINTS to IH500/MIDPOINTS DEVERS 500 ck 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2166 | ivsg_la_alt2d4r1 | 2598 | 2706 | 245.3 | 3143.4 | 2717 | 1.048 | 1.008 | ETIWANDA 230.00 - SANBRDNO 230.00 1, ETIWANDA 230.00 - VSTA 230.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2165 | ivsg_la_alt2d4r1 | 2598 | 2701.5 | 242.6 | 3137.7 | 2712.4 | 1.046 | 1.008 | ETIWANDA 230.00 - SANBRDNO 230.00 1, MIRALOMA 230.00 - VSTA 230.00 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2255 | ivsg_la_alt2d4r1 | 2598 | 2647.9 | 246.5 | 3128.5 | 2659.4 | 1.043 | 1.008 | LUGO 500.00 - MIRALOMA 500.00 3, LUGO 500.00 - MOHAVE 500.00 1 |
| 24901 | VSTA | 230 | 24804 | DEVERS | 230 | 1 | line_2175 | ivsg_la_alt2d4r1 | 988 | -939.2 | 260 | 2581.3 | 974.5 | 1.041 | 0.694 | DEVERS 230.00 - SANBRDNO 230.00 1, DEVERS 230.00 - VSTA 230.00 2 |
| 24804 | DEVERS | 230 | 24901 | VSTA | 230 | 2 | line_2177 | ivsg_la_alt2d4r1 | 988 | 984.6 | 220.8 | 2582.1 | 1009 | 1.041 | 0.694 | DEVERS 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 24901 | VSTA | 230 | 24804 | DEVERS | 230 | 1 | line_2178 | ivsg_la_alt2d4r1 | 988 | -939.2 | 260 | 2581.3 | 974.5 | 1.041 | 0.694 | DEVERS 230.00 - VSTA 230.00 2, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 24804 | DEVERS | 230 | 24901 | VSTA | 230 | 2 | line_2180 | ivsg_la_alt2d4r1 | 988 | 984.6 | 220.8 | 2582.1 | 1009 | 1.041 | 0.694 | SANBRDNO 230.00 - DEVERS 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 24901 | VSTA | 230 | 24804 | DEVERS | 230 | 1 | line_2247 | ivsg_la_alt2d4r1 | 988 | -939.2 | 260 | 2581.3 | 974.5 | 1.041 | 0.694 | DEVERS 230.00 - VSTA 230.00 2, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | line_2239 | ivsg_la_alt2d4r1 | 1120 | -1158.2 | -46.8 | 3010.8 | 1159.1 | 1.04 | 0.98 | CHINO 230.00 - S.ONOFRE 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | line_2240 | ivsg_la_alt2d4r1 | 1120 | -1159.8 | -48.1 | 3021 | 1160.8 | 1.04 | 0.98 | CHINO 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2194 | ivsg_la_alt2d4r1 | 2598 | 2650.9 | 224.8 | 3116 | 2660.5 | 1.039 | 1.008 | LUGO 500.00 - MIRALOMA 500.00 2, LUGO 500.00 - MIRALOMA 500.00 3 |
| 8600 | GEOSUB1 | 230 | 8300 | BANIS230 | 230 | 1 | line_N-204 | ivsg_la_alt2d4r1 | 550 | 544.9 | 84.3 | 1433.9 | 551.4 | 1.039 | 0.72 | COACHELLA MIDWAY 230 CKT 1&2 |
| 8600 | GEOSUB1 | 230 | 8300 | BANIS230 | 230 | 2 | line_N-204 | ivsg_la_alt2d4r1 | 550 | 544.9 | 84.3 | 1433.9 | 551.4 | 1.039 | 0.72 | COACHELLA MIDWAY 230 CKT 1&2 |
| 19051 | KNOB | 161 | 8367 | PILOTKNB | 161 | 1 | line_N-203 | ivsg_la_alt2d4r1 | 165 | -169.1 | 16.3 | 613 | 169.9 | 1.036 | 0.802 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2172 | ivsg_la_alt2d4r1 | 458 | 466.7 | 36.2 | 1187.5 | 468.1 | 1.033 | 1.098 | VSTA 230.00 - SANBRDNO 230.00 2, VSTA 230.00 - DEVERS 230.00 1 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | 23021/22/23/41 | ivsg_la_alt2d4r1 | 388 | -389.8 | 6.3 | 1005.9 | 389.9 | 1.033 | 0.904 | MIGUEL 230 CORRIDOR West of SN |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_N-204 | ivsg_la_alt2d4r1 | 458 | 466 | 37.9 | 1186.8 | 467.5 | 1.032 | 1.098 | COACHELLA MIDWAY 230 CKT 1&2 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2164 | ivsg_la_alt2d4r1 | 458 | 466.5 | 48.3 | 1184.7 | 469 | 1.031 | 1.098 | MIRALOMA 230.00 - VSTA 230.00 1, MIRALOMA 230.00 - VSTA 230.00 2 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 2 | line_2029 | ivsg_la_alt2d4r1 | 1195 | 1159.5 | -125.7 | 3064 | 1166.3 | 1.021 | 0.504 | LEWIS 230.00 - SERRANO 230.00 1, SERRANO 230.00 - VILLA PK 230.00 1 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 2 | line_2031 | ivsg_la_alt2d4r1 | 1195 | 1159.5 | -125.7 | 3064 | 1166.3 | 1.021 | 0.504 | LEWIS 230.00 - SERRANO 230.00 2, SERRANO 230.00 - VILLA PK 230.00 1 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 2 | line_2278 | ivsg_la_alt2d4r1 | 1195 | 1159.5 | -125.7 | 3064 | 1166.3 | 1.021 | 0.504 | LEWIS 230.00 - SERRANO 230.00 1, SERRANO 230.00 - VILLA PK 230.00 1 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | line_2179 | ivsg_la_alt2d4r1 | 1120 | -1134.3 | -46.2 | 2919.2 | 1135.2 | 1.02 | 0.98 | DEVERS 230.00 - VSTA 230.00 2, VSTA 230.00 - DEVERS 230.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2196 | ivsg_la_alt2d4r1 | 458 | 459.8 | 40 | 1172.9 | 461.5 | 1.02 | 1.098 | ETIWANDA 230.00 - SANBRDNO 230.00 1, LUGO 500.00 - MIRALOMA 500.00 2 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2198 | ivsg_la_alt2d4r1 | 458 | 459.8 | 40 | 1172.7 | 461.5 | 1.02 | 1.098 | ETIWANDA 230.00 - SANBRDNO 230.00 1, LUGO 500.00 - MIRALOMA 500.00 3 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | line_2238 | ivsg_la_alt2d4r1 | 1120 | -1140.7 | -45 | 2943.8 | 1141.6 | 1.02 | 0.98 | S.ONOFRE 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | line_N-203 | ivsg_la_alt2d4r1 | 388 | -380.4 | 4 | 993.7 | 380.4 | 1.02 | 0.904 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_2173 | ivsg_la_alt2d4r1 | 458 | 440.2 | -95.9 | 1172 | 450.5 | 1.019 | 0.781 | SANBRDNO 230.00 - DEVERS 230.00 1, VSTA 230.00 - SANBRDNO 230.00 2 |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_2174 | ivsg_la_alt2d4r1 | 458 | 440.2 | -95.9 | 1172 | 450.5 | 1.019 | 0.781 | DEVERS 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - SANBRDNO 230.00 2 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_N-204 | ivsg_la_alt2d4r1 | 800 | 768.1 | 14.7 | 2047.3 | 768.2 | 1.019 | 0.824 | COACHELLA MIDWAY 230 CKT 1&2 |
| 24701 | KRAMER | 230 | 24085 | LUGO | 230 | 2 | line_2260 | ivsg_la_alt2d4r1 | 478 | 477.4 | 74.7 | 1221.4 | 483.2 | 1.018 | 0.611 | KRAMER 230.00 - LUGO 230.00 1, PISGAH 230.00 - LUGO 230.00 1 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_2167 | ivsg_la_alt2d4r1 | 458 | 439.5 | -72.7 | 1167 | 445.4 | 1.015 | 0.781 | DEVERS 230.00 - SANBRDNO 230.00 1, ETIWANDA 230.00 - SANBRDNO 230.00 1 |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_2169 | ivsg_la_alt2d4r1 | 458 | 439.5 | -72.7 | 1167 | 445.4 | 1.015 | 0.781 | ETIWANDA 230.00 - SANBRDNO 230.00 1, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_2268 | ivsg_la_alt2d4r1 | 458 | 439.5 | -72.7 | 1167 | 445.4 | 1.015 | 0.781 | ETIWANDA 230.00 - SANBRDNO 230.00 1, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2209 | ivsg_la_alt2d4r1 | 458 | 457.7 | 40.7 | 1163.3 | 459.5 | 1.012 | 1.098 | ETIWANDA 230.00 - SANBRDNO 230.00 1, LUGO 500.00 - SERRANO 500.00 1 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | line_2175 | ivsg_la_alt2d4r1 | 1120 | -1129.3 | -45.3 | 2901.4 | 1130.2 | 1.01 | 0.98 | DEVERS 230.00 - SANBRDNO 230.00 1, DEVERS 230.00 - VSTA 230.00 2 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | line_2177 | ivsg_la_alt2d4r1 | 1120 | -1129.3 | -45.3 | 2901.4 | 1130.2 | 1.01 | 0.98 | DEVERS 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | line_2178 | ivsg_la_alt2d4r1 | 1120 | -1129.3 | -45.3 | 2901.4 | 1130.2 | 1.01 | 0.98 | DEVERS 230.00 - VSTA 230.00 2, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | line_2180 | ivsg_la_alt2d4r1 | 1120 | -1129.3 | -45.3 | 2901.4 | 1130.2 | 1.01 | 0.98 | SANBRDNO 230.00 - DEVERS 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | line_2246 | ivsg_la_alt2d4r1 | 1120 | -1126.8 | -39.5 | 2889.1 | 1127.5 | 1.01 | 0.98 | VSTA 230.00 - DEVERS 230.00 1, COACHELV 230.00 - DEVERS 230.00 2 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | line_2247 | ivsg_la_alt2d4r1 | 1120 | -1129.3 | -45.3 | 2901.4 | 1130.2 | 1.01 | 0.98 | DEVERS 230.00 - VSTA 230.00 2, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | line_N-204 | ivsg_la_alt2d4r1 | 1120 | -1132.7 | -9.1 | 2962.9 | 1132.7 | 1.01 | 0.98 | COACHELLA MIDWAY 230 CKT 1&2 |
| 24056 | ETIWANDA | 230 | 24132 | SANBRDNO | 230 | 1 | line_2172 | ivsg_la_alt2d4r1 | 797 | -759.8 | 67.7 | 2002.1 | 762.8 | 1.001 | 0.477 | VSTA 230.00 - SANBRDNO 230.00 2, VSTA 230.00 - DEVERS 230.00 1 |
| 24801 | DEVERS | 500 | 24804 | DEVERS | 230 | 1 | line_2238 | ivsg_la_alt2d4r1 | 1120 | 795.4 | 790.1 | 1268.2 | 1121.1 | 1 | 0.52 | S.ONOFRE 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 24801 | DEVERS | 500 | 24804 | DEVERS | 230 | 1 | line_2239 | ivsg_la_alt2d4r1 | 1120 | 795.6 | 782.6 | 1258 | 1116 | 1 | 0.52 | CHINO 230.00 - S.ONOFRE 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 24801 | DEVERS | 500 | 24804 | DEVERS | 230 | 1 | line_2240 | ivsg_la_alt2d4r1 | 1120 | 792.5 | 784.7 | 1257.7 | 1115.3 | 1 | 0.52 | CHINO 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_2191 | ivsg_la_alt2d4r1 | 1645.4 | 1742.5 | 207.8 | 1892 | 1754.8 | 0.999 | 1.035 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - ELDORDO 230.00 2 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_2192 | ivsg_la_alt2d4r1 | 1645.4 | 1743.9 | 207 | 1893.4 | 1756.1 | 0.999 | 1.035 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_2193 | ivsg_la_alt2d4r1 | 1645.4 | 1743.9 | 207 | 1893.4 | 1756.2 | 0.999 | 1.035 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - LUGO 230.00 2 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_2258 | ivsg_la_alt2d4r1 | 1645.4 | 1748.3 | 197 | 1893 | 1759.4 | 0.999 | 1.035 | LUGO 500.00 - VINCENT 500.00 2, LUGO 500.00 - VICTORVL 500.00 1 |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | 23022/23023 | ivsg_la_alt2d4r1 | 382.4 | 374.9 | -12.8 | 1596.9 | 375.1 | 0.998 | 0.676 | ML-MS1+ ML-MS2 230KV |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_2256 | ivsg_la_alt2d4r1 | 1645.4 | 1739.2 | 206.4 | 1887.9 | 1751.4 | 0.997 | 1.035 | ELDORDO 500.00 - LUGO 500.00 1, LUGO 500.00 - MIRALOMA 500.00 2 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_2214 | ivsg_la_alt2d4r1 | 56 | 54.9 | -3.9 | 270.6 | 55 | 0.99 | 0.94 | LUGO 500.00 - VINCENT 500.00 1, LUGO 500.00 - VINCENT 500.00 2 |
| 24042 | ELDORDO | 500 | 24086 | LUGO | 500 | 1 | line_2258 | ivsg_la_alt2d4r1 | 1386 | 1400.2 | 120.6 | 1574.1 | 1405.4 | 0.988 | 0.735 | LUGO 500.00 - VINCENT 500.00 2, LUGO 500.00 - VICTORVL 500.00 1 |
| 19051 | KNOB | 161 | 8367 | PILOTKNB | 161 | 1 | line_N-204 | ivsg_la_alt2d4r1 | 165 | -162.5 | 19.4 | 584.4 | 163.7 | 0.988 | 0.802 | COACHELLA MIDWAY 230 CKT 1&2 |
| 24804 | DEVERS | 230 | 24901 | VSTA | 230 | 2 | line_2172 | ivsg_la_alt2d4r1 | 988 | 936.4 | 223.1 | 2441.7 | 962.6 | 0.985 | 0.694 | VSTA 230.00 - SANBRDNO 230.00 2, VSTA 230.00 - DEVERS 230.00 1 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | 23022/23023 | ivsg_la_alt2d4r1 | 388 | -372.7 | 7.4 | 958.5 | 372.7 | 0.984 | 0.904 | ML-MS1+ ML-MS2 230KV |
| 20238 | HRD-230 | 230 | 20239 | HRD-115 | 115 | 1 | 23021/22/23/41 | ivsg_la_alt2d4r1 | 225 | 218.5 | -21.5 | 562.6 | 219.5 | 0.98 | 0.88 | MIGUEL 230 CORRIDOR West of SN |
| 24132 | SANBRDNO | 230 | 24804 | DEVERS | 230 | 1 | line_2179 | ivsg_la_alt2d4r1 | 988 | -893.9 | 213.1 | 2422.6 | 919 | 0.977 | 0.638 | DEVERS 230.00 - VSTA 230.00 2, VSTA 230.00 - DEVERS 230.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2022 | ivsg_la_alt2d4r1 | 2598 | 2517.5 | 191 | 2925.2 | 2524.8 | 0.975 | 1.008 | BARRE 230.00 - VILLA PK 230.00 1, BARRE 230.00 - LEWIS 230.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2165 | ivsg_la_alt2d4r1 | 458 | 441.3 | 39.5 | 1120.6 | 443.1 | 0.975 | 1.098 | ETIWANDA 230.00 - SANBRDNO 230.00 1, MIRALOMA 230.00 - VSTA 230.00 2 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2166 | ivsg_la_alt2d4r1 | 458 | 440.1 | 39.4 | 1117.4 | 441.8 | 0.972 | 1.098 | ETIWANDA 230.00 - SANBRDNO 230.00 1, ETIWANDA 230.00 - VSTA 230.00 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_2121 | ivsg_la_alt2d4r1 | 56 | 53.5 | -5.5 | 265.2 | 53.7 | 0.97 | 0.94 | S.CLARA 230.00 - MANDALAY 230.00 1, S.CLARA 230.00 - MANDALAY 230.00 2 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_2154 | ivsg_la_alt2d4r1 | 56 | 53.6 | -5.3 | 265.7 | 53.9 | 0.97 | 0.94 | MIRALOMA 230.00 - OLINDA 230.00 1, MIRALOMA 230.00 - WALNUT 230.00 1 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | line_2240 | ivsg_la_alt2d4r1 | 388 | -365.1 | 6.8 | 943 | 365.2 | 0.968 | 0.904 | CHINO 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | line_N-204 | ivsg_la_alt2d4r1 | 388 | -363.4 | 10.2 | 942.3 | 363.6 | 0.968 | 0.904 | COACHELLA MIDWAY 230 CKT 1&2 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_N-203 | ivsg_la_alt2d4r1 | 458 | 442.2 | 44.2 | 1111.5 | 444.4 | 0.967 | 1.098 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | line_2239 | ivsg_la_alt2d4r1 | 388 | -364.3 | 7.1 | 940.2 | 364.3 | 0.965 | 0.904 | CHINO 230.00 - S.ONOFRE 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 20238 | HRD-230 | 230 | 20239 | HRD-115 | 115 | 1 | line_N-203 | ivsg_la_alt2d4r1 | 225 | 213.9 | -19 | 558 | 214.8 | 0.96 | 0.88 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 24056 | ETIWANDA | 230 | 24901 | VSTA | 230 | 1 | line_2164 | ivsg_la_alt2d4r1 | 797 | -722.3 | 136.3 | 1914.1 | 735 | 0.958 | 0.423 | MIRALOMA 230.00 - VSTA 230.00 1, MIRALOMA 230.00 - VSTA 230.00 2 |
| 8601 | GEOSUB2 | 230 | 8300 | BANIS230 | 230 | 1 | line_N-203 | ivsg_la_alt2d4r1 | 550 | 503 | 83.4 | 1317.5 | 509.9 | 0.955 | 0.777 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_N-203 | ivsg_la_alt2d4r1 | 2598 | 2462.6 | 113.3 | 2847.7 | 2465.2 | 0.949 | 1.008 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 1 | line_2030 | ivsg_la_alt2d4r1 | 1287 | 1159.5 | -125.7 | 3064 | 1166.3 | 0.948 | 0.468 | LEWIS 230.00 - SERRANO 230.00 1, SERRANO 230.00 - VILLA PK 230.00 2 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 1 | line_2032 | ivsg_la_alt2d4r1 | 1287 | 1159.5 | -125.7 | 3064 | 1166.3 | 0.948 | 0.468 | LEWIS 230.00 - SERRANO 230.00 2, SERRANO 230.00 - VILLA PK 230.00 2 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | line_2238 | ivsg_la_alt2d4r1 | 388 | -358.7 | 8.6 | 923.8 | 358.8 | 0.948 | 0.904 | S.ONOFRE 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 13821C/25/23051A | ivsg_la_alt2d4r1 | 204.1 | 189.8 | -19.3 | 809.8 | 190.8 | 0.948 | 0.536 | CH-ES-NCM-SX |
| 24804 | DEVERS | 230 | 24901 | VSTA | 230 | 2 | line_2238 | ivsg_la_alt2d4r1 | 988 | 890.2 | 224.6 | 2342.5 | 918.1 | 0.945 | 0.694 | S.ONOFRE 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 24901 | VSTA | 230 | 24804 | DEVERS | 230 | 1 | line_2238 | ivsg_la_alt2d4r1 | 988 | -852.8 | 168.8 | 2343.8 | 869.4 | 0.945 | 0.694 | S.ONOFRE 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_2246 | ivsg_la_alt2d4r1 | 458 | 412.3 | -53.3 | 1086.8 | 415.7 | 0.945 | 0.781 | VSTA 230.00 - DEVERS 230.00 1, COACHELV 230.00 - DEVERS 230.00 2 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | line_2179 | ivsg_la_alt2d4r1 | 388 | -356.9 | 9 | 918.2 | 357 | 0.943 | 0.904 | DEVERS 230.00 - VSTA 230.00 2, VSTA 230.00 - DEVERS 230.00 1 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2191 | ivsg_la_alt2d4r1 | 2400 | -2236 | 461.2 | 2601.5 | 2283 | 0.941 | 0.682 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - ELDORDO 230.00 2 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | line_2114 | ivsg_la_alt2d4r1 | 1120 | -1044.2 | -44 | 2615.6 | 1045.2 | 0.94 | 0.98 | ELLIS 230.00 - SANTIAGO 230.00 1, JOHANNA 230.00 - SANTIAGO 230.00 1 |
| 20238 | HRD-230 | 230 | 20239 | HRD-115 | 115 | 1 | 23022/23023 | ivsg_la_alt2d4r1 | 225 | 210.7 | -17.8 | 540.7 | 211.5 | 0.94 | 0.88 | ML-MS1+ ML-MS2 230KV |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | 23011/23003 | ivsg_la_alt2d4r1 | 1120 | -1054 | -43.9 | 2651.5 | 1054.9 | 0.94 | 0.98 | SA-EA 230KV + SA-ES-EA 230KV |
| 24016 | BARRE | 230 | 25201 | LEWIS | 230 | 1 | line_2115 | ivsg_la_alt2d4r1 | 1195 | -1021.8 | 266.9 | 2813.3 | 1056 | 0.938 | 0.582 | S.ONOFRE 230.00 - SANTIAGO 230.00 1, S.ONOFRE 230.00 - SANTIAGO 230.00 2 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | line_2175 | ivsg_la_alt2d4r1 | 388 | -355.4 | 9.4 | 913.9 | 355.5 | 0.938 | 0.904 | DEVERS 230.00 - SANBRDNO 230.00 1, DEVERS 230.00 - VSTA 230.00 2 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | line_2177 | ivsg_la_alt2d4r1 | 388 | -355.4 | 9.4 | 913.9 | 355.5 | 0.938 | 0.904 | DEVERS 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | line_2178 | ivsg_la_alt2d4r1 | 388 | -355.4 | 9.4 | 913.9 | 355.5 | 0.938 | 0.904 | DEVERS 230.00 - VSTA 230.00 2, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | line_2180 | ivsg_la_alt2d4r1 | 388 | -355.4 | 9.4 | 913.9 | 355.5 | 0.938 | 0.904 | SANBRDNO 230.00 - DEVERS 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 8695 | RAMON | 230 | 24806 | MIRAGE | 230 | 2 | line_2246 | ivsg_la_alt2d4r1 | 800 | 710.2 | -152.2 | 1883.9 | 726.3 | 0.938 | 0.693 | VSTA 230.00 - DEVERS 230.00 1, COACHELV 230.00 - DEVERS 230.00 2 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | line_2247 | ivsg_la_alt2d4r1 | 388 | -355.4 | 9.4 | 913.9 | 355.5 | 0.938 | 0.904 | DEVERS 230.00 - VSTA 230.00 2, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | line_2246 | ivsg_la_alt2d4r1 | 388 | -354.8 | 10.1 | 912.2 | 355 | 0.937 | 0.904 | VSTA 230.00 - DEVERS 230.00 1, COACHELV 230.00 - DEVERS 230.00 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_N-217 | ivsg_la_alt2d4r1 | 2598 | 2358 | 21.3 | 2810.8 | 2358.1 | 0.937 | 1.008 | line MIDPINTS to IH500/MIDPOINTS DEVERS 500 ck 1 |
| 8695 | RAMON | 230 | 24806 | MIRAGE | 230 | 2 | line_2186 | ivsg_la_alt2d4r1 | 800 | 708 | -139.4 | 1880.4 | 721.6 | 0.936 | 0.693 | COACHELV 230.00 - DEVERS 230.00 2, J.HINDS 230.00 - MIRAGE 230.00 1 |
| 24804 | DEVERS | 230 | 24901 | VSTA | 230 | 2 | line_2239 | ivsg_la_alt2d4r1 | 988 | 886.7 | 218.2 | 2318.1 | 913.1 | 0.935 | 0.694 | CHINO 230.00 - S.ONOFRE 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 24901 | VSTA | 230 | 24804 | DEVERS | 230 | 1 | line_2239 | ivsg_la_alt2d4r1 | 988 | -850.1 | 166.5 | 2319.4 | 866.2 | 0.935 | 0.694 | CHINO 230.00 - S.ONOFRE 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2192 | ivsg_la_alt2d4r1 | 2400 | -2218 | 426.4 | 2581 | 2258.6 | 0.933 | 0.682 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2193 | ivsg_la_alt2d4r1 | 2400 | -2217.8 | 426.2 | 2580.6 | 2258.3 | 0.933 | 0.682 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - LUGO 230.00 2 |
| 24804 | DEVERS | 230 | 24901 | VSTA | 230 | 2 | line_2240 | ivsg_la_alt2d4r1 | 988 | 883.6 | 219.8 | 2313.5 | 910.6 | 0.933 | 0.694 | CHINO 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 24901 | VSTA | 230 | 24804 | DEVERS | 230 | 1 | line_2240 | ivsg_la_alt2d4r1 | 988 | -847.2 | 163.3 | 2314.9 | 862.8 | 0.933 | 0.694 | CHINO 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | line_2116 | ivsg_la_alt2d4r1 | 1120 | -1041.5 | -44 | 2607.5 | 1042.4 | 0.93 | 0.98 | S.ONOFRE 230.00 - SANTIAGO 230.00 1, S.ONOFRE 230.00 - SERRANO 230.00 1 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | line_2118 | ivsg_la_alt2d4r1 | 1120 | -1041.5 | -44 | 2607.5 | 1042.4 | 0.93 | 0.98 | S.ONOFRE 230.00 - SANTIAGO 230.00 2, S.ONOFRE 230.00 - SERRANO 230.00 1 |
| 20238 | HRD-230 | 230 | 20239 | HRD-115 | 115 | 1 | line_2240 | ivsg_la_alt2d4r1 | 225 | 207.2 | -16.1 | 533.9 | 207.8 | 0.93 | 0.88 | CHINO 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | 23051A/23011 | ivsg_la_alt2d4r1 | 1120 | -1035.5 | -68.5 | 2634.9 | 1037.8 | 0.93 | 0.98 | SX-EPP + ES-EA-SA 230KV |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | 23051B/23011 | ivsg_la_alt2d4r1 | 1120 | -1036.3 | -66.2 | 2634 | 1038.4 | 0.93 | 0.98 | EPP-ES + ES-EA-SA 230KV |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20238 | HRD-230 | 230 | 20239 | HRD-115 | 115 | 1 | line_2239 | ivsg_la_alt2d4r1 | 225 | 206.8 | -16 | 532.6 | 207.4 | 0.92 | 0.88 | CHINO 230.00 - S.ONOFRE 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 20238 | HRD-230 | 230 | 20239 | HRD-115 | 115 | 1 | line_N-204 | ivsg_la_alt2d4r1 | 225 | 206.4 | -17.8 | 532.7 | 207.1 | 0.92 | 0.88 | COACHELLA MIDWAY 230 CKT 1&2 |
| 19051 | KNOB | 161 | 8367 | PILOTKNB | 161 | 1 | line_N-210 | ivsg_la_alt2d4r1 | 165 | -151.6 | 18.3 | 544.1 | 152.7 | 0.92 | 0.802 | EL CENTRO IMPERIAL VALLEY 230 CKTS 2&3 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | 13821C/25/23051A | ivsg_la_alt2d4r1 | 1120 | -1023.6 | -68.5 | 2599.8 | 1025.9 | 0.92 | 0.98 | CH-ES-NCM-SX |
| 8601 | GEOSUB2 | 230 | 8300 | BANIS230 | 230 | 1 | line_N-209 | ivsg_la_alt2d4r1 | 550 | 501.1 | 60.1 | 1268 | 504.7 | 0.919 | 0.777 | EL CENTRO HIGHLINE 230 CKTS 1&2 |
| 22832 | SYCAMORE | 230 | 22652 | PENSQTOS | 230 | 1 | 13821C/25/23051A | ivsg_la_alt2d4r1 | 796.7 | 706.3 | -105.6 | 1836.6 | 714.1 | 0.918 | 0.638 | CH-ES-NCM-SX |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_2185 | ivsg_la_alt2d4r1 | 800 | 719.7 | 31 | 1835.7 | 720.4 | 0.914 | 0.824 | RAMON 230.00 - MIRAGE 230.00 2, J.HINDS 230.00 - MIRAGE 230.00 1 |
| 20238 | HRD-230 | 230 | 20118 | ROA-230 | 230 | 1 | 23021/22/23/41 | ivsg_la_alt2d4r1 | 388 | -332.9 | 87.2 | 881.9 | 344.1 | 0.911 | 0.782 | MIGUEL 230 CORRIDOR West of SN |
| 20238 | HRD-230 | 230 | 20239 | HRD-115 | 115 | 1 | line_2238 | ivsg_la_alt2d4r1 | 225 | 204.3 | -15.4 | 524.6 | 204.9 | 0.91 | 0.88 | S.ONOFRE 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_2246 | ivsg_la_alt2d4r1 | 800 | 714.9 | 33.4 | 1826.5 | 715.7 | 0.91 | 0.824 | VSTA 230.00 - DEVERS 230.00 1, COACHELV 230.00 - DEVERS 230.00 2 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_2186 | ivsg_la_alt2d4r1 | 800 | 711.3 | 25.6 | 1814.6 | 711.7 | 0.904 | 0.824 | COACHELV 230.00 - DEVERS 230.00 2, J.HINDS 230.00 - MIRAGE 230.00 1 |
| 24804 | DEVERS | 230 | 24901 | VSTA | 230 | 2 | line_2170 | ivsg_la_alt2d4r1 | 988 | 855.8 | 206 | 2237.9 | 880.3 | 0.903 | 0.694 | ETIWANDA 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - SANBRDNO 230.00 2 |
| 24901 | VSTA | 230 | 24804 | DEVERS | 230 | 1 | line_2170 | ivsg_la_alt2d4r1 | 988 | -821.7 | 151.4 | 2239.3 | 835.6 | 0.903 | 0.694 | ETIWANDA 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - SANBRDNO 230.00 2 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_N-208 | ivsg_la_alt2d4r1 | 800 | 712.7 | 29.8 | 1808.9 | 713.3 | 0.901 | 0.824 | COACHELLA BANISTER/BANISTER AVE58 230 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_2096 | ivsg_la_alt2d4r1 | 56 | 49.7 | -5.3 | 245.4 | 50 | 0.9 | 0.94 | EAGLROCK 230.00 - MESA CAL 230.00 1, GOODRICH 230.00 - GOULD 230.00 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_2106 | ivsg_la_alt2d4r1 | 56 | 49.8 | -5.2 | 246 | 50.1 | 0.9 | 0.94 | PARDEE 230.00 - SYLMAR S 230.00 1, SYLMAR S 230.00 - GOULD 230.00 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_2107 | ivsg_la_alt2d4r1 | 56 | 49.8 | -5.2 | 246 | 50.1 | 0.9 | 0.94 | PARDEE 230.00 - SYLMAR S 230.00 2, SYLMAR S 230.00 - GOULD 230.00 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_2280 | ivsg_la_alt2d4r1 | 56 | 49.8 | -5.2 | 246 | 50.1 | 0.9 | 0.94 | PARDEE 230.00 - SYLMAR S 230.00 1, SYLMAR S 230.00 - GOULD 230.00 1 |

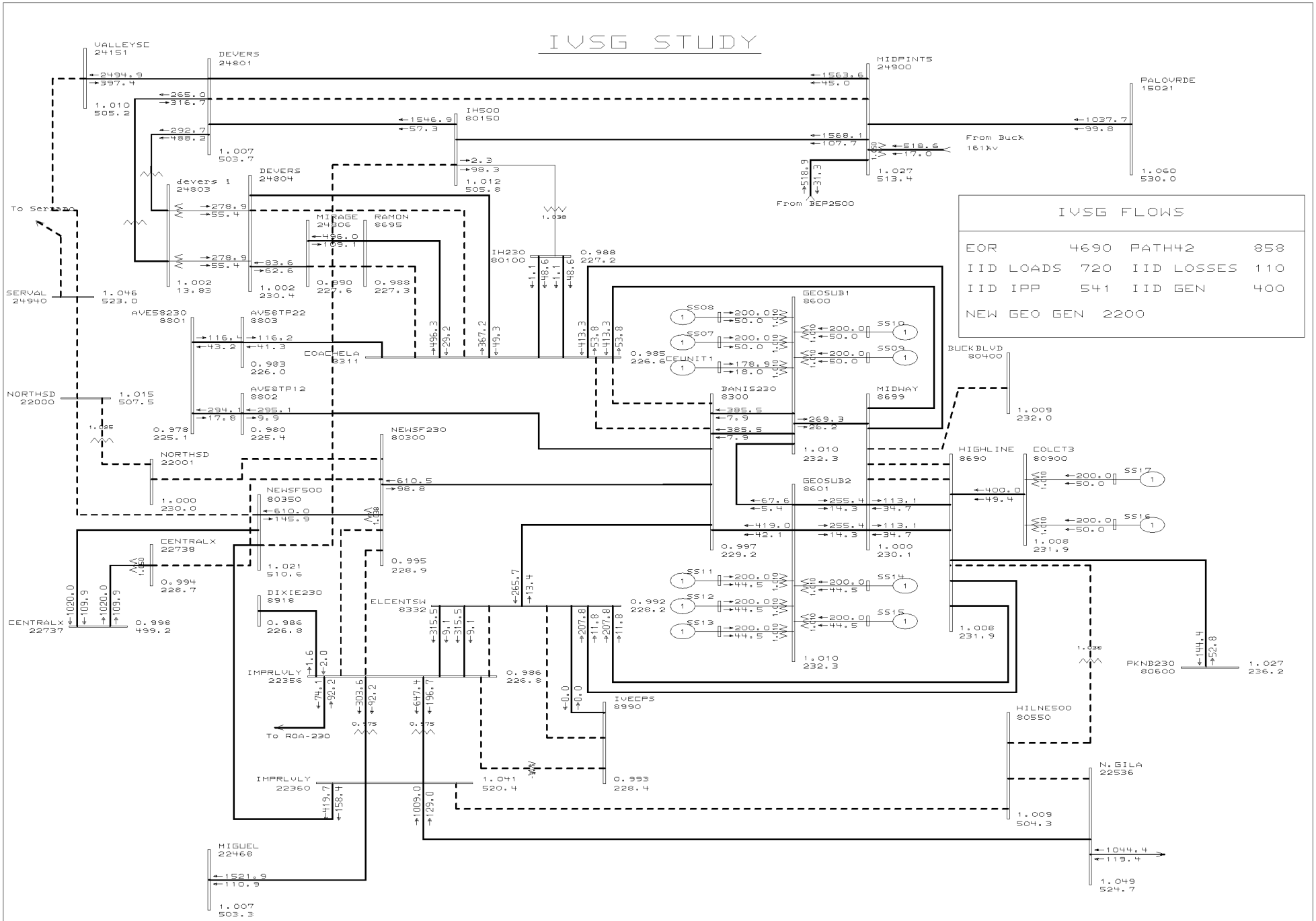
ivsg_la_alt2d4r1.sav
No Solve Summary
N-2 Outages

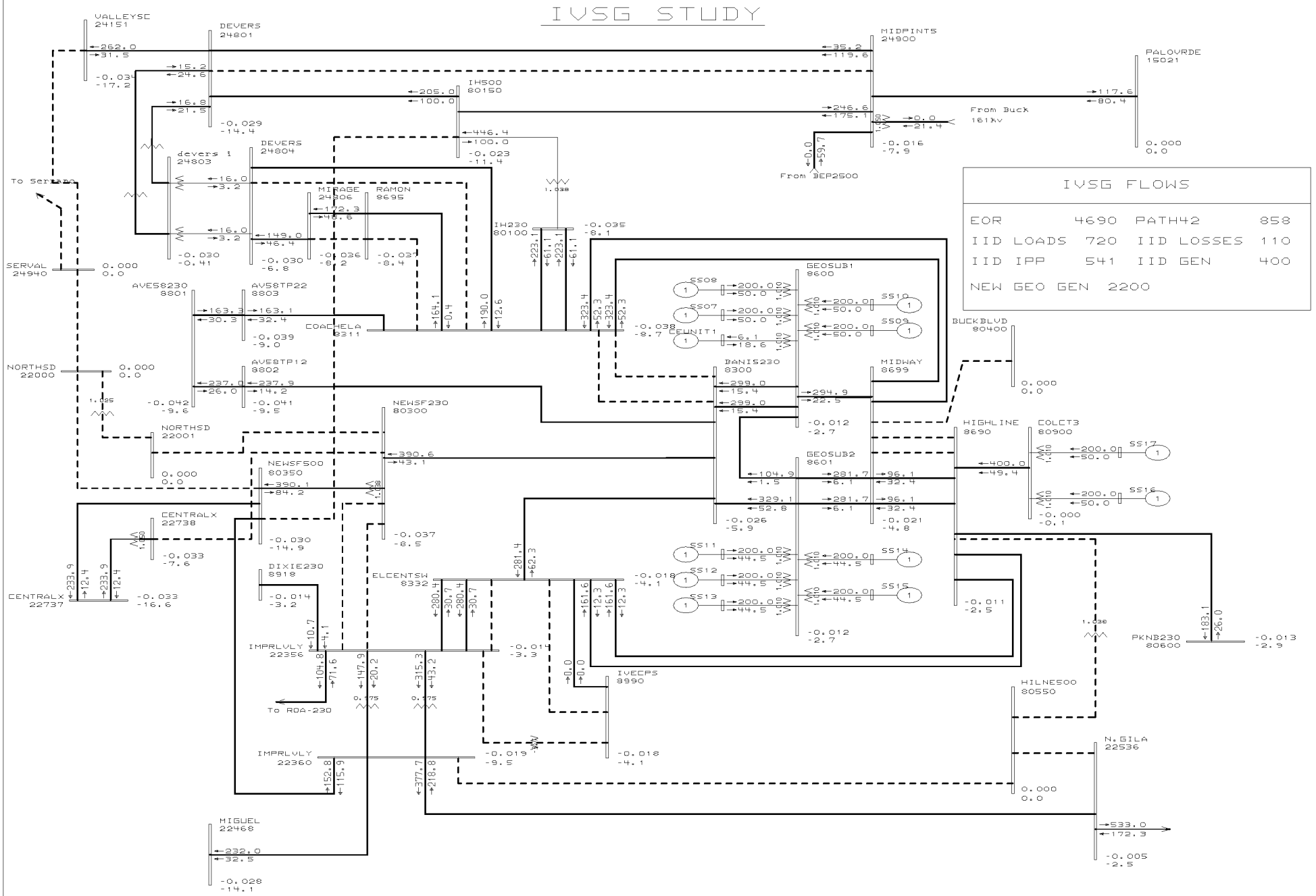
| Contingency-Description | | Case | Problem-Description |
|---|---|---|---|
| line MIDPINTS to DEVERS | 500 ck 1&2 | ivsg_la_alt2d4r1 | Pmis 48281 NOXON 230.00 = -3535.98 MW + j -901844.25 MVAR |

# Imperial Valley Study Group

## Appendix B.1.4

Alt 2a D3
Light Autumn
Alternative 2a
Dispatch 3


IVSG STUDY
VALLEYSC 24151
DEVERS 24801
MIDPINTS 24900
PALOVRDE 15021
IH500 80150
From Buck 161kV
From BEP2500
devers 1 24803
DEVERS 24804
To Serrano
MIRAGE 24806
RAMON 8695
IH230 80100
SERVAL 24940
AVE58230 8801
AVE58TP22 8803
AVE58TP12 8802
COACHELA 8311
GEOSUB1 8600
GEOSUB2 8601
BANIS230 8300
MIDWAY 8699
BUCKBLVD 80400
HIGHLINE 8690
COLCT3 80900
NORTHSD 22000
NORTHSD 22001
NEWSF230 80300
NEWSF500 80350
CENTRALX 22738
CENTRALX 22737
DIXIE230 8918
ELCENTSW 8332
IMPRLVLY 22356
IMPRLVLY 22360
IVECPS 8990
To ROA-230
MIGUEL 22468
HILNE500 80550
N.GILA 22536
PKNB230 80600
IVSG FLOWS
EOR 4690 PATH42 858
IID LOADS 720 IID LOSSES 110
IID IPP 541 IID GEN 400
NEW GEO GEN 2200




General Electric International, Inc. PSLF Program MW/MVAR Wed Apr 20 15:12:24 2005

Differences between base case d:\pslf\cases\ivsg_la_alt2abase.sav
and delta case d:\pslf\cases\ivsg_la_alt2ad3.sav

g:\iid\2005\ivgs\ivgsprojectla

ivsg_la_alt2ad3.sav
Voltage Summary
N-0 Outages

| Bus | Name | kV | Area | Zone | Outage | Case | Vbase | Vcont | DeltaV | Vmin | Vmax | Max-dv | Contingency Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 14534 | N.GILA 4 | 100 | 14 | 847 | base | ivsg_la_alt2ad3 | 0.939 | 0.939 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14606 | N.GILA 3 | 100 | 14 | 847 | base | ivsg_la_alt2ad3 | 0.939 | 0.939 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14608 | OCOTIL 1 | 100 | 14 | 141 | base | ivsg_la_alt2ad3 | 1.05 | 1.05 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24748 | OXBOW A | 230 | 24 | 247 | base | ivsg_la_alt2ad3 | 1.052 | 1.052 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15093 | HARQUAHA | 500 | 14 | 158 | base | ivsg_la_alt2ad3 | 1.053 | 1.053 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14007 | GILARIVR | 500 | 14 | 141 | base | ivsg_la_alt2ad3 | 1.053 | 1.053 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15089 | JOJOBA | 500 | 14 | 158 | base | ivsg_la_alt2ad3 | 1.054 | 1.054 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24141 | SPRINGVL | 230 | 24 | 240 | base | ivsg_la_alt2ad3 | 1.054 | 1.054 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14000 | CHOLLA | 500 | 14 | 141 | base | ivsg_la_alt2ad3 | 1.055 | 1.055 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14001 | FOURCORN | 500 | 14 | 141 | base | ivsg_la_alt2ad3 | 1.055 | 1.055 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24153 | VESTAL | 230 | 24 | 240 | base | ivsg_la_alt2ad3 | 1.055 | 1.055 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 19038 | MEAD | 500 | 14 | 191 | base | ivsg_la_alt2ad3 | 1.056 | 1.056 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24775 | RUSH | 115 | 24 | 247 | base | ivsg_la_alt2ad3 | 1.056 | 1.056 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24156 | VINCENT | 500 | 24 | 240 | base | ivsg_la_alt2ad3 | 1.056 | 1.056 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15031 | PERK PS1 | 500 | 14 | 158 | base | ivsg_la_alt2ad3 | 1.057 | 1.057 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15032 | PERK PS2 | 500 | 14 | 158 | base | ivsg_la_alt2ad3 | 1.057 | 1.057 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15033 | PERKINPS | 500 | 14 | 158 | base | ivsg_la_alt2ad3 | 1.057 | 1.057 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14005 | WESTWING | 500 | 14 | 141 | base | ivsg_la_alt2ad3 | 1.057 | 1.057 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 16310 | NL.3WP2 | 100 | 14 | 160 | base | ivsg_la_alt2ad3 | 1.057 | 1.057 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24729 | INYO | 230 | 24 | 247 | base | ivsg_la_alt2ad3 | 1.057 | 1.057 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15092 | ARLINTON | 500 | 14 | 158 | base | ivsg_la_alt2ad3 | 1.059 | 1.059 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15094 | MESQUITE | 500 | 14 | 158 | base | ivsg_la_alt2ad3 | 1.059 | 1.059 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14009 | REDHAWK | 500 | 14 | 158 | base | ivsg_la_alt2ad3 | 1.059 | 1.059 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15021 | PALOVRDE | 500 | 14 | 158 | base | ivsg_la_alt2ad3 | 1.06 | 1.06 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15061 | RUDD | 500 | 14 | 158 | base | ivsg_la_alt2ad3 | 1.06 | 1.06 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15090 | HASSYAMP | 500 | 14 | 158 | base | ivsg_la_alt2ad3 | 1.06 | 1.06 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14100 | CHOLLA | 345 | 14 | 141 | base | ivsg_la_alt2ad3 | 1.06 | 1.06 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14010 | TS5 | 500 | 14 | 840 | base | ivsg_la_alt2ad3 | 1.061 | 1.061 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24097 | MOHAVE | 500 | 24 | 240 | base | ivsg_la_alt2ad3 | 1.062 | 1.062 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15034 | PERKINS | 500 | 14 | 158 | base | ivsg_la_alt2ad3 | 1.063 | 1.063 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14006 | YAVAPAI | 500 | 14 | 141 | base | ivsg_la_alt2ad3 | 1.063 | 1.063 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24776 | LEE VINE | 115 | 24 | 247 | base | ivsg_la_alt2ad3 | 1.063 | 1.063 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15087 | SNTAROSA | 500 | 14 | 158 | base | ivsg_la_alt2ad3 | 1.067 | 1.067 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 16302 | NL.3WP | 100 | 14 | 160 | base | ivsg_la_alt2ad3 | 1.067 | 1.067 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24235 | RECTOR | 230 | 24 | 240 | base | ivsg_la_alt2ad3 | 1.067 | 1.067 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24234 | RECTRSVC | 230 | 24 | 240 | base | ivsg_la_alt2ad3 | 1.067 | 1.067 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15088 | PINAL_W | 500 | 14 | 158 | base | ivsg_la_alt2ad3 | 1.068 | 1.068 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15001 | CORONADO | 500 | 14 | 140 | base | ivsg_la_alt2ad3 | 1.07 | 1.07 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14002 | MOENKOPI | 500 | 14 | 141 | base | ivsg_la_alt2ad3 | 1.079 | 1.079 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14003 | NAVAJO | 500 | 14 | 141 | base | ivsg_la_alt2ad3 | 1.084 | 1.084 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24304 | BIG CRK4 | 230 | 24 | 243 | base | ivsg_la_alt2ad3 | 1.089 | 1.089 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24301 | BIG CRK1 | 230 | 24 | 243 | base | ivsg_la_alt2ad3 | 1.09 | 1.09 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24320 | EASTWOOD | 230 | 24 | 243 | base | ivsg_la_alt2ad3 | 1.09 | 1.09 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24302 | BIG CRK2 | 230 | 24 | 243 | base | ivsg_la_alt2ad3 | 1.091 | 1.091 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24303 | BIG CRK3 | 230 | 24 | 243 | base | ivsg_la_alt2ad3 | 1.091 | 1.091 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24305 | BIG CRK8 | 230 | 24 | 243 | base | ivsg_la_alt2ad3 | 1.091 | 1.091 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24316 | MAMMOTH | 230 | 24 | 243 | base | ivsg_la_alt2ad3 | 1.091 | 1.091 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |

ivsg_la_alt2ad3.sav
Flow Summary
N-0 Outages

| LEGEND | % of RATING 1 | |
|---|---|---|
| C_pu | 100% - 110% | |
| C_pu | 110% - 120% | P.U. of |
| C_pu | > 120% | Rate 1 |

| FROM | FR | BKV | TO | TO | BKV | CK | Outage_Name | Case | Rate-Mva | Pflow | Qflow | Amps | MVA | C_pu | B_pu | Contingency_Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24900 | MIDPINTS | 500 | 19399 | BUCK161 | 161 | 1 | base | ivsg_la_alt2ad3 | 250 | -514.1 | 75.2 | 584.2 | 519.5 | 2.08 | 2.08 | Base system (n-0) |
| 19400 | BUCK230 | 230 | 19399 | BUCK161 | 161 | 1 | base | ivsg_la_alt2ad3 | 280 | 339.2 | 48 | 874.1 | 342.6 | 1.22 | 1.22 | Base system (n-0) |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | base | ivsg_la_alt2ad3 | 1411.6 | 1702.6 | 115 | 1817.6 | 1706.5 | 1.126 | 1.126 | Base system (n-0) |
| 16900 | COPPERVR | 345 | 16901 | COPPERVR | 230 | 1 | base | ivsg_la_alt2ad3 | 200 | 202.2 | 98.4 | 370.8 | 224.9 | 1.12 | 1.12 | Base system (n-0) |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | base | ivsg_la_alt2ad3 | 458 | 479.3 | 49 | 1207.6 | 481.8 | 1.051 | 1.051 | Base system (n-0) |
| 24999 | DEVRSVC1 | 500 | 24801 | DEVERS | 500 | 1 | base | ivsg_la_alt2ad3 | 387.5 | 0 | 400.1 | 458.6 | 400.1 | 1.025 | 1.025 | Base system (n-0) |
| 24912 | SHANDIN | 115 | 24916 | TAP902 | 115 | 1 | base | ivsg_la_alt2ad3 | 109.1 | -104.3 | 31.2 | 544.6 | 108.9 | 0.996 | 0.996 | Base system (n-0) |
| 25641 | TAP816 | 115 | 25664 | TAP998 | 115 | 1 | base | ivsg_la_alt2ad3 | 107.6 | -96.4 | 41.6 | 537.5 | 105 | 0.996 | 0.996 | Base system (n-0) |
| 25641 | TAP816 | 115 | 25644 | TAP818 | 115 | 1 | base | ivsg_la_alt2ad3 | 107.6 | 96.4 | -40.8 | 535.9 | 104.7 | 0.992 | 0.992 | Base system (n-0) |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | base | ivsg_la_alt2ad3 | 1645.4 | 1744.1 | 129.2 | 1871.4 | 1748.8 | 0.985 | 0.985 | Base system (n-0) |
| 24805 | DEVERS | 115 | 25644 | TAP818 | 115 | 1 | base | ivsg_la_alt2ad3 | 217 | -183.7 | 97.6 | 1053 | 208 | 0.967 | 0.967 | Base system (n-0) |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | base | ivsg_la_alt2ad3 | 2598 | 2520.1 | 135.6 | 2892.8 | 2523.8 | 0.964 | 0.964 | Base system (n-0) |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | base | ivsg_la_alt2ad3 | 56 | 51.8 | -5.2 | 255.8 | 52.1 | 0.94 | 0.94 | Base system (n-0) |
| 25629 | TAP813 | 115 | 25630 | TAP814 | 115 | 1 | base | ivsg_la_alt2ad3 | 82.7 | 69.9 | -28.4 | 384.7 | 75.4 | 0.926 | 0.926 | Base system (n-0) |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | base | ivsg_la_alt2ad3 | 1120 | -1018.8 | -74.6 | 2579.4 | 1021.6 | 0.92 | 0.92 | Base system (n-0) |

| Bus | Name | kV | Area | Zone | Outage | Case | Vbase | Vcont | DeltaV | Vmin | Vmax | Max-dv | Contingency Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22464 | MIGUEL | 230 | 22 | 222 | B2_002 | ivsg_la_alt2ad3 | 0.963 | 0.912 | -0.05 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 24017 | BLYTHESC | 161 | 24 | 248 | line_007 | ivsg_la_alt2ad3 | 1.002 | 0.917 | -0.085 | 0.9 | 1.05 | 0.05 | line BLYTHE to BLYTHESC 161 ck 1 |
| 22832 | SYCAMORE | 230 | 22 | 221 | B2_002 | ivsg_la_alt2ad3 | 0.979 | 0.923 | -0.056 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22738 | CENTRALX | 230 | 22 | 225 | B2_002 | ivsg_la_alt2ad3 | 0.994 | 0.923 | -0.072 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 24731 | INYOKERN | 115 | 24 | 247 | line_175 | ivsg_la_alt2ad3 | 1.012 | 0.924 | -0.087 | 0.9 | 1.05 | 0.05 | line INYO to COTTONWD 230 ck 1 |
| 22737 | CENTRALX | 500 | 22 | 225 | B2_002 | ivsg_la_alt2ad3 | 0.998 | 0.93 | -0.069 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 22831 | SYCAMORE | 138 | 22 | 221 | B2_002 | ivsg_la_alt2ad3 | 0.984 | 0.932 | -0.052 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 24739 | MC GEN | 115 | 24 | 247 | line_175 | ivsg_la_alt2ad3 | 1.031 | 0.95 | -0.081 | 0.9 | 1.05 | 0.05 | line INYO to COTTONWD 230 ck 1 |
| 24749 | SEARLES | 115 | 24 | 247 | line_175 | ivsg_la_alt2ad3 | 1.031 | 0.95 | -0.081 | 0.9 | 1.05 | 0.05 | line INYO to COTTONWD 230 ck 1 |
| 24762 | TAP702 | 115 | 24 | 247 | line_175 | ivsg_la_alt2ad3 | 1.031 | 0.95 | -0.081 | 0.9 | 1.05 | 0.05 | line INYO to COTTONWD 230 ck 1 |
| 24763 | TAP703 | 115 | 24 | 247 | line_175 | ivsg_la_alt2ad3 | 1.031 | 0.95 | -0.081 | 0.9 | 1.05 | 0.05 | line INYO to COTTONWD 230 ck 1 |
| 22468 | MIGUEL | 500 | 22 | 227 | B2_002 | ivsg_la_alt2ad3 | 1.007 | 0.951 | -0.056 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 24768 | RANDSBRG | 115 | 24 | 247 | line_175 | ivsg_la_alt2ad3 | 1.006 | 0.952 | -0.055 | 0.9 | 1.05 | 0.05 | line INYO to COTTONWD 230 ck 1 |
| 24761 | TAP701 | 115 | 24 | 247 | line_175 | ivsg_la_alt2ad3 | 1.006 | 0.952 | -0.055 | 0.9 | 1.05 | 0.05 | line INYO to COTTONWD 230 ck 1 |
| 22472 | MIGUELMP | 500 | 22 | 227 | B2_002 | ivsg_la_alt2ad3 | 1.009 | 0.956 | -0.053 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 80350 | NEWSF500 | 500 | 8 | 800 | line_56 | ivsg_la_alt2ad3 | 1.021 | 0.966 | -0.055 | 0.9 | 1.05 | 0.05 | line NEWSF500 to IMPRLVLY 500 ck 1 |
| 14534 | N.GILA 4 | 100 | 14 | 847 | NG500/69 | ivsg_la_alt2ad3 | 0.939 | 1 | 0.061 | 0.9 | 1.05 | 0.05 | tran N.GILA 500 to N.GILA 69 ck 1 |
| 24035 | EAGLEMTN | 161 | 24 | 248 | tran_241 | ivsg_la_alt2ad3 | 0.966 | 1.023 | 0.057 | 0.9 | 1.05 | 0.05 | tran EAGLEMTN 230 to EAGLEMTN 161 ck 1 |
| 24142 | SYC CYN | 230 | 24 | 240 | line_086 | ivsg_la_alt2ad3 | 1.037 | 1.091 | 0.054 | 0.9 | 1.05 | 0.05 | line MAGUNDEN to OMAR 230 ck 1 |
| 25613 | EDMONSTN | 230 | 24 | 256 | line_122 | ivsg_la_alt2ad3 | 1.024 | 1.091 | 0.067 | 0.9 | 1.05 | 0.05 | line PASTORIA to EDMONSTN 230 ck 1 |
| 24142 | SYC CYN | 230 | 24 | 240 | line_140 | ivsg_la_alt2ad3 | 1.037 | 1.091 | 0.054 | 0.9 | 1.05 | 0.05 | line SYC CYN to OMAR 230 ck 1 |

ivsg_la_alt2ad3.sav
FLOW Summary
N-1 Outages

| LEGEND | % of RATING 1 | |
|---|---|---|
| C_pu | 100% - 110% | |
| C_pu | 110% - 120% | P.U. of |
| C_pu | > 120% | Rate 1 |

| FROM | FR | BKV | TO | TO | BKV | CK | Outage_Name | Case | Rate-Mva | Pflow | Qflow | Amps | MVA | C_pu | B_pu | Contingency_Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24142 | SYC CYN | 230 | 24101 | OMAR | 230 | 1 | line_086 | ivsg_la_alt2ad3 | 643 | 720.1 | 5514.7 | 12797.5 | 5561.6 | 7.929 | 0.422 | line MAGUNDEN to OMAR 230 ck 1 |
| 24781 | NAVYCOSO | 230 | 24706 | BLM EAST | 230 | 1 | line_173 | ivsg_la_alt2ad3 | 1287 | -152.8 | -3160.7 | 7943.4 | 3164.4 | 2.459 | 0.056 | line BLM EAST to BLM WEST 230 ck 1 |
| 24781 | NAVYCOSO | 230 | 24706 | BLM EAST | 230 | 1 | line_174 | ivsg_la_alt2ad3 | 1287 | -152.8 | -3160.7 | 7943.4 | 3164.4 | 2.459 | 0.056 | line BLM WEST to KRAMER 230 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_175 | ivsg_la_alt2ad3 | 56 | -106.6 | 5.5 | 544.3 | 106.8 | 1.91 | 0.94 | line INYO to COTTONWD 230 ck 1 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_001 | ivsg_la_alt2ad3 | 1411.6 | 2581.8 | 380.7 | 2792.7 | 2609.7 | 1.731 | 1.126 | line MOENKOPI to ELDORDO 500 ck 1 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | B2_002 | ivsg_la_alt2ad3 | 1120 | -1672.9 | -86.9 | 4557.8 | 1675.2 | 1.51 | 0.92 | IMPRLVLY - MIGUEL 1 500kV |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_202 | ivsg_la_alt2ad3 | 56 | 80.7 | -9.9 | 406.1 | 81.3 | 1.47 | 0.94 | line OWENSCON to INYO 230 ck 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_206 | ivsg_la_alt2ad3 | 458 | 616.7 | 110 | 1567.5 | 626.4 | 1.364 | 1.051 | line SERRANO to VALLEYSC 500 ck 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_135 | ivsg_la_alt2ad3 | 458 | 608.1 | 79.1 | 1541.4 | 613.2 | 1.341 | 1.051 | line SANBRDNO to DEVERS 230 ck 1 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | B2_002 | ivsg_la_alt2ad3 | 388 | -464.6 | -21.7 | 1220.7 | 465.1 | 1.253 | 0.842 | IMPRLVLY - MIGUEL 1 500kV |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_183 | ivsg_la_alt2ad3 | 458 | 562.9 | 75.5 | 1425.1 | 567.9 | 1.24 | 1.051 | line DEVERS to VSTA 230 ck 2 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_185 | ivsg_la_alt2ad3 | 458 | 562.9 | 75.5 | 1425.1 | 567.9 | 1.24 | 1.051 | line VSTA to DEVERS 230 ck 1 |
| 22464 | MIGUEL | 230 | 22472 | MIGUELMP | 500 | 1 | ML81 | ivsg_la_alt2ad3 | 1120 | -1341 | 166.6 | 3537 | 1351.3 | 1.21 | 0.7 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 22468 | MIGUEL | 500 | 22472 | MIGUELMP | 500 | 1 | ML81 | ivsg_la_alt2ad3 | 1120 | 1343.4 | 60.7 | 1549.5 | 1344.8 | 1.2 | 0.7 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_206 | ivsg_la_alt2ad3 | 1411.6 | 1798.8 | 161.9 | 1934.8 | 1806.1 | 1.2 | 1.126 | line SERRANO to VALLEYSC 500 ck 1 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | B2_001 | ivsg_la_alt2ad3 | 1411.6 | 1792.3 | 156.1 | 1926.1 | 1799.1 | 1.194 | 1.126 | HASSYAMP - N.GILA 1 500kV |
| 22464 | MIGUEL | 230 | 22468 | MIGUEL | 500 | 1 | ML80 | ivsg_la_alt2ad3 | 1120 | -1323.1 | 166.8 | 3491.2 | 1333.6 | 1.19 | 0.66 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | B2_003 | ivsg_la_alt2ad3 | 1411.6 | 1769.7 | 148.7 | 1899.3 | 1776 | 1.177 | 1.126 | N.GILA - IMPRLVLY 1 500kV |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | B2_002 | ivsg_la_alt2ad3 | 1411.6 | 1760.9 | 156.4 | 1891.6 | 1767.8 | 1.173 | 1.126 | IMPRLVLY - MIGUEL 1 500kV |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_86 | ivsg_la_alt2ad3 | 1411.6 | 1761.3 | 141.3 | 1888.2 | 1767 | 1.17 | 1.126 | line MIDPINTS to IH500 500 ck 1 |
| 22356 | IMPRLVLY | 230 | 22360 | IMPRLVLY | 500 | 1 | IV81 | ivsg_la_alt2ad3 | 600 | 668.3 | 218 | 1779.6 | 702.9 | 1.17 | 0.53 | tran IMPRLVLY 230 to IMPRLVLY 500 ck 2 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_84 | ivsg_la_alt2ad3 | 1411.6 | 1759.6 | 141.9 | 1886.5 | 1765.3 | 1.169 | 1.126 | line MIDPINTS to DEVERS 500 ck 1 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_83 | ivsg_la_alt2ad3 | 1411.6 | 1746.3 | 134.3 | 1869.9 | 1751.4 | 1.159 | 1.126 | line IH500 to DEVERS 500 ck 1 |
| 24806 | MIRAGE | 230 | 24807 | MIRAGE | 115 | 2 | tran_238 | ivsg_la_alt2ad3 | 280 | 319.7 | 22.3 | 817.7 | 320.5 | 1.15 | 0.58 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 24900 | MIDPINTS | 500 | 80150 | IH500 | 500 | 1 | line_84 | ivsg_la_alt2ad3 | 3420 | 2727.5 | 382.6 | 3125.4 | 2754.2 | 1.137 | 0.645 | line MIDPINTS to DEVERS 500 ck 1 |
| 20238 | HRD-230 | 230 | 20239 | HRD-115 | 115 | 1 | B2_002 | ivsg_la_alt2ad3 | 225 | 251.6 | -29.7 | 667.1 | 253.3 | 1.13 | 0.84 | IMPRLVLY - MIGUEL 1 500kV |
| 24729 | INYO | 230 | 24730 | INYO PS | 115 | 1 | line_175 | ivsg_la_alt2ad3 | 50 | 53.3 | 18.9 | 136.1 | 56.5 | 1.13 | 0.54 | line INYO to COTTONWD 230 ck 1 |
| 24729 | INYO | 230 | 24730 | INYO PS | 115 | 2 | line_175 | ivsg_la_alt2ad3 | 50 | 53.3 | 18.9 | 136.1 | 56.5 | 1.13 | 0.54 | line INYO to COTTONWD 230 ck 1 |
| 20238 | HRD-230 | 230 | 20118 | ROA-230 | 230 | 1 | B2_002 | ivsg_la_alt2ad3 | 388 | -401.8 | 109.2 | 1096.6 | 416.4 | 1.129 | 0.721 | IMPRLVLY - MIGUEL 1 500kV |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | B2_002 | ivsg_la_alt2ad3 | 458 | 501.1 | 43.3 | 1295.3 | 503 | 1.127 | 1.051 | IMPRLVLY - MIGUEL 1 500kV |
| 24900 | MIDPINTS | 500 | 24801 | DEVERS | 500 | 1 | line_86 | ivsg_la_alt2ad3 | 2338 | 2614.3 | 346.1 | 2980.7 | 2637.1 | 1.107 | 0.653 | line MIDPINTS to IH500 500 ck 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_001 | ivsg_la_alt2ad3 | 458 | 496.4 | 45.6 | 1267.1 | 498.5 | 1.102 | 1.051 | line MOENKOPI to ELDORDO 500 ck 1 |
| 24723 | CONTROL | 115 | 24731 | INYOKERN | 115 | 1 | line_175 | ivsg_la_alt2ad3 | 82.7 | 88.9 | -7.5 | 457.5 | 89.3 | 1.102 | 0.305 | line INYO to COTTONWD 230 ck 1 |
| 24723 | CONTROL | 115 | 24731 | INYOKERN | 115 | 2 | line_175 | ivsg_la_alt2ad3 | 82.7 | 88.9 | -7.5 | 457.5 | 89.3 | 1.102 | 0.305 | line INYO to COTTONWD 230 ck 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_085 | ivsg_la_alt2ad3 | 458 | 496.4 | 46.9 | 1262.9 | 498.6 | 1.099 | 1.051 | line LUGO to VICTORVL 500 ck 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_66 | ivsg_la_alt2ad3 | 458 | 493.2 | 46.8 | 1258.4 | 495.4 | 1.095 | 1.051 | line CENTRALX to NEWSF500 500 ck 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_047 | ivsg_la_alt2ad3 | 458 | 491.2 | 48.8 | 1251.2 | 493.6 | 1.089 | 1.051 | line ELDORDO to LUGO 500 ck 1 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_085 | ivsg_la_alt2ad3 | 1411.6 | 1637.2 | 124.4 | 1748.9 | 1641.9 | 1.084 | 1.126 | line LUGO to VICTORVL 500 ck 1 |
| 20238 | HRD-230 | 230 | 20102 | RUM-230 | 230 | 1 | B2_002 | ivsg_la_alt2ad3 | 388 | -382.6 | 105 | 1044.7 | 396.7 | 1.077 | 0.673 | IMPRLVLY - MIGUEL 1 500kV |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_169 | ivsg_la_alt2ad3 | 56 | 59.6 | -5 | 295.9 | 59.8 | 1.07 | 0.94 | line KRAMER to LUGO 230 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_170 | ivsg_la_alt2ad3 | 56 | 59.6 | -5 | 295.9 | 59.8 | 1.07 | 0.94 | line KRAMER to LUGO 230 ck 2 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | line_66 | ivsg_la_alt2ad3 | 388 | -402.1 | 2.1 | 1040 | 402.1 | 1.068 | 0.842 | line CENTRALX to NEWSF500 500 ck 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_206 | ivsg_la_alt2ad3 | 1645.4 | 1856.8 | 178 | 2011.8 | 1865.3 | 1.059 | 0.985 | line SERRANO to VALLEYSC 500 ck 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | B2_001 | ivsg_la_alt2ad3 | 1645.4 | 1847 | 171.1 | 1998.8 | 1854.9 | 1.052 | 0.985 | HASSYAMP - N.GILA 1 500kV |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_206 | ivsg_la_alt2ad3 | 458 | 457.2 | -38.3 | 1200 | 458.8 | 1.044 | 0.736 | line SERRANO to VALLEYSC 500 ck 1 |
| 24900 | MIDPINTS | 500 | 24801 | DEVERS | 500 | 1 | line_83 | ivsg_la_alt2ad3 | 2338 | 2471.2 | 261.1 | 2806.5 | 2485 | 1.041 | 0.653 | line IH500 to DEVERS 500 ck 1 |
| 24805 | DEVERS | 115 | 24804 | DEVERS | 230 | 1 | tran_236 | ivsg_la_alt2ad3 | 280 | 254.2 | -95.1 | 1362.6 | 271.5 | 1.04 | 0.68 | tran DEVERS 115 to DEVERS 230 ck 3 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | B2_002 | ivsg_la_alt2ad3 | 2598 | 2639 | 218.2 | 3116.8 | 2648 | 1.039 | 0.964 | IMPRLVLY - MIGUEL 1 500kV |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | B2_003 | ivsg_la_alt2ad3 | 1645.4 | 1821.7 | 164.2 | 1968.1 | 1829.1 | 1.036 | 0.985 | N.GILA - IMPRLVLY 1 500kV |
| 8601 | GEOSUB2 | 230 | 8300 | BANIS230 | 230 | 1 | line_22 | ivsg_la_alt2ad3 | 550 | 569.1 | 64.6 | 1423.8 | 572.8 | 1.032 | 0.759 | line GEOSUB1 to BANIS230 230 ck 1 |
| 8601 | GEOSUB2 | 230 | 8300 | BANIS230 | 230 | 1 | line_23 | ivsg_la_alt2ad3 | 550 | 569.1 | 64.6 | 1423.8 | 572.8 | 1.032 | 0.759 | line GEOSUB1 to BANIS230 230 ck 2 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | B2_002 | ivsg_la_alt2ad3 | 1645.4 | 1811.2 | 173.7 | 1959.3 | 1819.5 | 1.031 | 0.985 | IMPRLVLY - MIGUEL 1 500kV |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | PV1 | ivsg_la_alt2ad3 | 1411.6 | 1571.3 | 59 | 1665 | 1572.4 | 1.03 | 1.126 | gen PALOVRD1 24.00 |
| 24805 | DEVERS | 115 | 24804 | DEVERS | 230 | 3 | tran_235 | ivsg_la_alt2ad3 | 280 | 251.3 | -92.9 | 1337.1 | 267.9 | 1.03 | 0.66 | tran DEVERS 115 to DEVERS 230 ck 1 |
| 24805 | DEVERS | 115 | 24804 | DEVERS | 230 | 1 | tran_237 | ivsg_la_alt2ad3 | 280 | 252.8 | -94.5 | 1353.7 | 269.9 | 1.03 | 0.68 | tran DEVERS 115 to DEVERS 230 ck 4 |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_86 | ivsg_la_alt2ad3 | 1645.4 | 1812.2 | 156 | 1955 | 1818.9 | 1.029 | 0.985 | line MIDPINTS to IH500 500 ck 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_84 | ivsg_la_alt2ad3 | 1645.4 | 1810.5 | 157 | 1953.4 | 1817.3 | 1.028 | 0.985 | line MIDPINTS to DEVERS 500 ck 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_183 | ivsg_la_alt2ad3 | 2598 | 2670.2 | 226.7 | 3079.5 | 2679.8 | 1.027 | 0.964 | line DEVERS to VSTA 230 ck 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_185 | ivsg_la_alt2ad3 | 2598 | 2670.2 | 226.7 | 3079.5 | 2679.8 | 1.027 | 0.964 | line VSTA to DEVERS 230 ck 1 |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_135 | ivsg_la_alt2ad3 | 458 | 449.2 | -64.1 | 1178.2 | 453.8 | 1.025 | 0.736 | line SANBRDNO to DEVERS 230 ck 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_29 | ivsg_la_alt2ad3 | 458 | 467.4 | 48.9 | 1169.5 | 470 | 1.018 | 1.051 | line HIGHLINE to COLCT3 230 ck 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_83 | ivsg_la_alt2ad3 | 1645.4 | 1795.3 | 149.1 | 1934.1 | 1801.5 | 1.018 | 0.985 | line IH500 to DEVERS 500 ck 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_001 | ivsg_la_alt2ad3 | 2598 | 2617.8 | 171.5 | 3052.8 | 2623.4 | 1.018 | 0.964 | line MOENKOPI to ELDORDO 500 ck 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_135 | ivsg_la_alt2ad3 | 2598 | 2646 | 209 | 3052.5 | 2654.2 | 1.018 | 0.964 | line SANBRDNO to DEVERS 230 ck 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_83 | ivsg_la_alt2ad3 | 458 | 459.9 | 35.4 | 1168.5 | 461.2 | 1.016 | 1.051 | line IH500 to DEVERS 500 ck 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_085 | ivsg_la_alt2ad3 | 2598 | 2614 | 163.5 | 3036.9 | 2619.1 | 1.012 | 0.964 | line LUGO to VICTORVL 500 ck 1 |
| 24701 | KRAMER | 230 | 24085 | LUGO | 230 | 2 | line_169 | ivsg_la_alt2ad3 | 478 | 479 | 68.1 | 1214.9 | 483.8 | 1.012 | 0.607 | line KRAMER to LUGO 230 ck 1 |
| 24701 | KRAMER | 230 | 24085 | LUGO | 230 | 1 | line_170 | ivsg_la_alt2ad3 | 478 | 479 | 68.1 | 1214.9 | 483.8 | 1.012 | 0.607 | line KRAMER to LUGO 230 ck 2 |
| 24805 | DEVERS | 115 | 24804 | DEVERS | 230 | 4 | tran_235 | ivsg_la_alt2ad3 | 280 | 248.4 | -91.8 | 1321.5 | 264.8 | 1.01 | 0.65 | tran DEVERS 115 to DEVERS 230 ck 1 |
| 24805 | DEVERS | 115 | 24804 | DEVERS | 230 | 3 | tran_237 | ivsg_la_alt2ad3 | 280 | 246.8 | -92.2 | 1321.8 | 263.5 | 1.01 | 0.66 | tran DEVERS 115 to DEVERS 230 ck 4 |
| 24151 | VALLEYSC | 500 | 24160 | VALLEYSC | 115 | 2 | tran_247 | ivsg_la_alt2ad3 | 560 | 541 | 164.9 | 652.2 | 565.6 | 1.01 | 0.49 | tran VALLEYSC 500 to VALLEYSC 115 ck 1 |
| 24151 | VALLEYSC | 500 | 24160 | VALLEYSC | 115 | 1 | tran_248 | ivsg_la_alt2ad3 | 560 | 541 | 164.9 | 652.2 | 565.6 | 1.01 | 0.49 | tran VALLEYSC 500 to VALLEYSC 115 ck 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_66 | ivsg_la_alt2ad3 | 2598 | 2593.9 | 180.8 | 3019.6 | 2600.2 | 1.007 | 0.964 | line CENTRALX to NEWSF500 500 ck 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_84 | ivsg_la_alt2ad3 | 458 | 451.7 | 28.2 | 1154.8 | 452.6 | 1.004 | 1.051 | line MIDPINTS to DEVERS 500 ck 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_302 | ivsg_la_alt2ad3 | 2598 | 2613 | 189.3 | 3011.7 | 2619.8 | 1.004 | 0.964 | line DEVERS to OAK_VLLY 230 ck 1 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | B2_003 | ivsg_la_alt2ad3 | 800 | 788.3 | 43.9 | 2011.8 | 789.5 | 1.002 | 0.778 | N.GILA - IMPRLVLY 1 500kV |
| 20238 | HRD-230 | 230 | 20239 | HRD-115 | 115 | 1 | line_66 | ivsg_la_alt2ad3 | 225 | 224 | -22.5 | 579.2 | 225.1 | 1 | 0.84 | line CENTRALX to NEWSF500 500 ck 1 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | ML80 | ivsg_la_alt2ad3 | 1120 | -1108.8 | -68.3 | 2821.7 | 1110.9 | 1 | 0.92 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_047 | ivsg_la_alt2ad3 | 2598 | 2580.4 | 182.2 | 3000.5 | 2586.8 | 1 | 0.964 | line ELDORDO to LUGO 500 ck 1 |
| 24805 | DEVERS | 115 | 24804 | DEVERS | 230 | 4 | tran_236 | ivsg_la_alt2ad3 | 280 | 245.4 | -91.8 | 1315.1 | 262 | 1 | 0.65 | tran DEVERS 115 to DEVERS 230 ck 3 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | B2_003 | ivsg_la_alt2ad3 | 2598 | 2571.6 | 169.9 | 2992.8 | 2577.2 | 0.998 | 0.964 | N.GILA - IMPRLVLY 1 500kV |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | B2_001 | ivsg_la_alt2ad3 | 2598 | 2565.6 | 168.6 | 2989.4 | 2571.1 | 0.997 | 0.964 | HASSYAMP - N.GILA 1 500kV |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_86 | ivsg_la_alt2ad3 | 458 | 449.7 | 31.2 | 1145.2 | 450.8 | 0.996 | 1.051 | line MIDPINTS to IH500 500 ck 1 |
| 22738 | CENTRALX | 230 | 22832 | SYCAMORE | 230 | 2 | B2_002 | ivsg_la_alt2ad3 | 912 | 836.5 | 43.4 | 2278.9 | 837.6 | 0.995 | 0.563 | IMPRLVLY - MIGUEL 1 500kV |
| 22738 | CENTRALX | 230 | 22832 | SYCAMORE | 230 | 1 | B2_002 | ivsg_la_alt2ad3 | 912 | 836.5 | 43.4 | 2278.9 | 837.6 | 0.995 | 0.563 | IMPRLVLY - MIGUEL 1 500kV |
| 8600 | GEOSUB1 | 230 | 8300 | BANIS230 | 230 | 1 | line_47 | ivsg_la_alt2ad3 | 550 | 547.1 | 60.2 | 1369.6 | 550.4 | 0.992 | 0.703 | line GEOSUB2 to BANIS230 230 ck 1 |
| 8600 | GEOSUB1 | 230 | 8300 | BANIS230 | 230 | 2 | line_47 | ivsg_la_alt2ad3 | 550 | 547.1 | 60.2 | 1369.6 | 550.4 | 0.992 | 0.703 | line GEOSUB2 to BANIS230 230 ck 1 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | ML81 | ivsg_la_alt2ad3 | 1120 | -1100.6 | -69.1 | 2799.3 | 1102.7 | 0.99 | 0.92 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | tran_210 | ivsg_la_alt2ad3 | 56 | 54.8 | -5 | 271 | 55 | 0.99 | 0.94 | tran LUGO 500 to LUGO 230 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | tran_211 | ivsg_la_alt2ad3 | 56 | 54.8 | -5 | 271.2 | 55.1 | 0.99 | 0.94 | tran LUGO 500 to LUGO 230 ck 2 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_56 | ivsg_la_alt2ad3 | 800 | 760 | 133.6 | 1976.9 | 771.6 | 0.985 | 0.778 | line NEWSF500 to IMPRLVLY 500 ck 1 |
| 8600 | GEOSUB1 | 230 | 8300 | BANIS230 | 230 | 2 | line_22 | ivsg_la_alt2ad3 | 550 | 541.6 | 61.2 | 1354.6 | 545 | 0.982 | 0.703 | line GEOSUB1 to BANIS230 230 ck 1 |
| 8600 | GEOSUB1 | 230 | 8300 | BANIS230 | 230 | 1 | line_23 | ivsg_la_alt2ad3 | 550 | 541.6 | 61.2 | 1354.6 | 545 | 0.982 | 0.703 | line GEOSUB1 to BANIS230 230 ck 2 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | B2_022 | ivsg_la_alt2ad3 | 1120 | -1085.9 | -68 | 2771 | 1088 | 0.98 | 0.92 | OTAYMESA - TJI-230 1 230kV |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | B2_028 | ivsg_la_alt2ad3 | 1120 | -1086.8 | -58.4 | 2752.2 | 1088.4 | 0.98 | 0.92 | MIGUEL - SYCAMORE 1 230kV |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | SO2 | ivsg_la_alt2ad3 | 1120 | -1090.2 | -97.2 | 2866.1 | 1094.5 | 0.98 | 0.92 | gen S.ONOFR2 22.00 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | line_206 | ivsg_la_alt2ad3 | 1120 | -1089.6 | -75.6 | 2807.7 | 1092.2 | 0.98 | 0.92 | line SERRANO to VALLEYSC 500 ck 1 |
| 24016 | BARRE | 230 | 25201 | LEWIS | 230 | 1 | line_024 | ivsg_la_alt2ad3 | 1195 | -1089.4 | 283 | 2909.8 | 1125.5 | 0.97 | 0.632 | line BARRE to VILLA PK 230 ck 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_059 | ivsg_la_alt2ad3 | 458 | 443.1 | 42 | 1114.8 | 445.1 | 0.97 | 1.051 | line ETIWANDA to SANBRDNO 230 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_086 | ivsg_la_alt2ad3 | 56 | 53.7 | -5.6 | 266.4 | 54 | 0.97 | 0.94 | line MAGUNDEN to OMAR 230 ck 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | PV1 | ivsg_la_alt2ad3 | 458 | 443.2 | 47.1 | 1094.6 | 445.7 | 0.953 | 1.051 | gen PALOVRD1 24.00 |
| 22464 | MIGUEL | 230 | 22472 | MIGUELMP | 500 | 1 | line_66 | ivsg_la_alt2ad3 | 1120 | -1052.6 | 115.8 | 2864.8 | 1058.9 | 0.95 | 0.7 | line CENTRALX to NEWSF500 500 ck 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_047 | ivsg_la_alt2ad3 | 1645.4 | 1672.6 | 162.1 | 1801.7 | 1680.4 | 0.95 | 0.985 | line ELDORDO to LUGO 500 ck 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_085 | ivsg_la_alt2ad3 | 1645.4 | 1679.3 | 147.8 | 1804 | 1685.8 | 0.95 | 0.985 | line LUGO to VICTORVL 500 ck 1 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | IV81 | ivsg_la_alt2ad3 | 388 | -361 | 7.9 | 922.7 | 361.1 | 0.947 | 0.842 | tran IMPRLVLY 230 to IMPRLVLY 500 ck 2 |
| 24042 | ELDORDO | 500 | 24086 | LUGO | 500 | 1 | line_085 | ivsg_la_alt2ad3 | 1386 | 1368.2 | 46.5 | 1515.8 | 1369 | 0.947 | 0.693 | line LUGO to VICTORVL 500 ck 1 |
| 20238 | HRD-230 | 230 | 20118 | ROA-230 | 230 | 1 | line_66 | ivsg_la_alt2ad3 | 388 | -344.4 | 90.2 | 916 | 356 | 0.945 | 0.721 | line CENTRALX to NEWSF500 500 ck 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | B2_002 | ivsg_la_alt2ad3 | 204.1 | 179.5 | -10.2 | 806.9 | 179.8 | 0.945 | 0.55 | IMPRLVLY - MIGUEL 1 500kV |
| 22360 | IMPRLVLY | 500 | 22468 | MIGUEL | 500 | 1 | line_66 | ivsg_la_alt2ad3 | 2252 | 2086.1 | 475.5 | 2405.4 | 2139.6 | 0.942 | 0.673 | line CENTRALX to NEWSF500 500 ck 1 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | B2_001 | ivsg_la_alt2ad3 | 800 | 748.8 | 16.3 | 1890.5 | 749 | 0.941 | 0.778 | HASSYAMP - N.GILA 1 500kV |
| 22468 | MIGUEL | 500 | 22472 | MIGUELMP | 500 | 1 | line_66 | ivsg_la_alt2ad3 | 1120 | 1054.2 | 33.3 | 1255 | 1054.7 | 0.94 | 0.7 | line CENTRALX to NEWSF500 500 ck 1 |
| 24151 | VALLEYSC | 500 | 24229 | VALLEY-S | 115 | 4 | tran_249 | ivsg_la_alt2ad3 | 560 | 518.5 | 95.4 | 606.8 | 527.2 | 0.94 | 0.46 | tran VALLEYSC 500 to VALLEY-S 115 ck 3 |
| 24151 | VALLEYSC | 500 | 24229 | VALLEY-S | 115 | 3 | tran_250 | ivsg_la_alt2ad3 | 560 | 518.5 | 95.4 | 606.8 | 527.2 | 0.94 | 0.46 | tran VALLEYSC 500 to VALLEY-S 115 ck 4 |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_183 | ivsg_la_alt2ad3 | 458 | 406.5 | -46.7 | 1061.2 | 409.2 | 0.923 | 0.736 | line DEVERS to VSTA 230 ck 2 |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_185 | ivsg_la_alt2ad3 | 458 | 406.5 | -46.7 | 1061.2 | 409.2 | 0.923 | 0.736 | line VSTA to DEVERS 230 ck 1 |
| 20238 | HRD-230 | 230 | 20239 | HRD-115 | 115 | 1 | IV81 | ivsg_la_alt2ad3 | 225 | 205.4 | -15.1 | 524.1 | 206 | 0.92 | 0.84 | tran IMPRLVLY 230 to IMPRLVLY 500 ck 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_86 | ivsg_la_alt2ad3 | 2598 | 2353.3 | 30.5 | 2752.5 | 2353.5 | 0.918 | 0.964 | line MIDPINTS to IH500 500 ck 1 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | SO2 | ivsg_la_alt2ad3 | 388 | -345.6 | 9.6 | 889.9 | 345.7 | 0.914 | 0.842 | gen S.ONOFR2 22.00 |
| 22832 | SYCAMORE | 230 | 22652 | PENSQTOS | 230 | 1 | B2_009 | ivsg_la_alt2ad3 | 796.7 | 701.7 | -40.1 | 1809 | 702.8 | 0.905 | 0.619 | EPP - ESCNDIDO 1 230kV |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_122 | ivsg_la_alt2ad3 | 56 | 49.6 | -4.8 | 244.1 | 49.9 | 0.9 | 0.94 | line PASTORIA to EDMONSTN 230 ck 1 |
| 24801 | DEVERS | 500 | 24804 | DEVERS | 230 | 1 | line_206 | ivsg_la_alt2ad3 | 1120 | 699.5 | 725.4 | 1127.6 | 1007.7 | 0.9 | 0.51 | line SERRANO to VALLEYSC 500 ck 1 |
| 24729 | INYO | 230 | 24730 | INYO PS | 115 | 2 | tran_230 | ivsg_la_alt2ad3 | 50 | -43.4 | 12.6 | 107.2 | 45.2 | 0.9 | 0.54 | tran INYO 230 to INYO PS 115 ck 1 |
| 24729 | INYO | 230 | 24730 | INYO PS | 115 | 1 | tran_231 | ivsg_la_alt2ad3 | 50 | -43.4 | 12.6 | 107.2 | 45.2 | 0.9 | 0.54 | tran INYO 230 to INYO PS 115 ck 2 |

ivsg_la_alt2ad3.sav
No Solve Summary
N-1 Outages

| Contingency-Description | Case | Problem-Description |
|---|---|---|
| line DEVERS to VALLEYSC 500 ck 1 | ivsg_la_alt2ad3 | Pmis 26114 INTERMTX 345.00 = 0.02 MW + j 1.96 MVAR |

ivsg_la_alt2ad3.sav
VOLTAGE Summary
N-2 Outages

| Bus | Name | kV | Area | Zone | Outage | Case | Vbase | Vcont | DeltaV | Vmin | Vmax | Max-dv | Contingency Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22734 | SANTEE | 138 | 22 | 223 | 23021/22/23/41 | ivsg_la_alt2ad3 | 0.973 | 0.921 | -0.051 | 0.9 | 1.05 | 0.05 | MIGUEL 230 CORRIDOR West of SN |
| 24237 | RANCHVST | 230 | 24 | 240 | 23021/22/23/41 | ivsg_la_alt2ad3 | 0.975 | 1.029 | 0.054 | 0.9 | 1.05 | 0.05 | MIGUEL 230 CORRIDOR West of SN |
| 25001 | GOODRICH | 230 | 24 | 250 | line_2073 | ivsg_la_alt2ad3 | 0.989 | 1.044 | 0.055 | 0.9 | 1.05 | 0.05 | GOODRICH 230.00 - GOULD 230.00 1, GOODRICH 230.00 - LAGUBELL 230.00 1 |

ivsg_la_alt2ad3.sav
FLOW Summary
N-2 Outages

| LEGEND | % of RATING 1 | |
|---|---|---|
| C_pu | 100% - 110% | |
| C_pu | 110% - 120% | P.U. of |
| C_pu | > 120% | Rate 1 |

| FROM | FR | BKV | TO | TO | BKV | CK | Outage_Name | Case | Rate-Mva | Pflow | Qflow | Amps | MVA | C_pu | B_pu | Contingency_Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_2233 | ivsg_la_alt2ad3 | 1411.6 | 2578.4 | 383.7 | 2789.9 | 2606.8 | 1.73 | 1.126 | MOENKOPI 500.00 - ELDORDO 500.00 1, PISGAH 230.00 - ELDORDO 230.00 2 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2175 | ivsg_la_alt2ad3 | 458 | 738.2 | 130.1 | 1887.5 | 749.6 | 1.642 | 1.051 | DEVERS 230.00 - SANBRDNO 230.00 1, DEVERS 230.00 - VSTA 230.00 2 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2177 | ivsg_la_alt2ad3 | 458 | 738.2 | 130.1 | 1887.5 | 749.6 | 1.642 | 1.051 | DEVERS 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2178 | ivsg_la_alt2ad3 | 458 | 738.2 | 130.1 | 1887.5 | 749.6 | 1.642 | 1.051 | DEVERS 230.00 - VSTA 230.00 2, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2180 | ivsg_la_alt2ad3 | 458 | 738.2 | 130.1 | 1887.5 | 749.6 | 1.642 | 1.051 | SANBRDNO 230.00 - DEVERS 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2247 | ivsg_la_alt2ad3 | 458 | 738.2 | 130.1 | 1887.5 | 749.6 | 1.642 | 1.051 | DEVERS 230.00 - VSTA 230.00 2, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2179 | ivsg_la_alt2ad3 | 458 | 694.2 | 128.6 | 1772.9 | 706 | 1.543 | 1.051 | DEVERS 230.00 - VSTA 230.00 2, VSTA 230.00 - DEVERS 230.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2238 | ivsg_la_alt2ad3 | 458 | 621.1 | 112.3 | 1584.3 | 631.1 | 1.379 | 1.051 | S.ONOFRE 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2239 | ivsg_la_alt2ad3 | 458 | 616.7 | 110 | 1567.5 | 626.4 | 1.364 | 1.051 | CHINO 230.00 - S.ONOFRE 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2240 | ivsg_la_alt2ad3 | 458 | 615.4 | 110.1 | 1563.7 | 625.2 | 1.361 | 1.051 | CHINO 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2176 | ivsg_la_alt2ad3 | 458 | 608.1 | 79.1 | 1541.4 | 613.2 | 1.341 | 1.051 | DEVERS 230.00 - SANBRDNO 230.00 1, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_la_alt2ad3 | 392 | 518.5 | 60.1 | 1404.2 | 522 | 1.33 | 0.76 | MIGUEL 230 CORRIDOR West of SN |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_2175 | ivsg_la_alt2ad3 | 458 | 570.7 | -85.8 | 1520.1 | 577.1 | 1.322 | 0.736 | DEVERS 230.00 - SANBRDNO 230.00 1, DEVERS 230.00 - VSTA 230.00 2 |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_2177 | ivsg_la_alt2ad3 | 458 | 570.7 | -85.8 | 1520.1 | 577.1 | 1.322 | 0.736 | DEVERS 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_2178 | ivsg_la_alt2ad3 | 458 | 570.7 | -85.8 | 1520.1 | 577.1 | 1.322 | 0.736 | DEVERS 230.00 - VSTA 230.00 2, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_2180 | ivsg_la_alt2ad3 | 458 | 570.7 | -85.8 | 1520.1 | 577.1 | 1.322 | 0.736 | SANBRDNO 230.00 - DEVERS 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_2247 | ivsg_la_alt2ad3 | 458 | 570.7 | -85.8 | 1520.1 | 577.1 | 1.322 | 0.736 | DEVERS 230.00 - VSTA 230.00 2, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_la_alt2ad3 | 392 | 509.8 | 58.9 | 1379.6 | 513.2 | 1.31 | 0.76 | MIGUEL 230 CORRIDOR West of LC |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_la_alt2ad3 | 408.3 | -510.2 | 18.8 | 2238.5 | 510.5 | 1.31 | 0.729 | MIGUEL 230 CORRIDOR West of SN |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_la_alt2ad3 | 408.3 | -501.7 | 17.3 | 2199.3 | 502 | 1.287 | 0.729 | MIGUEL 230 CORRIDOR West of LC |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_la_alt2ad3 | 392 | 496.6 | 60.5 | 1342 | 500.2 | 1.28 | 0.76 | MIGUEL 230 CORRIDOR North of ML |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2167 | ivsg_la_alt2ad3 | 458 | 578.7 | 70.1 | 1464.5 | 582.9 | 1.274 | 1.051 | DEVERS 230.00 - SANBRDNO 230.00 1, ETIWANDA 230.00 - SANBRDNO 230.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2169 | ivsg_la_alt2ad3 | 458 | 578.7 | 70.1 | 1464.5 | 582.9 | 1.274 | 1.051 | ETIWANDA 230.00 - SANBRDNO 230.00 1, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2268 | ivsg_la_alt2ad3 | 458 | 578.7 | 70.1 | 1464.5 | 582.9 | 1.274 | 1.051 | ETIWANDA 230.00 - SANBRDNO 230.00 1, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2173 | ivsg_la_alt2ad3 | 458 | 578.1 | 49 | 1460.1 | 580.2 | 1.27 | 1.051 | SANBRDNO 230.00 - DEVERS 230.00 1, VSTA 230.00 - SANBRDNO 230.00 2 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2174 | ivsg_la_alt2ad3 | 458 | 578.1 | 49 | 1460.1 | 580.2 | 1.27 | 1.051 | DEVERS 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - SANBRDNO 230.00 2 |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | 23021/22/23/41 | ivsg_la_alt2ad3 | 382.4 | 459.9 | -6.2 | 2022.4 | 459.9 | 1.264 | 0.658 | MIGUEL 230 CORRIDOR West of SN |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_la_alt2ad3 | 408.3 | -488.9 | 11.6 | 2139.3 | 489.1 | 1.252 | 0.729 | MIGUEL 230 CORRIDOR North of ML |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | 23021/22/23/41 | ivsg_la_alt2ad3 | 382.4 | 451.5 | -3.9 | 1983.9 | 451.5 | 1.24 | 0.658 | MIGUEL 230 CORRIDOR West of LC |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_2179 | ivsg_la_alt2ad3 | 458 | 529.8 | -61.7 | 1404.2 | 533.4 | 1.221 | 0.736 | DEVERS 230.00 - VSTA 230.00 2, VSTA 230.00 - DEVERS 230.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2246 | ivsg_la_alt2ad3 | 458 | 551 | 73.6 | 1391.3 | 555.9 | 1.211 | 1.051 | VSTA 230.00 - DEVERS 230.00 1, COACHELV 230.00 - DEVERS 230.00 2 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_2238 | ivsg_la_alt2ad3 | 1411.6 | 1806.8 | 170.4 | 1945.9 | 1814.8 | 1.207 | 1.126 | S.ONOFRE 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | 23021/22/23/41 | ivsg_la_alt2ad3 | 382.4 | 438.9 | 3 | 1926.2 | 438.9 | 1.204 | 0.658 | MIGUEL 230 CORRIDOR North of ML |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_2239 | ivsg_la_alt2ad3 | 1411.6 | 1798.8 | 161.9 | 1934.8 | 1806.1 | 1.2 | 1.126 | CHINO 230.00 - S.ONOFRE 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_2240 | ivsg_la_alt2ad3 | 1411.6 | 1799.1 | 162.8 | 1935.3 | 1806.4 | 1.2 | 1.126 | CHINO 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | 23021/22/23/41 | ivsg_la_alt2ad3 | 1120 | -1312.4 | -64.3 | 3409.2 | 1313.9 | 1.18 | 0.92 | MIGUEL 230 CORRIDOR North of ML |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_N-218 | ivsg_la_alt2ad3 | 1411.6 | 1759.6 | 141.9 | 1886.5 | 1765.3 | 1.169 | 1.126 | line MIDPINTS to DEVERS 500 ck 1&2 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_2179 | ivsg_la_alt2ad3 | 1411.6 | 1752.1 | 146.3 | 1879.3 | 1758.2 | 1.165 | 1.126 | DEVERS 230.00 - VSTA 230.00 2, VSTA 230.00 - DEVERS 230.00 1 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_2175 | ivsg_la_alt2ad3 | 1411.6 | 1746.4 | 142.9 | 1872.2 | 1752.2 | 1.161 | 1.126 | DEVERS 230.00 - SANBRDNO 230.00 1, DEVERS 230.00 - VSTA 230.00 2 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_2177 | ivsg_la_alt2ad3 | 1411.6 | 1746.4 | 142.9 | 1872.2 | 1752.2 | 1.161 | 1.126 | DEVERS 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_2178 | ivsg_la_alt2ad3 | 1411.6 | 1746.4 | 142.9 | 1872.2 | 1752.2 | 1.161 | 1.126 | DEVERS 230.00 - VSTA 230.00 2, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_2180 | ivsg_la_alt2ad3 | 1411.6 | 1746.4 | 142.9 | 1872.2 | 1752.2 | 1.161 | 1.126 | SANBRDNO 230.00 - DEVERS 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_2247 | ivsg_la_alt2ad3 | 1411.6 | 1746.4 | 142.9 | 1872.2 | 1752.2 | 1.161 | 1.126 | DEVERS 230.00 - VSTA 230.00 2, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | 23021/22/23/41 | ivsg_la_alt2ad3 | 1120 | -1295.4 | -59.8 | 3357.2 | 1296.8 | 1.16 | 0.92 | MIGUEL 230 CORRIDOR West of LC |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | 23021/22/23/41 | ivsg_la_alt2ad3 | 1120 | -1289.4 | -55.4 | 3334 | 1290.6 | 1.16 | 0.92 | MIGUEL 230 CORRIDOR West of SN |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2168 | ivsg_la_alt2ad3 | 458 | 526.8 | 67.3 | 1331.6 | 531.1 | 1.159 | 1.051 | DEVERS 230.00 - VSTA 230.00 2, ETIWANDA 230.00 - SANBRDNO 230.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2171 | ivsg_la_alt2ad3 | 458 | 526.8 | 67.3 | 1331.6 | 531.1 | 1.159 | 1.051 | ETIWANDA 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 24900 | MIDPINTS | 500 | 80150 | IH500 | 500 | 1 | line_N-218 | ivsg_la_alt2ad3 | 3420 | 2727.5 | 382.6 | 3125.4 | 2754.2 | 1.137 | 0.645 | line MIDPINTS to DEVERS 500 ck 1&2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2179 | ivsg_la_alt2ad3 | 2598 | 2903.4 | 382.9 | 3379.4 | 2928.5 | 1.126 | 0.964 | DEVERS 230.00 - VSTA 230.00 2, VSTA 230.00 - DEVERS 230.00 1 |
| 8601 | GEOSUB2 | 230 | 8300 | BANIS230 | 230 | 1 | line_N-204 | ivsg_la_alt2ad3 | 550 | 590 | 89.6 | 1529.7 | 596.7 | 1.109 | 0.759 | COACHELLA MIDWAY 230 CKT 1&2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2175 | ivsg_la_alt2ad3 | 2598 | 2853.5 | 345.3 | 3319.8 | 2874.3 | 1.107 | 0.964 | DEVERS 230.00 - SANBRDNO 230.00 1, DEVERS 230.00 - VSTA 230.00 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2177 | ivsg_la_alt2ad3 | 2598 | 2853.5 | 345.3 | 3319.8 | 2874.3 | 1.107 | 0.964 | DEVERS 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2178 | ivsg_la_alt2ad3 | 2598 | 2853.5 | 345.3 | 3319.8 | 2874.3 | 1.107 | 0.964 | DEVERS 230.00 - VSTA 230.00 2, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2180 | ivsg_la_alt2ad3 | 2598 | 2853.5 | 345.3 | 3319.8 | 2874.3 | 1.107 | 0.964 | SANBRDNO 230.00 - DEVERS 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2247 | ivsg_la_alt2ad3 | 2598 | 2853.5 | 345.3 | 3319.8 | 2874.3 | 1.107 | 0.964 | DEVERS 230.00 - VSTA 230.00 2, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2233 | ivsg_la_alt2ad3 | 458 | 497.1 | 45.6 | 1269.6 | 499.2 | 1.104 | 1.051 | MOENKOPI 500.00 - ELDORDO 500.00 1, PISGAH 230.00 - ELDORDO 230.00 2 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2258 | ivsg_la_alt2ad3 | 458 | 495.4 | 47.9 | 1265 | 497.7 | 1.1 | 1.051 | LUGO 500.00 - VINCENT 500.00 2, LUGO 500.00 - VICTORVL 500.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | 23002/06/10 | ivsg_la_alt2ad3 | 458 | 495.5 | 46.9 | 1264.7 | 497.7 | 1.1 | 1.051 | SANLUISREY 230 CORRIDOR |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2115 | ivsg_la_alt2ad3 | 458 | 490.5 | 48.8 | 1259.4 | 492.9 | 1.096 | 1.051 | S.ONOFRE 230.00 - SANTIAGO 230.00 1, S.ONOFRE 230.00 - SANTIAGO 230.00 2 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2256 | ivsg_la_alt2ad3 | 458 | 492.9 | 48.5 | 1260 | 495.3 | 1.096 | 1.051 | ELDORDO 500.00 - LUGO 500.00 1, LUGO 500.00 - MIRALOMA 500.00 2 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2191 | ivsg_la_alt2ad3 | 458 | 492.2 | 48.6 | 1255.3 | 494.6 | 1.092 | 1.051 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - ELDORDO 230.00 2 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2192 | ivsg_la_alt2ad3 | 458 | 491.9 | 48.7 | 1254.2 | 494.3 | 1.091 | 1.051 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2193 | ivsg_la_alt2ad3 | 458 | 491.9 | 48.7 | 1254.2 | 494.3 | 1.091 | 1.051 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - LUGO 230.00 2 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_2258 | ivsg_la_alt2ad3 | 1411.6 | 1635.6 | 132.1 | 1748.9 | 1640.9 | 1.085 | 1.126 | LUGO 500.00 - VINCENT 500.00 2, LUGO 500.00 - VICTORVL 500.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2255 | ivsg_la_alt2ad3 | 458 | 488.3 | 49.7 | 1244.9 | 490.8 | 1.083 | 1.051 | LUGO 500.00 - MIRALOMA 500.00 3, LUGO 500.00 - MOHAVE 500.00 1 |
| 22672 | PRCTRVLY | 138 | 22852 | TELECYN | 138 | 1 | 23021/22/23/41 | ivsg_la_alt2ad3 | 478 | 493.2 | -21 | 2164.8 | 493.7 | 1.082 | 0.587 | MIGUEL 230 CORRIDOR West of SN |
| 24016 | BARRE | 230 | 24044 | ELLIS | 230 | 1 | line_2115 | ivsg_la_alt2ad3 | 988 | 994.7 | -138.2 | 2680.7 | 1004.3 | 1.081 | 0.308 | S.ONOFRE 230.00 - SANTIAGO 230.00 1, S.ONOFRE 230.00 - SANTIAGO 230.00 2 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 2 | line_2029 | ivsg_la_alt2ad3 | 1195 | 1229.2 | -85.2 | 3226 | 1232.2 | 1.075 | 0.529 | LEWIS 230.00 - SERRANO 230.00 1, SERRANO 230.00 - VILLA PK 230.00 1 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 2 | line_2031 | ivsg_la_alt2ad3 | 1195 | 1229.2 | -85.2 | 3226 | 1232.2 | 1.075 | 0.529 | LEWIS 230.00 - SERRANO 230.00 2, SERRANO 230.00 - VILLA PK 230.00 1 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 2 | line_2278 | ivsg_la_alt2ad3 | 1195 | 1229.2 | -85.2 | 3226 | 1232.2 | 1.075 | 0.529 | LEWIS 230.00 - SERRANO 230.00 1, SERRANO 230.00 - VILLA PK 230.00 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_2260 | ivsg_la_alt2ad3 | 56 | 59.4 | -5 | 295 | 59.6 | 1.07 | 0.94 | KRAMER 230.00 - LUGO 230.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_2238 | ivsg_la_alt2ad3 | 1645.4 | 1865.6 | 187.3 | 2024.7 | 1874.9 | 1.066 | 0.985 | S.ONOFRE 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2170 | ivsg_la_alt2ad3 | 2598 | 2752.7 | 302.3 | 3189.9 | 2769.3 | 1.063 | 0.964 | ETIWANDA 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - SANBRDNO 230.00 2 |
| 22672 | PRCTRVLY | 138 | 22852 | TELECYN | 138 | 1 | 23021/22/23/41 | ivsg_la_alt2ad3 | 478 | 484.8 | -19.5 | 2125.6 | 485.2 | 1.063 | 0.587 | MIGUEL 230 CORRIDOR West of LC |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2172 | ivsg_la_alt2ad3 | 2598 | 2747.3 | 290.7 | 3177.6 | 2762.7 | 1.059 | 0.964 | VSTA 230.00 - SANBRDNO 230.00 2, VSTA 230.00 - DEVERS 230.00 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_2239 | ivsg_la_alt2ad3 | 1645.4 | 1856.8 | 178 | 2011.8 | 1865.3 | 1.059 | 0.985 | CHINO 230.00 - S.ONOFRE 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_2240 | ivsg_la_alt2ad3 | 1645.4 | 1856.9 | 179 | 2012.3 | 1865.6 | 1.059 | 0.985 | CHINO 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_N-210 | ivsg_la_alt2ad3 | 800 | 831.6 | 56.7 | 2124.4 | 833.5 | 1.058 | 0.778 | EL CENTRO IMPERIAL VALLEY 230 CKTS 2&3 |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_2238 | ivsg_la_alt2ad3 | 458 | 461.2 | -39.4 | 1215.4 | 462.9 | 1.057 | 0.736 | S.ONOFRE 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 24901 | VSTA | 230 | 24132 | SANBRDNO | 230 | 2 | line_2179 | ivsg_la_alt2ad3 | 916 | -922 | 72.6 | 2422 | 924.9 | 1.053 | 0.513 | DEVERS 230.00 - VSTA 230.00 2, VSTA 230.00 - DEVERS 230.00 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23022/23023 | ivsg_la_alt2ad3 | 392 | 410.2 | 32.1 | 1086.8 | 411.4 | 1.05 | 0.76 | ML-MS1+ ML-MS2 230KV |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2168 | ivsg_la_alt2ad3 | 2598 | 2713.6 | 256.6 | 3132.7 | 2725.7 | 1.044 | 0.964 | DEVERS 230.00 - VSTA 230.00 2, ETIWANDA 230.00 - SANBRDNO 230.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2171 | ivsg_la_alt2ad3 | 2598 | 2713.6 | 256.6 | 3132.7 | 2725.7 | 1.044 | 0.964 | ETIWANDA 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_2239 | ivsg_la_alt2ad3 | 458 | 457.2 | -38.3 | 1200 | 458.8 | 1.044 | 0.736 | CHINO 230.00 - S.ONOFRE 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_2240 | ivsg_la_alt2ad3 | 458 | 456.1 | -37.5 | 1196.3 | 457.6 | 1.041 | 0.736 | CHINO 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 22672 | PRCTRVLY | 138 | 22852 | TELECYN | 138 | 1 | 23021/22/23/41 | ivsg_la_alt2ad3 | 478 | 472 | -13.7 | 2065.6 | 472.2 | 1.033 | 0.587 | MIGUEL 230 CORRIDOR North of ML |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_N-218 | ivsg_la_alt2ad3 | 1645.4 | 1810.5 | 157 | 1953.4 | 1817.3 | 1.028 | 0.985 | line MIDPINTS to DEVERS 500 ck 1&2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2167 | ivsg_la_alt2ad3 | 2598 | 2666.1 | 224.1 | 3076.8 | 2675.5 | 1.026 | 0.964 | DEVERS 230.00 - SANBRDNO 230.00 1, ETIWANDA 230.00 - SANBRDNO 230.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2169 | ivsg_la_alt2ad3 | 2598 | 2666.1 | 224.1 | 3076.8 | 2675.5 | 1.026 | 0.964 | ETIWANDA 230.00 - SANBRDNO 230.00 1, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2268 | ivsg_la_alt2ad3 | 2598 | 2666.1 | 224.1 | 3076.8 | 2675.5 | 1.026 | 0.964 | ETIWANDA 230.00 - SANBRDNO 230.00 1, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_2176 | ivsg_la_alt2ad3 | 458 | 449.2 | -64.1 | 1178.2 | 453.8 | 1.025 | 0.736 | DEVERS 230.00 - SANBRDNO 230.00 1, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 24901 | VSTA | 230 | 24132 | SANBRDNO | 230 | 2 | line_2168 | ivsg_la_alt2ad3 | 916 | -902 | -13.1 | 2353.8 | 902.1 | 1.024 | 0.513 | DEVERS 230.00 - VSTA 230.00 2, ETIWANDA 230.00 - SANBRDNO 230.00 1 |
| 24901 | VSTA | 230 | 24132 | SANBRDNO | 230 | 2 | line_2171 | ivsg_la_alt2ad3 | 916 | -902 | -13.1 | 2353.8 | 902.1 | 1.024 | 0.513 | ETIWANDA 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_2179 | ivsg_la_alt2ad3 | 1645.4 | 1801.6 | 162.8 | 1945.1 | 1808.9 | 1.024 | 0.985 | DEVERS 230.00 - VSTA 230.00 2, VSTA 230.00 - DEVERS 230.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2246 | ivsg_la_alt2ad3 | 2598 | 2660.1 | 219 | 3068.8 | 2669.1 | 1.023 | 0.964 | VSTA 230.00 - DEVERS 230.00 1, COACHELV 230.00 - DEVERS 230.00 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2173 | ivsg_la_alt2ad3 | 2598 | 2649.4 | 218.2 | 3060.5 | 2658.4 | 1.02 | 0.964 | SANBRDNO 230.00 - DEVERS 230.00 1, VSTA 230.00 - SANBRDNO 230.00 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2174 | ivsg_la_alt2ad3 | 2598 | 2649.4 | 218.2 | 3060.5 | 2658.4 | 1.02 | 0.964 | DEVERS 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - SANBRDNO 230.00 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2233 | ivsg_la_alt2ad3 | 2598 | 2621 | 174.7 | 3058.9 | 2626.8 | 1.02 | 0.964 | MOENKOPI 500.00 - ELDORDO 500.00 1, PISGAH 230.00 - ELDORDO 230.00 2 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_2175 | ivsg_la_alt2ad3 | 1645.4 | 1794.9 | 159.2 | 1936.6 | 1802 | 1.019 | 0.985 | DEVERS 230.00 - SANBRDNO 230.00 1, DEVERS 230.00 - VSTA 230.00 2 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_2177 | ivsg_la_alt2ad3 | 1645.4 | 1794.9 | 159.2 | 1936.6 | 1802 | 1.019 | 0.985 | DEVERS 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_2178 | ivsg_la_alt2ad3 | 1645.4 | 1794.9 | 159.2 | 1936.6 | 1802 | 1.019 | 0.985 | DEVERS 230.00 - VSTA 230.00 2, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_2180 | ivsg_la_alt2ad3 | 1645.4 | 1794.9 | 159.2 | 1936.6 | 1802 | 1.019 | 0.985 | SANBRDNO 230.00 - DEVERS 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_2247 | ivsg_la_alt2ad3 | 1645.4 | 1794.9 | 159.2 | 1936.6 | 1802 | 1.019 | 0.985 | DEVERS 230.00 - VSTA 230.00 2, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2176 | ivsg_la_alt2ad3 | 2598 | 2646 | 209 | 3052.5 | 2654.2 | 1.018 | 0.964 | DEVERS 230.00 - SANBRDNO 230.00 1, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 8600 | GEOSUB1 | 230 | 8300 | BANIS230 | 230 | 1 | line_N-204 | ivsg_la_alt2ad3 | 550 | 540.3 | 79.8 | 1401.1 | 546.2 | 1.016 | 0.703 | COACHELLA MIDWAY 230 CKT 1&2 |
| 8600 | GEOSUB1 | 230 | 8300 | BANIS230 | 230 | 2 | line_N-204 | ivsg_la_alt2ad3 | 550 | 540.3 | 79.8 | 1401.1 | 546.2 | 1.016 | 0.703 | COACHELLA MIDWAY 230 CKT 1&2 |
| 24701 | KRAMER | 230 | 24085 | LUGO | 230 | 2 | line_2260 | ivsg_la_alt2ad3 | 478 | 479.3 | 70.1 | 1217.2 | 484.4 | 1.014 | 0.607 | KRAMER 230.00 - LUGO 230.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23022/23023 | ivsg_la_alt2ad3 | 408.3 | -405.1 | 15.1 | 1732.6 | 405.4 | 1.014 | 0.729 | ML-MS1+ ML-MS2 230KV |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | 23002/06/10 | ivsg_la_alt2ad3 | 2598 | 2607.7 | 183 | 3037.6 | 2614.1 | 1.013 | 0.964 | SANLUISREY 230 CORRIDOR |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2258 | ivsg_la_alt2ad3 | 2598 | 2604.4 | 185.8 | 3037.1 | 2611.1 | 1.012 | 0.964 | LUGO 500.00 - VINCENT 500.00 2, LUGO 500.00 - VICTORVL 500.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2115 | ivsg_la_alt2ad3 | 2598 | 2584.5 | 240.3 | 3032.8 | 2595.6 | 1.011 | 0.964 | S.ONOFRE 230.00 - SANTIAGO 230.00 1, S.ONOFRE 230.00 - SANTIAGO 230.00 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2164 | ivsg_la_alt2ad3 | 2598 | 2636.9 | 206.1 | 3031 | 2644.9 | 1.01 | 0.964 | MIRALOMA 230.00 - VSTA 230.00 1, MIRALOMA 230.00 - VSTA 230.00 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2256 | ivsg_la_alt2ad3 | 2598 | 2590.7 | 197 | 3024.4 | 2598.1 | 1.008 | 0.964 | ELDORDO 500.00 - LUGO 500.00 1, LUGO 500.00 - MIRALOMA 500.00 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | 23021/22/23/41 | ivsg_la_alt2ad3 | 2598 | 2624 | 145.7 | 3023.6 | 2628 | 1.008 | 0.964 | MIGUEL 230 CORRIDOR West of SN |
| 24016 | BARRE | 230 | 25201 | LEWIS | 230 | 1 | line_2115 | ivsg_la_alt2ad3 | 1195 | -1105.3 | 224.2 | 3010.4 | 1127.8 | 1.004 | 0.632 | S.ONOFRE 230.00 - SANTIAGO 230.00 1, S.ONOFRE 230.00 - SANTIAGO 230.00 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2191 | ivsg_la_alt2ad3 | 2598 | 2585.6 | 185.8 | 3010.5 | 2592.3 | 1.004 | 0.964 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - ELDORDO 230.00 2 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_N-218 | ivsg_la_alt2ad3 | 458 | 451.7 | 28.2 | 1154.8 | 452.6 | 1.004 | 1.051 | line MIDPINTS to DEVERS 500 ck 1&2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2192 | ivsg_la_alt2ad3 | 2598 | 2583.7 | 185.7 | 3007.6 | 2590.4 | 1.003 | 0.964 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2193 | ivsg_la_alt2ad3 | 2598 | 2583.7 | 185.7 | 3007.6 | 2590.3 | 1.003 | 0.964 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - LUGO 230.00 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2166 | ivsg_la_alt2ad3 | 2598 | 2615.5 | 193.6 | 3006.9 | 2622.7 | 1.002 | 0.964 | ETIWANDA 230.00 - SANBRDNO 230.00 1, ETIWANDA 230.00 - VSTA 230.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2165 | ivsg_la_alt2ad3 | 2598 | 2611.2 | 191.5 | 3001.6 | 2618.2 | 1.001 | 0.964 | ETIWANDA 230.00 - SANBRDNO 230.00 1, MIRALOMA 230.00 - VSTA 230.00 2 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | 23021/23041 | ivsg_la_alt2ad3 | 1120 | -1110.9 | -72.1 | 2836.2 | 1113.3 | 1 | 0.92 | ML-SX + OM-SX 230KV |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 1 | line_2030 | ivsg_la_alt2ad3 | 1287 | 1229.2 | -85.2 | 3226 | 1232.2 | 0.999 | 0.492 | LEWIS 230.00 - SERRANO 230.00 1, SERRANO 230.00 - VILLA PK 230.00 2 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 1 | line_2032 | ivsg_la_alt2ad3 | 1287 | 1229.2 | -85.2 | 3226 | 1232.2 | 0.999 | 0.492 | LEWIS 230.00 - SERRANO 230.00 2, SERRANO 230.00 - VILLA PK 230.00 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2194 | ivsg_la_alt2ad3 | 2598 | 2568.7 | 186.4 | 2984.6 | 2575.4 | 0.995 | 0.964 | LUGO 500.00 - MIRALOMA 500.00 2, LUGO 500.00 - MIRALOMA 500.00 3 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2255 | ivsg_la_alt2ad3 | 2598 | 2564.1 | 193.4 | 2983.8 | 2571.4 | 0.995 | 0.964 | LUGO 500.00 - MIRALOMA 500.00 3, LUGO 500.00 - MOHAVE 500.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_N-204 | ivsg_la_alt2ad3 | 458 | 455.5 | 43.6 | 1144.2 | 457.6 | 0.995 | 1.051 | COACHELLA MIDWAY 230 CKT 1&2 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_N-204 | ivsg_la_alt2ad3 | 800 | 759.8 | 18.5 | 1995.2 | 760 | 0.994 | 0.778 | COACHELLA MIDWAY 230 CKT 1&2 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_2214 | ivsg_la_alt2ad3 | 56 | 54.9 | -4.6 | 271.2 | 55.1 | 0.99 | 0.94 | LUGO 500.00 - VINCENT 500.00 1, LUGO 500.00 - VINCENT 500.00 2 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | 23022/23023 | ivsg_la_alt2ad3 | 1120 | -1100.5 | -80.6 | 2809.9 | 1103.5 | 0.99 | 0.92 | ML-MS1+ ML-MS2 230KV |
| 24901 | VSTA | 230 | 24804 | DEVERS | 230 | 1 | line_2175 | ivsg_la_alt2ad3 | 988 | -909.7 | 218.9 | 2453.3 | 935.7 | 0.989 | 0.662 | DEVERS 230.00 - SANBRDNO 230.00 1, DEVERS 230.00 - VSTA 230.00 2 |
| 24804 | DEVERS | 230 | 24901 | VSTA | 230 | 2 | line_2177 | ivsg_la_alt2ad3 | 988 | 950.7 | 213.2 | 2453.4 | 974.3 | 0.989 | 0.662 | DEVERS 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 24901 | VSTA | 230 | 24804 | DEVERS | 230 | 1 | line_2178 | ivsg_la_alt2ad3 | 988 | -909.7 | 218.9 | 2453.3 | 935.7 | 0.989 | 0.662 | DEVERS 230.00 - VSTA 230.00 2, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 24804 | DEVERS | 230 | 24901 | VSTA | 230 | 2 | line_2180 | ivsg_la_alt2ad3 | 988 | 950.7 | 213.2 | 2453.4 | 974.3 | 0.989 | 0.662 | SANBRDNO 230.00 - DEVERS 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 24901 | VSTA | 230 | 24804 | DEVERS | 230 | 1 | line_2247 | ivsg_la_alt2ad3 | 988 | -909.7 | 218.9 | 2453.3 | 935.7 | 0.989 | 0.662 | DEVERS 230.00 - VSTA 230.00 2, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2164 | ivsg_la_alt2ad3 | 458 | 451.3 | 48.5 | 1134.9 | 453.9 | 0.988 | 1.051 | MIRALOMA 230.00 - VSTA 230.00 1, MIRALOMA 230.00 - VSTA 230.00 2 |
| 19051 | KNOB | 161 | 8367 | PILOTKNB | 161 | 1 | line_N-204 | ivsg_la_alt2ad3 | 165 | -163.1 | 20.9 | 584.3 | 164.4 | 0.988 | 0.804 | COACHELLA MIDWAY 230 CKT 1&2 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2172 | ivsg_la_alt2ad3 | 458 | 450.7 | 38.3 | 1133.7 | 452.4 | 0.986 | 1.051 | VSTA 230.00 - SANBRDNO 230.00 2, VSTA 230.00 - DEVERS 230.00 1 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | line_2239 | ivsg_la_alt2ad3 | 1120 | -1089.6 | -75.6 | 2807.7 | 1092.2 | 0.98 | 0.92 | CHINO 230.00 - S.ONOFRE 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | line_2240 | ivsg_la_alt2ad3 | 1120 | -1091.7 | -75.8 | 2815.1 | 1094.3 | 0.98 | 0.92 | CHINO 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2196 | ivsg_la_alt2ad3 | 458 | 445.6 | 42.2 | 1124.3 | 447.6 | 0.978 | 1.051 | ETIWANDA 230.00 - SANBRDNO 230.00 1, LUGO 500.00 - MIRALOMA 500.00 2 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2198 | ivsg_la_alt2ad3 | 458 | 445.5 | 42.2 | 1124.1 | 447.5 | 0.978 | 1.051 | ETIWANDA 230.00 - SANBRDNO 230.00 1, LUGO 500.00 - MIRALOMA 500.00 3 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_N-203 | ivsg_la_alt2ad3 | 458 | 446 | 43.9 | 1118.2 | 448.2 | 0.973 | 1.051 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_2022 | ivsg_la_alt2ad3 | 56 | 53.5 | -5.2 | 265 | 53.8 | 0.97 | 0.94 | BARRE 230.00 - VILLA PK 230.00 1, BARRE 230.00 - LEWIS 230.00 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_2121 | ivsg_la_alt2ad3 | 56 | 53.5 | -5.5 | 265 | 53.8 | 0.97 | 0.94 | S.CLARA 230.00 - MANDALAY 230.00 1, S.CLARA 230.00 - MANDALAY 230.00 2 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_2154 | ivsg_la_alt2ad3 | 56 | 53.6 | -5.2 | 265.6 | 53.9 | 0.97 | 0.94 | MIRALOMA 230.00 - OLINDA 230.00 1, MIRALOMA 230.00 - WALNUT 230.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2209 | ivsg_la_alt2ad3 | 458 | 443.1 | 42 | 1114.8 | 445.1 | 0.97 | 1.051 | ETIWANDA 230.00 - SANBRDNO 230.00 1, LUGO 500.00 - SERRANO 500.00 1 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | line_2238 | ivsg_la_alt2ad3 | 1120 | -1067 | -75.5 | 2733.2 | 1069.6 | 0.96 | 0.92 | S.ONOFRE 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | line_N-204 | ivsg_la_alt2ad3 | 1120 | -1072.6 | -38.5 | 2784.4 | 1073.3 | 0.96 | 0.92 | COACHELLA MIDWAY 230 CKT 1&2 |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_2167 | ivsg_la_alt2ad3 | 458 | 421.5 | -58.9 | 1102 | 425.6 | 0.959 | 0.736 | DEVERS 230.00 - SANBRDNO 230.00 1, ETIWANDA 230.00 - SANBRDNO 230.00 1 |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_2169 | ivsg_la_alt2ad3 | 458 | 421.5 | -58.9 | 1102 | 425.6 | 0.959 | 0.736 | ETIWANDA 230.00 - SANBRDNO 230.00 1, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_2268 | ivsg_la_alt2ad3 | 458 | 421.5 | -58.9 | 1102 | 425.6 | 0.959 | 0.736 | ETIWANDA 230.00 - SANBRDNO 230.00 1, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_2173 | ivsg_la_alt2ad3 | 458 | 421 | -79.1 | 1101.9 | 428.4 | 0.958 | 0.736 | SANBRDNO 230.00 - DEVERS 230.00 1, VSTA 230.00 - SANBRDNO 230.00 2 |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_2174 | ivsg_la_alt2ad3 | 458 | 421 | -79.1 | 1101.9 | 428.4 | 0.958 | 0.736 | DEVERS 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - SANBRDNO 230.00 2 |
| 24016 | BARRE | 230 | 25201 | LEWIS | 230 | 1 | line_2287 | ivsg_la_alt2ad3 | 1195 | -1070.8 | 283.8 | 2865 | 1107.8 | 0.955 | 0.632 | BARRE 230.00 - VILLA PK 230.00 1, SERRANO 230.00 - VILLA PK 230.00 1 |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | 23022/23023 | ivsg_la_alt2ad3 | 382.4 | 356 | 8 | 1525 | 356 | 0.953 | 0.658 | ML-MS1+ ML-MS2 230KV |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | 23021/22/23/41 | ivsg_la_alt2ad3 | 388 | -361.1 | 11.7 | 926.3 | 361.3 | 0.951 | 0.842 | MIGUEL 230 CORRIDOR North of ML |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | line_2175 | ivsg_la_alt2ad3 | 1120 | -1055 | -76 | 2696.2 | 1057.7 | 0.95 | 0.92 | DEVERS 230.00 - SANBRDNO 230.00 1, DEVERS 230.00 - VSTA 230.00 2 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | line_2177 | ivsg_la_alt2ad3 | 1120 | -1055 | -76 | 2696.2 | 1057.7 | 0.95 | 0.92 | DEVERS 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | line_2178 | ivsg_la_alt2ad3 | 1120 | -1055 | -76 | 2696.2 | 1057.7 | 0.95 | 0.92 | DEVERS 230.00 - VSTA 230.00 2, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | line_2179 | ivsg_la_alt2ad3 | 1120 | -1060 | -76.1 | 2712.4 | 1062.7 | 0.95 | 0.92 | DEVERS 230.00 - VSTA 230.00 2, VSTA 230.00 - DEVERS 230.00 1 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | line_2180 | ivsg_la_alt2ad3 | 1120 | -1055 | -76 | 2696.2 | 1057.7 | 0.95 | 0.92 | SANBRDNO 230.00 - DEVERS 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | line_2247 | ivsg_la_alt2ad3 | 1120 | -1055 | -76 | 2696.2 | 1057.7 | 0.95 | 0.92 | DEVERS 230.00 - VSTA 230.00 2, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | line_N-203 | ivsg_la_alt2ad3 | 1120 | -1056.3 | -69.6 | 2697.6 | 1058.6 | 0.95 | 0.92 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_2191 | ivsg_la_alt2ad3 | 1645.4 | 1668.7 | 165.8 | 1798.4 | 1676.9 | 0.949 | 0.985 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - ELDORDO 230.00 2 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_2192 | ivsg_la_alt2ad3 | 1645.4 | 1670 | 164 | 1799.4 | 1678.1 | 0.949 | 0.985 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_2193 | ivsg_la_alt2ad3 | 1645.4 | 1670.1 | 164 | 1799.4 | 1678.1 | 0.949 | 0.985 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - LUGO 230.00 2 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_2258 | ivsg_la_alt2ad3 | 1645.4 | 1674.5 | 156.8 | 1801 | 1681.8 | 0.949 | 0.985 | LUGO 500.00 - VINCENT 500.00 2, LUGO 500.00 - VICTORVL 500.00 1 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | 23021/22/23/41 | ivsg_la_alt2ad3 | 388 | -359.8 | 12.2 | 922.7 | 360.1 | 0.947 | 0.842 | MIGUEL 230 CORRIDOR West of SN |
| 24056 | ETIWANDA | 230 | 24132 | SANBRDNO | 230 | 1 | line_2172 | ivsg_la_alt2ad3 | 797 | -724.8 | 55.2 | 1892.1 | 726.9 | 0.946 | 0.448 | VSTA 230.00 - SANBRDNO 230.00 2, VSTA 230.00 - DEVERS 230.00 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_2256 | ivsg_la_alt2ad3 | 1645.4 | 1664.4 | 163 | 1792.9 | 1672.4 | 0.946 | 0.985 | ELDORDO 500.00 - LUGO 500.00 1, LUGO 500.00 - MIRALOMA 500.00 2 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | 23021/22/23/41 | ivsg_la_alt2ad3 | 388 | -358.7 | 12.3 | 919.7 | 358.9 | 0.944 | 0.842 | MIGUEL 230 CORRIDOR West of LC |
| 24804 | DEVERS | 230 | 24901 | VSTA | 230 | 2 | line_2172 | ivsg_la_alt2ad3 | 988 | 903.7 | 213.1 | 2327 | 928.5 | 0.939 | 0.662 | VSTA 230.00 - SANBRDNO 230.00 2, VSTA 230.00 - DEVERS 230.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2165 | ivsg_la_alt2ad3 | 458 | 427.6 | 40.9 | 1075 | 429.5 | 0.935 | 1.051 | ETIWANDA 230.00 - SANBRDNO 230.00 1, MIRALOMA 230.00 - VSTA 230.00 2 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2166 | ivsg_la_alt2ad3 | 458 | 426.4 | 40.8 | 1072.1 | 428.4 | 0.933 | 1.051 | ETIWANDA 230.00 - SANBRDNO 230.00 1, ETIWANDA 230.00 - VSTA 230.00 1 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 13821C/25/23051A | ivsg_la_alt2ad3 | 204.1 | 185.5 | -0.8 | 793.8 | 185.5 | 0.93 | 0.55 | CH-ES-NCM-SX |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2022 | ivsg_la_alt2ad3 | 2598 | 2422.7 | 133.7 | 2779.7 | 2426.4 | 0.927 | 0.964 | BARRE 230.00 - VILLA PK 230.00 1, BARRE 230.00 - LEWIS 230.00 1 |
| 24132 | SANBRDNO | 230 | 24804 | DEVERS | 230 | 1 | line_2179 | ivsg_la_alt2ad3 | 988 | -863.6 | 177.2 | 2299.4 | 881.6 | 0.927 | 0.607 | DEVERS 230.00 - VSTA 230.00 2, VSTA 230.00 - DEVERS 230.00 1 |
| 24042 | ELDORDO | 500 | 24086 | LUGO | 500 | 1 | line_2258 | ivsg_la_alt2ad3 | 1386 | 1331.2 | 63.3 | 1479 | 1332.7 | 0.925 | 0.693 | LUGO 500.00 - VINCENT 500.00 2, LUGO 500.00 - VICTORVL 500.00 1 |
| 24016 | BARRE | 230 | 25201 | LEWIS | 230 | 1 | line_2020 | ivsg_la_alt2ad3 | 1195 | -1035.3 | 268 | 2768.3 | 1069.5 | 0.923 | 0.632 | BARRE 230.00 - VILLA PK 230.00 1, DELAMO 230.00 - ELLIS 230.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_N-204 | ivsg_la_alt2ad3 | 2598 | 2415 | 85.5 | 2768.9 | 2416.6 | 0.923 | 0.964 | COACHELLA MIDWAY 230 CKT 1&2 |
| 20238 | HRD-230 | 230 | 20239 | HRD-115 | 115 | 1 | 23021/22/23/41 | ivsg_la_alt2ad3 | 225 | 205.5 | -17.4 | 524.7 | 206.2 | 0.92 | 0.84 | MIGUEL 230 CORRIDOR North of ML |
| 20238 | HRD-230 | 230 | 20239 | HRD-115 | 115 | 1 | 23021/22/23/41 | ivsg_la_alt2ad3 | 225 | 204.9 | -17.3 | 522.9 | 205.6 | 0.92 | 0.84 | MIGUEL 230 CORRIDOR West of SN |
| 24016 | BARRE | 230 | 25201 | LEWIS | 230 | 1 | line_2023 | ivsg_la_alt2ad3 | 1195 | -1026.8 | 278.5 | 2751.5 | 1063.9 | 0.918 | 0.632 | BARRE 230.00 - VILLA PK 230.00 1, LEWIS 230.00 - SERRANO 230.00 1 |
| 24016 | BARRE | 230 | 25201 | LEWIS | 230 | 1 | line_2024 | ivsg_la_alt2ad3 | 1195 | -1026.8 | 278.5 | 2751.5 | 1063.9 | 0.918 | 0.632 | BARRE 230.00 - VILLA PK 230.00 1, LEWIS 230.00 - SERRANO 230.00 2 |
| 24016 | BARRE | 230 | 25201 | LEWIS | 230 | 1 | line_2025 | ivsg_la_alt2ad3 | 1195 | -1028.4 | 273.1 | 2749.9 | 1064 | 0.917 | 0.632 | BARRE 230.00 - VILLA PK 230.00 1, LEWIS 230.00 - VILLA PK 230.00 1 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | 23022/23023 | ivsg_la_alt2ad3 | 388 | -348 | 11.7 | 890.5 | 348.2 | 0.914 | 0.842 | ML-MS1+ ML-MS2 230KV |
| 24801 | DEVERS | 500 | 24804 | DEVERS | 230 | 1 | line_2238 | ivsg_la_alt2ad3 | 1120 | 704.9 | 729 | 1137.4 | 1014.1 | 0.91 | 0.51 | S.ONOFRE 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 20238 | HRD-230 | 230 | 20239 | HRD-115 | 115 | 1 | 23021/22/23/41 | ivsg_la_alt2ad3 | 225 | 204.4 | -17.1 | 521.5 | 205.1 | 0.91 | 0.84 | MIGUEL 230 CORRIDOR West of LC |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | line_N-204 | ivsg_la_alt2ad3 | 388 | -342.1 | 14.8 | 881.7 | 342.4 | 0.905 | 0.842 | COACHELLA MIDWAY 230 CKT 1&2 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_2096 | ivsg_la_alt2ad3 | 56 | 49.7 | -5.2 | 244.7 | 49.9 | 0.9 | 0.94 | EAGLROCK 230.00 - MESA CAL 230.00 1, GOODRICH 230.00 - GOULD 230.00 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_2106 | ivsg_la_alt2ad3 | 56 | 49.9 | -5.1 | 245.9 | 50.2 | 0.9 | 0.94 | PARDEE 230.00 - SYLMAR S 230.00 1, SYLMAR S 230.00 - GOULD 230.00 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_2107 | ivsg_la_alt2ad3 | 56 | 49.9 | -5.1 | 245.9 | 50.2 | 0.9 | 0.94 | PARDEE 230.00 - SYLMAR S 230.00 2, SYLMAR S 230.00 - GOULD 230.00 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_2109 | ivsg_la_alt2ad3 | 56 | 49.7 | -5 | 245.1 | 50 | 0.9 | 0.94 | PARDEE 230.00 - SYLMAR S 230.00 1, PARDEE 230.00 - SYLMAR S 230.00 2 |
| 24801 | DEVERS | 500 | 24804 | DEVERS | 230 | 1 | line_2239 | ivsg_la_alt2ad3 | 1120 | 699.5 | 725.4 | 1127.6 | 1007.7 | 0.9 | 0.51 | CHINO 230.00 - S.ONOFRE 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 24801 | DEVERS | 500 | 24804 | DEVERS | 230 | 1 | line_2240 | ivsg_la_alt2ad3 | 1120 | 696.9 | 725.3 | 1125.1 | 1005.9 | 0.9 | 0.51 | CHINO 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_2280 | ivsg_la_alt2ad3 | 56 | 49.9 | -5.1 | 245.9 | 50.2 | 0.9 | 0.94 | PARDEE 230.00 - SYLMAR S 230.00 1, SYLMAR S 230.00 - GOULD 230.00 1 |

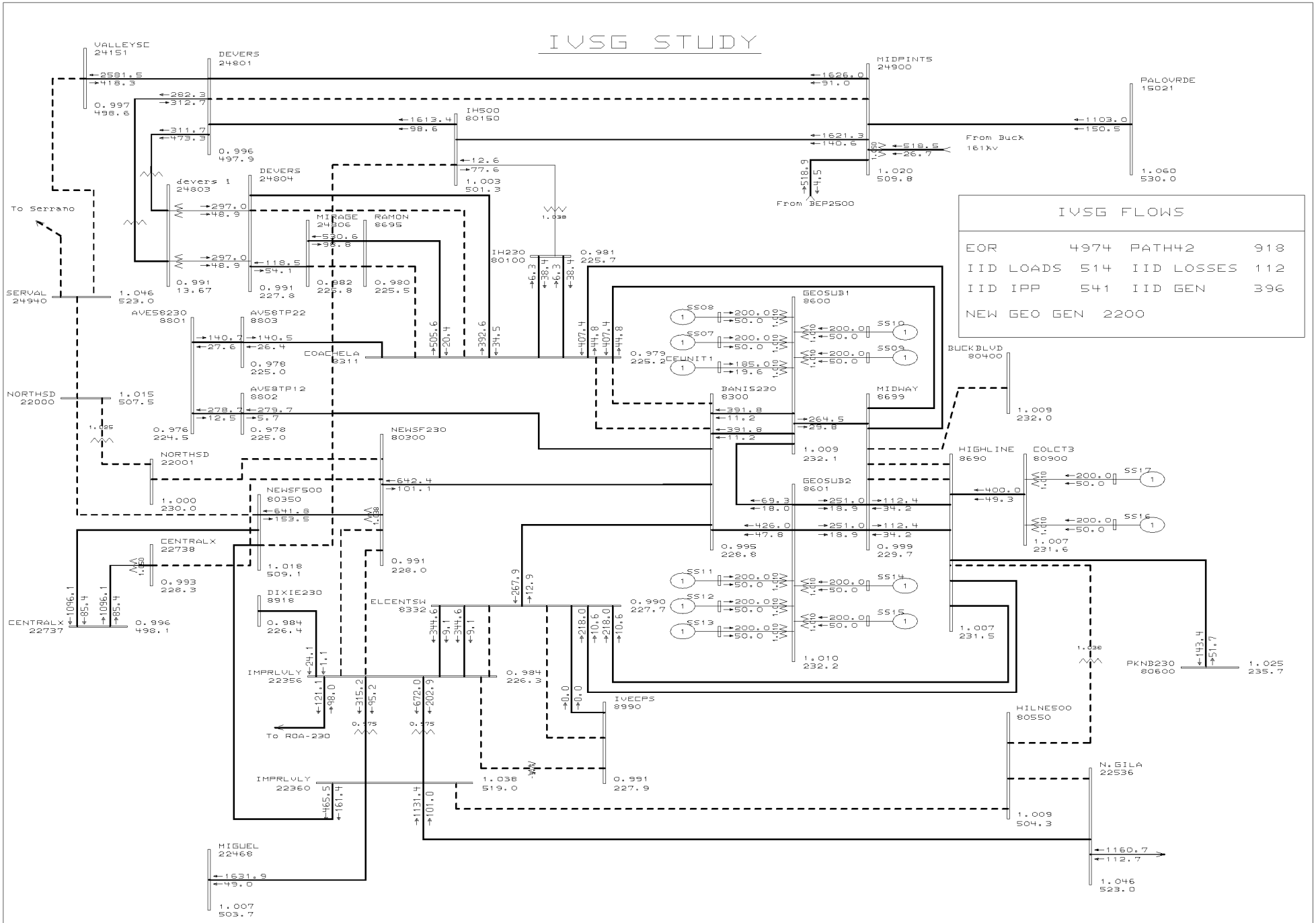
ivsg_la_alt2ad3.sav
No Solve Summary
N-2 Outages

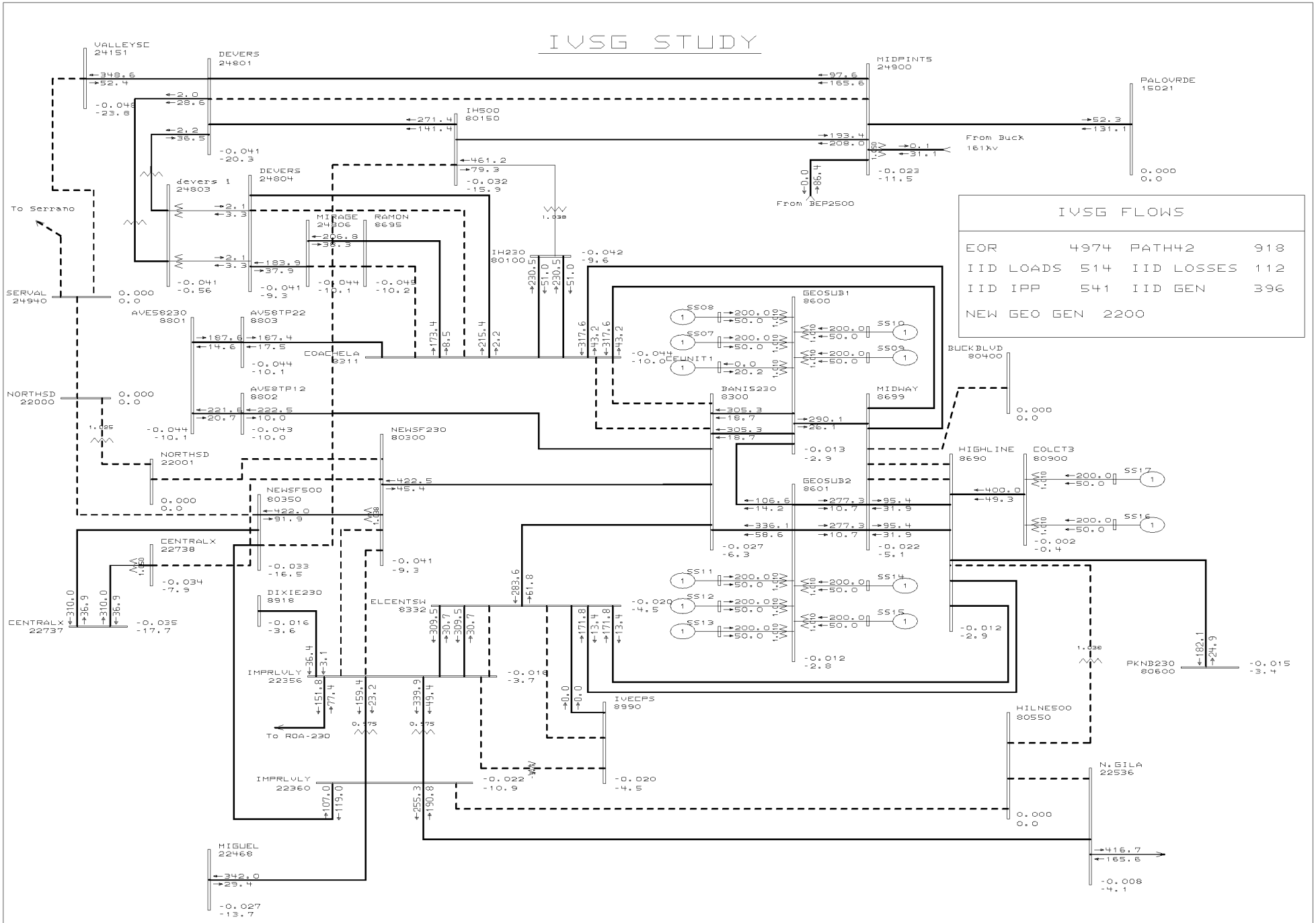
| Contingency-Description | Case | Problem-Description |
|---|---|---|
| line MIDPINTS to IH500/MIDPOINTS DEVERS 500 ck 1 | ivsg_la_alt2ad3 | Pmis 24801 DEVERS 500.00 = -0.00 MW + j -400.10 MVAR |

# Imperial Valley Study Group

## Appendix B.1.5

Alt 2a D4
Light Autumn
Alternative 2a
Dispatch 4


IVSG STUDY
IVSG FLOWS
EOR 4974 PATH42 918
IID LOADS 514 IID LOSSES 112
IID IPP 541 IID GEN 396
NEW GEO GEN 2200
VALLEYSC 24151
DEVERS 24801
MIDPINTS 24900
PALOVRDE 15021
IH500 80150
From Buck 161kV
From BEP2500
devers 1 24803
DEVERS 24804
To Serrano
MIRAGE 24806
RAMON 8695
IH230 80100
SERVAL 24940
AVES8230 8801
AVES8TP22 8803
AVES8TP12 8802
COACHELA 8311
GEOSUB1 8600
GEOSUB2 8601
BANIS230 8300
MIDWAY 8699
BUCKBLVD 80400
HIGHLINE 8690
COLCT3 80900
NORTHSD 22000
NORTHSD 22001
NEWSF230 80300
NEWSF500 80350
CENTRALX 22738
CENTRALX 22737
DIXIE230 8918
ELCENTSW 8332
IMPRLVLY 22356
IMPRLVLY 22360
To ROA-230
IVECPS 8990
HILNE500 80550
N.GILA 22536
PKNB230 80600
MIGUEL 22468
SS08
SS07
CELUNIT1
SS10
SS09
SS17
SS16
SS11
SS12
SS13
SS14
SS15
General Electric International, Inc. PSLF Program
MW/MVAR
Mon Apr 25 07:59:38 2005
IVSG_LA_ALT2AD4.sav from IVSG_LA_ALT2ABASE.SAV IID/MLE 041605
IMPERIAL VALLEY STUDY GROUP LIGHT AUTUMN
LIGHT AUTUMN ALTERNATIVE 2A, DISPATCH SCENARIO 4
g:\iid\2005\ivgs\ivgsprojectla cases\ivsg_la_alt2ad4r1.sav
Rating = 1


IVSG STUDY
VALLEYSC 24151
DEVERS 24801
MIDPINTS 24900
PALOVRDE 15021
IH500 80150
From Buck 161kV
From BEP2500
devers 1 24803
DEVERS 24804
To Serrano
MIRAGE 24806
RAMON 8695
IH230 80100
SERVAL 24940
AVE58230 8801
AVE58TP22 8803
AVE58TP12 8802
COACHELA 8211
GEOSUB1 8600
BANIS230 8300
MIDWAY 8699
BUCKBLVD 80400
NORTHSD 22000
NORTHSD 22001
NEWSF230 80300
NEWSF500 80350
GEOSUB2 8601
HIGHLINE 8690
COLCT3 80900
CENTRALX 22738
CENTRALX 22737
DIXIE230 8918
ELCENTSW 8332
IMPRLVLY 22356
IMPRLVLY 22360
To ROA-230
IVECPS 8990
HILNE500 80550
N.GILA 22536
PKNB230 80600
MIGUEL 22468
IVSG FLOWS
EOR 4974 PATH42 918
IID LOADS 514 IID LOSSES 112
IID IPP 541 IID GEN 396
NEW GEO GEN 2200

ivsg_la_alt2ad4r1.sav
Voltage Summary
N-0 Outages

| Bus | Name | kV | Area | Zone | Outage | Case | Vbase | Vcont | DeltaV | Vmin | Vmax | Max-dv | Contingency Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 14534 | N.GILA 4 | 100 | 14 | 847 | base | ivsg_la_alt2ad4r | 0.937 | 0.937 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14606 | N.GILA 3 | 100 | 14 | 847 | base | ivsg_la_alt2ad4r | 0.937 | 0.937 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 19038 | MEAD | 500 | 14 | 191 | base | ivsg_la_alt2ad4r | 1.05 | 1.05 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15093 | HARQUAHA | 500 | 14 | 158 | base | ivsg_la_alt2ad4r | 1.051 | 1.051 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14608 | OCOTIL 1 | 100 | 14 | 141 | base | ivsg_la_alt2ad4r | 1.051 | 1.051 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24748 | OXBOW A | 230 | 24 | 247 | base | ivsg_la_alt2ad4r | 1.051 | 1.051 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24097 | MOHAVE | 500 | 24 | 240 | base | ivsg_la_alt2ad4r | 1.052 | 1.052 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24141 | SPRINGVL | 230 | 24 | 240 | base | ivsg_la_alt2ad4r | 1.052 | 1.052 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24153 | VESTAL | 230 | 24 | 240 | base | ivsg_la_alt2ad4r | 1.052 | 1.052 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14007 | GILARIVR | 500 | 14 | 141 | base | ivsg_la_alt2ad4r | 1.053 | 1.053 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14001 | FOURCORN | 500 | 14 | 141 | base | ivsg_la_alt2ad4r | 1.054 | 1.054 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15089 | JOJOBA | 500 | 14 | 158 | base | ivsg_la_alt2ad4r | 1.054 | 1.054 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24775 | RUSH | 115 | 24 | 247 | base | ivsg_la_alt2ad4r | 1.055 | 1.055 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14005 | WESTWING | 500 | 14 | 141 | base | ivsg_la_alt2ad4r | 1.056 | 1.056 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24729 | INYO | 230 | 24 | 247 | base | ivsg_la_alt2ad4r | 1.056 | 1.056 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15031 | PERK PS1 | 500 | 14 | 158 | base | ivsg_la_alt2ad4r | 1.057 | 1.057 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15032 | PERK PS2 | 500 | 14 | 158 | base | ivsg_la_alt2ad4r | 1.057 | 1.057 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15033 | PERKINPS | 500 | 14 | 158 | base | ivsg_la_alt2ad4r | 1.057 | 1.057 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14000 | CHOLLA | 500 | 14 | 141 | base | ivsg_la_alt2ad4r | 1.057 | 1.057 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 16310 | NL.3WP2 | 100 | 14 | 160 | base | ivsg_la_alt2ad4r | 1.058 | 1.058 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15092 | ARLINTON | 500 | 14 | 158 | base | ivsg_la_alt2ad4r | 1.059 | 1.059 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15094 | MESQUITE | 500 | 14 | 158 | base | ivsg_la_alt2ad4r | 1.059 | 1.059 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14009 | REDHAWK | 500 | 14 | 158 | base | ivsg_la_alt2ad4r | 1.059 | 1.059 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15021 | PALOVRDE | 500 | 14 | 158 | base | ivsg_la_alt2ad4r | 1.06 | 1.06 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15034 | PERKINS | 500 | 14 | 158 | base | ivsg_la_alt2ad4r | 1.06 | 1.06 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15061 | RUDD | 500 | 14 | 158 | base | ivsg_la_alt2ad4r | 1.06 | 1.06 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15090 | HASSYAMP | 500 | 14 | 158 | base | ivsg_la_alt2ad4r | 1.06 | 1.06 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14006 | YAVAPAI | 500 | 14 | 141 | base | ivsg_la_alt2ad4r | 1.06 | 1.06 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14010 | TS5 | 500 | 14 | 840 | base | ivsg_la_alt2ad4r | 1.061 | 1.061 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14100 | CHOLLA | 345 | 14 | 141 | base | ivsg_la_alt2ad4r | 1.062 | 1.062 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24776 | LEE VINE | 115 | 24 | 247 | base | ivsg_la_alt2ad4r | 1.063 | 1.063 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24235 | RECTOR | 230 | 24 | 240 | base | ivsg_la_alt2ad4r | 1.065 | 1.065 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24234 | RECTRSVC | 230 | 24 | 240 | base | ivsg_la_alt2ad4r | 1.065 | 1.065 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15087 | SNTAROSA | 500 | 14 | 158 | base | ivsg_la_alt2ad4r | 1.067 | 1.067 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15088 | PINAL_W | 500 | 14 | 158 | base | ivsg_la_alt2ad4r | 1.068 | 1.068 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 16302 | NL.3WP | 100 | 14 | 160 | base | ivsg_la_alt2ad4r | 1.068 | 1.068 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15001 | CORONADO | 500 | 14 | 140 | base | ivsg_la_alt2ad4r | 1.071 | 1.071 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14002 | MOENKOPI | 500 | 14 | 141 | base | ivsg_la_alt2ad4r | 1.074 | 1.074 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14003 | NAVAJO | 500 | 14 | 141 | base | ivsg_la_alt2ad4r | 1.08 | 1.08 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24304 | BIG CRK4 | 230 | 24 | 243 | base | ivsg_la_alt2ad4r | 1.087 | 1.087 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24301 | BIG CRK1 | 230 | 24 | 243 | base | ivsg_la_alt2ad4r | 1.089 | 1.089 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24320 | EASTWOOD | 230 | 24 | 243 | base | ivsg_la_alt2ad4r | 1.089 | 1.089 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24316 | MAMMOTH | 230 | 24 | 243 | base | ivsg_la_alt2ad4r | 1.089 | 1.089 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24302 | BIG CRK2 | 230 | 24 | 243 | base | ivsg_la_alt2ad4r | 1.09 | 1.09 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24303 | BIG CRK3 | 230 | 24 | 243 | base | ivsg_la_alt2ad4r | 1.09 | 1.09 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24305 | BIG CRK8 | 230 | 24 | 243 | base | ivsg_la_alt2ad4r | 1.09 | 1.09 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |

ivsg_la_alt2ad4r1.sav
Flow Summary
N-0 Outages

| LEGEND | % of RATING 1 | |
|---|---|---|
| C_pu | 100% - 110% | |
| C_pu | 110% - 120% | P.U. of |
| C_pu | > 120% | Rate 1 |

| FROM | FR | BKV | TO | TO | BKV | CK | Outage_Name | Case | Rate-Mva | Pflow | Qflow | Amps | MVA | C_pu | B_pu | Contingency_Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24900 | MIDPINTS | 500 | 19399 | BUCK161 | 161 | 1 | base | ivsg_la_alt2ad4r | 250 | -514 | 66.3 | 586.9 | 518.3 | 2.08 | 2.08 | Base system (n-0) |
| 19400 | BUCK230 | 230 | 19399 | BUCK161 | 161 | 1 | base | ivsg_la_alt2ad4r | 280 | 339.2 | 52 | 876.8 | 343.1 | 1.23 | 1.23 | Base system (n-0) |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | base | ivsg_la_alt2ad4r | 1411.6 | 1776.8 | 148.4 | 1905.8 | 1783 | 1.181 | 1.181 | Base system (n-0) |
| 16900 | COPPERVR | 345 | 16901 | COPPERVR | 230 | 1 | base | ivsg_la_alt2ad4r | 200 | 202.2 | 98.3 | 370.5 | 224.9 | 1.12 | 1.12 | Base system (n-0) |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | base | ivsg_la_alt2ad4r | 458 | 497.1 | 49.3 | 1266 | 499.6 | 1.101 | 1.101 | Base system (n-0) |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | base | ivsg_la_alt2ad4r | 1645.4 | 1828.3 | 164.8 | 1973.6 | 1835.7 | 1.039 | 1.039 | Base system (n-0) |
| 24999 | DEVRSVC1 | 500 | 24801 | DEVERS | 500 | 1 | base | ivsg_la_alt2ad4r | 387.5 | 0 | 400.1 | 464 | 400.1 | 1.037 | 1.037 | Base system (n-0) |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | base | ivsg_la_alt2ad4r | 2598 | 2609.2 | 179 | 3032.9 | 2615.3 | 1.011 | 1.011 | Base system (n-0) |
| 14206 | CTRYCLUB | 230 | 14216 | LINCSTRT | 230 | 1 | base | ivsg_la_alt2ad4r | 462.1 | -457.6 | -89.3 | 1162.3 | 466.3 | 1.002 | 1.002 | Base system (n-0) |
| 25641 | TAP816 | 115 | 25664 | TAP998 | 115 | 1 | base | ivsg_la_alt2ad4r | 107.6 | -96.4 | 41.6 | 533.4 | 105 | 0.988 | 0.988 | Base system (n-0) |
| 25641 | TAP816 | 115 | 25644 | TAP818 | 115 | 1 | base | ivsg_la_alt2ad4r | 107.6 | 96.4 | -40.8 | 531.8 | 104.7 | 0.984 | 0.984 | Base system (n-0) |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | base | ivsg_la_alt2ad4r | 1120 | -1094.8 | -44.7 | 2770.5 | 1095.7 | 0.98 | 0.98 | Base system (n-0) |
| 24912 | SHANDIN | 115 | 24916 | TAP902 | 115 | 1 | base | ivsg_la_alt2ad4r | 109.1 | -104.4 | 23.1 | 535.9 | 106.9 | 0.979 | 0.979 | Base system (n-0) |
| 24805 | DEVERS | 115 | 25644 | TAP818 | 115 | 1 | base | ivsg_la_alt2ad4r | 217 | -183.7 | 97.1 | 1044.5 | 207.8 | 0.959 | 0.959 | Base system (n-0) |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | base | ivsg_la_alt2ad4r | 56 | 51.8 | -5.3 | 256.1 | 52.1 | 0.94 | 0.94 | Base system (n-0) |
| 25629 | TAP813 | 115 | 25630 | TAP814 | 115 | 1 | base | ivsg_la_alt2ad4r | 82.7 | 69.9 | -28.3 | 381.6 | 75.4 | 0.919 | 0.919 | Base system (n-0) |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | base | ivsg_la_alt2ad4r | 388 | -344.3 | 12 | 881.1 | 344.5 | 0.905 | 0.905 | Base system (n-0) |

| Bus | Name | kV | Area | Zone | Outage | Case | Vbase | Vcont | DeltaV | Vmin | Vmax | Max-dv | Contingency Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22464 | MIGUEL | 230 | 22 | 222 | SO2 | ivsg_la_alt2ad4r | 0.968 | 0.906 | -0.062 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 24017 | BLYTHESC | 161 | 24 | 248 | line_007 | ivsg_la_alt2ad4r | 0.999 | 0.909 | -0.09 | 0.9 | 1.05 | 0.05 | line BLYTHE to BLYTHESC 161 ck 1 |
| 22648 | PENSQTOS | 138 | 22 | 221 | SO2 | ivsg_la_alt2ad4r | 0.982 | 0.911 | -0.071 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22184 | DOUBLET | 138 | 22 | 221 | SO2 | ivsg_la_alt2ad4r | 0.982 | 0.912 | -0.071 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22192 | DOUBLTTP | 138 | 22 | 221 | SO2 | ivsg_la_alt2ad4r | 0.982 | 0.912 | -0.071 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22922 | MIRA SOR | 138 | 22 | 221 | SO2 | ivsg_la_alt2ad4r | 0.982 | 0.912 | -0.07 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22580 | NORTHCTY | 138 | 22 | 224 | SO2 | ivsg_la_alt2ad4r | 0.984 | 0.913 | -0.071 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22300 | FRIARS | 138 | 22 | 221 | SO2 | ivsg_la_alt2ad4r | 0.988 | 0.918 | -0.069 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22832 | SYCAMORE | 230 | 22 | 221 | SO2 | ivsg_la_alt2ad4r | 0.983 | 0.918 | -0.065 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22734 | SANTEE | 138 | 22 | 223 | SO2 | ivsg_la_alt2ad4r | 0.99 | 0.919 | -0.071 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22120 | CARLTNHS | 138 | 22 | 223 | SO2 | ivsg_la_alt2ad4r | 0.99 | 0.92 | -0.07 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22412 | LOSCOCHS | 138 | 22 | 223 | SO2 | ivsg_la_alt2ad4r | 0.993 | 0.92 | -0.073 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22500 | MISSION | 138 | 22 | 221 | SO2 | ivsg_la_alt2ad4r | 0.989 | 0.92 | -0.069 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22116 | CARLTHTP | 138 | 22 | 223 | SO2 | ivsg_la_alt2ad4r | 0.99 | 0.921 | -0.07 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22124 | CHCARITA | 138 | 22 | 225 | SO2 | ivsg_la_alt2ad4r | 0.991 | 0.921 | -0.07 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22504 | MISSION | 230 | 22 | 221 | SO2 | ivsg_la_alt2ad4r | 0.987 | 0.921 | -0.067 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22268 | ESCNDO51 | 138 | 22 | 225 | SO2 | ivsg_la_alt2ad4r | 0.993 | 0.922 | -0.072 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22424 | MAINST50 | 138 | 22 | 222 | SO2 | ivsg_la_alt2ad4r | 0.995 | 0.922 | -0.072 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22428 | MAINST51 | 138 | 22 | 222 | SO2 | ivsg_la_alt2ad4r | 0.995 | 0.922 | -0.072 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22436 | MDWLRKTP | 138 | 22 | 225 | SO2 | ivsg_la_alt2ad4r | 0.993 | 0.922 | -0.072 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22568 | NCMETER | 138 | 22 | 225 | SO2 | ivsg_la_alt2ad4r | 0.993 | 0.922 | -0.072 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22572 | NCMETRTP | 138 | 22 | 225 | SO2 | ivsg_la_alt2ad4r | 0.993 | 0.922 | -0.072 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22772 | SOUTHBAY | 138 | 22 | 222 | SO2 | ivsg_la_alt2ad4r | 0.994 | 0.922 | -0.072 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22048 | BATIQTOS | 138 | 22 | 224 | SO2 | ivsg_la_alt2ad4r | 0.995 | 0.923 | -0.072 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22052 | BATIQTP | 138 | 22 | 224 | SO2 | ivsg_la_alt2ad4r | 0.995 | 0.923 | -0.072 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22596 | OLD TOWN | 230 | 22 | 221 | SO2 | ivsg_la_alt2ad4r | 0.99 | 0.924 | -0.065 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22652 | PENSQTOS | 230 | 22 | 221 | SO2 | ivsg_la_alt2ad4r | 0.991 | 0.924 | -0.067 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22831 | SYCAMORE | 138 | 22 | 221 | SO2 | ivsg_la_alt2ad4r | 0.992 | 0.924 | -0.068 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22108 | CANNON | 138 | 22 | 224 | SO2 | ivsg_la_alt2ad4r | 0.997 | 0.925 | -0.072 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22228 | ENCINA | 138 | 22 | 224 | SO2 | ivsg_la_alt2ad4r | 0.997 | 0.925 | -0.072 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22632 | PALOMAR | 138 | 22 | 224 | SO2 | ivsg_la_alt2ad4r | 0.997 | 0.925 | -0.072 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22264 | ESCNDO50 | 138 | 22 | 225 | SO2 | ivsg_la_alt2ad4r | 0.997 | 0.926 | -0.072 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 24731 | INYOKERN | 115 | 24 | 247 | line_175 | ivsg_la_alt2ad4r | 1.011 | 0.926 | -0.085 | 0.9 | 1.05 | 0.05 | line INYO to COTTONWD 230 ck 1 |
| 22232 | ENCINA | 230 | 22 | 224 | SO2 | ivsg_la_alt2ad4r | 0.995 | 0.928 | -0.067 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22227 | ENCINATP | 230 | 22 | 224 | SO2 | ivsg_la_alt2ad4r | 0.995 | 0.929 | -0.067 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22716 | SANLUSRY | 230 | 22 | 224 | SO2 | ivsg_la_alt2ad4r | 0.995 | 0.929 | -0.066 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22100 | CALAVRTP | 138 | 22 | 224 | SO2 | ivsg_la_alt2ad4r | 1.004 | 0.932 | -0.072 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22852 | TELECYN | 138 | 22 | 222 | SO2 | ivsg_la_alt2ad4r | 1.002 | 0.932 | -0.07 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22261 | EPP | 230 | 22 | 225 | SO2 | ivsg_la_alt2ad4r | 1 | 0.932 | -0.068 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22260 | ESCNDIDO | 230 | 22 | 225 | SO2 | ivsg_la_alt2ad4r | 1 | 0.933 | -0.068 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22672 | PRCTRVLY | 138 | 22 | 222 | SO2 | ivsg_la_alt2ad4r | 1.004 | 0.934 | -0.07 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22760 | SHADOWR | 138 | 22 | 224 | SO2 | ivsg_la_alt2ad4r | 1.006 | 0.934 | -0.073 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22254 | ENVIREPL | 69 | 22 | 225 | SO2 | ivsg_la_alt2ad4r | 1.007 | 0.934 | -0.072 | 0 | 0 | 0 | gen S.ONOFR2 22.00 |
| 22738 | CENTRALX | 230 | 22 | 225 | SO2 | ivsg_la_alt2ad4r | 0.993 | 0.934 | -0.059 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 80300 | NEWSF230 | 230 | 8 | 800 | line_56 | ivsg_la_alt2ad4r | 0.991 | 0.936 | -0.055 | 0.9 | 1.05 | 0.05 | line NEWSF500 to IMPRLVLY 500 ck 1 |
| 22460 | MIGUEL | 138 | 22 | 222 | SO2 | ivsg_la_alt2ad4r | 1.005 | 0.936 | -0.069 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 24131 | S.ONOFRE | 230 | 24 | 240 | SO2 | ivsg_la_alt2ad4r | 0.999 | 0.936 | -0.063 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22712 | SANLUSRY | 138 | 22 | 224 | SO2 | ivsg_la_alt2ad4r | 1.009 | 0.937 | -0.072 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22844 | TALEGA | 230 | 22 | 226 | SO2 | ivsg_la_alt2ad4r | 0.998 | 0.94 | -0.058 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22737 | CENTRALX | 500 | 22 | 225 | SO2 | ivsg_la_alt2ad4r | 0.996 | 0.94 | -0.056 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22468 | MIGUEL | 500 | 22 | 227 | SO2 | ivsg_la_alt2ad4r | 1.007 | 0.95 | -0.058 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22472 | MIGUELMP | 500 | 22 | 227 | SO2 | ivsg_la_alt2ad4r | 1.013 | 0.95 | -0.064 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 24739 | MC GEN | 115 | 24 | 247 | line_175 | ivsg_la_alt2ad4r | 1.031 | 0.952 | -0.079 | 0.9 | 1.05 | 0.05 | line INYO to COTTONWD 230 ck 1 |
| 24749 | SEARLES | 115 | 24 | 247 | line_175 | ivsg_la_alt2ad4r | 1.031 | 0.952 | -0.079 | 0.9 | 1.05 | 0.05 | line INYO to COTTONWD 230 ck 1 |
| 24762 | TAP702 | 115 | 24 | 247 | line_175 | ivsg_la_alt2ad4r | 1.031 | 0.952 | -0.079 | 0.9 | 1.05 | 0.05 | line INYO to COTTONWD 230 ck 1 |
| 24763 | TAP703 | 115 | 24 | 247 | line_175 | ivsg_la_alt2ad4r | 1.031 | 0.952 | -0.079 | 0.9 | 1.05 | 0.05 | line INYO to COTTONWD 230 ck 1 |
| 24768 | RANDSBRG | 115 | 24 | 247 | line_175 | ivsg_la_alt2ad4r | 1.006 | 0.954 | -0.052 | 0.9 | 1.05 | 0.05 | line INYO to COTTONWD 230 ck 1 |
| 24761 | TAP701 | 115 | 24 | 247 | line_175 | ivsg_la_alt2ad4r | 1.006 | 0.954 | -0.052 | 0.9 | 1.05 | 0.05 | line INYO to COTTONWD 230 ck 1 |
| 80350 | NEWSF500 | 500 | 8 | 800 | line_56 | ivsg_la_alt2ad4r | 1.018 | 0.958 | -0.06 | 0.9 | 1.05 | 0.05 | line NEWSF500 to IMPRLVLY 500 ck 1 |
| 22396 | LAGNA NL | 138 | 22 | 226 | SO2 | ivsg_la_alt2ad4r | 1.02 | 0.969 | -0.051 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22112 | CAPSTRNO | 138 | 22 | 226 | SO2 | ivsg_la_alt2ad4r | 1.021 | 0.97 | -0.051 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22432 | MARGARTA | 138 | 22 | 226 | SO2 | ivsg_la_alt2ad4r | 1.021 | 0.97 | -0.051 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22860 | TRABUCO | 138 | 22 | 226 | SO2 | ivsg_la_alt2ad4r | 1.021 | 0.97 | -0.051 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22930 | MSNVIEJO | 138 | 22 | 226 | SO2 | ivsg_la_alt2ad4r | 1.021 | 0.97 | -0.051 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22720 | SANMATEO | 138 | 22 | 226 | SO2 | ivsg_la_alt2ad4r | 1.024 | 0.973 | -0.051 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22656 | PICO | 138 | 22 | 226 | SO2 | ivsg_la_alt2ad4r | 1.025 | 0.975 | -0.051 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22840 | TALEGA | 138 | 22 | 226 | SO2 | ivsg_la_alt2ad4r | 1.026 | 0.976 | -0.051 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 14534 | N.GILA 4 | 100 | 14 | 847 | NG500/69 | ivsg_la_alt2ad4r | 0.937 | 1 | 0.063 | 0.9 | 1.05 | 0.05 | tran N.GILA 500 to N.GILA 69 ck 1 |
| 24035 | EAGLEMTN | 161 | 24 | 248 | tran_241 | ivsg_la_alt2ad4r | 0.961 | 1.022 | 0.061 | 0.9 | 1.05 | 0.05 | tran EAGLEMTN 230 to EAGLEMTN 161 ck 1 |
| 24142 | SYC CYN | 230 | 24 | 240 | line_086 | ivsg_la_alt2ad4r | 1.033 | 1.091 | 0.058 | 0.9 | 1.05 | 0.05 | line MAGUNDEN to OMAR 230 ck 1 |
| 25613 | EDMONSTN | 230 | 24 | 256 | line_122 | ivsg_la_alt2ad4r | 1.021 | 1.091 | 0.07 | 0.9 | 1.05 | 0.05 | line PASTORIA to EDMONSTN 230 ck 1 |
| 24142 | SYC CYN | 230 | 24 | 240 | line_140 | ivsg_la_alt2ad4r | 1.033 | 1.091 | 0.058 | 0.9 | 1.05 | 0.05 | line SYC CYN to OMAR 230 ck 1 |

ivsg_la_alt2ad4r1.sav
FLOW Summary
N-1 Outages

| LEGEND | % of RATING 1 | |
|---|---|---|
| C_pu | 100% - 110% | |
| C_pu | 110% - 120% | P.U. of |
| C_pu | > 120% | Rate 1 |

| FROM | FR | BKV | TO | TO | BKV | CK | Outage_Name | Case | Rate-Mva | Pflow | Qflow | Amps | MVA | C_pu | B_pu | Contingency_Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24142 | SYC CYN | 230 | 24101 | OMAR | 230 | 1 | line_086 | ivsg_la_alt2ad4r | 643 | 722.1 | 5514.6 | 12797.7 | 5561.7 | 7.929 | 0.423 | line MAGUNDEN to OMAR 230 ck 1 |
| 24781 | NAVYCOSO | 230 | 24706 | BLM EAST | 230 | 1 | line_173 | ivsg_la_alt2ad4r | 1287 | -152.6 | -3160.7 | 7943.4 | 3164.4 | 2.459 | 0.057 | line BLM EAST to BLM WEST 230 ck 1 |
| 24781 | NAVYCOSO | 230 | 24706 | BLM EAST | 230 | 1 | line_174 | ivsg_la_alt2ad4r | 1287 | -152.6 | -3160.7 | 7943.4 | 3164.4 | 2.459 | 0.057 | line BLM WEST to KRAMER 230 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_175 | ivsg_la_alt2ad4r | 56 | -106.6 | 5.6 | 544.1 | 106.8 | 1.91 | 0.94 | line INYO to COTTONWD 230 ck 1 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_001 | ivsg_la_alt2ad4r | 1411.6 | 2697.7 | 461.4 | 2940.9 | 2736.8 | 1.824 | 1.181 | line MOENKOPI to ELDORDO 500 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_202 | ivsg_la_alt2ad4r | 56 | 80.6 | -8.8 | 406.3 | 81.1 | 1.47 | 0.94 | line OWENSCON to INYO 230 ck 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_206 | ivsg_la_alt2ad4r | 458 | 642.8 | 117.5 | 1658.8 | 653.4 | 1.444 | 1.101 | line SERRANO to VALLEYSC 500 ck 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_135 | ivsg_la_alt2ad4r | 458 | 630.7 | 80.4 | 1619.8 | 635.8 | 1.409 | 1.101 | line SANBRDNO to DEVERS 230 ck 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_183 | ivsg_la_alt2ad4r | 458 | 583.8 | 77.3 | 1496.2 | 588.9 | 1.302 | 1.101 | line DEVERS to VSTA 230 ck 2 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_185 | ivsg_la_alt2ad4r | 458 | 583.8 | 77.3 | 1496.2 | 588.9 | 1.302 | 1.101 | line VSTA to DEVERS 230 ck 1 |
| 22464 | MIGUEL | 230 | 22472 | MIGUELMP | 500 | 1 | ML81 | ivsg_la_alt2ad4r | 1120 | -1438.1 | 245.5 | 3797.8 | 1458.9 | 1.3 | 0.76 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 22468 | MIGUEL | 500 | 22472 | MIGUELMP | 500 | 1 | ML81 | ivsg_la_alt2ad4r | 1120 | 1440.8 | 16.5 | 1663.8 | 1440.9 | 1.3 | 0.75 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 22464 | MIGUEL | 230 | 22468 | MIGUEL | 500 | 1 | ML80 | ivsg_la_alt2ad4r | 1120 | -1418.9 | 245.1 | 3749.2 | 1439.9 | 1.29 | 0.72 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_206 | ivsg_la_alt2ad4r | 1411.6 | 1878 | 218.2 | 2036.9 | 1890.6 | 1.264 | 1.181 | line SERRANO to VALLEYSC 500 ck 1 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | B2_001 | ivsg_la_alt2ad4r | 1411.6 | 1875.2 | 214.8 | 2033 | 1887.5 | 1.261 | 1.181 | HASSYAMP - N.GILA 1 500kV |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | B2_003 | ivsg_la_alt2ad4r | 1411.6 | 1851.1 | 203.7 | 2002.6 | 1862.3 | 1.242 | 1.181 | N.GILA - IMPRLVLY 1 500kV |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_84 | ivsg_la_alt2ad4r | 1411.6 | 1836 | 190.5 | 1982.2 | 1845.9 | 1.23 | 1.181 | line MIDPINTS to DEVERS 500 ck 1 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_86 | ivsg_la_alt2ad4r | 1411.6 | 1838.1 | 179.7 | 1981.8 | 1846.9 | 1.229 | 1.181 | line MIDPINTS to IH500 500 ck 1 |
| 22356 | IMPRLVLY | 230 | 22360 | IMPRLVLY | 500 | 1 | IV81 | ivsg_la_alt2ad4r | 600 | 694 | 230.5 | 1857 | 731.3 | 1.22 | 0.55 | tran IMPRLVLY 230 to IMPRLVLY 500 ck 2 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_83 | ivsg_la_alt2ad4r | 1411.6 | 1823.3 | 172.7 | 1963.5 | 1831.5 | 1.217 | 1.181 | line IH500 to DEVERS 500 ck 1 |
| 24900 | MIDPINTS | 500 | 80150 | IH500 | 500 | 1 | line_84 | ivsg_la_alt2ad4r | 3420 | 2821.1 | 478.2 | 3273.8 | 2861.3 | 1.192 | 0.673 | line MIDPINTS to DEVERS 500 ck 1 |
| 24900 | MIDPINTS | 500 | 24801 | DEVERS | 500 | 1 | line_86 | ivsg_la_alt2ad4r | 2338 | 2706.5 | 437.9 | 3121.8 | 2741.7 | 1.161 | 0.686 | line MIDPINTS to IH500 500 ck 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_001 | ivsg_la_alt2ad4r | 458 | 514.1 | 43 | 1334.1 | 515.9 | 1.16 | 1.101 | line MOENKOPI to ELDORDO 500 ck 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_085 | ivsg_la_alt2ad4r | 458 | 514.7 | 45 | 1329.7 | 516.6 | 1.157 | 1.101 | line LUGO to VICTORVL 500 ck 1 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | line_66 | ivsg_la_alt2ad4r | 388 | -431.1 | -8 | 1126.2 | 431.2 | 1.156 | 0.905 | line CENTRALX to NEWSF500 500 ck 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_66 | ivsg_la_alt2ad4r | 458 | 511.4 | 44.6 | 1326.8 | 513.4 | 1.154 | 1.101 | line CENTRALX to NEWSF500 500 ck 1 |
| 24806 | MIRAGE | 230 | 24807 | MIRAGE | 115 | 2 | tran_238 | ivsg_la_alt2ad4r | 280 | 319.8 | 25.4 | 826 | 320.8 | 1.15 | 0.58 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_047 | ivsg_la_alt2ad4r | 458 | 509 | 47.1 | 1316.5 | 511.2 | 1.145 | 1.101 | line ELDORDO to LUGO 500 ck 1 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_085 | ivsg_la_alt2ad4r | 1411.6 | 1708 | 158 | 1833.2 | 1715.2 | 1.137 | 1.181 | line LUGO to VICTORVL 500 ck 1 |
| 24729 | INYO | 230 | 24730 | INYO PS | 115 | 1 | line_175 | ivsg_la_alt2ad4r | 50 | 53.3 | 18.8 | 136 | 56.5 | 1.13 | 0.54 | line INYO to COTTONWD 230 ck 1 |
| 24729 | INYO | 230 | 24730 | INYO PS | 115 | 2 | line_175 | ivsg_la_alt2ad4r | 50 | 53.3 | 18.8 | 136 | 56.5 | 1.13 | 0.54 | line INYO to COTTONWD 230 ck 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_206 | ivsg_la_alt2ad4r | 1645.4 | 1946 | 231.1 | 2129.5 | 1959.7 | 1.121 | 1.039 | line SERRANO to VALLEYSC 500 ck 1 |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_206 | ivsg_la_alt2ad4r | 458 | 481.2 | -49.2 | 1285.9 | 483.7 | 1.118 | 0.784 | line SERRANO to VALLEYSC 500 ck 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | B2_001 | ivsg_la_alt2ad4r | 1645.4 | 1939.8 | 226.8 | 2121.6 | 1953.1 | 1.117 | 1.039 | HASSYAMP - N.GILA 1 500kV |
| 24723 | CONTROL | 115 | 24731 | INYOKERN | 115 | 1 | line_175 | ivsg_la_alt2ad4r | 82.7 | 89 | -7.6 | 457.5 | 89.3 | 1.102 | 0.305 | line INYO to COTTONWD 230 ck 1 |
| 24723 | CONTROL | 115 | 24731 | INYOKERN | 115 | 2 | line_175 | ivsg_la_alt2ad4r | 82.7 | 89 | -7.6 | 457.5 | 89.3 | 1.102 | 0.305 | line INYO to COTTONWD 230 ck 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | B2_003 | ivsg_la_alt2ad4r | 1645.4 | 1913.8 | 216.1 | 2087.4 | 1925.9 | 1.099 | 1.039 | N.GILA - IMPRLVLY 1 500kV |
| 24900 | MIDPINTS | 500 | 24801 | DEVERS | 500 | 1 | line_83 | ivsg_la_alt2ad4r | 2338 | 2568.3 | 356.6 | 2952.1 | 2593 | 1.097 | 0.686 | line IH500 to DEVERS 500 ck 1 |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_135 | ivsg_la_alt2ad4r | 458 | 470 | -78.2 | 1253.1 | 476.5 | 1.09 | 0.784 | line SANBRDNO to DEVERS 230 ck 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_84 | ivsg_la_alt2ad4r | 1645.4 | 1897.3 | 201.6 | 2064.1 | 1907.9 | 1.086 | 1.039 | line MIDPINTS to DEVERS 500 ck 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_86 | ivsg_la_alt2ad4r | 1645.4 | 1898.5 | 197.1 | 2063.1 | 1908.7 | 1.086 | 1.039 | line MIDPINTS to IH500 500 ck 1 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | PV1 | ivsg_la_alt2ad4r | 1411.6 | 1646.4 | 85.1 | 1750.1 | 1648.6 | 1.084 | 1.181 | gen PALOVRD1 24.00 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_169 | ivsg_la_alt2ad4r | 56 | 59.6 | -5 | 296.5 | 59.8 | 1.08 | 0.94 | line KRAMER to LUGO 230 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_170 | ivsg_la_alt2ad4r | 56 | 59.6 | -5 | 296.5 | 59.8 | 1.08 | 0.94 | line KRAMER to LUGO 230 ck 2 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | B2_003 | ivsg_la_alt2ad4r | 800 | 841.3 | 51.3 | 2165.4 | 842.9 | 1.078 | 0.821 | N.GILA - IMPRLVLY 1 500kV |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_183 | ivsg_la_alt2ad4r | 2598 | 2763.3 | 277.3 | 3232.7 | 2777.2 | 1.078 | 1.011 | line DEVERS to VSTA 230 ck 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_185 | ivsg_la_alt2ad4r | 2598 | 2763.3 | 277.3 | 3232.7 | 2777.2 | 1.078 | 1.011 | line VSTA to DEVERS 230 ck 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_83 | ivsg_la_alt2ad4r | 1645.4 | 1882.2 | 190.1 | 2042.2 | 1891.7 | 1.075 | 1.039 | line IH500 to DEVERS 500 ck 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_001 | ivsg_la_alt2ad4r | 2598 | 2705.4 | 217.9 | 3213.6 | 2714.1 | 1.071 | 1.011 | line MOENKOPI to ELDORDO 500 ck 1 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | ML80 | ivsg_la_alt2ad4r | 1120 | -1189.8 | -34.4 | 3033.7 | 1190.3 | 1.07 | 0.98 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_135 | ivsg_la_alt2ad4r | 2598 | 2738.1 | 257.7 | 3205.4 | 2750.2 | 1.068 | 1.011 | line SANBRDNO to DEVERS 230 ck 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_29 | ivsg_la_alt2ad4r | 458 | 485.8 | 50.7 | 1226.4 | 488.4 | 1.067 | 1.101 | line HIGHLINE to COLCT3 230 ck 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_83 | ivsg_la_alt2ad4r | 458 | 475.8 | 31.5 | 1227.2 | 476.8 | 1.067 | 1.101 | line IH500 to DEVERS 500 ck 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_085 | ivsg_la_alt2ad4r | 2598 | 2705.2 | 210.9 | 3197.1 | 2713.4 | 1.066 | 1.011 | line LUGO to VICTORVL 500 ck 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_66 | ivsg_la_alt2ad4r | 2598 | 2684.9 | 230.7 | 3183.4 | 2694.8 | 1.061 | 1.011 | line CENTRALX to NEWSF500 500 ck 1 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20238 | HRD-230 | 230 | 20239 | HRD-115 | 115 | 1 | line_66 | ivsg_la_alt2ad4r | 225 | 236.8 | -26 | 621 | 238.2 | 1.06 | 0.88 | line CENTRALX to NEWSF500 500 ck 1 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | ML81 | ivsg_la_alt2ad4r | 1120 | -1181.1 | -35.6 | 3009.4 | 1181.6 | 1.06 | 0.98 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_84 | ivsg_la_alt2ad4r | 458 | 467.3 | 23.8 | 1214.2 | 467.9 | 1.056 | 1.101 | line MIDPINTS to DEVERS 500 ck 1 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_56 | ivsg_la_alt2ad4r | 800 | 806.1 | 150.7 | 2116 | 820 | 1.054 | 0.821 | line NEWSF500 to IMPRLVLY 500 ck 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_302 | ivsg_la_alt2ad4r | 2598 | 2703.7 | 236.2 | 3160.9 | 2714 | 1.054 | 1.011 | line DEVERS to OAK_VLLY 230 ck 1 |
| 8601 | GEOSUB2 | 230 | 8300 | BANIS230 | 230 | 1 | line_22 | ivsg_la_alt2ad4r | 550 | 578.4 | 67.6 | 1453 | 582.3 | 1.053 | 0.773 | line GEOSUB1 to BANIS230 230 ck 1 |
| 8601 | GEOSUB2 | 230 | 8300 | BANIS230 | 230 | 1 | line_23 | ivsg_la_alt2ad4r | 550 | 578.4 | 67.6 | 1453 | 582.3 | 1.053 | 0.773 | line GEOSUB1 to BANIS230 230 ck 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | B2_003 | ivsg_la_alt2ad4r | 2598 | 2661 | 220.2 | 3155.6 | 2670.1 | 1.052 | 1.011 | N.GILA - IMPRLVLY 1 500kV |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_047 | ivsg_la_alt2ad4r | 2598 | 2669.4 | 229.5 | 3156.9 | 2679.3 | 1.052 | 1.011 | line ELDORDO to LUGO 500 ck 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | B2_001 | ivsg_la_alt2ad4r | 2598 | 2650.6 | 223.5 | 3151.4 | 2660 | 1.051 | 1.011 | HASSYAMP - N.GILA 1 500kV |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | B2_022 | ivsg_la_alt2ad4r | 1120 | -1172 | -41.4 | 3015.4 | 1172.7 | 1.05 | 0.98 | OTAYMESA - TJI-230 1 230kV |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | B2_028 | ivsg_la_alt2ad4r | 1120 | -1169.5 | -28.1 | 2965.3 | 1169.8 | 1.05 | 0.98 | MIGUEL - SYCAMORE 1 230kV |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | line_206 | ivsg_la_alt2ad4r | 1120 | -1165.9 | -51.8 | 3029.7 | 1167 | 1.05 | 0.98 | line SERRANO to VALLEYSC 500 ck 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_86 | ivsg_la_alt2ad4r | 458 | 465.7 | 28.1 | 1202.8 | 466.6 | 1.046 | 1.101 | line MIDPINTS to IH500 500 ck 1 |
| 24805 | DEVERS | 115 | 24804 | DEVERS | 230 | 1 | tran_236 | ivsg_la_alt2ad4r | 280 | 254.3 | -94.2 | 1354.4 | 271.2 | 1.04 | 0.68 | tran DEVERS 115 to DEVERS 230 ck 3 |
| 20238 | HRD-230 | 230 | 20118 | ROA-230 | 230 | 1 | line_66 | ivsg_la_alt2ad4r | 388 | -371.1 | 99.7 | 1001.7 | 384.3 | 1.032 | 0.783 | line CENTRALX to NEWSF500 500 ck 1 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | SO2 | ivsg_la_alt2ad4r | 1120 | -1145.6 | -98 | 3089.9 | 1149.8 | 1.03 | 0.98 | gen S.ONOFR2 22.00 |
| 24805 | DEVERS | 115 | 24804 | DEVERS | 230 | 3 | tran_235 | ivsg_la_alt2ad4r | 280 | 251.3 | -93.4 | 1341.2 | 268.1 | 1.03 | 0.66 | tran DEVERS 115 to DEVERS 230 ck 1 |
| 24805 | DEVERS | 115 | 24804 | DEVERS | 230 | 1 | tran_237 | ivsg_la_alt2ad4r | 280 | 252.8 | -94.9 | 1357.6 | 270 | 1.03 | 0.68 | tran DEVERS 115 to DEVERS 230 ck 4 |
| 24805 | DEVERS | 115 | 24804 | DEVERS | 230 | 4 | tran_235 | ivsg_la_alt2ad4r | 280 | 248.4 | -92.3 | 1325.6 | 265 | 1.02 | 0.65 | tran DEVERS 115 to DEVERS 230 ck 1 |
| 24701 | KRAMER | 230 | 24085 | LUGO | 230 | 2 | line_169 | ivsg_la_alt2ad4r | 478 | 478.2 | 75.6 | 1221.4 | 484.1 | 1.018 | 0.611 | line KRAMER to LUGO 230 ck 1 |
| 24701 | KRAMER | 230 | 24085 | LUGO | 230 | 1 | line_170 | ivsg_la_alt2ad4r | 478 | 478.2 | 75.6 | 1221.4 | 484.1 | 1.018 | 0.611 | line KRAMER to LUGO 230 ck 2 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | IV81 | ivsg_la_alt2ad4r | 388 | -385.7 | 2.8 | 991 | 385.8 | 1.017 | 0.905 | tran IMPRLVLY 230 to IMPRLVLY 500 ck 2 |
| 22360 | IMPRLVLY | 500 | 22468 | MIGUEL | 500 | 1 | line_66 | ivsg_la_alt2ad4r | 2252 | 2230 | 508.1 | 2597.2 | 2287.2 | 1.016 | 0.72 | line CENTRALX to NEWSF500 500 ck 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_059 | ivsg_la_alt2ad4r | 458 | 458.9 | 41.5 | 1166.6 | 460.8 | 1.015 | 1.101 | line ETIWANDA to SANBRDNO 230 ck 1 |
| 24042 | ELDORDO | 500 | 24086 | LUGO | 500 | 1 | line_085 | ivsg_la_alt2ad4r | 1386 | 1450.8 | 92.8 | 1623.2 | 1453.7 | 1.015 | 0.736 | line LUGO to VICTORVL 500 ck 1 |
| 8600 | GEOSUB1 | 230 | 8300 | BANIS230 | 230 | 1 | line_47 | ivsg_la_alt2ad4r | 550 | 556 | 63.7 | 1397.4 | 559.6 | 1.013 | 0.716 | line GEOSUB2 to BANIS230 230 ck 1 |
| 8600 | GEOSUB1 | 230 | 8300 | BANIS230 | 230 | 2 | line_47 | ivsg_la_alt2ad4r | 550 | 556 | 63.7 | 1397.4 | 559.6 | 1.013 | 0.716 | line GEOSUB2 to BANIS230 230 ck 1 |
| 22464 | MIGUEL | 230 | 22472 | MIGUELMP | 500 | 1 | line_66 | ivsg_la_alt2ad4r | 1120 | -1123.3 | 161.8 | 3092.1 | 1134.9 | 1.01 | 0.76 | line CENTRALX to NEWSF500 500 ck 1 |
| 22468 | MIGUEL | 500 | 22472 | MIGUELMP | 500 | 1 | line_66 | ivsg_la_alt2ad4r | 1120 | 1125.1 | 11.9 | 1354.7 | 1125.2 | 1.01 | 0.75 | line CENTRALX to NEWSF500 500 ck 1 |
| 24805 | DEVERS | 115 | 24804 | DEVERS | 230 | 3 | tran_237 | ivsg_la_alt2ad4r | 280 | 246.8 | -92.7 | 1325.6 | 263.6 | 1.01 | 0.66 | tran DEVERS 115 to DEVERS 230 ck 4 |
| 24151 | VALLEYSC | 500 | 24160 | VALLEYSC | 115 | 2 | tran_247 | ivsg_la_alt2ad4r | 560 | 541 | 172.6 | 664.3 | 567.9 | 1.01 | 0.49 | tran VALLEYSC 500 to VALLEYSC 115 ck 1 |
| 24151 | VALLEYSC | 500 | 24160 | VALLEYSC | 115 | 1 | tran_248 | ivsg_la_alt2ad4r | 560 | 541 | 172.6 | 664.3 | 567.9 | 1.01 | 0.49 | tran VALLEYSC 500 to VALLEYSC 115 ck 2 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | B2_001 | ivsg_la_alt2ad4r | 800 | 797.7 | 21.2 | 2022.7 | 798 | 1.007 | 0.821 | HASSYAMP - N.GILA 1 500kV |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_047 | ivsg_la_alt2ad4r | 1645.4 | 1753.1 | 204.6 | 1902.8 | 1765 | 1.004 | 1.039 | line ELDORDO to LUGO 500 ck 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_085 | ivsg_la_alt2ad4r | 1645.4 | 1760.5 | 185.2 | 1902.9 | 1770.2 | 1.003 | 1.039 | line LUGO to VICTORVL 500 ck 1 |
| 8600 | GEOSUB1 | 230 | 8300 | BANIS230 | 230 | 2 | line_22 | ivsg_la_alt2ad4r | 550 | 550.4 | 64.3 | 1382.4 | 554.1 | 1.002 | 0.716 | line GEOSUB1 to BANIS230 230 ck 1 |
| 8600 | GEOSUB1 | 230 | 8300 | BANIS230 | 230 | 1 | line_23 | ivsg_la_alt2ad4r | 550 | 550.4 | 64.3 | 1382.4 | 554.1 | 1.002 | 0.716 | line GEOSUB1 to BANIS230 230 ck 2 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | PV1 | ivsg_la_alt2ad4r | 458 | 462.1 | 49.3 | 1148.7 | 464.8 | 1 | 1.101 | gen PALOVRD1 24.00 |
| 24805 | DEVERS | 115 | 24804 | DEVERS | 230 | 4 | tran_236 | ivsg_la_alt2ad4r | 280 | 245.4 | -90.9 | 1307.2 | 261.7 | 1 | 0.65 | tran DEVERS 115 to DEVERS 230 ck 3 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | tran_210 | ivsg_la_alt2ad4r | 56 | 54.9 | -5.1 | 271.9 | 55.1 | 0.99 | 0.94 | tran LUGO 500 to LUGO 230 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | tran_211 | ivsg_la_alt2ad4r | 56 | 54.9 | -5.1 | 272.1 | 55.2 | 0.99 | 0.94 | tran LUGO 500 to LUGO 230 ck 2 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | SO2 | ivsg_la_alt2ad4r | 388 | -368.6 | -8.7 | 962.8 | 368.7 | 0.989 | 0.905 | gen S.ONOFR2 22.00 |
| 20238 | HRD-230 | 230 | 20102 | RUM-230 | 230 | 1 | line_66 | ivsg_la_alt2ad4r | 388 | -352 | 96 | 951.1 | 364.9 | 0.982 | 0.735 | line CENTRALX to NEWSF500 500 ck 1 |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_183 | ivsg_la_alt2ad4r | 458 | 425.9 | -57.8 | 1128.6 | 429.8 | 0.982 | 0.784 | line DEVERS to VSTA 230 ck 2 |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_185 | ivsg_la_alt2ad4r | 458 | 425.9 | -57.8 | 1128.6 | 429.8 | 0.982 | 0.784 | line VSTA to DEVERS 230 ck 1 |
| 20238 | HRD-230 | 230 | 20239 | HRD-115 | 115 | 1 | IV81 | ivsg_la_alt2ad4r | 225 | 216.6 | -18.3 | 556.8 | 217.4 | 0.97 | 0.88 | tran IMPRLVLY 230 to IMPRLVLY 500 ck 2 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_086 | ivsg_la_alt2ad4r | 56 | 53.7 | -5.6 | 266.6 | 54 | 0.97 | 0.94 | line MAGUNDEN to OMAR 230 ck 1 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | line_206 | ivsg_la_alt2ad4r | 388 | -365.9 | 6.5 | 944.2 | 366 | 0.969 | 0.905 | line SERRANO to VALLEYSC 500 ck 1 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | line_56 | ivsg_la_alt2ad4r | 388 | -366.6 | 6 | 941.1 | 366.6 | 0.966 | 0.905 | line NEWSF500 to IMPRLVLY 500 ck 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_86 | ivsg_la_alt2ad4r | 2598 | 2433.2 | 61.5 | 2890.4 | 2434 | 0.963 | 1.011 | line MIDPINTS to IH500 500 ck 1 |
| 22464 | MIGUEL | 230 | 22468 | MIGUEL | 500 | 1 | line_66 | ivsg_la_alt2ad4r | 1120 | -1063.3 | 150.8 | 2926.1 | 1074 | 0.96 | 0.72 | line CENTRALX to NEWSF500 500 ck 1 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | ML80 | ivsg_la_alt2ad4r | 388 | -363.7 | 9 | 933.9 | 363.9 | 0.959 | 0.905 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | ML81 | ivsg_la_alt2ad4r | 388 | -362 | 9.3 | 929 | 362.1 | 0.954 | 0.905 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | line_29 | ivsg_la_alt2ad4r | 1120 | -1059.7 | -45.2 | 2662.3 | 1060.6 | 0.95 | 0.98 | line HIGHLINE to COLCT3 230 ck 1 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | IV81 | ivsg_la_alt2ad4r | 1120 | -1059.5 | -19.7 | 2713.8 | 1059.7 | 0.95 | 0.98 | tran IMPRLVLY 230 to IMPRLVLY 500 ck 2 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | PV1 | ivsg_la_alt2ad4r | 1645.4 | 1682.9 | 97.5 | 1796 | 1685.7 | 0.945 | 1.039 | gen PALOVRD1 24.00 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | line_7 | ivsg_la_alt2ad4r | 388 | -357.5 | 13.7 | 919.8 | 357.7 | 0.944 | 0.905 | line BANIS230 to NEWSF230 230 ck 1 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | tran_74 | ivsg_la_alt2ad4r | 388 | -357.5 | 13.6 | 919.6 | 357.7 | 0.944 | 0.905 | tran NEWSF230 230 to NEWSF500 500 ck 1 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | B2_009 | ivsg_la_alt2ad4r | 1120 | -1041.3 | -65.9 | 2642.4 | 1043.4 | 0.94 | 0.98 | EPP - ESCNDIDO 1 230kV |
| 24151 | VALLEYSC | 500 | 24229 | VALLEY-S | 115 | 4 | tran_249 | ivsg_la_alt2ad4r | 560 | 518.5 | 99.9 | 616.4 | 528 | 0.94 | 0.46 | tran VALLEYSC 500 to VALLEY-S 115 ck 3 |
| 24151 | VALLEYSC | 500 | 24229 | VALLEY-S | 115 | 3 | tran_250 | ivsg_la_alt2ad4r | 560 | 518.5 | 99.8 | 616.4 | 528 | 0.94 | 0.46 | tran VALLEYSC 500 to VALLEY-S 115 ck 4 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24804 | DEVERS | 230 | 24901 | VSTA | 230 | 2 | line_206 | ivsg_la_alt2ad4r | 988 | 889.1 | 220.2 | 2325.1 | 916 | 0.938 | 0.696 | line SERRANO to VALLEYSC 500 ck 1 |
| 24901 | VSTA | 230 | 24804 | DEVERS | 230 | 1 | line_206 | ivsg_la_alt2ad4r | 988 | -852.3 | 167 | 2326.5 | 868.5 | 0.938 | 0.696 | line SERRANO to VALLEYSC 500 ck 1 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | IV80 | ivsg_la_alt2ad4r | 388 | -356.2 | 9.5 | 912.4 | 356.3 | 0.937 | 0.905 | tran IMPRLVLY 230 to IMPRLVLY 500 ck 1 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_6 | ivsg_la_alt2ad4r | 800 | 739.8 | 34.1 | 1877.5 | 740.6 | 0.935 | 0.821 | line BANIS230 to ELCENTSW 230 ck 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_84 | ivsg_la_alt2ad4r | 2598 | 2351.5 | 18.8 | 2805.1 | 2351.6 | 0.935 | 1.011 | line MIDPINTS to DEVERS 500 ck 1 |
| 20238 | HRD-230 | 230 | 20239 | HRD-115 | 115 | 1 | line_56 | ivsg_la_alt2ad4r | 225 | 207.9 | -15.6 | 533.2 | 208.5 | 0.93 | 0.88 | line NEWSF500 to IMPRLVLY 500 ck 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_83 | ivsg_la_alt2ad4r | 2598 | 2362.1 | 36.2 | 2788.8 | 2362.4 | 0.93 | 1.011 | line IH500 to DEVERS 500 ck 1 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | B2_013 | ivsg_la_alt2ad4r | 1120 | -1040.5 | -68.3 | 2643.2 | 1042.7 | 0.93 | 0.98 | EPP - SYCAMORE 1 230kV |
| 20238 | HRD-230 | 230 | 20239 | HRD-115 | 115 | 1 | SO2 | ivsg_la_alt2ad4r | 225 | 208.5 | -9.8 | 548.4 | 208.7 | 0.93 | 0.88 | gen S.ONOFR2 22.00 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | PV1 | ivsg_la_alt2ad4r | 1120 | -1035.9 | -47.6 | 2586.4 | 1037 | 0.93 | 0.98 | gen PALOVRD1 24.00 |
| 24801 | DEVERS | 500 | 24804 | DEVERS | 230 | 1 | line_206 | ivsg_la_alt2ad4r | 1120 | 742.7 | 737.8 | 1185 | 1046.9 | 0.93 | 0.51 | line SERRANO to VALLEYSC 500 ck 1 |
| 20238 | HRD-230 | 230 | 20239 | HRD-115 | 115 | 1 | line_206 | ivsg_la_alt2ad4r | 225 | 207.5 | -16 | 534.6 | 208.2 | 0.93 | 0.88 | line SERRANO to VALLEYSC 500 ck 1 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | IV81 | ivsg_la_alt2ad4r | 800 | 731.7 | 55.6 | 1865 | 733.8 | 0.929 | 0.821 | tran IMPRLVLY 230 to IMPRLVLY 500 ck 2 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_047 | ivsg_la_alt2ad4r | 2400 | -2192.5 | 439.3 | 2546.9 | 2236.1 | 0.921 | 0.682 | line ELDORDO to LUGO 500 ck 1 |
| 22356 | IMPRLVLY | 230 | 22360 | IMPRLVLY | 500 | 2 | B2_003 | ivsg_la_alt2ad4r | 1120 | 1013.1 | 211.6 | 2678.5 | 1035 | 0.92 | 0.63 | N.GILA - IMPRLVLY 1 500kV |
| 20238 | HRD-230 | 230 | 20239 | HRD-115 | 115 | 1 | ML80 | ivsg_la_alt2ad4r | 225 | 206.7 | -16.6 | 529 | 207.3 | 0.92 | 0.88 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 20238 | HRD-230 | 230 | 20239 | HRD-115 | 115 | 1 | ML81 | ivsg_la_alt2ad4r | 225 | 205.8 | -16.3 | 526.7 | 206.5 | 0.92 | 0.88 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | B2_036 | ivsg_la_alt2ad4r | 1120 | -1024.2 | -69.2 | 2601.5 | 1026.5 | 0.92 | 0.98 | SYCAMORE - PENSQTOS 1 230kV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | line_66 | ivsg_la_alt2ad4r | 392 | 355.8 | 5.2 | 969.6 | 355.9 | 0.91 | 0.79 | line CENTRALX to NEWSF500 500 ck 1 |
| 24729 | INYO | 230 | 24730 | INYO PS | 115 | 2 | tran_230 | ivsg_la_alt2ad4r | 50 | -43.5 | 12.6 | 107.5 | 45.3 | 0.91 | 0.54 | tran INYO 230 to INYO PS 115 ck 1 |
| 24729 | INYO | 230 | 24730 | INYO PS | 115 | 1 | tran_231 | ivsg_la_alt2ad4r | 50 | -43.5 | 12.6 | 107.5 | 45.3 | 0.91 | 0.54 | tran INYO 230 to INYO PS 115 ck 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | PV1 | ivsg_la_alt2ad4r | 2598 | 2415.5 | 77.8 | 2725.5 | 2416.8 | 0.909 | 1.011 | gen PALOVRD1 24.00 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | line_66 | ivsg_la_alt2ad4r | 408.3 | -351.8 | 32.3 | 1545.7 | 353.3 | 0.905 | 0.751 | line CENTRALX to NEWSF500 500 ck 1 |
| 8695 | RAMON | 230 | 24806 | MIRAGE | 230 | 2 | line_83 | ivsg_la_alt2ad4r | 800 | 693.4 | -92.7 | 1816.8 | 699.6 | 0.905 | 0.687 | line IH500 to DEVERS 500 ck 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_184 | ivsg_la_alt2ad4r | 458 | 410.2 | 16.9 | 1040.5 | 410.5 | 0.905 | 1.101 | line VSTA to SANBRDNO 230 ck 2 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_50 | ivsg_la_alt2ad4r | 800 | 716.8 | 35.9 | 1815.1 | 717.7 | 0.904 | 0.821 | line BANIS230 to AV58TP12 230 ck 1 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_51 | ivsg_la_alt2ad4r | 800 | 717.6 | 39.5 | 1813 | 718.7 | 0.903 | 0.821 | line AV58TP12 to AVE58230 230 ck 1 |
| 8601 | GEOSUB2 | 230 | 8300 | BANIS230 | 230 | 1 | B2_003 | ivsg_la_alt2ad4r | 550 | 488.6 | 68.6 | 1243.1 | 493.4 | 0.901 | 0.773 | N.GILA - IMPRLVLY 1 500kV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_015 | ivsg_la_alt2ad4r | 392 | 352.7 | 11.2 | 921.3 | 352.9 | 0.9 | 0.79 | MIGUEL - MISSION 1 230kV |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_020 | ivsg_la_alt2ad4r | 392 | 350.9 | 9.6 | 917.2 | 351 | 0.9 | 0.79 | MIGUEL - MISSION 2 230kV |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_122 | ivsg_la_alt2ad4r | 56 | 49.6 | -4.8 | 244.5 | 49.9 | 0.9 | 0.94 | line PASTORIA to EDMONSTN 230 ck 1 |

ivsg_la_alt2ad4r1.sav
No Solve Summary
N-1 Outages

| Contingency-Description | Case | Problem-Description |
|---|---|---|
| IMPRLVLY - MIGUEL 1 500kV | ivsg_la_alt2ad4r | Pmis 8690 HIGHLINE 230.00 = -158.34 MW + j -337401.69 MVAR |
| line DEVERS to VALLEYSC 500 ck 1 | ivsg_la_alt2ad4r | Pmis 22700 SAMPSON 69.00 = 51099.51 MW + j -180116.06 MVAR |

| Bus | Name | kV | Area | Zone | Outage | Case | Vbase | Vcont | DeltaV | Vmin | Vmax | Max-dv | Contingency Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24237 | RANCHVST | 230 | 24 | 240 | 23021/22/23/41 | ivsg_la_alt2ad4r | 0.967 | 1.029 | 0.063 | 0.9 | 1.05 | 0.05 | MIGUEL 230 CORRIDOR West of SN |
| 24219 | PISGAH | 230 | 24 | 240 | line_2190 | ivsg_la_alt2ad4r | 0.989 | 1.04 | 0.05 | 0.9 | 1.05 | 0.05 | PISGAH 230.00 - LUGO 230.00 1, PISGAH 230.00 - LUGO 230.00 2 |
| 25001 | GOODRICH | 230 | 24 | 250 | line_2073 | ivsg_la_alt2ad4r | 0.986 | 1.044 | 0.058 | 0.9 | 1.05 | 0.05 | GOODRICH 230.00 - GOULD 230.00 1, GOODRICH 230.00 - LAGUBELL 230.00 1 |

ivsg_la_alt2ad4r1.sav
FLOW Summary
N-2 Outages

| LEGEND | % of RATING 1 | |
|---|---|---|
| C_pu | 100% - 110% | |
| C_pu | 110% - 120% | P.U. of |
| C_pu | > 120% | Rate 1 |

| FROM | FR | BKV | TO | TO | BKV | CK | Outage_Name | Case | Rate-Mva | Pflow | Qflow | Amps | MVA | C_pu | B_pu | Contingency_Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_2233 | ivsg_la_alt2ad4r | 1411.6 | 2691.8 | 476 | 2939.5 | 2733.6 | 1.823 | 1.181 | MOENKOPI 500.00 - ELDORDO 500.00 1, PISGAH 230.00 - ELDORDO 230.00 2 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2175 | ivsg_la_alt2ad4r | 458 | 765.3 | 135.7 | 1988.9 | 777.2 | 1.73 | 1.101 | DEVERS 230.00 - SANBRDNO 230.00 1, DEVERS 230.00 - VSTA 230.00 2 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2177 | ivsg_la_alt2ad4r | 458 | 765.3 | 135.7 | 1988.9 | 777.2 | 1.73 | 1.101 | DEVERS 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2178 | ivsg_la_alt2ad4r | 458 | 765.3 | 135.7 | 1988.9 | 777.2 | 1.73 | 1.101 | DEVERS 230.00 - VSTA 230.00 2, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2180 | ivsg_la_alt2ad4r | 458 | 765.3 | 135.7 | 1988.9 | 777.2 | 1.73 | 1.101 | SANBRDNO 230.00 - DEVERS 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2247 | ivsg_la_alt2ad4r | 458 | 765.3 | 135.7 | 1988.9 | 777.2 | 1.73 | 1.101 | DEVERS 230.00 - VSTA 230.00 2, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2179 | ivsg_la_alt2ad4r | 458 | 719.6 | 134.9 | 1866.9 | 732.2 | 1.625 | 1.101 | DEVERS 230.00 - VSTA 230.00 2, VSTA 230.00 - DEVERS 230.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2238 | ivsg_la_alt2ad4r | 458 | 645.7 | 121.3 | 1676.4 | 657 | 1.459 | 1.101 | S.ONOFRE 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2239 | ivsg_la_alt2ad4r | 458 | 642.8 | 117.5 | 1658.8 | 653.4 | 1.444 | 1.101 | CHINO 230.00 - S.ONOFRE 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2240 | ivsg_la_alt2ad4r | 458 | 641.3 | 118.6 | 1657 | 652.2 | 1.442 | 1.101 | CHINO 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_la_alt2ad4r | 392 | 549.6 | 49 | 1481.5 | 551.8 | 1.41 | 0.79 | MIGUEL 230 CORRIDOR West of SN |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2176 | ivsg_la_alt2ad4r | 458 | 630.7 | 80.4 | 1619.8 | 635.8 | 1.409 | 1.101 | DEVERS 230.00 - SANBRDNO 230.00 1, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_2175 | ivsg_la_alt2ad4r | 458 | 595 | -104.6 | 1617 | 604.1 | 1.406 | 0.784 | DEVERS 230.00 - SANBRDNO 230.00 1, DEVERS 230.00 - VSTA 230.00 2 |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_2177 | ivsg_la_alt2ad4r | 458 | 595 | -104.6 | 1617 | 604.1 | 1.406 | 0.784 | DEVERS 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_2178 | ivsg_la_alt2ad4r | 458 | 595 | -104.6 | 1617 | 604.1 | 1.406 | 0.784 | DEVERS 230.00 - VSTA 230.00 2, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_2180 | ivsg_la_alt2ad4r | 458 | 595 | -104.6 | 1617 | 604.1 | 1.406 | 0.784 | SANBRDNO 230.00 - DEVERS 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_2247 | ivsg_la_alt2ad4r | 458 | 595 | -104.6 | 1617 | 604.1 | 1.406 | 0.784 | DEVERS 230.00 - VSTA 230.00 2, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_la_alt2ad4r | 408.3 | -540.3 | 38.9 | 2361.8 | 541.7 | 1.383 | 0.751 | MIGUEL 230 CORRIDOR West of SN |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | 23021/22/23/41 | ivsg_la_alt2ad4r | 382.4 | 489.7 | -28.2 | 2141.5 | 490.5 | 1.339 | 0.677 | MIGUEL 230 CORRIDOR West of SN |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2167 | ivsg_la_alt2ad4r | 458 | 599.7 | 70.2 | 1536.9 | 603.8 | 1.337 | 1.101 | DEVERS 230.00 - SANBRDNO 230.00 1, ETIWANDA 230.00 - SANBRDNO 230.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2169 | ivsg_la_alt2ad4r | 458 | 599.7 | 70.2 | 1536.9 | 603.8 | 1.337 | 1.101 | ETIWANDA 230.00 - SANBRDNO 230.00 1, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2173 | ivsg_la_alt2ad4r | 458 | 600.5 | 46.7 | 1537 | 602.3 | 1.337 | 1.101 | SANBRDNO 230.00 - DEVERS 230.00 1, VSTA 230.00 - SANBRDNO 230.00 2 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2174 | ivsg_la_alt2ad4r | 458 | 600.5 | 46.7 | 1537 | 602.3 | 1.337 | 1.101 | DEVERS 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - SANBRDNO 230.00 2 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2268 | ivsg_la_alt2ad4r | 458 | 599.7 | 70.2 | 1536.9 | 603.8 | 1.337 | 1.101 | ETIWANDA 230.00 - SANBRDNO 230.00 1, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_2179 | ivsg_la_alt2ad4r | 458 | 552.8 | -76.8 | 1493.2 | 558.1 | 1.299 | 0.784 | DEVERS 230.00 - VSTA 230.00 2, VSTA 230.00 - DEVERS 230.00 1 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_2238 | ivsg_la_alt2ad4r | 1411.6 | 1884.9 | 230.5 | 2048.5 | 1899 | 1.271 | 1.181 | S.ONOFRE 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2246 | ivsg_la_alt2ad4r | 458 | 571.1 | 74.5 | 1459.8 | 575.9 | 1.27 | 1.101 | VSTA 230.00 - DEVERS 230.00 1, COACHELV 230.00 - DEVERS 230.00 2 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_2240 | ivsg_la_alt2ad4r | 1411.6 | 1878.3 | 221.6 | 2038.3 | 1891.4 | 1.265 | 1.181 | CHINO 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_2239 | ivsg_la_alt2ad4r | 1411.6 | 1878 | 218.2 | 2036.9 | 1890.6 | 1.264 | 1.181 | CHINO 230.00 - S.ONOFRE 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_N-218 | ivsg_la_alt2ad4r | 1411.6 | 1836 | 190.5 | 1982.2 | 1845.9 | 1.23 | 1.181 | line MIDPINTS to DEVERS 500 ck 1&2 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | 23021/22/23/41 | ivsg_la_alt2ad4r | 1120 | -1375.6 | -26.3 | 3576.1 | 1375.9 | 1.23 | 0.98 | MIGUEL 230 CORRIDOR West of SN |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_2179 | ivsg_la_alt2ad4r | 1411.6 | 1828.3 | 196.1 | 1975.1 | 1838.8 | 1.225 | 1.181 | DEVERS 230.00 - VSTA 230.00 2, VSTA 230.00 - DEVERS 230.00 1 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_2175 | ivsg_la_alt2ad4r | 1411.6 | 1822.7 | 191.9 | 1967.6 | 1832.7 | 1.221 | 1.181 | DEVERS 230.00 - SANBRDNO 230.00 1, DEVERS 230.00 - VSTA 230.00 2 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_2177 | ivsg_la_alt2ad4r | 1411.6 | 1822.7 | 191.9 | 1967.6 | 1832.7 | 1.221 | 1.181 | DEVERS 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_2178 | ivsg_la_alt2ad4r | 1411.6 | 1822.7 | 191.9 | 1967.6 | 1832.7 | 1.221 | 1.181 | DEVERS 230.00 - VSTA 230.00 2, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_2180 | ivsg_la_alt2ad4r | 1411.6 | 1822.7 | 191.9 | 1967.6 | 1832.7 | 1.221 | 1.181 | SANBRDNO 230.00 - DEVERS 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_2247 | ivsg_la_alt2ad4r | 1411.6 | 1822.7 | 191.9 | 1967.6 | 1832.7 | 1.221 | 1.181 | DEVERS 230.00 - VSTA 230.00 2, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2168 | ivsg_la_alt2ad4r | 458 | 546 | 68.5 | 1396.3 | 550.3 | 1.215 | 1.101 | DEVERS 230.00 - VSTA 230.00 2, ETIWANDA 230.00 - SANBRDNO 230.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2171 | ivsg_la_alt2ad4r | 458 | 546 | 68.5 | 1396.3 | 550.3 | 1.215 | 1.101 | ETIWANDA 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 24900 | MIDPINTS | 500 | 80150 | IH500 | 500 | 1 | line_N-218 | ivsg_la_alt2ad4r | 3420 | 2821.1 | 478.2 | 3273.8 | 2861.3 | 1.192 | 0.673 | line MIDPINTS to DEVERS 500 ck 1&2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2179 | ivsg_la_alt2ad4r | 2598 | 3001.6 | 450.9 | 3557 | 3035.2 | 1.186 | 1.011 | DEVERS 230.00 - VSTA 230.00 2, VSTA 230.00 - DEVERS 230.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2175 | ivsg_la_alt2ad4r | 2598 | 2950.3 | 409.2 | 3495 | 2978.6 | 1.165 | 1.011 | DEVERS 230.00 - SANBRDNO 230.00 1, DEVERS 230.00 - VSTA 230.00 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2177 | ivsg_la_alt2ad4r | 2598 | 2950.3 | 409.2 | 3495 | 2978.6 | 1.165 | 1.011 | DEVERS 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2178 | ivsg_la_alt2ad4r | 2598 | 2950.3 | 409.2 | 3495 | 2978.6 | 1.165 | 1.011 | DEVERS 230.00 - VSTA 230.00 2, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2180 | ivsg_la_alt2ad4r | 2598 | 2950.3 | 409.2 | 3495 | 2978.6 | 1.165 | 1.011 | SANBRDNO 230.00 - DEVERS 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2247 | ivsg_la_alt2ad4r | 2598 | 2950.3 | 409.2 | 3495 | 2978.6 | 1.165 | 1.011 | DEVERS 230.00 - VSTA 230.00 2, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2233 | ivsg_la_alt2ad4r | 458 | 514.8 | 42.9 | 1338.1 | 516.6 | 1.164 | 1.101 | MOENKOPI 500.00 - ELDORDO 500.00 1, PISGAH 230.00 - ELDORDO 230.00 2 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2258 | ivsg_la_alt2ad4r | 458 | 513.1 | 46.5 | 1334.2 | 515.2 | 1.16 | 1.101 | LUGO 500.00 - VINCENT 500.00 2, LUGO 500.00 - VICTORVL 500.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2256 | ivsg_la_alt2ad4r | 458 | 510.4 | 47.1 | 1327.1 | 512.6 | 1.154 | 1.101 | ELDORDO 500.00 - LUGO 500.00 1, LUGO 500.00 - MIRALOMA 500.00 2 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2191 | ivsg_la_alt2ad4r | 458 | 510 | 47.1 | 1322.8 | 512.1 | 1.151 | 1.101 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - ELDORDO 230.00 2 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2192 | ivsg_la_alt2ad4r | 458 | 509.6 | 47.2 | 1321.6 | 511.8 | 1.15 | 1.101 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2193 | ivsg_la_alt2ad4r | 458 | 509.6 | 47.2 | 1321.6 | 511.8 | 1.15 | 1.101 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - LUGO 230.00 2 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2115 | ivsg_la_alt2ad4r | 458 | 506.9 | 48.3 | 1320.5 | 509.2 | 1.149 | 1.101 | S.ONOFRE 230.00 - SANTIAGO 230.00 1, S.ONOFRE 230.00 - SANTIAGO 230.00 2 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | 23002/06/10 | ivsg_la_alt2ad4r | 458 | 511.4 | 46.5 | 1321.2 | 513.5 | 1.149 | 1.101 | SANLUISREY 230 CORRIDOR |
| 22672 | PRCTRVLY | 138 | 22852 | TELECYN | 138 | 1 | 23021/22/23/41 | ivsg_la_alt2ad4r | 478 | 523.4 | -41 | 2289 | 525 | 1.145 | 0.607 | MIGUEL 230 CORRIDOR West of SN |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2255 | ivsg_la_alt2ad4r | 458 | 505.6 | 48.5 | 1309.7 | 507.9 | 1.139 | 1.101 | LUGO 500.00 - MIRALOMA 500.00 3, LUGO 500.00 - MOHAVE 500.00 1 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_2258 | ivsg_la_alt2ad4r | 1411.6 | 1706.6 | 169.5 | 1834.6 | 1715 | 1.139 | 1.181 | LUGO 500.00 - VINCENT 500.00 2, LUGO 500.00 - VICTORVL 500.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2200 | ivsg_la_alt2ad4r | 458 | 504.5 | 48.6 | 1303.7 | 506.9 | 1.134 | 1.101 | LUGO 500.00 - MOHAVE 500.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2201 | ivsg_la_alt2ad4r | 458 | 504.5 | 48.6 | 1303.6 | 506.9 | 1.134 | 1.101 | LUGO 500.00 - MOHAVE 500.00 1, PISGAH 230.00 - LUGO 230.00 2 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_N-210 | ivsg_la_alt2ad4r | 800 | 882.4 | 71.5 | 2276.3 | 885.3 | 1.134 | 0.821 | EL CENTRO IMPERIAL VALLEY 230 CKTS 2&3 |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_2238 | ivsg_la_alt2ad4r | 458 | 483.7 | -49.1 | 1301.1 | 486.1 | 1.132 | 0.784 | S.ONOFRE 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_2238 | ivsg_la_alt2ad4r | 1645.4 | 1952.9 | 244.8 | 2142.4 | 1968.1 | 1.129 | 1.039 | S.ONOFRE 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 8601 | GEOSUB2 | 230 | 8300 | BANIS230 | 230 | 1 | line_N-204 | ivsg_la_alt2ad4r | 550 | 593.5 | 91.8 | 1550.1 | 600.6 | 1.123 | 0.773 | COACHELLA MIDWAY 230 CKT 1&2 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_2240 | ivsg_la_alt2ad4r | 1645.4 | 1945.9 | 235.1 | 2130.8 | 1960 | 1.122 | 1.039 | CHINO 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_2239 | ivsg_la_alt2ad4r | 1645.4 | 1946 | 231.1 | 2129.5 | 1959.7 | 1.121 | 1.039 | CHINO 230.00 - S.ONOFRE 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2170 | ivsg_la_alt2ad4r | 2598 | 2851.3 | 366.3 | 3356.4 | 2874.7 | 1.119 | 1.011 | ETIWANDA 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - SANBRDNO 230.00 2 |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_2239 | ivsg_la_alt2ad4r | 458 | 481.2 | -49.2 | 1285.9 | 483.7 | 1.118 | 0.784 | CHINO 230.00 - S.ONOFRE 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_2240 | ivsg_la_alt2ad4r | 458 | 479.8 | -47.8 | 1283.6 | 482.2 | 1.116 | 0.784 | CHINO 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2172 | ivsg_la_alt2ad4r | 2598 | 2843 | 348.6 | 3336.9 | 2864.3 | 1.112 | 1.011 | VSTA 230.00 - SANBRDNO 230.00 2, VSTA 230.00 - DEVERS 230.00 1 |
| 24901 | VSTA | 230 | 24132 | SANBRDNO | 230 | 2 | line_2179 | ivsg_la_alt2ad4r | 916 | -956.2 | 92.5 | 2541.2 | 960.7 | 1.105 | 0.539 | DEVERS 230.00 - VSTA 230.00 2, VSTA 230.00 - DEVERS 230.00 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23022/23023 | ivsg_la_alt2ad4r | 392 | 430.4 | 16.8 | 1137.6 | 430.8 | 1.1 | 0.79 | ML-MS1+ ML-MS2 230KV |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2168 | ivsg_la_alt2ad4r | 2598 | 2809 | 311.5 | 3289.3 | 2826.2 | 1.096 | 1.011 | DEVERS 230.00 - VSTA 230.00 2, ETIWANDA 230.00 - SANBRDNO 230.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2171 | ivsg_la_alt2ad4r | 2598 | 2809 | 311.5 | 3289.3 | 2826.2 | 1.096 | 1.011 | ETIWANDA 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 24016 | BARRE | 230 | 24044 | ELLIS | 230 | 1 | line_2115 | ivsg_la_alt2ad4r | 988 | 1007.8 | -136.5 | 2712.2 | 1017 | 1.094 | 0.349 | S.ONOFRE 230.00 - SANTIAGO 230.00 1, S.ONOFRE 230.00 - SANTIAGO 230.00 2 |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_2176 | ivsg_la_alt2ad4r | 458 | 470 | -78.2 | 1253.1 | 476.5 | 1.09 | 0.784 | DEVERS 230.00 - SANBRDNO 230.00 1, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_N-218 | ivsg_la_alt2ad4r | 1645.4 | 1897.3 | 201.6 | 2064.1 | 1907.9 | 1.086 | 1.039 | line MIDPINTS to DEVERS 500 ck 1&2 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_2179 | ivsg_la_alt2ad4r | 1645.4 | 1888.2 | 209 | 2055.8 | 1899.7 | 1.083 | 1.039 | DEVERS 230.00 - VSTA 230.00 2, VSTA 230.00 - DEVERS 230.00 1 |
| 24901 | VSTA | 230 | 24132 | SANBRDNO | 230 | 2 | line_2168 | ivsg_la_alt2ad4r | 916 | -944 | -7.6 | 2486.8 | 944 | 1.082 | 0.539 | DEVERS 230.00 - VSTA 230.00 2, ETIWANDA 230.00 - SANBRDNO 230.00 1 |
| 24901 | VSTA | 230 | 24132 | SANBRDNO | 230 | 2 | line_2171 | ivsg_la_alt2ad4r | 916 | -944 | -7.6 | 2486.8 | 944 | 1.082 | 0.539 | ETIWANDA 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_2175 | ivsg_la_alt2ad4r | 1645.4 | 1881.7 | 204.5 | 2046.9 | 1892.8 | 1.078 | 1.039 | DEVERS 230.00 - SANBRDNO 230.00 1, DEVERS 230.00 - VSTA 230.00 2 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_2177 | ivsg_la_alt2ad4r | 1645.4 | 1881.7 | 204.5 | 2046.9 | 1892.8 | 1.078 | 1.039 | DEVERS 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_2178 | ivsg_la_alt2ad4r | 1645.4 | 1881.7 | 204.5 | 2046.9 | 1892.8 | 1.078 | 1.039 | DEVERS 230.00 - VSTA 230.00 2, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_2180 | ivsg_la_alt2ad4r | 1645.4 | 1881.7 | 204.5 | 2046.9 | 1892.8 | 1.078 | 1.039 | SANBRDNO 230.00 - DEVERS 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_2247 | ivsg_la_alt2ad4r | 1645.4 | 1881.7 | 204.5 | 2046.9 | 1892.8 | 1.078 | 1.039 | DEVERS 230.00 - VSTA 230.00 2, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2167 | ivsg_la_alt2ad4r | 2598 | 2759.3 | 275.1 | 3231.5 | 2773 | 1.077 | 1.011 | DEVERS 230.00 - SANBRDNO 230.00 1, ETIWANDA 230.00 - SANBRDNO 230.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2169 | ivsg_la_alt2ad4r | 2598 | 2759.3 | 275.1 | 3231.5 | 2773 | 1.077 | 1.011 | ETIWANDA 230.00 - SANBRDNO 230.00 1, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2268 | ivsg_la_alt2ad4r | 2598 | 2759.3 | 275.1 | 3231.5 | 2773 | 1.077 | 1.011 | ETIWANDA 230.00 - SANBRDNO 230.00 1, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 8319 | DIXIELAN | 92 | 8946 | DIXPRI2 | 92 | 1 | line_N-210 | ivsg_la_alt2ad4r | 54 | -57.2 | 7.5 | 364.4 | 57.7 | 1.076 | 0.334 | EL CENTRO IMPERIAL VALLEY 230 CKTS 2&3 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2233 | ivsg_la_alt2ad4r | 2598 | 2708.5 | 222.9 | 3222.8 | 2717.7 | 1.074 | 1.011 | MOENKOPI 500.00 - ELDORDO 500.00 1, PISGAH 230.00 - ELDORDO 230.00 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2246 | ivsg_la_alt2ad4r | 2598 | 2752.3 | 268.5 | 3221.7 | 2765.4 | 1.074 | 1.011 | VSTA 230.00 - DEVERS 230.00 1, COACHELV 230.00 - DEVERS 230.00 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2173 | ivsg_la_alt2ad4r | 2598 | 2741.3 | 267.5 | 3214.9 | 2754.3 | 1.072 | 1.011 | SANBRDNO 230.00 - DEVERS 230.00 1, VSTA 230.00 - SANBRDNO 230.00 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2174 | ivsg_la_alt2ad4r | 2598 | 2741.3 | 267.5 | 3214.9 | 2754.3 | 1.072 | 1.011 | DEVERS 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - SANBRDNO 230.00 2 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_2260 | ivsg_la_alt2ad4r | 56 | 59.5 | -4.9 | 295.4 | 59.7 | 1.07 | 0.94 | KRAMER 230.00 - LUGO 230.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | 23021/23041 | ivsg_la_alt2ad4r | 1120 | -1188.8 | -38.4 | 3035.4 | 1189.4 | 1.07 | 0.98 | ML-SX + OM-SX 230KV |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2176 | ivsg_la_alt2ad4r | 2598 | 2738.1 | 257.7 | 3205.4 | 2750.2 | 1.068 | 1.011 | DEVERS 230.00 - SANBRDNO 230.00 1, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2258 | ivsg_la_alt2ad4r | 2598 | 2689.6 | 246.7 | 3200.2 | 2700.9 | 1.067 | 1.011 | LUGO 500.00 - VINCENT 500.00 2, LUGO 500.00 - VICTORVL 500.00 1 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23022/23023 | ivsg_la_alt2ad4r | 408.3 | -425 | 35 | 1813.5 | 426.4 | 1.062 | 0.751 | ML-MS1+ ML-MS2 230KV |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2256 | ivsg_la_alt2ad4r | 2598 | 2676.1 | 251.7 | 3183.2 | 2687.9 | 1.061 | 1.011 | ELDORDO 500.00 - LUGO 500.00 1, LUGO 500.00 - MIRALOMA 500.00 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2164 | ivsg_la_alt2ad4r | 2598 | 2732.3 | 258 | 3180.7 | 2744.5 | 1.06 | 1.011 | MIRALOMA 230.00 - VSTA 230.00 1, MIRALOMA 230.00 - VSTA 230.00 2 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | 23022/23023 | ivsg_la_alt2ad4r | 1120 | -1180.5 | -51.1 | 3023.7 | 1181.6 | 1.06 | 0.98 | ML-MS1+ ML-MS2 230KV |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2115 | ivsg_la_alt2ad4r | 2598 | 2664.5 | 287.2 | 3176.9 | 2680 | 1.059 | 1.011 | S.ONOFRE 230.00 - SANTIAGO 230.00 1, S.ONOFRE 230.00 - SANTIAGO 230.00 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2191 | ivsg_la_alt2ad4r | 2598 | 2672.9 | 240.9 | 3171 | 2683.7 | 1.057 | 1.011 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - ELDORDO 230.00 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | 23002/06/10 | ivsg_la_alt2ad4r | 2598 | 2686 | 225.2 | 3171.5 | 2695.4 | 1.057 | 1.011 | SANLUISREY 230 CORRIDOR |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | 23021/22/23/41 | ivsg_la_alt2ad4r | 2598 | 2718.3 | 183.5 | 3170.5 | 2724.5 | 1.057 | 1.011 | MIGUEL 230 CORRIDOR West of SN |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2192 | ivsg_la_alt2ad4r | 2598 | 2670.4 | 241.5 | 3167.5 | 2681.3 | 1.056 | 1.011 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2193 | ivsg_la_alt2ad4r | 2598 | 2670.3 | 241.5 | 3167.5 | 2681.2 | 1.056 | 1.011 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - LUGO 230.00 2 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_N-218 | ivsg_la_alt2ad4r | 458 | 467.3 | 23.8 | 1214.2 | 467.9 | 1.056 | 1.101 | line MIDPINTS to DEVERS 500 ck 1&2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2166 | ivsg_la_alt2ad4r | 2598 | 2710.1 | 244.9 | 3155.6 | 2721.1 | 1.052 | 1.011 | ETIWANDA 230.00 - SANBRDNO 230.00 1, ETIWANDA 230.00 - VSTA 230.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2165 | ivsg_la_alt2ad4r | 2598 | 2705.5 | 242.2 | 3149.8 | 2716.3 | 1.05 | 1.011 | ETIWANDA 230.00 - SANBRDNO 230.00 1, MIRALOMA 230.00 - VSTA 230.00 2 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | line_2239 | ivsg_la_alt2ad4r | 1120 | -1165.9 | -51.8 | 3029.7 | 1167 | 1.05 | 0.98 | CHINO 230.00 - S.ONOFRE 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | line_2240 | ivsg_la_alt2ad4r | 1120 | -1167.3 | -53.6 | 3040.1 | 1168.5 | 1.05 | 0.98 | CHINO 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_N-204 | ivsg_la_alt2ad4r | 458 | 474 | 43.2 | 1204.1 | 475.9 | 1.047 | 1.101 | COACHELLA MIDWAY 230 CKT 1&2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2255 | ivsg_la_alt2ad4r | 2598 | 2649.3 | 245.2 | 3137.7 | 2660.6 | 1.046 | 1.011 | LUGO 500.00 - MIRALOMA 500.00 3, LUGO 500.00 - MOHAVE 500.00 1 |
| 24901 | VSTA | 230 | 24804 | DEVERS | 230 | 1 | line_2175 | ivsg_la_alt2ad4r | 988 | -941.2 | 260 | 2588.3 | 976.4 | 1.044 | 0.696 | DEVERS 230.00 - SANBRDNO 230.00 1, DEVERS 230.00 - VSTA 230.00 2 |
| 24804 | DEVERS | 230 | 24901 | VSTA | 230 | 2 | line_2177 | ivsg_la_alt2ad4r | 988 | 986.8 | 223.6 | 2589.1 | 1011.8 | 1.044 | 0.696 | DEVERS 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 24901 | VSTA | 230 | 24804 | DEVERS | 230 | 1 | line_2178 | ivsg_la_alt2ad4r | 988 | -941.2 | 260 | 2588.3 | 976.4 | 1.044 | 0.696 | DEVERS 230.00 - VSTA 230.00 2, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 24804 | DEVERS | 230 | 24901 | VSTA | 230 | 2 | line_2180 | ivsg_la_alt2ad4r | 988 | 986.8 | 223.6 | 2589.1 | 1011.8 | 1.044 | 0.696 | SANBRDNO 230.00 - DEVERS 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 24901 | VSTA | 230 | 24804 | DEVERS | 230 | 1 | line_2247 | ivsg_la_alt2ad4r | 988 | -941.2 | 260 | 2588.3 | 976.4 | 1.044 | 0.696 | DEVERS 230.00 - VSTA 230.00 2, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2194 | ivsg_la_alt2ad4r | 2598 | 2652.5 | 223.7 | 3125.5 | 2662 | 1.042 | 1.011 | LUGO 500.00 - MIRALOMA 500.00 2, LUGO 500.00 - MIRALOMA 500.00 3 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_N-204 | ivsg_la_alt2ad4r | 800 | 786 | 30.9 | 2080.4 | 786.6 | 1.036 | 0.821 | COACHELLA MIDWAY 230 CKT 1&2 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2172 | ivsg_la_alt2ad4r | 458 | 467.8 | 37 | 1190.5 | 469.3 | 1.035 | 1.101 | VSTA 230.00 - SANBRDNO 230.00 2, VSTA 230.00 - DEVERS 230.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2164 | ivsg_la_alt2ad4r | 458 | 467.7 | 49.2 | 1187.8 | 470.2 | 1.034 | 1.101 | MIRALOMA 230.00 - VSTA 230.00 1, MIRALOMA 230.00 - VSTA 230.00 2 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | 23021/22/23/41 | ivsg_la_alt2ad4r | 388 | -390 | 6.1 | 1005.9 | 390 | 1.033 | 0.905 | MIGUEL 230 CORRIDOR West of SN |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | line_2238 | ivsg_la_alt2ad4r | 1120 | -1147.8 | -49.9 | 2960.6 | 1148.9 | 1.03 | 0.98 | S.ONOFRE 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 8600 | GEOSUB1 | 230 | 8300 | BANIS230 | 230 | 1 | line_N-204 | ivsg_la_alt2ad4r | 550 | 543.7 | 81.6 | 1420.1 | 549.8 | 1.029 | 0.716 | COACHELLA MIDWAY 230 CKT 1&2 |
| 8600 | GEOSUB1 | 230 | 8300 | BANIS230 | 230 | 2 | line_N-204 | ivsg_la_alt2ad4r | 550 | 543.7 | 81.6 | 1420.1 | 549.8 | 1.029 | 0.716 | COACHELLA MIDWAY 230 CKT 1&2 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 2 | line_2029 | ivsg_la_alt2ad4r | 1195 | 1163.8 | -127.5 | 3078.1 | 1170.8 | 1.026 | 0.506 | LEWIS 230.00 - SERRANO 230.00 1, SERRANO 230.00 - VILLA PK 230.00 1 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 2 | line_2031 | ivsg_la_alt2ad4r | 1195 | 1163.8 | -127.5 | 3078.1 | 1170.8 | 1.026 | 0.506 | LEWIS 230.00 - SERRANO 230.00 2, SERRANO 230.00 - VILLA PK 230.00 1 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 2 | line_2278 | ivsg_la_alt2ad4r | 1195 | 1163.8 | -127.5 | 3078.1 | 1170.8 | 1.026 | 0.506 | LEWIS 230.00 - SERRANO 230.00 1, SERRANO 230.00 - VILLA PK 230.00 1 |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_2173 | ivsg_la_alt2ad4r | 458 | 441.8 | -95.8 | 1176.4 | 452 | 1.023 | 0.784 | SANBRDNO 230.00 - DEVERS 230.00 1, VSTA 230.00 - SANBRDNO 230.00 2 |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_2174 | ivsg_la_alt2ad4r | 458 | 441.8 | -95.8 | 1176.4 | 452 | 1.023 | 0.784 | DEVERS 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - SANBRDNO 230.00 2 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2196 | ivsg_la_alt2ad4r | 458 | 461.1 | 40.8 | 1176.4 | 462.9 | 1.023 | 1.101 | ETIWANDA 230.00 - SANBRDNO 230.00 1, LUGO 500.00 - MIRALOMA 500.00 2 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2198 | ivsg_la_alt2ad4r | 458 | 461 | 40.8 | 1176.1 | 462.8 | 1.023 | 1.101 | ETIWANDA 230.00 - SANBRDNO 230.00 1, LUGO 500.00 - MIRALOMA 500.00 3 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | line_2179 | ivsg_la_alt2ad4r | 1120 | -1135.5 | -48.9 | 2921 | 1136.5 | 1.02 | 0.98 | DEVERS 230.00 - VSTA 230.00 2, VSTA 230.00 - DEVERS 230.00 1 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | line_N-203 | ivsg_la_alt2ad4r | 1120 | -1132.3 | -41 | 2903 | 1133 | 1.02 | 0.98 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | line_N-204 | ivsg_la_alt2ad4r | 1120 | -1140.7 | -13.6 | 2981.6 | 1140.7 | 1.02 | 0.98 | COACHELLA MIDWAY 230 CKT 1&2 |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_2167 | ivsg_la_alt2ad4r | 458 | 440.9 | -72.4 | 1171.1 | 446.8 | 1.019 | 0.784 | DEVERS 230.00 - SANBRDNO 230.00 1, ETIWANDA 230.00 - SANBRDNO 230.00 1 |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_2169 | ivsg_la_alt2ad4r | 458 | 440.9 | -72.4 | 1171.1 | 446.8 | 1.019 | 0.784 | ETIWANDA 230.00 - SANBRDNO 230.00 1, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_2268 | ivsg_la_alt2ad4r | 458 | 440.9 | -72.4 | 1171.1 | 446.8 | 1.019 | 0.784 | ETIWANDA 230.00 - SANBRDNO 230.00 1, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 24701 | KRAMER | 230 | 24085 | LUGO | 230 | 2 | line_2260 | ivsg_la_alt2ad4r | 478 | 477.4 | 75.3 | 1221.9 | 483.3 | 1.018 | 0.611 | KRAMER 230.00 - LUGO 230.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_N-203 | ivsg_la_alt2ad4r | 458 | 461.2 | 41.6 | 1170 | 463.1 | 1.018 | 1.101 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2209 | ivsg_la_alt2ad4r | 458 | 458.9 | 41.5 | 1166.6 | 460.8 | 1.015 | 1.101 | ETIWANDA 230.00 - SANBRDNO 230.00 1, LUGO 500.00 - SERRANO 500.00 1 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | line_2175 | ivsg_la_alt2ad4r | 1120 | -1130.7 | -48.1 | 2903.8 | 1131.7 | 1.01 | 0.98 | DEVERS 230.00 - SANBRDNO 230.00 1, DEVERS 230.00 - VSTA 230.00 2 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | line_2177 | ivsg_la_alt2ad4r | 1120 | -1130.7 | -48.1 | 2903.8 | 1131.7 | 1.01 | 0.98 | DEVERS 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | line_2178 | ivsg_la_alt2ad4r | 1120 | -1130.7 | -48.1 | 2903.8 | 1131.7 | 1.01 | 0.98 | DEVERS 230.00 - VSTA 230.00 2, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | line_2180 | ivsg_la_alt2ad4r | 1120 | -1130.7 | -48.1 | 2903.8 | 1131.7 | 1.01 | 0.98 | SANBRDNO 230.00 - DEVERS 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | line_2247 | ivsg_la_alt2ad4r | 1120 | -1130.7 | -48.1 | 2903.8 | 1131.7 | 1.01 | 0.98 | DEVERS 230.00 - VSTA 230.00 2, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 24056 | ETIWANDA | 230 | 24132 | SANBRDNO | 230 | 1 | line_2172 | ivsg_la_alt2ad4r | 797 | -762.1 | 66.6 | 2009.9 | 765 | 1.005 | 0.479 | VSTA 230.00 - SANBRDNO 230.00 2, VSTA 230.00 - DEVERS 230.00 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_2191 | ivsg_la_alt2ad4r | 1645.4 | 1748.4 | 212.3 | 1900 | 1761.2 | 1.003 | 1.039 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - ELDORDO 230.00 2 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_2192 | ivsg_la_alt2ad4r | 1645.4 | 1750.1 | 209.2 | 1900.9 | 1762.6 | 1.003 | 1.039 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_2193 | ivsg_la_alt2ad4r | 1645.4 | 1750.1 | 209.2 | 1901 | 1762.6 | 1.003 | 1.039 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - LUGO 230.00 2 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_2258 | ivsg_la_alt2ad4r | 1645.4 | 1754.6 | 198.9 | 1900.5 | 1765.8 | 1.003 | 1.039 | LUGO 500.00 - VINCENT 500.00 2, LUGO 500.00 - VICTORVL 500.00 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_2256 | ivsg_la_alt2ad4r | 1645.4 | 1745.3 | 208 | 1895.3 | 1757.7 | 1 | 1.039 | ELDORDO 500.00 - LUGO 500.00 1, LUGO 500.00 - MIRALOMA 500.00 2 |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | 23022/23023 | ivsg_la_alt2ad4r | 382.4 | 375.6 | -12.5 | 1599.7 | 375.8 | 1 | 0.677 | ML-MS1+ ML-MS2 230KV |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_2214 | ivsg_la_alt2ad4r | 56 | 54.9 | -4 | 270.9 | 55.1 | 0.99 | 0.94 | LUGO 500.00 - VINCENT 500.00 1, LUGO 500.00 - VINCENT 500.00 2 |
| 24042 | ELDORDO | 500 | 24086 | LUGO | 500 | 1 | line_2258 | ivsg_la_alt2ad4r | 1386 | 1399.7 | 122.3 | 1574.4 | 1405.1 | 0.989 | 0.736 | LUGO 500.00 - VINCENT 500.00 2, LUGO 500.00 - VICTORVL 500.00 1 |
| 19051 | KNOB | 161 | 8367 | PILOTKNB | 161 | 1 | line_N-204 | ivsg_la_alt2ad4r | 165 | -162.8 | 20.2 | 584.8 | 164.1 | 0.989 | 0.803 | COACHELLA MIDWAY 230 CKT 1&2 |
| 24804 | DEVERS | 230 | 24901 | VSTA | 230 | 2 | line_2172 | ivsg_la_alt2ad4r | 988 | 938.7 | 225.9 | 2449.2 | 965.5 | 0.988 | 0.696 | VSTA 230.00 - SANBRDNO 230.00 2, VSTA 230.00 - DEVERS 230.00 1 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | 23022/23023 | ivsg_la_alt2ad4r | 388 | -373.1 | 7.2 | 959.3 | 373.1 | 0.985 | 0.905 | ML-MS1+ ML-MS2 230KV |
| 24132 | SANBRDNO | 230 | 24804 | DEVERS | 230 | 1 | line_2179 | ivsg_la_alt2ad4r | 988 | -895.8 | 212.9 | 2428.8 | 920.8 | 0.98 | 0.64 | DEVERS 230.00 - VSTA 230.00 2, VSTA 230.00 - DEVERS 230.00 1 |
| 20238 | HRD-230 | 230 | 20239 | HRD-115 | 115 | 1 | 23021/22/23/41 | ivsg_la_alt2ad4r | 225 | 218.5 | -21.4 | 562.6 | 219.6 | 0.98 | 0.88 | MIGUEL 230 CORRIDOR West of SN |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2022 | ivsg_la_alt2ad4r | 2598 | 2517.4 | 188.6 | 2932.3 | 2524.5 | 0.977 | 1.011 | BARRE 230.00 - VILLA PK 230.00 1, BARRE 230.00 - LEWIS 230.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2165 | ivsg_la_alt2ad4r | 458 | 442.4 | 40.3 | 1123.5 | 444.2 | 0.977 | 1.101 | ETIWANDA 230.00 - SANBRDNO 230.00 1, MIRALOMA 230.00 - VSTA 230.00 2 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2166 | ivsg_la_alt2ad4r | 458 | 441.2 | 40.2 | 1120.3 | 443 | 0.975 | 1.101 | ETIWANDA 230.00 - SANBRDNO 230.00 1, ETIWANDA 230.00 - VSTA 230.00 1 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | line_2240 | ivsg_la_alt2ad4r | 388 | -366.8 | 6.1 | 947.1 | 366.9 | 0.972 | 0.905 | CHINO 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | line_N-204 | ivsg_la_alt2ad4r | 388 | -365.2 | 9.6 | 946.5 | 365.3 | 0.972 | 0.905 | COACHELLA MIDWAY 230 CKT 1&2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_N-204 | ivsg_la_alt2ad4r | 2598 | 2507.9 | 127.1 | 2913.5 | 2511.1 | 0.971 | 1.011 | COACHELLA MIDWAY 230 CKT 1&2 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_2121 | ivsg_la_alt2ad4r | 56 | 53.5 | -5.6 | 265.3 | 53.8 | 0.97 | 0.94 | S.CLARA 230.00 - MANDALAY 230.00 1, S.CLARA 230.00 - MANDALAY 230.00 2 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_2154 | ivsg_la_alt2ad4r | 56 | 53.6 | -5.3 | 265.9 | 53.9 | 0.97 | 0.94 | MIRALOMA 230.00 - OLINDA 230.00 1, MIRALOMA 230.00 - WALNUT 230.00 1 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | line_2239 | ivsg_la_alt2ad4r | 388 | -365.9 | 6.5 | 944.2 | 366 | 0.969 | 0.905 | CHINO 230.00 - S.ONOFRE 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 24056 | ETIWANDA | 230 | 24901 | VSTA | 230 | 1 | line_2164 | ivsg_la_alt2ad4r | 797 | -725.6 | 135.7 | 1923.4 | 738.2 | 0.962 | 0.425 | MIRALOMA 230.00 - VSTA 230.00 1, MIRALOMA 230.00 - VSTA 230.00 2 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 1 | line_2030 | ivsg_la_alt2ad4r | 1287 | 1163.8 | -127.5 | 3078.1 | 1170.8 | 0.953 | 0.47 | LEWIS 230.00 - SERRANO 230.00 1, SERRANO 230.00 - VILLA PK 230.00 2 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 1 | line_2032 | ivsg_la_alt2ad4r | 1287 | 1163.8 | -127.5 | 3078.1 | 1170.8 | 0.953 | 0.47 | LEWIS 230.00 - SERRANO 230.00 2, SERRANO 230.00 - VILLA PK 230.00 2 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | line_2238 | ivsg_la_alt2ad4r | 388 | -360.2 | 8 | 927.3 | 360.3 | 0.952 | 0.905 | S.ONOFRE 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_2246 | ivsg_la_alt2ad4r | 458 | 414 | -54.1 | 1093 | 417.5 | 0.951 | 0.784 | VSTA 230.00 - DEVERS 230.00 1, COACHELV 230.00 - DEVERS 230.00 2 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | 23011/23003 | ivsg_la_alt2ad4r | 1120 | -1055.7 | -46.4 | 2654.7 | 1056.7 | 0.95 | 0.98 | SA-EA 230KV + SA-ES-EA 230KV |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 13821C/25/23051A | ivsg_la_alt2ad4r | 204.1 | 190.1 | -19.1 | 810.6 | 191 | 0.949 | 0.536 | CH-ES-NCM-SX |
| 24804 | DEVERS | 230 | 24901 | VSTA | 230 | 2 | line_2238 | ivsg_la_alt2ad4r | 988 | 892.6 | 226.5 | 2349.9 | 920.9 | 0.948 | 0.696 | S.ONOFRE 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 24901 | VSTA | 230 | 24804 | DEVERS | 230 | 1 | line_2238 | ivsg_la_alt2ad4r | 988 | -855 | 169.4 | 2351.3 | 871.7 | 0.948 | 0.696 | S.ONOFRE 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 24016 | BARRE | 230 | 25201 | LEWIS | 230 | 1 | line_2115 | ivsg_la_alt2ad4r | 1195 | -1027.4 | 270.4 | 2833.3 | 1062.4 | 0.945 | 0.586 | S.ONOFRE 230.00 - SANTIAGO 230.00 1, S.ONOFRE 230.00 - SANTIAGO 230.00 2 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | line_2179 | ivsg_la_alt2ad4r | 388 | -357.1 | 8.8 | 918.4 | 357.2 | 0.943 | 0.905 | DEVERS 230.00 - VSTA 230.00 2, VSTA 230.00 - DEVERS 230.00 1 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | line_2114 | ivsg_la_alt2ad4r | 1120 | -1045.5 | -46.2 | 2617.5 | 1046.6 | 0.94 | 0.98 | ELLIS 230.00 - SANTIAGO 230.00 1, JOHANNA 230.00 - SANTIAGO 230.00 1 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | line_2116 | ivsg_la_alt2ad4r | 1120 | -1042.9 | -46.3 | 2609.8 | 1044 | 0.94 | 0.98 | S.ONOFRE 230.00 - SANTIAGO 230.00 1, S.ONOFRE 230.00 - SERRANO 230.00 1 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | line_2118 | ivsg_la_alt2ad4r | 1120 | -1042.9 | -46.3 | 2609.8 | 1044 | 0.94 | 0.98 | S.ONOFRE 230.00 - SANTIAGO 230.00 2, S.ONOFRE 230.00 - SERRANO 230.00 1 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2191 | ivsg_la_alt2ad4r | 2400 | -2230.2 | 436.7 | 2598.9 | 2272.5 | 0.94 | 0.682 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - ELDORDO 230.00 2 |
| 24801 | DEVERS | 500 | 24804 | DEVERS | 230 | 1 | line_2238 | ivsg_la_alt2ad4r | 1120 | 745.2 | 745.6 | 1197.5 | 1054.2 | 0.94 | 0.51 | S.ONOFRE 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | line_N-203 | ivsg_la_alt2ad4r | 388 | -356.1 | 9.8 | 915.5 | 356.2 | 0.94 | 0.905 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 20238 | HRD-230 | 230 | 20239 | HRD-115 | 115 | 1 | 23022/23023 | ivsg_la_alt2ad4r | 225 | 210.9 | -17.8 | 541.2 | 211.6 | 0.94 | 0.88 | ML-MS1+ ML-MS2 230KV |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | line_2175 | ivsg_la_alt2ad4r | 388 | -355.6 | 9.2 | 914.2 | 355.7 | 0.939 | 0.905 | DEVERS 230.00 - SANBRDNO 230.00 1, DEVERS 230.00 - VSTA 230.00 2 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | line_2177 | ivsg_la_alt2ad4r | 388 | -355.6 | 9.2 | 914.2 | 355.7 | 0.939 | 0.905 | DEVERS 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | line_2178 | ivsg_la_alt2ad4r | 388 | -355.6 | 9.2 | 914.2 | 355.7 | 0.939 | 0.905 | DEVERS 230.00 - VSTA 230.00 2, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | line_2180 | ivsg_la_alt2ad4r | 388 | -355.6 | 9.2 | 914.2 | 355.7 | 0.939 | 0.905 | SANBRDNO 230.00 - DEVERS 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | line_2247 | ivsg_la_alt2ad4r | 388 | -355.6 | 9.2 | 914.2 | 355.7 | 0.939 | 0.905 | DEVERS 230.00 - VSTA 230.00 2, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 24804 | DEVERS | 230 | 24901 | VSTA | 230 | 2 | line_2239 | ivsg_la_alt2ad4r | 988 | 889.1 | 220.2 | 2325.1 | 916 | 0.938 | 0.696 | CHINO 230.00 - S.ONOFRE 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 24901 | VSTA | 230 | 24804 | DEVERS | 230 | 1 | line_2239 | ivsg_la_alt2ad4r | 988 | -852.3 | 167 | 2326.5 | 868.5 | 0.938 | 0.696 | CHINO 230.00 - S.ONOFRE 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 24804 | DEVERS | 230 | 24901 | VSTA | 230 | 2 | line_2240 | ivsg_la_alt2ad4r | 988 | 886.1 | 221.8 | 2320.7 | 913.4 | 0.936 | 0.696 | CHINO 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 24901 | VSTA | 230 | 24804 | DEVERS | 230 | 1 | line_2240 | ivsg_la_alt2ad4r | 988 | -849.4 | 163.8 | 2322.1 | 865 | 0.936 | 0.696 | CHINO 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_N-218 | ivsg_la_alt2ad4r | 2598 | 2351.5 | 18.8 | 2805.1 | 2351.6 | 0.935 | 1.011 | line MIDPINTS to DEVERS 500 ck 1&2 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2192 | ivsg_la_alt2ad4r | 2400 | -2216.2 | 419.2 | 2580.7 | 2255.4 | 0.933 | 0.682 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 24086 | LUGO | 500 | 26105 | VICTORVL | 500 | 1 | line_2193 | ivsg_la_alt2ad4r | 2400 | -2215.9 | 419.1 | 2580.3 | 2255.2 | 0.933 | 0.682 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - LUGO 230.00 2 |
| 24801 | DEVERS | 500 | 24804 | DEVERS | 230 | 1 | line_2239 | ivsg_la_alt2ad4r | 1120 | 742.7 | 737.8 | 1185 | 1046.9 | 0.93 | 0.51 | CHINO 230.00 - S.ONOFRE 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 20238 | HRD-230 | 230 | 20239 | HRD-115 | 115 | 1 | line_2239 | ivsg_la_alt2ad4r | 225 | 207.5 | -16 | 534.6 | 208.2 | 0.93 | 0.88 | CHINO 230.00 - S.ONOFRE 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 24801 | DEVERS | 500 | 24804 | DEVERS | 230 | 1 | line_2240 | ivsg_la_alt2ad4r | 1120 | 739.4 | 739.7 | 1184.4 | 1045.9 | 0.93 | 0.51 | CHINO 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 20238 | HRD-230 | 230 | 20239 | HRD-115 | 115 | 1 | line_2240 | ivsg_la_alt2ad4r | 225 | 207.9 | -16.1 | 536 | 208.6 | 0.93 | 0.88 | CHINO 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 20238 | HRD-230 | 230 | 20239 | HRD-115 | 115 | 1 | line_N-204 | ivsg_la_alt2ad4r | 225 | 207.2 | -17.8 | 534.7 | 207.9 | 0.93 | 0.88 | COACHELLA MIDWAY 230 CKT 1&2 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | 23051A/23011 | ivsg_la_alt2ad4r | 1120 | -1037.3 | -71.3 | 2638.5 | 1039.8 | 0.93 | 0.98 | SX-EPP + ES-EA-SA 230KV |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | 23051B/23011 | ivsg_la_alt2ad4r | 1120 | -1038.2 | -69 | 2637.6 | 1040.4 | 0.93 | 0.98 | EPP-ES + ES-EA-SA 230KV |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_N-203 | ivsg_la_alt2ad4r | 800 | 725.6 | 41.8 | 1849.2 | 726.8 | 0.921 | 0.821 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 20238 | HRD-230 | 230 | 20239 | HRD-115 | 115 | 1 | line_2238 | ivsg_la_alt2ad4r | 225 | 205 | -15.4 | 526.4 | 205.6 | 0.92 | 0.88 | S.ONOFRE 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 22832 | SYCAMORE | 230 | 22652 | PENSQTOS | 230 | 1 | 13821C/25/23051A | ivsg_la_alt2ad4r | 796.7 | 708.2 | -104.2 | 1840.7 | 715.8 | 0.92 | 0.639 | CH-ES-NCM-SX |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | 13821C/25/23051A | ivsg_la_alt2ad4r | 1120 | -1025.4 | -71.3 | 2603.2 | 1027.8 | 0.92 | 0.98 | CH-ES-NCM-SX |
| 8601 | GEOSUB2 | 230 | 8300 | BANIS230 | 230 | 1 | line_N-209 | ivsg_la_alt2ad4r | 550 | 498.3 | 59.9 | 1256.9 | 501.8 | 0.911 | 0.773 | EL CENTRO HIGHLINE 230 CKTS 1&2 |
| 20238 | HRD-230 | 230 | 20118 | ROA-230 | 230 | 1 | 23021/22/23/41 | ivsg_la_alt2ad4r | 388 | -333 | 87 | 881.9 | 344.2 | 0.911 | 0.783 | MIGUEL 230 CORRIDOR West of SN |
| 24804 | DEVERS | 230 | 24901 | VSTA | 230 | 2 | line_2170 | ivsg_la_alt2ad4r | 988 | 858 | 208.6 | 2245.1 | 883 | 0.906 | 0.696 | ETIWANDA 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - SANBRDNO 230.00 2 |
| 24901 | VSTA | 230 | 24804 | DEVERS | 230 | 1 | line_2170 | ivsg_la_alt2ad4r | 988 | -823.6 | 151.2 | 2246.5 | 837.4 | 0.906 | 0.696 | ETIWANDA 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - SANBRDNO 230.00 2 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 19051 | KNOB | 161 | 8367 | PILOTKNB | 161 | 1 | line_N-210 | ivsg_la_alt2ad4r | 165 | -150 | 17.7 | 535.4 | 151 | 0.905 | 0.803 | EL CENTRO IMPERIAL VALLEY 230 CKTS 2&3 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_N-208 | ivsg_la_alt2ad4r | 800 | 716.8 | 35.9 | 1815.1 | 717.7 | 0.904 | 0.821 | COACHELLA BANISTER/BANISTER AVE58 230 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_2096 | ivsg_la_alt2ad4r | 56 | 49.8 | -5.3 | 245.5 | 50 | 0.9 | 0.94 | EAGLROCK 230.00 - MESA CAL 230.00 1, GOODRICH 230.00 - GOULD 230.00 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_2106 | ivsg_la_alt2ad4r | 56 | 49.9 | -5.2 | 246.1 | 50.1 | 0.9 | 0.94 | PARDEE 230.00 - SYLMAR S 230.00 1, SYLMAR S 230.00 - GOULD 230.00 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_2107 | ivsg_la_alt2ad4r | 56 | 49.9 | -5.2 | 246.1 | 50.1 | 0.9 | 0.94 | PARDEE 230.00 - SYLMAR S 230.00 2, SYLMAR S 230.00 - GOULD 230.00 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_2280 | ivsg_la_alt2ad4r | 56 | 49.9 | -5.2 | 246.1 | 50.1 | 0.9 | 0.94 | PARDEE 230.00 - SYLMAR S 230.00 1, SYLMAR S 230.00 - GOULD 230.00 1 |

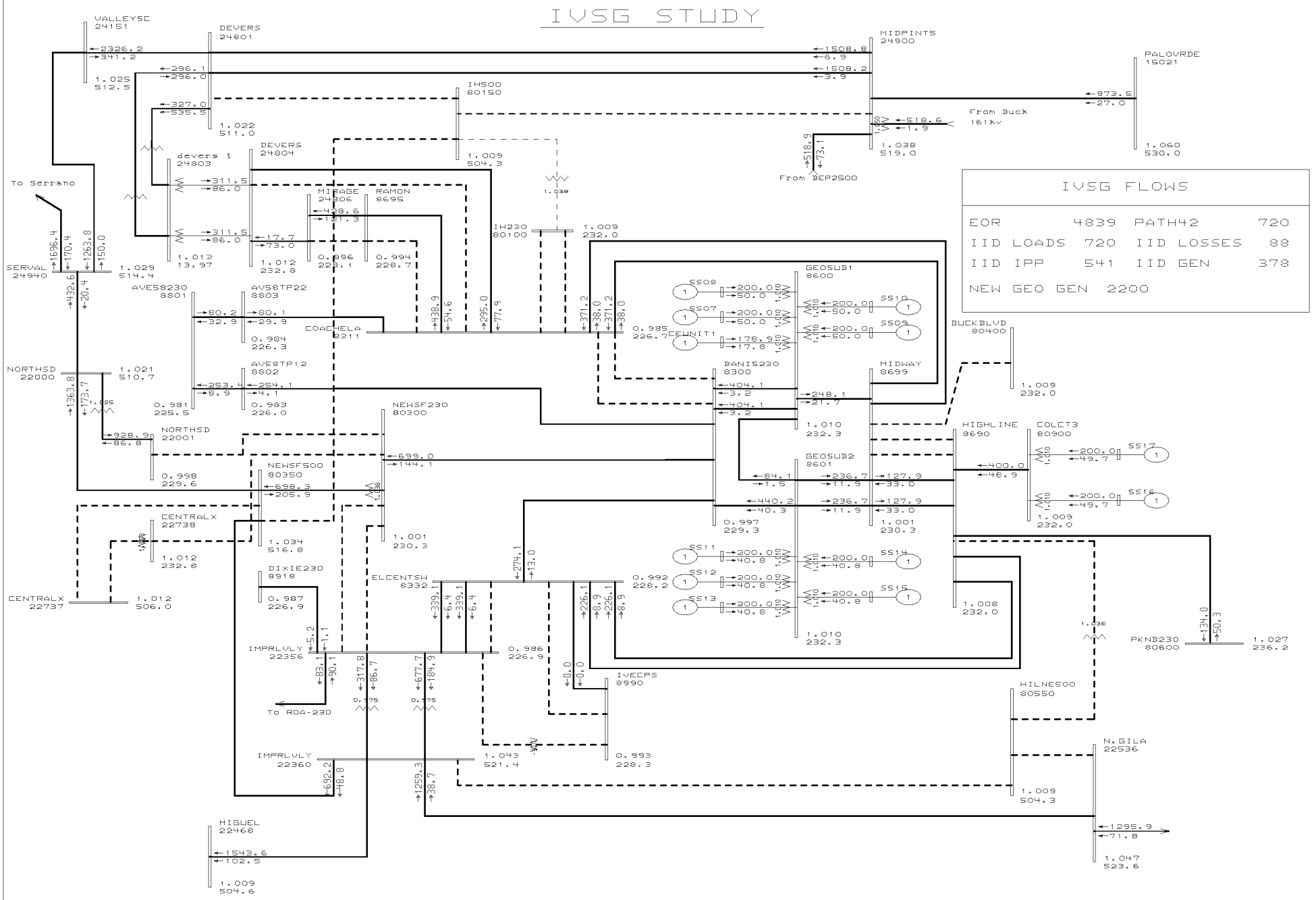
ivsg_la_alt2ad4r1.sav
No Solve Summary
N-2 Outages

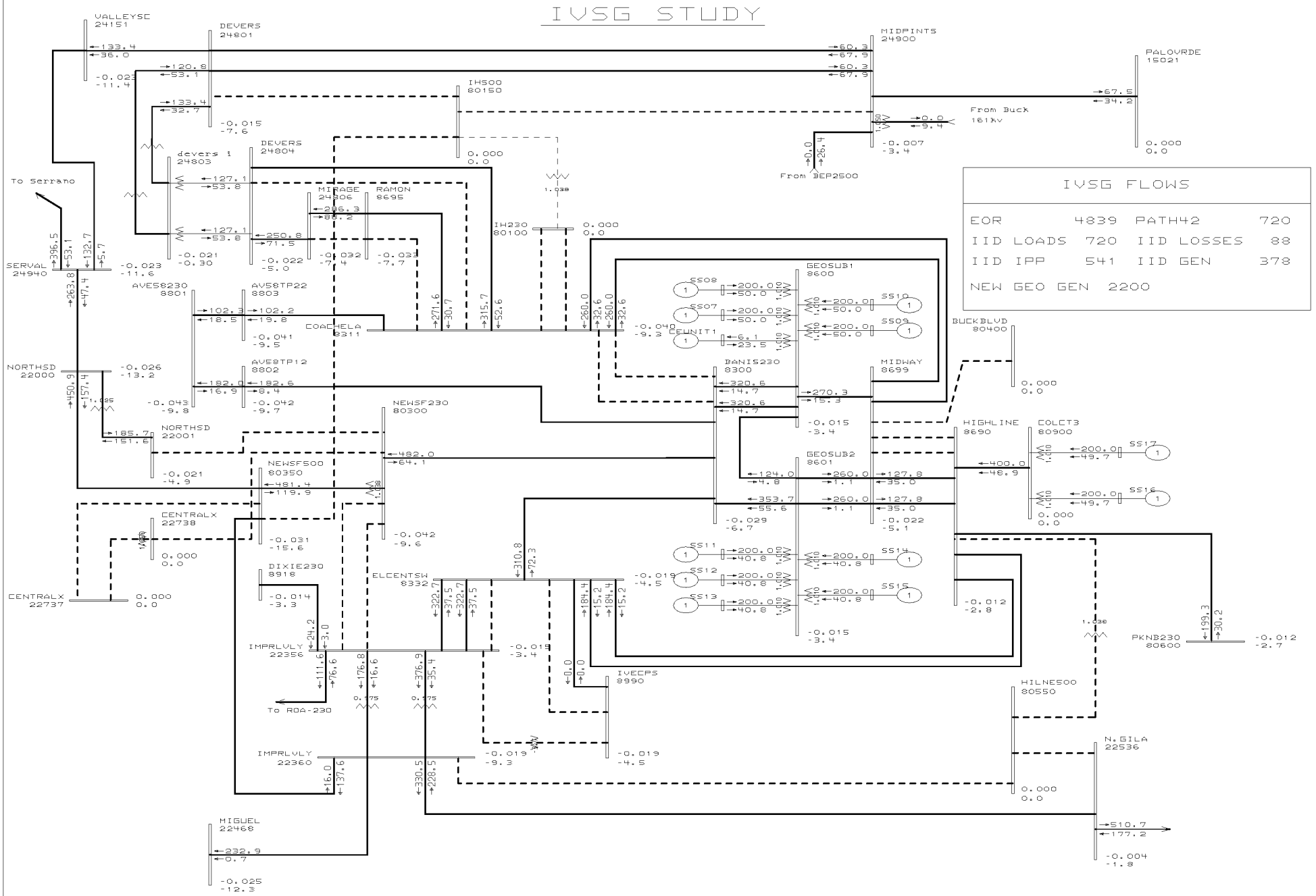
| Contingency-Description | | Case | | Problem-Description | |
|---|---|---|---|---|---|
| line MIDPINTS to IH500/MIDPOINTS DEVERS | 500 ck 1 | ivsg_la_alt2ad4r | Pmis | 8308 CITP4 | 92.00 = 1657026.13 MW + j -1839843.75 MVAR |

# Imperial Valley Study Group

## Appendix B.1.6

Alt 3b D3
Light Autumn
Alternative 3b
Dispatch 3


IVSG STUDY
VALLEYSC 24151
DEVERS 24801
MIDPINTS 24900
PALOVRDE 15021
IH500 80150
From Buck 161kV
From BEP2500
DEVERS 24804
devers 1 24803
To Serrano
MIRAGE 24806
RAMON 8695
IH230 80100
SERVAL 24940
AVES8230 8801
AVES8TP22 8803
AVES8TP12 8802
COACHELA 8211
GEOSUB1 8600
GEOSUB2 8601
BANIS230 8300
MIDWAY 8699
BUCKBLVD 80400
HIGHLINE 8690
COLCT3 80900
NORTHSD 22000
NORTHSD 22001
NEWSF230 80300
NEWSF500 80350
CENTRALX 22738
CENTRALX 22737
DIXIE230 8918
ELCENTSW 8332
IMPRLVLY 22356
IMPRLVLY 22360
IVECPS 8990
HILNE500 80550
N.GILA 22536
PKNB230 80600
MIGUEL 22468
To ROA-230
IVSG FLOWS
EOR 4839 PATH42 720
IID LOADS 720 IID LOSSES 88
IID IPP 541 IID GEN 378
NEW GEO GEN 2200


IVSG STUDY
VALLEYSC 24151
DEVERS 24801
MIDPINTS 24900
PALOVRDE 15021
IH500 80150
From Buck 161kV
From BEP2500
devers 1 24803
DEVERS 24804
To Serrano
MIRAGE 24806
RAMON 8695
IH230 80100
SERVAL 24940
AVE58230 8801
AVE58TP22 8803
AVE58TP12 8802
COACHELA 8311
GEOSUB1 8600
SS08
SS07
SS10
SS09
CELNIT1
BUCKBLVD 80400
NORTHSD 22000
NORTHSD 22001
BANIS230 8300
MIDWAY 8699
NEWSF230 80300
NEWSF500 80350
HIGHLINE 8690
COLCT3 80900
SS17
SS16
GEOSUB2 8601
CENTRALX 22738
CENTRALX 22737
DIXIE230 8918
ELCENTSW 8332
SS11
SS12
SS13
SS14
SS15
IMPRLVLY 22356
IVECPS 8990
To ROA-230
HILNE500 80550
IMPRLVLY 22360
N.GILA 22536
MIGUEL 22468
PKNB230 80600
IVSG FLOWS
EOR 4839 PATH42 720
IID LOADS 720 IID LOSSES 88
IID IPP 541 IID GEN 378
NEW GEO GEN 2200

ivsg_la_alt3bd3.sav
Voltage Summary
N-0 Outages

| Bus | Name | kV | Area | Zone | Outage | Case | Vbase | Vcont | DeltaV | Vmin | Vmax | Max-dv | Contingency Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 14534 | N.GILA 4 | 100 | 14 | 847 | base | ivsg_la_alt3bd3 | 0.939 | 0.939 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14606 | N.GILA 3 | 100 | 14 | 847 | base | ivsg_la_alt3bd3 | 0.939 | 0.939 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14234 | YAVAPAI | 230 | 14 | 141 | base | ivsg_la_alt3bd3 | 1.05 | 1.05 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14355 | PRESCOTT | 115 | 14 | 141 | base | ivsg_la_alt3bd3 | 1.05 | 1.05 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14608 | OCOTIL 1 | 100 | 14 | 141 | base | ivsg_la_alt3bd3 | 1.05 | 1.05 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 25633 | CAPWIND | 115 | 24 | 248 | base | ivsg_la_alt3bd3 | 1.051 | 1.051 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24819 | CONCHO | 115 | 24 | 248 | base | ivsg_la_alt3bd3 | 1.051 | 1.051 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24822 | INDIAN W | 115 | 24 | 248 | base | ivsg_la_alt3bd3 | 1.051 | 1.051 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24821 | TAMARISK | 115 | 24 | 248 | base | ivsg_la_alt3bd3 | 1.051 | 1.051 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 25622 | TAP806 | 115 | 24 | 248 | base | ivsg_la_alt3bd3 | 1.051 | 1.051 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24829 | TAP821 | 115 | 24 | 248 | base | ivsg_la_alt3bd3 | 1.051 | 1.051 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24042 | ELDORDO | 500 | 24 | 240 | base | ivsg_la_alt3bd3 | 1.052 | 1.052 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14007 | GILARIVR | 500 | 14 | 141 | base | ivsg_la_alt3bd3 | 1.053 | 1.053 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24827 | TAP823 | 115 | 24 | 248 | base | ivsg_la_alt3bd3 | 1.053 | 1.053 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24807 | MIRAGE | 115 | 24 | 248 | base | ivsg_la_alt3bd3 | 1.053 | 1.053 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24748 | OXBOW A | 230 | 24 | 247 | base | ivsg_la_alt3bd3 | 1.053 | 1.053 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15089 | JOJOBA | 500 | 14 | 158 | base | ivsg_la_alt3bd3 | 1.054 | 1.054 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24816 | SANTA RO | 115 | 24 | 248 | base | ivsg_la_alt3bd3 | 1.054 | 1.054 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14000 | CHOLLA | 500 | 14 | 141 | base | ivsg_la_alt3bd3 | 1.055 | 1.055 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14001 | FOURCORN | 500 | 14 | 141 | base | ivsg_la_alt3bd3 | 1.055 | 1.055 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15093 | HARQUAHA | 500 | 14 | 158 | base | ivsg_la_alt3bd3 | 1.056 | 1.056 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24775 | RUSH | 115 | 24 | 247 | base | ivsg_la_alt3bd3 | 1.056 | 1.056 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24141 | SPRINGVL | 230 | 24 | 240 | base | ivsg_la_alt3bd3 | 1.056 | 1.056 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 16310 | NL.3WP2 | 100 | 14 | 160 | base | ivsg_la_alt3bd3 | 1.057 | 1.057 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24729 | INYO | 230 | 24 | 247 | base | ivsg_la_alt3bd3 | 1.057 | 1.057 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24153 | VESTAL | 230 | 24 | 240 | base | ivsg_la_alt3bd3 | 1.057 | 1.057 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15031 | PERK PS1 | 500 | 14 | 158 | base | ivsg_la_alt3bd3 | 1.058 | 1.058 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15032 | PERK PS2 | 500 | 14 | 158 | base | ivsg_la_alt3bd3 | 1.058 | 1.058 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15033 | PERKINPS | 500 | 14 | 158 | base | ivsg_la_alt3bd3 | 1.058 | 1.058 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14005 | WESTWING | 500 | 14 | 141 | base | ivsg_la_alt3bd3 | 1.058 | 1.058 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15092 | ARLINTON | 500 | 14 | 158 | base | ivsg_la_alt3bd3 | 1.059 | 1.059 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15094 | MESQUITE | 500 | 14 | 158 | base | ivsg_la_alt3bd3 | 1.059 | 1.059 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14100 | CHOLLA | 345 | 14 | 141 | base | ivsg_la_alt3bd3 | 1.059 | 1.059 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14009 | REDHAWK | 500 | 14 | 158 | base | ivsg_la_alt3bd3 | 1.059 | 1.059 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15021 | PALOVRDE | 500 | 14 | 158 | base | ivsg_la_alt3bd3 | 1.06 | 1.06 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15061 | RUDD | 500 | 14 | 158 | base | ivsg_la_alt3bd3 | 1.06 | 1.06 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15090 | HASSYAMP | 500 | 14 | 158 | base | ivsg_la_alt3bd3 | 1.06 | 1.06 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 19038 | MEAD | 500 | 14 | 191 | base | ivsg_la_alt3bd3 | 1.06 | 1.06 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24156 | VINCENT | 500 | 24 | 240 | base | ivsg_la_alt3bd3 | 1.06 | 1.06 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14010 | TS5 | 500 | 14 | 840 | base | ivsg_la_alt3bd3 | 1.061 | 1.061 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24776 | LEE VINE | 115 | 24 | 247 | base | ivsg_la_alt3bd3 | 1.064 | 1.064 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15034 | PERKINS | 500 | 14 | 158 | base | ivsg_la_alt3bd3 | 1.065 | 1.065 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14006 | YAVAPAI | 500 | 14 | 141 | base | ivsg_la_alt3bd3 | 1.065 | 1.065 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15087 | SNTAROSA | 500 | 14 | 158 | base | ivsg_la_alt3bd3 | 1.067 | 1.067 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 16302 | NL.3WP | 100 | 14 | 160 | base | ivsg_la_alt3bd3 | 1.067 | 1.067 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15088 | PINAL_W | 500 | 14 | 158 | base | ivsg_la_alt3bd3 | 1.068 | 1.068 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24097 | MOHAVE | 500 | 24 | 240 | base | ivsg_la_alt3bd3 | 1.068 | 1.068 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24235 | RECTOR | 230 | 24 | 240 | base | ivsg_la_alt3bd3 | 1.069 | 1.069 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24234 | RECTRSVC | 230 | 24 | 240 | base | ivsg_la_alt3bd3 | 1.069 | 1.069 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15001 | CORONADO | 500 | 14 | 140 | base | ivsg_la_alt3bd3 | 1.07 | 1.07 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14002 | MOENKOPI | 500 | 14 | 141 | base | ivsg_la_alt3bd3 | 1.082 | 1.082 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14003 | NAVAJO | 500 | 14 | 141 | base | ivsg_la_alt3bd3 | 1.086 | 1.086 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24304 | BIG CRK4 | 230 | 24 | 243 | base | ivsg_la_alt3bd3 | 1.09 | 1.09 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24301 | BIG CRK1 | 230 | 24 | 243 | base | ivsg_la_alt3bd3 | 1.091 | 1.091 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24320 | EASTWOOD | 230 | 24 | 243 | base | ivsg_la_alt3bd3 | 1.091 | 1.091 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24302 | BIG CRK2 | 230 | 24 | 243 | base | ivsg_la_alt3bd3 | 1.092 | 1.092 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24303 | BIG CRK3 | 230 | 24 | 243 | base | ivsg_la_alt3bd3 | 1.092 | 1.092 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24305 | BIG CRK8 | 230 | 24 | 243 | base | ivsg_la_alt3bd3 | 1.092 | 1.092 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24316 | MAMMOTH | 230 | 24 | 243 | base | ivsg_la_alt3bd3 | 1.092 | 1.092 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |

ivsg_la_alt3bd3.sav
Flow Summary
N-0 Outages

| LEGEND | % of RATING 1 | |
|---|---|---|
| C_pu | 100% - 110% | |
| C_pu | 110% - 120% | P.U. of |
| C_pu | > 120% | Rate 1 |

| FROM | FR | BKV | TO | TO | BKV | CK | Outage_Name | Case | Rate-Mva | Pflow | Qflow | Amps | MVA | C_pu | B_pu | Contingency_Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24900 | MIDPINTS | 500 | 19399 | BUCK161 | 161 | 1 | base | ivsg_la_alt3bd3 | 250 | -514.1 | 89 | 580.5 | 521.8 | 2.09 | 2.09 | Base system (n-0) |
| 19400 | BUCK230 | 230 | 19399 | BUCK161 | 161 | 1 | base | ivsg_la_alt3bd3 | 280 | 339.2 | 41.9 | 870 | 341.8 | 1.22 | 1.22 | Base system (n-0) |
| 16900 | COPPERVR | 345 | 16901 | COPPERVR | 230 | 1 | base | ivsg_la_alt3bd3 | 200 | 202.2 | 98.4 | 370.9 | 224.9 | 1.12 | 1.12 | Base system (n-0) |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | base | ivsg_la_alt3bd3 | 1411.6 | 1658.7 | 96.8 | 1766 | 1661.5 | 1.094 | 1.094 | Base system (n-0) |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | base | ivsg_la_alt3bd3 | 458 | 466.2 | 51 | 1163.1 | 469 | 1.012 | 1.012 | Base system (n-0) |
| 24999 | DEVRSVC1 | 500 | 24801 | DEVERS | 500 | 1 | base | ivsg_la_alt3bd3 | 387.5 | 0 | 400.1 | 452.1 | 400.1 | 1.01 | 1.01 | Base system (n-0) |
| 24912 | SHANDIN | 115 | 24916 | TAP902 | 115 | 1 | base | ivsg_la_alt3bd3 | 109.1 | -104.3 | 32.5 | 544.4 | 109.3 | 0.995 | 0.995 | Base system (n-0) |
| 25641 | TAP816 | 115 | 25664 | TAP998 | 115 | 1 | base | ivsg_la_alt3bd3 | 107.6 | -96.4 | 41.6 | 534.4 | 105 | 0.99 | 0.99 | Base system (n-0) |
| 25641 | TAP816 | 115 | 25644 | TAP818 | 115 | 1 | base | ivsg_la_alt3bd3 | 107.6 | 96.4 | -40.8 | 532.8 | 104.7 | 0.986 | 0.986 | Base system (n-0) |
| 24805 | DEVERS | 115 | 25644 | TAP818 | 115 | 1 | base | ivsg_la_alt3bd3 | 217 | -183.7 | 97.2 | 1046.6 | 207.8 | 0.961 | 0.961 | Base system (n-0) |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | base | ivsg_la_alt3bd3 | 1645.4 | 1694.1 | 110.2 | 1811.5 | 1697.7 | 0.953 | 0.953 | Base system (n-0) |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | base | ivsg_la_alt3bd3 | 56 | 51.7 | -5.1 | 254.9 | 51.9 | 0.93 | 0.93 | Base system (n-0) |
| 25629 | TAP813 | 115 | 25630 | TAP814 | 115 | 1 | base | ivsg_la_alt3bd3 | 82.7 | 69.9 | -28.3 | 382.4 | 75.4 | 0.921 | 0.921 | Base system (n-0) |

ivsg_la_alt3bd3.sav
VOLTAGE Summary
N-1 Outages

| Bus | Name | kV | Area | Zone | Outage | Case | Vbase | Vcont | DeltaV | Vmin | Vmax | Max-dv | Contingency Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24017 | BLYTHESC | 161 | 24 | 248 | line_007 | ivsg_la_alt3bd3 | 1.007 | 0.923 | -0.084 | 0.9 | 1.05 | 0.05 | line BLYTHE to BLYTHESC 161 ck 1 |
| 24731 | INYOKERN | 115 | 24 | 247 | line_175 | ivsg_la_alt3bd3 | 1.013 | 0.926 | -0.087 | 0.9 | 1.05 | 0.05 | line INYO to COTTONWD 230 ck 1 |
| 24739 | MC GEN | 115 | 24 | 247 | line_175 | ivsg_la_alt3bd3 | 1.033 | 0.952 | -0.081 | 0.9 | 1.05 | 0.05 | line INYO to COTTONWD 230 ck 1 |
| 24749 | SEARLES | 115 | 24 | 247 | line_175 | ivsg_la_alt3bd3 | 1.033 | 0.952 | -0.081 | 0.9 | 1.05 | 0.05 | line INYO to COTTONWD 230 ck 1 |
| 24762 | TAP702 | 115 | 24 | 247 | line_175 | ivsg_la_alt3bd3 | 1.033 | 0.952 | -0.081 | 0.9 | 1.05 | 0.05 | line INYO to COTTONWD 230 ck 1 |
| 24763 | TAP703 | 115 | 24 | 247 | line_175 | ivsg_la_alt3bd3 | 1.033 | 0.952 | -0.081 | 0.9 | 1.05 | 0.05 | line INYO to COTTONWD 230 ck 1 |
| 24768 | RANDSBRG | 115 | 24 | 247 | line_175 | ivsg_la_alt3bd3 | 1.008 | 0.954 | -0.054 | 0.9 | 1.05 | 0.05 | line INYO to COTTONWD 230 ck 1 |
| 24761 | TAP701 | 115 | 24 | 247 | line_175 | ivsg_la_alt3bd3 | 1.008 | 0.954 | -0.054 | 0.9 | 1.05 | 0.05 | line INYO to COTTONWD 230 ck 1 |
| 25667 | OAK_VLLY | 115 | 24 | 248 | line_207 | ivsg_la_alt3bd3 | 1.03 | 0.978 | -0.052 | 0.9 | 1.05 | 0.05 | line DEVERS to VALLEYSC 500 ck 1 |
| 14534 | N.GILA 4 | 100 | 14 | 847 | NG500/69 | ivsg_la_alt3bd3 | 0.939 | 1 | 0.061 | 0.9 | 1.05 | 0.05 | tran N.GILA 500 to N.GILA 69 ck 1 |
| 24035 | EAGLEMTN | 161 | 24 | 248 | tran_241 | ivsg_la_alt3bd3 | 0.973 | 1.027 | 0.054 | 0.9 | 1.05 | 0.05 | tran EAGLEMTN 230 to EAGLEMTN 161 ck 1 |
| 24142 | SYC CYN | 230 | 24 | 240 | line_086 | ivsg_la_alt3bd3 | 1.039 | 1.091 | 0.052 | 0.9 | 1.05 | 0.05 | line MAGUNDEN to OMAR 230 ck 1 |
| 25613 | EDMONSTN | 230 | 24 | 256 | line_122 | ivsg_la_alt3bd3 | 1.026 | 1.091 | 0.065 | 0.9 | 1.05 | 0.05 | line PASTORIA to EDMONSTN 230 ck 1 |
| 24142 | SYC CYN | 230 | 24 | 240 | line_140 | ivsg_la_alt3bd3 | 1.039 | 1.091 | 0.052 | 0.9 | 1.05 | 0.05 | line SYC CYN to OMAR 230 ck 1 |

ivsg_la_alt3bd3.sav
FLOW Summary
N-1 Outages

| LEGEND | % of RATING 1 | |
|---|---|---|
| C_pu | 100% - 110% | |
| C_pu | 110% - 120% | P.U. of |
| C_pu | > 120% | Rate 1 |

| FROM | FR | BKV | TO | TO | BKV | CK | Outage_Name | Case | Rate-Mva | Pflow | Qflow | Amps | MVA | C_pu | B_pu | Contingency_Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24142 | SYC CYN | 230 | 24101 | OMAR | 230 | 1 | line_086 | ivsg_la_alt3bd3 | 643 | 718.9 | 5514.8 | 12797.3 | 5561.5 | 7.929 | 0.421 | line MAGUNDEN to OMAR 230 ck 1 |
| 24781 | NAVYCOSO | 230 | 24706 | BLM EAST | 230 | 1 | line_173 | ivsg_la_alt3bd3 | 1287 | -152.9 | -3160.7 | 7943.4 | 3164.4 | 2.459 | 0.056 | line BLM EAST to BLM WEST 230 ck 1 |
| 24781 | NAVYCOSO | 230 | 24706 | BLM EAST | 230 | 1 | line_174 | ivsg_la_alt3bd3 | 1287 | -152.9 | -3160.7 | 7943.4 | 3164.4 | 2.459 | 0.056 | line BLM WEST to KRAMER 230 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_175 | ivsg_la_alt3bd3 | 56 | -106.6 | 5.6 | 544 | 106.8 | 1.91 | 0.93 | line INYO to COTTONWD 230 ck 1 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_001 | ivsg_la_alt3bd3 | 1411.6 | 2511.7 | 327.8 | 2703.3 | 2533 | 1.675 | 1.094 | line MOENKOPI to ELDORDO 500 ck 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_207 | ivsg_la_alt3bd3 | 458 | 653.6 | 120.3 | 1699.5 | 664.6 | 1.479 | 1.012 | line DEVERS to VALLEYSC 500 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_202 | ivsg_la_alt3bd3 | 56 | 80.6 | -10.5 | 405.6 | 81.3 | 1.47 | 0.93 | line OWENSCON to INYO 230 ck 1 |
| 22001 | NORTHSD | 230 | 22000 | NORTHSD | 500 | 1 | B2_002 | ivsg_la_alt3bd3 | 1120 | -1610.4 | 187.9 | 4264.4 | 1621.3 | 1.45 | 0.83 | IMPRLVLY - MIGUEL 1 500kV |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | B2_002 | ivsg_la_alt3bd3 | 388 | -497.6 | -30.2 | 1314.3 | 498.5 | 1.349 | 0.854 | IMPRLVLY - MIGUEL 1 500kV |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_135 | ivsg_la_alt3bd3 | 458 | 591 | 80.4 | 1481.4 | 596.4 | 1.289 | 1.012 | line SANBRDNO to DEVERS 230 ck 1 |
| 22464 | MIGUEL | 230 | 22472 | MIGUELMP | 500 | 1 | ML81 | ivsg_la_alt3bd3 | 1120 | -1372.8 | 183.6 | 3611.2 | 1385 | 1.24 | 0.71 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 22468 | MIGUEL | 500 | 22472 | MIGUELMP | 500 | 1 | ML81 | ivsg_la_alt3bd3 | 1120 | 1375.3 | 53.4 | 1582.1 | 1376.3 | 1.23 | 0.71 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 20238 | HRD-230 | 230 | 20118 | ROA-230 | 230 | 1 | B2_002 | ivsg_la_alt3bd3 | 388 | -431.9 | 125.9 | 1190.2 | 449.9 | 1.225 | 0.733 | IMPRLVLY - MIGUEL 1 500kV |
| 22356 | IMPRLVLY | 230 | 22360 | IMPRLVLY | 500 | 1 | IV81 | ivsg_la_alt3bd3 | 600 | 704 | 207.3 | 1857.3 | 733.9 | 1.22 | 0.55 | tran IMPRLVLY 230 to IMPRLVLY 500 ck 2 |
| 22464 | MIGUEL | 230 | 22468 | MIGUEL | 500 | 1 | ML80 | ivsg_la_alt3bd3 | 1120 | -1355.7 | 184.2 | 3567.7 | 1368.2 | 1.22 | 0.67 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_207 | ivsg_la_alt3bd3 | 1411.6 | 1801.1 | 190.1 | 1945.1 | 1811.1 | 1.207 | 1.094 | line DEVERS to VALLEYSC 500 ck 1 |
| 20238 | HRD-230 | 230 | 20239 | HRD-115 | 115 | 1 | B2_002 | ivsg_la_alt3bd3 | 225 | 266.1 | -37 | 710.7 | 268.6 | 1.2 | 0.84 | IMPRLVLY - MIGUEL 1 500kV |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_183 | ivsg_la_alt3bd3 | 458 | 547.1 | 76.3 | 1370.4 | 552.4 | 1.193 | 1.012 | line DEVERS to VSTA 230 ck 2 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_185 | ivsg_la_alt3bd3 | 458 | 547.1 | 76.3 | 1370.4 | 552.4 | 1.193 | 1.012 | line VSTA to DEVERS 230 ck 1 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | B2_001 | ivsg_la_alt3bd3 | 1411.6 | 1786.6 | 151.4 | 1918.9 | 1793 | 1.189 | 1.094 | HASSYAMP - N.GILA 1 500kV |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_56 | ivsg_la_alt3bd3 | 800 | 930 | 88.1 | 2377.1 | 934.2 | 1.184 | 0.892 | line NEWSF500 to IMPRLVLY 500 ck 1 |
| 20238 | HRD-230 | 230 | 20102 | RUM-230 | 230 | 1 | B2_002 | ivsg_la_alt3bd3 | 388 | -412.5 | 121 | 1137.3 | 429.9 | 1.172 | 0.685 | IMPRLVLY - MIGUEL 1 500kV |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | B2_003 | ivsg_la_alt3bd3 | 1411.6 | 1753.9 | 140.2 | 1880 | 1759.5 | 1.165 | 1.094 | N.GILA - IMPRLVLY 1 500kV |
| 24806 | MIRAGE | 230 | 24807 | MIRAGE | 115 | 2 | tran_238 | ivsg_la_alt3bd3 | 280 | 319.7 | 20 | 811.8 | 320.3 | 1.16 | 0.58 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_207 | ivsg_la_alt3bd3 | 458 | 491 | -55 | 1324.1 | 494.1 | 1.152 | 0.7 | line DEVERS to VALLEYSC 500 ck 1 |
| 24801 | DEVERS | 500 | 24804 | DEVERS | 230 | 1 | line_207 | ivsg_la_alt3bd3 | 1120 | 1015.4 | 796.4 | 1465.4 | 1290.4 | 1.15 | 0.56 | line DEVERS to VALLEYSC 500 ck 1 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_68 | ivsg_la_alt3bd3 | 1411.6 | 1719.2 | 130.5 | 1839.6 | 1724.1 | 1.14 | 1.094 | line NORTHSD to NEWSF500 500 ck 1 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | B2_002 | ivsg_la_alt3bd3 | 1411.6 | 1715.4 | 138.7 | 1837.7 | 1721 | 1.139 | 1.094 | IMPRLVLY - MIGUEL 1 500kV |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_84 | ivsg_la_alt3bd3 | 1411.6 | 1712.7 | 119.4 | 1829.9 | 1716.9 | 1.134 | 1.094 | line MIDPINTS to DEVERS 500 ck 1 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_85 | ivsg_la_alt3bd3 | 1411.6 | 1712.7 | 119.3 | 1829.9 | 1716.9 | 1.134 | 1.094 | line MIDPINTS to DEVERS 500 ck 2 |
| 24729 | INYO | 230 | 24730 | INYO PS | 115 | 1 | line_175 | ivsg_la_alt3bd3 | 50 | 53.3 | 18.8 | 136 | 56.5 | 1.13 | 0.54 | line INYO to COTTONWD 230 ck 1 |
| 24729 | INYO | 230 | 24730 | INYO PS | 115 | 2 | line_175 | ivsg_la_alt3bd3 | 50 | 53.3 | 18.8 | 136 | 56.5 | 1.13 | 0.54 | line INYO to COTTONWD 230 ck 1 |
| 24723 | CONTROL | 115 | 24731 | INYOKERN | 115 | 1 | line_175 | ivsg_la_alt3bd3 | 82.7 | 88.9 | -7.7 | 457 | 89.2 | 1.101 | 0.305 | line INYO to COTTONWD 230 ck 1 |
| 24723 | CONTROL | 115 | 24731 | INYOKERN | 115 | 2 | line_175 | ivsg_la_alt3bd3 | 82.7 | 88.9 | -7.7 | 457 | 89.2 | 1.101 | 0.305 | line INYO to COTTONWD 230 ck 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | B2_002 | ivsg_la_alt3bd3 | 458 | 490 | 49.5 | 1251.3 | 492.5 | 1.089 | 1.012 | IMPRLVLY - MIGUEL 1 500kV |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_68 | ivsg_la_alt3bd3 | 458 | 489.6 | 44.1 | 1247.4 | 491.6 | 1.085 | 1.012 | line NORTHSD to NEWSF500 500 ck 1 |
| 8601 | GEOSUB2 | 230 | 8300 | BANIS230 | 230 | 1 | line_22 | ivsg_la_alt3bd3 | 550 | 597.7 | 64.3 | 1494 | 601.1 | 1.082 | 0.796 | line GEOSUB1 to BANIS230 230 ck 1 |
| 8601 | GEOSUB2 | 230 | 8300 | BANIS230 | 230 | 1 | line_23 | ivsg_la_alt3bd3 | 550 | 597.7 | 64.3 | 1494 | 601.1 | 1.082 | 0.796 | line GEOSUB1 to BANIS230 230 ck 2 |
| 24900 | MIDPINTS | 500 | 24801 | DEVERS | 500 | 2 | line_84 | ivsg_la_alt3bd3 | 2338 | 2574 | 247.2 | 2902.7 | 2585.9 | 1.076 | 0.622 | line MIDPINTS to DEVERS 500 ck 1 |
| 24900 | MIDPINTS | 500 | 24801 | DEVERS | 500 | 1 | line_85 | ivsg_la_alt3bd3 | 2338 | 2574.3 | 248.2 | 2903.3 | 2586.3 | 1.076 | 0.622 | line MIDPINTS to DEVERS 500 ck 2 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_207 | ivsg_la_alt3bd3 | 800 | 831.4 | 85.3 | 2159.4 | 835.8 | 1.075 | 0.892 | line DEVERS to VALLEYSC 500 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_169 | ivsg_la_alt3bd3 | 56 | 59.4 | -5.1 | 295 | 59.6 | 1.07 | 0.93 | line KRAMER to LUGO 230 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_170 | ivsg_la_alt3bd3 | 56 | 59.4 | -5.1 | 295 | 59.6 | 1.07 | 0.93 | line KRAMER to LUGO 230 ck 2 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_207 | ivsg_la_alt3bd3 | 1645.4 | 1860.3 | 202.1 | 2024.8 | 1871.3 | 1.066 | 0.953 | line DEVERS to VALLEYSC 500 ck 1 |
| 22001 | NORTHSD | 230 | 22000 | NORTHSD | 500 | 1 | SO2 | ivsg_la_alt3bd3 | 1120 | -1186.8 | 34.9 | 3065.7 | 1187.3 | 1.06 | 0.83 | gen S.ONOFR2 22.00 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_001 | ivsg_la_alt3bd3 | 458 | 483 | 50.9 | 1214.7 | 485.7 | 1.057 | 1.012 | line MOENKOPI to ELDORDO 500 ck 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_085 | ivsg_la_alt3bd3 | 458 | 482.7 | 51.2 | 1211.4 | 485.4 | 1.054 | 1.012 | line LUGO to VICTORVL 500 ck 1 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_085 | ivsg_la_alt3bd3 | 1411.6 | 1593.8 | 105 | 1697.7 | 1597.2 | 1.052 | 1.094 | line LUGO to VICTORVL 500 ck 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | B2_001 | ivsg_la_alt3bd3 | 1645.4 | 1841.8 | 165.6 | 1991.8 | 1849.3 | 1.048 | 0.953 | HASSYAMP - N.GILA 1 500kV |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_047 | ivsg_la_alt3bd3 | 458 | 477.9 | 53.4 | 1201.2 | 480.9 | 1.045 | 1.012 | line ELDORDO to LUGO 500 ck 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_7 | ivsg_la_alt3bd3 | 458 | 477.8 | 47.7 | 1200.3 | 480.1 | 1.044 | 1.012 | line BANIS230 to NEWSF230 230 ck 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | tran_74 | ivsg_la_alt3bd3 | 458 | 477.8 | 47.9 | 1200.3 | 480.2 | 1.044 | 1.012 | tran NEWSF230 230 to NEWSF500 500 ck 1 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | B2_003 | ivsg_la_alt3bd3 | 800 | 827.8 | 12.9 | 2093.8 | 827.9 | 1.043 | 0.892 | N.GILA - IMPRLVLY 1 500kV |
| 8600 | GEOSUB1 | 230 | 8300 | BANIS230 | 230 | 1 | line_47 | ivsg_la_alt3bd3 | 550 | 574 | 59.6 | 1436 | 577.1 | 1.04 | 0.737 | line GEOSUB2 to BANIS230 230 ck 1 |
| 8600 | GEOSUB1 | 230 | 8300 | BANIS230 | 230 | 2 | line_47 | ivsg_la_alt3bd3 | 550 | 574 | 59.6 | 1436 | 577.1 | 1.04 | 0.737 | line GEOSUB2 to BANIS230 230 ck 1 |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | line_68 | ivsg_la_alt3bd3 | 388 | -392.4 | 3.9 | 1013.3 | 392.5 | 1.04 | 0.854 | line NORTHSD to NEWSF500 500 ck 1 |
| 24805 | DEVERS | 115 | 24804 | DEVERS | 230 | 1 | tran_236 | ivsg_la_alt3bd3 | 280 | 254.2 | -95 | 1361.6 | 271.4 | 1.04 | 0.67 | tran DEVERS 115 to DEVERS 230 ck 3 |
| 24805 | DEVERS | 115 | 24804 | DEVERS | 230 | 3 | tran_235 | ivsg_la_alt3bd3 | 280 | 251.3 | -94.2 | 1347.9 | 268.3 | 1.03 | 0.66 | tran DEVERS 115 to DEVERS 230 ck 1 |
| 24805 | DEVERS | 115 | 24804 | DEVERS | 230 | 1 | tran_237 | ivsg_la_alt3bd3 | 280 | 252.8 | -94.4 | 1352.8 | 269.8 | 1.03 | 0.67 | tran DEVERS 115 to DEVERS 230 ck 4 |
| 8600 | GEOSUB1 | 230 | 8300 | BANIS230 | 230 | 2 | line_22 | ivsg_la_alt3bd3 | 550 | 567.8 | 60.3 | 1419.2 | 571 | 1.028 | 0.737 | line GEOSUB1 to BANIS230 230 ck 1 |
| 8600 | GEOSUB1 | 230 | 8300 | BANIS230 | 230 | 1 | line_23 | ivsg_la_alt3bd3 | 550 | 567.8 | 60.3 | 1419.2 | 571 | 1.028 | 0.737 | line GEOSUB1 to BANIS230 230 ck 2 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | B2_003 | ivsg_la_alt3bd3 | 1645.4 | 1805 | 155 | 1947 | 1811.7 | 1.025 | 0.953 | N.GILA - IMPRLVLY 1 500kV |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_68 | ivsg_la_alt3bd3 | 2598 | 2646.5 | 159 | 3063.7 | 2651.2 | 1.021 | 0.885 | line NORTHSD to NEWSF500 500 ck 1 |
| 24701 | KRAMER | 230 | 24085 | LUGO | 230 | 2 | line_169 | ivsg_la_alt3bd3 | 478 | 479.9 | 64.3 | 1211.7 | 484.1 | 1.01 | 0.604 | line KRAMER to LUGO 230 ck 1 |
| 24701 | KRAMER | 230 | 24085 | LUGO | 230 | 1 | line_170 | ivsg_la_alt3bd3 | 478 | 479.9 | 64.3 | 1211.7 | 484.1 | 1.01 | 0.604 | line KRAMER to LUGO 230 ck 2 |
| 24805 | DEVERS | 115 | 24804 | DEVERS | 230 | 4 | tran_235 | ivsg_la_alt3bd3 | 280 | 248.3 | -93.1 | 1332.2 | 265.2 | 1.01 | 0.65 | tran DEVERS 115 to DEVERS 230 ck 1 |
| 24805 | DEVERS | 115 | 24804 | DEVERS | 230 | 3 | tran_237 | ivsg_la_alt3bd3 | 280 | 246.8 | -92.1 | 1320.9 | 263.5 | 1.01 | 0.66 | tran DEVERS 115 to DEVERS 230 ck 4 |
| 24151 | VALLEYSC | 500 | 24160 | VALLEYSC | 115 | 2 | tran_247 | ivsg_la_alt3bd3 | 560 | 541 | 156.5 | 639 | 563.2 | 1.01 | 0.49 | tran VALLEYSC 500 to VALLEYSC 115 ck 1 |
| 24151 | VALLEYSC | 500 | 24160 | VALLEYSC | 115 | 1 | tran_248 | ivsg_la_alt3bd3 | 560 | 541 | 156.5 | 639 | 563.2 | 1.01 | 0.49 | tran VALLEYSC 500 to VALLEYSC 115 ck 2 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_6 | ivsg_la_alt3bd3 | 800 | 804 | 21.8 | 2026.5 | 804.3 | 1.009 | 0.892 | line BANIS230 to ELCENTSW 230 ck 1 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | PV1 | ivsg_la_alt3bd3 | 1411.6 | 1531.7 | 47.1 | 1620.5 | 1532.5 | 1.003 | 1.094 | gen PALOVRD1 24.00 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | IV81 | ivsg_la_alt3bd3 | 800 | 795.6 | 35.1 | 2009.8 | 796.4 | 1.001 | 0.892 | tran IMPRLVLY 230 to IMPRLVLY 500 ck 2 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_68 | ivsg_la_alt3bd3 | 1645.4 | 1765.1 | 146.1 | 1899.8 | 1771.1 | 1 | 0.953 | line NORTHSD to NEWSF500 500 ck 1 |
| 24805 | DEVERS | 115 | 24804 | DEVERS | 230 | 4 | tran_236 | ivsg_la_alt3bd3 | 280 | 245.4 | -91.7 | 1314.1 | 262 | 1 | 0.65 | tran DEVERS 115 to DEVERS 230 ck 3 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | B2_001 | ivsg_la_alt3bd3 | 2598 | 2583.9 | 116.9 | 2992.7 | 2586.5 | 0.998 | 0.885 | HASSYAMP - N.GILA 1 500kV |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | B2_002 | ivsg_la_alt3bd3 | 1645.4 | 1759.7 | 155.8 | 1896.8 | 1766.6 | 0.998 | 0.953 | IMPRLVLY - MIGUEL 1 500kV |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_84 | ivsg_la_alt3bd3 | 1645.4 | 1757.4 | 133.4 | 1887.8 | 1762.5 | 0.994 | 0.953 | line MIDPINTS to DEVERS 500 ck 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_85 | ivsg_la_alt3bd3 | 1645.4 | 1757.4 | 133.3 | 1887.7 | 1762.4 | 0.994 | 0.953 | line MIDPINTS to DEVERS 500 ck 2 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | tran_210 | ivsg_la_alt3bd3 | 56 | 54.6 | -5 | 269.9 | 54.8 | 0.99 | 0.93 | tran LUGO 500 to LUGO 230 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | tran_211 | ivsg_la_alt3bd3 | 56 | 54.7 | -5 | 270.1 | 54.9 | 0.99 | 0.93 | tran LUGO 500 to LUGO 230 ck 2 |
| 24016 | BARRE | 230 | 25201 | LEWIS | 230 | 1 | line_024 | ivsg_la_alt3bd3 | 1195 | -1117.8 | 268 | 2958.3 | 1149.5 | 0.987 | 0.644 | line BARRE to VILLA PK 230 ck 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | B2_003 | ivsg_la_alt3bd3 | 2598 | 2559.3 | 125.6 | 2951.1 | 2562.4 | 0.984 | 0.885 | N.GILA - IMPRLVLY 1 500kV |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_29 | ivsg_la_alt3bd3 | 458 | 454.1 | 49.9 | 1127.2 | 456.8 | 0.981 | 1.012 | line HIGHLINE to COLCT3 230 ck 1 |
| 20238 | HRD-230 | 230 | 20239 | HRD-115 | 115 | 1 | line_68 | ivsg_la_alt3bd3 | 225 | 219.6 | -20.9 | 566.7 | 220.6 | 0.98 | 0.84 | line NORTHSD to NEWSF500 500 ck 1 |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_135 | ivsg_la_alt3bd3 | 458 | 433.4 | -51.5 | 1121.2 | 436.5 | 0.975 | 0.7 | line SANBRDNO to DEVERS 230 ck 1 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_63 | ivsg_la_alt3bd3 | 800 | 771.8 | 15.3 | 1948.2 | 771.9 | 0.97 | 0.892 | line RAMON to MIRAGE 230 ck 2 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_086 | ivsg_la_alt3bd3 | 56 | 53.6 | -5.5 | 265.4 | 53.9 | 0.97 | 0.93 | line MAGUNDEN to OMAR 230 ck 1 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_50 | ivsg_la_alt3bd3 | 800 | 770.2 | 16.7 | 1938.4 | 770.4 | 0.965 | 0.892 | line BANIS230 to AV58TP12 230 ck 1 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_51 | ivsg_la_alt3bd3 | 800 | 770.7 | 18.5 | 1937.9 | 770.9 | 0.965 | 0.892 | line AV58TP12 to AVE58230 230 ck 1 |
| 24912 | SHANDIN | 115 | 24916 | TAP902 | 115 | 1 | line_207 | ivsg_la_alt3bd3 | 109.1 | -104.4 | -2.2 | 527.8 | 104.4 | 0.964 | 0.995 | line DEVERS to VALLEYSC 500 ck 1 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | IV81 | ivsg_la_alt3bd3 | 388 | -366.8 | 8.1 | 937.7 | 366.9 | 0.963 | 0.854 | tran IMPRLVLY 230 to IMPRLVLY 500 ck 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | B2_002 | ivsg_la_alt3bd3 | 2598 | 2480.4 | 217 | 2884.5 | 2489.9 | 0.962 | 0.885 | IMPRLVLY - MIGUEL 1 500kV |
| 24804 | DEVERS | 230 | 24901 | VSTA | 230 | 2 | line_207 | ivsg_la_alt3bd3 | 988 | 905.3 | 225.2 | 2385.5 | 932.9 | 0.962 | 0.636 | line DEVERS to VALLEYSC 500 ck 1 |
| 24901 | VSTA | 230 | 24804 | DEVERS | 230 | 1 | line_207 | ivsg_la_alt3bd3 | 988 | -866.5 | 183.3 | 2386.6 | 885.7 | 0.962 | 0.636 | line DEVERS to VALLEYSC 500 ck 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_84 | ivsg_la_alt3bd3 | 458 | 439.5 | 36.7 | 1105 | 441 | 0.961 | 1.012 | line MIDPINTS to DEVERS 500 ck 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_85 | ivsg_la_alt3bd3 | 458 | 439.5 | 36.8 | 1105 | 441 | 0.961 | 1.012 | line MIDPINTS to DEVERS 500 ck 2 |
| 22001 | NORTHSD | 230 | 22844 | TALEGA | 230 | 1A | B2_002 | ivsg_la_alt3bd3 | 456 | 412.9 | -67.4 | 1100.3 | 418.3 | 0.961 | 0.661 | IMPRLVLY - MIGUEL 1 500kV |
| 22001 | NORTHSD | 230 | 22844 | TALEGA | 230 | 2A | B2_002 | ivsg_la_alt3bd3 | 456 | 412.9 | -67.4 | 1100.3 | 418.3 | 0.961 | 0.661 | IMPRLVLY - MIGUEL 1 500kV |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_12 | ivsg_la_alt3bd3 | 800 | 760.7 | 10.9 | 1919.8 | 760.8 | 0.956 | 0.892 | line COACHELA to RAMON 230 ck 2 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | line_207 | ivsg_la_alt3bd3 | 388 | -359.7 | 12.4 | 930.9 | 359.9 | 0.956 | 0.854 | line DEVERS to VALLEYSC 500 ck 1 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | B2_001 | ivsg_la_alt3bd3 | 800 | 759.8 | -21.2 | 1912.1 | 760.1 | 0.952 | 0.892 | HASSYAMP - N.GILA 1 500kV |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_44 | ivsg_la_alt3bd3 | 800 | 755.1 | 8.2 | 1905.2 | 755.1 | 0.949 | 0.892 | line COACHELA to DEVERS 230 ck 2 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_61 | ivsg_la_alt3bd3 | 800 | 756.1 | 6.9 | 1905.4 | 756.2 | 0.949 | 0.892 | line IMPRLVLY to ELCENTSW 230 ck 2 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_62 | ivsg_la_alt3bd3 | 800 | 756.1 | 6.9 | 1905.4 | 756.2 | 0.949 | 0.892 | line IMPRLVLY to ELCENTSW 230 ck 3 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_13 | ivsg_la_alt3bd3 | 800 | 751 | 3.5 | 1900.4 | 751.1 | 0.946 | 0.892 | line COACHELA to MIDWAY 230 ck 1 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_14 | ivsg_la_alt3bd3 | 800 | 751 | 3.5 | 1900.4 | 751.1 | 0.946 | 0.892 | line COACHELA to MIDWAY 230 ck 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_183 | ivsg_la_alt3bd3 | 2598 | 2491.5 | 168.5 | 2825.9 | 2497.1 | 0.942 | 0.885 | line DEVERS to VSTA 230 ck 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_185 | ivsg_la_alt3bd3 | 2598 | 2491.5 | 168.5 | 2825.9 | 2497.1 | 0.942 | 0.885 | line VSTA to DEVERS 230 ck 1 |
| 24151 | VALLEYSC | 500 | 24229 | VALLEY-S | 115 | 4 | tran_249 | ivsg_la_alt3bd3 | 560 | 518.5 | 90.5 | 596.3 | 526.3 | 0.94 | 0.46 | tran VALLEYSC 500 to VALLEY-S 115 ck 3 |
| 24151 | VALLEYSC | 500 | 24229 | VALLEY-S | 115 | 3 | tran_250 | ivsg_la_alt3bd3 | 560 | 518.5 | 90.5 | 596.3 | 526.3 | 0.94 | 0.46 | tran VALLEYSC 500 to VALLEY-S 115 ck 4 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_059 | ivsg_la_alt3bd3 | 458 | 431.4 | 44.6 | 1075 | 433.7 | 0.936 | 1.012 | line ETIWANDA to SANBRDNO 230 ck 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_135 | ivsg_la_alt3bd3 | 2598 | 2468.2 | 152.9 | 2799.9 | 2473 | 0.933 | 0.885 | line SANBRDNO to DEVERS 230 ck 1 |
| 20238 | HRD-230 | 230 | 20239 | HRD-115 | 115 | 1 | IV81 | ivsg_la_alt3bd3 | 225 | 208.1 | -16.5 | 530.9 | 208.7 | 0.93 | 0.84 | tran IMPRLVLY 230 to IMPRLVLY 500 ck 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_001 | ivsg_la_alt3bd3 | 2598 | 2438.9 | 118 | 2788.8 | 2441.8 | 0.93 | 0.885 | line MOENKOPI to ELDORDO 500 ck 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_56 | ivsg_la_alt3bd3 | 2598 | 2432.9 | 110.3 | 2768.2 | 2435.4 | 0.923 | 0.885 | line NEWSF500 to IMPRLVLY 500 ck 1 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | IV80 | ivsg_la_alt3bd3 | 800 | 735.5 | 6.1 | 1853 | 735.5 | 0.923 | 0.892 | tran IMPRLVLY 230 to IMPRLVLY 500 ck 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | PV1 | ivsg_la_alt3bd3 | 458 | 430.7 | 45.2 | 1060 | 433 | 0.923 | 1.012 | gen PALOVRD1 24.00 |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_085 | ivsg_la_alt3bd3 | 2598 | 2428.4 | 109.8 | 2768.8 | 2430.8 | 0.923 | 0.885 | line LUGO to VICTORVL 500 ck 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_302 | ivsg_la_alt3bd3 | 2598 | 2437 | 136 | 2763 | 2440.8 | 0.921 | 0.885 | line DEVERS to OAK_VLLY 230 ck 1 |
| 22464 | MIGUEL | 230 | 22472 | MIGUELMP | 500 | 1 | line_68 | ivsg_la_alt3bd3 | 1120 | -1028.2 | 106 | 2791.3 | 1033.6 | 0.92 | 0.71 | line NORTHSD to NEWSF500 500 ck 1 |
| 22468 | MIGUEL | 500 | 22472 | MIGUELMP | 500 | 1 | line_68 | ivsg_la_alt3bd3 | 1120 | 1029.7 | 35.6 | 1222.9 | 1030.3 | 0.92 | 0.71 | line NORTHSD to NEWSF500 500 ck 1 |
| 20238 | HRD-230 | 230 | 20239 | HRD-115 | 115 | 1 | line_207 | ivsg_la_alt3bd3 | 225 | 204.7 | -18 | 526.7 | 205.5 | 0.92 | 0.84 | line DEVERS to VALLEYSC 500 ck 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_7 | ivsg_la_alt3bd3 | 2598 | 2426.4 | 92.7 | 2756.1 | 2428.1 | 0.919 | 0.885 | line BANIS230 to NEWSF230 230 ck 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | tran_74 | ivsg_la_alt3bd3 | 2598 | 2426.5 | 92.9 | 2755.8 | 2428.2 | 0.919 | 0.885 | tran NEWSF230 230 to NEWSF500 500 ck 1 |
| 22360 | IMPRLVLY | 500 | 22468 | MIGUEL | 500 | 1 | line_68 | ivsg_la_alt3bd3 | 2252 | 2036.7 | 457.1 | 2343.6 | 2087.4 | 0.918 | 0.681 | line NORTHSD to NEWSF500 500 ck 1 |
| 20238 | HRD-230 | 230 | 20118 | ROA-230 | 230 | 1 | line_68 | ivsg_la_alt3bd3 | 388 | -335.3 | 86.3 | 889.4 | 346.3 | 0.918 | 0.733 | line NORTHSD to NEWSF500 500 ck 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_047 | ivsg_la_alt3bd3 | 1645.4 | 1623.1 | 140.8 | 1741.4 | 1629.2 | 0.918 | 0.953 | line ELDORDO to LUGO 500 ck 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_085 | ivsg_la_alt3bd3 | 1645.4 | 1629.4 | 126.6 | 1743.7 | 1634.3 | 0.918 | 0.953 | line LUGO to VICTORVL 500 ck 1 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | SO2 | ivsg_la_alt3bd3 | 388 | -346.4 | 10.8 | 890.1 | 346.6 | 0.914 | 0.854 | gen S.ONOFR2 22.00 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | ML80 | ivsg_la_alt3bd3 | 388 | -346.5 | 13 | 885.9 | 346.7 | 0.91 | 0.854 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 22001 | NORTHSD | 230 | 22000 | NORTHSD | 500 | 1 | ML80 | ivsg_la_alt3bd3 | 1120 | -1011.6 | 107.2 | 2565.4 | 1017.3 | 0.91 | 0.83 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | line_56 | ivsg_la_alt3bd3 | 388 | -345.8 | 11.4 | 883 | 346 | 0.907 | 0.854 | line NEWSF500 to IMPRLVLY 500 ck 1 |
| 24042 | ELDORDO | 500 | 24086 | LUGO | 500 | 1 | line_085 | ivsg_la_alt3bd3 | 1386 | 1317.7 | 17.3 | 1451.8 | 1317.8 | 0.907 | 0.668 | line LUGO to VICTORVL 500 ck 1 |
| 22260 | ESCNDIDO | 230 | 22001 | NORTHSD | 230 | 1A | B2_002 | ivsg_la_alt3bd3 | 456 | -383.4 | 88.1 | 1031.3 | 393.4 | 0.904 | 0.364 | IMPRLVLY - MIGUEL 1 500kV |
| 22260 | ESCNDIDO | 230 | 22001 | NORTHSD | 230 | 2A | B2_002 | ivsg_la_alt3bd3 | 456 | -383.4 | 88.1 | 1031.3 | 393.4 | 0.904 | 0.364 | IMPRLVLY - MIGUEL 1 500kV |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | ML81 | ivsg_la_alt3bd3 | 388 | -344.6 | 13.2 | 880.8 | 344.8 | 0.904 | 0.854 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 22001 | NORTHSD | 230 | 22000 | NORTHSD | 500 | 1 | ML81 | ivsg_la_alt3bd3 | 1120 | -1004 | 105.1 | 2545 | 1009.5 | 0.9 | 0.83 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 24729 | INYO | 230 | 24730 | INYO PS | 115 | 2 | tran_230 | ivsg_la_alt3bd3 | 50 | -43.3 | 12.4 | 106.9 | 45.1 | 0.9 | 0.54 | tran INYO 230 to INYO PS 115 ck 1 |
| 24729 | INYO | 230 | 24730 | INYO PS | 115 | 1 | tran_231 | ivsg_la_alt3bd3 | 50 | -43.3 | 12.4 | 106.9 | 45.1 | 0.9 | 0.54 | tran INYO 230 to INYO PS 115 ck 2 |

ivsg_la_alt3bd3.sav
VOLTAGE Summary
N-2 Outages

| Bus | Name | kV | Area | Zone | Outage | Case | Vbase | Vcont | DeltaV | Vmin | Vmax | Max-dv | Contingency Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22734 | SANTEE | 138 | 22 | 223 | 23021/22/23/41 | ivsg_la_alt3bd3 | 0.974 | 0.918 | -0.056 | 0.9 | 1.05 | 0.05 | MIGUEL 230 CORRIDOR West of SN |
| 25001 | GOODRICH | 230 | 24 | 250 | line_2073 | ivsg_la_alt3bd3 | 0.993 | 1.044 | 0.052 | 0.9 | 1.05 | 0.05 | GOODRICH 230.00 - GOULD 230.00 1, GOODRICH 230.00 - LAGUBELL 230.00 1 |

ivsg_la_alt3bd3.sav
FLOW Summary
N-2 Outages

| LEGEND | % of RATING 1 | |
|---|---|---|
| C_pu | 100% - 110% | |
| C_pu | 110% - 120% | P.U. of |
| C_pu | > 120% | Rate 1 |

| FROM | FR | BKV | TO | TO | BKV | CK | Outage_Name | Case | Rate-Mva | Pflow | Qflow | Amps | MVA | C_pu | B_pu | Contingency_Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_2233 | ivsg_la_alt3bd3 | 1411.6 | 2508.4 | 330 | 2700.3 | 2530 | 1.673 | 1.094 | MOENKOPI 500.00 - ELDORDO 500.00 1, PISGAH 230.00 - ELDORDO 230.00 2 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2175 | ivsg_la_alt3bd3 | 458 | 717.1 | 128.6 | 1809.8 | 728.6 | 1.575 | 1.012 | DEVERS 230.00 - SANBRDNO 230.00 1, DEVERS 230.00 - VSTA 230.00 2 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2177 | ivsg_la_alt3bd3 | 458 | 717.1 | 128.6 | 1809.8 | 728.6 | 1.575 | 1.012 | DEVERS 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2178 | ivsg_la_alt3bd3 | 458 | 717.1 | 128.6 | 1809.8 | 728.6 | 1.575 | 1.012 | DEVERS 230.00 - VSTA 230.00 2, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2180 | ivsg_la_alt3bd3 | 458 | 717.1 | 128.6 | 1809.8 | 728.6 | 1.575 | 1.012 | SANBRDNO 230.00 - DEVERS 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2247 | ivsg_la_alt3bd3 | 458 | 717.1 | 128.6 | 1809.8 | 728.6 | 1.575 | 1.012 | DEVERS 230.00 - VSTA 230.00 2, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2179 | ivsg_la_alt3bd3 | 458 | 674.3 | 126.2 | 1700.7 | 686 | 1.48 | 1.012 | DEVERS 230.00 - VSTA 230.00 2, VSTA 230.00 - DEVERS 230.00 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_la_alt3bd3 | 392 | 530.4 | 61.9 | 1432.9 | 534 | 1.36 | 0.76 | MIGUEL 230 CORRIDOR West of SN |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_la_alt3bd3 | 392 | 526 | 60.5 | 1419.7 | 529.5 | 1.35 | 0.76 | MIGUEL 230 CORRIDOR West of LC |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_la_alt3bd3 | 408.3 | -521.7 | 20.4 | 2284.3 | 522 | 1.337 | 0.727 | MIGUEL 230 CORRIDOR West of SN |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_la_alt3bd3 | 408.3 | -517.5 | 20.2 | 2263.3 | 517.9 | 1.325 | 0.727 | MIGUEL 230 CORRIDOR West of LC |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_la_alt3bd3 | 392 | 512.2 | 61.9 | 1379.4 | 515.9 | 1.32 | 0.76 | MIGUEL 230 CORRIDOR North of ML |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | 23021/22/23/41 | ivsg_la_alt3bd3 | 382.4 | 471.2 | -8.5 | 2068.1 | 471.3 | 1.293 | 0.657 | MIGUEL 230 CORRIDOR West of SN |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2176 | ivsg_la_alt3bd3 | 458 | 591 | 80.4 | 1481.4 | 596.4 | 1.289 | 1.012 | DEVERS 230.00 - SANBRDNO 230.00 1, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_la_alt3bd3 | 408.3 | -504.1 | 14.3 | 2199 | 504.3 | 1.287 | 0.727 | MIGUEL 230 CORRIDOR North of ML |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | 23021/22/23/41 | ivsg_la_alt3bd3 | 382.4 | 467.1 | -7.8 | 2047.4 | 467.2 | 1.28 | 0.657 | MIGUEL 230 CORRIDOR West of LC |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_2175 | ivsg_la_alt3bd3 | 458 | 551.7 | -69.5 | 1446 | 556.1 | 1.258 | 0.7 | DEVERS 230.00 - SANBRDNO 230.00 1, DEVERS 230.00 - VSTA 230.00 2 |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_2177 | ivsg_la_alt3bd3 | 458 | 551.7 | -69.5 | 1446 | 556.1 | 1.258 | 0.7 | DEVERS 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_2178 | ivsg_la_alt3bd3 | 458 | 551.7 | -69.5 | 1446 | 556.1 | 1.258 | 0.7 | DEVERS 230.00 - VSTA 230.00 2, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_2180 | ivsg_la_alt3bd3 | 458 | 551.7 | -69.5 | 1446 | 556.1 | 1.258 | 0.7 | SANBRDNO 230.00 - DEVERS 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_2247 | ivsg_la_alt3bd3 | 458 | 551.7 | -69.5 | 1446 | 556.1 | 1.258 | 0.7 | DEVERS 230.00 - VSTA 230.00 2, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | 23021/22/23/41 | ivsg_la_alt3bd3 | 382.4 | 453.9 | -0.5 | 1985.5 | 453.9 | 1.241 | 0.657 | MIGUEL 230 CORRIDOR North of ML |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2167 | ivsg_la_alt3bd3 | 458 | 562.8 | 72.4 | 1408.9 | 567.5 | 1.226 | 1.012 | DEVERS 230.00 - SANBRDNO 230.00 1, ETIWANDA 230.00 - SANBRDNO 230.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2169 | ivsg_la_alt3bd3 | 458 | 562.8 | 72.4 | 1408.9 | 567.5 | 1.226 | 1.012 | ETIWANDA 230.00 - SANBRDNO 230.00 1, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2268 | ivsg_la_alt3bd3 | 458 | 562.8 | 72.4 | 1408.9 | 567.5 | 1.226 | 1.012 | ETIWANDA 230.00 - SANBRDNO 230.00 1, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2173 | ivsg_la_alt3bd3 | 458 | 561.1 | 53.3 | 1401.1 | 563.6 | 1.219 | 1.012 | SANBRDNO 230.00 - DEVERS 230.00 1, VSTA 230.00 - SANBRDNO 230.00 2 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2174 | ivsg_la_alt3bd3 | 458 | 561.1 | 53.3 | 1401.1 | 563.6 | 1.219 | 1.012 | DEVERS 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - SANBRDNO 230.00 2 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_N-210 | ivsg_la_alt3bd3 | 800 | 946.8 | 59.7 | 2421.2 | 948.6 | 1.206 | 0.892 | EL CENTRO IMPERIAL VALLEY 230 CKTS 2&3 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_N-203 | ivsg_la_alt3bd3 | 800 | 931.6 | 70 | 2407.6 | 934.2 | 1.199 | 0.892 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2246 | ivsg_la_alt3bd3 | 458 | 537.4 | 76 | 1342 | 542.8 | 1.168 | 1.012 | VSTA 230.00 - DEVERS 230.00 1, COACHELV 230.00 - DEVERS 230.00 2 |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_2179 | ivsg_la_alt3bd3 | 458 | 511.7 | -48.5 | 1335.9 | 514 | 1.162 | 0.7 | DEVERS 230.00 - VSTA 230.00 2, VSTA 230.00 - DEVERS 230.00 1 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_N-217 | ivsg_la_alt3bd3 | 1411.6 | 1712.7 | 119.4 | 1829.9 | 1716.9 | 1.134 | 1.094 | line MIDPINTS to IH500/MIDPOINTS DEVERS 500 ck 1 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_2179 | ivsg_la_alt3bd3 | 1411.6 | 1703.6 | 123.9 | 1821.1 | 1708.1 | 1.128 | 1.094 | DEVERS 230.00 - VSTA 230.00 2, VSTA 230.00 - DEVERS 230.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2168 | ivsg_la_alt3bd3 | 458 | 512.4 | 68.9 | 1281.6 | 517 | 1.115 | 1.012 | DEVERS 230.00 - VSTA 230.00 2, ETIWANDA 230.00 - SANBRDNO 230.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2171 | ivsg_la_alt3bd3 | 458 | 512.4 | 68.9 | 1281.6 | 517 | 1.115 | 1.012 | ETIWANDA 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 8601 | GEOSUB2 | 230 | 8300 | BANIS230 | 230 | 1 | line_N-204 | ivsg_la_alt3bd3 | 550 | 597.9 | 88.6 | 1535.1 | 604.4 | 1.113 | 0.796 | COACHELLA MIDWAY 230 CKT 1&2 |
| 22001 | NORTHSD | 230 | 22000 | NORTHSD | 500 | 1 | 23021/22/23/41 | ivsg_la_alt3bd3 | 1120 | -1234.1 | 158.6 | 3167.8 | 1244.2 | 1.11 | 0.83 | MIGUEL 230 CORRIDOR North of ML |
| 22672 | PRCTRVLY | 138 | 22852 | TELECYN | 138 | 1 | 23021/22/23/41 | ivsg_la_alt3bd3 | 478 | 504.7 | -22.5 | 2210.7 | 505.2 | 1.105 | 0.585 | MIGUEL 230 CORRIDOR West of SN |
| 22001 | NORTHSD | 230 | 22000 | NORTHSD | 500 | 1 | 23021/22/23/41 | ivsg_la_alt3bd3 | 1120 | -1216.4 | 159 | 3111.4 | 1226.8 | 1.1 | 0.83 | MIGUEL 230 CORRIDOR West of SN |
| 22672 | PRCTRVLY | 138 | 22852 | TELECYN | 138 | 1 | 23021/22/23/41 | ivsg_la_alt3bd3 | 478 | 500.5 | -22.3 | 2189.8 | 501 | 1.095 | 0.585 | MIGUEL 230 CORRIDOR West of LC |
| 22001 | NORTHSD | 230 | 22000 | NORTHSD | 500 | 1 | 23021/22/23/41 | ivsg_la_alt3bd3 | 1120 | -1216 | 159.1 | 3118.8 | 1226.3 | 1.09 | 0.83 | MIGUEL 230 CORRIDOR West of LC |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 2 | line_2029 | ivsg_la_alt3bd3 | 1195 | 1248.3 | -72.8 | 3254 | 1250.4 | 1.085 | 0.534 | LEWIS 230.00 - SERRANO 230.00 1, SERRANO 230.00 - VILLA PK 230.00 1 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 2 | line_2031 | ivsg_la_alt3bd3 | 1195 | 1248.3 | -72.8 | 3254 | 1250.4 | 1.085 | 0.534 | LEWIS 230.00 - SERRANO 230.00 2, SERRANO 230.00 - VILLA PK 230.00 1 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 2 | line_2278 | ivsg_la_alt3bd3 | 1195 | 1248.3 | -72.8 | 3254 | 1250.4 | 1.085 | 0.534 | LEWIS 230.00 - SERRANO 230.00 1, SERRANO 230.00 - VILLA PK 230.00 1 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_N-204 | ivsg_la_alt3bd3 | 800 | 834.6 | 9.9 | 2169.6 | 834.6 | 1.08 | 0.892 | COACHELLA MIDWAY 230 CKT 1&2 |
| 24016 | BARRE | 230 | 24044 | ELLIS | 230 | 1 | line_2115 | ivsg_la_alt3bd3 | 988 | 1003.1 | -122.8 | 2671.6 | 1010.6 | 1.077 | 0.319 | S.ONOFRE 230.00 - SANTIAGO 230.00 1, S.ONOFRE 230.00 - SANTIAGO 230.00 2 |
| 24900 | MIDPINTS | 500 | 24801 | DEVERS | 500 | 2 | line_N-217 | ivsg_la_alt3bd3 | 2338 | 2574 | 247.2 | 2902.7 | 2585.9 | 1.076 | 0.622 | line MIDPINTS to IH500/MIDPOINTS DEVERS 500 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_2260 | ivsg_la_alt3bd3 | 56 | 59.2 | -5 | 294 | 59.4 | 1.07 | 0.93 | KRAMER 230.00 - LUGO 230.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 22672 | PRCTRVLY | 138 | 22852 | TELECYN | 138 | 1 | 23021/22/23/41 | ivsg_la_alt3bd3 | 478 | 487.2 | -16.4 | 2125.5 | 487.5 | 1.063 | 0.585 | MIGUEL 230 CORRIDOR North of ML |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2233 | ivsg_la_alt3bd3 | 458 | 483.7 | 51.2 | 1216.8 | 486.4 | 1.059 | 1.012 | MOENKOPI 500.00 - ELDORDO 500.00 1, PISGAH 230.00 - ELDORDO 230.00 2 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2258 | ivsg_la_alt3bd3 | 458 | 481.9 | 53.1 | 1212.4 | 484.9 | 1.055 | 1.012 | LUGO 500.00 - VINCENT 500.00 2, LUGO 500.00 - VICTORVL 500.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2115 | ivsg_la_alt3bd3 | 458 | 479.5 | 56.7 | 1209.5 | 482.8 | 1.053 | 1.012 | S.ONOFRE 230.00 - SANTIAGO 230.00 1, S.ONOFRE 230.00 - SANTIAGO 230.00 2 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2256 | ivsg_la_alt3bd3 | 458 | 479.8 | 54 | 1208.5 | 482.8 | 1.052 | 1.012 | ELDORDO 500.00 - LUGO 500.00 1, LUGO 500.00 - MIRALOMA 500.00 2 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_2258 | ivsg_la_alt3bd3 | 1411.6 | 1592.2 | 111.8 | 1697.3 | 1596.1 | 1.052 | 1.094 | LUGO 500.00 - VINCENT 500.00 2, LUGO 500.00 - VICTORVL 500.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2191 | ivsg_la_alt3bd3 | 458 | 479 | 53.5 | 1204.7 | 482 | 1.048 | 1.012 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - ELDORDO 230.00 2 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2192 | ivsg_la_alt3bd3 | 458 | 478.7 | 53.6 | 1203.7 | 481.6 | 1.047 | 1.012 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2193 | ivsg_la_alt3bd3 | 458 | 478.7 | 53.6 | 1203.7 | 481.6 | 1.047 | 1.012 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - LUGO 230.00 2 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | 23021/22/23/41 | ivsg_la_alt3bd3 | 458 | 476.7 | 51.6 | 1197.7 | 479.5 | 1.042 | 1.012 | MIGUEL 230 CORRIDOR North of ML |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2179 | ivsg_la_alt3bd3 | 2598 | 2716.4 | 301.7 | 3100.7 | 2733.1 | 1.034 | 0.885 | DEVERS 230.00 - VSTA 230.00 2, VSTA 230.00 - DEVERS 230.00 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23022/23023 | ivsg_la_alt3bd3 | 392 | 399.5 | 29.1 | 1054.1 | 400.6 | 1.02 | 0.76 | ML-MS1+ ML-MS2 230KV |
| 8600 | GEOSUB1 | 230 | 8300 | BANIS230 | 230 | 1 | line_N-204 | ivsg_la_alt3bd3 | 550 | 547.3 | 78.8 | 1405.6 | 553 | 1.019 | 0.737 | COACHELLA MIDWAY 230 CKT 1&2 |
| 8600 | GEOSUB1 | 230 | 8300 | BANIS230 | 230 | 2 | line_N-204 | ivsg_la_alt3bd3 | 550 | 547.3 | 78.8 | 1405.6 | 553 | 1.019 | 0.737 | COACHELLA MIDWAY 230 CKT 1&2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2175 | ivsg_la_alt3bd3 | 2598 | 2668.4 | 269.1 | 3044.2 | 2681.9 | 1.015 | 0.885 | DEVERS 230.00 - SANBRDNO 230.00 1, DEVERS 230.00 - VSTA 230.00 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2177 | ivsg_la_alt3bd3 | 2598 | 2668.4 | 269.1 | 3044.2 | 2681.9 | 1.015 | 0.885 | DEVERS 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2178 | ivsg_la_alt3bd3 | 2598 | 2668.4 | 269.1 | 3044.2 | 2681.9 | 1.015 | 0.885 | DEVERS 230.00 - VSTA 230.00 2, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2180 | ivsg_la_alt3bd3 | 2598 | 2668.4 | 269.1 | 3044.2 | 2681.9 | 1.015 | 0.885 | SANBRDNO 230.00 - DEVERS 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2247 | ivsg_la_alt3bd3 | 2598 | 2668.4 | 269.1 | 3044.2 | 2681.9 | 1.015 | 0.885 | DEVERS 230.00 - VSTA 230.00 2, SANBRDNO 230.00 - DEVERS 230.00 1 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24901 | VSTA | 230 | 24132 | SANBRDNO | 230 | 2 | line_2179 | ivsg_la_alt3bd3 | 916 | -894.9 | 57.1 | 2329.7 | 896.7 | 1.013 | 0.492 | DEVERS 230.00 - VSTA 230.00 2, VSTA 230.00 - DEVERS 230.00 1 |
| 24701 | KRAMER | 230 | 24085 | LUGO | 230 | 2 | line_2260 | ivsg_la_alt3bd3 | 478 | 479 | 64.1 | 1212.1 | 483.3 | 1.01 | 0.604 | KRAMER 230.00 - LUGO 230.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 1 | line_2030 | ivsg_la_alt3bd3 | 1287 | 1248.3 | -72.8 | 3254 | 1250.4 | 1.007 | 0.496 | LEWIS 230.00 - SERRANO 230.00 1, SERRANO 230.00 - VILLA PK 230.00 2 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 1 | line_2032 | ivsg_la_alt3bd3 | 1287 | 1248.3 | -72.8 | 3254 | 1250.4 | 1.007 | 0.496 | LEWIS 230.00 - SERRANO 230.00 2, SERRANO 230.00 - VILLA PK 230.00 2 |
| 24016 | BARRE | 230 | 25201 | LEWIS | 230 | 1 | line_2115 | ivsg_la_alt3bd3 | 1195 | -1120.8 | 203.5 | 3011.2 | 1139.1 | 1.004 | 0.644 | S.ONOFRE 230.00 - SANTIAGO 230.00 1, S.ONOFRE 230.00 - SANTIAGO 230.00 2 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_N-217 | ivsg_la_alt3bd3 | 1645.4 | 1757.4 | 133.4 | 1887.8 | 1762.5 | 0.994 | 0.953 | line MIDPINTS to IH500/MIDPOINTS DEVERS 500 ck 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_2179 | ivsg_la_alt3bd3 | 1645.4 | 1746.7 | 139.5 | 1877.5 | 1752.3 | 0.988 | 0.953 | DEVERS 230.00 - VSTA 230.00 2, VSTA 230.00 - DEVERS 230.00 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_2175 | ivsg_la_alt3bd3 | 1645.4 | 1740.4 | 136 | 1869.5 | 1745.7 | 0.984 | 0.953 | DEVERS 230.00 - SANBRDNO 230.00 1, DEVERS 230.00 - VSTA 230.00 2 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_2177 | ivsg_la_alt3bd3 | 1645.4 | 1740.4 | 136 | 1869.5 | 1745.7 | 0.984 | 0.953 | DEVERS 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_2178 | ivsg_la_alt3bd3 | 1645.4 | 1740.4 | 136 | 1869.5 | 1745.7 | 0.984 | 0.953 | DEVERS 230.00 - VSTA 230.00 2, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_2180 | ivsg_la_alt3bd3 | 1645.4 | 1740.4 | 136 | 1869.5 | 1745.7 | 0.984 | 0.953 | SANBRDNO 230.00 - DEVERS 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_2247 | ivsg_la_alt3bd3 | 1645.4 | 1740.4 | 136 | 1869.5 | 1745.7 | 0.984 | 0.953 | DEVERS 230.00 - VSTA 230.00 2, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23022/23023 | ivsg_la_alt3bd3 | 408.3 | -394.8 | 15.3 | 1680.5 | 395.1 | 0.984 | 0.727 | ML-MS1+ ML-MS2 230KV |
| 24901 | VSTA | 230 | 24132 | SANBRDNO | 230 | 2 | line_2168 | ivsg_la_alt3bd3 | 916 | -870.2 | -17.3 | 2252.4 | 870.4 | 0.98 | 0.492 | DEVERS 230.00 - VSTA 230.00 2, ETIWANDA 230.00 - SANBRDNO 230.00 1 |
| 24901 | VSTA | 230 | 24132 | SANBRDNO | 230 | 2 | line_2171 | ivsg_la_alt3bd3 | 916 | -870.2 | -17.3 | 2252.4 | 870.4 | 0.98 | 0.492 | ETIWANDA 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_2214 | ivsg_la_alt3bd3 | 56 | 54.6 | -4.7 | 269.9 | 54.8 | 0.98 | 0.93 | LUGO 500.00 - VINCENT 500.00 1, LUGO 500.00 - VINCENT 500.00 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2170 | ivsg_la_alt3bd3 | 2598 | 2568.7 | 228.5 | 2923.8 | 2578.9 | 0.975 | 0.885 | ETIWANDA 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - SANBRDNO 230.00 2 |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_2176 | ivsg_la_alt3bd3 | 458 | 433.4 | -51.5 | 1121.2 | 436.5 | 0.975 | 0.7 | DEVERS 230.00 - SANBRDNO 230.00 1, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2172 | ivsg_la_alt3bd3 | 2598 | 2566.5 | 222.9 | 2917.1 | 2576.1 | 0.972 | 0.885 | VSTA 230.00 - SANBRDNO 230.00 2, VSTA 230.00 - DEVERS 230.00 1 |
| 24016 | BARRE | 230 | 25201 | LEWIS | 230 | 1 | line_2287 | ivsg_la_alt3bd3 | 1195 | -1098.7 | 269 | 2912.4 | 1131.2 | 0.971 | 0.644 | BARRE 230.00 - VILLA PK 230.00 1, SERRANO 230.00 - VILLA PK 230.00 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_2154 | ivsg_la_alt3bd3 | 56 | 53.5 | -5.1 | 264.5 | 53.7 | 0.97 | 0.93 | MIRALOMA 230.00 - OLINDA 230.00 1, MIRALOMA 230.00 - WALNUT 230.00 1 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_2185 | ivsg_la_alt3bd3 | 800 | 772 | 15.2 | 1948.6 | 772.1 | 0.97 | 0.892 | RAMON 230.00 - MIRAGE 230.00 2, J.HINDS 230.00 - MIRAGE 230.00 1 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_2246 | ivsg_la_alt3bd3 | 800 | 767 | 18.5 | 1937.3 | 767.2 | 0.965 | 0.892 | VSTA 230.00 - DEVERS 230.00 1, COACHELV 230.00 - DEVERS 230.00 2 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_N-208 | ivsg_la_alt3bd3 | 800 | 770.2 | 16.7 | 1938.4 | 770.4 | 0.965 | 0.892 | COACHELLA BANISTER/BANISTER AVE58 230 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | 23021/22/23/41 | ivsg_la_alt3bd3 | 388 | -365.9 | 11.1 | 938 | 366 | 0.963 | 0.854 | MIGUEL 230 CORRIDOR North of ML |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_N-217 | ivsg_la_alt3bd3 | 458 | 439.5 | 36.7 | 1105 | 441 | 0.961 | 1.012 | line MIDPINTS to IH500/MIDPOINTS DEVERS 500 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_2022 | ivsg_la_alt3bd3 | 56 | 53.4 | -5.2 | 264 | 53.6 | 0.96 | 0.93 | BARRE 230.00 - VILLA PK 230.00 1, BARRE 230.00 - LEWIS 230.00 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_2121 | ivsg_la_alt3bd3 | 56 | 53.3 | -5.4 | 264 | 53.6 | 0.96 | 0.93 | S.CLARA 230.00 - MANDALAY 230.00 1, S.CLARA 230.00 - MANDALAY 230.00 2 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_N-207 | ivsg_la_alt3bd3 | 800 | 758 | -7.8 | 1927 | 758 | 0.96 | 0.892 | MIDWAY HIGHLINE 230 CKT 3&4 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2168 | ivsg_la_alt3bd3 | 2598 | 2532.3 | 193.8 | 2874.1 | 2539.7 | 0.958 | 0.885 | DEVERS 230.00 - VSTA 230.00 2, ETIWANDA 230.00 - SANBRDNO 230.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2171 | ivsg_la_alt3bd3 | 2598 | 2532.3 | 193.8 | 2874.1 | 2539.7 | 0.958 | 0.885 | ETIWANDA 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_2186 | ivsg_la_alt3bd3 | 800 | 762.4 | 10.7 | 1924.4 | 762.5 | 0.958 | 0.892 | COACHELV 230.00 - DEVERS 230.00 2, J.HINDS 230.00 - MIRAGE 230.00 1 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | 23021/22/23/41 | ivsg_la_alt3bd3 | 388 | -363.2 | 11.9 | 930.8 | 363.4 | 0.956 | 0.854 | MIGUEL 230 CORRIDOR West of SN |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | 23021/22/23/41 | ivsg_la_alt3bd3 | 388 | -363 | 11.9 | 930.3 | 363.1 | 0.955 | 0.854 | MIGUEL 230 CORRIDOR West of LC |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2164 | ivsg_la_alt3bd3 | 458 | 439.1 | 50.1 | 1094 | 442 | 0.952 | 1.012 | MIRALOMA 230.00 - VSTA 230.00 1, MIRALOMA 230.00 - VSTA 230.00 2 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_N-204 | ivsg_la_alt3bd3 | 458 | 438.6 | 44.3 | 1093.1 | 440.8 | 0.951 | 1.012 | COACHELLA MIDWAY 230 CKT 1&2 |
| 22001 | NORTHSD | 230 | 22000 | NORTHSD | 500 | 1 | line_2022 | ivsg_la_alt3bd3 | 1120 | -1055.5 | 79.6 | 2675.5 | 1058.5 | 0.95 | 0.83 | BARRE 230.00 - VILLA PK 230.00 1, BARRE 230.00 - LEWIS 230.00 1 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_2179 | ivsg_la_alt3bd3 | 800 | 754.6 | 25.1 | 1905.7 | 755.1 | 0.949 | 0.892 | DEVERS 230.00 - VSTA 230.00 2, VSTA 230.00 - DEVERS 230.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2172 | ivsg_la_alt3bd3 | 458 | 437.7 | 41.8 | 1089.6 | 439.7 | 0.948 | 1.012 | VSTA 230.00 - SANBRDNO 230.00 2, VSTA 230.00 - DEVERS 230.00 1 |
| 24901 | VSTA | 230 | 24804 | DEVERS | 230 | 1 | line_2175 | ivsg_la_alt3bd3 | 988 | -884.9 | 185.8 | 2350 | 904.2 | 0.948 | 0.636 | DEVERS 230.00 - SANBRDNO 230.00 1, DEVERS 230.00 - VSTA 230.00 2 |
| 24804 | DEVERS | 230 | 24901 | VSTA | 230 | 2 | line_2177 | ivsg_la_alt3bd3 | 988 | 922.5 | 208.7 | 2349.4 | 945.8 | 0.948 | 0.636 | DEVERS 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 24901 | VSTA | 230 | 24804 | DEVERS | 230 | 1 | line_2178 | ivsg_la_alt3bd3 | 988 | -884.9 | 185.8 | 2350 | 904.2 | 0.948 | 0.636 | DEVERS 230.00 - VSTA 230.00 2, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 24804 | DEVERS | 230 | 24901 | VSTA | 230 | 2 | line_2180 | ivsg_la_alt3bd3 | 988 | 922.5 | 208.7 | 2349.4 | 945.8 | 0.948 | 0.636 | SANBRDNO 230.00 - DEVERS 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 24901 | VSTA | 230 | 24804 | DEVERS | 230 | 1 | line_2247 | ivsg_la_alt3bd3 | 988 | -884.9 | 185.8 | 2350 | 904.2 | 0.948 | 0.636 | DEVERS 230.00 - VSTA 230.00 2, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2196 | ivsg_la_alt3bd3 | 458 | 433.8 | 45.3 | 1083.3 | 436.1 | 0.943 | 1.012 | ETIWANDA 230.00 - SANBRDNO 230.00 1, LUGO 500.00 - MIRALOMA 500.00 2 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2198 | ivsg_la_alt3bd3 | 458 | 433.7 | 45.3 | 1083.1 | 436.1 | 0.943 | 1.012 | ETIWANDA 230.00 - SANBRDNO 230.00 1, LUGO 500.00 - MIRALOMA 500.00 3 |
| 24016 | BARRE | 230 | 25201 | LEWIS | 230 | 1 | line_2020 | ivsg_la_alt3bd3 | 1195 | -1067 | 253.5 | 2825.5 | 1096.7 | 0.942 | 0.644 | BARRE 230.00 - VILLA PK 230.00 1, DELAMO 230.00 - ELLIS 230.00 1 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_2175 | ivsg_la_alt3bd3 | 800 | 749.3 | 21.2 | 1891.4 | 749.6 | 0.942 | 0.892 | DEVERS 230.00 - SANBRDNO 230.00 1, DEVERS 230.00 - VSTA 230.00 2 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_2177 | ivsg_la_alt3bd3 | 800 | 749.3 | 21.2 | 1891.4 | 749.6 | 0.942 | 0.892 | DEVERS 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_2178 | ivsg_la_alt3bd3 | 800 | 749.3 | 21.2 | 1891.4 | 749.6 | 0.942 | 0.892 | DEVERS 230.00 - VSTA 230.00 2, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_2180 | ivsg_la_alt3bd3 | 800 | 749.3 | 21.2 | 1891.4 | 749.6 | 0.942 | 0.892 | SANBRDNO 230.00 - DEVERS 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_2247 | ivsg_la_alt3bd3 | 800 | 749.3 | 21.2 | 1891.4 | 749.6 | 0.942 | 0.892 | DEVERS 230.00 - VSTA 230.00 2, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2167 | ivsg_la_alt3bd3 | 2598 | 2486.9 | 165.6 | 2822 | 2492.4 | 0.941 | 0.885 | DEVERS 230.00 - SANBRDNO 230.00 1, ETIWANDA 230.00 - SANBRDNO 230.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2169 | ivsg_la_alt3bd3 | 2598 | 2486.9 | 165.6 | 2822 | 2492.4 | 0.941 | 0.885 | ETIWANDA 230.00 - SANBRDNO 230.00 1, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2268 | ivsg_la_alt3bd3 | 2598 | 2486.9 | 165.6 | 2822 | 2492.4 | 0.941 | 0.885 | ETIWANDA 230.00 - SANBRDNO 230.00 1, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_N-209 | ivsg_la_alt3bd3 | 800 | 745 | -5.7 | 1889.6 | 745 | 0.941 | 0.892 | EL CENTRO HIGHLINE 230 CKTS 1&2 |
| 8601 | GEOSUB2 | 230 | 8300 | BANIS230 | 230 | 1 | line_N-209 | ivsg_la_alt3bd3 | 550 | 516.2 | 58.7 | 1295.6 | 519.5 | 0.939 | 0.796 | EL CENTRO HIGHLINE 230 CKTS 1&2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2173 | ivsg_la_alt3bd3 | 2598 | 2472.1 | 159.9 | 2807.1 | 2477.2 | 0.936 | 0.885 | SANBRDNO 230.00 - DEVERS 230.00 1, VSTA 230.00 - SANBRDNO 230.00 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2174 | ivsg_la_alt3bd3 | 2598 | 2472.1 | 159.9 | 2807.1 | 2477.2 | 0.936 | 0.885 | DEVERS 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - SANBRDNO 230.00 2 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2209 | ivsg_la_alt3bd3 | 458 | 431.4 | 44.6 | 1075 | 433.7 | 0.936 | 1.012 | ETIWANDA 230.00 - SANBRDNO 230.00 1, LUGO 500.00 - SERRANO 500.00 1 |
| 8601 | GEOSUB2 | 230 | 8300 | BANIS230 | 230 | 1 | line_N-203 | ivsg_la_alt3bd3 | 550 | 505 | 74.7 | 1288.6 | 510.5 | 0.934 | 0.796 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2176 | ivsg_la_alt3bd3 | 2598 | 2468.2 | 152.9 | 2799.9 | 2473 | 0.933 | 0.885 | DEVERS 230.00 - SANBRDNO 230.00 1, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 24016 | BARRE | 230 | 25201 | LEWIS | 230 | 1 | line_2023 | ivsg_la_alt3bd3 | 1195 | -1053.1 | 264.3 | 2795.8 | 1085.8 | 0.932 | 0.644 | BARRE 230.00 - VILLA PK 230.00 1, LEWIS 230.00 - SERRANO 230.00 1 |
| 24016 | BARRE | 230 | 25201 | LEWIS | 230 | 1 | line_2024 | ivsg_la_alt3bd3 | 1195 | -1053.1 | 264.3 | 2795.8 | 1085.8 | 0.932 | 0.644 | BARRE 230.00 - VILLA PK 230.00 1, LEWIS 230.00 - SERRANO 230.00 2 |
| 24016 | BARRE | 230 | 25201 | LEWIS | 230 | 1 | line_2025 | ivsg_la_alt3bd3 | 1195 | -1054.4 | 259.1 | 2793.9 | 1085.8 | 0.932 | 0.644 | BARRE 230.00 - VILLA PK 230.00 1, LEWIS 230.00 - VILLA PK 230.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2233 | ivsg_la_alt3bd3 | 2598 | 2441.9 | 120.3 | 2793.5 | 2444.8 | 0.931 | 0.885 | MOENKOPI 500.00 - ELDORDO 500.00 1, PISGAH 230.00 - ELDORDO 230.00 2 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | line_N-203 | ivsg_la_alt3bd3 | 388 | -351.8 | 14.5 | 906.1 | 352.1 | 0.93 | 0.854 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 8319 | DIXIELAN | 92 | 8946 | DIXPRI2 | 92 | 1 | line_N-210 | ivsg_la_alt3bd3 | 54 | -49.4 | 7.6 | 314.9 | 50 | 0.93 | 0.191 | EL CENTRO IMPERIAL VALLEY 230 CKTS 2&3 |
| 20238 | HRD-230 | 230 | 20239 | HRD-115 | 115 | 1 | 23021/22/23/41 | ivsg_la_alt3bd3 | 225 | 207.7 | -18 | 530.2 | 208.5 | 0.93 | 0.84 | MIGUEL 230 CORRIDOR North of ML |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2164 | ivsg_la_alt3bd3 | 2598 | 2458.4 | 150.5 | 2782.3 | 2463 | 0.927 | 0.885 | MIRALOMA 230.00 - VSTA 230.00 1, MIRALOMA 230.00 - VSTA 230.00 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | 23021/22/23/41 | ivsg_la_alt3bd3 | 2598 | 2444.8 | 119.9 | 2779.6 | 2447.7 | 0.927 | 0.885 | MIGUEL 230 CORRIDOR West of SN |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_2170 | ivsg_la_alt3bd3 | 800 | 737.3 | 14.4 | 1859.8 | 737.5 | 0.926 | 0.892 | ETIWANDA 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - SANBRDNO 230.00 2 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_2172 | ivsg_la_alt3bd3 | 800 | 737 | 13.3 | 1858.6 | 737.1 | 0.926 | 0.892 | VSTA 230.00 - SANBRDNO 230.00 2, VSTA 230.00 - DEVERS 230.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2246 | ivsg_la_alt3bd3 | 2598 | 2454.3 | 161.7 | 2779.3 | 2459.6 | 0.926 | 0.885 | VSTA 230.00 - DEVERS 230.00 1, COACHELV 230.00 - DEVERS 230.00 2 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2258 | ivsg_la_alt3bd3 | 2598 | 2422.6 | 127.9 | 2768.7 | 2426 | 0.923 | 0.885 | LUGO 500.00 - VINCENT 500.00 2, LUGO 500.00 - VICTORVL 500.00 1 |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | 23022/23023 | ivsg_la_alt3bd3 | 382.4 | 345.8 | 9 | 1474.1 | 345.9 | 0.921 | 0.657 | ML-MS1+ ML-MS2 230KV |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2256 | ivsg_la_alt3bd3 | 2598 | 2413.2 | 138.5 | 2761 | 2417.2 | 0.92 | 0.885 | ELDORDO 500.00 - LUGO 500.00 1, LUGO 500.00 - MIRALOMA 500.00 2 |
| 22001 | NORTHSD | 230 | 22000 | NORTHSD | 500 | 1 | 23022/23023 | ivsg_la_alt3bd3 | 1120 | -1023.2 | 109.2 | 2596.9 | 1029 | 0.92 | 0.83 | ML-MS1+ ML-MS2 230KV |
| 20238 | HRD-230 | 230 | 20239 | HRD-115 | 115 | 1 | 23021/22/23/41 | ivsg_la_alt3bd3 | 225 | 206.3 | -17.8 | 526.4 | 207.1 | 0.92 | 0.84 | MIGUEL 230 CORRIDOR West of LC |
| 20238 | HRD-230 | 230 | 20239 | HRD-115 | 115 | 1 | 23021/22/23/41 | ivsg_la_alt3bd3 | 225 | 206.4 | -17.9 | 526.7 | 207.2 | 0.92 | 0.84 | MIGUEL 230 CORRIDOR West of SN |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2166 | ivsg_la_alt3bd3 | 2598 | 2435.8 | 138.9 | 2756.9 | 2439.8 | 0.919 | 0.885 | ETIWANDA 230.00 - SANBRDNO 230.00 1, ETIWANDA 230.00 - VSTA 230.00 1 |
| 8601 | GEOSUB2 | 230 | 8300 | BANIS230 | 230 | 1 | line_N-207 | ivsg_la_alt3bd3 | 550 | 503.7 | 44.3 | 1267.9 | 505.7 | 0.919 | 0.796 | MIDWAY HIGHLINE 230 CKT 3&4 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | 23022/23023 | ivsg_la_alt3bd3 | 388 | -350.1 | 12.4 | 895.5 | 350.3 | 0.919 | 0.854 | ML-MS1+ ML-MS2 230KV |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2165 | ivsg_la_alt3bd3 | 2598 | 2432.4 | 137.3 | 2752.9 | 2436.3 | 0.918 | 0.885 | ETIWANDA 230.00 - SANBRDNO 230.00 1, MIRALOMA 230.00 - VSTA 230.00 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2191 | ivsg_la_alt3bd3 | 2598 | 2408.2 | 129.9 | 2750.5 | 2411.7 | 0.917 | 0.885 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - ELDORDO 230.00 2 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_2192 | ivsg_la_alt3bd3 | 1645.4 | 1620.5 | 142.4 | 1739 | 1626.7 | 0.917 | 0.953 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_2193 | ivsg_la_alt3bd3 | 1645.4 | 1620.5 | 142.4 | 1739 | 1626.8 | 0.917 | 0.953 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - LUGO 230.00 2 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_2258 | ivsg_la_alt3bd3 | 1645.4 | 1624.6 | 134.5 | 1740.4 | 1630.1 | 0.917 | 0.953 | LUGO 500.00 - VINCENT 500.00 2, LUGO 500.00 - VICTORVL 500.00 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_2191 | ivsg_la_alt3bd3 | 1645.4 | 1619.2 | 144 | 1738 | 1625.6 | 0.916 | 0.953 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - ELDORDO 230.00 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2192 | ivsg_la_alt3bd3 | 2598 | 2406.5 | 129.9 | 2748.2 | 2410 | 0.916 | 0.885 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2193 | ivsg_la_alt3bd3 | 2598 | 2406.5 | 129.9 | 2748.1 | 2410 | 0.916 | 0.885 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - LUGO 230.00 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | 23021/22/23/41 | ivsg_la_alt3bd3 | 2598 | 2409.6 | 134 | 2748.6 | 2413.3 | 0.916 | 0.885 | MIGUEL 230 CORRIDOR North of ML |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_2167 | ivsg_la_alt3bd3 | 458 | 406.8 | -46.7 | 1049.3 | 409.5 | 0.913 | 0.7 | DEVERS 230.00 - SANBRDNO 230.00 1, ETIWANDA 230.00 - SANBRDNO 230.00 1 |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_2169 | ivsg_la_alt3bd3 | 458 | 406.8 | -46.7 | 1049.3 | 409.5 | 0.913 | 0.7 | ETIWANDA 230.00 - SANBRDNO 230.00 1, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_2256 | ivsg_la_alt3bd3 | 1645.4 | 1614.7 | 141.3 | 1732.4 | 1620.9 | 0.913 | 0.953 | ELDORDO 500.00 - LUGO 500.00 1, LUGO 500.00 - MIRALOMA 500.00 2 |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_2268 | ivsg_la_alt3bd3 | 458 | 406.8 | -46.7 | 1049.3 | 409.5 | 0.913 | 0.7 | ETIWANDA 230.00 - SANBRDNO 230.00 1, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_N-203 | ivsg_la_alt3bd3 | 458 | 424 | 49.7 | 1048 | 426.9 | 0.912 | 1.012 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 22001 | NORTHSD | 230 | 22000 | NORTHSD | 500 | 1 | 23021/23041 | ivsg_la_alt3bd3 | 1120 | -1017 | 104.3 | 2581.3 | 1022.4 | 0.91 | 0.83 | ML-SX + OM-SX 230KV |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_2173 | ivsg_la_alt3bd3 | 458 | 405.2 | -64.3 | 1045 | 410.3 | 0.909 | 0.7 | SANBRDNO 230.00 - DEVERS 230.00 1, VSTA 230.00 - SANBRDNO 230.00 2 |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_2174 | ivsg_la_alt3bd3 | 458 | 405.2 | -64.3 | 1045 | 410.3 | 0.909 | 0.7 | DEVERS 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - SANBRDNO 230.00 2 |
| 8900 | PRUETTAP | 92 | 8691 | HIGHLINE | 92 | 1 | line_N-209 | ivsg_la_alt3bd3 | 86 | -76.4 | 18.7 | 488.6 | 78.6 | 0.906 | 0.563 | EL CENTRO HIGHLINE 230 CKTS 1&2 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2165 | ivsg_la_alt3bd3 | 458 | 416.6 | 43.5 | 1037.5 | 418.8 | 0.903 | 1.012 | ETIWANDA 230.00 - SANBRDNO 230.00 1, MIRALOMA 230.00 - VSTA 230.00 2 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | line_N-204 | ivsg_la_alt3bd3 | 388 | -342.2 | 15.7 | 879.6 | 342.6 | 0.903 | 0.854 | COACHELLA MIDWAY 230 CKT 1&2 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2166 | ivsg_la_alt3bd3 | 458 | 415.5 | 43.5 | 1034.9 | 417.8 | 0.901 | 1.012 | ETIWANDA 230.00 - SANBRDNO 230.00 1, ETIWANDA 230.00 - VSTA 230.00 1 |
| 24056 | ETIWANDA | 230 | 24132 | SANBRDNO | 230 | 1 | line_2172 | ivsg_la_alt3bd3 | 797 | -696.3 | 46.1 | 1802.2 | 697.8 | 0.901 | 0.425 | VSTA 230.00 - SANBRDNO 230.00 2, VSTA 230.00 - DEVERS 230.00 1 |
| 24804 | DEVERS | 230 | 24901 | VSTA | 230 | 2 | line_2172 | ivsg_la_alt3bd3 | 988 | 877 | 207.2 | 2233 | 901.2 | 0.901 | 0.636 | VSTA 230.00 - SANBRDNO 230.00 2, VSTA 230.00 - DEVERS 230.00 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_2096 | ivsg_la_alt3bd3 | 56 | 49.6 | -5.2 | 244.1 | 49.9 | 0.9 | 0.93 | EAGLROCK 230.00 - MESA CAL 230.00 1, GOODRICH 230.00 - GOULD 230.00 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_2106 | ivsg_la_alt3bd3 | 56 | 49.8 | -5.1 | 245.2 | 50.1 | 0.9 | 0.93 | PARDEE 230.00 - SYLMAR S 230.00 1, SYLMAR S 230.00 - GOULD 230.00 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_2107 | ivsg_la_alt3bd3 | 56 | 49.8 | -5.1 | 245.2 | 50.1 | 0.9 | 0.93 | PARDEE 230.00 - SYLMAR S 230.00 2, SYLMAR S 230.00 - GOULD 230.00 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_2109 | ivsg_la_alt3bd3 | 56 | 49.7 | -5 | 244.6 | 49.9 | 0.9 | 0.93 | PARDEE 230.00 - SYLMAR S 230.00 1, PARDEE 230.00 - SYLMAR S 230.00 2 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_2280 | ivsg_la_alt3bd3 | 56 | 49.8 | -5.1 | 245.2 | 50.1 | 0.9 | 0.93 | PARDEE 230.00 - SYLMAR S 230.00 1, SYLMAR S 230.00 - GOULD 230.00 1 |
| 20238 | HRD-230 | 230 | 20239 | HRD-115 | 115 | 1 | line_N-203 | ivsg_la_alt3bd3 | 225 | 201.2 | -17.1 | 514.7 | 201.9 | 0.9 | 0.84 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 20238 | HRD-230 | 230 | 20239 | HRD-115 | 115 | 1 | 23022/23023 | ivsg_la_alt3bd3 | 225 | 200.5 | -15.2 | 510.4 | 201 | 0.9 | 0.84 | ML-MS1+ ML-MS2 230KV |

