2026-2027 Transmission Planning Process

Stakeholder Meeting

September 23-24, 2026

Housekeeping Reminders

- Stakeholder calls and meetings related to Transmission Planning are not recorded.
  - Given the expectation that documentation from these calls will be referred to in subsequent regulatory proceedings, we address written questions through written comments, and enable more informal dialogue at the call itself.
  - Minutes are not generated from these calls, however, written responses are provided to all submitted comments.

- Calls are structured to stimulate an honest dialogue and engage different perspectives.

- Please keep comments professional and respectful.

Instructions for raising your hand to ask a question

- Click on the raise hand icon at the bottom of your screen.
  - NOTE: If you dialed into the call outside of Webex, press *3 to get into the question queue.
- If you would like to view attendees, refresh your screen and open the “Intellor Transparency Viewer” at the bottom right of your screen.
- Closed captioning is now available by clicking the “CC” button on the bottom left of your screen.
- Please remember to state your name and affiliation before making your comment.
- You may also send your question via chat: Open the **Direct** message tab and select **all panelists** in the dropdown.
- If you need technical assistance during the meeting, please send a chat to the event producer **@Intellor Events.**

2026-2027 TPP Stakeholder Meeting - Agenda

Topic	Presenter
Day 1 - September 23	
Overview	Andrew Rivera
Preliminary Reliability Assessment - North	RT North Engineers
Preliminary Reliability Assessment - South	RT South Engineers
High Voltage TAC Update	Yara Khalaf
Day 2 - September 24	
PTO Proposed Reliability Solutions	PG&E, SCE, GLW, SDG&E
Policy Driven Assessment Update	Meng Zhang
Economic Driven Assessment Update	Yi Zhang
Wrap up	Yelena Kopylov-Alford

Overview

Preliminary Reliability Assessment Results

Andrew Rivera

Sr. Transmission Planning Specialist

2026-2027 Transmission Planning Process Stakeholder Meeting

September 23-24, 2026

2026-2027 Transmission Planning Process

January 2026 | May 2026 | May 2027

Phase 1 – Develop detailed study plan

State and federal policy

CEC - Demand forecasts

CPUC - Resource forecasts and common assumptions with procurement processes

Other issues or concerns

Phase 2 - Sequential technical studies

- Reliability analysis
- Renewable (policy-driven) analysis
- Economic analysis

Publish comprehensive transmission plan with recommended projects

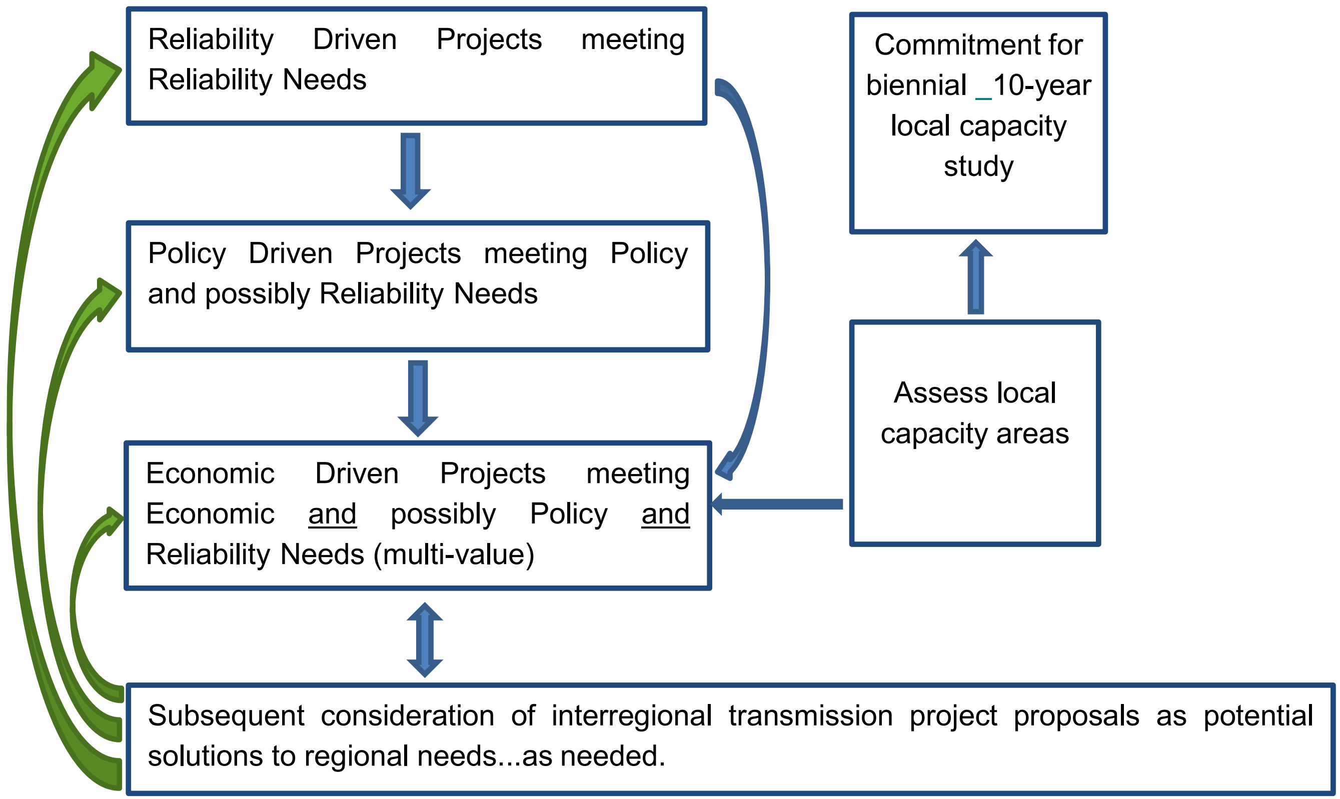
Phase 3 Procurement

CAISO Board for approval of transmission plan

2026-2027 Transmission Plan Milestones

- Draft Study Plan posted on February 17
- Stakeholder Meeting: Draft Study Plan on February 24
  - Comments to be submitted by March 10
- Final Study Plan to be posted in April
- Preliminary reliability study results to be posted on August 14
- Stakeholder Meeting: Preliminary Reliability Results on September 23 and 24
  - Comments to be submitted by October 8
- Request window closes October 15
- Stakeholder Meeting: Preliminary policy and economic results on November 18
  - Comments to be submitted by December 4
- Stakeholder Meeting: Long Term LCR on December 7, 2026
- Draft transmission plan to be posted on March 31, 2027
- Stakeholder Meeting: Draft Transmission Plan on April 7, 2027
  - Comments to be submitted by April 21, 2027
- Revised draft for approval at May 2027 Board of Governor meeting

Studies are coordinated as a part of the transmission planning process



2026-2041 10 and 15-Year Reliability Assessment

- Preliminary study results were posted on August 14
  - Based on assumptions identified in 2026-2027 TPP Study Plan
  - Satisfy requirements of:
    - NERC Reliability Standards
    - WECC Regional Criteria
    - ISO Planning Standards

2026-2041 10 and 15-Year Reliability Assessment

- ISO recommended projects:
  - For management approval of reliability projects less than $50 million, will be presented at November stakeholder session
  - For Board of Governor approval of reliability projects over $50 million, will be included in draft transmission plan

- Purpose of today's stakeholder meeting
  - Review the results of the reliability analysis
  - Set stage for stakeholder feedback on potential mitigations

Request Window

- Opened on August 15
  - PTO request window closed September 14
  - Open request window closes October 15

- Request Window Submittal Form can be found on the Transmission Planning page
  - https://www.caiso.com/generation-transmission/transmission/transmission-planning#planning-engagement

- For questions and to submit the Request Window form: requestwindow@caiso.com

CAISO Management Approval

- Approving these projects allows streamlining the review and approval process of the annual transmission plan in May 2026.
- Only those projects less than $50 million are considered for management approval that:
  - Can reasonably be addressed on a standalone basis
  - Are not impacted by policy or economic issues that are still being assessed.
  - Are not impacted by the approval of the transmission plan (and reliability projects over $50 million) by the Board of Governors in May 2026.
  - Management will only approve these projects after a Board of Governors meeting
- None of the projects identified are considered eligible for competitive solicitation.

