Application No.: 12-05-020

Exhibit No.: ____________

Witness: Robert Sparks

In the Matter of the Application of San Diego Gas & Electric Company (U902E) for a Certificate of Public Convenience and Necessity for the South Orange County Reliability Enhancement Project.	Application 12-05-020

SUPPLEMENTAL REBUTTAL TESTIMONY OF ROBERT SPARKS ON BEHALF OF THE CALIFORNIA INDEPENDENT SYSTEM OPERATOR CORPORATION

Q. What is your name and by whom are you employed?

A. My name is Robert Sparks. I am employed by the California Independent System Operator Corporation (CAISO), 250 Outcropping Way, Folsom, California as Manager, Regional Transmission.

Q. Have you previously provided testimony in this proceeding?

A. Yes, I provided direct testimony in this proceeding served on May 26, 2015 and rebuttal testimony on June 24, 2015. My educational and professional background is provided in my direct testimony.

Q. What is the purpose of this testimony?

A. The purpose of my testimony is to present the CAISO's analysis of Alternative J to the South Orange County Reliability Enhancement (SOCRE) project proposed in the Recirculated Draft Environmental Impact Report (RDEIR). In summary, Alternative J as proposed is infeasible because it relies on a non-standard substation design that is not consistent with industry standards. If Alternative J was reconfigured to a standard substation design, the alternative would fail to meet the reliability concerns and objectives identified by the CAISO and it would exacerbate other identified reliability concerns in the Southern California Electric Company (SCE) service area.

Q. Please provide an overview of Alternative J to the SOCRE project as included in the RDEIR.

A. Alternative J is a 230 kilovolt (kV) loop in from the Southern California Edison Company (SCE) 220 kV system to the Trabuco Substation. This alternative was suggested during public review process for the Draft EIR and the DEIR includes it as the environmentally superior alternative. Alternative J would upgrade the SDG&E owned Trabuco Substation from 138/12 kV to 230/138/12 kV and interconnect it to the SCE owned 220 kV transmission line between the San Onofre to Santiago substations. Under Alternative J, the DEIR proposes a non-standard substation design as an additional 230 kV source for the South Orange County 138 kV transmission system.

Q. Does the CAISO have any concerns regarding the non-standard substation design at the Trabuco Substation as proposed in Alternative J?

A. Yes. As described in Section 7 of Chapter 4 of SDG&E's Second Supplemental Testimony, this substation design is infeasible because it provides insufficient space to construct the 230/138/12 kV Trabuco Substation in accordance with IEEE, industry and SDG&E standards for safety and reliability. A standard substation design would also loop the SONGS-Santiago 230 kV line into Trabuco substation designed in a breaker-and-a-half 230 kV bus configuration.[1] As proposed, the new SONGS-Trabuco and the Santiago-Trabuco 220 kV transmission circuits would directly connect to the Trabuco 230 kV bus without a circuit breaker protecting the substation facilities and circuits. Under this arrangement, San Diego would need to de-energize the two new circuits to perform maintenance at the Trabuco Substation. In the event of a bus fault, line fault, or breaker failure in the SONGS, Santiago, or Trabuco substation, the entire Trabuco 230 kV Substation and the two circuits would be shut down. This substation configuration would unduly limit operational

[1] ORA's proposed Trabuco Alternative reflected this substation design, and the CAISO previously commented on ORA's proposal in its June 24, 2015 rebuttal testimony.

flexibility and lead to more frequent reductions of transmission capability on the major transmission path between the Los Angeles Basin and the San Diego systems.

Q. If Alternative J was modified to meet industry standards, would the CAISO have any other concerns with this alternative?

A. Yes. Even if Alternative J was modified to meet industry standards for substation design, the alternative still must be rejected because it fails to address all identified reliability concerns and objectives that the project is intended to address.

Q. The RDEIR indicates that Alternative J would ensure that each of the CAISO identified Category C (N-1-1) violations would be avoided through the 10-year planning horizon. Is this statement correct?