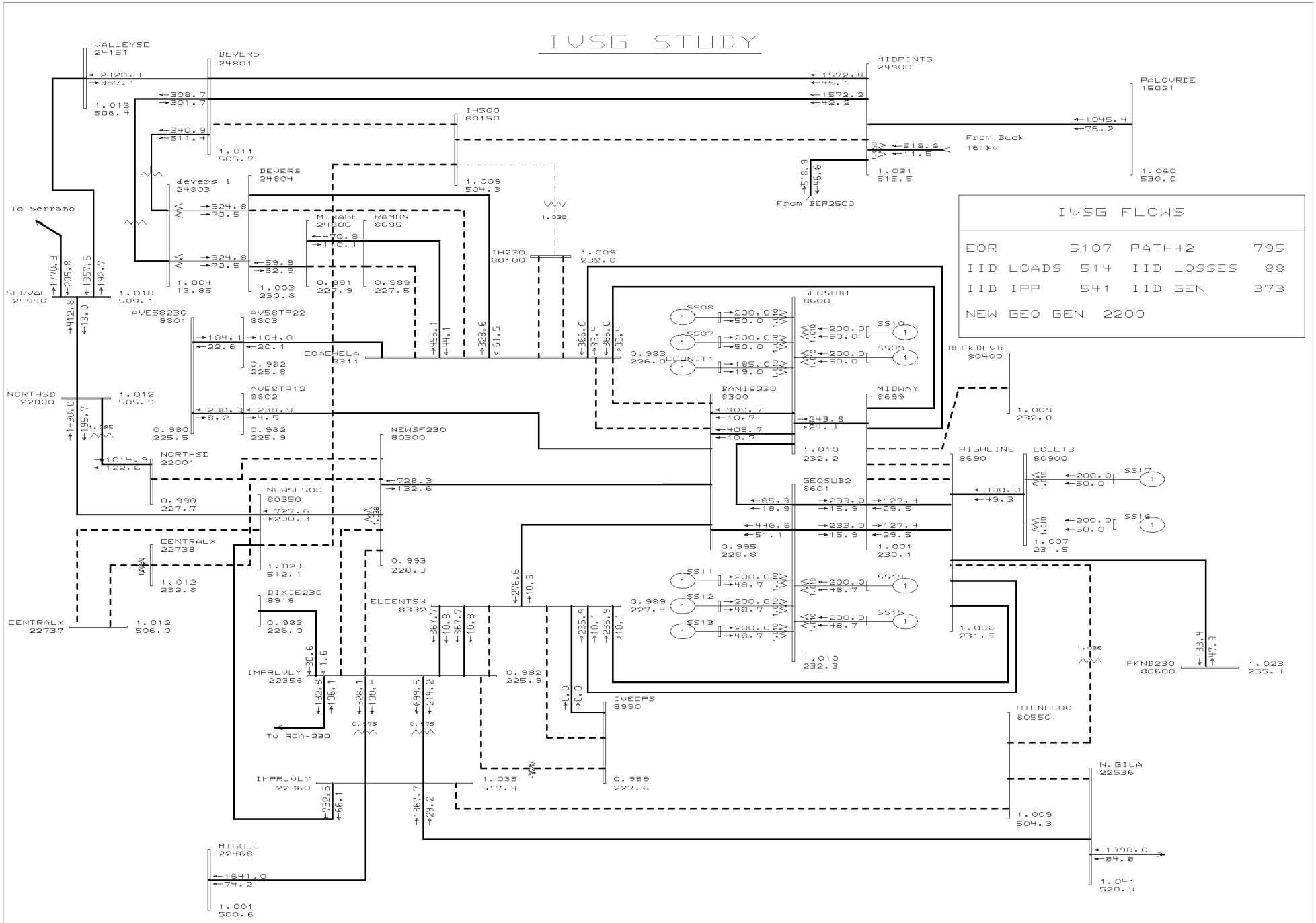
ivsg_la_alt3bd3.sav
No Solve Summary
N-2 Outages

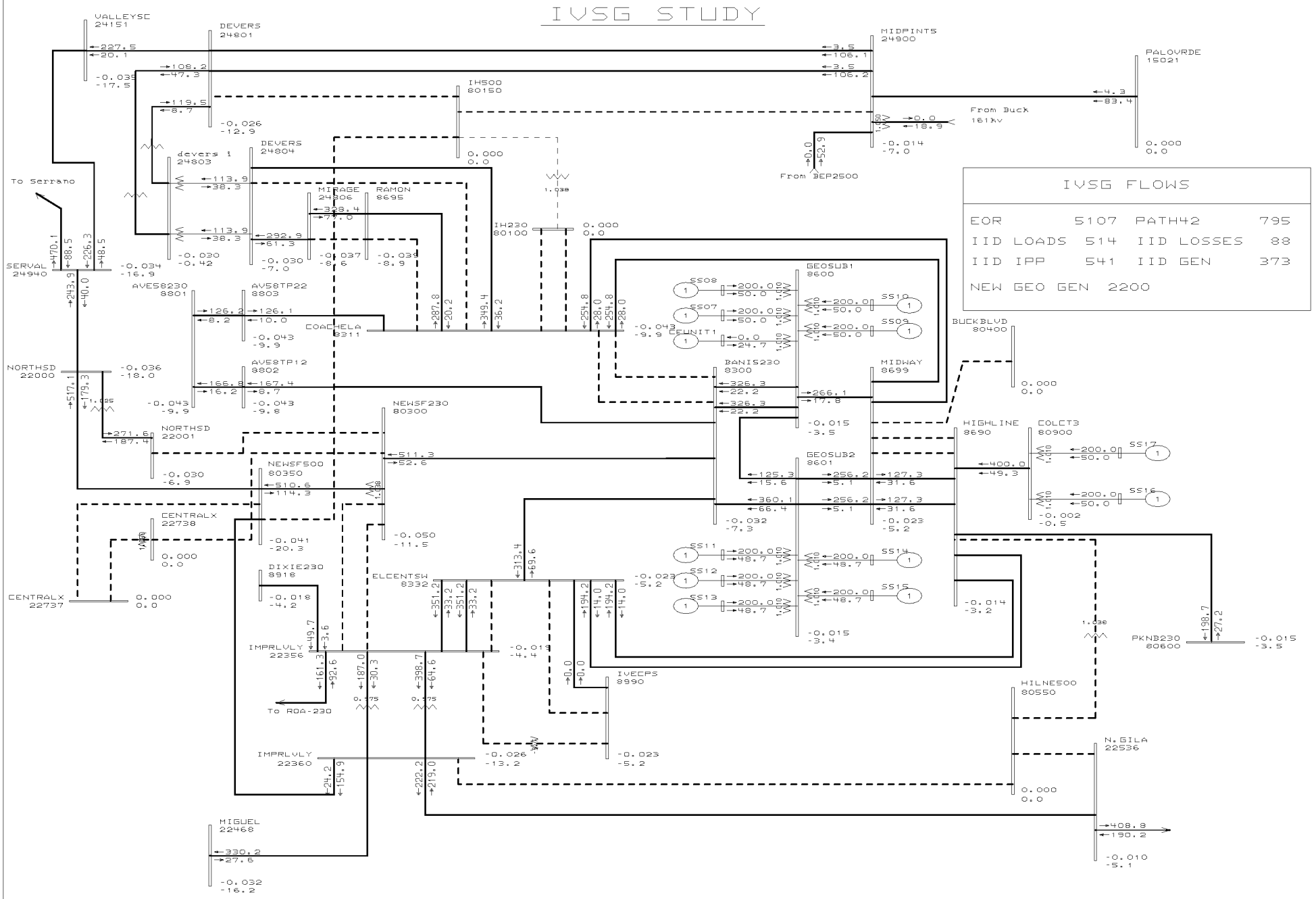
| Contingency-Description | | Case | Problem-Description | | | |
|---|---|---|---|---|---|---|
| line MIDPINTS to DEVERS | 500 ck 1&2 | ivsg_la_alt3bd3 | Pmis | 24801 DEVERS | 500.00 = | 0.00 MW + j -400.10 MVAR |

# Imperial Valley Study Group

## Appendix B.1.7

Alt 3b D4
Light Autumn
Alternative 3b
Dispatch 4


IVSG STUDY
VALLEYSC 24151
DEVERS 24801
MIDPINTS 24900
PALOVRDE 15021
IH500 80150
From Buck 161kV
From BEP2500
devers 1 24803
DEVERS 24804
To Serrano
MIRAGE 24806
RAMON 8695
IH230 80100
SERVAL 24940
AVES8230 8801
AVES8TP22 8803
AVES8TP12 8802
COACHELA 8311
GEOSUB1 8600
CELUNIT1
BANIS230 8300
MIDWAY 8699
BUCKBLVD 80400
NORTHSD 22000
NORTHSD 22001
NEWSF230 80300
NEWSF500 80350
GEOSUB2 8601
HIGHLINE 8690
COLCT3 80900
CENTRALX 22738
CENTRALX 22737
DIXIE230 8918
ELCENTSW 8332
IMPRLVLY 22356
IMPRLVLY 22360
IVECPS 8990
To ROA-230
HILNE500 80550
N.GILA 22536
PKNB230 80600
MIGUEL 22468
IVSG FLOWS
EOR 5107 PATH42 795
IID LOADS 514 IID LOSSES 88
IID IPP 541 IID GEN 373
NEW GEO GEN 2200


IVSG STUDY
VALLEYSC 24151
DEVERS 24801
MIDPINTS 24900
PALOVRDE 15021
IH500 80150
From Buck 161kv
From BEP2500
devers 1 24803
DEVERS 24804
To Serrano
MIRAGE 24806
RAMON 8695
IH230 80100
SERVAL 24940
AVE58230 8801
AVE58TP22 8803
AVE58TP12 8802
COACHELLA 8211
GEOSUB1 8600
SS08
SS07
SS10
SS09
CELNIT1
BANIS230 8300
MIDWAY 8699
BUCKBLVD 80400
NORTHSD 22000
NORTHSD 22001
NEWSF230 80300
NEWSF500 80350
GEOSUB2 8601
HIGHLINE 8690
COLCT3 80900
SS17
SS16
CENTRALX 22738
CENTRALX 22737
DIXIE230 8918
ELCENTSW 8332
SS11
SS12
SS13
SS14
SS15
IMPRLVLY 22356
IMPRLVLY 22360
To ROA-230
IVECPS 8990
HILNE500 80550
N.GILA 22536
PKNB230 80600
MIGUEL 22468
IVSG FLOWS
EOR 5107 PATH42 795
IID LOADS 514 IID LOSSES 88
IID IPP 541 IID GEN 373
NEW GEO GEN 2200

ivsg_3bd4r1.sav
Voltage Summary
N-0 Outages

| Bus | Name | kV | Area | Zone | Outage | Case | Vbase | Vcont | DeltaV | Vmin | Vmax | Max-dv | Contingency Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 14534 | N.GILA 4 | 100 | 14 | 847 | base | ivsg_la_alt3bd4r | 0.936 | 0.936 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14606 | N.GILA 3 | 100 | 14 | 847 | base | ivsg_la_alt3bd4r | 0.936 | 0.936 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24156 | VINCENT | 500 | 24 | 240 | base | ivsg_la_alt3bd4r | 1.05 | 1.05 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14608 | OCOTIL 1 | 100 | 14 | 141 | base | ivsg_la_alt3bd4r | 1.051 | 1.051 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24748 | OXBOW A | 230 | 24 | 247 | base | ivsg_la_alt3bd4r | 1.052 | 1.052 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14007 | GILARIVR | 500 | 14 | 141 | base | ivsg_la_alt3bd4r | 1.053 | 1.053 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24141 | SPRINGVL | 230 | 24 | 240 | base | ivsg_la_alt3bd4r | 1.053 | 1.053 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15093 | HARQUAHA | 500 | 14 | 158 | base | ivsg_la_alt3bd4r | 1.054 | 1.054 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15089 | JOJOBA | 500 | 14 | 158 | base | ivsg_la_alt3bd4r | 1.054 | 1.054 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 19038 | MEAD | 500 | 14 | 191 | base | ivsg_la_alt3bd4r | 1.054 | 1.054 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24153 | VESTAL | 230 | 24 | 240 | base | ivsg_la_alt3bd4r | 1.054 | 1.054 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14001 | FOURCORN | 500 | 14 | 141 | base | ivsg_la_alt3bd4r | 1.055 | 1.055 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14000 | CHOLLA | 500 | 14 | 141 | base | ivsg_la_alt3bd4r | 1.056 | 1.056 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24775 | RUSH | 115 | 24 | 247 | base | ivsg_la_alt3bd4r | 1.056 | 1.056 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14005 | WESTWING | 500 | 14 | 141 | base | ivsg_la_alt3bd4r | 1.057 | 1.057 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24729 | INYO | 230 | 24 | 247 | base | ivsg_la_alt3bd4r | 1.057 | 1.057 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15031 | PERK PS1 | 500 | 14 | 158 | base | ivsg_la_alt3bd4r | 1.058 | 1.058 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15032 | PERK PS2 | 500 | 14 | 158 | base | ivsg_la_alt3bd4r | 1.058 | 1.058 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15033 | PERKINPS | 500 | 14 | 158 | base | ivsg_la_alt3bd4r | 1.058 | 1.058 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 16310 | NL.3WP2 | 100 | 14 | 160 | base | ivsg_la_alt3bd4r | 1.058 | 1.058 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24097 | MOHAVE | 500 | 24 | 240 | base | ivsg_la_alt3bd4r | 1.058 | 1.058 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15090 | HASSYAMP | 500 | 14 | 158 | base | ivsg_la_alt3bd4r | 1.059 | 1.059 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15092 | ARLINTON | 500 | 14 | 158 | base | ivsg_la_alt3bd4r | 1.059 | 1.059 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15094 | MESQUITE | 500 | 14 | 158 | base | ivsg_la_alt3bd4r | 1.059 | 1.059 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14009 | REDHAWK | 500 | 14 | 158 | base | ivsg_la_alt3bd4r | 1.059 | 1.059 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15021 | PALOVRDE | 500 | 14 | 158 | base | ivsg_la_alt3bd4r | 1.06 | 1.06 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15061 | RUDD | 500 | 14 | 158 | base | ivsg_la_alt3bd4r | 1.061 | 1.061 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14100 | CHOLLA | 345 | 14 | 141 | base | ivsg_la_alt3bd4r | 1.061 | 1.061 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14010 | TS5 | 500 | 14 | 840 | base | ivsg_la_alt3bd4r | 1.061 | 1.061 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15034 | PERKINS | 500 | 14 | 158 | base | ivsg_la_alt3bd4r | 1.062 | 1.062 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14006 | YAVAPAI | 500 | 14 | 141 | base | ivsg_la_alt3bd4r | 1.063 | 1.063 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24776 | LEE VINE | 115 | 24 | 247 | base | ivsg_la_alt3bd4r | 1.063 | 1.063 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24235 | RECTOR | 230 | 24 | 240 | base | ivsg_la_alt3bd4r | 1.066 | 1.066 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24234 | RECTRSVC | 230 | 24 | 240 | base | ivsg_la_alt3bd4r | 1.066 | 1.066 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15087 | SNTAROSA | 500 | 14 | 158 | base | ivsg_la_alt3bd4r | 1.067 | 1.067 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15088 | PINAL_W | 500 | 14 | 158 | base | ivsg_la_alt3bd4r | 1.068 | 1.068 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 16302 | NL.3WP | 100 | 14 | 160 | base | ivsg_la_alt3bd4r | 1.068 | 1.068 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15001 | CORONADO | 500 | 14 | 140 | base | ivsg_la_alt3bd4r | 1.071 | 1.071 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14002 | MOENKOPI | 500 | 14 | 141 | base | ivsg_la_alt3bd4r | 1.077 | 1.077 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14003 | NAVAJO | 500 | 14 | 141 | base | ivsg_la_alt3bd4r | 1.083 | 1.083 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24304 | BIG CRK4 | 230 | 24 | 243 | base | ivsg_la_alt3bd4r | 1.088 | 1.088 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24301 | BIG CRK1 | 230 | 24 | 243 | base | ivsg_la_alt3bd4r | 1.089 | 1.089 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24320 | EASTWOOD | 230 | 24 | 243 | base | ivsg_la_alt3bd4r | 1.09 | 1.09 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24316 | MAMMOTH | 230 | 24 | 243 | base | ivsg_la_alt3bd4r | 1.09 | 1.09 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24302 | BIG CRK2 | 230 | 24 | 243 | base | ivsg_la_alt3bd4r | 1.091 | 1.091 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24303 | BIG CRK3 | 230 | 24 | 243 | base | ivsg_la_alt3bd4r | 1.091 | 1.091 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24305 | BIG CRK8 | 230 | 24 | 243 | base | ivsg_la_alt3bd4r | 1.091 | 1.091 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |

ivsg_la_3bd4r1.sav
Flow Summary
N-0 Outages

| LEGEND | % of RATING 1 | |
|---|---|---|
| C_pu | 100% - 110% | |
| C_pu | 110% - 120% | P.U. of |
| C_pu | > 120% | Rate 1 |

| FROM | FR | BKV | TO | TO | BKV | CK | Outage_Name | Case | Rate-Mva | Pflow | Qflow | Amps | MVA | C_pu | B_pu | Contingency_Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24900 | MIDPINTS | 500 | 19399 | BUCK161 | 161 | 1 | base | ivsg_la_alt3bd4r | 250 | -514.1 | 80.3 | 582.8 | 520.3 | 2.08 | 2.08 | Base system (n-0) |
| 19400 | BUCK230 | 230 | 19399 | BUCK161 | 161 | 1 | base | ivsg_la_alt3bd4r | 280 | 339.2 | 45.8 | 872.5 | 342.3 | 1.22 | 1.22 | Base system (n-0) |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | base | ivsg_la_alt3bd4r | 1411.6 | 1731.7 | 129.3 | 1851.8 | 1736.5 | 1.148 | 1.148 | Base system (n-0) |
| 16900 | COPPERVR | 345 | 16901 | COPPERVR | 230 | 1 | base | ivsg_la_alt3bd4r | 200 | 202.2 | 98.4 | 370.6 | 224.9 | 1.12 | 1.12 | Base system (n-0) |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | base | ivsg_la_alt3bd4r | 458 | 485.1 | 53.7 | 1220.9 | 488 | 1.062 | 1.062 | Base system (n-0) |
| 24999 | DEVRSVC1 | 500 | 24801 | DEVERS | 500 | 1 | base | ivsg_la_alt3bd4r | 387.5 | 0 | 400.1 | 456.8 | 400.1 | 1.021 | 1.021 | Base system (n-0) |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | base | ivsg_la_alt3bd4r | 1645.4 | 1777.4 | 145.1 | 1911.2 | 1783.3 | 1.006 | 1.006 | Base system (n-0) |
| 14206 | CTRYCLUB | 230 | 14216 | LINCSTRT | 230 | 1 | base | ivsg_la_alt3bd4r | 462.1 | -455.9 | -88.7 | 1157.3 | 464.4 | 0.998 | 0.998 | Base system (n-0) |
| 24912 | SHANDIN | 115 | 24916 | TAP902 | 115 | 1 | base | ivsg_la_alt3bd4r | 109.1 | -104.3 | 30.3 | 543.5 | 108.7 | 0.994 | 0.994 | Base system (n-0) |
| 25641 | TAP816 | 115 | 25664 | TAP998 | 115 | 1 | base | ivsg_la_alt3bd4r | 107.6 | -96.4 | 41.6 | 536.3 | 105 | 0.993 | 0.993 | Base system (n-0) |
| 25641 | TAP816 | 115 | 25644 | TAP818 | 115 | 1 | base | ivsg_la_alt3bd4r | 107.6 | 96.4 | -40.8 | 534.7 | 104.7 | 0.99 | 0.99 | Base system (n-0) |
| 24805 | DEVERS | 115 | 25644 | TAP818 | 115 | 1 | base | ivsg_la_alt3bd4r | 217 | -183.7 | 97.4 | 1050.5 | 207.9 | 0.965 | 0.965 | Base system (n-0) |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | base | ivsg_la_alt3bd4r | 800 | 742.1 | 19.7 | 1873.5 | 742.4 | 0.933 | 0.933 | Base system (n-0) |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | base | ivsg_la_alt3bd4r | 2598 | 2443.9 | 133.6 | 2794.3 | 2447.5 | 0.931 | 0.931 | Base system (n-0) |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | base | ivsg_la_alt3bd4r | 56 | 51.7 | -5.1 | 255.3 | 52 | 0.93 | 0.93 | Base system (n-0) |
| 25629 | TAP813 | 115 | 25630 | TAP814 | 115 | 1 | base | ivsg_la_alt3bd4r | 82.7 | 69.9 | -28.3 | 383.8 | 75.4 | 0.924 | 0.924 | Base system (n-0) |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | base | ivsg_la_alt3bd4r | 388 | -349.9 | 10.9 | 897.1 | 350.1 | 0.921 | 0.921 | Base system (n-0) |
| 22001 | NORTHSD | 230 | 22000 | NORTHSD | 500 | 1 | base | ivsg_la_alt3bd4r | 1120 | -1014.9 | 122.6 | 2592.1 | 1022.2 | 0.91 | 0.91 | Base system (n-0) |

| Bus | Name | kV | Area | Zone | Outage | Case | Vbase | Vcont | DeltaV | Vmin | Vmax | Max-dv | Contingency Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22464 | MIGUEL | 230 | 22 | 222 | line_68 | ivsg_la_alt3bd4r | 0.96 | 0.904 | -0.056 | 0.9 | 1.05 | 0.05 | line NORTHSD to NEWSF500 500 ck 1 |
| 24017 | BLYTHESC | 161 | 24 | 248 | line_007 | ivsg_la_alt3bd4r | 1.005 | 0.917 | -0.087 | 0.9 | 1.05 | 0.05 | line BLYTHE to BLYTHESC 161 ck 1 |
| 22648 | PENSQTOS | 138 | 22 | 221 | SO2 | ivsg_la_alt3bd4r | 0.973 | 0.921 | -0.052 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22184 | DOUBLET | 138 | 22 | 221 | SO2 | ivsg_la_alt3bd4r | 0.974 | 0.922 | -0.052 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22192 | DOUBLTTP | 138 | 22 | 221 | SO2 | ivsg_la_alt3bd4r | 0.974 | 0.922 | -0.052 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22922 | MIRA SOR | 138 | 22 | 221 | SO2 | ivsg_la_alt3bd4r | 0.973 | 0.922 | -0.052 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22580 | NORTHCTY | 138 | 22 | 224 | SO2 | ivsg_la_alt3bd4r | 0.976 | 0.924 | -0.052 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22412 | LOSCOCHS | 138 | 22 | 223 | line_68 | ivsg_la_alt3bd4r | 0.981 | 0.925 | -0.056 | 0.9 | 1.05 | 0.05 | line NORTHSD to NEWSF500 500 ck 1 |
| 22424 | MAINST50 | 138 | 22 | 222 | line_68 | ivsg_la_alt3bd4r | 0.984 | 0.925 | -0.059 | 0.9 | 1.05 | 0.05 | line NORTHSD to NEWSF500 500 ck 1 |
| 22428 | MAINST51 | 138 | 22 | 222 | line_68 | ivsg_la_alt3bd4r | 0.984 | 0.925 | -0.059 | 0.9 | 1.05 | 0.05 | line NORTHSD to NEWSF500 500 ck 1 |
| 22772 | SOUTHBAY | 138 | 22 | 222 | line_68 | ivsg_la_alt3bd4r | 0.983 | 0.925 | -0.058 | 0.9 | 1.05 | 0.05 | line NORTHSD to NEWSF500 500 ck 1 |
| 24731 | INYOKERN | 115 | 24 | 247 | line_175 | ivsg_la_alt3bd4r | 1.013 | 0.926 | -0.087 | 0.9 | 1.05 | 0.05 | line INYO to COTTONWD 230 ck 1 |
| 22734 | SANTEE | 138 | 22 | 223 | line_68 | ivsg_la_alt3bd4r | 0.98 | 0.927 | -0.053 | 0.9 | 1.05 | 0.05 | line NORTHSD to NEWSF500 500 ck 1 |
| 22412 | LOSCOCHS | 138 | 22 | 223 | SO2 | ivsg_la_alt3bd4r | 0.981 | 0.927 | -0.054 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22300 | FRIARS | 138 | 22 | 221 | line_68 | ivsg_la_alt3bd4r | 0.979 | 0.928 | -0.051 | 0.9 | 1.05 | 0.05 | line NORTHSD to NEWSF500 500 ck 1 |
| 22300 | FRIARS | 138 | 22 | 221 | SO2 | ivsg_la_alt3bd4r | 0.979 | 0.928 | -0.051 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22734 | SANTEE | 138 | 22 | 223 | SO2 | ivsg_la_alt3bd4r | 0.98 | 0.928 | -0.052 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22500 | MISSION | 138 | 22 | 221 | line_68 | ivsg_la_alt3bd4r | 0.98 | 0.929 | -0.051 | 0.9 | 1.05 | 0.05 | line NORTHSD to NEWSF500 500 ck 1 |
| 22500 | MISSION | 138 | 22 | 221 | SO2 | ivsg_la_alt3bd4r | 0.98 | 0.929 | -0.051 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22116 | CARLTHTP | 138 | 22 | 223 | line_68 | ivsg_la_alt3bd4r | 0.983 | 0.931 | -0.051 | 0.9 | 1.05 | 0.05 | line NORTHSD to NEWSF500 500 ck 1 |
| 22120 | CARLTNHS | 138 | 22 | 223 | line_68 | ivsg_la_alt3bd4r | 0.982 | 0.931 | -0.051 | 0.9 | 1.05 | 0.05 | line NORTHSD to NEWSF500 500 ck 1 |
| 22120 | CARLTNHS | 138 | 22 | 223 | SO2 | ivsg_la_alt3bd4r | 0.982 | 0.931 | -0.051 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22424 | MAINST50 | 138 | 22 | 222 | SO2 | ivsg_la_alt3bd4r | 0.984 | 0.931 | -0.053 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22428 | MAINST51 | 138 | 22 | 222 | SO2 | ivsg_la_alt3bd4r | 0.984 | 0.931 | -0.053 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22772 | SOUTHBAY | 138 | 22 | 222 | SO2 | ivsg_la_alt3bd4r | 0.983 | 0.931 | -0.052 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22852 | TELECYN | 138 | 22 | 222 | line_68 | ivsg_la_alt3bd4r | 0.993 | 0.932 | -0.061 | 0.9 | 1.05 | 0.05 | line NORTHSD to NEWSF500 500 ck 1 |
| 22116 | CARLTHTP | 138 | 22 | 223 | SO2 | ivsg_la_alt3bd4r | 0.983 | 0.932 | -0.051 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22672 | PRCTRVLY | 138 | 22 | 222 | line_68 | ivsg_la_alt3bd4r | 0.995 | 0.934 | -0.061 | 0.9 | 1.05 | 0.05 | line NORTHSD to NEWSF500 500 ck 1 |
| 22268 | ESCNDO51 | 138 | 22 | 225 | SO2 | ivsg_la_alt3bd4r | 0.987 | 0.934 | -0.053 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22436 | MDWLRKTP | 138 | 22 | 225 | SO2 | ivsg_la_alt3bd4r | 0.987 | 0.934 | -0.053 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22568 | NCMETER | 138 | 22 | 225 | SO2 | ivsg_la_alt3bd4r | 0.987 | 0.934 | -0.053 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22572 | NCMETRTP | 138 | 22 | 225 | SO2 | ivsg_la_alt3bd4r | 0.987 | 0.934 | -0.053 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22460 | MIGUEL | 138 | 22 | 222 | line_68 | ivsg_la_alt3bd4r | 0.996 | 0.935 | -0.061 | 0.9 | 1.05 | 0.05 | line NORTHSD to NEWSF500 500 ck 1 |
| 22048 | BATIQTOS | 138 | 22 | 224 | SO2 | ivsg_la_alt3bd4r | 0.988 | 0.935 | -0.053 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22052 | BATIQTP | 138 | 22 | 224 | SO2 | ivsg_la_alt3bd4r | 0.988 | 0.935 | -0.053 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22124 | CHCARITA | 138 | 22 | 225 | SO2 | ivsg_la_alt3bd4r | 0.985 | 0.935 | -0.05 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22108 | CANNON | 138 | 22 | 224 | SO2 | ivsg_la_alt3bd4r | 0.99 | 0.937 | -0.053 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22228 | ENCINA | 138 | 22 | 224 | SO2 | ivsg_la_alt3bd4r | 0.99 | 0.937 | -0.053 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22632 | PALOMAR | 138 | 22 | 224 | SO2 | ivsg_la_alt3bd4r | 0.99 | 0.937 | -0.053 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22264 | ESCNDO50 | 138 | 22 | 225 | SO2 | ivsg_la_alt3bd4r | 0.99 | 0.938 | -0.053 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22227 | ENCINATP | 230 | 22 | 224 | SO2 | ivsg_la_alt3bd4r | 0.99 | 0.939 | -0.051 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22232 | ENCINA | 230 | 22 | 224 | SO2 | ivsg_la_alt3bd4r | 0.99 | 0.939 | -0.051 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22716 | SANLUSRY | 230 | 22 | 224 | SO2 | ivsg_la_alt3bd4r | 0.991 | 0.939 | -0.052 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22852 | TELECYN | 138 | 22 | 222 | SO2 | ivsg_la_alt3bd4r | 0.993 | 0.941 | -0.052 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 24131 | S.ONOFRE | 230 | 24 | 240 | SO2 | ivsg_la_alt3bd4r | 0.996 | 0.943 | -0.054 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22100 | CALAVRTP | 138 | 22 | 224 | SO2 | ivsg_la_alt3bd4r | 0.997 | 0.944 | -0.054 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22672 | PRCTRVLY | 138 | 22 | 222 | SO2 | ivsg_la_alt3bd4r | 0.995 | 0.944 | -0.051 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22254 | ENVIREPL | 69 | 22 | 225 | SO2 | ivsg_la_alt3bd4r | 0.999 | 0.944 | -0.055 | 0 | 0 | 0 | gen S.ONOFR2 22.00 |
| 22460 | MIGUEL | 138 | 22 | 222 | SO2 | ivsg_la_alt3bd4r | 0.996 | 0.945 | -0.05 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22760 | SHADOWR | 138 | 22 | 224 | SO2 | ivsg_la_alt3bd4r | 0.999 | 0.945 | -0.054 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22468 | MIGUEL | 500 | 22 | 227 | line_68 | ivsg_la_alt3bd4r | 1.001 | 0.947 | -0.055 | 0.9 | 1.05 | 0.05 | line NORTHSD to NEWSF500 500 ck 1 |
| 22472 | MIGUELMP | 500 | 22 | 227 | line_68 | ivsg_la_alt3bd4r | 1.006 | 0.947 | -0.059 | 0.9 | 1.05 | 0.05 | line NORTHSD to NEWSF500 500 ck 1 |
| 22712 | SANLUSRY | 138 | 22 | 224 | SO2 | ivsg_la_alt3bd4r | 1.003 | 0.949 | -0.054 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 24739 | MC GEN | 115 | 24 | 247 | line_175 | ivsg_la_alt3bd4r | 1.032 | 0.951 | -0.081 | 0.9 | 1.05 | 0.05 | line INYO to COTTONWD 230 ck 1 |
| 24762 | TAP702 | 115 | 24 | 247 | line_175 | ivsg_la_alt3bd4r | 1.032 | 0.951 | -0.081 | 0.9 | 1.05 | 0.05 | line INYO to COTTONWD 230 ck 1 |
| 24763 | TAP703 | 115 | 24 | 247 | line_175 | ivsg_la_alt3bd4r | 1.032 | 0.951 | -0.081 | 0.9 | 1.05 | 0.05 | line INYO to COTTONWD 230 ck 1 |
| 24749 | SEARLES | 115 | 24 | 247 | line_175 | ivsg_la_alt3bd4r | 1.032 | 0.952 | -0.081 | 0.9 | 1.05 | 0.05 | line INYO to COTTONWD 230 ck 1 |
| 24768 | RANDSBRG | 115 | 24 | 247 | line_175 | ivsg_la_alt3bd4r | 1.008 | 0.953 | -0.054 | 0.9 | 1.05 | 0.05 | line INYO to COTTONWD 230 ck 1 |
| 24761 | TAP701 | 115 | 24 | 247 | line_175 | ivsg_la_alt3bd4r | 1.008 | 0.953 | -0.054 | 0.9 | 1.05 | 0.05 | line INYO to COTTONWD 230 ck 1 |
| 14534 | N.GILA 4 | 100 | 14 | 847 | NG500/69 | ivsg_la_alt3bd4r | 0.936 | 1 | 0.064 | 0.9 | 1.05 | 0.05 | tran N.GILA 500 to N.GILA 69 ck 1 |
| 24035 | EAGLEMTN | 161 | 24 | 248 | tran_241 | ivsg_la_alt3bd4r | 0.969 | 1.026 | 0.058 | 0.9 | 1.05 | 0.05 | tran EAGLEMTN 230 to EAGLEMTN 161 ck 1 |
| 24142 | SYC CYN | 230 | 24 | 240 | line_086 | ivsg_la_alt3bd4r | 1.035 | 1.091 | 0.056 | 0.9 | 1.05 | 0.05 | line MAGUNDEN to OMAR 230 ck 1 |
| 25613 | EDMONSTN | 230 | 24 | 256 | line_122 | ivsg_la_alt3bd4r | 1.022 | 1.091 | 0.069 | 0.9 | 1.05 | 0.05 | line PASTORIA to EDMONSTN 230 ck 1 |
| 24142 | SYC CYN | 230 | 24 | 240 | line_140 | ivsg_la_alt3bd4r | 1.035 | 1.091 | 0.056 | 0.9 | 1.05 | 0.05 | line SYC CYN to OMAR 230 ck 1 |

ivsg_la_3bd4r1.sav
FLOW Summary
N-1 Outages

| LEGEND | % of RATING 1 | |
|---|---|---|
| C_pu | 100% - 110% | |
| C_pu | 110% - 120% | P.U. of |
| C_pu | > 120% | Rate 1 |

| FROM | FR | BKV | TO | TO | BKV | CK | Outage_Name | Case | Rate-Mva | Pflow | Qflow | Amps | MVA | C_pu | B_pu | Contingency_Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24142 | SYC CYN | 230 | 24101 | OMAR | 230 | 1 | line_086 | ivsg_la_alt3bd4r | 643 | 720.9 | 5514.7 | 12797.6 | 5561.6 | 7.929 | 0.423 | line MAGUNDEN to OMAR 230 ck 1 |
| 24781 | NAVYCOSO | 230 | 24706 | BLM EAST | 230 | 1 | line_173 | ivsg_la_alt3bd4r | 1287 | -152.7 | -3160.7 | 7943.4 | 3164.4 | 2.459 | 0.057 | line BLM EAST to BLM WEST 230 ck 1 |
| 24781 | NAVYCOSO | 230 | 24706 | BLM EAST | 230 | 1 | line_174 | ivsg_la_alt3bd4r | 1287 | -152.7 | -3160.7 | 7943.4 | 3164.4 | 2.459 | 0.057 | line BLM WEST to KRAMER 230 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_175 | ivsg_la_alt3bd4r | 56 | -106.6 | 5.6 | 544.1 | 106.8 | 1.91 | 0.93 | line INYO to COTTONWD 230 ck 1 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_001 | ivsg_la_alt3bd4r | 1411.6 | 2624.4 | 408.3 | 2845.1 | 2656 | 1.764 | 1.148 | line MOENKOPI to ELDORDO 500 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_202 | ivsg_la_alt3bd4r | 56 | 80.6 | -9.3 | 405.9 | 81.2 | 1.47 | 0.93 | line OWENSCON to INYO 230 ck 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_135 | ivsg_la_alt3bd4r | 458 | 615.5 | 85.5 | 1558.2 | 621.4 | 1.356 | 1.062 | line SANBRDNO to DEVERS 230 ck 1 |
| 22464 | MIGUEL | 230 | 22472 | MIGUELMP | 500 | 1 | ML81 | ivsg_la_alt3bd4r | 1120 | -1458.5 | 232.3 | 3873.2 | 1476.8 | 1.32 | 0.76 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 22468 | MIGUEL | 500 | 22472 | MIGUELMP | 500 | 1 | ML81 | ivsg_la_alt3bd4r | 1120 | 1461.3 | 40.3 | 1696.8 | 1461.9 | 1.31 | 0.76 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 22464 | MIGUEL | 230 | 22468 | MIGUEL | 500 | 1 | ML80 | ivsg_la_alt3bd4r | 1120 | -1440.3 | 232.9 | 3826.9 | 1459 | 1.3 | 0.72 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 22356 | IMPRLVLY | 230 | 22360 | IMPRLVLY | 500 | 1 | IV81 | ivsg_la_alt3bd4r | 600 | 726.5 | 238.9 | 1944 | 764.8 | 1.27 | 0.57 | tran IMPRLVLY 230 to IMPRLVLY 500 ck 2 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | B2_001 | ivsg_la_alt3bd4r | 1411.6 | 1868.6 | 205.9 | 2023.1 | 1879.9 | 1.255 | 1.148 | HASSYAMP - N.GILA 1 500kV |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_183 | ivsg_la_alt3bd4r | 458 | 569.6 | 81.3 | 1440.3 | 575.4 | 1.253 | 1.062 | line DEVERS to VSTA 230 ck 2 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_185 | ivsg_la_alt3bd4r | 458 | 569.6 | 81.3 | 1440.3 | 575.4 | 1.253 | 1.062 | line VSTA to DEVERS 230 ck 1 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_56 | ivsg_la_alt3bd4r | 800 | 969.4 | 120.6 | 2509.6 | 976.9 | 1.25 | 0.933 | line NEWSF500 to IMPRLVLY 500 ck 1 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | B2_003 | ivsg_la_alt3bd4r | 1411.6 | 1834.5 | 191.4 | 1980.9 | 1844.5 | 1.229 | 1.148 | N.GILA - IMPRLVLY 1 500kV |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_68 | ivsg_la_alt3bd4r | 1411.6 | 1800.5 | 175.7 | 1939.8 | 1809.1 | 1.203 | 1.148 | line NORTHSD to NEWSF500 500 ck 1 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_84 | ivsg_la_alt3bd4r | 1411.6 | 1789.3 | 155.9 | 1921.7 | 1796 | 1.191 | 1.148 | line MIDPINTS to DEVERS 500 ck 1 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_85 | ivsg_la_alt3bd4r | 1411.6 | 1789.2 | 155.8 | 1921.6 | 1796 | 1.191 | 1.148 | line MIDPINTS to DEVERS 500 ck 2 |
| 24806 | MIRAGE | 230 | 24807 | MIRAGE | 115 | 2 | tran_238 | ivsg_la_alt3bd4r | 280 | 319.7 | 22.1 | 817.2 | 320.5 | 1.16 | 0.58 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_68 | ivsg_la_alt3bd4r | 458 | 508.1 | 39.9 | 1322.3 | 509.7 | 1.15 | 1.062 | line NORTHSD to NEWSF500 500 ck 1 |
| 24900 | MIDPINTS | 500 | 24801 | DEVERS | 500 | 2 | line_84 | ivsg_la_alt3bd4r | 2338 | 2677.2 | 340.7 | 3052 | 2698.8 | 1.133 | 0.654 | line MIDPINTS to DEVERS 500 ck 1 |
| 24900 | MIDPINTS | 500 | 24801 | DEVERS | 500 | 1 | line_85 | ivsg_la_alt3bd4r | 2338 | 2677.5 | 341.7 | 3052.7 | 2699.3 | 1.133 | 0.654 | line MIDPINTS to DEVERS 500 ck 2 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | line_68 | ivsg_la_alt3bd4r | 388 | -419.6 | -16.5 | 1101.6 | 419.9 | 1.131 | 0.921 | line NORTHSD to NEWSF500 500 ck 1 |
| 22001 | NORTHSD | 230 | 22000 | NORTHSD | 500 | 1 | SO2 | ivsg_la_alt3bd4r | 1120 | -1261.4 | 25.7 | 3334.6 | 1261.7 | 1.13 | 0.91 | gen S.ONOFR2 22.00 |
| 24729 | INYO | 230 | 24730 | INYO PS | 115 | 1 | line_175 | ivsg_la_alt3bd4r | 50 | 53.3 | 18.8 | 136 | 56.5 | 1.13 | 0.54 | line INYO to COTTONWD 230 ck 1 |
| 24729 | INYO | 230 | 24730 | INYO PS | 115 | 2 | line_175 | ivsg_la_alt3bd4r | 50 | 53.3 | 18.8 | 136 | 56.5 | 1.13 | 0.54 | line INYO to COTTONWD 230 ck 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_001 | ivsg_la_alt3bd4r | 458 | 501.9 | 50.8 | 1278.9 | 504.5 | 1.113 | 1.062 | line MOENKOPI to ELDORDO 500 ck 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | B2_001 | ivsg_la_alt3bd4r | 1645.4 | 1934.6 | 216.6 | 2112.1 | 1946.6 | 1.112 | 1.006 | HASSYAMP - N.GILA 1 500kV |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_085 | ivsg_la_alt3bd4r | 458 | 502.3 | 52 | 1276.3 | 505 | 1.11 | 1.062 | line LUGO to VICTORVL 500 ck 1 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | B2_003 | ivsg_la_alt3bd4r | 800 | 868.6 | 30.7 | 2218.7 | 869.1 | 1.105 | 0.933 | N.GILA - IMPRLVLY 1 500kV |
| 8601 | GEOSUB2 | 230 | 8300 | BANIS230 | 230 | 1 | line_22 | ivsg_la_alt3bd4r | 550 | 605.9 | 73.8 | 1521.9 | 610.4 | 1.103 | 0.81 | line GEOSUB1 to BANIS230 230 ck 1 |
| 8601 | GEOSUB2 | 230 | 8300 | BANIS230 | 230 | 1 | line_23 | ivsg_la_alt3bd4r | 550 | 605.9 | 73.8 | 1521.9 | 610.4 | 1.103 | 0.81 | line GEOSUB1 to BANIS230 230 ck 2 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_085 | ivsg_la_alt3bd4r | 1411.6 | 1662.7 | 136.9 | 1778.9 | 1668.4 | 1.103 | 1.148 | line LUGO to VICTORVL 500 ck 1 |
| 24723 | CONTROL | 115 | 24731 | INYOKERN | 115 | 1 | line_175 | ivsg_la_alt3bd4r | 82.7 | 88.9 | -7.6 | 457.1 | 89.2 | 1.101 | 0.306 | line INYO to COTTONWD 230 ck 1 |
| 24723 | CONTROL | 115 | 24731 | INYOKERN | 115 | 2 | line_175 | ivsg_la_alt3bd4r | 82.7 | 88.9 | -7.6 | 457.1 | 89.2 | 1.101 | 0.306 | line INYO to COTTONWD 230 ck 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_047 | ivsg_la_alt3bd4r | 458 | 497 | 54 | 1263.8 | 499.9 | 1.1 | 1.062 | line ELDORDO to LUGO 500 ck 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_7 | ivsg_la_alt3bd4r | 458 | 496.2 | 47.6 | 1262 | 498.4 | 1.098 | 1.062 | line BANIS230 to NEWSF230 230 ck 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | tran_74 | ivsg_la_alt3bd4r | 458 | 496.3 | 48 | 1261.8 | 498.6 | 1.098 | 1.062 | tran NEWSF230 230 to NEWSF500 500 ck 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | B2_003 | ivsg_la_alt3bd4r | 458 | 492.3 | 47.1 | 1259.4 | 494.5 | 1.096 | 1.062 | N.GILA - IMPRLVLY 1 500kV |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_68 | ivsg_la_alt3bd4r | 2598 | 2749.6 | 221.1 | 3256.7 | 2758.4 | 1.086 | 0.931 | line NORTHSD to NEWSF500 500 ck 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | B2_003 | ivsg_la_alt3bd4r | 1645.4 | 1896.8 | 202.6 | 2064 | 1907.6 | 1.086 | 1.006 | N.GILA - IMPRLVLY 1 500kV |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_169 | ivsg_la_alt3bd4r | 56 | 59.5 | -4.9 | 295.6 | 59.7 | 1.07 | 0.93 | line KRAMER to LUGO 230 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_170 | ivsg_la_alt3bd4r | 56 | 59.5 | -4.9 | 295.6 | 59.7 | 1.07 | 0.93 | line KRAMER to LUGO 230 ck 2 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_68 | ivsg_la_alt3bd4r | 1645.4 | 1856.6 | 194.4 | 2015.7 | 1866.8 | 1.061 | 1.006 | line NORTHSD to NEWSF500 500 ck 1 |
| 8600 | GEOSUB1 | 230 | 8300 | BANIS230 | 230 | 1 | line_47 | ivsg_la_alt3bd4r | 550 | 581.9 | 69.4 | 1462.4 | 586.1 | 1.06 | 0.749 | line GEOSUB2 to BANIS230 230 ck 1 |
| 8600 | GEOSUB1 | 230 | 8300 | BANIS230 | 230 | 2 | line_47 | ivsg_la_alt3bd4r | 550 | 581.9 | 69.4 | 1462.4 | 586.1 | 1.06 | 0.749 | line GEOSUB2 to BANIS230 230 ck 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | B2_001 | ivsg_la_alt3bd4r | 2598 | 2690.1 | 156.4 | 3169.7 | 2694.6 | 1.057 | 0.931 | HASSYAMP - N.GILA 1 500kV |
| 24999 | DEVRSVC1 | 500 | 24801 | DEVERS | 500 | 1 | line_68 | ivsg_la_alt3bd4r | 387.5 | 0 | 400.1 | 472.4 | 400.1 | 1.056 | 1.021 | line NORTHSD to NEWSF500 500 ck 1 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_6 | ivsg_la_alt3bd4r | 800 | 834.1 | 44.8 | 2116.4 | 835.3 | 1.054 | 0.933 | line BANIS230 to ELCENTSW 230 ck 1 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | PV1 | ivsg_la_alt3bd4r | 1411.6 | 1604.4 | 70.9 | 1702.1 | 1605.9 | 1.053 | 1.148 | gen PALOVRD1 24.00 |
| 24999 | DEVRSVC1 | 500 | 24801 | DEVERS | 500 | 1 | B2_001 | ivsg_la_alt3bd4r | 387.5 | 0 | 400.1 | 470.6 | 400.1 | 1.052 | 1.021 | HASSYAMP - N.GILA 1 500kV |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_84 | ivsg_la_alt3bd4r | 1645.4 | 1844.1 | 172.3 | 1994.2 | 1852.2 | 1.05 | 1.006 | line MIDPINTS to DEVERS 500 ck 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_85 | ivsg_la_alt3bd4r | 1645.4 | 1844.1 | 172.3 | 1994.1 | 1852.1 | 1.05 | 1.006 | line MIDPINTS to DEVERS 500 ck 2 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | IV81 | ivsg_la_alt3bd4r | 800 | 826.9 | 61.5 | 2106.7 | 829.2 | 1.049 | 0.933 | tran IMPRLVLY 230 to IMPRLVLY 500 ck 2 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8600 | GEOSUB1 | 230 | 8300 | BANIS230 | 230 | 2 | line_22 | ivsg_la_alt3bd4r | 550 | 575.8 | 70 | 1445.7 | 580 | 1.048 | 0.749 | line GEOSUB1 to BANIS230 230 ck 1 |
| 8600 | GEOSUB1 | 230 | 8300 | BANIS230 | 230 | 1 | line_23 | ivsg_la_alt3bd4r | 550 | 575.8 | 70 | 1445.7 | 580 | 1.048 | 0.749 | line GEOSUB1 to BANIS230 230 ck 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | B2_003 | ivsg_la_alt3bd4r | 2598 | 2666.7 | 168 | 3128.2 | 2671.9 | 1.043 | 0.931 | N.GILA - IMPRLVLY 1 500kV |
| 20238 | HRD-230 | 230 | 20239 | HRD-115 | 115 | 1 | line_68 | ivsg_la_alt3bd4r | 225 | 231.5 | -19.1 | 613 | 232.3 | 1.04 | 0.89 | line NORTHSD to NEWSF500 500 ck 1 |
| 24805 | DEVERS | 115 | 24804 | DEVERS | 230 | 1 | tran_236 | ivsg_la_alt3bd4r | 280 | 254.3 | -94.6 | 1358.3 | 271.3 | 1.04 | 0.68 | tran DEVERS 115 to DEVERS 230 ck 3 |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_135 | ivsg_la_alt3bd4r | 458 | 456.2 | -60.9 | 1194.8 | 460.3 | 1.039 | 0.748 | line SANBRDNO to DEVERS 230 ck 1 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | IV81 | ivsg_la_alt3bd4r | 388 | -392.8 | 1.3 | 1010.8 | 392.8 | 1.038 | 0.921 | tran IMPRLVLY 230 to IMPRLVLY 500 ck 2 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | tran_234 | ivsg_la_alt3bd4r | 458 | 463.1 | 27.8 | 1185.1 | 463.9 | 1.031 | 1.062 | tran DEVERS 500 to DEVERS 230 ck 1 |
| 24805 | DEVERS | 115 | 24804 | DEVERS | 230 | 3 | tran_235 | ivsg_la_alt3bd4r | 280 | 251.3 | -93.8 | 1344.8 | 268.2 | 1.03 | 0.66 | tran DEVERS 115 to DEVERS 230 ck 1 |
| 24805 | DEVERS | 115 | 24804 | DEVERS | 230 | 1 | tran_237 | ivsg_la_alt3bd4r | 280 | 252.8 | -94 | 1349.4 | 269.7 | 1.03 | 0.68 | tran DEVERS 115 to DEVERS 230 ck 4 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_29 | ivsg_la_alt3bd4r | 458 | 473 | 52.6 | 1183 | 475.9 | 1.029 | 1.062 | line HIGHLINE to COLCT3 230 ck 1 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_63 | ivsg_la_alt3bd4r | 800 | 806.5 | 40.9 | 2050.6 | 807.6 | 1.021 | 0.933 | line RAMON to MIRAGE 230 ck 2 |
| 24701 | KRAMER | 230 | 24085 | LUGO | 230 | 2 | line_169 | ivsg_la_alt3bd4r | 478 | 478 | 69.7 | 1216.2 | 483 | 1.014 | 0.608 | line KRAMER to LUGO 230 ck 1 |
| 24701 | KRAMER | 230 | 24085 | LUGO | 230 | 1 | line_170 | ivsg_la_alt3bd4r | 478 | 478 | 69.7 | 1216.2 | 483 | 1.014 | 0.608 | line KRAMER to LUGO 230 ck 2 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_84 | ivsg_la_alt3bd4r | 458 | 456 | 34.3 | 1161.8 | 457.3 | 1.011 | 1.062 | line MIDPINTS to DEVERS 500 ck 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_85 | ivsg_la_alt3bd4r | 458 | 456.1 | 34.4 | 1161.7 | 457.4 | 1.01 | 1.062 | line MIDPINTS to DEVERS 500 ck 2 |
| 24805 | DEVERS | 115 | 24804 | DEVERS | 230 | 4 | tran_235 | ivsg_la_alt3bd4r | 280 | 248.4 | -92.7 | 1329.2 | 265.1 | 1.01 | 0.65 | tran DEVERS 115 to DEVERS 230 ck 1 |
| 24805 | DEVERS | 115 | 24804 | DEVERS | 230 | 3 | tran_237 | ivsg_la_alt3bd4r | 280 | 246.9 | -91.8 | 1317.7 | 263.4 | 1.01 | 0.66 | tran DEVERS 115 to DEVERS 230 ck 4 |
| 24151 | VALLEYSC | 500 | 24160 | VALLEYSC | 115 | 2 | tran_247 | ivsg_la_alt3bd4r | 560 | 541 | 163 | 649.3 | 565 | 1.01 | 0.49 | tran VALLEYSC 500 to VALLEYSC 115 ck 1 |
| 24151 | VALLEYSC | 500 | 24160 | VALLEYSC | 115 | 1 | tran_248 | ivsg_la_alt3bd4r | 560 | 541 | 163 | 649.3 | 565 | 1.01 | 0.49 | tran VALLEYSC 500 to VALLEYSC 115 ck 2 |
| 20238 | HRD-230 | 230 | 20118 | ROA-230 | 230 | 1 | line_68 | ivsg_la_alt3bd4r | 388 | -360.2 | 85.6 | 977 | 370.2 | 1.006 | 0.799 | line NORTHSD to NEWSF500 500 ck 1 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_50 | ivsg_la_alt3bd4r | 800 | 795.7 | 38 | 2015.1 | 796.7 | 1.003 | 0.933 | line BANIS230 to AV58TP12 230 ck 1 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_51 | ivsg_la_alt3bd4r | 800 | 796.6 | 41.8 | 2012.9 | 797.7 | 1.002 | 0.933 | line AV58TP12 to AVE58230 230 ck 1 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_12 | ivsg_la_alt3bd4r | 800 | 791.6 | 34.6 | 2010.9 | 792.4 | 1.001 | 0.933 | line COACHELA to RAMON 230 ck 2 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | B2_001 | ivsg_la_alt3bd4r | 800 | 796.5 | -1.3 | 2008 | 796.5 | 1 | 0.933 | HASSYAMP - N.GILA 1 500kV |
| 24805 | DEVERS | 115 | 24804 | DEVERS | 230 | 4 | tran_236 | ivsg_la_alt3bd4r | 280 | 245.4 | -91.3 | 1311 | 261.8 | 1 | 0.65 | tran DEVERS 115 to DEVERS 230 ck 3 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_44 | ivsg_la_alt3bd4r | 800 | 788.9 | 32.5 | 2003.8 | 789.5 | 0.998 | 0.933 | line COACHELA to DEVERS 230 ck 2 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_61 | ivsg_la_alt3bd4r | 800 | 789.8 | 32.7 | 1999.5 | 790.5 | 0.996 | 0.933 | line IMPRLVLY to ELCENTSW 230 ck 2 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_62 | ivsg_la_alt3bd4r | 800 | 789.8 | 32.7 | 1999.5 | 790.5 | 0.996 | 0.933 | line IMPRLVLY to ELCENTSW 230 ck 3 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | SO2 | ivsg_la_alt3bd4r | 388 | -371.9 | -0.9 | 966.3 | 371.9 | 0.992 | 0.921 | gen S.ONOFR2 22.00 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_183 | ivsg_la_alt3bd4r | 2598 | 2593.3 | 219.8 | 2977.3 | 2602.6 | 0.992 | 0.931 | line DEVERS to VSTA 230 ck 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_185 | ivsg_la_alt3bd4r | 2598 | 2593.3 | 219.8 | 2977.3 | 2602.6 | 0.992 | 0.931 | line VSTA to DEVERS 230 ck 1 |
| 22360 | IMPRLVLY | 500 | 22468 | MIGUEL | 500 | 1 | line_68 | ivsg_la_alt3bd4r | 2252 | 2141.5 | 559.6 | 2529 | 2213.4 | 0.991 | 0.729 | line NORTHSD to NEWSF500 500 ck 1 |
| 22001 | NORTHSD | 230 | 22000 | NORTHSD | 500 | 1 | B2_022 | ivsg_la_alt3bd4r | 1120 | -1094.3 | 142.5 | 2824.1 | 1103.6 | 0.99 | 0.91 | OTAYMESA - TJI-230 1 230kV |
| 22001 | NORTHSD | 230 | 22000 | NORTHSD | 500 | 1 | ML80 | ivsg_la_alt3bd4r | 1120 | -1102 | 145 | 2830.6 | 1111.5 | 0.99 | 0.91 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 22001 | NORTHSD | 230 | 22000 | NORTHSD | 500 | 1 | ML81 | ivsg_la_alt3bd4r | 1120 | -1094 | 142.7 | 2808.4 | 1103.3 | 0.99 | 0.91 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | tran_210 | ivsg_la_alt3bd4r | 56 | 54.7 | -5 | 270.8 | 55 | 0.99 | 0.93 | tran LUGO 500 to LUGO 230 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | tran_211 | ivsg_la_alt3bd4r | 56 | 54.8 | -5 | 271 | 55 | 0.99 | 0.93 | tran LUGO 500 to LUGO 230 ck 2 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_13 | ivsg_la_alt3bd4r | 800 | 779.2 | 23.9 | 1986.3 | 779.6 | 0.989 | 0.933 | line COACHELA to MIDWAY 230 ck 1 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_14 | ivsg_la_alt3bd4r | 800 | 779.2 | 23.9 | 1986.3 | 779.6 | 0.989 | 0.933 | line COACHELA to MIDWAY 230 ck 2 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | ML80 | ivsg_la_alt3bd4r | 388 | -372 | 7.5 | 957 | 372.1 | 0.983 | 0.921 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_135 | ivsg_la_alt3bd4r | 2598 | 2569.2 | 202.7 | 2950.4 | 2577.2 | 0.983 | 0.931 | line SANBRDNO to DEVERS 230 ck 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_001 | ivsg_la_alt3bd4r | 2598 | 2536.6 | 164.4 | 2945.4 | 2541.9 | 0.982 | 0.931 | line MOENKOPI to ELDORDO 500 ck 1 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | line_56 | ivsg_la_alt3bd4r | 388 | -371.6 | 5.3 | 955.1 | 371.7 | 0.981 | 0.921 | line NEWSF500 to IMPRLVLY 500 ck 1 |
| 20238 | HRD-230 | 230 | 20239 | HRD-115 | 115 | 1 | IV81 | ivsg_la_alt3bd4r | 225 | 219.8 | -19.3 | 566.3 | 220.7 | 0.98 | 0.89 | tran IMPRLVLY 230 to IMPRLVLY 500 ck 2 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_059 | ivsg_la_alt3bd4r | 458 | 448.1 | 46.3 | 1126 | 450.5 | 0.98 | 1.062 | line ETIWANDA to SANBRDNO 230 ck 1 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | ML81 | ivsg_la_alt3bd4r | 388 | -370 | 7.9 | 951.3 | 370.1 | 0.977 | 0.921 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_085 | ivsg_la_alt3bd4r | 2598 | 2528.4 | 156.7 | 2925.4 | 2533.2 | 0.975 | 0.931 | line LUGO to VICTORVL 500 ck 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_56 | ivsg_la_alt3bd4r | 2598 | 2532.4 | 156.9 | 2920.9 | 2537.2 | 0.974 | 0.931 | line NEWSF500 to IMPRLVLY 500 ck 1 |
| 24042 | ELDORDO | 500 | 24086 | LUGO | 500 | 1 | line_085 | ivsg_la_alt3bd4r | 1386 | 1401.7 | 62.8 | 1558.1 | 1403.1 | 0.974 | 0.711 | line LUGO to VICTORVL 500 ck 1 |
| 22464 | MIGUEL | 230 | 22472 | MIGUELMP | 500 | 1 | line_68 | ivsg_la_alt3bd4r | 1120 | -1079 | 113.2 | 3012.7 | 1084.9 | 0.97 | 0.76 | line NORTHSD to NEWSF500 500 ck 1 |
| 22468 | MIGUEL | 500 | 22472 | MIGUELMP | 500 | 1 | line_68 | ivsg_la_alt3bd4r | 1120 | 1080.7 | 51.7 | 1319.8 | 1082 | 0.97 | 0.76 | line NORTHSD to NEWSF500 500 ck 1 |
| 22001 | NORTHSD | 230 | 22000 | NORTHSD | 500 | 1 | B2_028 | ivsg_la_alt3bd4r | 1120 | -1079.8 | 141.2 | 2766.6 | 1089 | 0.97 | 0.91 | MIGUEL - SYCAMORE 1 230kV |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_047 | ivsg_la_alt3bd4r | 1645.4 | 1703.1 | 176.7 | 1838.3 | 1712.2 | 0.97 | 1.006 | line ELDORDO to LUGO 500 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_086 | ivsg_la_alt3bd4r | 56 | 53.6 | -5.5 | 265.8 | 53.9 | 0.97 | 0.93 | line MAGUNDEN to OMAR 230 ck 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_302 | ivsg_la_alt3bd4r | 2598 | 2536.3 | 183.8 | 2910.4 | 2543 | 0.97 | 0.931 | line DEVERS to OAK_VLLY 230 ck 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_7 | ivsg_la_alt3bd4r | 2598 | 2524.6 | 135.4 | 2907.1 | 2528.2 | 0.969 | 0.931 | line BANIS230 to NEWSF230 230 ck 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | tran_74 | ivsg_la_alt3bd4r | 2598 | 2524.7 | 135.6 | 2906.6 | 2528.4 | 0.969 | 0.931 | tran NEWSF230 230 to NEWSF500 500 ck 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_085 | ivsg_la_alt3bd4r | 1645.4 | 1709 | 162.2 | 1839.3 | 1716.7 | 0.969 | 1.006 | line LUGO to VICTORVL 500 ck 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | PV1 | ivsg_la_alt3bd4r | 458 | 450.3 | 50.2 | 1112 | 453.1 | 0.968 | 1.062 | gen PALOVRD1 24.00 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_42 | ivsg_la_alt3bd4r | 800 | 763.7 | 18.4 | 1937.8 | 763.9 | 0.965 | 0.933 | line PKNB230 to HIGHLINE 230 ck 1 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | B2_028 | ivsg_la_alt3bd4r | 388 | -365.9 | 9 | 940 | 366 | 0.965 | 0.921 | MIGUEL - SYCAMORE 1 230kV |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | IV80 | ivsg_la_alt3bd4r | 800 | 766.4 | 32.7 | 1938.5 | 767.1 | 0.965 | 0.933 | tran IMPRLVLY 230 to IMPRLVLY 500 ck 1 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | SO2 | ivsg_la_alt3bd4r | 800 | 752.6 | 65.4 | 1938.6 | 755.4 | 0.965 | 0.933 | gen S.ONOFR2 22.00 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_047 | ivsg_la_alt3bd4r | 2598 | 2501.1 | 172 | 2894.7 | 2507 | 0.965 | 0.931 | line ELDORDO to LUGO 500 ck 1 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | line_7 | ivsg_la_alt3bd4r | 388 | -363.7 | 12.1 | 939.1 | 363.9 | 0.964 | 0.921 | line BANIS230 to NEWSF230 230 ck 1 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | tran_74 | ivsg_la_alt3bd4r | 388 | -363.6 | 12.1 | 938.8 | 363.8 | 0.964 | 0.921 | tran NEWSF230 230 to NEWSF500 500 ck 1 |
| 20238 | HRD-230 | 230 | 20102 | RUM-230 | 230 | 1 | line_68 | ivsg_la_alt3bd4r | 388 | -341.3 | 82.1 | 926.3 | 351 | 0.955 | 0.751 | line NORTHSD to NEWSF500 500 ck 1 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | IV80 | ivsg_la_alt3bd4r | 388 | -362.2 | 8.3 | 929.3 | 362.3 | 0.954 | 0.921 | tran IMPRLVLY 230 to IMPRLVLY 500 ck 1 |
| 22001 | NORTHSD | 230 | 22000 | NORTHSD | 500 | 1 | B2_015 | ivsg_la_alt3bd4r | 1120 | -1050.4 | 130 | 2689.2 | 1058.4 | 0.95 | 0.91 | MIGUEL - MISSION 1 230kV |
| 22001 | NORTHSD | 230 | 22000 | NORTHSD | 500 | 1 | line_023 | ivsg_la_alt3bd4r | 1120 | -1060.3 | 123.9 | 2710.5 | 1067.6 | 0.95 | 0.91 | line BARRE to ELLIS 230 ck 1 |
| 20238 | HRD-230 | 230 | 20239 | HRD-115 | 115 | 1 | line_56 | ivsg_la_alt3bd4r | 225 | 210.2 | -16.4 | 539.8 | 210.8 | 0.94 | 0.89 | line NEWSF500 to IMPRLVLY 500 ck 1 |
| 22001 | NORTHSD | 230 | 22000 | NORTHSD | 500 | 1 | B2_020 | ivsg_la_alt3bd4r | 1120 | -1049.1 | 130.6 | 2685.7 | 1057.2 | 0.94 | 0.91 | MIGUEL - MISSION 2 230kV |
| 22001 | NORTHSD | 230 | 22000 | NORTHSD | 500 | 1 | B2_021 | ivsg_la_alt3bd4r | 1120 | -1048.6 | 143.1 | 2697.4 | 1058.3 | 0.94 | 0.91 | IMPRLVLY - ROA-230 1 230kV |
| 20238 | HRD-230 | 230 | 20239 | HRD-115 | 115 | 1 | ML80 | ivsg_la_alt3bd4r | 225 | 210.4 | -17.7 | 540 | 211.2 | 0.94 | 0.89 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 20238 | HRD-230 | 230 | 20239 | HRD-115 | 115 | 1 | ML81 | ivsg_la_alt3bd4r | 225 | 209.5 | -17.4 | 537.3 | 210.2 | 0.94 | 0.89 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 20238 | HRD-230 | 230 | 20239 | HRD-115 | 115 | 1 | SO2 | ivsg_la_alt3bd4r | 225 | 210.1 | -14.1 | 547.2 | 210.6 | 0.94 | 0.89 | gen S.ONOFR2 22.00 |
| 22001 | NORTHSD | 230 | 22000 | NORTHSD | 500 | 1 | tran_219 | ivsg_la_alt3bd4r | 1120 | -1049.1 | 125.4 | 2682.7 | 1056.5 | 0.94 | 0.91 | tran SERRANO 500 to SERRANO 230 ck 2 |
| 24151 | VALLEYSC | 500 | 24229 | VALLEY-S | 115 | 4 | tran_249 | ivsg_la_alt3bd4r | 560 | 518.5 | 94.4 | 604.6 | 527 | 0.94 | 0.46 | tran VALLEYSC 500 to VALLEY-S 115 ck 3 |
| 24151 | VALLEYSC | 500 | 24229 | VALLEY-S | 115 | 3 | tran_250 | ivsg_la_alt3bd4r | 560 | 518.5 | 94.3 | 604.6 | 527 | 0.94 | 0.46 | tran VALLEYSC 500 to VALLEY-S 115 ck 4 |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_183 | ivsg_la_alt3bd4r | 458 | 412.9 | -43.5 | 1076.3 | 415.2 | 0.936 | 0.748 | line DEVERS to VSTA 230 ck 2 |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_185 | ivsg_la_alt3bd4r | 458 | 412.9 | -43.5 | 1076.3 | 415.2 | 0.936 | 0.748 | line VSTA to DEVERS 230 ck 1 |
| 22356 | IMPRLVLY | 230 | 22360 | IMPRLVLY | 500 | 2 | B2_003 | ivsg_la_alt3bd4r | 1120 | 1030.9 | 182.9 | 2699.4 | 1047 | 0.93 | 0.65 | N.GILA - IMPRLVLY 1 500kV |
| 20238 | HRD-230 | 230 | 20239 | HRD-115 | 115 | 1 | B2_028 | ivsg_la_alt3bd4r | 225 | 207.6 | -17.1 | 531.8 | 208.3 | 0.93 | 0.89 | MIGUEL - SYCAMORE 1 230kV |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | line_68 | ivsg_la_alt3bd4r | 408.3 | -352.1 | 18.6 | 1579.6 | 352.6 | 0.925 | 0.753 | line NORTHSD to NEWSF500 500 ck 1 |
| 22464 | MIGUEL | 230 | 22468 | MIGUEL | 500 | 1 | line_68 | ivsg_la_alt3bd4r | 1120 | -1021.3 | 104.9 | 2850.9 | 1026.7 | 0.92 | 0.72 | line NORTHSD to NEWSF500 500 ck 1 |
| 20238 | HRD-230 | 230 | 20118 | ROA-230 | 230 | 1 | IV81 | ivsg_la_alt3bd4r | 388 | -335.7 | 83.1 | 887.4 | 345.8 | 0.916 | 0.799 | tran IMPRLVLY 230 to IMPRLVLY 500 ck 2 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | PV1 | ivsg_la_alt3bd4r | 1645.4 | 1634.8 | 82.8 | 1740.2 | 1636.9 | 0.916 | 1.006 | gen PALOVRD1 24.00 |
| 24016 | BARRE | 230 | 25201 | LEWIS | 230 | 1 | line_024 | ivsg_la_alt3bd4r | 1195 | -1016.5 | 308.4 | 2736.8 | 1062.2 | 0.913 | 0.596 | line BARRE to VILLA PK 230 ck 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | line_68 | ivsg_la_alt3bd4r | 392 | 356.2 | 20.7 | 990.8 | 356.8 | 0.91 | 0.79 | line NORTHSD to NEWSF500 500 ck 1 |
| 8601 | GEOSUB2 | 230 | 8300 | BANIS230 | 230 | 1 | B2_003 | ivsg_la_alt3bd4r | 550 | 495.7 | 64.9 | 1253 | 499.9 | 0.908 | 0.81 | N.GILA - IMPRLVLY 1 500kV |
| 22001 | NORTHSD | 230 | 22844 | TALEGA | 230 | 1A | SO2 | ivsg_la_alt3bd4r | 456 | 393.1 | -13.1 | 1039.4 | 393.3 | 0.908 | 0.679 | gen S.ONOFR2 22.00 |
| 22001 | NORTHSD | 230 | 22844 | TALEGA | 230 | 2A | SO2 | ivsg_la_alt3bd4r | 456 | 393.1 | -13.1 | 1039.4 | 393.3 | 0.908 | 0.679 | gen S.ONOFR2 22.00 |
| 8601 | GEOSUB2 | 230 | 8300 | BANIS230 | 230 | 1 | line_13 | ivsg_la_alt3bd4r | 550 | 494.9 | 62.4 | 1248.6 | 498.8 | 0.905 | 0.81 | line COACHELA to MIDWAY 230 ck 1 |
| 8601 | GEOSUB2 | 230 | 8300 | BANIS230 | 230 | 1 | line_14 | ivsg_la_alt3bd4r | 550 | 494.9 | 62.4 | 1248.6 | 498.8 | 0.905 | 0.81 | line COACHELA to MIDWAY 230 ck 2 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | B2_028 | ivsg_la_alt3bd4r | 392 | 350.7 | 14.8 | 925 | 351 | 0.9 | 0.79 | MIGUEL - SYCAMORE 1 230kV |
| 24729 | INYO | 230 | 24730 | INYO PS | 115 | 2 | tran_230 | ivsg_la_alt3bd4r | 50 | -43.4 | 12.5 | 107.1 | 45.1 | 0.9 | 0.54 | tran INYO 230 to INYO PS 115 ck 1 |
| 24729 | INYO | 230 | 24730 | INYO PS | 115 | 1 | tran_231 | ivsg_la_alt3bd4r | 50 | -43.4 | 12.5 | 107.1 | 45.1 | 0.9 | 0.54 | tran INYO 230 to INYO PS 115 ck 2 |

ivsg_la_3bd4r1.sav
No Solve Summary
N-1 Outages

| Contingency-Description | Case | Problem-Description |
|---|---|---|
| IMPRLVLY - MIGUEL 1 500kV | ivsg_la_alt3bd4r | Pmis 20423 JOV-U3 18.00 = 8223.38 MW + j -386480.41 MVAR |
| line DEVERS to VALLEYSC 500 ck 1 | ivsg_la_alt3bd4r | Pmis 8690 HIGHLINE 230.00 = -96.25 MW + j -272436.38 MVAR |

ivsg_la_3bd4r1.sav
VOLTAGE Summary
N-2 Outages

| Bus | Name | kV | Area | Zone | Outage | Case | Vbase | Vcont | DeltaV | Vmin | Vmax | Max-dv | Contingency Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24237 | RANCHVST | 230 | 24 | 240 | 23021/22/23/41 | ivsg_la_alt3bd4r | 0.973 | 1.029 | 0.056 | 0.9 | 1.05 | 0.05 | MIGUEL 230 CORRIDOR West of SN |
| 25001 | GOODRICH | 230 | 24 | 250 | line_2073 | ivsg_la_alt3bd4r | 0.989 | 1.044 | 0.055 | 0.9 | 1.05 | 0.05 | GOODRICH 230.00 - GOULD 230.00 1, GOODRICH 230.00 - LAGUBELL 230.00 1 |

| LEGEND | % of RATING 1 | |
|---|---|---|
| C_pu | 100% - 110% | |
| C_pu | 110% - 120% | P.U. of |
| C_pu | > 120% | Rate 1 |

| FROM | FR | BKV | TO | TO | BKV | CK | Outage_Name | Case | Rate-Mva | Pflow | Qflow | Amps | MVA | C_pu | B_pu | Contingency_Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_2233 | ivsg_la_alt3bd4r | 1411.6 | 2620.9 | 411.4 | 2842.2 | 2653 | 1.762 | 1.148 | MOENKOPI 500.00 - ELDORDO 500.00 1, PISGAH 230.00 - ELDORDO 230.00 2 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2175 | ivsg_la_alt3bd4r | 458 | 747.1 | 138.5 | 1907.8 | 759.8 | 1.66 | 1.062 | DEVERS 230.00 - SANBRDNO 230.00 1, DEVERS 230.00 - VSTA 230.00 2 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2177 | ivsg_la_alt3bd4r | 458 | 747.1 | 138.5 | 1907.8 | 759.8 | 1.66 | 1.062 | DEVERS 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2178 | ivsg_la_alt3bd4r | 458 | 747.1 | 138.5 | 1907.8 | 759.8 | 1.66 | 1.062 | DEVERS 230.00 - VSTA 230.00 2, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2180 | ivsg_la_alt3bd4r | 458 | 747.1 | 138.5 | 1907.8 | 759.8 | 1.66 | 1.062 | SANBRDNO 230.00 - DEVERS 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2247 | ivsg_la_alt3bd4r | 458 | 747.1 | 138.5 | 1907.8 | 759.8 | 1.66 | 1.062 | DEVERS 230.00 - VSTA 230.00 2, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2179 | ivsg_la_alt3bd4r | 458 | 702.5 | 136.4 | 1792 | 715.6 | 1.56 | 1.062 | DEVERS 230.00 - VSTA 230.00 2, VSTA 230.00 - DEVERS 230.00 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_la_alt3bd4r | 392 | 558 | 56.1 | 1518.1 | 560.8 | 1.43 | 0.79 | MIGUEL 230 CORRIDOR West of SN |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | ivsg_la_alt3bd4r | 408.3 | -548.2 | 36.2 | 2420.1 | 549.4 | 1.417 | 0.753 | MIGUEL 230 CORRIDOR West of SN |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | 23021/22/23/41 | ivsg_la_alt3bd4r | 382.4 | 497.4 | -27.5 | 2198.2 | 498.2 | 1.374 | 0.679 | MIGUEL 230 CORRIDOR West of SN |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2176 | ivsg_la_alt3bd4r | 458 | 615.5 | 85.5 | 1558.2 | 621.4 | 1.356 | 1.062 | DEVERS 230.00 - SANBRDNO 230.00 1, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_2175 | ivsg_la_alt3bd4r | 458 | 579.1 | -82.1 | 1540.2 | 584.9 | 1.34 | 0.748 | DEVERS 230.00 - SANBRDNO 230.00 1, DEVERS 230.00 - VSTA 230.00 2 |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_2177 | ivsg_la_alt3bd4r | 458 | 579.1 | -82.1 | 1540.2 | 584.9 | 1.34 | 0.748 | DEVERS 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_2178 | ivsg_la_alt3bd4r | 458 | 579.1 | -82.1 | 1540.2 | 584.9 | 1.34 | 0.748 | DEVERS 230.00 - VSTA 230.00 2, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_2180 | ivsg_la_alt3bd4r | 458 | 579.1 | -82.1 | 1540.2 | 584.9 | 1.34 | 0.748 | SANBRDNO 230.00 - DEVERS 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_2247 | ivsg_la_alt3bd4r | 458 | 579.1 | -82.1 | 1540.2 | 584.9 | 1.34 | 0.748 | DEVERS 230.00 - VSTA 230.00 2, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2167 | ivsg_la_alt3bd4r | 458 | 585.4 | 75.8 | 1479.4 | 590.2 | 1.287 | 1.062 | DEVERS 230.00 - SANBRDNO 230.00 1, ETIWANDA 230.00 - SANBRDNO 230.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2169 | ivsg_la_alt3bd4r | 458 | 585.4 | 75.8 | 1479.4 | 590.2 | 1.287 | 1.062 | ETIWANDA 230.00 - SANBRDNO 230.00 1, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2268 | ivsg_la_alt3bd4r | 458 | 585.4 | 75.8 | 1479.4 | 590.2 | 1.287 | 1.062 | ETIWANDA 230.00 - SANBRDNO 230.00 1, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_N-210 | ivsg_la_alt3bd4r | 800 | 993.4 | 87.2 | 2578.5 | 997.2 | 1.284 | 0.933 | EL CENTRO IMPERIAL VALLEY 230 CKTS 2&3 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2173 | ivsg_la_alt3bd4r | 458 | 584.9 | 54.6 | 1475.1 | 587.5 | 1.283 | 1.062 | SANBRDNO 230.00 - DEVERS 230.00 1, VSTA 230.00 - SANBRDNO 230.00 2 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2174 | ivsg_la_alt3bd4r | 458 | 584.9 | 54.6 | 1475.1 | 587.5 | 1.283 | 1.062 | DEVERS 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - SANBRDNO 230.00 2 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_N-203 | ivsg_la_alt3bd4r | 800 | 976 | 106.4 | 2574.9 | 981.7 | 1.282 | 0.933 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_2179 | ivsg_la_alt3bd4r | 458 | 537.5 | -58.1 | 1423.2 | 540.7 | 1.238 | 0.748 | DEVERS 230.00 - VSTA 230.00 2, VSTA 230.00 - DEVERS 230.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2246 | ivsg_la_alt3bd4r | 458 | 558.6 | 79.8 | 1408.8 | 564.3 | 1.226 | 1.062 | VSTA 230.00 - DEVERS 230.00 1, COACHELV 230.00 - DEVERS 230.00 2 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_N-217 | ivsg_la_alt3bd4r | 1411.6 | 1789.3 | 155.9 | 1921.7 | 1796 | 1.191 | 1.148 | line MIDPINTS to IH500/MIDPOINTS DEVERS 500 ck 1 |
| 22001 | NORTHSD | 230 | 22000 | NORTHSD | 500 | 1 | 23021/22/23/41 | ivsg_la_alt3bd4r | 1120 | -1318.7 | 198 | 3415.8 | 1333.4 | 1.19 | 0.91 | MIGUEL 230 CORRIDOR West of SN |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_2179 | ivsg_la_alt3bd4r | 1411.6 | 1779.7 | 160.4 | 1912.4 | 1786.9 | 1.186 | 1.148 | DEVERS 230.00 - VSTA 230.00 2, VSTA 230.00 - DEVERS 230.00 1 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_2175 | ivsg_la_alt3bd4r | 1411.6 | 1774 | 156.7 | 1905.2 | 1780.9 | 1.181 | 1.148 | DEVERS 230.00 - SANBRDNO 230.00 1, DEVERS 230.00 - VSTA 230.00 2 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_2177 | ivsg_la_alt3bd4r | 1411.6 | 1774 | 156.7 | 1905.2 | 1780.9 | 1.181 | 1.148 | DEVERS 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_2178 | ivsg_la_alt3bd4r | 1411.6 | 1774 | 156.7 | 1905.2 | 1780.9 | 1.181 | 1.148 | DEVERS 230.00 - VSTA 230.00 2, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_2180 | ivsg_la_alt3bd4r | 1411.6 | 1774 | 156.7 | 1905.2 | 1780.9 | 1.181 | 1.148 | SANBRDNO 230.00 - DEVERS 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_2247 | ivsg_la_alt3bd4r | 1411.6 | 1774 | 156.7 | 1905.2 | 1780.9 | 1.181 | 1.148 | DEVERS 230.00 - VSTA 230.00 2, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 22672 | PRCTRVLY | 138 | 22852 | TELECYN | 138 | 1 | 23021/22/23/41 | ivsg_la_alt3bd4r | 478 | 531.3 | -38.4 | 2346.5 | 532.7 | 1.173 | 0.608 | MIGUEL 230 CORRIDOR West of SN |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2168 | ivsg_la_alt3bd4r | 458 | 532.9 | 72.9 | 1344.8 | 537.9 | 1.17 | 1.062 | DEVERS 230.00 - VSTA 230.00 2, ETIWANDA 230.00 - SANBRDNO 230.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2171 | ivsg_la_alt3bd4r | 458 | 532.9 | 72.9 | 1344.8 | 537.9 | 1.17 | 1.062 | ETIWANDA 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 8319 | DIXIELAN | 92 | 8946 | DIXPRI2 | 92 | 1 | line_N-210 | ivsg_la_alt3bd4r | 54 | -61.5 | 7.9 | 393.6 | 62 | 1.162 | 0.344 | EL CENTRO IMPERIAL VALLEY 230 CKTS 2&3 |
| 24900 | MIDPINTS | 500 | 24801 | DEVERS | 500 | 2 | line_N-217 | ivsg_la_alt3bd4r | 2338 | 2677.2 | 340.7 | 3052 | 2698.8 | 1.133 | 0.654 | line MIDPINTS to IH500/MIDPOINTS DEVERS 500 ck 1 |
| 8601 | GEOSUB2 | 230 | 8300 | BANIS230 | 230 | 1 | line_N-204 | ivsg_la_alt3bd4r | 550 | 601 | 91.2 | 1559.9 | 607.8 | 1.13 | 0.81 | COACHELLA MIDWAY 230 CKT 1&2 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_N-204 | ivsg_la_alt3bd4r | 800 | 858.1 | 29.8 | 2257.3 | 858.6 | 1.124 | 0.933 | COACHELLA MIDWAY 230 CKT 1&2 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2233 | ivsg_la_alt3bd4r | 458 | 502.6 | 50.7 | 1281.6 | 505.1 | 1.115 | 1.062 | MOENKOPI 500.00 - ELDORDO 500.00 1, PISGAH 230.00 - ELDORDO 230.00 2 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2258 | ivsg_la_alt3bd4r | 458 | 501.1 | 53 | 1277.6 | 503.9 | 1.111 | 1.062 | LUGO 500.00 - VINCENT 500.00 2, LUGO 500.00 - VICTORVL 500.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2256 | ivsg_la_alt3bd4r | 458 | 498.4 | 53.6 | 1271.2 | 501.3 | 1.106 | 1.062 | ELDORDO 500.00 - LUGO 500.00 1, LUGO 500.00 - MIRALOMA 500.00 2 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2191 | ivsg_la_alt3bd4r | 458 | 498 | 53.8 | 1267.8 | 500.9 | 1.103 | 1.062 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - ELDORDO 230.00 2 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_2258 | ivsg_la_alt3bd4r | 1411.6 | 1661 | 144.8 | 1778.7 | 1667.3 | 1.103 | 1.148 | LUGO 500.00 - VINCENT 500.00 2, LUGO 500.00 - VICTORVL 500.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2192 | ivsg_la_alt3bd4r | 458 | 497.7 | 53.9 | 1266.7 | 500.6 | 1.102 | 1.062 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2193 | ivsg_la_alt3bd4r | 458 | 497.7 | 53.9 | 1266.7 | 500.6 | 1.102 | 1.062 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - LUGO 230.00 2 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2115 | ivsg_la_alt3bd4r | 458 | 497 | 57.1 | 1264.8 | 500.2 | 1.101 | 1.062 | S.ONOFRE 230.00 - SANTIAGO 230.00 1, S.ONOFRE 230.00 - SANTIAGO 230.00 2 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_N-210 | ivsg_la_alt3bd4r | 458 | 494.9 | 48.8 | 1258.2 | 497.3 | 1.095 | 1.062 | EL CENTRO IMPERIAL VALLEY 230 CKTS 2&3 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2255 | ivsg_la_alt3bd4r | 458 | 493.8 | 54.9 | 1256.1 | 496.9 | 1.093 | 1.062 | LUGO 500.00 - MIRALOMA 500.00 3, LUGO 500.00 - MOHAVE 500.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2179 | ivsg_la_alt3bd4r | 2598 | 2825.5 | 371.4 | 3272.6 | 2849.9 | 1.091 | 0.931 | DEVERS 230.00 - VSTA 230.00 2, VSTA 230.00 - DEVERS 230.00 1 |
| 24016 | BARRE | 230 | 24044 | ELLIS | 230 | 1 | line_2115 | ivsg_la_alt3bd4r | 988 | 1016.2 | -115.8 | 2695.2 | 1022.8 | 1.087 | 0.358 | S.ONOFRE 230.00 - SANTIAGO 230.00 1, S.ONOFRE 230.00 - SANTIAGO 230.00 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2175 | ivsg_la_alt3bd4r | 2598 | 2776.1 | 333.5 | 3213.1 | 2796.1 | 1.071 | 0.931 | DEVERS 230.00 - SANBRDNO 230.00 1, DEVERS 230.00 - VSTA 230.00 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2177 | ivsg_la_alt3bd4r | 2598 | 2776.1 | 333.5 | 3213.1 | 2796.1 | 1.071 | 0.931 | DEVERS 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2178 | ivsg_la_alt3bd4r | 2598 | 2776.1 | 333.5 | 3213.1 | 2796.1 | 1.071 | 0.931 | DEVERS 230.00 - VSTA 230.00 2, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2180 | ivsg_la_alt3bd4r | 2598 | 2776.1 | 333.5 | 3213.1 | 2796.1 | 1.071 | 0.931 | SANBRDNO 230.00 - DEVERS 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2247 | ivsg_la_alt3bd4r | 2598 | 2776.1 | 333.5 | 3213.1 | 2796.1 | 1.071 | 0.931 | DEVERS 230.00 - VSTA 230.00 2, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_2260 | ivsg_la_alt3bd4r | 56 | 59.3 | -5 | 294.6 | 59.5 | 1.07 | 0.93 | KRAMER 230.00 - LUGO 230.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 24901 | VSTA | 230 | 24132 | SANBRDNO | 230 | 2 | line_2179 | ivsg_la_alt3bd4r | 916 | -933.4 | 70.5 | 2454.2 | 936.1 | 1.067 | 0.52 | DEVERS 230.00 - VSTA 230.00 2, VSTA 230.00 - DEVERS 230.00 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23022/23023 | ivsg_la_alt3bd4r | 392 | 416.1 | 19.2 | 1106 | 416.6 | 1.06 | 0.79 | ML-MS1+ ML-MS2 230KV |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_N-217 | ivsg_la_alt3bd4r | 1645.4 | 1844.1 | 172.3 | 1994.2 | 1852.2 | 1.05 | 1.006 | line MIDPINTS to IH500/MIDPOINTS DEVERS 500 ck 1 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | 23021/22/23/41 | ivsg_la_alt3bd4r | 388 | -394.4 | 5 | 1018.3 | 394.4 | 1.046 | 0.921 | MIGUEL 230 CORRIDOR West of SN |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_2179 | ivsg_la_alt3bd4r | 1645.4 | 1833 | 178.5 | 1983.5 | 1841.7 | 1.044 | 1.006 | DEVERS 230.00 - VSTA 230.00 2, VSTA 230.00 - DEVERS 230.00 1 |
| 24901 | VSTA | 230 | 24132 | SANBRDNO | 230 | 2 | line_2168 | ivsg_la_alt3bd4r | 916 | -915.3 | -17.4 | 2390.5 | 915.4 | 1.04 | 0.52 | DEVERS 230.00 - VSTA 230.00 2, ETIWANDA 230.00 - SANBRDNO 230.00 1 |
| 24901 | VSTA | 230 | 24132 | SANBRDNO | 230 | 2 | line_2171 | ivsg_la_alt3bd4r | 916 | -915.3 | -17.4 | 2390.5 | 915.4 | 1.04 | 0.52 | ETIWANDA 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_2175 | ivsg_la_alt3bd4r | 1645.4 | 1826.5 | 174.6 | 1974.9 | 1834.8 | 1.039 | 1.006 | DEVERS 230.00 - SANBRDNO 230.00 1, DEVERS 230.00 - VSTA 230.00 2 |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_2176 | ivsg_la_alt3bd4r | 458 | 456.2 | -60.9 | 1194.8 | 460.3 | 1.039 | 0.748 | DEVERS 230.00 - SANBRDNO 230.00 1, SANBRDNO 230.00 - DEVERS 230.00 1 |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_2177 | ivsg_la_alt3bd4r | 1645.4 | 1826.5 | 174.6 | 1974.9 | 1834.8 | 1.039 | 1.006 | DEVERS 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_2178 | ivsg_la_alt3bd4r | 1645.4 | 1826.5 | 174.6 | 1974.9 | 1834.8 | 1.039 | 1.006 | DEVERS 230.00 - VSTA 230.00 2, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_2180 | ivsg_la_alt3bd4r | 1645.4 | 1826.5 | 174.6 | 1974.9 | 1834.8 | 1.039 | 1.006 | SANBRDNO 230.00 - DEVERS 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_2247 | ivsg_la_alt3bd4r | 1645.4 | 1826.5 | 174.6 | 1974.9 | 1834.8 | 1.039 | 1.006 | DEVERS 230.00 - VSTA 230.00 2, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 2 | line_2029 | ivsg_la_alt3bd4r | 1195 | 1181.7 | -110.8 | 3105 | 1186.9 | 1.035 | 0.511 | LEWIS 230.00 - SERRANO 230.00 1, SERRANO 230.00 - VILLA PK 230.00 1 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 2 | line_2031 | ivsg_la_alt3bd4r | 1195 | 1181.7 | -110.8 | 3105 | 1186.9 | 1.035 | 0.511 | LEWIS 230.00 - SERRANO 230.00 2, SERRANO 230.00 - VILLA PK 230.00 1 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 2 | line_2278 | ivsg_la_alt3bd4r | 1195 | 1181.7 | -110.8 | 3105 | 1186.9 | 1.035 | 0.511 | LEWIS 230.00 - SERRANO 230.00 1, SERRANO 230.00 - VILLA PK 230.00 1 |
| 8600 | GEOSUB1 | 230 | 8300 | BANIS230 | 230 | 1 | line_N-204 | ivsg_la_alt3bd4r | 550 | 550.3 | 81 | 1428.6 | 556.2 | 1.035 | 0.749 | COACHELLA MIDWAY 230 CKT 1&2 |
| 8600 | GEOSUB1 | 230 | 8300 | BANIS230 | 230 | 2 | line_N-204 | ivsg_la_alt3bd4r | 550 | 550.3 | 81 | 1428.6 | 556.2 | 1.035 | 0.749 | COACHELLA MIDWAY 230 CKT 1&2 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23022/23023 | ivsg_la_alt3bd4r | 408.3 | -410.9 | 29.7 | 1763.1 | 412 | 1.032 | 0.753 | ML-MS1+ ML-MS2 230KV |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2170 | ivsg_la_alt3bd4r | 2598 | 2677 | 289.7 | 3086.9 | 2692.6 | 1.029 | 0.931 | ETIWANDA 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - SANBRDNO 230.00 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2172 | ivsg_la_alt3bd4r | 2598 | 2671.4 | 280.4 | 3074.2 | 2686.1 | 1.025 | 0.931 | VSTA 230.00 - SANBRDNO 230.00 2, VSTA 230.00 - DEVERS 230.00 1 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_2185 | ivsg_la_alt3bd4r | 800 | 806.7 | 40.9 | 2051.2 | 807.8 | 1.021 | 0.933 | RAMON 230.00 - MIRAGE 230.00 2, J.HINDS 230.00 - MIRAGE 230.00 1 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_2246 | ivsg_la_alt3bd4r | 800 | 800.8 | 43.2 | 2039.7 | 801.9 | 1.016 | 0.933 | VSTA 230.00 - DEVERS 230.00 1, COACHELV 230.00 - DEVERS 230.00 2 |
| 24701 | KRAMER | 230 | 24085 | LUGO | 230 | 2 | line_2260 | ivsg_la_alt3bd4r | 478 | 478.3 | 71.5 | 1218.6 | 483.7 | 1.016 | 0.608 | KRAMER 230.00 - LUGO 230.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | line_N-203 | ivsg_la_alt3bd4r | 388 | -380 | 7.7 | 988.8 | 380.1 | 1.015 | 0.921 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_N-217 | ivsg_la_alt3bd4r | 458 | 456 | 34.3 | 1161.8 | 457.3 | 1.011 | 1.062 | line MIDPINTS to IH500/MIDPOINTS DEVERS 500 ck 1 |
| 22001 | NORTHSD | 230 | 22000 | NORTHSD | 500 | 1 | line_2022 | ivsg_la_alt3bd4r | 1120 | -1129.4 | 116.4 | 2900.2 | 1135.4 | 1.01 | 0.91 | BARRE 230.00 - VILLA PK 230.00 1, BARRE 230.00 - LEWIS 230.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2168 | ivsg_la_alt3bd4r | 2598 | 2636.5 | 249.1 | 3029.2 | 2648.3 | 1.01 | 0.931 | DEVERS 230.00 - VSTA 230.00 2, ETIWANDA 230.00 - SANBRDNO 230.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2171 | ivsg_la_alt3bd4r | 2598 | 2636.5 | 249.1 | 3029.2 | 2648.3 | 1.01 | 0.931 | ETIWANDA 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_2186 | ivsg_la_alt3bd4r | 800 | 796.2 | 34.6 | 2024.2 | 796.9 | 1.008 | 0.933 | COACHELV 230.00 - DEVERS 230.00 2, J.HINDS 230.00 - MIRAGE 230.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_N-204 | ivsg_la_alt3bd4r | 458 | 458.2 | 46.3 | 1152.8 | 460.6 | 1.003 | 1.062 | COACHELLA MIDWAY 230 CKT 1&2 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_N-207 | ivsg_la_alt3bd4r | 800 | 787.1 | 12.3 | 2013.9 | 787.2 | 1.003 | 0.933 | MIDWAY HIGHLINE 230 CKT 3&4 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_N-208 | ivsg_la_alt3bd4r | 800 | 795.7 | 38 | 2015.1 | 796.7 | 1.003 | 0.933 | COACHELLA BANISTER/BANISTER AVE58 230 |
| 24901 | VSTA | 230 | 24804 | DEVERS | 230 | 1 | line_2175 | ivsg_la_alt3bd4r | 988 | -920.7 | 217.4 | 2482.6 | 946 | 1.001 | 0.67 | DEVERS 230.00 - SANBRDNO 230.00 1, DEVERS 230.00 - VSTA 230.00 2 |
| 24804 | DEVERS | 230 | 24901 | VSTA | 230 | 2 | line_2177 | ivsg_la_alt3bd4r | 988 | 962.6 | 225.5 | 2482.4 | 988.7 | 1.001 | 0.67 | DEVERS 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 24901 | VSTA | 230 | 24804 | DEVERS | 230 | 1 | line_2178 | ivsg_la_alt3bd4r | 988 | -920.7 | 217.4 | 2482.6 | 946 | 1.001 | 0.67 | DEVERS 230.00 - VSTA 230.00 2, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 24804 | DEVERS | 230 | 24901 | VSTA | 230 | 2 | line_2180 | ivsg_la_alt3bd4r | 988 | 962.6 | 225.5 | 2482.4 | 988.7 | 1.001 | 0.67 | SANBRDNO 230.00 - DEVERS 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 24901 | VSTA | 230 | 24804 | DEVERS | 230 | 1 | line_2247 | ivsg_la_alt3bd4r | 988 | -920.7 | 217.4 | 2482.6 | 946 | 1.001 | 0.67 | DEVERS 230.00 - VSTA 230.00 2, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 22001 | NORTHSD | 230 | 22000 | NORTHSD | 500 | 1 | 23021/23041 | ivsg_la_alt3bd4r | 1120 | -1106.1 | 140.9 | 2842.4 | 1115 | 1 | 0.91 | ML-SX + OM-SX 230KV |
| 22001 | NORTHSD | 230 | 22000 | NORTHSD | 500 | 1 | 23022/23023 | ivsg_la_alt3bd4r | 1120 | -1114.7 | 146.4 | 2866.3 | 1124.3 | 1 | 0.91 | ML-MS1+ ML-MS2 230KV |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2164 | ivsg_la_alt3bd4r | 458 | 456.3 | 52.8 | 1146.3 | 459.3 | 0.998 | 1.062 | MIRALOMA 230.00 - VSTA 230.00 1, MIRALOMA 230.00 - VSTA 230.00 2 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2172 | ivsg_la_alt3bd4r | 458 | 455.8 | 43.1 | 1144.2 | 457.8 | 0.996 | 1.062 | VSTA 230.00 - SANBRDNO 230.00 2, VSTA 230.00 - DEVERS 230.00 1 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_2179 | ivsg_la_alt3bd4r | 800 | 785.5 | 53.9 | 1999.3 | 787.4 | 0.996 | 0.933 | DEVERS 230.00 - VSTA 230.00 2, VSTA 230.00 - DEVERS 230.00 1 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | 23022/23023 | ivsg_la_alt3bd4r | 388 | -376 | 6.7 | 967.9 | 376.1 | 0.994 | 0.921 | ML-MS1+ ML-MS2 230KV |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2167 | ivsg_la_alt3bd4r | 2598 | 2589.1 | 217 | 2974.5 | 2598.2 | 0.992 | 0.931 | DEVERS 230.00 - SANBRDNO 230.00 1, ETIWANDA 230.00 - SANBRDNO 230.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2169 | ivsg_la_alt3bd4r | 2598 | 2589.1 | 217 | 2974.5 | 2598.2 | 0.992 | 0.931 | ETIWANDA 230.00 - SANBRDNO 230.00 1, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2268 | ivsg_la_alt3bd4r | 2598 | 2589.1 | 217 | 2974.5 | 2598.2 | 0.992 | 0.931 | ETIWANDA 230.00 - SANBRDNO 230.00 1, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_2214 | ivsg_la_alt3bd4r | 56 | 54.7 | -4.1 | 270 | 54.9 | 0.99 | 0.93 | LUGO 500.00 - VINCENT 500.00 1, LUGO 500.00 - VINCENT 500.00 2 |
| 20238 | HRD-230 | 230 | 20239 | HRD-115 | 115 | 1 | 23021/22/23/41 | ivsg_la_alt3bd4r | 225 | 220.5 | -22 | 568.6 | 221.6 | 0.99 | 0.89 | MIGUEL 230 CORRIDOR West of SN |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_2175 | ivsg_la_alt3bd4r | 800 | 780.4 | 48.9 | 1984.6 | 781.9 | 0.988 | 0.933 | DEVERS 230.00 - SANBRDNO 230.00 1, DEVERS 230.00 - VSTA 230.00 2 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_2177 | ivsg_la_alt3bd4r | 800 | 780.4 | 48.9 | 1984.6 | 781.9 | 0.988 | 0.933 | DEVERS 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_2178 | ivsg_la_alt3bd4r | 800 | 780.4 | 48.9 | 1984.6 | 781.9 | 0.988 | 0.933 | DEVERS 230.00 - VSTA 230.00 2, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_2180 | ivsg_la_alt3bd4r | 800 | 780.4 | 48.9 | 1984.6 | 781.9 | 0.988 | 0.933 | SANBRDNO 230.00 - DEVERS 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_2247 | ivsg_la_alt3bd4r | 800 | 780.4 | 48.9 | 1984.6 | 781.9 | 0.988 | 0.933 | DEVERS 230.00 - VSTA 230.00 2, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2196 | ivsg_la_alt3bd4r | 458 | 450.3 | 46.4 | 1134.3 | 452.6 | 0.987 | 1.062 | ETIWANDA 230.00 - SANBRDNO 230.00 1, LUGO 500.00 - MIRALOMA 500.00 2 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2198 | ivsg_la_alt3bd4r | 458 | 450.2 | 46.4 | 1134 | 452.6 | 0.987 | 1.062 | ETIWANDA 230.00 - SANBRDNO 230.00 1, LUGO 500.00 - MIRALOMA 500.00 3 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2173 | ivsg_la_alt3bd4r | 2598 | 2573.1 | 210.1 | 2958.8 | 2581.7 | 0.986 | 0.931 | SANBRDNO 230.00 - DEVERS 230.00 1, VSTA 230.00 - SANBRDNO 230.00 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2174 | ivsg_la_alt3bd4r | 2598 | 2573.1 | 210.1 | 2958.8 | 2581.7 | 0.986 | 0.931 | DEVERS 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - SANBRDNO 230.00 2 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_N-209 | ivsg_la_alt3bd4r | 800 | 775.6 | 15.7 | 1979.4 | 775.8 | 0.986 | 0.933 | EL CENTRO HIGHLINE 230 CKTS 1&2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2233 | ivsg_la_alt3bd4r | 2598 | 2539.5 | 166.8 | 2951.4 | 2545 | 0.984 | 0.931 | MOENKOPI 500.00 - ELDORDO 500.00 1, PISGAH 230.00 - ELDORDO 230.00 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2176 | ivsg_la_alt3bd4r | 2598 | 2569.2 | 202.7 | 2950.4 | 2577.2 | 0.983 | 0.931 | DEVERS 230.00 - SANBRDNO 230.00 1, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2209 | ivsg_la_alt3bd4r | 458 | 448.1 | 46.3 | 1126 | 450.5 | 0.98 | 1.062 | ETIWANDA 230.00 - SANBRDNO 230.00 1, LUGO 500.00 - SERRANO 500.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2164 | ivsg_la_alt3bd4r | 2598 | 2561.6 | 202.8 | 2932.7 | 2569.7 | 0.978 | 0.931 | MIRALOMA 230.00 - VSTA 230.00 1, MIRALOMA 230.00 - VSTA 230.00 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2246 | ivsg_la_alt3bd4r | 2598 | 2552.1 | 211.5 | 2926.9 | 2560.8 | 0.976 | 0.931 | VSTA 230.00 - DEVERS 230.00 1, COACHELV 230.00 - DEVERS 230.00 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2258 | ivsg_la_alt3bd4r | 2598 | 2520.9 | 175.8 | 2926.6 | 2527 | 0.976 | 0.931 | LUGO 500.00 - VINCENT 500.00 2, LUGO 500.00 - VICTORVL 500.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | 23021/22/23/41 | ivsg_la_alt3bd4r | 2598 | 2547.3 | 160.6 | 2928.3 | 2552.3 | 0.976 | 0.931 | MIGUEL 230 CORRIDOR West of SN |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | line_N-204 | ivsg_la_alt3bd4r | 388 | -366.6 | 10.2 | 949 | 366.7 | 0.974 | 0.921 | COACHELLA MIDWAY 230 CKT 1&2 |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_2167 | ivsg_la_alt3bd4r | 458 | 427.8 | -55.9 | 1116.8 | 431.5 | 0.971 | 0.748 | DEVERS 230.00 - SANBRDNO 230.00 1, ETIWANDA 230.00 - SANBRDNO 230.00 1 |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_2169 | ivsg_la_alt3bd4r | 458 | 427.8 | -55.9 | 1116.8 | 431.5 | 0.971 | 0.748 | ETIWANDA 230.00 - SANBRDNO 230.00 1, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_2170 | ivsg_la_alt3bd4r | 800 | 768.7 | 41.8 | 1949.9 | 769.8 | 0.971 | 0.933 | ETIWANDA 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - SANBRDNO 230.00 2 |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_2173 | ivsg_la_alt3bd4r | 458 | 427.5 | -76.2 | 1116.7 | 434.3 | 0.971 | 0.748 | SANBRDNO 230.00 - DEVERS 230.00 1, VSTA 230.00 - SANBRDNO 230.00 2 |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_2174 | ivsg_la_alt3bd4r | 458 | 427.5 | -76.2 | 1116.7 | 434.3 | 0.971 | 0.748 | DEVERS 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - SANBRDNO 230.00 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2256 | ivsg_la_alt3bd4r | 2598 | 2509.6 | 181.9 | 2913.8 | 2516.2 | 0.971 | 0.931 | ELDORDO 500.00 - LUGO 500.00 1, LUGO 500.00 - MIRALOMA 500.00 2 |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_2268 | ivsg_la_alt3bd4r | 458 | 427.8 | -55.9 | 1116.8 | 431.5 | 0.971 | 0.748 | ETIWANDA 230.00 - SANBRDNO 230.00 1, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 8601 | GEOSUB2 | 230 | 8300 | BANIS230 | 230 | 1 | line_N-203 | ivsg_la_alt3bd4r | 550 | 515.8 | 84.2 | 1339.3 | 522.7 | 0.971 | 0.81 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_2154 | ivsg_la_alt3bd4r | 56 | 53.5 | -5.2 | 264.9 | 53.8 | 0.97 | 0.93 | MIRALOMA 230.00 - OLINDA 230.00 1, MIRALOMA 230.00 - WALNUT 230.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2166 | ivsg_la_alt3bd4r | 2598 | 2538.2 | 190.1 | 2905.7 | 2545.3 | 0.969 | 0.931 | ETIWANDA 230.00 - SANBRDNO 230.00 1, ETIWANDA 230.00 - VSTA 230.00 1 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_2172 | ivsg_la_alt3bd4r | 800 | 768.1 | 40.6 | 1946.5 | 769.1 | 0.969 | 0.933 | VSTA 230.00 - SANBRDNO 230.00 2, VSTA 230.00 - DEVERS 230.00 1 |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | 23022/23023 | ivsg_la_alt3bd4r | 382.4 | 361.7 | -7 | 1549.8 | 361.8 | 0.969 | 0.679 | ML-MS1+ ML-MS2 230KV |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2191 | ivsg_la_alt3bd4r | 2598 | 2506.1 | 175.1 | 2904.1 | 2512.2 | 0.968 | 0.931 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - ELDORDO 230.00 2 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_2191 | ivsg_la_alt3bd4r | 1645.4 | 1698.9 | 180.5 | 1834.7 | 1708.5 | 0.968 | 1.006 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - ELDORDO 230.00 2 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_2192 | ivsg_la_alt3bd4r | 1645.4 | 1700.4 | 178.6 | 1835.8 | 1709.7 | 0.968 | 1.006 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_2193 | ivsg_la_alt3bd4r | 1645.4 | 1700.4 | 178.6 | 1835.8 | 1709.7 | 0.968 | 1.006 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - LUGO 230.00 2 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_2258 | ivsg_la_alt3bd4r | 1645.4 | 1703.3 | 171.3 | 1835.6 | 1711.9 | 0.968 | 1.006 | LUGO 500.00 - VINCENT 500.00 2, LUGO 500.00 - VICTORVL 500.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2165 | ivsg_la_alt3bd4r | 2598 | 2534.5 | 188.1 | 2901.3 | 2541.5 | 0.967 | 0.931 | ETIWANDA 230.00 - SANBRDNO 230.00 1, MIRALOMA 230.00 - VSTA 230.00 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2192 | ivsg_la_alt3bd4r | 2598 | 2504.3 | 174.9 | 2901.4 | 2510.4 | 0.967 | 0.931 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2193 | ivsg_la_alt3bd4r | 2598 | 2504.3 | 174.9 | 2901.3 | 2510.4 | 0.967 | 0.931 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - LUGO 230.00 2 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_2256 | ivsg_la_alt3bd4r | 1645.4 | 1695.6 | 177.4 | 1830.2 | 1704.9 | 0.965 | 1.006 | ELDORDO 500.00 - LUGO 500.00 1, LUGO 500.00 - MIRALOMA 500.00 2 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_2168 | ivsg_la_alt3bd4r | 800 | 764 | 36.4 | 1934 | 764.8 | 0.963 | 0.933 | DEVERS 230.00 - VSTA 230.00 2, ETIWANDA 230.00 - SANBRDNO 230.00 1 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_2171 | ivsg_la_alt3bd4r | 800 | 764 | 36.4 | 1934 | 764.8 | 0.963 | 0.933 | ETIWANDA 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_2183 | ivsg_la_alt3bd4r | 800 | 763.5 | 23.3 | 1934.6 | 763.9 | 0.963 | 0.933 | DEVERS 230.00 - MIRAGE 230.00 1, J.HINDS 230.00 - MIRAGE 230.00 1 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 1 | line_2030 | ivsg_la_alt3bd4r | 1287 | 1181.7 | -110.8 | 3105 | 1186.9 | 0.961 | 0.474 | LEWIS 230.00 - SERRANO 230.00 1, SERRANO 230.00 - VILLA PK 230.00 2 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 1 | line_2032 | ivsg_la_alt3bd4r | 1287 | 1181.7 | -110.8 | 3105 | 1186.9 | 0.961 | 0.474 | LEWIS 230.00 - SERRANO 230.00 2, SERRANO 230.00 - VILLA PK 230.00 2 |
| 24056 | ETIWANDA | 230 | 24132 | SANBRDNO | 230 | 1 | line_2172 | ivsg_la_alt3bd4r | 797 | -735.9 | 53.9 | 1922.5 | 737.8 | 0.961 | 0.457 | VSTA 230.00 - SANBRDNO 230.00 2, VSTA 230.00 - DEVERS 230.00 1 |
| 8601 | GEOSUB2 | 230 | 8300 | BANIS230 | 230 | 1 | line_N-209 | ivsg_la_alt3bd4r | 550 | 525.3 | 65.9 | 1326.2 | 529.4 | 0.961 | 0.81 | EL CENTRO HIGHLINE 230 CKTS 1&2 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_2121 | ivsg_la_alt3bd4r | 56 | 53.4 | -5.5 | 264.5 | 53.7 | 0.96 | 0.93 | S.CLARA 230.00 - MANDALAY 230.00 1, S.CLARA 230.00 - MANDALAY 230.00 2 |
| 22001 | NORTHSD | 230 | 22000 | NORTHSD | 500 | 1 | line_2175 | ivsg_la_alt3bd4r | 1120 | -1060.9 | 157.3 | 2755.9 | 1072.5 | 0.96 | 0.91 | DEVERS 230.00 - SANBRDNO 230.00 1, DEVERS 230.00 - VSTA 230.00 2 |
| 22001 | NORTHSD | 230 | 22000 | NORTHSD | 500 | 1 | line_2177 | ivsg_la_alt3bd4r | 1120 | -1060.9 | 157.3 | 2755.9 | 1072.5 | 0.96 | 0.91 | DEVERS 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 22001 | NORTHSD | 230 | 22000 | NORTHSD | 500 | 1 | line_2178 | ivsg_la_alt3bd4r | 1120 | -1060.9 | 157.3 | 2755.9 | 1072.5 | 0.96 | 0.91 | DEVERS 230.00 - VSTA 230.00 2, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 22001 | NORTHSD | 230 | 22000 | NORTHSD | 500 | 1 | line_2179 | ivsg_la_alt3bd4r | 1120 | -1067.9 | 157.9 | 2780.1 | 1079.5 | 0.96 | 0.91 | DEVERS 230.00 - VSTA 230.00 2, VSTA 230.00 - DEVERS 230.00 1 |
| 22001 | NORTHSD | 230 | 22000 | NORTHSD | 500 | 1 | line_2180 | ivsg_la_alt3bd4r | 1120 | -1060.9 | 157.3 | 2755.9 | 1072.5 | 0.96 | 0.91 | SANBRDNO 230.00 - DEVERS 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 22001 | NORTHSD | 230 | 22000 | NORTHSD | 500 | 1 | line_2247 | ivsg_la_alt3bd4r | 1120 | -1060.9 | 157.3 | 2755.9 | 1072.5 | 0.96 | 0.91 | DEVERS 230.00 - VSTA 230.00 2, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 20238 | HRD-230 | 230 | 20239 | HRD-115 | 115 | 1 | line_N-203 | ivsg_la_alt3bd4r | 225 | 213.9 | -20.5 | 554.6 | 214.8 | 0.96 | 0.89 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | line_2179 | ivsg_la_alt3bd4r | 388 | -362 | 8.1 | 932.6 | 362.1 | 0.958 | 0.921 | DEVERS 230.00 - VSTA 230.00 2, VSTA 230.00 - DEVERS 230.00 1 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | line_2175 | ivsg_la_alt3bd4r | 388 | -360.5 | 8.6 | 928.1 | 360.6 | 0.953 | 0.921 | DEVERS 230.00 - SANBRDNO 230.00 1, DEVERS 230.00 - VSTA 230.00 2 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | line_2177 | ivsg_la_alt3bd4r | 388 | -360.5 | 8.6 | 928.1 | 360.6 | 0.953 | 0.921 | DEVERS 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | line_2178 | ivsg_la_alt3bd4r | 388 | -360.5 | 8.6 | 928.1 | 360.6 | 0.953 | 0.921 | DEVERS 230.00 - VSTA 230.00 2, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | line_2180 | ivsg_la_alt3bd4r | 388 | -360.5 | 8.6 | 928.1 | 360.6 | 0.953 | 0.921 | SANBRDNO 230.00 - DEVERS 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | line_2247 | ivsg_la_alt3bd4r | 388 | -360.5 | 8.6 | 928.1 | 360.6 | 0.953 | 0.921 | DEVERS 230.00 - VSTA 230.00 2, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_N-203 | ivsg_la_alt3bd4r | 458 | 438.5 | 49.4 | 1095.1 | 441.3 | 0.953 | 1.062 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 24804 | DEVERS | 230 | 24901 | VSTA | 230 | 2 | line_2172 | ivsg_la_alt3bd4r | 988 | 915.3 | 224.6 | 2355.4 | 942.4 | 0.95 | 0.67 | VSTA 230.00 - SANBRDNO 230.00 2, VSTA 230.00 - DEVERS 230.00 1 |
| 22001 | NORTHSD | 230 | 22000 | NORTHSD | 500 | 1 | line_2172 | ivsg_la_alt3bd4r | 1120 | -1049.7 | 147.2 | 2711.3 | 1059.9 | 0.95 | 0.91 | VSTA 230.00 - SANBRDNO 230.00 2, VSTA 230.00 - DEVERS 230.00 1 |
| 22001 | NORTHSD | 230 | 22000 | NORTHSD | 500 | 1 | line_2252 | ivsg_la_alt3bd4r | 1120 | -1055.2 | 122.1 | 2697.8 | 1062.2 | 0.95 | 0.91 | BARRE 230.00 - ELLIS 230.00 1, ELLIS 230.00 - JOHANNA 230.00 1 |
| 22001 | NORTHSD | 230 | 22000 | NORTHSD | 500 | 1 | line_2262 | ivsg_la_alt3bd4r | 1120 | -1052.3 | 126 | 2696.7 | 1059.8 | 0.95 | 0.91 | CHINO 230.00 - MIRALOMA 230.00 3, MIRALOMA 230.00 - OLINDA 230.00 1 |
| 20238 | HRD-230 | 230 | 20239 | HRD-115 | 115 | 1 | 23022/23023 | ivsg_la_alt3bd4r | 225 | 212.2 | -18.3 | 545.2 | 213 | 0.95 | 0.89 | ML-MS1+ ML-MS2 230KV |
| 24042 | ELDORDO | 500 | 24086 | LUGO | 500 | 1 | line_2258 | ivsg_la_alt3bd4r | 1386 | 1356.4 | 76.1 | 1511.9 | 1358.5 | 0.946 | 0.711 | LUGO 500.00 - VINCENT 500.00 2, LUGO 500.00 - VICTORVL 500.00 1 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2165 | ivsg_la_alt3bd4r | 458 | 432.2 | 44.9 | 1085.2 | 434.5 | 0.944 | 1.062 | ETIWANDA 230.00 - SANBRDNO 230.00 1, MIRALOMA 230.00 - VSTA 230.00 2 |
| 24804 | DEVERS | 230 | 25666 | OAK_VLLY | 230 | 1 | line_2166 | ivsg_la_alt3bd4r | 458 | 431 | 44.9 | 1082.3 | 433.4 | 0.942 | 1.062 | ETIWANDA 230.00 - SANBRDNO 230.00 1, ETIWANDA 230.00 - VSTA 230.00 1 |
| 22001 | NORTHSD | 230 | 22000 | NORTHSD | 500 | 1 | line_2154 | ivsg_la_alt3bd4r | 1120 | -1050.7 | 125.5 | 2696.4 | 1058.2 | 0.94 | 0.91 | MIRALOMA 230.00 - OLINDA 230.00 1, MIRALOMA 230.00 - WALNUT 230.00 1 |
| 22001 | NORTHSD | 230 | 22000 | NORTHSD | 500 | 1 | line_2170 | ivsg_la_alt3bd4r | 1120 | -1047.3 | 150.8 | 2710.4 | 1058.1 | 0.94 | 0.91 | ETIWANDA 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - SANBRDNO 230.00 2 |
| 24016 | BARRE | 230 | 25201 | LEWIS | 230 | 1 | line_2115 | ivsg_la_alt3bd4r | 1195 | -1041.9 | 238.2 | 2816.4 | 1068.8 | 0.939 | 0.596 | S.ONOFRE 230.00 - SANTIAGO 230.00 1, S.ONOFRE 230.00 - SANTIAGO 230.00 2 |
| 24132 | SANBRDNO | 230 | 24804 | DEVERS | 230 | 1 | line_2179 | ivsg_la_alt3bd4r | 988 | -874 | 175 | 2326.7 | 891.3 | 0.938 | 0.615 | DEVERS 230.00 - VSTA 230.00 2, VSTA 230.00 - DEVERS 230.00 1 |
| 8601 | GEOSUB2 | 230 | 8300 | BANIS230 | 230 | 1 | line_N-207 | ivsg_la_alt3bd4r | 550 | 509.9 | 48 | 1291.4 | 512.2 | 0.936 | 0.81 | MIDWAY HIGHLINE 230 CKT 3&4 |
| 20238 | HRD-230 | 230 | 20239 | HRD-115 | 115 | 1 | line_N-204 | ivsg_la_alt3bd4r | 225 | 207.8 | -18.3 | 535.7 | 208.6 | 0.93 | 0.89 | COACHELLA MIDWAY 230 CKT 1&2 |
| 20238 | HRD-230 | 230 | 20118 | ROA-230 | 230 | 1 | 23021/22/23/41 | ivsg_la_alt3bd4r | 388 | -337.2 | 88.5 | 894.3 | 348.6 | 0.923 | 0.799 | MIGUEL 230 CORRIDOR West of SN |
| 24056 | ETIWANDA | 230 | 24901 | VSTA | 230 | 1 | line_2164 | ivsg_la_alt3bd4r | 797 | -694.4 | 115.5 | 1821.6 | 703.9 | 0.911 | 0.401 | MIRALOMA 230.00 - VSTA 230.00 1, MIRALOMA 230.00 - VSTA 230.00 2 |
| 19051 | KNOB | 161 | 8367 | PILOTKNB | 161 | 1 | line_N-203 | ivsg_la_alt3bd4r | 165 | -149.8 | 17.1 | 538.5 | 150.8 | 0.91 | 0.738 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 80300 | NEWSF230 | 230 | 80350 | NEWSF500 | 500 | 1 | line_N-210 | ivsg_la_alt3bd4r | 1120 | 967.3 | -210 | 2577.1 | 989.9 | 0.91 | 0.67 | EL CENTRO IMPERIAL VALLEY 230 CKTS 2&3 |
| 25666 | OAK_VLLY | 230 | 24132 | SANBRDNO | 230 | 1 | line_2246 | ivsg_la_alt3bd4r | 458 | 402.5 | -39.5 | 1045.6 | 404.5 | 0.909 | 0.748 | VSTA 230.00 - DEVERS 230.00 1, COACHELV 230.00 - DEVERS 230.00 2 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_2096 | ivsg_la_alt3bd4r | 56 | 49.7 | -5.2 | 245 | 50 | 0.9 | 0.93 | EAGLROCK 230.00 - MESA CAL 230.00 1, GOODRICH 230.00 - GOULD 230.00 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_2106 | ivsg_la_alt3bd4r | 56 | 49.8 | -5.1 | 245.5 | 50.1 | 0.9 | 0.93 | PARDEE 230.00 - SYLMAR S 230.00 1, SYLMAR S 230.00 - GOULD 230.00 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_2107 | ivsg_la_alt3bd4r | 56 | 49.8 | -5.1 | 245.5 | 50.1 | 0.9 | 0.93 | PARDEE 230.00 - SYLMAR S 230.00 2, SYLMAR S 230.00 - GOULD 230.00 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_2280 | ivsg_la_alt3bd4r | 56 | 49.8 | -5.1 | 245.5 | 50.1 | 0.9 | 0.93 | PARDEE 230.00 - SYLMAR S 230.00 1, SYLMAR S 230.00 - GOULD 230.00 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23021/23041 | ivsg_la_alt3bd4r | 392 | 354.2 | 17.5 | 939.1 | 354.6 | 0.9 | 0.79 | ML-SX + OM-SX 230KV |

ivsg_la_3bd4r1.sav
No Solve Summary
N-2 Outages

| Contingency-Description | | Case | Problem-Description |
|---|---|---|---|
| line MIDPINTS to DEVERS | 500 ck 1&2 | ivsg_la_alt3bd4r | Pmis 20421 JOV-U1 18.00 = -584985.56 MW + j -11119691.00 MVAR |

# Imperial Valley Study Group

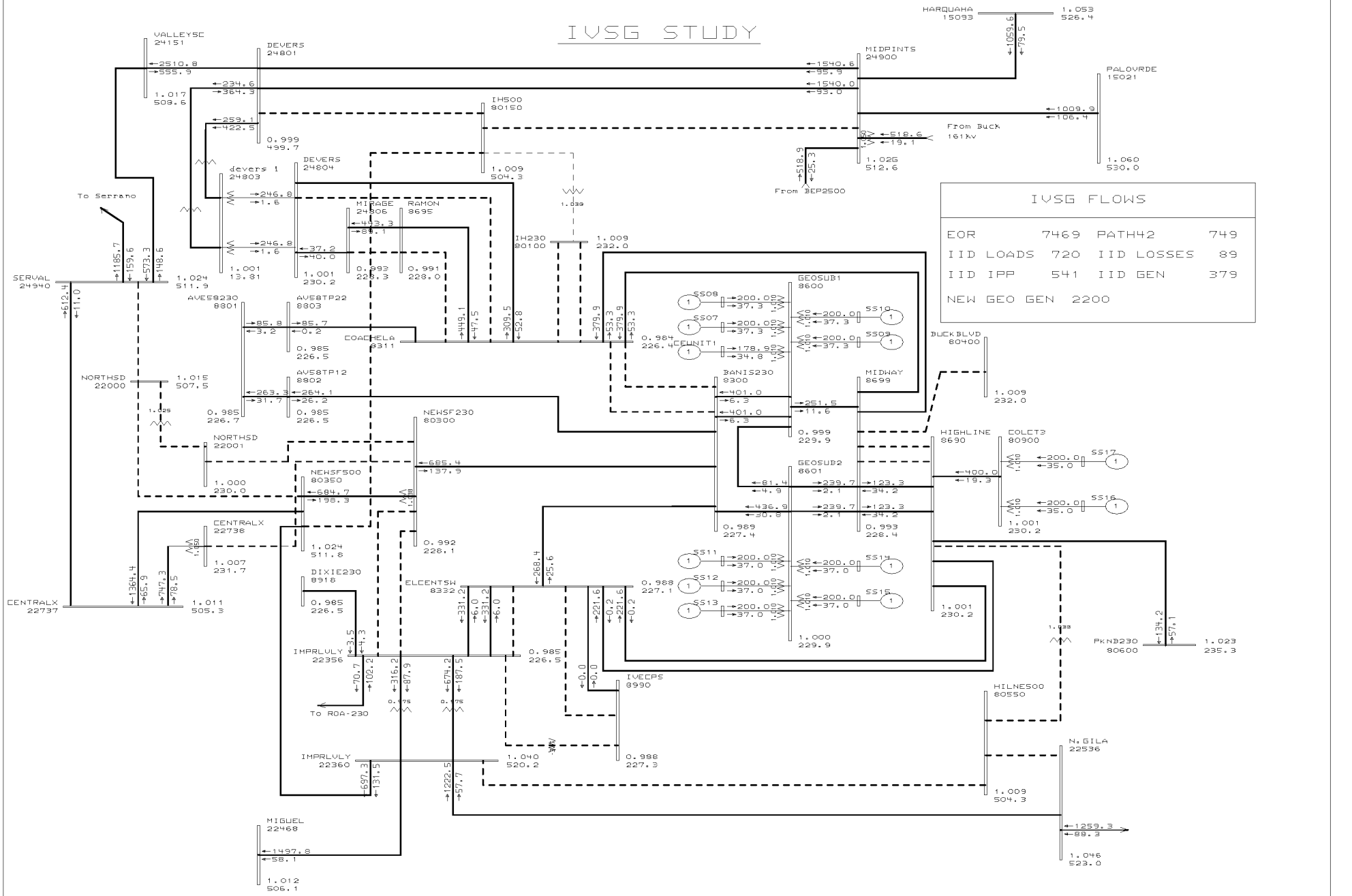
## Appendix B.2

Sensitivity Cases

# Imperial Valley Study Group

## Appendix B.2.1

LA – Alt 2 D3 S-CSV
Light Autumn
Alternative 2
Dispatch 3
Sensitivity – Central SerVal




General Electric International, Inc. PSLF Program MW/MVAR Tue Jul 12 16:14:18 2005

LA_ALT2D3_S-CSV.sav from IVSG_LA_ALT2D3_S1.SAV IID/MLE 070505
IMPERIAL VALLEY STUDY GROUP LIGHT AUTUMN

LIGHT AUTUMN ALTERNATIVE 2, DISPATCH SCENARIO 3
SENSITIVITY CASE - SERVAL/CENTRALX 500KV LINE

ivgs\ivgslasens.drw
d:\pslf\ivgs\cases\stabcases\l
Rating = 1

| Bus | Name | kV | Area | Zone | Outage | Case | Vbase | Vcont | DeltaV | Vmin | Vmax | Max-dv | Contingency Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 14534 | N.GILA 4 | 100 | 14 | 847 | base | LA_ALT2D3_S-CSV | 0.938 | 0.938 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14606 | N.GILA 3 | 100 | 14 | 847 | base | LA_ALT2D3_S-CSV | 0.938 | 0.938 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14234 | YAVAPAI | 230 | 14 | 141 | base | LA_ALT2D3_S-CSV | 1.05 | 1.05 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14355 | PRESCOTT | 115 | 14 | 141 | base | LA_ALT2D3_S-CSV | 1.05 | 1.05 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14608 | OCOTIL 1 | 100 | 14 | 141 | base | LA_ALT2D3_S-CSV | 1.05 | 1.05 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24816 | SANTA RO | 115 | 24 | 248 | base | LA_ALT2D3_S-CSV | 1.05 | 1.05 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24042 | ELDORDO | 500 | 24 | 240 | base | LA_ALT2D3_S-CSV | 1.051 | 1.051 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15093 | HARQUAHA | 500 | 14 | 158 | base | LA_ALT2D3_S-CSV | 1.053 | 1.053 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14007 | GILARIVR | 500 | 14 | 141 | base | LA_ALT2D3_S-CSV | 1.053 | 1.053 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24748 | OXBOW A | 230 | 24 | 247 | base | LA_ALT2D3_S-CSV | 1.053 | 1.053 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15089 | JOJOBA | 500 | 14 | 158 | base | LA_ALT2D3_S-CSV | 1.054 | 1.054 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14000 | CHOLLA | 500 | 14 | 141 | base | LA_ALT2D3_S-CSV | 1.055 | 1.055 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24141 | SPRINGVL | 230 | 24 | 240 | base | LA_ALT2D3_S-CSV | 1.055 | 1.055 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14001 | FOURCORN | 500 | 14 | 141 | base | LA_ALT2D3_S-CSV | 1.056 | 1.056 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24775 | RUSH | 115 | 24 | 247 | base | LA_ALT2D3_S-CSV | 1.056 | 1.056 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24153 | VESTAL | 230 | 24 | 240 | base | LA_ALT2D3_S-CSV | 1.056 | 1.056 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 16310 | NL.3WP2 | 100 | 14 | 160 | base | LA_ALT2D3_S-CSV | 1.057 | 1.057 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24729 | INYO | 230 | 24 | 247 | base | LA_ALT2D3_S-CSV | 1.057 | 1.057 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24156 | VINCENT | 500 | 24 | 240 | base | LA_ALT2D3_S-CSV | 1.057 | 1.057 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15031 | PERK PS1 | 500 | 14 | 158 | base | LA_ALT2D3_S-CSV | 1.058 | 1.058 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15032 | PERK PS2 | 500 | 14 | 158 | base | LA_ALT2D3_S-CSV | 1.058 | 1.058 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15033 | PERKINPS | 500 | 14 | 158 | base | LA_ALT2D3_S-CSV | 1.058 | 1.058 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14005 | WESTWING | 500 | 14 | 141 | base | LA_ALT2D3_S-CSV | 1.058 | 1.058 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15092 | ARLINTON | 500 | 14 | 158 | base | LA_ALT2D3_S-CSV | 1.059 | 1.059 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15094 | MESQUITE | 500 | 14 | 158 | base | LA_ALT2D3_S-CSV | 1.059 | 1.059 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14100 | CHOLLA | 345 | 14 | 141 | base | LA_ALT2D3_S-CSV | 1.059 | 1.059 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14009 | REDHAWK | 500 | 14 | 158 | base | LA_ALT2D3_S-CSV | 1.059 | 1.059 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15021 | PALOVRDE | 500 | 14 | 158 | base | LA_ALT2D3_S-CSV | 1.06 | 1.06 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15061 | RUDD | 500 | 14 | 158 | base | LA_ALT2D3_S-CSV | 1.06 | 1.06 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15090 | HASSYAMP | 500 | 14 | 158 | base | LA_ALT2D3_S-CSV | 1.06 | 1.06 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 19038 | MEAD | 500 | 14 | 191 | base | LA_ALT2D3_S-CSV | 1.06 | 1.06 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14010 | TS5 | 500 | 14 | 840 | base | LA_ALT2D3_S-CSV | 1.061 | 1.061 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24776 | LEE VINE | 115 | 24 | 247 | base | LA_ALT2D3_S-CSV | 1.064 | 1.064 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15034 | PERKINS | 500 | 14 | 158 | base | LA_ALT2D3_S-CSV | 1.065 | 1.065 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14006 | YAVAPAI | 500 | 14 | 141 | base | LA_ALT2D3_S-CSV | 1.065 | 1.065 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15087 | SNTAROSA | 500 | 14 | 158 | base | LA_ALT2D3_S-CSV | 1.067 | 1.067 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 16302 | NL.3WP | 100 | 14 | 160 | base | LA_ALT2D3_S-CSV | 1.067 | 1.067 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24097 | MOHAVE | 500 | 24 | 240 | base | LA_ALT2D3_S-CSV | 1.067 | 1.067 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15088 | PINAL_W | 500 | 14 | 158 | base | LA_ALT2D3_S-CSV | 1.068 | 1.068 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24235 | RECTOR | 230 | 24 | 240 | base | LA_ALT2D3_S-CSV | 1.068 | 1.068 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24234 | RECTRSVC | 230 | 24 | 240 | base | LA_ALT2D3_S-CSV | 1.068 | 1.068 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15001 | CORONADO | 500 | 14 | 140 | base | LA_ALT2D3_S-CSV | 1.07 | 1.07 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14002 | MOENKOPI | 500 | 14 | 141 | base | LA_ALT2D3_S-CSV | 1.082 | 1.082 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14003 | NAVAJO | 500 | 14 | 141 | base | LA_ALT2D3_S-CSV | 1.086 | 1.086 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24304 | BIG CRK4 | 230 | 24 | 243 | base | LA_ALT2D3_S-CSV | 1.089 | 1.089 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24301 | BIG CRK1 | 230 | 24 | 243 | base | LA_ALT2D3_S-CSV | 1.09 | 1.09 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24320 | EASTWOOD | 230 | 24 | 243 | base | LA_ALT2D3_S-CSV | 1.091 | 1.091 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24316 | MAMMOTH | 230 | 24 | 243 | base | LA_ALT2D3_S-CSV | 1.091 | 1.091 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24302 | BIG CRK2 | 230 | 24 | 243 | base | LA_ALT2D3_S-CSV | 1.092 | 1.092 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24303 | BIG CRK3 | 230 | 24 | 243 | base | LA_ALT2D3_S-CSV | 1.092 | 1.092 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24305 | BIG CRK8 | 230 | 24 | 243 | base | LA_ALT2D3_S-CSV | 1.092 | 1.092 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |

la_alt2d3_s-csv.sav
Flow Summary
N-0 Outages

| LEGEND | % of RATING 1 | |
|---|---|---|
| C_pu | 100% - 110% | |
| C_pu | 110% - 120% | P.U. of |
| C_pu | > 120% | Rate 1 |

| FROM | FR | BKV | TO | TO | BKV | CK | Outage_Name | Case | Rate-Mva | Pflow | Qflow | Amps | MVA | C_pu | B_pu | Contingency_Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24900 | MIDPINTS | 500 | 19399 | BUCK161 | 161 | 1 | base | LA_ALT2D3_S-CSV | 250 | -514 | 73.2 | 584.8 | 519.2 | 2.08 | 2.08 | Base system (n-0) |
| 19400 | BUCK230 | 230 | 19399 | BUCK161 | 161 | 1 | base | LA_ALT2D3_S-CSV | 280 | 339.2 | 48.9 | 874.7 | 342.7 | 1.22 | 1.22 | Base system (n-0) |
| 16900 | COPPERVR | 345 | 16901 | COPPERVR | 230 | 1 | base | LA_ALT2D3_S-CSV | 200 | 202.2 | 98.4 | 370.8 | 224.9 | 1.12 | 1.12 | Base system (n-0) |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | base | LA_ALT2D3_S-CSV | 1411.6 | 1651.8 | 99 | 1759.1 | 1654.8 | 1.09 | 1.09 | Base system (n-0) |
| 24912 | SHANDIN | 115 | 24916 | TAP902 | 115 | 1 | base | LA_ALT2D3_S-CSV | 109.1 | -104.3 | 32.5 | 545.7 | 109.3 | 0.998 | 0.998 | Base system (n-0) |
| 25641 | TAP816 | 115 | 25664 | TAP998 | 115 | 1 | base | LA_ALT2D3_S-CSV | 107.6 | -96.4 | 41.6 | 530.4 | 105 | 0.982 | 0.982 | Base system (n-0) |
| 25641 | TAP816 | 115 | 25644 | TAP818 | 115 | 1 | base | LA_ALT2D3_S-CSV | 107.6 | 96.4 | -40.8 | 528.8 | 104.7 | 0.979 | 0.979 | Base system (n-0) |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | base | LA_ALT2D3_S-CSV | 2598 | 2536.6 | -7.8 | 2930.6 | 2536.6 | 0.977 | 0.977 | Base system (n-0) |
| 24805 | DEVERS | 115 | 25644 | TAP818 | 115 | 1 | base | LA_ALT2D3_S-CSV | 217 | -183.7 | 96.8 | 1038.2 | 207.7 | 0.953 | 0.953 | Base system (n-0) |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | base | LA_ALT2D3_S-CSV | 1645.4 | 1685.3 | 113.2 | 1802.6 | 1689.1 | 0.949 | 0.949 | Base system (n-0) |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | base | LA_ALT2D3_S-CSV | 56 | 51.8 | -5.1 | 255.8 | 52.1 | 0.94 | 0.94 | Base system (n-0) |
| 25629 | TAP813 | 115 | 25630 | TAP814 | 115 | 1 | base | LA_ALT2D3_S-CSV | 82.7 | 69.9 | -28.2 | 379.4 | 75.4 | 0.914 | 0.914 | Base system (n-0) |

| Bus | Name | kV | Area | Zone | Outage | Case | Vbase | Vcont | DeltaV | Vmin | Vmax | Max-dv | Contingency Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24731 | INYOKERN | 115 | 24 | 247 | line_175 | LA_ALT2D3_S-CSV | 1.013 | 0.909 | -0.104 | 0.9 | 1.05 | 0.05 | line INYO to COTTONWD 230 ck 1 |
| 25666 | OAK_VLLY | 230 | 24 | 248 | line_207 | LA_ALT2D3_S-CSV | 0.979 | 0.916 | -0.064 | 0.9 | 1.05 | 0.05 | line DEVERS to VALLEYSC 500 ck 1 |
| 24017 | BLYTHESC | 161 | 24 | 248 | line_007 | LA_ALT2D3_S-CSV | 1.007 | 0.919 | -0.087 | 0.9 | 1.05 | 0.05 | line BLYTHE to BLYTHESC 161 ck 1 |
| 24901 | VSTA | 230 | 24 | 248 | line_207 | LA_ALT2D3_S-CSV | 0.973 | 0.92 | -0.052 | 0.9 | 1.05 | 0.05 | line DEVERS to VALLEYSC 500 ck 1 |
| 24824 | CARODEAN | 115 | 24 | 248 | line_207 | LA_ALT2D3_S-CSV | 0.988 | 0.929 | -0.059 | 0.9 | 1.05 | 0.05 | line DEVERS to VALLEYSC 500 ck 1 |
| 24132 | SANBRDNO | 230 | 24 | 248 | line_207 | LA_ALT2D3_S-CSV | 0.982 | 0.93 | -0.053 | 0.9 | 1.05 | 0.05 | line DEVERS to VALLEYSC 500 ck 1 |
| 24811 | TAP802 | 115 | 24 | 248 | line_207 | LA_ALT2D3_S-CSV | 0.988 | 0.93 | -0.059 | 0.9 | 1.05 | 0.05 | line DEVERS to VALLEYSC 500 ck 1 |
| 24808 | TAP801 | 115 | 24 | 248 | line_207 | LA_ALT2D3_S-CSV | 0.99 | 0.931 | -0.058 | 0.9 | 1.05 | 0.05 | line DEVERS to VALLEYSC 500 ck 1 |
| 24809 | YUCCA | 115 | 24 | 248 | line_207 | LA_ALT2D3_S-CSV | 0.99 | 0.931 | -0.058 | 0.9 | 1.05 | 0.05 | line DEVERS to VALLEYSC 500 ck 1 |
| 24768 | RANDSBRG | 115 | 24 | 247 | line_175 | LA_ALT2D3_S-CSV | 1.008 | 0.932 | -0.075 | 0.9 | 1.05 | 0.05 | line INYO to COTTONWD 230 ck 1 |
| 24761 | TAP701 | 115 | 24 | 247 | line_175 | LA_ALT2D3_S-CSV | 1.008 | 0.932 | -0.075 | 0.9 | 1.05 | 0.05 | line INYO to COTTONWD 230 ck 1 |
| 24810 | HI DESER | 115 | 24 | 248 | line_207 | LA_ALT2D3_S-CSV | 0.991 | 0.933 | -0.058 | 0.9 | 1.05 | 0.05 | line DEVERS to VALLEYSC 500 ck 1 |
| 24817 | EISENHOW | 115 | 24 | 248 | line_207 | LA_ALT2D3_S-CSV | 0.993 | 0.934 | -0.058 | 0.9 | 1.05 | 0.05 | line DEVERS to VALLEYSC 500 ck 1 |
| 24820 | THORNHIL | 115 | 24 | 248 | line_207 | LA_ALT2D3_S-CSV | 0.992 | 0.934 | -0.058 | 0.9 | 1.05 | 0.05 | line DEVERS to VALLEYSC 500 ck 1 |
| 24831 | TAP822 | 115 | 24 | 248 | line_207 | LA_ALT2D3_S-CSV | 0.993 | 0.934 | -0.058 | 0.9 | 1.05 | 0.05 | line DEVERS to VALLEYSC 500 ck 1 |
| 25640 | PANAERO | 115 | 24 | 248 | line_207 | LA_ALT2D3_S-CSV | 0.993 | 0.935 | -0.058 | 0.9 | 1.05 | 0.05 | line DEVERS to VALLEYSC 500 ck 1 |
| 25639 | SEAWIND | 115 | 24 | 248 | line_207 | LA_ALT2D3_S-CSV | 0.994 | 0.935 | -0.058 | 0.9 | 1.05 | 0.05 | line DEVERS to VALLEYSC 500 ck 1 |
| 25641 | TAP816 | 115 | 24 | 248 | line_207 | LA_ALT2D3_S-CSV | 0.994 | 0.935 | -0.058 | 0.9 | 1.05 | 0.05 | line DEVERS to VALLEYSC 500 ck 1 |
| 28260 | ALTAMSA4 | 115 | 24 | 248 | line_207 | LA_ALT2D3_S-CSV | 0.994 | 0.935 | -0.058 | 0.9 | 1.05 | 0.05 | line DEVERS to VALLEYSC 500 ck 1 |
| 25664 | TAP998 | 115 | 24 | 248 | line_207 | LA_ALT2D3_S-CSV | 0.994 | 0.935 | -0.058 | 0.9 | 1.05 | 0.05 | line DEVERS to VALLEYSC 500 ck 1 |
| 24739 | MC GEN | 115 | 24 | 247 | line_175 | LA_ALT2D3_S-CSV | 1.032 | 0.936 | -0.097 | 0.9 | 1.05 | 0.05 | line INYO to COTTONWD 230 ck 1 |
| 24749 | SEARLES | 115 | 24 | 247 | line_175 | LA_ALT2D3_S-CSV | 1.032 | 0.936 | -0.097 | 0.9 | 1.05 | 0.05 | line INYO to COTTONWD 230 ck 1 |
| 24762 | TAP702 | 115 | 24 | 247 | line_175 | LA_ALT2D3_S-CSV | 1.032 | 0.936 | -0.097 | 0.9 | 1.05 | 0.05 | line INYO to COTTONWD 230 ck 1 |
| 24763 | TAP703 | 115 | 24 | 247 | line_175 | LA_ALT2D3_S-CSV | 1.032 | 0.936 | -0.097 | 0.9 | 1.05 | 0.05 | line INYO to COTTONWD 230 ck 1 |
| 24814 | BANNING | 115 | 24 | 248 | line_207 | LA_ALT2D3_S-CSV | 0.994 | 0.936 | -0.058 | 0.9 | 1.05 | 0.05 | line DEVERS to VALLEYSC 500 ck 1 |
| 24818 | FARREL | 115 | 24 | 248 | line_207 | LA_ALT2D3_S-CSV | 0.994 | 0.936 | -0.058 | 0.9 | 1.05 | 0.05 | line DEVERS to VALLEYSC 500 ck 1 |
| 25646 | SANWIND | 115 | 24 | 248 | line_207 | LA_ALT2D3_S-CSV | 0.995 | 0.936 | -0.058 | 0.9 | 1.05 | 0.05 | line DEVERS to VALLEYSC 500 ck 1 |
| 24920 | MNTVIEW | 230 | 24 | 240 | line_207 | LA_ALT2D3_S-CSV | 0.986 | 0.936 | -0.05 | 0.9 | 1.05 | 0.05 | line DEVERS to VALLEYSC 500 ck 1 |
| 25644 | TAP818 | 115 | 24 | 248 | line_207 | LA_ALT2D3_S-CSV | 0.995 | 0.937 | -0.058 | 0.9 | 1.05 | 0.05 | line DEVERS to VALLEYSC 500 ck 1 |
| 25635 | ALTWIND | 115 | 24 | 248 | line_207 | LA_ALT2D3_S-CSV | 0.996 | 0.938 | -0.058 | 0.9 | 1.05 | 0.05 | line DEVERS to VALLEYSC 500 ck 1 |
| 24832 | TAP820 | 115 | 24 | 248 | line_207 | LA_ALT2D3_S-CSV | 0.996 | 0.938 | -0.058 | 0.9 | 1.05 | 0.05 | line DEVERS to VALLEYSC 500 ck 1 |
| 28060 | SEAWEST | 115 | 24 | 248 | line_207 | LA_ALT2D3_S-CSV | 0.996 | 0.938 | -0.058 | 0.9 | 1.05 | 0.05 | line DEVERS to VALLEYSC 500 ck 1 |
| 25642 | TAP819 | 115 | 24 | 248 | line_207 | LA_ALT2D3_S-CSV | 0.996 | 0.939 | -0.058 | 0.9 | 1.05 | 0.05 | line DEVERS to VALLEYSC 500 ck 1 |
| 24815 | GARNET | 115 | 24 | 248 | line_207 | LA_ALT2D3_S-CSV | 0.998 | 0.94 | -0.058 | 0.9 | 1.05 | 0.05 | line DEVERS to VALLEYSC 500 ck 1 |
| 25624 | TAP808 | 115 | 24 | 248 | line_207 | LA_ALT2D3_S-CSV | 0.998 | 0.94 | -0.058 | 0.9 | 1.05 | 0.05 | line DEVERS to VALLEYSC 500 ck 1 |
| 25627 | TAP811 | 115 | 24 | 248 | line_207 | LA_ALT2D3_S-CSV | 0.998 | 0.94 | -0.058 | 0.9 | 1.05 | 0.05 | line DEVERS to VALLEYSC 500 ck 1 |
| 25629 | TAP813 | 115 | 24 | 248 | line_207 | LA_ALT2D3_S-CSV | 0.998 | 0.94 | -0.058 | 0.9 | 1.05 | 0.05 | line DEVERS to VALLEYSC 500 ck 1 |
| 25637 | TRANWND | 115 | 24 | 248 | line_207 | LA_ALT2D3_S-CSV | 0.998 | 0.94 | -0.058 | 0.9 | 1.05 | 0.05 | line DEVERS to VALLEYSC 500 ck 1 |
| 24833 | MARASCHI | 115 | 24 | 248 | line_207 | LA_ALT2D3_S-CSV | 0.998 | 0.941 | -0.058 | 0.9 | 1.05 | 0.05 | line DEVERS to VALLEYSC 500 ck 1 |
| 24645 | TAP817 | 115 | 24 | 248 | line_207 | LA_ALT2D3_S-CSV | 1.001 | 0.943 | -0.057 | 0.9 | 1.05 | 0.05 | line DEVERS to VALLEYSC 500 ck 1 |
| 25634 | BUCKWND | 115 | 24 | 248 | line_207 | LA_ALT2D3_S-CSV | 1.001 | 0.944 | -0.057 | 0.9 | 1.05 | 0.05 | line DEVERS to VALLEYSC 500 ck 1 |
| 25636 | RENWIND | 115 | 24 | 248 | line_207 | LA_ALT2D3_S-CSV | 1.001 | 0.944 | -0.058 | 0.9 | 1.05 | 0.05 | line DEVERS to VALLEYSC 500 ck 1 |
| 25625 | TAP809 | 115 | 24 | 248 | line_207 | LA_ALT2D3_S-CSV | 1.001 | 0.944 | -0.057 | 0.9 | 1.05 | 0.05 | line DEVERS to VALLEYSC 500 ck 1 |
| 25630 | TAP814 | 115 | 24 | 248 | line_207 | LA_ALT2D3_S-CSV | 1.001 | 0.944 | -0.058 | 0.9 | 1.05 | 0.05 | line DEVERS to VALLEYSC 500 ck 1 |
| 24826 | INDIGO | 115 | 24 | 248 | line_207 | LA_ALT2D3_S-CSV | 1.001 | 0.944 | -0.057 | 0.9 | 1.05 | 0.05 | line DEVERS to VALLEYSC 500 ck 1 |
| 28020 | WINTEC6 | 115 | 24 | 248 | line_207 | LA_ALT2D3_S-CSV | 1.001 | 0.944 | -0.057 | 0.9 | 1.05 | 0.05 | line DEVERS to VALLEYSC 500 ck 1 |
| 25645 | VENWIND | 115 | 24 | 248 | line_207 | LA_ALT2D3_S-CSV | 1.003 | 0.945 | -0.057 | 0.9 | 1.05 | 0.05 | line DEVERS to VALLEYSC 500 ck 1 |
| 24813 | TAP804 | 115 | 24 | 248 | line_207 | LA_ALT2D3_S-CSV | 1.003 | 0.946 | -0.057 | 0.9 | 1.05 | 0.05 | line DEVERS to VALLEYSC 500 ck 1 |
| 24805 | DEVERS | 115 | 24 | 248 | line_207 | LA_ALT2D3_S-CSV | 1.004 | 0.947 | -0.057 | 0.9 | 1.05 | 0.05 | line DEVERS to VALLEYSC 500 ck 1 |
| 25623 | TAP807 | 115 | 24 | 248 | line_207 | LA_ALT2D3_S-CSV | 1.004 | 0.947 | -0.057 | 0.9 | 1.05 | 0.05 | line DEVERS to VALLEYSC 500 ck 1 |
| 25632 | TERAWND | 115 | 24 | 248 | line_207 | LA_ALT2D3_S-CSV | 1.004 | 0.947 | -0.057 | 0.9 | 1.05 | 0.05 | line DEVERS to VALLEYSC 500 ck 1 |
| 25667 | OAK_VLLY | 115 | 24 | 248 | line_207 | LA_ALT2D3_S-CSV | 1.023 | 0.956 | -0.067 | 0.9 | 1.05 | 0.05 | line DEVERS to VALLEYSC 500 ck 1 |
| 22738 | CENTRALX | 230 | 22 | 225 | B2_002 | LA_ALT2D3_S-CSV | 1.007 | 0.957 | -0.05 | 0.9 | 1.05 | 0.05 | IMPRLVLY - MIGUEL 1 500kV |
| 24760 | OXBOW B | 230 | 24 | 247 | line_175 | LA_ALT2D3_S-CSV | 1.031 | 0.98 | -0.051 | 0.9 | 1.05 | 0.05 | line INYO to COTTONWD 230 ck 1 |
| 14534 | N.GILA 4 | 100 | 14 | 847 | NG500/69 | LA_ALT2D3_S-CSV | 0.938 | 1 | 0.062 | 0.9 | 1.05 | 0.05 | tran N.GILA 500 to N.GILA 69 ck 1 |
| 24035 | EAGLEMTN | 161 | 24 | 248 | tran_241 | LA_ALT2D3_S-CSV | 0.972 | 1.028 | 0.057 | 0.9 | 1.05 | 0.05 | tran EAGLEMTN 230 to EAGLEMTN 161 ck 1 |
| 24142 | SYC CYN | 230 | 24 | 240 | line_086 | LA_ALT2D3_S-CSV | 1.038 | 1.091 | 0.053 | 0.9 | 1.05 | 0.05 | line MAGUNDEN to OMAR 230 ck 1 |
| 25613 | EDMONSTN | 230 | 24 | 256 | line_122 | LA_ALT2D3_S-CSV | 1.025 | 1.091 | 0.066 | 0.9 | 1.05 | 0.05 | line PASTORIA to EDMONSTN 230 ck 1 |
| 24142 | SYC CYN | 230 | 24 | 240 | line_140 | LA_ALT2D3_S-CSV | 1.038 | 1.091 | 0.053 | 0.9 | 1.05 | 0.05 | line SYC CYN to OMAR 230 ck 1 |

la_alt2d3_s-csv.sav
FLOW Summary
N-1 Outages

| LEGEND | % of RATING 1 | |
|---|---|---|
| C_pu | 100% - 110% | |
| C_pu | 110% - 120% | P.U. of |
| C_pu | > 120% | Rate 1 |

| FROM | FR | BKV | TO | TO | BKV | CK | Outage_Name | Case | Rate-Mva | Pflow | Qflow | Amps | MVA | C_pu | B_pu | Contingency_Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24142 | SYC CYN | 230 | 24101 | OMAR | 230 | 1 | line_086 | LA_ALT2D3_S-CSV | 643 | 719.5 | 5514.8 | 12797.4 | 5561.5 | 7.929 | 0.422 | line MAGUNDEN to OMAR 230 ck 1 |
| 24781 | NAVYCOSO | 230 | 24706 | BLM EAST | 230 | 1 | line_173 | LA_ALT2D3_S-CSV | 1287 | -152.9 | -3160.7 | 7943.4 | 3164.4 | 2.459 | 0.056 | line BLM EAST to BLM WEST 230 ck 1 |
| 24781 | NAVYCOSO | 230 | 24706 | BLM EAST | 230 | 1 | line_174 | LA_ALT2D3_S-CSV | 1287 | -152.9 | -3160.7 | 7943.4 | 3164.4 | 2.459 | 0.056 | line BLM WEST to KRAMER 230 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_175 | LA_ALT2D3_S-CSV | 56 | -106.6 | 4.7 | 546.3 | 106.7 | 1.91 | 0.94 | line INYO to COTTONWD 230 ck 1 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_001 | LA_ALT2D3_S-CSV | 1411.6 | 2500 | 328.9 | 2691.1 | 2521.6 | 1.668 | 1.09 | line MOENKOPI to ELDORDO 500 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_202 | LA_ALT2D3_S-CSV | 56 | 80.7 | -10.3 | 406.1 | 81.3 | 1.47 | 0.94 | line OWENSCON to INYO 230 ck 1 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | B2_002 | LA_ALT2D3_S-CSV | 1120 | -1434.3 | -34.1 | 3761.8 | 1434.7 | 1.29 | 0.67 | IMPRLVLY - MIGUEL 1 500kV |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | B2_002 | LA_ALT2D3_S-CSV | 388 | -458.8 | -10.3 | 1197.6 | 458.9 | 1.23 | 0.838 | IMPRLVLY - MIGUEL 1 500kV |
| 22356 | IMPRLVLY | 230 | 22360 | IMPRLVLY | 500 | 1 | IV81 | LA_ALT2D3_S-CSV | 600 | 700.7 | 209.5 | 1854.7 | 731.4 | 1.22 | 0.55 | tran IMPRLVLY 230 to IMPRLVLY 500 ck 2 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_207 | LA_ALT2D3_S-CSV | 1411.6 | 1818.4 | 190.7 | 1966.1 | 1828.4 | 1.22 | 1.09 | line DEVERS to VALLEYSC 500 ck 1 |
| 22464 | MIGUEL | 230 | 22472 | MIGUELMP | 500 | 1 | ML81 | LA_ALT2D3_S-CSV | 1120 | -1320.8 | 208.1 | 3462.6 | 1337.1 | 1.19 | 0.69 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 22468 | MIGUEL | 500 | 22472 | MIGUELMP | 500 | 1 | ML81 | LA_ALT2D3_S-CSV | 1120 | 1323.1 | 9.8 | 1516.9 | 1323.1 | 1.19 | 0.69 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | B2_001 | LA_ALT2D3_S-CSV | 1411.6 | 1777.5 | 153.6 | 1909.5 | 1784.1 | 1.184 | 1.09 | HASSYAMP - N.GILA 1 500kV |
| 22464 | MIGUEL | 230 | 22468 | MIGUEL | 500 | 1 | ML80 | LA_ALT2D3_S-CSV | 1120 | -1303.3 | 207.6 | 3417.6 | 1319.7 | 1.18 | 0.66 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | B2_003 | LA_ALT2D3_S-CSV | 1411.6 | 1745.1 | 142.8 | 1871.1 | 1751 | 1.16 | 1.09 | N.GILA - IMPRLVLY 1 500kV |
| 24806 | MIRAGE | 230 | 24807 | MIRAGE | 115 | 2 | tran_238 | LA_ALT2D3_S-CSV | 280 | 319.7 | 21.6 | 815.9 | 320.4 | 1.16 | 0.58 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_56 | LA_ALT2D3_S-CSV | 800 | 893.3 | 109.5 | 2310.7 | 900 | 1.151 | 0.882 | line NEWSF500 to IMPRLVLY 500 ck 1 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_84 | LA_ALT2D3_S-CSV | 1411.6 | 1711.2 | 125.9 | 1829.9 | 1715.9 | 1.134 | 1.09 | line MIDPINTS to DEVERS 500 ck 1 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_85 | LA_ALT2D3_S-CSV | 1411.6 | 1711.2 | 125.8 | 1829.8 | 1715.8 | 1.134 | 1.09 | line MIDPINTS to DEVERS 500 ck 2 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | B2_002 | LA_ALT2D3_S-CSV | 1411.6 | 1704.5 | 136.7 | 1825.2 | 1710 | 1.131 | 1.09 | IMPRLVLY - MIGUEL 1 500kV |
| 20238 | HRD-230 | 230 | 20239 | HRD-115 | 115 | 1 | B2_002 | LA_ALT2D3_S-CSV | 225 | 249.2 | -32.9 | 653.4 | 251.4 | 1.13 | 0.83 | IMPRLVLY - MIGUEL 1 500kV |
| 24729 | INYO | 230 | 24730 | INYO PS | 115 | 1 | line_175 | LA_ALT2D3_S-CSV | 50 | 53.3 | 19.4 | 136.6 | 56.7 | 1.13 | 0.54 | line INYO to COTTONWD 230 ck 1 |
| 24729 | INYO | 230 | 24730 | INYO PS | 115 | 2 | line_175 | LA_ALT2D3_S-CSV | 50 | 53.3 | 19.4 | 136.6 | 56.7 | 1.13 | 0.54 | line INYO to COTTONWD 230 ck 1 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_66 | LA_ALT2D3_S-CSV | 1411.6 | 1702.6 | 127.3 | 1820.8 | 1707.4 | 1.128 | 1.09 | line CENTRALX to NEWSF500 500 ck 1 |
| 24900 | MIDPINTS | 500 | 24801 | DEVERS | 500 | 2 | line_84 | LA_ALT2D3_S-CSV | 2338 | 2604.2 | 414.7 | 2993.8 | 2637 | 1.114 | 0.648 | line MIDPINTS to DEVERS 500 ck 1 |
| 24900 | MIDPINTS | 500 | 24801 | DEVERS | 500 | 1 | line_85 | LA_ALT2D3_S-CSV | 2338 | 2604.5 | 415.7 | 2994.6 | 2637.5 | 1.114 | 0.649 | line MIDPINTS to DEVERS 500 ck 2 |
| 20238 | HRD-230 | 230 | 20118 | ROA-230 | 230 | 1 | B2_002 | LA_ALT2D3_S-CSV | 388 | -396.8 | 114.7 | 1073.6 | 413.1 | 1.106 | 0.717 | IMPRLVLY - MIGUEL 1 500kV |
| 24723 | CONTROL | 115 | 24731 | INYOKERN | 115 | 1 | line_175 | LA_ALT2D3_S-CSV | 82.7 | 88.6 | -6 | 456.9 | 88.8 | 1.101 | 0.304 | line INYO to COTTONWD 230 ck 1 |
| 24723 | CONTROL | 115 | 24731 | INYOKERN | 115 | 2 | line_175 | LA_ALT2D3_S-CSV | 82.7 | 88.6 | -6 | 456.9 | 88.8 | 1.101 | 0.304 | line INYO to COTTONWD 230 ck 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_66 | LA_ALT2D3_S-CSV | 2598 | 2788.1 | 27.2 | 3290.7 | 2788.3 | 1.097 | 0.977 | line CENTRALX to NEWSF500 500 ck 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | B2_001 | LA_ALT2D3_S-CSV | 2598 | 2754.5 | 2.4 | 3266.2 | 2754.5 | 1.089 | 0.977 | HASSYAMP - N.GILA 1 500kV |
| 8601 | GEOSUB2 | 230 | 8300 | BANIS230 | 230 | 1 | line_22 | LA_ALT2D3_S-CSV | 550 | 593 | 49.2 | 1496.7 | 595 | 1.084 | 0.797 | line GEOSUB1 to BANIS230 230 ck 1 |
| 8601 | GEOSUB2 | 230 | 8300 | BANIS230 | 230 | 1 | line_23 | LA_ALT2D3_S-CSV | 550 | 593 | 49.2 | 1496.7 | 595 | 1.084 | 0.797 | line GEOSUB1 to BANIS230 230 ck 2 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_207 | LA_ALT2D3_S-CSV | 1645.4 | 1878.3 | 208.1 | 2048.7 | 1889.8 | 1.079 | 0.949 | line DEVERS to VALLEYSC 500 ck 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | B2_003 | LA_ALT2D3_S-CSV | 2598 | 2731.8 | 13.7 | 3225.7 | 2731.8 | 1.075 | 0.977 | N.GILA - IMPRLVLY 1 500kV |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_169 | LA_ALT2D3_S-CSV | 56 | 59.6 | -5.1 | 295.9 | 59.8 | 1.07 | 0.94 | line KRAMER to LUGO 230 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_170 | LA_ALT2D3_S-CSV | 56 | 59.6 | -5.1 | 295.9 | 59.8 | 1.07 | 0.94 | line KRAMER to LUGO 230 ck 2 |
| 24801 | DEVERS | 500 | 24804 | DEVERS | 230 | 1 | line_207 | LA_ALT2D3_S-CSV | 1120 | 989.2 | 685.2 | 1418 | 1203.3 | 1.07 | 0.44 | line DEVERS to VALLEYSC 500 ck 1 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_207 | LA_ALT2D3_S-CSV | 800 | 816.7 | 92.7 | 2131.5 | 821.9 | 1.061 | 0.882 | line DEVERS to VALLEYSC 500 ck 1 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | line_66 | LA_ALT2D3_S-CSV | 388 | -398.8 | 5.8 | 1029.3 | 398.8 | 1.057 | 0.838 | line CENTRALX to NEWSF500 500 ck 1 |
| 20238 | HRD-230 | 230 | 20102 | RUM-230 | 230 | 1 | B2_002 | LA_ALT2D3_S-CSV | 388 | -377.5 | 110.5 | 1022.3 | 393.3 | 1.055 | 0.669 | IMPRLVLY - MIGUEL 1 500kV |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_87 | LA_ALT2D3_S-CSV | 2598 | 2704.5 | 26 | 3162.2 | 2704.6 | 1.054 | 0.977 | line CENTRALX to NEWSF500 500 ck 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | B2_002 | LA_ALT2D3_S-CSV | 2598 | 2663.1 | 81.6 | 3158.4 | 2664.3 | 1.053 | 0.977 | IMPRLVLY - MIGUEL 1 500kV |
| 24805 | DEVERS | 115 | 24804 | DEVERS | 230 | 1 | tran_236 | LA_ALT2D3_S-CSV | 280 | 254 | -101 | 1415.8 | 273.3 | 1.05 | 0.67 | tran DEVERS 115 to DEVERS 230 ck 3 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_085 | LA_ALT2D3_S-CSV | 1411.6 | 1587.9 | 106.3 | 1691.7 | 1591.5 | 1.049 | 1.09 | line LUGO to VICTORVL 500 ck 1 |
| 24016 | BARRE | 230 | 25201 | LEWIS | 230 | 1 | line_024 | LA_ALT2D3_S-CSV | 1195 | -1177 | 299.2 | 3133.5 | 1214.4 | 1.045 | 0.683 | line BARRE to VILLA PK 230 ck 1 |
| 25641 | TAP816 | 115 | 25664 | TAP998 | 115 | 1 | line_207 | LA_ALT2D3_S-CSV | 107.6 | -96.3 | 41.8 | 563.5 | 105 | 1.044 | 0.982 | line DEVERS to VALLEYSC 500 ck 1 |
| 8600 | GEOSUB1 | 230 | 8300 | BANIS230 | 230 | 1 | line_47 | LA_ALT2D3_S-CSV | 550 | 569.7 | 46.6 | 1438.5 | 571.6 | 1.042 | 0.738 | line GEOSUB2 to BANIS230 230 ck 1 |
| 8600 | GEOSUB1 | 230 | 8300 | BANIS230 | 230 | 2 | line_47 | LA_ALT2D3_S-CSV | 550 | 569.7 | 46.6 | 1438.5 | 571.6 | 1.042 | 0.738 | line GEOSUB2 to BANIS230 230 ck 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | B2_001 | LA_ALT2D3_S-CSV | 1645.4 | 1830.3 | 168.7 | 1979.9 | 1838.1 | 1.042 | 0.949 | HASSYAMP - N.GILA 1 500kV |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | B2_003 | LA_ALT2D3_S-CSV | 800 | 818 | 17.4 | 2090.4 | 818.2 | 1.041 | 0.882 | N.GILA - IMPRLVLY 1 500kV |
| 25641 | TAP816 | 115 | 25644 | TAP818 | 115 | 1 | line_207 | LA_ALT2D3_S-CSV | 107.6 | 96.3 | -41.1 | 562 | 104.7 | 1.04 | 0.979 | line DEVERS to VALLEYSC 500 ck 1 |
| 24805 | DEVERS | 115 | 24804 | DEVERS | 230 | 3 | tran_235 | LA_ALT2D3_S-CSV | 280 | 251 | -100.1 | 1401.9 | 270.2 | 1.04 | 0.66 | tran DEVERS 115 to DEVERS 230 ck 1 |
| 24805 | DEVERS | 115 | 24804 | DEVERS | 230 | 1 | tran_237 | LA_ALT2D3_S-CSV | 280 | 252.5 | -100.3 | 1406.4 | 271.7 | 1.04 | 0.67 | tran DEVERS 115 to DEVERS 230 ck 4 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_183 | LA_ALT2D3_S-CSV | 2598 | 2691.7 | 67.3 | 3118 | 2692.6 | 1.039 | 0.977 | line DEVERS to VSTA 230 ck 2 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_185 | LA_ALT2D3_S-CSV | 2598 | 2691.7 | 67.3 | 3118 | 2692.6 | 1.039 | 0.977 | line VSTA to DEVERS 230 ck 1 |
| 8600 | GEOSUB1 | 230 | 8300 | BANIS230 | 230 | 2 | line_22 | LA_ALT2D3_S-CSV | 550 | 563.7 | 47.3 | 1422.4 | 565.6 | 1.03 | 0.738 | line GEOSUB1 to BANIS230 230 ck 1 |
| 8600 | GEOSUB1 | 230 | 8300 | BANIS230 | 230 | 1 | line_23 | LA_ALT2D3_S-CSV | 550 | 563.7 | 47.3 | 1422.4 | 565.6 | 1.03 | 0.738 | line GEOSUB1 to BANIS230 230 ck 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_001 | LA_ALT2D3_S-CSV | 2598 | 2639.9 | 8.8 | 3090.3 | 2639.9 | 1.03 | 0.977 | line MOENKOPI to ELDORDO 500 ck 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_135 | LA_ALT2D3_S-CSV | 2598 | 2666.7 | 51.1 | 3090.7 | 2667.2 | 1.03 | 0.977 | line SANBRDNO to DEVERS 230 ck 1 |
| 24805 | DEVERS | 115 | 24804 | DEVERS | 230 | 4 | tran_235 | LA_ALT2D3_S-CSV | 280 | 248.1 | -99 | 1385.6 | 267.1 | 1.03 | 0.65 | tran DEVERS 115 to DEVERS 230 ck 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_085 | LA_ALT2D3_S-CSV | 2598 | 2628.8 | 4 | 3067.3 | 2628.9 | 1.022 | 0.977 | line LUGO to VICTORVL 500 ck 1 |
| 25641 | TAP816 | 115 | 25664 | TAP998 | 115 | 1 | tran_235 | LA_ALT2D3_S-CSV | 107.6 | -96.4 | 41.7 | 551.1 | 105 | 1.021 | 0.982 | tran DEVERS 115 to DEVERS 230 ck 1 |
| 24805 | DEVERS | 115 | 24804 | DEVERS | 230 | 3 | tran_237 | LA_ALT2D3_S-CSV | 280 | 246.6 | -98 | 1373.3 | 265.3 | 1.02 | 0.66 | tran DEVERS 115 to DEVERS 230 ck 4 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | B2_003 | LA_ALT2D3_S-CSV | 1645.4 | 1793.9 | 158.6 | 1935.7 | 1800.9 | 1.019 | 0.949 | N.GILA - IMPRLVLY 1 500kV |
| 25641 | TAP816 | 115 | 25664 | TAP998 | 115 | 1 | tran_236 | LA_ALT2D3_S-CSV | 107.6 | -96.4 | 41.7 | 550.2 | 105 | 1.019 | 0.982 | tran DEVERS 115 to DEVERS 230 ck 3 |
| 25641 | TAP816 | 115 | 25664 | TAP998 | 115 | 1 | tran_237 | LA_ALT2D3_S-CSV | 107.6 | -96.4 | 41.7 | 549.8 | 105 | 1.018 | 0.982 | tran DEVERS 115 to DEVERS 230 ck 4 |
| 24805 | DEVERS | 115 | 25644 | TAP818 | 115 | 1 | line_207 | LA_ALT2D3_S-CSV | 217 | -183.4 | 100.3 | 1107.8 | 209 | 1.017 | 0.953 | line DEVERS to VALLEYSC 500 ck 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_302 | LA_ALT2D3_S-CSV | 2598 | 2633.6 | 35.4 | 3050.9 | 2633.8 | 1.017 | 0.977 | line DEVERS to OAK_VLLY 230 ck 1 |
| 25641 | TAP816 | 115 | 25644 | TAP818 | 115 | 1 | tran_235 | LA_ALT2D3_S-CSV | 107.6 | 96.4 | -41 | 549.6 | 104.7 | 1.017 | 0.979 | tran DEVERS 115 to DEVERS 230 ck 1 |
| 25641 | TAP816 | 115 | 25644 | TAP818 | 115 | 1 | tran_236 | LA_ALT2D3_S-CSV | 107.6 | 96.4 | -40.9 | 548.7 | 104.7 | 1.016 | 0.979 | tran DEVERS 115 to DEVERS 230 ck 3 |
| 25641 | TAP816 | 115 | 25664 | TAP998 | 115 | 1 | B2_002 | LA_ALT2D3_S-CSV | 107.6 | -96.4 | 41.7 | 548.1 | 105 | 1.015 | 0.982 | IMPRLVLY - MIGUEL 1 500kV |
| 25641 | TAP816 | 115 | 25644 | TAP818 | 115 | 1 | tran_237 | LA_ALT2D3_S-CSV | 107.6 | 96.4 | -40.9 | 548.3 | 104.7 | 1.015 | 0.979 | tran DEVERS 115 to DEVERS 230 ck 4 |
| 25641 | TAP816 | 115 | 25644 | TAP818 | 115 | 1 | B2_002 | LA_ALT2D3_S-CSV | 107.6 | 96.4 | -40.9 | 546.6 | 104.7 | 1.012 | 0.979 | IMPRLVLY - MIGUEL 1 500kV |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_047 | LA_ALT2D3_S-CSV | 2598 | 2599 | 23.8 | 3035.4 | 2599.1 | 1.012 | 0.977 | line ELDORDO to LUGO 500 ck 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_7 | LA_ALT2D3_S-CSV | 2598 | 2609.8 | -11.9 | 3031.7 | 2609.8 | 1.011 | 0.977 | line BANIS230 to NEWSF230 230 ck 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_56 | LA_ALT2D3_S-CSV | 2598 | 2609 | 8.9 | 3034.1 | 2609 | 1.011 | 0.977 | line NEWSF500 to IMPRLVLY 500 ck 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | tran_74 | LA_ALT2D3_S-CSV | 2598 | 2609.8 | -11.8 | 3031.5 | 2609.9 | 1.011 | 0.977 | tran NEWSF230 230 to NEWSF500 500 ck 1 |
| 24701 | KRAMER | 230 | 24085 | LUGO | 230 | 2 | line_169 | LA_ALT2D3_S-CSV | 478 | 479.6 | 66.9 | 1213.1 | 484.3 | 1.011 | 0.605 | line KRAMER to LUGO 230 ck 1 |
| 24701 | KRAMER | 230 | 24085 | LUGO | 230 | 1 | line_170 | LA_ALT2D3_S-CSV | 478 | 479.6 | 66.9 | 1213.1 | 484.3 | 1.011 | 0.605 | line KRAMER to LUGO 230 ck 2 |
| 24805 | DEVERS | 115 | 24804 | DEVERS | 230 | 4 | tran_236 | LA_ALT2D3_S-CSV | 280 | 245.1 | -97.5 | 1366.4 | 263.8 | 1.01 | 0.65 | tran DEVERS 115 to DEVERS 230 ck 3 |
| 24151 | VALLEYSC | 500 | 24160 | VALLEYSC | 115 | 2 | tran_247 | LA_ALT2D3_S-CSV | 560 | 541 | 159.9 | 644.4 | 564.2 | 1.01 | 0.49 | tran VALLEYSC 500 to VALLEYSC 115 ck 1 |
| 24151 | VALLEYSC | 500 | 24160 | VALLEYSC | 115 | 1 | tran_248 | LA_ALT2D3_S-CSV | 560 | 541 | 159.9 | 644.4 | 564.2 | 1.01 | 0.49 | tran VALLEYSC 500 to VALLEYSC 115 ck 2 |
| 20238 | HRD-230 | 230 | 20239 | HRD-115 | 115 | 1 | line_66 | LA_ALT2D3_S-CSV | 225 | 222.5 | -23.5 | 573.3 | 223.8 | 1 | 0.83 | line CENTRALX to NEWSF500 500 ck 1 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_6 | LA_ALT2D3_S-CSV | 800 | 787.7 | 20 | 2007.2 | 787.9 | 0.999 | 0.882 | line BANIS230 to ELCENTSW 230 ck 1 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | PV1 | LA_ALT2D3_S-CSV | 1411.6 | 1519.9 | 44.7 | 1607.2 | 1520.6 | 0.994 | 1.09 | gen PALOVRD1 24.00 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_84 | LA_ALT2D3_S-CSV | 1645.4 | 1754.7 | 141 | 1886.9 | 1760.3 | 0.993 | 0.949 | line MIDPINTS to DEVERS 500 ck 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_85 | LA_ALT2D3_S-CSV | 1645.4 | 1754.6 | 140.9 | 1886.8 | 1760.3 | 0.993 | 0.949 | line MIDPINTS to DEVERS 500 ck 2 |
| 24805 | DEVERS | 115 | 25644 | TAP818 | 115 | 1 | tran_235 | LA_ALT2D3_S-CSV | 217 | -183.5 | 99 | 1081.6 | 208.5 | 0.993 | 0.953 | tran DEVERS 115 to DEVERS 230 ck 1 |
| 24805 | DEVERS | 115 | 25644 | TAP818 | 115 | 1 | tran_236 | LA_ALT2D3_S-CSV | 217 | -183.5 | 98.9 | 1079.8 | 208.5 | 0.992 | 0.953 | tran DEVERS 115 to DEVERS 230 ck 3 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | IV81 | LA_ALT2D3_S-CSV | 800 | 780 | 36 | 1990.3 | 780.9 | 0.991 | 0.882 | tran IMPRLVLY 230 to IMPRLVLY 500 ck 2 |
| 24805 | DEVERS | 115 | 25644 | TAP818 | 115 | 1 | tran_237 | LA_ALT2D3_S-CSV | 217 | -183.5 | 98.9 | 1078.9 | 208.4 | 0.991 | 0.953 | tran DEVERS 115 to DEVERS 230 ck 4 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | B2_002 | LA_ALT2D3_S-CSV | 1645.4 | 1746.1 | 154.1 | 1881.1 | 1752.9 | 0.99 | 0.949 | IMPRLVLY - MIGUEL 1 500kV |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | tran_210 | LA_ALT2D3_S-CSV | 56 | 54.8 | -4.9 | 270.7 | 55 | 0.99 | 0.94 | tran LUGO 500 to LUGO 230 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | tran_211 | LA_ALT2D3_S-CSV | 56 | 54.8 | -4.9 | 270.9 | 55 | 0.99 | 0.94 | tran LUGO 500 to LUGO 230 ck 2 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_66 | LA_ALT2D3_S-CSV | 1645.4 | 1745 | 143.3 | 1876.7 | 1750.8 | 0.988 | 0.949 | line CENTRALX to NEWSF500 500 ck 1 |
| 24805 | DEVERS | 115 | 25644 | TAP818 | 115 | 1 | B2_002 | LA_ALT2D3_S-CSV | 217 | -183.5 | 98.7 | 1075.4 | 208.4 | 0.988 | 0.953 | IMPRLVLY - MIGUEL 1 500kV |
| 24804 | DEVERS | 230 | 24901 | VSTA | 230 | 2 | line_207 | LA_ALT2D3_S-CSV | 988 | 897.1 | 196.2 | 2417.5 | 918.3 | 0.975 | 0.613 | line DEVERS to VALLEYSC 500 ck 1 |
| 24901 | VSTA | 230 | 24804 | DEVERS | 230 | 1 | line_207 | LA_ALT2D3_S-CSV | 988 | -857.4 | 224.2 | 2416.9 | 886.2 | 0.975 | 0.613 | line DEVERS to VALLEYSC 500 ck 1 |
| 25629 | TAP813 | 115 | 25630 | TAP814 | 115 | 1 | line_207 | LA_ALT2D3_S-CSV | 82.7 | 69.9 | -28.9 | 404.2 | 75.6 | 0.973 | 0.914 | line DEVERS to VALLEYSC 500 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_086 | LA_ALT2D3_S-CSV | 56 | 53.6 | -5.4 | 265.5 | 53.9 | 0.97 | 0.94 | line MAGUNDEN to OMAR 230 ck 1 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_63 | LA_ALT2D3_S-CSV | 800 | 758.3 | 18.6 | 1931.2 | 758.6 | 0.962 | 0.882 | line RAMON to MIRAGE 230 ck 2 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_50 | LA_ALT2D3_S-CSV | 800 | 756.9 | 16.3 | 1925.7 | 757 | 0.959 | 0.882 | line BANIS230 to AV58TP12 230 ck 1 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_51 | LA_ALT2D3_S-CSV | 800 | 757.5 | 18.6 | 1924.7 | 757.7 | 0.958 | 0.882 | line AV58TP12 to AVE58230 230 ck 1 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | B2_001 | LA_ALT2D3_S-CSV | 800 | 753.9 | -14.6 | 1911.1 | 754 | 0.952 | 0.882 | HASSYAMP - N.GILA 1 500kV |
| 25629 | TAP813 | 115 | 25630 | TAP814 | 115 | 1 | tran_235 | LA_ALT2D3_S-CSV | 82.7 | 69.9 | -28.7 | 394.9 | 75.5 | 0.951 | 0.914 | tran DEVERS 115 to DEVERS 230 ck 1 |
| 22464 | MIGUEL | 230 | 22472 | MIGUELMP | 500 | 1 | line_66 | LA_ALT2D3_S-CSV | 1120 | -1052.8 | 145.3 | 2832.6 | 1062.8 | 0.95 | 0.69 | line CENTRALX to NEWSF500 500 ck 1 |
| 22468 | MIGUEL | 500 | 22472 | MIGUELMP | 500 | 1 | line_66 | LA_ALT2D3_S-CSV | 1120 | 1054.3 | 0.5 | 1241 | 1054.3 | 0.95 | 0.69 | line CENTRALX to NEWSF500 500 ck 1 |

| Bus | Name | kV | Area | Zone | Outage | Case | Vbase | Vcont | DeltaV | Vmin | Vmax | Max-dv | Contingency Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24824 | CARODEAN | 115 | 24 | 248 | line_2245 | LA_ALT2D3_S-CSV | 0.988 | 0.888 | -0.1 | 0.9 | 1.05 | 0.05 | DEVERS 500.00 - VALLEYSC 500.00 1, MIDPINTS 500.00 - DEVERS 500.00 1 |
| 24811 | TAP802 | 115 | 24 | 248 | line_2245 | LA_ALT2D3_S-CSV | 0.988 | 0.888 | -0.1 | 0.9 | 1.05 | 0.05 | DEVERS 500.00 - VALLEYSC 500.00 1, MIDPINTS 500.00 - DEVERS 500.00 1 |
| 24808 | TAP801 | 115 | 24 | 248 | line_2245 | LA_ALT2D3_S-CSV | 0.99 | 0.89 | -0.1 | 0.9 | 1.05 | 0.05 | DEVERS 500.00 - VALLEYSC 500.00 1, MIDPINTS 500.00 - DEVERS 500.00 1 |
| 24809 | YUCCA | 115 | 24 | 248 | line_2245 | LA_ALT2D3_S-CSV | 0.99 | 0.89 | -0.1 | 0.9 | 1.05 | 0.05 | DEVERS 500.00 - VALLEYSC 500.00 1, MIDPINTS 500.00 - DEVERS 500.00 1 |
| 24810 | HI DESER | 115 | 24 | 248 | line_2245 | LA_ALT2D3_S-CSV | 0.991 | 0.891 | -0.1 | 0.9 | 1.05 | 0.05 | DEVERS 500.00 - VALLEYSC 500.00 1, MIDPINTS 500.00 - DEVERS 500.00 1 |
| 24817 | EISENHOW | 115 | 24 | 248 | line_2245 | LA_ALT2D3_S-CSV | 0.993 | 0.893 | -0.1 | 0.9 | 1.05 | 0.05 | DEVERS 500.00 - VALLEYSC 500.00 1, MIDPINTS 500.00 - DEVERS 500.00 1 |
| 24820 | THORNHIL | 115 | 24 | 248 | line_2245 | LA_ALT2D3_S-CSV | 0.992 | 0.893 | -0.1 | 0.9 | 1.05 | 0.05 | DEVERS 500.00 - VALLEYSC 500.00 1, MIDPINTS 500.00 - DEVERS 500.00 1 |
| 24831 | TAP822 | 115 | 24 | 248 | line_2245 | LA_ALT2D3_S-CSV | 0.993 | 0.893 | -0.1 | 0.9 | 1.05 | 0.05 | DEVERS 500.00 - VALLEYSC 500.00 1, MIDPINTS 500.00 - DEVERS 500.00 1 |
| 24814 | BANNING | 115 | 24 | 248 | line_2245 | LA_ALT2D3_S-CSV | 0.994 | 0.894 | -0.1 | 0.9 | 1.05 | 0.05 | DEVERS 500.00 - VALLEYSC 500.00 1, MIDPINTS 500.00 - DEVERS 500.00 1 |
| 25640 | PANAERO | 115 | 24 | 248 | line_2245 | LA_ALT2D3_S-CSV | 0.993 | 0.894 | -0.1 | 0.9 | 1.05 | 0.05 | DEVERS 500.00 - VALLEYSC 500.00 1, MIDPINTS 500.00 - DEVERS 500.00 1 |
| 25639 | SEAWIND | 115 | 24 | 248 | line_2245 | LA_ALT2D3_S-CSV | 0.994 | 0.894 | -0.1 | 0.9 | 1.05 | 0.05 | DEVERS 500.00 - VALLEYSC 500.00 1, MIDPINTS 500.00 - DEVERS 500.00 1 |
| 25641 | TAP816 | 115 | 24 | 248 | line_2245 | LA_ALT2D3_S-CSV | 0.994 | 0.894 | -0.1 | 0.9 | 1.05 | 0.05 | DEVERS 500.00 - VALLEYSC 500.00 1, MIDPINTS 500.00 - DEVERS 500.00 1 |
| 28260 | ALTAMSA4 | 115 | 24 | 248 | line_2245 | LA_ALT2D3_S-CSV | 0.994 | 0.894 | -0.1 | 0.9 | 1.05 | 0.05 | DEVERS 500.00 - VALLEYSC 500.00 1, MIDPINTS 500.00 - DEVERS 500.00 1 |
| 25664 | TAP998 | 115 | 24 | 248 | line_2245 | LA_ALT2D3_S-CSV | 0.994 | 0.894 | -0.1 | 0.9 | 1.05 | 0.05 | DEVERS 500.00 - VALLEYSC 500.00 1, MIDPINTS 500.00 - DEVERS 500.00 1 |
| 24818 | FARREL | 115 | 24 | 248 | line_2245 | LA_ALT2D3_S-CSV | 0.994 | 0.895 | -0.099 | 0.9 | 1.05 | 0.05 | DEVERS 500.00 - VALLEYSC 500.00 1, MIDPINTS 500.00 - DEVERS 500.00 1 |
| 25646 | SANWIND | 115 | 24 | 248 | line_2245 | LA_ALT2D3_S-CSV | 0.995 | 0.895 | -0.099 | 0.9 | 1.05 | 0.05 | DEVERS 500.00 - VALLEYSC 500.00 1, MIDPINTS 500.00 - DEVERS 500.00 1 |
| 25666 | OAK_VLLY | 230 | 24 | 248 | line_2245 | LA_ALT2D3_S-CSV | 0.979 | 0.895 | -0.084 | 0.9 | 1.05 | 0.05 | DEVERS 500.00 - VALLEYSC 500.00 1, MIDPINTS 500.00 - DEVERS 500.00 1 |
| 25644 | TAP818 | 115 | 24 | 248 | line_2245 | LA_ALT2D3_S-CSV | 0.995 | 0.896 | -0.099 | 0.9 | 1.05 | 0.05 | DEVERS 500.00 - VALLEYSC 500.00 1, MIDPINTS 500.00 - DEVERS 500.00 1 |
| 25635 | ALTWIND | 115 | 24 | 248 | line_2245 | LA_ALT2D3_S-CSV | 0.996 | 0.898 | -0.099 | 0.9 | 1.05 | 0.05 | DEVERS 500.00 - VALLEYSC 500.00 1, MIDPINTS 500.00 - DEVERS 500.00 1 |
| 25642 | TAP819 | 115 | 24 | 248 | line_2245 | LA_ALT2D3_S-CSV | 0.996 | 0.898 | -0.099 | 0.9 | 1.05 | 0.05 | DEVERS 500.00 - VALLEYSC 500.00 1, MIDPINTS 500.00 - DEVERS 500.00 1 |
| 24832 | TAP820 | 115 | 24 | 248 | line_2245 | LA_ALT2D3_S-CSV | 0.996 | 0.898 | -0.099 | 0.9 | 1.05 | 0.05 | DEVERS 500.00 - VALLEYSC 500.00 1, MIDPINTS 500.00 - DEVERS 500.00 1 |
| 28060 | SEAWEST | 115 | 24 | 248 | line_2245 | LA_ALT2D3_S-CSV | 0.996 | 0.898 | -0.099 | 0.9 | 1.05 | 0.05 | DEVERS 500.00 - VALLEYSC 500.00 1, MIDPINTS 500.00 - DEVERS 500.00 1 |
| 25624 | TAP808 | 115 | 24 | 248 | line_2245 | LA_ALT2D3_S-CSV | 0.998 | 0.899 | -0.099 | 0.9 | 1.05 | 0.05 | DEVERS 500.00 - VALLEYSC 500.00 1, MIDPINTS 500.00 - DEVERS 500.00 1 |
| 25627 | TAP811 | 115 | 24 | 248 | line_2245 | LA_ALT2D3_S-CSV | 0.998 | 0.899 | -0.099 | 0.9 | 1.05 | 0.05 | DEVERS 500.00 - VALLEYSC 500.00 1, MIDPINTS 500.00 - DEVERS 500.00 1 |
| 25629 | TAP813 | 115 | 24 | 248 | line_2245 | LA_ALT2D3_S-CSV | 0.998 | 0.899 | -0.099 | 0.9 | 1.05 | 0.05 | DEVERS 500.00 - VALLEYSC 500.00 1, MIDPINTS 500.00 - DEVERS 500.00 1 |
| 25637 | TRANWND | 115 | 24 | 248 | line_2245 | LA_ALT2D3_S-CSV | 0.998 | 0.899 | -0.099 | 0.9 | 1.05 | 0.05 | DEVERS 500.00 - VALLEYSC 500.00 1, MIDPINTS 500.00 - DEVERS 500.00 1 |
| 24833 | MARASCHI | 115 | 24 | 248 | line_2245 | LA_ALT2D3_S-CSV | 0.998 | 0.899 | -0.099 | 0.9 | 1.05 | 0.05 | DEVERS 500.00 - VALLEYSC 500.00 1, MIDPINTS 500.00 - DEVERS 500.00 1 |
| 24815 | GARNET | 115 | 24 | 248 | line_2245 | LA_ALT2D3_S-CSV | 0.998 | 0.9 | -0.098 | 0.9 | 1.05 | 0.05 | DEVERS 500.00 - VALLEYSC 500.00 1, MIDPINTS 500.00 - DEVERS 500.00 1 |
| 25634 | BUCKWND | 115 | 24 | 248 | line_2245 | LA_ALT2D3_S-CSV | 1.001 | 0.903 | -0.098 | 0.9 | 1.05 | 0.05 | DEVERS 500.00 - VALLEYSC 500.00 1, MIDPINTS 500.00 - DEVERS 500.00 1 |
| 25636 | RENWIND | 115 | 24 | 248 | line_2245 | LA_ALT2D3_S-CSV | 1.001 | 0.903 | -0.098 | 0.9 | 1.05 | 0.05 | DEVERS 500.00 - VALLEYSC 500.00 1, MIDPINTS 500.00 - DEVERS 500.00 1 |
| 25625 | TAP809 | 115 | 24 | 248 | line_2245 | LA_ALT2D3_S-CSV | 1.001 | 0.903 | -0.098 | 0.9 | 1.05 | 0.05 | DEVERS 500.00 - VALLEYSC 500.00 1, MIDPINTS 500.00 - DEVERS 500.00 1 |
| 25630 | TAP814 | 115 | 24 | 248 | line_2245 | LA_ALT2D3_S-CSV | 1.001 | 0.903 | -0.098 | 0.9 | 1.05 | 0.05 | DEVERS 500.00 - VALLEYSC 500.00 1, MIDPINTS 500.00 - DEVERS 500.00 1 |
| 24645 | TAP817 | 115 | 24 | 248 | line_2245 | LA_ALT2D3_S-CSV | 1.001 | 0.903 | -0.098 | 0.9 | 1.05 | 0.05 | DEVERS 500.00 - VALLEYSC 500.00 1, MIDPINTS 500.00 - DEVERS 500.00 1 |
| 24826 | INDIGO | 115 | 24 | 248 | line_2245 | LA_ALT2D3_S-CSV | 1.001 | 0.903 | -0.098 | 0.9 | 1.05 | 0.05 | DEVERS 500.00 - VALLEYSC 500.00 1, MIDPINTS 500.00 - DEVERS 500.00 1 |
| 28020 | WINTEC6 | 115 | 24 | 248 | line_2245 | LA_ALT2D3_S-CSV | 1.001 | 0.903 | -0.098 | 0.9 | 1.05 | 0.05 | DEVERS 500.00 - VALLEYSC 500.00 1, MIDPINTS 500.00 - DEVERS 500.00 1 |
| 25645 | VENWIND | 115 | 24 | 248 | line_2245 | LA_ALT2D3_S-CSV | 1.003 | 0.905 | -0.098 | 0.9 | 1.05 | 0.05 | DEVERS 500.00 - VALLEYSC 500.00 1, MIDPINTS 500.00 - DEVERS 500.00 1 |
| 24813 | TAP804 | 115 | 24 | 248 | line_2245 | LA_ALT2D3_S-CSV | 1.003 | 0.906 | -0.098 | 0.9 | 1.05 | 0.05 | DEVERS 500.00 - VALLEYSC 500.00 1, MIDPINTS 500.00 - DEVERS 500.00 1 |
| 25623 | TAP807 | 115 | 24 | 248 | line_2245 | LA_ALT2D3_S-CSV | 1.004 | 0.906 | -0.097 | 0.9 | 1.05 | 0.05 | DEVERS 500.00 - VALLEYSC 500.00 1, MIDPINTS 500.00 - DEVERS 500.00 1 |
| 25632 | TERAWND | 115 | 24 | 248 | line_2245 | LA_ALT2D3_S-CSV | 1.004 | 0.906 | -0.097 | 0.9 | 1.05 | 0.05 | DEVERS 500.00 - VALLEYSC 500.00 1, MIDPINTS 500.00 - DEVERS 500.00 1 |
| 24805 | DEVERS | 115 | 24 | 248 | line_2245 | LA_ALT2D3_S-CSV | 1.004 | 0.907 | -0.097 | 0.9 | 1.05 | 0.05 | DEVERS 500.00 - VALLEYSC 500.00 1, MIDPINTS 500.00 - DEVERS 500.00 1 |
| 24901 | VSTA | 230 | 24 | 248 | line_2245 | LA_ALT2D3_S-CSV | 0.973 | 0.909 | -0.064 | 0.9 | 1.05 | 0.05 | DEVERS 500.00 - VALLEYSC 500.00 1, MIDPINTS 500.00 - DEVERS 500.00 1 |
| 24132 | SANBRDNO | 230 | 24 | 248 | line_2245 | LA_ALT2D3_S-CSV | 0.982 | 0.916 | -0.067 | 0.9 | 1.05 | 0.05 | DEVERS 500.00 - VALLEYSC 500.00 1, MIDPINTS 500.00 - DEVERS 500.00 1 |
| 24804 | DEVERS | 230 | 24 | 248 | line_2245 | LA_ALT2D3_S-CSV | 1.001 | 0.921 | -0.08 | 0.9 | 1.05 | 0.05 | DEVERS 500.00 - VALLEYSC 500.00 1, MIDPINTS 500.00 - DEVERS 500.00 1 |
| 24920 | MNTVIEW | 230 | 24 | 240 | line_2245 | LA_ALT2D3_S-CSV | 0.986 | 0.922 | -0.064 | 0.9 | 1.05 | 0.05 | DEVERS 500.00 - VALLEYSC 500.00 1, MIDPINTS 500.00 - DEVERS 500.00 1 |
| 25330 | P330 | 230 | 24 | 240 | line_2245 | LA_ALT2D3_S-CSV | 1.008 | 0.928 | -0.08 | 0.9 | 1.05 | 0.05 | DEVERS 500.00 - VALLEYSC 500.00 1, MIDPINTS 500.00 - DEVERS 500.00 1 |
| 24806 | MIRAGE | 230 | 24 | 248 | line_2245 | LA_ALT2D3_S-CSV | 0.993 | 0.929 | -0.063 | 0.9 | 1.05 | 0.05 | DEVERS 500.00 - VALLEYSC 500.00 1, MIDPINTS 500.00 - DEVERS 500.00 1 |
| 8695 | RAMON | 230 | 8 | 818 | line_2245 | LA_ALT2D3_S-CSV | 0.991 | 0.93 | -0.061 | 0.9 | 1.05 | 0.05 | DEVERS 500.00 - VALLEYSC 500.00 1, MIDPINTS 500.00 - DEVERS 500.00 1 |
| 24801 | DEVERS | 500 | 24 | 248 | line_2245 | LA_ALT2D3_S-CSV | 0.999 | 0.935 | -0.065 | 0.9 | 1.05 | 0.05 | DEVERS 500.00 - VALLEYSC 500.00 1, MIDPINTS 500.00 - DEVERS 500.00 1 |
| 25667 | OAK_VLLY | 115 | 24 | 248 | line_2245 | LA_ALT2D3_S-CSV | 1.023 | 0.935 | -0.088 | 0.9 | 1.05 | 0.05 | DEVERS 500.00 - VALLEYSC 500.00 1, MIDPINTS 500.00 - DEVERS 500.00 1 |
| 24999 | DEVRSVC1 | 500 | 24 | 248 | line_2245 | LA_ALT2D3_S-CSV | 0.999 | 0.935 | -0.065 | 0.9 | 1.05 | 0.05 | DEVERS 500.00 - VALLEYSC 500.00 1, MIDPINTS 500.00 - DEVERS 500.00 1 |
| 80300 | NEWSF230 | 230 | 8 | 800 | line_2245 | LA_ALT2D3_S-CSV | 0.992 | 0.936 | -0.056 | 0.9 | 1.05 | 0.05 | DEVERS 500.00 - VALLEYSC 500.00 1, MIDPINTS 500.00 - DEVERS 500.00 1 |
| 25406 | J.HINDS | 230 | 24 | 248 | line_2245 | LA_ALT2D3_S-CSV | 1 | 0.949 | -0.051 | 0.9 | 1.05 | 0.05 | DEVERS 500.00 - VALLEYSC 500.00 1, MIDPINTS 500.00 - DEVERS 500.00 1 |
| 22738 | CENTRALX | 230 | 22 | 225 | line_2245 | LA_ALT2D3_S-CSV | 1.007 | 0.954 | -0.053 | 0.9 | 1.05 | 0.05 | DEVERS 500.00 - VALLEYSC 500.00 1, MIDPINTS 500.00 - DEVERS 500.00 1 |
| 22737 | CENTRALX | 500 | 22 | 225 | line_2245 | LA_ALT2D3_S-CSV | 1.011 | 0.954 | -0.057 | 0.9 | 1.05 | 0.05 | DEVERS 500.00 - VALLEYSC 500.00 1, MIDPINTS 500.00 - DEVERS 500.00 1 |
| 22468 | MIGUEL | 500 | 22 | 227 | line_2245 | LA_ALT2D3_S-CSV | 1.012 | 0.959 | -0.054 | 0.9 | 1.05 | 0.05 | DEVERS 500.00 - VALLEYSC 500.00 1, MIDPINTS 500.00 - DEVERS 500.00 1 |
| 8330 | EDOM | 92 | 8 | 162 | line_2245 | LA_ALT2D3_S-CSV | 1.014 | 0.964 | -0.05 | 0.9 | 1.05 | 0.05 | DEVERS 500.00 - VALLEYSC 500.00 1, MIDPINTS 500.00 - DEVERS 500.00 1 |
| 8640 | MIRAGTIE | 92 | 8 | 162 | line_2245 | LA_ALT2D3_S-CSV | 1.015 | 0.964 | -0.051 | 0.9 | 1.05 | 0.05 | DEVERS 500.00 - VALLEYSC 500.00 1, MIDPINTS 500.00 - DEVERS 500.00 1 |
| 22472 | MIGUELMP | 500 | 22 | 227 | line_2245 | LA_ALT2D3_S-CSV | 1.017 | 0.965 | -0.052 | 0.9 | 1.05 | 0.05 | DEVERS 500.00 - VALLEYSC 500.00 1, MIDPINTS 500.00 - DEVERS 500.00 1 |
| 80350 | NEWSF500 | 500 | 8 | 800 | line_2245 | LA_ALT2D3_S-CSV | 1.024 | 0.966 | -0.057 | 0.9 | 1.05 | 0.05 | DEVERS 500.00 - VALLEYSC 500.00 1, MIDPINTS 500.00 - DEVERS 500.00 1 |
| 25633 | CAPWIND | 115 | 24 | 248 | line_2245 | LA_ALT2D3_S-CSV | 1.046 | 0.976 | -0.07 | 0.9 | 1.05 | 0.05 | DEVERS 500.00 - VALLEYSC 500.00 1, MIDPINTS 500.00 - DEVERS 500.00 1 |
| 24819 | CONCHO | 115 | 24 | 248 | line_2245 | LA_ALT2D3_S-CSV | 1.047 | 0.976 | -0.071 | 0.9 | 1.05 | 0.05 | DEVERS 500.00 - VALLEYSC 500.00 1, MIDPINTS 500.00 - DEVERS 500.00 1 |
| 24822 | INDIAN W | 115 | 24 | 248 | line_2245 | LA_ALT2D3_S-CSV | 1.047 | 0.976 | -0.071 | 0.9 | 1.05 | 0.05 | DEVERS 500.00 - VALLEYSC 500.00 1, MIDPINTS 500.00 - DEVERS 500.00 1 |
| 25622 | TAP806 | 115 | 24 | 248 | line_2245 | LA_ALT2D3_S-CSV | 1.046 | 0.976 | -0.07 | 0.9 | 1.05 | 0.05 | DEVERS 500.00 - VALLEYSC 500.00 1, MIDPINTS 500.00 - DEVERS 500.00 1 |
| 24821 | TAMARISK | 115 | 24 | 248 | line_2245 | LA_ALT2D3_S-CSV | 1.047 | 0.977 | -0.071 | 0.9 | 1.05 | 0.05 | DEVERS 500.00 - VALLEYSC 500.00 1, MIDPINTS 500.00 - DEVERS 500.00 1 |
| 24829 | TAP821 | 115 | 24 | 248 | line_2245 | LA_ALT2D3_S-CSV | 1.047 | 0.977 | -0.07 | 0.9 | 1.05 | 0.05 | DEVERS 500.00 - VALLEYSC 500.00 1, MIDPINTS 500.00 - DEVERS 500.00 1 |
| 24827 | TAP823 | 115 | 24 | 248 | line_2245 | LA_ALT2D3_S-CSV | 1.049 | 0.978 | -0.07 | 0.9 | 1.05 | 0.05 | DEVERS 500.00 - VALLEYSC 500.00 1, MIDPINTS 500.00 - DEVERS 500.00 1 |
| 24807 | MIRAGE | 115 | 24 | 248 | line_2245 | LA_ALT2D3_S-CSV | 1.049 | 0.979 | -0.07 | 0.9 | 1.05 | 0.05 | DEVERS 500.00 - VALLEYSC 500.00 1, MIDPINTS 500.00 - DEVERS 500.00 1 |
| 24816 | SANTA RO | 115 | 24 | 248 | line_2245 | LA_ALT2D3_S-CSV | 1.05 | 0.979 | -0.071 | 0.9 | 1.05 | 0.05 | DEVERS 500.00 - VALLEYSC 500.00 1, MIDPINTS 500.00 - DEVERS 500.00 1 |
| 24237 | RANCHVST | 230 | 24 | 240 | 23021/22/23/41 | LA_ALT2D3_S-CSV | 0.978 | 1.029 | 0.051 | 0.9 | 1.05 | 0.05 | MIGUEL 230 CORRIDOR West of SN |
| 25001 | GOODRICH | 230 | 24 | 250 | line_2073 | LA_ALT2D3_S-CSV | 0.991 | 1.044 | 0.054 | 0.9 | 1.05 | 0.05 | GOODRICH 230.00 - GOULD 230.00 1, GOODRICH 230.00 - LAGUBELL 230.00 1 |

| LEGEND | % of RATING 1 | |
|---|---|---|
| C_pu | 100% - 110% | |
| C_pu | 110% - 120% | P.U. of |
| C_pu | > 120% | Rate 1 |

| FROM | FR | BKV | TO | TO | BKV | CK | Outage_Name | Case | Rate-Mva | Pflow | Qflow | Amps | MVA | C_pu | B_pu | Contingency_Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_2233 | LA_ALT2D3_S-CSV | 1411.6 | 2496.8 | 331.2 | 2688.3 | 2518.7 | 1.666 | 1.09 | MOENKOPI 500.00 - ELDORDO 500.00 1, PISGAH 230.00 - ELDORDO 230.00 2 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | LA_ALT2D3_S-CSV | 392 | 506.2 | 43.4 | 1357.5 | 508.1 | 1.3 | 0.75 | MIGUEL 230 CORRIDOR West of SN |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | LA_ALT2D3_S-CSV | 408.3 | -498.4 | 30.4 | 2164.1 | 499.3 | 1.267 | 0.707 | MIGUEL 230 CORRIDOR West of SN |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_2245 | LA_ALT2D3_S-CSV | 1411.6 | 1851.1 | 217.8 | 2012.2 | 1863.9 | 1.249 | 1.09 | DEVERS 500.00 - VALLEYSC 500.00 1, MIDPINTS 500.00 - DEVERS 500.00 1 |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | 23021/22/23/41 | LA_ALT2D3_S-CSV | 382.4 | 448.3 | -15.5 | 1947.5 | 448.6 | 1.217 | 0.635 | MIGUEL 230 CORRIDOR West of SN |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_N-210 | LA_ALT2D3_S-CSV | 800 | 929.5 | 64.6 | 2392 | 931.7 | 1.191 | 0.882 | EL CENTRO IMPERIAL VALLEY 230 CKTS 2&3 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_N-203 | LA_ALT2D3_S-CSV | 800 | 924.7 | 91 | 2388.3 | 929.1 | 1.189 | 0.882 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2179 | LA_ALT2D3_S-CSV | 2598 | 2931.2 | 194.4 | 3414.3 | 2937.7 | 1.138 | 0.977 | DEVERS 230.00 - VSTA 230.00 2, VSTA 230.00 - DEVERS 230.00 1 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_2236 | LA_ALT2D3_S-CSV | 1411.6 | 1714.9 | 127.3 | 1834.1 | 1719.6 | 1.137 | 1.09 | MIDPINTS 500.00 - DEVERS 500.00 1, COACHELV 230.00 - DEVERS 230.00 2 |
| 24900 | MIDPINTS | 500 | 24801 | DEVERS | 500 | 2 | line_2236 | LA_ALT2D3_S-CSV | 2338 | 2657.5 | 415.1 | 3055.8 | 2689.7 | 1.137 | 0.648 | MIDPINTS 500.00 - DEVERS 500.00 1, COACHELV 230.00 - DEVERS 230.00 2 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_2237 | LA_ALT2D3_S-CSV | 1411.6 | 1713.8 | 125.7 | 1832.6 | 1718.4 | 1.136 | 1.09 | MIDPINTS 500.00 - DEVERS 500.00 1, J.HINDS 230.00 - MIRAGE 230.00 1 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_2235 | LA_ALT2D3_S-CSV | 1411.6 | 1711.4 | 125.9 | 1830.1 | 1716 | 1.134 | 1.09 | DEVERS 230.00 - MIRAGE 230.00 1, MIDPINTS 500.00 - DEVERS 500.00 1 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_N-217 | LA_ALT2D3_S-CSV | 1411.6 | 1711.2 | 125.9 | 1829.9 | 1715.9 | 1.134 | 1.09 | line MIDPINTS to IH500/MIDPOINTS DEVERS 500 ck 1 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 2 | line_2029 | LA_ALT2D3_S-CSV | 1195 | 1287 | -84.1 | 3371 | 1289.8 | 1.124 | 0.553 | LEWIS 230.00 - SERRANO 230.00 1, SERRANO 230.00 - VILLA PK 230.00 1 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 2 | line_2031 | LA_ALT2D3_S-CSV | 1195 | 1287 | -84.1 | 3371 | 1289.8 | 1.124 | 0.553 | LEWIS 230.00 - SERRANO 230.00 2, SERRANO 230.00 - VILLA PK 230.00 1 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 2 | line_2278 | LA_ALT2D3_S-CSV | 1195 | 1287 | -84.1 | 3371 | 1289.8 | 1.124 | 0.553 | LEWIS 230.00 - SERRANO 230.00 1, SERRANO 230.00 - VILLA PK 230.00 1 |
| 24900 | MIDPINTS | 500 | 24801 | DEVERS | 500 | 2 | line_2235 | LA_ALT2D3_S-CSV | 2338 | 2619.6 | 409.2 | 3009.7 | 2651.4 | 1.12 | 0.648 | DEVERS 230.00 - MIRAGE 230.00 1, MIDPINTS 500.00 - DEVERS 500.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2175 | LA_ALT2D3_S-CSV | 2598 | 2880.1 | 161.2 | 3354.9 | 2884.7 | 1.118 | 0.977 | DEVERS 230.00 - SANBRDNO 230.00 1, DEVERS 230.00 - VSTA 230.00 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2177 | LA_ALT2D3_S-CSV | 2598 | 2880.1 | 161.2 | 3354.9 | 2884.7 | 1.118 | 0.977 | DEVERS 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2178 | LA_ALT2D3_S-CSV | 2598 | 2880.1 | 161.2 | 3354.9 | 2884.7 | 1.118 | 0.977 | DEVERS 230.00 - VSTA 230.00 2, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2180 | LA_ALT2D3_S-CSV | 2598 | 2880.1 | 161.2 | 3354.9 | 2884.7 | 1.118 | 0.977 | SANBRDNO 230.00 - DEVERS 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2247 | LA_ALT2D3_S-CSV | 2598 | 2880.1 | 161.2 | 3354.9 | 2884.7 | 1.118 | 0.977 | DEVERS 230.00 - VSTA 230.00 2, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 8601 | GEOSUB2 | 230 | 8300 | BANIS230 | 230 | 1 | line_N-204 | LA_ALT2D3_S-CSV | 550 | 598.5 | 89.3 | 1537.7 | 605.1 | 1.114 | 0.797 | COACHELLA MIDWAY 230 CKT 1&2 |
| 24900 | MIDPINTS | 500 | 24801 | DEVERS | 500 | 2 | line_N-217 | LA_ALT2D3_S-CSV | 2338 | 2604.2 | 414.7 | 2993.8 | 2637 | 1.114 | 0.648 | line MIDPINTS to IH500/MIDPOINTS DEVERS 500 ck 1 |
| 24900 | MIDPINTS | 500 | 24801 | DEVERS | 500 | 2 | line_2237 | LA_ALT2D3_S-CSV | 2338 | 2587.2 | 419.7 | 2976 | 2621 | 1.108 | 0.648 | MIDPINTS 500.00 - DEVERS 500.00 1, J.HINDS 230.00 - MIRAGE 230.00 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_2245 | LA_ALT2D3_S-CSV | 1645.4 | 1913.7 | 235 | 2101.4 | 1928.1 | 1.107 | 0.949 | DEVERS 500.00 - VALLEYSC 500.00 1, MIDPINTS 500.00 - DEVERS 500.00 1 |
| 25641 | TAP816 | 115 | 25664 | TAP998 | 115 | 1 | line_2245 | LA_ALT2D3_S-CSV | 107.6 | -96.3 | 42 | 589.7 | 105 | 1.092 | 0.982 | DEVERS 500.00 - VALLEYSC 500.00 1, MIDPINTS 500.00 - DEVERS 500.00 1 |
| 25641 | TAP816 | 115 | 25644 | TAP818 | 115 | 1 | line_2245 | LA_ALT2D3_S-CSV | 107.6 | 96.3 | -41.3 | 588.2 | 104.8 | 1.089 | 0.979 | DEVERS 500.00 - VALLEYSC 500.00 1, MIDPINTS 500.00 - DEVERS 500.00 1 |
| 24016 | BARRE | 230 | 24044 | ELLIS | 230 | 1 | line_2115 | LA_ALT2D3_S-CSV | 988 | 1004.7 | -126.5 | 2688.4 | 1012.7 | 1.084 | 0.4 | S.ONOFRE 230.00 - SANTIAGO 230.00 1, S.ONOFRE 230.00 - SANTIAGO 230.00 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2170 | LA_ALT2D3_S-CSV | 2598 | 2771.3 | 128.1 | 3218.1 | 2774.2 | 1.073 | 0.977 | ETIWANDA 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - SANBRDNO 230.00 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2172 | LA_ALT2D3_S-CSV | 2598 | 2771.6 | 122.1 | 3214.8 | 2774.3 | 1.072 | 0.977 | VSTA 230.00 - SANBRDNO 230.00 2, VSTA 230.00 - DEVERS 230.00 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_2260 | LA_ALT2D3_S-CSV | 56 | 59.4 | -5.1 | 295 | 59.6 | 1.07 | 0.94 | KRAMER 230.00 - LUGO 230.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 24805 | DEVERS | 115 | 25644 | TAP818 | 115 | 1 | line_2245 | LA_ALT2D3_S-CSV | 217 | -183 | 103.3 | 1163.6 | 210.2 | 1.068 | 0.953 | DEVERS 500.00 - VALLEYSC 500.00 1, MIDPINTS 500.00 - DEVERS 500.00 1 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_N-204 | LA_ALT2D3_S-CSV | 800 | 822 | 22.8 | 2139.2 | 822.3 | 1.065 | 0.882 | COACHELLA MIDWAY 230 CKT 1&2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2168 | LA_ALT2D3_S-CSV | 2598 | 2734.3 | 92.1 | 3168.2 | 2735.8 | 1.056 | 0.977 | DEVERS 230.00 - VSTA 230.00 2, ETIWANDA 230.00 - SANBRDNO 230.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2171 | LA_ALT2D3_S-CSV | 2598 | 2734.3 | 92.1 | 3168.2 | 2735.8 | 1.056 | 0.977 | ETIWANDA 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_2245 | LA_ALT2D3_S-CSV | 800 | 800.1 | 86.2 | 2120.2 | 804.7 | 1.056 | 0.882 | DEVERS 500.00 - VALLEYSC 500.00 1, MIDPINTS 500.00 - DEVERS 500.00 1 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_2258 | LA_ALT2D3_S-CSV | 1411.6 | 1586.6 | 113.4 | 1691.6 | 1590.6 | 1.049 | 1.09 | LUGO 500.00 - VINCENT 500.00 2, LUGO 500.00 - VICTORVL 500.00 1 |
| 22672 | PRCTRVLY | 138 | 22852 | TELECYN | 138 | 1 | 23021/22/23/41 | LA_ALT2D3_S-CSV | 478 | 481.5 | -32.6 | 2091.6 | 482.6 | 1.046 | 0.569 | MIGUEL 230 CORRIDOR West of SN |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 1 | line_2030 | LA_ALT2D3_S-CSV | 1287 | 1287 | -84.1 | 3371 | 1289.8 | 1.043 | 0.514 | LEWIS 230.00 - SERRANO 230.00 1, SERRANO 230.00 - VILLA PK 230.00 2 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 1 | line_2032 | LA_ALT2D3_S-CSV | 1287 | 1287 | -84.1 | 3371 | 1289.8 | 1.043 | 0.514 | LEWIS 230.00 - SERRANO 230.00 2, SERRANO 230.00 - VILLA PK 230.00 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2167 | LA_ALT2D3_S-CSV | 2598 | 2685.8 | 63.6 | 3113.2 | 2686.6 | 1.038 | 0.977 | DEVERS 230.00 - SANBRDNO 230.00 1, ETIWANDA 230.00 - SANBRDNO 230.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2169 | LA_ALT2D3_S-CSV | 2598 | 2685.8 | 63.6 | 3113.2 | 2686.6 | 1.038 | 0.977 | ETIWANDA 230.00 - SANBRDNO 230.00 1, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2268 | LA_ALT2D3_S-CSV | 2598 | 2685.8 | 63.6 | 3113.2 | 2686.6 | 1.038 | 0.977 | ETIWANDA 230.00 - SANBRDNO 230.00 1, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2173 | LA_ALT2D3_S-CSV | 2598 | 2670.4 | 58.2 | 3098.5 | 2671.1 | 1.033 | 0.977 | SANBRDNO 230.00 - DEVERS 230.00 1, VSTA 230.00 - SANBRDNO 230.00 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2174 | LA_ALT2D3_S-CSV | 2598 | 2670.4 | 58.2 | 3098.5 | 2671.1 | 1.033 | 0.977 | DEVERS 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - SANBRDNO 230.00 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2233 | LA_ALT2D3_S-CSV | 2598 | 2643 | 10.8 | 3096.1 | 2643 | 1.032 | 0.977 | MOENKOPI 500.00 - ELDORDO 500.00 1, PISGAH 230.00 - ELDORDO 230.00 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2176 | LA_ALT2D3_S-CSV | 2598 | 2666.7 | 51.1 | 3090.7 | 2667.2 | 1.03 | 0.977 | DEVERS 230.00 - SANBRDNO 230.00 1, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 24016 | BARRE | 230 | 25201 | LEWIS | 230 | 1 | line_2287 | LA_ALT2D3_S-CSV | 1195 | -1157.4 | 300.3 | 3086.5 | 1195.8 | 1.029 | 0.683 | BARRE 230.00 - VILLA PK 230.00 1, SERRANO 230.00 - VILLA PK 230.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2164 | LA_ALT2D3_S-CSV | 2598 | 2654 | 50.8 | 3066.4 | 2654.5 | 1.022 | 0.977 | MIRALOMA 230.00 - VSTA 230.00 1, MIRALOMA 230.00 - VSTA 230.00 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2246 | LA_ALT2D3_S-CSV | 2598 | 2650.8 | 58.4 | 3067 | 2651.4 | 1.022 | 0.977 | VSTA 230.00 - DEVERS 230.00 1, COACHELV 230.00 - DEVERS 230.00 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2258 | LA_ALT2D3_S-CSV | 2598 | 2620.3 | 23.6 | 3066.6 | 2620.4 | 1.022 | 0.977 | LUGO 500.00 - VINCENT 500.00 2, LUGO 500.00 - VICTORVL 500.00 1 |
| 25629 | TAP813 | 115 | 25630 | TAP814 | 115 | 1 | line_2245 | LA_ALT2D3_S-CSV | 82.7 | 69.9 | -29.5 | 423.8 | 75.9 | 1.021 | 0.914 | DEVERS 500.00 - VALLEYSC 500.00 1, MIDPINTS 500.00 - DEVERS 500.00 1 |
| 8600 | GEOSUB1 | 230 | 8300 | BANIS230 | 230 | 1 | line_N-204 | LA_ALT2D3_S-CSV | 550 | 547.9 | 79.4 | 1407.9 | 553.6 | 1.02 | 0.738 | COACHELLA MIDWAY 230 CKT 1&2 |
| 8600 | GEOSUB1 | 230 | 8300 | BANIS230 | 230 | 2 | line_N-204 | LA_ALT2D3_S-CSV | 550 | 547.9 | 79.4 | 1407.9 | 553.6 | 1.02 | 0.738 | COACHELLA MIDWAY 230 CKT 1&2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2256 | LA_ALT2D3_S-CSV | 2598 | 2609.2 | 35.5 | 3057.4 | 2609.5 | 1.019 | 0.977 | ELDORDO 500.00 - LUGO 500.00 1, LUGO 500.00 - MIRALOMA 500.00 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2191 | LA_ALT2D3_S-CSV | 2598 | 2604.4 | 26.2 | 3044.9 | 2604.6 | 1.015 | 0.977 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - ELDORDO 230.00 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2192 | LA_ALT2D3_S-CSV | 2598 | 2602.5 | 26.4 | 3042.1 | 2602.6 | 1.014 | 0.977 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2193 | LA_ALT2D3_S-CSV | 2598 | 2602.4 | 26.3 | 3042 | 2602.6 | 1.014 | 0.977 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - LUGO 230.00 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | 23021/22/23/41 | LA_ALT2D3_S-CSV | 2598 | 2619.2 | 4.3 | 3040.6 | 2619.2 | 1.014 | 0.977 | MIGUEL 230 CORRIDOR West of SN |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2166 | LA_ALT2D3_S-CSV | 2598 | 2629.1 | 38.8 | 3038.2 | 2629.3 | 1.013 | 0.977 | ETIWANDA 230.00 - SANBRDNO 230.00 1, ETIWANDA 230.00 - VSTA 230.00 1 |
| 24701 | KRAMER | 230 | 24085 | LUGO | 230 | 2 | line_2260 | LA_ALT2D3_S-CSV | 478 | 480 | 68.8 | 1215.4 | 484.9 | 1.013 | 0.605 | KRAMER 230.00 - LUGO 230.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2165 | LA_ALT2D3_S-CSV | 2598 | 2625.9 | 37.7 | 3034.4 | 2626.2 | 1.012 | 0.977 | ETIWANDA 230.00 - SANBRDNO 230.00 1, MIRALOMA 230.00 - VSTA 230.00 2 |
| 24016 | BARRE | 230 | 25201 | LEWIS | 230 | 1 | line_2115 | LA_ALT2D3_S-CSV | 1195 | -1122.6 | 210.9 | 3032.4 | 1142.3 | 1.011 | 0.683 | S.ONOFRE 230.00 - SANTIAGO 230.00 1, S.ONOFRE 230.00 - SANTIAGO 230.00 2 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23022/23023 | LA_ALT2D3_S-CSV | 392 | 397.3 | 20.5 | 1042.7 | 397.8 | 1.01 | 0.75 | ML-MS1+ ML-MS2 230KV |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_2182 | LA_ALT2D3_S-CSV | 800 | 791 | 28 | 2021.2 | 791.5 | 1.007 | 0.882 | DEVERS 230.00 - MIRAGE 230.00 1, COACHELV 230.00 - DEVERS 230.00 2 |
| 24016 | BARRE | 230 | 25201 | LEWIS | 230 | 1 | line_2020 | LA_ALT2D3_S-CSV | 1195 | -1130.6 | 285.9 | 3012.6 | 1166.2 | 1.005 | 0.683 | BARRE 230.00 - VILLA PK 230.00 1, DELAMO 230.00 - ELLIS 230.00 1 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_2236 | LA_ALT2D3_S-CSV | 1645.4 | 1759.2 | 142.4 | 1892.3 | 1765 | 0.996 | 0.949 | MIDPINTS 500.00 - DEVERS 500.00 1, COACHELV 230.00 - DEVERS 230.00 2 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_2237 | LA_ALT2D3_S-CSV | 1645.4 | 1757 | 140.4 | 1889.3 | 1762.6 | 0.994 | 0.949 | MIDPINTS 500.00 - DEVERS 500.00 1, J.HINDS 230.00 - MIRAGE 230.00 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_2235 | LA_ALT2D3_S-CSV | 1645.4 | 1755.1 | 141 | 1887.3 | 1760.7 | 0.993 | 0.949 | DEVERS 230.00 - MIRAGE 230.00 1, MIDPINTS 500.00 - DEVERS 500.00 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_N-217 | LA_ALT2D3_S-CSV | 1645.4 | 1754.7 | 141 | 1886.9 | 1760.3 | 0.993 | 0.949 | line MIDPINTS to IH500/MIDPOINTS DEVERS 500 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_2214 | LA_ALT2D3_S-CSV | 56 | 54.8 | -4.8 | 271.3 | 55 | 0.99 | 0.94 | LUGO 500.00 - VINCENT 500.00 1, LUGO 500.00 - VINCENT 500.00 2 |
| 24016 | BARRE | 230 | 25201 | LEWIS | 230 | 1 | line_2023 | LA_ALT2D3_S-CSV | 1195 | -1110 | 295.2 | 2964.4 | 1148.6 | 0.989 | 0.683 | BARRE 230.00 - VILLA PK 230.00 1, LEWIS 230.00 - SERRANO 230.00 1 |
| 24016 | BARRE | 230 | 25201 | LEWIS | 230 | 1 | line_2024 | LA_ALT2D3_S-CSV | 1195 | -1110 | 295.2 | 2964.4 | 1148.6 | 0.989 | 0.683 | BARRE 230.00 - VILLA PK 230.00 1, LEWIS 230.00 - SERRANO 230.00 2 |
| 24016 | BARRE | 230 | 25201 | LEWIS | 230 | 1 | line_2025 | LA_ALT2D3_S-CSV | 1195 | -1110.8 | 289.6 | 2960.8 | 1147.9 | 0.987 | 0.683 | BARRE 230.00 - VILLA PK 230.00 1, LEWIS 230.00 - VILLA PK 230.00 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_2179 | LA_ALT2D3_S-CSV | 1645.4 | 1731.3 | 138.8 | 1860.2 | 1736.9 | 0.979 | 0.949 | DEVERS 230.00 - VSTA 230.00 2, VSTA 230.00 - DEVERS 230.00 1 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23022/23023 | LA_ALT2D3_S-CSV | 408.3 | -392.7 | 23 | 1662.2 | 393.3 | 0.973 | 0.707 | ML-MS1+ ML-MS2 230KV |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_2022 | LA_ALT2D3_S-CSV | 56 | 53.6 | -5.1 | 265.4 | 53.9 | 0.97 | 0.94 | BARRE 230.00 - VILLA PK 230.00 1, BARRE 230.00 - LEWIS 230.00 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_2154 | LA_ALT2D3_S-CSV | 56 | 53.7 | -5.1 | 265.4 | 53.9 | 0.97 | 0.94 | MIRALOMA 230.00 - OLINDA 230.00 1, MIRALOMA 230.00 - WALNUT 230.00 1 |
| 24901 | VSTA | 230 | 24132 | SANBRDNO | 230 | 2 | line_2179 | LA_ALT2D3_S-CSV | 916 | -848.9 | 51.8 | 2213.8 | 850.5 | 0.963 | 0.475 | DEVERS 230.00 - VSTA 230.00 2, VSTA 230.00 - DEVERS 230.00 1 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_2185 | LA_ALT2D3_S-CSV | 800 | 758.6 | 18.6 | 1931.9 | 758.8 | 0.962 | 0.882 | RAMON 230.00 - MIRAGE 230.00 2, J.HINDS 230.00 - MIRAGE 230.00 1 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | line_2245 | LA_ALT2D3_S-CSV | 388 | -360.2 | 14.6 | 935.5 | 360.5 | 0.961 | 0.838 | DEVERS 500.00 - VALLEYSC 500.00 1, MIDPINTS 500.00 - DEVERS 500.00 1 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_N-208 | LA_ALT2D3_S-CSV | 800 | 756.9 | 16.3 | 1925.7 | 757 | 0.959 | 0.882 | COACHELLA BANISTER/BANISTER AVE58 230 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_2246 | LA_ALT2D3_S-CSV | 800 | 752.7 | 19.5 | 1918.8 | 753 | 0.956 | 0.882 | VSTA 230.00 - DEVERS 230.00 1, COACHELV 230.00 - DEVERS 230.00 2 |
| 25646 | SANWIND | 115 | 25644 | TAP818 | 115 | 1 | line_2245 | LA_ALT2D3_S-CSV | 120.5 | 89.5 | -50.9 | 577.5 | 103 | 0.955 | 0.845 | DEVERS 500.00 - VALLEYSC 500.00 1, MIDPINTS 500.00 - DEVERS 500.00 1 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_2186 | LA_ALT2D3_S-CSV | 800 | 748.9 | 13 | 1908.3 | 749.1 | 0.95 | 0.882 | COACHELV 230.00 - DEVERS 230.00 2, J.HINDS 230.00 - MIRAGE 230.00 1 |

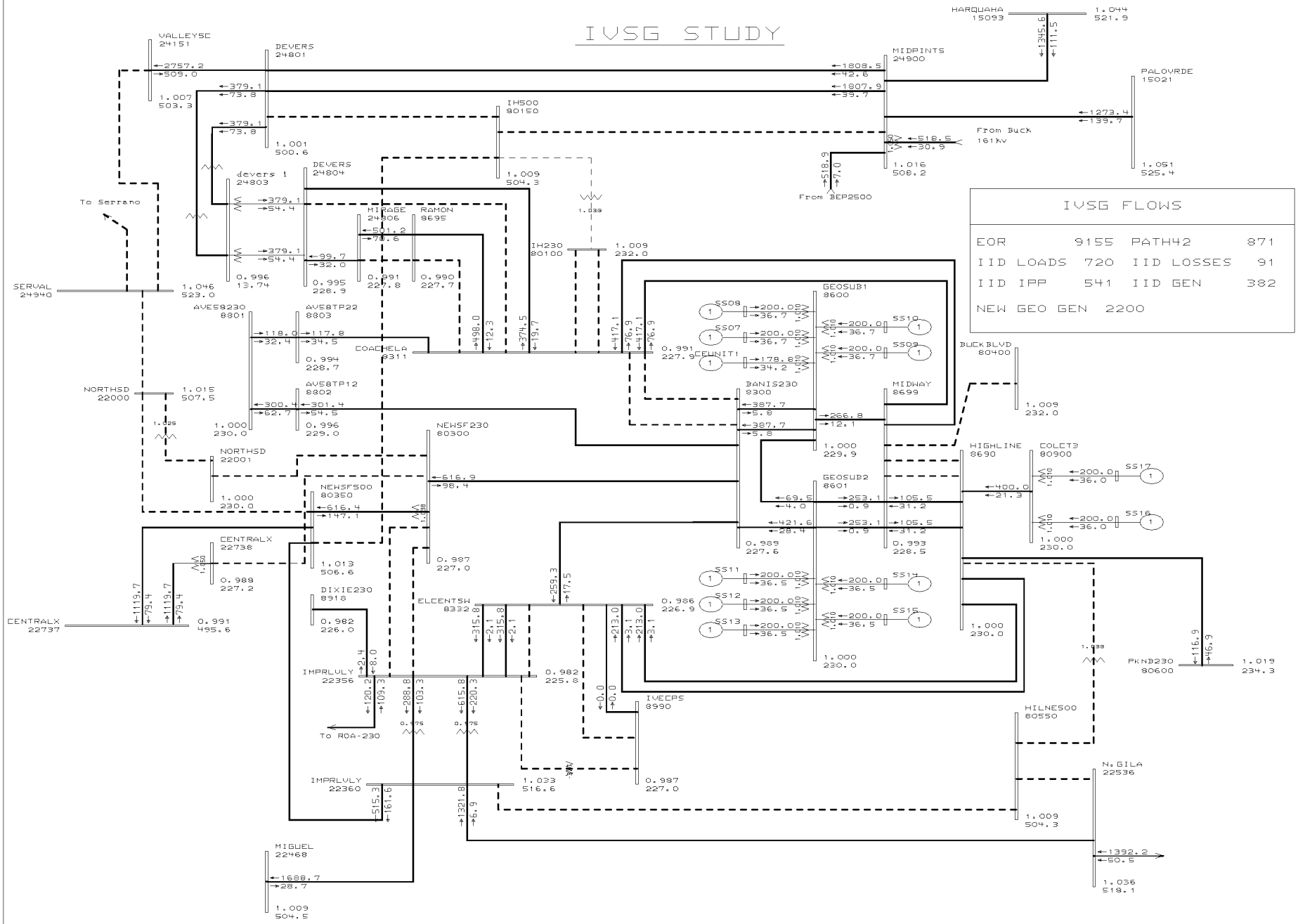
la_alt2d3_s-csv.sav
No Solve Summary
N-2 Outages

| Contingency-Description | Case | Problem-Description |
|---|---|---|
| DEVERS 230.00 - MIRAGE 230.00 1, RAMON 230.00 - MIRAGE 230.00 2 | LA_ALT2D3_S-CSV | BAD Qgen: 8714 COLMAC -15.0 MVAr |
| DEVERS 230.00 - MIRAGE 230.00 1, RAMON 230.00 - MIRAGE 230.00 2 | LA_ALT2D3_S-CSV | BAD Qgen: 8714 COLMAC -15.0 MVAr |
| line MIDPINTS to DEVERS 500 ck 1&2 | LA_ALT2D3_S-CSV | BAD Qgen: 8701 EARTHE1 5.0 MVAr |

# Imperial Valley Study Group

## Appendix B.2.2

LA – Alt 2 D3 S-EOR
Light Autumn
Alternative 2
Dispatch 3
Sensitivity – East of River


IVSG STUDY
VALLEY5C 24151
DEVERS 24801
MIDPINTS 24900
HARQUAHA 15093
PALOVRDE 15021
IH500 80150
From Buck 161kv
From BEP2500
DEVERS 24804
devers 1 24803
To Serrano
MIRAGE 24806
RAMON 8695
IH230 80100
SERVAL 24940
AVES8230 8801
AVES8TP22 8803
AVES8TP12 8802
COACHELA 8311
GEOSUB1 8600
CELNIT1
BANI5230 8300
MIDWAY 8699
BUCKBLVD 80400
NORTHSD 22000
NORTHSD 22001
NEWSF230 80300
NEWSF500 80350
GEOSUB2 8601
HIGHLINE 8690
COLCT3 80900
CENTRALX 22738
CENTRALX 22737
DIXIE230 8918
ELCENTSW 8332
IMPRLVLY 22356
IMPRLVLY 22360
To ROA-230
IVECPS 8990
HILNE500 80550
N.GILA 22536
PKNB230 80600
MIGUEL 22468
IVSG FLOWS
EOR 9155 PATH42 871
IID LOADS 720 IID LOSSES 91
IID IPP 541 IID GEN 382
NEW GEO GEN 2200

la_alt2d3_s-eor.sav
Voltage Summary
N-0 Outages

| Bus | Name | kV | Area | Zone | Outage | Case | Vbase | Vcont | DeltaV | Vmin | Vmax | Max-dv | Contingency Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 14534 | N.GILA 4 | 100 | 14 | 847 | base | la_alt2d3_s-eor | 0.933 | 0.933 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14606 | N.GILA 3 | 100 | 14 | 847 | base | la_alt2d3_s-eor | 0.933 | 0.933 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24137 | SERRANO | 230 | 24 | 240 | base | la_alt2d3_s-eor | 0.945 | 0.945 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24154 | VILLA PK | 230 | 24 | 240 | base | la_alt2d3_s-eor | 0.946 | 0.946 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 25201 | LEWIS | 230 | 24 | 252 | base | la_alt2d3_s-eor | 0.947 | 0.947 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15090 | HASSYAMP | 500 | 14 | 158 | base | la_alt2d3_s-eor | 1.05 | 1.05 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15092 | ARLINTON | 500 | 14 | 158 | base | la_alt2d3_s-eor | 1.05 | 1.05 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15094 | MESQUITE | 500 | 14 | 158 | base | la_alt2d3_s-eor | 1.05 | 1.05 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14009 | REDHAWK | 500 | 14 | 158 | base | la_alt2d3_s-eor | 1.05 | 1.05 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15021 | PALOVRDE | 500 | 14 | 158 | base | la_alt2d3_s-eor | 1.051 | 1.051 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14001 | FOURCORN | 500 | 14 | 141 | base | la_alt2d3_s-eor | 1.051 | 1.051 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14010 | TS5 | 500 | 14 | 840 | base | la_alt2d3_s-eor | 1.052 | 1.052 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24748 | OXBOW A | 230 | 24 | 247 | base | la_alt2d3_s-eor | 1.052 | 1.052 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14000 | CHOLLA | 500 | 14 | 141 | base | la_alt2d3_s-eor | 1.054 | 1.054 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24729 | INYO | 230 | 24 | 247 | base | la_alt2d3_s-eor | 1.054 | 1.054 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 16310 | NL.3WP2 | 100 | 14 | 160 | base | la_alt2d3_s-eor | 1.055 | 1.055 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24775 | RUSH | 115 | 24 | 247 | base | la_alt2d3_s-eor | 1.056 | 1.056 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24235 | RECTOR | 230 | 24 | 240 | base | la_alt2d3_s-eor | 1.057 | 1.057 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24234 | RECTRSVC | 230 | 24 | 240 | base | la_alt2d3_s-eor | 1.057 | 1.057 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14002 | MOENKOPI | 500 | 14 | 141 | base | la_alt2d3_s-eor | 1.058 | 1.058 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14100 | CHOLLA | 345 | 14 | 141 | base | la_alt2d3_s-eor | 1.058 | 1.058 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15087 | SNTAROSA | 500 | 14 | 158 | base | la_alt2d3_s-eor | 1.058 | 1.058 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15088 | PINAL_W | 500 | 14 | 158 | base | la_alt2d3_s-eor | 1.059 | 1.059 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24776 | LEE VINE | 115 | 24 | 247 | base | la_alt2d3_s-eor | 1.063 | 1.063 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 16302 | NL.3WP | 100 | 14 | 160 | base | la_alt2d3_s-eor | 1.065 | 1.065 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 14003 | NAVAJO | 500 | 14 | 141 | base | la_alt2d3_s-eor | 1.068 | 1.068 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 15001 | CORONADO | 500 | 14 | 140 | base | la_alt2d3_s-eor | 1.069 | 1.069 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24304 | BIG CRK4 | 230 | 24 | 243 | base | la_alt2d3_s-eor | 1.083 | 1.083 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24301 | BIG CRK1 | 230 | 24 | 243 | base | la_alt2d3_s-eor | 1.084 | 1.084 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24320 | EASTWOOD | 230 | 24 | 243 | base | la_alt2d3_s-eor | 1.085 | 1.085 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24316 | MAMMOTH | 230 | 24 | 243 | base | la_alt2d3_s-eor | 1.085 | 1.085 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24302 | BIG CRK2 | 230 | 24 | 243 | base | la_alt2d3_s-eor | 1.086 | 1.086 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24303 | BIG CRK3 | 230 | 24 | 243 | base | la_alt2d3_s-eor | 1.086 | 1.086 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |
| 24305 | BIG CRK8 | 230 | 24 | 243 | base | la_alt2d3_s-eor | 1.086 | 1.086 | 0 | 0.95 | 1.05 | 0.05 | Base system (n-0) |

la_alt2d3_s-eor.sav
Flow Summary
N-0 Outages

| LEGEND | % of RATING 1 | |
|---|---|---|
| C_pu | 100% - 110% | |
| C_pu | 110% - 120% | P.U. of |
| C_pu | > 120% | Rate 1 |

| FROM | FR | BKV | TO | TO | BKV | CK | Outage_Name | Case | Rate-Mva | Pflow | Qflow | Amps | MVA | C_pu | B_pu | Contingency_Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24900 | MIDPINTS | 500 | 19399 | BUCK161 | 161 | 1 | base | la_alt2d3_s-eor | 250 | -514 | 62.5 | 588.2 | 517.8 | 2.08 | 2.08 | Base system (n-0) |
| 24999 | DEVRSVC1 | 500 | 24801 | DEVERS | 500 | 1 | base | la_alt2d3_s-eor | 387.5 | 0 | 601.6 | 693.8 | 601.6 | 1.551 | 1.551 | Base system (n-0) |
| 19400 | BUCK230 | 230 | 19399 | BUCK161 | 161 | 1 | base | la_alt2d3_s-eor | 280 | 339.2 | 53.8 | 878.1 | 343.4 | 1.23 | 1.23 | Base system (n-0) |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | base | la_alt2d3_s-eor | 1411.6 | 1778.9 | 238.5 | 1939.6 | 1794.8 | 1.205 | 1.205 | Base system (n-0) |
| 16900 | COPPERVR | 345 | 16901 | COPPERVR | 230 | 1 | base | la_alt2d3_s-eor | 200 | 202.2 | 98.5 | 371.2 | 224.9 | 1.12 | 1.12 | Base system (n-0) |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | base | la_alt2d3_s-eor | 2598 | 2788.5 | 174.9 | 3222.3 | 2793.9 | 1.074 | 1.074 | Base system (n-0) |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | base | la_alt2d3_s-eor | 1645.4 | 1828.9 | 241.9 | 2012.5 | 1844.8 | 1.062 | 1.062 | Base system (n-0) |
| 19038 | MEAD | 500 | 15034 | PERKINS | 500 | 1 | base | la_alt2d3_s-eor | 1238.4 | -1260.6 | 158.7 | 1435.2 | 1270.5 | 1.011 | 1.011 | Base system (n-0) |
| 15034 | PERKINS | 500 | 15031 | PERK PS1 | 500 | 1 | base | la_alt2d3_s-eor | 650 | -645.9 | 6.1 | 723 | 645.9 | 1 | 1 | Base system (n-0) |
| 15034 | PERKINS | 500 | 15032 | PERK PS2 | 500 | 1 | base | la_alt2d3_s-eor | 650 | -645.9 | 6.1 | 723 | 645.9 | 1 | 1 | Base system (n-0) |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | base | la_alt2d3_s-eor | 1120 | -1118.3 | -36.5 | 2842.6 | 1118.9 | 1 | 1 | Base system (n-0) |
| 25641 | TAP816 | 115 | 25664 | TAP998 | 115 | 1 | base | la_alt2d3_s-eor | 107.6 | -96.4 | 41.6 | 530.2 | 105 | 0.982 | 0.982 | Base system (n-0) |
| 25641 | TAP816 | 115 | 25644 | TAP818 | 115 | 1 | base | la_alt2d3_s-eor | 107.6 | 96.4 | -40.8 | 528.6 | 104.7 | 0.979 | 0.979 | Base system (n-0) |
| 24912 | SHANDIN | 115 | 24916 | TAP902 | 115 | 1 | base | la_alt2d3_s-eor | 109.1 | -104.4 | 22.2 | 535.2 | 106.7 | 0.978 | 0.978 | Base system (n-0) |
| 24805 | DEVERS | 115 | 25644 | TAP818 | 115 | 1 | base | la_alt2d3_s-eor | 217 | -183.7 | 96.8 | 1037.9 | 207.7 | 0.953 | 0.953 | Base system (n-0) |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | base | la_alt2d3_s-eor | 56 | 51 | -4.6 | 251.7 | 51.2 | 0.92 | 0.92 | Base system (n-0) |
| 25629 | TAP813 | 115 | 25630 | TAP814 | 115 | 1 | base | la_alt2d3_s-eor | 82.7 | 69.9 | -28.2 | 379.3 | 75.4 | 0.913 | 0.913 | Base system (n-0) |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | base | la_alt2d3_s-eor | 388 | -343.8 | 11.9 | 880.8 | 344 | 0.904 | 0.904 | Base system (n-0) |

| Bus | Name | kV | Area | Zone | Outage | Case | Vbase | Vcont | DeltaV | Vmin | Vmax | Max-dv | Contingency Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22464 | MIGUEL | 230 | 22 | 222 | SO2 | la_alt2d3_s-eor | 0.967 | 0.907 | -0.06 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 24017 | BLYTHESC | 161 | 24 | 248 | line_007 | la_alt2d3_s-eor | 0.999 | 0.909 | -0.09 | 0.9 | 1.05 | 0.05 | line BLYTHE to BLYTHESC 161 ck 1 |
| 24731 | INYOKERN | 115 | 24 | 247 | line_175 | la_alt2d3_s-eor | 1.015 | 0.91 | -0.104 | 0.9 | 1.05 | 0.05 | line INYO to COTTONWD 230 ck 1 |
| 22922 | MIRA SOR | 138 | 22 | 221 | SO2 | la_alt2d3_s-eor | 0.982 | 0.915 | -0.066 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22184 | DOUBLET | 138 | 22 | 221 | SO2 | la_alt2d3_s-eor | 0.982 | 0.916 | -0.066 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22192 | DOUBLTTP | 138 | 22 | 221 | SO2 | la_alt2d3_s-eor | 0.982 | 0.916 | -0.066 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22648 | PENSQTOS | 138 | 22 | 221 | SO2 | la_alt2d3_s-eor | 0.982 | 0.916 | -0.066 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22580 | NORTHCTY | 138 | 22 | 224 | SO2 | la_alt2d3_s-eor | 0.985 | 0.919 | -0.067 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 25423 | ESRP MWD | 115 | 24 | 254 | B2_003 | la_alt2d3_s-eor | 0.976 | 0.92 | -0.056 | 0.9 | 1.05 | 0.05 | N.GILA - IMPRLVLY 1 500kV |
| 22300 | FRIARS | 138 | 22 | 221 | SO2 | la_alt2d3_s-eor | 0.986 | 0.92 | -0.066 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22832 | SYCAMORE | 230 | 22 | 221 | SO2 | la_alt2d3_s-eor | 0.98 | 0.92 | -0.06 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22500 | MISSION | 138 | 22 | 221 | SO2 | la_alt2d3_s-eor | 0.987 | 0.921 | -0.065 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22504 | MISSION | 230 | 22 | 221 | SO2 | la_alt2d3_s-eor | 0.985 | 0.921 | -0.063 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22734 | SANTEE | 138 | 22 | 223 | SO2 | la_alt2d3_s-eor | 0.988 | 0.921 | -0.067 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22120 | CARLTNHS | 138 | 22 | 223 | SO2 | la_alt2d3_s-eor | 0.988 | 0.922 | -0.066 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22412 | LOSCOCHS | 138 | 22 | 223 | SO2 | la_alt2d3_s-eor | 0.991 | 0.922 | -0.069 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 24160 | VALLEYSC | 115 | 24 | 240 | B2_003 | la_alt2d3_s-eor | 0.979 | 0.923 | -0.056 | 0.9 | 1.05 | 0.05 | N.GILA - IMPRLVLY 1 500kV |
| 25990 | VALYSVC1 | 115 | 24 | 240 | B2_003 | la_alt2d3_s-eor | 0.979 | 0.923 | -0.056 | 0.9 | 1.05 | 0.05 | N.GILA - IMPRLVLY 1 500kV |
| 22116 | CARLTHTP | 138 | 22 | 223 | SO2 | la_alt2d3_s-eor | 0.988 | 0.923 | -0.066 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22424 | MAINST50 | 138 | 22 | 222 | SO2 | la_alt2d3_s-eor | 0.993 | 0.924 | -0.069 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22428 | MAINST51 | 138 | 22 | 222 | SO2 | la_alt2d3_s-eor | 0.993 | 0.924 | -0.069 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22772 | SOUTHBAY | 138 | 22 | 222 | SO2 | la_alt2d3_s-eor | 0.992 | 0.924 | -0.068 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22124 | CHCARITA | 138 | 22 | 225 | SO2 | la_alt2d3_s-eor | 0.99 | 0.925 | -0.065 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22596 | OLD TOWN | 230 | 22 | 221 | SO2 | la_alt2d3_s-eor | 0.987 | 0.925 | -0.062 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22652 | PENSQTOS | 230 | 22 | 221 | SO2 | la_alt2d3_s-eor | 0.988 | 0.925 | -0.063 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22716 | SANLUSRY | 230 | 22 | 224 | SO2 | la_alt2d3_s-eor | 0.99 | 0.927 | -0.063 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22831 | SYCAMORE | 138 | 22 | 221 | SO2 | la_alt2d3_s-eor | 0.991 | 0.927 | -0.064 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22232 | ENCINA | 230 | 22 | 224 | SO2 | la_alt2d3_s-eor | 0.991 | 0.929 | -0.062 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22268 | ESCNDO51 | 138 | 22 | 225 | SO2 | la_alt2d3_s-eor | 0.996 | 0.929 | -0.067 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22436 | MDWLRKTP | 138 | 22 | 225 | SO2 | la_alt2d3_s-eor | 0.996 | 0.929 | -0.067 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22568 | NCMETER | 138 | 22 | 225 | SO2 | la_alt2d3_s-eor | 0.996 | 0.929 | -0.067 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22572 | NCMETRTP | 138 | 22 | 225 | SO2 | la_alt2d3_s-eor | 0.996 | 0.929 | -0.067 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 24131 | S.ONOFRE | 230 | 24 | 240 | SO2 | la_alt2d3_s-eor | 0.993 | 0.929 | -0.064 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22227 | ENCINATP | 230 | 22 | 224 | SO2 | la_alt2d3_s-eor | 0.992 | 0.93 | -0.062 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22048 | BATIQTOS | 138 | 22 | 224 | SO2 | la_alt2d3_s-eor | 0.998 | 0.931 | -0.067 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22052 | BATIQTP | 138 | 22 | 224 | SO2 | la_alt2d3_s-eor | 0.998 | 0.931 | -0.067 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22852 | TELECYN | 138 | 22 | 222 | SO2 | la_alt2d3_s-eor | 1.001 | 0.933 | -0.067 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22738 | CENTRALX | 230 | 22 | 225 | SO2 | la_alt2d3_s-eor | 0.988 | 0.933 | -0.055 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22228 | ENCINA | 138 | 22 | 224 | SO2 | la_alt2d3_s-eor | 1.002 | 0.934 | -0.068 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22632 | PALOMAR | 138 | 22 | 224 | SO2 | la_alt2d3_s-eor | 1.001 | 0.934 | -0.068 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22844 | TALEGA | 230 | 22 | 226 | SO2 | la_alt2d3_s-eor | 0.995 | 0.934 | -0.06 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22108 | CANNON | 138 | 22 | 224 | SO2 | la_alt2d3_s-eor | 1.002 | 0.935 | -0.068 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 24768 | RANDSBRG | 115 | 24 | 247 | line_175 | la_alt2d3_s-eor | 1.011 | 0.935 | -0.076 | 0.9 | 1.05 | 0.05 | line INYO to COTTONWD 230 ck 1 |
| 24761 | TAP701 | 115 | 24 | 247 | line_175 | la_alt2d3_s-eor | 1.011 | 0.935 | -0.076 | 0.9 | 1.05 | 0.05 | line INYO to COTTONWD 230 ck 1 |
| 24824 | CARODEAN | 115 | 24 | 248 | B2_003 | la_alt2d3_s-eor | 0.988 | 0.936 | -0.052 | 0.9 | 1.05 | 0.05 | N.GILA - IMPRLVLY 1 500kV |
| 22672 | PRCTRVLY | 138 | 22 | 222 | SO2 | la_alt2d3_s-eor | 1.002 | 0.936 | -0.066 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 24811 | TAP802 | 115 | 24 | 248 | B2_003 | la_alt2d3_s-eor | 0.988 | 0.937 | -0.052 | 0.9 | 1.05 | 0.05 | N.GILA - IMPRLVLY 1 500kV |
| 24229 | VALLEY-S | 115 | 24 | 240 | B2_003 | la_alt2d3_s-eor | 0.991 | 0.937 | -0.053 | 0.9 | 1.05 | 0.05 | N.GILA - IMPRLVLY 1 500kV |
| 25991 | VALYSVC2 | 115 | 24 | 240 | B2_003 | la_alt2d3_s-eor | 0.991 | 0.937 | -0.053 | 0.9 | 1.05 | 0.05 | N.GILA - IMPRLVLY 1 500kV |
| 22264 | ESCNDO50 | 138 | 22 | 225 | SO2 | la_alt2d3_s-eor | 1.003 | 0.937 | -0.066 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22460 | MIGUEL | 138 | 22 | 222 | SO2 | la_alt2d3_s-eor | 1.003 | 0.937 | -0.066 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 24739 | MC GEN | 115 | 24 | 247 | line_175 | la_alt2d3_s-eor | 1.034 | 0.937 | -0.097 | 0.9 | 1.05 | 0.05 | line INYO to COTTONWD 230 ck 1 |
| 24749 | SEARLES | 115 | 24 | 247 | line_175 | la_alt2d3_s-eor | 1.034 | 0.937 | -0.097 | 0.9 | 1.05 | 0.05 | line INYO to COTTONWD 230 ck 1 |
| 24762 | TAP702 | 115 | 24 | 247 | line_175 | la_alt2d3_s-eor | 1.034 | 0.937 | -0.097 | 0.9 | 1.05 | 0.05 | line INYO to COTTONWD 230 ck 1 |
| 24763 | TAP703 | 115 | 24 | 247 | line_175 | la_alt2d3_s-eor | 1.034 | 0.937 | -0.097 | 0.9 | 1.05 | 0.05 | line INYO to COTTONWD 230 ck 1 |
| 24808 | TAP801 | 115 | 24 | 248 | B2_003 | la_alt2d3_s-eor | 0.99 | 0.938 | -0.052 | 0.9 | 1.05 | 0.05 | N.GILA - IMPRLVLY 1 500kV |
| 24809 | YUCCA | 115 | 24 | 248 | B2_003 | la_alt2d3_s-eor | 0.99 | 0.938 | -0.052 | 0.9 | 1.05 | 0.05 | N.GILA - IMPRLVLY 1 500kV |
| 22254 | ENVIREPL | 69 | 22 | 225 | SO2 | la_alt2d3_s-eor | 1.005 | 0.939 | -0.066 | 0 | 0 | 0 | gen S.ONOFR2 22.00 |
| 22737 | CENTRALX | 500 | 22 | 225 | SO2 | la_alt2d3_s-eor | 0.991 | 0.939 | -0.053 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 24810 | HI DESER | 115 | 24 | 248 | B2_003 | la_alt2d3_s-eor | 0.991 | 0.94 | -0.052 | 0.9 | 1.05 | 0.05 | N.GILA - IMPRLVLY 1 500kV |
| 24817 | EISENHOW | 115 | 24 | 248 | B2_003 | la_alt2d3_s-eor | 0.993 | 0.941 | -0.052 | 0.9 | 1.05 | 0.05 | N.GILA - IMPRLVLY 1 500kV |
| 24820 | THORNHIL | 115 | 24 | 248 | B2_003 | la_alt2d3_s-eor | 0.993 | 0.941 | -0.052 | 0.9 | 1.05 | 0.05 | N.GILA - IMPRLVLY 1 500kV |
| 24831 | TAP822 | 115 | 24 | 248 | B2_003 | la_alt2d3_s-eor | 0.993 | 0.941 | -0.052 | 0.9 | 1.05 | 0.05 | N.GILA - IMPRLVLY 1 500kV |
| 25640 | PANAERO | 115 | 24 | 248 | B2_003 | la_alt2d3_s-eor | 0.994 | 0.942 | -0.052 | 0.9 | 1.05 | 0.05 | N.GILA - IMPRLVLY 1 500kV |
| 25639 | SEAWIND | 115 | 24 | 248 | B2_003 | la_alt2d3_s-eor | 0.994 | 0.942 | -0.052 | 0.9 | 1.05 | 0.05 | N.GILA - IMPRLVLY 1 500kV |
| 25641 | TAP816 | 115 | 24 | 248 | B2_003 | la_alt2d3_s-eor | 0.994 | 0.942 | -0.052 | 0.9 | 1.05 | 0.05 | N.GILA - IMPRLVLY 1 500kV |
| 28260 | ALTAMSA4 | 115 | 24 | 248 | B2_003 | la_alt2d3_s-eor | 0.994 | 0.942 | -0.052 | 0.9 | 1.05 | 0.05 | N.GILA - IMPRLVLY 1 500kV |
| 25664 | TAP998 | 115 | 24 | 248 | B2_003 | la_alt2d3_s-eor | 0.994 | 0.942 | -0.052 | 0.9 | 1.05 | 0.05 | N.GILA - IMPRLVLY 1 500kV |
| 24814 | BANNING | 115 | 24 | 248 | B2_003 | la_alt2d3_s-eor | 0.994 | 0.943 | -0.052 | 0.9 | 1.05 | 0.05 | N.GILA - IMPRLVLY 1 500kV |
| 24818 | FARREL | 115 | 24 | 248 | B2_003 | la_alt2d3_s-eor | 0.994 | 0.943 | -0.051 | 0.9 | 1.05 | 0.05 | N.GILA - IMPRLVLY 1 500kV |
| 25646 | SANWIND | 115 | 24 | 248 | B2_003 | la_alt2d3_s-eor | 0.995 | 0.943 | -0.052 | 0.9 | 1.05 | 0.05 | N.GILA - IMPRLVLY 1 500kV |
| 25644 | TAP818 | 115 | 24 | 248 | B2_003 | la_alt2d3_s-eor | 0.995 | 0.944 | -0.051 | 0.9 | 1.05 | 0.05 | N.GILA - IMPRLVLY 1 500kV |
| 22100 | CALAVRTP | 138 | 22 | 224 | SO2 | la_alt2d3_s-eor | 1.012 | 0.944 | -0.068 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 25635 | ALTWIND | 115 | 24 | 248 | B2_003 | la_alt2d3_s-eor | 0.996 | 0.945 | -0.051 | 0.9 | 1.05 | 0.05 | N.GILA - IMPRLVLY 1 500kV |
| 24832 | TAP820 | 115 | 24 | 248 | B2_003 | la_alt2d3_s-eor | 0.996 | 0.945 | -0.051 | 0.9 | 1.05 | 0.05 | N.GILA - IMPRLVLY 1 500kV |
| 28060 | SEAWEST | 115 | 24 | 248 | B2_003 | la_alt2d3_s-eor | 0.996 | 0.945 | -0.051 | 0.9 | 1.05 | 0.05 | N.GILA - IMPRLVLY 1 500kV |
| 25642 | TAP819 | 115 | 24 | 248 | B2_003 | la_alt2d3_s-eor | 0.997 | 0.946 | -0.051 | 0.9 | 1.05 | 0.05 | N.GILA - IMPRLVLY 1 500kV |
| 25637 | TRANWND | 115 | 24 | 248 | B2_003 | la_alt2d3_s-eor | 0.998 | 0.946 | -0.051 | 0.9 | 1.05 | 0.05 | N.GILA - IMPRLVLY 1 500kV |
| 22260 | ESCNDIDO | 230 | 22 | 225 | SO2 | la_alt2d3_s-eor | 1 | 0.946 | -0.054 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 22760 | SHADOWR | 138 | 22 | 224 | SO2 | la_alt2d3_s-eor | 1.014 | 0.946 | -0.068 | 0.9 | 1.05 | 0.05 | gen S.ONOFR2 22.00 |
| 24815 | GARNET | 115 | 24 | 248 | B2_003 | la_alt2d3_s-eor | 0.998 | 0.947 | -0.051 | 0.9 | 1.05 | 0.05 | N.GILA - IMPRLVLY 1 500kV |
| 25624 | TAP808 | 115 | 24 | 248 | B2_003 | la_alt2d3_s-eor | 0.998 | 0.947 | -0.051 | 0.9 | 1.05 | 0.05 | N.GILA - IMPRLVLY 1 500kV |
| 25627 | TAP811 | 115 | 24 | 248 | B2_003 | la_alt2d3_s-eor | 0.999 | 0.947 | -0.051 | 0.9 | 1.05 | 0.05 | N.GILA - IMPRLVLY 1 500kV |
| 25629 | TAP813 | 115 | 24 | 248 | B2_003 | la_alt2d3_s-eor | 0.998 | 0.947 | -0.051 | 0.9 | 1.05 | 0.05 | N.GILA - IMPRLVLY 1 500kV |
| 24833 | MARASCHI | 115 | 24 | 248 | B2_003 | la_alt2d3_s-eor | 0.999 | 0.947 | -0.051 | 0.9 | 1.05 | 0.05 | N.GILA - IMPRLVLY 1 500kV |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22261 | EPP | 230 | 22 | 225 | SO2 | la_alt2d3_s-eor | 1 | 0.947 | -0.053 | 0.9 | 1.05 | 0.05 gen S.ONOFR2 22.00 |
| 24801 | DEVERS | 500 | 24 | 248 | B2_003 | la_alt2d3_s-eor | 1.001 | 0.949 | -0.052 | 0.9 | 1.05 | 0.05 N.GILA - IMPRLVLY 1 500kV |
| 24999 | DEVRSVC1 | 500 | 24 | 248 | B2_003 | la_alt2d3_s-eor | 1.001 | 0.949 | -0.052 | 0.9 | 1.05 | 0.05 N.GILA - IMPRLVLY 1 500kV |
| 24645 | TAP817 | 115 | 24 | 248 | B2_003 | la_alt2d3_s-eor | 1.001 | 0.95 | -0.051 | 0.9 | 1.05 | 0.05 N.GILA - IMPRLVLY 1 500kV |
| 25634 | BUCKWND | 115 | 24 | 248 | B2_003 | la_alt2d3_s-eor | 1.001 | 0.951 | -0.051 | 0.9 | 1.05 | 0.05 N.GILA - IMPRLVLY 1 500kV |
| 25636 | RENWIND | 115 | 24 | 248 | B2_003 | la_alt2d3_s-eor | 1.002 | 0.951 | -0.051 | 0.9 | 1.05 | 0.05 N.GILA - IMPRLVLY 1 500kV |
| 25625 | TAP809 | 115 | 24 | 248 | B2_003 | la_alt2d3_s-eor | 1.001 | 0.951 | -0.051 | 0.9 | 1.05 | 0.05 N.GILA - IMPRLVLY 1 500kV |
| 25630 | TAP814 | 115 | 24 | 248 | B2_003 | la_alt2d3_s-eor | 1.002 | 0.951 | -0.051 | 0.9 | 1.05 | 0.05 N.GILA - IMPRLVLY 1 500kV |
| 24826 | INDIGO | 115 | 24 | 248 | B2_003 | la_alt2d3_s-eor | 1.002 | 0.951 | -0.051 | 0.9 | 1.05 | 0.05 N.GILA - IMPRLVLY 1 500kV |
| 28020 | WINTEC6 | 115 | 24 | 248 | B2_003 | la_alt2d3_s-eor | 1.001 | 0.951 | -0.051 | 0.9 | 1.05 | 0.05 N.GILA - IMPRLVLY 1 500kV |
| 25645 | VENWIND | 115 | 24 | 248 | B2_003 | la_alt2d3_s-eor | 1.003 | 0.952 | -0.051 | 0.9 | 1.05 | 0.05 N.GILA - IMPRLVLY 1 500kV |
| 22472 | MIGUELMP | 500 | 22 | 227 | SO2 | la_alt2d3_s-eor | 1.013 | 0.952 | -0.061 | 0.9 | 1.05 | 0.05 gen S.ONOFR2 22.00 |
| 24813 | TAP804 | 115 | 24 | 248 | B2_003 | la_alt2d3_s-eor | 1.003 | 0.953 | -0.051 | 0.9 | 1.05 | 0.05 N.GILA - IMPRLVLY 1 500kV |
| 24151 | VALLEYSC | 500 | 24 | 240 | B2_003 | la_alt2d3_s-eor | 1.007 | 0.953 | -0.054 | 0.9 | 1.05 | 0.05 N.GILA - IMPRLVLY 1 500kV |
| 24997 | VALYSVC1 | 500 | 24 | 240 | B2_003 | la_alt2d3_s-eor | 1.007 | 0.953 | -0.054 | 0.9 | 1.05 | 0.05 N.GILA - IMPRLVLY 1 500kV |
| 28040 | C8040 | 500 | 24 | 240 | B2_003 | la_alt2d3_s-eor | 1.007 | 0.953 | -0.054 | 0.9 | 1.05 | 0.05 N.GILA - IMPRLVLY 1 500kV |
| 22468 | MIGUEL | 500 | 22 | 227 | SO2 | la_alt2d3_s-eor | 1.009 | 0.953 | -0.056 | 0.9 | 1.05 | 0.05 gen S.ONOFR2 22.00 |
| 22712 | SANLUSRY | 138 | 22 | 224 | SO2 | la_alt2d3_s-eor | 1.022 | 0.953 | -0.068 | 0.9 | 1.05 | 0.05 gen S.ONOFR2 22.00 |
| 24805 | DEVERS | 115 | 24 | 248 | B2_003 | la_alt2d3_s-eor | 1.005 | 0.954 | -0.051 | 0.9 | 1.05 | 0.05 N.GILA - IMPRLVLY 1 500kV |
| 25623 | TAP807 | 115 | 24 | 248 | B2_003 | la_alt2d3_s-eor | 1.004 | 0.954 | -0.051 | 0.9 | 1.05 | 0.05 N.GILA - IMPRLVLY 1 500kV |
| 25632 | TERAWND | 115 | 24 | 248 | B2_003 | la_alt2d3_s-eor | 1.004 | 0.954 | -0.051 | 0.9 | 1.05 | 0.05 N.GILA - IMPRLVLY 1 500kV |
| 80350 | NEWSF500 | 500 | 8 | 800 | line_56 | la_alt2d3_s-eor | 1.013 | 0.96 | -0.053 | 0.9 | 1.05 | 0.05 line NEWSF500 to IMPRLVLY 500 ck 1 |
| 22112 | CAPSTRNO | 138 | 22 | 226 | SO2 | la_alt2d3_s-eor | 1.021 | 0.964 | -0.057 | 0.9 | 1.05 | 0.05 gen S.ONOFR2 22.00 |
| 22396 | LAGNA NL | 138 | 22 | 226 | SO2 | la_alt2d3_s-eor | 1.02 | 0.964 | -0.057 | 0.9 | 1.05 | 0.05 gen S.ONOFR2 22.00 |
| 22432 | MARGARTA | 138 | 22 | 226 | SO2 | la_alt2d3_s-eor | 1.021 | 0.964 | -0.057 | 0.9 | 1.05 | 0.05 gen S.ONOFR2 22.00 |
| 22860 | TRABUCO | 138 | 22 | 226 | SO2 | la_alt2d3_s-eor | 1.021 | 0.964 | -0.057 | 0.9 | 1.05 | 0.05 gen S.ONOFR2 22.00 |
| 22930 | MSNVIEJO | 138 | 22 | 226 | SO2 | la_alt2d3_s-eor | 1.021 | 0.964 | -0.057 | 0.9 | 1.05 | 0.05 gen S.ONOFR2 22.00 |
| 22720 | SANMATEO | 138 | 22 | 226 | SO2 | la_alt2d3_s-eor | 1.024 | 0.967 | -0.057 | 0.9 | 1.05 | 0.05 gen S.ONOFR2 22.00 |
| 22656 | PICO | 138 | 22 | 226 | SO2 | la_alt2d3_s-eor | 1.025 | 0.969 | -0.056 | 0.9 | 1.05 | 0.05 gen S.ONOFR2 22.00 |
| 22840 | TALEGA | 138 | 22 | 226 | SO2 | la_alt2d3_s-eor | 1.026 | 0.97 | -0.056 | 0.9 | 1.05 | 0.05 gen S.ONOFR2 22.00 |
| 24760 | OXBOW B | 230 | 24 | 247 | line_175 | la_alt2d3_s-eor | 1.03 | 0.98 | -0.05 | 0.9 | 1.05 | 0.05 line INYO to COTTONWD 230 ck 1 |
| 14534 | N.GILA 4 | 100 | 14 | 847 | NG500/69 | la_alt2d3_s-eor | 0.933 | 1 | 0.067 | 0.9 | 1.05 | 0.05 tran N.GILA 500 to N.GILA 69 ck 1 |
| 24035 | EAGLEMTN | 161 | 24 | 248 | tran_241 | la_alt2d3_s-eor | 0.961 | 1.021 | 0.06 | 0.9 | 1.05 | 0.05 tran EAGLEMTN 230 to EAGLEMTN 161 ck 1 |
| 25616 | PEARBLSM | 230 | 24 | 256 | line_148 | la_alt2d3_s-eor | 0.986 | 1.044 | 0.059 | 0.9 | 1.05 | 0.05 line VINCENT to PEARBLSM 230 ck 1 |
| 25423 | ESRP MWD | 115 | 24 | 254 | line_206 | la_alt2d3_s-eor | 0.976 | 1.081 | 0.104 | 0.9 | 1.05 | 0.05 line SERRANO to VALLEYSC 500 ck 1 |
| 24160 | VALLEYSC | 115 | 24 | 240 | line_206 | la_alt2d3_s-eor | 0.979 | 1.083 | 0.104 | 0.9 | 1.05 | 0.05 line SERRANO to VALLEYSC 500 ck 1 |
| 25990 | VALYSVC1 | 115 | 24 | 240 | line_206 | la_alt2d3_s-eor | 0.979 | 1.083 | 0.104 | 0.9 | 1.05 | 0.05 line SERRANO to VALLEYSC 500 ck 1 |
| 24142 | SYC CYN | 230 | 24 | 240 | line_086 | la_alt2d3_s-eor | 1.022 | 1.091 | 0.069 | 0.9 | 1.05 | 0.05 line MAGUNDEN to OMAR 230 ck 1 |
| 25613 | EDMONSTN | 230 | 24 | 256 | line_122 | la_alt2d3_s-eor | 1.009 | 1.091 | 0.082 | 0.9 | 1.05 | 0.05 line PASTORIA to EDMONSTN 230 ck 1 |
| 24142 | SYC CYN | 230 | 24 | 240 | line_140 | la_alt2d3_s-eor | 1.022 | 1.091 | 0.069 | 0.9 | 1.05 | 0.05 line SYC CYN to OMAR 230 ck 1 |
| 24229 | VALLEY-S | 115 | 24 | 240 | line_206 | la_alt2d3_s-eor | 0.991 | 1.091 | 0.1 | 0.9 | 1.05 | 0.05 line SERRANO to VALLEYSC 500 ck 1 |
| 25991 | VALYSVC2 | 115 | 24 | 240 | line_206 | la_alt2d3_s-eor | 0.991 | 1.091 | 0.1 | 0.9 | 1.05 | 0.05 line SERRANO to VALLEYSC 500 ck 1 |
| 24151 | VALLEYSC | 500 | 24 | 240 | line_206 | la_alt2d3_s-eor | 1.007 | 1.108 | 0.101 | 0.9 | 1.05 | 0.05 line SERRANO to VALLEYSC 500 ck 1 |
| 24997 | VALYSVC1 | 500 | 24 | 240 | line_206 | la_alt2d3_s-eor | 1.007 | 1.108 | 0.101 | 0.9 | 1.05 | 0.05 line SERRANO to VALLEYSC 500 ck 1 |
| 28040 | C8040 | 500 | 24 | 240 | line_206 | la_alt2d3_s-eor | 1.007 | 1.108 | 0.101 | 0.9 | 1.05 | 0.05 line SERRANO to VALLEYSC 500 ck 1 |

la_alt2d3_s-eor.sav
FLOW Summary
N-1 Outages

| LEGEND | % of RATING 1 | |
|---|---|---|
| C_pu | 100% - 110% | |
| C_pu | 110% - 120% | P.U. of |
| C_pu | > 120% | Rate 1 |

| FROM | FR | BKV | TO | TO | BKV | CK | Outage_Name | Case | Rate-Mva | Pflow | Qflow | Amps | MVA | C_pu | B_pu | Contingency_Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24142 | SYC CYN | 230 | 24101 | OMAR | 230 | 1 | line_086 | la_alt2d3_s-eor | 643 | 728.3 | 5514.1 | 12798.5 | 5562 | 7.93 | 0.428 | line MAGUNDEN to OMAR 230 ck 1 |
| 24781 | NAVYCOSO | 230 | 24706 | BLM EAST | 230 | 1 | line_173 | la_alt2d3_s-eor | 1287 | -153.1 | -3160.7 | 7943.4 | 3164.4 | 2.459 | 0.056 | line BLM EAST to BLM WEST 230 ck 1 |
| 24781 | NAVYCOSO | 230 | 24706 | BLM EAST | 230 | 1 | line_174 | la_alt2d3_s-eor | 1287 | -153.1 | -3160.7 | 7943.4 | 3164.4 | 2.459 | 0.056 | line BLM WEST to KRAMER 230 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_175 | la_alt2d3_s-eor | 56 | -106.6 | 4.7 | 546.5 | 106.7 | 1.91 | 0.92 | line INYO to COTTONWD 230 ck 1 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_001 | la_alt2d3_s-eor | 1411.6 | 2709.6 | 611.5 | 3027.4 | 2777.7 | 1.88 | 1.205 | line MOENKOPI to ELDORDO 500 ck 1 |
| 24999 | DEVRSVC1 | 500 | 24801 | DEVERS | 500 | 1 | line_206 | la_alt2d3_s-eor | 387.5 | 0 | 662 | 727.8 | 662 | 1.627 | 1.551 | line SERRANO to VALLEYSC 500 ck 1 |
| 24999 | DEVRSVC1 | 500 | 24801 | DEVERS | 500 | 1 | PV1 | la_alt2d3_s-eor | 387.5 | 0 | 652.6 | 722.6 | 652.6 | 1.615 | 1.551 | gen PALOVRD1 24.00 |
| 24999 | DEVRSVC1 | 500 | 24801 | DEVERS | 500 | 1 | line_079 | la_alt2d3_s-eor | 387.5 | 0 | 576.4 | 679.1 | 576.4 | 1.518 | 1.551 | line LUGO to MOHAVE 500 ck 1 |
| 24999 | DEVRSVC1 | 500 | 24801 | DEVERS | 500 | 1 | line_047 | la_alt2d3_s-eor | 387.5 | 0 | 566.5 | 673.3 | 566.5 | 1.505 | 1.551 | line ELDORDO to LUGO 500 ck 1 |
| 24999 | DEVRSVC1 | 500 | 24801 | DEVERS | 500 | 1 | line_001 | la_alt2d3_s-eor | 387.5 | 0 | 557.6 | 667.9 | 557.6 | 1.493 | 1.551 | line MOENKOPI to ELDORDO 500 ck 1 |
| 24999 | DEVRSVC1 | 500 | 24801 | DEVERS | 500 | 1 | line_84 | la_alt2d3_s-eor | 387.5 | 0 | 553.1 | 665.3 | 553.1 | 1.487 | 1.551 | line MIDPINTS to DEVERS 500 ck 1 |
| 24999 | DEVRSVC1 | 500 | 24801 | DEVERS | 500 | 1 | line_85 | la_alt2d3_s-eor | 387.5 | 0 | 553.4 | 665.4 | 553.4 | 1.487 | 1.551 | line MIDPINTS to DEVERS 500 ck 2 |
| 24999 | DEVRSVC1 | 500 | 24801 | DEVERS | 500 | 1 | B2_003 | la_alt2d3_s-eor | 387.5 | 0 | 541 | 657.9 | 541 | 1.47 | 1.551 | N.GILA - IMPRLVLY 1 500kV |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_202 | la_alt2d3_s-eor | 56 | 79.7 | -5.6 | 402 | 79.9 | 1.44 | 0.92 | line OWENSCON to INYO 230 ck 1 |
| 22464 | MIGUEL | 230 | 22472 | MIGUELMP | 500 | 1 | ML81 | la_alt2d3_s-eor | 1120 | -1489.8 | 225.9 | 3931.8 | 1506.8 | 1.35 | 0.78 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 24900 | MIDPINTS | 500 | 24801 | DEVERS | 500 | 2 | line_84 | la_alt2d3_s-eor | 2338 | 3070.9 | 488.5 | 3616.2 | 3109.5 | 1.341 | 0.761 | line MIDPINTS to DEVERS 500 ck 1 |
| 24900 | MIDPINTS | 500 | 24801 | DEVERS | 500 | 1 | line_85 | la_alt2d3_s-eor | 2338 | 3071.4 | 488.9 | 3617 | 3110 | 1.341 | 0.761 | line MIDPINTS to DEVERS 500 ck 2 |
| 22468 | MIGUEL | 500 | 22472 | MIGUELMP | 500 | 1 | ML81 | la_alt2d3_s-eor | 1120 | 1492.7 | 55 | 1722.5 | 1493.7 | 1.34 | 0.78 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 22464 | MIGUEL | 230 | 22468 | MIGUEL | 500 | 1 | ML80 | la_alt2d3_s-eor | 1120 | -1470.1 | 226.1 | 3882.6 | 1487.4 | 1.33 | 0.74 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_206 | la_alt2d3_s-eor | 1411.6 | 1881.6 | 321.2 | 2112.7 | 1908.8 | 1.314 | 1.205 | line SERRANO to VALLEYSC 500 ck 1 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | B2_003 | la_alt2d3_s-eor | 1411.6 | 1873.7 | 307.2 | 2101.3 | 1898.8 | 1.306 | 1.205 | N.GILA - IMPRLVLY 1 500kV |
| 19038 | MEAD | 500 | 15034 | PERKINS | 500 | 1 | line_001 | la_alt2d3_s-eor | 1238.4 | -1556.8 | 276.1 | 1836.8 | 1581.1 | 1.292 | 1.011 | line MOENKOPI to ELDORDO 500 ck 1 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_84 | la_alt2d3_s-eor | 1411.6 | 1849.8 | 290.9 | 2047.2 | 1872.5 | 1.273 | 1.205 | line MIDPINTS to DEVERS 500 ck 1 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_85 | la_alt2d3_s-eor | 1411.6 | 1849.8 | 290.8 | 2047.1 | 1872.5 | 1.273 | 1.205 | line MIDPINTS to DEVERS 500 ck 2 |
| 15034 | PERKINS | 500 | 15031 | PERK PS1 | 500 | 1 | line_001 | la_alt2d3_s-eor | 650 | -803.9 | -31.5 | 923.7 | 804.5 | 1.26 | 1 | line MOENKOPI to ELDORDO 500 ck 1 |
| 15034 | PERKINS | 500 | 15032 | PERK PS2 | 500 | 1 | line_001 | la_alt2d3_s-eor | 650 | -803.9 | -31.5 | 923.7 | 804.5 | 1.26 | 1 | line MOENKOPI to ELDORDO 500 ck 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_206 | la_alt2d3_s-eor | 1645.4 | 1942.8 | 344.1 | 2209.9 | 1973 | 1.168 | 1.062 | line SERRANO to VALLEYSC 500 ck 1 |
| 19038 | MEAD | 500 | 15034 | PERKINS | 500 | 1 | line_206 | la_alt2d3_s-eor | 1238.4 | -1409.6 | 177.8 | 1660.2 | 1420.7 | 1.165 | 1.011 | line SERRANO to VALLEYSC 500 ck 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | B2_003 | la_alt2d3_s-eor | 1645.4 | 1931.8 | 325.9 | 2194 | 1959.1 | 1.159 | 1.062 | N.GILA - IMPRLVLY 1 500kV |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | B2_003 | la_alt2d3_s-eor | 2598 | 2837.7 | 258.9 | 3465.5 | 2849.5 | 1.155 | 1.074 | N.GILA - IMPRLVLY 1 500kV |
| 19038 | MEAD | 500 | 15034 | PERKINS | 500 | 1 | B2_003 | la_alt2d3_s-eor | 1238.4 | -1394.7 | 196 | 1642.5 | 1408.4 | 1.154 | 1.011 | N.GILA - IMPRLVLY 1 500kV |
| 24806 | MIRAGE | 230 | 24807 | MIRAGE | 115 | 2 | tran_238 | la_alt2d3_s-eor | 280 | 319.7 | 22.5 | 818.4 | 320.5 | 1.15 | 0.58 | tran MIRAGE 230 to MIRAGE 115 ck 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_001 | la_alt2d3_s-eor | 2598 | 2868.7 | 237.1 | 3448.2 | 2878.5 | 1.149 | 1.074 | line MOENKOPI to ELDORDO 500 ck 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_183 | la_alt2d3_s-eor | 2598 | 2945.9 | 294.6 | 3437.7 | 2960.6 | 1.146 | 1.074 | line DEVERS to VSTA 230 ck 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_185 | la_alt2d3_s-eor | 2598 | 2945.9 | 294.6 | 3437.7 | 2960.6 | 1.146 | 1.074 | line VSTA to DEVERS 230 ck 1 |
| 22356 | IMPRLVLY | 230 | 22360 | IMPRLVLY | 500 | 1 | IV81 | la_alt2d3_s-eor | 600 | 639.3 | 241.9 | 1737.6 | 683.5 | 1.14 | 0.51 | tran IMPRLVLY 230 to IMPRLVLY 500 ck 2 |
| 24729 | INYO | 230 | 24730 | INYO PS | 115 | 1 | line_175 | la_alt2d3_s-eor | 50 | 53.3 | 19.5 | 136.6 | 56.8 | 1.14 | 0.53 | line INYO to COTTONWD 230 ck 1 |
| 24729 | INYO | 230 | 24730 | INYO PS | 115 | 2 | line_175 | la_alt2d3_s-eor | 50 | 53.3 | 19.5 | 136.6 | 56.8 | 1.14 | 0.53 | line INYO to COTTONWD 230 ck 1 |
| 15034 | PERKINS | 500 | 15031 | PERK PS1 | 500 | 1 | line_206 | la_alt2d3_s-eor | 650 | -725.6 | -36.8 | 832.9 | 726.5 | 1.14 | 1 | line SERRANO to VALLEYSC 500 ck 1 |
| 15034 | PERKINS | 500 | 15032 | PERK PS2 | 500 | 1 | line_206 | la_alt2d3_s-eor | 650 | -725.6 | -36.8 | 832.9 | 726.5 | 1.14 | 1 | line SERRANO to VALLEYSC 500 ck 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_135 | la_alt2d3_s-eor | 2598 | 2919.2 | 271.1 | 3410.3 | 2931.8 | 1.137 | 1.074 | line SANBRDNO to DEVERS 230 ck 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_047 | la_alt2d3_s-eor | 2598 | 2840.9 | 248.4 | 3389.1 | 2851.7 | 1.13 | 1.074 | line ELDORDO to LUGO 500 ck 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_84 | la_alt2d3_s-eor | 1645.4 | 1906.5 | 298 | 2135 | 1929.7 | 1.127 | 1.062 | line MIDPINTS to DEVERS 500 ck 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_85 | la_alt2d3_s-eor | 1645.4 | 1906.5 | 297.8 | 2134.8 | 1929.6 | 1.127 | 1.062 | line MIDPINTS to DEVERS 500 ck 2 |
| 15034 | PERKINS | 500 | 15031 | PERK PS1 | 500 | 1 | B2_003 | la_alt2d3_s-eor | 650 | -717.7 | -24 | 825.3 | 718.1 | 1.12 | 1 | N.GILA - IMPRLVLY 1 500kV |
| 15034 | PERKINS | 500 | 15032 | PERK PS2 | 500 | 1 | B2_003 | la_alt2d3_s-eor | 650 | -717.7 | -24 | 825.3 | 718.1 | 1.12 | 1 | N.GILA - IMPRLVLY 1 500kV |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_302 | la_alt2d3_s-eor | 2598 | 2883.7 | 244.4 | 3361.1 | 2894 | 1.12 | 1.074 | line DEVERS to OAK_VLLY 230 ck 1 |
| 19038 | MEAD | 500 | 15034 | PERKINS | 500 | 1 | line_84 | la_alt2d3_s-eor | 1238.4 | -1356 | 192.7 | 1576.1 | 1369.7 | 1.109 | 1.011 | line MIDPINTS to DEVERS 500 ck 1 |
| 19038 | MEAD | 500 | 15034 | PERKINS | 500 | 1 | line_85 | la_alt2d3_s-eor | 1238.4 | -1355.9 | 192.8 | 1575.9 | 1369.6 | 1.109 | 1.011 | line MIDPINTS to DEVERS 500 ck 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_079 | la_alt2d3_s-eor | 2598 | 2814.6 | 234.7 | 3327.8 | 2824.4 | 1.109 | 1.074 | line LUGO to MOHAVE 500 ck 1 |
| 24723 | CONTROL | 115 | 24731 | INYOKERN | 115 | 1 | line_175 | la_alt2d3_s-eor | 82.7 | 89.1 | -5.9 | 460 | 89.3 | 1.108 | 0.315 | line INYO to COTTONWD 230 ck 1 |
| 24723 | CONTROL | 115 | 24731 | INYOKERN | 115 | 2 | line_175 | la_alt2d3_s-eor | 82.7 | 89.1 | -5.9 | 460 | 89.3 | 1.108 | 0.315 | line INYO to COTTONWD 230 ck 1 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_103 | la_alt2d3_s-eor | 2598 | 2825.8 | 205.4 | 3316.6 | 2833.3 | 1.106 | 1.074 | line MOHAVE to ELDORDO 500 ck 1 |
| 24016 | BARRE | 230 | 25201 | LEWIS | 230 | 1 | line_024 | la_alt2d3_s-eor | 1195 | -1218.9 | 315.4 | 3308.4 | 1259.1 | 1.103 | 0.719 | line BARRE to VILLA PK 230 ck 1 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | PV1 | la_alt2d3_s-eor | 1411.6 | 1639.7 | 148.2 | 1759.4 | 1646.4 | 1.092 | 1.205 | gen PALOVRD1 24.00 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | ML80 | la_alt2d3_s-eor | 1120 | -1217.4 | -28.1 | 3121.8 | 1217.7 | 1.09 | 1 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 24155 | VINCENT | 230 | 24401 | ANTELOPE | 230 | 1 | line_086 | la_alt2d3_s-eor | 458 | 480.2 | -97.1 | 1248.7 | 489.9 | 1.086 | 0.767 | line MAGUNDEN to OMAR 230 ck 1 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | B2_003 | la_alt2d3_s-eor | 800 | 845.1 | 37.8 | 2170.3 | 845.9 | 1.081 | 0.792 | N.GILA - IMPRLVLY 1 500kV |
| 15034 | PERKINS | 500 | 15031 | PERK PS1 | 500 | 1 | line_84 | la_alt2d3_s-eor | 650 | -696.8 | -9.1 | 793.1 | 696.9 | 1.08 | 1 | line MIDPINTS to DEVERS 500 ck 1 |
| 15034 | PERKINS | 500 | 15032 | PERK PS2 | 500 | 1 | line_84 | la_alt2d3_s-eor | 650 | -696.8 | -9.1 | 793.1 | 696.9 | 1.08 | 1 | line MIDPINTS to DEVERS 500 ck 1 |
| 15034 | PERKINS | 500 | 15031 | PERK PS1 | 500 | 1 | line_85 | la_alt2d3_s-eor | 650 | -696.8 | -9.1 | 793 | 696.8 | 1.08 | 1 | line MIDPINTS to DEVERS 500 ck 2 |
| 15034 | PERKINS | 500 | 15032 | PERK PS2 | 500 | 1 | line_85 | la_alt2d3_s-eor | 650 | -696.8 | -9.1 | 793 | 696.8 | 1.08 | 1 | line MIDPINTS to DEVERS 500 ck 2 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | ML81 | la_alt2d3_s-eor | 1120 | -1208.3 | -29.1 | 3095.8 | 1208.6 | 1.08 | 1 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | B2_022 | la_alt2d3_s-eor | 1120 | -1197.6 | -32.8 | 3096.7 | 1198.1 | 1.07 | 1 | OTAYMESA - TJI-230 1 230kV |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | B2_028 | la_alt2d3_s-eor | 1120 | -1196 | -21.9 | 3048.9 | 1196.2 | 1.07 | 1 | MIGUEL - SYCAMORE 1 230kV |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | line_206 | la_alt2d3_s-eor | 1120 | -1193.3 | -56.4 | 3158.7 | 1194.6 | 1.07 | 1 | line SERRANO to VALLEYSC 500 ck 1 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | SO2 | la_alt2d3_s-eor | 1120 | -1175.1 | -83.9 | 3168.7 | 1178.1 | 1.06 | 1 | gen S.ONOFR2 22.00 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_169 | la_alt2d3_s-eor | 56 | 58.7 | -4.6 | 291.5 | 58.9 | 1.06 | 0.92 | line KRAMER to LUGO 230 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_170 | la_alt2d3_s-eor | 56 | 58.7 | -4.6 | 291.5 | 58.9 | 1.06 | 0.92 | line KRAMER to LUGO 230 ck 2 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_56 | la_alt2d3_s-eor | 800 | 805.1 | 152.5 | 2108.5 | 819.4 | 1.051 | 0.792 | line NEWSF500 to IMPRLVLY 500 ck 1 |
| 24805 | DEVERS | 115 | 24804 | DEVERS | 230 | 1 | tran_236 | la_alt2d3_s-eor | 280 | 254 | -101.5 | 1420.5 | 273.5 | 1.05 | 0.67 | tran DEVERS 115 to DEVERS 230 ck 3 |
| 24805 | DEVERS | 115 | 24804 | DEVERS | 230 | 1 | tran_237 | la_alt2d3_s-eor | 280 | 252.5 | -100.8 | 1410.9 | 271.9 | 1.05 | 0.67 | tran DEVERS 115 to DEVERS 230 ck 4 |
| 8601 | GEOSUB2 | 230 | 8300 | BANIS230 | 230 | 1 | line_22 | la_alt2d3_s-eor | 550 | 572.9 | 45.9 | 1445.2 | 574.7 | 1.047 | 0.769 | line GEOSUB1 to BANIS230 230 ck 1 |
| 8601 | GEOSUB2 | 230 | 8300 | BANIS230 | 230 | 1 | line_23 | la_alt2d3_s-eor | 550 | 572.9 | 45.9 | 1445.2 | 574.7 | 1.047 | 0.769 | line GEOSUB1 to BANIS230 230 ck 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_29 | la_alt2d3_s-eor | 2598 | 2743.2 | 135.6 | 3130 | 2746.5 | 1.043 | 1.074 | line HIGHLINE to COLCT3 230 ck 1 |
| 24805 | DEVERS | 115 | 24804 | DEVERS | 230 | 3 | tran_235 | la_alt2d3_s-eor | 280 | 251 | -100.7 | 1406.8 | 270.4 | 1.04 | 0.66 | tran DEVERS 115 to DEVERS 230 ck 1 |
| 25641 | TAP816 | 115 | 25664 | TAP998 | 115 | 1 | B2_003 | la_alt2d3_s-eor | 107.6 | -96.3 | 41.8 | 559.4 | 105 | 1.036 | 0.982 | N.GILA - IMPRLVLY 1 500kV |
| 25641 | TAP816 | 115 | 25644 | TAP818 | 115 | 1 | B2_003 | la_alt2d3_s-eor | 107.6 | 96.3 | -41 | 557.8 | 104.7 | 1.033 | 0.979 | N.GILA - IMPRLVLY 1 500kV |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_047 | la_alt2d3_s-eor | 1645.4 | 1745 | 305.4 | 1944.8 | 1771.6 | 1.031 | 1.062 | line ELDORDO to LUGO 500 ck 1 |
| 24804 | DEVERS | 230 | 24901 | VSTA | 230 | 2 | line_206 | la_alt2d3_s-eor | 988 | 962.8 | 315.5 | 2549.7 | 1013.2 | 1.03 | 0.732 | line SERRANO to VALLEYSC 500 ck 1 |
| 24901 | VSTA | 230 | 24804 | DEVERS | 230 | 1 | line_206 | la_alt2d3_s-eor | 988 | -918.5 | 154 | 2553.3 | 931.4 | 1.03 | 0.732 | line SERRANO to VALLEYSC 500 ck 1 |
| 24805 | DEVERS | 115 | 24804 | DEVERS | 230 | 4 | tran_235 | la_alt2d3_s-eor | 280 | 248 | -99.5 | 1390.4 | 267.3 | 1.03 | 0.65 | tran DEVERS 115 to DEVERS 230 ck 1 |
| 25641 | TAP816 | 115 | 25664 | TAP998 | 115 | 1 | line_001 | la_alt2d3_s-eor | 107.6 | -96.4 | 41.7 | 554.5 | 105 | 1.027 | 0.982 | line MOENKOPI to ELDORDO 500 ck 1 |
| 25641 | TAP816 | 115 | 25664 | TAP998 | 115 | 1 | line_84 | la_alt2d3_s-eor | 107.6 | -96.4 | 41.7 | 553 | 105 | 1.024 | 0.982 | line MIDPINTS to DEVERS 500 ck 1 |
| 25641 | TAP816 | 115 | 25664 | TAP998 | 115 | 1 | line_85 | la_alt2d3_s-eor | 107.6 | -96.4 | 41.7 | 552.8 | 105 | 1.024 | 0.982 | line MIDPINTS to DEVERS 500 ck 2 |
| 25641 | TAP816 | 115 | 25644 | TAP818 | 115 | 1 | line_001 | la_alt2d3_s-eor | 107.6 | 96.4 | -41 | 553 | 104.7 | 1.024 | 0.979 | line MOENKOPI to ELDORDO 500 ck 1 |
| 25641 | TAP816 | 115 | 25664 | TAP998 | 115 | 1 | tran_235 | la_alt2d3_s-eor | 107.6 | -96.4 | 41.7 | 552.8 | 105 | 1.024 | 0.982 | tran DEVERS 115 to DEVERS 230 ck 1 |
| 25641 | TAP816 | 115 | 25664 | TAP998 | 115 | 1 | tran_236 | la_alt2d3_s-eor | 107.6 | -96.4 | 41.7 | 551.8 | 105 | 1.022 | 0.982 | tran DEVERS 115 to DEVERS 230 ck 3 |
| 25641 | TAP816 | 115 | 25644 | TAP818 | 115 | 1 | line_84 | la_alt2d3_s-eor | 107.6 | 96.4 | -41 | 551.4 | 104.7 | 1.021 | 0.979 | line MIDPINTS to DEVERS 500 ck 1 |
| 25641 | TAP816 | 115 | 25644 | TAP818 | 115 | 1 | line_85 | la_alt2d3_s-eor | 107.6 | 96.4 | -41 | 551.3 | 104.7 | 1.021 | 0.979 | line MIDPINTS to DEVERS 500 ck 2 |
| 25641 | TAP816 | 115 | 25664 | TAP998 | 115 | 1 | tran_237 | la_alt2d3_s-eor | 107.6 | -96.4 | 41.7 | 551.3 | 105 | 1.021 | 0.982 | tran DEVERS 115 to DEVERS 230 ck 4 |
| 25641 | TAP816 | 115 | 25644 | TAP818 | 115 | 1 | tran_235 | la_alt2d3_s-eor | 107.6 | 96.4 | -41 | 551.2 | 104.7 | 1.02 | 0.979 | tran DEVERS 115 to DEVERS 230 ck 1 |
| 24805 | DEVERS | 115 | 24804 | DEVERS | 230 | 4 | tran_236 | la_alt2d3_s-eor | 280 | 245.1 | -98 | 1370.9 | 264 | 1.02 | 0.65 | tran DEVERS 115 to DEVERS 230 ck 3 |
| 24805 | DEVERS | 115 | 24804 | DEVERS | 230 | 3 | tran_237 | la_alt2d3_s-eor | 280 | 246.6 | -98.4 | 1377.7 | 265.5 | 1.02 | 0.66 | tran DEVERS 115 to DEVERS 230 ck 4 |
| 25641 | TAP816 | 115 | 25664 | TAP998 | 115 | 1 | line_047 | la_alt2d3_s-eor | 107.6 | -96.4 | 41.7 | 550 | 105 | 1.019 | 0.982 | line ELDORDO to LUGO 500 ck 1 |
| 25641 | TAP816 | 115 | 25644 | TAP818 | 115 | 1 | tran_236 | la_alt2d3_s-eor | 107.6 | 96.4 | -41 | 550.3 | 104.7 | 1.019 | 0.979 | tran DEVERS 115 to DEVERS 230 ck 3 |
| 25641 | TAP816 | 115 | 25644 | TAP818 | 115 | 1 | tran_237 | la_alt2d3_s-eor | 107.6 | 96.4 | -41 | 549.8 | 104.7 | 1.018 | 0.979 | tran DEVERS 115 to DEVERS 230 ck 4 |
| 25641 | TAP816 | 115 | 25644 | TAP818 | 115 | 1 | line_047 | la_alt2d3_s-eor | 107.6 | 96.4 | -40.9 | 548.5 | 104.7 | 1.015 | 0.979 | line ELDORDO to LUGO 500 ck 1 |
| 24701 | KRAMER | 230 | 24085 | LUGO | 230 | 2 | line_169 | la_alt2d3_s-eor | 478 | 483.5 | 54.7 | 1214.8 | 486.6 | 1.012 | 0.603 | line KRAMER to LUGO 230 ck 1 |
| 24701 | KRAMER | 230 | 24085 | LUGO | 230 | 1 | line_170 | la_alt2d3_s-eor | 478 | 483.5 | 54.7 | 1214.8 | 486.6 | 1.012 | 0.603 | line KRAMER to LUGO 230 ck 2 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | IV81 | la_alt2d3_s-eor | 388 | -383.2 | 2.7 | 984.9 | 383.2 | 1.011 | 0.904 | tran IMPRLVLY 230 to IMPRLVLY 500 ck 2 |
| 24151 | VALLEYSC | 500 | 24160 | VALLEYSC | 115 | 2 | tran_247 | la_alt2d3_s-eor | 560 | 541 | 168.4 | 657.7 | 566.6 | 1.01 | 0.49 | tran VALLEYSC 500 to VALLEYSC 115 ck 1 |
| 24151 | VALLEYSC | 500 | 24160 | VALLEYSC | 115 | 1 | tran_248 | la_alt2d3_s-eor | 560 | 541 | 168.4 | 657.7 | 566.6 | 1.01 | 0.49 | tran VALLEYSC 500 to VALLEYSC 115 ck 2 |
| 24805 | DEVERS | 115 | 25644 | TAP818 | 115 | 1 | B2_003 | la_alt2d3_s-eor | 217 | -183.4 | 99.9 | 1099 | 208.8 | 1.009 | 0.953 | N.GILA - IMPRLVLY 1 500kV |
| 8600 | GEOSUB1 | 230 | 8300 | BANIS230 | 230 | 1 | line_47 | la_alt2d3_s-eor | 550 | 550.7 | 43.5 | 1390 | 552.5 | 1.007 | 0.712 | line GEOSUB2 to BANIS230 230 ck 1 |
| 8600 | GEOSUB1 | 230 | 8300 | BANIS230 | 230 | 2 | line_47 | la_alt2d3_s-eor | 550 | 550.7 | 43.5 | 1390 | 552.5 | 1.007 | 0.712 | line GEOSUB2 to BANIS230 230 ck 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_84 | la_alt2d3_s-eor | 2598 | 2502.4 | 7.7 | 3009.8 | 2502.4 | 1.003 | 1.074 | line MIDPINTS to DEVERS 500 ck 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_85 | la_alt2d3_s-eor | 2598 | 2502.7 | 7.9 | 3009.4 | 2502.7 | 1.003 | 1.074 | line MIDPINTS to DEVERS 500 ck 2 |
| 24093 | MIRALOMW | 230 | 24158 | WALNUT | 230 | 1 | line_197 | la_alt2d3_s-eor | 797 | 761.9 | 38 | 2006.2 | 762.9 | 1.003 | 0.717 | line MIRALOME to OLINDA 230 ck 1 |
| 24805 | DEVERS | 115 | 25644 | TAP818 | 115 | 1 | line_001 | la_alt2d3_s-eor | 217 | -183.5 | 99.4 | 1088.8 | 208.6 | 1 | 0.953 | line MOENKOPI to ELDORDO 500 ck 1 |
| 24805 | DEVERS | 115 | 25644 | TAP818 | 115 | 1 | line_84 | la_alt2d3_s-eor | 217 | -183.5 | 99.2 | 1085.5 | 208.6 | 0.997 | 0.953 | line MIDPINTS to DEVERS 500 ck 1 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24805 | DEVERS | 115 | 25644 | TAP818 | 115 | 1 | line_85 | la_alt2d3_s-eor | 217 | -183.5 | 99.2 | 1085.2 | 208.6 | 0.997 | 0.953 | line MIDPINTS to DEVERS 500 ck 2 |
| 8600 | GEOSUB1 | 230 | 8300 | BANIS230 | 230 | 2 | line_22 | la_alt2d3_s-eor | 550 | 545.1 | 44.2 | 1374.8 | 546.9 | 0.996 | 0.712 | line GEOSUB1 to BANIS230 230 ck 1 |
| 8600 | GEOSUB1 | 230 | 8300 | BANIS230 | 230 | 1 | line_23 | la_alt2d3_s-eor | 550 | 545.1 | 44.2 | 1374.8 | 546.9 | 0.996 | 0.712 | line GEOSUB1 to BANIS230 230 ck 2 |
| 24805 | DEVERS | 115 | 25644 | TAP818 | 115 | 1 | tran_235 | la_alt2d3_s-eor | 217 | -183.5 | 99.2 | 1085.1 | 208.6 | 0.996 | 0.953 | tran DEVERS 115 to DEVERS 230 ck 1 |
| 24016 | BARRE | 230 | 24154 | VILLA PK | 230 | 1 | line_025 | la_alt2d3_s-eor | 1195 | -1099.2 | 290.8 | 2984.2 | 1137.1 | 0.995 | 0.517 | line BARRE to LEWIS 230 ck 1 |
| 24805 | DEVERS | 115 | 25644 | TAP818 | 115 | 1 | tran_236 | la_alt2d3_s-eor | 217 | -183.5 | 99.1 | 1083 | 208.5 | 0.995 | 0.953 | tran DEVERS 115 to DEVERS 230 ck 3 |
| 24805 | DEVERS | 115 | 25644 | TAP818 | 115 | 1 | tran_237 | la_alt2d3_s-eor | 217 | -183.5 | 99 | 1082.1 | 208.5 | 0.994 | 0.953 | tran DEVERS 115 to DEVERS 230 ck 4 |
| 24805 | DEVERS | 115 | 25644 | TAP818 | 115 | 1 | line_047 | la_alt2d3_s-eor | 217 | -183.5 | 98.9 | 1079.3 | 208.5 | 0.991 | 0.953 | line ELDORDO to LUGO 500 ck 1 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | SO2 | la_alt2d3_s-eor | 388 | -368.2 | -8.3 | 961.8 | 368.3 | 0.987 | 0.904 | gen S.ONOFR2 22.00 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | line_206 | la_alt2d3_s-eor | 388 | -370 | 3.6 | 959.4 | 370 | 0.985 | 0.904 | line SERRANO to VALLEYSC 500 ck 1 |
| 19038 | MEAD | 500 | 15034 | PERKINS | 500 | 1 | line_29 | la_alt2d3_s-eor | 1238.4 | -1229.1 | 151.6 | 1390.6 | 1238.4 | 0.98 | 1.011 | line HIGHLINE to COLCT3 230 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | tran_210 | la_alt2d3_s-eor | 56 | 54.2 | -4.5 | 267.8 | 54.3 | 0.98 | 0.92 | tran LUGO 500 to LUGO 230 ck 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | tran_211 | la_alt2d3_s-eor | 56 | 54.2 | -4.5 | 268.1 | 54.4 | 0.98 | 0.92 | tran LUGO 500 to LUGO 230 ck 2 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | line_29 | la_alt2d3_s-eor | 1120 | -1080.8 | -35.7 | 2716.3 | 1081.4 | 0.97 | 1 | line HIGHLINE to COLCT3 230 ck 1 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | line_56 | la_alt2d3_s-eor | 388 | -367.9 | 5.7 | 944.9 | 367.9 | 0.97 | 0.904 | line NEWSF500 to IMPRLVLY 500 ck 1 |
| 15034 | PERKINS | 500 | 15031 | PERK PS1 | 500 | 1 | line_079 | la_alt2d3_s-eor | 650 | -623.7 | -9.4 | 702.7 | 623.8 | 0.97 | 1 | line LUGO to MOHAVE 500 ck 1 |
| 15034 | PERKINS | 500 | 15032 | PERK PS2 | 500 | 1 | line_079 | la_alt2d3_s-eor | 650 | -623.7 | -9.4 | 702.7 | 623.8 | 0.97 | 1 | line LUGO to MOHAVE 500 ck 1 |
| 15034 | PERKINS | 500 | 15031 | PERK PS1 | 500 | 1 | line_103 | la_alt2d3_s-eor | 650 | -623.2 | -7 | 701.1 | 623.3 | 0.97 | 1 | line MOHAVE to ELDORDO 500 ck 1 |
| 15034 | PERKINS | 500 | 15032 | PERK PS2 | 500 | 1 | line_103 | la_alt2d3_s-eor | 650 | -623.2 | -7 | 701.1 | 623.3 | 0.97 | 1 | line MOHAVE to ELDORDO 500 ck 1 |
| 25629 | TAP813 | 115 | 25630 | TAP814 | 115 | 1 | B2_003 | la_alt2d3_s-eor | 82.7 | 69.9 | -28.8 | 401 | 75.6 | 0.966 | 0.913 | N.GILA - IMPRLVLY 1 500kV |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | ML80 | la_alt2d3_s-eor | 388 | -364.5 | 8.5 | 937 | 364.6 | 0.962 | 0.904 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 19038 | MEAD | 500 | 15034 | PERKINS | 500 | 1 | line_047 | la_alt2d3_s-eor | 1238.4 | -1190.5 | 98.3 | 1369.8 | 1194.5 | 0.961 | 1.011 | line ELDORDO to LUGO 500 ck 1 |
| 20238 | HRD-230 | 230 | 20239 | HRD-115 | 115 | 1 | IV81 | la_alt2d3_s-eor | 225 | 215.5 | -17.7 | 554.1 | 216.2 | 0.96 | 0.88 | tran IMPRLVLY 230 to IMPRLVLY 500 ck 2 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_086 | la_alt2d3_s-eor | 56 | 53 | -4.9 | 262.4 | 53.2 | 0.96 | 0.92 | line MAGUNDEN to OMAR 230 ck 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | PV1 | la_alt2d3_s-eor | 2598 | 2595.5 | 50.1 | 2874.4 | 2596 | 0.958 | 1.074 | gen PALOVRD1 24.00 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | ML81 | la_alt2d3_s-eor | 388 | -362.5 | 8.9 | 931.8 | 362.6 | 0.957 | 0.904 | tran MIGUEL 230 to MIGUELMP 500 ck 1 |
| 25629 | TAP813 | 115 | 25630 | TAP814 | 115 | 1 | line_001 | la_alt2d3_s-eor | 82.7 | 69.9 | -28.7 | 397.4 | 75.6 | 0.957 | 0.913 | line MOENKOPI to ELDORDO 500 ck 1 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 2 | line_136 | la_alt2d3_s-eor | 1195 | 1074 | -76.2 | 2863.7 | 1076.7 | 0.955 | 0.575 | line SERRANO to VILLA PK 230 ck 1 |
| 25629 | TAP813 | 115 | 25630 | TAP814 | 115 | 1 | line_84 | la_alt2d3_s-eor | 82.7 | 69.9 | -28.7 | 396.2 | 75.6 | 0.954 | 0.913 | line MIDPINTS to DEVERS 500 ck 1 |
| 25629 | TAP813 | 115 | 25630 | TAP814 | 115 | 1 | line_85 | la_alt2d3_s-eor | 82.7 | 69.9 | -28.7 | 396.1 | 75.6 | 0.954 | 0.913 | line MIDPINTS to DEVERS 500 ck 2 |
| 25629 | TAP813 | 115 | 25630 | TAP814 | 115 | 1 | tran_235 | la_alt2d3_s-eor | 82.7 | 69.9 | -28.7 | 396.1 | 75.6 | 0.954 | 0.913 | tran DEVERS 115 to DEVERS 230 ck 1 |
| 24042 | ELDORDO | 500 | 24086 | LUGO | 500 | 1 | line_103 | la_alt2d3_s-eor | 1386 | 1318.1 | 32 | 1524.9 | 1318.5 | 0.953 | 0.819 | line MOHAVE to ELDORDO 500 ck 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | PV1 | la_alt2d3_s-eor | 1645.4 | 1675.5 | 148.1 | 1807.6 | 1682 | 0.952 | 1.062 | gen PALOVRD1 24.00 |
| 25629 | TAP813 | 115 | 25630 | TAP814 | 115 | 1 | tran_236 | la_alt2d3_s-eor | 82.7 | 69.9 | -28.7 | 395.4 | 75.6 | 0.952 | 0.913 | tran DEVERS 115 to DEVERS 230 ck 3 |
| 25629 | TAP813 | 115 | 25630 | TAP814 | 115 | 1 | tran_237 | la_alt2d3_s-eor | 82.7 | 69.9 | -28.7 | 395 | 75.5 | 0.951 | 0.913 | tran DEVERS 115 to DEVERS 230 ck 4 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | B2_009 | la_alt2d3_s-eor | 1120 | -1062.2 | -51.9 | 2699.8 | 1063.5 | 0.95 | 1 | EPP - ESCNDIDO 1 230kV |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | B2_013 | la_alt2d3_s-eor | 1120 | -1061 | -65.6 | 2713.7 | 1063 | 0.95 | 1 | EPP - SYCAMORE 1 230kV |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | PV1 | la_alt2d3_s-eor | 1120 | -1058.1 | -42.4 | 2637 | 1058.9 | 0.95 | 1 | gen PALOVRD1 24.00 |
| 15034 | PERKINS | 500 | 15031 | PERK PS1 | 500 | 1 | line_047 | la_alt2d3_s-eor | 650 | -609.4 | -12.2 | 687.3 | 609.5 | 0.95 | 1 | line ELDORDO to LUGO 500 ck 1 |
| 15034 | PERKINS | 500 | 15032 | PERK PS2 | 500 | 1 | line_047 | la_alt2d3_s-eor | 650 | -609.4 | -12.2 | 687.3 | 609.5 | 0.95 | 1 | line ELDORDO to LUGO 500 ck 1 |

la_alt2d3_s-eor.sav
No Solve Summary
N-1 Outages

| Contingency-Description | Case | Problem-Description |
|---|---|---|
| line CENTRALX to NEWSF500 500 ck 1 | la_alt2d3_s-eor | BAD Qgen: 79123 FONTNLLE 4.0 MVAr |
| HASSYAMP - N.GILA 1 500kV | la_alt2d3_s-eor | BAD Qgen: 25334 P330_S1 193.1 MVAr |
| IMPRLVLY - MIGUEL 1 500kV | la_alt2d3_s-eor | BAD Qgen: 25331 P330_G1 90.0 MVAr |
| line LUGO to VICTORVL 500 ck 1 | la_alt2d3_s-eor | BAD Qgen: 79123 FONTNLLE 4.0 MVAr |
| line DEVERS to VALLEYSC 500 ck 1 | la_alt2d3_s-eor | BAD Qgen: 25331 P330_G1 90.0 MVAr |

| Bus | Name | kV | Area | Zone | Outage | Case | Vbase | Vcont | DeltaV | Vmin | Vmax | Max-dv | Contingency Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24137 | SERRANO | 230 | 24 | 240 | line_2214 | la_alt2d3_s-eor | 0.945 | 0.894 | -0.051 | 0.9 | 1.05 | 0.05 | LUGO 500.00 - VINCENT 500.00 1, LUGO 500.00 - VINCENT 500.00 2 |
| 24154 | VILLA PK | 230 | 24 | 240 | line_2214 | la_alt2d3_s-eor | 0.946 | 0.896 | -0.05 | 0.9 | 1.05 | 0.05 | LUGO 500.00 - VINCENT 500.00 1, LUGO 500.00 - VINCENT 500.00 2 |
| 24112 | PADUA | 230 | 24 | 240 | line_2214 | la_alt2d3_s-eor | 0.954 | 0.898 | -0.055 | 0.9 | 1.05 | 0.05 | LUGO 500.00 - VINCENT 500.00 1, LUGO 500.00 - VINCENT 500.00 2 |
| 24112 | PADUA | 230 | 24 | 240 | line_2238 | la_alt2d3_s-eor | 0.954 | 0.902 | -0.052 | 0.9 | 1.05 | 0.05 | S.ONOFRE 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 24056 | ETIWANDA | 230 | 24 | 248 | line_2214 | la_alt2d3_s-eor | 0.958 | 0.904 | -0.054 | 0.9 | 1.05 | 0.05 | LUGO 500.00 - VINCENT 500.00 1, LUGO 500.00 - VINCENT 500.00 2 |
| 24237 | RANCHVST | 230 | 24 | 240 | line_2214 | la_alt2d3_s-eor | 0.958 | 0.904 | -0.054 | 0.9 | 1.05 | 0.05 | LUGO 500.00 - VINCENT 500.00 1, LUGO 500.00 - VINCENT 500.00 2 |
| 25656 | MIRALOME | 230 | 24 | 240 | line_2214 | la_alt2d3_s-eor | 0.959 | 0.905 | -0.054 | 0.9 | 1.05 | 0.05 | LUGO 500.00 - VINCENT 500.00 1, LUGO 500.00 - VINCENT 500.00 2 |
| 24901 | VSTA | 230 | 24 | 248 | line_2238 | la_alt2d3_s-eor | 0.959 | 0.905 | -0.054 | 0.9 | 1.05 | 0.05 | S.ONOFRE 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 24025 | CHINO | 230 | 24 | 240 | line_2214 | la_alt2d3_s-eor | 0.959 | 0.907 | -0.052 | 0.9 | 1.05 | 0.05 | LUGO 500.00 - VINCENT 500.00 1, LUGO 500.00 - VINCENT 500.00 2 |
| 24093 | MIRALOMW | 230 | 24 | 240 | line_2214 | la_alt2d3_s-eor | 0.96 | 0.907 | -0.053 | 0.9 | 1.05 | 0.05 | LUGO 500.00 - VINCENT 500.00 1, LUGO 500.00 - VINCENT 500.00 2 |
| 24056 | ETIWANDA | 230 | 24 | 248 | line_2238 | la_alt2d3_s-eor | 0.958 | 0.908 | -0.051 | 0.9 | 1.05 | 0.05 | S.ONOFRE 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 24237 | RANCHVST | 230 | 24 | 240 | line_2238 | la_alt2d3_s-eor | 0.958 | 0.908 | -0.051 | 0.9 | 1.05 | 0.05 | S.ONOFRE 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 24901 | VSTA | 230 | 24 | 248 | line_2214 | la_alt2d3_s-eor | 0.959 | 0.909 | -0.05 | 0.9 | 1.05 | 0.05 | LUGO 500.00 - VINCENT 500.00 1, LUGO 500.00 - VINCENT 500.00 2 |
| 25423 | ESRP MWD | 115 | 24 | 254 | line_2214 | la_alt2d3_s-eor | 0.976 | 0.913 | -0.063 | 0.9 | 1.05 | 0.05 | LUGO 500.00 - VINCENT 500.00 1, LUGO 500.00 - VINCENT 500.00 2 |
| 24160 | VALLEYSC | 115 | 24 | 240 | line_2214 | la_alt2d3_s-eor | 0.979 | 0.916 | -0.063 | 0.9 | 1.05 | 0.05 | LUGO 500.00 - VINCENT 500.00 1, LUGO 500.00 - VINCENT 500.00 2 |
| 25990 | VALYSVC1 | 115 | 24 | 240 | line_2214 | la_alt2d3_s-eor | 0.979 | 0.916 | -0.063 | 0.9 | 1.05 | 0.05 | LUGO 500.00 - VINCENT 500.00 1, LUGO 500.00 - VINCENT 500.00 2 |
| 24132 | SANBRDNO | 230 | 24 | 248 | line_2238 | la_alt2d3_s-eor | 0.973 | 0.922 | -0.051 | 0.9 | 1.05 | 0.05 | S.ONOFRE 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 24824 | CARODEAN | 115 | 24 | 248 | line_2214 | la_alt2d3_s-eor | 0.988 | 0.928 | -0.06 | 0.9 | 1.05 | 0.05 | LUGO 500.00 - VINCENT 500.00 1, LUGO 500.00 - VINCENT 500.00 2 |
| 24811 | TAP802 | 115 | 24 | 248 | line_2214 | la_alt2d3_s-eor | 0.988 | 0.929 | -0.06 | 0.9 | 1.05 | 0.05 | LUGO 500.00 - VINCENT 500.00 1, LUGO 500.00 - VINCENT 500.00 2 |
| 24809 | YUCCA | 115 | 24 | 248 | line_2214 | la_alt2d3_s-eor | 0.99 | 0.93 | -0.06 | 0.9 | 1.05 | 0.05 | LUGO 500.00 - VINCENT 500.00 1, LUGO 500.00 - VINCENT 500.00 2 |
| 24808 | TAP801 | 115 | 24 | 248 | line_2214 | la_alt2d3_s-eor | 0.99 | 0.931 | -0.06 | 0.9 | 1.05 | 0.05 | LUGO 500.00 - VINCENT 500.00 1, LUGO 500.00 - VINCENT 500.00 2 |
| 24229 | VALLEY-S | 115 | 24 | 240 | line_2214 | la_alt2d3_s-eor | 0.991 | 0.931 | -0.06 | 0.9 | 1.05 | 0.05 | LUGO 500.00 - VINCENT 500.00 1, LUGO 500.00 - VINCENT 500.00 2 |
| 25991 | VALYSVC2 | 115 | 24 | 240 | line_2214 | la_alt2d3_s-eor | 0.991 | 0.931 | -0.06 | 0.9 | 1.05 | 0.05 | LUGO 500.00 - VINCENT 500.00 1, LUGO 500.00 - VINCENT 500.00 2 |
| 24810 | HI DESER | 115 | 24 | 248 | line_2214 | la_alt2d3_s-eor | 0.991 | 0.932 | -0.06 | 0.9 | 1.05 | 0.05 | LUGO 500.00 - VINCENT 500.00 1, LUGO 500.00 - VINCENT 500.00 2 |
| 24817 | EISENHOW | 115 | 24 | 248 | line_2214 | la_alt2d3_s-eor | 0.993 | 0.933 | -0.06 | 0.9 | 1.05 | 0.05 | LUGO 500.00 - VINCENT 500.00 1, LUGO 500.00 - VINCENT 500.00 2 |
| 24085 | LUGO | 230 | 24 | 240 | line_2214 | la_alt2d3_s-eor | 0.988 | 0.933 | -0.055 | 0.9 | 1.05 | 0.05 | LUGO 500.00 - VINCENT 500.00 1, LUGO 500.00 - VINCENT 500.00 2 |
| 24820 | THORNHIL | 115 | 24 | 248 | line_2214 | la_alt2d3_s-eor | 0.993 | 0.933 | -0.06 | 0.9 | 1.05 | 0.05 | LUGO 500.00 - VINCENT 500.00 1, LUGO 500.00 - VINCENT 500.00 2 |
| 24831 | TAP822 | 115 | 24 | 248 | line_2214 | la_alt2d3_s-eor | 0.993 | 0.933 | -0.06 | 0.9 | 1.05 | 0.05 | LUGO 500.00 - VINCENT 500.00 1, LUGO 500.00 - VINCENT 500.00 2 |
| 25640 | PANAERO | 115 | 24 | 248 | line_2214 | la_alt2d3_s-eor | 0.994 | 0.934 | -0.06 | 0.9 | 1.05 | 0.05 | LUGO 500.00 - VINCENT 500.00 1, LUGO 500.00 - VINCENT 500.00 2 |
| 25639 | SEAWIND | 115 | 24 | 248 | line_2214 | la_alt2d3_s-eor | 0.994 | 0.934 | -0.06 | 0.9 | 1.05 | 0.05 | LUGO 500.00 - VINCENT 500.00 1, LUGO 500.00 - VINCENT 500.00 2 |
| 25641 | TAP816 | 115 | 24 | 248 | line_2214 | la_alt2d3_s-eor | 0.994 | 0.934 | -0.06 | 0.9 | 1.05 | 0.05 | LUGO 500.00 - VINCENT 500.00 1, LUGO 500.00 - VINCENT 500.00 2 |
| 28260 | ALTAMSA4 | 115 | 24 | 248 | line_2214 | la_alt2d3_s-eor | 0.994 | 0.934 | -0.06 | 0.9 | 1.05 | 0.05 | LUGO 500.00 - VINCENT 500.00 1, LUGO 500.00 - VINCENT 500.00 2 |
| 25664 | TAP998 | 115 | 24 | 248 | line_2214 | la_alt2d3_s-eor | 0.994 | 0.934 | -0.06 | 0.9 | 1.05 | 0.05 | LUGO 500.00 - VINCENT 500.00 1, LUGO 500.00 - VINCENT 500.00 2 |
| 24814 | BANNING | 115 | 24 | 248 | line_2214 | la_alt2d3_s-eor | 0.994 | 0.935 | -0.06 | 0.9 | 1.05 | 0.05 | LUGO 500.00 - VINCENT 500.00 1, LUGO 500.00 - VINCENT 500.00 2 |
| 24818 | FARREL | 115 | 24 | 248 | line_2214 | la_alt2d3_s-eor | 0.994 | 0.935 | -0.059 | 0.9 | 1.05 | 0.05 | LUGO 500.00 - VINCENT 500.00 1, LUGO 500.00 - VINCENT 500.00 2 |
| 25646 | SANWIND | 115 | 24 | 248 | line_2214 | la_alt2d3_s-eor | 0.995 | 0.935 | -0.059 | 0.9 | 1.05 | 0.05 | LUGO 500.00 - VINCENT 500.00 1, LUGO 500.00 - VINCENT 500.00 2 |
| 25644 | TAP818 | 115 | 24 | 248 | line_2214 | la_alt2d3_s-eor | 0.995 | 0.936 | -0.059 | 0.9 | 1.05 | 0.05 | LUGO 500.00 - VINCENT 500.00 1, LUGO 500.00 - VINCENT 500.00 2 |
| 24601 | VICTOR | 230 | 24 | 246 | line_2214 | la_alt2d3_s-eor | 0.99 | 0.936 | -0.054 | 0.9 | 1.05 | 0.05 | LUGO 500.00 - VINCENT 500.00 1, LUGO 500.00 - VINCENT 500.00 2 |
| 24350 | HIDESERT | 230 | 24 | 240 | line_2214 | la_alt2d3_s-eor | 0.99 | 0.936 | -0.054 | 0.9 | 1.05 | 0.05 | LUGO 500.00 - VINCENT 500.00 1, LUGO 500.00 - VINCENT 500.00 2 |
| 25635 | ALTWIND | 115 | 24 | 248 | line_2214 | la_alt2d3_s-eor | 0.996 | 0.937 | -0.059 | 0.9 | 1.05 | 0.05 | LUGO 500.00 - VINCENT 500.00 1, LUGO 500.00 - VINCENT 500.00 2 |
| 24832 | TAP820 | 115 | 24 | 248 | line_2214 | la_alt2d3_s-eor | 0.996 | 0.937 | -0.059 | 0.9 | 1.05 | 0.05 | LUGO 500.00 - VINCENT 500.00 1, LUGO 500.00 - VINCENT 500.00 2 |
| 28060 | SEAWEST | 115 | 24 | 248 | line_2214 | la_alt2d3_s-eor | 0.996 | 0.937 | -0.059 | 0.9 | 1.05 | 0.05 | LUGO 500.00 - VINCENT 500.00 1, LUGO 500.00 - VINCENT 500.00 2 |
| 25642 | TAP819 | 115 | 24 | 248 | line_2214 | la_alt2d3_s-eor | 0.997 | 0.938 | -0.059 | 0.9 | 1.05 | 0.05 | LUGO 500.00 - VINCENT 500.00 1, LUGO 500.00 - VINCENT 500.00 2 |
| 24815 | GARNET | 115 | 24 | 248 | line_2214 | la_alt2d3_s-eor | 0.998 | 0.939 | -0.059 | 0.9 | 1.05 | 0.05 | LUGO 500.00 - VINCENT 500.00 1, LUGO 500.00 - VINCENT 500.00 2 |
| 25624 | TAP808 | 115 | 24 | 248 | line_2214 | la_alt2d3_s-eor | 0.998 | 0.939 | -0.059 | 0.9 | 1.05 | 0.05 | LUGO 500.00 - VINCENT 500.00 1, LUGO 500.00 - VINCENT 500.00 2 |
| 25627 | TAP811 | 115 | 24 | 248 | line_2214 | la_alt2d3_s-eor | 0.999 | 0.939 | -0.059 | 0.9 | 1.05 | 0.05 | LUGO 500.00 - VINCENT 500.00 1, LUGO 500.00 - VINCENT 500.00 2 |
| 25629 | TAP813 | 115 | 24 | 248 | line_2214 | la_alt2d3_s-eor | 0.998 | 0.939 | -0.059 | 0.9 | 1.05 | 0.05 | LUGO 500.00 - VINCENT 500.00 1, LUGO 500.00 - VINCENT 500.00 2 |
| 25637 | TRANWND | 115 | 24 | 248 | line_2214 | la_alt2d3_s-eor | 0.998 | 0.939 | -0.059 | 0.9 | 1.05 | 0.05 | LUGO 500.00 - VINCENT 500.00 1, LUGO 500.00 - VINCENT 500.00 2 |
| 24833 | MARASCHI | 115 | 24 | 248 | line_2214 | la_alt2d3_s-eor | 0.999 | 0.94 | -0.059 | 0.9 | 1.05 | 0.05 | LUGO 500.00 - VINCENT 500.00 1, LUGO 500.00 - VINCENT 500.00 2 |
| 24645 | TAP817 | 115 | 24 | 248 | line_2214 | la_alt2d3_s-eor | 1.001 | 0.942 | -0.059 | 0.9 | 1.05 | 0.05 | LUGO 500.00 - VINCENT 500.00 1, LUGO 500.00 - VINCENT 500.00 2 |
| 25634 | BUCKWND | 115 | 24 | 248 | line_2214 | la_alt2d3_s-eor | 1.001 | 0.943 | -0.059 | 0.9 | 1.05 | 0.05 | LUGO 500.00 - VINCENT 500.00 1, LUGO 500.00 - VINCENT 500.00 2 |
| 25636 | RENWIND | 115 | 24 | 248 | line_2214 | la_alt2d3_s-eor | 1.002 | 0.943 | -0.059 | 0.9 | 1.05 | 0.05 | LUGO 500.00 - VINCENT 500.00 1, LUGO 500.00 - VINCENT 500.00 2 |
| 25625 | TAP809 | 115 | 24 | 248 | line_2214 | la_alt2d3_s-eor | 1.001 | 0.943 | -0.059 | 0.9 | 1.05 | 0.05 | LUGO 500.00 - VINCENT 500.00 1, LUGO 500.00 - VINCENT 500.00 2 |
| 25630 | TAP814 | 115 | 24 | 248 | line_2214 | la_alt2d3_s-eor | 1.002 | 0.943 | -0.059 | 0.9 | 1.05 | 0.05 | LUGO 500.00 - VINCENT 500.00 1, LUGO 500.00 - VINCENT 500.00 2 |
| 24826 | INDIGO | 115 | 24 | 248 | line_2214 | la_alt2d3_s-eor | 1.002 | 0.943 | -0.059 | 0.9 | 1.05 | 0.05 | LUGO 500.00 - VINCENT 500.00 1, LUGO 500.00 - VINCENT 500.00 2 |
| 28020 | WINTEC6 | 115 | 24 | 248 | line_2214 | la_alt2d3_s-eor | 1.001 | 0.943 | -0.059 | 0.9 | 1.05 | 0.05 | LUGO 500.00 - VINCENT 500.00 1, LUGO 500.00 - VINCENT 500.00 2 |
| 24086 | LUGO | 500 | 24 | 240 | line_2214 | la_alt2d3_s-eor | 1.008 | 0.944 | -0.064 | 0.9 | 1.05 | 0.05 | LUGO 500.00 - VINCENT 500.00 1, LUGO 500.00 - VINCENT 500.00 2 |
| 25645 | VENWIND | 115 | 24 | 248 | line_2214 | la_alt2d3_s-eor | 1.003 | 0.944 | -0.058 | 0.9 | 1.05 | 0.05 | LUGO 500.00 - VINCENT 500.00 1, LUGO 500.00 - VINCENT 500.00 2 |
| 24813 | TAP804 | 115 | 24 | 248 | line_2214 | la_alt2d3_s-eor | 1.003 | 0.945 | -0.058 | 0.9 | 1.05 | 0.05 | LUGO 500.00 - VINCENT 500.00 1, LUGO 500.00 - VINCENT 500.00 2 |
| 24805 | DEVERS | 115 | 24 | 248 | line_2214 | la_alt2d3_s-eor | 1.005 | 0.946 | -0.058 | 0.9 | 1.05 | 0.05 | LUGO 500.00 - VINCENT 500.00 1, LUGO 500.00 - VINCENT 500.00 2 |
| 24236 | RANCHVST | 500 | 24 | 240 | line_2214 | la_alt2d3_s-eor | 1.008 | 0.946 | -0.062 | 0.9 | 1.05 | 0.05 | LUGO 500.00 - VINCENT 500.00 1, LUGO 500.00 - VINCENT 500.00 2 |
| 25623 | TAP807 | 115 | 24 | 248 | line_2214 | la_alt2d3_s-eor | 1.004 | 0.946 | -0.058 | 0.9 | 1.05 | 0.05 | LUGO 500.00 - VINCENT 500.00 1, LUGO 500.00 - VINCENT 500.00 2 |
| 25632 | TERAWND | 115 | 24 | 248 | line_2214 | la_alt2d3_s-eor | 1.004 | 0.946 | -0.058 | 0.9 | 1.05 | 0.05 | LUGO 500.00 - VINCENT 500.00 1, LUGO 500.00 - VINCENT 500.00 2 |
| 24151 | VALLEYSC | 500 | 24 | 240 | line_2214 | la_alt2d3_s-eor | 1.007 | 0.946 | -0.06 | 0.9 | 1.05 | 0.05 | LUGO 500.00 - VINCENT 500.00 1, LUGO 500.00 - VINCENT 500.00 2 |
| 24997 | VALYSVC1 | 500 | 24 | 240 | line_2214 | la_alt2d3_s-eor | 1.007 | 0.946 | -0.06 | 0.9 | 1.05 | 0.05 | LUGO 500.00 - VINCENT 500.00 1, LUGO 500.00 - VINCENT 500.00 2 |
| 28040 | C8040 | 500 | 24 | 240 | line_2214 | la_alt2d3_s-eor | 1.007 | 0.946 | -0.06 | 0.9 | 1.05 | 0.05 | LUGO 500.00 - VINCENT 500.00 1, LUGO 500.00 - VINCENT 500.00 2 |
| 24138 | SERRANO | 500 | 24 | 240 | line_2214 | la_alt2d3_s-eor | 1.009 | 0.95 | -0.06 | 0.9 | 1.05 | 0.05 | LUGO 500.00 - VINCENT 500.00 1, LUGO 500.00 - VINCENT 500.00 2 |
| 24092 | MIRALOMA | 500 | 24 | 240 | line_2214 | la_alt2d3_s-eor | 1.01 | 0.951 | -0.059 | 0.9 | 1.05 | 0.05 | LUGO 500.00 - VINCENT 500.00 1, LUGO 500.00 - VINCENT 500.00 2 |
| 24610 | BLKMTN | 115 | 24 | 246 | line_2214 | la_alt2d3_s-eor | 1.008 | 0.958 | -0.05 | 0.9 | 1.05 | 0.05 | LUGO 500.00 - VINCENT 500.00 1, LUGO 500.00 - VINCENT 500.00 2 |
| 24616 | TAP603 | 115 | 24 | 246 | line_2214 | la_alt2d3_s-eor | 1.009 | 0.959 | -0.05 | 0.9 | 1.05 | 0.05 | LUGO 500.00 - VINCENT 500.00 1, LUGO 500.00 - VINCENT 500.00 2 |
| 24609 | AFG IND | 115 | 24 | 246 | line_2214 | la_alt2d3_s-eor | 1.012 | 0.961 | -0.05 | 0.9 | 1.05 | 0.05 | LUGO 500.00 - VINCENT 500.00 1, LUGO 500.00 - VINCENT 500.00 2 |
| 24603 | APPLEVAL | 115 | 24 | 246 | line_2214 | la_alt2d3_s-eor | 1.012 | 0.961 | -0.051 | 0.9 | 1.05 | 0.05 | LUGO 500.00 - VINCENT 500.00 1, LUGO 500.00 - VINCENT 500.00 2 |
| 24605 | HESPERIA | 115 | 24 | 246 | line_2214 | la_alt2d3_s-eor | 1.011 | 0.961 | -0.05 | 0.9 | 1.05 | 0.05 | LUGO 500.00 - VINCENT 500.00 1, LUGO 500.00 - VINCENT 500.00 2 |
| 24608 | SAVAGE | 115 | 24 | 246 | line_2214 | la_alt2d3_s-eor | 1.012 | 0.961 | -0.05 | 0.9 | 1.05 | 0.05 | LUGO 500.00 - VINCENT 500.00 1, LUGO 500.00 - VINCENT 500.00 2 |
| 24619 | TAP606 | 115 | 24 | 246 | line_2214 | la_alt2d3_s-eor | 1.011 | 0.961 | -0.05 | 0.9 | 1.05 | 0.05 | LUGO 500.00 - VINCENT 500.00 1, LUGO 500.00 - VINCENT 500.00 2 |
| 25667 | OAK_VLLY | 115 | 24 | 248 | line_2214 | la_alt2d3_s-eor | 1.012 | 0.961 | -0.051 | 0.9 | 1.05 | 0.05 | LUGO 500.00 - VINCENT 500.00 1, LUGO 500.00 - VINCENT 500.00 2 |
| 24618 | TAP605 | 115 | 24 | 246 | line_2214 | la_alt2d3_s-eor | 1.013 | 0.962 | -0.051 | 0.9 | 1.05 | 0.05 | LUGO 500.00 - VINCENT 500.00 1, LUGO 500.00 - VINCENT 500.00 2 |
| 24611 | PLEUSS | 115 | 24 | 246 | line_2214 | la_alt2d3_s-eor | 1.014 | 0.963 | -0.051 | 0.9 | 1.05 | 0.05 | LUGO 500.00 - VINCENT 500.00 1, LUGO 500.00 - VINCENT 500.00 2 |
| 24617 | TAP604 | 115 | 24 | 246 | line_2214 | la_alt2d3_s-eor | 1.014 | 0.963 | -0.051 | 0.9 | 1.05 | 0.05 | LUGO 500.00 - VINCENT 500.00 1, LUGO 500.00 - VINCENT 500.00 2 |
| 24097 | MOHAVE | 500 | 24 | 240 | line_2238 | la_alt2d3_s-eor | 1.024 | 0.972 | -0.053 | 0.9 | 1.05 | 0.05 | S.ONOFRE 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 24622 | PERMANTE | 115 | 24 | 246 | line_2214 | la_alt2d3_s-eor | 1.036 | 0.983 | -0.053 | 0.9 | 1.05 | 0.05 | LUGO 500.00 - VINCENT 500.00 1, LUGO 500.00 - VINCENT 500.00 2 |
| 24623 | GOLDHILS | 115 | 24 | 246 | line_2214 | la_alt2d3_s-eor | 1.036 | 0.983 | -0.053 | 0.9 | 1.05 | 0.05 | LUGO 500.00 - VINCENT 500.00 1, LUGO 500.00 - VINCENT 500.00 2 |
| 24613 | COTNWD | 115 | 24 | 246 | line_2214 | la_alt2d3_s-eor | 1.036 | 0.984 | -0.053 | 0.9 | 1.05 | 0.05 | LUGO 500.00 - VINCENT 500.00 1, LUGO 500.00 - VINCENT 500.00 2 |
| 24237 | RANCHVST | 230 | 24 | 240 | 23021/22/23/41 | la_alt2d3_s-eor | 0.958 | 1.029 | 0.071 | 0.9 | 1.05 | 0.05 | MIGUEL 230 CORRIDOR West of SN |
| 24015 | ARCO SC | 230 | 24 | 240 | line_2013 | la_alt2d3_s-eor | 0.979 | 1.036 | 0.057 | 0.9 | 1.05 | 0.05 | ARCO SC 230.00 - HINSON 230.00 1, ARCO SC 230.00 - HINSON 230.00 2 |
| 24061 | HARBOR | 230 | 24 | 240 | line_2039 | la_alt2d3_s-eor | 0.977 | 1.036 | 0.059 | 0.9 | 1.05 | 0.05 | HARBOR 230.00 - HINSON 230.00 1, LBEACH 230.00 - LITEHIPE 230.00 1 |
| 24077 | LBEACH | 230 | 24 | 240 | line_2039 | la_alt2d3_s-eor | 0.977 | 1.036 | 0.059 | 0.9 | 1.05 | 0.05 | HARBOR 230.00 - HINSON 230.00 1, LBEACH 230.00 - LITEHIPE 230.00 1 |
| 24061 | HARBOR | 230 | 24 | 240 | line_2041 | la_alt2d3_s-eor | 0.977 | 1.036 | 0.059 | 0.9 | 1.05 | 0.05 | HARBOR 230.00 - HINSON 230.00 1, HARBOR 230.00 - LBEACH 230.00 1 |
| 24061 | HARBOR | 230 | 24 | 240 | line_2253 | la_alt2d3_s-eor | 0.977 | 1.036 | 0.059 | 0.9 | 1.05 | 0.05 | HARBOR 230.00 - HINSON 230.00 1, HARBOR 230.00 - LBEACH 230.00 1 |
| 25001 | GOODRICH | 230 | 24 | 250 | line_2073 | la_alt2d3_s-eor | 0.971 | 1.044 | 0.074 | 0.9 | 1.05 | 0.05 | GOODRICH 230.00 - GOULD 230.00 1, GOODRICH 230.00 - LAGUBELL 230.00 1 |
| 25423 | ESRP MWD | 115 | 24 | 254 | line_2238 | la_alt2d3_s-eor | 0.976 | 1.071 | 0.095 | 0.9 | 1.05 | 0.05 | S.ONOFRE 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 24160 | VALLEYSC | 115 | 24 | 240 | line_2238 | la_alt2d3_s-eor | 0.979 | 1.073 | 0.094 | 0.9 | 1.05 | 0.05 | S.ONOFRE 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 25990 | VALYSVC1 | 115 | 24 | 240 | line_2238 | la_alt2d3_s-eor | 0.979 | 1.073 | 0.094 | 0.9 | 1.05 | 0.05 | S.ONOFRE 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 25423 | ESRP MWD | 115 | 24 | 254 | line_2240 | la_alt2d3_s-eor | 0.976 | 1.08 | 0.104 | 0.9 | 1.05 | 0.05 | CHINO 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 25423 | ESRP MWD | 115 | 24 | 254 | line_2239 | la_alt2d3_s-eor | 0.976 | 1.081 | 0.104 | 0.9 | 1.05 | 0.05 | CHINO 230.00 - S.ONOFRE 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 24229 | VALLEY-S | 115 | 24 | 240 | line_2238 | la_alt2d3_s-eor | 0.991 | 1.082 | 0.091 | 0.9 | 1.05 | 0.05 | S.ONOFRE 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 25991 | VALYSVC2 | 115 | 24 | 240 | line_2238 | la_alt2d3_s-eor | 0.991 | 1.082 | 0.091 | 0.9 | 1.05 | 0.05 | S.ONOFRE 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 24160 | VALLEYSC | 115 | 24 | 240 | line_2239 | la_alt2d3_s-eor | 0.979 | 1.083 | 0.104 | 0.9 | 1.05 | 0.05 | CHINO 230.00 - S.ONOFRE 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 25990 | VALYSVC1 | 115 | 24 | 240 | line_2239 | la_alt2d3_s-eor | 0.979 | 1.083 | 0.104 | 0.9 | 1.05 | 0.05 | CHINO 230.00 - S.ONOFRE 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 24160 | VALLEYSC | 115 | 24 | 240 | line_2240 | la_alt2d3_s-eor | 0.979 | 1.083 | 0.104 | 0.9 | 1.05 | 0.05 | CHINO 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 25990 | VALYSVC1 | 115 | 24 | 240 | line_2240 | la_alt2d3_s-eor | 0.979 | 1.083 | 0.104 | 0.9 | 1.05 | 0.05 | CHINO 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 24229 | VALLEY-S | 115 | 24 | 240 | line_2239 | la_alt2d3_s-eor | 0.991 | 1.091 | 0.1 | 0.9 | 1.05 | 0.05 | CHINO 230.00 - S.ONOFRE 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 25991 | VALYSVC2 | 115 | 24 | 240 | line_2239 | la_alt2d3_s-eor | 0.991 | 1.091 | 0.1 | 0.9 | 1.05 | 0.05 | CHINO 230.00 - S.ONOFRE 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 24229 | VALLEY-S | 115 | 24 | 240 | line_2240 | la_alt2d3_s-eor | 0.991 | 1.091 | 0.1 | 0.9 | 1.05 | 0.05 | CHINO 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 25991 | VALYSVC2 | 115 | 24 | 240 | line_2240 | la_alt2d3_s-eor | 0.991 | 1.091 | 0.1 | 0.9 | 1.05 | 0.05 | CHINO 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24151 | VALLEYSC | 500 | 24 | 240 | line_2238 | la_alt2d3_s-eor | 1.007 | 1.098 | 0.092 | 0.9 | 1.05 | 0.05 | S.ONOFRE 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 24997 | VALYSVC1 | 500 | 24 | 240 | line_2238 | la_alt2d3_s-eor | 1.007 | 1.098 | 0.092 | 0.9 | 1.05 | 0.05 | S.ONOFRE 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 28040 | C8040 | 500 | 24 | 240 | line_2238 | la_alt2d3_s-eor | 1.007 | 1.098 | 0.092 | 0.9 | 1.05 | 0.05 | S.ONOFRE 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 24151 | VALLEYSC | 500 | 24 | 240 | line_2240 | la_alt2d3_s-eor | 1.007 | 1.107 | 0.101 | 0.9 | 1.05 | 0.05 | CHINO 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 24997 | VALYSVC1 | 500 | 24 | 240 | line_2240 | la_alt2d3_s-eor | 1.007 | 1.107 | 0.101 | 0.9 | 1.05 | 0.05 | CHINO 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 28040 | C8040 | 500 | 24 | 240 | line_2240 | la_alt2d3_s-eor | 1.007 | 1.107 | 0.101 | 0.9 | 1.05 | 0.05 | CHINO 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 24151 | VALLEYSC | 500 | 24 | 240 | line_2239 | la_alt2d3_s-eor | 1.007 | 1.108 | 0.101 | 0.9 | 1.05 | 0.05 | CHINO 230.00 - S.ONOFRE 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 24997 | VALYSVC1 | 500 | 24 | 240 | line_2239 | la_alt2d3_s-eor | 1.007 | 1.108 | 0.101 | 0.9 | 1.05 | 0.05 | CHINO 230.00 - S.ONOFRE 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 28040 | C8040 | 500 | 24 | 240 | line_2239 | la_alt2d3_s-eor | 1.007 | 1.108 | 0.101 | 0.9 | 1.05 | 0.05 | CHINO 230.00 - S.ONOFRE 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |

| LEGEND | % of RATING 1 | |
|---|---|---|
| C_pu | 100% - 110% | |
| C_pu | 110% - 120% | P.U. of |
| C_pu | > 120% | Rate 1 |

