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

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

Table of Contents

BEFORE THE PUBLIC UTILITIES COMMISSION OF THE STATE OF CALIFORNIA

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

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. Please describe your educational and professional background.

A. I am a licensed Professional Electrical Engineer in the State of California. I hold a Master of Science degree in Electrical Engineering from Purdue University, and a Bachelor of Science degree in Electrical Engineering from California State University, Sacramento.

Q. What are your job responsibilities?

A. I manage a group of engineers responsible for planning the CAISO controlled transmission system in southern California to ensure compliance with NERC, WECC, and CAISO Transmission Planning Standards in the most cost effective manner.

Q. What is the purpose of your testimony?

A. The purpose of my testimony is to provide the technical analysis underlying the CAISO's recommendation that the Commission approve San Diego Gas & Electric

Company's (SDG&E) Application for a certificate of public convenience and necessity for the South Orange County Reliability Enhancement (SOCRE) project. This testimony presents an updated analysis of reliability needs in the South Orange County area and a comparative analysis of the SOCRE project versus the alternatives studied in the Energy Division's Draft Environmental Impact Report (DEIR). Based on this updated analysis, the CAISO continues to see reliability needs for the SOCRE project and found that the SOCRE project is superior to the other DEIR alternatives because it is more effective at resolving the identified reliability needs without having negative system impacts on other reliability requirements. The CAISO's recommendations are discussed in more detail in the testimony of Mr. Neil Millar on behalf of the CAISO.

I. CAISO RELIABILITY OBJECTIVES FOR THE SOCRE PROJECT

Q. What is the primary driver for the need for the SOCRE project in the South Orange County area?

A. The SOCRE project is necessary to meet reliability requirements specified by the North American Electric Reliability Corporation (NERC) and the CAISO Planning Standards. As noted in the 2010-2011 transmission plan, the primary driver for the SOCRE project was the exceedance of applicable ratings during multiple Category C contingencies under Planning Standard TPL-003. In addition, the CAISO has identified numerous potential NERC violations of TPL-002 and TPL-003 during planned maintenance outages at the Talega Substation. These reliability concerns cannot be met by existing or expanded remedial action schemes in the study area.

The timing of the SOCRE project was driven by the need for capital maintenance to be conducted by SDG&E. The capital maintenance needs provided the opportunity more efficiently to leverage other construction work to address the excessively complex remedial action schemes in the area and further demonstrated the inadequacy of the existing system to adequately accommodate maintenance or construction-related outages.

Q. When is the SOCRE project needed to comply with the NERC Standards?

A. Notwithstanding a significant reduction in long-term load forecast for the South Orange County area, the SOCRE project is needed immediately, and the reliability concerns worsen over time.[1] The CAISO conducted an updated analysis for this proceeding and found that the reliability concerns are comparable with those initially identified in the CAISO's 2010-2011 transmission plan.

Q. Please explain the CAISO's analysis conducted for this proceeding.

A. The CAISO conducted power flow studies on the 2024 summer peak case for all Category A, B, C and D contingencies in the South Orange County 230/138 kV system without the SOCRE project.[2]

Table 1 presents a summary comparison of the reliability concerns identified in the CAISO's updated analysis and the reliability concerns identified based on the underlying assumptions used in the 2010-2011 transmission plan.[3] Table 1 also shows the impact of the SOCRE project on the 2024 case, which indicates that all reliability concerns are resolved. A detailed comparison of thermal overloads for the most severe contingencies is provided in Table A-2 of Appendix A. All thermal overload results under all contingencies for both cases are provided in Tables A-3A and A-3B of Appendix A, respectively.

[1] The forecasted 2024 1-in-10 coincident peak load in South Orange County is 489.5 MW. In addition, the CEC's 2024 1-in-10 coincident peak load includes a 43 MW load reduction which results in a net peak load in the summer 2024 of 446 MW, or about 13% lower than net peak load forecast used in the 2010-2011 transmission plan.

[2] The CAISO also notes that the 2013-2014 transmission plan identified sixteen Category C contingency overloads in the South Orange County area with forecasted loads for the year 2015.

[3] The CAISO's updated analysis used the 2024 Summer Peak Case to determine reliability concerns. The 2010-2011 transmission plan analysis used the 2020 Summer Peak Case.

Table 1 Summary Comparison of Reliability Concerns

Pre-Contingency System Condition	NERC Standard	Total number of reliability concerns			
		Power Flow Concerns	Without the SOCRE project		With the SOCRE project
			Updated Analysis	2010-2011 Transmission Plan Analysis	Updated Analysis
all transmission facilities in service	TPL-002 (Category B)	thermal overloads	0	1	0
	TPL-003 (Category C)	thermal overloads	26	44	0
		overloaded branches	8	6	0
		unique contingencies	13	19	0
	TPL-004 (Category D)	area blackout events	2	2	0

As indicated in Table 1, with all facilities in-service pre-contingency, the CAISO's updated analysis shows that there are no Category B contingencies in the South Orange County 138 kV system that would result in violation of NERC mandatory reliability criteria TPL-002 or the CAISO transmission planning standards. However, as described below, there are Category B contingency violations during planned outage conditions required for maintenance of electrical facilities at the Talega substation.

With respect to NERC planning criterion TPL-003, the CAISO identified various South Orange County transmission facilities with thermal overloads in the event of Category C contingencies, despite the lower load demand forecast in the updated analysis. Based on the CAISO's updated analysis for this proceeding, the CAISO identified 26 thermal overloads on 8 distinct facilities. The number of the unique contingencies identified was 13 in the updated analysis, compared to 19 based on the 2010-2011 transmission plan assumptions.[4] The updated results indicate that significant reliability concerns under Category C contingencies are comparable to those initially identified in the CAISO's 2010-2011 transmission plan.

In addition to the contingencies studied above, the CAISO identified two Category D events under TPL-004 that would result in loss of the entire load in the South Orange County service area in both the updated and original analyses. Without the SOCRE project, this potential for an area blackout exists whenever the Talega West/East 230 kV buses or Talega West/East138 kV buses are out of service.

Q. Please explain the CAISO-identified reliability concerns during maintenance outages.

A. Substations are points in the power network where transmission branches and distribution feeders are connected together through circuit breakers or switches via buses and transformers. This allows for the switching operations of transmission equipment for operation and maintenance purposes. Regular maintenance and service on substations without load interruptions is necessary for reliable system operation.

To comply with NERC TPL-002 and TPL-003 R1.3.12, the CAISO, as a Planning Authority, assessed the system reliability performance by including the planned (including maintenance and construction) outage of any bulk electric system element at demand levels for which planned outages are performed. The CAISO identified inadequate system performance during maintenance periods at the Talega 230/138 kV Substation. Table 2 presents reliability concerns with a single facility out of service for maintenance at the Talega 230/138 kV Substation and without the SOCRE project.

---

[4] The primary driver for the differences between the 2024 and the 2020 case are the recent system improvements at the Talega and Pico 138 kV substations and the lower load forecast.

Table 2: Reliability Concerns with Facility Out of Service for Maintenance in Talega 230/138 kV Substation

Type ID	Facility Out of Service for Maintenance	Contingency Followed by	Category	Category Description	load serving capability to the South Orange County Area (MW)
Type1-B1	230 East Bus	Bank #63	B	Transformer (B3)	0
Type1-B2	230 West Bus	Bank #60	B	Transformer (B3)	0
Type2-B1		Bank #61	B	Transformer (B3)	195
Type2-B2	CB #4E	Bank #63	B	Transformer (B3)	195
Type1-C01	138 East Bus	CB BK #50	C	Breaker Failure (C2)	0
Type1-C02		CB BK #63	C	Breaker Failure (C2)	0
Type1-C03		138 West Bus	C	Bus Section (C1)	0
Type1-C04		CB #11W	C	Breaker Failure (C2)	0
Type1-C05		CB #5W	C	Breaker Failure (C2)	0
Type1-C06		CB #6W	C	Breaker Failure (C2)	0
Type1-C07		CB #7W	C	Breaker Failure (C2)	0
Type1-C08		CB #8W	C	Breaker Failure (C2)	0
Type1-C09	138 West Bus	138 East Bus	C	Bus Section (C1)	0
Type1-C10		CB #11E	C	Breaker Failure (C2)	0
Type1-C11		CB #5E	C	Breaker Failure (C2)	0
Type1-C12		CB #BK60	C	Breaker Failure (C2)	0
Type1-C13		CB #6T	C	Breaker Failure (C2)	0
Type1-C14		CB #7T	C	Breaker Failure (C2)	0
Type1-C15		CB #8E	C	Breaker Failure (C2)	0
Type1-C16	230 East Bus	230 West Bus	C	Bus Section (C1)	0
Type1-C17		CB #1W	C	Breaker Failure (C2)	0
Type1-C18		CB #2W	C	Breaker Failure (C2)	0
Type1-C19		CB #3W	C	Breaker Failure (C2)	0
Type1-C20		CB #4W	C	Breaker Failure (C2)	0
Type1-C21		CB #BK63	C	Breaker Failure (C2)	0
Type1-C22	230 West Bus	230 East Bus	C	Bus Section (C1)	0
Type1-C23		CB #1E	C	Breaker Failure (C2)	0
Type1-C24		CB #2E	C	Breaker Failure (C2)	0

Type1-C25		CB #3E	C	Breaker Failure (C2)	0
Type1-C26		CB #4E	C	Breaker Failure (C2)	0
Type1-C27		CB #BK60	C	Breaker Failure (C2)	0
Type2-C01	138 West Bus	CB # BK61	C	Breaker Failure (C2)	195
Type2-C02		CB #4T	C	Breaker Failure (C2)	195
Type2-C03		CB #5T	C	Breaker Failure (C2)	195
Type2-C04	230 West Bus	CB # BK61	C	Breaker Failure (C2)	195
Type2-C05		CB #4T	C	Breaker Failure (C2)	195
Type2-C06		CB #5E	C	Breaker Failure (C2)	195
Type2-C07		CB #5T	C	Breaker Failure (C2)	195
Type2-C08	Bank #61	CB #4W	C	Breaker Failure (C2)	195
Type2-C09		CB #5W	C	Breaker Failure (C2)	195
Type2-C10	Bank #63	CB #4E	C	Breaker Failure (C2)	195
Type2-C11		CB #4T	C	Breaker Failure (C2)	195
Type2-C12		CB #5T	C	Breaker Failure (C2)	195
Type2-C13	CB #4E	230 West Bus	C	Bus Section (C1)	195
Type2-C14		CB # BK63	C	Breaker Failure (C2)	195
Type2-C15		CB #1W	C	Breaker Failure (C2)	195
Type2-C16		CB #4W	C	Breaker Failure (C2)	195
Type2-C17		CB #2W	C	Breaker Failure (C2)	195
Type2-C18		CB #3W	C	Breaker Failure (C2)	195
Type2-C19	CB #5E	138 West Bus	C	Bus Section (C1)	195
Type2-C20		CB # BK50	C	Breaker Failure (C2)	195
Type2-C21		CB # BK63	C	Breaker Failure (C2)	195
Type2-C22		CB #11W	C	Breaker Failure (C2)	195
Type2-C23		CB #5W	C	Breaker Failure (C2)	195
Type2-C24		CB #6W	C	Breaker Failure (C2)	195
Type2-C25		CB #7W	C	Breaker Failure (C2)	195
Type2-C26		CB #8W	C	Breaker Failure (C2)	195

The CAISO identified a total of 57 reliability events that would result in an uncontrolled interruption of service when a maintenance outage at the Talega Substation is followed by a contingency event. These events can be broken down into two types: Type 1 events that result in the loss of all load in the South Orange

County area; and Type 2 events that result in the loss of significant, but not all load. The CAISO identified 29 Type 1 events in which the combination of planned maintenance followed by a contingency resulted in uncontrolled interruption of service to the entire South Orange County. Two of these Type 1 events were the result of Category B contingencies, meaning the failure of just a single transformer element could potentially disrupt service to all South Orange County customers during a planned maintenance at the Talega Substation. The remaining 27 Type 1 events were a result of Category C contingencies.

Paraphrasing the operational concern differently, there are no windows for performing necessary maintenance or construction activities without facing unacceptable risk of the loss of all load in South Orange County. This is primarily due to the South Orange County system relying on a single power source from the Talega Substation to serve approximately 460 MW of load. This represents 29 single points of failure as demonstrated by these 29 Type 1 planned maintenance outage/contingency events.

In addition to the 29 Type 1 events, there were also 28 Type 2 events under which planned maintenance followed by a contingency results in an uncontrolled interruption of service to a significant number of customers. Two of the Type 2 events were a result of Category B contingencies. The remaining 26 Type 2 events were a result of Category C contingencies resulting in the loss of substantial South Orange County area load. During these events, the remaining system can only provide load serving capability up to 195 MW, about 40% of the area peak load, to keep facilities within emergency ratings[5]. In other words, there is a very limited time frame when maintenance can be performed on this additional set of facilities without creating unacceptable risk of the loss of load in South Orange County.