A. If the Trabuco Substation is designed to meet industry standards, as discussed above, its system performance would be problematic similar to other proposed alternatives that parallel the SCE 230-kV system with the SDG&E's South Orange County (SOC) 138 kV system.[2] As described in the direct testimony of Neil Millar on behalf of the CAISO, any alternative paralleling SCE 230-kV system with the SDG&E's SOC 138 kV system would materially impact the 230 kV transmission path between SCE's LA Basin and the San Diego area. Table 1, included in Appendix A to this testimony, demonstrates the negative effects on transfer

[2] See the previously submitted direct testimony of the CAISO regarding the Draft Environmental Impact Report Alternatives C1, C2 and D as well as my rebuttal testimony addressing the Trabuco and Pico alternatives proposed by ORA and Forest Residents Opposing New Transmission Lines (Frontlines).

capability that this would have on the major transmission corridor between San Diego and Los Angeles for various NERC Category P6 and P7 contingencies.[3]

As indicated in Line 1 of Table 1,[4] the CAISO identified thermal overload issues on the single 230/138 kV transformer at the Trabuco substation proposed in Alternative J.

Q. Does Alternative J cause additional reliability concerns on the SCE transmission system?

A. Yes. The CAISO 2015-2016 transmission planning process identified thermal overload and potential transient voltage instability concerns on SCE's adjacent Ellis-Santiago and Ellis-Johanna 220 kV lines and the Johanna/Santiago/Ellis substations for various NERC Category P6 contingencies.[5] Based on the CAISO's preliminary studies, these concerns could be addressed by implementing 2107 megawatts (MW) of preferred resources and energy storage as mitigation. Regardless of the bus configuration design at the Trabuco substation, Alternative J would contribute to the severity of these identified thermal overloads by shifting SOC load that is currently supplied by the Talega 230 kV/138 kV substation to the Trabuco 230/138 kV substation. This will exacerbate to the need to upgrade the SCE owned Ellis-Santiago and Ellis-Johanna 220 kV lines or increase the need for additional generation or storage resources.

[3] Please note that NERC recently changed its contingency naming methodology. New Category P6 and P7 contingencies would have previously been considered Category C3 or N-1-1 and C5 or N-2 contingencies under the prior naming convention.
[4] See ID #SDGE-T-OP1 in Table 1.
[5] Formerly known as Category C or N-1-1 contingencies.

The CAISO modeled the relative impacts of the SOCRE Project, and Alternative J with an industry standard Trabuco Substation configuration. Tables 2 through 4 provide the results in detail. Table 2 identifies thermal overloads for both of the alternatives based on the 2015-2016 summer peak base case without any mitigation by additional preferred resources and energy storage. As can be seen, overloading occurs in the SCE system under all alternatives, but the SOCRE Project reduces the magnitude of the overload in each case. Tables 3 and 4 illustrate the effect of the two alternatives in the summer peak base case and the California Energy Commission's high load scenario with mitigation by additional preferred resources and energy storage. As can be seen, the SOCRE project reduces loading on the identified lines in every scenario. This analysis indicates that Alternative J will cause additional loading in the SCE system which must be mitigated through either incremental resource additions or additional transmission system improvements.

Figures AA-1 and AA-2 show the one-line diagram for the SOCRE project and Alternative J including the SCE system in the vicinity. Because Alternative J is electrically closer to the SCE owned Ellis-Santiago and Ellis-Johanna 220 kV lines, it exacerbates overload concerns compared to the SOCRE Project.

Q. If the Commission approves Alternative J to the SOCRE Project, what additional improvements would be necessary to address all the CAISO identified reliability concerns?

A. In order to meet industry safety and reliability standards, mitigate the negative impact on transfer capability in the major transmission corridor between San Diego and Los Angeles and avoid the potential negative impact on the SCE system, the following system improvements would be required:

- modification to Alternative J to meet industry standards for substation design;
- elimination of aged Bank #60 and #62 transformers at Talega Substation and standardization of the 230/138/69 kV Talega substation;
- addition of a second 230/138 kV transformer at Trabuco Substation;
- upgrade of TL13835A of the Talega-San Mateo- Laguna Niguel three-terminal-line from Talega Tap to Laguna Niguel;
- upgrade of TL13846A of the Talega-San Mateo-Pico three-terminal-line from Talega to Talega Tap33;
- upgrade of TL13816 from Pico to Capistrano;
- upgrade of TL13836 from Talega to Pico;
- reconfiguration of the Trabuco-Capistrano-Pico-Laguna Niguel 138 kV system; and
- an increase of ampacity ratings of the SCE owned Ellis-Santiago 220 kV transmission circuit by replacing terminal equipment at Ellis/Santiago substations and an increase of clearance on transmission spans along the circuit.
- an increase of ampacity ratings of the SCE owned Ellis-Johanna 220 kV transmission circuit by replacing terminal equipment at Ellis/Johanna substations and an increase of clearance on transmission spans along the circuit.

