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CH2MHILL

May 10, 2002

Ms. Kristy Chew
Siting Project Manager
California Energy Commission
1516 Ninth Street, MS-15
Sacramento, CA 95814

RE: Data Responses, Set 4A
Cosumnes Power Plant (01-AFC-19)

On behalf of the Sacramento Municipal Utility District, please find attached four copies and one original of the Data Responses, Set 4A, in response to Staff's Data Requests dated May 10, 2002. Due to the size of the attachment, we are submitting only five copies of this Data Response. However, we will be happy to furnish a copy of the attachment to any party upon request.

Please call me if you have any questions.

Sincerely,

CH2M HILL

John L. Carrier, J.D.
Program Manager

c: Colin Taylor/SMUD
Kevin Hudson/SMUD
Steve Cohn/SMUD

COSUMNES POWER PLANT (01-AFC-19)

DATA RESPONSE, SET 4A

Submitted by

SACRAMENTO MUNICIPAL UTILITY DISTRICT (SMUD)

May 10, 2002

CH2MHILL

2485 Natomas Park Drive, Suite 600
Sacramento, California 95833-2937

Technical Area: Transmission System Engineering
Authors: Henry Zaininger and Laiping Ng
CPP Author: Gil Butler

BACKGROUND

Staff needs additional documentation and information regarding the System Impact Study and proposed mitigation measures in order to prepare the Staff Assessment for the Cosumnes Power Plant. For the studies requested herein, please use the Roseville Energy Facility (01-AFC-14) November 12, 2002 System Impact Study docketed January 2002.

Please note that staff is advised that the termination configuration of the Roseville Energy Facility project may change (Roseville Energy Facility Data Responses 157-192, dated March 15, 2002). While uncertain at this time it may be necessary to revise the studies requested herein if the Roseville termination configuration changes.

DATA REQUEST

254. Please provide stability studies for the transmission facilities with and without the project for both peak and off-peak (light spring) seasons.

Response: Please see attached CPP Stability Study (Attachment TSE-254).

255. Please provide fault duty impact studies for the transmission facilities with and without the project for peak conditions.

Response: Please see attached CPP Fault Duty Impact Study (Attachment TSE-254).

256. Please identify the proposed and selected mitigation measures for criteria violations. Provide reports or letters from Western Area Power Authority and PG&E demonstrating that the mitigation measures selected in their respective systems will be effective to offset the criteria violations and be implemented before the on-line date of the project.

Response: The Cosumnes Power Plant Transmission System Impact Study dated August 21, 2001 (Submitted as AFC Volume 2, Appendix 5), did not include the Roseville Energy Center (REC) and did not identify significant impacts associated with the addition of the Cosumnes Power Plant (CPP).

CEC has requested CPP impact studies based on the assumption that the REC is operational prior to the CPP and has asked SMUD to select and commit to specific mitigation based on these assumptions. The REC studies indicate substantial system impacts for a variety of interconnection options, none of which appear to be final, and none of which have definite mitigation plans on

which to base additional mitigation, if even needed. Because the REC interconnection plan and associated impacts and specific mitigation are still undefined, specific impacts and mitigation associated with CPP based on an REC interconnection remains speculative.

The need for mitigation associated with CPP is based on the unlikely assumptions that (a) REC is already operational, (b) is limited to light load conditions with full output from REC, Rio Linda/Elverta and Sutter, (c) occurs with heavy generation within SMUD, and (d) heavy California imports from the Northwest, forcing (e) disproportionately high generation in the local Sacramento area, with (f) extremely high export levels. This is the same type of congestion situation being currently addressed as an ongoing operational problem, and is an operating and system planning issue rather than an interconnection issue.

It may well be, when currently unknown plans such as the REC interconnection are resolved, that mitigation for CPP impacts will remain unneeded (which is the same as for conditions prior to REC). Mitigation may otherwise consist of operational measures.

Therefore, it is premature for SMUD to develop and commit to specific mitigation at this time or for PG&E and Western to pass judgment on such mitigation plans that would have no established technical basis.