| FROM | FR | BKV | TO | TO | BKV | CK | Outage_Name | Case | Rate-Mva | Pflow | Qflow | Amps | MVA | C_pu | B_pu | Contingency_Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_2233 | la_alt2d3_s-eor | 1411.6 | 2704.4 | 617.1 | 3027.3 | 2773.9 | 1.88 | 1.205 | MOENKOPI 500.00 - ELDORDO 500.00 1, PISGAH 230.00 - ELDORDO 230.00 2 |
| 24999 | DEVRSVC1 | 500 | 24801 | DEVERS | 500 | 1 | line_2239 | la_alt2d3_s-eor | 387.5 | 0 | 662 | 727.8 | 662 | 1.627 | 1.551 | CHINO 230.00 - S.ONOFRE 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 24999 | DEVRSVC1 | 500 | 24801 | DEVERS | 500 | 1 | line_2240 | la_alt2d3_s-eor | 387.5 | 0 | 661.8 | 727.7 | 661.8 | 1.626 | 1.551 | CHINO 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 24999 | DEVRSVC1 | 500 | 24801 | DEVERS | 500 | 1 | line_2238 | la_alt2d3_s-eor | 387.5 | 0 | 651.7 | 722.1 | 651.7 | 1.614 | 1.551 | S.ONOFRE 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 24999 | DEVRSVC1 | 500 | 24801 | DEVERS | 500 | 1 | line_2200 | la_alt2d3_s-eor | 387.5 | 0 | 574.2 | 677.8 | 574.2 | 1.515 | 1.551 | LUGO 500.00 - MOHAVE 500.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 24999 | DEVRSVC1 | 500 | 24801 | DEVERS | 500 | 1 | line_2201 | la_alt2d3_s-eor | 387.5 | 0 | 574.2 | 677.8 | 574.2 | 1.515 | 1.551 | LUGO 500.00 - MOHAVE 500.00 1, PISGAH 230.00 - LUGO 230.00 2 |
| 24999 | DEVRSVC1 | 500 | 24801 | DEVERS | 500 | 1 | line_2255 | la_alt2d3_s-eor | 387.5 | 0 | 569.9 | 675.3 | 569.9 | 1.509 | 1.551 | LUGO 500.00 - MIRALOMA 500.00 3, LUGO 500.00 - MOHAVE 500.00 1 |
| 24999 | DEVRSVC1 | 500 | 24801 | DEVERS | 500 | 1 | line_2258 | la_alt2d3_s-eor | 387.5 | 0 | 569.7 | 675.2 | 569.7 | 1.509 | 1.551 | LUGO 500.00 - VINCENT 500.00 2, LUGO 500.00 - VICTORVL 500.00 1 |
| 24999 | DEVRSVC1 | 500 | 24801 | DEVERS | 500 | 1 | 23002/06/10 | la_alt2d3_s-eor | 387.5 | 0 | 569.2 | 674.8 | 569.2 | 1.508 | 1.551 | SANLUISREY 230 CORRIDOR |
| 24999 | DEVRSVC1 | 500 | 24801 | DEVERS | 500 | 1 | line_2192 | la_alt2d3_s-eor | 387.5 | 0 | 563.6 | 671.5 | 563.6 | 1.501 | 1.551 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 24999 | DEVRSVC1 | 500 | 24801 | DEVERS | 500 | 1 | line_2193 | la_alt2d3_s-eor | 387.5 | 0 | 563.6 | 671.5 | 563.6 | 1.501 | 1.551 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - LUGO 230.00 2 |
| 24999 | DEVRSVC1 | 500 | 24801 | DEVERS | 500 | 1 | line_2191 | la_alt2d3_s-eor | 387.5 | 0 | 562.5 | 670.9 | 562.5 | 1.499 | 1.551 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - ELDORDO 230.00 2 |
| 24999 | DEVRSVC1 | 500 | 24801 | DEVERS | 500 | 1 | line_2256 | la_alt2d3_s-eor | 387.5 | 0 | 559.1 | 668.8 | 559.1 | 1.495 | 1.551 | ELDORDO 500.00 - LUGO 500.00 1, LUGO 500.00 - MIRALOMA 500.00 2 |
| 24999 | DEVRSVC1 | 500 | 24801 | DEVERS | 500 | 1 | line_2233 | la_alt2d3_s-eor | 387.5 | 0 | 554.3 | 666 | 554.3 | 1.488 | 1.551 | MOENKOPI 500.00 - ELDORDO 500.00 1, PISGAH 230.00 - ELDORDO 230.00 2 |
| 24999 | DEVRSVC1 | 500 | 24801 | DEVERS | 500 | 1 | line_N-217 | la_alt2d3_s-eor | 387.5 | 0 | 553.1 | 665.3 | 553.1 | 1.487 | 1.551 | line MIDPINTS to IH500/MIDPOINTS DEVERS 500 ck 1 |
| 24999 | DEVRSVC1 | 500 | 24801 | DEVERS | 500 | 1 | line_2235 | la_alt2d3_s-eor | 387.5 | 0 | 552.7 | 665 | 552.7 | 1.486 | 1.551 | DEVERS 230.00 - MIRAGE 230.00 1, MIDPINTS 500.00 - DEVERS 500.00 1 |
| 24999 | DEVRSVC1 | 500 | 24801 | DEVERS | 500 | 1 | line_2237 | la_alt2d3_s-eor | 387.5 | 0 | 551.3 | 664.2 | 551.3 | 1.484 | 1.551 | MIDPINTS 500.00 - DEVERS 500.00 1, J.HINDS 230.00 - MIRAGE 230.00 1 |
| 24999 | DEVRSVC1 | 500 | 24801 | DEVERS | 500 | 1 | line_2214 | la_alt2d3_s-eor | 387.5 | 0 | 547.7 | 662 | 547.7 | 1.479 | 1.551 | LUGO 500.00 - VINCENT 500.00 1, LUGO 500.00 - VINCENT 500.00 2 |
| 24999 | DEVRSVC1 | 500 | 24801 | DEVERS | 500 | 1 | line_2236 | la_alt2d3_s-eor | 387.5 | 0 | 546.5 | 661.3 | 546.5 | 1.478 | 1.551 | MIDPINTS 500.00 - DEVERS 500.00 1, COACHELV 230.00 - DEVERS 230.00 2 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | la_alt2d3_s-eor | 392 | 569.6 | 61.2 | 1531.8 | 572.9 | 1.46 | 0.81 | MIGUEL 230 CORRIDOR West of SN |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23021/22/23/41 | la_alt2d3_s-eor | 408.3 | -559.6 | 32.7 | 2442 | 560.6 | 1.43 | 0.77 | MIGUEL 230 CORRIDOR West of SN |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | 23021/22/23/41 | la_alt2d3_s-eor | 382.4 | 508.8 | -23.7 | 2223.3 | 509.3 | 1.39 | 0.697 | MIGUEL 230 CORRIDOR West of SN |
| 24900 | MIDPINTS | 500 | 24801 | DEVERS | 500 | 2 | line_2236 | la_alt2d3_s-eor | 2338 | 3140.2 | 524.8 | 3720.9 | 3183.7 | 1.38 | 0.761 | MIDPINTS 500.00 - DEVERS 500.00 1, COACHELV 230.00 - DEVERS 230.00 2 |
| 24900 | MIDPINTS | 500 | 24801 | DEVERS | 500 | 2 | line_2235 | la_alt2d3_s-eor | 2338 | 3101.2 | 493.6 | 3655.7 | 3140.2 | 1.356 | 0.761 | DEVERS 230.00 - MIRAGE 230.00 1, MIDPINTS 500.00 - DEVERS 500.00 1 |
| 24900 | MIDPINTS | 500 | 24801 | DEVERS | 500 | 2 | line_N-217 | la_alt2d3_s-eor | 2338 | 3070.9 | 488.5 | 3616.2 | 3109.5 | 1.341 | 0.761 | line MIDPINTS to IH500/MIDPOINTS DEVERS 500 ck 1 |
| 24900 | MIDPINTS | 500 | 24801 | DEVERS | 500 | 2 | line_2237 | la_alt2d3_s-eor | 2338 | 3055.1 | 494.1 | 3600.2 | 3094.8 | 1.336 | 0.761 | MIDPINTS 500.00 - DEVERS 500.00 1, J.HINDS 230.00 - MIRAGE 230.00 1 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_2238 | la_alt2d3_s-eor | 1411.6 | 1886.7 | 330.2 | 2133 | 1915.4 | 1.326 | 1.205 | S.ONOFRE 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_2240 | la_alt2d3_s-eor | 1411.6 | 1881.6 | 322.8 | 2115.1 | 1909.1 | 1.315 | 1.205 | CHINO 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_2239 | la_alt2d3_s-eor | 1411.6 | 1881.6 | 321.2 | 2112.7 | 1908.8 | 1.314 | 1.205 | CHINO 230.00 - S.ONOFRE 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 19038 | MEAD | 500 | 15034 | PERKINS | 500 | 1 | line_2233 | la_alt2d3_s-eor | 1238.4 | -1551.9 | 269.7 | 1834.3 | 1575.1 | 1.29 | 1.011 | MOENKOPI 500.00 - ELDORDO 500.00 1, PISGAH 230.00 - ELDORDO 230.00 2 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_2236 | la_alt2d3_s-eor | 1411.6 | 1856.3 | 294.1 | 2061.6 | 1879.4 | 1.282 | 1.205 | MIDPINTS 500.00 - DEVERS 500.00 1, COACHELV 230.00 - DEVERS 230.00 2 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_2237 | la_alt2d3_s-eor | 1411.6 | 1852.3 | 290.7 | 2050.8 | 1874.9 | 1.275 | 1.205 | MIDPINTS 500.00 - DEVERS 500.00 1, J.HINDS 230.00 - MIRAGE 230.00 1 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_2235 | la_alt2d3_s-eor | 1411.6 | 1850.8 | 291.8 | 2049.9 | 1873.7 | 1.274 | 1.205 | DEVERS 230.00 - MIRAGE 230.00 1, MIDPINTS 500.00 - DEVERS 500.00 1 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_N-217 | la_alt2d3_s-eor | 1411.6 | 1849.8 | 290.9 | 2047.2 | 1872.5 | 1.273 | 1.205 | line MIDPINTS to IH500/MIDPOINTS DEVERS 500 ck 1 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | 23021/22/23/41 | la_alt2d3_s-eor | 1120 | -1418.3 | -19.2 | 3703.5 | 1418.4 | 1.27 | 1 | MIGUEL 230 CORRIDOR West of SN |
| 15034 | PERKINS | 500 | 15031 | PERK PS1 | 500 | 1 | line_2233 | la_alt2d3_s-eor | 650 | -801.4 | -34.2 | 922.1 | 802.1 | 1.26 | 1 | MOENKOPI 500.00 - ELDORDO 500.00 1, PISGAH 230.00 - ELDORDO 230.00 2 |
| 15034 | PERKINS | 500 | 15032 | PERK PS2 | 500 | 1 | line_2233 | la_alt2d3_s-eor | 650 | -801.4 | -34.2 | 922.1 | 802.1 | 1.26 | 1 | MOENKOPI 500.00 - ELDORDO 500.00 1, PISGAH 230.00 - ELDORDO 230.00 2 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | 23002/06/10 | la_alt2d3_s-eor | 1411.6 | 1819.2 | 287.8 | 2002.1 | 1841.8 | 1.245 | 1.205 | SANLUISREY 230 CORRIDOR |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_2172 | la_alt2d3_s-eor | 1411.6 | 1810.3 | 280.3 | 1989.6 | 1831.9 | 1.237 | 1.205 | VSTA 230.00 - SANBRDNO 230.00 2, VSTA 230.00 - DEVERS 230.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2172 | la_alt2d3_s-eor | 2598 | 3026.8 | 387.8 | 3555.6 | 3051.5 | 1.185 | 1.074 | VSTA 230.00 - SANBRDNO 230.00 2, VSTA 230.00 - DEVERS 230.00 1 |
| 22672 | PRCTRVLY | 138 | 22852 | TELECYN | 138 | 1 | 23021/22/23/41 | la_alt2d3_s-eor | 478 | 542.7 | -34.9 | 2369 | 543.8 | 1.185 | 0.622 | MIGUEL 230 CORRIDOR West of SN |
| 19038 | MEAD | 500 | 15034 | PERKINS | 500 | 1 | line_2238 | la_alt2d3_s-eor | 1238.4 | -1418.9 | 174.3 | 1682.4 | 1429.6 | 1.18 | 1.011 | S.ONOFRE 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_2238 | la_alt2d3_s-eor | 1645.4 | 1947.7 | 358.7 | 2231.8 | 1980.4 | 1.179 | 1.062 | S.ONOFRE 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 14003 | NAVAJO | 500 | 26123 | CRYSTAL | 500 | 1 | line_2258 | la_alt2d3_s-eor | 1411.6 | 1711.5 | 297.6 | 1886.7 | 1737.1 | 1.175 | 1.205 | LUGO 500.00 - VINCENT 500.00 2, LUGO 500.00 - VICTORVL 500.00 1 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 2 | line_2029 | la_alt2d3_s-eor | 1195 | 1314.4 | -86.9 | 3510.4 | 1317.2 | 1.17 | 0.575 | LEWIS 230.00 - SERRANO 230.00 1, SERRANO 230.00 - VILLA PK 230.00 1 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 2 | line_2031 | la_alt2d3_s-eor | 1195 | 1314.4 | -86.9 | 3510.4 | 1317.2 | 1.17 | 0.575 | LEWIS 230.00 - SERRANO 230.00 1, SERRANO 230.00 - VILLA PK 230.00 1 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 2 | line_2278 | la_alt2d3_s-eor | 1195 | 1314.4 | -86.9 | 3510.4 | 1317.2 | 1.17 | 0.575 | LEWIS 230.00 - SERRANO 230.00 1, SERRANO 230.00 - VILLA PK 230.00 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_2240 | la_alt2d3_s-eor | 1645.4 | 1942.5 | 346.7 | 2212.3 | 1973.2 | 1.169 | 1.062 | CHINO 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_2239 | la_alt2d3_s-eor | 1645.4 | 1942.8 | 344.1 | 2209.9 | 1973 | 1.168 | 1.062 | CHINO 230.00 - S.ONOFRE 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2168 | la_alt2d3_s-eor | 2598 | 2992.6 | 340.4 | 3498.3 | 3011.9 | 1.166 | 1.074 | DEVERS 230.00 - VSTA 230.00 2, ETIWANDA 230.00 - SANBRDNO 230.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2171 | la_alt2d3_s-eor | 2598 | 2992.6 | 340.4 | 3498.3 | 3011.9 | 1.166 | 1.074 | ETIWANDA 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 19038 | MEAD | 500 | 15034 | PERKINS | 500 | 1 | line_2240 | la_alt2d3_s-eor | 1238.4 | -1409.9 | 176.5 | 1662.3 | 1420.9 | 1.166 | 1.011 | CHINO 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 19038 | MEAD | 500 | 15034 | PERKINS | 500 | 1 | line_2239 | la_alt2d3_s-eor | 1238.4 | -1409.6 | 177.8 | 1660.2 | 1420.7 | 1.165 | 1.011 | CHINO 230.00 - S.ONOFRE 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 24901 | VSTA | 230 | 24132 | SANBRDNO | 230 | 2 | line_2168 | la_alt2d3_s-eor | 916 | -1006.4 | -60.3 | 2669.2 | 1008.2 | 1.161 | 0.58 | DEVERS 230.00 - VSTA 230.00 2, ETIWANDA 230.00 - SANBRDNO 230.00 1 |
| 24901 | VSTA | 230 | 24132 | SANBRDNO | 230 | 2 | line_2171 | la_alt2d3_s-eor | 916 | -1006.4 | -60.3 | 2669.2 | 1008.2 | 1.161 | 0.58 | ETIWANDA 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2233 | la_alt2d3_s-eor | 2598 | 2870.8 | 243.7 | 3461.5 | 2881.1 | 1.154 | 1.074 | MOENKOPI 500.00 - ELDORDO 500.00 1, PISGAH 230.00 - ELDORDO 230.00 2 |
| 15034 | PERKINS | 500 | 15031 | PERK PS1 | 500 | 1 | line_2238 | la_alt2d3_s-eor | 650 | -730.8 | -44.5 | 843.5 | 732.2 | 1.15 | 1 | S.ONOFRE 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 15034 | PERKINS | 500 | 15032 | PERK PS2 | 500 | 1 | line_2238 | la_alt2d3_s-eor | 650 | -730.8 | -44.5 | 843.5 | 732.2 | 1.15 | 1 | S.ONOFRE 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2167 | la_alt2d3_s-eor | 2598 | 2940.5 | 296 | 3438.7 | 2955.3 | 1.146 | 1.074 | DEVERS 230.00 - SANBRDNO 230.00 1, ETIWANDA 230.00 - SANBRDNO 230.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2169 | la_alt2d3_s-eor | 2598 | 2940.5 | 296 | 3438.7 | 2955.3 | 1.146 | 1.074 | ETIWANDA 230.00 - SANBRDNO 230.00 1, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2268 | la_alt2d3_s-eor | 2598 | 2940.5 | 296 | 3438.7 | 2955.3 | 1.146 | 1.074 | ETIWANDA 230.00 - SANBRDNO 230.00 1, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2173 | la_alt2d3_s-eor | 2598 | 2920.3 | 286.8 | 3425.9 | 2934.3 | 1.142 | 1.074 | SANBRDNO 230.00 - DEVERS 230.00 1, VSTA 230.00 - SANBRDNO 230.00 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2174 | la_alt2d3_s-eor | 2598 | 2920.3 | 286.8 | 3425.9 | 2934.3 | 1.142 | 1.074 | DEVERS 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - SANBRDNO 230.00 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2256 | la_alt2d3_s-eor | 2598 | 2847.7 | 266 | 3421.6 | 2860.1 | 1.141 | 1.074 | ELDORDO 500.00 - LUGO 500.00 1, LUGO 500.00 - MIRALOMA 500.00 2 |
| 15034 | PERKINS | 500 | 15031 | PERK PS1 | 500 | 1 | line_2239 | la_alt2d3_s-eor | 650 | -725.6 | -36.8 | 832.9 | 726.5 | 1.14 | 1 | CHINO 230.00 - S.ONOFRE 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 15034 | PERKINS | 500 | 15032 | PERK PS2 | 500 | 1 | line_2239 | la_alt2d3_s-eor | 650 | -725.6 | -36.8 | 832.9 | 726.5 | 1.14 | 1 | CHINO 230.00 - S.ONOFRE 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 15034 | PERKINS | 500 | 15031 | PERK PS1 | 500 | 1 | line_2240 | la_alt2d3_s-eor | 650 | -725.8 | -38.1 | 833.9 | 726.8 | 1.14 | 1 | CHINO 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15034 | PERKINS | 500 | 15032 | PERK PS2 | 500 | 1 | line_2240 | la_alt2d3_s-eor | 650 | -725.8 | -38.1 | 833.9 | 726.8 | 1.14 | 1 | CHINO 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2176 | la_alt2d3_s-eor | 2598 | 2919.2 | 271.1 | 3410.3 | 2931.8 | 1.137 | 1.074 | DEVERS 230.00 - SANBRDNO 230.00 1, SANBRDNO 230.00 - DEVERS 230.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2191 | la_alt2d3_s-eor | 2598 | 2845.5 | 256.8 | 3407.5 | 2857.1 | 1.136 | 1.074 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - ELDORDO 230.00 2 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_2236 | la_alt2d3_s-eor | 1645.4 | 1913.9 | 304.1 | 2151.3 | 1937.9 | 1.136 | 1.062 | MIDPINTS 500.00 - DEVERS 500.00 1, COACHELV 230.00 - DEVERS 230.00 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | 23002/06/10 | la_alt2d3_s-eor | 2598 | 2860.3 | 248.7 | 3404.1 | 2871 | 1.135 | 1.074 | SANLUISREY 230 CORRIDOR |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2192 | la_alt2d3_s-eor | 2598 | 2843.6 | 255.2 | 3401.8 | 2855 | 1.134 | 1.074 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2193 | la_alt2d3_s-eor | 2598 | 2843.5 | 255.1 | 3401.7 | 2855 | 1.134 | 1.074 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - LUGO 230.00 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2246 | la_alt2d3_s-eor | 2598 | 2913.1 | 272.4 | 3399.8 | 2925.8 | 1.133 | 1.074 | VSTA 230.00 - DEVERS 230.00 1, COACHELV 230.00 - DEVERS 230.00 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2258 | la_alt2d3_s-eor | 2598 | 2859.3 | 227.7 | 3399.3 | 2868.3 | 1.133 | 1.074 | LUGO 500.00 - VINCENT 500.00 2, LUGO 500.00 - VICTORVL 500.00 1 |
| 22464 | MIGUEL | 230 | 22460 | MIGUEL | 138 | 1 | 23022/23023 | la_alt2d3_s-eor | 392 | 443.7 | 23.9 | 1174 | 444.4 | 1.13 | 0.81 | ML-MS1+ ML-MS2 230KV |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_2235 | la_alt2d3_s-eor | 1645.4 | 1908 | 299.7 | 2138.3 | 1931.4 | 1.129 | 1.062 | DEVERS 230.00 - MIRAGE 230.00 1, MIDPINTS 500.00 - DEVERS 500.00 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_2237 | la_alt2d3_s-eor | 1645.4 | 1908.7 | 297.6 | 2138.2 | 1931.8 | 1.129 | 1.062 | MIDPINTS 500.00 - DEVERS 500.00 1, J.HINDS 230.00 - MIRAGE 230.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2164 | la_alt2d3_s-eor | 2598 | 2920.2 | 280.8 | 3382.9 | 2933.7 | 1.128 | 1.074 | MIRALOMA 230.00 - VSTA 230.00 1, MIRALOMA 230.00 - VSTA 230.00 2 |
| 8601 | GEOSUB2 | 230 | 8300 | BANIS230 | 230 | 1 | line_N-204 | la_alt2d3_s-eor | 550 | 598.4 | 90.6 | 1556.7 | 605.3 | 1.128 | 0.769 | COACHELLA MIDWAY 230 CKT 1&2 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_N-217 | la_alt2d3_s-eor | 1645.4 | 1906.5 | 298 | 2135 | 1929.7 | 1.127 | 1.062 | line MIDPINTS to IH500/MIDPOINTS DEVERS 500 ck 1 |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_N-203 | la_alt2d3_s-eor | 800 | 871.7 | 130.7 | 2260 | 881.4 | 1.126 | 0.792 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | 23021/22/23/41 | la_alt2d3_s-eor | 2598 | 2910.3 | 171.7 | 3365.1 | 2915.4 | 1.122 | 1.074 | MIGUEL 230 CORRIDOR West of SN |
| 19038 | MEAD | 500 | 15034 | PERKINS | 500 | 1 | line_2236 | la_alt2d3_s-eor | 1238.4 | -1365.5 | 195.1 | 1592.9 | 1379.4 | 1.121 | 1.011 | MIDPINTS 500.00 - DEVERS 500.00 1, COACHELV 230.00 - DEVERS 230.00 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2255 | la_alt2d3_s-eor | 2598 | 2823.5 | 249.6 | 3358.6 | 2834.5 | 1.12 | 1.074 | LUGO 500.00 - MIRALOMA 500.00 3, LUGO 500.00 - MOHAVE 500.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2166 | la_alt2d3_s-eor | 2598 | 2893.1 | 262.3 | 3352.1 | 2904.9 | 1.117 | 1.074 | ETIWANDA 230.00 - SANBRDNO 230.00 1, ETIWANDA 230.00 - VSTA 230.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2165 | la_alt2d3_s-eor | 2598 | 2889.2 | 259.2 | 3346.9 | 2900.8 | 1.116 | 1.074 | ETIWANDA 230.00 - SANBRDNO 230.00 1, MIRALOMA 230.00 - VSTA 230.00 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2200 | la_alt2d3_s-eor | 2598 | 2817.2 | 239.8 | 3337.7 | 2827.4 | 1.113 | 1.074 | LUGO 500.00 - MOHAVE 500.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2201 | la_alt2d3_s-eor | 2598 | 2817.2 | 239.8 | 3337.6 | 2827.4 | 1.113 | 1.074 | LUGO 500.00 - MOHAVE 500.00 1, PISGAH 230.00 - LUGO 230.00 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2214 | la_alt2d3_s-eor | 2598 | 2741 | 352.3 | 3340.3 | 2763.5 | 1.113 | 1.074 | LUGO 500.00 - VINCENT 500.00 1, LUGO 500.00 - VINCENT 500.00 2 |
| 19038 | MEAD | 500 | 15034 | PERKINS | 500 | 1 | line_2237 | la_alt2d3_s-eor | 1238.4 | -1360 | 195.3 | 1581.6 | 1373.9 | 1.113 | 1.011 | MIDPINTS 500.00 - DEVERS 500.00 1, J.HINDS 230.00 - MIRAGE 230.00 1 |
| 19038 | MEAD | 500 | 15034 | PERKINS | 500 | 1 | line_2235 | la_alt2d3_s-eor | 1238.4 | -1357.4 | 192.5 | 1578.8 | 1371 | 1.111 | 1.011 | DEVERS 230.00 - MIRAGE 230.00 1, MIDPINTS 500.00 - DEVERS 500.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2194 | la_alt2d3_s-eor | 2598 | 2831.8 | 213.5 | 3329.5 | 2839.8 | 1.11 | 1.074 | LUGO 500.00 - MIRALOMA 500.00 2, LUGO 500.00 - MIRALOMA 500.00 3 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2234 | la_alt2d3_s-eor | 2598 | 2830.4 | 211 | 3330.7 | 2838.2 | 1.11 | 1.074 | MOHAVE 500.00 - ELDORDO 500.00 1, PISGAH 230.00 - ELDORDO 230.00 2 |
| 19038 | MEAD | 500 | 15034 | PERKINS | 500 | 1 | line_N-217 | la_alt2d3_s-eor | 1238.4 | -1356 | 192.7 | 1576.1 | 1369.7 | 1.109 | 1.011 | line MIDPINTS to IH500/MIDPOINTS DEVERS 500 ck 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2116 | la_alt2d3_s-eor | 2598 | 2816.3 | 249.9 | 3322.1 | 2827.4 | 1.107 | 1.074 | S.ONOFRE 230.00 - SANTIAGO 230.00 1, S.ONOFRE 230.00 - SERRANO 230.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2118 | la_alt2d3_s-eor | 2598 | 2816.3 | 249.9 | 3322.1 | 2827.4 | 1.107 | 1.074 | S.ONOFRE 230.00 - SANTIAGO 230.00 2, S.ONOFRE 230.00 - SERRANO 230.00 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | 23002/06/10 | la_alt2d3_s-eor | 1645.4 | 1871.8 | 293.8 | 2083.4 | 1894.7 | 1.101 | 1.062 | SANLUISREY 230 CORRIDOR |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_N-210 | la_alt2d3_s-eor | 800 | 856.9 | 75.5 | 2206.8 | 860.2 | 1.099 | 0.792 | EL CENTRO IMPERIAL VALLEY 230 CKTS 2&3 |
| 22672 | PRCTRVLY | 138 | 22460 | MIGUEL | 138 | 1 | 23022/23023 | la_alt2d3_s-eor | 408.3 | -437.9 | 31.3 | 1871.6 | 439 | 1.096 | 0.77 | ML-MS1+ ML-MS2 230KV |
| 15034 | PERKINS | 500 | 15031 | PERK PS1 | 500 | 1 | line_2235 | la_alt2d3_s-eor | 650 | -697.5 | -10 | 794.3 | 697.6 | 1.09 | 1 | DEVERS 230.00 - MIRAGE 230.00 1, MIDPINTS 500.00 - DEVERS 500.00 1 |
| 15034 | PERKINS | 500 | 15032 | PERK PS2 | 500 | 1 | line_2235 | la_alt2d3_s-eor | 650 | -697.5 | -10 | 794.3 | 697.6 | 1.09 | 1 | DEVERS 230.00 - MIRAGE 230.00 1, MIDPINTS 500.00 - DEVERS 500.00 1 |
| 15034 | PERKINS | 500 | 15031 | PERK PS1 | 500 | 1 | line_2236 | la_alt2d3_s-eor | 650 | -702 | -12.2 | 801.3 | 702.1 | 1.09 | 1 | MIDPINTS 500.00 - DEVERS 500.00 1, COACHELV 230.00 - DEVERS 230.00 2 |
| 15034 | PERKINS | 500 | 15032 | PERK PS2 | 500 | 1 | line_2236 | la_alt2d3_s-eor | 650 | -702 | -12.2 | 801.3 | 702.1 | 1.09 | 1 | MIDPINTS 500.00 - DEVERS 500.00 1, COACHELV 230.00 - DEVERS 230.00 2 |
| 15034 | PERKINS | 500 | 15031 | PERK PS1 | 500 | 1 | line_2237 | la_alt2d3_s-eor | 650 | -698.9 | -9.1 | 795.8 | 699 | 1.09 | 1 | MIDPINTS 500.00 - DEVERS 500.00 1, J.HINDS 230.00 - MIRAGE 230.00 1 |
| 15034 | PERKINS | 500 | 15032 | PERK PS2 | 500 | 1 | line_2237 | la_alt2d3_s-eor | 650 | -698.9 | -9.1 | 795.8 | 699 | 1.09 | 1 | MIDPINTS 500.00 - DEVERS 500.00 1, J.HINDS 230.00 - MIRAGE 230.00 1 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | line_N-203 | la_alt2d3_s-eor | 1120 | -1221.5 | -31.2 | 3224.9 | 1221.9 | 1.09 | 1 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | 23021/23041 | la_alt2d3_s-eor | 1120 | -1220.6 | -32 | 3135.2 | 1221 | 1.09 | 1 | ML-SX + OM-SX 230KV |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 1 | line_2030 | la_alt2d3_s-eor | 1287 | 1314.4 | -86.9 | 3510.4 | 1317.2 | 1.087 | 0.534 | LEWIS 230.00 - SERRANO 230.00 1, SERRANO 230.00 - VILLA PK 230.00 2 |
| 24137 | SERRANO | 230 | 24154 | VILLA PK | 230 | 1 | line_2032 | la_alt2d3_s-eor | 1287 | 1314.4 | -86.9 | 3510.4 | 1317.2 | 1.087 | 0.534 | LEWIS 230.00 - SERRANO 230.00 2, SERRANO 230.00 - VILLA PK 230.00 2 |
| 24155 | VINCENT | 230 | 24401 | ANTELOPE | 230 | 1 | line_2109 | la_alt2d3_s-eor | 458 | 478.1 | -104.6 | 1249.2 | 489.4 | 1.087 | 0.767 | PARDEE 230.00 - SYLMAR S 230.00 1, PARDEE 230.00 - SYLMAR S 230.00 2 |
| 24016 | BARRE | 230 | 25201 | LEWIS | 230 | 1 | line_2287 | la_alt2d3_s-eor | 1195 | -1199.2 | 316.9 | 3261.1 | 1240.3 | 1.087 | 0.719 | BARRE 230.00 - VILLA PK 230.00 1, SERRANO 230.00 - VILLA PK 230.00 1 |
| 24056 | ETIWANDA | 230 | 24132 | SANBRDNO | 230 | 1 | line_2172 | la_alt2d3_s-eor | 797 | -812.3 | 22.9 | 2169.8 | 812.6 | 1.085 | 0.513 | VSTA 230.00 - SANBRDNO 230.00 2, VSTA 230.00 - DEVERS 230.00 1 |
| 15034 | PERKINS | 500 | 15031 | PERK PS1 | 500 | 1 | line_N-217 | la_alt2d3_s-eor | 650 | -696.8 | -9.1 | 793.1 | 696.9 | 1.08 | 1 | line MIDPINTS to IH500/MIDPOINTS DEVERS 500 ck 1 |
| 15034 | PERKINS | 500 | 15032 | PERK PS2 | 500 | 1 | line_N-217 | la_alt2d3_s-eor | 650 | -696.8 | -9.1 | 793.1 | 696.9 | 1.08 | 1 | line MIDPINTS to IH500/MIDPOINTS DEVERS 500 ck 1 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | 23022/23023 | la_alt2d3_s-eor | 1120 | -1209.3 | -44.9 | 3114.8 | 1210.1 | 1.08 | 1 | ML-MS1+ ML-MS2 230KV |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | line_2239 | la_alt2d3_s-eor | 1120 | -1193.3 | -56.4 | 3158.7 | 1194.6 | 1.07 | 1 | CHINO 230.00 - S.ONOFRE 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | line_2240 | la_alt2d3_s-eor | 1120 | -1194.9 | -58.9 | 3171.6 | 1196.3 | 1.07 | 1 | CHINO 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 19038 | MEAD | 500 | 15034 | PERKINS | 500 | 1 | 23002/06/10 | la_alt2d3_s-eor | 1238.4 | -1313.7 | 163.7 | 1515.1 | 1323.9 | 1.066 | 1.011 | SANLUISREY 230 CORRIDOR |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | line_2238 | la_alt2d3_s-eor | 1120 | -1176.3 | -52.9 | 3090.8 | 1177.5 | 1.06 | 1 | S.ONOFRE 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 24042 | ELDORDO | 500 | 24086 | LUGO | 500 | 1 | line_2258 | la_alt2d3_s-eor | 1386 | 1449.5 | 80.9 | 1690.7 | 1451.8 | 1.056 | 0.819 | LUGO 500.00 - VINCENT 500.00 2, LUGO 500.00 - VICTORVL 500.00 1 |
| 19038 | MEAD | 500 | 15034 | PERKINS | 500 | 1 | line_2172 | la_alt2d3_s-eor | 1238.4 | -1301.5 | 161.4 | 1497.9 | 1311.4 | 1.054 | 1.011 | VSTA 230.00 - SANBRDNO 230.00 2, VSTA 230.00 - DEVERS 230.00 1 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | line_2182 | la_alt2d3_s-eor | 1120 | -1171.4 | -34.7 | 3019 | 1172 | 1.05 | 1 | DEVERS 230.00 - MIRAGE 230.00 1, COACHELV 230.00 - DEVERS 230.00 2 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | line_2236 | la_alt2d3_s-eor | 1120 | -1166.5 | -37.6 | 3046.4 | 1167.1 | 1.05 | 1 | MIDPINTS 500.00 - DEVERS 500.00 1, COACHELV 230.00 - DEVERS 230.00 2 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_2260 | la_alt2d3_s-eor | 56 | 58.5 | -4.6 | 290.4 | 58.6 | 1.05 | 0.92 | KRAMER 230.00 - LUGO 230.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 19038 | MEAD | 500 | 15034 | PERKINS | 500 | 1 | line_N-203 | la_alt2d3_s-eor | 1238.4 | -1299.8 | 177.2 | 1490.5 | 1311.8 | 1.05 | 1.011 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 15034 | PERKINS | 500 | 15031 | PERK PS1 | 500 | 1 | 23002/06/10 | la_alt2d3_s-eor | 650 | -674.2 | -9.4 | 761.8 | 674.3 | 1.05 | 1 | SANLUISREY 230 CORRIDOR |
| 15034 | PERKINS | 500 | 15032 | PERK PS2 | 500 | 1 | 23002/06/10 | la_alt2d3_s-eor | 650 | -674.2 | -9.4 | 761.8 | 674.3 | 1.05 | 1 | SANLUISREY 230 CORRIDOR |
| 24804 | DEVERS | 230 | 24901 | VSTA | 230 | 2 | line_2172 | la_alt2d3_s-eor | 988 | 988.1 | 269.8 | 2597.3 | 1024.3 | 1.048 | 0.732 | VSTA 230.00 - SANBRDNO 230.00 2, VSTA 230.00 - DEVERS 230.00 1 |
| 19038 | MEAD | 500 | 15034 | PERKINS | 500 | 1 | line_2168 | la_alt2d3_s-eor | 1238.4 | -1295.8 | 163.2 | 1487.4 | 1306 | 1.047 | 1.011 | DEVERS 230.00 - VSTA 230.00 2, ETIWANDA 230.00 - SANBRDNO 230.00 1 |
| 19038 | MEAD | 500 | 15034 | PERKINS | 500 | 1 | line_2171 | la_alt2d3_s-eor | 1238.4 | -1295.8 | 163.2 | 1487.4 | 1306 | 1.047 | 1.011 | ETIWANDA 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - DEVERS 230.00 1 |
| 24016 | BARRE | 230 | 25201 | LEWIS | 230 | 1 | line_2023 | la_alt2d3_s-eor | 1195 | -1150.7 | 312.1 | 3135.3 | 1192.3 | 1.046 | 0.719 | BARRE 230.00 - VILLA PK 230.00 1, LEWIS 230.00 - SERRANO 230.00 1 |
| 24016 | BARRE | 230 | 25201 | LEWIS | 230 | 1 | line_2024 | la_alt2d3_s-eor | 1195 | -1150.7 | 312.1 | 3135.3 | 1192.3 | 1.046 | 0.719 | BARRE 230.00 - VILLA PK 230.00 1, LEWIS 230.00 - SERRANO 230.00 2 |
| 25641 | TAP816 | 115 | 25664 | TAP998 | 115 | 1 | line_2214 | la_alt2d3_s-eor | 107.6 | -96.3 | 41.8 | 564.1 | 105 | 1.045 | 0.982 | LUGO 500.00 - VINCENT 500.00 1, LUGO 500.00 - VINCENT 500.00 2 |
| 24804 | DEVERS | 230 | 24901 | VSTA | 230 | 2 | line_2238 | la_alt2d3_s-eor | 988 | 965.2 | 322.1 | 2587.3 | 1017.5 | 1.045 | 0.732 | S.ONOFRE 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 24901 | VSTA | 230 | 24804 | DEVERS | 230 | 1 | line_2238 | la_alt2d3_s-eor | 988 | -919.6 | 162.2 | 2590.8 | 933.8 | 1.045 | 0.732 | S.ONOFRE 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 24016 | BARRE | 230 | 25201 | LEWIS | 230 | 1 | line_2025 | la_alt2d3_s-eor | 1195 | -1151.3 | 306.1 | 3130 | 1191.3 | 1.044 | 0.719 | BARRE 230.00 - VILLA PK 230.00 1, LEWIS 230.00 - VILLA PK 230.00 1 |
| 19038 | MEAD | 500 | 15034 | PERKINS | 500 | 1 | line_2246 | la_alt2d3_s-eor | 1238.4 | -1292.6 | 164.7 | 1482.2 | 1303.1 | 1.043 | 1.011 | VSTA 230.00 - DEVERS 230.00 1, COACHELV 230.00 - DEVERS 230.00 2 |
| 24056 | ETIWANDA | 230 | 24901 | VSTA | 230 | 1 | line_2164 | la_alt2d3_s-eor | 797 | -788.5 | 66.1 | 2084.8 | 791.3 | 1.042 | 0.447 | MIRALOMA 230.00 - VSTA 230.00 1, MIRALOMA 230.00 - VSTA 230.00 2 |
| 25641 | TAP816 | 115 | 25644 | TAP818 | 115 | 1 | line_2214 | la_alt2d3_s-eor | 107.6 | 96.3 | -41.1 | 562.6 | 104.7 | 1.041 | 0.979 | LUGO 500.00 - VINCENT 500.00 1, LUGO 500.00 - VINCENT 500.00 2 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24016 | BARRE | 230 | 25201 | LEWIS | 230 | 1 | line_2020 | la_alt2d3_s-eor | 1195 | -1146.1 | 299.1 | 3117.5 | 1184.5 | 1.04 | 0.719 | BARRE 230.00 - VILLA PK 230.00 1, DELAMO 230.00 - ELLIS 230.00 1 |
| 15034 | PERKINS | 500 | 15031 | PERK PS1 | 500 | 1 | line_2172 | la_alt2d3_s-eor | 650 | -667.7 | -6.6 | 753.4 | 667.7 | 1.04 | 1 | VSTA 230.00 - SANBRDNO 230.00 2, VSTA 230.00 - DEVERS 230.00 1 |
| 15034 | PERKINS | 500 | 15032 | PERK PS2 | 500 | 1 | line_2172 | la_alt2d3_s-eor | 650 | -667.7 | -6.6 | 753.4 | 667.7 | 1.04 | 1 | VSTA 230.00 - SANBRDNO 230.00 2, VSTA 230.00 - DEVERS 230.00 1 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | line_2246 | la_alt2d3_s-eor | 1120 | -1155.7 | -36.7 | 2975 | 1156.3 | 1.04 | 1 | VSTA 230.00 - DEVERS 230.00 1, COACHELV 230.00 - DEVERS 230.00 2 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | line_N-204 | la_alt2d3_s-eor | 1120 | -1164.8 | -9.6 | 3043.8 | 1164.8 | 1.04 | 1 | COACHELLA MIDWAY 230 CKT 1&2 |
| 24155 | VINCENT | 230 | 24401 | ANTELOPE | 230 | 1 | line_2147 | la_alt2d3_s-eor | 458 | 456.7 | -97.1 | 1194 | 467 | 1.039 | 0.767 | PARDEE 230.00 - VINCENT 230.00 1, VINCENT 230.00 - S.CLARA 230.00 1 |
| 24087 | MAGUNDEN | 230 | 24115 | PASTORIA | 230 | 1 | line_2133 | la_alt2d3_s-eor | 329 | 351.2 | 21.3 | 857.6 | 351.9 | 1.038 | 0.457 | MAGUNDEN 230.00 - PASTORIA 230.00 2, MAGUNDEN 230.00 - PASTORIA 230.00 3 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2182 | la_alt2d3_s-eor | 2598 | 2700.9 | 124.8 | 3114.7 | 2703.8 | 1.038 | 1.074 | DEVERS 230.00 - MIRAGE 230.00 1, COACHELV 230.00 - DEVERS 230.00 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2022 | la_alt2d3_s-eor | 2598 | 2679.5 | 183.8 | 3110.6 | 2685.8 | 1.037 | 1.074 | BARRE 230.00 - VILLA PK 230.00 1, BARRE 230.00 - LEWIS 230.00 1 |
| 22852 | TELECYN | 138 | 22772 | SOUTHBAY | 138 | 1 | 23022/23023 | la_alt2d3_s-eor | 382.4 | 388.4 | -9.9 | 1658.5 | 388.5 | 1.037 | 0.697 | ML-MS1+ ML-MS2 230KV |
| 24155 | VINCENT | 230 | 24401 | ANTELOPE | 230 | 1 | line_2284 | la_alt2d3_s-eor | 458 | 457.7 | -92.9 | 1191.2 | 467 | 1.036 | 0.767 | PARDEE 230.00 - VINCENT 230.00 1, VINCENT 230.00 - MESA CAL 230.00 1 |
| 24155 | VINCENT | 230 | 24401 | ANTELOPE | 230 | 1 | line_N-214 | la_alt2d3_s-eor | 458 | 457.7 | -92.9 | 1191.2 | 467 | 1.036 | 0.767 | GEOSUB1 MIDWAY/GEOSUB2 BANISTER 230 |
| 8600 | GEOSUB1 | 230 | 8300 | BANIS230 | 230 | 1 | line_N-204 | la_alt2d3_s-eor | 550 | 547.8 | 80.5 | 1425.3 | 553.7 | 1.033 | 0.712 | COACHELLA MIDWAY 230 CKT 1&2 |
| 8600 | GEOSUB1 | 230 | 8300 | BANIS230 | 230 | 2 | line_N-204 | la_alt2d3_s-eor | 550 | 547.8 | 80.5 | 1425.3 | 553.7 | 1.033 | 0.712 | COACHELLA MIDWAY 230 CKT 1&2 |
| 25641 | TAP816 | 115 | 25664 | TAP998 | 115 | 1 | line_2233 | la_alt2d3_s-eor | 107.6 | -96.3 | 41.7 | 556.6 | 105 | 1.031 | 0.982 | MOENKOPI 500.00 - ELDORDO 500.00 1, PISGAH 230.00 - ELDORDO 230.00 2 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | 23021/22/23/41 | la_alt2d3_s-eor | 388 | -389.1 | 5.9 | 1004 | 389.1 | 1.031 | 0.904 | MIGUEL 230 CORRIDOR West of SN |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_2191 | la_alt2d3_s-eor | 1645.4 | 1739.7 | 314.9 | 1942.9 | 1768 | 1.03 | 1.062 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - ELDORDO 230.00 2 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_2192 | la_alt2d3_s-eor | 1645.4 | 1741.7 | 310.6 | 1943.3 | 1769.1 | 1.03 | 1.062 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_2193 | la_alt2d3_s-eor | 1645.4 | 1741.7 | 310.6 | 1943.3 | 1769.2 | 1.03 | 1.062 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - LUGO 230.00 2 |
| 24804 | DEVERS | 230 | 24901 | VSTA | 230 | 2 | line_2239 | la_alt2d3_s-eor | 988 | 962.8 | 315.5 | 2549.7 | 1013.2 | 1.03 | 0.732 | CHINO 230.00 - S.ONOFRE 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 24901 | VSTA | 230 | 24804 | DEVERS | 230 | 1 | line_2239 | la_alt2d3_s-eor | 988 | -918.5 | 154 | 2553.3 | 931.4 | 1.03 | 0.732 | CHINO 230.00 - S.ONOFRE 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 15034 | PERKINS | 500 | 15031 | PERK PS1 | 500 | 1 | line_N-203 | la_alt2d3_s-eor | 650 | -666.7 | 3.1 | 750.8 | 666.7 | 1.03 | 1 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 15034 | PERKINS | 500 | 15032 | PERK PS2 | 500 | 1 | line_N-203 | la_alt2d3_s-eor | 650 | -666.7 | 3.1 | 750.8 | 666.7 | 1.03 | 1 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 24093 | MIRALOMW | 230 | 24158 | WALNUT | 230 | 1 | line_2158 | la_alt2d3_s-eor | 797 | 782.1 | 47.6 | 2058 | 783.5 | 1.029 | 0.717 | CHINO 230.00 - SERRANO 230.00 1, MIRALOMA 230.00 - OLINDA 230.00 1 |
| 25641 | TAP816 | 115 | 25664 | TAP998 | 115 | 1 | line_2236 | la_alt2d3_s-eor | 107.6 | -96.3 | 41.7 | 555.8 | 105 | 1.029 | 0.982 | MIDPINTS 500.00 - DEVERS 500.00 1, COACHELV 230.00 - DEVERS 230.00 2 |
| 25641 | TAP816 | 115 | 25644 | TAP818 | 115 | 1 | line_2233 | la_alt2d3_s-eor | 107.6 | 96.3 | -41 | 555.1 | 104.7 | 1.028 | 0.979 | MOENKOPI 500.00 - ELDORDO 500.00 1, PISGAH 230.00 - ELDORDO 230.00 2 |
| 14002 | MOENKOPI | 500 | 24042 | ELDORDO | 500 | 1 | line_2256 | la_alt2d3_s-eor | 1645.4 | 1736.8 | 311.6 | 1938.4 | 1764.5 | 1.028 | 1.062 | ELDORDO 500.00 - LUGO 500.00 1, LUGO 500.00 - MIRALOMA 500.00 2 |
| 8695 | RAMON | 230 | 24806 | MIRAGE | 230 | 2 | line_2236 | la_alt2d3_s-eor | 800 | 778.3 | -74.2 | 2062 | 781.8 | 1.027 | 0.639 | MIDPINTS 500.00 - DEVERS 500.00 1, COACHELV 230.00 - DEVERS 230.00 2 |
| 25641 | TAP816 | 115 | 25664 | TAP998 | 115 | 1 | line_2237 | la_alt2d3_s-eor | 107.6 | -96.4 | 41.7 | 554.6 | 105 | 1.027 | 0.982 | MIDPINTS 500.00 - DEVERS 500.00 1, J.HINDS 230.00 - MIRAGE 230.00 1 |
| 24804 | DEVERS | 230 | 24901 | VSTA | 230 | 2 | line_2240 | la_alt2d3_s-eor | 988 | 960.2 | 316 | 2544.2 | 1010.8 | 1.027 | 0.732 | CHINO 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 24901 | VSTA | 230 | 24804 | DEVERS | 230 | 1 | line_2240 | la_alt2d3_s-eor | 988 | -916 | 151.5 | 2547.9 | 928.5 | 1.027 | 0.732 | CHINO 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 25641 | TAP816 | 115 | 25664 | TAP998 | 115 | 1 | line_2256 | la_alt2d3_s-eor | 107.6 | -96.4 | 41.7 | 554.6 | 105 | 1.027 | 0.982 | ELDORDO 500.00 - LUGO 500.00 1, LUGO 500.00 - MIRALOMA 500.00 2 |
| 25641 | TAP816 | 115 | 25644 | TAP818 | 115 | 1 | line_2236 | la_alt2d3_s-eor | 107.6 | 96.3 | -41 | 554.3 | 104.7 | 1.026 | 0.979 | MIDPINTS 500.00 - DEVERS 500.00 1, COACHELV 230.00 - DEVERS 230.00 2 |
| 25641 | TAP816 | 115 | 25644 | TAP818 | 115 | 1 | line_2237 | la_alt2d3_s-eor | 107.6 | 96.4 | -41 | 553.1 | 104.7 | 1.024 | 0.979 | MIDPINTS 500.00 - DEVERS 500.00 1, J.HINDS 230.00 - MIRAGE 230.00 1 |
| 25641 | TAP816 | 115 | 25644 | TAP818 | 115 | 1 | line_2256 | la_alt2d3_s-eor | 107.6 | 96.4 | -41 | 553.1 | 104.7 | 1.024 | 0.979 | ELDORDO 500.00 - LUGO 500.00 1, LUGO 500.00 - MIRALOMA 500.00 2 |
| 25641 | TAP816 | 115 | 25664 | TAP998 | 115 | 1 | line_N-217 | la_alt2d3_s-eor | 107.6 | -96.4 | 41.7 | 553 | 105 | 1.024 | 0.982 | line MIDPINTS to IH500/MIDPOINTS DEVERS 500 ck 1 |
| 25641 | TAP816 | 115 | 25664 | TAP998 | 115 | 1 | line_2191 | la_alt2d3_s-eor | 107.6 | -96.4 | 41.7 | 552.4 | 105 | 1.023 | 0.982 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - ELDORDO 230.00 2 |
| 25641 | TAP816 | 115 | 25664 | TAP998 | 115 | 1 | line_2235 | la_alt2d3_s-eor | 107.6 | -96.4 | 41.7 | 552.4 | 105 | 1.023 | 0.982 | DEVERS 230.00 - MIRAGE 230.00 1, MIDPINTS 500.00 - DEVERS 500.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_N-203 | la_alt2d3_s-eor | 2598 | 2638.5 | 90.1 | 3068.4 | 2640 | 1.023 | 1.074 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 25641 | TAP816 | 115 | 25664 | TAP998 | 115 | 1 | line_2192 | la_alt2d3_s-eor | 107.6 | -96.4 | 41.7 | 551.8 | 105 | 1.022 | 0.982 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 25641 | TAP816 | 115 | 25664 | TAP998 | 115 | 1 | line_2193 | la_alt2d3_s-eor | 107.6 | -96.4 | 41.7 | 551.8 | 105 | 1.022 | 0.982 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - LUGO 230.00 2 |
| 25641 | TAP816 | 115 | 25644 | TAP818 | 115 | 1 | line_N-217 | la_alt2d3_s-eor | 107.6 | 96.4 | -41 | 551.4 | 104.7 | 1.021 | 0.979 | line MIDPINTS to IH500/MIDPOINTS DEVERS 500 ck 1 |
| 25641 | TAP816 | 115 | 25644 | TAP818 | 115 | 1 | line_2191 | la_alt2d3_s-eor | 107.6 | 96.4 | -41 | 550.9 | 104.7 | 1.02 | 0.979 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - ELDORDO 230.00 2 |
| 25641 | TAP816 | 115 | 25644 | TAP818 | 115 | 1 | line_2235 | la_alt2d3_s-eor | 107.6 | 96.4 | -41 | 550.9 | 104.7 | 1.02 | 0.979 | DEVERS 230.00 - MIRAGE 230.00 1, MIDPINTS 500.00 - DEVERS 500.00 1 |
| 25641 | TAP816 | 115 | 25644 | TAP818 | 115 | 1 | line_2192 | la_alt2d3_s-eor | 107.6 | 96.4 | -41 | 550.2 | 104.7 | 1.019 | 0.979 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 25641 | TAP816 | 115 | 25644 | TAP818 | 115 | 1 | line_2193 | la_alt2d3_s-eor | 107.6 | 96.4 | -41 | 550.2 | 104.7 | 1.019 | 0.979 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - LUGO 230.00 2 |
| 24805 | DEVERS | 115 | 25644 | TAP818 | 115 | 1 | line_2214 | la_alt2d3_s-eor | 217 | -183.4 | 100.4 | 1109 | 209 | 1.018 | 0.953 | LUGO 500.00 - VINCENT 500.00 1, LUGO 500.00 - VINCENT 500.00 2 |
| 25641 | TAP816 | 115 | 25664 | TAP998 | 115 | 1 | 23002/06/10 | la_alt2d3_s-eor | 107.6 | -96.4 | 41.7 | 549.9 | 105 | 1.018 | 0.982 | SANLUISREY 230 CORRIDOR |
| 25641 | TAP816 | 115 | 25664 | TAP998 | 115 | 1 | line_2255 | la_alt2d3_s-eor | 107.6 | -96.4 | 41.7 | 548.2 | 105 | 1.015 | 0.982 | LUGO 500.00 - MIRALOMA 500.00 3, LUGO 500.00 - MOHAVE 500.00 1 |
| 25641 | TAP816 | 115 | 25664 | TAP998 | 115 | 1 | line_2258 | la_alt2d3_s-eor | 107.6 | -96.4 | 41.7 | 547.8 | 105 | 1.015 | 0.982 | LUGO 500.00 - VINCENT 500.00 2, LUGO 500.00 - VICTORVL 500.00 1 |
| 25641 | TAP816 | 115 | 25644 | TAP818 | 115 | 1 | 23002/06/10 | la_alt2d3_s-eor | 107.6 | 96.4 | -40.9 | 548.3 | 104.7 | 1.015 | 0.979 | SANLUISREY 230 CORRIDOR |
| 24701 | KRAMER | 230 | 24085 | LUGO | 230 | 2 | line_2260 | la_alt2d3_s-eor | 478 | 483.9 | 56.2 | 1217 | 487.2 | 1.014 | 0.603 | KRAMER 230.00 - LUGO 230.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 25641 | TAP816 | 115 | 25644 | TAP818 | 115 | 1 | line_2255 | la_alt2d3_s-eor | 107.6 | 96.4 | -40.9 | 546.6 | 104.7 | 1.012 | 0.979 | LUGO 500.00 - MIRALOMA 500.00 3, LUGO 500.00 - MOHAVE 500.00 1 |
| 25641 | TAP816 | 115 | 25644 | TAP818 | 115 | 1 | line_2258 | la_alt2d3_s-eor | 107.6 | 96.4 | -40.9 | 546.3 | 104.7 | 1.011 | 0.979 | LUGO 500.00 - VINCENT 500.00 2, LUGO 500.00 - VICTORVL 500.00 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_2214 | la_alt2d3_s-eor | 56 | 55.9 | -4.5 | 278.3 | 56.1 | 1.01 | 0.92 | LUGO 500.00 - VINCENT 500.00 1, LUGO 500.00 - VINCENT 500.00 2 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | line_N-203 | la_alt2d3_s-eor | 388 | -378.3 | 4.7 | 982.5 | 378.3 | 1.009 | 0.904 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2237 | la_alt2d3_s-eor | 2598 | 2510 | 11.3 | 3023.8 | 2510 | 1.008 | 1.074 | MIDPINTS 500.00 - DEVERS 500.00 1, J.HINDS 230.00 - MIRAGE 230.00 1 |
| 24805 | DEVERS | 115 | 25644 | TAP818 | 115 | 1 | line_2233 | la_alt2d3_s-eor | 217 | -183.4 | 99.6 | 1093.2 | 208.7 | 1.004 | 0.953 | MOENKOPI 500.00 - ELDORDO 500.00 1, PISGAH 230.00 - ELDORDO 230.00 2 |
| 24093 | MIRALOMW | 230 | 24158 | WALNUT | 230 | 1 | line_2157 | la_alt2d3_s-eor | 797 | 761.9 | 38 | 2006.2 | 762.9 | 1.003 | 0.717 | CHINO 230.00 - S.ONOFRE 230.00 1, MIRALOMA 230.00 - OLINDA 230.00 1 |
| 24093 | MIRALOMW | 230 | 24158 | WALNUT | 230 | 1 | line_2211 | la_alt2d3_s-eor | 797 | 761.9 | 38 | 2006.2 | 762.9 | 1.003 | 0.717 | MIRALOMA 230.00 - OLINDA 230.00 1, LUGO 500.00 - SERRANO 500.00 1 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_N-217 | la_alt2d3_s-eor | 2598 | 2502.4 | 7.7 | 3009.8 | 2502.4 | 1.003 | 1.074 | line MIDPINTS to IH500/MIDPOINTS DEVERS 500 ck 1 |
| 24805 | DEVERS | 115 | 25644 | TAP818 | 115 | 1 | line_2236 | la_alt2d3_s-eor | 217 | -183.4 | 99.5 | 1091.5 | 208.7 | 1.002 | 0.953 | MIDPINTS 500.00 - DEVERS 500.00 1, COACHELV 230.00 - DEVERS 230.00 2 |
| 24093 | MIRALOMW | 230 | 24158 | WALNUT | 230 | 1 | line_2091 | la_alt2d3_s-eor | 797 | 759.2 | 52.3 | 2003.5 | 761 | 1.001 | 0.717 | CENTER S 230.00 - OLINDA 230.00 1, MIRALOMA 230.00 - OLINDA 230.00 1 |
| 24805 | DEVERS | 115 | 25644 | TAP818 | 115 | 1 | line_2237 | la_alt2d3_s-eor | 217 | -183.5 | 99.4 | 1089.1 | 208.6 | 1 | 0.953 | MIDPINTS 500.00 - DEVERS 500.00 1, J.HINDS 230.00 - MIRAGE 230.00 1 |
| 24805 | DEVERS | 115 | 25644 | TAP818 | 115 | 1 | line_2256 | la_alt2d3_s-eor | 217 | -183.5 | 99.4 | 1088.9 | 208.6 | 1 | 0.953 | ELDORDO 500.00 - LUGO 500.00 1, LUGO 500.00 - MIRALOMA 500.00 2 |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2235 | la_alt2d3_s-eor | 2598 | 2485 | -0.1 | 2989.9 | 2485 | 0.997 | 1.074 | DEVERS 230.00 - MIRAGE 230.00 1, MIDPINTS 500.00 - DEVERS 500.00 1 |
| 24805 | DEVERS | 115 | 25644 | TAP818 | 115 | 1 | line_N-217 | la_alt2d3_s-eor | 217 | -183.5 | 99.2 | 1085.5 | 208.6 | 0.997 | 0.953 | line MIDPINTS to IH500/MIDPOINTS DEVERS 500 ck 1 |
| 24805 | DEVERS | 115 | 25644 | TAP818 | 115 | 1 | line_2191 | la_alt2d3_s-eor | 217 | -183.5 | 99.1 | 1084.4 | 208.5 | 0.996 | 0.953 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - ELDORDO 230.00 2 |
| 24805 | DEVERS | 115 | 25644 | TAP818 | 115 | 1 | line_2235 | la_alt2d3_s-eor | 217 | -183.5 | 99.1 | 1084.3 | 208.5 | 0.996 | 0.953 | DEVERS 230.00 - MIRAGE 230.00 1, MIDPINTS 500.00 - DEVERS 500.00 1 |
| 24805 | DEVERS | 115 | 25644 | TAP818 | 115 | 1 | line_2192 | la_alt2d3_s-eor | 217 | -183.5 | 99.1 | 1083 | 208.5 | 0.995 | 0.953 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 24805 | DEVERS | 115 | 25644 | TAP818 | 115 | 1 | line_2193 | la_alt2d3_s-eor | 217 | -183.5 | 99.1 | 1083 | 208.5 | 0.995 | 0.953 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - LUGO 230.00 2 |
| 24805 | DEVERS | 115 | 25644 | TAP818 | 115 | 1 | 23002/06/10 | la_alt2d3_s-eor | 217 | -183.5 | 98.9 | 1079 | 208.4 | 0.991 | 0.953 | SANLUISREY 230 CORRIDOR |
| 24801 | DEVERS | 500 | 24151 | VALLEYSC | 500 | 1 | line_2236 | la_alt2d3_s-eor | 2598 | 2454.4 | -13.9 | 2969.8 | 2454.4 | 0.99 | 1.074 | MIDPINTS 500.00 - DEVERS 500.00 1, COACHELV 230.00 - DEVERS 230.00 2 |
| 24016 | BARRE | 230 | 24154 | VILLA PK | 230 | 1 | line_2286 | la_alt2d3_s-eor | 1195 | -1091.7 | 292.2 | 2967 | 1130.1 | 0.99 | 0.517 | BARRE 230.00 - LEWIS 230.00 1, LEWIS 230.00 - SERRANO 230.00 2 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 19051 | KNOB | 161 | 8367 | PILOTKNB | 161 | 1 | line_N-203 | la_alt2d3_s-eor | 165 | -163.2 | 11.9 | 585.5 | 163.6 | 0.99 | 0.777 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 24016 | BARRE | 230 | 24154 | VILLA PK | 230 | 1 | line_N-216 | la_alt2d3_s-eor | 1195 | -1091.7 | 292.2 | 2967 | 1130.1 | 0.99 | 0.517 | GEOSUB2 BANISTER/GEOSUB1 GEOSUB2 230 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | 23022/23023 | la_alt2d3_s-eor | 388 | -374.4 | 6.5 | 964.2 | 374.5 | 0.99 | 0.904 | ML-MS1+ ML-MS2 230KV |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | line_2240 | la_alt2d3_s-eor | 388 | -370.8 | 2.1 | 962.5 | 370.8 | 0.988 | 0.904 | CHINO 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 24805 | DEVERS | 115 | 25644 | TAP818 | 115 | 1 | line_2255 | la_alt2d3_s-eor | 217 | -183.5 | 98.7 | 1075.5 | 208.4 | 0.988 | 0.953 | LUGO 500.00 - MIRALOMA 500.00 3, LUGO 500.00 - MOHAVE 500.00 1 |
| 24805 | DEVERS | 115 | 25644 | TAP818 | 115 | 1 | line_2258 | la_alt2d3_s-eor | 217 | -183.5 | 98.6 | 1074.7 | 208.4 | 0.987 | 0.953 | LUGO 500.00 - VINCENT 500.00 2, LUGO 500.00 - VICTORVL 500.00 1 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | line_2239 | la_alt2d3_s-eor | 388 | -370 | 3.6 | 959.4 | 370 | 0.985 | 0.904 | CHINO 230.00 - S.ONOFRE 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 15034 | PERKINS | 500 | 15031 | PERK PS1 | 500 | 1 | line_2214 | la_alt2d3_s-eor | 650 | -625.7 | -25.5 | 712.4 | 626.3 | 0.98 | 1 | LUGO 500.00 - VINCENT 500.00 1, LUGO 500.00 - VINCENT 500.00 2 |
| 15034 | PERKINS | 500 | 15032 | PERK PS2 | 500 | 1 | line_2214 | la_alt2d3_s-eor | 650 | -625.7 | -25.5 | 712.4 | 626.3 | 0.98 | 1 | LUGO 500.00 - VINCENT 500.00 1, LUGO 500.00 - VINCENT 500.00 2 |
| 20238 | HRD-230 | 230 | 20239 | HRD-115 | 115 | 1 | 23021/22/23/41 | la_alt2d3_s-eor | 225 | 218.1 | -21.1 | 561.9 | 219.1 | 0.98 | 0.88 | MIGUEL 230 CORRIDOR West of SN |
| 8300 | BANIS230 | 230 | 80300 | NEWSF230 | 230 | 1 | line_N-204 | la_alt2d3_s-eor | 800 | 745.9 | 25.8 | 1966.4 | 746.3 | 0.979 | 0.792 | COACHELLA MIDWAY 230 CKT 1&2 |
| 19038 | MEAD | 500 | 15034 | PERKINS | 500 | 1 | line_2194 | la_alt2d3_s-eor | 1238.4 | -1219.1 | 136.8 | 1389.1 | 1226.8 | 0.978 | 1.011 | LUGO 500.00 - MIRALOMA 500.00 2, LUGO 500.00 - MIRALOMA 500.00 3 |
| 19038 | MEAD | 500 | 15034 | PERKINS | 500 | 1 | line_2234 | la_alt2d3_s-eor | 1238.4 | -1210.9 | 111.5 | 1390.3 | 1216 | 0.976 | 1.011 | MOHAVE 500.00 - ELDORDO 500.00 1, PISGAH 230.00 - ELDORDO 230.00 2 |
| 8311 | COACHELA | 230 | 8695 | RAMON | 230 | 2 | line_2236 | la_alt2d3_s-eor | 800 | 751.3 | 60.1 | 1959.8 | 753.7 | 0.976 | 0.628 | MIDPINTS 500.00 - DEVERS 500.00 1, COACHELV 230.00 - DEVERS 230.00 2 |
| 19038 | MEAD | 500 | 15034 | PERKINS | 500 | 1 | line_2255 | la_alt2d3_s-eor | 1238.4 | -1207.4 | 108.3 | 1388.8 | 1212.3 | 0.975 | 1.011 | LUGO 500.00 - MIRALOMA 500.00 3, LUGO 500.00 - MOHAVE 500.00 1 |
| 24093 | MIRALOMW | 230 | 24158 | WALNUT | 230 | 1 | line_2022 | la_alt2d3_s-eor | 797 | 731.2 | 48.1 | 1948.2 | 732.8 | 0.974 | 0.717 | BARRE 230.00 - VILLA PK 230.00 1, BARRE 230.00 - LEWIS 230.00 1 |
| 25629 | TAP813 | 115 | 25630 | TAP814 | 115 | 1 | line_2214 | la_alt2d3_s-eor | 82.7 | 69.9 | -28.9 | 404.6 | 75.6 | 0.974 | 0.913 | LUGO 500.00 - VINCENT 500.00 1, LUGO 500.00 - VINCENT 500.00 2 |
| 22831 | SYCAMORE | 138 | 22116 | CARLTHTP | 138 | 1 | 13821C/25/23051A | la_alt2d3_s-eor | 204.1 | 193.6 | -20.6 | 831.7 | 194.7 | 0.974 | 0.538 | CH-ES-NCM-SX |
| 24016 | BARRE | 230 | 25201 | LEWIS | 230 | 1 | line_2154 | la_alt2d3_s-eor | 1195 | -1065.7 | 219.5 | 2917.8 | 1088.1 | 0.973 | 0.719 | MIRALOMA 230.00 - OLINDA 230.00 1, MIRALOMA 230.00 - WALNUT 230.00 1 |
| 15034 | PERKINS | 500 | 15031 | PERK PS1 | 500 | 1 | line_2194 | la_alt2d3_s-eor | 650 | -624.1 | 4.3 | 699.3 | 624.2 | 0.97 | 1 | LUGO 500.00 - MIRALOMA 500.00 2, LUGO 500.00 - MIRALOMA 500.00 3 |
| 15034 | PERKINS | 500 | 15032 | PERK PS2 | 500 | 1 | line_2194 | la_alt2d3_s-eor | 650 | -624.1 | 4.3 | 699.3 | 624.2 | 0.97 | 1 | LUGO 500.00 - MIRALOMA 500.00 2, LUGO 500.00 - MIRALOMA 500.00 3 |
| 15034 | PERKINS | 500 | 15031 | PERK PS1 | 500 | 1 | line_2200 | la_alt2d3_s-eor | 650 | -621.6 | -10.6 | 700.8 | 621.7 | 0.97 | 1 | LUGO 500.00 - MOHAVE 500.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 15034 | PERKINS | 500 | 15032 | PERK PS2 | 500 | 1 | line_2200 | la_alt2d3_s-eor | 650 | -621.6 | -10.6 | 700.8 | 621.7 | 0.97 | 1 | LUGO 500.00 - MOHAVE 500.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 15034 | PERKINS | 500 | 15031 | PERK PS1 | 500 | 1 | line_2201 | la_alt2d3_s-eor | 650 | -621.6 | -10.6 | 700.8 | 621.7 | 0.97 | 1 | LUGO 500.00 - MOHAVE 500.00 1, PISGAH 230.00 - LUGO 230.00 2 |
| 15034 | PERKINS | 500 | 15032 | PERK PS2 | 500 | 1 | line_2201 | la_alt2d3_s-eor | 650 | -621.6 | -10.6 | 700.8 | 621.7 | 0.97 | 1 | LUGO 500.00 - MOHAVE 500.00 1, PISGAH 230.00 - LUGO 230.00 2 |
| 24042 | ELDORDO | 500 | 24086 | LUGO | 500 | 1 | line_2234 | la_alt2d3_s-eor | 1386 | 1337 | 38.1 | 1550.4 | 1337.5 | 0.969 | 0.819 | MOHAVE 500.00 - ELDORDO 500.00 1, PISGAH 230.00 - ELDORDO 230.00 2 |
| 22832 | SYCAMORE | 230 | 22652 | PENSQTOS | 230 | 1 | 13821C/25/23051A | la_alt2d3_s-eor | 796.7 | 741.8 | -102.5 | 1938.8 | 748.9 | 0.969 | 0.667 | CH-ES-NCM-SX |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | line_2238 | la_alt2d3_s-eor | 388 | -364.5 | 5.5 | 943 | 364.6 | 0.968 | 0.904 | S.ONOFRE 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | line_N-204 | la_alt2d3_s-eor | 388 | -363.1 | 9.7 | 940.6 | 363.3 | 0.966 | 0.904 | COACHELLA MIDWAY 230 CKT 1&2 |
| 19051 | KNOB | 161 | 8367 | PILOTKNB | 161 | 1 | line_N-204 | la_alt2d3_s-eor | 165 | -158.8 | 17.4 | 570.4 | 159.8 | 0.964 | 0.777 | COACHELLA MIDWAY 230 CKT 1&2 |
| 24093 | MIRALOMW | 230 | 24158 | WALNUT | 230 | 1 | line_2262 | la_alt2d3_s-eor | 797 | 730 | 29 | 1925.1 | 730.6 | 0.962 | 0.717 | CHINO 230.00 - MIRALOMA 230.00 3, MIRALOMA 230.00 - OLINDA 230.00 1 |
| 25629 | TAP813 | 115 | 25630 | TAP814 | 115 | 1 | line_2233 | la_alt2d3_s-eor | 82.7 | 69.9 | -28.8 | 399 | 75.6 | 0.961 | 0.913 | MOENKOPI 500.00 - ELDORDO 500.00 1, PISGAH 230.00 - ELDORDO 230.00 2 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_2022 | la_alt2d3_s-eor | 56 | 53.3 | -4.8 | 264.4 | 53.6 | 0.96 | 0.92 | BARRE 230.00 - VILLA PK 230.00 1, BARRE 230.00 - LEWIS 230.00 1 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | line_2116 | la_alt2d3_s-eor | 1120 | -1066.9 | -34.8 | 2679 | 1067.5 | 0.96 | 1 | S.ONOFRE 230.00 - SANTIAGO 230.00 1, S.ONOFRE 230.00 - SERRANO 230.00 1 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | line_2118 | la_alt2d3_s-eor | 1120 | -1066.9 | -34.8 | 2679 | 1067.5 | 0.96 | 1 | S.ONOFRE 230.00 - SANTIAGO 230.00 2, S.ONOFRE 230.00 - SERRANO 230.00 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_2154 | la_alt2d3_s-eor | 56 | 53.5 | -4.7 | 265.1 | 53.7 | 0.96 | 0.92 | MIRALOMA 230.00 - OLINDA 230.00 1, MIRALOMA 230.00 - WALNUT 230.00 1 |
| 24042 | ELDORDO | 500 | 24086 | LUGO | 500 | 1 | line_2200 | la_alt2d3_s-eor | 1386 | 1321.8 | 72.9 | 1536.7 | 1323.8 | 0.96 | 0.819 | LUGO 500.00 - MOHAVE 500.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 24042 | ELDORDO | 500 | 24086 | LUGO | 500 | 1 | line_2201 | la_alt2d3_s-eor | 1386 | 1321.7 | 72.8 | 1536.6 | 1323.7 | 0.96 | 0.819 | LUGO 500.00 - MOHAVE 500.00 1, PISGAH 230.00 - LUGO 230.00 2 |
| 15034 | PERKINS | 500 | 15031 | PERK PS1 | 500 | 1 | line_2234 | la_alt2d3_s-eor | 650 | -620 | -9.3 | 698.1 | 620.1 | 0.96 | 1 | MOHAVE 500.00 - ELDORDO 500.00 1, PISGAH 230.00 - ELDORDO 230.00 2 |
| 15034 | PERKINS | 500 | 15032 | PERK PS2 | 500 | 1 | line_2234 | la_alt2d3_s-eor | 650 | -620 | -9.3 | 698.1 | 620.1 | 0.96 | 1 | MOHAVE 500.00 - ELDORDO 500.00 1, PISGAH 230.00 - ELDORDO 230.00 2 |
| 15034 | PERKINS | 500 | 15031 | PERK PS1 | 500 | 1 | line_2255 | la_alt2d3_s-eor | 650 | -618.3 | -10.9 | 697.2 | 618.4 | 0.96 | 1 | LUGO 500.00 - MIRALOMA 500.00 3, LUGO 500.00 - MOHAVE 500.00 1 |
| 15034 | PERKINS | 500 | 15032 | PERK PS2 | 500 | 1 | line_2255 | la_alt2d3_s-eor | 650 | -618.3 | -10.9 | 697.2 | 618.4 | 0.96 | 1 | LUGO 500.00 - MIRALOMA 500.00 3, LUGO 500.00 - MOHAVE 500.00 1 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | 23011/23003 | la_alt2d3_s-eor | 1120 | -1075.7 | -39.4 | 2717.6 | 1076.4 | 0.96 | 1 | SA-EA 230KV + SA-ES-EA 230KV |
| 25629 | TAP813 | 115 | 25630 | TAP814 | 115 | 1 | line_2236 | la_alt2d3_s-eor | 82.7 | 69.9 | -28.8 | 398.4 | 75.6 | 0.959 | 0.913 | MIDPINTS 500.00 - DEVERS 500.00 1, COACHELV 230.00 - DEVERS 230.00 2 |
| 19038 | MEAD | 500 | 15034 | PERKINS | 500 | 1 | line_2192 | la_alt2d3_s-eor | 1238.4 | -1185.9 | 94.1 | 1365.9 | 1189.6 | 0.958 | 1.011 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 19038 | MEAD | 500 | 15034 | PERKINS | 500 | 1 | line_2193 | la_alt2d3_s-eor | 1238.4 | -1185.9 | 94.2 | 1365.9 | 1189.7 | 0.958 | 1.011 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - LUGO 230.00 2 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | line_2236 | la_alt2d3_s-eor | 388 | -360.9 | 7.6 | 932.7 | 361 | 0.958 | 0.904 | MIDPINTS 500.00 - DEVERS 500.00 1, COACHELV 230.00 - DEVERS 230.00 2 |
| 19038 | MEAD | 500 | 15034 | PERKINS | 500 | 1 | line_2191 | la_alt2d3_s-eor | 1238.4 | -1183.3 | 90.8 | 1364.1 | 1186.8 | 0.957 | 1.011 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - ELDORDO 230.00 2 |
| 25629 | TAP813 | 115 | 25630 | TAP814 | 115 | 1 | line_2237 | la_alt2d3_s-eor | 82.7 | 69.9 | -28.7 | 397.5 | 75.6 | 0.957 | 0.913 | MIDPINTS 500.00 - DEVERS 500.00 1, J.HINDS 230.00 - MIRAGE 230.00 1 |
| 24132 | SANBRDNO | 230 | 24804 | DEVERS | 230 | 1 | line_2238 | la_alt2d3_s-eor | 988 | -862.2 | 132.9 | 2374.3 | 872.4 | 0.957 | 0.672 | S.ONOFRE 230.00 - SERRANO 230.00 1, SERRANO 500.00 - VALLEYSC 500.00 1 |
| 25629 | TAP813 | 115 | 25630 | TAP814 | 115 | 1 | line_2256 | la_alt2d3_s-eor | 82.7 | 69.9 | -28.7 | 397.5 | 75.6 | 0.957 | 0.913 | ELDORDO 500.00 - LUGO 500.00 1, LUGO 500.00 - MIRALOMA 500.00 2 |
| 19038 | MEAD | 500 | 15034 | PERKINS | 500 | 1 | line_2256 | la_alt2d3_s-eor | 1238.4 | -1181 | 92.2 | 1360.6 | 1184.6 | 0.954 | 1.011 | ELDORDO 500.00 - LUGO 500.00 1, LUGO 500.00 - MIRALOMA 500.00 2 |
| 25629 | TAP813 | 115 | 25630 | TAP814 | 115 | 1 | line_N-217 | la_alt2d3_s-eor | 82.7 | 69.9 | -28.7 | 396.2 | 75.6 | 0.954 | 0.913 | line MIDPINTS to IH500/MIDPOINTS DEVERS 500 ck 1 |
| 25629 | TAP813 | 115 | 25630 | TAP814 | 115 | 1 | line_2191 | la_alt2d3_s-eor | 82.7 | 69.9 | -28.7 | 395.8 | 75.6 | 0.953 | 0.913 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - ELDORDO 230.00 2 |
| 25629 | TAP813 | 115 | 25630 | TAP814 | 115 | 1 | line_2235 | la_alt2d3_s-eor | 82.7 | 69.9 | -28.7 | 395.8 | 75.6 | 0.953 | 0.913 | DEVERS 230.00 - MIRAGE 230.00 1, MIDPINTS 500.00 - DEVERS 500.00 1 |
| 25629 | TAP813 | 115 | 25630 | TAP814 | 115 | 1 | line_2192 | la_alt2d3_s-eor | 82.7 | 69.9 | -28.7 | 395.3 | 75.6 | 0.952 | 0.913 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - LUGO 230.00 1 |
| 25629 | TAP813 | 115 | 25630 | TAP814 | 115 | 1 | line_2193 | la_alt2d3_s-eor | 82.7 | 69.9 | -28.7 | 395.3 | 75.6 | 0.952 | 0.913 | ELDORDO 500.00 - LUGO 500.00 1, PISGAH 230.00 - LUGO 230.00 2 |
| 25201 | LEWIS | 230 | 24154 | VILLA PK | 230 | 1 | line_2028 | la_alt2d3_s-eor | 956 | -847 | 149.1 | 2282.6 | 860 | 0.951 | 0.282 | LEWIS 230.00 - SERRANO 230.00 1, LEWIS 230.00 - SERRANO 230.00 2 |
| 20102 | RUM-230 | 230 | 20118 | ROA-230 | 230 | 1 | line_2182 | la_alt2d3_s-eor | 388 | -359.6 | 8.9 | 926 | 359.7 | 0.951 | 0.904 | DEVERS 230.00 - MIRAGE 230.00 1, COACHELV 230.00 - DEVERS 230.00 2 |
| 22260 | ESCNDIDO | 230 | 22844 | TALEGA | 230 | 1 | 23002/06/10 | la_alt2d3_s-eor | 456.1 | 438.5 | 36.2 | 1088.6 | 440 | 0.951 | 0.246 | SANLUISREY 230 CORRIDOR |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | line_2114 | la_alt2d3_s-eor | 1120 | -1065.3 | -33.2 | 2670.8 | 1065.8 | 0.95 | 1 | ELLIS 230.00 - SANTIAGO 230.00 1, JOHANNA 230.00 - SANTIAGO 230.00 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_2147 | la_alt2d3_s-eor | 56 | 52.9 | -4.7 | 261.8 | 53.1 | 0.95 | 0.92 | PARDEE 230.00 - VINCENT 230.00 1, VINCENT 230.00 - S.CLARA 230.00 1 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_2283 | la_alt2d3_s-eor | 56 | 52.9 | -4.8 | 261.7 | 53.1 | 0.95 | 0.92 | VINCENT 230.00 - S.CLARA 230.00 1, VINCENT 230.00 - ANTELOPE 230.00 1 |
| 20238 | HRD-230 | 230 | 20239 | HRD-115 | 115 | 1 | line_N-203 | la_alt2d3_s-eor | 225 | 213.1 | -18.4 | 552.6 | 213.9 | 0.95 | 0.88 | COACHELLA DEVERS/RAMOM MIRAGE 230 CKT 2 |
| 24728 | INYO | 115 | 24730 | INYO PS | 115 | 1 | line_N-213 | la_alt2d3_s-eor | 56 | 52.9 | -4.8 | 261.7 | 53.1 | 0.95 | 0.92 | GEOSUB2 MIDWAY 230 CKTS 1&2 |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | 23051A/23011 | la_alt2d3_s-eor | 1120 | -1055.8 | -73.2 | 2710.1 | 1058.3 | 0.95 | 1 | SX-EPP + ES-EA-SA 230KV |
| 22738 | CENTRALX | 230 | 22737 | CENTRALX | 500 | 1 | 23051B/23011 | la_alt2d3_s-eor | 1120 | -1059.3 | -54.3 | 2694.6 | 1060.7 | 0.95 | 1 | EPP-ES + ES-EA-SA 230KV |
| 20238 | HRD-230 | 230 | 20239 | HRD-115 | 115 | 1 | 23022/23023 | la_alt2d3_s-eor | 225 | 211.5 | -17.8 | 543.6 | 212.2 | 0.95 | 0.88 | ML-MS1+ ML-MS2 230KV |

la_alt2d3_s-eor.sav
No Solve Summary
N-2 Outages

| Contingency-Description | Case | Problem-Description |
|---|---|---|
| S.ONOFRE 230.00 - SANTIAGO 230.00 1, S.ONOFRE 230.00 - SANTIAGO 230.00 2 | la_alt2d3_s-eor | BAD Qgen: 79123 FONTNLLE 4.0 MVAr |
| ETIWANDA 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - SANBRDNO 230.00 2 | la_alt2d3_s-eor | BAD Qgen: 79123 FONTNLLE 4.0 MVAr |
| DEVERS 230.00 - SANBRDNO 230.00 1, DEVERS 230.00 - VSTA 230.00 2 | la_alt2d3_s-eor | BAD Qgen: 79123 FONTNLLE 4.0 MVAr |
| DEVERS 230.00 - SANBRDNO 230.00 1, VSTA 230.00 - DEVERS 230.00 1 | la_alt2d3_s-eor | BAD Qgen: 79123 FONTNLLE 4.0 MVAr |
| DEVERS 230.00 - VSTA 230.00 2, SANBRDNO 230.00 - DEVERS 230.00 1 | la_alt2d3_s-eor | BAD Qgen: 79123 FONTNLLE 4.0 MVAr |
| DEVERS 230.00 - VSTA 230.00 2, VSTA 230.00 - DEVERS 230.00 1 | la_alt2d3_s-eor | BAD Qgen: 79123 FONTNLLE 4.0 MVAr |
| SANBRDNO 230.00 - DEVERS 230.00 1, VSTA 230.00 - DEVERS 230.00 1 | la_alt2d3_s-eor | BAD Qgen: 79123 FONTNLLE 4.0 MVAr |
| DEVERS 230.00 - MIRAGE 230.00 1, RAMON 230.00 - MIRAGE 230.00 2 | la_alt2d3_s-eor | BAD Qgen: 25331 P330_G1 90.0 MVAr |
| DEVERS 500.00 - VALLEYSC 500.00 1, MIDPINTS 500.00 - DEVERS 500.00 1 | la_alt2d3_s-eor | BAD Qgen: 25331 P330_G1 90.0 MVAr |
| DEVERS 230.00 - VSTA 230.00 2, SANBRDNO 230.00 - DEVERS 230.00 1 | la_alt2d3_s-eor | BAD Qgen: 79123 FONTNLLE 4.0 MVAr |
| DEVERS 230.00 - MIRAGE 230.00 1, RAMON 230.00 - MIRAGE 230.00 2 | la_alt2d3_s-eor | BAD Qgen: 25331 P330_G1 90.0 MVAr |
| line MIDPINTS to DEVERS 500 ck 1&2 | la_alt2d3_s-eor | BAD Qgen: 80815 SS15 36.5 MVAr |

# Imperial Valley Study Group

## Appendix B.3

Pivot Tables

IVSG Study
Contingency Per Unit Comparison
LA Cases

| | | | | | | | Case | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FROM Bus | BKV | TO Bus | BKV2 | Rate-Mva | Rate-Amp | Contingency_Description | ivsg_la_alt2ad3 | ivsg_la_alt2d3 | ivsg_la_alt3bd3 | ivsg_la_rev5 | LA_ALT2D3_S-CSV | la_alt2d3_s-eor |
| DEVERS | 115 | DEVERS | 230 | 280 | | tran DEVERS 115 to DEVERS 230 ck 1 | 2.04 | 2.04 | 2.04 | 2.03 | 2.07 | 2.07 |
| | | | | | | tran DEVERS 115 to DEVERS 230 ck 3 | 2.04 | 2.04 | 2.04 | 2.03 | 2.06 | 2.07 |
| | | | | | | tran DEVERS 115 to DEVERS 230 ck 4 | 2.04 | 2.04 | 2.04 | 2.03 | 2.06 | 2.07 |
| | | TAP818 | 115 | 217 | 1091 | IMPRLVLY - MIGUEL 1 500kV | | | | | 0.988 | |
| | | | | | | line DEVERS to VALLEYSC 500 ck 1 | | | | | 1.017 | |
| | | | | | | line ELDORDO to LUGO 500 ck 1 | | | | | | 0.991 |
| | | | | | | line MIDPINTS to DEVERS 500 ck 1 | | | | | | 0.997 |
| | | | | | | line MIDPINTS to DEVERS 500 ck 2 | | | | | | 0.997 |
| | | | | | | line MOENKOPI to ELDORDO 500 ck 1 | | | | | | 1 |
| | | | | | | N.GILA - IMPRLVLY 1 500kV | | | | | | 1.009 |
| | | | | | | tran DEVERS 115 to DEVERS 230 ck 1 | | | | | 0.993 | 0.996 |
| | | | | | | tran DEVERS 115 to DEVERS 230 ck 3 | | | | | 0.992 | 0.995 |
| | | | | | | tran DEVERS 115 to DEVERS 230 ck 4 | | | | | 0.991 | 0.994 |
| | 230 | VSTA | 230 | 988 | 2483 | line DEVERS to VALLEYSC 500 ck 1 | | | 0.962 | 0.951 | 0.975 | |
| | | | | | | line SERRANO to VALLEYSC 500 ck 1 | | | | | | 1.03 |
| | 500 | DEVERS | 230 | 1120 | | line DEVERS to VALLEYSC 500 ck 1 | | | 1.15 | 2.14 | 1.07 | |
| | | | | | | line SERRANO to VALLEYSC 500 ck 1 | 0.9 | 0.97 | | 0.95 | | |
| | | VALLEYSC | 500 | 2598 | 3003 | gen PALOVRD1 24.00 | | | | | | 0.958 |
| | | | | | | HASSYAMP - N.GILA 1 500kV | 0.997 | 1.014 | 0.998 | 1.001 | 1.089 | |
| | | | | | | IMPRLVLY - MIGUEL 1 500kV | 1.039 | 1.036 | 0.962 | 1.014 | 1.053 | |
| | | | | | | line BANIS230 to NEWSF230 230 ck 1 | | | 0.919 | | 1.011 | |
| | | | | | | line CENTRALX to NEWSF500 500 ck 1 | 1.007 | 1.003 | | | 2.151 | |
| | | | | | | line DEVERS to OAK_VLLY 230 ck 1 | 1.004 | 1.002 | 0.921 | 0.923 | 1.017 | 1.12 |
| | | | | | | line DEVERS to VSTA 230 ck 2 | 1.027 | 1.024 | 0.942 | 0.943 | 1.039 | 1.146 |
| | | | | | | line ELDORDO to LUGO 500 ck 1 | 1 | 0.999 | | 0.922 | 1.012 | 1.13 |
| | | | | | | line HIGHLINE to COLCT3 230 ck 1 | | | | | | 1.043 |
| | | | | | | line LUGO to MOHAVE 500 ck 1 | | | | | | 1.109 |
| | | | | | | line LUGO to VICTORVL 500 ck 1 | 1.012 | 1.012 | 0.923 | 0.938 | 1.022 | |
| | | | | | | line MIDPINTS to DEVERS 500 ck 1 | | | | | | 1.003 |
| | | | | | | line MIDPINTS to DEVERS 500 ck 2 | | | | | | 1.003 |
| | | | | | | line MIDPINTS to IH500 500 ck 1 | 0.918 | | | | | |
| | | | | | | line MOENKOPI to ELDORDO 500 ck 1 | 1.018 | 1.018 | 0.93 | 0.938 | 1.03 | 1.149 |
| | | | | | | line MOHAVE to ELDORDO 500 ck 1 | | | | | | 1.106 |
| | | | | | | line NEWSF500 to IMPRLVLY 500 ck 1 | | | 0.923 | | 1.011 | |
| | | | | | | line NORTHSD to NEWSF500 500 ck 1 | | | 1.021 | | | |
| | | | | | | line SANBRDNO to DEVERS 230 ck 1 | 1.018 | 1.015 | 0.933 | 0.935 | 1.03 | 1.137 |
| | | | | | | line VSTA to DEVERS 230 ck 1 | 1.027 | 1.024 | 0.942 | 0.943 | 1.039 | 1.146 |
| | | | | | | N.GILA - IMPRLVLY 1 500kV | 0.998 | 1.007 | 0.984 | 0.998 | 1.075 | 1.155 |
| | | | | | | tran DEVERS 500 to DEVERS 230 ck 1 | | | | 0.92 | | |
| | | | | | | tran NEWSF230 230 to NEWSF500 500 ck 1 | | | 0.919 | | 1.011 | |
| INYO | 115 | INYO PS | 115 | 56 | 281 | line INYO to COTTONWD 230 ck 1 | 1.91 | 1.91 | 1.91 | 1.91 | 1.91 | 1.91 |
| | | | | | | line KRAMER to LUGO 230 ck 1 | 1.07 | 1.07 | 1.07 | 1.05 | 1.07 | 1.06 |
| | | | | | | line KRAMER to LUGO 230 ck 2 | 1.07 | 1.07 | 1.07 | 1.05 | 1.07 | 1.06 |
| | | | | | | line MAGUNDEN to OMAR 230 ck 1 | 0.97 | 0.97 | 0.97 | 0.94 | 0.97 | 0.96 |
| | | | | | | line OWENSCON to INYO 230 ck 1 | 1.47 | 1.47 | 1.47 | 1.45 | 1.47 | 1.44 |
| | | | | | | line PASTORIA to EDMONSTN 230 ck 1 | 0.9 | 0.9 | | | | |
| | | | | | | tran LUGO 500 to LUGO 230 ck 1 | 0.99 | 0.99 | 0.99 | 0.96 | 0.99 | 0.98 |
| | | | | | | tran LUGO 500 to LUGO 230 ck 2 | 0.99 | 0.99 | 0.99 | 0.96 | 0.99 | 0.98 |
| | 230 | INYO PS | 115 | 50 | | line INYO to COTTONWD 230 ck 1 | 2.26 | 2.26 | 2.26 | 2.26 | 2.26 | 2.28 |
| | | | | | | tran INYO 230 to INYO PS 115 ck 1 | 0.9 | 0.9 | 0.9 | | | |
| | | | | | | tran INYO 230 to INYO PS 115 ck 2 | 0.9 | 0.9 | 0.9 | | | |
| NAVAJO | 500 | CRYSTAL | 500 | 1411.6 | 1632 | gen PALOVRD1 24.00 | 1.03 | 1.029 | 1.003 | 1.002 | 0.994 | 1.092 |
| | | | | | | HASSYAMP - N.GILA 1 500kV | 1.194 | 1.204 | 1.189 | 1.227 | 1.184 | |
| | | | | | | IMPRLVLY - MIGUEL 1 500kV | 1.173 | 1.173 | 1.139 | 1.186 | 1.131 | |
| | | | | | | line CENTRALX to NEWSF500 500 ck 1 | | | | | 1.128 | |
| | | | | | | line DEVERS to VALLEYSC 500 ck 1 | | | 1.207 | 1.228 | 1.22 | |
| | | | | | | line IH500 to DEVERS 500 ck 1 | 1.159 | | | | | |
| | | | | | | line LUGO to VICTORVL 500 ck 1 | 1.084 | 1.084 | 1.052 | 1.051 | 1.049 | |
| | | | | | | line MIDPINTS to DEVERS 500 ck 1 | 1.169 | 1.172 | 1.134 | 1.143 | 1.134 | 1.273 |
| | | | | | | line MIDPINTS to DEVERS 500 ck 2 | | 1.172 | 1.134 | 1.143 | 1.134 | 1.273 |
| | | | | | | line MIDPINTS to IH500 500 ck 1 | 1.17 | | | | | |

IVSG Study
Contingency Per Unit Comparison
LA Cases

| FROM Bus | BKV | TO Bus | BKV2 | Rate-Mva | Rate-Amp | Contingency_Description | ivsg_la_alt2ad3 | ivsg_la_alt2d3 | ivsg_la_alt3bd3 | ivsg_la_rev5 | LA_ALT2D3_S-CSV | la_alt2d3_s-eor |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NAVAJO | 500 | CRYSTAL | 500 | 1411.6 | 1632 | line MOENKOPI to ELDORDO 500 ck 1 | 1.731 | 1.731 | 1.675 | 1.683 | 1.668 | 1.88 |
| | | | | | | line NORTHSD to NEWSF500 500 ck 1 | | | 1.14 | | | |
| | | | | | | line SERRANO to VALLEYSC 500 ck 1 | 1.2 | 1.202 | | 1.163 | | 1.314 |
| | | | | | | N.GILA - IMPRLVLY 1 500kV | 1.177 | 1.182 | 1.165 | 1.207 | 1.16 | 1.306 |
| MOENKOPI | 500 | ELDORDO | 500 | 1645.4 | 1902 | gen PALOVRD1 24.00 | | | | | | 0.952 |
| | | | | | | HASSYAMP - N.GILA 1 500kV | 1.052 | 1.062 | 1.048 | 1.085 | 1.042 | |
| | | | | | | IMPRLVLY - MIGUEL 1 500kV | 1.031 | 1.031 | 0.998 | 1.047 | 0.99 | |
| | | | | | | line CENTRALX to NEWSF500 500 ck 1 | | | | | 0.988 | |
| | | | | | | line DEVERS to VALLEYSC 500 ck 1 | | | 1.066 | 1.09 | 1.079 | |
| | | | | | | line ELDORDO to LUGO 500 ck 1 | 0.95 | 0.95 | 0.918 | 0.922 | | 1.031 |
| | | | | | | line IH500 to DEVERS 500 ck 1 | 1.018 | | | | | |
| | | | | | | line LUGO to VICTORVL 500 ck 1 | 0.95 | 0.95 | 0.918 | 0.919 | | |
| | | | | | | line MIDPINTS to DEVERS 500 ck 1 | 1.028 | 1.03 | 0.994 | 1.005 | 0.993 | 1.127 |
| | | | | | | line MIDPINTS to DEVERS 500 ck 2 | | 1.03 | 0.994 | 1.005 | 0.993 | 1.127 |
| | | | | | | line MIDPINTS to IH500 500 ck 1 | 1.029 | | | | | |
| | | | | | | line NORTHSD to NEWSF500 500 ck 1 | | | 1 | | | |
| | | | | | | line SERRANO to VALLEYSC 500 ck 1 | 1.059 | 1.061 | | 1.026 | | 1.168 |
| | | | | | | N.GILA - IMPRLVLY 1 500kV | 1.036 | 1.04 | 1.025 | 1.067 | 1.019 | 1.159 |
| SYC CYN | 230 | OMAR | 230 | 643 | 1616 | line MAGUNDEN to OMAR 230 ck 1 | 7.929 | 7.929 | 7.929 | 7.929 | 7.929 | 7.93 |
| MIGUEL | 230 | MIGUEL | 138 | 392 | | MIGUEL - MISSION 1 230kV | | | | 0.91 | | |
| | | | | | | MIGUEL - MISSION 2 230kV | | | | 0.9 | | |
| | | | | | | MIGUEL - SYCAMORE 1 230kV | | | | 0.91 | | |
| | | | 500 | 1120 | | tran MIGUEL 230 to MIGUELMP 500 ck 1 | 1.19 | 1.19 | 1.22 | 1.37 | 1.18 | 1.33 |
| | | MIGUELMP | 500 | 1120 | | line CENTRALX to NEWSF500 500 ck 1 | 0.95 | 0.94 | | | 0.95 | |
| | | | | | | line NORTHSD to NEWSF500 500 ck 1 | | | 0.92 | | | |
| | | | | | | tran MIGUEL 230 to MIGUELMP 500 ck 1 | 1.21 | 1.2 | 1.24 | 1.38 | 1.19 | 1.35 |
| | 500 | MIGUELMP | 500 | 1120 | 1295 | line CENTRALX to NEWSF500 500 ck 1 | 0.94 | 0.94 | | | 0.95 | |
| | | | | | | line NORTHSD to NEWSF500 500 ck 1 | | | 0.92 | | | |
| | | | | | | tran MIGUEL 230 to MIGUELMP 500 ck 1 | 1.2 | 1.2 | 1.23 | 1.38 | 1.19 | 1.34 |
| BANIS230 | 230 | NEWSF230 | 230 | 800 | 2011 | HASSYAMP - N.GILA 1 500kV | 0.941 | 0.91 | 0.952 | | 0.952 | |
| | | | | | | line AV58TP12 to AVE58230 230 ck 1 | | | 0.965 | | 0.958 | |
| | | | | | | line BANIS230 to AV58TP12 230 ck 1 | | | 0.965 | | 0.959 | |
| | | | | | | line BANIS230 to ELCENTSW 230 ck 1 | | | 1.009 | | 0.999 | |
| | | | | | | line COACHELA to DEVERS 230 ck 2 | | | 0.949 | | | |
| | | | | | | line COACHELA to MIDWAY 230 ck 1 | | | 0.946 | | | |
| | | | | | | line COACHELA to MIDWAY 230 ck 2 | | | 0.946 | | | |
| | | | | | | line COACHELA to RAMON 230 ck 2 | | | 0.956 | | | |
| | | | | | | line DEVERS to VALLEYSC 500 ck 1 | | | 1.075 | | 1.061 | |
| | | | | | | line IMPRLVLY to ELCENTSW 230 ck 2 | | | 0.949 | | | |
| | | | | | | line IMPRLVLY to ELCENTSW 230 ck 3 | | | 0.949 | | | |
| | | | | | | line NEWSF500 to IMPRLVLY 500 ck 1 | 0.985 | 0.984 | 1.184 | | 1.151 | 1.051 |
| | | | | | | line RAMON to MIRAGE 230 ck 2 | | | 0.97 | | 0.962 | |
| | | | | | | N.GILA - IMPRLVLY 1 500kV | 1.002 | 0.983 | 1.043 | | 1.041 | 1.081 |
| | | | | | | tran IMPRLVLY 230 to IMPRLVLY 500 ck 1 | | | 0.923 | | | |
| | | | | | | tran IMPRLVLY 230 to IMPRLVLY 500 ck 2 | | | 1.001 | | 0.991 | |
| HRD-230 | 230 | HRD-115 | 115 | 225 | | IMPRLVLY - MIGUEL 1 500kV | 1.13 | 1.13 | 1.2 | 1.44 | 1.13 | |
| | | | | | | line CENTRALX to NEWSF500 500 ck 1 | 1 | 1.01 | | | 1 | |
| | | | | | | line DEVERS to VALLEYSC 500 ck 1 | | | 0.92 | 0.9 | | |
| | | | | | | line NORTHSD to NEWSF500 500 ck 1 | | | 0.98 | | | |
| | | | | | | tran IMPRLVLY 230 to IMPRLVLY 500 ck 2 | 0.92 | 0.92 | 0.93 | | | 0.96 |
| | | MTP-230 | 230 | 388 | 975 | IMPRLVLY - MIGUEL 1 500kV | | | | 1.185 | | |
| | | ROA-230 | 230 | 388 | 975 | IMPRLVLY - MIGUEL 1 500kV | 1.129 | 1.132 | 1.225 | 1.573 | 1.106 | |
| | | | | | | line CENTRALX to NEWSF500 500 ck 1 | 0.945 | 0.947 | | | | |
| | | | | | | line NORTHSD to NEWSF500 500 ck 1 | | | 0.918 | | | |
| | | RUM-230 | 230 | 388 | 975.1193767 | IMPRLVLY - MIGUEL 1 500kV | 1.077 | 1.08 | 1.172 | 1.517 | 1.055 | |
| | | TOY-230 | 230 | 388 | 975.1193767 | IMPRLVLY - MIGUEL 1 500kV | | | | 1.019 | | |
| CENTRALX | 230 | CENTRALX | 500 | 1120 | | EPP - ESCNDIDO 1 230kV | | | | | | 0.95 |
| | | | | | | EPP - SYCAMORE 1 230kV | | | | | | 0.95 |
| | | | | | | gen PALOVRD1 24.00 | | | | | | 0.95 |
| | | | | | | gen S.ONOFR2 22.00 | 0.98 | 0.98 | | | | 1.06 |

IVSG Study
Contingency Per Unit Comparison
LA Cases

| FROM Bus | BKV | TO Bus | BKV2 | Rate-Mva | Rate-Amp | Contingency_Description | ivsg_la_alt2ad3 | ivsg_la_alt2d3 | ivsg_la_alt3bd3 | ivsg_la_rev5 | LA_ALT2D3_S-CSV | la_alt2d3_s-eor |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CENTRALX | 230 | CENTRALX | 500 | 1120 | 975.1193767 | IMPRLVLY - MIGUEL 1 500kV | 1.51 | 1.5 | | | 1.29 | |
| | | | | | | line HIGHLINE to COLCT3 230 ck 1 | | | | | | 0.97 |
| | | | | | | line SERRANO to VALLEYSC 500 ck 1 | 0.98 | 0.97 | | | | 1.07 |
| | | | | | | MIGUEL - SYCAMORE 1 230kV | 0.98 | 0.97 | | | | 1.07 |
| | | | | | | OTAYMESA - TJI-230 1 230kV | 0.98 | 0.97 | | | | 1.07 |
| | | | | | | tran MIGUEL 230 to MIGUELMP 500 ck 1 | 1.99 | 1.98 | | | | 2.17 |
| | | SYCAMORE | 230 | 912 | 2292 | IMPRLVLY - MIGUEL 1 500kV | 1.99 | 1.994 | | | | |
| NAVYCOSO | 230 | BLM EAST | 230 | 1287 | 3234 | line BLM EAST to BLM WEST 230 ck 1 | 2.459 | 2.459 | 2.459 | 2.459 | 2.459 | 2.459 |
| | | | | | | line BLM WEST to KRAMER 230 ck 1 | 2.459 | 2.459 | 2.459 | 2.459 | 2.459 | 2.459 |
| RUM-230 | 230 | ROA-230 | 230 | 388 | 975 | gen S.ONOFR2 22.00 | 0.914 | 0.912 | 0.914 | | | 0.987 |
| | | | | | | IMPRLVLY - MIGUEL 1 500kV | 1.253 | 1.257 | 1.349 | 1.7 | 1.23 | |
| | | | | | | line CENTRALX to NEWSF500 500 ck 1 | 1.068 | 1.069 | | | 1.057 | |
| | | | | | | line DEVERS to VALLEYSC 500 ck 1 | | | 0.956 | 0.923 | | |
| | | | | | | line NEWSF500 to IMPRLVLY 500 ck 1 | | | 0.907 | | | 0.97 |
| | | | | | | line NORTHSD to NEWSF500 500 ck 1 | | | 1.04 | | | |
| | | | | | | line SERRANO to VALLEYSC 500 ck 1 | | | | | | 0.985 |
| | | | | | | tran IMPRLVLY 230 to IMPRLVLY 500 ck 2 | 0.947 | 0.948 | 0.963 | | | 1.011 |
| | | | | | | tran MIGUEL 230 to MIGUELMP 500 ck 1 | | | 1.814 | 0.901 | | 1.919 |
| TAP816 | 115 | TAP998 | 115 | 107.6 | 541 | IMPRLVLY - MIGUEL 1 500kV | | | | | 1.015 | |
| | | | | | | line DEVERS to VALLEYSC 500 ck 1 | | | | | 1.044 | |
| | | | | | | line ELDORDO to LUGO 500 ck 1 | | | | | | 1.019 |
| | | | | | | line MIDPINTS to DEVERS 500 ck 1 | | | | | | 1.024 |
| | | | | | | line MIDPINTS to DEVERS 500 ck 2 | | | | | | 1.024 |
| | | | | | | line MOENKOPI to ELDORDO 500 ck 1 | | | | | | 1.027 |
| | | | | | | N.GILA - IMPRLVLY 1 500kV | | | | | | 1.036 |
| | | | | | | tran DEVERS 115 to DEVERS 230 ck 1 | | | | | 1.021 | 1.024 |
| | | | | | | tran DEVERS 115 to DEVERS 230 ck 3 | | | | | 1.019 | 1.022 |
| | | | | | | tran DEVERS 115 to DEVERS 230 ck 4 | | | | | 1.018 | 1.021 |
| | | TAP818 | 115 | 107.6 | 540.8394069 | IMPRLVLY - MIGUEL 1 500kV | | | | | 1.012 | |
| | | | | | | line DEVERS to VALLEYSC 500 ck 1 | | | | | 1.04 | |
| | | | | | | line ELDORDO to LUGO 500 ck 1 | | | | | | 1.015 |
| | | | | | | line MIDPINTS to DEVERS 500 ck 1 | | | | | | 1.021 |
| | | | | | | line MIDPINTS to DEVERS 500 ck 2 | | | | | | 1.021 |
| | | | | | | line MOENKOPI to ELDORDO 500 ck 1 | | | | | | 1.024 |
| | | | | | | N.GILA - IMPRLVLY 1 500kV | | | | | | 1.033 |
| | | | | | | tran DEVERS 115 to DEVERS 230 ck 1 | | | | | 1.017 | 1.02 |
| | | | | | | tran DEVERS 115 to DEVERS 230 ck 3 | | | | | 1.016 | 1.019 |
| | | | | | | tran DEVERS 115 to DEVERS 230 ck 4 | | | | | 1.015 | 1.018 |
| GEOSUB1 | 230 | BANIS230 | 230 | 550 | 1382 | line GEOSUB1 to BANIS230 230 ck 1 | 0.982 | 0.988 | 1.028 | | 1.03 | 0.996 |
| | | | | | | line GEOSUB1 to BANIS230 230 ck 2 | 0.982 | 0.988 | 1.028 | | 1.03 | 0.996 |
| | | | | | | line GEOSUB2 to BANIS230 230 ck 1 | 1.984 | 1.998 | 2.08 | | 2.084 | 2.014 |
| VALLEYSC | 500 | VALLEY-S | 115 | 560 | | tran VALLEYSC 500 to VALLEY-S 115 ck 3 | 0.94 | 0.94 | 0.94 | 0.94 | | |
| | | | | | | tran VALLEYSC 500 to VALLEY-S 115 ck 4 | 0.94 | 0.94 | 0.94 | 0.94 | | |
| | | VALLEYSC | 115 | 560 | | tran VALLEYSC 500 to VALLEYSC 115 ck 1 | 1.01 | 1.01 | 1.01 | 1 | 1.01 | 1.01 |
| | | | | | | tran VALLEYSC 500 to VALLEYSC 115 ck 2 | 1.01 | 1.01 | 1.01 | 1 | 1.01 | 1.01 |
| PERKINS | 500 | PERK PS1 | 500 | 650 | 751 | line ELDORDO to LUGO 500 ck 1 | | | | | | 0.95 |
| | | | | | | line LUGO to MOHAVE 500 ck 1 | | | | | | 0.97 |
| | | | | | | line MIDPINTS to DEVERS 500 ck 1 | | | | | | 1.08 |
| | | | | | | line MIDPINTS to DEVERS 500 ck 2 | | | | | | 1.08 |
| | | | | | | line MOENKOPI to ELDORDO 500 ck 1 | | | | | | 1.26 |
| | | | | | | line MOHAVE to ELDORDO 500 ck 1 | | | | | | 0.97 |
| | | | | | | line SERRANO to VALLEYSC 500 ck 1 | | | | | | 1.14 |
| | | | | | | N.GILA - IMPRLVLY 1 500kV | | | | | | 1.12 |
| | | PERK PS2 | 500 | 650 | 751.4450867 | line ELDORDO to LUGO 500 ck 1 | | | | | | 0.95 |
| | | | | | | line LUGO to MOHAVE 500 ck 1 | | | | | | 0.97 |
| | | | | | | line MIDPINTS to DEVERS 500 ck 1 | | | | | | 1.08 |
| | | | | | | line MIDPINTS to DEVERS 500 ck 2 | | | | | | 1.08 |
| | | | | | | line MOENKOPI to ELDORDO 500 ck 1 | | | | | | 1.26 |
| | | | | | | line MOHAVE to ELDORDO 500 ck 1 | | | | | | 0.97 |
| | | | | | | line SERRANO to VALLEYSC 500 ck 1 | | | | | | 1.14 |

IVSG Study
Contingency Per Unit Comparison
LA Cases

| FROM Bus | BKV | TO Bus | BKV2 | Rate-Mva | Rate-Amp | Contingency_Description | ivsg_la_alt2ad3 | ivsg_la_alt2d3 | ivsg_la_alt3bd3 | ivsg_la_rev5 | LA_ALT2D3_S-CSV | la_alt2d3_s-eor |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PERKINS | 500 | PERK PS2 | 500 | 650 | 751.4450867 | N.GILA - IMPRLVLY 1 500kV | | | | | | 1.12 |
| DEVRSVC1 | 500 | DEVERS | 500 | 387.5 | 448 | gen PALOVRD1 24.00 | | | | | | 1.615 |
| | | | | | | HASSYAMP - N.GILA 1 500kV | | | | 1.052 | | |
| | | | | | | IMPRLVLY - MIGUEL 1 500kV | | | | 1.044 | | |
| | | | | | | line ELDORDO to LUGO 500 ck 1 | | | | | | 1.505 |
| | | | | | | line LUGO to MOHAVE 500 ck 1 | | | | | | 1.518 |
| | | | | | | line MIDPINTS to DEVERS 500 ck 1 | | | | | | 1.487 |
| | | | | | | line MIDPINTS to DEVERS 500 ck 2 | | | | | | 1.487 |
| | | | | | | line MOENKOPI to ELDORDO 500 ck 1 | | | | | | 1.493 |
| | | | | | | line SERRANO to VALLEYSC 500 ck 1 | | | | | | 1.627 |
| | | | | | | N.GILA - IMPRLVLY 1 500kV | | | | 1.046 | | 1.47 |
| MIDPINTS | 500 | DEVERS | 500 | 2338 | 2703 | line IH500 to DEVERS 500 ck 1 | 1.041 | | | | | |
| | | | | | | line MIDPINTS to DEVERS 500 ck 1 | | 1.137 | 1.076 | 1.165 | 1.114 | 1.341 |
| | | | | | | line MIDPINTS to DEVERS 500 ck 2 | | 1.137 | 1.076 | 1.166 | 1.114 | 1.341 |
| | | | | | | line MIDPINTS to IH500 500 ck 1 | 1.107 | | | | | |
| | | IH500 | 500 | 3420 | 3954 | line MIDPINTS to DEVERS 500 ck 1 | 1.137 | | | | | |
| CONTROL | 115 | INYOKERN | 115 | 82.7 | 416 | line INYO to COTTONWD 230 ck 1 | 2.204 | 2.204 | 2.202 | 2.218 | 2.202 | 2.216 |
| KRAMER | 230 | LUGO | 230 | 478 | 1201 | line KRAMER to LUGO 230 ck 1 | 1.012 | 1.012 | 1.01 | 1.008 | 1.011 | 1.012 |
| | | | | | | line KRAMER to LUGO 230 ck 2 | 1.012 | 1.012 | 1.01 | 1.008 | 1.011 | 1.012 |
| GEOSUB2 | 230 | BANIS230 | 230 | 550 | 1382 | line GEOSUB1 to BANIS230 230 ck 1 | 1.032 | 1.039 | 1.082 | | 1.084 | 1.047 |
| | | | | | | line GEOSUB1 to BANIS230 230 ck 2 | 1.032 | 1.039 | 1.082 | | 1.084 | 1.047 |
| IMPRLVLY | 230 | IMPRLVLY | 500 | 600 | | tran IMPRLVLY 230 to IMPRLVLY 500 ck 2 | 1.17 | 1.17 | 1.22 | | 1.22 | 1.14 |
| | 500 | MIGUEL | 500 | 2252 | 2603 | line CENTRALX to NEWSF500 500 ck 1 | 0.942 | 0.942 | | | | |
| | | | | | | line NORTHSD to NEWSF500 500 ck 1 | | | 0.918 | | | |
| TAP813 | 115 | TAP814 | 115 | 82.7 | 416 | line DEVERS to VALLEYSC 500 ck 1 | | | | | 0.973 | |
| | | | | | | line MIDPINTS to DEVERS 500 ck 1 | | | | | | 0.954 |
| | | | | | | line MIDPINTS to DEVERS 500 ck 2 | | | | | | 0.954 |
| | | | | | | line MOENKOPI to ELDORDO 500 ck 1 | | | | | | 0.957 |
| | | | | | | N.GILA - IMPRLVLY 1 500kV | | | | | | 0.966 |
| | | | | | | tran DEVERS 115 to DEVERS 230 ck 1 | | | | | 0.951 | 0.954 |
| | | | | | | tran DEVERS 115 to DEVERS 230 ck 3 | | | | | | 0.952 |
| | | | | | | tran DEVERS 115 to DEVERS 230 ck 4 | | | | | | 0.951 |
| MEAD | 500 | PERKINS | 500 | 1238.4 | 1432 | line ELDORDO to LUGO 500 ck 1 | | | | | | 0.961 |
| | | | | | | line HIGHLINE to COLCT3 230 ck 1 | | | | | | 0.98 |
| | | | | | | line MIDPINTS to DEVERS 500 ck 1 | | | | | | 1.109 |
| | | | | | | line MIDPINTS to DEVERS 500 ck 2 | | | | | | 1.109 |
| | | | | | | line MOENKOPI to ELDORDO 500 ck 1 | | | | | | 1.292 |
| | | | | | | line SERRANO to VALLEYSC 500 ck 1 | | | | | | 1.165 |
| | | | | | | N.GILA - IMPRLVLY 1 500kV | | | | | | 1.154 |
| MIRAGE | 230 | MIRAGE | 115 | 280 | | tran MIRAGE 230 to MIRAGE 115 ck 1 | 1.15 | 1.15 | 1.16 | 1.16 | 1.16 | 1.15 |
| NORTHSD | 230 | NORTHSD | 500 | 1120 | | gen S.ONOFR2 22.00 | | | 1.06 | | | |
| | | | | | | IMPRLVLY - MIGUEL 1 500kV | | | 1.45 | | | |
| | | | | | | tran MIGUEL 230 to MIGUELMP 500 ck 1 | | | 1.81 | | | |
| | | TALEGA | 230 | 456 | 1146 | IMPRLVLY - MIGUEL 1 500kV | | | 1.922 | | | |
| BARRE | 230 | LEWIS | 230 | 1195 | 3003 | line BARRE to VILLA PK 230 ck 1 | 0.97 | 0.964 | 0.987 | | 1.045 | 1.103 |
| | | VILLA PK | 230 | 1195 | 3003.267153 | line BARRE to LEWIS 230 ck 1 | | | | | | 0.995 |
| ELDORDO | 500 | LUGO | 500 | 1386 | 1602 | line LUGO to VICTORVL 500 ck 1 | 0.947 | 0.945 | 0.907 | 0.956 | | |
| | | | | | | line MOHAVE to ELDORDO 500 ck 1 | | | | | | 0.953 |
| VSTA | 230 | DEVERS | 230 | 988 | 2483 | line DEVERS to VALLEYSC 500 ck 1 | | | 0.962 | 0.951 | 0.975 | |
| | | | | | | line SERRANO to VALLEYSC 500 ck 1 | | | | | | 1.03 |
| SYCAMORE | 138 | CARLTHTP | 138 | 204.1 | 855 | IMPRLVLY - MIGUEL 1 500kV | 0.945 | 0.946 | | | | |
| | 230 | PENSQTOS | 230 | 796.7 | 2002.261875 | EPP - ESCNDIDO 1 230kV | 0.905 | 0.903 | | | | |

IVSG Study
Contingency Per Unit Comparison
LA Cases

| FROM Bus | BKV | TO Bus | BKV2 | Rate-Mva | Rate-Amp | Contingency_Description | ivsg_la_alt2ad3 | ivsg_la_alt2d3 | ivsg_la_alt3bd3 | ivsg_la_rev5 | LA_ALT2D3_S-CSV | la_alt2d3_s-eor |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DIXIELAN | 92 | DIXPRI2 | 92 | 54 | 339 | HASSYAMP - N.GILA 1 500kV | | | | 1.017 | | |
| | | | | | | N.GILA - IMPRLVLY 1 500kV | | | | 1.324 | | |
| RAMON | 230 | MIRAGE | 230 | 389 | 978 | line DEVERS to MIRAGE 230 ck 1 | | | | 0.923 | | |
| | | | | 800 | 2011 | line COACHELA to DEVERS 230 ck 2 | | 0.913 | | | | |
| ESCNDIDO | 230 | NORTHSD | 230 | 456 | 1146 | IMPRLVLY - MIGUEL 1 500kV | | | 1.808 | | | |
| VINCENT | 230 | ANTELOPE | 230 | 458 | 1151 | line MAGUNDEN to OMAR 230 ck 1 | | | | | | 1.086 |
| OTAYMESA | 230 | TJI-230 | 230 | 796.7 | 2002 | IMPRLVLY - MIGUEL 1 500kV | | | | 1.004 | | |
| MIRALOMW | 230 | WALNUT | 230 | 797 | 2003 | line MIRALOME to OLINDA 230 ck 1 | | | | | | 1.003 |
| MTP-230 | 230 | TOY-230 | 230 | 388 | 975 | IMPRLVLY - MIGUEL 1 500kV | | | | 0.996 | | |
| SHANDIN | 115 | TAP902 | 115 | 109.1 | 548 | line DEVERS to VALLEYSC 500 ck 1 | | 0.964 | | | | |
| SERRANO | 230 | VILLA PK | 230 | 1195 | 3003 | line SERRANO to VILLA PK 230 ck 1 | | | | | | 0.955 |
| HASSYAMP | 500 | N.GILA | 500 | 1905.3 | 2203 | line DEVERS to VALLEYSC 500 ck 1 | | | | 0.924 | | |
| DIXIE230 | 230 | DIXIELAN | 92 | 225 | | N.GILA - IMPRLVLY 1 500kV | | | | 0.92 | | |
| USNAF | 92 | ELTERMIN | 92 | 132 | 829 | N.GILA - IMPRLVLY 1 500kV | | | | 0.915 | | |
| COACHELA | 230 | RAMON | 230 | 389 | 978 | line DEVERS to MIRAGE 230 ck 1 | | | | 0.91 | | |
| ELCENTSW | 161 | ELSTEAMP | 92 | 125 | | N.GILA - IMPRLVLY 1 500kV | | | | 0.9 | | |

# APPENDIX C - 4

Development Plan for the Phased Expansion of the Transmission to Access Renewable Resources in the Imperial Valley, Appendix C

# Imperial Valley Study Group

# Appendix C

## Transmission Planning Studies
## Vol. 3

Stability Data

# Imperial Valley Study Group

## Appendix C.1

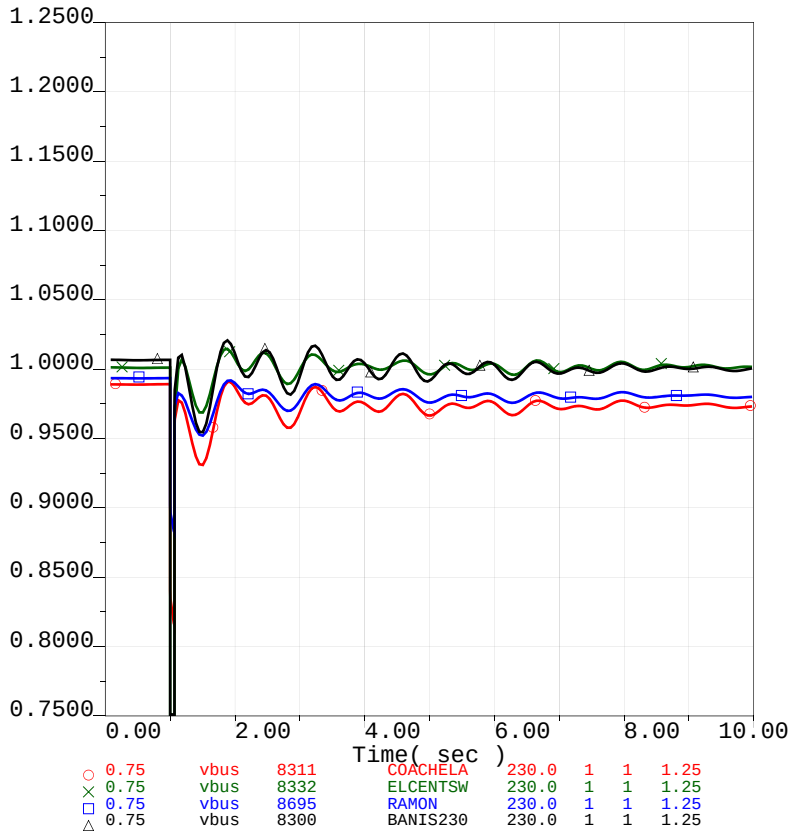
Stability Plots

# Imperial Valley Study Group

## Appendix C.1.1

Heavy Summer

IID Busses



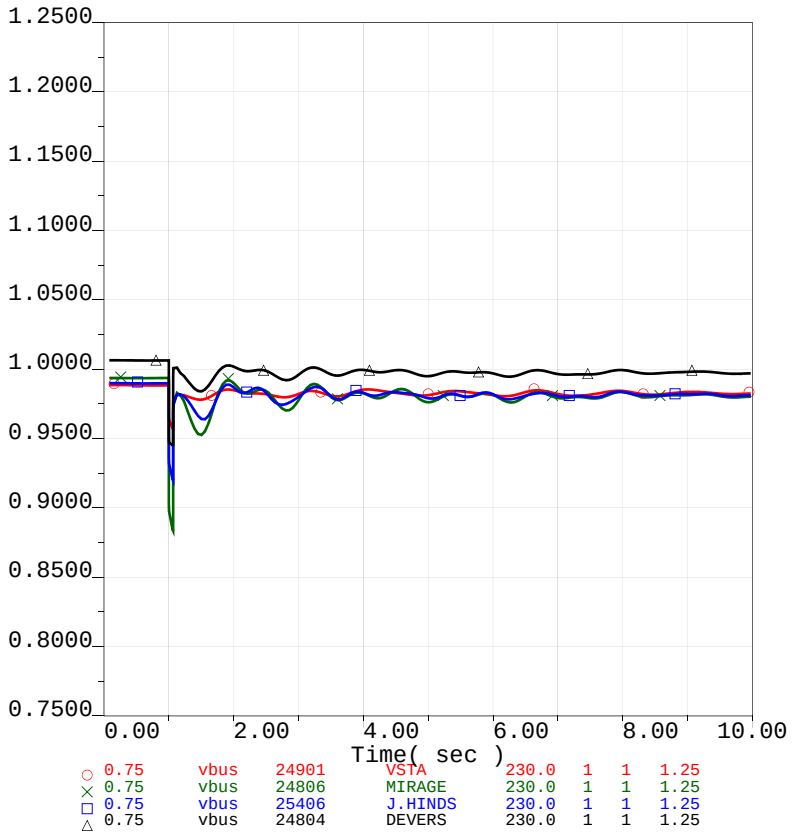

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbus | 8311 | COACHELA | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 8332 | ELCENTSW | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 8695 | RAMON | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbus | 8300 | BANIS230 | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
2014 Heavy Summer Case
Trip Imperial Valley - Miguel 500 kV No RAS
Case ALT 2 DISPATCH 1
ALTERNATIVE 2 HEAVY SUMMER BASE CASE, DISPATCH SCENARIO 1





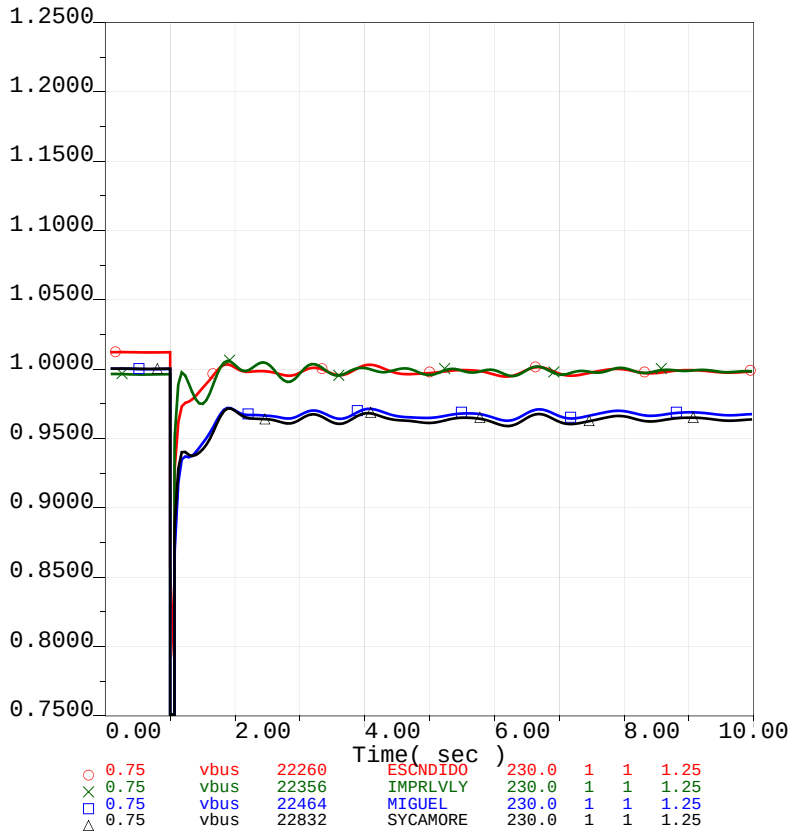
SCE Busses




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbus | 24901 | VSTA | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 24806 | MIRAGE | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 25406 | J.HINDS | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbus | 24804 | DEVERS | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
2014 Heavy Summer Case
Trip Imperial Valley - Miguel 500 kV No RAS
Case ALT 2 DISPATCH 1
ALTERNATIVE 2 HEAVY SUMMER BASE CASE, DISPATCH SCENARIO 1

SDGE Busses



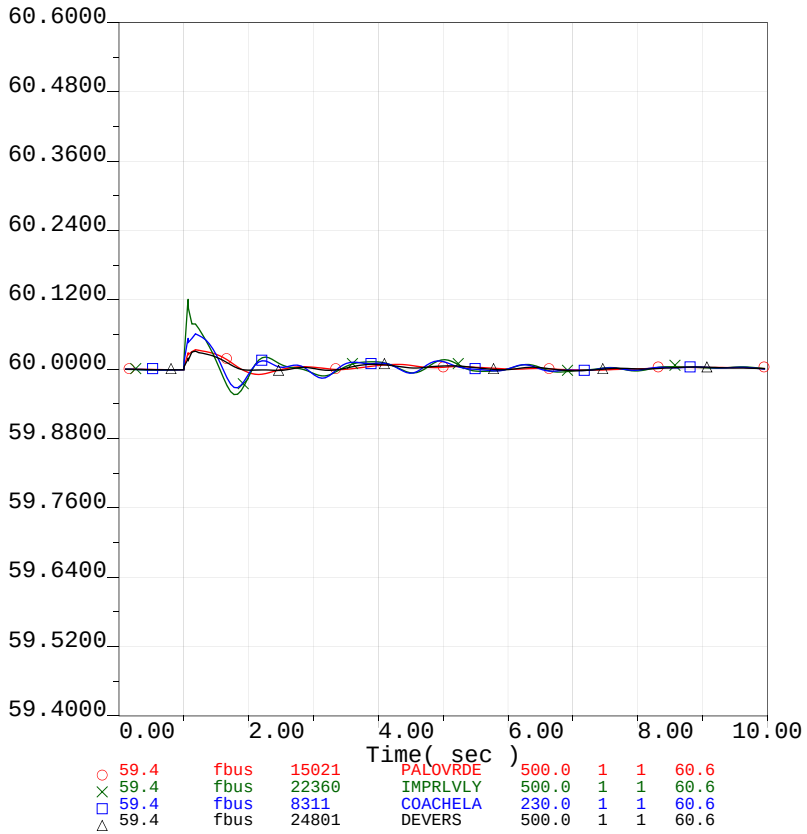

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ○ | 0.75 | vbus | 22260 | ESCNDIDO | 230.0 | 1 | 1 | 1.25 |
| × | 0.75 | vbus | 22356 | IMPRLVLY | 230.0 | 1 | 1 | 1.25 |
| □ | 0.75 | vbus | 22464 | MIGUEL | 230.0 | 1 | 1 | 1.25 |
| △ | 0.75 | vbus | 22832 | SYCAMORE | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
2014 Heavy Summer Case
Trip Imperial Valley - Miguel 500 kV No RAS
Case ALT 2 DISPATCH 1
ALTERNATIVE 2 HEAVY SUMMER BASE CASE, DISPATCH SCENARIO 1





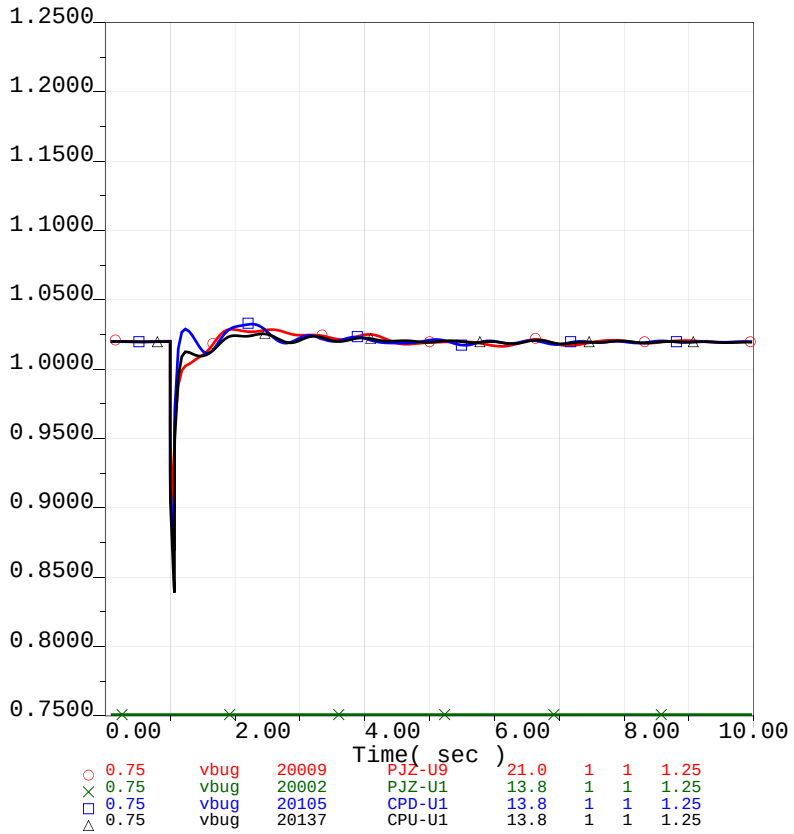
FBus Readings




| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ○ | 59.4 | fbus | 15021 | PALOVRDE | 500.0 | 1 | 1 | 60.6 |
| × | 59.4 | fbus | 22360 | IMPRLVLY | 500.0 | 1 | 1 | 60.6 |
| □ | 59.4 | fbus | 8311 | COACHELA | 230.0 | 1 | 1 | 60.6 |
| △ | 59.4 | fbus | 24801 | DEVERS | 500.0 | 1 | 1 | 60.6 |

IVSG STUDY
2014 Heavy Summer Case
Trip Imperial Valley - Miguel 500 kV No RAS
Case ALT 2 DISPATCH 1
ALTERNATIVE 2 HEAVY SUMMER BASE CASE, DISPATCH SCENARIO 1

CFE Busses Page 1

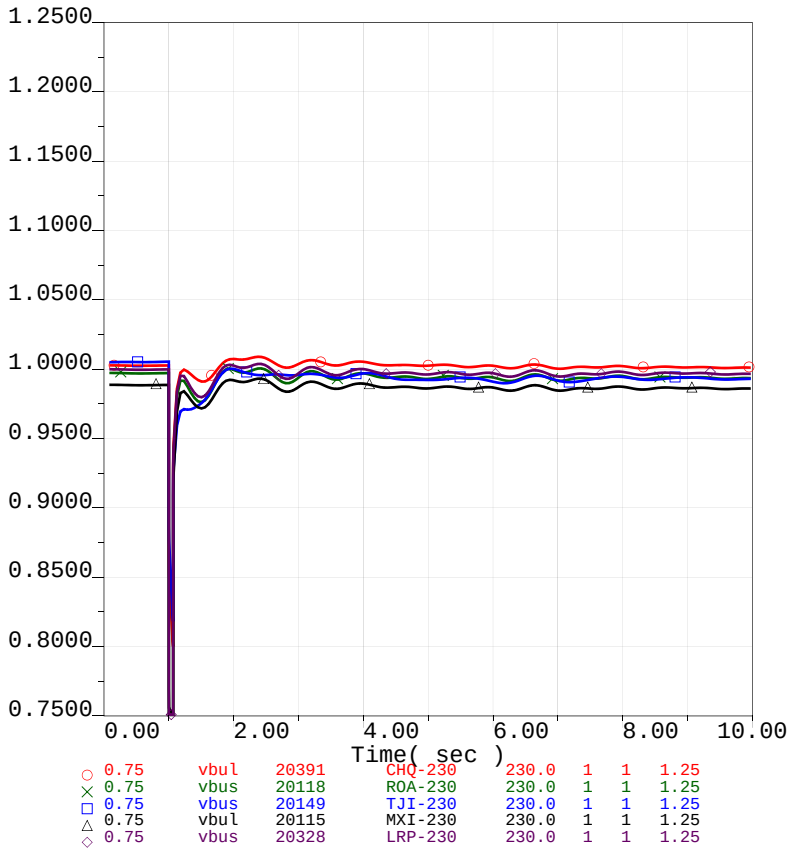



| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbug | 20009 | PJZ-U9 | 21.0 | 1 | 1 | 1.25 |
| × 0.75 | vbug | 20002 | PJZ-U1 | 13.8 | 1 | 1 | 1.25 |
| □ 0.75 | vbug | 20105 | CPD-U1 | 13.8 | 1 | 1 | 1.25 |
| △ 0.75 | vbug | 20137 | CPU-U1 | 13.8 | 1 | 1 | 1.25 |

IVSG STUDY
2014 Heavy Summer Case
Trip Imperial Valley - Miguel 500 kV No RAS
Case ALT 2 DISPATCH 1
ALTERNATIVE 2 HEAVY SUMMER BASE CASE, DISPATCH SCENARIO 1



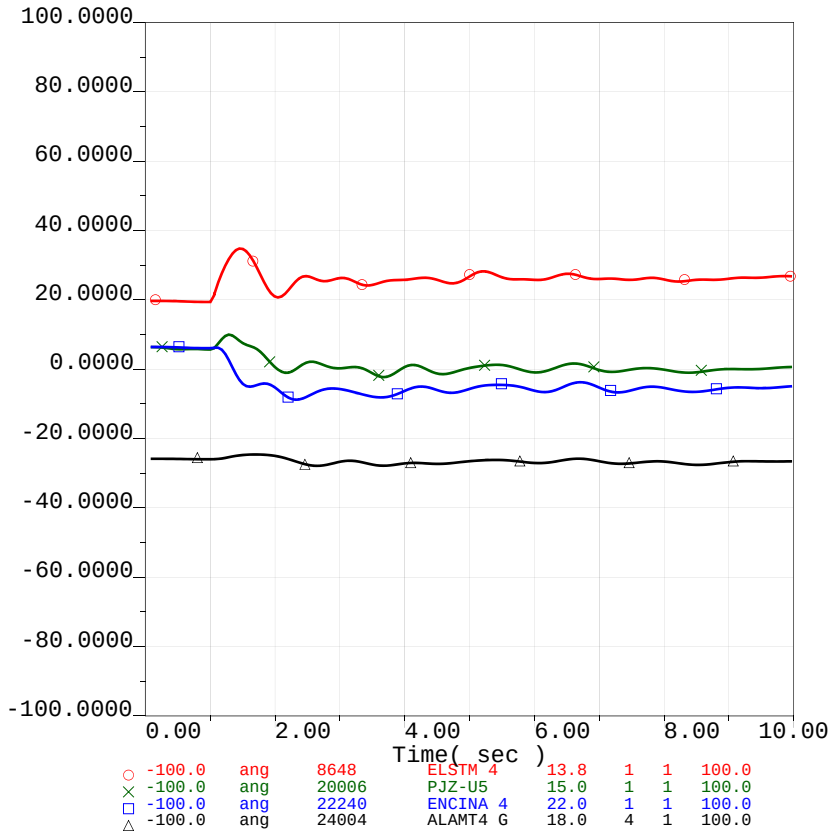
CFE Busses Page 2




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbul | 20391 | CHQ-230 | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 20118 | ROA-230 | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 20149 | TJI-230 | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbul | 20115 | MXI-230 | 230.0 | 1 | 1 | 1.25 |
| ◇ 0.75 | vbus | 20328 | LRP-230 | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
2014 Heavy Summer Case
Trip Imperial Valley - Miguel 500 kV No RAS
Case ALT 2 DISPATCH 1
ALTERNATIVE 2 HEAVY SUMMER BASE CASE, DISPATCH SCENARIO 1

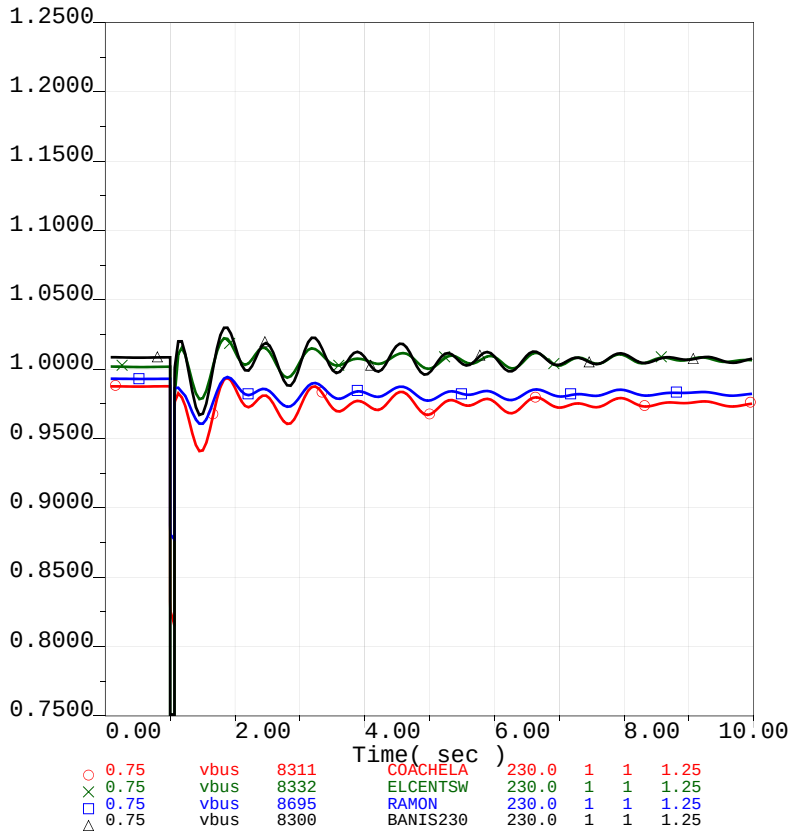
Rotor Angles for Gen Busses




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ -100.0 | ang | 8648 | ELSTM 4 | 13.8 | 1 | 1 | 100.0 |
| × -100.0 | ang | 20006 | PJZ-U5 | 15.0 | 1 | 1 | 100.0 |
| □ -100.0 | ang | 22240 | ENCINA 4 | 22.0 | 1 | 1 | 100.0 |
| △ -100.0 | ang | 24004 | ALAMT4 G | 18.0 | 4 | 1 | 100.0 |

IVSG STUDY
2014 Heavy Summer Case
Trip Imperial Valley - Miguel 500 kV No RAS
Case ALT 2 DISPATCH 1
ALTERNATIVE 2 HEAVY SUMMER BASE CASE, DISPATCH SCENARIO 1

IID Busses



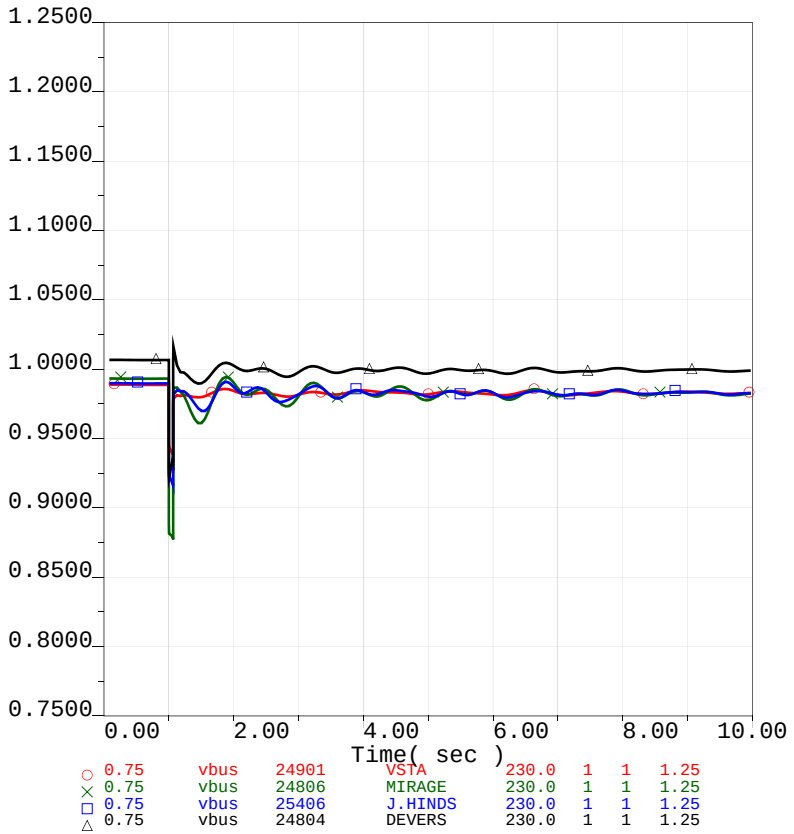

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbus | 8311 | COACHELA | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 8332 | ELCENTSW | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 8695 | RAMON | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbus | 8300 | BANIS230 | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
2014 Heavy Summer Case
Trip Imperial Valley - Miguel 500 kV No RAS
Case ALT 3B DISPATCH 1
ALTERNATIVE 3B HEAVY SUMMER BASE CASE, DISPATCH SCENARIO 1





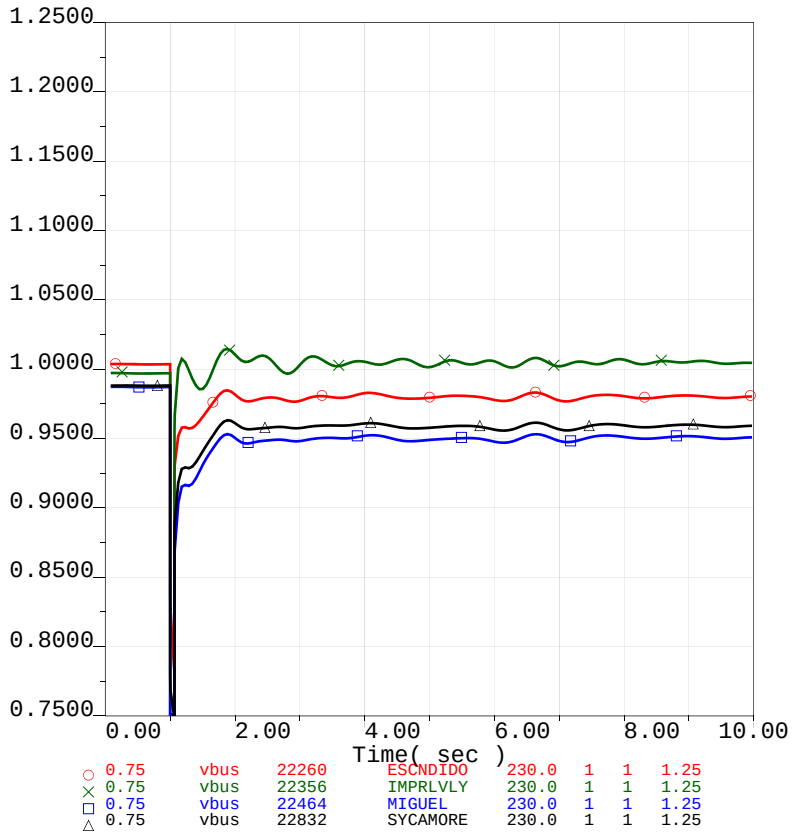
SCE Busses




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbus | 24901 | VSTA | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 24806 | MIRAGE | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 25406 | J.HINDS | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbus | 24804 | DEVERS | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
2014 Heavy Summer Case
Trip Imperial Valley - Miguel 500 kV No RAS
Case ALT 3B DISPATCH 1
ALTERNATIVE 3B HEAVY SUMMER BASE CASE, DISPATCH SCENARIO 1

SDGE Busses

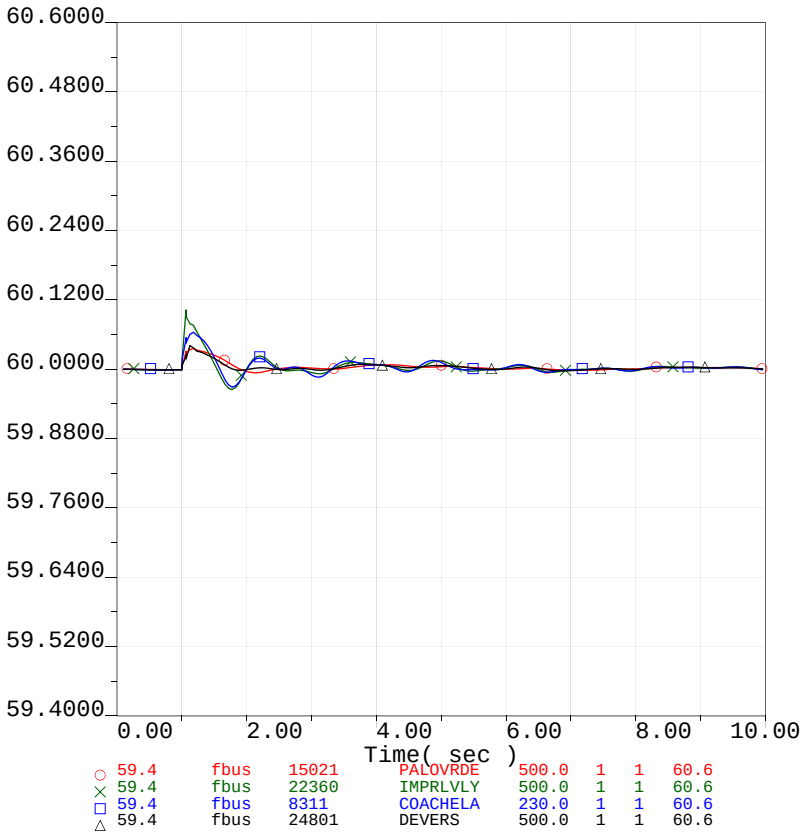



| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ○ | 0.75 | vbus | 22260 | ESCNDIDO | 230.0 | 1 | 1 | 1.25 |
| × | 0.75 | vbus | 22356 | IMPRLVLY | 230.0 | 1 | 1 | 1.25 |
| □ | 0.75 | vbus | 22464 | MIGUEL | 230.0 | 1 | 1 | 1.25 |
| △ | 0.75 | vbus | 22832 | SYCAMORE | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
2014 Heavy Summer Case
Trip Imperial Valley - Miguel 500 kV No RAS
Case ALT 3B DISPATCH 1
ALTERNATIVE 3B HEAVY SUMMER BASE CASE, DISPATCH SCENARIO 1



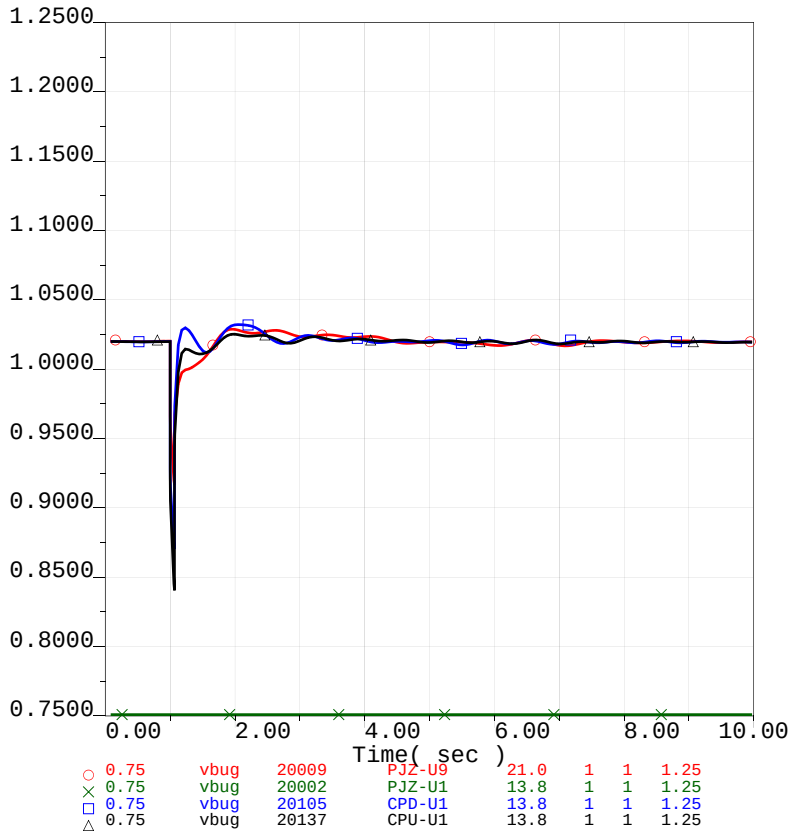
FBus Readings




| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ○ | 59.4 | fbus | 15021 | PALOVRDE | 500.0 | 1 | 1 | 60.6 |
| × | 59.4 | fbus | 22360 | IMPRLVLY | 500.0 | 1 | 1 | 60.6 |
| □ | 59.4 | fbus | 8311 | COACHELA | 230.0 | 1 | 1 | 60.6 |
| △ | 59.4 | fbus | 24801 | DEVERS | 500.0 | 1 | 1 | 60.6 |

IVSG STUDY
2014 Heavy Summer Case
Trip Imperial Valley - Miguel 500 kV No RAS
Case ALT 3B DISPATCH 1
ALTERNATIVE 3B HEAVY SUMMER BASE CASE, DISPATCH SCENARIO 1

CFE Busses Page 1




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbug | 20009 | PJZ-U9 | 21.0 | 1 | 1 | 1.25 |
| × 0.75 | vbug | 20002 | PJZ-U1 | 13.8 | 1 | 1 | 1.25 |
| □ 0.75 | vbug | 20105 | CPD-U1 | 13.8 | 1 | 1 | 1.25 |
| △ 0.75 | vbug | 20137 | CPU-U1 | 13.8 | 1 | 1 | 1.25 |

IVSG STUDY
2014 Heavy Summer Case
Trip Imperial Valley - Miguel 500 kV No RAS
Case ALT 3B DISPATCH 1
ALTERNATIVE 3B HEAVY SUMMER BASE CASE, DISPATCH SCENARIO 1

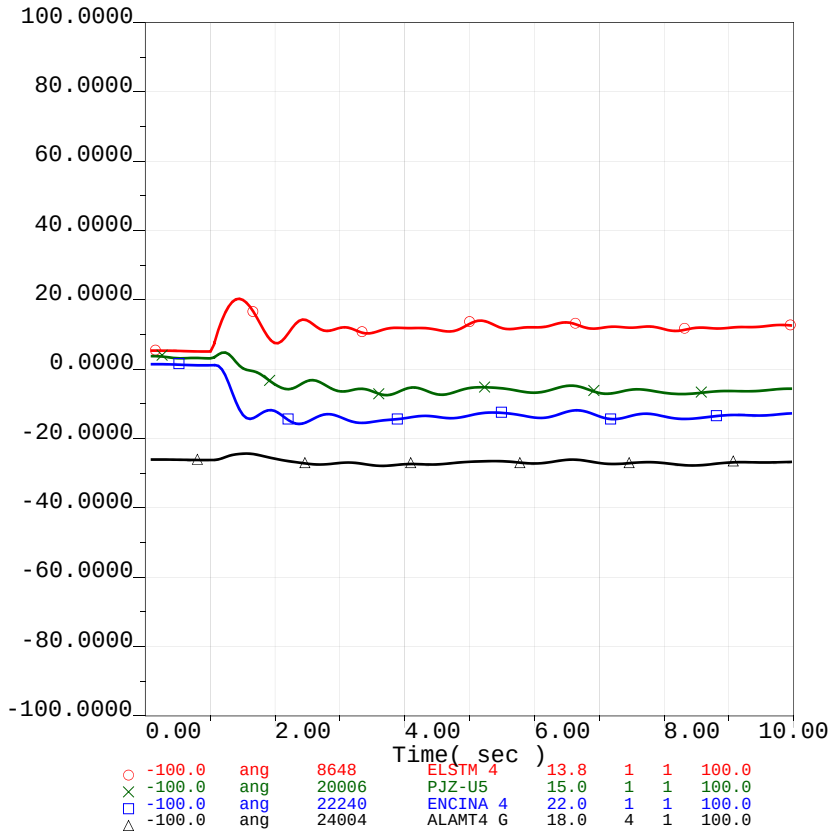


CFE Busses Page 2

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbul | 20391 | CHQ-230 | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 20118 | ROA-230 | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 20149 | TJI-230 | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbul | 20115 | MXI-230 | 230.0 | 1 | 1 | 1.25 |
| ◇ 0.75 | vbus | 20328 | LRP-230 | 230.0 | 1 | 1 | 1.25 |

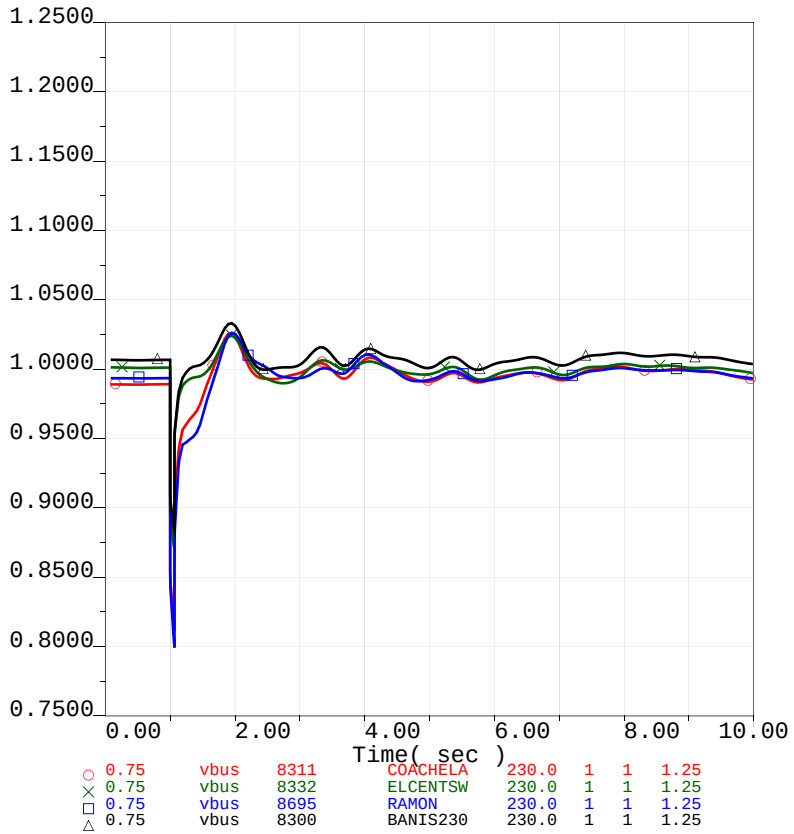
IVSG STUDY
2014 Heavy Summer Case
Trip Imperial Valley - Miguel 500 kV No RAS
Case ALT 3B DISPATCH 1
ALTERNATIVE 3B HEAVY SUMMER BASE CASE, DISPATCH SCENARIO 1

Rotor Angles for Gen Busses




IVSG STUDY
2014 Heavy Summer Case
Trip Imperial Valley - Miguel 500 kV No RAS
Case ALT 3B DISPATCH 1
ALTERNATIVE 3B HEAVY SUMMER BASE CASE, DISPATCH SCENARIO 1

IID Busses



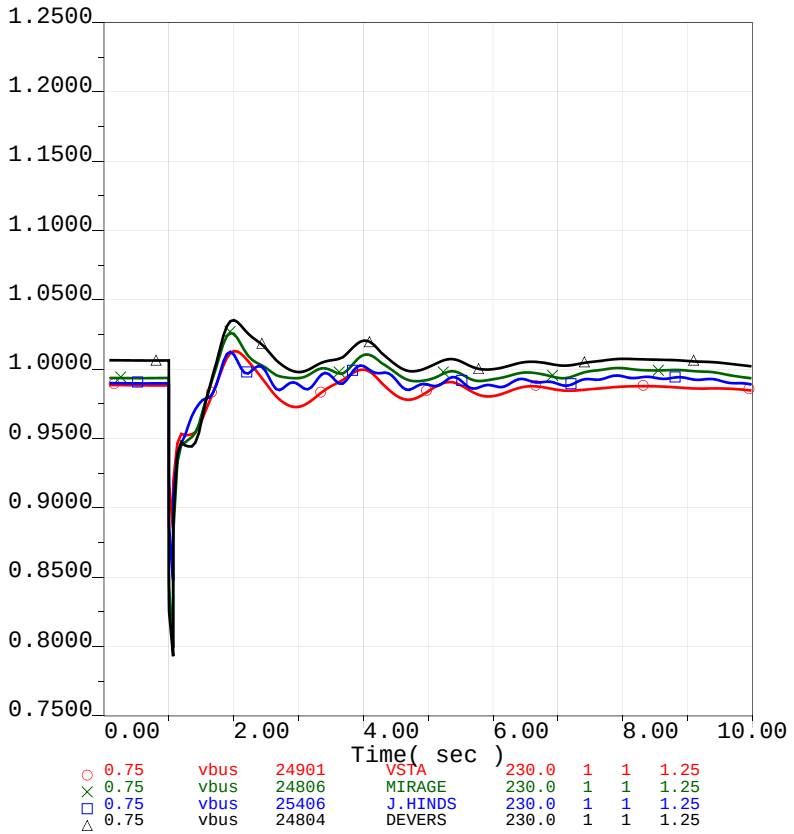

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbus | 8311 | COACHELA | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 8332 | ELCENTSW | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 8695 | RAMON | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbus | 8300 | BANIS230 | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
2014 Heavy Summer Case
Trip Hassayampa - N. Gila 500 kV
Case ALT 2 DISPATCH 1
ALTERNATIVE 2 HEAVY SUMMER BASE CASE, DISPATCH SCENARIO 1





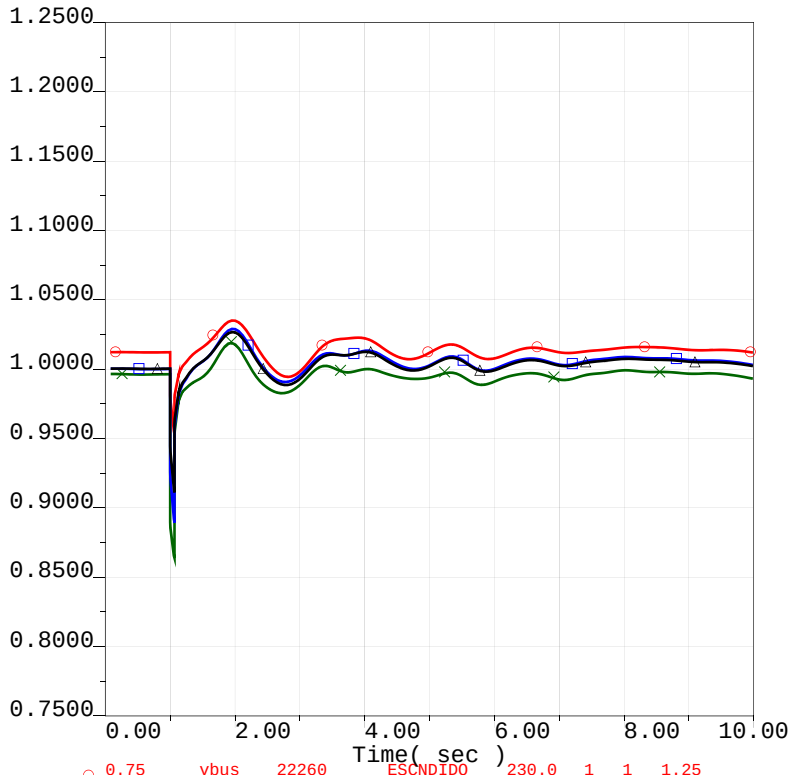
SCE Busses




| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbus | 24901 | VSTA | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 24806 | MIRAGE | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 25406 | J.HINDS | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbus | 24804 | DEVERS | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
2014 Heavy Summer Case
Trip Hassayampa - N. Gila 500 kV
Case ALT 2 DISPATCH 1
ALTERNATIVE 2 HEAVY SUMMER BASE CASE, DISPATCH SCENARIO 1

SDGE Busses



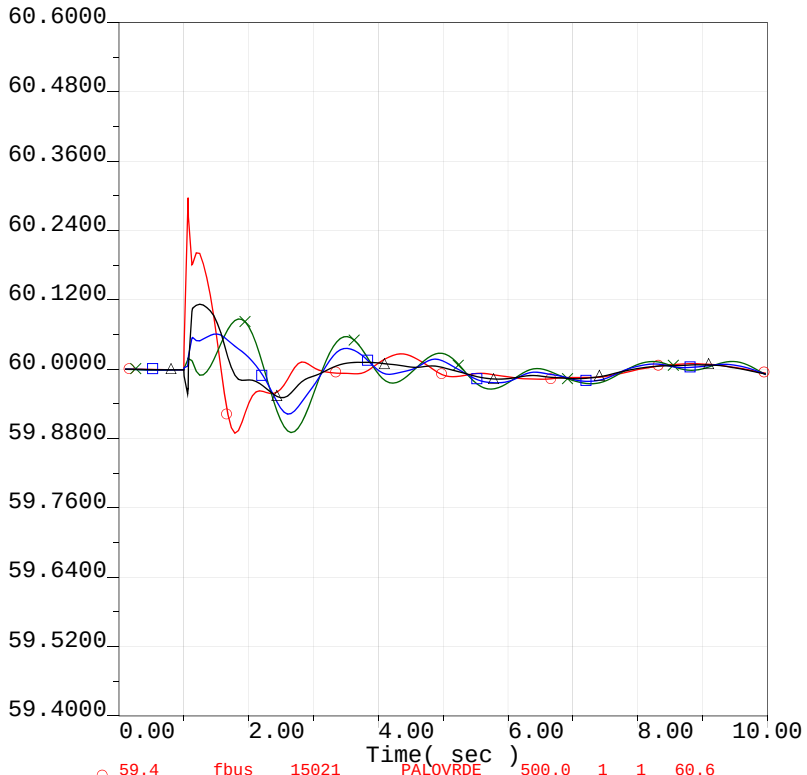

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ○ | 0.75 | vbus | 22260 | ESCNDIDO | 230.0 | 1 | 1 | 1.25 |
| × | 0.75 | vbus | 22356 | IMPRLVLY | 230.0 | 1 | 1 | 1.25 |
| □ | 0.75 | vbus | 22464 | MIGUEL | 230.0 | 1 | 1 | 1.25 |
| △ | 0.75 | vbus | 22832 | SYCAMORE | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
2014 Heavy Summer Case
Trip Hassayampa - N. Gila 500 kV
Case ALT 2 DISPATCH 1
ALTERNATIVE 2 HEAVY SUMMER BASE CASE, DISPATCH SCENARIO 1





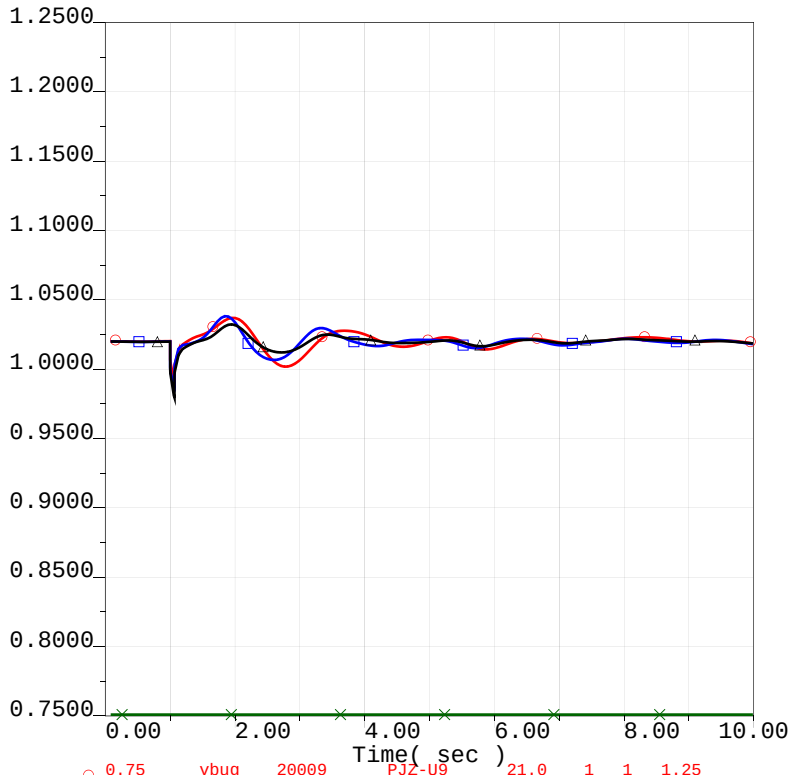
FBus Readings




| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ○ | 59.4 | fbus | 15021 | PALOVRDE | 500.0 | 1 | 1 | 60.6 |
| × | 59.4 | fbus | 22360 | IMPRLVLY | 500.0 | 1 | 1 | 60.6 |
| □ | 59.4 | fbus | 8311 | COACHELA | 230.0 | 1 | 1 | 60.6 |
| △ | 59.4 | fbus | 24801 | DEVERS | 500.0 | 1 | 1 | 60.6 |

IVSG STUDY
2014 Heavy Summer Case
Trip Hassayampa - N. Gila 500 kV
Case ALT 2 DISPATCH 1
ALTERNATIVE 2 HEAVY SUMMER BASE CASE, DISPATCH SCENARIO 1

CFE Busses Page 1



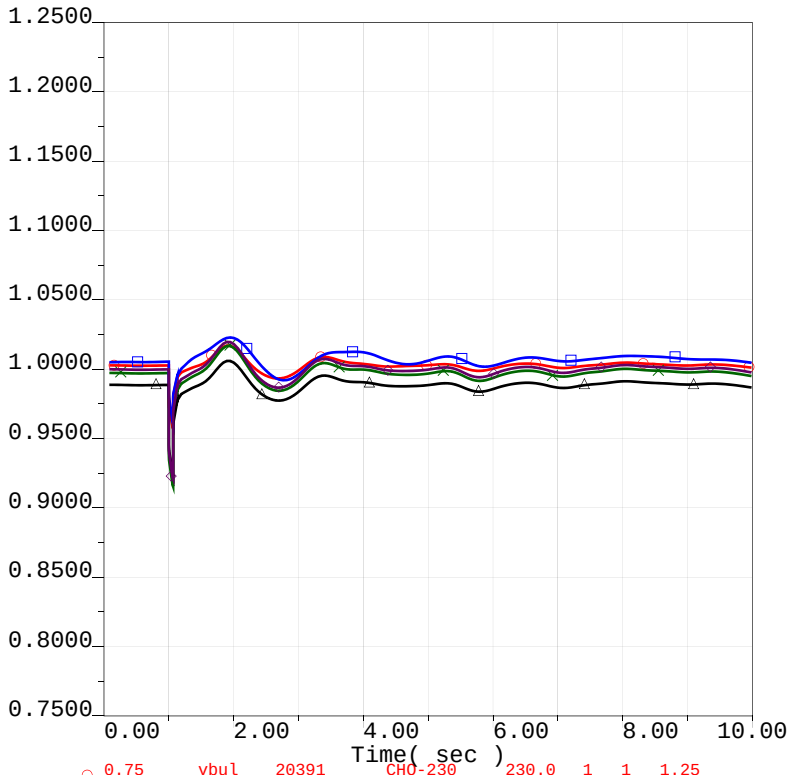

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbug | 20009 | PJZ-U9 | 21.0 | 1 | 1 | 1.25 |
| × 0.75 | vbug | 20002 | PJZ-U1 | 13.8 | 1 | 1 | 1.25 |
| □ 0.75 | vbug | 20105 | CPD-U1 | 13.8 | 1 | 1 | 1.25 |
| △ 0.75 | vbug | 20137 | CPU-U1 | 13.8 | 1 | 1 | 1.25 |

IVSG STUDY
2014 Heavy Summer Case
Trip Hassayampa - N. Gila 500 kV
Case ALT 2 DISPATCH 1
ALTERNATIVE 2 HEAVY SUMMER BASE CASE, DISPATCH SCENARIO 1

hang

Wed Jun 08 12:47:22 2005

CFE Busses Page 2



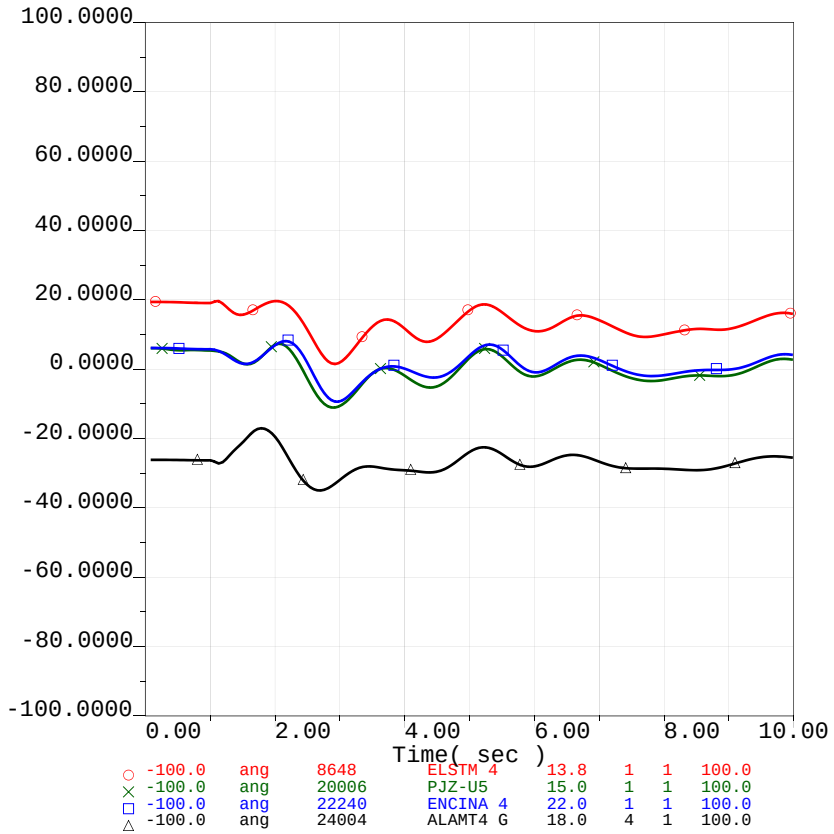

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbul | 20391 | CHQ-230 | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 20118 | ROA-230 | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 20149 | TJI-230 | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbul | 20115 | MXI-230 | 230.0 | 1 | 1 | 1.25 |
| ◇ 0.75 | vbus | 20328 | LRP-230 | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
2014 Heavy Summer Case
Trip Hassayampa - N. Gila 500 kV
Case ALT 2 DISPATCH 1
ALTERNATIVE 2 HEAVY SUMMER BASE CASE, DISPATCH SCENARIO 1

hang

Wed Jun 08 12:47:23 2005

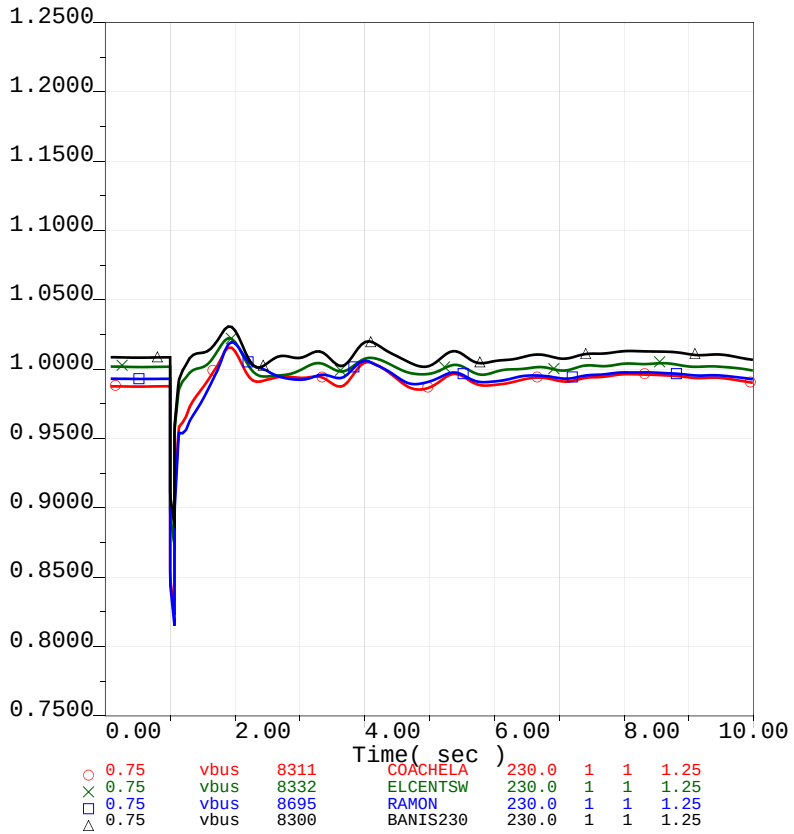
Rotor Angles for Gen Busses




| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ○ | -100.0 | ang | 8648 | ELSTM 4 | 13.8 | 1 | 1 | 100.0 |
| × | -100.0 | ang | 20006 | PJZ-U5 | 15.0 | 1 | 1 | 100.0 |
| □ | -100.0 | ang | 22240 | ENCINA 4 | 22.0 | 1 | 1 | 100.0 |
| △ | -100.0 | ang | 24004 | ALAMT4 G | 18.0 | 4 | 1 | 100.0 |

IVSG STUDY
2014 Heavy Summer Case
Trip Hassayampa - N. Gila 500 kV
Case ALT 2 DISPATCH 1
ALTERNATIVE 2 HEAVY SUMMER BASE CASE, DISPATCH SCENARIO 1

IID Busses

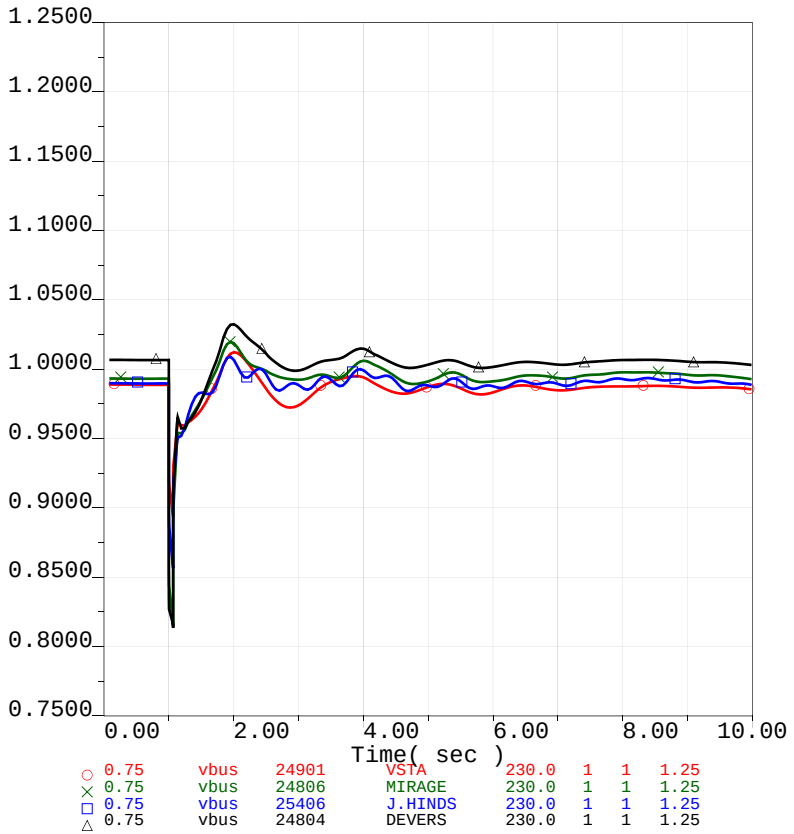



| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbus | 8311 | COACHELA | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 8332 | ELCENTSW | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 8695 | RAMON | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbus | 8300 | BANIS230 | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
2014 Heavy Summer Case
Trip Hassayampa - N. Gila 500 kV
Case ALT 3B DISPATCH 1
ALTERNATIVE 3B HEAVY SUMMER BASE CASE, DISPATCH SCENARIO 1



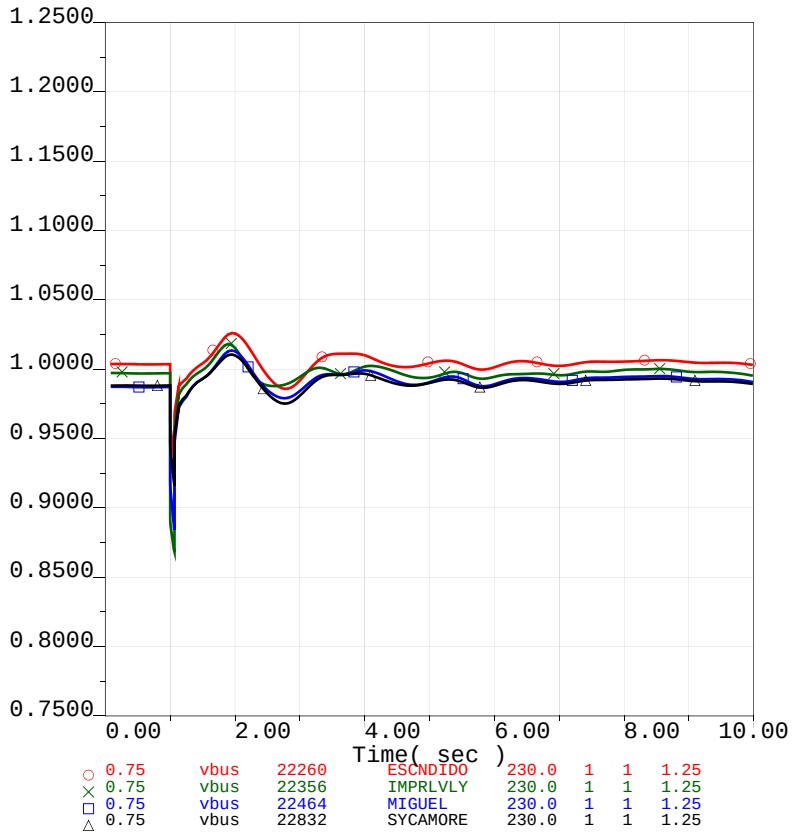
SCE Busses




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbus | 24901 | VSTA | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 24806 | MIRAGE | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 25406 | J.HINDS | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbus | 24804 | DEVERS | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
2014 Heavy Summer Case
Trip Hassayampa - N. Gila 500 kV
Case ALT 3B DISPATCH 1
ALTERNATIVE 3B HEAVY SUMMER BASE CASE, DISPATCH SCENARIO 1

SDGE Busses



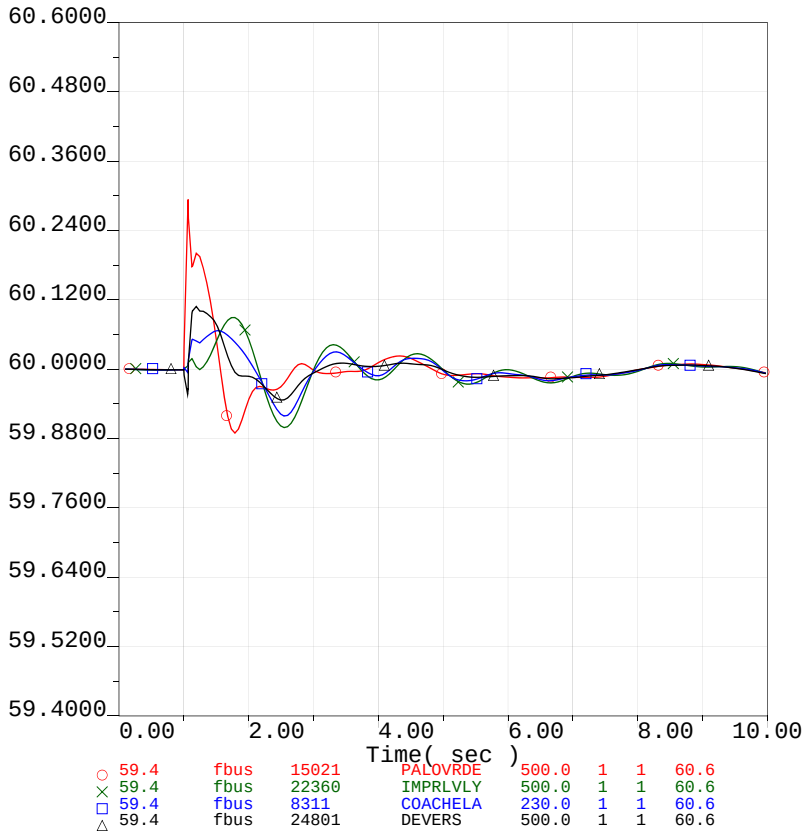

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ○ | 0.75 | vbus | 22260 | ESCNDIDO | 230.0 | 1 | 1 | 1.25 |
| × | 0.75 | vbus | 22356 | IMPRLVLY | 230.0 | 1 | 1 | 1.25 |
| □ | 0.75 | vbus | 22464 | MIGUEL | 230.0 | 1 | 1 | 1.25 |
| △ | 0.75 | vbus | 22832 | SYCAMORE | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
2014 Heavy Summer Case
Trip Hassayampa - N. Gila 500 kV
Case ALT 3B DISPATCH 1
ALTERNATIVE 3B HEAVY SUMMER BASE CASE, DISPATCH SCENARIO 1





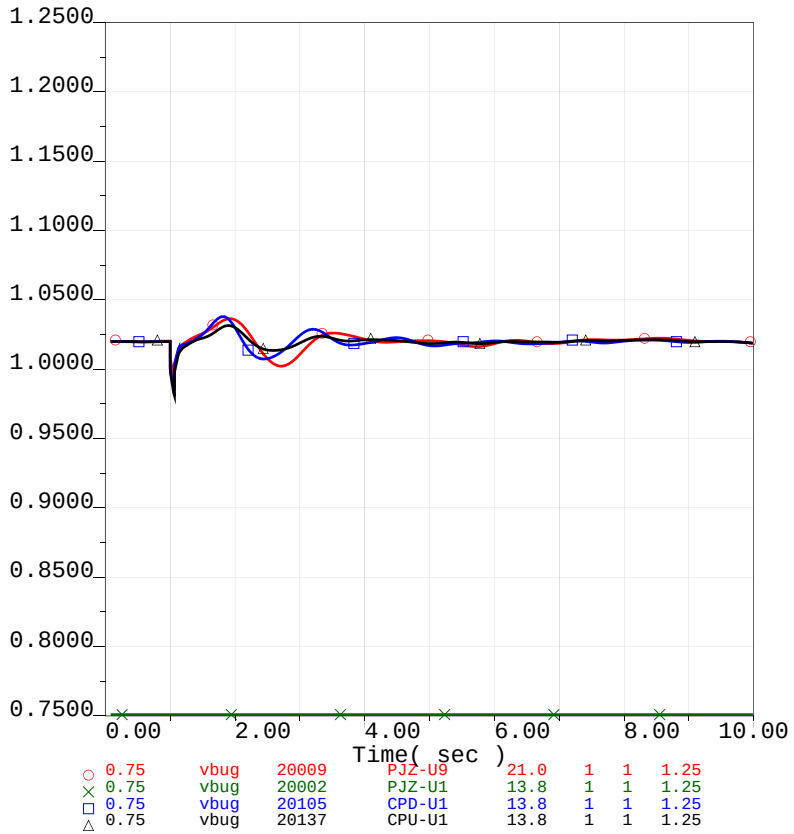
FBus Readings




| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ○ | 59.4 | fbus | 15021 | PALOVRDE | 500.0 | 1 | 1 | 60.6 |
| × | 59.4 | fbus | 22360 | IMPRLVLY | 500.0 | 1 | 1 | 60.6 |
| □ | 59.4 | fbus | 8311 | COACHELA | 230.0 | 1 | 1 | 60.6 |
| △ | 59.4 | fbus | 24801 | DEVERS | 500.0 | 1 | 1 | 60.6 |

IVSG STUDY
2014 Heavy Summer Case
Trip Hassayampa - N. Gila 500 kV
Case ALT 3B DISPATCH 1
ALTERNATIVE 3B HEAVY SUMMER BASE CASE, DISPATCH SCENARIO 1

CFE Busses Page 1

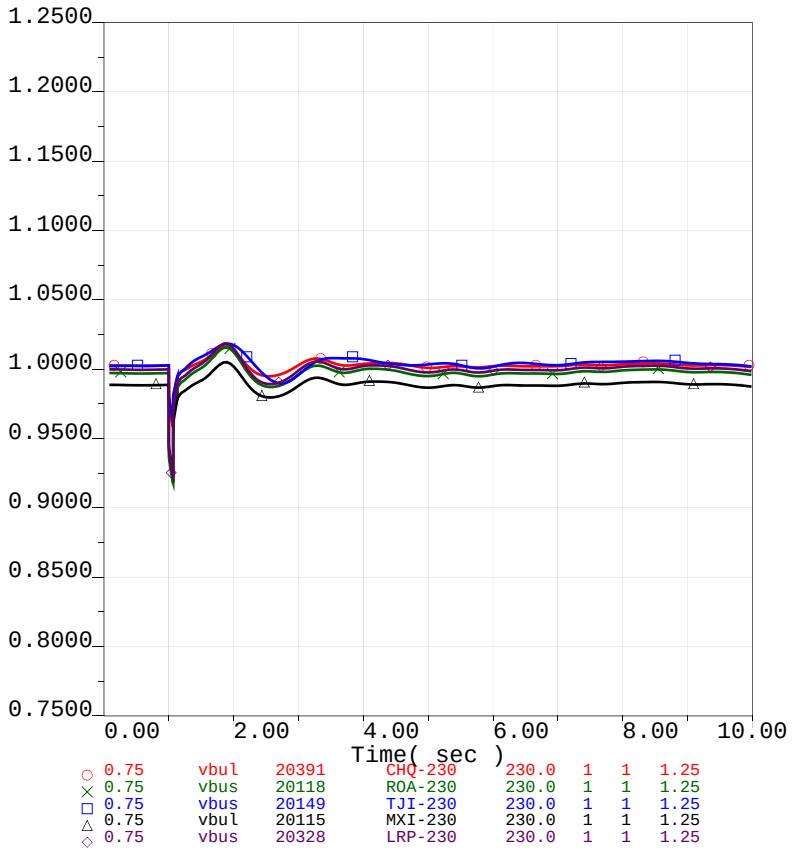



| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbug | 20009 | PJZ-U9 | 21.0 | 1 | 1 | 1.25 |
| × 0.75 | vbug | 20002 | PJZ-U1 | 13.8 | 1 | 1 | 1.25 |
| □ 0.75 | vbug | 20105 | CPD-U1 | 13.8 | 1 | 1 | 1.25 |
| △ 0.75 | vbug | 20137 | CPU-U1 | 13.8 | 1 | 1 | 1.25 |

IVSG STUDY
2014 Heavy Summer Case
Trip Hassayampa - N. Gila 500 kV
Case ALT 3B DISPATCH 1
ALTERNATIVE 3B HEAVY SUMMER BASE CASE, DISPATCH SCENARIO 1



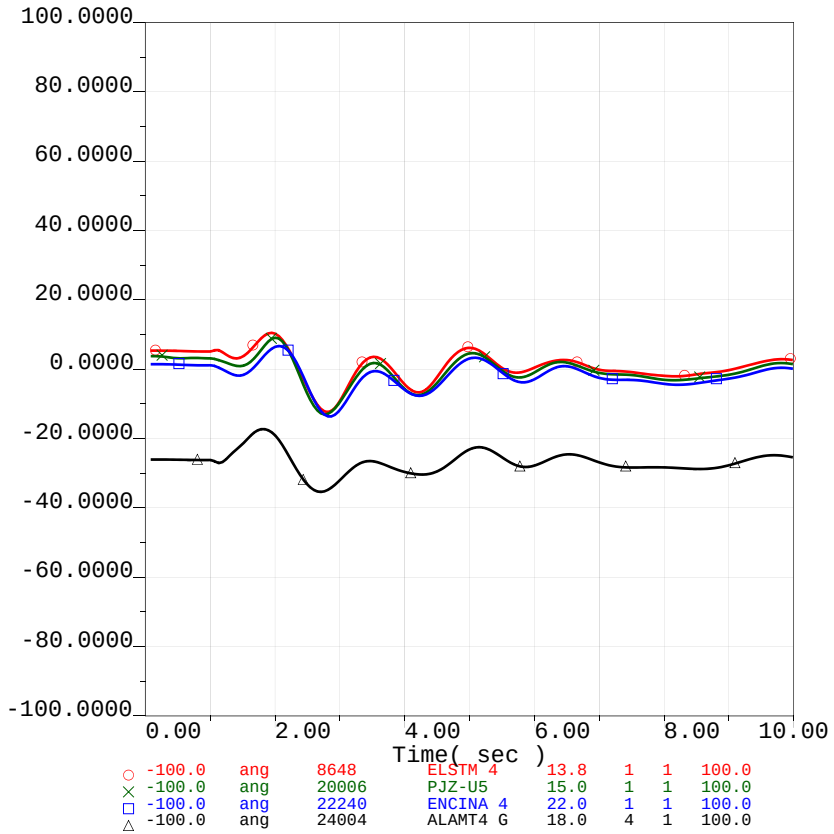
CFE Busses Page 2




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbul | 20391 | CHQ-230 | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 20118 | ROA-230 | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 20149 | TJI-230 | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbul | 20115 | MXI-230 | 230.0 | 1 | 1 | 1.25 |
| ◇ 0.75 | vbus | 20328 | LRP-230 | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
2014 Heavy Summer Case
Trip Hassayampa - N. Gila 500 kV
Case ALT 3B DISPATCH 1
ALTERNATIVE 3B HEAVY SUMMER BASE CASE, DISPATCH SCENARIO 1

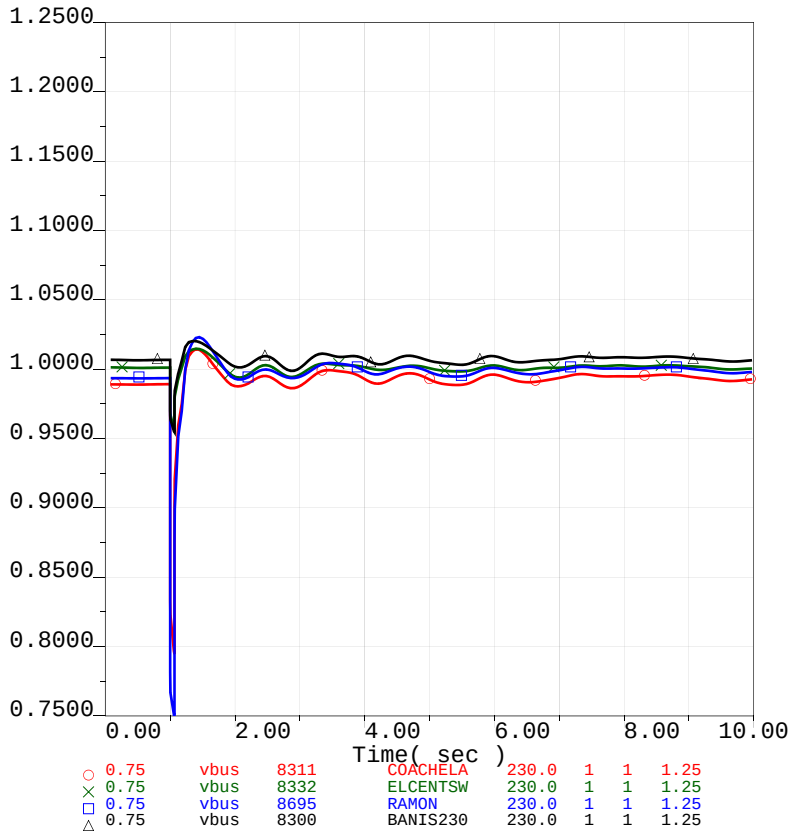
Rotor Angles for Gen Busses




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ -100.0 | ang | 8648 | ELSTM 4 | 13.8 | 1 | 1 | 100.0 |
| × -100.0 | ang | 20006 | PJZ-U5 | 15.0 | 1 | 1 | 100.0 |
| □ -100.0 | ang | 22240 | ENCINA 4 | 22.0 | 1 | 1 | 100.0 |
| △ -100.0 | ang | 24004 | ALAMT4 G | 18.0 | 4 | 1 | 100.0 |

IVSG STUDY
2014 Heavy Summer Case
Trip Hassayampa - N. Gila 500 kV
Case ALT 3B DISPATCH 1
ALTERNATIVE 3B HEAVY SUMMER BASE CASE, DISPATCH SCENARIO 1

IID Busses

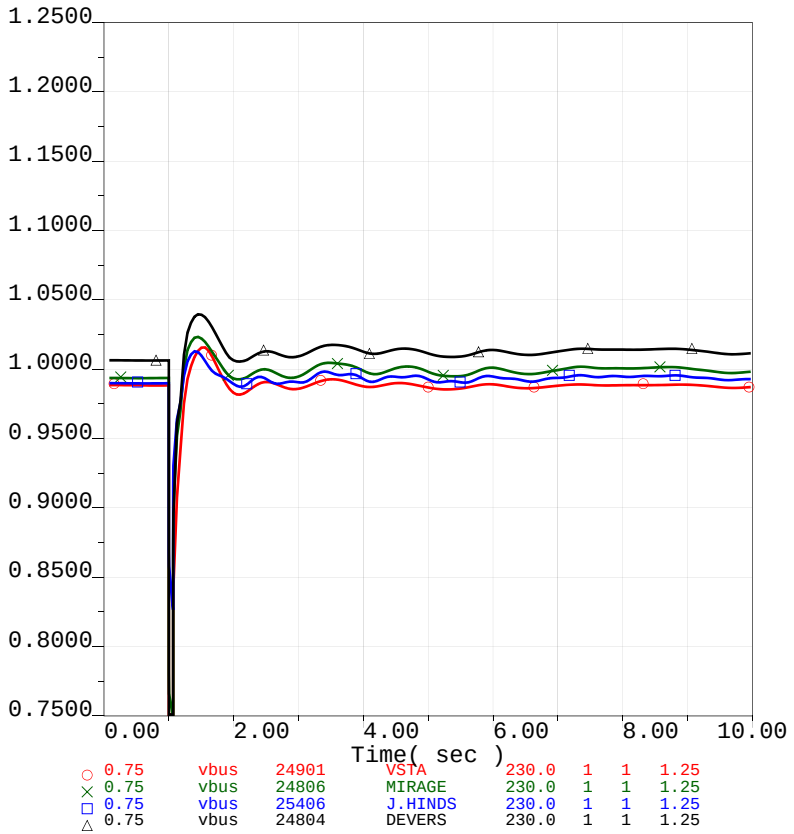



| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ○ | 0.75 | vbus | 8311 | COACHELA | 230.0 | 1 | 1 | 1.25 |
| × | 0.75 | vbus | 8332 | ELCENTSW | 230.0 | 1 | 1 | 1.25 |
| □ | 0.75 | vbus | 8695 | RAMON | 230.0 | 1 | 1 | 1.25 |
| △ | 0.75 | vbus | 8300 | BANIS230 | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
2014 Heavy Summer Case
Trip Serrano - Valley 500 kV Line
Case 0 - Base Case
ALTERNATIVE 2 HEAVY SUMMER BASE CASE, DISPATCH SCENARIO 1



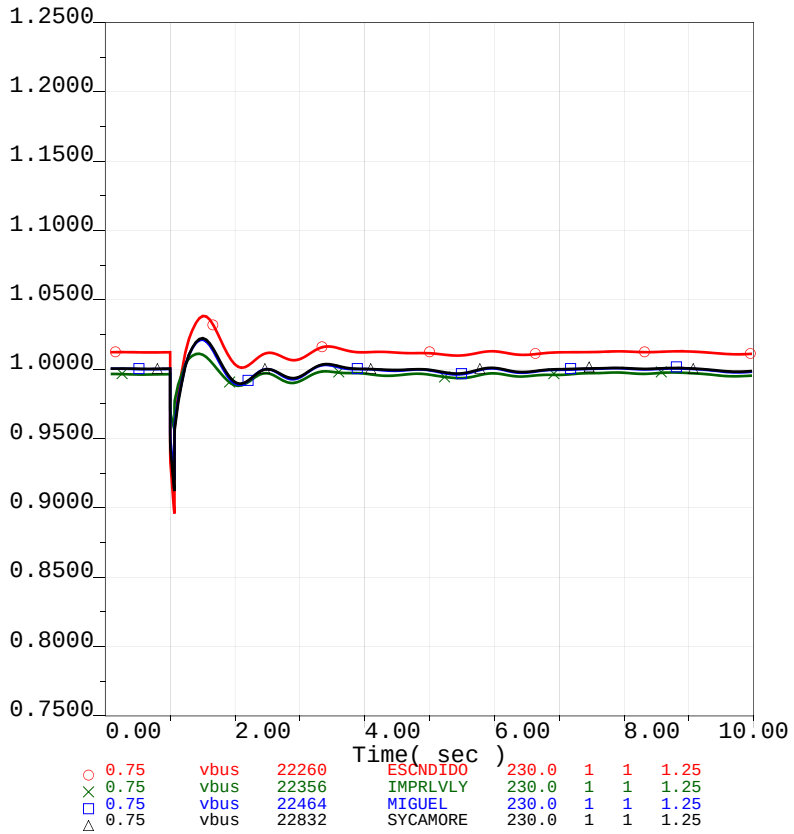
SCE Busses




| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ○ | 0.75 | vbus | 24901 | VSTA | 230.0 | 1 | 1 | 1.25 |
| × | 0.75 | vbus | 24806 | MIRAGE | 230.0 | 1 | 1 | 1.25 |
| □ | 0.75 | vbus | 25406 | J.HINDS | 230.0 | 1 | 1 | 1.25 |
| △ | 0.75 | vbus | 24804 | DEVERS | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
2014 Heavy Summer Case
Trip Serrano - Valley 500 kV Line
Case 0 - Base Case
ALTERNATIVE 2 HEAVY SUMMER BASE CASE, DISPATCH SCENARIO 1

SDGE Busses

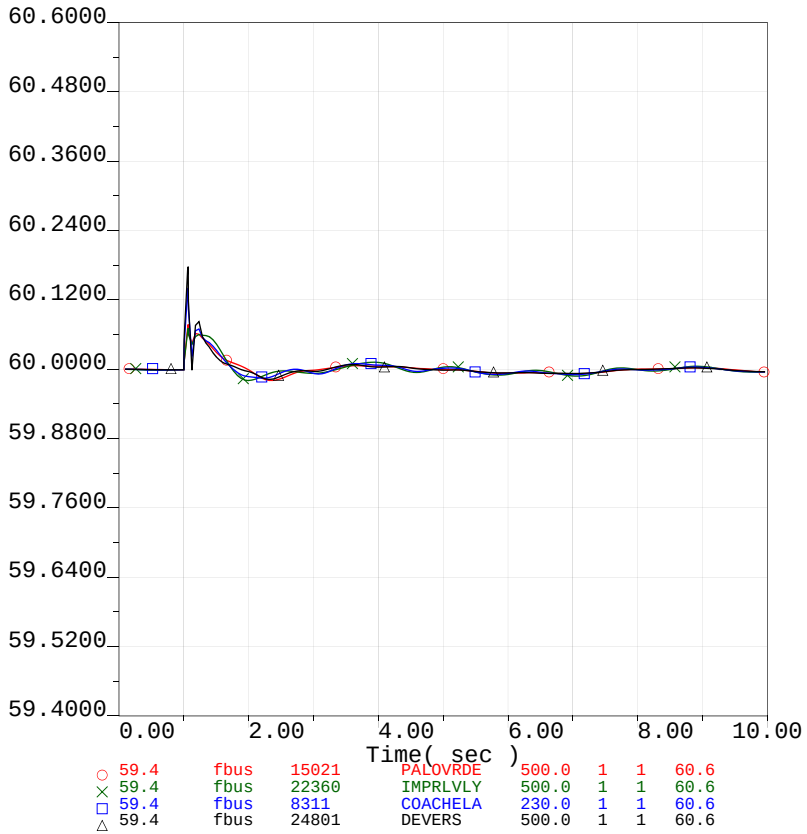



| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ○ | 0.75 | vbus | 22260 | ESCNDIDO | 230.0 | 1 | 1 | 1.25 |
| × | 0.75 | vbus | 22356 | IMPRLVLY | 230.0 | 1 | 1 | 1.25 |
| □ | 0.75 | vbus | 22464 | MIGUEL | 230.0 | 1 | 1 | 1.25 |
| △ | 0.75 | vbus | 22832 | SYCAMORE | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
2014 Heavy Summer Case
Trip Serrano - Valley 500 kV Line
Case 0 - Base Case
ALTERNATIVE 2 HEAVY SUMMER BASE CASE, DISPATCH SCENARIO 1



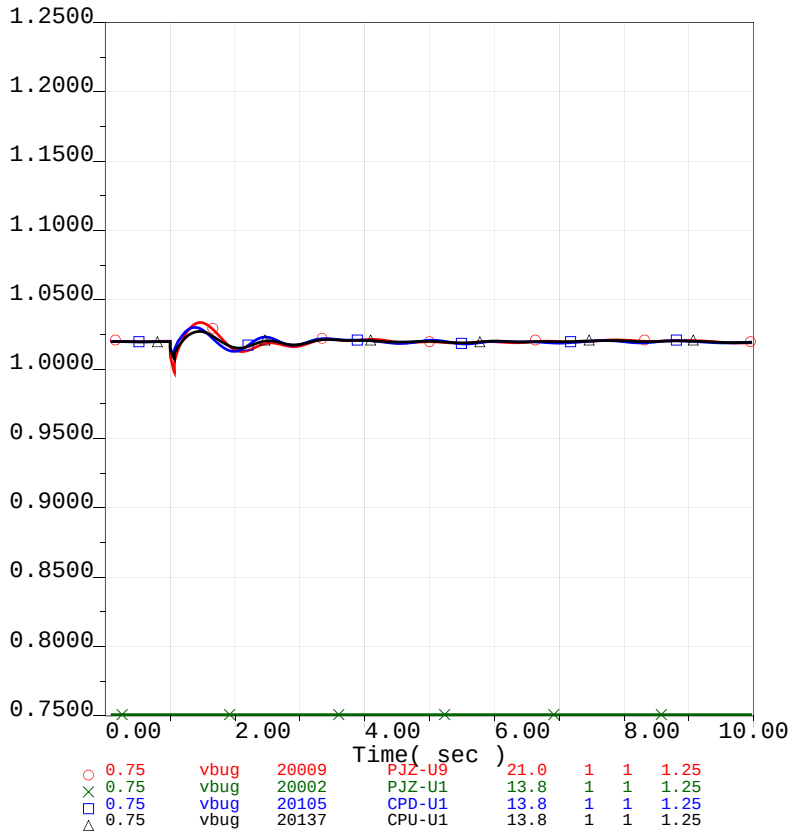
FBus Readings




| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ○ | 59.4 | fbus | 15021 | PALOVRDE | 500.0 | 1 | 1 | 60.6 |
| × | 59.4 | fbus | 22360 | IMPRLVLY | 500.0 | 1 | 1 | 60.6 |
| □ | 59.4 | fbus | 8311 | COACHELA | 230.0 | 1 | 1 | 60.6 |
| △ | 59.4 | fbus | 24801 | DEVERS | 500.0 | 1 | 1 | 60.6 |

IVSG STUDY
2014 Heavy Summer Case
Trip Serrano - Valley 500 kV Line
Case 0 - Base Case
ALTERNATIVE 2 HEAVY SUMMER BASE CASE, DISPATCH SCENARIO 1

CFE Busses Page 1

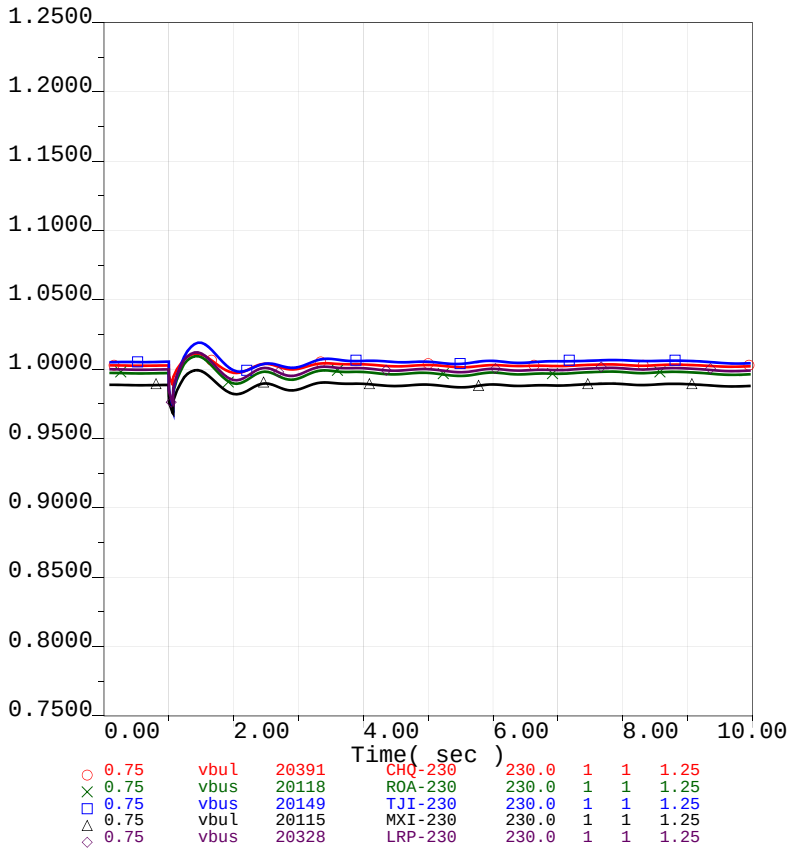



| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbug | 20009 | PJZ-U9 | 21.0 | 1 | 1 | 1.25 |
| × 0.75 | vbug | 20002 | PJZ-U1 | 13.8 | 1 | 1 | 1.25 |
| □ 0.75 | vbug | 20105 | CPD-U1 | 13.8 | 1 | 1 | 1.25 |
| △ 0.75 | vbug | 20137 | CPU-U1 | 13.8 | 1 | 1 | 1.25 |

IVSG STUDY
2014 Heavy Summer Case
Trip Serrano - Valley 500 kV Line
Case 0 - Base Case
ALTERNATIVE 2 HEAVY SUMMER BASE CASE, DISPATCH SCENARIO 1



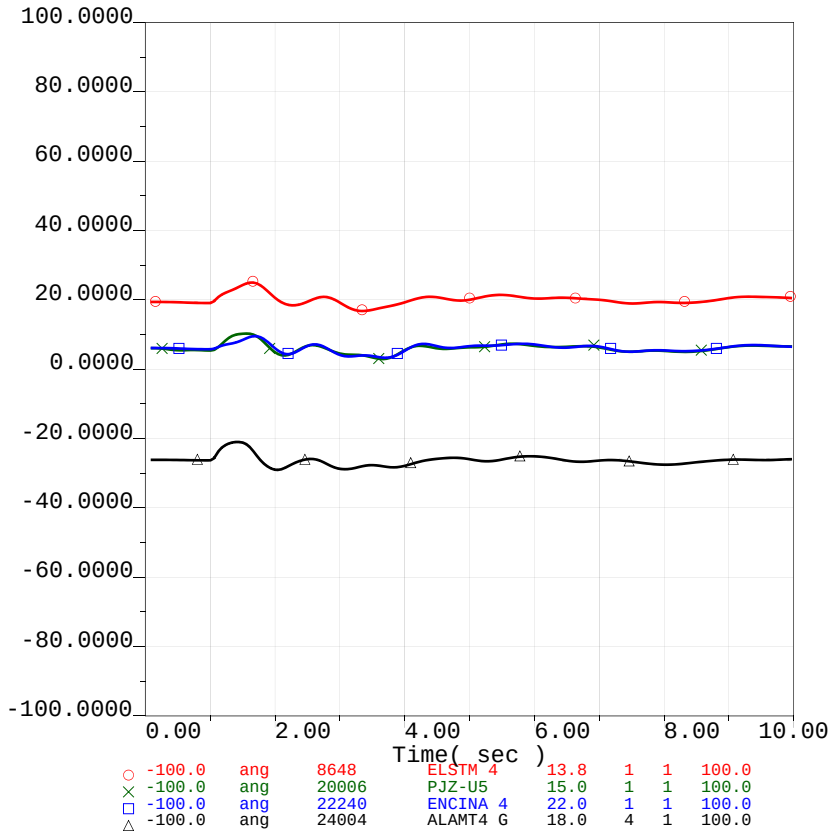
CFE Busses Page 2




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbul | 20391 | CHQ-230 | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 20118 | ROA-230 | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 20149 | TJI-230 | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbul | 20115 | MXI-230 | 230.0 | 1 | 1 | 1.25 |
| ◇ 0.75 | vbus | 20328 | LRP-230 | 230.0 | 1 | 1 | 1.25 |

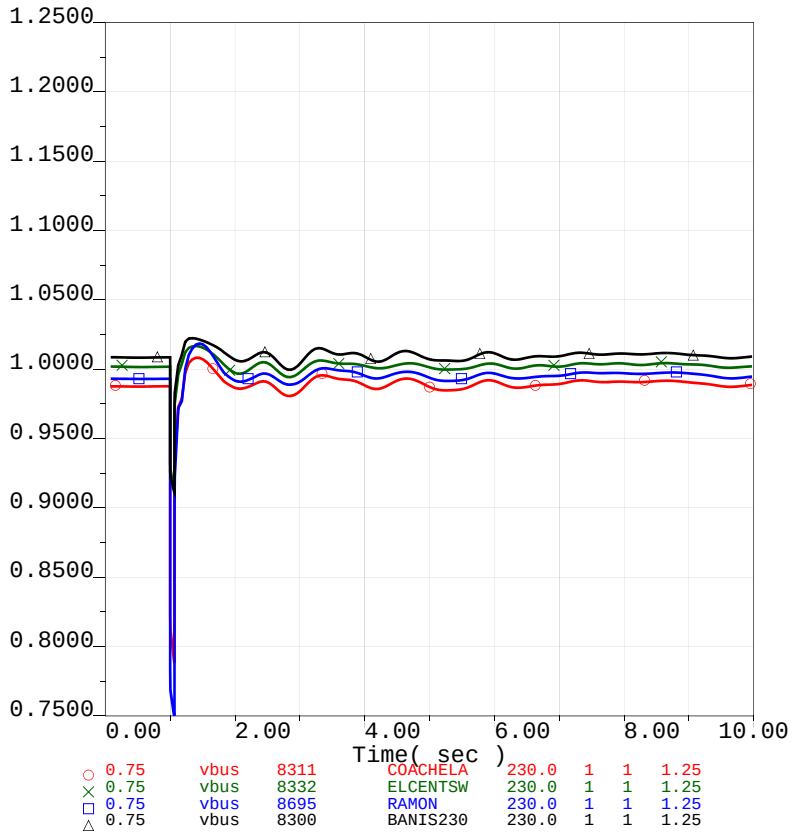
IVSG STUDY
2014 Heavy Summer Case
Trip Serrano - Valley 500 kV Line
Case 0 - Base Case
ALTERNATIVE 2 HEAVY SUMMER BASE CASE, DISPATCH SCENARIO 1

Rotor Angles for Gen Busses




IVSG STUDY
2014 Heavy Summer Case
Trip Serrano - Valley 500 kV Line
Case 0 - Base Case
ALTERNATIVE 2 HEAVY SUMMER BASE CASE, DISPATCH SCENARIO 1

IID Busses



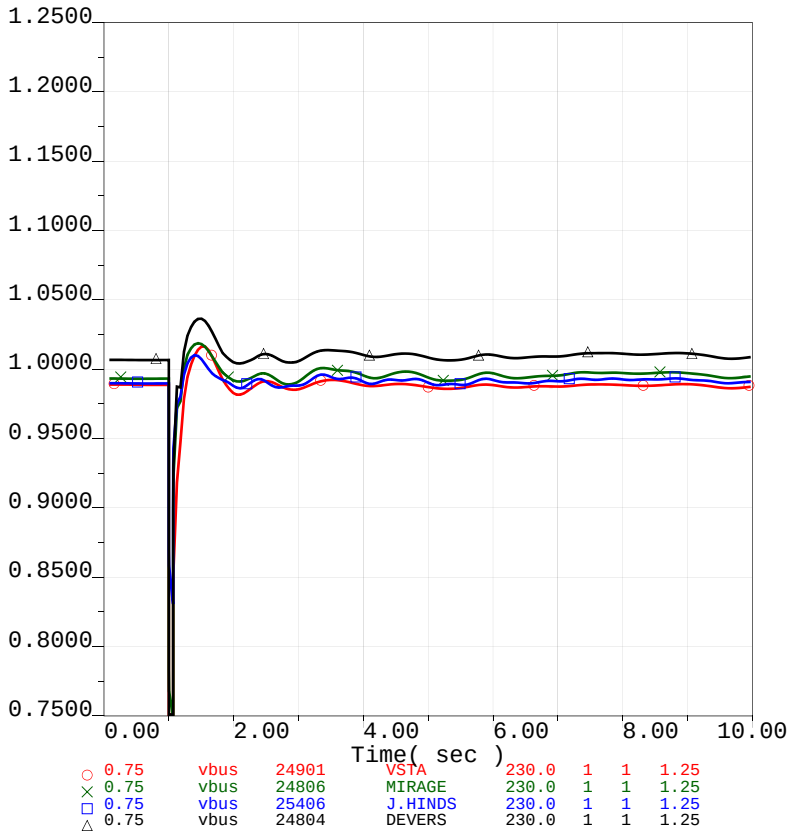

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ○ | 0.75 | vbus | 8311 | COACHELA | 230.0 | 1 | 1 | 1.25 |
| × | 0.75 | vbus | 8332 | ELCENTSW | 230.0 | 1 | 1 | 1.25 |
| □ | 0.75 | vbus | 8695 | RAMON | 230.0 | 1 | 1 | 1.25 |
| △ | 0.75 | vbus | 8300 | BANIS230 | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
2014 Heavy Summer Case
Trip Serrano - SerVal 500 kV
Case ALT 3b DISPATCH 1
ALTERNATIVE 3B HEAVY SUMMER BASE CASE, DISPATCH SCENARIO 1





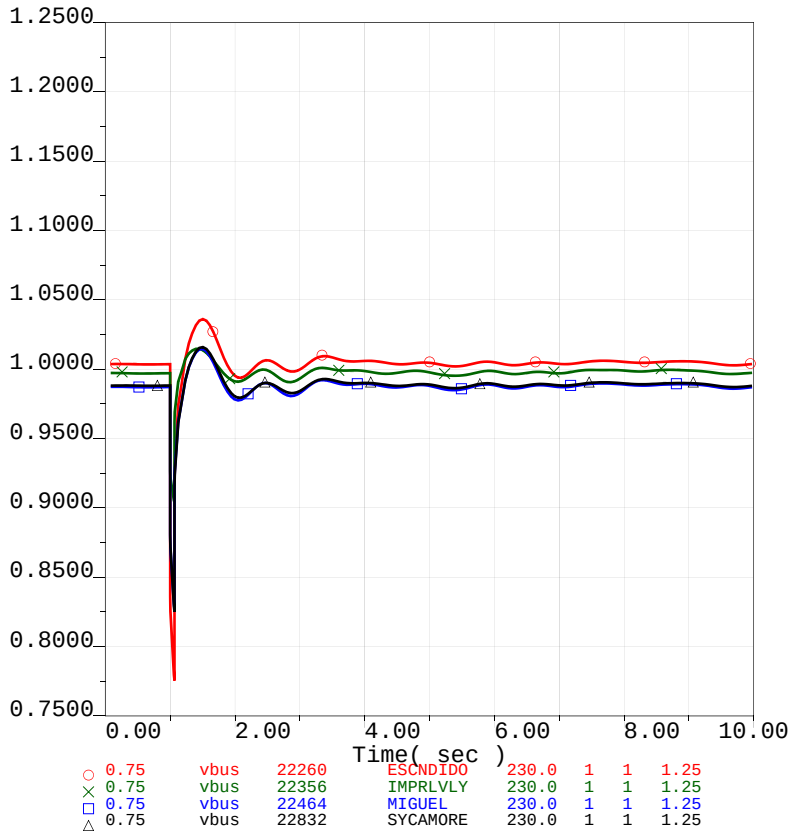
SCE Busses




| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ○ | 0.75 | vbus | 24901 | VSTA | 230.0 | 1 | 1 | 1.25 |
| × | 0.75 | vbus | 24806 | MIRAGE | 230.0 | 1 | 1 | 1.25 |
| □ | 0.75 | vbus | 25406 | J.HINDS | 230.0 | 1 | 1 | 1.25 |
| △ | 0.75 | vbus | 24804 | DEVERS | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
2014 Heavy Summer Case
Trip Serrano - SerVal 500 kV
Case ALT 3b DISPATCH 1
ALTERNATIVE 3B HEAVY SUMMER BASE CASE, DISPATCH SCENARIO 1

SDGE Busses



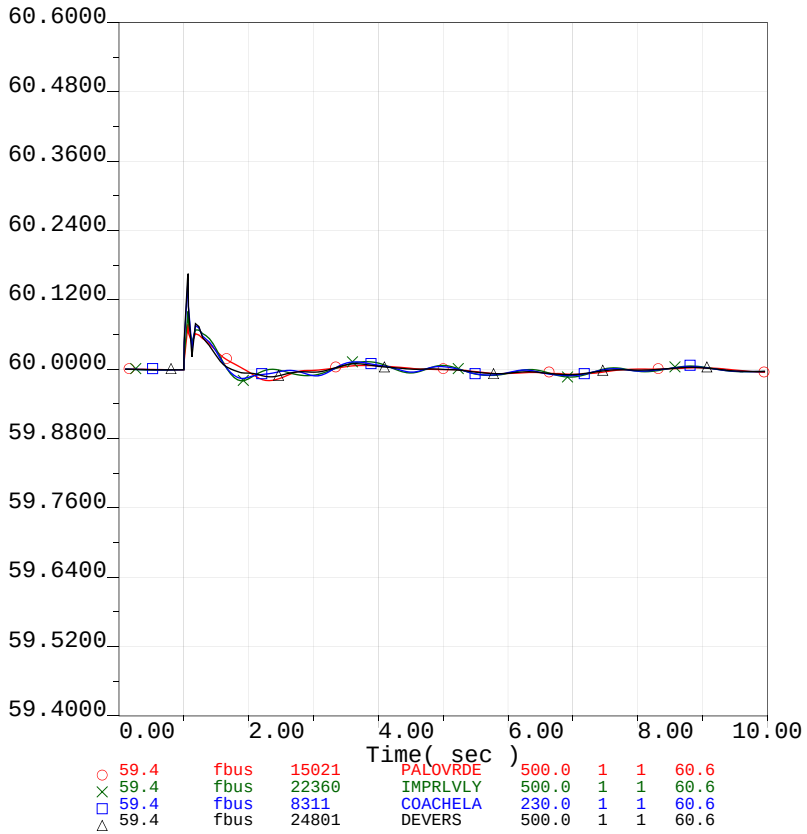

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ○ | 0.75 | vbus | 22260 | ESCNDIDO | 230.0 | 1 | 1 | 1.25 |
| × | 0.75 | vbus | 22356 | IMPRLVLY | 230.0 | 1 | 1 | 1.25 |
| □ | 0.75 | vbus | 22464 | MIGUEL | 230.0 | 1 | 1 | 1.25 |
| △ | 0.75 | vbus | 22832 | SYCAMORE | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
2014 Heavy Summer Case
Trip Serrano - SerVal 500 kV
Case ALT 3b DISPATCH 1
ALTERNATIVE 3B HEAVY SUMMER BASE CASE, DISPATCH SCENARIO 1





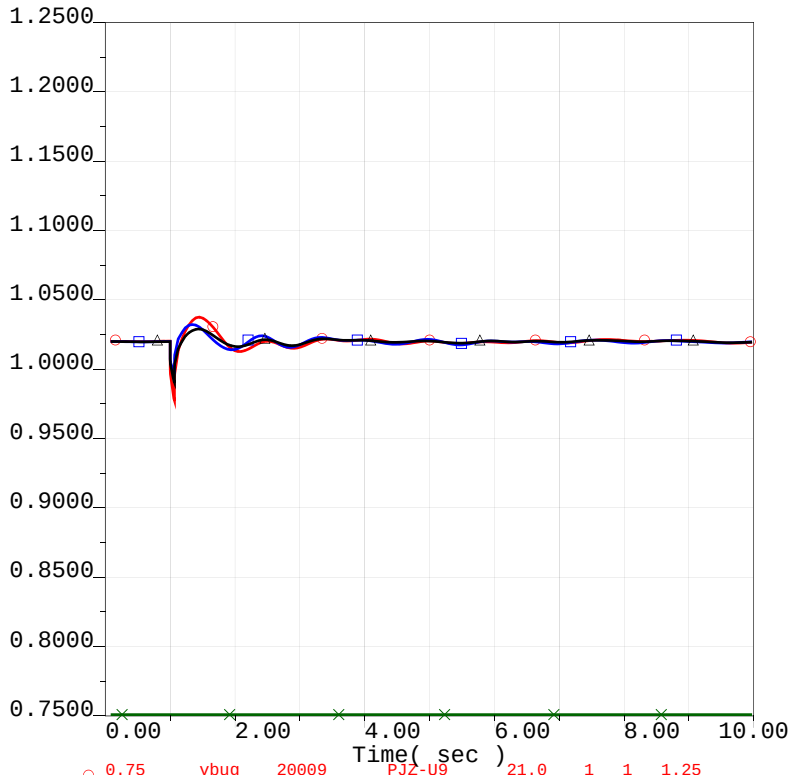
FBus Readings




| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ○ | 59.4 | fbus | 15021 | PALOVRDE | 500.0 | 1 | 1 | 60.6 |
| × | 59.4 | fbus | 22360 | IMPRLVLY | 500.0 | 1 | 1 | 60.6 |
| □ | 59.4 | fbus | 8311 | COACHELA | 230.0 | 1 | 1 | 60.6 |
| △ | 59.4 | fbus | 24801 | DEVERS | 500.0 | 1 | 1 | 60.6 |

IVSG STUDY
2014 Heavy Summer Case
Trip Serrano - SerVal 500 kV
Case ALT 3b DISPATCH 1
ALTERNATIVE 3B HEAVY SUMMER BASE CASE, DISPATCH SCENARIO 1

CFE Busses Page 1

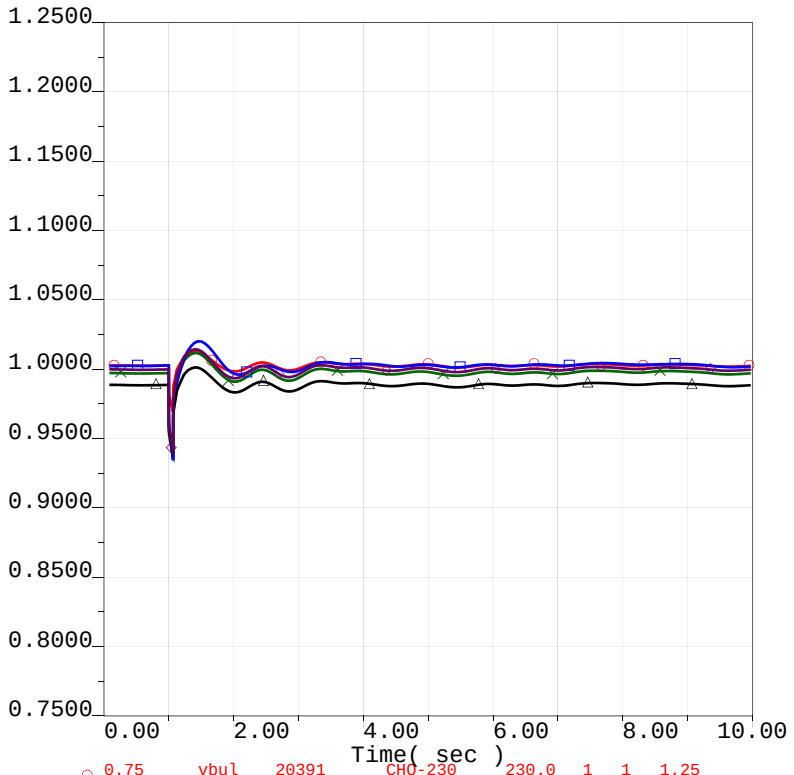



| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbug | 20009 | PJZ-U9 | 21.0 | 1 | 1 | 1.25 |
| × 0.75 | vbug | 20002 | PJZ-U1 | 13.8 | 1 | 1 | 1.25 |
| □ 0.75 | vbug | 20105 | CPD-U1 | 13.8 | 1 | 1 | 1.25 |
| △ 0.75 | vbug | 20137 | CPU-U1 | 13.8 | 1 | 1 | 1.25 |

IVSG STUDY
2014 Heavy Summer Case
Trip Serrano - SerVal 500 kV
Case ALT 3b DISPATCH 1
ALTERNATIVE 3B HEAVY SUMMER BASE CASE, DISPATCH SCENARIO 1



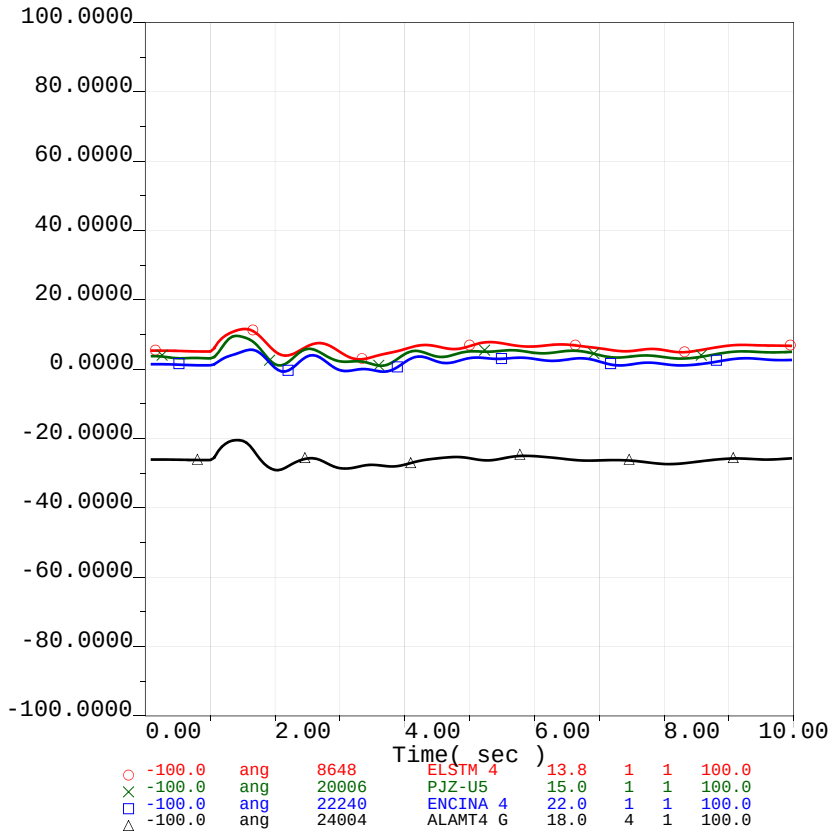
CFE Busses Page 2




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbul | 20391 | CHQ-230 | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 20118 | ROA-230 | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 20149 | TJI-230 | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbul | 20115 | MXI-230 | 230.0 | 1 | 1 | 1.25 |
| ◇ 0.75 | vbus | 20328 | LRP-230 | 230.0 | 1 | 1 | 1.25 |

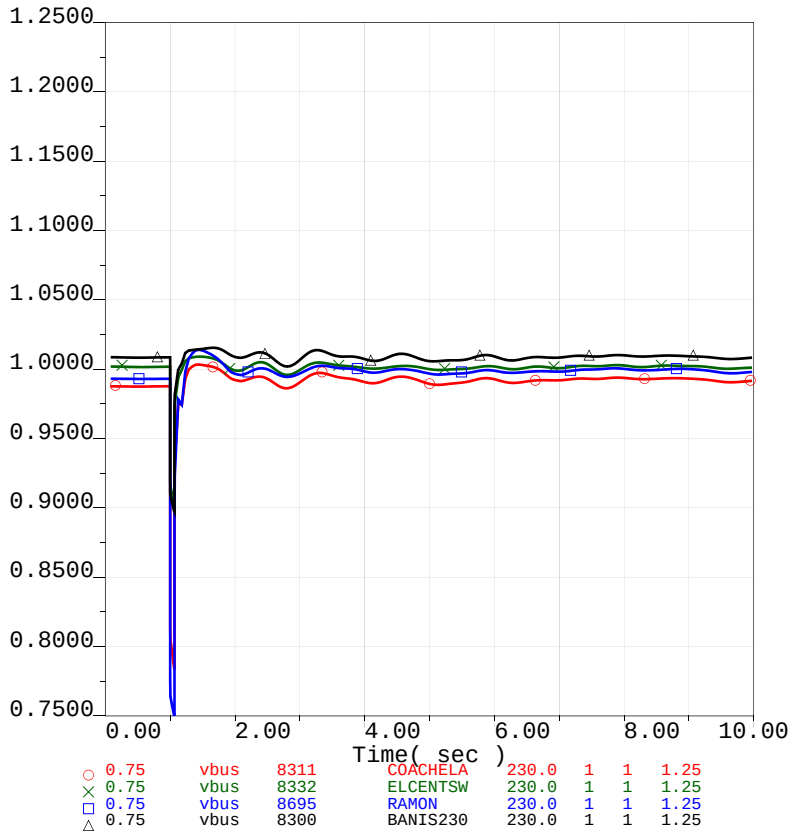
IVSG STUDY
2014 Heavy Summer Case
Trip Serrano - SerVal 500 kV
Case ALT 3b DISPATCH 1
ALTERNATIVE 3B HEAVY SUMMER BASE CASE, DISPATCH SCENARIO 1

Rotor Angles for Gen Busses




IVSG STUDY
2014 Heavy Summer Case
Trip Serrano - SerVal 500 kV
Case ALT 3b DISPATCH 1
ALTERNATIVE 3B HEAVY SUMMER BASE CASE, DISPATCH SCENARIO 1

IID Busses

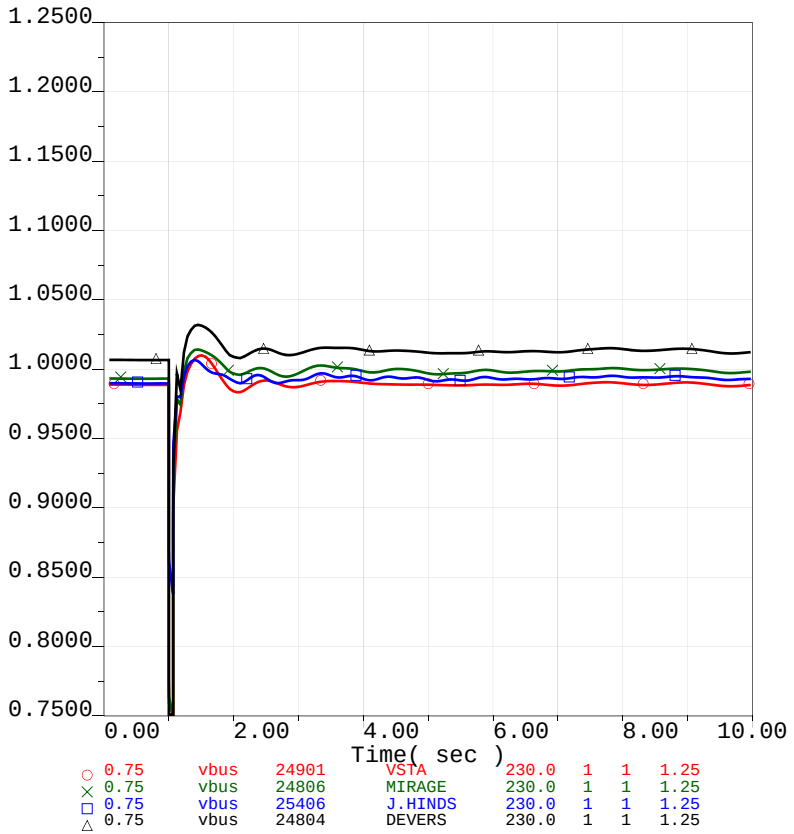



| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbus | 8311 | COACHELA | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 8332 | ELCENTSW | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 8695 | RAMON | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbus | 8300 | BANIS230 | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
2014 Heavy Summer Case
Trip SerVal - Valley 500 kV
Case ALT 3b DISPATCH 1
ALTERNATIVE 3B HEAVY SUMMER BASE CASE, DISPATCH SCENARIO 1



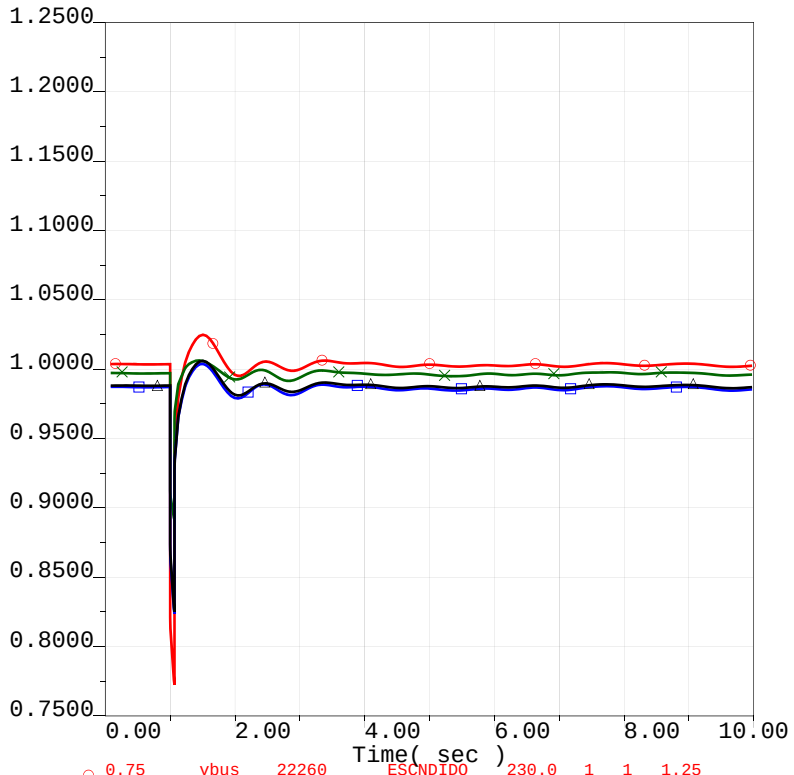
SCE Busses




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbus | 24901 | VSTA | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 24806 | MIRAGE | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 25406 | J.HINDS | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbus | 24804 | DEVERS | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
2014 Heavy Summer Case
Trip SerVal - Valley 500 kV
Case ALT 3b DISPATCH 1
ALTERNATIVE 3B HEAVY SUMMER BASE CASE, DISPATCH SCENARIO 1

SDGE Busses



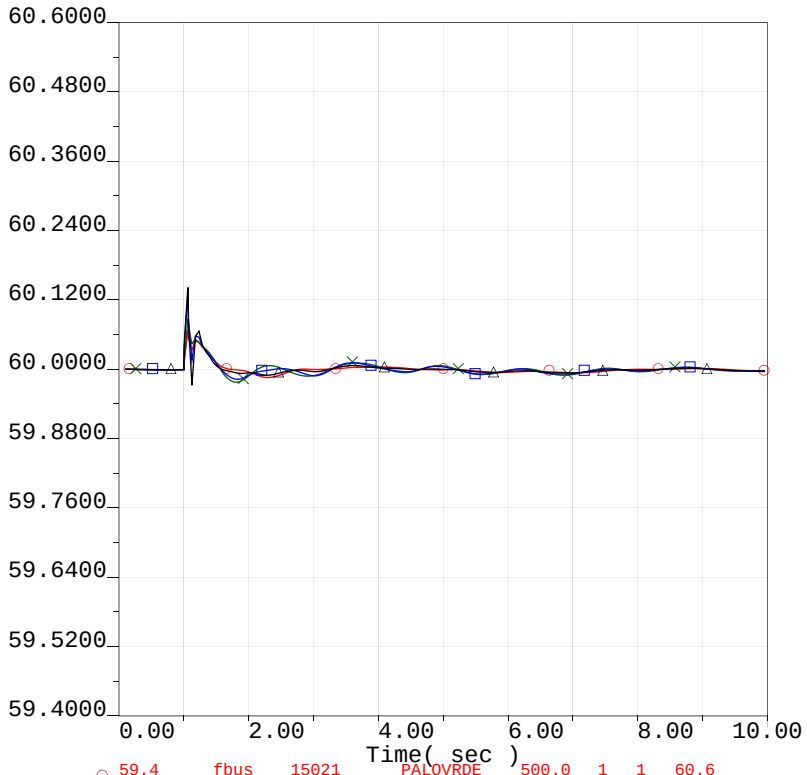

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ○ | 0.75 | vbus | 22260 | ESCNDIDO | 230.0 | 1 | 1 | 1.25 |
| × | 0.75 | vbus | 22356 | IMPRLVLY | 230.0 | 1 | 1 | 1.25 |
| □ | 0.75 | vbus | 22464 | MIGUEL | 230.0 | 1 | 1 | 1.25 |
| △ | 0.75 | vbus | 22832 | SYCAMORE | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
2014 Heavy Summer Case
Trip SerVal - Valley 500 kV
Case ALT 3b DISPATCH 1
ALTERNATIVE 3B HEAVY SUMMER BASE CASE, DISPATCH SCENARIO 1





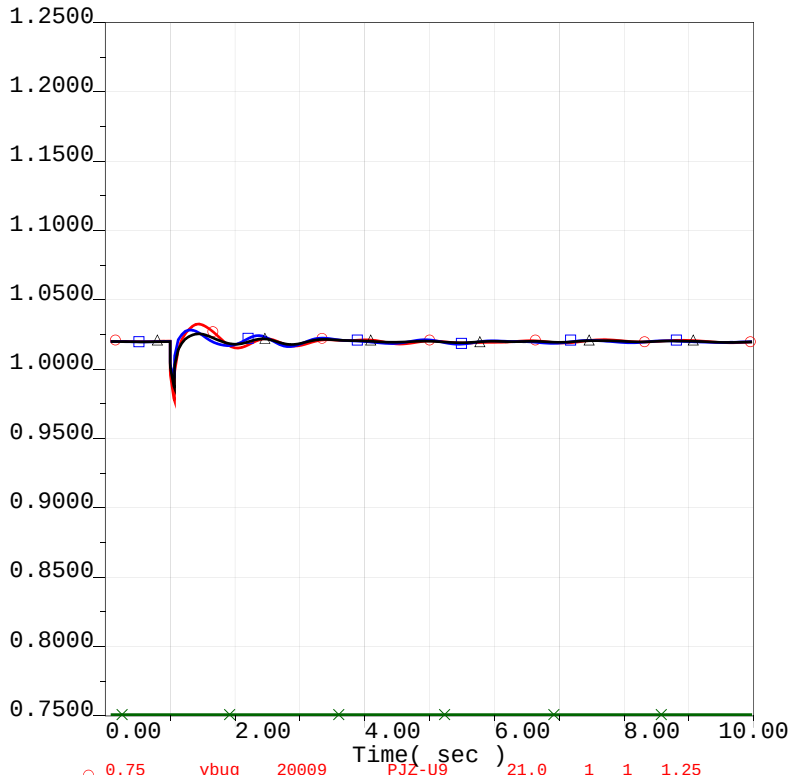
FBus Readings




| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ○ | 59.4 | fbus | 15021 | PALOVRDE | 500.0 | 1 | 1 | 60.6 |
| × | 59.4 | fbus | 22360 | IMPRLVLY | 500.0 | 1 | 1 | 60.6 |
| □ | 59.4 | fbus | 8311 | COACHELA | 230.0 | 1 | 1 | 60.6 |
| △ | 59.4 | fbus | 24801 | DEVERS | 500.0 | 1 | 1 | 60.6 |

IVSG STUDY
2014 Heavy Summer Case
Trip SerVal - Valley 500 kV
Case ALT 3b DISPATCH 1
ALTERNATIVE 3B HEAVY SUMMER BASE CASE, DISPATCH SCENARIO 1

CFE Busses Page 1



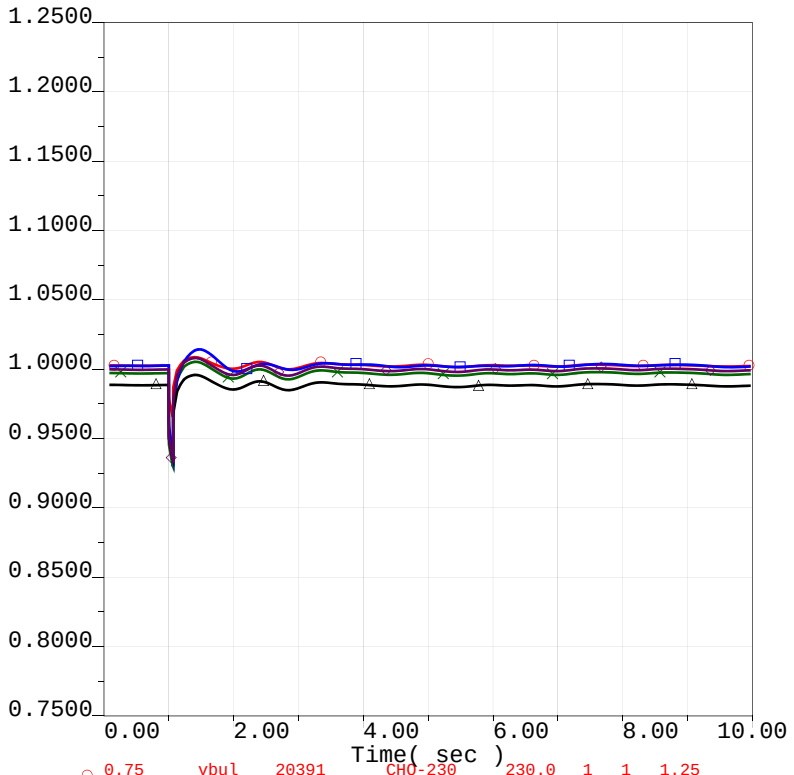

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbug | 20009 | PJZ-U9 | 21.0 | 1 | 1 | 1.25 |
| × 0.75 | vbug | 20002 | PJZ-U1 | 13.8 | 1 | 1 | 1.25 |
| □ 0.75 | vbug | 20105 | CPD-U1 | 13.8 | 1 | 1 | 1.25 |
| △ 0.75 | vbug | 20137 | CPU-U1 | 13.8 | 1 | 1 | 1.25 |

IVSG STUDY
2014 Heavy Summer Case
Trip SerVal - Valley 500 kV
Case ALT 3b DISPATCH 1
ALTERNATIVE 3B HEAVY SUMMER BASE CASE, DISPATCH SCENARIO 1





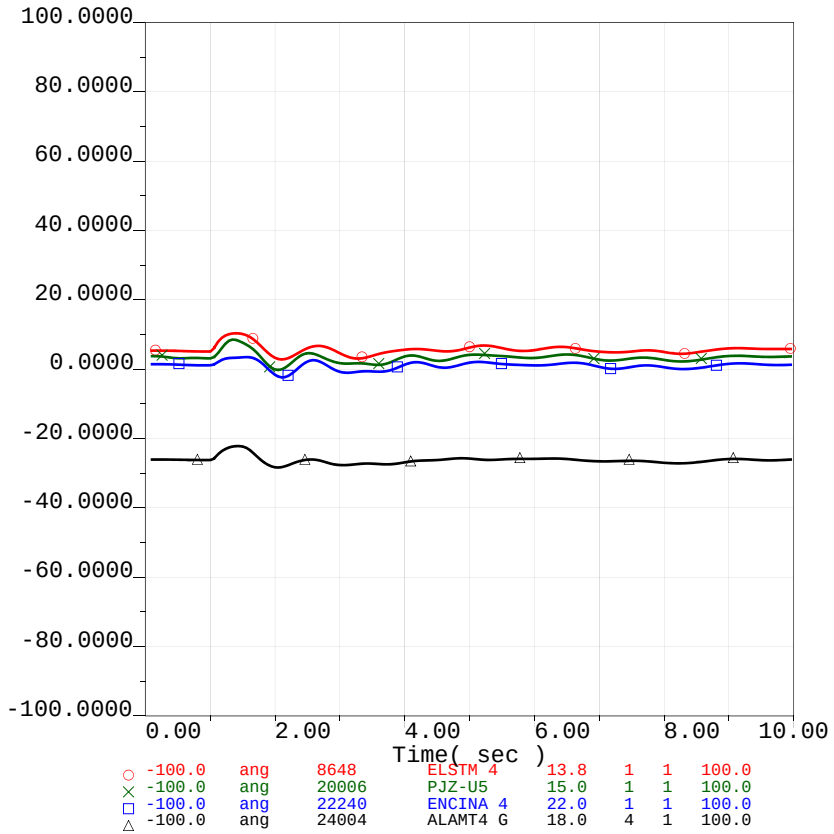
CFE Busses Page 2




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbul | 20391 | CHQ-230 | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 20118 | ROA-230 | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 20149 | TJI-230 | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbul | 20115 | MXI-230 | 230.0 | 1 | 1 | 1.25 |
| ◇ 0.75 | vbus | 20328 | LRP-230 | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
2014 Heavy Summer Case
Trip SerVal - Valley 500 kV
Case ALT 3b DISPATCH 1
ALTERNATIVE 3B HEAVY SUMMER BASE CASE, DISPATCH SCENARIO 1

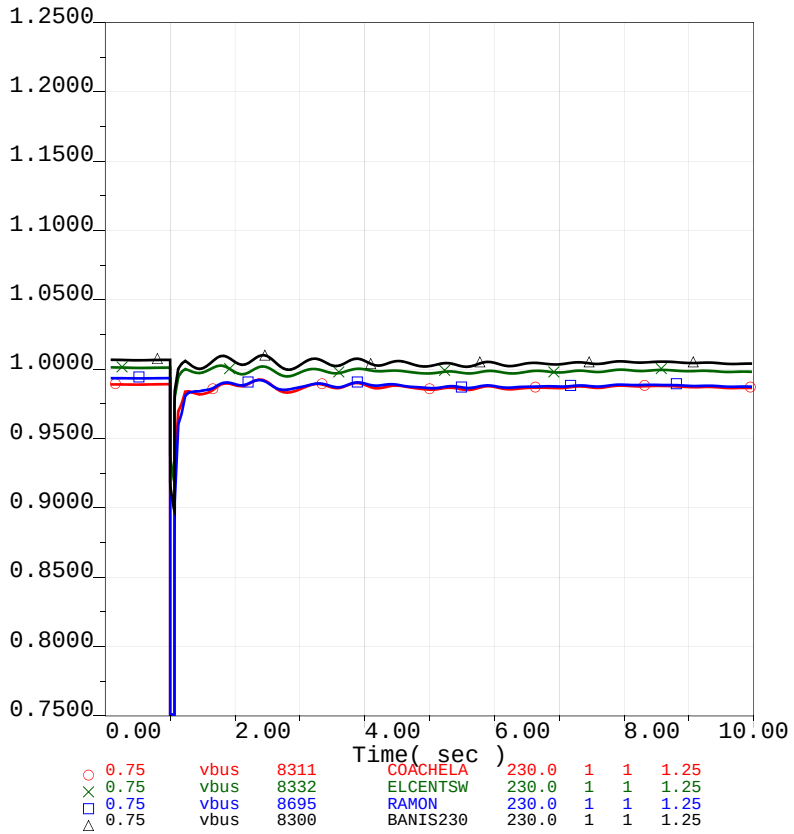
Rotor Angles for Gen Busses




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ -100.0 | ang | 8648 | ELSTM 4 | 13.8 | 1 | 1 | 100.0 |
| × -100.0 | ang | 20006 | PJZ-U5 | 15.0 | 1 | 1 | 100.0 |
| □ -100.0 | ang | 22240 | ENCINA 4 | 22.0 | 1 | 1 | 100.0 |
| △ -100.0 | ang | 24004 | ALAMT4 G | 18.0 | 4 | 1 | 100.0 |

IVSG STUDY
2014 Heavy Summer Case
Trip SerVal - Valley 500 kV
Case ALT 3b DISPATCH 1
ALTERNATIVE 3B HEAVY SUMMER BASE CASE, DISPATCH SCENARIO 1

IID Busses



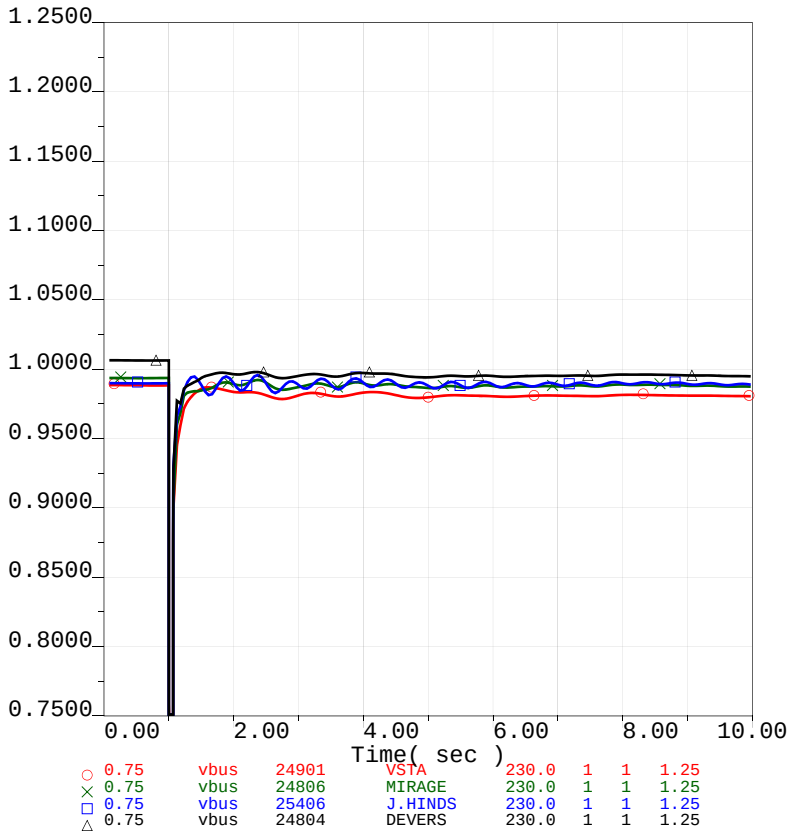

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbus | 8311 | COACHELA | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 8332 | ELCENTSW | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 8695 | RAMON | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbus | 8300 | BANIS230 | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
2014 Heavy Summer Case
Trip Devers - Valley 500 kV
Case ALT 2 DISPATCH 1
ALTERNATIVE 2 HEAVY SUMMER BASE CASE, DISPATCH SCENARIO 1





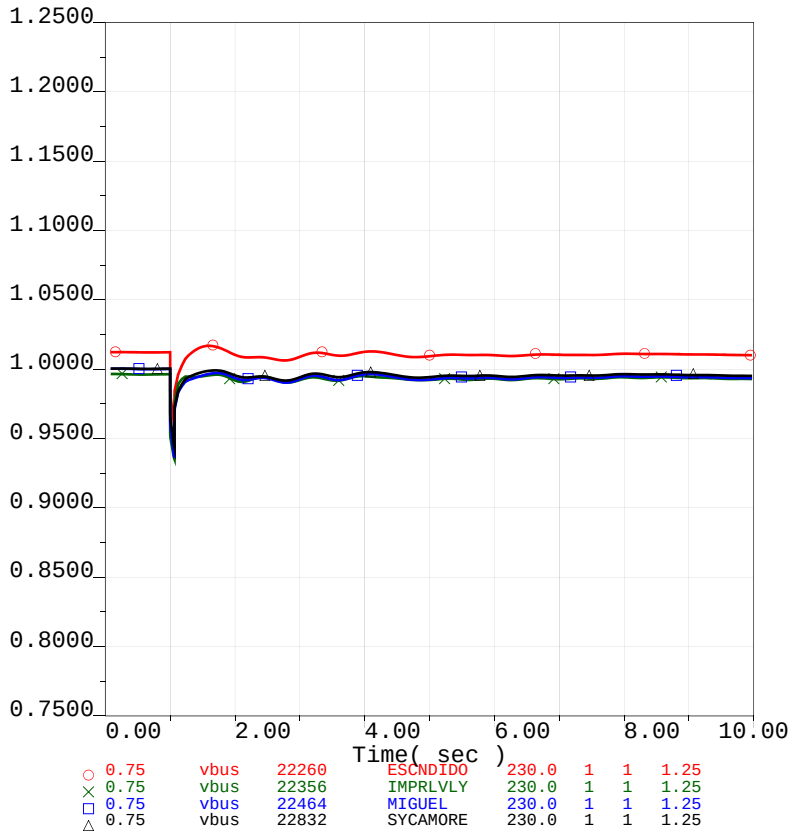
SCE Busses




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbus | 24901 | VSTA | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 24806 | MIRAGE | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 25406 | J.HINDS | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbus | 24804 | DEVERS | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
2014 Heavy Summer Case
Trip Devers - Valley 500 kV
Case ALT 2 DISPATCH 1
ALTERNATIVE 2 HEAVY SUMMER BASE CASE, DISPATCH SCENARIO 1

SDGE Busses



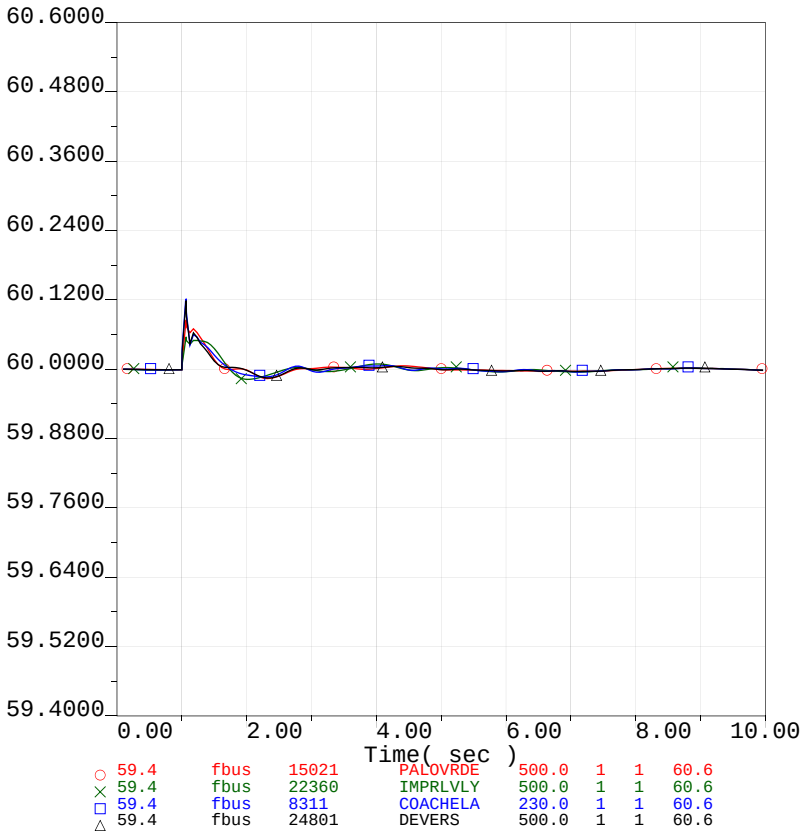

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ○ | 0.75 | vbus | 22260 | ESCNDIDO | 230.0 | 1 | 1 | 1.25 |
| × | 0.75 | vbus | 22356 | IMPRLVLY | 230.0 | 1 | 1 | 1.25 |
| □ | 0.75 | vbus | 22464 | MIGUEL | 230.0 | 1 | 1 | 1.25 |
| △ | 0.75 | vbus | 22832 | SYCAMORE | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
2014 Heavy Summer Case
Trip Devers - Valley 500 kV
Case ALT 2 DISPATCH 1
ALTERNATIVE 2 HEAVY SUMMER BASE CASE, DISPATCH SCENARIO 1





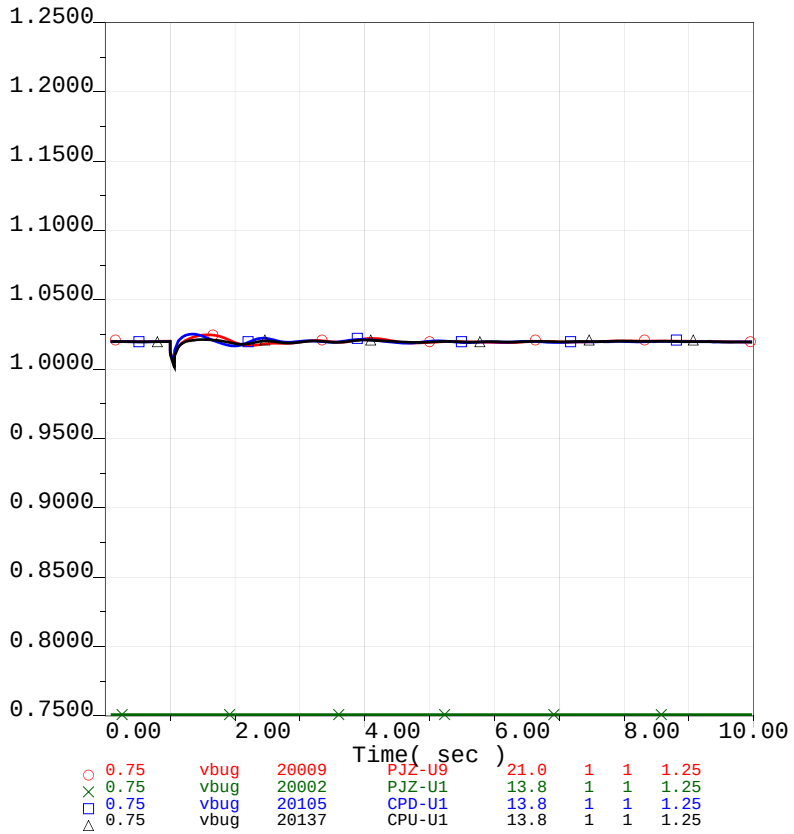
FBus Readings




| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ○ | 59.4 | fbus | 15021 | PALOVRDE | 500.0 | 1 | 1 | 60.6 |
| × | 59.4 | fbus | 22360 | IMPRLVLY | 500.0 | 1 | 1 | 60.6 |
| □ | 59.4 | fbus | 8311 | COACHELA | 230.0 | 1 | 1 | 60.6 |
| △ | 59.4 | fbus | 24801 | DEVERS | 500.0 | 1 | 1 | 60.6 |

IVSG STUDY
2014 Heavy Summer Case
Trip Devers - Valley 500 kV
Case ALT 2 DISPATCH 1
ALTERNATIVE 2 HEAVY SUMMER BASE CASE, DISPATCH SCENARIO 1

CFE Busses Page 1



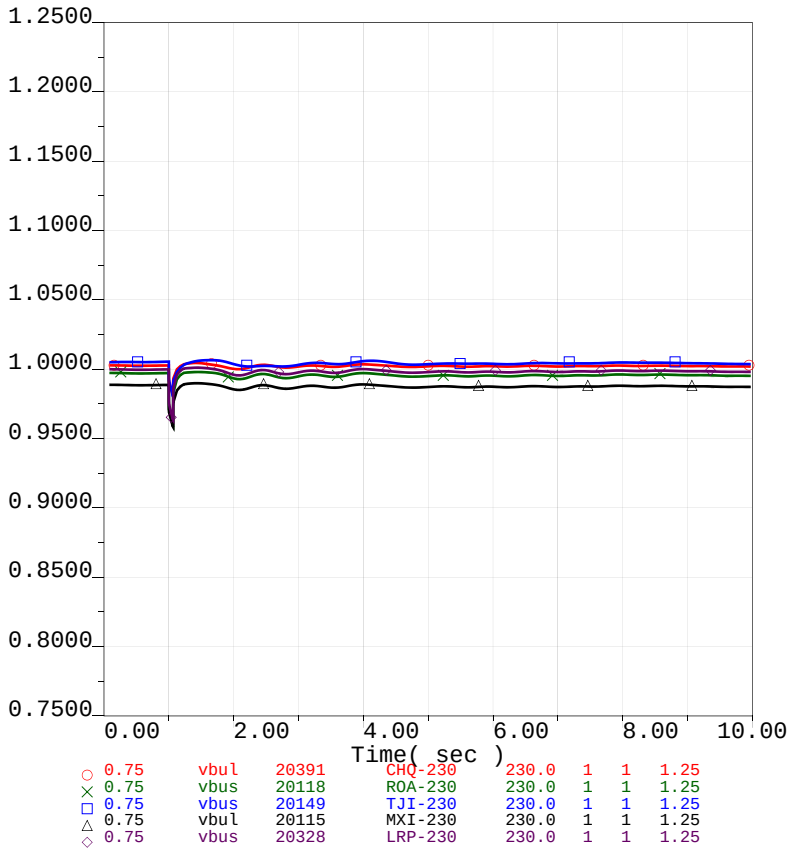

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbug | 20009 | PJZ-U9 | 21.0 | 1 | 1 | 1.25 |
| × 0.75 | vbug | 20002 | PJZ-U1 | 13.8 | 1 | 1 | 1.25 |
| □ 0.75 | vbug | 20105 | CPD-U1 | 13.8 | 1 | 1 | 1.25 |
| △ 0.75 | vbug | 20137 | CPU-U1 | 13.8 | 1 | 1 | 1.25 |

IVSG STUDY
2014 Heavy Summer Case
Trip Devers - Valley 500 kV
Case ALT 2 DISPATCH 1
ALTERNATIVE 2 HEAVY SUMMER BASE CASE, DISPATCH SCENARIO 1





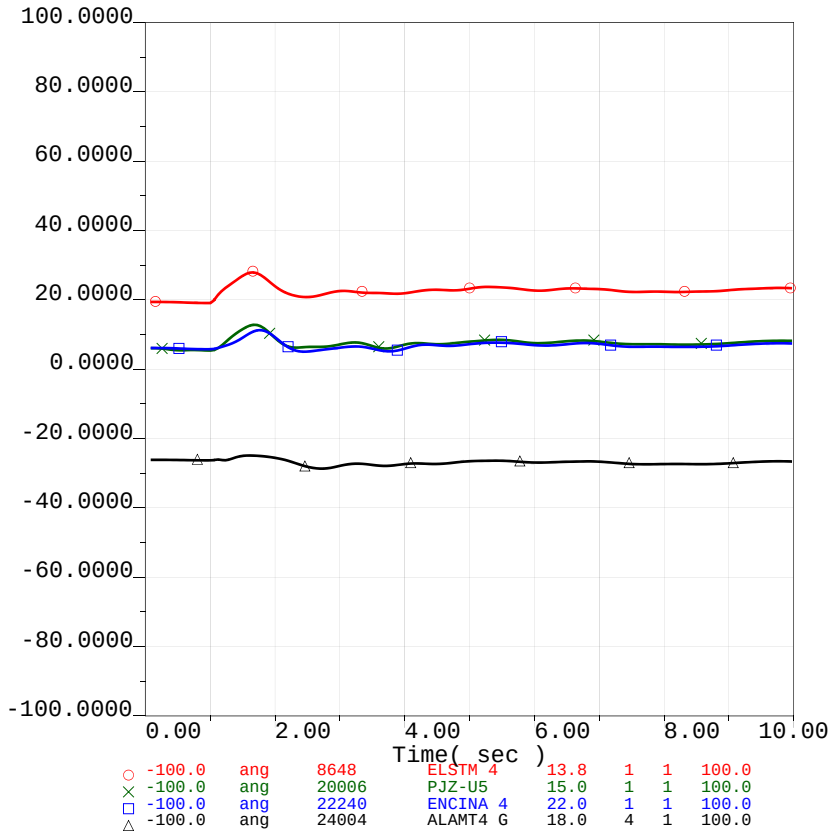
CFE Busses Page 2




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbul | 20391 | CHQ-230 | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 20118 | ROA-230 | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 20149 | TJI-230 | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbul | 20115 | MXI-230 | 230.0 | 1 | 1 | 1.25 |
| ◇ 0.75 | vbus | 20328 | LRP-230 | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
2014 Heavy Summer Case
Trip Devers - Valley 500 kV
Case ALT 2 DISPATCH 1
ALTERNATIVE 2 HEAVY SUMMER BASE CASE, DISPATCH SCENARIO 1

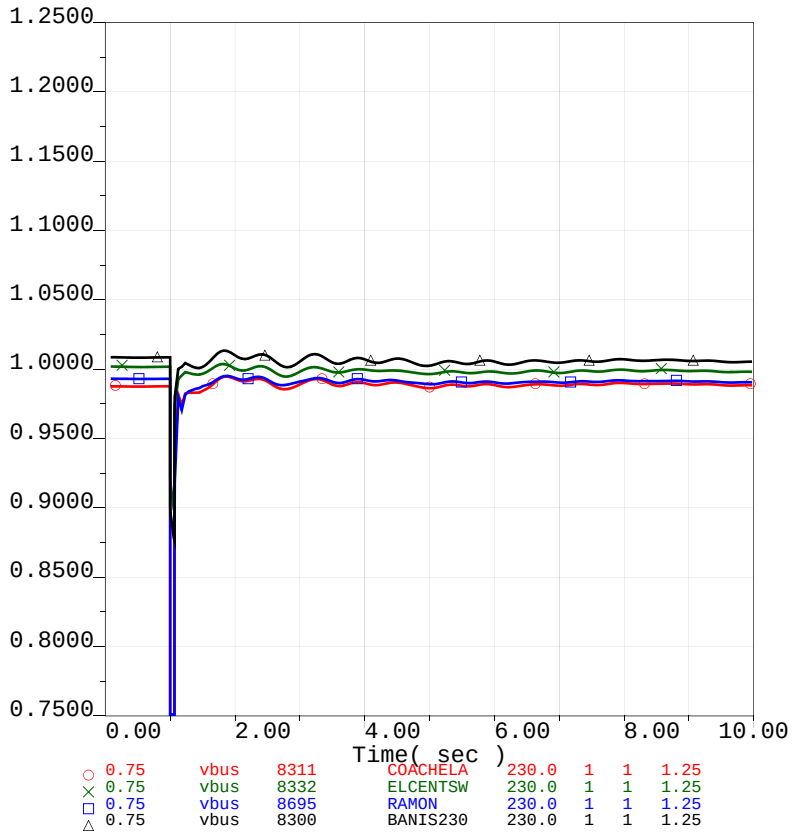
Rotor Angles for Gen Busses




| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ○ | -100.0 | ang | 8648 | ELSTM 4 | 13.8 | 1 | 1 | 100.0 |
| × | -100.0 | ang | 20006 | PJZ-U5 | 15.0 | 1 | 1 | 100.0 |
| □ | -100.0 | ang | 22240 | ENCINA 4 | 22.0 | 1 | 1 | 100.0 |
| △ | -100.0 | ang | 24004 | ALAMT4 G | 18.0 | 4 | 1 | 100.0 |

IVSG STUDY
2014 Heavy Summer Case
Trip Devers - Valley 500 kV
Case ALT 2 DISPATCH 1
ALTERNATIVE 2 HEAVY SUMMER BASE CASE, DISPATCH SCENARIO 1

IID Busses

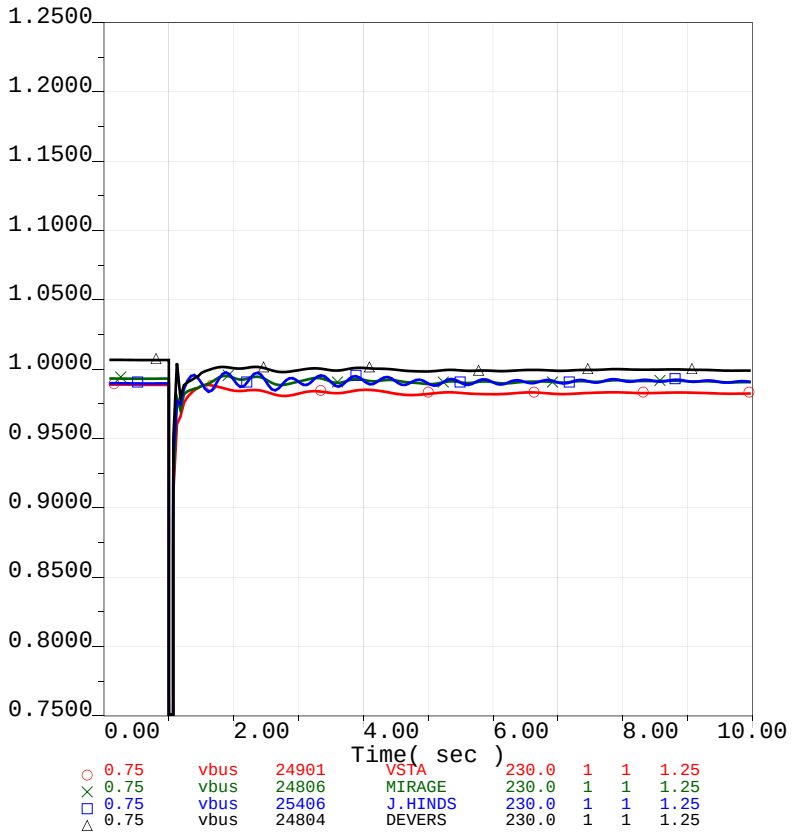



| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbus | 8311 | COACHELA | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 8332 | ELCENTSW | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 8695 | RAMON | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbus | 8300 | BANIS230 | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
2014 Heavy Summer Case
Trip Devers - Valley 500 kV
Case ALT 3B DISPATCH 1
ALTERNATIVE 3B HEAVY SUMMER BASE CASE, DISPATCH SCENARIO 1



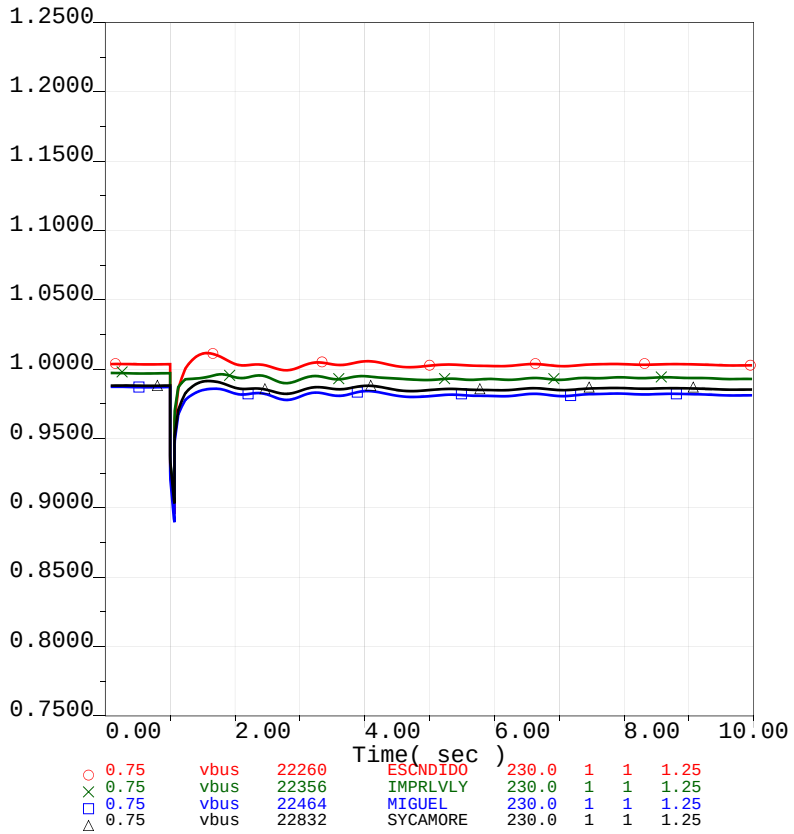
SCE Busses




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbus | 24901 | VSTA | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 24806 | MIRAGE | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 25406 | J.HINDS | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbus | 24804 | DEVERS | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
2014 Heavy Summer Case
Trip Devers - Valley 500 kV
Case ALT 3B DISPATCH 1
ALTERNATIVE 3B HEAVY SUMMER BASE CASE, DISPATCH SCENARIO 1

SDGE Busses



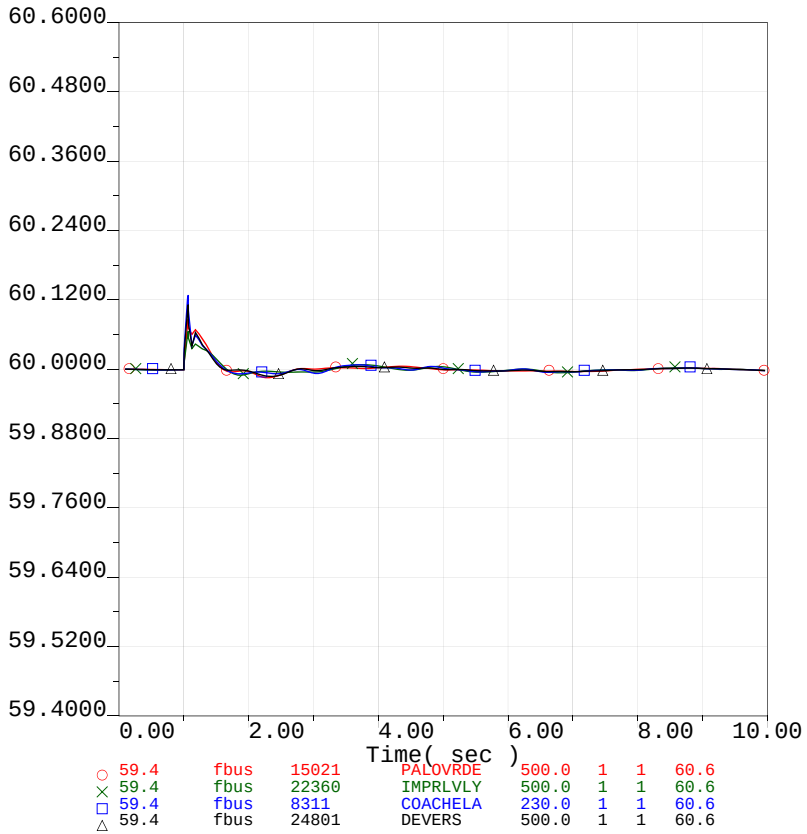

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ○ | 0.75 | vbus | 22260 | ESCNDIDO | 230.0 | 1 | 1 | 1.25 |
| × | 0.75 | vbus | 22356 | IMPRLVLY | 230.0 | 1 | 1 | 1.25 |
| □ | 0.75 | vbus | 22464 | MIGUEL | 230.0 | 1 | 1 | 1.25 |
| △ | 0.75 | vbus | 22832 | SYCAMORE | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
2014 Heavy Summer Case
Trip Devers - Valley 500 kV
Case ALT 3B DISPATCH 1
ALTERNATIVE 3B HEAVY SUMMER BASE CASE, DISPATCH SCENARIO 1





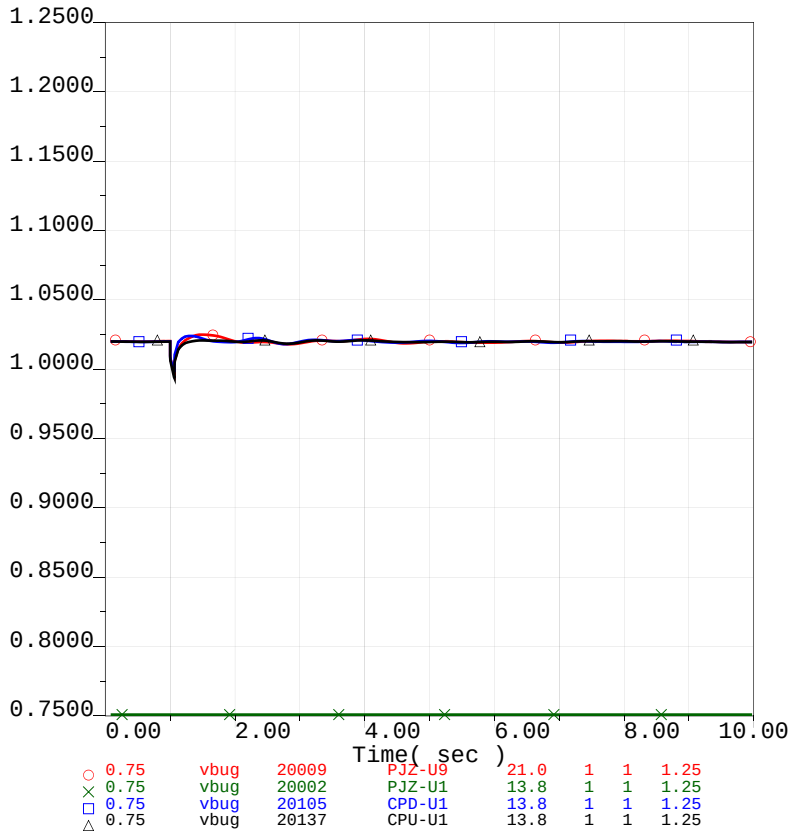
FBus Readings




| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ○ | 59.4 | fbus | 15021 | PALOVRDE | 500.0 | 1 | 1 | 60.6 |
| × | 59.4 | fbus | 22360 | IMPRLVLY | 500.0 | 1 | 1 | 60.6 |
| □ | 59.4 | fbus | 8311 | COACHELA | 230.0 | 1 | 1 | 60.6 |
| △ | 59.4 | fbus | 24801 | DEVERS | 500.0 | 1 | 1 | 60.6 |

IVSG STUDY
2014 Heavy Summer Case
Trip Devers - Valley 500 kV
Case ALT 3B DISPATCH 1
ALTERNATIVE 3B HEAVY SUMMER BASE CASE, DISPATCH SCENARIO 1

CFE Busses Page 1



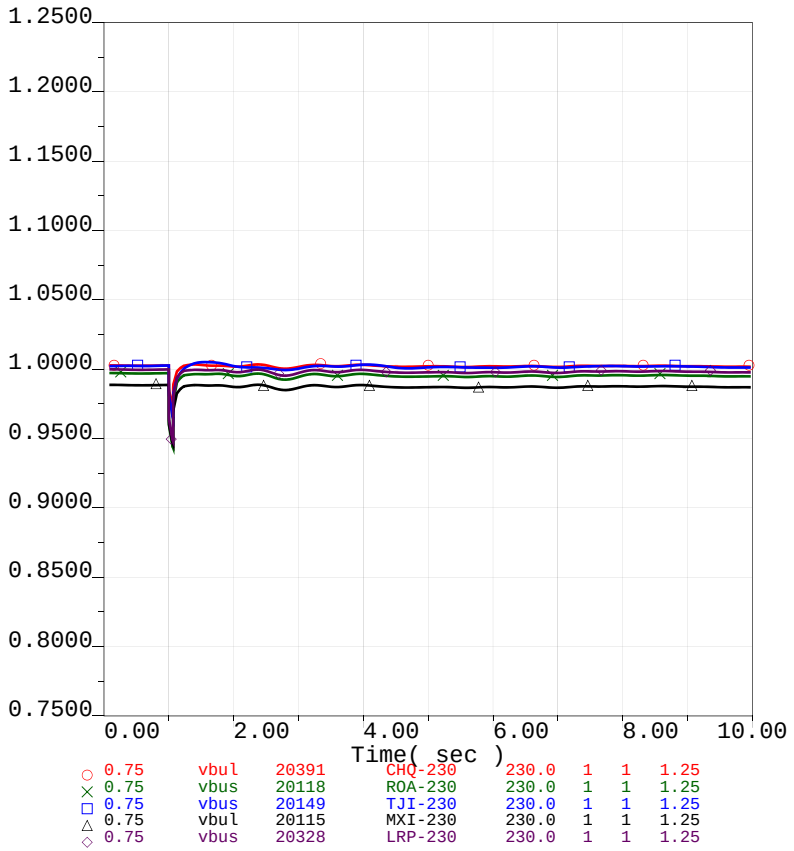

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbug | 20009 | PJZ-U9 | 21.0 | 1 | 1 | 1.25 |
| × 0.75 | vbug | 20002 | PJZ-U1 | 13.8 | 1 | 1 | 1.25 |
| □ 0.75 | vbug | 20105 | CPD-U1 | 13.8 | 1 | 1 | 1.25 |
| △ 0.75 | vbug | 20137 | CPU-U1 | 13.8 | 1 | 1 | 1.25 |

IVSG STUDY
2014 Heavy Summer Case
Trip Devers - Valley 500 kV
Case ALT 3B DISPATCH 1
ALTERNATIVE 3B HEAVY SUMMER BASE CASE, DISPATCH SCENARIO 1





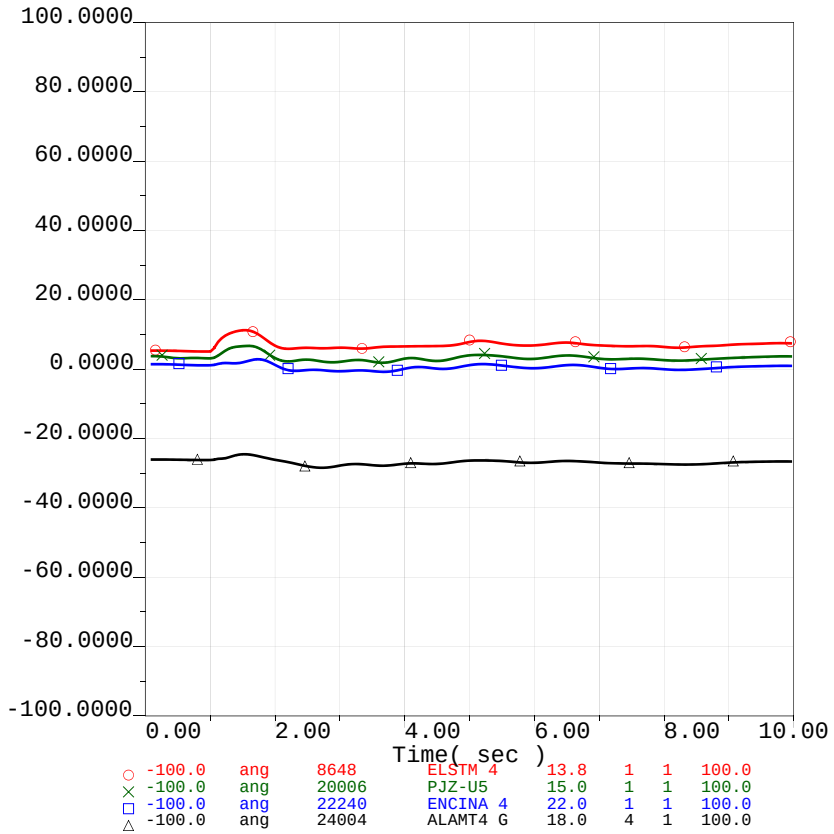
CFE Busses Page 2




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbul | 20391 | CHQ-230 | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 20118 | ROA-230 | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 20149 | TJI-230 | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbul | 20115 | MXI-230 | 230.0 | 1 | 1 | 1.25 |
| ◇ 0.75 | vbus | 20328 | LRP-230 | 230.0 | 1 | 1 | 1.25 |

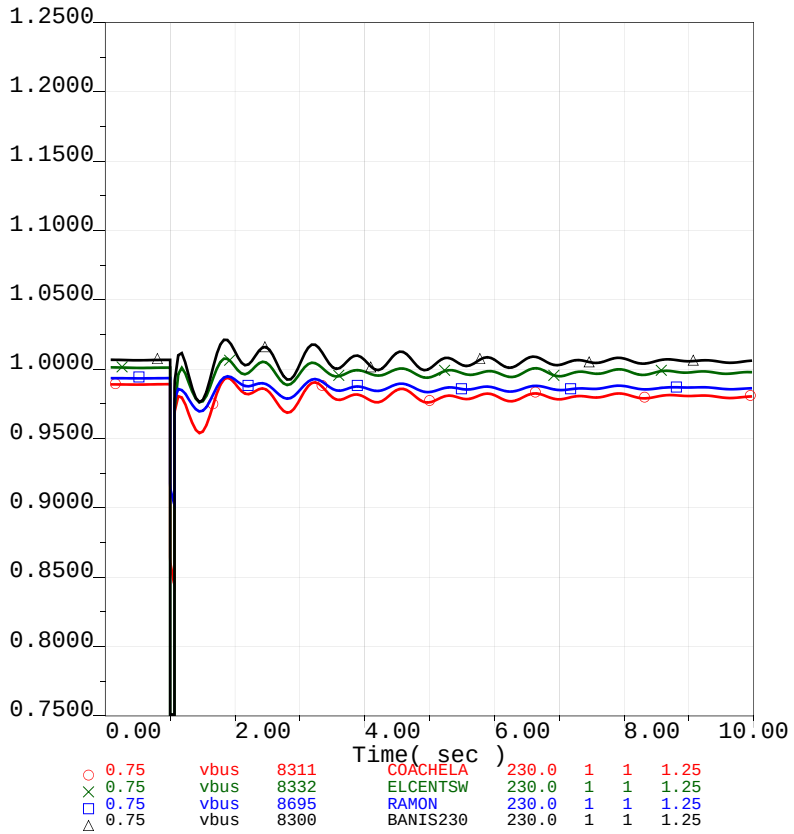
IVSG STUDY
2014 Heavy Summer Case
Trip Devers - Valley 500 kV
Case ALT 3B DISPATCH 1
ALTERNATIVE 3B HEAVY SUMMER BASE CASE, DISPATCH SCENARIO 1

Rotor Angles for Gen Busses




IVSG STUDY
2014 Heavy Summer Case
Trip Devers - Valley 500 kV
Case ALT 3B DISPATCH 1
ALTERNATIVE 3B HEAVY SUMMER BASE CASE, DISPATCH SCENARIO 1

IID Busses



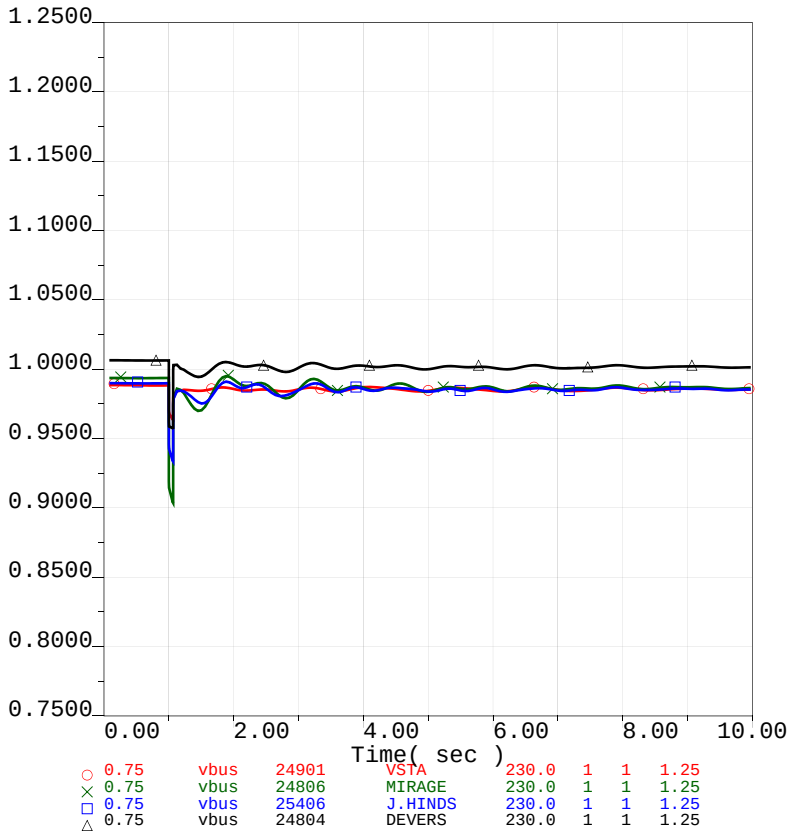

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbus | 8311 | COACHELA | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 8332 | ELCENTSW | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 8695 | RAMON | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbus | 8300 | BANIS230 | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
2014 Heavy Summer Case
Trip NEW SAN FELIPE - CENTRAL 500 kV
Case ALT 2 DISPATCH 1
ALTERNATIVE 2 HEAVY SUMMER BASE CASE, DISPATCH SCENARIO 1





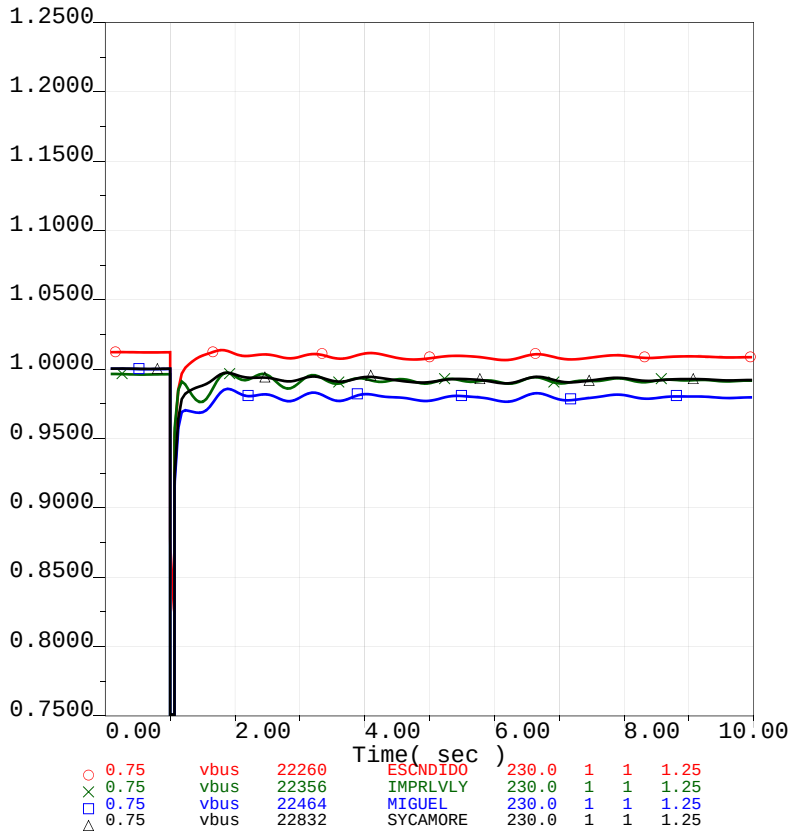
SCE Busses




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbus | 24901 | VSTA | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 24806 | MIRAGE | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 25406 | J.HINDS | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbus | 24804 | DEVERS | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
2014 Heavy Summer Case
Trip NEW SAN FELIPE - CENTRAL 500 kV
Case ALT 2 DISPATCH 1
ALTERNATIVE 2 HEAVY SUMMER BASE CASE, DISPATCH SCENARIO 1

SDGE Busses



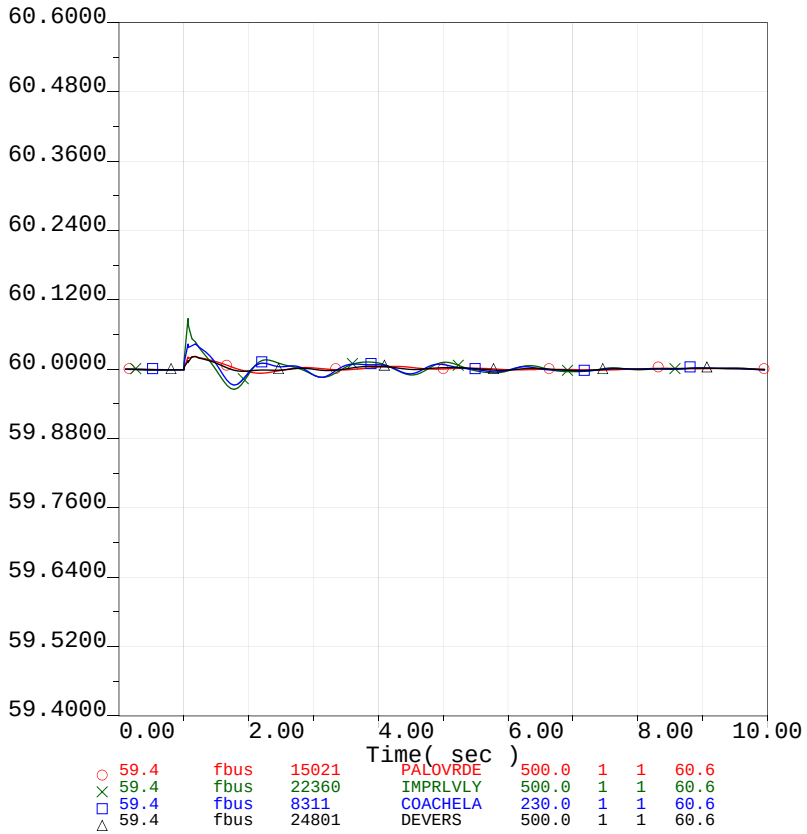

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ○ | 0.75 | vbus | 22260 | ESCNDIDO | 230.0 | 1 | 1 | 1.25 |
| × | 0.75 | vbus | 22356 | IMPRLVLY | 230.0 | 1 | 1 | 1.25 |
| □ | 0.75 | vbus | 22464 | MIGUEL | 230.0 | 1 | 1 | 1.25 |
| △ | 0.75 | vbus | 22832 | SYCAMORE | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
2014 Heavy Summer Case
Trip NEW SAN FELIPE - CENTRAL 500 kV
Case ALT 2 DISPATCH 1
ALTERNATIVE 2 HEAVY SUMMER BASE CASE, DISPATCH SCENARIO 1





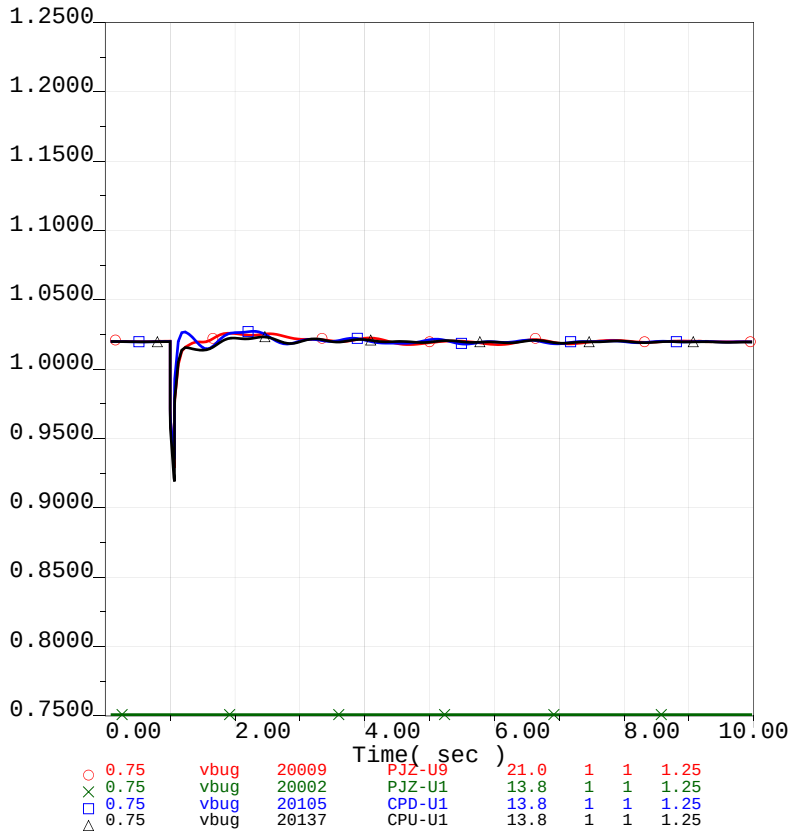
FBus Readings




| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ○ | 59.4 | fbus | 15021 | PALOVRDE | 500.0 | 1 | 1 | 60.6 |
| × | 59.4 | fbus | 22360 | IMPRLVLY | 500.0 | 1 | 1 | 60.6 |
| □ | 59.4 | fbus | 8311 | COACHELA | 230.0 | 1 | 1 | 60.6 |
| △ | 59.4 | fbus | 24801 | DEVERS | 500.0 | 1 | 1 | 60.6 |

IVSG STUDY
2014 Heavy Summer Case
Trip NEW SAN FELIPE - CENTRAL 500 kV
Case ALT 2 DISPATCH 1
ALTERNATIVE 2 HEAVY SUMMER BASE CASE, DISPATCH SCENARIO 1

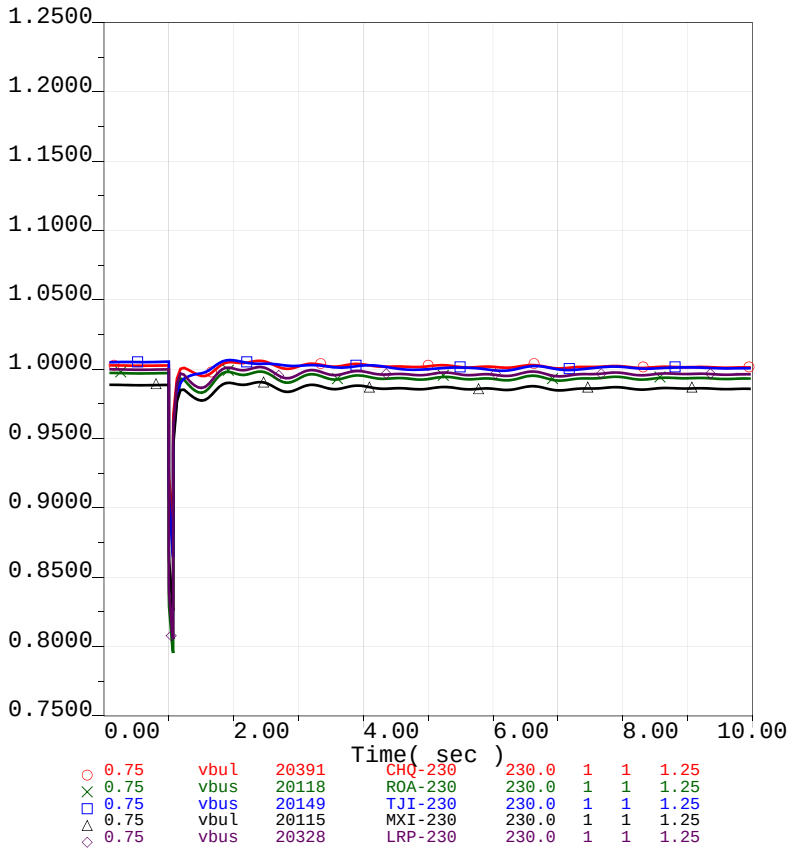
CFE Busses Page 1




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbug | 20009 | PJZ-U9 | 21.0 | 1 | 1 | 1.25 |
| × 0.75 | vbug | 20002 | PJZ-U1 | 13.8 | 1 | 1 | 1.25 |
| □ 0.75 | vbug | 20105 | CPD-U1 | 13.8 | 1 | 1 | 1.25 |
| △ 0.75 | vbug | 20137 | CPU-U1 | 13.8 | 1 | 1 | 1.25 |

IVSG STUDY
2014 Heavy Summer Case
Trip NEW SAN FELIPE - CENTRAL 500 kV
Case ALT 2 DISPATCH 1
ALTERNATIVE 2 HEAVY SUMMER BASE CASE, DISPATCH SCENARIO 1

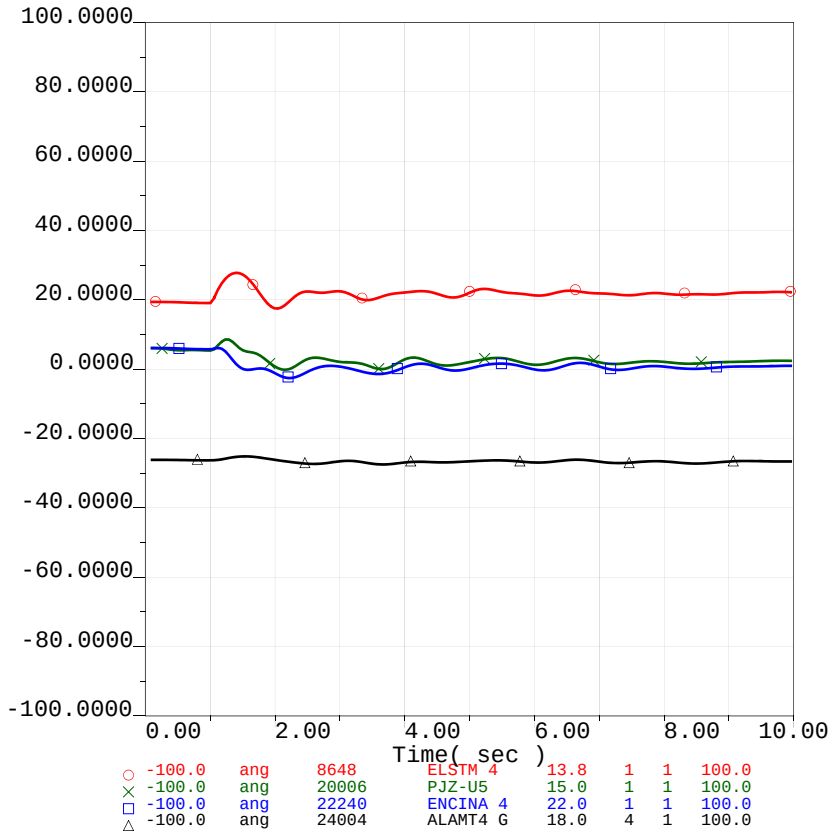
CFE Busses Page 2




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbul | 20391 | CHQ-230 | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 20118 | ROA-230 | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 20149 | TJI-230 | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbul | 20115 | MXI-230 | 230.0 | 1 | 1 | 1.25 |
| ◇ 0.75 | vbus | 20328 | LRP-230 | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
2014 Heavy Summer Case
Trip NEW SAN FELIPE - CENTRAL 500 kV
Case ALT 2 DISPATCH 1
ALTERNATIVE 2 HEAVY SUMMER BASE CASE, DISPATCH SCENARIO 1

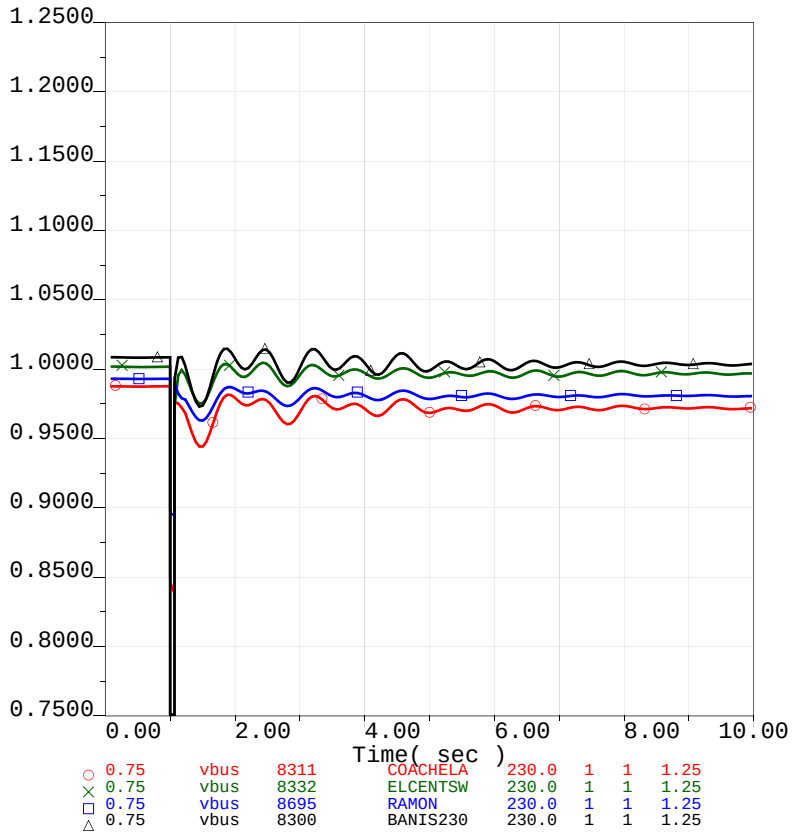
Rotor Angles for Gen Busses




| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ○ | -100.0 | ang | 8648 | ELSTM 4 | 13.8 | 1 | 1 | 100.0 |
| × | -100.0 | ang | 20006 | PJZ-U5 | 15.0 | 1 | 1 | 100.0 |
| □ | -100.0 | ang | 22240 | ENCINA 4 | 22.0 | 1 | 1 | 100.0 |
| △ | -100.0 | ang | 24004 | ALAMT4 G | 18.0 | 4 | 1 | 100.0 |

IVSG STUDY
2014 Heavy Summer Case
Trip NEW SAN FELIPE - CENTRAL 500 kV
Case ALT 2 DISPATCH 1
ALTERNATIVE 2 HEAVY SUMMER BASE CASE, DISPATCH SCENARIO 1

IID Busses



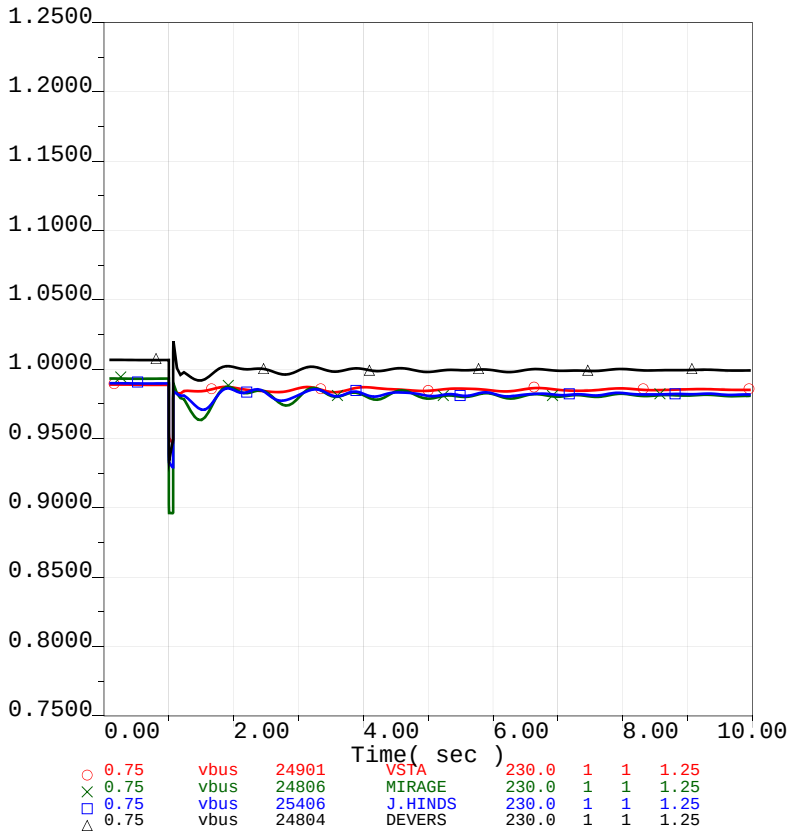

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbus | 8311 | COACHELA | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 8332 | ELCENTSW | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 8695 | RAMON | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbus | 8300 | BANIS230 | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
2014 Heavy Summer Case
Trip NEW SAN FELIPE - NORTHSD 500 kV
Case ALT 3B DISPATCH 1
ALTERNATIVE 3B HEAVY SUMMER BASE CASE, DISPATCH SCENARIO 1





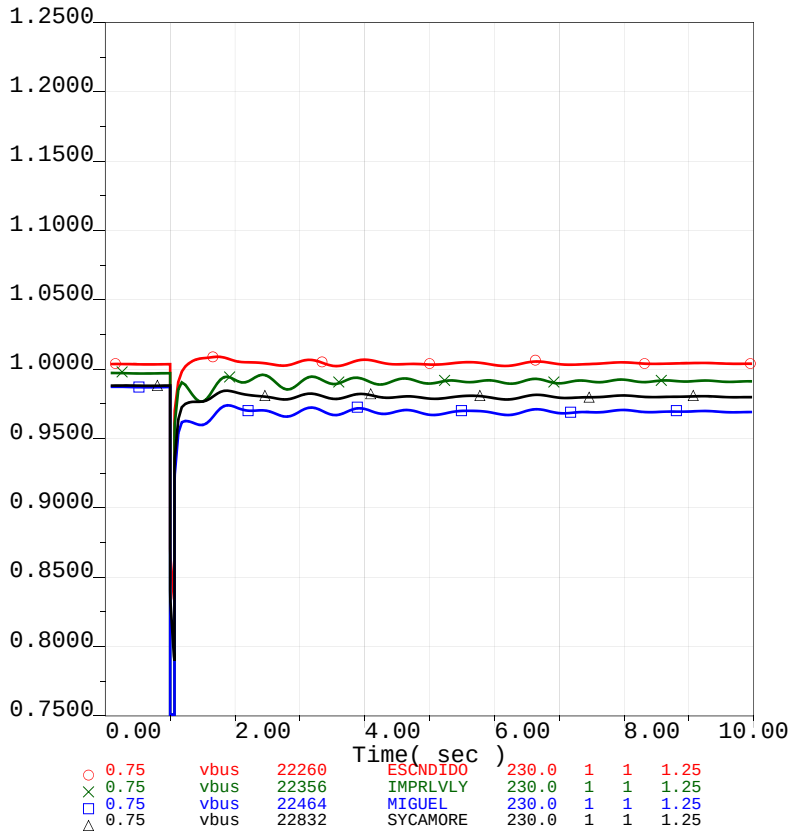
SCE Busses




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbus | 24901 | VSTA | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 24806 | MIRAGE | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 25406 | J.HINDS | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbus | 24804 | DEVERS | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
2014 Heavy Summer Case
Trip NEW SAN FELIPE - NORTHSD 500 kV
Case ALT 3B DISPATCH 1
ALTERNATIVE 3B HEAVY SUMMER BASE CASE, DISPATCH SCENARIO 1

SDGE Busses

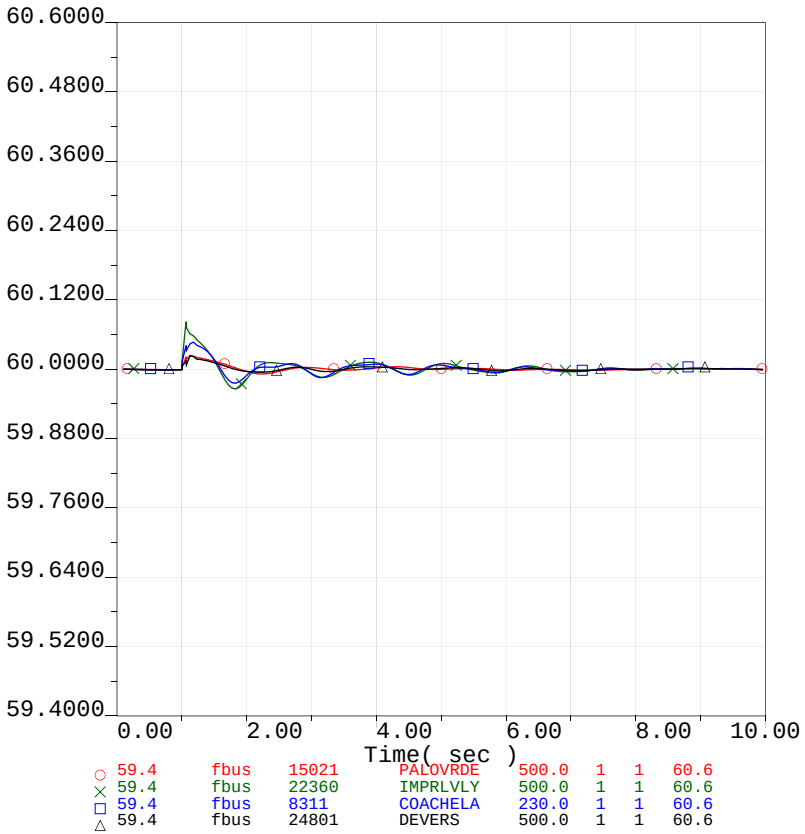



| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ○ | 0.75 | vbus | 22260 | ESCNDIDO | 230.0 | 1 | 1 | 1.25 |
| × | 0.75 | vbus | 22356 | IMPRLVLY | 230.0 | 1 | 1 | 1.25 |
| □ | 0.75 | vbus | 22464 | MIGUEL | 230.0 | 1 | 1 | 1.25 |
| △ | 0.75 | vbus | 22832 | SYCAMORE | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
2014 Heavy Summer Case
Trip NEW SAN FELIPE - NORTHSD 500 kV
Case ALT 3B DISPATCH 1
ALTERNATIVE 3B HEAVY SUMMER BASE CASE, DISPATCH SCENARIO 1



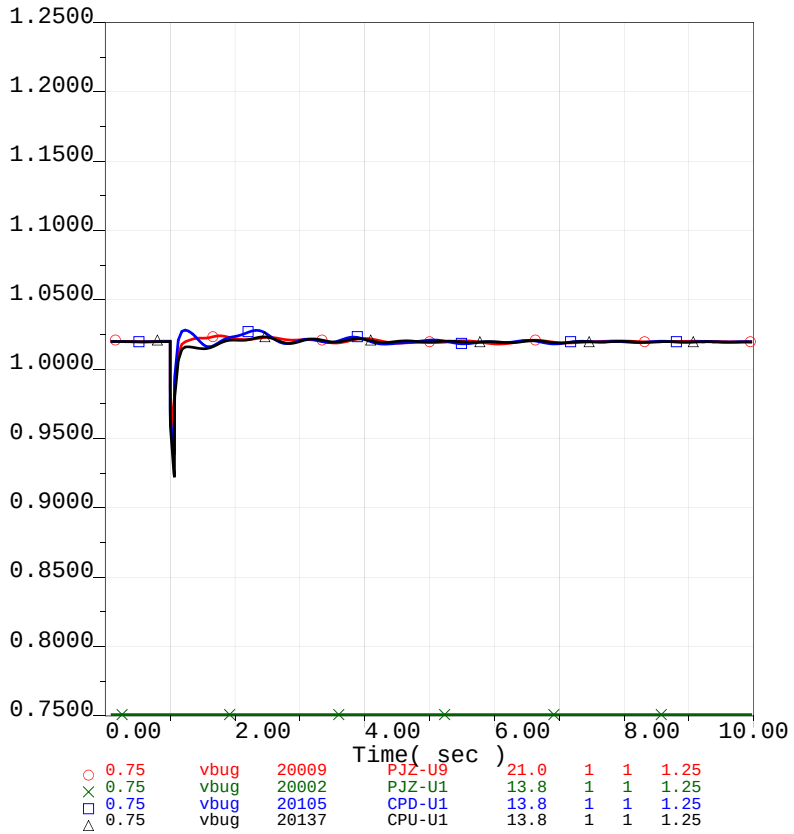
FBus Readings




| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ○ | 59.4 | fbus | 15021 | PALOVRDE | 500.0 | 1 | 1 | 60.6 |
| × | 59.4 | fbus | 22360 | IMPRLVLY | 500.0 | 1 | 1 | 60.6 |
| □ | 59.4 | fbus | 8311 | COACHELA | 230.0 | 1 | 1 | 60.6 |
| △ | 59.4 | fbus | 24801 | DEVERS | 500.0 | 1 | 1 | 60.6 |

IVSG STUDY
2014 Heavy Summer Case
Trip NEW SAN FELIPE - NORTHSD 500 kV
Case ALT 3B DISPATCH 1
ALTERNATIVE 3B HEAVY SUMMER BASE CASE, DISPATCH SCENARIO 1

CFE Busses Page 1



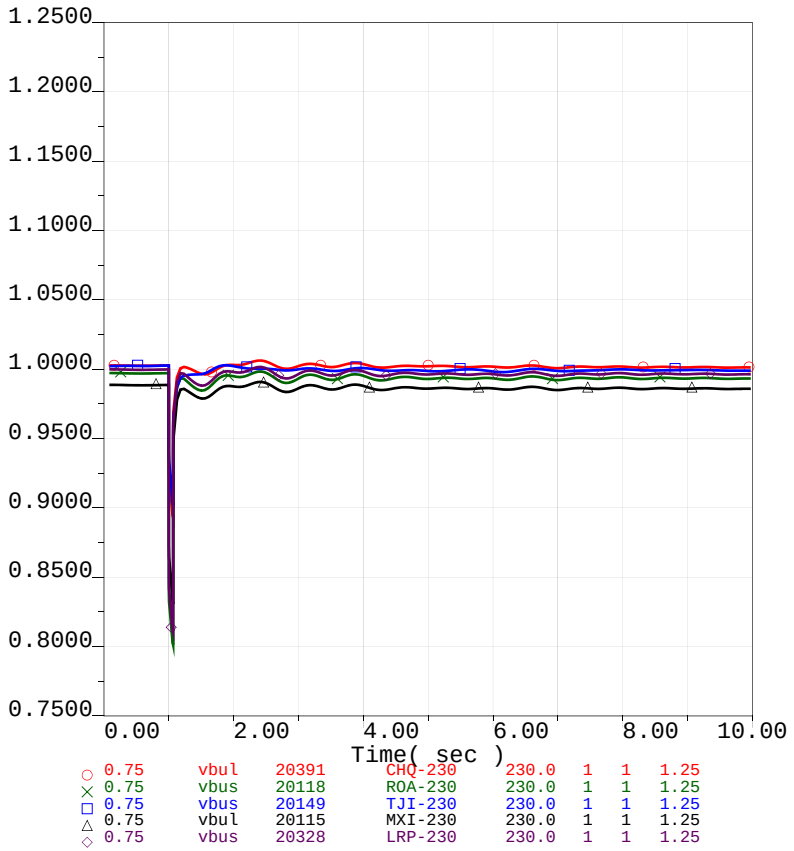

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbug | 20009 | PJZ-U9 | 21.0 | 1 | 1 | 1.25 |
| × 0.75 | vbug | 20002 | PJZ-U1 | 13.8 | 1 | 1 | 1.25 |
| □ 0.75 | vbug | 20105 | CPD-U1 | 13.8 | 1 | 1 | 1.25 |
| △ 0.75 | vbug | 20137 | CPU-U1 | 13.8 | 1 | 1 | 1.25 |

IVSG STUDY
2014 Heavy Summer Case
Trip NEW SAN FELIPE - NORTHSD 500 kV
Case ALT 3B DISPATCH 1
ALTERNATIVE 3B HEAVY SUMMER BASE CASE, DISPATCH SCENARIO 1





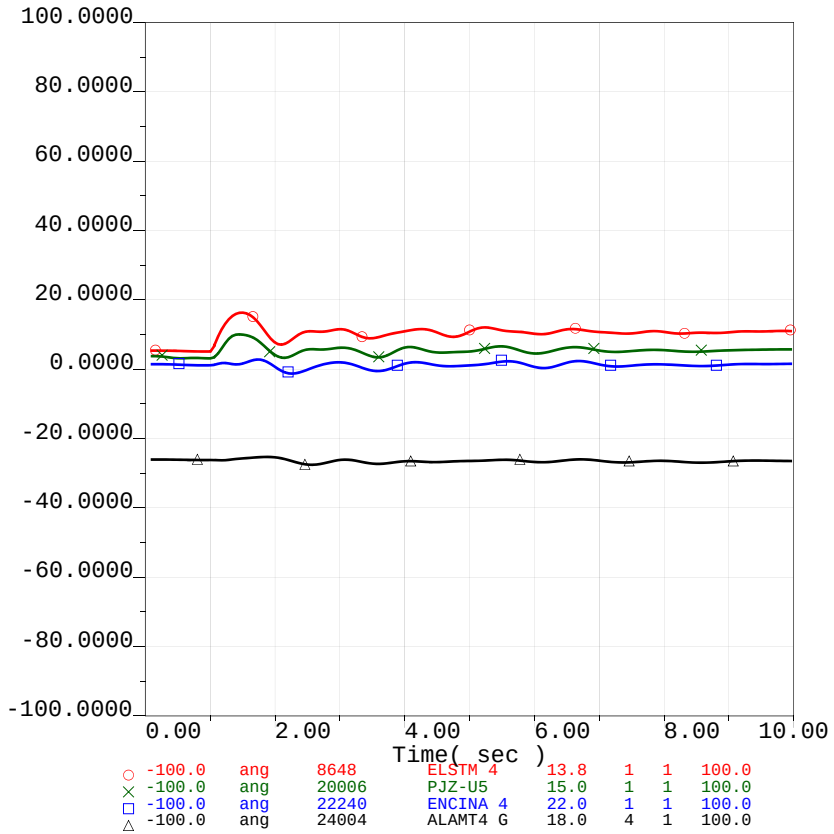
CFE Busses Page 2




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbul | 20391 | CHQ-230 | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 20118 | ROA-230 | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 20149 | TJI-230 | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbul | 20115 | MXI-230 | 230.0 | 1 | 1 | 1.25 |
| ◇ 0.75 | vbus | 20328 | LRP-230 | 230.0 | 1 | 1 | 1.25 |

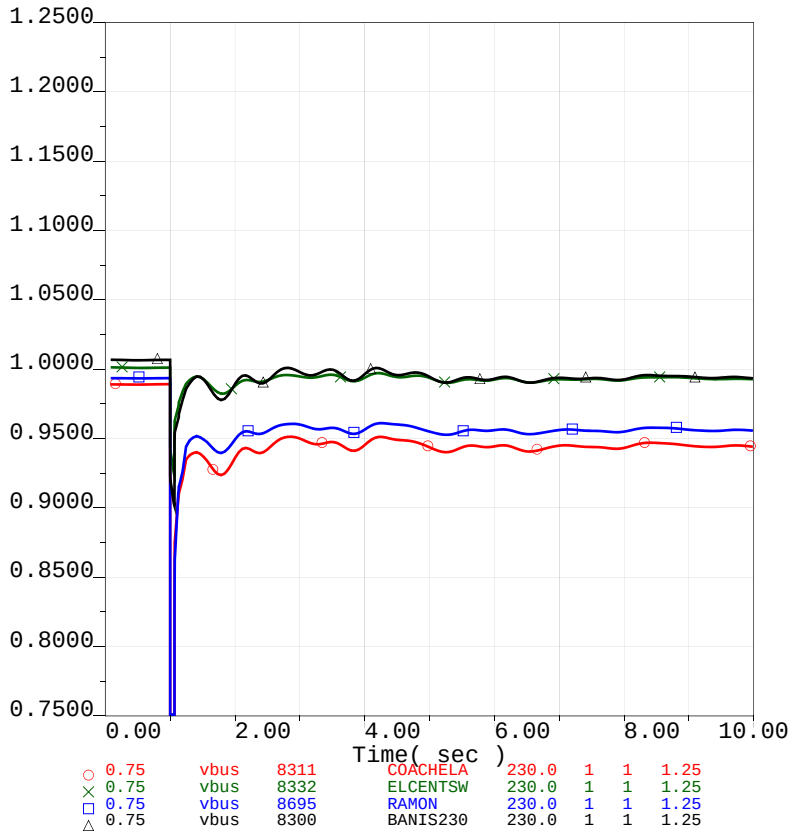
IVSG STUDY
2014 Heavy Summer Case
Trip NEW SAN FELIPE - NORTHSD 500 kV
Case ALT 3B DISPATCH 1
ALTERNATIVE 3B HEAVY SUMMER BASE CASE, DISPATCH SCENARIO 1

Rotor Angles for Gen Busses




IVSG STUDY
2014 Heavy Summer Case
Trip NEW SAN FELIPE - NORTHSD 500 kV
Case ALT 3B DISPATCH 1
ALTERNATIVE 3B HEAVY SUMMER BASE CASE, DISPATCH SCENARIO 1

IID Busses



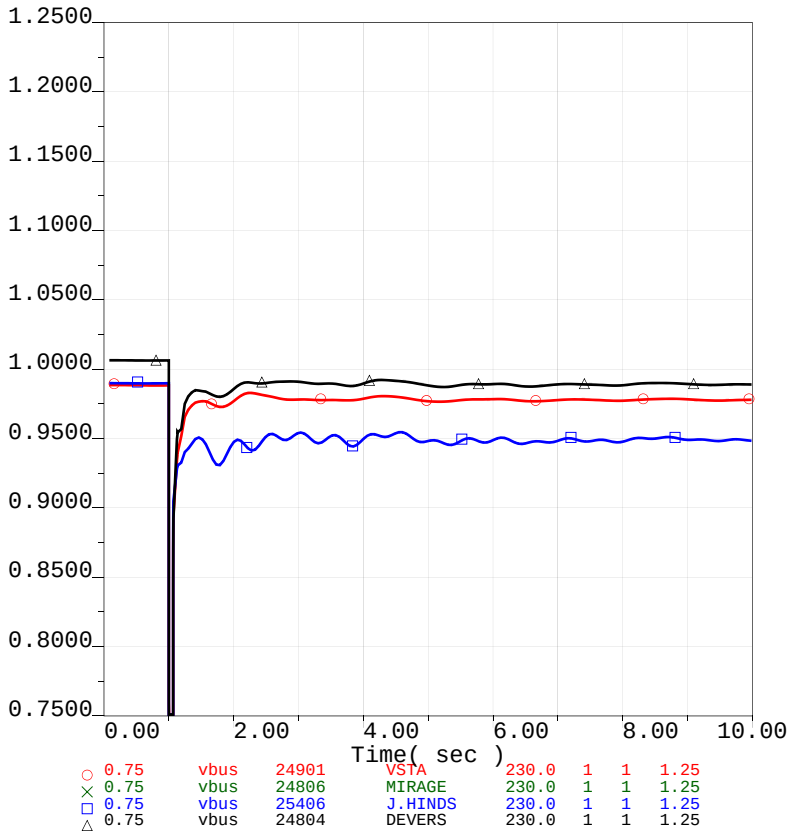

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbus | 8311 | COACHELA | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 8332 | ELCENTSW | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 8695 | RAMON | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbus | 8300 | BANIS230 | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
2014 Heavy Summer Case
N-2 PV-Devers HARQ-DEVERS 500 kV
Case ALT 2 DISPATCH 1
ALTERNATIVE 2 HEAVY SUMMER BASE CASE, DISPATCH SCENARIO 1





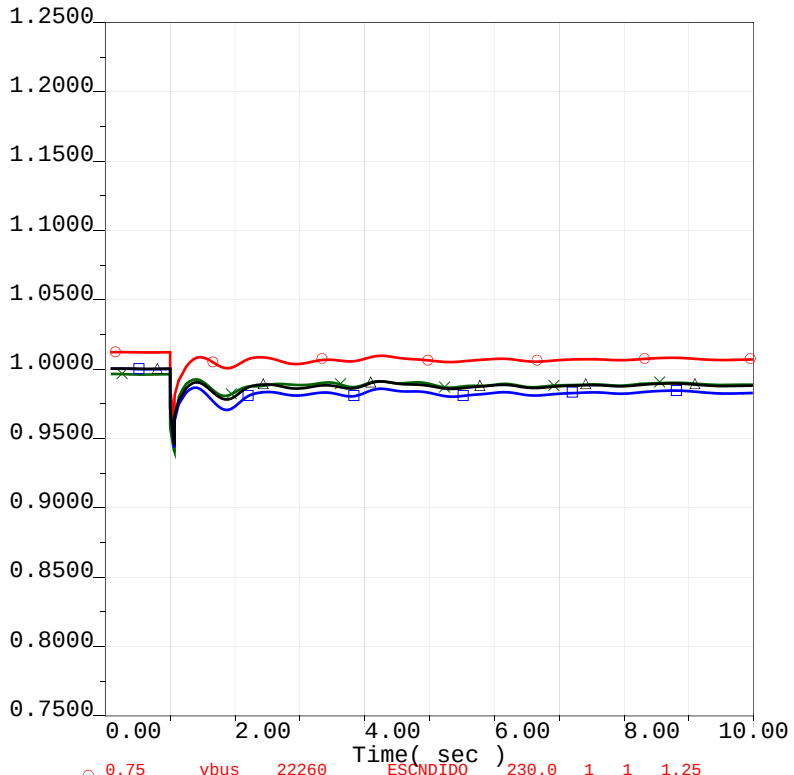
SCE Busses




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbus | 24901 | VSTA | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 24806 | MIRAGE | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 25406 | J.HINDS | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbus | 24804 | DEVERS | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
2014 Heavy Summer Case
N-2 PV-Devers HARQ-DEVERS 500 kV
Case ALT 2 DISPATCH 1
ALTERNATIVE 2 HEAVY SUMMER BASE CASE, DISPATCH SCENARIO 1

SDGE Busses

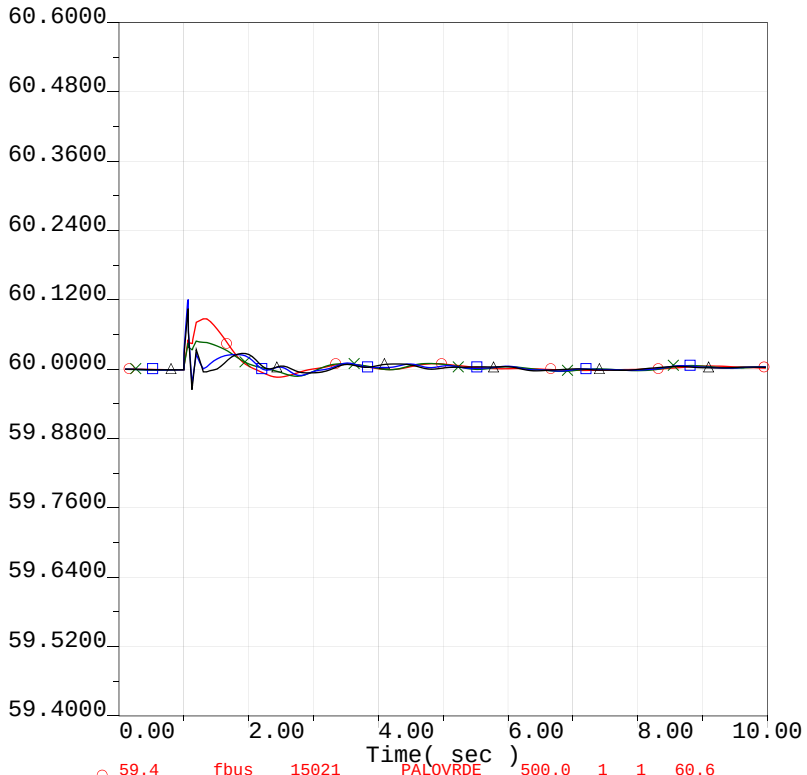



| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ○ | 0.75 | vbus | 22260 | ESCNDIDO | 230.0 | 1 | 1 | 1.25 |
| × | 0.75 | vbus | 22356 | IMPRLVLY | 230.0 | 1 | 1 | 1.25 |
| □ | 0.75 | vbus | 22464 | MIGUEL | 230.0 | 1 | 1 | 1.25 |
| △ | 0.75 | vbus | 22832 | SYCAMORE | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
2014 Heavy Summer Case
N-2 PV-Devers HARQ-DEVERS 500 kV
Case ALT 2 DISPATCH 1
ALTERNATIVE 2 HEAVY SUMMER BASE CASE, DISPATCH SCENARIO 1



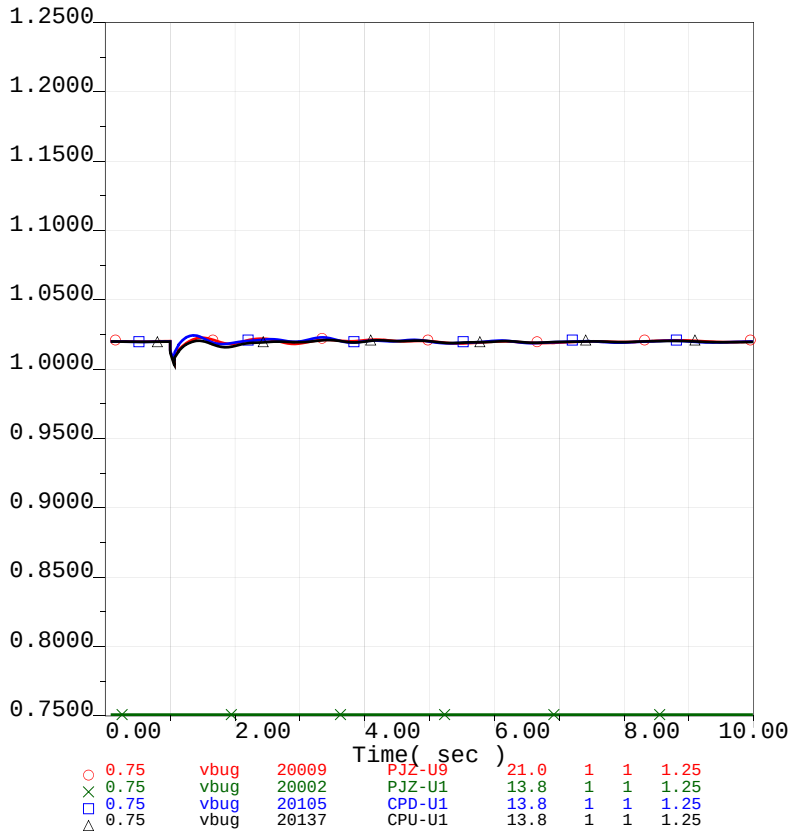
FBus Readings




| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ○ | 59.4 | fbus | 15021 | PALOVRDE | 500.0 | 1 | 1 | 60.6 |
| × | 59.4 | fbus | 22360 | IMPRLVLY | 500.0 | 1 | 1 | 60.6 |
| □ | 59.4 | fbus | 8311 | COACHELA | 230.0 | 1 | 1 | 60.6 |
| △ | 59.4 | fbus | 24801 | DEVERS | 500.0 | 1 | 1 | 60.6 |

IVSG STUDY
2014 Heavy Summer Case
N-2 PV-Devers HARQ-DEVERS 500 kV
Case ALT 2 DISPATCH 1
ALTERNATIVE 2 HEAVY SUMMER BASE CASE, DISPATCH SCENARIO 1

CFE Busses Page 1

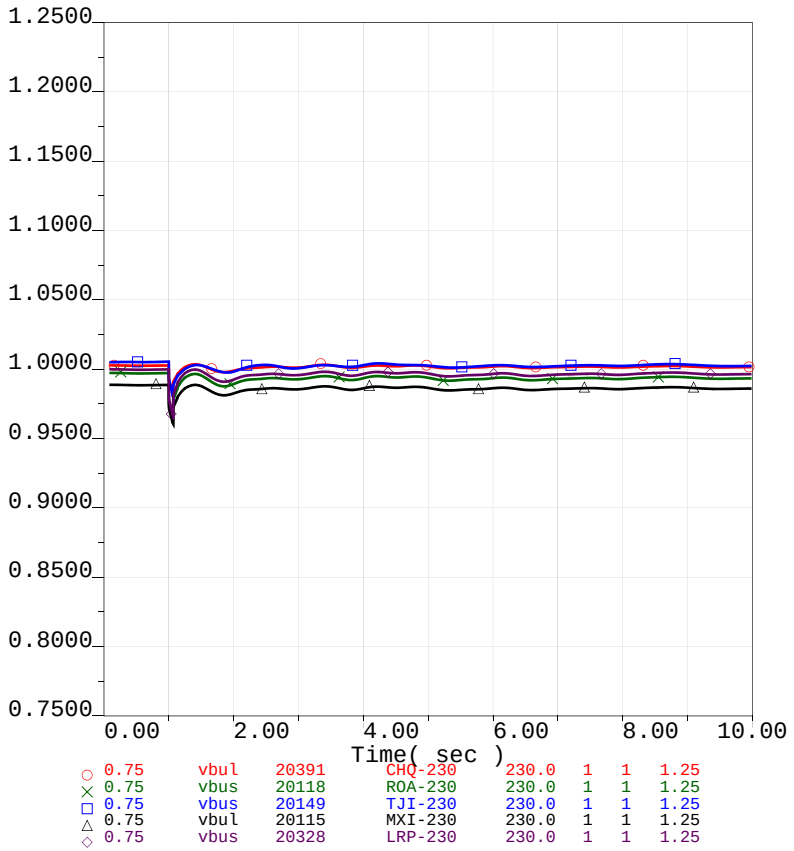



| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbug | 20009 | PJZ-U9 | 21.0 | 1 | 1 | 1.25 |
| × 0.75 | vbug | 20002 | PJZ-U1 | 13.8 | 1 | 1 | 1.25 |
| □ 0.75 | vbug | 20105 | CPD-U1 | 13.8 | 1 | 1 | 1.25 |
| △ 0.75 | vbug | 20137 | CPU-U1 | 13.8 | 1 | 1 | 1.25 |

IVSG STUDY
2014 Heavy Summer Case
N-2 PV-Devers HARQ-DEVERS 500 kV
Case ALT 2 DISPATCH 1
ALTERNATIVE 2 HEAVY SUMMER BASE CASE, DISPATCH SCENARIO 1



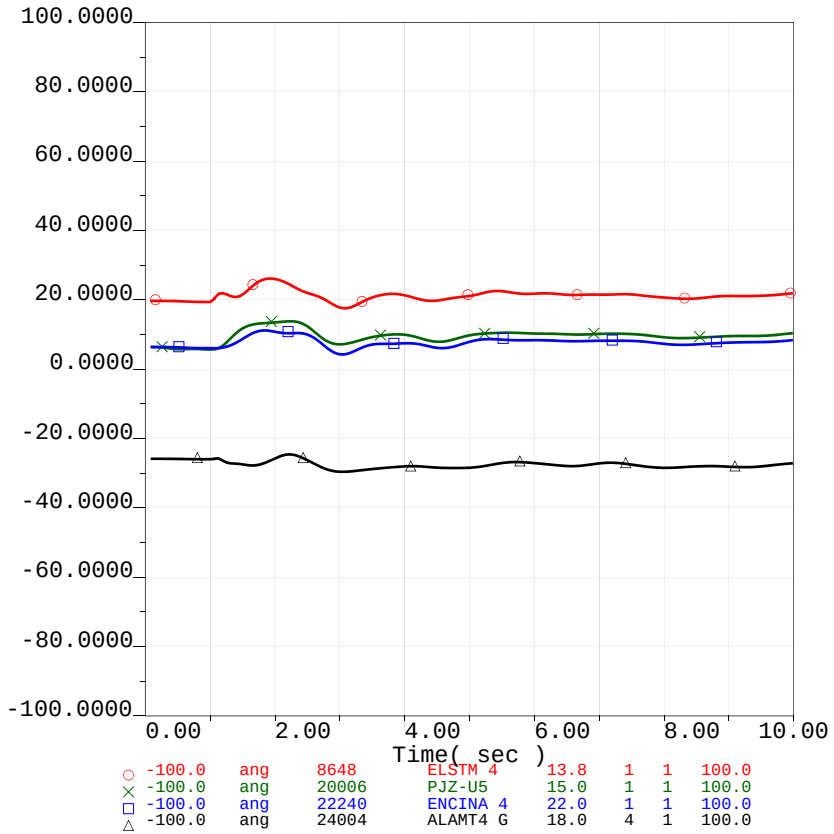
CFE Busses Page 2




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbul | 20391 | CHQ-230 | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 20118 | ROA-230 | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 20149 | TJI-230 | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbul | 20115 | MXI-230 | 230.0 | 1 | 1 | 1.25 |
| ◇ 0.75 | vbus | 20328 | LRP-230 | 230.0 | 1 | 1 | 1.25 |

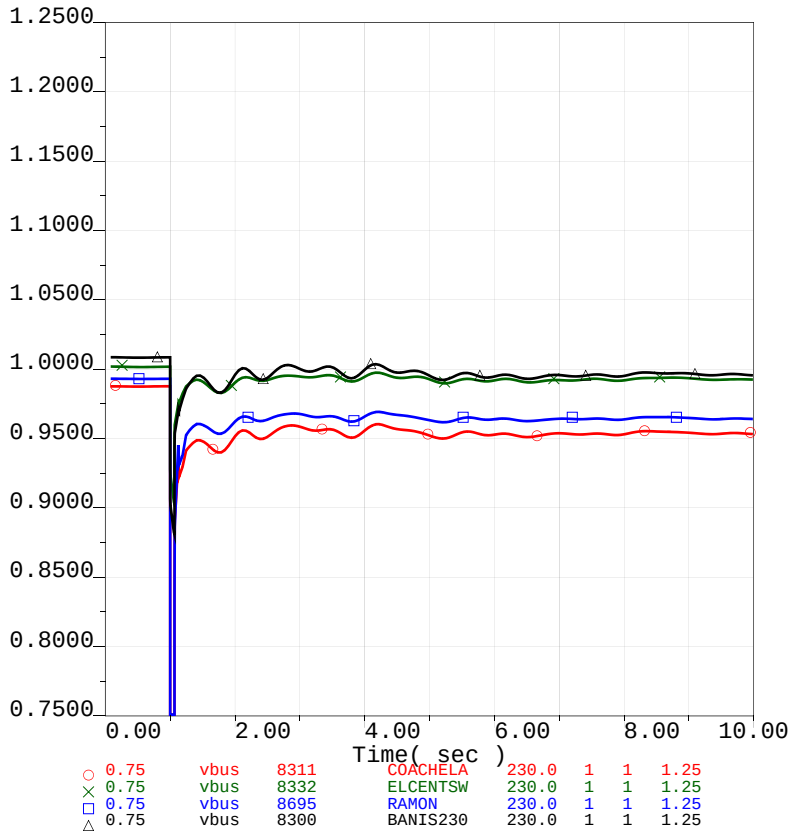
IVSG STUDY
2014 Heavy Summer Case
N-2 PV-Devers HARQ-DEVERS 500 kV
Case ALT 2 DISPATCH 1
ALTERNATIVE 2 HEAVY SUMMER BASE CASE, DISPATCH SCENARIO 1

Rotor Angles for Gen Busses




IVSG STUDY
2014 Heavy Summer Case
N-2 PV-Devers HARQ-DEVERS 500 kV
Case ALT 2 DISPATCH 1
ALTERNATIVE 2 HEAVY SUMMER BASE CASE, DISPATCH SCENARIO 1

IID Busses



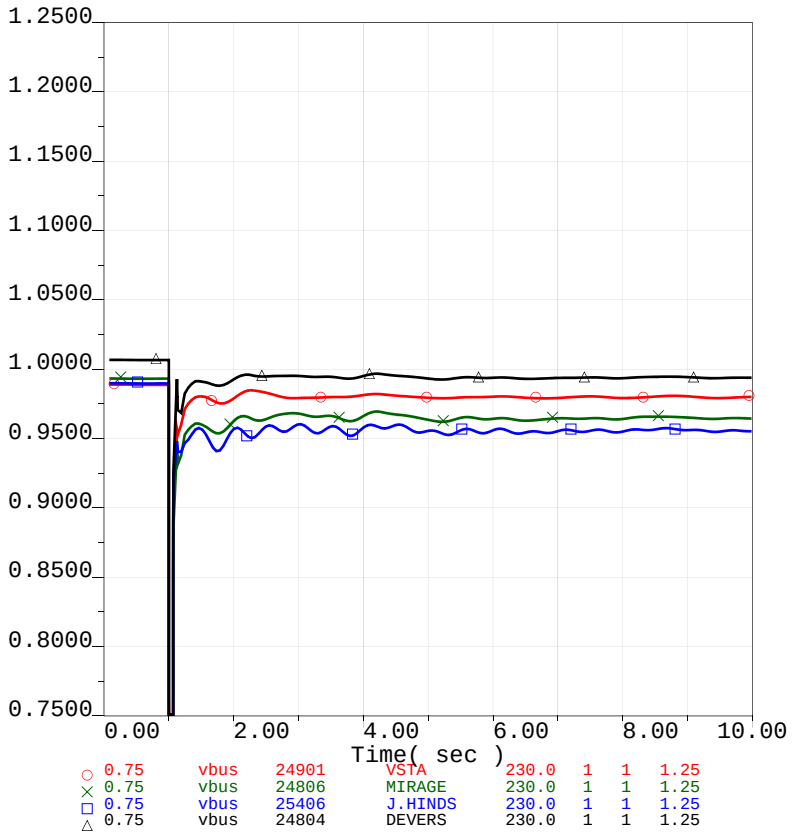

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbus | 8311 | COACHELA | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 8332 | ELCENTSW | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 8695 | RAMON | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbus | 8300 | BANIS230 | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
2014 Heavy Summer Case
N-2 PV-Devers HARQ-DEVERS 500 kV
Case ALT 3B DISPATCH 1
ALTERNATIVE 3B HEAVY SUMMER BASE CASE, DISPATCH SCENARIO 1





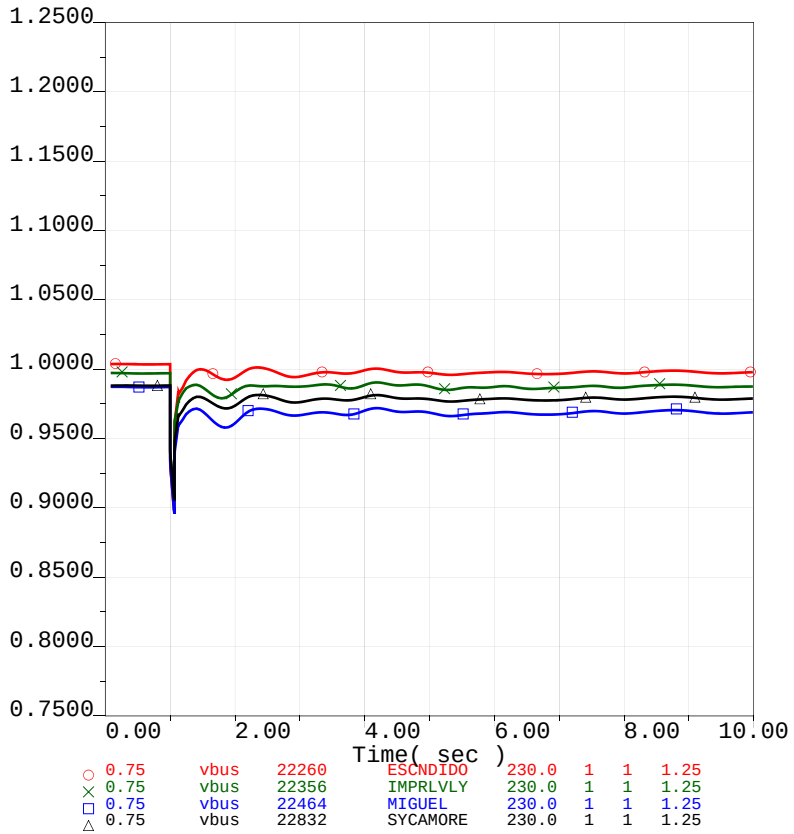
SCE Busses




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbus | 24901 | VSTA | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 24806 | MIRAGE | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 25406 | J.HINDS | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbus | 24804 | DEVERS | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
2014 Heavy Summer Case
N-2 PV-Devers HARQ-DEVERS 500 kV
Case ALT 3B DISPATCH 1
ALTERNATIVE 3B HEAVY SUMMER BASE CASE, DISPATCH SCENARIO 1

SDGE Busses

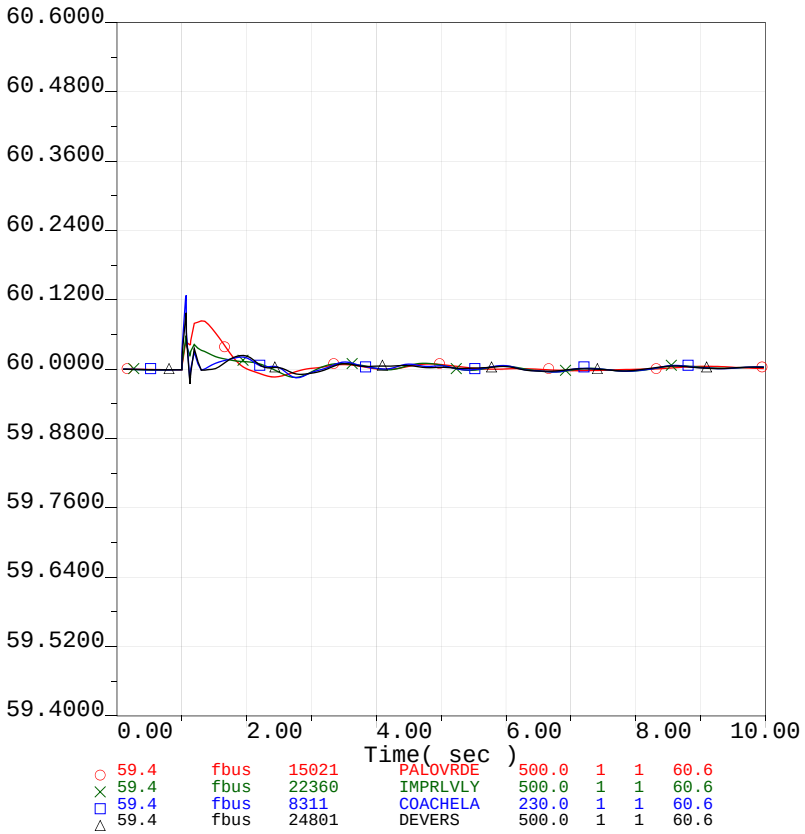



| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ○ | 0.75 | vbus | 22260 | ESCNDIDO | 230.0 | 1 | 1 | 1.25 |
| × | 0.75 | vbus | 22356 | IMPRLVLY | 230.0 | 1 | 1 | 1.25 |
| □ | 0.75 | vbus | 22464 | MIGUEL | 230.0 | 1 | 1 | 1.25 |
| △ | 0.75 | vbus | 22832 | SYCAMORE | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
2014 Heavy Summer Case
N-2 PV-Devers HARQ-DEVERS 500 kV
Case ALT 3B DISPATCH 1
ALTERNATIVE 3B HEAVY SUMMER BASE CASE, DISPATCH SCENARIO 1



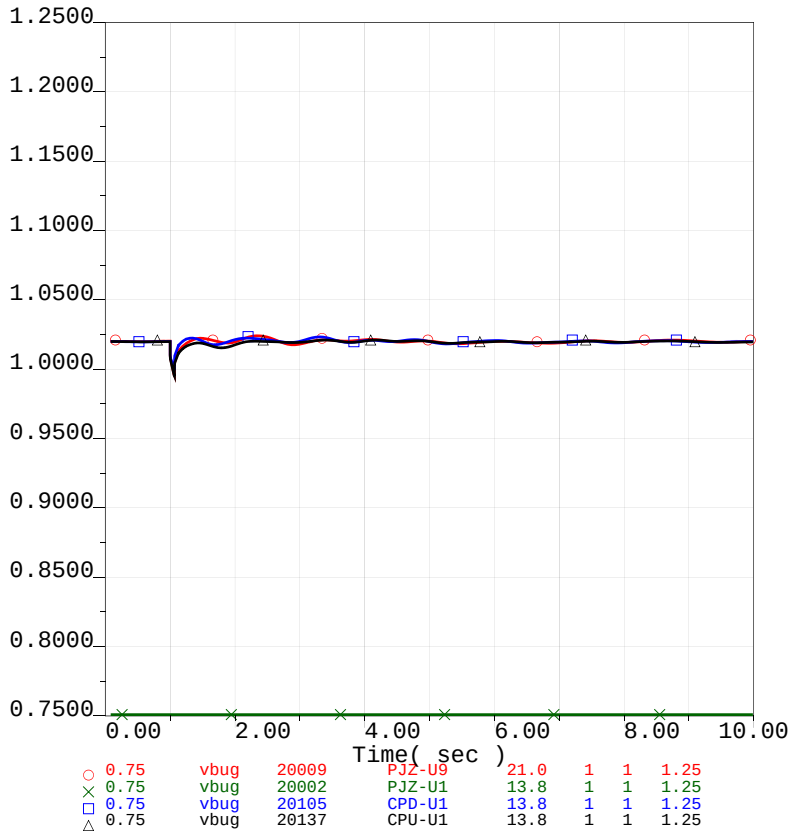
FBus Readings




| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ○ | 59.4 | fbus | 15021 | PALOVRDE | 500.0 | 1 | 1 | 60.6 |
| × | 59.4 | fbus | 22360 | IMPRLVLY | 500.0 | 1 | 1 | 60.6 |
| □ | 59.4 | fbus | 8311 | COACHELA | 230.0 | 1 | 1 | 60.6 |
| △ | 59.4 | fbus | 24801 | DEVERS | 500.0 | 1 | 1 | 60.6 |

IVSG STUDY
2014 Heavy Summer Case
N-2 PV-Devers HARQ-DEVERS 500 kV
Case ALT 3B DISPATCH 1
ALTERNATIVE 3B HEAVY SUMMER BASE CASE, DISPATCH SCENARIO 1

CFE Busses Page 1

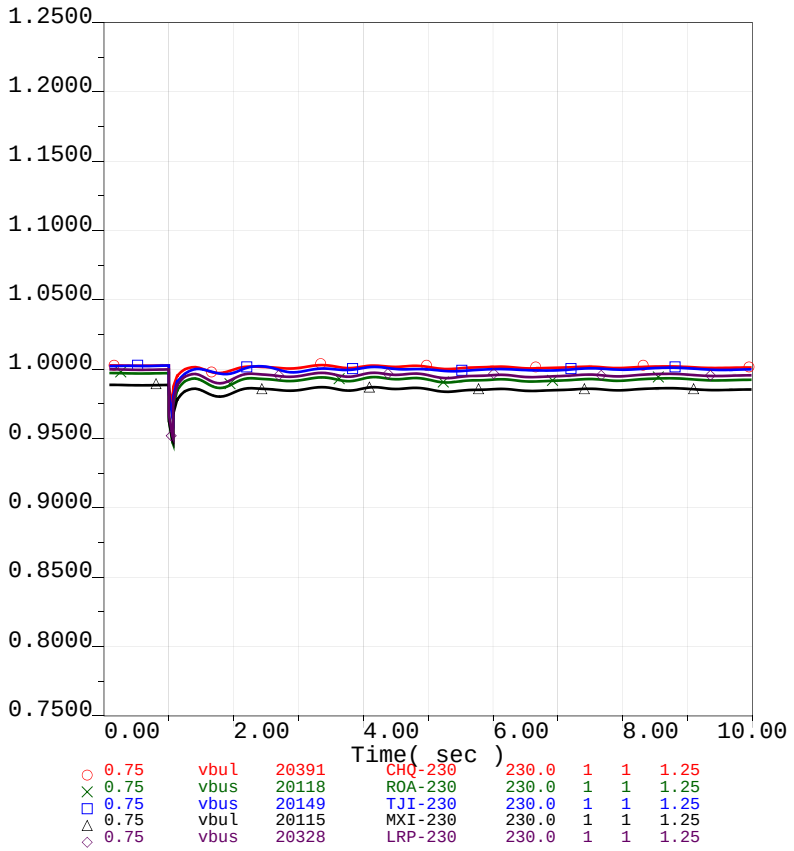



| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbug | 20009 | PJZ-U9 | 21.0 | 1 | 1 | 1.25 |
| × 0.75 | vbug | 20002 | PJZ-U1 | 13.8 | 1 | 1 | 1.25 |
| □ 0.75 | vbug | 20105 | CPD-U1 | 13.8 | 1 | 1 | 1.25 |
| △ 0.75 | vbug | 20137 | CPU-U1 | 13.8 | 1 | 1 | 1.25 |

IVSG STUDY
2014 Heavy Summer Case
N-2 PV-Devers HARQ-DEVERS 500 kV
Case ALT 3B DISPATCH 1
ALTERNATIVE 3B HEAVY SUMMER BASE CASE, DISPATCH SCENARIO 1



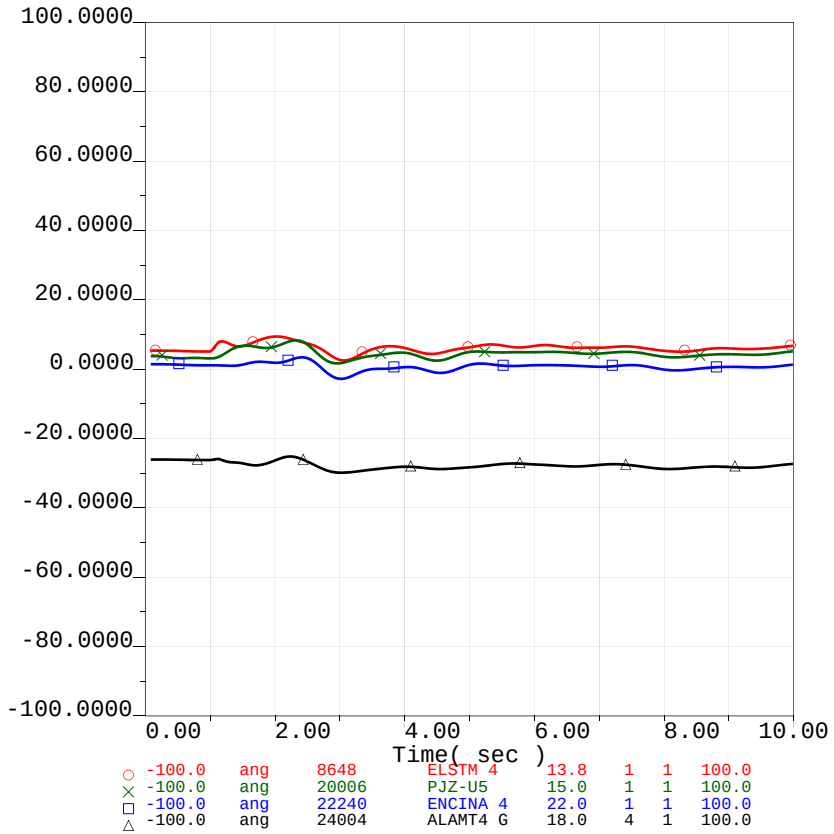
CFE Busses Page 2




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbul | 20391 | CHQ-230 | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 20118 | ROA-230 | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 20149 | TJI-230 | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbul | 20115 | MXI-230 | 230.0 | 1 | 1 | 1.25 |
| ◇ 0.75 | vbus | 20328 | LRP-230 | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
2014 Heavy Summer Case
N-2 PV-Devers HARQ-DEVERS 500 kV
Case ALT 3B DISPATCH 1
ALTERNATIVE 3B HEAVY SUMMER BASE CASE, DISPATCH SCENARIO 1

Rotor Angles for Gen Busses



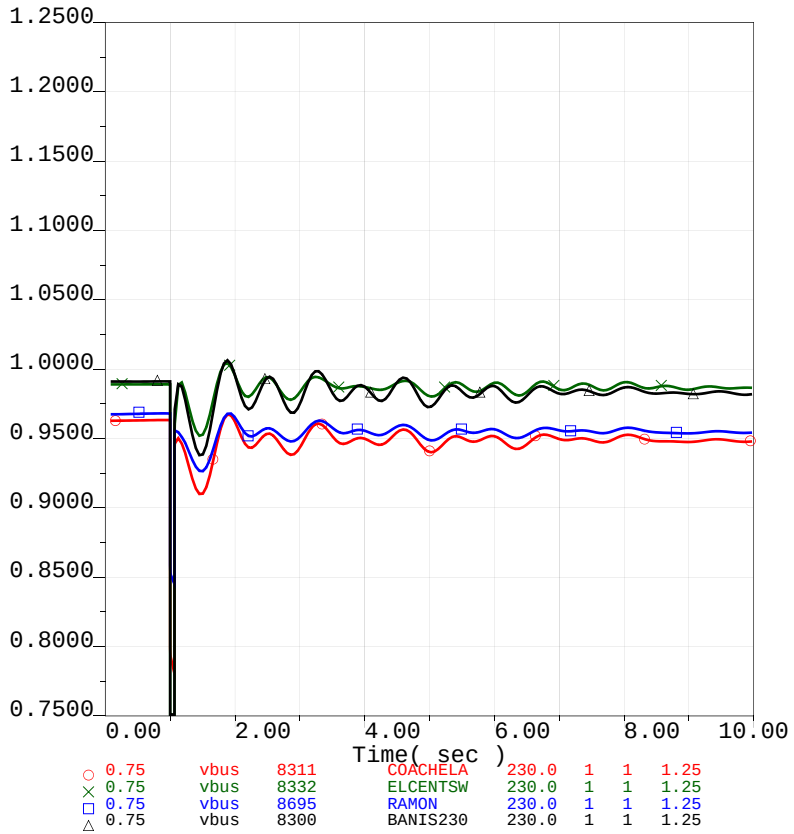

IVSG STUDY
2014 Heavy Summer Case
N-2 PV-Devers HARQ-DEVERS 500 kV
Case ALT 3B DISPATCH 1
ALTERNATIVE 3B HEAVY SUMMER BASE CASE, DISPATCH SCENARIO 1

# Imperial Valley Study Group

## Appendix C.1.2

Light Autumn

IID Busses

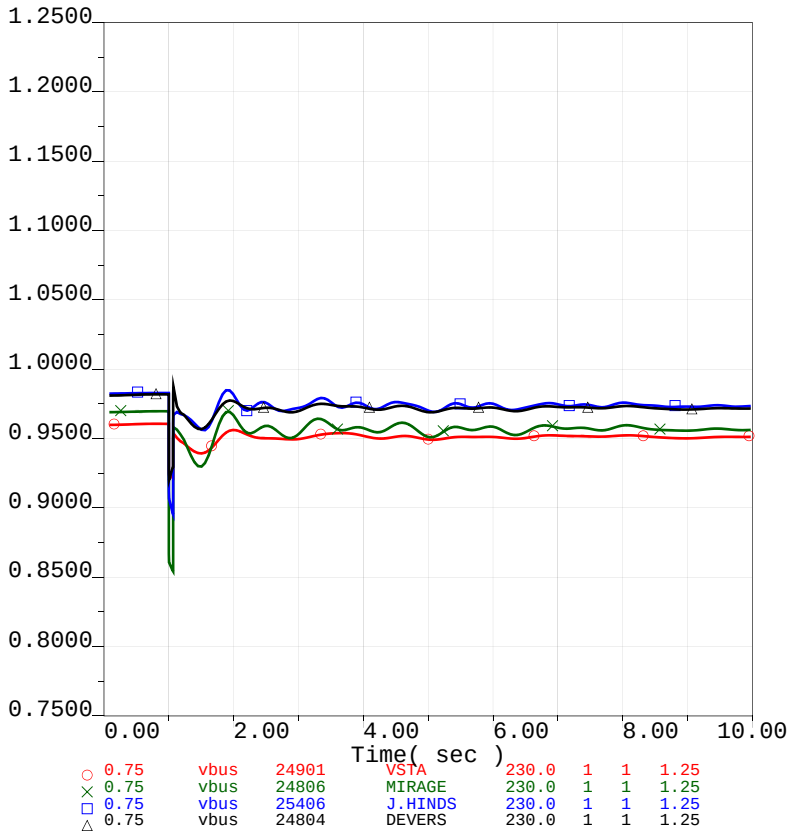



IVSG STUDY
Light Autumn Case
Trip Imperial Valley - Miguel 500 kV No RAS
Case ALT 2 DISPATCH 3



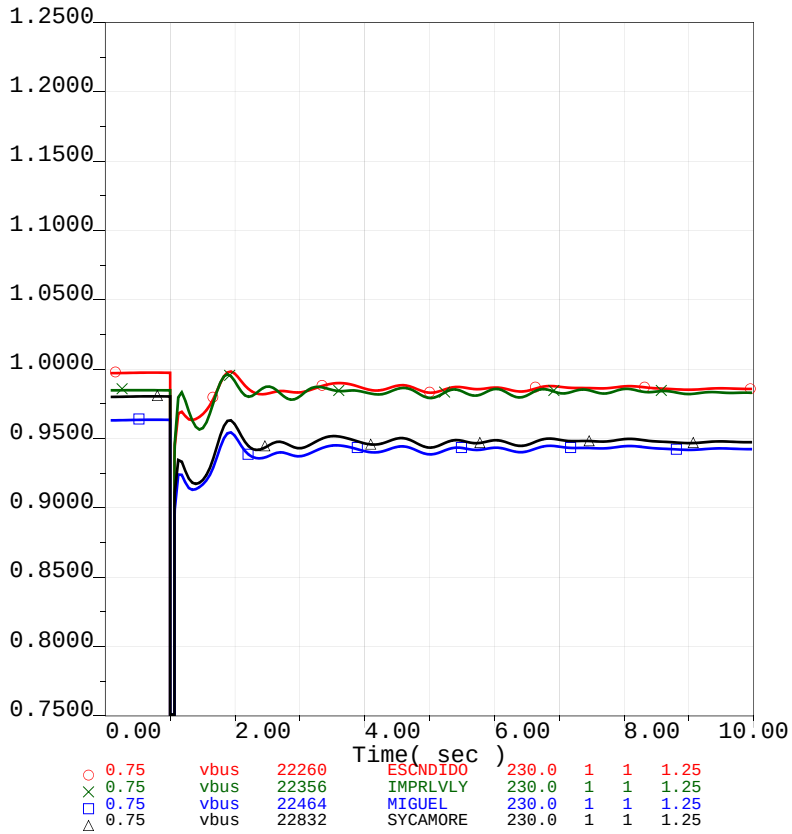


SCE Busses




IVSG STUDY
Light Autumn Case
Trip Imperial Valley - Miguel 500 kV No RAS
Case ALT 2 DISPATCH 3

SDGE Busses

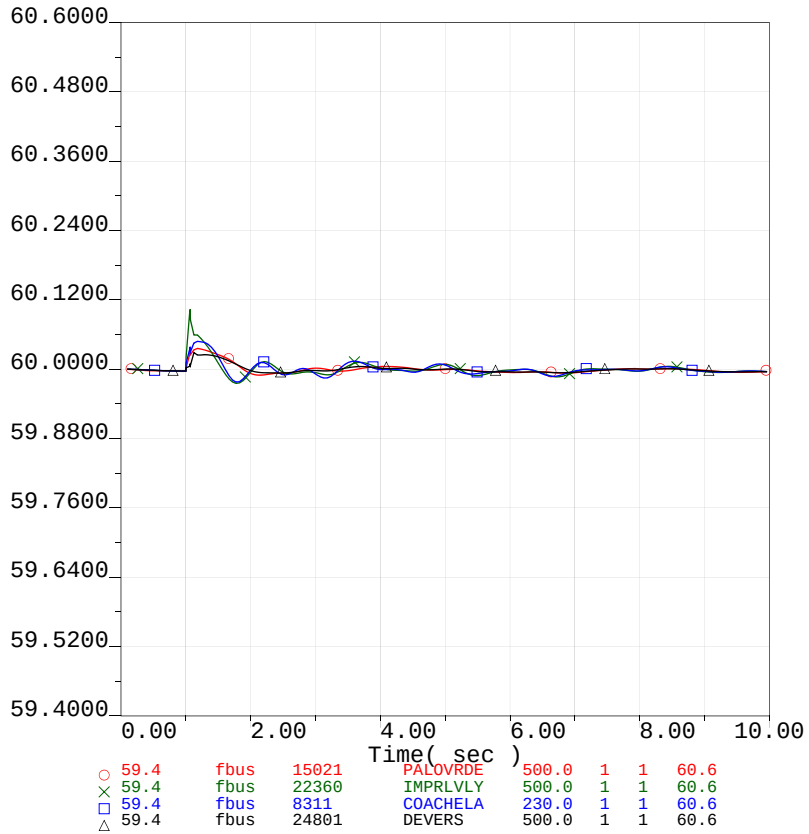



| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ○ | 0.75 | vbus | 22260 | ESCNDIDO | 230.0 | 1 | 1 | 1.25 |
| × | 0.75 | vbus | 22356 | IMPRLVLY | 230.0 | 1 | 1 | 1.25 |
| □ | 0.75 | vbus | 22464 | MIGUEL | 230.0 | 1 | 1 | 1.25 |
| △ | 0.75 | vbus | 22832 | SYCAMORE | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip Imperial Valley - Miguel 500 kV No RAS
Case ALT 2 DISPATCH 3



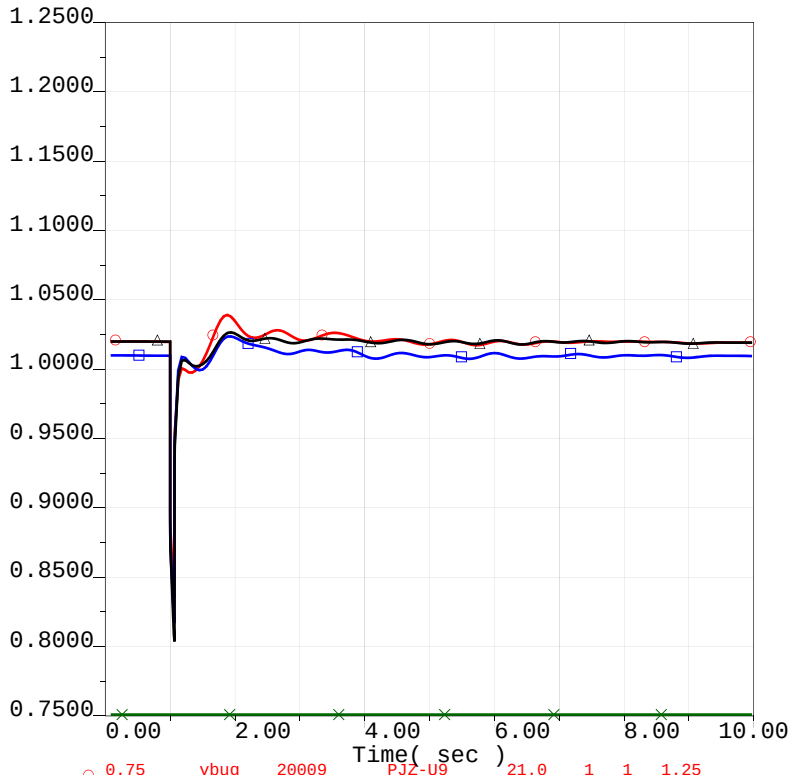
FBus Readings




| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ○ | 59.4 | fbus | 15021 | PALOVRDE | 500.0 | 1 | 1 | 60.6 |
| × | 59.4 | fbus | 22360 | IMPRLVLY | 500.0 | 1 | 1 | 60.6 |
| □ | 59.4 | fbus | 8311 | COACHELA | 230.0 | 1 | 1 | 60.6 |
| △ | 59.4 | fbus | 24801 | DEVERS | 500.0 | 1 | 1 | 60.6 |

IVSG STUDY
Light Autumn Case
Trip Imperial Valley - Miguel 500 kV No RAS
Case ALT 2 DISPATCH 3

CFE Busses Page 1

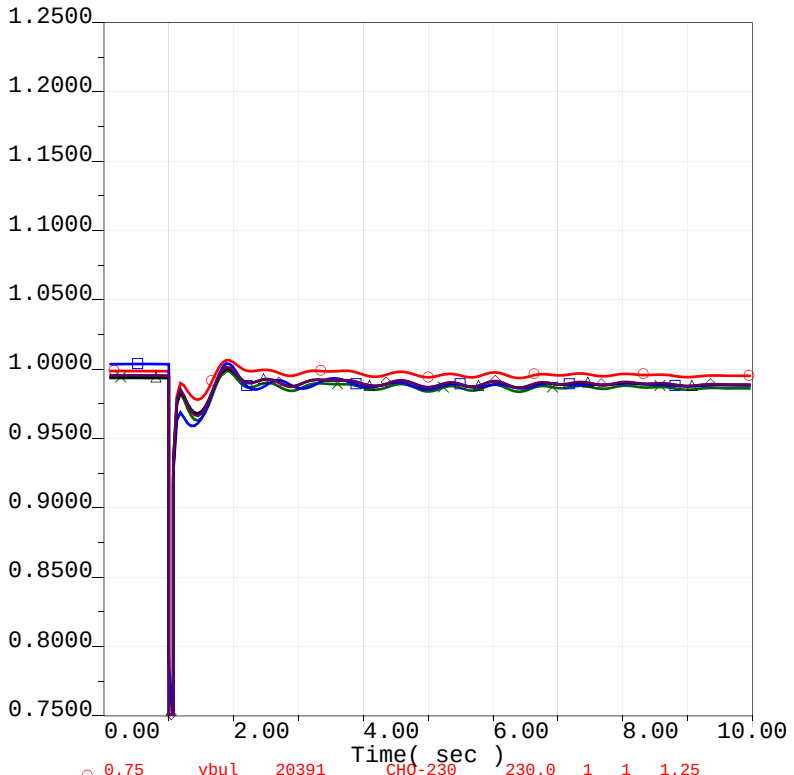



| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbug | 20009 | PJZ-U9 | 21.0 | 1 | 1 | 1.25 |
| × 0.75 | vbug | 20002 | PJZ-U1 | 13.8 | 1 | 1 | 1.25 |
| □ 0.75 | vbug | 20105 | CPD-U1 | 13.8 | 1 | 1 | 1.25 |
| △ 0.75 | vbug | 20137 | CPU-U1 | 13.8 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip Imperial Valley - Miguel 500 kV No RAS
Case ALT 2 DISPATCH 3



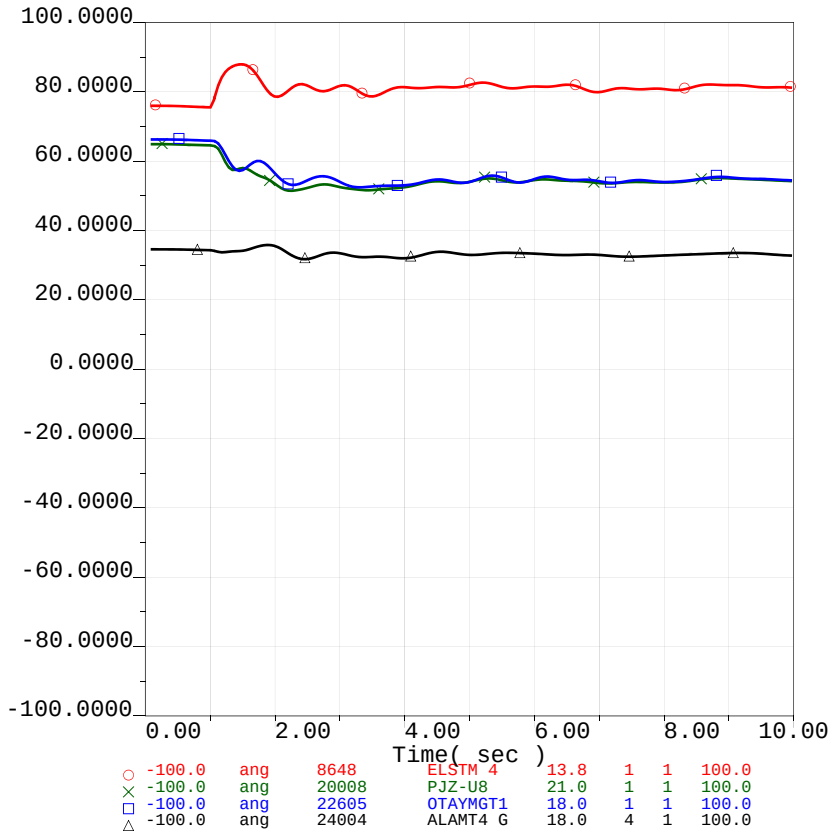
CFE Busses Page 2




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbul | 20391 | CHQ-230 | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 20118 | ROA-230 | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 20149 | TJI-230 | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbul | 20115 | MXI-230 | 230.0 | 1 | 1 | 1.25 |
| ◇ 0.75 | vbus | 20328 | LRP-230 | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip Imperial Valley - Miguel 500 kV No RAS
Case ALT 2 DISPATCH 3

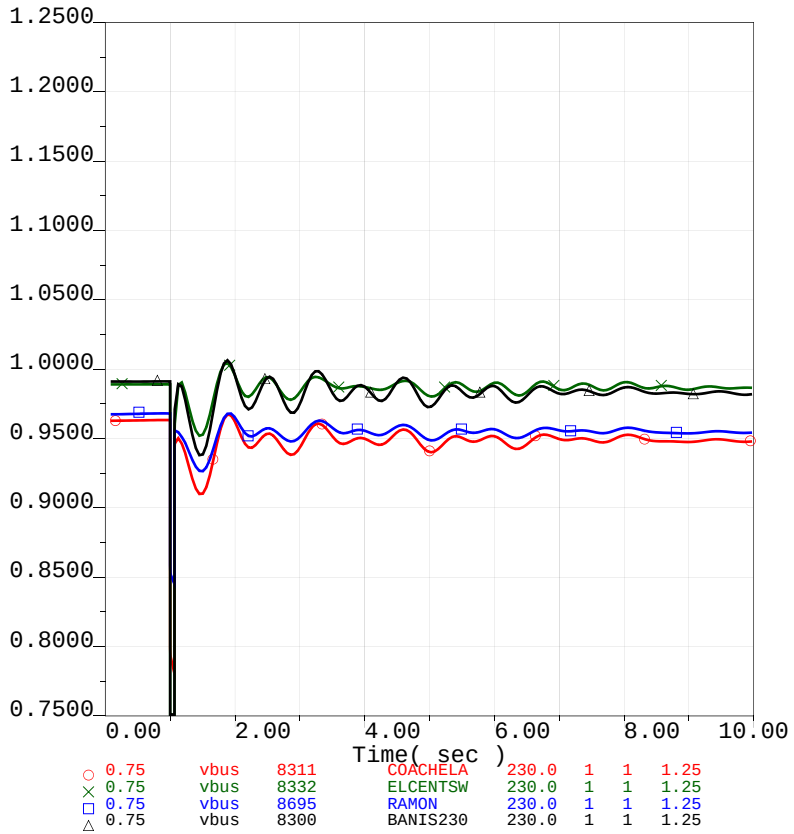
Rotor Angles for Gen Busses




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ -100.0 | ang | 8648 | ELSTM 4 | 13.8 | 1 | 1 | 100.0 |
| × -100.0 | ang | 20008 | PJZ-U8 | 21.0 | 1 | 1 | 100.0 |
| □ -100.0 | ang | 22605 | OTAYMGT1 | 18.0 | 1 | 1 | 100.0 |
| △ -100.0 | ang | 24004 | ALAMT4 G | 18.0 | 4 | 1 | 100.0 |

IVSG STUDY
Light Autumn Case
Trip Imperial Valley - Miguel 500 kV No RAS
Case ALT 2 DISPATCH 3

IID Busses

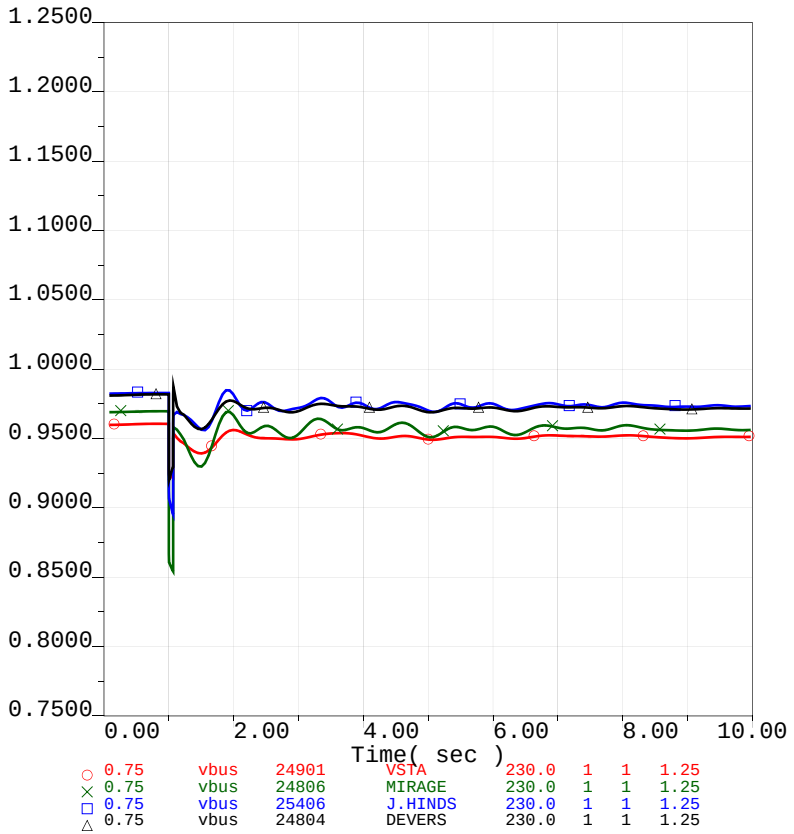



| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ○ | 0.75 | vbus | 8311 | COACHELA | 230.0 | 1 | 1 | 1.25 |
| × | 0.75 | vbus | 8332 | ELCENTSW | 230.0 | 1 | 1 | 1.25 |
| □ | 0.75 | vbus | 8695 | RAMON | 230.0 | 1 | 1 | 1.25 |
| △ | 0.75 | vbus | 8300 | BANIS230 | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip Imperial Valley - Miguel 500 kV No RAS
Case ALT 2a DISPATCH 3