The cost of modification to Alternative J to meet industry standards for substation design alone is estimated by SDG&E[6] to cost $518 million to $634 million, which far exceeds the cost estimate for the SOCRE project.

Q. Please summarize your testimony.

A. The Commission should reject Alternative J presented in the RDEIR for a number of reasons. First, it does not meet industry standards for a substation. Even if Alternative J is configured to meet industry standards for substation design, it will not address all the reliability concerns and objectives that the project is intended to meet. More specifically, Alternative J will negatively impact the transfer capability of 230 kV transmission corridor between San Diego and Los Angeles and increase identified thermal overloading concerns on the SCE 230 kV system. Based on these findings, Alternative J is not a reasonable alternative to the SOCRE Project.

Q. Does this conclude your testimony?

A. Yes.

[6] SDG&E's Second Supplemental Testimony, p. 73, line 8.

Table 1 Thermal Overloads in the SDGE SOC System - Based on 2020 Off-Peak Case (1800 MW Northbound Flow via the SONGS Path)

SOCREP VS Alternative J

ID	Overloaded Facility	Contingency	Category Description	Thermal Loading (% over applicable rating)	
				SOCREP	Alternative J
SDGE-T-OP1	22862 TRABUCO2 230 22860 TRABUCO 138 1	L_0010_Line S.ONOFRE 230.0 to TRABUCO2 230.0 Ckt 1 and L_40082_Line S.ONOFRE 230.0 to SANTIAGO 230.0 Ckt 1	P6 (N-1-1) P7 (N-2)*	NA	114
SDGE-T-OP2	22112 CAPSTRNO 138 22656 PICO 138 1	L_0010_Line S.ONOFRE 230.0 to TRABUCO2 230.0 Ckt 1 and L_40082_Line S.ONOFRE 230.0 to SANTIAGO 230.0 Ckt 1	P6 (N-1-1) P7 (N-2)*	NA	99
SDGE-T-OP3	22840 TALEGA 138 22842 TA TAP33 138 1	L_0010_Line S.ONOFRE 230.0 to TRABUCO2 230.0 Ckt 1 and L_7008_Line TALEGA 138.0 to PICO 138.0 Ckt 1	P6 (N-1-1)	NA	98
SDGE-T-OP4	22842 TA TAP33 138 22656 PICO 138 1	L_0010_Line S.ONOFRE 230.0 to TRABUCO2 230.0 Ckt 1 and L_7008_Line TALEGA 138.0 to PICO 138.0 Ckt 1	P6 (N-1-1)	NA	97
SDGE-T-OP5	22841 LAGNA NL TAP 138 22396 LAGNA NL 138 1	L_0010_Line S.ONOFRE 230.0 to TRABUCO2 230.0 Ckt 1 and L_7002_Line CAPSTRNO 138.0 to PICO 138.0 Ckt 1	P6 (N-1-1)	NA	97
SDGE-T-OP6	22840 TALEGA 138 22656 PICO 138 1	L_0010_Line S.ONOFRE 230.0 to TRABUCO2 230.0 Ckt 1 and Tap_9001_Line TALEGA-TAP33-PICO-SANMATEO 138.0 1	P6 (N-1-1)	NA	95

Note: * Category P7 or N-2 contingency is credible assuming the RDEIR Trabuco Alternative was modified to meet industry standards

Table 2 Thermal Overloads in the SCE System - Based on CAISO 2015~16 TPP 2025 Summer Peak Base Case without mitigation