Key Updates

- Preparation for policy and economic assessment are underway with the preliminary analysis to be presented at the November 18th stakeholder meeting
- The transmission access forecast charge model from the 2025-2026 transmission planning process has been posted to the transmission planning process webpage.
  - http://www.caiso.com/planning/Pages/TransmissionPlanning/Default.aspx
  - The CAISO will accept comments that could provide enhancements to the model for use in the 2026-2027 transmission planning process with the stakeholder comments submitted on this stakeholder call

Long-Term Local Capacity Technical Study

- Reduction in scope
- Studies in areas with recently approved transmission projects only
- Studies without known load only
- LA Basin and Bay Area only

Comments
2026-2027 TPP Stakeholder Meeting

- Comments due by end of day October 8th

- Submit public comments through the ISO's commenting tool, using the template provided on the process webpage:

https://stakeholdercenter.caiso.com/RecurringStakeholderProcesses/2026-2027-Transmission-planning-process

Regional Transmission North
Preliminary Reliability Assessment Results

2026-2027 Transmission Planning Process Stakeholder Meeting

September 23-24, 2026

Greater Bay Area
Preliminary Reliability Assessment Results

Uriel Abraham Rangel Diaz
Regional Transmission North

2026-2027 Transmission Planning Process Stakeholder Meeting
September 23-24, 2026

Greater Bay Area

- Service areas cover Alameda, Contra Costa, Santa Clara, San Mateo and San Francisco counties.
- Supply sources: Vaca Dixon, Tesla, Metcalf, and Collinsville*.
- Comprised of 60, 115 & 230 & 500 kV transmission facilities.
- For ease of conducting the performance evaluation, the Greater Bay Area is divided into Seven sub-areas:
  - East Bay
  - Diablo
  - Mission
  - San Francisco
  - Peninsula
  - San Jose
  - De Anza

* ISD 2028

Load and Load Modifier Assumptions - Greater Bay Area

Study Case	Description	Gross Load (MW)	BTM-PV		AAEE (MW)	AAFS (MW)	AATE (MW)	AADS (MW)	Known Loads (MW)	Net Load (MW)	DR (MW)
			Output (MW)	Installed (MW)							
2028-SPOP	2028 Spring off-Peak load condition. Off-Peak load time - hours ending 20:00	8,696	-	2,820	-303	87	250	1,099	-	8,390	-38
2028-WP	2028 Winter Peak load condition. Winter Peak load time - hours ending 19:00	9,749	-	2,820	-252	105	299	1,177	-	9,493	-38
2031-SPOP	2031 Spring off-Peak load condition. Off-Peak load time - hours ending 13:00	7,472	2,052	3,157	-233	90	340	1,412	369	5,160	-48
2031-WP	2031 Winter Peak load condition. Winter Peak load time - hours ending 09:00	13,156	284	3,157	-239	879	937	2,476	497	12,625	-42
2036-SOP	2036 Summer off-Peak load condition. Off-Peak load time - hours ending 11:00	15,098	2,413	3,713	-494	166	1,671	1,986	706	12,194	-41
2041-WP	2036 Winter Peak load condition. Winter Peak load time - hours ending 09:00	16,1571	330	4,108	-544	2,688	2,701	2,717	428	15,690	-41
GBA-2028-SP	2028 Summer Peak load condition. Peak load time - hours ending 18:00	12,531	308	2,820	-73	60	212	754	856	11,918	-38
GBA-2031-SP	2031 Summer Peak load condition. Peak load time - hours ending 18:00	14,817	346	3,157	-182	222	568	2,012	859	14,078	-42
GBA-2036-SP	2036 Summer Peak load condition. Peak load time - hours ending 18:00	16,763	257	3,713	-504	489	1,428	2,778	810	15,962	-41
GBA-2041-SP	2041 Summer Peak load condition. Peak load time - hours ending 18:00	17,633	288	4,108	-619	559	1,972	2,778	758	16,698	-41
Sensitivity Scenarios											
2028-SPOP-Hire	2028 Spring off-peak load conditions and high renewables (Sensitivity)	8,696	-	2,820	-303	87	250	1,099	-	8,390	-38
GBA-2028-SP_HiRE	2028 Summer peak Load conditions with Hi-Renewable dispatch (Sensitivity)	11,198	2,773	2,820	-73	60	212	754	-	8,197	-38
GBA-2031-SP-HiCEC	2031 Summer Peak load condition with Hi-CEC load forecast (Sensitivity)	14,938	347	3,157	0	231	603	2,127	859	14,480	-42

California ISO

Generation Assumptions - Greater Bay Area

Study Case	Description	Solar		Wind		Thermal		Energy Storage	
		Dispatch (MW)	Installed (MW)	Dispatch (MW)	Installed (MW)	Dispatch (MW)	Installed (MW)	Dispatch (MW)	Installed (MW)
2028-SPOP	2028 Spring off-Peak load condition. Off-Peak load time - hours ending 20:00	-	191	105	262	1,294	5,587	-400	778
2028-WP	2028 Winter Peak load condition. Winter Peak load time - hours ending 19:00	-	191	114	262	5,179	5,587	606	778
2031-SPOP	2031 Spring off-Peak load condition. Off-Peak load time - hours ending 13:00	112	191	154	262	4,200	5,587	-720	728
2031-WP	2031 Winter Peak load condition. Winter Peak load time - hours ending 09:00	119	191	65	262	4,826	5,587	-83	728
2036-SOP	2036 Summer off-Peak load condition. Off-Peak load time - hours ending 11:00	928	1,226	34	262	2,652	5,587	-377	2,094
2041-WP	2036 Winter Peak load condition. Winter Peak load time - hours ending 09:00	885	1,456	65	262	4,979	5,587	446	2,025
GBA-2028-SP	2028 Summer Peak load condition. Peak load time - hours ending 18:00	19	191	94	262	4,121	5,587	456	728
GBA-2031-SP	2031 Summer Peak load condition. Peak load time - hours ending 18:00	17	191	131	262	4,505	5,587	725	728
GBA-2036-SP	2036 Summer Peak load condition. Peak load time - hours ending 18:00	74	1,226	59	262	5,416	5,587	660	823
GBA-2041-SP	2041 Summer Peak load condition. Peak load time - hours ending 18:00	87	1,456	72	262	5,440	5,587	733	823
Sensitivity Scenarios									
2028-SPOP-Hire	2028 Spring off-peak load conditions and high renewables (Sensitivity)	-	191	130	262	2,193	5,587	400	778
GBA-2028-SP_HiRE	2028 Summer peak Load conditions with Hi-Renewable dispatch (Sensitivity)	182	191	195	262	3,437	5,587	-498	728
GBA-2031-SP-HiCEC	2031 Summer Peak load condition with Hi-CEC load forecast (Sensitivity)	19	191	141	262	4,541	5,587	725	728