[5] Within 30 minutes after the contingency, the equipment loading would need to be reduced to its Normal Rating of approximately 168 MW.

Based on the SDG&E 8760-hour load duration curve[6] there are only about 260 hours a year, or about 3% of all hours, during which the loads in the South Orange County area would be lower than 195 MW. In other words, the 195 MW of load serving capability means that, without the SOCRE project in-service, the CAISO and SDG&E operations would not be able to find adequate maintenance windows without a significant risk of load service interruption.

The existing system does not provide adequate windows for maintenance or planned construction activities without risking area blackout or non-consequential loss of load under four Category B contingencies. This is a violation of the NERC TPL-002 planning standard that does not allow non-consequential load service interruption under Category B contingencies. In addition, during maintenance or planned construction, 53 Category C contingency events result in area blackout or load shedding in South Orange County, which results in an unacceptable reliability risk. There is no acceptable method of implementing the necessary load shedding for these overlapping Category C contingencies. Shedding load after the first contingency to prepare for the second contingency is not allowed by the CAISO Planning Standards for long-term planning purposes. Shedding load after the second contingency would require an exceedingly complex Special Protection System (SPS) that would not meet the CAISO Planning Standards.

Q. Can the reliability concerns identified by the CAISO be resolved through an SPS?

No. The CAISO Planning Standards include guidelines that specifically address the complexity that can reliably be managed in relying on an SPS. As stated in the CAISO Planning Standards, “SPSs have substantial advantages, [but] they have disadvantages as well. With the increased transmission system utilization that comes with application of SPS, there can be increased exposure to not meeting system

[6] See Figure 5.

performance criteria if the SPS fails or inadvertently operates. Transmission outages can become more difficult to schedule due to increased flows across a larger portion of the year; and/or the system can become more difficult to operate because of the independent nature of the SPS. If there are a large number of SPSs, it may become difficult to assess the interdependency of these various schemes on system reliability." In order to mitigate concerns regarding the complexity of an SPS, the CAISO Planning Standards specify that any one SPS (1) should not be monitoring more than six local contingencies and (2) should not be monitoring more than four transmission system elements.

The CAISO's updated analysis identified 13 unique local contingencies that would need to be monitored by an SPS if the SOCRE project is not built. This is well in excess of the six allowable local contingences that may be addressed by an SPS pursuant to CAISO Planning Standards. In addition, the CAISO's updated analysis identified 8 transmission elements on which power flow would need to be monitored, without the SOCRE Project. This is double the allowed limit of monitored elements for an SPS under the CAISO Planning Standards.[7] In real time system operations, the SPS design would likely need to monitor even more elements because of operational complexities such as load levels, planned maintenance and configuration variation.

Implementation of the SOCRE project eliminates all local contingencies that would otherwise need to be monitored by an SPS.

---

[7] Please see Tables A-4 and A-5 in Appendix A for the list of 13 unique local contingencies and 8 transmission elements on which power flow would need to be monitored.

II. DEIR ALTERNATIVES TO THE SOCRE PROJECT

Q. Please provide an overview of the alternatives to the SOCRE project identified in the DEIR.

A. The DEIR identified 11 alternatives to the SOCRE project. For this analysis, the CAISO has classified the 11 alternatives into 4 groups based on common mitigation characteristics and system performance.

The No Project alternative is designated as the sole alternative in Group 1. This alternative is unique because it does not address any of the system performance issues identified by the CAISO and therefore does not propose any mitigation strategies. Alternatives B1, B2, B3, B4, and E are designated as Group 2 alternatives, all of which focus on South Orange County 138 kV System improvements.[8] Alternatives C1, C2, and D are designated as Group 3 alternatives, because each one incorporates an element that parallels the South Orange County 138 kV system with the Southern California Electric Company (SCE) 230 kV system. Alternatives F, G, and H are designated as Group 4 alternatives, all of which provide a second new 230 kV or 138 kV transmission source into the South Orange County service area from a substation other than the Talega Substation.

Q. Do the DEIR alternatives to the SOCRE project address the reliability concerns identified by the CAISO?

A. No, all of the DEIR alternatives fail to meet the reliability concerns identified by the CAISO. The CAISO identified ongoing reliability concerns for each Group of DEIR alternatives. Table 3 lists the reliability concerns for each DEIR alternative group.[9]

[8] The CAISO notes that the Group 2 alternatives are similar to "SOCRUP Alternative 2" as evaluated in the 2010-2011 CAISO transmission plan.
[9] More detailed load flow results are shown in Tables B-1, B-2A, B-2B, B-3A, and B-3B in Appendix A.

Table 3. Summary of Reliability Concerns

Alternatives			Pre-contingency of all facilities in-service			One Element out of service for maintenance at Talega	
Group #	ID	Name	Cat. B	Cat. C	Cat. D	Cat. B	Cat. C
1	A	No Project	0	26	2	4	53
2	B1	Reconductor Laguna Niguel–Talega 138-kV Line	0	2	2	4	53
	B2	Use of Existing Transmission Lines					
	B3	Phased Construction of Alternatives B1 and B2					
	B4	Rebuild South Orange County 138-kV System					
	E	New 230-kV Line Operated at 138 kV					
3	C1	SCE 230-kV Loop In to Capistrano in GIS	4	56	0	0	0
	C2	SCE 230-kV Loop In to Capistrano Alt Route					
	D	SCE 230-kV Loop In to Reduced-Footprint Substation at Landfill in GIS					
4	F	230-kV Rancho Mission Viejo Substation	0	2	1	0	2
	G	138-kV San Luis Rey–San Mateo Line & Sub Expansion	0	4	1	0	2
SOCRE Project			0	0	0	0	0

Q. Do the DEIR alternatives allow for necessary maintenance in the South Orange County area?

A. Only the DEIR alternatives in Group 3 provide a second independent transmission source that is adequate to maintain reliable network service to all the South Orange County load during maintenance conditions followed by a forced outage at the Talega Substation. DEIR alternatives in Groups 1 and 2 do not provide any load serving capability during such conditions. The alternatives in Group 4 add a second independent transmission source at a suboptimal location, and therefore do not provide adequate load serving capability without additional network upgrades.

Table 4. Load Serving Capabilities under Maintenance Conditions

Alternatives			Under maintenance condition followed by one of the forced Outages at Talega Substation		
Group #	ID	Name	load serving capability MW	limiting facility	typical worst event
1	A	No Project	0	NA	Talega 138 kV West out of service followed by Talega 138 kV East Bus outage
2	B1	Reconductor Laguna Niguel–Talega 138-kV Line	0	NA	
	B2	Use of Existing Transmission Lines			
	B3	Phased Construction of Alternatives B1 and B2			
	B4	Rebuild South Orange County 138-kV System			
	E	New 230-kV Line Operated at 138 kV			
3	C1	SCE 230-kV Loop In to Capistrano in GIS	670*	Talega Tap-L. Niguel 138 kV	Break Failure at Capistrano (CB_CP138BT "CP-TR/LNL/PI")
	C2	SCE 230-kV Loop In to Capistrano Alt Route			
	D	SCE 230-kV Loop In to Reduced-Footprint Substation at Landfill in GIS			
4	F	230-kV Rancho Mission Viejo Substation	350	TL13838 (R. M. Viejo-Margarita)	Talega 138 kV West out of service followed by Talega 138 kV East Bus outage
	G	138-kV San Luis Rey–San Mateo Line & Sub Expansion	180	TL13833/32 (San Mateo-L. Niguel)	
SOCRE Project			850	SONGS-Capistrano 230 kV Line	SONGS-Talega 230 kV Line

* Estimated by assuming that TL13834 (Capistrano-Trabuco) was upgraded along with the three alternatives in Group #3, otherwise load serving capability would be limited to 450 MW due to limitations on TL13834.

Q. Please explain why the Capistrano Substation is the best electrical location to add a second transmission source in the South Orange County area.

A. As can be seen in Table 4 above, the Capistrano Substation is the best location to add a second transmission source into the South Orange County area because it can serve the entire load in the event of a maintenance outage followed by a forced outage at the Talega Substation. Providing a second transmission source at this location provides unique benefits because the Capistrano Substation is:

- Electrically located in the load center of SDG&E's South Orange County service area;
- Within close proximity to a collection of 138 kV substations that serve approximately 375 MW of load, or 82% area peak load;
- Currently accommodating six 138 kV transmission lines; and
- Resistant to cascading outages associated with the loss of the existing 138 kV Talega transmission source.

Q. Will the DEIR's No Project Alternative meet the CAISO identified-reliability objectives?

A. No. As described above, the CAISO's analysis of the existing system has demonstrated numerous reliability concerns in the South Orange County system if no upgrade were made in the planning horizon.

Q. If the Commission approves the No Project Alternative what additional improvements will be necessary to meet NERC or CAISO transmission planning standards?

A. To address the identified reliability needs, additional improvements include:

- Upgrading the existing 138 kV system to re-conductor the Talega-Pico, Pico-Capistrano, Capistrano-Trabuco, Talega Tap-San Mateo-Laguna Niguel, Talega-Pico-San Mateo 138 kV lines; and

- Expansion of the 230/138 kV Talega Substation by sectioning the 230/138 kV buses, adding at least two more bay positions at both 230 kV and 138 kV voltage sides, and upgrading the two 230/138 kV transformers (Banks #60 and #62).

However, as described in SDG&E's Initial Prepared Testimony, SDG&E cannot expand the Talega Substation without shutting down its service depending on the status of the construction and the nature of the forced outage because it is the sole transmission source. For this reason, SDG&E considered building a temporary substation configuration to facilitate the construction, but rejected this alternative due to its high estimated cost and the environmental concerns discussed in SDG&E's Proponent's Environmental Assessment (PEA). This minimal work strategy is not cost effective compared with the SOCRE project. The SOCRE project would not only address the identified reliability needs but also eliminate the sole transmission source issue.

Q. Will the DEIR Group 2 Alternatives (B1, B2, B3, B4 and E) meet the CAISO-identified reliability objectives?

A. No. The Group 2 DEIR alternatives are similar to an alternative configuration investigated in the CAISO 2010-2011 TPP. As indicated in Table 3, if all facilities are in-service as a pre-contingency condition, Alternatives B1, B2, B3, B4, and E would address some of the reliability concerns for the Category C events. However, these alternatives would not address the Talega Bank #60 and #62 overload concerns for the overlapping contingency (Category C) of Talega Bank #63 and #61. In addition, the DEIR Alternatives are not adequate to meet system performance during maintenance outages at the Talega Substation as described above. All or a significant amount of customer load in the area would be interrupted with any one of the 4 Category B or the 53 Category C events listed in Table 2.

Q. If the Commission approves one of the DEIR Group 2 alternatives, what additional improvements will be necessary to meet NERC or CAISO transmission planning standards?

A. The scope of each of these upgrade alternatives would need to be expanded to include upgrades to the Talega Substation in order to eliminate the Bank #60 and #62 overloads for the Category C contingency and meet the NERC TPL-002 and TPL-003 maintenance requirement (R1.3.12). This work would include:

- Upgrading two of the 230/138 kV transformers at Talega Substation, Banks #60 and #62; and
- Rebuilding and extending the existing non-standard substation layout and 230/138 kV buses configurations at the Talega Substation.

As described above, rebuilding and expanding the Talega substation is not feasible without building costly temporary facilities during the construction process in order to ensure service to customers. In addition, as indicated in SDG&E's testimony, the equipment at the Capistrano Substation is inadequate and any alternative without rebuilding the Capistrano Substation is infeasible. Based on these considerations, the Group 2 DEIR alternatives will not be a cost effective means to meet the identified reliability concerns when compared to the SOCRE project.[10]

Q. Will the DEIR Group 3 alternatives (C1, C2, or D) meet the CAISO-identified reliability objectives?

A. While these alternatives meet some of the immediate reliability concerns in the South Orange County area, they are unacceptable because of their negative impact on transfer capability on the major transmission corridor between San Diego and the Los Angeles basin.

[10] The CAISO notes that this is the same reason that "SOCRUP Alternative 2" was not selected in the CAISO's 2010-2011 transmission plan.

As discussed in the testimony of Mr. Millar, in approving the SOCRE project, the CAISO ensured that mitigations for the immediate area reliability issues would not compromise the overall effectiveness or reliability of the bulk electric system in Southern California. The existing 230 kV corridor connecting the LA Basin to the San Diego area previously played a key role in supporting flows southward when the San Onofre Nuclear Generating Station was in service. Now this major transmission link between San Diego and the Los Angeles basin serves as a back up to each area during emergency transmission and resource conditions.

