Interconnection System Impact Study

Generation Interconnection

J-Power USA

Orange Grove

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Table of Contents

1. Executive Summary 4
2. Project and Interconnection Information 9
3. Study Assumptions 13
4. Power Flow Cases 14
   4.1 Commercial Operation Date (COD) 14
      4.1.1 2008 Heavy Summer 14
      4.1.2 2008-09 Light Winter 14
   4.2 Future Year (FY) 14
5. Study Criteria 15
   5.1 Thermal Steady-State Criteria 15
      5.1.1 Category A – All Facilities in Service 15
      5.1.2 Category B – Loss of Single Element 15
      5.1.3 Category C – Loss of Multiple Elements 15
   5.2 Short Circuit Breaker Duty Criteria 15
   5.3 Transient Stability Criteria 16
   5.4 Post-Transient Voltage Criteria 17
   5.5 Reactive Power Deficiency Criteria 17
6. Interconnection System Impact Study Results 19
   6.1 Steady State Power Flow Results 19
      6.1.1 Category A (N-0) Normal Violations 19
      6.1.2 Category B (N-1) Contingency Violations 19
      6.1.3 Category C (N-2) Contingency Violations 19
   6.2 Short Circuit Study Results 21
   6.3 Transient Stability Study Results 21
   6.4 Deliverability Assessment Results 25
   6.5 Post-Transient Voltage Analysis Results 25
   6.6 Reactive Power Deficiency Analysis Results 25
7. Mitigation 26
   7.1 TL 698E, Pala-Monserate Tap 26
   7.2 TL 698B, Monserate-Monserate Tap 26
   7.3 TL 691B, Monserate-Avocado Tap 26
   7.4 TL 6932, Lilac-Pala 26
   7.5 TL 683, Rincon-Lilac 27
   7.6 TL682, Warners-Rincon 27
   7.7 Maximum Output without Delivery Network Upgrades 27
8. Local Furnishing Bonds/Industrial Development Bonds 28
9. Estimated Costs 29
   9.1 Participating TO's Interconnection Facilities 31
   9.2 Reliability Network Upgrades 33
   9.3 Delivery Network Upgrades 33
   9.4 Other Issues 33
10. Estimated Time to Construct 34
11. Re-Study 37

List of Appendices

Appendix A - Definitions
Appendix B - CAISO Controlled Grid Generation Queue
Appendix C - Load and Resource Summary Tables
Appendix D - Contingency Lists
Appendix E - Power Flow Analysis Results
Appendix F - Power Flow Plots
Appendix G - Short Circuit Analysis Results
Appendix H - Transient Stability Modeling
Appendix I - Transient Stability Switching Sequences
Appendix J - Transient Stability Analysis Results
Appendix K - Transient Stability Plots
Appendix L - PTO’s Interconnection Facilities

1. Executive Summary

J-Power USA, the Interconnection Customer (IC), proposes to interconnect their 99 MW combustion turbine Orange Grove Project (Orange Grove or the Project) to the California Independent System Operator Corporation's (CAISO) Controlled Grid. The proposed in-service date is April 1, 2008 and the Commercial Operation Date (COD) is May 31, 2008. The proposed location of the project is in San Diego County, California; along Highway 76 (Pala Road), east of Interstate 15. The Point of Interconnection is at San Diego Gas & Electric's (SDG&E) Pala 69 kV Substation. The Orange Grove Project occupies Queue Position #201 in the CAISO Controlled Grid Generation Queue.

In accordance with Federal Energy Regulatory Commission (FERC) Large Generation Interconnection Procedures (LGIP), the CAISO and SDG&E performed an Interconnection System Impact Study (ISIS). Per mutual agreement with SDG&E, CAISO, and the IC, the Feasibility Study (IFS) for Orange Grove was waived, allowing the project to proceed directly to the ISIS. The ISIS determined:

A. Transmission system impacts caused solely by the Orange Grove Project

B. System reinforcements necessary to mitigate the adverse impacts of the Project under various system conditions

C. Maximum allowed output without Delivery Network Upgrades, under various system conditions

D. Non-binding, good faith estimate of cost and cost responsibility for Interconnection Facilities and Network Upgrades

E. Non-binding, good faith estimate of time to construct for Interconnection Facilities and Network Upgrades

This study is composed of a Commercial Operation Date (COD) and Future Year (FY) analysis. The COD analysis examines the effect of the Orange Grove Project on the bulk power grid at the time of its commercial operation date. The "furthest out" commercial operation date of higher-queued projects established the year of the FY analysis, 2012. To determine the system impacts caused by the addition of the Orange Grove Project, studies were performed using the following COD and FY power flow cases:

A. 2008 Heavy Summer COD

B. 2008-09 Light Winter COD

C. 2012 Heavy Summer FY

The studies performed in this ISIS included:

A. Steady State Power Flow Analysis

B. Short Circuit Analysis

C. Transient Stability Analysis

D. Local Furnishing Bonds (LFB) analysis

Typically, post-transient voltage and reactive power deficiency analyses are performed in this phase of system impact evaluation. Per mutual agreement with SDG&E, CAISO, and the IC, these analyses were waived for this project because no negative impact on voltage stability or reactive power is expected.

The power flow analysis concluded that the addition of the Orange Grove Project:

A. Did not cause any facilities to overload for Category A (normal) conditions.

B. Caused six (6) facilities to overload for Category B or C (emergency) conditions:

   a. TL 698E (Pala-Monserate Tap)

   b. TL 698B (Monserate-Monserate Tap)

   c. TL 691B (Monserate-Avocado Tap)

   d. TL 6932 (Lilac-Pala)

   e. TL 683 (Rincon-Lilac)

   f. TL 682 (Warners-Rincon)

C. Did not cause any voltage limit violations.

The short circuit analysis found no overstressed circuit breakers caused by the addition of the Orange Grove Project.

The transient stability analysis concluded that the WECC transmission system remained stable for all contingency simulations but there are frequency and voltage deviation violations at the 69 kV Pala load bus. The IC may have to implement a protection scheme which includes faster switching to separate from SDG&E's system. The study was performed with typical data for this kind of generator, since actual data was not available. When actual data is available, another transient stability analysis must be performed to determine if the IC must mitigate the impact of the generator.

The Orange Grove Project does not appear to cause an Impairment of the tax-exempt status of the interest on Local Furnishing Bonds.

Based on the proposed operating date, Point of Interconnection, and the results of the COD and FY analyses, this study identified Interconnection Facilities and Delivery Network Upgrades necessary to interconnect the Orange Grove Project at full output to the CAISO Controlled Grid.

The following Interconnection Facilities are needed to interconnect the Orange Grove Project to the Pala 69 kV bus via underground facilities:

A. Install one 69 kV circuit breaker.

B. Install underground cable termination and bus support stands and two 2000 amp disconnects in an existing line position.

C. Install approximately 150' of 3-6" conduit from the termination stand to the substation fence.

D. Install associated control and protection panels for the new line and add RTU points for control, monitoring, and alarming.

E. Install approximately 150' of cable from the termination stand to the substation fence.

The Delivery Network Upgrades recommended to mitigate the six (6) overloaded facilities are:

A. TL 698E (Pala-Monserate Tap): Reconductor from Pala to Monserate Tap with 636 KCM ACSS and replace Pala getaways with 3000 KCM Cu.

B. TL 698B (Monserate-Monserate Tap): Replace Monserate getaways with 3000 KCM Cu and reconductor one span with 636 KCM ACSS.

C. TL 691B (Monserate-Avocado Tap): Increase relay settings at Monserate.

D. TL 6932 (Lilac-Pala): Replace Pala getaways with 3000 KCM Cu and upgrade TL 6932 breaker at Lilac. (An existing project is scheduled to replace this breaker by December 2007. If SDG&E cancels the project, the upgrade will be the responsibility of the IC.)

E. TL 683 (Rincon-Lilac): Advance the reconductor of TL 683. (An existing project is currently scheduled to reconductor TL 683 in the year 2011 timeframe. If SDG&E cancels the project, the upgrade will be the responsibility of the IC.)

F. TL 682 (Warners-Rincon): Implement a Special Protection System (SPS) to monitor TL 682 and initiate tripping of TL 685 (Warners-Santa Ysabel) for overload of TL 682. Due to the 2008 COD requested by the IC, this SPS is recommended in lieu of a major reconductor of TL 682 to mitigate the overload.

The preliminary, non-binding, good faith estimate of cost and estimate of time to construct for the Interconnection Facilities and Network Upgrades are shown in Table 1.1.