257. Please provide voltage support analysis, including impacts/benefits of all the proposed generation additions.

Response: Please see attached Voltage Support Sensitivity Study (Attachment TSE-254).

Attachment TSE-254

Cosumnes Power Plant

Stability Study

Fault Duty Impact Study

Voltage Support Sensitivity Study

May 10, 2002

Order of Contents

Cosumnes Power Plant Stability Study

This dynamic stability study investigates system responses to disturbances near the proposed Cosumnes Power Plant for various scenarios that include combinations of projects proposed for construction in northern California around the same time frame.

The connection to the existing transmission system for the Cosumnes Power Plant will be the same connection point previously used for the similarly sized Rancho Seco nuclear generation plant that has been permanently removed from service.

The base cases used for this study are those used for the Cosumnes Power Plant AFC system impact study and those used to provide the supplemental sensitivity impact study to the California Energy Commission.

The cases chosen here allow comparisons between summer and spring conditions and between various combinations of proposed generation facilities that might affect these results.

The results are described in the attached 150 pages of plots in the following order: six pages of plots for each disturbance, five disturbances for each scenario, and five scenarios. The scenarios, disturbances and plot types are described below.

Conclusion/Summary of Results

No violations or near violations of any of the evaluation criteria were observed.

The performances for all disturbances and all scenarios are quite similar.

Inspections of worst condition summary tables (not presented here) confirmed that effects near the disturbances were consistently and substantially more significant than those effects further from the disturbances.

Evaluation Criteria

The evaluation criteria used for this dynamic stability study are those included in the Western Systems Coordinating Council Reliability Criteria and summarized in the following table of maximum allowable effects.

	Transient Voltage Dip Standard (Other than during the fault)		Minimum Transient Frequency Standard
	Load Bus	Non-Load Bus	Load Bus
Single Contingency	Not to exceed 25% Not to exceed 20% for more than 20 cycles	Not to exceed 30%	Not below 59.6 Hz for 6 cycles or more at any load bus
Double Contingency	Not to exceed 30% Not to exceed 20% for more than 40 cycles	Not to exceed 30%	Not below 59.0 Hz for 6 cycles or more at any load bus

System Conditions

The following four scenarios are included in this dynamic stability study to investigate a range of responses for various combinations of projects proposed for construction in northern California around the same time frame.

- 2005 Heavy Summer with Roseville Energy Center, Colusa Power Plant, East Altamont Energy Center, Rio Linda/Elverta Power Plant, and the Cosumnes Power Plant
- 2005 Spring with Roseville Energy Center, Colusa Power Plant, East Altamont Energy Center, Rio Linda/Elverta Power Plant, and the Cosumnes Power Plant
- 2005 Heavy Summer with the Rio Linda/Elverta Power Plant, and the Cosumnes Power Plant (No Roseville, Colusa or East Altamont)
- 2005 Heavy Summer with the Cosumnes Power Plant (No Rio Linda, Roseville, Colusa or East Altamont)
- 2005 Heavy Summer with No Cosumnes Power Plant (No Rio Linda, Roseville, Colusa or East Altamont)

The first two scenarios (with Roseville, Colusa and East Altamont) are based on the powerflow cases developed by Western for the Roseville AFC and used for the sensitivity studies provided to the CEC as a supplement to the Cosumnes Power Plant system impact study.

The last three scenarios are based on the powerflow cases developed for the Rio Linda/Elverta Power Plant AFC and used for the initial Cosumnes Power Plant system impact study.

Disturbances

The following five disturbances are included for each of the scenarios described above to demonstrate the anticipated Cosumnes generation responses and system impacts

- Rancho Seco 230 kV bus fault at a Cosumnes Power Plant generator step-up transformer, cleared at 6 cycles by removing the transformer and generator. (For the case with no Cosumnes Power Plant, this fault is at a Rancho Seco ancillary transformer.)
- Rancho Seco to Bellota 230 kV line fault at Rancho Seco, cleared at 6 cycles by opening the Rancho Seco to Bellota line.
- Rancho Seco to Bellota 230 kV double line fault at Rancho Seco, cleared at 6 cycles by opening both Rancho Seco to Bellota lines.
- Rancho Seco to Pocket 230 kV line fault at Rancho Seco, cleared at 6 cycles by opening the Rancho Seco to Pocket line.
- Rancho Seco to Pocket 230 kV double line fault at Rancho Seco, cleared at 6 cycles by opening both Rancho Seco to Pocket lines.

