

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

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

Table of Contents

I.	CAISO RELIABILITY OBJECTIVES FOR THE SOCRE PROJECT	2
II.	DEIR ALTERNATIVES TO THE SOCRE PROJECT	11
III.	CONCLUSION.....	21

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
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**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.

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**CORRECTED TESTIMONY OF ROBERT SPARKS
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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

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

A.12-05-020

Page 2 of 21

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

12

13 **I. CAISO RELIABILITY OBJECTIVES FOR THE SOCRE PROJECT**

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

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

24

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

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

A.12-05-020

Page 3 of 21

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

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

7
8 **Q. Please explain the CAISO's analysis conducted for this proceeding.**

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

12
13 Table 1 presents a summary comparison of the reliability concerns identified in the
14 CAISO's updated analysis and the reliability concerns identified based on the
15 underlying assumptions used in the 2010-2011 transmission plan.³ Table 1 also
16 shows the impact of the SOCRE project on the 2024 case, which indicates that all
17 reliability concerns are resolved. A detailed comparison of thermal overloads for the
18 most severe contingencies is provided in Table A-2 of Appendix A. All thermal
19 overload results under all contingencies for both cases are provided in Tables A-3A
20 and A-3B of Appendix A, respectively.

21
22

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.

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

A.12-05-020

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

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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

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

A.12-05-020

Page 5 of 21

1 the 2010-2011 transmission plan assumptions.⁴ The updated results indicate that
2 significant reliability concerns under Category C contingencies are comparable to
3 those initially identified in the CAISO's 2010-2011 transmission plan.

4 In addition to the contingencies studied above, the CAISO identified two Category
5 D events under TPL-004 that would result in loss of the entire load in the South
6 Orange County service area in both the updated and original analyses. Without the
7 SOCRE project, this potential for an area blackout exists whenever the Talega
8 West/East 230 kV buses or Talega West/East 138 kV buses are out of service.

9

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

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

18

19 To comply with NERC TPL-002 and TPL-003 R1.3.12, the CAISO, as a Planning
20 Authority, assessed the system reliability performance by including the planned
21 (including maintenance and construction) outage of any bulk electric system
22 element at demand levels for which planned outages are performed. The CAISO
23 identified inadequate system performance during maintenance periods at the Talega
24 230/138 kV Substation. Table 2 presents reliability concerns with a single facility
25 out of service for maintenance at the Talega 230/138 kV Substation and without the
26 SOCRE project.

27

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.

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

A.12-05-020

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

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

A.12-05-020

Page 7 of 21

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		138 West Bus	C	Bus Section (C1)	195
Type2-C20	CB #5E	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

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

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

A.12-05-020

Page 8 of 21

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

9
10 Paraphrasing the operational concern differently, there are no windows for
11 performing necessary maintenance or construction activities without facing
12 unacceptable risk of the loss of all load in South Orange County. This is primarily
13 due to the South Orange County system relying on a single power source from the
14 Talega Substation to serve approximately 460 MW of load. This represents 29
15 single points of failure as demonstrated by these 29 Type 1 planned maintenance
16 outage/contingency events.

17
18 In addition to the 29 Type 1 events, there were also 28 Type 2 events under which
19 planned maintenance followed by a contingency results in an uncontrolled
20 interruption of service to a significant number of customers. Two of the Type 2
21 events were a result of Category B contingencies. The remaining 26 Type 2 events
22 were a result of Category C contingencies resulting in the loss of substantial South
23 Orange County area load. During these events, the remaining system can only
24 provide load serving capability up to 195 MW, about 40% of the area peak load, to
25 keep facilities within emergency ratings⁵. In other words, there is a very limited
26 time frame when maintenance can be performed on this additional set of facilities
27 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.

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

A.12-05-020

Page 9 of 21

1 Based on the SDG&E 8760-hour load duration curve⁶ there are only about 260
2 hours a year, or about 3% of all hours, during which the loads in the South Orange
3 County area would be lower than 195 MW. In other words, the 195 MW of load
4 serving capability means that, without the SOCRE project in-service, the CAISO
5 and SDG&E operations would not be able to find adequate maintenance windows
6 without a significant risk of load service interruption.