The Group 3 DEIR alternatives provide a new independent transmission source to serve the SDG&E's South Orange County service area from the SCE system. In the Group 3 alternatives, the South Orange County 138 kV system would be interconnected with the SCE 230 kV transmission system at the Prima Deschecha landfill near the existing Capistrano Substation and an existing SCE 230 kV line. The SCE 230 kV line is a critical facility associated with the transmission corridor between the Los Angeles area and the San Diego area. As a consequence, the Group 3 DEIR alternatives result in the 138 kV network being paralleled to the existing 230 kV corridor linking the Los Angeles basin and San Diego. This paralleling of lower capacity networks with higher capacity networks lowers the overall capability of the 230 kV corridor.

The CAISO conducted additional analysis to test the impact of the Group 3 DEIR alternatives on the capability of the 230 kV corridor. Based on this analysis, the CAISO found numerous overloading concerns under Category B and Category C contingencies in the South Orange County and SCE systems.[11] The CAISO identified four thermal overloads for Category B contingencies and 52 thermal overloads for Category C contingencies in the 2024 Summer Off-Peak case.[12] Even

[11] See Table B-2A and Table B-2B of Appendix A for more detailed results.
[12] Table B-2A.

for the 2024 Summer Peak case with only about 200 MW flowing northbound between the two areas, there were 3 thermal overloads identified for Category C contingencies. This indicates that the Alternatives have significant adverse impacts on the Transfer Capability between the two areas and system operation without further improvement in the south Orange County system.

Q. If the Commission approves one of the Group 3 DEIR alternatives, what additional improvements will be necessary to meet NERC or CAISO transmission planning standards?

A. To maintain transfer capability between the Los Angeles and San Diego bulk electric power supply systems, major portions of the existing 138 kV transmission lines between the Talega Substation and the Capistrano Substation would need to be rebuilt or upgraded if the Commission were to approve the Group 3 DEIR alternatives. The CAISO would also need to conduct detailed analysis to identify whether additional upgrades to transmission facilities in the SCE system would be needed. Given the additional costs of including these upgrades in the scope of these alternatives, the CAISO expects that the Group 3 DEIR alternatives would not be cost effective when compared to the SOCRE project.

Q. Would the DEIR's Alternative F, 230-kV Rancho Mission Viejo Substation, meet the CAISO-identified reliability objectives?

A. No. Although the specifications of the DEIR's Alternative F may appear to be similar to those of the SOCRE project, Alternative F does not provide an electrically equivalent new 230 kV transmission source in South Orange County when compared to the SOCRE project. In terms of system power flow performance and reliability, the new Rancho Mission Viejo Substation would be inferior to the new Capistrano Substation proposed in the SOCRE project.

The Rancho Mission Viejo Substation is an electrically inferior 230 kV transmission source because (1) it is not electrically located in the load center of South Orange

County, and (2) there are only two 138 kV lines connected to the existing Rancho Mission Viejo Substation.

In addition, because the Rancho Mission Viejo Substation is only one bus away from the Talega Substation, cascading impacts can occur at Rancho Mission Viejo Substation during contingencies at the Talega Substation. The loss of the Talega 138 kV substation (Category D event) would also trip one of the two 138 kV lines out of the Rancho Mission Viejo Substation. This would result in cascading outages on the remaining 138 kV line and lead to interruption of all load service in the south Orange County area, except the distribution load served by the Rancho Mission Viejo Substation. The remaining 138 kV line at the Rancho Mission Viejo Substation would be not be able to serve the other substation loads in the area. This is due to the poor location of the new second transmission source and its weak link with the rest of main 138 kV system.

More details regarding the CAISO's analysis of Alternative F and the identified reliability concerns associated with this alternative are presented in Table B-3A of Appendix A.

Q. If the Commission approves Alternative F what additional improvements would be necessary to meet NERC or CAISO transmission planning standards?

A. As shown in Table B-3A in Appendix A, the 138 kV line between Talega and Laguna Niguel would need to be upgraded in addition to the Alternative F improvements. Also, to avoid cascading outages, an additional 138 kV line may be needed between the Rancho Mission Viejo, Margarita, and Trabuco Substations because upgrading the existing 138 kV lines out of the Rancho Mission Viejo Substation may not be feasible or adequate to address the identified contingency concerns.[13] More system improvements to address load growth would also likely be necessary in the future because of the inferior locational attributes of the Rancho Mission Viejo Substation.

Q. Would the DEIR's Alternative G, New 138-kV San Luis Rey–San Mateo Line and San Luis Rey Substation Expansion, meet the CAISO-identified reliability objectives?

A. No. In addition to feasibility concerns associated with Alternative G, adding a new long 138-kV San Luis Rey–San Mateo line as the new transmission source into the South Orange County area is a significantly weaker source than any of the 230 kV transmission alternatives. Similar to Alternative F, the new transmission source is not electrically located in the load center. There are only two 138 kV lines out of the existing San Mateo Substation, and it is only one bus away from the Talega Substation, which makes the two transmission sources not fully independent.

The loss of the Talega 138 kV substation (Category D event) would trip one of the two 138 kV lines out of the San Mateo Substation. The remaining 138 kV line at the San Mateo Substation would be inadequate to serve the other substation loads in the area, resulting in interruption of all load service in the South Orange County area, except the distribution load served by the San Mateo Substation. This is similar to the poor location issue for Alternative F discussed above. These findings are supported by the identified reliability concerns listed in Table B-3B of Appendix A.

Q. If the Commission approves Alternative G what additional improvements would be necessary to meet NERC or CAISO transmission planning standards?

A. As shown in Table B-3B in Appendix A, the 138 kV lines between Talega and Laguna Niguel and between Talega and Pico would also need to be upgraded. In

[13] The CAISO notes that the Margarita-Trabuco 138 kV line is mostly underground.

addition, as described above, to avoid cascading outages, additional upgrades may be needed at the 230/138 kV San Luis Rey Substation and between San Mateo, Laguna Niguel, and Capistrano. More system improvements to address load growth would also likely be needed in the future due to the inferior locational attributes of a new source at the San Mateo substation. Given the additional costs of including these upgrades in the scope of this alternative, the CAISO expects it would not be cost effective when compared to the SOCRE project.

III. CONCLUSION

Q. Please summarize your conclusions.

A. The CAISO's updated analysis of reliability needs in the South Orange County area found comparable results to the analysis documented in the CAISO's 2010-2011 Transmission Plan. These results confirm the need for the SOCRE Project to meet NERC and CAISO Planning Standards. Based on the CAISO's updated analysis, none of the alternatives in the DEIR provide a more effective means to meet reliability needs identified. The SOCRE project was found to be superior to the DEIR alternatives because the SOCRE project is more effective without negative system impacts on other requirements.

Q. Does this conclude your testimony?

A. Yes, it does.

APPENDIX A

The CAISO used assumptions consistent with the 2014-2015 transmission plan in conducting its updated SOCRE project analysis. The assumptions are shown in Table A-1 and can be summarized as follows:

- Latest load forecast by California Energy Commission (CEC);
- San Onofre Nuclear Generating Station (SONGS) retirement announced by Southern California Edison on July 6, 2012;
- Once-Through Cooled (OTC) generation retirement schedule;
- CEC/Commission Long-Term Procurement Process forecasts and authorization, including energy efficiency, behind the meter solar, Energy Storage, Demand Response, and conventional resources;
- The Commission's 33% renewable portfolio standards; and
- Network upgrade projects implemented and approved by CAISO since the CAISO 2010-2011 transmission plan.

For comparison purposes, the assumptions in the 2020 Summer Peak case used in the original CAISO's 2010-2011 transmission plan analysis of the SOCRE project are also provided in Table A-1.

The CAISO investigated the 11 DEIR alternatives based on the CAISO's understanding on the available project descriptions. Comparison of system performance between the SOCRE project and the DEIR Alternatives were based on the same assumptions in Table A-1 for the 2024 Summer Peak case.

Load forecast and generation resources assumptions

Table A-1 summarizes and compares the load and generation resource assumptions for the South Orange County area used in the 2024 and the 2020 Summer Peak cases. The forecasted 1-in-10 coincident peak load in the 2024 Summer Peak case is about 3% lower than the peak load in the 2020 Summer Peak case used in the 2010-2011 transmission plan. In addition, there is 48.6 MW of load reduction built into the 2024 Summer Peak case as a result of the projected energy efficiency, energy storage, demand response, distributed generation and the existing landfill generator. Therefore, the net peak load in the 2024 Summer Peak case is about 446 MW, about 13% lower than the net peak load in the 2020 Summer Peak case.

Table A-1. Load and Generation Resources Assumptions (CAISO 2014-2015 TPP VS. CAISO 2010-2011 TPP)

		Unit	2014-2015 TPP: 2024 Summer	2010-2011 TPP: 2020 Summer
Load Forecast	1-in-10 coincident peak	MW	489.5	503.2
Load Reduction	Energy Efficiency	MW	30.9	0
	Demand Response	MW	2	0
	Preferred Resources (DG)	MW	7.3	0
	Energy Storage	MW	3.1	0
	total of load reduction	MW	43.3	0.0
Net Peak Load in SOC		MW	446.2	503.2
Generation Resource (Landfill)		MW (in NQC)	5.3	3.3

Transmission Upgrades

With regard to transmission improvements in the South Orange County 138 kV system since the CAISO 2011-2011 TPP, a few minor network upgrades have been implemented to eliminate various power flow concerns, such as the Talega-Trabuco 138 kV line loop-in and the new 138 kV tap on the Talega-Pico 138 kV line. The Talega synchronous condensers project was approved by the CAISO after the SONGS retirement, and will be in service by the summer of 2015 based on the latest schedule. Figure 1 and Figure 2 show one-line diagrams of the SDG&E South Orange County 230/138 kV system configurations in the years 2011 and 2015 and represent the base case or "existing system" in the CAISO 2010-2011 and 2014-2015 TPP, respectively.

Figure 1. Southern Orange Country 230/138 kV System Configuration in the Year of 2011 (the existing system in the CAISO 2010-2011 TPP)

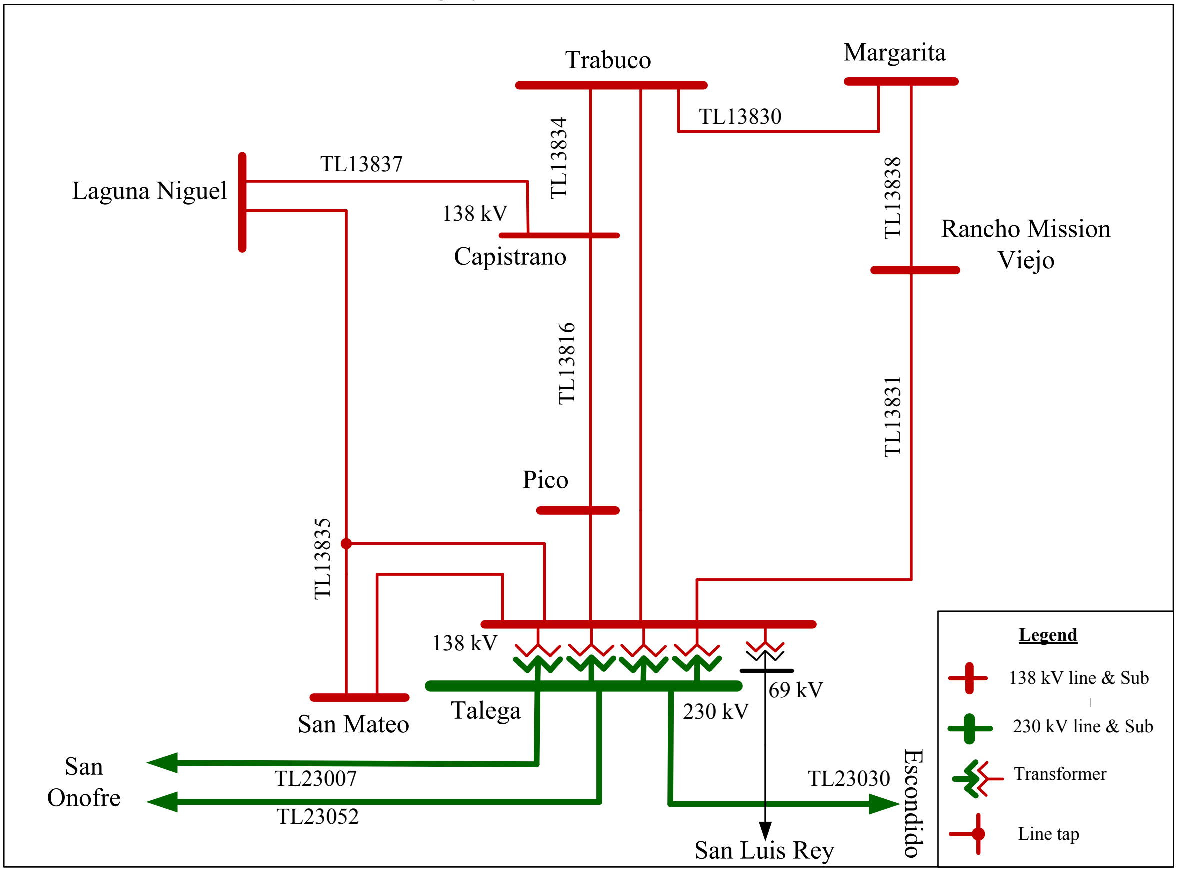

Figure 2. Southern Orange Country 230/138 kV System Configuration in the Year of 2015 (the existing system in the CAISO 2014-2015 TPP)