Response Plots

For each disturbance modeled, the following six plots are included to demonstrate responses most significantly affected by Cosumnes generation.

- Generator Voltages
- Generator Angles
- Bus Voltages
- Bus Frequencies
- Load Bus Voltages
- Load Bus Frequencies

The plots of bus voltages, load bus voltages, and load bus frequencies demonstrate compliance with the evaluation criteria. Plots of generator voltages and angles and plots of bus frequencies (non-load bus frequencies) are included for general interest and perspective.

Plot data included is for those buses and generators within and near the SMUD system and Cosumnes Power Project. Impacts on more remote buses are less severe.

Cosumnes Power Plant Fault Duty Impact Study

This fault duty impact study investigates the impacts on local and neighboring systems associated with the addition of the proposed Cosumnes Power Plant (CPP). The specific impacts are described in the attached Table 1 and Table 2. Table 1 identifies impacts associated with the addition of CPP to a system without the proposed Rio Linda/Elverta Power Plant, Roseville Energy Center, Colusa Power Plant and the East Altimont Energy Center. Table 2 identifies impacts associated with the addition of CPP to a system that includes the proposed Rio Linda/Elverta Power Plant, Roseville Energy Center, Colusa Power Plant and the East Altimont Energy Center.

For the majority of the table entries (without specific circuit breakers identified), the interrupting capacity shown is that of the lowest rated breaker connected to the 230 kV bus, and all the fault duties shown are those at the 230 kV bus. Thus, maximum fault duties are compared to minimum interrupting capacities at each 230 kV bus.

For the table entries that identify specific circuit breakers (e.g., CB xx), the interrupting capacities and fault duties shown are those associated with each specific circuit breaker.

All circuit breakers with fault duties exceeding interrupting capacities disclosed during this study are listed, along with all circuit breakers with fault duties impacted by 5% or more with the addition of the Cosumnes Power Plant.

Values shown in parenthesis within Table1 and Table 2 are negative numbers.

Table 1 indicates that the first phase of CPP would allow fault duty at the Hedge circuit breakers #54 and #60 to exceed the breaker interrupting capabilities during single line to ground faults. The second phase of CPP would allow fault duty at seven of the nine Hedge breakers to exceed the breaker interrupting capabilities.

Table 1 also indicates no violations of circuit breaker interrupting capacities outside the SMUD system for the system without the proposed Rio Linda/Elverta Power Plant, Roseville Energy Center, Colusa Power Plant and the East Altimont Energy Center.

Table 2 indicates that if the proposed Rio Linda/Elverta Power Plant, Roseville Energy Center, Colusa Power Plant and the East Altimont Energy Center are included prior to assessing the impacts of CPP, two areas of impacts are changed. First, fault duties at three Elverta-SMUD circuit breakers will exceed interrupting ratings even prior to addition of the CPP. Second, fault duties at all seven Hedge circuit breakers will exceed breaker interrupting capacities upon addition of the first phase of CPP.

The conclusion of this study is: The addition of the Cosumnes Power Plant will not cause significant fault duty impacts outside the SMUD transmission system, and the impacts within the SMUD system are limited to the Hedge substation.

Cosumnes Power Plant Voltage Support Analysis Sensitivity

The Cosumnes Power Plant Transmission System Impact Study, dated August 21, 2001, included a detailed voltage support study for all combinations of the system with and without the Rio Linda/Elverta Power Plant and with and without the Cosumnes Power Plant. That study considered voltage support during the most significant single line outages and double line outages.