Previously approved transmission projects modelled in base cases

Project Name	Division	In Service Date
Contra Costa PP 230 kV Line Terminals Reconfiguration Project	Diablo	Feb-26
Pittsburg 230/115 kV Transformer Capacity Increase	Diablo	Jan-29
Lone Tree – Cayetano – Newark corridor Series Compensation	Diablo	Aug-28
North Dublin - Vineyard 230 kV line Reconductoring	Diablo	May-34
New Collinsville 500 kV substation	Diablo	Dec-28
Pittsburg 115 kV Bus Reactor Project	Diablo	May-28
Christie-Sobrante 115 kV Line Reconductor	East Bay	Sep-29
Moraga 230 kV Bus Upgrade	East Bay	May-29
Newark 230/115 kV Transformer Bank #7 Circuit Breaker Addition	Mission	Aug-27
North Tower 115 kV Looping Project	Mission	Mar-30
Jefferson 230 kV Bus Upgrade	Peninsula	Jun-28
South of San Mateo Capacity Increase	Peninsula	Dec-31
Redwood City Area 115 kV System Reinforcement	Peninsula	Mar-30
Martin 230 kV Bus Extension	San Francisco	Dec-29
Newark-Milpitas #1 115 kV Line Limiting Facility Upgrade	San Jose	Dec-26
Vasona-Metcalf 230 kV Line Limiting Elements Removal Project	San Jose	Jun-27
Series Compensation on Los Esteros-Nortech 115 kV Line	San Jose	Nov-26
South Bay Area Limiting Elements Upgrade	San Jose	Nov-26
Metcalf-Piercy & Swift and Newark-Dixon Landing 115 kV Upgrade	San Jose	Dec-30
San Jose Area HVDC Line (Metcalf – San Jose B)	San Jose	May-28
Newark – NRS 230 kV Line	San Jose	Apr-28
Morgan Hill Area Reinforcement (formerly Spring 230/115 kV substation)	San Jose	Dec-28
Monta Vista 230 kV Bus Upgrade	De Anza	May-28

Previously approved transmission projects modelled in base cases

Project Name	Division	In Service Date
Pittsburg - Kirker 115 kV line	Diablo	May-28
Sobrante 230 kV Bus Upgrade	Diablo	May-33
Moraga 230/115 kV Transformer Bank	East Bay	May-31
North Oakland Reinforcement Project	East Bay	May-32
South Oakland Reinforcement Project	East Bay	May-32
Ames Distribution - Palo Alto 115 kV Transmission Line	Peninsula	Mar-34
Jefferson - Stanford recabling (Menlo - SLAC 60 kV Tap only)	Peninsula	May-29
San Mateo 230/115 kV TB Addition Project	Peninsula	May-32
Martin - Millbrae 60 kV Area Reinforcement	Peninsula	May-30
San Jose B – NRS 230 kV line	San Jose	May-30
Greater Bay Area 500 kV Transmission Reinforcement	San Jose	May-34
Metcalf 500/230 kV TB	San Jose	May-34
South Bay Reinforcement project	San Jose	May-32

Reliability assessment preliminary results summary

Summary results for the East Bay, Diablo and Mission (1/2)

Contra Costa – Newark 230 kV path.

- **Lone Tree – Cayetano 230 kV line.** Near and Long-term overloads under P0 to P7 contingencies.
- **Cayetano – North Dublin 230 kV line.** Long-term overloads under P2 contingencies.
- **Las Positas – Newark 230 kV line.** P2 and P7 contingencies overloading this line in the near and long-term.
- **Contra Costa – Las Positas 230 kV line.** Long-term overloads under P2 contingencies.

Newark – Newark DIST 230 kV line. Near and long-term overloads for P1, P2, and P3 contingencies. A major contributing factor to this loading issue is the forecasted load from the Known Load component in this substation.

Sobrante – Grizzly – Claremont 115 kV line. Near and long-term overloads for P2, and P3 contingencies.

Grant – East Shore, Grant – San Leandro 115 kV lines. Long-term overloads due to P2 contingencies.

Potential Mitigations

- For the Contra Costa – Newark 230 kV path and the Newark – Newark DIST 230 kV line a potential flow control or capacity increase.
- Re-rate of the Sobrante – Grizzly – Claremont 115 kV line for near-term. Potential reconductoring for long-term overloads
- Potential Moraga 115 kV Bus upgrade to mitigate the P2 issues.

Summary results for the East Bay, Diablo and Mission (2/2)

Newark – Jarvis 115 kV lines. The two lines supplying the load at Jarvis from Newark have near and long-term overloads when one of the lines is out under P1 and P2 contingencies.

Pittsburg – Moraga 115 kV pocket.

- **Clayton – Lakewood, Clayton – Lakewood (Meadow Lane), and Moraga – Lakewood 115 kV lines.** Near and Long-term overloads under P2, P6, and P7 contingencies.

Oleum – El Cerrito 115 kV line. Near and long-term overloads under P6, and P7 contingencies.

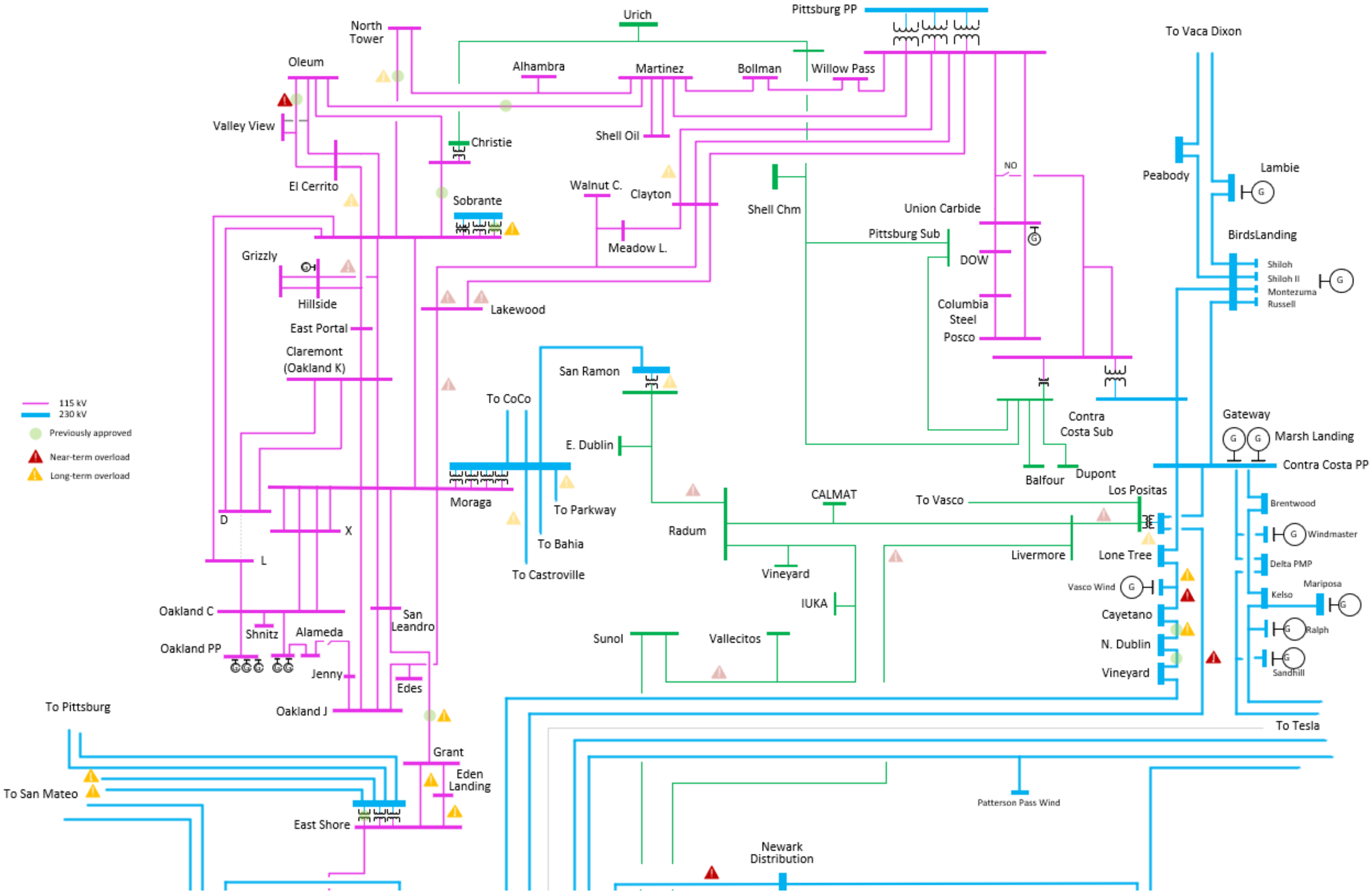
San Ramon – Las Positas – Newark 60 kV pocket.