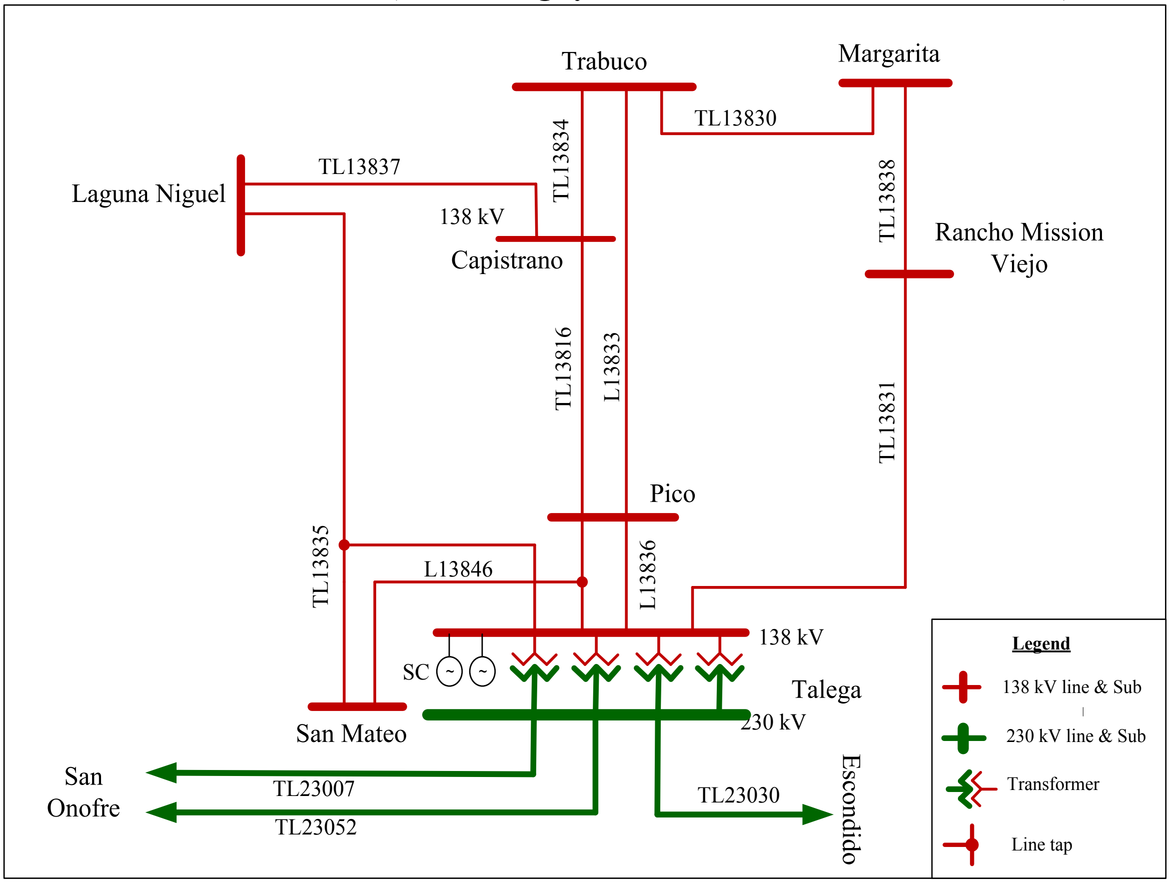

Figure 3 shows the SOCRE project that was approved in the CAISO 2010-2011 Transmission Plan. Figure 4 presents the SOCRE project that was modified by SDG&E and accepted by the CAISO to improve load services at Laguna Niguel and San Mateo without increasing cost after the CAISO 2014-2015 TPP.

Figure 3. Southern Orange Country 230/138 kV System Configuration with the proposed SOCRE project modeled in the CAISO 2014-2015 TPP

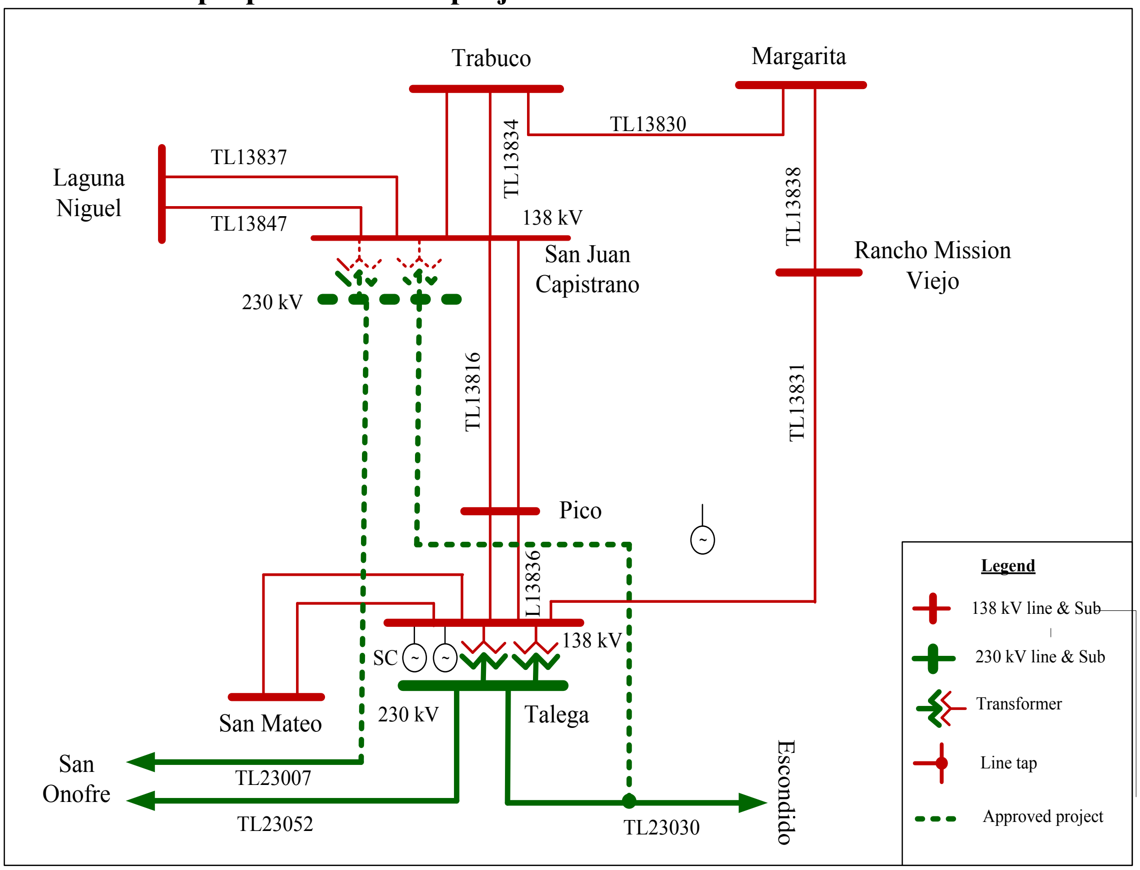

Figure 4. Southern Orange Country 230/138 kV System Configuration with the proposed SOCRE project that was refined with minor modifications after the CAISO 2014-2015 TPP

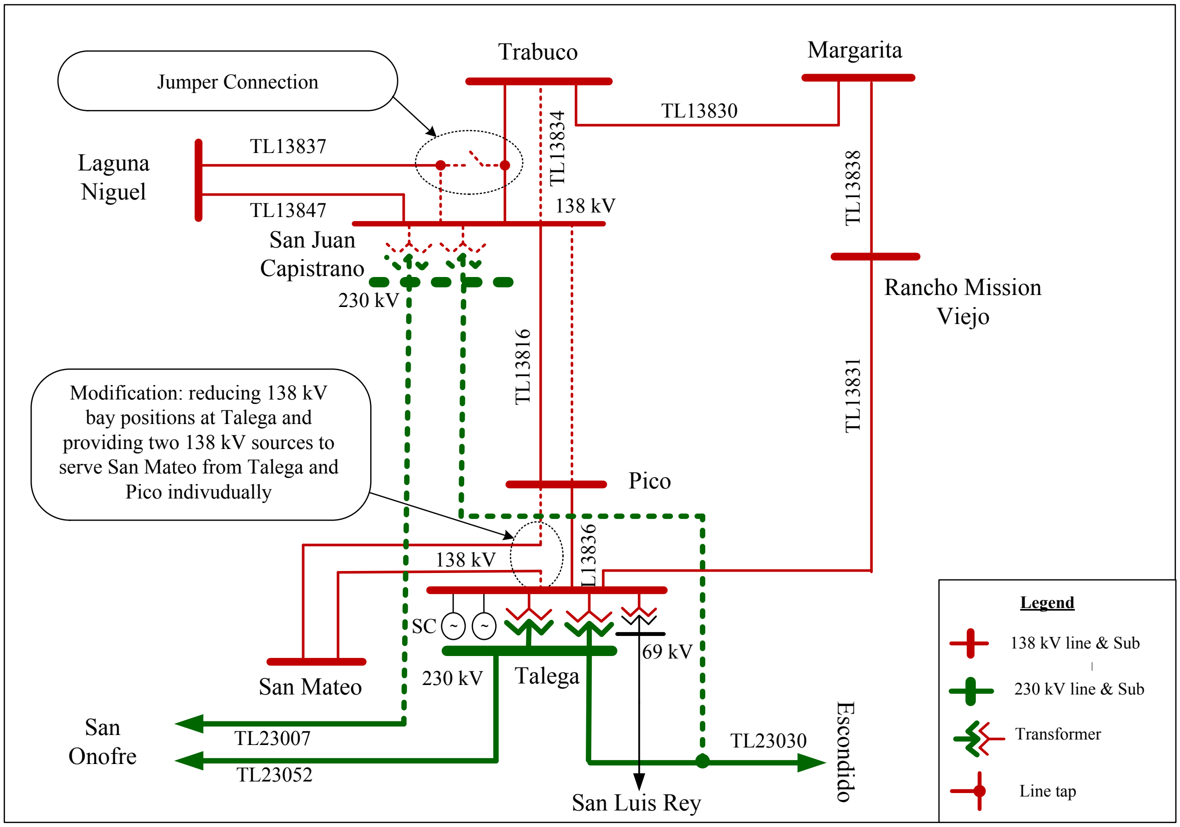

Figure 5. SDG&E's 8760-hour load duration curve used in the CAISO production simulation data base in Gridview