7

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

21

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

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

⁶ See Figure 5.

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

A.12-05-020

Page 10 of 21

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

10

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

21

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

24

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.

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

A.12-05-020

Page 11 of 21

1 **II. DEIR ALTERNATIVES TO THE SOCRE PROJECT**

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

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

7

8 The No Project alternative is designated as the sole alternative in Group 1. This
9 alternative is unique because it does not address any of the system performance
10 issues identified by the CAISO and therefore does not propose any mitigation
11 strategies. Alternatives B1, B2, B3, B4, and E are designated as Group 2
12 alternatives, all of which focus on South Orange County 138 kV System
13 improvements.⁸ Alternatives C1, C2, and D are designated as Group 3 alternatives,
14 because each one incorporates an element that parallels the South Orange County
15 138 kV system with the Southern California Electric Company (SCE) 230 kV
16 system. Alternatives F, G, and H are designated as Group 4 alternatives, all of which
17 provide a second new 230 kV or 138 kV transmission source into the South Orange
18 County service area from a substation other than the Talega Substation.

19

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

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

25

26

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.

**CORRECTED TESTIMONY OF ROBERT SPARKS
ON BEHALF OF THE CALIFORNIA INDEPENDENT SYSTEM OPERATOR
CORPORATION
A.12-05-020**

1

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

2

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

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

12

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

A.12-05-020

1 **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	limiting facility	typical worst event
			MW		
1	A	No Project	0	NA	
2	B1	Reconductor Laguna Niguel–Talega 138-kV Line	0	NA	Talega 138 kV West out of service followed by Talega 138 kV East Bus outage
	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

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

4

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

A.12-05-020

Page 14 of 21

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

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

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

15

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

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

21

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

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

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

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

A.12-05-020

Page 15 of 21

- 1 • Expansion of the 230/138 kV Talega Substation by sectioning the
2 230/138 kV buses, adding at least two more bay positions at both 230 kV
3 and 138 kV voltage sides, and upgrading the two 230/138 kV
4 transformers (Banks #60 and #62).

5
6 However, as described in SDG&E's Initial Prepared Testimony, SDG&E cannot
7 expand the Talega Substation without shutting down its service depending on the
8 status of the construction and the nature of the forced outage because it is the sole
9 transmission source. For this reason, SDG&E considered building a temporary
10 substation configuration to facilitate the construction, but rejected this alternative
11 due to its high estimated cost and the environmental concerns discussed in
12 SDG&E's Proponent's Environmental Assessment (PEA). This minimal work
13 strategy is not cost effective compared with the SOCRE project. The SOCRE
14 project would not only address the identified reliability needs but also eliminate the
15 sole transmission source issue.

16
17 **Q. Will the DEIR Group 2 Alternatives (B1, B2, B3, B4 and E) meet the CAISO-**
18 **identified reliability objectives?**

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

29

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

A.12-05-020

Page 16 of 21

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

4 **A.** The scope of each of these upgrade alternatives would need to be expanded to
5 include upgrades to the Talega Substation in order to eliminate the Bank #60 and
6 #62 overloads for the Category C contingency and meet the NERC TPL-002 and
7 TPL-003 maintenance requirement (R1.3.12). This work would include:

- 8 • Upgrading two of the 230/138 kV transformers at Talega Substation, Banks
9 #60 and #62; and
- 10 • Rebuilding and extending the existing non-standard substation layout and
11 230/138 kV buses configurations at the Talega Substation.

12
13 As described above, rebuilding and expanding the Talega substation is not feasible
14 without building costly temporary facilities during the construction process in order
15 to ensure service to customers. In addition, as indicated in SDG&E's testimony, the
16 equipment at the Capistrano Substation is inadequate and any alternative without
17 rebuilding the Capistrano Substation is infeasible. Based on these considerations,
18 the Group 2 DEIR alternatives will not be a cost effective means to meet the
19 identified reliability concerns when compared to the SOCRE project.¹⁰

20
21 **Q. Will the DEIR Group 3 alternatives (C1, C2, or D) meet the CAISO-identified**
22 **reliability objectives?**

23 **A.** While these alternatives meet some of the immediate reliability concerns in the
24 South Orange County area, they are unacceptable because of their negative impact
25 on transfer capability on the major transmission corridor between San Diego and the
26 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.