- **San Ramon – East Dublin – Radum – Livermore – Las Positas 60 kV lines.** There are near and long-term overloads under P1, P2, and P7 contingencies.

Potential Mitigations

- A potential capacity increase project is under review for the Newark – Jarvis 115 kV lines overload.
- For the Pittsburg – Moraga 115 kV pocket, there was an update on the load and topology modeled. After this updated, no near-term overloads were observed. The Long-term issues will continue to be monitored in future planning cycles.
- Regarding the San Ramon – Las Positas – Newark, operational procedures mitigate the near-term issues. Long-term overloads will be monitored for potential network upgrades in future.

Summary results for the East Bay, Diablo and Mission



Summary results for De Anza

Metcalf – Monta Vista 230 kV path.

- **Mona Vista – Hicks, Saratoga – Monta Vista, and Metcalf – Hicks 230 kV lines.** Near-term overloads with one P7 and long-term overloads under P1, P2, and P6 contingencies.
- **Metcalf – Vasona 230 kV lines.** P1, P2, and P6 contingencies causing overloads on this lines in the long-term.

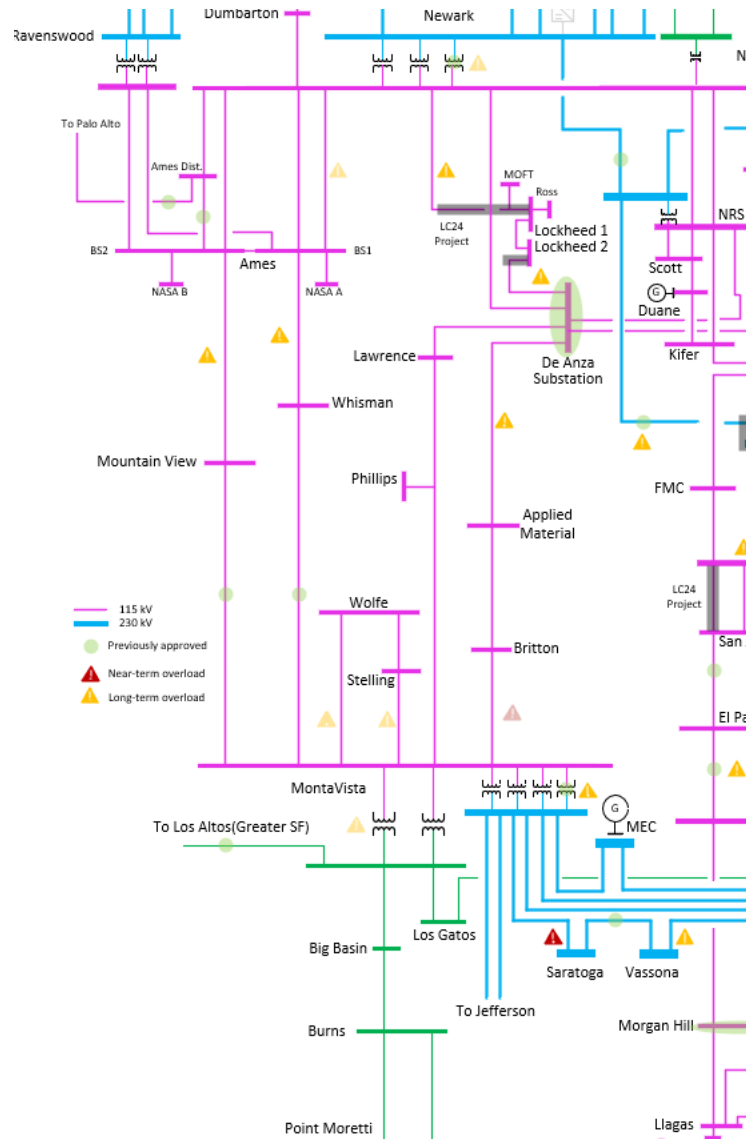
Monta Vista – Newark 115 kV load pocket.

- **Monta Vista – Britton, Newark – Lockheed, New De Anza – Applied Materials 115 kV lines.** Near and long-term overloads under P2, P3, P6, and P7 contingencies.
- **Monta Vista 230/115 kV Transformer Banks #1 and #2**. P1, P2, and P6 contingencies causing overloads on these transformer banks in the long-term.

The Monta Vista – Newark 115 kV load pocket have a significant known load component.

<u>Potential Mitigations</u>

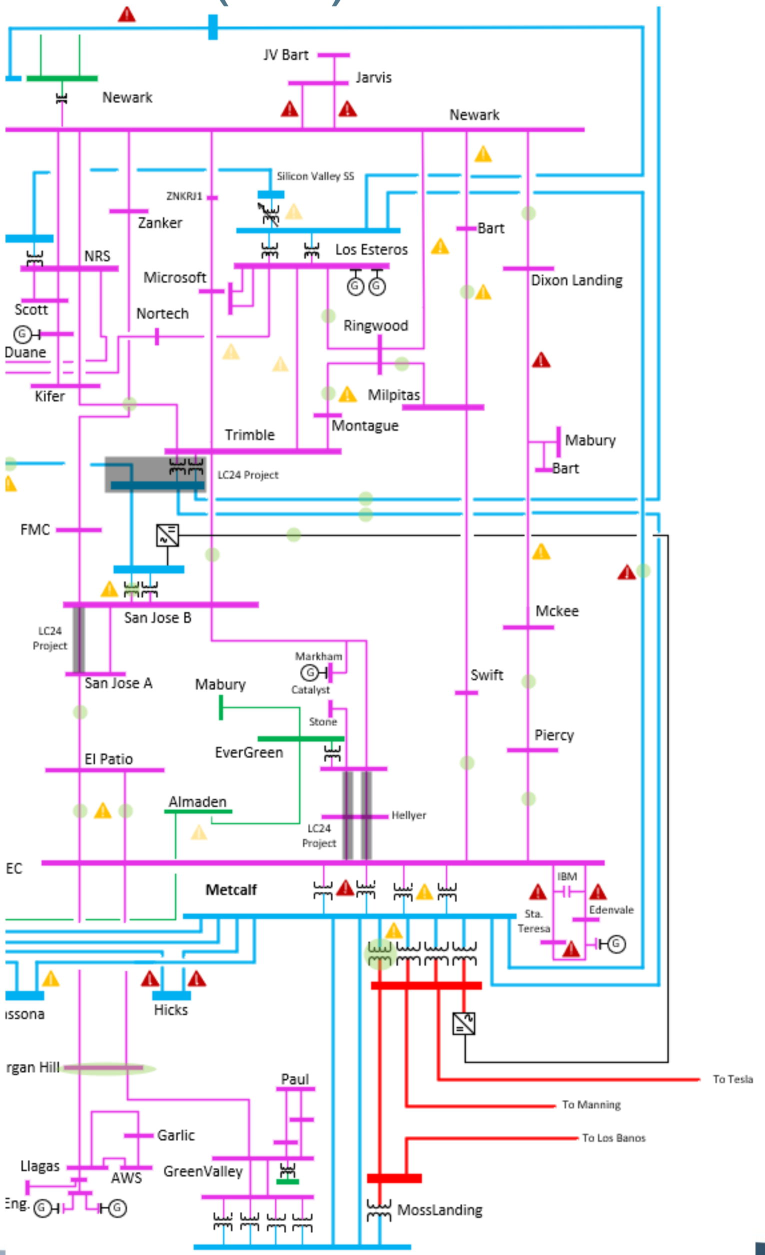
- Potential 230 kV line upgrade project for the Metcalf – Monta Vista 230 kV path.
- Potential network upgrade for the Monta Vista – Newark 115 kV load pocket.
- A more comprehensive solution to address both overload issues in the De Anza region by introducing new sources to this load pocket.