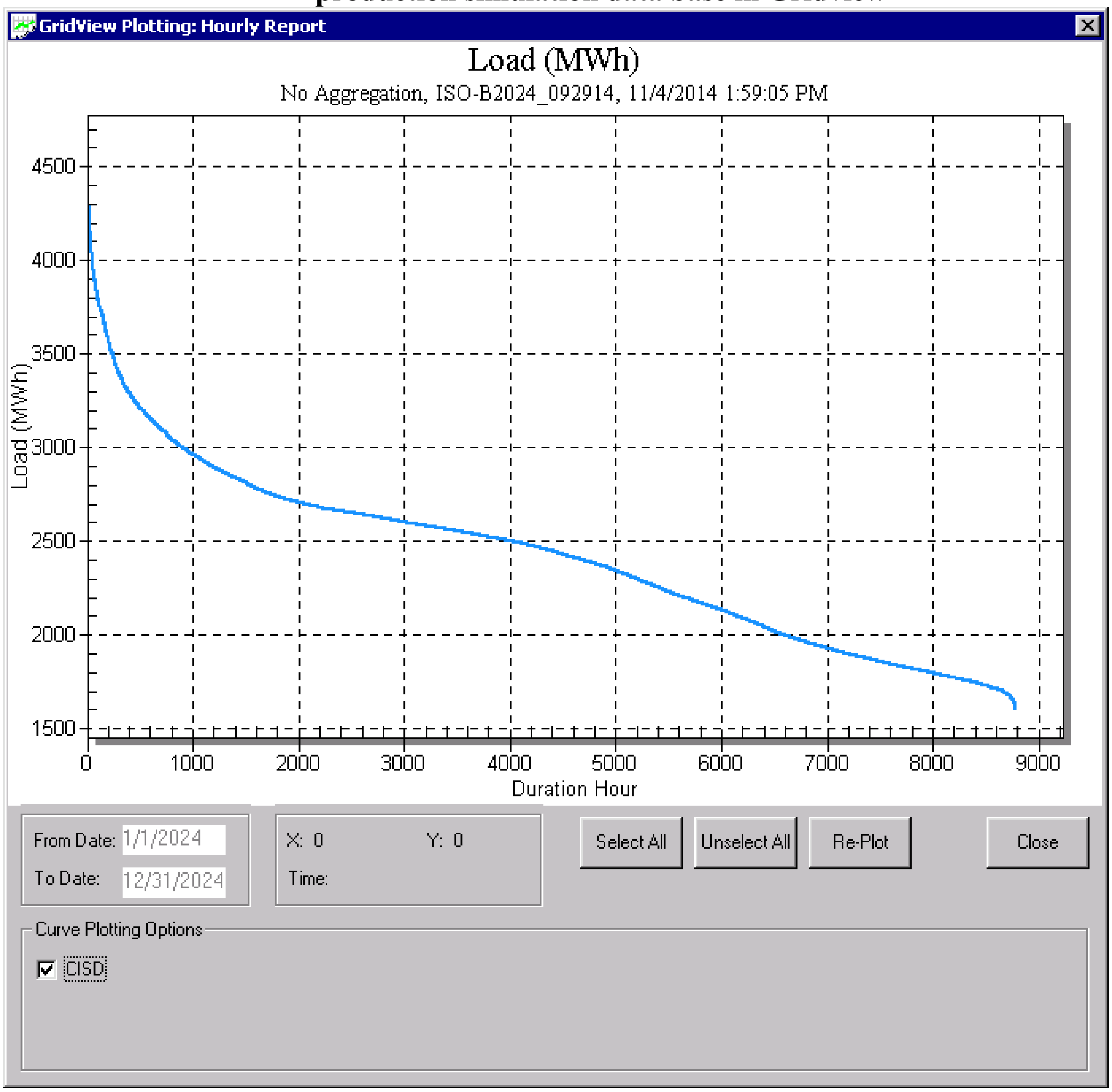

Table A-2 Comparison of Thermal Overloads for Worst Contingency in the SDG&E South Orange County area

CAISO 2014-2015 TPP vs. CAISO 2010-2011 TPP

Overloaded Facility	Worst Contingency	Category	Category Description	Thermal Loading (% over applicable rating)	
				2024 Summer Peak Case	2020 Summer Peak Case
22841 TA TAP 138 22396 LAGNA NL 138 1	SL-10233_ 22840 TALEGA 138 22656 PICO 138 1	B	L-1		101.09
22841 TA TAP 138 22396 LAGNA NL 138 1	TALEGA-TA TAP33-PICO-SANMATEO 138.0 Tap33 -- TALEGA 138.0 to PICO 138.0 Circuit	C	L-1/L-1	127.43	
	TALEGA 138.0 to PICO 138.0 Circuit -- CAPSTRNO 138.0 to TRABUCO 138.0 Circuit	C	L-1/L-1		155.88
22112 CAPSTRNO 138 22656 PICO 138 1	TALEGA 138.0 to R.MSNVJO 138.0 Circuit -- PICO 138.0 to TRABUCO 138.0 Circuit	C	L-1/L-1	114.13	
	TALEGA 138.0 to R.MSNVJO 138.0 Circuit -- TALEGA 138.0 to TRABUCO 138.0 Circuit	C	L-1/L-1		121.32
22112 CAPSTRNO 138 22860 TRABUCO 138 1	TALEGA 138.0 to R.MSNVJO 138.0 Circuit -- PICO 138.0 to TRABUCO 138.0 Circuit	C	L-1/L-1	144.47	
	TALEGA 138.0 to R.MSNVJO 138.0 Circuit -- TALEGA 138.0 to TRABUCO 138.0 Circuit	C	L-1/L-1		156.2
22840 TALEGA 138 22656 PICO 138 1	TALEGA-TA TAP33-PICO-SANMATEO 138.0 Tap33 -- TALEGA 138.0 to R.MSNVJO 138.0 Circuit	C	L-1/L-1	106.99	

	TALEGA 138.0 to R.MSNVJO 138.0 Circuit -- TALEGA 138.0 to TRABUCO 138.0 Circuit	C	L-1/L-1		146.01
22840 TALEGA 138 22842 TA TAP33 138 1	TALEGA 138.0 to R.MSNVJO 138.0 Circuit -- TALEGA 138.0 to PICO 138.0 Circuit	C	L-1/L-1	113.16	
22841 TA TAP 138 22396 LAGNA NL 138 1	TALEGA-TA TAP33-PICO-SANMATEO 138.0 Tap33 -- TALEGA 138.0 to PICO 138.0 Circuit	C	L-1/L-1	127.43	
	TALEGA 138.0 to PICO 138.0 Circuit -- CAPSTRNO 138.0 to TRABUCO 138.0 Circuit	C	L-1/L-1		155.88
22840 TALEGA 138 22842 TA TAP33 138 1	TALEGA 138.0 to R.MSNVJO 138.0 Circuit -- TALEGA 138.0 to PICO 138.0 Circuit	C	L-1/L-1	113.16	
22842 TA TAP33 138 22656 PICO 138 1	TALEGA 138.0 to R.MSNVJO 138.0 Circuit -- TALEGA 138.0 to PICO 138.0 Circuit	C	L-1/L-1	109.36	
22844 TALEGA 230 22840 TALEGA 138 1 BK60	Tran TALEGA 230.00 to TALEGA 138.00 BK61 -- Tran TALEGA 230.00 to TALEGA 138.00 BK63	C	T-1/L-1	120.93	131.73
22844 TALEGA 230 22840 TALEGA 138 3 BK62	Tran TALEGA 230.00 to TALEGA 138.00 BK61 -- Tran TALEGA 230.00 to TALEGA 138.00 BK63	C	T-1/L-1	118.68	129.27
SDG&E's South Orange County Service Area	Loss of Talega West/East 230 kV Buses plus BK #60/61/62/63)	D	Loss of substation	load drop for the area (460 MW)	load drop for the area (503 MW)
SDG&E's South Orange County Service Area	Loss of Talega West/East 138 kV Buses plus BK #60/61/62/63)	D	Loss of substation	load drop for the area (460 MW)	load drop for the area (503 MW)

Table A-3A Thermal Overloads in the SDG&E South Orange County area

2024 Summer Peak Case in CAISO 2014-2015 TPP

ID	Overloaded Facility	Contingency	Category	Category Description	Thermal Loading (% over applicable rating)
20SP-1	22112 CAPSTRNO 138 22656 PICO 138 1	SANMATEO-TA TAP-TALEGA-LAGNA NL 138.0 Tap -- TALEGA 138.0 to R.MSNVJO 138.0 Circuit	C	L-1/L-1	102.85
20SP-2	22112 CAPSTRNO 138 22860 TRABUCO 138 1	PICO 138.0 to TRABUCO 138.0 Circuit -- TALEGA 138.0 to R.MSNVJO 138.0 Circuit	C	L-1/L-1	144.47
20SP-3	22112 CAPSTRNO 138 22860 TRABUCO 138 1	PICO 138.0 to TRABUCO 138.0 Circuit -- R.MSNVJO 138.0 to MARGARTA 138.0 Circuit	C	L-1/L-1	113.98
20SP-4	22840 TALEGA 138 22656 PICO 138 1	TALEGA-TA TAP33-PICO-SANMATEO 138.0 Tap33 -- TALEGA 138.0 to R.MSNVJO 138.0 Circuit	C	L-1/L-1	106.99
20SP-5	22112 CAPSTRNO 138 22656 PICO 138 1	PICO 138.0 to TRABUCO 138.0 Circuit -- TALEGA 138.0 to R.MSNVJO 138.0 Circuit	C	L-1/L-1	114.13
20SP-6	22840 TALEGA 138 22842 TA TAP33 138 1	TALEGA 138.0 to PICO 138.0 Circuit -- TALEGA 138.0 to R.MSNVJO 138.0 Circuit	C	L-1/L-1	113.16
20SP-7	22840 TALEGA 138 22842 TA TAP33 138 1	SANMATEO-TA TAP-TALEGA-LAGNA NL 138.0 Tap -- TALEGA 138.0 to PICO 138.0 Circuit	C	L-1/L-1	108.31
20SP-8	22840 TALEGA 138 22842 TA TAP33 138 1	R.MSNVJO 138.0 to MARGARTA 138.0 Circuit -- TALEGA 138.0 to PICO 138.0 Circuit	C	L-1/L-1	100.26
20SP-9	22842 TA TAP33 138 22656 PICO 138 1	TALEGA 138.0 to PICO 138.0 Circuit -- TALEGA 138.0 to R.MSNVJO 138.0 Circuit	C	L-1/L-1	109.36
20SP-10	22841 TA TAP 138 22396 LAGNA NL 138 1	TALEGA-TA TAP33-PICO-SANMATEO 138.0 Tap33 -- TALEGA 138.0 to PICO 138.0 Circuit	C	L-1/L-1	127.43

20SP-11	22841 TA TAP 138 22396 LAGNA NL 138 1	CAPSTRNO 138.0 to PICO 138.0 Circuit -- TALEGA 138.0 to R.MSNVJO 138.0 Circuit	C	L-1/L-1	122.55
20SP-12	22841 TA TAP 138 22396 LAGNA NL 138 1	CAPSTRNO 138.0 to PICO 138.0 Circuit -- PICO 138.0 to TRABUCO 138.0 Circuit	C	L-1/L-1	111.78
20SP-13	22841 TA TAP 138 22396 LAGNA NL 138 1	PICO 138.0 to TRABUCO 138.0 Circuit -- TALEGA 138.0 to R.MSNVJO 138.0 Circuit	C	L-1/L-1	100.74
20SP-14	22841 TA TAP 138 22396 LAGNA NL 138 1	CAPSTRNO 138.0 to PICO 138.0 Circuit -- R.MSNVJO 138.0 to MARGARTA 138.0 Circuit	C	L-1/L-1	108.89
20SP-15	22841 TA TAP 138 22396 LAGNA NL 138 1	CAPSTRNO 138.0 to PICO 138.0 Circuit -- CAPSTRNO 138.0 to TRABUCO 138.0 Circuit	C	L-1/L-1	102.5
20SP-16	22844 TALEGA 230 22840 TALEGA 138 1 BK62	Tran TALEGA 230.00 to TALEGA 138.00 Circu -- Tran TALEGA 230.00 to TALEGA 138.00 Circu	C	T-1/T-1	118.68
20SP-17	22844 TALEGA 230 22840 TALEGA 138 3 BK60	Tran TALEGA 230.00 to TALEGA 138.00 Circu -- Tran TALEGA 230.00 to TALEGA 138.00 Circu	C	T-1/T-1	120.93
20SP-18	22841 TA TAP 138 22396 LAGNA NL 138 1	BA_PI138E_PICO 138KV E	C	Bus Section (C1)	127.43
20SP-19	22844 TALEGA 230 22840 TALEGA 138 1 BK60	CB_TA4W_TA BK 62 + TA BK 63	C	Breaker Failure or internal Fault (C2)	120.93
20SP-20	22844 TALEGA 230 22840 TALEGA 138 1 BK60	CB_TA5W_TA BK 62 + TA BK 63 + TA K 50	C	Breaker Failure or internal Fault (C2)	120.65
20SP-21	22844 TALEGA 230 22840 TALEGA 138 3 BK62	CB_TA4W_TA BK 62 + TA BK 63	C	Breaker Failure or internal Fault (C2)	118.68
20SP-22	22844 TALEGA 230 22840 TALEGA 138 3 BK62	CB_TA5W_TA BK 62 + TA BK 63 + TA K 50	C	Breaker Failure or internal Fault (C2)	118.4
20SP-23	22840 TALEGA 138 22842 TA TAP33 138 1	CA_PI13836B_TL13836 TALEGA-PICO ck 1	C	Commod Structure (C5)	113.16