Table 1.1: Estimated Cost and Estimated Time to Construct

Type of Upgrade[1]	Location	Description	Estimated Cost x 1,000[2]	Estimated Time to Construct[3]
PTO's Interconnection Facilities[4]	Pala Substation[5]	• Install one 69 kV circuit breaker • Install underground cable termination and bus support stands and two 2000 amp disconnects in an existing line position • Install 150' of 3-6" conduit from the termination stand to the substation fence • Install associated control and protection panels for the new line and add RTU points for control, monitoring, and alarming. • Install 150' of cable from the termination stand to substation fence.	$1,404	6 Months
Reliability Network Upgrades[6]	None[7]	None	$0	0
Delivery Network Upgrades[8]	TL 698E (Pala-Monserate Tap)	Reconductor from Pala to Monserate Tap with 636 KCM ACSS and replace Pala getaways with 3000 KCM Cu	$10,447	6 Months
	TL 698B (Monserate-Monserate Tap)	Replace Monserate getaways with 3000 KCM Cu and reconductor one span to 636 KCM ACSS	$278	6 Months
	TL 691B (Monserate-Avocado Tap)	Increase relay settings at Monserate	$5	1 Month
	TL 6932 (Lilac-Pala)	Replace Pala getaways with 3000 KCM Cu. (An existing project to replace the TL 6932 breaker at Lilac is scheduled for completion by December 2007.)	$276	6 Months
	TL 683 (Rincon-Lilac)	Advance the reconductor of TL 683 (needed after 2008)	To be determined[9]	To be determined[9]
Special Protection System (SPS)	TL 682 (Warners-Rincon)	• SPS to prevent overload of TL 682 • Monitor TL 682 • If TL 682 exceeds rating • Trip TL 685 (Warners-Santa Ysabel)	$44	6 Months
Total			**$12,454**	**6 Months**

Based on this study, there are no Reliability Network Upgrades attributed to the interconnection of the Orange Grove Project. This assumes a higher-queued project, Queue Position #173, extends the 69 kV Main Bus at the Pala Substation as part of

1 See Appendix A for the definitions of the types of upgrades as defined by the LGIP.
2 All costs estimates are preliminary, non-binding, good faith estimates in "as year spent" dollars. See Section 9 for details.
3 Estimated time to construct includes time for design, equipment procurement, and construction. The estimate assumes the process is continuous and excludes time for environmental review, permitting, and delays for outage coordination. See Section 10 for details.
4 The IC is obligated to fund the PTO's Interconnection Facilities.
5 If a higher-queued project (#173) delays its in-service date or withdraws from the Queue, the Orange Grove Project will be responsible for funding an additional $33K for PTO's Interconnection Facilities.
6 The IC is obligated to advance funds to SDG&E for Reliability Network Upgrades and will be reimbursed upon commercial operation of the plant.
7 If a higher-queued project (#173) delays its in-service date or withdraws from the Queue, the Orange Grove Project will be responsible for advancing an additional $85K for extending the 69 kV Pala Main Bus.
8 The IC may elect to advance funds to SDG&E for Delivery Network Upgrades and will be reimbursed upon commercial operation of the plant.
9 The estimated cost and timeframe of this advancement will be studied in the Interconnection Facilities Study phase.

its project upgrades. This is an upgrade of the PTO's existing facilities beyond the Point of Interconnection. If the higher-queued project delays its in-service date or withdraws from the Queue, the Orange Grove Project will be responsible for advancing $85K for this Reliability Network Upgrade.

If the higher-queued project, Queue Position #173, delays its in-service date or withdraws from the Queue, the Orange Grove Project will also be responsible for funding an additional $33K for the PTO's Interconnection Facilities. This additional cost is needed to 1) install bus work associated with a new line position created with the Main Bus Extension at the Pala Substation and 2) install an additional 50' (200' total) of cable from the termination stand to the substation fence. (No conduit installation will be needed.)

The preliminary, non-binding, good faith construction schedule estimate to design, procure, and construct the facilities typically begins after the signing of the Large Generator Interconnection Agreement (LGIA) and does not include the time required for environmental review and the permitting processes, if applicable. Required lead times depend on many factors, including whether an exemption(s) from the California Public Utilities Commission's (CPUC's) G.O. 131-D Permit to Construct (PTC) process, can be obtained. For example, absent an exemption, the process of obtaining a PTC could take one to two years, possibly even longer. SDG&E anticipates that the ability to obtain exemptions from the PTC process (in which case an Advice Letter filing with the CPUC should be sufficient for obtaining the CPUC's approval to proceed with construction) will be enhanced if the IC includes the full scope of the transmission and substation additions and upgrades in its application to the lead agency. Filing of the Advice Letter is dependent on the IC's licensing approval from the California Energy Commission (CEC). A delay in the CEC approval would delay the filing of the Advice Letter and result in a delay of the in-service date (see Section 10 for further details).

Considering the time needed to complete the Interconnection Facilities Study, the LGIA, construction of the Interconnection Facilities and Network Upgrades (including potential environmental review, permitting, design, procurement, and construction), the in-service date of April 1, 2008 does not appear to be feasible unless an expedited schedule is executed. Per Section 9 of the LGIP, an Engineering & Procurement (E&P) Agreement may be utilized prior to executing an LGIA. The E&P Agreement authorizes the Participating TO to commence engineering and procurement of long lead-time items necessary for the interconnection. The IC should consider this optional procedure to attempt to meet the in-service date.

Operating procedures which may include curtailing the output of the project during planned or extended forced outages may be required in order to operate reliably. However, identification of the operating procedures is outside the scope of this study.

2. Project and Interconnection Information

The Orange Grove Project is a 99 MW (net output to California ISO Controlled Grid) combustion turbine project. The proposed location of the project is in San Diego County, California, along Highway 76 (Pala Road), east of Interstate 15.

J-Power USA proposes the following milestone dates:

A. Proposed In-Service Date: April 1, 2008

B. Proposed Trial Operation Date: May 1, 2008

C. Proposed Commercial Operation Date: May 31, 2008

The requested point of interconnection is the 69 kV bus at SDG&E's Pala Substation. No alternative point of interconnection was identified.

A conceptual one-line diagram of the proposed interconnection is shown in Figure 2.1. Figures 2.2 and 2.3 show the transmission facilities in the area and the Project location.