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

A.12-05-020

Page 17 of 21

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

9

10 The Group 3 DEIR alternatives provide a new independent transmission source to
11 serve the SDG&E's South Orange County service area from the SCE system. In the
12 Group 3 alternatives, the South Orange County 138 kV system would be
13 interconnected with the SCE 230 kV transmission system at the Prima Deschecha
14 landfill near the existing Capistrano Substation and an existing SCE 230 kV line.
15 The SCE 230 kV line is a critical facility associated with the transmission corridor
16 between the Los Angeles area and the San Diego area. As a consequence, the Group
17 3 DEIR alternatives result in the 138 kV network being paralleled to the existing
18 230 kV corridor linking the Los Angeles basin and San Diego. This paralleling of
19 lower capacity networks with higher capacity networks lowers the overall capability
20 of the 230 kV corridor.

21

22 The CAISO conducted additional analysis to test the impact of the Group 3 DEIR
23 alternatives on the capability of the 230 kV corridor. Based on this analysis, the
24 CAISO found numerous overloading concerns under Category B and Category C
25 contingencies in the South Orange County and SCE systems.¹¹ The CAISO
26 identified four thermal overloads for Category B contingencies and 52 thermal
27 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.

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

A.12-05-020

Page 18 of 21

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

6

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

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

19

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

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

28

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

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

A.12-05-020

Page 19 of 21

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

3

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

15

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

19

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

23 **A.** As shown in Table B-3A in Appendix A, the 138 kV line between Talega and
24 Laguna Niguel would need to be upgraded in addition to the Alternative F
25 improvements. Also, to avoid cascading outages, an additional 138 kV line may be
26 needed between the Rancho Mission Viejo, Margarita, and Trabuco Substations
27 because upgrading the existing 138 kV lines out of the Rancho Mission Viejo
28 Substation may not be feasible or adequate to address the identified contingency

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

A.12-05-020

Page 20 of 21

1 concerns.¹³ More system improvements to address load growth would also likely be
2 necessary in the future because of the inferior locational attributes of the Rancho
3 Mission Viejo Substation.

4

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

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

15

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

23

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

27 **A.** As shown in Table B-3B in Appendix A, the 138 kV lines between Talega and
28 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.

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

A.12-05-020

Page 21 of 21

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

8

9 **III. CONCLUSION**

10 **Q. Please summarize your conclusions.**

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

19

20 **Q. Does this conclude your testimony?**

21 **A.** Yes, it does.

22

23

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 County 230/138 kV System Configuration in the Year of 2011 (the existing system in the CAISO 2010~2011 TPP)