20SP-24	22841 TA TAP 138 22396 LAGNA NL 138 1	BA_PI138W"PICO_138KV	C	Bus Section (C1)	111.78
20SP-25	22842 TA TAP33 138 22656 PICO 138 1	CA_PI13836B_TL13836 TALEGA-PICO ck 1	C	Commod Structure (C5)	109.36
20SP-26	22840 TALEGA 138 22656 PICO 138 1	CA_TA7T_TA-TB 1 + TA-RMV 1 138 kV	C	Commod Structure (C5)	106.99
20SP-27	SDG&E's South Orange County Service Area	Loss of Talega West/East 230 kV Buses plus BK #60/61/62/63)	D	Loss of substation (D8)	Blackout resulting in load drop for the area (460 MW of customers)
20SP-28	SDG&E's South Orange County Service Area	Loss of Talega West/East 138 kV Buses plus BK #60/61/62/63)	D	Loss of substation (D8)	

Table A-3B Thermal Overloads in the SDG&E South Orange County area

2020 Summer Peak Case in CAISO 2010-2011 TPP

ID	Overloaded Facility	Contingency	Category	Category Description	Thermal Loading (% over applicable rating)
20SP-1	22841 TA TAP 138 22396 LAGNA NL 138 1	SL-10233_ 22840 TALEGA 138 22656 PICO 138 1	B	L-1	101.09
20SP-2	22112 CAPSTRNO 138 22656 PICO 138 1	TALEGA 138.0 to R.MSNVJO 138.0 Circuit -- TALEGA 138.0 to TRABUCO 138.0 Circuit	C	L-1/L-1	121.32
20SP-3	22112 CAPSTRNO 138 22656 PICO 138 1	R.MSNVJO 138.0 to MARGARTA 138.0 Circuit -- TALEGA 138.0 to TRABUCO 138.0 Circuit	C	L-1/L-1	111.92
20SP-4	22112 CAPSTRNO 138 22656 PICO 138 1	TA TAP-LAGNA NL-SANMATEO-TALEGA 138.0 TA TAP -- TALEGA 138.0 to R.MSNVJO 138.0 Circuit	C	L-1/L-1	107.34
20SP-5	22112 CAPSTRNO 138 22656 PICO 138 1	TA TAP-LAGNA NL-SANMATEO-TALEGA 138.0 TA TAP -- R.MSNVJO 138.0 to MARGARTA 138.0 Circuit	C	L-1/L-1	100.48
20SP-6	22112 CAPSTRNO 138 22860 TRABUCO 138 1	CAPSTRNO 138.0 to PICO 138.0 Circuit -- TA TAP-LAGNA NL-SANMATEO-TALEGA 138.0 TA TAP	C	L-1/L-1	101.17
20SP-7	22112 CAPSTRNO 138 22860 TRABUCO 138 1	TA TAP-LAGNA NL-SANMATEO-TALEGA 138.0 TA TAP -- TALEGA 138.0 to PICO 138.0 Circuit	C	L-1/L-1	133.92
20SP-8	22112 CAPSTRNO 138 22860 TRABUCO 138 1	R.MSNVJO 138.0 to MARGARTA 138.0 Circuit -- TALEGA 138.0 to TRABUCO 138.0 Circuit	C	L-1/L-1	137.72
20SP-9	22112 CAPSTRNO 138 22860 TRABUCO 138 1	TALEGA 138.0 to R.MSNVJO 138.0 Circuit -- TALEGA 138.0 to TRABUCO 138.0 Circuit	C	L-1/L-1	156.2

20SP-10	22840 TALEGA 138 22656 PICO 138 1	TALEGA 138.0 to R.MSNVJO 138.0 Circuit -- TALEGA 138.0 to TRABUCO 138.0 Circuit	C	L-1/L-1	146.01
20SP-11	22840 TALEGA 138 22656 PICO 138 1	R.MSNVJO 138.0 to MARGARTA 138.0 Circuit -- TALEGA 138.0 to TRABUCO 138.0 Circuit	C	L-1/L-1	136.58
20SP-12	22840 TALEGA 138 22656 PICO 138 1	MARGARTA 138.0 to TRABUCO 138.0 Circuit -- TALEGA 138.0 to TRABUCO 138.0 Circuit	C	L-1/L-1	100.09
20SP-13	22840 TALEGA 138 22656 PICO 138 1	CAPSTRNO 138.0 to TRABUCO 138.0 Circuit -- TA TAP-LAGNA NL-SANMATEO-TALEGA 138.0 TA TAP	C	L-1/L-1	101.23
20SP-14	22840 TALEGA 138 22656 PICO 138 1	TA TAP-LAGNA NL-SANMATEO-TALEGA 138.0 TA TAP -- TALEGA 138.0 to TRABUCO 138.0 Circuit	C	L-1/L-1	122.1
20SP-15	22840 TALEGA 138 22656 PICO 138 1	TA TAP-LAGNA NL-SANMATEO-TALEGA 138.0 TA TAP -- R.MSNVJO 138.0 to MARGARTA 138.0 Circuit	C	L-1/L-1	125.03
20SP-16	22840 TALEGA 138 22656 PICO 138 1	TA TAP-LAGNA NL-SANMATEO-TALEGA 138.0 TA TAP -- TALEGA 138.0 to R.MSNVJO 138.0 Circuit	C	L-1/L-1	131.94
20SP-17	22841 TA TAP 138 22396 LAGNA NL 138 1	MARGARTA 138.0 to TRABUCO 138.0 Circuit -- TALEGA 138.0 to PICO 138.0 Circuit	C	L-1/L-1	112.57
20SP-18	22841 TA TAP 138 22396 LAGNA NL 138 1	CAPSTRNO 138.0 to PICO 138.0 Circuit -- CAPSTRNO 138.0 to TRABUCO 138.0 Circuit	C	L-1/L-1	116.81
20SP-19	22841 TA TAP 138 22396 LAGNA NL 138 1	CAPSTRNO 138.0 to PICO 138.0 Circuit -- TALEGA 138.0 to TRABUCO 138.0 Circuit	C	L-1/L-1	121.59
20SP-20	22841 TA TAP 138 22396 LAGNA NL 138 1	CAPSTRNO 138.0 to PICO 138.0 Circuit -- R.MSNVJO 138.0 to MARGARTA 138.0 Circuit	C	L-1/L-1	124.98

20SP-21	22841 TA TAP 138 22396 LAGNA NL 138 1	CAPSTRNO 138.0 to PICO 138.0 Circuit -- TALEGA 138.0 to R.MSNVJO 138.0 Circuit	C	L-1/L-1	133.06
20SP-22	22841 TA TAP 138 22396 LAGNA NL 138 1	TALEGA 138.0 to PICO 138.0 Circuit -- TALEGA 138.0 to TRABUCO 138.0 Circuit	C	L-1/L-1	141.01
20SP-23	22841 TA TAP 138 22396 LAGNA NL 138 1	R.MSNVJO 138.0 to MARGARTA 138.0 Circuit -- TALEGA 138.0 to PICO 138.0 Circuit	C	L-1/L-1	144.45
20SP-24	22841 TA TAP 138 22396 LAGNA NL 138 1	TALEGA 138.0 to PICO 138.0 Circuit -- TALEGA 138.0 to R.MSNVJO 138.0 Circuit	C	L-1/L-1	152.72
20SP-25	22841 TA TAP 138 22396 LAGNA NL 138 1	TALEGA 138.0 to R.MSNVJO 138.0 Circuit -- TALEGA 138.0 to TRABUCO 138.0 Circuit	C	L-1/L-1	114.14
20SP-26	22841 TA TAP 138 22396 LAGNA NL 138 1	CAPSTRNO 138.0 to TRABUCO 138.0 Circuit -- TALEGA 138.0 to PICO 138.0 Circuit	C	L-1/L-1	155.87
20SP-27	22841 TA TAP 138 22396 LAGNA NL 138 1	R.MSNVJO 138.0 to MARGARTA 138.0 Circuit -- TALEGA 138.0 to TRABUCO 138.0 Circuit	C	L-1/L-1	106.72
20SP-28	22844 TALEGA 230 22840 TALEGA 138 1 BK#62	Tran TALEGA 230.00 to TALEGA 138.00 BK61 -- Tran TALEGA 230.00 to TALEGA 138.00 BK63	C	T-1/L-1	129.27
20SP-29	22844 TALEGA 230 22840 TALEGA 138 3 BK60	Tran TALEGA 230.00 to TALEGA 138.00 BK61 -- Tran TALEGA 230.00 to TALEGA 138.00 BK63	C	T-1/L-1	131.73
20SP-30	22112 CAPSTRNO 138 22860 TRABUCO 138 1	CB_TA7T_TA-TB 1 + TA-RMV 1 138 kV	C	Breaker Failure or internal Fault (C2)	156.2
20SP-31	22841 TA TAP 138 22396 LAGNA NL 138 1	CA_PI13836B_TL13836 TALEGA-PICO ck 1	C	Commod Structure (C5)	152.16

20SP-32	22840 TALEGA 138 22656 PICO 138 1	CB_TA7T_TA-TB 1 + TA-RMV 1 138 kV	C	Breaker Failure or internal Fault (C2)	146.01
20SP-33	22844 TALEGA 230 22840 TALEGA 138 1	CB_TA5W_TA BK 62 + TA BK 63 + TA K 50	C	Breaker Failure or internal Fault (C2)	132.47
20SP-34	22844 TALEGA 230 22840 TALEGA 138 1	CB_TA4W_TA BK 62 + TA BK 63	C	Breaker Failure or internal Fault (C2)	131.73
20SP-35	22844 TALEGA 230 22840 TALEGA 138 3	CB_TA5W_TA BK 62 + TA BK 63 + TA K 50	C	Breaker Failure or internal Fault (C2)	130
20SP-36	22844 TALEGA 230 22840 TALEGA 138 3	CB_TA4W_TA BK 62 + TA BK 63	C	Breaker Failure or internal Fault (C2)	129.27
20SP-37	22112 CAPSTRNO 138 22656 PICO 138 1	CB_TA7T_TA-TB 1 + TA-RMV 1 138 kV	C	Breaker Failure or internal Fault (C2)	121.32
20SP-38	22841 TA TAP 138 22396 LAGNA NL 138 1	CB_TA7T_TA-TB 1 + TA-RMV 1 138 kV	C	Breaker Failure or internal Fault (C2)	113.72
20SP-39	22841 TA TAP 138 22396 LAGNA NL 138 1	CA_13836_TL13836 TALEGA-PICO ck 1	C	Commod Structure (C5)	101.09
20SP-40	22841 TA TAP 138 22396 LAGNA NL 138 1	B_PI138E_PICO 138KV E	C	Bus Section (C1)	101.09
20SP-41	22841 TA TAP 138 22396 LAGNA NL 138 1	B_TA13836_TALEGA 138KV 13836	C	Bus Section (C1)	101.09
20SP-42	22841 TA TAP 138 22396 LAGNA NL 138 1	BA_PI138E_PICO 138KV E	C	Bus Section (C1)	101.09

20SP-43	22841 TA TAP 138 22396 LAGNA NL 138 1	CB_PI13836_TL13836 TALEGA-PICO ck 1	C	Breaker Failure or internal Fault (C2)	101.09
20SP-44	22841 TA TAP 138 22396 LAGNA NL 138 1	CB_TA8W_TA-PI 1 + TA BK 63 + TA BK 50	C	Breaker Failure or internal Fault (C2)	101.01
20SP-45	22841 TA TAP 138 22396 LAGNA NL 138 1	CB_TA8T_TA-PI 1 138 + TA-SMO 1 138	C	Breaker Failure or internal Fault (C2)	100.91
20SP-46	SDG&E's South Orange County Service Area	Loss of Talega West/East 230 kV Buses plus BK #60/61/62/63)	D	Loss of substation (D8)	Blackout resulting in load drop for the area (460 MW of customers)
20SP-47	SDG&E's South Orange County Service Area	Loss of Talega West/East 138 kV Buses plus BK #60/61/62/63)	D	Loss of substation (D8)	

Table A-4 SPS Design Comparison of Unique Contingencies that would trigger operation of SPS

Unique Contingency #	Unique Contingencies Monitored by SPS	
	Updated SOCRE Analysis (2024 Summer Peak Case)	2010-2011 TPP SOCRE Analysis (2020 Summer Peak Case)
1	CAPSTRNO 138.0 to PICO 138.0 Circuit -- TALEGA 138.0 to R.MSNVJO 138.0 Circuit	CAPSTRNO 138.0 to PICO 138.0 Circuit -- TALEGA 138.0 to R.MSNVJO 138.0 Circuit
2	CAPSTRNO 138.0 to PICO 138.0 Circuit -- CAPSTRNO 138.0 to TRABUCO 138.0 Circuit	CAPSTRNO 138.0 to PICO 138.0 Circuit -- CAPSTRNO 138.0 to TRABUCO 138.0 Circuit
3	R.MSNVJO 138.0 to MARGARTA 138.0 Circuit -- TALEGA 138.0 to PICO 138.0 Circuit	R.MSNVJO 138.0 to MARGARTA 138.0 Circuit -- TALEGA 138.0 to PICO 138.0 Circuit
4	TALEGA 138.0 to PICO 138.0 Circuit -- TALEGA 138.0 to R.MSNVJO 138.0 Circuit	TALEGA 138.0 to PICO 138.0 Circuit -- TALEGA 138.0 to R.MSNVJO 138.0 Circuit
5	CAPSTRNO 138.0 to PICO 138.0 Circuit -- PICO 138.0 to TRABUCO 138.0 Circuit	CAPSTRNO 138.0 to PICO 138.0 Circuit -- R.MSNVJO 138.0 to MARGARTA 138.0 Circuit
6	CAPSTRNO 138.0 to PICO 138.0 Circuit -- R.MSNVJO 138.0 to MARGARTA 138.0 Circuit	CAPSTRNO 138.0 to PICO 138.0 Circuit -- TA TAP-LAGNA NL-SANMATEO-TALEGA 138.0 TA TAP