SOCREP VS Alternative J

ID	Overloaded Facility	Contingency	Category Description	Thermal Loading (% over applicable rating)	
				SOCREP	Alternative J
SCE-T-B1	24044 ELLIS 230 24134 SANTIAGO 230 1	L_40033_Line ELLIS 230.0 to JOHANNA 230.0 Ckt 1 and L_50001 MIGUEL-ECO ck 1	P6 (N-1-1)	106	108
SCE-T-B2	24044 ELLIS 230 24134 SANTIAGO 230 1	L_40033_Line ELLIS 230.0 to JOHANNA 230.0 Ckt 1 and L_50004 ECO-IMPRLVLY ck 1	P6 (N-1-1)	105	107
SCE-T-B3	24044 ELLIS 230 24072 JOHANNA 230 1	L_40034_Line ELLIS 230.0 to SANTIAGO 230.0 Ckt 1 and L_50001 MIGUEL-ECO ck 1	P6 (N-1-1)	102	103
SCE-T-B4	24044 ELLIS 230 24072 JOHANNA 230 1	L_40034_Line ELLIS 230.0 to SANTIAGO 230.0 Ckt 1 and L_50004 ECO-IMPRLVLY ck 1	P6 (N-1-1)	101	102
SCE-T-B5	24044 ELLIS 230 24072 JOHANNA 230 1	L_50001 MIGUEL-ECO ck 1 and L_50003_OCOTILLO - SUNCREST ck 1	P6 (N-1-1)	99	101
SCE-T-B6	24044 ELLIS 230 24072 JOHANNA 230 1	L_50004 ECO-IMPRLVLY ck 1 and L_50003_OCOTILLO - SUNCREST ck 1	P6 (N-1-1)	97	99
SCE-T-B7	24044 ELLIS 230 24072 JOHANNA 230 1	L_50001 MIGUEL-ECO ck 1 and L_50005_IMPRLVLY - OCOTILLO ck 1	P6 (N-1-1)	97	99

Table 3 Thermal Overloads in the SCE System - Based on CAISO 2015~16 TPP 2025 Summer Peak Base Case with mitigation

SOCREP VS Alternative J

ID	Overloaded Facility	Contingency	Category Description	Thermal Loading (% over applicable rating)	
				SOCREP	Alternative J
SCE-T-B-M1	24044 ELLIS 230 24134 SANTIAGO 230 1	L_40033_Line ELLIS 230.0 to JOHANNA 230.0 Ckt 1 and L_50001 MIGUEL-ECO ck 1	P6 (N-1-1)	93	95
SCE-T-B-M2	24044 ELLIS 230 24134 SANTIAGO 230 1	L_40033_Line ELLIS 230.0 to JOHANNA 230.0 Ckt 1 and L_50004 ECO-IMPRLVLY ck 1	P6 (N-1-1)	91	93
SCE-T-B-M3	24044 ELLIS 230 24072 JOHANNA 230 1	L_40034_Line ELLIS 230.0 to SANTIAGO 230.0 Ckt 1 and L_50001 MIGUEL-ECO ck 1	P6 (N-1-1)	88	90
SCE-T-B-M4	24044 ELLIS 230 24072 JOHANNA 230 1	L_40034_Line ELLIS 230.0 to SANTIAGO 230.0 Ckt 1 and L_50004 ECO-IMPRLVLY ck 1	P6 (N-1-1)	87	89
SCE-T-B-M5	24044 ELLIS 230 24072 JOHANNA 230 1	L_50001 MIGUEL-ECO ck 1 and L_50003_OCOTILLO - SUNCREST ck 1	P6 (N-1-1)	87	89
SCE-T-B-M6	24044 ELLIS 230 24072 JOHANNA 230 1	L_50004 ECO-IMPRLVLY ck 1 and L_50003_OCOTILLO - SUNCREST ck 1	P6 (N-1-1)	86	88
SCE-T-B-M7	24044 ELLIS 230 24072 JOHANNA 230 1	L_50001 MIGUEL-ECO ck 1 and L_50005_IMPRLVLY - OCOTILLO ck 1	P6 (N-1-1)	85	88

Table 4 Thermal Overloads in the SCE System - Based on CAISO 2015~16 TPP CEC's 2025 High Load Scenario with mitigation