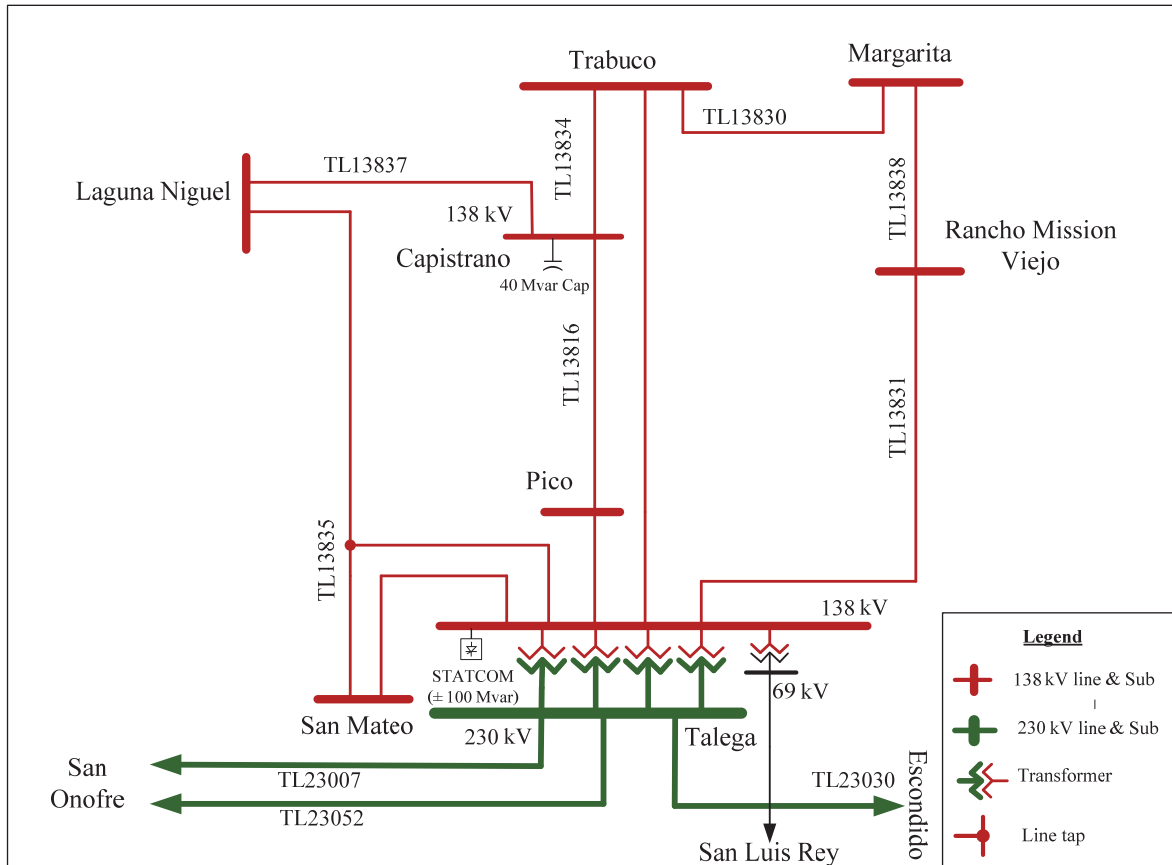


Figure 2. Southern Orange County 230/138 kV System Configuration in the Year of 2015 (the existing system in the CAISO 2014~2015 TPP)