The interconnection plan for the proposed Roseville Energy Center has not been finalized, but could involve multiple interconnections with the SMUD transmission system. Since the transmission configuration for the proposed Roseville Energy Center is not known and the configuration will affect results of a voltage support study, it is not feasible to perform a detailed voltage support study involving that project at this time.

It is feasible to perform a generalized sensitivity study involving the Roseville Energy Center however, and the results are shown in the attached Figure 1, Figure 2 and Figure 3, each showing PV curves that demonstrate the n-0 impacts associated with additions of the Cosumnes Power Plant, the Rio Linda/Elverta Power plant, and the Roseville Energy Center (along with Colusa and East Altimont).

Figure 1 shows the improvements in local voltage support as the various local generation plants are added to the system.

Figure 2 shows the improvement in local voltage support with the addition of the Cosumnes Power Plant to the system without the Rio Linda/Elverta Power Plant and Roseville Energy Center (along with Colusa and East Altimont). This improvement corresponds to a 481 MW increase in local load support. This is consistent with the detailed voltage support study in the original Cosumnes Power Plant Transmission System Impact Study.

Figure 3 shows the improvement in local voltage support with the addition of the Cosumnes Power Plant to the system that includes the Rio Linda/Elverta Power Plant and Roseville Energy Center (along with Colusa and East Altimont). This improvement corresponds to a 440 MW increase in local load support, which is reasonably consistent with the above results.

The conclusion of this voltage support sensitivity study is: As expected, addition of local generation provides significant local voltage support without adverse voltage support impacts.