Figure 2.1: Conceptual One-line Diagram

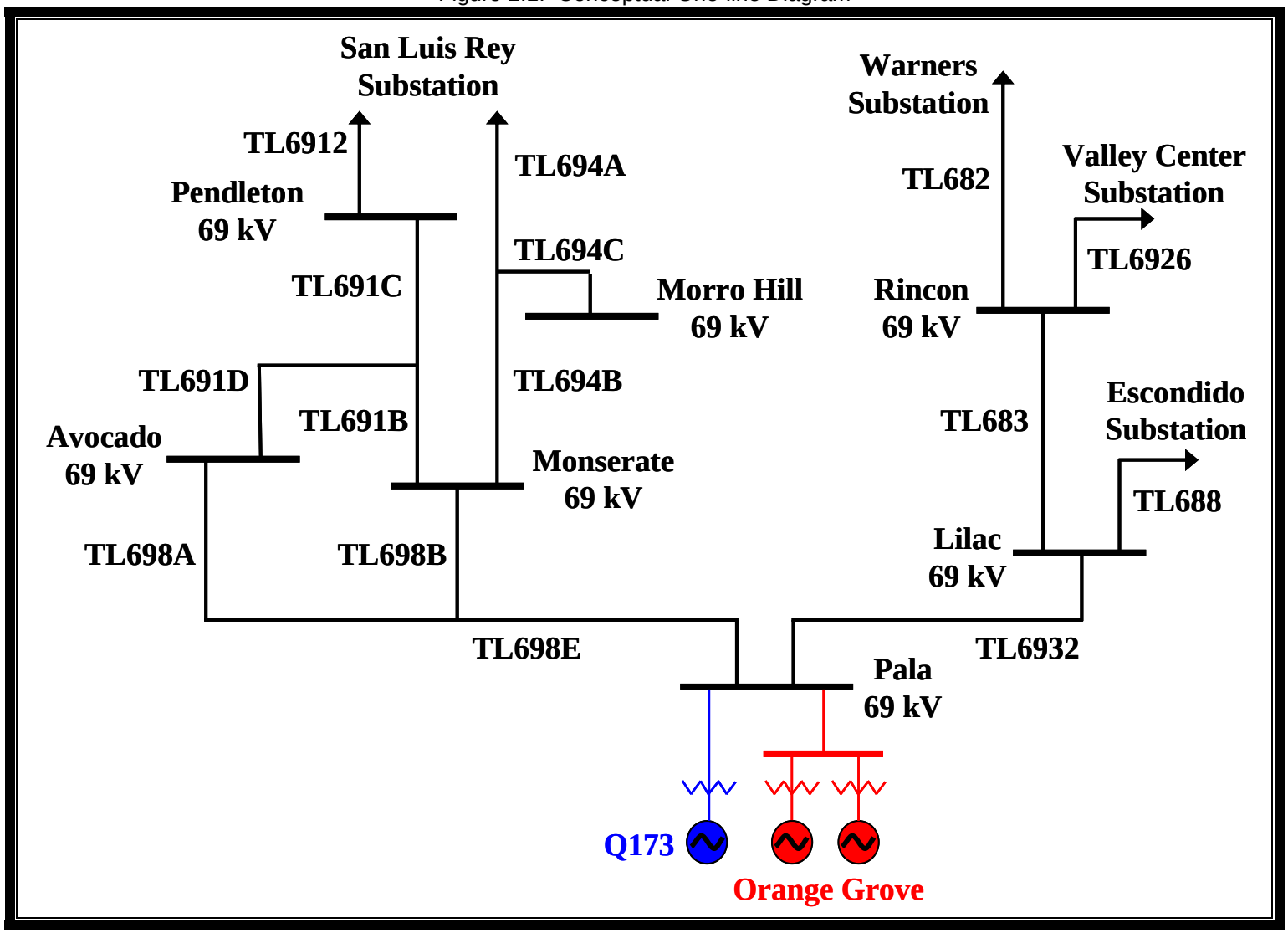


Figure 2.2: Project Vicinity Map

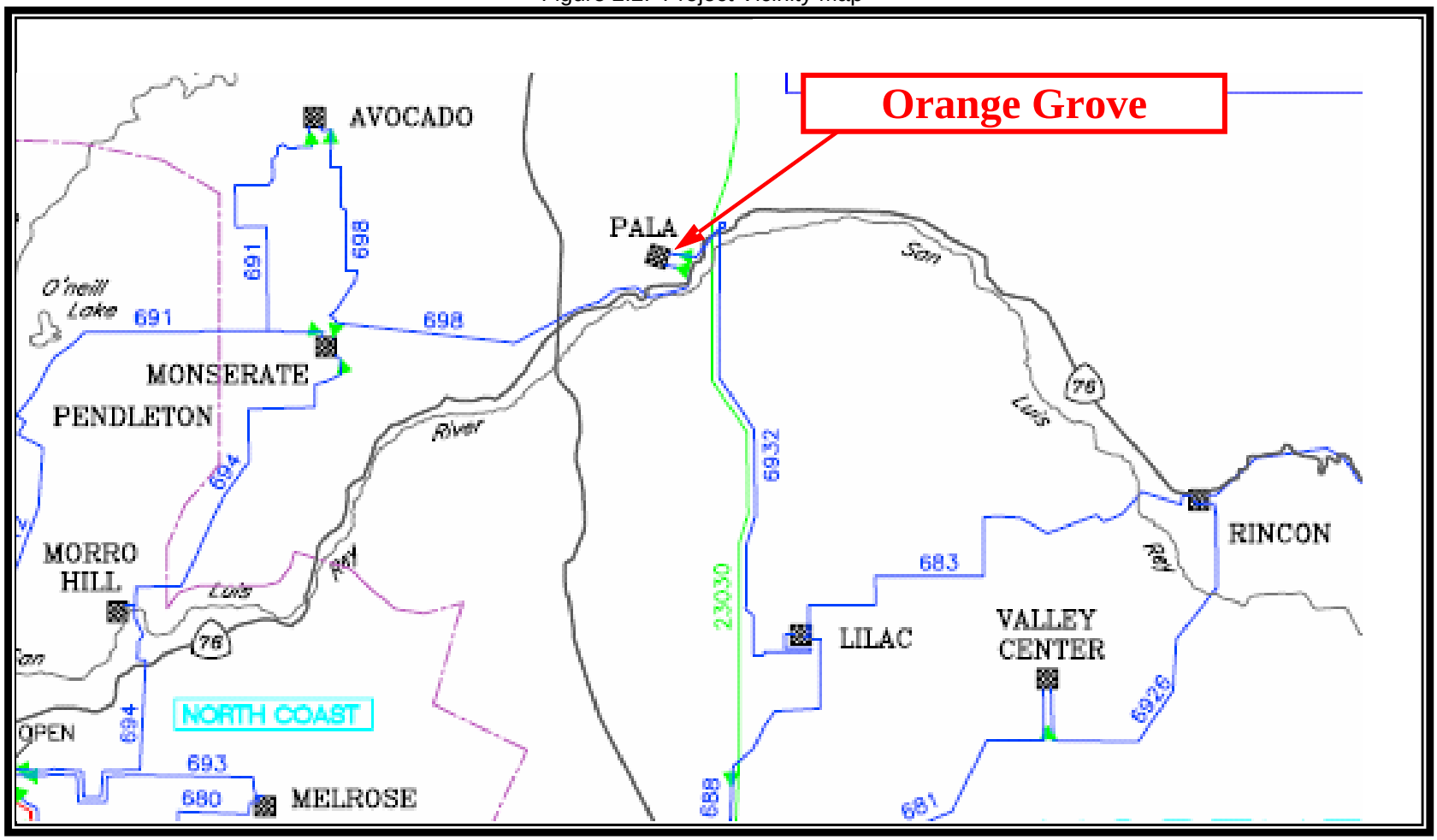
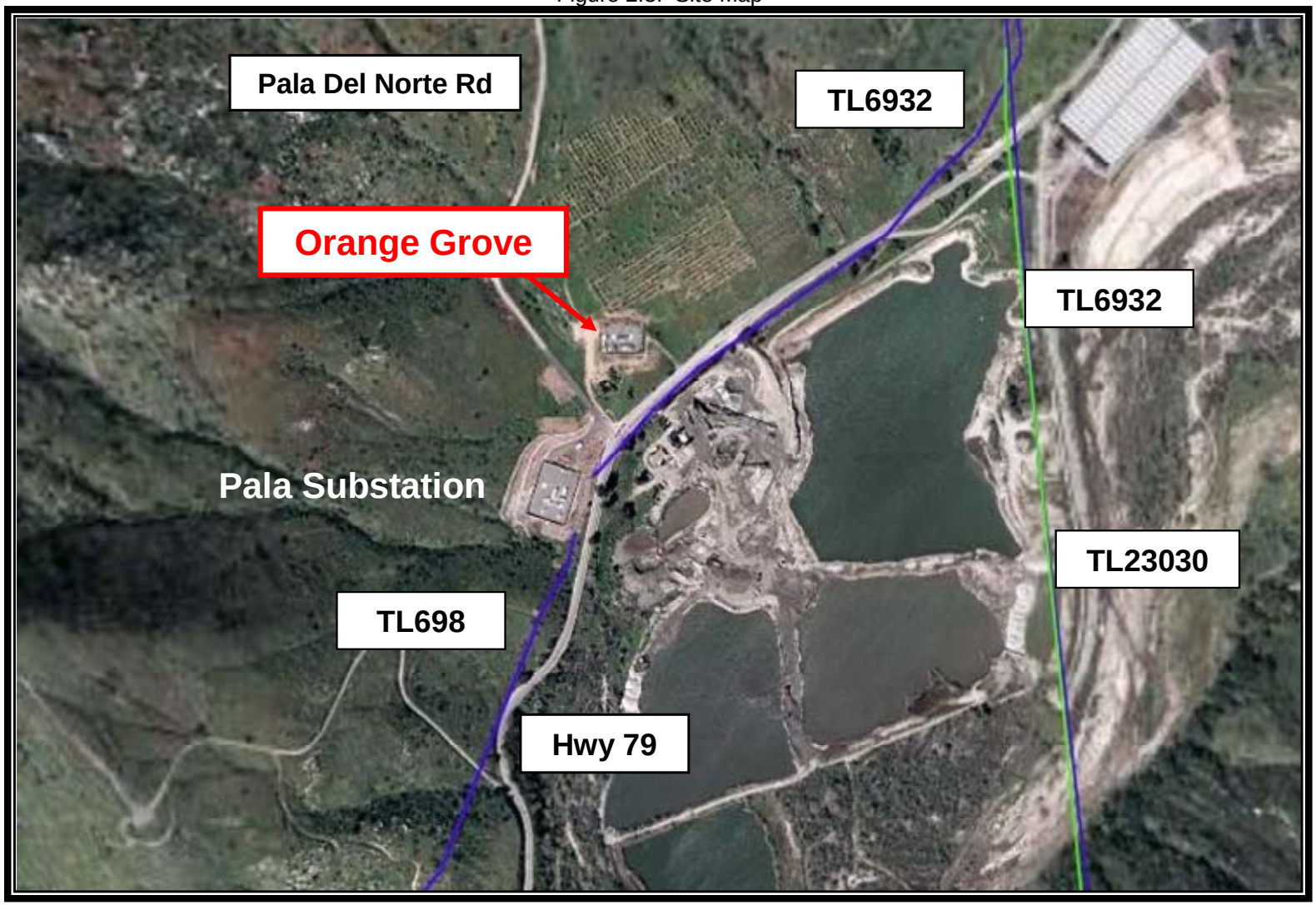


Figure 2.3: Site Map



3. Study Assumptions

The CAISO and SDG&E conducted the ISIS using the following assumptions:

A. The Project consists of two combustion turbines with a 99 MW net output to the grid.

B. The proposed Commercial Operation Date (COD) is May 31, 2008.

C. The project will be connected to SDG&E's Pala 69 kV substation with one 69 kV generator transmission line. Each generator will be connected to the Orange Grove 69 kV bus with a three-phase 13.8/69 kV step-up transformer rated at 75 MVA with 8% impedance at 45 MVA.

D. Orange Grove occupies Queue Position #201 in the CAISO Controlled Grid Generation Queue (CAISO Queue). The Commercial Operation Date (COD) study examines operating conditions modeling higher-queued generation projects within the SDG&E network which will be in-service when Orange Grove is in-service. The COD study will evaluate the 2008 heavy summer and 2008/2009 light winter study periods. The Future Year (FY) study, or 'Queue' study, includes all higher-queued generation projects within the SDG&E network. The FY study will evaluate the 2012 heavy summer study period. The modeled CAISO Queue generation projects and the latest CAISO Queue are included in Appendix B. These generation projects will be modeled in the study cases, but may not necessarily be dispatched under all study conditions. Generation was dispatched to represent a "worst case analysis" by stressing the transmission system in a reasonable manner.

E. Special Protection Systems (SPS) were modeled in the power flow cases.

F. Table 3.1 identifies SDG&E transmission projects modeled in each of the power flow and short circuit cases.

Table 3.1: Modeled SDG&E Transmission Projects

Project	COD		FY
	2008 Heavy Summer	**2008-09 Light Winter**	**2012 Heavy Summer**
230 kV Otay Metro Powerloop	Yes	Yes	Yes
Silvergate Substation	No	Yes	Yes
Sunrise Powerlink 500 kV and associated plan of service	No	No	Yes

G. The power flow models include forecast peak and off-peak load conditions.

4. Power Flow Cases

Three (3) power flow cases were used to evaluate the addition of the Orange Grove Project. All cases were derived from the latest available CAISO/Western Electric Coordinating Council (WECC) full-loop power flow cases and developed with GE PSLF version 16 or higher.

4.1 Commercial Operation Date (COD)

The Commercial Operation Date (COD) analysis examines operating conditions modeling higher-queued generation projects within the SDG&E network which will be in-service when Orange Grove is in-service. Two power flow cases were developed for the COD analysis.

4.1.1 2008 Heavy Summer

The 2008 heavy summer case has a 1-in-10 year heat wave load forecast of 4,742 MW and SDG&E import level of 2,833 MW. The case is derived from the WECC "08hs3sa1" case. This case represents high load and high import level conditions. Generation within the immediate proximity of the project is fully dispatched.

4.1.2 2008-09 Light Winter

The 2008-09 light winter case has an off-peak load forecast of 1,778 MW (38% of peak) and SDG&E import level of 848 MW. The case is derived from the WECC "07lw1" case. This case represents low load and low import level conditions. Generation within the immediate proximity of the project is fully dispatched.

Both COD cases include SDG&E's updated model, all CAISO Queue generation within SDG&E's transmission system as shown in Appendix B, and all SDG&E transmission projects as shown in Table 3.1.