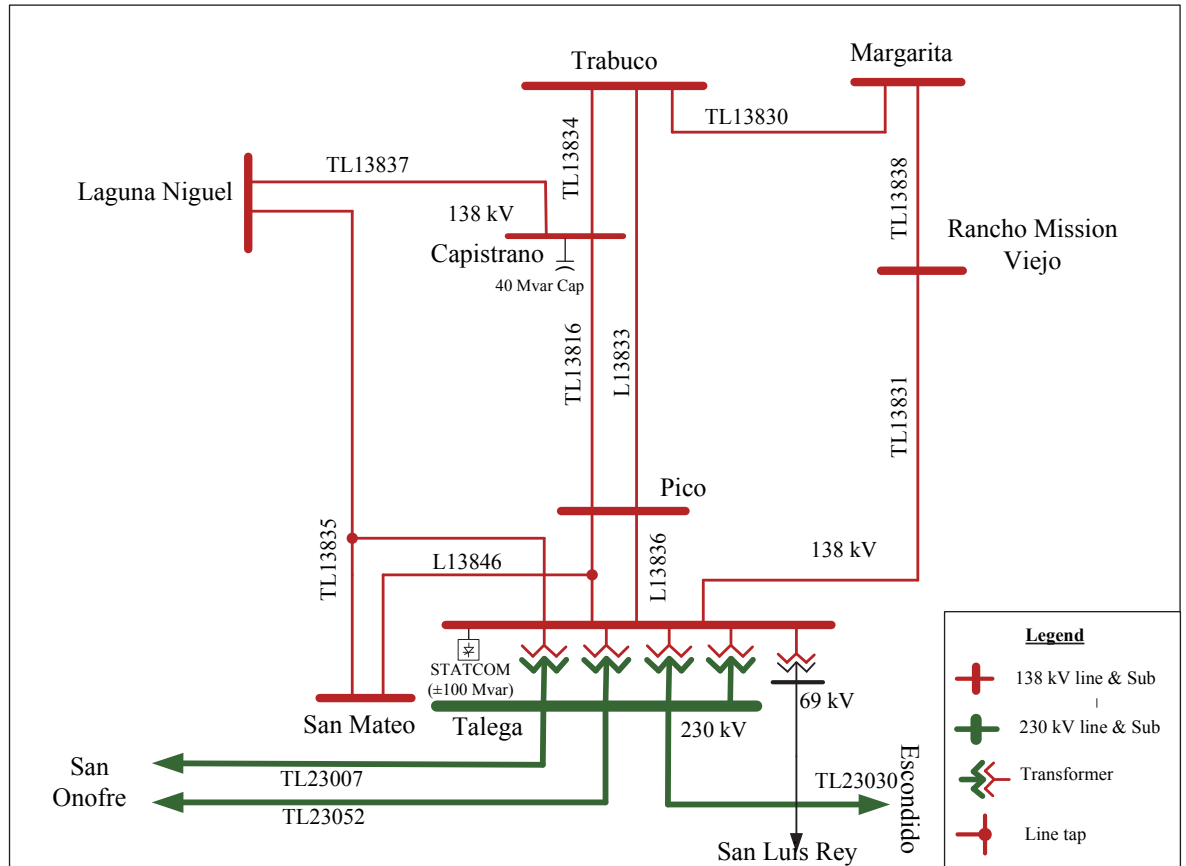


Figure 3 shows the SOCRE project that was approved in the CAISO 2010-2011 Transmission Plan. Figure 4 presents the SOCRE project that was modified by SDG&E and accepted by the CAISO to improve load services at Laguna Niguel and San Mateo without increasing cost after the CAISO 2014-2015 TPP.