SOCREP VS Alternative J

ID	Overloaded Facility	Contingency	Category Description	Thermal Loading (% over applicable rating)	
				SOCREP	Alternative J
SCE-T-S-M1	24044 ELLIS 230 24134 SANTIAGO 230 1	L_40033_Line ELLIS 230.0 to JOHANNA 230.0 Ckt 1 and L_50001 MIGUEL-ECO ck 1	P6 (N-1-1)	102	104
SCE-T-S-M2	24044 ELLIS 230 24134 SANTIAGO 230 1	L_40033_Line ELLIS 230.0 to JOHANNA 230.0 Ckt 1 and L_50004 ECO-IMPRLVLY ck 1	P6 (N-1-1)	101	103
SCE-T-S-M3	24044 ELLIS 230 24072 JOHANNA 230 1	L_40034_Line ELLIS 230.0 to SANTIAGO 230.0 Ckt 1 and L_50001 MIGUEL-ECO ck 1	P6 (N-1-1)	97	99
SCE-T-S-M4	24044 ELLIS 230 24072 JOHANNA 230 1	L_40034_Line ELLIS 230.0 to SANTIAGO 230.0 Ckt 1 and L_50004 ECO-IMPRLVLY ck 1	P6 (N-1-1)	96	98
SCE-T-S-M5	24044 ELLIS 230 24072 JOHANNA 230 1	L_50001 MIGUEL-ECO ck 1 and L_50003_OCOTILLO - SUNCREST ck 1	P6 (N-1-1)	93	95
SCE-T-S-M6	24044 ELLIS 230 24072 JOHANNA 230 1	L_50004 ECO-IMPRLVLY ck 1 and L_50003_OCOTILLO - SUNCREST ck 1	P6 (N-1-1)	92	94
SCE-T-S-M7	24044 ELLIS 230 24072 JOHANNA 230 1	L_50001 MIGUEL-ECO ck 1 and L_50005_IMPRLVLY - OCOTILLO ck 1	P6 (N-1-1)	92	94