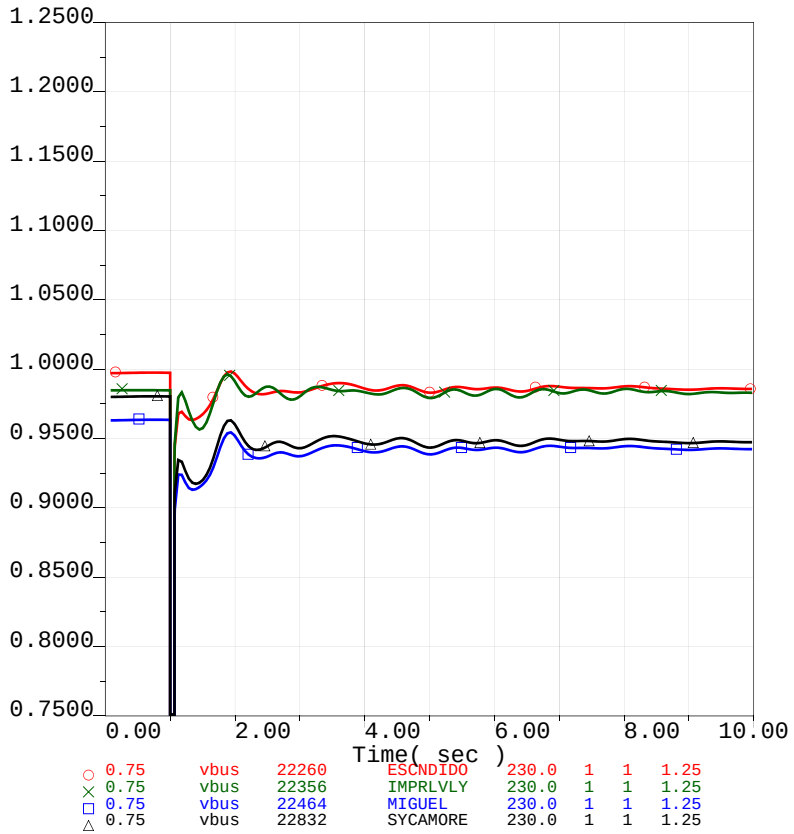
SCE Busses




| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ○ | 0.75 | vbus | 24901 | VSTA | 230.0 | 1 | 1 | 1.25 |
| × | 0.75 | vbus | 24806 | MIRAGE | 230.0 | 1 | 1 | 1.25 |
| □ | 0.75 | vbus | 25406 | J.HINDS | 230.0 | 1 | 1 | 1.25 |
| △ | 0.75 | vbus | 24804 | DEVERS | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip Imperial Valley - Miguel 500 kV No RAS
Case ALT 2a DISPATCH 3

SDGE Busses



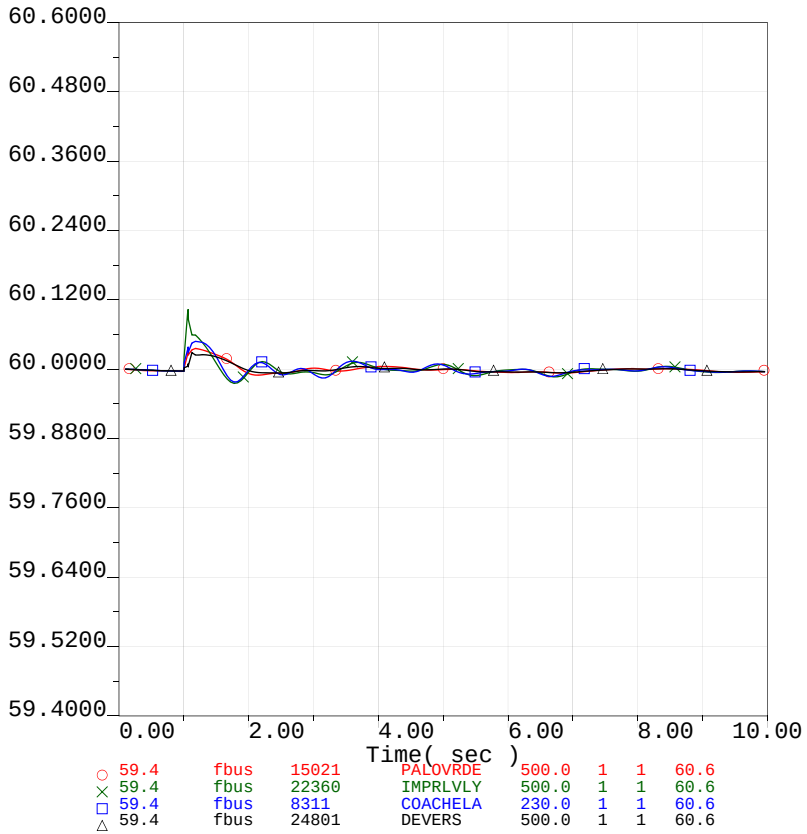

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ○ | 0.75 | vbus | 22260 | ESCNDIDO | 230.0 | 1 | 1 | 1.25 |
| × | 0.75 | vbus | 22356 | IMPRLVLY | 230.0 | 1 | 1 | 1.25 |
| □ | 0.75 | vbus | 22464 | MIGUEL | 230.0 | 1 | 1 | 1.25 |
| △ | 0.75 | vbus | 22832 | SYCAMORE | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip Imperial Valley - Miguel 500 kV No RAS
Case ALT 2a DISPATCH 3





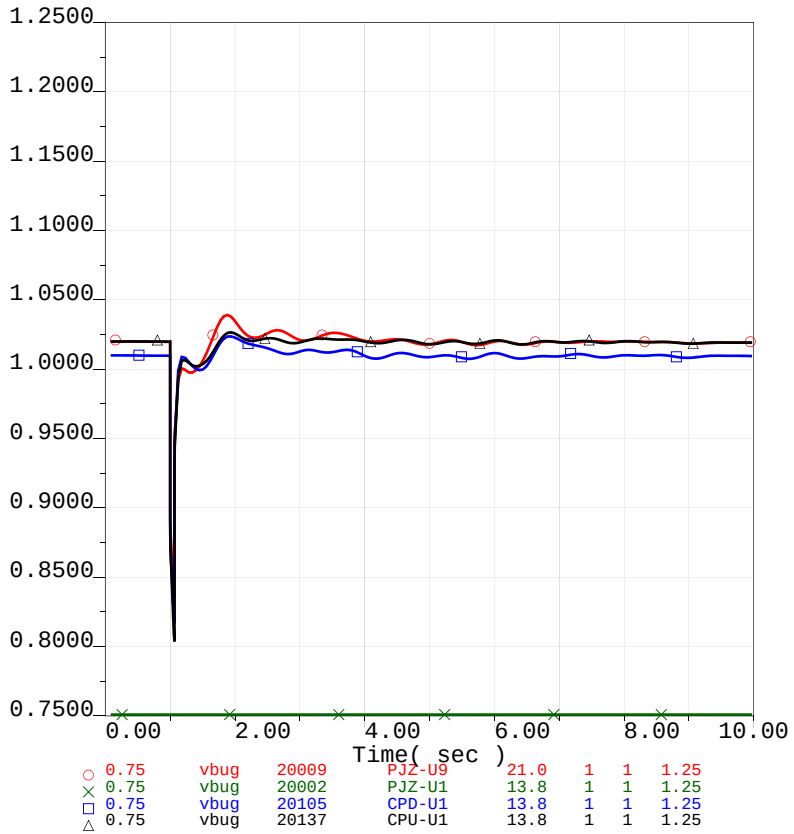
FBus Readings




| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ○ | 59.4 | fbus | 15021 | PALOVRDE | 500.0 | 1 | 1 | 60.6 |
| × | 59.4 | fbus | 22360 | IMPRLVLY | 500.0 | 1 | 1 | 60.6 |
| □ | 59.4 | fbus | 8311 | COACHELA | 230.0 | 1 | 1 | 60.6 |
| △ | 59.4 | fbus | 24801 | DEVERS | 500.0 | 1 | 1 | 60.6 |

IVSG STUDY
Light Autumn Case
Trip Imperial Valley - Miguel 500 kV No RAS
Case ALT 2a DISPATCH 3

CFE Busses Page 1

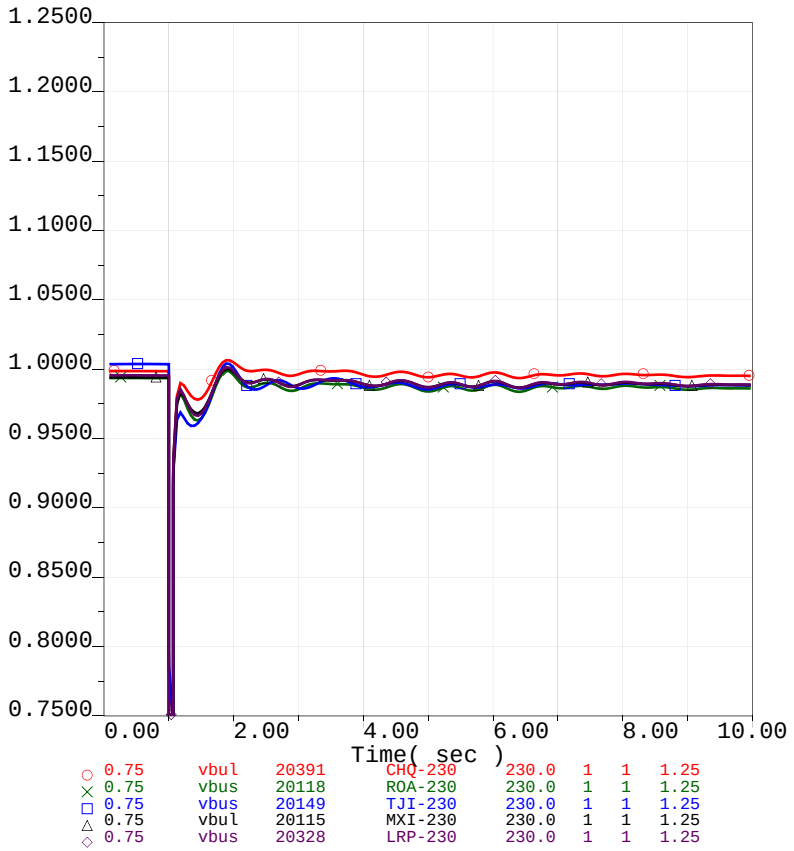



| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbug | 20009 | PJZ-U9 | 21.0 | 1 | 1 | 1.25 |
| × 0.75 | vbug | 20002 | PJZ-U1 | 13.8 | 1 | 1 | 1.25 |
| □ 0.75 | vbug | 20105 | CPD-U1 | 13.8 | 1 | 1 | 1.25 |
| △ 0.75 | vbug | 20137 | CPU-U1 | 13.8 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip Imperial Valley - Miguel 500 kV No RAS
Case ALT 2a DISPATCH 3



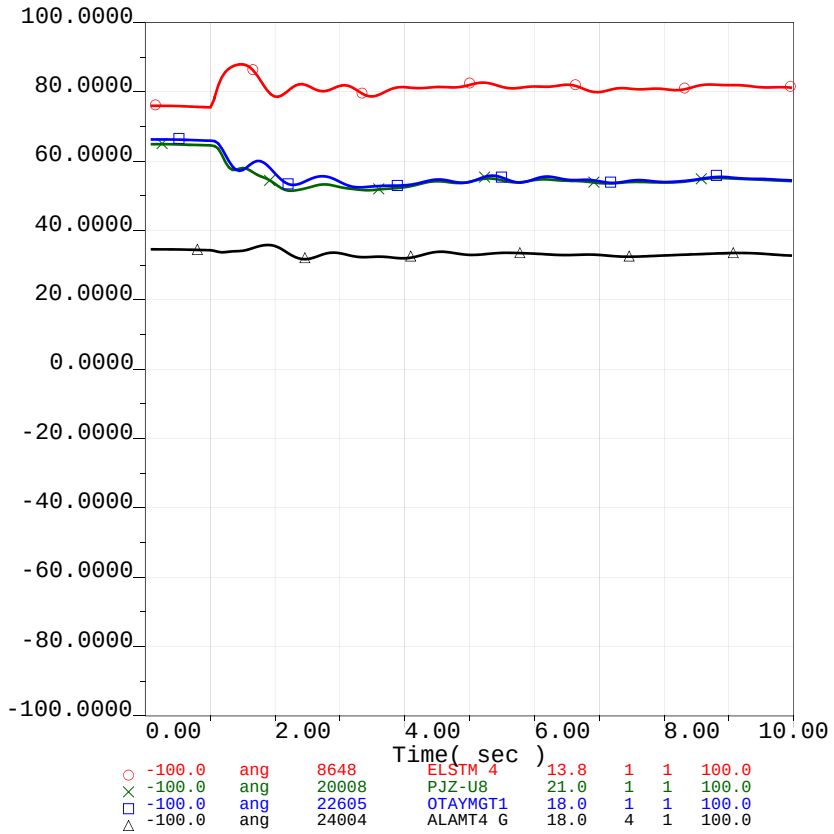
CFE Busses Page 2




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbul | 20391 | CHQ-230 | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 20118 | ROA-230 | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 20149 | TJI-230 | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbul | 20115 | MXI-230 | 230.0 | 1 | 1 | 1.25 |
| ◇ 0.75 | vbus | 20328 | LRP-230 | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip Imperial Valley - Miguel 500 kV No RAS
Case ALT 2a DISPATCH 3

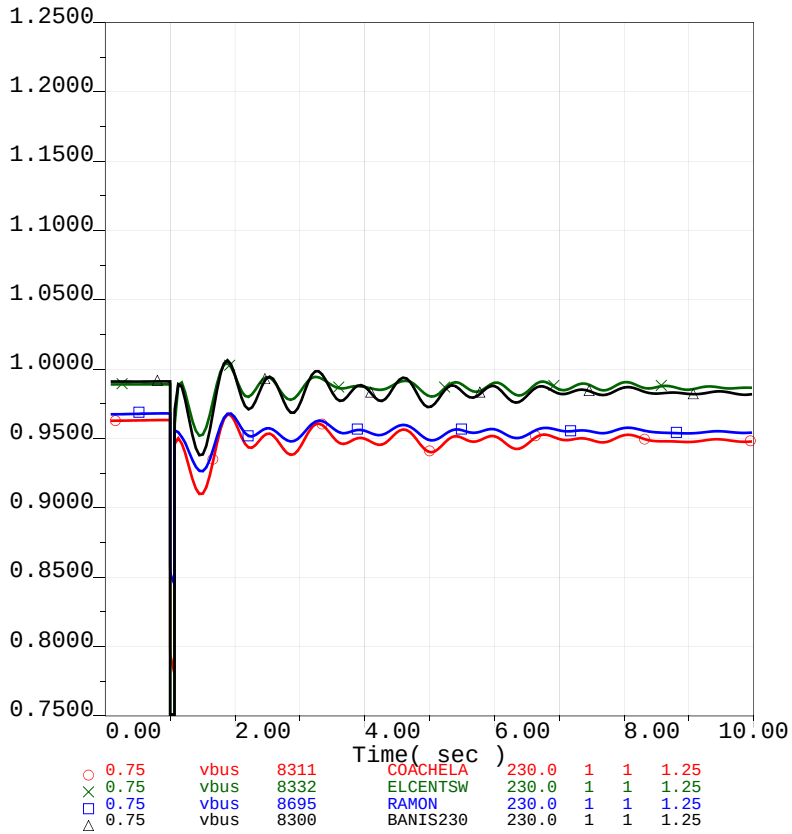
Rotor Angles for Gen Busses




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ -100.0 | ang | 8648 | ELSTM 4 | 13.8 | 1 | 1 | 100.0 |
| × -100.0 | ang | 20008 | PJZ-U8 | 21.0 | 1 | 1 | 100.0 |
| □ -100.0 | ang | 22605 | OTAYMGT1 | 18.0 | 1 | 1 | 100.0 |
| △ -100.0 | ang | 24004 | ALAMT4 G | 18.0 | 4 | 1 | 100.0 |

IVSG STUDY
Light Autumn Case
Trip Imperial Valley - Miguel 500 kV No RAS
Case ALT 2a DISPATCH 3

IID Busses

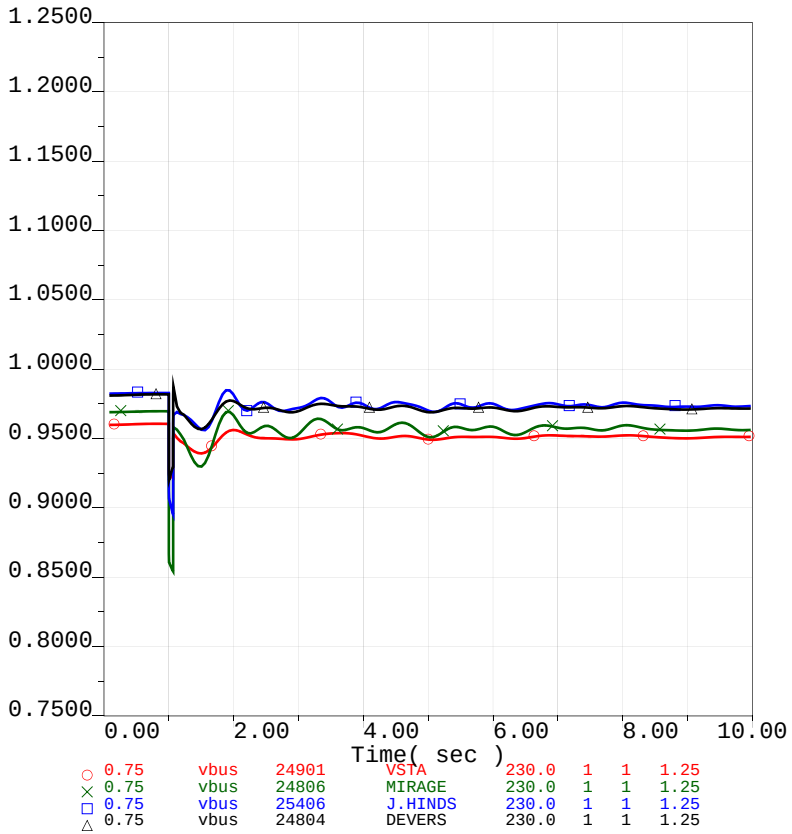



| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbus | 8311 | COACHELA | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 8332 | ELCENTSW | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 8695 | RAMON | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbus | 8300 | BANIS230 | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip Imperial Valley - Miguel 500 kV No RAS
Case ALT 3b DISPATCH 3



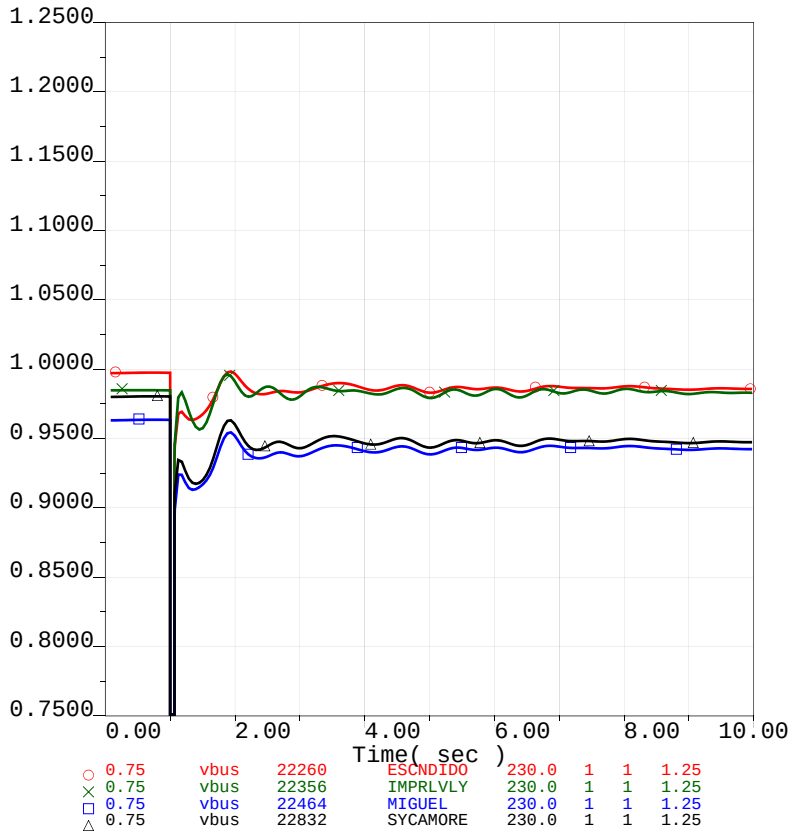
SCE Busses




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbus | 24901 | VSTA | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 24806 | MIRAGE | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 25406 | J.HINDS | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbus | 24804 | DEVERS | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip Imperial Valley - Miguel 500 kV No RAS
Case ALT 3b DISPATCH 3

SDGE Busses

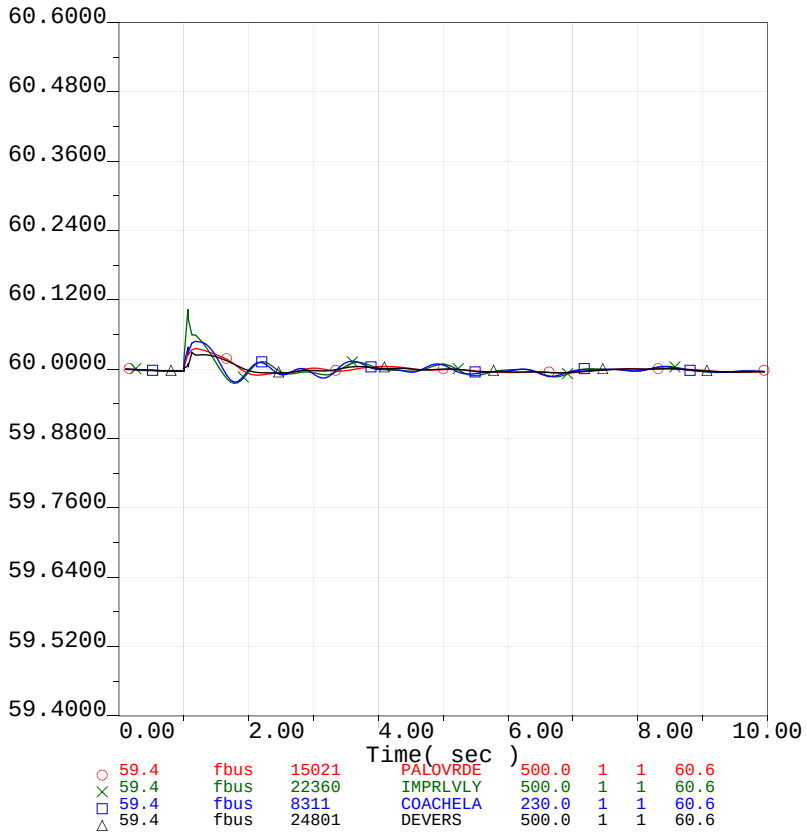



| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ○ | 0.75 | vbus | 22260 | ESCNDIDO | 230.0 | 1 | 1 | 1.25 |
| × | 0.75 | vbus | 22356 | IMPRLVLY | 230.0 | 1 | 1 | 1.25 |
| □ | 0.75 | vbus | 22464 | MIGUEL | 230.0 | 1 | 1 | 1.25 |
| △ | 0.75 | vbus | 22832 | SYCAMORE | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip Imperial Valley - Miguel 500 kV No RAS
Case ALT 3b DISPATCH 3



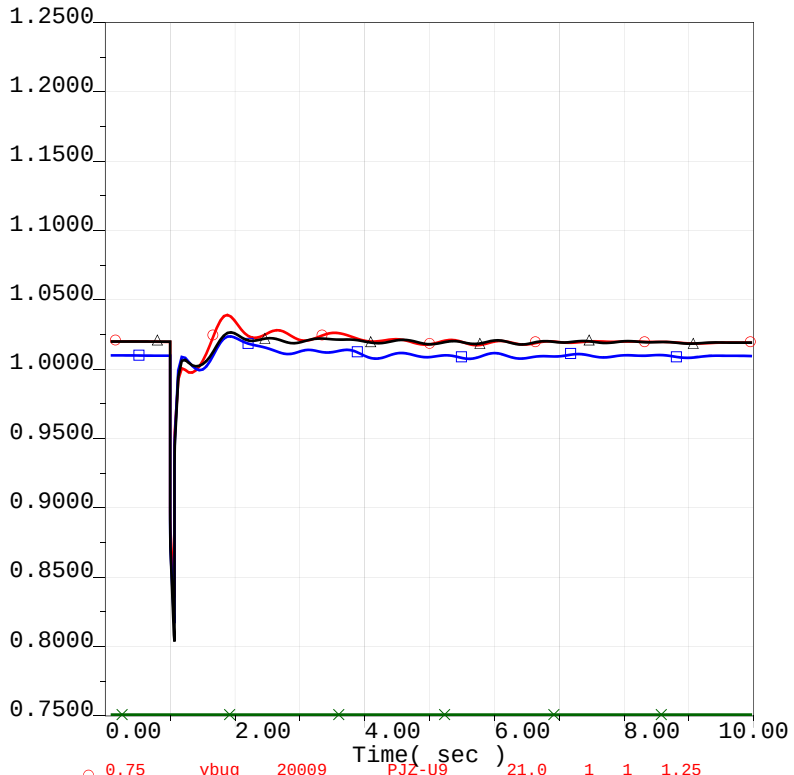
FBus Readings




| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ○ | 59.4 | fbus | 15021 | PALOVRDE | 500.0 | 1 | 1 | 60.6 |
| × | 59.4 | fbus | 22360 | IMPRLVLY | 500.0 | 1 | 1 | 60.6 |
| □ | 59.4 | fbus | 8311 | COACHELA | 230.0 | 1 | 1 | 60.6 |
| △ | 59.4 | fbus | 24801 | DEVERS | 500.0 | 1 | 1 | 60.6 |

IVSG STUDY
Light Autumn Case
Trip Imperial Valley - Miguel 500 kV No RAS
Case ALT 3b DISPATCH 3

CFE Busses Page 1

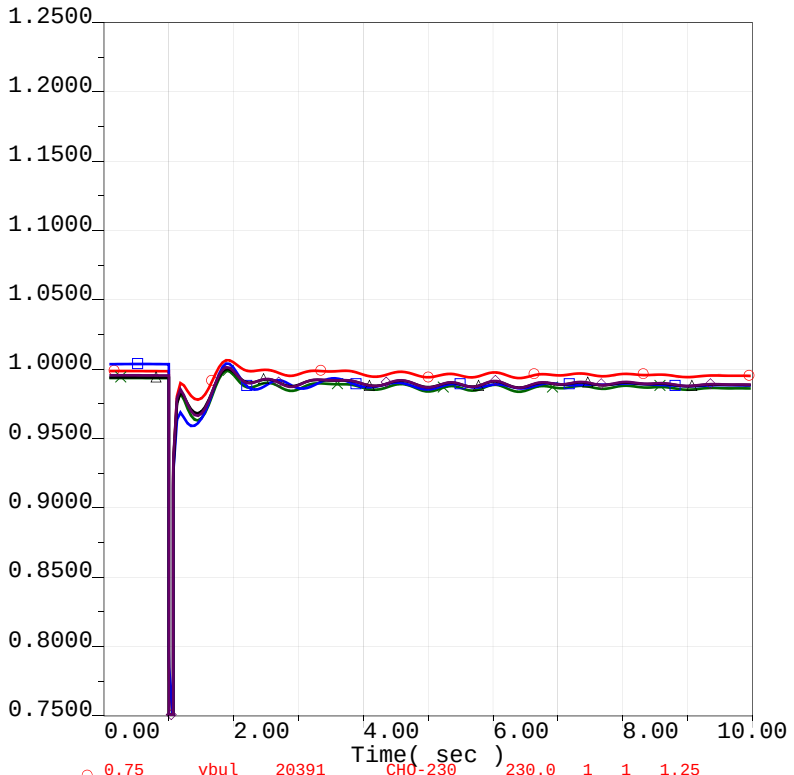



| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbug | 20009 | PJZ-U9 | 21.0 | 1 | 1 | 1.25 |
| × 0.75 | vbug | 20002 | PJZ-U1 | 13.8 | 1 | 1 | 1.25 |
| □ 0.75 | vbug | 20105 | CPD-U1 | 13.8 | 1 | 1 | 1.25 |
| △ 0.75 | vbug | 20137 | CPU-U1 | 13.8 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip Imperial Valley - Miguel 500 kV No RAS
Case ALT 3b DISPATCH 3



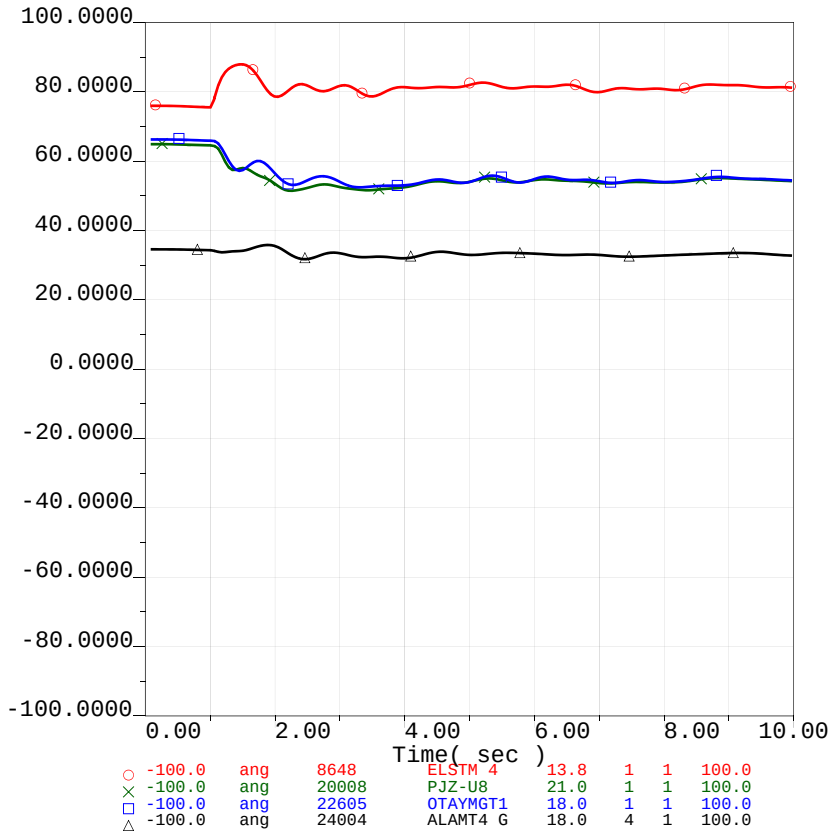
CFE Busses Page 2




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbul | 20391 | CHQ-230 | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 20118 | ROA-230 | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 20149 | TJI-230 | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbul | 20115 | MXI-230 | 230.0 | 1 | 1 | 1.25 |
| ◇ 0.75 | vbus | 20328 | LRP-230 | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip Imperial Valley - Miguel 500 kV No RAS
Case ALT 3b DISPATCH 3

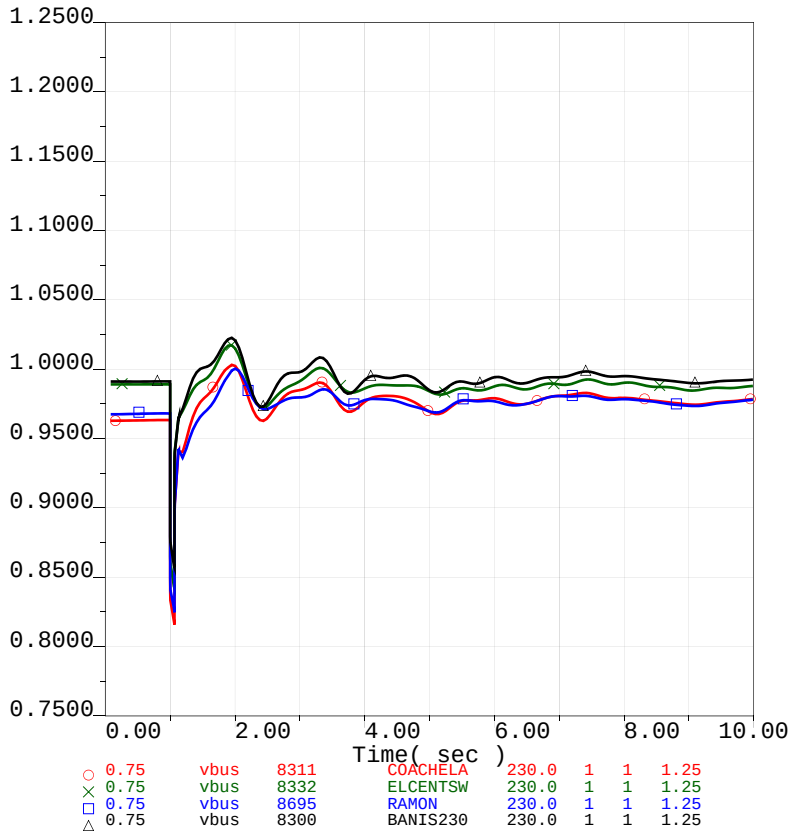
Rotor Angles for Gen Busses




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ -100.0 | ang | 8648 | ELSTM 4 | 13.8 | 1 | 1 | 100.0 |
| × -100.0 | ang | 20008 | PJZ-U8 | 21.0 | 1 | 1 | 100.0 |
| □ -100.0 | ang | 22605 | OTAYMGT1 | 18.0 | 1 | 1 | 100.0 |
| △ -100.0 | ang | 24004 | ALAMT4 G | 18.0 | 4 | 1 | 100.0 |

IVSG STUDY
Light Autumn Case
Trip Imperial Valley - Miguel 500 kV No RAS
Case ALT 3b DISPATCH 3

IID Busses



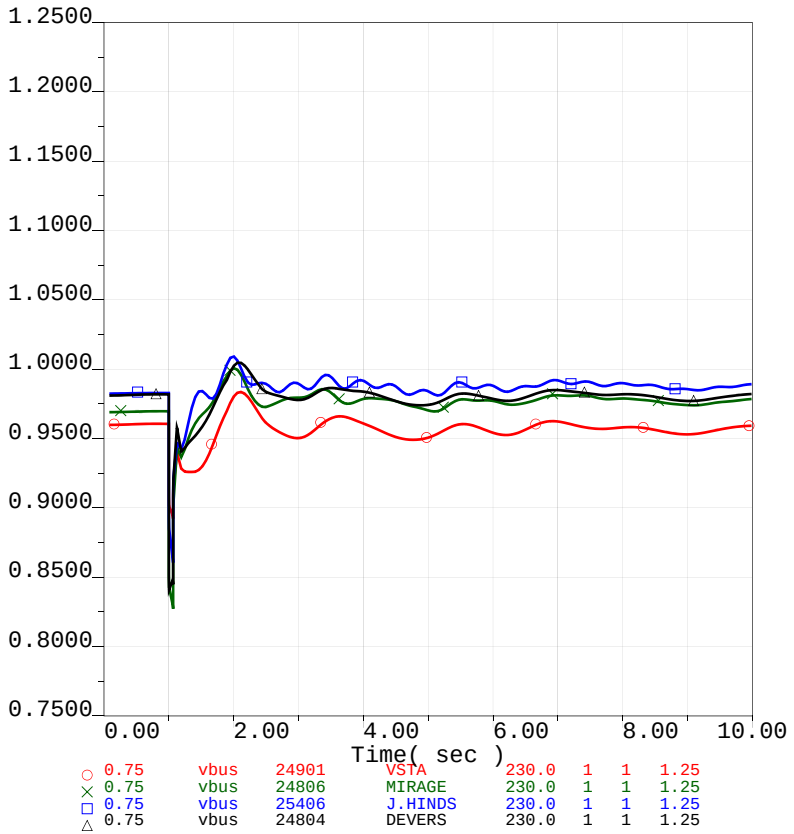

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbus | 8311 | COACHELA | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 8332 | ELCENTSW | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 8695 | RAMON | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbus | 8300 | BANIS230 | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip Hassayampa - N. Gila 500 kV
Case ALT 2 DISPATCH 3





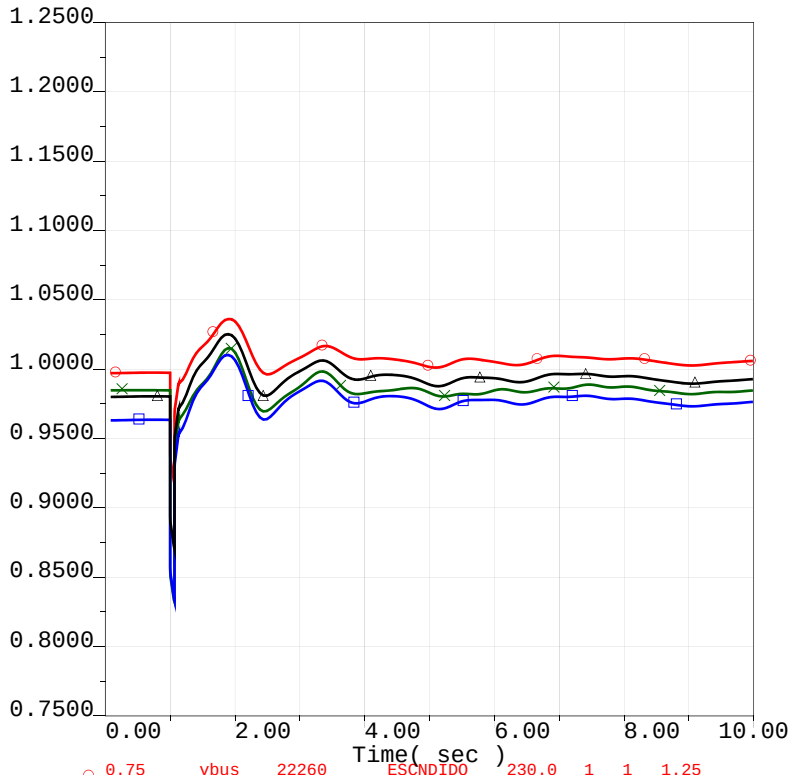
SCE Busses




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbus | 24901 | VSTA | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 24806 | MIRAGE | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 25406 | J.HINDS | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbus | 24804 | DEVERS | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip Hassayampa - N. Gila 500 kV
Case ALT 2 DISPATCH 3

SDGE Busses

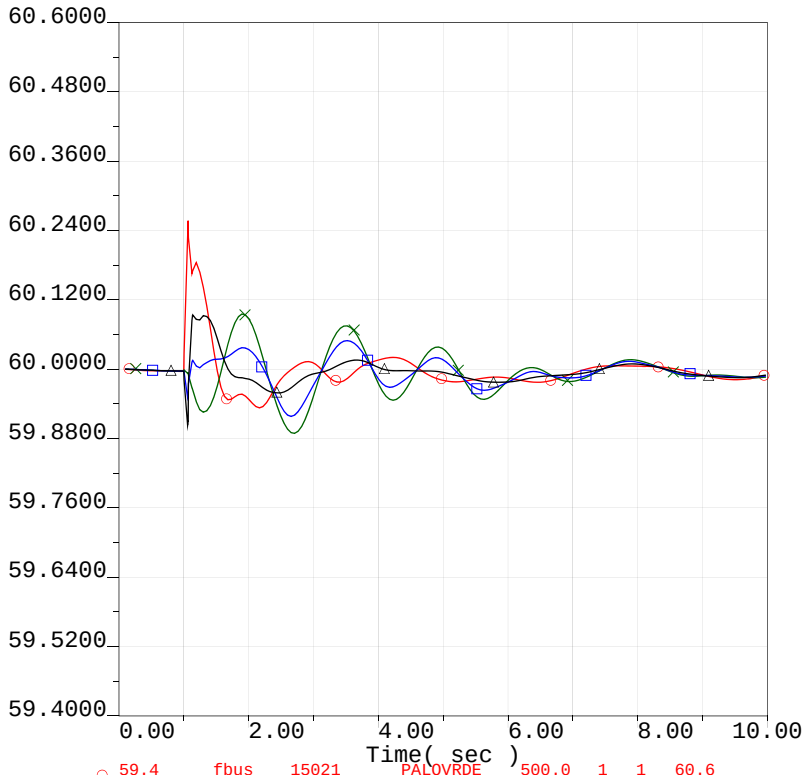



| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ○ | 0.75 | vbus | 22260 | ESCNDIDO | 230.0 | 1 | 1 | 1.25 |
| × | 0.75 | vbus | 22356 | IMPRLVLY | 230.0 | 1 | 1 | 1.25 |
| □ | 0.75 | vbus | 22464 | MIGUEL | 230.0 | 1 | 1 | 1.25 |
| △ | 0.75 | vbus | 22832 | SYCAMORE | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip Hassayampa - N. Gila 500 kV
Case ALT 2 DISPATCH 3



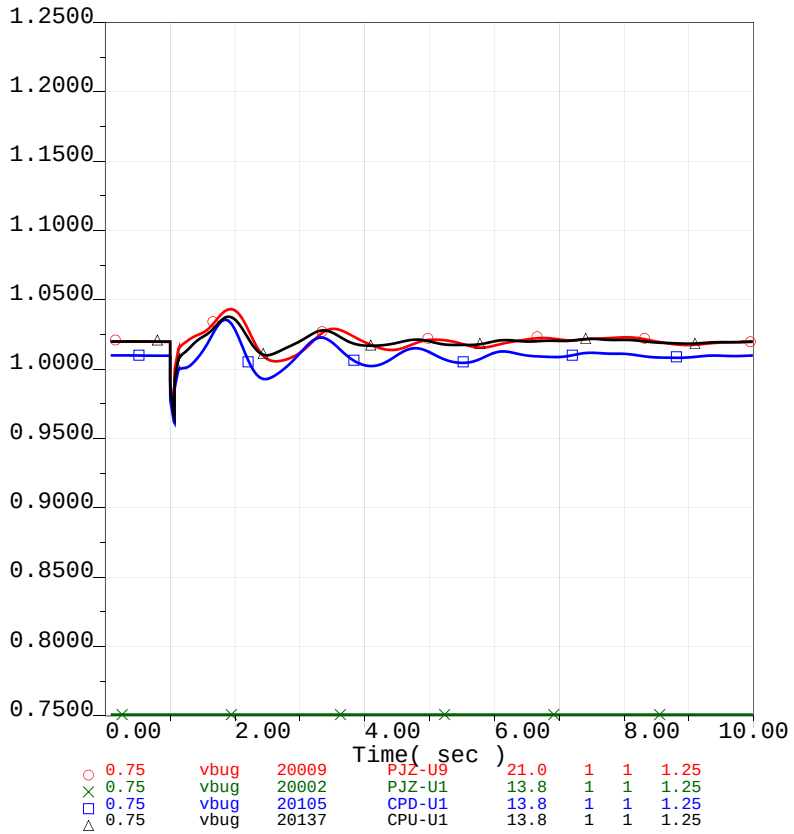
FBus Readings




| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ○ | 59.4 | fbus | 15021 | PALOVRDE | 500.0 | 1 | 1 | 60.6 |
| × | 59.4 | fbus | 22360 | IMPRLVLY | 500.0 | 1 | 1 | 60.6 |
| □ | 59.4 | fbus | 8311 | COACHELA | 230.0 | 1 | 1 | 60.6 |
| △ | 59.4 | fbus | 24801 | DEVERS | 500.0 | 1 | 1 | 60.6 |

IVSG STUDY
Light Autumn Case
Trip Hassayampa - N. Gila 500 kV
Case ALT 2 DISPATCH 3

CFE Busses Page 1



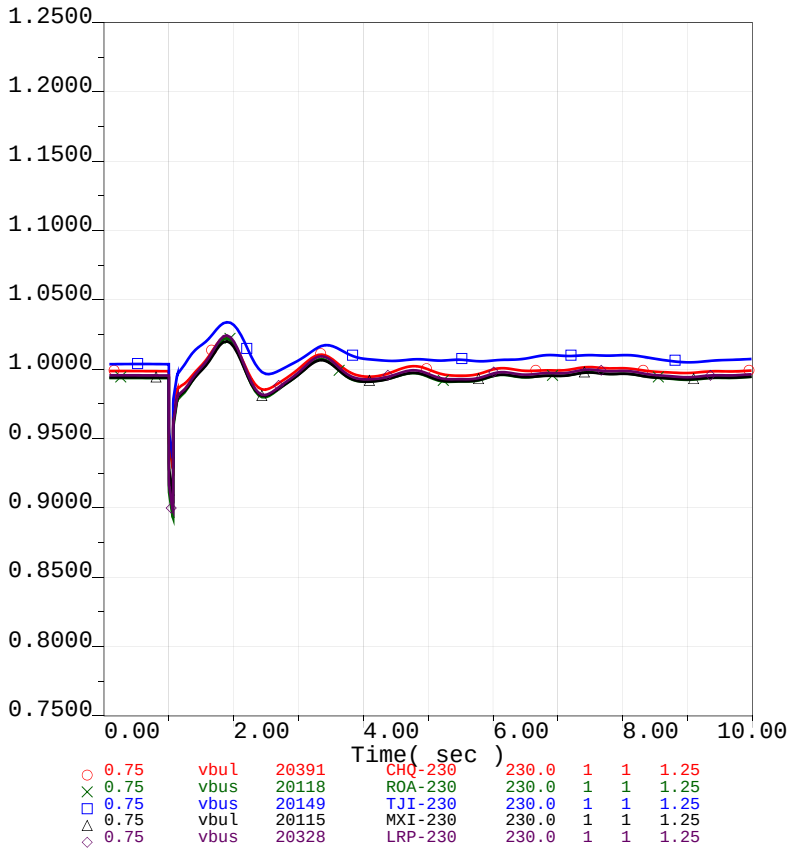

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbug | 20009 | PJZ-U9 | 21.0 | 1 | 1 | 1.25 |
| × 0.75 | vbug | 20002 | PJZ-U1 | 13.8 | 1 | 1 | 1.25 |
| □ 0.75 | vbug | 20105 | CPD-U1 | 13.8 | 1 | 1 | 1.25 |
| △ 0.75 | vbug | 20137 | CPU-U1 | 13.8 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip Hassayampa - N. Gila 500 kV
Case ALT 2 DISPATCH 3





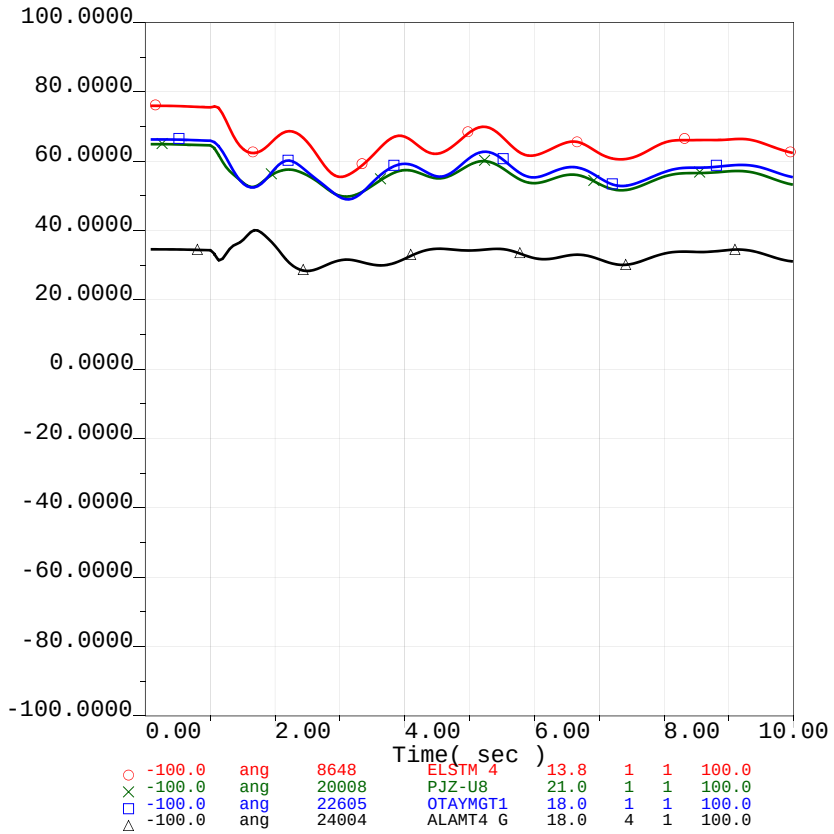
CFE Busses Page 2




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbul | 20391 | CHQ-230 | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 20118 | ROA-230 | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 20149 | TJI-230 | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbul | 20115 | MXI-230 | 230.0 | 1 | 1 | 1.25 |
| ◇ 0.75 | vbus | 20328 | LRP-230 | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip Hassayampa - N. Gila 500 kV
Case ALT 2 DISPATCH 3

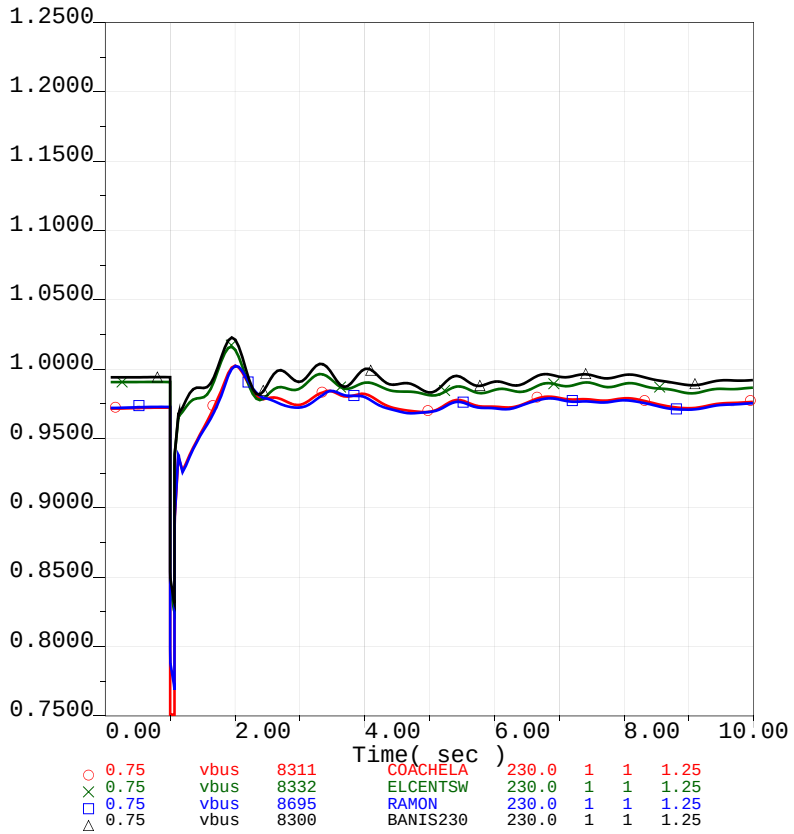
Rotor Angles for Gen Busses




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ -100.0 | ang | 8648 | ELSTM 4 | 13.8 | 1 | 1 | 100.0 |
| × -100.0 | ang | 20008 | PJZ-U8 | 21.0 | 1 | 1 | 100.0 |
| □ -100.0 | ang | 22605 | OTAYMGT1 | 18.0 | 1 | 1 | 100.0 |
| △ -100.0 | ang | 24004 | ALAMT4 G | 18.0 | 4 | 1 | 100.0 |

IVSG STUDY
Light Autumn Case
Trip Hassayampa - N. Gila 500 kV
Case ALT 2 DISPATCH 3

IID Busses



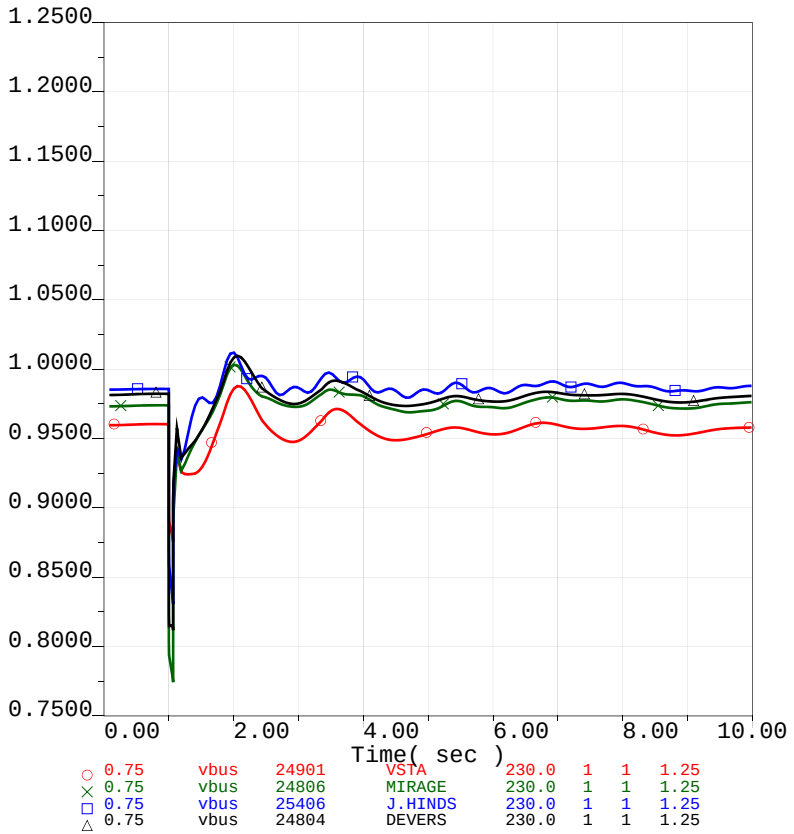

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbus | 8311 | COACHELA | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 8332 | ELCENTSW | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 8695 | RAMON | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbus | 8300 | BANIS230 | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip Hassayampa - N. Gila 500 kV
Case ALT 2A DISPATCH 3





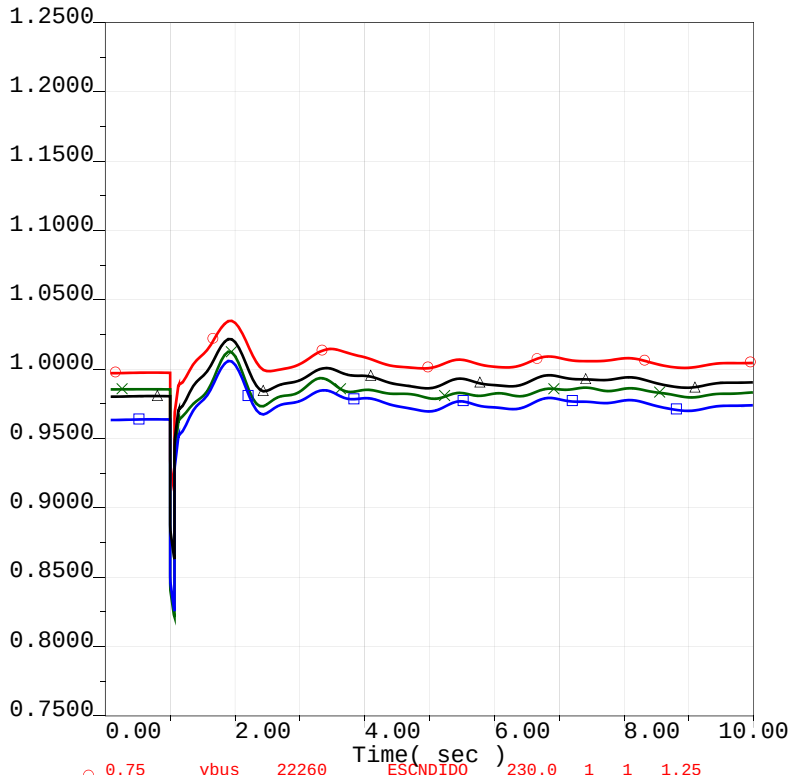
SCE Busses




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbus | 24901 | VSTA | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 24806 | MIRAGE | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 25406 | J.HINDS | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbus | 24804 | DEVERS | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip Hassayampa - N. Gila 500 kV
Case ALT 2A DISPATCH 3

SDGE Busses



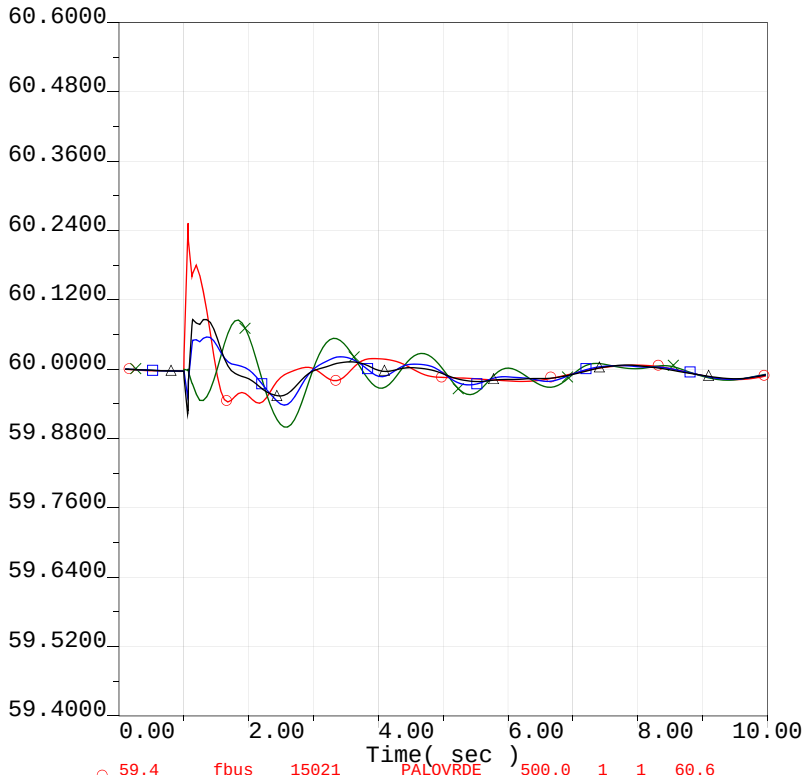

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ○ | 0.75 | vbus | 22260 | ESCNDIDO | 230.0 | 1 | 1 | 1.25 |
| × | 0.75 | vbus | 22356 | IMPRLVLY | 230.0 | 1 | 1 | 1.25 |
| □ | 0.75 | vbus | 22464 | MIGUEL | 230.0 | 1 | 1 | 1.25 |
| △ | 0.75 | vbus | 22832 | SYCAMORE | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip Hassayampa - N. Gila 500 kV
Case ALT 2A DISPATCH 3



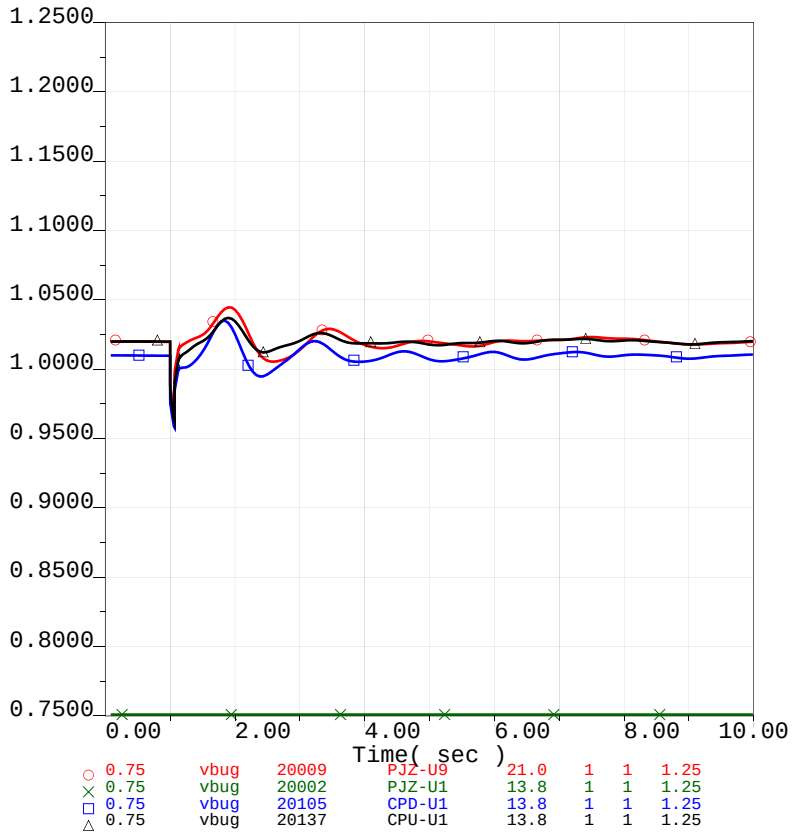


FBus Readings




| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ○ | 59.4 | fbus | 15021 | PALOVRDE | 500.0 | 1 | 1 | 60.6 |
| × | 59.4 | fbus | 22360 | IMPRLVLY | 500.0 | 1 | 1 | 60.6 |
| □ | 59.4 | fbus | 8311 | COACHELA | 230.0 | 1 | 1 | 60.6 |
| △ | 59.4 | fbus | 24801 | DEVERS | 500.0 | 1 | 1 | 60.6 |

IVSG STUDY
Light Autumn Case
Trip Hassayampa - N. Gila 500 kV
Case ALT 2A DISPATCH 3

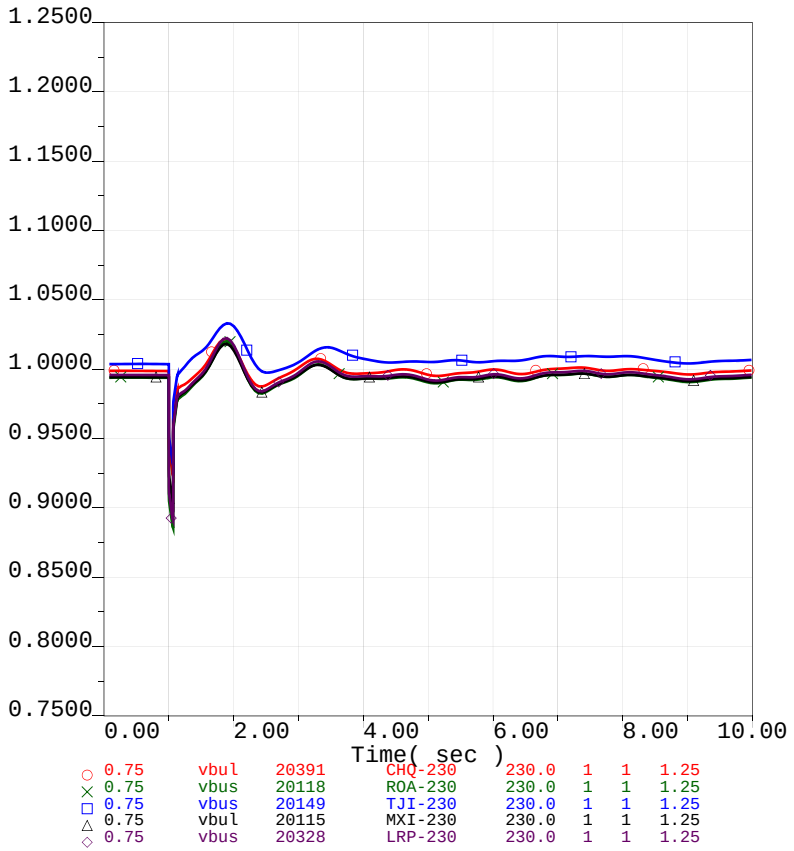



| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbug | 20009 | PJZ-U9 | 21.0 | 1 | 1 | 1.25 |
| × 0.75 | vbug | 20002 | PJZ-U1 | 13.8 | 1 | 1 | 1.25 |
| □ 0.75 | vbug | 20105 | CPD-U1 | 13.8 | 1 | 1 | 1.25 |
| △ 0.75 | vbug | 20137 | CPU-U1 | 13.8 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip Hassayampa - N. Gila 500 kV
Case ALT 2A DISPATCH 3



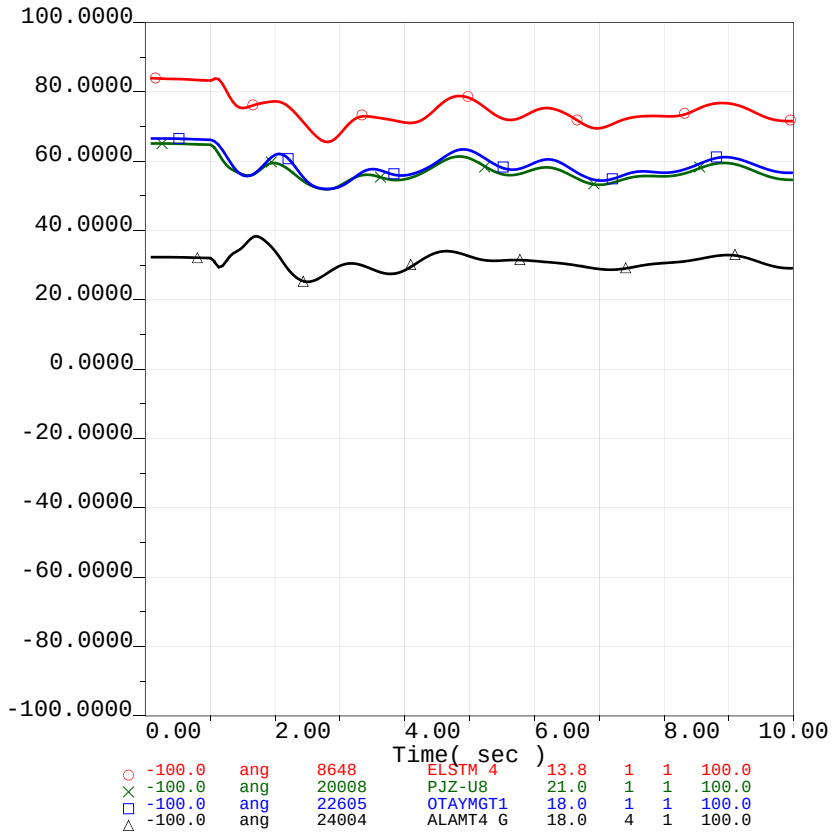





| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbul | 20391 | CHQ-230 | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 20118 | ROA-230 | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 20149 | TJI-230 | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbul | 20115 | MXI-230 | 230.0 | 1 | 1 | 1.25 |
| ◇ 0.75 | vbus | 20328 | LRP-230 | 230.0 | 1 | 1 | 1.25 |

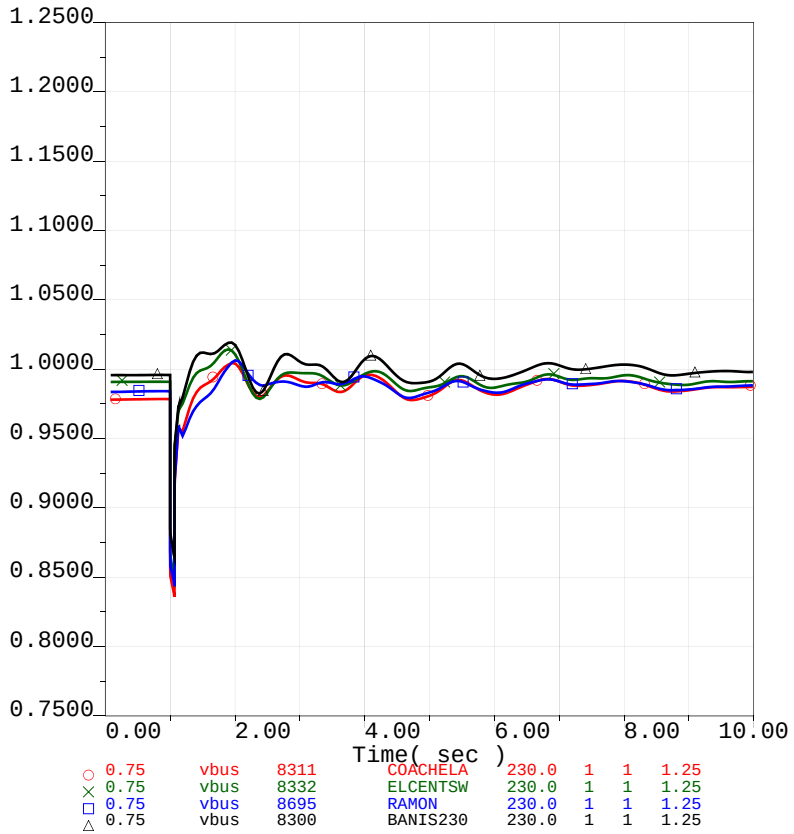
IVSG STUDY
Light Autumn Case
Trip Hassayampa - N. Gila 500 kV
Case ALT 2A DISPATCH 3

Rotor Angles for Gen Busses




IVSG STUDY
Light Autumn Case
Trip Hassayampa - N. Gila 500 kV
Case ALT 2A DISPATCH 3

IID Busses



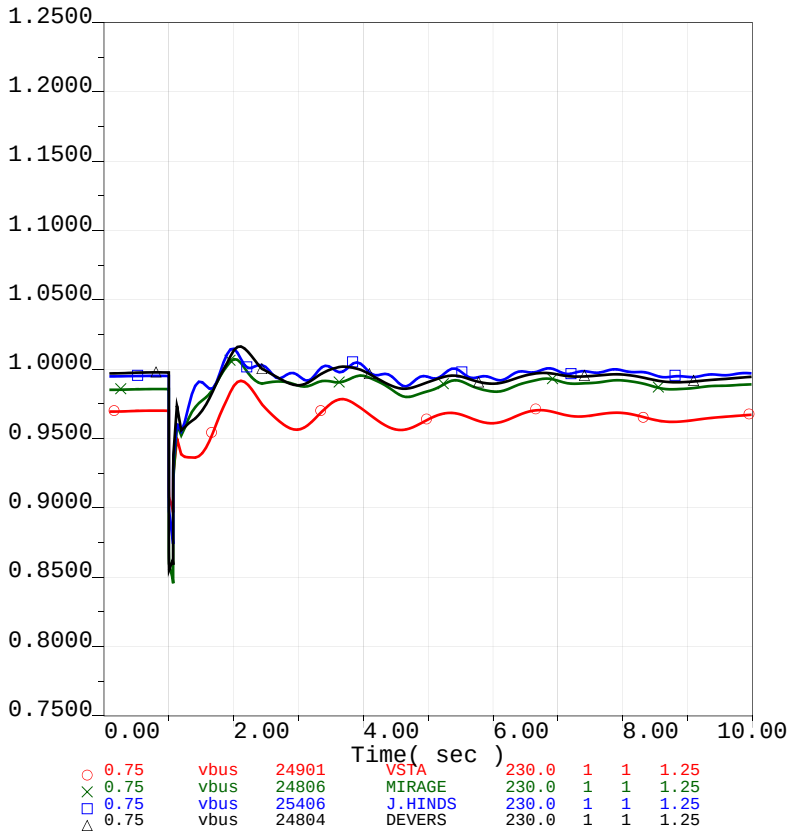

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbus | 8311 | COACHELA | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 8332 | ELCENTSW | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 8695 | RAMON | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbus | 8300 | BANIS230 | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip Hassayampa - N. Gila 500 kV
Case ALT 3B DISPATCH 3





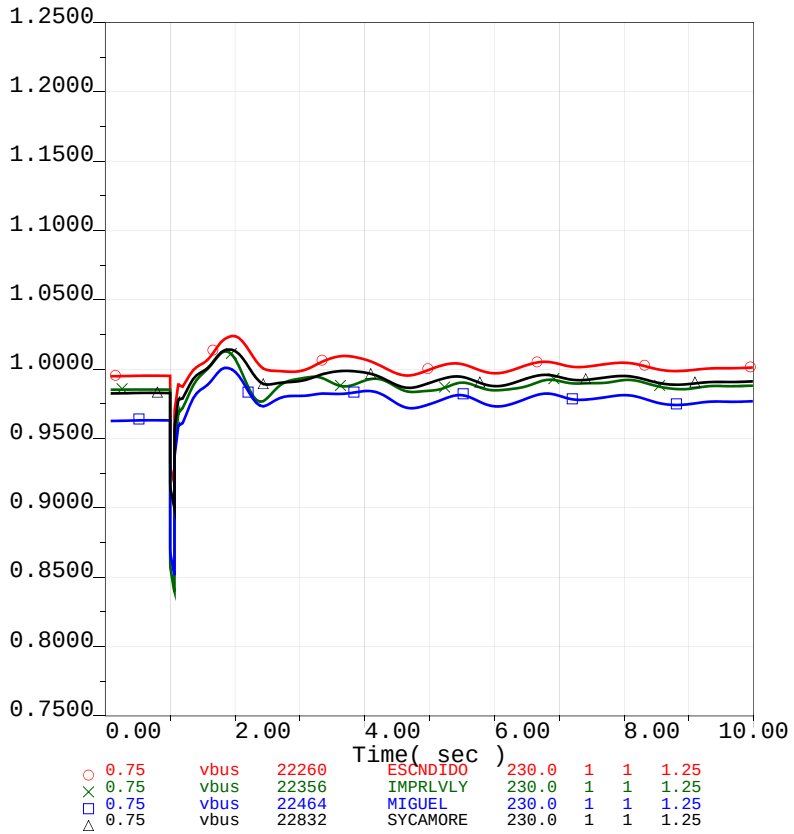
SCE Busses




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbus | 24901 | VSTA | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 24806 | MIRAGE | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 25406 | J.HINDS | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbus | 24804 | DEVERS | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip Hassayampa - N. Gila 500 kV
Case ALT 3B DISPATCH 3

SDGE Busses



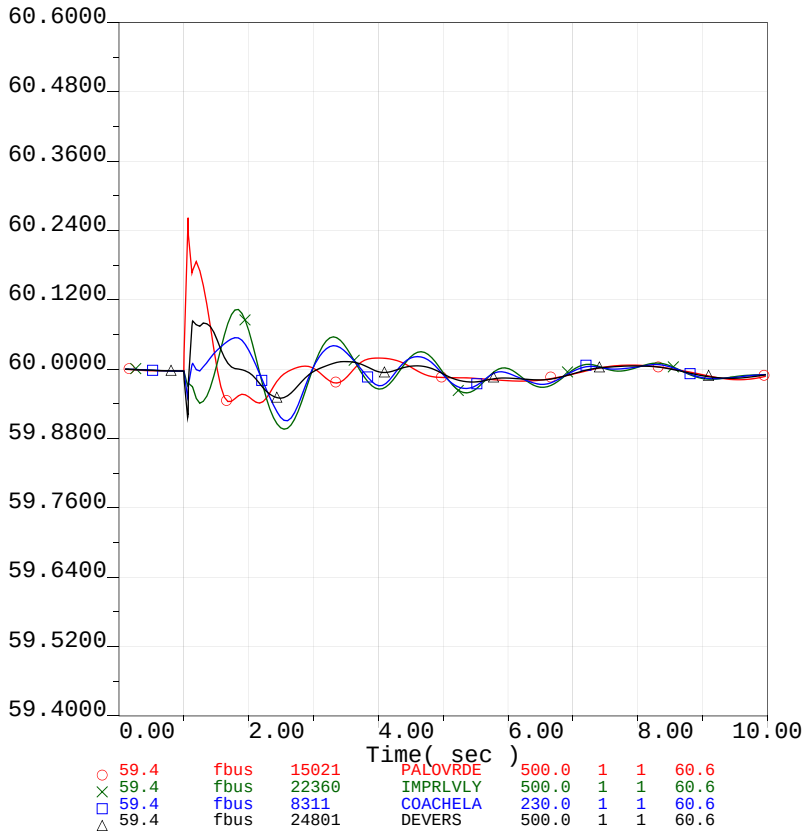

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ○ | 0.75 | vbus | 22260 | ESCNDIDO | 230.0 | 1 | 1 | 1.25 |
| × | 0.75 | vbus | 22356 | IMPRLVLY | 230.0 | 1 | 1 | 1.25 |
| □ | 0.75 | vbus | 22464 | MIGUEL | 230.0 | 1 | 1 | 1.25 |
| △ | 0.75 | vbus | 22832 | SYCAMORE | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip Hassayampa - N. Gila 500 kV
Case ALT 3B DISPATCH 3



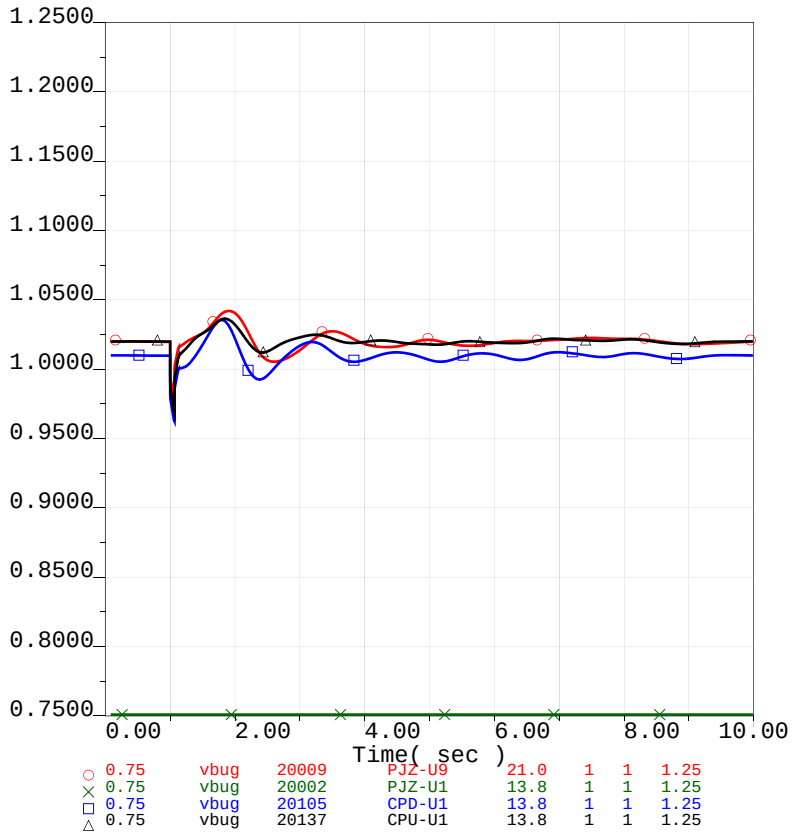


FBus Readings




| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ○ | 59.4 | fbus | 15021 | PALOVRDE | 500.0 | 1 | 1 | 60.6 |
| × | 59.4 | fbus | 22360 | IMPRLVLY | 500.0 | 1 | 1 | 60.6 |
| □ | 59.4 | fbus | 8311 | COACHELA | 230.0 | 1 | 1 | 60.6 |
| △ | 59.4 | fbus | 24801 | DEVERS | 500.0 | 1 | 1 | 60.6 |

IVSG STUDY
Light Autumn Case
Trip Hassayampa - N. Gila 500 kV
Case ALT 3B DISPATCH 3

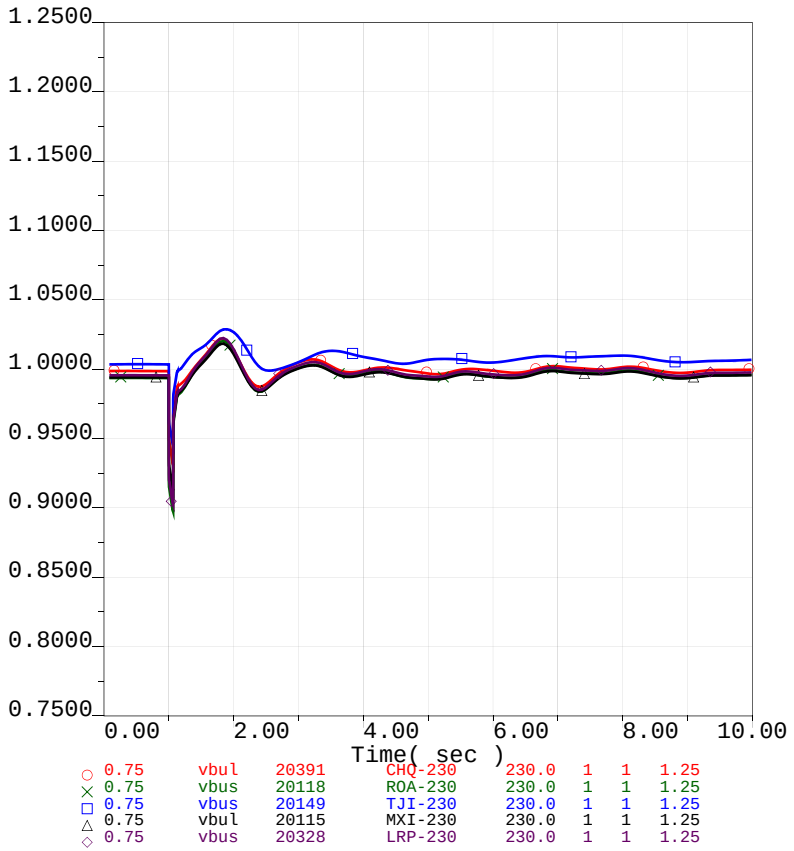



| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbug | 20009 | PJZ-U9 | 21.0 | 1 | 1 | 1.25 |
| × 0.75 | vbug | 20002 | PJZ-U1 | 13.8 | 1 | 1 | 1.25 |
| □ 0.75 | vbug | 20105 | CPD-U1 | 13.8 | 1 | 1 | 1.25 |
| △ 0.75 | vbug | 20137 | CPU-U1 | 13.8 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip Hassayampa - N. Gila 500 kV
Case ALT 3B DISPATCH 3



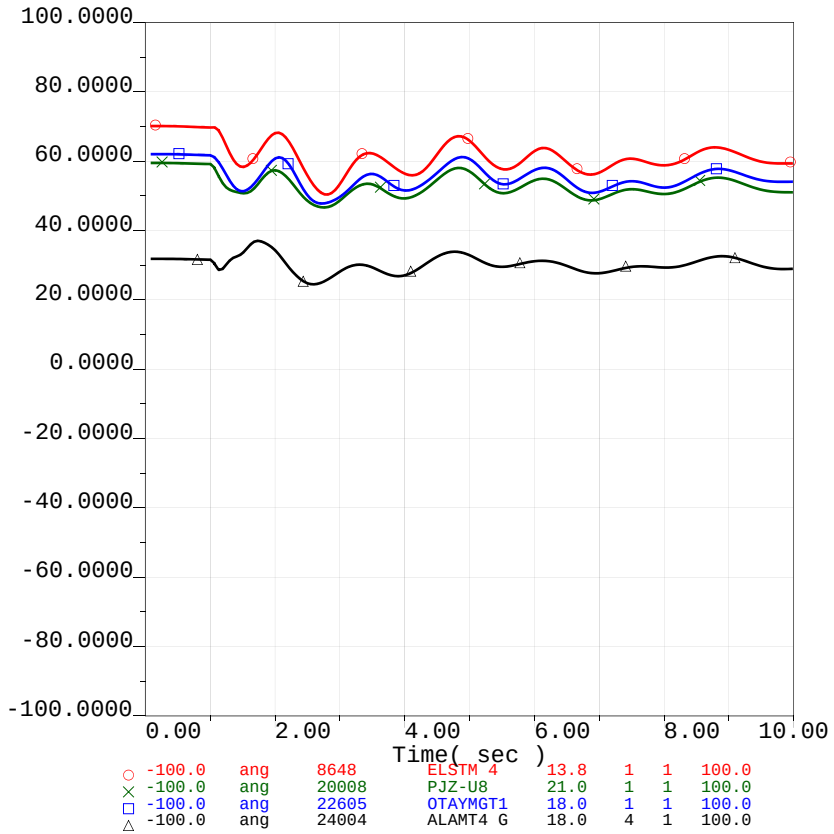





| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbul | 20391 | CHQ-230 | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 20118 | ROA-230 | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 20149 | TJI-230 | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbul | 20115 | MXI-230 | 230.0 | 1 | 1 | 1.25 |
| ◇ 0.75 | vbus | 20328 | LRP-230 | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip Hassayampa - N. Gila 500 kV
Case ALT 3B DISPATCH 3

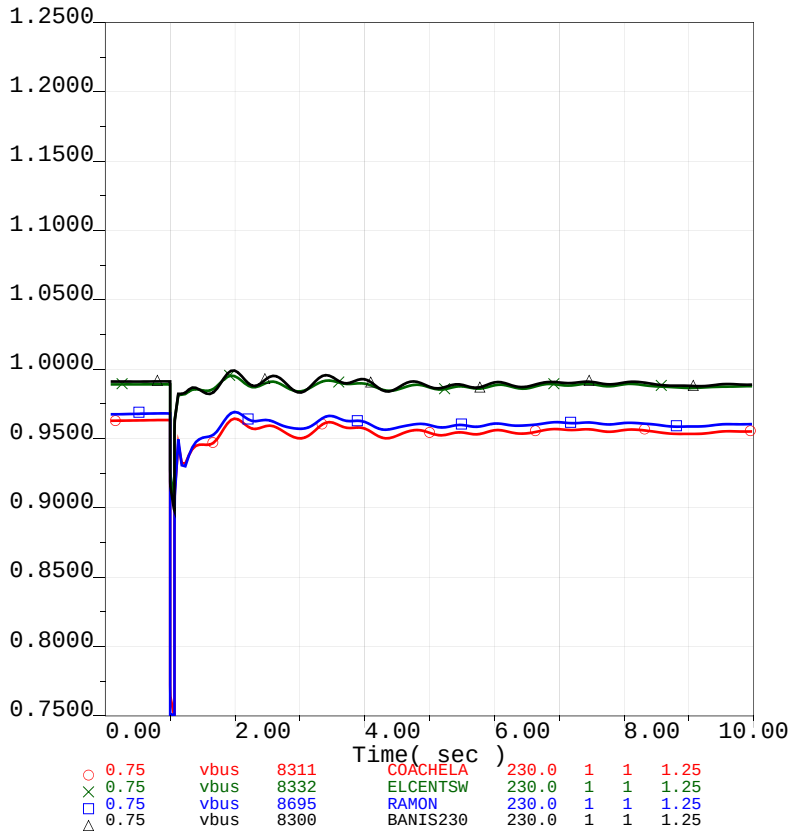
Rotor Angles for Gen Busses




| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ○ | -100.0 | ang | 8648 | ELSTM 4 | 13.8 | 1 | 1 | 100.0 |
| × | -100.0 | ang | 20008 | PJZ-U8 | 21.0 | 1 | 1 | 100.0 |
| □ | -100.0 | ang | 22605 | OTAYMGT1 | 18.0 | 1 | 1 | 100.0 |
| △ | -100.0 | ang | 24004 | ALAMT4 G | 18.0 | 4 | 1 | 100.0 |

IVSG STUDY
Light Autumn Case
Trip Hassayampa - N. Gila 500 kV
Case ALT 3B DISPATCH 3

IID Busses



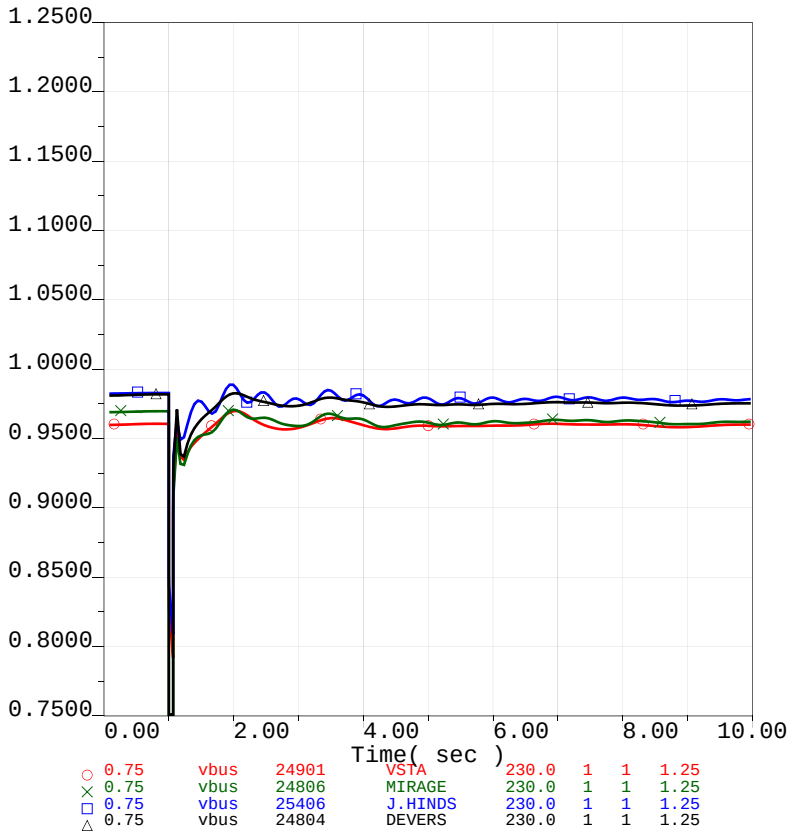

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbus | 8311 | COACHELA | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 8332 | ELCENTSW | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 8695 | RAMON | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbus | 8300 | BANIS230 | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip MIDPINTS - DEVERS 500 kV
Case ALT 2 DISPATCH 3





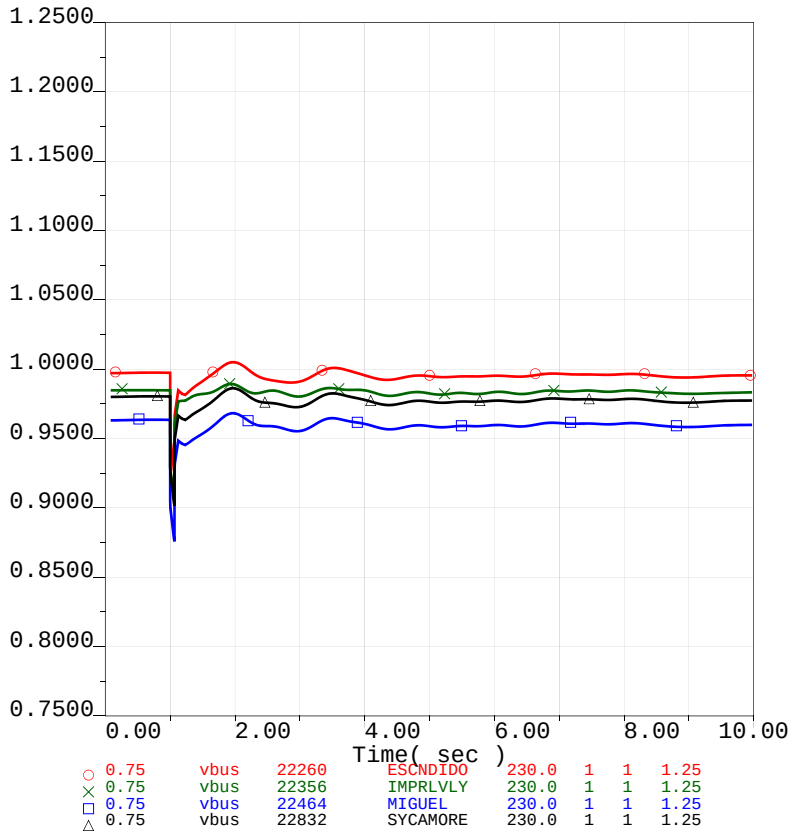
SCE Busses




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbus | 24901 | VSTA | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 24806 | MIRAGE | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 25406 | J.HINDS | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbus | 24804 | DEVERS | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip MIDPINTS - DEVERS 500 kV
Case ALT 2 DISPATCH 3

SDGE Busses

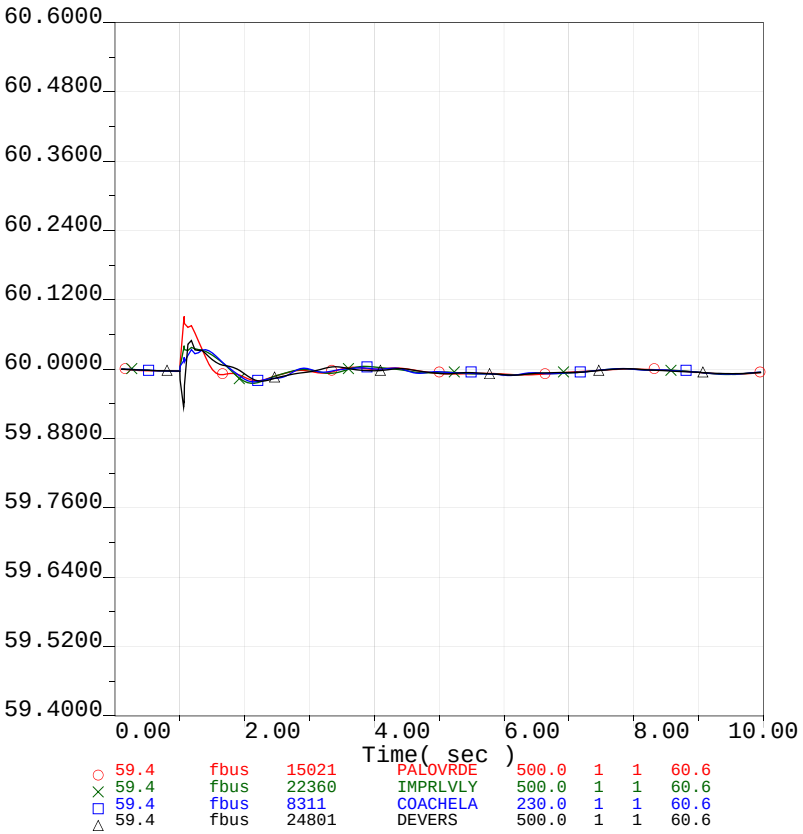



| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ○ | 0.75 | vbus | 22260 | ESCNDIDO | 230.0 | 1 | 1 | 1.25 |
| × | 0.75 | vbus | 22356 | IMPRLVLY | 230.0 | 1 | 1 | 1.25 |
| □ | 0.75 | vbus | 22464 | MIGUEL | 230.0 | 1 | 1 | 1.25 |
| △ | 0.75 | vbus | 22832 | SYCAMORE | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip MIDPINTS - DEVERS 500 kV
Case ALT 2 DISPATCH 3



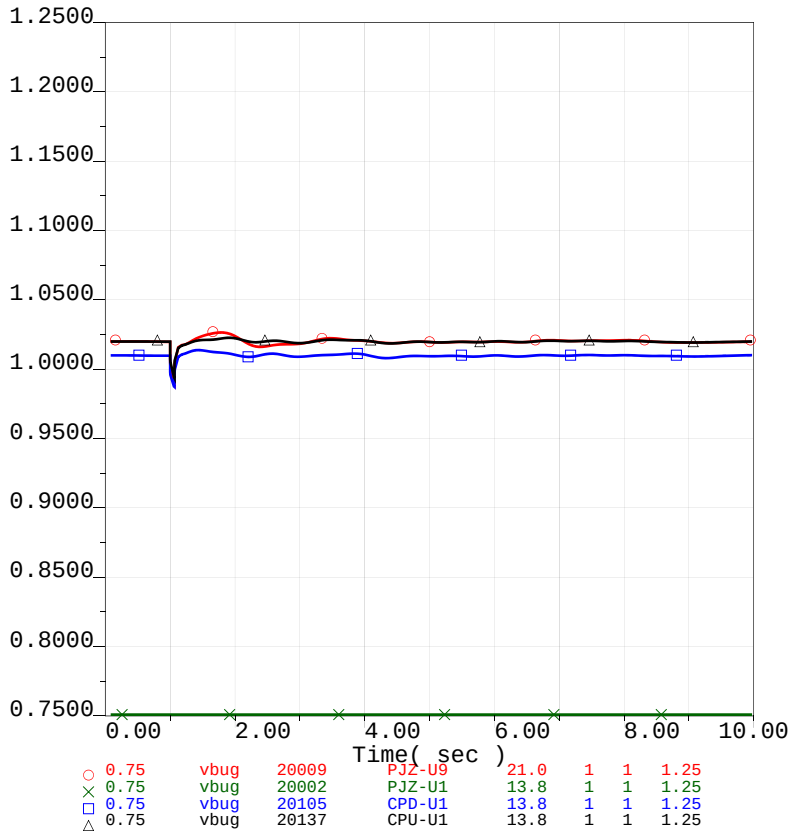
FBus Readings




| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ○ | 59.4 | fbus | 15021 | PALOVRDE | 500.0 | 1 | 1 | 60.6 |
| × | 59.4 | fbus | 22360 | IMPRLVLY | 500.0 | 1 | 1 | 60.6 |
| □ | 59.4 | fbus | 8311 | COACHELA | 230.0 | 1 | 1 | 60.6 |
| △ | 59.4 | fbus | 24801 | DEVERS | 500.0 | 1 | 1 | 60.6 |

IVSG STUDY
Light Autumn Case
Trip MIDPINTS - DEVERS 500 kV
Case ALT 2 DISPATCH 3

CFE Busses Page 1

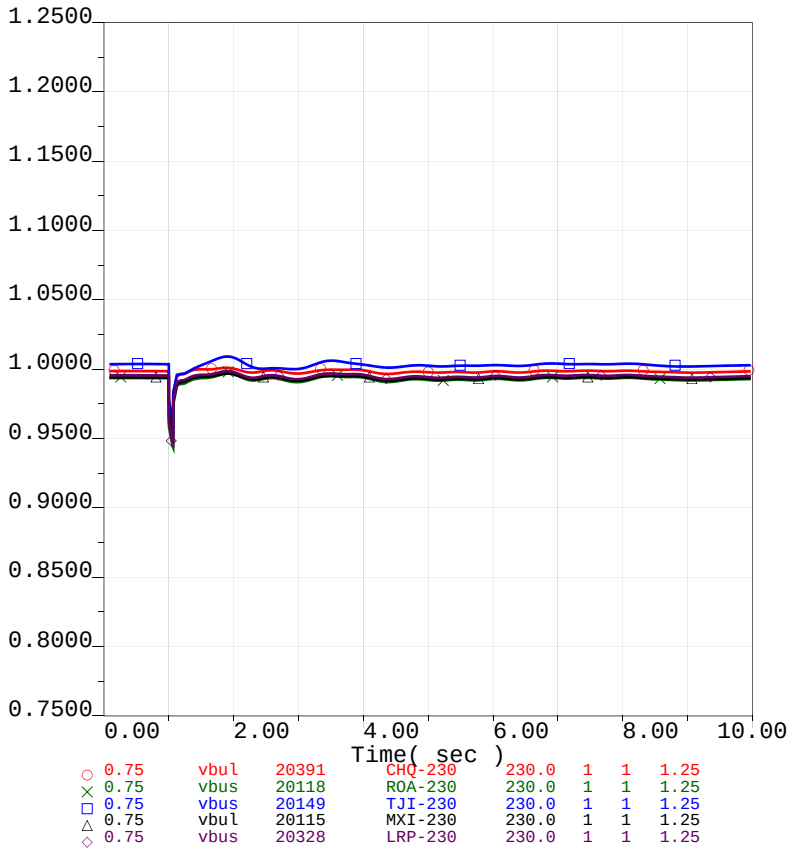



| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbug | 20009 | PJZ-U9 | 21.0 | 1 | 1 | 1.25 |
| × 0.75 | vbug | 20002 | PJZ-U1 | 13.8 | 1 | 1 | 1.25 |
| □ 0.75 | vbug | 20105 | CPD-U1 | 13.8 | 1 | 1 | 1.25 |
| △ 0.75 | vbug | 20137 | CPU-U1 | 13.8 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip MIDPINTS - DEVERS 500 kV
Case ALT 2 DISPATCH 3



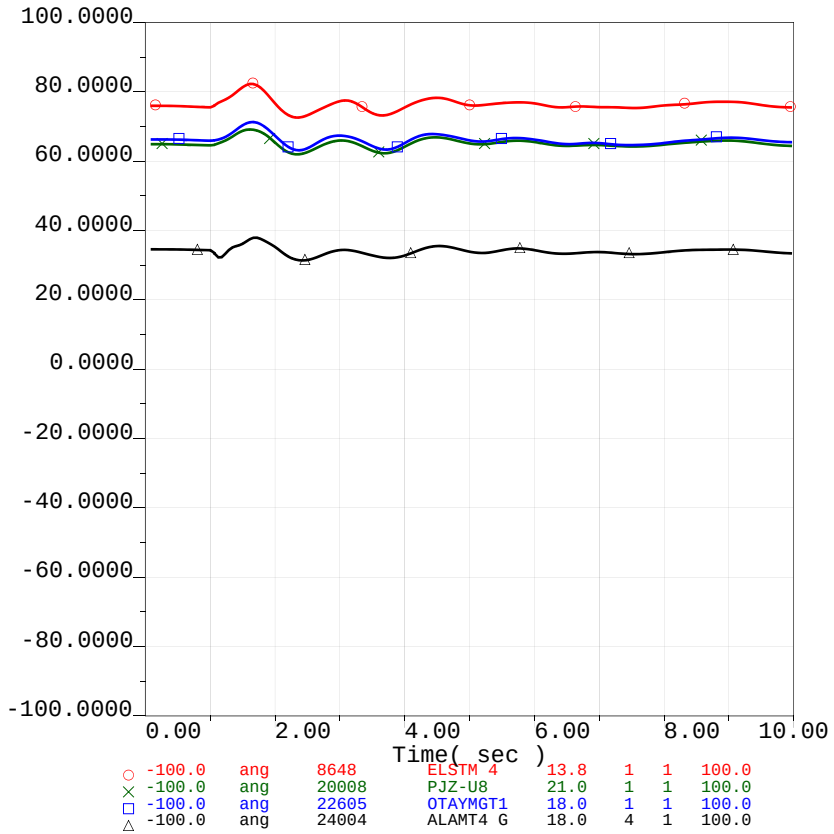
CFE Busses Page 2




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbul | 20391 | CHQ-230 | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 20118 | ROA-230 | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 20149 | TJI-230 | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbul | 20115 | MXI-230 | 230.0 | 1 | 1 | 1.25 |
| ◇ 0.75 | vbus | 20328 | LRP-230 | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip MIDPINTS - DEVERS 500 kV
Case ALT 2 DISPATCH 3

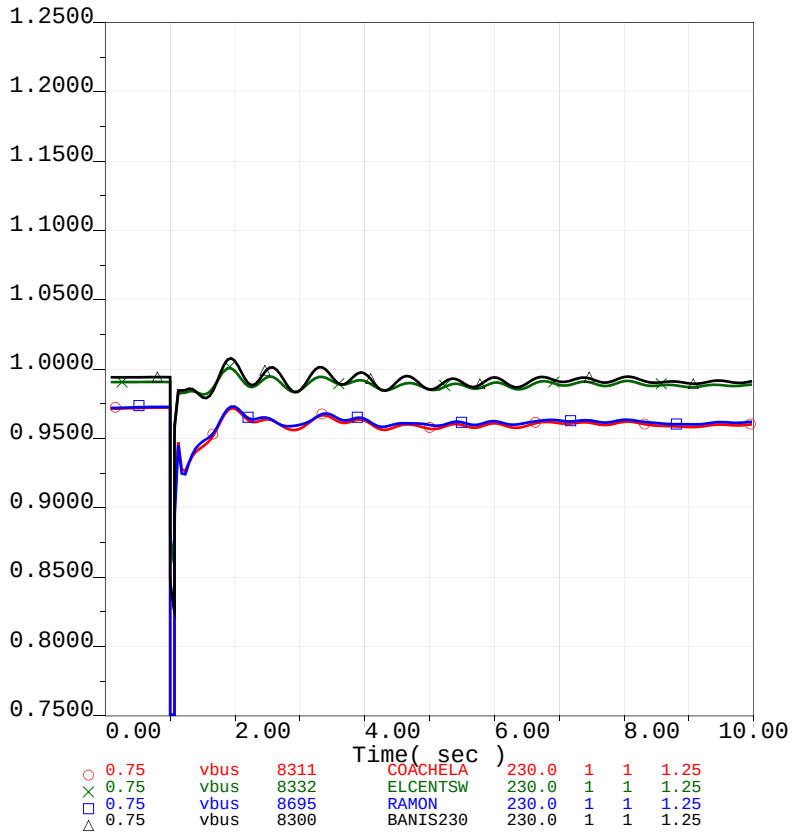
Rotor Angles for Gen Busses




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ -100.0 | ang | 8648 | ELSTM 4 | 13.8 | 1 | 1 | 100.0 |
| × -100.0 | ang | 20008 | PJZ-U8 | 21.0 | 1 | 1 | 100.0 |
| □ -100.0 | ang | 22605 | OTAYMGT1 | 18.0 | 1 | 1 | 100.0 |
| △ -100.0 | ang | 24004 | ALAMT4 G | 18.0 | 4 | 1 | 100.0 |

IVSG STUDY
Light Autumn Case
Trip MIDPINTS - DEVERS 500 kV
Case ALT 2 DISPATCH 3

IID Busses



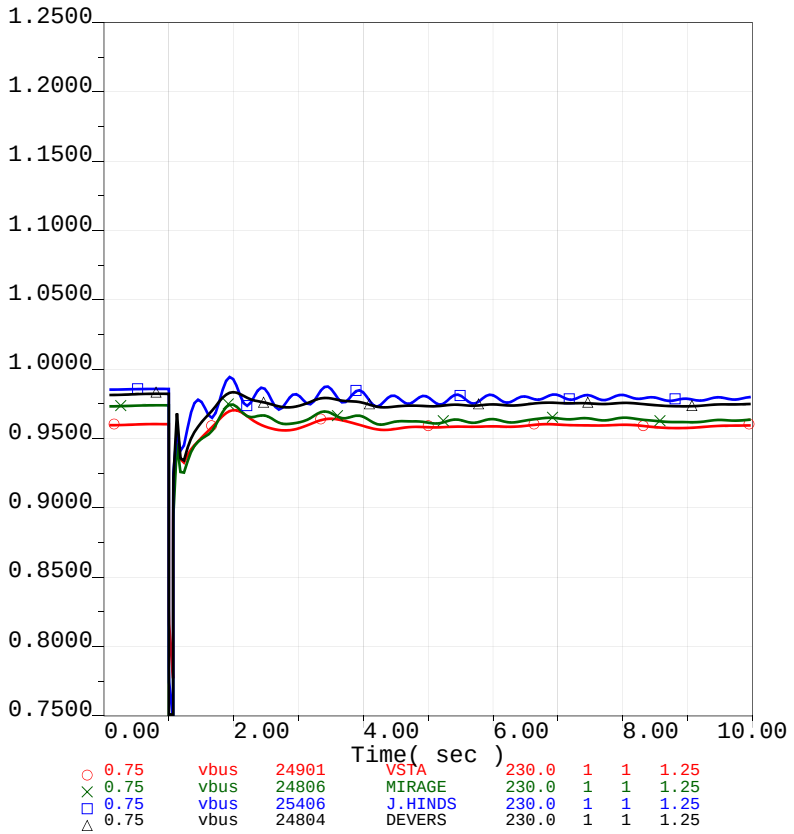

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbus | 8311 | COACHELA | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 8332 | ELCENTSW | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 8695 | RAMON | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbus | 8300 | BANIS230 | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip MIDPINTS - DEVERS 500 kV
Case ALT 2a DISPATCH 3





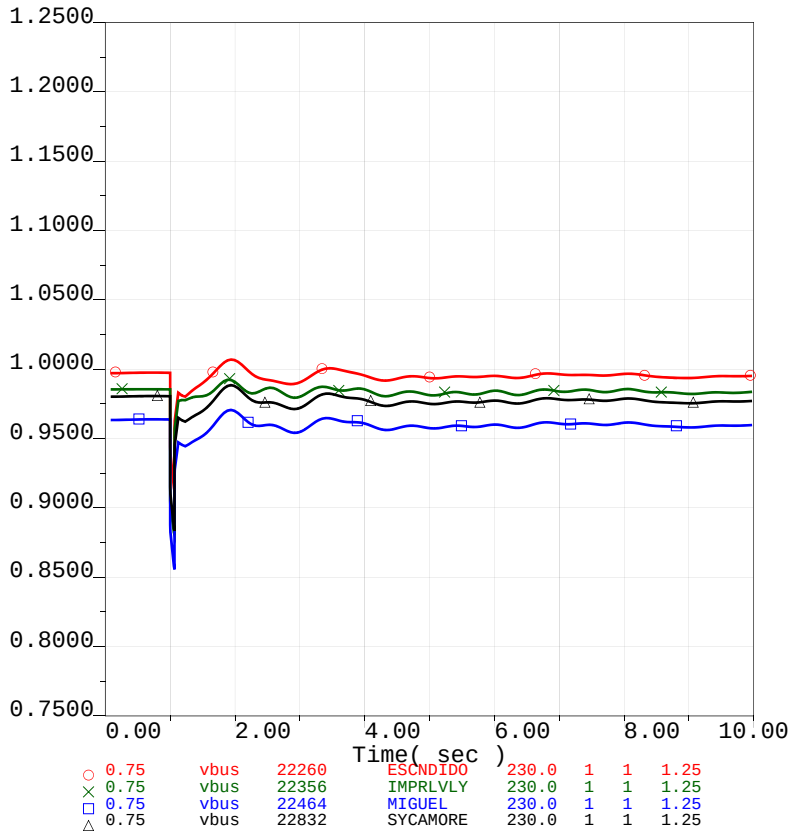
SCE Busses




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbus | 24901 | VSTA | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 24806 | MIRAGE | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 25406 | J.HINDS | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbus | 24804 | DEVERS | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip MIDPINTS - DEVERS 500 kV
Case ALT 2a DISPATCH 3

SDGE Busses

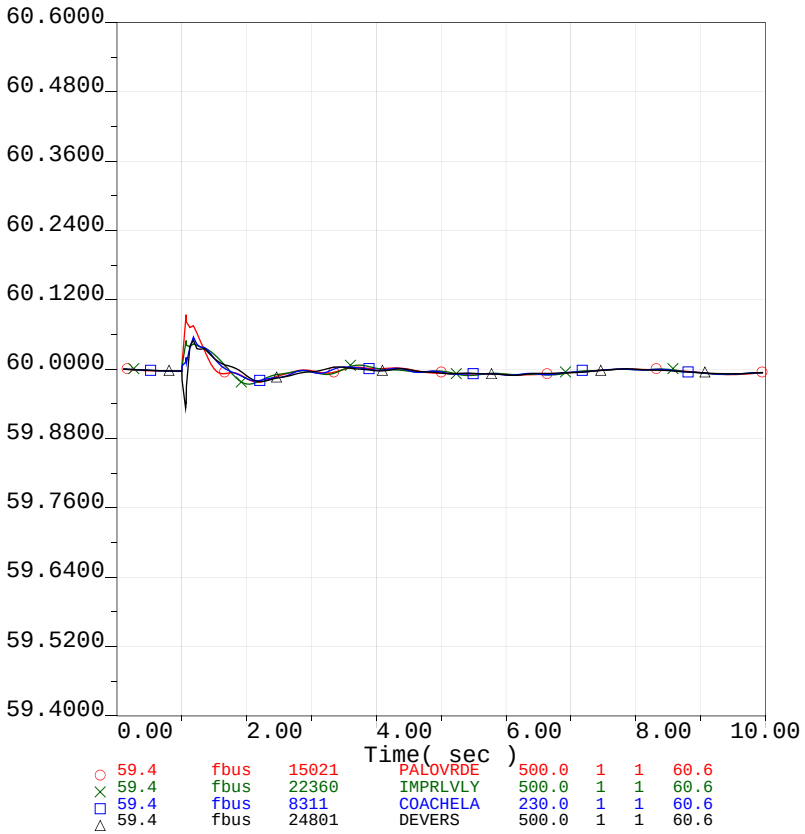



| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ○ | 0.75 | vbus | 22260 | ESCNDIDO | 230.0 | 1 | 1 | 1.25 |
| × | 0.75 | vbus | 22356 | IMPRLVLY | 230.0 | 1 | 1 | 1.25 |
| □ | 0.75 | vbus | 22464 | MIGUEL | 230.0 | 1 | 1 | 1.25 |
| △ | 0.75 | vbus | 22832 | SYCAMORE | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip MIDPINTS - DEVERS 500 kV
Case ALT 2a DISPATCH 3



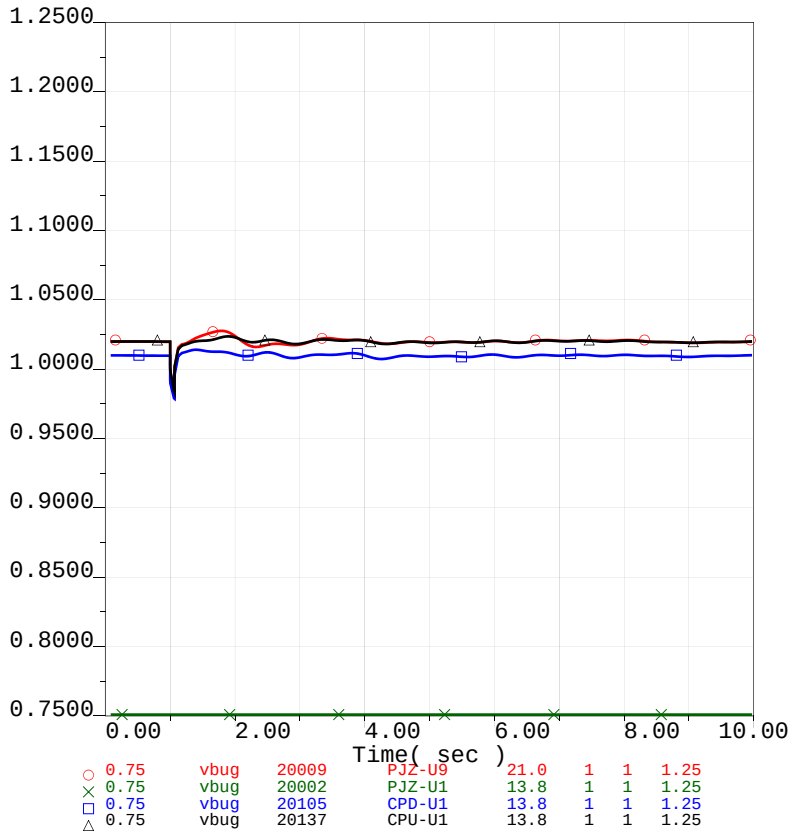
FBus Readings




| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ○ | 59.4 | fbus | 15021 | PALOVRDE | 500.0 | 1 | 1 | 60.6 |
| × | 59.4 | fbus | 22360 | IMPRLVLY | 500.0 | 1 | 1 | 60.6 |
| □ | 59.4 | fbus | 8311 | COACHELA | 230.0 | 1 | 1 | 60.6 |
| △ | 59.4 | fbus | 24801 | DEVERS | 500.0 | 1 | 1 | 60.6 |

IVSG STUDY
Light Autumn Case
Trip MIDPINTS - DEVERS 500 kV
Case ALT 2a DISPATCH 3

CFE Busses Page 1



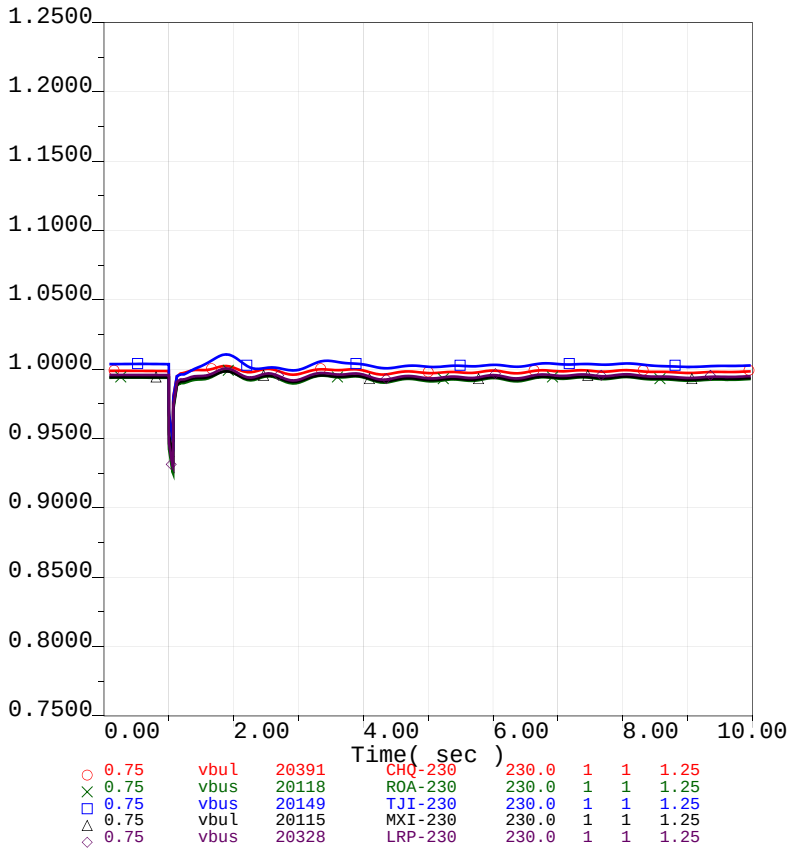

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbug | 20009 | PJZ-U9 | 21.0 | 1 | 1 | 1.25 |
| × 0.75 | vbug | 20002 | PJZ-U1 | 13.8 | 1 | 1 | 1.25 |
| □ 0.75 | vbug | 20105 | CPD-U1 | 13.8 | 1 | 1 | 1.25 |
| △ 0.75 | vbug | 20137 | CPU-U1 | 13.8 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip MIDPINTS - DEVERS 500 kV
Case ALT 2a DISPATCH 3





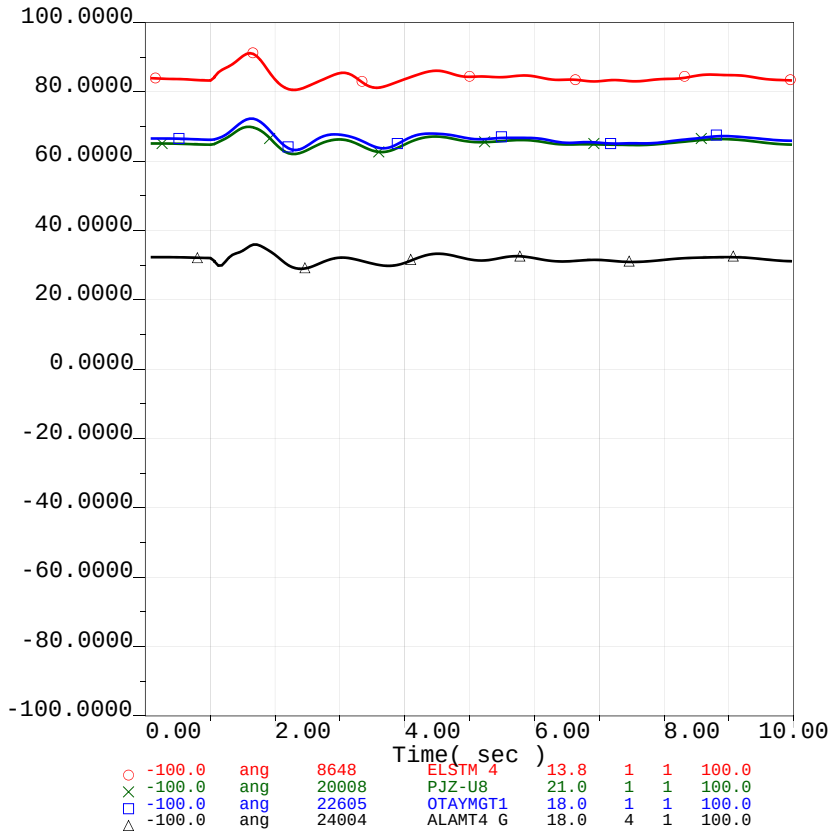
CFE Busses Page 2




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbul | 20391 | CHQ-230 | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 20118 | ROA-230 | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 20149 | TJI-230 | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbul | 20115 | MXI-230 | 230.0 | 1 | 1 | 1.25 |
| ◇ 0.75 | vbus | 20328 | LRP-230 | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip MIDPINTS - DEVERS 500 kV
Case ALT 2a DISPATCH 3

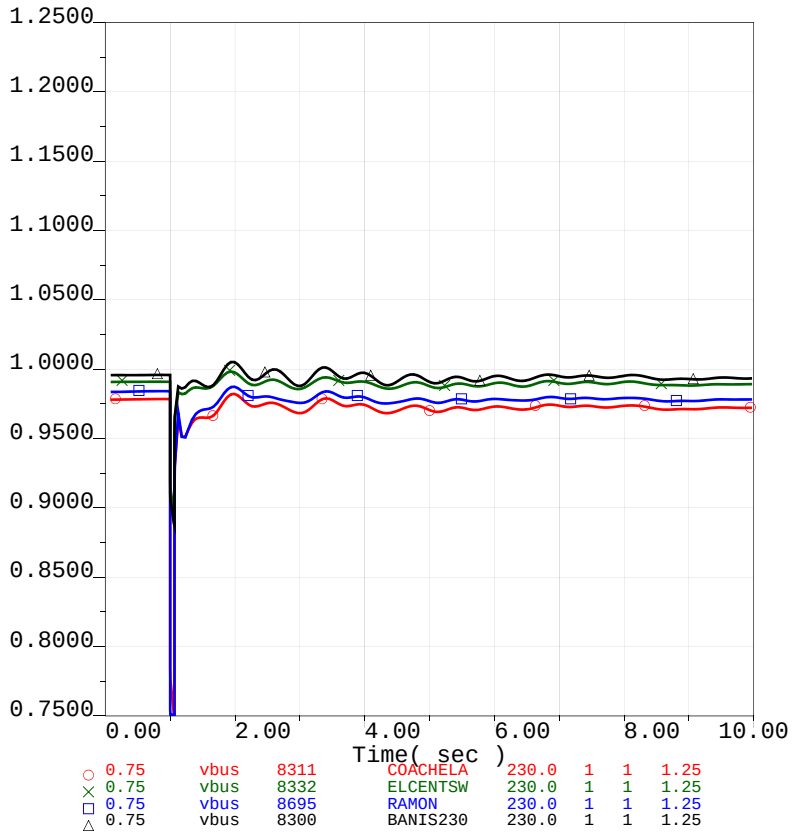
Rotor Angles for Gen Busses




| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ○ | -100.0 | ang | 8648 | ELSTM 4 | 13.8 | 1 | 1 | 100.0 |
| × | -100.0 | ang | 20008 | PJZ-U8 | 21.0 | 1 | 1 | 100.0 |
| □ | -100.0 | ang | 22605 | OTAYMGT1 | 18.0 | 1 | 1 | 100.0 |
| △ | -100.0 | ang | 24004 | ALAMT4 G | 18.0 | 4 | 1 | 100.0 |

IVSG STUDY
Light Autumn Case
Trip MIDPINTS - DEVERS 500 kV
Case ALT 2a DISPATCH 3

IID Busses

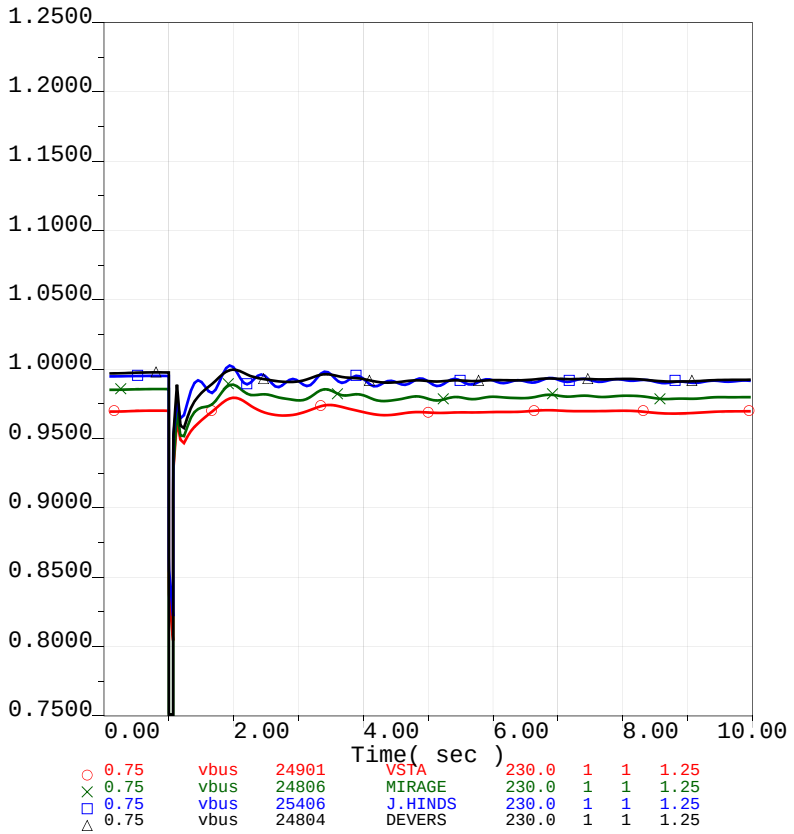



| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbus | 8311 | COACHELA | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 8332 | ELCENTSW | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 8695 | RAMON | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbus | 8300 | BANIS230 | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip MIDPINTS - DEVERS 500 kV
Case ALT 3B DISPATCH 3



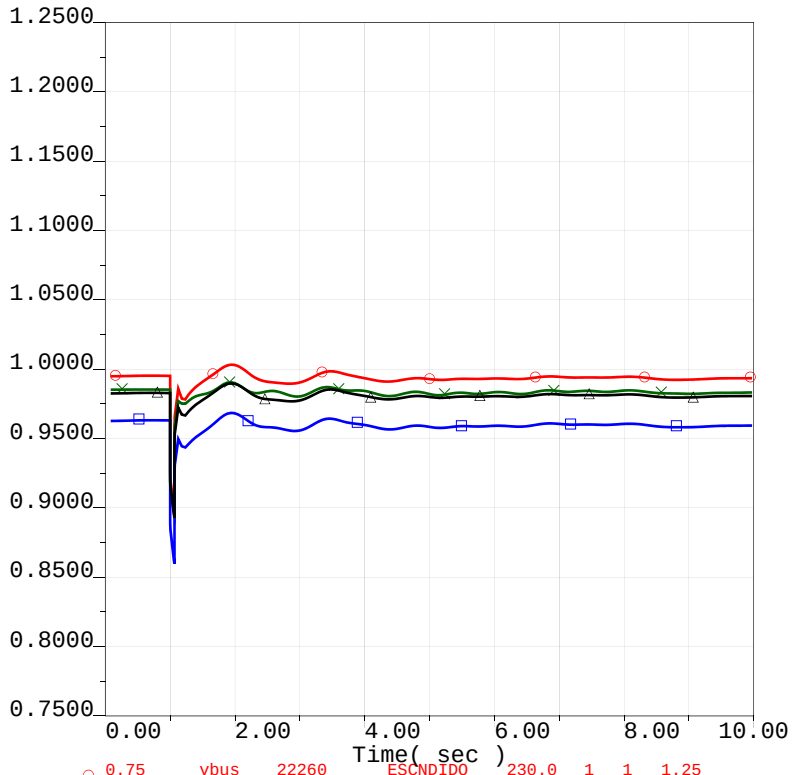
SCE Busses




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbus | 24901 | VSTA | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 24806 | MIRAGE | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 25406 | J.HINDS | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbus | 24804 | DEVERS | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip MIDPINTS - DEVERS 500 kV
Case ALT 3B DISPATCH 3

SDGE Busses

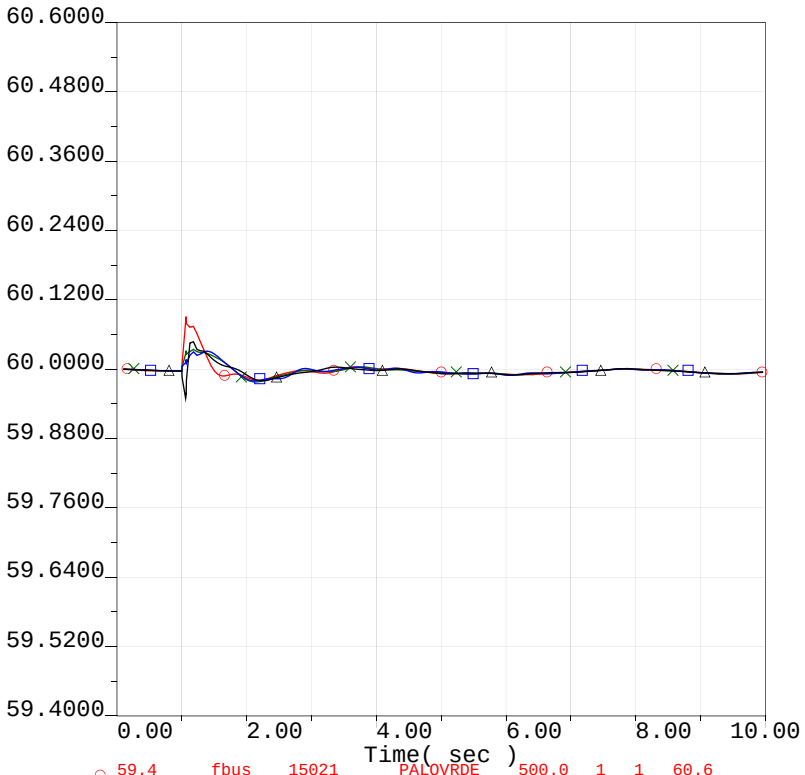



| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ○ | 0.75 | vbus | 22260 | ESCNDIDO | 230.0 | 1 | 1 | 1.25 |
| × | 0.75 | vbus | 22356 | IMPRLVLY | 230.0 | 1 | 1 | 1.25 |
| □ | 0.75 | vbus | 22464 | MIGUEL | 230.0 | 1 | 1 | 1.25 |
| △ | 0.75 | vbus | 22832 | SYCAMORE | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip MIDPINTS - DEVERS 500 kV
Case ALT 3B DISPATCH 3



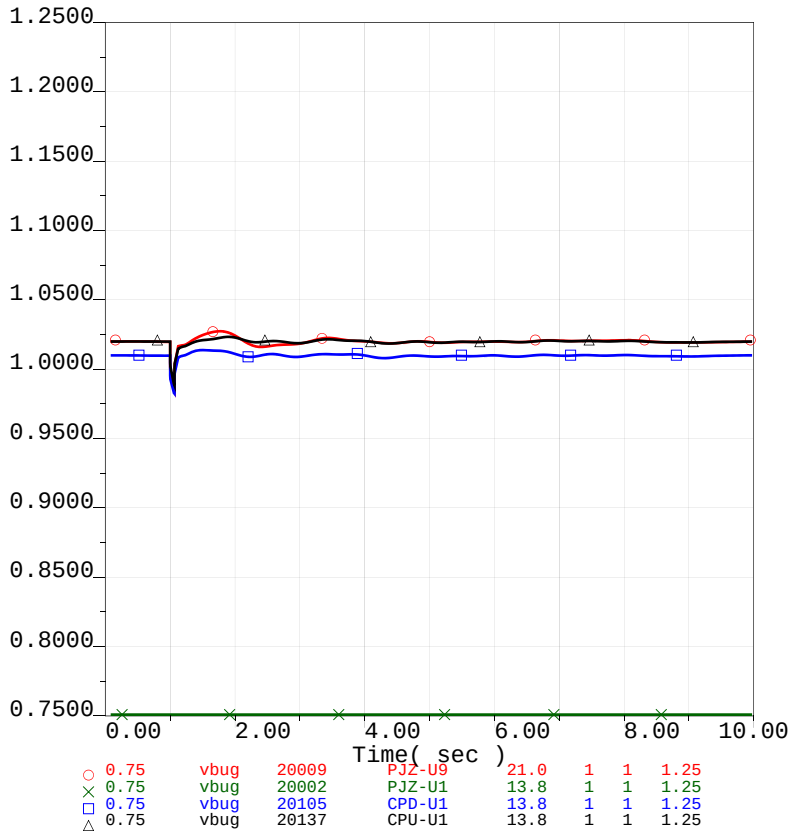
FBus Readings




| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ○ | 59.4 | fbus | 15021 | PALOVRDE | 500.0 | 1 | 1 | 60.6 |
| × | 59.4 | fbus | 22360 | IMPRLVLY | 500.0 | 1 | 1 | 60.6 |
| □ | 59.4 | fbus | 8311 | COACHELA | 230.0 | 1 | 1 | 60.6 |
| △ | 59.4 | fbus | 24801 | DEVERS | 500.0 | 1 | 1 | 60.6 |

IVSG STUDY
Light Autumn Case
Trip MIDPINTS - DEVERS 500 kV
Case ALT 3B DISPATCH 3

CFE Busses Page 1



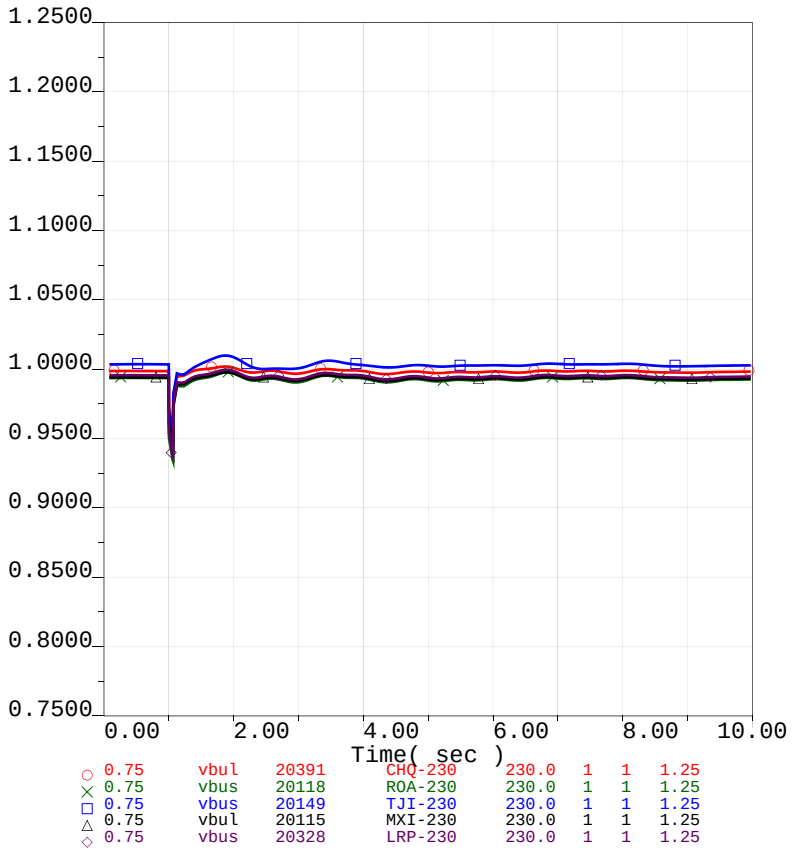

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbug | 20009 | PJZ-U9 | 21.0 | 1 | 1 | 1.25 |
| × 0.75 | vbug | 20002 | PJZ-U1 | 13.8 | 1 | 1 | 1.25 |
| □ 0.75 | vbug | 20105 | CPD-U1 | 13.8 | 1 | 1 | 1.25 |
| △ 0.75 | vbug | 20137 | CPU-U1 | 13.8 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip MIDPINTS - DEVERS 500 kV
Case ALT 3B DISPATCH 3





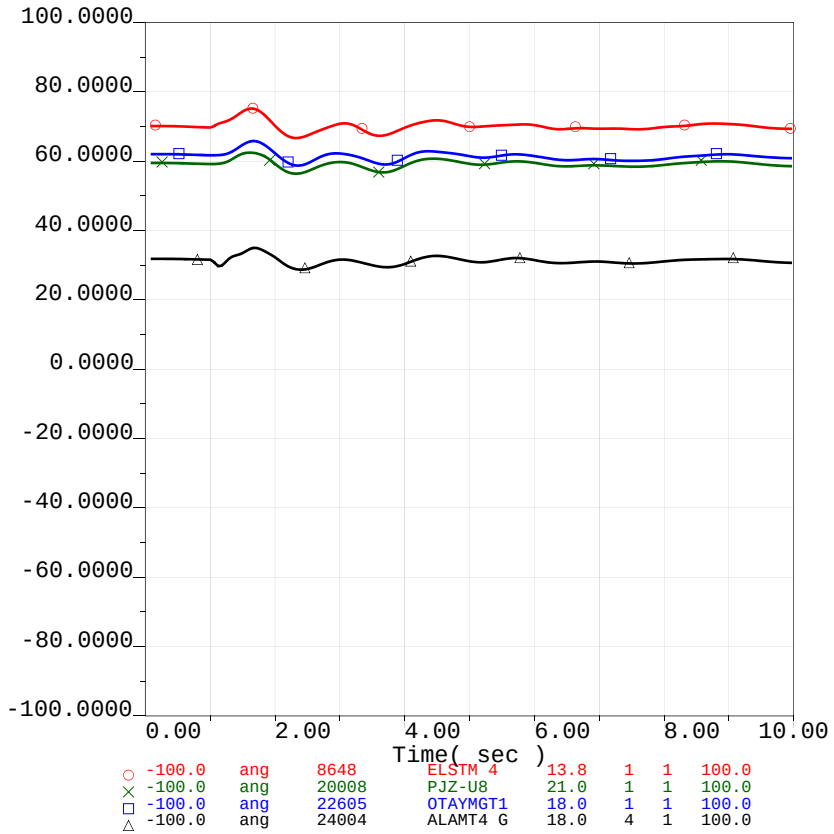
CFE Busses Page 2




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbul | 20391 | CHQ-230 | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 20118 | ROA-230 | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 20149 | TJI-230 | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbul | 20115 | MXI-230 | 230.0 | 1 | 1 | 1.25 |
| ◇ 0.75 | vbus | 20328 | LRP-230 | 230.0 | 1 | 1 | 1.25 |

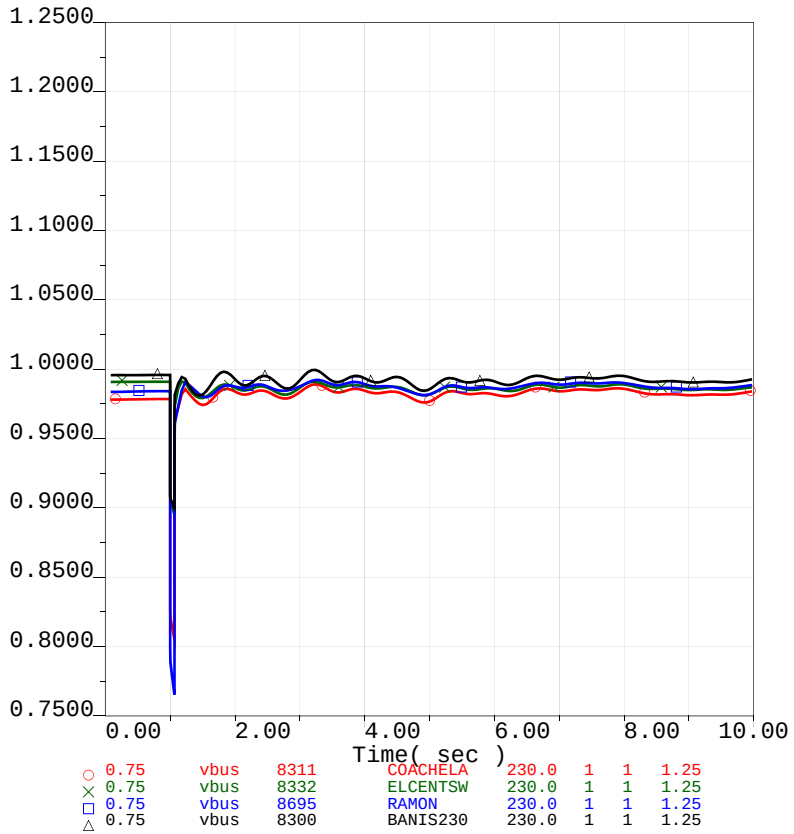
IVSG STUDY
Light Autumn Case
Trip MIDPINTS - DEVERS 500 kV
Case ALT 3B DISPATCH 3

Rotor Angles for Gen Busses




IVSG STUDY
Light Autumn Case
Trip MIDPINTS - DEVERS 500 kV
Case ALT 3B DISPATCH 3

IID Busses



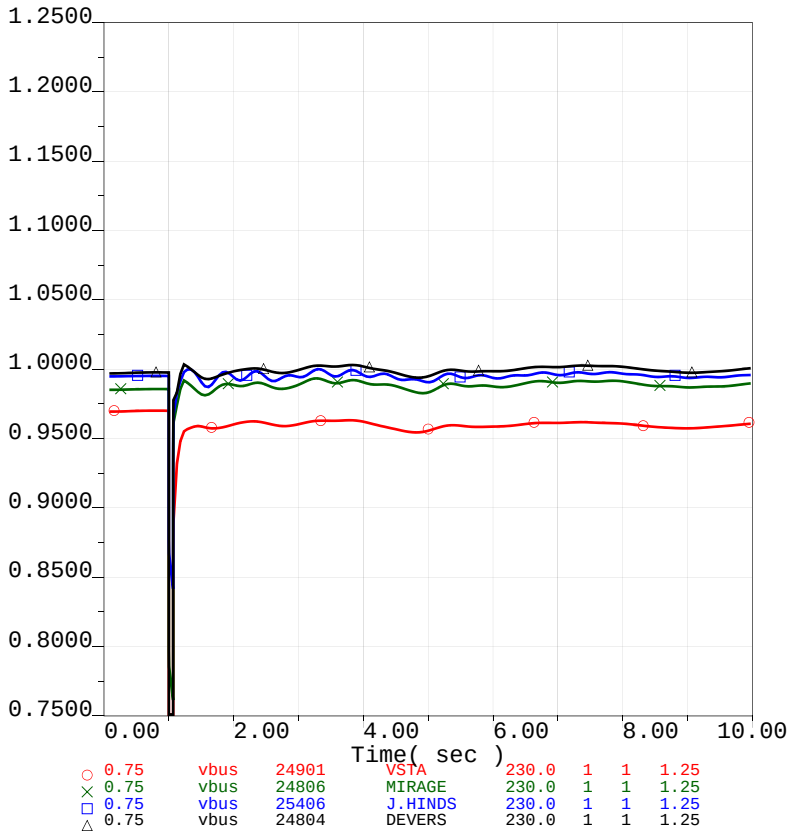

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbus | 8311 | COACHELA | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 8332 | ELCENTSW | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 8695 | RAMON | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbus | 8300 | BANIS230 | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip SerVal - Valley 500 kV
Case ALT 3b DISPATCH 3





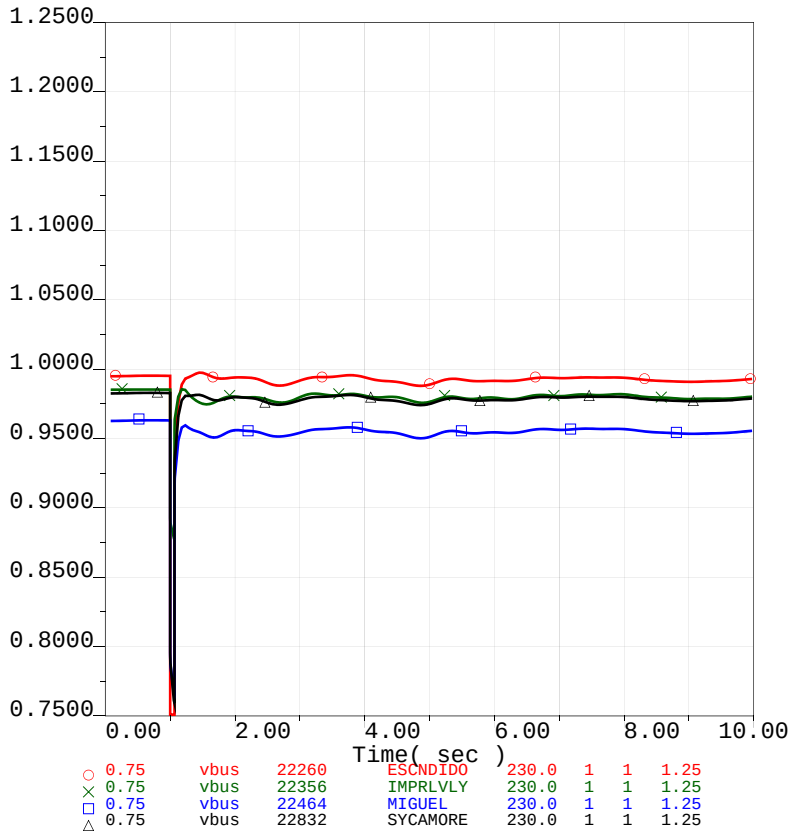
SCE Busses




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbus | 24901 | VSTA | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 24806 | MIRAGE | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 25406 | J.HINDS | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbus | 24804 | DEVERS | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip SerVal - Valley 500 kV
Case ALT 3b DISPATCH 3

SDGE Busses



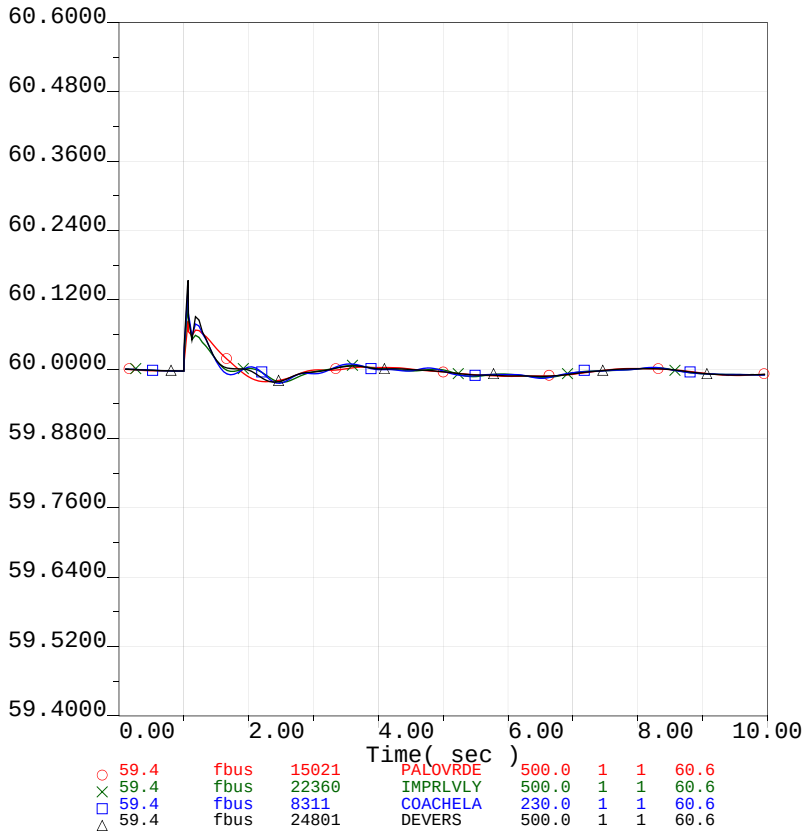

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ○ | 0.75 | vbus | 22260 | ESCNDIDO | 230.0 | 1 | 1 | 1.25 |
| × | 0.75 | vbus | 22356 | IMPRLVLY | 230.0 | 1 | 1 | 1.25 |
| □ | 0.75 | vbus | 22464 | MIGUEL | 230.0 | 1 | 1 | 1.25 |
| △ | 0.75 | vbus | 22832 | SYCAMORE | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip SerVal - Valley 500 kV
Case ALT 3b DISPATCH 3



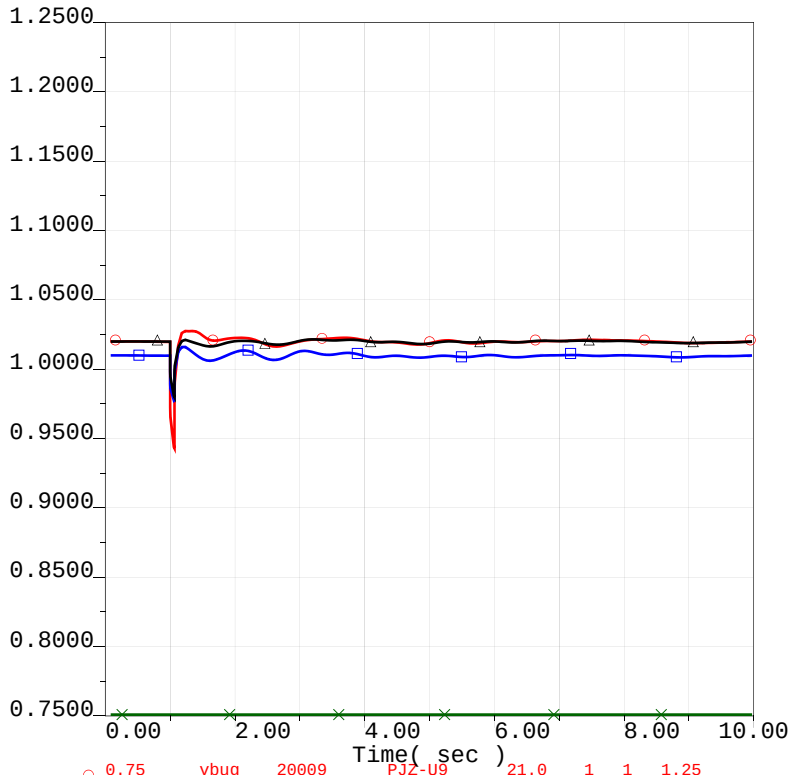


FBus Readings




| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ○ | 59.4 | fbus | 15021 | PALOVRDE | 500.0 | 1 | 1 | 60.6 |
| × | 59.4 | fbus | 22360 | IMPRLVLY | 500.0 | 1 | 1 | 60.6 |
| □ | 59.4 | fbus | 8311 | COACHELA | 230.0 | 1 | 1 | 60.6 |
| △ | 59.4 | fbus | 24801 | DEVERS | 500.0 | 1 | 1 | 60.6 |

IVSG STUDY
Light Autumn Case
Trip SerVal - Valley 500 kV
Case ALT 3b DISPATCH 3

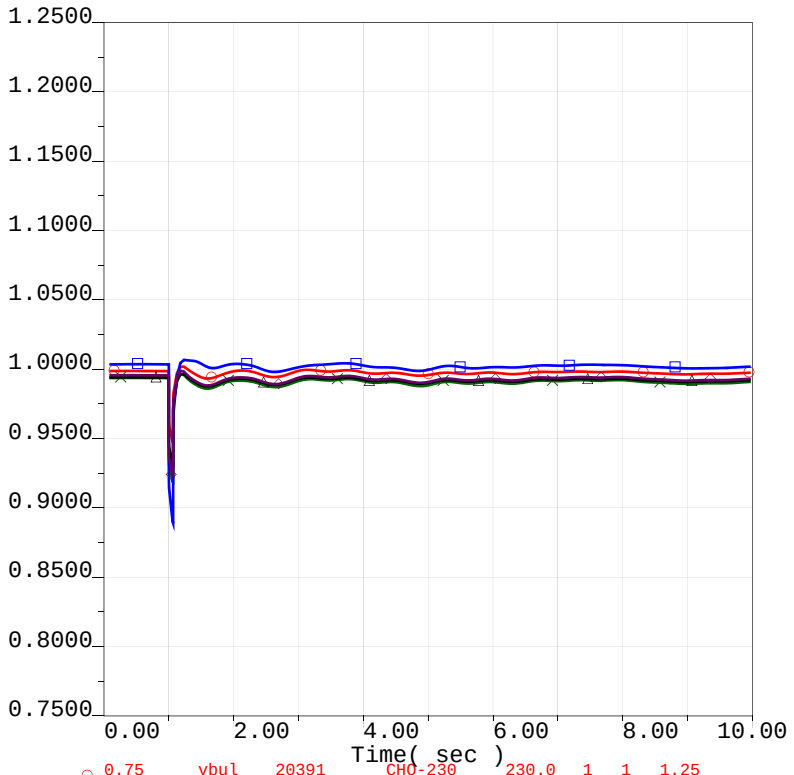



| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbug | 20009 | PJZ-U9 | 21.0 | 1 | 1 | 1.25 |
| × 0.75 | vbug | 20002 | PJZ-U1 | 13.8 | 1 | 1 | 1.25 |
| □ 0.75 | vbug | 20105 | CPD-U1 | 13.8 | 1 | 1 | 1.25 |
| △ 0.75 | vbug | 20137 | CPU-U1 | 13.8 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip SerVal - Valley 500 kV
Case ALT 3b DISPATCH 3



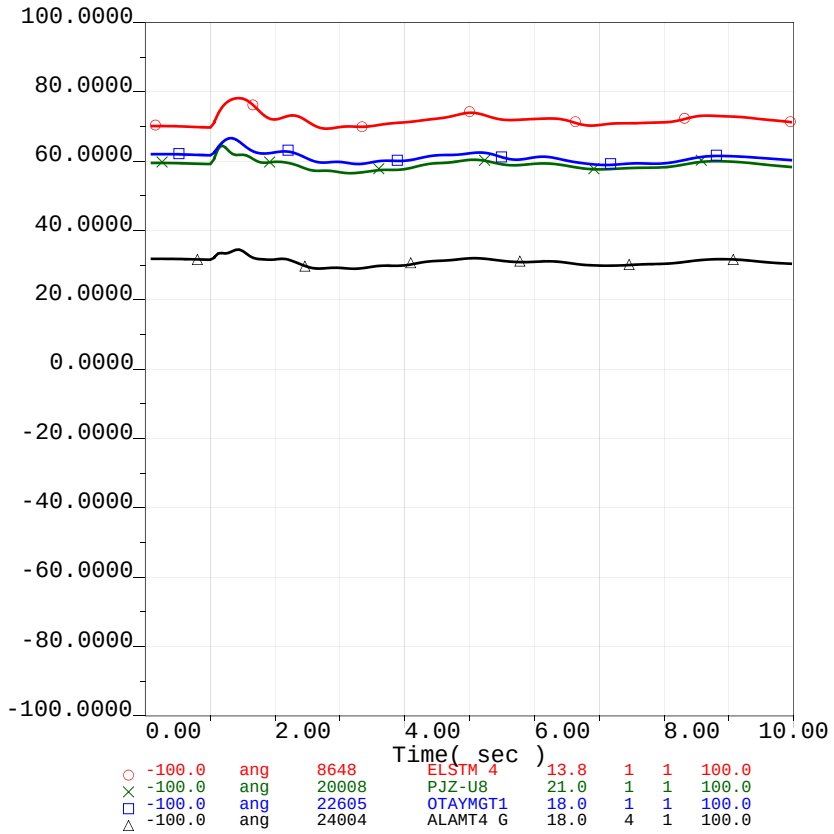





| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbul | 20391 | CHQ-230 | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 20118 | ROA-230 | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 20149 | TJI-230 | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbul | 20115 | MXI-230 | 230.0 | 1 | 1 | 1.25 |
| ◇ 0.75 | vbus | 20328 | LRP-230 | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip SerVal - Valley 500 kV
Case ALT 3b DISPATCH 3

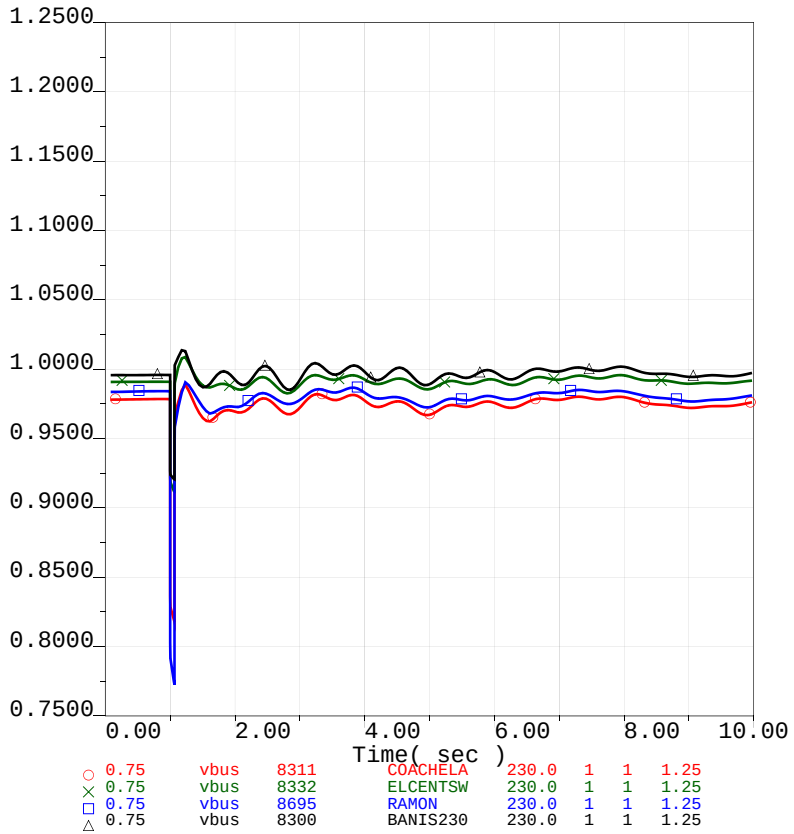
Rotor Angles for Gen Busses




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ -100.0 | ang | 8648 | ELSTM 4 | 13.8 | 1 | 1 | 100.0 |
| × -100.0 | ang | 20008 | PJZ-U8 | 21.0 | 1 | 1 | 100.0 |
| □ -100.0 | ang | 22605 | OTAYMGT1 | 18.0 | 1 | 1 | 100.0 |
| △ -100.0 | ang | 24004 | ALAMT4 G | 18.0 | 4 | 1 | 100.0 |

IVSG STUDY
Light Autumn Case
Trip SerVal - Valley 500 kV
Case ALT 3b DISPATCH 3

IID Busses

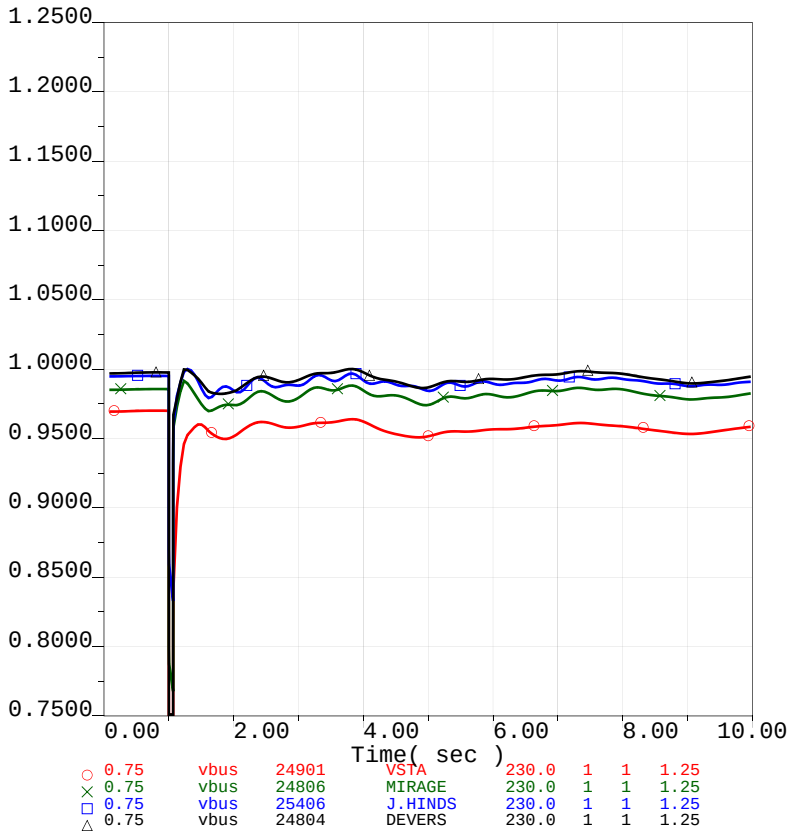



| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbus | 8311 | COACHELA | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 8332 | ELCENTSW | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 8695 | RAMON | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbus | 8300 | BANIS230 | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip Serrano - SerVal 500 kV
Case ALT 3b DISPATCH 3



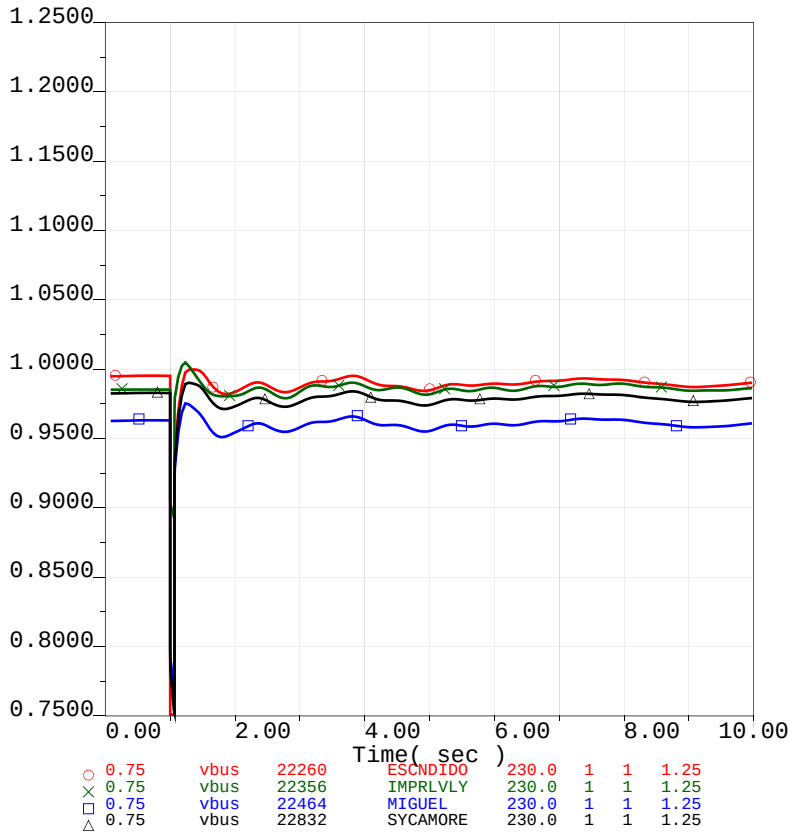
SCE Busses




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbus | 24901 | VSTA | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 24806 | MIRAGE | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 25406 | J.HINDS | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbus | 24804 | DEVERS | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip Serrano - SerVal 500 kV
Case ALT 3b DISPATCH 3

SDGE Busses



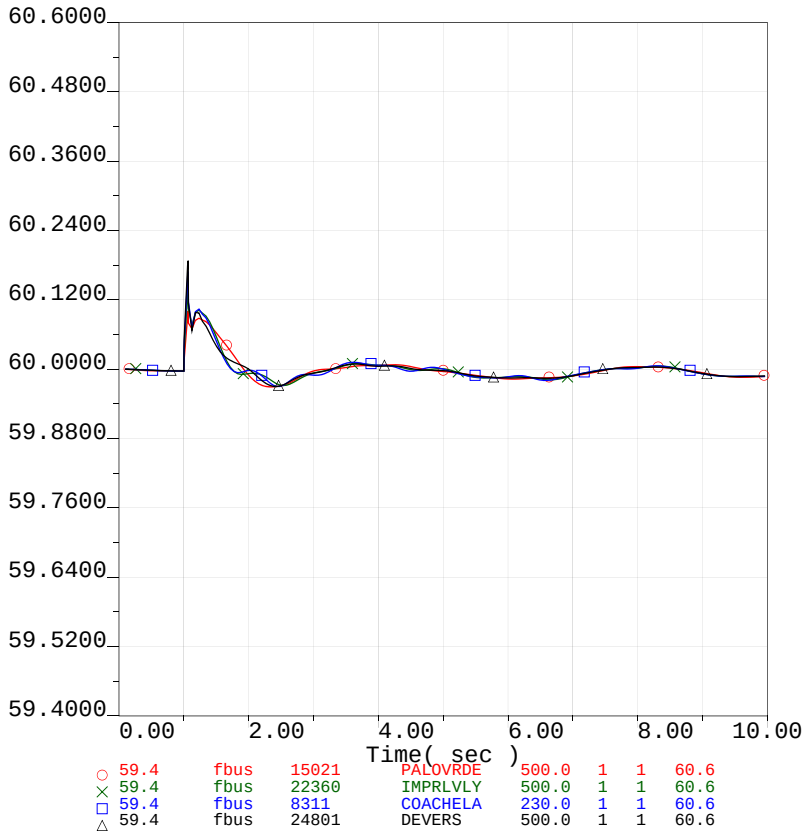

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ○ | 0.75 | vbus | 22260 | ESCNDIDO | 230.0 | 1 | 1 | 1.25 |
| × | 0.75 | vbus | 22356 | IMPRLVLY | 230.0 | 1 | 1 | 1.25 |
| □ | 0.75 | vbus | 22464 | MIGUEL | 230.0 | 1 | 1 | 1.25 |
| △ | 0.75 | vbus | 22832 | SYCAMORE | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip Serrano - SerVal 500 kV
Case ALT 3b DISPATCH 3



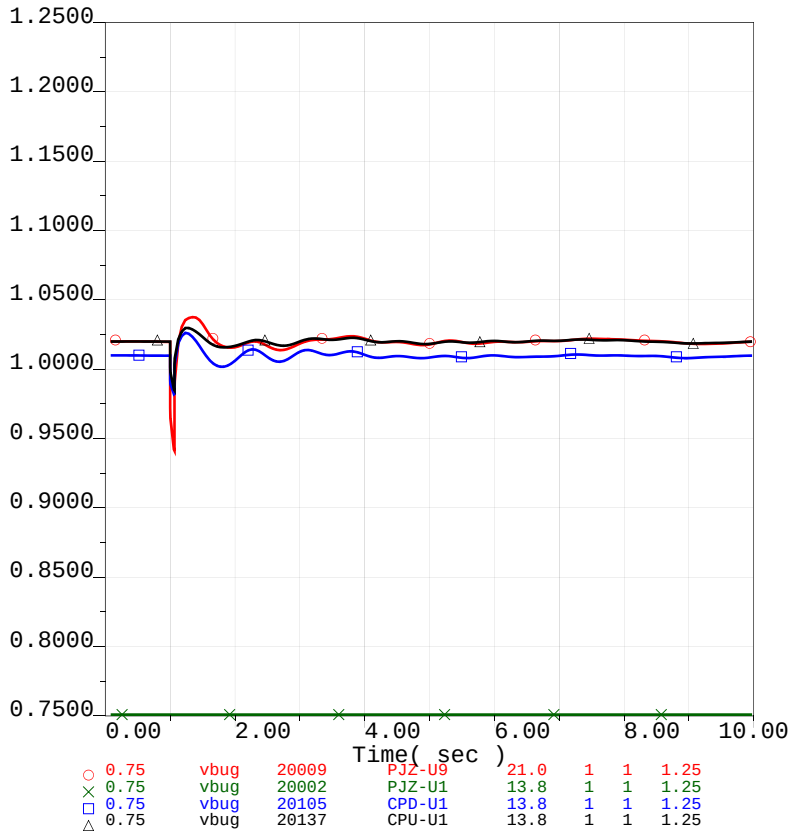


FBus Readings




| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ○ | 59.4 | fbus | 15021 | PALOVRDE | 500.0 | 1 | 1 | 60.6 |
| × | 59.4 | fbus | 22360 | IMPRLVLY | 500.0 | 1 | 1 | 60.6 |
| □ | 59.4 | fbus | 8311 | COACHELA | 230.0 | 1 | 1 | 60.6 |
| △ | 59.4 | fbus | 24801 | DEVERS | 500.0 | 1 | 1 | 60.6 |

IVSG STUDY
Light Autumn Case
Trip Serrano - SerVal 500 kV
Case ALT 3b DISPATCH 3

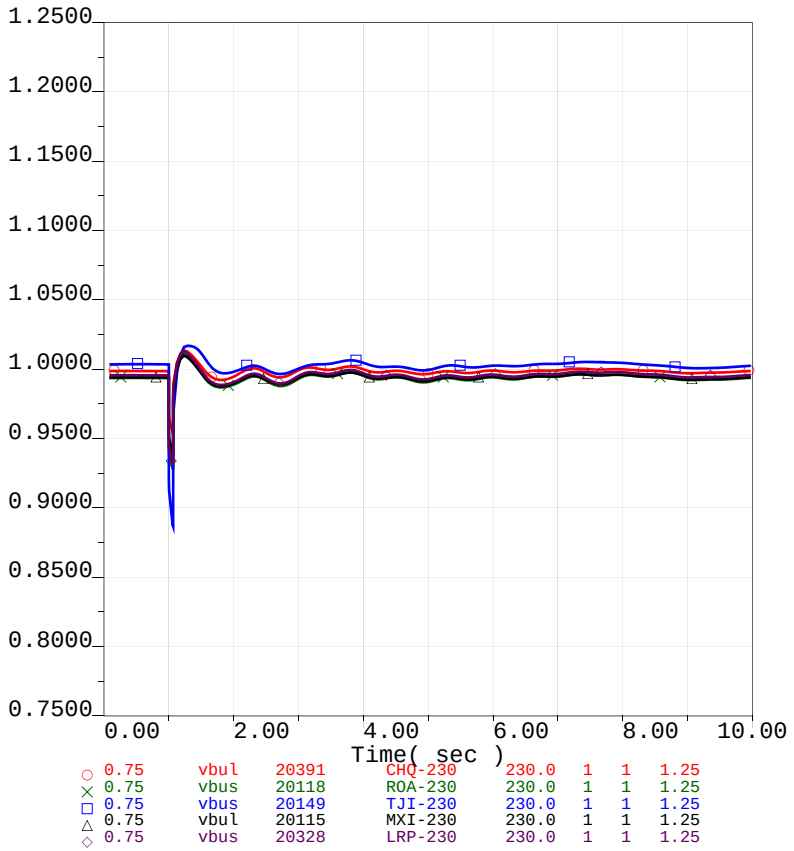



| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbug | 20009 | PJZ-U9 | 21.0 | 1 | 1 | 1.25 |
| × 0.75 | vbug | 20002 | PJZ-U1 | 13.8 | 1 | 1 | 1.25 |
| □ 0.75 | vbug | 20105 | CPD-U1 | 13.8 | 1 | 1 | 1.25 |
| △ 0.75 | vbug | 20137 | CPU-U1 | 13.8 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip Serrano - SerVal 500 kV
Case ALT 3b DISPATCH 3



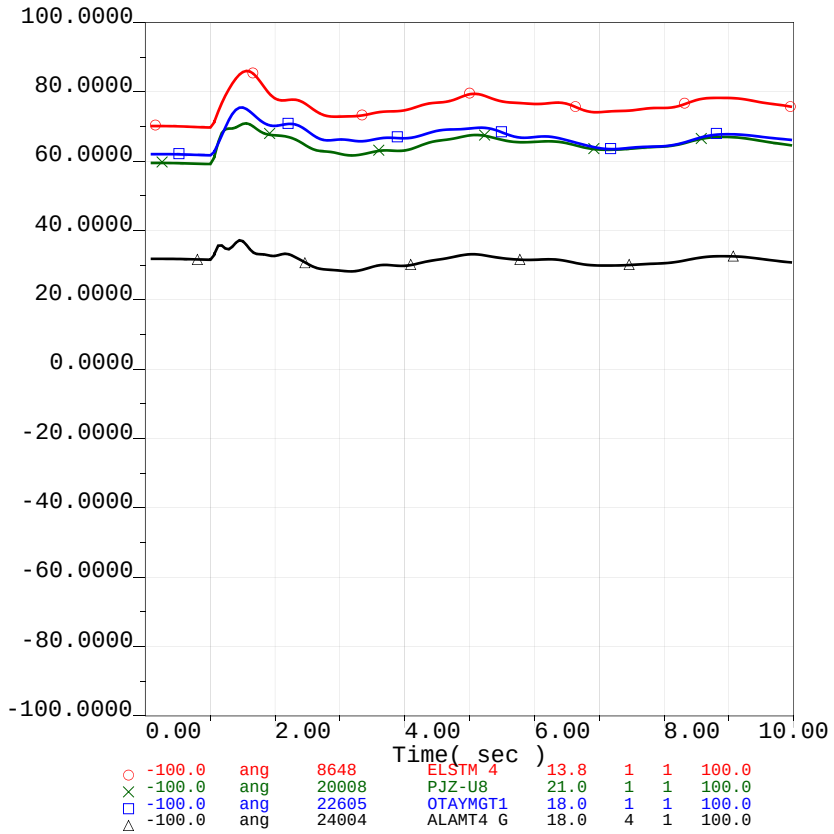





| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbul | 20391 | CHQ-230 | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 20118 | ROA-230 | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 20149 | TJI-230 | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbul | 20115 | MXI-230 | 230.0 | 1 | 1 | 1.25 |
| ◇ 0.75 | vbus | 20328 | LRP-230 | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip Serrano - SerVal 500 kV
Case ALT 3b DISPATCH 3

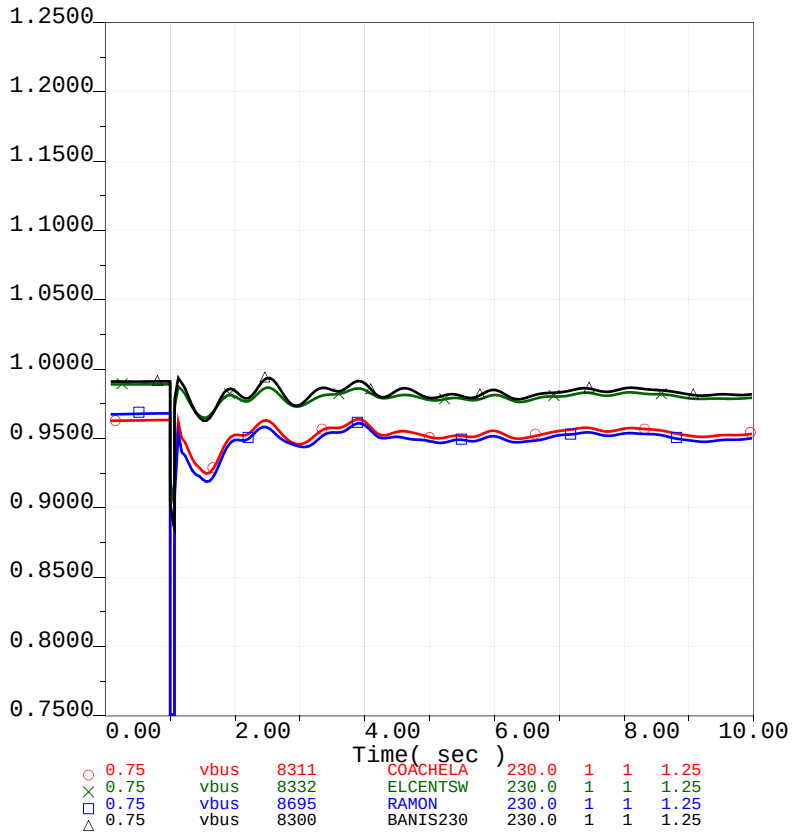
Rotor Angles for Gen Busses




| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ○ | -100.0 | ang | 8648 | ELSTM 4 | 13.8 | 1 | 1 | 100.0 |
| × | -100.0 | ang | 20008 | PJZ-U8 | 21.0 | 1 | 1 | 100.0 |
| □ | -100.0 | ang | 22605 | OTAYMGT1 | 18.0 | 1 | 1 | 100.0 |
| △ | -100.0 | ang | 24004 | ALAMT4 G | 18.0 | 4 | 1 | 100.0 |

IVSG STUDY
Light Autumn Case
Trip Serrano - SerVal 500 kV
Case ALT 3b DISPATCH 3

IID Busses



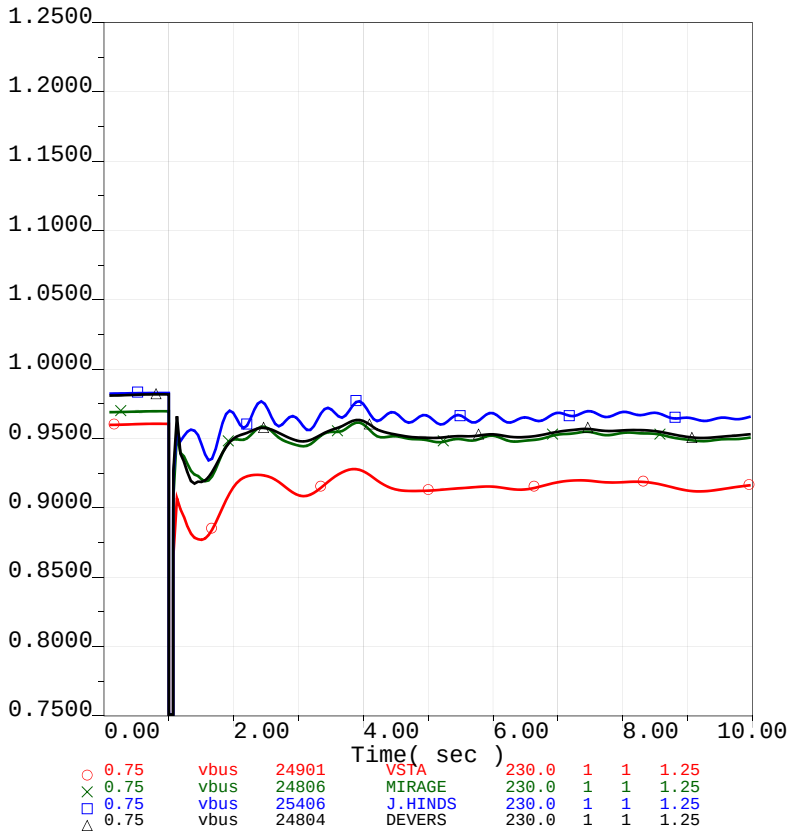

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbus | 8311 | COACHELA | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 8332 | ELCENTSW | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 8695 | RAMON | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbus | 8300 | BANIS230 | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip Devers - Valley 500 kV
Case ALT 2 DISPATCH 3





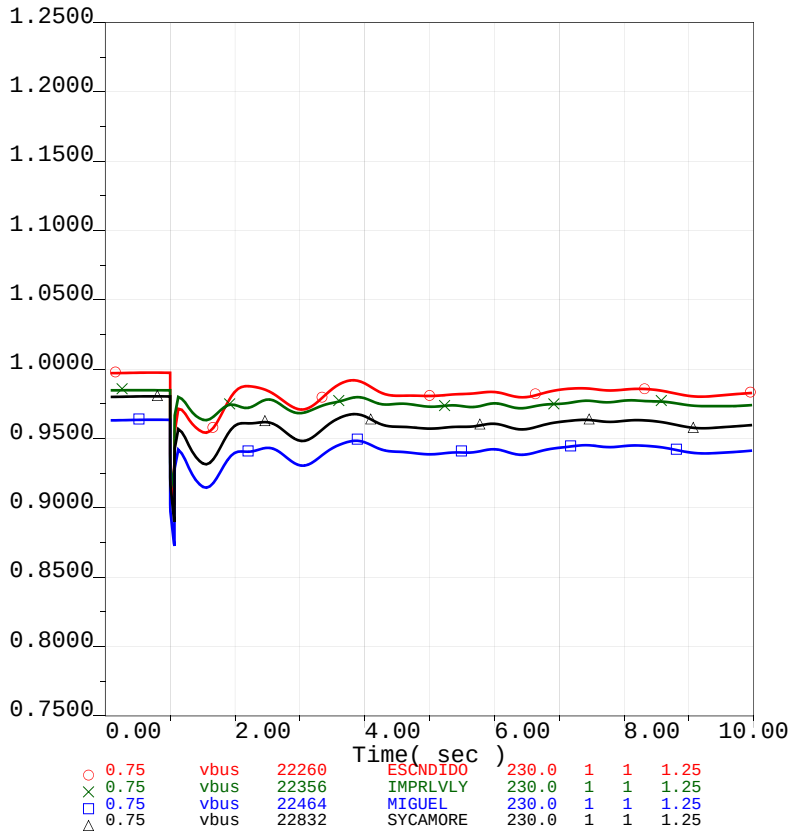
SCE Busses




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbus | 24901 | VSTA | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 24806 | MIRAGE | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 25406 | J.HINDS | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbus | 24804 | DEVERS | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip Devers - Valley 500 kV
Case ALT 2 DISPATCH 3

SDGE Busses

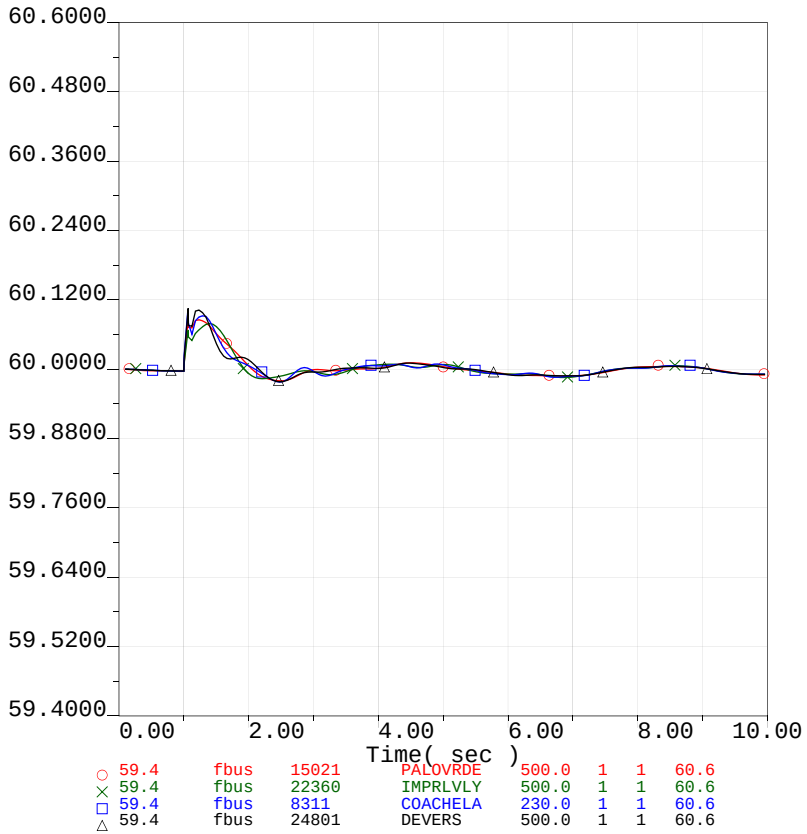



| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ○ | 0.75 | vbus | 22260 | ESCNDIDO | 230.0 | 1 | 1 | 1.25 |
| × | 0.75 | vbus | 22356 | IMPRLVLY | 230.0 | 1 | 1 | 1.25 |
| □ | 0.75 | vbus | 22464 | MIGUEL | 230.0 | 1 | 1 | 1.25 |
| △ | 0.75 | vbus | 22832 | SYCAMORE | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip Devers - Valley 500 kV
Case ALT 2 DISPATCH 3

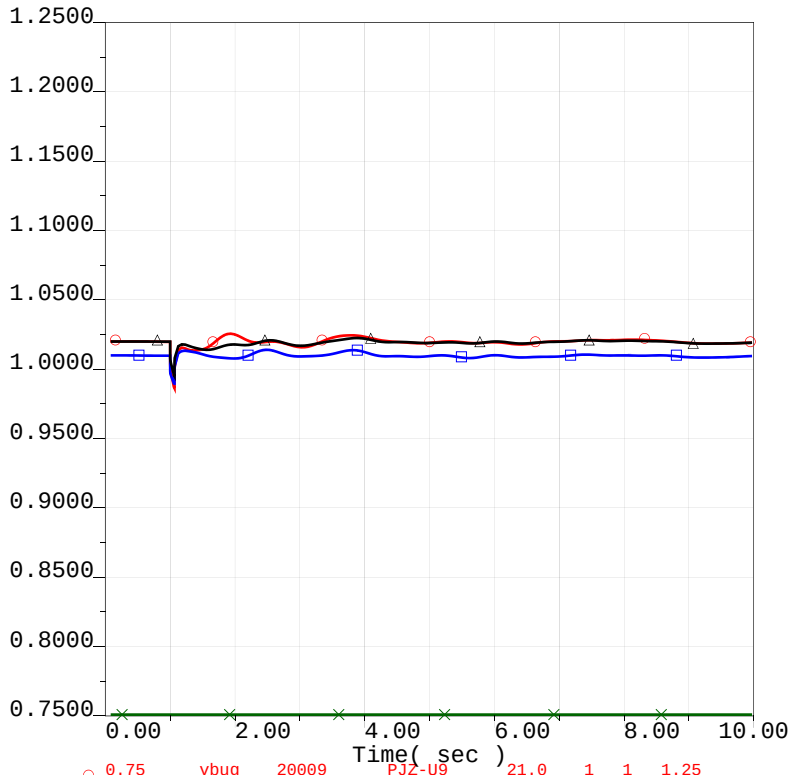


FBus Readings




| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ○ | 59.4 | fbus | 15021 | PALOVRDE | 500.0 | 1 | 1 | 60.6 |
| × | 59.4 | fbus | 22360 | IMPRLVLY | 500.0 | 1 | 1 | 60.6 |
| □ | 59.4 | fbus | 8311 | COACHELA | 230.0 | 1 | 1 | 60.6 |
| △ | 59.4 | fbus | 24801 | DEVERS | 500.0 | 1 | 1 | 60.6 |

IVSG STUDY
Light Autumn Case
Trip Devers - Valley 500 kV
Case ALT 2 DISPATCH 3

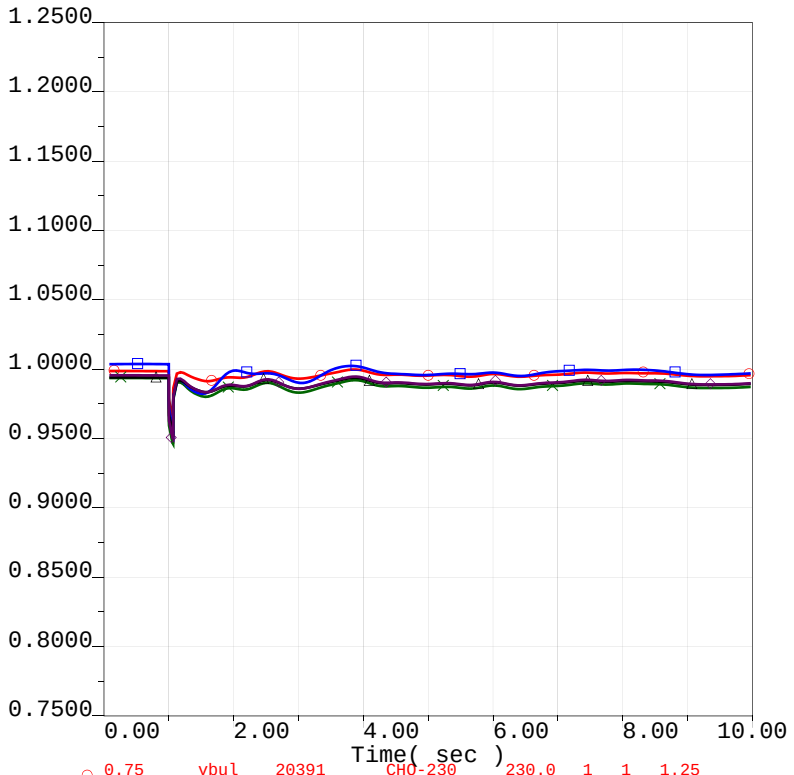



| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbug | 20009 | PJZ-U9 | 21.0 | 1 | 1 | 1.25 |
| × 0.75 | vbug | 20002 | PJZ-U1 | 13.8 | 1 | 1 | 1.25 |
| □ 0.75 | vbug | 20105 | CPD-U1 | 13.8 | 1 | 1 | 1.25 |
| △ 0.75 | vbug | 20137 | CPU-U1 | 13.8 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip Devers - Valley 500 kV
Case ALT 2 DISPATCH 3



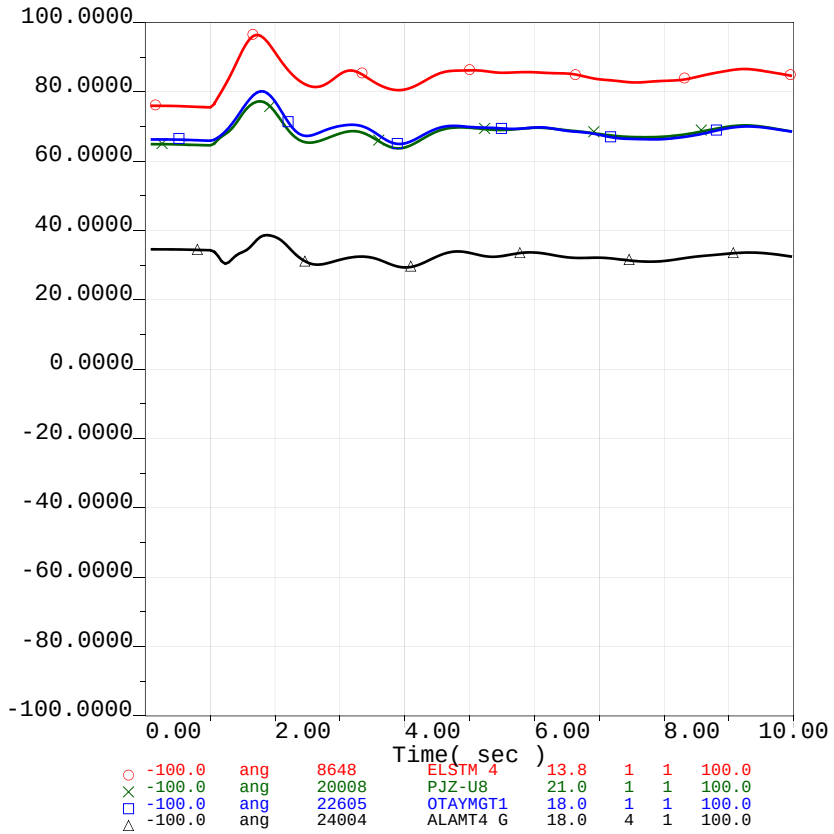





| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbul | 20391 | CHQ-230 | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 20118 | ROA-230 | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 20149 | TJI-230 | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbul | 20115 | MXI-230 | 230.0 | 1 | 1 | 1.25 |
| ◇ 0.75 | vbus | 20328 | LRP-230 | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip Devers - Valley 500 kV
Case ALT 2 DISPATCH 3

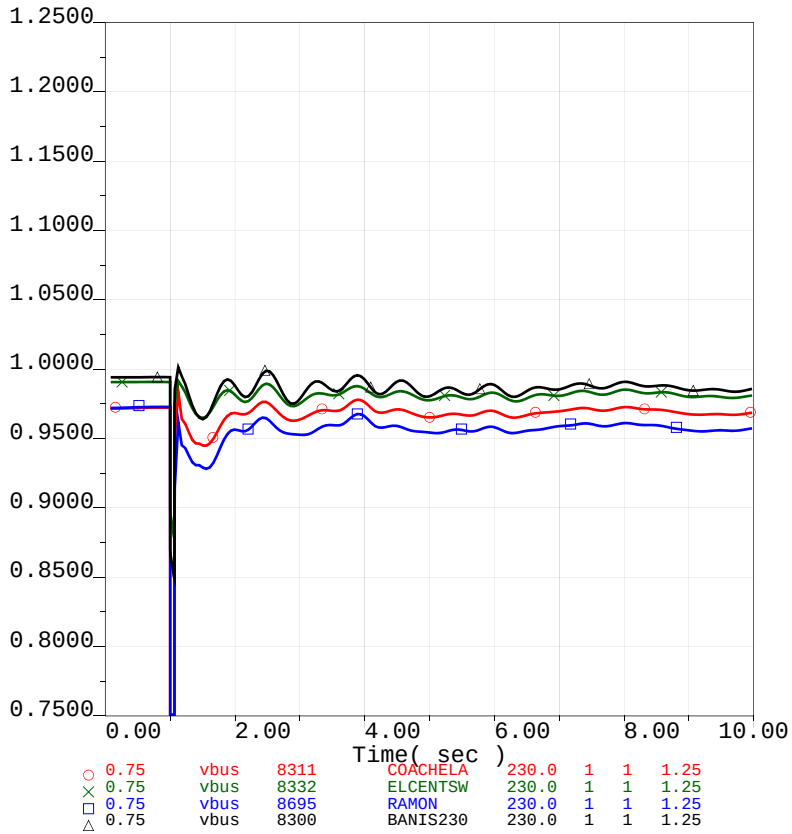
Rotor Angles for Gen Busses




| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ○ | -100.0 | ang | 8648 | ELSTM 4 | 13.8 | 1 | 1 | 100.0 |
| × | -100.0 | ang | 20008 | PJZ-U8 | 21.0 | 1 | 1 | 100.0 |
| □ | -100.0 | ang | 22605 | OTAYMGT1 | 18.0 | 1 | 1 | 100.0 |
| △ | -100.0 | ang | 24004 | ALAMT4 G | 18.0 | 4 | 1 | 100.0 |

IVSG STUDY
Light Autumn Case
Trip Devers - Valley 500 kV
Case ALT 2 DISPATCH 3

IID Busses



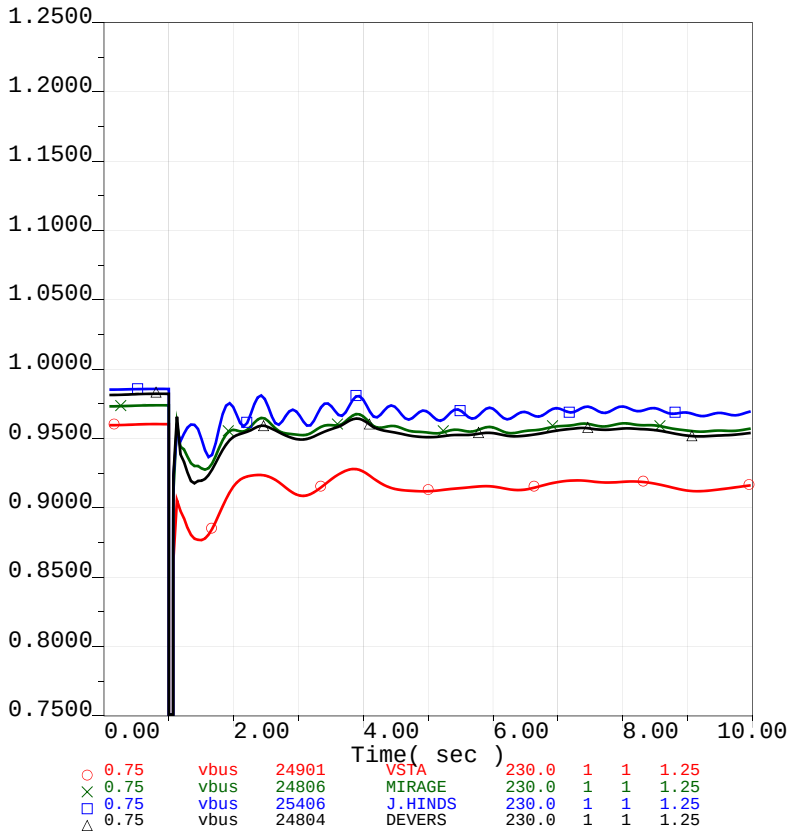

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbus | 8311 | COACHELA | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 8332 | ELCENTSW | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 8695 | RAMON | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbus | 8300 | BANIS230 | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip Devers - Valley 500 kV
Case ALT 2a DISPATCH 3





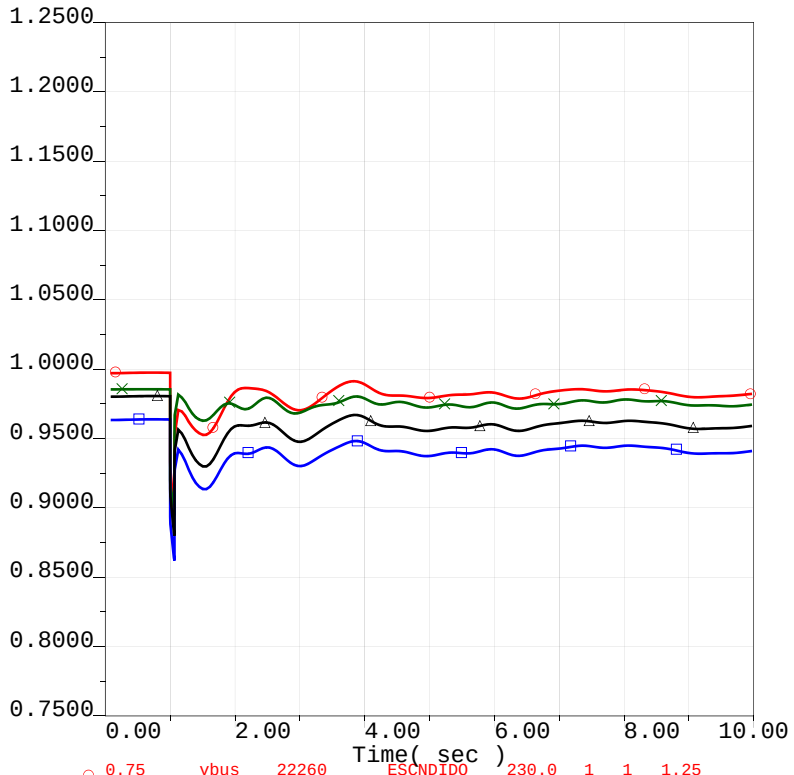
SCE Busses




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbus | 24901 | VSTA | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 24806 | MIRAGE | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 25406 | J.HINDS | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbus | 24804 | DEVERS | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip Devers - Valley 500 kV
Case ALT 2a DISPATCH 3

SDGE Busses

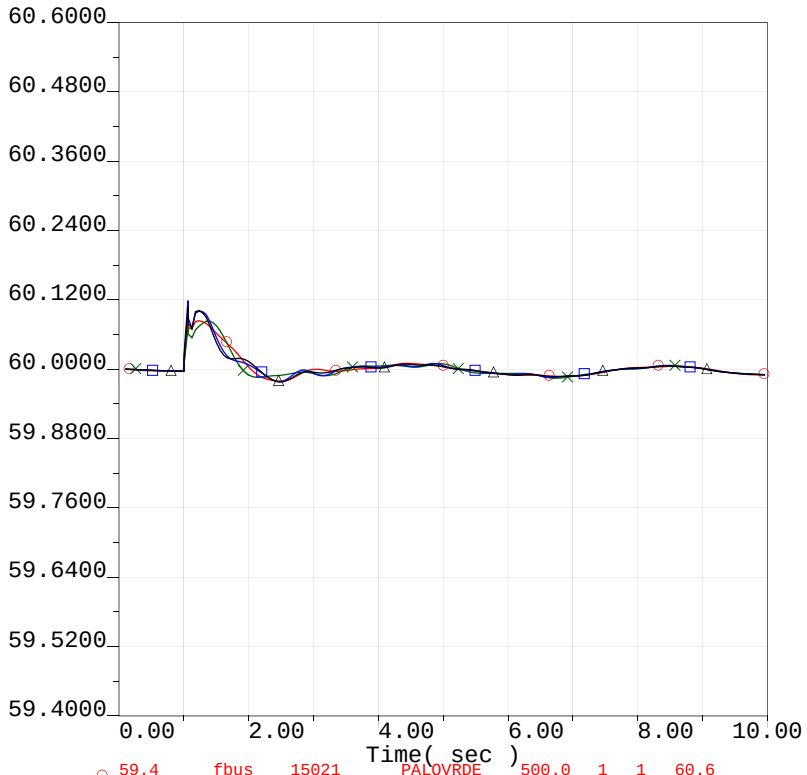



| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ○ | 0.75 | vbus | 22260 | ESCNDIDO | 230.0 | 1 | 1 | 1.25 |
| × | 0.75 | vbus | 22356 | IMPRLVLY | 230.0 | 1 | 1 | 1.25 |
| □ | 0.75 | vbus | 22464 | MIGUEL | 230.0 | 1 | 1 | 1.25 |
| △ | 0.75 | vbus | 22832 | SYCAMORE | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip Devers - Valley 500 kV
Case ALT 2a DISPATCH 3



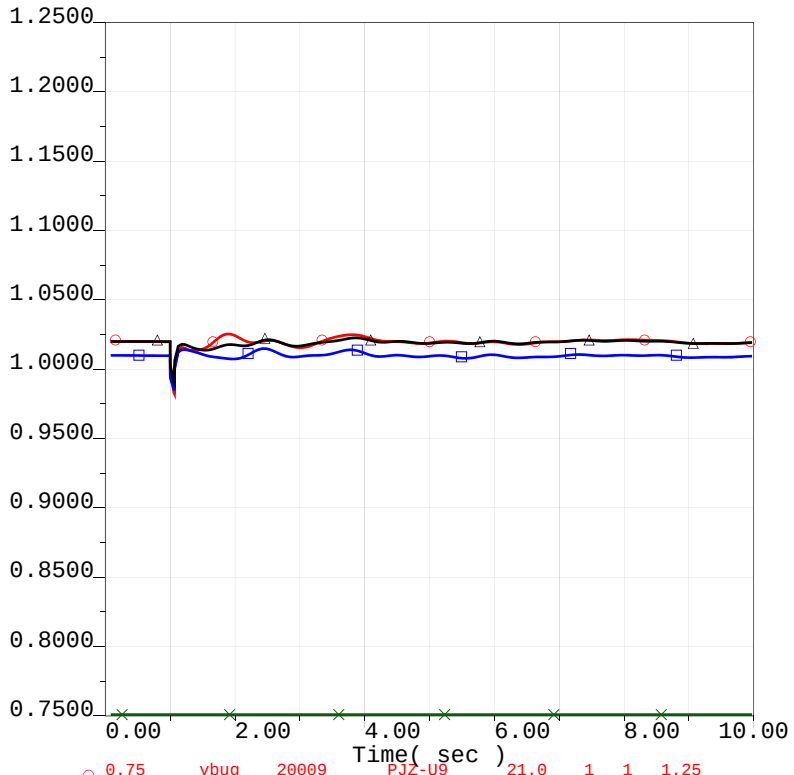
FBus Readings




| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ○ | 59.4 | fbus | 15021 | PALOVRDE | 500.0 | 1 | 1 | 60.6 |
| × | 59.4 | fbus | 22360 | IMPRLVLY | 500.0 | 1 | 1 | 60.6 |
| □ | 59.4 | fbus | 8311 | COACHELA | 230.0 | 1 | 1 | 60.6 |
| △ | 59.4 | fbus | 24801 | DEVERS | 500.0 | 1 | 1 | 60.6 |

IVSG STUDY
Light Autumn Case
Trip Devers - Valley 500 kV
Case ALT 2a DISPATCH 3

CFE Busses Page 1



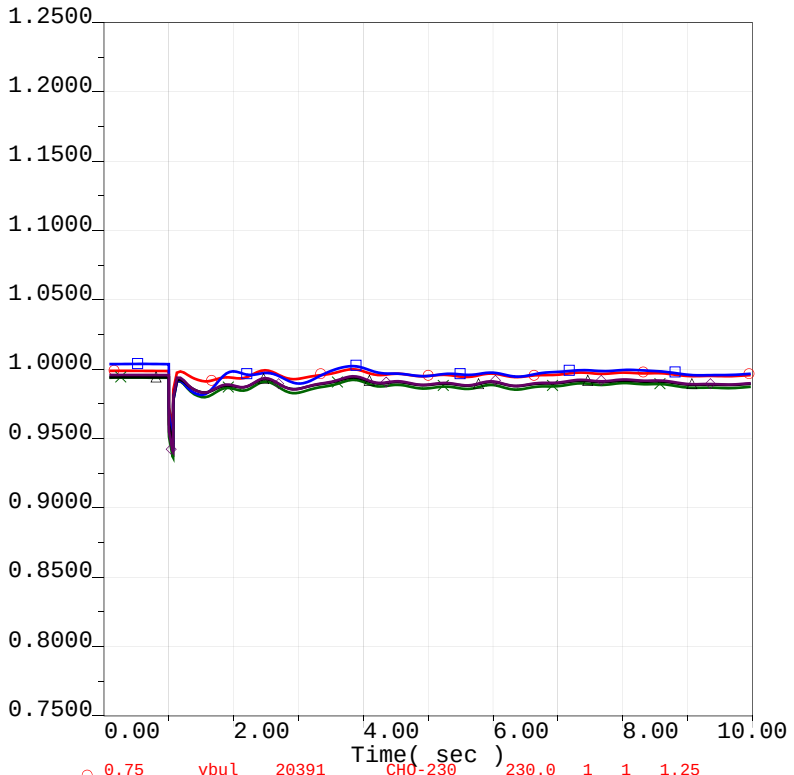

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbug | 20009 | PJZ-U9 | 21.0 | 1 | 1 | 1.25 |
| × 0.75 | vbug | 20002 | PJZ-U1 | 13.8 | 1 | 1 | 1.25 |
| □ 0.75 | vbug | 20105 | CPD-U1 | 13.8 | 1 | 1 | 1.25 |
| △ 0.75 | vbug | 20137 | CPU-U1 | 13.8 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip Devers - Valley 500 kV
Case ALT 2a DISPATCH 3





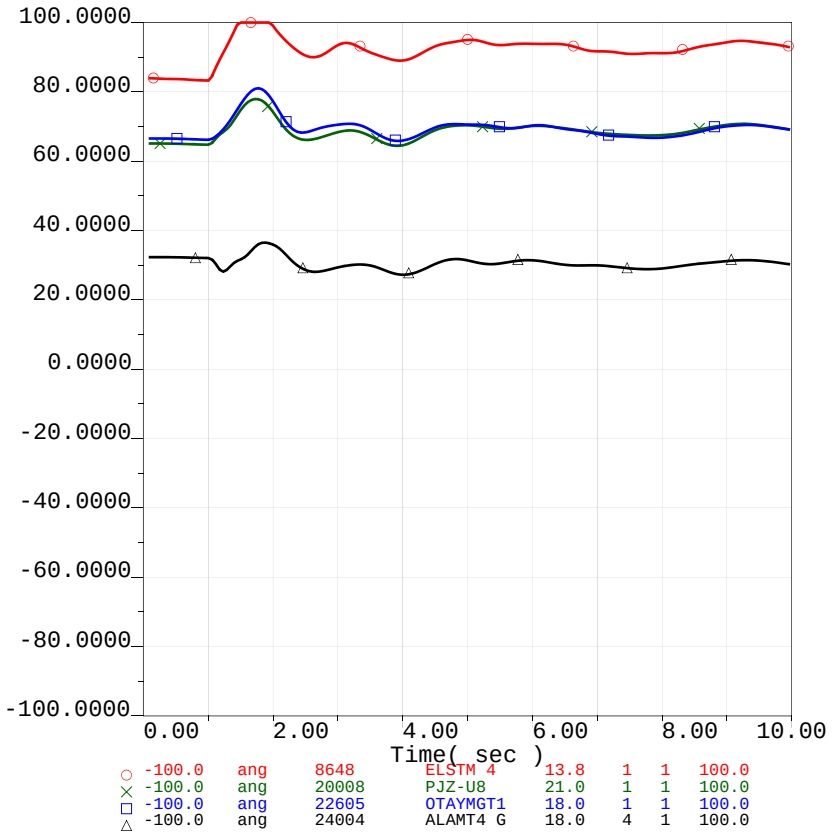
CFE Busses Page 2




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbul | 20391 | CHQ-230 | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 20118 | ROA-230 | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 20149 | TJI-230 | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbul | 20115 | MXI-230 | 230.0 | 1 | 1 | 1.25 |
| ◇ 0.75 | vbus | 20328 | LRP-230 | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip Devers - Valley 500 kV
Case ALT 2a DISPATCH 3

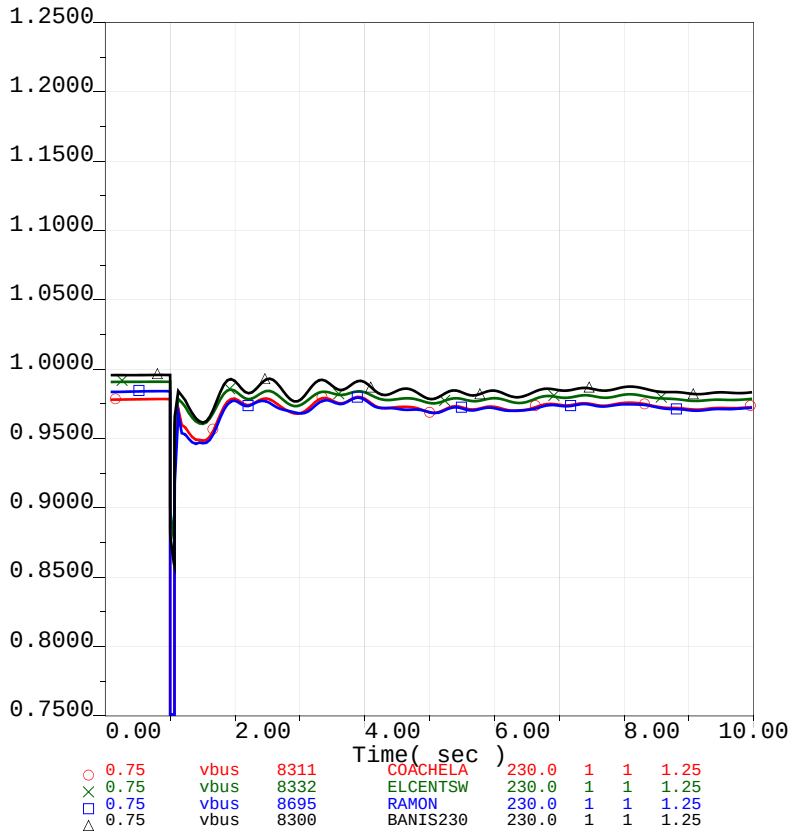
Rotor Angles for Gen Busses




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ -100.0 | ang | 8648 | ELSTM 4 | 13.8 | 1 | 1 | 100.0 |
| × -100.0 | ang | 20008 | PJZ-U8 | 21.0 | 1 | 1 | 100.0 |
| □ -100.0 | ang | 22605 | OTAYMGT1 | 18.0 | 1 | 1 | 100.0 |
| △ -100.0 | ang | 24004 | ALAMT4 G | 18.0 | 4 | 1 | 100.0 |

IVSG STUDY
Light Autumn Case
Trip Devers - Valley 500 kV
Case ALT 2a DISPATCH 3

IID Busses



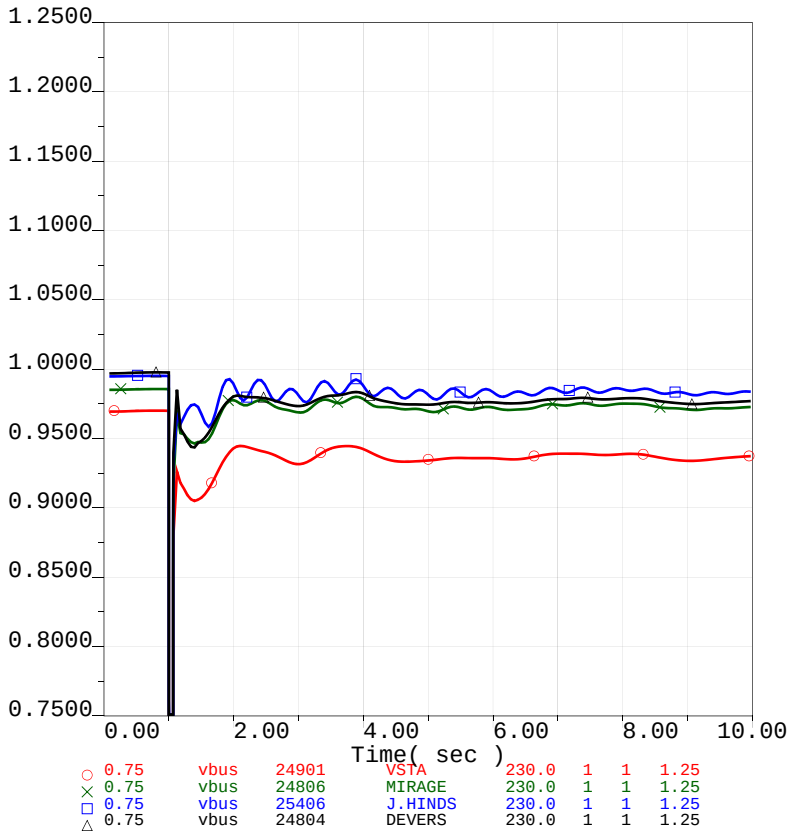

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbus | 8311 | COACHELA | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 8332 | ELCENTSW | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 8695 | RAMON | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbus | 8300 | BANIS230 | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip Devers - Valley 500 kV
Case ALT 3B DISPATCH 3





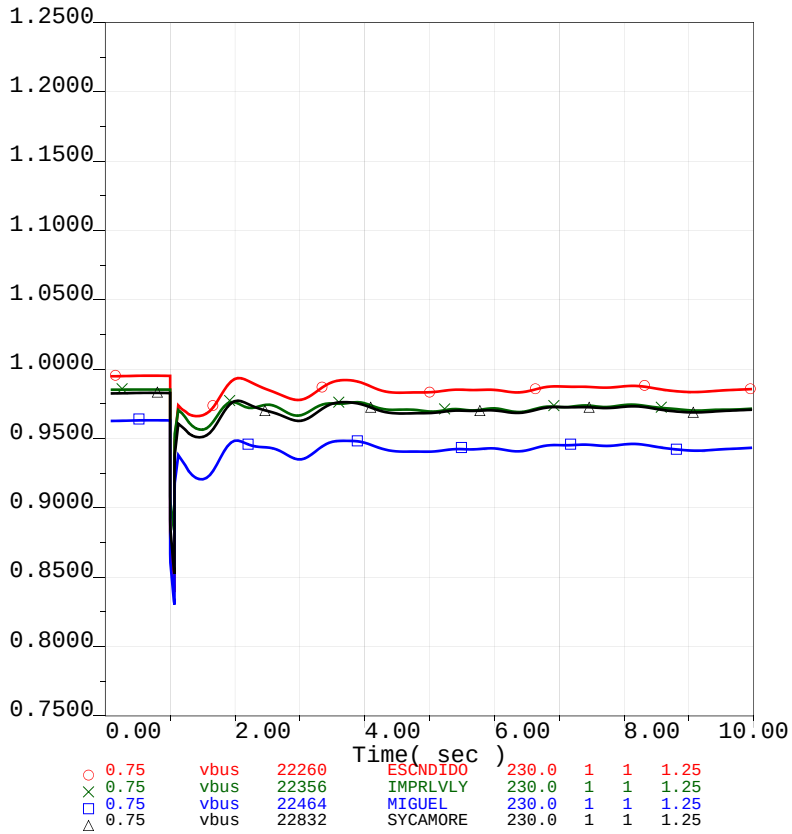
SCE Busses




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbus | 24901 | VSTA | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 24806 | MIRAGE | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 25406 | J.HINDS | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbus | 24804 | DEVERS | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip Devers - Valley 500 kV
Case ALT 3B DISPATCH 3

SDGE Busses



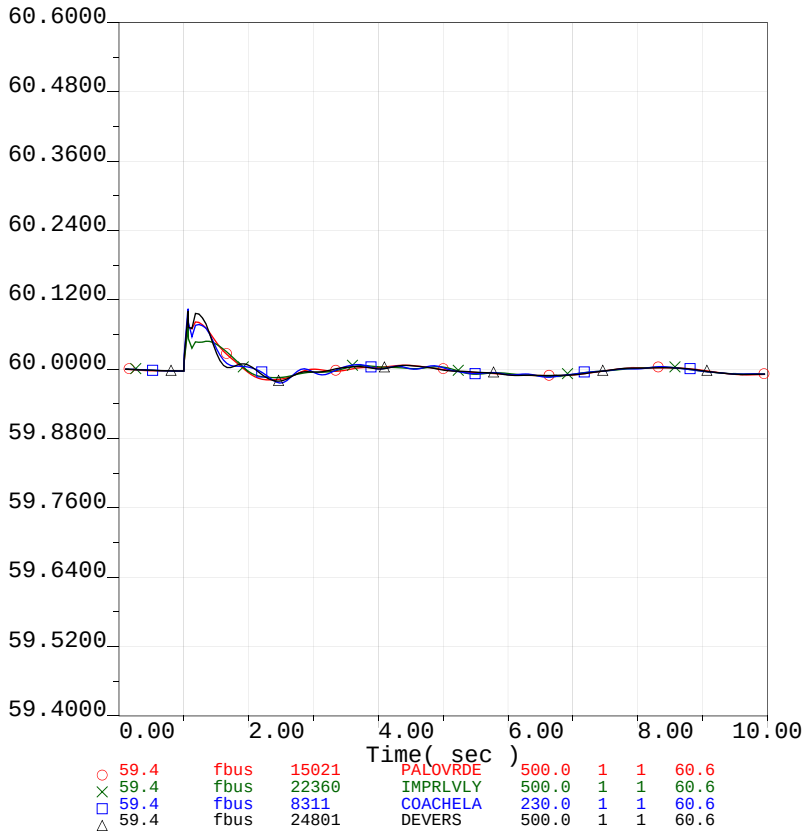

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ○ | 0.75 | vbus | 22260 | ESCNDIDO | 230.0 | 1 | 1 | 1.25 |
| × | 0.75 | vbus | 22356 | IMPRLVLY | 230.0 | 1 | 1 | 1.25 |
| □ | 0.75 | vbus | 22464 | MIGUEL | 230.0 | 1 | 1 | 1.25 |
| △ | 0.75 | vbus | 22832 | SYCAMORE | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip Devers - Valley 500 kV
Case ALT 3B DISPATCH 3





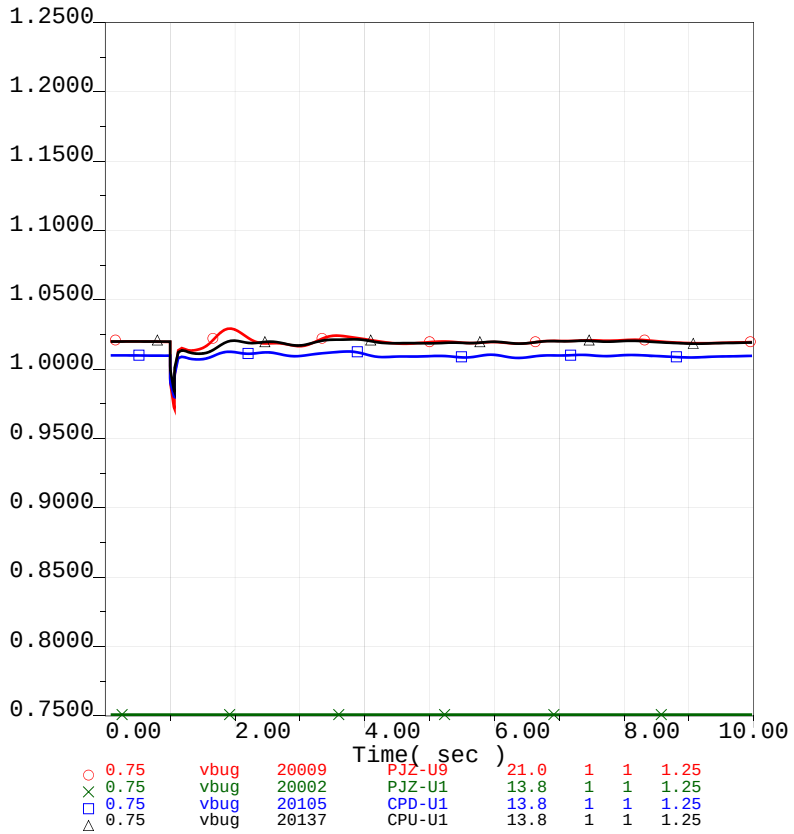
FBus Readings




| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ○ | 59.4 | fbus | 15021 | PALOVRDE | 500.0 | 1 | 1 | 60.6 |
| × | 59.4 | fbus | 22360 | IMPRLVLY | 500.0 | 1 | 1 | 60.6 |
| □ | 59.4 | fbus | 8311 | COACHELA | 230.0 | 1 | 1 | 60.6 |
| △ | 59.4 | fbus | 24801 | DEVERS | 500.0 | 1 | 1 | 60.6 |

IVSG STUDY
Light Autumn Case
Trip Devers - Valley 500 kV
Case ALT 3B DISPATCH 3

CFE Busses Page 1

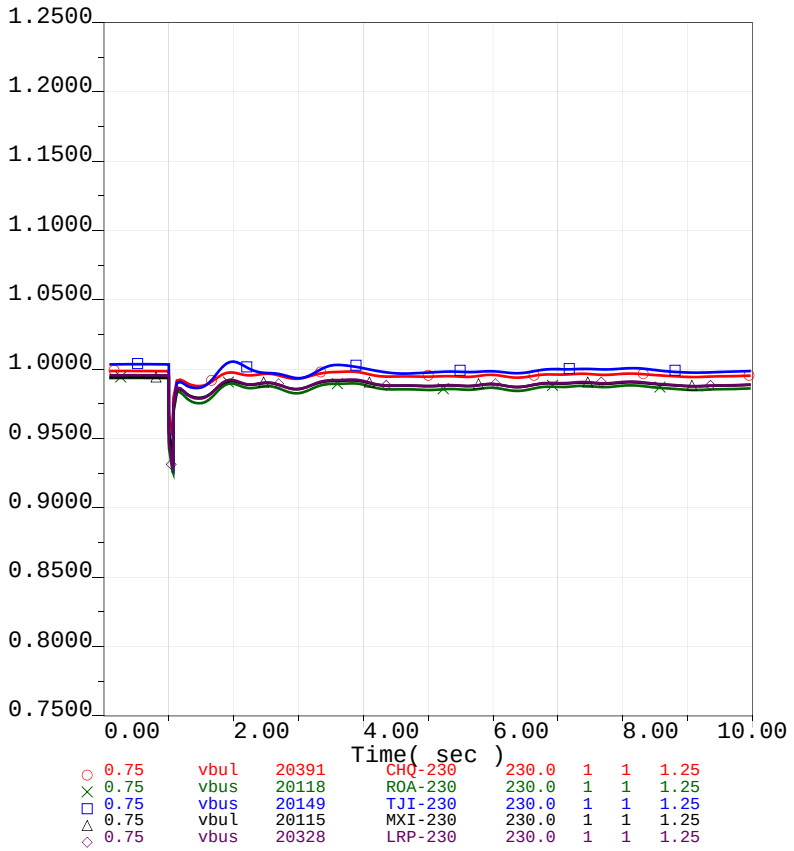



| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbug | 20009 | PJZ-U9 | 21.0 | 1 | 1 | 1.25 |
| × 0.75 | vbug | 20002 | PJZ-U1 | 13.8 | 1 | 1 | 1.25 |
| □ 0.75 | vbug | 20105 | CPD-U1 | 13.8 | 1 | 1 | 1.25 |
| △ 0.75 | vbug | 20137 | CPU-U1 | 13.8 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip Devers - Valley 500 kV
Case ALT 3B DISPATCH 3



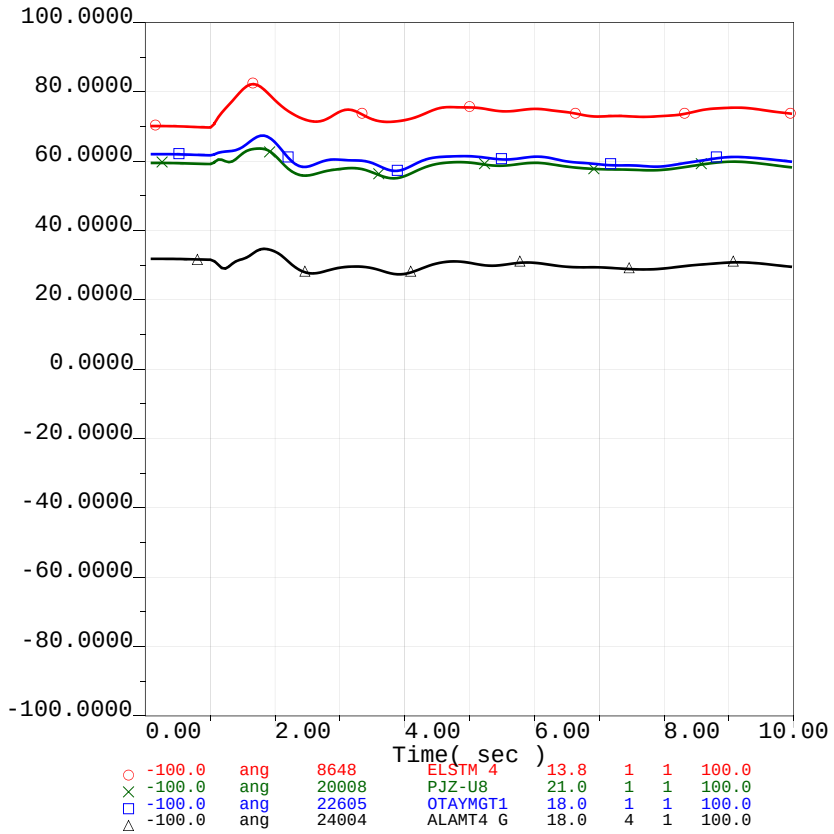
CFE Busses Page 2




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbul | 20391 | CHQ-230 | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 20118 | ROA-230 | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 20149 | TJI-230 | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbul | 20115 | MXI-230 | 230.0 | 1 | 1 | 1.25 |
| ◇ 0.75 | vbus | 20328 | LRP-230 | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip Devers - Valley 500 kV
Case ALT 3B DISPATCH 3

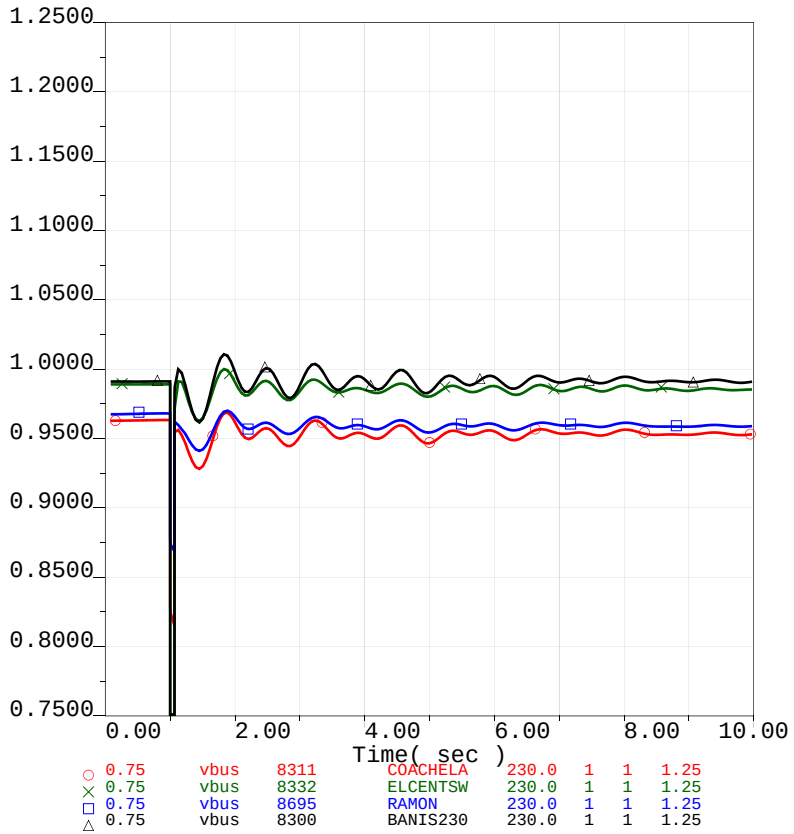
Rotor Angles for Gen Busses




| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ○ | -100.0 | ang | 8648 | ELSTM 4 | 13.8 | 1 | 1 | 100.0 |
| × | -100.0 | ang | 20008 | PJZ-U8 | 21.0 | 1 | 1 | 100.0 |
| □ | -100.0 | ang | 22605 | OTAYMGT1 | 18.0 | 1 | 1 | 100.0 |
| △ | -100.0 | ang | 24004 | ALAMT4 G | 18.0 | 4 | 1 | 100.0 |

IVSG STUDY
Light Autumn Case
Trip Devers - Valley 500 kV
Case ALT 3B DISPATCH 3

IID Busses



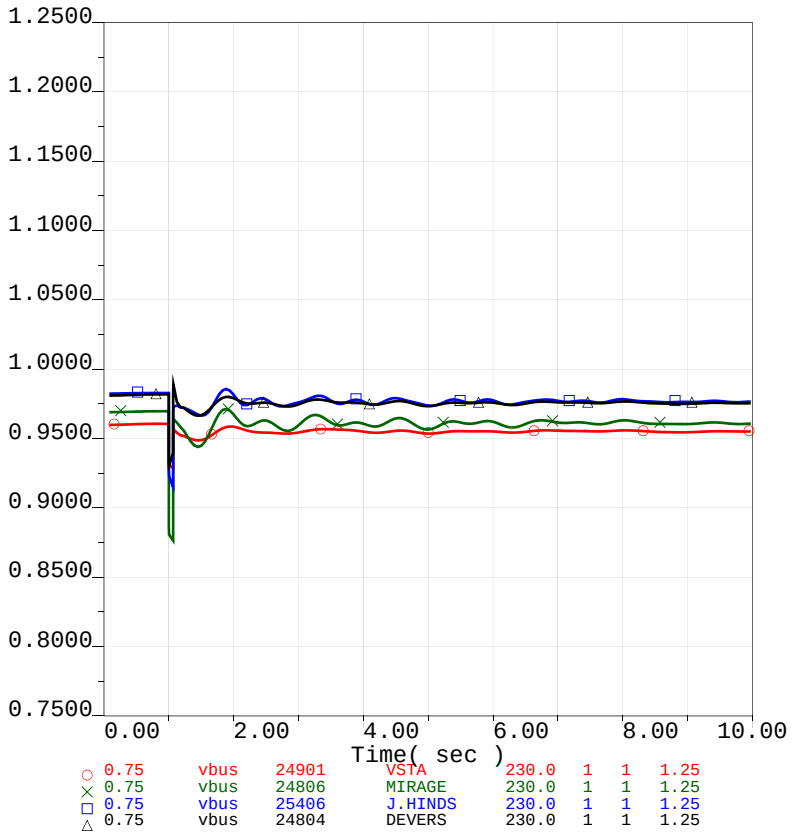

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbus | 8311 | COACHELA | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 8332 | ELCENTSW | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 8695 | RAMON | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbus | 8300 | BANIS230 | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip NEW SAN FELIPE - CENTRAL 500 kV
Case ALT 2 DISPATCH 3





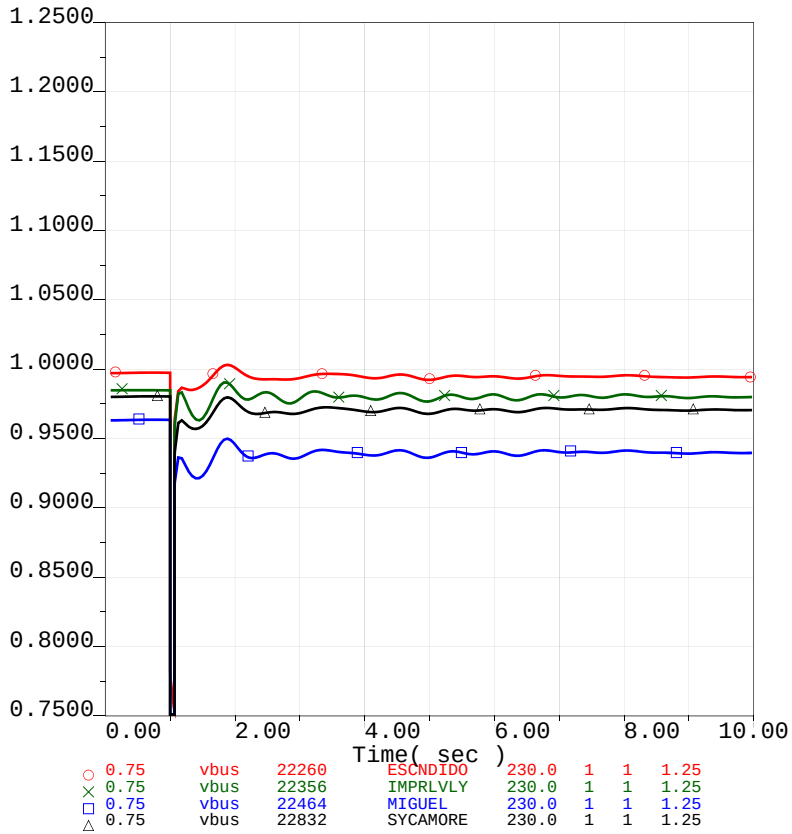
SCE Busses




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbus | 24901 | VSTA | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 24806 | MIRAGE | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 25406 | J.HINDS | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbus | 24804 | DEVERS | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip NEW SAN FELIPE - CENTRAL 500 kV
Case ALT 2 DISPATCH 3

SDGE Busses

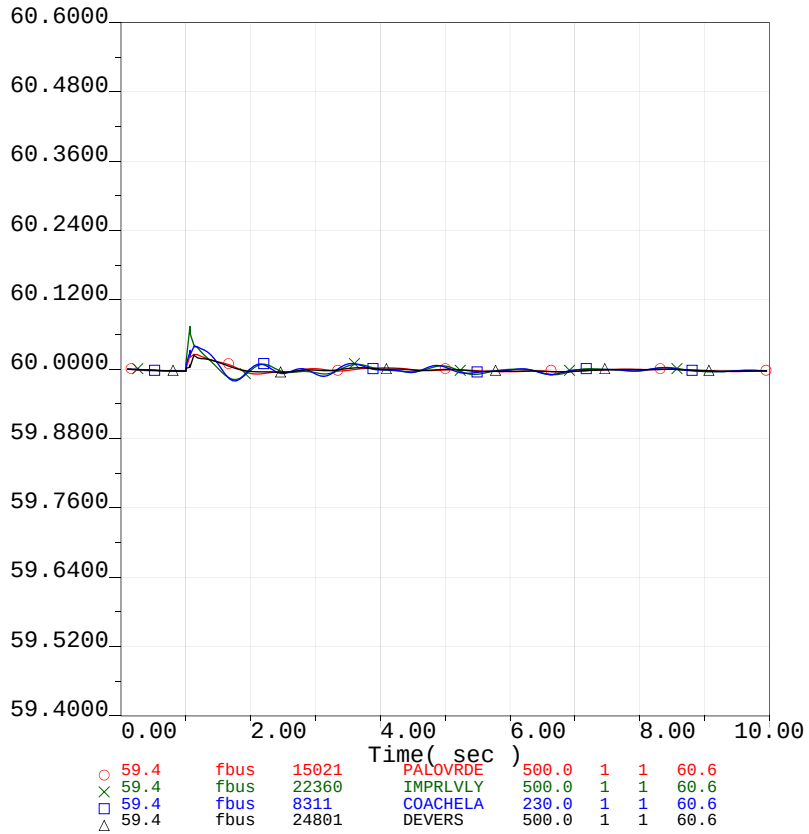



| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ○ | 0.75 | vbus | 22260 | ESCNDIDO | 230.0 | 1 | 1 | 1.25 |
| × | 0.75 | vbus | 22356 | IMPRLVLY | 230.0 | 1 | 1 | 1.25 |
| □ | 0.75 | vbus | 22464 | MIGUEL | 230.0 | 1 | 1 | 1.25 |
| △ | 0.75 | vbus | 22832 | SYCAMORE | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip NEW SAN FELIPE - CENTRAL 500 kV
Case ALT 2 DISPATCH 3



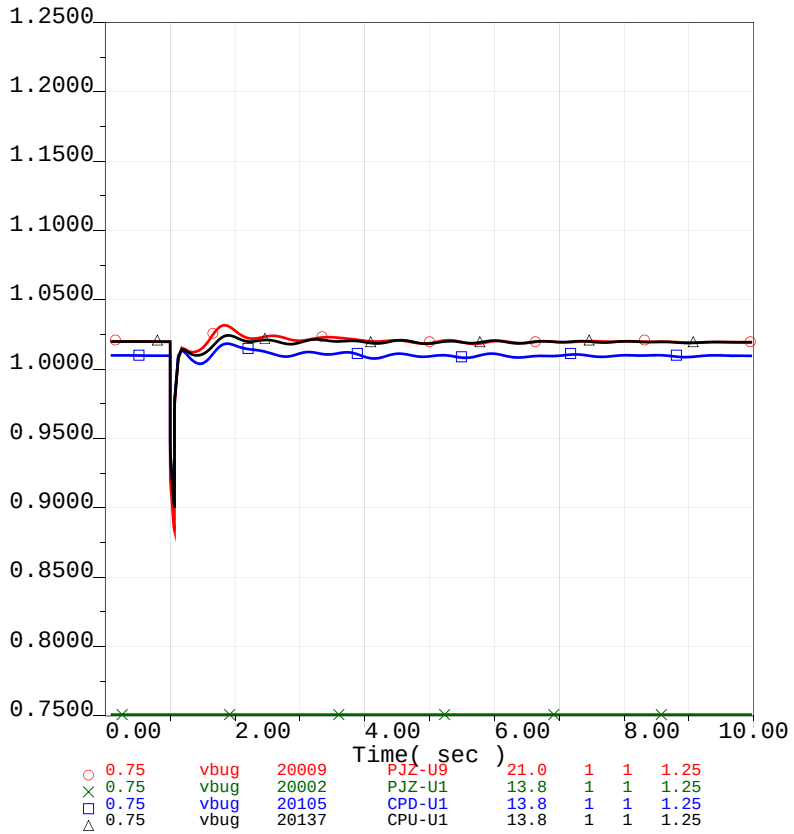
FBus Readings




| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ○ | 59.4 | fbus | 15021 | PALOVRDE | 500.0 | 1 | 1 | 60.6 |
| × | 59.4 | fbus | 22360 | IMPRLVLY | 500.0 | 1 | 1 | 60.6 |
| □ | 59.4 | fbus | 8311 | COACHELA | 230.0 | 1 | 1 | 60.6 |
| △ | 59.4 | fbus | 24801 | DEVERS | 500.0 | 1 | 1 | 60.6 |

IVSG STUDY
Light Autumn Case
Trip NEW SAN FELIPE - CENTRAL 500 kV
Case ALT 2 DISPATCH 3

CFE Busses Page 1




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbug | 20009 | PJZ-U9 | 21.0 | 1 | 1 | 1.25 |
| × 0.75 | vbug | 20002 | PJZ-U1 | 13.8 | 1 | 1 | 1.25 |
| □ 0.75 | vbug | 20105 | CPD-U1 | 13.8 | 1 | 1 | 1.25 |
| △ 0.75 | vbug | 20137 | CPU-U1 | 13.8 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip NEW SAN FELIPE - CENTRAL 500 kV
Case ALT 2 DISPATCH 3

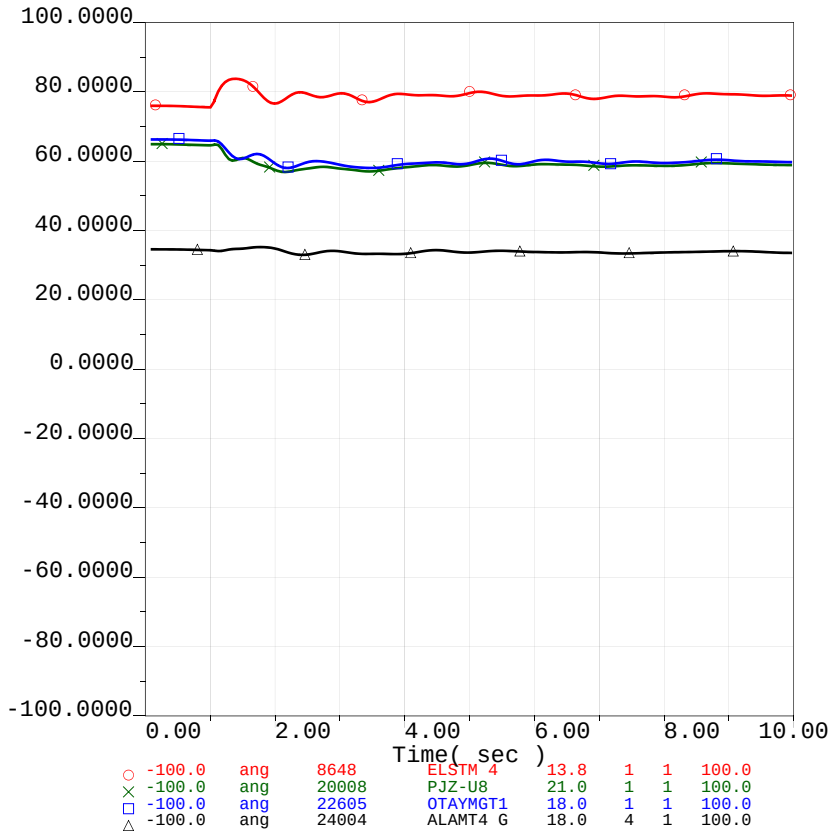


CFE Busses Page 2

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbul | 20391 | CHQ-230 | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 20118 | ROA-230 | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 20149 | TJI-230 | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbul | 20115 | MXI-230 | 230.0 | 1 | 1 | 1.25 |
| ◇ 0.75 | vbus | 20328 | LRP-230 | 230.0 | 1 | 1 | 1.25 |

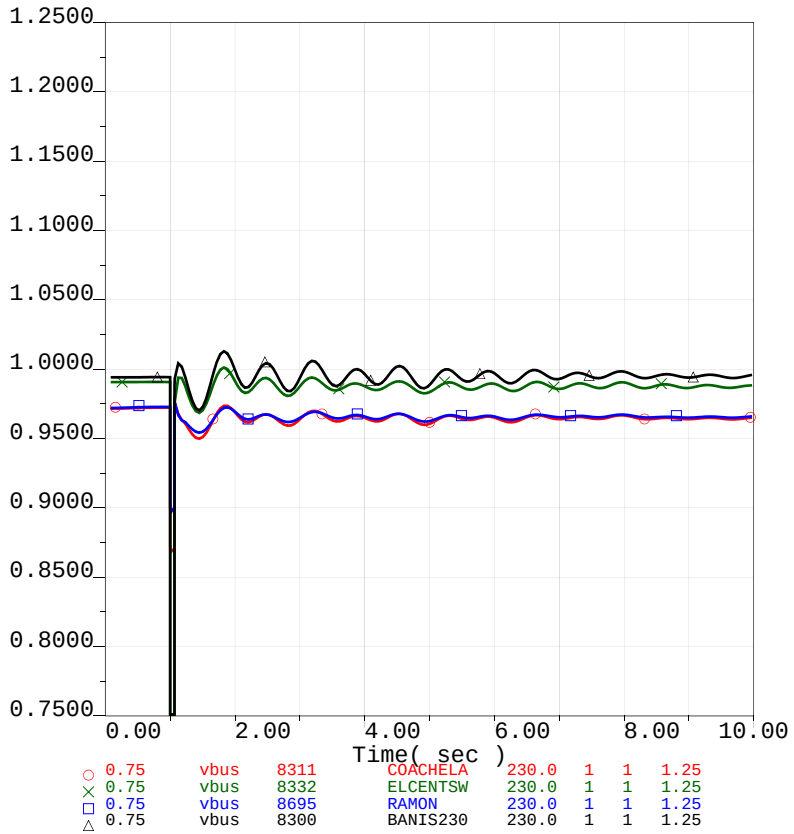
IVSG STUDY
Light Autumn Case
Trip NEW SAN FELIPE - CENTRAL 500 kV
Case ALT 2 DISPATCH 3

Rotor Angles for Gen Busses




IVSG STUDY
Light Autumn Case
Trip NEW SAN FELIPE - CENTRAL 500 kV
Case ALT 2 DISPATCH 3

IID Busses

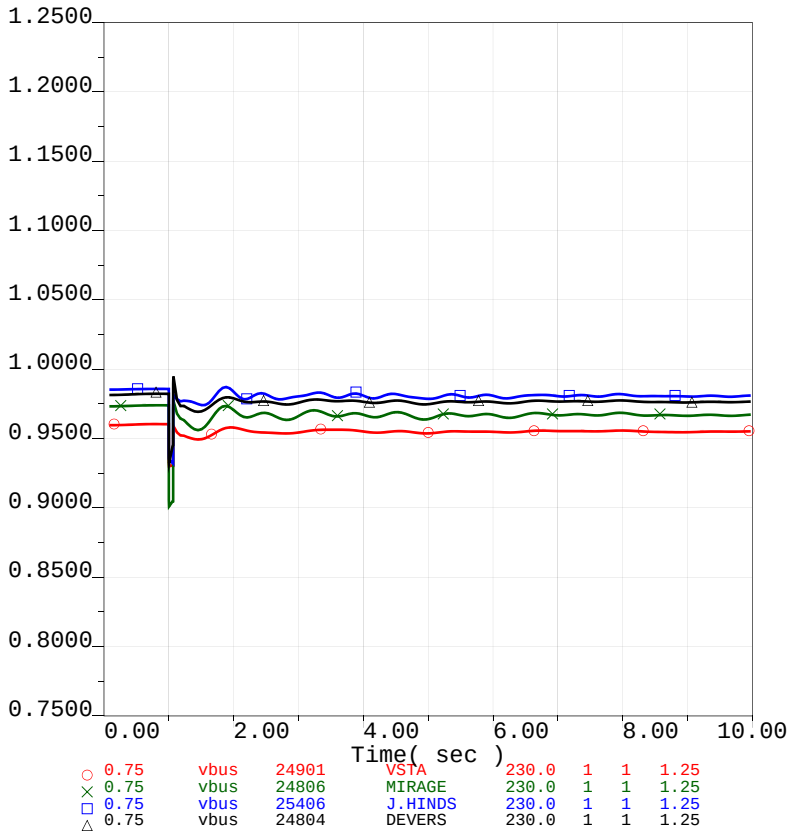



| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbus | 8311 | COACHELA | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 8332 | ELCENTSW | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 8695 | RAMON | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbus | 8300 | BANIS230 | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip NEW SAN FELIPE - CENTRAL 500 kV
Case ALT 2a DISPATCH 3



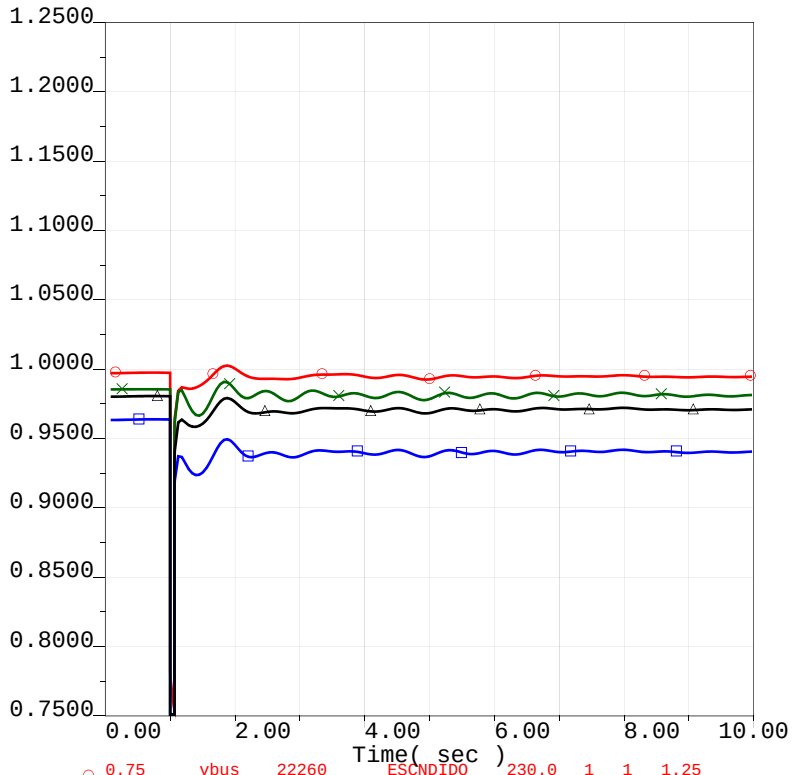
SCE Busses




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbus | 24901 | VSTA | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 24806 | MIRAGE | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 25406 | J.HINDS | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbus | 24804 | DEVERS | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip NEW SAN FELIPE - CENTRAL 500 kV
Case ALT 2a DISPATCH 3

SDGE Busses



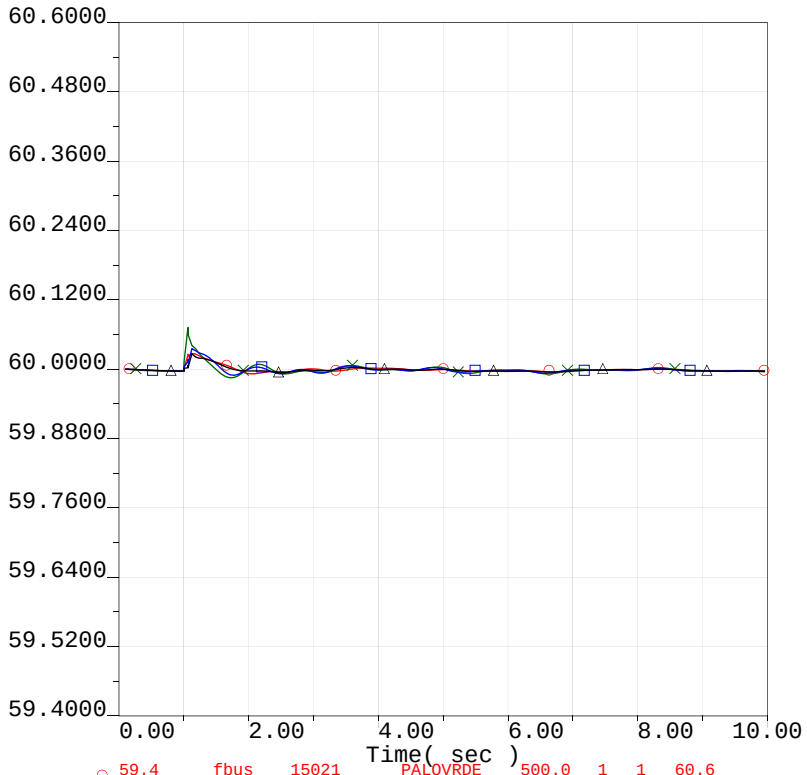

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ○ | 0.75 | vbus | 22260 | ESCNDIDO | 230.0 | 1 | 1 | 1.25 |
| × | 0.75 | vbus | 22356 | IMPRLVLY | 230.0 | 1 | 1 | 1.25 |
| □ | 0.75 | vbus | 22464 | MIGUEL | 230.0 | 1 | 1 | 1.25 |
| △ | 0.75 | vbus | 22832 | SYCAMORE | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip NEW SAN FELIPE - CENTRAL 500 kV
Case ALT 2a DISPATCH 3



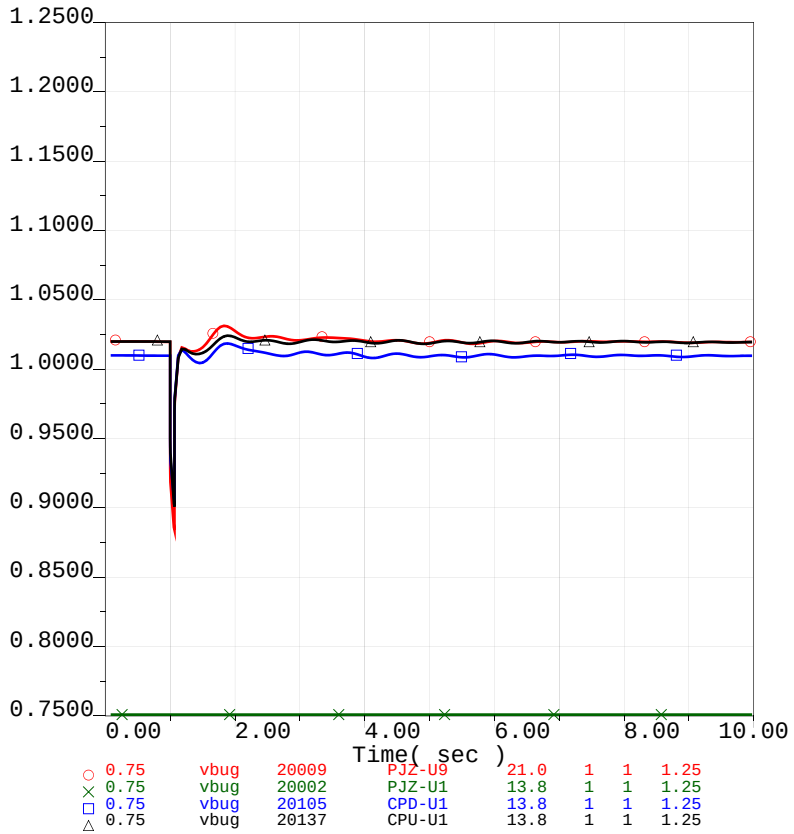


FBus Readings




| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ○ | 59.4 | fbus | 15021 | PALOVRDE | 500.0 | 1 | 1 | 60.6 |
| × | 59.4 | fbus | 22360 | IMPRLVLY | 500.0 | 1 | 1 | 60.6 |
| □ | 59.4 | fbus | 8311 | COACHELA | 230.0 | 1 | 1 | 60.6 |
| △ | 59.4 | fbus | 24801 | DEVERS | 500.0 | 1 | 1 | 60.6 |

IVSG STUDY
Light Autumn Case
Trip NEW SAN FELIPE - CENTRAL 500 kV
Case ALT 2a DISPATCH 3

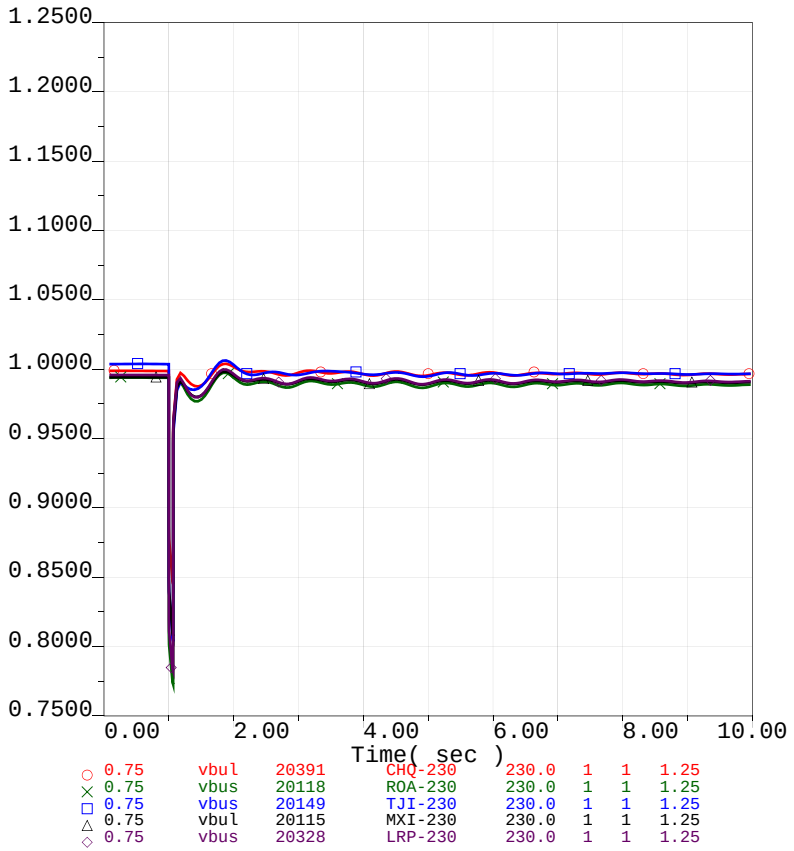



| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbug | 20009 | PJZ-U9 | 21.0 | 1 | 1 | 1.25 |
| × 0.75 | vbug | 20002 | PJZ-U1 | 13.8 | 1 | 1 | 1.25 |
| □ 0.75 | vbug | 20105 | CPD-U1 | 13.8 | 1 | 1 | 1.25 |
| △ 0.75 | vbug | 20137 | CPU-U1 | 13.8 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip NEW SAN FELIPE - CENTRAL 500 kV
Case ALT 2a DISPATCH 3



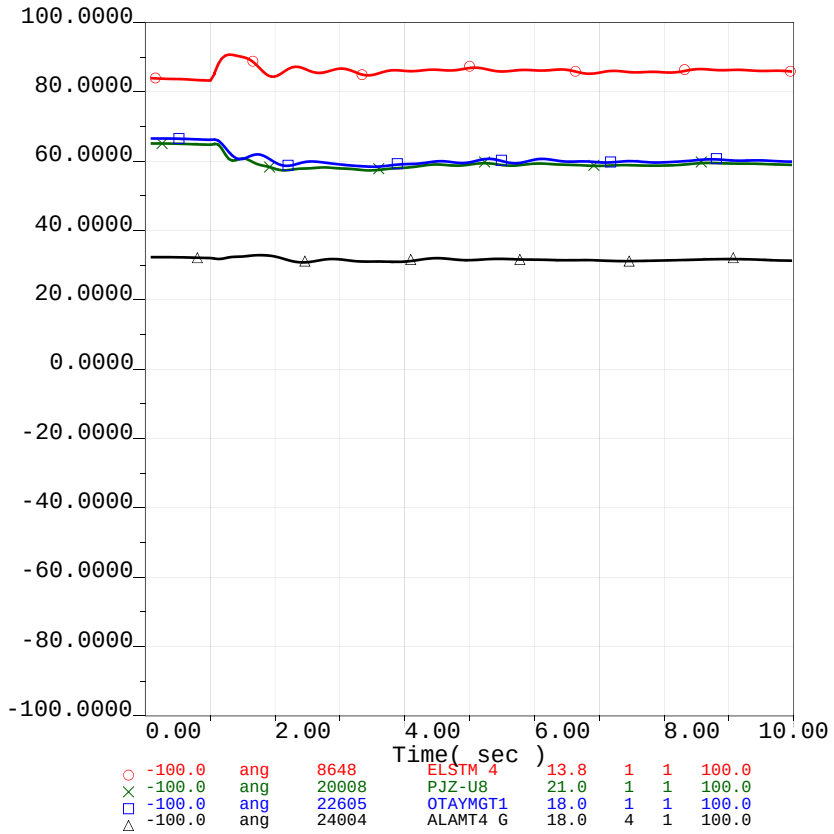





| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbul | 20391 | CHQ-230 | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 20118 | ROA-230 | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 20149 | TJI-230 | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbul | 20115 | MXI-230 | 230.0 | 1 | 1 | 1.25 |
| ◇ 0.75 | vbus | 20328 | LRP-230 | 230.0 | 1 | 1 | 1.25 |

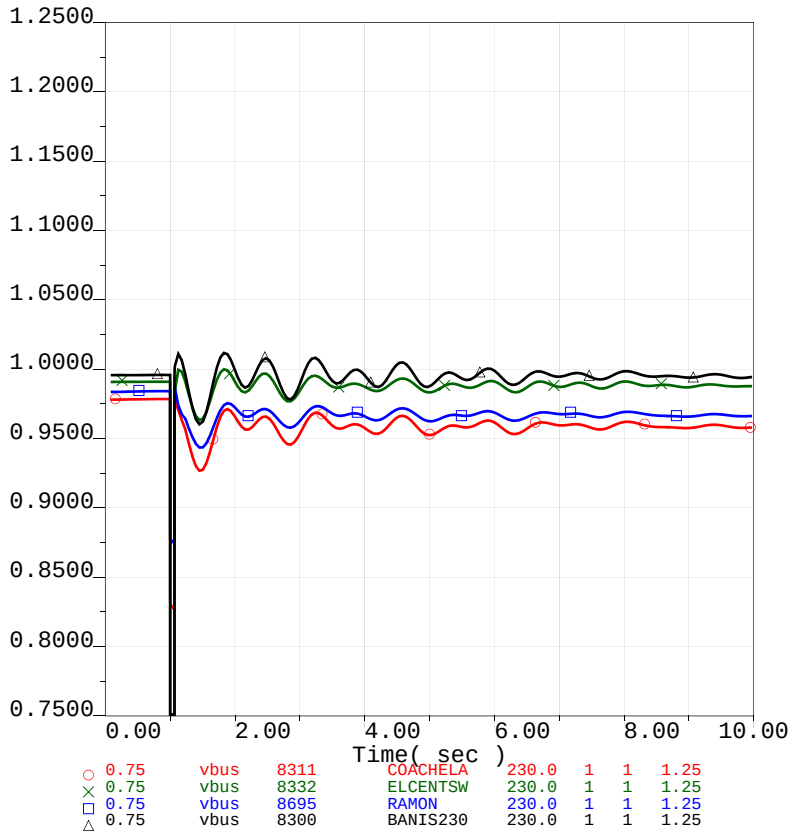
IVSG STUDY
Light Autumn Case
Trip NEW SAN FELIPE - CENTRAL 500 kV
Case ALT 2a DISPATCH 3

Rotor Angles for Gen Busses




IVSG STUDY
Light Autumn Case
Trip NEW SAN FELIPE - CENTRAL 500 kV
Case ALT 2a DISPATCH 3

IID Busses

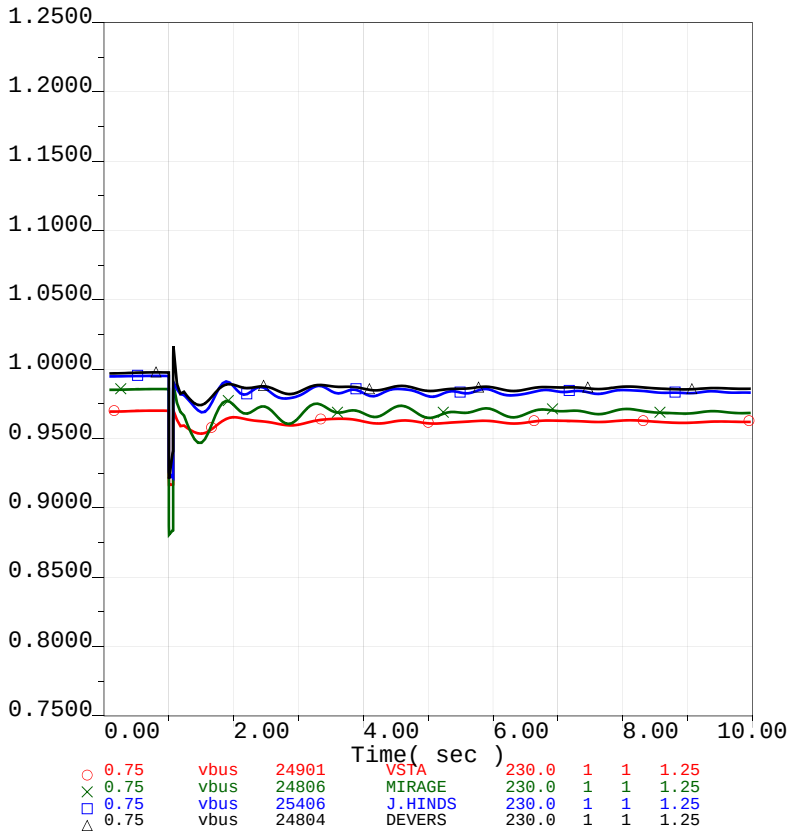



| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbus | 8311 | COACHELA | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 8332 | ELCENTSW | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 8695 | RAMON | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbus | 8300 | BANIS230 | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip NEW SAN FELIPE - NORTHSD 500 kV
Case ALT 3B DISPATCH 3



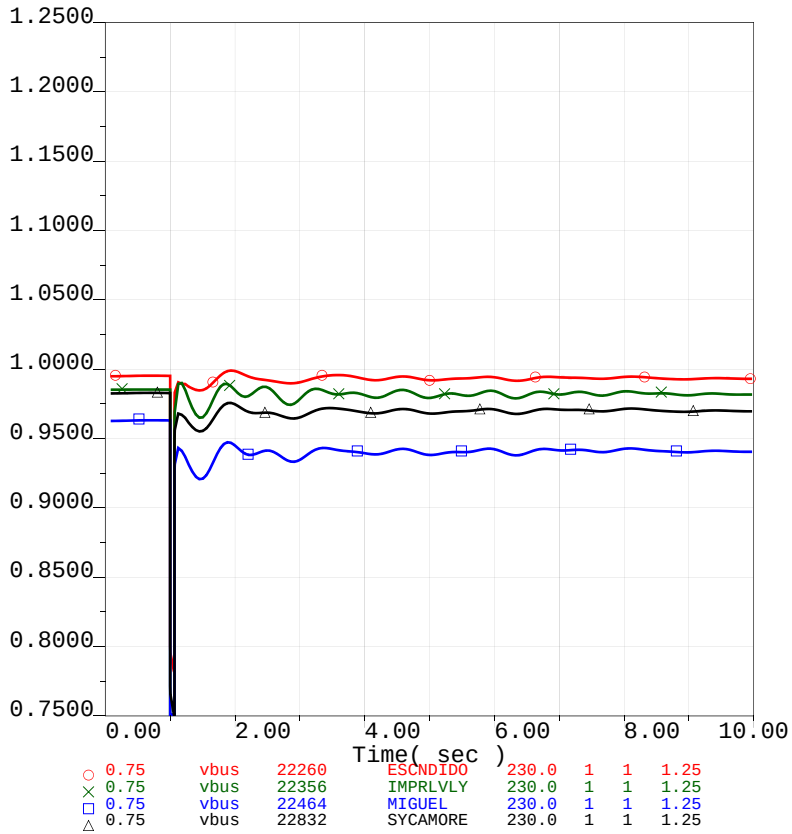
SCE Busses




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbus | 24901 | VSTA | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 24806 | MIRAGE | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 25406 | J.HINDS | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbus | 24804 | DEVERS | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip NEW SAN FELIPE - NORTHSD 500 kV
Case ALT 3B DISPATCH 3

SDGE Busses

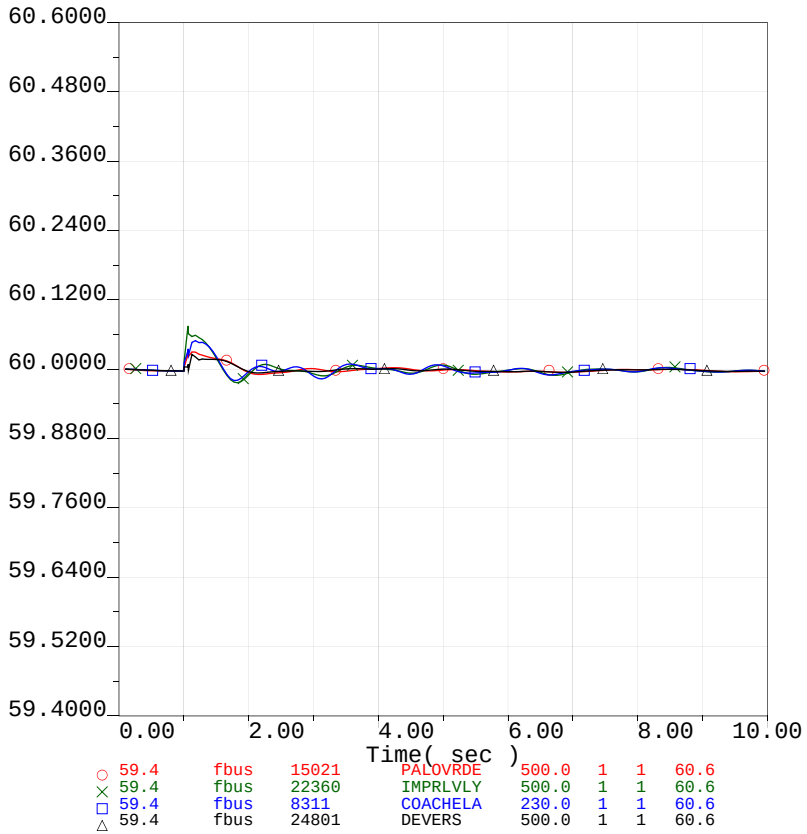



| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ○ | 0.75 | vbus | 22260 | ESCNDIDO | 230.0 | 1 | 1 | 1.25 |
| × | 0.75 | vbus | 22356 | IMPRLVLY | 230.0 | 1 | 1 | 1.25 |
| □ | 0.75 | vbus | 22464 | MIGUEL | 230.0 | 1 | 1 | 1.25 |
| △ | 0.75 | vbus | 22832 | SYCAMORE | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip NEW SAN FELIPE - NORTHSD 500 kV
Case ALT 3B DISPATCH 3



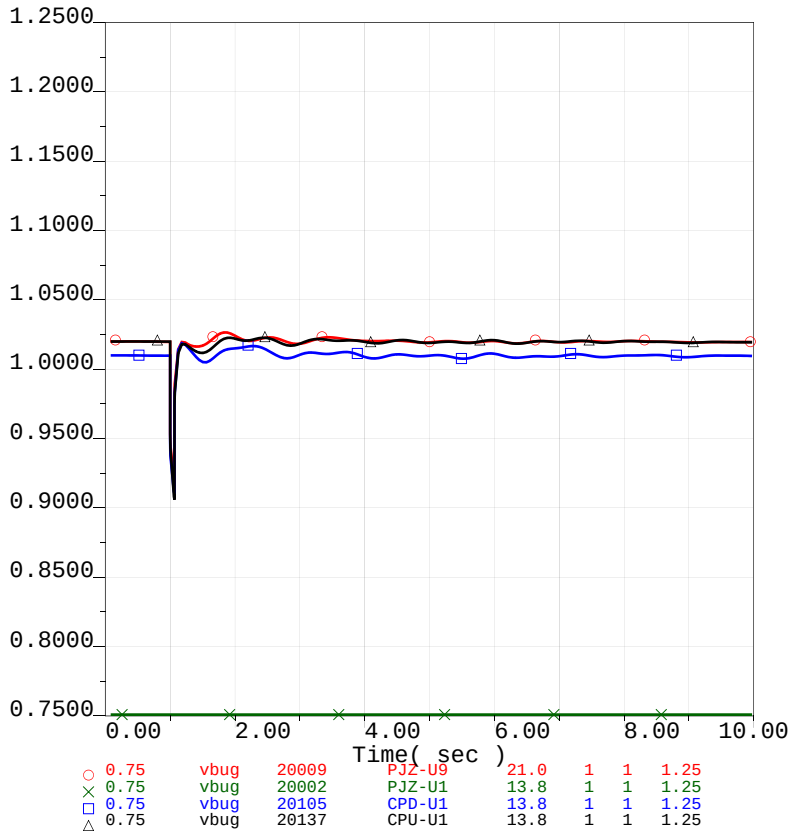
FBus Readings




| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ○ | 59.4 | fbus | 15021 | PALOVRDE | 500.0 | 1 | 1 | 60.6 |
| × | 59.4 | fbus | 22360 | IMPRLVLY | 500.0 | 1 | 1 | 60.6 |
| □ | 59.4 | fbus | 8311 | COACHELA | 230.0 | 1 | 1 | 60.6 |
| △ | 59.4 | fbus | 24801 | DEVERS | 500.0 | 1 | 1 | 60.6 |

IVSG STUDY
Light Autumn Case
Trip NEW SAN FELIPE - NORTHSD 500 kV
Case ALT 3B DISPATCH 3

CFE Busses Page 1



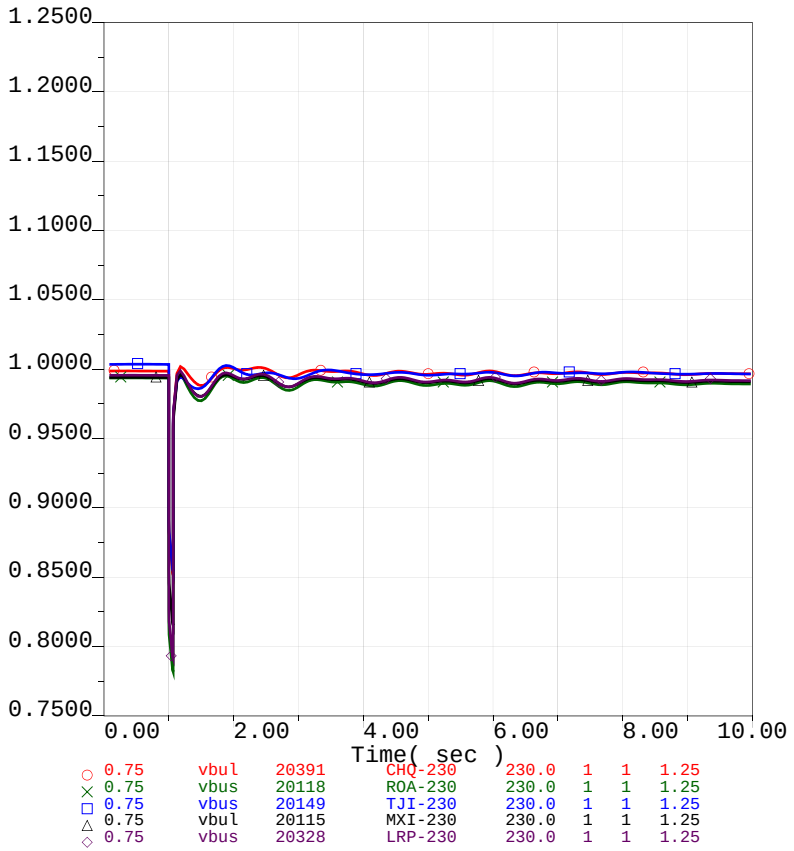

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbug | 20009 | PJZ-U9 | 21.0 | 1 | 1 | 1.25 |
| × 0.75 | vbug | 20002 | PJZ-U1 | 13.8 | 1 | 1 | 1.25 |
| □ 0.75 | vbug | 20105 | CPD-U1 | 13.8 | 1 | 1 | 1.25 |
| △ 0.75 | vbug | 20137 | CPU-U1 | 13.8 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip NEW SAN FELIPE - NORTHSD 500 kV
Case ALT 3B DISPATCH 3





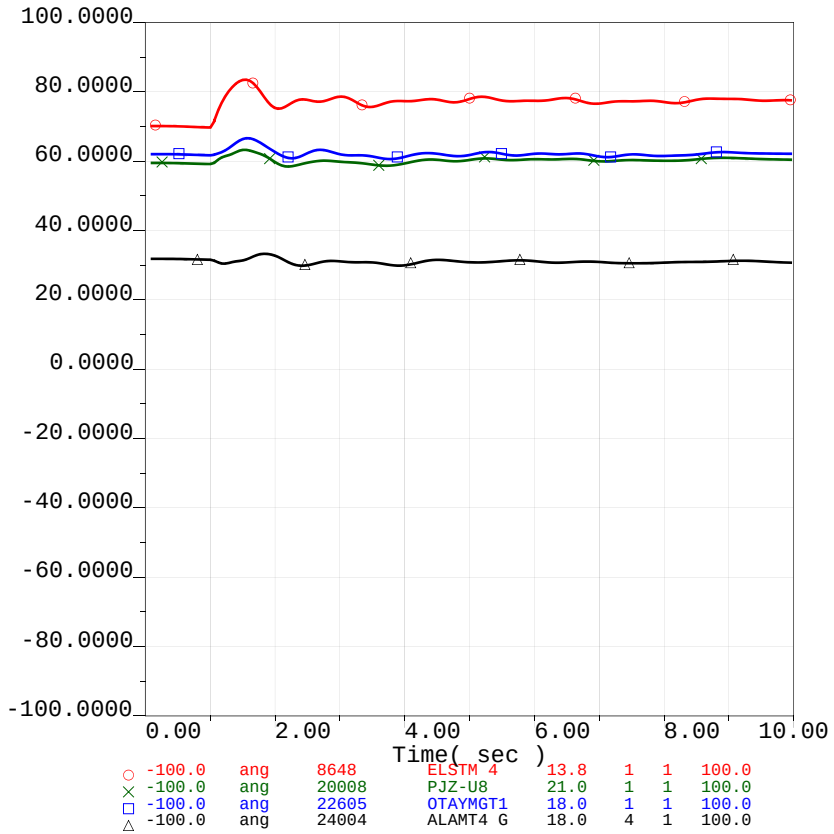
CFE Busses Page 2




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbul | 20391 | CHQ-230 | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 20118 | ROA-230 | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 20149 | TJI-230 | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbul | 20115 | MXI-230 | 230.0 | 1 | 1 | 1.25 |
| ◇ 0.75 | vbus | 20328 | LRP-230 | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip NEW SAN FELIPE - NORTHSD 500 kV
Case ALT 3B DISPATCH 3

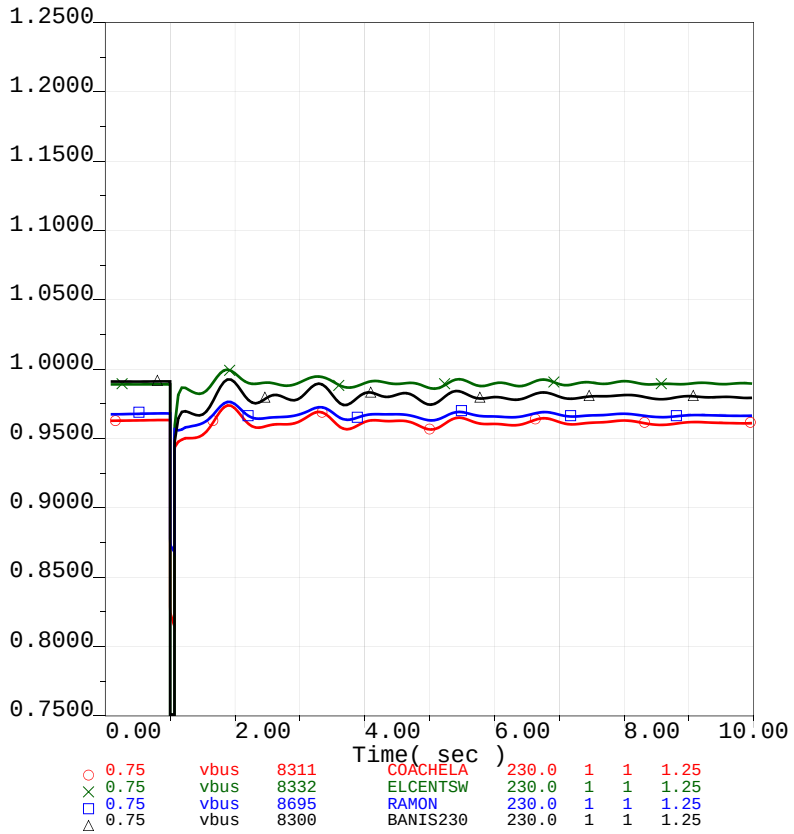
Rotor Angles for Gen Busses




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ -100.0 | ang | 8648 | ELSTM 4 | 13.8 | 1 | 1 | 100.0 |
| × -100.0 | ang | 20008 | PJZ-U8 | 21.0 | 1 | 1 | 100.0 |
| □ -100.0 | ang | 22605 | OTAYMGT1 | 18.0 | 1 | 1 | 100.0 |
| △ -100.0 | ang | 24004 | ALAMT4 G | 18.0 | 4 | 1 | 100.0 |

IVSG STUDY
Light Autumn Case
Trip NEW SAN FELIPE - NORTHSD 500 kV
Case ALT 3B DISPATCH 3

IID Busses



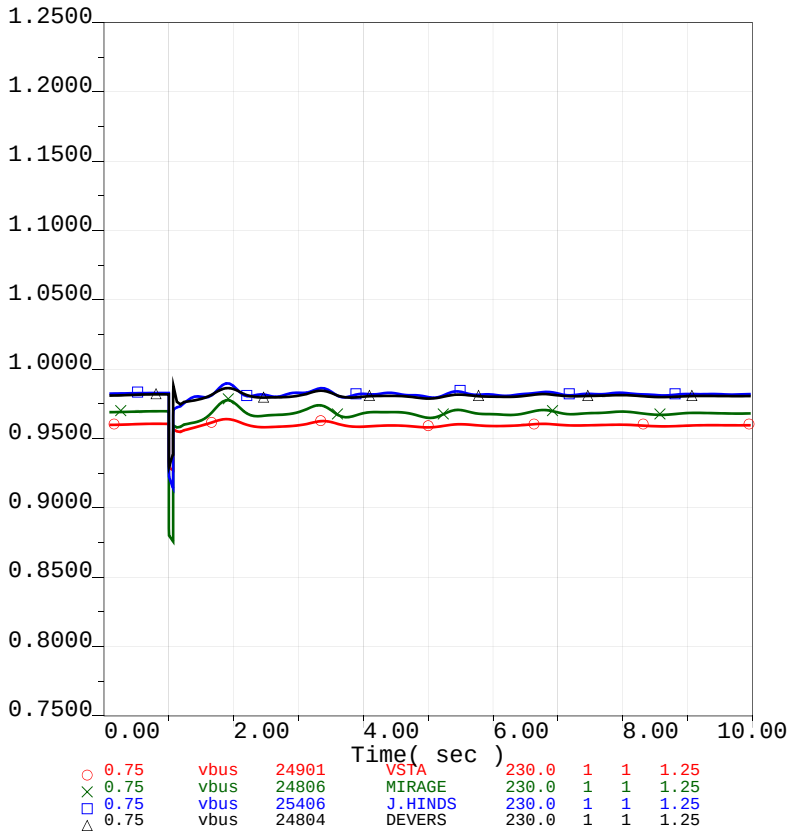

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbus | 8311 | COACHELA | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 8332 | ELCENTSW | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 8695 | RAMON | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbus | 8300 | BANIS230 | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip NEW SAN FELIPE - IMPERIAL VALLEY 500 kV
Case ALT 2 DISPATCH 3





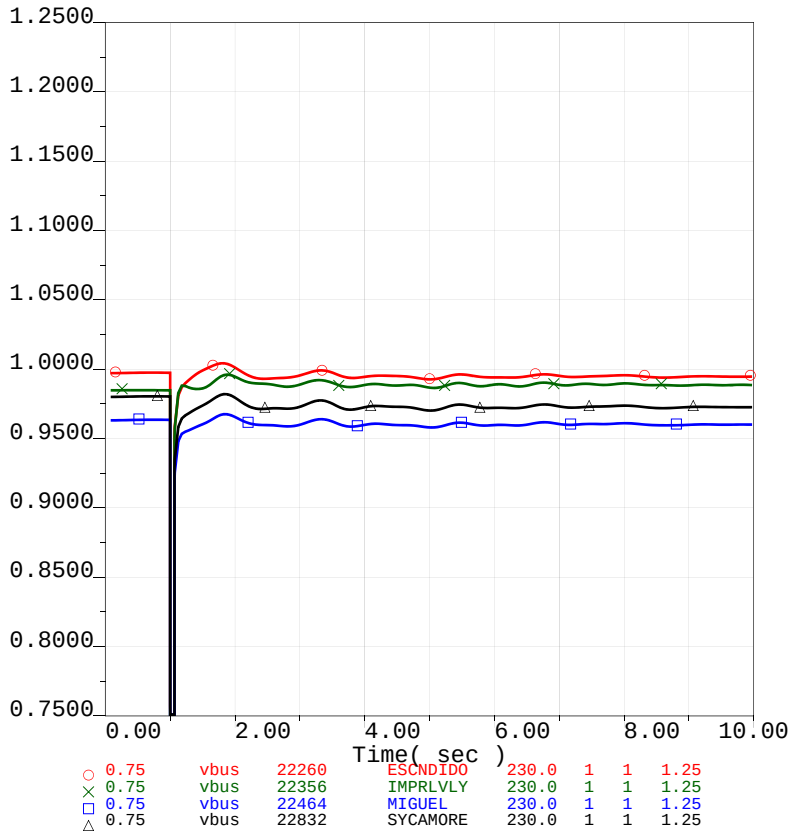
SCE Busses




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbus | 24901 | VSTA | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 24806 | MIRAGE | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 25406 | J.HINDS | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbus | 24804 | DEVERS | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip NEW SAN FELIPE - IMPERIAL VALLEY 500 kV
Case ALT 2 DISPATCH 3

SDGE Busses

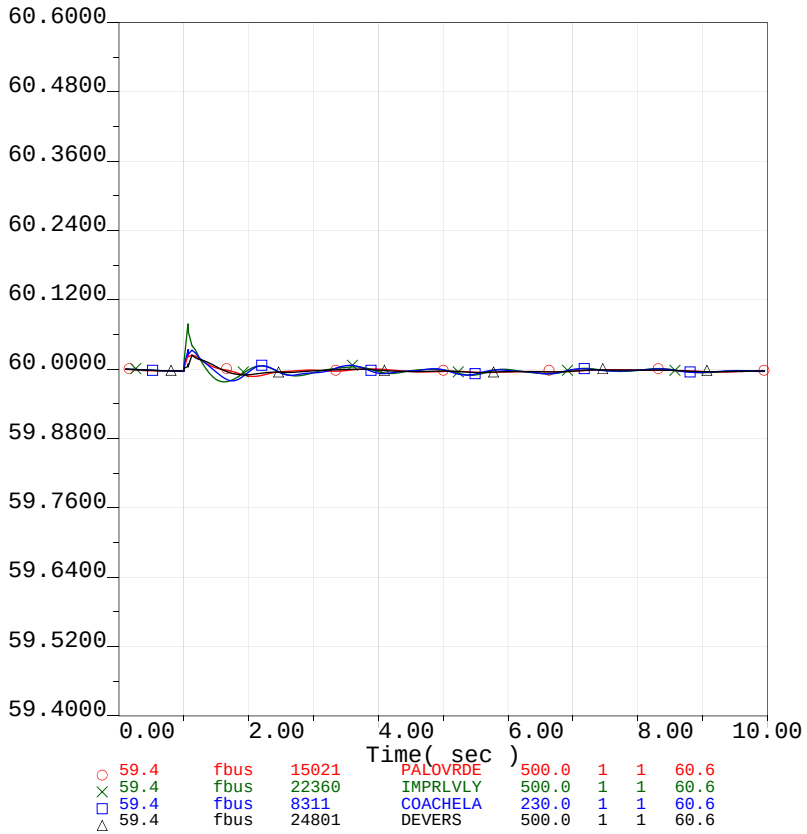



| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ○ | 0.75 | vbus | 22260 | ESCNDIDO | 230.0 | 1 | 1 | 1.25 |
| × | 0.75 | vbus | 22356 | IMPRLVLY | 230.0 | 1 | 1 | 1.25 |
| □ | 0.75 | vbus | 22464 | MIGUEL | 230.0 | 1 | 1 | 1.25 |
| △ | 0.75 | vbus | 22832 | SYCAMORE | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip NEW SAN FELIPE - IMPERIAL VALLEY 500 kV
Case ALT 2 DISPATCH 3



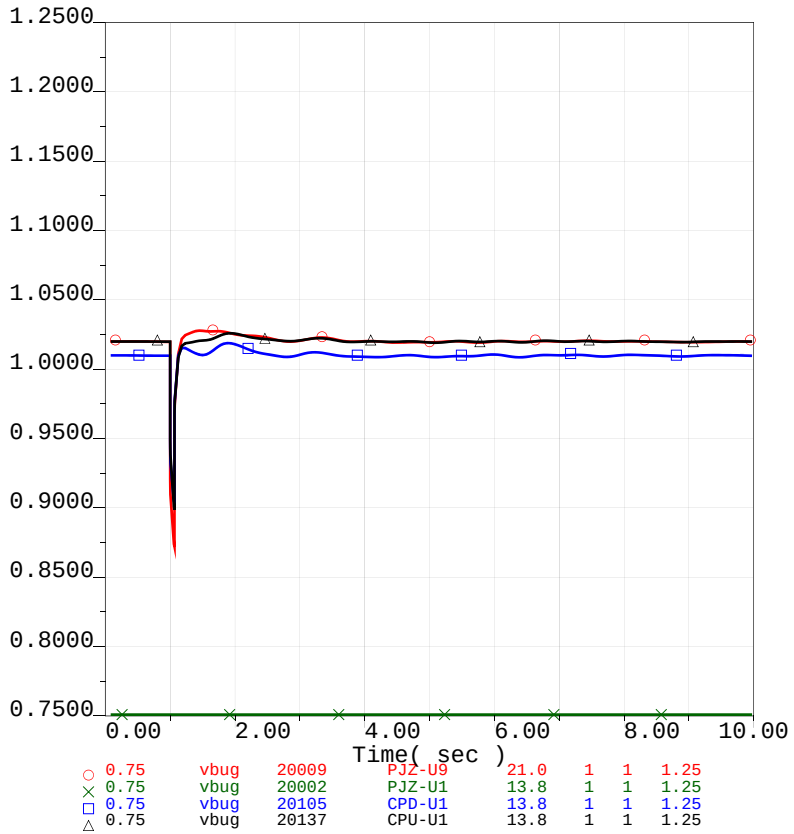
FBus Readings




| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ○ | 59.4 | fbus | 15021 | PALOVRDE | 500.0 | 1 | 1 | 60.6 |
| × | 59.4 | fbus | 22360 | IMPRLVLY | 500.0 | 1 | 1 | 60.6 |
| □ | 59.4 | fbus | 8311 | COACHELA | 230.0 | 1 | 1 | 60.6 |
| △ | 59.4 | fbus | 24801 | DEVERS | 500.0 | 1 | 1 | 60.6 |

IVSG STUDY
Light Autumn Case
Trip NEW SAN FELIPE - IMPERIAL VALLEY 500 kV
Case ALT 2 DISPATCH 3

CFE Busses Page 1

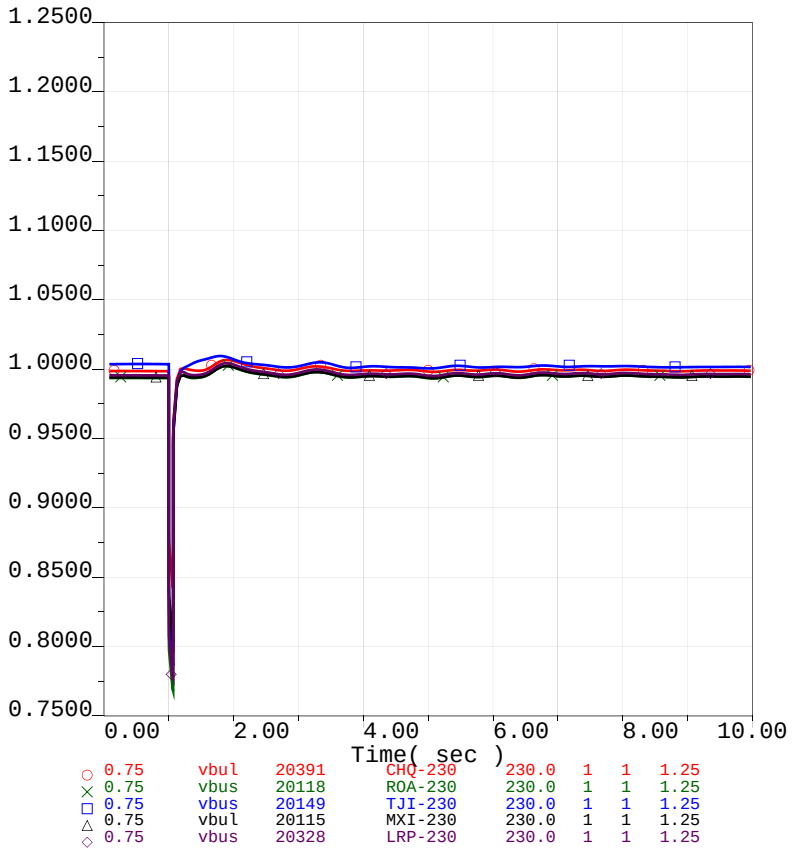



| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbug | 20009 | PJZ-U9 | 21.0 | 1 | 1 | 1.25 |
| × 0.75 | vbug | 20002 | PJZ-U1 | 13.8 | 1 | 1 | 1.25 |
| □ 0.75 | vbug | 20105 | CPD-U1 | 13.8 | 1 | 1 | 1.25 |
| △ 0.75 | vbug | 20137 | CPU-U1 | 13.8 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip NEW SAN FELIPE - IMPERIAL VALLEY 500 kV
Case ALT 2 DISPATCH 3



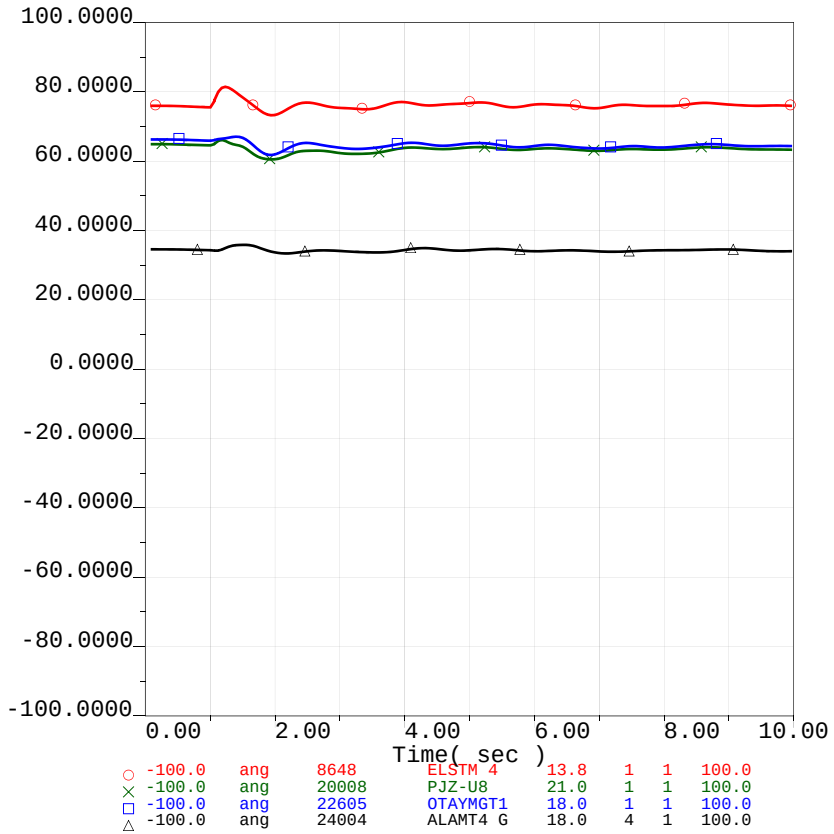
CFE Busses Page 2




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbul | 20391 | CHQ-230 | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 20118 | ROA-230 | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 20149 | TJI-230 | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbul | 20115 | MXI-230 | 230.0 | 1 | 1 | 1.25 |
| ◇ 0.75 | vbus | 20328 | LRP-230 | 230.0 | 1 | 1 | 1.25 |

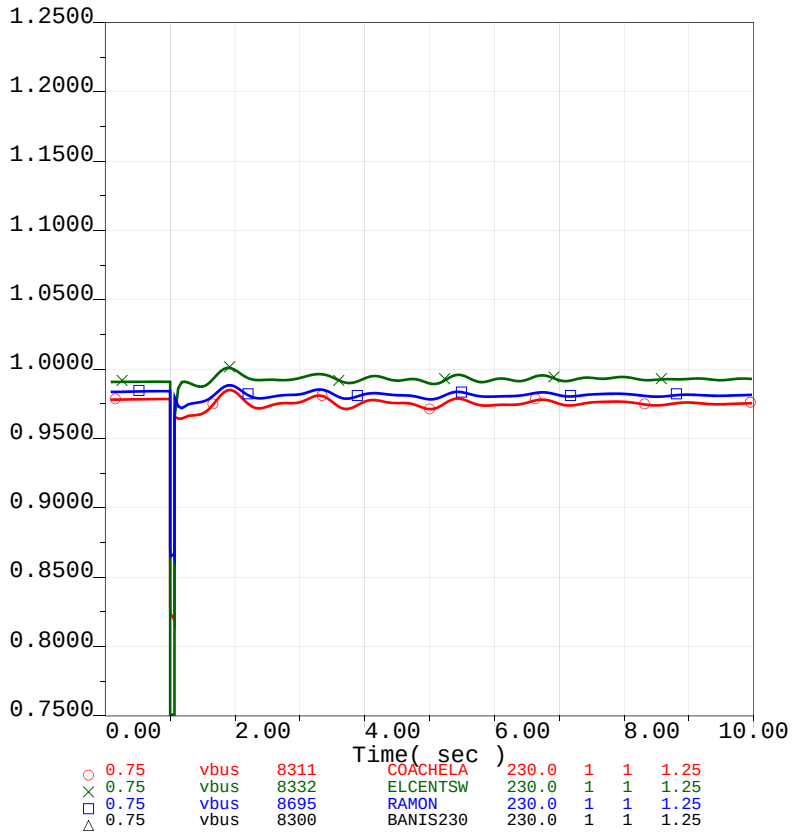
IVSG STUDY
Light Autumn Case
Trip NEW SAN FELIPE - IMPERIAL VALLEY 500 kV
Case ALT 2 DISPATCH 3

Rotor Angles for Gen Busses




IVSG STUDY
Light Autumn Case
Trip NEW SAN FELIPE - IMPERIAL VALLEY 500 kV
Case ALT 2 DISPATCH 3

IID Busses

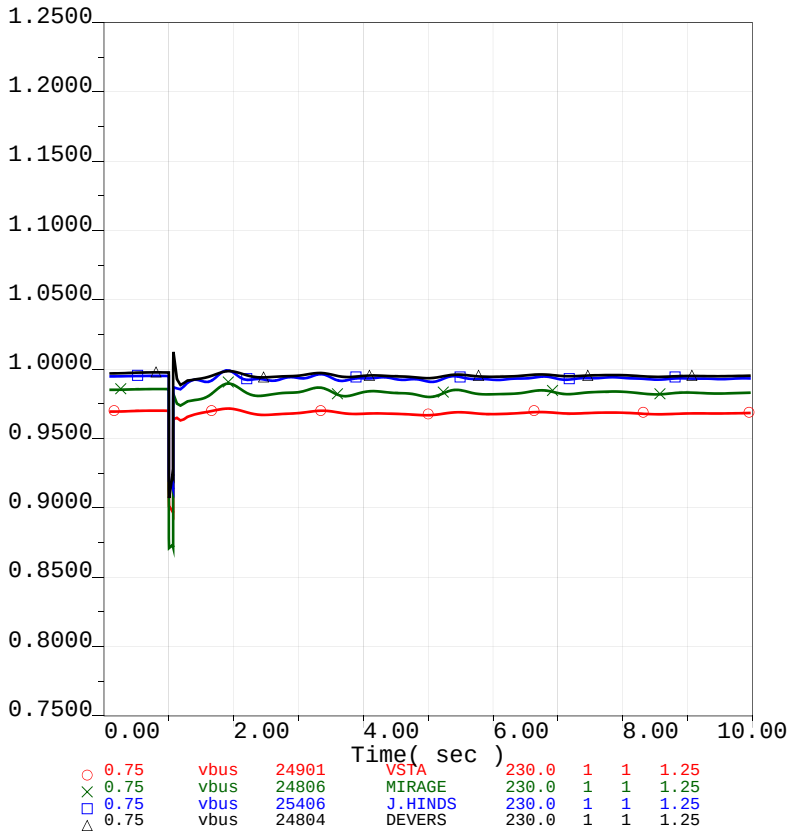



| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbus | 8311 | COACHELA | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 8332 | ELCENTSW | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 8695 | RAMON | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbus | 8300 | BANIS230 | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip NEW SAN FELIPE - IMPERIAL VALLEY 500 kV
Case ALT 3B DISPATCH 3



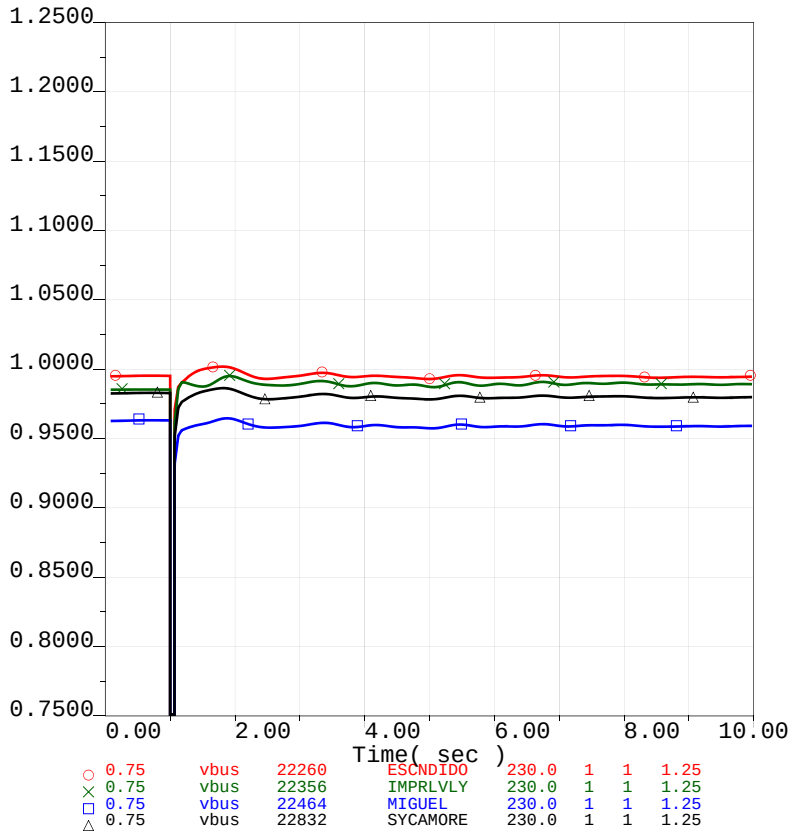
SCE Busses




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbus | 24901 | VSTA | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 24806 | MIRAGE | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 25406 | J.HINDS | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbus | 24804 | DEVERS | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip NEW SAN FELIPE - IMPERIAL VALLEY 500 kV
Case ALT 3B DISPATCH 3

SDGE Busses

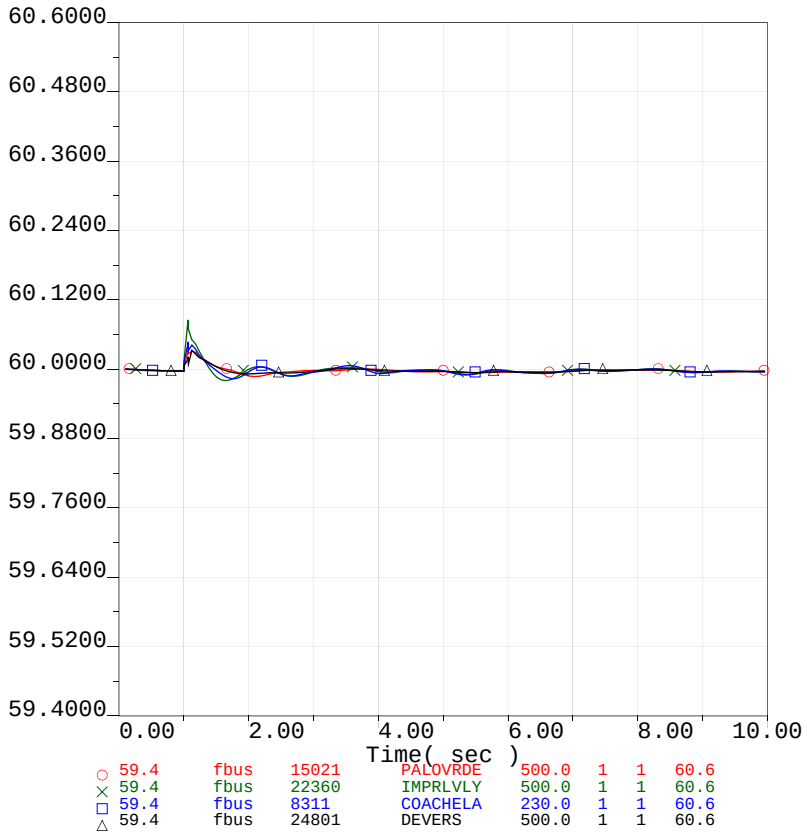



| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ○ | 0.75 | vbus | 22260 | ESCNDIDO | 230.0 | 1 | 1 | 1.25 |
| × | 0.75 | vbus | 22356 | IMPRLVLY | 230.0 | 1 | 1 | 1.25 |
| □ | 0.75 | vbus | 22464 | MIGUEL | 230.0 | 1 | 1 | 1.25 |
| △ | 0.75 | vbus | 22832 | SYCAMORE | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip NEW SAN FELIPE - IMPERIAL VALLEY 500 kV
Case ALT 3B DISPATCH 3



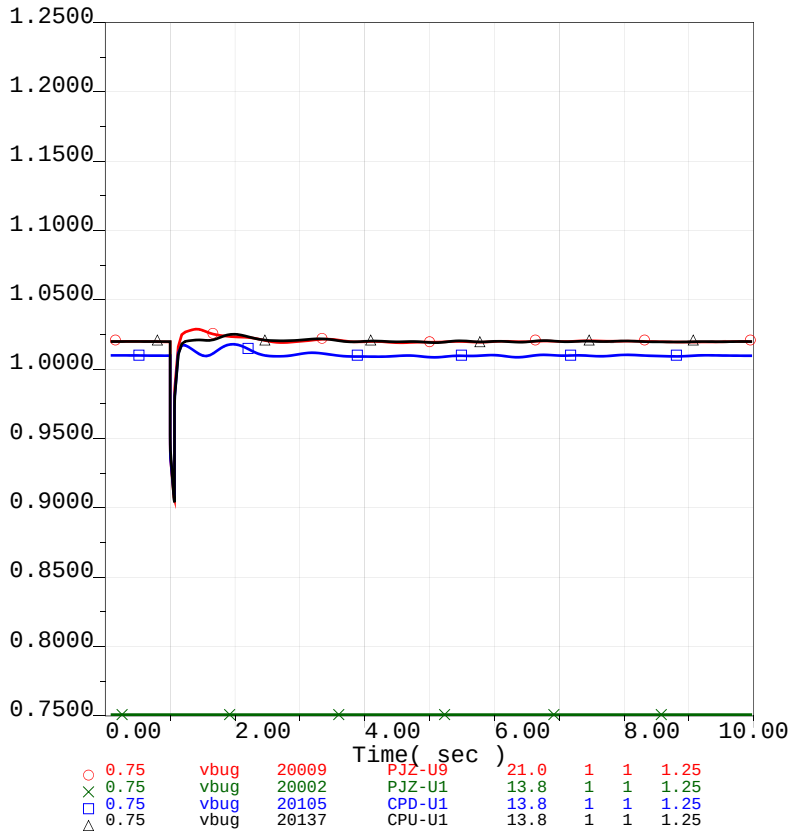
FBus Readings




| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ○ | 59.4 | fbus | 15021 | PALOVRDE | 500.0 | 1 | 1 | 60.6 |
| × | 59.4 | fbus | 22360 | IMPRLVLY | 500.0 | 1 | 1 | 60.6 |
| □ | 59.4 | fbus | 8311 | COACHELA | 230.0 | 1 | 1 | 60.6 |
| △ | 59.4 | fbus | 24801 | DEVERS | 500.0 | 1 | 1 | 60.6 |

IVSG STUDY
Light Autumn Case
Trip NEW SAN FELIPE - IMPERIAL VALLEY 500 kV
Case ALT 3B DISPATCH 3

CFE Busses Page 1

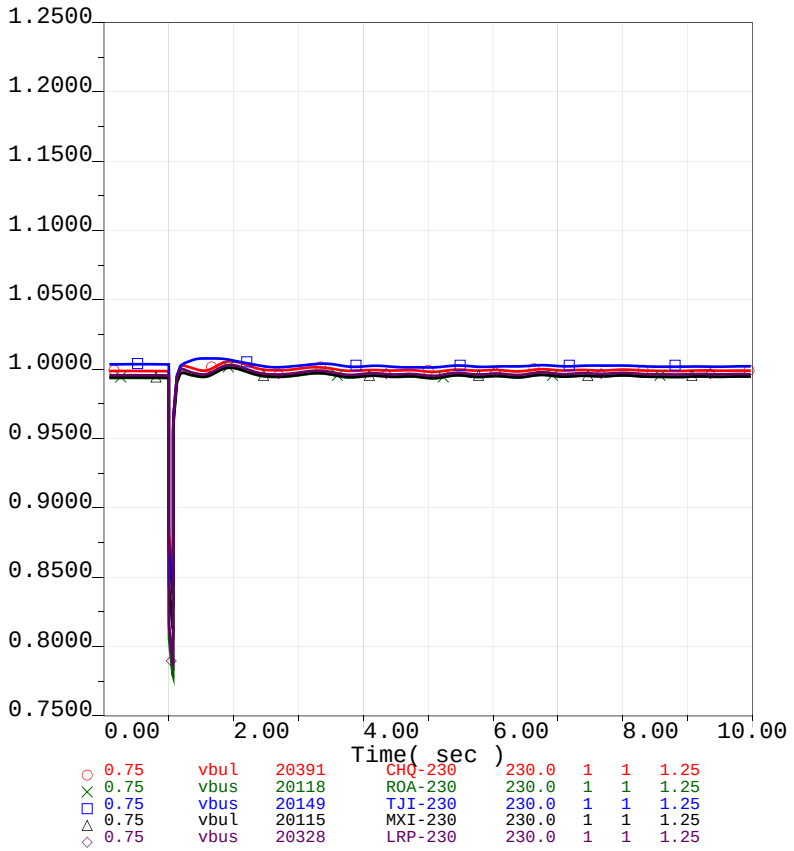



| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbug | 20009 | PJZ-U9 | 21.0 | 1 | 1 | 1.25 |
| × 0.75 | vbug | 20002 | PJZ-U1 | 13.8 | 1 | 1 | 1.25 |
| □ 0.75 | vbug | 20105 | CPD-U1 | 13.8 | 1 | 1 | 1.25 |
| △ 0.75 | vbug | 20137 | CPU-U1 | 13.8 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip NEW SAN FELIPE - IMPERIAL VALLEY 500 kV
Case ALT 3B DISPATCH 3



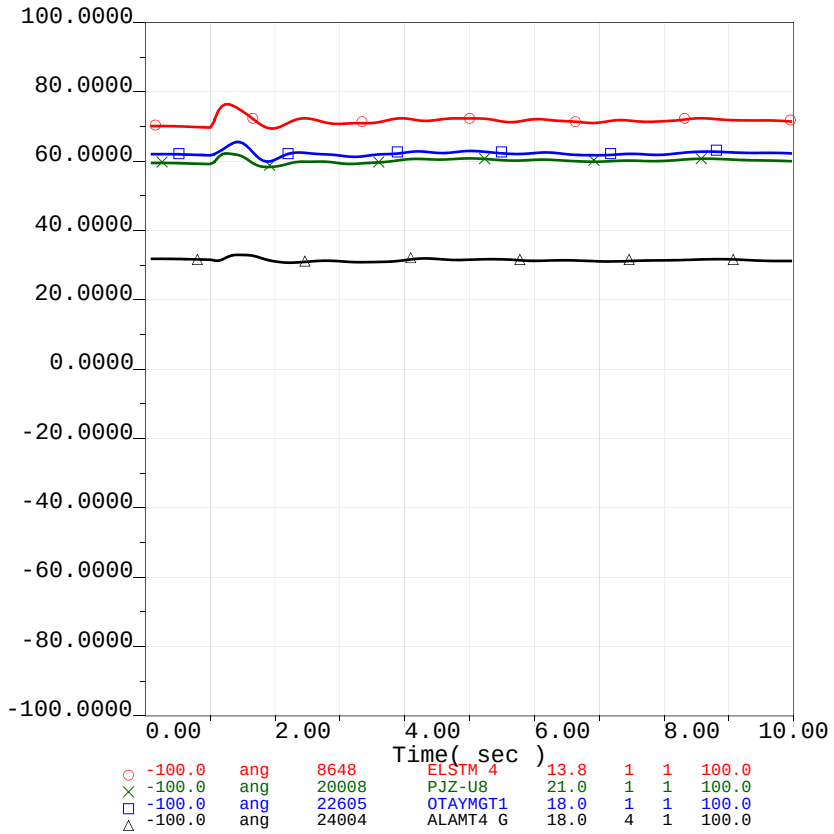
CFE Busses Page 2




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbul | 20391 | CHQ-230 | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 20118 | ROA-230 | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 20149 | TJI-230 | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbul | 20115 | MXI-230 | 230.0 | 1 | 1 | 1.25 |
| ◇ 0.75 | vbus | 20328 | LRP-230 | 230.0 | 1 | 1 | 1.25 |

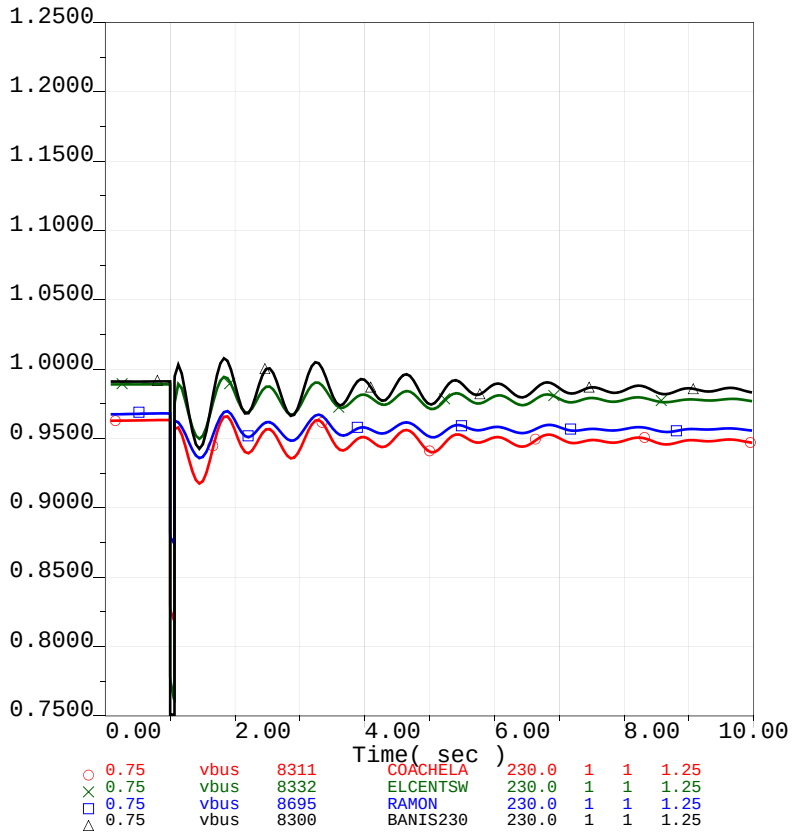
IVSG STUDY
Light Autumn Case
Trip NEW SAN FELIPE - IMPERIAL VALLEY 500 kV
Case ALT 3B DISPATCH 3

Rotor Angles for Gen Busses




IVSG STUDY
Light Autumn Case
Trip NEW SAN FELIPE - IMPERIAL VALLEY 500 kV
Case ALT 3B DISPATCH 3

IID Busses



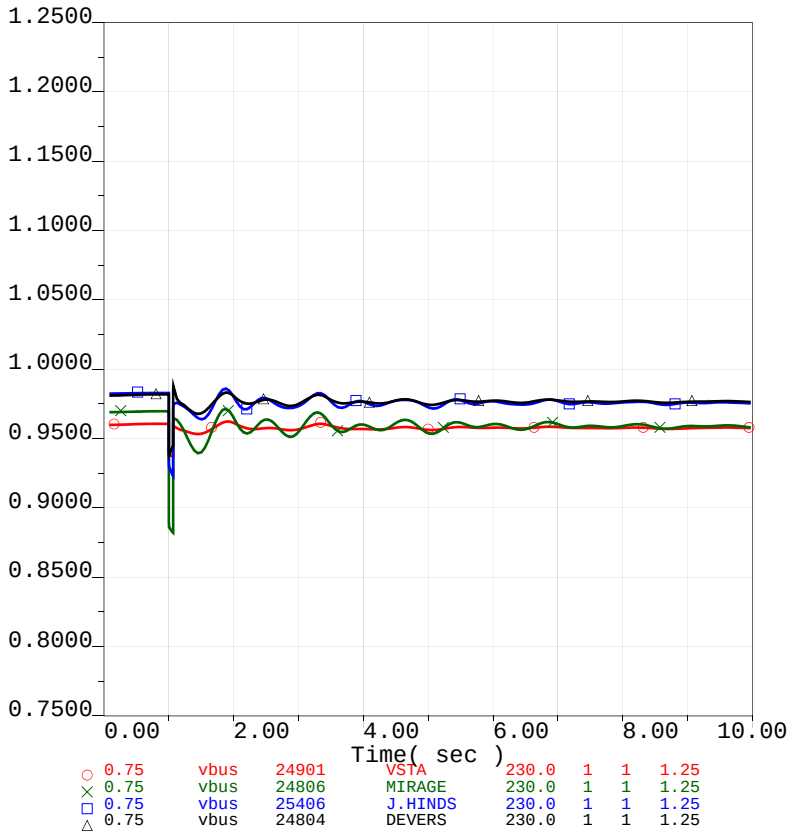

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbus | 8311 | COACHELA | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 8332 | ELCENTSW | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 8695 | RAMON | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbus | 8300 | BANIS230 | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip BANISTER - NEW SAN FELIPE 230 kV
Case ALT 2 DISPATCH 3





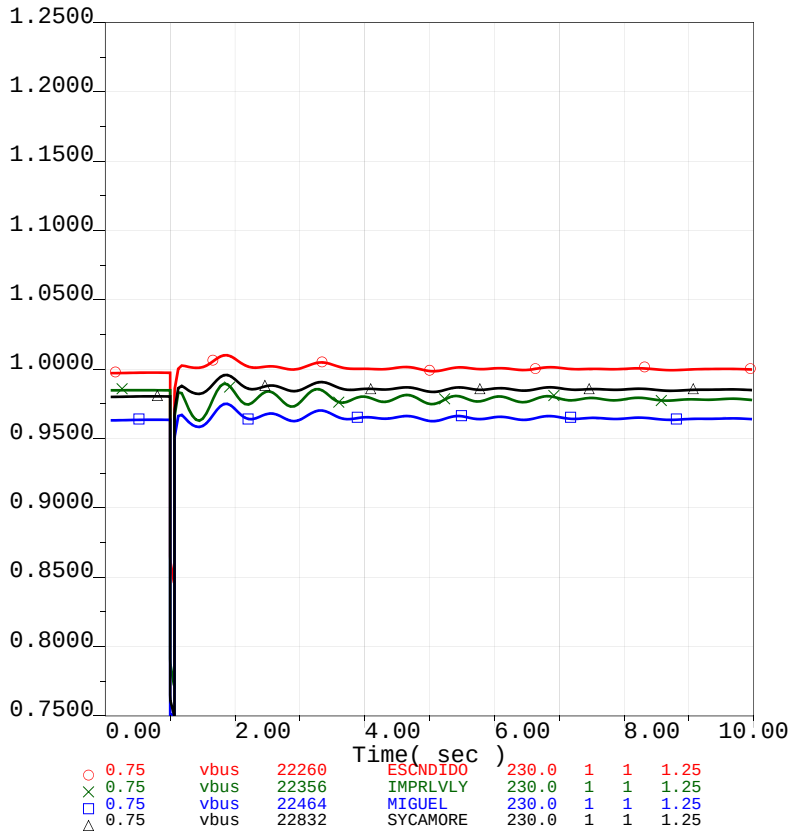
SCE Busses




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbus | 24901 | VSTA | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 24806 | MIRAGE | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 25406 | J.HINDS | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbus | 24804 | DEVERS | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip BANISTER - NEW SAN FELIPE 230 kV
Case ALT 2 DISPATCH 3

SDGE Busses

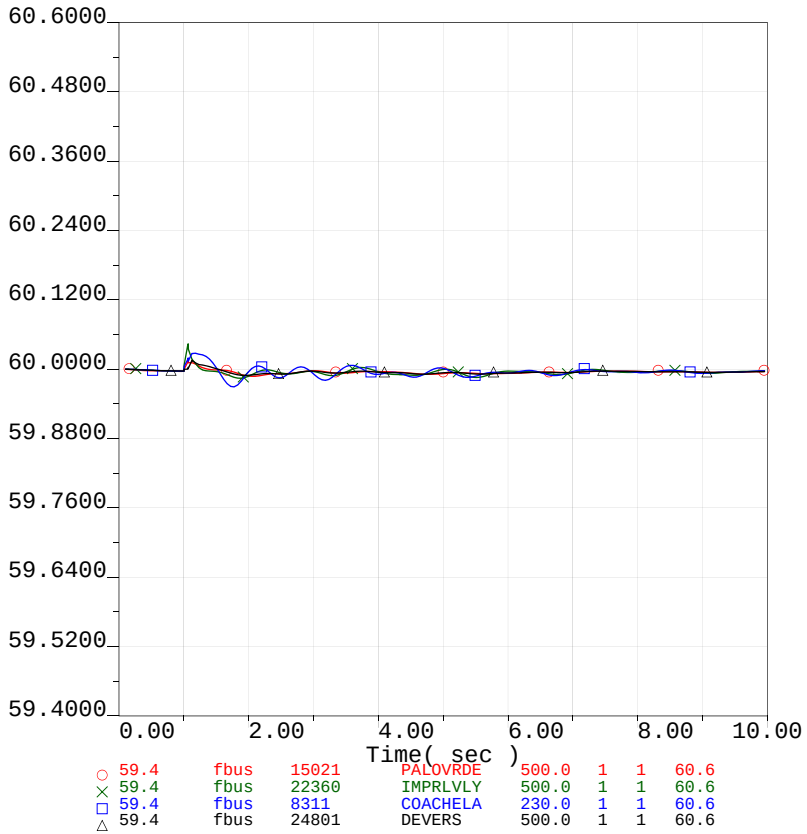



| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ○ | 0.75 | vbus | 22260 | ESCNDIDO | 230.0 | 1 | 1 | 1.25 |
| × | 0.75 | vbus | 22356 | IMPRLVLY | 230.0 | 1 | 1 | 1.25 |
| □ | 0.75 | vbus | 22464 | MIGUEL | 230.0 | 1 | 1 | 1.25 |
| △ | 0.75 | vbus | 22832 | SYCAMORE | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip BANISTER - NEW SAN FELIPE 230 kV
Case ALT 2 DISPATCH 3

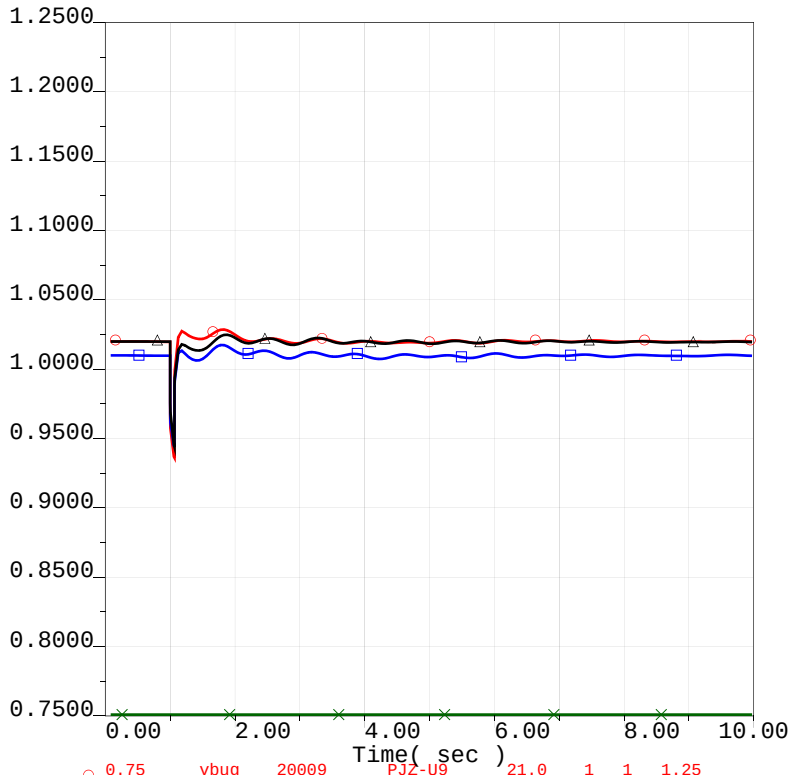


FBus Readings




| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ○ | 59.4 | fbus | 15021 | PALOVRDE | 500.0 | 1 | 1 | 60.6 |
| × | 59.4 | fbus | 22360 | IMPRLVLY | 500.0 | 1 | 1 | 60.6 |
| □ | 59.4 | fbus | 8311 | COACHELA | 230.0 | 1 | 1 | 60.6 |
| △ | 59.4 | fbus | 24801 | DEVERS | 500.0 | 1 | 1 | 60.6 |

IVSG STUDY
Light Autumn Case
Trip BANISTER - NEW SAN FELIPE 230 kV
Case ALT 2 DISPATCH 3

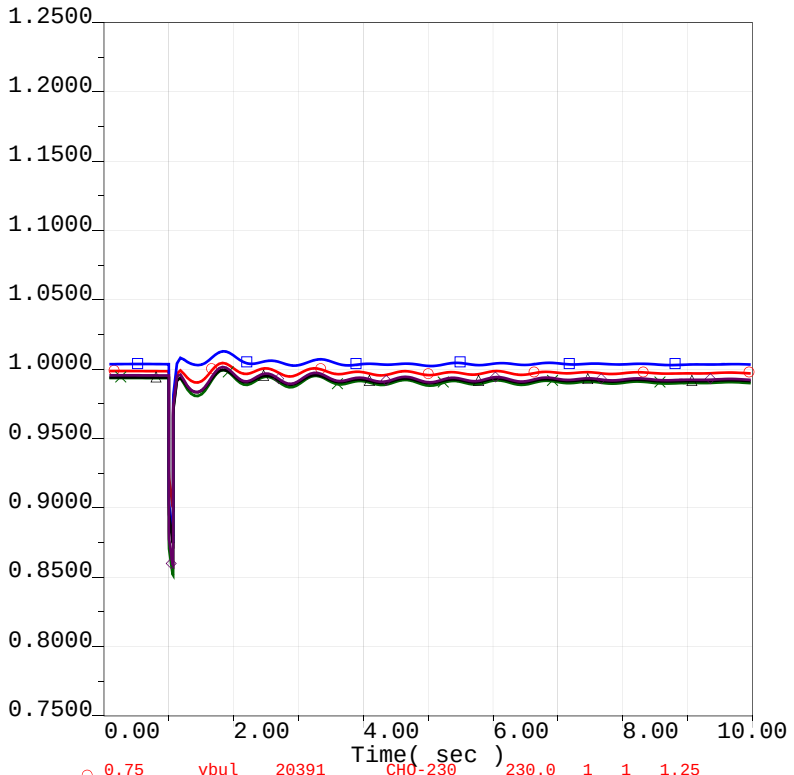



| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbug | 20009 | PJZ-U9 | 21.0 | 1 | 1 | 1.25 |
| × 0.75 | vbug | 20002 | PJZ-U1 | 13.8 | 1 | 1 | 1.25 |
| □ 0.75 | vbug | 20105 | CPD-U1 | 13.8 | 1 | 1 | 1.25 |
| △ 0.75 | vbug | 20137 | CPU-U1 | 13.8 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip BANISTER - NEW SAN FELIPE 230 kV
Case ALT 2 DISPATCH 3



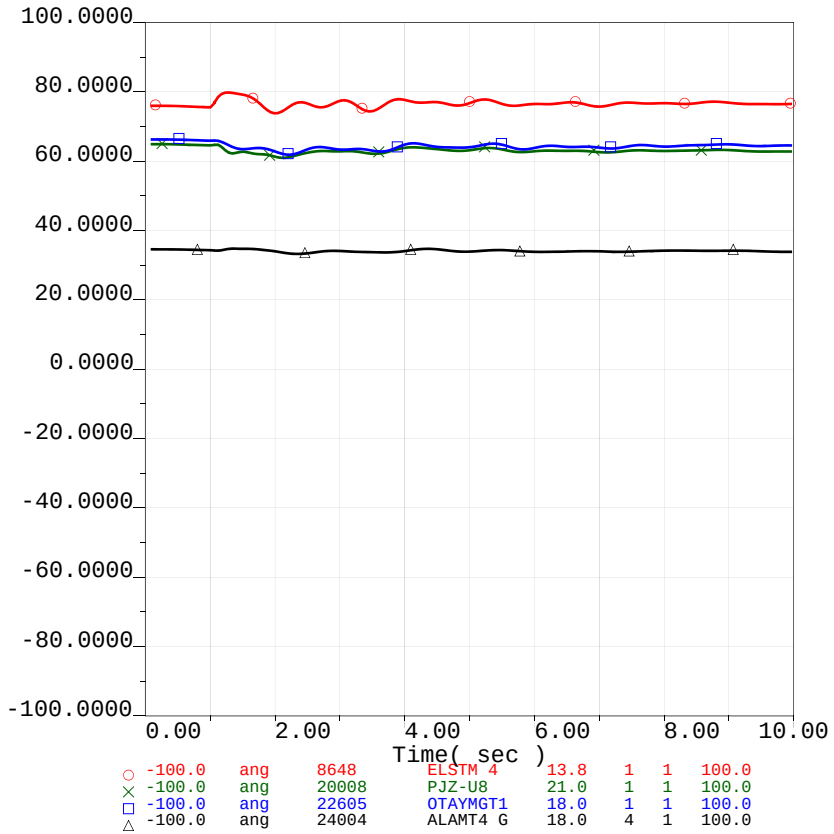





| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbul | 20391 | CHQ-230 | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 20118 | ROA-230 | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 20149 | TJI-230 | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbul | 20115 | MXI-230 | 230.0 | 1 | 1 | 1.25 |
| ◇ 0.75 | vbus | 20328 | LRP-230 | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip BANISTER - NEW SAN FELIPE 230 kV
Case ALT 2 DISPATCH 3

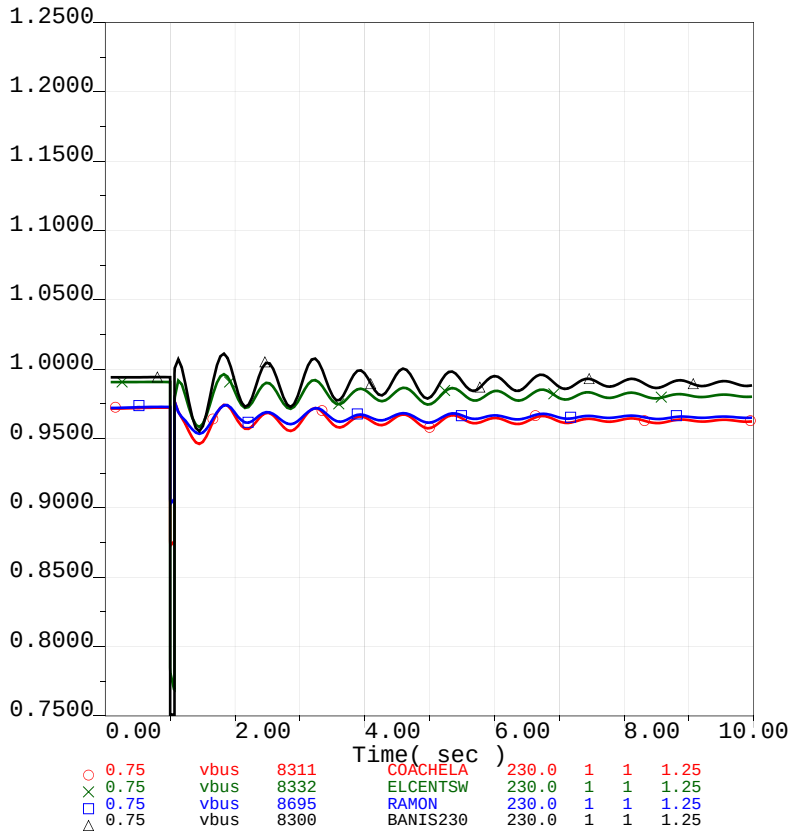
Rotor Angles for Gen Busses




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ -100.0 | ang | 8648 | ELSTM 4 | 13.8 | 1 | 1 | 100.0 |
| × -100.0 | ang | 20008 | PJZ-U8 | 21.0 | 1 | 1 | 100.0 |
| □ -100.0 | ang | 22605 | OTAYMGT1 | 18.0 | 1 | 1 | 100.0 |
| △ -100.0 | ang | 24004 | ALAMT4 G | 18.0 | 4 | 1 | 100.0 |

IVSG STUDY
Light Autumn Case
Trip BANISTER - NEW SAN FELIPE 230 kV
Case ALT 2 DISPATCH 3

IID Busses

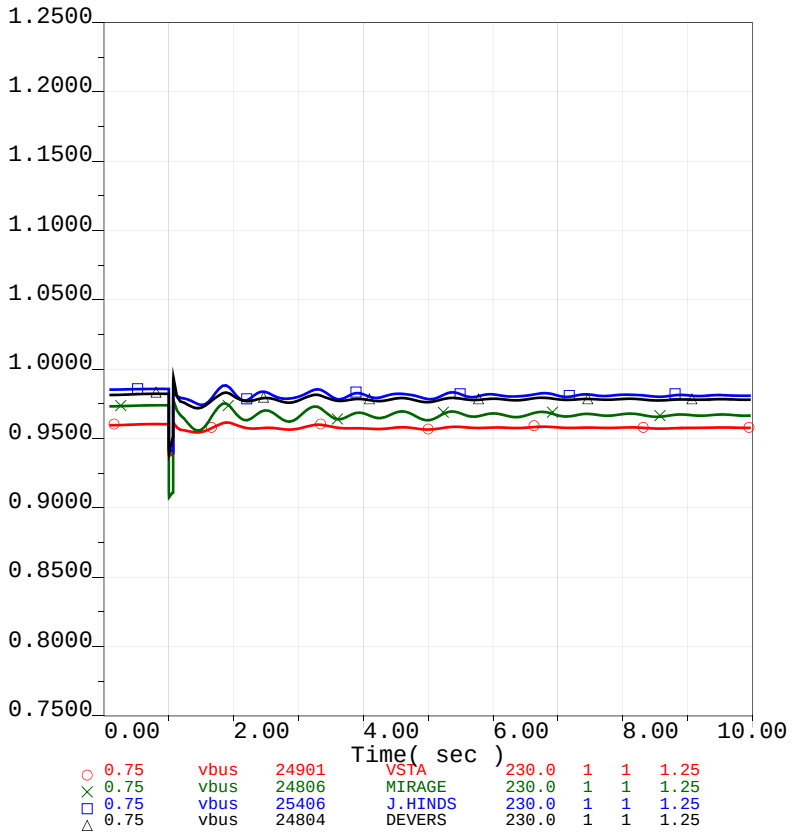



| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbus | 8311 | COACHELA | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 8332 | ELCENTSW | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 8695 | RAMON | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbus | 8300 | BANIS230 | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip BANISTER - NEW SAN FELIPE 230 kV
Case ALT 2A DISPATCH 3



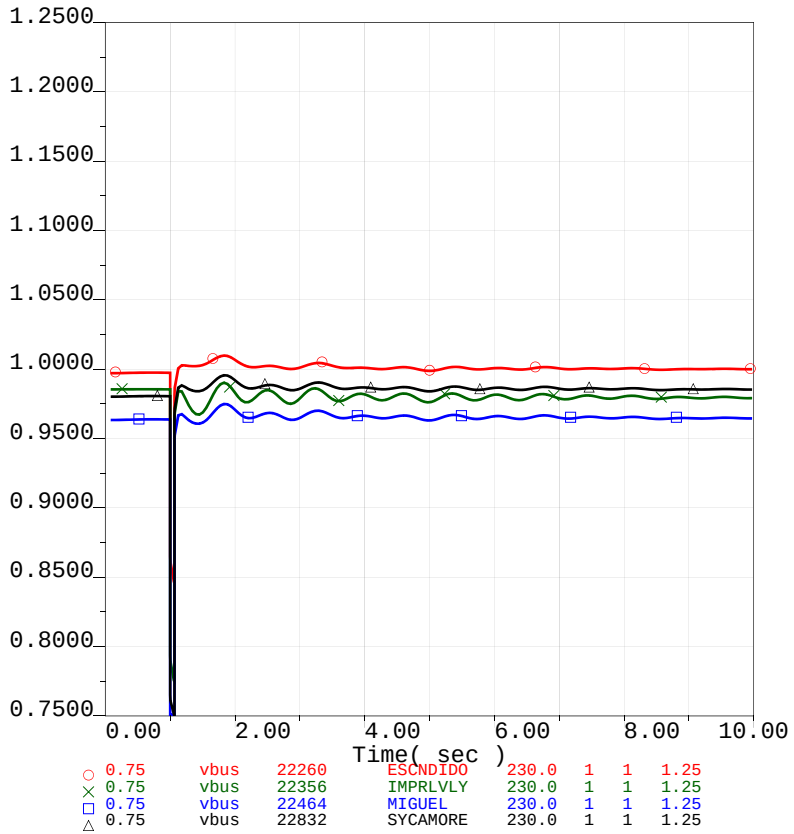
SCE Busses




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbus | 24901 | VSTA | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 24806 | MIRAGE | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 25406 | J.HINDS | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbus | 24804 | DEVERS | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip BANISTER - NEW SAN FELIPE 230 kV
Case ALT 2A DISPATCH 3

SDGE Busses

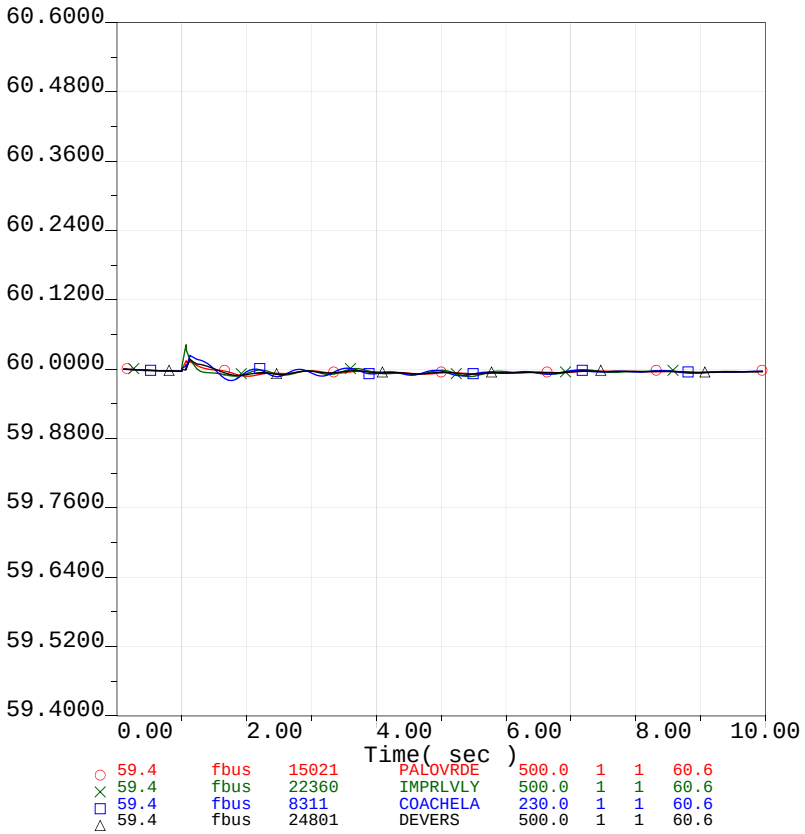



| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ○ | 0.75 | vbus | 22260 | ESCNDIDO | 230.0 | 1 | 1 | 1.25 |
| × | 0.75 | vbus | 22356 | IMPRLVLY | 230.0 | 1 | 1 | 1.25 |
| □ | 0.75 | vbus | 22464 | MIGUEL | 230.0 | 1 | 1 | 1.25 |
| △ | 0.75 | vbus | 22832 | SYCAMORE | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip BANISTER - NEW SAN FELIPE 230 kV
Case ALT 2A DISPATCH 3



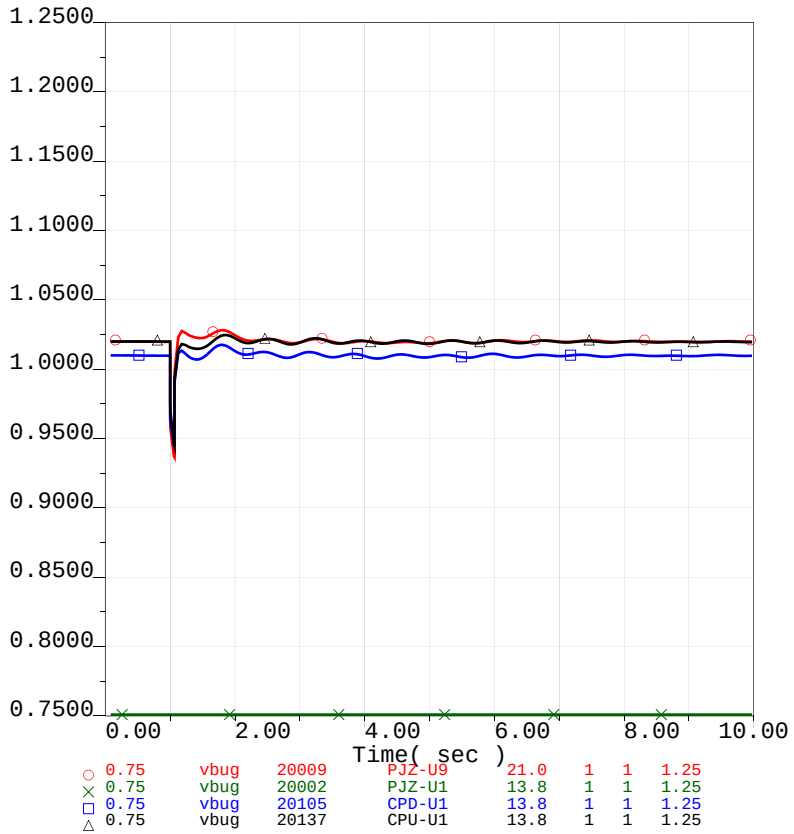
FBus Readings




| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ○ | 59.4 | fbus | 15021 | PALOVRDE | 500.0 | 1 | 1 | 60.6 |
| × | 59.4 | fbus | 22360 | IMPRLVLY | 500.0 | 1 | 1 | 60.6 |
| □ | 59.4 | fbus | 8311 | COACHELA | 230.0 | 1 | 1 | 60.6 |
| △ | 59.4 | fbus | 24801 | DEVERS | 500.0 | 1 | 1 | 60.6 |

IVSG STUDY
Light Autumn Case
Trip BANISTER - NEW SAN FELIPE 230 kV
Case ALT 2A DISPATCH 3

CFE Busses Page 1



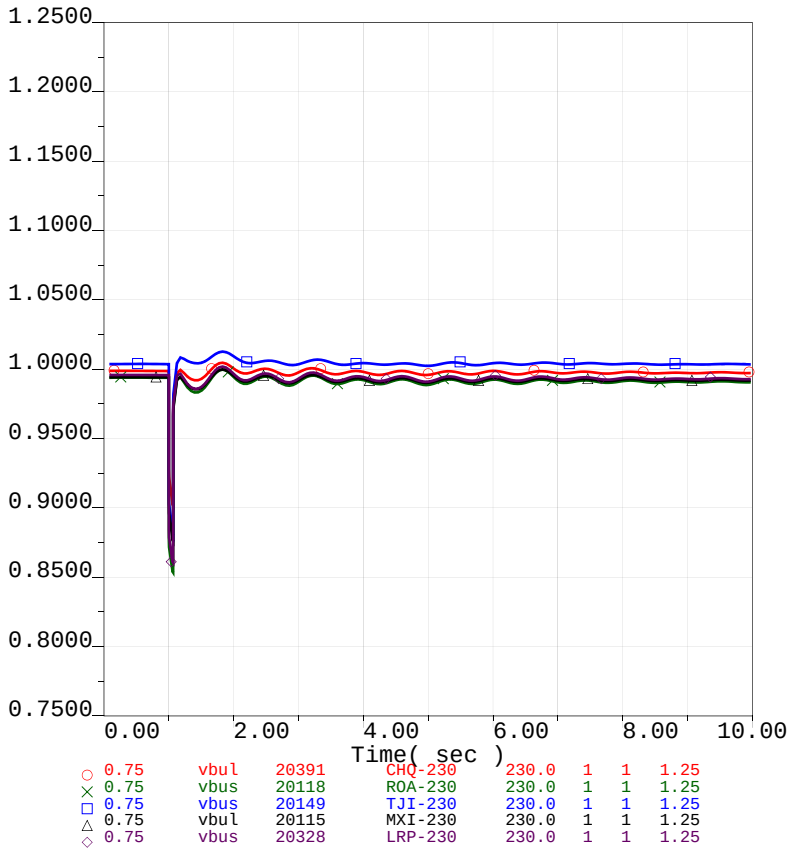

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbug | 20009 | PJZ-U9 | 21.0 | 1 | 1 | 1.25 |
| × 0.75 | vbug | 20002 | PJZ-U1 | 13.8 | 1 | 1 | 1.25 |
| □ 0.75 | vbug | 20105 | CPD-U1 | 13.8 | 1 | 1 | 1.25 |
| △ 0.75 | vbug | 20137 | CPU-U1 | 13.8 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip BANISTER - NEW SAN FELIPE 230 kV
Case ALT 2A DISPATCH 3





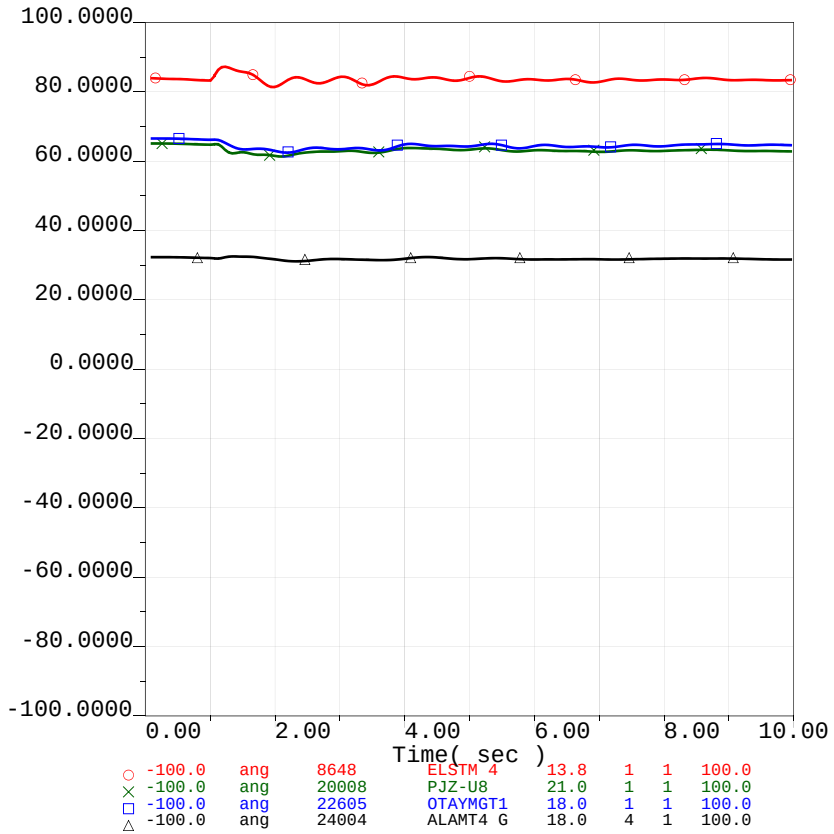
CFE Busses Page 2




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbul | 20391 | CHQ-230 | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 20118 | ROA-230 | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 20149 | TJI-230 | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbul | 20115 | MXI-230 | 230.0 | 1 | 1 | 1.25 |
| ◇ 0.75 | vbus | 20328 | LRP-230 | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip BANISTER - NEW SAN FELIPE 230 kV
Case ALT 2A DISPATCH 3

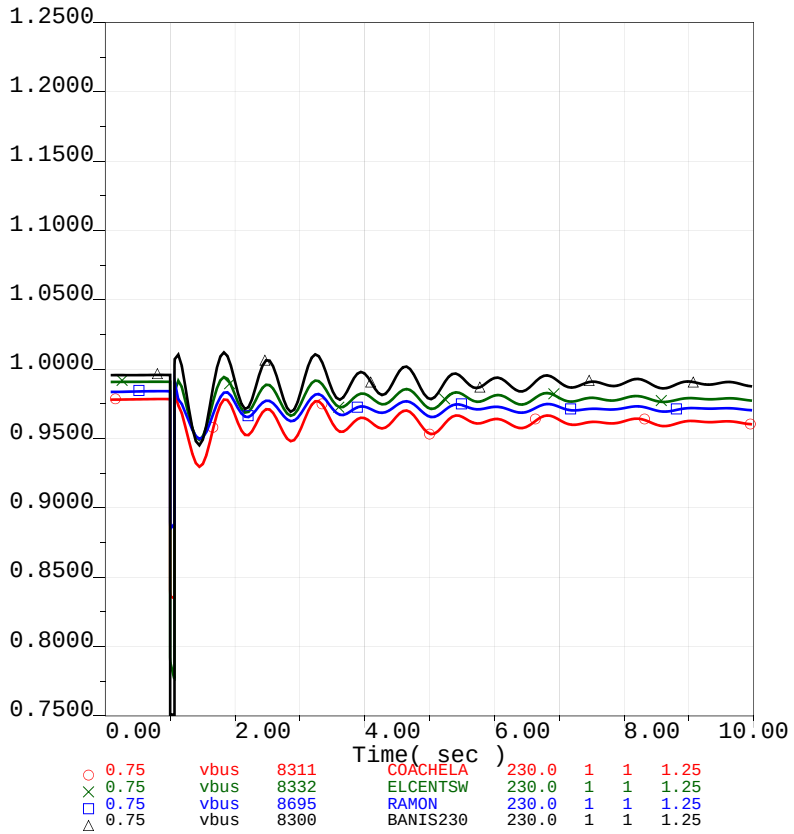
Rotor Angles for Gen Busses




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ -100.0 | ang | 8648 | ELSTM 4 | 13.8 | 1 | 1 | 100.0 |
| × -100.0 | ang | 20008 | PJZ-U8 | 21.0 | 1 | 1 | 100.0 |
| □ -100.0 | ang | 22605 | OTAYMGT1 | 18.0 | 1 | 1 | 100.0 |
| △ -100.0 | ang | 24004 | ALAMT4 G | 18.0 | 4 | 1 | 100.0 |

IVSG STUDY
Light Autumn Case
Trip BANISTER - NEW SAN FELIPE 230 kV
Case ALT 2A DISPATCH 3

IID Busses



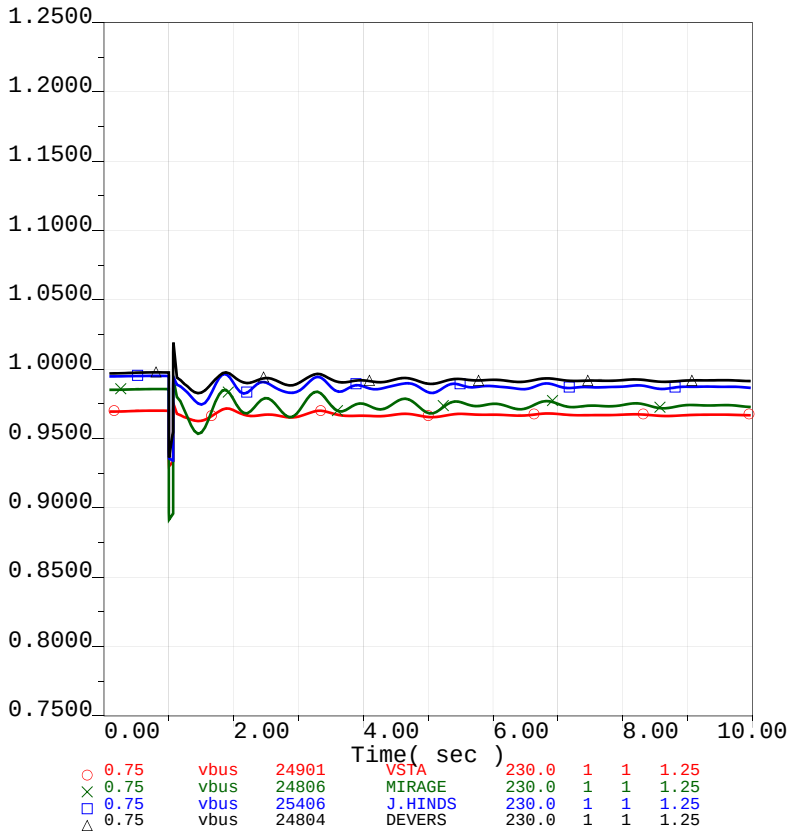

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbus | 8311 | COACHELA | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 8332 | ELCENTSW | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 8695 | RAMON | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbus | 8300 | BANIS230 | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip BANISTER - NEW SAN FELIPE 230 kV
Case ALT 3B DISPATCH 3





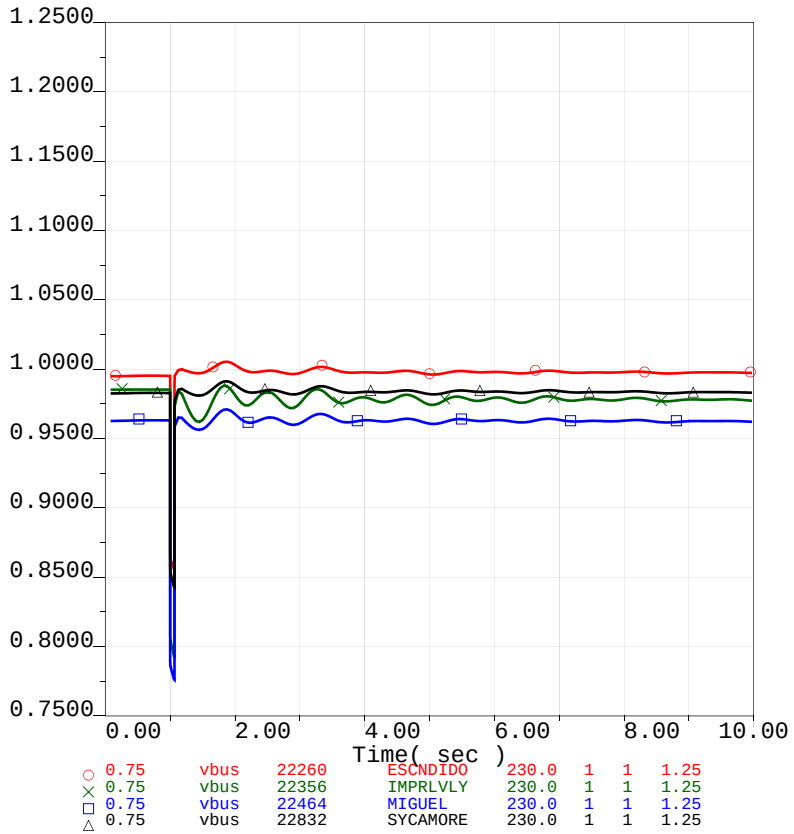
SCE Busses




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbus | 24901 | VSTA | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 24806 | MIRAGE | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 25406 | J.HINDS | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbus | 24804 | DEVERS | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip BANISTER - NEW SAN FELIPE 230 kV
Case ALT 3B DISPATCH 3

SDGE Busses

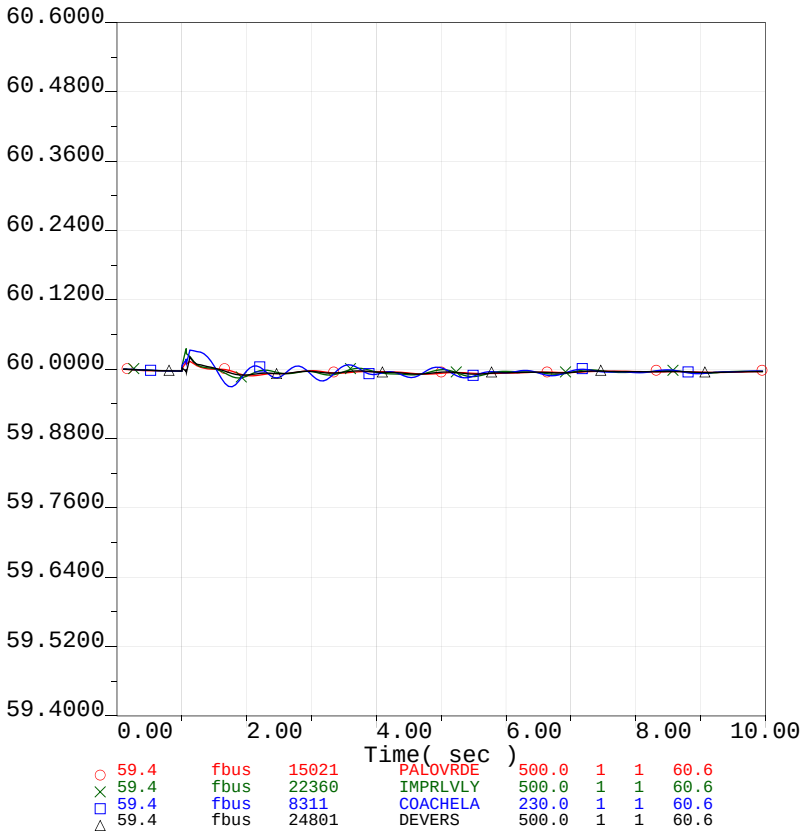



| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ○ | 0.75 | vbus | 22260 | ESCNDIDO | 230.0 | 1 | 1 | 1.25 |
| × | 0.75 | vbus | 22356 | IMPRLVLY | 230.0 | 1 | 1 | 1.25 |
| □ | 0.75 | vbus | 22464 | MIGUEL | 230.0 | 1 | 1 | 1.25 |
| △ | 0.75 | vbus | 22832 | SYCAMORE | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip BANISTER - NEW SAN FELIPE 230 kV
Case ALT 3B DISPATCH 3



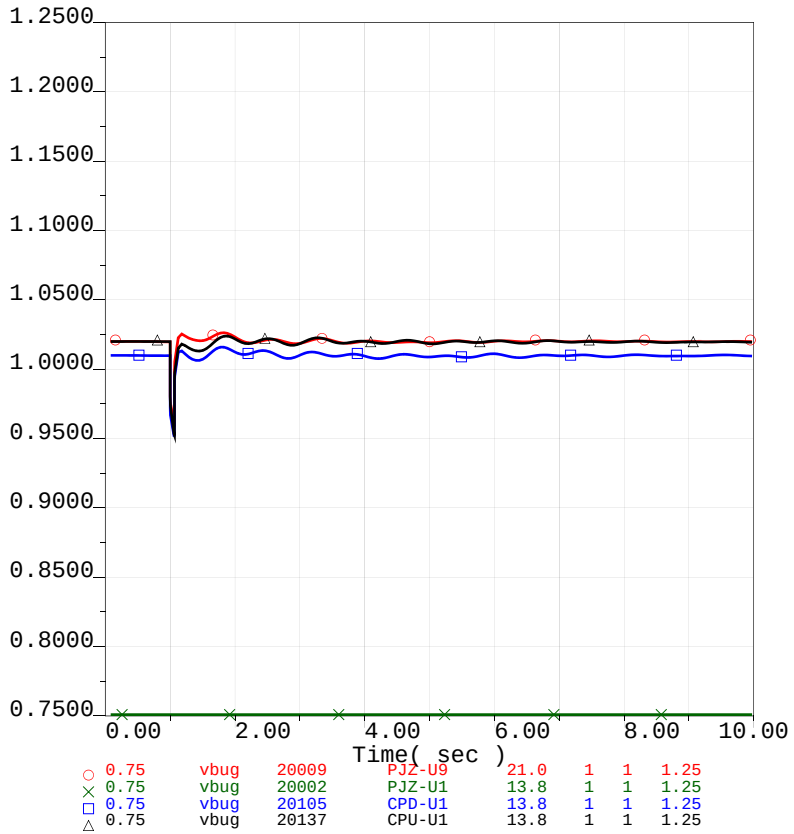
FBus Readings




| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ○ | 59.4 | fbus | 15021 | PALOVRDE | 500.0 | 1 | 1 | 60.6 |
| × | 59.4 | fbus | 22360 | IMPRLVLY | 500.0 | 1 | 1 | 60.6 |
| □ | 59.4 | fbus | 8311 | COACHELA | 230.0 | 1 | 1 | 60.6 |
| △ | 59.4 | fbus | 24801 | DEVERS | 500.0 | 1 | 1 | 60.6 |

IVSG STUDY
Light Autumn Case
Trip BANISTER - NEW SAN FELIPE 230 kV
Case ALT 3B DISPATCH 3