4.2 Future Year (FY)

The Future Year (FY) analysis includes all higher-queued generation projects within the SDG&E network. The FY power flow case is a 2012 heavy summer power flow case. The 2012 heavy summer case has a 1-in-10 year heat wave load forecast of 4,981 MW and SDG&E import level of 3,584 MW. The case is derived from the CAISO "CSRTP06" case. This case represents high load and high import level conditions as well as the expected impact of the California Solar Initiative (60 MW reduction) and the Demand Response Program (29 MW reduction). Generation within the immediate proximity of the project is fully dispatched.

The FY case includes SDG&E's updated model, all CAISO Queue generation within SDG&E's transmission system as shown in Appendix B, and all SDG&E transmission projects as shown in Table 3.1.

Load and resource summary tables for all power flow cases are included in Appendix C.

5. Study Criteria

The Western Electricity Coordinating Council (WECC) and North American Electric Reliability Council (NERC) planning criteria were used to evaluate the system impact.

5.1 Thermal Steady-State Criteria

All power flow analyses are conducted with the General Electric PSLF Version 16 software.

5.1.1 Category A – All Facilities in Service

Category A (N-0) normal overloads are those that exceed 100% of normal ratings that occur with all facilities in service.

5.1.2 Category B – Loss of Single Element

Category B emergency overloads are those that exceed 100% of emergency ratings that occur due to a Category B contingency. A Category B contingency is commonly referred to as an “N-1” event, where there is a loss of a single element. No loss of customer load is allowed for Category B contingencies.

A single transmission circuit outage with one generator already out of service and the system adjusted shall meet the performance requirements of the NERC Planning Standards for Category B contingencies.

5.1.3 Category C – Loss of Multiple Elements

Category C emergency overloads are those that exceed 100% of emergency ratings that occur due to a Category C contingency. A Category C contingency is commonly referred to as an “N-2” event, where there is a loss of two or more elements. Planned (controlled) interruption of customer load and/or generation may occur and contracted firm (non-recalled reserved) transfers may be curtailed.

5.2 Short Circuit Breaker Duty Criteria

Short circuit studies are performed to determine the maximum fault currents on various buses in the vicinity of the project. This study assesses the impact of increased fault duty resulting from the interconnection of the project. The Aspen Version 9.0 program is used to conduct the detailed short circuit studies with three line-to-ground (3LG) and single line-to-ground (LG) faults to examine the impact of the project on the system. Equipment that may become overstressed as a result of the added generation will be identified using the criteria in Table 5.1.

Table 5.1: SDG&E Short Circuit Breaker Duty Criteria Summary

Equipment	Disturbance	Criteria
Existing Generator Breakers	LG and 3LG faults	No fault exceeds 100% of the nameplate interrupting rating.
Existing Non-Generator Breakers ≤ 230 kV	LG and 3LG faults	No fault exceeds 115% of the nameplate interrupting rating.
Existing Non-Generator Breakers > 230 kV	LG and 3LG faults	No fault exceeds 100% of the nameplate interrupting rating.

5.3 Transient Stability Criteria

Transient stability analysis is a time-based simulation that assesses the performance of the power system during (and shortly following) a contingency. Transient stability studies were performed to ensure system stability following critical faults on the system.

The system is considered stable if the following conditions are met:

A. Machine Synchronism - All machines in the WECC interconnected system must remain in synchronism as demonstrated by relative rotor angles (unless modeling problems are identified and concurrence is reached that a problem does not really exist).

B. Simulation Time and System Damping

a. A stability simulation will be deemed to exhibit positive damping if a line defined by the peaks of the machine relative rotor angle swing curves tends to intersect a second line connecting the valleys of the curves with the passing of time.

b. Corresponding lines on bus voltage swing curves will likewise tend to intersect. A stability simulation, which satisfies these conditions, will be defined as stable.

c. Duration of a stability simulation run will be ten seconds unless a longer time is required to ascertain damping.

d. The transient performance analysis will start 3 cycles after the fault clearing and conclude at the end of the simulation.

e. A case will be defined as marginally stable if it appears to have zero percent damping and the voltage dips are within (or at) the WECC Reliability Criteria limits.

Performance of the transmission system is measured against the WECC Reliability Criteria and the NERC Planning Standards.

Table 5.2 is an excerpt from the NERC/WECC Reliability Criteria. The reliability and performance criteria were applied to the entire WECC transmission system.

Table 5.2: WECC Disturbance-Performance Table of Allowable Effects on Other Systems

NERC/WECC Categories	Transient Voltage Dip Standard	Minimum Transient Frequency Standard
A System normal	Nothing in addition to NERC	
B One element out-of-service	Not to exceed 25% at load buses or 30% at non-load buses. Not to exceed 20% for more than 20 cycles at load buses.	Not below 59.6Hz for 6 cycles or more at a load bus.
C Two or more elements out-of-service	Not to exceed 30% at any bus. Not to exceed 20% for more than 40 cycles at load buses.	Not below 59.0Hz for 6 cycles or more at a load bus.
D Extreme multiple-element outages	Nothing in addition to NERC	

5.4 Post-Transient Voltage Criteria

Table 5.3 is an excerpt from the NERC/WECC Planning Standards. The governor power flow is utilized to the post-transient voltage deviation criteria.

Table 5.3: WECC Disturbance-Performance Table of Allowable Effects on Other Systems

Performance Level/Category	Disturbance	Post Transient Voltage Deviation Criteria
B	Generator One Circuit One Transformer PDCI	Not to exceed 5% at any bus.*
C	Two Generators Two Circuits IPPDC	Not to exceed 10% at any bus.
* SCE allows deviation up to 7% on certain buses for N-1		

5.5 Reactive Power Deficiency Criteria

Table 5.4 summarizes the voltage support and reactive power criteria in the NERC/WECC Planning Standards.

Table 5.4: Reactive Power Deficiency Criteria Summary

Performance Level/Category	Disturbance	Reactive Power Deficiency Criteria
B	Generator One Circuit One Transformer PDCI	Governor power flow to reach convergence at 105% of SDG&E load level
C	Two Generators Two Circuits IPPDC	Governor power flow to reach convergence at 102.5% of SDG&E load level

6. Interconnection System Impact Study Results

6.1 Steady State Power Flow Results

Steady state power flow analysis, including Category A, B, and C contingencies, was performed for the COD 2008 heavy summer, COD 2008-09 light winter, and FY 2012 heavy summer power flow cases. A complete listing of all contingencies is included in Appendix D.

Some contingencies caused facilities to overload in the pre-project and the post-project scenarios. The impact of the Project on the pre-project overloads was minimal. The project is relatively a small generator and the mitigation measures for the pre-project overloads will be sufficient to accommodate the project. The IC is not responsible for mitigating overloads if they were pre-existing.

6.1.1 Category A (N-0) Normal Violations

There were no Category A normal overloads or voltage limit violations resulting from the interconnection of the project for any of the scenarios studied.

6.1.2 Category B (N-1) Contingency Violations

There were six (6) facilities that have Category B emergency overloads resulting from the interconnection of the project. Mitigation for these overloads is the responsibility of the Interconnection Customer.

There were no Category B voltage limit violations resulting from the interconnection of the project for any of the scenarios studied.

Table 6.1 shows the worst Category B overloads for all overloaded facilities for COD and FY scenarios.

6.1.3 Category C (N-2) Contingency Violations

There were four (4) facilities that have Category C emergency overloads resulting from the interconnection of the project. These facilities were already identified as having Category B overloads and the IC is obligated to mitigate these overloads.

There were no Category C voltage limit violations resulting from the interconnection of the project for any of the scenarios studied.

Table 6.2 shows the worst Category C overloads for all overloaded facilities for COD and FY scenarios.

Complete listings of all power flow analysis results are included in Appendix E. Selected power flow plots for normal and emergency conditions are included in Appendix F.

Table 6.1 Worst Category B Overloads

Worst Category B MVA1 pu Loading				Case Name					
Monitored Element	**Contingency Description**	**MVA1**	**MVA2**	**08hs-pre**	**08hs-pst**	**08lw-pre**	**08lw-pst**	**12hs-pre**	**12hs-pst**
LINE PALA 69kV-MNSRATTP 69kV ck1	line LILAC to PALA 69 ck 1	68	68	0.44	1.80	0.63	1.97	0.42	1.78
LINE MONSRATE 69kV-MNSRATTP 69kV ck1	line LILAC to PALA 69 ck 1	77	77	0.21	1.36	0.47	1.60	0.19	1.33
LINE MONSRATE 69kV-AVCADOTP 69kV ck1	line LILAC to PALA 69 ck 1	51	51			0.29	1.10		
LINE LILAC 69kV-PALA 69kV ck1	line AVOCADO to MNSRATTP 69 ck 1	71	71	0.42	1.73	0.60	1.89	0.40	1.71
LINE RINCON 69kV-LILAC 69kV ck1	line ASH-ASHTP-FELICITA-VC 69 ck 1	55	55					0.95	1.06
LINE WARNERS 69kV-RINCON 69kV ck1	line CREELMAN to SYCAMORE 69 ck 1	32	32					0.98	1.10
LINE WARNERS 69kV-RINCON 69kV ck1	line WIND-ML 500kV SPS6.2 trip ML-TJI	32	32	0.96	1.09				

Table 6.2 Worst Category C Overloads

Worst Category C MVA1 pu Loading				Case Name					
Monitored Element	**Contingency Description**	**MVA1**	**MVA2**	**08hs-pre**	**08hs-pst**	**08lw-pre**	**08lw-pst**	**12hs-pre**	**12hs-pst**
LINE PALA 69kV-MNSRATTP 69kV ck1	Lilac 69kV S Bus	68	68	0.17	1.22	0.47	1.81	0.21	1.18
LINE MONSRATE 69kV-MNSRATTP 69kV ck1	Lilac 69kV S Bus	77	77			0.34	1.47		
LINE LILAC 69kV-PALA 69kV ck1	PEN-ES #1+ PEN-ES #2 230KV	71	71	0.61	1.25	0.40	1.04	0.53	1.18
LINE WARNERS 69kV-RINCON 69kV ck1	CH-SX-SN+LC-EL 138/69 KV	32	32					0.90	1.02

6.2 Short Circuit Study Results

Three line-to-ground (3LG) and single line-to-ground (SLG) faults were simulated with and without the Orange Grove Project to determine if there are any overstressed circuit breakers caused by addition of the Project.