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

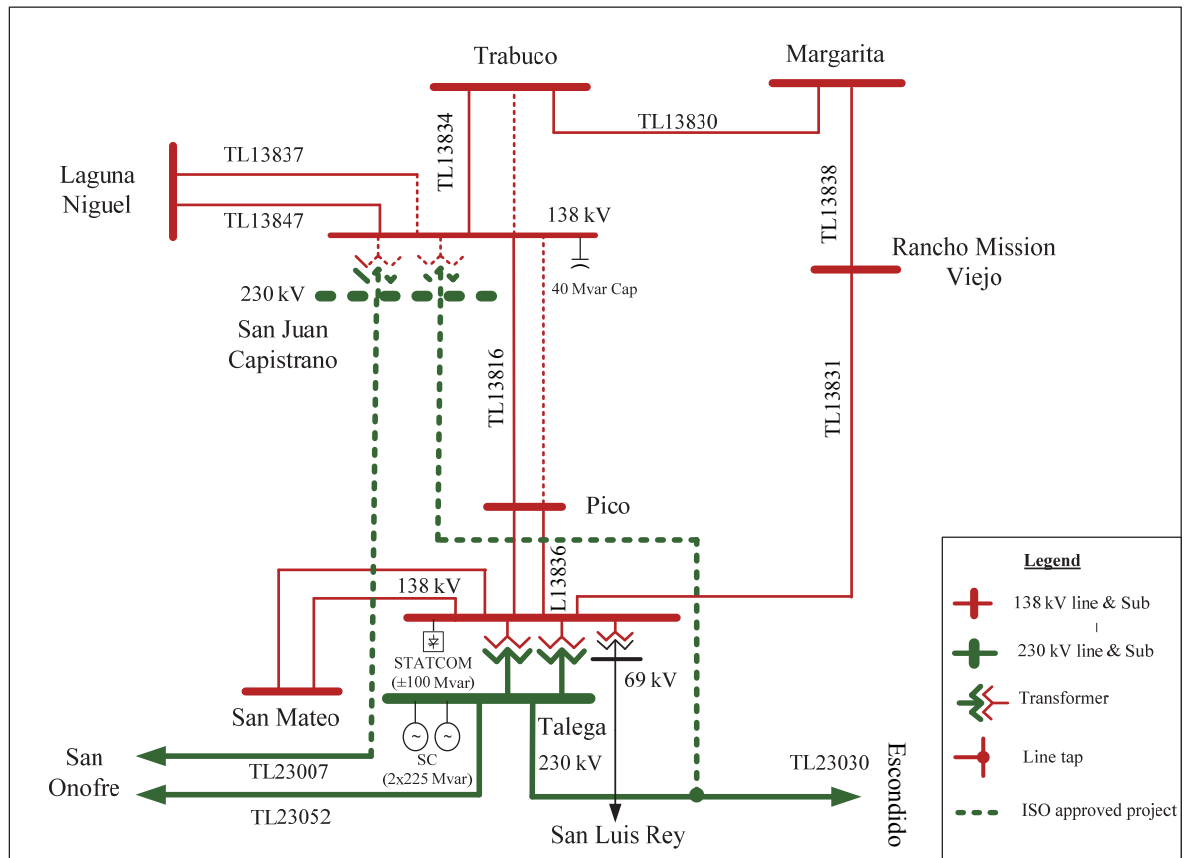


Figure 4. Southern Orange County 230/138 kV System Configuration with the proposed SOCRE project that was refined with minor modifications after the CAISO 2014~2015 TPP (for information purpose only)

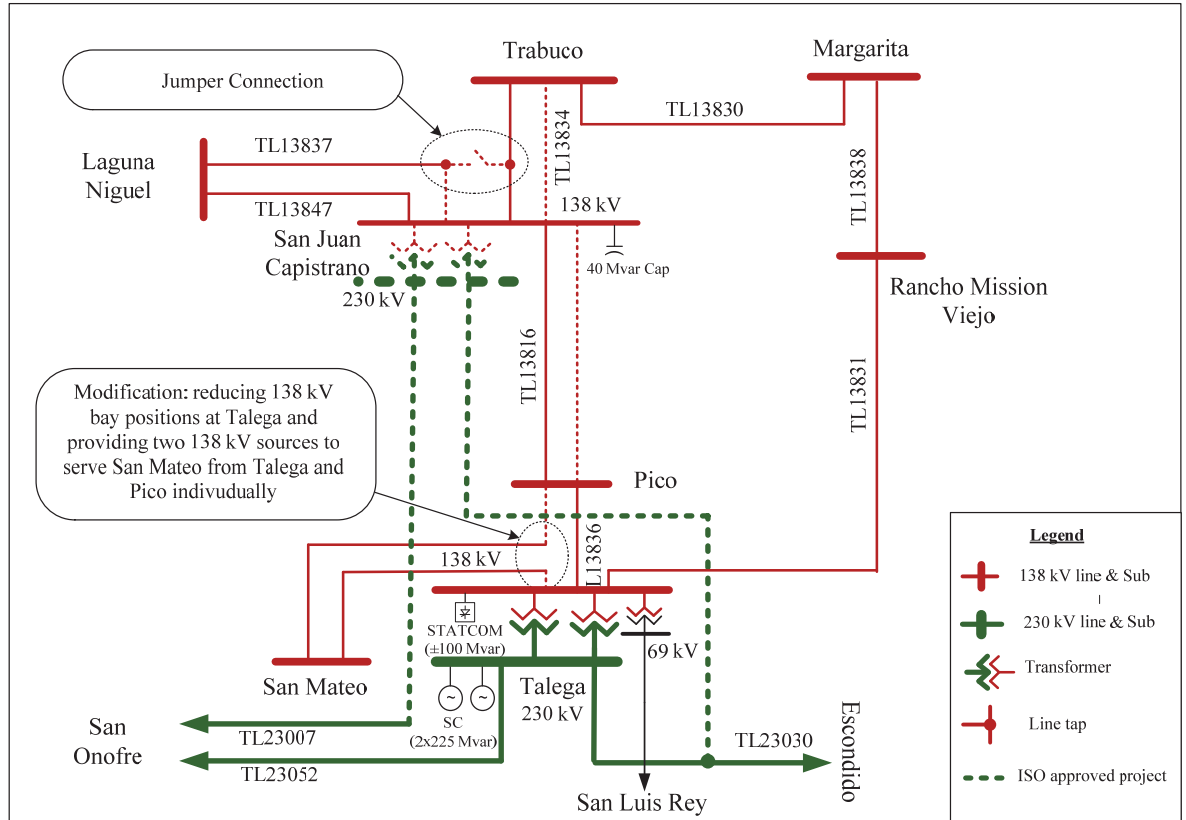


Figure 5. SDG&E's 8760-hour load duration curve used in the CAISO production simulation data base in Gridview