CFE Busses Page 1

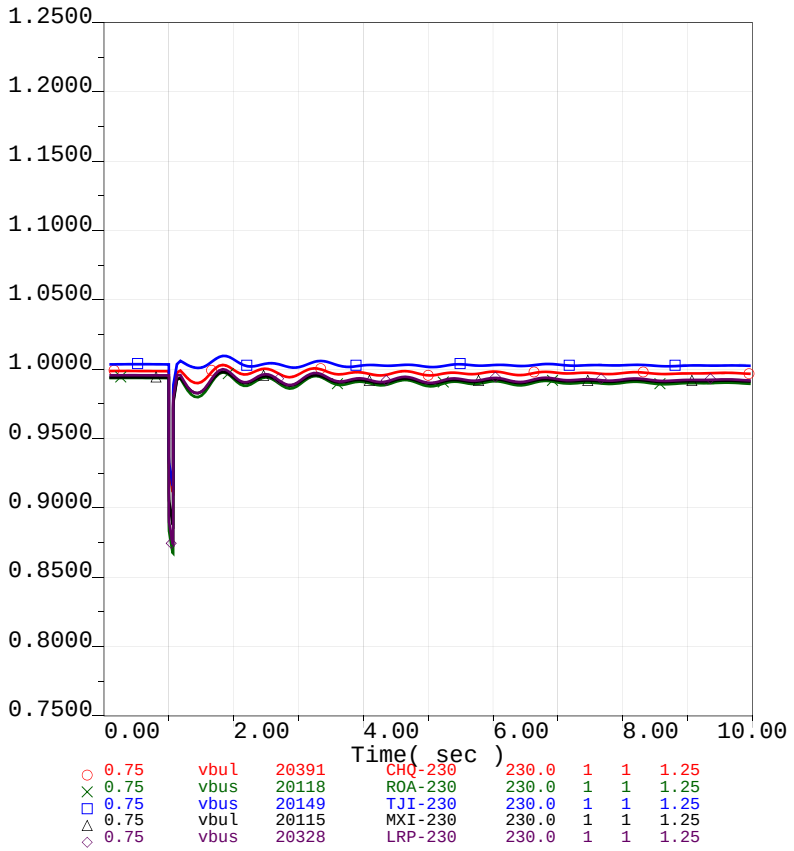



| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbug | 20009 | PJZ-U9 | 21.0 | 1 | 1 | 1.25 |
| × 0.75 | vbug | 20002 | PJZ-U1 | 13.8 | 1 | 1 | 1.25 |
| □ 0.75 | vbug | 20105 | CPD-U1 | 13.8 | 1 | 1 | 1.25 |
| △ 0.75 | vbug | 20137 | CPU-U1 | 13.8 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip BANISTER - NEW SAN FELIPE 230 kV
Case ALT 3B DISPATCH 3



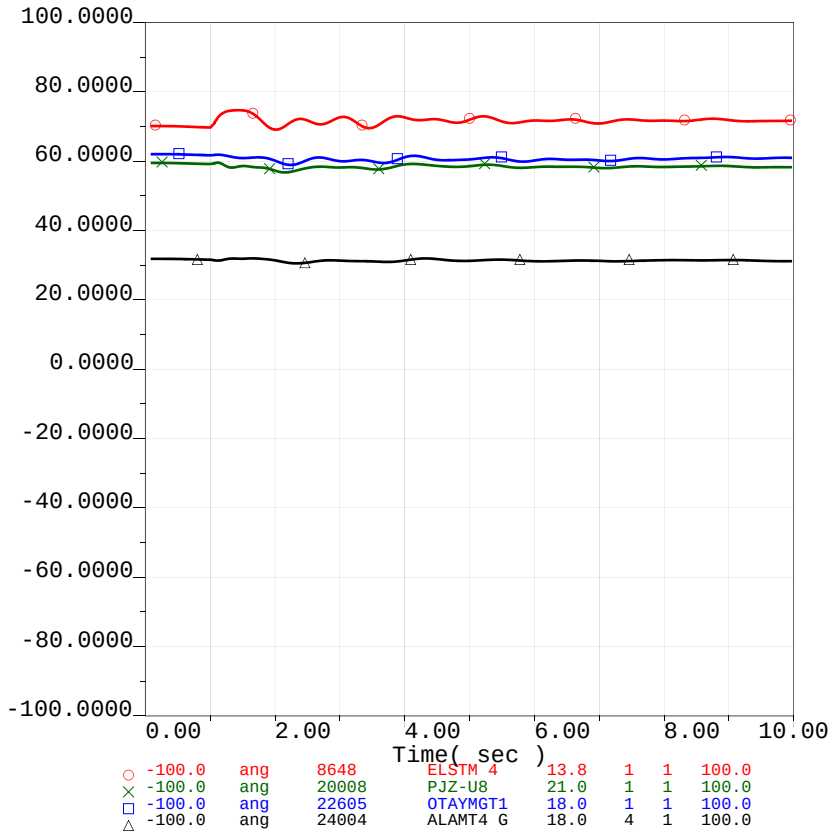
CFE Busses Page 2




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbul | 20391 | CHQ-230 | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 20118 | ROA-230 | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 20149 | TJI-230 | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbul | 20115 | MXI-230 | 230.0 | 1 | 1 | 1.25 |
| ◇ 0.75 | vbus | 20328 | LRP-230 | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip BANISTER - NEW SAN FELIPE 230 kV
Case ALT 3B DISPATCH 3

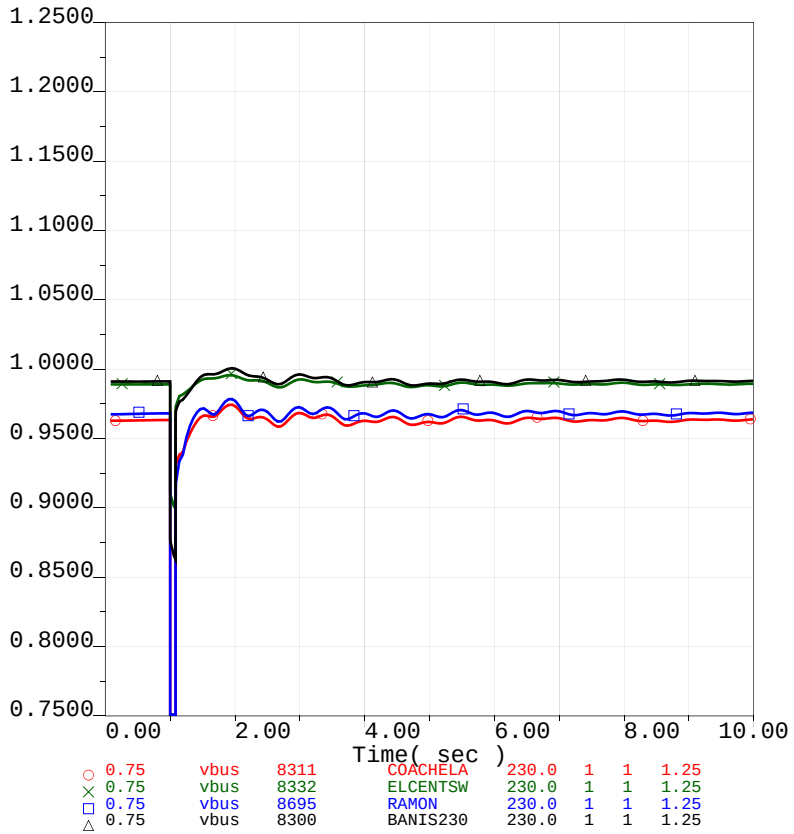
Rotor Angles for Gen Busses




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ -100.0 | ang | 8648 | ELSTM 4 | 13.8 | 1 | 1 | 100.0 |
| × -100.0 | ang | 20008 | PJZ-U8 | 21.0 | 1 | 1 | 100.0 |
| □ -100.0 | ang | 22605 | OTAYMGT1 | 18.0 | 1 | 1 | 100.0 |
| △ -100.0 | ang | 24004 | ALAMT4 G | 18.0 | 4 | 1 | 100.0 |

IVSG STUDY
Light Autumn Case
Trip BANISTER - NEW SAN FELIPE 230 kV
Case ALT 3B DISPATCH 3

IID Busses



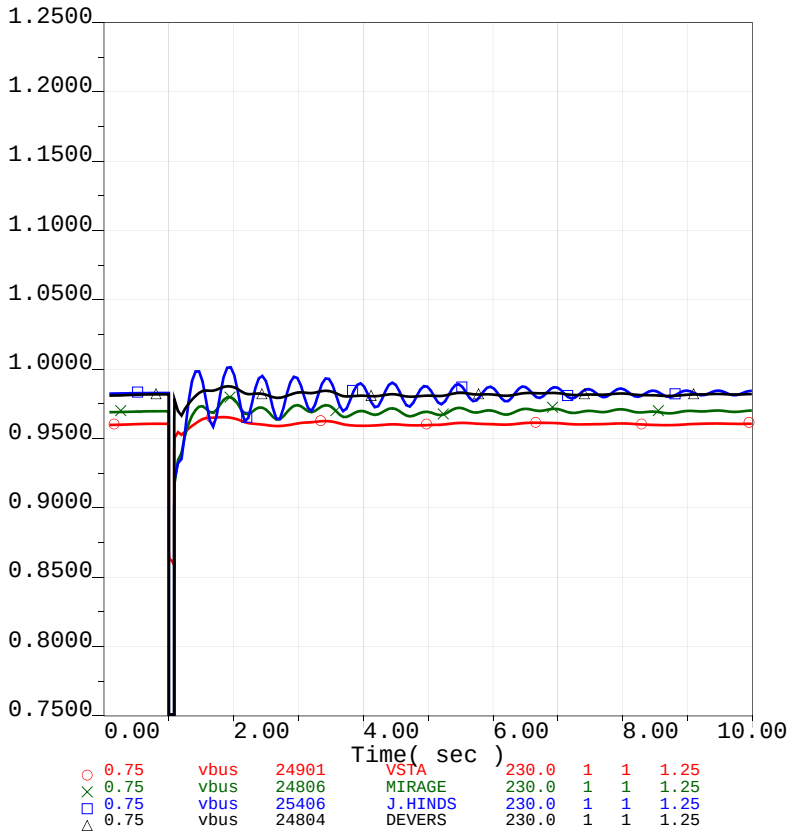

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbus | 8311 | COACHELA | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 8332 | ELCENTSW | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 8695 | RAMON | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbus | 8300 | BANIS230 | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip PATH 42
Case ALT 2 DISPATCH 3





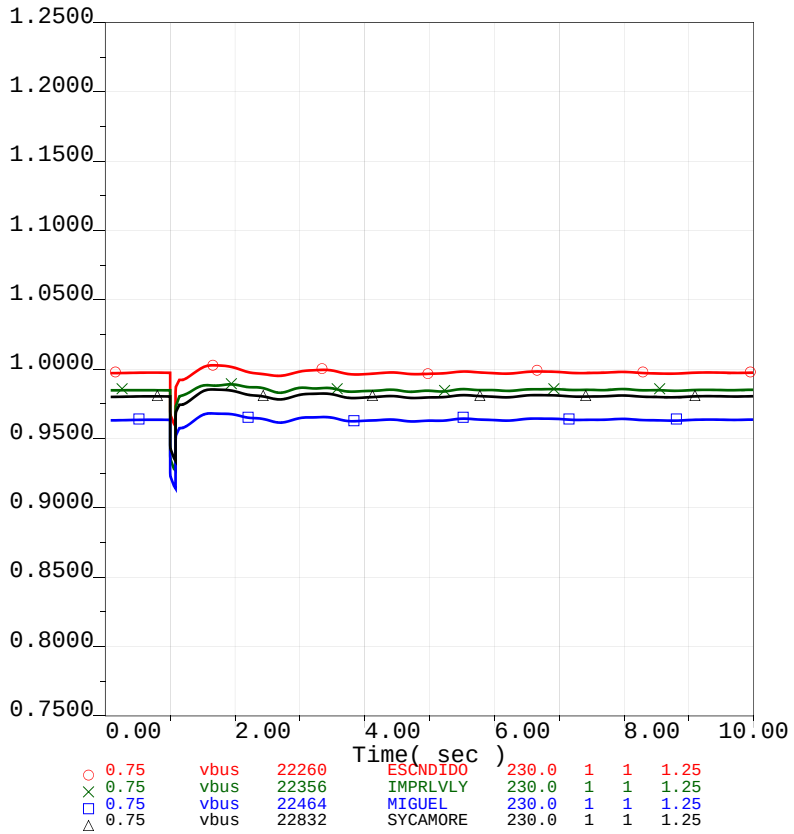
SCE Busses




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbus | 24901 | VSTA | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 24806 | MIRAGE | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 25406 | J.HINDS | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbus | 24804 | DEVERS | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip PATH 42
Case ALT 2 DISPATCH 3

SDGE Busses



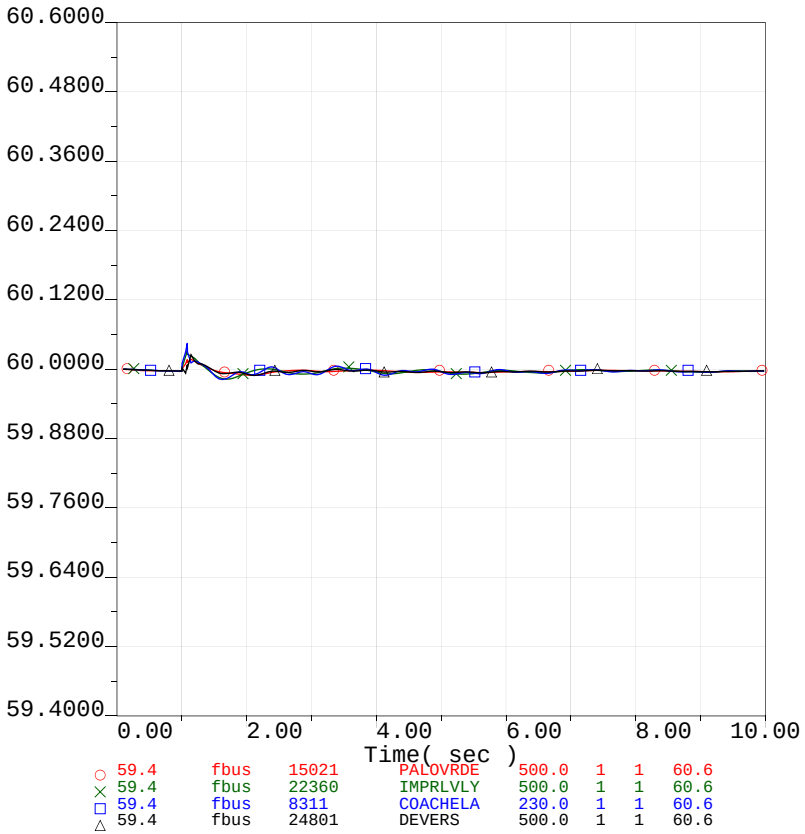

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ○ | 0.75 | vbus | 22260 | ESCNDIDO | 230.0 | 1 | 1 | 1.25 |
| × | 0.75 | vbus | 22356 | IMPRLVLY | 230.0 | 1 | 1 | 1.25 |
| □ | 0.75 | vbus | 22464 | MIGUEL | 230.0 | 1 | 1 | 1.25 |
| △ | 0.75 | vbus | 22832 | SYCAMORE | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip PATH 42
Case ALT 2 DISPATCH 3





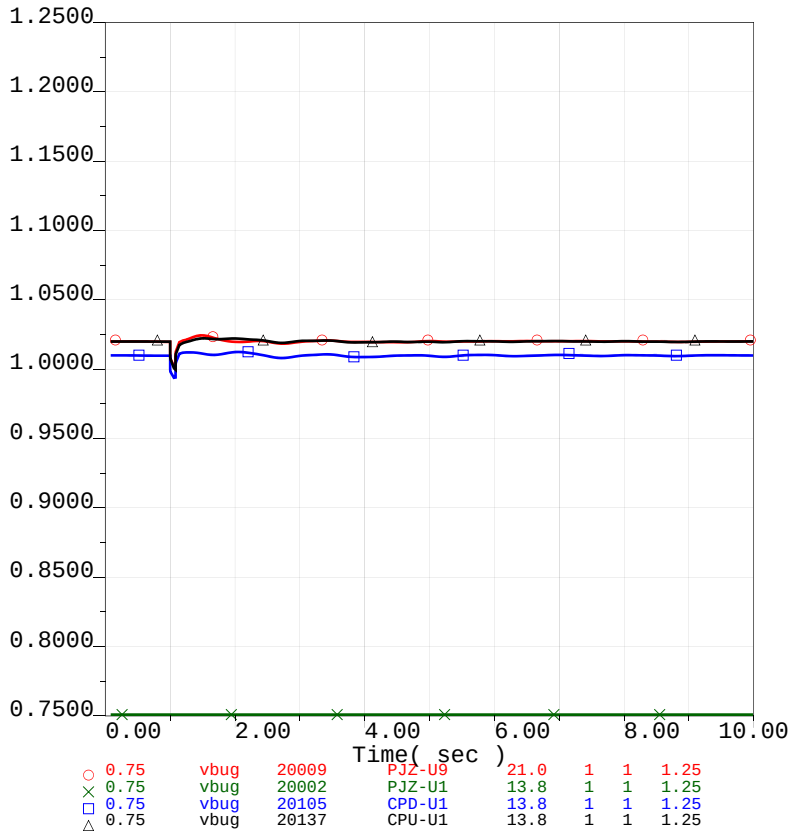
FBus Readings




| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ○ | 59.4 | fbus | 15021 | PALOVRDE | 500.0 | 1 | 1 | 60.6 |
| × | 59.4 | fbus | 22360 | IMPRLVLY | 500.0 | 1 | 1 | 60.6 |
| □ | 59.4 | fbus | 8311 | COACHELA | 230.0 | 1 | 1 | 60.6 |
| △ | 59.4 | fbus | 24801 | DEVERS | 500.0 | 1 | 1 | 60.6 |

IVSG STUDY
Light Autumn Case
Trip PATH 42
Case ALT 2 DISPATCH 3

CFE Busses Page 1

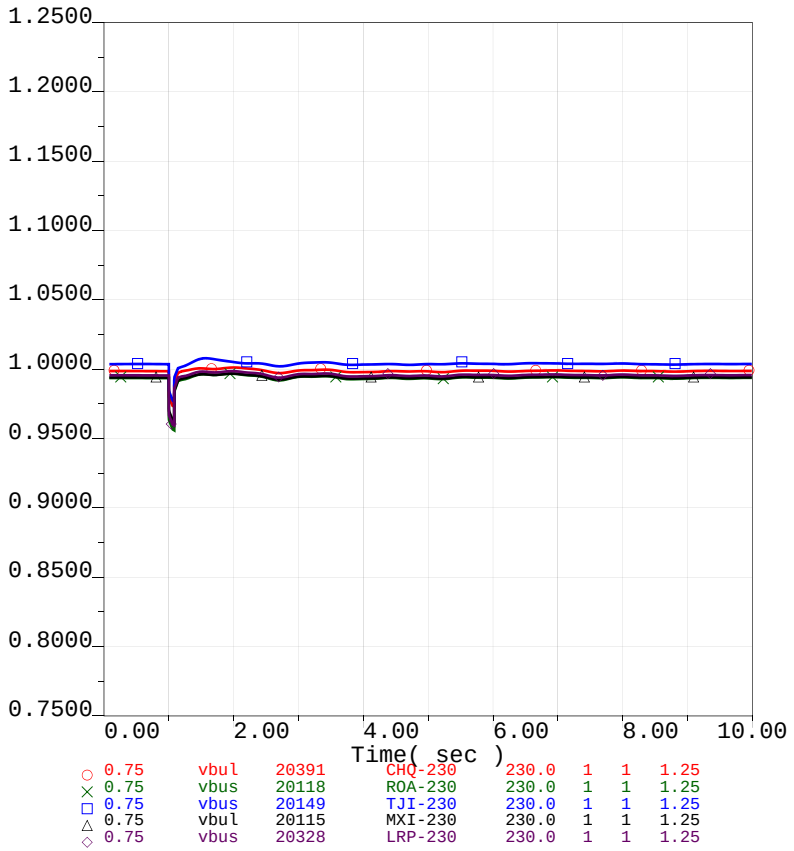



| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbug | 20009 | PJZ-U9 | 21.0 | 1 | 1 | 1.25 |
| × 0.75 | vbug | 20002 | PJZ-U1 | 13.8 | 1 | 1 | 1.25 |
| □ 0.75 | vbug | 20105 | CPD-U1 | 13.8 | 1 | 1 | 1.25 |
| △ 0.75 | vbug | 20137 | CPU-U1 | 13.8 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip PATH 42
Case ALT 2 DISPATCH 3



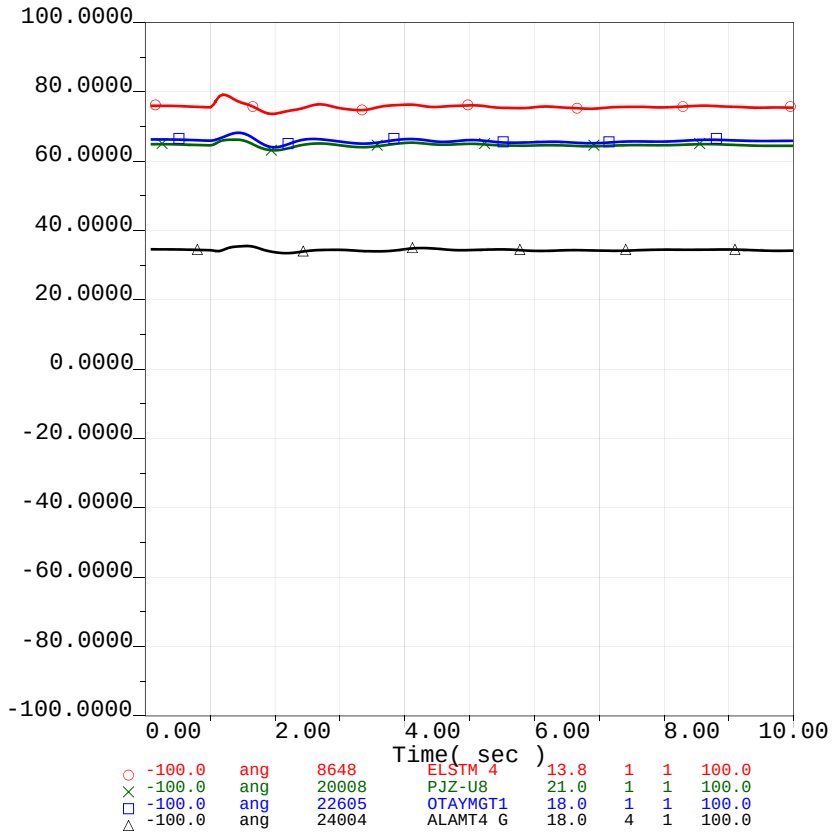
CFE Busses Page 2




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbul | 20391 | CHQ-230 | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 20118 | ROA-230 | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 20149 | TJI-230 | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbul | 20115 | MXI-230 | 230.0 | 1 | 1 | 1.25 |
| ◇ 0.75 | vbus | 20328 | LRP-230 | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip PATH 42
Case ALT 2 DISPATCH 3

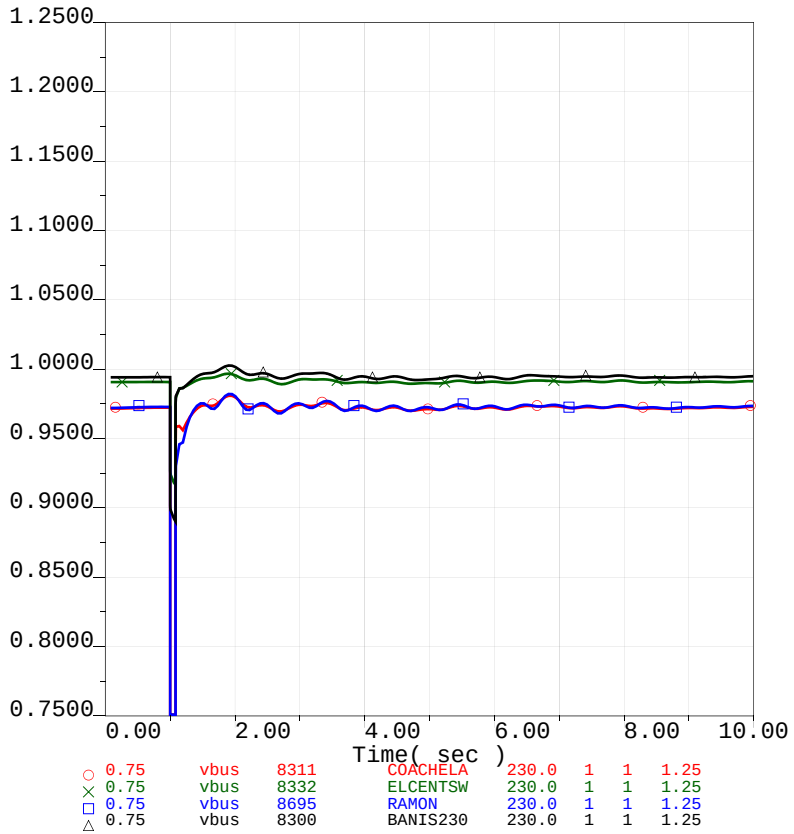
Rotor Angles for Gen Busses




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ -100.0 | ang | 8648 | ELSTM 4 | 13.8 | 1 | 1 | 100.0 |
| × -100.0 | ang | 20008 | PJZ-U8 | 21.0 | 1 | 1 | 100.0 |
| □ -100.0 | ang | 22605 | OTAYMGT1 | 18.0 | 1 | 1 | 100.0 |
| △ -100.0 | ang | 24004 | ALAMT4 G | 18.0 | 4 | 1 | 100.0 |

IVSG STUDY
Light Autumn Case
Trip PATH 42
Case ALT 2 DISPATCH 3

IID Busses



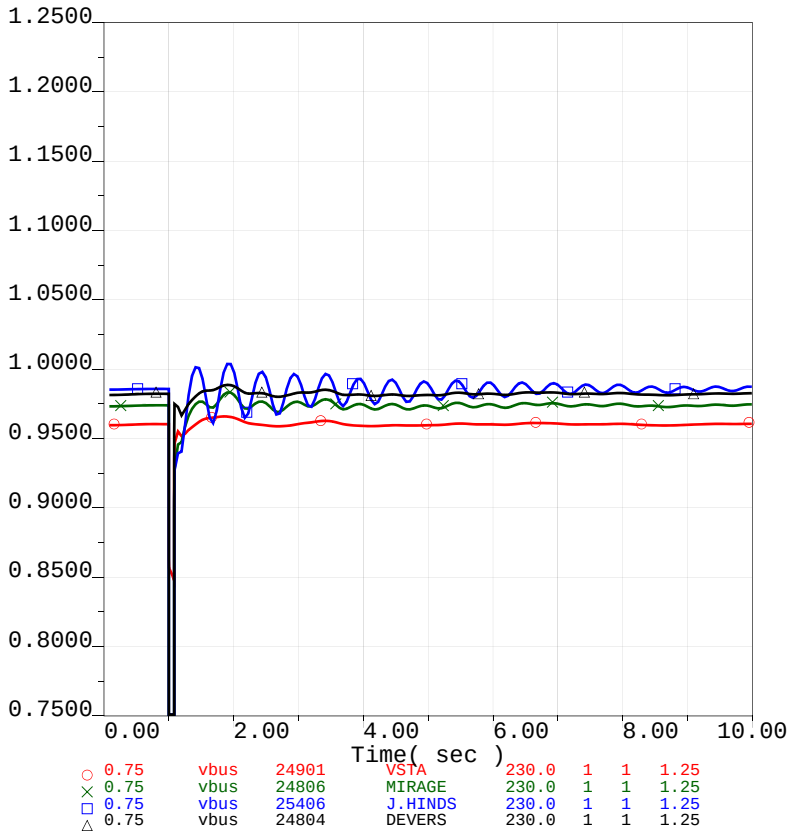

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbus | 8311 | COACHELA | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 8332 | ELCENTSW | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 8695 | RAMON | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbus | 8300 | BANIS230 | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip PATH 42
Case ALT 2a DISPATCH 3





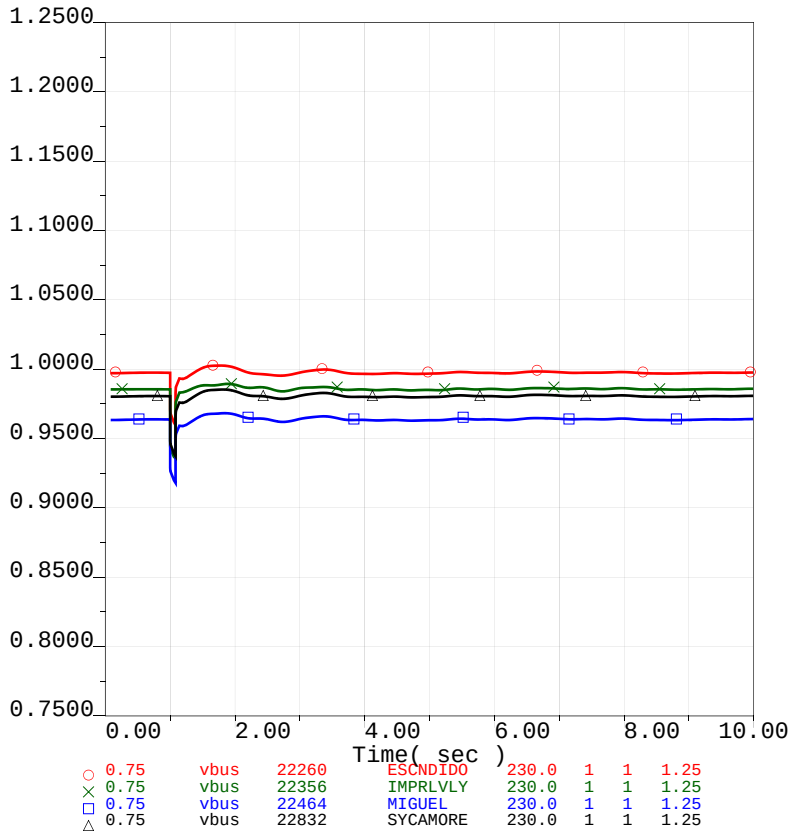
SCE Busses




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbus | 24901 | VSTA | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 24806 | MIRAGE | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 25406 | J.HINDS | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbus | 24804 | DEVERS | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip PATH 42
Case ALT 2a DISPATCH 3

SDGE Busses



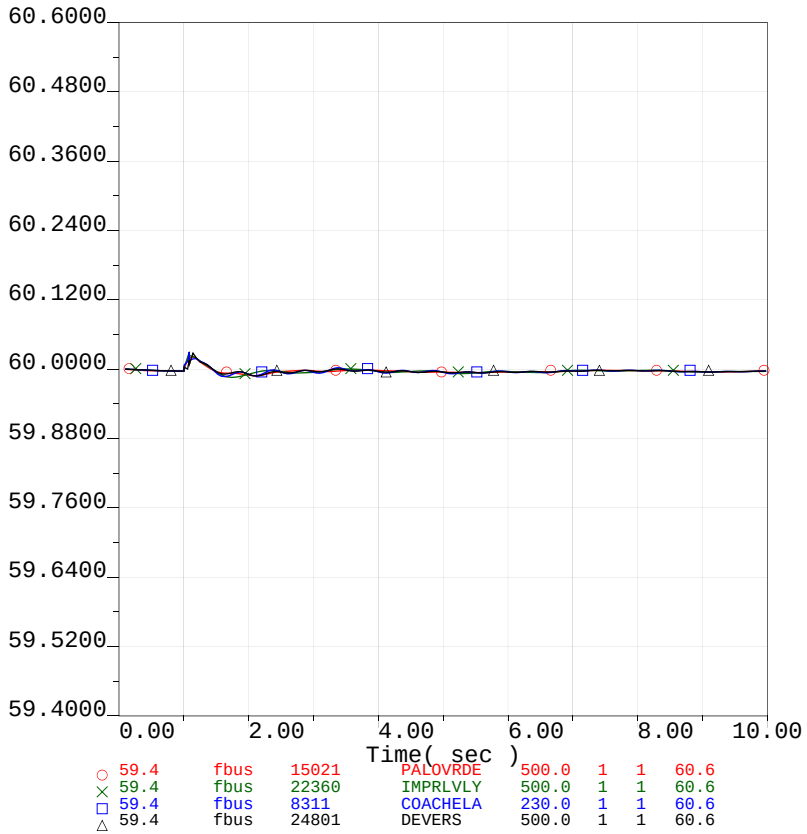

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ○ | 0.75 | vbus | 22260 | ESCNDIDO | 230.0 | 1 | 1 | 1.25 |
| × | 0.75 | vbus | 22356 | IMPRLVLY | 230.0 | 1 | 1 | 1.25 |
| □ | 0.75 | vbus | 22464 | MIGUEL | 230.0 | 1 | 1 | 1.25 |
| △ | 0.75 | vbus | 22832 | SYCAMORE | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip PATH 42
Case ALT 2a DISPATCH 3





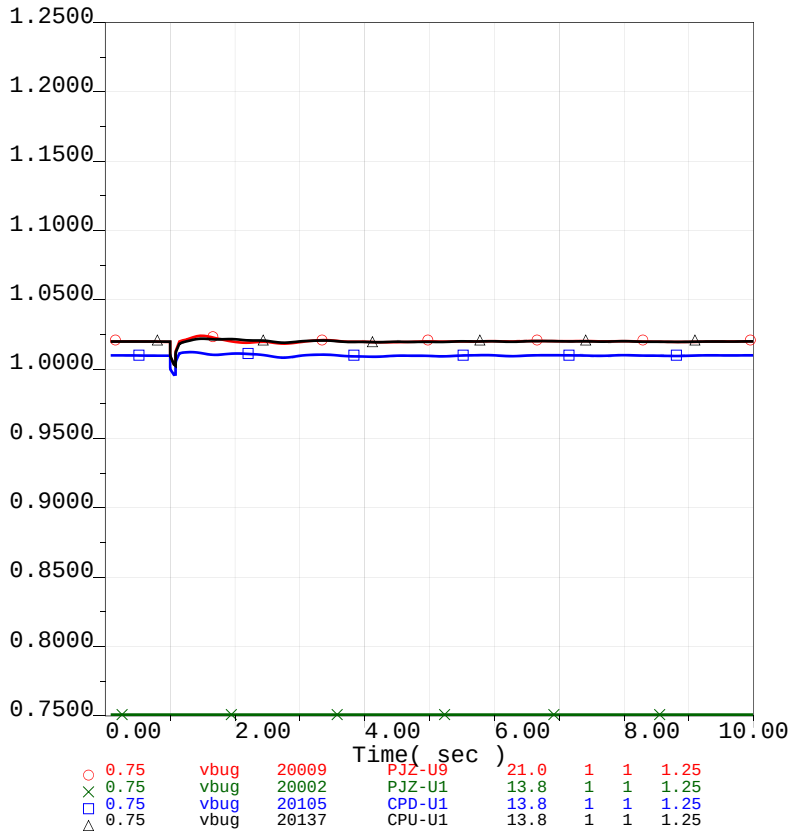
FBus Readings




| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ○ | 59.4 | fbus | 15021 | PALOVRDE | 500.0 | 1 | 1 | 60.6 |
| × | 59.4 | fbus | 22360 | IMPRLVLY | 500.0 | 1 | 1 | 60.6 |
| □ | 59.4 | fbus | 8311 | COACHELA | 230.0 | 1 | 1 | 60.6 |
| △ | 59.4 | fbus | 24801 | DEVERS | 500.0 | 1 | 1 | 60.6 |

IVSG STUDY
Light Autumn Case
Trip PATH 42
Case ALT 2a DISPATCH 3

CFE Busses Page 1

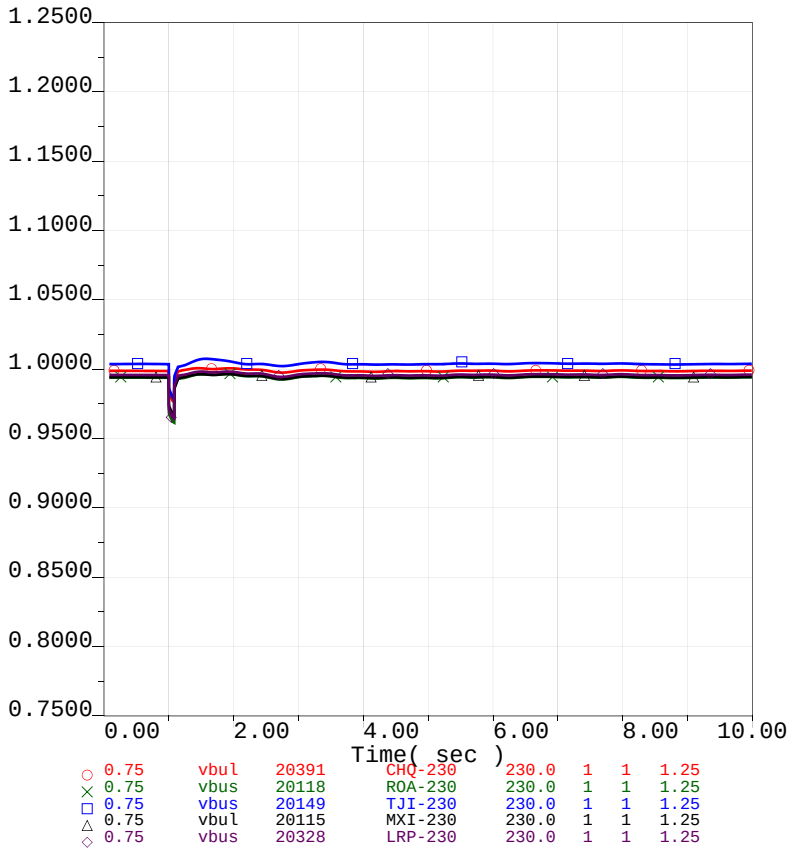



| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbug | 20009 | PJZ-U9 | 21.0 | 1 | 1 | 1.25 |
| × 0.75 | vbug | 20002 | PJZ-U1 | 13.8 | 1 | 1 | 1.25 |
| □ 0.75 | vbug | 20105 | CPD-U1 | 13.8 | 1 | 1 | 1.25 |
| △ 0.75 | vbug | 20137 | CPU-U1 | 13.8 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip PATH 42
Case ALT 2a DISPATCH 3



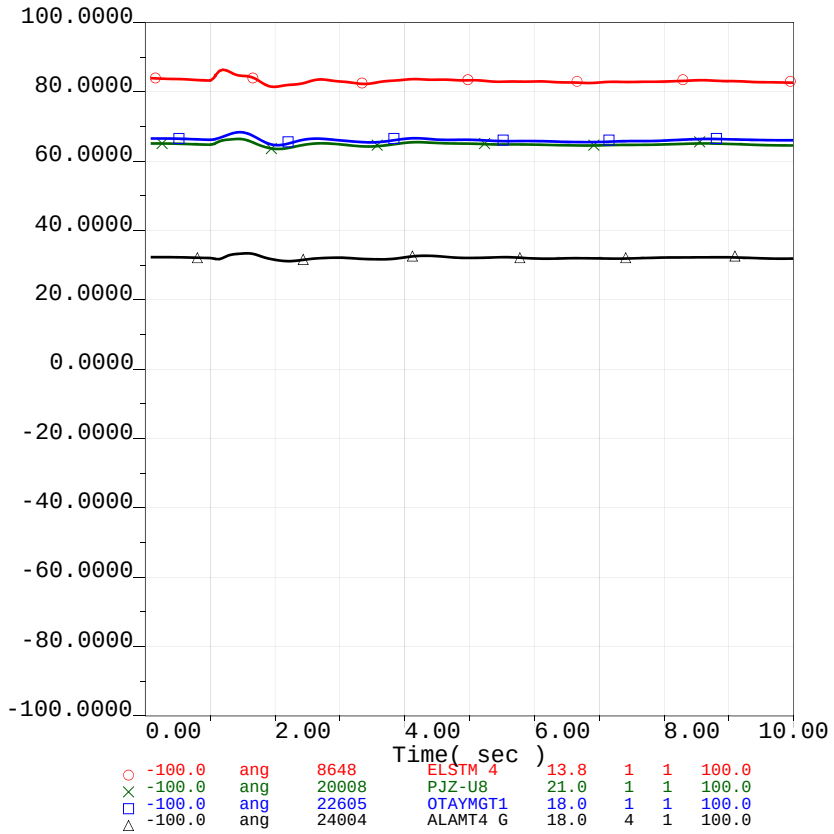
CFE Busses Page 2




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbul | 20391 | CHQ-230 | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 20118 | ROA-230 | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 20149 | TJI-230 | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbul | 20115 | MXI-230 | 230.0 | 1 | 1 | 1.25 |
| ◇ 0.75 | vbus | 20328 | LRP-230 | 230.0 | 1 | 1 | 1.25 |

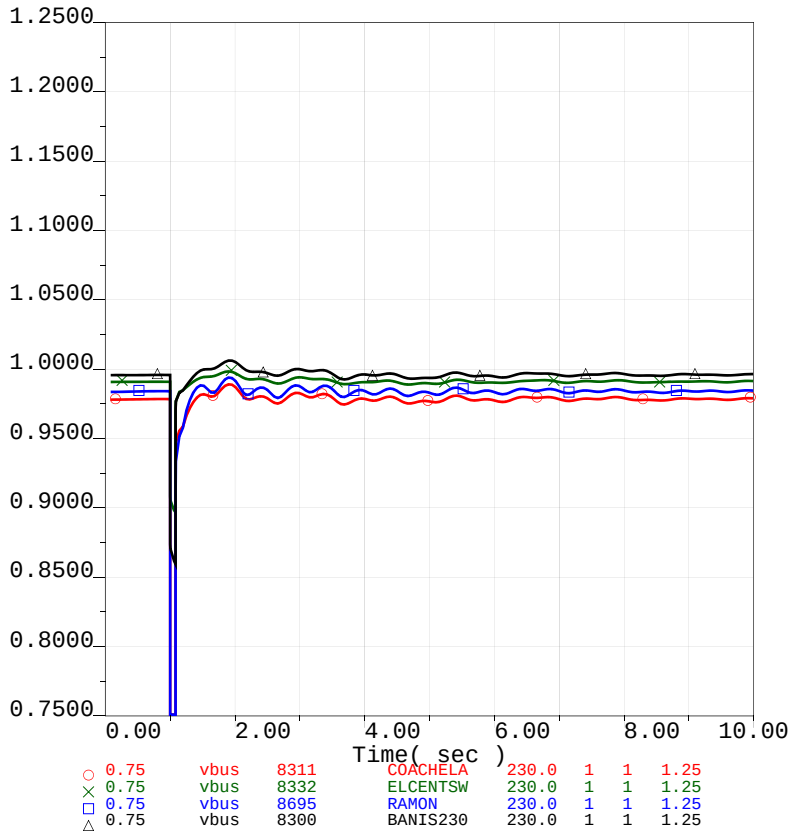
IVSG STUDY
Light Autumn Case
Trip PATH 42
Case ALT 2a DISPATCH 3

Rotor Angles for Gen Busses




IVSG STUDY
Light Autumn Case
Trip PATH 42
Case ALT 2a DISPATCH 3

IID Busses



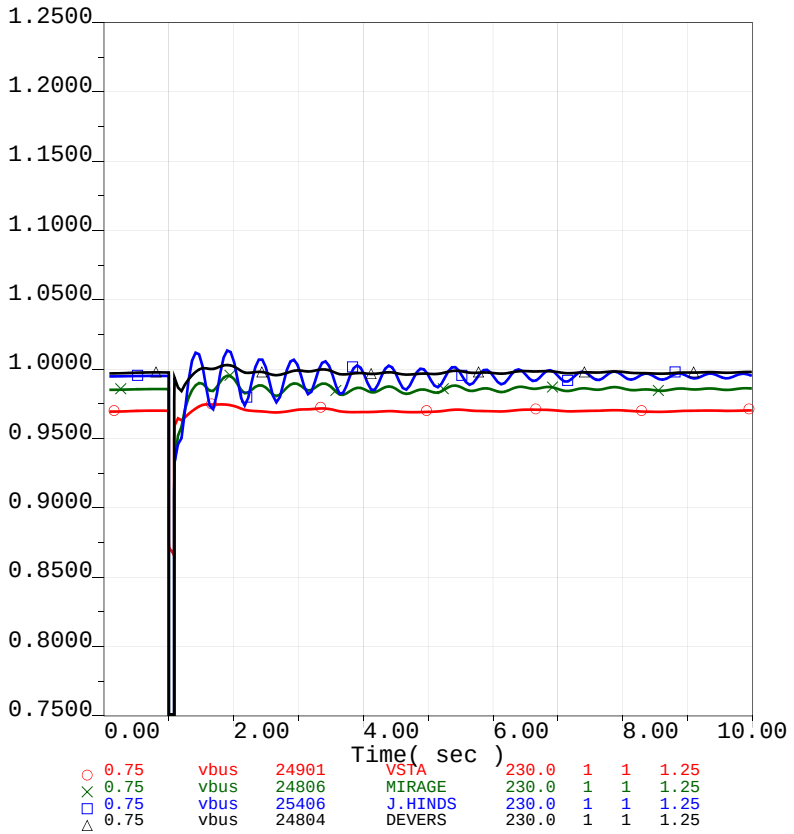

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbus | 8311 | COACHELA | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 8332 | ELCENTSW | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 8695 | RAMON | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbus | 8300 | BANIS230 | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip PATH 42
Case ALT 3B DISPATCH 3





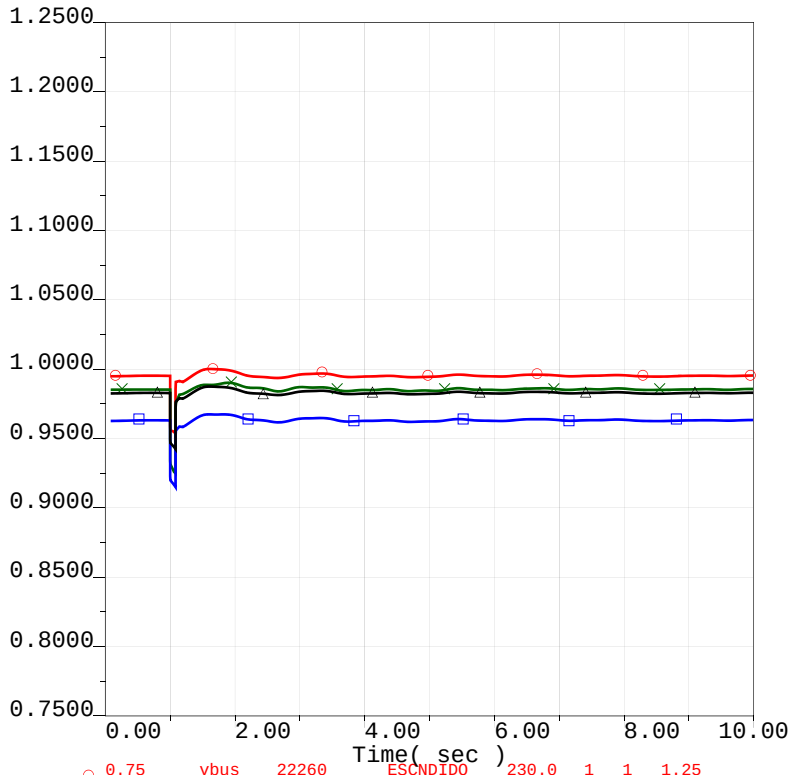
SCE Busses




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbus | 24901 | VSTA | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 24806 | MIRAGE | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 25406 | J.HINDS | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbus | 24804 | DEVERS | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip PATH 42
Case ALT 3B DISPATCH 3

SDGE Busses



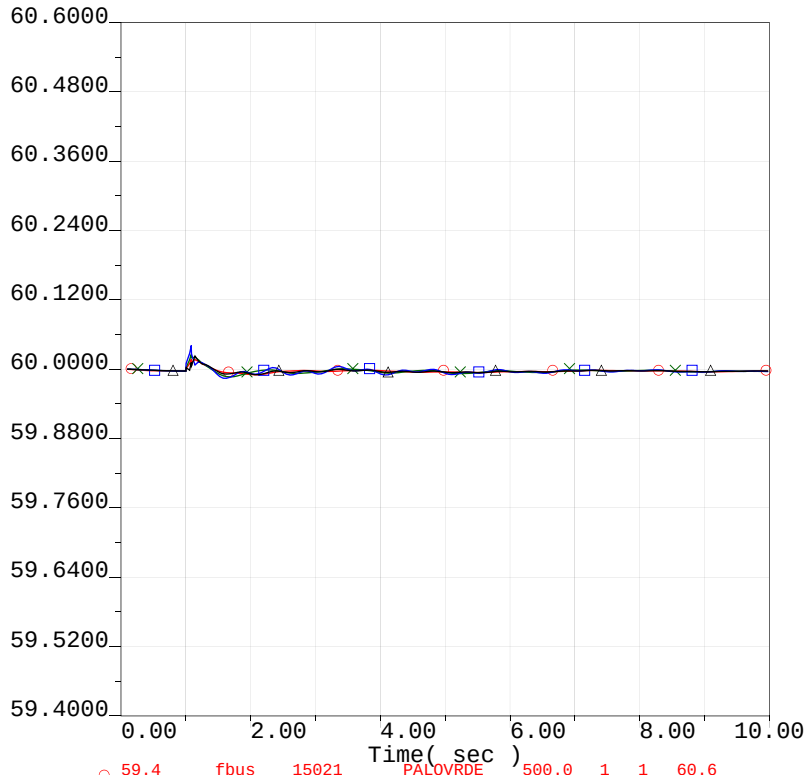

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ○ | 0.75 | vbus | 22260 | ESCNDIDO | 230.0 | 1 | 1 | 1.25 |
| × | 0.75 | vbus | 22356 | IMPRLVLY | 230.0 | 1 | 1 | 1.25 |
| □ | 0.75 | vbus | 22464 | MIGUEL | 230.0 | 1 | 1 | 1.25 |
| △ | 0.75 | vbus | 22832 | SYCAMORE | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip PATH 42
Case ALT 3B DISPATCH 3





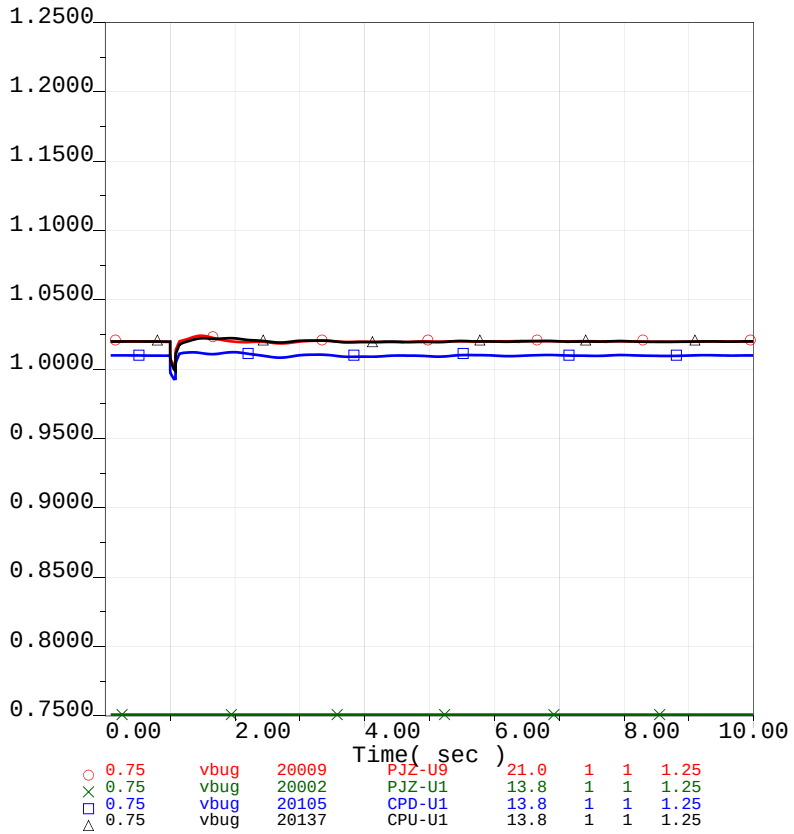
FBus Readings




| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ○ | 59.4 | fbus | 15021 | PALOVRDE | 500.0 | 1 | 1 | 60.6 |
| × | 59.4 | fbus | 22360 | IMPRLVLY | 500.0 | 1 | 1 | 60.6 |
| □ | 59.4 | fbus | 8311 | COACHELA | 230.0 | 1 | 1 | 60.6 |
| △ | 59.4 | fbus | 24801 | DEVERS | 500.0 | 1 | 1 | 60.6 |

IVSG STUDY
Light Autumn Case
Trip PATH 42
Case ALT 3B DISPATCH 3

CFE Busses Page 1

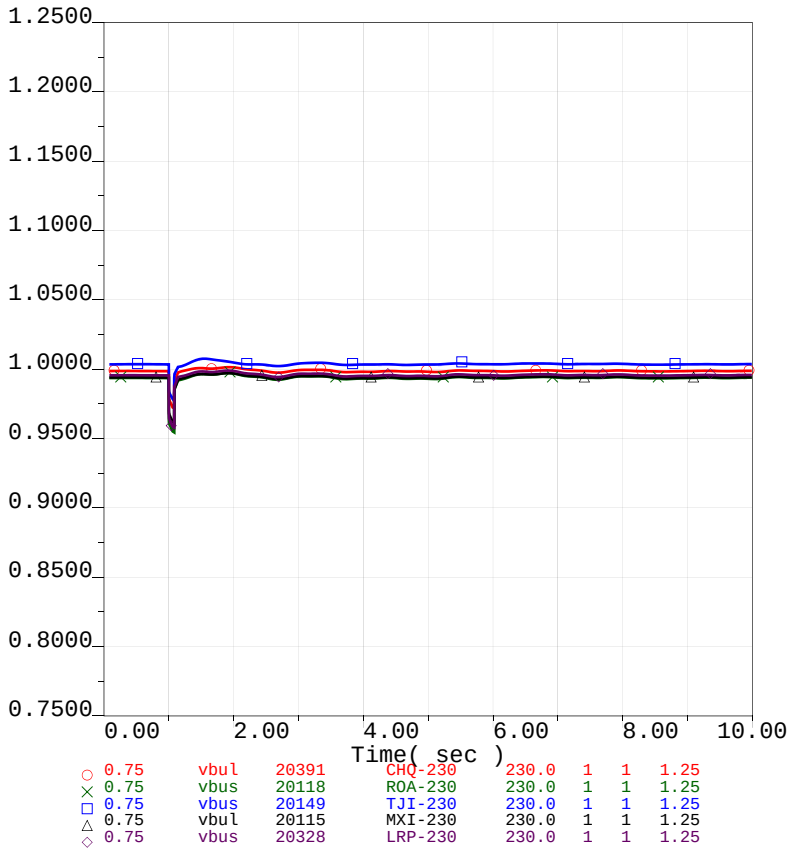



| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbug | 20009 | PJZ-U9 | 21.0 | 1 | 1 | 1.25 |
| × 0.75 | vbug | 20002 | PJZ-U1 | 13.8 | 1 | 1 | 1.25 |
| □ 0.75 | vbug | 20105 | CPD-U1 | 13.8 | 1 | 1 | 1.25 |
| △ 0.75 | vbug | 20137 | CPU-U1 | 13.8 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip PATH 42
Case ALT 3B DISPATCH 3



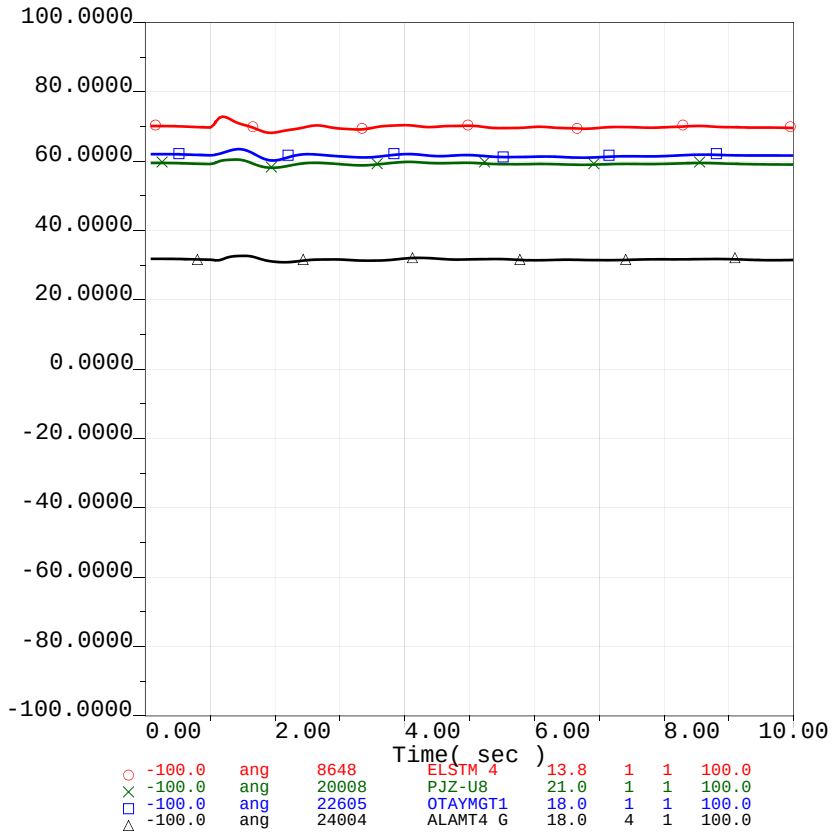
CFE Busses Page 2




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbul | 20391 | CHQ-230 | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 20118 | ROA-230 | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 20149 | TJI-230 | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbul | 20115 | MXI-230 | 230.0 | 1 | 1 | 1.25 |
| ◇ 0.75 | vbus | 20328 | LRP-230 | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
Trip PATH 42
Case ALT 3B DISPATCH 3

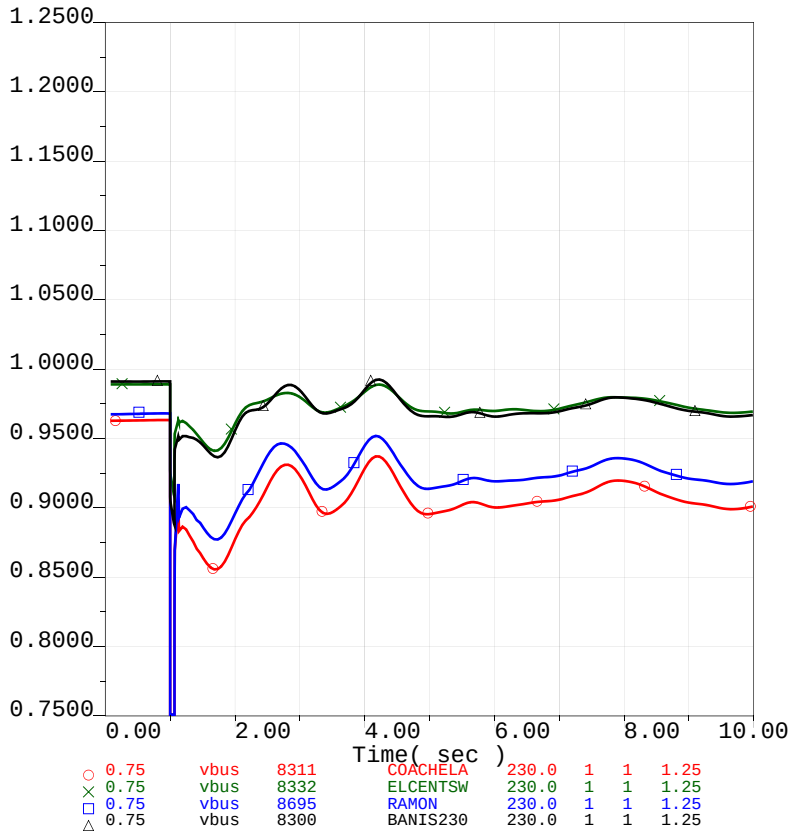
Rotor Angles for Gen Busses




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ -100.0 | ang | 8648 | ELSTM 4 | 13.8 | 1 | 1 | 100.0 |
| × -100.0 | ang | 20008 | PJZ-U8 | 21.0 | 1 | 1 | 100.0 |
| □ -100.0 | ang | 22605 | OTAYMGT1 | 18.0 | 1 | 1 | 100.0 |
| △ -100.0 | ang | 24004 | ALAMT4 G | 18.0 | 4 | 1 | 100.0 |

IVSG STUDY
Light Autumn Case
Trip PATH 42
Case ALT 3B DISPATCH 3

IID Busses



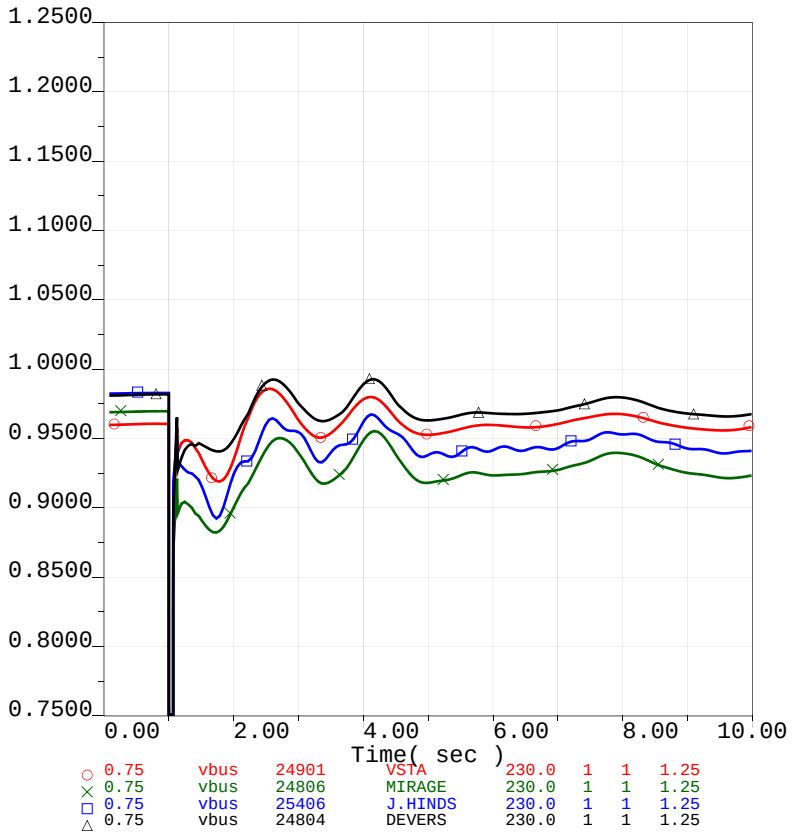

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbus | 8311 | COACHELA | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 8332 | ELCENTSW | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 8695 | RAMON | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbus | 8300 | BANIS230 | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
N-2 MIDPOINTS - DEVERS 1&2 500 kV
Case ALT 2 DISPATCH 3





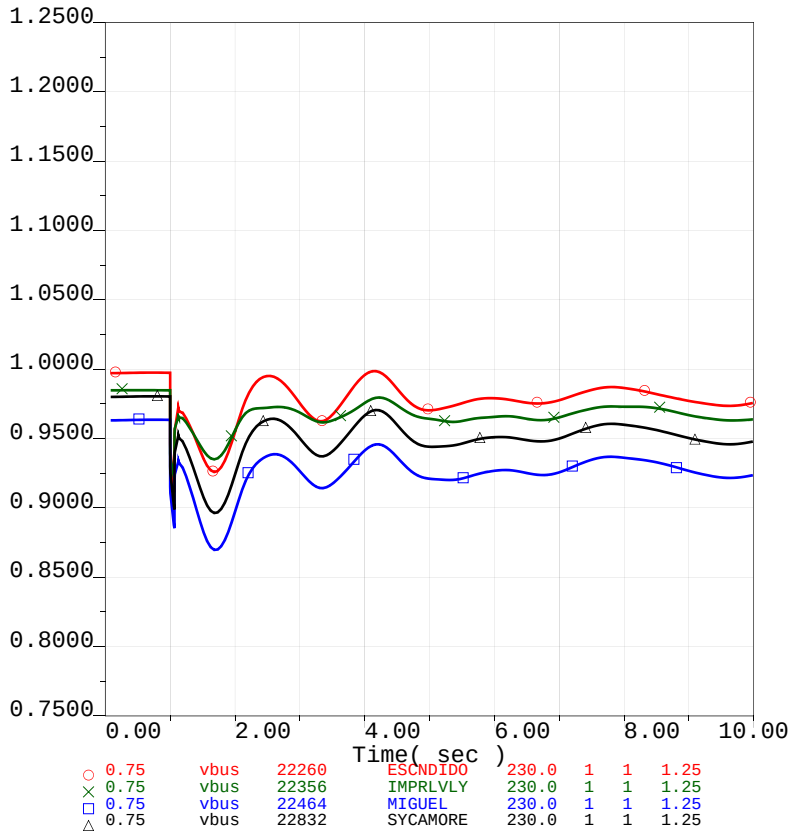
SCE Busses




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbus | 24901 | VSTA | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 24806 | MIRAGE | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 25406 | J.HINDS | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbus | 24804 | DEVERS | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
N-2 MIDPOINTS - DEVERS 1&2 500 kV
Case ALT 2 DISPATCH 3

SDGE Busses



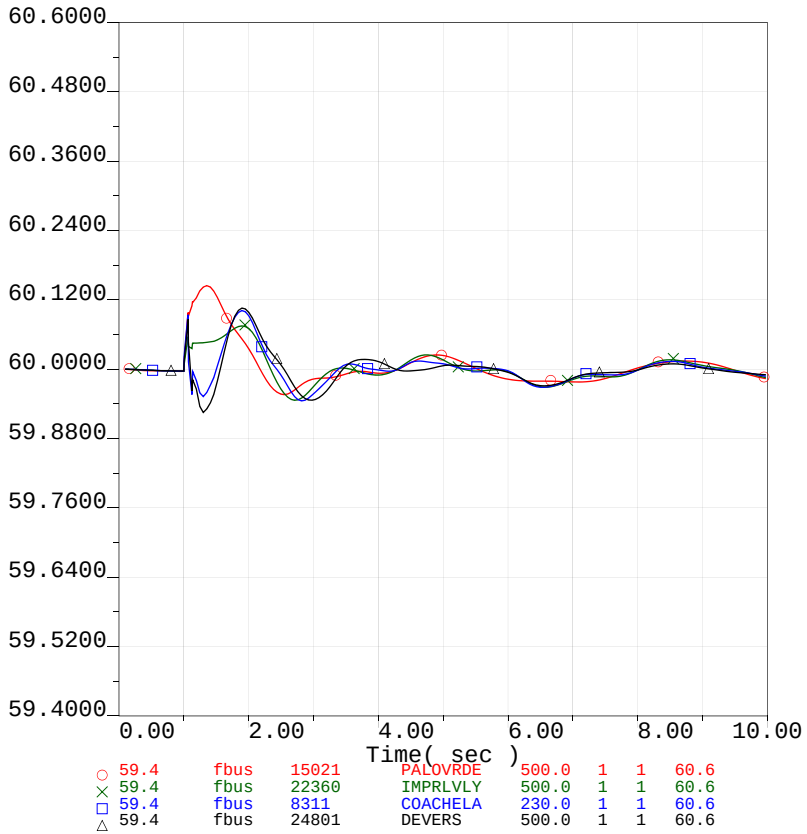

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ○ | 0.75 | vbus | 22260 | ESCNDIDO | 230.0 | 1 | 1 | 1.25 |
| × | 0.75 | vbus | 22356 | IMPRLVLY | 230.0 | 1 | 1 | 1.25 |
| □ | 0.75 | vbus | 22464 | MIGUEL | 230.0 | 1 | 1 | 1.25 |
| △ | 0.75 | vbus | 22832 | SYCAMORE | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
N-2 MIDPOINTS - DEVERS 1&2 500 kV
Case ALT 2 DISPATCH 3





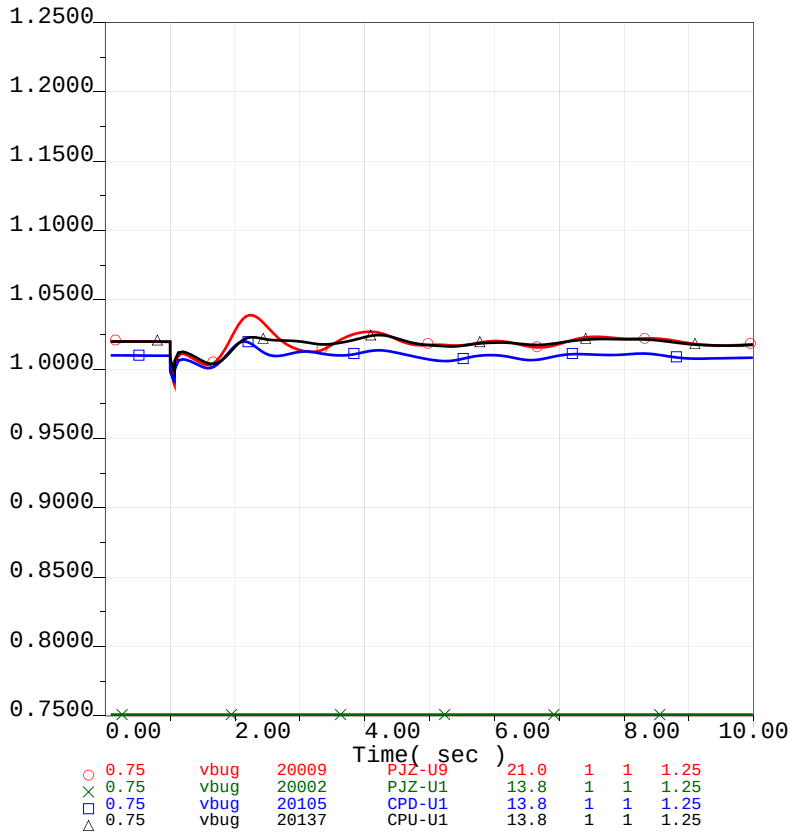
FBus Readings




| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ○ | 59.4 | fbus | 15021 | PALOVRDE | 500.0 | 1 | 1 | 60.6 |
| × | 59.4 | fbus | 22360 | IMPRLVLY | 500.0 | 1 | 1 | 60.6 |
| □ | 59.4 | fbus | 8311 | COACHELA | 230.0 | 1 | 1 | 60.6 |
| △ | 59.4 | fbus | 24801 | DEVERS | 500.0 | 1 | 1 | 60.6 |

IVSG STUDY
Light Autumn Case
N-2 MIDPOINTS - DEVERS 1&2 500 kV
Case ALT 2 DISPATCH 3

CFE Busses Page 1

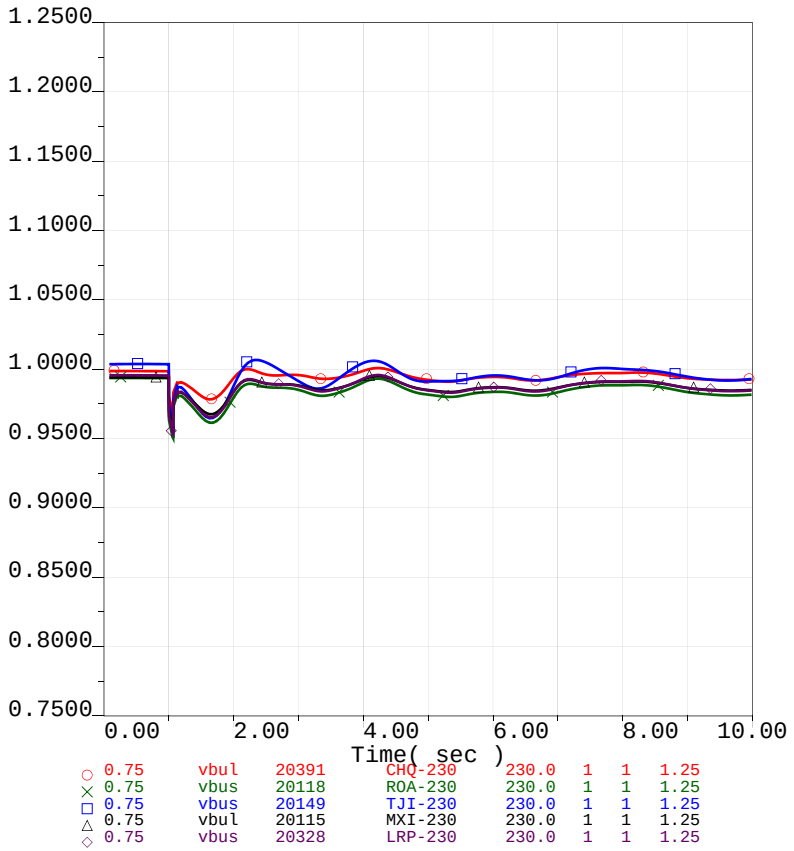



| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbug | 20009 | PJZ-U9 | 21.0 | 1 | 1 | 1.25 |
| × 0.75 | vbug | 20002 | PJZ-U1 | 13.8 | 1 | 1 | 1.25 |
| □ 0.75 | vbug | 20105 | CPD-U1 | 13.8 | 1 | 1 | 1.25 |
| △ 0.75 | vbug | 20137 | CPU-U1 | 13.8 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
N-2 MIDPOINTS - DEVERS 1&2 500 kV
Case ALT 2 DISPATCH 3



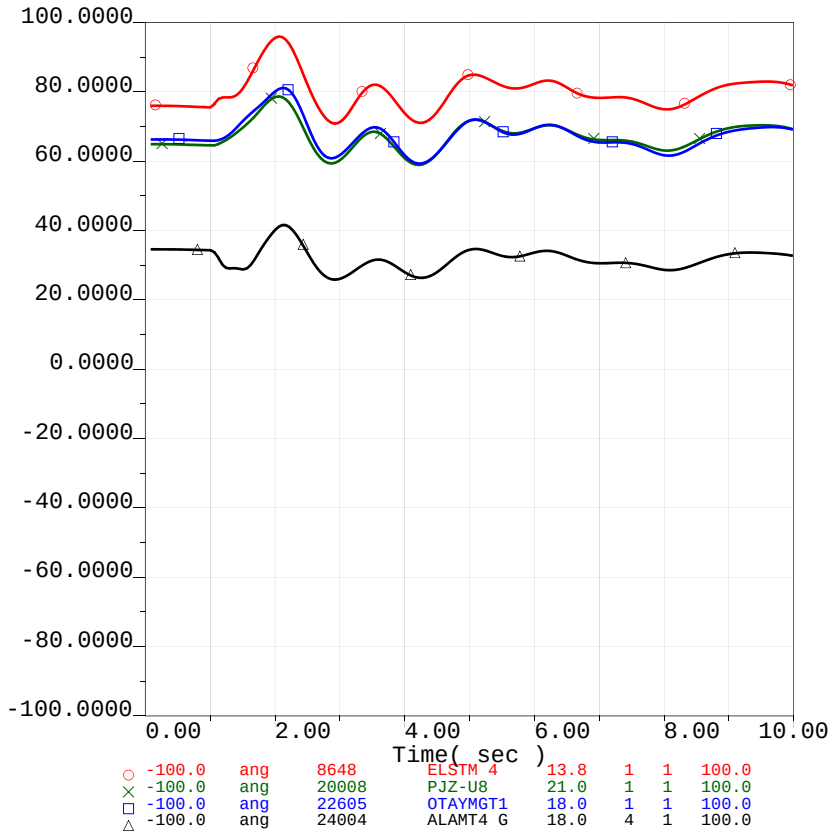
CFE Busses Page 2




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbul | 20391 | CHQ-230 | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 20118 | ROA-230 | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 20149 | TJI-230 | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbul | 20115 | MXI-230 | 230.0 | 1 | 1 | 1.25 |
| ◇ 0.75 | vbus | 20328 | LRP-230 | 230.0 | 1 | 1 | 1.25 |

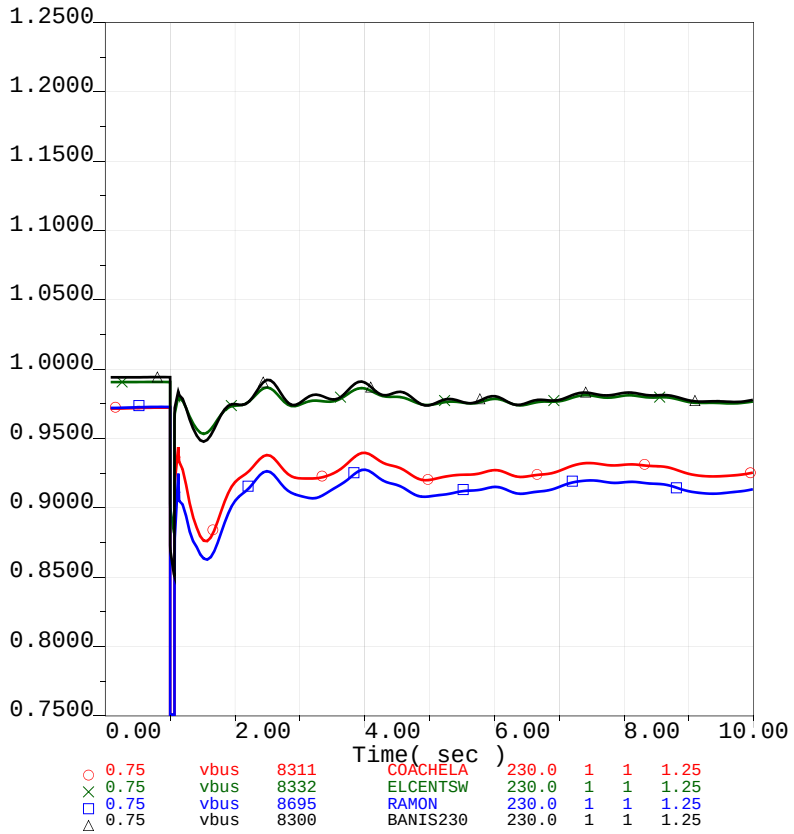
IVSG STUDY
Light Autumn Case
N-2 MIDPOINTS - DEVERS 1&2 500 kV
Case ALT 2 DISPATCH 3

Rotor Angles for Gen Busses




IVSG STUDY
Light Autumn Case
N-2 MIDPOINTS - DEVERS 1&2 500 kV
Case ALT 2 DISPATCH 3

IID Busses



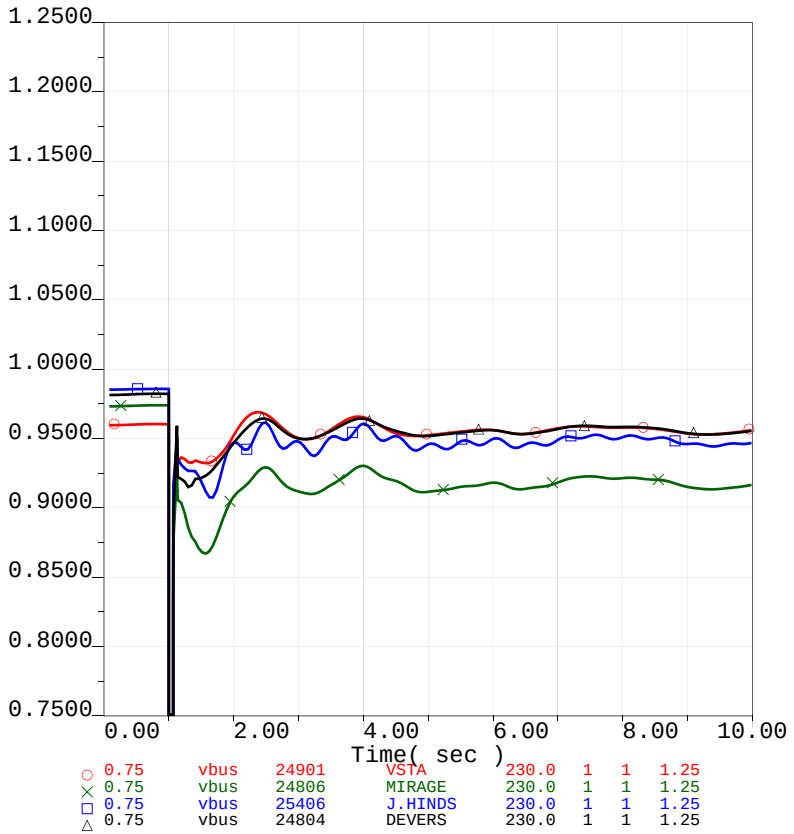

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbus | 8311 | COACHELA | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 8332 | ELCENTSW | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 8695 | RAMON | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbus | 8300 | BANIS230 | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
N-2 MIDPOINTS - DEVERS 1 INDIAN HILLS - DEVERS 500 kV
Case ALT 2A DISPATCH 3





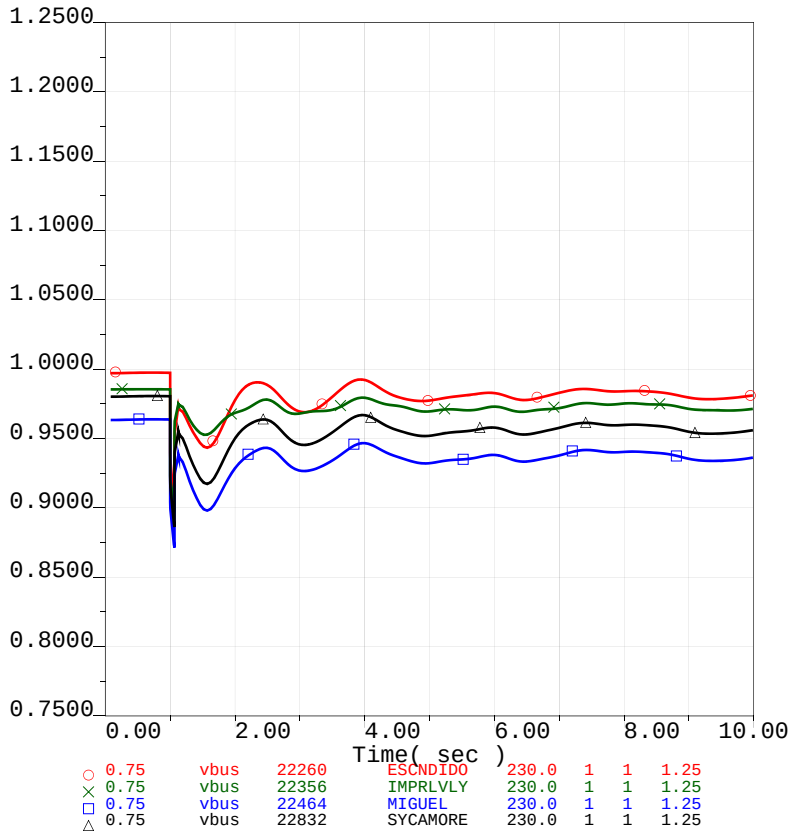
SCE Busses




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbus | 24901 | VSTA | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 24806 | MIRAGE | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 25406 | J.HINDS | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbus | 24804 | DEVERS | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
N-2 MIDPOINTS - DEVERS 1 INDIAN HILLS - DEVERS 500 kV
Case ALT 2A DISPATCH 3

SDGE Busses

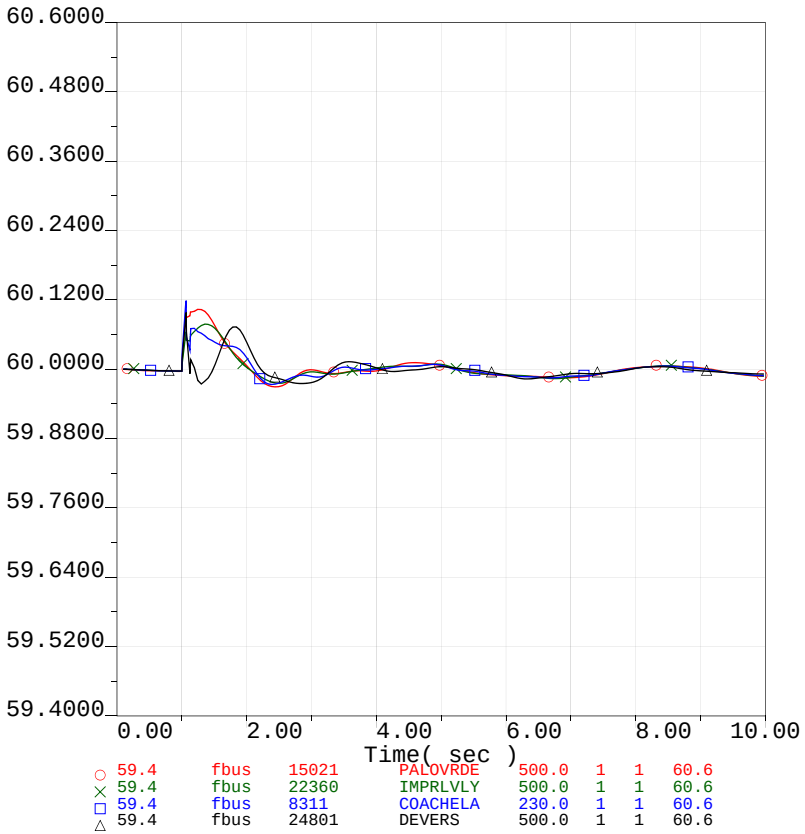



| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ○ | 0.75 | vbus | 22260 | ESCNDIDO | 230.0 | 1 | 1 | 1.25 |
| × | 0.75 | vbus | 22356 | IMPRLVLY | 230.0 | 1 | 1 | 1.25 |
| □ | 0.75 | vbus | 22464 | MIGUEL | 230.0 | 1 | 1 | 1.25 |
| △ | 0.75 | vbus | 22832 | SYCAMORE | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
N-2 MIDPOINTS - DEVERS 1 INDIAN HILLS - DEVERS 500 kV
Case ALT 2A DISPATCH 3



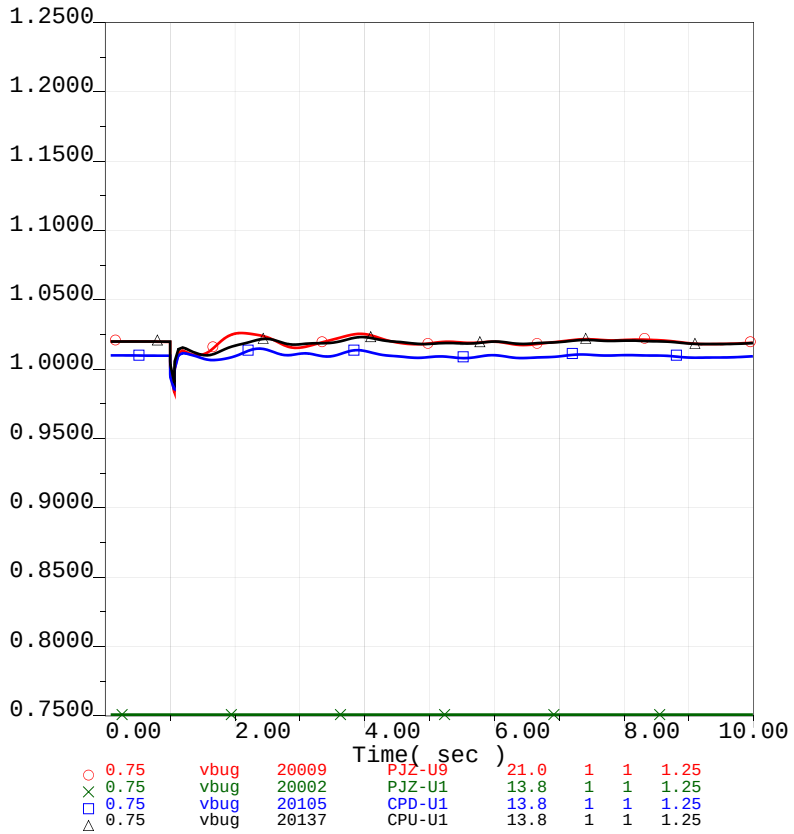
FBus Readings




| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ○ | 59.4 | fbus | 15021 | PALOVRDE | 500.0 | 1 | 1 | 60.6 |
| × | 59.4 | fbus | 22360 | IMPRLVLY | 500.0 | 1 | 1 | 60.6 |
| □ | 59.4 | fbus | 8311 | COACHELA | 230.0 | 1 | 1 | 60.6 |
| △ | 59.4 | fbus | 24801 | DEVERS | 500.0 | 1 | 1 | 60.6 |

IVSG STUDY
Light Autumn Case
N-2 MIDPOINTS - DEVERS 1 INDIAN HILLS - DEVERS 500 kV
Case ALT 2A DISPATCH 3

CFE Busses Page 1

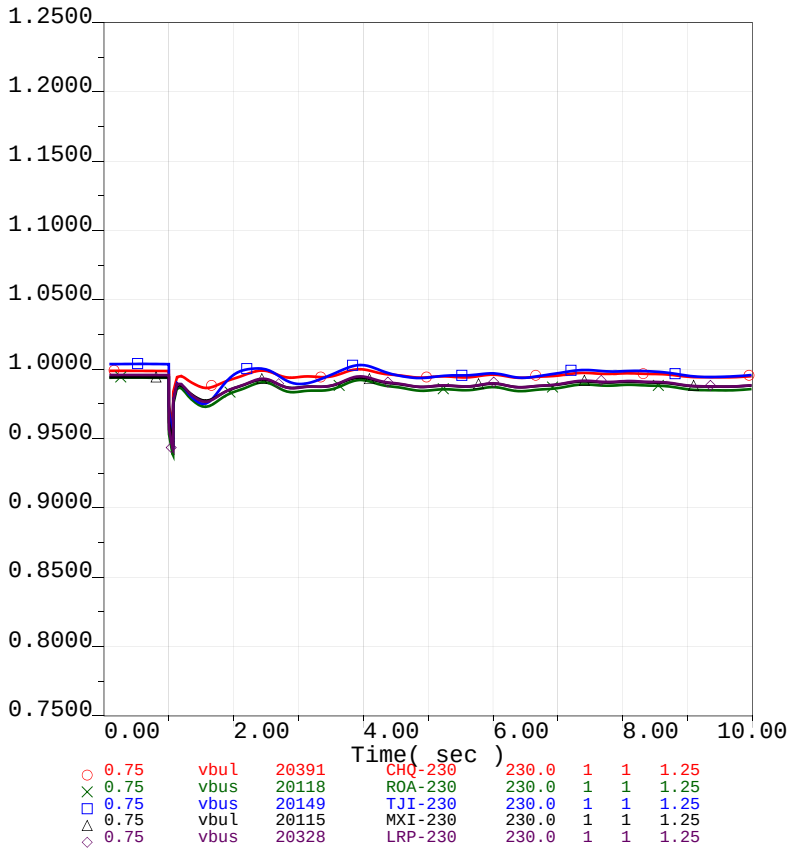



| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbug | 20009 | PJZ-U9 | 21.0 | 1 | 1 | 1.25 |
| × 0.75 | vbug | 20002 | PJZ-U1 | 13.8 | 1 | 1 | 1.25 |
| □ 0.75 | vbug | 20105 | CPD-U1 | 13.8 | 1 | 1 | 1.25 |
| △ 0.75 | vbug | 20137 | CPU-U1 | 13.8 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
N-2 MIDPOINTS - DEVERS 1 INDIAN HILLS - DEVERS 500 kV
Case ALT 2A DISPATCH 3



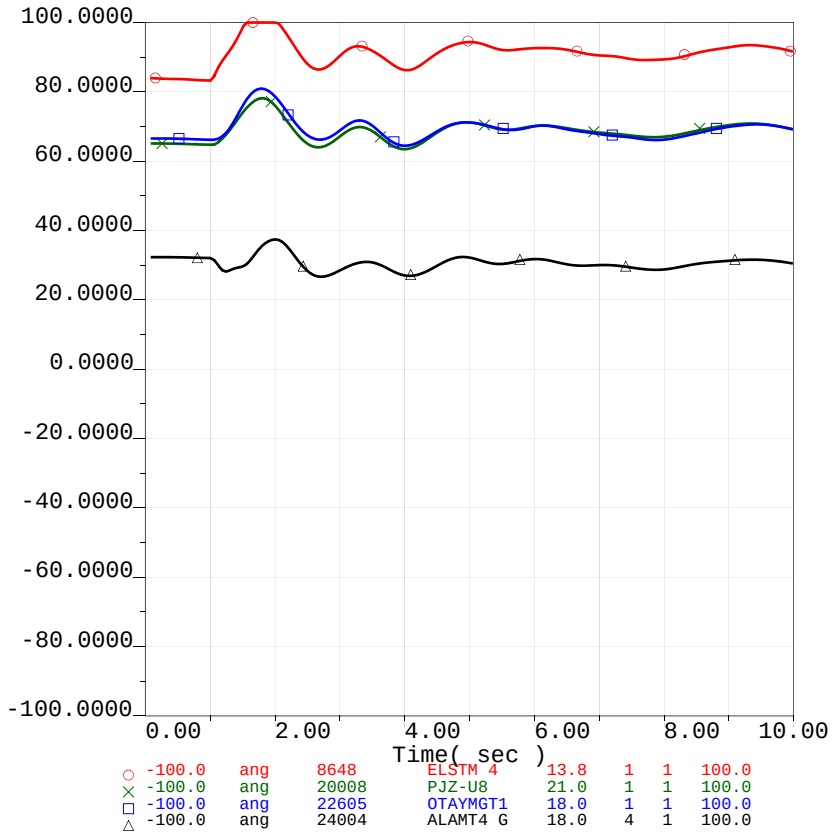
CFE Busses Page 2




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbul | 20391 | CHQ-230 | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 20118 | ROA-230 | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 20149 | TJI-230 | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbul | 20115 | MXI-230 | 230.0 | 1 | 1 | 1.25 |
| ◇ 0.75 | vbus | 20328 | LRP-230 | 230.0 | 1 | 1 | 1.25 |

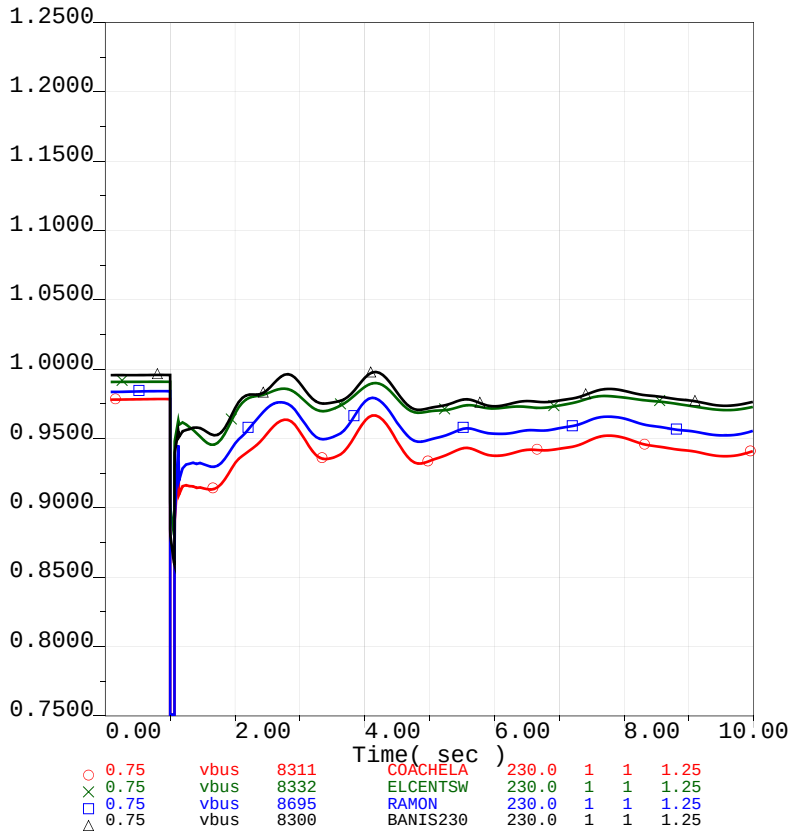
IVSG STUDY
Light Autumn Case
N-2 MIDPOINTS - DEVERS 1 INDIAN HILLS - DEVERS 500 kV
Case ALT 2A DISPATCH 3

Rotor Angles for Gen Busses




IVSG STUDY
Light Autumn Case
N-2 MIDPOINTS - DEVERS 1 INDIAN HILLS - DEVERS 500 kV
Case ALT 2A DISPATCH 3

IID Busses



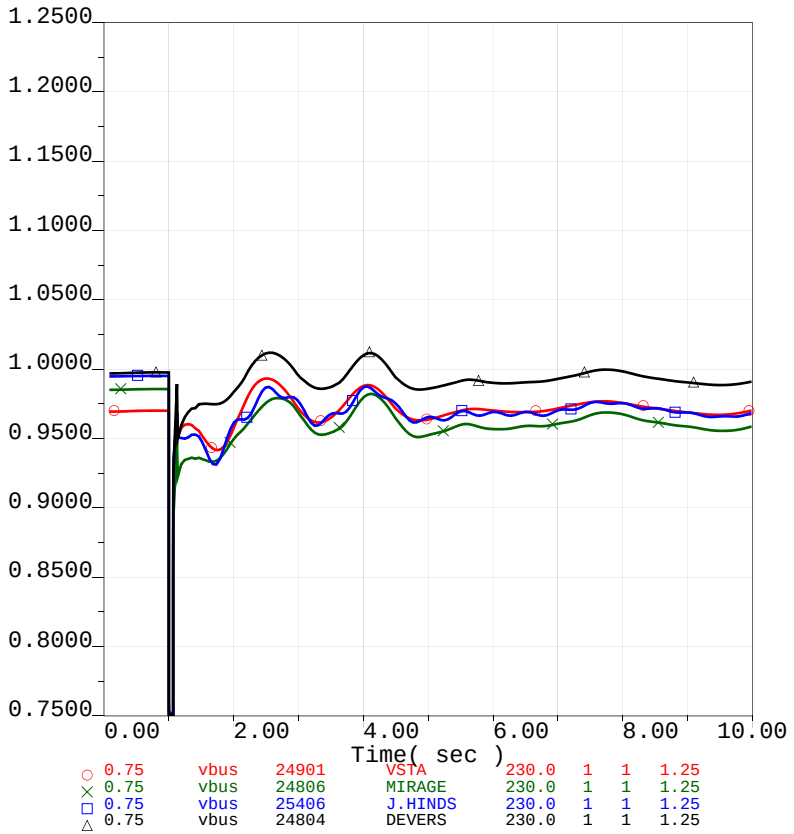

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbus | 8311 | COACHELA | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 8332 | ELCENTSW | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 8695 | RAMON | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbus | 8300 | BANIS230 | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
N-2 MIDPOINTS - DEVERS 1&2 500 kV
Case ALT 3B DISPATCH 3





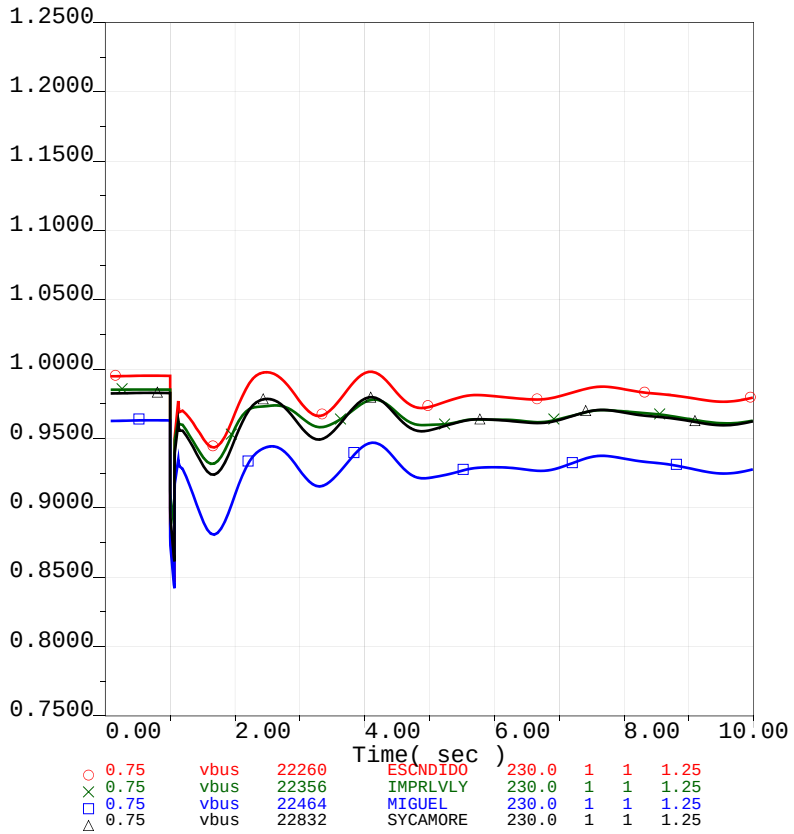
SCE Busses




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbus | 24901 | VSTA | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 24806 | MIRAGE | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 25406 | J.HINDS | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbus | 24804 | DEVERS | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
N-2 MIDPOINTS - DEVERS 1&2 500 kV
Case ALT 3B DISPATCH 3

SDGE Busses

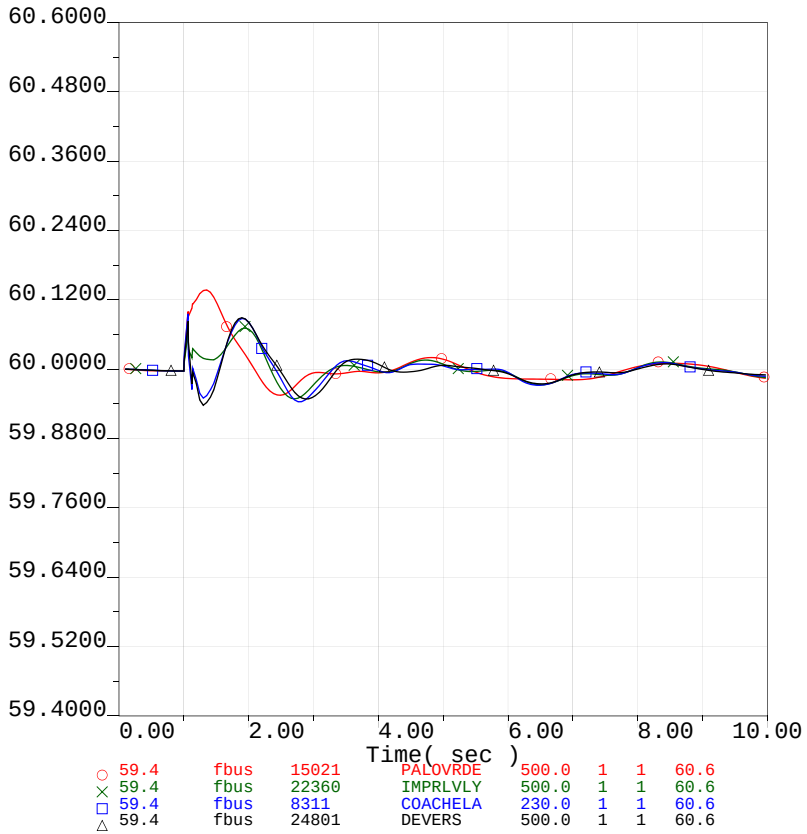



| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ○ | 0.75 | vbus | 22260 | ESCNDIDO | 230.0 | 1 | 1 | 1.25 |
| × | 0.75 | vbus | 22356 | IMPRLVLY | 230.0 | 1 | 1 | 1.25 |
| □ | 0.75 | vbus | 22464 | MIGUEL | 230.0 | 1 | 1 | 1.25 |
| △ | 0.75 | vbus | 22832 | SYCAMORE | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
N-2 MIDPOINTS - DEVERS 1&2 500 kV
Case ALT 3B DISPATCH 3

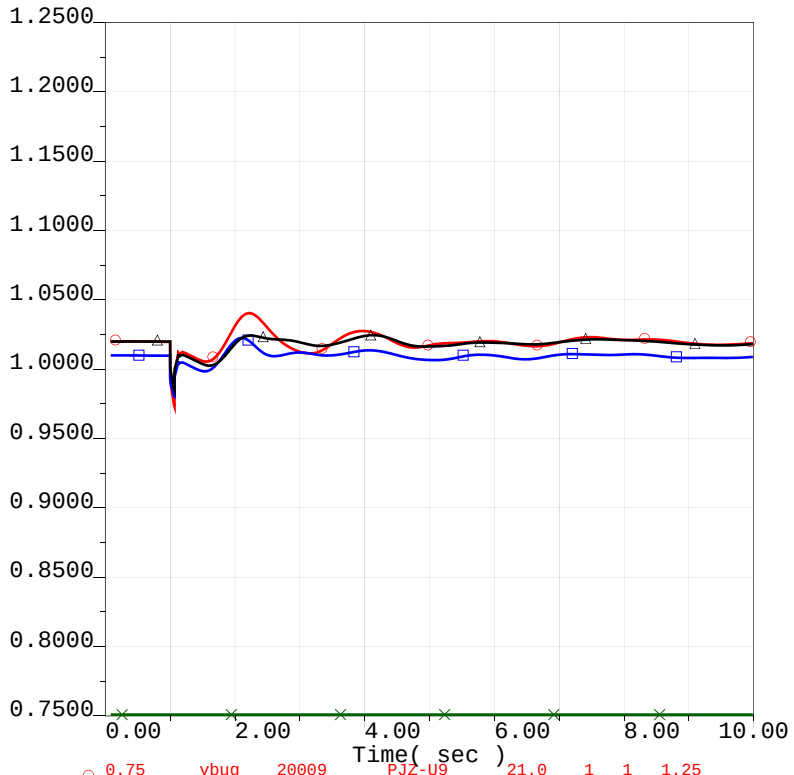


FBus Readings




| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ○ | 59.4 | fbus | 15021 | PALOVRDE | 500.0 | 1 | 1 | 60.6 |
| × | 59.4 | fbus | 22360 | IMPRLVLY | 500.0 | 1 | 1 | 60.6 |
| □ | 59.4 | fbus | 8311 | COACHELA | 230.0 | 1 | 1 | 60.6 |
| △ | 59.4 | fbus | 24801 | DEVERS | 500.0 | 1 | 1 | 60.6 |

IVSG STUDY
Light Autumn Case
N-2 MIDPOINTS - DEVERS 1&2 500 kV
Case ALT 3B DISPATCH 3

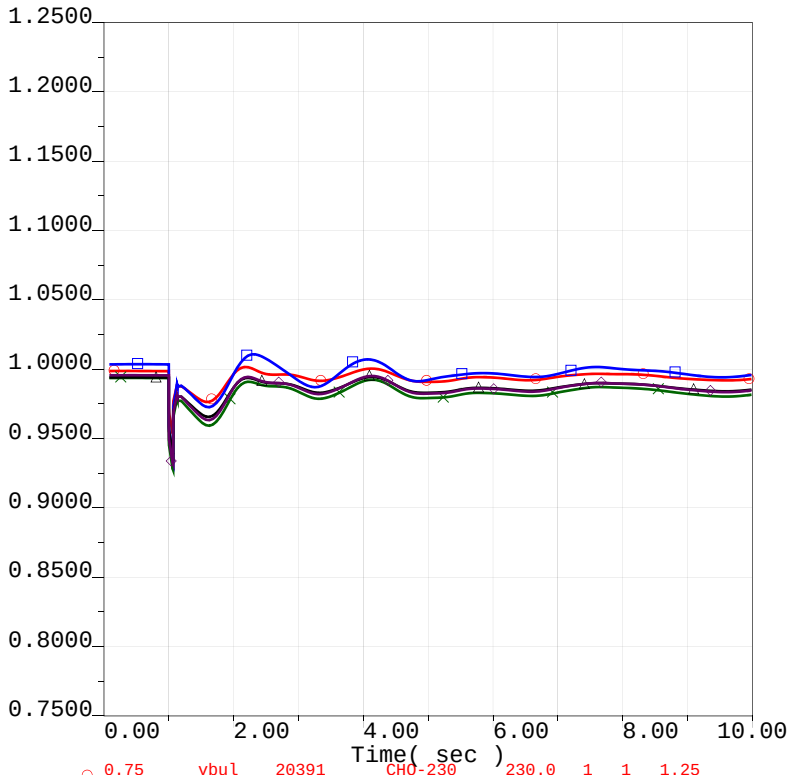



| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbug | 20009 | PJZ-U9 | 21.0 | 1 | 1 | 1.25 |
| × 0.75 | vbug | 20002 | PJZ-U1 | 13.8 | 1 | 1 | 1.25 |
| □ 0.75 | vbug | 20105 | CPD-U1 | 13.8 | 1 | 1 | 1.25 |
| △ 0.75 | vbug | 20137 | CPU-U1 | 13.8 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
N-2 MIDPOINTS - DEVERS 1&2 500 kV
Case ALT 3B DISPATCH 3



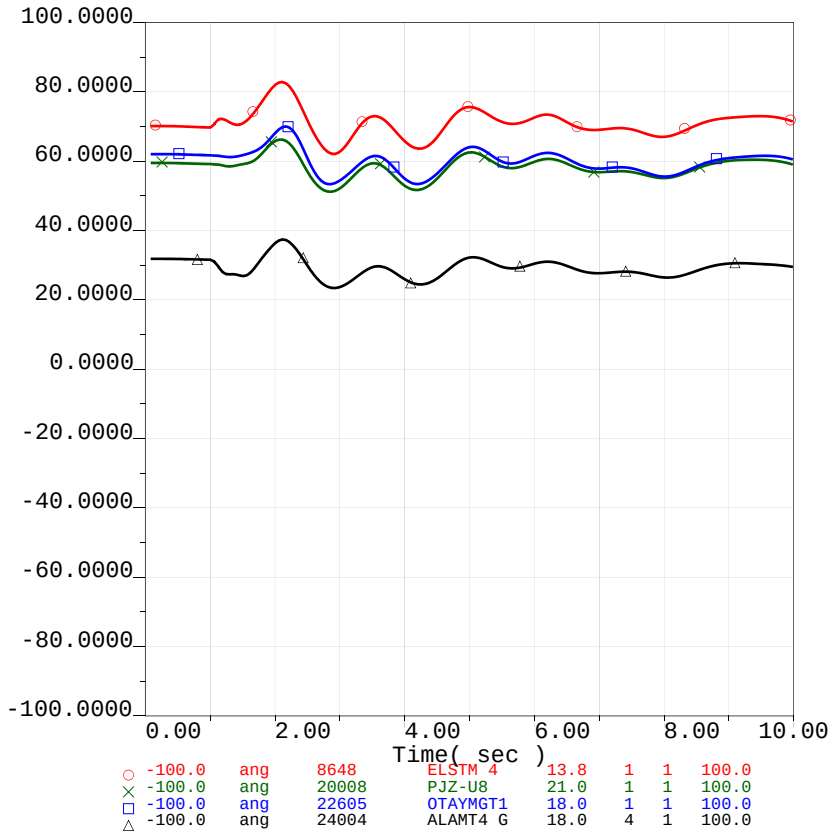





| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbul | 20391 | CHQ-230 | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 20118 | ROA-230 | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 20149 | TJI-230 | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbul | 20115 | MXI-230 | 230.0 | 1 | 1 | 1.25 |
| ◇ 0.75 | vbus | 20328 | LRP-230 | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
N-2 MIDPOINTS - DEVERS 1&2 500 kV
Case ALT 3B DISPATCH 3

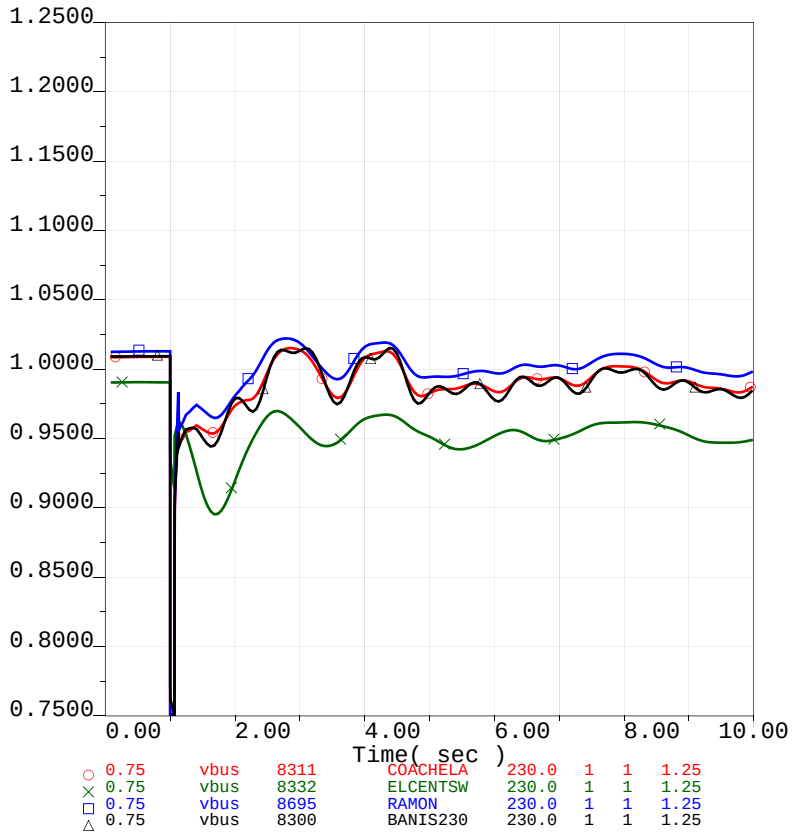
Rotor Angles for Gen Busses




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ -100.0 | ang | 8648 | ELSTM 4 | 13.8 | 1 | 1 | 100.0 |
| × -100.0 | ang | 20008 | PJZ-U8 | 21.0 | 1 | 1 | 100.0 |
| □ -100.0 | ang | 22605 | OTAYMGT1 | 18.0 | 1 | 1 | 100.0 |
| △ -100.0 | ang | 24004 | ALAMT4 G | 18.0 | 4 | 1 | 100.0 |

IVSG STUDY
Light Autumn Case
N-2 MIDPOINTS - DEVERS 1&2 500 kV
Case ALT 3B DISPATCH 3

IID Busses

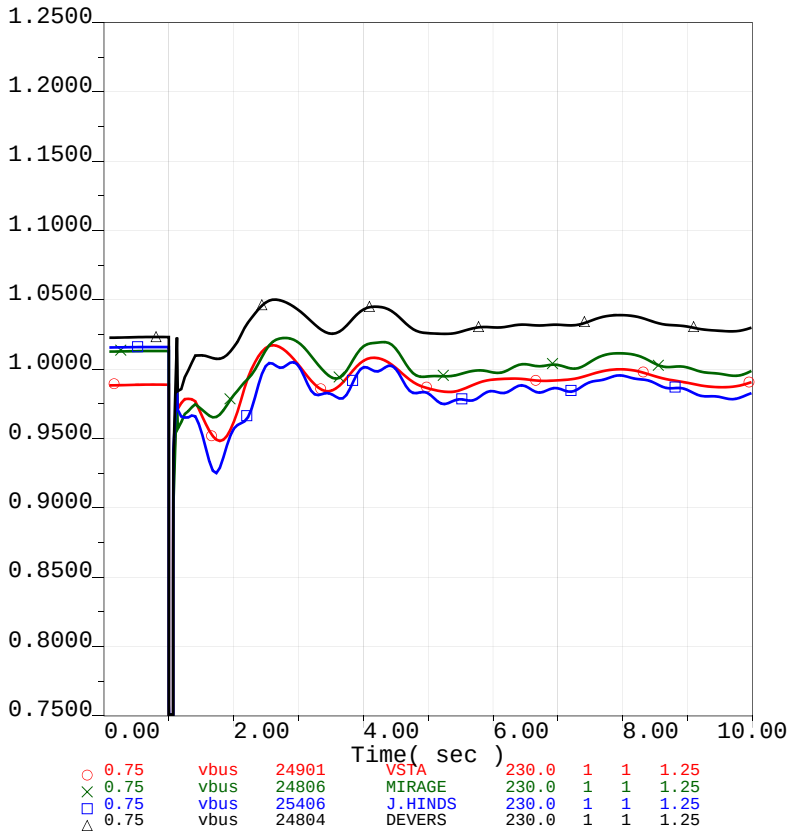



| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbus | 8311 | COACHELA | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 8332 | ELCENTSW | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 8695 | RAMON | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbus | 8300 | BANIS230 | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
N-2 MIDPOINTS - DEVERS 1&2 500 kV
Case Rev 5 Base Case



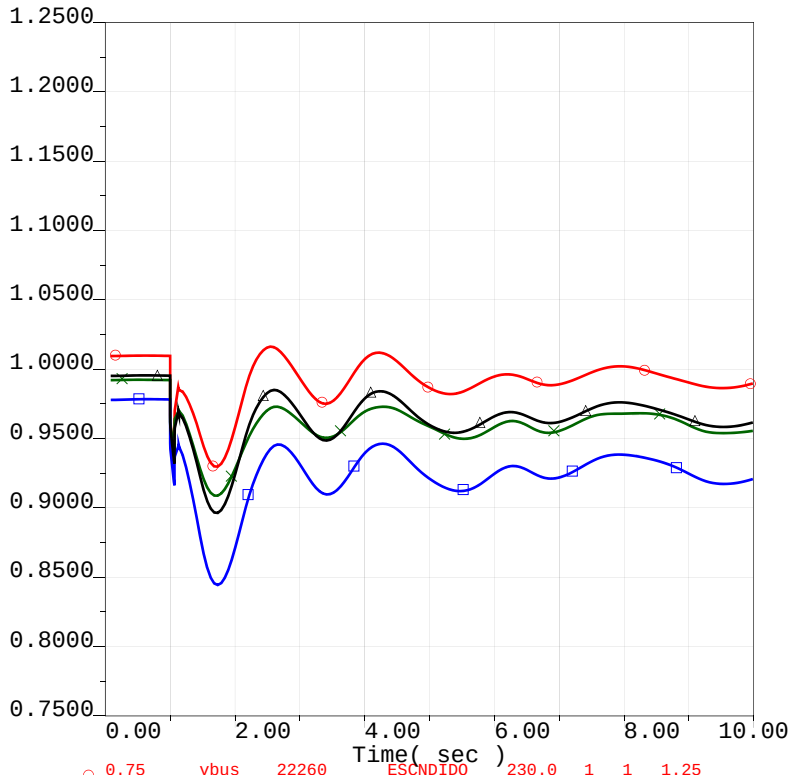
SCE Busses




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbus | 24901 | VSTA | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 24806 | MIRAGE | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 25406 | J.HINDS | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbus | 24804 | DEVERS | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
N-2 MIDPOINTS - DEVERS 1&2 500 kV
Case Rev 5 Base Case

SDGE Busses

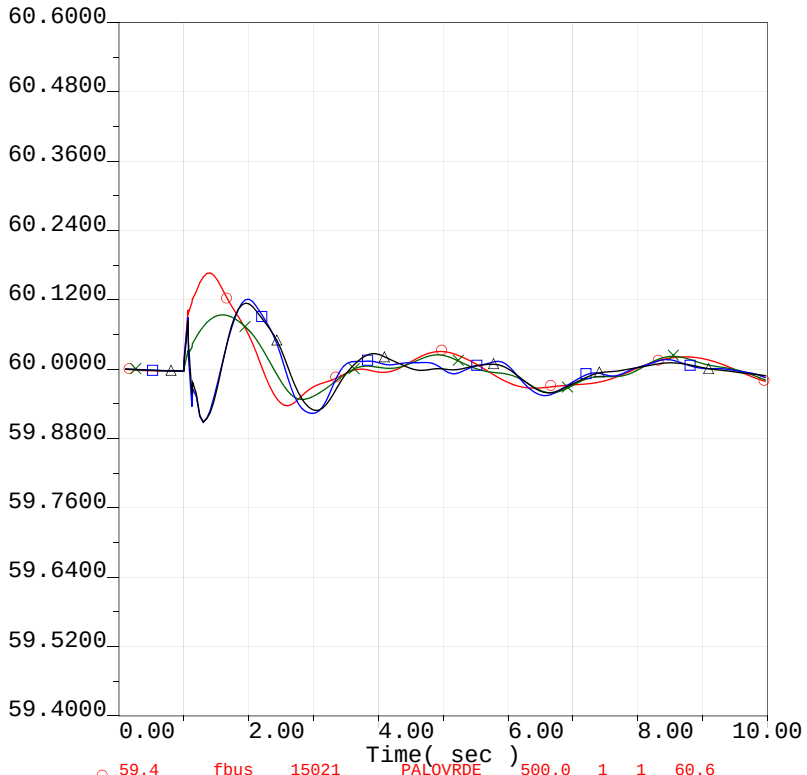



| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ○ | 0.75 | vbus | 22260 | ESCNDIDO | 230.0 | 1 | 1 | 1.25 |
| × | 0.75 | vbus | 22356 | IMPRLVLY | 230.0 | 1 | 1 | 1.25 |
| □ | 0.75 | vbus | 22464 | MIGUEL | 230.0 | 1 | 1 | 1.25 |
| △ | 0.75 | vbus | 22832 | SYCAMORE | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
N-2 MIDPOINTS - DEVERS 1&2 500 kV
Case Rev 5 Base Case



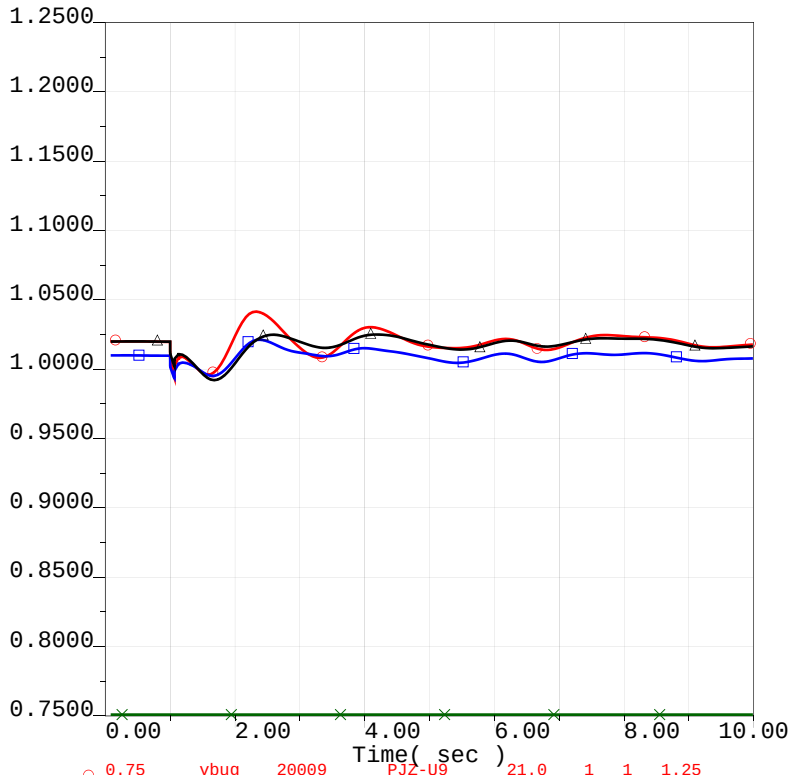
FBus Readings




| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ○ | 59.4 | fbus | 15021 | PALOVRDE | 500.0 | 1 | 1 | 60.6 |
| × | 59.4 | fbus | 22360 | IMPRLVLY | 500.0 | 1 | 1 | 60.6 |
| □ | 59.4 | fbus | 8311 | COACHELA | 230.0 | 1 | 1 | 60.6 |
| △ | 59.4 | fbus | 24801 | DEVERS | 500.0 | 1 | 1 | 60.6 |

IVSG STUDY
Light Autumn Case
N-2 MIDPOINTS - DEVERS 1&2 500 kV
Case Rev 5 Base Case

CFE Busses Page 1

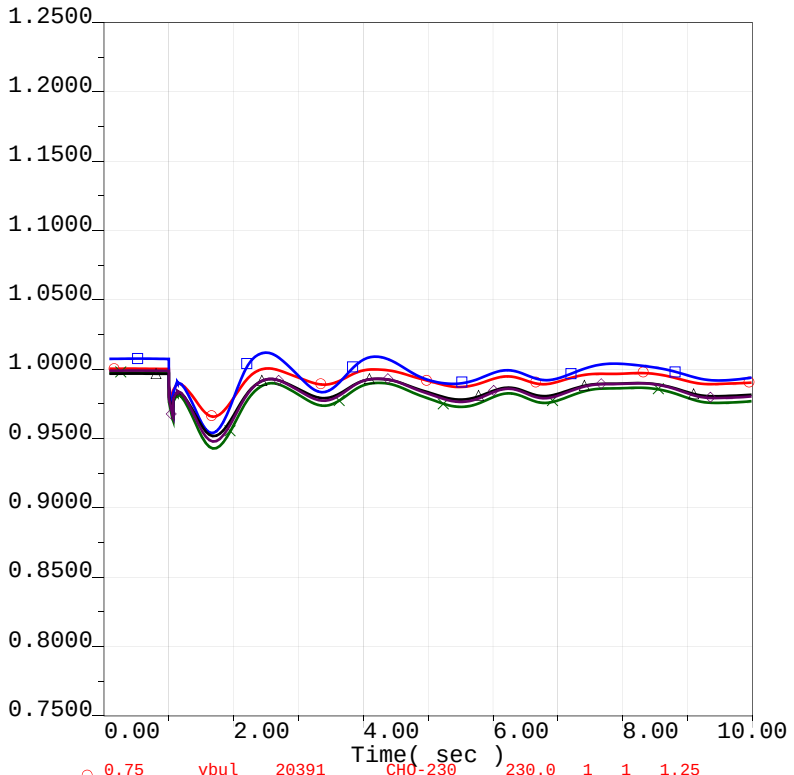



| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbug | 20009 | PJZ-U9 | 21.0 | 1 | 1 | 1.25 |
| × 0.75 | vbug | 20002 | PJZ-U1 | 13.8 | 1 | 1 | 1.25 |
| □ 0.75 | vbug | 20105 | CPD-U1 | 13.8 | 1 | 1 | 1.25 |
| △ 0.75 | vbug | 20137 | CPU-U1 | 13.8 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
N-2 MIDPOINTS - DEVERS 1&2 500 kV
Case Rev 5 Base Case



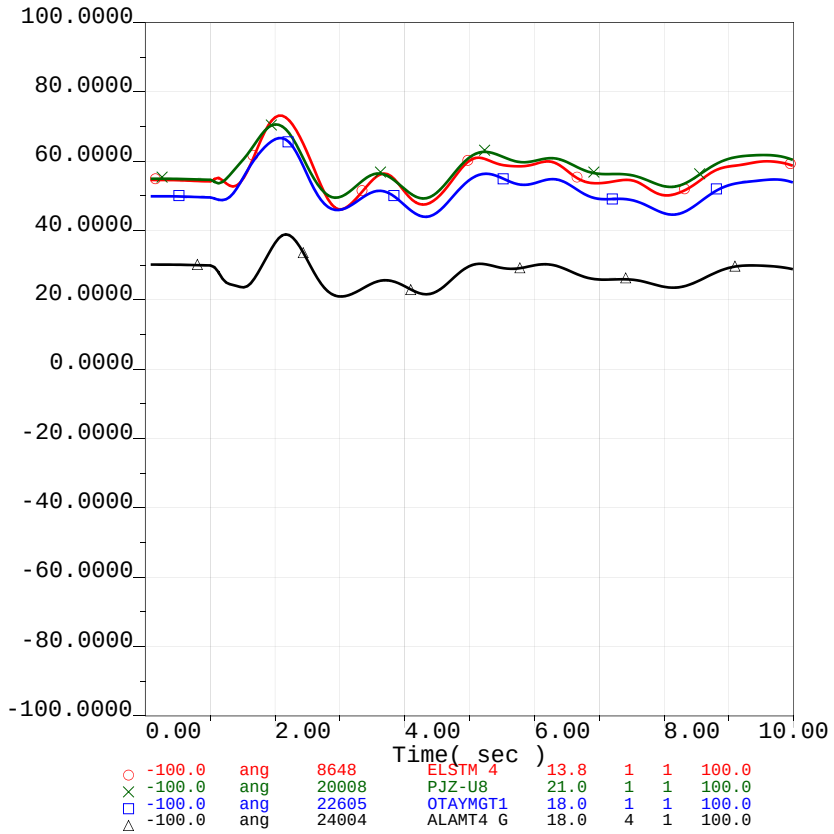
CFE Busses Page 2




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ 0.75 | vbul | 20391 | CHQ-230 | 230.0 | 1 | 1 | 1.25 |
| × 0.75 | vbus | 20118 | ROA-230 | 230.0 | 1 | 1 | 1.25 |
| □ 0.75 | vbus | 20149 | TJI-230 | 230.0 | 1 | 1 | 1.25 |
| △ 0.75 | vbul | 20115 | MXI-230 | 230.0 | 1 | 1 | 1.25 |
| ◇ 0.75 | vbus | 20328 | LRP-230 | 230.0 | 1 | 1 | 1.25 |

IVSG STUDY
Light Autumn Case
N-2 MIDPOINTS - DEVERS 1&2 500 kV
Case Rev 5 Base Case

Rotor Angles for Gen Busses




| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ○ | -100.0 | ang | 8648 | ELSTM 4 | 13.8 | 1 | 1 | 100.0 |
| × | -100.0 | ang | 20008 | PJZ-U8 | 21.0 | 1 | 1 | 100.0 |
| □ | -100.0 | ang | 22605 | OTAYMGT1 | 18.0 | 1 | 1 | 100.0 |
| △ | -100.0 | ang | 24004 | ALAMT4 G | 18.0 | 4 | 1 | 100.0 |

IVSG STUDY
Light Autumn Case
N-2 MIDPOINTS - DEVERS 1&2 500 kV
Case Rev 5 Base Case

# Imperial Valley Study Group

## Appendix C.2

Switch Decks

| | Power Flow Case and Associated Switch Decks | | | | |
|---|---|---|---|---|---|
| **Contingency** | **HS_ALT2_S1** | **HS_ALT3b_S1** | **LA_ALT2_S1** | **LA_ALT2a_S1** | **LA_ALT3b_S1** |
| **NERC/WECC Planning Standard - Category B (Loss of Single Element)** | | | | | |
| IMPERIAL VALLEY-MIGUEL 500kV | ivml_noras | ivml_noras3 | laivml_noras2 | laivml_noras2a | laivml_noras3 |
| HASSAYAMPA-NORTH GILA 500 kV | hang | hang3 | lahang2 | lahang2a | lahang3 |
| DEVERS-MIDPOINT 500kV | NA | NA | lademp2 | lademp2a | lademp3 |
| SERVAL-VALLEY 500kV | NA | seva | NA | NA | laseva3 |
| SERRANO-SERVAL 500kV | NA | sesv3 | NA | NA | lasesv3 |
| SERRANO-VALLEY 500kV | seva1 | NA | laseva2 | laseva2a | NA |
| DEVERS-VALLEY 500kV | deva | deva3 | ladeva2 | ladeva2a | ladeva3 |
| SAN FELIPE-CENTRAL/NORTH SD 500 kV | nsfc | nsfn | lansfc2 | lansfc2a | lansfn3b |
| IMPERIAL VALLEY-SAN FELIPE 500 kV | NA | NA | lansfi2 | NA | lansfi3b |
| BANNISTER-SAN FELIPE 230kV | NA | NA | lansfb2 | lansfb2a | lansfb3b |
| **NERC/WECC Planning Standard - Category C (Loss of Two or More Elements)** | | | | | |
| COACHELLA-DEVERS/MIRAGE 230kV N-2 | NA | NA | lap42_noras2 | lap42_noras2a | lap42_noras3b |

# Imperial Valley Study Group

## Appendix C.2.1

Heavy Summer

# Heavy Summer Switch Decks

### Imperial Valley-Miguel 500kV

**(ivml_noras.swt)**
D:\PSLF\IVGS\CASES\STABCASES\ivsg_hs_alt2d1_S1.sav
d:\pslf\ivgs\dyd\14hs_ivgs_pst.dyd
TIT
IVSG STUDY
2014 Heavy Summer Case
Trip Imperial Valley - Miguel 500 kV No RAS
Case ALT 2 DISPATCH 1

```
RUN 9
*
*   Imperial Valley - Miguel 500kV Line Out
*   followed by automatic SPS 6.1 to open IV Generation
*   followed by automatic SPS 6.2 to open IV-ROA (CFE)
*   3-phase 4 cycle fault at Imperial Valley
*
*   Fault bus at Imperial Valley
*
FB  0.0  "IMPRLVLY" 500.
*
*   Flash SWPL capacitors
*
FC  0.0  "HASSYAMP" 500. "N.GILA  " 500. "1 " 2
FC  0.0  "N.GILA  " 500. "IMPRLVLY" 500. "1 " 2
FC  0.0  "IMPRLVLY" 500. "MIGUEL  " 500. "1 " 1
*
*   Clear fault bus at Imperial Valley
*
CFB 4.0  "IMPRLVLY" 500.
*
*   Trip Imperial Valley - Miguel line
*
DL  4.0  "IMPRLVLY" 500. "MIGUEL  " 500. "1 "
*
*   Reinsert remaining SWPL capacitors
*
RC  4.0  "N.GILA  " 500. "IMPRLVLY" 500. "1 " 2
RC  4.0  "HASSYAMP" 500. "N.GILA  " 500. "1 " 2
*
*   SDG&E SPS TMC1505 6.1 SPS B
*   (assume reduntant scheme in CFE operates in 2 sec)
*   Trip IV Generation
*
*TG  4.0  "INTBST   "  18. "1 "
*TG  4.0  "INTBCT   "  16. "1 "
*TG  4.0  "IV GEN1  "  21. "1 "
*TG  4.0  "IV GEN2  "  18. "1 "
*TG  4.0  "IV GEN3  "  18. "1 "
*
*   SDG&E SPS TMC1505 6.2
*   (assumes ROA-HRD or ROA-RUM over 388 MVA operates in 2 sec)
*   Trip Imperial - La Rosita line
*
*DL  124.  "IMPRLVLY" 230. "ROA-230 " 230. "1"
```

**(ivml_noras3.swt)**
D:\PSLF\IVGS\CASES\STABCASES\ivsg_hs_alt3Bd1_S1.sav
d:\pslf\ivgs\dyd\14hs_ivgs_pst.dyd
TIT
IVSG STUDY
2014 Heavy Summer Case
Trip Imperial Valley - Miguel 500 kV No RAS
Case ALT 3B DISPATCH 1

```
RUN 9
*
*   Imperial Valley - Miguel 500kV Line Out
*   followed by automatic SPS 6.1 to open IV Generation
*   followed by automatic SPS 6.2 to open IV-ROA (CFE)
*   3-phase 4 cycle fault at Imperial Valley
*
*   Fault bus at Imperial Valley
*
FB  0.0  "IMPRLVLY" 500.
*
*   Flash SWPL capacitors
*
FC  0.0  "HASSYAMP" 500. "N.GILA  " 500. "1 " 2
FC  0.0  "N.GILA  " 500. "IMPRLVLY" 500. "1 " 2
FC  0.0  "IMPRLVLY" 500. "MIGUEL  " 500. "1 " 1
*
*   Clear fault bus at Imperial Valley
*
CFB 4.0  "IMPRLVLY" 500.
*
*   Trip Imperial Valley - Miguel line
*
DL  4.0  "IMPRLVLY" 500. "MIGUEL  " 500. "1 "
*
*   Reinsert remaining SWPL capacitors
*
RC  4.0  "N.GILA  " 500. "IMPRLVLY" 500. "1 " 2
RC  4.0  "HASSYAMP" 500. "N.GILA  " 500. "1 " 2
*
*   SDG&E SPS TMC1505 6.1 SPS B
*   (assume reduntant scheme in CFE operates in 2 sec)
*   Trip IV Generation
*
*TG  4.0  "INTBST   "  18. "1 "
*TG  4.0  "INTBCT   "  16. "1 "
*TG  4.0  "IV GEN1  "  21. "1 "
*TG  4.0  "IV GEN2  "  18. "1 "
*TG  4.0  "IV GEN3  "  18. "1 "
*
*   SDG&E SPS TMC1505 6.2
*   (assumes ROA-HRD or ROA-RUM over 388 MVA operates in 2 sec)
*   Trip Imperial - La Rosita line
*
*DL  124.  "IMPRLVLY" 230. "ROA-230 " 230. "1"
*
```

## Hassayampa-N.Gila 500kV

**(hang.swt)**

```
D:\PSLF\IVGS\CASES\STABCASES\ivsg_hs_alt2d1_S1.sav
d:\pslf\ivgs\dyd\14hs_ivgs_pst.dyd
TIT
  IVSG STUDY
  2014 Heavy Summer Case
  Trip Hassayampa - N. Gila 500 kV
  Case ALT 2 DISPATCH 1

RUN 9
*   Loss of Hassayampa - N. Gila 500 kV Line
*
*  CC cards for post-transient only
*
*   Fault bus at Hassayampa
*
FB   0.0 "HASSYAMP" 500.
*
*  Apply fault damping to each Palo Verde Unit
*
GFD   0.0 "PALOVRD1" 24. "1 "  0.072485
GFD   0.0 "PALOVRD2" 24. "1 "  0.072485
GFD   0.0 "PALOVRD3" 24. "1 "  0.072485
*
*   Flash series capacitors in following 500 kV Lines
*
FC   0.0 "PALOVRDE" 500. "DEVERS  " 500. "1 " 2
FC   0.0 "PALOVRDE" 500. "DEVERS  " 500. "1 " 4
FC   0.0 "HARQUAHA" 500. "DEVERS  " 500. "1 " 2
FC   0.0 "HARQUAHA" 500. "DEVERS  " 500. "1 " 4
FC   0.0 "HASSYAMP" 500. "N.GILA  " 500. "1 " 2
FC   0.0 "N.GILA  " 500. "IMPRLVLY" 500. "1 " 2
FC   0.0 "IMPRLVLY" 500. "MIGUEL  " 500. "1 " 1
FC   0.0 "MOENKOPI" 500. "YAVAPAI " 500. "1 " 1
FC   0.0 "YAVAPAI " 500. "WESTWING" 500. "1 " 2
*FC   0.0 "NAVAJO  " 500. "WESTWING" 500. "1 " 1
*FC   0.0 "NAVAJO  " 500. "WESTWING" 500. "1 " 3
FC   0.0 "MEAD    " 500. "PERKINS " 500. "1 " 1
FC   0.0 "MEAD    " 500. "PERKINS " 500. "1 " 3
*
*   Clear fault at Hassayampa
*
CFB  4.0 "HASSYAMP" 500.
*
*   Trip Hassyampa - N. Gila 500 kV Line
*
DL   4.0 "HASSYAMP" 500. "N.GILA   " 500. "1 "
*
*  Remove fault damping to each Palo Verde Unit
*
GFD   4.0 "PALOVRD1" 24. "1 "  0.0
GFD   4.0 "PALOVRD2" 24. "1 "  0.0
GFD   4.0 "PALOVRD3" 24. "1 "  0.0
*
*   Reinsert series capacitors in following 500 kV Lines
*
RC   4.0 "PALOVRDE" 500. "DEVERS  " 500. "1 " 2
RC   4.0 "PALOVRDE" 500. "DEVERS  " 500. "1 " 4
RC   4.0 "HARQUAHA" 500. "DEVERS  " 500. "1 " 2
RC   4.0 "HARQUAHA" 500. "DEVERS  " 500. "1 " 4
*RC   4.0 "HASSYAMP" 500. "N.GILA  " 500. "1 " 2
RC   4.0 "N.GILA  " 500. "IMPRLVLY" 500. "1 " 2
RC   4.0 "IMPRLVLY" 500. "MIGUEL  " 500. "1 " 1
RC   4.0 "MEAD    " 500. "PERKINS " 500. "1 " 1
RC   4.0 "MEAD    " 500. "PERKINS " 500. "1 " 3
*
*   Reinsert series capacitors in following 500 kV Lines
*
RC   8.0 "MOENKOPI" 500. "YAVAPAI " 500. "1 " 1
RC   8.0 "YAVAPAI " 500. "WESTWING" 500. "1 " 2
*RC   8.0 "NAVAJO  " 500. "WESTWING" 500. "1 " 1
*RC   8.0 "NAVAJO  " 500. "WESTWING" 500. "1 " 3
*
```

**(hang3.swt)**

```
D:\PSLF\IVGS\CASES\STABCASES\ivsg_hs_alt3Bd1_S1.sav
d:\pslf\ivgs\dyd\14hs_ivgs_pst.dyd
TIT
  IVSG STUDY
  2014 Heavy Summer Case
  Trip Hassayampa - N. Gila 500 kV
  Case ALT 3B DISPATCH 1

RUN 9
*   Loss of Hassayampa - N. Gila 500 kV Line
*
*  CC cards for post-transient only
*
*   Fault bus at Hassayampa
*
FB   0.0 "HASSYAMP" 500.
*
*  Apply fault damping to each Palo Verde Unit
*
GFD   0.0 "PALOVRD1" 24. "1 "  0.072485
GFD   0.0 "PALOVRD2" 24. "1 "  0.072485
GFD   0.0 "PALOVRD3" 24. "1 "  0.072485
*
*   Flash series capacitors in following 500 kV Lines
*
FC   0.0 "PALOVRDE" 500. "DEVERS  " 500. "1 " 2
FC   0.0 "PALOVRDE" 500. "DEVERS  " 500. "1 " 4
FC   0.0 "HARQUAHA" 500. "DEVERS  " 500. "1 " 2
FC   0.0 "HARQUAHA" 500. "DEVERS  " 500. "1 " 4
FC   0.0 "HASSYAMP" 500. "N.GILA  " 500. "1 " 2
FC   0.0 "N.GILA  " 500. "IMPRLVLY" 500. "1 " 2
FC   0.0 "IMPRLVLY" 500. "MIGUEL  " 500. "1 " 1
FC   0.0 "MOENKOPI" 500. "YAVAPAI " 500. "1 " 1
FC   0.0 "YAVAPAI " 500. "WESTWING" 500. "1 " 2
*FC   0.0 "NAVAJO  " 500. "WESTWING" 500. "1 " 1
*FC   0.0 "NAVAJO  " 500. "WESTWING" 500. "1 " 3
FC   0.0 "MEAD    " 500. "PERKINS " 500. "1 " 1
FC   0.0 "MEAD    " 500. "PERKINS " 500. "1 " 3
*
*   Clear fault at Hassayampa
*
CFB  4.0 "HASSYAMP" 500.
*
```

```
*   Trip Hassyampa - N. Gila 500 kV Line
*
DL   4.0 "HASSYAMP" 500. "N.GILA   " 500. "1 "
*
*  Remove fault damping to each Palo Verde Unit
*
GFD   4.0 "PALOVRD1" 24. "1 "  0.0
GFD   4.0 "PALOVRD2" 24. "1 "  0.0
GFD   4.0 "PALOVRD3" 24. "1 "  0.0
*
*   Reinsert series capacitors in following 500 kV Lines
*
RC   4.0 "PALOVRDE" 500. "DEVERS  " 500. "1 " 2
RC   4.0 "PALOVRDE" 500. "DEVERS  " 500. "1 " 4
RC   4.0 "HARQUAHA" 500. "DEVERS  " 500. "1 " 2
RC   4.0 "HARQUAHA" 500. "DEVERS  " 500. "1 " 4
*RC   4.0 "HASSYAMP" 500. "N.GILA  " 500. "1 " 2
RC   4.0 "N.GILA  " 500. "IMPRLVLY" 500. "1 " 2
RC   4.0 "IMPRLVLY" 500. "MIGUEL  " 500. "1 " 1
RC   4.0 "MEAD    " 500. "PERKINS " 500. "1 " 1
RC   4.0 "MEAD    " 500. "PERKINS " 500. "1 " 3
*
*   Reinsert series capacitors in following 500 kV Lines
*
RC   8.0 "MOENKOPI" 500. "YAVAPAI " 500. "1 " 1
RC   8.0 "YAVAPAI " 500. "WESTWING" 500. "1 " 2
*RC   8.0 "NAVAJO  " 500. "WESTWING" 500. "1 " 1
*RC   8.0 "NAVAJO  " 500. "WESTWING" 500. "1 " 3
*
```

## Serval-Valley 500kV

**(seva.swt)**

```
D:\PSLF\IVGS\CASES\stabcases\ivsg_hs_alt2d1_S1.sav
d:\pslf\ivgs\dyd\14hs_ivgs_pst.dyd
TIT
  IVSG STUDY
  2014 Heavy Summer Case
  Trip SerVal - Valley 500 kV
  Case ALT 2 DISPATCH 1

RUN 9
*
*   SerVal - Valley 500 kV Line Out
*   3 phase 4 cycles fault at SerVal 500 kV
*
*
*   Fault bus at SerVal 500 kV
*
FB   0.0 "SERVAL  " 500.
*
*   Clear fault at SerVal
*
CFB  4.0 "SERVAL  " 500.
*
*   Trip SerVal - Valley 500 kV Line
*
DL   4.0 "SERVAL  " 500. "VALLEYSC" 500. "1 "
*
```

## Serrano-SerVal 500kV

**(sesv3.swt)**

```
D:\PSLF\IVGS\CASES\stabcases\ivsg_hs_alt3Bd1_S1.sav
d:\pslf\ivgs\dyd\14hs_ivgs_pst.dyd
TIT
  IVSG STUDY
  2014 Heavy Summer Case
  Trip Serrano - SerVal 500 kV
  Case ALT 3b DISPATCH 1

RUN 9
*
*   SERRANO-SERVAL 500 kV Line Out
*   3 phase 4 cycles fault at SerVal 500 kV
*
*
*   Fault bus at SerVal 500 kV
*
FB   0.0 "SERRANO  " 500.
*
*   Clear fault at SerVal
*
CFB  4.0 "SERRANO  " 500.
*
*   Trip SerVal - Valley 500 kV Line
*
DL   4.0 "SERRANO  " 500. "SERVAL" 500. "1 "
```

## Serrano-Valley 500kV

**(seva1.swt)**

```
D:\PSLF\IVGS\CASES\STABCASES\ivsg_hs_alt2d1_S1.sav
d:\pslf\ivgs\dyd\14hs_ivgs_pst.dyd
TIT
  IVSG STUDY
  2014 Heavy Summer Case
  Trip Serrano - Valley 500 kV Line
  Case Alt 2 Dispatch 1

RUN 9
*
*   Serrano - Valley 500 kV Line Out
*   3 phase 4 cycles fault at Serrano 500 kV
*
*
*   Fault bus at Serrano 500 kV
*
FB   0.0 "SERRANO " 500.
*
*   Clear fault at Serrano
*
CFB  4.0 "SERRANO " 500.
*
*   Trip Serrano - Valley 500 kV Line
*
DL   4.0 "SERRANO " 500. "VALLEYSC" 500. "1 "
*
```

## Devers-Valley 500kV

**(deva.swt)**

```
D:\PSLF\IVGS\CASES\STABCASES\ivsg_hs_alt2d1_S1.sav
d:\pslf\ivgs\dyd\14hs_ivgs_pst.dyd
TIT
  IVSG STUDY
  2014 Heavy Summer Case
  Trip Devers - Valley 500 kV
  Case ALT 2 DISPATCH 1

RUN 9
*
*   Loss of Devers - Valley 500 kV Line
*
*
*   Fault bus at Devers
*
FB   0.0 "DEVERS  " 500.
*
*   Clear fault at Devers
*
CFB  4.0 "DEVERS   " 500.
*
*   Trip Devers - Valley 500 kV Line
*
DL   4.0 "DEVERS  " 500. "VALLEYSC" 500. "1 "
*
```

**(deva3.swt)**

```
D:\PSLF\IVGS\CASES\STABCASES\ivsg_hs_alt3Bd1_S1.sav
d:\pslf\ivgs\dyd\14hs_ivgs_pst.dyd
TIT
  IVSG STUDY
  2014 Heavy Summer Case
  Trip Devers - Valley 500 kV
  Case ALT 3B DISPATCH 1

RUN 9
*
*   Loss of Devers - Valley 500 kV Line
*
*
*   Fault bus at Devers
*
FB   0.0 "DEVERS  " 500.
*
*   Clear fault at Devers
*
CFB  4.0 "DEVERS   " 500.
*
*   Trip Devers - Valley 500 kV Line
*
DL   4.0 "DEVERS  " 500. "VALLEYSC" 500. "1 "
*
```

## New San Felipe-Central 500kV

**(nsfc.swt)**

```
D:\PSLF\IVGS\CASES\STABCASES\ivsg_hs_alt2d1_S1.sav
d:\pslf\ivgs\dyd\14hs_ivgs_pst.dyd
TIT
  IVSG STUDY
  2014 Heavy Summer Case
  Trip NEW SAN FELIPE - CENTRAL 500 kV
  Case ALT 2 DISPATCH 1

RUN 9
*
*   Loss of NEW SAN FELIPE CENTRAL 500 kV Line
*
*
*   Fault bus at New San Felipe
*
FB   0.0 "NEWSF500  " 500.
*
*   Flash capacitors
*
FC  0.0  "CENTRALX" 500. "NEWSF500" 500. "1 " 2
*
*   Clear fault at New San Felipe
*
CFB  4.0 "NEWSF500   " 500.
*
*   Trip New San Felipe - Central 500 kV Line
*
DL   4.0 "CENTRALX" 500. "NEWSF500" 500. "1 "
```

## New San Felipe-NorthSD 500kV

**(nsfn.swt)**

```
D:\PSLF\IVGS\CASES\STABCASES\ivsg_hs_alt3Bd1_S1.sav
d:\pslf\ivgs\dyd\14hs_ivgs_pst.dyd
TIT
  IVSG STUDY
  2014 Heavy Summer Case
  Trip NEW SAN FELIPE - NORTHSD 500 kV
  Case ALT 3B DISPATCH 1

RUN 9
*
*   Loss of NEW SAN FELIPE NORTHSD 500 kV Line
*
*
*   Fault bus at New San Felipe
*
FB   0.0 "NEWSF500  " 500.
*
*   Flash capacitors
*
FC  0.0  "NORTHSD" 500. "NEWSF500" 500. "1 " 2
*
*   Clear fault at New San Felipe
*
CFB  4.0 "NEWSF500   " 500.
*
*   Trip New San Felipe - Central 500 kV Line
*
DL   4.0 "NORTHSD" 500. "NEWSF500" 500. "1 "
```

## PV-DV/HARQ-DV 500kV N-2

**(pvdv2i.swt)**

```
D:\PSLF\IVGS\CASES\STABCASES\ivsg_hs_alt2d1_S1.sav
d:\pslf\ivgs\dyd\14hs_ivgs_pst.dyd
TIT
  IVSG STUDY
  2014 Heavy Summer Case
  N-2  PV-Devers HARQ-DEVERS 500 kV
  Case ALT 2 DISPATCH 1

RUN 9
*   Loss of Palo Verde - Devers 1 & 2
*
*  CC cards for post-transient only
*
*   Fault bus at Palo Verde
*
FB   0.0 "DEVERS" 500.
*
*  Apply fault damping to each Palo Verde Unit
*
GFD   0.0 "PALOVRD1" 24. "1 "  0.072485
GFD   0.0 "PALOVRD2" 24. "1 "  0.072485
GFD   0.0 "PALOVRD3" 24. "1 "  0.072485
*
*   Flash series capacitors in following 500 kV Lines
*
FC   0.0 "PALOVRDE" 500. "DEVERS  " 500. "1 " 2
FC   0.0 "PALOVRDE" 500. "DEVERS  " 500. "1 " 4
FC   0.0 "HARQUAHA" 500. "DEVERS  " 500. "1 " 2
FC   0.0 "HARQUAHA" 500. "DEVERS  " 500. "1 " 4
FC   0.0 "HASSYAMP" 500. "N.GILA  " 500. "1 " 2
FC   0.0 "N.GILA  " 500. "IMPRLVLY" 500. "1 " 2
FC   0.0 "IMPRLVLY" 500. "MIGUEL  " 500. "1 " 1
FC   0.0 "MEAD    " 500. "PERKINS " 500. "1 " 1
FC   0.0 "MEAD    " 500. "PERKINS " 500. "1 " 3
FC   0.0 "MOENKOPI" 500. "YAVAPAI " 500. "1 " 1
FC   0.0 "YAVAPAI " 500. "WESTWING" 500. "1 " 2
FC   0.0 "NAVAJO  " 500. "RACEWAY " 500. "1 " 2
*
*   Clear fault at PV AND HARQ
*
CFB  4.0 "DEVERS" 500.
*
*   Trip Palo Verde - Devers 500 kV Line
*   Trip Haquahala  - Devers 500 kV Line
*
DL   4.0 "PALOVRDE" 500. "DEVERS   " 500. "1 "
DL   4.0 "HARQUAHA" 500. "DEVERS   " 500. "1 "
*
*  Remove fault damping to each Palo Verde Unit
*
GFD   4.0 "PALOVRD1" 24. "1 "  0.0
GFD   4.0 "PALOVRD2" 24. "1 "  0.0
GFD   4.0 "PALOVRD3" 24. "1 "  0.0
*
*   Reinsert series capacitors in following 500 kV Lines
*
* RC   4.0 "PALOVRDE" 500. "DEVERS  " 500. "1 " 2
```

```
* RC   4.0 "PALOVRDE" 500. "DEVERS  " 500. "1 " 4
* RC   4.0 "HARQUAHA" 500. "DEVERS  " 500. "1 " 2
* RC   4.0 "HARQUAHA" 500. "DEVERS  " 500. "1 " 4
RC   4.0 "HASSYAMP" 500. "N.GILA  " 500. "1 " 2
RC   4.0 "N.GILA  " 500. "IMPRLVLY" 500. "1 " 2
RC   4.0 "IMPRLVLY" 500. "MIGUEL  " 500. "1 " 1
RC   4.0 "MEAD    " 500. "PERKINS " 500. "1 " 1
RC   4.0 "MEAD    " 500. "PERKINS " 500. "1 " 3
*
*   Reinsert series capacitors in following 500 kV Lines
*
RC   8.0 "MOENKOPI" 500. "YAVAPAI " 500. "1 " 1
RC   8.0 "YAVAPAI " 500. "WESTWING" 500. "1 " 2
RC   8.0 "NAVAJO  " 500. "RACEWAY " 500. "1 " 2
*
```

**(pvdv3b.swt)**

```
D:\PSLF\IVGS\CASES\STABCASES\ivsg_hs_alt3Bd1_S1.sav
d:\pslf\ivgs\dyd\14hs_ivgs_pst.dyd
TIT
  IVSG STUDY
  2014 Heavy Summer Case
  N-2  PV-Devers HARQ-DEVERS 500 kV
  Case ALT 3B DISPATCH 1

RUN 9
*   Loss of Palo Verde - Devers 1 & 2
*
*  CC cards for post-transient only
*
*   Fault bus at Palo Verde
*
FB   0.0 "DEVERS" 500.
*
*  Apply fault damping to each Palo Verde Unit
*
GFD   0.0 "PALOVRD1" 24. "1 "  0.072485
GFD   0.0 "PALOVRD2" 24. "1 "  0.072485
GFD   0.0 "PALOVRD3" 24. "1 "  0.072485
*
*   Flash series capacitors in following 500 kV Lines
*
FC   0.0 "PALOVRDE" 500. "DEVERS  " 500. "1 " 2
FC   0.0 "PALOVRDE" 500. "DEVERS  " 500. "1 " 4
FC   0.0 "HARQUAHA" 500. "DEVERS  " 500. "1 " 2
FC   0.0 "HARQUAHA" 500. "DEVERS  " 500. "1 " 4
FC   0.0 "HASSYAMP" 500. "N.GILA  " 500. "1 " 2
FC   0.0 "N.GILA  " 500. "IMPRLVLY" 500. "1 " 2
FC   0.0 "IMPRLVLY" 500. "MIGUEL  " 500. "1 " 1
FC   0.0 "MEAD    " 500. "PERKINS " 500. "1 " 1
FC   0.0 "MEAD    " 500. "PERKINS " 500. "1 " 3
FC   0.0 "MOENKOPI" 500. "YAVAPAI " 500. "1 " 1
FC   0.0 "YAVAPAI " 500. "WESTWING" 500. "1 " 2
FC   0.0 "NAVAJO  " 500. "RACEWAY " 500. "1 " 2
*
*   Clear fault at PV AND HARQ
*
CFB  4.0 "DEVERS" 500.
*
*   Trip Palo Verde - Devers 500 kV Line
*
DL   4.0 "PALOVRDE" 500. "DEVERS   " 500. "1 "
DL   4.0 "HARQUAHA" 500. "DEVERS   " 500. "1 "
*
*  Remove fault damping to each Palo Verde Unit
*
GFD   4.0 "PALOVRD1" 24. "1 "  0.0
GFD   4.0 "PALOVRD2" 24. "1 "  0.0
GFD   4.0 "PALOVRD3" 24. "1 "  0.0
*
*   Reinsert series capacitors in following 500 kV Lines
*
* RC   4.0 "PALOVRDE" 500. "DEVERS  " 500. "1 " 2
* RC   4.0 "PALOVRDE" 500. "DEVERS  " 500. "1 " 4
* RC   4.0 "HARQUAHA" 500. "DEVERS  " 500. "1 " 2
* RC   4.0 "HARQUAHA" 500. "DEVERS  " 500. "1 " 4
RC   4.0 "HASSYAMP" 500. "N.GILA  " 500. "1 " 2
RC   4.0 "N.GILA  " 500. "IMPRLVLY" 500. "1 " 2
RC   4.0 "IMPRLVLY" 500. "MIGUEL  " 500. "1 " 1
RC   4.0 "MEAD    " 500. "PERKINS " 500. "1 " 1
RC   4.0 "MEAD    " 500. "PERKINS " 500. "1 " 3
*
*   Reinsert series capacitors in following 500 kV Lines
*
RC   8.0 "MOENKOPI" 500. "YAVAPAI " 500. "1 " 1
RC   8.0 "YAVAPAI " 500. "WESTWING" 500. "1 " 2
RC   8.0 "NAVAJO  " 500. "RACEWAY " 500. "1 " 2
*
```

# Imperial Valley Study Group

## Appendix C.2.2

Light Autumn

# Light Autumn Switch Decks

### Imperial Valley-Miguel 500kV

**(laivml_noras2.swt)**
D:\PSLF\IVGS\CASES\autumn\ivsg_la_alt2d3.sav
d:\pslf\ivgs\dyd\08la1s1ivsg.dyd
TIT
  IVSG STUDY
  Light Autumn Case
  Trip Imperial Valley - Miguel 500 kV No RAS
  Case ALT 2 DISPATCH 3

```
RUN 9
*
*   Imperial Valley - Miguel 500kV Line Out
*   followed by automatic SPS 6.1 to open IV Generation
*   followed by automatic SPS 6.2 to open IV-ROA (CFE)
*   3-phase 4 cycle fault at Imperial Valley
*
*   Fault bus at Imperial Valley
*
FB  0.0  "IMPRLVLY" 500.
*
*   Flash SWPL capacitors
*
FC  0.0  "HASSYAMP" 500. "N.GILA  " 500. "1 " 2
FC  0.0  "N.GILA  " 500. "IMPRLVLY" 500. "1 " 2
FC  0.0  "IMPRLVLY" 500. "MIGUEL  " 500. "1 " 1
*
*   Clear fault bus at Imperial Valley
*
CFB 4.0  "IMPRLVLY" 500.
*
*   Trip Imperial Valley - Miguel line
*
DL  4.0  "IMPRLVLY" 500. "MIGUEL  " 500. "1 "
*
*   Reinsert remaining SWPL capacitors
*
RC  4.0  "N.GILA  " 500. "IMPRLVLY" 500. "1 " 2
RC  4.0  "HASSYAMP" 500. "N.GILA  " 500. "1 " 2
*
*   SDG&E SPS TMC1505 6.1 SPS B
*   (assume reduntant scheme in CFE operates in 2 sec)
*   Trip IV Generation
*
*TG  4.0  "INTBST   "  18. "1 "
*TG  4.0  "INTBCT   "  16. "1 "
*TG  4.0  "IV GEN1  "  21. "1 "
*TG  4.0  "IV GEN2  "  18. "1 "
*TG  4.0  "IV GEN3  "  18. "1 "
*
*   SDG&E SPS TMC1505 6.2
*   (assumes ROA-HRD or ROA-RUM over 388 MVA operates in 2 sec)
*   Trip Imperial - La Rosita line
*
*DL  124.  "IMPRLVLY" 230. "ROA-230 " 230. "1"
```

**(laivml_noras2a.swt)**
D:\PSLF\IVGS\CASES\autumn\ivsg_la_alt2d3.sav
d:\pslf\ivgs\dyd\08la1s1ivsg.dyd
TIT
  IVSG STUDY
  Light Autumn Case
  Trip Imperial Valley - Miguel 500 kV No RAS
  Case ALT 2a DISPATCH 3

```
RUN 9
*
*   Imperial Valley - Miguel 500kV Line Out
*   followed by automatic SPS 6.1 to open IV Generation
*   followed by automatic SPS 6.2 to open IV-ROA (CFE)
*   3-phase 4 cycle fault at Imperial Valley
*
*   Fault bus at Imperial Valley
*
FB  0.0  "IMPRLVLY" 500.
*
*   Flash SWPL capacitors
*
FC  0.0  "HASSYAMP" 500. "N.GILA  " 500. "1 " 2
FC  0.0  "N.GILA  " 500. "IMPRLVLY" 500. "1 " 2
FC  0.0  "IMPRLVLY" 500. "MIGUEL  " 500. "1 " 1
*
*   Clear fault bus at Imperial Valley
*
CFB 4.0  "IMPRLVLY" 500.
*
*   Trip Imperial Valley - Miguel line
*
DL  4.0  "IMPRLVLY" 500. "MIGUEL  " 500. "1 "
*
*   Reinsert remaining SWPL capacitors
*
RC  4.0  "N.GILA  " 500. "IMPRLVLY" 500. "1 " 2
RC  4.0  "HASSYAMP" 500. "N.GILA  " 500. "1 " 2
*
*   SDG&E SPS TMC1505 6.1 SPS B
*   (assume reduntant scheme in CFE operates in 2 sec)
*   Trip IV Generation
*
*TG  4.0  "INTBST   "  18. "1 "
*TG  4.0  "INTBCT   "  16. "1 "
*TG  4.0  "IV GEN1  "  21. "1 "
*TG  4.0  "IV GEN2  "  18. "1 "
*TG  4.0  "IV GEN3  "  18. "1 "
*
*   SDG&E SPS TMC1505 6.2
*   (assumes ROA-HRD or ROA-RUM over 388 MVA operates in 2 sec)
*   Trip Imperial - La Rosita line
*
*DL  124.  "IMPRLVLY" 230. "ROA-230 " 230. "1"
*
```

**(laivml_noras3b.swt)**

```
D:\PSLF\IVGS\CASES\autumn\ivsg_la_alt2d3.sav
d:\pslf\ivgs\dyd\08la1s1ivsg.dyd
TIT
  IVSG STUDY
  Light Autumn Case
  Trip Imperial Valley - Miguel 500 kV No RAS
  Case ALT 3b DISPATCH 3

RUN 9
*
*   Imperial Valley - Miguel 500kV Line Out
*   followed by automatic SPS 6.1 to open IV Generation
*   followed by automatic SPS 6.2 to open IV-ROA (CFE)
*   3-phase 4 cycle fault at Imperial Valley
*
*   Fault bus at Imperial Valley
*
FB  0.0  "IMPRLVLY" 500.
*
*   Flash SWPL capacitors
*
FC  0.0  "HASSYAMP" 500. "N.GILA  " 500. "1" 2
FC  0.0  "N.GILA  " 500. "IMPRLVLY" 500. "1 " 2
FC  0.0  "IMPRLVLY" 500. "MIGUEL  " 500. "1 " 1
*
*   Clear fault bus at Imperial Valley
*
CFB 4.0  "IMPRLVLY" 500.
*
*   Trip Imperial Valley - Miguel line
*
DL  4.0  "IMPRLVLY" 500. "MIGUEL  " 500. "1 "
*
*   Reinsert remaining SWPL capacitors
*
RC  4.0  "N.GILA  " 500. "IMPRLVLY" 500. "1 " 2
RC  4.0  "HASSYAMP" 500. "N.GILA  " 500. "1 " 2
*
*   SDG&E SPS TMC1505 6.1 SPS B
*   (assume reduntant scheme in CFE operates in 2 sec)
*   Trip IV Generation
*
*TG  4.0  "INTBST   "  18. "1 "
*TG  4.0  "INTBCT   "  16. "1 "
*TG  4.0  "IV GEN1  "  21. "1 "
*TG  4.0  "IV GEN2  "  18. "1 "
*TG  4.0  "IV GEN3  "  18. "1 "
*
*   SDG&E SPS TMC1505 6.2
*   (assumes ROA-HRD or ROA-RUM over 388 MVA operates in 2 sec)
*   Trip Imperial - La Rosita line
*
*DL  124.  "IMPRLVLY" 230. "ROA-230 " 230. "1"
*
```

## Hassayampa-N.Gila 500kV

**(lahang2.swt)**

```
D:\PSLF\IVGS\CASES\AUTUMN\ivsg_la_alt2d3.sav
d:\pslf\ivgs\dyd\08la1s1ivsg.dyd
TIT
  IVSG STUDY
  Light Autumn Case
  Trip Hassayampa - N. Gila 500 kV
  Case ALT 2 DISPATCH 3

RUN 9
*   Loss of Hassayampa - N. Gila 500 kV Line
*
*  CC cards for post-transient only
*
*   Fault bus at Hassayampa
*
FB   0.0 "HASSYAMP" 500.
*
*  Apply fault damping to each Palo Verde Unit
*
GFD   0.0 "PALOVRD1" 24. "1 "  0.072485
GFD   0.0 "PALOVRD2" 24. "1 "  0.072485
GFD   0.0 "PALOVRD3" 24. "1 "  0.072485
*
*   Flash series capacitors in following 500 kV Lines
*
FC   0.0 "MIDPINTS" 500. "PALOVRDE" 500. "1 " 2
FC   0.0 "MIDPINTS" 500. "DEVERS  " 500. "1 " 2
FC   0.0 "MIDPINTS" 500. "DEVERS  " 500. "2 " 2
FC   0.0 "HARQUAHA" 500. "MIDPINTS" 500. "1 " 2
FC   0.0 "HASSYAMP" 500. "N.GILA  " 500. "1 " 2
FC   0.0 "N.GILA  " 500. "IMPRLVLY" 500. "1 " 2
FC   0.0 "IMPRLVLY" 500. "MIGUEL  " 500. "1 " 1
FC   0.0 "MOENKOPI" 500. "YAVAPAI " 500. "1 " 1
FC   0.0 "YAVAPAI " 500. "WESTWING" 500. "1 " 2
*FC   0.0 "NAVAJO  " 500. "WESTWING" 500. "1 " 1
*FC   0.0 "NAVAJO  " 500. "WESTWING" 500. "1 " 3
FC   0.0 "MEAD    " 500. "PERKINS " 500. "1 " 1
FC   0.0 "MEAD    " 500. "PERKINS " 500. "1 " 3
*
*   Clear fault at Hassayampa
*
CFB  4.0 "HASSYAMP" 500.
*
*   Trip Hassyampa - N. Gila 500 kV Line
*
DL   4.0 "HASSYAMP" 500. "N.GILA   " 500. "1 "
*
*  Remove fault damping to each Palo Verde Unit
*
GFD   4.0 "PALOVRD1" 24. "1 "  0.0
GFD   4.0 "PALOVRD2" 24. "1 "  0.0
GFD   4.0 "PALOVRD3" 24. "1 "  0.0
*
*   Reinsert series capacitors in following 500 kV Lines
*
RC   4.0 "MIDPINTS" 500. "PALOVRDE" 500. "1 " 2
RC   4.0 "MIDPINTS" 500. "DEVERS  " 500. "1 " 2
```

```
RC   4.0 "MIDPINTS" 500. "DEVERS  " 500. "2 " 2
RC   4.0 "HARQUAHA" 500. "MIDPINTS" 500. "1 " 2
*RC   4.0 "HASSYAMP" 500. "N.GILA  " 500. "1 " 2
RC   4.0 "N.GILA  " 500. "IMPRLVLY" 500. "1 " 2
RC   4.0 "IMPRLVLY" 500. "MIGUEL  " 500. "1 " 1
RC   4.0 "MEAD    " 500. "PERKINS " 500. "1 " 1
RC   4.0 "MEAD    " 500. "PERKINS " 500. "1 " 3
*
*   Reinsert series capacitors in following 500 kV Lines
*
RC   8.0 "MOENKOPI" 500. "YAVAPAI " 500. "1 " 1
RC   8.0 "YAVAPAI " 500. "WESTWING" 500. "1 " 2
*RC   8.0 "NAVAJO  " 500. "WESTWING" 500. "1 " 1
*RC   8.0 "NAVAJO  " 500. "WESTWING" 500. "1 " 3
*
```

**(lahang2a.swt)**

```
D:\PSLF\IVGS\CASES\AUTUMN\ivsg_la_alt2Ad3.sav
d:\pslf\ivgs\dyd\08la1s1ivsg.dyd
TIT
  IVSG STUDY
  Light Autumn Case
  Trip Hassayampa - N. Gila 500 kV
  Case ALT 2A DISPATCH 3

RUN 9
*   Loss of Hassayampa - N. Gila 500 kV Line
*
*  CC cards for post-transient only
*
*   Fault bus at Hassayampa
*
FB   0.0 "HASSYAMP" 500.
*
*  Apply fault damping to each Palo Verde Unit
*
GFD   0.0 "PALOVRD1" 24. "1 "  0.072485
GFD   0.0 "PALOVRD2" 24. "1 "  0.072485
GFD   0.0 "PALOVRD3" 24. "1 "  0.072485
*
*   Flash series capacitors in following 500 kV Lines
*
FC   0.0 "MIDPINTS" 500. "PALOVRDE" 500. "1 " 2
FC   0.0 "MIDPINTS" 500. "DEVERS  " 500. "1 " 2
FC   0.0 "MIDPINTS" 500. "DEVERS  " 500. "2 " 2
FC   0.0 "HARQUAHA" 500. "MIDPINTS" 500. "1 " 2
FC   0.0 "HASSYAMP" 500. "N.GILA  " 500. "1 " 2
FC   0.0 "N.GILA  " 500. "IMPRLVLY" 500. "1 " 2
FC   0.0 "IMPRLVLY" 500. "MIGUEL  " 500. "1 " 1
FC   0.0 "MOENKOPI" 500. "YAVAPAI " 500. "1 " 1
FC   0.0 "YAVAPAI " 500. "WESTWING" 500. "1 " 2
*FC   0.0 "NAVAJO  " 500. "WESTWING" 500. "1 " 1
*FC   0.0 "NAVAJO  " 500. "WESTWING" 500. "1 " 3
FC   0.0 "MEAD    " 500. "PERKINS " 500. "1 " 1
FC   0.0 "MEAD    " 500. "PERKINS " 500. "1 " 3
*
*   Clear fault at Hassayampa
*
CFB  4.0 "HASSYAMP" 500.
*
*   Trip Hassyampa - N. Gila 500 kV Line
*
DL   4.0 "HASSYAMP" 500. "N.GILA   " 500. "1 "
*
*  Remove fault damping to each Palo Verde Unit
*
GFD   4.0 "PALOVRD1" 24. "1 "  0.0
GFD   4.0 "PALOVRD2" 24. "1 "  0.0
GFD   4.0 "PALOVRD3" 24. "1 "  0.0
*
*   Reinsert series capacitors in following 500 kV Lines
*
RC   4.0 "MIDPINTS" 500. "PALOVRDE" 500. "1 " 2
RC   4.0 "MIDPINTS" 500. "DEVERS  " 500. "1 " 2
RC   4.0 "MIDPINTS" 500. "DEVERS  " 500. "2 " 2
RC   4.0 "HARQUAHA" 500. "MIDPINTS" 500. "1 " 2
*RC   4.0 "HASSYAMP" 500. "N.GILA  " 500. "1 " 2
RC   4.0 "N.GILA  " 500. "IMPRLVLY" 500. "1 " 2
RC   4.0 "IMPRLVLY" 500. "MIGUEL  " 500. "1 " 1
RC   4.0 "MEAD    " 500. "PERKINS " 500. "1 " 1
RC   4.0 "MEAD    " 500. "PERKINS " 500. "1 " 3
*
*   Reinsert series capacitors in following 500 kV Lines
*
RC   8.0 "MOENKOPI" 500. "YAVAPAI " 500. "1 " 1
RC   8.0 "YAVAPAI " 500. "WESTWING" 500. "1 " 2
*RC   8.0 "NAVAJO  " 500. "WESTWING" 500. "1 " 1
*RC   8.0 "NAVAJO  " 500. "WESTWING" 500. "1 " 3
*
```

**(lahang3b.swt)**

```
D:\PSLF\IVGS\CASES\AUTUMN\ivsg_la_alt3Bd3.sav
d:\pslf\ivgs\dyd\08la1s1ivsg.dyd
TIT
  IVSG STUDY
  Light Autumn Case
  Trip Hassayampa - N. Gila 500 kV
  Case ALT 3B DISPATCH 3

RUN 9
*   Loss of Hassayampa - N. Gila 500 kV Line
*
*  CC cards for post-transient only
*
*   Fault bus at Hassayampa
*
FB   0.0 "HASSYAMP" 500.
*
*  Apply fault damping to each Palo Verde Unit
*
GFD   0.0 "PALOVRD1" 24. "1 "  0.072485
GFD   0.0 "PALOVRD2" 24. "1 "  0.072485
GFD   0.0 "PALOVRD3" 24. "1 "  0.072485
*
*   Flash series capacitors in following 500 kV Lines
*
FC   0.0 "MIDPINTS" 500. "PALOVRDE" 500. "1 " 2
FC   0.0 "MIDPINTS" 500. "DEVERS  " 500. "1 " 2
FC   0.0 "MIDPINTS" 500. "DEVERS  " 500. "2 " 2
FC   0.0 "HARQUAHA" 500. "MIDPINTS" 500. "1 " 2
```

```
FC   0.0 "HASSYAMP" 500. "N.GILA  " 500. "1 " 2
FC   0.0 "N.GILA  " 500. "IMPRLVLY" 500. "1 " 2
FC   0.0 "IMPRLVLY" 500. "MIGUEL  " 500. "1 " 1
FC   0.0 "MOENKOPI" 500. "YAVAPAI " 500. "1 " 1
FC   0.0 "YAVAPAI " 500. "WESTWING" 500. "1 " 2
*FC   0.0 "NAVAJO  " 500. "WESTWING" 500. "1 " 1
*FC   0.0 "NAVAJO  " 500. "WESTWING" 500. "1 " 3
FC   0.0 "MEAD    " 500. "PERKINS " 500. "1 " 1
FC   0.0 "MEAD    " 500. "PERKINS " 500. "1 " 3
*
*   Clear fault at Hassayampa
*
CFB  4.0 "HASSYAMP" 500.
*
*   Trip Hassyampa - N. Gila 500 kV Line
*
DL   4.0 "HASSYAMP" 500. "N.GILA   " 500. "1 "
*
*  Remove fault damping to each Palo Verde Unit
*
GFD   4.0 "PALOVRD1" 24. "1 "  0.0
GFD   4.0 "PALOVRD2" 24. "1 "  0.0
GFD   4.0 "PALOVRD3" 24. "1 "  0.0
*
*   Reinsert series capacitors in following 500 kV Lines
*
RC   4.0 "MIDPINTS" 500. "PALOVRDE" 500. "1 " 2
RC   4.0 "MIDPINTS" 500. "DEVERS  " 500. "1 " 2
RC   4.0 "MIDPINTS" 500. "DEVERS  " 500. "2 " 2
RC   4.0 "HARQUAHA" 500. "MIDPINTS" 500. "1 " 2
*RC   4.0 "HASSYAMP" 500. "N.GILA  " 500. "1 " 2
RC   4.0 "N.GILA  " 500. "IMPRLVLY" 500. "1 " 2
RC   4.0 "IMPRLVLY" 500. "MIGUEL  " 500. "1 " 1
RC   4.0 "MEAD    " 500. "PERKINS " 500. "1 " 1
RC   4.0 "MEAD    " 500. "PERKINS " 500. "1 " 3
*
*   Reinsert series capacitors in following 500 kV Lines
*
RC   8.0 "MOENKOPI" 500. "YAVAPAI " 500. "1 " 1
RC   8.0 "YAVAPAI " 500. "WESTWING" 500. "1 " 2
*RC   8.0 "NAVAJO  " 500. "WESTWING" 500. "1 " 1
*RC   8.0 "NAVAJO  " 500. "WESTWING" 500. "1 " 3
*
```

## Midpoints-Devers 500kV

**(lampde2.swt)**

```
D:\PSLF\IVGS\CASES\AUTUMN\ivsg_la_alt2d3.sav
d:\pslf\ivgs\dyd\08la1s1ivsg.dyd
TIT
  IVSG STUDY
  Light Autumn Case
  Trip MIDPINTS - DEVERS 500 kV
  Case ALT 2 DISPATCH 3

RUN 9
*
*   Loss of MIDPINTS-DEVERS 500 kV Line
*
*
*   Fault bus at MIDPINTS
*
FB   0.0 "MIDPINTS  " 500.
*
*   Flash capacitors
*
FC  0.0  "MIDPINTS" 500. "DEVERS" 500. "1 " 2
*
*   Clear fault at MIDPINTS
*
CFB  4.0 "MIDPINTS  " 500.
*
*   Trip MIDPINTS-DEVERS 500 kV Line
*
DL   4.0 "MIDPINTS" 500. "DEVERS" 500. "1 "
*
```

**(lampde2a.swt)**

```
D:\PSLF\IVGS\CASES\AUTUMN\ivsg_la_alt2ad3.sav
d:\pslf\ivgs\dyd\08la1s1ivsg.dyd
TIT
  IVSG STUDY
  Light Autumn Case
  Trip MIDPINTS - DEVERS 500 kV
  Case ALT 2a DISPATCH 3

RUN 9
*
*   Loss of MIDPINTS-DEVERS 500 kV Line
*
*
*   Fault bus at MIDPINTS
*
FB   0.0 "MIDPINTS  " 500.
*
*   Flash capacitors
*
FC  0.0  "MIDPINTS" 500. "DEVERS" 500. "1 " 2
*
*   Clear fault at MIDPINTS
*
CFB  4.0 "MIDPINTS  " 500.
*
*   Trip MIDPINTS-DEVERS 500 kV Line
```

```
*
DL   4.0 "MIDPINTS" 500. "DEVERS" 500. "1 "
```

**(lampde3b.swt)**

```
D:\PSLF\IVGS\CASES\AUTUMN\ivsg_la_alt3Bd3.sav
d:\pslf\ivgs\dyd\08la1s1ivsg.dyd
TIT
  IVSG STUDY
  Light Autumn Case
  Trip MIDPINTS - DEVERS 500 kV
  Case ALT 3B DISPATCH 3

RUN 9
*
*   Loss of MIDPINTS-DEVERS 500 kV Line
*
*
*   Fault bus at MIDPINTS
*
FB   0.0 "MIDPINTS  " 500.
*
*   Flash capacitors
*
FC  0.0  "MIDPINTS" 500. "DEVERS" 500. "1 " 2
*
*   Clear fault at MIDPINTS
*
CFB  4.0 "MIDPINTS  " 500.
*
*   Trip MIDPINTS-DEVERS 500 kV Line
*
DL   4.0 "MIDPINTS" 500. "DEVERS" 500. "1 "
*
```

## SerVal-Valley 500kV

**(laseva3.swt)**

```
D:\PSLF\IVGS\CASES\stabcases\ivsg_la_alt3bd3_s1.sav
d:\pslf\ivgs\dyd\08la1s1ivsg.dyd
TIT
  IVSG STUDY
  Light Autumn Case
  Trip SerVal - Valley 500 kV
  Case ALT 3b DISPATCH 3

RUN 9
*
*   SerVal - Valley 500 kV Line Out
*   3 phase 4 cycles fault at SerVal 500 kV
*
*
*   Fault bus at SerVal 500 kV
*
FB   0.0 "SERVAL  " 500.
*
*   Clear fault at SerVal
*
CFB  4.0 "SERVAL  " 500.
*
*   Trip SerVal - Valley 500 kV Line
*
DL   4.0 "SERVAL  " 500. "VALLEYSC" 500. "1 "
*
```

## Serrano-SerVal 500kV

**(lasesv3.swt)**
D:\PSLF\IVGS\CASES\stabcases\ivsg_la_alt3bd3_s1.sav
d:\pslf\ivgs\dyd\08la1s1ivsg.dyd
TIT
  IVSG STUDY
  Light Autumn Case
  Trip Serrano - SerVal 500 kV
  Case ALT 3b DISPATCH 3

RUN 9
*
*  SerVal - Valley 500 kV Line Out
*  3 phase 4 cycles fault at SerVal 500 kV
*
*
*  Fault bus at SerVal 500 kV
*
FB  0.0 "SERRANO  " 500.
*
*  Clear fault at SerVal
*
CFB  4.0 "SERRANO  " 500.
*
*  Trip SerVal - Valley 500 kV Line
*
DL  4.0 "SERRANO  " 500. "SERVAL" 500. "1 "
*

## Devers-Valley 500kV

**(ladeva2.swt)**
D:\PSLF\IVGS\CASES\AUTUMN\ivsg_la_alt2d3.sav
d:\pslf\ivgs\dyd\08la1s1ivsg.dyd
TIT
  IVSG STUDY
  Light Autumn Case
  Trip Devers - Valley 500 kV
  Case ALT 2 DISPATCH 3

RUN 9
*
*  Loss of Devers - Valley 500 kV Line
*
*
*  Fault bus at Devers
*
FB  0.0 "DEVERS  " 500.
*
*  Clear fault at Devers
*
CFB  4.0 "DEVERS   " 500.
*
*  Trip Devers - Valley 500 kV Line
*
DL  4.0 "DEVERS  " 500. "VALLEYSC" 500. "1 "
*

**(ladeva2a.swt)**
D:\PSLF\IVGS\CASES\stabcases\ivsg_la_alt2ad3_s1.sav
d:\pslf\ivgs\dyd\08la1s1ivsg.dyd
TIT
  IVSG STUDY
  Light Autumn Case
  Trip Devers - Valley 500 kV
  Case ALT 2a DISPATCH 3

RUN 9
*
*  Loss of Devers - Valley 500 kV Line
*
*
*  Fault bus at Devers
*
FB  0.0 "DEVERS  " 500.
*
*  Clear fault at Devers
*
CFB  4.0 "DEVERS   " 500.
*
*  Trip Devers - Valley 500 kV Line
*
DL  4.0 "DEVERS  " 500. "VALLEYSC" 500. "1 "
*
**(ladeva3.swt)**
D:\PSLF\IVGS\CASES\AUTUMN\ivsg_la_alt3Bd3.sav
d:\pslf\ivgs\dyd\08la1s1ivsg.dyd
TIT
  IVSG STUDY

```
  Light Autumn Case
  Trip Devers - Valley 500 kV
  Case ALT 3B DISPATCH 3

RUN 9
*
*   Loss of Devers - Valley 500 kV Line
*
*
*   Fault bus at Devers
*
FB   0.0 "DEVERS  " 500.
*
*   Clear fault at Devers
*
CFB  4.0 "DEVERS   " 500.
*
*   Trip Devers - Valley 500 kV Line
*
DL   4.0 "DEVERS  " 500. "VALLEYSC" 500. "1 "
*
```

**New San Felipe-Central 500kV**

**(lansfc2.swt)**

```
D:\PSLF\IVGS\CASES\AUTUMN\ivsg_la_alt2d3.sav
d:\pslf\ivgs\dyd\08la1s1ivsg.dyd
TIT
  IVSG STUDY
  Light Autumn Case
  Trip NEW SAN FELIPE - CENTRAL 500 kV
  Case ALT 2 DISPATCH 3

RUN 9
*
*   Loss of NEW SAN FELIPE CENTRAL 500 kV Line
*
*
*   Fault bus at New San Felipe
*
FB   0.0 "NEWSF500  " 500.
*
*   Flash capacitors
*
FC  0.0  "CENTRALX" 500. "NEWSF500" 500. "1 " 2
*
*   Clear fault at New San Felipe
*
CFB  4.0 "NEWSF500   " 500.
*
*   Trip New San Felipe - Central 500 kV Line
*
DL   4.0 "CENTRALX" 500. "NEWSF500" 500. "1 "
```

**(lansfc2a.swt)**

```
D:\PSLF\IVGS\CASES\AUTUMN\ivsg_la_alt2ad3.sav
d:\pslf\ivgs\dyd\08la1s1ivsg.dyd
TIT
  IVSG STUDY
  Light Autumn Case
  Trip NEW SAN FELIPE - CENTRAL 500 kV
  Case ALT 2a DISPATCH 3

RUN 9
*
*   Loss of NEW SAN FELIPE CENTRAL 500 kV Line
*
*   Fault bus at New San Felipe
*
FB   0.0 "NEWSF500  " 500.
*
*   Flash capacitors
*
FC  0.0  "CENTRALX" 500. "NEWSF500" 500. "1 " 2
*
*   Clear fault at New San Felipe
*
CFB  4.0 "NEWSF500   " 500.
*
*   Trip New San Felipe - Central 500 kV Line
*
DL   4.0 "CENTRALX" 500. "NEWSF500" 500. "1 "
```

## New San Felipe-NorthSD 500kV

**(lansfn3b.swt)**

```
D:\PSLF\IVGS\CASES\AUTUMN\ivsg_la_alt3Bd3.sav
d:\pslf\ivgs\dyd\08la1s1ivsg.dyd
TIT
  IVSG STUDY
  Light Autumn Case
  Trip NEW SAN FELIPE - NORTHSD 500 kV
  Case ALT 3B DISPATCH 3

RUN 9
*
*   Loss of NEW SAN FELIPE NORTHSD 500 kV Line
*
*
*   Fault bus at New San Felipe
*
FB   0.0 "NEWSF500  " 500.
*
*   Flash capacitors
*
FC  0.0  "NORTHSD" 500. "NEWSF500" 500. "1 " 2
*
*   Clear fault at New San Felipe
*
CFB  4.0 "NEWSF500   " 500.
*
*   Trip New San Felipe - Central 500 kV Line
*
DL   4.0 "NORTHSD" 500. "NEWSF500" 500. "1 "
*
```

## New San Felipe-Imperial Valley 500kV

**(lansfi2.swt)**

```
D:\PSLF\IVGS\CASES\AUTUMN\ivsg_la_alt2d3.sav
d:\pslf\ivgs\dyd\08la1s1ivsg.dyd
TIT
  IVSG STUDY
  Light Autumn Case
  Trip NEW SAN FELIPE - IMPERIAL VALLEY 500 kV
  Case ALT 2 DISPATCH 3

RUN 9
*
*   Loss of NEWSF-IMPRLVLY 500 kV Line
*
*
*   Fault bus at NEW SAN FELIPE
*
FB   0.0 "NEWSF500  " 500.
*
*   Clear fault at NEWSF500
*
CFB  4.0 "NEWSF500  " 500.
*
*   Trip NEWSF500-IMPRLVLY 500 kV Line
*
DL   4.0 "NEWSF500" 500. "IMPRLVLY" 500. "1 "
*
```

**(lansfi3b.swt)**

```
D:\PSLF\IVGS\CASES\AUTUMN\ivsg_la_alt3Bd3.sav
d:\pslf\ivgs\dyd\08la1s1ivsg.dyd
TIT
  IVSG STUDY
  Light Autumn Case
  Trip NEW SAN FELIPE - IMPERIAL VALLEY 500 kV
  Case ALT 3B DISPATCH 3

RUN 9
*
*   Loss of NEWSF-IMPRLVLY 500 kV Line
*
*
*   Fault bus at NEW SAN FELIPE
*
FB   0.0 "NEWSF500  " 500.
*
*   Clear fault at NEWSF500
*
CFB  4.0 "NEWSF500  " 500.
*
*   Trip NEWSF500-IMPRLVLY 500 kV Line
*
DL   4.0 "NEWSF500" 500. "IMPRLVLY" 500. "1 "
*
```

## New San Felipe-Banister 230kV

**(lansfb2.swt)**

```
D:\PSLF\IVGS\CASES\AUTUMN\ivsg_la_alt2d3.sav
d:\pslf\ivgs\dyd\08la1s1ivsg.dyd
TIT
  IVSG STUDY
  Light Autumn Case
  Trip BANISTER - NEW SAN FELIPE 230 kV
  Case ALT 2 DISPATCH 3

RUN 9
*
*   Loss of BANISTER-NEWSF230 230 kV Line
*
*
*   Fault bus at NEW SAN FELIPE
*
FB   0.0 "NEWSF230  " 230.
*
*   Clear fault at NEWSF230
*
CFB  4.0 "NEWSF230  " 230.
*
*   Trip BANISTER-NEWSF230 230 kV Line
*
DL   4.0 "BANIS230" 230. "NEWSF230" 230. "1 "
*
```

**(lansfb2a.swt)**

```
D:\PSLF\IVGS\CASES\AUTUMN\ivsg_la_alt2Ad3.sav
d:\pslf\ivgs\dyd\08la1s1ivsg.dyd
TIT
  IVSG STUDY
  Light Autumn Case
  Trip BANISTER - NEW SAN FELIPE 230 kV
  Case ALT 2A DISPATCH 3

RUN 9
*
*   Loss of BANISTER-NEWSF230 230 kV Line
*
*
*   Fault bus at NEW SAN FELIPE
*
FB   0.0 "NEWSF230  " 230.
*
*   Clear fault at NEWSF230
*
CFB  4.0 "NEWSF230  " 230.
*
*   Trip BANISTER-NEWSF230 230 kV Line
*
DL   4.0 "BANIS230" 230. "NEWSF230" 230. "1 "
*
```

**(lansfb3b.swt)**

```
D:\PSLF\IVGS\CASES\AUTUMN\ivsg_la_alt3Bd3.sav
d:\pslf\ivgs\dyd\08la1s1ivsg.dyd
TIT
  IVSG STUDY
  Light Autumn Case
  Trip BANISTER - NEW SAN FELIPE 230 kV
  Case ALT 3B DISPATCH 3

RUN 9
*
*   Loss of BANISTER-NEWSF230 230 kV Line
*
*
*   Fault bus at NEW SAN FELIPE
*
FB   0.0 "NEWSF230  " 230.
*
*   Clear fault at NEWSF230
*
CFB  4.0 "NEWSF230  " 230.
*
*   Trip BANISTER-NEWSF230 230 kV Line
*
DL   4.0 "BANIS230" 230. "NEWSF230" 230. "1 "
*
```

## Path42 with No RAS

**(lap42_noras2.swt)**

```
D:\PSLF\IVGS\CASES\AUTUMN\ivsg_la_alt2d3.sav
d:\pslf\ivgs\dyd\08la1s1ivsg.dyd
TIT
  IVSG STUDY
  Light Autumn Case
  Trip PATH 42
  Case ALT 2 DISPATCH 3

RUN 09
*  ========================================================================
*
*  Path 42 Line trip without RAS
*
*
*  ========================================================================
*  Fault Bus - Mirage 230kV
FB  0.0 "MIRAGE" 230.
*
*  Clear Fault
CFB 5 "MIRAGE" 230.
*
*  Trip Path 42 Elements
DL  5  "COACHELA " 230.  "DEVERS " 230.  "1 "
DL  5  "RAMON "    230.  "MIRAGE " 230.  "1 "
*
*  Trip 92kV ties and Generation as part of RAS (approx 200MW)
*DL  8  "MIDWAY "   92.   "VULCAN "  92.  "1 "
*DL  8  "MIDWAY "   92.   "LEATHERS "  92.  "1 "
*TG  8  "VULCAN1 "  14.4 "1 "
*TG  8  "VULCAN1 "  14.4 "2 "
*TG  8  "EARTHE2 "  92 "1 "
*TG  8  "LEATHERS "  14.4 "1 "
*TG  8  "JJELMORE "  14.4 "1 "
*TG  8  "DELRANCH "  14.4 "1 "
```

**(lap42_noras2a.swt)**

```
D:\PSLF\IVGS\CASES\AUTUMN\ivsg_la_alt2ad3.sav
d:\pslf\ivgs\dyd\08la1s1ivsg.dyd
TIT
  IVSG STUDY
  Light Autumn Case
  Trip PATH 42
  Case ALT 2a DISPATCH 3

RUN 09
*  ========================================================================
*
*  Path 42 Line trip without RAS
*
*
*  ========================================================================
*  Fault Bus - Mirage 230kV
FB  0.0 "MIRAGE" 230.
*
*  Clear Fault
CFB 5 "MIRAGE" 230.
*
*  Trip Path 42 Elements
DL  5  "COACHELA " 230.  "DEVERS " 230.  "1 "
DL  5  "RAMON "    230.  "MIRAGE " 230.  "1 "
*
*  Trip 92kV ties and Generation as part of RAS (approx 200MW)
*DL  8  "MIDWAY "   92.   "VULCAN "  92.  "1 "
*DL  8  "MIDWAY "   92.   "LEATHERS "  92.  "1 "
*TG  8  "VULCAN1 "  14.4 "1 "
*TG  8  "VULCAN1 "  14.4 "2 "
*TG  8  "EARTHE2 "  92 "1 "
*TG  8  "LEATHERS "  14.4 "1 "
*TG  8  "JJELMORE "  14.4 "1 "
*TG  8  "DELRANCH "  14.4 "1 "
```

**(lap42_noras3b.swt)**

```
D:\PSLF\IVGS\CASES\AUTUMN\ivsg_la_alt3Bd3.sav
d:\pslf\ivgs\dyd\08la1s1ivsg.dyd
TIT
  IVSG STUDY
  Light Autumn Case
  Trip PATH 42
  Case ALT 3B DISPATCH 3

RUN 09
*  ========================================================================
*
*  Path 42 Line trip without RAS
*
*
*  ========================================================================
*  Fault Bus - Mirage 230kV
FB  0.0 "MIRAGE" 230.
*
*  Clear Fault
CFB 5 "MIRAGE" 230.
*
*  Trip Path 42 Elements
DL  5  "COACHELA " 230.  "DEVERS " 230.  "1 "
DL  5  "RAMON "    230.  "MIRAGE " 230.  "1 "
*
*  Trip 92kV ties and Generation as part of RAS (approx 200MW)
*DL  8  "MIDWAY "   92.   "VULCAN "  92.  "1 "
*DL  8  "MIDWAY "   92.   "LEATHERS "  92.  "1 "
*TG  8  "VULCAN1 "  14.4 "1 "
*TG  8  "VULCAN1 "  14.4 "2 "
*TG  8  "EARTHE2 "  92 "1 "
*TG  8  "LEATHERS "  14.4 "1 "
*TG  8  "JJELMORE "  14.4 "1 "
*TG  8  "DELRANCH "  14.4 "1 "
```

## Midpoints-Devers 1&2 500kV N-2

**(lapvdv2i.swt)**

```
D:\PSLF\IVGS\CASES\STABCASES\ivsg_la_alt2d3_s1.sav
d:\pslf\ivgs\dyd\08la1s1ivsg.dyd
TIT
  IVSG STUDY
  Light Autumn Case
  N-2  MIDPOINTS - DEVERS 1&2 500 kV
  Case ALT 2 DISPATCH 3

RUN 9
*   Loss of MIDPOINTS-DEVERS 1 & 2
*
*
*   Fault bus at DEVERS
*
FB   0.0 "DEVERS" 500.
*
*  Apply fault damping to each Palo Verde Unit
*
GFD   0.0 "PALOVRD1" 24. "1 "  0.072485
GFD   0.0 "PALOVRD2" 24. "1 "  0.072485
GFD   0.0 "PALOVRD3" 24. "1 "  0.072485
*
*   Flash series capacitors in following 500 kV Lines
*
FC   0.0 "PALOVRDE" 500. "MIDPINTS" 500. "1 " 2
FC   0.0 "HARQUAHA" 500. "MIDPINTS" 500. "1 " 2
FC   0.0 "MIDPINTS" 500. "DEVERS  " 500. "1 " 2
FC   0.0 "MIDPINTS" 500. "DEVERS  " 500. "2 " 2
FC   0.0 "HASSYAMP" 500. "N.GILA  " 500. "1 " 2
FC   0.0 "N.GILA  " 500. "IMPRLVLY" 500. "1 " 2
FC   0.0 "IMPRLVLY" 500. "MIGUEL  " 500. "1 " 1
FC   0.0 "MEAD    " 500. "PERKINS " 500. "1 " 1
FC   0.0 "MEAD    " 500. "PERKINS " 500. "1 " 3
FC   0.0 "MOENKOPI" 500. "YAVAPAI " 500. "1 " 1
FC   0.0 "YAVAPAI " 500. "WESTWING" 500. "1 " 2
FC   0.0 "NAVAJO  " 500. "WESTWING" 500. "1 " 2
*
*   Clear fault at DEVERS
*
CFB  4.0 "DEVERS" 500.
*
*   Trip MIDPOINTS - Devers 500 kV Line
*
DL   4.0 "MIDPINTS" 500. "DEVERS   " 500. "1 "
DL   4.0 "MIDPINTS" 500. "DEVERS   " 500. "2 "
*
*  Remove fault damping to each Palo Verde Unit
*
GFD   4.0 "PALOVRD1" 24. "1 "  0.0
GFD   4.0 "PALOVRD2" 24. "1 "  0.0
GFD   4.0 "PALOVRD3" 24. "1 "  0.0
*
*   Reinsert series capacitors in following 500 kV Lines
*
RC   4.0 "PALOVRDE" 500. "MIDPINTS" 500. "1 " 2
RC   4.0 "HARQUAHA" 500. "MIDPINTS" 500. "1 " 2
RC   4.0 "HASSYAMP" 500. "N.GILA  " 500. "1 " 2
RC   4.0 "N.GILA  " 500. "IMPRLVLY" 500. "1 " 2
RC   4.0 "IMPRLVLY" 500. "MIGUEL  " 500. "1 " 1
RC   4.0 "MEAD    " 500. "PERKINS " 500. "1 " 1
RC   4.0 "MEAD    " 500. "PERKINS " 500. "1 " 3
*
*   Reinsert series capacitors in following 500 kV Lines
*
RC   8.0 "MOENKOPI" 500. "YAVAPAI " 500. "1 " 1
RC   8.0 "YAVAPAI " 500. "WESTWING" 500. "1 " 2
RC   8.0 "NAVAJO  " 500. "WESTWING" 500. "1 " 2
*
```

**(lapvdv2a.swt)**

```
D:\PSLF\IVGS\CASES\STABCASES\ivsg_la_alt2Ad3_s1.sav
d:\pslf\ivgs\dyd\08la1s1ivsg.dyd
TIT
  IVSG STUDY
  Light Autumn Case
  N-2  MIDPOINTS - DEVERS 1 INDIAN HILLS - DEVERS 500 kV
  Case ALT 2A DISPATCH 3

RUN 9
*   Loss of MIDPOINTS-DEVERS 1 AND INDIAN HILLS - DEVERS
*
*
*   Fault bus at DEVERS
*
FB   0.0 "DEVERS" 500.
*
*  Apply fault damping to each Palo Verde Unit
*
GFD   0.0 "PALOVRD1" 24. "1 "  0.072485
GFD   0.0 "PALOVRD2" 24. "1 "  0.072485
GFD   0.0 "PALOVRD3" 24. "1 "  0.072485
*
*   Flash series capacitors in following 500 kV Lines
*
FC   0.0 "PALOVRDE" 500. "MIDPINTS" 500. "1 " 2
FC   0.0 "HARQUAHA" 500. "MIDPINTS" 500. "1 " 2
FC   0.0 "MIDPINTS" 500. "DEVERS  " 500. "1 " 2
FC   0.0 "MIDPINTS" 500. "DEVERS  " 500. "2 " 2
FC   0.0 "HASSYAMP" 500. "N.GILA  " 500. "1 " 2
FC   0.0 "N.GILA  " 500. "IMPRLVLY" 500. "1 " 2
FC   0.0 "IMPRLVLY" 500. "MIGUEL  " 500. "1 " 1
FC   0.0 "MEAD    " 500. "PERKINS " 500. "1 " 1
FC   0.0 "MEAD    " 500. "PERKINS " 500. "1 " 3
FC   0.0 "MOENKOPI" 500. "YAVAPAI " 500. "1 " 1
FC   0.0 "YAVAPAI " 500. "WESTWING" 500. "1 " 2
FC   0.0 "NAVAJO  " 500. "WESTWING" 500. "1 " 2
*
*   Clear fault at DEVERS
*
CFB  4.0 "DEVERS" 500.
*
*   Trip MIDPOINTS - Devers 500 kV Line
*
DL   4.0 "MIDPINTS" 500. "DEVERS   " 500. "1 "
DL   4.0 "IH500   " 500. "DEVERS   " 500. "1 "
*
```

```
*  Remove fault damping to each Palo Verde Unit
*
GFD   4.0 "PALOVRD1" 24. "1 "  0.0
GFD   4.0 "PALOVRD2" 24. "1 "  0.0
GFD   4.0 "PALOVRD3" 24. "1 "  0.0
*
*   Reinsert series capacitors in following 500 kV Lines
*
RC   4.0 "PALOVRDE" 500. "MIDPINTS" 500. "1 " 2
RC   4.0 "HARQUAHA" 500. "MIDPINTS" 500. "1 " 2
RC   4.0 "HASSYAMP" 500. "N.GILA  " 500. "1 " 2
RC   4.0 "N.GILA  " 500. "IMPRLVLY" 500. "1 " 2
RC   4.0 "IMPRLVLY" 500. "MIGUEL  " 500. "1 " 1
RC   4.0 "MEAD    " 500. "PERKINS " 500. "1 " 1
RC   4.0 "MEAD    " 500. "PERKINS " 500. "1 " 3
*
*   Reinsert series capacitors in following 500 kV Lines
*
RC   8.0 "MOENKOPI" 500. "YAVAPAI " 500. "1 " 1
RC   8.0 "YAVAPAI " 500. "WESTWING" 500. "1 " 2
RC   8.0 "NAVAJO  " 500. "WESTWING" 500. "1 " 2
*
```

**(lapvdv3b.swt)**

```
D:\PSLF\IVGS\CASES\STABCASES\ivsg_la_alt3Bd3_s1.sav
d:\pslf\ivgs\dyd\08la1s1ivsg.dyd
TIT
  IVSG STUDY
  Light Autumn Case
  N-2  MIDPOINTS - DEVERS 1&2 500 kV
  Case ALT 3B DISPATCH 3

RUN 9
*   Loss of MIDPOINTS-DEVERS 1 & 2
*
*
*   Fault bus at DEVERS
*
FB   0.0 "DEVERS" 500.
*
*  Apply fault damping to each Palo Verde Unit
*
GFD   0.0 "PALOVRD1" 24. "1 "  0.072485
GFD   0.0 "PALOVRD2" 24. "1 "  0.072485
GFD   0.0 "PALOVRD3" 24. "1 "  0.072485
*
*   Flash series capacitors in following 500 kV Lines
*
FC   0.0 "PALOVRDE" 500. "MIDPINTS" 500. "1 " 2
FC   0.0 "HARQUAHA" 500. "MIDPINTS" 500. "1 " 2
FC   0.0 "MIDPINTS" 500. "DEVERS  " 500. "1 " 2
FC   0.0 "MIDPINTS" 500. "DEVERS  " 500. "2 " 2
FC   0.0 "HASSYAMP" 500. "N.GILA  " 500. "1 " 2
FC   0.0 "N.GILA  " 500. "IMPRLVLY" 500. "1 " 2
FC   0.0 "IMPRLVLY" 500. "MIGUEL  " 500. "1 " 1
FC   0.0 "MEAD    " 500. "PERKINS " 500. "1 " 1
FC   0.0 "MEAD    " 500. "PERKINS " 500. "1 " 3
FC   0.0 "MOENKOPI" 500. "YAVAPAI " 500. "1 " 1
FC   0.0 "YAVAPAI " 500. "WESTWING" 500. "1 " 2
FC   0.0 "NAVAJO  " 500. "WESTWING" 500. "1 " 2
*
*   Clear fault at DEVERS
*
CFB  4.0 "DEVERS" 500.
*
*   Trip MIDPOINTS - Devers 500 kV Line
*
DL   4.0 "MIDPINTS" 500. "DEVERS   " 500. "1 "
DL   4.0 "MIDPINTS" 500. "DEVERS   " 500. "2 "
*
*  Remove fault damping to each Palo Verde Unit
*
GFD   4.0 "PALOVRD1" 24. "1 "  0.0
GFD   4.0 "PALOVRD2" 24. "1 "  0.0
GFD   4.0 "PALOVRD3" 24. "1 "  0.0
*
*   Reinsert series capacitors in following 500 kV Lines
*
RC   4.0 "PALOVRDE" 500. "MIDPINTS" 500. "1 " 2
RC   4.0 "HARQUAHA" 500. "MIDPINTS" 500. "1 " 2
RC   4.0 "HASSYAMP" 500. "N.GILA  " 500. "1 " 2
RC   4.0 "N.GILA  " 500. "IMPRLVLY" 500. "1 " 2
RC   4.0 "IMPRLVLY" 500. "MIGUEL  " 500. "1 " 1
RC   4.0 "MEAD    " 500. "PERKINS " 500. "1 " 1
RC   4.0 "MEAD    " 500. "PERKINS " 500. "1 " 3
*
*   Reinsert series capacitors in following 500 kV Lines
*
RC   8.0 "MOENKOPI" 500. "YAVAPAI " 500. "1 " 1
RC   8.0 "YAVAPAI " 500. "WESTWING" 500. "1 " 2
RC   8.0 "NAVAJO  " 500. "WESTWING" 500. "1 " 2
*
```

**(lapvdvbase.swt)**

```
d:\PSLF\IVGS\CASES\STABCASES\ivsg_la_rev5.sav
d:\pslf\ivgs\dyd\08la1s1ivsg.dyd
TIT
  IVSG STUDY
  Light Autumn Case
  N-2  MIDPOINTS - DEVERS 1&2 500 kV
  Case Rev 5 Base Case

RUN 9
*   Loss of MIDPOINTS-DEVERS 1 & 2
*
*
*   Fault bus at DEVERS
*
FB   0.0 "DEVERS" 500.
*
*  Apply fault damping to each Palo Verde Unit
*
GFD   0.0 "PALOVRD1" 24. "1 "  0.072485
GFD   0.0 "PALOVRD2" 24. "1 "  0.072485
GFD   0.0 "PALOVRD3" 24. "1 "  0.072485
*
*   Flash series capacitors in following 500 kV Lines
*
FC   0.0 "PALOVRDE" 500. "MIDPINTS" 500. "1 " 2
FC   0.0 "HARQUAHA" 500. "MIDPINTS" 500. "1 " 2
```

```
FC   0.0 "MIDPINTS" 500. "DEVERS  " 500. "1 " 2
FC   0.0 "MIDPINTS" 500. "DEVERS  " 500. "2 " 2
FC   0.0 "HASSYAMP" 500. "N.GILA  " 500. "1 " 2
FC   0.0 "N.GILA  " 500. "IMPRLVLY" 500. "1 " 2
FC   0.0 "IMPRLVLY" 500. "MIGUEL  " 500. "1 " 1
FC   0.0 "MEAD    " 500. "PERKINS " 500. "1 " 1
FC   0.0 "MEAD    " 500. "PERKINS " 500. "1 " 3
FC   0.0 "MOENKOPI" 500. "YAVAPAI " 500. "1 " 1
FC   0.0 "YAVAPAI " 500. "WESTWING" 500. "1 " 2
FC   0.0 "NAVAJO  " 500. "WESTWING" 500. "1 " 2
*
*   Clear fault at DEVERS
*
CFB  4.0 "DEVERS" 500.
*
*   Trip MIDPOINTS - Devers 500 kV Line
*
DL   4.0 "MIDPINTS" 500. "DEVERS   " 500. "1 "
DL   4.0 "MIDPINTS" 500. "DEVERS   " 500. "2 "
*
*  Remove fault damping to each Palo Verde Unit
*
GFD   4.0 "PALOVRD1" 24. "1 "  0.0
GFD   4.0 "PALOVRD2" 24. "1 "  0.0
GFD   4.0 "PALOVRD3" 24. "1 "  0.0
*
*   Reinsert series capacitors in following 500 kV Lines
*
RC   4.0 "PALOVRDE" 500. "MIDPINTS" 500. "1 " 2
RC   4.0 "HARQUAHA" 500. "MIDPINTS" 500. "1 " 2
RC   4.0 "HASSYAMP" 500. "N.GILA  " 500. "1 " 2
RC   4.0 "N.GILA  " 500. "IMPRLVLY" 500. "1 " 2
RC   4.0 "IMPRLVLY" 500. "MIGUEL  " 500. "1 " 1
RC   4.0 "MEAD    " 500. "PERKINS " 500. "1 " 1
RC   4.0 "MEAD    " 500. "PERKINS " 500. "1 " 3
*
*   Reinsert series capacitors in following 500 kV Lines
*
RC   8.0 "MOENKOPI" 500. "YAVAPAI " 500. "1 " 1
RC   8.0 "YAVAPAI " 500. "WESTWING" 500. "1 " 2
RC   8.0 "NAVAJO  " 500. "WESTWING" 500. "1 " 2
*
```

# APPENDIX C - 5

Development Plan for the Phased Expansion of the Transmission to Access Renewable Resources in the Imperial Valley, Appendix D

# Imperial Valley Study Group

# Appendix D

## Transmission Planning Studies
## Vol. 4

Post-Transient Data
Production Simulations

# Imperial Valley Study Group

## Appendix D.1

Post Transient Analysis

# Imperial Valley Study Group

## Appendix D.1.1

Study Assumptions

## Post-Transient Study Assumptions

*Post-Transient Cases*

The Post-Transient analysis was performed on seven (7) Cases, two (2) Benchmark cases and five (5) scenario cases using the GE PSLF Version 13.1 program. The benchmark cases represent heavy summer 2014 and light autumn 2014. There are two (2) heavy summer alternative case and three (3) light autumn alternative cases. These seven cases were as follows:

1) Heavy Summer Benchmark (ivsg_hs_rev4)
2) HS, Imperial Valley – Central, Dispatch 1 (ivsg_hs_alt2d1_s1)
3) HS, Imperial Valley – Northern – Ser/Val, Dispatch 1 (ivsg_hs_alt3bd1_s1)
4) Light Autumn Benchmark (ivsg_la_rev5)
5) LA, Imperial Valley – Central, Dispatch 3 (ivsg_la_alt2d3_s1)
6) LA, Imperial Valley – Central & Coachella Valley – Indian Hills, Dispatch 3 (ivsg_la_alt2ad3_s1)
7) LA, Imperial Valley – Northern – Ser/Val, Dispatch 3 (ivsg_la_alt3bd3_s1)

***Post-Transient Contingencies***

For this Post-Transient analysis 18 contingencies were run, two of which not apply to the two Benchmark cases. These eighteen (18) contingencies included twelve (12) single and six (6) double as follows:

*Single Contingencies*

1) Central – San Felipe 500 kV line (two alt 2's & alt 2a), Northern – San Felipe 500 kV (two alt 3b's), (this contingency does not apply to the Benchmark Cases (rev 4 & rev 5))
2) Banister – San Felipe 230 kV (this contingency does not apply to the Benchmark Cases (rev 4 & rev 5))
3) Devers – Valley 500 kV line
4) Valley – Serrano 500 kV line (rev 4 & 5, two alt 2's & alt 2a) or Valley – Ser/Val 500 kV line (two alt 3b's)
5) Palo Verde – Devers 1 500 kV line
6) Imperial Valley – North Gila 500 kV line
7) Imperial Valley – Miguel 500 kV line
8) Lugo – Mohave 500 kV line

9) Lugo – Mira Loma 500 kV line

10) Mira Loma - Serrano 500 kV line

11) Lugo – Victorville 500 kV line

12) Otay Mesa – Tijuana 230 kV line

*Double Contingencies*

1) Lugo – Victorville and Lugo – Vincent 500 kV lines
2) Lugo – Mira Loma 2 & 3 500 kV lines
3) Palo Verde – Devers 1 & 2 500 kV lines
4) SONGS – Talega 1 & 2 230 kV lines
5) 2 San Onofre units
6) 2 Palo Verde units

***Post-Transient Buses to Monitor***

For this Post-Transient analysis the following 25 buses were monitored, including nine (9) buses in SCE, seven (7) buses in SDG&E, four (4) in IID, four (4) in CFE, and one (1) in MWD:

| **Monitored Buses** | | |
|---|---|---|
| **CFE** | **SDG&E** | **SCE** |
| 20238 HRD-230 230 | 22260 ESCNDIDO 230 | 24804 DEVERS 230 |
| 20017 MEP-230 230 | 22356 IMPRLVLY 230 | 24086 LUGO 500 |
| 20118 ROA-230 230 | 22464 MIGUEL 230 | 24093 MIRALOMW 230 |
| 20149 TJI-230 230 | 22504 MISSION 230 | 24131 S.ONOFRE 230 |
| **IID** | 22716 SANLUSRY 230 | 24137 SERRANO 230 |
| 8311 COACHELA 230 | 22768 SOUTHBAY 69 | 24151 VALLEYSC 500 |
| 8332 ELCENTSW 230 | 22832 SYCAMORE 230 | 24156 VINCENT 500 |
| 8690 HIGHLINE 230 | **MWD** | 24901 VSTA 230 |
| 80300 NEWSF230 230 | 25417 IRONMTP1 6.9 | 24112 PADUA 230 |

***Post-Transient Reactive Margin Criteria***

The Reactive Margin Criteria used in this Post Transient analysis for SCE, SDG&E, CFE, and IID, was:

For SCE the following interim criteria will be used:

- Level B disturbance (single element outage): 300 Mvars
- Level C disturbance (double element outage): 150 Mvars

For SDG&E the following criteria will be used:

- Level B disturbance (single element outage): 150 Mvars
- Level C disturbance (double element outage): 75 Mvars

For CFE the following interim criteria will be used:

- Level B 230 kV disturbance (single element outage): 100 Mvars
- Level C 230 kV disturbance (double element outage): 50 Mvars

For IID the following interim criteria will be used:

- Level B disturbance (single element outage): 100 Mvars
- Level C disturbance (double element outage): 50 Mvars

It should be noted that the Reactive Margin Criteria used in this study is only applicable to this study and that they do not necessarily represent any utility's standard or policy. These values only represent the criteria used in this Study.

***Post-Transient Assumptions***

This Post-Transient analysis considered the period of time after the power and voltage transient oscillations have damped out and before operator intervention can take place. This time frame is approximately one and half (1½) to three (3) minutes subsequent to a disturbance. The following assumptions are inherent to this one and half (1½) to three (3) minute methodology:

1) Transient stability simulation of the disturbance has found the system to be stable and within the voltage and frequency dip criteria.
2) Sufficient time after the disturbance has elapsed such that the system frequency is uniform and turbine outputs have reached steady-state values.
3) Unless specific information is available, LTCs and regulators have sufficient regulating range and time delay settings such that post-transient voltages at loads are restored to the pre-disturbance levels.
4) Normal automatic generation control (AGC) will not significantly change generation within the one and half (1½) to three (3) minute time frame - either because of being too slow or because of being intentionally suspended after the disturbance. In power flow simulation, this means area interchange control is not active.
5) All turbine-generators will be reviewed as to whether the Base-load flag is set in power flow generator data. For units indicating "1", the unit will be assumed operating in base-load mode and adjustments up or down to generator loading will not be simulated in the

voltage stability analysis. For units not identified as base-loaded, the governor power flow routine will increase or decrease generator load due to governor action. All generators operating with free governors will pick up their share of the generation deficiency (or reduce excess) in proportion to their capacities (Pmax) and inversely proportional to their droop setting until they reach maximum/minimum output.

6) Phase shifters are assumed to hold a fixed angle.
7) Transmission voltage regulating transformers modeled in the pre-disturbance power flow to change taps in accordance with pre-set voltage schedules are fixed at their pre-disturbance level except where there is specific information to do otherwise.
8) Those remedial measures, which affect post transient steady state conditions, should be modeled. These remedial measures include high speed series capacitor switching, generation dropping and load (pump) dropping.
9) Shunt capacitors and reactors, modeled in the pre disturbance power flow to automatically switch "on" or "off" based on pre-set voltage schedules, are fixed at their pre-disturbance level except where there is specific information to do otherwise.
10) Bus voltage deviation shall not exceed 5 percent of its initial voltage unless agreed by the affected operating agent.
11) No system element should be loaded more than 100% of its emergency rating.
12) During post-contingency, all manually operated voltage control and phase shifting devices were fixed except as follows (which is to say that the following switchable shunts were allowed to float):

| SCE | | |
|---|---|---|
| ANTELOPE 230 | BARRE 230 | CHINO 230 |
| DEVERS 230 | EL NIDO 230 | GOULD 230 |
| KRAMER 230 | LCIENEGA 230 | LAGUBELL 230 |
| LA FRESA 230 | MESA CAL 230 | MIRALOMW 230 |
| MIRALOME 230 | MIRAGE 230 | MOORPARK 230 |
| OLINDA 230 | PADUA 230 | PARDEE 230 |
| RIOHONDO 230 | SANBRDNO 230 | S.CLARA 230 |
| VALLEYSC 115 | VICTOR 115 | VILLA PK 230 |
| VINCENT 230 | VISTA 230 | VSTA 230 |
| WALNUT 230 | | |

| SDG&E | | |
|---|---|---|
| CAPSTRNO 138 | EL CAJON 69 | LOSCOCHS 69 |
| MAIN ST 69 | MIGUEL 69 | MISSION 69 |
| PALOMAR 138 | SHADOWR 138 | TELECYN 138 |
| PENSQTOS 69 | SANLUSRY 138 | SYCAMORE 69 |
| PENSQTOS 230 | ESCNDIDO 230 | |

13) All generators which control a high side remote bus were set at the pre-disturbance voltage at the terminal bus, except for the following generators:

| | | |
|---|---|---|
| EHUNTR 1 24 | EHUNTR 2 24 | EHUNTR 3 22 |
| HUNTN G1 22 | HUNTN G2 22 | |

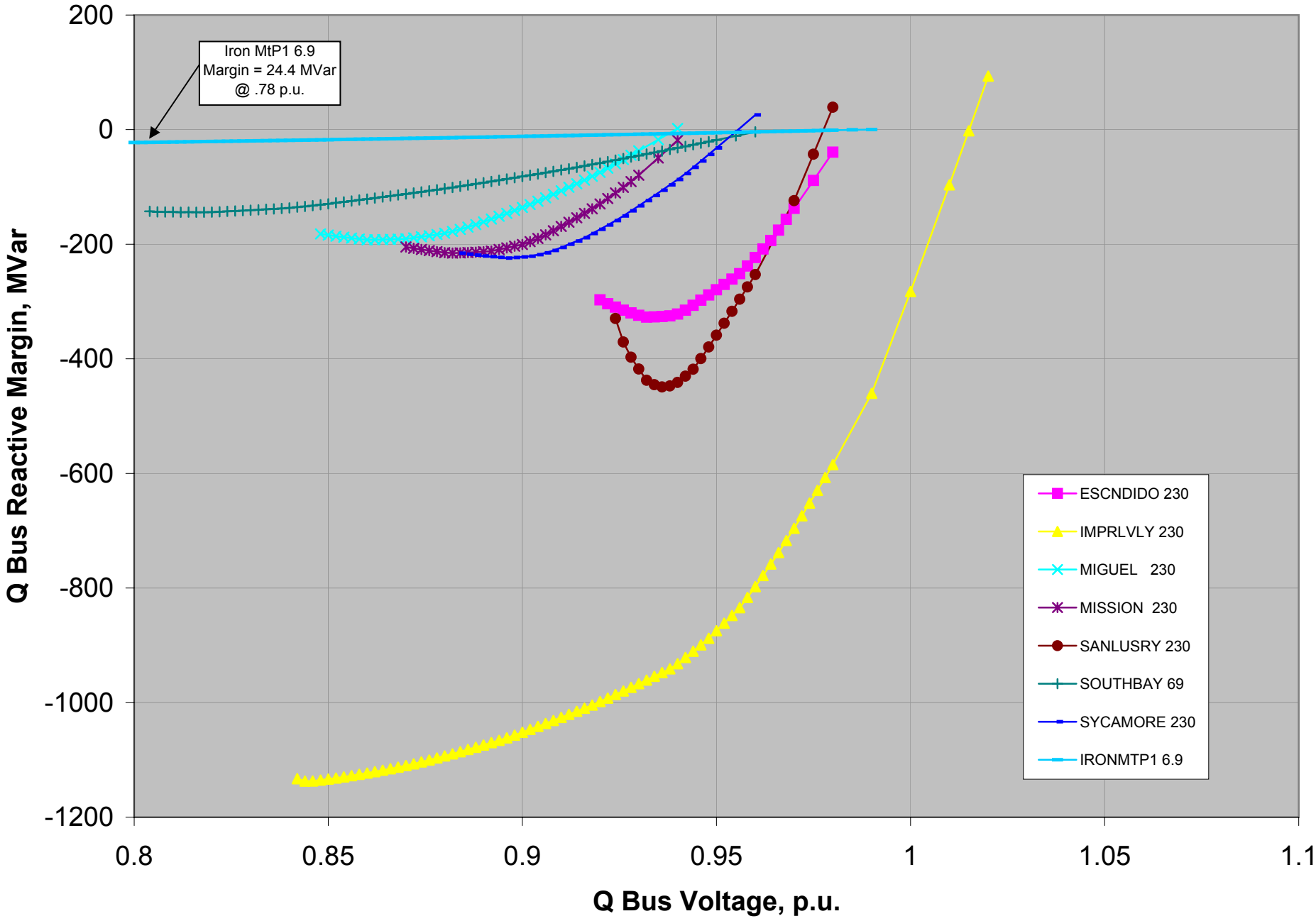
14) Northwest shunt capacitors modeled as synchronous condensers will be converted to fixed shunt capacitors using their pre-disturbance Mvar value except for Keeler and Maple Valley Static Var Compensators.

# Imperial Valley Study Group

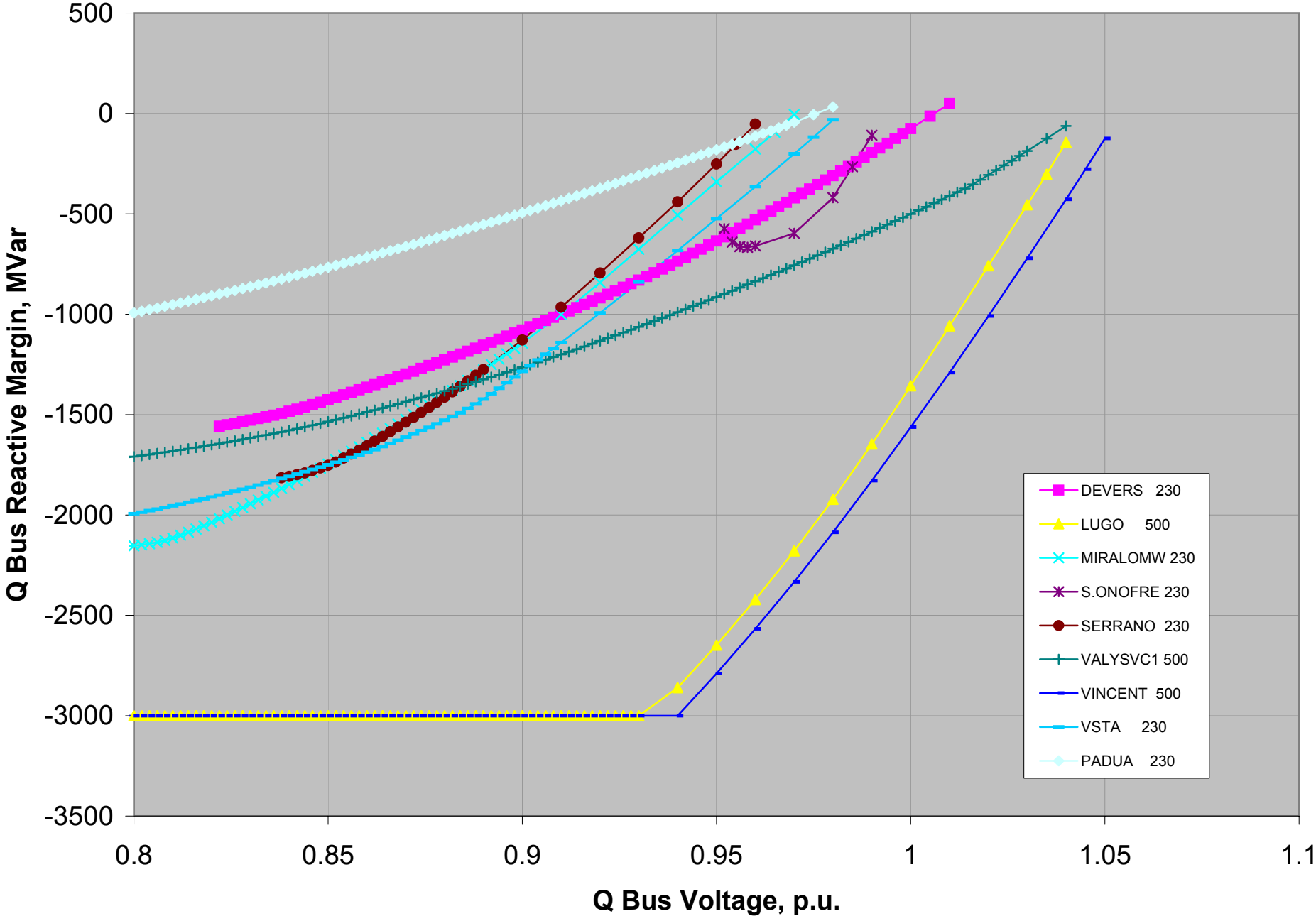
## Appendix D.1.2

Q-V Curves

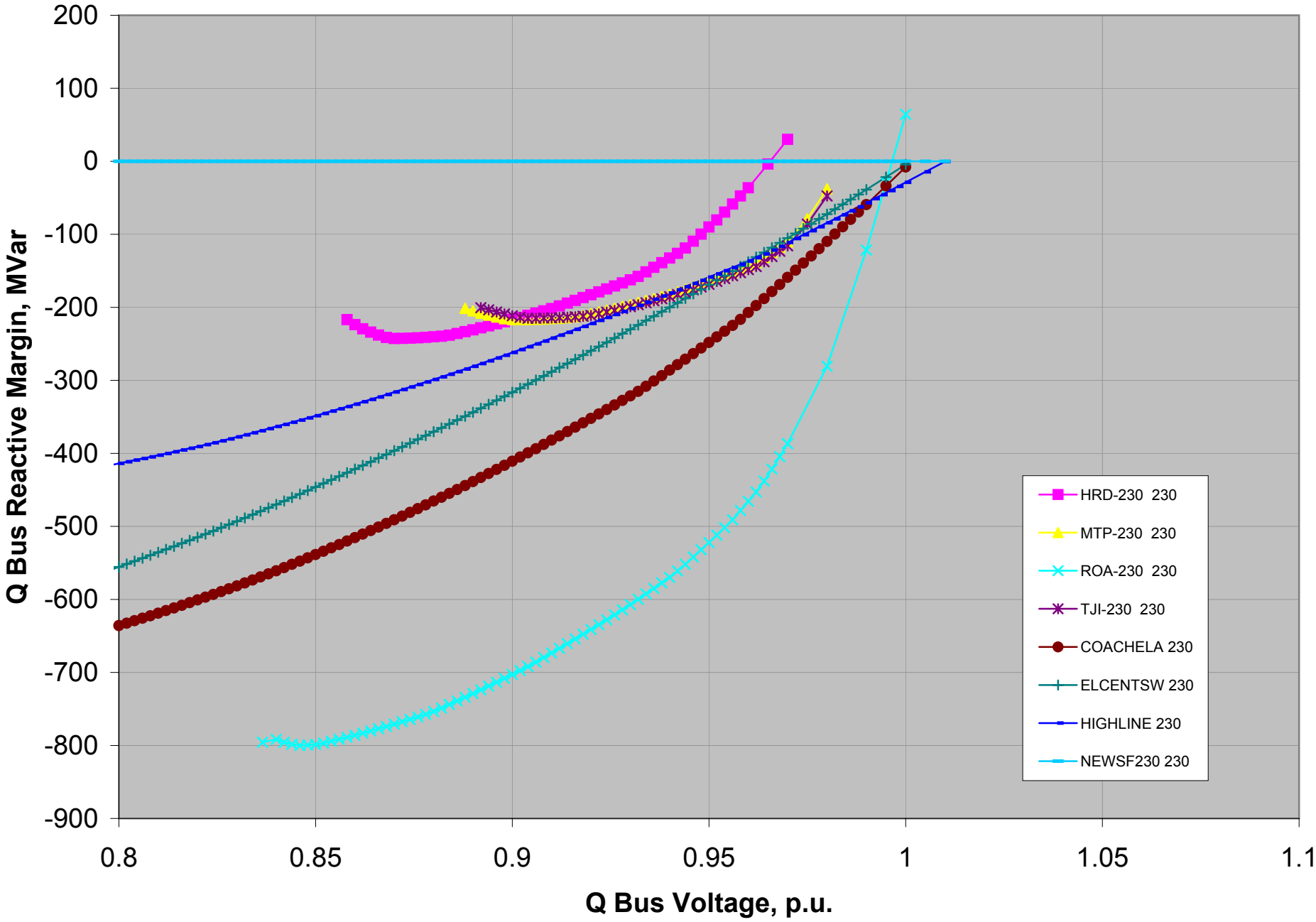
hs_rev4: HS Benchmark Case - No New Facilities, Outage: Imperial Valley - Miguel 500kV,
Source File = hs_rev4_v2_ivml.nose Chart 1 - SDG&E



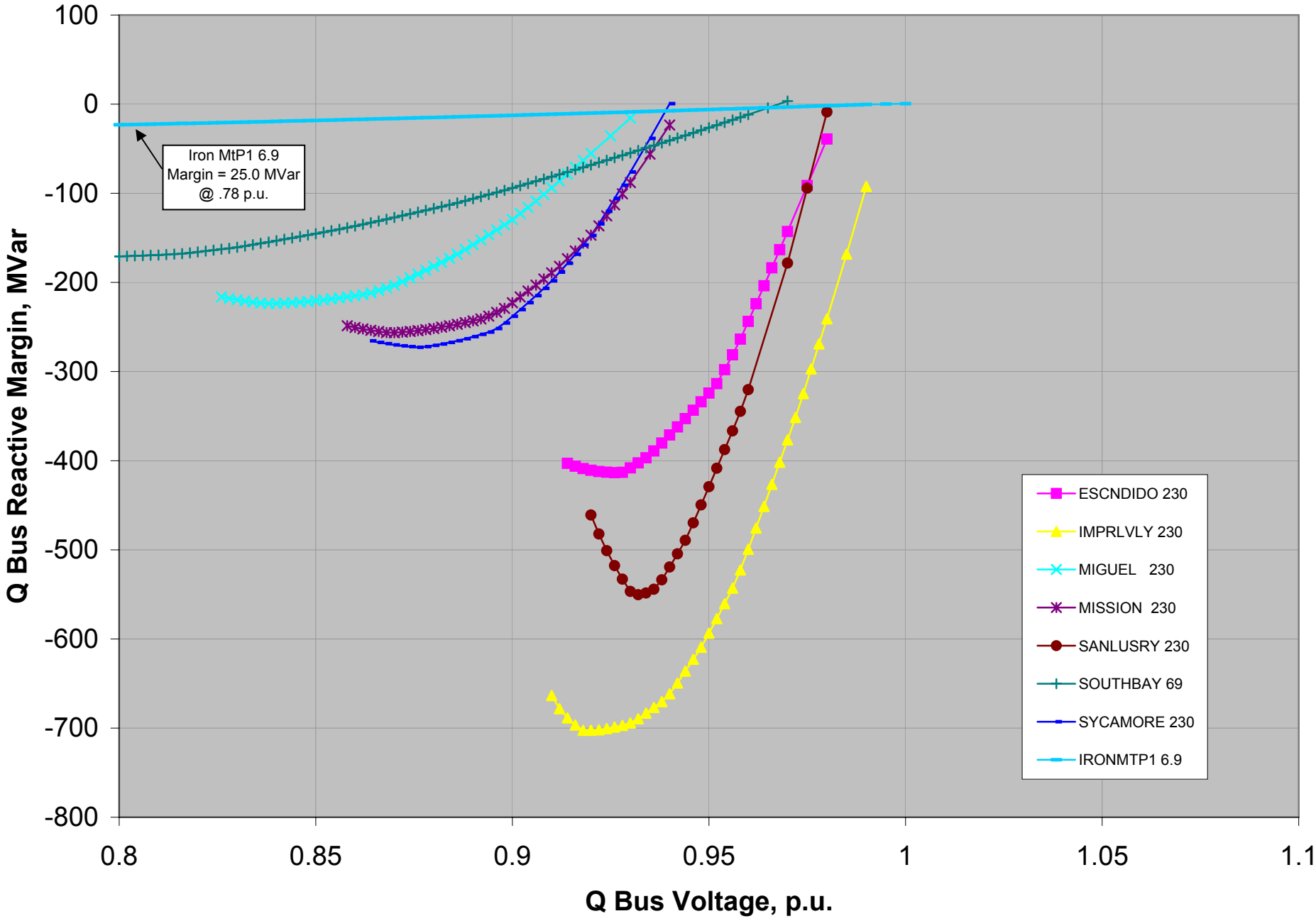
hs_rev4: HS Benchmark Case - No New Facilities, Outage: Imperial Valley - Miguel 500kV,
Source File = hs_rev4_v2_ivml.nose Chart 2 - SCE



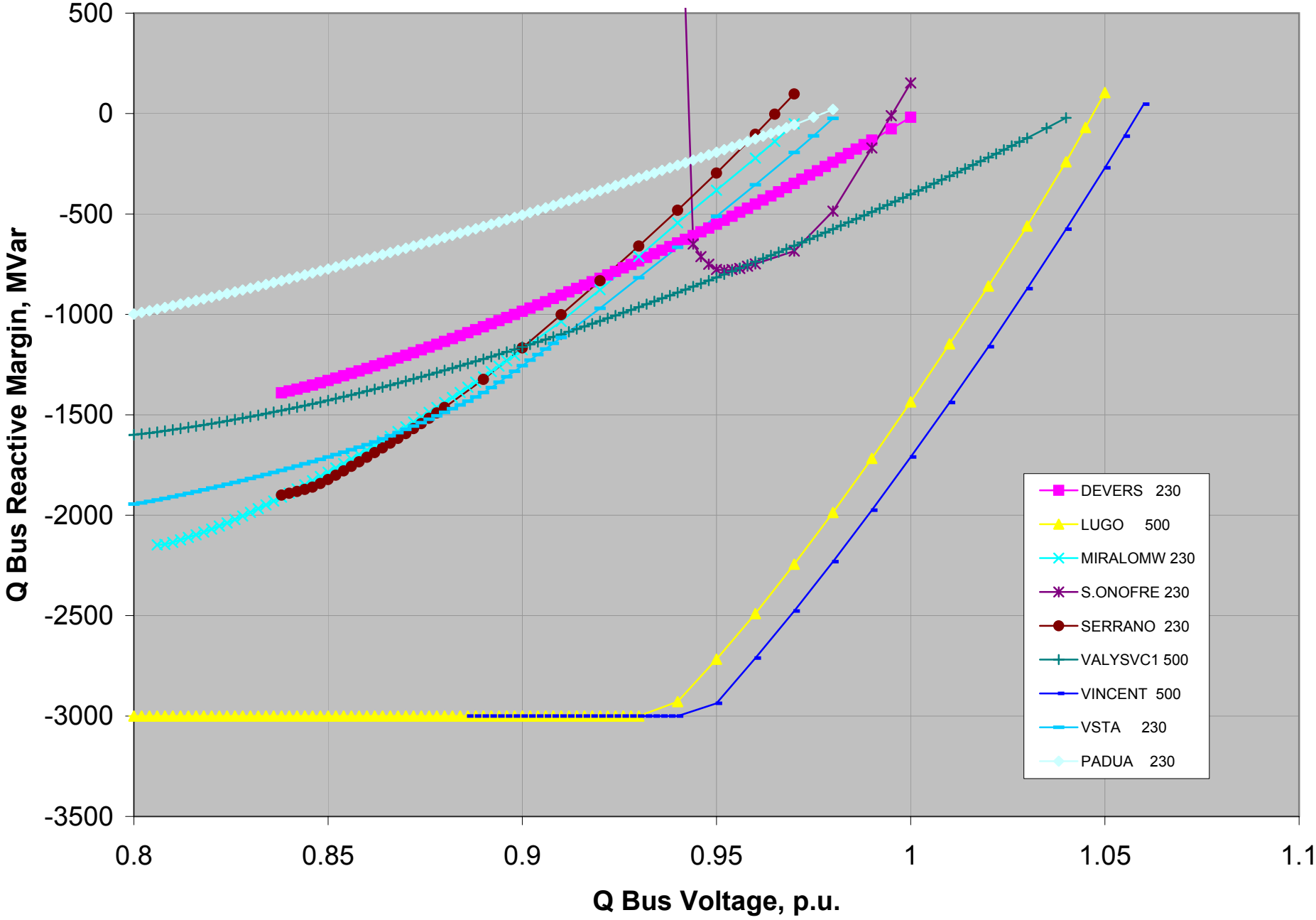
hs_rev4: HS Benchmark Case - No New Facilities, Outage: Imperial Valley - Miguel 500kV,
Source File = hs_rev4_v2_ivml.nose Chart 3 - CFE & IID



**hs_alt2d1: IV - New San Filipe - CentralX 500, Outage: Imperial Valley - Miguel 500kV,**
**Source File = hs_alt2d1_s1_v2_ivml.nose Chart 1 - SDG&E**



hs_alt2d1: IV - New San Filipe - CentralX 500, Outage: Imperial Valley - Miguel 500kV,
Source File = hs_alt2d1_s1_v2_ivml.nose Chart 2 - SCE



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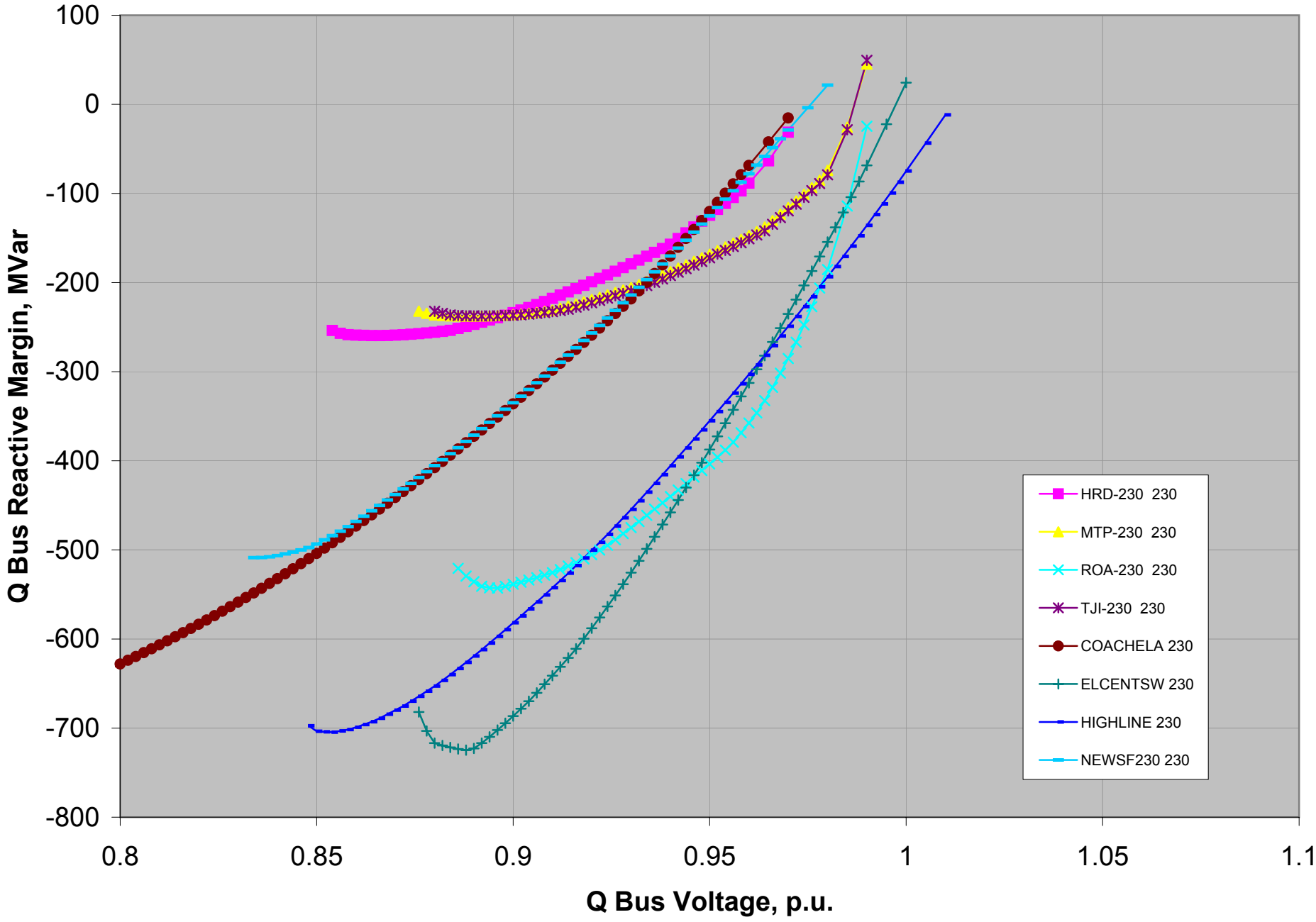
Source File = hs_alt2d1_s1_v2_ivml.nose Chart 3 - CFE & IID



hs_alt3bd1: IV - New San Filipe - North SD - SerVal 500, Outage: Imperial Valley - Miguel 500kV,
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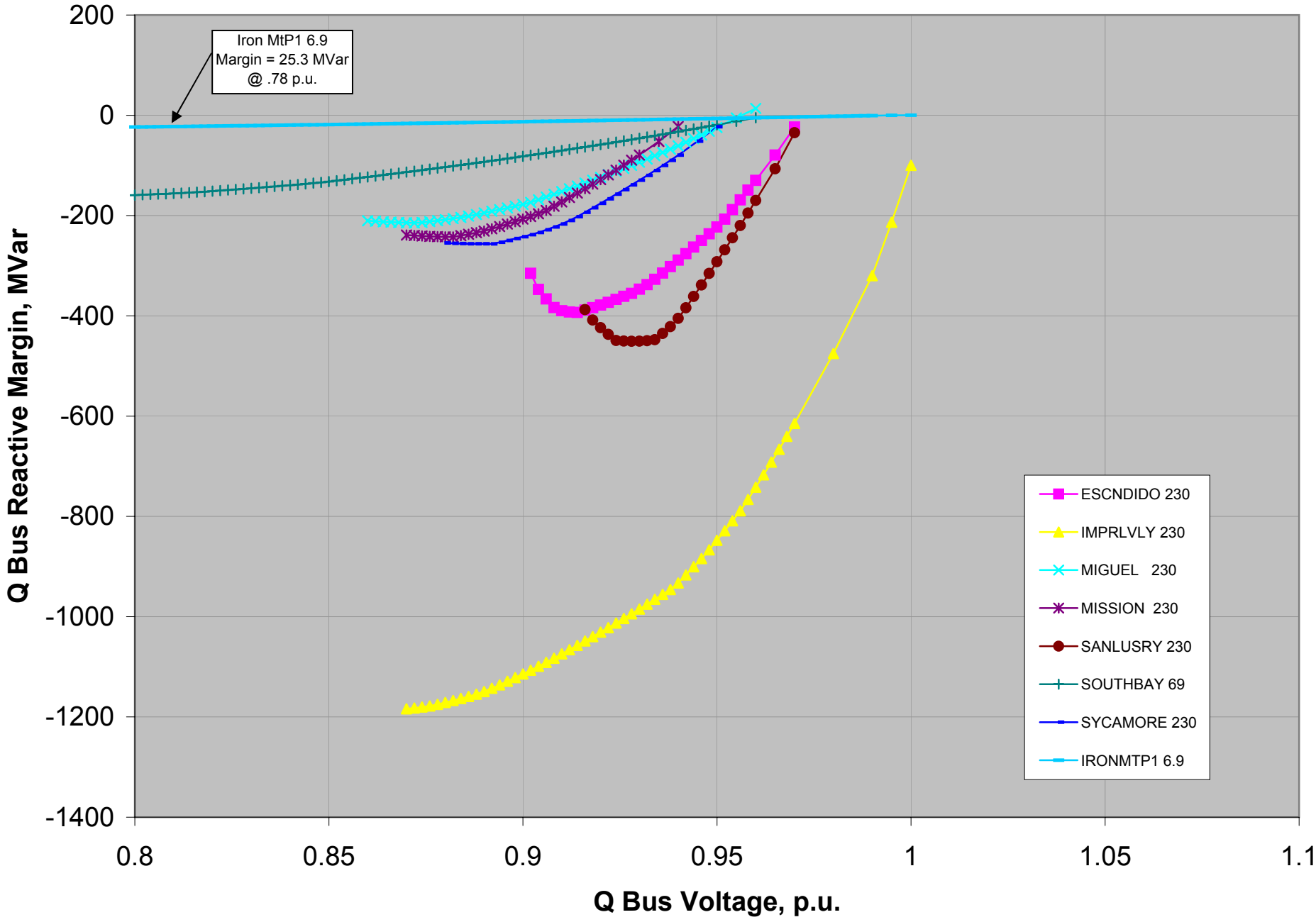
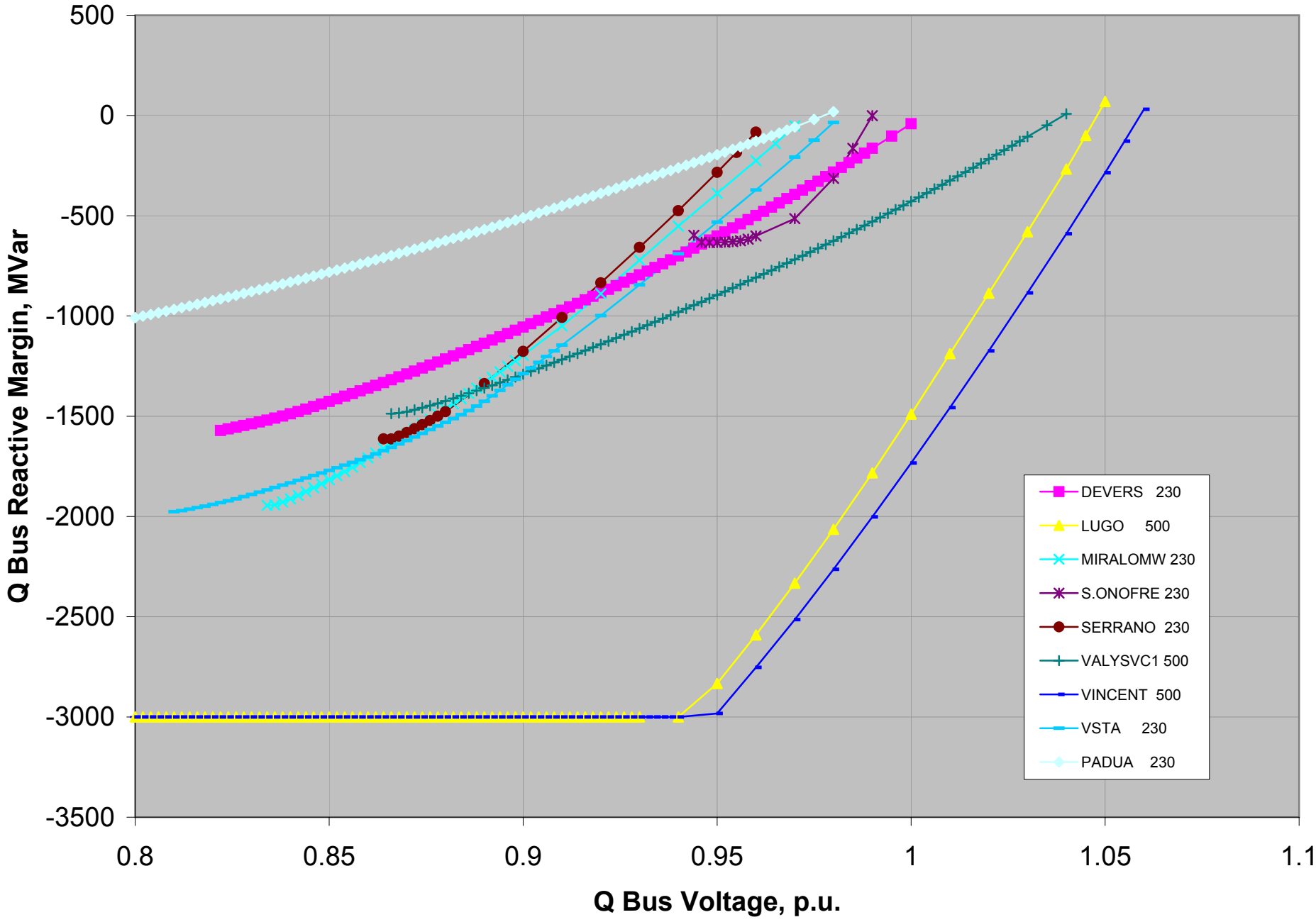
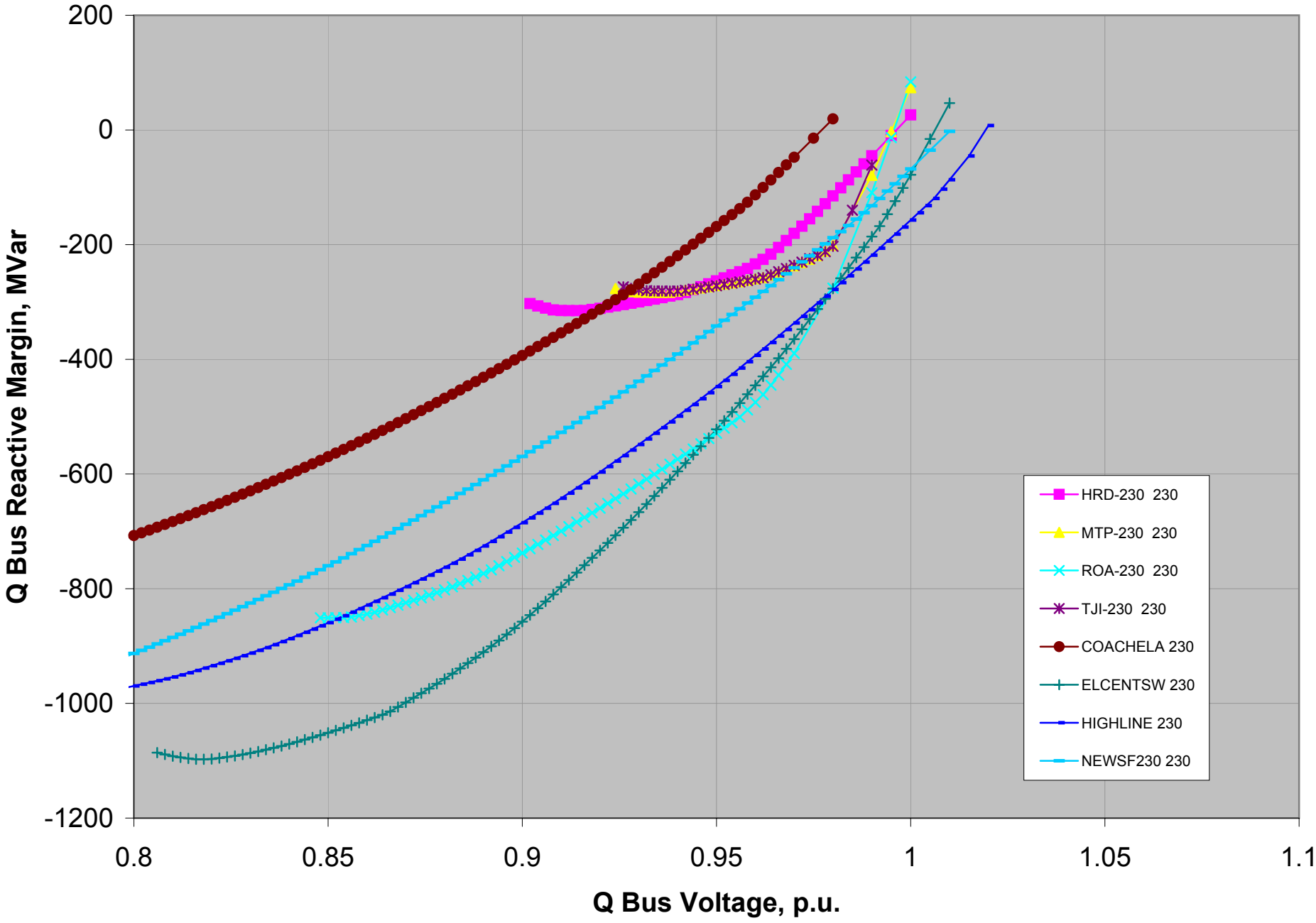


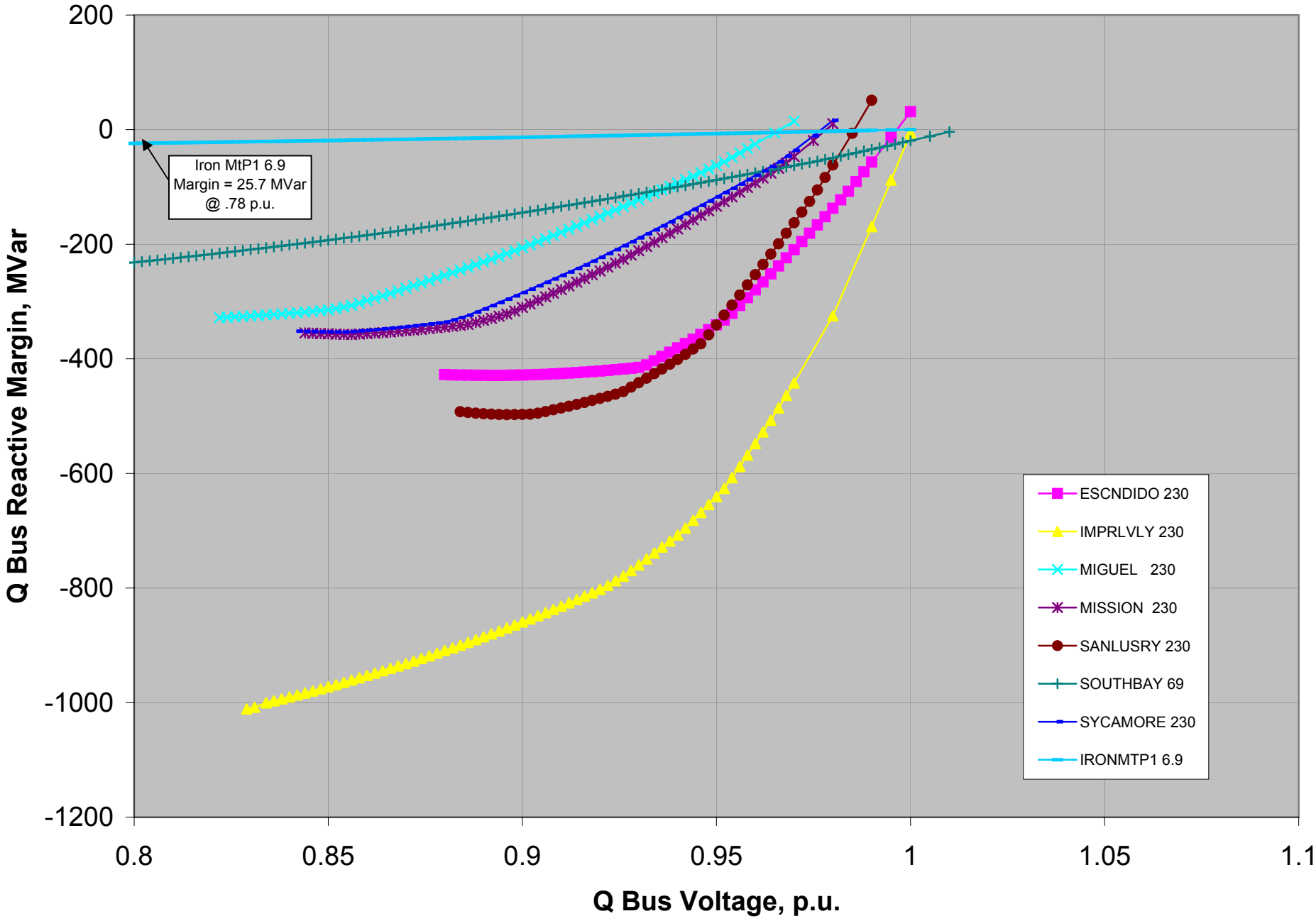
hs_alt3bd1: IV - New San Filipe - North SD - SerVal 500, Outage: Imperial Valley - Miguel 500kV,
Source File = hs_alt3bd1_s1_v2_ivml_VCaps.nose Chart 2 - SCE



hs_alt3bd1: IV - New San Filipe - North SD - SerVal 500, Outage: Imperial Valley - Miguel 500kV,
Source File = hs_alt3bd1_s1_v2_ivml_VCaps.nose Chart 3 - CFE & IID



la_rev5: LA Benchmark Case - No New Facilities, Outage: Imperial Valley - Miguel 500kV,
Source File = la_rev5_v2_ivml.nose Chart 1 - SDG&E



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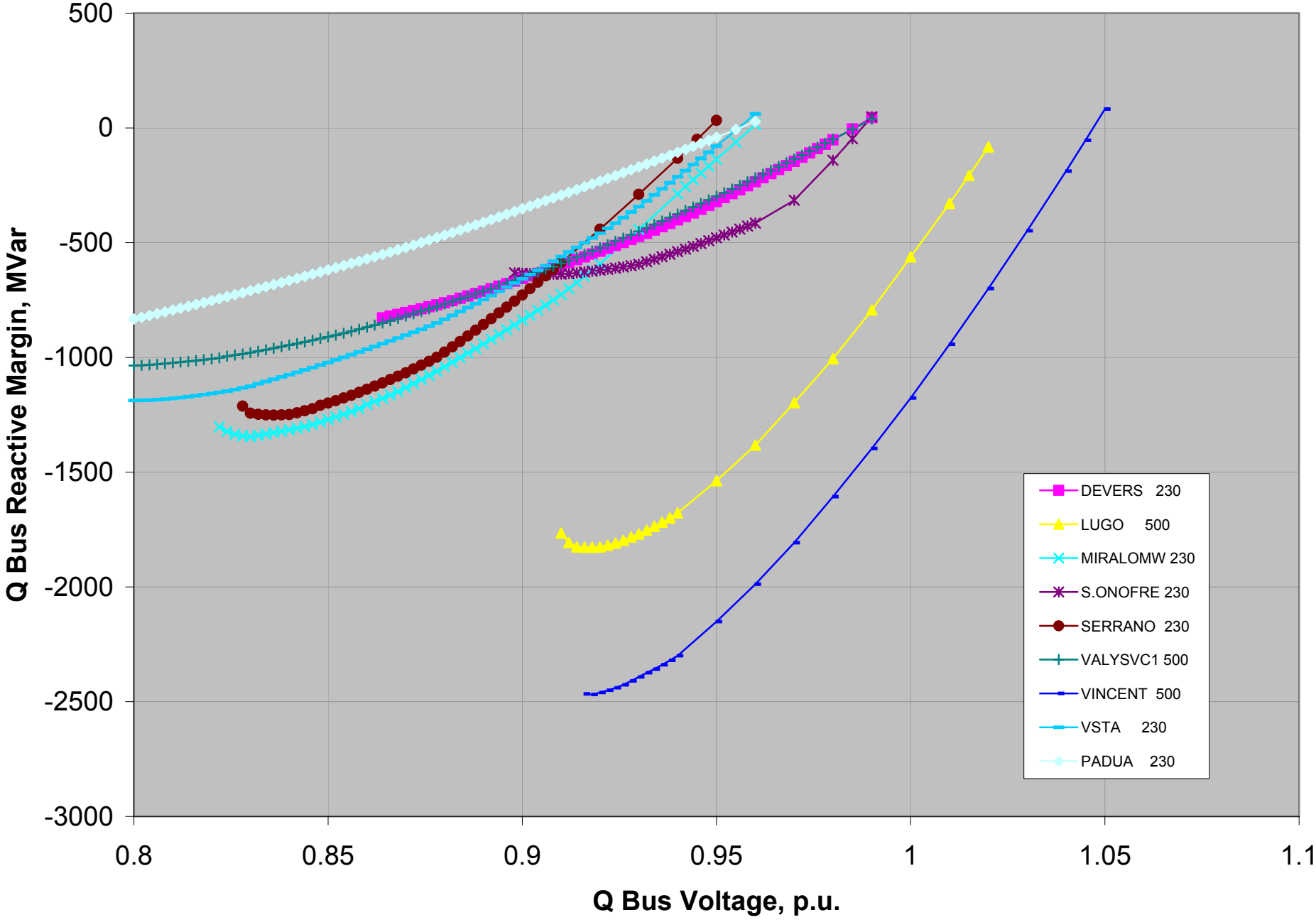
Source File = la_rev5_v2_ivml.nose Chart 2 - SCE



la_rev5: LA Benchmark Case - No New Facilities, Outage: Imperial Valley - Miguel 500kV,
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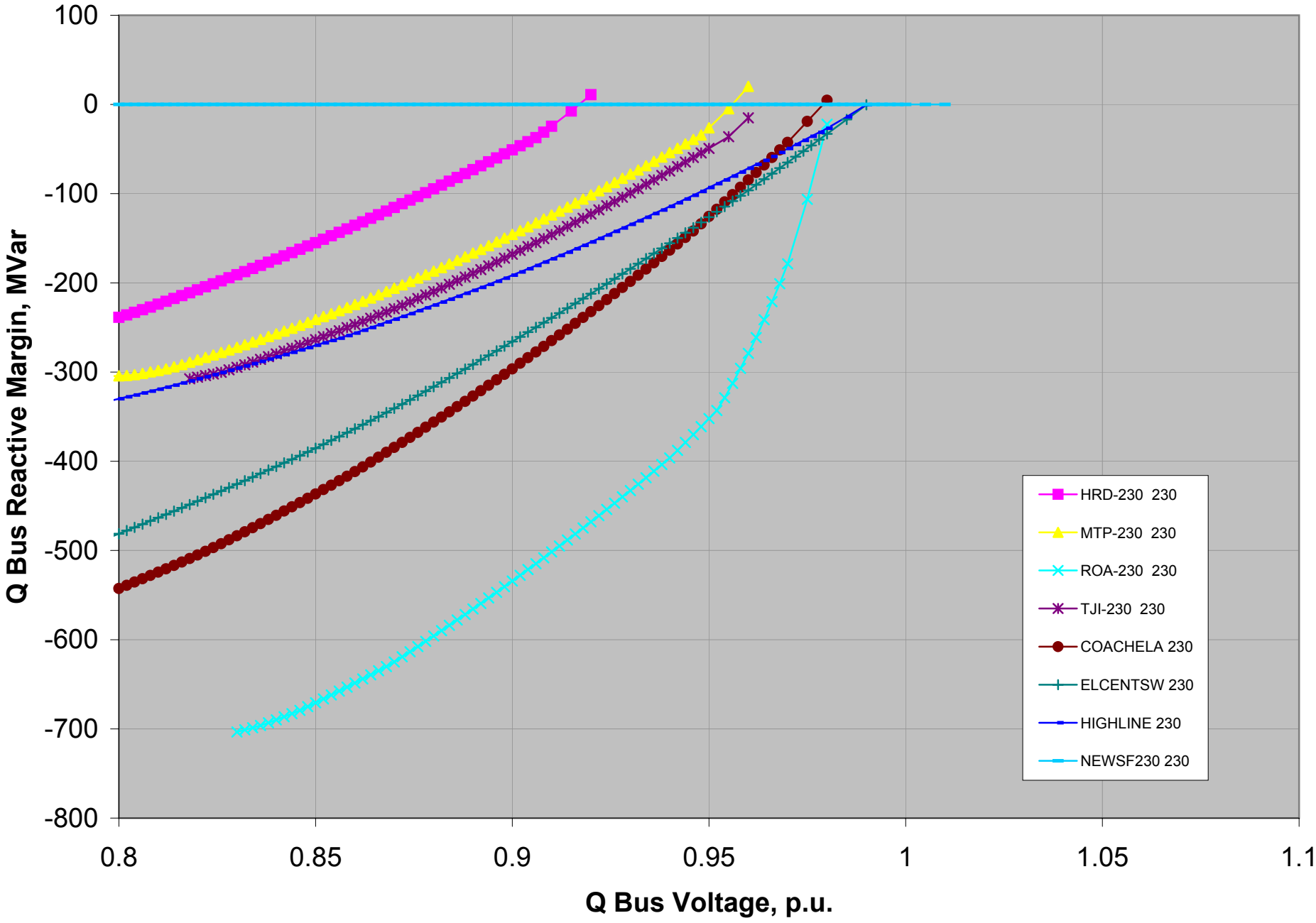
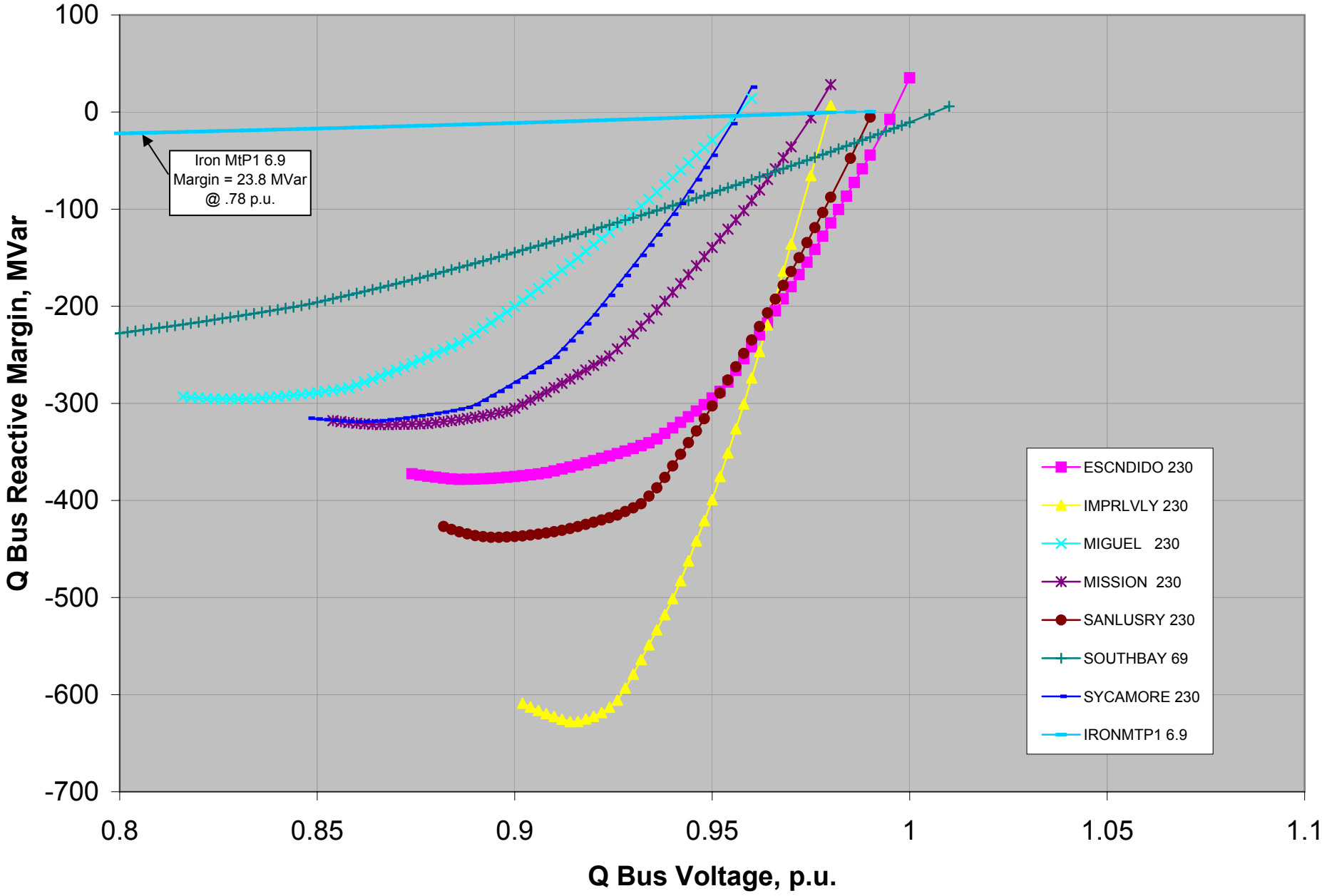
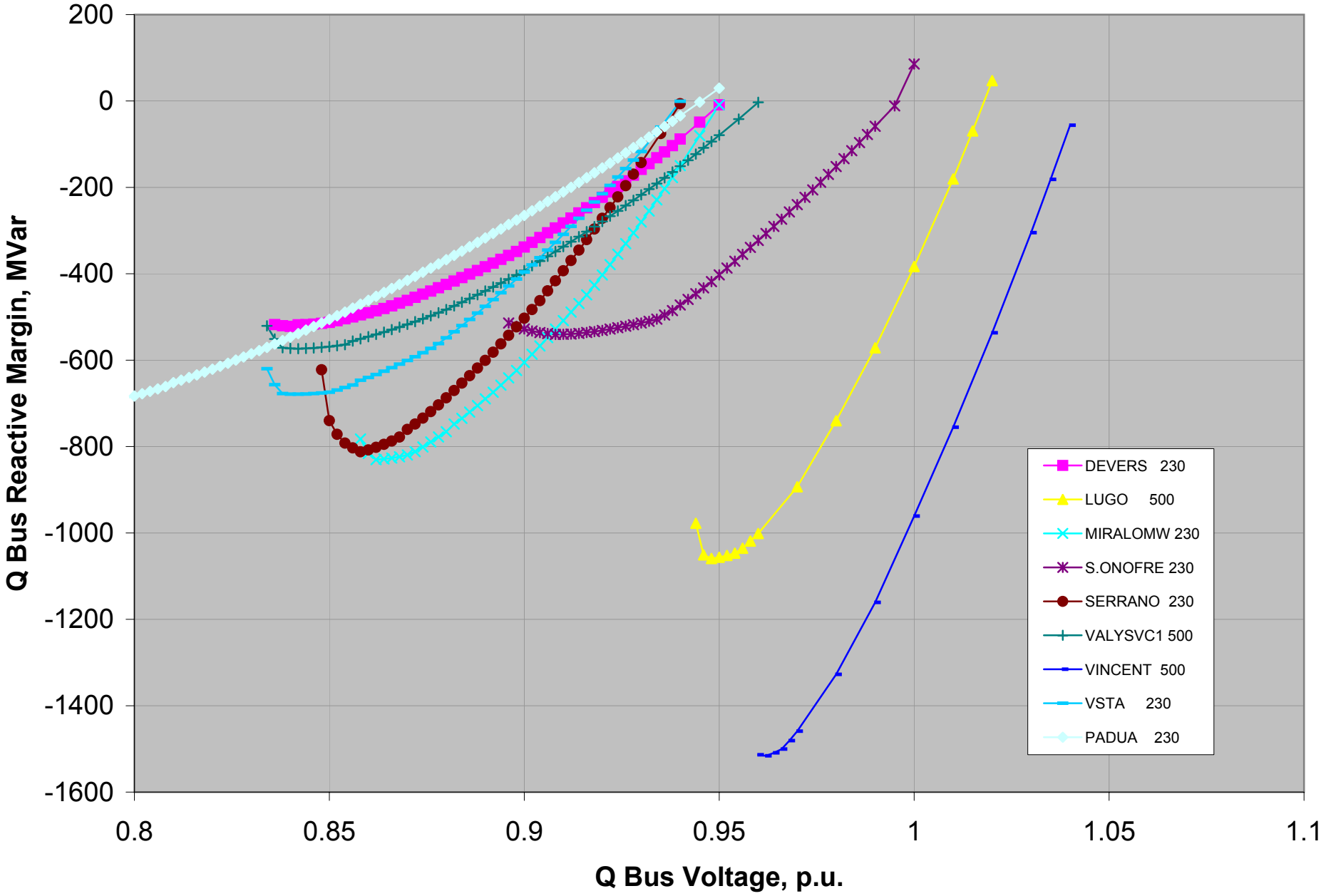


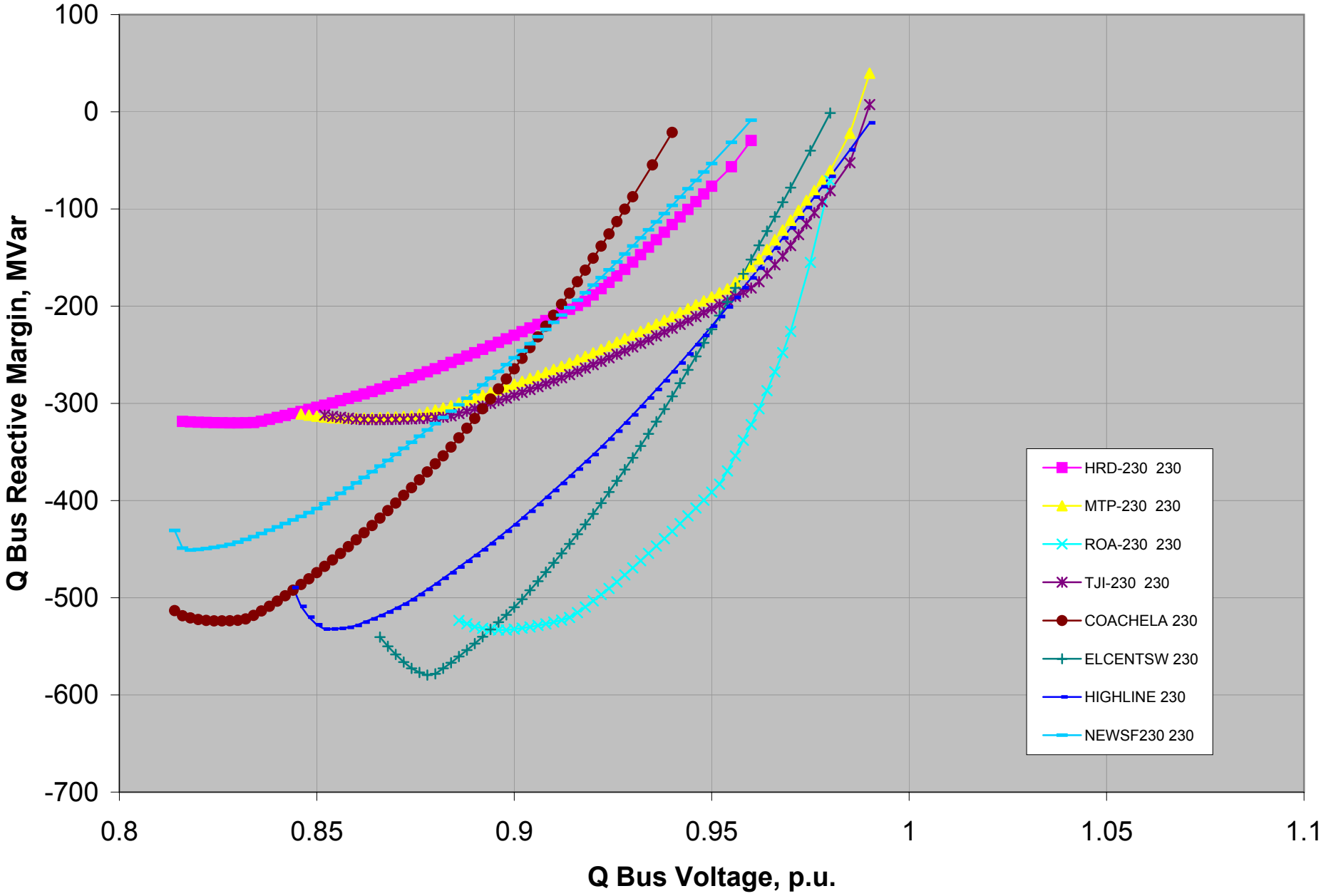
**la_alt2ad3: IV - New San Filipe - CentralX 500 & IH 500/230 To Coachella,**
**Outage: Imperial Valley - Miguel 500kV,**
**Source File = la_alt2ad3_s1_v2_ivml.nose Chart 1 - SDG&E**

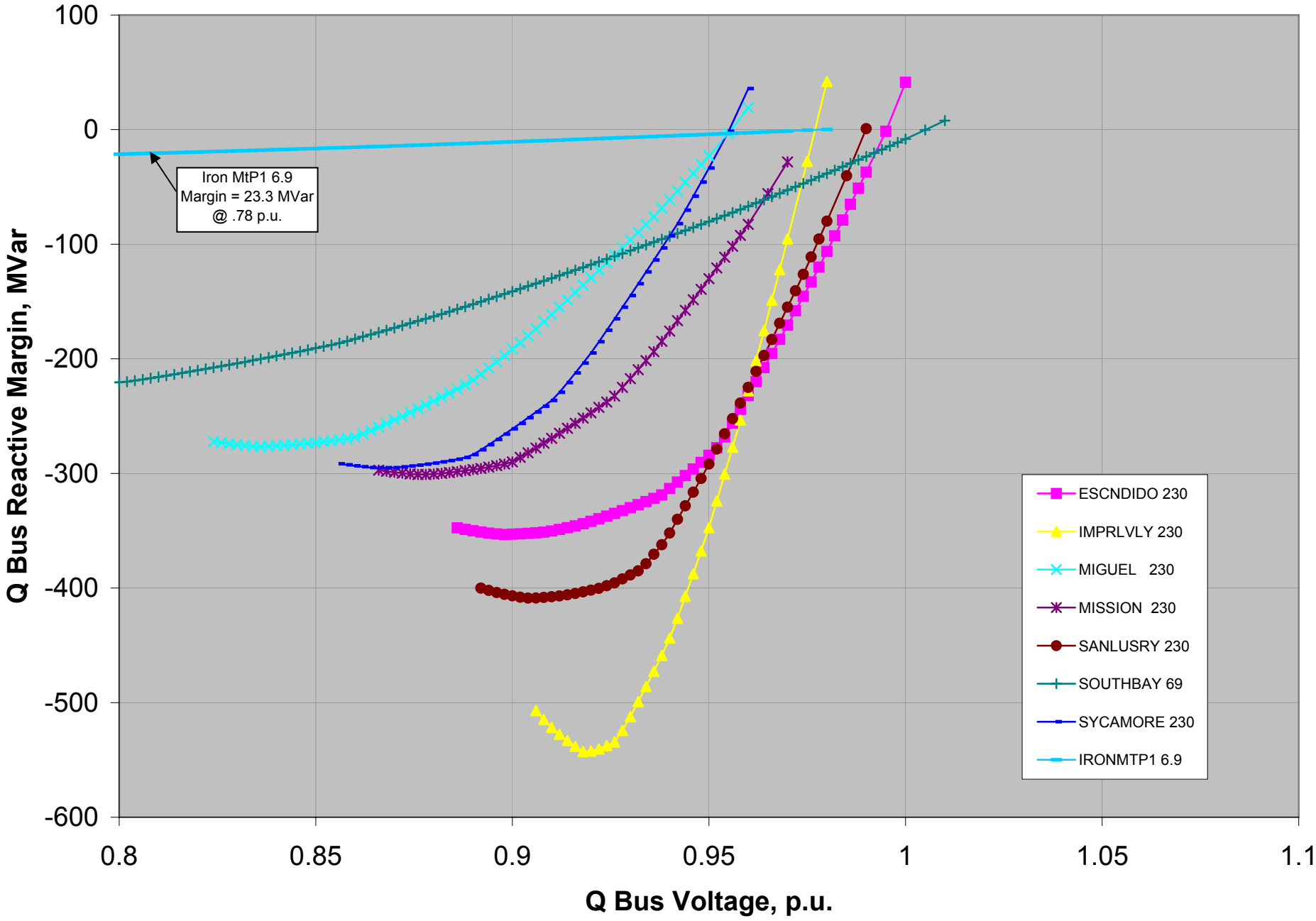


la_alt2ad3: IV - New San Filipe - CentralX 500 & IH 500/230 To Coachella,
Outage: Imperial Valley - Miguel 500kV,
Source File = la_alt2ad3_s1_v2_ivml.nose Chart 2 - SCE

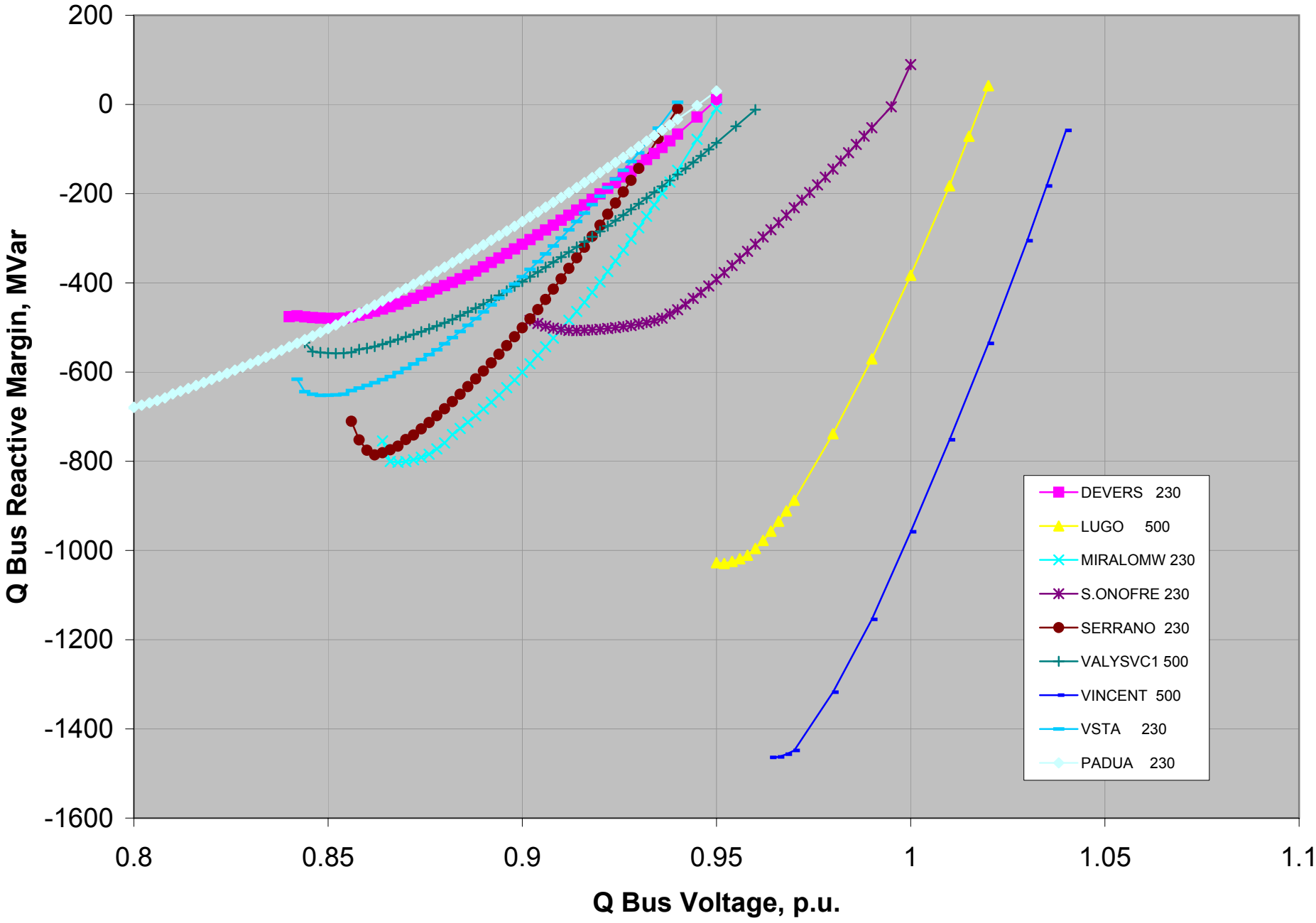


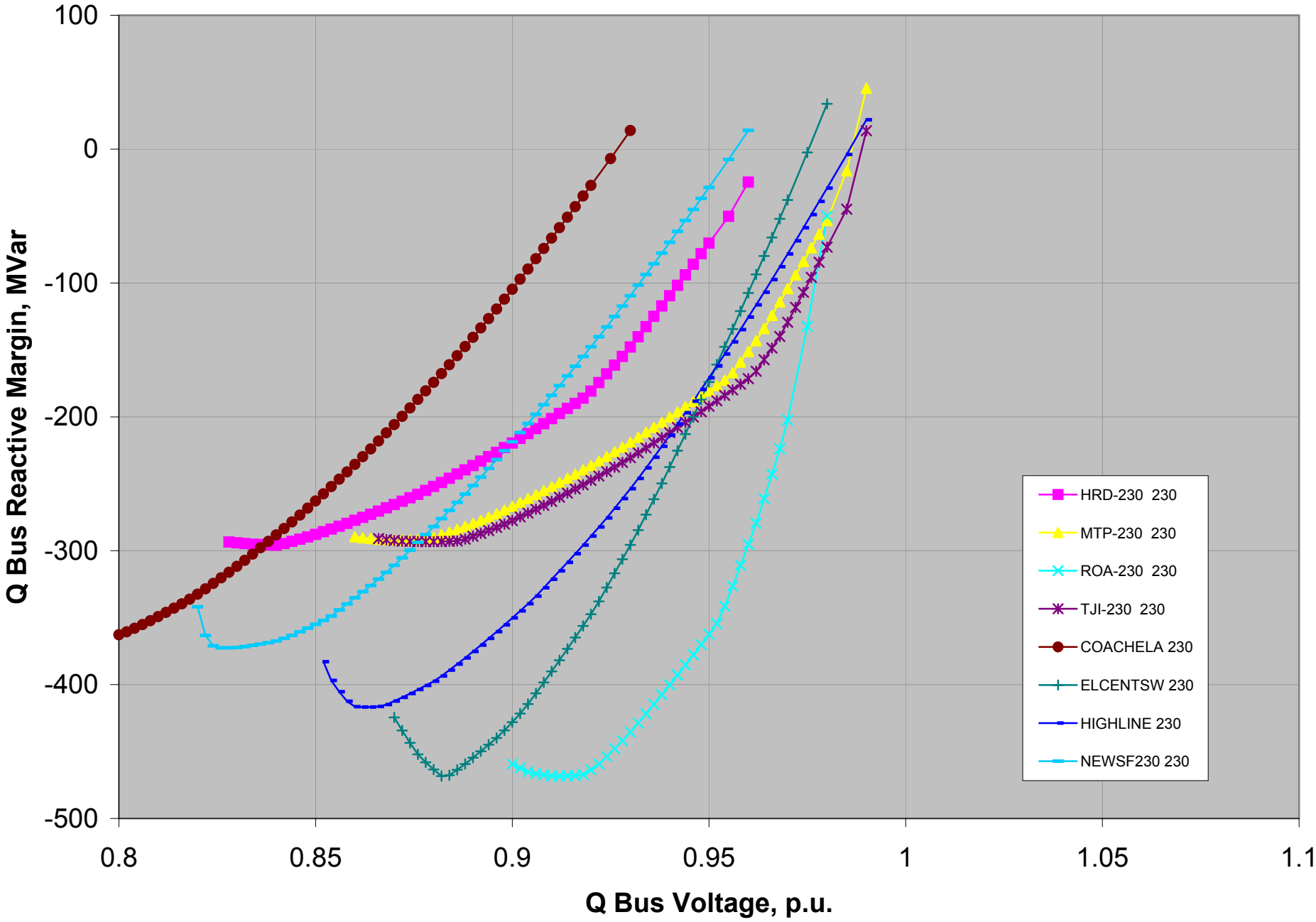
la_alt2ad3: IV - New San Filipe - CentralX 500 & IH 500/230 To Coachella,
Outage: Imperial Valley - Miguel 500kV,
Source File = la_alt2ad3_s1_v2_ivml.nose Chart 3 - CFE & IID



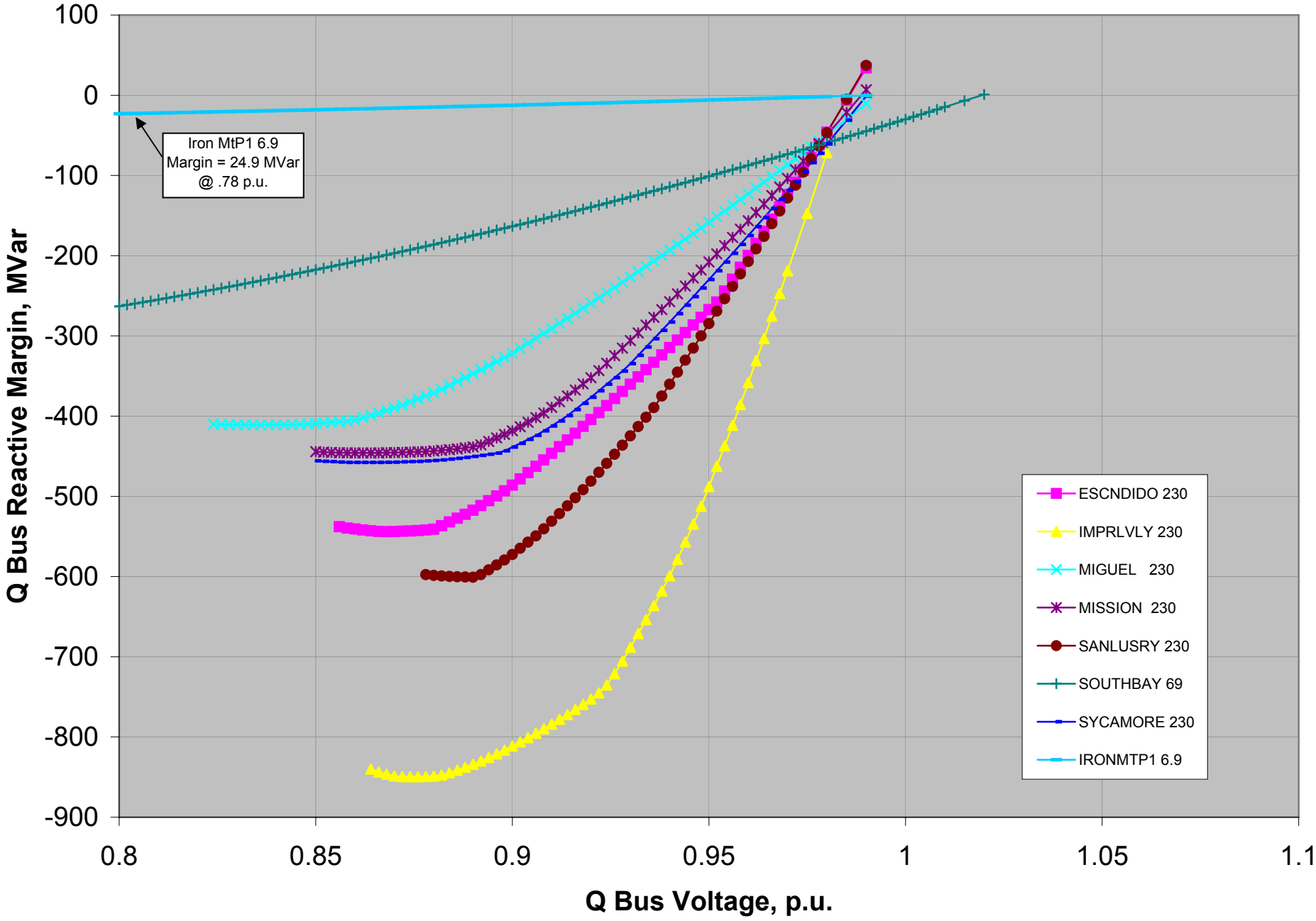

la_alt2d3 IV - New San Filipe - CentralX 500, Outage: Imperial Valley - Miguel 500kV,
Source File = la_alt2d3_s1_v2_ivml.nose Chart 1 - SDG&E
Iron MtP1 6.9
Margin = 23.3 MVar
@ .78 p.u.
ESCNDIDO 230
IMPRLVLY 230
MIGUEL 230
MISSION 230
SANLUSRY 230
SOUTHBAY 69
SYCAMORE 230
IRONMTP1 6.9
Q Bus Reactive Margin, MVar
100
0
-100
-200
-300
-400
-500
-600
0.8
0.85
0.9
0.95
1
1.05
1.1
Q Bus Voltage, p.u.

la_alt2d3 IV - New San Filipe - CentralX 500, Outage: Imperial Valley - Miguel 500kV,
Source File = la_alt2d3_s1_v2_ivml.nose Chart 2 - SCE




la_alt2d3 IV - New San Filipe - CentralX 500, Outage: Imperial Valley - Miguel 500kV,
Source File = la_alt2d3_s1_v2_ivml.nose Chart 3 - CFE & IID
Q Bus Reactive Margin, MVar
100
0
-100
-200
-300
-400
-500
0.8
0.85
0.9
0.95
1
1.05
1.1
Q Bus Voltage, p.u.
HRD-230 230
MTP-230 230
ROA-230 230
TJI-230 230
COACHELA 230
ELCENTSW 230
HIGHLINE 230
NEWSF230 230

la_alt3bd3: IV - New San Filipe - North SD - SerVal 500, Outage: Imperial Valley - Miguel 500kV,
Source File = la_alt3bd3_s1_v2_ivml_VCaps.nose Chart 1 - SDG&E



la_alt3bd3: IV - New San Filipe - North SD - SerVal 500, Outage: Imperial Valley - Miguel 500kV,
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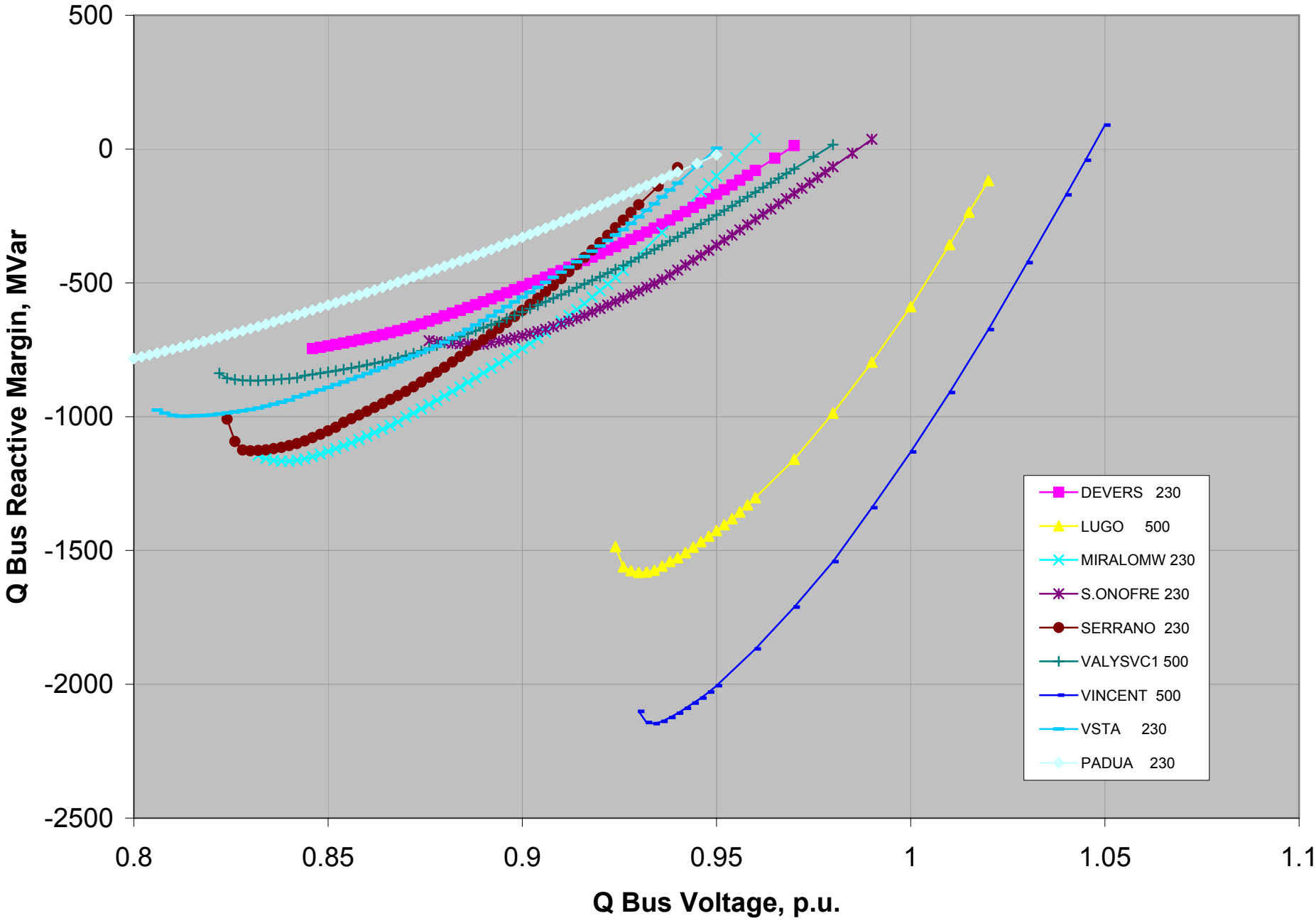
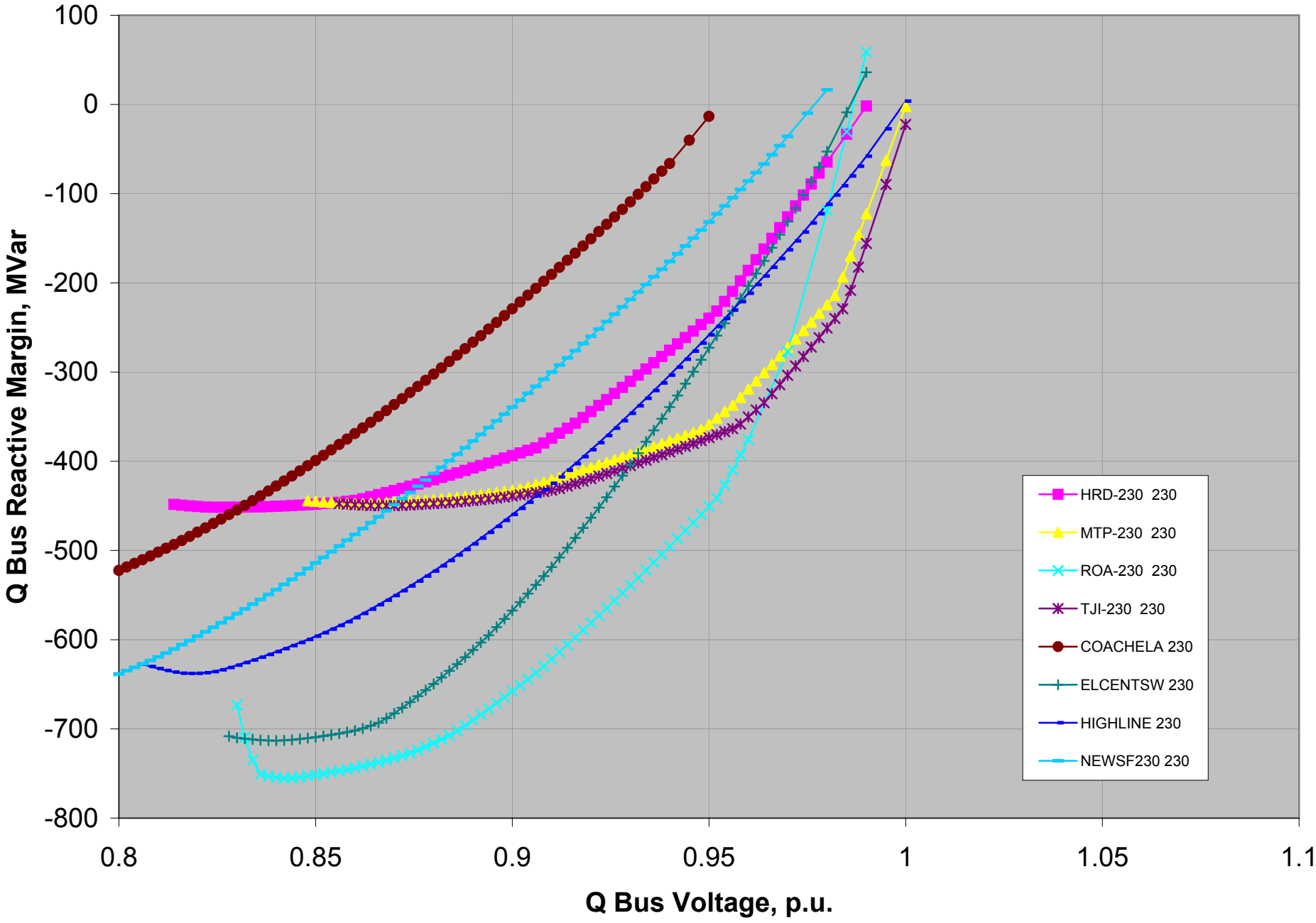


la_alt3bd3: IV - New San Filipe - North SD - SerVal 500, Outage: Imperial Valley - Miguel 500kV,
Source File = la_alt3bd3_s1_v2_ivml_VCaps.nose Chart 3 - CFE & IID



**hs_rev4: HS Benchmark Case - No New Facilities, Outage: Devers - Valley SC 500kV,**
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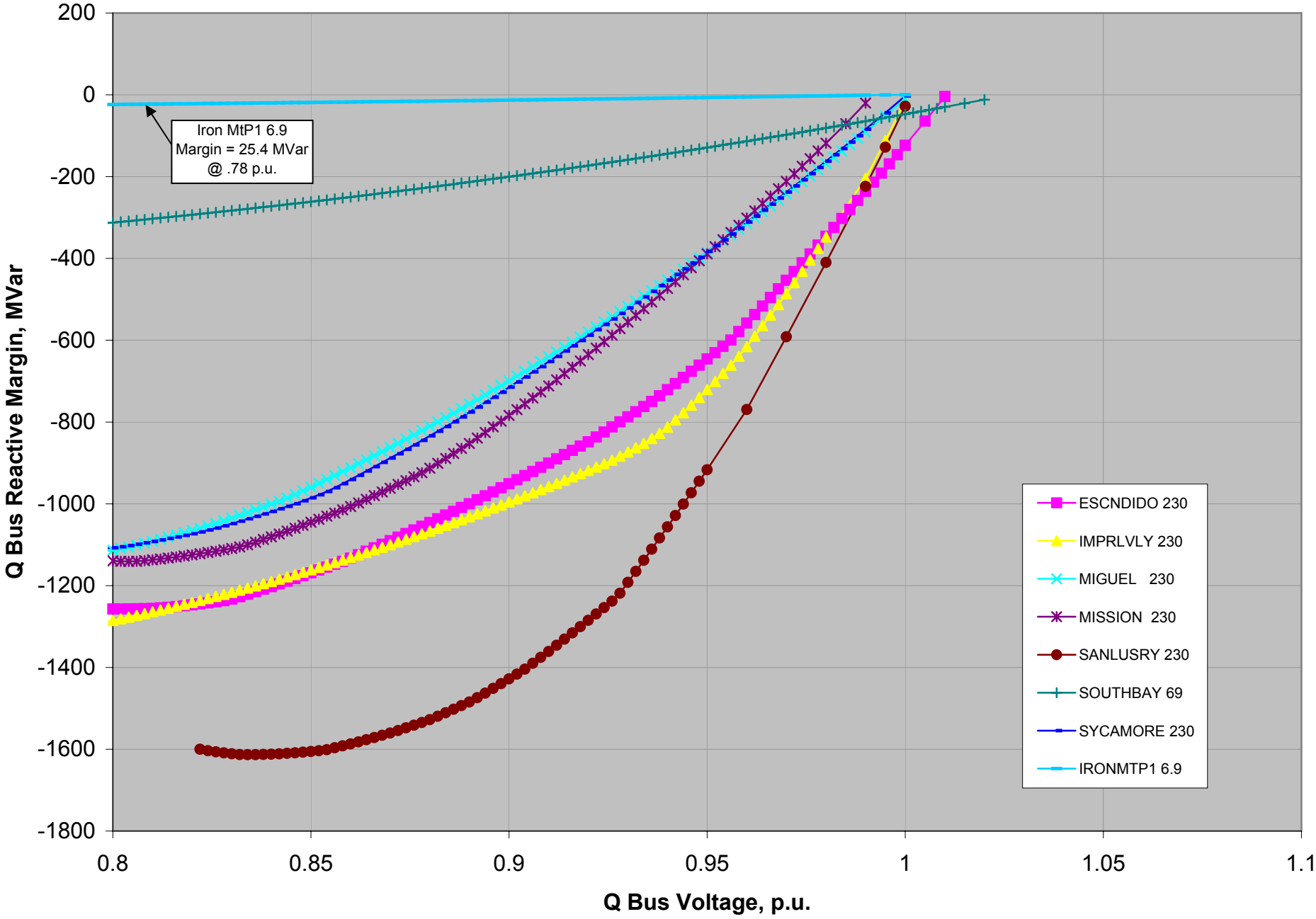
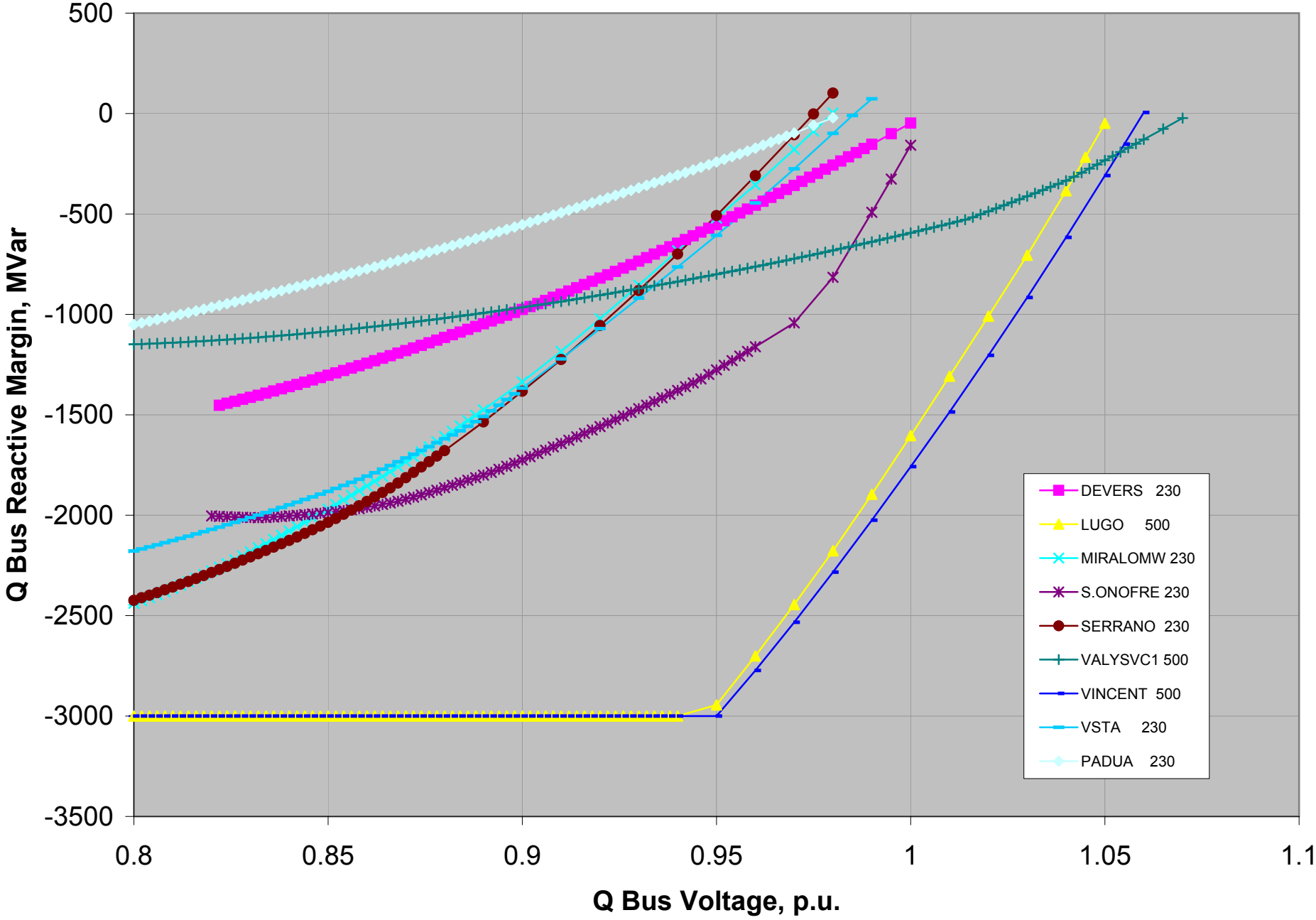
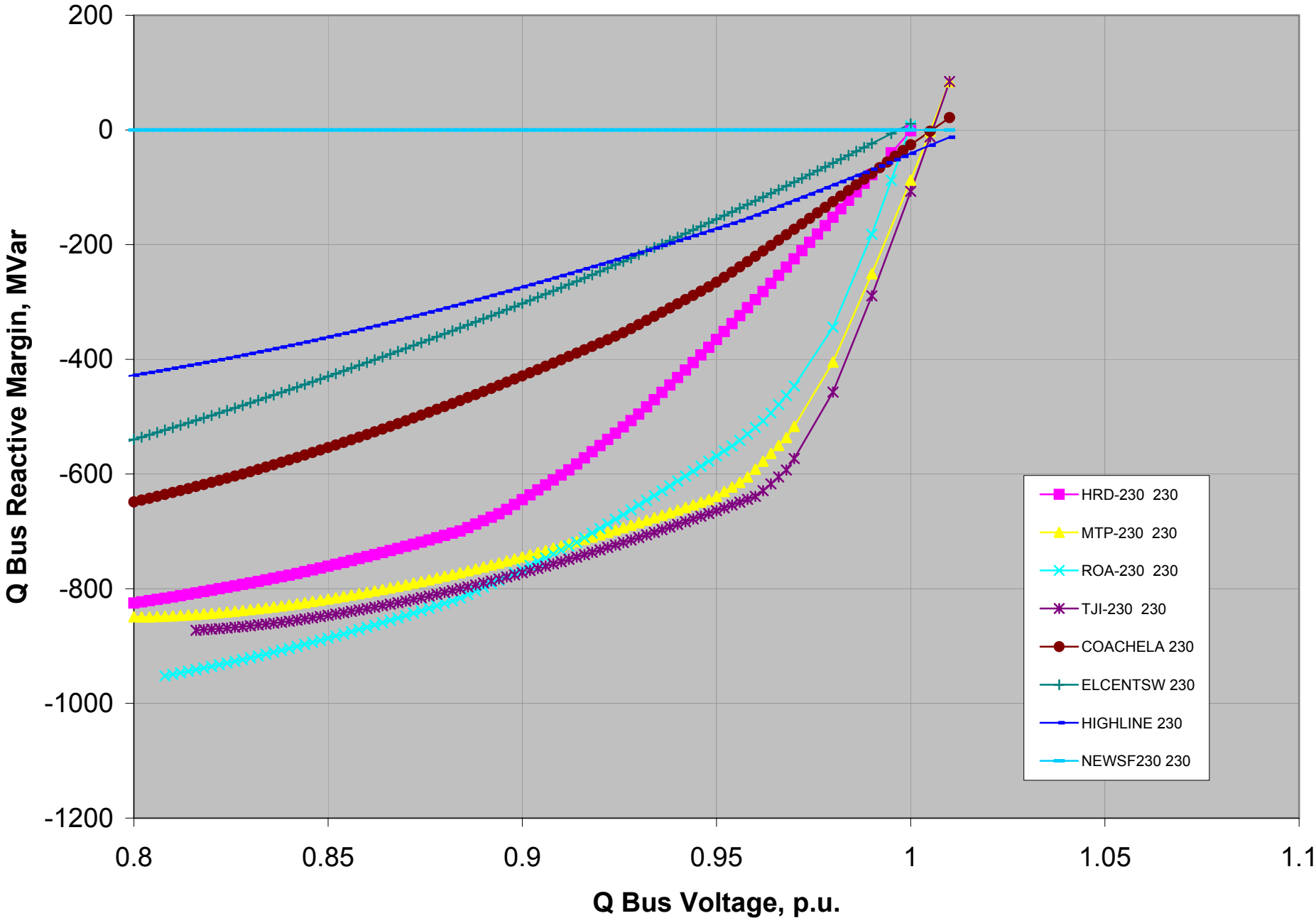


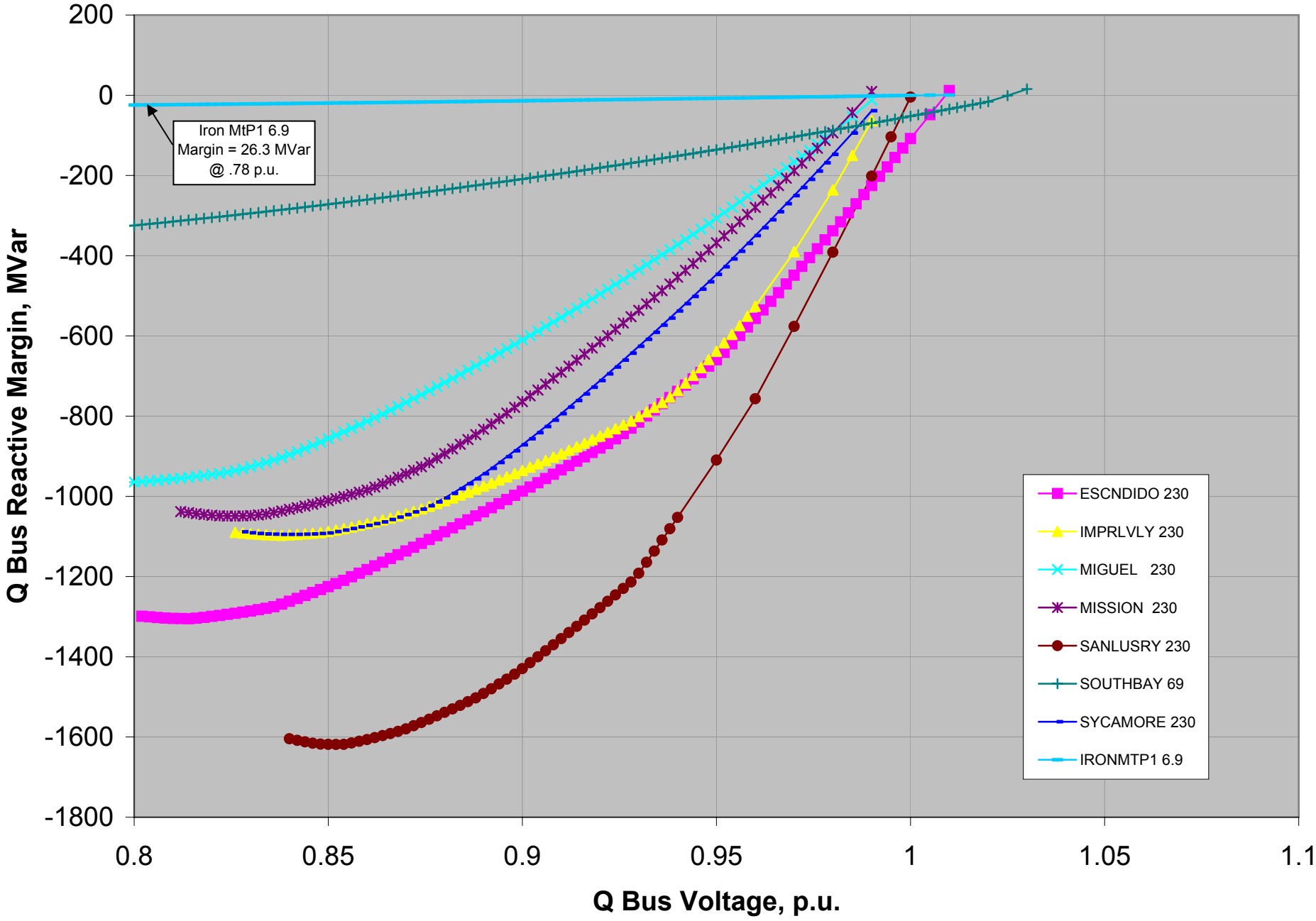
hs_rev4: HS Benchmark Case - No New Facilities, Outage: Devers - Valley SC 500kV,
Source File = hs_rev4_v2_deva.nose Chart 2 - SCE



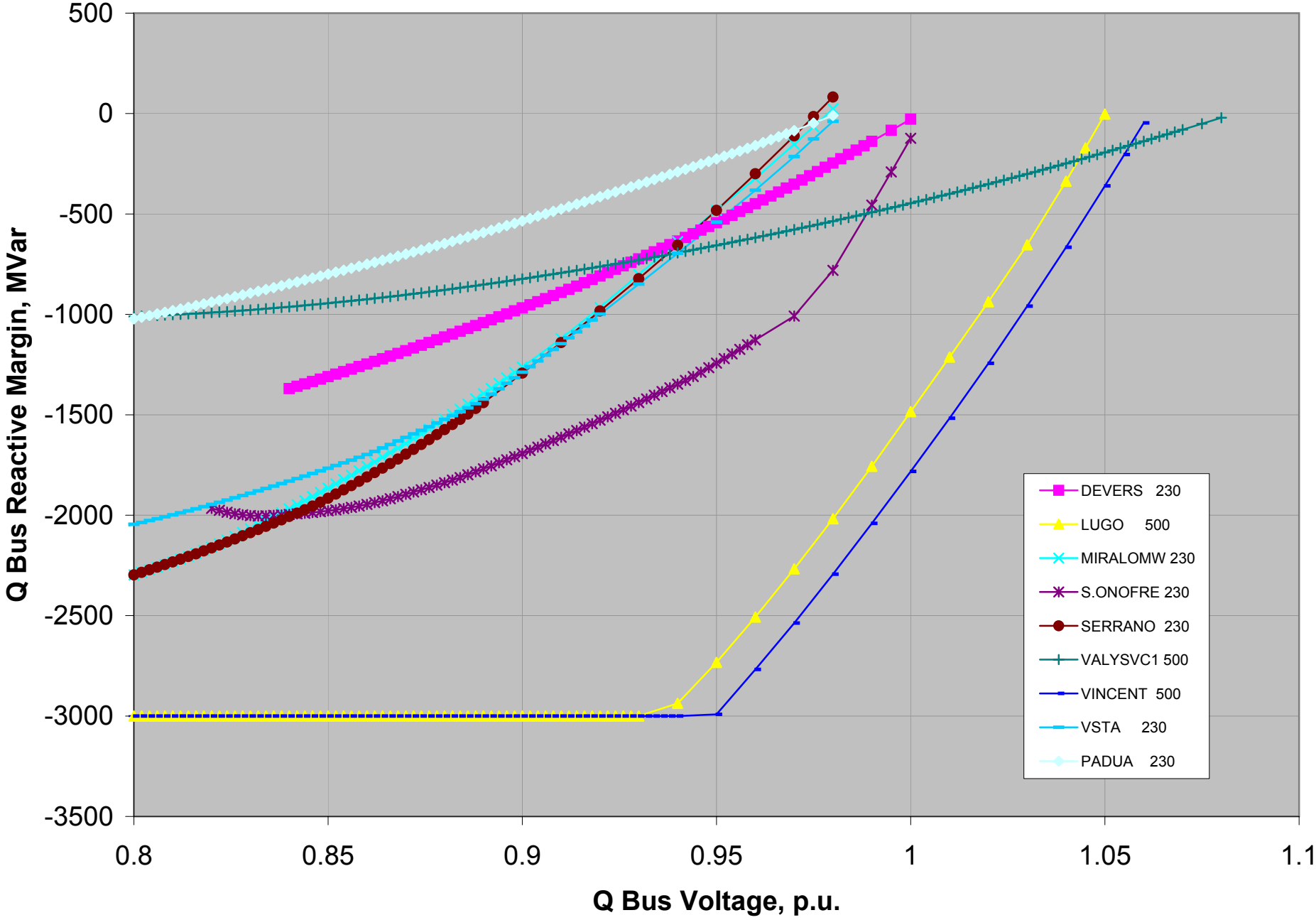
hs_rev4: HS Benchmark Case - No New Facilities, Outage: Devers - Valley SC 500kV,
Source File = hs_rev4_v2_deva.nose Chart 3 - CFE & IID



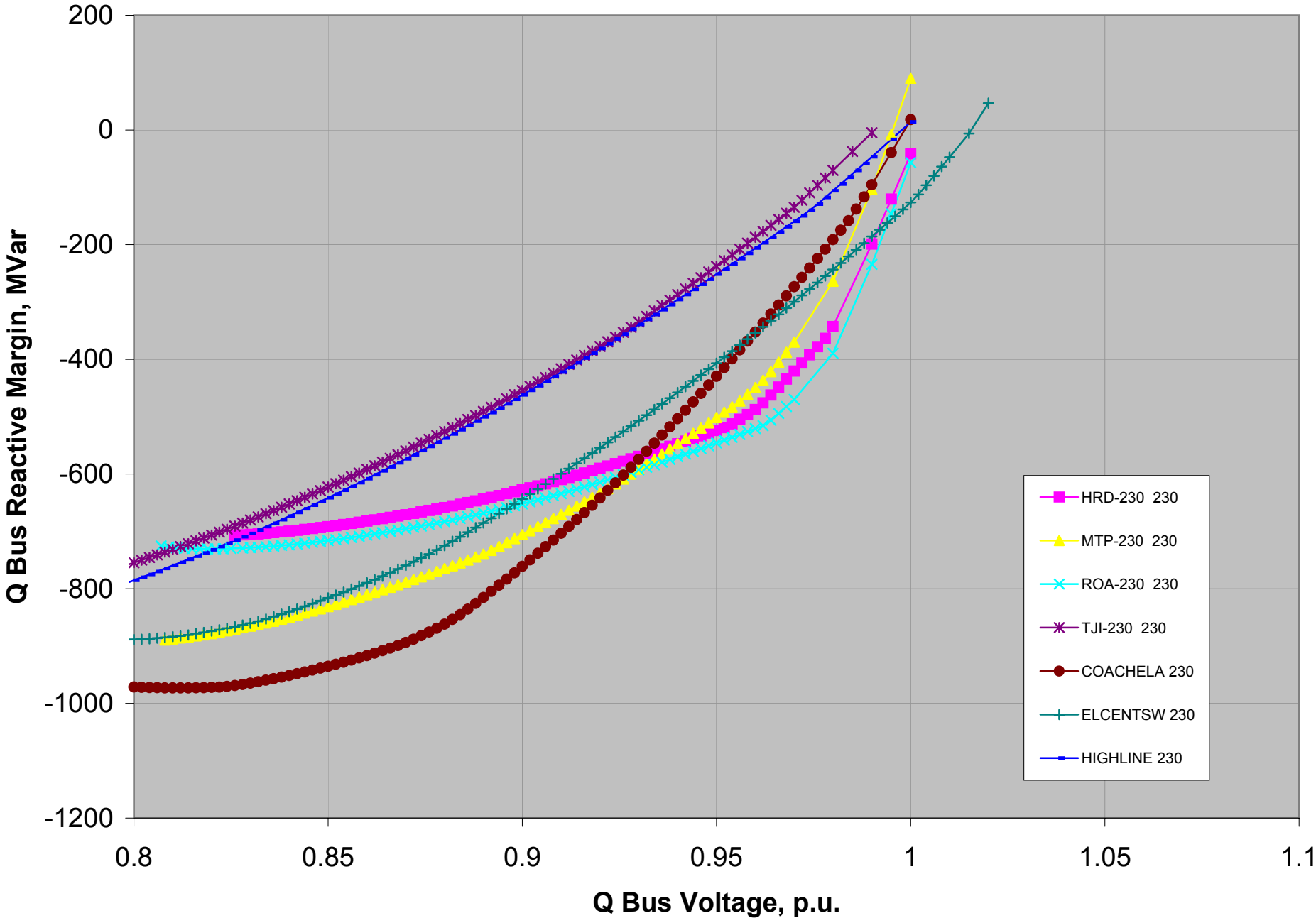
**hs_alt2d1: IV - New San Filipe - CentralX 500, Outage: Devers - Valley SC 500kV**
**Source file = hs_alt2d1_s1_v2_deva.nose Chart 1 - SDG&E**



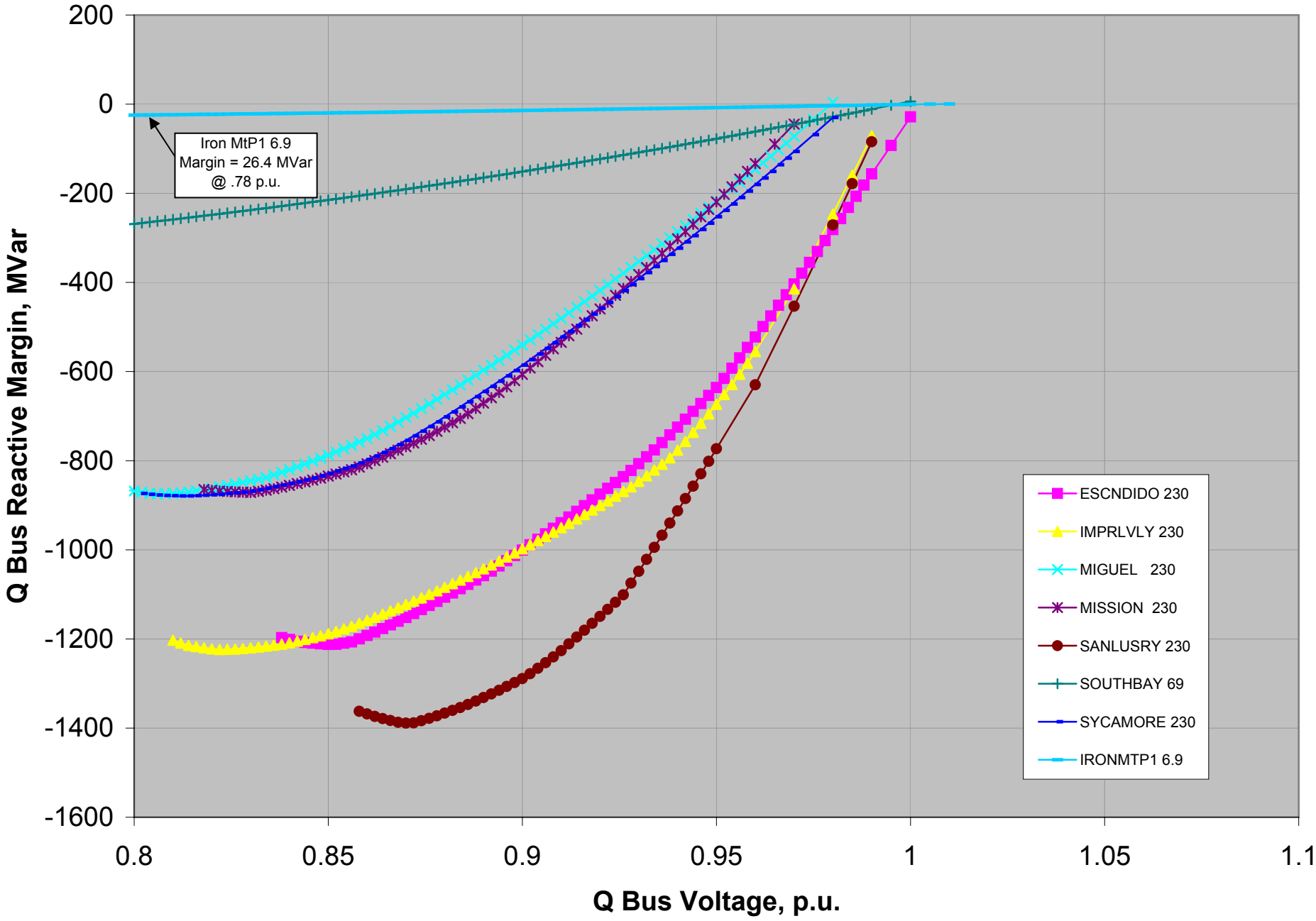
hs_alt2d1: IV - New San Filipe - CentralX 500,  Outage:  Devers - Valley SC 500kV
Source file = hs_alt2d1_s1_v2_deva.nose  Chart 2 - SCE



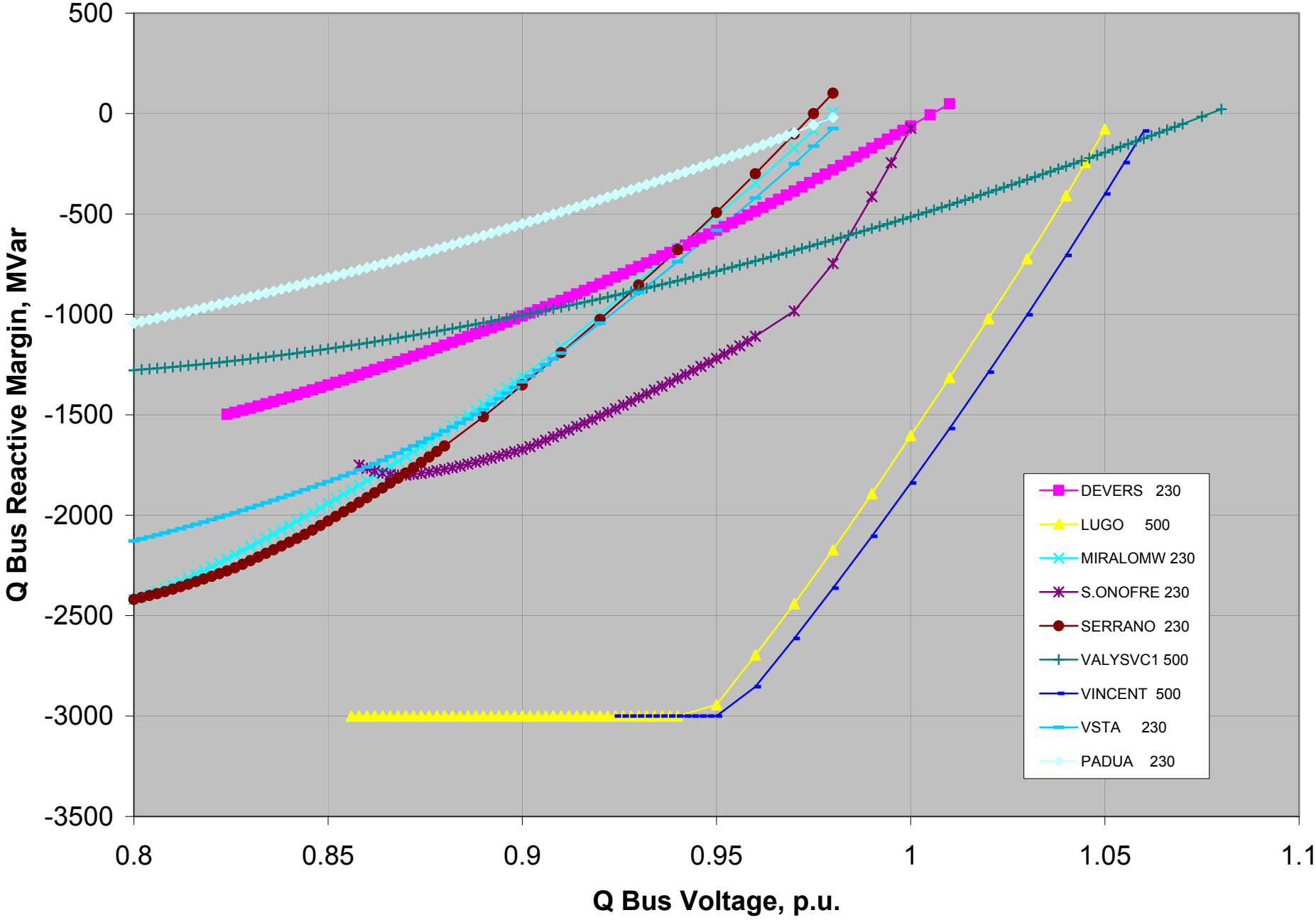
hs_alt2d1: IV - New San Filipe - CentralX 500, Outage: Devers - Valley SC 500kV
Source file = hs_alt2d1_s1_v2_deva.nose Chart 3 - CFE & IID



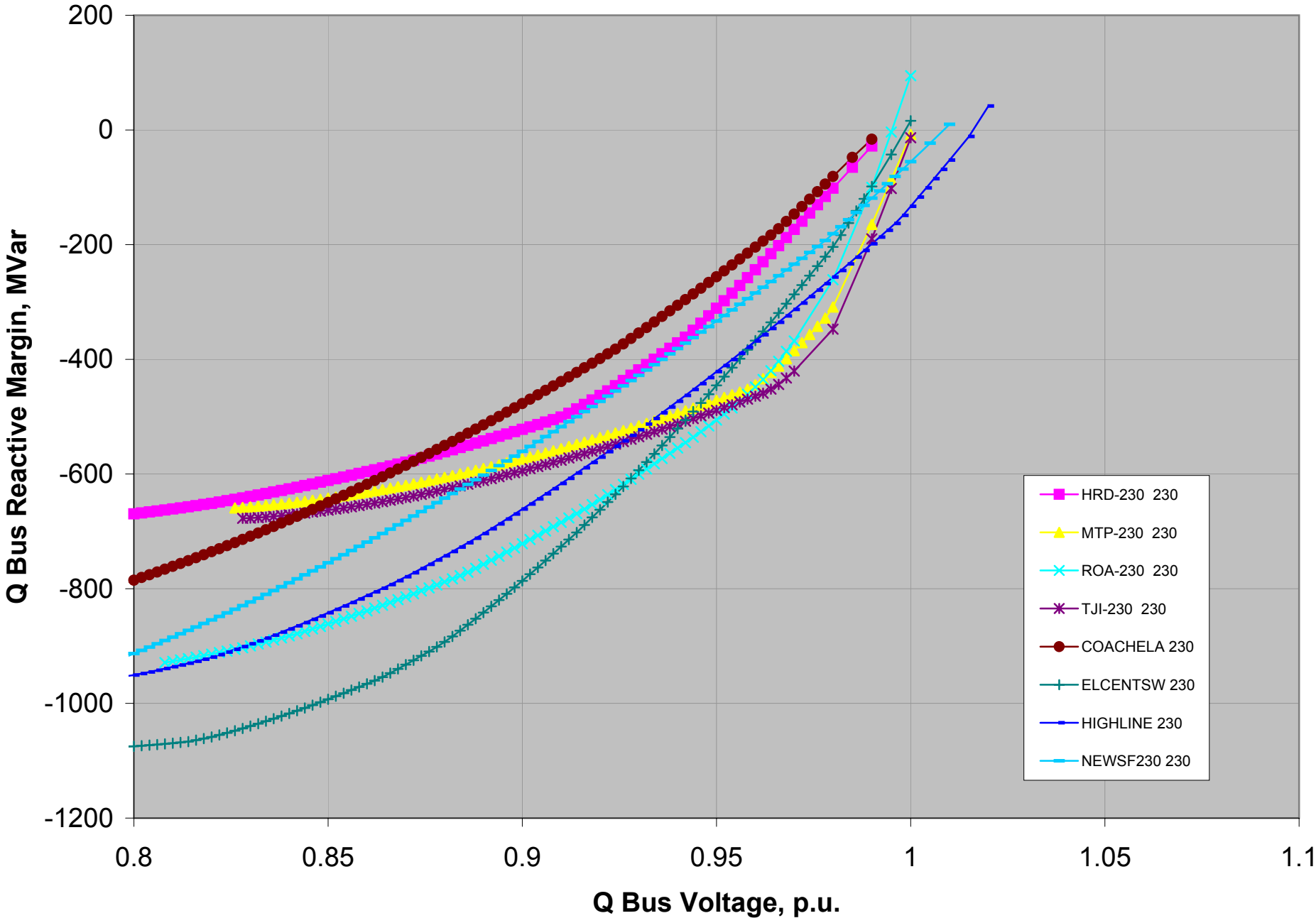
hs_alt3bd1: IV - New San Filipe - North SD - SerVal 500, Outage: Devers - Valley SC 500kV,
Source File = hs_alt3bd1_s1_v2_deva.nose Chart 1 - SDG&E



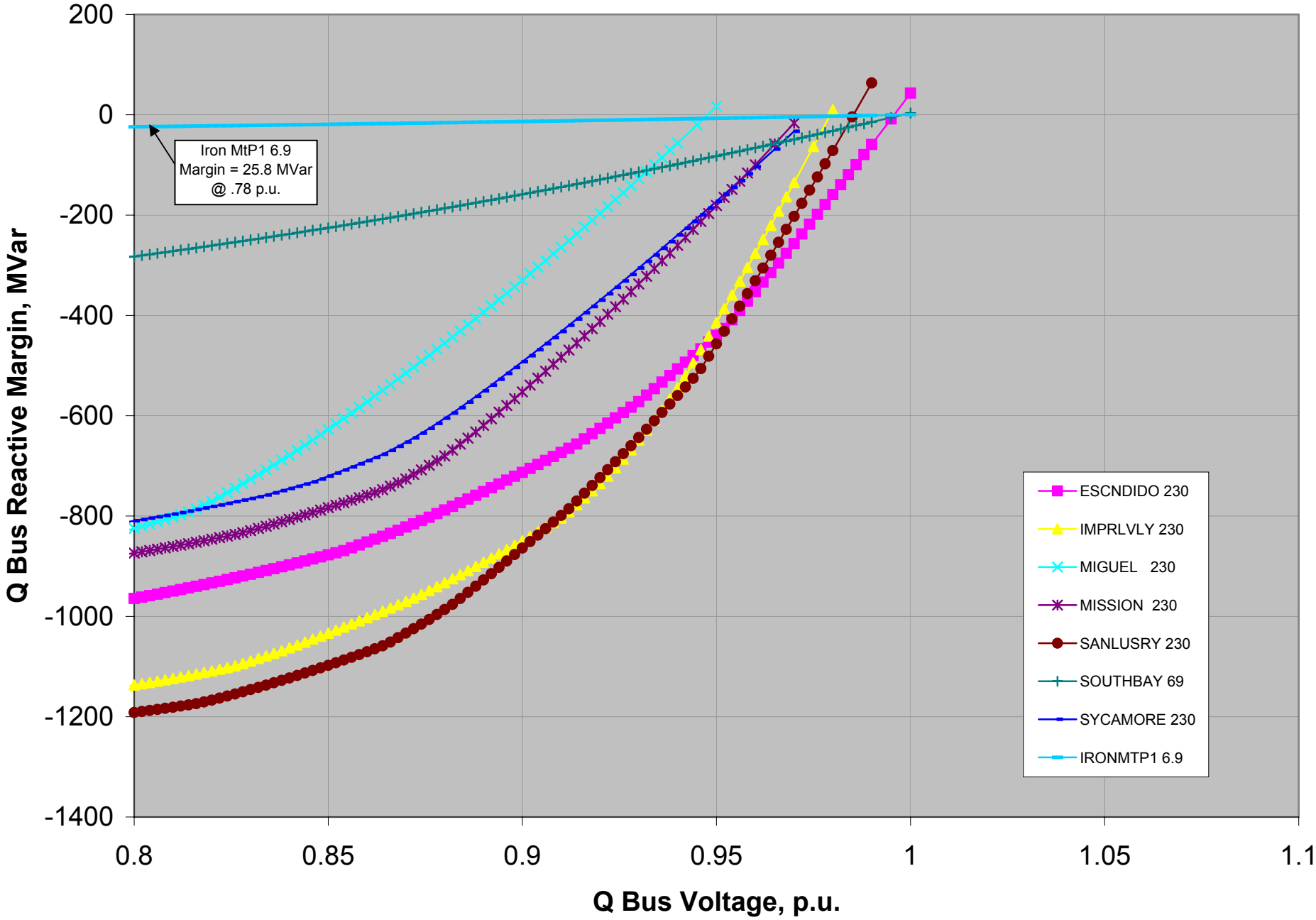
hs_alt3bd1: IV - New San Filipe - North SD - SerVal 500, Outage: Devers - Valley SC 500kV,
Source File = hs_alt3bd1_s1_v2_deva.nose Chart 2 - SCE



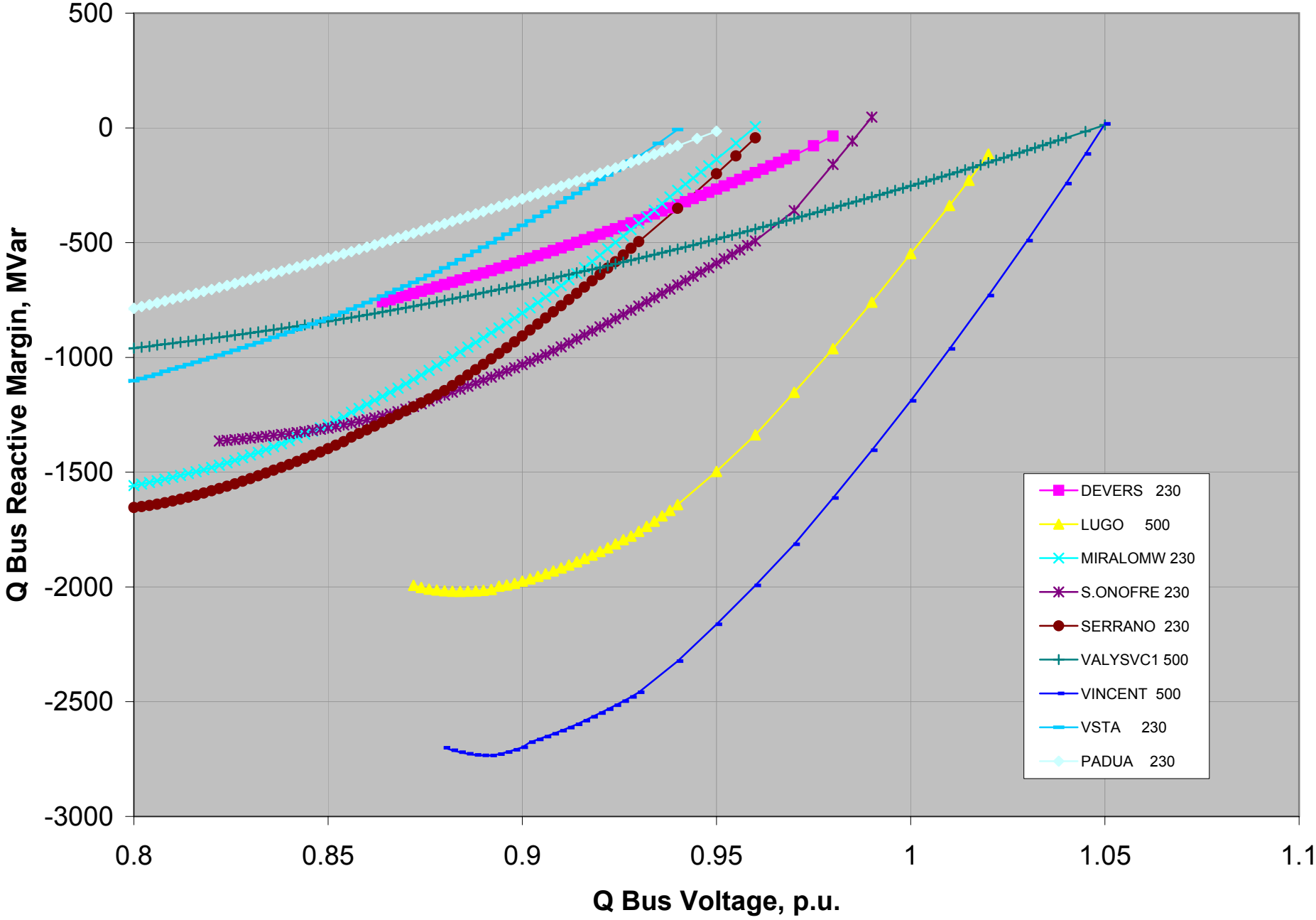
hs_alt3bd1: IV - New San Filipe - North SD - SerVal 500, Outage: Devers - Valley SC 500kV,
Source File = hs_alt3bd1_s1_v2_deva.nose Chart 3 - CFE & IID



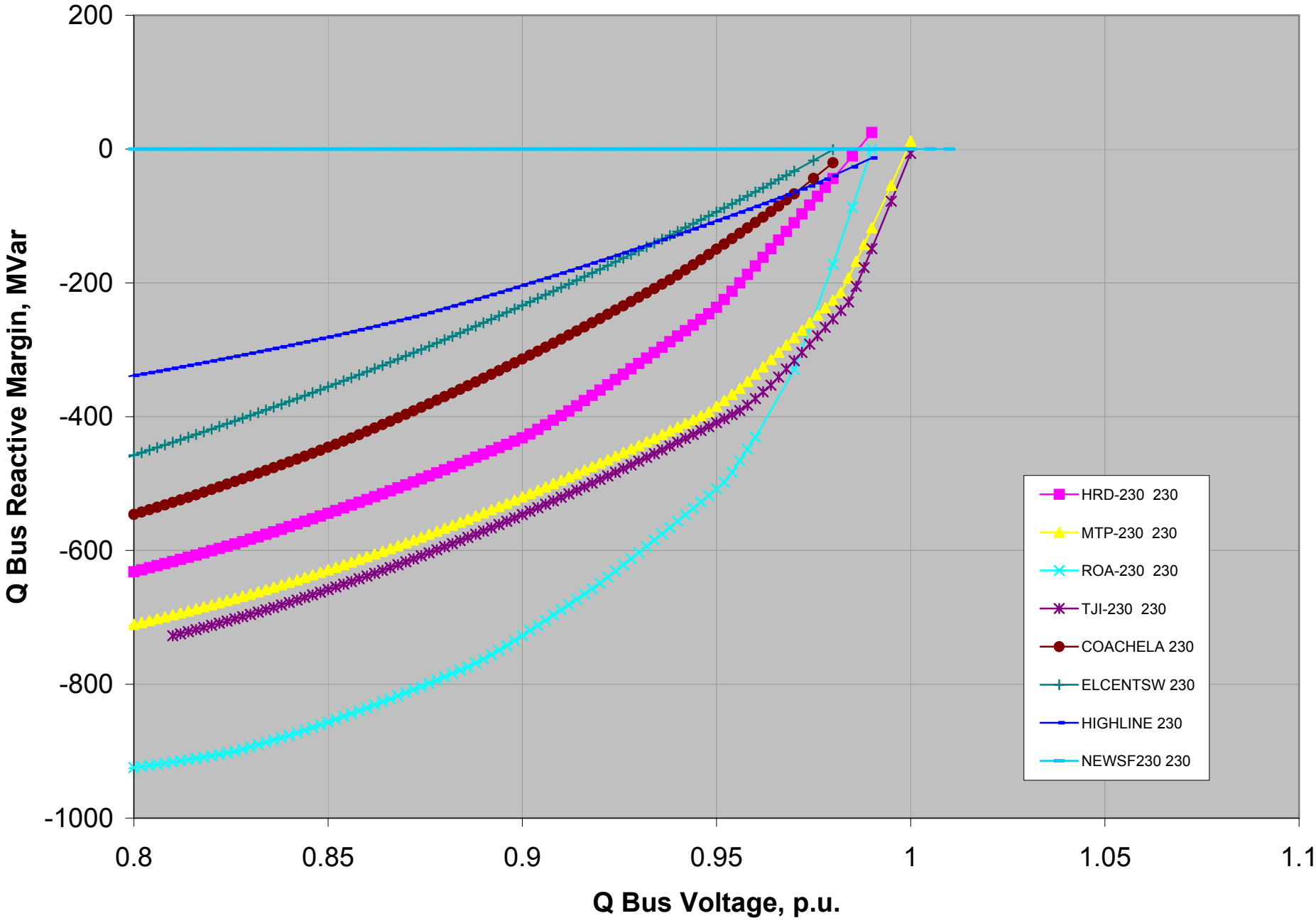
la_rev5: LA Benchmark Case - No New Facilities, Outage: Devers - Valley SC 500kV,
Source File = la_rev5_v2_deva.nose Chart 1 - SDG&E



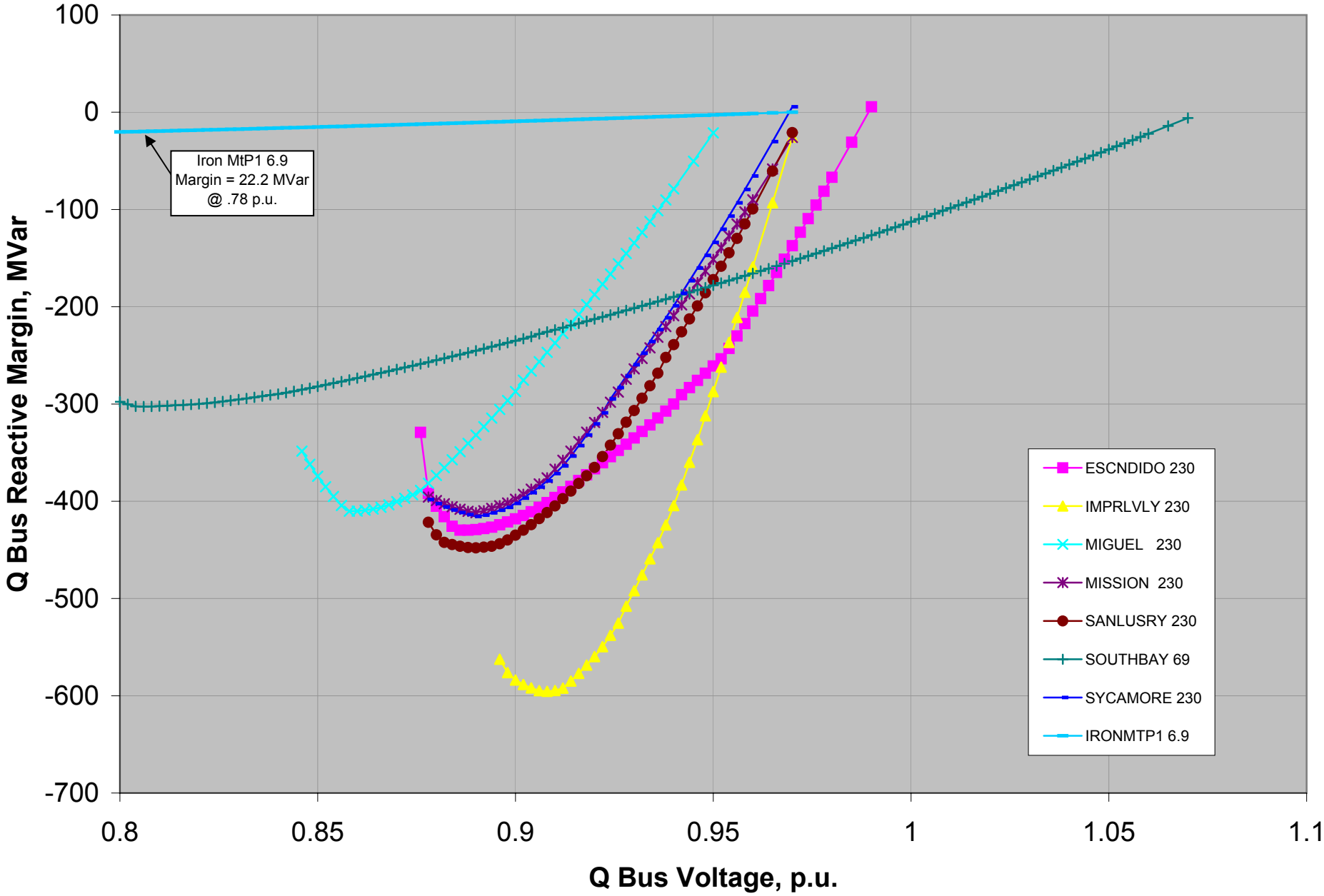
la_rev5: LA Benchmark Case - No New Facilities, Outage: Devers - Valley SC 500kV,
Source File = la_rev5_v2_deva.nose Chart 2 - SCE



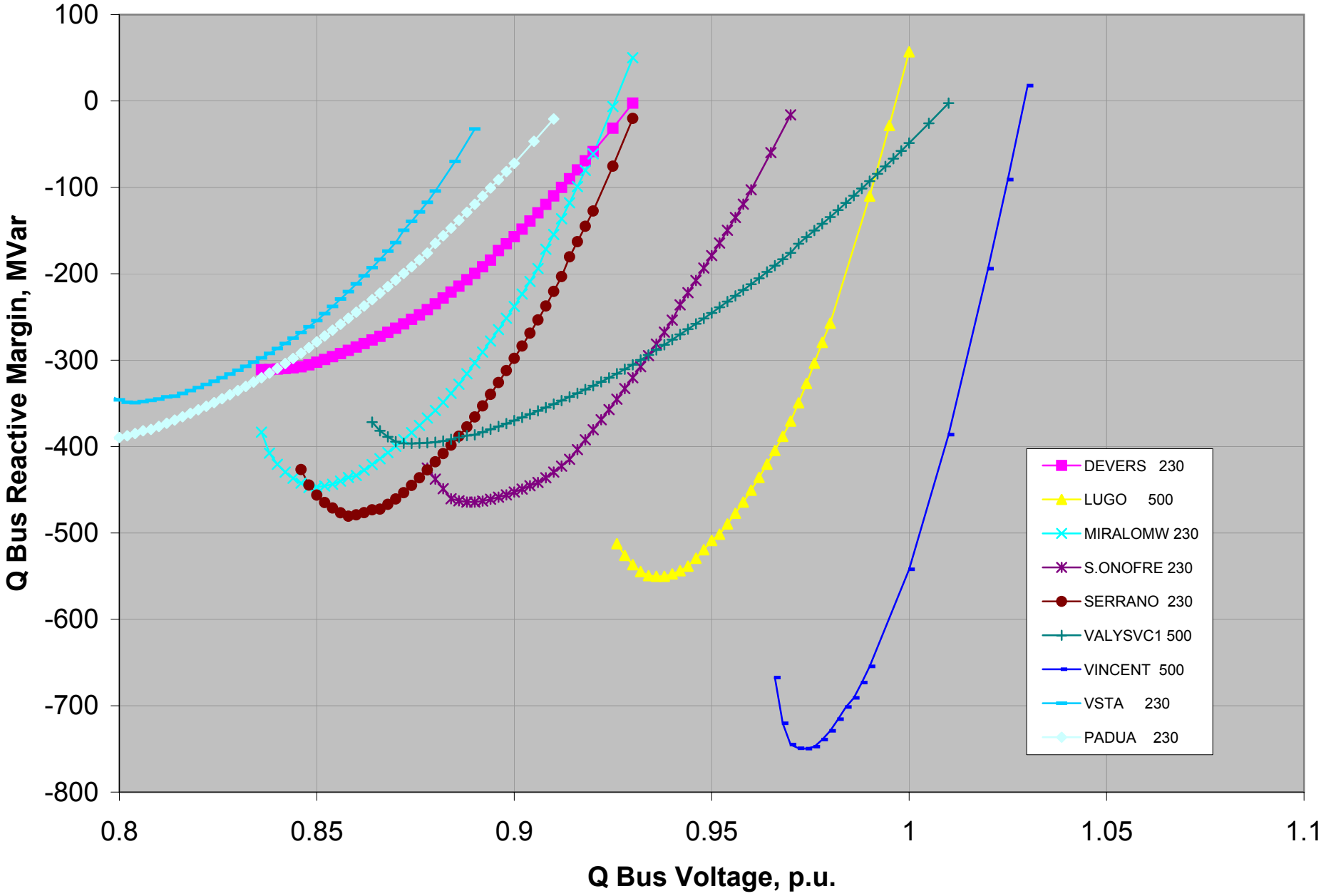
la_rev5: LA Benchmark Case - No New Facilities, Outage: Devers - Valley SC 500kV,
Source File = la_rev5_v2_deva.nose Chart 3 - CFE & IID



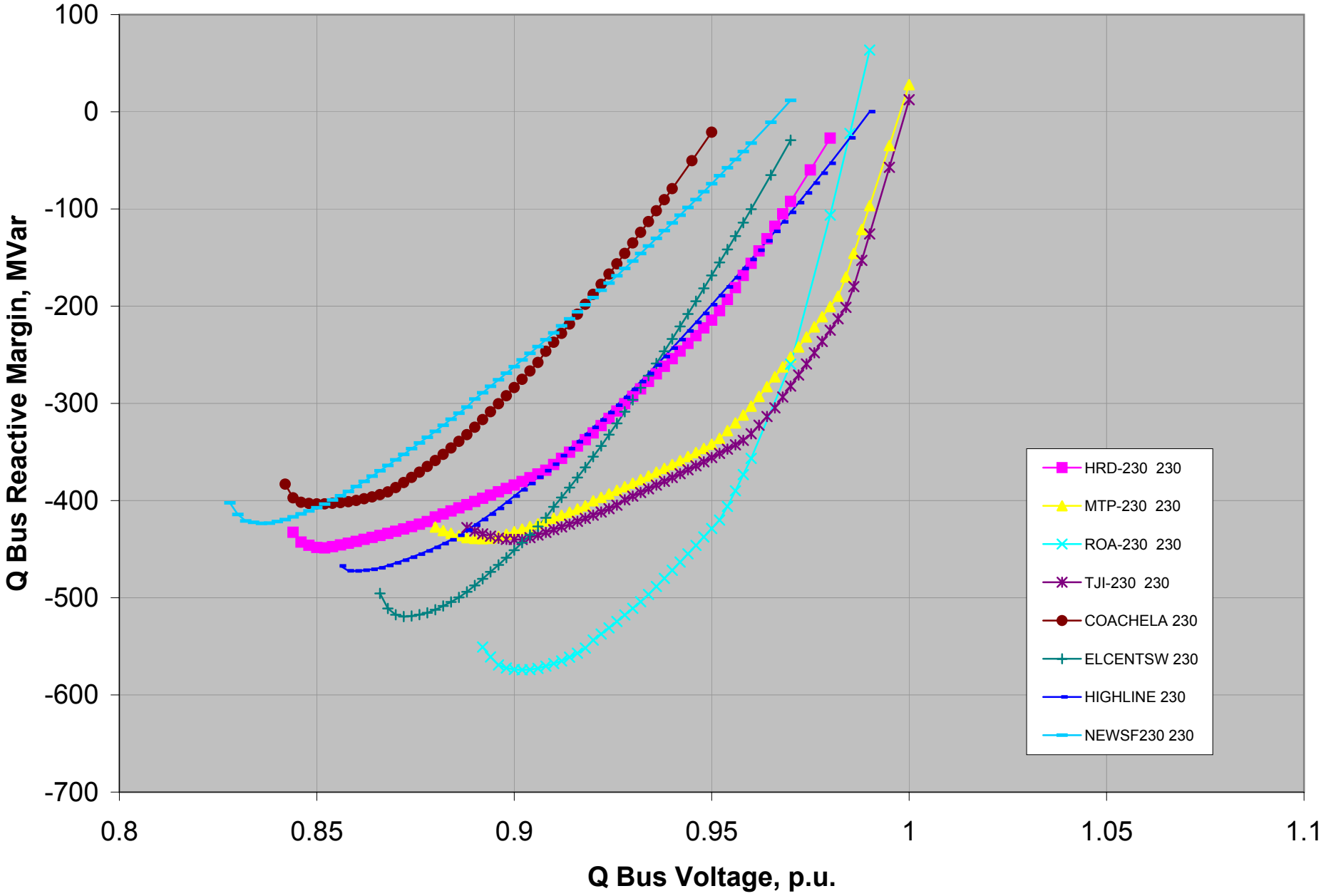
**la_alt2ad3: IV - New San Filipe - CentralX 500 & IH 500/230 To Coachella,**
**Outage: Devers - Valley SC 500kV,**
**Source File = la_alt2ad3_s1_v2_deva_caps.nose Chart 1 - SDG&E**