California ISO

Summary results for San Jose (1/2)

- **Metcalf 500/230 kV transformer banks**. P1, P2, P3, and P6 contingencies at Metcalf overload the transformer banks in the long-term scenarios.
- **Los Esteros – Metcalf 230 kV line**. P2 contingencies at Newark and Metcalf overload this line in the near and long-term scenarios.
- **Trimble – NRS 230 kV line.** There are P1, P2, and P7 long-term overloads on this line.
- **Metcalf 230/115 kV transformer banks**. P1, P2, P3, and P7 contingencies at Metcalf overload the transformer banks in the long-term scenarios.
- **San Jose B 230/115 kV transformer banks.** P1, P2, P3, and P6 contingencies involving the loss of one of the two San Jose B transformer banks cause long-term overloads in the remaining one.
- **Metcalf – El Patio, and Metcalf – Hellyer – Evergreen 115 kV lines.** P2 contingencies at Metcalf and San Jose B causing long-term overloads on these lines connecting Metcalf and San Jose B in 115 kV.



Potential Mitigations

- The overload issues in the South Bay have been previously identified and addressed with mitigation measures approved in previous Transmission Plans. However, due to the further increase in the load forecast, some of the previously proposed projects may be insufficient to accommodate the new load forecast. Further review and assessment will be conducted in this cycle in coordination with the needs identified in other studies, like load interconnection.

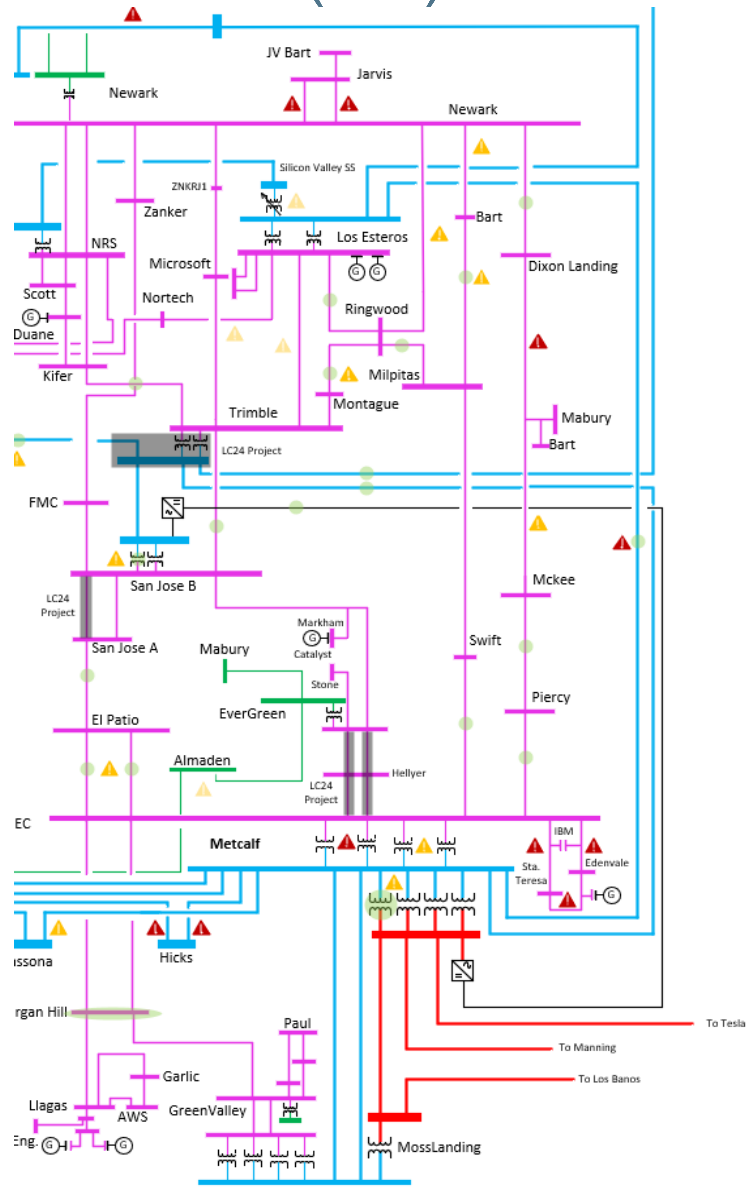
Summary results for San Jose (2/2)

- **Dixon Landing – Mabury – McKee 115 kV line.** P1 to P7 contingencies overloading this line in the near and long-term.

- **Metcalf – Santa Teresa – Edenvale 115 kV lines.** The two lines supplying the load at Santa Teresa and Edenvale from Newark have near and long-term overloads when one of the lines is out under P1 and P2 contingencies.

<u>Potential Mitigations</u>

- Under review a potential Dixon Landing – Mabury – McKee line upgrade.
- A potential capacity increase project for the Metcalf – Santa Teresa – Edenvale 115 kV lines overload.



Summary results for San Francisco and Peninsula

<u>San Mateo – Ravenswood 115 kV load pocket.</u>

- **Ravenswood – Cooley Landing #1 and #2, Cooley Landing – Palo Alto, and Ravenswood – Palo Alto 115 kV lines.** There are P1 to P7 contingencies causing near and long-term overloads on these lines.

<u>San Mateo – Martin 115 kV load pocket.</u>

- **Martin – East Grand – San Mateo 115 kV lines.** Near and long-term overloads on this lines under P2, P6, and P7 contingencies.

<u>Martin - Potrero 115 kV load pocket.</u>

- **Potrero – Larkin, Mission – Larkin, and Martin – Bay Shore 115 kV lines.** Near and long-term overloads on this lines under P2, contingencies in the Potrero substation.

<u>Potential Mitigations</u>

- Potential mitigations could include maintenance projects, line re-rates, topology reconfiguration and bus upgrades. Further review and assessment will be conducted in coordination with the needs identified in other studies, like load interconnection.
- A more comprehensive approach that resolves both overload issues in the San Francisco and Peninsula regions by introducing a new source to the pocket.

Martin – Daly City – Serramonte 115 kV lines. The two lines supplying the load at Daly City and Serramonte from Martin have long-term overloads when one of the lines is out under P2 contingencies.

San Mateo – Bay Meadows 115 kV lines. The two lines supplying the load at Bay Meadows from San Mateo have long-term overloads when one of the lines is out under P2 contingencies.