Figure AA-1 SDG&E 230/500 kV System with the SOCRE Project

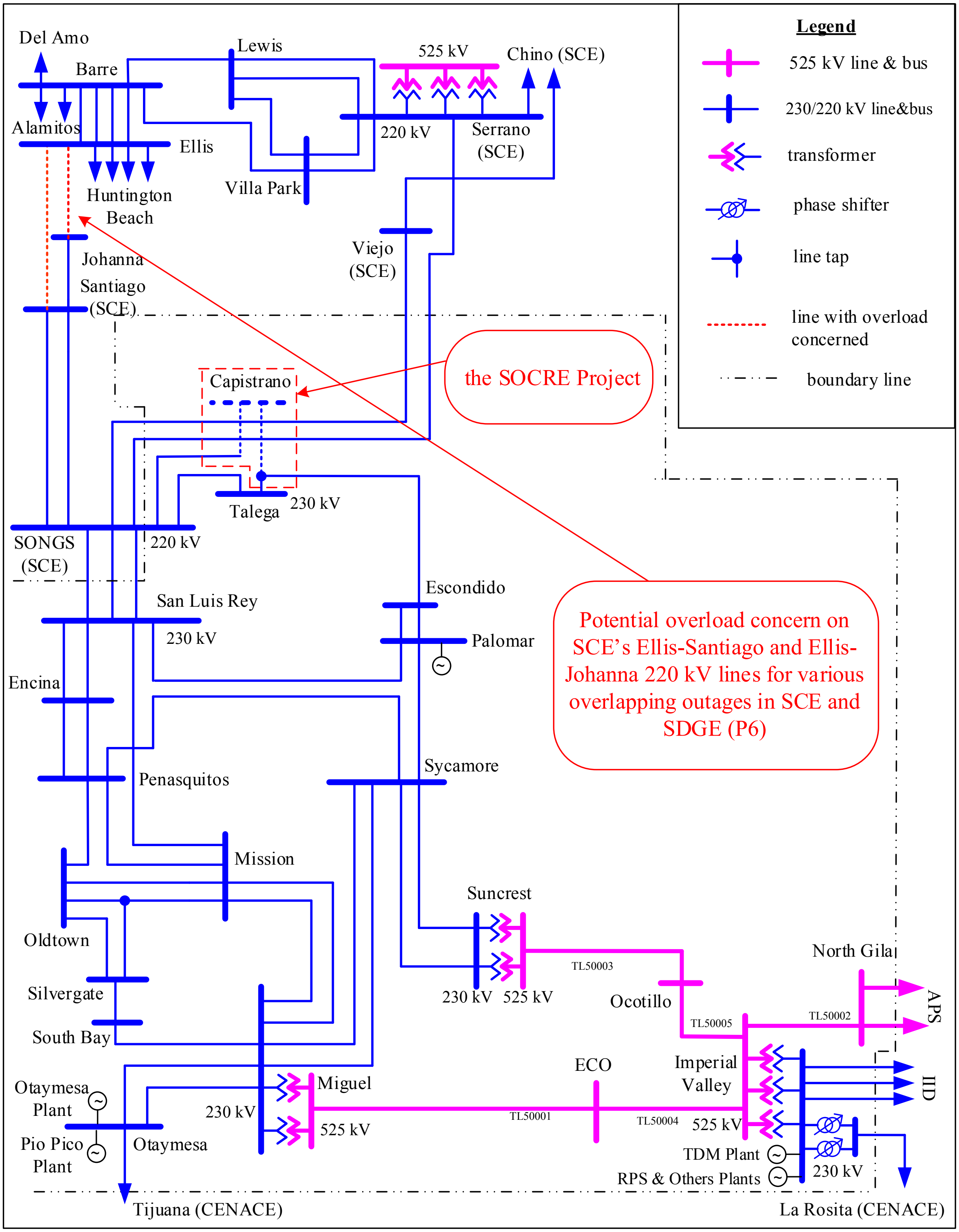
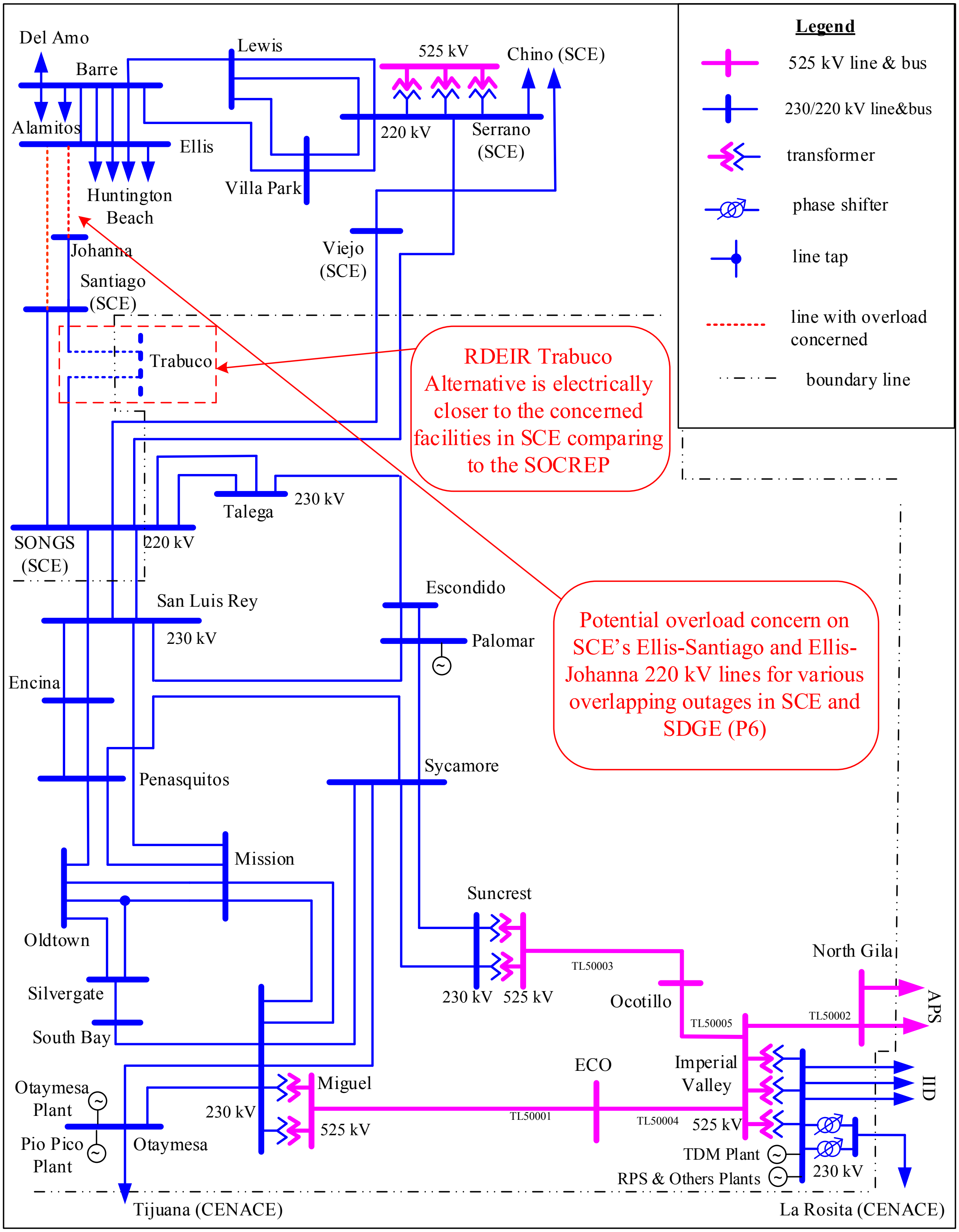