Cosumnes Power Plant PV Curves

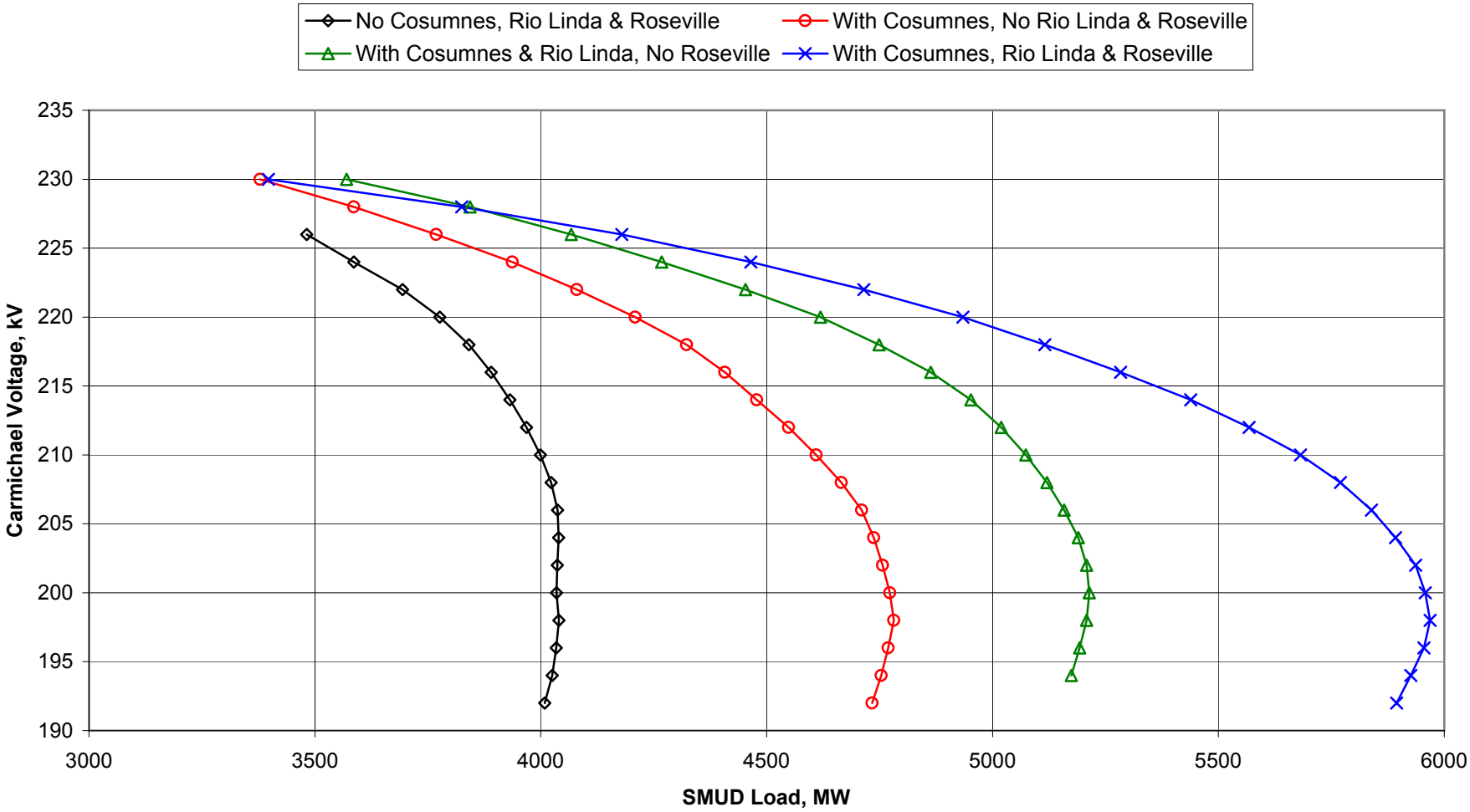

Figure 1

Cosumnes Power Plant
Without Rio Linda, Colusa, East Altimont and Roseville Generation