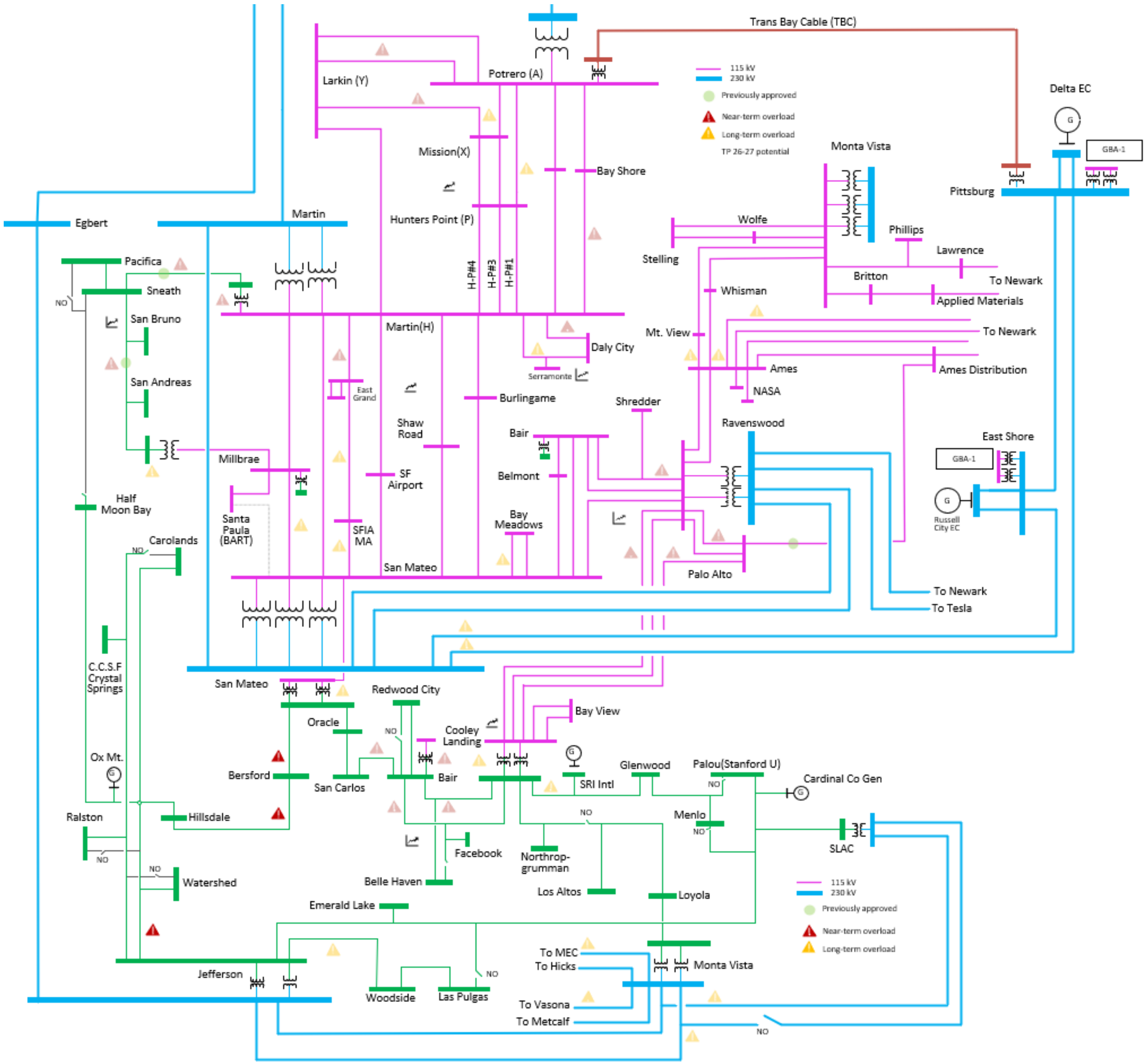
<u>San Mateo – Jefferson and Bair – Cooley Landing 60 kV pocket.</u>

- The increased load in the 60 kV substations that are served by the 115/60 kV transformer banks at San Mateo, Bair and Cooley Landing as well as for the 230/60 kV at Jefferson causes near and long-term overloads on the lines emanating from these under P1, P2, P6, and P7 contingencies involving one or more of these sources.

<u>Potential Mitigations</u>

- The 115 kV line overloads are under review.
- For the reported 60 kV system, operating procedures can be considered for the near-term overloads and potential network upgrades or reconfigurations for the long-term overloads.

Summary results for San Francisco and Peninsula



Summary results of P5 contingencies

- There are multiple overloaded facilities in the near and long-term

Potential Mitigations

- P5 driven projects that are being considered for implementation:

Newark 230 kV DC Supply and Control Circuit
Ravenswood 115 kV Redundant Bus Differential Relay
Ravenswood 230-115 kV DC Supply and Control Circuit
Moraga 230 kV Redundant Bus Differential Relay
Moraga 230-115 kV DC Supply and Control Circuit
Pittsburg PP 230 kV Redundant Bus Differential Relay
Sobrante 230-115 kV DC Supply and Control Circuit
Potrero 115 kV DC Supply and Control Circuit Project
Palo Alto Switching Station 115 kV Redundant Bus Differential Relay
Monta Vista 115 kV Redundant Bus Differential Relay
Metcalf 115kV Redundant Bus Differential Relay
East Shore 115 kV DC Supply and Control Circuit Project
East Shore 115 kV Redundant Bus Differential Relay Project

San Mateo 230-115-60 kV DC Supply and Control Circuit
Martin (SF H) 230-115-60 kV DC Supply and Control Circuit
Metcalf 230 kV Redundant Bus Differential Relay
Metcalf 500 kV-230 kV DC Supply and Control Circuit
Jefferson 230 kV Redundant Bus Differential Relay
Newark Bus E&F 115 kV DC Supply and Control Circuit
Las Positas 230-60 kV DC Supply and Control Circuit
Ravenswood 230 kV Redundant Bus Differential Relay
Los Esteros 115 kV Bus 1&2 Redundant Bus Differential Relay
Los Esteros 230-115KV DC Supply and Control Circuit Project
Metcalf 115 kV DC Supply and Control Circuit
East Shore 230 kV DC Supply and Control Circuit Project

Summary results of P5 contingencies

Potential Mitigations

- Other P5 driven projects identified for installation of Redundant Battery/Relay/Circuitry:

MONTA VISTA 230-115KV BATT
APPLIED MATERIALS 115KV BATT
BAIR 115 KV
BAIR 115-60KV BATT
BURLINGAME 115KV BATT
C. COSTA SUB 230-115-60KV BATT
C.COSTAPP 230KV BUS 1&2
CAYETANO 230KV BATT
CLAREMONT (OAKLAND K) 115KV BATT
CLAYTON 115KV BATT
CONTRA COSTA PP 230KV BATT
COYOTE SW STA (MEC) 230KV BATT
EAST GRAND 115KV BATT
EST GRND 115KV
HUNTERS POINT (SF P) 115KV BATT
KIRKER 115KV BATT
LARKIN (SF Y) 115KV BATT
LAWRENCE 115KV BATT
MARTIN 115KV BAAH
MARTIN 230 KV BAAH
MILLBRAE 115KV BATT
NEWARK 115 KV
NORTH DUBLIN 230KV BATT
OAKLAND X 115KV BATT
OLEUM 115KV BATT
PIERCY 115KV BATT
PITTSBURG PP 230-115KV BATT
POTRERO (SF A) 115KV BATT
POTRERO (SF A) 230KV BATT
POTRERO 230KV
SAN JOSE B 115KV BATT
SAN LEANDRO (OAK U) 115KV BATT
SAN RAMON 230 KV
SAN RAMON 230-60KV BATT
SERRAMONTE 115KV BATT
SFIA STATION MA 115KV BATT
TRIMBLE 115KV BATT
VASONA 230KV BATT

Summary results of long-term overloads

- Excluding P5 overloads, the following facilities in 230 kV and 500 kV experienced overloading issues in the longer-term scenarios.

TRANSFORMER BANKS	LINES	
LS PSTAS 230/60KV TB 4	BVISTAWNDC1-DELTAPMP-C.COSTAPPE 230KV	NEWARK D-NSJ-MIDPNTSS #1 230KV
MONTA VISTA 230/115 kV TB #1	EASTSHORE-SAN MATEO 230KV	NRS-TRIMBLE #1 230KV
NEWARK 230/115 kV TB #7	LOS ESTEROS-METCALF 230KV	PARKWAY-MORAGA 230KV
NEWARK E 230/115KV TB 11	MONTA VISTA - SLAC 230 KV	SAN MATEO-MARTIN 230KV (2)
PITTSBURG-D 230/115KV TB 13	MONTA VISTA-JEFFERSON #2 230KV	SANMATEO-E. SHORE #2 230KV
SANRAMON 230/60KV TB 1	MONTAVIS-STNFD230 #1 230KV	TRIMBLE-SANJOSEB230 #1 230KV
	MORAGA-CASTRO VALLEY 230KV	

<u>Potential Mitigations</u>

- To address long-term issues, a comprehensive review and assessment will be conducted in coordination with the needs identified in other studies, like load interconnection and aligning the previously approved projects in both the TPP and load interconnection process.