7	PICO 138.0 to TRABUCO 138.0 Circuit -- R.MSNVJO 138.0 to MARGARTA 138.0 Circuit	CAPSTRNO 138.0 to PICO 138.0 Circuit -- TALEGA 138.0 to TRABUCO 138.0 Circuit
8	PICO 138.0 to TRABUCO 138.0 Circuit -- TALEGA 138.0 to R.MSNVJO 138.0 Circuit	CAPSTRNO 138.0 to TRABUCO 138.0 Circuit -- TA TAP-LAGNA NL-SANMATEO-TALEGA 138.0 TA TAP
9	SANMATEO-TA TAP-TALEGA-LAGNA NL 138.0 Tap -- TALEGA 138.0 to PICO 138.0 Circuit	CAPSTRNO 138.0 to TRABUCO 138.0 Circuit -- TALEGA 138.0 to PICO 138.0 Circuit
10	SANMATEO-TA TAP-TALEGA-LAGNA NL 138.0 Tap -- TALEGA 138.0 to R.MSNVJO 138.0 Circuit	MARGARTA 138.0 to TRABUCO 138.0 Circuit -- TALEGA 138.0 to PICO 138.0 Circuit
11	TALEGA-TA TAP33-PICO-SANMATEO 138.0 Tap33 -- TALEGA 138.0 to PICO 138.0 Circuit	MARGARTA 138.0 to TRABUCO 138.0 Circuit -- TALEGA 138.0 to TRABUCO 138.0 Circuit
12	TALEGA-TA TAP33-PICO-SANMATEO 138.0 Tap33 -- TALEGA 138.0 to R.MSNVJO 138.0 Circuit	R.MSNVJO 138.0 to MARGARTA 138.0 Circuit -- TALEGA 138.0 to TRABUCO 138.0 Circuit
13	Tran TALEGA 230.00 to TALEGA 138.00 BK#61 -- Tran TALEGA 230.00 to TALEGA 138.00 BK#63	TA TAP-LAGNA NL-SANMATEO-TALEGA 138.0 TA TAP -- R.MSNVJO 138.0 to MARGARTA 138.0 Circuit
14		TA TAP-LAGNA NL-SANMATEO-TALEGA 138.0 TA TAP -- TALEGA 138.0 to PICO 138.0 Circuit
15		TA TAP-LAGNA NL-SANMATEO-TALEGA 138.0 TA TAP -- TALEGA 138.0 to R.MSNVJO 138.0 Circuit
16		TA TAP-LAGNA NL-SANMATEO-TALEGA 138.0 TA TAP -- TALEGA 138.0 to TRABUCO 138.0 Circuit
17		TALEGA 138.0 to PICO 138.0 Circuit -- TALEGA 138.0 to TRABUCO 138.0 Circuit
18		TALEGA 138.0 to R.MSNVJO 138.0 Circuit -- TALEGA 138.0 to TRABUCO 138.0 Circuit
19		Tran TALEGA 230.00 to TALEGA 138.00 BK61 -- Tran TALEGA 230.00 to TALEGA 138.00 BK63
number of unique contingencies	13	19

Table A-5 Comparison of Monitored System Elements required by an SPS (CAISO 2010-2011 TPP vs CAISO 2014-2015 TPP)

Element or Variables #	Elements Monitored by SPS	
	Updated SOCRE Analysis (2024 Summer Peak Case)	2010-2011 TPP SOCRE Analysis (2020 Summer Peak Case)
1	22112 CAPSTRNO 138 22656 PICO 138 1	22112 CAPSTRNO 138 22656 PICO 138 1
2	22112 CAPSTRNO 138 22860 TRABUCO 138 1	22112 CAPSTRNO 138 22860 TRABUCO 138 1
3	22840 TALEGA 138 22656 PICO 138 1	22840 TALEGA 138 22656 PICO 138 1
4	22841 TA TAP 138 22396 LAGNA NL 138 1	22841 TA TAP 138 22396 LAGNA NL 138 1
5	22844 TALEGA 230 22840 TALEGA 138 1	22844 TALEGA 230 22840 TALEGA 138 1
6	22844 TALEGA 230 22840 TALEGA 138 3	22844 TALEGA 230 22840 TALEGA 138 3
7	22840 TALEGA 138 22842 TA TAP33 138 1	
8	22842 TA TAP33 138 22656 PICO 138 1	
number of elements	8	6

Table B-1 Thermal Overloads in the SDG&E South Orange County area

With Alternative B1/B2/B3/B4/E: Upgrade South Orange County 138 kV System

2024 Summer Peak Case in CAISO 2014-2015 TPP

ID	Overloaded Facility	Contingency	Category	Category Description	Thermal Loading (% over applicable rating)
24SP-1	22844 TALEGA 230 22840 TALEGA 138 1	tran_7019_Tran TALEGA 230.00 to TALEGA 138.00 Circu---tran_7020_Tran TALEGA 230.00 to TALEGA 138.00 Circu	C	T-1-1	120.69
24SP-2	22844 TALEGA 230 22840 TALEGA 138 3	tran_7019_Tran TALEGA 230.00 to TALEGA 138.00 Circu---tran_7020_Tran TALEGA 230.00 to TALEGA 138.00 Circu	C	T-1-1	118.44
24SP-3	SDG&E's South Orange County Service Area	Loss of Talega West/East 230 kV Buses plus BK #60/61/62/63)	D	Loss of substation (D8)	load drop for the area (up to 460 MW of customers)
24SP-4	SDG&E's South Orange County Service Area	Loss of Talega West/East 138 kV Buses plus BK #60/61/62/63)	D	Loss of substation (D8)	

Table B-2A Thermal Overloads in the SDG&E South Orange County area

With Alternative C1/C2/D: SCE 230 kV Loop-in to South Orange County 138 kV System

2024 Summer Peak Case in CAISO 2014-2015 TPP

ID	Overloaded Facility	Contingency	Category	Category Description	Thermal Loading (% over applicable rating) (Summer Peak)
24SP-1	22112 CAPSTRNO 138 22860 TRABUCO 138 1	line_7000_Line CAPSTRNO 138.0 to LAGNA NL 138.0 Circuit---line_7009_Line TALEGA 138.0 to R.MSNVJO 138.0 Circuit	C	L-1-1	105.12
24SP-2	22112 CAPSTRNO 138 22860 TRABUCO 138 1	line_7009_Line TALEGA 138.0 to R.MSNVJO 138.0 Circuit---tran_7020_Tran TALEGA 230.00 to TALEGA 138.00 Circu	C	T-1/L-1	100.87
24SP-3	22112 CAPSTRNO 138 22860 TRABUCO 138 1	line_7009_Line TALEGA 138.0 to R.MSNVJO 138.0 Circuit---tran_7019_Tran TALEGA 230.00 to TALEGA 138.00 Circu	C	T-1/L-1	100.8

Table B-2B Thermal Overloads in the SDG&E South Orange County area

With Alternative C1/C2/D: SCE 230 kV Loop-in to South Orange County 138 kV System

2024 Summer Off-Peak Case for the SDGE area with 1600 MW Southbound Flow via Path 44

ID	Overloaded Facility	Contingency	Category	Category Description	Thermal Loading (% over applicable rating) (Summer Off-Peak)
24OP-1	22112 CAPSTRNO 138 22396 LAGNA NL 138 1	line_7015_Line CAPSTRNO 230.0 to S.ONOFRE 230.0 Circuit	B	L-1	103.98
24OP-2	22112 CAPSTRNO 138 22860 TRABUCO 138 1	line_7000_Line CAPSTRNO 138.0 to LAGNA NL 138.0 Circuit	B	L-1	105.95

24OP-3	22112 CAPSTRNO 138 22860 TRABUCO 138 1	line_7002_Line CAPSTRNO 138.0 to PICO 138.0 Circuit	B	L-1	112.96
24OP-4	22112 CAPSTRNO 138 22860 TRABUCO 138 1	line_7015_Line CAPSTRNO 230.0 to S.ONOFRE 230.0 Circuit	B	L-1	142.96
24OP-5	22112 CAPSTRNO 138 22396 LAGNA NL 138 1	line_7002_Line CAPSTRNO 138.0 to PICO 138.0 Circuit---line_7004_Line CAPSTRNO 138.0 to TRABUCO 138.0 Circuit	C	L-1-1	131.84
24OP-6	22112 CAPSTRNO 138 22396 LAGNA NL 138 1	line_7008_Line TALEGA 138.0 to PICO 138.0 Circuit---line_7015_Line CAPSTRNO 230.0 to S.ONOFRE 230.0 Circuit	C	L-1-1	107.19
24OP-7	22112 CAPSTRNO 138 22396 LAGNA NL 138 1	line_7015_Line CAPSTRNO 230.0 to S.ONOFRE 230.0 Circuit---line_7002_Line CAPSTRNO 138.0 to PICO 138.0 Circuit	C	L-1-1	146.16
24OP-8	22112 CAPSTRNO 138 22396 LAGNA NL 138 1	line_7015_Line CAPSTRNO 230.0 to S.ONOFRE 230.0 Circuit---line_7004_Line CAPSTRNO 138.0 to TRABUCO 138.0 Circuit	C	L-1-1	146.36
24OP-9	22112 CAPSTRNO 138 22396 LAGNA NL 138 1	line_7015_Line CAPSTRNO 230.0 to S.ONOFRE 230.0 Circuit---line_7006_Line MARGARTA 138.0 to TRABUCO 138.0 Circuit	C	L-1-1	119.01
24OP-10	22112 CAPSTRNO 138 22396 LAGNA NL 138 1	line_7015_Line CAPSTRNO 230.0 to S.ONOFRE 230.0 Circuit---line_7007_Line R.MSNVJO 138.0 to MARGARTA 138.0 Circuit	C	L-1-1	112.19
24OP-11	22112 CAPSTRNO 138 22396 LAGNA NL 138 1	line_7015_Line CAPSTRNO 230.0 to S.ONOFRE 230.0 Circuit---line_7008_Line TALEGA 138.0 to PICO 138.0 Circuit	C	L-1-1	107.54
24OP-12	22112 CAPSTRNO 138 22396 LAGNA NL 138 1	line_7015_Line CAPSTRNO 230.0 to S.ONOFRE 230.0 Circuit---line_7009_Line TALEGA 138.0 to R.MSNVJO 138.0 Circuit	C	L-1-1	108.69
24OP-13	22112 CAPSTRNO 138 22396 LAGNA NL 138 1	line_7015_Line CAPSTRNO 230.0 to S.ONOFRE 230.0 Circuit---tran_7019_Tran TALEGA 230.00 to TALEGA 138.00 Circu	C	T-1/L-1	101.88