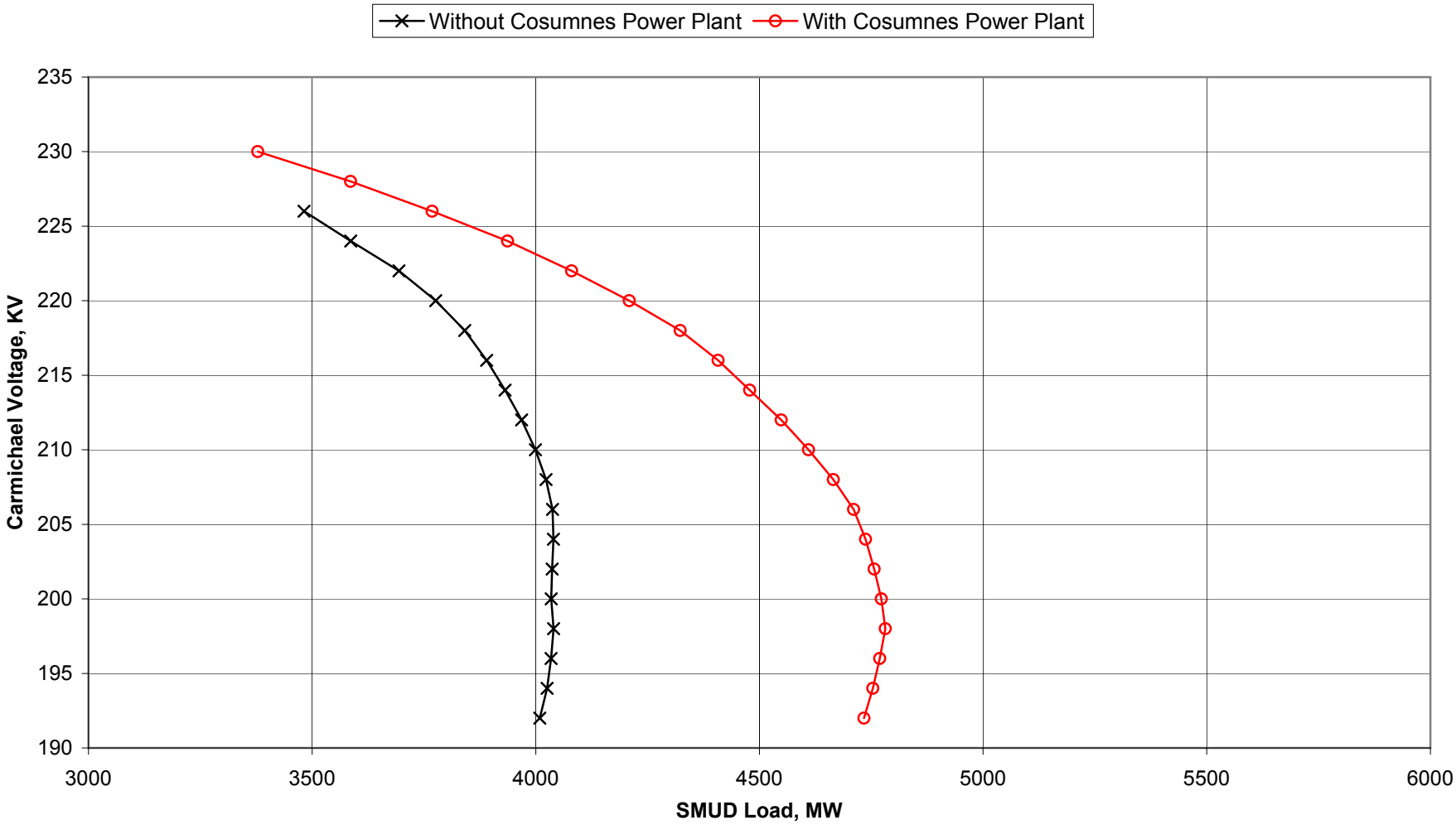

Figure 2

Cosumnes Power Plant PV Curves
With Rio Linda, Colusa, East Altimont and Roseville Generation