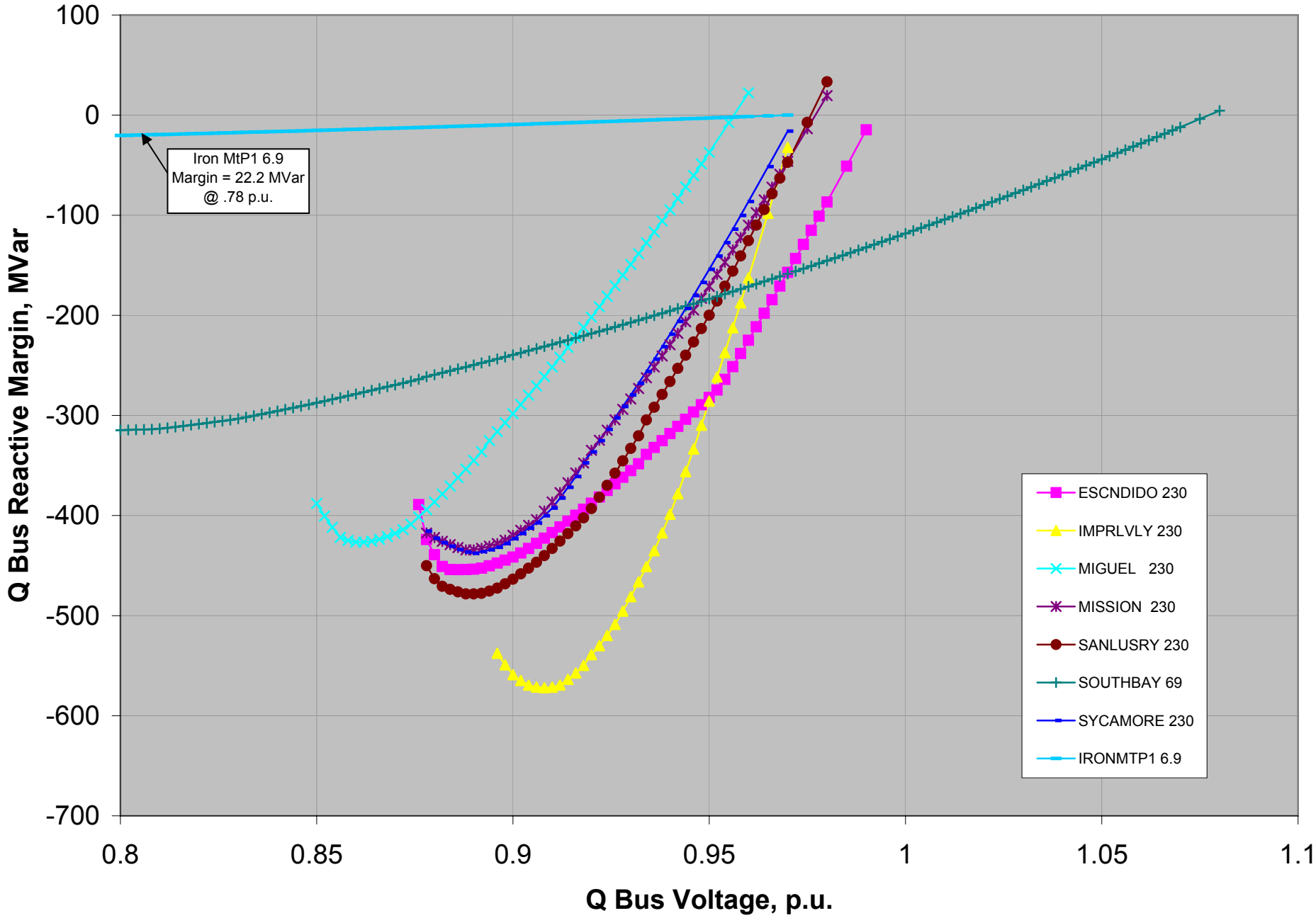


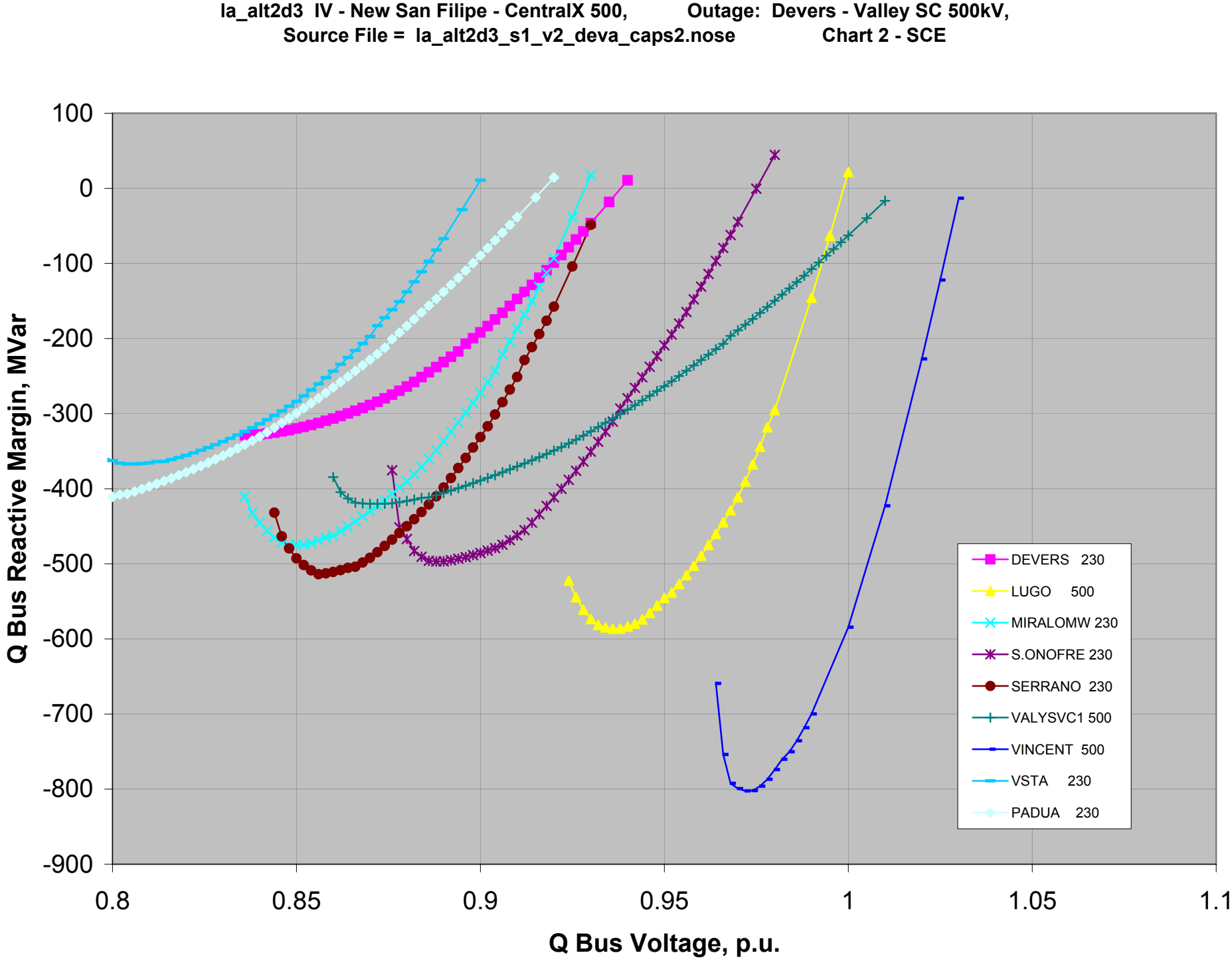
**la_alt2ad3: IV - New San Filipe - CentralX 500 & IH 500/230 To Coachella,**
**Outage: Devers - Valley SC 500kV,**
**Source File = la_alt2ad3_s1_v2_deva_caps.nose Chart 2 - SCE**



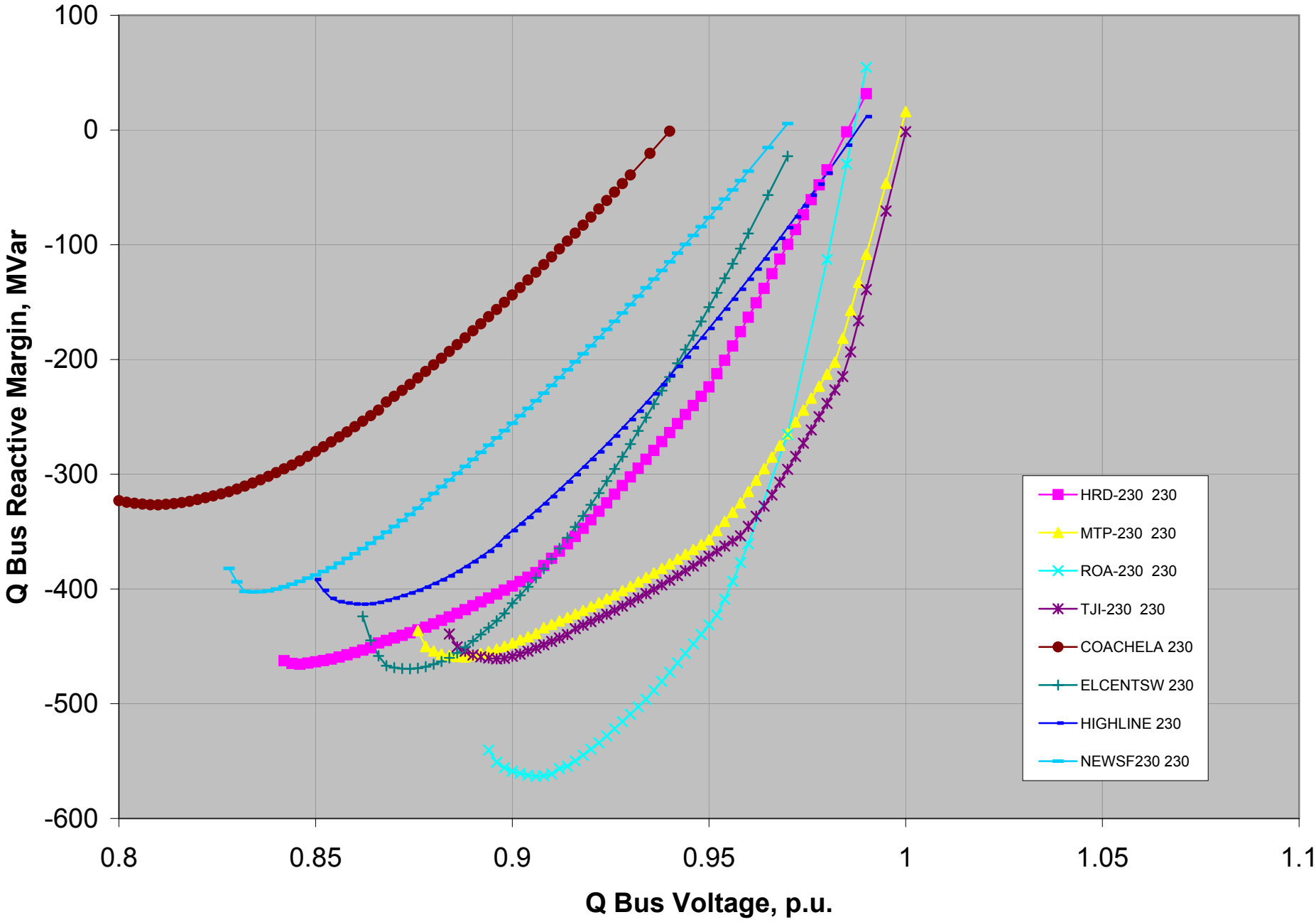
**Ia_alt2ad3: IV - New San Filipe - CentralX 500 & IH 500/230 To Coachella,**
**Outage: Devers - Valley SC 500kV,**
**Source File = Ia_alt2ad3_s1_v2_deva_caps.nose Chart 3 - CFE & IID**

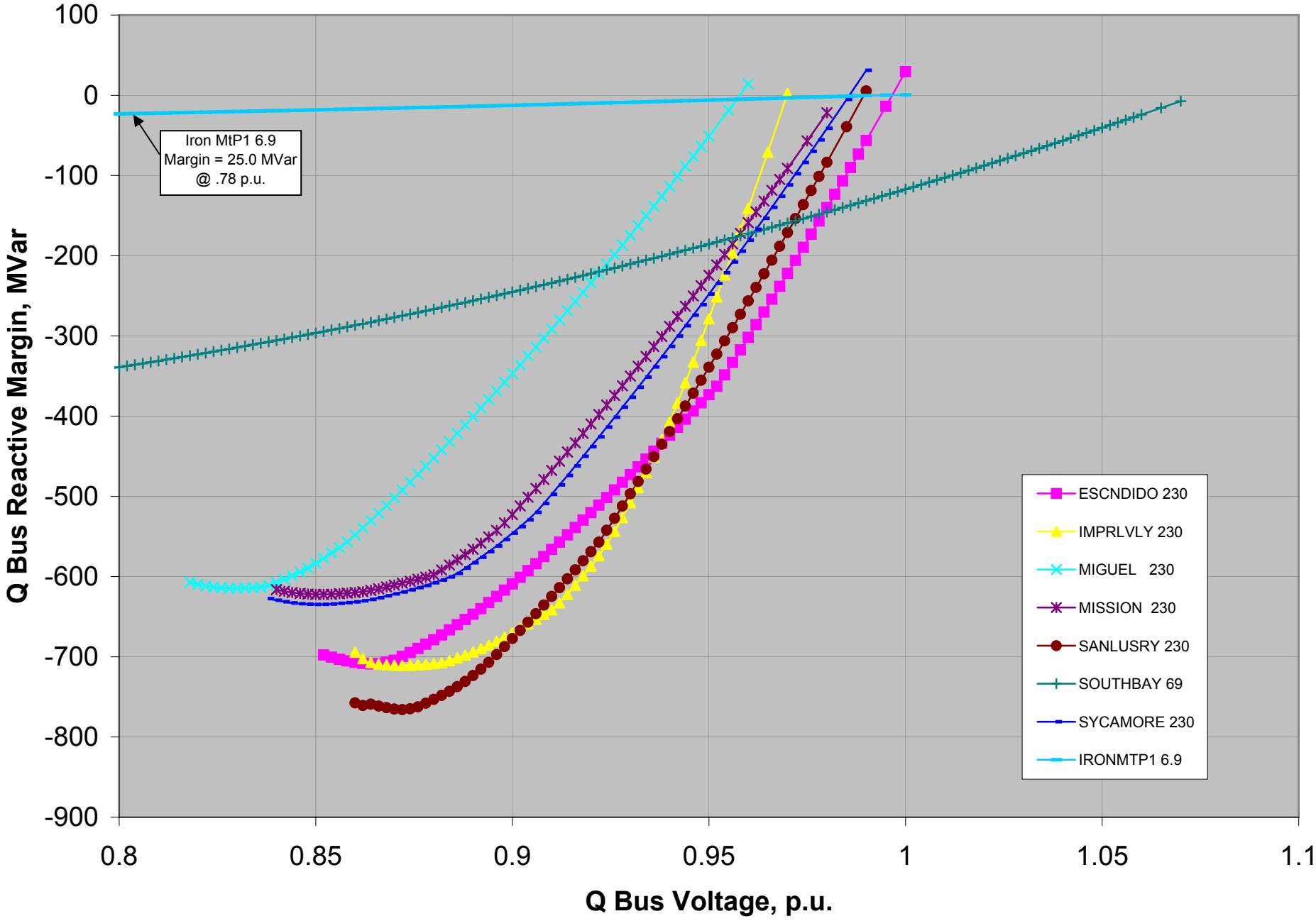


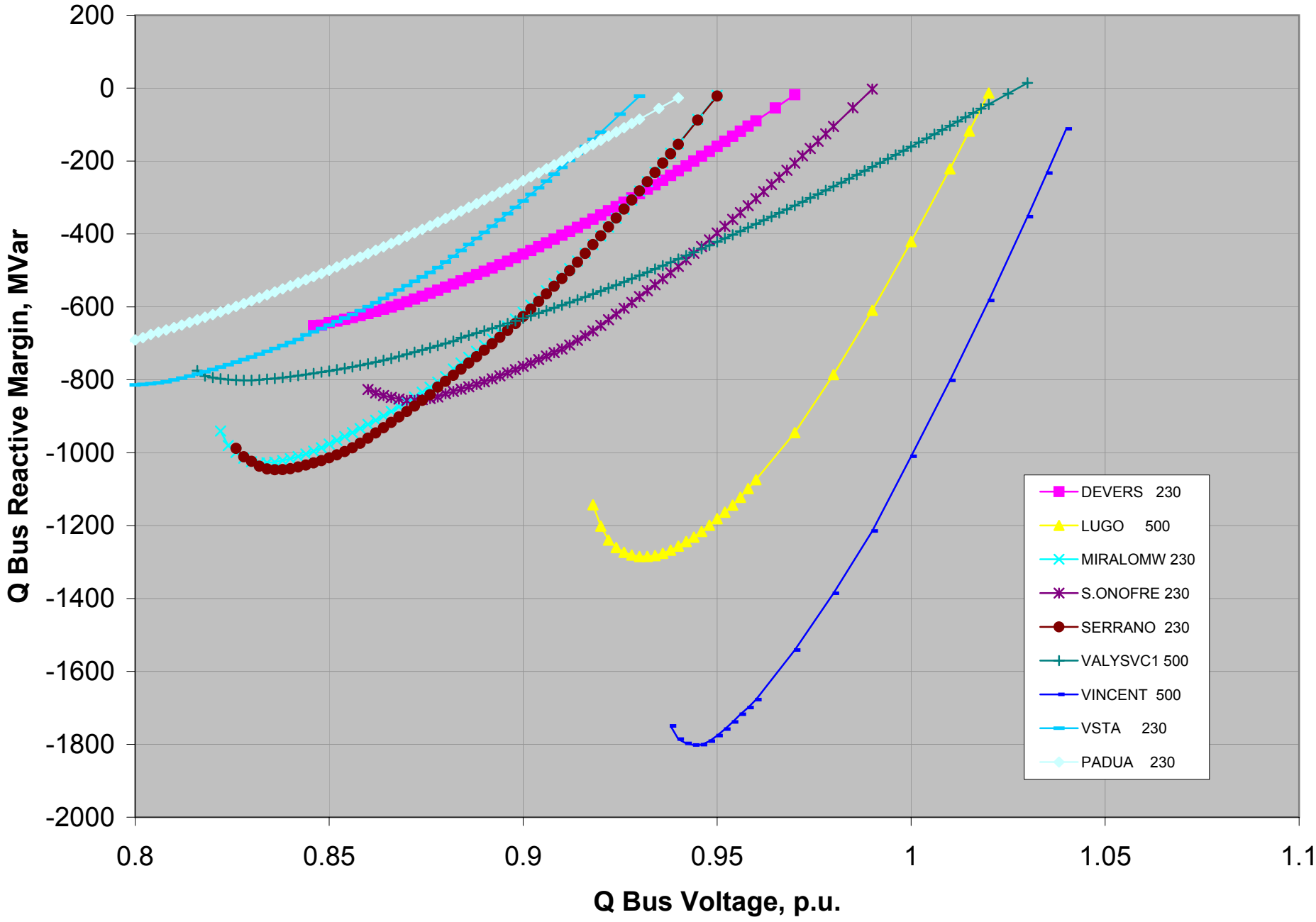

la_alt2d3 IV - New San Filipe - CentralX 500, Outage: Devers - Valley SC 500kV,
Source File = la_alt2d3_s1_v2_deva_caps2.nose Chart 1 - SDG&E
Iron MtP1 6.9
Margin = 22.2 MVar
@ .78 p.u.
Q Bus Reactive Margin, MVar
Q Bus Voltage, p.u.
100
0
-100
-200
-300
-400
-500
-600
-700
0.8
0.85
0.9
0.95
1
1.05
1.1
ESCNDIDO 230
IMPRLVLY 230
MIGUEL 230
MISSION 230
SANLUSRY 230
SOUTHBAY 69
SYCAMORE 230
IRONMTP1 6.9


la_alt2d3 IV - New San Filipe - CentralX 500, Outage: Devers - Valley SC 500kV,
Source File = la_alt2d3_s1_v2_deva_caps2.nose Chart 2 - SCE
Q Bus Reactive Margin, MVar
100
0
-100
-200
-300
-400
-500
-600
-700
-800
-900
0.8
0.85
0.9
0.95
1
1.05
1.1
Q Bus Voltage, p.u.
DEVERS 230
LUGO 500
MIRALOMW 230
S.ONOFRE 230
SERRANO 230
VALYSVC1 500
VINCENT 500
VSTA 230
PADUA 230

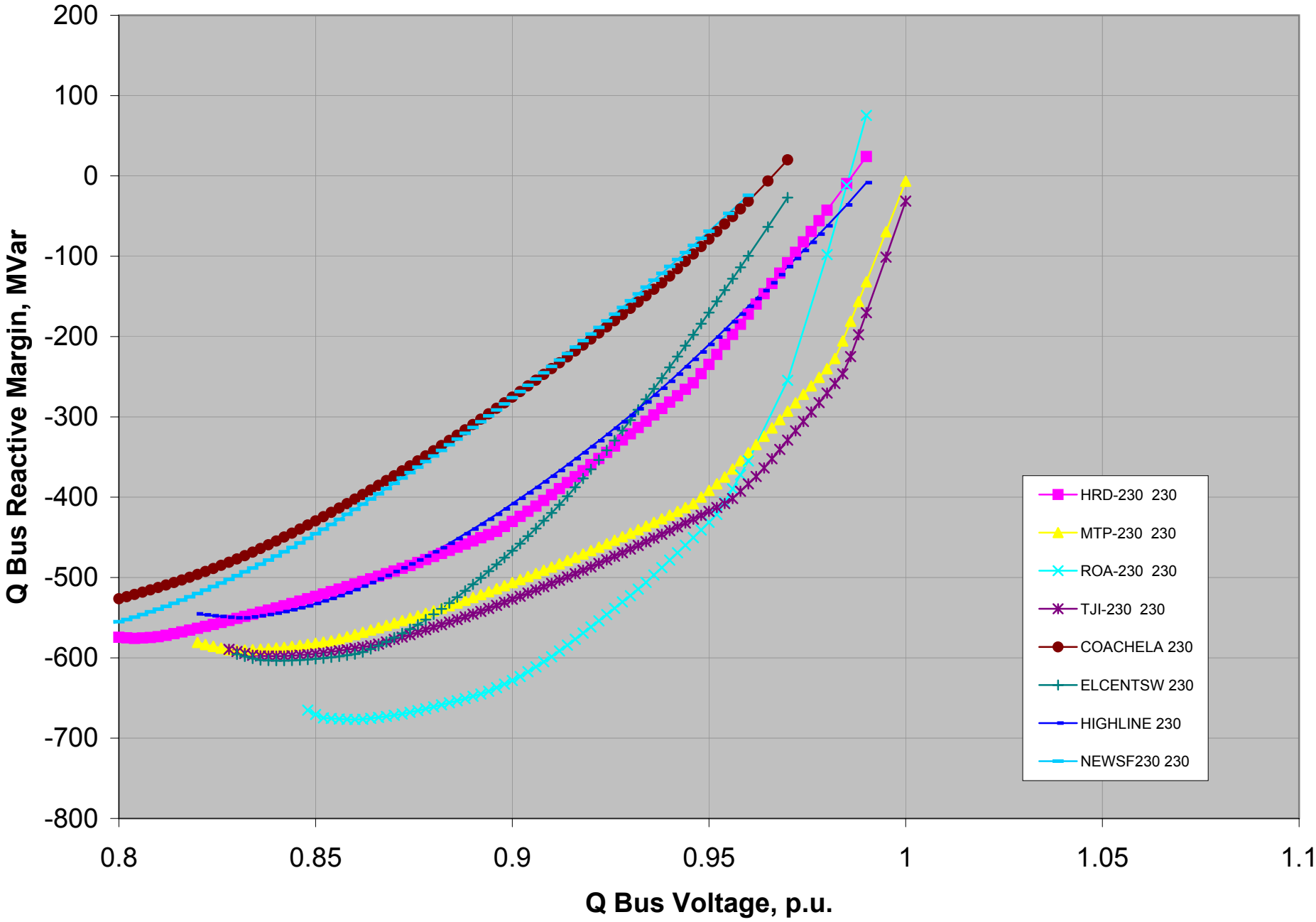
la_alt2d3 IV - New San Filipe - CentralX 500, Outage: Devers - Valley SC 500kV,
Source File = la_alt2d3_s1_v2_deva_caps2.nose Chart 3 - CFE & IID



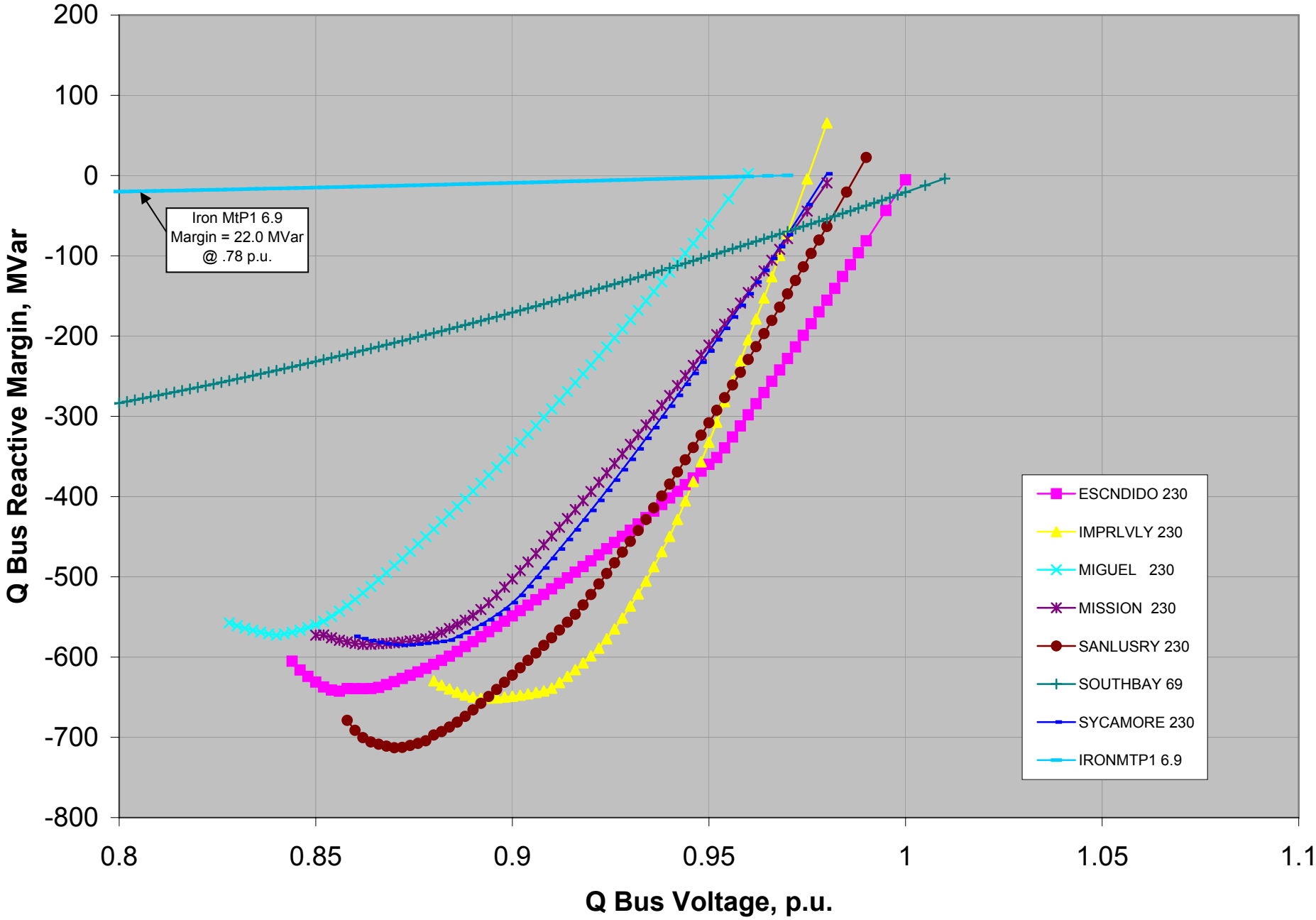

la_alt3bd3: IV - New San Filipe - North SD - SerVal 500, Outage: Devers - Valley SC 500kV,
Source File = la_alt3bd3_s1_v2_deva_caps.nose Chart 1 - SDG&E
Iron MtP1 6.9
Margin = 25.0 MVar
@ .78 p.u.
Q Bus Reactive Margin, MVar
Q Bus Voltage, p.u.
100
0
-100
-200
-300
-400
-500
-600
-700
-800
-900
0.8
0.85
0.9
0.95
1
1.05
1.1
ESCNDIDO 230
IMPRLVLY 230
MIGUEL 230
MISSION 230
SANLUSRY 230
SOUTHBAY 69
SYCAMORE 230
IRONMTP1 6.9

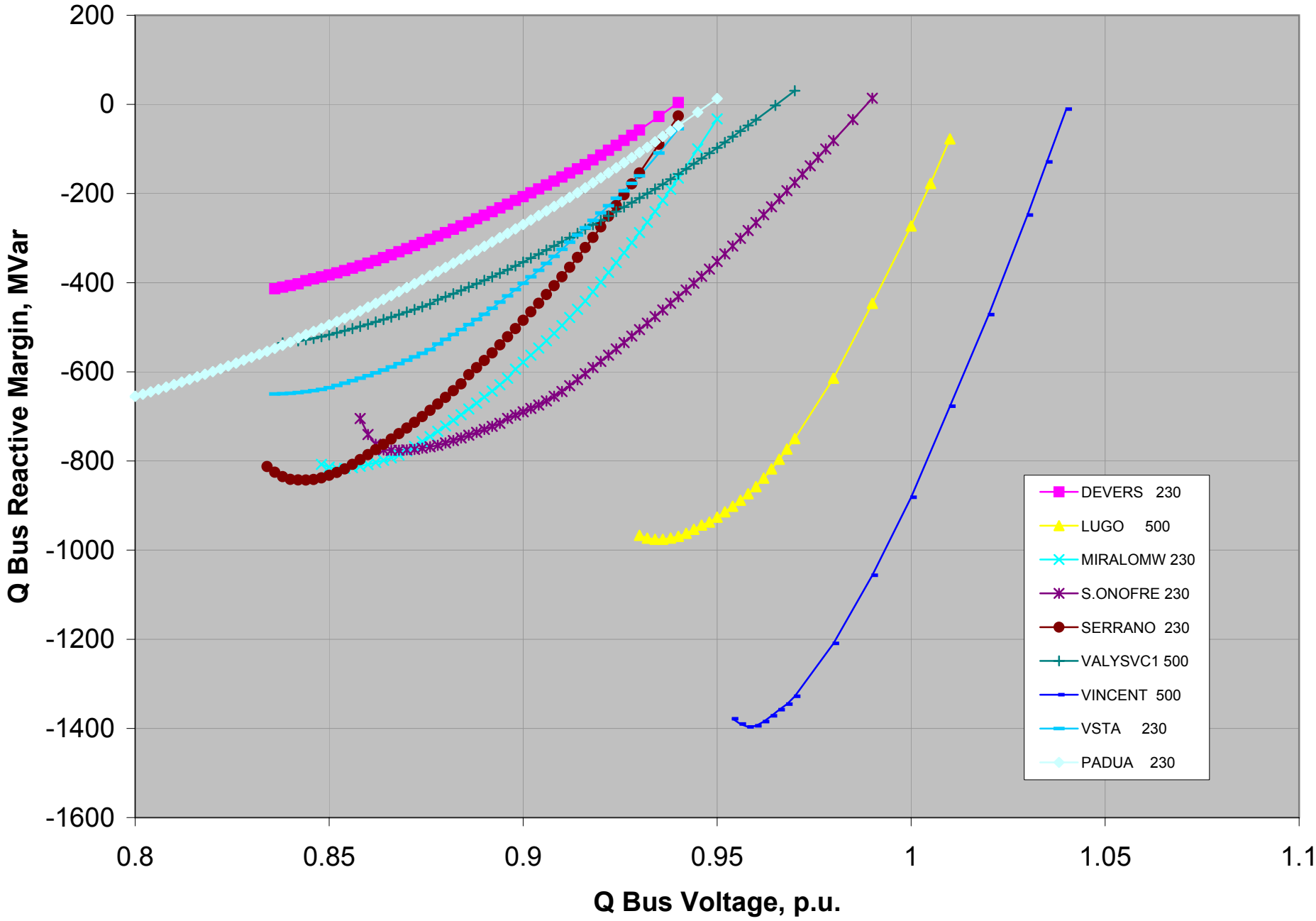

la_alt3bd3: IV - New San Filipe - North SD - SerVal 500, Outage: Devers - Valley SC 500kV,
Source File = la_alt3bd3_s1_v2_deva_caps.nose Chart 2 - SCE
Q Bus Reactive Margin, MVar
200
0
-200
-400
-600
-800
-1000
-1200
-1400
-1600
-1800
-2000
0.8
0.85
0.9
0.95
1
1.05
1.1
Q Bus Voltage, p.u.
DEVERS 230
LUGO 500
MIRALOMW 230
S.ONOFRE 230
SERRANO 230
VALYSVC1 500
VINCENT 500
VSTA 230
PADUA 230

la_alt3bd3: IV - New San Filipe - North SD - SerVal 500, Outage: Devers - Valley SC 500kV,
Source File = la_alt3bd3_s1_v2_deva_caps.nose Chart 3 - CFE & IID

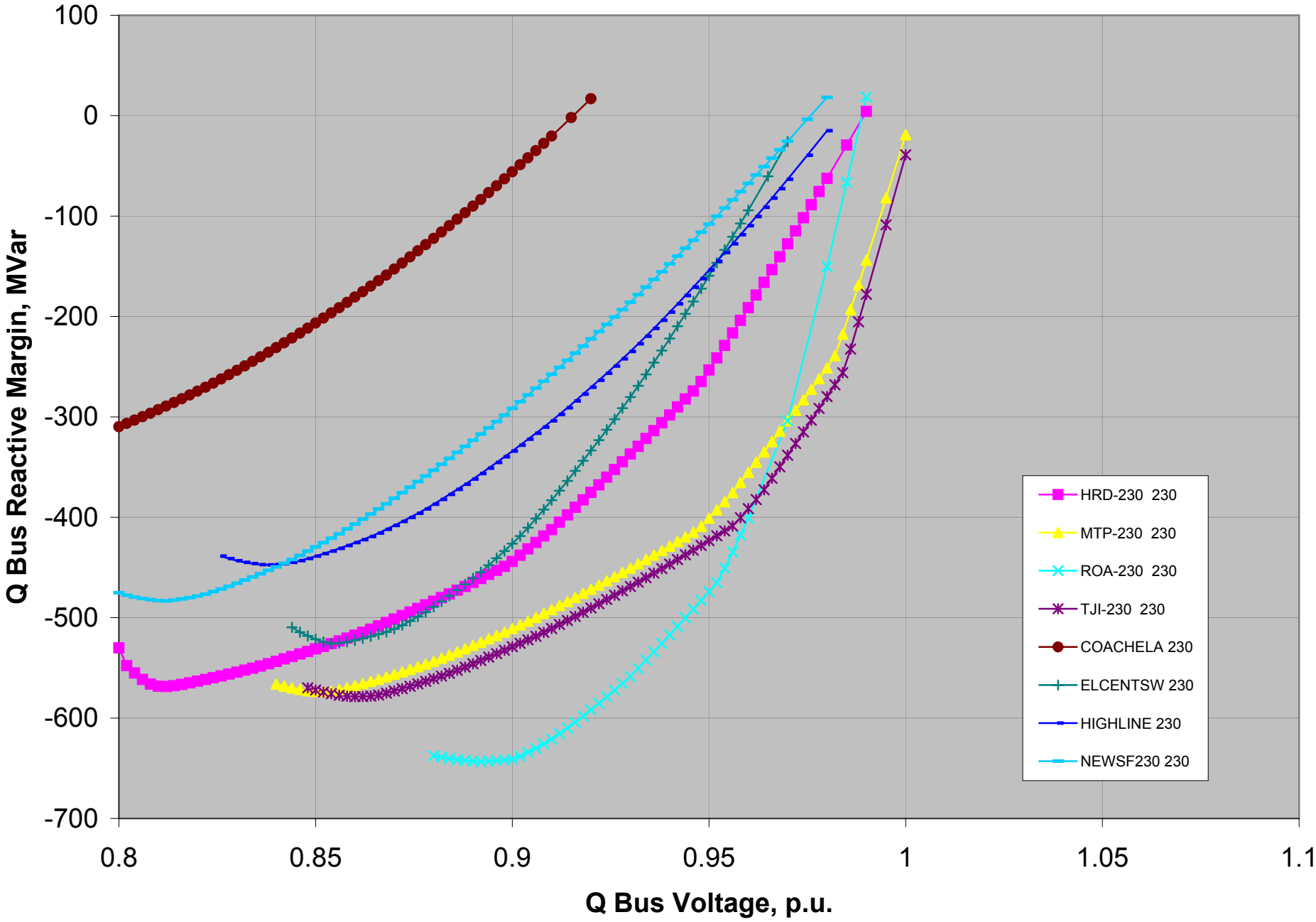


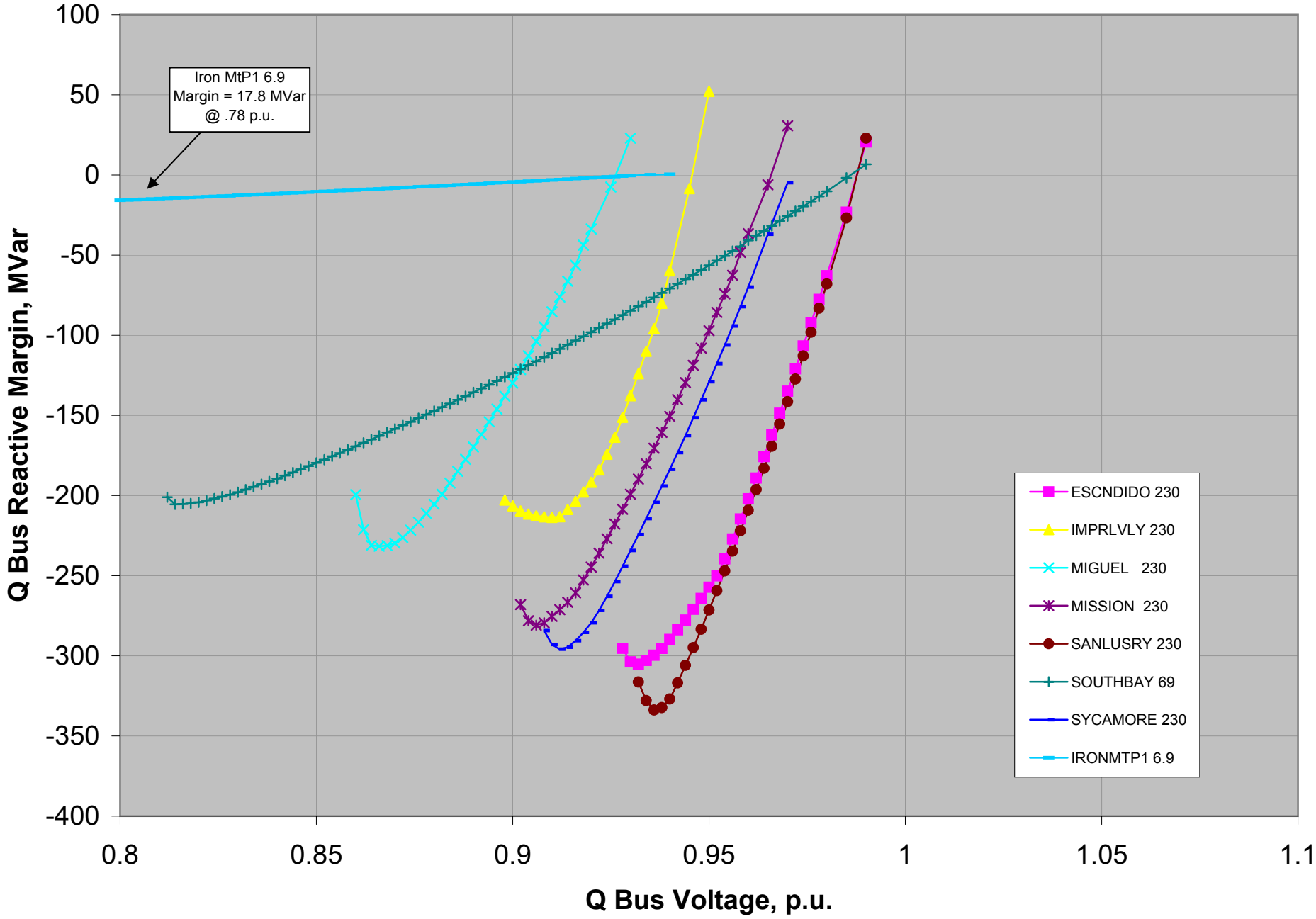
la_alt2d3 IV - New San Filipe - CentralX 500, Outage: East of Devers 500kV SLO,
Source File = la_alt2d3_s1_v2_dv_east-slo.nose Chart 1 - SDG&E

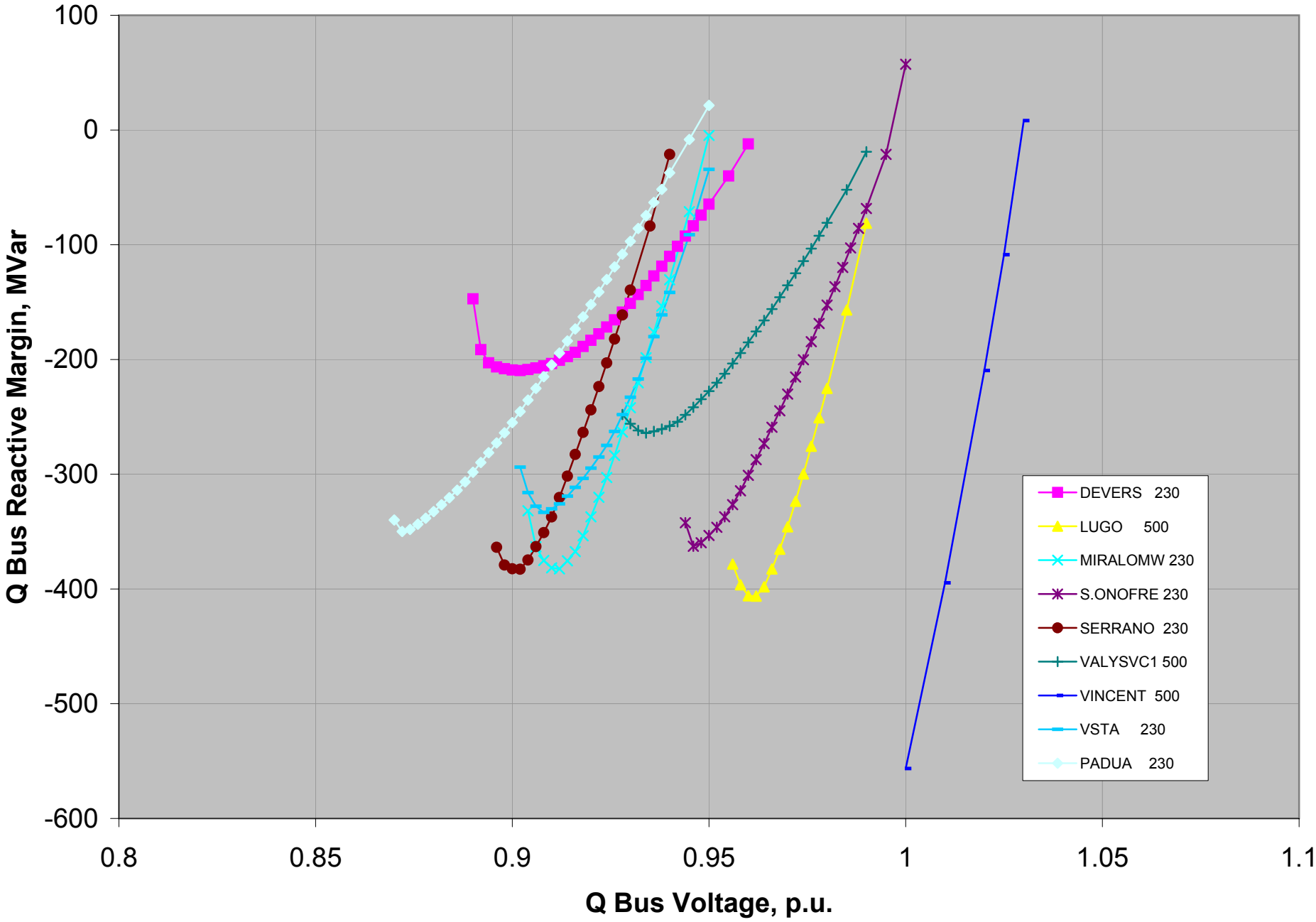



la_alt2d3 IV - New San Filipe - CentralX 500, Outage: East of Devers 500kV SLO,
Source File = la_alt2d3_s1_v2_dv_east-slo.nose Chart 2 - SCE
Q Bus Reactive Margin, MVar
200
0
-200
-400
-600
-800
-1000
-1200
-1400
-1600
0.8
0.85
0.9
0.95
1
1.05
1.1
Q Bus Voltage, p.u.
DEVERS 230
LUGO 500
MIRALOMW 230
S.ONOFRE 230
SERRANO 230
VALYSVC1 500
VINCENT 500
VSTA 230
PADUA 230

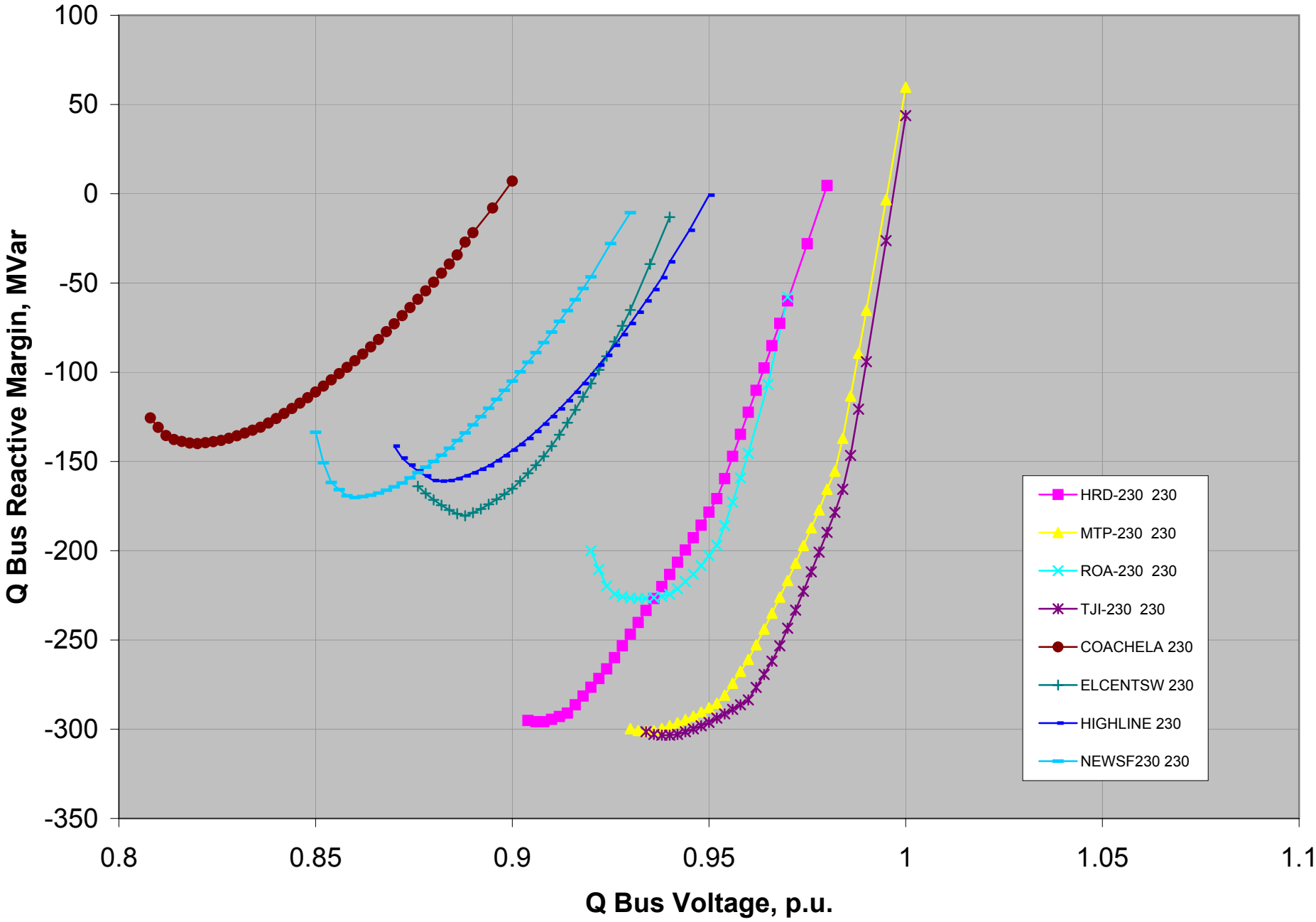
la_alt2d3 IV - New San Filipe - CentralX 500, Outage: East of Devers 500kV SLO,
Source File = la_alt2d3_s1_v2_dv_east-slo.nose Chart 3 - CFE & IID




la_alt3bd3: IV - New San Filipe - North SD - SerVal 500, Outage: East of Devers 500kV DLO,
Source File = la_alt3bd3_s1_v2_dvmp12_Caps.nose Chart 1 - SDG&E
Iron MtP1 6.9
Margin = 17.8 MVar
@ .78 p.u.
Q Bus Reactive Margin, MVar
Q Bus Voltage, p.u.
100
50
0
-50
-100
-150
-200
-250
-300
-350
-400
0.8
0.85
0.9
0.95
1
1.05
1.1
ESCNDIDO 230
IMPRLVLY 230
MIGUEL 230
MISSION 230
SANLUSRY 230
SOUTHBAY 69
SYCAMORE 230
IRONMTP1 6.9


la_alt3bd3: IV - New San Filipe - North SD - SerVal 500, Outage: East of Devers 500kV DLO,
Source File = la_alt3bd3_s1_v2_dvmp12_Caps.nose Chart 2 - SCE
Q Bus Reactive Margin, MVar
100
0
-100
-200
-300
-400
-500
-600
0.8
0.85
0.9
0.95
1
1.05
1.1
Q Bus Voltage, p.u.
DEVERS 230
LUGO 500
MIRALOMW 230
S.ONOFRE 230
SERRANO 230
VALYSVC1 500
VINCENT 500
VSTA 230
PADUA 230

la_alt3bd3: IV - New San Filipe - North SD - SerVal 500, Outage: East of Devers 500kV DLO,
Source File = la_alt3bd3_s1_v2_dvmp12_Caps.nose Chart 3 - CFE & IID



# Imperial Valley Study Group

## Appendix D.1.3

Tables

| Switch-Deck | OUTAGE DESCRIPTION | Q Bus Name | Margin Criteria, MVar | Q V MARGIN ANALYSIS RESULTS (Results shown as "- - -" when margin is greater than 200% of the margin critera) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | hs_rev4_v2 | | hs_alt2d1_s1_v2 | | hs_alt3bd1_s1_v2 | | la_rev5_v2 | | la_alt2ad3_s1_v2 | | la_alt2d3_s1_v2 | | la_alt3bd3_s1_v2 | |
| | | | | MVar | Crit.,% | MVar | Crit.,% | MVar | Crit.,% | MVar | Crit.,% | MVar | Crit.,% | MVar | Crit.,% | MVar | Crit.,% |
| **SINGLE CONTINGENCIES:** | | | | | | | | | | | | | | | | | |
| NSF_West | San Filipe - Cental X 500kV | HRD-230 230 | 100 | | | 595 | - - - | 567 | - - - | | | 516 | - - - | 493 | - - - | 603 | - - - |
| | | MTP-230 230 | 100 | | | 587 | - - - | 553 | - - - | | | 528 | - - - | 506 | - - - | 640 | - - - |
| | - or - | ROA-230 230 | 100 | | | 741 | - - - | 706 | - - - | | | 711 | - - - | 647 | - - - | 776 | - - - |
| | | TJI-230 230 | 100 | | | 602 | - - - | 562 | - - - | | | 535 | - - - | 513 | - - - | 657 | - - - |
| | San Filipe - North SD 500kV | COACHELA 230 | 100 | | | 724 | - - - | 679 | - - - | | | 776 | - - - | 506 | - - - | 551 | - - - |
| | | ELCENTSW 230 | 100 | | | 813 | - - - | 787 | - - - | | | 731 | - - - | 608 | - - - | 708 | - - - |
| | | HIGHLINE 230 | 100 | | | 755 | - - - | 728 | - - - | | | 686 | - - - | 553 | - - - | 630 | - - - |
| | | NEWSF230 230 | 100 | | | 713 | - - - | 689 | - - - | | | 672 | - - - | 570 | - - - | 661 | - - - |
| | | ESCNDIDO 230 | 150 | | | 1080 | - - - | 1093 | - - - | | | 651 | - - - | 628 | - - - | 889 | - - - |
| | | IMPRLVLY 230 | 150 | | | 886 | - - - | 842 | - - - | | | 801 | - - - | 700 | - - - | 836 | - - - |
| | | MIGUEL 230 | 150 | | | 747 | - - - | 667 | - - - | | | 564 | - - - | 531 | - - - | 711 | - - - |
| | | MISSION 230 | 150 | | | 814 | - - - | 701 | - - - | | | 576 | - - - | 549 | - - - | 731 | - - - |
| | | SANLUSRY 230 | 150 | | | 1326 | - - - | 1241 | - - - | | | 750 | - - - | 724 | - - - | 967 | - - - |
| | | SOUTHBAY 69 | 150 | | | 307 | - - - | 245 | 163% | | | 276 | 184% | 273 | 182% | 304 | - - - |
| | | SYCAMORE 230 | 150 | | | 834 | - - - | 720 | - - - | | | 579 | - - - | 552 | - - - | 751 | - - - |
| | | DEVERS 230 | 300 | | | 1490 | - - - | 1566 | - - - | | | 744 | - - - | 721 | - - - | 801 | - - - |
| | | LUGO 500 | 300 | | | 3000 | - - - | 3000 | - - - | | | 1686 | - - - | 1675 | - - - | 1958 | - - - |
| | | MIRALOMW 230 | 300 | | | 2389 | - - - | 2473 | - - - | | | 1237 | - - - | 1252 | - - - | 1450 | - - - |
| | | S.ONOFRE 230 | 300 | | | 1713 | - - - | 1650 | - - - | | | 880 | - - - | 852 | - - - | 1118 | - - - |
| | | SERRANO 230 | 300 | | | 2434 | - - - | 2482 | - - - | | | 1247 | - - - | 1238 | - - - | 1455 | - - - |
| | | VALYSVC1 500 | 300 | | | 1755 | - - - | 1959 | - - - | | | 877 | - - - | 875 | - - - | 1058 | - - - |
| | | VINCENT 500 | 300 | | | 3000 | - - - | 3000 | - - - | | | 2228 | - - - | 2221 | - - - | 2628 | - - - |
| | | VSTA 230 | 300 | | | 2162 | - - - | 2219 | - - - | | | 1038 | - - - | 1018 | - - - | 1198 | - - - |
| | | PADUA 230 | 300 | | | 1111 | - - - | 1123 | - - - | | | 853 | - - - | 851 | - - - | 919 | - - - |
| | | IRONMTP1 6.9 | | | | 26 | | 25 | | | | 25 | | 25 | | 25 | |

| Switch-Deck | OUTAGE DESCRIPTION | Q Bus Name | Margin Criteria, MVar | Q V MARGIN ANALYSIS RESULTS (Results shown as "- - -" when margin is greater than 200% of the margin critera) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | hs_rev4_v2 | | hs_alt2d1_s1_v2 | | hs_alt3bd1_s1_v2 | | la_rev5_v2 | | la_alt2ad3_s1_v2 | | la_alt2d3_s1_v2 | | la_alt3bd3_s1_v2 | |
| | | | | MVar | Crit.,% | MVar | Crit.,% | MVar | Crit.,% | MVar | Crit.,% | MVar | Crit.,% | MVar | Crit.,% | MVar | Crit.,% |
| basf | Banister - San Filipe 230 | HRD-230 230 | 100 | | | 731 | - - - | 684 | - - - | | | 661 | - - - | 610 | - - - | 633 | - - - |
| | | MTP-230 230 | 100 | | | 733 | - - - | 672 | - - - | | | 697 | - - - | 642 | - - - | 663 | - - - |
| | | ROA-230 230 | 100 | | | 833 | - - - | 861 | - - - | | | 797 | - - - | 635 | - - - | 711 | - - - |
| | | TJI-230 230 | 100 | | | 756 | - - - | 690 | - - - | | | 708 | - - - | 654 | - - - | 678 | - - - |
| | | COACHELA 230 | 100 | | | 627 | - - - | 607 | - - - | | | 710 | - - - | 345 | - - - | 432 | - - - |
| | | ELCENTSW 230 | 100 | | | 758 | - - - | 777 | - - - | | | 663 | - - - | 445 | - - - | 515 | - - - |
| | | HIGHLINE 230 | 100 | | | 670 | - - - | 674 | - - - | | | 570 | - - - | 365 | - - - | 425 | - - - |
| | | NEWSF230 230 | 100 | | | 701 | - - - | 853 | - - - | | | 657 | - - - | 628 | - - - | 740 | - - - |
| | | ESCNDIDO 230 | 150 | | | 1377 | - - - | 1279 | - - - | | | 874 | - - - | 805 | - - - | 907 | - - - |
| | | IMPRLVLY 230 | 150 | | | 965 | - - - | 1035 | - - - | | | 853 | - - - | 631 | - - - | 730 | - - - |
| | | MIGUEL 230 | 150 | | | 1007 | - - - | 914 | - - - | | | 783 | - - - | 695 | - - - | 765 | - - - |
| | | MISSION 230 | 150 | | | 1114 | - - - | 912 | - - - | | | 801 | - - - | 723 | - - - | 773 | - - - |
| | | SANLUSRY 230 | 150 | | | 1710 | - - - | 1468 | - - - | | | 1013 | - - - | 928 | - - - | 1002 | - - - |
| | | SOUTHBAY 69 | 150 | | | 358 | - - - | 298 | 198% | | | 301 | - - - | 296 | 197% | 291 | 194% |
| | | SYCAMORE 230 | 150 | | | 1166 | - - - | 918 | - - - | | | 815 | - - - | 731 | - - - | 790 | - - - |
| | | DEVERS 230 | 300 | | | 1522 | - - - | 1520 | - - - | | | 789 | - - - | 691 | - - - | 875 | - - - |
| | | LUGO 500 | 300 | | | 3000 | - - - | 3000 | - - - | | | 1966 | - - - | 1811 | - - - | 2248 | - - - |
| | | MIRALOMW 230 | 300 | | | 2479 | - - - | 2589 | - - - | | | 1455 | - - - | 1362 | - - - | 1605 | - - - |
| | | S.ONOFRE 230 | 300 | | | 2104 | - - - | 1915 | - - - | | | 1160 | - - - | 1071 | - - - | 1168 | - - - |
| | | SERRANO 230 | 300 | | | 2528 | - - - | 2619 | - - - | | | 1441 | - - - | 1378 | - - - | 1600 | - - - |
| | | VALYSVC1 500 | 300 | | | 1795 | - - - | 2050 | - - - | | | 975 | - - - | 910 | - - - | 1165 | - - - |
| | | VINCENT 500 | 300 | | | 3000 | - - - | 3000 | - - - | | | 2553 | - - - | 2426 | - - - | 2945 | - - - |
| | | VSTA 230 | 300 | | | 2207 | - - - | 2267 | - - - | | | 1169 | - - - | 1048 | - - - | 1311 | - - - |
| | | PADUA 230 | 300 | | | 1132 | - - - | 1146 | - - - | | | 903 | - - - | 890 | - - - | 980 | - - - |
| | | IRONMTP1 6.9 | | | | 26 | | 26 | | | | 25 | | 24 | | 25 | |

| Switch-Deck | OUTAGE DESCRIPTION | Q Bus Name | Margin Criteria, MVar | Q V MARGIN ANALYSIS RESULTS (Results shown as "- - -" when margin is greater than 200% of the margin critera) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | hs_rev4_v2 | | hs_alt2d1_s1_v2 | | hs_alt3bd1_s1_v2 | | la_rev5_v2 | | la_alt2ad3_s1_v2 | | la_alt2d3_s1_v2 | | la_alt3bd3_s1_v2 | |
| | | | | MVar | Crit.,% | MVar | Crit.,% | MVar | Crit.,% | MVar | Crit.,% | MVar | Crit.,% | MVar | Crit.,% | MVar | Crit.,% |
| | | | | | | | | | | | | See Note 2 | | See Note 7 | | See Note 2 | |
| deva | Devers - ValleySC 500kV | HRD-230 230 | 100 | 842 | - - - | 715 | - - - | 680 | - - - | 660 | - - - | 449 | - - - | 466 | - - - | 576 | - - - |
| | | MTP-230 230 | 100 | 849 | - - - | 707 | - - - | 659 | - - - | 718 | - - - | 439 | - - - | 459 | - - - | 590 | - - - |
| | | ROA-230 230 | 100 | 952 | - - - | 889 | - - - | 929 | - - - | 929 | - - - | 574 | - - - | 563 | - - - | 677 | - - - |
| Cases | | TJI-230 230 | 100 | 873 | - - - | 730 | - - - | 677 | - - - | 728 | - - - | 440 | - - - | 461 | - - - | 598 | - - - |
| la_alt2ad3, | | COACHELA 230 | 100 | 678 | - - - | 796 | - - - | 829 | - - - | 580 | - - - | 404 | - - - | 327 | - - - | 544 | - - - |
| & la_alt3bd3 | | ELCENTSW 230 | 100 | 579 | - - - | 973 | - - - | 1078 | - - - | 494 | - - - | 519 | - - - | 470 | - - - | 604 | - - - |
| deva_caps | | HIGHLINE 230 | 100 | 448 | - - - | 889 | - - - | 953 | - - - | 358 | - - - | 472 | - - - | 413 | - - - | 550 | - - - |
| | | NEWSF230 230 | 100 | NA | NA | 832 | - - - | 965 | - - - | NA | NA | 424 | - - - | 403 | - - - | 565 | - - - |
| Case | | ESCNDIDO 230 | 150 | 1257 | - - - | 1305 | - - - | 1212 | - - - | 987 | - - - | 430 | - - - | 454 | - - - | 709 | - - - |
| la_alt2d3, | | IMPRLVLY 230 | 150 | 1317 | - - - | 1097 | - - - | 1224 | - - - | 1159 | - - - | 596 | - - - | 572 | - - - | 711 | - - - |
| deva_caps2 | | MIGUEL 230 | 150 | 1132 | - - - | 965 | - - - | 874 | - - - | 860 | - - - | 410 | - - - | 427 | - - - | 615 | - - - |
| | | MISSION 230 | 150 | 1141 | - - - | 1049 | - - - | 871 | - - - | 892 | - - - | 412 | - - - | 434 | - - - | 622 | - - - |
| | | SANLUSRY 230 | 150 | 1613 | - - - | 1619 | - - - | 1389 | - - - | 1198 | - - - | 448 | - - - | 478 | - - - | 766 | - - - |
| | | SOUTHBAY 69 | 150 | 330 | - - - | 343 | - - - | 287 | 192% | 303 | - - - | 303 | - - - | 315 | - - - | 354 | - - - |
| | | SYCAMORE 230 | 150 | 1113 | - - - | 1095 | - - - | 879 | - - - | 833 | - - - | 416 | - - - | 438 | - - - | 635 | - - - |
| | | DEVERS 230 | 300 | 1453 | - - - | 1370 | - - - | 1497 | - - - | 758 | - - - | 311 | 104% | 329 | 110% | 651 | - - - |
| | | LUGO 500 | 300 | 3000 | - - - | 3000 | - - - | 3000 | - - - | 2019 | - - - | 550 | 183% | 587 | 196% | 1285 | - - - |
| | | MIRALOMW 230 | 300 | 2464 | - - - | 2322 | - - - | 2448 | - - - | 1573 | - - - | 447 | 149% | 475 | 158% | 1028 | - - - |
| | | S.ONOFRE 230 | 300 | 2012 | - - - | 2004 | - - - | 1800 | - - - | 1364 | - - - | 464 | 155% | 497 | 166% | 857 | - - - |
| | | SERRANO 230 | 300 | 2437 | - - - | 2310 | - - - | 2429 | - - - | 1655 | - - - | 481 | 160% | 514 | 171% | 1047 | - - - |
| | | VALYSVC1 500 | 300 | 1156 | - - - | 1018 | - - - | 1300 | - - - | 991 | - - - | 396 | 132% | 420 | 140% | 802 | - - - |
| | | VINCENT 500 | 300 | 3000 | - - - | 3000 | - - - | 3000 | - - - | 2734 | - - - | 750 | - - - | 803 | - - - | 1802 | - - - |
| | | VSTA 230 | 300 | 2268 | - - - | 2129 | - - - | 2219 | - - - | 1180 | - - - | 349 | 116% | 367 | 122% | 816 | - - - |
| | | PADUA 230 | 300 | 1129 | - - - | 1098 | - - - | 1121 | - - - | 859 | - - - | 394 | 131% | 416 | 139% | 747 | - - - |
| | | IRONMTP1 6.9 | | 25 | | 26 | | 26 | | 26 | | 22 | | 22 | | 25 | |

| Switch-Deck | OUTAGE DESCRIPTION | Q Bus Name | Margin Criteria, MVar | Q V MARGIN ANALYSIS RESULTS (Results shown as "- - -" when margin is greater than 200% of the margin critera) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | hs_rev4_v2 | | hs_alt2d1_s1_v2 | | hs_alt3bd1_s1_v2 | | la_rev5_v2 | | la_alt2ad3_s1_v2 | | la_alt2d3_s1_v2 | | la_alt3bd3_s1_v2 | |
| | | | MVar | MVar | Crit.,% | MVar | Crit.,% | MVar | Crit.,% | MVar | Crit.,% | MVar | Crit.,% | MVar | Crit.,% | MVar | Crit.,% |
| seva | Serrano - ValleySC 500 | HRD-230 230 | 100 | 865 | - - - | 762 | - - - | 715 | - - - | 730 | - - - | 627 | - - - | 614 | - - - | 680 | - - - |
| | | MTP-230 230 | 100 | 871 | - - - | 754 | - - - | 694 | - - - | 780 | - - - | 646 | - - - | 628 | - - - | 718 | - - - |
| | | ROA-230 230 | 100 | 984 | - - - | 953 | - - - | 990 | - - - | 1069 | - - - | 854 | - - - | 795 | - - - | 949 | - - - |
| | - or - | TJI-230 230 | 100 | 898 | - - - | 776 | - - - | 710 | - - - | 809 | - - - | 654 | - - - | 638 | - - - | 726 | - - - |
| | | COACHELA 230 | 100 | 691 | - - - | 798 | - - - | 816 | - - - | 748 | - - - | 890 | - - - | 588 | - - - | 734 | - - - |
| | SerVal - ValleySC 500 | ELCENTSW 230 | 100 | 583 | - - - | 1043 | - - - | 1144 | - - - | 519 | - - - | 858 | - - - | 735 | - - - | 895 | - - - |
| | | HIGHLINE 230 | 100 | 447 | - - - | 942 | - - - | 994 | - - - | 416 | - - - | 791 | - - - | 653 | - - - | 780 | - - - |
| | | NEWSF230 230 | 100 | NA | NA | 881 | - - - | 1019 | - - - | NA | NA | 731 | - - - | 658 | - - - | 797 | - - - |
| | | ESCNDIDO 230 | 150 | 1285 | - - - | 1385 | - - - | 1272 | - - - | 1150 | - - - | 774 | - - - | 749 | - - - | 990 | - - - |
| | | IMPRLVLY 230 | 150 | 1365 | - - - | 1201 | - - - | 1334 | - - - | 1373 | - - - | 954 | - - - | 859 | - - - | 1076 | - - - |
| | | MIGUEL 230 | 150 | 1180 | - - - | 1063 | - - - | 942 | - - - | 1054 | - - - | 708 | - - - | 672 | - - - | 859 | - - - |
| | | MISSION 230 | 150 | 1184 | - - - | 1143 | - - - | 928 | - - - | 1083 | - - - | 711 | - - - | 684 | - - - | 853 | - - - |
| | | SANLUSRY 230 | 150 | 1648 | - - - | 1724 | - - - | 1461 | - - - | 1466 | - - - | 891 | - - - | 860 | - - - | 1099 | - - - |
| | | SOUTHBAY 69 | 150 | 338 | - - - | 357 | - - - | 297 | 198% | 330 | - - - | 299 | 199% | 298 | 198% | 307 | - - - |
| | | SYCAMORE 230 | 150 | 1154 | - - - | 1202 | - - - | 935 | - - - | 988 | - - - | 722 | - - - | 688 | - - - | 871 | - - - |
| | | DEVERS 230 | 300 | 1454 | - - - | 1317 | - - - | 1390 | - - - | 1244 | - - - | 782 | - - - | 768 | - - - | 996 | - - - |
| | | LUGO 500 | 300 | 3000 | - - - | 3000 | - - - | 3000 | - - - | 3000 | - - - | 1811 | - - - | 1776 | - - - | 2415 | - - - |
| | | MIRALOMW 230 | 300 | 2531 | - - - | 2477 | - - - | 2611 | - - - | 2307 | - - - | 1408 | - - - | 1383 | - - - | 1757 | - - - |
| | | S.ONOFRE 230 | 300 | 2034 | - - - | 2104 | - - - | 1901 | - - - | 1660 | - - - | 1025 | - - - | 994 | - - - | 1272 | - - - |
| | | SERRANO 230 | 300 | 2418 | - - - | 2418 | - - - | 2543 | - - - | 2286 | - - - | 1404 | - - - | 1383 | - - - | 1713 | - - - |
| | | VALYSVC1 500 | 300 | 720 | - - - | 613 | - - - | 615 | - - - | 914 | - - - | 599 | 200% | 604 | - - - | 728 | - - - |
| | | VINCENT 500 | 300 | 3000 | - - - | 3000 | - - - | 3000 | - - - | 3000 | - - - | 2403 | - - - | 2365 | - - - | 3000 | - - - |
| | | VSTA 230 | 300 | 2342 | - - - | 2246 | - - - | 2310 | - - - | 1853 | - - - | 1127 | - - - | 1105 | - - - | 1445 | - - - |
| | | PADUA 230 | 300 | 1135 | - - - | 1123 | - - - | 1147 | - - - | 1093 | - - - | 847 | - - - | 842 | - - - | 976 | - - - |
| | | IRONMTP1 6.9 | | 25 | | 26 | | 26 | | 28 | | 26 | | 25 | | 27 | |

| Switch-Deck | OUTAGE DESCRIPTION | Q Bus Name | Margin Criteria, MVar | Q V MARGIN ANALYSIS RESULTS (Results shown as "- - -" when margin is greater than 200% of the margin critera) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | hs_rev4_v2 | | hs_alt2d1_s1_v2 | | hs_alt3bd1_s1_v2 | | la_rev5_v2 | | la_alt2ad3_s1_v2 | | la_alt2d3_s1_v2 | | la_alt3bd3_s1_v2 | |
| | | | MVar | MVar | Crit.,% | MVar | Crit.,% | MVar | Crit.,% | MVar | Crit.,% | MVar | Crit.,% | MVar | Crit.,% | MVar | Crit.,% |
| dv_east_slo | Devers - Palo Verde 500kV #1 | HRD-230 230 | 100 | 836 | - - - | 738 | - - - | 690 | - - - | 701 | - - - | 634 | - - - | 569 | - - - | 682 | - - - |
| | | MTP-230 230 | 100 | 842 | - - - | 727 | - - - | 670 | - - - | 748 | - - - | 649 | - - - | 574 | - - - | 716 | - - - |
| | | ROA-230 230 | 100 | 976 | - - - | 943 | - - - | 968 | - - - | 988 | - - - | 826 | - - - | 643 | - - - | 840 | - - - |
| | - or - | TJI-230 230 | 100 | 865 | - - - | 753 | - - - | 685 | - - - | 775 | - - - | 658 | - - - | 579 | - - - | 726 | - - - |
| | | COACHELA 230 | 100 | 667 | - - - | 697 | - - - | 729 | - - - | 654 | - - - | 735 | - - - | 319 | - - - | 529 | - - - |
| | Devers - Midpints 500kV #1 | ELCENTSW 230 | 100 | 569 | - - - | 998 | - - - | 1083 | - - - | 492 | - - - | 791 | - - - | 526 | - - - | 726 | - - - |
| | | HIGHLINE 230 | 100 | 438 | - - - | 889 | - - - | 939 | - - - | 380 | - - - | 714 | - - - | 447 | - - - | 630 | - - - |
| | | NEWSF230 230 | 100 | NA | NA | 861 | - - - | 982 | - - - | NA | NA | 696 | - - - | 484 | - - - | 689 | - - - |
| | | ESCNDIDO 230 | 150 | 1248 | - - - | 1338 | - - - | 1217 | - - - | 1097 | - - - | 759 | - - - | 643 | - - - | 894 | - - - |
| | | IMPRLVLY 230 | 150 | 1398 | - - - | 1188 | - - - | 1295 | - - - | 1243 | - - - | 906 | - - - | 651 | - - - | 891 | - - - |
| | | MIGUEL 230 | 150 | 1142 | - - - | 1034 | - - - | 899 | - - - | 971 | - - - | 696 | - - - | 573 | - - - | 784 | - - - |
| | | MISSION 230 | 150 | 1136 | - - - | 1100 | - - - | 883 | - - - | 1013 | - - - | 701 | - - - | 584 | - - - | 790 | - - - |
| | | SANLUSRY 230 | 150 | 1605 | - - - | 1661 | - - - | 1395 | - - - | 1385 | - - - | 861 | - - - | 713 | - - - | 977 | - - - |
| | | SOUTHBAY 69 | 150 | 326 | - - - | 348 | - - - | 289 | 192% | 316 | - - - | 293 | 195% | 302 | - - - | 323 | - - - |
| | | SYCAMORE 230 | 150 | 1107 | - - - | 1157 | - - - | 892 | - - - | 932 | - - - | 710 | - - - | 585 | - - - | 804 | - - - |
| | | DEVERS 230 | 300 | 1466 | - - - | 1291 | - - - | 1445 | - - - | 1052 | - - - | 637 | - - - | 414 | 138% | 688 | - - - |
| | | LUGO 500 | 300 | 3000 | - - - | 3000 | - - - | 3000 | - - - | 2903 | - - - | 1551 | - - - | 976 | - - - | 1735 | - - - |
| | | MIRALOMW 230 | 300 | 2430 | - - - | 2328 | - - - | 2437 | - - - | 2206 | - - - | 1202 | - - - | 817 | - - - | 1343 | - - - |
| | | S.ONOFRE 230 | 300 | 1995 | - - - | 2035 | - - - | 1815 | - - - | 1584 | - - - | 972 | - - - | 776 | - - - | 1097 | - - - |
| | | SERRANO 230 | 300 | 2492 | - - - | 2413 | - - - | 2481 | - - - | 2179 | - - - | 1191 | - - - | 843 | - - - | 1306 | - - - |
| | | VALYSVC1 500 | 300 | 1726 | - - - | 1564 | - - - | 1840 | - - - | 1472 | - - - | 809 | - - - | 535 | 178% | 933 | - - - |
| | | VINCENT 500 | 300 | 3000 | - - - | 3000 | - - - | 3000 | - - - | 3000 | - - - | 2106 | - - - | 1397 | - - - | 2311 | - - - |
| | | VSTA 230 | 300 | 2166 | - - - | 2050 | - - - | 2159 | - - - | 1784 | - - - | 965 | - - - | 650 | - - - | 1093 | - - - |
| | | PADUA 230 | 300 | 1125 | - - - | 1099 | - - - | 1120 | - - - | 1107 | - - - | 826 | - - - | 681 | - - - | 908 | - - - |
| | | IRONMTP1 6.9 | | 24 | | 25 | | 25 | | 26 | | 24 | | 22 | | 25 | |

| Switch-Deck | OUTAGE DESCRIPTION | Q Bus Name | Margin Criteria, MVar | Q V MARGIN ANALYSIS RESULTS (Results shown as "- - -" when margin is greater than 200% of the margin critera) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | hs_rev4_v2 | | hs_alt2d1_s1_v2 | | hs_alt3bd1_s1_v2 | | la_rev5_v2 | | la_alt2ad3_s1_v2 | | la_alt2d3_s1_v2 | | la_alt3bd3_s1_v2 | |
| | | | MVar | MVar | Crit.,% | MVar | Crit.,% | MVar | Crit.,% | MVar | Crit.,% | MVar | Crit.,% | MVar | Crit.,% | MVar | Crit.,% |
| ivng | Imperial Valley - N. Gila 500 #1 | HRD-230 230 | 100 | 887 | - - - | 710 | - - - | 690 | - - - | 850 | - - - | 634 | - - - | 641 | - - - | 688 | - - - |
| | | MTP-230 230 | 100 | 896 | - - - | 719 | - - - | 679 | - - - | 913 | - - - | 667 | - - - | 675 | - - - | 716 | - - - |
| | | ROA-230 230 | 100 | 878 | - - - | 762 | - - - | 845 | - - - | 1049 | - - - | 684 | - - - | 662 | - - - | 785 | - - - |
| | | TJI-230 230 | 100 | 924 | - - - | 740 | - - - | 696 | - - - | 959 | - - - | 677 | - - - | 685 | - - - | 726 | - - - |
| | | COACHELA 230 | 100 | 697 | - - - | 816 | - - - | 815 | - - - | 607 | - - - | 827 | - - - | 587 | - - - | 666 | - - - |
| | | ELCENTSW 230 | 100 | 578 | - - - | 838 | - - - | 965 | - - - | 497 | - - - | 665 | - - - | 602 | - - - | 719 | - - - |
| | | HIGHLINE 230 | 100 | 444 | - - - | 826 | - - - | 915 | - - - | 346 | - - - | 662 | - - - | 586 | - - - | 684 | - - - |
| | | NEWSF230 230 | 100 | NA | NA | 724 | - - - | 900 | - - - | NA | NA | 590 | - - - | 547 | - - - | 693 | - - - |
| | | ESCNDIDO 230 | 150 | 1227 | - - - | 1304 | - - - | 1211 | - - - | 1214 | - - - | 822 | - - - | 828 | - - - | 921 | - - - |
| | | IMPRLVLY 230 | 150 | 1086 | - - - | 881 | - - - | 1043 | - - - | 1183 | - - - | 707 | - - - | 670 | - - - | 820 | - - - |
| | | MIGUEL 230 | 150 | 1124 | - - - | 891 | - - - | 857 | - - - | 1192 | - - - | 684 | - - - | 685 | - - - | 776 | - - - |
| | | MISSION 230 | 150 | 1154 | - - - | 1036 | - - - | 883 | - - - | 1190 | - - - | 733 | - - - | 738 | - - - | 798 | - - - |
| | | SANLUSRY 230 | 150 | 1544 | - - - | 1608 | - - - | 1387 | - - - | 1492 | - - - | 955 | - - - | 964 | - - - | 1020 | - - - |
| | | SOUTHBAY 69 | 150 | 346 | - - - | 352 | - - - | 288 | 192% | 336 | - - - | 297 | 198% | 301 | - - - | 305 | - - - |
| | | SYCAMORE 230 | 150 | 1144 | - - - | 1077 | - - - | 894 | - - - | 1105 | - - - | 733 | - - - | 736 | - - - | 815 | - - - |
| | | DEVERS 230 | 300 | 1576 | - - - | 1533 | - - - | 1632 | - - - | 864 | - - - | 773 | - - - | 761 | - - - | 877 | - - - |
| | | LUGO 500 | 300 | 3000 | - - - | 3000 | - - - | 3000 | - - - | 2167 | - - - | 1688 | - - - | 1702 | - - - | 1970 | - - - |
| | | MIRALOMW 230 | 300 | 2308 | - - - | 2365 | - - - | 2443 | - - - | 1687 | - - - | 1309 | - - - | 1300 | - - - | 1484 | - - - |
| | | S.ONOFRE 230 | 300 | 1916 | - - - | 1994 | - - - | 1802 | - - - | 1611 | - - - | 1112 | - - - | 1125 | - - - | 1178 | - - - |
| | | SERRANO 230 | 300 | 2332 | - - - | 2413 | - - - | 2484 | - - - | 1736 | - - - | 1314 | - - - | 1308 | - - - | 1487 | - - - |
| | | VALYSVC1 500 | 300 | 1780 | - - - | 1729 | - - - | 1970 | - - - | 1149 | - - - | 913 | - - - | 906 | - - - | 1093 | - - - |
| | | VINCENT 500 | 300 | 3000 | - - - | 3000 | - - - | 3000 | - - - | 2910 | - - - | 2287 | - - - | 2262 | - - - | 2626 | - - - |
| | | VSTA 230 | 300 | 2133 | - - - | 2164 | - - - | 2224 | - - - | 1379 | - - - | 1090 | - - - | 1079 | - - - | 1251 | - - - |
| | | PADUA 230 | 300 | 1094 | - - - | 1104 | - - - | 1117 | - - - | 939 | - - - | 860 | - - - | 857 | - - - | 927 | - - - |
| | | IRONMTP1 6.9 | | 24 | | 26 | | 25 | | 26 | | 25 | | 25 | | 26 | |

| Switch-Deck | OUTAGE DESCRIPTION | Q Bus Name | Margin Criteria, MVar | Q V MARGIN ANALYSIS RESULTS (Results shown as "- - -" when margin is greater than 200% of the margin critera) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | hs_rev4_v2 | | hs_alt2d1_s1_v2 | | hs_alt3bd1_s1_v2 | | la_rev5_v2 | | la_alt2ad3_s1_v2 | | la_alt2d3_s1_v2 | | la_alt3bd3_s1_v2 | |
| | | | | MVar | Crit.,% | MVar | Crit.,% | MVar | Crit.,% | MVar | Crit.,% | MVar | Crit.,% | MVar | Crit.,% | MVar | Crit.,% |
| | | | | | | | | See Note 3 | | | | | | | | See Note 3 | |
| ivml | Imperial Valley - Miguel 500 #1 | HRD-230 230 | 100 | 243 | - - - | 260 | - - - | 315 | - - - | 265 | - - - | 320 | - - - | 296 | - - - | 452 | - - - |
| | | MTP-230 230 | 100 | 217 | - - - | 238 | - - - | 283 | - - - | 306 | - - - | 315 | - - - | 292 | - - - | 447 | - - - |
| | | ROA-230 230 | 100 | 800 | - - - | 543 | - - - | 851 | - - - | 704 | - - - | 533 | - - - | 468 | - - - | 755 | - - - |
| | | TJI-230 230 | 100 | 215 | - - - | 238 | - - - | 281 | - - - | 308 | - - - | 317 | - - - | 293 | - - - | 450 | - - - |
| | | COACHELA 230 | 100 | 666 | - - - | 664 | - - - | 751 | - - - | 576 | - - - | 524 | - - - | 365 | - - - | 558 | - - - |
| | | ELCENTSW 230 | 100 | 593 | - - - | 725 | - - - | 1097 | - - - | 515 | - - - | 580 | - - - | 468 | - - - | 713 | - - - |
| | | HIGHLINE 230 | 100 | 435 | - - - | 705 | - - - | 973 | - - - | 350 | - - - | 532 | - - - | 417 | - - - | 638 | - - - |
| | | NEWSF230 230 | 100 | 0 | NA | 509 | - - - | 963 | - - - | NA | NA | 451 | - - - | 373 | - - - | 665 | - - - |
| | | ESCNDIDO 230 | 150 | 327 | - - - | 413 | - - - | 393 | - - - | 429 | - - - | 378 | - - - | 353 | - - - | 544 | - - - |
| | | IMPRLVLY 230 | 150 | 1137 | - - - | 702 | - - - | 1184 | - - - | 1011 | - - - | 628 | - - - | 543 | - - - | 850 | - - - |
| | | MIGUEL 230 | 150 | 192 | 128% | 224 | 149% | 215 | 143% | 328 | - - - | 295 | 197% | 277 | 184% | 411 | - - - |
| | | MISSION 230 | 150 | 215 | 144% | 256 | 171% | 243 | 162% | 358 | - - - | 322 | - - - | 301 | - - - | 446 | - - - |
| | | SANLUSRY 230 | 150 | 449 | - - - | 550 | - - - | 451 | - - - | 497 | - - - | 438 | - - - | 409 | - - - | 601 | - - - |
| | | SOUTHBAY 69 | 150 | 144 | 96% | 171 | 114% | 160 | 107% | 244 | 163% | 233 | 155% | 222 | 148% | 272 | 181% |
| | | SYCAMORE 230 | 150 | 224 | 149% | 273 | 182% | 257 | 171% | 353 | - - - | 319 | - - - | 295 | 197% | 458 | - - - |
| | | DEVERS 230 | 300 | 1558 | - - - | 1390 | - - - | 1571 | - - - | 828 | - - - | 522 | 174% | 480 | 160% | 745 | - - - |
| | | LUGO 500 | 300 | 3000 | - - - | 3000 | - - - | 3000 | - - - | 1827 | - - - | 1059 | - - - | 1029 | - - - | 1582 | - - - |
| | | MIRALOMW 230 | 300 | 2155 | - - - | 2148 | - - - | 1945 | - - - | 1345 | - - - | 830 | - - - | 802 | - - - | 1166 | - - - |
| | | S.ONOFRE 230 | 300 | 666 | - - - | 781 | - - - | 634 | - - - | 637 | - - - | 540 | 180% | 507 | 169% | 729 | - - - |
| | | SERRANO 230 | 300 | 1814 | - - - | 1900 | - - - | 1614 | - - - | 1251 | - - - | 812 | - - - | 786 | - - - | 1128 | - - - |
| | | VALYSVC1 500 | 300 | 1750 | - - - | 1610 | - - - | 1487 | - - - | 1037 | - - - | 574 | 191% | 558 | 186% | 865 | - - - |
| | | VINCENT 500 | 300 | 3000 | - - - | 3000 | - - - | 3000 | - - - | 2469 | - - - | 1516 | - - - | 1464 | - - - | 2147 | - - - |
| | | VSTA 230 | 300 | 2062 | - - - | 1956 | - - - | 1976 | - - - | 1188 | - - - | 679 | - - - | 652 | - - - | 998 | - - - |
| | | PADUA 230 | 300 | 1071 | - - - | 1075 | - - - | 1086 | - - - | 903 | - - - | 708 | - - - | 688 | - - - | 848 | - - - |
| | | IRONMTP1 6.9 | | 24 | | 25 | | 25 | | 26 | | 24 | | 23 | | 25 | |

| Switch-Deck | OUTAGE DESCRIPTION | Q Bus Name | Margin Criteria, MVar | Q V MARGIN ANALYSIS RESULTS (Results shown as "- - -" when margin is greater than 200% of the margin critera) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | hs_rev4_v2 | | hs_alt2d1_s1_v2 | | hs_alt3bd1_s1_v2 | | la_rev5_v2 | | la_alt2ad3_s1_v2 | | la_alt2d3_s1_v2 | | la_alt3bd3_s1_v2 | |
| | | | | MVar | Crit.,% | MVar | Crit.,% | MVar | Crit.,% | MVar | Crit.,% | MVar | Crit.,% | MVar | Crit.,% | MVar | Crit.,% |
| lumo | Lugo - Mohave 500 | HRD-230 230 | 100 | 857 | - - - | 751 | - - - | 705 | - - - | 768 | - - - | 651 | - - - | 641 | - - - | 705 | - - - |
| | | MTP-230 230 | 100 | 865 | - - - | 743 | - - - | 685 | - - - | 832 | - - - | 675 | - - - | 661 | - - - | 734 | - - - |
| | | ROA-230 230 | 100 | 971 | - - - | 936 | - - - | 968 | - - - | 1125 | - - - | 888 | - - - | 836 | - - - | 1008 | - - - |
| | | TJI-230 230 | 100 | 889 | - - - | 768 | - - - | 701 | - - - | 876 | - - - | 682 | - - - | 669 | - - - | 752 | - - - |
| | | COACHELA 230 | 100 | 705 | - - - | 791 | - - - | 808 | - - - | 737 | - - - | 875 | - - - | 573 | - - - | 713 | - - - |
| | | ELCENTSW 230 | 100 | 580 | - - - | 1010 | - - - | 1100 | - - - | 526 | - - - | 882 | - - - | 762 | - - - | 936 | - - - |
| | | HIGHLINE 230 | 100 | 451 | - - - | 914 | - - - | 963 | - - - | 408 | - - - | 791 | - - - | 665 | - - - | 796 | - - - |
| | | NEWSF230 230 | 100 | NA | NA | 863 | - - - | 994 | - - - | NA | NA | 751 | - - - | 686 | - - - | 834 | - - - |
| | | ESCNDIDO 230 | 150 | 1269 | - - - | 1358 | - - - | 1237 | - - - | 1209 | - - - | 806 | - - - | 785 | - - - | 1017 | - - - |
| | | IMPRLVLY 230 | 150 | 1347 | - - - | 1163 | - - - | 1281 | - - - | 1450 | - - - | 997 | - - - | 906 | - - - | 1142 | - - - |
| | | MIGUEL 230 | 150 | 1164 | - - - | 1039 | - - - | 918 | - - - | 1139 | - - - | 750 | - - - | 717 | - - - | 901 | - - - |
| | | MISSION 230 | 150 | 1167 | - - - | 1121 | - - - | 907 | - - - | 1159 | - - - | 748 | - - - | 724 | - - - | 885 | - - - |
| | | SANLUSRY 230 | 150 | 1627 | - - - | 1684 | - - - | 1417 | - - - | 1544 | - - - | 925 | - - - | 898 | - - - | 1125 | - - - |
| | | SOUTHBAY 69 | 150 | 335 | - - - | 354 | - - - | 294 | 196% | 344 | - - - | 288 | 192% | 286 | 191% | 311 | - - - |
| | | SYCAMORE 230 | 150 | 1138 | - - - | 1176 | - - - | 914 | - - - | 1054 | - - - | 763 | - - - | 732 | - - - | 904 | - - - |
| | | DEVERS 230 | 300 | 1654 | - - - | 1502 | - - - | 1643 | - - - | 1316 | - - - | 787 | - - - | 774 | - - - | 1030 | - - - |
| | | LUGO 500 | 300 | 3000 | - - - | 3000 | - - - | 3000 | - - - | 3000 | - - - | 1704 | - - - | 1707 | - - - | 2306 | - - - |
| | | MIRALOMW 230 | 300 | 2403 | - - - | 2313 | - - - | 2404 | - - - | 2368 | - - - | 1276 | - - - | 1276 | - - - | 1675 | - - - |
| | | S.ONOFRE 230 | 300 | 2014 | - - - | 2051 | - - - | 1840 | - - - | 1723 | - - - | 1043 | - - - | 1023 | - - - | 1285 | - - - |
| | | SERRANO 230 | 300 | 2463 | - - - | 2389 | - - - | 2459 | - - - | 2320 | - - - | 1276 | - - - | 1280 | - - - | 1627 | - - - |
| | | VALYSVC1 500 | 300 | 1879 | - - - | 1718 | - - - | 1987 | - - - | 1694 | - - - | 926 | - - - | 930 | - - - | 1299 | - - - |
| | | VINCENT 500 | 300 | 3000 | - - - | 3000 | - - - | 3000 | - - - | 3000 | - - - | 2270 | - - - | 2276 | - - - | 2959 | - - - |
| | | VSTA 230 | 300 | 2218 | - - - | 2113 | - - - | 2202 | - - - | 1947 | - - - | 1084 | - - - | 1079 | - - - | 1438 | - - - |
| | | PADUA 230 | 300 | 1107 | - - - | 1081 | - - - | 1101 | - - - | 1116 | - - - | 848 | - - - | 849 | - - - | 968 | - - - |
| | | IRONMTP1 6.9 | | 24 | | 25 | | 25 | | 28 | | 25 | | 25 | | 26 | |

| Switch-Deck | OUTAGE DESCRIPTION | Q Bus Name | Margin Criteria, MVar | Q V MARGIN ANALYSIS RESULTS (Results shown as "- - -" when margin is greater than 200% of the margin critera) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | hs_rev4_v2 | | hs_alt2d1_s1_v2 | | hs_alt3bd1_s1_v2 | | la_rev5_v2 | | la_alt2ad3_s1_v2 | | la_alt2d3_s1_v2 | | la_alt3bd3_s1_v2 | |
| | | | | MVar | Crit.,% | MVar | Crit.,% | MVar | Crit.,% | MVar | Crit.,% | MVar | Crit.,% | MVar | Crit.,% | MVar | Crit.,% |
| lumi | Lugo - Mira Loma 500 | HRD-230 230 | 100 | 867 | - - - | 769 | - - - | 723 | - - - | 782 | - - - | 695 | - - - | 688 | - - - | 696 | - - - |
| | | MTP-230 230 | 100 | 873 | - - - | 762 | - - - | 703 | - - - | 848 | - - - | 732 | - - - | 721 | - - - | 734 | - - - |
| | | ROA-230 230 | 100 | 986 | - - - | 960 | - - - | 999 | - - - | 1148 | - - - | 982 | - - - | 927 | - - - | 1026 | - - - |
| | | TJI-230 230 | 100 | 901 | - - - | 784 | - - - | 720 | - - - | 893 | - - - | 740 | - - - | 729 | - - - | 742 | - - - |
| | | COACHELA 230 | 100 | 700 | - - - | 822 | - - - | 836 | - - - | 766 | - - - | 1022 | - - - | 642 | - - - | 752 | - - - |
| | | ELCENTSW 230 | 100 | 583 | - - - | 1053 | - - - | 1150 | - - - | 532 | - - - | 988 | - - - | 855 | - - - | 975 | - - - |
| | | HIGHLINE 230 | 100 | 447 | - - - | 948 | - - - | 996 | - - - | 417 | - - - | 858 | - - - | 739 | - - - | 823 | - - - |
| | | NEWSF230 230 | 100 | NA | NA | 886 | - - - | 1025 | - - - | NA | NA | 808 | - - - | 751 | - - - | 861 | - - - |
| | | ESCNDIDO 230 | 150 | 1296 | - - - | 1405 | - - - | 1304 | - - - | 1245 | - - - | 919 | - - - | 905 | - - - | 1025 | - - - |
| | | IMPRLVLY 230 | 150 | 1369 | - - - | 1216 | - - - | 1349 | - - - | 1480 | - - - | 1127 | - - - | 1023 | - - - | 1178 | - - - |
| | | MIGUEL 230 | 150 | 1187 | - - - | 1083 | - - - | 963 | - - - | 1175 | - - - | 864 | - - - | 835 | - - - | 903 | - - - |
| | | MISSION 230 | 150 | 1191 | - - - | 1162 | - - - | 947 | - - - | 1199 | - - - | 868 | - - - | 844 | - - - | 885 | - - - |
| | | SANLUSRY 230 | 150 | 1668 | - - - | 1753 | - - - | 1499 | - - - | 1602 | - - - | 1094 | - - - | 1069 | - - - | 1167 | - - - |
| | | SOUTHBAY 69 | 150 | 339 | - - - | 361 | - - - | 300 | 200% | 351 | - - - | 302 | - - - | 301 | - - - | 299 | 199% |
| | | SYCAMORE 230 | 150 | 1160 | - - - | 1224 | - - - | 954 | - - - | 1090 | - - - | 889 | - - - | 857 | - - - | 907 | - - - |
| | | DEVERS 230 | 300 | 1721 | - - - | 1570 | - - - | 1723 | - - - | 1431 | - - - | 971 | - - - | 955 | - - - | 1144 | - - - |
| | | LUGO 500 | 300 | 3000 | - - - | 3000 | - - - | 3000 | - - - | 3000 | - - - | 2233 | - - - | 2239 | - - - | 2687 | - - - |
| | | MIRALOMW 230 | 300 | 2620 | - - - | 2521 | - - - | 2611 | - - - | 2601 | - - - | 1623 | - - - | 1625 | - - - | 1897 | - - - |
| | | S.ONOFRE 230 | 300 | 2074 | - - - | 2138 | - - - | 1954 | - - - | 1784 | - - - | 1235 | - - - | 1222 | - - - | 1337 | - - - |
| | | SERRANO 230 | 300 | 2618 | - - - | 2558 | - - - | 2642 | - - - | 2489 | - - - | 1606 | - - - | 1608 | - - - | 1801 | - - - |
| | | VALYSVC1 500 | 300 | 1984 | - - - | 1833 | - - - | 2097 | - - - | 1824 | - - - | 1160 | - - - | 1166 | - - - | 1460 | - - - |
| | | VINCENT 500 | 300 | 3000 | - - - | 3000 | - - - | 3000 | - - - | 3000 | - - - | 2884 | - - - | 2900 | - - - | 3000 | - - - |
| | | VSTA 230 | 300 | 2356 | - - - | 2272 | - - - | 2341 | - - - | 2098 | - - - | 1372 | - - - | 1368 | - - - | 1609 | - - - |
| | | PADUA 230 | 300 | 1160 | - - - | 1140 | - - - | 1154 | - - - | 1175 | - - - | 956 | - - - | 955 | - - - | 1034 | - - - |
| | | IRONMTP1 6.9 | | 25 | | 26 | | 26 | | 28 | | 26 | | 26 | | 27 | |

| Switch-Deck | OUTAGE DESCRIPTION | Q Bus Name | Margin Criteria, MVar | Q V MARGIN ANALYSIS RESULTS (Results shown as "- - -" when margin is greater than 200% of the margin critera) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | hs_rev4_v2 | | hs_alt2d1_s1_v2 | | hs_alt3bd1_s1_v2 | | la_rev5_v2 | | la_alt2ad3_s1_v2 | | la_alt2d3_s1_v2 | | la_alt3bd3_s1_v2 | |
| | | | MVar | MVar | Crit.,% | MVar | Crit.,% | MVar | Crit.,% | MVar | Crit.,% | MVar | Crit.,% | MVar | Crit.,% | MVar | Crit.,% |
| mise | Mira Loma - Serrano 500 kV | HRD-230 230 | 100 | 863 | - - - | 762 | - - - | 715 | - - - | 780 | - - - | 687 | - - - | 679 | - - - | 688 | - - - |
| | | MTP-230 230 | 100 | 869 | - - - | 755 | - - - | 695 | - - - | 846 | - - - | 719 | - - - | 708 | - - - | 721 | - - - |
| | | ROA-230 230 | 100 | 980 | - - - | 949 | - - - | 982 | - - - | 1145 | - - - | 961 | - - - | 909 | - - - | 1001 | - - - |
| | | TJI-230 230 | 100 | 896 | - - - | 777 | - - - | 711 | - - - | 890 | - - - | 726 | - - - | 716 | - - - | 727 | - - - |
| | | COACHELA 230 | 100 | 689 | - - - | 804 | - - - | 823 | - - - | 761 | - - - | 974 | - - - | 629 | - - - | 739 | - - - |
| | | ELCENTSW 230 | 100 | 582 | - - - | 1032 | - - - | 1122 | - - - | 531 | - - - | 963 | - - - | 835 | - - - | 951 | - - - |
| | | HIGHLINE 230 | 100 | 443 | - - - | 932 | - - - | 979 | - - - | 416 | - - - | 843 | - - - | 724 | - - - | 810 | - - - |
| | | NEWSF230 230 | 100 | NA | NA | 876 | - - - | 1005 | - - - | NA | NA | 796 | - - - | 739 | - - - | 842 | - - - |
| | | ESCNDIDO 230 | 150 | 1287 | - - - | 1387 | - - - | 1271 | - - - | 1238 | - - - | 888 | - - - | 873 | - - - | 973 | - - - |
| | | IMPRLVLY 230 | 150 | 1361 | - - - | 1192 | - - - | 1310 | - - - | 1476 | - - - | 1098 | - - - | 998 | - - - | 1141 | - - - |
| | | MIGUEL 230 | 150 | 1178 | - - - | 1065 | - - - | 940 | - - - | 1170 | - - - | 836 | - - - | 806 | - - - | 869 | - - - |
| | | MISSION 230 | 150 | 1182 | - - - | 1146 | - - - | 928 | - - - | 1191 | - - - | 835 | - - - | 812 | - - - | 849 | - - - |
| | | SANLUSRY 230 | 150 | 1652 | - - - | 1723 | - - - | 1457 | - - - | 1585 | - - - | 1039 | - - - | 1017 | - - - | 1100 | - - - |
| | | SOUTHBAY 69 | 150 | 338 | - - - | 358 | - - - | 298 | 198% | 350 | - - - | 299 | 199% | 298 | 199% | 296 | 197% |
| | | SYCAMORE 230 | 150 | 1152 | - - - | 1204 | - - - | 935 | - - - | 1084 | - - - | 854 | - - - | 825 | - - - | 869 | - - - |
| | | DEVERS 230 | 300 | 1660 | - - - | 1515 | - - - | 1669 | - - - | 1404 | - - - | 917 | - - - | 903 | - - - | 1109 | - - - |
| | | LUGO 500 | 300 | 3000 | - - - | 3000 | - - - | 3000 | - - - | 3000 | - - - | 2170 | - - - | 2178 | - - - | 2662 | - - - |
| | | MIRALOMW 230 | 300 | 2471 | - - - | 2398 | - - - | 2475 | - - - | 2551 | - - - | 1612 | - - - | 1615 | - - - | 1876 | - - - |
| | | S.ONOFRE 230 | 300 | 2049 | - - - | 2096 | - - - | 1887 | - - - | 1761 | - - - | 1177 | - - - | 1159 | - - - | 1269 | - - - |
| | | SERRANO 230 | 300 | 2338 | - - - | 2265 | - - - | 2376 | - - - | 2249 | - - - | 1394 | - - - | 1399 | - - - | 1599 | - - - |
| | | VALYSVC1 500 | 300 | 1764 | - - - | 1610 | - - - | 1911 | - - - | 1643 | - - - | 1007 | - - - | 1013 | - - - | 1309 | - - - |
| | | VINCENT 500 | 300 | 3000 | - - - | 3000 | - - - | 3000 | - - - | 3000 | - - - | 2824 | - - - | 2837 | - - - | 3000 | - - - |
| | | VSTA 230 | 300 | 2290 | - - - | 2212 | - - - | 2285 | - - - | 2085 | - - - | 1320 | - - - | 1317 | - - - | 1584 | - - - |
| | | PADUA 230 | 300 | 1135 | - - - | 1118 | - - - | 1133 | - - - | 1168 | - - - | 942 | - - - | 942 | - - - | 1027 | - - - |
| | | IRONMTP1 6.9 | | 24 | | 26 | | 26 | | 28 | | 26 | | 26 | | 27 | |

| Switch-Deck | OUTAGE DESCRIPTION | Q Bus Name | Margin Criteria, MVar | Q V MARGIN ANALYSIS RESULTS (Results shown as "- - -" when margin is greater than 200% of the margin critera) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | hs_rev4_v2 | | hs_alt2d1_s1_v2 | | hs_alt3bd1_s1_v2 | | la_rev5_v2 | | la_alt2ad3_s1_v2 | | la_alt2d3_s1_v2 | | la_alt3bd3_s1_v2 | |
| | | | | MVar | Crit.,% | MVar | Crit.,% | MVar | Crit.,% | MVar | Crit.,% | MVar | Crit.,% | MVar | Crit.,% | MVar | Crit.,% |
| luvi | Lugo - Victorville 500 | HRD-230 230 | 100 | 851 | - - - | 745 | - - - | 695 | - - - | 760 | - - - | 637 | - - - | 626 | - - - | 708 | - - - |
| | | MTP-230 230 | 100 | 859 | - - - | 735 | - - - | 675 | - - - | 811 | - - - | 656 | - - - | 642 | - - - | 739 | - - - |
| | | ROA-230 230 | 100 | 963 | - - - | 925 | - - - | 949 | - - - | 1109 | - - - | 857 | - - - | 806 | - - - | 1002 | - - - |
| | | TJI-230 230 | 100 | 883 | - - - | 761 | - - - | 691 | - - - | 842 | - - - | 664 | - - - | 650 | - - - | 770 | - - - |
| | | COACHELA 230 | 100 | 706 | - - - | 779 | - - - | 783 | - - - | 722 | - - - | 822 | - - - | 548 | - - - | 702 | - - - |
| | | ELCENTSW 230 | 100 | 578 | - - - | 993 | - - - | 1068 | - - - | 523 | - - - | 846 | - - - | 732 | - - - | 922 | - - - |
| | | HIGHLINE 230 | 100 | 452 | - - - | 902 | - - - | 940 | - - - | 404 | - - - | 765 | - - - | 640 | - - - | 788 | - - - |
| | | NEWSF230 230 | 100 | NA | NA | 855 | - - - | 975 | - - - | NA | NA | 728 | - - - | 659 | - - - | 824 | - - - |
| | | ESCNDIDO 230 | 150 | 1262 | - - - | 1345 | - - - | 1212 | - - - | 1201 | - - - | 780 | - - - | 758 | - - - | 1020 | - - - |
| | | IMPRLVLY 230 | 150 | 1334 | - - - | 1141 | - - - | 1241 | - - - | 1430 | - - - | 954 | - - - | 868 | - - - | 1129 | - - - |
| | | MIGUEL 230 | 150 | 1152 | - - - | 1021 | - - - | 896 | - - - | 1119 | - - - | 719 | - - - | 686 | - - - | 903 | - - - |
| | | MISSION 230 | 150 | 1157 | - - - | 1105 | - - - | 888 | - - - | 1146 | - - - | 720 | - - - | 695 | - - - | 889 | - - - |
| | | SANLUSRY 230 | 150 | 1616 | - - - | 1664 | - - - | 1388 | - - - | 1531 | - - - | 892 | - - - | 867 | - - - | 1130 | - - - |
| | | SOUTHBAY 69 | 150 | 333 | - - - | 352 | - - - | 291 | 194% | 341 | - - - | 284 | 189% | 282 | 188% | 316 | - - - |
| | | SYCAMORE 230 | 150 | 1129 | - - - | 1158 | - - - | 896 | - - - | 1043 | - - - | 733 | - - - | 701 | - - - | 907 | - - - |
| | | DEVERS 230 | 300 | 1634 | - - - | 1479 | - - - | 1570 | - - - | 1259 | - - - | 735 | - - - | 721 | - - - | 998 | - - - |
| | | LUGO 500 | 300 | 3000 | - - - | 3000 | - - - | 3000 | - - - | 3000 | - - - | 1560 | - - - | 1562 | - - - | 2198 | - - - |
| | | MIRALOMW 230 | 300 | 2308 | - - - | 2235 | - - - | 2304 | - - - | 2300 | - - - | 1241 | - - - | 1241 | - - - | 1693 | - - - |
| | | S.ONOFRE 230 | 300 | 1997 | - - - | 2029 | - - - | 1797 | - - - | 1718 | - - - | 1003 | - - - | 988 | - - - | 1292 | - - - |
| | | SERRANO 230 | 300 | 2398 | - - - | 2342 | - - - | 2371 | - - - | 2320 | - - - | 1234 | - - - | 1237 | - - - | 1642 | - - - |
| | | VALYSVC1 500 | 300 | 1823 | - - - | 1664 | - - - | 1910 | - - - | 1627 | - - - | 862 | - - - | 865 | - - - | 1263 | - - - |
| | | VINCENT 500 | 300 | 3000 | - - - | 3000 | - - - | 3000 | - - - | 3000 | - - - | 2156 | - - - | 2161 | - - - | 2937 | - - - |
| | | VSTA 230 | 300 | 2135 | - - - | 2040 | - - - | 2098 | - - - | 1889 | - - - | 1018 | - - - | 1012 | - - - | 1408 | - - - |
| | | PADUA 230 | 300 | 1090 | - - - | 1065 | - - - | 1079 | - - - | 1114 | - - - | 839 | - - - | 839 | - - - | 974 | - - - |
| | | IRONMTP1 6.9 | | 24 | | 25 | | 25 | | 28 | | 25 | | 25 | | 26 | |

| Switch-Deck | OUTAGE DESCRIPTION | Q Bus Name | Margin Criteria, MVar | Q V MARGIN ANALYSIS RESULTS (Results shown as "- - -" when margin is greater than 200% of the margin critera) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | hs_rev4_v2 | | hs_alt2d1_s1_v2 | | hs_alt3bd1_s1_v2 | | la_rev5_v2 | | la_alt2ad3_s1_v2 | | la_alt2d3_s1_v2 | | la_alt3bd3_s1_v2 | |
| | | | MVar | MVar | Crit.,% | MVar | Crit.,% | MVar | Crit.,% | MVar | Crit.,% | MVar | Crit.,% | MVar | Crit.,% | MVar | Crit.,% |
| omtj | Otay Mesa - Tijuana 230 | HRD-230 230 | 100 | 353 | - - - | 272 | - - - | 281 | - - - | 357 | - - - | 350 | - - - | 349 | - - - | 354 | - - - |
| | | MTP-230 230 | 100 | 308 | - - - | 235 | - - - | 243 | - - - | 313 | - - - | 307 | - - - | 307 | - - - | 310 | - - - |
| | | ROA-230 230 | 100 | 920 | - - - | 799 | - - - | 851 | - - - | 1057 | - - - | 971 | - - - | 923 | - - - | 1037 | - - - |
| | | TJI-230 230 | 100 | 303 | - - - | 231 | - - - | 239 | - - - | 308 | - - - | 302 | - - - | 302 | - - - | 305 | - - - |
| | | COACHELA 230 | 100 | 689 | - - - | 754 | - - - | 769 | - - - | 752 | - - - | 925 | - - - | 583 | - - - | 725 | - - - |
| | | ELCENTSW 230 | 100 | 567 | - - - | 910 | - - - | 1016 | - - - | 524 | - - - | 918 | - - - | 780 | - - - | 970 | - - - |
| | | HIGHLINE 230 | 100 | 442 | - - - | 832 | - - - | 903 | - - - | 412 | - - - | 799 | - - - | 665 | - - - | 806 | - - - |
| | | NEWSF230 230 | 100 | NA | NA | 780 | - - - | 928 | - - - | NA | NA | 717 | - - - | 647 | - - - | 826 | - - - |
| | | ESCNDIDO 230 | 150 | 1170 | - - - | 1217 | - - - | 1054 | - - - | 1102 | - - - | 745 | - - - | 717 | - - - | 936 | - - - |
| | | IMPRLVLY 230 | 150 | 1270 | - - - | 1041 | - - - | 1190 | - - - | 1477 | - - - | 1053 | - - - | 944 | - - - | 1225 | - - - |
| | | MIGUEL 230 | 150 | 982 | - - - | 868 | - - - | 744 | - - - | 1012 | - - - | 681 | - - - | 648 | - - - | 821 | - - - |
| | | MISSION 230 | 150 | 969 | - - - | 948 | - - - | 738 | - - - | 1018 | - - - | 676 | - - - | 650 | - - - | 800 | - - - |
| | | SANLUSRY 230 | 150 | 1494 | - - - | 1497 | - - - | 1204 | - - - | 1404 | - - - | 868 | - - - | 835 | - - - | 1059 | - - - |
| | | SOUTHBAY 69 | 150 | 326 | - - - | 337 | - - - | 278 | 186% | 330 | - - - | 278 | 186% | 276 | 184% | 309 | - - - |
| | | SYCAMORE 230 | 150 | 944 | - - - | 994 | - - - | 755 | - - - | 927 | - - - | 695 | - - - | 660 | - - - | 818 | - - - |
| | | DEVERS 230 | 300 | 1664 | - - - | 1688 | - - - | 1621 | - - - | 1391 | - - - | 883 | - - - | 862 | - - - | 1100 | - - - |
| | | LUGO 500 | 300 | 3000 | - - - | 3000 | - - - | 3000 | - - - | 3000 | - - - | 1991 | - - - | 1951 | - - - | 2543 | - - - |
| | | MIRALOMW 230 | 300 | 2570 | - - - | 2445 | - - - | 2543 | - - - | 2504 | - - - | 1428 | - - - | 1457 | - - - | 1807 | - - - |
| | | S.ONOFRE 230 | 300 | 1928 | - - - | 1911 | - - - | 1602 | - - - | 1629 | - - - | 1007 | - - - | 973 | - - - | 1241 | - - - |
| | | SERRANO 230 | 300 | 2581 | - - - | 2516 | - - - | 2513 | - - - | 2432 | - - - | 1421 | - - - | 1413 | - - - | 1728 | - - - |
| | | VALYSVC1 500 | 300 | 1958 | - - - | 1788 | - - - | 2013 | - - - | 1781 | - - - | 1033 | - - - | 1034 | - - - | 1371 | - - - |
| | | VINCENT 500 | 300 | 3000 | - - - | 3000 | - - - | 3000 | - - - | 3000 | - - - | 2607 | - - - | 2573 | - - - | 3000 | - - - |
| | | VSTA 230 | 300 | 2322 | - - - | 2205 | - - - | 2259 | - - - | 2052 | - - - | 1219 | - - - | 1200 | - - - | 1545 | - - - |
| | | PADUA 230 | 300 | 1151 | - - - | 1125 | - - - | 1134 | - - - | 1162 | - - - | 922 | - - - | 921 | - - - | 1025 | - - - |
| | | IRONMTP1 6.9 | | 24 | | 26 | | 26 | | 28 | | 26 | | 25 | | 27 | |

| Switch-Deck | OUTAGE DESCRIPTION | Q Bus Name | Margin Criteria, MVar | Q V MARGIN ANALYSIS RESULTS (Results shown as "- - -" when margin is greater than 200% of the margin critera) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | hs_rev4_v2 | | hs_alt2d1_s1_v2 | | hs_alt3bd1_s1_v2 | | la_rev5_v2 | | la_alt2ad3_s1_v2 | | la_alt2d3_s1_v2 | | la_alt3bd3_s1_v2 | |
| | | | MVar | MVar | Crit.,% | MVar | Crit.,% | MVar | Crit.,% | MVar | Crit.,% | MVar | Crit.,% | MVar | Crit.,% | MVar | Crit.,% |
| **DOUBLE CONTINGENCIES:** | | | | | | | | | | | | | | | | | |
| lu-vcvi | Lugo-Vincent & Lugo - Victorvil | HRD-230 230 | 50 | 850 | - - - | 742 | - - - | 696 | - - - | 756 | - - - | 649 | - - - | 638 | - - - | 694 | - - - |
| | | MTP-230 230 | 50 | 858 | - - - | 732 | - - - | 675 | - - - | 807 | - - - | 665 | - - - | 650 | - - - | 729 | - - - |
| | | ROA-230 230 | 50 | 962 | - - - | 918 | - - - | 951 | - - - | 1104 | - - - | 867 | - - - | 814 | - - - | 969 | - - - |
| | | TJI-230 230 | 50 | 882 | - - - | 757 | - - - | 691 | - - - | 838 | - - - | 673 | - - - | 659 | - - - | 737 | - - - |
| | | COACHELA 230 | 50 | 698 | - - - | 768 | - - - | 794 | - - - | 713 | - - - | 779 | - - - | 535 | - - - | 678 | - - - |
| | | ELCENTSW 230 | 50 | 577 | - - - | 981 | - - - | 1074 | - - - | 522 | - - - | 842 | - - - | 729 | - - - | 890 | - - - |
| | | HIGHLINE 230 | 50 | 450 | - - - | 893 | - - - | 946 | - - - | 401 | - - - | 756 | - - - | 635 | - - - | 766 | - - - |
| | | NEWSF230 230 | 50 | NA | NA | 849 | - - - | 977 | - - - | NA | NA | 729 | - - - | 660 | - - - | 803 | - - - |
| | | ESCNDIDO 230 | 75 | 1254 | - - - | 1331 | - - - | 1205 | - - - | 1186 | - - - | 773 | - - - | 755 | - - - | 960 | - - - |
| | | IMPRLVLY 230 | 75 | 1332 | - - - | 1129 | - - - | 1245 | - - - | 1420 | - - - | 959 | - - - | 870 | - - - | 1082 | - - - |
| | | MIGUEL 230 | 75 | 1148 | - - - | 1011 | - - - | 895 | - - - | 1109 | - - - | 722 | - - - | 692 | - - - | 861 | - - - |
| | | MISSION 230 | 75 | 1153 | - - - | 1096 | - - - | 886 | - - - | 1130 | - - - | 722 | - - - | 699 | - - - | 842 | - - - |
| | | SANLUSRY 230 | 75 | 1602 | - - - | 1645 | - - - | 1379 | - - - | 1503 | - - - | 868 | - - - | 852 | - - - | 1053 | - - - |
| | | SOUTHBAY 69 | 75 | 333 | - - - | 351 | - - - | 291 | - - - | 340 | - - - | 297 | - - - | 295 | - - - | 310 | - - - |
| | | SYCAMORE 230 | 75 | 1125 | - - - | 1148 | - - - | 895 | - - - | 1031 | - - - | 734 | - - - | 705 | - - - | 859 | - - - |
| | | DEVERS 230 | 150 | 1592 | - - - | 1438 | - - - | 1584 | - - - | 1215 | - - - | 677 | - - - | 668 | - - - | 933 | - - - |
| | | LUGO 500 | 150 | 3000 | - - - | 3000 | - - - | 3000 | - - - | 2883 | - - - | 1306 | - - - | 1310 | - - - | 1856 | - - - |
| | | MIRALOMW 230 | 150 | 2207 | - - - | 2130 | - - - | 2238 | - - - | 2168 | - - - | 1096 | - - - | 1098 | - - - | 1510 | - - - |
| | | S.ONOFRE 230 | 150 | 1975 | - - - | 2001 | - - - | 1782 | - - - | 1685 | - - - | 962 | - - - | 953 | - - - | 1197 | - - - |
| | | SERRANO 230 | 150 | 2316 | - - - | 2244 | - - - | 2324 | - - - | 2171 | - - - | 1101 | - - - | 1105 | - - - | 1482 | - - - |
| | | VALYSVC1 500 | 150 | 1760 | - - - | 1604 | - - - | 1887 | - - - | 1561 | - - - | 775 | - - - | 779 | - - - | 1147 | - - - |
| | | VINCENT 500 | 150 | 3000 | - - - | 3000 | - - - | 3000 | - - - | 3000 | - - - | 2113 | - - - | 2124 | - - - | 2836 | - - - |
| | | VSTA 230 | 150 | 2051 | - - - | 1949 | - - - | 2054 | - - - | 1794 | - - - | 905 | - - - | 903 | - - - | 1268 | - - - |
| | | PADUA 230 | 150 | 1061 | - - - | 1033 | - - - | 1059 | - - - | 1070 | - - - | 780 | - - - | 780 | - - - | 914 | - - - |
| | | IRONMTP1 6.9 | | 24 | | 25 | | 25 | | 28 | | 25 | | 25 | | 26 | |

| Switch-Deck | OUTAGE DESCRIPTION | Q Bus Name | Margin Criteria, MVar | Q V MARGIN ANALYSIS RESULTS (Results shown as "- - -" when margin is greater than 200% of the margin critera) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | hs_rev4_v2 | | hs_alt2d1_s1_v2 | | hs_alt3bd1_s1_v2 | | la_rev5_v2 | | la_alt2ad3_s1_v2 | | la_alt2d3_s1_v2 | | la_alt3bd3_s1_v2 | |
| | | | | MVar | Crit.,% | MVar | Crit.,% | MVar | Crit.,% | MVar | Crit.,% | MVar | Crit.,% | MVar | Crit.,% | MVar | Crit.,% |
| lumi23 | Lugo - Mira Loma 500 Ckts 2 & | HRD-230 230 | 50 | 846 | - - - | 740 | - - - | 685 | - - - | 764 | - - - | 640 | - - - | 629 | - - - | 707 | - - - |
| | | MTP-230 230 | 50 | 853 | - - - | 730 | - - - | 664 | - - - | 816 | - - - | 658 | - - - | 643 | - - - | 736 | - - - |
| | | ROA-230 230 | 50 | 956 | - - - | 915 | - - - | 939 | - - - | 1119 | - - - | 868 | - - - | 815 | - - - | 1003 | - - - |
| | | TJI-230 230 | 50 | 879 | - - - | 755 | - - - | 680 | - - - | 871 | - - - | 665 | - - - | 651 | - - - | 754 | - - - |
| | | COACHELA 230 | 50 | 684 | - - - | 771 | - - - | 775 | - - - | 726 | - - - | 819 | - - - | 552 | - - - | 701 | - - - |
| | | ELCENTSW 230 | 50 | 576 | - - - | 982 | - - - | 1046 | - - - | 525 | - - - | 857 | - - - | 740 | - - - | 924 | - - - |
| | | HIGHLINE 230 | 50 | 445 | - - - | 891 | - - - | 925 | - - - | 405 | - - - | 773 | - - - | 646 | - - - | 789 | - - - |
| | | NEWSF230 230 | 50 | NA | NA | 848 | - - - | 960 | - - - | NA | NA | 734 | - - - | 665 | - - - | 825 | - - - |
| | | ESCNDIDO 230 | 75 | 1233 | - - - | 1327 | - - - | 1161 | - - - | 1199 | - - - | 768 | - - - | 747 | - - - | 996 | - - - |
| | | IMPRLVLY 230 | 75 | 1320 | - - - | 1128 | - - - | 1208 | - - - | 1440 | - - - | 966 | - - - | 878 | - - - | 1129 | - - - |
| | | MIGUEL 230 | 75 | 1135 | - - - | 1010 | - - - | 870 | - - - | 1130 | - - - | 720 | - - - | 688 | - - - | 895 | - - - |
| | | MISSION 230 | 75 | 1139 | - - - | 1093 | - - - | 863 | - - - | 1148 | - - - | 716 | - - - | 693 | - - - | 874 | - - - |
| | | SANLUSRY 230 | 75 | 1569 | - - - | 1639 | - - - | 1326 | - - - | 1521 | - - - | 869 | - - - | 847 | - - - | 1093 | - - - |
| | | SOUTHBAY 69 | 75 | 331 | - - - | 350 | - - - | 279 | - - - | 343 | - - - | 285 | - - - | 283 | - - - | 315 | - - - |
| | | SYCAMORE 230 | 75 | 1114 | - - - | 1144 | - - - | 872 | - - - | 1045 | - - - | 730 | - - - | 701 | - - - | 892 | - - - |
| | | DEVERS 230 | 150 | 1522 | - - - | 1520 | - - - | 1524 | - - - | 1262 | - - - | 723 | - - - | 712 | - - - | 985 | - - - |
| | | LUGO 500 | 150 | 3000 | - - - | 3000 | - - - | 3000 | - - - | 3000 | - - - | 1796 | - - - | 1800 | - - - | 2524 | - - - |
| | | MIRALOMW 230 | 150 | 1952 | - - - | 1997 | - - - | 2002 | - - - | 2102 | - - - | 1118 | - - - | 1118 | - - - | 1528 | - - - |
| | | S.ONOFRE 230 | 150 | 1923 | - - - | 1986 | - - - | 1703 | - - - | 1699 | - - - | 968 | - - - | 952 | - - - | 1240 | - - - |
| | | SERRANO 230 | 150 | 2130 | - - - | 2174 | - - - | 2146 | - - - | 2178 | - - - | 1142 | - - - | 1144 | - - - | 1527 | - - - |
| | | VALYSVC1 500 | 150 | 1664 | - - - | 1590 | - - - | 1800 | - - - | 1606 | - - - | 824 | - - - | 828 | - - - | 1213 | - - - |
| | | VINCENT 500 | 150 | 3000 | - - - | 3000 | - - - | 3000 | - - - | 3000 | - - - | 2209 | - - - | 2214 | - - - | 3000 | - - - |
| | | VSTA 230 | 150 | 1912 | - - - | 1904 | - - - | 1932 | - - - | 1826 | - - - | 955 | - - - | 952 | - - - | 1330 | - - - |
| | | PADUA 230 | 150 | 1025 | - - - | 1033 | - - - | 1028 | - - - | 1092 | - - - | 805 | - - - | 805 | - - - | 942 | - - - |
| | | IRONMTP1 6.9 | | 24 | | 25 | | 25 | | 28 | | 25 | | 25 | | 27 | |

| Switch-Deck | OUTAGE DESCRIPTION | Q Bus Name | Margin Criteria, MVar | Q V MARGIN ANALYSIS RESULTS (Results shown as "- - -" when margin is greater than 200% of the margin critera) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | hs_rev4_v2 | | hs_alt2d1_s1_v2 | | hs_alt3bd1_s1_v2 | | la_rev5_v2 | | la_alt2ad3_s1_v2 | | la_alt2d3_s1_v2 | | la_alt3bd3_s1_v2 | |
| | | | | MVar | Crit.,% | MVar | Crit.,% | MVar | Crit.,% | MVar | Crit.,% | MVar | Crit.,% | MVar | Crit.,% | MVar | Crit.,% |
| | | | | | | | | | | | | See Note 4 | | See Note 5 | | See Note 6 | |
| dv_east_dlo | Devers - PV & Devers - Harqua | HRD-230 230 | 50 | 722 | - - - | 585 | - - - | 541 | - - - | 383 | - - - | 703 | - - - | 504 | - - - | 296 | - - - |
| | | MTP-230 230 | 50 | 727 | - - - | 587 | - - - | 530 | - - - | 413 | - - - | 737 | - - - | 518 | - - - | 301 | - - - |
| | | ROA-230 230 | 50 | 822 | - - - | 665 | - - - | 685 | - - - | 417 | - - - | 803 | - - - | 443 | - - - | 227 | - - - |
| | - or - | TJI-230 230 | 50 | 745 | - - - | 603 | - - - | 539 | - - - | 423 | - - - | 751 | - - - | 524 | - - - | 303 | - - - |
| Case | | COACHELA 230 | 50 | 548 | - - - | 426 | - - - | 472 | - - - | 523 | - - - | 622 | - - - | 197 | - - - | 140 | - - - |
| la_alt2ad3: | Devers - Midpints 500kV #1 & 2 | ELCENTSW 230 | 50 | 511 | - - - | 628 | - - - | 697 | - - - | 326 | - - - | 719 | - - - | 316 | - - - | 180 | - - - |
| dvmpih_Caps | | HIGHLINE 230 | 50 | 386 | - - - | 563 | - - - | 622 | - - - | 301 | - - - | 646 | - - - | 266 | - - - | 161 | - - - |
| | - or - | NEWSF230 230 | 50 | NA | NA | 612 | - - - | 711 | - - - | NA | NA | 655 | - - - | 294 | - - - | 170 | - - - |
| | | ESCNDIDO 230 | 75 | 1056 | - - - | 1075 | - - - | 912 | - - - | 639 | - - - | 881 | - - - | 535 | - - - | 305 | - - - |
| Case | Devers-Midpints & Devers - IH | IMPRLVLY 230 | 75 | 1127 | - - - | 752 | - - - | 814 | - - - | 459 | - - - | 849 | - - - | 416 | - - - | 214 | - - - |
| la_alt2d3: | | MIGUEL 230 | 75 | 893 | - - - | 717 | - - - | 632 | - - - | 413 | - - - | 778 | - - - | 403 | - - - | 232 | - - - |
| lvmp12_Caps4V | | MISSION 230 | 75 | 919 | - - - | 812 | - - - | 652 | - - - | 502 | - - - | 811 | - - - | 481 | - - - | 281 | - - - |
| | | SANLUSRY 230 | 75 | 1337 | - - - | 1309 | - - - | 1031 | - - - | 765 | - - - | 993 | - - - | 584 | - - - | 334 | - - - |
| | | SOUTHBAY 69 | 75 | 287 | - - - | 305 | - - - | 250 | - - - | 249 | - - - | 355 | - - - | 325 | - - - | 206 | - - - |
| Case | | SYCAMORE 230 | 75 | 904 | - - - | 836 | - - - | 661 | - - - | 496 | - - - | 815 | - - - | 476 | - - - | 296 | - - - |
| la_alt3bd3: | | DEVERS 230 | 150 | 1083 | - - - | 858 | - - - | 914 | - - - | 922 | - - - | 483 | - - - | 306 | - - - | 210 | 140% |
| dvmp12_Caps | | LUGO 500 | 150 | 2942 | - - - | 2626 | - - - | 2860 | - - - | 1164 | - - - | 1187 | - - - | 590 | - - - | 406 | - - - |
| | | MIRALOMW 230 | 150 | 1964 | - - - | 1829 | - - - | 1884 | - - - | 1320 | - - - | 1030 | - - - | 563 | - - - | 383 | - - - |
| | | S.ONOFRE 230 | 150 | 1698 | - - - | 1650 | - - - | 1338 | - - - | 963 | - - - | 1052 | - - - | 579 | - - - | 363 | - - - |
| | | SERRANO 230 | 150 | 2083 | - - - | 1984 | - - - | 1915 | - - - | 1343 | - - - | 1082 | - - - | 598 | - - - | 383 | - - - |
| | | VALYSVC1 500 | 150 | 1263 | - - - | 1110 | - - - | 1259 | - - - | 1062 | - - - | 682 | - - - | 397 | - - - | 264 | 176% |
| | | VINCENT 500 | 150 | 3000 | - - - | 3000 | - - - | 3000 | - - - | 1812 | - - - | 1713 | - - - | 878 | - - - | 557 | - - - |
| | | VSTA 230 | 150 | 1643 | - - - | 1486 | - - - | 1586 | - - - | 1185 | - - - | 830 | - - - | 485 | - - - | 333 | - - - |
| | | PADUA 230 | 150 | 1019 | - - - | 1018 | - - - | 1023 | - - - | 971 | - - - | 819 | - - - | 500 | - - - | 350 | - - - |
| | | IRONMTP1 6.9 | | 19 | | 21 | | 21 | | 18 | | 21 | | 17 | | 18 | |

| Switch-Deck | OUTAGE DESCRIPTION | Q Bus Name | Margin Criteria, MVar | Q V MARGIN ANALYSIS RESULTS (Results shown as "- - -" when margin is greater than 200% of the margin critera) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | hs_rev4_v2 | | hs_alt2d1_s1_v2 | | hs_alt3bd1_s1_v2 | | la_rev5_v2 | | la_alt2ad3_s1_v2 | | la_alt2d3_s1_v2 | | la_alt3bd3_s1_v2 | |
| | | | MVar | MVar | Crit.,% | MVar | Crit.,% | MVar | Crit.,% | MVar | Crit.,% | MVar | Crit.,% | MVar | Crit.,% | MVar | Crit.,% |
| pvgen23a | Palo Verde Units 2 & 3 | HRD-230 230 | 50 | 902 | - - - | 790 | - - - | 766 | - - - | 824 | - - - | 824 | - - - | 820 | - - - | 811 | - - - |
| | | MTP-230 230 | 50 | 907 | | 779 | - - - | 741 | - - - | 891 | - - - | 894 | - - - | 889 | - - - | 873 | - - - |
| | | ROA-230 230 | 50 | 1065 | - - - | 1016 | - - - | 1083 | - - - | 1234 | - - - | 1272 | - - - | 1234 | - - - | 1305 | - - - |
| | | TJI-230 230 | 50 | 940 | - - - | 801 | - - - | 768 | - - - | 938 | - - - | 939 | - - - | 933 | - - - | 916 | - - - |
| | | COACHELA 230 | 50 | 740 | - - - | 873 | - - - | 889 | - - - | 898 | - - - | 1510 | - - - | 903 | - - - | 988 | - - - |
| | | ELCENTSW 230 | 50 | 601 | - - - | 1143 | - - - | 1272 | - - - | 554 | - - - | 1335 | - - - | 1186 | - - - | 1314 | - - - |
| | | HIGHLINE 230 | 50 | 463 | - - - | 1011 | - - - | 1065 | - - - | 440 | - - - | 1061 | - - - | 951 | - - - | 1020 | - - - |
| | | NEWSF230 230 | 50 | NA | NA | 939 | - - - | 1105 | - - - | NA | NA | 991 | - - - | 942 | - - - | 1078 | - - - |
| | | ESCNDIDO 230 | 75 | 1346 | - - - | 1432 | - - - | 1446 | - - - | 1326 | - - - | 1233 | - - - | 1224 | - - - | 1398 | - - - |
| | | IMPRLVLY 230 | 75 | 1475 | - - - | 1323 | - - - | 1518 | - - - | 1613 | - - - | 1611 | - - - | 1470 | - - - | 1671 | - - - |
| | | MIGUEL 230 | 75 | 1295 | - - - | 1146 | - - - | 1091 | - - - | 1290 | - - - | 1229 | - - - | 1208 | - - - | 1238 | - - - |
| | | MISSION 230 | 75 | 1269 | - - - | 1201 | - - - | 1058 | - - - | 1305 | - - - | 1239 | - - - | 1221 | - - - | 1197 | - - - |
| | | SANLUSRY 230 | 75 | 1735 | - - - | 1783 | - - - | 1660 | - - - | 1741 | - - - | 1571 | - - - | 1553 | - - - | 1635 | - - - |
| | | SOUTHBAY 69 | 75 | 356 | - - - | 356 | - - - | 316 | - - - | 351 | - - - | 355 | - - - | 353 | - - - | 347 | - - - |
| | | SYCAMORE 230 | 75 | 1231 | - - - | 1276 | - - - | 1062 | - - - | 1164 | - - - | 1303 | - - - | 1278 | - - - | 1212 | - - - |
| | | DEVERS 230 | 150 | 1854 | - - - | 1730 | - - - | 1874 | - - - | 1931 | - - - | 1676 | - - - | 1637 | - - - | 1748 | - - - |
| | | LUGO 500 | 150 | 3000 | - - - | 3000 | - - - | 3000 | - - - | 3000 | - - - | 3000 | - - - | 3000 | - - - | 3000 | - - - |
| | | MIRALOMW 230 | 150 | 2537 | - - - | 2544 | - - - | 2668 | - - - | 3000 | - - - | 2553 | - - - | 2556 | - - - | 2713 | - - - |
| | | S.ONOFRE 230 | 150 | 2126 | - - - | 2167 | - - - | 2143 | - - - | 1929 | - - - | 1667 | - - - | 1663 | - - - | 1847 | - - - |
| | | SERRANO 230 | 150 | 2587 | - - - | 2570 | - - - | 2679 | - - - | 3000 | - - - | 2431 | - - - | 2412 | - - - | 2530 | - - - |
| | | VALYSVC1 500 | 150 | 2108 | - - - | 1994 | - - - | 2282 | - - - | 2299 | - - - | 1903 | - - - | 1909 | - - - | 2212 | - - - |
| | | VINCENT 500 | 150 | 3000 | - - - | 3000 | - - - | 3000 | - - - | 3000 | - - - | 3000 | - - - | 3000 | - - - | 3000 | - - - |
| | | VSTA 230 | 150 | 2380 | - - - | 2348 | - - - | 2417 | - - - | 2588 | - - - | 2169 | - - - | 2161 | - - - | 2301 | - - - |
| | | PADUA 230 | 150 | 1145 | - - - | 1144 | - - - | 1158 | - - - | 1316 | - - - | 1213 | - - - | 1215 | - - - | 1252 | - - - |
| | | IRONMTP1 6.9 | | 25 | | 26 | | 26 | | 29 | | 29 | | 28 | | 29 | |

| Switch-Deck | OUTAGE DESCRIPTION | Q Bus Name | Margin Criteria, MVar | Q V MARGIN ANALYSIS RESULTS (Results shown as "- - -" when margin is greater than 200% of the margin critera) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | hs_rev4_v2 | | hs_alt2d1_s1_v2 | | hs_alt3bd1_s1_v2 | | la_rev5_v2 | | la_alt2ad3_s1_v2 | | la_alt2d3_s1_v2 | | la_alt3bd3_s1_v2 | |
| | | | MVar | MVar | Crit.,% | MVar | Crit.,% | MVar | Crit.,% | MVar | Crit.,% | MVar | Crit.,% | MVar | Crit.,% | MVar | Crit.,% |
| sota12 | Songs - Talega 230kV Ckts 1 & | HRD-230 230 | 50 | 823 | - - - | 713 | - - - | 722 | - - - | 767 | - - - | 680 | - - - | 671 | - - - | 689 | - - - |
| | | MTP-230 230 | 50 | 821 | - - - | 702 | - - - | 702 | - - - | 830 | - - - | 710 | - - - | 698 | - - - | 725 | - - - |
| | | ROA-230 230 | 50 | 949 | - - - | 902 | - - - | 989 | - - - | 1129 | - - - | 955 | - - - | 902 | - - - | 1020 | - - - |
| | | TJI-230 230 | 50 | 844 | - - - | 724 | - - - | 719 | - - - | 874 | - - - | 717 | - - - | 705 | - - - | 732 | - - - |
| | | COACHELA 230 | 50 | 702 | - - - | 818 | - - - | 831 | - - - | 768 | - - - | 1000 | - - - | 639 | - - - | 747 | - - - |
| | | ELCENTSW 230 | 50 | 577 | - - - | 993 | - - - | 1126 | - - - | 529 | - - - | 967 | - - - | 838 | - - - | 971 | - - - |
| | | HIGHLINE 230 | 50 | 448 | - - - | 905 | - - - | 984 | - - - | 417 | - - - | 849 | - - - | 729 | - - - | 821 | - - - |
| | | NEWSF230 230 | 50 | NA | NA | 842 | - - - | 996 | - - - | NA | NA | 795 | - - - | 738 | - - - | 861 | - - - |
| | | ESCNDIDO 230 | 75 | 792 | - - - | 856 | - - - | 1307 | - - - | 1127 | - - - | 815 | - - - | 801 | - - - | 1018 | - - - |
| | | IMPRLVLY 230 | 75 | 1307 | - - - | 1114 | - - - | 1314 | - - - | 1451 | - - - | 1092 | - - - | 995 | - - - | 1172 | - - - |
| | | MIGUEL 230 | 75 | 1007 | - - - | 916 | - - - | 952 | - - - | 1131 | - - - | 823 | - - - | 792 | - - - | 891 | - - - |
| | | MISSION 230 | 75 | 993 | - - - | 976 | - - - | 942 | - - - | 1147 | - - - | 824 | - - - | 799 | - - - | 868 | - - - |
| | | SANLUSRY 230 | 75 | 1343 | - - - | 1418 | - - - | 1464 | - - - | 1520 | - - - | 1039 | - - - | 1015 | - - - | 1156 | - - - |
| | | SOUTHBAY 69 | 75 | 320 | - - - | 340 | - - - | 300 | - - - | 345 | - - - | 297 | - - - | 296 | - - - | 297 | - - - |
| | | SYCAMORE 230 | 75 | 959 | - - - | 1005 | - - - | 945 | - - - | 1042 | - - - | 835 | - - - | 807 | - - - | 894 | - - - |
| | | DEVERS 230 | 150 | 1726 | - - - | 1733 | - - - | 1711 | - - - | 1439 | - - - | 967 | - - - | 951 | - - - | 1131 | - - - |
| | | LUGO 500 | 150 | 3000 | - - - | 3000 | - - - | 3000 | - - - | 3000 | - - - | 2182 | - - - | 2187 | - - - | 2644 | - - - |
| | | MIRALOMW 230 | 150 | 2620 | - - - | 2535 | - - - | 2609 | - - - | 2536 | - - - | 1581 | - - - | 1617 | - - - | 1867 | - - - |
| | | S.ONOFRE 230 | 150 | 1723 | - - - | 1782 | - - - | 1806 | - - - | 1661 | - - - | 1198 | - - - | 1184 | - - - | 1271 | - - - |
| | | SERRANO 230 | 150 | 2621 | - - - | 2558 | - - - | 2644 | - - - | 2465 | - - - | 1560 | - - - | 1562 | - - - | 1772 | - - - |
| | | VALYSVC1 500 | 150 | 1990 | - - - | 1838 | - - - | 2055 | - - - | 1830 | - - - | 1147 | - - - | 1153 | - - - | 1443 | - - - |
| | | VINCENT 500 | 150 | 3000 | - - - | 3000 | - - - | 3000 | - - - | 3000 | - - - | 2823 | - - - | 2838 | - - - | 3000 | - - - |
| | | VSTA 230 | 150 | 2359 | - - - | 2275 | - - - | 2334 | - - - | 2104 | - - - | 1350 | - - - | 1346 | - - - | 1587 | - - - |
| | | PADUA 230 | 150 | 1161 | - - - | 1142 | - - - | 1153 | - - - | 1176 | - - - | 952 | - - - | 951 | - - - | 1026 | - - - |
| | | IRONMTP1 6.9 | | 25 | | 26 | | 26 | | 28 | | 26 | | 26 | | 27 | |

| Switch-Deck | OUTAGE DESCRIPTION | Q Bus Name | Margin Criteria, MVar | Q V MARGIN ANALYSIS RESULTS (Results shown as "- - -" when margin is greater than 200% of the margin critera) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | hs_rev4_v2 | | hs_alt2d1_s1_v2 | | hs_alt3bd1_s1_v2 | | la_rev5_v2 | | la_alt2ad3_s1_v2 | | la_alt2d3_s1_v2 | | la_alt3bd3_s1_v2 | |
| | | | | MVar | Crit.,% | MVar | Crit.,% | MVar | Crit.,% | MVar | Crit.,% | MVar | Crit.,% | MVar | Crit.,% | MVar | Crit.,% |
| song23a | San Onofre Units 2 & 3 | HRD-230 230 | 50 | 585 | - - - | 378 | - - - | 361 | - - - | 661 | - - - | 547 | - - - | 534 | - - - | 638 | - - - |
| | | MTP-230 230 | 50 | 558 | - - - | 366 | - - - | 336 | - - - | 699 | - - - | 552 | - - - | 536 | - - - | 659 | - - - |
| | | ROA-230 230 | 50 | 719 | - - - | 471 | - - - | 542 | - - - | 959 | - - - | 750 | - - - | 708 | - - - | 876 | - - - |
| | | TJI-230 230 | 50 | 561 | - - - | 369 | - - - | 335 | - - - | 706 | - - - | 557 | - - - | 541 | - - - | 666 | - - - |
| | | COACHELA 230 | 50 | 702 | - - - | 647 | - - - | 694 | - - - | 735 | - - - | 830 | - - - | 572 | - - - | 697 | - - - |
| | | ELCENTSW 230 | 50 | 541 | - - - | 568 | - - - | 662 | - - - | 507 | - - - | 763 | - - - | 669 | - - - | 835 | - - - |
| | | HIGHLINE 230 | 50 | 450 | - - - | 572 | - - - | 661 | - - - | 406 | - - - | 718 | - - - | 606 | - - - | 740 | - - - |
| | | NEWSF230 230 | 50 | NA | NA | 464 | - - - | 563 | - - - | NA | NA | 640 | - - - | 579 | - - - | 763 | - - - |
| | | ESCNDIDO 230 | 75 | 562 | - - - | 480 | - - - | 418 | - - - | 913 | - - - | 618 | - - - | 602 | - - - | 828 | - - - |
| | | IMPRLVLY 230 | 75 | 857 | - - - | 539 | - - - | 635 | - - - | 1183 | - - - | 826 | - - - | 762 | - - - | 977 | - - - |
| | | MIGUEL 230 | 75 | 523 | - - - | 366 | - - - | 320 | - - - | 827 | - - - | 574 | - - - | 552 | - - - | 734 | - - - |
| | | MISSION 230 | 75 | 502 | - - - | 382 | - - - | 313 | - - - | 836 | - - - | 567 | - - - | 551 | - - - | 719 | - - - |
| | | SANLUSRY 230 | 75 | 659 | - - - | 549 | - - - | 461 | - - - | 1089 | - - - | 696 | - - - | 680 | - - - | 904 | - - - |
| | | SOUTHBAY 69 | 75 | 249 | - - - | 243 | - - - | 198 | - - - | 297 | - - - | 285 | - - - | 284 | - - - | 301 | - - - |
| | | SYCAMORE 230 | 75 | 526 | - - - | 399 | - - - | 334 | - - - | 785 | - - - | 576 | - - - | 558 | - - - | 735 | - - - |
| | | DEVERS 230 | 150 | 1565 | - - - | 1346 | - - - | 1252 | - - - | 1304 | - - - | 807 | - - - | 790 | - - - | 1006 | - - - |
| | | LUGO 500 | 150 | 2889 | - - - | 2507 | - - - | 2085 | - - - | 3000 | - - - | 1676 | - - - | 1678 | - - - | 2157 | - - - |
| | | MIRALOMW 230 | 150 | 1788 | - - - | 1576 | - - - | 1398 | - - - | 2185 | - - - | 1211 | - - - | 1210 | - - - | 1541 | - - - |
| | | S.ONOFRE 230 | 150 | 805 | - - - | 673 | - - - | 582 | - - - | 1206 | - - - | 798 | - - - | 783 | - - - | 1031 | - - - |
| | | SERRANO 230 | 150 | 1546 | - - - | 1345 | - - - | 1175 | - - - | 2062 | - - - | 1176 | - - - | 1175 | - - - | 1470 | - - - |
| | | VALYSVC1 500 | 150 | 1594 | - - - | 1358 | - - - | 1083 | - - - | 1633 | - - - | 901 | - - - | 903 | - - - | 1179 | - - - |
| | | VINCENT 500 | 150 | 3000 | - - - | 3000 | - - - | 2812 | - - - | 3000 | - - - | 2232 | - - - | 2225 | - - - | 2799 | - - - |
| | | VSTA 230 | 150 | 1811 | - - - | 1603 | - - - | 1545 | - - - | 1865 | - - - | 1048 | - - - | 1040 | - - - | 1349 | - - - |
| | | PADUA 230 | 150 | 1035 | - - - | 1016 | - - - | 1029 | - - - | 1103 | - - - | 855 | - - - | 855 | - - - | 963 | - - - |
| | | IRONMTP1 6.9 | | 24 | | 25 | | 25 | | 28 | | 26 | | 25 | | 26 | |

2) Reactive margin solution resolved by addition of two 75 MVar shunt caps at SouthBay 69, and two 79 MVar Caps at Devers 230
3) Reactive margin solution resolved by addition of two 75 MVar shunt caps at SouthBay 69
4) Reactive margin & voltage ciolation solution for base case la_alt2ad3_s1_v2 resolved by addition of shunt capts at: S.Onofre 230: 500 Mvars, South Bay 69: 75 Mvar, Serrano: 395 MVar, Miguel 230: 450 MVar, Sycamore 230: 300 MVar, Coachella 230: 150 MVar (la_alt2ad3_s1_v2_dvmpih_Caps)
5) Reactive margin solution for base case la_alt2d3_s1_v2 resolved by addition of shunt caps at; S.Onofre 230: 500 MVar, Southbay 69: 75 MVar, Serrano 230: 395 MVar, Miguel 230: 450 MVar, and Sycamore 230: 300 MVar (la_alt2d3_s1_v2_dvmp12_Caps4V)
6) Reactive margin solution for base case la_alt3bd3_s1_v2 resolved by addition of five 75 MVar shunt cap at S.Onofre 230 (la_alt3bd3_s1_v2_dvmp12_Caps)
7) Reactive margin solution resolved by addition of two 75 MVar shunt caps at SouthBay 69, and three 79 MVar Caps at Devers 230

## POST OUTAGE LOADING AS A % OF MVA2 (EMERGENCY RATING) EXCLUDING GENERATOR STEP-UP TRANSFORMERS

| Switch-deck | OUTAGE DESCRIPTION | OVERLOADED ELEMENT | | | | | | hs_rev4_v2 | hs_alt2d1_s1_v2 | hs_alt3bd1_s1_v2 | la_rev5_v2 | la_alt2ad3_s1_v2 | la_alt2d3_s1_v2 | la_alt3bd3_s1_v2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | FROM BUS | TO BUS | ID | Area | RATING | UNIT | PERCENT | PERCENT | PERCENT | PERCENT | PERCENT | PERCENT | PERCENT |
| **SINGLE CONTINGENCIES:** | | | | | | | | | | | | | | |
| sfcn | San Filipe - Cental X 500kV | ARABY S 69.0 | NGILATAP 69.0 | #1 | 14 | 326.33 | Amps | NA | 201% | 203% | NA | -- -- -- | -- -- -- | -- -- -- |
| - or - | - or - | RUM-230 230 | ROA-230 230 | #1 | 20 | 973.97 | Amps | NA | -- -- -- | -- -- -- | NA | 107% | 107% | 104% |
| sfnr | San Filipe - North SD 500kV | HRD-230 230 | HRD-115 115 | #1 | 20 | 225 | MVA | NA | -- -- -- | -- -- -- | NA | 101% | 101% | 99% |
| | | ROA-230 230 | HRD-230 230 | #1 | 20 | 973.97 | Amps | NA | -- -- -- | -- -- -- | NA | 94% | 95% | 92% |
| | | DEVERS 230 | OAK_VLLY 230 | #1 | 24 | 1149.7 | Amps | NA | -- -- -- | -- -- -- | NA | -- -- -- | -- -- -- | 109% |
| | | DEVERS 500 | VALLEYSC 500 | #1 | 24 | 2999.9 | Amps | NA | -- -- -- | -- -- -- | NA | -- -- -- | -- -- -- | 103% |
| basf | Banister - San Filipe 230 | No Overloaded Elements | | | | | | -- -- -- | -- -- -- | -- -- -- | -- -- -- | -- -- -- | -- -- -- | -- -- -- |
| | | | | | | | | | | | | See Note 2 | See Note 7 | See Note 2 |
| deva | Devers - ValleySC 500kV | DEVERS 230 | OAK_VLLY 230 | #1 | 24 | 1149.7 | Amps | -- -- -- | -- -- -- | -- -- -- | 147% | 162% | 162% | 147% |
| | | SANBRDNO 230 | OAK_VLLY 230 | #1 | 24 | 1149.7 | Amps | -- -- -- | -- -- -- | -- -- -- | 114% | 128% | 127% | 114% |
| | | BANIS230 230 | NEWSF230 230 | #1 | 8 | 2209 | Amps | -- -- -- | -- -- -- | -- -- -- | -- -- -- | -- -- -- | -- -- -- | 98% |
| | | RUM-230 230 | ROA-230 230 | #1 | 20 | 973.97 | Amps | -- -- -- | -- -- -- | -- -- -- | 93% | 94% | 94% | 94% |
| | | HRD-230 230 | HRD-115 115 | #1 | 20 | 225 | MVA | -- -- -- | -- -- -- | -- -- -- | -- -- -- | 91% | 91% | 91% |
| | | DEVERS 230 | VSTA 230 | #2 | 2 | 2849.1 | Amps | -- -- -- | -- -- -- | -- -- -- | -- -- -- | 92% | 92% | -- -- -- |
| | | DEVERS 230 | VSTA 230 | #1 | 2 | 2849.1 | Amps | -- -- -- | -- -- -- | -- -- -- | -- -- -- | 92% | 92% | -- -- -- |
| seva | Serrano - ValleySC 500 | DEVERS 230 | OAK_VLLY 230 | #1 | 24 | 1149.7 | Amps | -- -- -- | -- -- -- | -- -- -- | 122% | 136% | 162% | 126% |
| | - or - | SANBRDNO 230 | OAK_VLLY 230 | #1 | 24 | 1149.7 | Amps | -- -- -- | -- -- -- | -- -- -- | 90% | 104% | 128% | 94% |
| | SerVal - ValleySC 500 | | | | | | | | | | | | | |
| dv_east_slo | Devers - Palo Verde 500kV #1 | RTP1 92 | RTAP2 92 | #1 | 8 | 357.71 | Amps | 102% | -- -- -- | -- -- -- | -- -- -- | -- -- -- | -- -- -- | -- -- -- |
| | - or - | MIDPINTS 500 | IH500 500 | #1 | 8 | 2757.4 | Amps | -- -- -- | -- -- -- | -- -- -- | -- -- -- | 114.71% | -- -- -- | -- -- -- |
| | Devers - Midpints 500kV #1 | DEVERS 500 | VALLEYSC 500 | #1 | 24 | 2999.9 | Amps | -- -- -- | -- -- -- | -- -- -- | -- -- -- | 90.60% | -- -- -- | -- -- -- |
| | | DEVERS 230 | OAK_VLLY 230 | #1 | 24 | 1149.7 | Amps | -- -- -- | -- -- -- | -- -- -- | -- -- -- | -- -- -- | 92.92% | -- -- -- |
| ivng | Imperial Valley - N. Gila 500 #1 | ARABY S 69 | NGILATAP 69 | #1 | 14 | 326.33 | Amps | 168% | -- -- -- | -- -- -- | -- -- -- | -- -- -- | -- -- -- | -- -- -- |
| | | KNOB 161 | PILOTKNB 161 | #1 | 8 | 591.69 | Amps | 128% | -- -- -- | -- -- -- | -- -- -- | -- -- -- | -- -- -- | -- -- -- |
| | | B 69 | KETTNER 69 | #1 | 22 | 1631.6 | Amps | -- -- -- | 0.93 | -- -- -- | -- -- -- | -- -- -- | -- -- -- | -- -- -- |
| | | DIXIELAN 92 | DIXPRI2 92 | #1 | 8 | 338.88 | Amps | -- -- -- | -- -- -- | -- -- -- | 131.57% | -- -- -- | -- -- -- | -- -- -- |
| | | DEVERS 230 | OAK_VLLY 230 | #1 | 24 | 1149.7 | Amps | -- -- -- | -- -- -- | -- -- -- | 100.88% | -- -- -- | -- -- -- | -- -- -- |
| | | DEVERS 500 | VALLEYSC 500 | #1 | 24 | 2999.9 | Amps | -- -- -- | -- -- -- | -- -- -- | 100.02% | -- -- -- | -- -- -- | 99.70% |
| | | USNAF 92 | ELTERMIN 92 | #1 | 8 | 828.37 | Amps | -- -- -- | -- -- -- | -- -- -- | 91.00% | -- -- -- | -- -- -- | -- -- -- |
| | | BANIS230 230 | NEWSF230 230 | #1 | 8 | 2209 | Amps | -- -- -- | -- -- -- | -- -- -- | -- -- -- | 92.25% | 90.38% | 95.71% |

## POST OUTAGE LOADING AS A % OF MVA2 (EMERGENCY RATING) EXCLUDING GENERATOR STEP-UP TRANSFORMERS

| Switch-deck | OUTAGE DESCRIPTION | OVERLOADED ELEMENT | | | | | | hs_rev4_v2 | hs_alt2d1_s1_v2 | hs_alt3bd1_s1_v2 | la_rev5_v2 | la_alt2ad3_s1_v2 | la_alt2d3_s1_v2 | la_alt3bd3_s1_v2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | FROM BUS | TO BUS | ID | Area | RATING | UNIT | PERCENT | PERCENT | PERCENT | PERCENT | PERCENT | PERCENT | PERCENT |
| | | | | | | | | | | See Note 3 | | | | See Note 3 |
| ivml | Imperial Valley - Miguel 500 #1 | ARABY S 69 | NGILATAP 69 | #1 | 14 | 326.3 | Amps | 164% | 206% | 203% | -- -- -- | -- -- -- | -- -- -- | -- -- -- |
| | | HRD-230 230 | HRD-115 115 | #1 | 20 | 225.0 | MVA | 119% | 102% | 112% | 145% | 115% | 115% | 121% |
| | | RUM-230 230 | ROA-230 230 | #1 | 20 | 974.0 | Amps | 117% | 95% | -- -- -- | 171% | 126% | 126% | -- -- -- |
| | | RTP1 92 | RTAP2 92 | #1 | 8 | 357.7 | Amps | 117% | -- -- -- | -- -- -- | -- -- -- | -- -- -- | -- -- -- | -- -- -- |
| | | B 69 | KETTNER 69 | #1 | 22 | 1631.6 | Amps | 113% | 127% | 137% | -- -- -- | -- -- -- | -- -- -- | -- -- -- |
| ivml_Caps | | CARLTHTP 138 | SYCAMORE 138 | #1 | 22 | 853.9 | Amps | 111% | 137% | 121% | -- -- -- | 94% | 94% | -- -- -- |
| | | OTAYMESA 230 | TJI-230 230 | #1 | 22 | 1999.9 | Amps | 107% | -- -- -- | 99% | -- -- -- | -- -- -- | -- -- -- | -- -- -- |
| | | KETTNER 69 | OLD TOWN 69 | #1 | 22 | 1999.8 | Amps | 106% | 117% | 125% | -- -- -- | -- -- -- | -- -- -- | -- -- -- |
| | | ROA-230 230 | HRD-230 230 | #1 | 20 | 974.0 | Amps | 105% | -- -- -- | 95% | 158% | 113% | -- -- -- | 124% |
| Case | | RINCON 69 | WARNERS 69 | #1 | 22 | 270.3 | Amps | 103% | -- -- -- | 108% | -- -- -- | -- -- -- | -- -- -- | -- -- -- |
| la_alt3bd3 | | RUM-230 230 | HRD-230 230 | #1 | 20 | 974.0 | Amps | 100% | -- -- -- | 90% | 153% | 108% | 108% | 119% |
| ivml_VCaps | | GARFIELD 69 | MURRAY 69 | #1 | 22 | 854.3 | Amps | 97% | -- -- -- | 99% | -- -- -- | -- -- -- | -- -- -- | -- -- -- |
| | | BERNARDO 69 | FELCTATP 69 | #1 | 22 | 854.3 | Amps | 95% | -- -- -- | 108% | -- -- -- | -- -- -- | -- -- -- | -- -- -- |
| | | BRAW92 92 | ROCKWOOD 92 | #1 | 8 | 828.4 | Amps | 90% | -- -- -- | -- -- -- | -- -- -- | -- -- -- | -- -- -- | -- -- -- |
| | | ELLIOTT 69 | SYCAMORE 69 | #1 | 22 | 570.7 | Amps | -- -- -- | 133% | -- -- -- | -- -- -- | -- -- -- | -- -- -- | -- -- -- |
| | | CENTRALX 230 | CENTRALX 500 | #1 | 22 | 1329.0 | MVA | -- -- -- | 123% | -- -- -- | -- -- -- | 130% | 130% | -- -- -- |
| | | EASTGATE 69 | ROSE CYN 69 | #1 | 22 | 420.9 | Amps | -- -- -- | 113% | -- -- -- | -- -- -- | -- -- -- | -- -- -- | -- -- -- |
| | | RUM-230 230 | ROA-230 230 | #1 | 20 | 974.0 | Amps | -- -- -- | 95% | 107% | -- -- -- | -- -- -- | -- -- -- | 136% |
| | | SYCAMORE 230 | CENTRALX 230 | #2 | 22 | 2289.3 | Amps | -- -- -- | 94% | -- -- -- | -- -- -- | 100% | 100% | -- -- -- |
| | | SYCAMORE 230 | CENTRALX 230 | #1 | 22 | 2289.3 | Amps | -- -- -- | 94% | -- -- -- | -- -- -- | 100% | 100% | -- -- -- |
| | | DEVERS 230 | OAK_VLLY 230 | #1 | 24 | 1149.7 | Amps | -- -- -- | -- -- -- | -- -- -- | 106% | 114% | 114% | 109% |
| | | DEVERS 500 | VALLEYSC 500 | #1 | 24 | 2999.9 | Amps | -- -- -- | -- -- -- | -- -- -- | 102% | 105% | -- -- -- | 97% |
| | | TOY-230 230 | HRD-230 230 | #2 | 20 | 974.0 | Amps | -- -- -- | -- -- -- | -- -- -- | 102% | -- -- -- | -- -- -- | -- -- -- |
| | | OTAYMESA 230 | TJI-230 230 | #1 | 22 | 1999.9 | Amps | -- -- -- | -- -- -- | -- -- -- | 101% | -- -- -- | -- -- -- | -- -- -- |
| | | MTP-230 230 | TOY-230 230 | #1 | 20 | 974.0 | Amps | -- -- -- | -- -- -- | -- -- -- | 100% | -- -- -- | -- -- -- | -- -- -- |
| | | MTP-230 230 | HRD-230 230 | #1 | 20 | 974.0 | Amps | -- -- -- | -- -- -- | -- -- -- | 119% | -- -- -- | -- -- -- | -- -- -- |
| | | NORTHSD 500 | NORTHSD 230 | #1 | 20 | 1329.0 | Amps | -- -- -- | -- -- -- | 124% | -- -- -- | -- -- -- | 125% | 124% |
| | | DIVISION 69 | NAVSTMTR 69 | #1 | 22 | 841.8 | Amps | -- -- -- | -- -- -- | 97% | -- -- -- | -- -- -- | -- -- -- | -- -- -- |
| | | BERNDOTP 69 | Lkhodges 69 | #1 | 22 | 854.3 | Amps | -- -- -- | -- -- -- | 96% | -- -- -- | -- -- -- | -- -- -- | -- -- -- |
| | | ESCNDIDO 230 | NORTHSD 230 | #1A | 22 | 1338.0 | Amps | -- -- -- | -- -- -- | 94% | -- -- -- | -- -- -- | -- -- -- | -- -- -- |
| | | ESCNDIDO 230 | NORTHSD 230 | #2A | 22 | 1338.0 | Amps | -- -- -- | -- -- -- | 94% | -- -- -- | -- -- -- | -- -- -- | -- -- -- |
| | | SYCAMORE 69 | SYCAMORE 230 | #1 | 22 | 285.0 | MVA | -- -- -- | -- -- -- | 92% | -- -- -- | -- -- -- | -- -- -- | -- -- -- |
| | | ESCNDIDO 69 | FELCTATP 69 | #1 | 22 | 854.3 | Amps | -- -- -- | -- -- -- | 90% | -- -- -- | -- -- -- | -- -- -- | -- -- -- |
| lumo | Lugo - Mohave 500 | None | | | | | | -- -- -- | -- -- -- | -- -- -- | -- -- -- | -- -- -- | -- -- -- | -- -- -- |
| lumi | Lugo - Mira Loma 500 | None | | | | | | -- -- -- | -- -- -- | -- -- -- | -- -- -- | -- -- -- | -- -- -- | -- -- -- |
| mise | Mira Loma - Serrano 500 kV | None | | | | | | -- -- -- | -- -- -- | -- -- -- | -- -- -- | -- -- -- | -- -- -- | -- -- -- |

## POST OUTAGE LOADING AS A % OF MVA2 (EMERGENCY RATING) EXCLUDING GENERATOR STEP-UP TRANSFORMERS

| Switch-deck | OUTAGE DESCRIPTION | OVERLOADED ELEMENT | | | | | | hs_rev4_v2 | hs_alt2d1_s1_v2 | hs_alt3bd1_s1_v2 | la_rev5_v2 | la_alt2ad3_s1_v2 | la_alt2d3_s1_v2 | la_alt3bd3_s1_v2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | FROM BUS | TO BUS | ID | Area | RATING | UNIT | PERCENT | PERCENT | PERCENT | PERCENT | PERCENT | PERCENT | PERCENT |
| luvi | Lugo - Victorville 500 | KNOB 161 | PILOTKNB 161 | #1 | 8 | 591.69 | Amps | 102% | -- -- -- | -- -- -- | -- -- -- | -- -- -- | -- -- -- | -- -- -- |
| | | ELDORDO 500 | LUGO 500 | #1 | 24 | 1600.4 | Amps | 92% | 95% | 94% | 95% | 96% | 96% | 91% |
| | | DEVERS 500 | VALLEYSC 500 | #1 | 24 | 2999.9 | Amps | -- -- -- | -- -- -- | -- -- -- | 94% | 103% | 103% | -- -- -- |
| | | DEVERS 230 | OAK_VLLY 230 | #1 | 24 | 1149.7 | Amps | -- -- -- | -- -- -- | -- -- -- | -- -- -- | 111% | 111% | -- -- -- |
| omtj | Otay Mesa - Tijuana 230 | RTP1 92 | RTAP2 92 | #1 | 8 | 357.71 | Amps | 91% | -- -- -- | -- -- -- | -- -- -- | -- -- -- | -- -- -- | -- -- -- |
| | | LOM-115 115 | LOM-69 69 | #1 | 20 | 20 | MVA | -- -- -- | 105% | 105% | -- -- -- | -- -- -- | -- -- -- | -- -- -- |

## POST OUTAGE LOADING AS A % OF MVA2 (EMERGENCY RATING) EXCLUDING GENERATOR STEP-UP TRANSFORMERS

| Switch-deck | OUTAGE DESCRIPTION | OVERLOADED ELEMENT | | | | | | hs_rev4_v2 | hs_alt2d1_s1_v2 | hs_alt3bd1_s1_v2 | la_rev5_v2 | la_alt2ad3_s1_v2 | la_alt2d3_s1_v2 | la_alt3bd3_s1_v2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | FROM BUS | TO BUS | ID | Area | RATING | UNIT | PERCENT | PERCENT | PERCENT | PERCENT | PERCENT | PERCENT | PERCENT |
| **DOUBLE CONTINGENCIES:** | | | | | | | | | | | | | | |
| lu-vcvi | Lugo-Vincent & Lugo - Victorville | KNOB 161 | PILOTKNB 161 | #1 | 8 | 591.69 | Amps | 102% | -- -- -- | -- -- -- | -- -- -- | -- -- -- | -- -- -- | -- -- -- |
| | | ELDORDO 500 | LUGO 500 | #1 | 24 | 1600.4 | Amps | 94% | 96% | 95% | 93% | 94% | 94% | -- -- -- |
| | | DEVERS 230 | OAK_VLLY 230 | #1 | 24 | 1149.7 | Amps | -- -- -- | -- -- -- | -- -- -- | -- -- -- | 111% | 111% | -- -- -- |
| | | DEVERS 500 | VALLEYSC 500 | #1 | 24 | 2999.9 | Amps | -- -- -- | -- -- -- | -- -- -- | -- -- -- | 103% | 102% | -- -- -- |
| lumi23 | Lugo - Mira Loma 500 Ckts 2 & 3 | LUGO 500 | RANCHVST 500 | #1 | 24 | 3000 | Amps | 122% | 116% | 115% | -- -- -- | -- -- -- | -- -- -- | -- -- -- |
| | | KNOB 161 | PILOTKNB 161 | #1 | 8 | 591.69 | Amps | 102% | -- -- -- | -- -- -- | -- -- -- | -- -- -- | -- -- -- | -- -- -- |
| | | | | | | | | | | | | See Note 4 | See Note 5 | See Note 6 |
| dvpv12 | Devers - PV & Devers - Harquahal | RTP1 92 | RTAP2 92 | #1 | 8 | 358 | Amps | 136% | 99% | -- -- -- | -- -- -- | -- -- -- | -- -- -- | -- -- -- |
| - or - | - or - | KNOB 161 | PILOTKNB 161 | #1 | 8 | 592 | Amps | 114% | -- -- -- | -- -- -- | -- -- -- | -- -- -- | -- -- -- | -- -- -- |
| dvmp12 | Devers - Midpints 500kV #1 & 2 | J.HINDS 230 | MIRAGE 230 | #1 | 24 | 600 | Amps | 113% | -- -- -- | -- -- -- | -- -- -- | -- -- -- | -- -- -- | -- -- -- |
| - or - | - or - | KYRENE 500 | JOJOBA 500 | #1 | 14 | 2000 | Amps | 100% | -- -- -- | -- -- -- | -- -- -- | -- -- -- | -- -- -- | -- -- -- |
| dv-mpih_caps | Devers-Midpints & Devers - IH 500 | VICTORVL 500 | LUGO 500 | #1 | 24 | 3000 | Amps | 99% | 96% | 92% | 103% | -- -- -- | 93% | -- -- -- |
| | | BRAW92 92 | ROCKWOOD 92 | #1 | 8 | 828 | Amps | 96% | -- -- -- | -- -- -- | -- -- -- | -- -- -- | -- -- -- | -- -- -- |
| | | BLYTHESC 161 | EAGLEMTN 161 | #1 | 24 | 724 | Amps | 95% | -- -- -- | -- -- -- | -- -- -- | -- -- -- | -- -- -- | -- -- -- |
| | | LUGO 500 | RANCHVST 500 | #1 | 24 | 3000 | Amps | 91% | -- -- -- | -- -- -- | -- -- -- | -- -- -- | -- -- -- | -- -- -- |
| | | ARABY S 69 | NGILATAP 69 | #1 | 14 | 326.33 | Amps | -- -- -- | 177% | 174% | -- -- -- | -- -- -- | -- -- -- | -- -- -- |
| | | JEFERSN 92 | AVE58 92 | #1 | 8 | 828 | Amps | -- -- -- | 105% | 103% | -- -- -- | -- -- -- | -- -- -- | -- -- -- |
| | | KYRENE 500 | JOJOBA 500 | #1 | 14 | 2000 | Amps | -- -- -- | 101% | 100% | -- -- -- | -- -- -- | -- -- -- | -- -- -- |
| | | ELDORDO 500 | LUGO 500 | #1 | 24 | 1600.4 | Amps | -- -- -- | -- -- -- | -- -- -- | 105% | -- -- -- | 101% | 96% |
| | | RTP1 92 | RTAP2 92 | #1 | 8 | 357.71 | Amps | -- -- -- | -- -- -- | -- -- -- | 102% | -- -- -- | -- -- -- | -- -- -- |
| | | RUM-230 230 | ROA-230 230 | #1 | 20 | 973.97 | Amps | -- -- -- | -- -- -- | -- -- -- | 102% | 93% | 93% | 97% |
| | | MIRAGE 230 | RAMON 230 | #1 | 21 | 976.48 | Amps | -- -- -- | -- -- -- | -- -- -- | 101% | 133% | -- -- -- | -- -- -- |
| | | HASSYAMP 500 | N.GILA 500 | #1 | 22 | 2969.9 | Amps | -- -- -- | -- -- -- | -- -- -- | 100% | -- -- -- | -- -- -- | 97% |
| | | HRD-230 230 | HRD-115 115 | #1 | 20 | 225 | MVA | -- -- -- | -- -- -- | -- -- -- | 96% | 90% | -- -- -- | 93% |
| | | MOENKOPI 500 | ELDORDO 500 | #1 | 14 | 2750 | Amps | -- -- -- | -- -- -- | -- -- -- | 93% | -- -- -- | 91% | -- -- -- |
| | | RAMON 230 | COACHELA 230 | #1 | 8 | 976.48 | Amps | -- -- -- | -- -- -- | -- -- -- | 91% | 124% | -- -- -- | -- -- -- |
| | | DEVERS 230 | COACHELA 230 | #2 | 8 | 2209.0 | Amps | -- -- -- | -- -- -- | -- -- -- | -- -- -- | 127% | -- -- -- | -- -- -- |
| | | IH230 230 | IH500 500 | #1 | 22 | 1194.0 | MVA | -- -- -- | -- -- -- | -- -- -- | -- -- -- | 123% | -- -- -- | -- -- -- |
| | | DEVERS 230 | MIRAGE 230 | #1 | 24 | 1674.3 | Amps | -- -- -- | -- -- -- | -- -- -- | -- -- -- | 116% | -- -- -- | -- -- -- |
| | | CENTRALX 230 | CENTRALX 500 | #1 | 22 | 1329.0 | MVA | -- -- -- | -- -- -- | -- -- -- | -- -- -- | 90% | -- -- -- | -- -- -- |
| | | MIDWAY 92 | LEATHERS 92 | #1 | 8 | 828.37 | Amps | -- -- -- | -- -- -- | -- -- -- | -- -- -- | -- -- -- | -- -- -- | 93% |

## POST OUTAGE LOADING AS A % OF MVA2 (EMERGENCY RATING) EXCLUDING GENERATOR STEP-UP TRANSFORMERS

| Switch-deck | OUTAGE DESCRIPTION | OVERLOADED ELEMENT | | | | | | hs_rev4_v2 | hs_alt2d1_s1_v2 | hs_alt3bd1_s1_v2 | la_rev5_v2 | la_alt2ad3_s1_v2 | la_alt2d3_s1_v2 | la_alt3bd3_s1_v2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | FROM BUS | TO BUS | ID | Area | RATING | UNIT | PERCENT | PERCENT | PERCENT | PERCENT | PERCENT | PERCENT | PERCENT |
| pvgen23a | Palo Verde Units 2 & 3 | ARABY S 69 | NGILATAP 69 | #1 | 14 | 326 | Amps | 161% | 210% | 208% | -- -- -- | -- -- -- | -- -- -- | -- -- -- |
| | | PINPK 230 | PNPKAPS 230 | #1 | 14 | 1707 | Amps | 124% | 123% | 123% | -- -- -- | -- -- -- | -- -- -- | -- -- -- |
| | | KESWICK 230 | SPRINGCR 230 | #2 | 30 | 500 | Amps | 98% | 96% | 96% | 96% | 96% | 96% | 96% |
| | | BELTLINE 115 | TEXASSPR 115 | #1 | 30 | 265 | Amps | 95% | 93% | 93% | -- -- -- | -- -- -- | -- -- -- | -- -- -- |
| | | GLENCANY 230 | GLENCANY 345 | #1 | 14 | 350 | MVA | -- -- -- | -- -- -- | -- -- -- | 97% | 96% | 96% | 97% |
| | | GLENCANY 230 | GLENCANY 345 | #2 | 14 | 350 | MVA | -- -- -- | -- -- -- | -- -- -- | 97% | 96% | 96% | 97% |
| sota12 | Songs - Talega 230kV Ckts 1 & 2 | OCNSDETP 69 | STUARTTP 69 | #1 | 22 | 270 | Amps | 120% | 126% | -- -- -- | -- -- -- | -- -- -- | -- -- -- | -- -- -- |
| | | LASPULGS 69 | STUARTTP 69 | #1 | 22 | 270 | Amps | 114% | 120% | -- -- -- | -- -- -- | -- -- -- | -- -- -- | -- -- -- |
| | | HORNO TP 69 | LASPULGS 69 | #1 | 22 | 270 | Amps | 104% | 110% | -- -- -- | -- -- -- | -- -- -- | -- -- -- | -- -- -- |
| | | HORNO TP 69 | JAP MESA 69 | #1 | 22 | 270 | Amps | 104% | 110% | -- -- -- | -- -- -- | -- -- -- | -- -- -- | -- -- -- |
| | | ESCNDIDO 230 | TALEGA 230 | #1 | 22 | 1145 | Amps | 103% | 103% | -- -- -- | -- -- -- | -- -- -- | -- -- -- | -- -- -- |
| song23a | San Onofre Units 2 & 3 | KNOB 161 | PILOTKNB 161 | #1 | 8 | 592 | Amps | 106% | | | | | | |
| | | KESWICK 230 | SPRINGCR 230 | #2 | 30 | 500 | Amps | 98% | 96% | 96% | | | | |
| | | BELTLINE 115 | TEXASSPR 115 | #1 | 30 | 265 | Amps | 94% | | | | | | |
| | | ARABY S 69 | NGILATAP 69 | #1 | 14 | 326 | Amps | | 188% | 187% | | | | |
| | | NORTHSD 500 | NORTHSD 230 | #1 | 20 | 1329 | Amps | | | 109% | | | | |
| | | CARLTHTP 138 | SYCAMORE 138 | #1 | 22 | 853.89 | Amps | | | 106% | | | | |
| | | RUM-230 230 | ROA-230 230 | #1 | 20 | 973.97 | Amps | | | | 91% | 91% | 91% | 91% |

2) Reactive margin solution resolved by addition of two 75 MVar shunt caps at SouthBay 69, and two 79 MVar Caps at Devers 230
3) Reactive margin solution resolved by addition of two 75 MVar shunt caps at SouthBay 69
4) Reactive margin & voltage ciolation solution for base case la_alt2ad3_s1_v2 resolved by addition of shunt capts at: S.Onofre 230: 500 Mvars, South Bay 69: 75 Mvar, Serrano: 395 MVar, Miguel 230: 450 MVar, Sycamore 230: 300 MVar, Coachella 230: 150 MVar (la_alt2ad3_s1_v2_dvmpih_Caps)
5) Reactive margin solution for base case la_alt2d3_s1_v2 resolved by addition of shunt caps at; S.Onofre 230: 500 MVar, Southbay 69: 75 MVar, Serrano 230: 395 MVar, Miguel 230: 450 MVar, and Sycamore 230: 300 MVar (la_alt2d3_s1_v2_dvmp12_Caps4V)
6) Reactive margin solution for base case la_alt3bd3_s1_v2 resolved by addition of five 75 MVar shunt cap at S.Onofre 230 (la_alt3bd3_s1_v2_dvmp12_Caps)
7) Reactive margin solution resolved by addition of two 75 MVar shunt caps at SouthBay 69, and three 79 MVar Caps at Devers 230

## POST OUTAGE VOLTAGE DEVIATION BASED ON % CHANGE

| Switchdeck Name | OUTAGE DESCRIPTION | | | hs_rev4_v2 | hs_alt2d1_s1_v2 | hs_alt3bd1_s1_v2 | la_rev5_v2 | la_alt2ad3_s1_v2 | la_alt2d3_s1_v2 | la_alt3bd3_s1_v2 |
|---|---|---|---|---|---|---|---|---|---|---|
| **SINGLE CONTINGENCIES:** | | Bus | Area | Change (%) | Change (%) | Change (%) | Change (%) | Change (%) | Change (%) | Change (%) |
| NSF_West | San Filipe - Cental X 500kV<br>- or -<br>San Filipe - North SD 500kV | All buses <5% change | | NA | -- | -- | NA | -- | -- | -- |
| basf | Banister - San Filipe 230 | All buses <5% change | | NA | -- | -- | NA | -- | -- | -- |
| | | | | | | | | deva caps2 | deva caps2 | deva caps |
| deva<br>or deva_caps<br>or deva_caps2 | Devers - ValleySC 500kV | OAK_VLLY 115<br>OAK_VLLY 230<br>WHITEWTR 33<br>CABAZON 33 | | -- | -- | -- | 5.6<br>5.5<br>5.6<br>5.1 | 7.2<br>7.2<br>See Note 18 | 7.5<br>7.5<br>See Note 18 | -- |
| seva1<br>- or -<br>seva2 | Serrano - ValleySC 500<br>- or -<br>SerVal - ValleySC 500 | All buses <5% change | | -- | -- | -- | -- | -- | -- | -- |
| dv_east_dlo | Devers - Palo Verde 500kV #1<br>- or -<br>Devers - Midpints 500kV #1 | N.LAQUIN 92<br>N.VIEW 92<br>LAQUINTA 92<br>EDOM 92<br>MIRAGTIE 92 | | -- | -- | -- | -- | -- | 5.0<br>5.0<br>5.0<br>5.0<br>5.1 | -- |
| ivng | Imperial Valley - N. Gila 500 #1 | CENTRALX 230<br>CENTRALX 500<br>WHITEWTR 33 | | -- | -- | -- | -- | -- | -- | -- |
| ivml | Imperial Valley - Miguel 500 #1 | CENTRALX 230<br>CENTRALX 500 | | 125 Buses w/ > 5% change See Note 12 | 155 Buses w/ > 5% change See Note 13 | 15 Buses w/ > 5% change See Note 14 | 33 Buses w/ > 5% change See Note 15 | 5.3<br>5.3 | 5.5<br>5.5 | -- |
| lumo | Lugo - Mohave 500 | All buses <5% change | | -- | -- | -- | -- | -- | -- | -- |
| lumi | Lugo - Mira Loma 500 | All buses <5% change | | -- | -- | -- | -- | -- | -- | -- |
| mise | Mira Loma - Serrano 500 kV | All buses <5% change | | -- | -- | -- | -- | -- | -- | -- |

## POST OUTAGE VOLTAGE DEVIATION BASED ON % CHANGE

| Switchdeck Name | OUTAGE DESCRIPTION | | | hs_rev4 _v2 | hs_alt2d1 _s1_v2 | hs_alt3bd1 _s1_v2 | la_rev5 _v2 | la_alt2ad3 _s1_v2 | la_alt2d3 _s1_v2 | la_alt3bd3 _s1_v2 |
|---|---|---|---|---|---|---|---|---|---|---|
| **SINGLE CONTINGENCIES:** | | Bus | Area | Change (%) | Change (%) | Change (%) | Change (%) | Change (%) | Change (%) | Change (%) |
| luvi | Lugo - Victorville 500 | All buses <5% change | | -- | -- | -- | -- | -- | -- | -- |
| omtj | Otay Mesa - Tijuana 230 | All buses <5% change | | -- | -- | -- | -- | -- | -- | -- |
| **DOUBLE CONTINGENCIES:** | | | | | | | | | | |
| lu-vcvi | Lugo-Vincent & Lugo - Victorville | All buses <10% change | | -- | -- | -- | -- | -- | -- | -- |
| lumi23 | Lugo - Mira Loma 500 Ckts 2 & 3 | | | -- | -- | -- | -- | -- | -- | -- |
| dv_east_dlo | Devers - PV & Devers - Harquahala<br>- or -<br>Devers - Midpints 500kV #1 & 2<br>- or -<br>Devers-Midpints & Devers - IH 500kV | NEEDLES 69 | | -- | -- | -- | 10.2 | dvmpih_Caps<br>--<br>See Note 16 | dvmp12_Caps4V<br>--<br>See Note 17 | dvmp12_Caps<br>--<br>See Note 16 |
| pvgen23a | Palo Verde Units 2 & 3 | All buses <10% change | | -- | -- | -- | -- | -- | -- | -- |
| sota12 | Songs - Talega 230kV Ckts 1 & 2 | All buses <10% change | | -- | -- | -- | -- | -- | -- | -- |
| song23a | San Onofre Units 2 & 3 | All buses <10% change | | -- | -- | -- | -- | -- | -- | -- |

12) Voltage violations eliminated by the addition of two 75 MVar Shunt Caps at Miguel 230
13) Voltage violations eliminated by the addition of three 75 MVar Shunt Caps at Miguel 230 and two 75 MVar Shunt Caps at Sycamore
14) Voltage violations reduced by the addition of three 75 MVar Shunt Caps at Miguel 230 and two 75 MVar Shunt Caps at SouthBay 69
15) Voltage violations eliminated by the addition of three 75 MVar Shunt Caps at Miguel 230 and 200 MVar of Shunt Caps at HRD-230
16) Divergence problem and voltage violations eliminated resolved by addition of shunt caps at; S.Onofre 230: 500 MVar, Southbay 69: 75 MVar, Serrano 230: 395 MVar, Miguel 230: 450 MVar, Sycamore 230: 300 MVar, and COACHELA 230: 150 MVar
17) Divergence problem and voltage violations eliminated resolved by addition of shunt caps at; S.Onofre 230: 500 MVar, Southbay 69: 75 MVar, Serrano 230: 395 MVar, Miguel 230: 450 MVar, Sycamore 230: 300 MVar, and COACHELA 230: 150 MVar
18) With reactive margin additions of two 75 MVar shunt caps at SouthBay 69, and three 79 MVar Caps at Devers 230

# Imperial Valley Study Group

## Appendix D.2

Production Cost Simulations

# Imperial Valley Study Group

## Appendix D.2.1

SSG-WI Generation Assumptions

| Fuel Type | Technology | Size/MW | Vintage | Min. Heat Rate (Btu/kWh) | Variable O&M Cost ($/MWh) | Forced Outage Rate | Forced Outage Duration (hrs) |
|---|---|---|---|---|---|---|---|
| Gas/Oil | Steam | <100 | <1960 | 12,194 | 5.001 | 0.071 | 55 |
| | | >100 | | 9,125 | | | |
| | | <100 9,214 | >1960 | | | | |
| | | >100 | | 6,856 3.001 | | | |
| Gas | SCCT - | | <1985 | 11,403 | 8.001 | 0.036 | 89 |
| | CCCT - | | | 9,600 0.055 | | | 22 |
| | SCCT <70 | | >1985 | 14,114 | 5.001 | 0.036 89 | |
| | SCCT >70 | | | 12,106 | | | |
| | CCCT - | | >1985 | 8,815 | 2.000 | 0.055 | 22 |
| Gas/Oil CCCT-Fra | me F | - | >2001 | 3,620 | 2.000 | | |
| Gas DT | | - | <1985 9,600 | | 5.001 | | |
| | | | >1985 10,695 | | | | |
| Oil | IC - | | - | 9,125 | 13.250 | 0.036 55 | |
| | SCCT - | | - | 11,403 | 8.001 | | |
| Coal | Steam | <100 12,000 | <1960 | | 4.000 | 0.066 | 38 |
| | | >100 | | 11,500 2.000 | | | |
| | | <100 11,000 | >1960 | | 3.001 | | |
| | | >100 | | 10,500 2.000 | | | |
| Bio/WH/Wood Steam | | - | - | 12,194 | 5.001 | 0.071 | |
| Geothermal GE | | - | - | - | 4.000 | 0.071 | 16 |
| Uranium Nuclear | | - | - | - | - | 0.070 | 298 |

Table D.2.1 SSG-WI Generation Assumptions

# Imperial Valley Study Group

## Appendix D.2.2

Geothermal Hourly Output with
No New Transmission

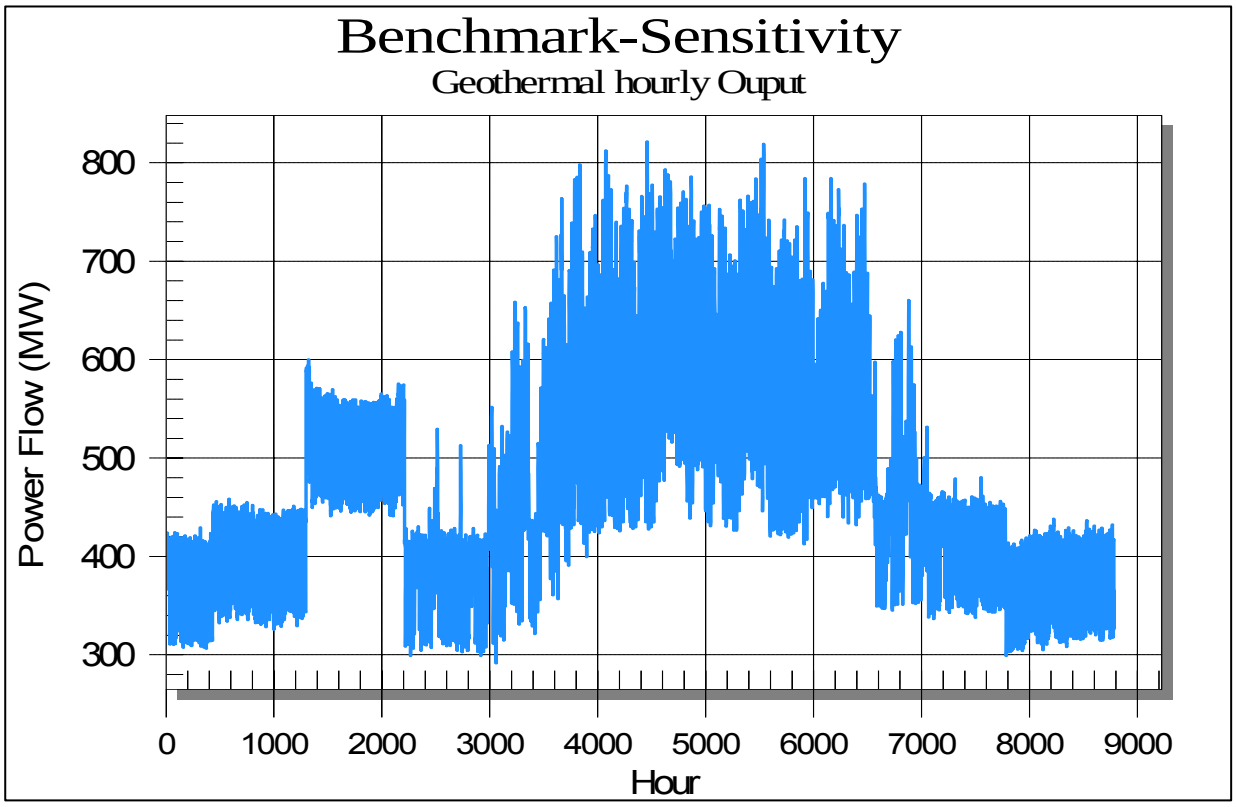


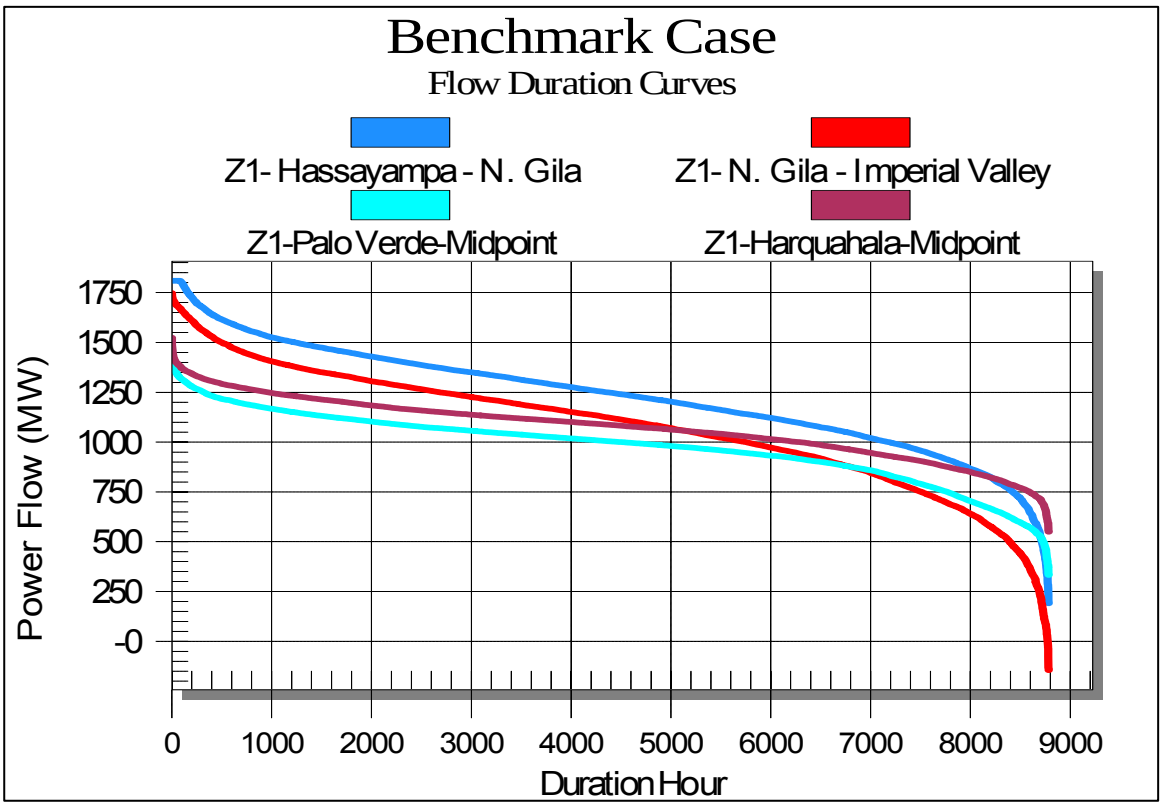

Figure D.2.2: Geothermal Hourly Output from Benchmark-Sensitivity Case

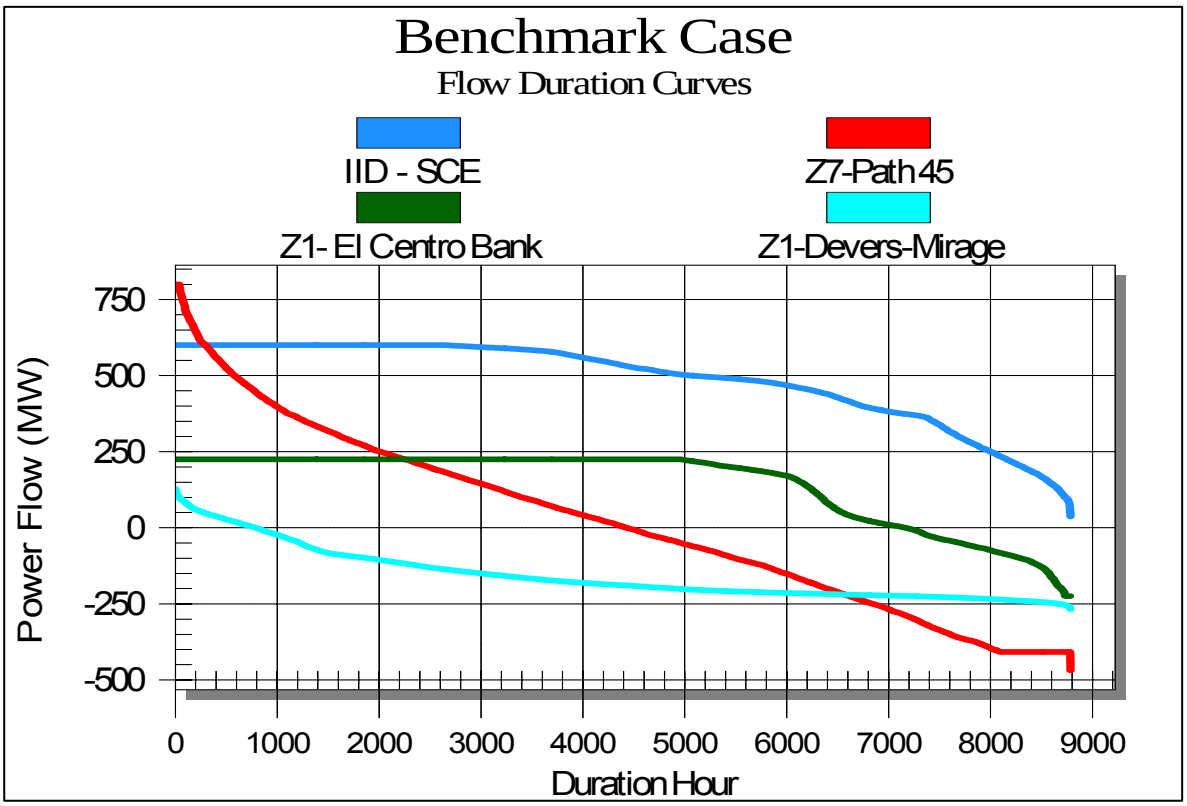
# Imperial Valley Study Group

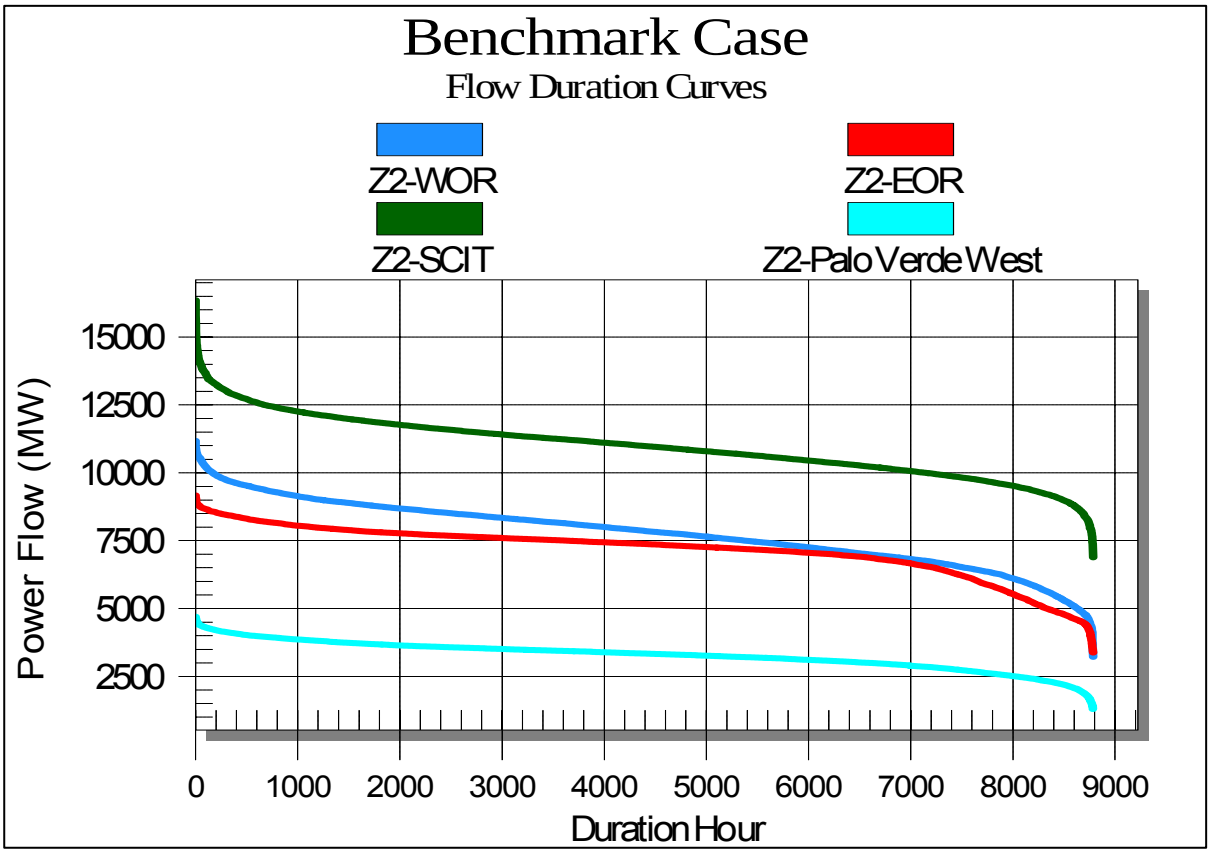
## Appendix D.2.3

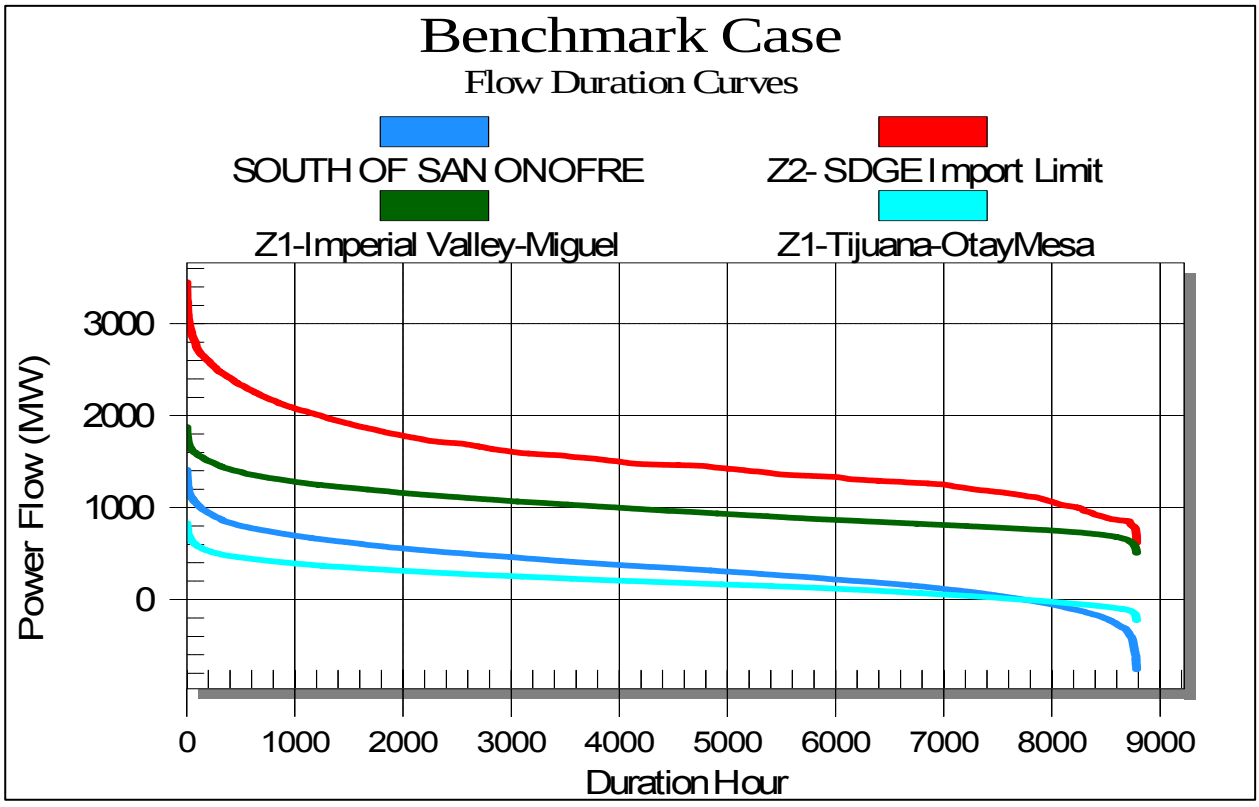
Flow Duration Curves on
Major Lines

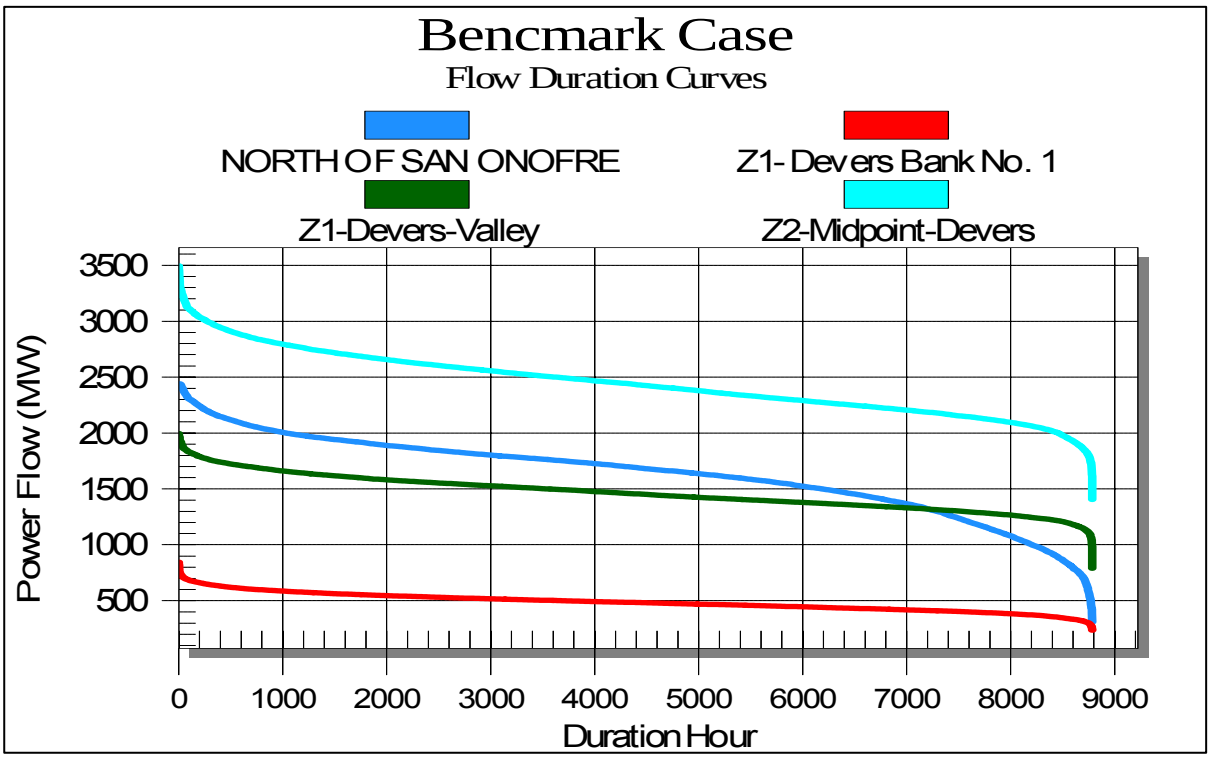
D.2.3.1 Benchmark Case: Flow Duration Curves



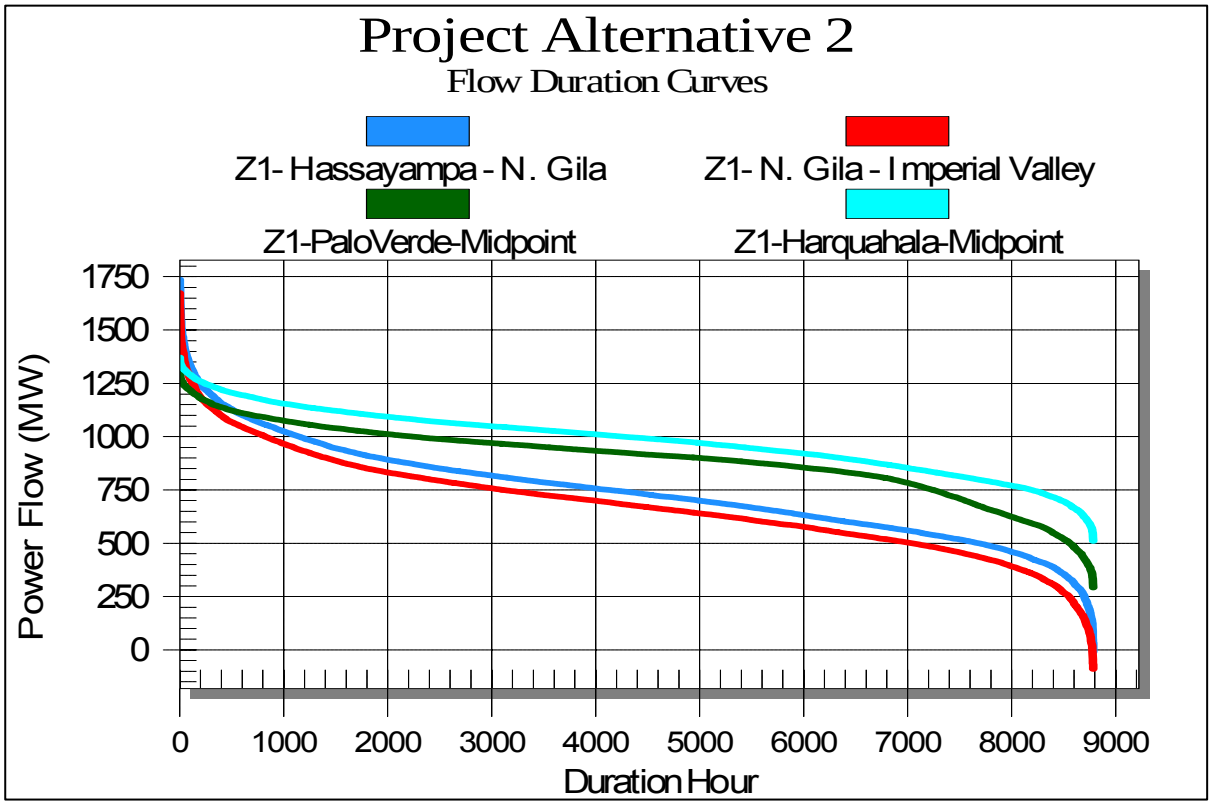



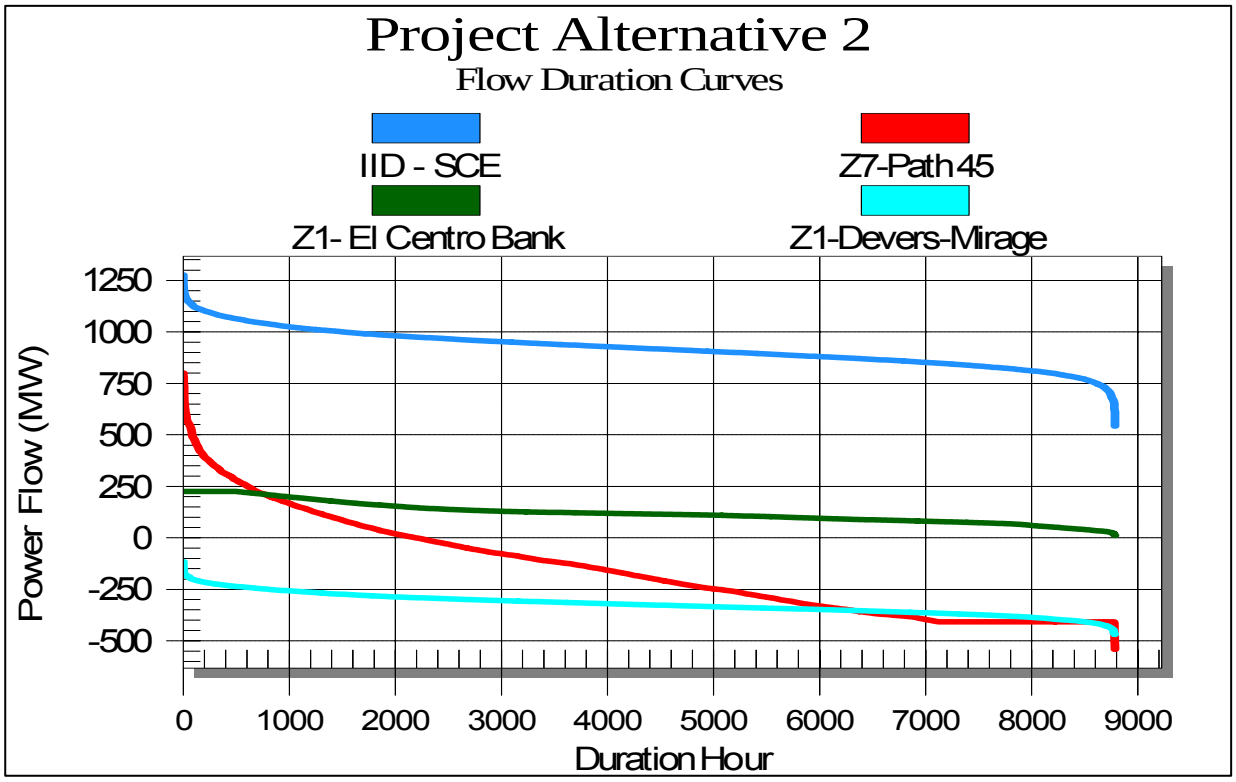

Benchmark Case
Flow Duration Curves
Z2-WOR
Z2-EOR
Z2-SCIT
Z2-Palo Verde West
Power Flow (MW)
15000
12500
10000
7500
5000
2500
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
Duration Hour

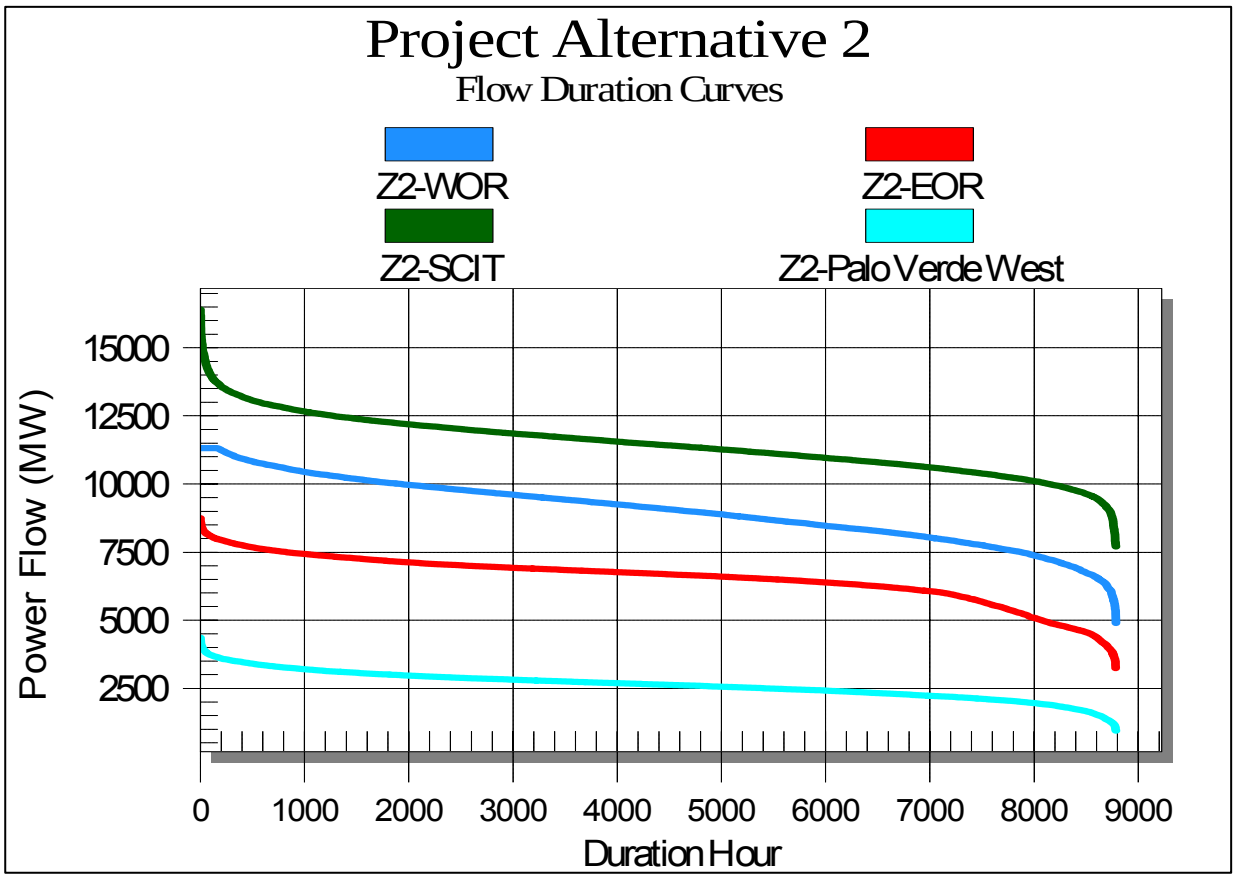

Benchmark Case
Flow Duration Curves
SOUTH OF SAN ONOFRE
Z2- SDGE Import Limit
Z1-Imperial Valley-Miguel
Z1-Tijuana-OtayMesa
Power Flow (MW)
3000
2000
1000
0
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
Duration Hour

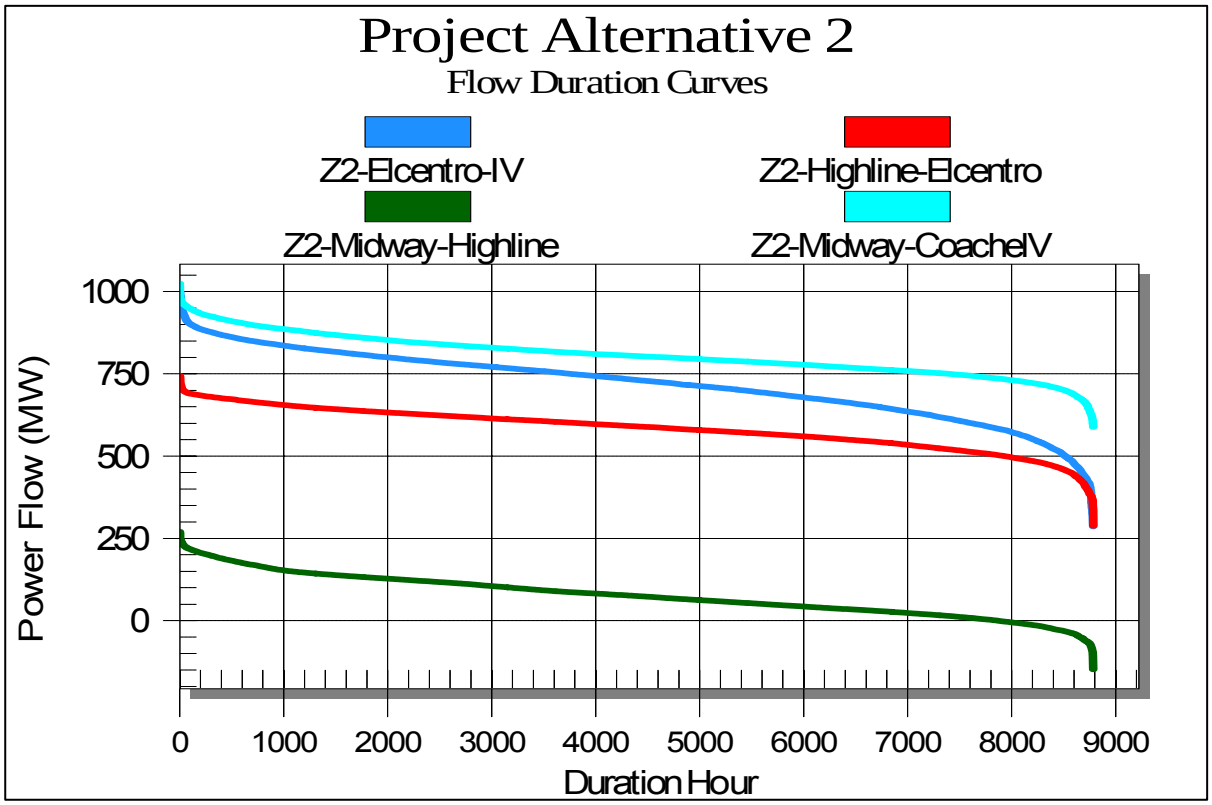


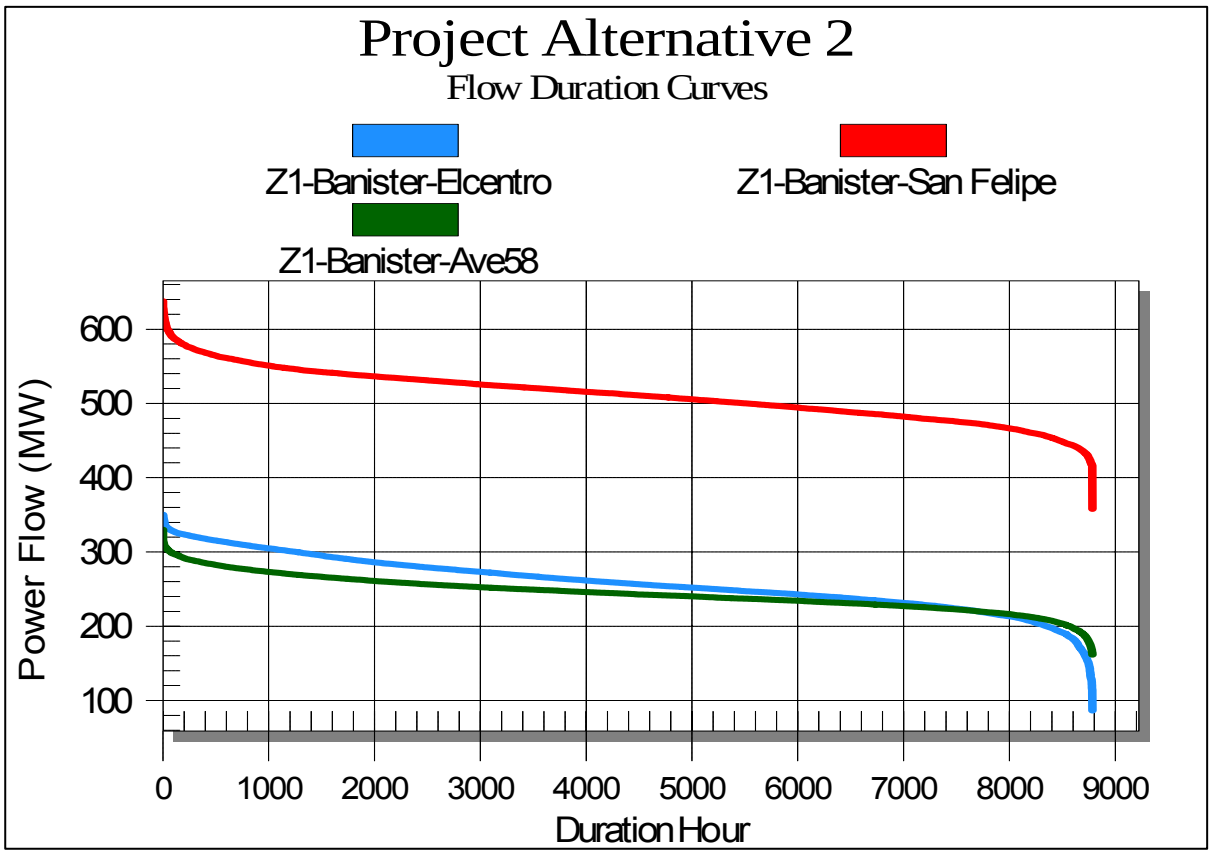

D.2.3.2 Project Alt. 2: Flow Duration Curves

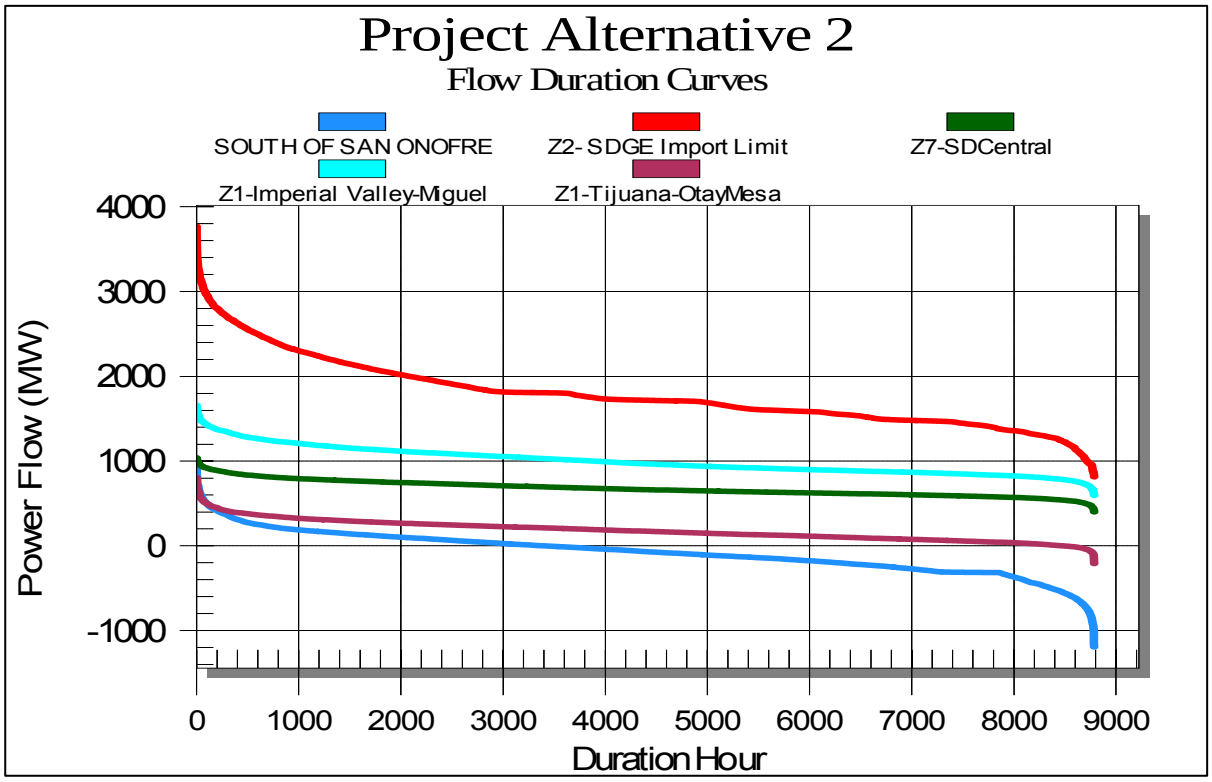


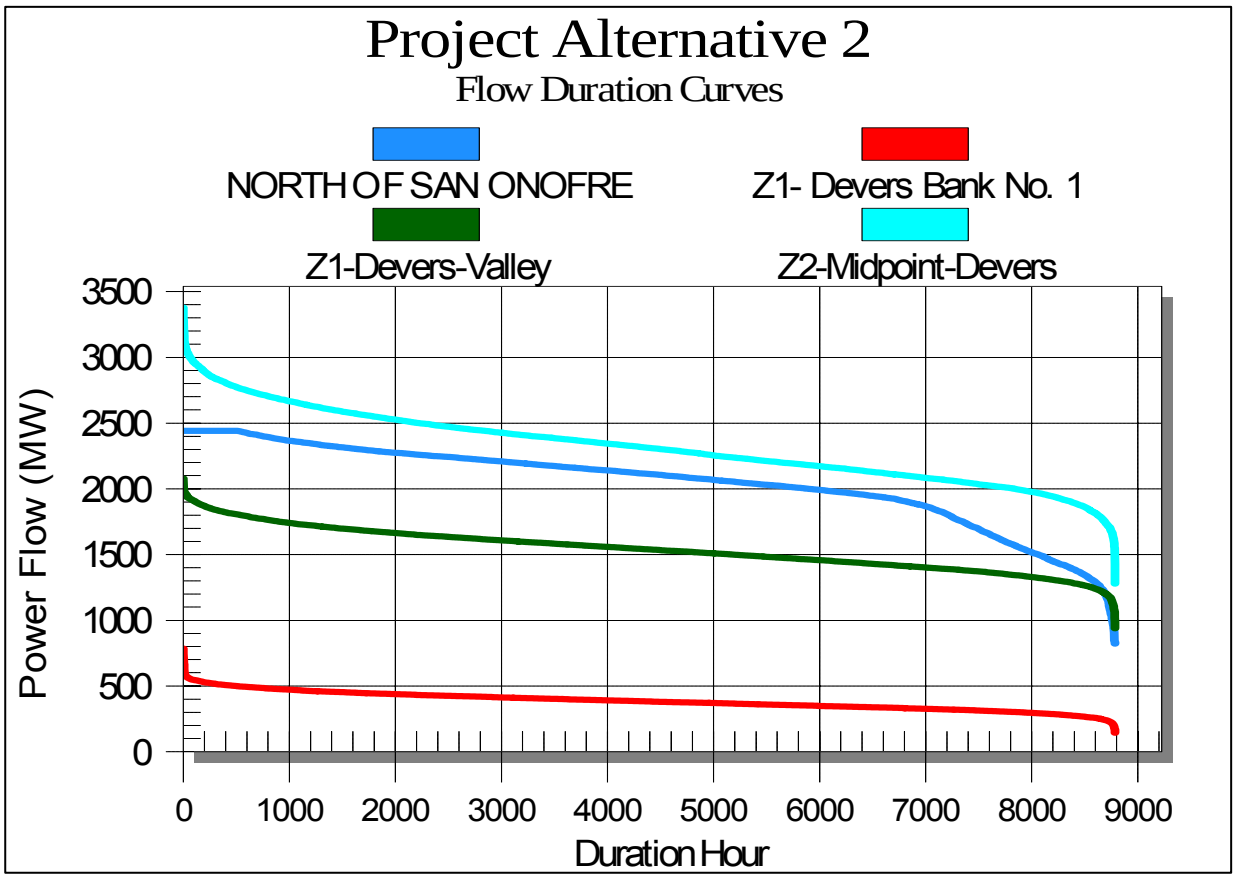

Project Alternative 2
Flow Duration Curves
IID - SCE
Z7-Path 45
Z1- El Centro Bank
Z1-Devers-Mirage
Power Flow (MW)
1250
1000
750
500
250
0
-250
-500
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
Duration Hour


Project Alternative 2
Flow Duration Curves
Z2-WOR
Z2-EOR
Z2-SCIT
Z2-Palo Verde West
Power Flow (MW)
15000
12500
10000
7500
5000
2500
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
Duration Hour

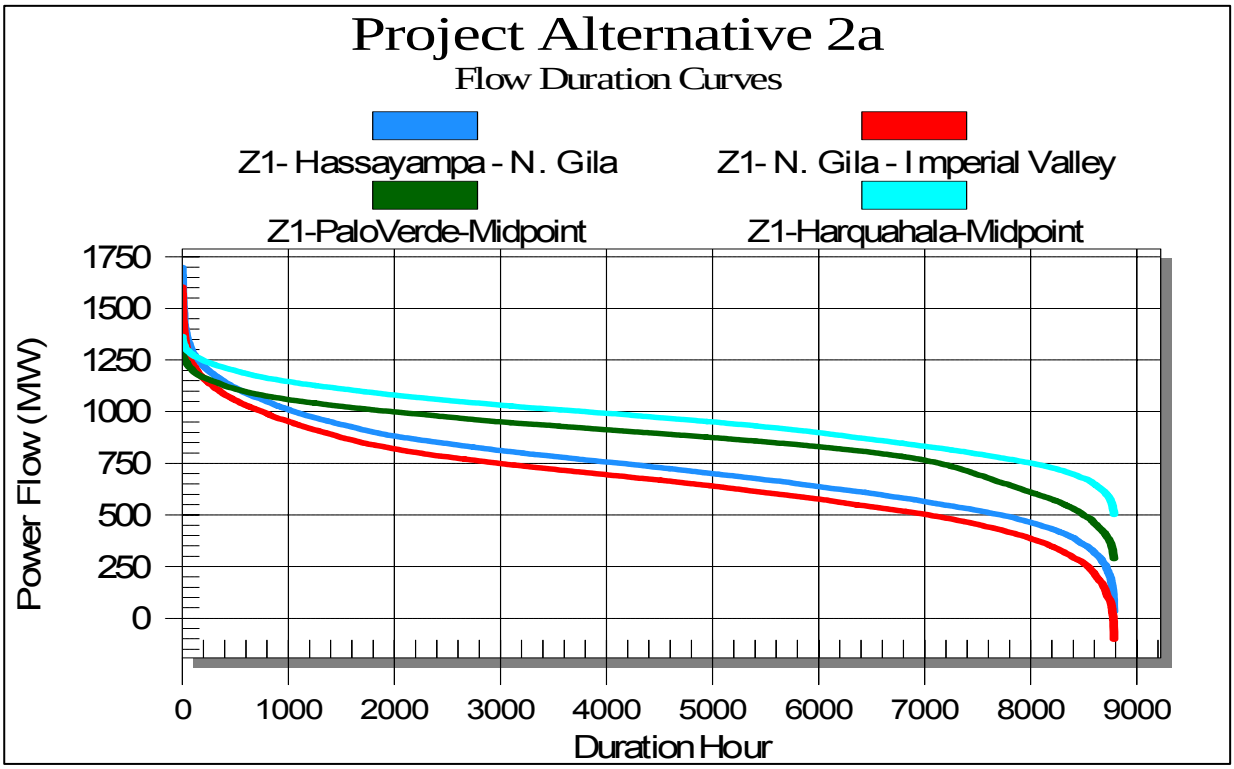

Project Alternative 2
Flow Duration Curves
Z2-Elcentro-IV
Z2-Highline-Elcentro
Z2-Midway-Highline
Z2-Midway-CoachelV
Power Flow (MW)
1000
750
500
250
0
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
Duration Hour

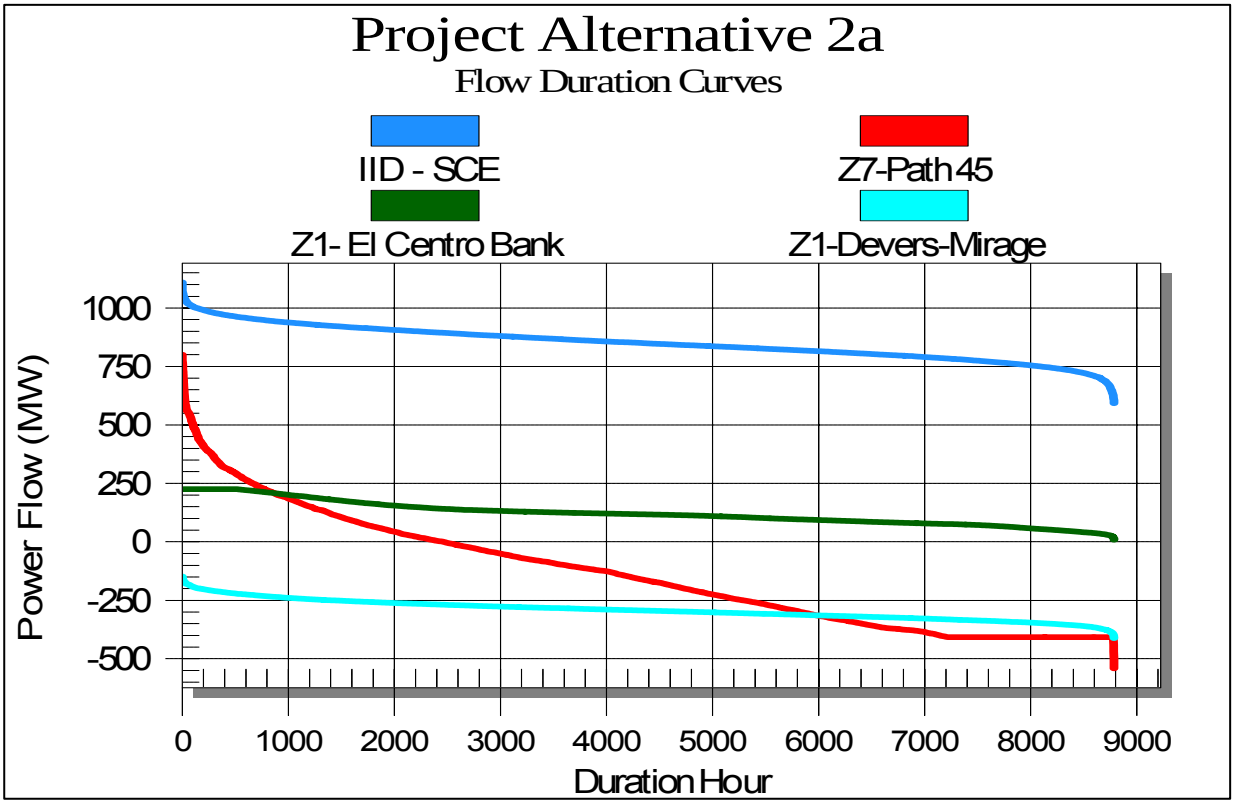

Project Alternative 2
Flow Duration Curves
Z1-Banister-Elcentro
Z1-Banister-San Felipe
Z1-Banister-Ave58
Power Flow (MW)
600
500
400
300
200
100
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
Duration Hour

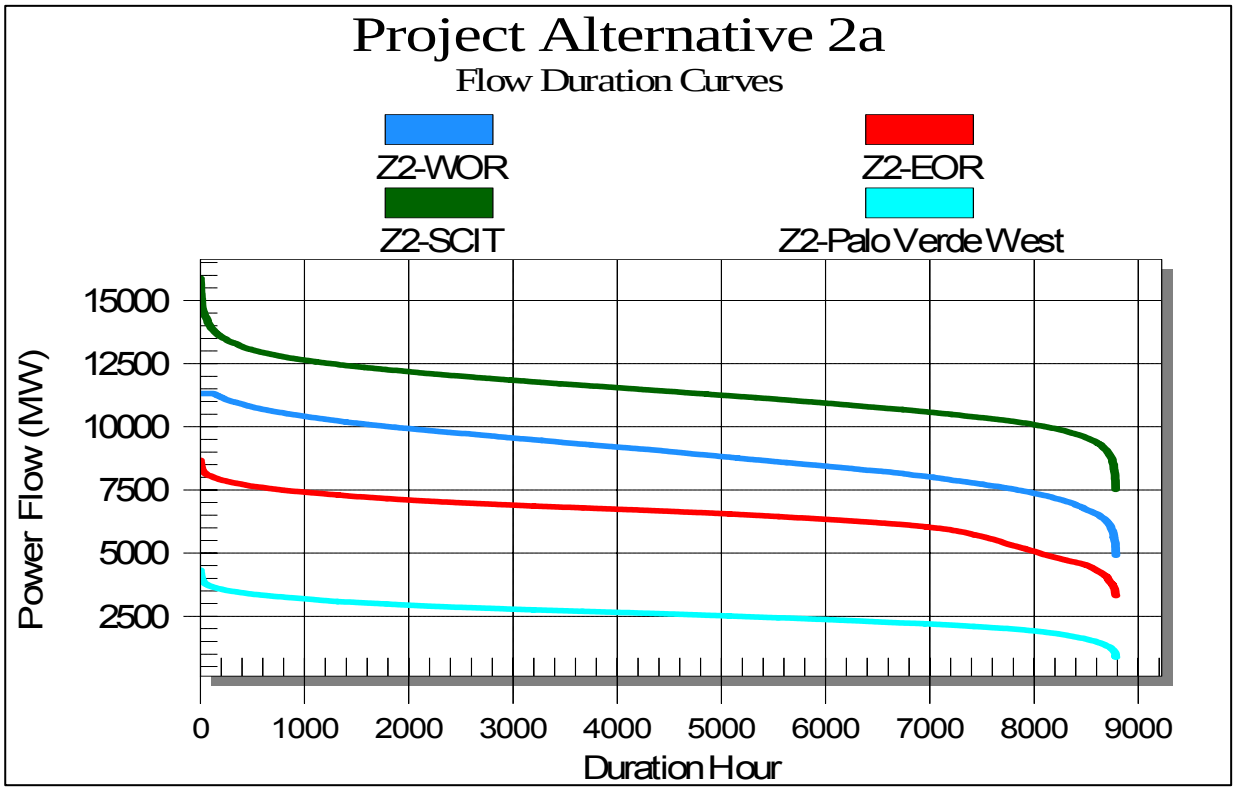

Project Alternative 2
Flow Duration Curves
SOUTH OF SAN ONOFRE
Z2- SDGE Import Limit
Z7-SDCentral
Z1-Imperial Valley-Miguel
Z1-Tijuana-OtayMesa
Power Flow (MW)
4000
3000
2000
1000
0
-1000
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
Duration Hour

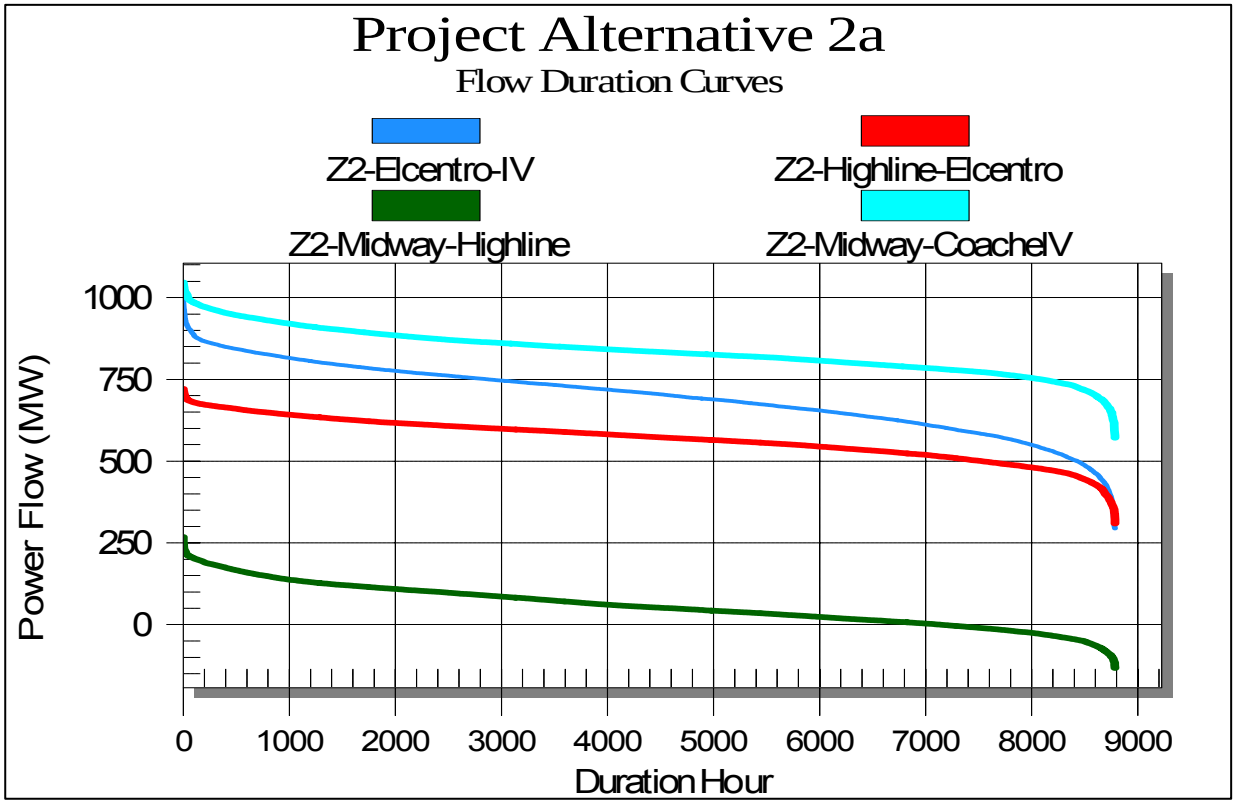

Project Alternative 2
Flow Duration Curves
NORTH OF SAN ONOFRE
Z1- Devers Bank No. 1
Z1-Devers-Valley
Z2-Midpoint-Devers
Power Flow (MW)
3500
3000
2500
2000
1500
1000
500
0
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
Duration Hour

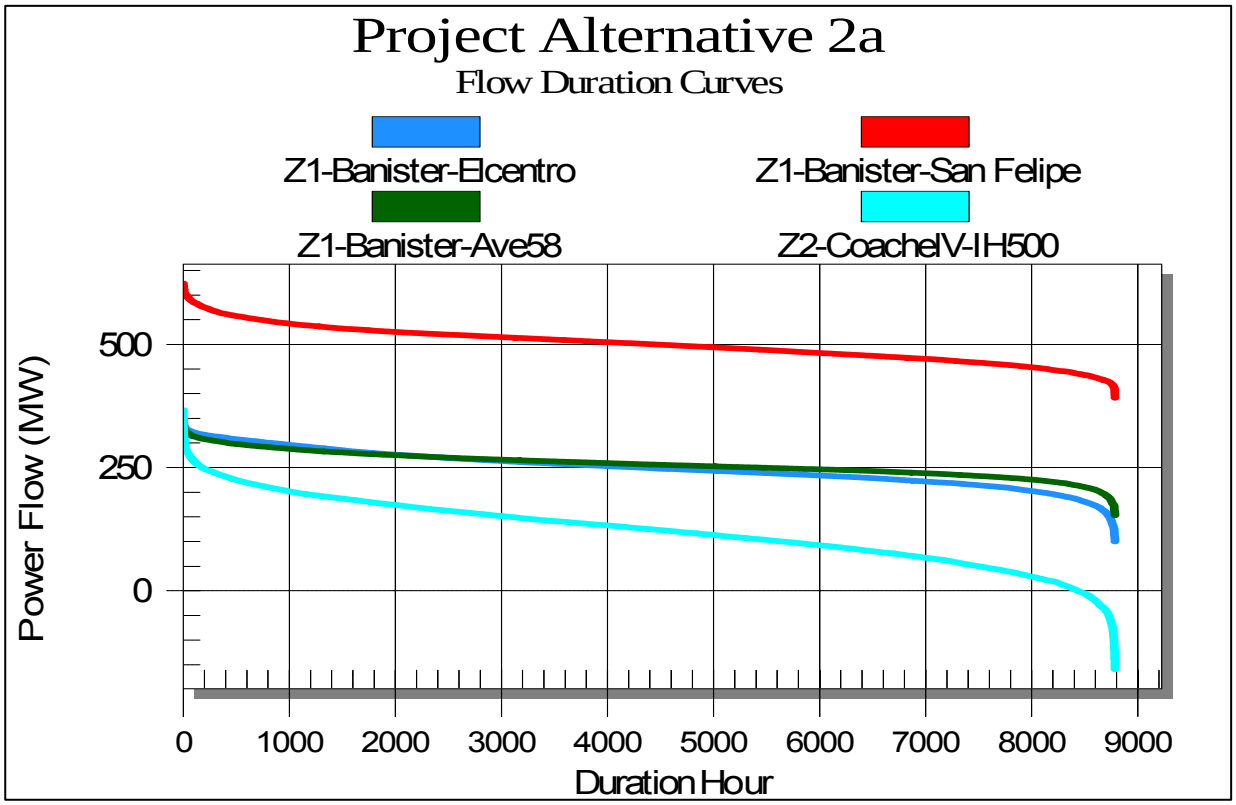
D.2.3.3 Project Alternative 2a: Flow Duration Curves

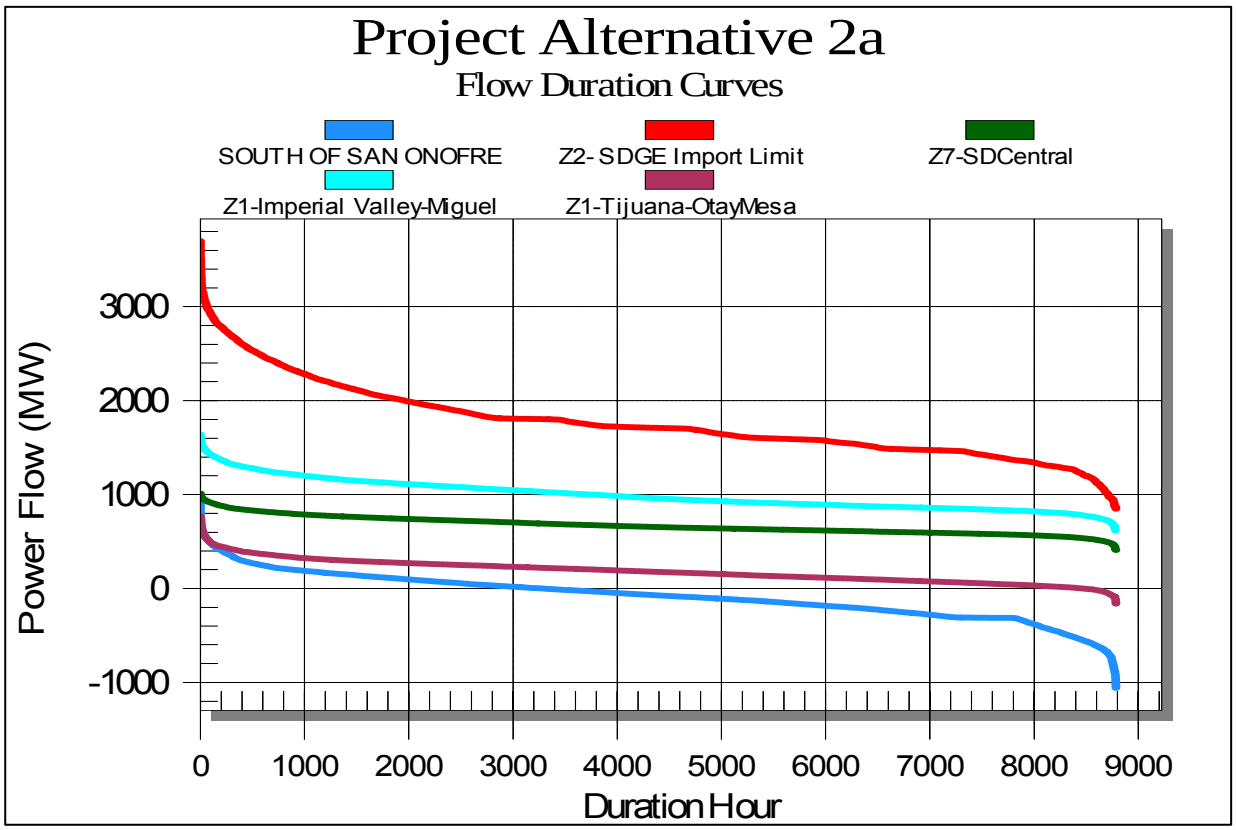


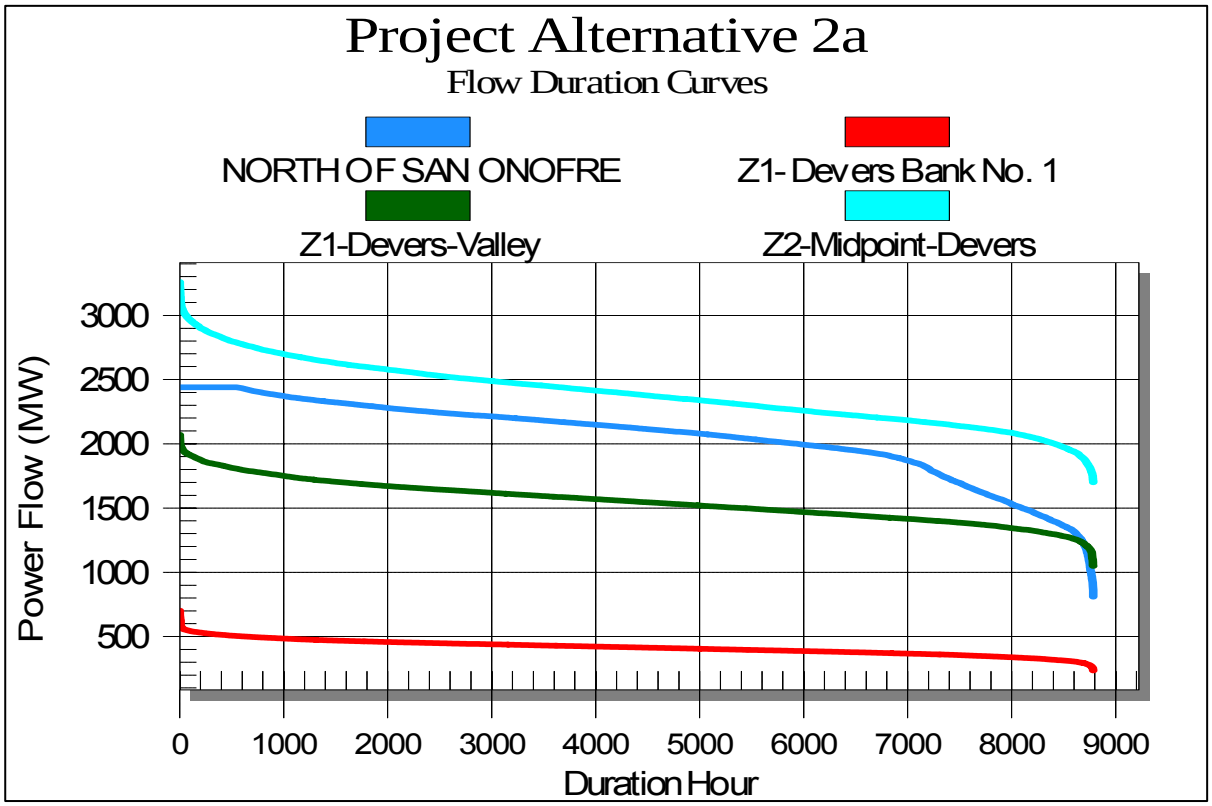




Project Alternative 2a
Flow Duration Curves
Z2-WOR
Z2-EOR
Z2-SCIT
Z2-Palo Verde West
Power Flow (MW)
15000
12500
10000
7500
5000
2500
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
Duration Hour

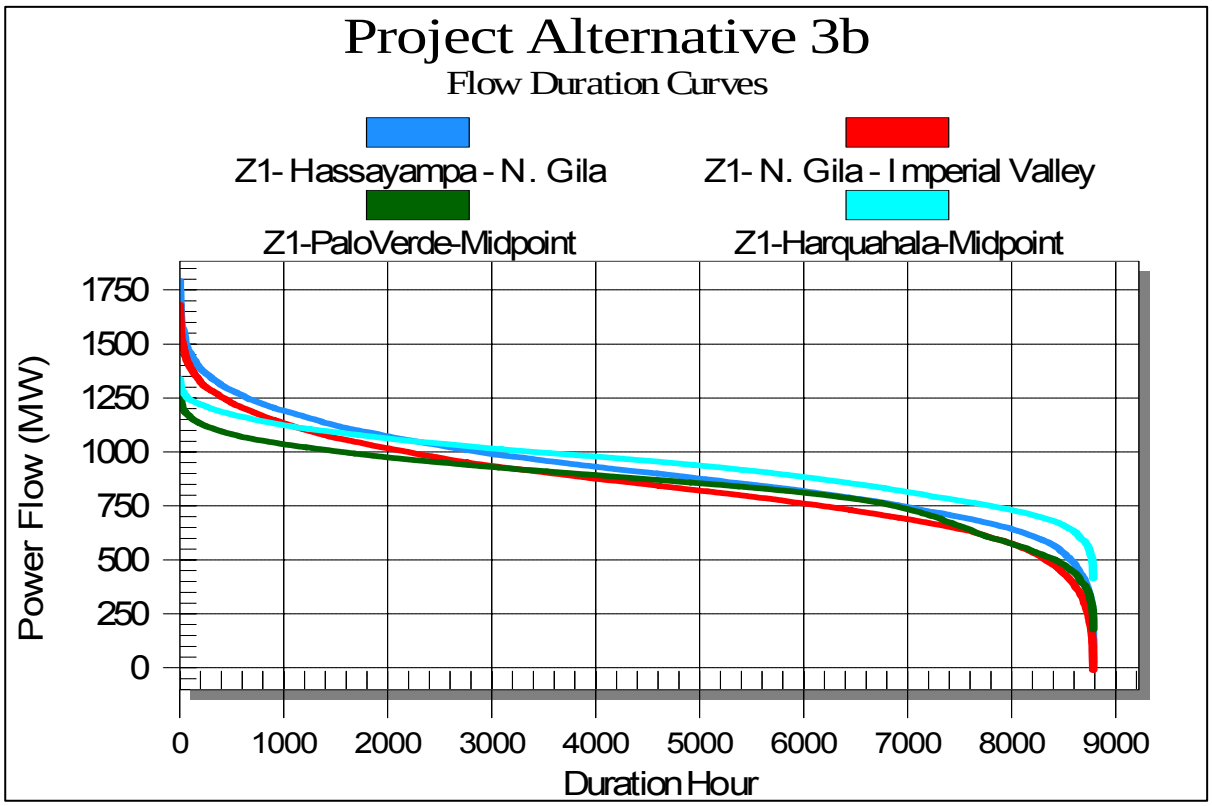

Project Alternative 2a
Flow Duration Curves
Z2-Elcentro-IV
Z2-Highline-Elcentro
Z2-Midway-Highline
Z2-Midway-CoachelV
Power Flow (MW)
1000
750
500
250
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
Duration Hour

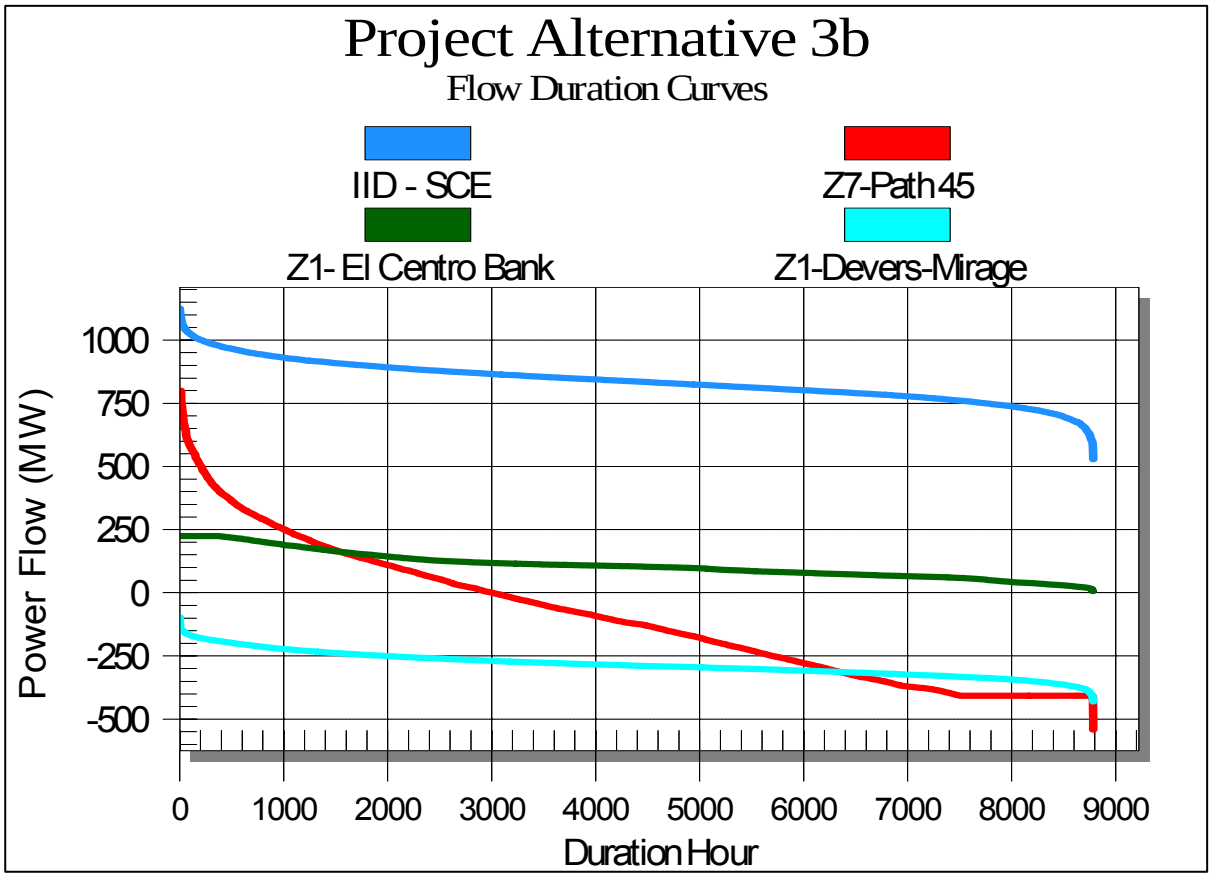

Project Alternative 2a
Flow Duration Curves
Z1-Banister-Elcentro
Z1-Banister-San Felipe
Z1-Banister-Ave58
Z2-CoachellV-IH500
Power Flow (MW)
500
250
0
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
Duration Hour

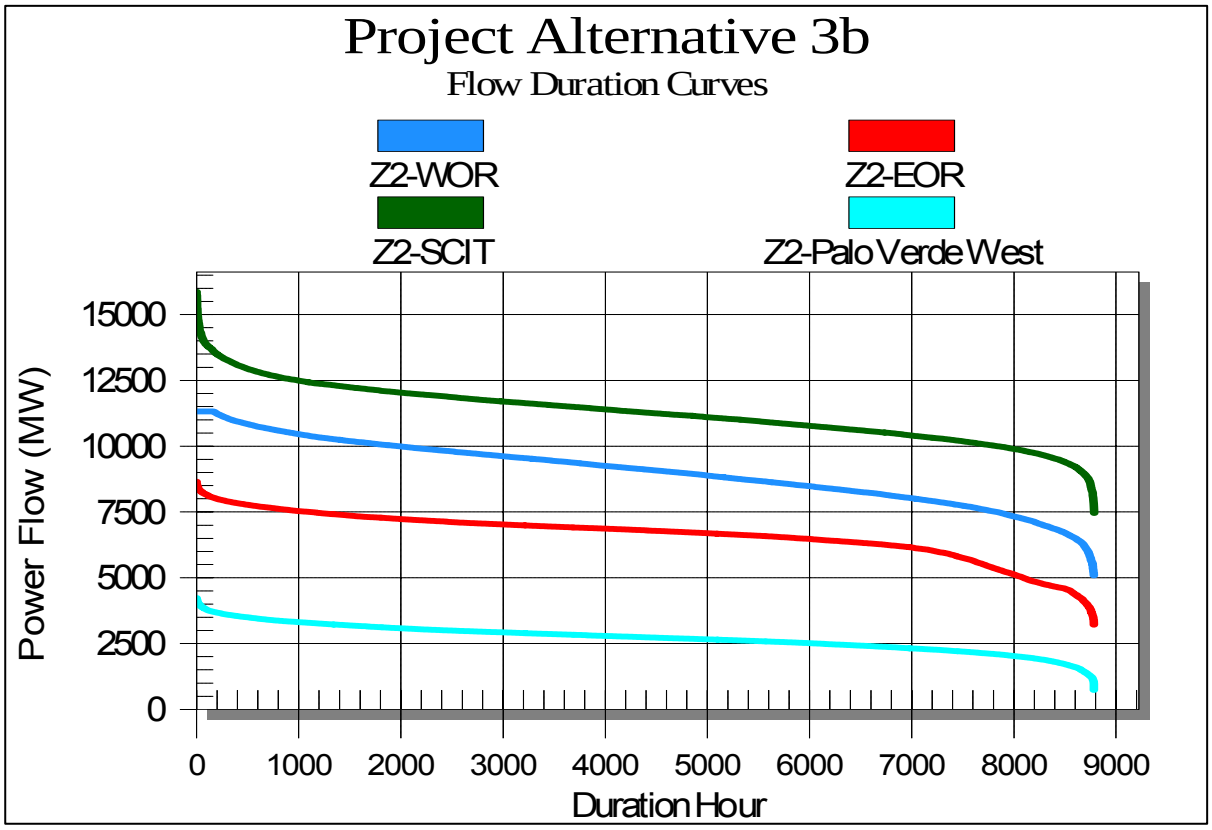

Project Alternative 2a
Flow Duration Curves
SOUTH OF SAN ONOFRE
Z2- SDGE Import Limit
Z7-SDCentral
Z1-Imperial Valley-Miguel
Z1-Tijuana-OtayMesa
Power Flow (MW)
3000
2000
1000
0
-1000
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
Duration Hour

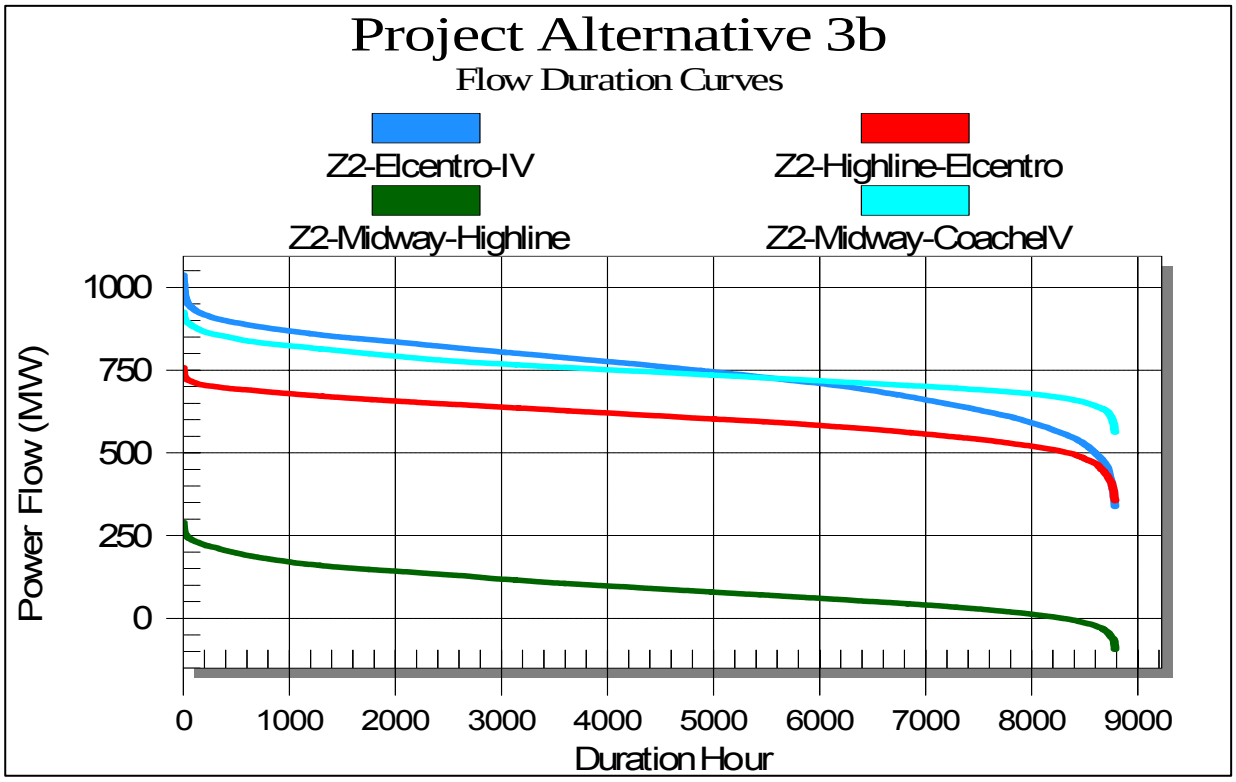


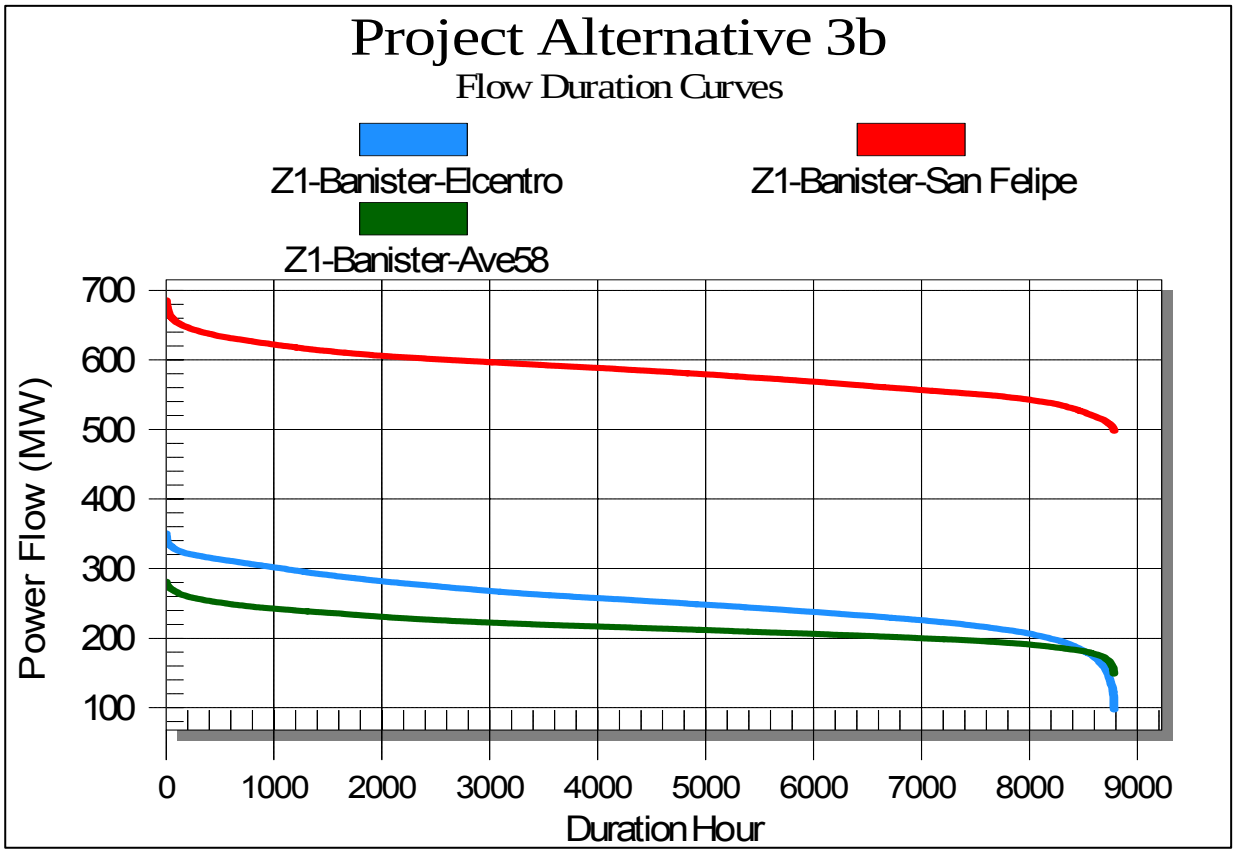

D.2.3.4 Project Alternative 3b: Flow Duration Curves

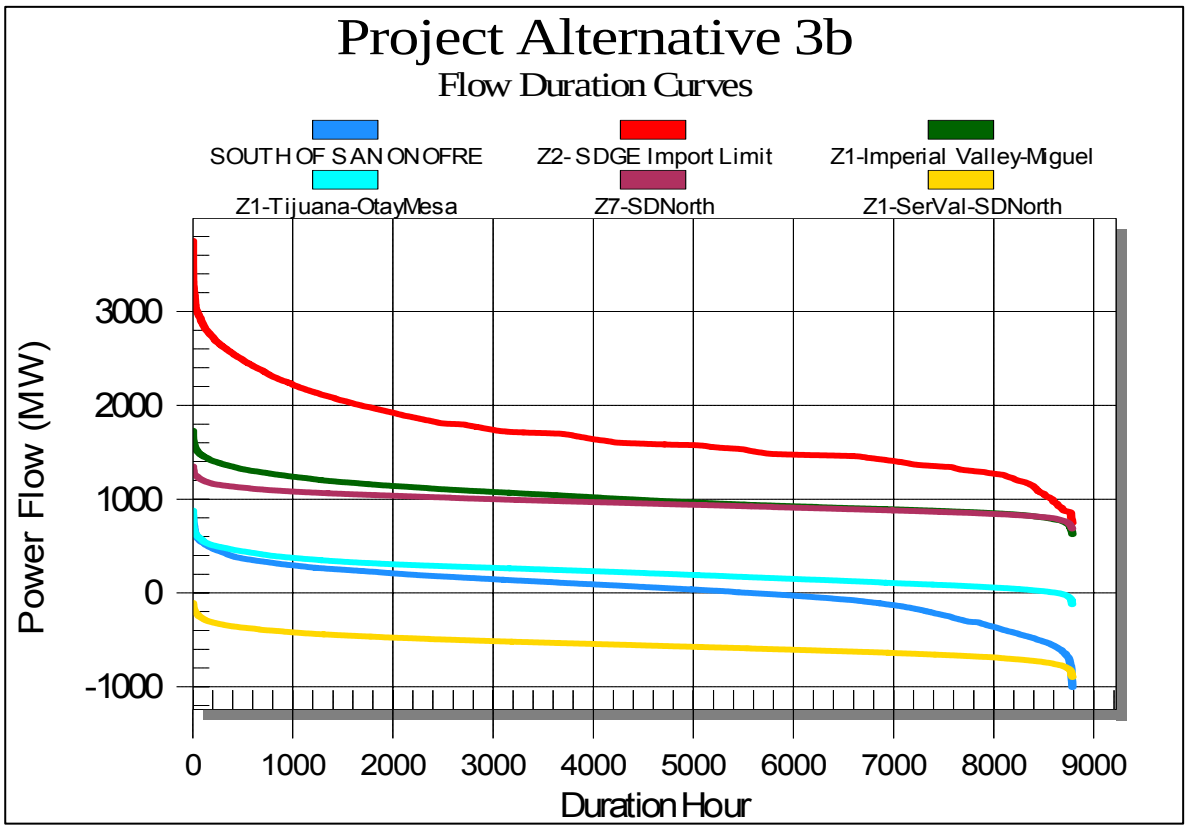


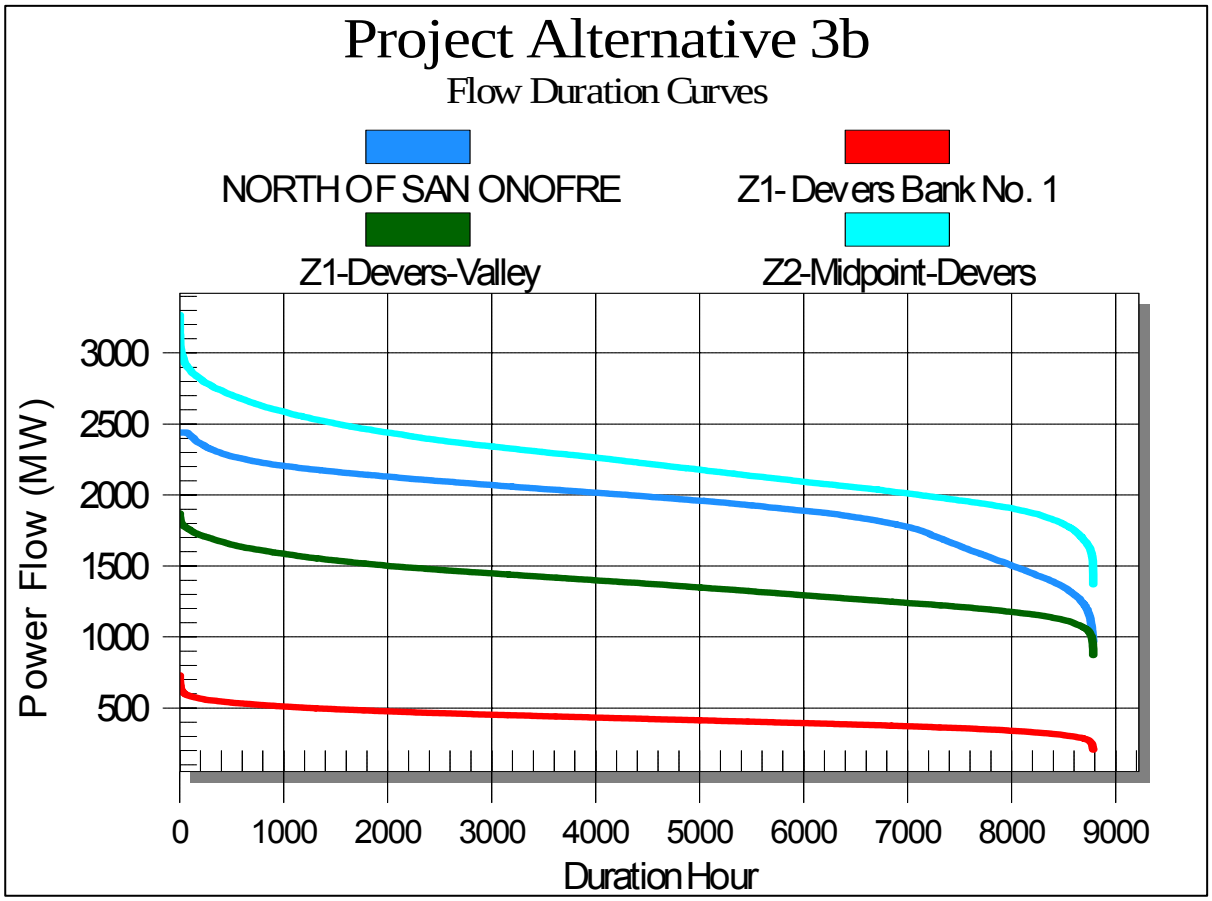

Project Alternative 3b
Flow Duration Curves
IID - SCE
Z7-Path 45
Z1- El Centro Bank
Z1-Devers-Mirage
Power Flow (MW)
1000
750
500
250
0
-250
-500
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
Duration Hour


Project Alternative 3b
Flow Duration Curves
Z2-WOR
Z2-EOR
Z2-SCIT
Z2-Palo Verde West
Power Flow (MW)
15000
12500
10000
7500
5000
2500
0
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
Duration Hour

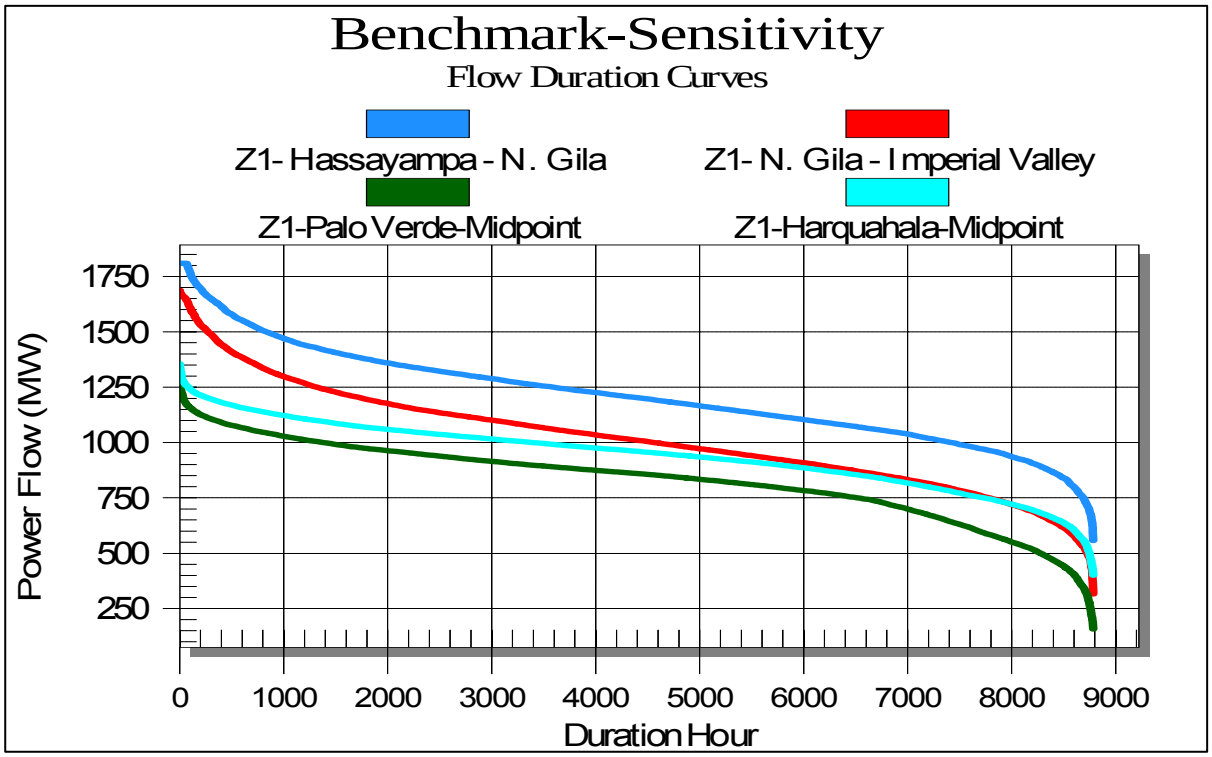

Project Alternative 3b
Flow Duration Curves
Z2-Elcentro-IV
Z2-Highline-Elcentro
Z2-Midway-Highline
Z2-Midway-CoachelV
Power Flow (MW)
1000
750
500
250
0
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
Duration Hour

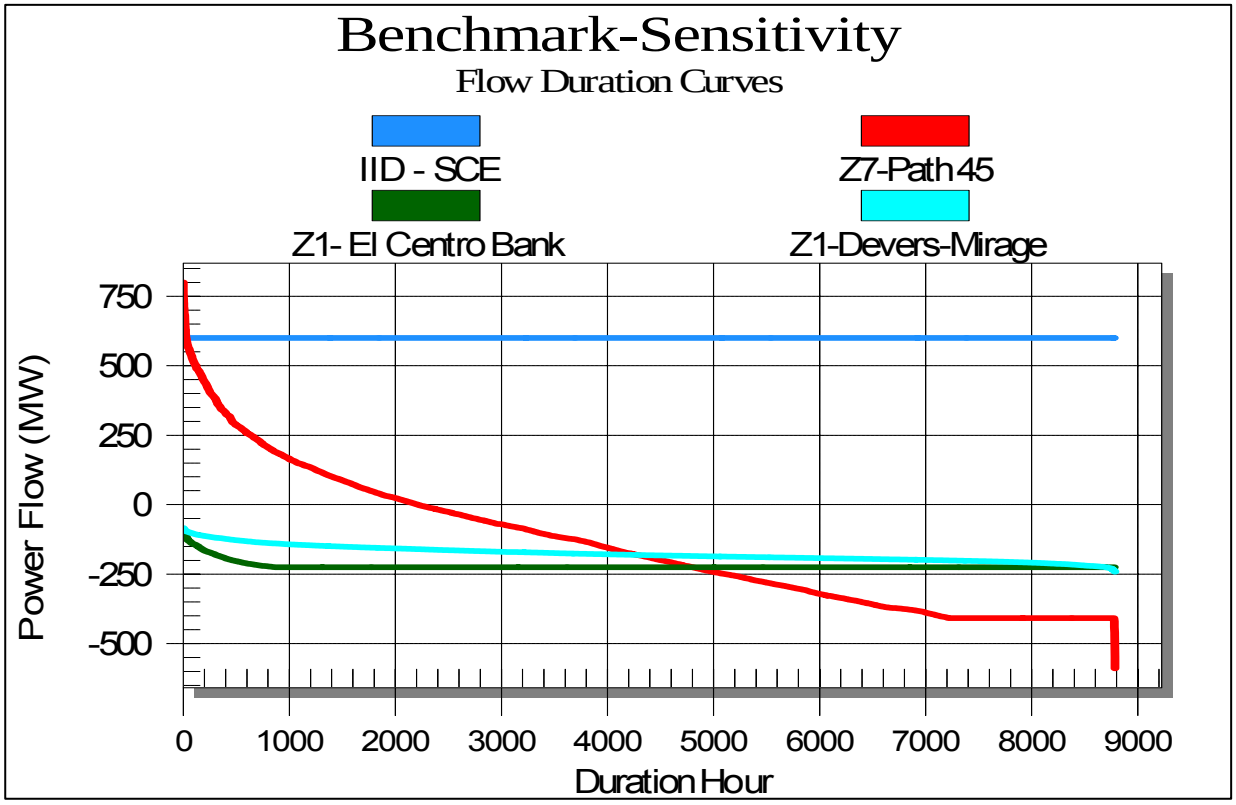

Project Alternative 3b
Flow Duration Curves
Z1-Banister-Elcentro
Z1-Banister-San Felipe
Z1-Banister-Ave58
Power Flow (MW)
700
600
500
400
300
200
100
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
Duration Hour

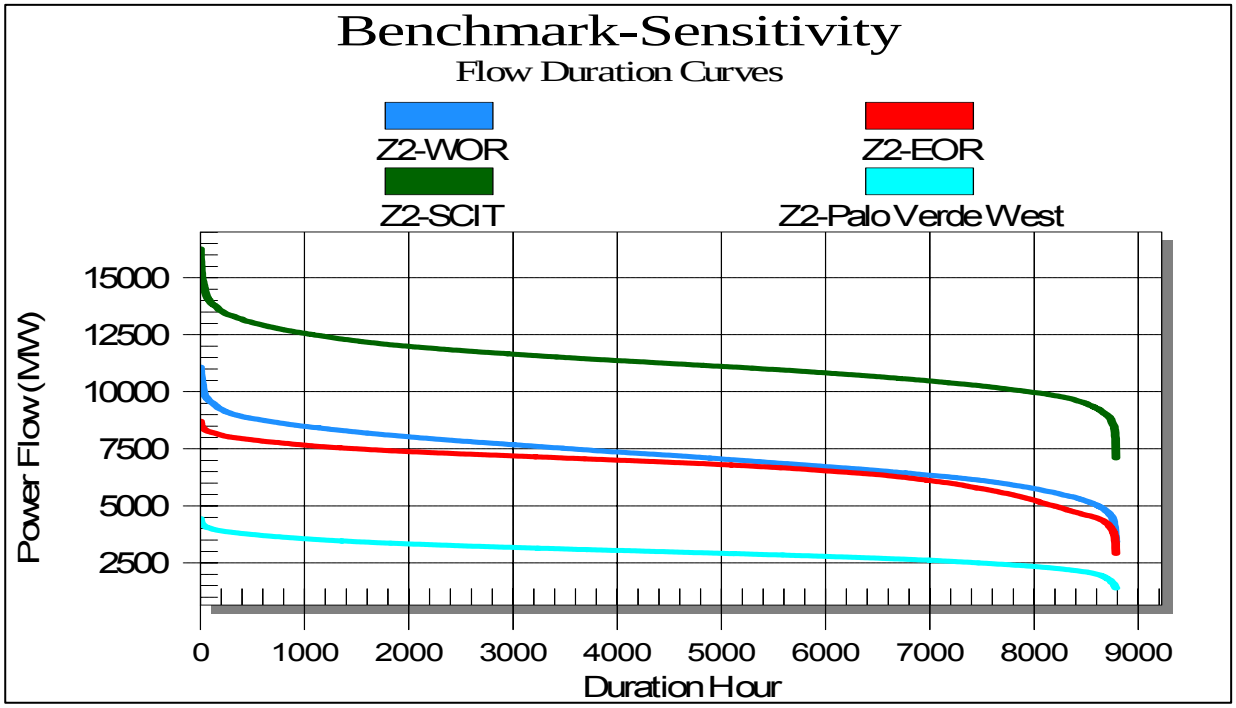

Project Alternative 3b
Flow Duration Curves
SOUTH OF SAN ONOFRE
Z2- SDGE Import Limit
Z1-Imperial Valley-Miguel
Z1-Tijuana-OtayMesa
Z7-SDNorth
Z1-SerVal-SDNorth
Power Flow (MW)
3000
2000
1000
0
-1000
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
Duration Hour

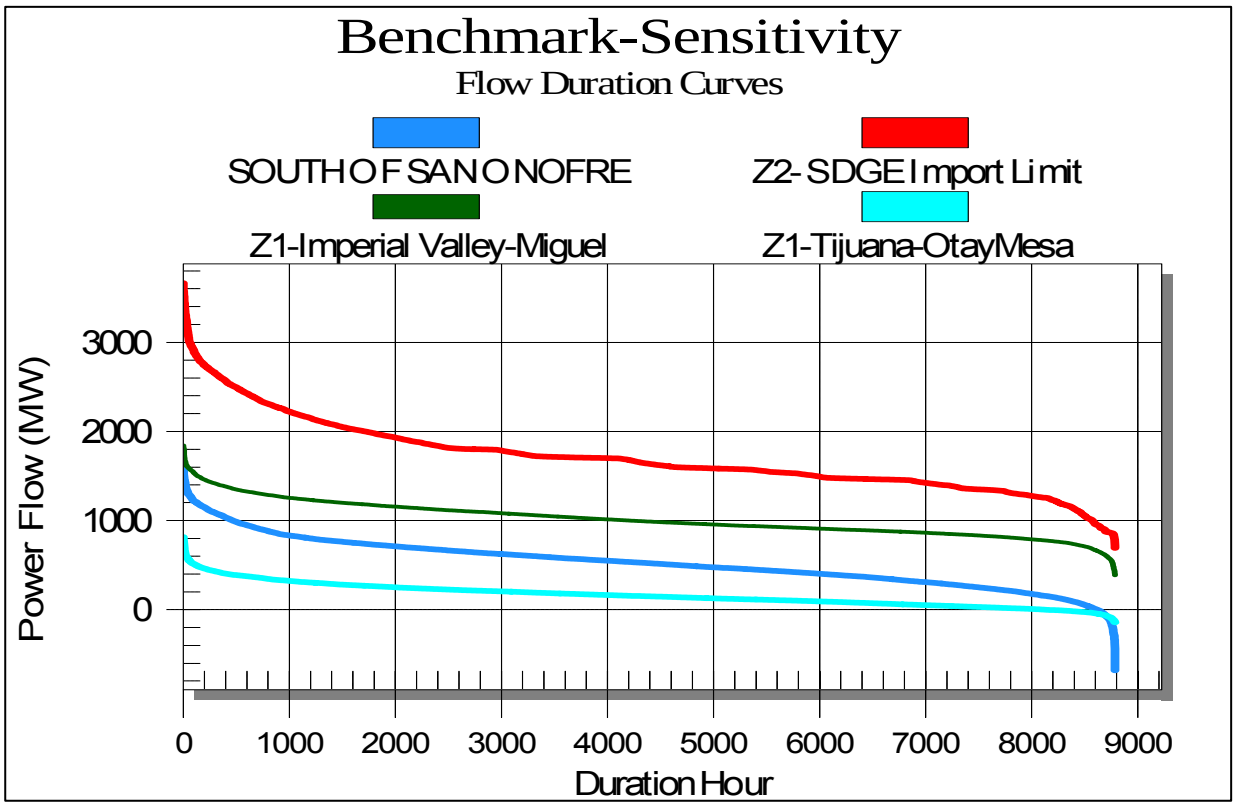

Project Alternative 3b
Flow Duration Curves
NORTH OF SAN ONOFRE
Z1- Devers Bank No. 1
Z1-Devers-Valley
Z2-Midpoint-Devers
Power Flow (MW)
3000
2500
2000
1500
1000
500
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
Duration Hour

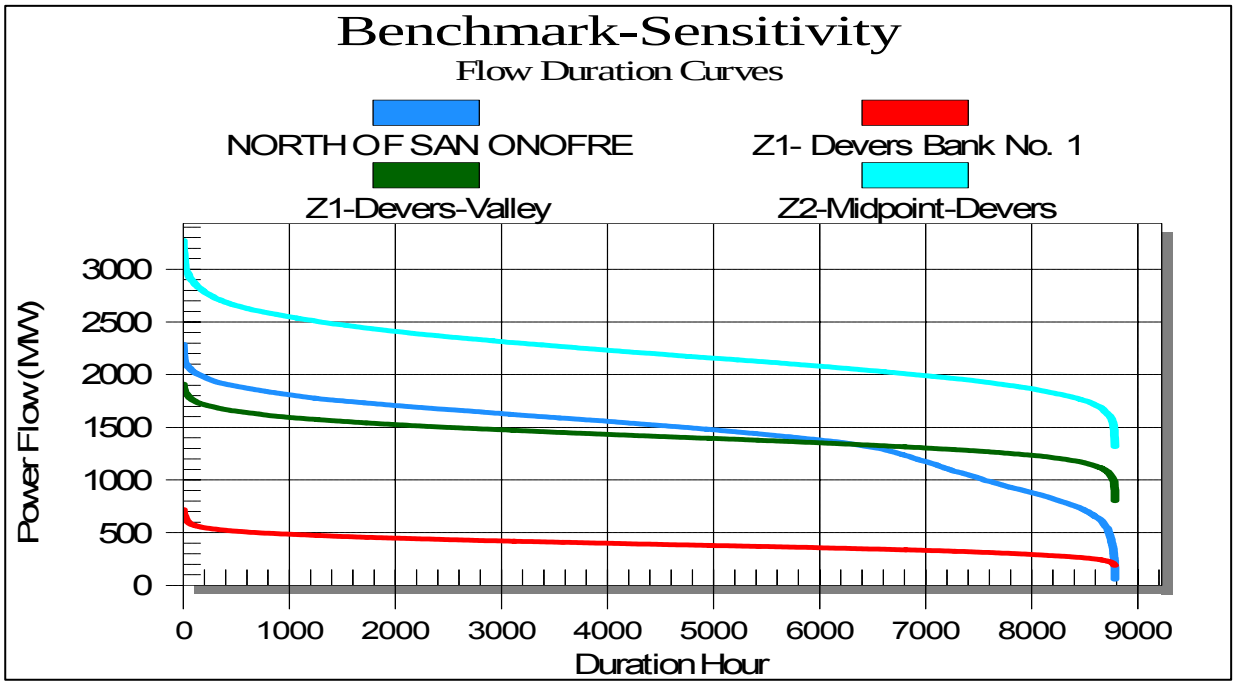
D.2.3.5 Benchmark-Sensitivit y: Flow Duration Curves



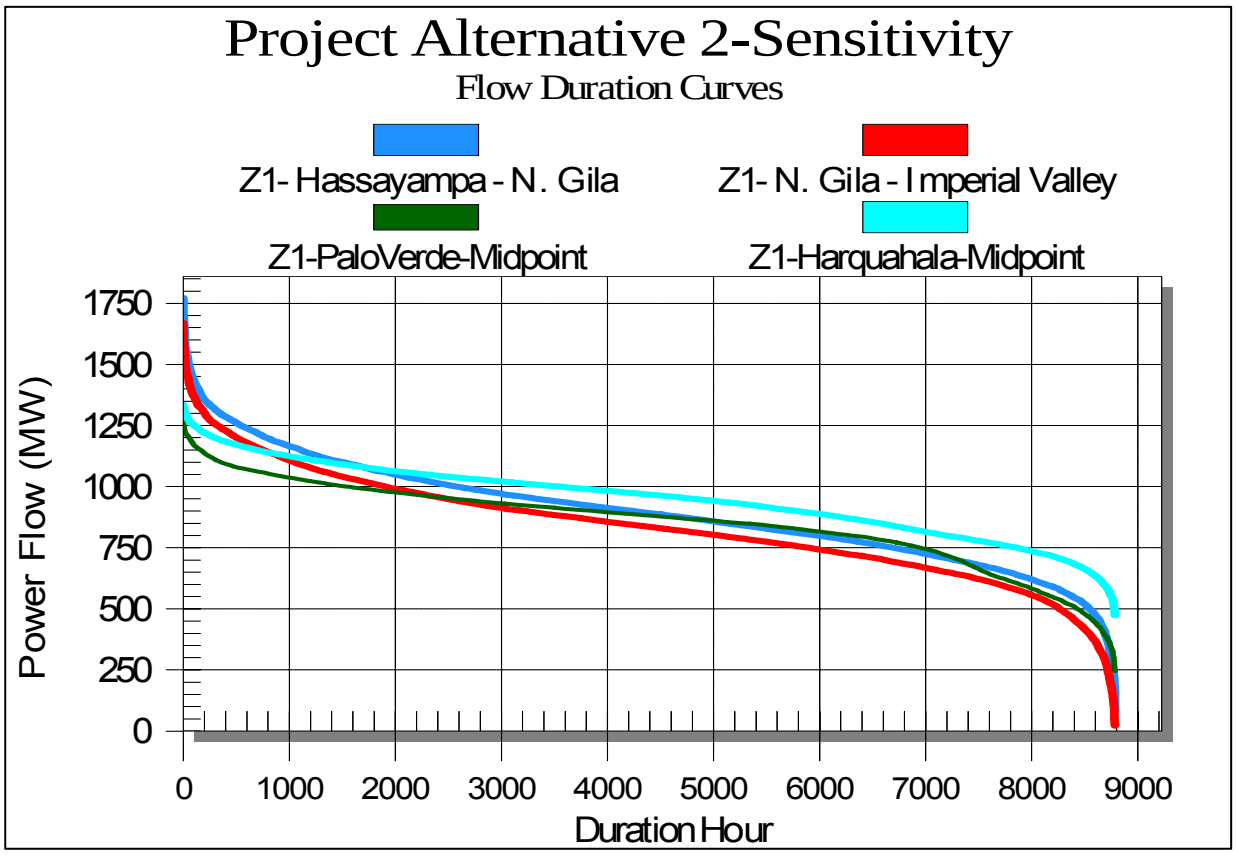



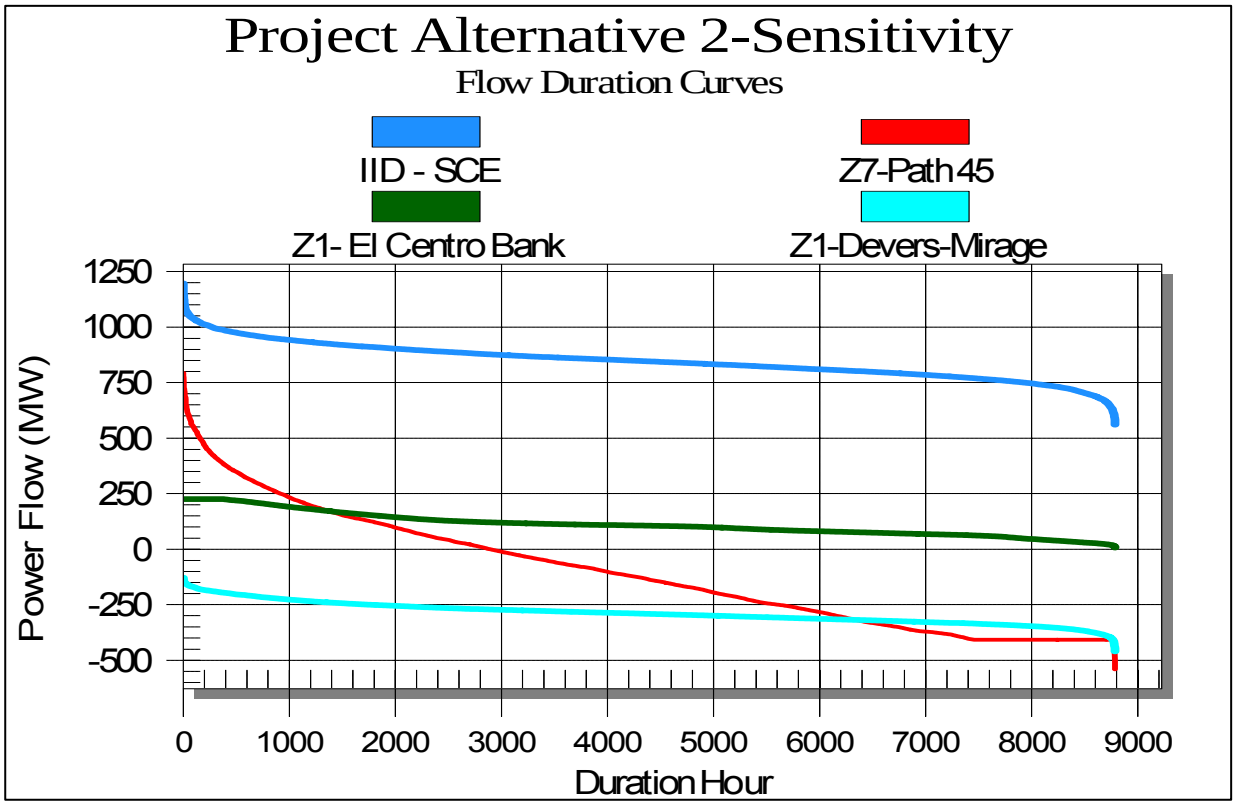

Benchmark-Sensitivity
Flow Duration Curves
Z2-WOR
Z2-EOR
Z2-SCIT
Z2-Palo Verde West
Power Flow (MW)
15000
12500
10000
7500
5000
2500
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
Duration Hour

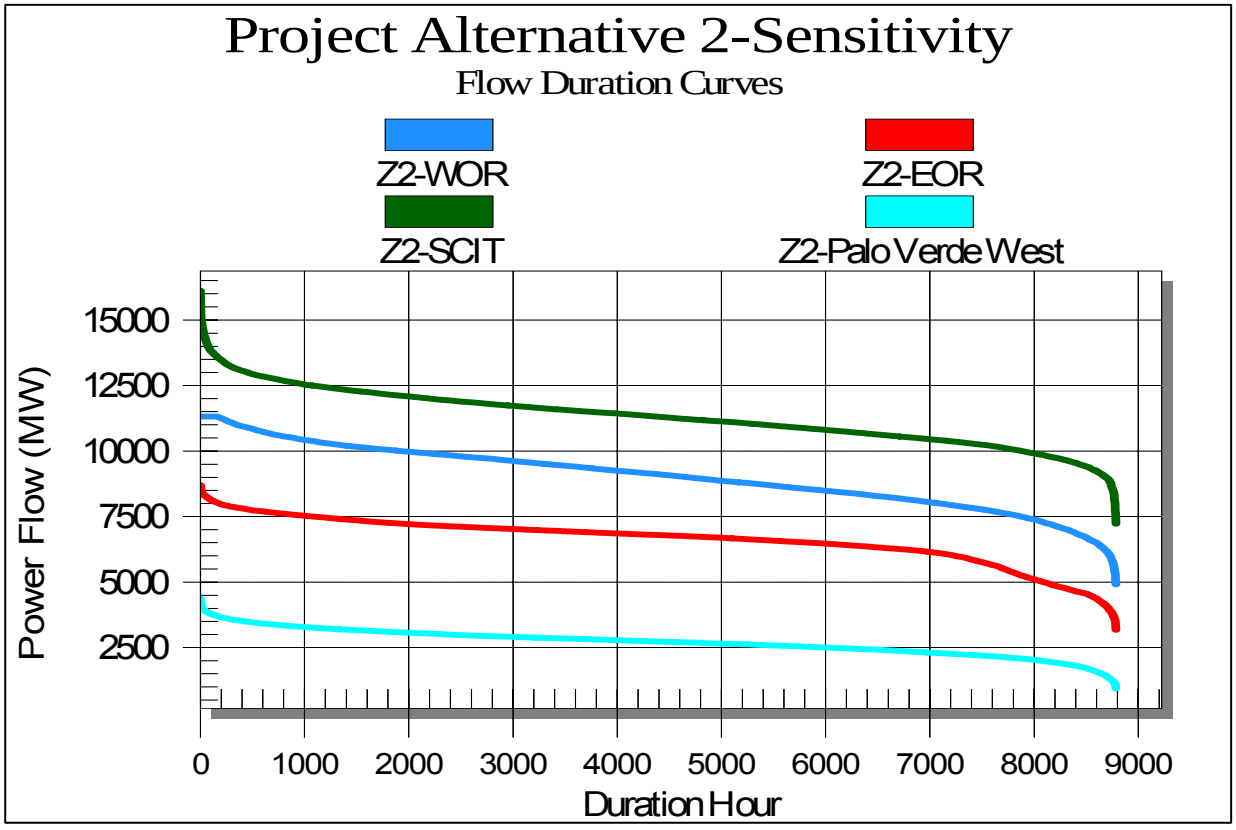

Benchmark-Sensitivity
Flow Duration Curves
SOUTH OF SAN ONOFRE
Z2- SDGE Import Limit
Z1-Imperial Valley-Miguel
Z1-Tijuana-OtayMesa
Power Flow (MW)
3000
2000
1000
0
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
Duration Hour

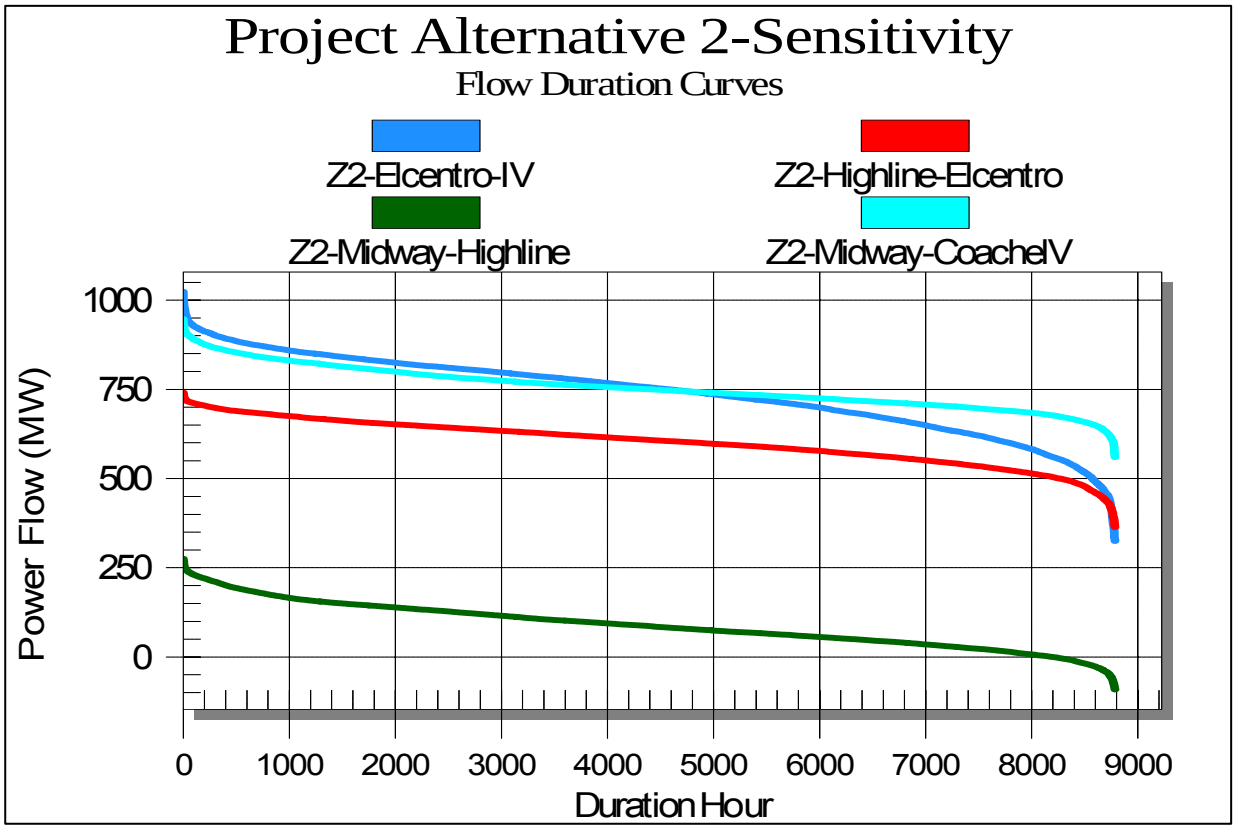


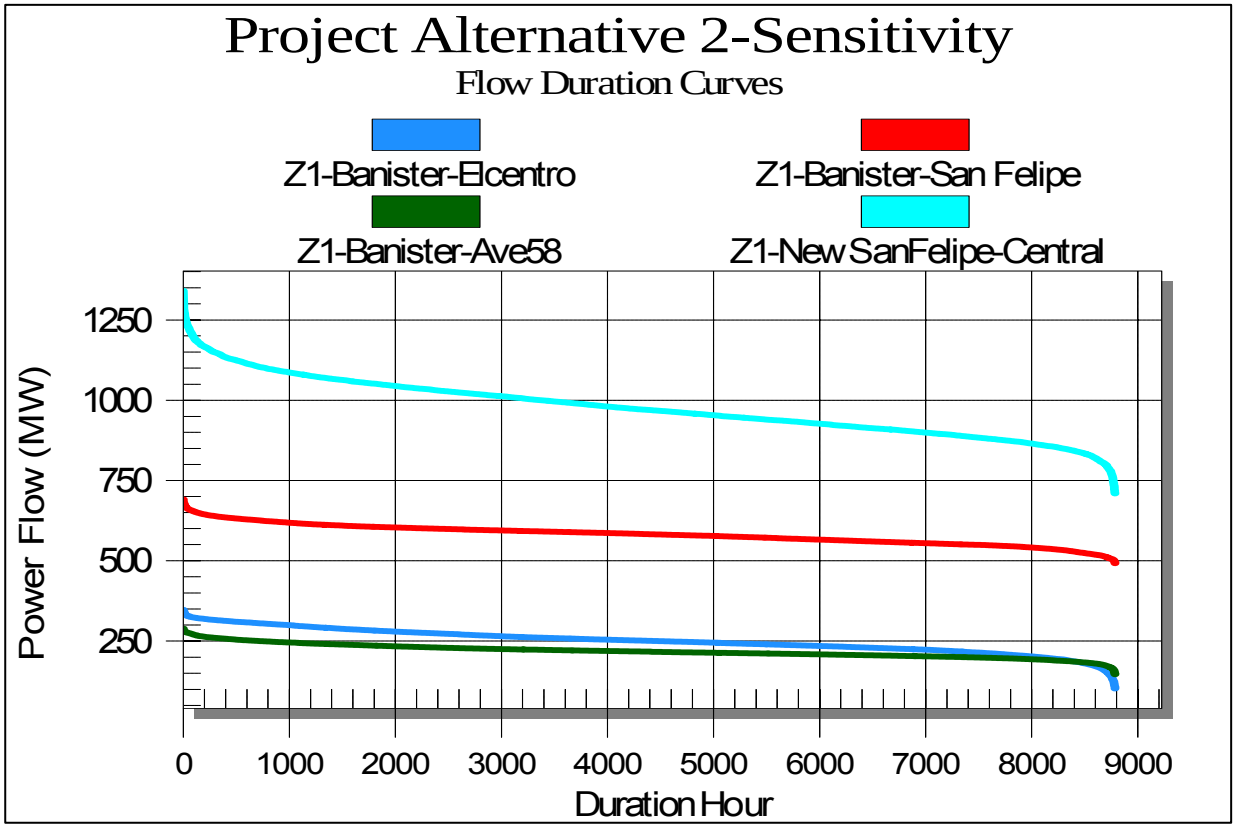

D.2.3.6 Project Alternative 2-Sensitivity: Flow Duration Curves

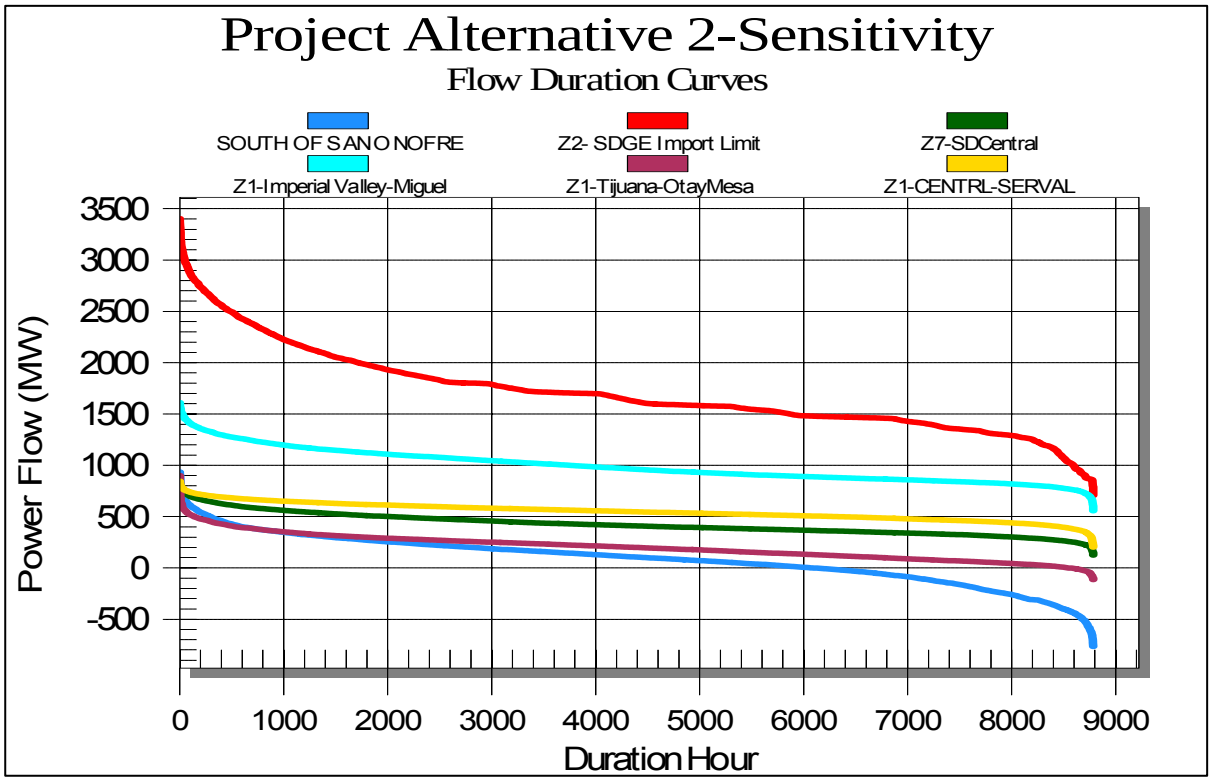


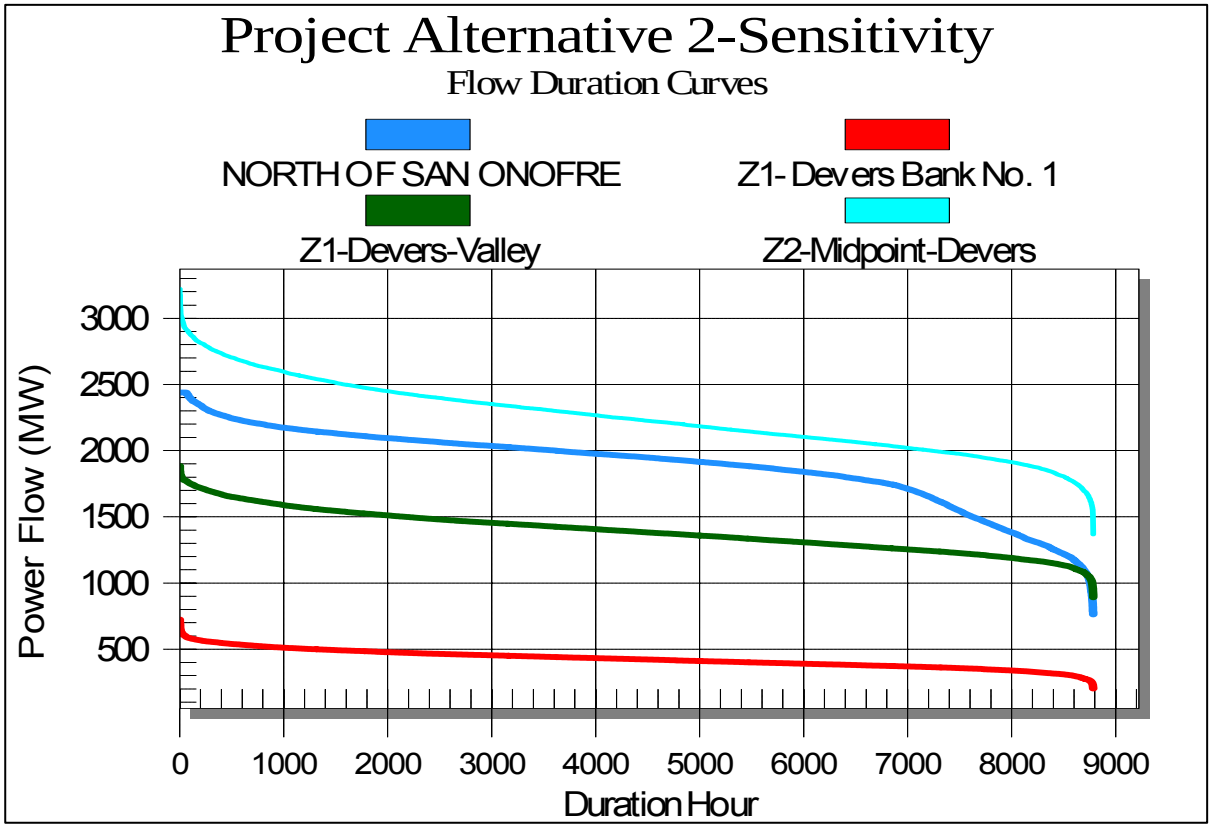

Project Alternative 2-Sensitivity
Flow Duration Curves
IID - SCE
Z7-Path 45
Z1- El Centro Bank
Z1-Devers-Mirage
Power Flow (MW)
1250
1000
750
500
250
0
-250
-500
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
Duration Hour


Project Alternative 2-Sensitivity
Flow Duration Curves
Z2-WOR
Z2-EOR
Z2-SCIT
Z2-Palo Verde West
Power Flow (MW)
15000
12500
10000
7500
5000
2500
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
Duration Hour


Project Alternative 2-Sensitivity
Flow Duration Curves
Z2-Elcentro-IV
Z2-Highline-Elcentro
Z2-Midway-Highline
Z2-Midway-CoachelV
Power Flow (MW)
1000
750
500
250
0
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
Duration Hour


Project Alternative 2-Sensitivity
Flow Duration Curves
Z1-Banister-Elcentro
Z1-Banister-San Felipe
Z1-Banister-Ave58
Z1-New SanFelipe-Central
Power Flow (MW)
1250
1000
750
500
250
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
Duration Hour


Project Alternative 2-Sensitivity
Flow Duration Curves
SOUTH OF SAN ONOFRE
Z2- SDGE Import Limit
Z7-SDCentral
Z1-Imperial Valley-Miguel
Z1-Tijuana-OtayMesa
Z1-CENTRL-SERVAL
Power Flow (MW)
3500
3000
2500
2000
1500
1000
500
0
-500
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
Duration Hour


Project Alternative 2-Sensitivity
Flow Duration Curves
NORTH OF SAN ONOFRE
Z1- Devers Bank No. 1
Z1-Devers-Valley
Z2-Midpoint-Devers
Power Flow (MW)
3000
2500
2000
1500
1000
500
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
Duration Hour

# APPENDIX D

Continuation of Tehachapi Collaborative Study

# Continuation of Tehachapi Collaborative Study

Study Plan #2…….……..1

Schedule…….10

Appendix A – SCE Contingencies…….11

Appendix B – PG&E Contingencies…..…....15

Appendix C – Study Plan – July 14, 2004.....16

# Study Plan #2

## Purpose

The purpose of this continuation of the Tehachapi Collaborative Study is to formulate a plan for the transmission of 4,000MW of wind generation at Tehachapi and 500MW in the Antelope Valley to load centers in the PG&E and SCE service areas. It is assumed that half the 4,000 MW at Tehachapi will go to PG&E and half will go to SCE. The plan resulting from this study will be sufficient to initiate the preparation of Proponent's Environmental Assessments (PEAs) which will form the basis of CPCN applications for the facilities defined in the plan. The plan covers only the facilities from Tehachapi Substation 1 to the load centers and does not include the Tehachapi collector system. It is envisioned that this transmission plan may be fine-tuned to accommodate each (or each group of) specific wind plant projects as they move through the ISO Interconnection Process andas the Tehachapi collector loop beyond Tehachapi Substation 1 becomes more precisely defined.

## Background

Pursuant to CPUC Decision 04-06-010, the Tehachapi Collaborative Study Group (TCSG) was formed to develop a comprehensive transmission development plan for the phased expansion of transmission capabilities in the Tehachapi area. The CPUC Staff coordinated the collaborative study group. As directed by the decision, TCSG completed a study that assumed there would be more than 4,000 MW of wind resources at Tehachapi Wind Area[1]. To conduct the study the TCGS further assumed that 50% of the 4,000 MW would be delivered to load centers in the transmission system North of Path 26 and the remaining 50% would be delivered to load centers in the system south of Path 26[2]. The Executive Director extended the original due date for filing the report, by one week by letter dated March 4, 2005. The report entitled, "Development Plan for the Phased Expansion of Transmission in the Tehachapi Wind Resource Area" (Report), was filed by Southern California Edison (SCE) on March 16, 2005.

As stated in the Report, the development plan prepared by the TCSG is a conceptual roadmap to the eventual Tehachapi transmission system rather than a definitive plan[3]. The Report recommended that further study be performed to select among the alternatives identified in the Report (and referred to herein with the same identification numbers as in the Report). These alternatives require further planning evaluation in order to formulate a single plan for implementation. To do this, additional studies (specific

[1] Decision 04-06-010, at 6
[2] Study Plan, date July 14, 2004, at 18
[3] Report, at 3

rather than generic) need to be performed and facility cost estimates refined. The final plan for the Tehachapi collector system requires information concerning actual wind project locations and capacities which are not available at this time, and therefore is not covered in the study. However, it is envisioned that the transmission plan may be fine-tuned in the future as each (or each group of) specific wind plant projects moves through the ISO Interconnection Process and the Tehachapi collector loop beyond Tehachapi Substation 1 becomes more precisely defined.

The CPUC Energy Division convened a study group consisting of CPUC Staff, CAISO, SCE and PG&E. The study group will be coordinated by the CPUC Staff. This new study plan will build on the earlier TCSG Study Plan, dated July 14, 2004 (Attachment A), and utilizes essentially the same study assumptions. As such, only exceptions to those earlier assumptions will be noted in this study plan.

## 1. Fresno 230 kV Tie: Big Creek – Fresno Interconnection

Establish a new 230 kV connection between PG&E and SCE by constructing a switching station at the crossing of PG&E-owned and SCE-owned transmission lines and installing a phase-shifting transformer to "push" power from the Big Creek corridor into the PG&E system. This study will investigate impacts on the SCE system and the PG&E system, the possible mitigation measures, and provide cost estimates for the connection and the mitigation measures associated with the amounts of power that would be "pushed" into the PG&E system. The studies will evaluate "pushing" 300 MW to 1,200 MW in successive increments. The study will consider PG&E Alternative 2, Plan A alone and in conjunction with PG&E Alternative 2, Plan B.
The cost per megawatt transferred will be evaluated to determine the optimum capacity of the connection.

### Alternative 2: PG&E and SCE Fresno 230 kV Tie Plan A.

Build a switching station at the crossing of PG&E's Helms – Gregg 230 kV lines and SCE's Big Creek – Rector 230 kV lines. Establish a 230 kV tie between PG&E and SCE. A phase shifter or power flow controller may be needed to control the tie line flow.

### Alternative 2: PG&E and SCE Fresno 230 kV Tie Plan B.

Build a switching station at the crossing of PG&E's Haas-McCall and Balch-McCall 230 kV lines and SCE's Big Creek – Rector 230 kV lines. Establish a 230 kV tie between PG&E and SCE. A phase shifter or power flow controller may be needed to control the tie line flow.

## A. SCE Studies

### Base Case Assumptions

SCE will utilize the load forecast currently under development for the upcoming CAISO Controlled SCE Transmission Expansion Plan. Studies for evaluating the two plans will be conducted assuming both heavy summer and spring load forecast in order to ensure that system performance is maintained within allowable thermal limits. Heavy summer load forecast will include a 1-in-10 year heat wave adjustment consistent with CAISO Planning Standards. Light Spring conditions will be modeled with load at 50% of summer peak consistent with study assumptions utilized in performing generation interconnection studies in the Big Creek Corridor.

### Power Flow Studies

Power flow studies will be conducted by systematically increasing the power transfer from SCE to PG&E through the phase-shifted system tie. The increment step size will be 100 MW.

a. North of Magunden study

   i. Increase power transfer into the PG&E system at the Fresno 230kV tie (Plan A and Plan A in conjunction with Plan B); investigate system performance under normal (all facilities in service) conditions and under NERC/WECC Category B (N-1) contingencies and 230 kV common corridor lines in the Big Creek Corridor. (See Appendix A for a list of contingencies to be studied.) Where the system does not meet the Planning Standards, develop mitigation measures, such as the addition of a transmission upgrade.

   ii. Repeat step 1 until the power transfer reaches between 1,000 MW to 1,200 MW.

   iii. Develop cost estimates corresponding to each power transfer level

b. South of Magunden study

   i. Repeat the North of Magunden Study, for transmission system south of Magunden.

## B. PG&E Studies

The study will include two different scenarios, namely, summer peak and off-peak conditions. The objectives for developing summer peak and off-peak cases

are to identify transmission import and reliability concerns during both conditions. The following Table 1 describes the critical study assumption for the two scenarios proposed for this study.

**Base Case Assumptions**

For summer peak studies PG&E will use the summer peak base case developed for the 2005 PG&E Transmission Grid Assessment Study. This case is being developed. PG&E will send the PG&E case to the ISO for approval, but PG&E's work will not be delayed pending this approval. For the summer off peak case, the load for the Greater Fresno Area will be modeled at 50 % of the peak load from summer peak base case for the study area.

**Study Scenarios**

| Study Scenarios | Summer peak | Summer Off peak |
|---|---|---|
| Starting base case | 2005 PG&E Grid Expansion Study, 2010 Heavy Summer North Peak case | 2005 PG&E Grid Expansion Study, 2010 Summer Off-peak case |
| Fresno load level | PG&E 1 in 5 year adverse weather load forecast for 500 kV system studies, and 1 in 10 year adverse weather load forecast for Greater Fresno Area for 230 kV system studies | 50 % of 2010 summer peak case for the area. |
| Helms units | 3 units generation | 3 units pumping depending on the import level to find boundary conditions |
| Hydro dispatch | Summer peak average hydro level | Summer off-peak average hydro level |
| COI | 4800 MW (n to s) | 3650 MW (s to n) |
| Path 15 flow | | 5400 MW (s to n) or other relevant operating limit(s) |
| Path 26 flow | 3700 MW (n to s) | <3000 MW (s to n) |
| Sensitive study | 1. Spring hydro spill condition<br>2. Path 26 4000 MW N-S | Spring light load case with Helms PGP units Off line |

Sensitivities may be run depending on the initial results.

**Generation Assumptions in addition to those used in the earlier TCSG Study**

Kingsburg and Sanger Qualifying Facility units will be assumed off for the summer off peak case as per the existing contracts for these units.

SCE will furnish the model to be used for the Tehachapi collector system in the absence of firm wind developer commitments. GE Wind generators will be used for the wind plant model and SVCs (at various locations) will be sized as required to provide voltage and transient stability.

**Fresno 230 kV Tie Assumptions**

SCE and CAISO will provide the necessary data for SCE load, network topology, generation level and pattern for the Big Creek facility. The data provided and approved by CAISO for the SCE system will be used in the base case. ISO will provide data on expected wind generation variations, such as, expected wind generation changes in MW/sec.

**Technical Analyses**

The technical analysis will include the following:

a. For each of the base case and study alternatives, Power Flow simulations will be carried out for the following CAISO contingency Categories in the Greater Fresno Area:

   i. ISO Category "B": B1, B2, B3 and overlapping line and generator outage in the study area. (See Appendix B for a list of contingencies).

   ii. ISO Category "C" list for 500 KV outages, 230 kV common tower line outages in the Greater Fresno Area, and 230 kV common corridor lines in the Big Creek Corridor, also listed in Appendix B.

b. Run Post Transient and Voltage Stability simulations for critical Categories B and C contingencies to assess the reactive support requirements and potential facility overloads on the more promising alternatives.
c. Run Transient stability simulations of critical Categories B and C contingencies .

## 2. Further Studies on PG&E Alternatives 4 and 5

The earlier conceptual study results show that the cost estimates for PG&E Alternatives 4 and 5 are practically the same. To select the preferred alternative, more detailed studies using more specific information are needed.

### A. PG&E Alternative 4

No voltage Stability study or transient stability study was conducted in the conceptual study. To form a more definitive selection of the alternatives, these studies need to be run based on selected Categories B and C contingencies in Appendix B.

### B. PG&E Alternative 5

In the earlier conceptual study, Alternative 5 included a 500 kV line between Tehachapi and Gregg. This study will investigate if this Gregg – Tehachapi 500 kV line can be separated into two sections:

- Gregg – Midway 500 kV line
- Tehachapi – Midway 500 kV line

a. Run Power flow simulations for normal and single and double contingencies based on the list of ISO Categories B and C contingencies. (See Appendix B).

b. Run Post Transient and Voltage Stability simulations for critical Categories B and C contingencies to assess the reactive support requirements and potential facility overloads on the most promising alternatives..

c. Run Transient stability simulations critical Categories B and C contingencies on the most promising alternatives.

## 3. Further Studies on SCE Alternatives

SCE's Alternatives 1, 2, 3 and 10 will be studied as described above for PG&E Alternatives 4 and 5.

## 4. Production Simulation Study

The CAISO will run production simulation models to determine the production costs, congestion costs and system losses associated with the various transmission alternatives using the SSG-WI data base for study year 2008 after it is updated. The purpose of this portion of the study is to help in answering the following questions:

a. How would the Fresno 230 kV Tie be operated? How frequently would the angle change and how large would the flow be across the phase shifter?
b. How would the Helms pumped storage plant operation change with the addition of the Tehachapi generation?
c. Would the potential line additions north of Midway provide a substantial economic benefit?
d. If a line is constructed north of Midway, what is to preferred termination?
e. How would the addition of the Tehachapi generation impact the operation of the generators connected at Midway and in other areas of the system?
f. What is the optimum combination of the Fresno 230 kV Tie, PG&E's Alternatives 4 and 5 and SCE's Alternatives 1, 2, 3 and 10.

g. Would the adding a line between Tehachapi and Midway instead of from Tehachapi south help transmit Tehachapi generation to PG&E? If so, at what level of Tehachapi generation?
h. Would adding a line between Tehachapi and Midway benefit the transmission system more than adding a line from Tehachapi south? If so, identify the party or parties that benefit(s).

A. Assumptions:

Hydro conditions: Initially average and high hydro will be studied. Additional studies to examine high and low hydro scenarios will be conducted as necessary. For Fresno 230 kV Tie, PG&E will need to consider high hydro conditions, since this alternative would inject power into a generating system. SCE considers all hydro conditions as valid conditions that need to be explored.

Gas cost: Modeled per SSG-WI base case assumptions.

Coal cost: Modeled per SSG-WI base case assumptions.

Wind modeling: The wind generation will be modeled as non-dispatchable, fixed hourly generation quantities. Two wind generation output models will be studied. One that has been developed by NREL and others and a second that is simply a scaling up of the existing Tehachapi historical output. The production simulation runs will determine the megawatthours of wind generation used. The cost assigned to wind generation will be determined as part of this study and will be applied to the wind generation quantity determined in each run to yield the total production cost.

New resources will be included as modeled by SSG-WI, which will be consistent with each LSE's filed Long Term Plans.

Path ratings, line ratings, and nomograms: Modeled per SSG-WI base case assumptions.

Selected non-simultaneous Ratings:
COI: 4,800 MW N-S; 3,675 MW S-N
Path 15: 3,265 MW N-S; 5,400 MW S-N
Path 26: 3,700 MW N-S; 3,000 MW S-N

**Additional limits to be modeled:**

*a.* Path 26: Power flow between 3,000 MW and 3,700 MW N-S is supported by a RAS that trips Midway area generation. The Path 26 limit will be decreased by 1 MW for every 1 MW decrease in Midway generation (La Paloma, Sunrise, Elk Hills)
b. Path 15: 5,400 MW S-N is supported by RAS that trips generation connected to Midway. The Path 15 limit will be decreased by 1 MW for every 2 MW decrease in Midway generation (La Paloma, Sunrise, Elk Hills).

c. Run power flow and stability studies to see if there is a simultaneous interaction between the Fresno 230 kV Tie and Path 26. If there is, model the nomogram in the production simulation.

d. SCIT nomogram: Either from existing SCIT nomogram studies or assume no more than 60% of SCE's load would be supplied from imports into Southern California.

B. Study Scenarios

**Tehachapi and Antelope Valley wind generation = 0 MW**

a. Existing system after completion of SCE's Phase 1 Facilities, Segments 1, 2 and 3

b. Same as (a) but with the Fresno 230 kV Tie
Phase shifter setting to be determined.

**Tehachapi and Antelope Valley wind generation = 1600 MW**

c. Existing system plus SCE Phase 1 and Phase 2 facilities.
d. Same as a, but with the Fresno 230 kV Tie.

**Tehachapi and Antelope Valley wind generation = 4,500 MW without Fresno 230kV tie**

e. Existing System after completion of SCE's Phase 1 and Phase 2 facilities.
f. PG&E Alternative 4 with SCE Alternative 1, i.e., Tesla-Los Banos-Gates-Midway-Tehachapi, Tehachapi-Antelope, Antelope-Vincent and Antelope-Pardee. (Total of two lines between Tehachapi-Antelope)
g. PG&E Alternative 4, modified to remove Tehachapi-Midway line, and SCE Alternative 2, i.e., Tesla-Los Banos-Gates-Midway, and Tehachapi-Antelope-Vincent, Tehachapi-Vincent and Antelope-Pardee (Two lines between Tehachapi-Antelope and one Tehachapi-Vincent)
h. PG&E Alternative 5 with SCE Alternaitve 1
i. PG&E Alternative 5 modified to replace Gregg-Tehachapi with Gregg-Midway with SCE Alternative 1, i.e., Tesla-Los Banos-Gregg-Midway-Tehachapi-Antelope–Vincent and Antelope-Pardee. (Total of two lines between Tehachapi-Antelope)
j. PG&E Alternative 5, modified to replace Gregg-Tehachapi with Gregg-Midway line and SCE Alternative 2, i.e., Tesla-Los Banos-Gregg-Midway; and Tehachapi-Antelope-Vincent, Tehachapi-Vincent and Antelope-Pardee (Total of two lines between Tehachapi-Antelope).

**Tehachapi and Antelope Valley wind generation = 3,300 MW**

k. Same as f, above.
l. Same as h, above.
m. Tesla-Gregg, with Fresno 230kV tie, two 500kV lines Tehachapi-Antelope.
n. Tesla-Los Banos-Gates-Midway, with Fresno 230kV tie, two 500kV lines Tehachapi-Antelope

Based on the above, choose the best PG&E alternative.

o. Fresno 230 kV Tie with SCE Alternative 2

p. Best PG&E alternative with SCE Alternative 3

q. Best PG&E alternative with SCE Alternative 10

## 5. Cost Estimation of Facilities

All costs associated with the Fresno 230 kV Tie, PG&E Alternatives 4 and 5 and SCE Alternatives 1, 2, 3 and 10, including engineering and permitting, purchase of equipment and rights-of way, construction, interest during construction, contract administration, etc. will be estimated in 2005 dollars

## 6. Determination of Recommended Plan

The present value of the costs given by the production simulation runs in Section 4, above, plus the wind generation costs, over 30 years, at a discount rate to be established in the study, will be added to the costs of the facilities, determined in Section 5, above, to obtain the least cost combination of alternatives. This total present value cost will also be expressed as a series of annual costs.

This combination of alternatives will be the recommended plan.

## 7. Study Schedule

| WORK ITEM | START | FINISH | 2005 May | June | July | Aug | Sep | Oct | Nov | Dec | 2006 Jan | Feb |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SCE: Fresno 230 kV Tie PG&E Plan A, N of Magunden power flow | 5/1/05 | 6/1/05 | ■ | | | | | | | | | |
| SCE: Fresno 230 kV Tie PG&E Plan A, S of Magunden power flow | 6/1/05 | 7/1/05 | | ■ | | | | | | | | |
| SCE: Fresno 230 kV Tie PG&E Plan A with Plan B power flow | 7/1/05 | 8/1/05 | | | ■ | | | | | | | |
| PG&E: Base Case Available | 6/1/05 | | | o | | | | | | | | |
| PG&E: Fresno 230 kV Tie power flow | 6/1/05 | 7/1/05 | | ■ | | | | | | | | |
| Meeting of Participants at PG&E | 6/28/05 | | | | o | | | | | | | |
| SCE & PG&E: Fresno facilities cost estimate | 6/1/05 | 9/1/05 | | ■ | ■ | ■ | | | | | | |
| CA ISO: first results of production simulations | 7/1/05 | 9/1/05 | | | ■ | ■ | | | | | | |
| All: determine optimum capacity of Fresno Tie: Plan A or A & B | 9/1/05 | 10/1/05 | | | | | ■ | | | | | |
| SCE & PG&E: cost of facilities for all alternatives | 6/1/05 | 11/1/05 | | ■ | ■ | ■ | ■ | ■ | | | | |
| CA ISO final report on results of production simulations | 9/1/05 | 11/1/05 | | | | | ■ | ■ | | | | |
| CPUC: calculates ranking of combinations of alternatives | 11/1/05 | 11/15/05 | | | | | | | ■ | | | |
| Meeting of Participants | 11/15/05 | | | | | | | | o | | | |
| CA ISO operator report on compatibility of Fresno Intertie | 10/1/05 | 12/15/05 | | | | | | ■ | ■ | ■ | | |
| CPUC: Develop Table of Contents | 10/1/05 | 11/1/05 | | | | | | ■ | | | | |
| ALL: draft report | 11/1/05 | 12/15/05 | | | | | | | ■ | ■ | | |
| CPUC: Final Report | 12/15/05 | 3/1/06 | | | | | | | | ■ | ■ | ■ |

**ERRATA:** CAISO 12/15/05 operator report topic should read “system operability with 4500MW of wind generation at Tehachapi/Antelope Valley”.

# Appendix A
# SCE list of on Contingencies

Table 1
Single Contingency Outage List

| Outage Number | From Bus No. | To Bus No. | From Bus | | To Bus | | Circuit ID |
|---|---|---|---|---|---|---|---|
| | | | Name | Voltage | Name | Voltage | |
| N1-1 | 24301 | 24302 | BIG CRK1 | 230 | BIG CRK2 | 230 | 1 |
| N1-2 | 24301 | 24320 | BIG CRK1 | 230 | EASTWOOD | 230 | 1 |
| N1-3 | 24302 | 24303 | BIG CRK2 | 230 | BIG CRK3 | 230 | 1 |
| N1-4 | 24302 | 24305 | BIG CRK2 | 230 | BIG CRK8 | 230 | 1 |
| N1-5 | 24304 | 24303 | BIG CRK4 | 230 | BIG CRK3 | 230 | 1 |
| N1-6 | 24305 | 24303 | BIG CRK8 | 230 | BIG CRK3 | 230 | 1 |
| N1-7 | 24316 | 24303 | MAMMOTH | 230 | BIG CRK3 | 230 | 1 |
| N1-8 | 24303 | 24235 | BIG CRK3 | 230 | RECTOR | 230 | 2 |
| N1-9 | 24301 | 25900 | BIG CRK1 | 230 | FRSNOSCE | 230 | 1 |
| N1-10 | 24303 | 25900 | BIG CRK3 | 230 | FRSNOSCE | 230 | 1 |
| N1-11 | 30820 | 39000 | HELMS PP | 230 | FRSNOPGE | 230 | 1 |
| N1-12 | 30820 | 39000 | HELMS PP | 230 | FRSNOPGE | 230 | 2 |
| N1-13 | 30810 | 39000 | GREGG | 230 | FRSNOPGE | 230 | 1 |
| N1-14 | 30810 | 39000 | GREGG | 230 | FRSNOPGE | 230 | 2 |
| N1-15 | 24235 | 25900 | RECTOR | 230 | FRSNOSCE | 230 | 1 |
| N1-16 | 24235 | 25900 | RECTOR | 230 | FRSNOSCE | 230 | 2 |
| N1-17 | 24141 | 24304 | SPRINGVL | 230 | BIG CRK4 | 230 | 1 |
| N1-18 | 24141 | 24235 | SPRINGVL | 230 | RECTOR | 230 | 1 |
| N1-19 | 24153 | 24235 | VESTAL | 230 | RECTOR | 230 | 1 |
| N1-20 | 24235 | 24153 | RECTOR | 230 | VESTAL | 230 | 2 |
| N1-21 | 24235 | 24087 | RECTOR | 230 | MAGUNDEN | 230 | 1 |
| N1-22 | 24087 | 24141 | MAGUNDEN | 230 | SPRINGVL | 230 | 1 |
| N1-23 | 24087 | 24141 | MAGUNDEN | 230 | SPRINGVL | 230 | 2 |
| N1-24 | 24087 | 24153 | MAGUNDEN | 230 | VESTAL | 230 | 1 |
| N1-25 | 24087 | 24153 | MAGUNDEN | 230 | VESTAL | 230 | 2 |
| N1-26 | 24142 | 24101 | SYC CYN | 230 | OMAR | 230 | 1 |
| N1-27 | 24087 | 24101 | MAGUNDEN | 230 | OMAR | 230 | 1 |
| N1-28 | 24087 | 24115 | MAGUNDEN | 230 | PASTORIA | 230 | 1 |
| N1-29 | 24087 | 24115 | MAGUNDEN | 230 | PASTORIA | 230 | 2 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| N1-30 | 24087 | 24115 | MAGUNDEN | 230 | PASTORIA | 230 | 3 |
| N1-31 | 24087 | 24401 | MAGUNDEN | 230 | ANTELOPE | 230 | 2 |
| N1-32 | 24087 | 27020 | MAGUNDEN | 230 | TEHACH_5 | 230 | 1 |
| N1-33 | 24401 | 27020 | ANTELOPE | 230 | TEHACH_5 | 230 | 1 |
| N1-34 | 24401 | 27000 | ANTELOPE | 230 | TEHACH_6 | 230 | 1 |
| N1-35 | 24115 | 25613 | PASTORIA | 230 | EDMONSTN | 230 | 1 |
| N1-36 | 24115 | 28050 | PASTORIA | 230 | LEBEC | 230 | 1 |
| N1-37 | 24114 | 24115 | PARDEE | 230 | PASTORIA | 230 | 1 |
| N1-38 | 24114 | 24217 | PARDEE | 230 | WARNETAP | 230 | 1 |
| | 24115 | 24217 | PASTORIA | 230 | WARNETAP | 230 | 1 |
| | 24218 | 24217 | WARNE | 230 | WARNETAP | 230 | 1 |
| N1-39 | 24403 | 24115 | BAILEY | 230 | PASTORIA | 230 | 1 |
| N1-40 | 24114 | 24403 | PARDEE | 230 | BAILEY | 230 | 1 |
| N1-41 | 24114 | 24155 | PARDEE | 230 | VINCENT | 230 | 1 |
| N1-42 | 24155 | 24091 | VINCENT | 230 | MESA CAL | 230 | 1 |
| N1-43 | 24155 | 24126 | VINCENT | 230 | RIOHONDO | 230 | 1 |
| N1-44 | 24155 | 24126 | VINCENT | 230 | RIOHONDO | 230 | 3 |
| N1-45 | 24091 | 24126 | MESA CAL | 230 | RIOHONDO | 230 | 1 |
| N1-46 | 24091 | 24126 | MESA CAL | 230 | RIOHONDO | 230 | 2 |
| N1-47 | 24076 | 24126 | LAGUBELL | 230 | RIOHONDO | 230 | 1 |
| N1-48 | 24114 | 24147 | PARDEE | 230 | SYLMAR S | 230 | 1 |
| N1-49 | 24114 | 24147 | PARDEE | 230 | SYLMAR S | 230 | 2 |
| N1-50 | 24036 | 24114 | EAGLROCK | 230 | PARDEE | 230 | 1 |
| N1-51 | 24147 | 24089 | SYLMAR S | 230 | GOULD | 230 | 1 |
| N1-52 | 24036 | 24147 | EAGLROCK | 230 | SYLMAR S | 230 | 1 |
| N1-53 | 24086 | 24156 | LUGO | 500 | VINCENT | 500 | 1 |
| N1-54 | 24086 | 24156 | LUGO | 500 | VINCENT | 500 | 2 |
| N1-55 | 24156 | 24092 | VINCENT | 500 | MIRALOMA | 500 | 1 |
| N1-56 | 24500 | 24156 | ANTELOPE | 500 | VINCENT | 500 | 1 |
| N1-57 | 24500 | 24156 | ANTELOPE | 500 | VINCENT | 500 | 2 |
| N1-58 | 24500 | 24510 | ANTELOPE | 500 | PARDEE | 500 | 1 |
| N1-59 | 24520 | 24500 | TEHACHPI | 500 | ANTELOPE | 500 | 1 |
| N1-60 | 24520 | 24500 | TEHACHPI | 500 | ANTELOPE | 500 | 2 |
| N1-61 | 24520 | 30060 | TEHACHPI | 500 | MIDWAY | 500 | 1 |
| N1-62 | 30060 | 24156 | MIDWAY | 500 | VINCENT | 500 | 1 |
| N1-63 | 30060 | 24156 | MIDWAY | 500 | VINCENT | 500 | 2 |
| N1-64 | 30060 | 24156 | MIDWAY | 500 | VINCENT | 500 | 3 |
| T1-1 | 25900 | 39000 | FRSNOSCE | 230 | FRSNOPGE | 230 | 1 |
| T1-2 | 24156 | 24155 | VINCENT | 500 | VINCENT | 230 | 1 |
| T1-3 | 24092 | 24093 | MIRALOMA | 500 | MIRALOMA | 230 | 1 |
| T1-4 | 24500 | 24401 | ANTELOPE | 500 | ANTELOPE | 230 | 1 |
| T1-5 | 24510 | 24114 | PARDEE | 500 | PARDEE | 230 | 1 |

Table 2
Double Contingency Outage List

| Outage Number | From Bus No. | To Bus No. | From Bus | | To Bus | | Circuit ID |
|---|---|---|---|---|---|---|---|
| | | | Name | Voltage | Name | Voltage | |
| N2-1 | 24301 | 25900 | BIG CRK1 | 230 | FRSNOSCE | 230 | 1 |
| | 24303 | 25900 | BIG CRK3 | 230 | FRSNOSCE | 230 | 1 |
| N2-2 | 24235 | 25900 | RECTOR | 230 | FRSNOSCE | 230 | 1 |
| | 24235 | 25900 | RECTOR | 230 | FRSNOSCE | 230 | 2 |
| N2-3 | 24303 | 24235 | BIG CRK3 | 230 | RECTOR | 230 | 2 |
| | 24141 | 24304 | SPRINGVL | 230 | BIG CRK4 | 230 | 1 |
| N2-4 | 24303 | 24235 | BIG CRK3 | 230 | RECTOR | 230 | 2 |
| | 24141 | 24235 | SPRINGVL | 230 | RECTOR | 230 | 1 |
| N2-5 | 24141 | 24304 | SPRINGVL | 230 | BIG CRK4 | 230 | 1 |
| | 24141 | 24235 | SPRINGVL | 230 | RECTOR | 230 | 1 |
| N2-6 | 30820 | 39000 | HELMS PP | 230 | FRSNOPGE | 230 | 1 |
| | 30820 | 39000 | HELMS PP | 230 | FRSNOPGE | 230 | 2 |
| N2-7 | 30810 | 39000 | GREGG | 230 | FRSNOPGE | 230 | 1 |
| | 30810 | 39000 | GREGG | 230 | FRSNOPGE | 230 | 2 |
| N2-8 | 24153 | 24235 | VESTAL | 230 | RECTOR | 230 | 1 |
| | 24235 | 24153 | RECTOR | 230 | VESTAL | 230 | 2 |
| N2-9 | 24153 | 24235 | VESTAL | 230 | RECTOR | 230 | 1 |
| | 24235 | 24087 | RECTOR | 230 | MAGUNDEN | 230 | 1 |
| N2-10 | 24235 | 24153 | RECTOR | 230 | VESTAL | 230 | 2 |
| | 24235 | 24087 | RECTOR | 230 | MAGUNDEN | 230 | 1 |
| N2-11 | 24087 | 24141 | MAGUNDEN | 230 | SPRINGVL | 230 | 1 |
| | 24087 | 24141 | MAGUNDEN | 230 | SPRINGVL | 230 | 2 |
| N2-12 | 24087 | 24153 | MAGUNDEN | 230 | VESTAL | 230 | 1 |
| | 24087 | 24153 | MAGUNDEN | 230 | VESTAL | 230 | 2 |
| N2-13 | 24087 | 24115 | MAGUNDEN | 230 | PASTORIA | 230 | 1 |
| | 24087 | 24115 | MAGUNDEN | 230 | PASTORIA | 230 | 2 |
| N2-14 | 24087 | 24115 | MAGUNDEN | 230 | PASTORIA | 230 | 1 |
| | 24087 | 24115 | MAGUNDEN | 230 | PASTORIA | 230 | 3 |
| N2-15 | 24087 | 24115 | MAGUNDEN | 230 | PASTORIA | 230 | 2 |
| | 24087 | 24115 | MAGUNDEN | 230 | PASTORIA | 230 | 3 |
| N2-16 | 24087 | 24401 | MAGUNDEN | 230 | ANTELOPE | 230 | 2 |
| | 24087 | 27020 | MAGUNDEN | 230 | TEHACH_5 | 230 | 1 |
| N2-17 | 24087 | 24401 | MAGUNDEN | 230 | ANTELOPE | 230 | 2 |
| | 24401 | 27020 | ANTELOPE | 230 | TEHACH_5 | 230 | 1 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| N2-18 | 24403 | 24115 | BAILEY | 230 | PASTORIA | 230 | 1 |
| | 24114 | 24217 | PARDEE | 230 | WARNETAP | 230 | 1 |
| | 24115 | 24217 | PASTORIA | 230 | WARNETAP | 230 | 1 |
| | 24218 | 24217 | WARNE | 230 | WARNETAP | 230 | 1 |
| N2-19 | 24403 | 24115 | BAILEY | 230 | PASTORIA | 230 | 1 |
| | 24114 | 24217 | PARDEE | 230 | WARNETAP | 230 | 1 |
| | 24115 | 24217 | PASTORIA | 230 | WARNETAP | 230 | 1 |
| | 24218 | 24217 | WARNE | 230 | WARNETAP | 230 | 1 |
| N2-20 | 24114 | 24115 | PARDEE | 230 | PASTORIA | 230 | 1 |
| | 24114 | 24217 | PARDEE | 230 | WARNETAP | 230 | 1 |
| | 24115 | 24217 | PASTORIA | 230 | WARNETAP | 230 | 1 |
| | 24218 | 24217 | WARNE | 230 | WARNETAP | 230 | 1 |
| N2-21 | 24114 | 24403 | PARDEE | 230 | BAILEY | 230 | 1 |
| | 24114 | 24217 | PARDEE | 230 | WARNETAP | 230 | 1 |
| | 24115 | 24217 | PASTORIA | 230 | WARNETAP | 230 | 1 |
| | 24218 | 24217 | WARNE | 230 | WARNETAP | 230 | 1 |
| N2-22 | 24114 | 24155 | PARDEE | 230 | VINCENT | 230 | 1 |
| | 24036 | 24114 | EAGLROCK | 230 | PARDEE | 230 | 1 |
| N2-23 | 24114 | 24147 | PARDEE | 230 | SYLMAR S | 230 | 1 |
| | 24114 | 24147 | PARDEE | 230 | SYLMAR S | 230 | 2 |
| N2-24 | 24147 | 24089 | SYLMAR S | 230 | GOULD | 230 | 1 |
| | 24036 | 24147 | EAGLROCK | 230 | SYLMAR S | 230 | 1 |
| N2-25 | 24155 | 24126 | VINCENT | 230 | RIOHONDO | 230 | 1 |
| | 24155 | 24126 | VINCENT | 230 | RIOHONDO | 230 | 3 |
| N2-26 | 24156 | 24092 | VINCENT | 500 | MIRALOMA | 500 | 1 |
| | 24155 | 24126 | VINCENT | 230 | RIOHONDO | 230 | 1 |
| N2-27 | 24156 | 24092 | VINCENT | 500 | MIRALOMA | 500 | 1 |
| | 24155 | 24126 | VINCENT | 230 | RIOHONDO | 230 | 3 |
| N2-28 | 24091 | 24126 | MESA CAL | 230 | RIOHONDO | 230 | 1 |
| | 24091 | 24126 | MESA CAL | 230 | RIOHONDO | 230 | 2 |
| N2-29 | 24091 | 24126 | MESA CAL | 230 | RIOHONDO | 230 | 1 |
| | 24076 | 24126 | LAGUBELL | 230 | RIOHONDO | 230 | 1 |
| N2-30 | 24091 | 24126 | MESA CAL | 230 | RIOHONDO | 230 | 2 |
| | 24076 | 24126 | LAGUBELL | 230 | RIOHONDO | 230 | 1 |
| N2-31 | 24086 | 24156 | LUGO | 500 | VINCENT | 500 | 1 |
| | 24086 | 24156 | LUGO | 500 | VINCENT | 500 | 2 |
| N2-32 | 24500 | 24156 | ANTELOPE | 500 | VINCENT | 500 | 1 |
| | 24500 | 24156 | ANTELOPE | 500 | VINCENT | 500 | 2 |
| N2-33 | 24520 | 24500 | TEHACHPI | 500 | ANTELOPE | 500 | 1 |
| | 24520 | 24500 | TEHACHPI | 500 | ANTELOPE | 500 | 2 |
| N2-34 | 30060 | 24156 | MIDWAY | 500 | VINCENT | 500 | 1 |
| | 30060 | 24156 | MIDWAY | 500 | VINCENT | 500 | 2 |

# Appendix B
# PG&E list of Contingencies

### "B" contingencies for 500 kV system:

- Tesla – Los Banos 500 kV line outage,
- Los Banos – Gates 500 kV line outage,
- Los Banos – Midway 500 kV line outage,
- Gates – Midway 500 kV line outage,
- Tesla – Gregg 500 kV line outage (Alt. 5),
- Gregg – Midway 500 kV line outage (Alt. 5),
- PDCI Bi-pole Outage.

### "C" contingencies for 500 kV system:

- Tesla – Los Banos and Tracy – Los Banos 500 kV double line outage (Los Banos north),
- Los Banos – Midway and Los Banos – Gates #3 500 kV double line outage (Los Banos south),
- Los Banos – Midway and Gates – Midway 500 kV double line outage (Midway north),
- Los Banos – Midway #1 and #2 (new) 500 kV double line outage (Midway north for Alt. 4),
- Tesla – Los Banos and Tesla – Gregg (new) 500 kV double line outage (Alt. 5),
- Two Palo Verde generation units outage,
- Two Diablo Canyon generation units outage.

# Attachment C
# July 14, 2004 Study Plan

# Phased Transmission Development Plan for Interconnecting Over 4,000 MW of Wind Generation In North Los Angeles and Kern Counties Referred to as the "Tehachapi Area"

## Study Plan

July 14, 2004

For information or questions regarding this Study Plan, please contact Jorge Chacon via phone at (626) 302-9637 or e-mail at jorge.chacon@sce.com

# Summary of Revisions

A number of participants provided comments to the Tehachapi Collaborative Study Plan date June 21, 2004. The following is a summary of the revision made to the Study Plan.

A new section that discusses the purpose of the Tehachapi Conceptual Transmission Plan was added.

Objective No.2 was expanded to include the goal of a single phased conceptual transmission plan and what happens if consensus is not reached.

Objective No.7e was expanded to include determination of how much spacing between transmission lines is required to consider the lines to be on "separate" right-of-way.

Objective No.9 was added to address whether regional transmission approach should be adopted for other renewable areas in the State.

CPUC Staff responsibilities were added to the responsibility section.

The section covering currently proposed projects was expanded to include electrical characteristics and thermal ratings so that the collaborative group can effectively model these projects into any study case.

A new section was added to cover electrical characteristics and thermal ratings for each of the Alternative Tehachapi Area Conceptual Plans.

A new element was added to the power flow base case assumptions section to cover the generation displacement assumptions as provided by the CAISO

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## Introduction

The Tehachapi area has been categorized as the largest wind resource area in the State of California. This area, if more fully developed, could meet a significant portion of the goals for the renewable energy development in California. In order to tap this energy resource area, large-scale transmission upgrades are required as the existing transmission facilities in the area, the Antelope-Bailey 66-kV subtransmission network and the Big Creek 230-kV Corridor, are already fully utilized.

Transmission constraints into the Tehachapi area have been discussed as part of the ongoing Assembly Bill (AB) 970 Investigation 00-11-001 with Phase 6 of the proceeding devoted to Tehachapi. The outcome of AB 970 Phase 6 is an Interim Opinion on Transmission Needs in the Tehachapi Wind Resource Area which orders (CPUC Decision 04-06-010) the formation of a collaborative study group to be convened to develop a comprehensive transmission development plan for the phased expansion of transmission capabilities into the Tehachapi area.

The CPUC Staff will coordinate the collaborative study group with assistance by the California Independent System Operator (CAISO) as needed. The collaborative study group will include participation by Southern California Edison Company (SCE), Pacific Gas and Electric Company (PG&E), wind developers, and any other interested parties including the California Energy Resources Conservation and Development Commission (CEC), Department of Defense, the counties of Kern and Los Angeles, the Los Angeles Department of Water and Power (LADWP), and the owners of the independently owned Sagebrush line. It is envisioned that the collaborative study group will function in a manner similar to the Southwest Transmission Expansion Plan (STEP) process.

This Study Plan provides a proposed guideline for the Tehachapi Comprehensive Transmission Development Assessment. The study plan is divided into fourteen sections: (1) Introduction, (2) Background, (3) Purpose of Tehachapi Conceptual Transmission Plan, (4) Objectives, (5) Responsibilities, (6) Currently Proposed Projects in Area, (7) Alternative Tehachapi Area Conceptual Plans, (8) Electrical Characteristics and Thermal Ratings of Alternate Conceptual Plans, (9) Assessment Process Outline, (10) Study Areas and Study Conditions, (11) Power Flow Base Case Assumptions,
(12) Power Flow Screening Level Preliminary Assessment, (13) Final Report, and
(14) Schedule of Major Milestones. The study plan will be followed by the Collaborative Study Group in completing the order set forth which requires Edison, acting on behalf of the study group, to file a report in the AB 970 proceeding containing the study group's findings and recommendations within nine months of the effective date of CPUC Decision 04-06-010 which is March 9, 2005.

## Background

Southern California Edison has performed a number of conceptual studies for interconnecting renewable wind generation in the Tehachapi area. These conceptual studies were performed for the purpose of identifying conceptual transmission facilities necessary to meet future delivery needs for wind generation in the Tehachapi area. The initial conceptual study was done with participation of ten wind developers who collectively identified, on a conceptual basis, a total of 2,500 MW of potential wind development in the Tehachapi area.

A subsequent conceptual study (Phase 2) was performed with participation of eight wind developers. The purpose for this subsequent conceptual study was to perform preliminary

substation site selection studies in the Cal Cement, Monolith, and Jawbone areas as well as identify potential line routes for new transmission into the Tehachapi area. Total wind generation considered was unchanged at the 2,500 MW level. Testimony was filed by SCE in the AB 970 Phase VI proceeding based on the study results of this conceptual study. The CAISO interjected testimony suggesting a different project alternative to interconnect Tehachapi area wind generation.

A third conceptual study (Phase 3) was performed to evaluate an additional 770 MW of wind generation development increasing the total Tehachapi wind generation potential from 2,500 MW to 3,270 MW. This conceptual study resulted in two conceptual transmission alternatives (230-kV and 500-kV conceptual alternative) for integrating Tehachapi area wind generation. The 500-kV transmission alternative plan was further refined to accommodate increased Tehachapi area wind generation potential as identified by the CEC in their Electric Transmission Plan for Renewable Resources in California Report to the Legislature dated December 1, 2003. The new Tehachapi area wind generation potential as identified by the CEC is now in excess of 4,000 MW. The CPUC adopted the 500-kV transmission alternative in their report to the Legislature for interconnecting over 4,000 MW of wind generation.

This increased MW potential and the identification of a 500-kV transmission alternative has resulted in the presentation of yet another transmission alternative to the SCE Conceptual Study Plan. The alternative, as presented by Oak Creek Energy Systems and CalWea, includes the development of a fourth Midway-Vincent (via Tehachapi)
500-kV transmission line.

These project alternatives resulted in a number of outstanding issues that need to be addressed by the Tehachapi Collaborative Study Group. The outstanding issues include the determination if the CAISO proposed PG&E-SCE interconnection alternative provides statewide benefits and allow wind generation development to proceed, identification of expected demarcation between gen-ties and network transmission facilities, and consideration of regional benefits when developing revised Tehachapi Phased Conceptual Transmission plan.

Purpose of Tehachapi Conceptual Plan

Conceptual studies are no substitute for System Impact or Facilities Studies, which will be required prior to interconnecting any new wind generation in the area. The results of the conceptual studies are to be used as a roadmap in developing transmission facilities into the Tehachapi area. The roadmap will serve as a means to avoid the piecemeal transmission additions associated with construction of facilities to interconnect only each year's winning RPS bidders or to interconnect only the projects which request interconnection (incremental requests). The actual timing of construction of transmission facilities will be driven by actual interconnection requests. However, instead of sizing the facility to accommodate the requested interconnection amount, the facilities will be developed in a way that is consistent with the conceptual transmission plan.

It should be noted that conceptual transmission plans should not be viewed as a permanent plan. Modifications to the conceptual transmission plan may be necessary as a result of actual need. In other words, the plan needs to be flexible so that future changes can be made if actual generation locations turn out to be different than what is assumed in developing this conceptual transmission plan.

Objectives

Edison, PG&E and the collaborative study group, in coordination with the CPUC Staff and the CAISO, will:

a. assess the amount of resources available in the Tehachapi Area that can be accommodated using existing transmission system capacity

b. develop a comprehensive Tehachapi transmission development plan in order for upgrades in the Tehachapi area to be most cost effective, least environmentally disruptive, orderly, and logical based on the magnitude of the wind resource identified by the CEC

   i. The study group should cooperatively work on developing a single phased conceptual transmission plan, at least for the initial portions of the phased upgrades

   ii. If consensus among the participants is not reached, the study group should explain clearly factors that would influence a choice among any alternative proposals

c. incorporate the transmission facilities for the Tehachapi Upgrades necessary to interconnect the PPM Project into the conceptual plan

   i. the PPM Project has completed the System Impact and Facilities Studies, has priority over conceptual projects, is ready to pursue as a Market Participant, and should not be held-up by the Collaborative Study Group

   ii. approval of System Impact and Facilities Studies should follow the FERC Interconnection Process

d. identify viable transmission alternatives, taking a statewide approach, for systematically phasing transmission into the Tehachapi area to ultimately interconnect the full Tehachapi wind resource potential identified by the CEC (over 4,000 MW)

e. assess the extent to which each transmission alternative configuration would assist in the transport of power to companies other than Edison in order to meet their corresponding RPS goals

f. develop phasing and priority of each transmission alternative

   i. develop a list of short lead time transmission upgrades can be pursued on a fast-track schedule

   ii. identify phase development of each transmission alternative in an orderly, rational and cost effective manner

   iii. determine the amount of wind generation that can be accommodated with each phase of each transmission alternative

   iv. determine if any additional transmission elements should be included into a subsequent CPCN filing

v. identify all new conceptual transmission facilities (e.g. lines, substations, and upgrades to existing lines and substations) required to transmit the power from Tehachapi to the various load centers (PG&E, Edison, and SDG&E)

vi. identify the expected demarcation between gen-ties and network transmission facilities to the extent feasible

vii. develop recommendations regarding the procedures whereby each phase of the upgrades would be trigger after the first phase

g. perform preliminary feasibility analysis for the transmission facilities identified

i. perform preliminary "screening-level" power flow analysis

ii. perform preliminary engineering review to identify transmission elements that may be problematic

iii. perform preliminary environmental review of transmission facilities based on available information contained in currently available environmental data bases in order to identify potential significant environmental constraints

iv. develop a preliminary list of licensing and environmental requirements for the transmission line right-of-way and potential substation sites

v. resolve with the Department of Defense any critical issues surrounding transmission line routes and heights and minimum distance between lines to consider lines as different corridor

vi. address how long it would take for the anticipated transmission owner to prepare and file each of the needed certificate applications based on the study group recommendations

vii. identify the maximum reasonably foreseeable build-out for the utility-owned assets in order to comply with CEQA requirements

h. identify estimates of the transmission costs, including substation costs and land acquisition costs, based on standard, off-the-shelf, general unit cost basis

i. determine if the regional transmission planning approach should be adopted for other renewable areas in the State

Responsibilities

The following are assignments for the supply of information to the Study Group to facilitate the development of a Collaborative Transmission Development Plan

a. The CPUC Staff will coordinate the collaborative study group with assistance by the California Independent System Operator (CAISO) as needed.

b. Edison is responsible for completing the aforementioned objectives for identifying

   a. conceptual facilities required within SCE's service territory to interconnect additional Tehachapi wind generation into SCE's existing network

   b. potential transmission upgrades needed to deliver energy to SCE's load center or to the first interconnection point with PG&E and/or SDG&E,

   c. potential impacts to SCE's network as a result of new facilities that are proposed to interconnect the SCE system with the PG&E system,

   d. potential impacts to SCE's existing network as a result of implementing third party transmission expansion.

c. PG&E is responsible for completing the aforementioned objectives for

   a. Identifying new facilities within PG&E's service territory required to deliver Tehachapi wind generation from SCE's first interconnection point to PG&E's load center in the Bay area,

   b. evaluating new facilities that are proposed to directly interconnect additional Tehachapi wind generation into PG&E's existing network

   c. evaluating potential impact to PG&E's network as a result of new facilities that are proposed to interconnect the SCE system with the PG&E system

   d. potential impacts to SCE's existing network as a result of implementing third party transmission expansion

d. The CAISO is responsible for conducting cost analysis for

   a. quantifying any new RMR exposure identified in either SCE's or PG&E's system as a result of the proposed alternatives,

   b. quantifying any additional congestion exposure on Path 26, Path 15, and other parts of the ISO Grid as a result of either connecting the SCE system with the PG&E system, delivering Tehachapi area wind generation to SDG&E, or delivering Tehachapi area wind generation to PG&E

e. Third Parties who may wish to participate (such as LADWP and the Sagebrush Owners) in the study process are responsible for

   a. identifying whether they are interested in participating in conceptual studies to support Tehachapi,

   b. providing the specifics on how any facilities currently owned by those entities or new proposed facilities to be owned by those entities can be used to integrate additional Tehachapi area wind generation

If active participation of these third parties does not evolve or is of limited input, the study group should dispense in evaluating how these non-CAISO controlled assets could be utilized since they are outside the jurisdiction of the CAISO and CPUC and therefore should not be rolled into the final plan.