Study results indicate there are no circuit breaker fault duty limit violations attributable to the Project. The IC is not responsible for mitigating any pre-existing overstressed circuit breakers. SDG&E has various projects planned to eliminate the overstressed circuit breakers identified before the Project's proposed interconnection. The short circuit analysis results are included in Appendix G.

6.3 Transient Stability Study Results

The purpose of the transient stability study is to determine if the transmission system would be stable with the addition of the project. Project specific data provided by J-Power USA was used to create dynamic models for the transient stability study. Default data was used for the excitation system model due to unstable initialization of the IC provided data. Details of the machine dynamic models are included in Appendix H.

Transient stability analysis was performed for the following system contingencies for both the 2008 heavy summer and 2008-09 light winter cases for a study period of 10 seconds:

A. Three-phase fault on Pala 69 kV bus cleared after 6 cycles (no system elements removed post clearing).

B. Three-phase fault on Pala 69 kV bus cleared after 6 cycles by opening Pala-Lilac 69 kV transmission line.

C. Three-phase fault on Pala 69 kV bus cleared after 6 cycles by opening Pala-Monserate-Avocado 69 kV transmission line.

D. Three-phase fault on San Onofre 230 kV bus cleared after 6 cycles by tripping San Onofre units 2 and 3.

E. Three-phase fault on Palomar Energy 230 kV bus cleared after 6 cycles by tripping Palomar Energy units 1, 2, and 3.

F. Three-phase fault on Imperial Valley 500 kV bus cleared after 4 cycles by opening Imperial Valley-Miguel 500 kV transmission line.

Switching sequences for the transient stability simulations are included in Appendix I.

The transmission system was adequately damped and all generators remained synchronized for all transient stability simulations studied.

Frequency deviation violations were observed in both the pre and post-project cases at SDG&E's load bus (Pala 69 kV) and at Q173 13.8 kV generator bus for the three-phase faults on the Pala 69 kV bus in both heavy summer and light winter conditions. Additional frequency deviation violations were observed in the post-project cases at the Orange Grove 13.8 kV generator bus and voltage deviation violations were observed in the post-project cases at SDG&E's load bus (Pala 69 kV) for the same conditions. The frequency/voltage deviation violations were observed in the local area and did not migrate to adjacent systems. The frequency and voltage violations are shown in Table 6.3. Transient stability analysis results are shown in Appendix J and transient stability plots are shown in Appendix K.

Additional transient stability analysis was performed to determine if the Orange Grove Project would cause any transient stability violations without Q173. Frequency deviation violations were observed in post-project scenarios at the Orange Grove 69 kV, Orange Grove 13.8 kV, and Pala 69 kV buses without Q173 for the three-phase faults on the Pala 69 kV bus in both heavy summer and light winter conditions. The transient stability analysis results are shown at the end of Appendix J and transient stability plots are shown at the end of Appendix K.

The transient stability simulation is based on "typical" generator data for the proposed project because actual data is not yet available. The frequency/voltage concerns may be caused by incorrect modeling in the study. It is recommended that another transient stability analysis be performed to validate the system performance when the actual test data becomes available. This must occur before the Project is commercially operational. If the results with the actual test data are similar to the results with the typical data, the IC must implement a faster switching protection scheme to separate the generator from SDG&E's system.

The transient stability analysis concluded that the WECC transmission system remained stable for all contingency simulations but there are frequency and voltage deviation violations at the 69 kV Pala load bus. The IC may have to implement a protection scheme which includes faster switching to separate from SDG&E's system.

Table 6.3 Transient Stability Frequency and Voltage Violations

CASE NAME/SIMULATION	EXTNUM/NAME/BASEKV	TYPE	ID	AREA	ZONE	INITIAL	MIN/MAX	DELTA	PERCDIFF	ATTIME	DURATION (Seconds)	DURATION (Cycles)
08hs-pre_swt1_pa69	22623 PA49MW 13.8	fbug	1	22	225	60.000	59.138	0.862	1.437	1.254	0.113	6.750
08hs-pre_swt2_pa-li-tl6932	22623 PA49MW 13.8	fbug	1	22	225	60.000	58.987	1.013	1.689	1.254	0.150	9.000
08hs-pre_swt3_av-mn-pa-tl698	22623 PA49MW 13.8	vbug	1	22	225	0.985	0.663	0.322	32.655	1.179	0.038	2.250
08hs-pre_swt3_av-mn-pa-tl698	22623 PA49MW 13.8	fbug	1	22	225	60.000	58.986	1.014	1.690	1.254	0.150	9.000
08hs-pst_swt1_pa69	22623 PA49MW 13.8	fbug	1	22	225	60.000	59.055	0.945	1.575	1.254	0.150	9.000
08hs-pst_swt1_pa69	22624 PALA 69	fbul	1	22	225	60.000	59.393	0.607	1.012	1.292	0.113	6.750
08hs-pst_swt1_pa69	22627 PA99MW 69	fbus	1	22	225	60.000	59.391	0.609	1.014	1.292	0.113	6.750
08hs-pst_swt1_pa69	22628 PA99MWQ1 13.8	fbug	1	22	225	60.000	59.062	0.938	1.563	1.254	0.188	11.250
08hs-pst_swt1_pa69	22629 PA99MWQ2 13.8	fbug	1	22	225	60.000	59.062	0.938	1.563	1.254	0.188	11.250
08hs-pst_swt2_pa-li-tl6932	22623 PA49MW 13.8	fbug	1	22	225	60.000	59.058	0.942	1.570	1.329	0.188	11.250
08hs-pst_swt2_pa-li-tl6932	22624 PALA 69	fbul	1	22	225	60.000	59.188	0.812	1.354	1.329	0.188	11.250
08hs-pst_swt2_pa-li-tl6932	22627 PA99MW 69	fbus	1	22	225	60.000	59.184	0.816	1.360	1.329	0.188	11.250
08hs-pst_swt2_pa-li-tl6932	22628 PA99MWQ1 13.8	fbug	1	22	225	60.000	58.908	1.092	1.820	1.329	0.188	11.250
08hs-pst_swt2_pa-li-tl6932	22629 PA99MWQ2 13.8	fbug	1	22	225	60.000	58.908	1.092	1.820	1.329	0.188	11.250
08hs-pst_swt3_av-mn-pa-tl698	22623 PA49MW 13.8	vbug	1	22	225	1.005	0.700	0.305	30.372	1.217	0.038	2.250
08hs-pst_swt3_av-mn-pa-tl698	22623 PA49MW 13.8	fbug	1	22	225	60.000	59.052	0.948	1.580	1.329	0.225	13.500
08hs-pst_swt3_av-mn-pa-tl698	22624 PALA 69	vbul	1	22	225	1.016	0.698	0.319	31.358	1.217	0.075	4.500
08hs-pst_swt3_av-mn-pa-tl698	22624 PALA 69	fbul	1	22	225	60.000	59.218	0.782	1.303	1.329	0.188	11.250
08hs-pst_swt3_av-mn-pa-tl698	22627 PA99MW 69	vbus	1	22	225	1.017	0.698	0.318	31.311	1.217	0.075	4.500
08hs-pst_swt3_av-mn-pa-tl698	22627 PA99MW 69	fbus	1	22	225	60.000	59.215	0.785	1.309	1.329	0.188	11.250
08hs-pst_swt3_av-mn-pa-tl698	22628 PA99MWQ1 13.8	fbug	1	22	225	60.000	58.931	1.069	1.782	1.329	0.225	13.500
08hs-pst_swt3_av-mn-pa-tl698	22629 PA99MWQ2 13.8	fbug	1	22	225	60.000	58.931	1.069	1.782	1.329	0.225	13.500
08lw-pre_swt2_pa-li-tl6932	22623 PA49MW 13.8	fbug	1	22	225	60.000	58.941	1.059	1.764	1.254	0.150	9.000
08lw-pre_swt2_pa-li-tl6932	22624 PALA 69	fbul	1	22	225	60.000	59.398	0.602	1.003	1.254	0.113	6.750
08lw-pre_swt2_pa-li-tl6932	22627 PA99MW 69	fbus	1	22	225	60.000	59.398	0.602	1.003	1.254	0.113	6.750
08lw-pre_swt2_pa-li-tl6932	22628 PA99MWQ1 13.8	fbug	1	22	225	60.000	59.398	0.602	1.003	1.254	0.113	6.750
08lw-pre_swt2_pa-li-tl6932	22629 PA99MWQ2 13.8	fbug	1	22	225	60.000	59.398	0.602	1.003	1.254	0.113	6.750
08lw-pre_swt3_av-mn-pa-tl698	22623 PA49MW 13.8	fbug	1	22	225	60.000	58.973	1.027	1.711	1.254	0.113	6.750
08lw-pst_swt1_pa69	22623 PA49MW 13.8	fbug	1	22	225	60.000	59.036	0.964	1.607	1.254	0.150	9.000
08lw-pst_swt1_pa69	22624 PALA 69	fbul	1	22	225	60.000	59.402	0.598	0.997	1.292	0.113	6.750
08lw-pst_swt1_pa69	22627 PA99MW 69	fbus	1	22	225	60.000	59.401	0.599	0.999	1.292	0.113	6.750