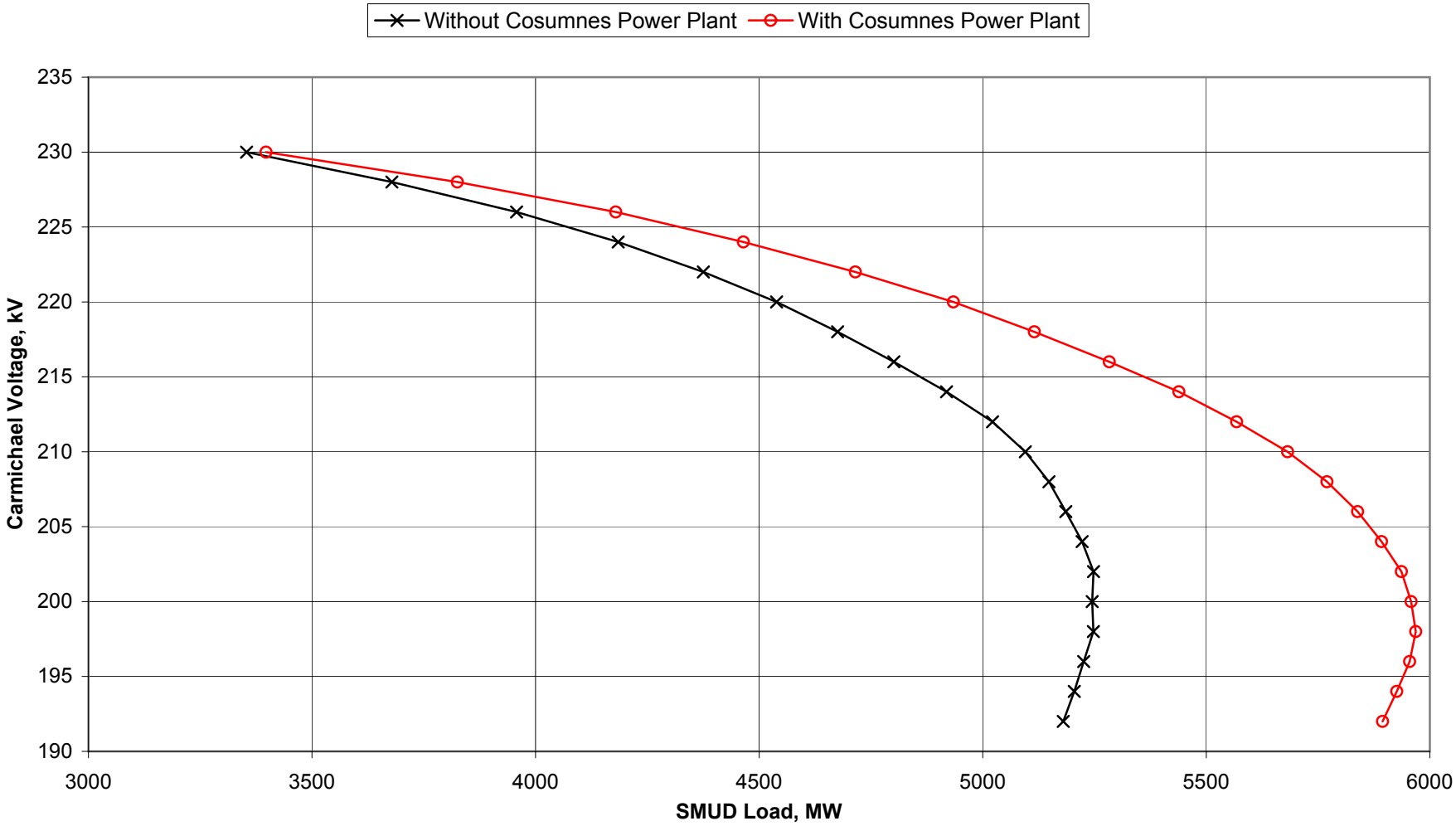

Figure 3

Cosumnes Power Plant Fault Duty Impacts, Without Rio Linda, Roseville, Colusa and East Altimont Projects

SUBSTATION	230 KV CB Interrupting Capacity	3 phase bus fault w/o CPP	3 phase bus fault w/ CPP	Percentage increase in 3 phase fault	3 phase interrupting margin with CPP on-line	SLG w/o CPP	SLG w/CPP Phase 1	SLG interrupting margin with CPP on-line	SLG w/CPP Phase 2	SLG interrupting margin with CPP on-line
RANCHO SECO	40000	18305	29445	61%	10555	12211	23033	16967	31378	8622
HEDGE CB 20	23857	20824	25391	22%	(1534)	20452	23797	60	23531	326
CB 28	23857	20824	25391	22%	(1534)	21132	23767	90	22253	1604
CB 34	23857	19230	23767	24%	90	21436	23417	440	24756	(899)
CB 40	23857	20729	25295	22%	(1438)	21436	20664	3193	21808	2049
CB 48	23857	20729	25295	22%	(1438)	21148	20664	3193	21808	2049
CB 54	23857	21189	25763	22%	(1906)	22217	24106	(249)	25648	(1791)
CB 60	23857	21189	25763	22%	(1906)	22217	24106	(249)	25648	(1791)
CB 68	23857	20547	25111	22%	(1254)	21394	21225	2632	24460	(603)
CB 74	23857	19014	22104	16%	1753	21394	23523	334	23523	334
ELK GROVE	40000	14051	17032	21%	22968	12788	14106	25894	14874	25126
POCKET	40000	17702	21418	21%	18582	16337	17688	22312	18561	21439
CAMPELL SOUP	40000	17947	21583	20%	18417	17355	18772	21228	19703	20297
PROCTOR GAMB	40000	20798	23974	15%	16026	19976	21156	18844	21935	18065
BELLOTA	37653	25431	28071	10%	9582	20733	21797	15856	22348	15305
HURLEY	33000	22615	24884	10%	8116	22389	23295	9705	23881	9119
ORANGEVALE	23857	18458	19853	8%	4004	20810	21489	2368	18113	5744
ELVERTA SMUD	26000	21078	22672	8%	3328	17288	17792	8208	21857	4143
ELVERTA WAPA	40000	21124	22720	8%	17280	16973	17468	22533	21898	18102
CARMICHAEL	40000	18027	19381	8%	20619	20849	21449	18551	17782	22218
LAKE	40000	14654	15638	7%	24362	13706	14066	25934	14294	25706
LOCKEFRD PGE	40000	10900	11268	3%	28732	7845	7951	32049	8008	31992
WEBER CB202	37653	7619	7848	3%	29805	7875	7961	29692	8046	29607
CB232	12000	7619	7848	3%	4152	8550	8619	3381	8688	3312
CB242	12000	7619	7848	3%	4152	10069	10172	1828	10275	1725
CB252	40000	7619	7848	3%	32152	7311	7393	32607	7475	32525
BRIGHTON-PGE	40000	8404	8498	1%	31502	6570	6598	33402	6614	33386
GLD HILL-PGE	37653	14355	14476	1%	23177	13397	13443	24210	13471	24182