Figure AA-2 SDG&E 230/500 kV System with the RDEIT Trabuco Alternative



APPENDIX A

The CAISO used assumptions consistent with the 2015-2016 transmission plan process in conducting additional analysis on the SOCRE project and the RDEIR Alternative J, which are shown in Table A-1 and Table A-2 and can be summarized as follows:

- Updated load forecast by California Energy Commission (CEC);
- Updated Once-Through Cooled (OTC) generation retirement schedule;
- CEC/Commission Long-Term Procurement Process (LTPP) forecasts and authorization, including energy efficiency, Demand Response, Distributed Generation, Energy Storage, and conventional gas fired resources;
- A total of 2107 MW in NQC of Preferred Resource and Energy Storage are assumed to be implemented as mitigation to address reliability concerns in LA Basin and SDGE;

Load forecast and generation resources assumptions
Table A-1 summarizes the 1-in-10 load forecast and generation resource in the South Orange County area assumed in the CAISO 2015-2016 2025 Summer Peak base cases. For comparison purpose, similar load forecast and generation resource in the CAISO 2014~2015 TPP 2024 Summer Peak base case are also listed in the table. The 453 MW of net load in the 2025 Summer Peak case is 1.6% higher than the net peak load in the 2024 Summer Peak cases on which the CAISO original and the rebuttal testimonies provided in A.12-05-020 were based.

Table A-1. Load and Resources Assumptions in the SDGE's South Orange County Area
CAISO 2015~2016 TPP VS CAISO 2014~2015 TPP

		Unit	2014~2015 TPP: 2024 Peak	2015~2016 TPP: 2025 Peak
Load Forecast	1-in-10 coincident peak	MW	489.5	506.2
Load Reduction	AAEE	MW	-30.9	-41.78
	Demand Response (DR)	MW	-2	-11
	Distributed Generation (DG)	MW	-7.3	0
	Energy Storage (ES)	MW	-3.1	0
	Subtotal	MW	-43.3	-52.8
Net Peak Load in SOC		MW	446	453
Landfill Generation		MW (in NQC)	5.3	5.3

Table A-2. Load Forecast and Additional Preferred Resources Used as Mitigation in SCE and SDGE

1-in-10 load in LA Basin and SDGE, 1-in-5 in other areas

		Unit	SCE		SDGE	
			Base Case	High Load Scenario	Base Case	High Load Scenario
Load Forecast		MW	28653	29634	5850	6170
Energy Efficiency (AAEE)		MW	-1568	-1568	-401	-401
Net Load		MW	27085	28066	5449	5769
Track 1 and 4 Conventional Gas Fired		MW (in NQC)	1382		800	
Preferred Resources and Energy Storage that are used as mitigation to address reliability concerns in LA Basin and SDGE in the 2015~2016 TPP	CPUC Authorized Preferred Resource and Energy storage in LA Basin and SDGE	MW	501		100	
	Existing repurposed Demand Response	MW	1124		17	
	RPS Portfolio Distributed Generation	MW	203		65	
	Additional Energy Storage based on CPUC D13-10-040	MW	0		97	
	Subtotal of MW in NQC	MW	1828		182	