CASE NAME/SIMULATION	EXTNUM/NAME/BASEKV	TYPE	ID	AREA	ZONE	INITIAL	MIN/MAX	DELTA	PERCDIFF	ATTIME	DURATION (Seconds)	DURATION (Cycles)
08lw-pst_swt1_pa69	22628 PA99MWQ1 13.8	fbug	1	22	225	60.000	59.071	0.929	1.549	1.254	0.150	9.000
08lw-pst_swt1_pa69	22629 PA99MWQ2 13.8	fbug	1	22	225	60.000	59.071	0.929	1.549	1.254	0.150	9.000
08lw-pst_swt2_pa-li-tl6932	22623 PA49MW 13.8	fbug	1	22	225	60.000	59.058	0.942	1.570	1.292	0.225	13.500
08lw-pst_swt2_pa-li-tl6932	22624 PALA 69	fbul	1	22	225	60.000	59.187	0.813	1.355	1.329	0.188	11.250
08lw-pst_swt2_pa-li-tl6932	22627 PA99MW 69	fbus	1	22	225	60.000	59.183	0.817	1.361	1.329	0.188	11.250
08lw-pst_swt2_pa-li-tl6932	22628 PA99MWQ1 13.8	fbug	1	22	225	60.000	58.906	1.094	1.824	1.329	0.188	11.250
08lw-pst_swt2_pa-li-tl6932	22629 PA99MWQ2 13.8	fbug	1	22	225	60.000	58.906	1.094	1.824	1.329	0.188	11.250
08lw-pst_swt3_av-mn-pa-tl698	22623 PA49MW 13.8	vbug	1	22	225	1.023	0.714	0.309	30.198	1.217	0.038	2.250
08lw-pst_swt3_av-mn-pa-tl698	22623 PA49MW 13.8	fbug	1	22	225	60.000	59.068	0.932	1.554	1.292	0.225	13.500
08lw-pst_swt3_av-mn-pa-tl698	22624 PALA 69	vbul	1	22	225	1.041	0.720	0.321	30.876	1.217	0.075	4.500
08lw-pst_swt3_av-mn-pa-tl698	22624 PALA 69	fbul	1	22	225	60.000	59.222	0.778	1.297	1.329	0.188	11.250
08lw-pst_swt3_av-mn-pa-tl698	22627 PA99MW 69	vbus	1	22	225	1.041	0.720	0.321	30.830	1.217	0.038	2.250
08lw-pst_swt3_av-mn-pa-tl698	22627 PA99MW 69	fbus	1	22	225	60.000	59.218	0.782	1.303	1.329	0.188	11.250
08lw-pst_swt3_av-mn-pa-tl698	22628 PA99MWQ1 13.8	fbug	1	22	225	60.000	58.931	1.069	1.782	1.329	0.188	11.250
08lw-pst_swt3_av-mn-pa-tl698	22629 PA99MWQ2 13.8	fbug	1	22	225	60.000	58.931	1.069	1.782	1.329	0.188	11.250

6.4 Deliverability Assessment Results

In accordance with LGIP section 3.3.3.1 of the LGIP, a Deliverability Assessment will be performed to determine the Project's ability to deliver its energy to the CAISO Controlled Grid under peak load conditions. The Deliverability Assessment will provide the IC with information as to the level of deliverability without Network Upgrades, and the information as to the required Network Upgrades to enable the Project to deliver the full output to the grid based on specified study assumptions. For more details of Deliverability Assessment including methodology and modeling requirements for deliverability base case, please refer to http://www.caiso.com/181c/181c902120c80.html.

As required by LGIP tariff language, deliverability results need to provide the following information of this project regarding deliverability:

A. The deliverability level without Network Upgrades.

B. The required Network Upgrades to support 100% deliverability.

6.5 Post-Transient Voltage Analysis Results

Per mutual agreement with SDG&E, CAISO, and the IC, the post-transient voltage analysis was waived for this project. No decrease in voltage stability is expected due to Orange Grove's relatively small size, interconnection voltage, location, and other projects in the area.

6.6 Reactive Power Deficiency Analysis Results

Per mutual agreement with SDG&E, CAISO, and the IC, the reactive power deficiency analysis was waived for this project. No negative impact on reactive power is expected due to the Project's relatively small size, interconnection voltage, location, and other projects in the area.

7. Mitigation

The power flow analyses identified six (6) facilities which require mitigation due to Category B emergency overloads resulting from the interconnection of the Project. Four (4) of these facilities also overload under Category C emergency conditions. The overloaded facilities are identified in Tables 6.1 and 6.2. Each of the overloaded facilities is listed with its corresponding mitigation measure. The mitigation measures are proposed to eliminate the Category B overloads and will also eliminate the Category C overloads.

7.1 TL 698E, Pala-Monserate Tap

This 69 kV line overloads under Category B and C conditions for numerous contingencies in the COD 2008 heavy summer, COD 2008-2009 light winter, and FY 2012 heavy summer cases. The greatest overload is due to the outage of TL 6932, Lilac-Pala. The mitigation for this overload is a reconductor of TL 698E from Pala to Monserate with 636 KCM ACSS and a replacement of the Pala getaways with 3000 KCM Cu.

7.2 TL 698B, Monserate-Monserate Tap

This 69 kV line overloads with the outage of TL 6932, Lilac-Pala, under Category B conditions in the COD heavy summer and light winter and the FY heavy summer cases. The line also overloads under Category C conditions with the outage of the Lilac South Bus in the COD light winter case. The pole line was upgraded for a distribution project. The IC is responsible for minimal upgrades which were not included in the distribution project – replacement of the getaways at Monserate with 3000 KCM Cu and reconductoring one span to 636 KCM ACSS.

7.3 TL 691B, Monserate-Avocado Tap

This 69 kV line overloads with the outage of TL 6932, Lilac-Pala, under Category B conditions in the COD light winter case. The limiting element is the relay setting at Monserate. Increasing the relay setting will mitigate this overload.

7.4 TL 6932, Lilac-Pala

This 69 kV line overloads under Category B and C conditions for numerous contingencies in the COD heavy summer and light winter and the FY heavy summer cases. The greatest overload is due to the outage of TL 691B, Monserate-Avocado Tap. The limiting elements for this line are the TL 6932 circuit breaker at Lilac and the Pala getaways. The mitigation for this overload is an upgrade of this breaker and a reconductor of the Pala getaways. At this time, the IC is only responsible for upgrading the Pala getaways because there is an existing project scheduled to replace this breaker by December 2007. If the existing project is canceled, the IC will be responsible for replacing this breaker.

7.5 TL 683, Rincon-Lilac

This 69 kV line overloads with the outage of TL 681, Ash-Ash Tap-Felicita-Valley Center, under Category B conditions in the FY heavy summer case. The recommended mitigation for this overload is a reconductor of TL 683. There is an existing project to reconductor this line. It is planned for the year 2011 timeframe. This overload does not exist in the 2008 analyses but is evident in 2012. The IC is responsible for advancing the reconductor project to eliminate the overload caused by the Orange Grove Project. The analysis shows that the reconductor is not needed in 2008. Further study is needed to establish the year the reconductor is needed, sometime between 2009 and 2012. This will be studied during the Facilities Study phase to determine when the absence of this project is detrimental to Orange Grove reliability.

7.6 TL682, Warners-Rincon

This 69 kV line overloads with two Category B contingencies - the outage of TL 6917, Creelman-Sycamore in the FY heavy summer and the outage of TL 50001, Imperial Valley-Miguel, with the SPS 6.2 in the COD heavy summer. The SPS 6.2 will trip the generation at Imperial Valley and the Miguel-Tijuana line in the summer. (A proposed substation is modeled as WIND so the existing TL 50001 is modeled as two sections, IV-WIND and WIND-ML.)

TL 682 also overloads with the “common structure” outage (Category C) of Carlton Hills-Sycamore-Santee 138 kV line and Los Coches-El Cajon 69 kV line in the FY heavy summer.

Due to the 2008 COD requested by the IC, a Special Protection System is recommended in lieu of a major reconductor to mitigate the overload of TL 682. The SPS would monitor TL 682 and initiate tripping of TL 685, Warners-Santa Ysabel, for overload of TL 682.

7.7 Maximum Output without Delivery Network Upgrades

The maximum generation output allowed without the need for Delivery Network Upgrades is 25 MW. Limiting the output of this project’s generation to 25 MW may not be an acceptable mitigation for this Interconnection Request. Per the LGIP 4.4.2, prior to the return of the executed Interconnection Facility Study Agreement to the CAISO, a 15 percent decrease in the generation output is permitted. A reduction in generation output to 25 MW is greater than permitted under this section, LGIP 4.4.2. If this lower generation level of 25 MW is pursued, the IC must request that the CAISO evaluate whether such a modification is a Material Modification. If it is determined that this reduction is not a Material Modification, the reduction in output will be acceptable. If it is deemed a Material Modification, this Interconnection Request must be withdrawn from the Queue and a new Interconnection Request for 25 MW must be submitted.

8. Local Furnishing Bonds/Industrial Development Bonds

SDG&E has financed or refinanced substantial portions of its wholly-owned transmission and distribution systems with proceeds from $687,000,000 of outstanding Local Furnishing Bonds ("LFBs") issued by the City of San Diego and the City of Chula Vista. This includes (without limitation) a portion of the costs of SDG&E's wholly-owned Miguel-Imperial Valley 500 kV transmission line and a portion of SDG&E's wholly-owned United States portion of the Miguel-Tijuana 230 kV transmission line. Interest on these LFBs is tax-exempt. If the proposed Project would impair the tax-exempt status of interest on these LFBs under the Internal Revenue Code, Treasury Regulations and applicable IRS private letter rulings (an "Impairment"), the IC would pay any costs SDG&E incurs in mitigating the Impairment.

The Orange Grove Project does not appear to cause an Impairment at this time. This conclusion may need to be revisited if there is any change in material facts which are relevant to determining whether an Impairment may arise.