Table 1

Cosumnes Power Plant Fault Duty Impacts, With Rio Linda, Roseville, Colusa and East Altimont Projects Includec

SUBSTATION	230 KV CB Interrupting Capacity	3 phase bus fault w/o CPP	3 phase bus fault w/ CPP	Percentage increase in 3 phase fault	3 phase interrupting margin with CPP on-line	SLG w/o CPP	SLG w/ CPP	Percentage increase in SLG fault	SLG interrupting margin with CPP on-line
RANCHO SECO	40000	19385	30523	57%	9477	12530	32172	157%	7828
HEDGE CB 20	23857	23315	27757	19%	(3900)	21692	24979	15%	(1122)
CB 28	23857	23315	27727	19%	(3870)	21445	23997	12%	(140)
CB 34	23857	21638	26054	20%	(2197)	21817	25163	15%	(1306)
CB 40	23857	23195	26054	12%	(2197)	21244	24708	16%	(851)
CB 48	23857	23195	27637	19%	(3780)	21817	25163	15%	(1306)
CB 54	23857	23775	28218	19%	(4361)	22217	25648	15%	(1791)
CB 60	23857	23775	28218	19%	(4361)	22217	25648	15%	(1791)
CB 68	23857	22966	27407	19%	(3550)	21593	24167	12%	(310)
CB 74	23857	21568	27407	27%	(3550)	21445	23997	12%	(140)
ELK GROVE	40000	14957	17789	19%	22211	13289	15256	15%	24744
POCKET	40000	19115	22672	19%	17328	17136	19184	12%	20816
CAMPELL SOUP	40000	19437	22913	18%	17087	18282	20438	12%	19562
PROCTOR GAMBLE	40000	23838	26909	13%	13091	21834	23570	8%	16430
BELLOTA	37653	25868	28306	9%	9347	20932	22448	7%	15205
HURLEY	33000	28573	30783	8%	2217	26601	27889	5%	5111
ORANGEVALE	23857	21841	23047	6%	810	19285	19922	3%	3935
CARMICHAEL	40000	21346	22514	5%	17486	18968	19592	3%	20408
ELVERTA-WAPA	40000	29901	31485	5%	8515	29965	31042	4%	8958
ELVERTA-SMUD CB 2	40000	29427	30936	5%	9064	28278	29294	4%	10706
CB 6	40000	29427	30936	5%	9064	28278	29294	4%	10706
CB 10	26000	26544	27748	5%	(1748)	26781	27743	4%	(1743)
CB 14	26000	28322	29783	5%	(3783)	28731	29763	4%	(3763)
CB 20	26000	27888	29275	5%	(3275)	28727	29759	4%	(3759)
LAKE	40000	15965	16784	5%	23216	14475	14937	3%	25063
LOCKEFORD-PGE	40000	10971	11303	3%	28697	7872	8021	2%	31979
WEBER CB202	37653	7666	7980	4%	29673	7906	8061	2%	29592
CB232	12000	7666	7980	4%	4020	8584	8704	1%	3296
CB242	12000	7666	7980	4%	4020	10109	10294	2%	1706
CB252	40000	7666	7980	4%	32020	7340	7489	2%	32511
BRIGHTON-PGE	40000	8429	8511	1%	31489	6582	6620	1%	33380
GOLD HILL-PGE	37,653	14433	14530	1%	23123	13445	13505	0%	24148

Table 2

150 pages of graphs follow