Currently Proposed Projects in the Area

The following are transmission projects that have been identified in a different forum and should be included into the starting base cases. The Collaborative Tehachapi Study Group should base transmission development plans with these projects included into the starting cases.

1. Transmission requirements to interconnect the 201 MW PPM project (Antelope-Pardee)

   I. transmission requirements to interconnect the PPM project includes a new transmission line from the SCE Antelope substation to the SCE Pardee substation and substation expansions at Pardee and Antelope to accommodate the new line

   II. the CAISO has reviewed the System Impact and Facilities studies for this project and will present to their governing board on July 29 for approval

   III. electrical characteristics (per-unit) for this transmission line are as follows:

   a. 100 MVA / 230-kV base R=0.00124 X=0.02812 B=2.0699
   b. 100 MVA / 500-kV base R=0.00026 X=0.00595 B=0.4380

   IV. transmission ratings are as follows:

   a. Normal Rating = 3950 amps
   b. Long-Term Emergency Rating = 4540 amps
   c. Short-Term Emergency Rating = 5330 amps

2. Pastoria-Pardee Transmission Line Reconductor

   This project is an infrastructure replacement project which was identified in the 2004-2008, 2013 CAISO Controlled SCE Transmission Expansion plan. The scope of the project is to replace the existing 605 ACSR conductor on the Pastoria-Bailey, Pastoria-Pardee, and Bailey-Pardee 230-kV transmission lines with 666.6 ACSS/TW. This conductor type is the largest conductor that can be utilized on the existing transmission towers without requiring tear-down and rebuild. The project is not driven by Tehachapi wind generation needs.

   The CAISO has reviewed the studies for this project and provided conditional concurrence pending receiving any input from the Collaborative Study Group.

   SCE has presented this project to the Collaborative Study Group for informational purposes only and did not receive any opposition

   V. electrical characteristics (per-unit) for this upgrade provided on 100 MVA / 230-kV base are as follows:

   a. Pastoria-Pardee R=0.0109 X=0.0587 B=0.1085

b. Pastoria-Bailey R=0.0035 X=0.0187 B=0.0346
c. Pardee-Bailey R=0.0073 X=0.0398 B=0.0737

VI. ratings for the Pastoria-Bailey and Pardee-Bailey lines are as follows:

a. Normal Rating = 1240 amps
b. Long-Term Emergency Rating = 1426 amps
c. Short-Term Emergency Rating = 1500 amps

VII. ratings for the Pastoria- Pardee line is 1500 amps under all conditions

3. San Joaquin Valley Rector Loop and SVC

This project is a reliability driven project first identified in the 2002-2006, 2011 CAISO Controlled SCE Transmission Expansion plan and validated over the last two expansion plans. The project consists of constructing a new 15-20 mile double-circuit 230-kV transmission line so that the existing Big Creek3-Springville 230-kV line can be looped in and out of the Rector 230-kV substation and adding a 175 MVAR static VAR compensator (SVC) at Rector. This project has been approved by the CAISO governing board on June 24, 2004.

electrical characteristics (per-unit) for this upgrade provided on 100 MVA / 230-kV base are as follows:

a. New Big Creek3-Rector R=0.0106 X=0.0889 B=0.1711
b. New Rector-Springville R=0.0079 X=0.0660 B=0.1277

ratings for the New Big Creek3-Rector line will be as follows:

c. Normal Rating = 1200 amps (wave trap)
d. Long-Term Emergency Rating = 1200 amps (wave trap)
e. Short-Term Emergency Rating = 1284 amps (wave trap)

ratings for the New Rector-Springville line will be as follows:

f. Normal Rating = 1200 amps (wave trap)
g. Long-Term Emergency Rating = 1200 amps (wave trap)
h. Short-Term Emergency Rating = 1284 amps (wave trap)

<u>Alternative Tehachapi Area Conceptual Plans</u>

The following is a discussion of the currently proposed Tehachapi Area Conceptual Transmission Alternatives:

Revised SCE Conceptual Transmission Plan

New 500-kV Transmission line from Pardee to the Tehachapi area via Antelope. The line section between Antelope and Pardee (25 miles) should be included into the starting cases (initially energized at 230-kV) for reasons identified above. This line section will replace an existing 66-kV transmission line between Antelope and Pardee requiring expansion of existing right-of-way (ROW). New ROW will be required

between Tehachapi and Antelope
(30 miles).

New 500-kV Transmission line from Vincent to the Tehachapi area via Antelope. The line section between Vincent and Antelope will replace existing 230-kV transmission line(s). New ROW will be required between Tehachapi and Antelope that is distinct from the ROW required above (30 miles).

Second new 500-kV Transmission line from Vincent to the Tehachapi area via different route due to right-of-way restrictions. This line will require new ROW between Vincent and Tehachapi.

Additional capacity between Vincent and the Los Angeles Basin in order to deliver output from the Tehachapi area wind generation to the SCE or SDG&E load centers.

New 500/230-kV substation(s) located near the Tehachapi Pass with several (up to four) 230/66-kV substations located in the various wind regimes.

220-kV transmission lines from the new 500/230-kV substation(s) to the 230/66-kV substations.

66-kV transmission lines from the new 230/66-kV substation(s) to the windfarms to collect the wind generation from the various sites.

Substation Expansion at Pardee and Vincent.

SCE-PG&E Phase-shifted System-Tie (CAISO Suggestions)

New phase-shifted system-tie in the Fresno Area

New phase-shifted system-tie in the Bakersfield Area

New 500-kV or 230-kV transmission line from the Tehachapi area to existing transmission facilities (to be determined). New ROW will be required between Tehachapi and the existing transmission facilities.

New 500/230-kV substation(s) located near the Tehachapi Pass with several (up to four) 230/66-kV substations located in the various wind regimes.

220-kV transmission lines from the new 500/230-kV substation(s) to the 230/66-kV substations.

66-kV transmission lines from the new 230/66-kV substation(s) to the windfarms to collect the wind generation from the various sites.

Midway-Vincent No.4 via Tehachapi

New 500-kV Transmission line from Midway to the Tehachapi area. Some new ROW may be required.

New 500-kV Transmission line from Vincent to the Tehachapi area via Antelope. This line will replace existing 230-kV transmission line(s) between Vincent and Antelope. New ROW will be required between Tehachapi and Antelope.

New 500/230-kV substation(s) located near the Tehachapi Pass with several (up to four) 230/66-kV substations located in the various wind regimes.

220-kV transmission lines from the new 500/230-kV substation(s) to the 230/66-kV substations.

66-kV transmission lines from the new 230/66-kV substation(s) to the windfarms to collect the wind generation from the various sites.

Substation Expansion at Midway and Vincent.

Electrical Characteristics and Thermal Ratings of Alternative Conceptual Plans

The following are the corresponding electrical characteristics and corresponding thermal ratings for each Tehachapi Area Conceptual Transmission Alternative. The transmission line parameters are provided in percent per mile and the transformer parameters are provided in percent.

Revised SCE Conceptual Transmission Plan

New 500-kV Transmission lines based on 100 MVA / 230-kV Base
Bundled 2156 ACSR R=0.00496 X=0.11250 B=8.2798

New 500-kV Transmission lines based on 100 MVA / 500-kV Base
Bundled 2156 ACSR R=0.00105 X=0.02380 B=1.7520

New 230-kV Transmission lines based on 100 MVA / 230-kV Base
Bundled 1590 ACSR R=0.00627 X=0.10330 B=0.4060

New 66-kV Transmission lines based on 100 MVA / 66-kV Base
954 SAC R=0.28 X=1.49 B=0.0280

Transmission Line Ratings (amps)
500-kV: Normal-3,950 Long-Term Emergency-4,540 Short-Term Emergency-5,330
230-kV: Normal-3,230 Long-Term Emergency-3,710 Short-Term Emergency-4,360
66-kV: Normal-1,090 Long-Term Emergency-1,470 Short-Term Emergency-1,470

Transformer Parameters
500/230-kV : 15.0 percent based on 1120 MVA with $V_{from}$ of 525 and $V_{to}$ of 230
230/66-kV : 19.7 percent based on 280 MVA with $V_{from}$ of 230 and $V_{to}$ of 70.5
230/34.5-kV : 11.5 percent based on 100 MVA with $V_{from}$ of 230 and $V_{to}$ of 34.5
34.5/0.545kV : 5.75 percent based on 1.5 MVA with $V_{from}$ of 34.5 and $V_{to}$ of 0.545
Transformer Ratings
500/230-kV : 1120 MVA
230/66-kV : 280 MVA
230/34.5-kV : 100 MVA
34.5/0.545kV : 1.5 MVA

SCE-PG&E Phase-shifted System-Tie (CAISO Suggestions)

New switching station north of Rector at the crossing of Helms/Big Creek lines

Loop existing Big Creek-Rector lines into new switching station (FresnoTie)

i. Big Creek1-FresnoTie R=0.0079 X=0.0403 B=0.0760
j. Big Creek3-FresnoTie R=0.0049 X=0.0250 B=0.0470
k. Rector-FresnoTie No.1 R=0.0139 X=0.0707 B=0.1330
l. Rector-FresnoTie No.2 R=0.0139 X=0.0707 B=0.1330
m. Normal Rating = 885 amps Emergency Rating = 936 amps on all lines

Loop existing Gregg-Helms lines into new switching station (FresnoTie)

n. Helms-FresnoTie No.1 R=0.0025 X=0.0313 B=0.1110
o. Helms-FresnoTie No.2 R=0.0025 X=0.0313 B=0.1110
p. Gregg-FresnoTie No.1 R=0.0025 X=0.0313 B=0.1110
q. Gregg-FresnoTie No.2 R=0.0025 X=0.0313 B=0.1110
r. Normal Rating = 1,910 amps Emergency Rating = 2,264 amps on all lines

Assume SCE 230-kV transmission line characteristics provided above for new line from Bakersfield (PG&E) to Magunden (SCE)

Assume same electrical parameters as the Crystal 230-kV phase-shifter shown in WECC Base Case for new phase shifters at Bakersfield and new switching station

Midway-Vincent No.4 via Tehachapi

SCE 500-kV transmission lines are discussed above in Item 1b

PG&E 500-kV transmission lines (100 MVA / 500-kV Base)
Bundled 2300 AAL R=0.00102 X=0.02470 B=1.7440

Transmission Line Ratings (amps)
Summer Normal-2,478 Summer Emergency-2,964

Assume parameters discussed above in item for Tehachapi localized 230-kV and 66-kV Facilities

Assessment Process Outline

The following is the process outline for developing the phased Tehachapi Transmission Plan.

Develop Tehachapi conceptual transmission plans for the various alternatives in order to interconnect the magnitude of the wind resource identified by the CEC.

From each conceptual transmission plan, identify the short-lead time project elements that can be pursued on a fast-track schedule

Determine if any of the short-lead time project elements should be included into a Phase 1b CPCN filing so that SCE can amend CPCN filing as needed

Perform necessary conceptual studies in order to identify phase development of each transmission alternative in an orderly, rational and cost effective manner

determine the amount of wind generation that can be accommodated with each phase of each transmission alternative on a conceptual basis

identify all new conceptual transmission facilities (e.g. lines, substations, and upgrades to existing lines and substations) required to transmit the power from Tehachapi to the various load centers (PG&E, Edison, and SDG&E)

validate potential impacts associated with (a) and (b) above by performing screening level power flow studies and determine if project element(s) should be further evaluated

Perform preliminary feasibility analysis for the transmission facilities identified in the various alternatives that pass the screening level study

i. perform preliminary engineering review to identify transmission elements that may be problematic

ii. perform preliminary environmental review of transmission facilities based on available information contained in currently available environmental data bases in order to identify potential significant environmental constraints

iii. resolve with the Department of Defense any critical issues surrounding transmission line routes and heights

Determine how long it would take for the anticipated transmission owner to prepare and file each of the certificate applications based on the outcome of the preferred alternative

develop a preliminary list of licensing and environmental requirements for the transmission line right-of-way and potential substation sites

identify the maximum reasonably foreseeable buildout for the utility-owned assets in order to comply with CEQA requirements

Develop appropriate transmission cost estimates, including substation costs and land acquisition costs, based on standard, off-the-shelf, general unit cost basis

Study Areas and Study Conditions

Edison proposes the following study areas and study conditions in developing the transmission facilities necessary to interconnect the full potential of renewable resources in the Tehachapi area as identified by the CEC:

CAISO Controlled SCE Transmission System Areas

Edison will utilize the latest heavy summer and light spring power flow cases developed for the 2004-2008, 2013 Annual CAISO Assessment recently completed. The cases will be adjusted as necessary to accommodate the additional wind generation modeled in the Tehachapi area in order to reflect maximum anticipated stress conditions on SCE transmission facilities consistent with the ISO Grid Planning Criteria assuming delivery of wind generation to either PG&E or SCE/SDG&E. The adjustment will be made by displacing either import generation into SCE from the north to capture delivery of wind generation to PG&E via Path 26 or displacing SCE and/or SDG&E internal generation to capture delivery into SCE and/or SDG&E. The displacement will be made as identified in Section XI Item 6. The cases will include transmission projects identified and approved by the CAISO as part of the annual expansion plan.

4. Main 500-kV and 230-kV System – Heavy Summer Load Conditions

Summer peak load conditions requiring high internal SCE generation dispatch and high imports result in maximum stress on the system. Although historical data indicates that under peak load conditions the Tehachapi area wind generation levels are relatively low, the study will be performed assuming maximum wind generation dispatch to cover those instances when wind generation actually produces at a high generation levels during high system load conditions.

Studies will be performed to cover fifty percent delivery to the north and remaining fifty percent delivered to the south. These studies will address the conditions where power from wind generation resources are partially delivered to the north with remaining output delivered to the south. Sensitivity studies may be performed to evaluate full deliveries to the south and full deliveries to the north. Actual deliveries resulting from actual RPS contracts may be different and therefore additional transmission facilities not identified by this study may be required to deliver to the load centers.

5. Main 500-kV and 230-kV System – Spring Peak Load Conditions

Spring peak load conditions, with high import levels, high Big Creek corridor generation and reduced main system generation (sufficient generation on-line to maintain adequate voltages in the Los Angeles Basin) will be examined. Studies will be performed to cover fifty percent delivery to the north and remaining fifty percent delivered to the south. These studies will address the conditions where power from wind generation resources are partially delivered to the north with remaining output delivered to the south. Sensitivity studies may be performed to evaluate full deliveries to the south and full deliveries to the north. Actual deliveries resulting from actual RPS contracts may be different and therefore

additional transmission facilities not identified by this study may be required to deliver to the load centers.

6. Big Creek and San Joaquin Valley 230-kV System – Under heavy summer load with maximum generation, light spring load with maximum generation, and off-peak load summer with maximum hydro pumping conditions

This portion of the system, which is served practically radial from the Main Transmission system, has been identified to be transmission deficient under both maximum load with maximum generation and minimum load with maximum generation. The system includes two Special Protection Schemes (Big Creek and Pastoria Energy Facility) that could be affected by additional wind generation. Studies will be performed to evaluate corridor under both heavy summer load and light spring load conditions.

CAISO Controlled PG&E Transmission System Areas

PG&E will utilize the latest heavy summer and light autumn power flow cases developed for the 2004-2008, 2013 Annual CAISO Assessment recently completed. The cases will be adjusted as necessary to accommodate the additional wind generation modeled in the Tehachapi area in order to reflect maximum anticipated stress conditions on the PG&E transmission facilities consistent with the ISO Grid Planning Criteria assuming delivery of wind generation at the existing Midway substation or the proposed new 230 kV tie at Big Creek and Magunden. Old and less efficient generation units in the NP15 will be displaced to accommodate the import of wind generation into the PG&E system. The cases will include transmission projects identified and approved by the CAISO as part of the annual expansion plan

Heavy Summer Load Conditions

Summer peak load conditions with maximum North to South flow on Path 26 will be evaluated to assess impact of delivering Tehachapi area wind generation to the Bay area via Path 26 and Path 15

Autumn or Winter Off-Peak Load Conditions

Autumn or Winter Off-peak load conditions, with maximum South to North flow on Path 15 will be evaluated to assess impact of delivering Tehachapi area wind generation to the Bay area via Path 26 and Path 15.

Fresno and Bakersfield Area Studies

Studies will be performed to evaluate the impact of the proposed Big Creek-Helms Interconnection on the Fresno area transmission system. The studies will be based on the Fresno area summer peak base cases modeling three Helms units generating and Fresno area summer off-peak base cases modeling two Helms units pumping.

Studies will also be performed to evaluate the impact of the proposed Magunden Interconnection on the Kern area transmission system. The studies will be based on the summer peak base cases modeling 3400 MW of north-to-south flow on Path 26 and the autumn off-peak base cases modeling 5400 MW of south-to-north flow on Path 15.

Power Flow Base Case Assumptions

Edison proposes the following key assumptions in developing the conceptual transmission facilities necessary to interconnect the full potential of renewable resources in the Tehachapi area as identified by the CEC:

Load Related Assumptions

Loads will be modeled in load flow studies as follows:

Peak summer load conditions for SCE or PG&E will represent maximum anticipated loads based on a coincident load forecast, which will include consideration of a one-in-ten-year heat wave. Three cases will be used to represent coincident Control Area Peak, Northern California Peak and Southern California Peak.

Peak summer load conditions for RMR analysis within SCE and PG&E will represent maximum anticipated loads based on a localized coincident load forecast, which will include consideration of a one-in-five-year heat wave.

Spring Peak representing typical daily Spring Season load will be assumed for the main SCE 500-kV and 230-kV system. This load assumption represents approximately 65% of the summer normal peak loads through the main SCE network and approximately 50% of the summer normal peak for the Big Creek Corridor.

Autumn or Winter Off-Peak load will be assumed for the main SCE 500-kV and 230-kV system. This load assumption represents approximately 50% of the summer normal peak loads through the main SCE network and approximately 40% of the summer normal peak for the Big Creek Corridor. For PG&E, this load assumption represents approximately 45% of the summer normal peak. Both systems experience maximum pumping under this load condition.

Loads located within the service area of a Non-Participating Transmission Owner that is directly interconnected to a transmission or distribution facility owned by SCE or PG&E will be modeled based on the most recent forecast that the Non-Participating TO has provided.

Reactive load WATT/VAR ratios for the transmission substation loads represented in the base cases will reflect reasonable values for the operating conditions being studied.

Generation Related Assumptions

a. Edison and PG&E will incorporate the generation resources required to meet the WECC Minimum Operating Reliability Criteria (MORC): 1% for regulation plus 7% or the largest generation unit. The required generation will include all existing generation: 2004 Reliability Must Run (RMR), regulatory must-take resources (QF), Hydro, and Nuclear and all existing market generation resources.

b. Future market generation proposed through the FERC Interconnection Process for which has an active request will be incorporated into the completed phased development plan if those projects can impact the study results since these projects have priority over conceptual resources.

c. Hydro generation located within the Edison and PG&E CAISO Controlled Grid will be modeled at an output level that provides the maximum anticipated stress conditions on the corresponding transmission systems.

d. Nuclear generation will be assumed at the maximum capability consistent with the ISO Grid Planning Criteria.

e. All QF generation will be modeled in the base case consistent with the ISO Grid Planning Criteria and study practices for transient stability analysis, provided data is available to simulate actual machine characteristics.

f. All QF generation explicitly represented in the power flow base cases will have their reactive capabilities modeled according to contractual requirements, otherwise historical operating data will be used. Actual reactive power capabilities (i.e.

manufacturer data or field test data) will be modeled for dynamic stability analysis as available.

g. All generation connected to Edison's or PG&E's distribution system (at 12, 16, or 33-kV) will be netted with the transmission substation loads on the low side of the transformers. Other generation connected to the subtransmission systems will be represented with equivalent generators at the low side of the transmission substation transformers, when these systems are not CAISO controlled.

Imports into SCE

The generation import for SCE will be scheduled at the present 2004 maximum Southern California Import Transfer limit (SCIT), 14,300 MW for the summer and 13,600 MW for the spring, with Path 26 (Midway-Vincent) north-to-south flows modeled at maximum (3,400 MW) in order to stress the SCE 500-kV system and the 500/230-kV transformer banks

Edison will perform studies for delivering wind generation output to either SCE and/or SDG&E by assuming maximum north-to-south flow on Path 26 (Midway-Vincent). Edison will perform studies for delivering wind generation output to PG&E by reducing exchanges between Edison and PG&E, which will result in lowering north-to-south flow on Path 26 (Midway-Vincent).

Imports into PG&E

The generation import for PG&E in the Autumn/Winter off-peak cases will be scheduled at the maximum allowable south-to-north flow on Path 26 (Midway-Vincent). Path 15 will be stressed to the south-to-north rating of 5400 MW.

PG&E will perform studies for receiving wind generation output at Midway by increasing exchanges between Edison and PG&E and displacing older and less efficient generation units in the NP15, which will result in increasing south-to-north flow on Path 26 (Midway-Vincent) and Path 15.

Generation Displacement

In order to assess the impacts on the bulk system when performing the power flow simulations it is important to schedule the 4,000+ MW to "reasonable" locations. To perform the necessary conceptual studies which would identify the facilities necessary to interconnect and deliver renewable resources to the load centers, 50% of the Tehachapi area wind generation will be assumed to be delivered to the system north of Path 26 and the remaining 50% delivered to the system south of Path 26. This will be accomplished by reducing generation as follows:

COI by 7.5 % (import north of Path 26)
NP-15 by 42.5% (north of Path 26)
SCE by 17.5% (south of Path 26)
SDG&E by 17.5% (south of Path 26)
CFE by 2.5% (south of Path 26)
West-of-River by 12.5% (import south of Path 26)

These estimates are subject to change based on feedback from the study group. The feedback should be provided no later than the second meeting (August 18th) since last minute changes to the assumptions will result in failure to meet the scheduled milestones.

Other Assumptions

The Tehachapi Comprehensive Transmission Development Assessment will comply with the CAISO Grid Planning Standards which incorporate the NERC/WECC Planning Standards.

Existing or proposed special protection schemes in the Big Creek Corridor will be operational.

Comply with the CAISO guidelines on the use of Special Protection Schemes to integrated Tehachapi area generation. In particular, limit the tripping of generation to 1,150 MW for the loss of one transmission line and 1,400 MW for the loss of two transmission lines.

Major Path Flows will be modeled at reasonable and expected patterns.

For the long-term, include the generation projects identified by the CEC.

The existing Path 15 RAS and Path 26 RAS will be modeled in the studies.

Power Flow Screening Level Preliminary Assessment

To assess the performance of the CAISO Controlled Grid owned by Edison and PG&E, screening-level preliminary power flow analysis will be performed under base case and contingency conditions for both summer and spring/autumn/winter load assumptions. Contingency analysis will follow the requirements of the ISO Grid Planning Criteria. Contingency evaluation will include selective single contingencies (e.g. loss of a transmission line, generating unit, or transformer bank) and selective multiple-contingencies (e.g. overlapping outage of two transmission lines), consistent with the ISO Grid Planning Criteria.

If the loading of a transmission component of the CAISO Controlled Grid owned by Edison is determined to exceed its thermal rating during normal or contingency conditions, Edison will identify the corrective action(s) necessary to address the reliability concern (e.g. facility addition, special protection scheme, etc.) and will provide one project alternative. There may be other alternative solutions that may not be identified in these conceptual studies which would be evaluated in the future system impact studies.

If the loading of a transmission component of the CAISO Controlled Grid owned by PG&E is determined to exceed its thermal rating during normal or contingency conditions, PG&E will identify the corrective action(s) necessary to address the reliability concern (e.g. facility addition, special protection scheme, etc.) and will provide one project alternative. There may be other alternative solutions that may not be identified in these conceptual studies which would be evaluated in the future system impact studies.

Final Report

The final report, to be filed by SCE with the CPUC, will contain all criteria, assumptions, methodologies, simulation results, conclusion, and recommendations for “master plan”, and any other pertinent information necessary to comply with CPUC Order #04-06-010. A draft report will be made available for comments to the Collaborative Study Group four weeks prior to

filing with the CPUC. The results and recommendations will be presented to all interested parties for discussion three weeks prior to filing with the CPUC. Final comments are due one week prior to filing with the CPUC.

Schedule of Major Milestones

The schedule of the Major Milestones of the Tehachapi Comprehensive Transmission Development Assessment is as follows:

| Ref. # | Milestone | Target Date |
|---|---|---|
| 1. | **Milestone Meeting #1** at CPUC for presentation and discussion of the Tehachapi Comprehensive Transmission Development Assessment Study Plan | 06/23/2004 |
| 2. | Written comments on Tehachapi Comprehensive Transmission Assessment Study Plan including identification of additional project alternatives are due to Edison via e-mail (jorge.chacon@sce.com) | 07/06/2004 |
| 3. | Edison posts revised Study Plan | 07/12/2004 |
| 4. | Development of preliminary conceptual transmission plans for the various transmission alternatives and identification of additional fast-track project elements using the top-down approach | 07/21/2004 to 08/11/2004 |
| 5. | **Milestone Meeting #2** at CPUC to discuss fast-track project elements, additional project alternatives (if any), and progress of the phased assessment and solicit input | 08/18/2004 |
| 6. | Written comments on project alternatives and requests for sensitivity studies due to Edison via e-mail (jorge.chacon@sce.com) | 08/25/2004 |
| 7. | Commence development of transmission phasing prioritization for each conceptual transmission plan (Edison, PG&E, CAISO, and other project alternatives) | 08/26/2004 |
| 8. | **Milestone Meeting #3** at CPUC to discuss progress of the phased assessment | 10/27/2004 |
| 9. | Written comments on progress of the phased assessment and requests for last sensitivity studies due to Edison via e-mail (jorge.chacon@sce.com) | 11/03/2004 |
| 10. | Finalize development of transmission phasing prioritization for each conceptual transmission plan (Edison, PG&E, CAISO, and other project alternatives) | 11/05/2004 |
| 11. | Commence preliminary feasibility analysis for the conceptual transmission facilities identified in finalized transmission alternative | 11/08/2005 |
| | **NOTE: Edison Files CPCN for Phase 1** | 12/09/2004 |
| | **VACATION ANYONE?** | 12/18/2004 to 01/02/2004 |
| 12. | **Milestone Meeting #4** at CPUC to discuss progress of the preliminary feasibility analysis for the conceptual transmission facilities identified in finalized transmission alternative | 01/05/2004 |
| 13. | Written comments on preliminary feasibility analysis due to Edison via e-mail (jorge.chacon@sce.com) | 01/11/2005 |
| 14. | Finalize preliminary feasibility analysis | 01/25/2004 |
| 15. | Commence draft report of complete Tehachapi Transmission Phased Development Plan | 01/26/2005 |
| 16. | Edison makes draft report of complete Tehachapi Transmission Phased Development available | 02/09/2005 |
| 17. | **Milestone Meeting #5** at CPUC for study group to present final study report of complete transmission phased development | 02/16/2005 |
| 18. | Final comments due to Edison via e-mail (jorge.chacon@sce.com) | 02/23/2005 |
| 19. | Edison files final draft report of complete Tehachapi Transmission Phase Development Plan with Commission | 03/09/2005 |

# APPENDIX E

Transmission Permit Streamlining – A Project Management Approach

# Transmission Permit Streamlining - A Project Management Approach

Presentation to the CPUC Workshop
3/23/06

Rich Ferguson, PhD
Research Director
CEERT

# A new proactive role for CPUC

- To achieve State policy objectives, CPUC can no longer simply react to utility transmission plans and procedures.
  - TCSG exemplifies new proactive role of CPUC in transmission planning.
- Current process needs more than "streamlining".
- Being proactive requires a new project management approach by CPUC.

# Solving problems

- Energy Division has identified many problems and good solutions.
- ED proposals understate CPUC ability and responsibility to control development process.
  - Utilities still viewed as “applicant”.
  - CPUC still viewed as arbiter rather than as lead participant.
- Proposed process remains reactive, not proactive.

# Generic changes are not enough

- In a proactive role, CPUC agenda must followed by all participants.
  - Stakeholders have agendas different from CPUC.
- Generic changes in CPUC process won't ensure success.
- Need to focus on completing specific transmission projects, rather than on process.
  - Tehachapi, for example.

# A project management approach to Tehachapi transmission

- To build the Tehachapi transmission project we need to know –
  - Project scope.
  - Project schedule.
  - Scope of work.
    - Who. What. When.

# CPUC management of Tehachapi project

- Approve conceptual plan identifying project scope.
  - TCSG recommendation to be finalized in 2006.
- Determine schedule from beginning to end.
  - Detailed plans, approvals, timelines – CPCNs, etc.
- Determine scope of work.
  - Participants' roles and expectations
    - CPUC staff, utilities, state & federal agencies, others.
- Adjust schedule as necessary.

# Benefits of proactive project management approach

- Gives CPUC control of project.
- Avoids delays inherent in reactive approach.
  - Ensures next steps are ready to go when needed.
- Avoids pieces falling through cracks.
- Knows project status at all times.
- Anticipates problems and delays.
- Has CPUC support to remedy problems.

# CPUC project manager is required

- Project manager is needed to oversee all pieces of Tehachapi project and all participants.
- PM reports to the Commission.
  - Has CPUC authority to produce results.
- PM is responsible for seeing project is completed according to schedule.
  - Anticipates problems and plans accordingly.
  - Stakeholder panel provides advice.

# Summary

- Let's find out what works by using Tehachapi transmission as test management project.
- Project management approach is standard for overseeing large projects.
- Lessons learned can shape future permitting processes.

# Next steps in Tehachapi project management

- Project scope recommendation from TCSG should be finalized this year with help of ISO.
- Step #2 – develop detailed project schedule.
  - TCSG report will include rough schedule.
  - TCSG-like group should prepare detailed recommended schedule.
  - CEERT hereby offers to facilitate schedule group.

# Questions?
# Discussion?

# APPENDIX F

Establish the Imperial Valley Implementation Group Report

**Imperial Valley and Tehachapi Implementation Groups**
**Contract # 500-05-005**

**Contract Task #2: Establish the Imperial Valley Implementation Group**
**Final Report 4/28/06**

Contractor: Center for Energy Efficiency and Renewable Technologies
Lead Staff: Rich Ferguson, PhD, Research Director
Contractor Project Manager: Dave Olsen
Commission Project Manager: Clare Laufenberg Gallardo

## Task #2 Final Report:

The contract envisioned that the contractor would attempt to establish an advisory group of senior decision-makers (the IVIG) to help guide the conceptual transmission projects identified by the Imperial Valley Study Group toward approval and construction. The contractor worked diligently for seven months to convene such a group. Events surrounding development of the projects make the establishment of an IVIG impossible, and perhaps unnecessary.

This report summarizes the work done by the contractor in the attempt to form an IVIG, and explains the events preventing formation of the group. No further productive work can be done under this task. The contractor accordingly recommends that the remaining hours and budget for this task be transferred to work on the other contract tasks that were to be addressed by the IVIG.

## Events Preventing Formation of an IVIG

The major new facilities proposed by the IVSG plan are a 500 kV line from the Imperial Valley substation near El Centro to central San Diego County and associated substations. SDG&E indicated its interest in building this line during the Study Group process; IID also indicated interest in building the Imperial County portion of such a line.

One month after the IVSG completed its conceptual transmission plan, IID, LADWP and Citizens Energy Corporation (the Green Path parties) submitted a proposal to the WECC path rating process for this line, without any role for SDG&E in the project. The Green Path parties further proposed that all CAISO ratepayers should pay for the new facilities, even though they would be operated by LADWP and IID and not be part of the CAISO control area. This began a hostile competition between SDG&E and the Green Path parties as to who would build the line. SDG&E then filed the initial portion of its CPCN application for the Sunrise Powerlink at the CPUC on December 14, 2005.

Given this hostile competition, the key parties were unwilling to consider working cooperatively in a forum like the proposed IVIG. Meanwhile, each party worked separately to further define its proposed project and advance it in the permitting and approval process.

On March 20, 2006, SDG&E and IID announced that they had negotiated an agreement to cooperate on the construction of the 500 kV line. SDG&E also informed the CPUC that it would amend and re-file (in summer 2006) its application for its proposed Sunrise Powerlink to reflect this new agreement. IID informed the WECC that it would cooperate with SDG&E in seeking a path rating for the line from Imperial Valley to central San Diego County.

While this agreement resolved most of the hostilities between IID/LADWP/Citizens and SDG&E, each party is now pursuing the permitting of their respective segments of the overall line. They do not think that an IVIG would help them with this process. Meanwhile, the CAISO has begun a new study process to evaluate the need for, and benefits of, the proposed Imperial Valley transmission (in combination with the proposed new Tehachapi transmission). This process involves SDG&E, IID, SCE and the CAISO working closely together. This ISO process entails some of the cooperative interaction (on planning issues) that this contract envisioned being provided by an IVIG.

This CAISO process also makes heavy demands on the staff time of the key Imperial (and Tehachapi) parties. It is scheduled to continue at least to September 2006, with additional work required for the remainder of 2006. SCE, SDG&E and PG&E all have expressed great concern about the resource demands imposed by the (Tehachapi and Imperial) Study Group processes. The new CAISO process and the utility staff time required to support work in proceedings related to the Tehachapi and Imperial projects (e.g., I. 05-09-005, R06-02-012 and each IOU's CPCN applications) combine to make them unwilling to consider formation of an IVIG.

**Efforts to Form an IVIG**

For the past seven months, the contractor has explained the rationale for, and suggested formation of an IVIG with key Imperial Valley parties including SDG&E, IID, SCE, CPUC, CAISO and CalEnergy. This work has involved many discussions with each, including more than eight meetings and phone conferences with senior management of SDG&E alone. The contractor has also made the case for the usefulness of an IVIG to advance the progress on the proposed transmission projects at every STEP meeting since the beginning of this contract. This has served to alert the broader regional community of transmission stakeholders of the intent of the CEC and CPUC to support expedited development of the transmission necessary to access regional renewable resources.

The contractor also met with CPUC Commissioner Grueneich, to enlist her help in contacting the senior management of the IOUs to pursue formation of an IVIG. At her request, the contractor developed the agenda for a high-level meeting to initiate the Implementation Group process, and has remained in contact with her advisors on this issue. The Commissioner decided, however, not to pursue this approach but rather to address key issues through the I.05-09-005 proceeding.

**Task 2 Complete**

The contractor did prepare and submit the Draft List of IVIG members, and also prepared the 1st CPR report and participated in the first CPR meeting required under this task.

The contractor believes that the goal of achieving stakeholder consensus on outstanding Imperial Valley-related issues should be pursued. The contractor also concludes, however, that formation of an IVIG to address all issues will not be possible and that future consensus-building efforts must be oriented around specific remaining issues. Work on Task 2 is therefore considered complete.

# APPENDIX G

Imperial Valley Regional Network Upgrade Report

# Contract Task #3

# Final Imperial Valley Regional Network Upgrade Report

## Contract # 500-05-005

## April 5, 2006

**Imperial Valley and Tehachapi Implementation Groups**
**Contract # 500-05-005**

**Contract Task #3: Final Imperial Valley Regional Network Upgrade Report**
**April 5, 2006**

Contractor: Center for Energy Efficiency and Renewable Technologies
Lead Staff: Rich Ferguson, PhD, Research Director
Contractor Project Manager: Dave Olsen
Commission Project Manager: Clare Laufenberg Gallardo

## Completion of Task #3:

The attached Final Imperial Valley Regional Network Upgrade Report is the sole deliverable of contract Task #3. The IVSG has completed its transmission planning work, and the results reported here were reviewed and adopted by the full collaborative. The major network upgrades identified by the IVSG have now advanced to the permitting and approval stage. There is thus no need or purpose for a draft version of this report.

The purpose of Task #3 was to integrate Imperial Valley export planning with the Southwest Transmission Expansion Plan (STEP), to help ensure that plans to access renewables were coordinated with all other regional transmission development activities.

As contemplated in the contract Scope of Work, and as noted in CPR report #1, the Contractor successfully integrated Imperial Valley export planning with STEP; and with the IVSG, created a cooperative process in which STEP members did in fact "study the addition of Imperial Valley power to the regional grid in a coordinated fashion," as specified in Contract Task #3. Many STEP members participated actively in IVSG planning. Reports on IVSG planning and the several projects it has helped to identify and study have been and continue to be given at every STEP meeting. These projects include IID system upgrades, the Los Angeles Green Path and the Sunrise Powerlink. The effect of these projects on regional power flows and reliability are described in this report.

This report also summarizes the current status of these major proposed network upgrades in the region.

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**Final Imperial Valley Regional Network Upgrade Report**
**April 3, 2006**

The task of the Imperial Valley Study Group (IVSG) was to develop a consensus transmission plan capable of delivering 2,200 MW of renewable energy from the Imperial Valley to the CAISO grid and major load centers. This report describes the major network components of the IVSG plan and their effect on power flows and reliability in the region.

The final conceptual development plan recommended by the IVSG was filed at the CEC on September 30, 2005; SDG&E filed it at the CPUC on October 4, 2005. The IVSG plan, "Report of the Imperial Valley Study Group," is available at: www.energy.ca.gov/ivsg/. This Regional Network Upgrade Report refers extensively to the IVSG plan.

## 1. The Upgrade Study Process and Participants.

### 1.1. Participants.

All IVSG transmission planning studies were performed by its Technical Work Group (TWG). The TWG was led by the Imperial Irrigation District (IID) and San Diego Gas & Electric (SDG&E). Other members represented all the transmission entities having major interests in the region: Arizona Public Service (APS); the CAISO; Comisión Federal de Electricidad (CFE); Metropolitan Water District; Southern California Edison (SCE); and the Western Area Power Administration (WAPA). The Los Angeles Department of Water and Power (LADWP) joined later in the study process. The CPUC and CEC also participated, as did CalEnergy, the largest renewable energy generating company in (and largest power exporter from) the Imperial Valley. TWG meeting agendas, minutes and presentations is available on the IVSG website noted above.

### 1.2. Candidate Upgrade Configurations

The IVSG first identified several candidate configurations thought to be capable, in combination, of exporting 2,200 MW. These included upgrading connections from IID to the east, to support export to the APS and WAPA systems; to the south and CFE (upgrade of Path 45 through Mexico); to the west and SDG&E; and to the northwest and SCE/CAISO. Connections to the north/LADWP system were added later in the study process. These configurations included both 230 kV and 500 kV alternatives. Given the large amount of power to be exported, transmission at lower voltages was judged infeasible and was not considered.

### 1.3. Regional Upgrades Included in the Planning Context

The STEP Short-Term Upgrades to increase the East of (Colorado) River/West of the River (EOR/WOR) path ratings and thus import capability into Southern California were built into the starting point of the study. Several other proposed major regional network upgrade projects were taken into account in establishing the planning context for IVSG study work. These included the proposed Palo Verde-Devers #2 project; the Hassayampa-North Gila project; the proposed IID/APS Palo Verde-Yuma project; IID's plans to upgrade its own transmission system in order to support larger exports of renewable power from its control area and reinforce its system reliability; CalEnergy's development schedule for new geothermal generating units at the Salton Sea; and SDG&E's reliability-driven need for new EHV transmission by 2010 and its then on-going Transmission Comparison Study.

From these considerations, the IVSG selected seven regional upgrade configurations for initial study. These alternatives and their component upgrades are detailed in the IVSG Report cited above.

### 1.4. Power Flow Study Process

The power flow study process began with the development of base cases for both Heavy Summer and Light Autumn load conditions. The IVSG chose 2014 as its study year, for two reasons: it could represent a plausible midpoint in the contemplated 2,200 MW generation-transmission development; and there was a WECC-approved Heavy Summer case for that planning year. There was, however, no WECC-approved Light Autumn base case for 2014. Instead, the TWG began with the WECC-approved 2009 Light Autumn case, and modified it to represent 2014 loads and resources.

The CAISO supplied an initial dataset of 2014 loads, resources and flows, for both Heavy Summer and Light Autumn periods. Each TWG Transmission Owner modified/updated this pre-project model in turn, to ensure that the loads, resources and flows on its system were accurately represented. This was essential, as the ISO does not have data on the IID, WAPA or CFE systems.

All IVSG power flow studies employed PSLF version 13.1 and standard power flow planning criteria. Loading criteria were based on the normal or continuous rating (Rating 1) for major facilities. These planning criteria, and a more detailed description of the TWG study process, can be found in Chapter 3 of the IVSG Report.

The TWG developed different dispatch scenarios for each of the Heavy Summer and Light Autumn cases. These were designed to stress the regional transmission system under maximum and minimum flow conditions, in order to evaluate worst-case possibilities. The dispatch scenarios were also selected to represent likely or possible sales of power from Imperial Valley resources.

The study used CAISO Generation Retirement assumptions, to identify units on the ISO grid likely not to be running in 2014. Consistent with ISO planning criteria, new geothermal/renewable generation, which has very low marginal cost, was assumed to displace higher cost generation around the region. The dispatch scenarios employed are summarized on Table 1 below.

Each Transmission Owner provided a transmission element outage list covering key facilities on their systems. These were compiled to form a master contingency list. This contingency list included N-1 (one single transmission component out of service) and N-2 contingencies (two transmission components out of service). The list also included transmission component forced outage to model events such as a circuit breaker failing to open. This master contingency list was run in each study to evaluate system reliability, feasibility and impact.

### 1.5. Final Upgrade Study Alternatives

The results of this thermal analysis of the seven initial upgrade configurations led the TWG to select two of the original alternatives for further study, along with a variant of one alternative; it will eliminate the rest from further study. The TWG then constructed a base case for Light Autumn conditions, and performed power flow studies on each of the three remaining alternatives under those load conditions. As described in Chapter 3 of the IVSG Report, the TWG later performed stability studies and post-transient studies on these alternatives as well.

All three alternatives were found capable of exporting 2,200 MW of Imperial Valley resources and to perform well electrically. To evaluate the alternatives further, the CAISO next performed production cost simulations to estimate the effect of the proposed facilities on congestion, transmission losses and production cost across the WECC.

The TWG then developed a plan to develop and construct the upgrades in phases, and conducted additional power flow studies to evaluate the performance of each phase. Phase 1 added 645 MW of new Imperial Valley generation in 2010; Phase 2 increased cumulative new generation to 1,290 MW, in 2016; and in Phase 3, cumulative new generation to be exported across the recommended upgrades was 2,200 MW.

The detailed planning assumptions and results of the power flow, stability and post-transient studies conducted by the TWG for all of the upgrade alternatives are presented in the four volumes of Appendices (Appendices A-D) of the IVSG report.

## 2. IVSG Recommended Network Upgrades

The results of this analysis led the IVSG to a consensus recommendation for the upgrades necessary to deliver 2,200 MW of renewable energy from the Imperial Valley to the CAISO grid and major load centers. The major components of the IVSG conceptual plan are network upgrades of the IID system; and a new 500 kV line from the

Imperial Valley substation to a new San Diego-Central substation. Later, a 500 kV connection between the IID and LADWP systems was added, as described below.

The IID system covers all of Imperial County, and most renewable generators located there will likely connect first with IID.[1] The IID transmission system today includes single-circuit 230 kV lines, 161 kV lines, and 92 kV lines. To export the anticipated renewable generation, key facilities on its system must be upgraded to 230 kV (with some lines double-circuit 230 kV). These upgrades would support delivery of geothermal and solar generation connected in Imperial County to an interconnection with the CAISO at the existing Imperial Valley substation and/or a proposed San Felipe substation; and to a proposed interconnection with the LADWP system at a new Indian Hills substation. The IID system upgrades are outlined in detail in the IVSG Report.

The IVSG was led to recommend a new 500 kV connection between IID and SDG&E in large part to avoid exacerbating congestion at Devers. The TWG studied several alternatives which scheduled new Imperial Valley flows across Path 42 to the CAISO at the SCE Devers substation. These studies show that additional transfers through Devers to the west would be problematic. More than 5,000 MW of new generation, located in both Arizona and California is expected to flow to Devers; much of this is already in the SCE interconnection queue. SCE is developing a West of Devers upgrade plan, but even this plan is not geared to accommodate such a large amount of new generation. Accepting new Imperial Valley generation would require further, large-scale upgrades of the SCE system in that region, such as a 500 kV tie from Devers to Valley, in addition to SCE's current upgrade plan. An export plan that relied on making Imperial Valley generation deliverable through Devers accordingly would risk delaying Imperial Valley development until a regional plan for resolving west of Devers issues is identified and approved.

The IVSG found that adding 2,200 MW of generation in the Imperial Valley is likely to increase inadvertent flows across Path 42 connecting the IID and SCE systems, even when most or all IV generation is scheduled to SDG&E. Upgrades of Path 42 may be required when new Imperial Valley generation exceeds about 1,600 MW. The proposed connection between IID and LADWP at a new Indian Hills substation will also require upgrade of Path 42 on an earlier schedule. As described in Section 4 below, the plan of service for the proposed IID - LADWP Green Path project includes export of up to 400 MW of Imperial Valley generation to the LADWP control area. This leaves 1,800 MW of IV generation to be exported across the proposed IID – SDG&E 500 kV facilities.

This proposed Imperial Valley – San Diego 500 kV line thus remains the core of the IVSG regional network plan. This configuration minimizes flows from the Imperial Valley to Devers, thus avoiding the uncertainty, potential delays and high cost of that routing and instead, works to maximize utilization of the proposed 500 kV line into San Diego County.

[1] The Stirling Energy Systems solar generating project announced by SDG&E is proposed to connect directly to the Imperial Valley-San Diego Central 500 kV line, but this is expected to be an exception.

3. Effects on Flows at Regional Buses

Flows Evaluated by the IVSG

The IVSG evaluated the effect of adding 2,200 MW of new Imperial Valley generation on power flows at major regional buses under different dispatch scenarios and load conditions. As shown on Table 1 below, Dispatch Schedule 1 (D1, for Heavy Summer load conditions) scheduled 1,000 MW to SDG&E and the balance to SCE, LADWP and PG&E. Dispatch Schedule D2 scheduled only 200 MW to SDG&E, 600 MW to PG&E, and 700 MW to WAPA, Arizona and Nevada. Dispatch Schedule D3, for Light Autumn load conditions, scheduled 1,000 MW to SCE. This was intended to stress the SCE system West of Devers, in order to determine the amount of IV generation that would flow to SCE under minimum load conditions.

Table 1. Dispatch Scenarios Used to Evaluate Flows at Regional Buses

| AREA | D1 (HS) Dispatch | D2 (HS) Dispatch | D3 (LA) Dispatch | D4 (LA) Dispatch |
|---|---|---|---|---|
| IID | 200 | 200 | 200 | 200 |
| SDGE | 1000 | 200 | 200 | 400 |
| SCE | 400 | 300 | 1000 | 600 |
| LADWP | 200 | 200 | 200 | 200 |
| PG&E | 400 | 600 | 0 | 800 |
| WAPA | 0 | 100 | 100 | 0 |
| ARIZONA | 0 | 500 | 500 | 0 |
| NPC | 0 | 100 | 0 | 0 |
| Total | 2,200 | 2,200 | 2,200 | 2,200 |

The flows at major regional buses with 2,200 MW of generation added in the Imperial Valley are shown on Table 2. The IVSG recommended upgrade plan is represented by Alternative 2 (Alt2) on this table. Table 2 is attached as a separate file titled “Flows at Regional Buses”.

With 1,000 MW scheduled to SDG&E (Dispatch1), flows on Path 46 (West of the River) increase by only about 100 MW, from 7,707 MW, to 7,802 MW. Flows on Path 42 (IID to SCE at Ramon/Mirage) increase by 650 MW, indicating the need to upgrade this path. In this dispatch scenario, the proposed new 500 kV line from the Imperial Valley Substation to San Diego accommodated most of the flows resulting from the new generation.

With 1,100 MW of the new IV generation scheduled north (Dispatch D2, to PG&E, SCE and LADWP), and 700 MW scheduled to WAPA, Arizona and Nevada, flows on both Path 49 (East of the River) and Path 46 (West of the River) decrease by 600 MW, as the counterflows from the Imperial Valley reduce existing flows from Arizona into California. Scheduling more of the IV generation to SCE/PG&E does, however, increase flows on Path 42 by more than 700 MW over the pre-project case.

The detailed results of all IVSG power flow studies, in the form of PSLF plots, voltage summaries and flow summaries, are included in Appendices A and B of the IVSG Report. Flow duration curves showing the flows at all major regional buses for the final IVSG transmission plan are presented in Appendix D.2 of the IVSG Report.

### 3.2 Effect of the Los Angeles Green Path Project on Regional Flows.

The effect of the LA Green Path project (LAGP) on flows at major regional buses is included on Tables 3 and 4 below. This project is also known as the LADWP Indian Hills-Upland Project.

IVSG transmission Alternative 2a evaluated a connection between the IID and LADWP systems at a new Indian Hills substation that would be located on either the Palo Verde-Devers #1 or #2 lines, about 20 miles southeast of the SCE Devers Substation. The proposed LA Green Path project (LAGP) includes a new 500 kV line from Indian Hills to a new Upland substation in the northern section of LADWP service territory; upgrades of existing LADWP lines to connect at Upland; and two new interconnection points with the CAISO: at Indian Hills, and at Upland.

LADWP evaluated the regional effects of this project separately from the IVSG. Adding these proposed new 500 kV facilities under maximum power flow conditions increases flows on Path 49 (East of the River) by about 1,300 MW; and on Path 46 (West of the River) by about 1,700 MW. The project increases West of Devers flows by 1,000 MW; and flows on PVD1 and PVD2 by about 330 MW. These increases are expected, as the new 500 kV facilities will facilitate additional flows from Arizona into Southern California. At the same time, the LAGP was shown to decrease flows on Path 42 (by 200 MW in most of the configurations studied); to decrease flows on Path 61 (Victorville-Lugo) by 800 MW or more; and on South of Lugo by about 2,400 MW. Under projected normal operating scenarios, the LAGP appears to decrease congestion at several key Southern California buses. It also greatly reduces the need for reactive support at both Devers and Lugo Substations, and appears to support the reliability of the regional grid.

Table 3. Maximum Effect of LAGP on East of River Power Flows

| Case EOR | WOR | SCIT | IH-Dev | IH-Upld | PVD1 | PVD2 | HAR-IH |
|---|---|---|---|---|---|---|---|
| Cur. Rating | 7550 10118 | | TBD | TBD 1200 | | 1200 TBD | |
| 1E 9247 | 8973 | 10632 | | | 1455 | 1480 | |
| 2E 9249 | 8985 | 10647 | | 387 | 1464 | 1489 | |
| 3E 9314 | 9415 | 11049 928 | | 930 | 1439 | | 1871 |
| 4E 9331 | 9370 | 10991 683 | | 1317 1442 | | | 1950 |
| 6E 9339 | 9441 | 11060 1972* | | 1443 | 1559 | | 1867 |

| Case | WoD (230kV) | Dev-Val (500kV) | Total WoD | Path 42 | Vict-Lugo (Path 61) | South of Lugo |
|---|---|---|---|---|---|---|
| Cur. Rating | | | 1700 | 600 | 2400 | 5800 |
| 1E | 1061 | 1732 | 2793 | 280 | 1343 | 2023 |
| 2E | 1056 1732 2788 | | | 253 1379 | | 2043 |
| 3E | 1002 1559 2561 | | | 580 1671 | | 2287 |
| 4E | 867 | 1404 | 2271 | 528 | 1019 | 1453 |
| 6E 702 | | 1388 | 2090 | 569 1023 | | 1444 |

Table 4. Maximum Effect of LAGP on West of River Power Flows

| Case EOR | WOR | SCIT | IH-Dev | IH-Upld | PVD1 | PVD2 | PV-IH |
|---|---|---|---|---|---|---|---|
| Cur. Rating 7550 | 10118 | | TBD | TBD 1200 | | 1200 TBD | |
| 1W 8865 | 11824 | 15846 | | | 1523 | 1532 | |
| 2W 8868 | 11851 | 15878 | | 369 | 1538 | 1544 | |
| 3W 8923 | 12218 | 16221 | 1081 831 1505 | | | | 1881 |
| 4W 8940 | 12170 | 16156 806 | | 1260 1509 | | | 1967 |
| 6W 8945 | 12227 | 16214 | 2139* | 1405 | 1599** | | 1894 |

| Case | WoD (230kV) | Dev-Val (500kV) | Total (WoD) | Path 42 | Vict-Lugo (Path 61) | South of Lugo |
|---|---|---|---|---|---|---|
| Cur. Rating | | | 1700 600 2400 | | | 5800 |
| 1W | 890 | 1830 | 2720 | 411 | 1668 | 3216 |
| 2W 882 | | 1828 | 2710 | 364 1670 | | 3227 |
| 3W 849 | | 1682 | 2531 | 637 1926 | | 3443 |
| 4W | 737 | 1508 | 2245 | 581 | 1217 | 2523 |
| 6W 631 | | 1516 | 2147 | 603 1225 | | 2526 |

4. Status of Major Regional Network Upgrades

Imperial Valley-San Diego 500 kV Projects

The main component of the IVSG plan is a new 500 kV line from the Imperial Valley substation to a new San Diego Central substation, and related facilities. This line is now being developed as two separate but coordinated projects.

Under a recently-announced agreement between IID and SDG&E, IID and Citizens Energy Corporation will build and own the section of this line from the IV Substation to the existing Narrows Substation, near the border of Imperial and San Diego Counties in Anza Borrego Park. This section of the line is known as "IID Green Path Southwest." (On Figure 1 below, this project is identified as the "IID/Citizens San Felipe Project." IID changed the name of the project in early 2006.)

SDG&E will build and own the portion of the 500 kV line from the Narrows Substation to a new 500 kV/230 kV substation near Warner Springs; and new/upgraded 230 kV lines from that substation into its load centers. The SDG&E project is called the Sunrise Powerlink. The CAISO will operate the entire line, including the portion owned by IID.

LAGP and the IID-LADWP Connection

IID and LADWP propose to build a new connection between their systems at a new Indian Hills 500kV/230kV substation, with LADWP adding a new 500 kV line from Indian Hills to a new Upland substation near Lancaster. This project is known as the Los Angeles Green Path (LAGP). These facilities are an integral part of the Imperial Valley transmission solution, even though they were not studied by the IVSG. The LAGP Plan of Service includes transport of 400 MW of geothermal power from the Salton Sea region to Los Angeles.

4.3 Palo Verde-Devers #2 and EOR

Two other major regional upgrade projects are proceeding through the permitting and approval process: the East of the River (EOR) 9300 MW Upgrade; and the Palo Verde-Devers #2 500 kV line, from the Harquahala Substation in Arizona to the SCE Devers Substation near Palm Springs. These two projects have been studied together in the STEP process, and have completed the required WECC Comprehensive Progress Report on the combined projects. Salt River Project (SRP) is the sponsor of the EOR 9300 Upgrade Project, and SCE is the sponsor of Palo Verde-Devers #2. On December 30, 2005, those two parties requested that the combined projects be given Phase 2 status in the WECC path rating process.

The IVSG and LADWP Green Path planning studies assumed that both Palo Verde Devers #2 and the EOR 9300 MW Upgrade were in place. The effect of the 2,200

MW of new Imperial Valley generation and the addition of the LAGP 500 kV facilities on regional flows summarized in section 3 above includes the effects on these other upgrade facilities.

### 4.4 Study and Approval Status of Upgrade Projects

The current status of the IID System Upgrades, Sunrise Powerlink, IID Green Path Southwest and LAGP projects is as follows:

**IID System Upgrades**. In October 2005, the IID Board of Directors approved a Major Work Authorization releasing funds for the detailed engineering and environmental studies of the first of the IID upgrades. These upgrades will support increased power transfer across the IID system to the Imperial Valley Substation, and to the proposed Indian Hills substation.

**Sunrise Powerlink**. SDG&E submitted the initial part of its application for a Certificate of Public Convenience and Necessity (CPCN) for the Sunrise Powerlink to the CPUC on December 14, 2005. The company did not identify any preferred or alternative routings for the project in its application. Instead, SDG&E "bifurcated" its application into two parts: the Purpose and Need Determination section (filed December 14), and the environmental study portion. SDG&E indicated that it would file the required Proponent's Environmental Assessment (PEA) of the impact of its proposed routing in June 2006. Separately, SDG&E also requested a determination of need for the project from the CAISO on January 4, 2006.

In March 2006, SDG&E and IID signed a Memorandum of Agreement to share the ownership, construction and operation of the 500 kV line, as described above; and SDG&E announced its preferred routing for its portion of the line. As a result of these developments, SDG&E informed the CPUC on March 21, 2006 that it would amend its CPCN application to include the PEA on its preferred and alternative routings and file it later in 2006. This schedule would allow the CPUC to issue a decision on the project in mid-2007.

**IID Green Path Southwest**. IID initiated Regional Planning Review of the proposed IID Green Path Southwest 500 kV project in November 2005. (The project was then known as the IID/Citizens San Felipe Project). A Regional Planning Review Group was formed, in accordance with WECC Procedures for Regional Planning Project Review and Rating Transmission Facilities. IID submitted its WECC Regional Planning Compliance Report for the project on January 31, 2006. This regional review study process has built directly and explicitly on the studies performed by the IVSG.

**LA Green Path**. LADWP began Phase 1 of the WECC Regional Planning Project Review Process for this project on November 3, 2005, and submitted the required Comprehensive Progress Report (CPR) on the LAGP project on November 22, 2005. This CPR concluded that there would be no adverse simultaneous interaction between LAGP and Palo Verde-Devers #2 with EOR at 9,319 MW. On February 1, 2006, the

WECC Planning Coordinating Committee (PCC) accepted the final LAGP Regional Planning Compliance Report. The detailed study plan for Phase 2 study of the project is now under final review by the Project Review Group formed to study the project.

Figure 1. Green Path Coordinated Projects

**Figure 1 is attached in a separate document title "Green Path 10-28-05". You will find the map on page 4.**

Figure 2. IID Energy Upgrades - Green Path Coordinated Projects

**Figure 2 is attached in a separate document title "Green Path 10-28-05". You will find the map on page 8 (IID Energy, Green Path Coordinated Projects).**

Figure 3. Los Angeles Green Path Project

**Figure 3 is attached in a separate document title "Green Path 10-28-05". You will find the map on page 24 (LADWP Transmission Project).**

# APPENDIX H

Report of Completion and Transmittal of Deliverables

**Imperial Valley and Tehachapi Implementation Groups**
**Contract # 500-05-005**

**Contract Task #4: Report of Completion and Transmittal of Deliverables: 2/24/06**

Contractor: Center for Energy Efficiency and Renewable Technologies
Lead Staff: Rich Ferguson, PhD, Research Director
Contractor Project Manager: Dave Olsen
Commission Project Manager: Clare Laufenberg Gallardo

## Completion of Task #4:

With participation in the 2nd CPR meeting, the Contractor has completed all the work and the Deliverables specified in contract task #4, "Imperial Valley Conceptual Development Plan." Task #4 Deliverables are:

- Imperial Valley Conceptual Development Plan
- Notice of meeting location, time and details
- Meeting Agenda(s)
- Meeting Summaries
- Revised imperial Valley Development Plan (if needed)
- 2nd CPR Report

The web link to the Imperial Valley Conceptual Development Plan, as previously filed with the CEC, is provided below. A revised Development Plan has been found to be unnecessary, as explained herein. The agenda of the public meeting held to review the Imperial Valley Conceptual Development Plan is attached to this report; a summary of this meeting is contained herein. The presentation given by IID at this public meeting is also attached to this report, as part of the summary of that meeting. The 2nd CPR report under this contract was sent to the Commission Project Manager under separate cover on February 10, 2006.

## 1. Imperial Valley Conceptual Development Plan

The Contractor led the Imperial Valley Study Group to prepare and complete the Imperial Valley Conceptual Development Plan. This plan, "Development Plan for the Phased Expansion of Transmission to Access Renewable Resources in the Imperial Valley," was filed at the CEC on September 30, 2005, in Docket 04-IEP-1F, the Integrated Energy Policy Report proceeding. The plan was filed at the CPUC on October 4, 2005, by SDG&E, as required in proceeding I. 05-09-005. The generation and transmission development plan presented in the report is based on thorough and complete power flow, dynamic stability and post-transient analysis studies of many alternatives capable of exporting 2,200 MW of renewable generation from the

Imperial Valley. The detailed results of these studies are presented in four volumes of technical appendices. The report and its appendices are found at: http://www.energy.ca.gov/ivsg/documents/index.html

## 2. Public Review of the Conceptual Development Plan

In preparing the Imperial Valley Conceptual Development Plan, the Steering Committee of the Imperial Valley Study Group circulated drafts of the Plan to, and requested comment from, all participants in the IVSG process (55 people), and all parties on the Southwest Transmission Expansion Plan (STEP) contact list maintained by the CAISO (246 people). Comments on the draft plan were received from several parties, including Arizona Public Service, Aspen Environmental Group, Border Power Plant Working Group/UCAN, Imperial County Planning and Development Services Department, Kritikson and Associates, Ormat Technologies and Salt River Project. Comments received were incorporated into the final plan submitted September 30, 2005.

A public meeting to present and take comment on the Imperial Valley Conceptual Development Plan was held at the California Public Utilities Commission on December 7, 2005, as described below. This meeting was convened by the CPUC as part of a two-day workshop on Transmission for Renewables in its Order Instituting Investigation, I.05-09-005. The agenda of this workshop was developed to include public review of the Imperial Valley Plan as a result of the Contractor's requests to the Assigned Commissioner at the November 7, 2005 Pre-Hearing Conference in this proceeding, and subsequent work with the Assigned Commissioner's staff. Contract Deliverables associated with this meeting include:

- Notice of meeting location, time and details. The meeting to present and take comment on the Imperial Valley Conceptual Development Plan was held at the CPUC, 555 Van Ness Avenue, San Francisco, in Hearing Room A, on December 7, 2005 beginning at 9:00 AM. Notice of this CPUC workshop, including presentation of the Imperial Valley Plan (and status report on the Tehachapi development plan) was sent to all parties on the service lists of CPUC proceedings I.05-09-005 and I.00-11-001, on November 21, 2005, in the Administrative Law Judge's Ruling Scheduling Workshops on Renewable Transmission Issues.

- Meeting agenda. The agenda for this meeting, including the Assigned Commissioner's memo outlining the purpose and background of the two-day workshop, is attached to this report.

- Meeting Summary. The December 6-7, 2005 workshop was not recorded, and no transcript of the meeting is available. The portion of the meeting devoted to review of the Imperial Valley Conceptual Development Plan was organized into three sections: an overview of the IVSG process and development of the

conceptual plan, presented by IVSG Coordinator (and Contractor Project Manager) David Olsen; a PowerPoint presentation of the Green Path Coordinated Projects proposed by IID, LADWP and Citizens Energy, including the IID system upgrades found to be necessary in the IVSG process, by Juan Carlos Sandoval, IID Manager of Transmission Planning; and a verbal presentation of the proposed SDG&E Sunrise Powerlink by Jan Strack of the SDG&E Transmission Planning group. Mr. Sandoval's presentation is attached to this report.

IVSG Coordinator Olsen began by inviting comment on the Imperial Valley Conceptual Development Plan. He reviewed the formation of the IVSG in October 2004, its structure and participants. The plenary Study Group involved 55 people representing 39 organizations. The effort was directed by a Steering Committee that addressed policy issues; transmission planning studies were performed by a Technical Work Group comprised of IID, SDG&E, SCE, APS, CFE, WAPA, MWD, the CAISO, CPUC and CalEnergy; and an overall permitting plan for the multi-year, multi-phase development was designed by the Permitting Work Group made up of representatives of 14 local, state and federal agencies, environmental groups, generating companies, transmission owners and other stakeholders. The IVSG functioned as a collaborative, with decisions made by consensus, and detailed meeting minutes posted on its public website. Unlike the Tehachapi Study Group, the IVSG established its own goals for its work. These included the completion of a conceptual plan for the development and export of 2,200 MW of renewable generation from the Imperial Valley; a permitting plan for this development; and the building of institutional and public support for this development. IID and SDG&E both devoted large amounts of staff time and resources to the work of the IVSG, and other participants including SCE, the CAISO, CalEnergy and the CPUC also made it a priority. This support, together with strong facilitation and frequent meetings of the several work groups enabled the IVSG to complete a large amount of transmission and development planning work in just under 12 months.

Olsen explained how the IVSG identified initial transmission alternatives to investigate, the studies performed to evaluate them and the selection of final alternatives. The consensus plan for exporting 2,200 MW of new generation revolves around IID system upgrades and a new 500 kV line from the Imperial Valley to San Diego. He then introduced Mr. Sandoval and Mr. Strack to describe those two components of the plan.

Mr. Sandoval explained that most of the required upgrades of the IID system would utilize existing Right of Way and some of them, existing structures, making many of these upgrades very cost-effective. He indicated IID's ability to phase these upgrade to match the development schedules of the renewable resources in the region. He also presented LADWP's proposed Green Path project, including the Indian Hills-Upland 500 kV facilities, and its connection

to the IID system at a new Indian Hills substation. LADWP had planned to make this presentation itself at the Dec. 7 workshop but could not attend at the last moment.

LADWP has announced that the Green Path project will enable it to acquire up to 400 MW of geothermal power from Imperial Valley resources, with the balance of the new Indian Hills-Upland transmission capacity affording LADWP access to fossil generation in Arizona across the Devers-Palo Verde #2 line. The fact that LADWP does not intend to take more than 400 MW of Imperial Valley generation continues to make a new 500 kV connection from the Imperial Valley to San Diego a necessary component of regional generation-transmission development.

In Mr. Sandoval's presentation, IID credits the Imperial Valley Study Group with helping develop a workable transmission plan through a cooperative regional process and with triggering IID's own internal efforts to commit to build its Green Path project.

Among the questions after the IID presentation, SCE commented that the December 2009 in-service date shown for the LADWP Indian Hills-Upland project appeared overly optimistic and inconsistent with the time required for environmental study and permitting and the WECC path rating process.

Mr. Strack next explained SDG&E's need for expanded import capability, and the process the company had used to identify and study transmission alternatives. The IVSG made every attempt to coordinate its studies (focused on export from the Imperial Valley) with SDG&E's internal Transmission Comparison Study through STEP. In addition to its reliability needs and access to a larger generation market, SDG&E's ability to meet its RPS targets depend on transmission access to Imperial Valley renewables. SDG&E's proposed solution is the 500 kV Sunrise Powerlink project.

Mr. Strack announced that SDG&E would separate the Purpose and Need Determination section of its CPCN application for the Sunrise Powerlink from the environmental studies section of that filing. SDG&E has committed to file the former by December 31, 2005.

Mr. Olsen concluded the review of the IVSG Conceptual Development Plan by again calling for comments. He reported that the key IVSG parties believe that the transmission planning work of the Study Group has now been satisfactorily completed and that, as a result, there was no further need for the IVSG. The remaining issues confronting implementation of the plan are all policy-related ones. These include coordinating procurement with transmission development; expediting regulatory approvals; resolving funding and control-area issues; and building public and institutional support for actual construction of the combined generation-transmission development. Instead of a Study Group concerned with

conceptual planning, the need now was for a group of senior decision-makers, perhaps characterized as the Imperial Valley Implementation Group, able to take responsibility for getting the facilities built.

The Imperial Valley portion of the meeting concluded at 10:30 AM.

## 3. Revised Imperial Valley Development Plan Not Necessary

No comments on the need to consider other transmission alternatives at a conceptual level were received, either from STEP and IVSG participants during circulation of the draft IVSG Conceptual Development Plan for comment, or at the December 7, 2005 public review meeting.[1]

Imperial Irrigation District (IID), SCE and SDG&E, the key IVSG parties, have determined that it is not necessary, and will not be effective, to revise or update the Imperial Valley Conceptual Development Plan. The two major components of the plan, internal IID system upgrades and the 500 kV SDG&E Sunrise Powerlink, are fully defined and thoroughly documented in the technical studies performed by the IVSG. These two components are not likely to change with the addition of the LADWP Indian Hills-Upland 500 kV project to the region.

Imperial Valley transmission development has now moved beyond the conceptual planning phase, and the parties are pursuing definitive plans for each of these component transmission projects in other venues. SDG&E has announced that it will file a CPCN application for the Sunrise Powerlink by December 31, 2005, and will begin the WECC Path Rating process for that line immediately thereafter. On November 22, 2005, IID initiated a Regional Planning Project Review Group, to begin the WECC Path rating process for the 500 kV Imperial Valley Substation-San Felipe project. LADWP is expected to begin the WECC Path Rating process for the 500 kV Indian Hills-Upland project, including new interconnections between the LADWP and SCE and IID systems, in the first quarter of 2006. The commencement of definitive planning for these new facilities makes revision of the IVSG conceptual plan unnecessary.

[1] Earlier in the IVSG process, the Border Power Plant Working Group had requested further study of 230 kV export alternatives, including routing Imperial Valley generation to San Diego through Baja Norte. The IVSG Technical Work Group did in fact evaluate a transmission plan consisting solely of 230 kV facilities, and routings through Mexico. After study, it eliminated these alternatives because they did not perform as well electrically as other alternatives.

**Attachments**

- December 6-7, 2005 Workshop Agenda. (Provided under separate cover as hard copy; electronic copy not available from the CPUC).
- "Green Path Coordinated Projects," presentation by JC Sandoval, IID Energy, on the IID and LADWP components of the Imperial Valley Conceptual Development Plan at the December 7, 2005 workshop in I.05-09-005.

# APPENDIX I

Imperial Valley Production Simulation Study Report

# Contract Task #5

# Final Imperial Valley Production Simulation Study Report

**Contract # 500-05-005**

**March 27, 2006**

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**Imperial Valley and Tehachapi Implementation Groups**
**Contract # 500-05-005**

**Contract Task #5: Final Imperial Valley Production Simulation Study Report**
**March 27, 2006**

Contractor: Center for Energy Efficiency and Renewable Technologies
Lead Staff: Rich Ferguson, PhD, Research Director
Contractor Project Manager: Dave Olsen
Commission Project Manager: Clare Laufenberg Gallardo

**Completion of Task #5:**

The attached Final Imperial Valley Production Simulation Study Report is the sole deliverable of contract task #5. As contemplated in the contract Scope of Work, the Contractor arranged for the CAISO to perform production cost simulations of the final transmission alternatives considered by the IVSG. The results of these studies provided information to enable the IVSG to agree on a final recommended transmission plan for the export of Imperial Valley renewable resources, also as contemplated in the contract Scope of Work.

The Technical Work Group of the IVSG reviewed the initial production simulations produced by the CAISO, and requested additional simulations to test the final transmission alternatives, as described in the attached report. This interim review and re-study served the purpose of the Draft Production Simulation Study Report specified in the contract Scope of Work. The Technical Work Group then presented the simulation results to the full IVSG, which considered them in adopting its final transmission recommendation, which was filed with the CEC on September 30, 2005. The attached report presents the final simulations completed; there is no need for further production simulations of transmission alternatives.

**Final Imperial Valley Production Simulation Study Report**
**March 27, 2006**

At the request of the IVSG, the CAISO performed production cost simulations to estimate the economic and physical performance of three final transmission configurations considered by the IVSG.

These simulations helped the Imperial Valley Study Group (IVSG) decide among transmission alternatives to arrive at its final recommended conceptual development plan. The IVSG filed this plan for the export of 2,200 MW of renewable resources from the Imperial Valley at the CEC on September 30, 2005; SDG&E filed it at the CPUC on October 4, 2005. The IVSG plan, "Report of the Imperial Valley Study Group," is available at: www.energy.ca.gov/ivsg/. This report refers extensively to the IVSG plan.

1. The IVSG Study Process and the Role of Production Cost Simulations.

The IVSG initially identified seven transmission alternatives to analyze. The IVSG Technical Work Group (TWG) constructed a base case for Heavy Summer conditions, and performed power flow studies on each alternative in relation to this base case. The results of this thermal analysis led the TWG to select two of the original alternatives for further study, along with a variant of one alternative; it eliminated the rest from further study. The TWG then constructed a base case for Light Autumn conditions, and performed power flow studies on each of the three remaining alternatives under those load conditions. As described in Chapter 3 of the IVSG Report, the TWG later performed stability studies and post-transient studies on these alternatives as well.

All three alternatives were found capable of exporting 2,200 MW of Imperial Valley resources and to perform well electrically. The TWG then turned to production cost simulations to analyze the alternatives further.

2. Production Cost Simulation as Analysis Tool

Production simulations estimate both the economic and the physical performance of transmission alternatives. They do so by modeling the behavior of the generation and transmission system—in this case, the entire WECC region—dispatched to meet specified levels of load. Model algorithms seek to minimize the total hourly production cost of the system. They dispatch generating resources in economic merit order, so that lowest-cost/more efficient generators are dispatched first. The models observe real-world generation, transmission and operational constraints. These include start-up and shut-down times and ramping rates for generators; transmission line loading limits; Reliability

Must Run generation (nuclear plants, for example) and Remedial Action Schemes imposed to maintain transmission system operation within specified tolerances.

The results of the simulations include comparative production cost (the total fuel and operating costs of all generation dispatched to meet regional load, flowing across available transmission); hours of transmission congestion on major paths; and transmission losses. These outputs are especially useful in ranking alternative transmission solutions.

## 3. Transmission Alternatives Studied

Production simulations were performed on the following three transmission additions. The IVSG Report refers to them as Alternatives 2, 2a and 3b:

1. Alternative 2: A new 500 kV line from Imperial Valley to San Diego Central, with 50 percent series compensation added to the San Felipe-to-San Diego Central portion of the line.
2. Alternative 2a: This variant on Alt 2 was added to evaluate the effect of adding a new 230 kV tie between IID and the CAISO at a new Indian Hills substation on the Devers-Palo Verde 1 line. It is the same as Alternative 2 except for this tie.
3. Alternative 3b: A new 500 kV Imperial Valley to San Diego North to (SCE) Serrano-Valley transmission line, with 50 percent series compensation added to the San Felipe-to-San Diego North portion of the line.

Diagrams depicting these three alternatives are included in Appendix A.

## 4. Production Simulation Study Description

The simulations run for these three transmission projects looked at comparative savings in WECC production cost, power losses and the hours of congestion associated with each alternative. The study did not analyze other potential benefits that the new transmission might provide, such as market power mitigation, reduction in reliability-must-run generation cost, reduction in emissions and increased operational flexibility.

The SSG-WI 2008 base case[1] was used as the starting case. This base case includes the generation and transmission infrastructure likely to be in place by 2008. The SSG-WI base case was updated to reflect forecasted 2010 load conditions in the study area (IID, SCE, SDG&E, CFE, LADWP and Arizona). New transmission and generation projects that are approved and planned to be online by 2010 in the Southwest area were modeled. These projects include:

[1] SSG-WI, the Seams Steering Group-Western Interconnection, coordinates transmission expansion planning across the WECC. The base case was developed by the SSG-WI Planning Work Group.

- Harquahala-Devers 500 kV line.
- New 500 kV Substation to be located at the Midpoint of Palo Verde-Devers and Harquahala-Devers 500 kV lines.
- Blythe I and II Combined Cycle plant (1,000 MW) connecting to Midpoint Substation.
- Reconductoring of four West of Devers 230 kV lines.
- Four new simple cycle plants at CFE (340 MW).

The Benchmark base case used for the study included all of these projects. The project cases (Alternatives 2, 2a and 3b) also included the new generation and transmission facilities listed above, along with 2,200 MW geothermal generation added in the Imperial Valley. The geothermal units were considered to be base-load generators with must-run status. Startup/shut down cost, operation and maintenance costs, forced outage rate and outage duration were modeled using typical values.

The simulations also incorporated these transmission facility assumptions:

- All transmission paths were modeled according to the WECC 2005 Path rating catalog.
- Limits for all 500 kV transmission facilities were enforced.
- Lower voltage (230 kV and below) limits were not enforced.
- SDG&E Simultaneous import limit was not enforced.
- SCIT (Southern California Import Transfer) limit was modeled at 17,900 MW.
- EOR (East of the Colorado River) limit was modeled at 9,255 MW.
- WOR (West of the Colorado River) limit was modeled at 11,318 MW.
- Path 42 (IID-SCE) was limited to 600 MW in the benchmark case and 1,600 MW in the project cases (when upgrades of the IID system increase the capacity of this path).
- Reactive flows are not modeled in production simulations. To compensate for this, all AC transmission lines monitored were limited to 95% of their thermal capacity or applicable rating.
- Nomograms were used to reflect transmission system constraints.
- Transmission losses were modeled.
- Transmission line/Path limit violation penalty of $1000/MWh was applied.

The simulations were then run to predict both the economic and physical performance of the entire WECC transmission network with and without the projects, on an hourly basis for 2010.

Sensitivity Case: Export Potential With No New Transmission

To test its initial assumptions about the need for new transmission to export Imperial Valley renewables, the IVSG requested the CAISO to run additional production simulations to determine the amount of power that could be exported with no new transmission added in the region. Accordingly, the CAISO performed a sensitivity study

to evaluate the addition of 2,200 MW of geothermal generation to the Benchmark case without any new or upgraded transmission facilities. (In the IVSG Report, this is referred to as the Benchmark-Sensitivity case). This study was designed to quantify the proportion of the 2,200 MW of geothermal power that could be delivered without transmission upgrade, and the corresponding economic and physical performance of the system. This study assumed all the transmission facility limitations modeled in the Benchmark case. The limits for all 230 kV transmission lines in the IID area were also enforced in this sensitivity.

In addition, the CAISO performed a sensitivity run on IVSG Project Alternative 2. This sensitivity case evaluates the economic and physical performance of extending the Imperial Valley-San Diego Central 500 kV line to the midpoint of the Valley-Serrano 500 kV line in southern Orange County.

## 5. The Production Cost Model Employed

The CAISO used ABB's Gridview production cost model to conduct its simulation studies. This model simulates the electricity market under realistic transmission system constraints, in hourly intervals. It incorporates a detailed generation model, a demand model and a transmission system model. It incorporates an optimization algorithm that seeks to dispatch generation resources in order to minimize total production cost. The dispatch algorithm matches generation to hourly load and losses while observing transmission and operational constraints. Data inputs for the Gridview model include:

- Generator capacity, fuel costs, heat rates, maintenance schedules, start-up/shut-down cost, up time, down time, forced outage rates and outage durations.
- Transmission thermal limits, operational constraints and network topology.
- Hourly demand data and distribution.
- Hourly hydro and wind dispatch.

Simulation outputs includes hourly dispatch for each generation unit, hourly production cost, hourly transmission line flows and Locational Marginal Prices (LMP) at each WECC node.

## 6. Simulation Results

The hourly production runs created by the model successfully dispatched sufficient generation to meet hourly demand, observed all input transmission and operational constraints, and calculated transmission losses, for the benchmark case and the three project cases and two sensitivities studied. The results show various transmission lines and interfaces to be congested for time periods ranging from one hour to several hours in the different cases. These results are depicted graphically in Appendix C below, as annual flow duration curves for major transmission lines and interfaces studied.

In Table 1 below, WECC Annual Production Cost represents the total variable cost of generation for the entire WECC, before the new Imperial Valley generation is added (in the Benchmark cases), and after the 2,200 MW of renewable output is added in the other cases. (The variable cost of generation includes fuel cost and variable Operation and Maintenance costs; WECC production cost thus does not include the capital cost or the fixed O&M cost of the generation or transmission facilities). Other key study results are the total hours of congestion on transmission interfaces and lines, and the total annual MWh losses on the transmission system.

Table 1. Summary of Production Simulation Study Results

| Study Cases | WECC Annual Production Cost (M$) | Total transmission Congested hours (hrs) | Total transmission losses (MWh) |
|---|---|---|---|
| Benchmark | 15,731.35 | 146,206 | 34,687,733 |
| Benchmark - Sensitivity | 15,471.24 | 172,887 | 33,863,293 |
| Project Alternative 2 | 15,207.04 | 142,546 | 35,643,109 |
| Project Alternative 2 - Sensitivity | 15,197.79 | 141,123 | 35,602,670 |
| Project Alternative 2a | 15,194.96 | 143,264 | 35,433,995 |
| Project Alternative 3b | 15,198.16 | 140,378 | 35,649,818 |

These study results indicate that Project Alternative 2a provides marginally greater savings in production cost and transmission losses. Looking at the congestion data, Project Alternative 3b provides a network that is least congested.

The Benchmark-Sensitivity results show that out of the 2,200 MW of geothermal units modeled in that case, only 800 MW could be delivered without new transmission facility additions. The hourly output profile of the geothermal units modeled in this sensitivity case is shown in Appendix C. The geothermal output might be substantially further reduced if transmission outage constraints were modeled (i.e., geothermal output could be much less than 800 MW). The results show that transmission congestion increased tremendously when new generation is added without transmission upgrades. Savings were nonetheless recorded in annual production cost and transmission losses

with the geothermal units modeled. These savings might be eroded, however, if transmission outage constraints are included.

Project Alternative 2-Sensitivity study results showed a marginal saving in production cost, hours of congestion and transmission losses when compared to Project Alternative 2.

Each of the project alternatives reduced the hours of transmission congestion across the WECC by, on average, 4,400 hours/year (3%), as the new transmission capacity supported greater power flows. Losses increased, because generation in the Imperial Valley displaced more expensive generation closer to load. Adding the renewable generation reduced the total variable cost of generation WECC-wide by more than $500 million/year. That is, adding 2,200 MW of geothermal generation in the Imperial Valley and the transmission facilities necessary to export it, reduces the fuel and variable O&M costs of meeting WECC loads from $15.7 billion/year in the Benchmark case to less than $15.2 billion/year in the three study alternatives.

While these economic results may be roughly indicative of the possible savings, it is important to note that the IVSG production cost simulations were geared solely for comparing transmission alternatives. The studies were not designed to calculate total economic costs and benefits (as would be done, for example, using the TEAM methodology developed by the CAISO). A full economic evaluation would have to model, among other things, a current forecast of gas prices, regional differences in gas prices, a range of hydro conditions, and the capital cost of the new generation and new transmission. The simulation study results do not provide an adequate basis for making investment decisions.

## 7. Conclusion

The IVSG incorporated the results of the production cost simulations outlined above, the results of its power flow and stability studies, and the capital cost estimates of the final alternatives in its consideration of the transmission solution to be recommended in the IVSG Report. The information about the likely effect of the alternative transmission facilities on production cost, congestion and losses provided by production simulations added robustness to the overall IVSG transmission study process and helped create the basis for its consensus stakeholder recommendation.

## APPENDICES

Appendix A: Diagrams of Final IVSG Transmission Alternatives

Appendix B: Geothermal Unit Hourly Output With No New Transmission Added

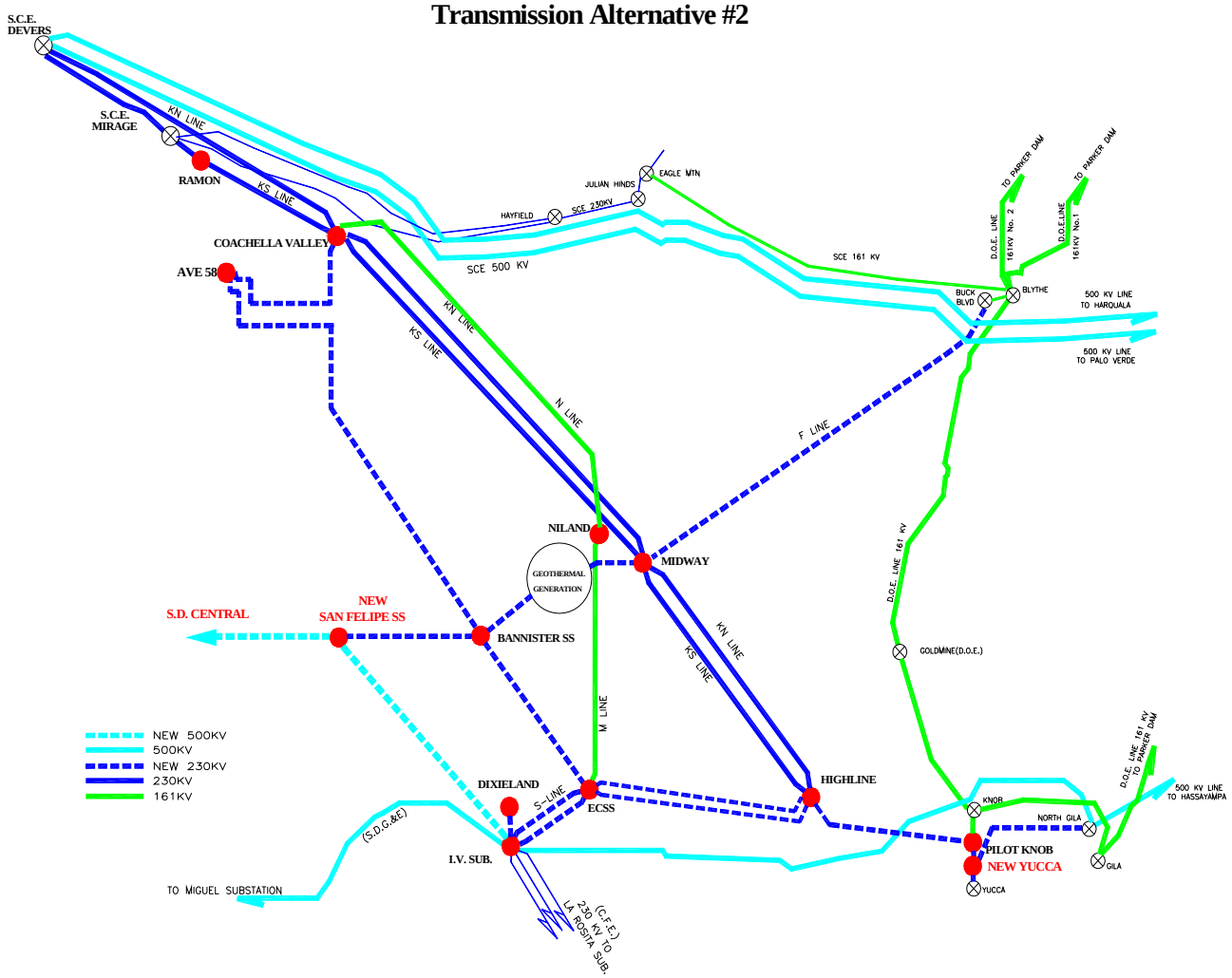
Appendix C: Graphs of Flows on Major Transmission Paths

Appendix A: Diagrams of Final IVSG Transmission Alternatives

Transmission Alternative 2

A new 500 kV line from Imperial Valley to San Diego Central, with 50 percent series compensation added to the San Felipe-to-San Diego Central portion of the line.

**Transmission Alternative #2**



Appendix A: Diagrams of Final IVSG Transmission Alternatives

Transmission Alternative 2a

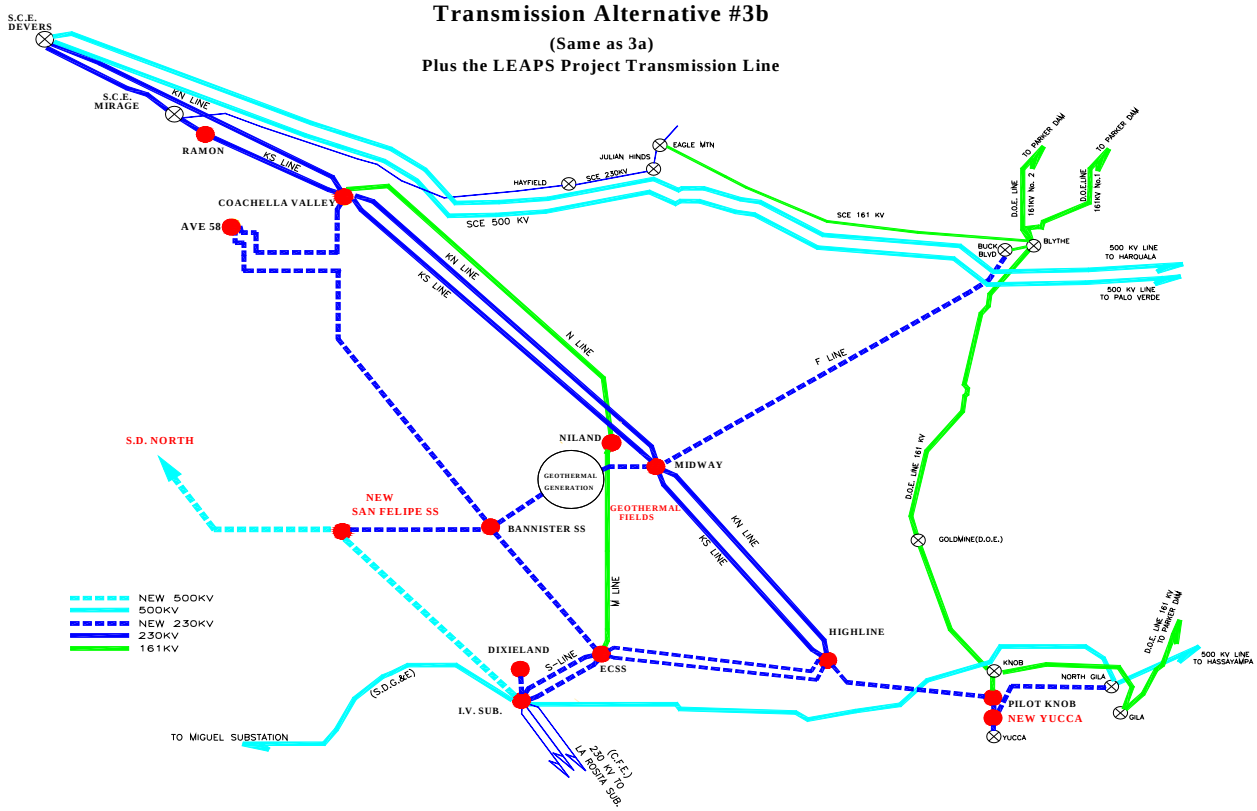
This variant on Alternative 2 was added to evaluate the effect of adding a new 230 kV tie between IID and the CAISO at a new Indian Hills substation on the Devers-Palo Verde 1 line. It is the same as Alternative 2 except for this tie.

QuickTime™ and a
TIFF (LZW) decompressor
are needed to see this picture.

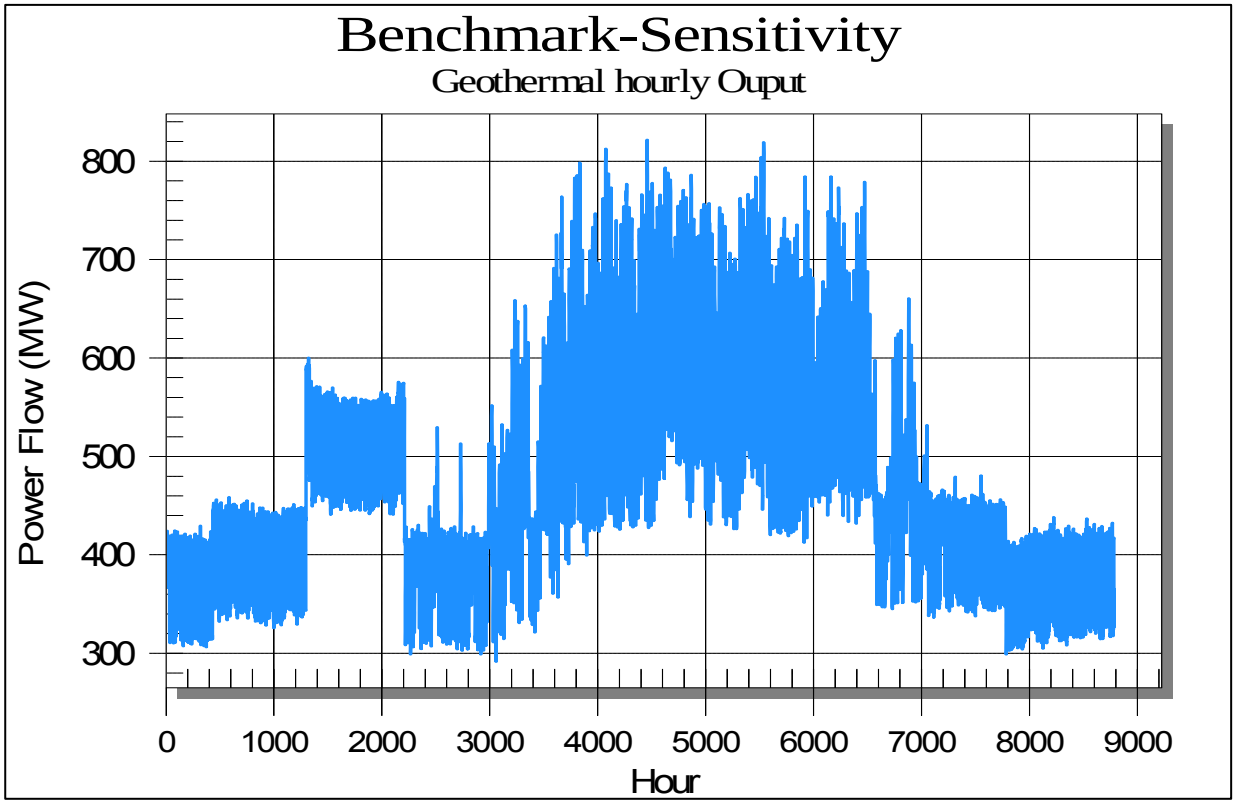
Appendix A: Diagrams of Final IVSG Transmission Alternatives

Transmission Alternative 3b

A new 500 kV Imperial Valley to San Diego North to (SCE) Serrano-Valley transmission line, with 50 percent series compensation added to the San Felipe-to-San Diego North portion of the line.

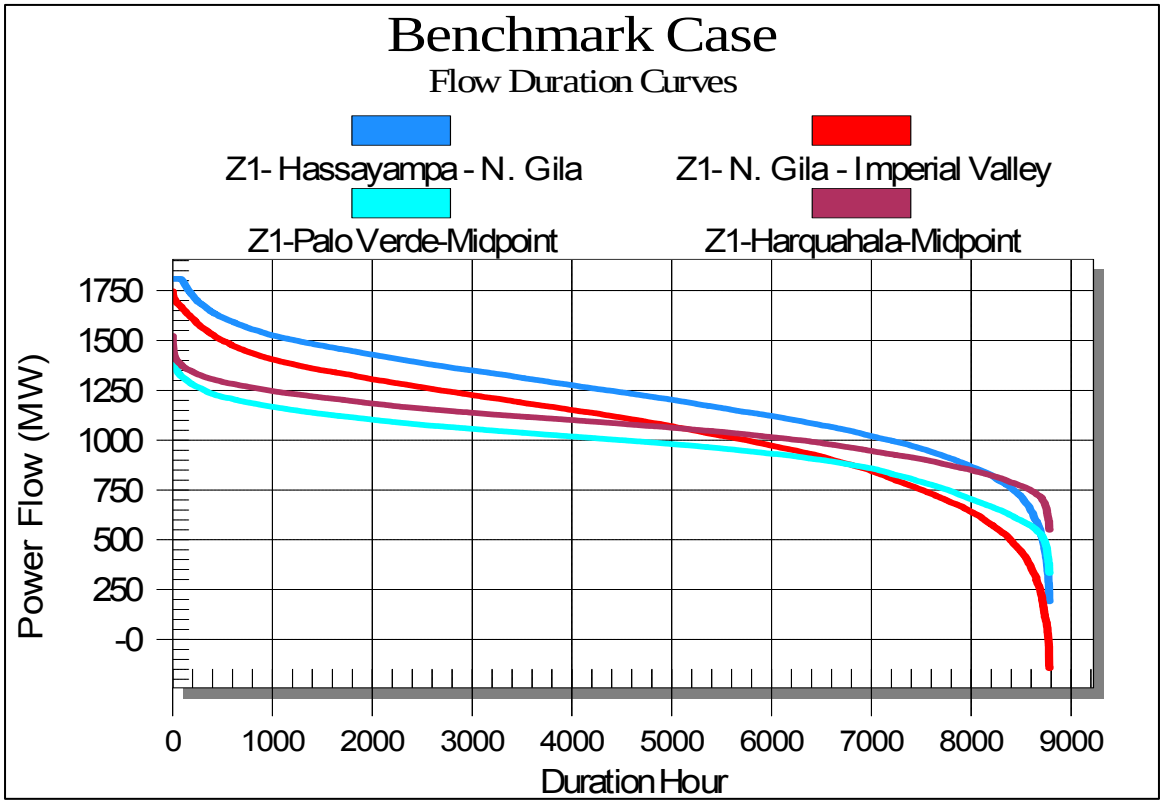


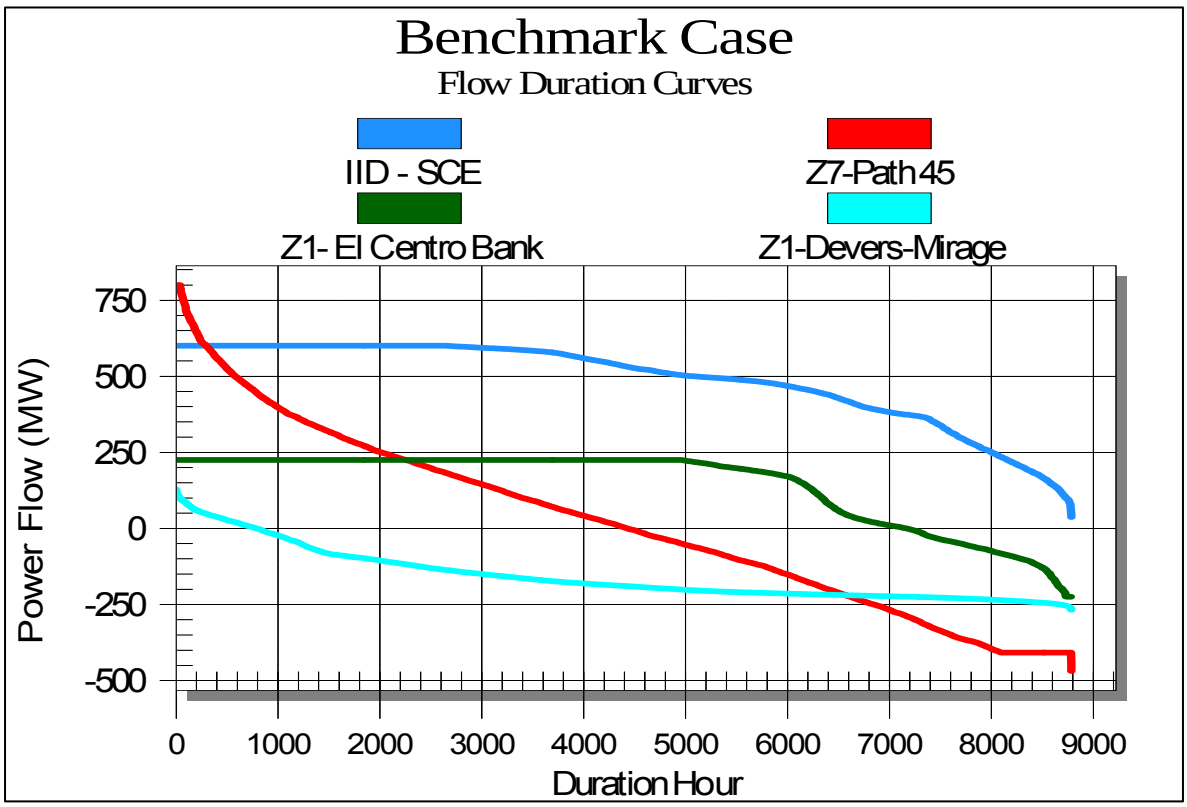
Appendix B: Geothermal Unit Hourly Output With No New Transmission Added

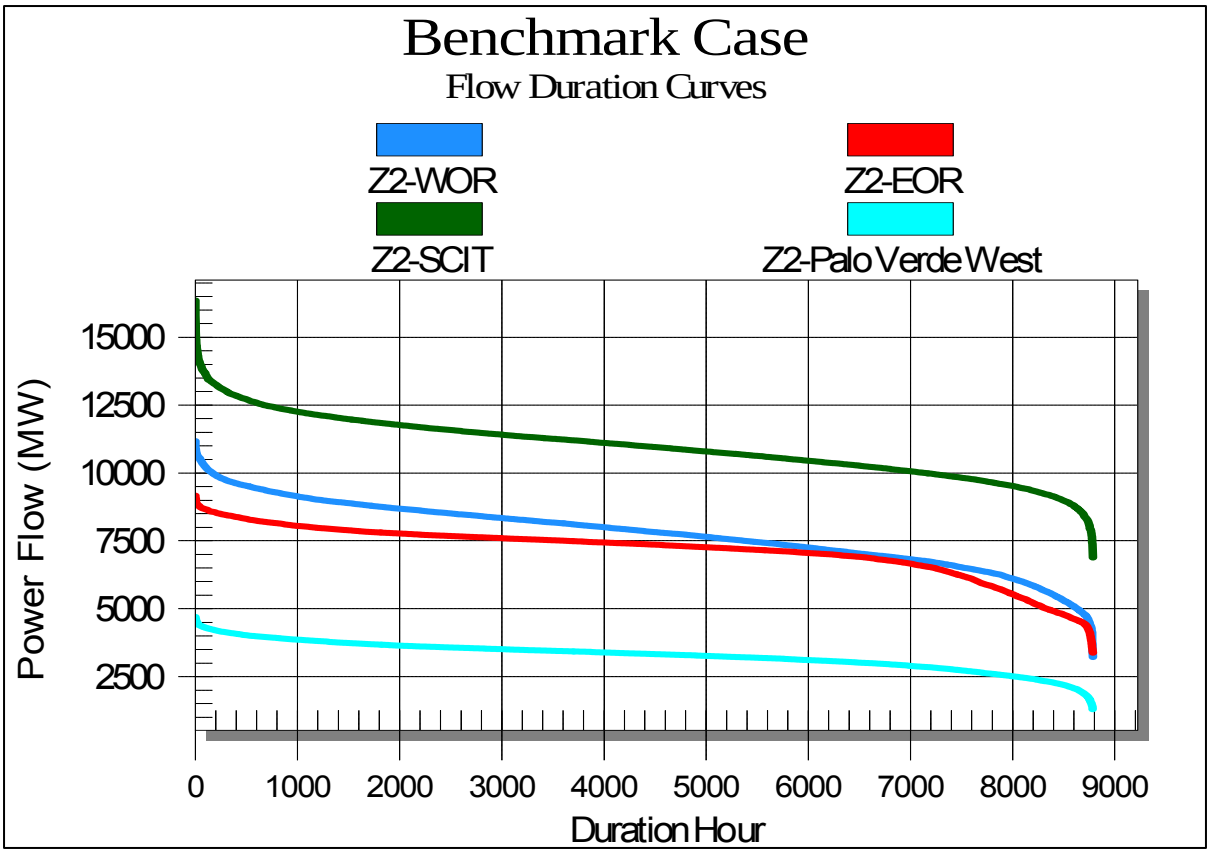


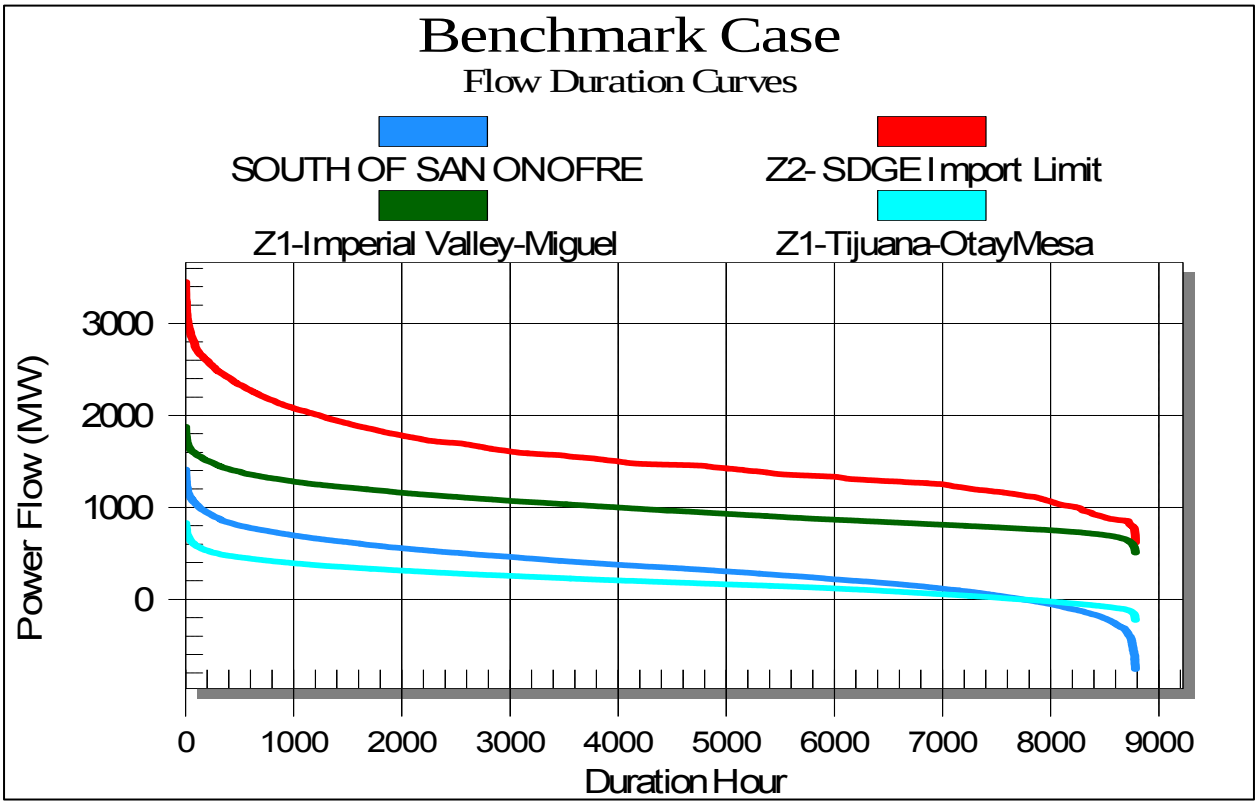

**Geothermal Hourly Output from Benchmark-Sensitivity Case**

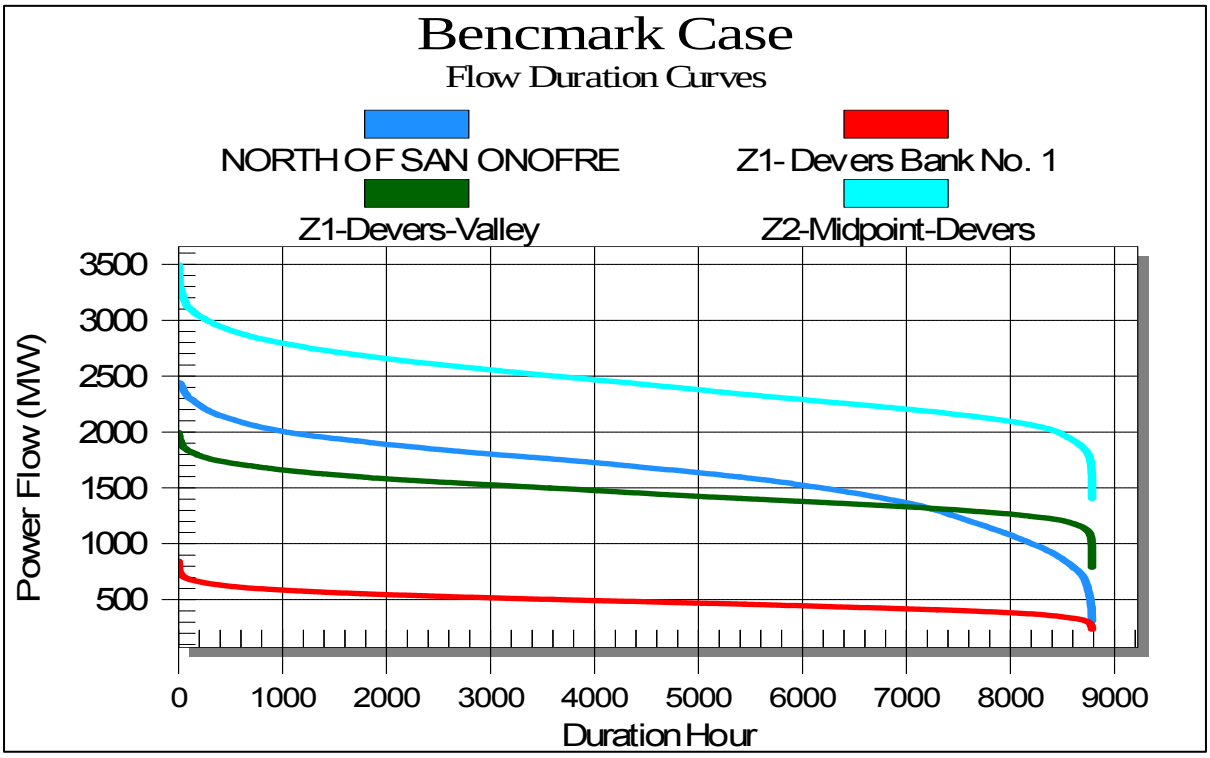
**Appendix C: Flow Duration Curves**

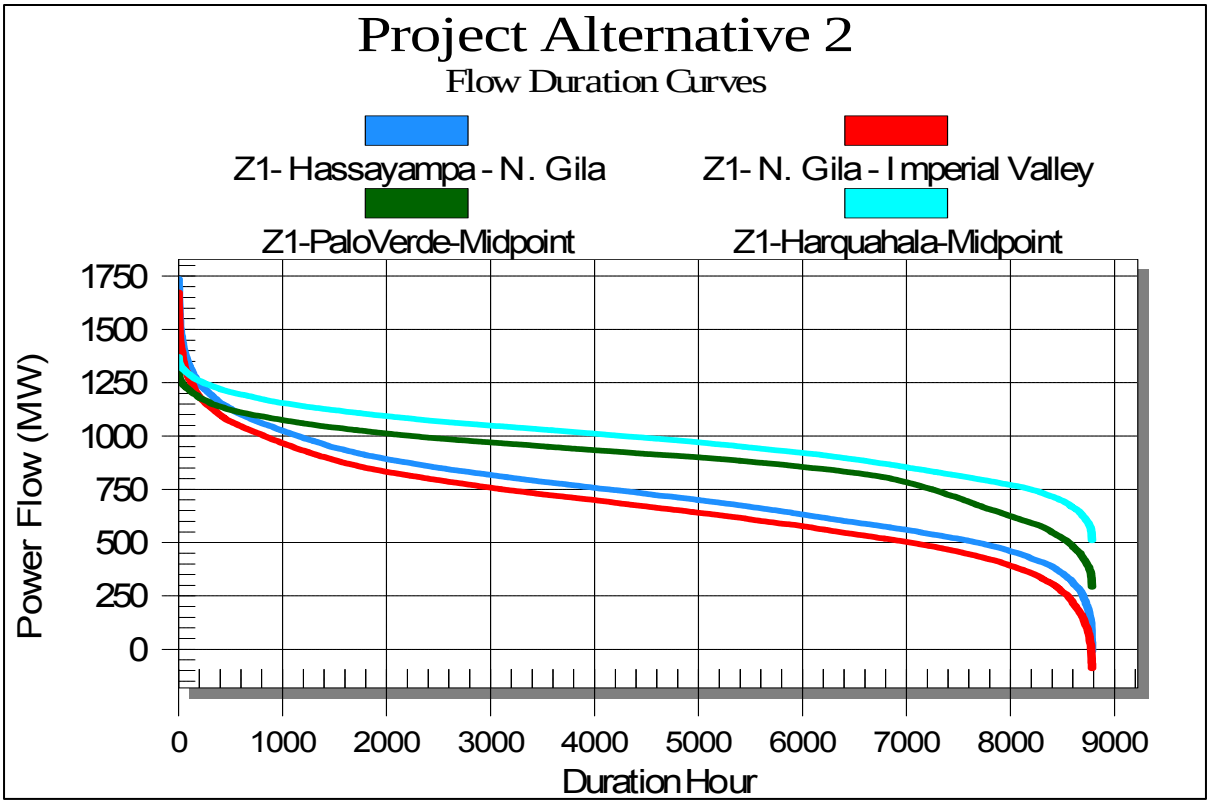


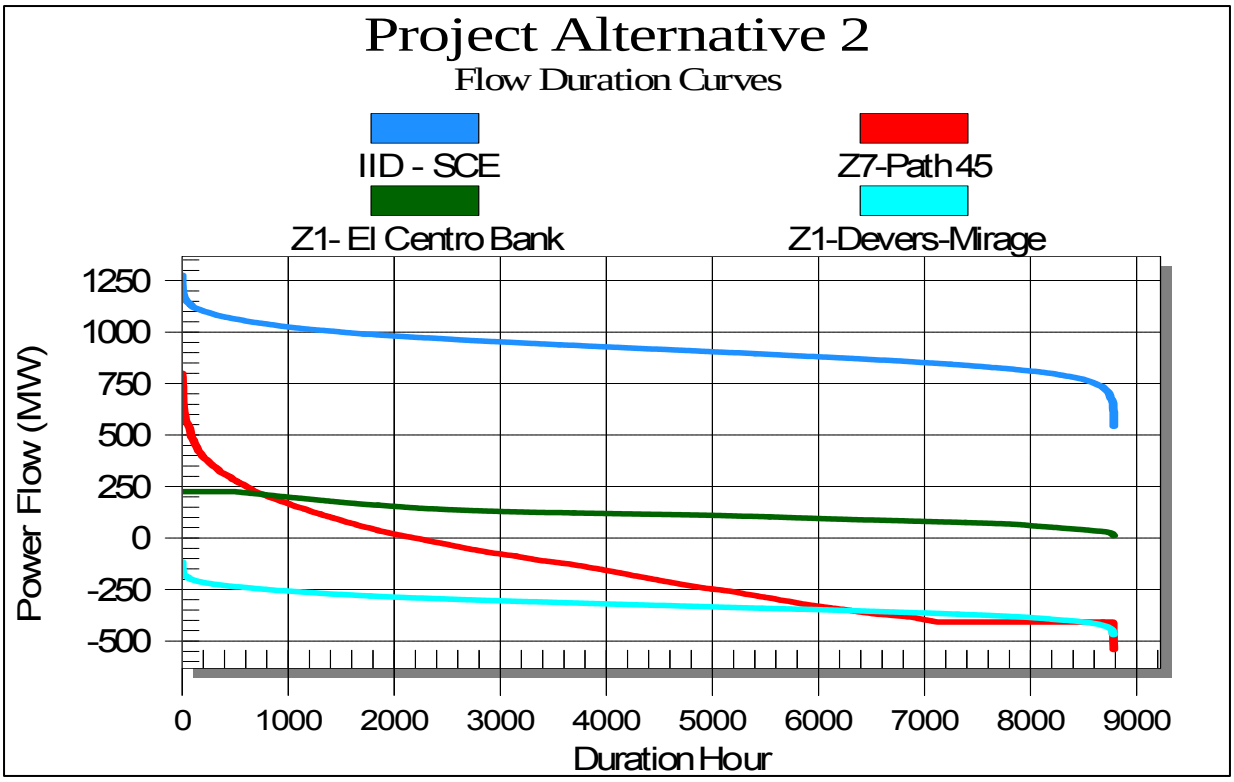



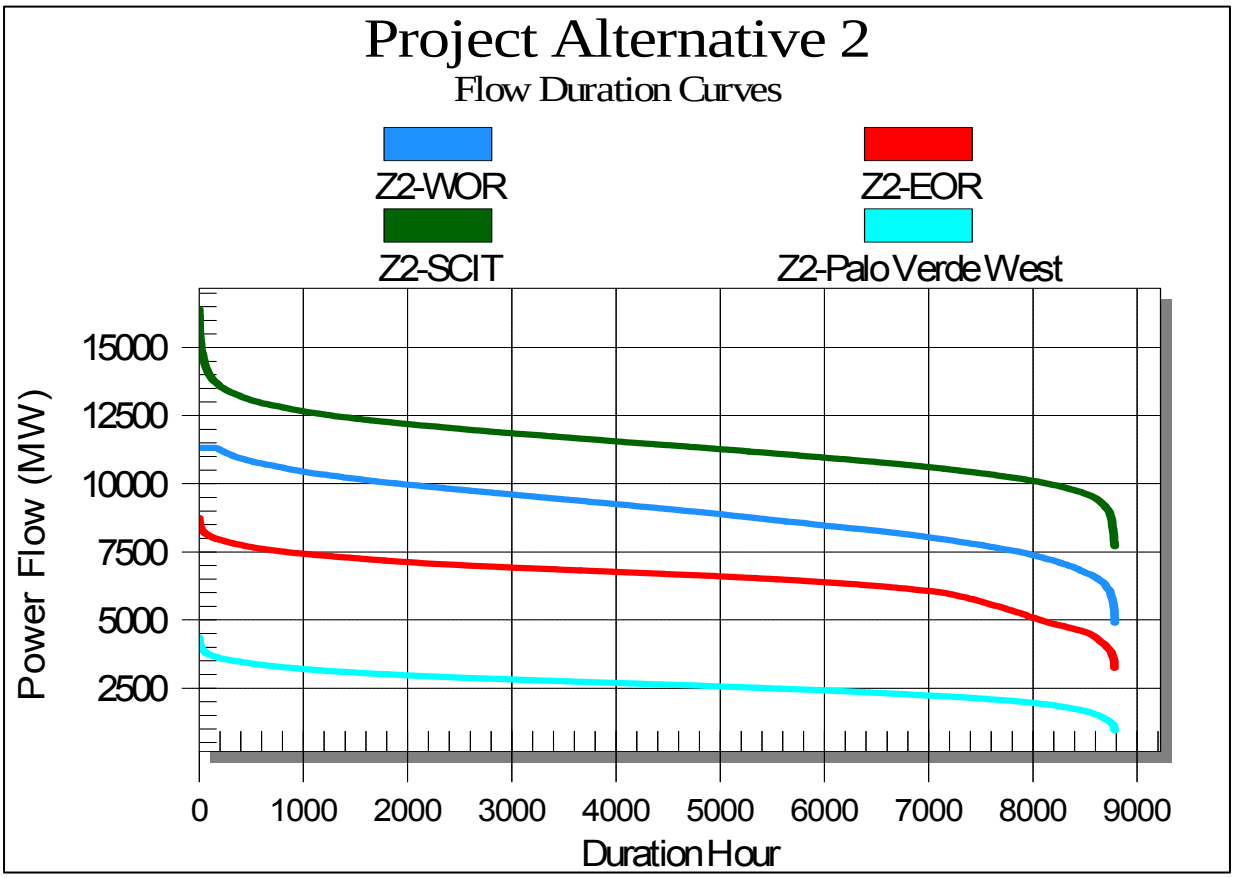

Benchmark Case
Flow Duration Curves
Z2-WOR
Z2-EOR
Z2-SCIT
Z2-Palo Verde West
Power Flow (MW)
15000
12500
10000
7500
5000
2500
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
Duration Hour

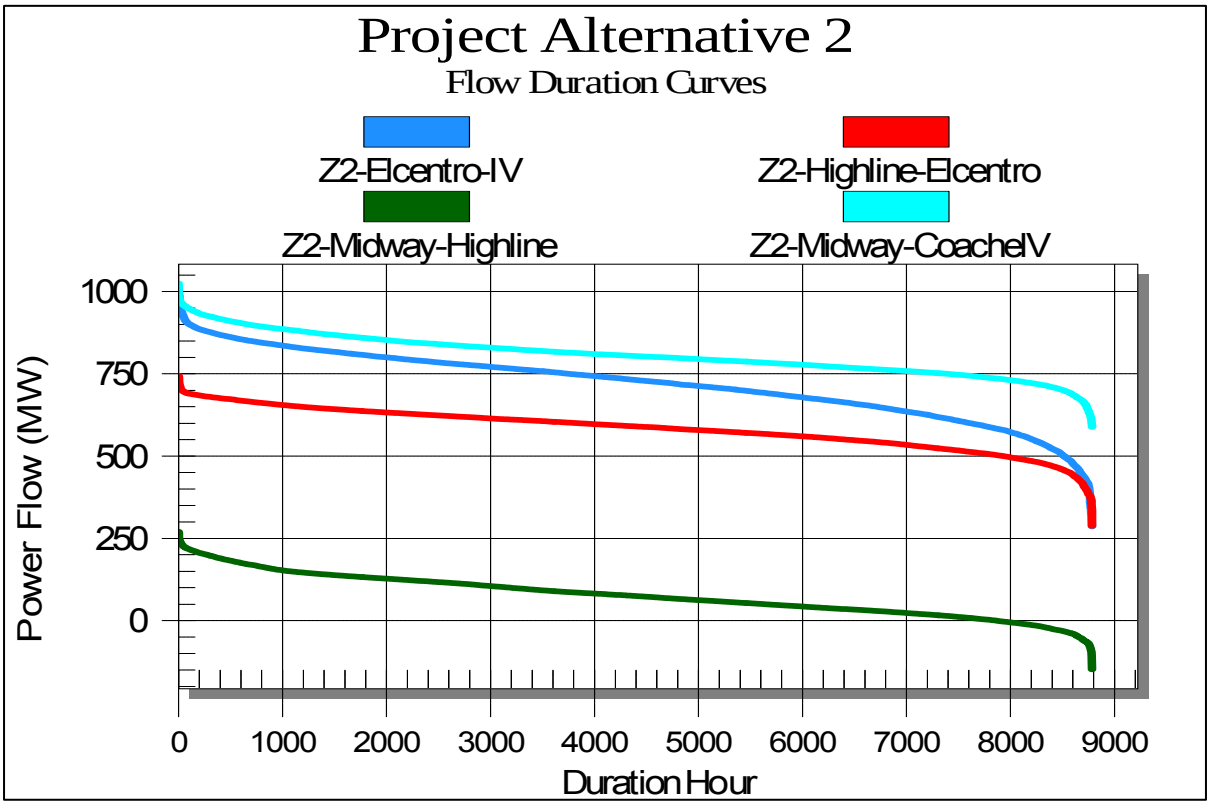

Benchmark Case
Flow Duration Curves
SOUTH OF SAN ONOFRE
Z2- SDGE Import Limit
Z1-Imperial Valley-Miguel
Z1-Tijuana-OtayMesa
Power Flow (MW)
3000
2000
1000
0
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
Duration Hour

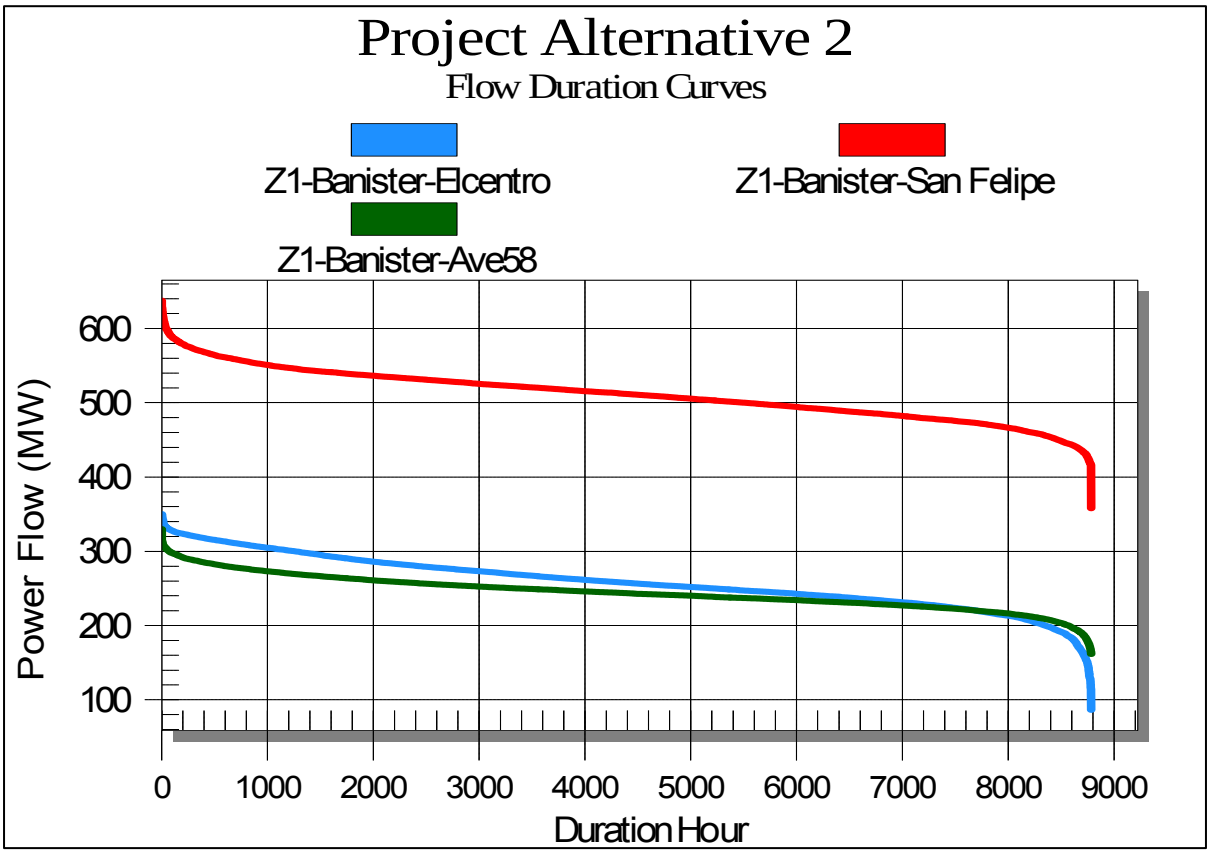

Bencmark Case
Flow Duration Curves
NORTH OF SAN ONOFRE
Z1- Devers Bank No. 1
Z1-Devers-Valley
Z2-Midpoint-Devers
Power Flow (MW)
3500
3000
2500
2000
1500
1000
500
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
Duration Hour

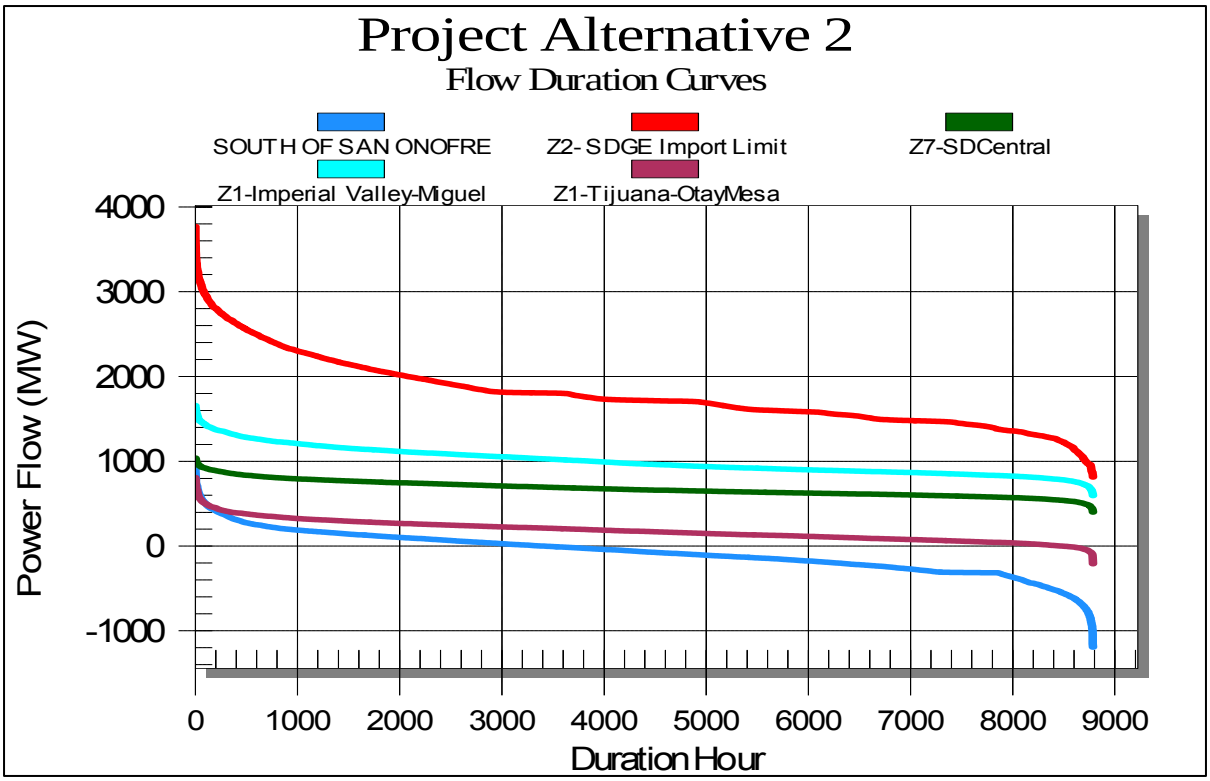

Project Alternative 2
Flow Duration Curves
Z1- Hassayampa - N. Gila
Z1- N. Gila - Imperial Valley
Z1-PaloVerde-Midpoint
Z1-Harquahala-Midpoint
Power Flow (MW)
1750
1500
1250
1000
750
500
250
0
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
Duration Hour

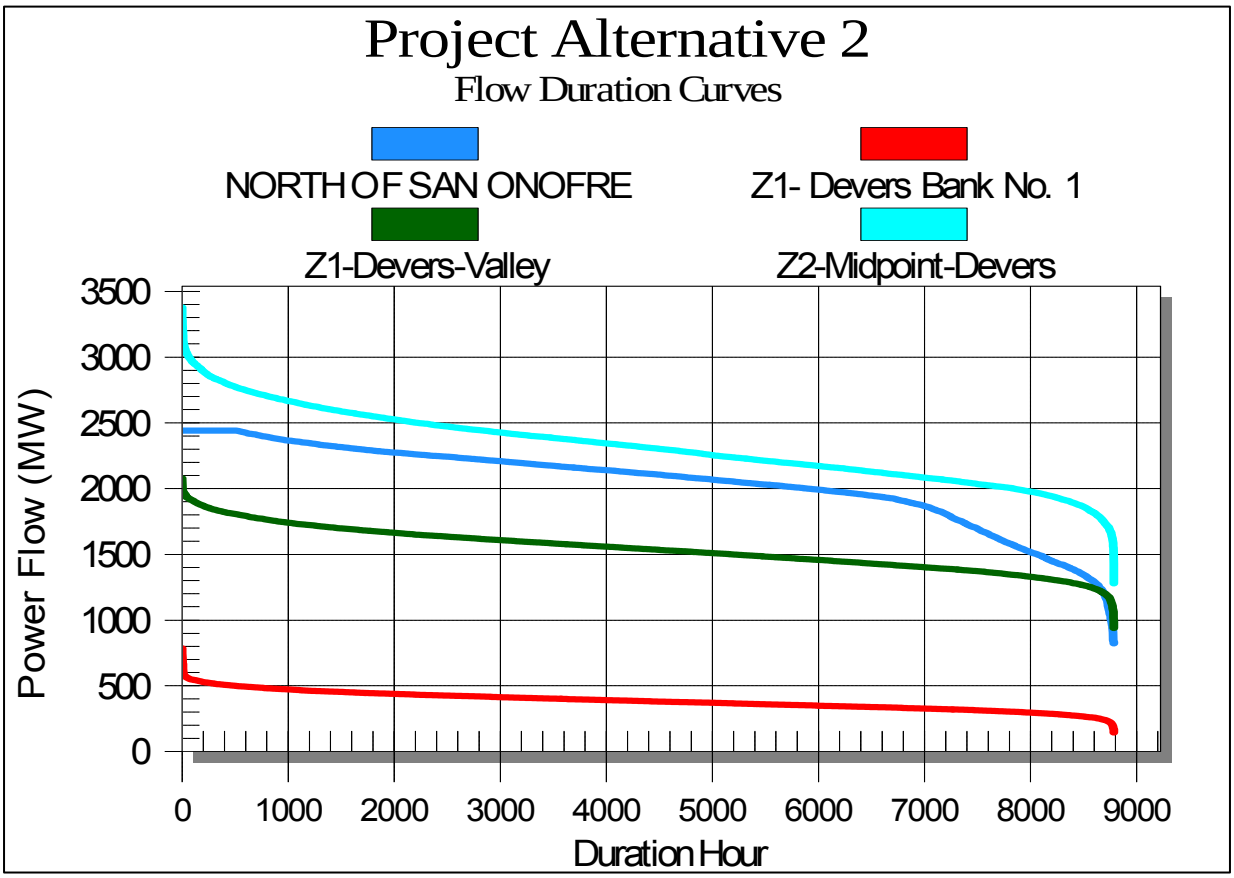

Project Alternative 2
Flow Duration Curves
IID - SCE
Z7-Path 45
Z1- El Centro Bank
Z1-Devers-Mirage
Power Flow (MW)
1250
1000
750
500
250
0
-250
-500
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
Duration Hour

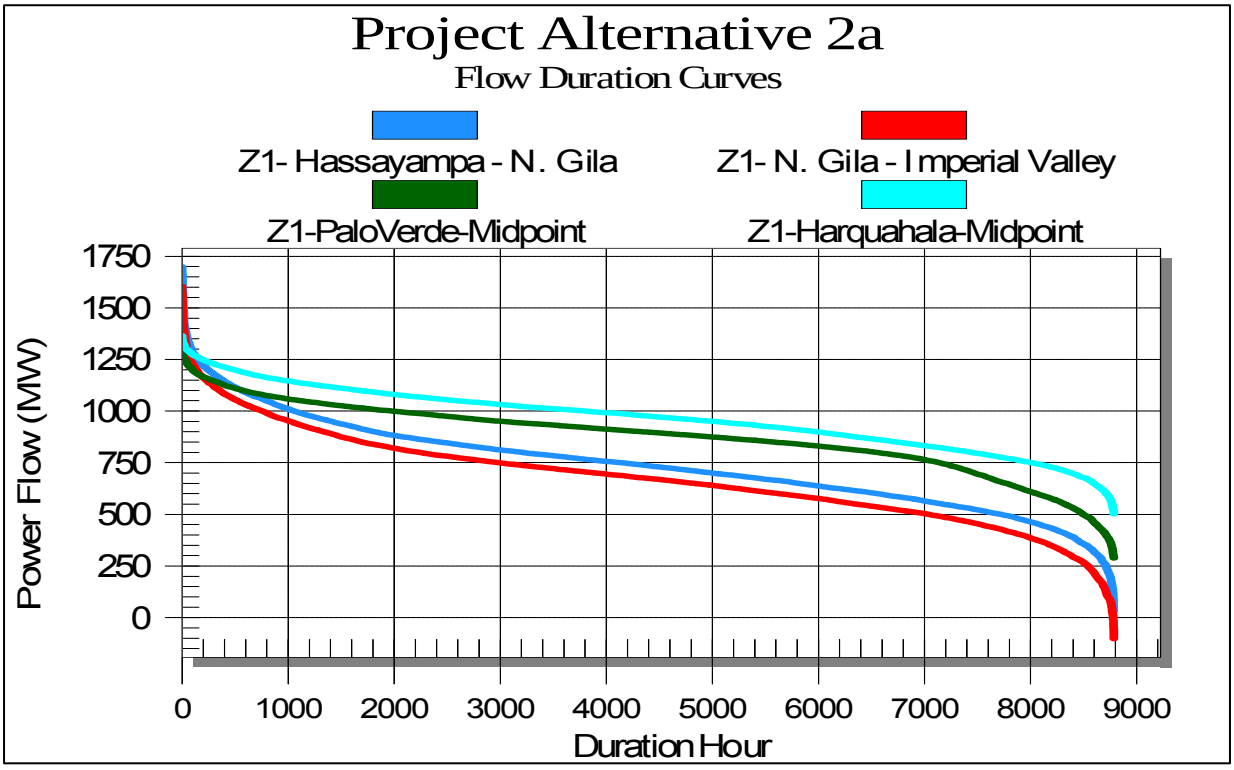

Project Alternative 2
Flow Duration Curves
Z2-WOR
Z2-EOR
Z2-SCIT
Z2-Palo Verde West
Power Flow (MW)
15000
12500
10000
7500
5000
2500
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
Duration Hour

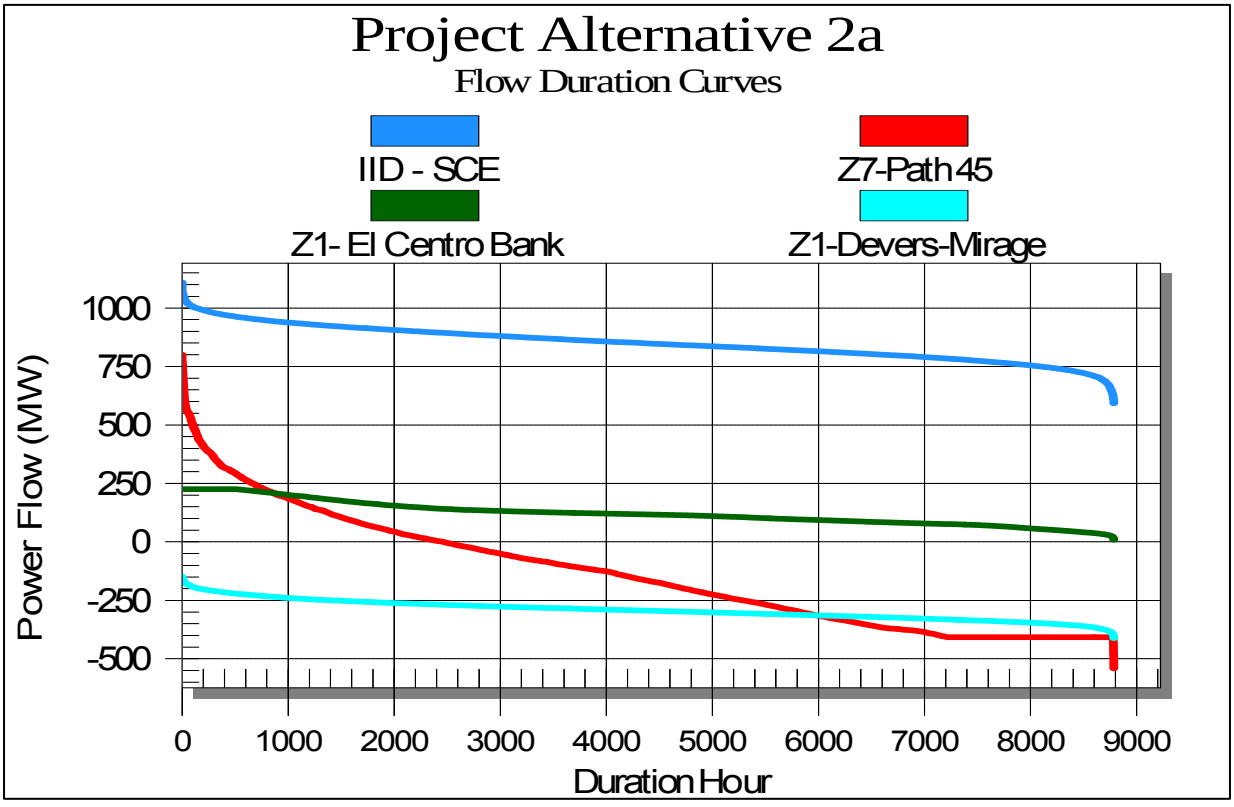

Project Alternative 2
Flow Duration Curves
Z2-Elcentro-IV
Z2-Highline-Elcentro
Z2-Midway-Highline
Z2-Midway-CoachellV
Power Flow (MW)
1000
750
500
250
0
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
Duration Hour

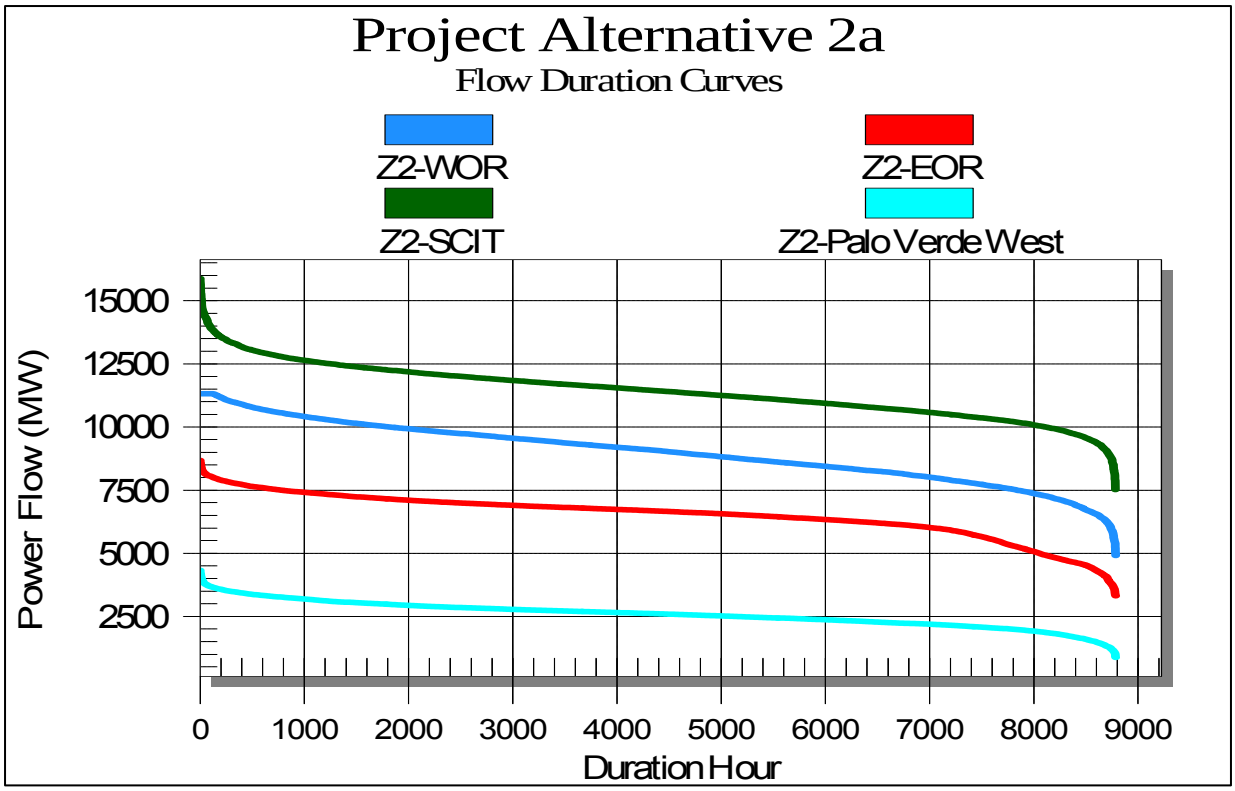

Project Alternative 2
Flow Duration Curves
Z1-Banister-Elcentro
Z1-Banister-San Felipe
Z1-Banister-Ave58
Power Flow (MW)
600
500
400
300
200
100
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
Duration Hour

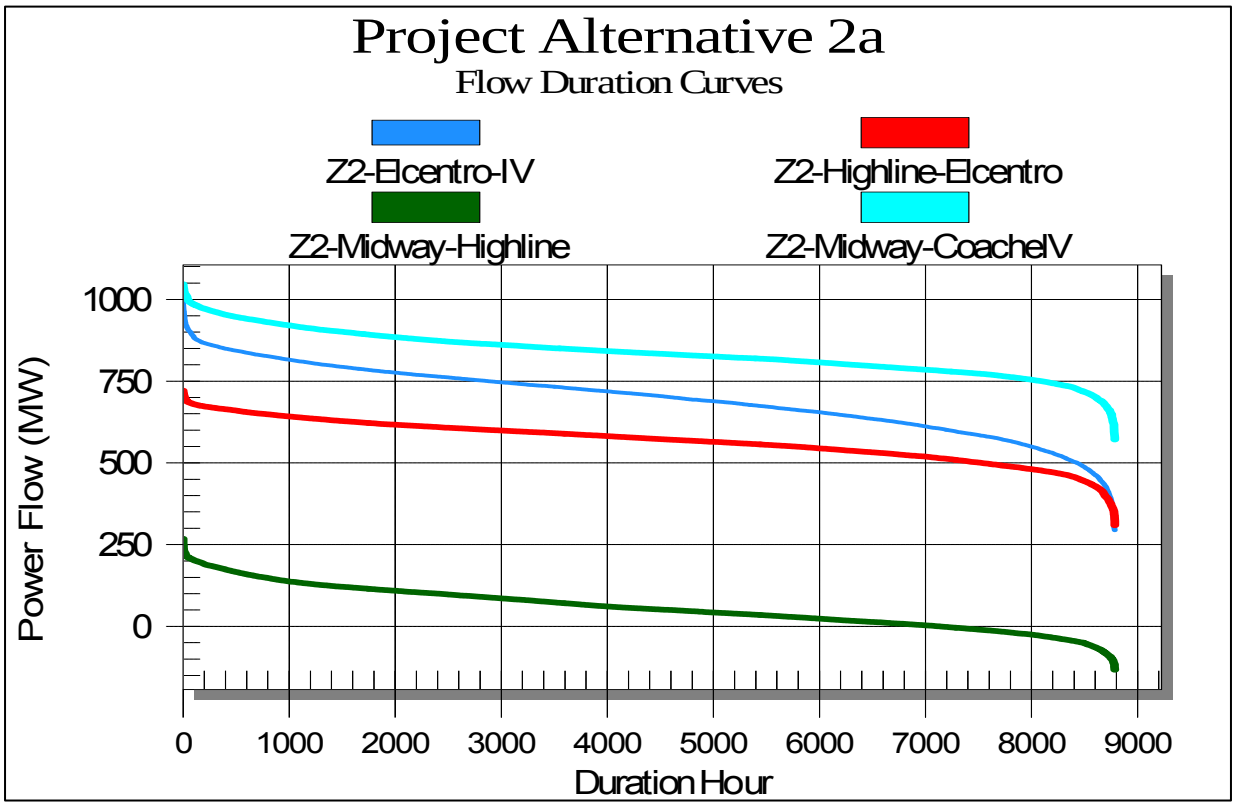

Project Alternative 2
Flow Duration Curves
SOUTH OF SAN ONOFRE
Z2- SDGE Import Limit
Z7-SDCentral
Z1-Imperial Valley-Miguel
Z1-Tijuana-OtayMesa
Power Flow (MW)
4000
3000
2000
1000
0
-1000
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
Duration Hour

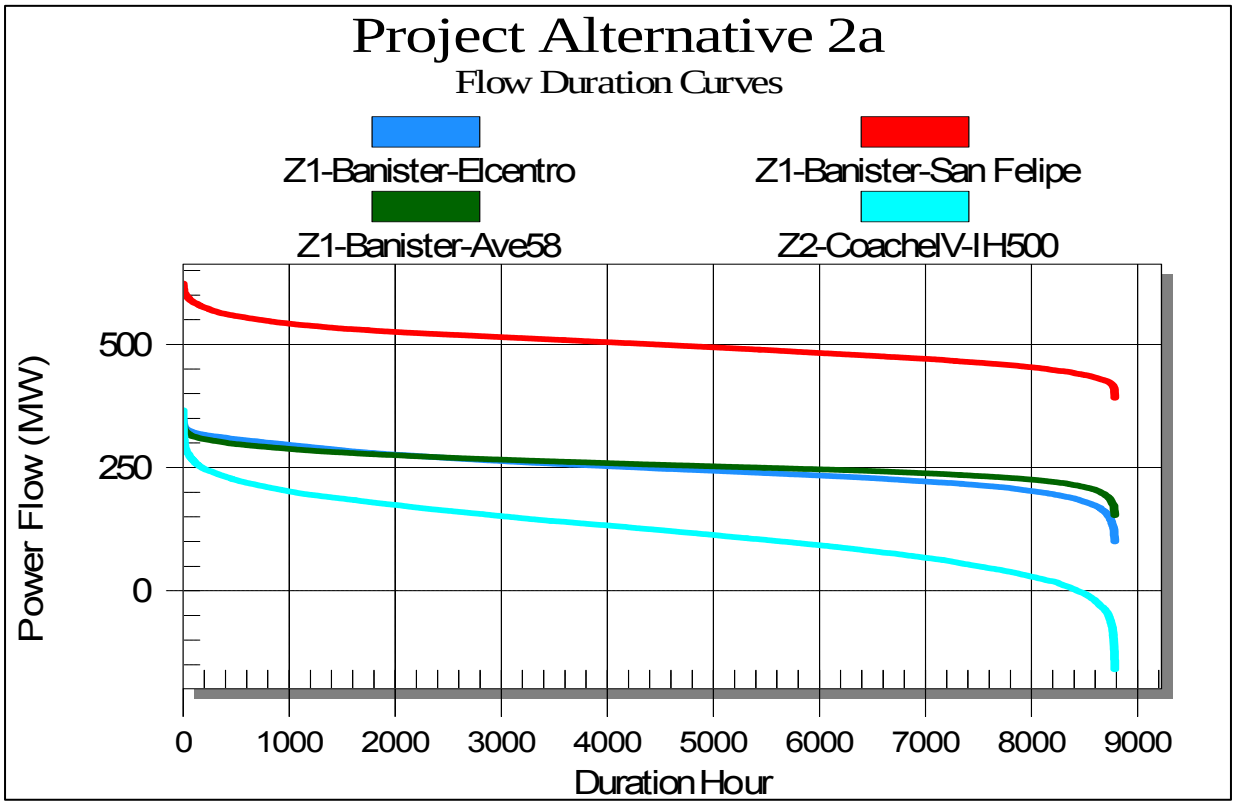

Project Alternative 2
Flow Duration Curves
NORTH OF SAN ONOFRE
Z1- Devers Bank No. 1
Z1-Devers-Valley
Z2-Midpoint-Devers
Power Flow (MW)
3500
3000
2500
2000
1500
1000
500
0
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
Duration Hour

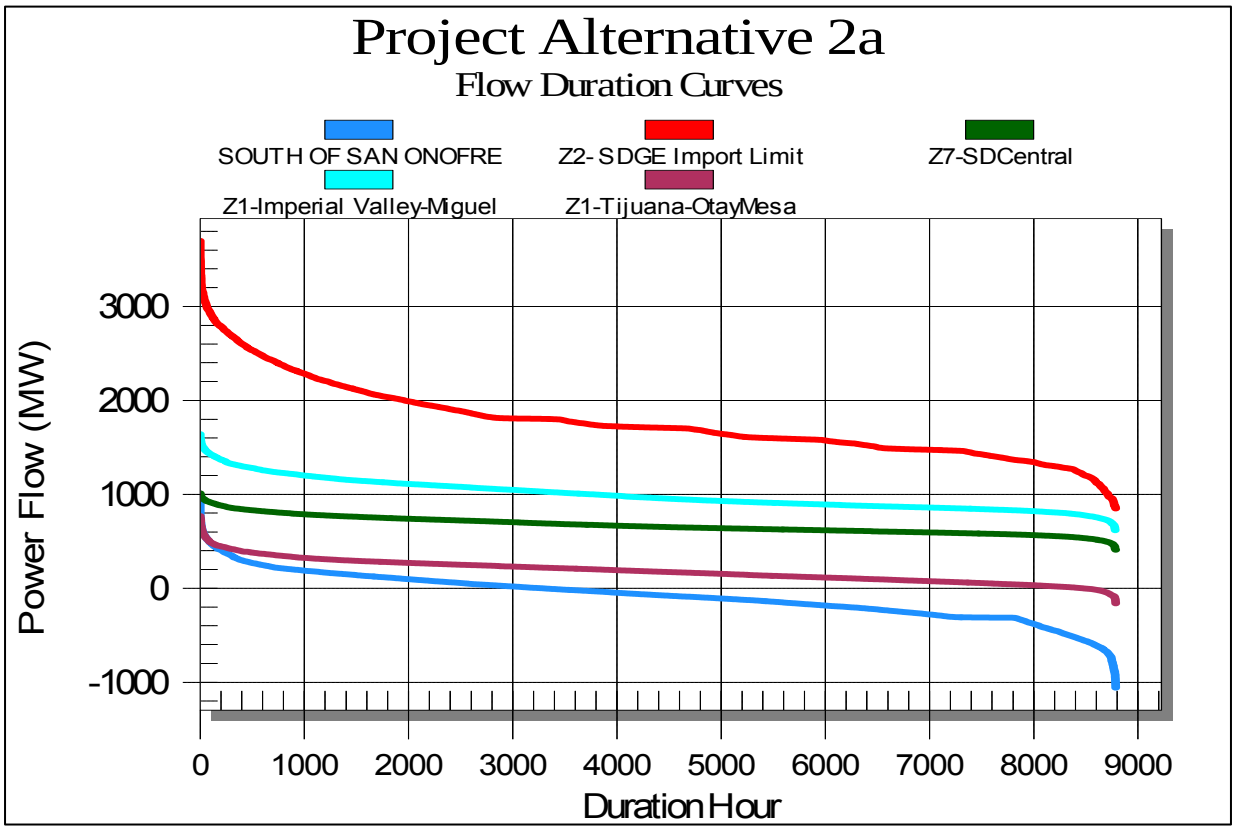

Project Alternative 2a
Flow Duration Curves
Z1- Hassayampa - N. Gila
Z1- N. Gila - Imperial Valley
Z1-PaloVerde-Midpoint
Z1-Harquahala-Midpoint
Power Flow (MW)
1750
1500
1250
1000
750
500
250
0
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
Duration Hour

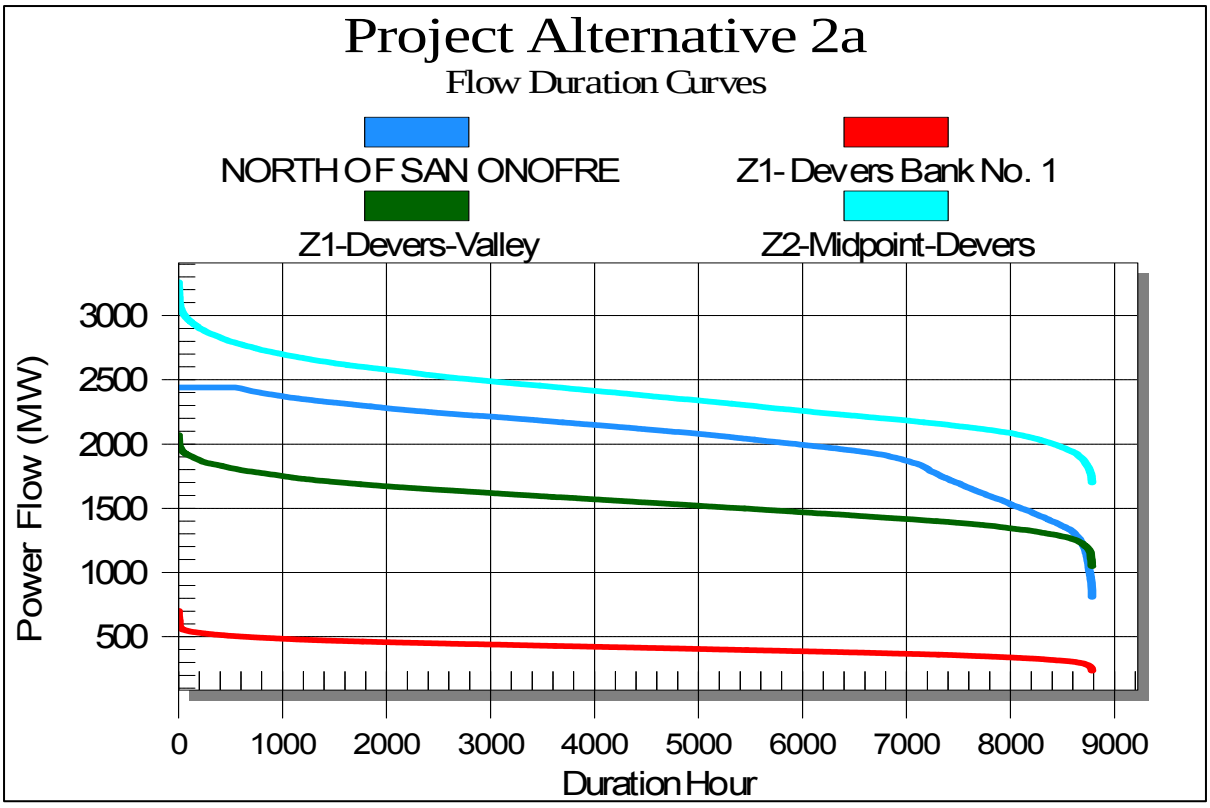

Project Alternative 2a
Flow Duration Curves
IID - SCE
Z7-Path 45
Z1- El Centro Bank
Z1-Devers-Mirage
Power Flow (MW)
1000
750
500
250
0
-250
-500
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
Duration Hour

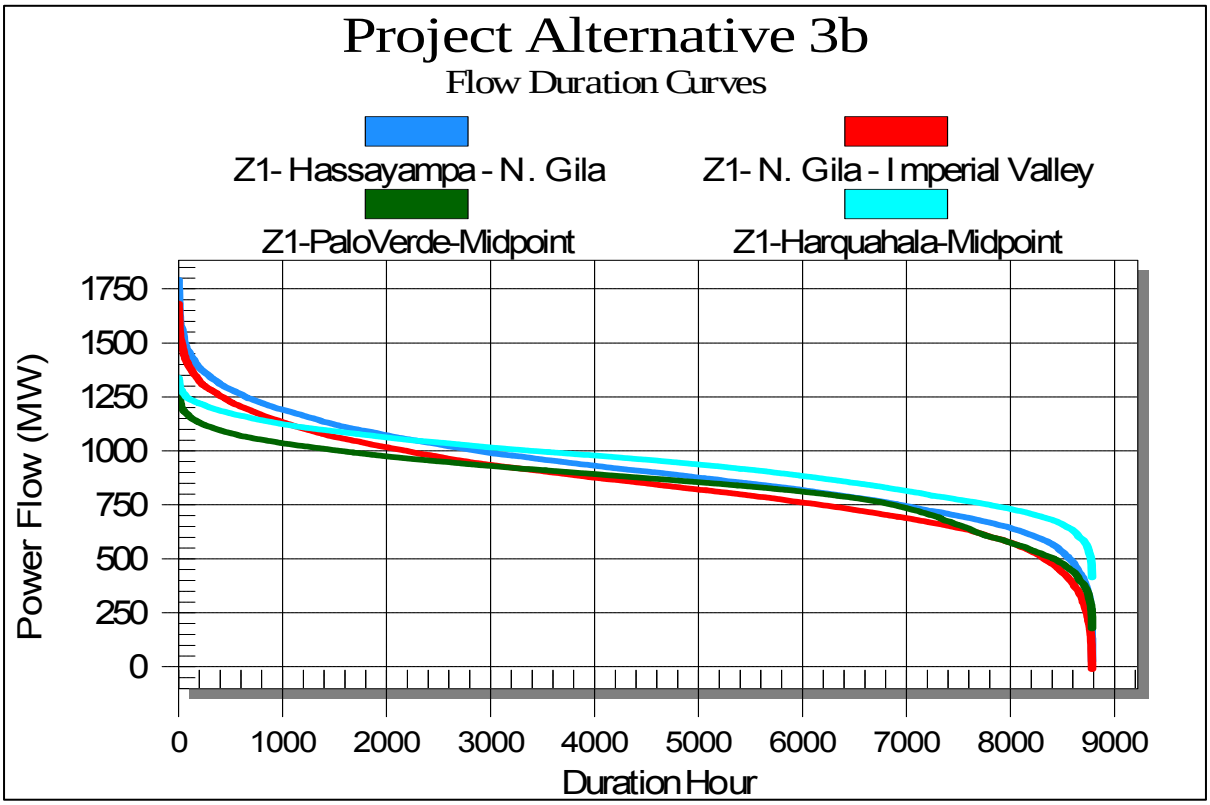

Project Alternative 2a
Flow Duration Curves
Z2-WOR
Z2-EOR
Z2-SCIT
Z2-Palo Verde West
Power Flow (MW)
15000
12500
10000
7500
5000
2500
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
Duration Hour

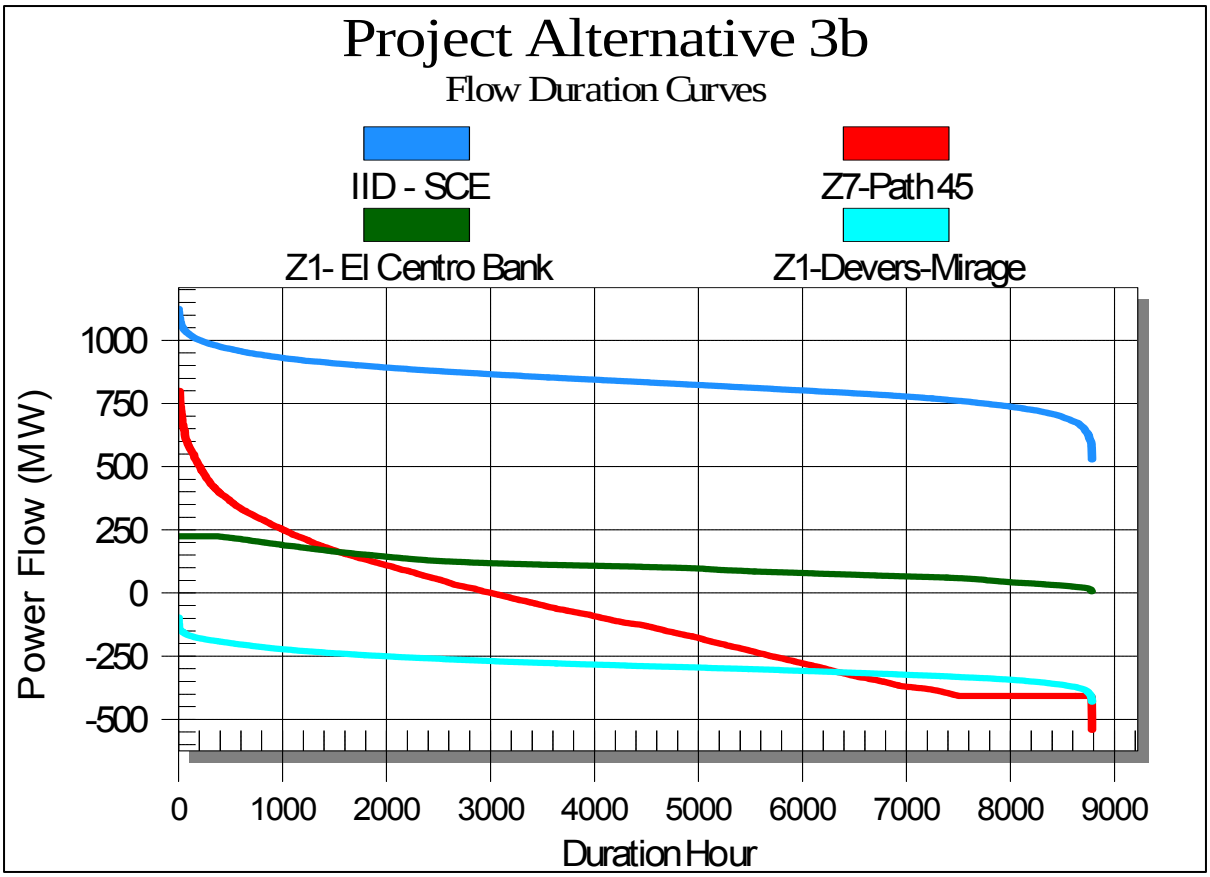

Project Alternative 2a
Flow Duration Curves
Z2-Elcentro-IV
Z2-Highline-Elcentro
Z2-Midway-Highline
Z2-Midway-CoachelV
Power Flow (MW)
1000
750
500
250
0
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
Duration Hour

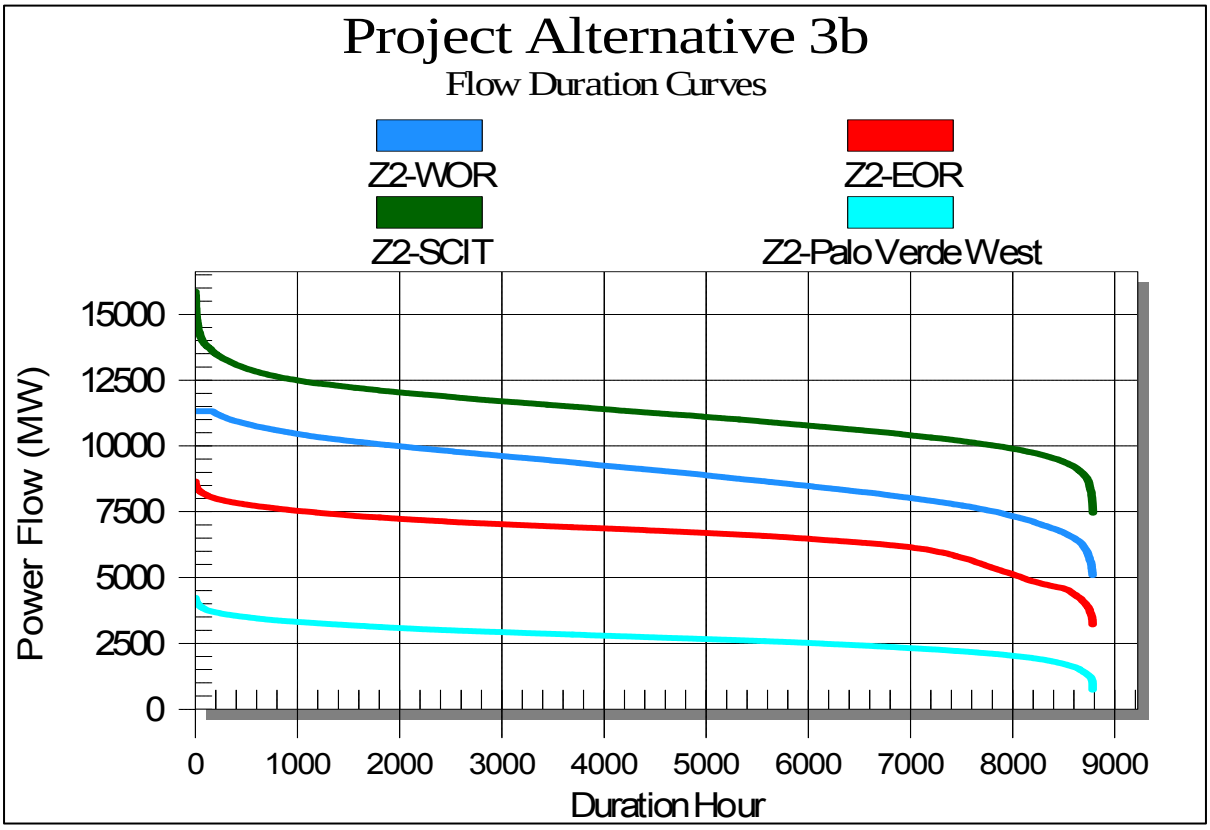

Project Alternative 2a
Flow Duration Curves
Z1-Banister-Elcentro
Z1-Banister-San Felipe
Z1-Banister-Ave58
Z2-CoachellV-IH500
Power Flow (MW)
500
250
0
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
Duration Hour

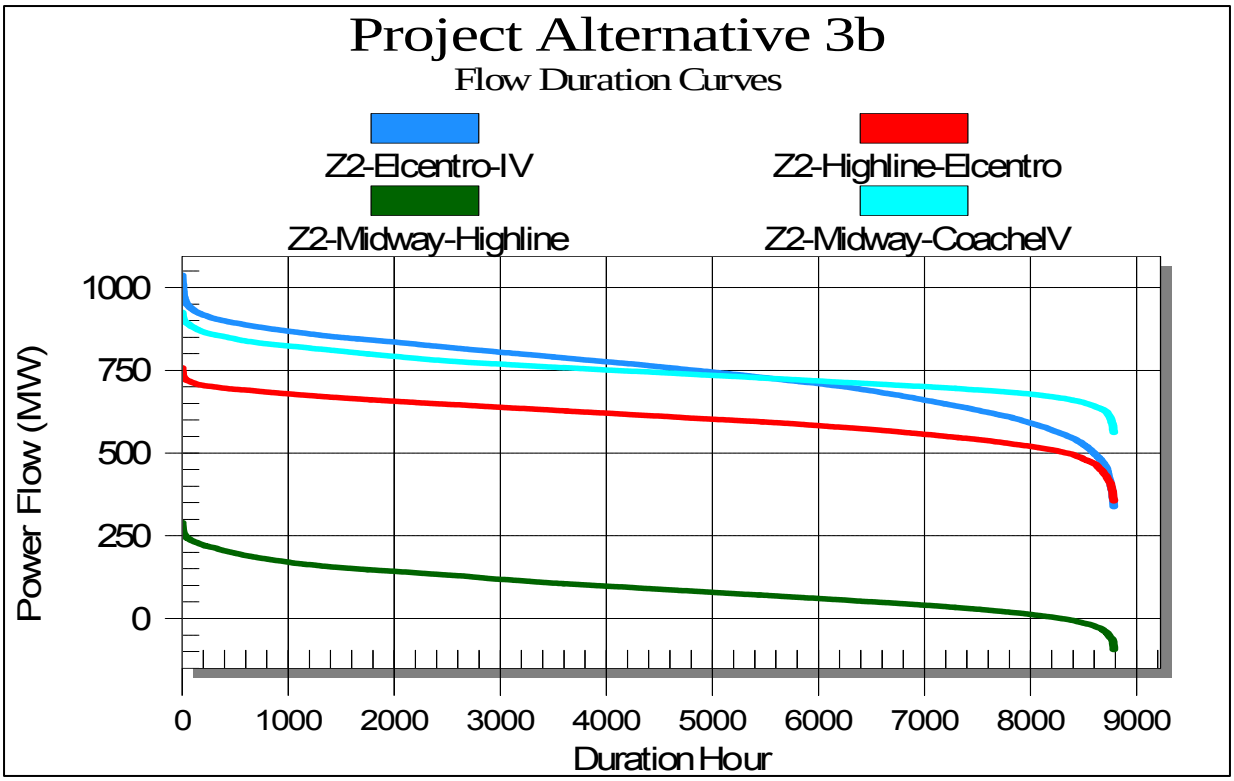

Project Alternative 2a
Flow Duration Curves
SOUTH OF SAN ONOFRE
Z2- SDGE Import Limit
Z7-SDCentral
Z1-Imperial Valley-Miguel
Z1-Tijuana-OtayMesa
Power Flow (MW)
3000
2000
1000
0
-1000
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
Duration Hour

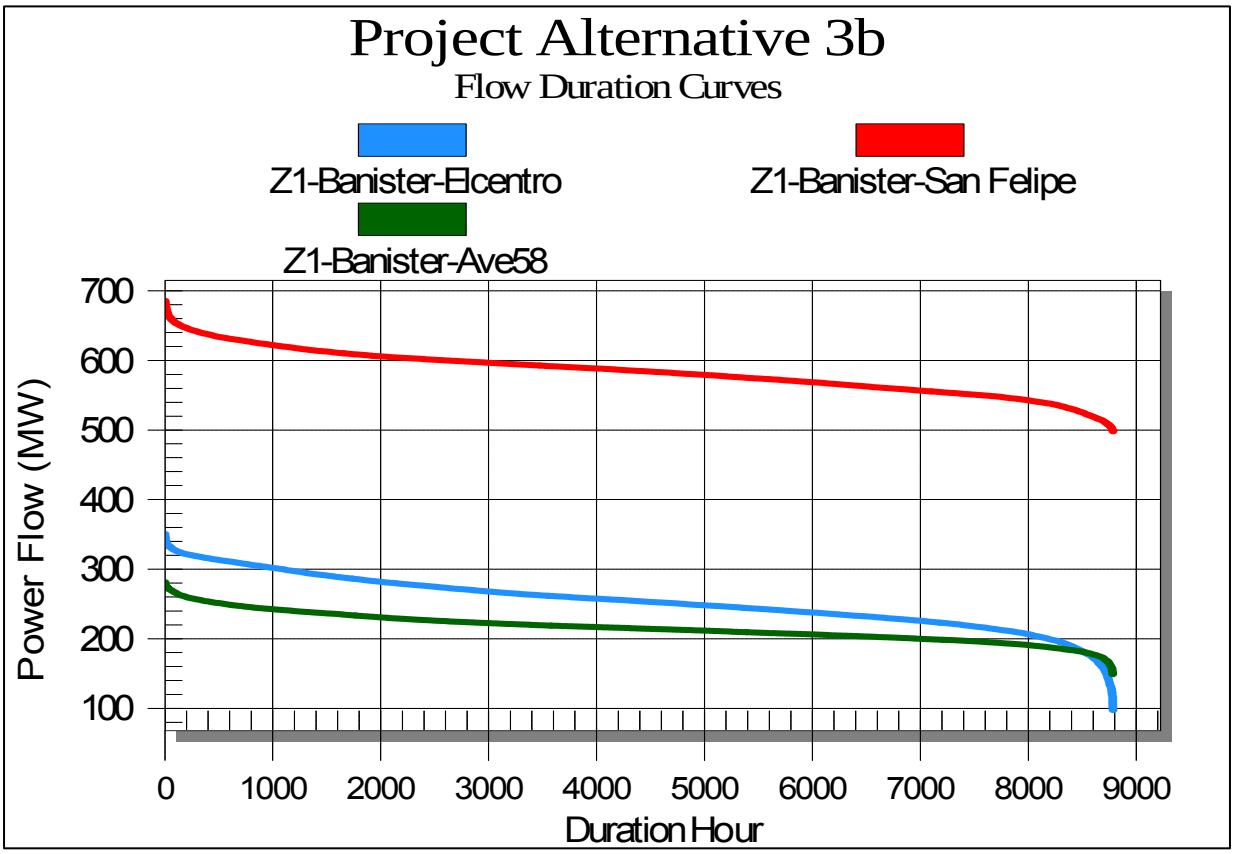

Project Alternative 2a
Flow Duration Curves
NORTH OF SAN ONOFRE
Z1- Devers Bank No. 1
Z1-Devers-Valley
Z2-Midpoint-Devers
Power Flow (MW)
3000
2500
2000
1500
1000
500
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
Duration Hour

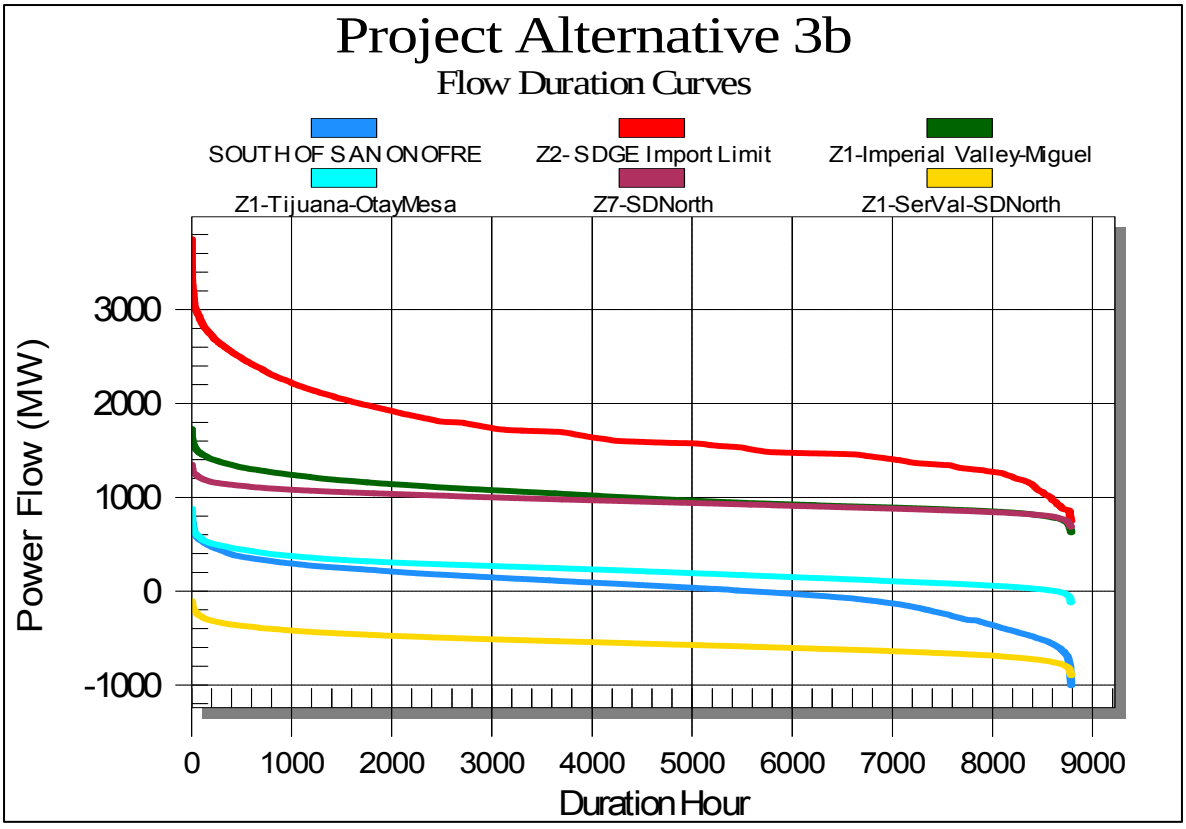

Project Alternative 3b
Flow Duration Curves
Z1- Hassayampa - N. Gila
Z1- N. Gila - Imperial Valley
Z1-PaloVerde-Midpoint
Z1-Harquahala-Midpoint
Power Flow (MW)
1750
1500
1250
1000
750
500
250
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
Duration Hour

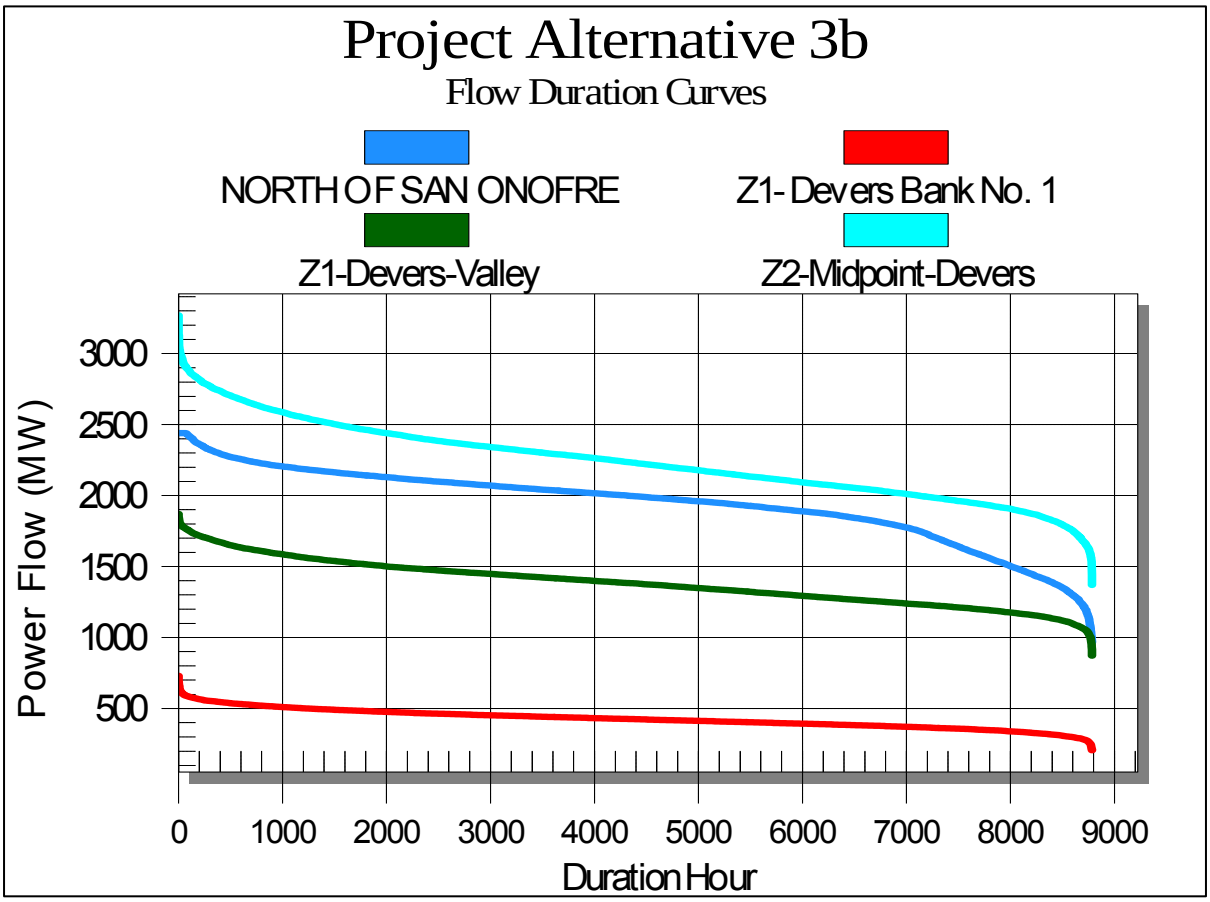

Project Alternative 3b
Flow Duration Curves
IID - SCE
Z7-Path 45
Z1- El Centro Bank
Z1-Devers-Mirage
Power Flow (MW)
1000
750
500
250
0
-250
-500
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
Duration Hour

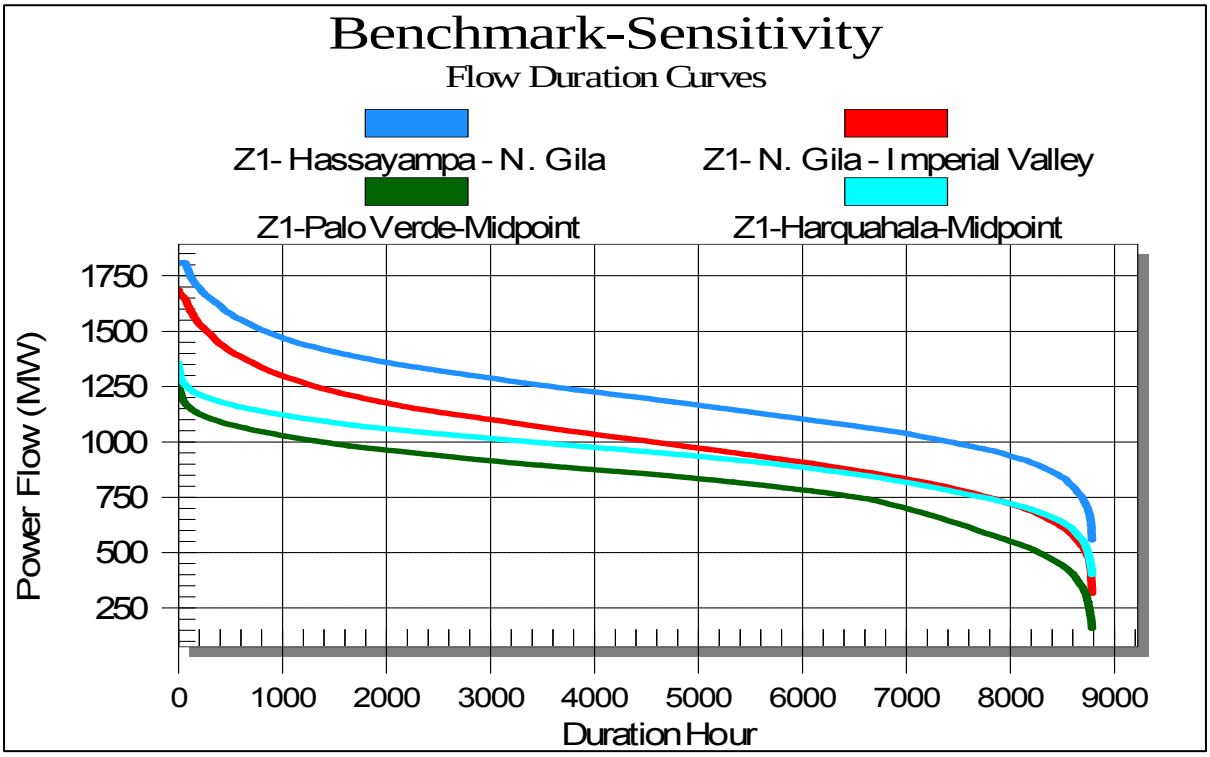

Project Alternative 3b
Flow Duration Curves
Z2-WOR
Z2-EOR
Z2-SCIT
Z2-Palo Verde West
Power Flow (MW)
15000
12500
10000
7500
5000
2500
0
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
Duration Hour

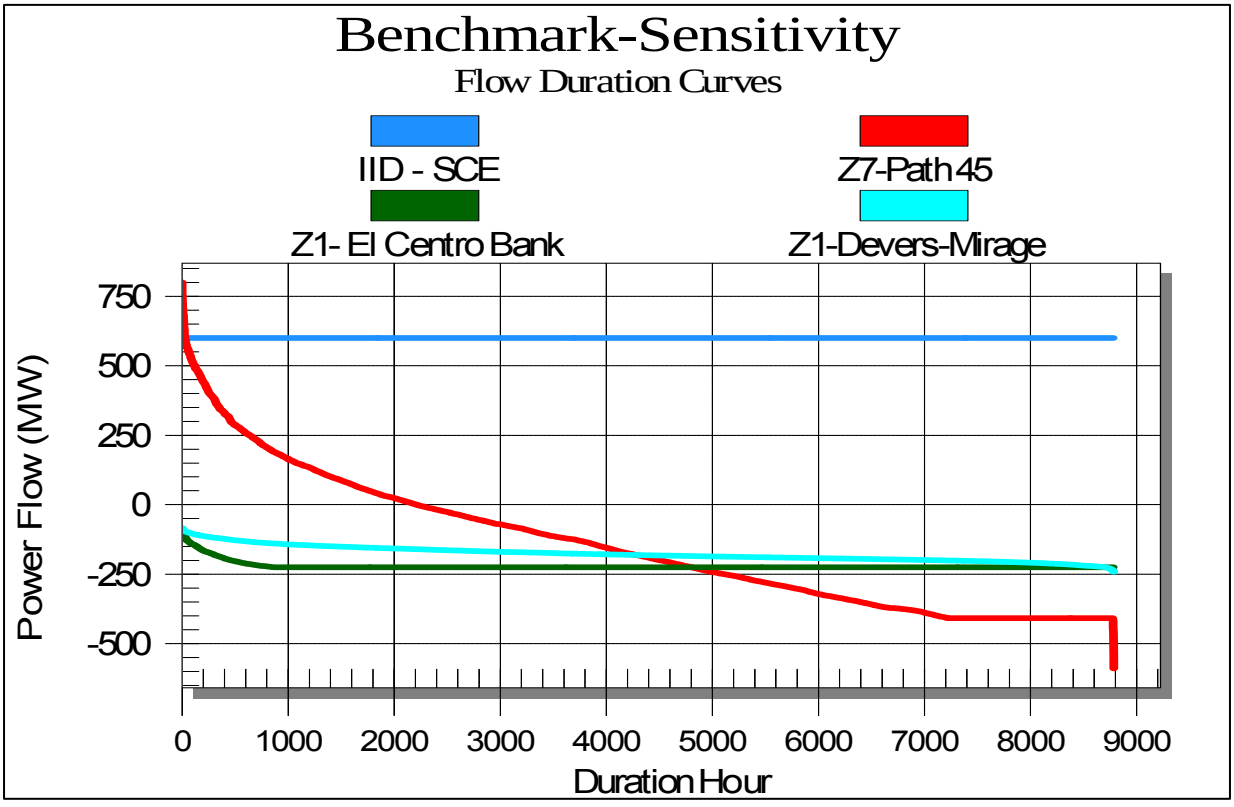

Project Alternative 3b
Flow Duration Curves
Z2-Elcentro-IV
Z2-Highline-Elcentro
Z2-Midway-Highline
Z2-Midway-CoachelV
Power Flow (MW)
1000
750
500
250
0
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
Duration Hour

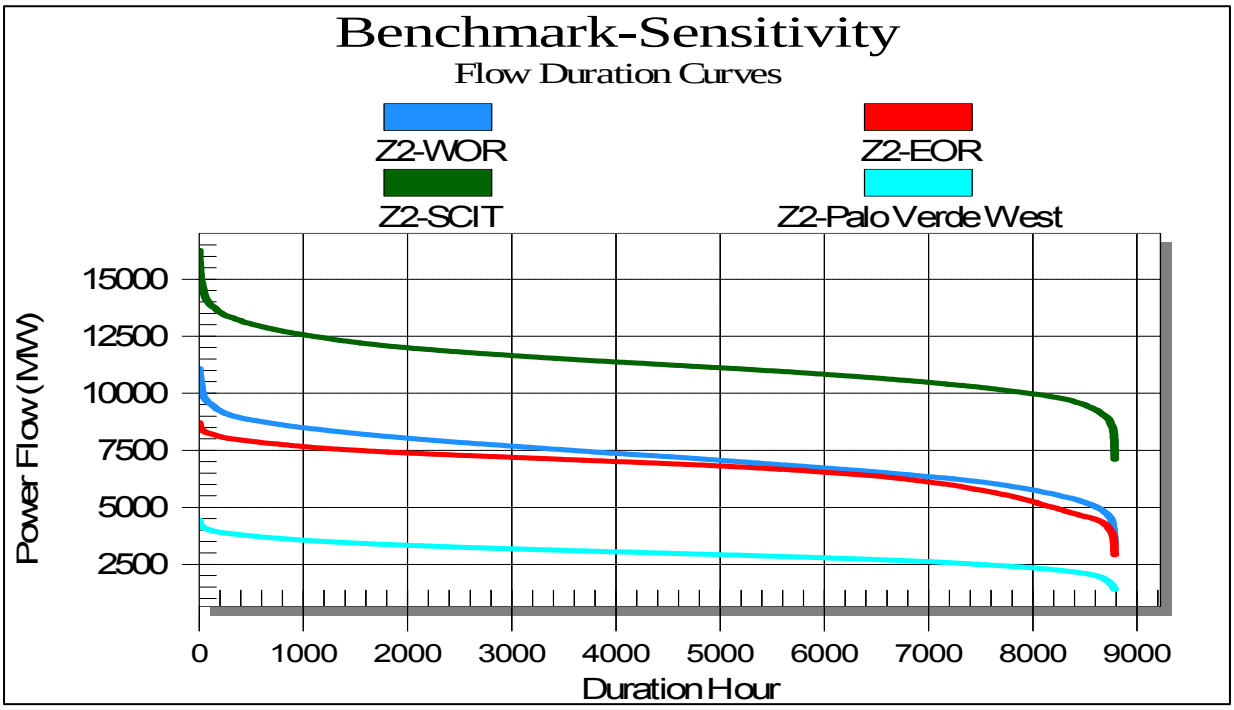

Project Alternative 3b
Flow Duration Curves
Z1-Banister-Elcentro
Z1-Banister-San Felipe
Z1-Banister-Ave58
Power Flow (MW)
700
600
500
400
300
200
100
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
Duration Hour

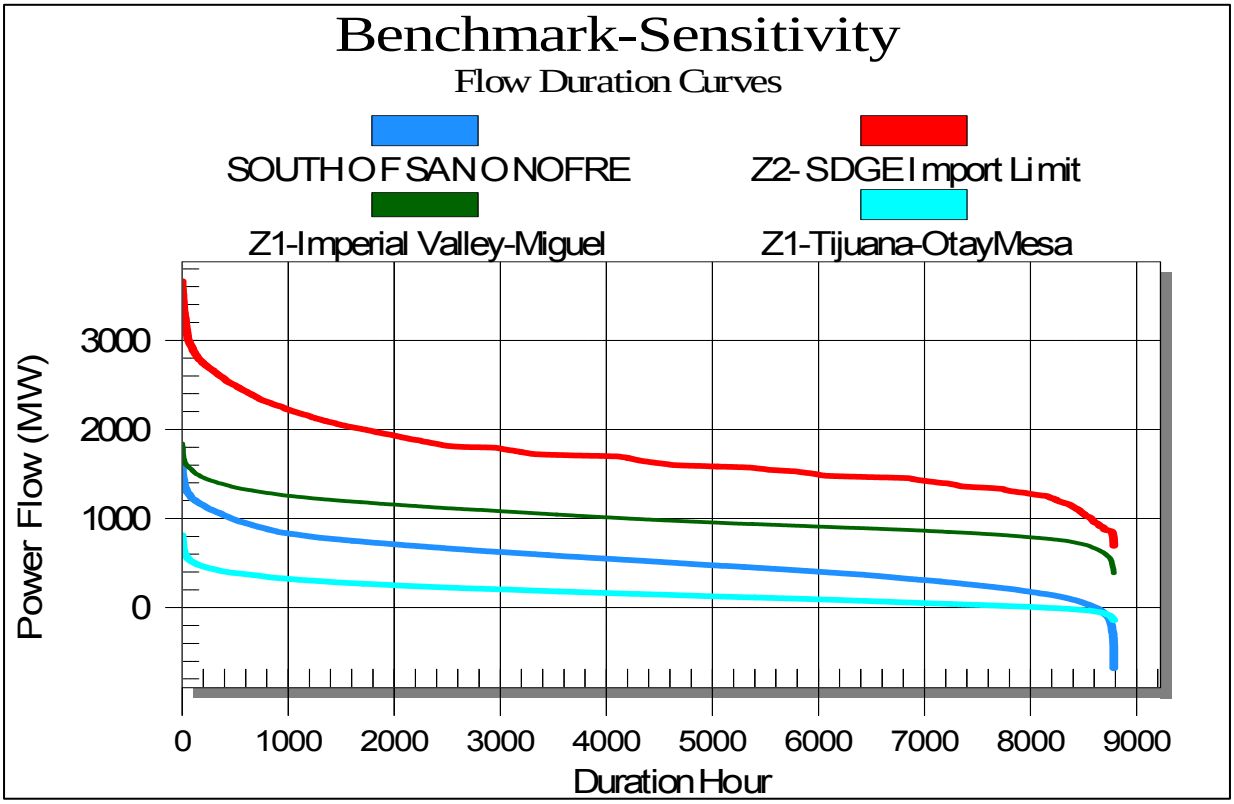

Project Alternative 3b
Flow Duration Curves
SOUTH OF SAN ONOFRE
Z2- SDGE Import Limit
Z1-Imperial Valley-Miguel
Z1-Tijuana-OtayMesa
Z7-SDNorth
Z1-SerVal-SDNorth
Power Flow (MW)
3000
2000
1000
0
-1000
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
Duration Hour

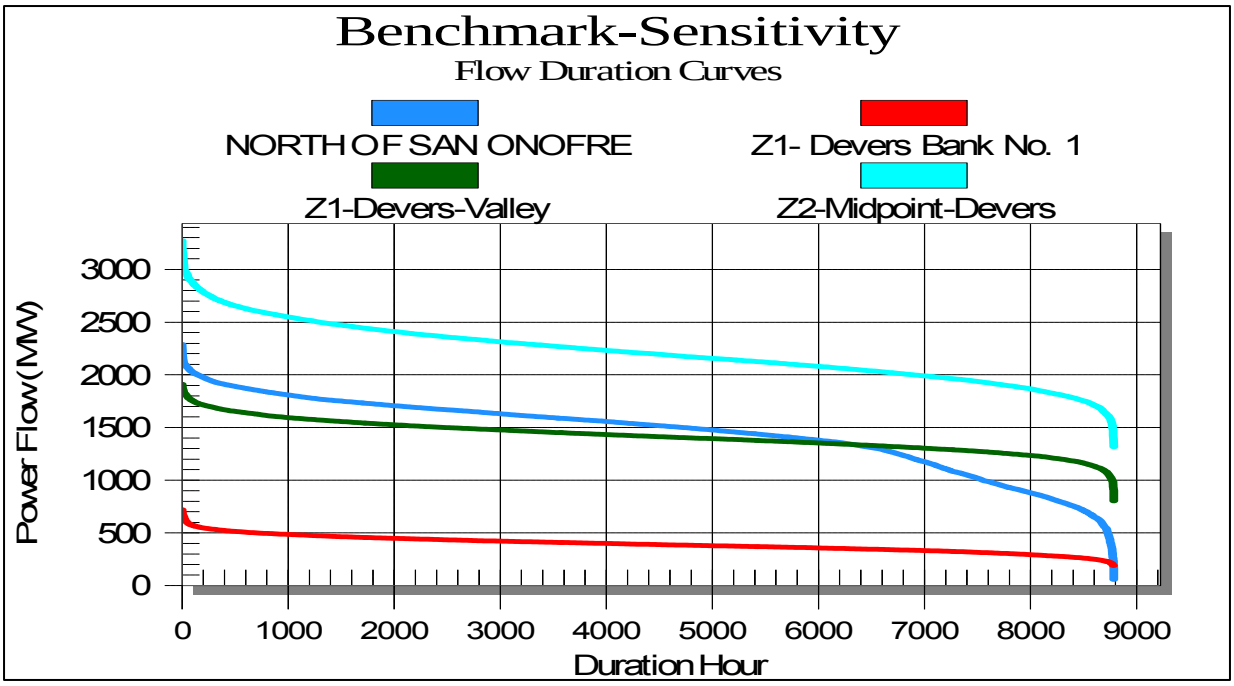

Project Alternative 3b
Flow Duration Curves
NORTH OF SAN ONOFRE
Z1- Devers Bank No. 1
Z1-Devers-Valley
Z2-Midpoint-Devers
Power Flow (MW)
3000
2500
2000
1500
1000
500
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
Duration Hour

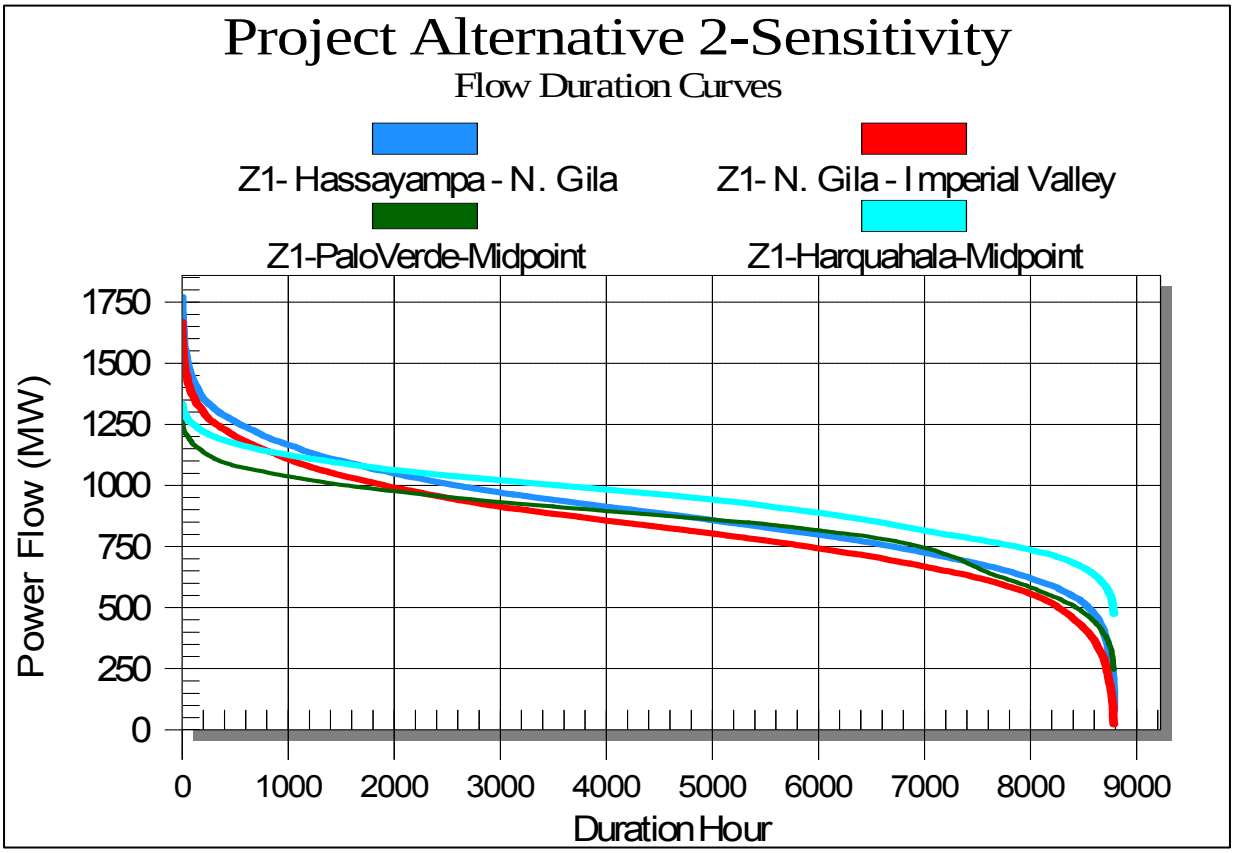

Benchmark-Sensitivity
Flow Duration Curves
Z1- Hassayampa - N. Gila
Z1- N. Gila - Imperial Valley
Z1-Palo Verde-Midpoint
Z1-Harquahala-Midpoint
Power Flow (MW)
1750
1500
1250
1000
750
500
250
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
Duration Hour

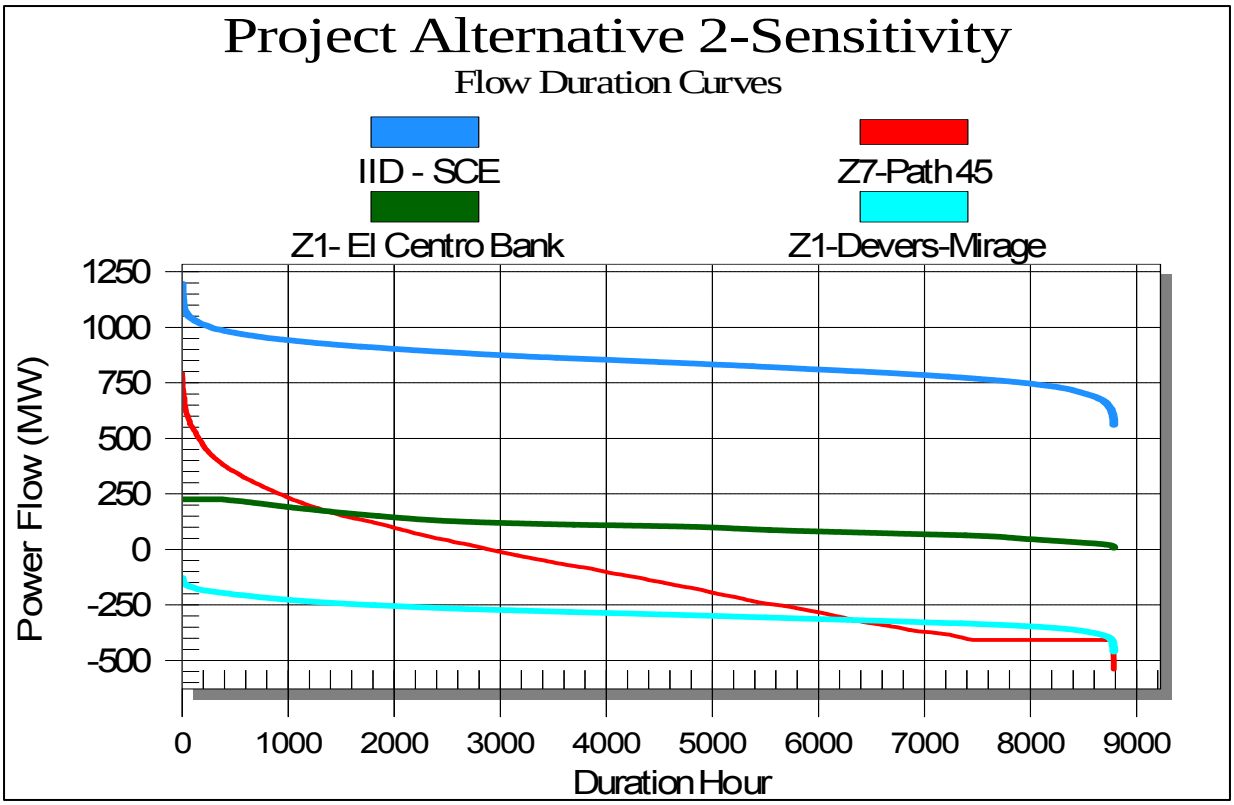

Benchmark-Sensitivity
Flow Duration Curves
IID - SCE
Z7-Path 45
Z1- El Centro Bank
Z1-Devers-Mirage
Power Flow (MW)
750
500
250
0
-250
-500
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
Duration Hour

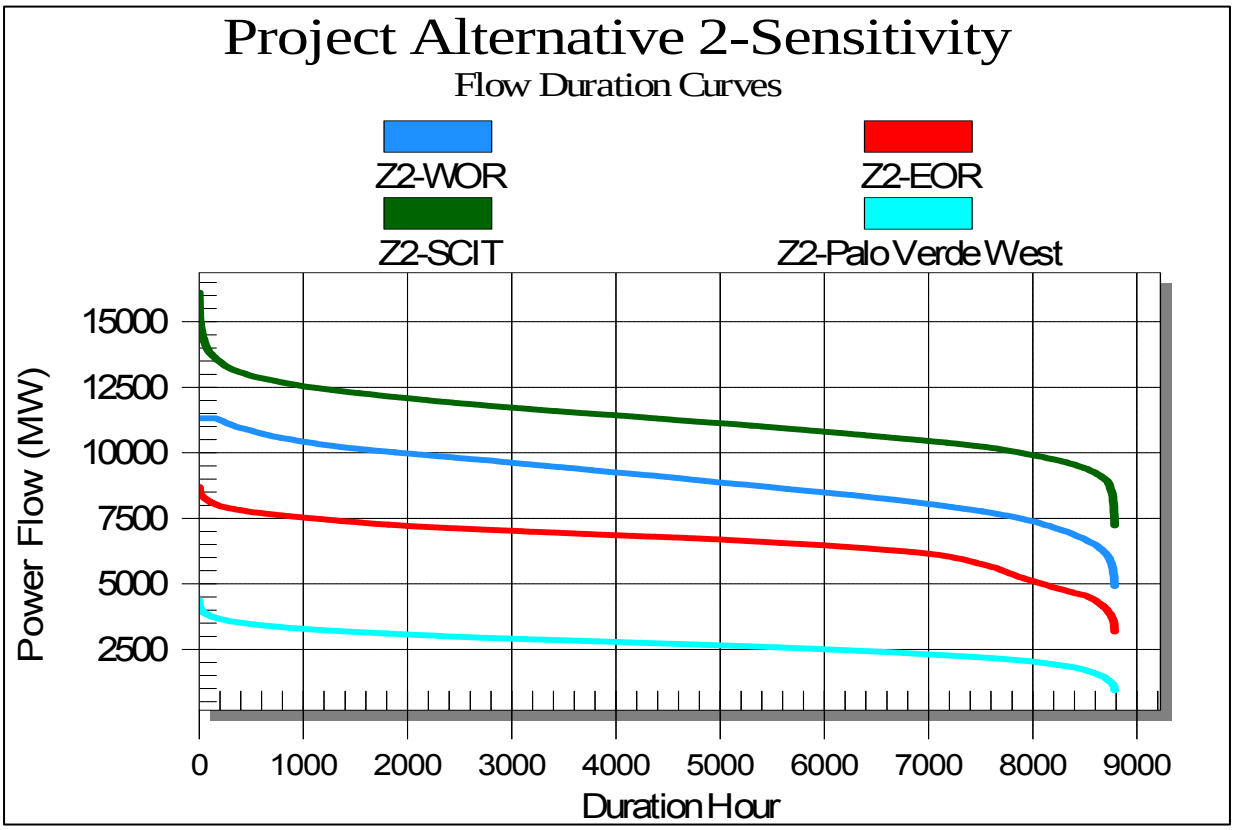

Benchmark-Sensitivity
Flow Duration Curves
Z2-WOR
Z2-EOR
Z2-SCIT
Z2-Palo Verde West
Power Flow (MW)
15000
12500
10000
7500
5000
2500
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
Duration Hour

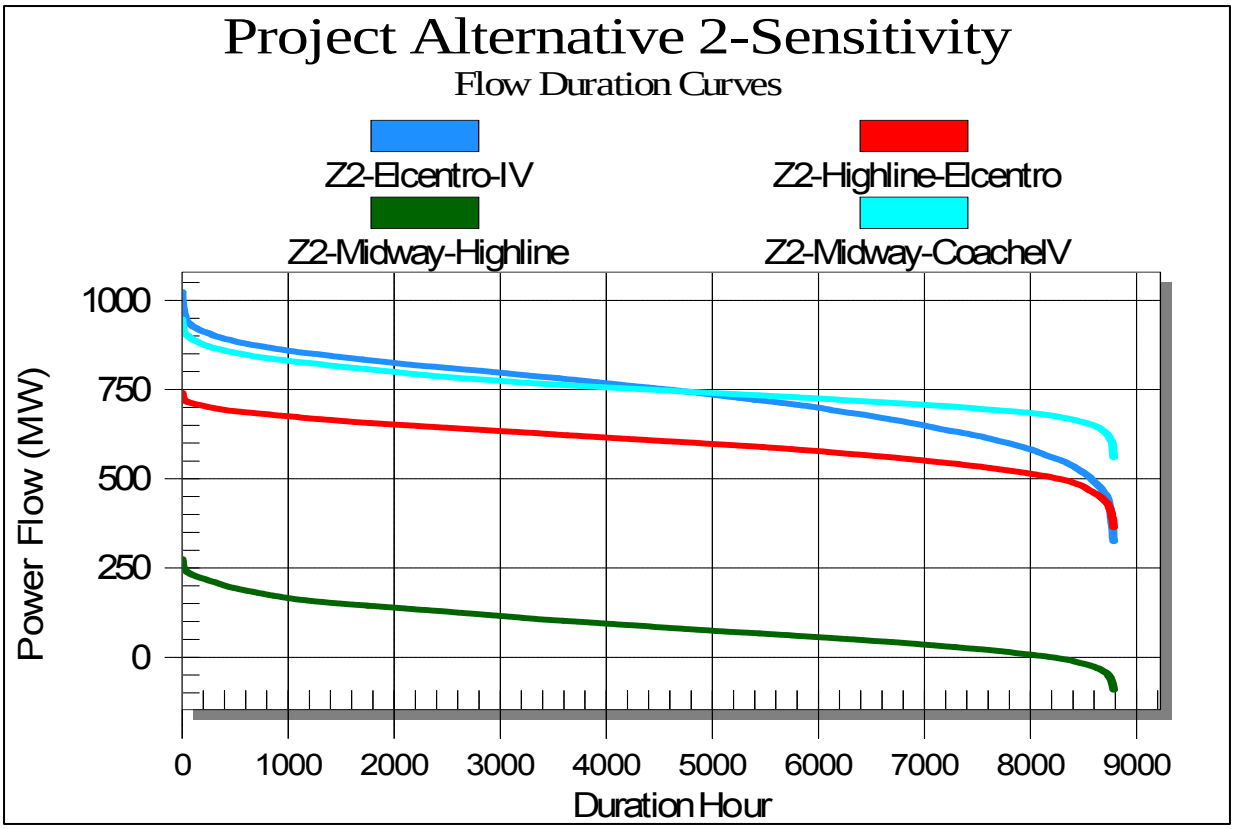

Benchmark-Sensitivity
Flow Duration Curves
SOUTH OF SAN ONOFRE
Z2- SDGE Import Limit
Z1-Imperial Valley-Miguel
Z1-Tijuana-OtayMesa
Power Flow (MW)
3000
2000
1000
0
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
Duration Hour

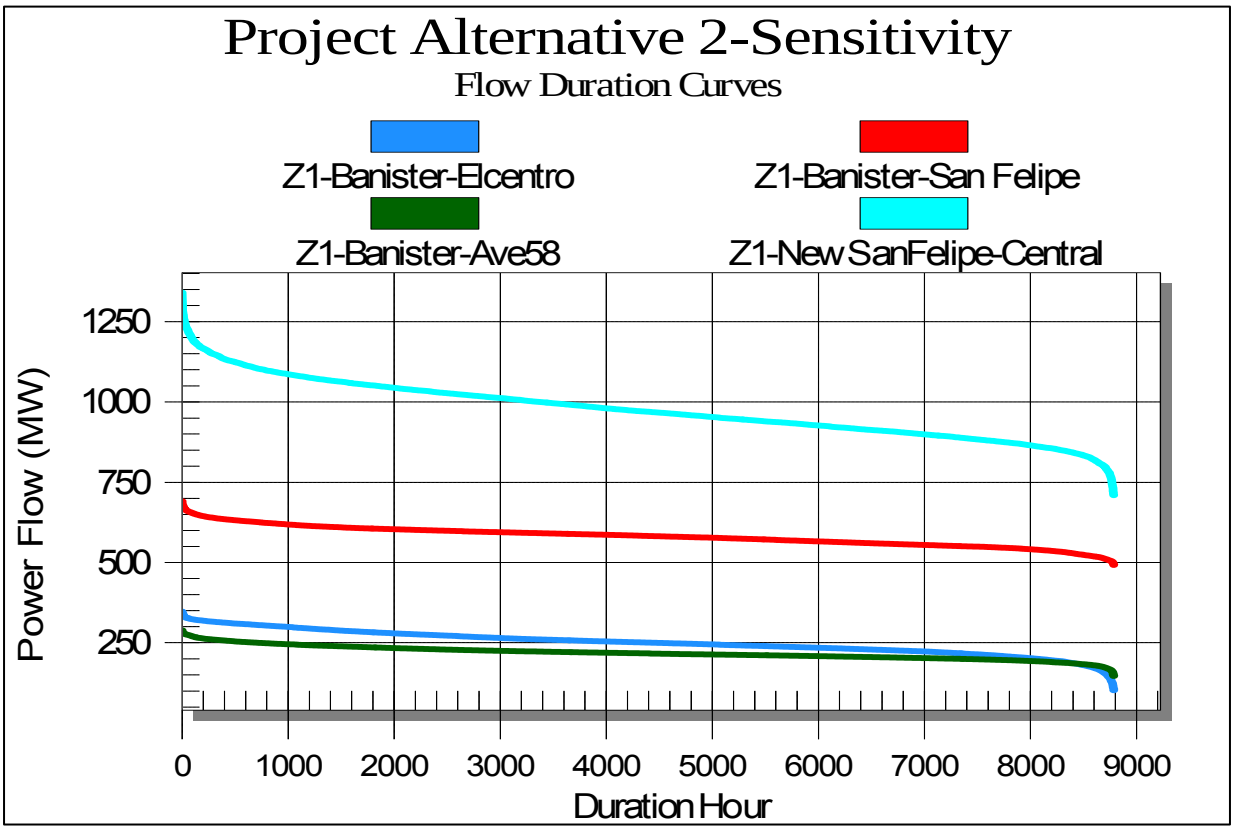

Benchmark-Sensitivity
Flow Duration Curves
NORTH OF SAN ONOFRE
Z1- Devers Bank No. 1
Z1-Devers-Valley
Z2-Midpoint-Devers
Power Flow(MW)
3000
2500
2000
1500
1000
500
0
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
Duration Hour

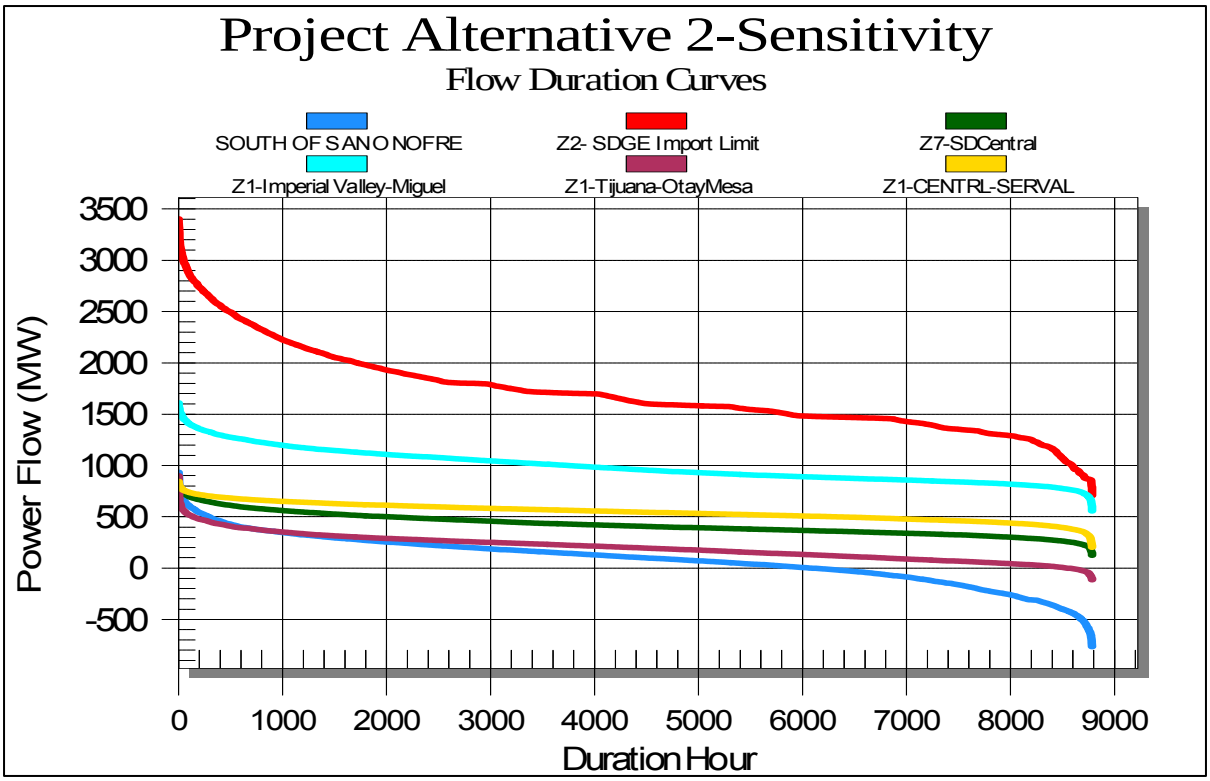

Project Alternative 2-Sensitivity
Flow Duration Curves
Z1- Hassayampa - N. Gila
Z1- N. Gila - Imperial Valley
Z1-PaloVerde-Midpoint
Z1-Harquahala-Midpoint
Power Flow (MW)
1750
1500
1250
1000
750
500
250
0
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
Duration Hour

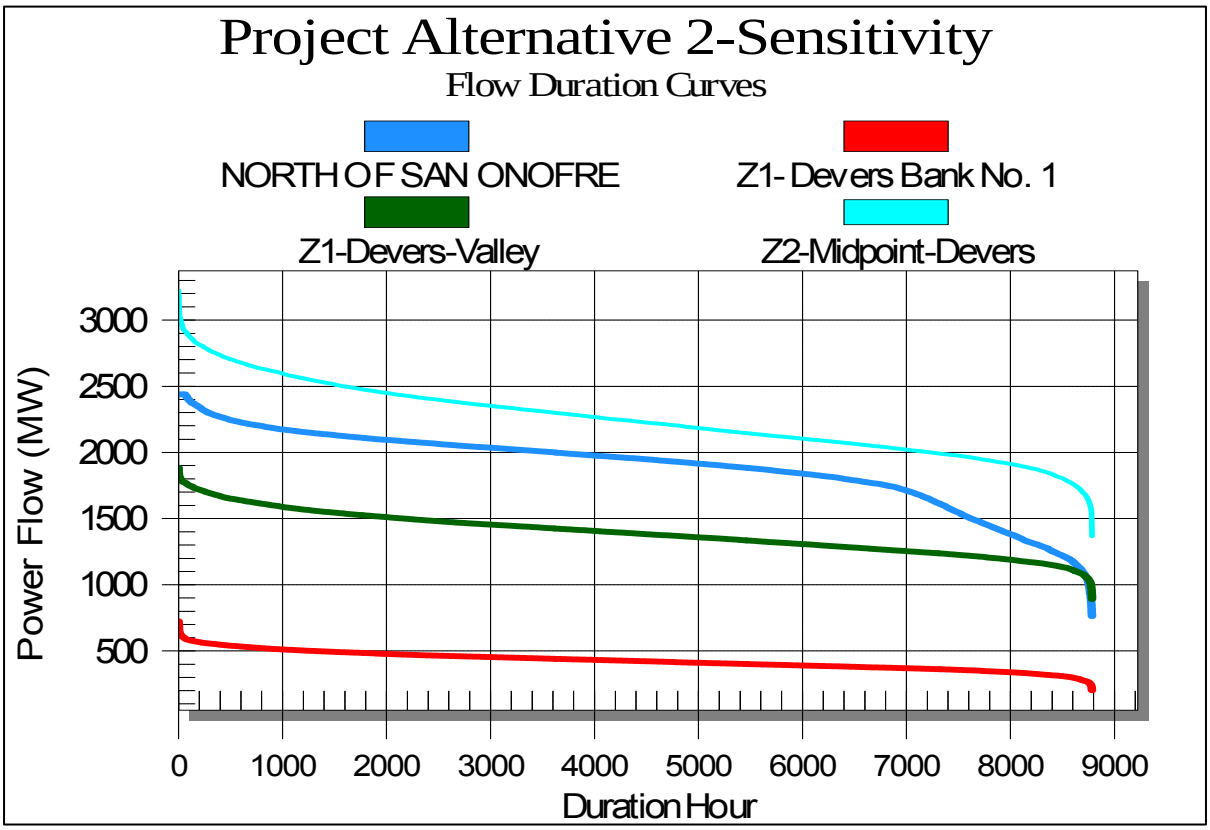

Project Alternative 2-Sensitivity
Flow Duration Curves
IID - SCE
Z7-Path 45
Z1- El Centro Bank
Z1-Devers-Mirage
Power Flow (MW)
1250
1000
750
500
250
0
-250
-500
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
Duration Hour


Project Alternative 2-Sensitivity
Flow Duration Curves
Z2-WOR
Z2-EOR
Z2-SCIT
Z2-Palo Verde West
Power Flow (MW)
15000
12500
10000
7500
5000
2500
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
Duration Hour


Project Alternative 2-Sensitivity
Flow Duration Curves
Z2-Elcentro-IV
Z2-Highline-Elcentro
Z2-Midway-Highline
Z2-Midway-CoachelV
Power Flow (MW)
1000
750
500
250
0
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
Duration Hour


Project Alternative 2-Sensitivity
Flow Duration Curves
Z1-Banister-Elcentro
Z1-Banister-San Felipe
Z1-Banister-Ave58
Z1-New SanFelipe-Central
Power Flow (MW)
1250
1000
750
500
250
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
Duration Hour


Project Alternative 2-Sensitivity
Flow Duration Curves
SOUTH OF SAN ONOFRE
Z2- SDGE Import Limit
Z7-SDCentral
Z1-Imperial Valley-Miguel
Z1-Tijuana-OtayMesa
Z1-CENTRL-SERVAL
Power Flow (MW)
3500
3000
2500
2000
1500
1000
500
0
-500
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
Duration Hour


Project Alternative 2-Sensitivity
Flow Duration Curves
NORTH OF SAN ONOFRE
Z1- Devers Bank No. 1
Z1-Devers-Valley
Z2-Midpoint-Devers
Power Flow (MW)
3000
2500
2000
1500
1000
500
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
Duration Hour

# APPENDIX J

Imperial Valley Dynamic Analysis Study

# Contract Task #6

# Final Imperial Valley Dynamic Analysis Study Report

**Contract # 500-05-005**

**April 21, 2006**

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(Separate Attachment-Excel Spreadsheet)

**Imperial Valley and Tehachapi Implementation Groups**
**Contract # 500-05-005**

**Contract Task #6: Final Imperial Valley Dynamic Analysis Study Report**
**April 21, 2006**

Contractor: Center for Energy Efficiency and Renewable Technologies
Lead Staff: Rich Ferguson, PhD, Research Director
Contractor Project Manager: Dave Olsen
Commission Project Manager: Clare Laufenberg Gallardo

## Completion of Task #6:

The attached Final Imperial Valley Dynamic Analysis Study Report is the sole deliverable of contract task #6. As contemplated in the contract Scope of Work, the Contractor coordinated dynamic analysis studies of IVSG transmission alternatives by the affected transmission owners. As described below, this work was done in accordance with CAISO and WECC standards. The results of these studies confirmed that the final transmission plan for the export of Imperial Valley renewable resources recommended by the IVSG meets all grid reliability requirements.

The Technical Work Group of the IVSG performed the studies reported here. It then presented the study results to the full IVSG, which considered them in adopting its final transmission recommendation, which was filed with the CEC on September 30, 2005.

IID, SDG&E and LADWP are now performing more detailed study of the effect of their actual proposed projects on the grid through the WECC Path Rating process. As a result, there is no need for further dynamic analysis of Imperial Valley conceptual transmission alternatives.

**Final Imperial Valley Dynamic Analysis Study Report**
**April 21, 2006**

The IVSG Technical Work Group (TWG) performed voltage stability, dynamic stability and short-circuit analysis studies of the final IVSG transmission alternatives. The results of these studies show that the addition of each and all of the alternative facilities proposed by the IVSG supports reliable operation of the grid.

These studies helped the Imperial Valley Study Group (IVSG) confirm the electrical viability of its final recommended conceptual development plan. The IVSG filed this plan for the export of 2,200 MW of renewable resources from the Imperial Valley at the CEC on September 30, 2005; SDG&E filed it at the CPUC on October 4, 2005. The IVSG plan, "Report of the Imperial Valley Study Group," is available at: www.energy.ca.gov/ivsg/. This report refers extensively to the IVSG plan. Detailed technical results of the studies summarized in this report are included in Appendices C and D of the IVSG Report, as separate volumes/separate electronic files.

## 1. Voltage Stability Studies

Transient stability studies were conducted to test the alternatives under faulted conditions and system response to the faults with the additional resources connected to the system. The transient stability analysis was conducted on cases for both Heavy Summer and Light Autumn. For the Heavy Summer, stability analysis was conducted on IVSG Alternative 2 and Alternative 3b. For the Light Autumn, stability analysis was conducted on Alternatives 2 and 2a (with the interconnection to Indian Hills) and Alternative 3b.[1]

The 2,200 MW of new Imperial Valley generation was analyzed using the generator models employed in IID's System Impact Study of Salton Sea Unit #6 (a 200 MW geothermal generator). For the purposes of this feasibility analysis, the modeling for the additional resources was proven adequate and acceptable.

Transient stability faults were analyzed for all of the major transmission facilities in the region, for the alternatives noted above, for both the Heavy Summer and Light

[1] Alternative 2: A new 500 kV line from Imperial Valley to San Diego Central, with 50 percent series compensation added to the San Felipe-to-San Diego Central portion of the line.
Alternative 2a: This variant on Alt 2 was added to evaluate the effect of adding a new 230 kV tie between IID and the CAISO at a new Indian Hills substation on the Devers-Palo Verde 1 line. It is the same as Alternative 2 except for this tie.
Alternative 3b: A new 500 kV Imperial Valley to San Diego North to (SCE) Serrano-Valley transmission line, with 50 percent series compensation added to the San Felipe-to-San Diego North portion of the line.

Autumn power flow cases. N-1 contingencies (NERC/WECC Planning Standard, Category B, loss of single element) included:

Imperial Valley-Miguel 500 kV
Hassayampa-North Gila 500 kV
Devers-Midpoint 500 kV
Serval-Valley 500 kV
Serrano-Serval 500 kV
Serrano-Valley 500 kV
Devers-Valley 500 kV
San Felipe-Central/North San Diego 500 kV
Imperial Valley-San Felipe 500 kV
Bannister-San Felipe 230 kV

In addition, one N-2 contingency case (NERC/WECC Planning Standard, Category C, loss of two or more elements) was analyzed for loss of the Coachella-Devers/Mirage 230 kV line.

Stability plots showing the voltage response on all major facilities in the region to faulted conditions are included as Appendix C.1 of the IVSG Report. The Switch Decks used in analyzing faults on each facility are included as Appendix C.2 of the IVSG Report.

Key findings of the stability analysis included:

- The proposed IID transmission system upgrades were found to be effective and stable under the conditions and faults taken for this analysis.
- The most critical single contingencies were found to be the loss of Devers-Valley 500 kV line or the Imperial Valley-Miguel 500 kV line. These results were consistent with the power flow (thermal) analysis.
- The lowest transient voltage (first swing voltage dip) was noted at the SCE Vista 230 kV bus for loss of the Devers-Valley 500 kV line.
- The addition of the Serrano/Valley to San Diego North 500 kV line was found to reduce the magnitude of the voltage dip at Vista 230 kV by providing an alternate source to Valley for loss of the Devers-Valley 500 kV line.

## 2. Post Transient Analysis

Post-Transient analysis considers the period of time after a disturbance when the power and voltage transient oscillations have damped out and before operator intervention can take place. This time frame is approximately 1.5 to three (3) minutes subsequent to a disturbance.

The IVSG performed a Post-Transient analysis on the cases listed below, using the Reactive Power Margin Requirement (also know as Q-V Methodology) developed by the Technical Studies Subcommittee of the WECC. The IVSG parties believe that the Reactive Power Margin Requirement provides the clearest, most accurate method for comparing alternatives.[2]

The study assumptions for the post-transient analysis, the contingencies run, buses monitored and the reactive margin criteria applied are listed in the Appendix below.

**Cases Analyzed**

The Post-Transient analysis was performed on seven cases: two Benchmark cases and five scenario cases using the GE PSLF Version 13.1 program. The benchmark cases represent Heavy Summer 2014 and Light Autumn 2014. There are two Heavy Summer alternative cases and three Light Autumn alternative cases. These seven cases were as follows:

1) Heavy Summer (HS) Benchmark (ivsg_hs_rev4)
2) HS, Imperial Valley – Central, Dispatch 1 (ivsg_hs_alt2d1_s1)
3) HS, Imperial Valley – Northern – Ser/Val, Dispatch 1 (ivsg_hs_alt3bd1_s1)
4) Light Autumn (LA) Benchmark (ivsg_la_rev5)
5) LA, Imperial Valley – Central, Dispatch 3 (ivsg_la_alt2d3_s1)
6) LA, Imperial Valley – Central & Coachella Valley – Indian Hills, Dispatch 3 (ivsg_la_alt2ad3_s1)
7) LA, Imperial Valley – Northern – Ser/Val, Dispatch 3 (ivsg_la_alt3bd3_s1)

Eighteen contingencies were run for this analysis, two of which did not apply to the two Benchmark cases. These included twelve single and six double contingencies.

In the analysis, 25 buses were monitored, including nine buses in SCE, seven buses in SDG&E, four in IID, four in CFE and one in MWD.

The Reactive Margin Criteria used in this study for SCE, SDG&E, CFE and IID was as follows:

- SCE - 300 MVAR (single element outage) and 150 MVAR (double element outage);
- SDG&E - 150 MVAR (single element outage) and 75 MVAR (double element outage);
- CFE - 100 MVAR (single element outage) and 50 MVAR (double element outage);

[2] To clarify, this study did not use the WECC method of the increasing load or import by 105% or 102.5% (depending upon contingency) and then if the case solves, using that as proof of Post-Transient stability. In terms of WECC standards, the Reactive Power Margin Requirement approach substitutes WECC Guidelines (NERC/WECC Planning Standards, I.D. WECC-G2) for WECC Standards I.D. WECC-S1, S2 and S3.

- IID - 100 MVAR (single element outage) and 50 MVAR (double element outage).

It should be noted that the Reactive Margin Criteria used in this study are applicable only to this study and that they do not necessarily represent any utility's standard or policy.

This Post-Transient analysis considered the period of time after the power and voltage transient oscillations have damped out and before operator intervention can take place. This time frame is approximately one and half (1.5) to three (3) minutes subsequent to a disturbance.

**Post-Transient Results**

This analysis resulted in approximately 2,928 reactive margin values. Some of these reactive margin values are shown as Q-V curves which were produced for the most critical contingency for each case, with a representative assortment of buses included.

The most critical single contingencies were Imperial Valley – Miguel 500 kV and Devers – Valley 500 kV. Note the shift from the historic critical single contingency of Palo Verde – Devers to Devers – Valley 500 kV with the addition of Palo Verde – Devers #2. The most critical double contingency is the loss of Palo Verde – Devers 500 kV #1 and #2.[3]

The reactive margin values contained in the tables include shunt capacitor additions as indicated in the footnotes of the tables in Appendix D.1.3 of the IVSG Report. With these additions, all buses met, or in most cases exceeded, the Reactive Margin Criteria. There is insufficient differentiation among margins, cases or seasons to strongly support one alternative over another.

In most cases, the shunt capacitor additions ranged from 150 MVAR to about 400 MVAR of increased reactive margin. Some of these additions will likely be part of other projects in the area, including the Sunrise Powerlink. The exception to needing no more than about 400 MVAR were some of the Light Autumn alternatives for the double contingency of Palo Verde – Devers 500 kV #1 and #2, which required as much as 1,870 MVAR. However, this does not represent the real amount of reactive additions that would be required, as this Post-Transient study did not include the load dropping and/or other Special Protection Schemes (SPS) or Remedial Action Schemes (RAS) which will be associated with this double contingency.

The results of the studies, in the form of Q-V curves for critical contingencies are presented in Appendix D.1.2 of the IVSG Report. Tables of reactive margin values for each of the study runs are presented in Appendix D.1.3 of the IVSG Report.

[3] Note that the eastern termination of the Palo Verde – Devers #2 line is at Harquahala, not Palo Verde.

## Appendix A: Post-Transient Study Assumptions, Contingencies, Buses Monitored and Reactive Margin Criteria Applied

### Post-Transient Study Assumptions

This Post-Transient analysis considered the period of time after the power and voltage transient oscillations have damped out and before operator intervention can take place. This time frame is approximately one and half (1.5) to three (3) minutes subsequent to a disturbance. The following assumptions are inherent to this one and half (1.5) to three (3) minute methodology:

1) Transient stability simulation of the disturbance has found the system to be stable and within the voltage and frequency dip criteria.
2) Sufficient time after the disturbance has elapsed such that the system frequency is uniform and turbine outputs have reached steady-state values.
3) Unless specific information is available, LTCs and regulators have sufficient regulating range and time delay settings such that post-transient voltages at loads are restored to the pre-disturbance levels.
4) Normal automatic generation control (AGC) will not significantly change generation within the one and half (1.5) to three (3) minute time frame - either because of being too slow or because of being intentionally suspended after the disturbance. In power flow simulations, this means area interchange control is not active.
5) All turbine-generators will be reviewed as to whether the base-load flag is set in power flow generator data. For units indicating "1", the unit will be assumed operating in base-load mode and adjustments up or down to generator loading will not be simulated in the voltage stability analysis. For units not identified as base-loaded, the governor power flow routine will increase or decrease generator load due to governor action. All generators operating with free governors will pick up their share of the generation deficiency (or reduce excess) in proportion to their capacities (Pmax) and inversely proportional to their droop setting until they reach maximum/minimum output.
6) Phase shifters are assumed to hold a fixed angle.
7) Transmission voltage regulating transformers modeled in the pre-disturbance power flow to change taps in accordance with pre-set voltage schedules are fixed at their pre-disturbance level except where there is specific information to do otherwise.
8) Those remedial measures, which affect post transient steady state conditions, should be modeled. These remedial measures include high speed series capacitor switching, generation dropping and load (pump) dropping.
9) Shunt capacitors and reactors, modeled in the pre disturbance power flow to automatically switch "on" or "off" based on pre-set voltage schedules, are fixed at their pre-disturbance level except where there is specific information to do otherwise.

10) Bus voltage deviation shall not exceed 5 percent of its initial voltage unless agreed by the affected operating agent.
11) No system element should be loaded more than 100% of its emergency rating.
12) During post-contingency, all manually operated voltage control and phase shifting devices were fixed except as follows (which is to say that the following switchable shunts were allowed to float):

| SCE | | |
|---|---|---|
| ANTELOPE 230 | BARRE 230 | CHINO 230 |
| DEVERS 230 | EL NIDO 230 | GOULD 230 |
| KRAMER 230 | LCIENEGA 230 | LAGUBELL 230 |
| LA FRESA 230 | MESA CAL 230 | MIRALOMW 230 |
| MIRALOME 230 | MIRAGE 230 | MOORPARK 230 |
| OLINDA 230 | PADUA 230 | PARDEE 230 |
| RIOHONDO 230 | SANBRDNO 230 | S.CLARA 230 |
| VALLEYSC 115 | VICTOR 115 | VILLA PK 230 |
| VINCENT 230 | VISTA 230 | VSTA 230 |
| WALNUT 230 | | |

| SDG&E | | |
|---|---|---|
| CAPSTRNO 138 | EL CAJON 69 | LOSCOCHS 69 |
| MAIN ST 69 | MIGUEL 69 | MISSION 69 |
| PALOMAR 138 | SHADOWR 138 | TELECYN 138 |
| PENSQTOS 69 | SANLUSRY 138 | SYCAMORE 69 |
| PENSQTOS 230 | ESCNDIDO 230 | |

13) All generators which control a high side remote bus were set at the pre-disturbance voltage at the terminal bus, except for the following generators:

| | | |
|---|---|---|
| EHUNTR 1 24 | EHUNTR 2 24 | EHUNTR 3 22 |
| HUNTN G1 22 | HUNTN G2 22 | |

14) Northwest shunt capacitors modeled as synchronous condensers will be converted to fixed shunt capacitors using their pre-disturbance MVAR value except for Keeler and Maple Valley Static VAR Compensators.

**Post-Transient Contingencies**

For this Post-Transient analysis 18 contingencies were run, two of which not apply to the two Benchmark cases. These eighteen (18) contingencies included twelve (12) single and six (6) double as follows:

*Single Contingencies*

1) Central – San Felipe 500 kV line (two alt 2's & alt 2a), Northern – San Felipe 500 kV (two alt 3b's), (this contingency does not apply to the Benchmark Cases (rev 4 & rev 5)
2) Banister – San Felipe 230 kV (this contingency does not apply to the Benchmark Cases (rev 4 & rev 5)
3) Devers – Valley 500 kV line
4) Valley – Serrano 500 kV line (rev 4 & 5, two alt 2's & alt 2a) or Valley – Ser/Val 500 kV line (two alt 3b's)
5) Palo Verde – Devers 1 500 kV line
6) Imperial Valley – North Gila 500 kV line
7) Imperial Valley – Miguel 500 kV line
8) Lugo – Mohave 500 kV line
9) Lugo – Mira Loma 500 kV line
10) Mira Loma - Serrano 500 kV line
11) Lugo – Victorville 500 kV line
12) Otay Mesa – Tijuana 230 kV line

*Double Contingencies*

1) Lugo – Victorville and Lugo – Vincent 500 kV lines
2) Lugo – Mira Loma 2 & 3 500 kV lines
3) Palo Verde – Devers 1 & 2 500 kV lines
4) SONGS – Talega 1 & 2 230 kV lines
5) 2 San Onofre units
6) 2 Palo Verde units

**Post-Transient Buses Monitored**

The following 25 buses were monitored, including nine (9) buses in SCE, seven (7) buses in SDG&E, four (4) in IID, four (4) in CFE, and one (1) in MWD:

| **Monitored Buses** | | |
|---|---|---|
| **CFE** | **SDG&E** | **SCE** |
| 20238 HRD-230 230 | 22260 ESCNDIDO 230 | 24804 DEVERS 230 |
| 20017 MEP-230 230 | 22356 IMPRLVLY 230 | 24086 LUGO 500 |
| 20118 ROA-230 230 | 22464 MIGUEL 230 | 24093 MIRALOMW 230 |
| 20149 TJI-230 230 | 22504 MISSION 230 | 24131 S.ONOFRE 230 |

| | | |
|---|---|---|
| **IID** | 22716 SANLUSRY 230 | 24137 SERRANO 230 |
| 8311 COACHELA 230 | 22768 SOUTHBAY 69 | 24151 VALLEYSC 500 |
| 8332 ELCENTSW 230 | 22832 SYCAMORE 230 | 24156 VINCENT 500 |
| 8690 HIGHLINE 230 | **MWD** | 24901 VSTA 230 |
| 80300 NEWSF230 230 | 25417 IRONMTP1 6.9 | 24112 PADUA 230 |

**Post-Transient Reactive Margin Criteria**

The following Reactive Margin Criteria were used in this Post Transient analysis for SCE, SDG&E, CFE, and IID:

For SCE:

- Level B disturbance (single element outage): 300 MVARs
- Level C disturbance (double element outage): 150 MVARs

For SDG&E:

- Level B disturbance (single element outage): 150 MVARs
- Level C disturbance (double element outage): 75 MVARs

For CFE:

- Level B 230 kV disturbance (single element outage): 100 MVARs
- Level C 230 kV disturbance (double element outage): 50 MVARs

For IID:

- Level B disturbance (single element outage): 100 MVARs
- Level C disturbance (double element outage): 50 MVARs

It should be noted that these Reactive Margin values used in this study apply only to this study; they do not necessarily represent any of the affected utilities' standards or policy.

Appendix B: Q-V Margin Analysis Results

Separate Attachment – Excel Spreadsheet

Appendix C: Post-Outage Loadings

Separate Attachment – Excel Spreadsheet

# APPENDIX K

Establish the Tehachapi Implementation Group

**Imperial Valley and Tehachapi Implementation Groups**
**Contract # 500-05-005**

**Contract Task #15: Establish the Tehachapi Implementation Group**
**Final Report 4/28/06**

Contractor: Center for Energy Efficiency and Renewable Technologies
Lead Staff: Rich Ferguson, PhD, Research Director
Contractor Project Manager: Dave Olsen
Commission Project Manager: Clare Laufenberg Gallardo

**Task #15 Final Report:**

The contract envisioned that the contractor would attempt to establish a high-level implementation group (TIG) to oversee all the other Tehachapi-related tasks and provide facilitation services to the group. However, a series of events has prevented the establishment of this group.

The contractor had a series of discussions with officials at PG&E, SCE and other stakeholders to elicit their interest in establishing a TIG to investigate and propose solutions for Tehachapi-related issues. The contractor also met with CPUC Commissioner Grueneich, to enlist her help in contacting the senior management of the IOUs to pursue formation of an TIG. At her request, the contractor developed the agenda for a high-level meeting to initiate the Implementation Group process, and has remained in contact with her advisors on this issue. The Commissioner decided, however, not to pursue this approach but rather to address key issues through the I.05-09-005 proceeding.

Planning for Tehachapi transmission had begun in the Tehachapi Collaborative Study Group (TCSG) in August 2004, and the contract envisioned that the TIG would oversee completion of the conceptual transmission plan. However, CPUC staff continued working on the plan with utility staff and a second TCSG effort was eventually begun in the fall of 2005. Stakeholders preferred to allow the TCSG to proceed under CPUC auspices rather than to form the TIG to oversee the conceptual planning as envisioned in Task 16.

The CPUC, by instigating I.05-09-005 in September 2005, also accepted responsibility for other tasks envisioned as being coordinated by the TIG. The Order Initiating Investigation is scheduled to deal with cost allocation (Task 20,) permit streamlining (Task 22,) and renewable energy procurement (Task 24,) among other issues. The stakeholders prefer to deal with these issues in the CPUC process rather than establish a separate TIG.

The Contractor believes that the goal of achieving stakeholder consensus on outstanding Tehachapi-related issues should be pursued. However, the Contractor also concludes that formation of the TIG to address all issues is unlikely and that future

consensus-building efforts must be oriented around specific remaining issues. Work on Task 15 is therefore considered complete.

# APPENDIX L

Tehachapi Collaborative Study Group – Cost Production Study Analysis

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# Tehachapi Collaborative Study Group

*Cost Production Study Analysis*

Paul Steckley – California ISO

September 19, 2005



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## Study Assumptions:

- Uses PG&E and SCE transmission alternatives identified in Study Plan #2 of June 2005
- Based on 2008 SSG-WI (Seams Steering Group-Western Interconnect) case received on 8/5/2005 developed by SSG-WI Planning Work Group (PWG)
- WECC-wide transmission network modeled
- CAISO load scaled to year 2010
- Palo Verde-Devers 2, Blythe-Midpoint are **modeled**
- Average fuel price and hydro/dry conditions
- Unit commitment, start up/shut down cost **included**
- Existing wind generation dispatch based on historical data
- Tehachapi wind generation dispatch provided by National Renewable Energy Laboratory (NREL), assumes 70 meter rotor, 7.5 m/s speed and 2% unavailability (45% capacity factor)
- Tehachapi wind dispatched as base load generation - modeled hourly (**no fuel cost and maintenance**)



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**Study Assumptions:**

- SSG-WI PWG developed approximate industrial figures for
  - variable and non-variable operation and maintenance costs,
  - minimum and incremental heat rates,
  - forced outage rate and outage duration for different generation units based on fuel type, technology, size and age.
- SSG-WI generation assumptions also include start up/shut down costs, minimum up time/down time and maintenance duration for different generation units.



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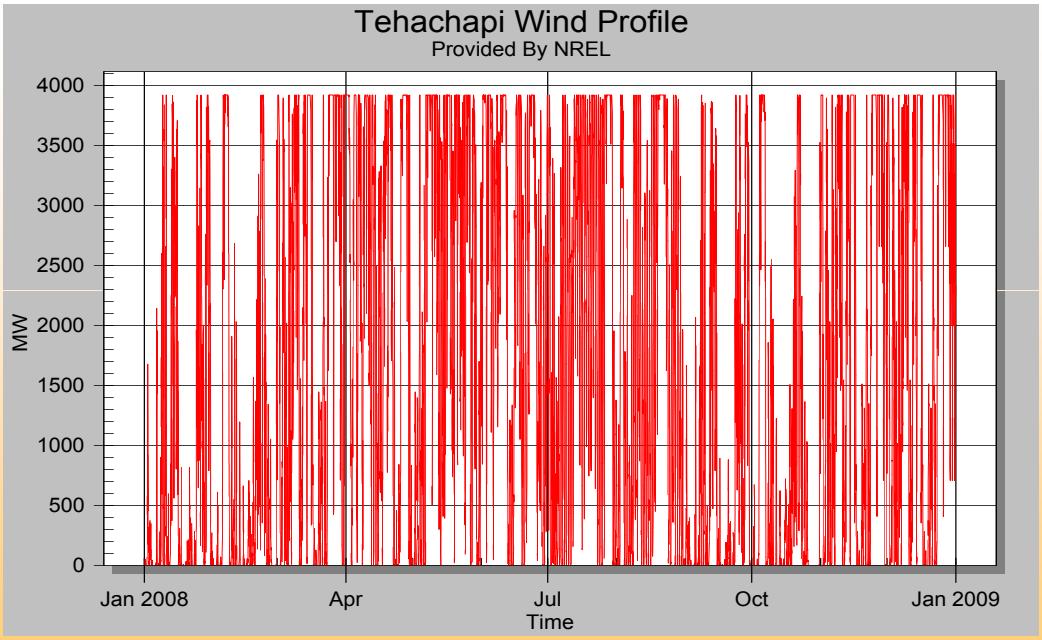
# Tehachapi Hourly Wind Profile



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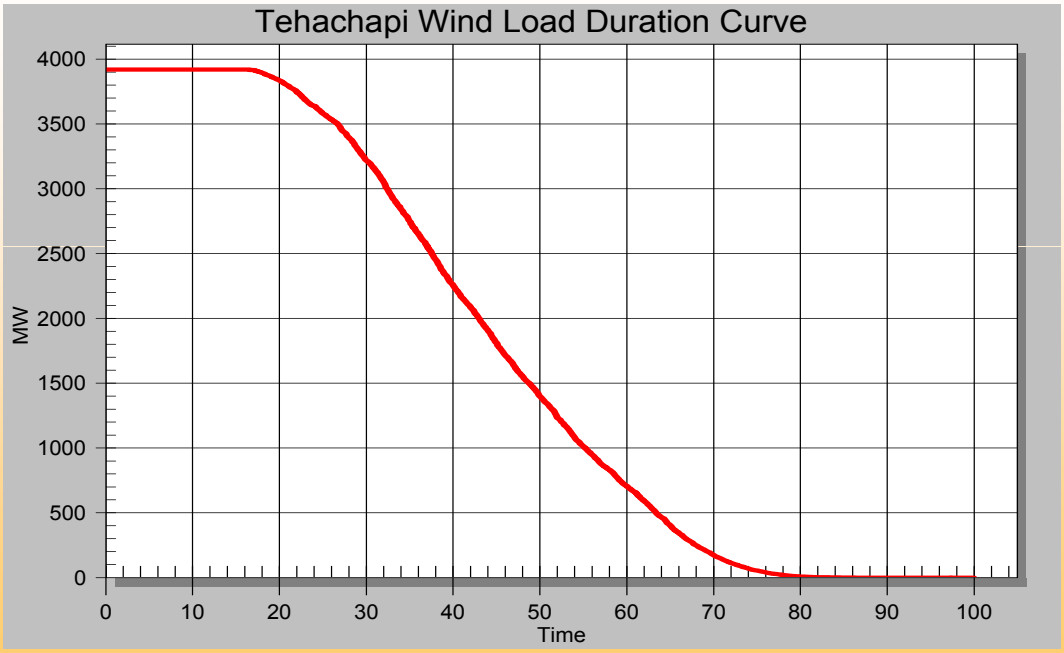
# Tehachapi Wind Duration Curve

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## Non-Simultaneous Interface Limits

| Interface | N-S Flow (MW) | S-N Flow (MW) |
|---|---|---|
| COI | 4800 | 3675 |
| Path 15 | 3265 | 5400[1] |
| Path 26 | 3700[2] | 3000 |

**Notes:**

1) Path 15: 5,400 MW S-N is supported by RAS that trips generation connected to Midway. The Path 15 limit will be decreased by 1 MW for every 2 MW decrease in Midway generation (La Paloma, Sunrise, Elk Hills).

2) Path 26: Power flow between 3,000 MW and 3,700 MW N-S is supported by a RAS that trips Midway area generation. The Path 26 limit will be decreased by 1 MW for every 1 MW decrease in Midway generation (La Paloma, Sunrise, Elk Hills)



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| Scenario | Tehachapi (MW) | Description |
|---|---|---|
| A | 0 | Existing System with SCE Phase 1 (Segments 1, 2 &3 at 500 kV) |
| B | 0 | Scenario A – with Fresno Phase Shifter |
| C | 1600 | Scenario A with Phase 2 Facility Upgrades (Vincent-Mesa 230 kV, Antelope-Vincent 500 kV) |
| D600 | 1600 | Scenario C with 600 MW Fresno Phase Shifter, +/- 45 degrees |
| E1 | 4500 | Scenario C with Midway-Tehachapi 500 kV |
| F | 4500 | PG&E Alt. 4 with SCE Alt.1: 500 kV Tesla-Los Banos-Gates-Midway-Tehachapi, 2 Tehachapi-Antelope, Antelope-Vincent, Antelope Pardee |
| G | 4500 | Scenario F with 500 kV Tehachapi-Midway replaced with 500 kV Tehachapi-Vincent |
| H | 4500 | PG&E Alt 5 with SCE Alt 1. : 500 kV Tesla-Gregg-Tehachapi, 2 Tehachapi-Antelope, Antelope-Vincent, Antelope Pardee |
| I | 4500 | PG&E Alt. 5 with SCE Alt. 1: 500 kV Tesla-Gregg -Midway-Tehachapi, 2 Tehachapi-Antelope, Antelope-Vincent, Antelope Pardee |
| J | 4500 | Scenario I with 500 kV Tehachapi-Midway replaced with 500 kV Tehachapi-Vincent |



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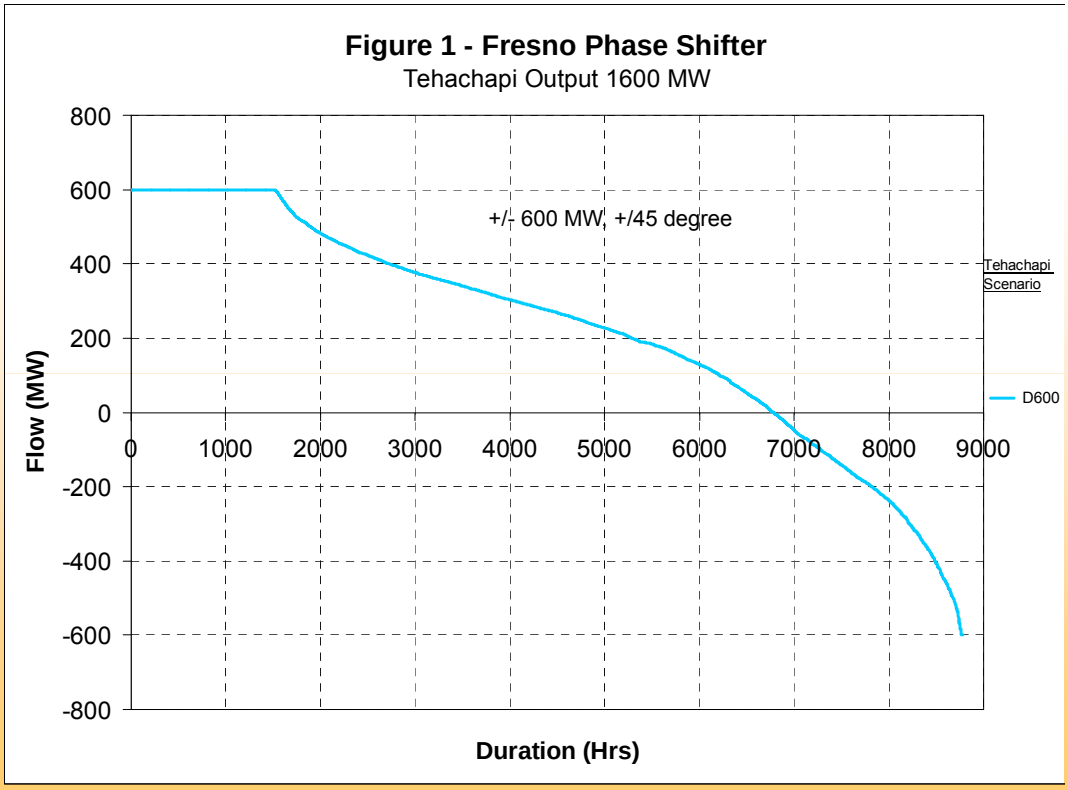
**Figure 1 - Fresno Phase Shifter**

Tehachapi Output 1600 MW



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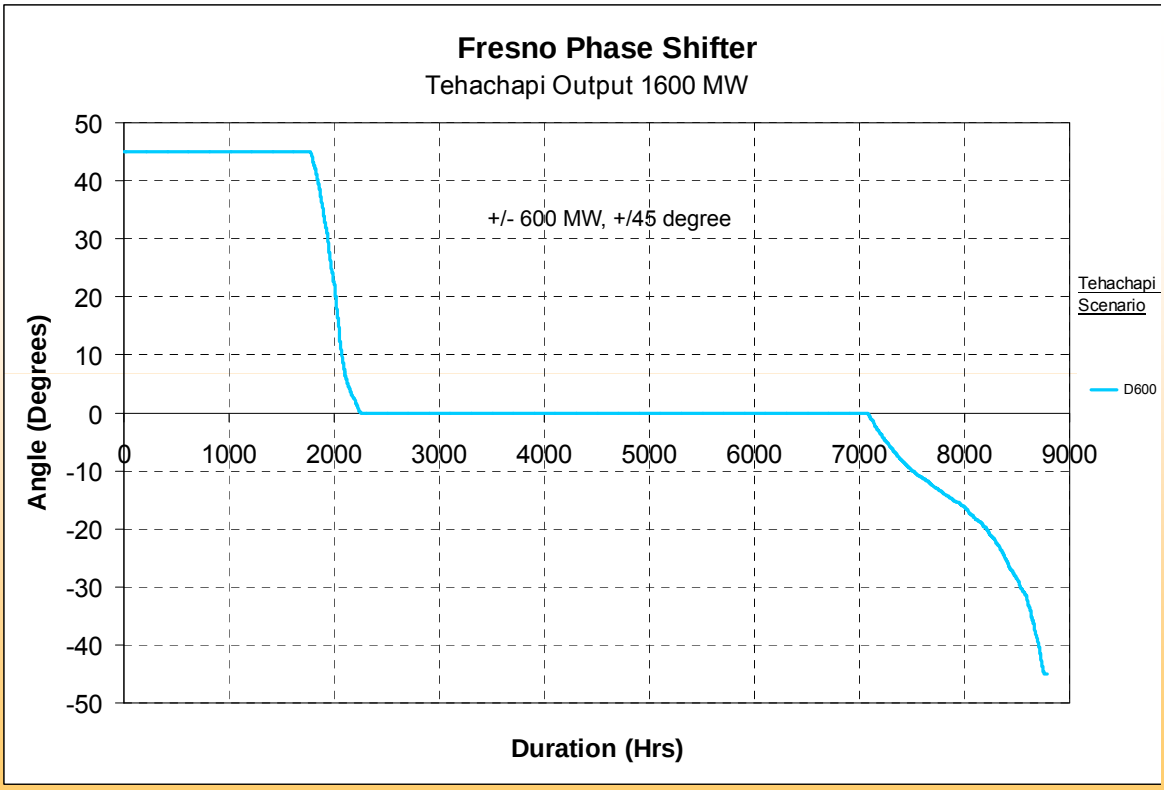




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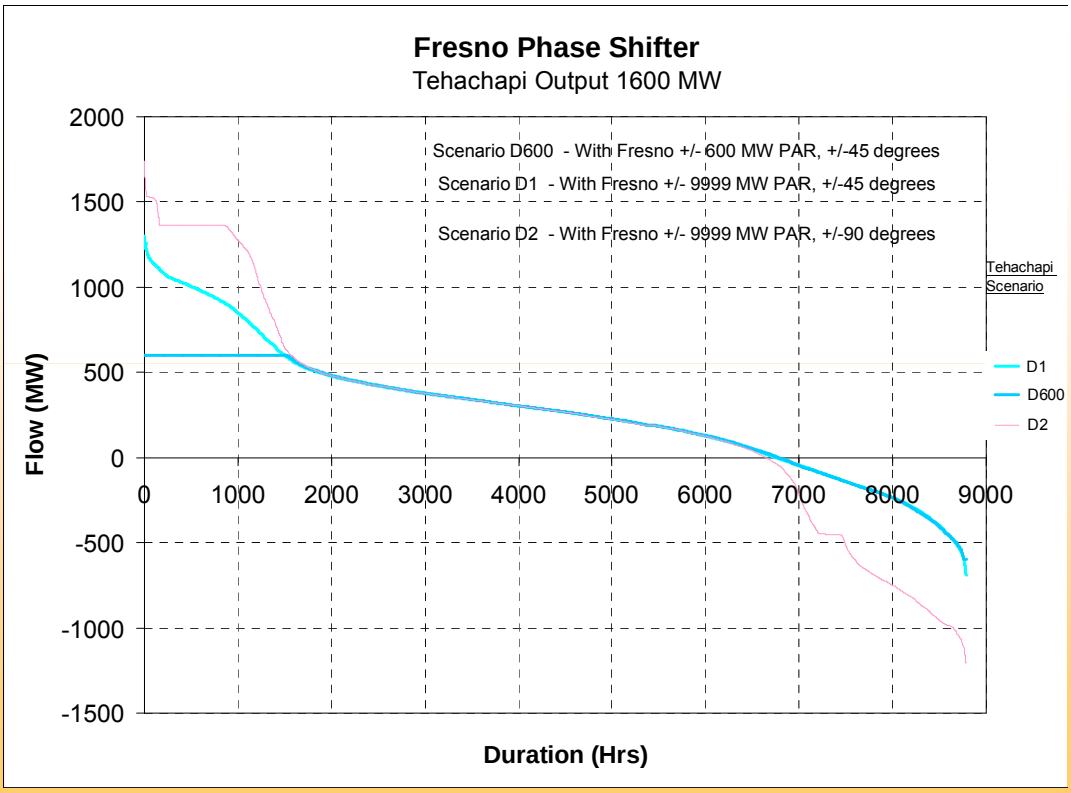




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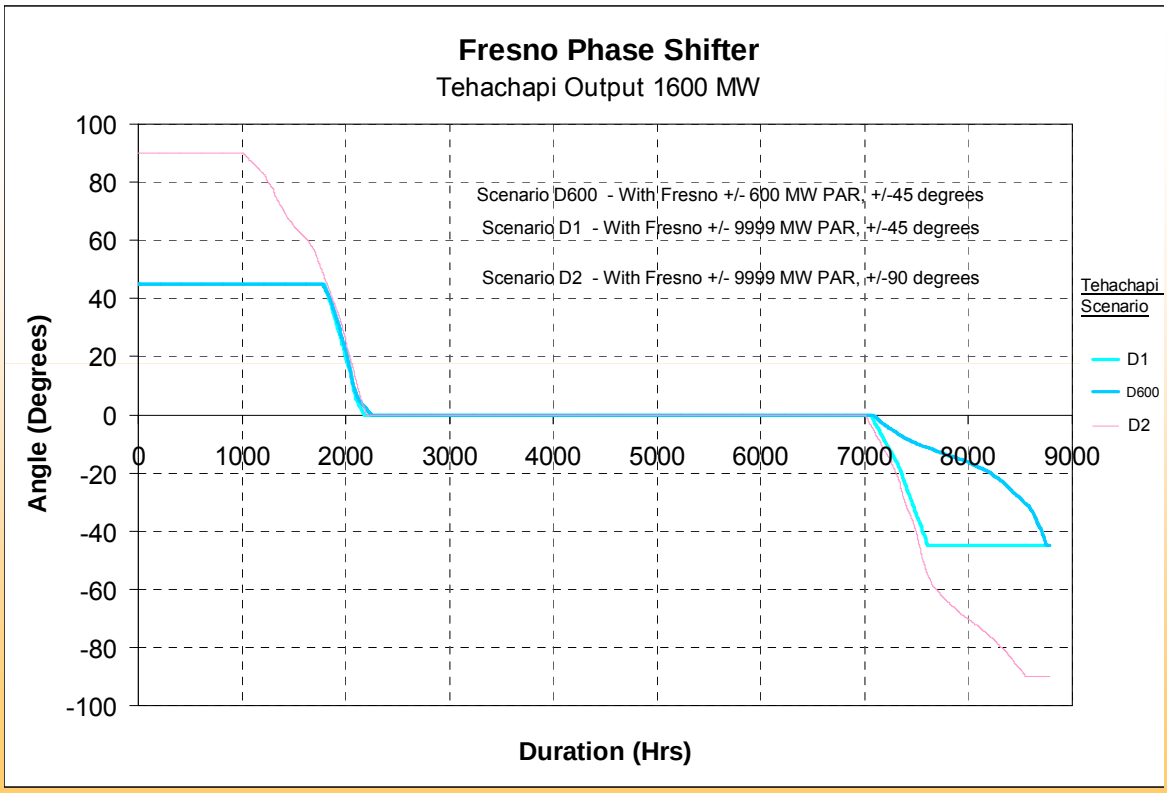




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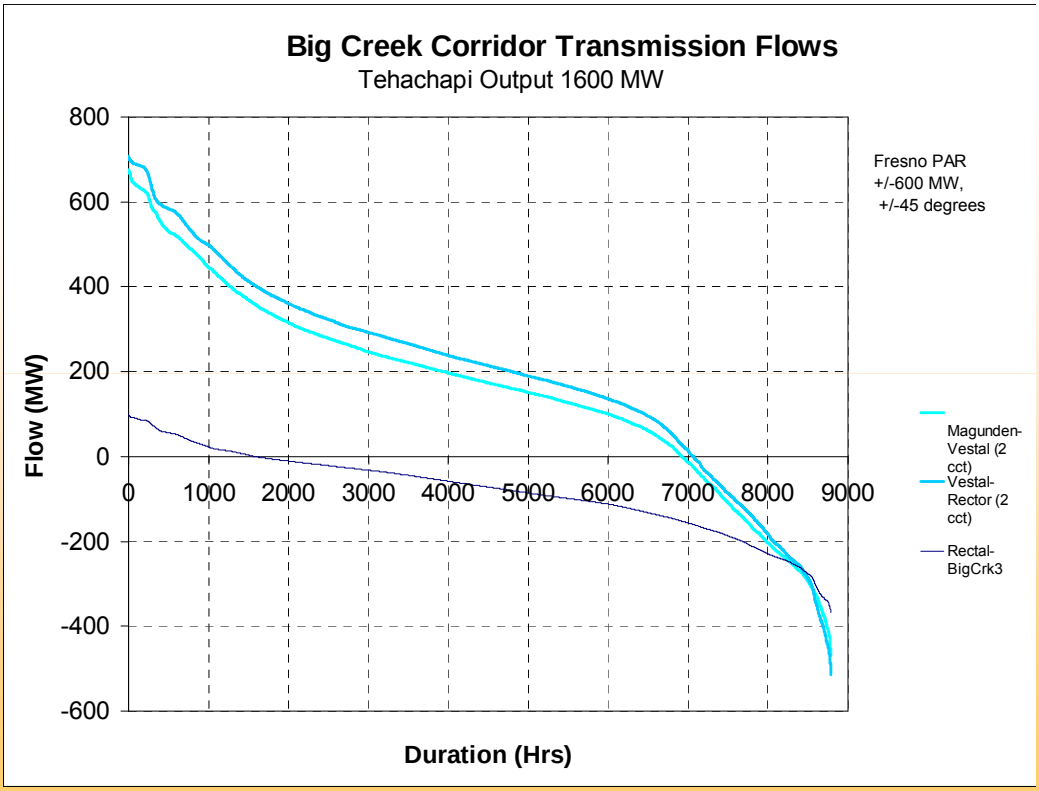


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## Summary of **WECC** Annual Results

| Scenario | Tehachapi Generation (MW) | Annual Production Cost (M$) | Generator Revenue (M$) | Load Payment (M$) | Transmission Losses (TWh) | WECC System Congestion (Hrs) | Cost* Difference to Load over Scenario E1 (M$) |
|---|---|---|---|---|---|---|---|
| A | 0 | 15702 | 33776 | 35749 | 34.3220 | 41780 | N/A |
| B | 0 | not run | not run | not run | not run | not run | |
| C | 1600 | 15429 | 33702 | 35666 | 34.693 | 41472 | |
| D600 | | 15434 | 33755 | 35709 | 34.529 | 41586 | |
| E1 | 4500 | 14976 | 33139 | **35181** | 34.895 | 40166 | 0 |
| F | | 14971 | 33194 | 35246 | 34.897 | 40665 | 65 |
| G | | **14922** | 33538 | 35493 | 34.670 | 42324 | 312 |
| H | | 14944 | 33514 | 35475 | **34.464** | 40002 | 293 |
| I | | 14969 | 33145 | 35186 | 34.672 | 40634 | 5 |
| J | | 14924 | 33511 | 35444 | 34.476 | 42103 | 263 |

**Bold Red indicates lowest values of Scenarios with 4500 MW Tehachapi Output**

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## Summary of **CALIFORNIA** Annual Results

| Scenario | Tehachapi Generation (MW) | Annual Production Cost (M$) | Generator Revenue (M$) | Load Payment (M$) | Transmission Losses (TWh) | WECC System Congestion (Hrs) | Cost* Difference to Load over Scenario I (M$) |
|---|---|---|---|---|---|---|---|
| A | 0 | 5144 | 8645 | 13707 | 10.227 | 41780 | N/A |
| B | 0 | not run | not run | not run | not run | not run | |
| C | 1600 | 4948 | 8696 | 13678 | 10.063 | 41472 | |
| D600 | | 4947 | 8709 | 13686 | 10.074 | 41586 | |
| E1 | 4500 | 4749 | 8821 | 13568 | **9.410** | 40166 | 15 |
| F | | 4742 | 8814 | 13566 | 9.419 | 40665 | 13 |
| G | | 4607 | 8756 | 13595 | 9.746 | 42324 | 42 |
| H | | 4601 | 8795 | 13615 | 9.726 | 40002 | 62 |
| I | | 4747 | 8811 | **13553** | 9.418 | 40634 | 0 |
| J | | **4606** | 8782 | 13593 | 9.726 | 42103 | 39 |

**Bold Red indicates lowest values of Scenarios with 4500 MW Tehachapi Output**

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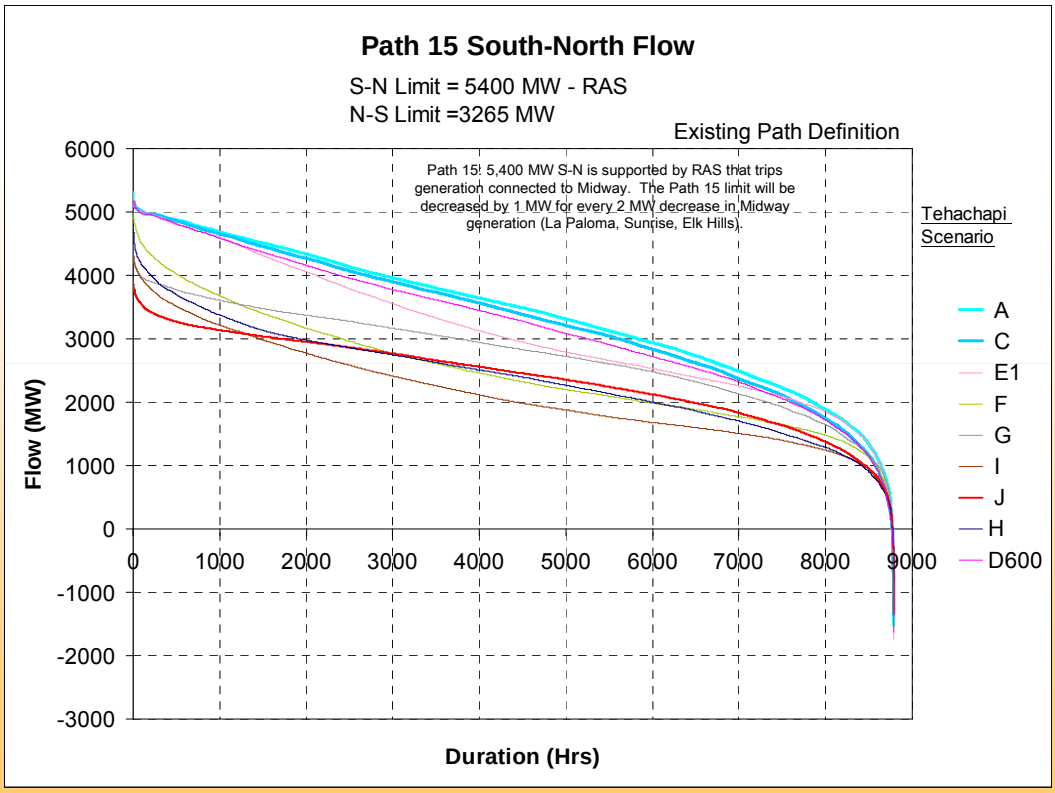


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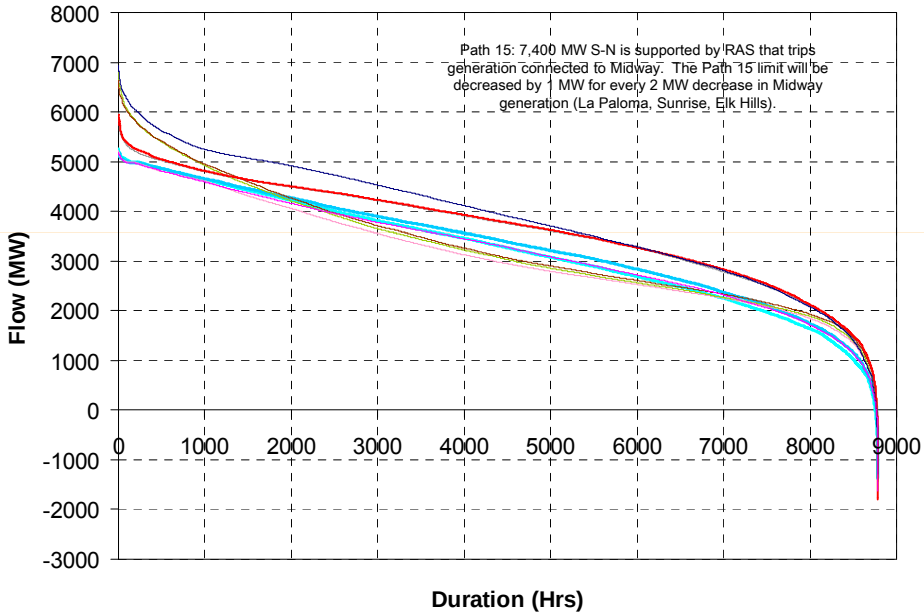
## NEW Path 15 S-N Flow

S-N Limit = 7400 MW - RAS
N-S Limit =3265 MW

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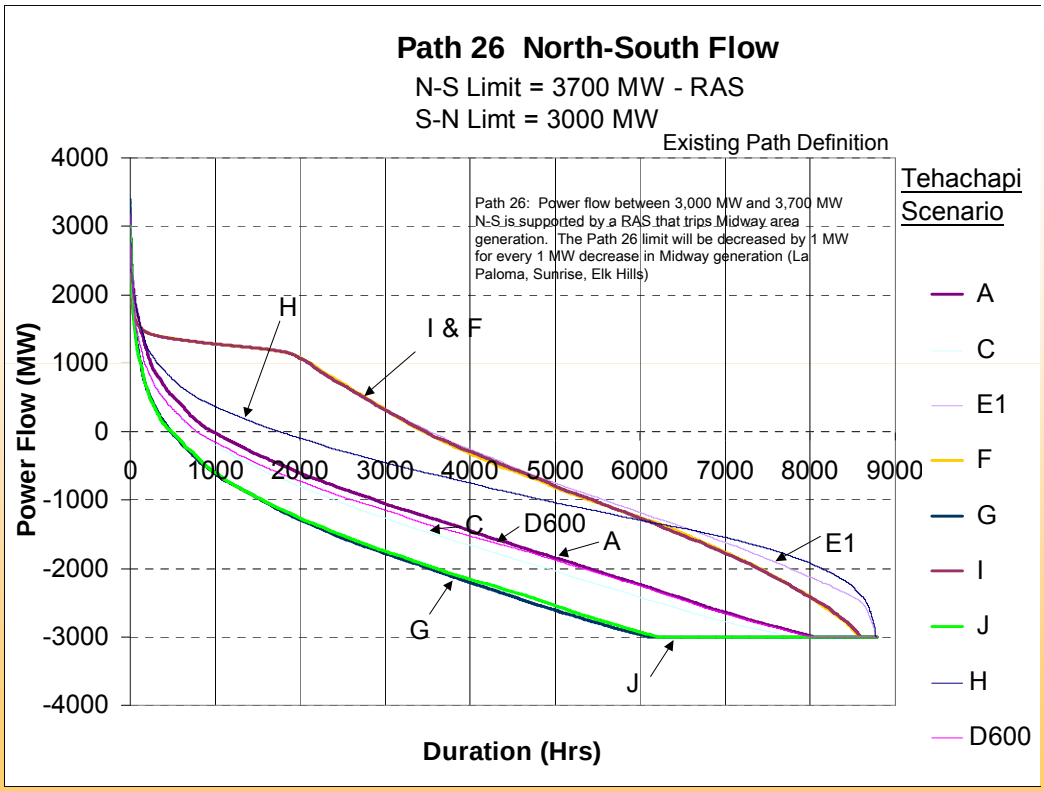


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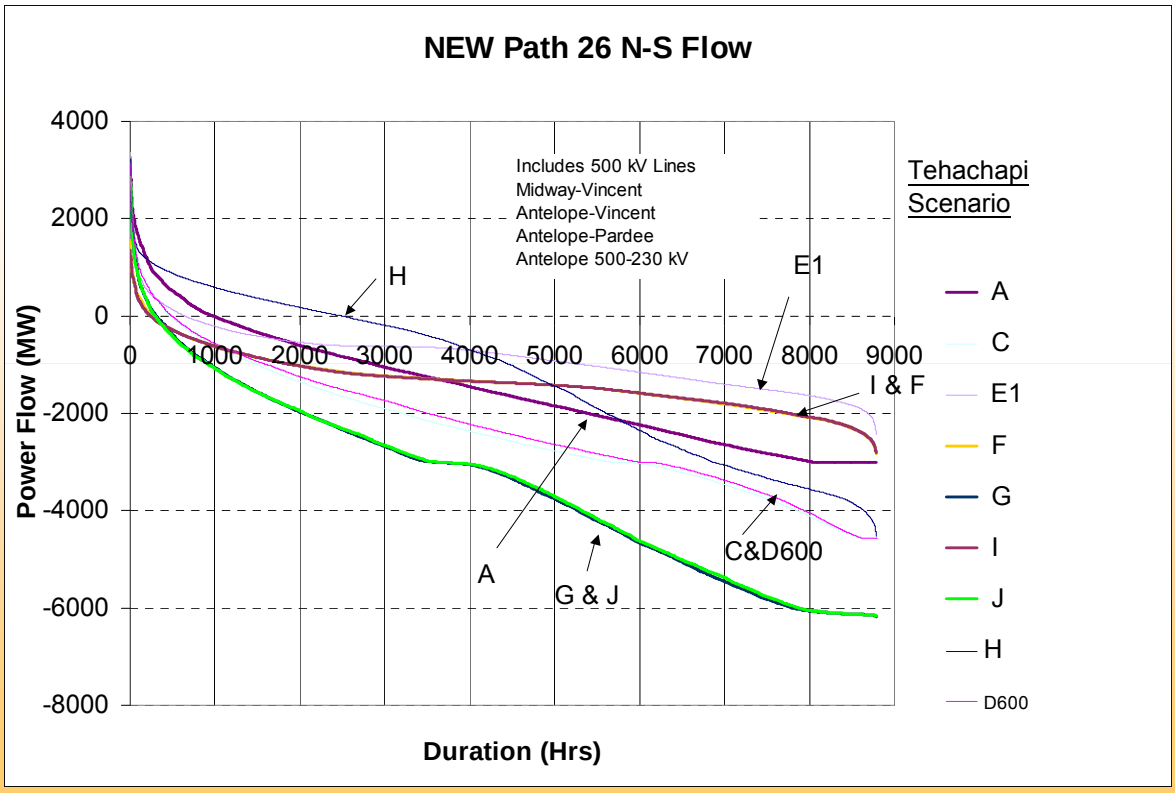




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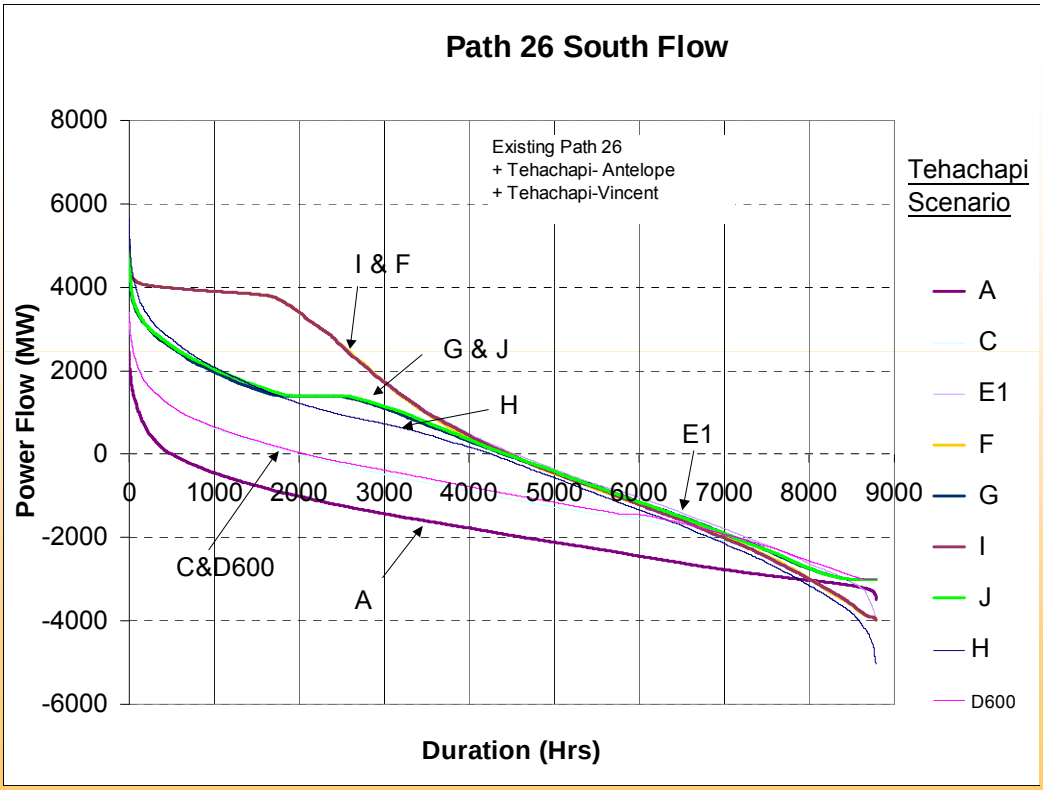




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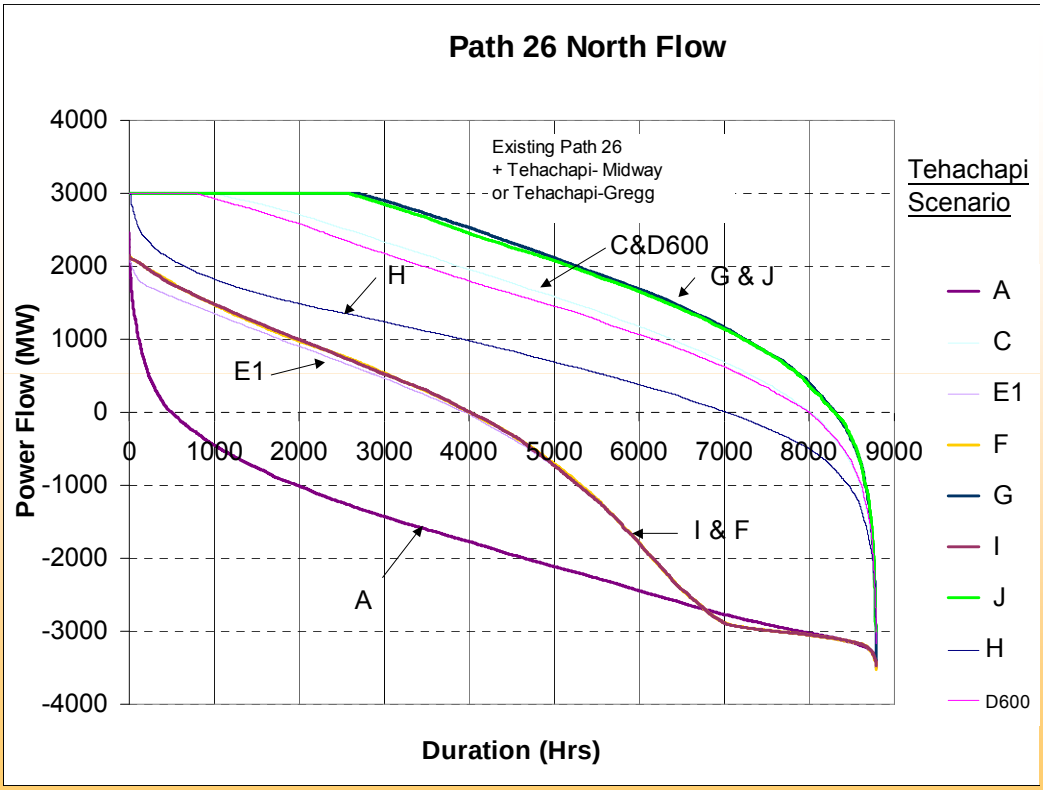




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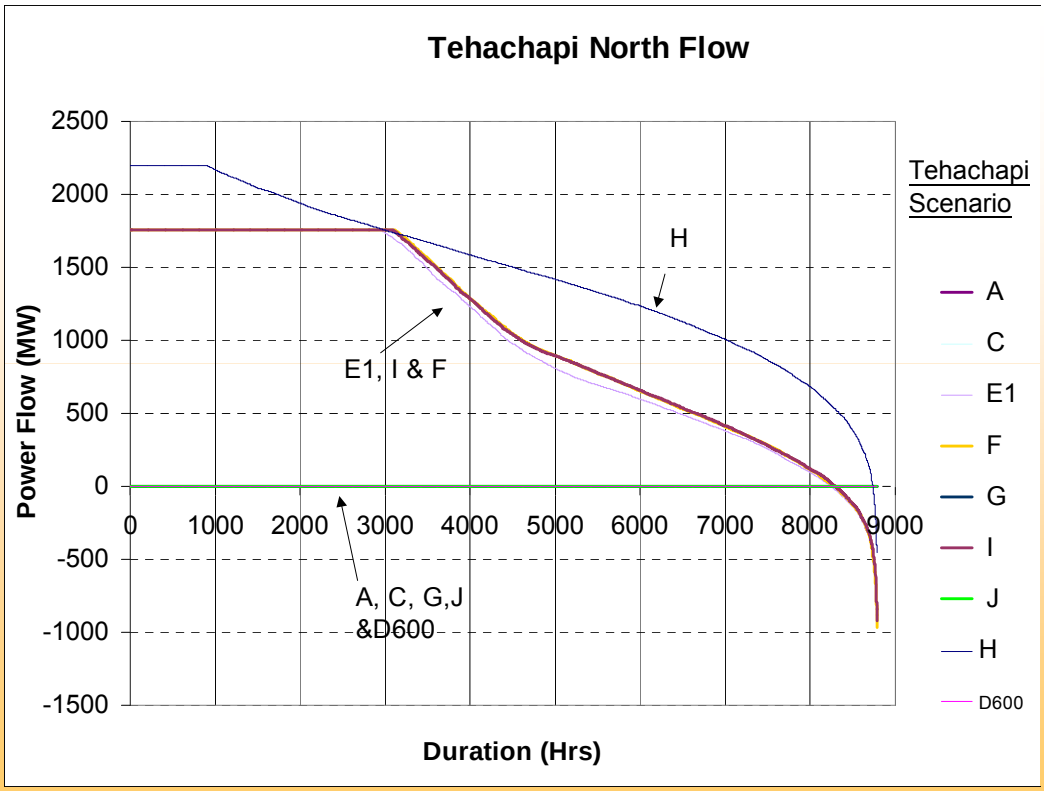




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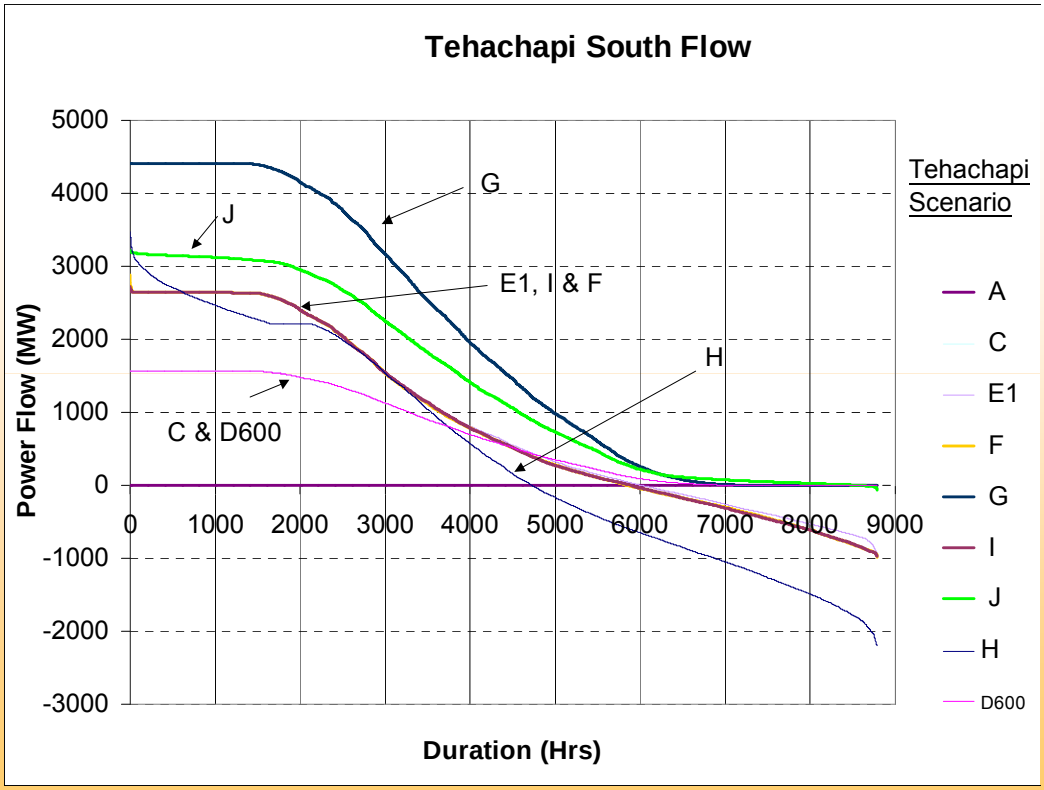




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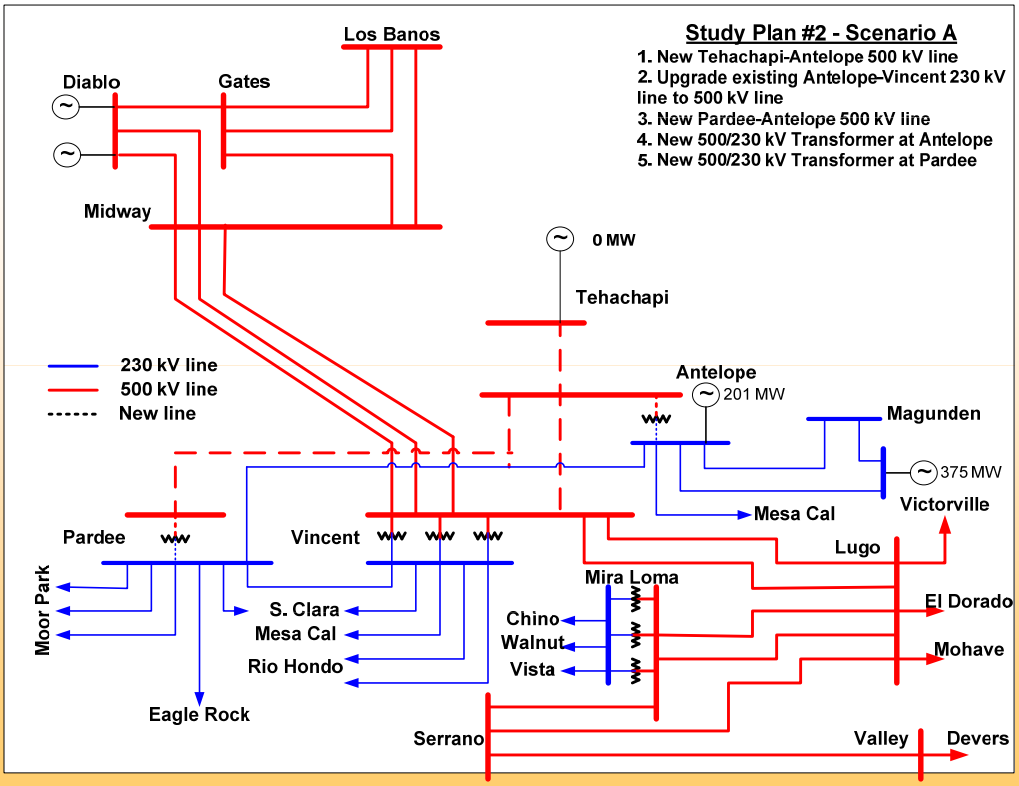


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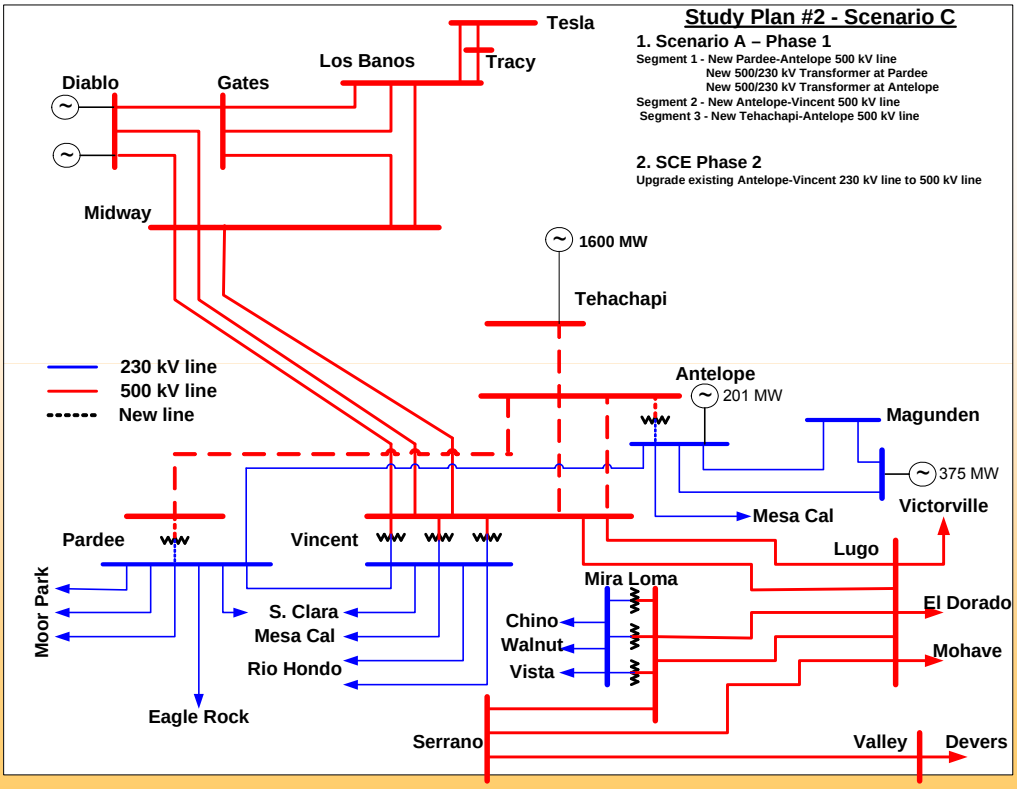


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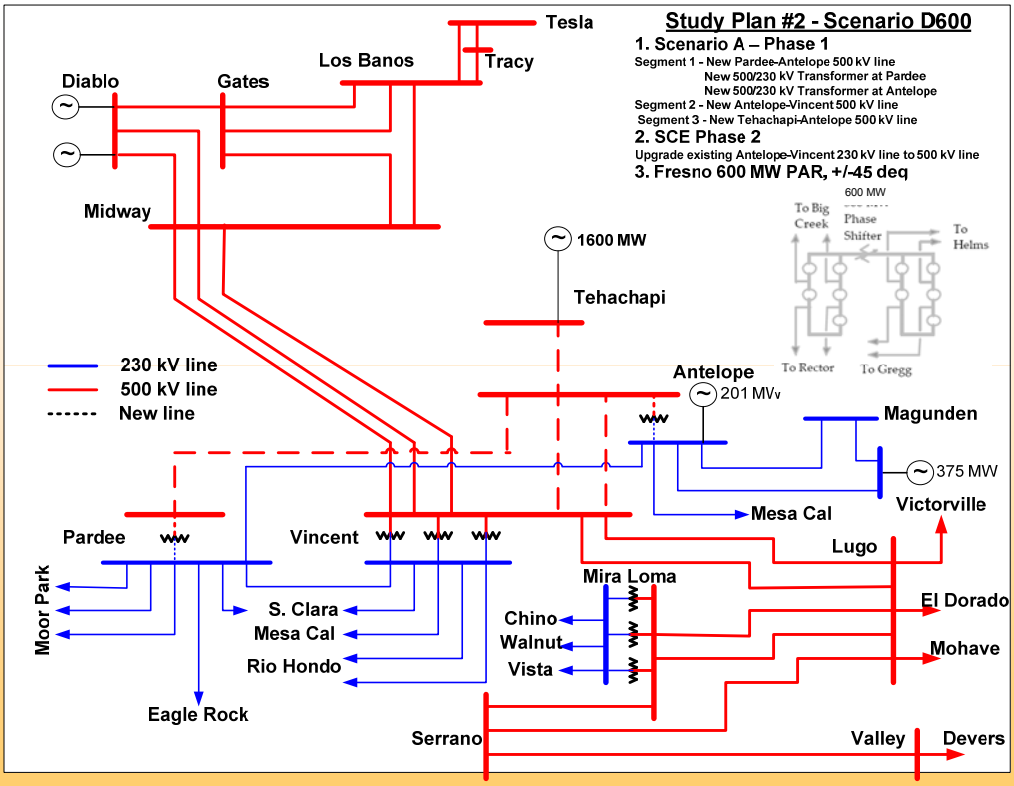


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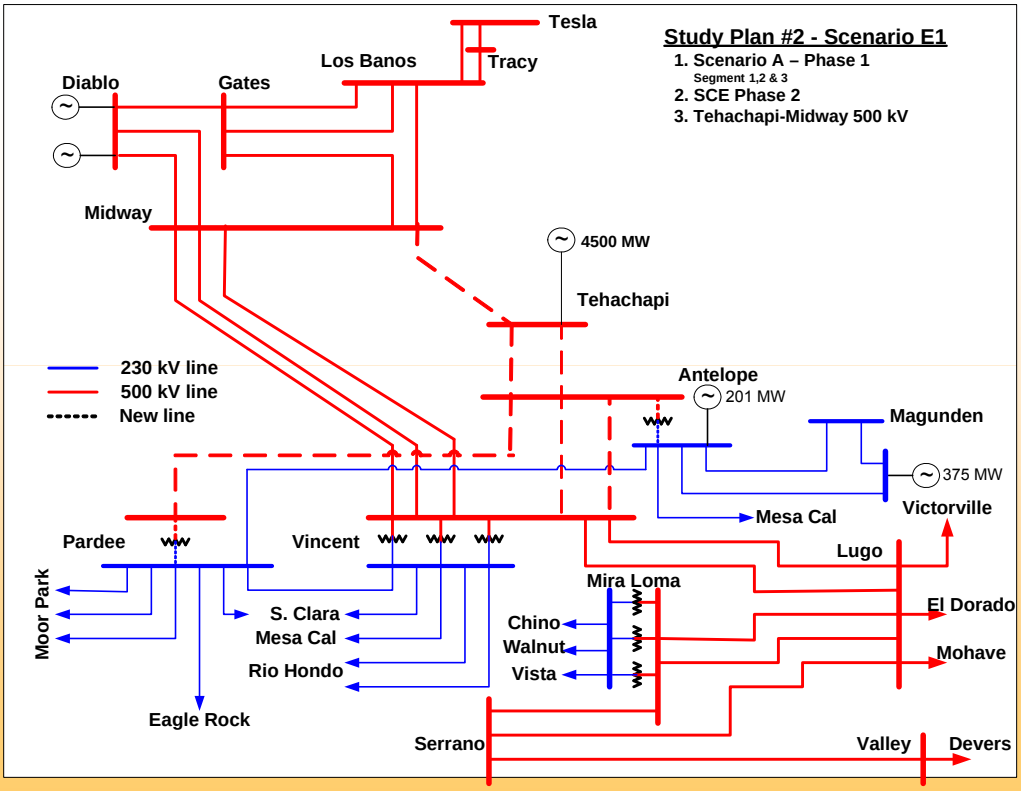


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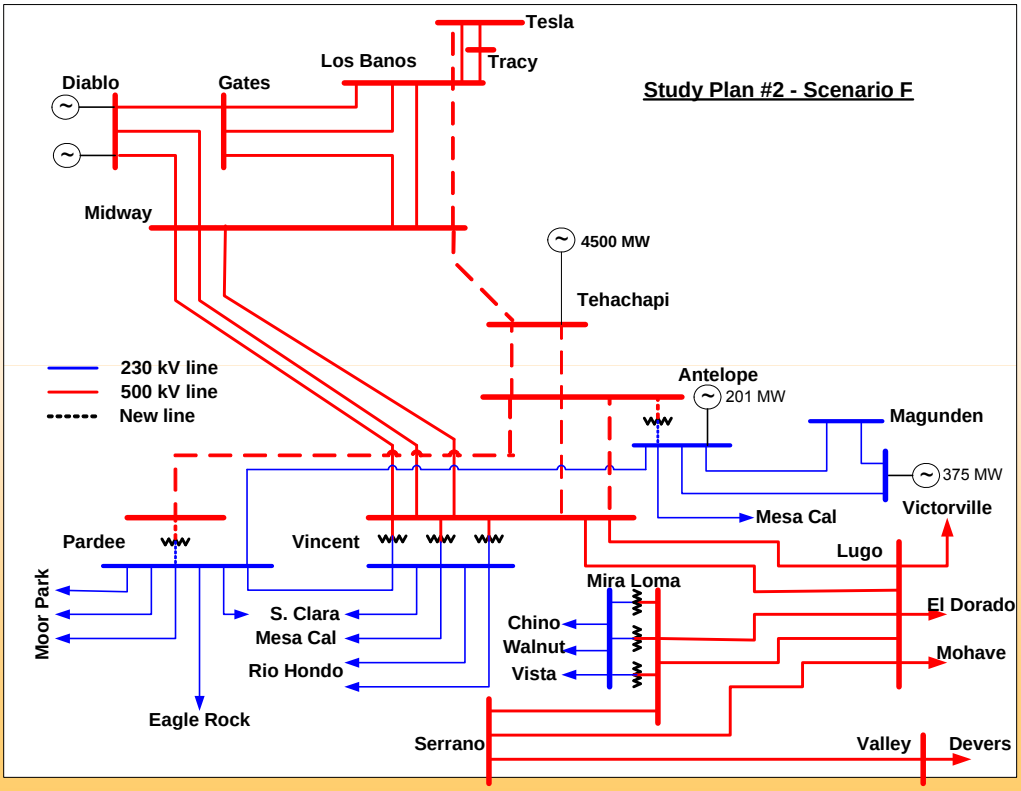


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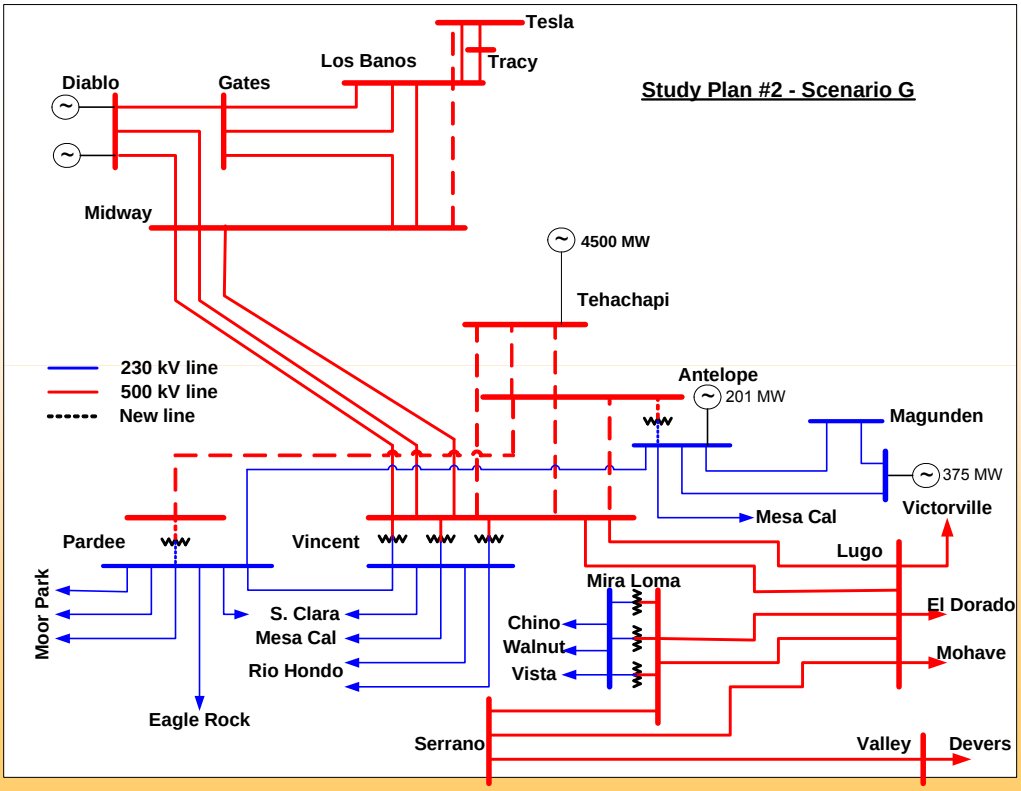


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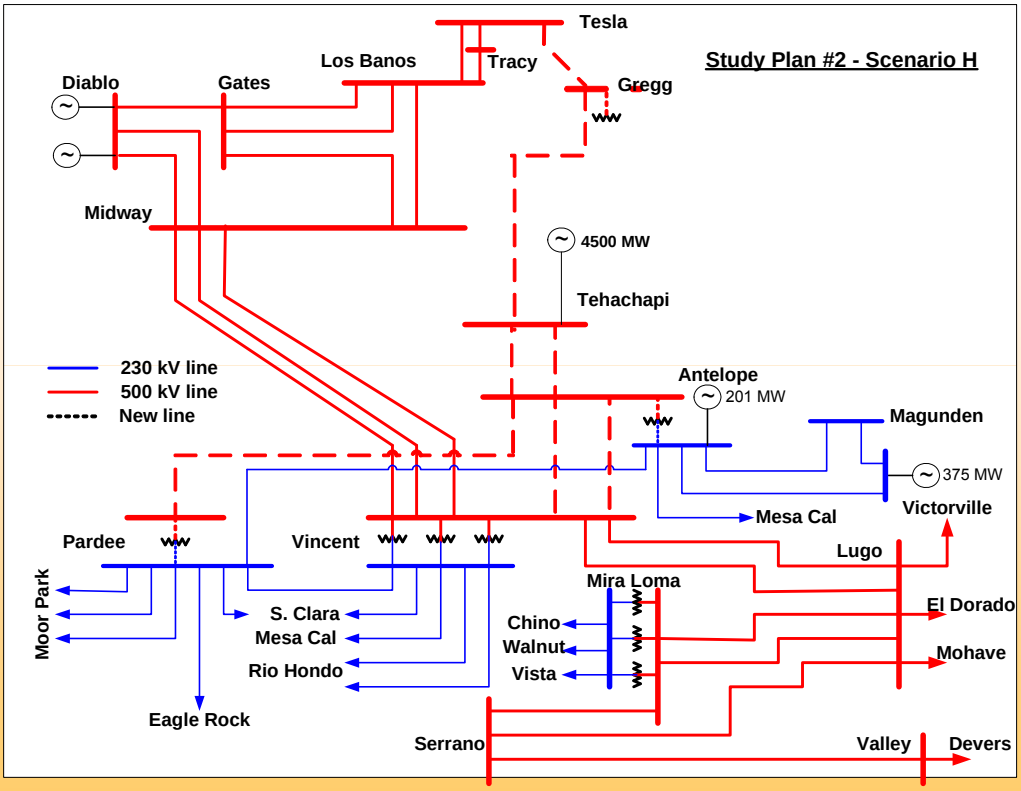


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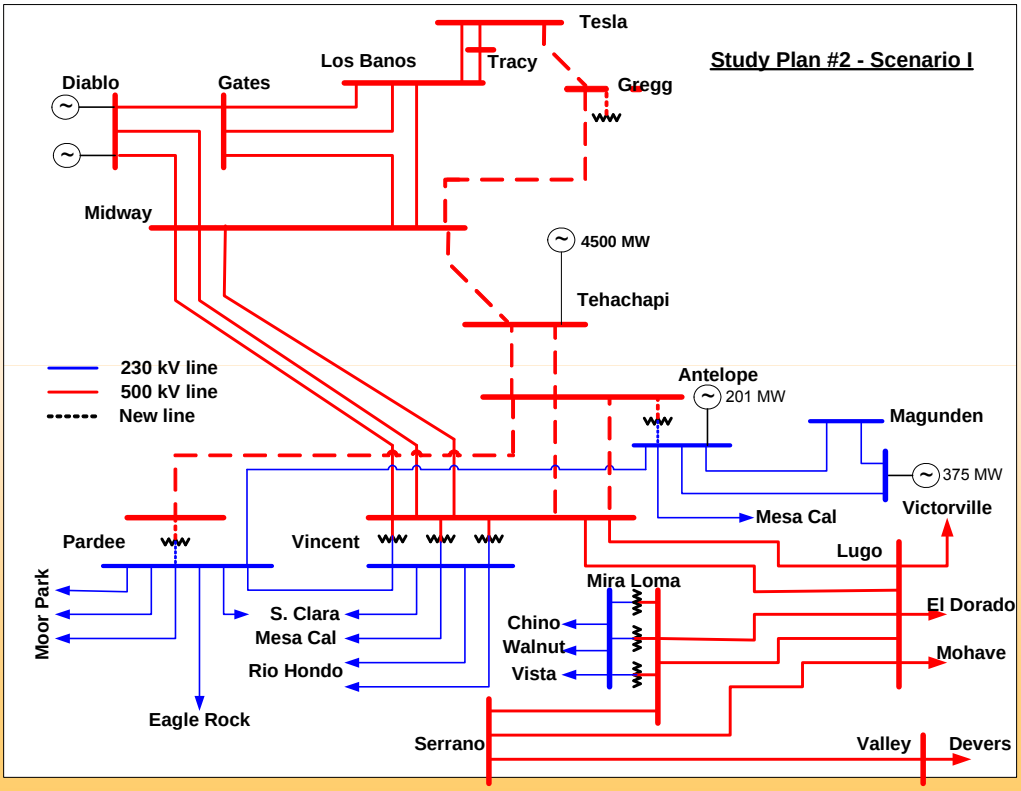


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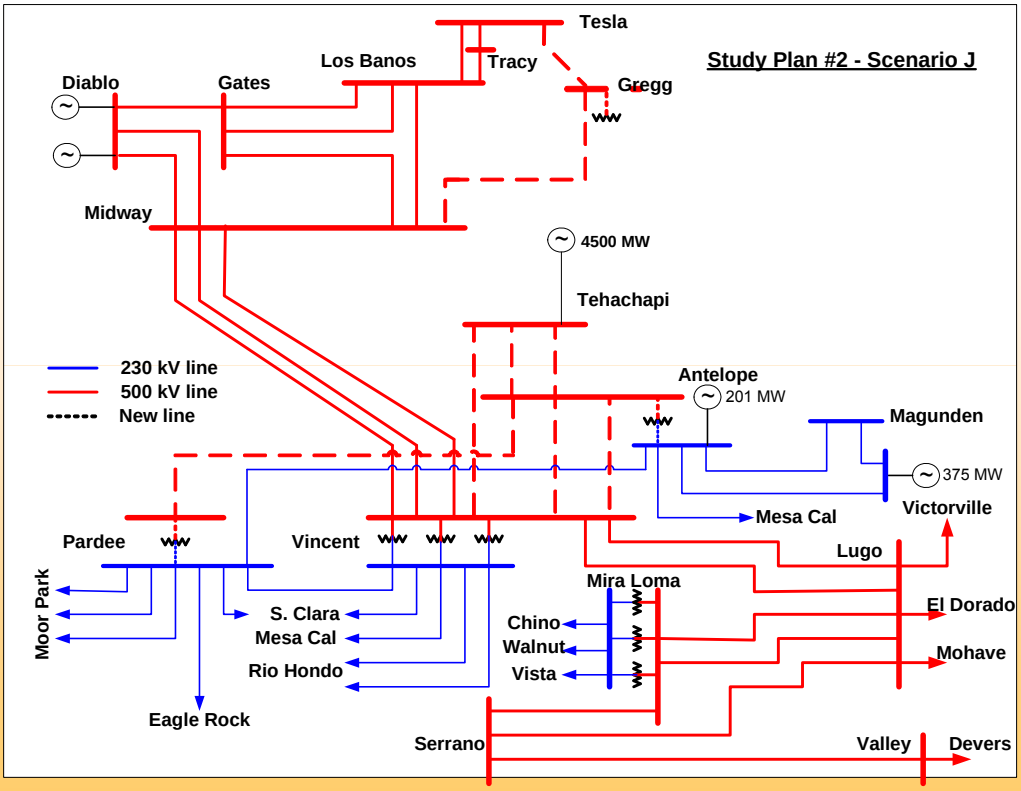


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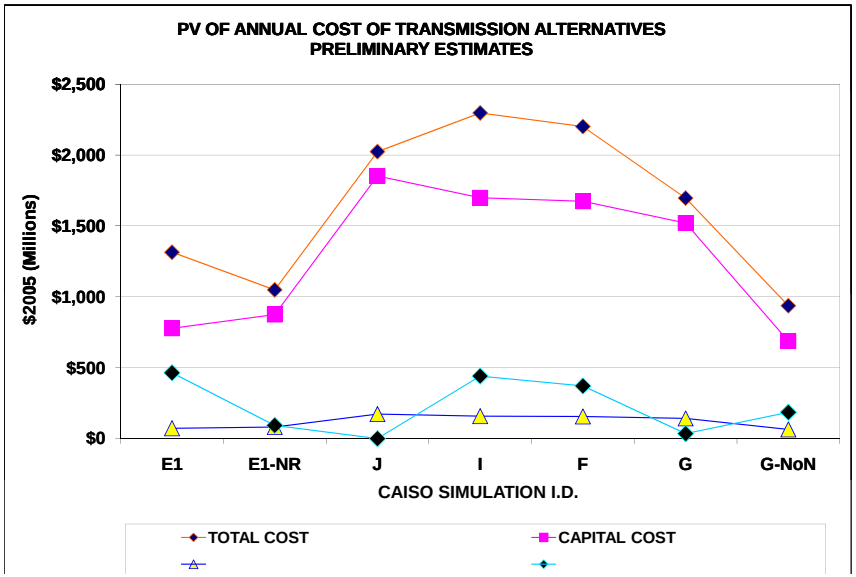
# APPENDIX M

Tehachapi Collaborative Study Group – Component and Cost of Transmission

## TEHACHAPI COLLABORATIVE STUDY
## COMPONENT AND TOTAL COSTS OF TRANSMISSION ALTERNATIVES ($2005 MILLION)

| COST COMPONENT | MULTIPLIER | CAISO PRODUCTION COST RUN | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | E1 | E1-NR | J | I | F | G | G-NoN |
| CAPITAL COST(1) | | $623 | $700 | $1,482 | $1,359 | $1,339 | $1,216 | 550 |
| REVENUE REQUIREMENT (2) | 1.25 | $778 | $875 | $1,852 | $1,698 | $1,674 | $1,520 | $688 |
| ANNUAL O & M & TAXES (3) | 0.01 | $6 | $7 | $15 | $14 | $13 | $12 | $6 |
| PV ANNUAL O & M PLUS TAXES (4) | 11.6 | $72 | $81 | $172 | $158 | $155 | $141 | $64 |
| INCREMENTAL PRODUCTION COST (5) | | $40 | $8 | $0 | $38 | $32 | $3 | 16 |
| PV INCREMENTAL PRODUCTION COST (6) | | $464 | $93 | $0 | $441 | $371 | $35 | $186 |
| TOTAL COST (7) = REV REQ +PV + PV | | $1,314 | $1,049 | $2,024 | $2,297 | $2,201 | $1,696 | $937 |
| **RANK (8)** | | **1** | | **3** | **5** | **4** | **2** | |
| PERCENT OVER (9) | | 0% | | 54% | 75% | 67% | 29% | |

NOTES
1: Construction cost estimated by SCE or PG&E in 2005 $
2: Construction cost plus taxes, insurance, administration and interest during construction (2005 $)
3: Annual O & M plus taxes and administration (2005 $)
4: Present value of annual O & M plus taxes and administration (2005 $) for 50-year project life
starting in 2010 at XX% discount rate for SCE facilities and YY% discount rate for PG&E facilities.
5: WECC-wide production cost (2005 $) minus production cost of lowest cost alternative (Run Z).
6: Present value of incremental production cost (2005 $) for 50-year project life
starting in 2010 at XX% discount rate for SCE facilities and YY% discount rate for PG&E facilities.
7: Sum of revenue requirement plus present value of O &M plus present value of incremental production cost
8: Cost ranking starting with lowest cost alternative
9: Percent increase of total cost over total cost of lowest cost alternative.



# APPENDIX N

Operations Analysis of 4000MWs Wind Generation in the Tehachapi Area

# Operations Analysis of 4000MWs of Wind Generation in the Tehachapi Area

## Introduction and Background

The California ISO (CAISO) has significant operating experience with managing the impact of over 2000 MWs of wind generation in our control area. The CAISO control area is one of the largest in the Western Interconnection and it covers approximately 70% of the State of California. The advantage of a large control area is that 2000 MW of wind generation is still only 4% of the total generation resources in this area. The other advantage is the wind generation is spread throughout the state in five different geographic areas with different weather patterns and different power production patterns. When one area has increasing energy production, one of the other areas may have decreasing production and the result is a smoother and more managable energy production pattern. Tehachapi and San Gorgonio are the two largest wind generation areas today and their energy production has the largest impact on CAISO Grid Operations.

Currently the Tehachapi area has over 700 MWs of installed wind generation capacity. The plan is to add more generation in this area in a series of phases:

| **Tehachapi Expansion Plan** | **Installation of Additional MWs** | **Total Installed MW Capacity** |
|---|---|---|
| Phase 1 - Current Generation capacity as of Jan 2006 | | 700 |
| Phase 2 | 900 MWs | 1600 MWs |
| Phase 3 | 1700 MWs | 3300 MWs |
| Phase 4 | 1200 MWs | 4500 MWs |

The exact timing for all the new generation construction in these phases is not firm but the goal is to complete all of these generation additions by 2010 for the utilities to meet their RPS goals. The addition of 3800 MWs of new wind generation over the next 5 years in the Tehachapi area will have significant impact on both the transmission system and the real-time operation of the California power grid.

## Market Issues

There are market issues that need to be solved for the consumers in the State to receive the maximum benefit from the use of renewable resources. Wind generation energy must be accurately forecasted and scheduled in the Day-Ahead market so that this energy displaces the energy that would normally be produced by fossil fueled generators. Accurate Day-Ahead

energy production forecasts are essential for unit commitment decisions and optimum procurement of ancillary services.

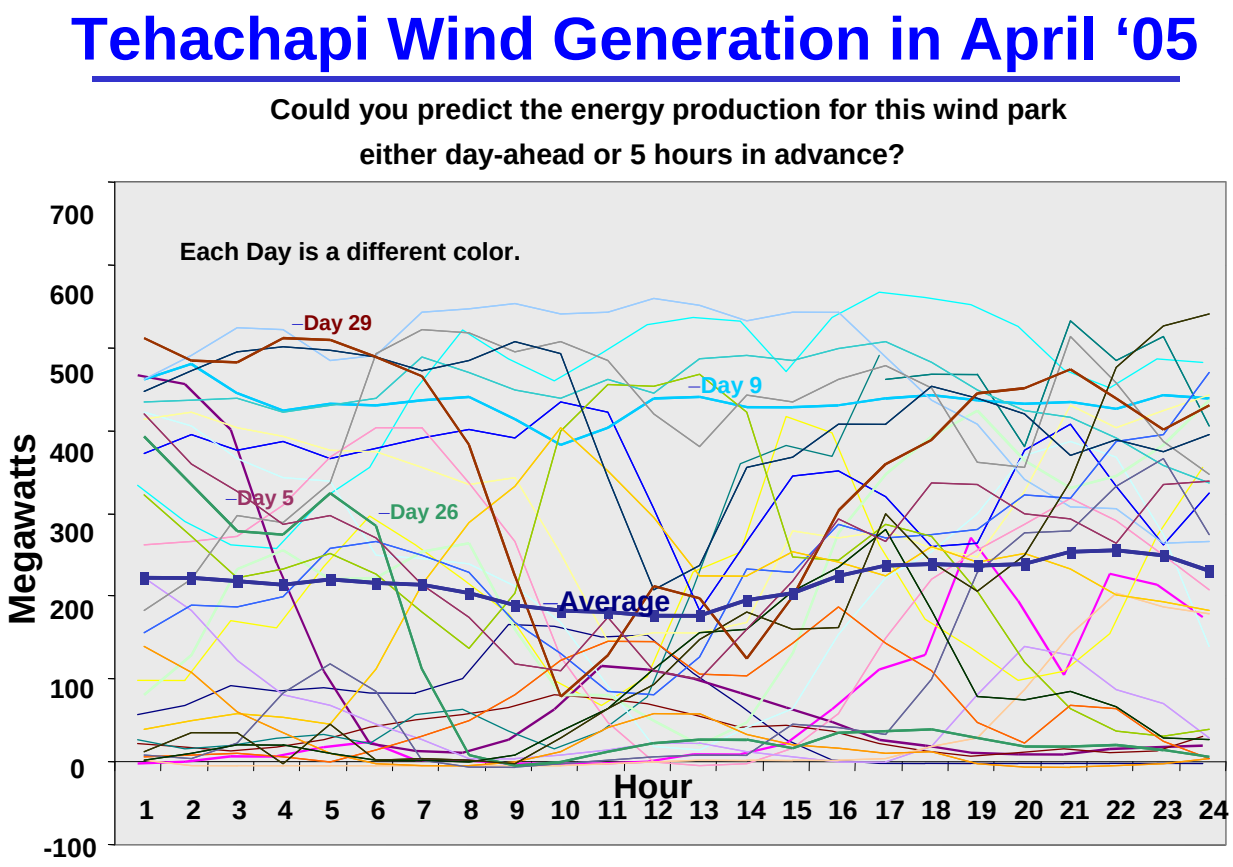



**Figure 1. Daily Wind Generation Energy Production inTehachapi for April 2005**

Figure 1 shows the hourly wind generation energy production in Tehachapi for April 2005. Although the average energy production is approximately 200 Megawatts per hour, the hourly pattern for any specific day shows how extremely variable the energy production is on any specific day. This picture illustrates the difficulty of forecasting the daily and hourly energy production for this area. April is probably one of the more difficult months for forecasting daily energy production due to the variability of the weather patterns. The summer weather patterns for the Tehachapi area are more predictable and the energy production forecasts can be more accurate.

Scheduling of the Tehachapi energy production in the Day-Ahead market will also help to mitigate transmission congestion issues and insure there are feasible schedules for delivery of the energy to the load centers. The new CAISO MRTU market system is expected to be operational by November 2007. Under the new market rules, the Tehachapi energy will have to be scheduled as a source and the load area (sink) will have to be identified for the energy schedules. This information will be used to verify that sufficient transmission capacity is available for the

delivery of the energy. Transmission congestion issues will be resolved in the Day-Ahead market with feasible schedules for all generators in the control area.

In addition, accurate energy production forecasts will be needed five hours ahead of the real-time operating hour for the CAISO to send the correct dispatch notices to quick start units that may be required to replace wind generation energy. Ideally the forecasted hourly wind generation energy production will be scheduled in the Day-Ahead and Hour-Ahead energy markets. The CAISO is working with the CEC and their consultants to develop improved wind generation energy forecasting methodologies that can improve the scheduling of energy from these wind generation resources.

## Operational Issues

The operational issues that must be addressed to accommodate this large amount of new wind generation in the Tehachapi area are:

1. Low Voltage Ride-Through (LVRT) Capability
2. Reactive Power supply and voltage control
3. Supervisory Control and Data Acquisition (SCADA) Capability
4. Impact on Regulation Resources
5. Load Following –Supplemental Energy Dispatch
6. Ramps and Ramp Rates
7. Frequency Response Issues
8. Operating Reserves
9. Energy Production Fit with Daily Load Pattern
10. Capacity factor for meeting summer peak loads

### 1. Low Voltage Ride-Through (LVRT) Capability

The WECC LVRT Standard requires wind generating plants to remain in-service during 3-phase faults with normal clearing times (4-9 cycles or 0.15 sec) and single line to ground faults with delayed clearing, and subsequent post-fault recovery to prefault voltage unless clearing the fault effectively disconnects the generator from the system. (Minimum voltage of 0.15 per unit as measured on the high side of the wind generating plant step up transformer)

All new wind generation built in the Tehachapi area should have a Low Voltage Ride Through Capability that meets the WECC planning standards. The existing 700 MWs of generation in the Tehachapi area does not have this capability and it is probably not practical to retrofit these existing units to bring them into compliance with the new standard. The net result is there will be some risk of a loss of 700 MWs of generation due to a three-phase fault in the Tehachapi, Antelope, or Vincent areas. 700 MWs is still below the CAISO's MSSC (Most Severe Single Contingency event), which is typically the loss of a 1100 MW unit. As long as all the new generation built in the Tehachapi area meets the WECC LVRT standard, the loss of ALL the generation (4500 MWs) in the Tehachapi area should be a very low probability event.

### 2. Reactive Power supply and voltage control

Our standard is that a wind generating plant shall operate with a power factor within the range of 0.95 leading to 0.95 lagging, measured at the Point of Interconnection as specified in the LGIA

(Large Generator Interconnection Agreement) **in order to maintain a specified voltage schedule**, if the Interconnection System Impact Study shows that such a requirement is necessary to ensure safety or reliability. The key requirement is the ability to control the generation facilities to meet the required voltage schedule at the interconnection point. The Tehachapi area has a history of voltage collapse problems so the reactive power supply/voltage control requirement is very important for this area.

### 3. Supervisory Control and Data Acquisition (SCADA) Capability

The CAISO needs real-time (4 second) SCADA data from the wind generation facilities and from metrological data associated with this facility. The detailed specification for the SCADA data and metrological data will be the same or similar to the requirements for the CAISO's PIRP (Participating Intermittent Resources Program) and these requirements are publish on the CAISO Web site.

### 4. Impact on Regulation Resources

Regulation Resources are used to automatically rebalance the system on a minute to minute basis within a specified tolerance band. The tolerance band for the CAISO is approximately plus and minus 110 MWs. The Automatic Generation Control (AGC) system sends control signals every 4 seconds to the generating units on regulation to increase or decrease generation to match the changes in system load and changes in other generating units. The CAISO typically procures between 600 MWs and 800 MWS of regulation per hour.

The currently 700 MWs of installed capacity in Tehachapi does not make a noticeable impact on the CAISO procurement and use of regulation resources. The minute-to-minute changes in the Tehachapi Wind Generation energy production are well within the control capability of the CAISO systems.

Increased generation capacity to Phase 2 – 1600 MWs; Phase 3 – 3300 MWs and Phase 4 – 4500 MWs is expected to have an impact on the amount of regulation resources required. Certainly Phase 3 and 4 will have an impact. Studies are still in progress to determine the magnitude of these impacts and these results should be available by summer 2006.

### 5. Load Following –Supplemental Energy Dispatch

Load following or Supplemental Energy Dispatches are used to rebalance the system every 5 minutes. The CAISO market based systems do an automatic supplemental energy dispatch every 5 minutes to follow increases/decreases in load and generation. These supplemental energy dispatches are often several hundred megawatts per hour. Generators typically have block hourly schedules or Preferred Operating Point (POP). Load however can vary by hundreds of megawatts in an hour so the supplemental energy dispatches are used to increment or decrement the generator schedules to make their energy production match the changes in system load. The Supplemental Dispatches change the real-time market-clearing price.

As can be seen in Figure 1 above, the Tehachapi energy production can vary from minimum to maximum or from maximum to minimum within a couple of hours. The existing 700 MWs of Tehachapi wind generation can result in 50 to 250 MWs of Supplement Energy Dispatch per hours during periods of major changes.

As the amount of wind generation increases in Tehachapi in Phases 2, 3, and 4, there will be major increases in the amount of Supplemental Energy Dispatches. Figure 2 illustrates the size of the increases such as 200, 400, 500, 1000 and even 1500 MWs per hour of supplemental energy dispatches, both increases and decreases. Figure 2 also shows that the Tehachapi wind generation typically has major decreases in energy production morning load pickup period (6 AM to 10 AM). This will exuberate the CAISO's control problems as 2000 to 3000 MWs of supplemental energy will be needed during some of these morning periods to make up for the decrease in wind generation energy production and the morning load pickup. The opposite problem will be true in the evening hours as the temperature sensitive load (Air conditioning) is dropping off at the same time as the wind generation is increasing.

To successfully integrate the planned increase in Tehachapi wind generation, the CAISO will need many generating units to bid INC and DEC supplemental energy bids. This will provide the flexibility needed to move the production of many units to keep the system in balance and meet frequency and control performance standards.

## 6. Ramps and Ramp Rates

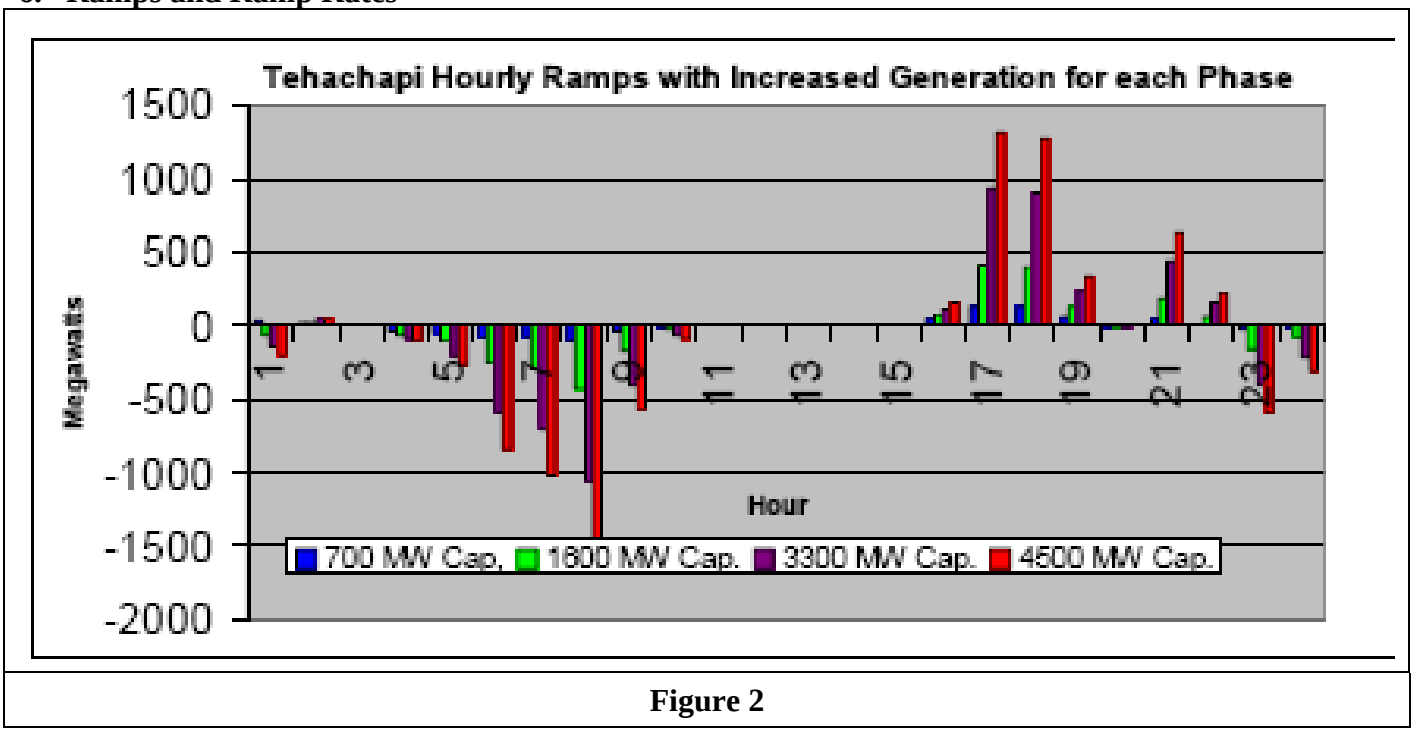



**Figure 2**

The most serious issue with the large amount of wind generation in the Tehachapi area will be the hourly energy ramps, both positive and negative. To successfully integrate this large amount of generation into the control area will require a ramp-forecasting tool. This type of forecasting tool is different from the market energy-forecasting tool as it's objective is to forecast the hourly energy ramps for the next day. This will enable the operator to get the system set up to handle the large ramps. The ISO will also need a real-time metrological forecasting tool that enables the operator to see large weather fronts that are approaching the Tehachapi area that will drive these large energy production ramps. The CAISO will work with the State Agencies, the IOU's and the Wind Generation developers in the Tehachapi area to determine the best ramp forecasting tool that would benefit all parties. Without such a tool, the CAISO will have significant problems with integrating this much wind generation into daily operations.

## 7. Frequency Response Issues

The WECC has decided to move ahead with a new Frequency Response Standard for the Western Interconnection. The WECC CMOPS subcommittee has adopted the recommendations of the FRR task force as published in their White Paper. The FRR standard will be written by the WECC MORC Work Group and the goal is to have it reviewed and approved by the NERC Board of Directors by the end of 2006.

The major issue for the CAISO is that the wind generators do not have a governor or any frequency response capability. Therefore, the ISO will have to have many other units on line that can provide the frequency response that will be required by the new WECC Standard in 2007.

## 8. Operating Reserves

The amount of operating reserves the CAISO procures today is not driven by the amount of wind generation. However, with the concentration 4500 MWs in the Tehachapi area, this will change.

If this generation is carried on 2 transmission lines, and it is producing at it's maximum capability, the ISO would have to plan for the loss of as mush as 2300 MWs of generation due to the loss of one line. This could become the ISO's MSSC. A remedial action scheme may be required to trip wind generation in the event of a transmission line outage.

The CAISO's operating reserve requirement could increase by approximately 800 to 1000 MWs. This may not be a serious operating problem as this would most likely occur at night and not during peak hours as the wind would be a maximum at night. So the reserves would probably be available but there would be an increased cost, as we would now procure this added amount.

## 9. Energy Production Fit with Daily Load Pattern

The Wind Generation energy production for the Tehachapi area tends to be the inverse of the daily load pattern and have a minimum amount of energy production across the afternoon peak load periods in the hot summer days. The ideal solution is if to have a large energy storage capability such as a new pump storage system or other types of energy storage that can be used to shift the off-peak energy production to delivery during peak load periods. Unfortunately current energy storage technology is still too expensive to provide this capability and unless we have a national or state tax credit plan for storage investments, it will be hard to finance investments in storage technology.

## 10. Potential Over-Generation Conditions

An issue that Operations encounters today with the current fleet of wind generation is the fact that the wind generation often peaks at night when the system is at minimum load. During off-peak hours in April, May and June, the ISO can experience over generation conditions when off-peak hydro generation levels are high due to heavy runoff and off-peak wind generation is high. Additional wind generation will increase the frequency and magnitude of over generation conditions.

## 11. Capacity factor for meeting summer peak loads

The ISO is calculating the actual capacity factor the Tehachapi wind generation for the past three years based upon the CPUC's formula for calculating the capacity factor. This information should be available later by March, 2006.

## 12. Additional Issues

1. Determine the best methodology for calculating the amount of regulation and load following resources that are needed on a month-to-month basis.
2. Determine the attributes required for new generation that can complement the production characteristics of wind generation and other renewable resources. Every type of generator has some type of limitation so we should determine the best mix of future generation types that meets operational requirements and energy reliability at reasonable cost.
3. Develop new concepts for automatic generation control and dispatch of controllable loads to assist with mitigating the impact of the variability of wind generation energy production.
4. Explore changes in interconnection scheduling protocols, policies and procedures to remove one of the barriers to moving wind generation energy between control areas.
5. Wind generators currently cannot increase energy output in response to frequency dips during system disturbances. What should be done to ensure the operator can meet interconnect performance standards.
6. There are over-generation problems during light load periods. What can be done to increase the flexibility for reducing power output from all generation resources, including wind generation, during minimum load periods?
7. Explore the feasibility of using energy storage technology to shift off-peak energy production to delivery during peak load periods.
8. Improve wind energy forecasting tools and weather forecasting.
9. Develop procedures and protocols with wind generators for controlling large ramps up and down during periods of high wind variability such as major storms.

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# APPENDIX O

Comparison of the Effects on the Transfer Capability of Path 26 Alternatives S1 and 2

# Comparison of the Effects on the Transfer Capability of Path 26 of Alternatives 1 and 2 for Delivering Tehachapi Power to the Grid Taking Into Account the Variability of Wind Generation

The evaluation of the effects of the proposed Tehachapi wind development on Path 26[1] is based on the following two alternatives considered:

Alternative 1 – consists of one 500kV line between Tehachapi and Midway, and two 500kV lines between Tehachapi and Antelope, see Figure 1.
Alternative 2 - consists of three 500kV lines between Tehachapi and Antelope, see Figure 2.

## Conclusions

1. South-to-North Capability: During off-peak hours when the power flow is from South to North (S-N) across Path 26, Path 26 transfer capability is limited by Path 15 capability, therefore there is no difference between Alternative 1 and Alternative 2 under this condition.
2. North-to-South Capability with No Wind: During peak hours when the power flow is from North to South (N-S), when Tehachapi wind generation is zero, the thermal transfer capability with Alternative 1 will be increased from 4000MW[2] to 5100MW and 4500MW given 70% and no series compensation, respectively, on the Tehachapi- Midway line. However, the usefulness of this capability is dependent on an increase in generation North of Midway. With Alternative 2, the transfer capability is unchanged by the level of generation at Tehachapi and remains at 4000MW.
3. North-to-South Capability with Wind: During peak hours when the power flow is from N-S and the wind is generating maximum output, the thermal transfer capability of Path 26 with Alternative 1 and 4000MW at Tehachapi will decrease from 4000MW to 3400MW and 3700MW with 70% and no series compensation, respectively, see Figure 3 for the case of 70% series compensation. The transfer capability as a function of varying levels of Tehachapi generation is shown on Figure 4. With Alternative 2, the transfer capability remains at 4000MW and is unchanged by the level of Tehachapi generation.
4. Alternative 1 would provide benefit during scheduling clearance for maintenance by providing additional transmission facilities over the interface

[1] The existing Path 26 transfer capabilities are determined by power flow and stability studies. The new values provided in this evaluation are estimated thermal transfer capabilities based on power flow analysis only. Detailed thermal, voltage and stability studies are needed to determine actual capabilities.

[2] The existing Path 26 North-to-South capability is 3700 MW. This is expected to increase to 4000 MW by Summer 2006, pending final approval. This increase to 4000 MW is currently in Phase II of the WECC Path Rating Process. WECC Procedure for Project Rating Review requires projects that have achieved a Phase II status be considered in the study of all project potential projects, therefore, this analysis assumes a 4000 MW N-S transfer capability for Path 26.

assuming wind generation at Tehachapi are off-line compared to the existing system or Alternative 2.

BOTTOM LINE: The estimated Path 26 thermal transfer capability is impacted only by Alternative 1 (with the Tehachapi-Midway line) and only in the North-to-South direction. The North-to-South thermal transfer capability is increased for Tehachapi generation up to about 2500MW; above this value, the line would degrade the thermal transfer capability. South-to-North thermal transfer capability would remain unchanged because it is limited by the Path 15 South-to-North transfer capability. Alternative 2 would not impact the Path 26 thermal transfer capability.

Alternative 1

Power flow with One Tehachapi-Midway and Two Tehachapi – Antelope lines

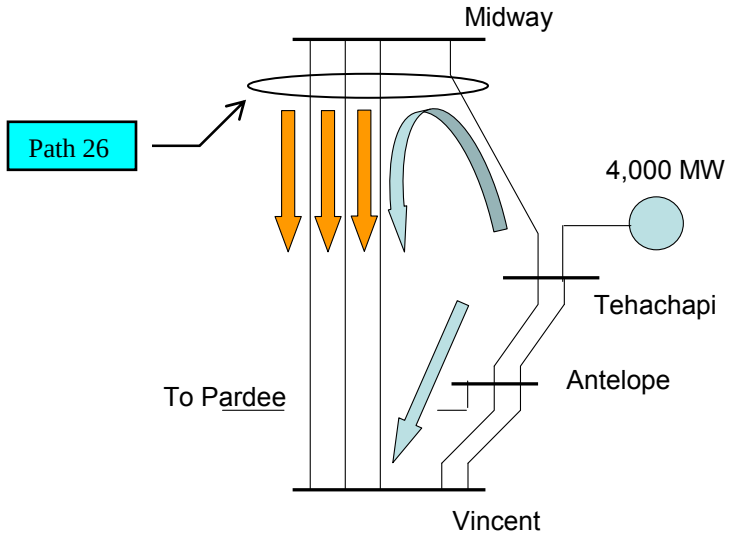



Figure 1

Alternative 2

Power flow with Three Tehachapi – Antelope lines

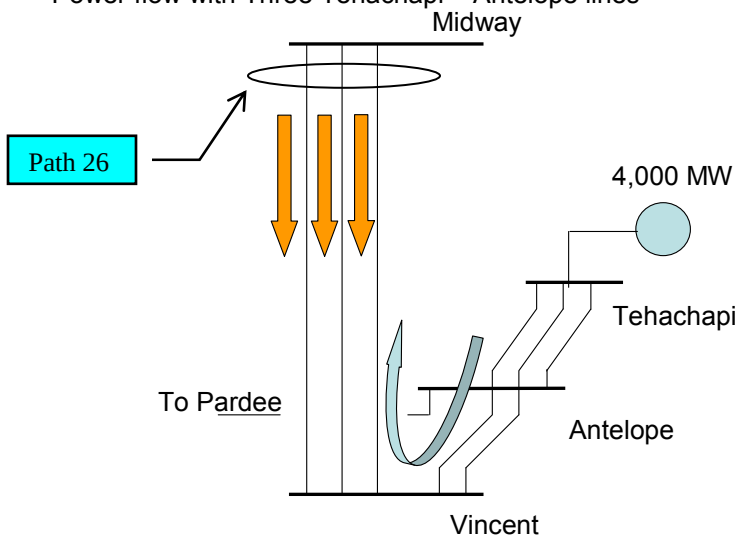



Figure 2

PF Plot: 2010 Summer Peak; P26 N-S=3400MW, Tehachapi Gen = 4000MW
Midway-Tehachapi 500 kV line with 70% series compensation

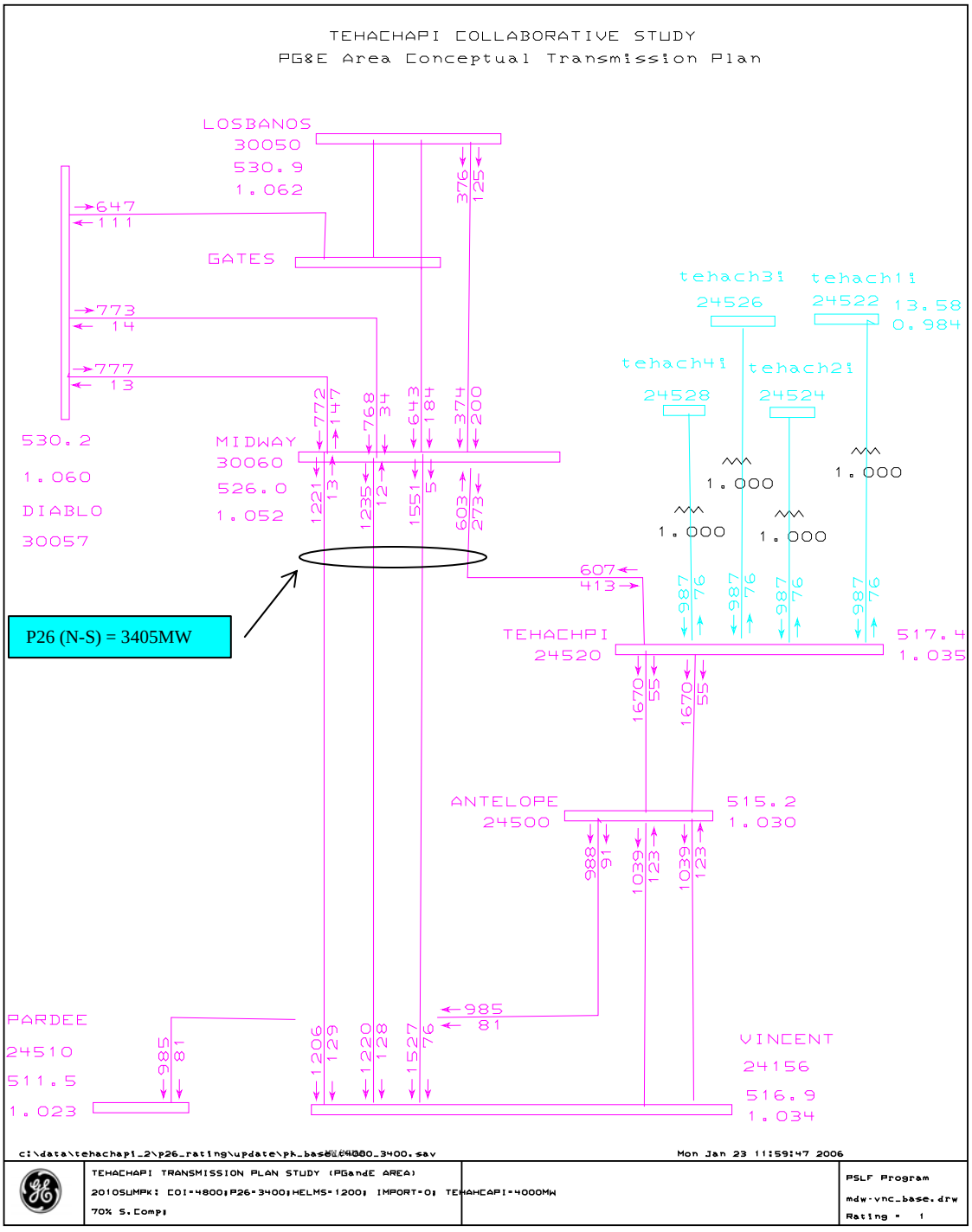



**Figure 3**

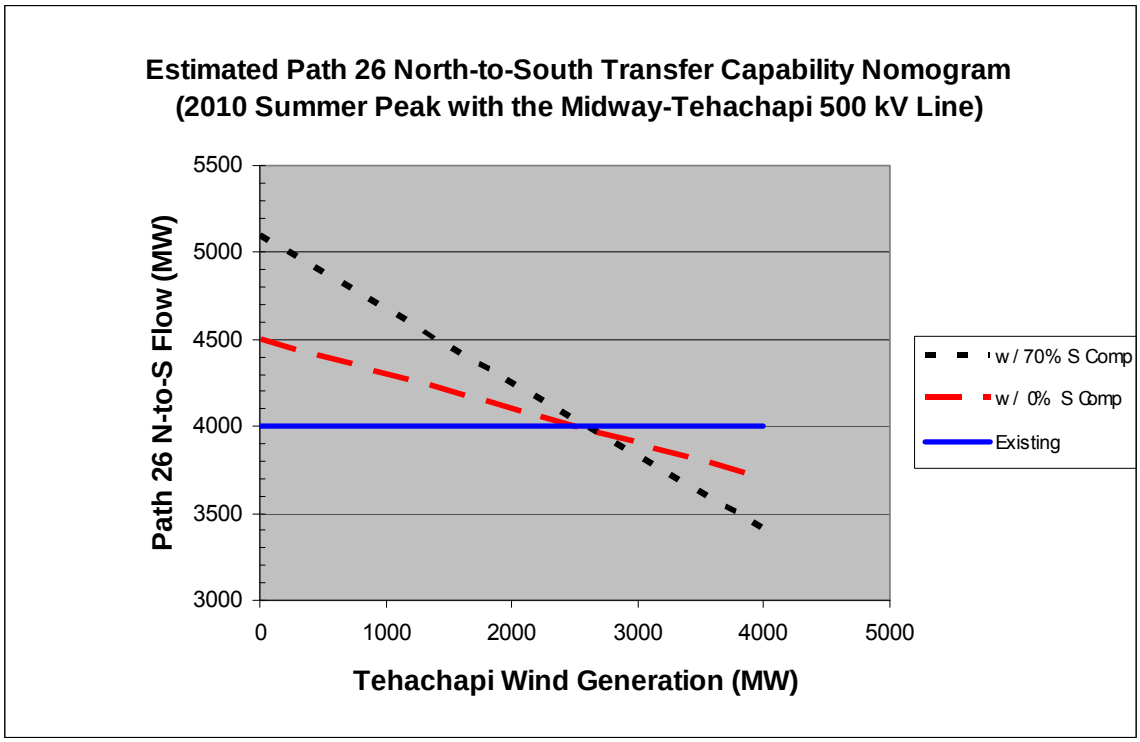



**Figure 4**

## The Alternatives

The only existing transmission link between northern and southern California are the three 500 kV lines between PG&E's Midway Substation and SCE's Vincent Substation which define the Path 26 interface. The existing non-simulataneous Path 26 transfer capability in either the North to South (N-S) or South to North (S-N) direction is determined by normal and emergency loading on the Midway – Vincent #3 500 kV line or voltage criteria violations. The limiting facilities are the 1736A summer normal rating of the #3 line conductors and the existing 3500 A emergency rating of the series capacitor banks on the Midway-Vincent #3 line. The most limiting credible contingency is the loss of both the Midway-Vincent #1 and #2 lines.

The existing maximum Path 26 N-S transfer limit of 4000 MW is based on heavy summer conditions and requires a Remedial Action Scheme (RAS) to trip 1400 MW[3] of Midway area generation and 500 MW of load in Southern California following the loss of the Midway-Vincent #1 and #2 lines. Without the RAS, existing maximum Path 26 N-S transfer limit is 3000 MW. The maximum existing Path 26 S-N transfer limit is 3000 MW and does not require RAS to support this limit. Path 26 S-N flows are typically limited to below 3000 MW due to congestion on Path 15.

[3] Maximum amount of generation rejection for loss or two elements under CAISO planning guidelines.

With the Tehachapi wind generation electrically near the Path 26 interface, there is a potential to impact the transfer capability depending on the 500 kV transmission reinforcements selected. Figure 1 shows SCE's proposed Alternative 1, which provides two 500kV circuits from Tehachapi Substation 1 to Antelope Substation and a 500 kV line from Midway to Tehachapi, thereby creating a 4$^{th}$ path from Midway to Vincent in parallel with the existing Path 26 interface. As such, the Path 26 interface would need to be redefined to include this new transmission path. The transfer capability of this path would be dependent on the level of Tehachapi wind power injected into the new Midway-Tehachapi-Vincent line at Tehachapi and also by the level of series compensation on the line. Due to the variability of the wind, the wind generation output may range from 0 to the maximum of 4000 MW. Under peak load conditions, when the prevailing power flow is from North to South, part of the Tehachapi power would flow North to Midway, then use the existing North-to-South transfer capability to flow back South over the existing Path 26 lines. That would decrease the available North-to-South transfer capability for transporting power from North of Midway to Southern California.

Figure 2 shows SCE's proposed Alternative 2, which consists of three 500kV lines from Tehachapi Substation 1 to Antelope/Vincent. This alternative would not affect the present Path 26 thermal transfer capability in either the North-to-South or South-to-North direction.

**Comparison of the Effects of the Alternatives**

The following table provides a comparison of the estimated Path 26 thermal transfer capability. Detailed thermal, voltage and stability studies are needed to definitively determine actual capabilities.

Estimated Path 26 Thermal Transfer Capability

| SCE Alternative | Tehachapi Wind Output (MW) | Path 26 | |
|---|---|---|---|
| | | N-S (MW) | S-N (MW) |
| Existing System | - | 4000[1] | 3000[2] |
| Alt. 1 – 500 kV, one Midway-Tehachapi, two Tehachapi-Antelope-Vincent | 0 | 4500[1] –5100[3] | 3000[2] |
| | 4000 | 3400-3700[1] | 3000[2] |
| Alt. 2 – Three 500 kV Tehachapi-Antelope-Vincent | 0 | 4000[1] | 3000[2] |
| | 4000 | 4000[1] | 3000[2] |

Notes:

1) Path 26 RAS will trip 1400 MW of Midway generation and 500 MW of Southern California load for Midway – Vincent #1 and #2 500 kV double-line outage.
2) No RAS required. Path 26 S-N transfers may be limited by Path 15 capability.
3) Range indicates without series compensation and with a high level of series compensation (70%) on the Midway-Tehachapi 500 kV line. Appropriate series compensation needs to be determined through additional studies.
4) Does not consider any limitation resulting from SCIT transfer capability.

Alternative 1 would provide a significant increase in the North-to-South transfer capability of Path 26 when there is no generation at Tehachapi. However, it would also decrease the existing N-S capability when Tehachapi is at full output, see Figure 3 for the transfer capability as a function of varying levels of Tehachapi generation. However, in order to take advantage of any increased capability, CAISO Operations would need sufficient advance forecast of the wind generation output to allow for rescheduling of Path 26 power flow. This may be problematic until better forecasting methods are implemented.

The upper range of this capability depends on use of the Midway RAS. Since the existing Path 26 interface RAS arms the maximum amount of generation for rejection for the limiting N-2 contingency plus 500MW of load rejection, no additional generation, such as Tehachapi wind, may be armed unless it is accompanied with a further equivalent amount of load rejection on the SCE system.

Alternative 1 S-N: Without an upgrade of Path 15, there will be no increase in Path 26 S-N capability since Path 26 would be limited by the existing Path 15 capability Alternative 1 would provide benefit by increased flexibility during scheduling clearance for maintenance by providing additional transmission facilities over the interface assuming wind generation at Tehachapi are off-line compared to the existing system or Alternative 2.

Alternative 2 would not provide any new transfer capability for Path 26, as it does not involve reinforcement or upgrade of the existing path.

Comparison of the Effects on the Transfer Capability of Path 26 of Alternatives 1 and 2 for Delivering Tehachapi Power to the Grid Taking Into Account the Variability of Wind Generation

## APPENDIX

## Study Plan

I. Purpose: To determine the effect of the variability of wind generation and a Tehachapi-Midway 3,400MVA line on the non-simultaneous thermal transfer capability of Path 26.

II. Introduction: In the December 19, 2005 TCSG meeting it was decided that a subgroup be formed to develop a collaborative statement on variability of wind and its impact and that of the Tehachapi-Midway line on Path 26 transfer capability. Power flow studies will be performed to provide the supporting data for this statement by establishing the approximate nomogram relationship between Tehachapi wind generation and Path 26 thermal transfer capability.

III. Limitations: It should be noted that Transfer Capability must be determined based on power flow, transient dynamic stability studies and post-transient voltage stability studies taking into account relationships with other interfaces such as SCIT, as well as the non-simultaneous power flow studies undertaken here. Such stability studies and studies to account for simultaneous transfer will not be performed here due to the lack of time and specific generator data. In addition, further studies with more detailed information may identify other more limiting contingencies. As such, the "thermal transfer capabilities" determined in this study must be adjusted when more specific information becomes available.

IV. Assumptions:

1. Starting Base Cases (same as the TCS Phase 2 study plan):
    a. 2005 PG&E Grid Expansion Study, 2010 Heavy Summer North Peak case
    b. 2005 PG&E Grid Expansion Study, 2010 Summer Off-peak case
2. Loss of Midway – Vincent 500 kV lines # 1 and #2 is the most limiting contingency.
3. Existing RAS are available to support 3700 MW of existing North-to-South power transfer on Path 26, and to support the existing 5,400 MW (or the most recent Operating Transfer Capability as determine by the WECC) of South-to-North power transfer on Path 15.

4. Decreasing generation that provide RAS to support the power transfer will be accompanied by:
    a. Decreasing Path 26 operating limit in the North-to-South direction at the rate of 1 MW for every 2 MW decrease in generation in the vicinity of Midway Substation
    b. Decreasing Path 15 operating limit in the South-to-North direction at the rate of 1 MW for every 2 MW decrease in generation in the vicinity of Midway Substation

V. Criteria: NERC/WECC Planning Standards and CAISO Planning Standards.

VI. System Operating Scenarios: The following reasonably adverse operating scenarios will be examined:

2. Peak conditions with 3700 MW of normal power flow in a North-to-South direction on Path 26 and 0 MW of PG&E's import at Midway from Southern California:
    a. Existing system with Tehachapi wind generation at 0 MW to establish benchmark case.
    b. Case E1-New Rating (i.e., SCE Alternative 1 with Tehachapi – Midway 500 kV line rated at 3,400 MVA without series compensation)
        i. Tehachapi wind generation at 0 MW
        ii. Tehachapi wind generation at 4,000 MW
    c. Case G-NNM (i.e., SCE Alternative 2)
        i. Tehachapi wind generation at 0 MW
        ii. Tehachapi wind generation at 4,000 MW

3. Off-Peak conditions with normal power flow in a South-to-North direction on Path 15 and Path 26, and with Path 26 loading increased (in the South-to-North direction) by 50% of Tehachapi generation.
    a. Existing system with Tehachapi wind generation at 0 MW to establish benchmark case.
    b. Case E1-New Rating (i.e., SCE Alternative 1 with Tehachapi – Midway 500 kV line rated at 3,400 MVA without series compensation)
        i. Tehachapi wind generation at 0 MW
        ii. Tehachapi wind generation at 4,000 MW
    c. Case G-NNM (i.e., SCE Alternative 2)
        i. Tehachapi wind generation at 0 MW
        ii. Tehachapi wind generation at 4,000 MW

4. Repeat Steps 1.b and 2.b with Tehachapi – Midway 500 kV line series compensated at 70%

VII. Methodology:

1. Examine each scenario above and run power flow program to determine the thermal transfer capability allowable on Path 26 under normal operating conditions by adjusting the power schedule under normal conditions at Midway until a transmission facility on Path 26 or Path 15 is loaded to 100% of its normal rating.
2. For each scenario above run Governor Power Flow program to simulate Midway – Vincent #1 and #2 double line outage to examine system conditions after the transient oscillations have subsided, all automatic actions are completed but before operator intervention.
3. Determine the thermal transfer capability of Path 26 by adjusting the power schedule under normal conditions at Midway until a transmission facility on Path 26 or Path 15 is loaded to 100% of its emergency rating after the Midway – Vincent 500 kV lines #1 and #2 double line outage. Record this power schedule at Midway. (To the extent applicable, the most recent Operating Transfer Capability as determined by the WECC can be used for the benchmark cases.)
4. Repeat for the remaining system scenarios
5. Develop nomogram relating Path 26

# APPENDIX P

Transmission Options for Tehachapi Wind Power

# Transmission Options for Tehachapi Wind Power

For discussion only

Rich Ferguson, Facilitator
Tehachapi Collaborative
Study Group

# Major Issues

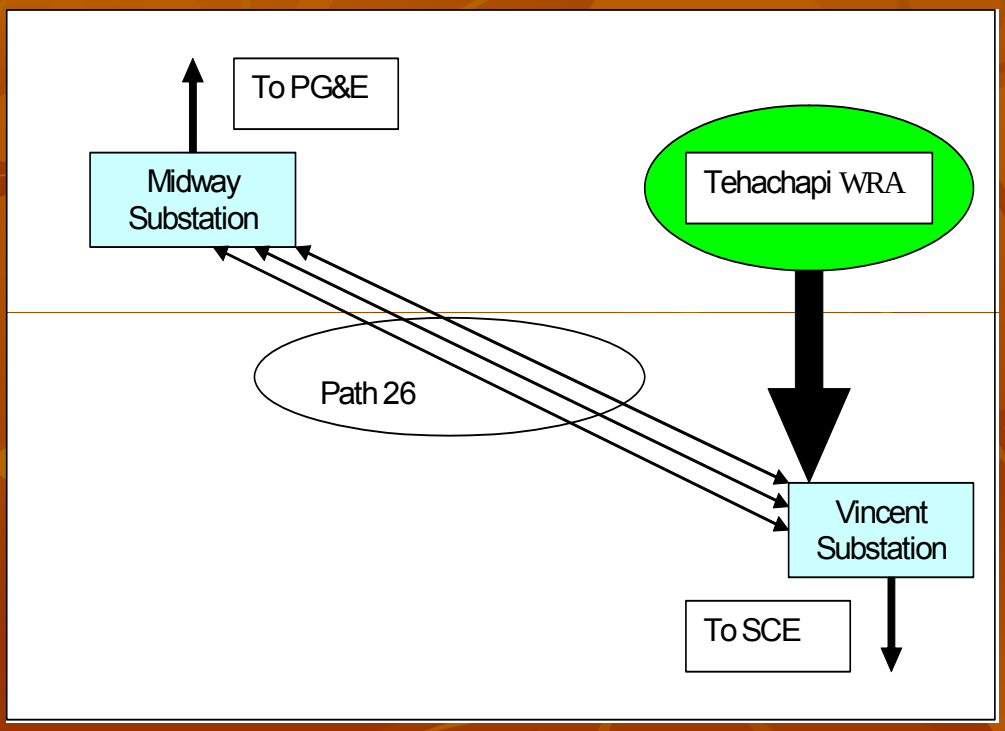
1. Tehachapi WRA grid connections
2. NP15 congestion
3. Other (Fresno tie, etc.)