SDG&E completed its assessment in the 2012 time period to determine whether (1) the Orange Grove Project will require SDG&E to acquire any facilities sooner, larger or of a different design than is needed for the purpose of providing electric service to SDG&E's retail electric customers, or (2) electric energy from the Orange Grove Project in combination with other local generation and SDG&E's share of electric energy from its remote generation, may cause an actual or deemed cumulative annual net outbound flow of electric energy from SDG&E's wholly-owned electric facilities in San Diego, Orange, and Imperial Counties in violation of the Encumbrances set forth in SDG&E's Appendix B to the Transmission Control Agreement with the CAISO (the "TCA"). Based on prior analyses where SDG&E utilized ABB's Grid View software, a market simulation tool, to model the net energy flow into the SDG&E service territory, electric generating plants used only for high peak load conditions will be dispatched relatively minimal hours per year. Per this assumption, SDG&E presently expects that (1) in connection with the Orange Grove Project, SDG&E will not need to acquire any facilities sooner, larger, or of a different design than is needed for the purpose of providing electric service to SDG&E's retail electric customers, and (2) the actual and deemed flows of electricity into and out of SDG&E's wholly-owned electric facilities in San Diego, Orange, and Imperial Counties are expected to remain in-bound on a net annual basis with the addition of the Orange Grove Project.

Also, if in the future electric energy produced by owners of existing and new generation facilities located in San Diego or Orange County and interconnecting to SDG&E's wholly-owned electric transmission and distribution system is not scheduled and dispatched for sale to SDG&E for service to its local furnishing customers, or if SDG&E is required to acquire facilities sooner, larger, or of a different design than is needed for the purpose of providing electric service to SDG&E's retail electric customers, SDG&E may be required to redeem or defease LFBs, as contemplated by the TCA. Under the CAISO Tariff and TCA, however, the CAISO is obligated to effect such remedial measures as might be available to avoid an Impairment that would otherwise trigger a redemption or defeasance. Such remedial measures, for example, might be undertaken by the CAISO through rejection of schedules or bid protocols sufficient to avoid net annual outbound flows resulting from the Orange Grove Project and other generation within the San Diego basin not utilized to service SDG&E's local furnishing customers, subject to the annual net importer limitation.

9. Estimated Costs

According to the CAISO LGIP study process, the role and responsibilities of SDG&E for this Interconnection System Impact Study are as follows:

A. Identify transmission constraints attributable to the proposed Orange Grove Project,

B. Develop and provide non-binding, good faith estimate of cost and cost responsibility for the Interconnection Facilities, Reliability Network Upgrades, and Delivery Network Upgrades identified in this study,

C. Determine fair and reasonable cost allocations across the various queued projects in the Future Year model with respect to the proposed project.

Cost estimates developed within this study are considered to be preliminary, non-binding, good faith and include the following assumptions:

A. Project concepts are based on representations from the Interconnection Customer.

B. Project concepts are based on mandatory reliability criteria from applicable reliability and regulatory authorities (NERC, WECC, and CAISO).

C. Project concepts are based on sound engineering judgment.

D. All costs are based on SDG&E construction methods and techniques.

E. All costs are in “as year spent” dollars.

F. All costs included in this report are valid for 90 days only.

Table 9.1 summarizes the scope of transmission reinforcements identified in this study and the associated preliminary, non-binding, good faith costs of construction of the facilities. The costs reflect a 2008 in-service date.

Table 9.1: Non-Binding, Good Faith Cost Estimate Summary[10]

Type of Upgrade[11]	Location	Description	Estimated Cost x 1,000
PTO's Interconnection Facilities[12]	Pala Substation[13]	• Install one 69 kV circuit breaker • Install underground cable termination and bus support stands and two 2000 amp disconnects in an existing line position • Install 150' of 3-6" conduit from the termination stand to the substation fence • Install associated control and protection panels for the new line and add RTU points for control, monitoring, and alarming. • Install 150' of cable from the termination stand to substation fence.	$1,404
Reliability Network Upgrades[14]	None[15]	None	$0
Delivery Network Upgrades[16]	TL 698E (Pala-Monserate Tap)	Reconductor from Pala to Monserate Tap with 636 KCM ACSS and replace Pala getaways with 3000 KCM Cu	$10,447
	TL 698B (Monserate-Monserate Tap)	Replace Monserate getaways with 3000 KCM Cu and reconductor one span to 636 KCM ACSS	$278
	TL 691B (Monserate-Avocado Tap)	Increase relay settings at Monserate	$5
	TL 6932 (Lilac-Pala)	Replace Pala getaways with 3000 KCM Cu. (An existing project to replace the TL 6932 breaker at Lilac is scheduled for completion by December 2007.)	$276
	TL 683 (Rincon-Lilac)	Advance the reconductor of TL 683 (needed after 2008)	To be determined[17]
Special Protection System (SPS)	TL 682 (Warners-Rincon)	• SPS to prevent overload of TL 682 • Monitor TL 682 • If TL 682 exceeds rating • Trip TL 685 (Warners-Santa Ysabel)	$44
Total			**$12,454**

[10] All costs estimates are preliminary, non-binding, good faith estimates in "as year spent" dollars. Taxes, landscaping, under grounding, walls, gates, driveways, CAISO metering, and environmental and licensing costs are not included. All Interconnection Facilities costs for ROW are assumed to be the responsibility of the Interconnection Customer. Network Upgrade costs exclude acquisition of new transmission Right-Of-Way (ROW) and substation land.

[11] See Appendix A for the definitions of the types of upgrades as defined by the LGIP.

[12] The IC is obligated to fund the PTO's Interconnection Facilities.

[13] If a higher-queued project (#173) delays its in-service date or withdraws from the Queue, the Orange Grove Project will be responsible for funding an additional $33K for PTO's Interconnection Facilities.

[14] The IC is obligated to advance funds to SDG&E for Reliability Network Upgrades and will be reimbursed upon commercial operation of the plant.

[15] If a higher-queued project (#173) delays its in-service date or withdraws from the Queue, the Orange Grove Project will be responsible for advancing an additional $85K for extending the 69 kV Pala Main Bus.

[16] The IC may elect to advance funds to SDG&E for Delivery Network Upgrades and will be reimbursed upon commercial operation of the plant.

[17] The estimated cost of this advancement will be studied in the Interconnection Facilities Study phase.

9.1 Participating TO's Interconnection Facilities

The PTO's Interconnection Facilities are all the facilities and equipment owned, controlled, or operated by SDG&E from the Point of Change of Ownership to the Point of Interconnection (see Figure 9.1). The Point of Interconnection is the 69 kV bus at the SDG&E Pala Substation. The Point of Change of Ownership is at the Pala Substation fence.

The following PTO's Interconnection Facilities are required for the Orange Grove Project's underground interconnection:

A. Install one 69 kV circuit breaker.

B. Install underground cable termination and bus support stands and two 2000 amp disconnects in an existing line position.

C. Install approximately 150' of 3-6" conduit from the termination stand to the substation fence.

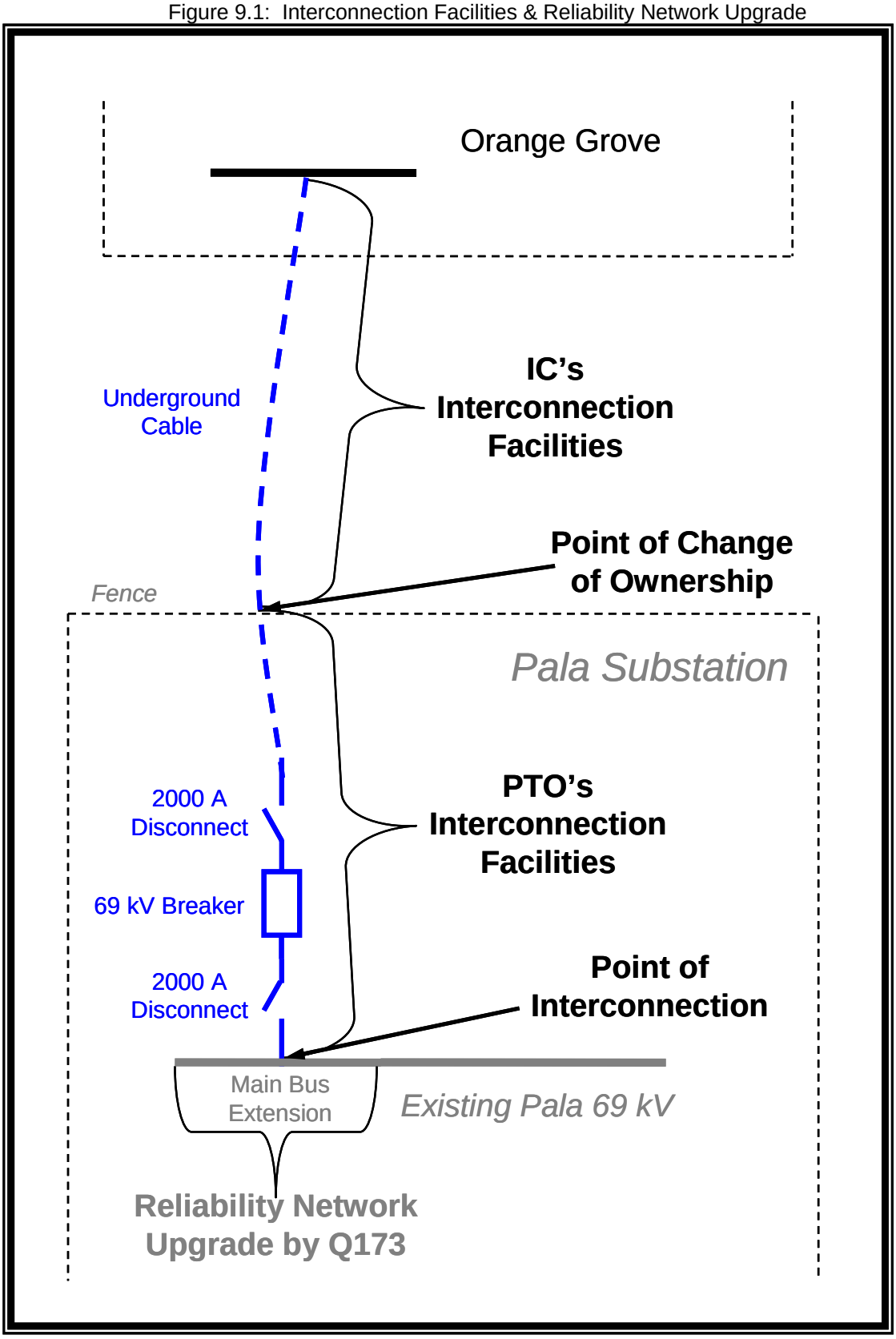
D. Install associated control and protection panels for the new line and add RTU points for control, monitoring, and alarming.