Humboldt
Preliminary Reliability Assessment Results

Rahul Iyer
Regional Transmission Engineer-North

2026-2027 Transmission Planning Process Stakeholder Meeting
September 23-24, 2026

Humboldt Area

- 3000 sq. mile area located NW corner of PG&E service area
- Cities include
  - Eureka
  - Arcata
  - Garberville
- Transmission facilities: 115 kV from Cottonwood and 60 kV – from Mendocino

Load and load modifier assumptions – Humboldt

Scenario	Study case	Description	Total Gross Load	BTM-PV Output	BTM-PV Installed Capacity	AAEE Load	AAFS load	AATE Load	Data Server Load (DS)	Known Loads (KL)	Total Net (Managed) Load	Total DR
Base	HUMB-2028-SP-SCRD.epc	2028 Summer peak load condition	176	5	46	-2	2	5	0	24	169	0
	HUMB-2031-SP-SCRD.epc	2031 Summer peak load condition	190	6	56	-3	5	13	0	24	180	0
	HUMB-2036-SP-SCRD.epc	2036 Summer peak load condition	209	5	69	-5	6	27	0	24	199	0
	2028-WP-SCRD.epc	2028 Winter peak load condition	94	0	46	-3	2	5	0	0	91	0
	2031-WP-SCRD.epc	2031 Winter peak load condition	216	5	56	-4	18	18	0	17	207	0
	2041-WP-SCRD.epc	2041 Winter peak load condition	284	6	77	-10	60	58	0	14	268	0
	2028-SPOP-SCRD.epc	2028 Spring off-peak load condition	82	0	46	-3	1	4	0	0	79	0
	2031-SPOP-SCRD.epc	2031 Spring off-peak load condition	114	36	56	-5	2	6	0	10	73	0
	2036-SOP-SCRD.epc	2036 Summer off-peak load condition	199	45	69	-6	3	34	0	21	148	0
Sensitivity	2028-SPOP-HIRE-SCRD.epc	2028 Spring off-peak load with Hi-renewable dispatch sensitivity	82	0	46	-3	1	4	0	0	79	0
	HUMB-2028-SP-HIRE-SCRD.epc	2028 Summer peak load with Hi-renewable dispatch sensitivity	176	45	46	-2	2	5	0	24	129	0
	HUMB-2031-SP-HICEC-SCRD.epc	2031 Summer peak load condition with high-cec load sensitivity	190	6	56	0	5	13	0	24	183	0

Generation assumptions - Humboldt

			Solar		Wind		Thermal		Battery		Geothermal		Hydro		Nuclear	
Scenario	Study case	Description	Dispatch (MW)	Installed (MW)	Dispatch (MW)	Installed (MW)	Dispatch (MW)	Installed (MW)	Dispatch (MW)	Installed (MW)	Dispatch (MW)	Installed (MW)	Dispatch (MW)	Installed (MW)	Dispatch (MW)	Installed (MW)
Base	HUMB-2028-SP-HIRE-SCRD.epc	2028 Summer peak load condition	4	4	0	0	195	254	0	6	0	0	0	5	0	0
	HUMB-2031-SP-SCRD.epc	2031 Summer peak load condition	0	4	0	0	190	254	5	6	0	0	0	5	0	0
	HUMB-2036-SP-SCRD.epc	2036 Summer peak load condition	3	4	0	0	214	254	4	6	102	185	0	5	0	0
	2028-WP-SCRD.epc	2028 Winter peak load condition	0	4	0	0	176	254	0	6	0	0	0	5	0	0
	2031-WP-SCRD.epc	2031 Winter peak load condition	3	4	0	0	234	254	-1	6	0	0	0	5	0	0
	2041-WP-SCRD.epc	2041 WInter peak load condition	3	4	91	315	205	254	1	6	3	185	0	5	0	0
	2028-SPOP-SCRD.epc	2028 Spring off-peak load condition	0	4	0	0	163	254	0	6	0	0	0	5	0	0
	2031-SPOP-SCRD.epc	2031 Spring off-peak load condition	2	4	0	0	153	254	-5	6	0	0	0	5	0	0
	2036-SOP-SCRD.epc	2036 Summer off-peak load condition	0	4	0	0	106	254	-3	6	0	185	0	5	0	0
Sensitivity	2028-SPOP-HIRE-SCRD.epc	2028 Spring off-peak load with Hi-renewable dispatch sensitivity	0	4	0	0	162	254	0	6	0	0	0	5	0	0
	HUMB-2028-SP-SCRD.epc	2028 Summer peak load with Hi-renewable dispatch sensitivity	0	4	0	0	185	254	0	6	0	0	0	5	0	0
	HUMB-2031-SP-HICEC-SCRD.epc	2031 Summer peak load condition with high-cec load sensitivity	0	4	0	0	190	254	5	6	0	0	0	5	0	0

Previously approved transmission projects modelled in base cases

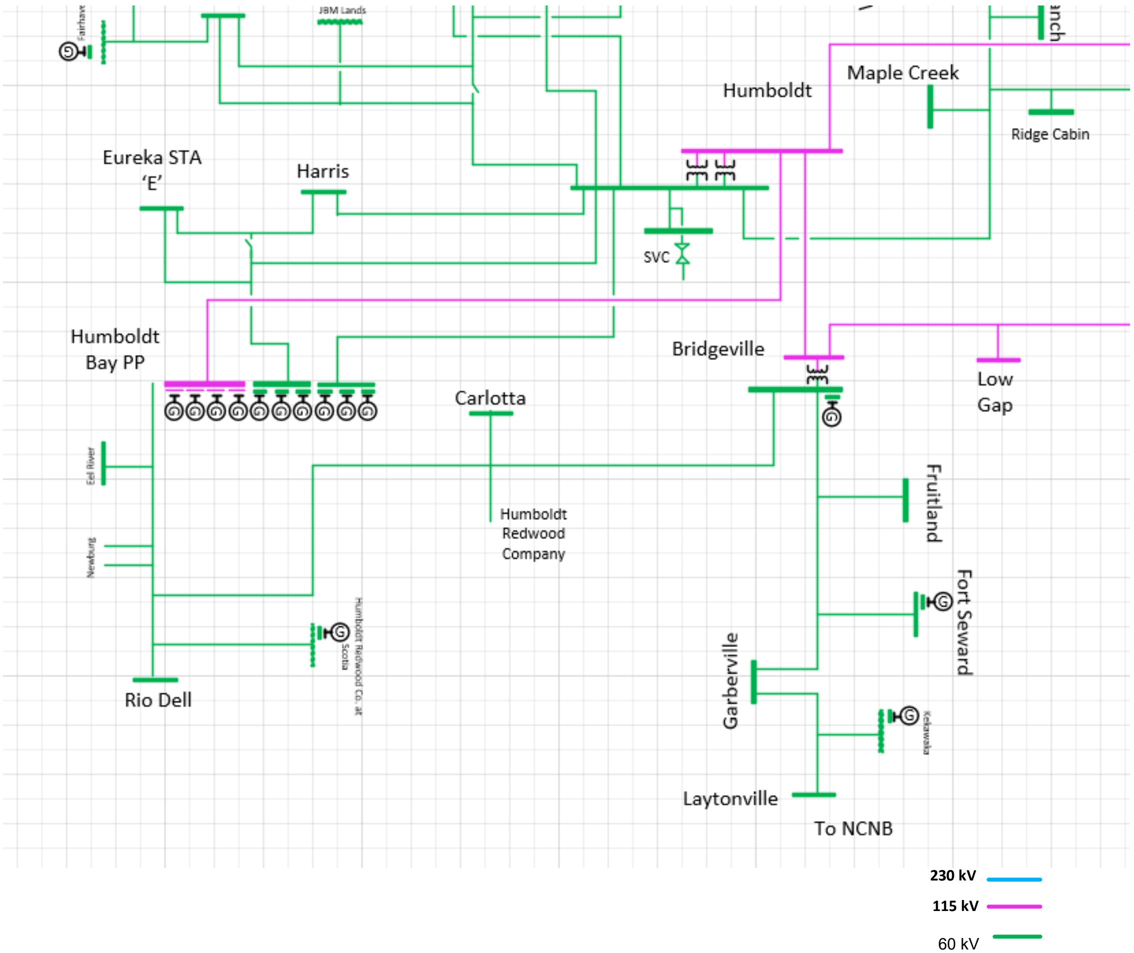
Project	Expected ISD
Willow creek reactive support project	Oct-28
Garberville area reinforcement project	Dec-28
New Humboldt 115/115 kV Phase Shifter with 115 kV line to Humboldt 115 kV Substation	May-34

Reliability assessment results summary

Humboldt – Results summary

<u>Low Voltage issue in Maple Creek Area:</u>

- P1, P2, P6 induced low voltages in long term case year.
- Low voltage in near term case caused by P1 contingency that causes loss of Humboldt – Maple Creek 60 kV line.