# 1) Tehachapi WRA Connections

- Choices
  - A) Gen-tie option – All lines connect Tehachapi to Vincent substation, perhaps through the Antelope substation.
  - B) Expanded Path 26 option –One line connects Midway to Tehachapi and one or more lines connect Tehachapi to Vincent.

3

# Gen-tie Option

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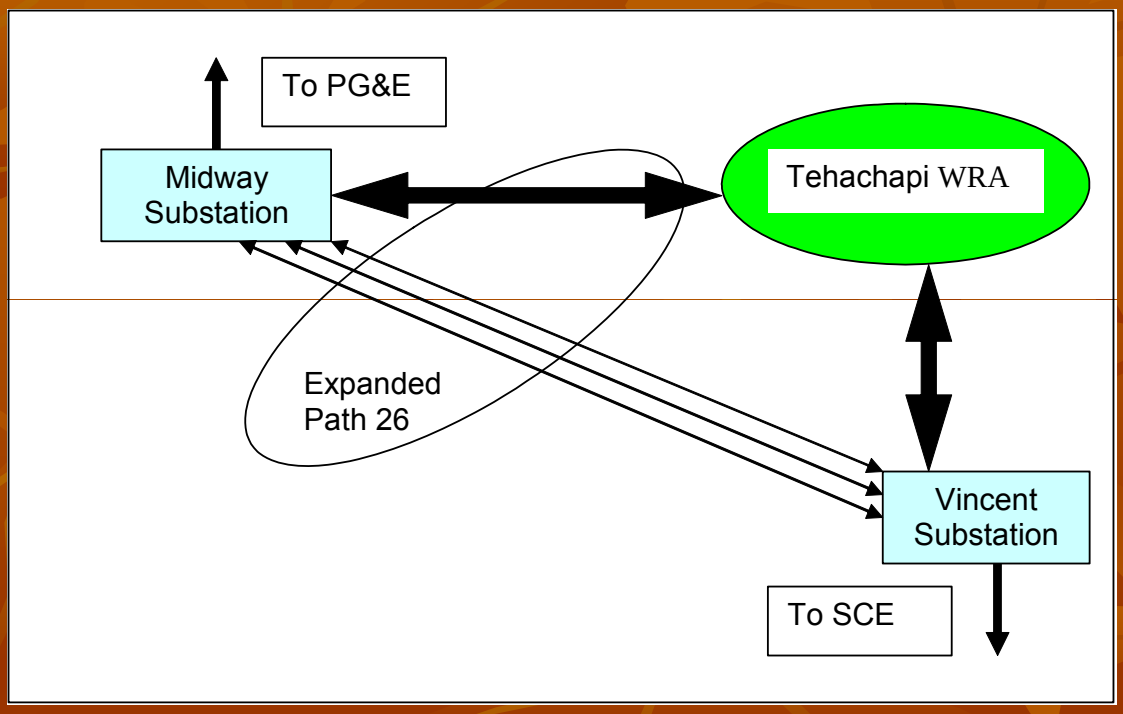
# Expanded Path 26 Option



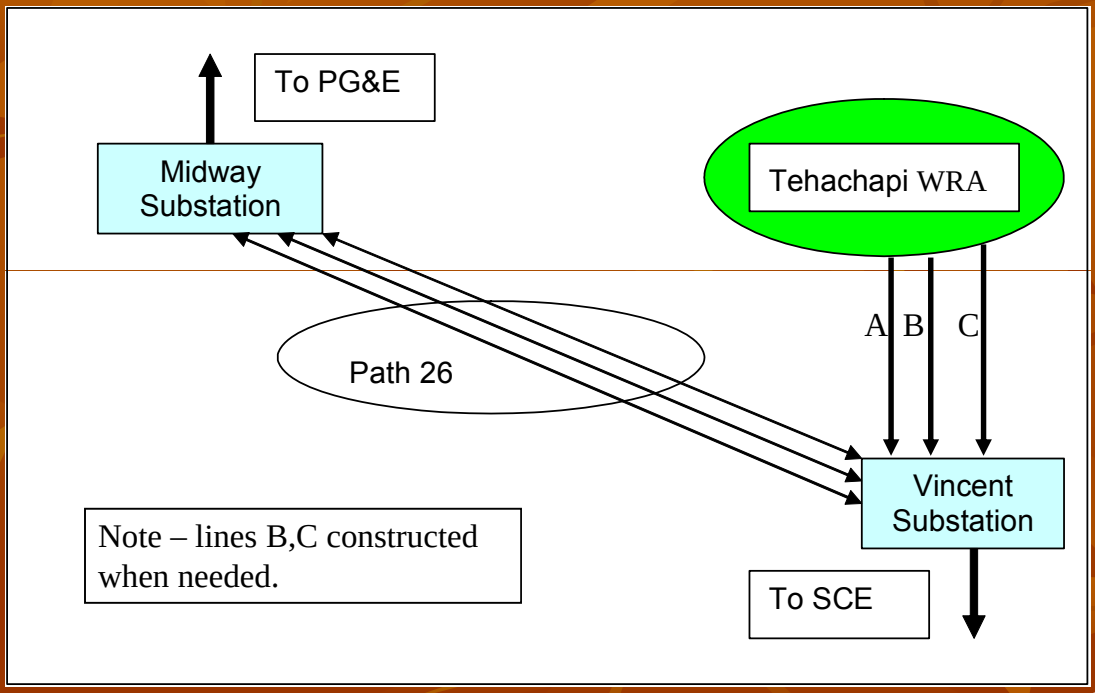
# Cost Considerations

- Costs for both options are approximately equal.
- Gen-tie option has slightly lower capital cost.
- Expanded Path 26 option leads to slightly lower production costs.
- Cost does not appear to be a deciding factor for choosing between the two options.

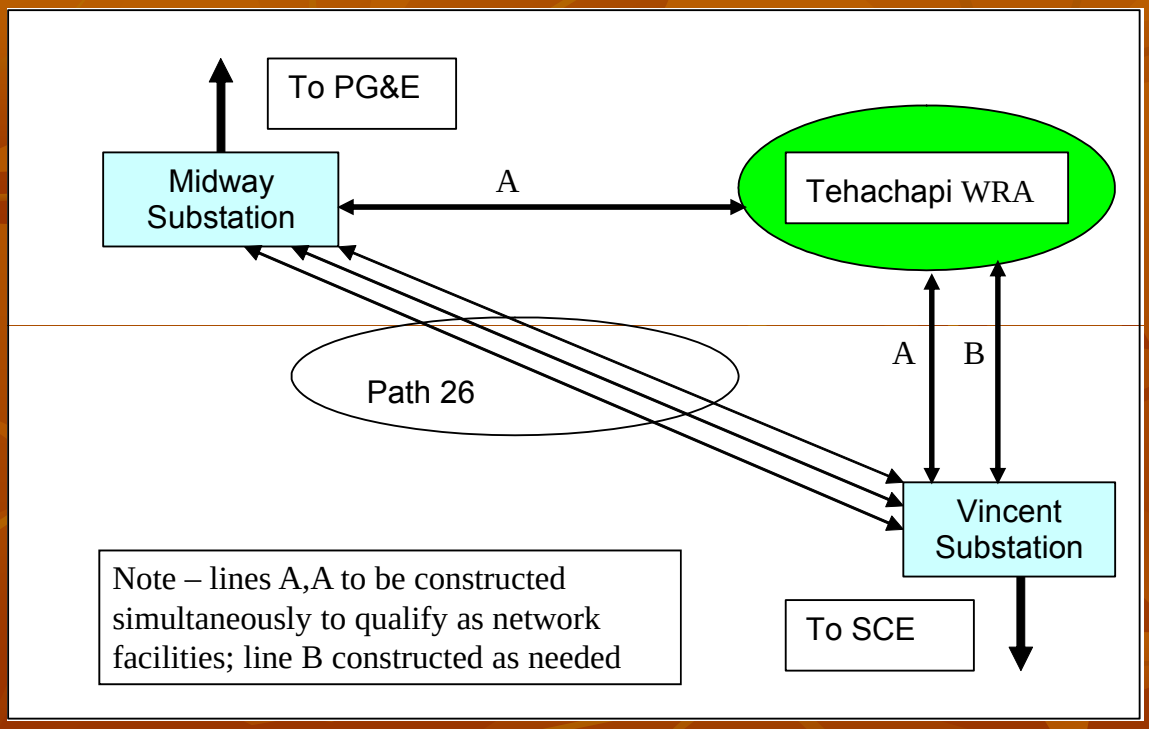
# Financial Considerations

- To recover capital costs in ISO transmission tariff, FERC rules require “network facilities”.
- Gen-tie option does not qualify as network facilities.
  - Alternative cost recovery mechanism would be required (eg PUC §399.25)
- Expanded Path 26 option likely to qualify as network facilities.
  - Interim financial guarantees may be required (eg PUC §399.25)

# Phased Gen-tie Option



# Phased Expanded Path 26 Option

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## Expanded Path 26 Considerations

- The interest in simultaneous construction of the Midway-Tehachapi line and a Tehachapi - Vincent line arises from financial concerns, not technical considerations.
- The Midway-Tehachapi-Vincent link has not yet been studied in detail by the CAISO or the utilities.

# Relation to TCSG Report #1

- Gen-tie option = phases 1,2,3 &4, with phase 4 being another line between Tehachapi and Vincent.
  - Phases 3 & 4 constructed as needed.
- Expanded Path 26 option = simultaneous construction of Phases 1,2 &4, with phase 4 being a line between Midway and Tehachapi.
  - Phase 3, a second line to Vincent, constructed as needed.

# Gen-tie Option

- Advantages –
  - Increased planning flexibility since first phase is smaller.
- Disadvantages –
  - Provides no network benefits – ie, does not create "network facilities";
  - FERC rules make financing difficult;
  - Transmission capacity is underutilized during periods of low wind generation.

12

# Expanded Path 26 Option

- Advantages –
  - Provides network benefits and likely qualifies as “network facilities”;
  - Conventional financing mechanisms likely exist, although financial guarantees may be required;
  - Insures against contingencies on existing Path 26.
- Disadvantages –
  - Decreased planning flexibility
  - Potential impact of Tehachapi wind on Path 26 capability.

# 2) NP 15 Congestion

- TCSG has not reached consensus on whether congestion relief is required to deliver Tehachapi power to PG&E.
- PG&E alternative #4 adds ~ $700M to capital cost of Tehachapi connections;
  - Provides only minimal reductions in WECC production costs.

# NP15 Congestion Relief

- Relieving congestion on Path 15 or elsewhere in NP15 does not appear cost effective.

15

# 3) Other Issues

- After initial connections -
  - A) What other connections will be needed?
  - B) Where are the decision points and what are the criteria?
- Operational issues.

# Other Tehachapi Connections

- Other Tehachapi – Vincent 500 kV line(s);
- Fresno phase-shifted tie;
- Other?

17

# Summary

- TCSG has not reached consensus on choice between Gen-tie option and Expanded Path 26 option.
- Additional facilities in NP 15 do not appear cost effective.
- TCSG has not reached consensus on whether congestion relief on Path 15 is required to deliver Tehachapi power to PG&E.
- TCSG continues to examine other issues.

# APPENDIX Q

Draft Workshop Agenda and Background Paper

# I.05-09-005: Transmission for Renewables

## Draft Workshop Agenda: Priority Issues for 2006 & 2007 Regarding Transmission for Renewables

December 6th-7th, 9:30am – 5pm
CPUC Hearing Room D

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**Purpose of the workshop:**

1. Through this workshop, we hope to develop consensus among parties regarding what issues the Commission should address in 2006 and 2007 to ensure sufficient transmission infrastructure is available to support the state's renewable energy goals. Parties will be asked to provide feedback on a proposed set of issues developed by Commission staff (see Background section below) as well as to propose other issues they feel should also be addressed, either in addition to, or as a substitute for, those identified by staff.

2. During this workshop we will also ask parties to comment on the process and/or approach they believe is appropriate for the various issues that have been identified (e.g., workshops, evidentiary hearings, studies, inter-agency collaboration, etc.), the timeframe within which they believe a given issue could be resolved, and a sense for what end-product would result (e.g., a decision issues by the Commission, new legislation, change in CAISO tariff, etc.)

3. Representatives from the Tehachapi Collaborative Study Group and the Imperial Valley Study Groups will, give presentations regarding their efforts to date, and ongoing activities.

4. A representative from the California Independent System Operator will give a presentation regarding the CAISO's new proactive transmission planning process, with emphasis on how that process dovetails with the goal of facilitating renewable energy development.

5. We will begin promptly at 9:30 am each day, so please arrive by 9:15 am in order to sign the attendance sheet and take your seat.

**Background:**

1. In September of this year, the Commission initiated Investigation (I.)05-09-005 to evaluate and address outstanding concerns regarding transmission as it relates to renewable energy development in California. The Order Instituting an Investigation included a preliminary scoping memo identifying a range of potential issues to be considered during the proceeding.

2. An all party meeting and pre-hearing conference was held on November 7, 2005, during which parties were directed by Commissioner Grueneich to file comments identifying the top 6 issues that the Commission should address in 2006 and the top six issues that should be addressed in 2007 related to transmission infrastructure and renewable energy development. Parties filed comments on November 15.

3. On the basis of these comments, as well as the overarching objective of advancing proactive transmission development, Commission staff identified six issues that could be addressed during this proceeding. Consistent with comments submitted by several of the parties, further pursuit of these or additional issues in 2007 might be most effectively planned at some point in the future, after achieving experience and progress dealing with the initial issues. The issues Commission staff have identified are the following:

    i. *Assuring Cost Recovery for Renewable Transmission Investments* – A majority of parties expressed the view that assurance of cost recovery needs to be provided if proactive investments in transmission infrastructure are to be made. Two potential avenues to providing this assurance are changes to the CAISO tariff, and/or implementing "backstop" cost recovery as envisioned under PUC 399.25. Various sub-issues might address finer details of cost allocation under different circumstances, regarding both initial financing and ultimate cost responsibility.

    ii. *Streamlining the Siting and Permitting Process* – In comments, the utilities and other parties identified the current siting and permitting process as unnecessarily drawn-out, thus confounding timely development of transmission infrastructure necessary to access renewable resources. Suggested improvements included accelerating certain steps, reducing duplication, making certain distinctions between higher level versus detailed aspects of projects.

    iii. *Including Renewables in CAISO's New Transmission Planning Process* – In August 2005, the CAISO announced its new proactive planning process. It is unclear at this point how that new process will facilitate transmission development for renewable resources. Consistent with suggestions by several parties, such a systemwide process might accommodate effective coordination across multiple regulatory agencies, and might address broader system-wide needs in a forward-looking manner that integrates reliability and congestion (economic) concerns, with the need to access renwewable energy resources to achieve the state's renewable energy goals .

    iv. *Coordinating Transmission Planning for Renewables With the RPS and General Procurement* – The RPS procurement process is the main current and foreseeable mechanism for developing renewable electric generation in the state. However, that process is hampered by uncertainty and incrementalism regarding the availability of transmission to bring renewable energy to consumers, as well as cost responsibility for that transmission. Major concerns include not only ultimate

cost responsibility, but also use of Transmission Ranking Costs and transmission-related bid adjustments in the procurement process. These stumbling blocks can be smoothed by better integrating and coordinating the RPS process (and also other procurement) with transmission planning, development and cost recovery processes. This might entail, for example, improved coordination of timing and decision points, improved development and flow of information, and/or improved interaction of parties involved in the different processes. A major goal would be to simultaneously manage the risks of (1) underutilization of new transmission and (2) lost or delayed opportunities to utilize high quality renewable resources.

v. *Clarifying the Role of Study Groups* – The role of study groups in developing actionable transmission plans for purposes of accessing renewable resources in the state needs to be clearly articulated. It is necessary to develop a better understanding of what is expected of these groups, including their ultimate work products. It would also be valuable to develop a process for determining the circumstances and locations for which any additional study groups (beyond Tehachapi and Imperial Valley) should be initiated.

vi. *Encouraging Development of "Low-Hanging Fruit" Renewable Projects* – There may be a substantial amount of renewable energy potential that could be developed without requiring large investments in transmission infrastructure. To realize this potential , it is essential to have an effective mans to identify and link updated information on both the resources and their transmission implications, as well as to effectively disseminate that information.

# DRAFT AGENDA

## DAY #1 – Tuesday (December 6)

### I. Overview – CPUC Staff (9:30 am -10:00 am)

1. Ground rules
2. Background
3. Workshop objectives

### II. Discussion of Scope Identified by Commission Staff (10:00 am – 12:00 pm)

1. Are these the "right" issues?

2. Are there other issues that should be considered in addition to or in place of those identified?

3. What are the key questions or sub-issues that should be addressed?

**LUNCH (12:00 pm – 1:00 pm)**

**III. Discussion of Process, Outcome, and Timing Associated with Priority Issues (1:00 pm – 4:00 pm)**

For each issue - - -

1. What process should be used to pursue this issue (e.g., evidentiary hearings, studies, etc.) and what agencies will be involved?

2. What end-product or action should result? (e.g., a ruling, new legislation, etc.)

3. What time and schedule should be allocated? (Which issues or sub-issues appear to be candidates for further effort in 2007?)

## DAY #2 – Wednesday (December 7)[1]

**I. CAISO's New Proactive Transmission Planning Process (9:00 am – 11:00 am)**

1. Presentation (9:00 am – 9:45 am)

2. Q&A (9:45 am - 10:30 am)

[1] Please note that in an effort to allow attendees to participate in both this workshop and the CEC's Workshop regarding proposed changes to the Renewables Portfolio Standards guidelines, we are starting at 9:00 am on December 7th rather than 9:30 am as stated in the ALJ's ruling scheduling this workshop.

**II. Study Group Presentations (10:30 am – 12:30 pm)**

1. Tehachapi Collaborative Study Group Presentation (10:30 am – 11:15 am)
2. Imperial Valley Study Group Presentation (11:15 am – 12:00 pm)
3. Q&A (12:00 pm – 12:30 pm)

# APPENDIX R

Total Tehachapi Transmission Cost

**Total Tehachapi Transmission Cost**

Estimates per J. Chacon/SCE, Nov. 29, 2005 and SCE CPCN Applications

$ million

| | Miles | Est'd Cost | |
|---|---|---|---|
| **Phase 1** | | | |
| Antelope-Pardee 500 kV T/L, ATP Seg 1 | 25.6 | 80.3 | |
| Ant-Vincent 500 kV T/L, ATP Seg 2 | 21.5 | 63.6 | |
| Ant-Tch 500 kV No. 1 T/L, ATP Seg 3 | 25.6 | 99.5 | |
| --New substation One | | | |
| --New Substation Two | | | |
| --New Ant-Tch 500 kV T/L | 21.6 | | |
| --New 230 kV T/L, Sub 1 to Sub 2 | 9.6 | | |
| --Land rights, Telecom, sub costs included | | | |
| | | Subtotal, Phase 1 | $243.4 |
| **Phase 2** | | | |
| Upgrade Ant-Mesa 230 kV T/L | | 145.0 | |
| --incl 2nd Ant-Vin 500 kV T/L | | | |
| --incl 3rd Vincent-Rio Hondo 500 kV T/L | | | |
| --incl. 2nd Rio Hondo-Mesa 230 kV T/L | | | |
| Ant-Tch Substation 5 230 kV T/L | | 41.0 | |
| | | Subtotal, Phase 2 | $186.0 |
| **Phase 3** | | | |
| Midway-Tch 500 kV T/L | 90 | 225.0 | |
| Midway-Tch land costs (G. Larson-SCE, 1/10/06 | | 81.5 | |
| Antelope 500 kV substation conversion | | 37.5 | |
| Pardee 500 kV substation conversion | | 37.5 | |
| Tehachapi 500 kV substation conversion | | 150.0 | |
| Vincent 500 kV substation conversion | | 12.6 | |
| Shunt capacitor support | | 12.0 | |
| | | Subtotal, Phase 3 | $556.1 |
| Tch-Pardee (instead of Tch-Midway) | 46 | 144.4 | 475.54 |
| **Phase 4** | | | |
| Ant-Tch 500 kV No. 2 T/L | | 63.8 | |
| | | Subtotal, Phase 4 | $63.8 |
| | | Total without Collector Network | $1,193.7 |
| | | Tehachapi 230 kV Local Area Collector Network | $715.0 |
| | | Total Transmission | $1,908.7 |
| | | Wind Projects, 4500 MW, $1.4 mil/MW | $6,300.0 |
| | | Total Tehachapi Generation and Transmission | $8,208.7 |

# APPENDIX S

Midway - Tehachapi Cost Estimate Report

# Tehachapi-Midway Cost Estimate

for TCSG Report, April 7, 2006

One major export path for Tehachapi generation is to connect to the state backbone grid at the Vincent substation at the southern end of Path 26. The TCSG has relied on the cost estimates for the Tehachapi-Vincent connections contained in SCE's CPCN Applications for the Antelope-Pardee (Application No. 04-12-007), and Antelope-Vincent and Antelope-Tehachapi Transmission Projects (Application No. 04-12-008).

Another major transmission alternative for connecting Tehachapi generation to the grid considered by the TCSG, outside of Tehachapi-Vincent corridor routings, is a line from Tehachapi to the Midway substation, at the southern end of Path 15, west of Bakersfield.

The Midway substation is roughly 90 miles west of the proposed Tehachapi substation #1. At this point, Tehachapi-Midway is only a conceptual routing. Neither SCE nor PG&E has yet identified any physical routings for such a connection. Without a physical routing, line distance can only be roughly estimated; no environmental studies have been performed. With so many factors unknown, any such conceptual cost estimate can only be roughly approximate.

PG&E estimates the cost of acquiring the land, doing the permitting work and building the line to be $508 million. SCE estimates this cost to be $315 million. This large disparity in conceptual cost estimates led the TCSG to appoint a subcommittee to better understand the basis of each company's estimate. The subcommittee held several meetings via conference call with the land and permitting experts of both utilities. Notes of the subcommittee conference call meeting of January 10, 2006 explain the components of each, and document the basis for cost estimate. These notes are available from the CPUC coordinator of the TCSG.

For purposes of evaluating a Tehachapi-Midway conceptual routing, the subcommittee recommended that the TCSG use the SCE estimate of $315 million for the 90-mile project.

The SCE estimate is in line with the cost estimates of the other components of the Tehachapi transmission projects proposed to date, and in line with recent experience of other transmission projects built or proposed in the WECC; the PG&E estimate is significantly higher. Construction costs are roughly equivalent ($262.1 million for PG&E; $225 million for SCE). The disparity appears due mainly to large overhead and multiple contingency charges added by PG&E to land acquisition and permitting costs (30% overhead charge, a 30% contingency for general unknowns, and an additional 25% contingency factor to account for unknown differences between a Tehachapi-Midway line vs. a Midway-Gregg line on which the PG&E estimate was based).

Tehachapi-Midway Conceptual Cost Estimates
$, millions

| | PG&E | SCE |
|---|---|---|
| Land Acquisition, Planning and Permitting (includes PEA, CPUC CPCN process) | $245.9 | $90.4 |
| Construction | $262.1 | $225.0 |
| Total Conceptual Cost Estimate | $508.0 | $315.4 |

# APPENDIX T

CAISO South Regional Transmission Plan for 2006 – RPS Methodology

California ISO
Your Link to Power

# CAISO South Regional Transmission Plan for 2006 (CSRTP-2006)

## RPS Benefit Quantification Methodology
## April 2006

Dariush Shirmohammadi
Director, Regional Transmission – South

California ISO
Your Link to Power

# Objective

*Present a reasonable and consistent methodology to quantify the RPS benefits of various transmission projects.*

California ISO
Your Link to Power

# RPS Benefit of Transmission Projects: Definition

- MWH of resources within CAISO footprint that would be displaced by the output of verifiable renewable resources due to one or more of transmission projects
- For CSRTP-2006 we will:
  - Perform evaluation for alternatives selected as part of Reliability/Economics studies
    - We may also select alternatives specifically based on RPS benefits
  - Study years: 2010 and 2015
    - 2015 study year will be performed as a substitute for 2017
  - CAISO will perform the RPS benefit assessment with help from project sponsors
    - Project sponsors are to determine the cost of new alternatives, if any

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# Quantifying RPS Benefit: CSRTP-2006 Study Approach

- Analysis 1: Perform economic study of the economic basecase for the target year per CSRTP-2006 assumptions
  - Exclude identified renewable resources for the target year
  - Exclude the transmission project(s) to be studied
  - Export and record generation output for all generating units outside CAISO footprint ("external units") for the entire target year
- Analysis 2: Perform a second economic run for the target year
  - Include identified renewable resources for the target year
  - Exclude the transmission project(s) to be studied
  - Set the output of external units for the year per values from Step 1
  - Determine the MWH of renewable resources dispatched for the target year
- Analysis 3: Perform a third economic run for the target year
  - Include identified renewable resources for the target year
  - Include the transmission project(s) to be studied
  - Set the output of external units for the year per values from Step 1
  - Determine the MWH of renewable resources dispatched for the target year
- Analysis 4: Quantify the RPS benefit for the project(s) as the difference in the dispatched MWH of renewable resources between Analyses 2 and 3

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# Quantifying RPS Benefit: Assumptions

- Identified renewable resources in 2010
  - Tehachapi: 4,500 MW of wind (3,400 MW @ Sub 1 and 1,100 MW @ Sub 5)*
  - Salton Sea: 645 MW of geothermal and 300 MW of solar
  - Mojave Desert (Kramer): 870 MW
- Identified renewable resources in 2015 (as replacement run for 2017)**
  - Tehachapi: 6,000 MW of wind (4,000 MW @ Sub 1, 1,400 MW @ Sub 5 and 600 MW @ Antelope)
  - Salton Sea: 2200 MW of geothermal and 900 MW of solar
  - Mojave Desert (Kramer): 870 MW

** See the next slide for the location of Sub 1 and Sub 5*
*** The MW numbers in 2015 are only applicable for the RPS benefit calculation in 2017*

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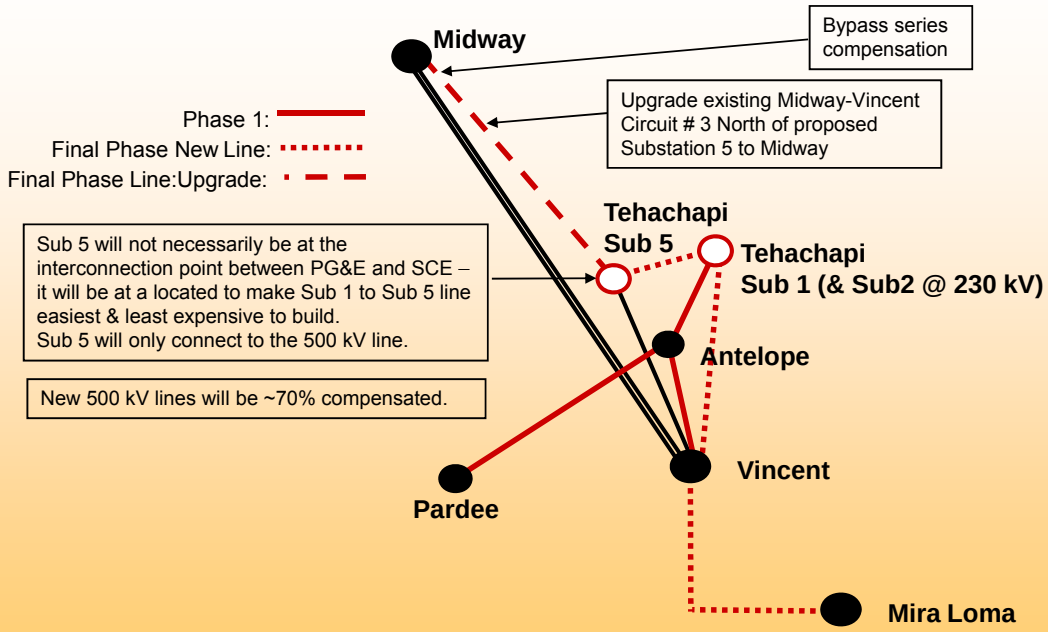
# Proposed 500 kV Tehachapi Transmission Infrastructure In the Tehachapi Wind Resource Area




Created By: DShirmohammadi LAST UPDATE: 4/28/06 Page 6

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# Concluding Remarks

- Methodology is intended to be reasonable and consistent rather than comprehensive and mathematically accurate
  - More suitable for comparative studies
    - With and without a project
    - Comparison between projects
- Study of RPS benefits for 2010 requires large amount of work as we have no economic basecase for 2010
  - We may have to forgo the 2010 study unless one of the sponsors builds the 2010 economic basecase

# APPENDIX U

Imperial Valley Resource Potential

July 11, 2006

To: CAISO, California South Regional Transmission Planning
Fm: David Olsen, Imperial Valley Study Group
Re: Imperial Valley Renewable Resource Development Potential

## 1. Resource Estimates

As required by SB 1038, the CEC Renewable Resources Development Report (RRDR, adopted November 19, 2003) identifies the resource potential on which implementation of the state RPS program is based. Appendix C-12 of the report lists this potential, by county and technology. These quantities for Imperial and San Diego Counties are shown on Table 1 below.

### Geothermal Resource

In May 2005, under a contract with the CEC, GeoThermex, Inc. updated its assessment of geothermal resources across the state, including those in Imperial County. In its report, GeoThermex identified 1,950 MW of Imperial County geothermal resource potential as "Most Likely." This is slightly less than the amount identified in the RRDR, which was based on earlier estimates of regional resource potential.

Most of this resource is contained in the Salton Sea Known Geothermal Resource Area (KGRA), some of which is now underwater, at the southern edge of the Sea. CalEnergy, Inc., which controls the KGRA, has testified that it is able to develop at least 1,075 MW of this resource today. This includes the 215 MW Salton Sea Unit 6 plant, the output of which will be sold to the Imperial Irrigation District under an existing contract, and four additional 215 MW power plants, the output of which would be exported from the Imperial Valley.

Under the recently approved Quantification Settlement Agreement pursuant to the Salton Sea Ecosystem Restoration Program, inflow to the Sea will be significantly reduced, beginning by 2017. As a result, the Sea will rapidly recede from its current shoreline. Final alternatives for ecosystem restoration are now being considered. Certain the alternatives would maintain some depth of water over portions of the Salton Sea KGRA, while other alternatives would expose the land over the portions of the KGRA that are now submerged under shallow water. There is thus some uncertainty as to whether, and when, land-based access to the remaining 1,090 MW of this resource can begin. Geothermal wellfield development will be less expensive if able to be done on land immediately over the resource. If land-based access is not possible, development of the remaining resource could depend on directional drilling or other advances in drilling technology.

**Wind Resource**

As shown on Table 1, the CEC RRDR identifies 467 MW of wind resource in Imperial County, and 739 MW in San Diego County. In its 2006 Short-Term Renewable Procurement Plan, filed July 10, 2006 in R.06-05-027, SDG&E identifies (at p. 18) 500 MW of wind resource in southeastern San Diego County. It observes that this resource can be economically accessed only with the addition of new, high-voltage transmission from Imperial County to San Diego which, by relieving current congestion of the existing Southwest Powerlink (SWPL), would enable SE San Diego County and/or SW Imperial County wind projects to connect to the SWPL.

**Solar Thermal**

As indicated in the RRDR, Imperial County has high quality insolation and as a result, a very large amount of solar thermal, or Concentrating Solar Power (CSP) potential. SDG&E has signed a Power Purchase Agreement with Stirling Energy Systems under which it will buy 300 MW of CSP from a plant to be located in the Imperial Valley by 2010, with the right to buy an additional 600 MW by 2017. (SCE has signed a contract with Stirling for a total of 800 MW, for projects to be built in San Bernadino County). The Dish-Stirling technology on which this contract is based has little operating history and has never been installed on a large scale. There is thus more uncertainty as to the amount and timing of the development of Imperial County solar resources than there is with regional geothermal and wind resources.

**2. Imperial Valley Study Group (IVSG) Report**

The IVSG developed a transmission plan for exporting 2,200 MW of renewable resources from the Imperial Valley. As shown on Table 1 below, this was comprised of geothermal and solar resources.

The IVSG transmission plan is divided into three development phases: 645 MW in 2010; an additional 645 MW (1,290 MW cumulative) in 2016; and 910 MW (2,200 MW cumulative) in 2020. This phasing provides a reasonable development schedule for Salton Sea geothermal resources, taking some of the uncertainty surrounding Salton Sea reliction into account.

The Study Group ignored wind resources in its transmission planning, because there is little or no wind resource to be exported from the Imperial Valley. As a result, the IVSG did not consider the extent to which Imperial Valley export transmission would enable transmission access for wind projects connecting to the Southwest Powerlink in SE San Diego County and/or SW Imperial County.

Participants consider the IVSG planning target of 2,200 MW of renewable export potential to be conservative for several reasons: 1) it is much less than the combined total of regional resources likely to be found needed under the state RPS program; 2) if any one resource proves uneconomic or not fully developable, other resources/technologies can be substituted to make up any shortfall; and 3) no wind resources were included, when in fact export

transmission from the Imperial Valley will provide access for 500 MW or more of wind power.

## 3. 2006 Estimate of Renewable Resource Potential

Assuming adequate transmission access, the main uncertainties affecting regional resource development are performance of the Stirling CSP technology and land-based access to portions of the Salton Sea KGRA now underwater. If the Stirling technology does not perform as expected, it may be possible to substitute proven parabolic-trough technology to export the original target quantity of CSP output. Land-based access to some of the now-submerged portions of the KGRA may become possible with a reliction of only a few inches in Sea level, given the very shallow depth of water over some affected areas. A modest amount of wind resource in southwestern Imperial County also appears to be economically developable.

For these reasons, it is reasonable to conclude that, as shown on Table 1, approximately 2,500 MW of resources can be developed for export from the region by 2017, with substantially more developed by 2020.

Table 1. Estimated Resource Development (MW)
Supported by Imperial Valley Export Transmission

| | CEC RRDR | GeoThermex Most Likely | IVSG Report | Minimum 2007-2017 | Possible 2007-2017 | Most Likely 2020 |
|---|---|---|---|---|---|---|
| IV Geothermal | 2,142 | 1,950 | 1,950 | 860 | 1,075 | 1,935 |
| IV Solar Thermal | 11,080 | | 250 | 300 | 900 | 900 |
| IV Wind | 467 | | | | | 100 |
| San Diego Wind | 739 | | | 500 | 500 | 500 |
| Totals | 14,428 | | 2,200 | 1,660 | 2,475 | 3,435 |

# APPENDIX V

CAISO South Regional Transmission Plan for 2006 - Status Briefing for STEP

California ISO
Your Link to Power

California Independent
System Operator Corporation

# CAISO South
# Regional Transmission Plan for 2006 (CSRTP-2006)

## Status Briefing for STEP

**Dariush Shirmohammadi**
**Director, Regional Transmission – South**

## July 24, 2006

# Content

- **Objective**
- **Background**
  - Focus on Sun Path project in this round
- **CSRTP-2006 process**
  - CSRTP-2006 guiding principles
- **CSRTP-2006 assessment approach**
  - Reliability assessment
  - Economic assessment
  - RPS assessment
- **Findings for the Sun Path project**
- **Recommendations on Sun Path project**

# Objective

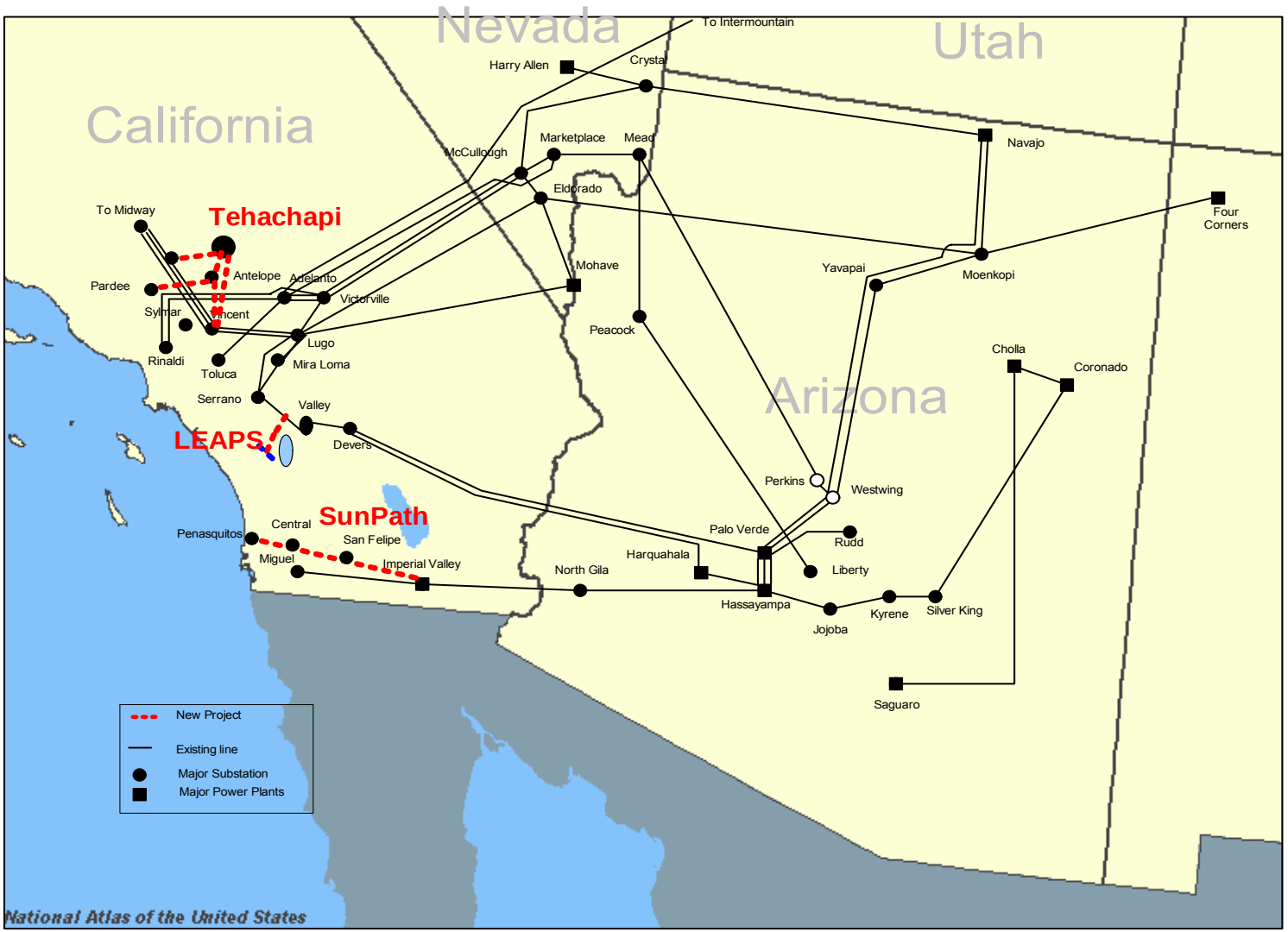
- **Establish the CAISO South Regional Transmission Planning process (CSRTP-2006) to review, assess and determine potential improvements to the configuration of three major proposed transmission projects in Southern California (Tehachapi, LEAPS and Sun Path) based on the following principles:**
  - Assess the need for individual projects and for the interaction of these projects with one another by studying them simultaneously
  - Recommend proper course of action on all three projects to the CAISO Board by Q3, 2006
- **For this presentation, we will present our findings and recommendations on the Sun Path project only, but we account for the interaction of the other two projects with Sun Path**

# CSRTP-2006 Background

# Projects Background

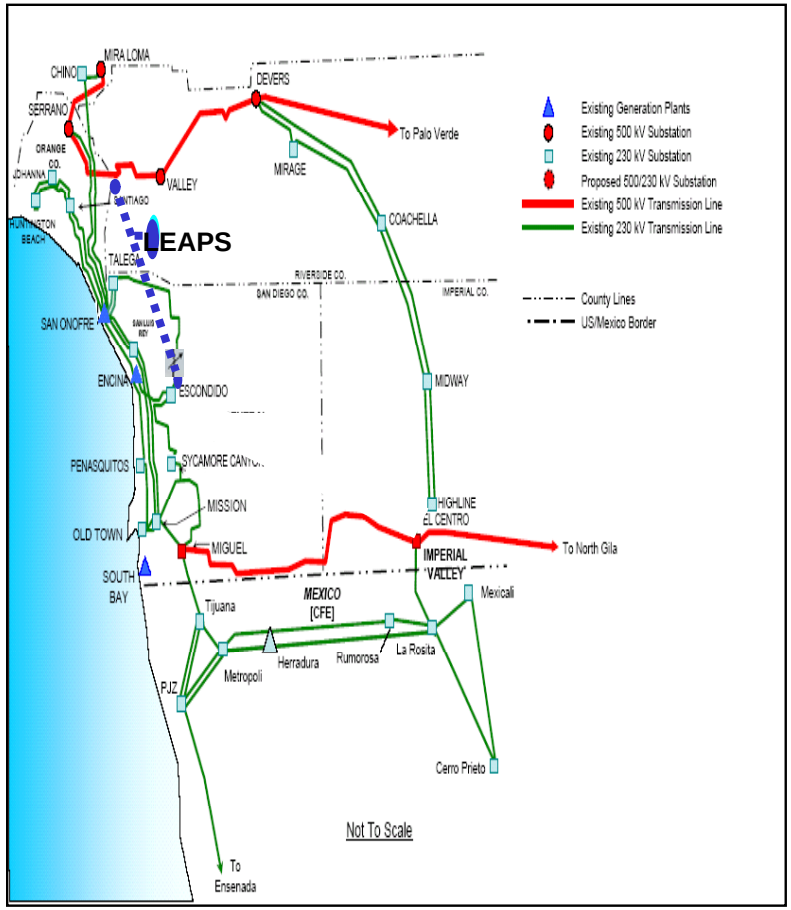
- **CAISO has been asked to assess three major transmission projects in Southern California Region:**
  - Tehachapi project: Transmission infrastructure to accommodate wind generation in Tehachapi area
  - LEAPS project: Lake Elsinore pumped storage plant and associated transmission line
  - Sun Path project: Combination of SDG&E's Sunrise Powerlink and Citizens Energy's and IID's Phase 2 Green Path projects connecting Imperial Valley to San Diego area
- **Each of these projects offers unique reliability and economic benefits**
  - All projects also play critical roles in enabling California to meet its Renewable Portfolio Standard (RPS) goals for 2010 and beyond

# The Three Projects

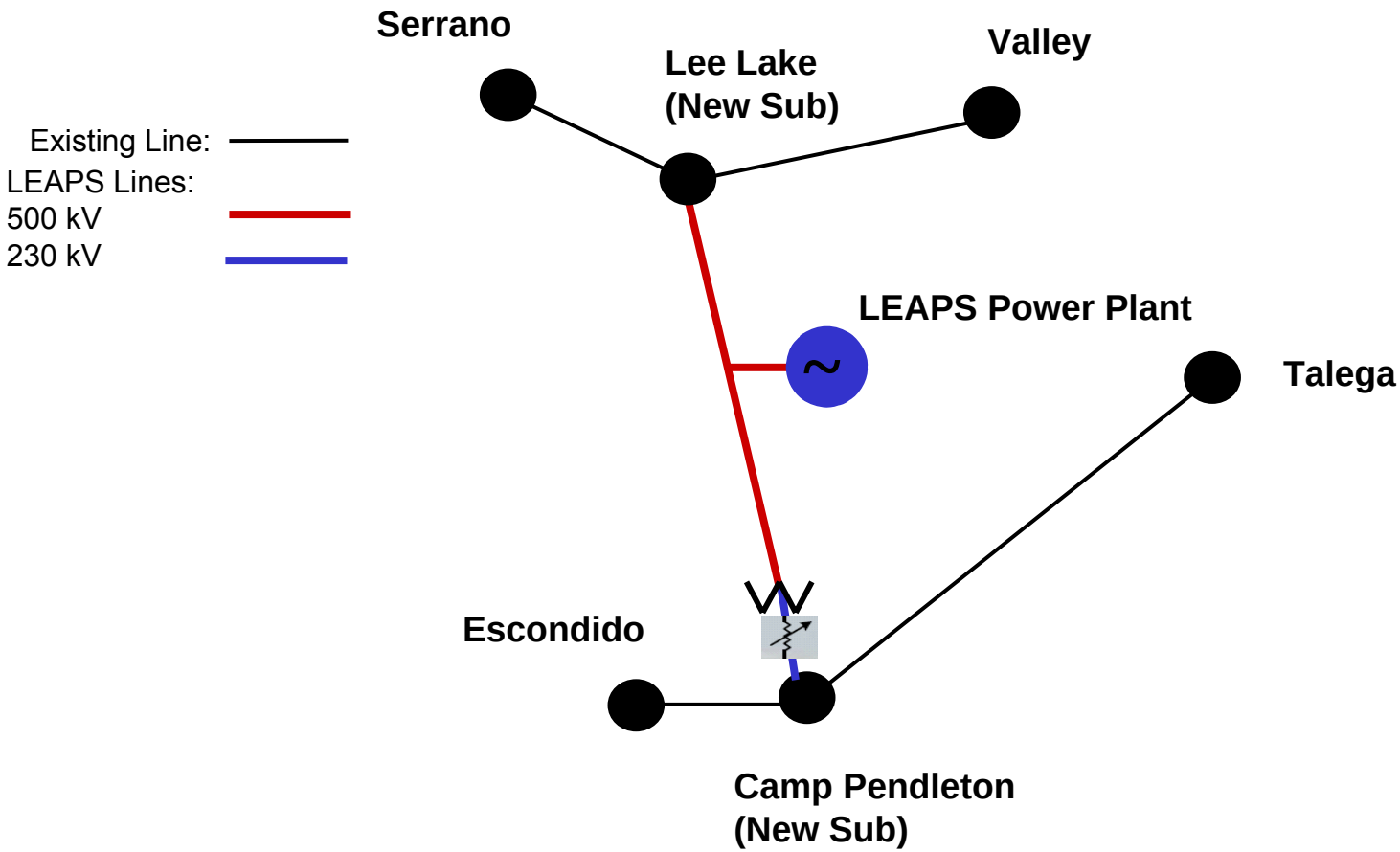


# LEAPS Project

- **Lake Elsinore Advanced Pump Storage (LEAPS) plant on Lake Elsinore and the associated transmission infrastructure connecting the plant to the SCE and SDG&E transmission systems**
  - The line is proposed to be built in 2007 followed by the pumped storage plant (500 MW Gen/600 MW Pump) in 2009
- **Purpose:**
  - Increase import capability into SDG&E and reduce reliance on LCR/RMR programs
  - Improve overall system reliability through operational flexibility & storage capability; especially in light of large volume of new intermittent resources
  - Provide community benefits: improve lake water quality and forest firefighting capability
- **Project Sponsors: The Nevada Hydro Company (TNHC) and Lake Elsinore Valley Municipal Water District (EVMWD)**
  - Project already filed at FERC - plant is presented as "Advanced Transmission Asset" based on EPACT2005 provisions

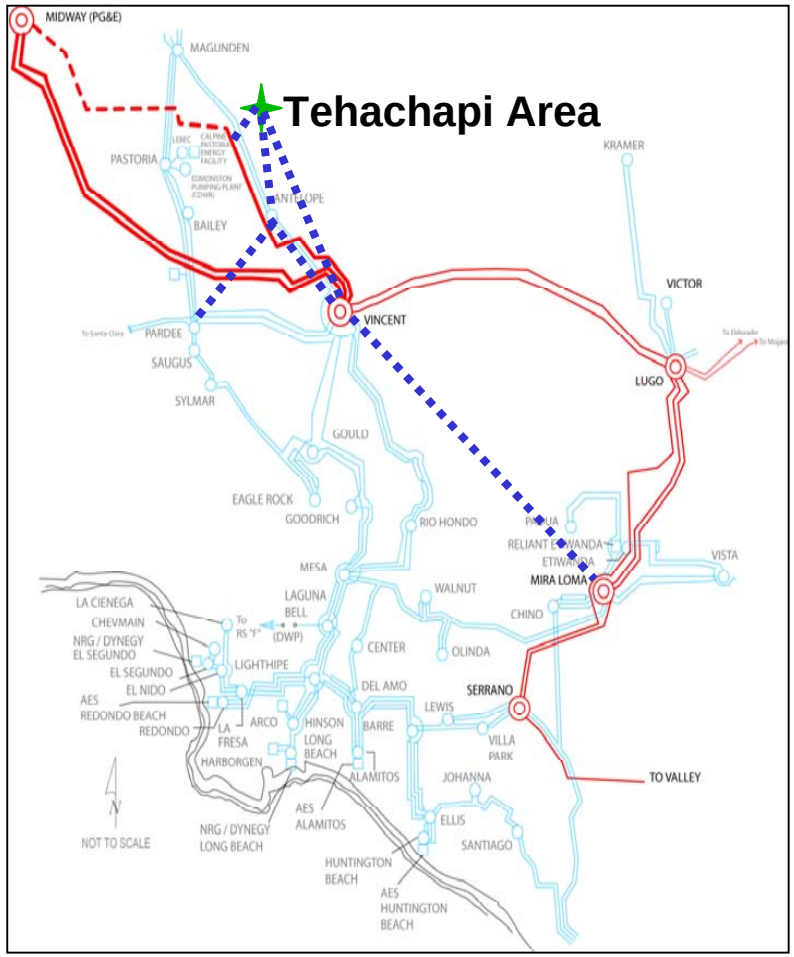


# Plan of Service For Major Components of the LEAPS Project

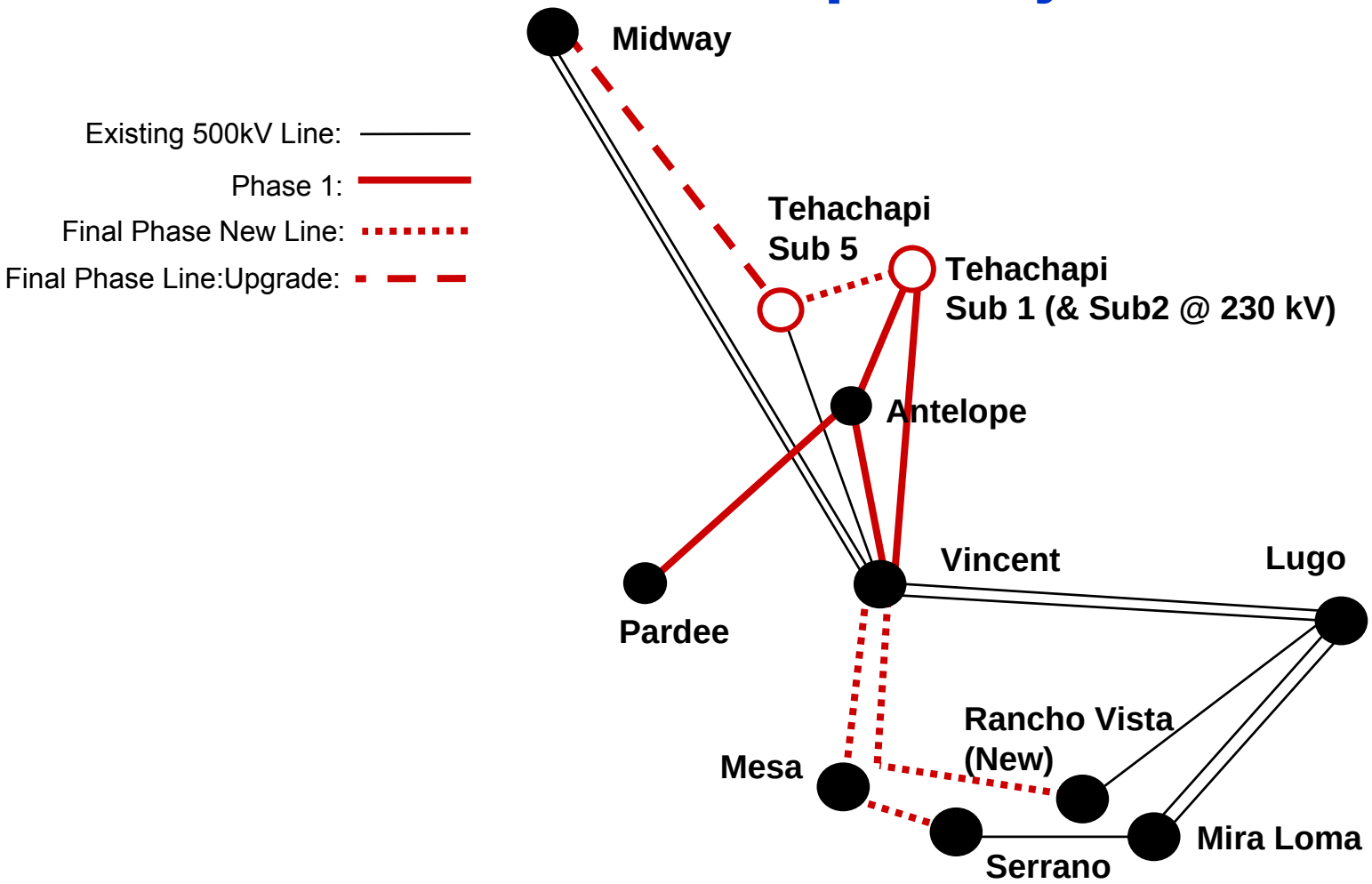


# Tehachapi Project

- **A 500 kV transmission infrastructure in the Tehachapi wind generation area to interconnect developing wind generation in that area to the SCE (and the PG&E) transmission systems**
- **Purpose:**
  - Help California reach its RPS goals for the year 2010 and beyond
    - Facilitate access to wind resources in Tehachapi area
  - Improve the reliability of the CAISO South by mitigating congestion on Path 26 and offering new energy sources
  - Include reinforcements to the SCE system for additional flow on Path 26 as well as normal load growth in SCE area
  - Part of the transmission infrastructure may develop prior to full wind generation development
- **Project Sponsors: SCE and PG&E**
  - Wind generation developers play critical role

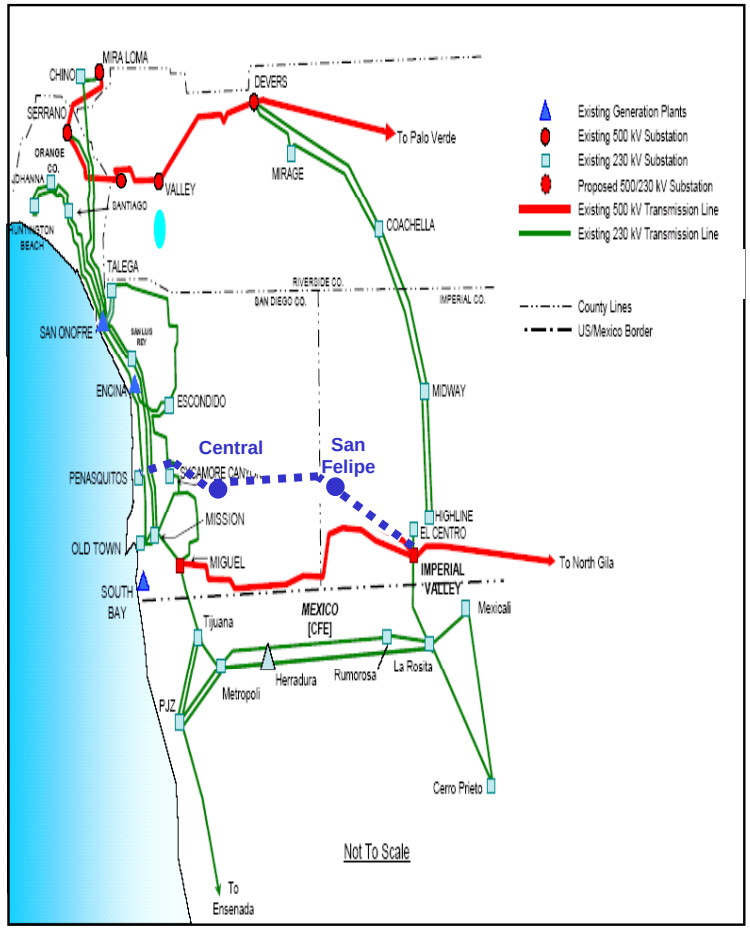


# Plan of Service For Major Components of the Tehachapi Project

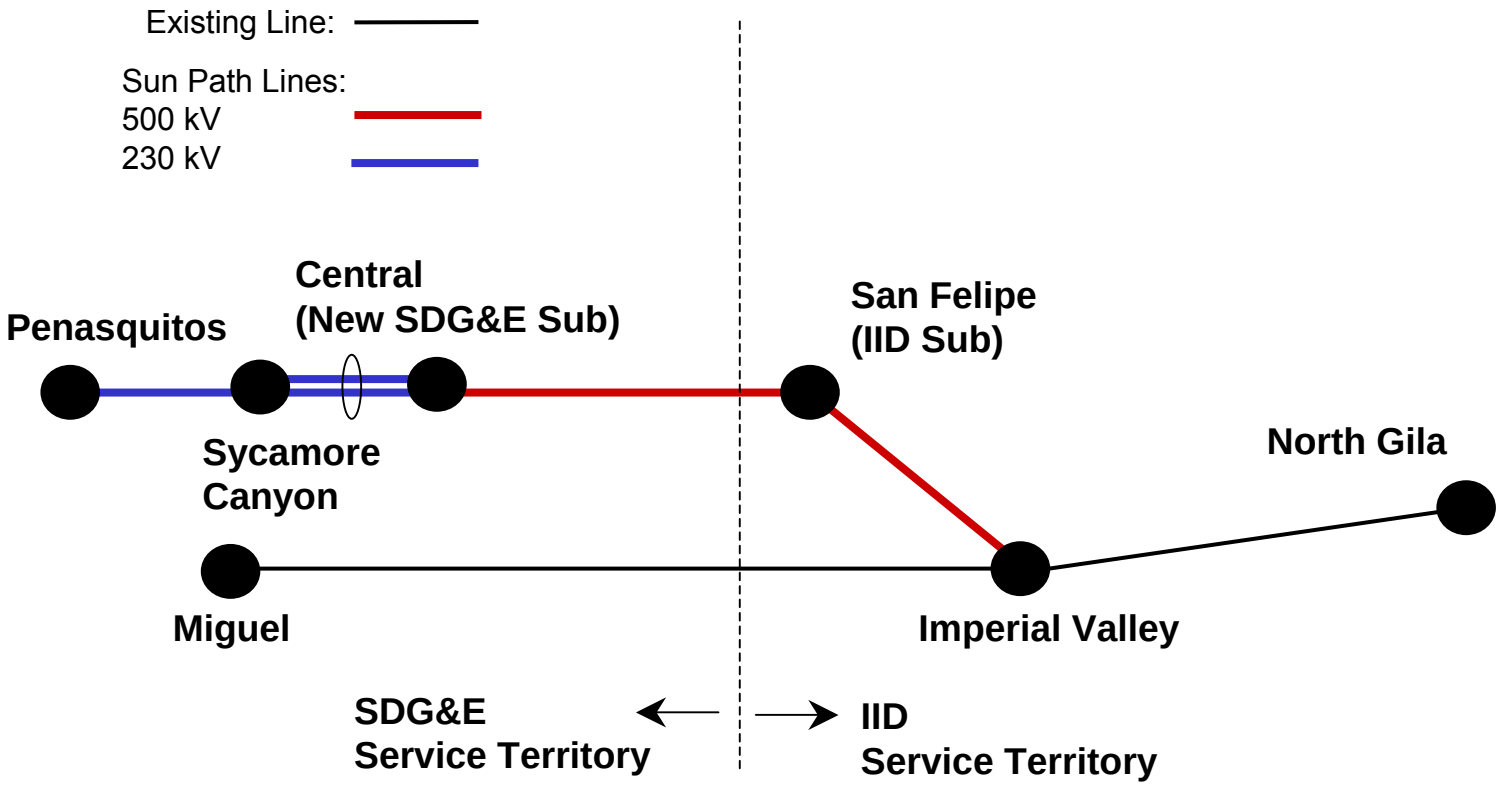


# Sun Path Project

- **A 500 kV link from the Imperial Valley (IV) sub to a new IID owned San Felipe Sub**
- **A 500 kV line from the San Felipe Sub to a new SDG&E owned Sub called "Central" in San Diego**
- **A double circuit 230 kV line from Central Sub to the existing Sycamore Sub**
- **A 230 kV line from Sycamore to Penasquitos Sub**
- **A 3rd San Luis Rey 230/69kV transformer**
- **Reconductoring of Sycamore Canyon–Elliott 69kV line**
- **A total of 240 MVAR reactive support at Central, San Luis Rey and South Bay subs.**
- **Purpose:**
  - Facilitate access to renewable (geothermal & solar) resources in Salton Sea area without curbing economy imports into California
  - Improve reliability by increasing import capability into San Diego and reduce reliance on LCR/RMR
- **Project Sponsors: SDG&E and Citizen's Energy/Imperial Irrigation District**
  - SDG&E would build and own the portion of the line & substations in SDG&E service territory, and a consortium of Citizen Energy and IID would build and own the line & substations in IID service territory



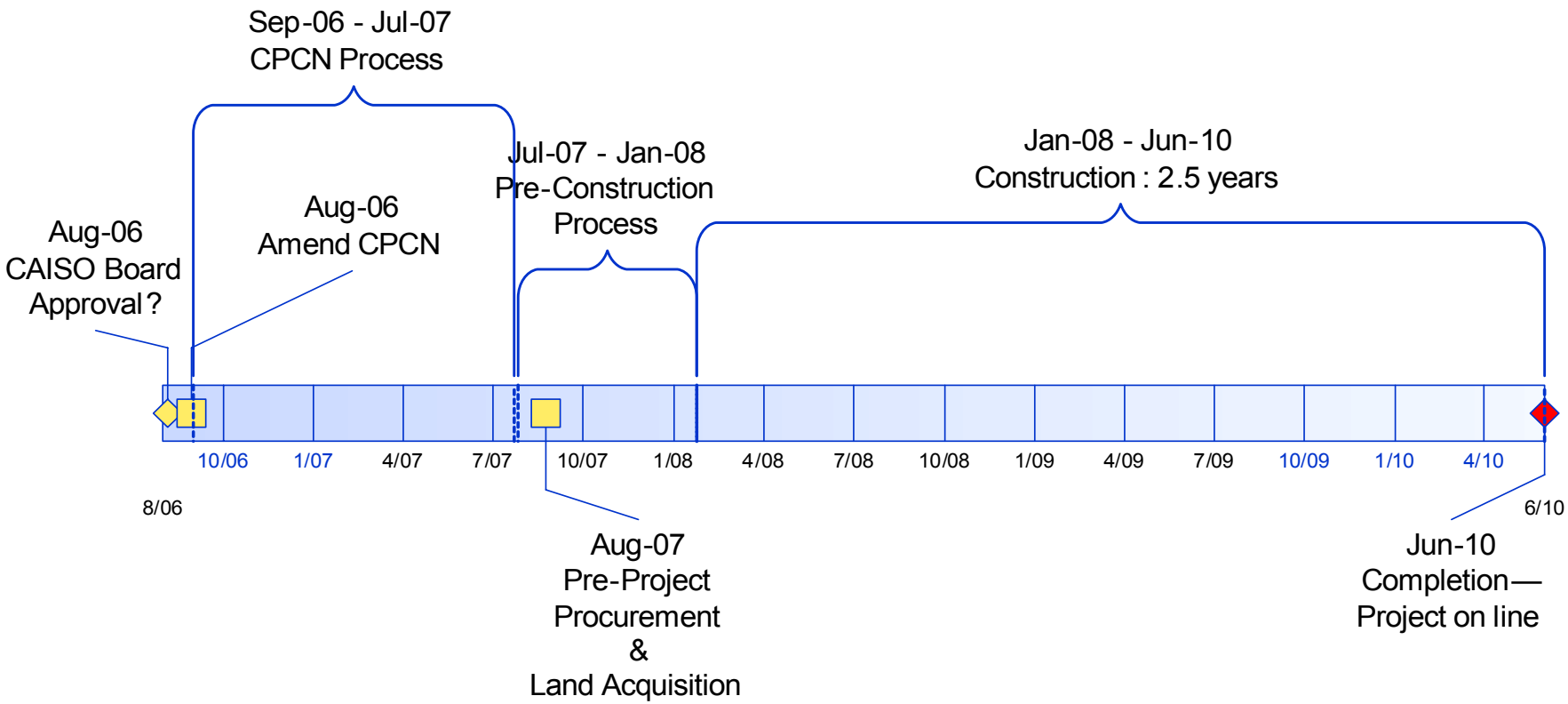
# Plan of Service For Major Components of the Sun Path Project



# CSRTP-2006 Study Timeline

- **We started the CSRTP-2006 process with a very aggressive timeline to assess all three proposed projects and present our findings/recommendations on them to the CAISO Board by Q3, 2006**
  - The aggressive timeline was set to help with completion of the critical components of the proposed projects, if approved by the CAISO Board, by 2010 in order to assist with meeting the state's RPS goals for the same year

# CSRTP-2006 – Sun Path Project Timeline



# One Project Before the Board in August Other Projects Presented in Q4, 2006

- **We bring one of the projects to the Board now since:**
  - Major changes in underlying system configuration took place halfway through of our studies and slowed the pace of our progress on all three projects
  - Scope of Tehachapi studies changed and expanded:
    - Draft complete plan of service for this project was only developed at the time of CSRTP launch – without full consensus among all parties
    - CSRTP-2006 process scope was then expanded to include South of Vincent (SOV) transmission reinforcements
      - SOV reinforcements were identified by SCE to address the added flow on Path 26 due to Tehachapi wind as well as for SCE load growth
  - Need direction from the FERC on the control of the LEAPS power plant before making a recommendation on the LEAPS project
    - CAISO's preliminary assessments have demonstrated potential for large short-term benefits from the power plant if the CAISO controls the power plant
      - However, there is potential for significant market distortions and long-term losses if the CAISO controls the LEAPS power plant
    - We need FERC's ruling on the treatment of the LEAPS power plant

# Focus on Sun Path for This Round

- **Significant work was performed by SDG&E, IID and Citizens Energy on the plan of service for the Sun Path project (including the study of numerous alternatives) allowing us to focus on and complete our assessment of the project:**
- **There are no tariff complications with this project**
- **We present our findings and recommendations on the Sun Path under three scenarios:**
  - Scenario 1: Sun Path project considered alone
  - Scenario 2: Sun Path project considered in presence of the Tehachapi project
  - Scenario 3: Sun Path project considered in presence of the Tehachapi and LEAPS projects

# Focus on Sun Path for This Round: SDG&E RPS Goals

- **Among California IOUs, SDG&E is farthest away from meeting its 2010 RPS Goal in relative terms partly due to transmission constraints into San Diego area**
  - Renewable deliveries to SDG&E in 2005:
    - SDG&E renewable delivery: 830 GWh*
    - SDG&E total retail delivery: 15,090 GWh
    - RPS goal reached: 5.54%
  - Required renewable deliveries to SDG&E in 2010:
    - SDG&E will need about 3,484 GWh to reach 20% RPS goal**
    - SDG&E has 977 GWh of contracted renewable energy
    - Additional required procurement 2,507 GWh
      - Correspond to additional capacity 572 MW (if CF*** = 50%)

* Source: CPUC
** SDG&E 2010 total retail delivery is forecasted to be 17,418 GWh
*** CF: Capacity Factor

# Development of New Renewable Resources in Areas Impacted by the Proposed Projects*

| Year | Resource Type | Tehachapi | Salton Sea |
|---|---|---|---|
| | Wind | 4500 MW | |
| 2010 | Geothermal | | 445 MW |
| | Solar | | 300 MW |
| | Wind | 4500 MW | |
| 2015 | Geothermal | | 1600 MW |
| | Solar | | 900 MW |
| | Wind | 6000 MW | |
| 2017 | Geothermal | | 2000 MW |
| | Solar | | 900 MW |

* Source: CSRTP project sponsors

# CSRTP-2006 Process

# CSRTP-2006 Process

- **Step 1: Formed technical study teams from project sponsors and impacted PTOs**
  - Formed three Technical Project Teams (TPTs) to cover the three projects
    - The three teams initially worked independently but later worked together on all projects
- **Step 2: Developed study assumptions and approaches**
  - Developed a uniform set of necessary assumptions and basecases to perform the reliability and economics assessments
  - Developed study methodology for the reliability and economics assessments
- **Step 3: Studied the three projects according to their "initial" plan of service in order to assess their individual reliability and economic values as well as to evaluate their interactions with one another**
  - Independently performed all critical reliability and economic studies including those already performed by the project sponsors
- **Step 4: Reviewing alternatives to individual project's plan of service in order to optimize the recommended plan of service**
  - Completed the review of alternatives for Sun Path project

# Guiding Principles for CSRTP-2006 Process

- **Perform studies based on data that can be shared on WECC level – NDA still required for some of the data**
- **Focus solely on the assessment of transmission solutions**
  - CSRTP-2006 process is NOT intended to:
    - Study path ratings
    - Study transmission line routing
    - Study generation or demand side alternatives
- **Provide opportunities to CSRTP-2006 participants to review and comment on the CAISO report**
  - Allow “minority report(s)” in the Board report
- **Inform participants if a decision or a recommendation is based on privileged information**

# Public Participation in the CSRTP-2006 Process

- **While CSRTP-2006 participation was mainly limited to technical representation from project sponsors, the impacted PTOs, the CEC and EOB, we initiated several efforts to share our information with and receive input from all stakeholders:**
  - Sent out notices of events and comment opportunities to the CAISO, CPUC and STEP lists covering more than 3000 stakeholders
  - Organized an open house in San Diego to present CAISO's role in transmission projects and the CSRTP-2006 approach and interim results
  - Shared our reliability and economic assumptions by posting them on the CAISO website
  - Shared our basecases with CSRTP-2006 members as well as other stakeholders
  - Facilitated the processes to receive comments and suggestions on the study approach and transmission alternatives from all stakeholders and responded to all comments and suggestion openly
    - Modified the direction of our assessment based on such input
  - Presented our approach as well as our findings/recommendations at the Southwest Transmission Expansion Plan (STEP) meetings
  - Met with various public groups, including project opponents, at the San Diego Regional Energy Office to address their specific concerns about the CSRTP-2006 process and findings on the Sun Path project

# CSRTP-2006
# Assessment Approach

# Overall Study Approach

- **Study various scenarios using the three proposed projects in their original plan of service one by one as well as in combination (two at a time and all three)**
  - Criteria used for our study:
    - Reliability performance
    - Economic performance
  - Account for California RPS goals mainly in phasing the projects
- **Identify one scenario/configuration (no, one, two, or three projects) that provides the most benefits considering all three performance areas as well as the cost of the projects**
- **Review and recommend alternative project configurations to be studied**
  - CAISO would study the new alternatives
  - Project sponsors to determine the cost of new alternatives
- **For this round we present the results for the Sun Path while accounting for the impact of the Tehachapi and LEAPS projects**

# Criteria and Approach for Reliability Assessment of Transmission Projects

- **Assess reliability impact of each project based on the following principles:**
  - Verify that the identified reliability problem(s) that is to be solved by the project does exist
  - Verify that the identified reliability problem(s) is actually solved by the project
  - Determine that no other serious reliability issues are created by the project
  - Account for other reliability improvements due to the project
- **Verify whether the proposed project is the least cost solution to solving the identified reliability problem**
  - If true: We are done and economic assessments, if performed at all, are mainly intended to potentially improve plan of service
  - If false: Economic assessment must be performed on the project

# Criteria and Approach for Economic Assessment of Transmission Projects

- **Assess whether over the project lifetime, its economic benefits to the CAISO Ratepayers* exceed its cost to the same ratepayers**
- **Benefits quantified in this assessment:**
  - Energy benefits: Quantified as the reduction in the CAISO Ratepayers' energy payment due to the transmission project
  - Locational capacity requirement (LCR) benefits: Quantified as the reduction in payments by the CAISO Ratepayers for meeting local capacity needs due to the transmission project
    - Due to insufficient data on upcoming locational capacity requirement programs that are to replace the existing RMR program, we will quantify this benefit in terms of savings in RMR payments
    - LCR/RMR payment actually quantifies the value of reliability
- **Benefits are quantified for two study years: 2010 and 2015**
  - Benefits for the years between study years are evaluated by linearly interpolating between the benefits in study years
  - Benefits beyond the study years are evaluated through extrapolation of the benefits in the study years using escalation factors mainly reflecting escalation in loads and fuel prices

* CAISO Ratepayers refers to the ratepayers of all utility members of the CAISO

# Criteria and Approach for Economic Assessment of LEAPS Power Plant

- **Benefits of LEAPS power plant are being evaluated based on CAISO having control over the power plant:**
  - Energy benefits: Quantified as reduction in the CAISO Ratepayers' energy payments due to the operation of the LEAPS power plant
  - Ancillary services benefits: Quantified as reduction in ancillary services payments due to the same services that can be provided by the LEAPS power plant
    - There will be added benefits for regulation services 2010 and beyond due to forecasted large penetration of wind generation
  - Overgeneration mitigation benefits: Savings in payments for overgeneration mitigation due to project(s)
  - Black start & reactive power benefits: Savings in payments for black start capability & reactive power (not quantified) due to project(s)

# Accounting for the State's RPS Goal

- **We account for the State's RPS goal mainly on decisions regarding the phasing of the projects**

# Studying Transmission Alternatives

- **Principles for studying and recommending transmission alternatives:**
  - Transmission alternatives proposed by other parties are considered for analysis
  - Transmission alternatives that are actually studied are selected based on deliberations of the CSRTP-2006 team
  - Given the specifics of the proposed projects, Transmission alternatives are first studied based on their economic value
    - If the net economic benefit of a proposed alternative measured as the difference in its benefit and its cost for the study year is larger than that of the proposed project, reliability studies will be performed on that alternative
    - If the result of reliability assessment is acceptable for the proposed alternative, the impact of the alternative project on meeting the State RPS goal is evaluated
    - If the impact on meeting the State RPS goal is also acceptable, the proposed alternative is recommended in lieu of the project

# Reliability Assumptions (1)

- **Reliability study scenarios from WECC**
  - 2010 Heavy Summer
  - 2015 Heavy Summer
  - 2011/12 Light Winter
- **List of critical contingencies for reliability studies**
  - 67 contingencies carefully selected
- **Base system configuration**
  - Existing system configuration accounting for relevant transmission and generation addition and retirements
    - Added new transmission: All transmission projects approved by the CAISO Board
    - Added new generation:
      - Generation under construction
      - Generation having received regulatory approval or signed contracts
      - All renewable resources per prior slide on “New Renewable Resources”
    - Retired generation: Official/public announcements
    - Re-powered generation: Treated as a sequence of generation retirement followed by generation addition

# Reliability Assumptions (2)

- **Transmission path and nomogram constraints**
  - Based on existing WECC approved ratings
    - CAISO ratings for internal paths
  - Estimated the impact of the new project on interface ratings and the nomograms
- **A list of reliability and economic assumptions is posted on the CAISO Website**
  - URL:http://www.caiso.com/1815/18159816f990.html

# Economic Assumptions (1)

- **Study the economic operation of the entire WECC system over the study year(s)**
  - Minimize production cost across the WECC based on least cost commitment/dispatch of all WECC resources
- **Deterministic scenario analysis**
- **Accounted for losses on marginal basis**
- **All studies conducted based on the most up-to-date WECC (formerly SSG-WI) economic data (available for 2015)**
  - WECC economic data was used without modifications
    - Exception: 1500 MW of new generation in Palo Verde area for 2010 and beyond was changed from Combustion Turbine to Combined Cycle
  - WECC generation production costs differences across regions seemed too low due to assumptions made for unit heat rates and regional gas price differentials
    - Hence calculated benefit for the projects should be conservative

# Economic Assumptions (2)

- **CAISO put together a 2010 study year case (first year when all the projects are expected in service) based on 2015 data**
  - Scaled back load across WECC by about 2% a year
  - Generation scaled back accordingly on a regional basis
  - California load was further adjusted to account for CEC's latest load forecast
- **Accounted for average strategic bidding behavior for non-CAISO utility generators in PG&E and SCE areas**
  - Using the Residual Supply Index approach
  - No strategic bidding allowed in SDG&E area
  - No strategic bidding in 2010
- **Gas price (average price in 2006 dollar at Henry Hub):**
  - $7/MMBTU for 2015
  - $6.50/MMBTU for 2010
  - Monthly regional gas prices based on WECC data

# Economic Assumptions (3)

- **Basecase energy benefit results were used for economic assessment**
  - Sensitivity analysis was performed to verify the suitability of this approach
  - Additional sensitivity analysis performed using:
    - Low and high gas prices
      - 2015: $5/MMBTU for low and $9/MMBTU for high
      - 2010: $4.5/MMBTU for low and $8.50/MMBTU for high
    - Low and high California load: -5% for low load and +5% for high load (both for 2015 and 2010 study years)
    - Low and high new renewable resources: -500 MW for low & +500 MW for for high (for 2015 only)
    - No strategic bidding for 2015
      - No strategic bidding for all 2010 cases
    - Generation re-power in 2015:
      - South Bay Power Plant: New CCCT 650 MW Plant
      - Encina Power Plant: New CCCT 640MW Plant
        - » Encina 1 & 2 retired

# Studies for Sun Path

| Study Area | Analysis & Modeling | Status |
|---|---|---|
| Reliability | Governor power flow simulations | Complete |
| | Transient stability simulations | Complete |
| Economic Benefit | Energy benefit assessment based on production cost savings | Complete |
| | LCR benefit assessment based on RMR payment savings | Complete |
| Study of alternatives | Economic studies followed by reliability studies if necessary | Complete |

# Sun Path Project Findings

# Study Results for Sun Path Project

- **Reliability assessment results**
- **Economic assessment results**
  - Energy benefit assessment summary
  - LCR/RMR benefit assessment summary
  - Total and net benefit summary
- **RPS assessment discussion**
- **Study of alternatives**

# Reliability Assessment results for Sun Path Project

- **SDG&E Import Study**
- **Other reliability considerations**

# Reliability Assessment results for Sun Path Project -- SDG&E Import Study

| | 2010HS Pre-Project, All Lines In Service | 2010HS Pre-Project, N-1 Conditions* | 2010HS Sun Path Project, All Lines In Service | 2010HS Sun Path Project, N-1 Condition*** |
|---|---|---|---|---|
| CONTINGENCY | G-1: Otay Mesa | G-1: Otay Mesa<br>N-1: IV-Miguel | G-1: Otay Mesa | G-1: Otay Mesa<br>N-1: IV-Miguel |
| SDG&E LOAD (MW) | 4906 | 4906 | 4906 | 4906 |
| SDG&E INTERNAL GENERATION (MW) | 2191 | 2196 | 2192 | 2193 |
| SDG&E SYSTEM LOSSES (MW) | 77 | 151 | 80 | 117 |
| TOTAL SDG&E IMPORT (MW) | 2792 | 2861 | 2794 | 2830 |
| Surplus / (Deficient) (MW) | 58 | (361) | 1206 | 670 |
| Total Import Capability (MW) | 2850 | 2500 | 4000 | 3500 |

*SPS for cross trip of the Imperial Valley – La Rosita 230kV line to help prevent overloading of CFE internal system.
** G-1 of Otay Mesa, system re-adjusted in the base case. The contingency analysis includes an N-1 on the Imperial Valley – Miguel 500kV line (N-1)
*** No need for cross trip SPS after implementing the Sun Path Project

# Reliability Assessment results for Sun Path Project -- SDG&E Import Study

| | 2015HS Pre-Project, All-Lines In Service | 2015HS Pre-Project, N-1 Condition | 2015HS Sun Path Project, All-Lines In Service | 2015HS Sun Path Project, N-1 Condition*** | 2015HS South Bay Re-power, All Lines In Service | 2015HS South Bay Re-power, N-1 Condition* |
|---|---|---|---|---|---|---|
| CONTINGENCY | G-1: Otay Mesa | G-1:Otay Mesa N-1: IV-Miguel | G-1: Otay Mesa | G-1:Otay Mesa N-1: IV-Miguel | G-1: South Bay | G-1:South Bay N-1: IV-Miguel |
| SDG&E LOAD (MW) | 5376 C | ase Diverged | 5376 | 5376 | 5376 | 5376 |
| SDG&E INTERNAL GENERATION (MW) | 2193 | | 2193 | 2194 | 2753 | 2759 |
| SDG&E SYSTEM LOSSES (MW) | 91 | | 100 | 154 | 96 | 156 |
| TOTAL SDG&E IMPORT (MW) | **3274** | | 3283 | 3336 | 2719 | 2773 |
| Surplus / (Deficient) (MW) | (424) | | 717 | 164 | 131 | (273) |
| Total Import Capability (MW) | 2850 | | 4000 | 3500 | 2850 | 2500 |

*SPS for cross trip of the Imperial Valley – La Rosita 230kV line to help prevent overloading of CFE internal system.
** G-1 of Otay Mesa, system re-adjusted in the base case. The contingency analysis includes an N-1 on the Imperial Valley – Miguel 500kV line (N-1)
*** No need for cross trip SPS after implementing the Sun Path Project

# Reliability Assessment results for Sun Path Project

- **The Sun Path project increases the SDG&E import capability by about 1000 MW (SWPL out) to 1150 MW (all lines in service), which helps address expected shortfalls in the import capability and maintains reliable load serving capability in the San Diego area**
- **No adverse impacts result from the Sun Path Project**
  - Provides additional benefit by eliminating potential pre-project contingency overloading concerns on the CFE system with the La Rosita - HRA 230kV, La Rosita - Rumorosa 230kV, Rumorosa - HRA 230kV lines
  - Provides additional benefit by addressing thermal contingency overloading concerns on IID's internal transmission network on the Blythe - Niland 161kV, Knob - Pilot Knob 161kV, Pilot Knob-Highline 161kV and RTP-RTAP2 lines
- **The transient studies demonstrate no adverse impacts result and an additional reliability benefit:**
  - Provides additional benefit by mitigating the frequency criteria violations in the CFE system due to an N-1 contingency of Imperial Valley – Miguel 500kV line

# Sun Path Project Energy Benefits for 2015

## Energy Benefit for year 2015 (in Millions of 2006$)

| | Sunpath Benefit | Sunpath Benefit in Presence of Tehachapi | Sunpath Benefit in Presence of LEAPS & Tehachapi |
|---|---|---|---|
| Total CAISO IOU Generator Surplus Gain (Loss) | (40.42) | (34.47) | (48.69) |
| Total CAISO Consumer Payment Reduction (Increase) | 185.12 | 159.31 | 194.54 |
| Total CAISO PTO Transmission Congestion Revenue Gain (Loss) | (0.05) | (0.05) | (4.87) |
| **Total CAISO Benefit (Loss)** | **144.65** | **124.79** | **140.99** |
| **Total WECC Production Cost Reduction (Increase)** | **60.95** | **65.66** | **83.36** |

# Sun Path Energy Benefit Sensitivity to California Load (2015)

## Energy Benefits with Load Sensitivity - 2015 (in Millions of 2006$)

| Benefit Description | Sun Path Benefit - 2015 Base Case | Sun Path Benefit with 5% Higher CAISO 2015 Load | Sun Path Benefit with 5% Lower CAISO 2015 Load |
|---|---|---|---|
| Total CAISO IOU Generator Surplus Gain (Loss) | (40.42) ( | 40.49) ( | 33.09) |
| Total CAISO Consumer Payment Reduction (Increase) | 185.12 | 208.49 | 153.59 |
| Total CAISO PTO Transmission Congestion Revenue Gain (Loss) | (0.05) (8 | .21) (7 | .13) |
| **Total CAISO Benefit (Loss)** | **144.65** | **159.79** | **113.37** |
| **Total WECC Production Cost Reduction (Increase)** | **60.95** | **66.54** | **67.95** |

# Sun Path Energy Benefit Sensitivity to Gas Prices (2015)

## Energy Benefits with Gas Price Sensitivity - 2015 (in Millions of 2006$)

| Benefit Description | Sun Path Benefit - 2015 Base Case | Sun Path Benefit with High Gas Prices | Sun Path Benefit with Low Gas Prices |
|---|---|---|---|
| Total CAISO IOU Generator Surplus Gain (Loss) | (40.42) ( | 50.11) ( | 24.84) |
| Total CAISO Consumer Payment Reduction (Increase) | 185.12 | 229.30 | 89.19 |
| Total CAISO PTO Transmission Congestion Revenue Gain (Loss) | (0.05) 3. | 02 | (1.69) |
| **Total CAISO Benefit (Loss)** | **144.65** | **182.21** | **62.66** |
| **Total WECC Production Cost Reduction (Increase)** | **60.95** | **103.98** | **85.71** |

# Sun Path Energy Benefit Sensitivity to Salton Sea Renewable Resources (2015)

## Energy Benefits with Renewable Resource Sensitivity - 2015 (in Millions of 2006$)

| Benefit Description | Sun Path Benefit - 2015 Base Case | Sun Path Benefit with additional Renewables: +300MW Geo, +200MW Solar | Sun Path Benefit with less Renewables: -300MW Geo, -200MW Solar |
|---|---|---|---|
| Total CAISO IOU Generator Surplus Gain (Loss) | (40.42) ( | 37.45) ( | 36.11) |
| Total CAISO Consumer Payment Reduction (Increase) | 185.12 | 147.97 | 164.87 |
| Total CAISO PTO Transmission Congestion Revenue Gain (Loss) | (0.05) 63.3 | 8 | (5.34) |
| **Total CAISO Benefit (Loss)** | **144.65** | **173.90** | **123.41** |
| **Total WECC Production Cost Reduction (Increase)** | **60.95** | **173.68** | **33.90** |

# Sun Path Energy Benefit Sensitivity to Strategic Bidding (2015)

## Energy Benefits with Marginal Cost Bidding Scenario – 2015 (in Millions of 2006$)

| Benefit Description | Sun Path Benefit - 2015 Base Case | Sun Path Benefit using Marginal Cost Bidding |
|---|---|---|
| Total CAISO IOU Generator Surplus Gain (Loss) | (40.42) (3 | 3.39) |
| Total CAISO Consumer Payment Reduction (Increase) | 185.12 | 165.52 |
| Total CAISO PTO Transmission Congestion Revenue Gain (Loss) | (0.05) (2 | .87) |
| **Total CAISO Benefit (Loss)** | **144.65** | **129.26** |
| **Total WECC Production Cost Reduction (Increase)** | **60.95** | **74.38** |

# Sun Path Energy Benefit Sensitivity to San Diego Area Generation Re-Powering (2015)

## Energy Benefits with Generation Re-power Scenario in 2015 (in Millions of 2006$)

- South Bay: Replace the existing power plant with a 650 MW CC unit
- Encina: Replace Encina 1 & 2 (~200 MW) with a 640 MW CC unit

| Benefit Description | Sun Path Benefit - 2015 Base Case | Sun Path Benefit with South Bay Re-power | Sun Path Benefit with Encina Re-power |
|---|---|---|---|
| Total CAISO IOU Generator Surplus Gain (Loss) | (40.42) (31.09) | | (31.02) |
| Total CAISO Consumer Payment Reduction (Increase) | 185.12 | 147.22 | 148.08 |
| Total CAISO PTO Transmission Congestion Revenue Gain (Loss) | (0.05) (1.9 | 2) | (1.63) |
| **Total CAISO Benefit (Loss)** | **144.65** | **114.21** | **115.42** |
| **Total WECC Production Cost Reduction (Increase)** | **60.95** | **72.24** | **82.74** |

# Sun Path Project Energy Benefits for 2010

## Energy Benefit for year 2010 (in Millions of 2006$)

| | Sunpath Benefit | Sunpath Benefit in Presence of Tehachapi | Sunpath Benefit in Presence of LEAPS & Tehachapi |
|---|---|---|---|
| Total CAISO IOU Generator Surplus Gain (Loss) | (18.28) | (7.46) | (12.85) |
| Total CAISO Consumer Payment Reduction (Increase) | 61.63 | 39.21 | 56.36 |
| Total CAISO PTO Transmission Congestion Revenue Gain (Loss) | (0.37) | (5.91) | (5.54) |
| **Total CAISO Benefit (Loss)** | **42.97** | **25.83** | **37.97** |
| **Total WECC Production Cost Reduction (Increase)** | **3.20** | **8.73** | **11.70** |

# Sun Path Energy Benefit Sensitivity to California Load (2010)

## Energy Benefits with Load Sensitivity - 2010 (in Millions of 2006$)

| Benefit Description | Sun Path Benefit - 2010 Base Case | Sun Path Benefit with 5% Higher CAISO 2010 Load | Sun Path Benefit with 5% Lower CAISO 2010 Load |
|---|---|---|---|
| Total CAISO IOU Generator Surplus Gain (Loss) | (18.28) ( | 17.56) ( | 15.67) |
| Total CAISO Consumer Payment Reduction (Increase) | 61.63 | 68.66 | 38.48 |
| Total CAISO PTO Transmission Congestion Revenue Gain (Loss) | (0.37) ( | 8.31) | 1.39 |
| **Total CAISO Benefit (Loss)** | **42.97** | **42.78** | **24.19** |
| **Total WECC Production Cost Reduction (Increase)** | **3.20** | **1.90** | **8.70** |

# Sun Path Energy Benefit Sensitivity to Gas Prices (2010)

## Energy Benefits with Fuel Price Sensitivity - 2010 (in Millions of 2006$)

| Benefit Description | Sun Path Benefit - 2010 Base Case | Sun Path Benefit with High Gas Prices | Sun Path Benefit with Low Gas Prices |
|---|---|---|---|
| Total CAISO IOU Generator Surplus Gain (Loss) | (18.28) ( | 11.55) ( | 10.33) |
| Total CAISO Consumer Payment Reduction (Increase) | 61.63 | 51.33 | 45.39 |
| Total CAISO PTO Transmission Congestion Revenue Gain (Loss) | (0.37) (7 | .17) (6 | .77) |
| **Total CAISO Benefit (Loss)** | **42.97** | **32.61** | **28.29** |
| **Total WECC Production Cost Reduction (Increase)** | **3.20** | **8.06** | **8.40** |

# Sun Path Energy Benefit Sensitivity to Renewable Development in Salton Sea in 2010

## Energy Benefits with Renewable Resource Sensitivity - 2010 (in Millions of 2006$)

| Benefit Description | Sun Path Benefit - 2010 Base Case | Sun Path Benefit with No New Salton Sea Renewables* in Pre-Project Case |
|---|---|---|
| Total CAISO IOU Generator Surplus Gain (Loss) | (18.28) ( | 36.09) |
| Total CAISO Consumer Payment Reduction (Increase) | 61.63 | 115.47 |
| Total CAISO PTO Transmission Congestion Revenue Gain (Loss) | (0.37) 0.41 | |
| **Total CAISO Benefit (Loss)** | **42.97** | **79.80** |
| **Total WECC Production Cost Reduction (Increase)** | **3.20** | **208.94** |

* Pre-Project New Renewables: 0MW (745 MW available)

# Local Capacity Requirement (LCR) Benefit of Sun Path Project

| | | Estimated Import limit | | | |
|---|---|---|---|---|---|
| Year | Load | No new projects | with Sunpath | with Sunpath and LEAPS | Largest Unit |
| 2010 | 4971 MW | 2500 MW | 3500 MW | 4500 MW | 561 MW |
| 2015 | 5192 MW | 2500 MW | 3500 MW | 4500 MW | 561 MW |

| | RMR Need | | | Available Resources | Required RMR Generation | | |
|---|---|---|---|---|---|---|---|
| Year | No New Projects | With Sunpath | With Sunpath and LEAPS | | No New Projects | with Sunpath | With Sunpath and LEAPS |
| 2010 | 3032 MW | 2032 MW | 1032 MW | 1380 MW | 1652 MW | 652 MW | 0 MW |
| 2015 | 3253 MW | 2253 MW | 1253 MW | 1380 MW | 1873 MW | 873 MW | 0 MW |

# LCR Benefit of Sun Path Project

## RMR Benefits

### (in Millions of 2006$)

| | Year 2010 | Year 2015 |
|---|---|---|
| RMR cost, no new projects | $71.55M* | $81.12M |
| RMR cost with Sun Path | $28.24M | $37.81M |
| RMR cost with Sun Path and LEAPS | $0 | $0 |
| **Sun Path RMR savings** | **$43.31M** | **$43.31M** |
| RMR savings with Sun Path and LEAPS | $71.55M | $81.12M |
| **RMR savings attributed to each project** | **$35.78M**** | **$40.56M**** |

* All benefits calculated based on CAISO's 2-year average RMR capacity payment of $43.31/kW-yr for San Diego Area
** We have divided the savings equally between the two projects

# Total Ratepayers Benefits of Sun Path Project: Sun Path Alone

**Sun Path Project Total CAISO Ratepayers Benefits Summary When Alone (in Millions of 2006 dollars)**

| Benefits | 2010 CAISO Ratepayer Benefit | 2015 CAISO Ratepayer Benefit |
|---|---|---|
| - Energy Benefit | $42.97 | $144.65 |
| - LCR/RMR Benefit | $43.31 | $43.31 |
| Total Benefit | $86.28 | $187.96 |

# Total Ratepayers Benefits of Sun Path Project: With Tehachapi

**Sun Path Project Total CAISO Ratepayers Benefits Summary when with Tehachapi Project (in Millions of 2006 dollars)**

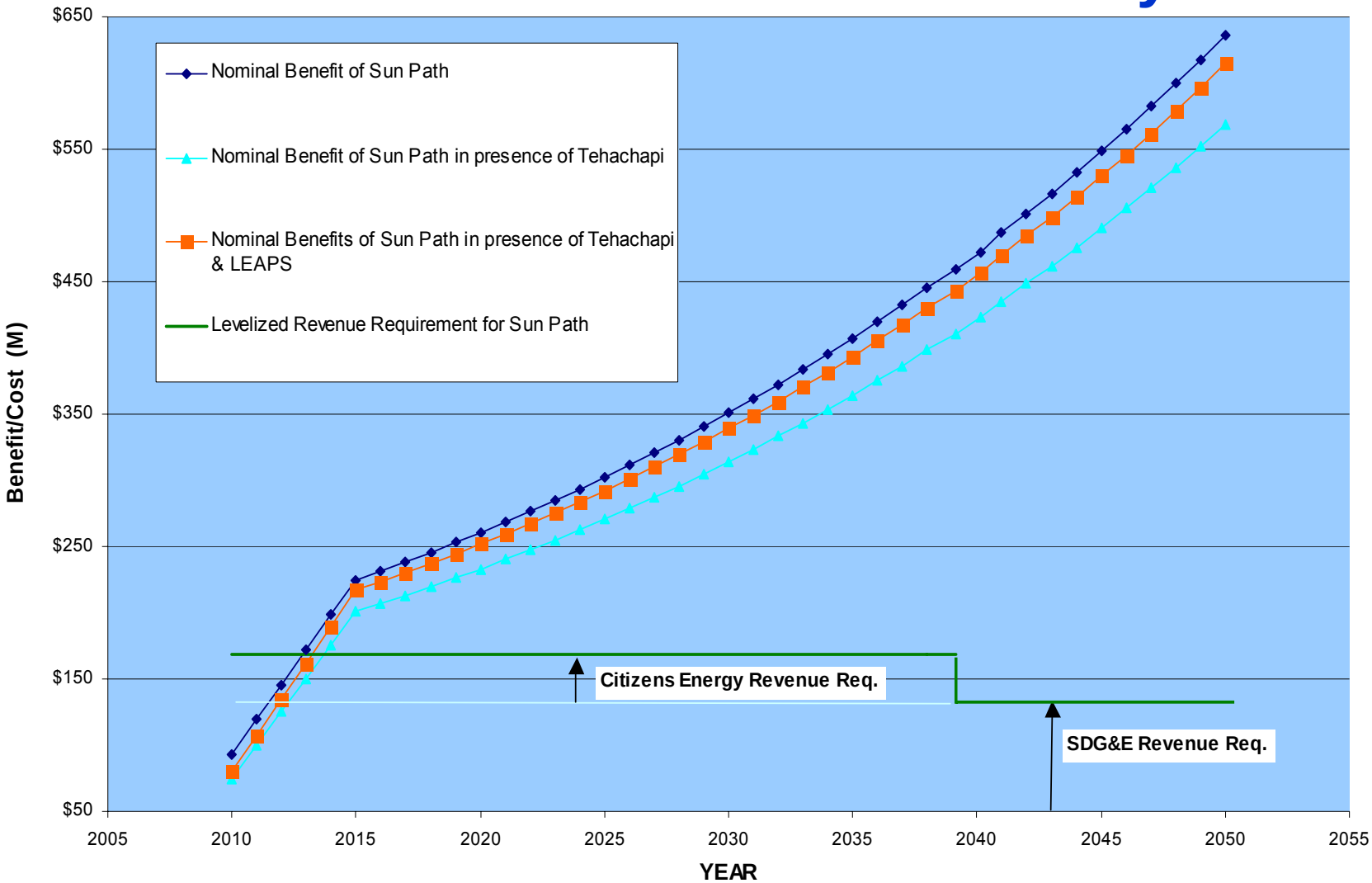
| Benefits | 2010 CAISO Ratepayer Benefit | 2015 CAISO Ratepayer Benefit |
|---|---|---|
| - Energy | $25.83 | $124.79 |
| - RMR/LCR | $43.31 | $43.31 |
| Total | $69.14 | $168.10 |

# Total Ratepayers Benefits of Sun Path Project: With Tehachapi & LEAPS

**Sun Path Project Total CAISO Ratepayers Benefits Summary when with Tehachapi & LEAPS Projects (in Millions of 2006 dollars)**

| Benefits | 2010 CAISO Ratepayer Benefits | 2015 CAISO Ratepayer Benefits |
|---|---|---|
| - Energy | $37.97 | $140.99 |
| - RMR/LCR | $35.78 | $40.56 |
| Total | $73.75 | $181.55 |

# Economic Assessment of Sun Path Project: Annual Cost/Benefits Summary



# Alternatives Assessed by CAISO

- **Mexico Light – Bundled along with LADWP-proposed Indian Hills – Upland 500kV Transmission Line Project**
- **SONGS Light Transmission**
- **SONGS Heavy Transmission**

# CAISO Alternatives Assessments

| Transmission Alternatives | Assessment Results |
|---|---|
| Mexico Light – Bundled with LADWP proposed Indian Hills – Upland 500kV Transmission Line Project | **LADWP Portion:**<br>• Could not receive any certainty on the schedule or plan of service for LADWP proposed Indian Hills – Upland 500kV Transmission Line Project<br>**Mexican Portion:**<br>• Mexican portion adds 18% overload on La Rosita plant to La Rositado sub<br>• Does not allow for long-term mitigation of the import capability concern for SDG&E area<br>• Will not help with economic benefit nor access to Salton Sea Renewables |
| SONGS Light/Heavy Transmission | • Upgrades of Barre-Ellis line is required and not possible<br>• No meaningful impact on import capability into San Diego, hence no economic benefit expected/studied |

# Alternatives Studies by SDG&E and Reviewed by CAISO

- **21 scenarios and alternatives were reviewed by project sponsors (mainly SDG&E)**
- **CAISO reviewed SDG&E's study of alternatives and confirms them**
  - These scenarios and alternatives are presented in the CAISO full report
- **The review helped the CAISO firm up the base plan of service for reliability and economic analyses**

# RPS Assessment for Sun Path Project

- **Meeting the state RPS goal (along with meeting the San Diego reliability needs) requires that the in-service date of the Sun Path project to be no later than 2010**
  - Sun Path project provides the needed access to renewable energy resources in Salton Sea area without hindering economic imports into the CAISO system
  - Without Sun Path, development of renewable energy resources in Imperial Valley area is expected to be limited as California utilities will not want their economy imports to be potentially curtailed by developing renewable resources
- **Similar argument can probably be made for the LEAPS and Tehachapi projects – we will bring such discussions forward at the time we will present our findings on those projects**

# Sun Path Project Recommendations

# Recommendation on the Sun Path Project

- **Based on the results presented here we intend to recommend the Board to approve the Sun Path project as it:**
  - Provides positive net economic value for the CAISO ratepayers;
  - Solves San Diego's known reliability problems for 2010 and beyond; and
  - Enables SDG&E and other California utilities to more readily comply with the state's mandated RPS requirement without curbing economic imports to California

# Concluding Remarks

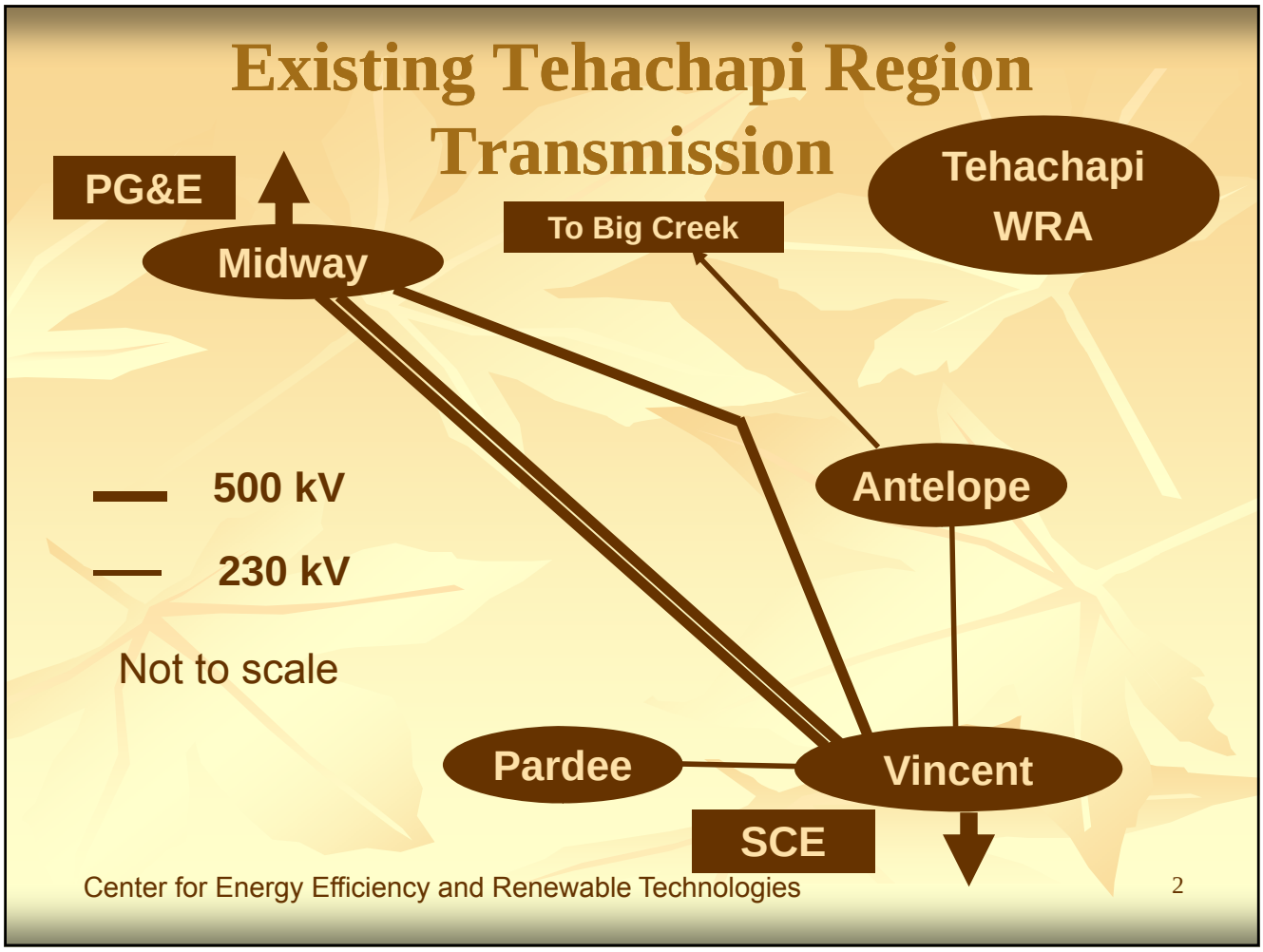
- *We have developed our findings and recommendations based on a set of credible, reasonable and verifiable data and assumptions on system configuration, loads and resources, and fuel prices; and*
- *The results of our assessment, whether economic or reliability based, could be used to determine whether non-transmission alternatives, including generation or demand-side alternatives, could be considered as replacement to the recommended transmission project.*

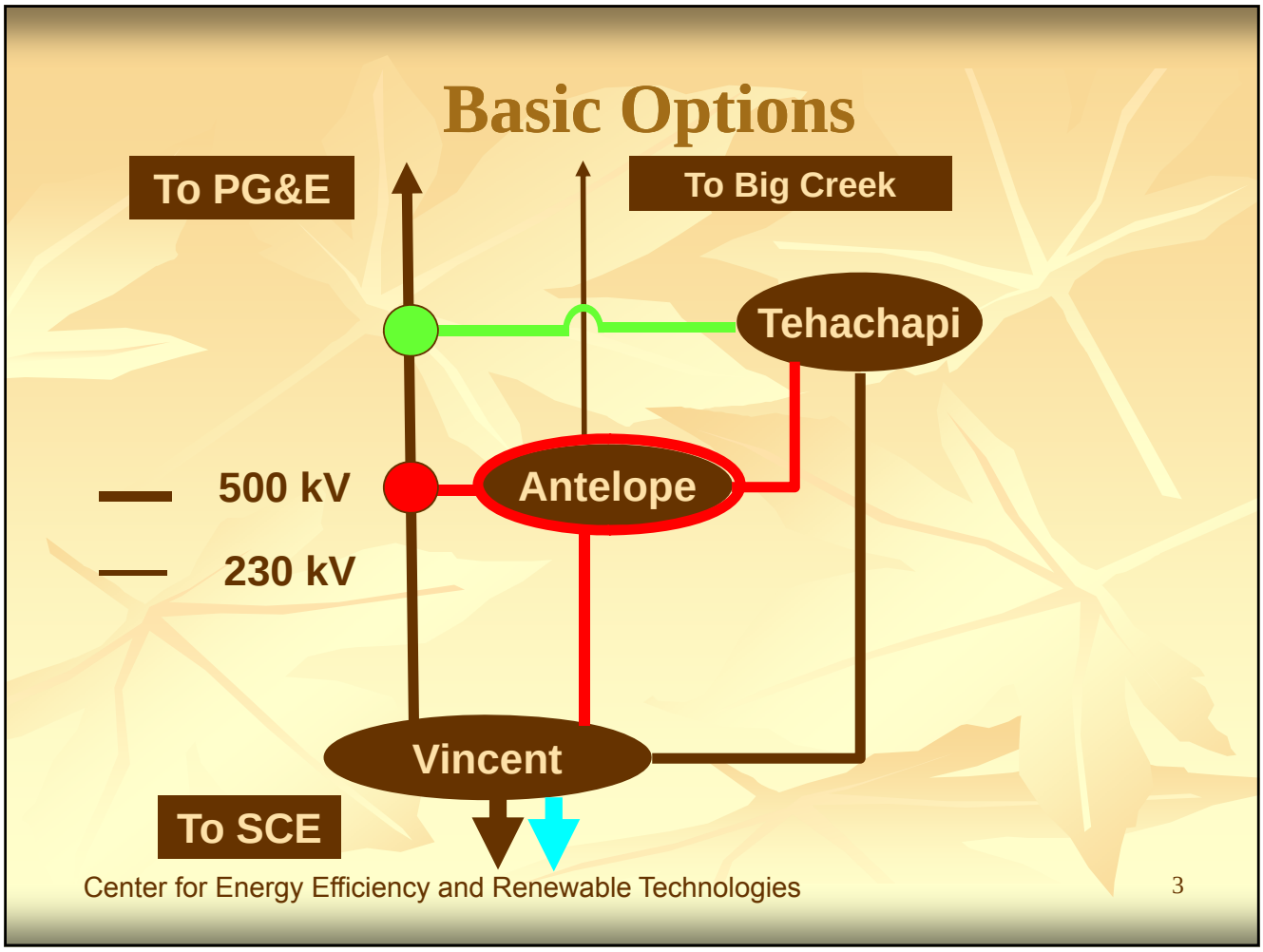
# APPENDIX W

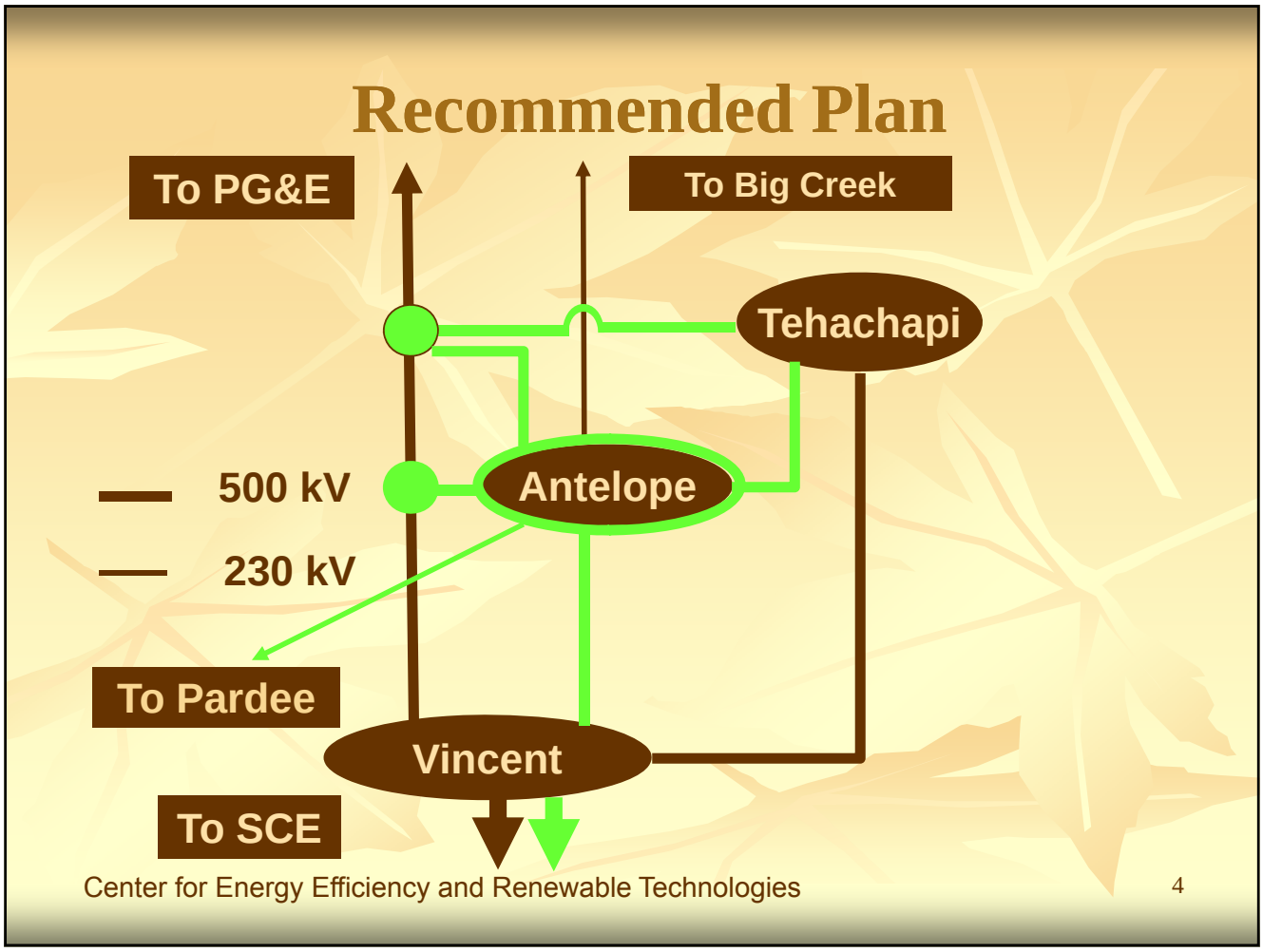
Tehachapi Workshop Presentation

# The Tehachapi Wind Energy Project

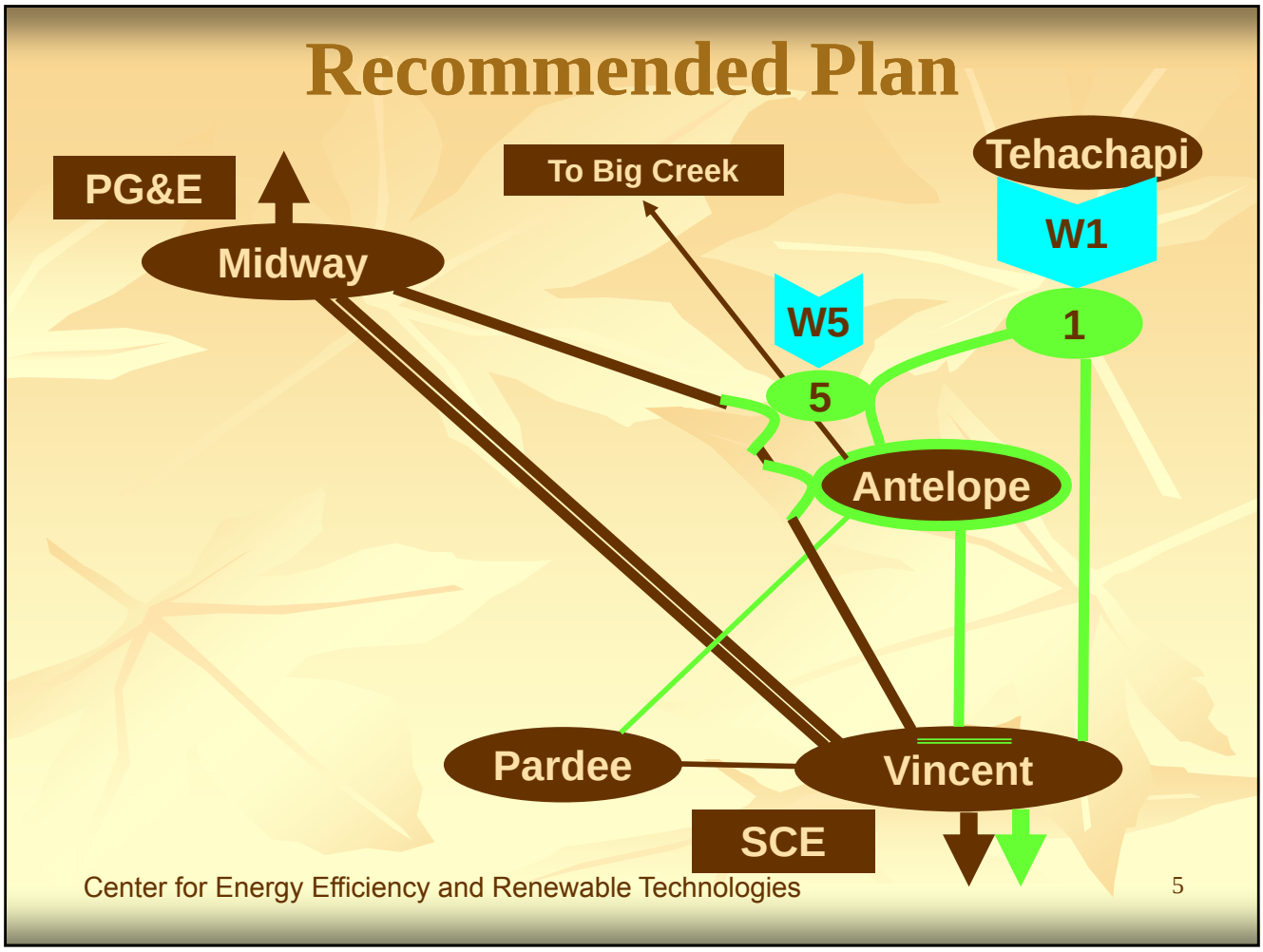
**Presented to the**
**Joint CPUC/CAISO Tehachapi Workshop**
**August 23, 2006**
**Rich Ferguson, PhD**
**Research Director, CEERT**


Existing Tehachapi Region Transmission
PG&E
Midway
To Big Creek
Tehachapi WRA
Antelope
500 kV
230 kV
Not to scale
Pardee
Vincent
SCE
Center for Energy Efficiency and Renewable Technologies
2


Basic Options
To PG&E
To Big Creek
Tehachapi
500 kV
230 kV
Antelope
Vincent
To SCE
Center for Energy Efficiency and Renewable Technologies
3

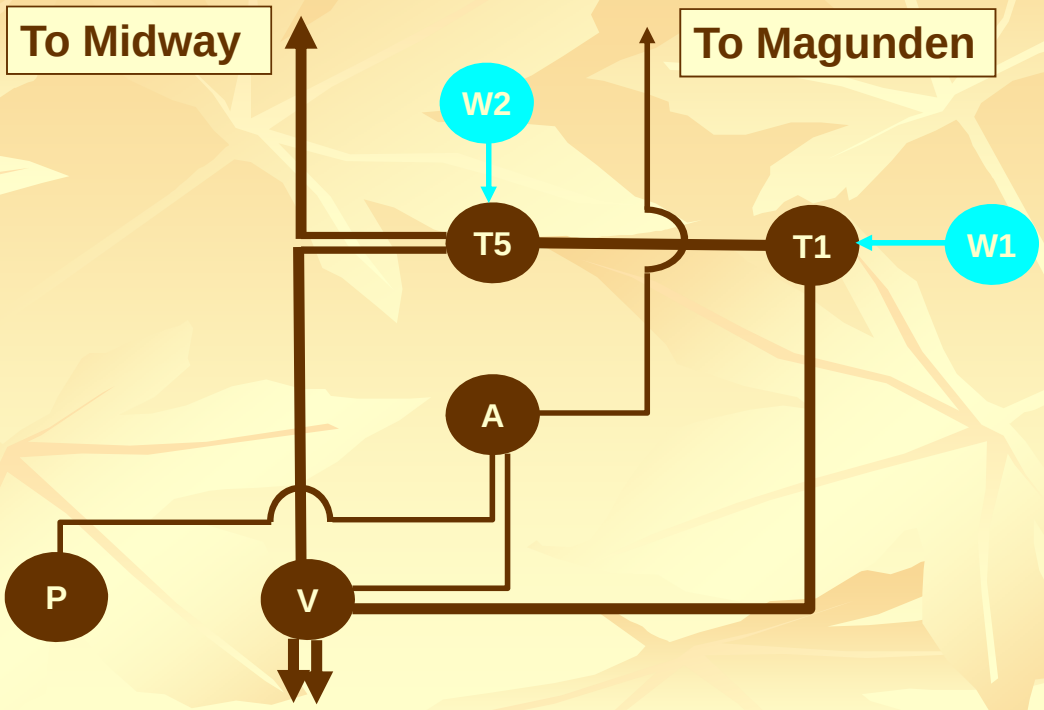

Recommended Plan
To PG&E
To Big Creek
Tehachapi
500 kV
230 kV
Antelope
To Pardee
Vincent
To SCE
Center for Energy Efficiency and Renewable Technologies
4

# Recommended Plan




Center for Energy Efficiency and Renewable Technologies 5

# Option 1




Center for Energy Efficiency and Renewable Technologies

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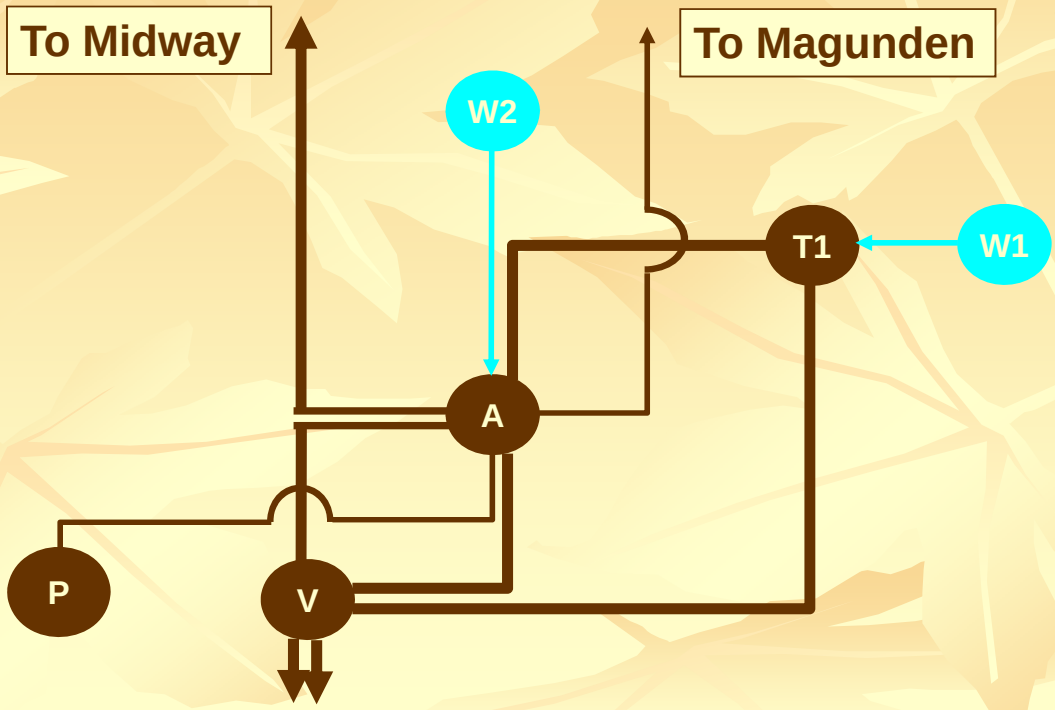
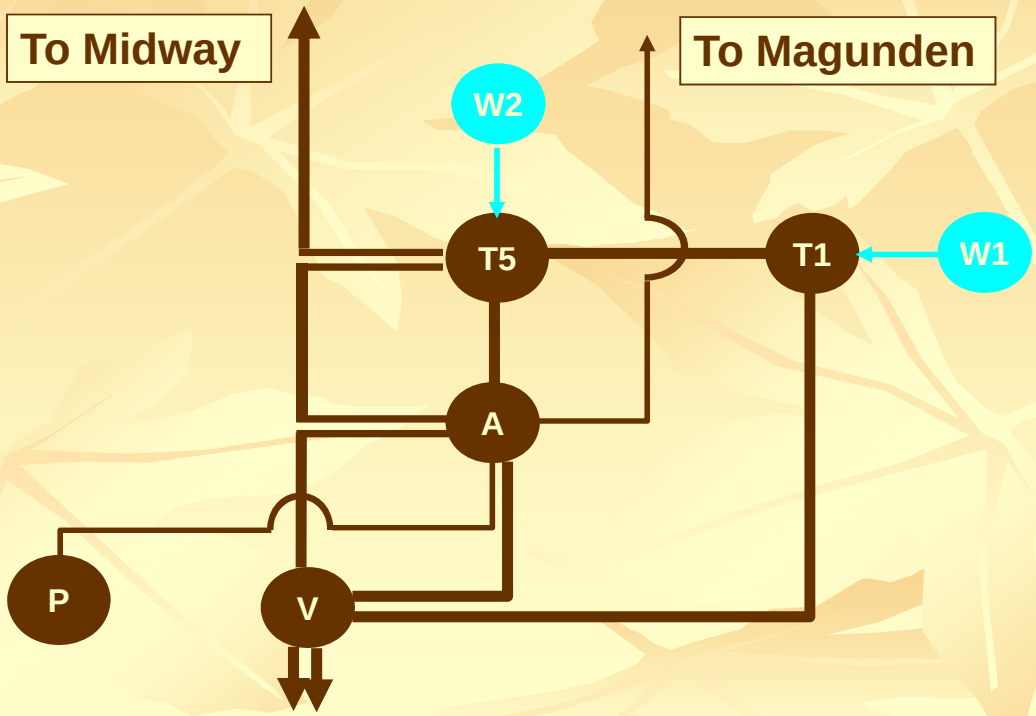
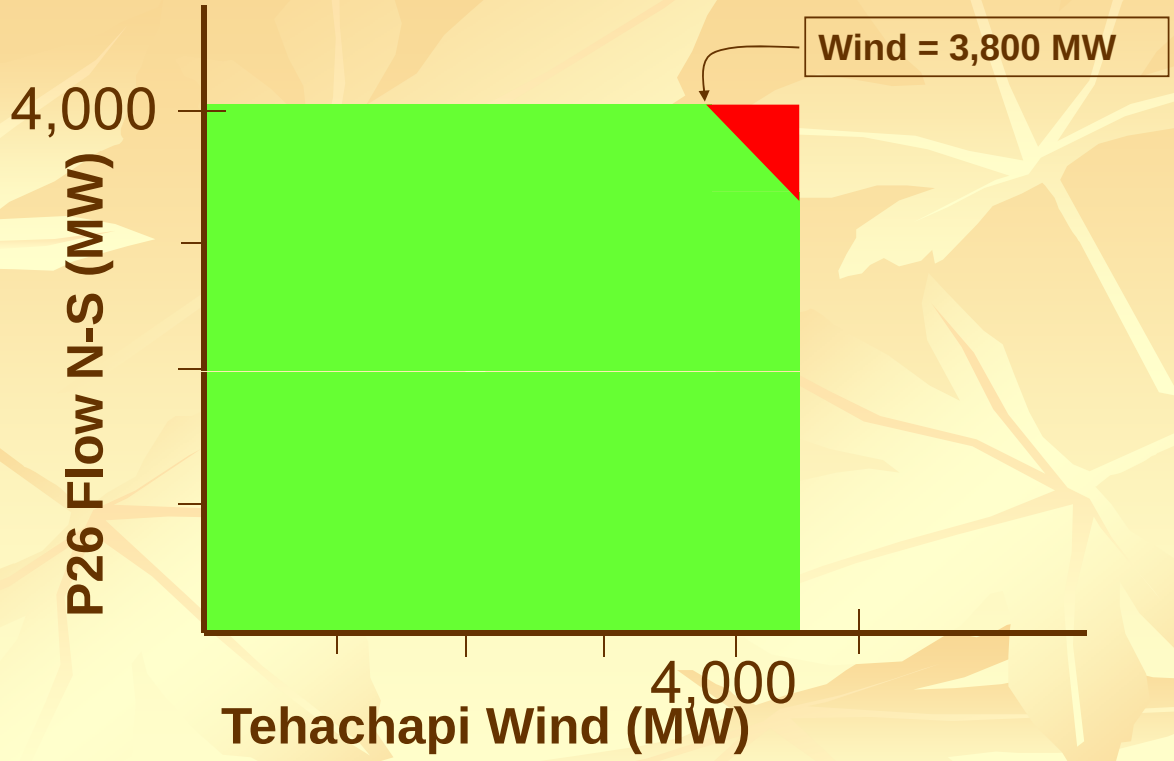
# Option 2



# Recommended Plan



# Recommended Plan Nomogram



# Cost Estimates

| Facility | Total | Wind |
|---|---|---|
| Sub 1 | 240 | 240 |
| Sub 1 – Vincent (500kV) | 140 | 140 |
| Sub Pardee | 20 | 10 |
| Antelope-Pardee (@230kV) | 80 | 40 |
| Vincent MSC | 40 | 40 |
| Antelope-Vincent upgrade (@500) | 70 | 0 |
| Antelope-Mesa upgrade | 35 | 0 |
| Vincent –Mira Loma (500kV) | 300 | 0 |
| Antelope (@500kV) | 200 | 100 |
| Sub 1 – Antelope | 100 | 100 |
| Sub 5 (@500kV) | 150 | 150 |
| TOTALS | $1,375 M | $820 M |

# Project Scope

- 500 kV network facilities are just the tip of the project iceberg.
- Total project:
  - 500 kV network
  - 230 kV collector network
  - Wind projects
- Total project cost estimate ~ $ 10 Billion.
- Much remains to be done to attract the capital and build the project.

# Next Steps

- Project scope of work
  - Complete transmission facilities plan
    - Approval by CAISO board of governors
  - 230 kV collector system planning
  - Wind development
- Project finance
  - Budget
  - Cash flow from §399.25 and wind developers
  - Energy procurement contracts
- Project schedule – completion by 1/1/11?

# CEERT Recommendation

- **Establish Tehachapi project steering committee for duration of project**
- **Function of steering committee:**
  - Assist CPUC Project Manager
  - Provide expert advice to CPUC
- **Potential subcommittees:**
  - Transmission
  - Finance
  - Regulatory affairs
- **Changes in scope of work, budget or schedule require CPUC approval**

# Thanks to:

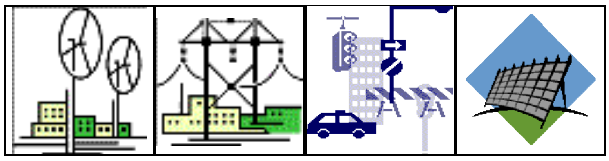
- Commissioner Dian Grueneich, CPUC
  - CPUC staff
- Commissioner John Geesman, CEC
  - CEC staff
- Dariush Shirmohammadi
  - CAISO staff
- SCE, PG&E and all the other stakeholders who have perservered

# Conclusions

- A milestone has been achieved –
  - A consensus plan has emerged after two years of study by the Tehachapi Collaborative Study Group and the CAISO.
- Time to begin next steps is now.
- Questions, comments, suggestions?
  - **rich@ceert.org**

# APPENDIX X

CAISO South Regional Transmission Plan for 2006 - Part II



California ISO
Your Link to Power

# CAISO South Regional Transmission Plan for 2006

# (CSRTP-2006)

## PART II:
## Findings and Recommendation on the Tehachapi Transmission Project

***Prepared by:***

**Regional Transmission – South**

**Planning and Infrastructure Development**

**California ISO**

**December 29, 2006**

# CAISO South Regional transmission Plan for 2006 (CSRTP-2006) Report
# --- The Tehachapi Study ---

## EXECUTIVE SUMMARY

### INTRODUCTION AND SUMMARY CONCLUSIONS

The California ISO (CAISO) was asked to review and approve three proposals by the project proponents for new transmission projects in the Southern California region. The three projects are:

- **Sunrise Powerlink / Green Path (Sun Path) Project:** The project combines Sunrise Powerlink Project sponsored by San Diego Gas & Electric Company (SDG&E) and Phase 2 of Green Path Project sponsored by Citizens Energy and Imperial Irrigation District (IID) connecting Imperial Valley to the San Diego area and is intended to help meet the reliability and economic needs of the ISO Controlled Grid as well as to integrate renewable resources in the Salton Sea and southern Imperial Valley areas.
- **Tehachapi Transmission Project:** This project presents the transmission network infrastructure necessary to reliably interconnect generation resources (mainly wind generation) in the Tehachapi Wind Resource Area (TWRA) and, at the same time, to provide reliability and economic value for the ISO Controlled Grid. Southern California Edison Company (SCE) has voluntarily sponsored this project pursuant to the terms of the CAISO's Large Generator Interconnection Procedures (LGIP). The TWRA lies at the southern end of the San Joaquin Valley in the mountainous region between Bakersfield and Mohave and is California's largest wind resource area.
- **Lake Elsinore Advanced Pumped Storage (LEAPS) Project:** This project includes a 500 kV transmission line project (LEAPS Transmission Line) that connects SCE's transmission system with that of SDG&E and is accompanied by a 500 MW pumped storage power plant built next to Lake Elsinore itself (LEAPS Power Plant) and interconnected to the middle of the line. This project is intended to improve the reliability and economics of the ISO Controlled Grid and is sponsored by The Nevada Hydro Company (TNHC) and Elsinore Valley Municipal Water District (EVMWD).

Figure 1 presents the general location of the three proposed transmission projects against the backdrop of the 500 kV network in the same general geographic areas.

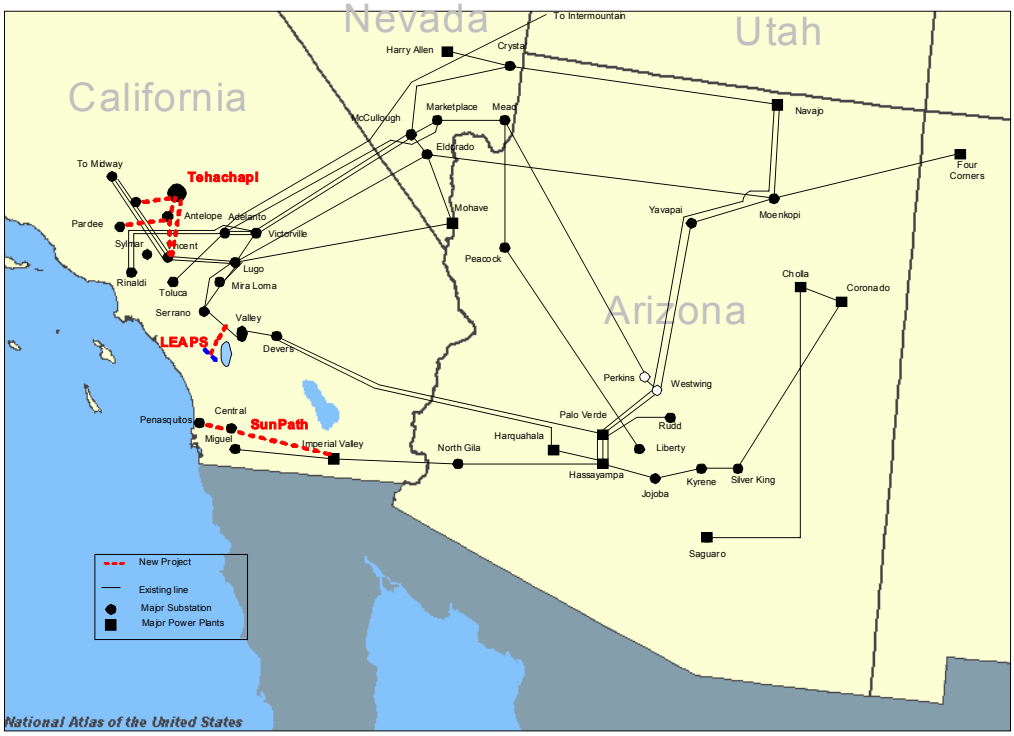
In this report, we focus on findings and recommendations for the Tehachapi Transmission Project. The Sun Path Project, which the CAISO Board of Governors previously approved, has been incorporated into the Base Case used for evaluating the Tehachapi Transmission Project.[1] However, given the novel and unprecedented proposed treatment of the Generating Facility of the LEAPS Project as a transmission asset, the CAISO's final findings and recommendation on the LEAPS Project can only follow the FERC determination on the operational control and related ratemaking aspects of the project.[2]

---

[1] However, the Sun Path Project does not have any direct impact on the results of this evaluation.

2 FERC has directed CAISO to investigate this matter based on a stakeholder process.

**Figure 1: General Location of Three Proposed Transmission Projects in Southern California**




The origin of the Tehachapi Transmission Project is the Tehachapi Collaborative Study Group, coordinated by the California Public Utilities Commission (CPUC), which was formed in 2004 to develop a comprehensive transmission development plan for the phased expansion of transmission capabilities in the TWRA. The TCSG issued two study reports to the CPUC in March 2005 and in April 2006. The outcome of the collaborative study group process was the identification of a number of alternatives for the transmission infrastructure and a recommendation to further study of these alternative schemes by the CAISO. The CAISO studied the Tehachapi Transmission Project as part of its CAISO South Regional Transmission Plan for 2006 (CSRTP-2006) in full collaboration with SCE and other CSRTP-2006 participants[3] and developed a least-cost solution for the network component of the transmission infrastructure that will interconnect planned generation projects in TWRA to the ISO Controlled Grid.

Under its federally approved tariff, the CAISO is responsible for ensuring open and non-discriminatory access to the ISO Controlled Grid for new Generating Facilities. The CAISO satisfies this obligation, in cooperation with the Participating Transmission Owners (PTOs), through its Large Generator Interconnection Procedures (LGIP). Because the primary purpose of the Tehachapi Transmission Project is to provide for the interconnection and delivery of generation in the TWRA, the CAISO has applied its LGIP within the context of its

3 CSRTP-2006 was launched on April 11, 2006. The CSRTP-2006 team included the CAISO, impacted Participating Transmission Owners (Pacific Gas and Electric Company (PG&E), SCE and SDG&E), technical representatives from all Project Sponsors (TNHC, Citizens Energy, IID, Oak Creek Energy System/Tehachapi Holdings), and technical representatives from the California Energy Commission (CEC) and the California Electricity Oversight Board (EOB). This team has provided and will continue to provide the CAISO with necessary technical data and advice needed to conduct its analyses.

CSRTP-2006 process to determine the least-cost transmission solution for integrating 4,350 MW[4] of generating resources in the Tehachapi Area Generation Queue (TGQ). Under the LGIP, once the CAISO has identified the transmission facilities associated with interconnecting generation, the discretion whether to proceed with the associated Network Upgrades as well as pursuing the required siting approvals lies with the Interconnection Customer and the affected PTO. However, given the substantial investment embodied by the Tehachapi Transmission Project, the CAISO has elected to seek approval from the CAISO Board in order to facilitate the subsequent regulatory processes.

Specifically, the CAISO's determinations and findings on the Tehachapi Transmission Project, as presented in this report, are as follows:

1. The Tehachapi Transmission Project is the least-cost solution that reliably interconnects 4,350 MW of generating resources in TGQ;
2. The Tehachapi Transmission Project also addresses the reliability needs of the ISO Controlled Grid due to projected load growth in Antelope Valley area as well as helps to address South of Lugo (SOL) transmission constraints – an ongoing source of reliability concern for the Los Angeles (LA) Basin;[5]
3. The Tehachapi Transmission Project facilitates the ability of California utilities to comply with the state mandated Renewable Portfolio Standard (RPS) by providing access to planned renewable resources in the TWRA – also see points 6 and 7 below;
4. The Tehachapi Transmission Project is expected to provide economic benefits to the CAISO ratepayers mainly by providing access to wind and other efficient generating resources under development in TWRA;
5. The Tehachapi Transmission Project makes it possible to expand the transfer capability of Path 26 in the near future with a low cost upgrade of PG&E's portion of Midway-Vincent Line 3;
6. The Tehachapi Transmission Project will be used by other projects in TGQ queued beyond the start date of the CSRTP-2006 for low-cost interconnection to the ISO Controlled Grid;[6] and
7. Although the detailed planning has not yet been performed, the Tehachapi Transmission Project lays the groundwork for the integration of large amounts of planned geothermal, solar, and wind generation in Inyo and northern San Bernardino counties with potential future 500 kV additions from the WindHub Substation (one of Tehachapi Transmission Project's substations) to the Kramer Substation.

## PROJECT DESCRIPTION

Table 1 presents the entire Tehachapi Transmission Project plan of service.[7] Figure 2 depicts the entire plan of service for the Tehachapi Transmission Project. The Tehachapi

[4] 4,350 MW of generation projects correspond to the capacity of all generation projects in the TGQ up to the start date of the CSRTP-2006 process - 3,570 MW of this total consists of wind generation that will be developed to allow compliance with the California mandated Renewable Portfolio Standard program.

[5] Concerns with the SOL transmission constraints are expected to increase as additional generation resources are sited outside the LA Basin. Delivery of this new generation to LA Basin load will require significant transmission additions as identified in this plan.

[6] Around 1260 MW of such generation was already in the TGQ as of December 1, 2006.

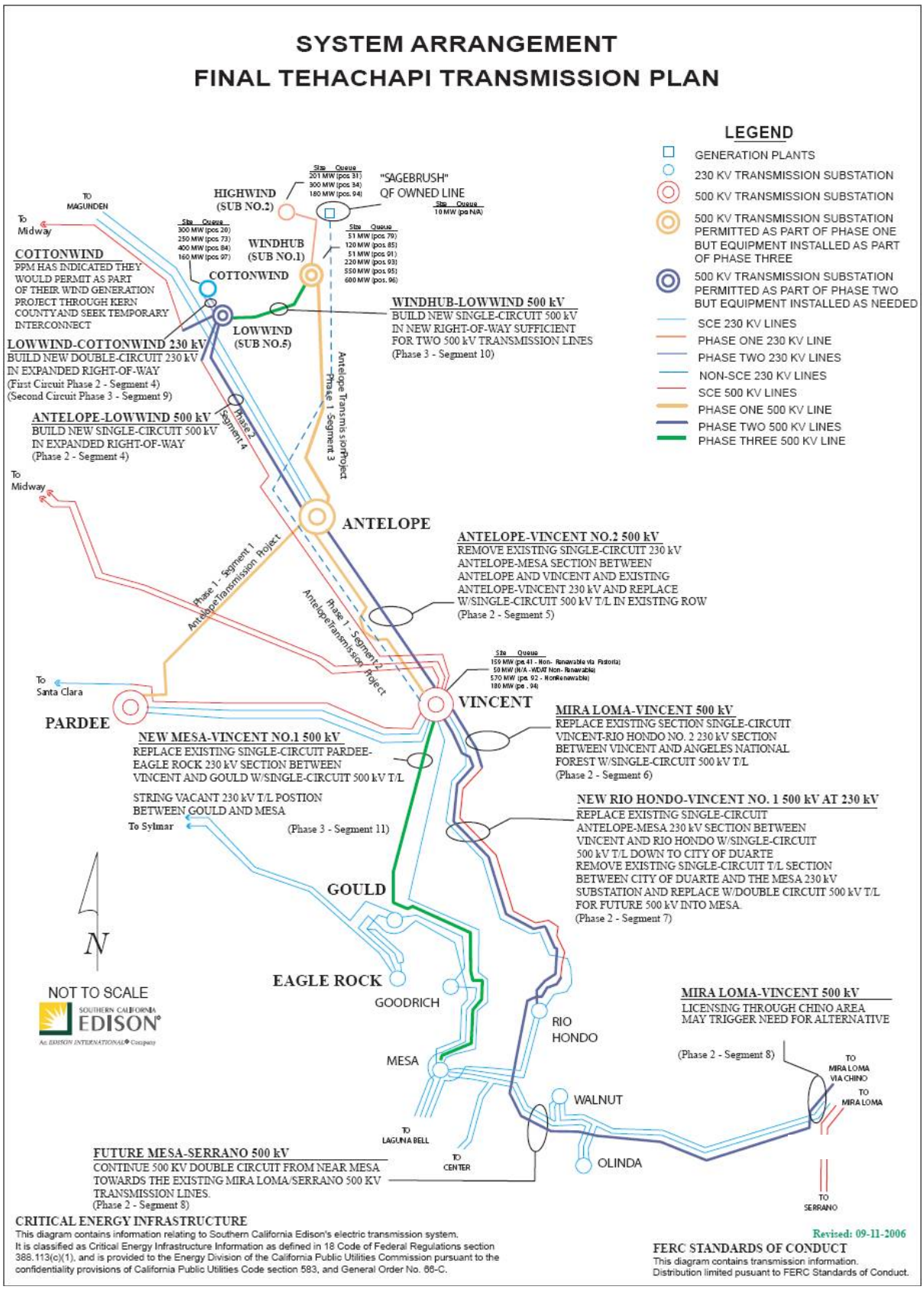
Transmission Project will accommodate all targeted generation projects in the TGQ. However, sufficient flexibility is built into the rollout of the Tehachapi Transmission Project to reasonably respond to changes in the magnitude and the location of generation resources in the area.

**Table 1: Tehachapi Transmission Project Plan of Services**

| Major Transmission Facilities | Planned In-Service Date |
|---|---|
| Antelope – Pardee 230 kV Line (500 kV Specifications) & Antelope Substation Expansion | Dec 2008 |
| Antelope – Vincent 230 kV Line #1 (500 kV Specifications) | Mar 2009 |
| WindHub Substation | Mar 2009 |
| Antelope – WindHub (also known as Substation 1) 230 kV Line ( 500 kV Specifications) | Mar 2009 |
| Antelope – Vincent 230 kV Line #2 (500 kV Specifications) | Mar 2011 |
| LowWind 500/230 kV Substation (also known as Substation 5) with Loop in of Midway – Vincent #3 500 kV line | Aug 2011 |
| Antelope – LowWind 500kV line | Aug 2011 |
| WindHub Substation 500 kV Upgrade | Mar 2011 |
| Antelope Substation 500 kV Upgrade | Mar 2011 |
| Vincent Substation 500 kV & 220 kV Upgrade | Sep 2011 |
| LowWind – WindHub 500 kV line | Oct 2011 |
| Replacement of Vincent – Rio Hondo No. 2 230kV line | Nov 2011 |
| Vincent – Mira Loma 500 kV line | Apr 2012 |
| Vincent – Mesa 500/220 kV Line and Mesa Substation Work | Nov 2013 |

[7] The planned in service dates are based on receiving all permits by January 2007 for the Antelope Transmission Project (segments 1 to 3) and the Tehachapi Renewable Transmission Project (segments 4 to 11) by January 2009.

**Figure 2: Tehachapi Transmission Project**
**(Routes shown on this diagram are for illustration purposes only)**



## PUBLIC PROCESS IN DEVELOPING RECOMMENDATION

Table 2 lists the CAISO's public outreach initiatives for this project. In addition to several outreach programs intended to familiarize the public with the CSRTP-2006 process and studies assumptions that the CAISO held as part of the Sun Path project, the CAISO held two days of open houses on the CSRTP-2006 planning process and the Tehachapi Transmission Project in the Tehachapi area. The CAISO established additional outreach programs to local agencies and local community organizations and provided several presentations about the CSRTP-2006 process and the CAISO's findings at workshops sponsored by the California Public Utilities Commission (CPUC) and the Southwest Transmission Expansion Plan (STEP). As a result of these public outreach programs, the CAISO received several valuable comments and suggestions from stakeholders that triggered modifications of study assumptions and approach and, eventually, the CAISO's findings and conclusions. Table 2 below lists the outreach activities and their results.

**Table 2: Stakeholder and Public Outreach for the CSRTP-2006 Process**

| Outreach Activity | Date |
|---|---|
| Open house in San Diego on CSRTP-2006 process | - May 19-20, 2006 |
| Created tailored distribution lists to reach affected parties, including those wishing not to be on master communications lists. | - May 2006 through present |
| Hosted conference call to discuss assumptions and comments | - June 22, 2006 |
| Collected written stakeholder comments on assumptions. | - Through June 29, 2006 |
| Initiated 1:1 outreach to individuals and interested groups. | - May through present |
| Published and re-posted updated study assumptions | - July 17, 2006 |
| Held joint Tehachapi Transmission Workshop with CPUC | - August 23, 2006 |
| Presented the CSRTP-2006 process and interim findings on all projects, including the Tehachapi Transmission Project, at multiple Southwest Transmission Expansion Plan (STEP) meetings. | - May 5, 2006<br>- July 24, 2006<br>- September 21, 2006<br>- November 17, 2006 (planned) |
| Hosted an Open House in Tehachapi to display CAISO's role in transmission planning and the Tehachapi Transmission Project final plan of service. | - September 25, 2006<br>- September 26, 2006 |
| Presentation at CPUC Workshop on the Tehachapi Transmission | - November 21, 2006 |

## COMPLIANCE WITH THE LGIP REQUIREMENTS

CAISO Management's recommendations on the Tehachapi Transmission Project are primarily based on the CAISO's obligation to identify least-cost transmission solutions to reliably interconnect generation projects in accordance with provisions of the CAISO's LGIP. The CAISO worked with the project sponsor (SCE) and other participants in the CSRTP-2006 process to plan the Tehachapi Transmission Project in a manner that reliably interconnects all generating projects in the TGQ (4,350 MW) as of the commencement date of the CSRTP-2006 process (April of 2006).[8] Accordingly, the CAISO has utilized the efforts of the CSRTP-2006 as a foundation to efficiently comply with its obligations under the LGIP. It has done so by accounting for all LGIP provisions related to "clustered" Interconnection System Impact Studies (SIS) in the CSRTP-2006 study process.

[8] Around 1460 MW of TGQ projects queued beyond April 2006 will be studied individually or in additional clusters according to their Queue Position in accordance with the LGIP.

"Clustering" permits the CAISO to collectively study the system impacts of a group of Interconnection Requests, rather than evaluate each potential Generation Facility one-at-a-time. The principal benefit of studying Interconnection Requests in clusters is that it allows the CAISO to better coordinate Interconnection Requests with its overall transmission planning process, and, as a result, achieves greater efficiency in the design of needed Network Upgrades.[9] Indeed, the reasoning that resulted in adoption of a Clustering study process option in the LGIP is strongly applicable to the situation faced by the CAISO with respect to the TWRA involving the interconnection of multiple projects in a proximate geographic location such that incremental study and transmission expansion would be inefficient in the design of the necessary Network Upgrades. By pursuing an integrated solution, the Clustering approach will result in substantial capital cost savings for Network Upgrades when compared to the probable outcome of any piecemeal solution associated with the traditional, sequential SIS approach.

However, the CAISO has deviated in several respects from a typical clustered Interconnection Study. First, unlike the product of a typical Interconnection Study, this report identifies only the network components or Network Upgrades of the transmission infrastructure necessary to interconnect the planned generation projects in TWRA to the ISO Controlled Grid.[10] It excludes Interconnection Facilities, including radial wind collector transmission systems that interconnect the individual generation projects to the grid and are the responsibility of generation developers. Needed Interconnection Facilities, and their cost responsibilities, will be identified through a separate, more narrow Interconnection Study for each particular Generating Facility in the TGQ.[11] Second, an element of Clustering is the selection of a time window for determining which generation projects in the queue will be included in the clustered SIS, i.e., the "Queue Cluster Window." For the Tehachapi Transmission Project the Queue Cluster Window was defined to encompass the first project in the TGQ up through the start date of the CSRTP-2006 process or from August 19, 2003 through April 11, 2006.[12] The

[9] Order No. 2003-A, *Standardization of Generator Interconnection Agreements and Procedures*, 106 FERC ¶ 61,220 (2004) at P 120.

[10] Network Upgrades are defined in the ISO Tariff as "[t]he additions, modifications, and upgrades to the ISO Controlled Grid required at or beyond the Point of Interconnection to accommodate the interconnection of the Large Generating Facility to the ISO Controlled Grid. Network Upgrades shall consist of Delivery Network Upgrades and Reliability Network Upgrades." (ISO Tariff, Appendix A, at 515.) Delivery Network Upgrades are "[t]ransmission facilities at or beyond the Point of Interconnection, other than Reliability Network Upgrades, identified in the Interconnection Studies to relieve constraints on the ISO Controlled Grid." (*Id.* at 489.) Reliability Network Upgrades are "[t]he transmission facilities at or beyond the Point of Interconnection necessary to interconnect a Large Generating Facility safely and reliably to the ISO Controlled Grid, which would not have been necessary but for the interconnection of the Large Generating Facility, including Network Upgrades necessary to remedy short circuit or stability problems resulting from the interconnection… [or] to mitigate any adverse impact that Large Generating Facility's interconnection may have on a path's WECC rating." Interconnection Facilities, on the other hand, are "all facilities and equipment between the Generating Facility and the Point of Interconnection, including any modification, additions, or upgrades that are necessary to physically and electrically interconnect the Generating Facility to the ISO Controlled Grid."

[11] As shown in Figure 2, the broader Tehachapi Transmission Project includes the 230 kV Highwind and Cottonwind substations as well as the radial transmission lines to these two substations. The costs for these facilities are not intended to be covered as part of this project.

12. It should be noted that the duration of the Queue Cluster Window is generally intended to extend for only 180 days. This 180-day limit was adopted by FERC, in large part, to protect Interconnection Customers from undue delay in processing their study requests by transmission owners. This risk is not present in the context where the CAISO conducts the study. Nevertheless, in an abundance of

Tehachapi Transmission Project will also provide low cost integration into the ISO Controlled Grid for additional TGQ projects queued beyond April 11, 2006 (around 1,260 MW).

Finally, due to the specific circumstances presented by this project, CAISO will file a petition with FERC for approval to proceed with the proposed study approach on a one-time basis.

## ECONOMIC, RELIABILITY AND ENVIRONMENTAL BENEFITS

In addition to interconnecting the TGQ generation projects, the Tehachapi Transmission Project offers System Reliability and efficiency (economy) benefits and facilitates compliance with the California's mandated RPS requirements. The CAISO is not relying on such reliability or economic benefits or RPS compliance to justify approval of the Tehachapi Transmission Project. Therefore, while significant, the CAISO does not attempt to quantify these or the following benefits of the Tehachapi Transmission Project for purposes of this study:

- Provision for the future low cost expansion capability for Path 26;
- Provision for the future expansion of transmission capability to integrate planned renewable resources in Inyo and northern San Bernardino counties area;
- Reduction in nitrogen oxides (NOx) and sulfur oxides (SOx) and other pollutant emissions from displaced fossil fuel generation;
- Potential reduction in natural gas prices stemming from lower fuel consumption by the natural gas generators that are displaced by the wind generation in TWRA - the benefits here would be both due to lower generation cost as well as other societal benefits stemming from lower natural gas costs;
- Augmentation of competitive wholesale Energy markets for California; and
- Further diversification of Energy resources.

## PROJECT COST

The total cost of the Tehachapi Transmission Project is $1.8 billion dollars in nominal terms. This cost includes the cost of the Antelope-Pardee line segment ($90 million) previously approved by the CAISO Board, but excludes the cost of Interconnection Facilities, i.e., radial wind collector transmission systems that interconnect the individual generation projects to the grid and are the responsibility of generation developers. The full cost and ownership of the facilities associated with this project will be assigned to SCE. SCE will recover such costs, including the commensurate rate-of-return, directly through the CAISO transmission Access Charge (TAC).

## RECOMMENDATION

Pursuant to CAISO's obligation to plan for least-cost transmission solutions to interconnect generation projects, as delineated in the LGIP, the CAISO Management recommends that CAISO Board approve the project and direct SCE, as the Project Sponsor, to proceed with the necessary permitting and construction of the project.

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caution, the CAISO will file with FERC a petition requesting an explicit one-time waiver of the 180-day Queue Cluster Window to ensure expansion of the transmission grid in the TWRA can be accomplished in the most efficient manner reasonably achievable.

Furthermore, given the CAISO's pending petition before FERC for a one-time waiver of the 180-day Queue Cluster Window, Management recognizes that the Board's approval may be affected by the outcome of the CAISO's pending petition before FERC. Hence, CAISO Management recommends that the Board consider the "substance" of the report and approve the Tehachapi Transmission Project contingent upon FERC consent to the CAISO's implementation its Clustering authority in the present circumstances.

# List of Acronyms

| Acronyms | Definition |
|---|---|
| AFUDC | Allowance for Funds Used During Construction |
| CAISO | California Independent System Operator Corporation |
| CCCT | Combined Cycle Combustion Turbine |
| CEC | California Energy Commission |
| CPCN | Certificate of Public Convenience and Necessity |
| CPUC | California Public Utilities Commission |
| CSRTP | California Southern Region Transmission Plan |
| DT | Diesel Turbine |
| EPAct 2005 | Energy Policy Act of 2005 |
| FERC | Federal Energy Regulatory Commission |
| FOD | Forced Outage Duration |
| FOR | Forced Outage Rate |
| IID | Imperial Irrigation District |
| IOU | Investor Owned Utility |
| LARS | Local Area Reliability Service |
| LCR | Local Capacity Requirement |
| LEAPS | Lake Elsinore Advanced Pumped Storage |
| LGIP | Large Generator Interconnection Procedures |
| LSE | Load Serving Entity |
| MRTU | Market Redesign & Technology Upgrade |
| NERC | North American Electric Reliability Council |
| NREL | National Renewable Energy Laboratory |
| NWPP | Northwest Power Pool |
| PAR | Phase Angle Regulator |
| PG&E | Pacific Gas and Electric Company |
| PTO | Participating Transmission Owner |
| PV | Present Value |
| PVD2 | Palo Verde-Devers Line No. 2 |
| QF | Qualifying Facility |
| RAS | Remedial Action Scheme |
| RMR | Reliability Must-Run |
| RPS | Renewables Portfolio Standard |
| RSI | Residual Supply Index |
| RTO | Regional Transmission Organization |
| SCCT | Simple Cycle Combustion Turbine |
| SCE | Southern California Edison Company |
| SDG&E | San Diego Gas & Electric Company |
| SPS | Special Protection System |
| SSG-WI | Seams Steering Group - Western Interconnection |
| STEP | Southwest Transmission Expansion Plan |
| TCSG | Tehachapi Collaborative Study Group |
| TEAM | Transmission Economic Assessment Methodology |
| TAC | Transmission Access Charge |
| TGQ | Tehachapi Generation Queue |
| TNHC | The Nevada Hydro Company |
| TPT | Technical Project Team |
| TWRA | Tehachapi Wind Resource Area |
| UPFC | Unified Power Flow Controller |
| WECC | Western Electricity Coordinating Council |

# CAISO South Regional Transmission Plan for 2006 (CSRTP-2006) Report
# Part II: The Tehachapi Transmission Project

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# CAISO South Regional Transmission Plan for 2006 (CSRTP-2006) Report
# Part II: The Tehachapi Transmission Project

## 1 Introduction

### 1.1 Overall Objectives

The CAISO is responsible for coordinating, reviewing and approving the transmission expansion for its service area. In April 2006, the CAISO initiated its South Regional Transmission Planning process for 2006 (CSRTP-2006) to assess on a regional basis three major transmission expansion projects located in southern California. These projects are:

- Sun Path Project: Combination of the San Diego Gas and Electric (SDG&E) Sunrise Powerlink Project and Citizens Energy (Citizens) and Imperial Irrigation District (IID) Green Path Project;
- Tehachapi Transmission Project: Tehachapi Wind Resource Area (TWRA) transmission infrastructure project, and
- LEAPS Project covering the Lake Elsinore Advanced Pumped Storage (LEAPS) plant and the associated transmission line.

This report is the second of three coordinated reports that will comprise the CSRTP-2006 and provides results and recommendations for the Tehachapi Transmission Project. The first report provided the findings and recommendations for the Sun Path Project.[13]The third pending report will cover LEAPS.[14]

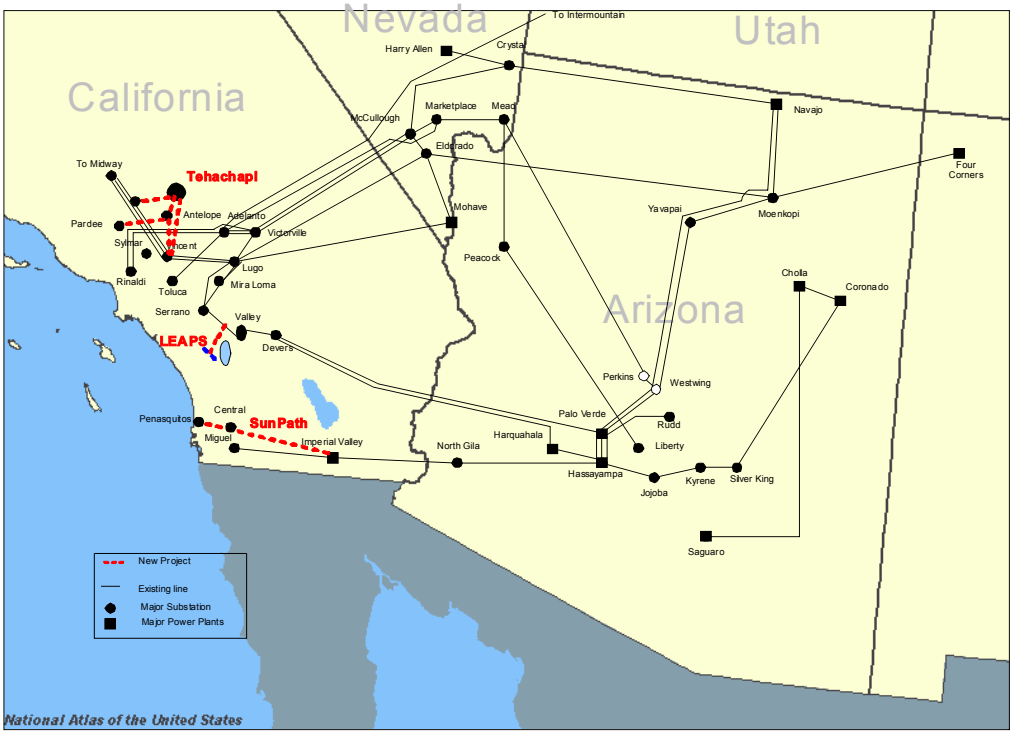
The CAISO's CSRTP-2006 assessment team included technical representatives from the three sponsoring and/or impacted Participating Transmission Owners (PTOs) (Pacific Gas and Electric Company (PG&E), Southern California Edison Company (SCE) and SDG&E), other project sponsors (The Nevada Hydro Company, Citizens, IID, Oak Creek Energy System/Tehachapi Holdings), the California Energy Commission (CEC), and the California Electricity Oversight Board (EOB). The CSRTP-2006 process was not intended as a stakeholder process, but rather was intended to provide technical focus and "real-time" technical advice for the analyses needed to study these projects.

Figure 1.1 presents the general location of the three proposed transmission projects against the backdrop of the 500kV network in the same general geographic areas.

[13] Additional information and details of the Sun Path Project may be found at http://www.caiso.com/1841/1841b1925a320.pdf.

[14] The CAISO has taken a phased approach for the CSRTP-2006 process to enhance study efficiency and flexibility, including the timing of study review and approval. The CAISO completed the assessment of the Sun Path Project in the first phase and received CAISO Board of Governors approval for that project on August 3, 2006. Evaluation of the LEAPS and the Tehachapi Transmission Projects continued following the Sun Path approval. The CAISO is currently awaiting guidance from FERC on the operational and rate treatment aspects of LEAPS' power plant. A separate report for the LEAPS Project (Part 3 and the final CSRTP-2006 report) will be prepared at that time.

**Figure 1.1: Locations of the Projects Studied under CSRTP 2006**




For additional details on the CSRTP-2006 process, please refer to Part I of the CSRTP-2006 report.

## 1.2 Public Participation in the CSRTP-2006 Process Focusing on the Tehachapi Transmission Project

While CSRTP-2006 participation was mainly limited to technical representation from the project sponsors, the impacted PTOs, the CEC, and the EOB for practical considerations, the CAISO launched several initiatives to share information with and receive input from the public. The CAISO's public outreach initiatives are listed in detail in Table 1.1 below.

In addition to several outreach programs held as part of the Sun Path project review intended to familiarize the public with the CSRTP-2006 process and general study assumptions, the CAISO held two days of "open house" on the CSRTP-2006 planning process and the Tehachapi Transmission Project in TWRA. The CAISO established additional outreach programs for local agencies and local community organizations and made several presentations regarding the CSRTP-2006 process and preliminary findings at workshops sponsored by the California Public Utilities Commission (CPUC) and the Southwest Transmission Expansion Plan (STEP). As a result of these public outreach programs, the CAISO received valuable comments and suggestions from stakeholders that resulted in modifications to study assumptions and methodology and, eventually, to the CAISO's findings and conclusions. Finally, this report will be posted on the CAISO website prior to the January 2007 Board of Governors meeting to facilitate public comment at that meeting.

Table 1.1 below lists the outreach activities and their results.

**Table 1.1: Stakeholder and Public Outreach for the CSRTP-2006 Process**

| Outreach Activity | Date |
|---|---|
| Open house in San Diego on CSRTP-2006 process | - May 19 – 20, 2006 |
| Created tailored distribution lists to reach affected parties, including those wishing not to be on master communications lists. | - May 2006 through present |
| Hosted conference call to discuss assumptions and comments | - June 22, 2006 |
| Collected written stakeholder comments on assumptions. | - Through June 29, 2006 |
| Initiated 1:1 outreach to individuals and interested groups. | - May through present |
| Published and re-posted updated study assumptions | - July 17, 2006 |
| Held joint Tehachapi Transmission Workshop with CPUC | - August 23, 2006 |
| Presented the CSRTP-2006 process and interim findings on all projects, including the Tehachapi Transmission Project, at multiple Southwest Transmission Expansion Plan (STEP) meetings. | - May 5, 2006<br>- July 24, 2006<br>- September 21, 2006<br>- November 17, 2006 |
| Hosted an Open House in Tehachapi to display ISO's role in transmission planning and the Tehachapi Transmission Project final plan of service. | - September 25, 2006<br>- September 26, 2006 |
| Presentation at CPUC Workshop on the Tehachapi Transmission | - November 21, 2006 |

## 1.3 Overview of the Findings

The CAISO's determinations and findings on the Tehachapi Transmission Project as presented in this report are as follows:

i. The Tehachapi Transmission Project is the least-cost solution that reliably interconnects 4,350 MW of generating resources in TGQ;

ii. The Tehachapi Transmission Project also addresses the reliability needs of the CAISO Controlled Grid due to projected load growth in Antelope Valley area as well as helps to address South of Lugo (SOL) transmission constraints – an ongoing source of reliability concern for the Los Angeles (LA) Basin;[15]

iii. The Tehachapi Transmission Project facilitates the ability of California utilities to comply with the state mandated Renewable Portfolio Standard (RPS) by providing access to planned renewable resources in the TWRA – also see points 6 and 7 below;

iv. The Tehachapi Transmission Project is expected to provide economic benefits to the CAISO ratepayers mainly by providing access to wind and other efficient generating resources under development in TWRA;

v. The Tehachapi Transmission Project makes it possible to expand the transfer capability of Path 26 in the near future with a low cost upgrade of the PG&E's portion of Midway-Vincent Line 3;

[15] Concerns with the SOL transmission constraints are expected to increase as additional generation resources are sited outside the LA Basin. Delivery of this new generation to LA Basin load will require significant transmission additions as identified in this plan.

vi. The Tehachapi Transmission Project will be used by other projects in TGQ queued beyond the start date of the CSRTP-2006 for low-cost interconnection to the CAISO transmission grid;[16] and

vii. Although the detailed planning is not yet performed, the Tehachapi Transmission Project lays the groundwork for the integration of large amounts of planned geothermal, solar, and wind generation in Inyo and northern San Bernardino counties with potential future 500 kV additions from the WindHub Substation (one of Tehachapi Transmission Project's substations) to the Kramer Substation.

## 1.4 Project Cost

Based on estimates provided by SCE, the total cost of the Tehachapi Transmission Project is $1.8 billion dollars in nominal terms. This cost includes the cost of the Antelope-Pardee line segment ($90 million) previously approved by the CAISO Board of Governors, but excludes the cost of Interconnection Facilities, i.e., radial wind collector transmission systems that interconnect the individual generation projects to the grid and are the responsibility of generation developers.

The Tehachapi Transmission Project cost estimate has been developed by SCE based on planning level cost studies that include a typical twenty five percent (25%) contingency uplift to cover potential future cost increases. These planning level cost figures can still vary by as much as +/- 40% from those calculated through full scale engineering studies.

As noted above, there will also be Interconnection Facilities or generation collector systems (substations and lines) outside the scope of the Tehachapi Transmission Project presented here that will radially interconnect generators in the Tehachapi Area Generation Queue (TGQ) to the Tehachapi Transmission Project infrastructure. Such Interconnection Facilities as well as their costs and cost responsibilities are directly assigned to generation developers and will be determined based on individual System Impact Studies (SISs) for each TGQ project.[17]

## 1.5 Project Description and Schedule

Figure 1.2 depicts the major components of the Tehachapi Transmission Project at full build-out in 2013. Table 1.2 sets forth the schedule for the rollout of the major components of the Tehachapi Transmission Project. Due the expansive nature of the Tehachapi Transmission Project, the components of this infrastructure will be developed and put into service over a five-year period starting from 2008. The addition of each component allows added access to TGQ generation as well as ensures compliance with reliability standards given projected load growth in the area. This schedule is intended to be flexible and subject to change in response to actual wind generation development in the TWRA.

[16] Around 1260 MW of such generation is already in TGQ as of December 1, 2006.
[17] Special rate treatment for such radial collectors systems may be provided from both the CAISO and the CPUC consistent with their respective regulatory authority.

**Figure 1.2: Tehachapi Transmission Project Configuration in 2013 and Beyond**

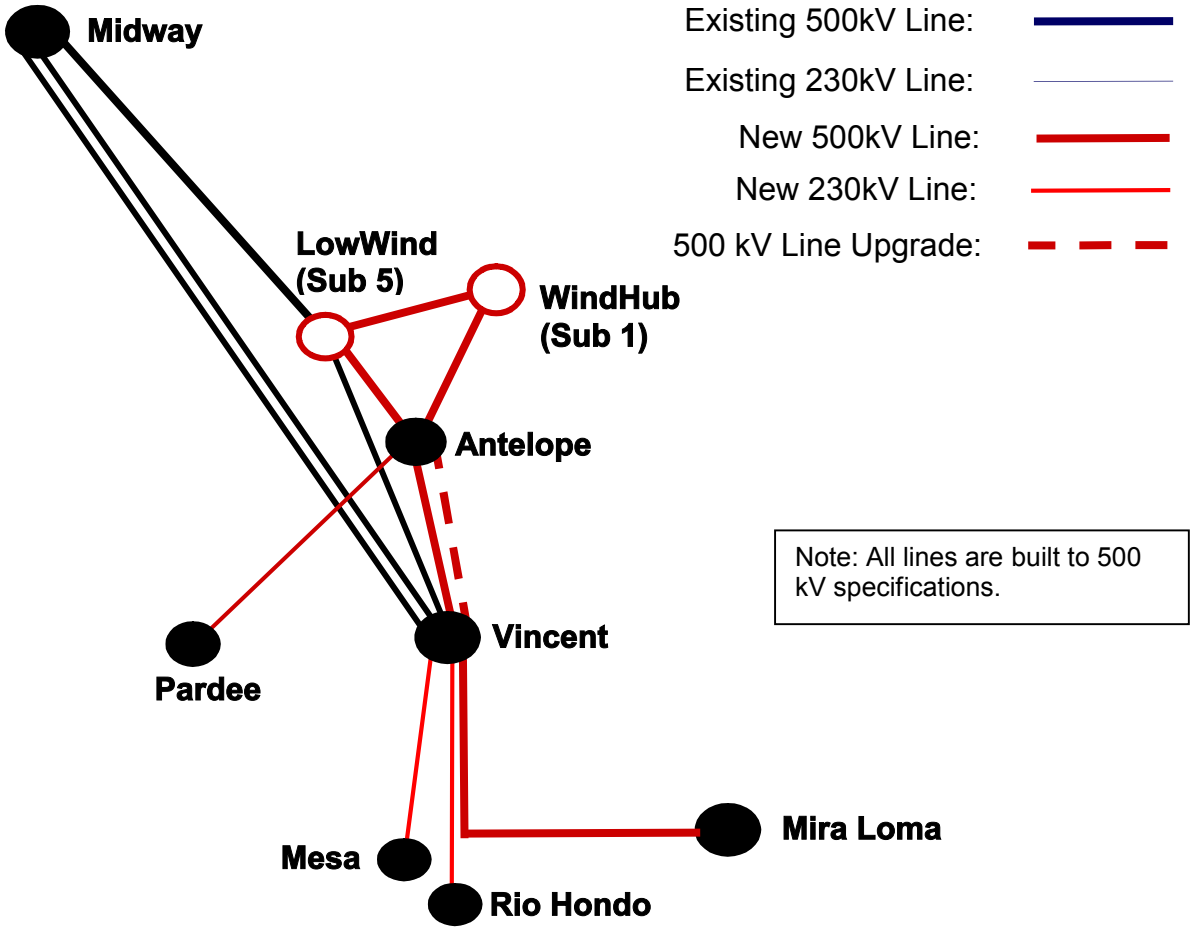



**Table 1.2: Tehachapi Transmission Project Schedule**

| Major Transmission Facilities | Planned In-Service Date |
|---|---|
| Antelope – Pardee 230 kV Line (500 kV Specifications) & Antelope Substation Expansion* | Dec 2008 |
| Antelope – Vincent 230 kV Line #1 (500 kV Specifications) | Mar 2009 |
| WindHub Substation | Mar 2009 |
| Antelope – WindHub (also known as Substation 1) 230 kV Line (500 kV Specifications) | Mar 2009 |
| Antelope – Vincent 230 kV Line #2 (500 kV Specifications) | Mar 2011 |
| LowWind 500/230 kV Substation (also known as Substation 5) with Loop in of Midway – Vincent #3 500 kV line | Aug 2011 |
| Antelope – LowWind 500kV line | Aug 2011 |
| WindHub Substation 500 kV Upgrade | Mar 2011 |

| | |
|---|---|
| Antelope Substation 500 kV Upgrade | Mar 2011 |
| Vincent Substation 500 kV & 220 kV Upgrades | Sep 2011 |
| LowWind – WindHub 500 kV line | Oct 2011 |
| Replacement of Vincent – Rio Hondo No. 2 230kV line | Nov 2011 |
| Vincent – Mira Loma 500 kV line | Apr 2012 |
| Vincent – Mesa 500/220 kV Line and Mesa Substation Work | Nov 2013 |

* This line segment was approved by the CAISO Board on July 29, 2004.

# 2 Description of the Tehachapi Transmission Project

The TWRA lies at the southern end of the San Joaquin Valley in the mountainous region between Bakersfield and Mohave. The TWRA is California's largest wind resource area. The primary goal of the Tehachapi Transmission Project is to provide transmission infrastructure to allow the wind generation potential in Tehachapi, estimated at a minimum of 4,500 MW, to reach California consumers.[18]

The Tehachapi Collaborative Study Group (TCSG) was formed to develop a comprehensive transmission development plan for the phased expansion of transmission capabilities in the TWRA. The CPUC Staff coordinated the TCSG. The TCSG issued the first study report to the CPUC in March 2005. The TCSG report identified a number of alternatives for the transmission infrastructure and recommended further study in order to select the best expansion plan. This second TCSG report, issued on April 2006, narrows and refines the alternatives submitted in the first report. In addition, the second TCSG report makes further recommendations to facilitate completion of the planning process and detailed technical studies.

## 2.1 Tehachapi Study Reliability Concerns

### Path 26

Path 26 is the major interface between northern and southern California (specifically the PG&E and SCE systems) and is also a measure of the power flow between northern and southern California. Path 26 is comprised of three 500 kV lines between PG&E's Midway Substation and SCE's Vincent Substation. TWRA lies geographically and electrically between these two points. Path 26 has interface limits for both North to South (N-S) and South to North (S-N) flow. The Path 26 N-S flow rating is 4000 MW, which is limited by the double line outage of Midway-Vincent #1 and #2 500 kV lines. Path 26 N-S is supported with a Special Protection Scheme (SPS) that protects for this contingency and when armed, trips 1400 MW of local generation at Midway and 500 MW of load on the SCE system. The Path 26 S-N limit is 3000 MW.

One objective of interconnection studies is to identify Network Upgrades that prevent an adverse impact of any proposed interconnection on a path's WECC rating. Thus, the Tehachapi studies were evaluated based on maintaining the existing Path 26 limits.

### Antelope Valley Area Load

The Antelope Valley area has seen continued growth and is forecast to grow at about 5% per year. The 2006 summer peak load was about 700 MW and is projected to increase to 1100 MW by 2016. SCE has identified reliability concerns in meeting the Antelope area load from the sub-transmission system by 2008 and on the bulk transmission system by year 2011. Today, existing operating procedures are used to mitigate problems on the 230 kV system that occur during heavy load conditions under both normal and contingency conditions.

[18] Second Report of the Tehachapi Collaborative Study Group: Development Plan for the Phased Expansion of Electric Power Transmission Facilities in the Tehachapi Wind Resource Area, ftp://ftp.cpuc.ca.gov/tehachapi.

### South of Lugo Transmission Constraint

Similar to the Antelope Valley area, load in eastern Los Angeles and San Bernardino Counties served by SCE substations of Mesa, Rio Hondo, Laguna Bell, Walnut, Chino, Mira Loma, Vista, etc., has also experienced rapid growth in recent years that is expected to continue in the future. This area South of Vincent is currently served via 230 kV transmission from Pardee and Vincent, and three 500 kV lines South of Lugo. A new Rancho Vista 500/230 kV substation was approved by the CAISO Board of Governors on January 27, 2005, to help supply the local area and will be served via one of the existing 500 kV lines from Lugo and Mira Loma substations. The local 230 kV transmission system in the area will become heavily stressed during conditions with heavy Path 26 N-S flows, high Ventura generation west of Pardee, high generation from North of Lugo and high deliveries from El Dorado, and with low generation south of the Mesa area. Current limit on the South of Lugo path is 6,100 MW, and is expected to be 6,400 MW with the completion of Rancho Vista 500/230kV Substation in 2009. However, under the CAISO's Local Capacity Requirements (LCR) study, South of Lugo flow is projected to be the limitation under a double-line contingency[19] beyond 2011. The transmission upgrades, identified in the plan of service, are expected to mitigate these South of Lugo reliability problems.

## 2.2 Tehachapi Transmission Project Plan of Service

A list of the facilities constituting the Tehachapi Transmission Project plan of service is presented in the following. Table 2.1 presents the planned in-service date and the overall cost of these components. The timing of complete build-out of the facilities will be eventually influenced by the actual generation development in the area. However, the cost impact of the schedule change is expected to be very small.

**New or Upgraded Substations:**

- Three new substations used as collector stations for the wind farms in the TWRA: WindHub, LowWind and HighWind Substations. The first two of the three new substations are part of the network component of the overall plan of service. The cost of the third substation is the responsibility of the wind developers and not included in the Tehachapi Transmission Project plan.
    - WindHub 500/230/66 kV will include up to four 500/230 kV transformer banks, four breaker-and-half 500 kV bus positions, six initial breaker-and-half 230 kV bus positions, static voltage support devices, and dynamic voltage support if necessary. Additional equipment will be added as wind generation develops in the region.
    - LowWind 500/230 kV will include up to two 500/230 kV transformer banks, four breaker-and-half 500 kV bus positions, three initial breaker-and-half 230 kV bus positions, static voltage support devices, and dynamic voltage support if necessary. Also includes loop in of Midway-Vincent #3 line to connect substation to grid. Additional equipment will be added as wind generation develops in the region.

[19] Double-line contingency of Palo Verde – Devers 500kV # 1 & 2 lines

- Upgrades to existing substations:
    - The Pardee 230/66 kV substation will be upgraded by outfitting existing 230 kV line position.
    - The existing Mira Loma 500/230/66 kV substation will be upgraded by outfitting existing 500 kV line position.
    - The existing 230/66 kV Antelope Substation will be expanded to include a new 500 kV switchyard, additional 230 kV line positions and static and dynamic voltage support.
    - The existing 500/230 kV Vincent Substation will be expanded to include additional 500 kV and 230 kV line positions, additional static and dynamic voltage support and additional 500/230 kV bank capacity.
    - The Mesa 230/66 kV substation will be upgraded by outfitting existing 230 kV line position.
    - The Gould 230/66 kV substation will be upgraded by outfitting existing 230 kV line position.

**New or Upgraded Transmission Lines:**

- New 25.6-mile 500 kV transmission line between Antelope and Pardee substations initially operated at 230 kV. This line is also known as Phase 1-Segment 1 of the original Antelope Transmission Project. Construction to 500 kV specifications with initial operation at 230 kV is required to maximize the capability of limited transmission corridors and minimize environmental impacts associated with multiple 230 kV lines and/or multiple tear-down and rebuild activities. Actual operation of 500 kV will be determined by the amount of generation build out in the system and changes to system conditions.[20]
- New 25.6-mile 500 kV transmission line between WindHub and Antelope substations. This line is also known as Phase 1-Segment 3 of the original Antelope Transmission Project and will initially operate at 230 kV.
- Two new 500 kV transmission lines between Antelope and Vincent substations.
    - The initial 500 kV transmission line will be approximately 21.0 miles built on new right-of-way mostly adjacent to the existing right-of-way. This line is also known as the Phase 1-Segment 2 of the original Antelope Transmission Project and will initially operate at 230 kV. This new transmission line is primarily required to meet the reliability needs of the CAISO controlled grid due to projected load growth in Antelope Valley.
    - The second 500 kV transmission line will be approximately 18.0 miles built on existing right-of-way replacing the existing Antelope-Vincent and Antelope-Mesa 230 kV transmission lines. This transmission line will also be initially operated at 230 kV.
- New 75-mile 500 kV transmission line between Vincent and Mira Loma substations. This transmission line is required to eliminate the South of Lugo transmission constraints, which have been a source of ongoing reliability concern for the LA Basin, especially in light of

[20] The CAISO Board of Governors approved the line on July 29, 2004; however, the CAISO included it as part of the proposed comprehensive solution for the Tehachapi and surrounding areas as presented in this report.

projected load growth in Mira Loma area, and is planned to go into service by 2012 timeframe. This line will utilize the existing Vincent-Rio Hondo No.2 230 kV transmission line (portion already built to 500 kV standards), portion of the existing Antelope-Mesa 230 kV South of Vincent, portions of existing idle 230 kV transmission line segments, and portions of new construction between the Mesa area and Mira Loma area. Between Vincent and the northern boundary of the City of Duarte (adjacent to Angeles National Forest), the transmission line will be constructed as single-circuit 500 kV specifications. From this point to the Mira Loma area, the transmission line will be constructed as double-circuit 500 kV specifications to maximize the capability of limited corridors and to minimize environmental impacts associated with multiple 230 kV lines and/or multiple tear-down and rebuild activities.

- New 32.5-mile 500/230 kV transmission line between Vincent and Rio Hondo is required to replace the existing Vincent-Rio Hondo No.2 230 kV transmission line that was utilized for the new Vincent-Mira Loma 500 kV transmission line. This line will utilize portion of existing Antelope-Mesa 230 kV transmission line and will be built to 500 kV specifications to maximize capability of limited transmission corridors avoid waste and numerous minimize environmental impacts associated with multiple 230 kV transmission lines and/or multiple tear-down and rebuild activities. As discussed above, such construction standard will allow for a future low cost upgrade to 500 kV operation.
- New 14-mile 500 kV transmission line between proposed LowWind and upgraded Antelope substations.
- New 42-mile 500/230 kV transmission line between Vincent and Mesa substations. Between Vincent and the Gould substation areas, this line will be built to 500 kV specifications to maximize capability of limited transmission corridors and minimize environmental impacts associated with multiple 230 kV transmission lines and/or multiple tear-down and rebuild activities and to allow for future low cost upgrade to 500 kV operation.

**Table 2.1: Tehachapi Transmission Project Plan of Service**

| Segment | Major Transmission Facilities | Planned In-Service Date |
|---|---|---|
| 1 | New Antelope – Pardee 230 kV Line (500 kV Specifications)[1] & Antelope Substation Expansion | Dec 2008 |
| 2 & 3 | New Antelope – Vincent 230 kV Line #1 (500 kV Specifications) | Mar 2009 |
| | WindHub Substation | Mar 2009 |
| | New Antelope – WindHub (also known as Substation 1) 230 kV Line (500 kV Specifications) | |
| 5 | New Antelope – Vincent 230 kV Line #2 (500 kV Specifications) | Mar 2011 |
| 4 | New LowWind 500/230 kV Substation (also known as Substation 5) with Loop in of Midway – Vincent #3 500 kV line | Aug 2011 |
| | Antelope – LowWind 500kV line | Aug 2011 |

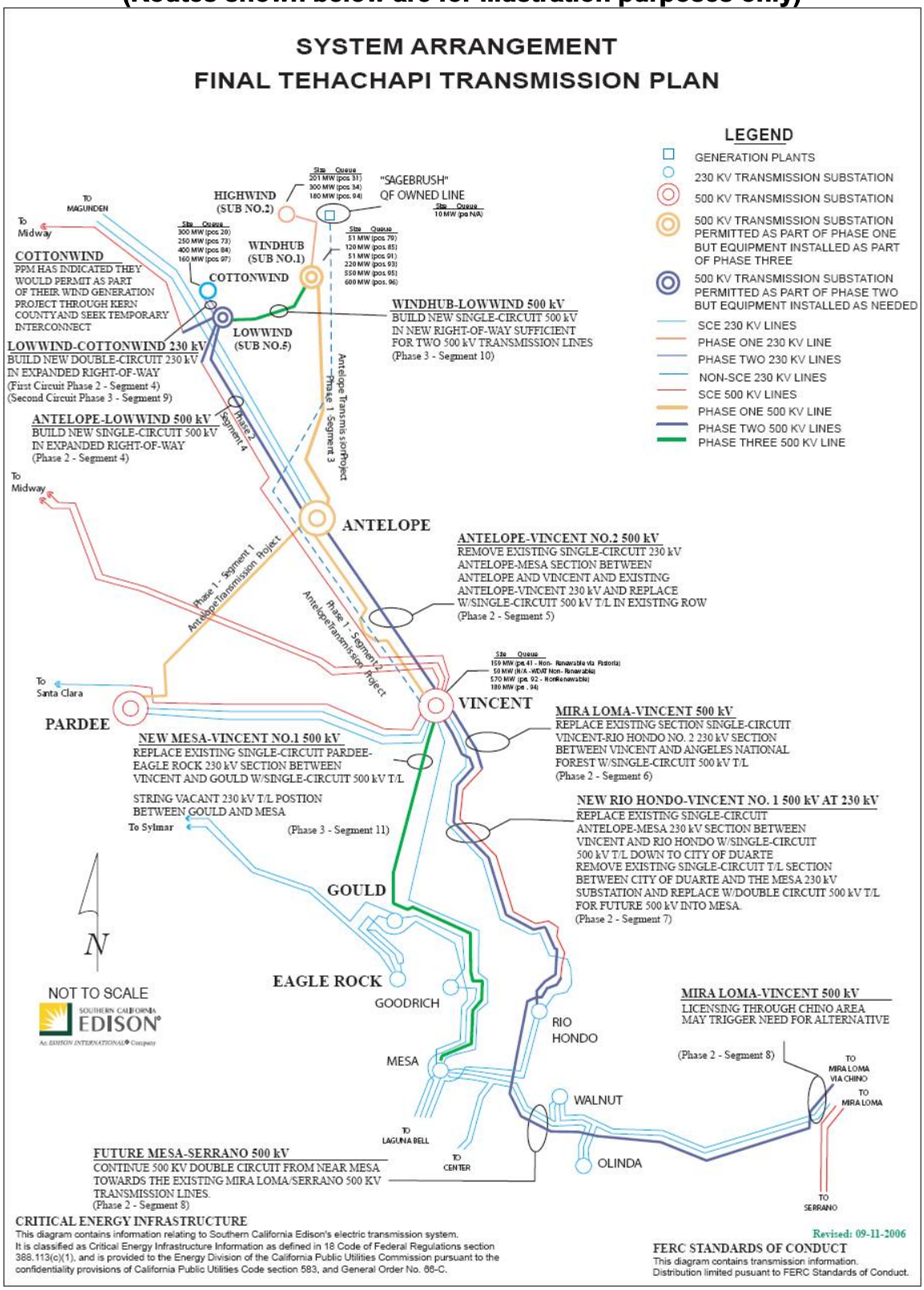
| Segment | Major Transmission Facilities | Planned In-Service Date |
|---|---|---|
| 9 | WindHub Substation 500 kV Operation | Mar 2011 |
| | Antelope Substation 500 kV Operation | Mar 2011 |
| | Vincent Substation 500 kV & 220 kV Upgrades | Sep 2011 |
| 10 | New LowWind – WindHub 500 kV line | Oct 2011 |
| 6 | Replacement of Vincent – Rio Hondo No. 2 230kV line | Nov 2011 |
| 7 & 8 | New Vincent – Mira Loma 500 kV line | Apr 2012 |
| 11 | New Vincent – Mesa 500/220 kV Line and Mesa Substation Work | Nov 2013 |
| **Total Cost Estimate for the Tehachapi Transmission Project (Nominal dollars)** | | $1,800M |

It must be noted that the project schedule and cost figures presented here are all planning level estimates developed based on best available information of SCE on the constructability of the facilities and the actual cost of procurement of necessary material and construction of the facilities in the years that the actual construction takes place. Some of the costs are based on detailed engineering analysis (around +/-10% accurate) and others are based on planning studies (around +/- 40% accurate).[21] The CAISO estimates that the total cost is also accurate within 40%. The CAISO realizes that the actual schedule and cost may vary once detailed engineering analysis of the entire Tehachapi Transmission Project plan of service is complete – expected by mid-2007.

Figure 2.1 presents the overall Tehachapi Transmission Project plan of service upon completion.

[21] All cost figures include a 25% contingency markup.

**Figure 2.1: Tehachapi Transmission Project Plan of Service**
**(Routes shown below are for illustration purposes only)**



# 3 System Impact Study

The CAISO worked with the project sponsor (SCE) and other participants in the CSRTP-2006 process to plan the Tehachapi Transmission Project in a manner that reliably interconnects and allows delivery of all generating projects (4,350 MW) in the TGQ up to the date the CSRTP-2006 process was launched (April of 2006). Table 3.1 provides the list of such targeted generation in the TGQ.

**Table 3.1 – Tehachapi Generation Queue through April 2006**

| Project | Queue Date | Queue Position | Type | Capacity (MW) |
|---|---|---|---|---|
| Project 1 | 9/4/2003 | 20 | WT | 300 |
| Project 2 | 5/11/2004 | 31 | WT | 201 |
| Project 3 | 7/19/2004 | 34 | WT | 300 |
| Project 4 | 11/18/2004 | 41 | CT | 158.8 |
| Project 5 | 6/17/2005 | WDAT | CT | 49.9 |
| Project 6 | 6/27/2005 | 73 | WT | 250 |
| Project 7 | 9/7/2005 | 79 | WT | 51 |
| Project 8 | 12/1/2005 | 84 | WT | 400 |
| Project 9 | 12/28/2005 | 85 | WT | 120 |
| Project 10 | 1/20/2006 | 86A | WT | 33.1 |
| Project 11 | 1/20/2006 | 86B | WT | 34 |
| Project 12 | 2/22/2006 | 91 | WT | 51 |
| Project 13 | 2/24/2006 | 92 | CC | 570 |
| Project 14 | 3/1/2006 | 93 | WT | 220 |
| Project 15 | 3/1/2006 | 94 | WT | 180 |
| Project 16 | 3/1/2006 | 95 | WT | 550 |
| Project 17 | 3/1/2006 | 96 | WT | 600 |
| Project 18 | 3/1/2006 | 97 | WT | 160 |
| Project 19 | 4/5/2006 | 100 | WT | 120 |
| **TOTAL** | | | | **4,350** |

* WT: Wind Turbine; CT: Combustion Turbine; CC: Combined Cycle

The CAISO utilized the efforts of the CSRTP-2006 in order to efficiently comply with its obligations under the LGIP. It did so by accounting for all the LGIP provisions for System Impact Studies (SIS) into the CSRTP-2006 study process. As such, the study that was performed was type of “clustered” system impact study to interconnect all targeted generation in the TGQ.

## 3.1 Reliability Analysis

### 3.1.1 Starting Power Flow Base Case

The CAISO provided a power flow case based on 2015 summer peak load condition. In addition to the power flow basecase, the power flow case was adjusted to reflect possible stress on the ISO Controlled Grid. The emphasis was on the northern SCE area with full network representation of the SCE’s proposed transmission upgrades required for connecting

the Tehachapi generation projects in the queue position through April 2006. The adjusted power flow case was tested along with dynamic data for system stability, and was determined to be stable.

### 3.1.2 Contingency Analysis

Based on the targeted generation projects of 4,350 MW in Tehachapi area, the study results indicated no facility overload and voltage issue for normal (N-0) and contingency (N-1 and N-2) conditions. Table 3.2 provides the summary listing of the critical contingencies that were evaluated for the study.

**Table 3.2 – List of Contingencies for the Tehachapi Transmission Project Study**

| | Contingencies | NERC/WECC Category |
|---|---|---|
| 1 | WindHub (Sub.1) – Antelope 500kV Line | B |
| 2 | WindHub (Sub.5) – LowWind (Sub.5) 500kV Line | B |
| 3 | LowWind (Sub.5) – Midway 500kV Line | B |
| 4 | Vincent – Mesa 230kV Line | B |
| 5 | Vincent – Mira Loma 500kV Line | B |
| 6 | Vincent – Rio Hondo 230kV Line | B |
| 7 | Lugo – Vincent 500kV Line | B |
| 8 | Vincent – Antelope 500kV Line | B |
| 9 | Lugo – Mira Loma 500kV Double Lines | C |
| 10 | Lugo – Vincent 500kV Double Lines | C |
| 11 | Midway – Vincent 500kV Double Lines (with SPS for 4000 MW Path 26 flow) | C |
| 12 | LowWind (Sub.5) – South 500kV Double Lines (Sub.5 – Antelope & Sub.5 – Vincent 500kV Lines) | C |
| 13 | Vincent – Antelope 500kV Double Lines | C |
| 14 | Vincent – Mesa 230kV Double Lines | C |
| 15 | Vincent – North 500kV Double Lines (Vincent – Antelope & Vincent – LowWind (Sub.5) 500kV Lines) | C |
| 16 | Vincent – Rio Hondo 230kV Double Lines | C |

Table 3.3 shows the results of the post-transient governor power flow studies with the Tehachapi Transmission Project modeled in the study power flow case. With the proposed plan of service for the Tehachapi Transmission Project, up to 4,350 MW of new generation in the Tehachapi area can be connected to the ISO Controlled Grid.

**Table 3.3 – Line Loading under Basecase and Contingency conditions (Post-transient Governor Power Flow Study Results Summary)**

| Equipment | Normal Rating Amps/MVA | Emergency Rating Amps/MVA | Loading | N | Contingency Description |
|---|---|---|---|---|---|
| Lugo - Ranchvst 500 Ckt 1 | 3950 | 5330 | 4980.3* | N-2 | Lugo-Miraloma-DLO |
| Vincent - Riohondo 230 Ckt 1 | 2480 | 3300 | 2213.2 | N-0 | Basecase |
| | | | 2923.1* | N-1 | Vincent-Riohondo-SLO |
| | | | N/A | N-2 | Vincent-South-DLO (Vincent-Mesa & Vincent-Serrano 500kV) |

* Above normal but below emergency rating.

### 3.1.3 Transient Stability Study Results

Transient stability with 10-second run was performed for the proposed Tehachapi Transmission Project under the assumptions of 4,000 MW flow for Path 26 (Midway – Vincent 500kV lines) in the North – South direction and with 4,350 MW of new generation additions in the TWRA. With the proposed plan of service for the Tehachapi Transmission Project, the study results met the NERC/WECC Planning Standards and the criteria of the WECC Disturbance Performance Table. Since many of these generation projects have not completed the LGIP process, typical dynamic data for the wind generating units were modeled. In addition, typical dynamic data for the combined and simple cycle generating units in the area were modeled for the proposed thermal generation projects. As more detailed and accurate dynamic data for these new generation units become available, additional further transient analyses will be required to ensure that there are no transient stability concerns with the new data.

**Table 3.4: Transient Voltage and Frequency Study Results Category B - Loss of Single Element**

| | Contingency | Transient Voltage Dip (%) and Damping | Lowest Transient Frequency at Load Bus (Hz) | Comments |
|---|---|---|---|---|
| 1 | Lugo-Vincent 500kV | Rio Hondo 66kV, $\Delta$V= 0.9%, Rio Hondo 230kV, $\Delta$V= 0.9%, Damping >0 | Gold Hills 115kV, f=59.99 Hz | Meet WECC Planning Standards |
| 2 | Sub.1 – Antelope 500kV | Marshall 92kV, $\Delta$V= 1.3%, MRedwtp 69kV, $\Delta$V= 1.2%, Damping >0 | Wilsona 66kV, f=59.42 Hz for t < 6 cycles | Meet WECC Planning Standards |
| 3 | Sub.1 – Sub.5 500kV | Marshall 92kV, $\Delta$V= 1.3%, Shields 92kV, $\Delta$V= 1.3%, Damping >0 | Wilsona 66kV, f=59.42 Hz for t < 6 cycles | Meet WECC Planning Standards |
| 4 | Sub.5 – Midway 500kV | Northcst 69kV, $\Delta$V= 2.1%, MRedwtp 69kV, $\Delta$V= 2.0%, Damping >0 | Wilsona 66kV, f=59.28 Hz for t < 6 cycles | Meet WECC Planning Standards |

| | Contingency | Transient Voltage Dip (%) and Damping | Lowest Transient Frequency at Load Bus (Hz) | Comments |
|---|---|---|---|---|
| 5 | Vincent-Antelope 500kV | La Cienega 66kV, ΔV= 6.5%, Tehachmm 66kV, ΔV= 12.1%, Damping >0 | Rio Hondo 66kV, f=59.07 Hz for t < 6 cycles, Searles 34.5kV, f<59.6 Hz for 9 cycles | Meet WECC Planning Standards |
| 6 | Vincent-Mesa 230kV | Rector 66kV, ΔV=10.9%, Rector 230kV, ΔV=12.7%, Damping >0 | Rio Hondo 66kV, f=59.15 Hz for t < 6 cycles | Meet WECC Planning Standards |
| 7 | Vincent – Mira Loma 500kV | Goldhills 115kV, ΔV=4.5%, Tehachmm 66kV, ΔV=4.2%, Damping >0 | Mira Loma 66kV, f=59.06 Hz for t < 6 cycles, Searles 34.5kV, f<59.6 Hz for 9 cycles | Meet WECC Planning Standards |
| 8 | Vincent – Rio Hondo 230kV | Rector 66kV, ΔV=4.5%, Rector 230kV, ΔV=4.2%, Damping >0 | Rio Hondo 66kV, f=59.15 Hz for t < 6 cycles | Meet WECC Planning Standards |

**Table 3.5: Transient Voltage and Frequency Study Results Category C Events (Loss of Two or More Elements)**

| | Contingency | Highest Transient Voltage Dip (%) and Damping | Lowest Transient Frequency at Load Bus (Hz) | Comments |
|---|---|---|---|---|
| 1 | Lugo-Mira Loma 500kV Double Line | Goldhills 115kV, ΔV= 9%, Tap604 115kV, ΔV= 8.7%, Damping >0 | Searles 34.5kV, f=59.68 Hz | Meet WECC Planning Standards |
| 2 | Lugo-Vincent 500kV Double Line | Rio Hondo 66kV, ΔV= 4%, Rio Hondo 230kV, ΔV= 3.7%, Damping >0 | Aurora 69kV, f=59.95 Hz | Meet WECC Planning Standards |
| 3 | Midway-Vincent 500kV DLO with SPS | Lakeview 69kV, V=8.2% Hackamor 69kV, ΔV=7.9% Damping >0 | Wilsona 66kV, f=59.15 Hz | Meet WECC Planning Standards |
| 4 | Sub.5-Antelope & Sub.5-Vincent 500kV Double Line (aka Sub.5-South Double Line) | Goldhills 115kV, □V=2.5%, Tap601 115kV, □V=2.4%, Damping >0 | Wilsona 66kV, f=59.28 Hz | Meet WECC Planning Standards |
| 5 | Vincent-Antelope 500kV Double Line | La Cienega 66kV, ΔV=21.8%, La Cienega 230kV, ΔV=15.9%, Damping >0 | Rio Hondo 66kV, f=59.07 Hz Searles 34.5kV, f<59.6 Hz for 6.8 cycles | Meet WECC Planning Standards, except for Searles 34.5kV (this is an existing pre-project concern) |
| 6 | Vincent-Mesa 230kV Double Line | Rio Hondo 66kV, ΔV=4.9%, Rio Hondo 230kV, ΔV=4.6%, Damping >0 | Rio Hondo 66kV, f=59.15 Hz | Meet WECC Planning Standards, |

| | Contingency | Highest Transient Voltage Dip (%) and Damping | Lowest Transient Frequency at Load Bus (Hz) | Comments |
|---|---|---|---|---|
| 7 | Vincent-Antelope & Vincent-Sub.5 500kV Double Line (aka Vincent – North 500kV DLO) | La Cienega 66kV, ΔV=20.1%, La Cienega 230kV, ΔV=14.5%, Damping >0 | Rio Hondo 66kV, f=59.07 Hz Searles 34.5kV, f<59.6 Hz for 6.8 cycles | Meet WECC Planning Standards, except for Searles 34.5kV (existing pre-project concern) |
| 8 | Vincent – Rio Hondo 230kV Double Line | Rector 66kV, ΔV=5.1%, Rector 230kV, ΔV=4.7%, Damping >0 | Rio Hondo 66kV, f=59.15 Hz | Meet WECC Planning Standards |

## 3.2 Transmission Alternatives

The CSRTP-2006 process reviewed and investigated several major project alternatives in order to optimize the recommended plan of service. This section presents the five most promising alternatives that were considered and studied in some detail for this project. Figures 5.1 To 5.5 show alternative configurations considered and the related estimated costs.[22] In all these alternatives, South of Vincent upgrades are common with those identified in the Tehachapi Transmission Project plan of service as presented in this report.

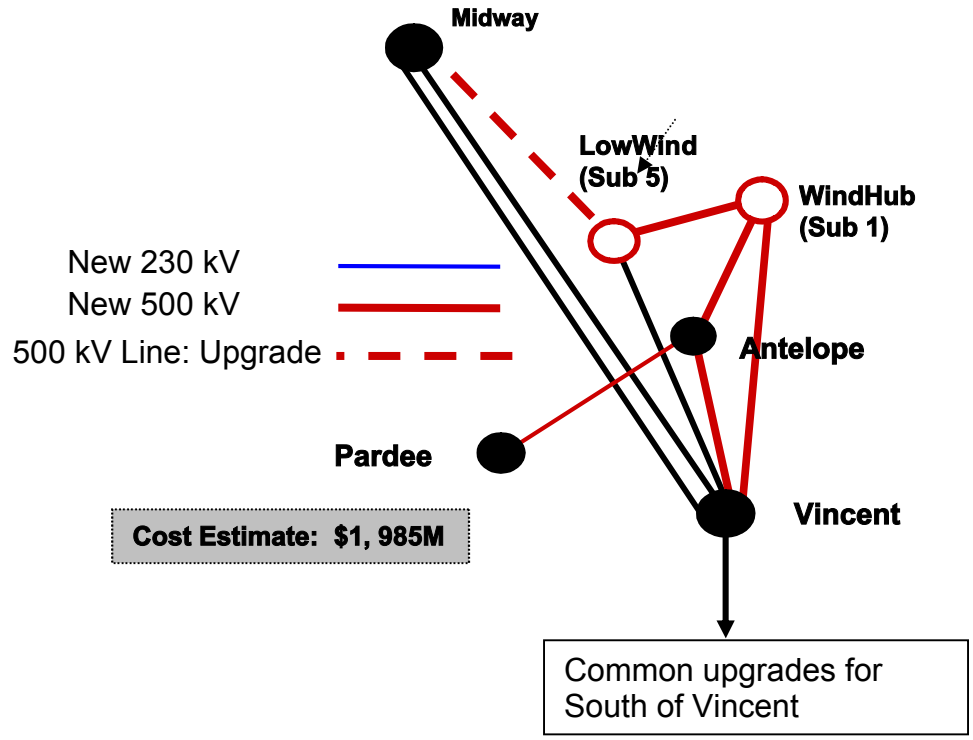
As shown below, all the alternatives considered were more expensive than the selected plan of service for the Tehachapi Transmission Project. At the same time, all alternatives are comparable with the selected method of service in regards to integrating TGQ generation projects, addressing load growth in Antelope Valley area, and mitigating South of Lugo constraints.

### 3.2.1 Alternative 1

Alternative 1 was the first alternative considered by the CSRTP-2006 team and was studied to a great extent. It was shown to provide the same level of benefits as the proposed Tehachapi Transmission Project, however, at a higher cost.

[22] The cost estimates are planning level estimates based on unit costs. Cost Estimates do not include Right-of-way ( R/W) for transmission lines and land use for substations.

**Figure 4.1: Alternative 1**




### 3.2.2 Alternatives 2 through 4

Alternatives 2 through 4 were recommended by the Tehachapi Collaborative Study Group (TCSG). All these alternatives cost more than the proposed Tehachapi Transmission Project.

**Figure 4.2: Alternative 2**

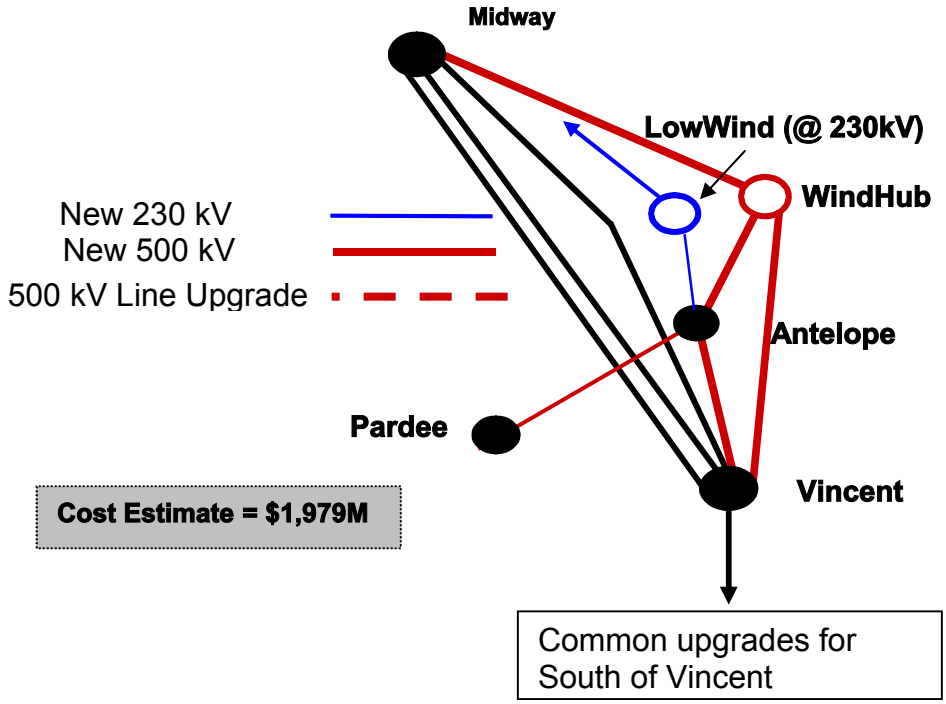


**Figure 4.3: Alternative 3**

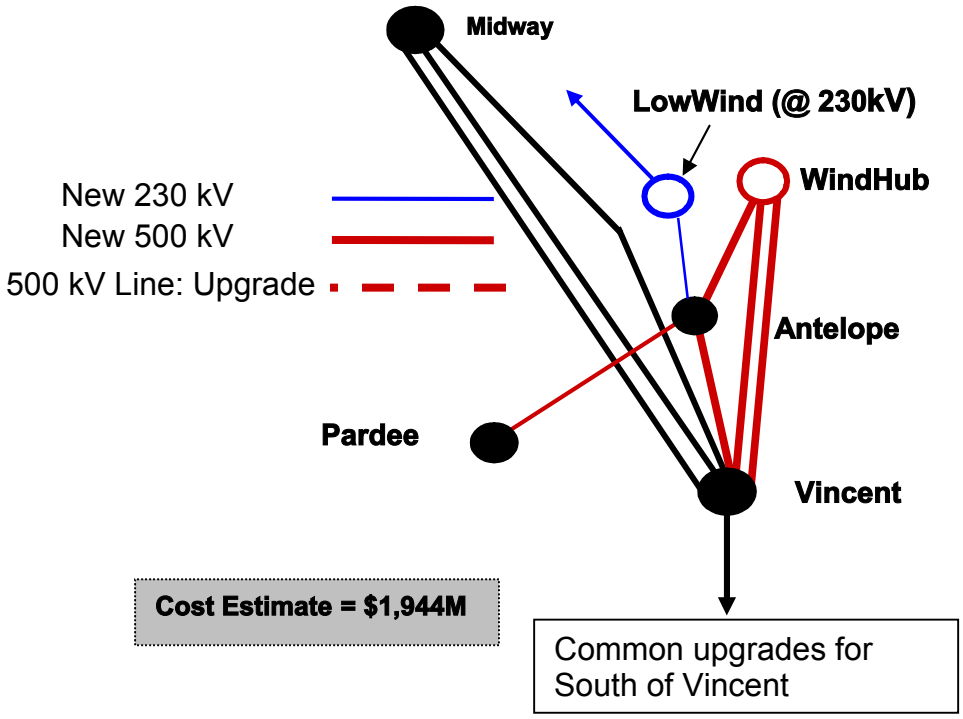
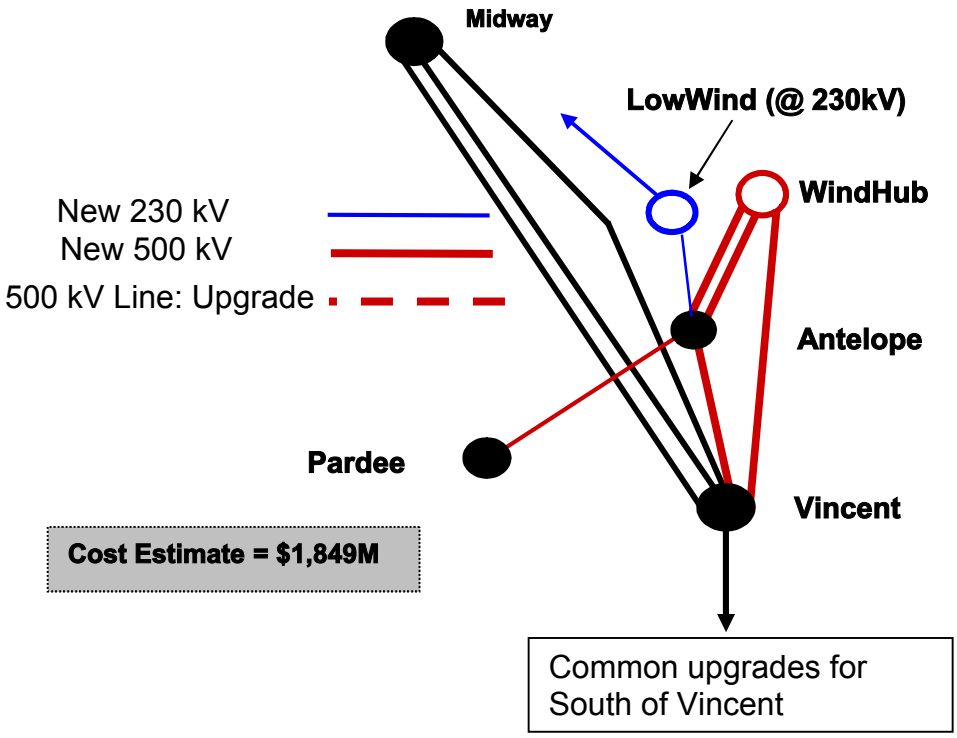


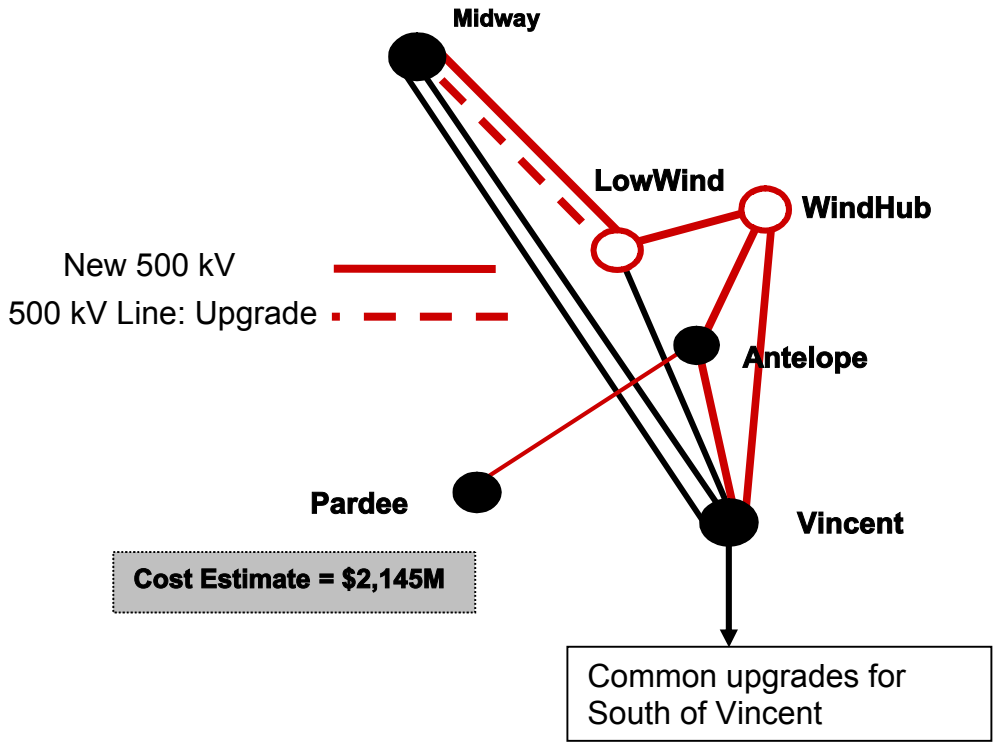

**Figure 4.4: Alternative 4**



### 3.2.3 Alternatives 5

Alternative 5 was an interim alternative proposed by SCE which would provide additional benefits compared to that of the proposed Tehachapi Transmission Project but at higher cost.

**Figure 4.5: Alternative 5**




## 3.3 Major Findings

1. The Tehachapi Transmission Project is the least cost network transmission solution to reliably interconnect a total of 4,350MW capacity of the TGQ generation projects under the 2015 summer peak load condition.

2. Even though the LGIP "clustering" study was performed to determine the total network upgrade to connect a total of 4,350MW new generation additions in the Tehachapi area, individual System Impact Studies will still be needed for these projects to determine direct facility assignment requirements to connect these projects to the ISO Controlled Grid.

3. Detailed dynamic data will still be required from the generation developer for accurate dynamic model in future WECC power flow base cases. At this time, only typical General Electric (GE) new wind model is used for the study.

# 4 Other Non-Quantified Benefits

In the course of CSRTP-2006 studies, the CAISO quantified Tehachapi Transmission Project benefits based on the quantifiable energy saving, green house gas (GHG) reduction benefits, and additional regulation costs. The CAISO also accounted for the reliability benefits of this project. However, many other operational and strategic benefits for the proposed Tehachapi Transmission Project are presently difficult to quantify. In the following, the sources of these benefits are discussed qualitatively.

## 4.1 RPS Program

Senate Bill 1078 established the California Renewables Portfolio Standard (RPS) program, which requires an annual increase in renewable generation by CPUC-jurisdictional utilities equivalent to at least 1 percent of sales, with an aggregate goal of 20 percent by 2017. The CPUC is aggressively implementing this policy, with the intention of accelerating the completion date to 2010. The CPUC is also considering ways to achieve 33 percent renewable energy by 2020. Other load serving entities (LSEs), including municipal and other public utilities, are also required to adopt RPS standards.

According to the CPUC[23], actual renewable deliveries in 2005 were:

- PG&E – 13.5 % (9,801 GWh)
- SCE – 17.7% (13,195 GWh)
- SDG&E - 5.5% (830 GWh)

In 2005, renewable resources consumption in California is about 23,800 GWh, which amounts to about 14.6% of total energy consumption.

The Tehachapi Transmission Project provides needed access to the renewable resources in the TWRA. The Tehachapi Transmission Project allows California LSEs to tap into the renewable power sources in this area. Because of the lack of sufficient transmission infrastructure to the TWRA, the renewable resources potential of the area cannot be readily available or developed without the Tehachapi Transmission Project. Although the renewable resources potential cannot be the only consideration for the proposed transmission investments, it is indeed one of the key concerns for optimizing statewide transmission capacity and accommodating renewable energy potentials.

## 4.2 Expected Economic Benefits

Significant economic benefits are expected as the Tehachapi Transmission Project provides access to renewable and efficient generation projects slated in the TWRA.

## 4.3 Infrastructural Improvement Benefits

The Tehachapi Transmission Project helps improve the robustness of the California's aging electric transmission system. It mitigates grid congestion and brings new renewable and conventional power plants online. Without transmission infrastructure upgrades, Californian may face negative impacts on the future economy in the region when frequent outages or disturbances might occur due to equipment degradation. The specific infrastructural

[23] http://www.cpuc.ca.gov/Static/energy/electric/renewableenergy/060224_rpssummary.htm

improvement benefits that the Tehachapi Transmission Project will bring include the followings:

- Provide the potential to expand Path 26 capability at a low cost in the near future with the upgrade of PG&E's portion of Midway-Vincent Line 3;
- Provide more options for future transmission expansions and realize the long-term vision of California's transmission infrastructure; and
- Integrate large amount of planned renewable resources (mainly solar generation) in Inyo and northern San Bernardino counties by future addition of a 500 kV line from WindHub Substation (one of Tehachapi Transmission Project's substations) and the Kramer Substation.

## 4.4 Other Non-Quantified Benefits

The Tehachapi Transmission Project provides the following additional listed benefits:

- Reduction in NOx and SOx and other pollutant emissions from displaced fossil fuel generation;
- Potential reduction in gas prices stemming from lower fuel consumption by the gas generators that are displaced by the wind generation in TWRA - the benefits here would be both due to lower generation cost as well as other societal benefits stemming from lower gas costs;
- Augmentation of competitive wholesale energy markets for California; and
- Further diversification of energy resources.

The CAISO has not attempted to quantify these additional benefits.

# 5 Conclusions

The CSRTP-2006 assessment of the Tehachapi Transmission Project leads to the following major findings regarding the project:

- The Tehachapi Transmission Project is the least-cost solution that reliably interconnects 4,350 MW of generating resources in TGQ;
- The Tehachapi Transmission Project also addresses the reliability needs of the CAISO controlled grid due to projected load growth in Antelope Valley area as well as helps to address the South of Lugo (SOL) transmission constraints, an ongoing source of reliability concern for the Los Angeles (LA) Basin;
- The Tehachapi Transmission Project facilitates California utilities to comply with the state mandated Renewable Portfolio Standard (RPS) by providing access to planned renewable resources in the TWRA;
- The Tehachapi Transmission Project is expected to provide significant economic benefits to the CAISO ratepayers by providing access to wind and other efficient generating resources under development in TWRA;
- The Tehachapi Transmission Project makes it possible to expand the transfer capability of Path 26 in the near future with a low cost upgrade of the PG&E's portion of Midway-Vincent Line 3;
- The Tehachapi Transmission Project will be used by other projects in TGQ queued beyond the start date of the CSRTP-2006 for low-cost interconnection to the CAISO transmission grid; and
- Although the detailed planning is not yet performed, the Tehachapi Transmission Project lays the groundwork for the integration of large amounts of planned geothermal, solar, and wind generation in Inyo and northern San Bernardino counties with potential future 500 kV additions from the WindHub Substation (one of Tehachapi Transmission Project's substations) to the Kramer Substation.

Based on the aforementioned findings, the CAISO Management has concluded that the build out of the entire Tehachapi Transmission Project by SCE should move forward effective immediately.

# APPENDIX Y

Path 26 - Comparison Alternative Tehachapi Connections

# Transmission Options for Tehachapi Wind Power

For discussion only

Rich Ferguson, Facilitator
Tehachapi Collaborative
Study Group

# Major Issues

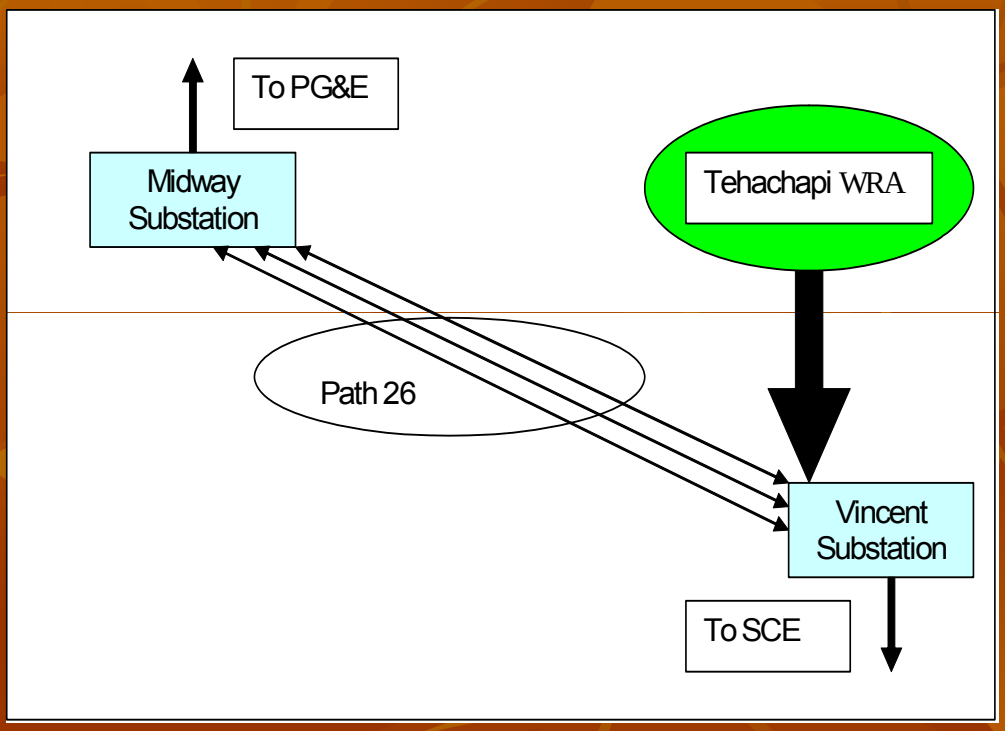
1. Tehachapi WRA grid connections
2. NP15 congestion
3. Other (Fresno tie, etc.)

# 1) Tehachapi WRA Connections

- Choices
  - A) Gen-tie option – All lines connect Tehachapi to Vincent substation, perhaps through the Antelope substation.
  - B) Expanded Path 26 option –One line connects Midway to Tehachapi and one or more lines connect Tehachapi to Vincent.

3

# Gen-tie Option

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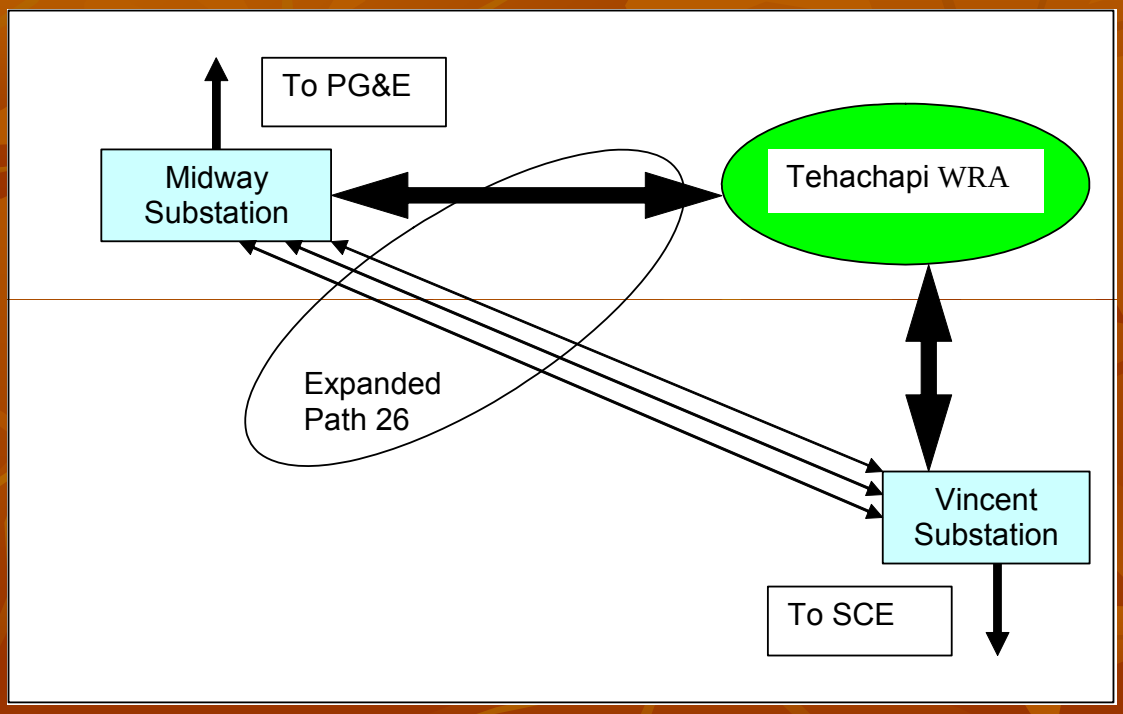
# Expanded Path 26 Option



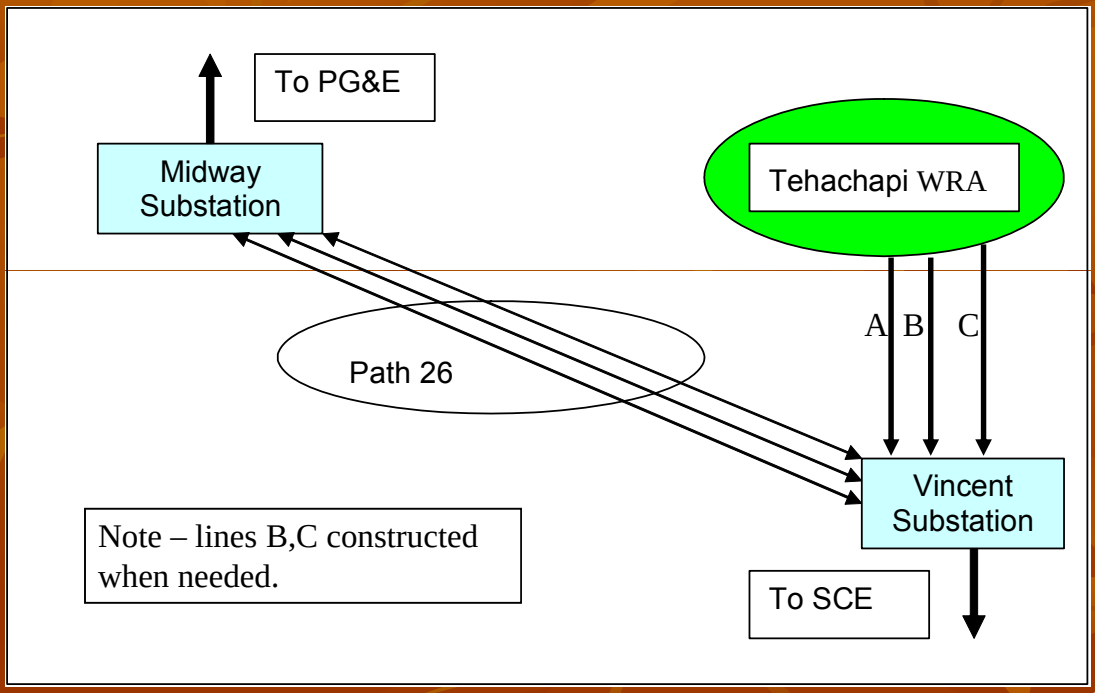
# Cost Considerations

- Costs for both options are approximately equal.
- Gen-tie option has slightly lower capital cost.
- Expanded Path 26 option leads to slightly lower production costs.
- Cost does not appear to be a deciding factor for choosing between the two options.

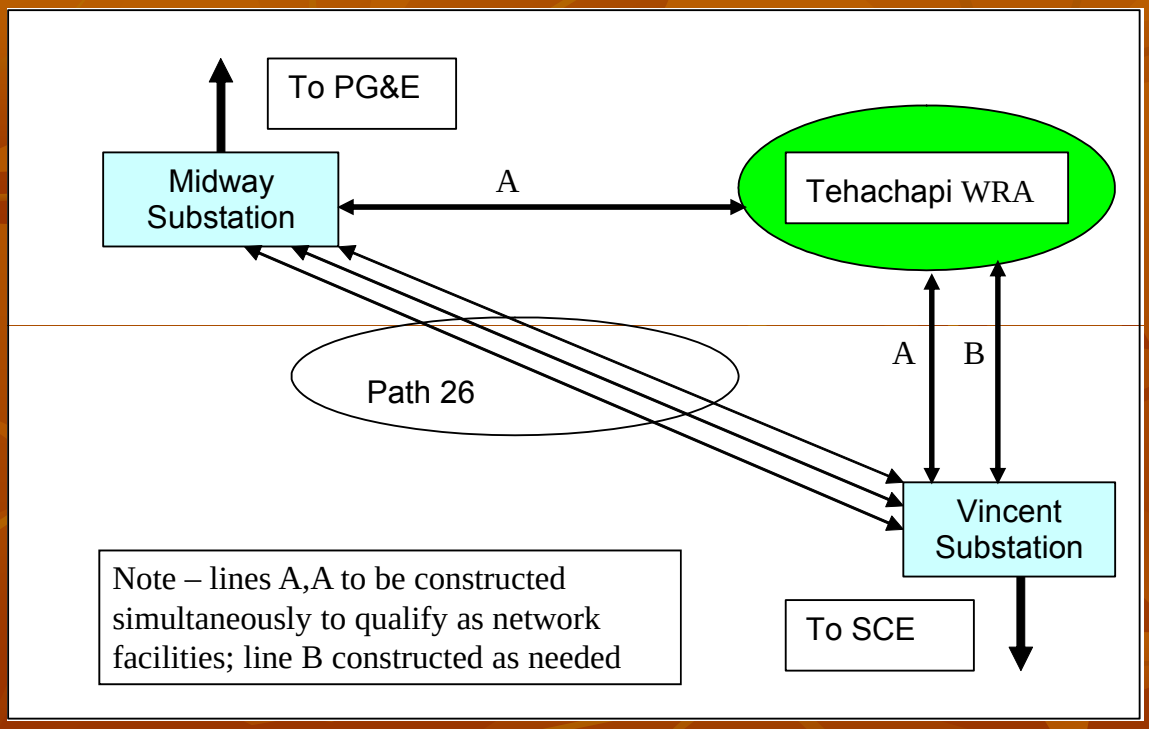
# Financial Considerations

- To recover capital costs in ISO transmission tariff, FERC rules require “network facilities”.
- Gen-tie option does not qualify as network facilities.
  - Alternative cost recovery mechanism would be required (eg PUC §399.25)
- Expanded Path 26 option likely to qualify as network facilities.
  - Interim financial guarantees may be required (eg PUC §399.25)

# Phased Gen-tie Option



# Phased Expanded Path 26 Option

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## Expanded Path 26 Considerations

- The interest in simultaneous construction of the Midway-Tehachapi line and a Tehachapi - Vincent line arises from financial concerns, not technical considerations.
- The Midway-Tehachapi-Vincent link has not yet been studied in detail by the CAISO or the utilities.

# Relation to TCSG Report #1

- Gen-tie option = phases 1,2,3 &4, with phase 4 being another line between Tehachapi and Vincent.
  - Phases 3 & 4 constructed as needed.
- Expanded Path 26 option = simultaneous construction of Phases 1,2 &4, with phase 4 being a line between Midway and Tehachapi.
  - Phase 3, a second line to Vincent, constructed as needed.

# Gen-tie Option

- Advantages –
  - Increased planning flexibility since first phase is smaller.
- Disadvantages –
  - Provides no network benefits – ie, does not create "network facilities";
  - FERC rules make financing difficult;
  - Transmission capacity is underutilized during periods of low wind generation.

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# Expanded Path 26 Option

- Advantages –
  - Provides network benefits and likely qualifies as “network facilities”;
  - Conventional financing mechanisms likely exist, although financial guarantees may be required;
  - Insures against contingencies on existing Path 26.
- Disadvantages –
  - Decreased planning flexibility
  - Potential impact of Tehachapi wind on Path 26 capability.

# 2) NP 15 Congestion

- TCSG has not reached consensus on whether congestion relief is required to deliver Tehachapi power to PG&E.
- PG&E alternative #4 adds ~ $700M to capital cost of Tehachapi connections;
  - Provides only minimal reductions in WECC production costs.

# NP15 Congestion Relief

- Relieving congestion on Path 15 or elsewhere in NP15 does not appear cost effective.

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# 3) Other Issues

- After initial connections -
  - A) What other connections will be needed?
  - B) Where are the decision points and what are the criteria?
- Operational issues.

# Other Tehachapi Connections

- Other Tehachapi – Vincent 500 kV line(s);
- Fresno phase-shifted tie;
- Other?

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# Summary

- TCSG has not reached consensus on choice between Gen-tie option and Expanded Path 26 option.
- Additional facilities in NP 15 do not appear cost effective.
- TCSG has not reached consensus on whether congestion relief on Path 15 is required to deliver Tehachapi power to PG&E.
- TCSG continues to examine other issues.

# APPENDIX Z

Energy Choices - Non-fossil vs. Fossil

# Energy Choices:
# Non-fossil vs. Fossil
# The California Global Warming Solutions Act of 2006

## Energy Policy Brief


## Rich Ferguson, PhD
## Research Director, CEERT

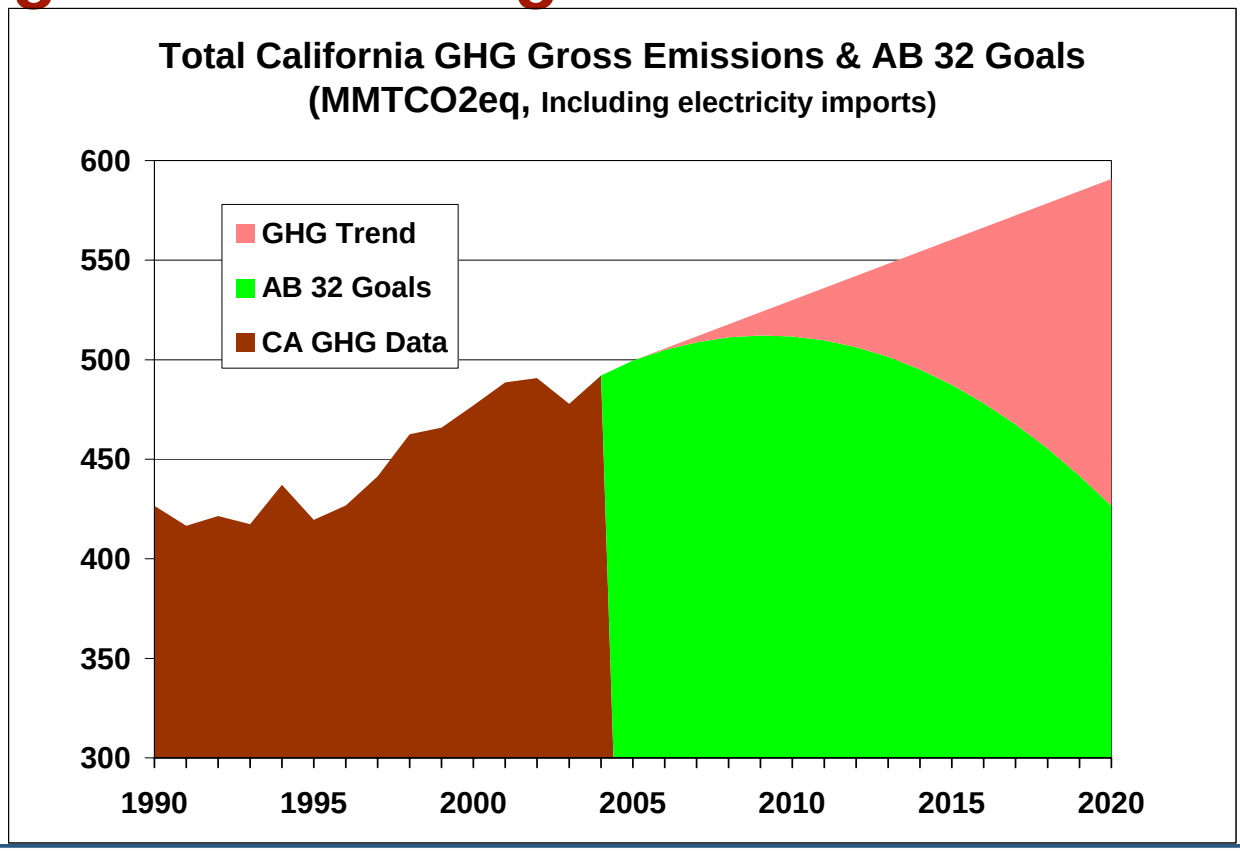

**Updated 2/11/07**

# California has taken the first step toward limiting climate change by passing Assembly Bill 32 in 2006.

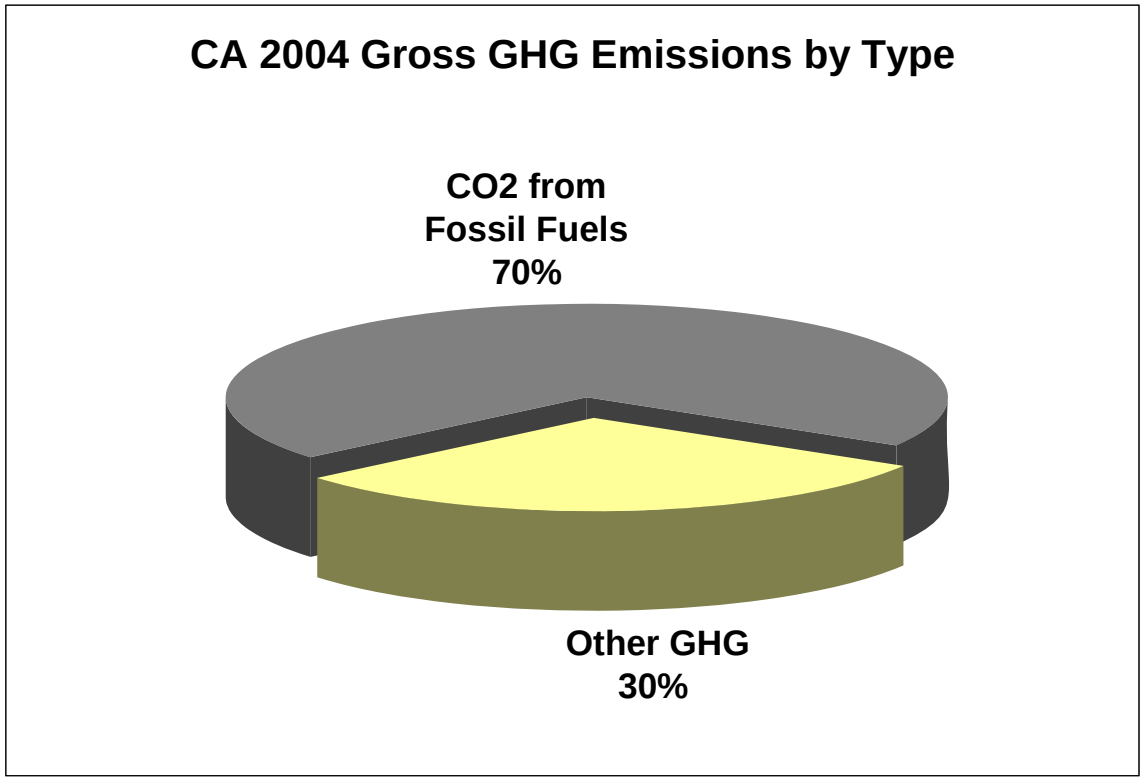
"By January 1, 2008, the state board [CARB] shall …. determine what the statewide greenhouse gas emissions level was in 1990, and approve …. a statewide greenhouse gas emissions limit that is equivalent to that level, to be achieved by 2020."

- Part 3, § 38550 (Division 25.5, CA Health and Safety Code)

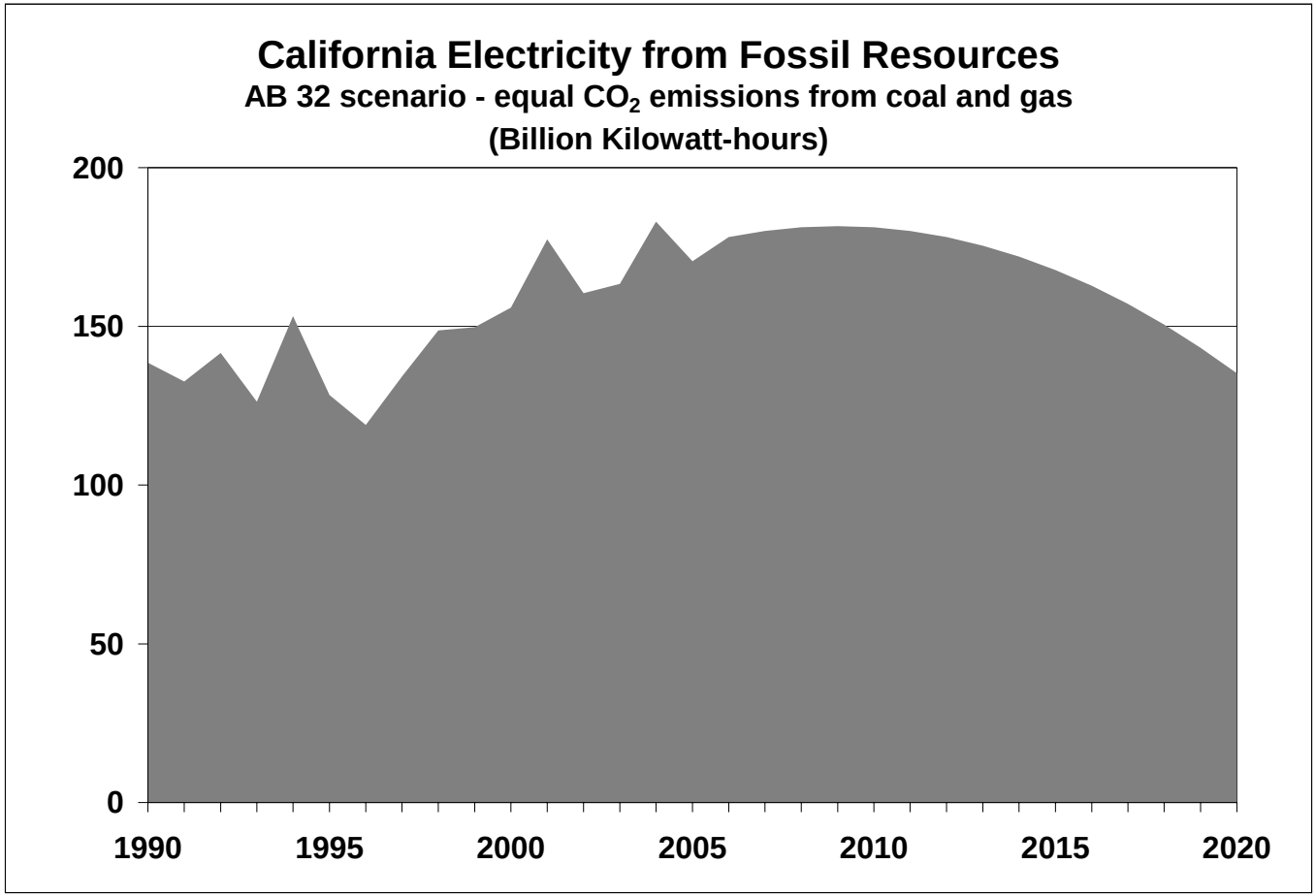
# California emissions of greenhouse gases must decrease – not increase – to limit global warming.



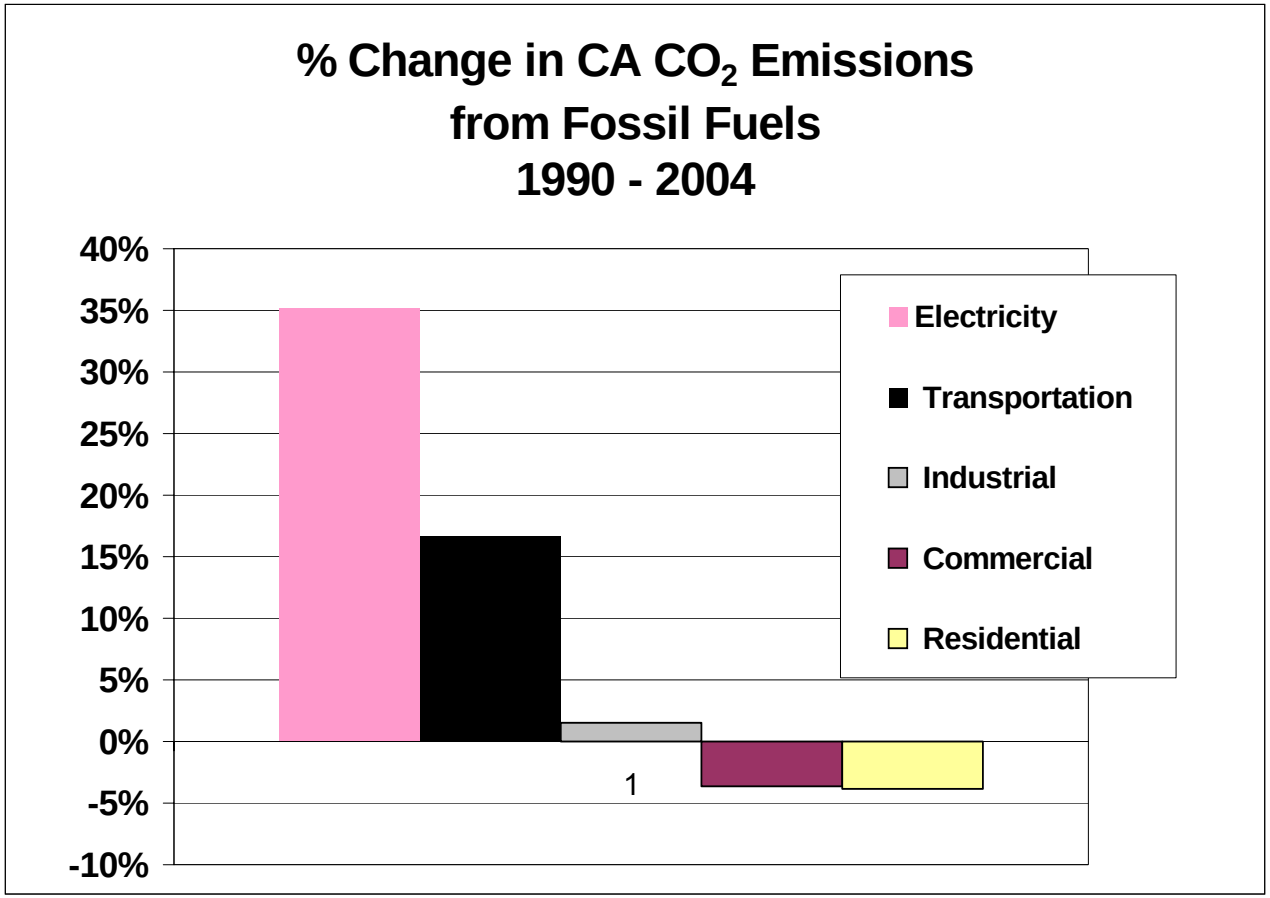
# Energy from fossil fuels causes 70% of California's greenhouse gas emissions.



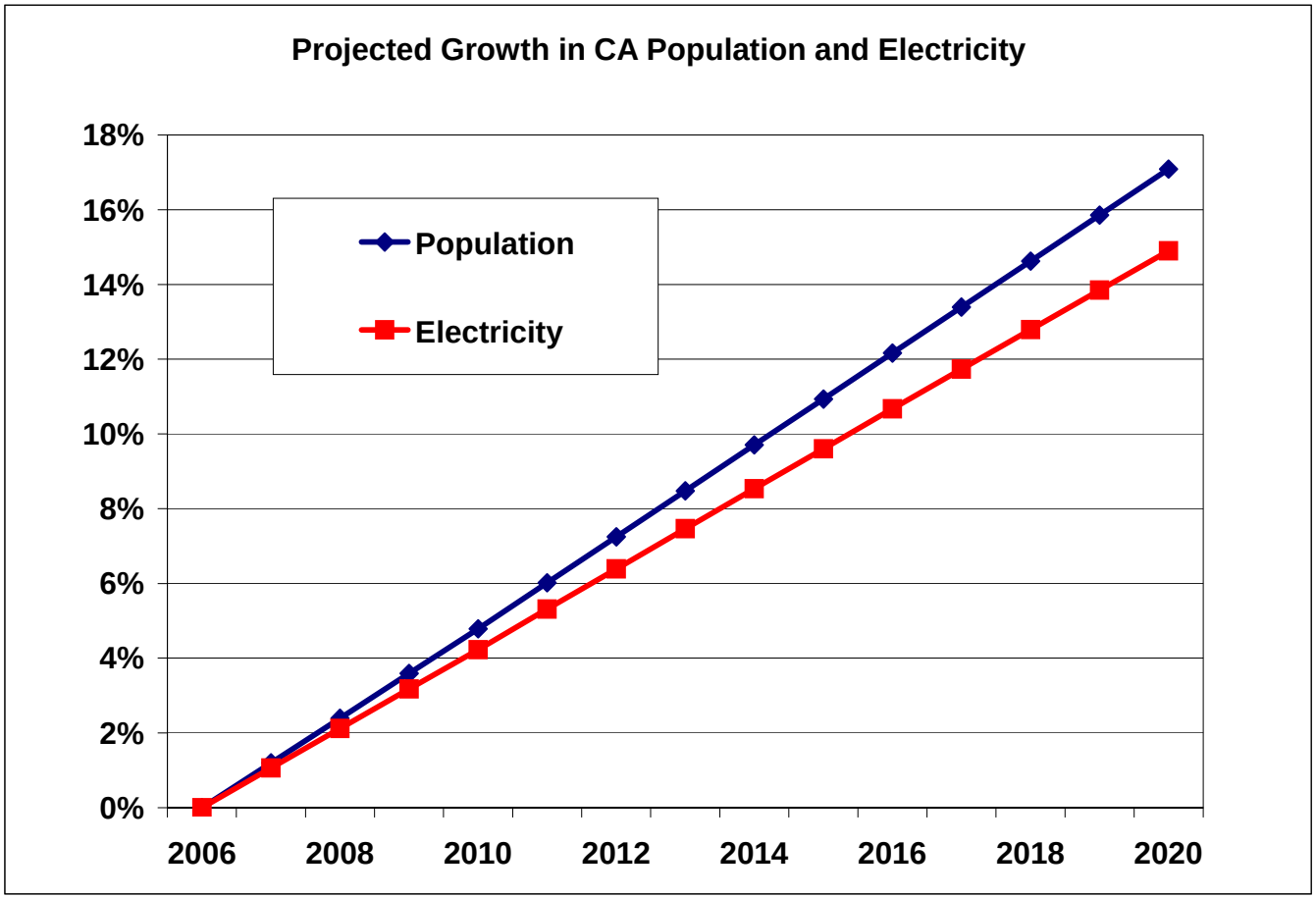
# To meet California's greenhouse gas reduction goals, the use of fossil fuels must decline.



# Greenhouse gas emissions from electricity generation have grown rapidly since 1990.



# Demand for electric energy will grow as California's population increases.



**Q** How can California reduce the use of fossil fuels to meet its global warming goals while continuing to supply needed energy for its growing population?

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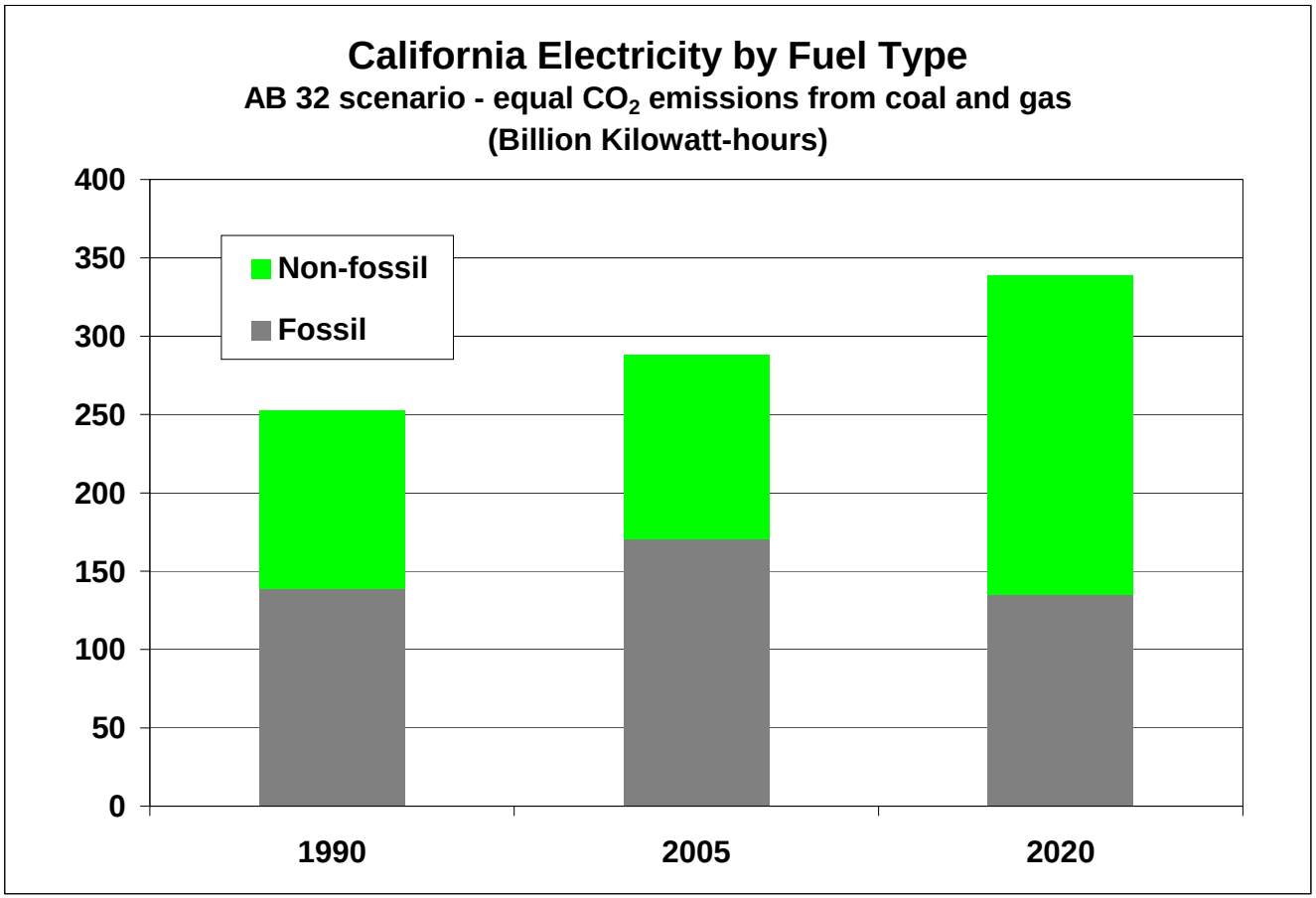
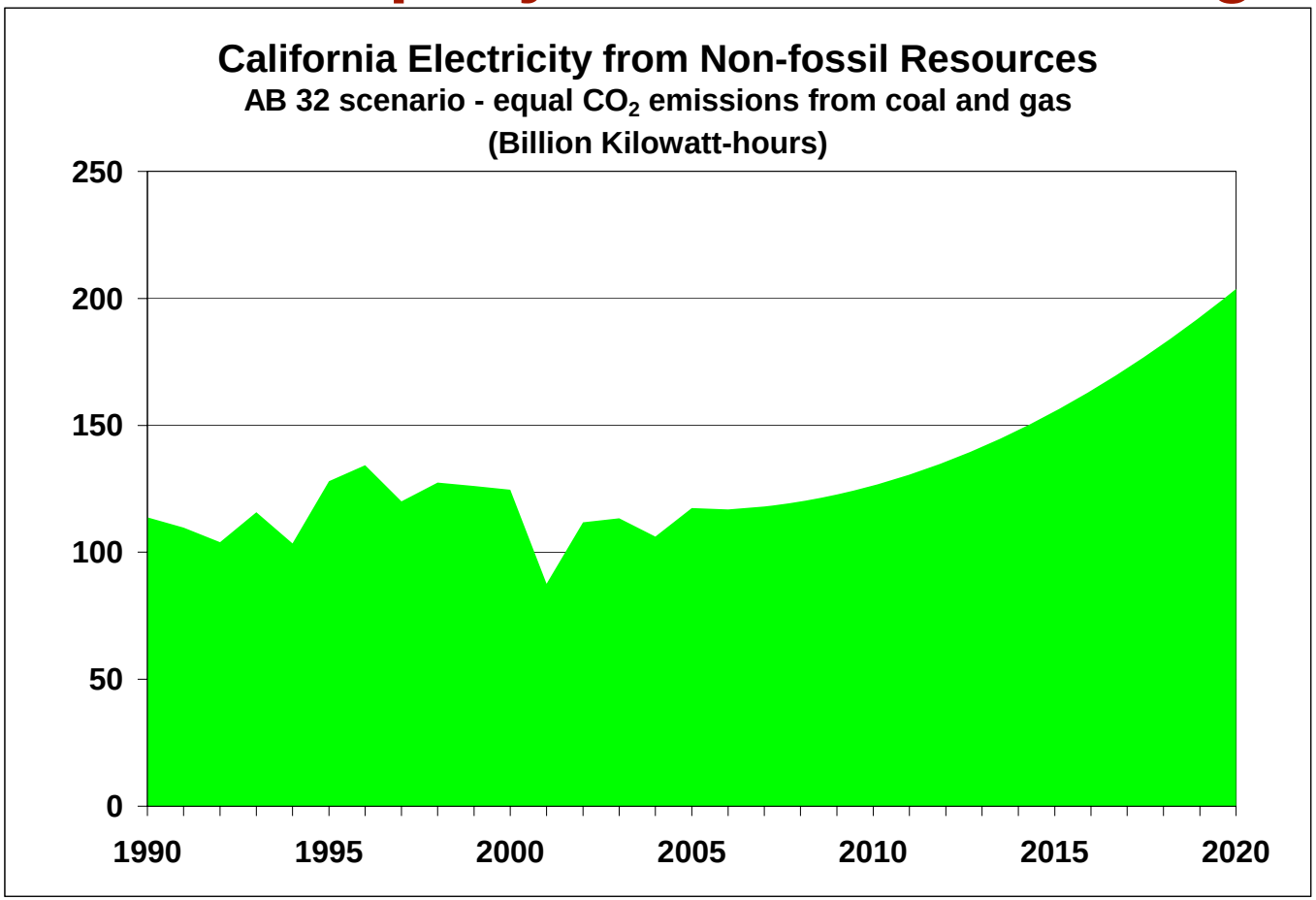
**A** California must increase reliance on its non-fossil energy resources. There is no other technically feasible and cost-effective option.

# More of California's electricity must be generated from non-fossil energy resources.



# California electricity from non-fossil resources must increase rapidly to meet the AB 32 goals.



# Commercially available non-fossil energy resources are:

| Energy Source | Technology |
|---|---|
| Falling water | Hydroelectricity |
| Atomic nuclei | Nuclear |
| Sunlight | Solar |
| Wind | Wind |
| Earth | Geothermal |
| Vegetation | Biomass |

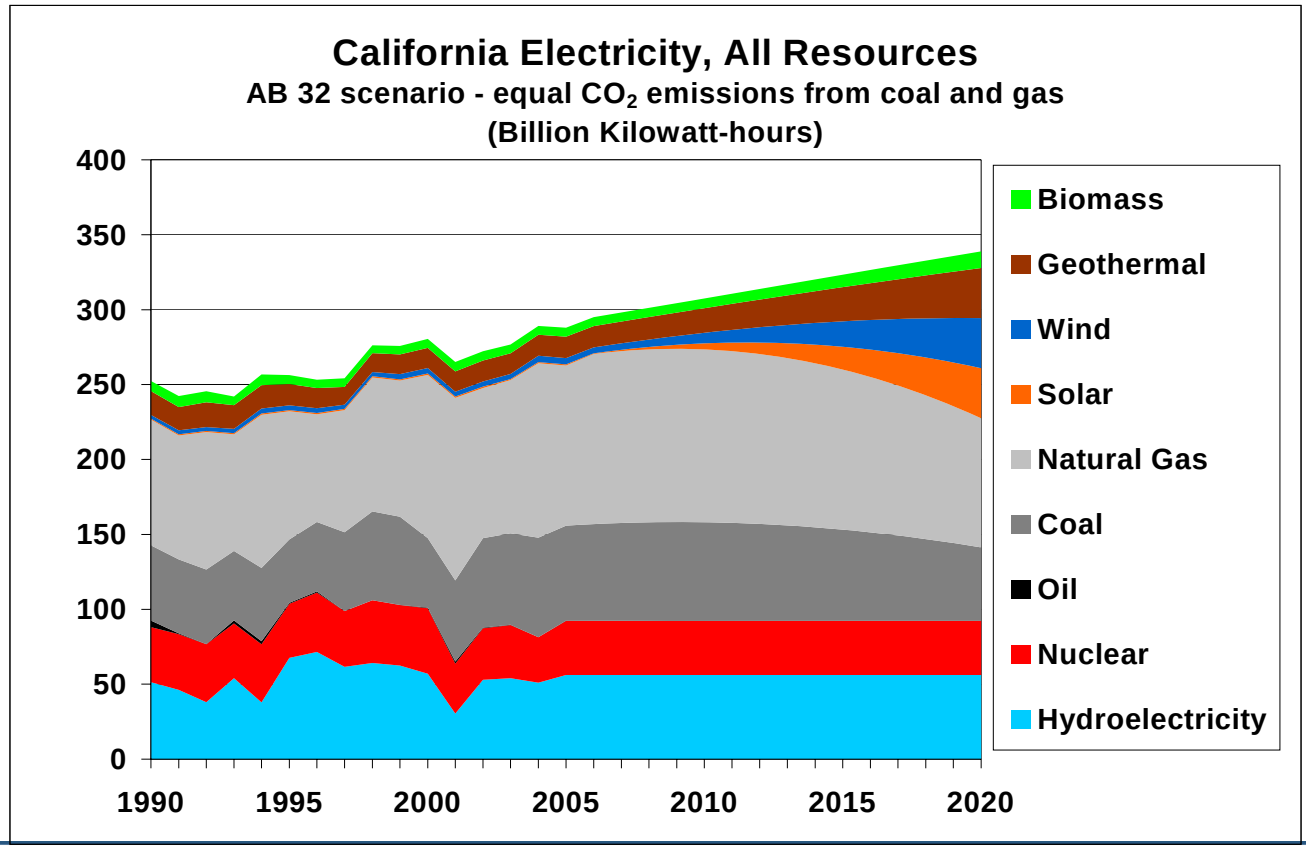
# Additional hydroelectricity or nuclear power is unlikely in California before 2020.

California rivers have already been dammed, and future water resources are at risk from climate changes.

California has prohibited new nuclear plants until a solution is found to the radioactive waste storage problem.

Permitting and construction of new hydroelectric or nuclear facilities could not be accomplished by 2020, even if these resources were available.

# To limit climate change, California's electricity increasingly will come from the sun, wind and the Earth.



# Scenario sensitivities: Increasing end use efficiency can reduce growth in electricity consumption.

- This scenario assumes that the slight downward historical trend in per capita consumption continues.
- Increasing efficiency decreases the new for new generation resources.
- Adoption of electric vehicles would increase electricity demand but could reduce emissions from the transportation sector.

# Scenario sensitivities: Coal-fired power may decrease more rapidly than assumed.

- This scenario assumes that emissions from coal and natural gas are reduced equally.
- Greater reductions in the use of coal would allow more natural gas to be used while still meeting the climate change goals.

# Scenario sensitivities:
# The efficiency with which natural gas is used to generate electricity may increase.

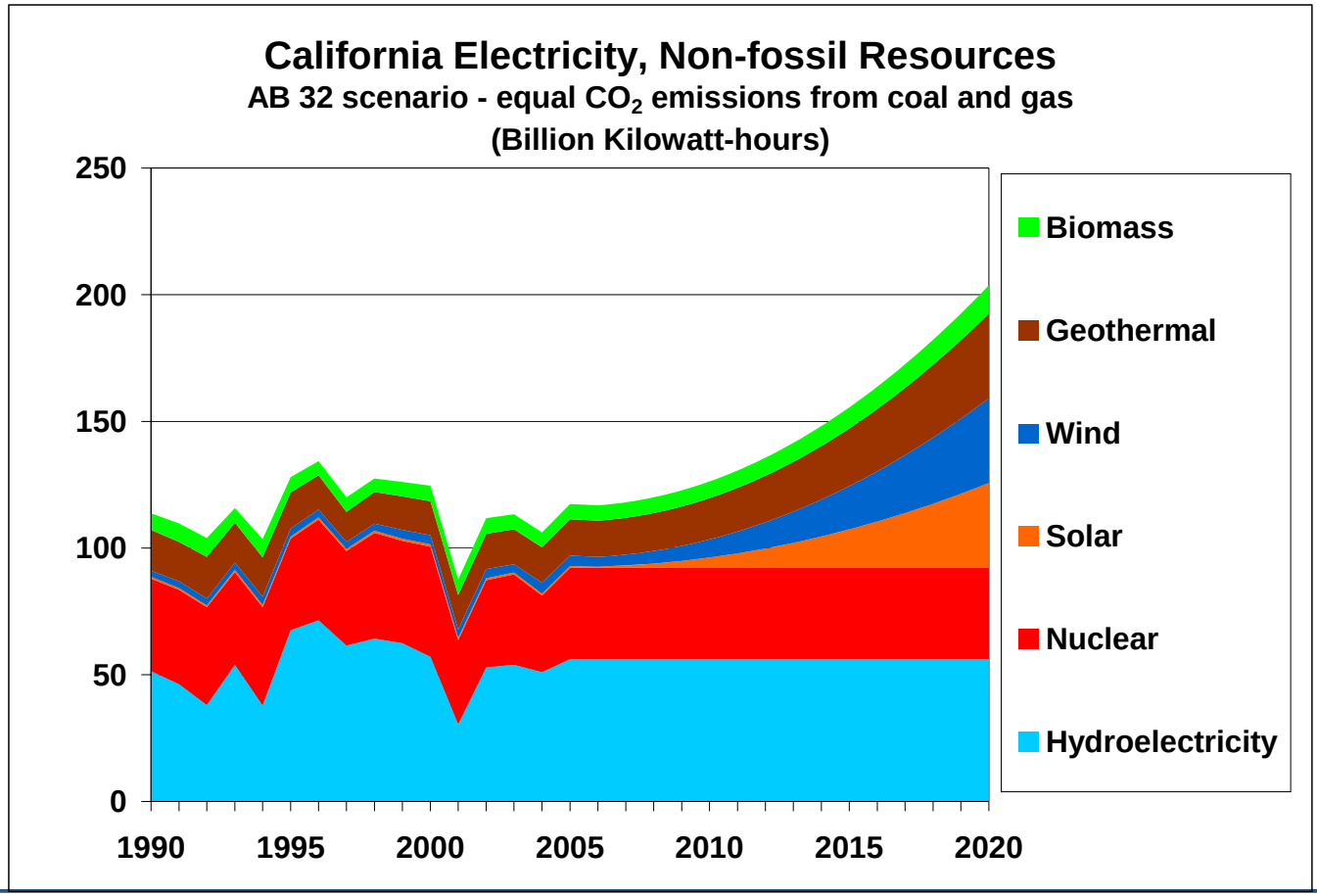
- This scenario assumes that 8,500 BTU of gas is required to generate one kilowatt-hour of electricity on average, and that that heat rate remains constant.
- More efficient gas-fueled generation technologies are commercially available.
- Widespread deployment of efficient fuel cell technologies could reduce emissions substantially.
- Combined heat and power applications could reduce emissions in sectors other than electricity as well.

# Sensitivities:
# Carbon dioxide emissions from new coal-fired generation may be captured and 'sequestered'.

This scenario assumes that emissions of greenhouse gases per kilowatt-hour of electricity from coal-fired plants does not change.

New technologies are being demonstrated for coal-fired power plants to capture and permanently store the carbon dioxide created.

# The challenge facing California is to develop its non-fossil resources quickly enough.



# California Has Chosen Non-fossil Energy The California Global Warming Solutions Act of 2006

**California has chosen wisely.**

**In the future, the people of California will have –**

- **More energy from the sun, wind, and the Earth.**
- **Less energy from coal, oil and natural gas.**

**Working together, we can limit global warming.**

# APPENDIX AA

California RPS Permit Streamlining Report

# California RPS Permit Streamlining Report

## Contract Amended Task #19: Transmission Plan Implementation Issues

**April 23, 2007**

**Imperial Valley and Tehachapi Implementation Groups**
**Contract # 500-05-005**

Center for Energy Efficiency and Renewable Technologies
Lead staff - Rich Ferguson, PhD, Research Director
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**California RPS Permit Streamlining Report**
**Contract # 500-05-005**
**Amended Task #19: Transmission Plan Implementation Issues**

Introduction

Transmission availability constrains the state's ability to meet its energy policy goals. The long lead times required for new transmission development make improving the efficiency of permitting and approval processes a priority concern.

Both the Imperial Valley Study Group (IVSG) and the Tehachapi Collaborative Study Group (TCSG) anticipated the permitting work necessary to implement those respective projects, and both made specific recommendations to streamline permitting processes. This report summarizes the permitting-related work of the two planning collaboratives, reviews the recommendations they proposed, and the changes that the CPUC has made in its review and approval processes, which incorporate many of the recommendations of the Study Groups. This report also identifies opportunities for managing permitting processes to help ensure that transmission siting and approvals do not unnecessarily delay bringing renewables generation into service.

## 1. IVSG and TCSG Permitting Activities and Lessons Learned

Both study groups intended: 1) to develop a comprehensive plan for coordinating and expediting environmental studies and permits approvals required for their respective multi-year, multi-phase generation-transmission projects; 2) to initiate preliminary permitting activities; and 3) to recommend policy changes to streamline permit application and approval processes. This section evaluates that work. Future transmission planning collaboratives may be able to benefit from understanding the problems and successes of the IVSG and TCSG as they wrestled with permitting issues.

### 1.1 IVSG Permitting Work Group

The Imperial Valley Study Group established a subcommittee, the Permitting Work Group (PWG), to focus exclusively on permitting issues. PWG members included SDG&E, SCE, non-jurisdictional utilities IID and LADWP, generation developer CalEnergy, Imperial County Planning and Development Services Department, US Bureau of Land Management (BLM), CPUC, California Department of Parks and Recreation ("State Parks"), and other interested groups such as the Sierra Club and Border Power Working Group. The PWG met periodically over seven months to develop a plan for coordinating and expediting the environmental studies and permit approvals required for all phases of the planned renewables/transmission development. The PWG identified coordination of environmental review and the length of time for CPUC and CEC permit approval as key concerns.

Proactive Outreach

The first task the PWG set for itself was to notify all agencies, governmental entities and landowners who would be involved in permitting and approval of the development or might be affected by it. The PWG identified nine federal agencies, seven state agencies and eight county agencies that would have to issue permits or approvals just for the transmission portions of the combined project. Additional local, state and federal agencies would be involved in permitting the geothermal generating plants. The PWG also contacted other entities whose operations might be affected by the proposed development, to inform them of the planning effort. These included the Naval Air Facility in El Centro; the Marine Air Station in Yuma, AZ; March Reserve Air Base in Riverside, CA; Imperial County Airport Land Use Commission; and the Imperial County Farm Bureau. This proactive outreach alerted potentially affected agencies to plan for a major development project. It enabled the IVSG, lead agencies and the key project proponents (SDG&E, IID and CalEnergy) to learn about potential permitting problems and concerns early in the development process.

Programmatic EIR

The PWG then explored the potential to develop one master environmental document to address both the regional benefits and the impacts of exporting renewable energy from the Imperial Valley. The IVSG transmission plan[1] proposed that the 2,200 MW generation-transmission development project be organized into three phases, with Phase 1 in service in 2010 and Phase 3 in service in 2020. This span of over 12 years raised concerns about surveys becoming stale and findings that might not adequately review the environmental effects of the upgrades at the time they would be constructed. Avoiding any appearance of "piece-mealing" was also an issue: If each entity analyzed only its own separate component of a larger transmission plan, there might be concerns that the effects of the project were not analyzed as a whole but divided into smaller components to avoid finding significant impacts. The PWG also grappled with who should be the lead agency for this high-level environmental review document, given the involvement of both jurisdictional and non-jurisdictional utilities.

The PWG concluded that a programmatic approach provided the best vehicle to address these concerns. The first step would be a broad, Programmatic EIR (P-EIR) that would take its project description from the development plan drafted by the IVSG. The advantage of a P-EIR with follow-on tiers is that the high-level framework is analyzed first. Future specific projects can then rely on the prior environmental assessment. The P-EIR would include at a high level:

- Impacts from the development of renewable resources in the Imperial Valley;
- Impacts from the upgrades of the IID system necessary to deliver geothermal/ renewable energy out of the IID control area;

[1] Development Plan for the Phased Expansion of Transmission to Access Renewable Resources in the Imperial Valley, September 30, 2005. Available at www.energy.ca.gov/ivsg.

- Impacts of a 500 kV line from Imperial Valley to San Felipe and on to San Diego;

- Impacts of a 500 kV line from the proposed Indian Hills substation to Upland, possibly including a connection to the IID Coachella Valley substation.

In the P-EIR, each of these four component projects would have its own separate environmental documentation, and different lead agencies. By cooperating on the P-EIR, and sharing the study results for each utility's component of the project, the parties could save time and cost. This would allow future specific projects to tier off of the prior "big picture" environmental review. The PWG further proposed to involve resource and permitting agencies in the development of the programmatic document, in order to identify all areas of concern for detailed analysis and expedited consideration in the follow-on documents.

As with all IVSG committees, the PWG posted detailed minutes of its meetings on the IVSG web site to facilitate information flow and maintain transparency in its work. Research and discussions among participants led the PWG to conclude that a joint P-EIR would be the most efficient way to organize permitting activities for the combined generation-transmission development. Ideally, the programmatic review would be conducted and the P-EIR approved prior to the more detailed environmental analysis for the individual project components.

The PWG concluded its work by securing an agreement among IID, SDG&E, LADWP and CalEnergy to enter into a Memorandum of Understanding for sharing the cost of the P-EIR and the work of writing the descriptions of each entity's development plans. Resource agencies and permitting authorities were to be invited to participate in the P-EIR Working Group, but would not be parties to the MOU because they would not have cost responsibilities.

Lead Agencies

The PWG also recommended that IID act as the CEQA Lead Agency on the P-EIR. IID's discretionary action triggering CEQA would be the approval by its Board of Directors of the proposed construction of the IID Green Path transmission plan, as part of the utility's system reliability upgrades.

The PWG discussed having the CPUC participate in the planning process on the programmatic document, either on the steering group or as a responsible agency under CEQA. Such participation might enable the CPUC to utilize the P-EIR as the Proponent's Environmental Assessment (PEA) required in the CPCN application process for jurisdictional utilities. If the CPUC would be willing to do this, it could reduce the normal processing time of a CPCN application by several months.

### Corridors and Rights of Way

The U.S. Bureau of Land Management (BLM)—both the El Centro and Palm Desert Field Offices—were instrumental in the PWG. BLM identified the existing utility corridors that have been designated in the California Desert Conservation Plan areas in Riverside and Imperial Counties. The PWG investigated the feasibility of doing one NEPA document with the BLM to designate new utility corridors, in which utility Rights of Way could be granted for the project, but could not reach consensus. All utilities had concerns about corridors being placed in their service territories which might allow other utilities to build within existing systems. In addition, SDG&E and LADWP were still investigating routing alternatives and were unable to identify potentially workable corridor locations precisely enough. The PWG subsequently abandoned the idea of developing one NEPA document to amend the Desert Plan for the purpose of adding utility corridors. This means that NEPA documents to amend the Desert Plan will have to be developed in conjunction with the EIRs or EAs for the second tier of Imperial Valley generation/transmission development. The utilities did, however, agree to identify corridor locations so that such corridors could be presented in the P-EIR.

### IVSG Permit Streamlining Recommendations

IVSG members have extensive experience with local, state and federal permitting and approval processes. The context of IVSG recommendations for streamlining permitting processes is explained in Section 4.3 of the IVSG Report referenced above. In its report, the IVSG Steering Committee proposes that the CPUC and CEC take specific steps to reduce approval times and make the overall environmental study and permitting processes more efficient. These recommendations are presented in Appendix A below.

## 1.2 TCSG Permitting Activities

Unlike the IVSG, which was convened and facilitated by a consultant under contract to the CEC, the TCSG was organized and directed by Energy Division staff of the CPUC. The CPUC declined stakeholder requests to form a subcommittee of the TCSG dedicated to permitting issues. Instead, CPUC CEQA staff participated in some TCSG meetings and advised participants on permitting issues likely associated with a multi-phase, multi-year generation-transmission development project. The TCSG devoted much less time to permitting issues than the IVSG, and never developed a plan for coordinating permitting activities for the overall project.

### Outreach Activities and Agency Agreements

At the beginning of the TCSG process, wind power generation companies recruited the active participation of Kern County officials, the Commander of nearby Edwards Air Force Base and the US Department of Defense. Using the TCSG as a forum, these parties negotiated an agreement specifying where wind turbines and transmission towers could be sited in relation to US Air Force over-flight routes and Air Base radar in the Tehachapi

region. This agreement removed a potentially fatal obstacle to large-scale wind power development in the region. The wind companies and Kern County also agreed on an approach to pursue permitting of the multi-phase project with local agencies. These two agreements are among the TCSG's most useful accomplishments.

Programmatic Approach Deemed Infeasible

CPUC CEQA staff concluded at the outset of the TCSG that Tehachapi development was best advised not to employ a P-EIR process to organize environmental study and permitting. Staff reasoned that initial studies might become outdated during the long-timeframe of the multi-year development and have to be re-done, and that the large and varied territory required for the combination of wind projects and transmission lines would make a comprehensive environmental document unwieldy. This stands in direct contrast to the IVSG which, also with CPUC CEQA staff advice, reached a different conclusion and actually laid the groundwork for a P-EIR. CPUC CEQA staff never satisfactorily explained why a P-EIR made sense for Imperial Valley development but not for Tehachapi development.

Lacking both a framework for organizing permitting activities for the overall multi-phase project and a subcommittee devoted to routing and permitting concerns, the TCSG focused elsewhere. The TCSG did review environmental and permitting problems with a few specific route segments, but did not address larger policy approaches such as transmission corridor reservation. Tehachapi development posed critical cost-recovery issues, and almost all TCSG work not devoted to detailed transmission planning focused on those. Permitting issues never became a primary concern of the Study Group.

TCSG Permit Streamlining Recommendations

Like the IVSG, many TCSG participants had extensive experience with environmental study and approval processes and were keen to recommend changes to speed up those processes and make them more efficient. The TCSG's specific recommendations are itemized in Appendix B below.

## 1.3 Evaluation of IVSG and TCSG Permitting Activities and Lessons Learned

Establishing a subcommittee to work exclusively on environmental study, corridor reservation and permitting issues enabled the IVSG to advance the development schedule of the anticipated geothermal power and transmission projects in that region. Contacting and seeking to recruit participation from affected agencies and interests helped raise awareness of the projects and generated information about stakeholder concerns early in the permitting process. Having lead project proponents—IID, SDG&E, LADWP and CalEnergy—with a strong interest in expediting the development schedule kept the Permitting Work Group focused on identifying priority permitting problems and on building cooperation among agencies and proponents to solve them. Agreement to form an MOU Group to jointly develop a P-EIR for the overall multi-phase project was a useful accomplishment.

The TCSG, in contrast, did not from a permitting subcommittee, did not systematically contact potentially affected interests to inform them about the project, did not develop a plan for organizing overall permitting for the multi-phase Tehachapi project, and did little to coordinate or develop cooperation among agencies and project proponents. Future transmission planning study groups would be well advised to establish a work group to take on such tasks.

The IVSG devoted significant attention to corridor identification and permitting issues because IID, SDG&E, LADWP and CalEnergy were all willing project proponents, intent on near-term development. With TCSG, only the wind power generation companies were willing proponents. Throughout the TCSG period, uncertainty surrounding its ability to fully recover the costs of non-network transmission upgrades undermined SCE's cooperation until such concerns were resolved by designing the new transmission as network facilities.[2] LADWP refused to participate in the TCSG despite owning and operating transmission in the Tehachapi area that could have been part of the overall Tehachapi Transmission Plan. PG&E resisted all study of power flowing from Tehachapi to its system. The lesson here is to plan study group efforts around willing proponents to the extent possible, and to resolve policy uncertainties (such as cost recovery) before beginning transmission planning work.

But despite having willing proponents, the IID Green Path-Sunrise Powerlink ("SunPath") remains mired in controversy due to its proposed routing across Anza Borrego Desert State Park—18 months after the IVSG recommended its transmission development plan with consensus stakeholder support. The IVSG studied routings for taking power from the Imperial Valley to the south (both into Mexico and paralleling the existing Southwest Powerlink) and to the northwest, in order to avoid crossing Anza Borrego, but concluded that such routings were electrically or politically infeasible. In view of the obvious concerns about routing a 500 kV line through a state park, the IVSG contacted the director of the California Department of Parks and Recreation and requested her to personally monitor the IVSG process and to assign staff to participate actively in IVSG meetings. State Parks staff attended every IVSG steering committee meeting, and did not speak against the consensus recommendation of the final transmission plan. IVSG members met several times with the Anza Borrego Park Superintendent and his staff to discuss line routing alternatives. These interactions, with State Parks staff always cooperative, led the IVSG steering committee to believe that a routing could be found through the park that State Parks could live with, however reluctantly. SDG&E subsequently filed a CPCN application for the Sunrise Powerlink with a proposed routing through the park. State Parks now strongly opposes this routing, for many valid and appropriate reasons; the CPUC has ordered additional study of routing alternatives in the SDG&E Sunrise Powerlink CPCN application proceeding.

[2] SCE, to its great credit, took the initiative to propose special rate treatment for renewable energy trunk lines. After FERC rejected this rate treatment in June 2005, the CAISO developed another approach to FERC on this issue, which is still under consideration there.

State Parks apparently did not view the IVSG as a forum for contesting a routing across the park, or for pressing for further study of non-park alternatives. The Sierra Club also largely declined to engage with the IVSG, despite repeated attempts encouraging them to do so. Some interveners calculate that refusing to collaborate in early-stage project design and waiting to register formal objection until late in the approval process improves the chances of blocking unwanted projects. These dynamics underline the need for a corridor establishment process, which would limit environmental impacts—and the controversy surrounding them—to relatively small geographical areas. Corridor permitting would also seek to resolve environmental issues in one proceeding so that infrastructure projects using the already-permitted corridor could later be built more quickly.

## 2. Permit Streamlining Activities Recommended by the IVSG and TCSG

The experience of study group members with the application and approval processes led the TCSG and the IVSG to make very similar recommendations for expediting permitting and approval processes and for making them more efficient. Study Group recommendations focused on these key issues:

- Eliminating duplication of environmental study effort, so that only one environmental report is required, rather than one produced by an applicant and one by the CPUC. This requires amendment of General Order 131-D.

- Retaining CPUC environmental consultants under on-call contracts enabling them to start work on short notice; or alternatively, hiring consultants in advance of the filing of CPCN applications.

- Consolidating NEPA/CEQA reviews or better coordinating federal agency study and approval processes with CPUC study and approval.

- Utilizing an existing environmental document in lieu of a Proponent's Environmental Assessment (PEA) where applicable.

- Reducing the time required for the CPUC to deem an application complete and free of deficiencies.

- Avoiding relitigation of electromagnetic frequency (EMF) policy in every proceeding.

In addition, the IVSG made recommendations for expediting the CEC plant-siting approval process for the specific case of geothermal projects in the Imperial Valley. One recommendation proposed that the CEC adopt the engineering studies of alternative transmission routings and configurations conducted by the IVSG (in collaboration with all transmission owners in the region) to satisfy the required investigation of transmission and connection alternatives required by the CEC. Another proposed transferring plant

licensing authority and CEQA responsibilities from the CEC to Imperial County, which has extensive experience with the permitting and operation of geothermal plants.

## 3. Evaluation of Recent Permitting Process Changes Made by the CPUC

The CPUC has been aware of delays attributable in part to its own approval processes. As outlined in the Second Report of the Tehachapi Collaborative Study Group, for example, CPUC Energy Division staff identified issues that have in recent years resulted in schedule delays in reviewing and approving permit applications.[3] Meanwhile, California Renewable Portfolio Standard (RPS) requirements urge rapid development of transmission to access renewable resources in both the Tehachapi and Imperial Valley regions. In response, the CPUC opened a proceeding, Investigation 05-09-005 to, among other things, find ways to streamline permitting for priority projects like Tehachapi.

This proceeding included a CPUC Energy Division briefing on November 15, 2005; a workshop on December 6, 2005; and, with the CPUC CEQA Division, a second workshop on March 23, 2006. These workshops reviewed the CPUC study and approval process for major transmission projects and solicited recommendations for improving it. Many of the recommendations, as documented in the joint Energy Division-CEQA Report on the March 23 workshop[4] are those also recommended in the Second Report of the TCSG referenced above.

As a result of this review and in recognition of party comments, the CPUC promulgated Transmission Project Review Streamlining Directives in a statement by the CPUC Executive Director on July 13, 2006. These directives are included as Appendix C below.

These directives implement many of the changes recommended by the TCSG and IVSG, and institute additional process improvements as well. Specifically, the directives:

- Require regular Energy Division management-level meetings with local, state and federal agencies involved with environmental review of California transmission projects, to ensure open communication and adherence to project schedules.

- Allow an Applicant to submit a Pre-Filing Notification six months prior to filing an Application. This is intended to enable the CPUC to hire consultants and obtain California Department of General Services approval of contracts for those consultants before the Application is filed. Regular pre-filing meetings with the Applicant then enable the CPUC and the Applicant to determine the appropriate scope of the project, and to identify and resolve potential deficiencies in the Application before it is filed.

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[3] Development Plan for the Phased Expansion of Electric Power Facilities in the Tehachapi Wind Resource Area, pp. 98-100. Filed in I.00-11-001 and I.05-09-005, April 19, 2006. Available at ftp://ftp.cpuc.ca.gov/tehachapi.

[4] Filed April 14, 2006 in I.05-09-005.

- Encourage an Applicant to submit a draft PEA, on a partially complete basis with updates, at least three months in advance of filing an Application.

- Require the Energy Division and the Applicant to address permitting requirements and potential roadblocks with all relevant local, state and federal agencies during the Pre-Filing Notification period.

- Require the Energy Division to deem a PEA complete or deficient within 30 days of filing. Where the Applicant has complied with Pre-Filing Notification requirements, this determination is to be made as soon as possible, without taking the entire 30 days.

- Require the Energy Division, within 30 days of deeming a PEA complete, to decide whether to prepare a negative declaration (ND), a mitigated negative declaration (MND), or an environmental impact report (EIR).

- Require the Energy Division to publish a final schedule for MND or EIR completion within 30 days of deeming an Application complete; Assigned Commissioner and/or ALJ to calendar and a notice a pre-hearing conference and develop a schedule for the proceeding.

- Limit Energy Division analysis of EMF to assessing the Applicant's compliance with the CPUC "prudent avoidance" and "low-cost/no-cost" principles established in D.93-11-013 and D.06-01-042.

Taken together, these directives represent a comprehensive streamlining of CPUC study and approval processes. They appear responsive both to the recommendations of Applicants and other parties involved in or affected by CPUC permitting, and to the interest of the state in expediting the development of new transmission projects.

As indication that these directives are being implemented effectively, the CPUC points out that SDG&E's voluminous application for its proposed Sunrise Powerlink was deemed complete five days after the utility submitted information addressing deficiencies identified by the Energy Division.

### 4. Opportunities to Expedite Renewables-Transmission Development

In addition to these improvements in internal CPUC approval processes, three other mechanisms offer the potential to expedite permitting-related aspects of development: state-led proactive management of large development projects; establishment of transmission corridors and consolidation of permitting for the generation and transmission accessed via the corridor; and anticipation of deliverability upgrades associated with new high voltage corridors. Each is discussed below.

## 4.1 Proactive Management of Large Development Projects

Most of the transmission necessary to access renewables will be built (as in the case of Tehachapi, for example) by only one or a few companies. Wind generation will be built by several companies; and many local, state and federal agencies are involved in studying and approving aspects of the overall project. These various parties have different interests and different schedule priorities. Most foreseeable renewables-transmission development projects are likely to present equally complex approval profiles. In these situations, a state-appointed project manager can help expedite development.

In its Second Report, the TCSG urged the CPUC to adopt a project management approach for major generation-transmission projects like Tehachapi, to facilitate better control of schedule, early identification of problems or sources of delay, and to promote transparency. In response to this recommendation, the CPUC appointed a project manager for the Tehachapi Transmission Project in May 2006.

In this approach, the CPUC acts as the project manager for the development of all Tehachapi transmission facilities. It establishes a detailed work plan and milestone schedule for all phases of the development, and acts to ensure achievement of the milestones. This schedule and work plan clarifies exactly when the CPUC must order IOUs to complete studies and file applications, and the dates by which the Commission must approve applications. It also identifies other Commission action, including coordinating procurement activities with the transmission development schedule, and providing cost recovery assurance.

To date, the CPUC Tehachapi project manager has been helpful in expediting agreement among SCE, the CAISO and other stakeholders on a final plan of service for all upgrades required for the export of 4,500 MW of wind power from Tehachapi, and on a schedule for this development. This schedule has in turn helped the CPUC set dates for the application and approval of every segment of the overall project. It is too early to tell how effective this project management approach is in anticipating and then in helping to resolve issues in any aspect of project implementation that threaten delay or failure to meet schedule milestones, or for how effective it is in coordinating generation-related issues with transmission development issues. But given the interest of the state in expediting the in-service date of transmission-dependent renewables, it appears to make sense to have a representative of the CPUC or CEC responsible, first, for getting parties to agree on a consensus milestone schedule for the development of each major project, and then for ensuring progress against that schedule.

## 4.2 Corridors and Comprehensive Permitting Plans

Increasing population density in almost every area of the state, and increasing concern about energy sector environmental impacts combine to make transmission line siting ever more controversial, and thus an ever more expensive and lengthy process. An effective mechanism for managing the costs and delays of transmission routing approval appears to

be designation of energy infrastructure corridors, and physical acquisition of the Rights of Way for such routings by utilities and/or a state agency.[5] After environmental study and public comment and review, such corridors could resolve permitting issues for transmission routings in many parts of the state. This would enable the transmission required to access both renewable and traditional generating resources to be essentially pre-permitted, and therefore approved in much less time than would otherwise be required.

It may be possible to focus development of a large percentage of the state's renewable resources into a small number of transmission corridors. Because geothermal, wind and solar (CSP) generation can be developed only where these resources are found, transmission must thus be built to these areas. Certain regions of the state have high densities of one or a combination of these resources, making it possible for a small number of transmission corridors to provide to access large quantities of such generation. CPUC Decision 04-06-010 (issued June 9, 2004) recognized this fact and, by outlining an agenda of developing large-scale transmission in advance of interconnection requests took a first step toward organizing access to renewable resources into corridors. Corridors may also combine power flows from renewables projects with flows from traditional generation, to ensure non-discriminatory transmission access.

Corridors are intended to resolve future permitting issues today, and then to provide an approved physical infrastructure route for an indefinite period of time. Both the generating projects and the transmission facilities in a corridor are likely to be developed in phases, over many years. The corridor provides both a geographic framework and a temporal framework for planning and coordinating permitting activities for multi-phase, multi-year development.

Consolidating the permitting of generating facilities associated with a corridor with permitting of the transmission corridor itself also stands to expedite environmental study and approvals. The Programmatic EIR or master permitting plan for a corridor can be structured to encompass generation siting study and mitigation requirements for currently planned units. Environmental review of further development in the corridor not originally anticipated, such as additional generating units, could build on and take advantage of the corridor EIR to facilitate permitting at a later date. The potential schedule savings from consolidating generation and transmission permitting this way are significant.

[5] Under current CPUC policy, IOUs can acquire land for transmission Rights of Way, by eminent domain where necessary, and to hold it in their rate base for up to five years. In practice, utilities are reluctant to exercise this right. Long-term protection of transmission corridors would further require ROW to be held indefinitely. Both problems could perhaps be addressed by transferring title, without compensation, to a state-supervised "ROW bank" until a transmission project is built on that ROW and the title is transferred back to the constructing and owning utility. Release of the land to the public could also be provided for, in the event that it is later decided that such reserved ROW will never be utilized for transmission purposes.

### 4.3 Anticipate Deliverability Upgrades Associated With New High Voltage Corridors

The Tehachapi Transmission Project required only a few new transmission lines to connect the large amount of wind power in that region to the high-voltage grid. But it required many existing lines to be upgraded, in order to allow power to flow without congestion through a large area of the Southern California load center. These upgrades are more expensive and will require at least as much time to permit as the new connections, in large part because these upgrades are in heavily populated regions and in areas of the grid where it is difficult to take lines out of service to upgrade them; they drive the delay in completion of the overall project to 2013.

Bringing large amounts of new generation through corridors to one or even a few major substations will almost certainly require those substations to be expanded, and will likely require transmission facilities downstream of those major delivery points also to be upgraded. To the extent possible, environmental study and permitting for such upgrades should be anticipated and planned along with the approval of the corridor itself. Building such permitting work into application for the corridor can save several years of permitting time and expense.

These three mechanisms, together with the approval process changes recently implemented by the CPUC, make it possible to manage environmental study and permitting so that these activities do not unnecessarily delay bringing more renewable generation on line.

Glossary

| | |
|---|---|
| BLM | US Bureau of Land Management |
| CAISO | California Independent System Operator |
| CEC | California Energy Commission |
| CEQA | California Environmental Quality Act |
| CPCN | Certificate of Public Convenience and Necessity |
| CPUC | California Public Utilities Commission |
| CSP | Concentrating Solar Power |
| EA | Environmental Assessment |
| EIR | Environmental Impact Report |
| EMF | Electromagnetic Frequency |
| FERC | Federal Energy Regulatory Commission |
| IID | Imperial Irrigation District |
| IOU | Investor Owned Utility |
| IVSG | Imperial Valley Study Group |
| LADWP | Los Angeles Department of Water and Power |
| MND | Mitigated Negative Declaration |
| MOU | Memorandum of Understanding |
| MW | Megawatt (1,000 kW) |
| ND | Negative Declaration |
| NEPA | National Environmental Policy Act |
| PEA | Proponent's Environmental Assessment |
| P-EIR | Programmatic Environmental Impact Report |
| PWG | Permitting Work Group (of the IVSG) |
| PG&E | Pacific Gas & Electric Company |
| PIER | CEC Public Interest Energy Research Program |
| RPS | Renewable Portfolio Standard |
| SCE | Southern California Edison Company |
| SDG&E | San Diego Gas & Electric Company |
| State Parks | California Department of Parks and Recreation |
| TCSG | Tehachapi Collaborative Study Group |
| WAPA | Western Area Power Administration |
| WECC | Western Electricity Coordinating Council |

Appendices

Appendix A: IVSG Permit Streamlining Recommendations

In its final report, the IVSG Steering Committee highlighted the following options for expediting permitting and project approvals processes. The full report is available at: www.energy.ca/gov/ivsg.

CPUC:

- Request the CPUC to amend General Order 131-D to eliminate the current duplication of environmental study efforts, so that only one environmental report is required (rather than one produced by an applicant and one by the CPUC).

- Request the CPUC to employ on-call contracts for its environmental consultants.

- In the absence of on-call contracting ability, request the CPUC to hire its environmental consultant before the IOU files its CPCN application (or at the time the applicant files the purpose and need portion of the CPCN application).

- Allow the state Lead Agency to assign an environmental consultant to work with the utility's (or applicant's) environmental consultant concurrently. This would enable the state Lead Agency's environmental consultant to be involved during a project's route selection, to help shape the PEA during the final four to six months of its development so that it can quickly be converted into an EIR. This option promotes earlier resource agency involvement.

CEC:

- Use CEC public review of the IVSG report (e.g., in the IEPR proceeding) to be counted as one of the public meetings necessary in the CEC plant-siting approval process. This could save one month or more in this approval process.

- The CEC plant-siting process requires investigating alternative lines/connections. IVSG transmission studies, which have been rigorously conducted by expert stakeholders, should help expedite the CEC's investigation of such alternatives.

- Power Plant Permitting: In the case of Imperial Valley renewable resources, transfer licensing authority and CEQA responsibilities from the CEC to Imperial County.

- Permitting Salton Sea Unit 6 required 15 months from the time the CEC found the Application for Certification (AFC) to be "data adequate" in September 2002 to

the formal approval of the AFC in December 2003.[6] By contrast, CalEnergy's 49 MW Salton Sea Unit 5 was permitted by Imperial County in less than four months. Imperial County has approved a resolution authorizing its Planning and Building Department to obtain siting authority from the CEC for plants up to 200 megawatts. The County believes that its 35 years of experience in processing geothermal plant permits, in combination with appropriate land use ordinances mandated in its General Plan gives it the expertise to satisfy CEQA requirements and other concerns.[7]

Federal:

- Expedite the environmental review for transmission projects in designated utility corridors once they are established. This involves the consideration of contingent corridors that would be evaluated at a programmatic level, and then elevated to 'designated' status upon a more detailed review at a project level.

[6] Salton Sea Unit 6 was the first geothermal power plant to be permitted by the CEC in more than 15 years. It is reasonable to assume that the staff's "learning curve" associated with this permitting effort significantly lengthened the overall permitting process.

[7] The Imperial County General Plan contains a "Geothermal Element" developed to provide guidelines for permitting geothermal energy plants. Imperial County has used those guidelines to permit more than 14 plants. In conjunction with the Geothermal Element, Imperial County also prepared a Master Environmental Impact Report for the Salton Sea KGRA. This EIR is updated regularly.

**Appendix B: TCSG Permit Streamlining Recommendations**

In its Second Report (filed at the CPUC April 19, 2006 in I.05-09-005), the Tehachapi Collaborative Study Group first described (report section 7.4) the existing CPUC permitting process, and then in section 7.5 recommended actions to streamline this process:

- CPUC consultants should not duplicate applicant's environmental analysis.
- CPUC should focus only on the requirements of CEQA.
- EMF policy should not be relitigated in every proceeding.
- CPUC needs to follow the required time frames for handling protests to 131-D exempt projects.
- Utility should be able to use an existing environmental document in lieu of a PEA where applicable.
- CPUC should avoid time consuming EIRs when a mitigated negative declaration would be appropriate with up-front negotiated mitigation measures.
- CPUC needs to start contract process prior to application filing to avoid review delays.
- CPUC needs to fully utilize PEA for preparing a MND or EIR and not duplicate efforts.
- CPUC should consider ways to consolidate NEPA/CEQA reviews.
- There needs to be more up front collaboration and cooperation.
- CPUC needs to adopt internal procedures to ensure compliance with Permit Streamlining Act and 131-D timeframes.
- CPUC should consider general changes in process to streamline and expedite the CPCN/PTC approval process.
- CPUC should consider separating the approval of a transmission corridor from the approval of the detailed siting and engineering of the transmission towers within the corridor.

The CPUC Energy Division has also found that the process has not always gone as smoothly and expeditiously as possible. There are numerous reasons for this situation including the following:

- The existing mandated state contract process takes 3 to 4 months, and is often not initiated prior to the application filing. This tends to extend out the time for PEA deficiency review and consultant preparation of the EIR or MND documentation.
- The contract process was not conducted in a reasonable amount of time.
- At the time of filing, the PEA has numerous deficiencies.
- In a joint EIR/EIS (environmental Impact statement), the memorandum of understanding (MOU) agreement was not done up front in a timely manner which allows co-lead agency issues to go unresolved for long periods of time.

- At the time of filing, up-front strategic planning was not done for handling and resolving known issues between ED and their consultant and, if applicable, with co-lead agency.
- The applicant is not timely with responses to PEA deficiencies or data requests as required by ED staff and consultant to maintain schedule.
- The ED staff and/or consultant do not adhere to the agreed upon schedule or there was not an up front commitment to a schedule by all parties.
- There was higher than anticipated public and agency controversy which in turn required more meetings, more alternative analysis, more required documentation on impacts and mitigation, and a longer proceeding with hearings, briefings, etc.
- ED staff, their consultant, and/or the applicant did not anticipate issues that later seriously impacted the schedule.
- The ALJ proceeding schedule is longer for any number of reasons.

In light of these comments on the existing permitting process and similar recommendations from the Imperial Valley Study Group, CPUC Energy Division CEQA Unit staff prepared a memo to Commissioner Grueneich responding to the parties' comments and provided preliminary recommendations on streamlining the transmission permitting process. At the direction of Commissioner Grueneich, Energy Division staff then convened a workshop for March 23, 2006 to discuss permitting issues and to allow comments on the Energy Division staff's preliminary recommendations on streamlining the permit process.

The CPUC Transmission Project Review Streamlining Directives resulting from this process are presented in Appendix C below.

## Appendix C: CPUC Project Review Streamlining Directives

### Executive Director's Statement
### Establishing Transmission Project Review Streamlining Directives

Through this Statement, and pursuant to my authority under Section 308 of the California Public Utilities Code, I hereby establish these "Transmission Project Review Streamlining Directives" ("Directives") to ensure that each Division within the California Public Utilities Commission ("CPUC") conducts procedures under its control and related to transmission facility siting and permitting in the most efficient and coordinated manner possible, and to encourage coordination in project review among the CPUC, project applicants, and other state and federal agencies.

### I. OVERVIEW

In Energy Action Plan II ("EAP II"),[8] the CPUC committed to, among other things, streamline CPUC approval processes in order to facilitate meeting the targets established by California's Renewables Portfolio Standard ("RPS") legislation.[9] Almost in parallel to this EAP II commitment, the CPUC opened its Order Instituting Investigation No. 0509-005 ("OII") in September 2005 to identify barriers to the construction of transmission infrastructure necessary to meet California's RPS goals. Parties to the OII, through workshops and filed comments, have assisted CPUC staff in identifying those CPUC transmission permitting procedures that could be streamlined to facilitate the timely development of needed transmission infrastructure

Thus, the CPUC's EAP II commitment, combined with unanimous support from parties in the OII for such a streamlining effort, have resulted in the development and adoption of these Directives. These Directives should streamline the transmission project permitting process, thus resulting in more efficient and timely project review, by, among other things:

- Stating explicitly, in one document, the steps that must be taken by CPUC Divisions to streamline the transmission siting and permitting process, thus making these obligations express and transparent;
- Establishing pre-filing guidelines for project applicants to follow if they desire to take advantage of the streamlining benefits of these Directives;
- Setting explicit time frames for action, whether required by law or self-imposed;
- Requiring coordination among CPUC Divisions; and
- Establishing a process for the CPUC to work with other California agencies critical to the CPUC's transmission project review procedures.

[8] Energy Action Plan II: Implementation Roadmap for Energy Policies, October 2005. Available at: http://www.cpuc.ca.gov/static/energy/electric/energy+action+plan/index.htm

[9] See Cal. Pub. Utils. Code §§ 387, 390.1, 299.25, and 399.11, et seq.

These Directives do not change any CPUC rule, regulation, or order. Rather, they reflect changes to internal CPUC procedures, or make express commitments to comply with existing legal obligations. In addition to ensuring greater coordination between the CPUC and project applicants, these Directives should ensure coordination among CPUC Divisions so as to avoid some of the Application processing delays identified in the OII. However, these Directives are not intended to abrogate the CPUC's obligation to independently review any application.

Significantly, these Directives, to the extent they apply to project applicants, are voluntary. However, to the extent a project applicant seeks to obtain the streamlining benefits of these Directives, it must meet its side of the bargain. Streamlining cannot succeed without a commitment from both the project applicant and the CPUC. These Directives represent the CPUC's commitment, provided a similar commitment from a project applicant, to work cooperatively and to quickly meet established schedules.

Finally, while the CPUC's efforts to date have focused on transmission related to renewable resources, these Directives apply to all transmission projects, not just those intended to facilitate RPS goals. To the extent appropriate, these Directives apply to both applications for Permits to Construct ("PTCs") as well as applications for Certificates of Public Convenience and Necessity ("CPCNs").

## II. GENERAL STREAMLINING DIRECTIVES

A. All CPUC Divisions shall coordinate and act to obtain the CPUC's compliance with all time requirements established by the CPUC's General Order 131-D ("GO 131-D"),[10] the California Environmental Quality Act ("CEQA"),[11] and the Permit Streamlining Act[12] in processing applications for Permits To Construct ("PTCs") and Certificates of Public Convenience and Necessity ("CPCNs") (together "Applications").

B. Energy Division shall follow the required GO 131-D timeframes for processing Notices of Exempt Construction ("NOCs") and any protests, including ensuring that the CPUC Executive Director's Resolution is issued within 30 days, as required by GO 131-D.

C. Energy Division shall develop a plan for regular management-level meetings with local, state and federal agencies overseeing California transmission projects and environmental review thereof to ensure open communication and adherence to project schedules.

## III. PRE-FILING STREAMLINING DIRECTIVES

[10] GO 131-D is available at: http://www.cpuc.ca.gov/PUBLISHED/Graphics/589.PDF.

[11] Cal. Gov. Code §§ 65920-65963.1.

[12] Cal. Pub. Res. Code §21000 et seq.

A. An applicant for a transmission project that seeks streamlined review of its Application ("Applicant") pursuant to these Directives shall notify the Director of the CPUC's Energy Division in writing at least six months prior to filing an Application ("Pre-Filing Notification") so that the CPUC may initiate internal procedures to prepare for receipt of the Application, including initiation of any internal contracting process. The Pre-Filing Notification shall include sufficient project information to initiate the CPUC's internal contracting process, including, without limitation, the following:

1. A specific description of the location of the project;
2. A description of the project and any accessory facilities; and
3. A proposed project schedule.

B. Energy Division shall, upon receipt of a Pre-Filing Notification:

1. Initiate any necessary internal contracting process and shall endeavor to complete the contracting process with the California Department of General Services ("DGS") within three months or less of the Pre-Filing Notification.
2. Establish a schedule for regular Pre-Filing meetings with the Applicant.

C. Energy Division (including any necessary consultants) and the Applicant shall participate in the Pre-Filing meetings. The goals of the Pre-Filing meetings shall include, without limitation, to:

1. Ensure open, regular, and meaningful communication between the CPUC and the Applicant;
2. Identify and timely resolve potential deficiencies in the Application so that when an Application is ultimately filed deficiencies are limited or nonexistent so that the CPUC can process the Application as quickly as possible;
3. Determine the appropriate scope of the project;
4. Provide substantive comments on an Applicant's administrative draft Proponent's Environmental Assessment ("PEA") or equivalent information, particularly with regard to its compliance with GO 131-D and the PEA "Information and Criteria List" contained as Appendix B to CPUC Decision No. 89905;[13] and
5. Avoid duplication of work and reduce deficiencies.

D. An Applicant shall endeavor to submit to Energy Division, at least three months prior to filing an Application, an administrative draft PEA or equivalent information consistent with GO 131-D and the Information and Criteria List. Such a submission may be on an incremental or rolling basis, upon agreement between Energy Division and the Applicant, in order to facilitate timely preparation and review of the draft PEA or equivalent information.

[13] The Information and Criteria list is available at http://www.cpuc.ca.gov/static/energy/environment/infocrit.htm

E. Energy Division and the Applicant shall consult with all relevant local, state, and federal agencies to address permit requirements and other project-related issues and potential roadblocks during the Pre-Filing Notification period. To the extent it would be helpful, the CPUC encourages Applicants to engage in public outreach through open houses or other forums during this period.

F. If CEQA requires a joint Environmental Impact Report/Environmental Impact Study ("EIR/EIS"), Energy Division shall negotiate, and the Executive Director shall execute, a Memorandum of Understanding ("MOU") with the co-lead federal agency during the Pre-Filing Notification period. The MOU shall:

1. List each agency's responsibilities;

2. Describe how issues will be resolved between the agencies; and

3. Set forth a detailed schedule for document completion.

## IV. POST-FILING STREAMLING DIRECTIVES

A. Energy Division shall, pursuant to GO 131-D, deem a PEA complete or deficient within thirty days of its filing and shall provide written notice of such a determination to the Applicant, the Assigned Commissioner, and the Assigned Administrative Law Judge ("ALJ"). In the event an Applicant has complied with the Pre-Filing Notification requirements, Energy Division shall endeavor to make this determination pursuant to GO 131-D as expeditiously as possible, rather than taking the entire thirty day period to review the application.

B. Energy Division shall, within thirty days of deeming a PEA complete, and pursuant to CEQA, decide whether to prepare a negative declaration ("ND"), a mitigated negative declaration ("MND"), or an environmental impact report ("EIR"). Using the PEA, and any supplemental information, Energy Division shall prepare an initial study to make this determination; or determine that an EIR is clearly required pursuant to CEQA, and therefore not prepare an initial study.

C. If applicable, Energy Division shall develop a final schedule for MND or EIR completion within thirty days of deeming an Application complete and shall provide written notice of such final schedule to the Applicant, the Assigned Commissioner, and the Assigned ALJ. All participants in the Application process, including the CPUC, its consultants, the Applicant, and any co-lead agency shall be expected to adhere to the schedule.

D. In developing environmental documents, Energy Division and its consultants shall comply with CEQA and its Guidelines 7 in determining the content of such documents and the level of analysis required. Further, consistent with legal

requirements, the EIR document shall identify and focus on the significant environmental effects of the proposed project.[14]

E. If preparing a MND, Energy Division shall work with the Applicant to develop project modifications and/or mitigation measures that would allow for the public release of a MND that can be adopted within six months of the determination that the PEA is complete, pursuant to CEQA requirements.

F. If preparing an EIR, Energy Division shall immediately address unresolved issues internally and/or in concert with the Applicant. Energy Division shall develop a strategic plan for resolution of any unresolved issues that maintains the EIR schedule.

G. In preparing any environmental document, Energy Division analysis addressing electromagnetic frequency (EMF) should be limited to assessing the Applicant's compliance with the CPUC's "prudent avoidance" and "low-cost/no-cost" principles, as articulated in CPUC Decision Nos. 93-11-013 and 06-01-042.

H. Energy Division shall closely manage its consultants to ensure strict compliance with CEQA standards and other statutory requirements and adherence to the adopted schedule as well as to ensure that documents are completed at a reasonable cost.

I. An Applicant shall respond as expeditiously as possible to any data requests or deficiency notices submitted by Energy Division or its consultants, particularly during preparation of the environmental document. Energy Division shall promptly notify the Assigned Commissioner and Assigned ALJ of any Applicant delays in responding to data requests.

## V. PROCEEDING PHASE STREAMLINING DIRECTIVES

A. No later than thirty calendar days after Energy Division provides written notice that the PEA is complete, and provides the final schedule for environmental document preparation, the Assigned Commissioner and/or ALJ shall endeavor to calendar and notice a pre-hearing conference ("PHC") to address issues and develop a schedule for the proceeding.

B. The Assigned Commissioner and/or ALJ shall endeavor to issue a scoping memo outlining the issues to be addressed and the schedule for the proceeding as soon as practicable after the PHC, and ideally within a month or less of the PHC. The scoping memo shall establish a schedule to ensure that the Proposed Decision on the Application is issued for the Commission's consideration as soon as possible after issuance of the final environmental document.

C. Consideration of EMF-related issues shall be consistent with the directives in Commission Decision Nos. 93-11-013 and 06-01-042 and should be limited to the

[14] Cal. Code of Regulations, Title 14, Chap. 3 ("CEQA Guidelines"). 8 CEQA Guidelines, Section 15126.2(a).

Applicant's compliance with the CPUC's "prudent avoidance" and "low-cost/no-cost" principles, as articulated in those decisions. As set forth in Decision No. 06-01-042: "prospective policy changes regarding EMF health effects should not be litigated in future utility Certificate of Public Convenience and Necessity (CPCN) or Permit to Construct (PTC) proceedings." Mimeo at 14.

## VI. ADDITIONAL STREAMLINING GOALS

A. The Executive Director will coordinate with the Directors of the Energy Division and the Information and Management Services Division to address:

1. Development of a consistent and efficient internal contracting process necessary to implement these Directives; and

2. Providing necessary staff to ensure that the CPUC can comply with these Directives.

B. The Executive Director will coordinate and implement a plan with the Director of DGS to ensure a more consistent and timely contract review and approval process so that the CPUC can comply with these Directives.

C. The Energy Division Director shall endeavor to obtain project management training for Energy Division CEQA Unit Staff to ensure consistent production quality in CEQA documents produced by the CPUC, compliance with CEQA standards, reasonable production costs, and adherence to adopted schedules.

Date: July 13, 2006 /s/ STEVE LARSON
Executive Director

# APPENDIX BB

California RPS Purchase of Renewable Energy Report

# California RPS Purchase of Renewable Energy Report

## Contract Amended Task #19: Transmission Plan Implementation Issues

**April 23, 2007**

**Imperial Valley and Tehachapi Implementation Groups**
**Contract # 500-05-005**

Center for Energy Efficiency and Renewable Technologies
Lead staff - Rich Ferguson, PhD, Research Director
Contractor Project Manager: Dave Olsen
Commission Project Manager: Clare Laufenberg Gallardo

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**California RPS Purchase of Renewable Energy Report**

1. Urgency of Coordinating Power Procurement and Transmission Development

In December 2006, when the CAISO Board of Governors approved the 4,500 MW Tehachapi Transmission Project, more than 6,000 MW of renewables generating projects had already applied to connect to the grid in the Tehachapi area and were in the CAISO interconnection queue. But the transmission necessary to deliver just the first 4,500 MW of these projects won't be completed until 2013.

For the state as a whole, the CAISO generation queue contains (April 2007) 14,415 MW of wind projects, and 8,490 MW of solar projects, as summarized on Appendix B. Planning for the transmission necessary to connect the great majority of these projects has not yet even begun. More than 4,500 MW of these projects have been in the queue since 2005 or earlier. This average wait time of eight years for transmission service delays meeting policy targets and deprives electric customers of the cost savings deriving from renewables displacing more expensive gas-fired generation.

Transmission development typically has lead times of four to eight years, while utility RFOs for renewable generation have lead times of two years or less. This timing mismatch frustrates the addition of renewables to the state energy mix and drives up costs. It forces generating companies to acquire and hold land, and to pay for interconnection and other studies many years in advance of project construction. It is a key factor in driving renewables generating companies away from California to states able to provide transmission access more quickly. And, as explained by the Tehachapi Collaborative Study Group (TCSG), every year of delay in adding, in its specific case, wind generation, imposes real economic costs on California ratepayers.[1]

Utility procurement of renewables is a driving factor in this timing mismatch. The lack of coordination between procurement and transmission development complicates and extends the schedule for regulatory approvals of needed transmission. In this situation, meeting state renewables goals depends heavily on a policy of building transmission in advance of generation. Both the CPUC and the CEC have recognized the need for and have taken steps to support proactive transmission development; the CAISO has petitioned FERC for guidance on how to implement such a policy under its tariff.

This report summarizes stakeholder comments addressing ways to better coordinate procurement of renewables with transmission development. Such coordination may require changes to the underlying framework of IOU procurement or, at a minimum, the

[1] Second Report of the Tehachapi Collaborative Study Group, filed with the California Public Utilities Commission in I.05-09-005, April 19, 2006, at p. 103.

addition of flexibility to an RPS procurement program almost universally seen as unworkably complex.

The context for such coordination is set by several dynamics. Most utilities remain reluctant purchasers of renewables. Intermittent renewables in particular are seen as contributing little to resource adequacy. Gas price increases that renewables help to hedge can be passed on to ratepayers, insulating shareholders from gas price risk. AB 32 emissions reduction requirements are still to be defined. Given this situation, the procurement priorities specified in the Energy Action Plan Loading Order and adopted as CPUC policy have been honored mainly in the breach: since 2003, about five times more gas-fired generation has been approved than renewables generation.

With more than 22,000 MW of renewable generating projects already in the CAISO generation queue, lack of project supply is clearly not one of the factors delaying achievement of the state's renewable energy goals.

## 2. Current State of RPS Procurement

### 2.1 Investor-Owned Utilities

In its October, 2006 Report to the Legislature on the Progress of the California Renewable Portfolio Standard, the CPUC shows these percentages of supply from actual deliveries of renewable power to the IOUs in 2005: PG&E, 13.5%; SCE, 17.7%; SDG&E, 5.5%.

The Report to the Legislature shows that in the first four years of the RPS program (2002 through 2005), PG&E signed contracts for just 470 MW of renewables; SCE for 969 MW; and SDG&E, 754 MW, making total new RPS generation under contract 2,193 MW at the end of 2005. But as of August 1, 2006, just 767 MW (35%) of this generation was online.

Transmission constraints and other problems are likely to prevent much of the remainder of the 2,193 MW already under contract from being placed into service until 2012 or later, and the online dates of many of any additional renewables purchase contracts to be signed by the IOUs in the 2007-2010 period are also likely to be delayed until transmission upgrades can be planned, approved and built. It is thus highly unlikely that the state will meet the 20% renewable energy target by the 2010 date mandated in SB 107.

The IOUs have argued that, especially in light of such transmission constraints, RPS compliance should be measured in terms of signed contracts, rather than in terms of delivered power. The CPUC, however, points out that the utilities have some ability to accelerate the pace of new transmission development; it has made it clear that it expects the utilities to move aggressively to solve transmission problems, and has repeatedly

urged them to submit applications for new transmission needed to access RPS generation. Other stakeholders, referencing the small amount of power under contract after four years of RPS solicitations, allege that the pace of compliance can't be blamed only on transmission constraints; in the view of many renewables generating companies, the utilities have been slow to contract for renewables generation, and have unnecessarily dragged out and delayed bid evaluation and contract negotiation.

To resolve the issue of how compliance with the 20% RPS target will be measured, the CPUC established in a series of decisions in 2005 and 2006 that it will count delivered power, in accord with the intent of SB 1078, the law establishing the RPS program. Signed contracts may be adduced as evidence of utility effort to comply with RPS requirements, but the existence of such contracts does not in itself constitute compliance.

The CEC 2005 Integrated Energy Policy Report includes a comprehensive analysis of the RPS program. It finds the primary problems to be: lack of transparency in the bidding, ranking and contracting processes, and the complexity of administering the program; and uneven application of RPS targets to all retail sellers in the state. Many, if not most stakeholders appear to agree both with its analysis and its recommendations for reducing complexity, increasing transparency and adding flexibility to RPS contracting.[2]

### 2.2 Publicly-Owned Utilities

Almost all California Publicly Owned Utilities (POUs) have adopted RPS targets similar to the IOU 20% target, although few of them have accelerated the compliance date to 2010 as required by SB 107. The POUs, on average, have farther to go to reach the 20% target than IOUs, meaning their acquisition targets must be more aggressive. On a load-weighted basis, POU incremental renewable energy acquisitions average 12.5% of load; for IOUs, the figure is 6.1%. This disguises a wide range of existing renewable supply among POUs. Five already have 20% or more of eligible renewables in their portfolios; and four have 4% or less renewables.

Data on POU acquisition of renewables is difficult to obtain, and POU progress toward their RPS targets is correspondingly difficult to assess. The Kema, Inc. Consultant Report to the California Energy Commission, "Publicly Owned Electric Utilities and the California Renewables Portfolio Standard," (November 2005; CEC-300-2005-023) provides the most comprehensive survey to date. Data for 2003 shows that POUs in the aggregate have been more aggressive in signing RPS contracts than PG&E or SCE, even though a third of POUs appear to have made no renewables acquisitions at all since the start of the RPS.

Since that study, the energy industry press has reported a steady volume of renewables acquisitions by state POUs. Of special note because it is by far the largest POU, Los

[2] Several stakeholder evaluations of the RPS program have been performed to date. See, e.g., Preliminary Stakeholder Evaluation of the California Renewables Portfolio Standard, Kema-Xenergy Consultant Report to the California Energy Commission, June 2005. CEC-300-2005-011.

Angeles Department of Water and Power (LADWP) had 4.2% renewables in its portfolio in 2003, and took more than twice as long to solicit, evaluate and negotiate contracts as any other IOU or POU. However, under a new board of Water and Power Commissioners appointed by Mayor Villaraigosa, LADWP has doubled its renewables supply (to 8.3% in early 2007), has announced substantial changes to improve its solicitation and contracting process, and has committed to meet the 20% RPS delivered energy target by 2010. LADWP and Imperial Irrigation District (IID) are each developing major transmission upgrades, the Green Path North and Green Path Southwest, respectively, with a plan for coordinating them for purposes of exporting renewables power from the Imperial Valley; the Green Path North will also take advantage of the Department's interest in the Palo Verde-Devers #2 transmission line, which has been approved both by the CAISO and the CPUC. LADWP has begun upgrading the DC line from the Intermountain Power Project in Utah to Los Angeles to provide an ability to import renewables from the Rocky Mountain region, and plans to expand the capacity of its Owens Gorge-Rinaldi line through Tehachapi.

This large-scale transmission development is critical, as POUs face many of the same transmission constraints in meeting RPS targets as do the IOUs.

## 3.0 Approaches for Coordinating RPS Procurement with Transmission Development

As the CAISO queue demonstrates, California has a large supply of wind and solar generating projects under development. With the notable exception of SCE's December 2006 contract to acquire 1,500 MW of Tehachapi wind power, utilities are procuring only small amounts of renewable generation each year, and are very slow in doing so. Both the quantities and the pace of procurement affect the ability to coordinate it with transmission development. The structure of RPS procurement and the attitudes underlying utility procurement practice both require rethinking.

### 3.1 Addressing Utility Reluctance to Acquire Renewables

As utilities evaluate supply options, renewables rarely appear a Least Cost-Best Fit choice. California utilities' procurement practices and behavior—in contrast to that of some utilities in other states—supports a conclusion that they acquire renewables primarily because they are forced to, rather than because of any objective evaluation of such resources. PG&E's RPS evaluation process, for example, ranks resources according to their ability to fill hourly net open positions in the daily dispatch stack—a practice that effectively excludes variable wind power from consideration.[3]

[3] "Pacific Gas and Electric Company's (U 39 E) Report of its RPS Evaluation an Selection Criteria in Compliance with August 21, 2006 Ruling of Assigned Commissioner;" filed at the CPUC on September 29, 2006 in R.06-05-027. See, e.g., section 4, Portfolio Fit. The PG&E evaluation methodology stands in marked contrast to that of SDG&E, whose evaluation process is straightforward and transparent.

By providing very low marginal cost power, geothermal, wind and solar resources displace operation of more expensive gas-fired generation. They thus hedge both gas price and supply risk. They provide emissions-free generation that hedges carbon liability risk. They are secure, indigenous and inexhaustible resources. They provide significantly more economic development benefits per MW than fossil generating projects. California has a 45-year history with geothermal generation and a 25-year history with wind and Concentrating Solar Power (CSP) generation. Yet most utilities continue to view renewables as unfamiliar and unproven technologies, problematic to acquire and operate, more expensive than gas-fired generation, and of little value in meeting Resource Adequacy requirements.

Several dynamics underlie this evaluation: the fact that utilities are largely insulated from gas price risk; underestimation of carbon liability risk; financial disincentives to sign Power Purchase Agreements (PPAs) and lack of incentives to build and own renewable generation; and the long-standing industry practice of designing electric supply planning around generating capacity. Policies addressing any of these factors could make a material difference in how utilities evaluate the value of renewables to their portfolios.

If utilities were prevented from passing their cost of gas directly through to ratepayers, for example, limiting and/or hedging their exposure to the costs of gas-fired generation would become a critical function. The single most effective policy change to promote objective evaluation of renewables vs. gas would be to eliminate or reduce the Energy Cost Adjustment Charge that enables IOUs to pass fuel costs on to ratepayers.

Second, AB 32 Greenhouse Gas (GHG) reduction goals are likely to require utilities to add renewables in excess of the 20% target required by SB 1078 and SB 107. Although the implementation schedule in the legislation does not require CARB to establish specific reduction targets until 2009, it is reasonable to anticipate compliance with that law. Pressure is mounting for a national policy to limit carbon emissions; and the SEC is considering requiring disclosure of GHG emissions as a contingent liability on corporate balance sheets. The CPUC now requires utility comparison of resource options to include a value of \$8/ton $CO_2$. But production simulation modeling of the WECC electric system has shown that supply portfolios are indifferent to the choice of fossil vs. non-fossil generation until $CO_2$ value exceeds \$30/ton. Evolving policy concern to address climate change risk support raising the imputed cost of carbon in resource planning administratively until market mechanisms to establish such a cost can be put in place.

Third, the great majority of renewables generation today is sold to utilities under long-term Power Purchase Agreements. This negatively affects utility balance sheets, to the extent that PPAs are treated as debt, and the utilities "charge" supply bids with the cost of restoring their debt-equity ratios to compensate for the effect of each PPA. More important, with no financial stake in the expansion of renewables, utilities have little incentive to add them proactively to their supply portfolios. Two fiscal policy changes—providing accelerated depreciation treatment for renewable energy property, and investment tax credits for such investment—could make utility ownership directly

competitive with their purchase of renewables from independent generators. Utility ability to ratebase and thereby earn a return on renewables generating assets stands to help increase in such installations. Financing renewable projects with lower-cost utility capital would in turn reduce the cost of wind, solar and geothermal power in utility portfolios. Widespread utility ownership may have the potential to transform procurement by making renewables a mainstream utility business.

Finally, procurement practice—and regulatory policy—focus first on capacity, not energy. One result is that wind and solar, as energy resources, are often undervalued in utility planning, despite their near-zero marginal cost and their emissions-free character. Increasing carbon prices, however, are likely to require a priority focus on energy, not capacity, because emissions are a function of energy. Today, LSEs expect capacity resources to supply the bulk of their energy. Instead, planning supply portfolios around low-carbon generation could lead utilities to maximize the use of energy resources, building capacity strategically to support carbon-free and fixed price energy. Such a fundamental paradigm shift, while perhaps not needed to achieve RPS goals, may in fact be needed to achieve the goals of AB 32. In any case, policies aimed at increasing the amount and pace of utility procurement of renewables have little chance of being effective unless they address utility attitudes about the value of those resources.

### 3.2 Integrating Renewables into Long-Term Procurement

Integrating procurement of renewables into mainstream utility procurement provides a structure for addressing utility reluctance to acquire renewables. Stakeholders, including renewables generating companies and environmental organizations, believe that doing so will also facilitate the coordination of generation with transmission development.

Today, with IOUs required to offer special RPS solicitations, renewables procurement is largely divorced from traditional procurement. The policy goals of separate RPS procurement were intended to support special consideration for renewable resources, and to provide added transparency into unfamiliar technologies and the possibility of above-market costs. In practice, however, separate procurement ghettoizes renewables. It leads utilities, regulators, policymakers and the public to view them—inaccurately, in many cases—as less reliable, more problematic to procure and operate, or more expensive than "real" supply options. It undermines the objectives of Integrated Resource Planning, and of the Loading Order, both of which encourage direct comparison of supply (and demand-side) resource options. It has made it more difficult for renewable generators to obtain contracts with power buyers. And with procurement decision-making shielded by Least Cost-Best Fit, Transmission Ranking Cost Report, Procurement Review Group, and Market Price Referent processes, it has occluded rather than improved the transparency of renewables acquisition by utilities.

Utility Long-Term Procurement Plans identify megawatt goals for RPS procurement, but specify little of the associated transmission needed. Transmission upgrades necessary to accommodate a small number of relatively large generating projects are easier to

anticipate than upgrades needed to access a large number of relatively small renewables projects, which may sometimes be dispersed across different regions. Segregated procurement encourages IOU and CAISO transmission planning to consider renewables as a discretionary add-on to core planning for reliability, congestion relief and resource adequacy needs. This further marginalizes renewables development. Instead, approaching transmission adequacy for renewables as integral to improving and expanding the grid makes renewables transmission easier to plan for and less expensive to realize.

For SCE, PG&E and some POUs, renewables acquisition is a marginal activity; reaching the 20% target requires them to obtain relatively small amounts of clean power each year. Transmission development, by contrast, revolves around large capacity additions. This mismatch between annual small-capacity generation additions and infrequent large-capacity transmission expansion complicates the utilities' job of ensuring transmission adequacy for renewables. Eliminating the 1% Annual Procurement Target, as discussed below, could help utilities group generation additions and transmission additions more effectively. Utility all-source Requests for Offers would group all procurement together, making it easier to coordinate with transmission development plans.

### 3.3 Anticipating Transmission Needed for Renewables: Proactive CAISO Planning

Because lack of transmission delays bringing renewables generation on line—more than eight years in the case of Tehachapi, for example—and transmission development timelines are so long, achievement of state policy goals depends on planning transmission to resource areas before specific generating projects are defined.

Current practice, however, in line with FERC Orders 890 and 2003A, justifies planning only for reliability upgrades (facilities required to maintain or improve grid reliability), and economic upgrades (able to reduce congestion or to provide access to lower cost generation), where specific generating projects have been proposed. Current practice makes it difficult to ensure that the transmission needed to meet state goals will be available on a timely basis. California policymakers have recognized this problem, and have sought to encourage proactive planning to access renewable resources. Several initiatives are underway, but it is too early to tell if they will be effective. Much more remains to be done.

In January 2007, the CAISO submitted a Petition for a Declaratory Order to FERC, seeking guidance for establishing rate recovery for a "third category" of transmission assets—those needed to access location-constrained resources. The policy proposed by the CAISO would allow utilities to recover costs for transmission built to such resources in advance of generator interconnection requests; generators would later pay their pro rata share of the facilities as they come on-line.[4] FERC approval of amending the CAISO

[4] The CAISO petition builds on the work of SCE, which in March 2005 proposed creation of a class of "Renewable Energy Trunkline" transmission assets in a petition to FERC, for the specific case of Tehachapi. The current CAISO proposal addresses concerns FERC identified in declining to allow cost

tariff to include cost recovery for transmission built proactively to location-constrained resources will make it easier for the CAISO to devote more attention to planning facilities needed for renewables. An answer from FERC is expected in mid-2007.

In June 2006, the CAISO announced an internal project aimed at integrating consideration of renewable resources into all dimensions of its work.[5] This commits the ISO to ensure that:

- there is a transmission plan for delivery of energy from renewable resources to major load areas;
- energy from renewables is included in ISO market systems and energy scheduling; and
- all operational issues needed to maintain reliability have been addressed.

This policy directs the ISO to work with the CEC to identify areas where new renewable resources could be developed, in Northern California (in conjunction with PG&E), and in Southern California (in conjunction with SCE, SDG&E, and the Tehachapi Collaborative Study Group). The ISO would then lead the development of transmission plans to access those resources.

It is too early to tell the extent to which the CAISO will be successful in anticipating the transmission needs of renewables. The CAISO 2006 Transmission Plan, the first statewide plan issued since adoption of its proactive planning process in 2005, mentions only transmission projects previously identified by PG&E, SCE and SDG&E to access renewables. The 2006 Plan does not address transmission to other potential resource areas and, contrary to ISO policy statements, was developed without stakeholder participation. Advancing CAISO proactive planning for renewables transmission appears to warrant active CEC support.

### 3.4 Engaging Publicly Owned Utilities: the California Subregional Planning Group

POU transmission assets could play a significant role in providing access to the large quantities of renewable resources needed to meet state goals. LADWP, for example, owns facilities that pass directly through the Tehachapi Wind Resource Area (WRA), and has plans to upgrade those lines to carry more power. Other LADWP lines could provide access to renewables in Nevada, and in the Rocky Mountains, via its DC line from the Intermountain Power Project in Delta, UT. The Imperial Irrigation District (IID) transmission system surrounds more than 2,000 MW of geothermal resources and much larger quantities of high quality solar (CSP) resources.

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recovery in transmission rates for such "trunklines;" it was also submitted with strong state support, which the SCE petition did not enjoy.

[5] CAISO Memorandum to ISO Operations Committee, June 7, 2006, "Review of Integration of Renewable Resources Project." This lists 22 specific tasks to be pursued.

The Imperial Valley Study Group provided a framework for coordinating the development of geothermal projects with the transmission necessary to export that power, both to the CAISO system in San Diego County (via a joint IID Green Path Southwest-SDG&E Sunrise Powerlink transmission line), and to the LADWP system (via upgrades of the IID system and an LADWP Green Path North transmission line). But attempts to phase transmission development in the region to match generating project on-line dates have largely collapsed, due to difficulties of marketing expensive Salton Sea geothermal power and SDG&E's focus on its Proposed Sunrise Powerlink as a reliability project. LADWP refused all invitations to engage in helping design transmission access to the Tehachapi WRA. The LADWP tariff for use of its lines is set at a level that makes it uneconomic for third parties to wheel power across its system. There is clearly much that might be done to engage key POUs in helping coordinate procurement of renewables with the development of new transmission across the state.

Incorporating POU renewables transmission plans into those of the CAISO and IOUs provides a first target of opportunity. The California Subregional Planning Group (CSPG) now being formed by the CAISO could provide the framework for integrating such planning.

The CAISO 2006 Transmission Plan announced creation of a CSPG. Every region of the WECC—except California—has formed a transmission planning group for purposes of coordinating study and review of new infrastructure and the interaction of proposed transmission with other subregions.[6] The new CSPG will provide a forum for coordinating transmission proposed throughout the West with transmission development in California. It will also facilitate preparation of a California statewide transmission plan, involving IOUs, municipal utilities and independent transmission companies. California has not had a mechanism for coordinating CAISO/IOU transmission planning with that done by publicly owned utilities. The CAISO has committed to organize the CSPG and hold a first meeting by the end of 2007.

## 4. Mechanisms for Enhancing Procurement Flexibility

Most stakeholders agree the complexity and inflexibility of the RPS program slows and complicates procurement. Coordinating transmission development with procurement requires adding flexibility. There are several mechanisms for doing so.

### 4.1 Eliminating the 1% Annual Procurement Target

Each IOU's one percent Annual Procurement Target (APT) represents a relatively small number of megawatts of renewable generating capacity. Even with compliance banking provisions, the APT thus encourages utilities to acquire small amounts of power through

[6] These include NTAC (Northwest Transmission Assessment Committee) covering OR, WA, ID and western MT; NTTG (Northern Tier Transmission Group, successor to RMATS in the Rockies); the Colorado Coordinated Planning Group; and SWAT (Southwest Area Transmission).

annual solicitations. Small-scale procurement stands in direct contrast to transmission development, which is most cost-effectively added in large increments, and planned to support multiple generating projects.

Some stakeholders think the APT should be eliminated, in order to give utilities more flexibility in scheduling generation additions to meet the overall 20% RPS goal. Holding solicitations every other year instead of annually would in itself reduce workload for utilities, renewables suppliers and the CPUC. Penalties for non-compliance might need to be clarified, to ensure timely achievement of the 20% target. In any case, larger-scale power purchase contracts would strengthen the possibilities for coordinating transmission development with procurement.

### 4.2 Decreased Reliance on RPS Solicitations

Some generating companies and IOUs have entered into bi-lateral supply contracts for renewables, outside of the RPS program, in order to avoid the lengthy and cumbersome RPS solicitation process. Such contracts are not eligible for Supplemental Energy Payment (SEP) funds; but given that more than 80% of all renewables supply contracts signed since the start of the RPS program have been at prices below the Market Price Referent (MPR), unavailability of SEPs for such contracts has been a non-issue.

The CPUC strongly prefers that IOUs acquire renewables through RPS solicitations. Achievement of the 20% target, however, may be better encouraged by providing the contracting parties more flexibility than the RPS program now provides. If RPS solicitations, and their Least Cost-Best Fit, Transmission Ranking Cost Report, Market Price Referent, and Procurement Review Group components can't be made more flexible, utilities and generators should be free to contract for renewables supply outside the RPS. Procurement flexibility enhances the prospects for coordinating generation with transmission development.

### 4.3 Renewable Energy Credits

Current CPUC policy proscribes use Renewable Energy Credits (RECs) for RPS compliance. The CPUC has indicated, however, that it will reconsider this issue in its proceeding R.06-05-027, on a schedule timed to coincide with the start-up of the Western Renewable Energy Generation Information System (WREGIS), now expected in June 2007. WREGIS assigns an identifying number to every megawatt-hour of generation from every renewable energy generating facility in the WECC, and in this way allows the output of every generator to be tracked and verified. Operation of WREGIS should eliminate possibilities for double-counting RECs, or the generation underlying those RECs (i.e., the possibility of using RECs to satisfy renewables-purchase requirements in more than one jurisdiction).

Allowing utilities to meet some amount of their purchase requirements with RECs unbundled from the underlying power will significantly increase procurement flexibility.

The CPUC now requires IOU Requests for Offers to accept power deliveries anywhere in California; the IOU must then arrange physical delivery of the power and charge the generator's bid for the cost of the wheeling and/or upgrades required for doing so. In contrast, buying unbundled RECs would free utilities to purchase renewables generation produced anywhere in the state (or anywhere in the WECC) without having to consider transmission or physical delivery requirements.

RECs stand to significantly increase the market for renewable energy, by expanding the universe of buyers. Today, generators can sell power only to a small number of mainly monopsony buyers able to take physical delivery. With RECs, project output can be sold in different combinations to different customers—for example, part as unbundled RECs, part under physical delivery contracts for the commodity electricity underlying the RECs, and part as renewables generation in which environmental attributes and the underlying power are bundled together. RECs facilitate selling project output to multiple IOUs, POUs and other entities rather than to one primary buyer. Cities, companies, government agencies, non-profit organizations all are potential buyers of California RECs, as are utilities in other states. WREGIS tracking capabilities similarly allow California entities to buy RECs from renewables generating projects in other states. By expanding opportunities to buy and sell renewable energy, RECs add liquidity and help make this market more competitive. Competition among renewables generators works to drive down the cost of RPS compliance. And a larger and more liquid market for renewables will in turn make it easier to coordinate generation procurement with transmission development.

## 5. Queue Policy and RPS Procurement

FERC Order 2003A revised earlier interconnection procedures and now allows transmission providers such as the CAISO to simultaneously study all projects that have applied, within a certain time period, to interconnect in one region of the grid. Performing Feasibility Studies and System Impact Studies of "clusters" of projects enables both applicants and transmission providers to understand the aggregate impact of, and determine the upgrades needed to accommodate the combination of projects applying to be connected in a region. Cluster studies thus facilitate development of comprehensive regional upgrade plans. They are particularly helpful where, as with Tehachapi development, multiple projects are planned to connect in one region within a few months or years of each other, in response to state policy encouragement.

Cluster study results, however, do not change interconnection queue priority, i.e., the order in which projects can actually be placed into service. This can create substantial financial risk for studied projects which have other generators ahead of them: A project must sign an Interconnection Agreement committing it to pay for upgrades found necessary in the cluster study of related projects. But if a project having higher queue priority drops out, this could change the upgrades necessary to connect the remaining

projects, potentially increasing costs enough to make a difference in the financial viability of a generating project.

The determination of necessary upgrades turns in part on assumptions about line utilization and loadings. Take the situation, for example, in which a variable-output wind project having an annual average capacity factor or 35% and a gas-fired combined cycle project with an 85% capacity factor connect to the same line. The gas-fired generator can be assigned a defined amount of line capacity. But transmission providers often seek to accommodate the variable-output wind by keeping significant line capacity in reserve. This reduces the amount of wind or solar generation that can be connected and so increases the need for upgrades and thus the cost of interconnecting variable output renewables.

The CAISO queue (referenced below as Appendix A to this report), shows many thermal projects to have interconnection priority ahead of the wind, solar and biomass projects. For the renewable projects to connect, the thermal projects ahead of them will either have to be built and placed into service, or withdraw from the queue. In practice, this means that at least some and perhaps dozens of renewable projects—including those having signed Power Purchase Agreements and executed Interconnection Agreements—may have to wait years for transmission service. FERC queue policy, as reflected in the CAISO tariff, is in this regard very much at odds with the RPS goal of placing many renewable projects into service in the next few years.

One obvious solution—encouraging renewable projects to enter the queue earlier—is often not a workable option. Entering the queue requires generators to pay for a succession of studies and to achieve other milestones toward project completion; projects that don't pay for required studies or make development progress are ejected from the queue, losing whatever fees they may have paid to date in the process. Because wind projects can be developed and permitted in about two years much more quickly than large thermal projects, they can enter the queue later. In practice, queue entry is driven by project economics. Most renewable generators can't afford to enter the queue years in advance of an RPS solicitation; instead, they often must defer queue entry until they have been short-listed in a utility solicitation or have other indication that they may be able to sell their power. Without RECs and given current transmission constraints, most renewable projects can expect to sell power only to one or a very limited number of buyers. Within this limited market, the uncertain timing of RPS solicitations, and the very long periods that some IOUs and POUs have taken to negotiate power contracts make it difficult for generators to evaluate when they are justified in entering the interconnection queue.

The dynamics of the queue make it possible for thermal generators having queue priority to take transmission capacity that was designed and intended to provide access for renewables; it appears this may happen with the Tehachapi Transmission Project, when a large gas-fired generator goes into service ahead of several thousand megawatts of wind projects awaiting interconnection in the same area.

Other states besides California continue to encourage transmission development specifically to access renewable resources. Minnesota legislation enacted in 2001, for example, required Xcel Energy to build transmission sufficient to access 825 MW of wind power in the Buffalo Ridge region of the state. FERC Open Access Transmission policy, however, prevents transmission capacity from being reserved for any specific class of generators. To ensure that the new transmission would be used for its intended purpose, the Minnesota Public Utilities Commission granted Xcel a Certificate of Need carrying the requirement that Xcel purchase 825 MW of wind generation in the Buffalo Ridge region of SW Minnesota.[7] FERC accepted Xcel's proposed tariff for this transmission and has allowed Xcel to recover its costs in transmission rates. Conditioning CPCNs granted for the construction of transmission needed to access renewables in California with similar renewable energy purchase requirements could help ensure that renewables transmission is in fact used for its intended purpose.

Making renewable energy purchase requirements a condition for issuance of CPCNs could also bolster RPS procurement. Efforts to better coordinate transmission development with procurement must start with changes in procurement practices that add flexibility, encourage larger purchases, and enlarge the universe of buyers.

[7] Minnesota Public Utilities Commission, "Order Granting Certificates of Need Subject to Conditions," Docket No. E-002/CN-01-1958, issued March 11, 2003.

## Glossary

| | |
|---|---|
| APT | Annual Procurement Target |
| CAISO | California Independent System Operator |
| CARB | California Air Resources Board |
| CEC | California Energy Commission |
| CPUC | California Public Utilities Commission |
| CSP | Concentrating Solar Power |
| CSPG | California Subregional Planning Group |
| FERC | Federal Energy Regulatory Commission |
| FS | Feasibility Study (CAISO interconnection process) |
| GHG | Greenhouse Gas |
| IID | Imperial Irrigation District |
| IOU | Investor Owned Utility |
| IVSG | Imperial Valley Study Group |
| LADWP | Los Angeles Department of Water and Power |
| LSE | Load-Serving Entity |
| MPR | Market Price Referent |
| MW | Megawatt (1,000 kW) |
| NTAC | Northwest Transmission Assessment Committee |
| NTTG | Northern Tier Transmission Group |
| OATT | Open Access Transmission Tariff |
| PG&E | Pacific Gas & Electric Company |
| PIER | CEC Public Interest Energy Research Program |
| POU | Publicly Owned Utility |
| PPA | Power Purchase Agreement |
| REC | Renewable Energy Credit |
| RMATS | Rocky Mountain Area Transmission Study |
| RPS | Renewable Portfolio Standard |
| SCE | Southern California Edison Company |
| SDG&E | San Diego Gas & Electric Company |
| SEP | Supplemental Energy Payment |
| SIS | System Impact Study (CAISO interconnection process) |
| SWAT | Southwest Area Transmission (Planning Group) |
| TCSG | Tehachapi Collaborative Study Group |
| WAPA | Western Area Power Administration |
| WECC | Western Electricity Coordinating Council |
| WRA | Wind Resource Area |
| WREGIS | Western Renewable Energy Generator Information System |

## Appendices

### Appendix A: CAISO Queue at April 18, 2007

Attached as separate document; and available at www.caiso.com.

### Appendix B: Renewables Generating Projects in the CAISO Generation Queue

**Summary by County**
as of April 18, 2007

| | **Wind** MW | **Solar** MW |
|---|---|---|
| **County** | | |
| Kern (Tehachapi) | 5,829 | 500 |
| San Bernadino | 2,284 | 5,050 |
| --includes 1,500 MW wind in Clark County, NV | | |
| Riverside | 297 | 1,350 |
| Imperial | 2,700 | 1,400 |
| --wind projects located in Baja California, Mexico | | |
| San Diego | 863 | 0 |
| Solano | 1,234 | 0 |
| 8 Other Counties | 1,208 | 190 |
| Totals | 14,415 | 8,490 |

Appendix B, cont'd

**Renewables Generating Projects in the CAISO Generation Queue**
at April 18, 2007

| **Kern County** | | | |
|---|---|---|---|
| Queue Position | Request Date | Wind MW | Solar MW |
| 20 | 8/19/03 | 300 | |
| 31 | 4/12/04 | 201 | |
| 34 | 7/19/04 | 300 | |
| 73 | 6/6/05 | 250 | |
| 79 | 5/24/05 | 51 | |
| 84 | 11/22/05 | 400 | |
| 85 | 12/28/05 | 120 | |
| 86a | 1/20/06 | 33 | |
| 86b | 1/20/06 | 34 | |
| 91 | 2/22/06 | 51 | |
| 93 | 3/1/06 | 220 | |
| 94 | 3/1/06 | 180 | |
| 95 | 3/1/06 | 550 | |
| 96 | 3/1/06 | 600 | |
| 97 | 3/1/06 | 160 | |
| 100 | 4/5/06 | 120 | |
| 119 | 8/8/06 | 500 | |
| 132 | 9/27/06 | 297 | |
| 149 | 11/16/06 | 362 | |
| 153 | 11/22/06 | 100 | |
| 157 | 12/15/06 | 100 | |
| 158 | 12/15/06 | 100 | |
| 159 | 12/15/06 | 100 | |
| 175 | 2/21/07 | 500 | |
| 182 | 3/5/07 | | 500 |
| 188 | 3/23/07 | 200 | |
| | County Subtotal | 5,829 | 500 |

| **Riverside County** | | | |
|---|---|---|---|
| Queue Position | Request Date | Wind MW | Solar MW |
| 1 | 9/30/98 | 16.5 | |
| 49 | 12/14/04 | 100.5 | |
| 138 | 10/23/06 | 150 | |
| 146 | 11/16/06 | | 150 |
| 147 | 11/16/06 | | 400 |
| 174 | 2/16/07 | 30 | |
| 179 | 2/15/07 | | 300 |
| 193 | 3/19/07 | | 500 |
| | County Subtotal | 297 | 1350 |
| **Imperial County** | | | |
| 78 | 8/31/05 | | 300 |
| 124 | 8/22/06 | | 600 |
| 159a | 12/6/06 | 400 (Baja) | |
| 164 | 1/12/07 | 1,000 (Baja) | |
| 168 | 2/2/07 | 1,000 (Baja) | |
| 169 | 2/2/07 | | 500 |
| 183 | 3/5/07 | 300 (Baja) | |
| | County Subtotal | 2,700 | 1400 |
| **San Diego County** | | | |
| 19 | 6/1/03 | 49 | |
| 25 | 2/1/04 | 117 | |
| 26 | 2/1/04 | 36 | |
| 32 | 5/1/04 | 201 | |
| 106a | 5/1/06 | 160 | |
| 112 | 6/1/06 | 300 | |
| | County Subtotal | 863 | |

Appendix B, cont'd

**Renewables Generating Projects in the CAISO Generation Queue**
at April 18, 2007

**San Bernadino County**

| Queue Position | Request Date | Wind MW | Solar MW |
|---|---|---|---|
| 11 | 10/14/02 | 63 | |
| 15 | 12/31/02 | 50 | |
| 83 | 9/1/05 | 60 | |
| 106 | 5/1/06 | | 635 |
| 109 | 6/1/06 | | 550 |
| 110 | 6/1/06 | | 1400 |
| 114 | 6/29/06 | 150 | |
| 115 | 6/29/06 | 150 | |
| 116 | 6/29/06 | 50 | |
| 120 | 8/9/06 | | 1,200 |
| 125 | 8/22/06 | | 300 |
| 130 | 9/13/06 | | 565 |
| 131 | 9/25/06 | | 100 |
| 135 | 10/10/06 | 60 | |
| 156 | 12/5/06 | 201 | |
| 163 | 1/9/07 | | 300 |
| Clark County, Nevada | | | |
| 126 | 8/31/06 | 1,500 | |
| | County Subtotal | 2,284 | 5,050 |

**Solano County**

| Queue Position | Request Date | Wind MW |
|---|---|---|
| 12 | 12/1/02 | 150 |
| 21 | 10/1/03 | 38 |
| 22 | 11/1/03 | 38 |
| 24 | 1/1/04 | 150 |
| 39 | 11/1/04 | 200 |
| 108 | 6/1/06 | 128 |
| 113 | 6/1/06 | 30 |
| 171 | 2/9/07 | 500 |
| | County Subtotal | 1,234 |

**Wind-other counties**

| Queue Position | Request Date | Wind MW | County |
|---|---|---|---|
| 16 | 3/1/03 | 120 | Santa Barbara |
| 29 | 3/1/04 | 201 | Lake-Sonoma |
| 74 | 7/1/05 | 102 | Shasta |
| 102 | 4/1/06 | 210 | Monterey |
| 117 | 7/7/06 | 70 | Humboldt |
| 152 | 11/22/06 | 105 | Santa Barbara |
| 177 | 2/27/07 | 200 | Contra Costa |
| 178 | 2/27/07 | 200 | Santa Clara |
| | County Subtotals | 1,208 | |

# APPENDIX CC

California RPS Proactive Transmission Report

# California RPS Proactive Transmission Planning Report

## Contract Amended Task #19: Transmission Plan Implementation Issues

**July 18, 2007**

**Imperial Valley and Tehachapi Implementation Groups**
**Contract # 500-05-005**

Center for Energy Efficiency and Renewable Technologies
Lead staff - Rich Ferguson, PhD, Research Director
Contractor Project Manager: Dave Olsen
Commission Project Manager: Clare Laufenberg Gallardo

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## California RPS Proactive Transmission Planning Report

### 1. Need for Proactive Transmission Planning to Access Renewable Energy Zones

California has established aggressive goals to increase the state's reliance on electricity from renewable energy resources by the year 2020. In addition, the state has adopted challenging goals to reduce emissions of greenhouse gases responsible for global warming that provide further incentives for reliance on renewable energy. To achieve these goals, substantial changes in the state's electric transmission infrastructure are required.

The details of these transmission projects are highly technical, require as much as a decade or more to plan, permit and construct, and can be controversial with the public and with transmission providers. By comparison, the time required for renewable energy projects to be developed is considerably shorter. Therefore, in order to meet the state's energy goals by 2020, transmission planning must be proactive. This report briefly describes two recent successful examples of proactive transmission planning.

### 2. The Tehachapi and Imperial Valley Study Groups

Two of California's major renewable resource areas are the Tehachapi Wind Resource Area and Imperial Valley where substantial solar and geothermal resources are located. The Center for Energy Efficiency and Renewable Technologies (CEERT) has facilitated the planning for these two regions with funding from California Energy Commission (CEC) contract # 500-05-005.

The Tehachapi and Imperial Study Groups were formed in 2004 at the direction of the California Public Utilities Commission (CPUC) to analyze transmission needed to access these regions, develop adequate plans of service, and move these projects into the permitting process. The goals of this proactive planning effort have now been accomplished.

A full report on this process will be published in the next few months as CEERT's final report on the work under this contract. In this report, we summarize the process utilized, the results achieved, and recommendations for further improvements in proactive transmission planning.

### 3. Proactive Planning for Tehachapi and Imperial Valley

The primary purpose of this project was to facilitate participation and collaboration by a wide range of stakeholders in the planning and permitting of transmission facilities for

these two major California renewable resource zones. As part of this proactive collaborative process, the project was to identify solutions to problems that create roadblocks to the planning and construction of new transmission facilities.

## 3.1 Project Objectives

Project objectives were to:

- Provide a complete and comprehensive conceptual transmission development plan that will allow approximately 4,000 megawatts (MW) of wind power generated in the Tehachapi area to reach load centers in California.
- Provide a complete and comprehensive conceptual plan for the Imperial Valley that will allow approximately 2,000 MW of geothermal power generated in the Imperial Valley area to reach load centers in California.
- Establish the institutional cooperation among federal, state, and local agencies needed for these transmission plans to be implemented, the generation facilities constructed, and the energy to be provided to consumers.

The CPUC ordered the establishment of the Tehachapi Collaborative Study Group (TCSG) to plan export of wind power from that region, and both the CPUC and the CEC supported formation of an Imperial Valley Study Group (IVSG) to plan export of renewables from that region. To accomplish project objectives, assistance was provided to both of these two transmission planning collaboratives.

Facilitation services to the working groups were provided to assist them in:

- Preparing conceptual plans for needed transmission infrastructure.
- Performing electric production simulation and dynamic analysis studies.
- Addressing transmission cost recovery and power procurement issues.
- Recommending measures for streamlining the permitting process.

Work was intended to directly support:

- Completion of final transmission project designs.
- Approval of the designs by the California ISO.
- Submission of applications for Certificates of Public Convenience and Necessity (CPCNs) to the CPUC.
- Eventual construction of the transmission facilities.

It should be noted that the objectives of the project did not involve decisions involving the routes to be used by the transmission lines.

## 3.2 Project Outcomes

Both the Tehachapi and Imperial transmission infrastructure projects have been designed, studied, and approved by the California ISO. San Diego Gas & Electric has filed a CPCN application for the “Sunrise PowerLink,” a major portion of the export plan recommended by the IVSG; it has not yet been approved by the CPUC due to

controversy over a route for the transmission lines. Applications have also been filed by Southern California Edison and approved by the CPUC for the initial segments of the Tehachapi project, and applications for the remaining segments were filed in June 2007. The permit review process at the CPUC has been substantially streamlined, incorporating most of the recommendations of both the IVSG and the TCSG, and a project manager has been appointed by the CPUC to expedite further work on the Tehachapi project, as proposed by the TCSG.

Cost recovery issues have largely been resolved with the establishment of a *backstop* ratemaking mechanism and approval in April 2007 by the Federal Energy Regulatory Commission of a third category of transmission ratemaking proposed by the California ISO.

These successful outcomes represent significant steps toward California's goal of incorporating large amounts of renewable energy into the state's electricity portfolio.

### 3.3 Lessons Learned

The successful outcomes of the project demonstrate the value of collaborative planning for new transmission projects and the usefulness of facilitation by experts knowledgeable in transmission-related issues. A consensus commitment to engage in further collaboration on transmission planning for renewable energy resources was made by all parties at an April 2007 workshop held by the Energy Commission.

The need for transmission facilities to access Tehachapi and Imperial Valley was widely accepted by most stakeholders before the planning process began. Agreement on the need for these facilities was essential and provided the impetus for stakeholders to participate in the deliberations.

The absence of high-level representation in the working groups slows the planning process. To expedite the process, decisions must be made quickly, and representatives with the authority to make such decisions need to be involved.

The studies required for successful planning are complex and time-consuming. Participating stakeholders should commit competent staff to this work and provide staff with adequate support. In addition, it is essential to have competent leadership of the working groups in order to avoid wasted time.

Comprehensive reports on the detailed studies undertaken by each Study Group, the participants involved, the processes they used to perform their work, and their recommendations are included in their two final reports:

- *Development Plan for the Phased Expansion of Transmission to Access Renewable Resources in the Imperial Valley: Report of the Imperial Valley Study Group,* 2005.[1]

1. Available at: www.energy.ca.gov/ivsg.

- *Development Plan for the Phased Expansion of Electric Power Transmission Facilities in the Tehachapi Wind Resource Area: Second Report of the Tehachapi Collaborative Study Group*, 2006.[2]

### 3.4 Recommendations

In 2006 the California Legislature passed and the Governor signed Assembly Bill 32 (AB 32) establishing aggressive goals to significantly reduce greenhouse gas emissions statewide by the year 2020. Although regulations implementing this legislation have not been finalized, there is little doubt that substantial increases in the utilization of renewable energy resources, together with transmission facilities to access these resources, will be required to meet the AB 32 goals. In consideration of the long lead times needed to plan and construct transmission facilities, the contractor makes the following recommendations:

- Analysis of potential renewable energy resource zones on which California will rely to meet the AB 32 goals should proceed immediately. Consensus agreement on the designation of the zones to be developed should be made as soon as possible so that transmission planning can get underway.
- The collaborative process should be utilized in the renewable resource zone designation process and in all planning for major transmission projects to access these zones. The working groups should involve high-level representatives of all significant stakeholders as early in the process as possible.
- In addition, key stakeholders must make a commitment to allocate sufficient staff to accomplish the tasks involved and to expedite the work by their organizations needed to complete the process.
- Efforts should continue to further streamline the transmission permitting process, assure that reasonable costs can be recovered, and assure that commitments are made to develop the renewable resources to be accessed.
- Designation of project managers to represent the state's interests in expediting the approval and construction of each major transmission project should become standard practice.
- Facilitation of the resource designation and transmission planning processes by knowledgeable independent experts should also become standard practice.

2. Filed in I.00-11-001 and I.05-09-005, April 19, 2006; available at ftp://ftp.cpuc.ca.gov/tehachapi.

## 4. Conclusion

Transmission planning cannot simply react to requests by renewable generators. Traditional transmission planning, which reacts to generator requests for interconnection, faces a “chicken and egg” problem. In the absence of a transmission plan, no renewable generators will make commitments, and in the traditional planning paradigm, the absence of generator commitments will ensure the absence of needed transmission. The timely development of renewable energy resources therefore requires a proactive approach to transmission planning.

The successful work of the Tehachapi and Imperial Valley Study Groups that was facilitated by this project demonstrates that proactive transmission planning can achieve its goals. The proactive collaborative process used by these groups can be improved by making use of the lessons learned and the resulting recommendations.

This brief report on recent proactive planning efforts in California will be expanded to include additional detail in the CEERT contract final report.

## Glossary

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| AB 32 | Assembly Bill 32 (2006) |
| CEERT | Center for Energy Efficiency and Renewable Technologies |
| CPCN | Certificate of Public Convenience and Necessity |
| CPUC | California Public Utilities Commission |
| ISO | [California] Independent System Operator |
| IVSG | Imperial Valley Study Group |
| MW | Megawatt (1,000 kW) |
| RPS | Renewable Portfolio Standard |
| TCSG | Tehachapi Collaborative Study Group |