24OP-14	22112 CAPSTRNO 138 22396 LAGNA NL 138 1	SCE-L_0002_Line VIEJOSC 230.0 to S.ONOFRE 230.0 Circu---line_7015_Line CAPSTRNO 230.0 to S.ONOFRE 230.0 Circuit	C	L-1-1	127.4
24OP-15	22112 CAPSTRNO 138 22396 LAGNA NL 138 1	tran_7019_Tran TALEGA 230.00 to TALEGA 138.00 Circu---line_7015_Line CAPSTRNO 230.0 to S.ONOFRE 230.0 Circuit	C	T-1/L-1	101.56
24OP-16	22112 CAPSTRNO 138 22656 PICO 138 1	B_CP138SO_CAPISTRANO 138KV S	C	Bus Section (C1)	111.02
24OP-17	22112 CAPSTRNO 138 22656 PICO 138 1	CB_CP13834_CP-TB 1 + CP-LNL 1 138 kV	C	Breaker Failure or internal Fault (C2)	111.02
24OP-18	22112 CAPSTRNO 138 22656 PICO 138 1	CB_CP13837_CP-TB 1 + CP-LNL 1 138 kV	C	Breaker Failure or internal Fault (C2)	111.02
24OP-19	22112 CAPSTRNO 138 22656 PICO 138 1	line_7000_Line CAPSTRNO 138.0 to LAGNA NL 138.0 Circuit---line_7004_Line CAPSTRNO 138.0 to TRABUCO 138.0 Circuit	C	L-1-1	111.03
24OP-20	22112 CAPSTRNO 138 22656 PICO 138 1	line_7007_Line R.MSNVJO 138.0 to MARGARTA 138.0 Circuit---line_7015_Line CAPSTRNO 230.0 to S.ONOFRE 230.0 Circuit	C	L-1-1	109.35
24OP-21	22112 CAPSTRNO 138 22656 PICO 138 1	line_7015_Line CAPSTRNO 230.0 to S.ONOFRE 230.0 Circuit---line_7000_Line CAPSTRNO 138.0 to LAGNA NL 138.0 Circuit	C	L-1-1	131.48
24OP-22	22112 CAPSTRNO 138 22656 PICO 138 1	line_7015_Line CAPSTRNO 230.0 to S.ONOFRE 230.0 Circuit---line_7004_Line CAPSTRNO 138.0 to TRABUCO 138.0 Circuit	C	L-1-1	160.41
24OP-23	22112 CAPSTRNO 138 22656 PICO 138 1	line_7015_Line CAPSTRNO 230.0 to S.ONOFRE 230.0 Circuit---line_7006_Line MARGARTA 138.0 to TRABUCO 138.0 Circuit	C	L-1-1	117.74
24OP-24	22112 CAPSTRNO 138 22656 PICO 138 1	line_7015_Line CAPSTRNO 230.0 to S.ONOFRE 230.0 Circuit---line_7007_Line R.MSNVJO 138.0 to MARGARTA 138.0 Circuit	C	L-1-1	109.83

24OP-25	22112 CAPSTRNO 138 22656 PICO 138 1	line_7015_Line CAPSTRNO 230.0 to S.ONOFRE 230.0 Circuit---line_7009_Line TALEGA 138.0 to R.MSNVJO 138.0 Circuit	C	L-1-1	105.83
24OP-26	22112 CAPSTRNO 138 22656 PICO 138 1	SCE-L_0002_Line VIEJOSC 230.0 to S.ONOFRE 230.0 Circu---line_7015_Line CAPSTRNO 230.0 to S.ONOFRE 230.0 Circuit	C	L-1-1	130.21
24OP-27	22112 CAPSTRNO 138 22860 TRABUCO 138 1	B_CP138NO_CAPISTRANO 138KV N	C	Bus Section (C1)	112.96
24OP-28	22112 CAPSTRNO 138 22860 TRABUCO 138 1	B_LNL138W_LAGUNA NIGUEL 138KV W	C	Bus Section (C1)	105.95
24OP-29	22112 CAPSTRNO 138 22860 TRABUCO 138 1	B_PI138W_PICO 138KV W	C	Bus Section (C1)	112.96
24OP-30	22112 CAPSTRNO 138 22860 TRABUCO 138 1	BA_PI138W"PICO_138KV	C	Bus Section (C1)	100.11
24OP-31	22112 CAPSTRNO 138 22860 TRABUCO 138 1	CB_CP_CAPBK1_CP-PI 138 + CP CAPBK1	C	Breaker Failure or internal Fault (C2)	112.96
24OP-32	22112 CAPSTRNO 138 22860 TRABUCO 138 1	CB_CP13816_CP-PI 138 + CP CAPBK1	C	Breaker Failure or internal Fault (C2)	112.96
24OP-33	22112 CAPSTRNO 138 22860 TRABUCO 138 1	CB_LNL_BK40	C	Breaker Failure or internal Fault (C2)	105.95
24OP-34	22112 CAPSTRNO 138 22860 TRABUCO 138 1	CB_LNL_BK41	C	Breaker Failure or internal Fault (C2)	105.95
24OP-35	22112 CAPSTRNO 138 22860 TRABUCO 138 1	CB_LNL13837_TL13837 CP-LNL ck 1	C	Breaker Failure or internal Fault (C2)	105.95
24OP-36	22112 CAPSTRNO 138 22860 TRABUCO 138 1	CB_LNL138BT_CP-LNL + TATAP-LNL 1 138	C	Breaker Failure or internal Fault (C2)	101.04

24OP-37	22112 CAPSTRNO 138 22860 TRABUCO 138 1	CB_PI13816_CAPSTRNO - PICO ck 1	C	Breaker Failure or internal Fault (C2)	112.96
24OP-38	22112 CAPSTRNO 138 22860 TRABUCO 138 1	CB_PI138BT_CP-PI 1 + TA-PI 1 138 kV	C	Breaker Failure or internal Fault (C2)	112.88
24OP-39	22112 CAPSTRNO 138 22860 TRABUCO 138 1	line_7000_Line CAPSTRNO 138.0 to LAGNA NL 138.0 Circuit---line_7016_Line TALEGA 230.0 to S.ONOFRE 230.0 Circuit	C	L-1-1	108.07
24OP-40	22112 CAPSTRNO 138 22860 TRABUCO 138 1	line_7002_Line CAPSTRNO 138.0 to PICO 138.0 Circuit---line_7000_Line CAPSTRNO 138.0 to LAGNA NL 138.0 Circuit	C	L-1-1	147.94
24OP-41	22112 CAPSTRNO 138 22860 TRABUCO 138 1	line_7002_Line CAPSTRNO 138.0 to PICO 138.0 Circuit---line_7007_Line R.MSNVJO 138.0 to MARGARTA 138.0 Circuit	C	L-1-1	100.97
24OP-42	22112 CAPSTRNO 138 22860 TRABUCO 138 1	line_7002_Line CAPSTRNO 138.0 to PICO 138.0 Circuit---line_7016_Line TALEGA 230.0 to S.ONOFRE 230.0 Circuit	C	L-1-1	115.98
24OP-43	22112 CAPSTRNO 138 22860 TRABUCO 138 1	line_7015_Line CAPSTRNO 230.0 to S.ONOFRE 230.0 Circuit---line_7000_Line CAPSTRNO 138.0 to LAGNA NL 138.0 Circuit	C	L-1-1	175.32
24OP-44	22112 CAPSTRNO 138 22860 TRABUCO 138 1	line_7015_Line CAPSTRNO 230.0 to S.ONOFRE 230.0 Circuit---line_7002_Line CAPSTRNO 138.0 to PICO 138.0 Circuit	C	L-1-1	205.57
24OP-45	22112 CAPSTRNO 138 22860 TRABUCO 138 1	line_7015_Line CAPSTRNO 230.0 to S.ONOFRE 230.0 Circuit---line_7007_Line R.MSNVJO 138.0 to MARGARTA 138.0 Circuit	C	L-1-1	119.36
24OP-46	22112 CAPSTRNO 138 22860 TRABUCO 138 1	line_7015_Line CAPSTRNO 230.0 to S.ONOFRE 230.0 Circuit---line_7009_Line TALEGA 138.0 to R.MSNVJO 138.0 Circuit	C	L-1-1	130.48
24OP-47	22112 CAPSTRNO 138 22860 TRABUCO 138 1	line_7015_Line CAPSTRNO 230.0 to S.ONOFRE 230.0 Circuit---tran_7017_Tran CAPSTRNO 230.00 to CAPSTRNO 138.00	C	T-1/L-1	127.02

		Circu			
24OP-48	22112 CAPSTRNO 138 22860 TRABUCO 138 1	line_7015_Line CAPSTRNO 230.0 to S.ONOFRE 230.0 Circuit---tran_7019_Tran TALEGA 230.00 to TALEGA 138.00 Circu	C	T-1/L-1	140.07
24OP-49	22112 CAPSTRNO 138 22860 TRABUCO 138 1	SCE-L_0002_Line VIEJOSC 230.0 to S.ONOFRE 230.0 Circu---line_7000_Line CAPSTRNO 138.0 to LAGNA NL 138.0 Circuit	C	L-1-1	119.06
24OP-50	22112 CAPSTRNO 138 22860 TRABUCO 138 1	SCE-L_0002_Line VIEJOSC 230.0 to S.ONOFRE 230.0 Circu---line_7002_Line CAPSTRNO 138.0 to PICO 138.0 Circuit	C	L-1-1	129.7
24OP-51	22112 CAPSTRNO 138 22860 TRABUCO 138 1	SCE-L_0002_Line VIEJOSC 230.0 to S.ONOFRE 230.0 Circu---line_7015_Line CAPSTRNO 230.0 to S.ONOFRE 230.0 Circuit	C	L-1-1	174.29
24OP-52	22112 CAPSTRNO 138 22860 TRABUCO 138 1	tran_7017_Tran CAPSTRNO 230.00 to CAPSTRNO 138.00 Circu---line_7015_Line CAPSTRNO 230.0 to S.ONOFRE 230.0 Circuit	C	T-1/L-1	126.65
24OP-53	22112 CAPSTRNO 138 22860 TRABUCO 138 1	tran_7019_Tran TALEGA 230.00 to TALEGA 138.00 Circu---line_7015_Line CAPSTRNO 230.0 to S.ONOFRE 230.0 Circuit	C	T-1/L-1	139.64
24OP-54	22113 CAPSTRNO 230 22112 CAPSTRNO 138 1	line_7015_Line CAPSTRNO 230.0 to S.ONOFRE 230.0 Circuit---tran_7018_Tran CAPSTRNO 230.00 to CAPSTRNO 138.00 Circu	C	T-1/L-1	109.57
24OP-55	22113 CAPSTRNO 230 22112 CAPSTRNO 138 1	tran_7018_Tran CAPSTRNO 230.00 to CAPSTRNO 138.00 Circu---line_7015_Line CAPSTRNO 230.0 to S.ONOFRE 230.0 Circuit	C	T-1/L-1	109.25
24OP-56	22841 TA TAP 138 22396 LAGNA NL 138 1	line_7015_Line CAPSTRNO 230.0 to S.ONOFRE 230.0 Circuit---line_7002_Line CAPSTRNO 138.0 to PICO 138.0 Circuit	C	L-1-1	111.25

Table B-3A   Thermal Overloads in the SDG&E South Orange County area

With Alternative F: 230-kV Rancho Mission Viejo Substation

2024 Summer Peak Case in CAISO 2014-2015 TPP

ID	Overloaded Facility	Contingency	Category	Category Description	Thermal Loading (% over applicable rating)
24SP-1	22841 TA TAP 138 22396 LAGNA NL 138 1	line_7002_Line CAPSTRNO 138.0 to PICO 138.0 Circuit---line_7007_Line R.MSNVJO 138.0 to MARGARTA 138.0 Circuit	C	L-1-1	108.16
24SP-2	22841 TA TAP 138 22396 LAGNA NL 138 1	line_7004_Line CAPSTRNO 138.0 to TRABUCO 138.0 Circuit---line_7002_Line CAPSTRNO 138.0 to PICO 138.0 Circuit	C	L-1-1	101.64
24SP-3	SDG&E's South Orange County Service Area	Loss of Talega West/East 138 kV Buses plus BK #60/61/62/63)	D	Loss of substation (D8)	Load drop for the area

Table B-3B Thermal Overloads in the SDG&E South Orange County area

With Alternative G: 138-kV San Luis Rey–San Mateo Line & San Luis Rey Sub Expansion

2024 Summer Peak Case in CAISO 2014-2015 TPP

ID	Overloaded Facility	Contingency	Category	Category Description	Thermal Loading (% over applicable rating)
24SP-1	22841 TA TAP 138 22396 LAGNA NL 138 1	line_7002_Line CAPSTRNO 138.0 to PICO 138.0 Circuit--- line_7009_Line TALEGA 138.0 to R.MSNVJO 138.0 Circuit	C	L-1-1	122.46
24SP-3	22841 TA TAP 138 22396 LAGNA NL 138 1	line_7002_Line CAPSTRNO 138.0 to PICO 138.0 Circuit--- line_7007_Line R.MSNVJO 138.0 to MARGARTA 138.0 Circuit	C	L-1-1	108.86
24SP-4	22841 TA TAP 138 22396 LAGNA NL 138 1	line_7004_Line CAPSTRNO 138.0 to TRABUCO 138.0 Circuit--- line_7002_Line CAPSTRNO 138.0 to PICO 138.0 Circuit	C	L-1-1	102.26
24SP-2	22842 TA TAP33 138 22656 PICO 138 1	line_7008_Line TALEGA 138.0 to PICO 138.0 Circuit--- line_7009_Line TALEGA 138.0 to R.MSNVJO 138.0 Circuit	C	L-1-1	109.09
24SP-5	SDG&E's South Orange County Service Area	Loss of Talega West/East 138 kV Buses plus BK #60/61/62/63)	D	Loss of substation (D8)	load drop for the area