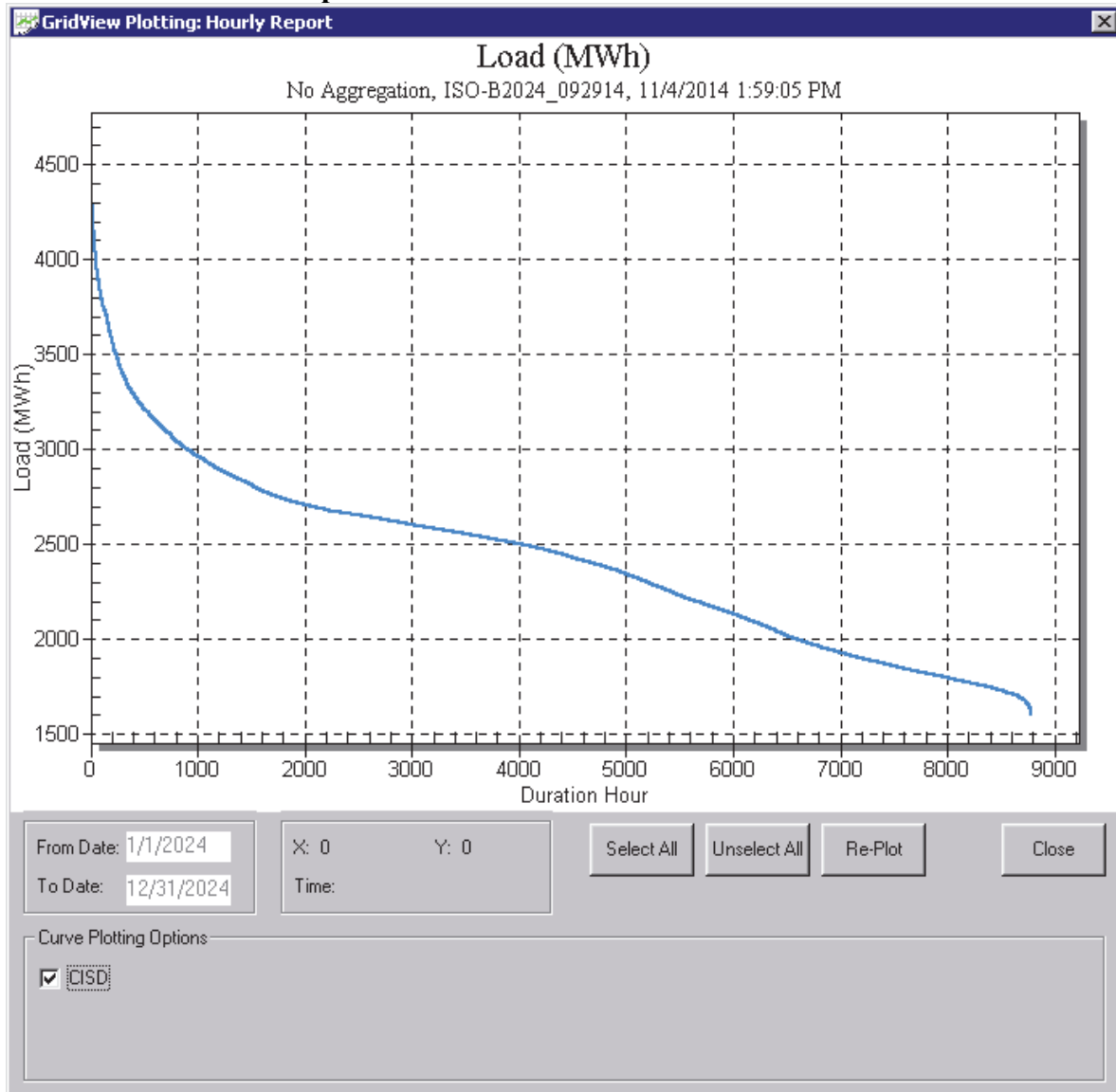


Table A-2 Comparison of Thermal Overloads for Worst Contingency in the SDG&E South Orange County area

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

APPENDIX A

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

**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

APPENDIX A

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_Trans 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

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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