E. Install approximately 150' of cable from the termination stand to the substation fence.

According to the current CAISO Tariff, the IC is obligated to fund $1,404K for the PTO's Interconnection Facilities. See Appendix L for the PTO's Interconnection Facilities in the Ultimate Arrangement and Section View of the Pala Substation.

If the higher-queued project, Queue Position #173, delays its in-service date or withdraws from the Queue, the Orange Grove Project will also be responsible for funding an additional $33K for the PTO's Interconnection Facilities. This additional cost is needed to 1) install bus work associated with a new line position created with the Main Bus Extension at the Pala Substation and 2) install an additional 50' (200' total) of cable from the termination stand to the substation fence. (No conduit installation will be needed.)

Figure 9.1: Interconnection Facilities & Reliability Network Upgrade



9.2 Reliability Network Upgrades

Based on this study, there are no Reliability Network Upgrades attributed to the interconnection of the Project. Although, if the higher-queued project, Queue Position #173, delays its in-service date or withdraws from the Queue, the Orange Grove Project will be responsible for extending the 69 kV Main Bus at the Pala Substation. This is an upgrade of the PTO's existing facilities beyond the Point of Interconnection (see Figure 9.1). The Project will be responsible for advancing $85K for this Reliability Network Upgrade.

9.3 Delivery Network Upgrades

The power flow analyses identified six (6) facilities requiring mitigation due to Category B emergency overloads resulting from the interconnection of the Project. The mitigation measures are proposed to eliminate the Category B overloads and will also eliminate the Category C overloads.

The Delivery Network Upgrades recommended to mitigate the overloaded facilities are:

A. TL 698E (Pala-Monserate Tap): Reconductor from Pala to Monserate Tap with 636 KCM ACSS and replace Pala getaways with 3000 KCM Cu.

B. TL 698B (Monserate-Monserate Tap): Replace Monserate getaways with 3000 KCM Cu and reconductor one span with 636 KCM ACSS.

C. TL 691B (Monserate-Avocado Tap): Increase relay settings at Monserate.

D. TL 6932 (Lilac-Pala): Replace Pala getaways with 3000 KCM Cu and upgrade TL 6932 breaker at Lilac. (An existing project is scheduled to replace this breaker by December 2007. If SDG&E cancels the project, the upgrade will be the responsibility of the IC.)

E. TL 683 (Rincon-Lilac): Advance the reconductor of TL 683. (An existing project is currently scheduled to reconductor TL 683 in the year 2011 timeframe. If SDG&E cancels the project, the upgrade will be the responsibility of the IC.)

F. TL 682 (Warners-Rincon): Implement a Special Protection System (SPS) to monitor TL 682 and initiate tripping of TL 685 (Warners-Santa Ysabel) for overload of TL 682. Due to the 2008 COD requested by the IC, this SPS is recommended in lieu of a major reconductor of TL 682 to mitigate the overload.

9.4 Other Issues

There are no other issues identified for the interconnection of the Orange Grove Project.

10. Estimated Time to Construct

The length of time that SDG&E needs to design, procure, and construct and/or upgrade a generation project's Interconnection Facilities, Reliability Network Upgrades, and Delivery Network Upgrades is a preliminary, non-binding, good-faith effort to estimate the total construction time. These estimates are dependent on many factors (when applicable), including but not limited to:

A. Whether an exemption can be obtained from the California Public Utilities Commission's (CPUC's) G.O. 131-D Certificate of Public Convenience and Necessity (CPCN) process.

B. Whether an exemption can be obtained from the CPUC's Permit to Construct (PTC) process.

C. Whether the IC includes the full scope of the transmission and substation additions and upgrades in its application to the lead agency for the California Environmental Quality Act (CEQA) review.

D. Whether the IC intends to fund the Delivery Network Upgrades.

E. Whether the IC chooses to build its own Interconnection Facilities.

The outcome of these processes and/or IC project/business decisions could increase cost and/or construction duration. Absent an exemption, the process of obtaining the CPUC's approval could take one to two years, or even longer.

SDG&E plans to file an Advice Letter with the CPUC once J-Power USA receives California Energy Commission approval with a finding of "no significant unavoidable environmental impacts" associated with SDG&E's activities. Construction by SDG&E will begin after the Advice Letter is received by the CPUC and the appropriate notice period has elapsed. SDG&E's experience is that the time frame for beginning construction on an unprotested Advice Letter is about 50 days from its filing. In addition to CPUC notification, other federal, state, and local permits may be required prior to beginning construction.

The estimated time to construct/upgrade the identified facilities summarized in Table 10.1 does not include the time needed for environmental review, permitting, and delays for outage coordination. The estimated time SDG&E needs to design, procure, and construct the facilities is listed in the table. The estimate assumes the design, equipment procurement, and construction process is continuous and also assumes timely scheduling of transmission system outages to perform the work. Outages may not be possible during periods of high system demand or emergency conditions. The design phase does not typically start until successful completion of the Large Generator Interconnection Agreement (LGIA).

The proposed in-service date of April 1, 2008 and commercial operation date of May 31, 2008 do not appear to be feasible considering the time needed to complete the Interconnection Facilities Study, the LGIA, and construction of the Interconnection Facilities

and Network Upgrades (including potential environmental review, permitting, design, procurement, and construction).

Table 10.1: Non-Binding, Good Faith Estimated Time to Construct[18]

Type of Upgrade[19]	Location	Description	Estimated Time to Construct
PTO's Interconnection Facilities[20]	Pala Substation[21]	• Install one 69 kV circuit breaker • Install underground cable termination and bus support stands and two 2000 amp disconnects in an existing line position • Install 150' of 3-6" conduit from the termination stand to the substation fence • Install associated control and protection panels for the new line and add RTU points for control, monitoring, and alarming. • Install 150' of cable from the termination stand to substation fence.	6 Months
Reliability Network Upgrades[22]	None[23]	None	0
Delivery Network Upgrades[24]	TL 698E (Pala-Monserate Tap)	Reconductor from Pala to Monserate Tap with 636 KCM ACSS and replace Pala getaways with 3000 KCM Cu	6 Months
	TL 698B (Monserate-Monserate Tap)	Replace Monserate getaways with 3000 KCM Cu and reconductor one span to 636 KCM ACSS	6 Months
	TL 691B (Monserate-Avocado Tap)	Increase relay settings at Monserate	1 Month
	TL 6932 (Lilac-Pala)	Replace Pala getaways with 3000 KCM Cu. (An existing project to replace the TL 6932 breaker at Lilac is scheduled for completion by December 2007.)	6 Months
	TL 683 (Rincon-Lilac)	Advance the reconductor of TL 683 (needed after 2008)	To be determined[25]
Special Protection System (SPS)	TL 682 (Warners-Rincon)	• SPS to prevent overload of TL 682 • Monitor TL 682 • If TL 682 exceeds rating • Trip TL 685 (Warners-Santa Ysabel)	6 Months
Total			**6 Months**

Per Section 9 of the LGIP, an Engineering & Procurement (E&P) Agreement may be utilized prior to executing an LGIA. The E&P Agreement authorizes the Participating TO to commence engineering and procurement of long lead-time items necessary for the interconnection. The IC should consider this optional procedure to meet the in-service date.

[18] Estimated time to construct includes time for design, equipment procurement, and construction. The estimate assumes the process is continuous and excludes time for environmental review, permitting, and delays for outage coordination.
[19] See Appendix A for the definitions of the types of upgrades as defined by the LGIP.
[20] The IC is obligated to fund the PTO's Interconnection Facilities.
[21] If a higher-queued project (#173) delays its in-service date or withdraws from the Queue, the Orange Grove Project will be responsible for additional PTO's Interconnection Facilities, estimated to take 6 months to construct.
[22] The IC is obligated to advance funds to SDG&E for Reliability Network Upgrades and will be reimbursed upon commercial operation of the plant.
[23] If a higher-queued project (#173) delays its in-service date or withdraws from the Queue, the Orange Grove Project will be responsible for extending the 69 kV Pala Main Bus, estimated to take 6 months to construct.
[24] The IC may elect to advance funds to SDG&E for Delivery Network Upgrades and will be reimbursed upon commercial operation of the plant.
[25] The estimated timeframe of this advancement will be studied in the Interconnection Facilities Study phase.

11. Re-Study

Potential for re-study of the ISIS exists and may be required due to a higher-queued project dropping out of the Queue or a modification of a higher-queued project, or any other effective change in information which necessitates a re-study. If this possibility materializes CAISO shall notify the IC in writing. Upon receipt of such notice, the IC shall provide CAISO, within ten (10) business days, a written request that the Participating TO either (i) terminate the study and withdraw the Interconnection Request; or (ii) continue the study. If the IC requests CAISO to continue the study, the IC shall pay an additional $10,000 deposit for the re-study along with providing written notice for the study to continue. Such re-study shall take no longer than sixty (60) calendar days from the date written notice is received to continue the study and payment of the additional $10,000 deposit. Study results will be shared for review. Comments will be incorporated and a final study report will be issued within eighty (80) calendar days following receipt of the IC's written notice to continue the study and payment of the additional $10,000 deposit. If SDG&E and/or the CAISO are unable to complete the ISIS within that additional eighty (80) calendar days time period, CAISO shall notify the IC and provide an estimated completion date with an explanation of the reasons why additional time is required. Any and all costs of a re-study shall be borne by the IC.