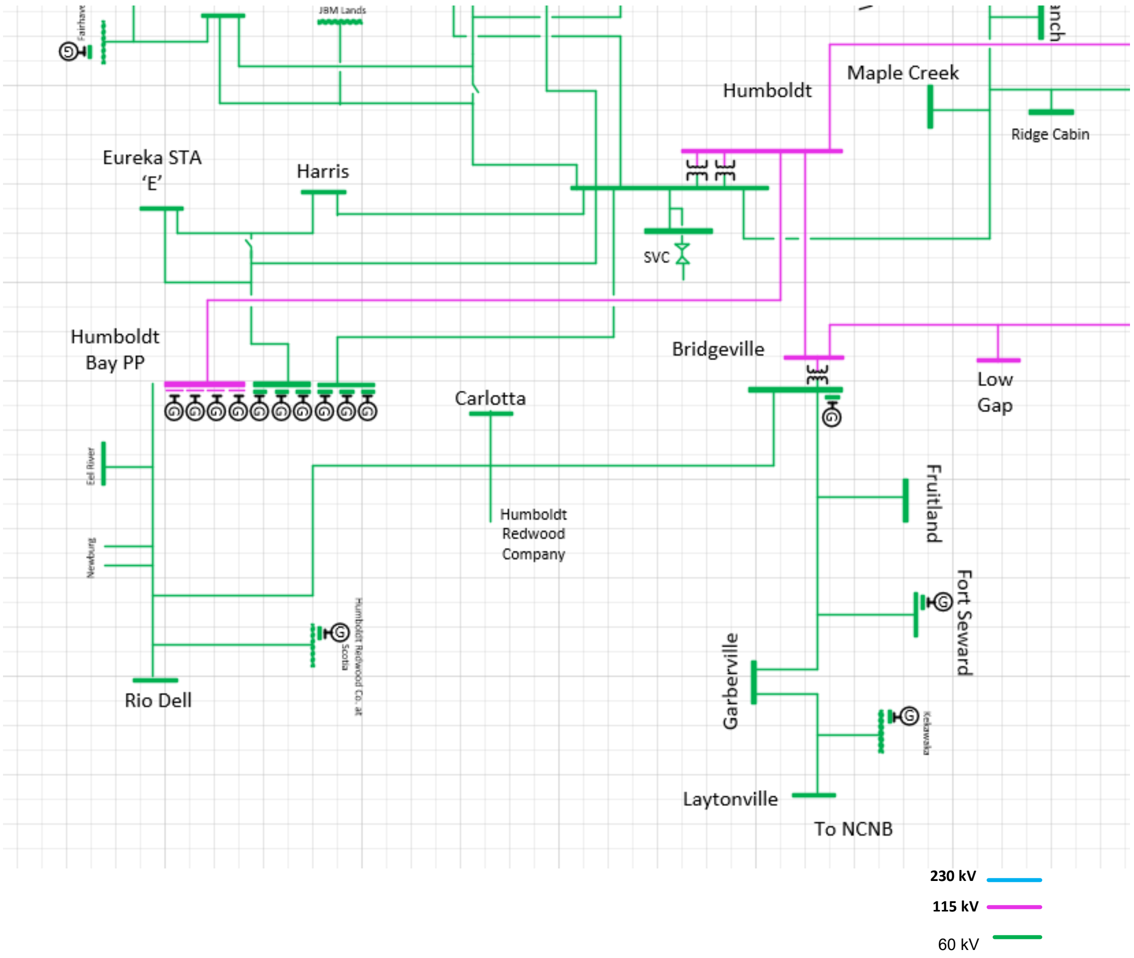
Humboldt – Results summary

Near-term

- P2, P3, P6 overloads on multiple 60 kV lines and line sections in near term and P1, P2, P3, P6 low voltages, mostly in Garberville area that are resolved in mid term & long term by approved project.

Approved and Potential Mitigations

- Garberville reinforcement project approved in TPP 22-23.



California ISO

P5 results summary

Contingency	Mitigation
Humboldt 115 kV Redundant Bus Differential Relay	In flight
Humboldt 115 kV Redundant Battery	In flight

North Coast and North Bay Area
Preliminary Reliability Assessment Results

Vignesh Subramanian
Regional Transmission Engineer

2026-2027 Transmission Planning Process Stakeholder Meeting
September 23-24, 2026

North Coast and North Bay Areas

- 10,000 sq. mile area located north of the Bay Area and south of Humboldt
- Counties include:
  - Sonoma, Mendocino, Lake, Marin and part of Napa and Sonoma counties – 10,000 sq. miles
- Cities include:
  - Laytonville, Petaluma, San Rafael, Novato, Benicia, Vallejo
- Transmission facilities: 60 kV, 115 kV and 230 kV

Load and Load Modifier Assumptions – NCNB Area

Scenario	Study case	Description	Total Gross Load	BTM-PV Output	BTM-PV Installed Capacity	AAEE Load	AAFS load	AATE Load	Data Server Load (DS)	Known Loads (KL)	Total Net (Managed) Load	Total DR
Base	NCNB-2028-SP-SCRD.epc	2028 Summer peak load condition	1798	94	1672	-23	20	49	0	98	1672	-17
	NCNB-2031-SP-SCRD.epc	2031 Summer peak load condition	1951	101	1798	-43	59	118	0	101	1798	-18
	NCNB-2036-SP-SCRD.epc	2036 Summer peak load condition	2189	74	1064	-72	94	259	0	93	2036	0
	2028-WP-SCRD.epc	2028 Winter peak load condition	1290	0	1672	-39	20	41	0	0	1250	-17
	2031-WP-SCRD.epc	2031 Winter peak load condition	1717	83	1798	-39	191	167	0	60	1592	0
	2041-WP-SCRD.epc	2041 Winter peak load condition	2448	94	2262	-89	613	566	0	51	2262	0
	2028-SPOP-SCRD.epc	2028 Spring off-peak load condition	1099	0	1672	-47	17	34	0	0	1051	-17
	2031-SPOP-SCRD.epc	2031 Spring off-peak load condition	829	598	1798	-37	16	57	0	43	190	0
	2036-SOP-SCRD.epc	2036 Summer off-peak load condition	1984	691	1064	-63	28	328	0	81	1224	-21
Sensitivity	2028-SPOP-HIRE-SCRD.epc	2028 Spring off-peak load with Hi-renewable dispatch sensitivity	1099	0	1672	-47	17	34	0	0	1051	-17
	NCNB-2028-SP-Hire-SCRD.epc	2028 Summer peak load with Hi-renewable dispatch sensitivity	1798	842	1672	-23	20	49	0	0	924	-17
	NCNB-2031-SP-Hicec-SCRD.epc	2031 Summer peak load condition with high-cec load sensitivity	1951	101	1798	0	59	118	0	101	1842	-18

Generation Assumptions – NCNB Area

			Solar		Thermal		Battery		Geothermal		Hydro	
Scenario	Study case	Description	Dispatch (MW)	Installed (MW)	Dispatch (MW)	Installed (MW)	Dispatch (MW)	Installed (MW)	Dispatch (MW)	Installed (MW)	Dispatch (MW)	Installed (MW)
Base	NCNB-2028-SP-SCRD.epc	2028 Summer peak load condition	1	13	751	964	10	25	25	25	10	25
	NCNB-2031-SP-SCRD.epc	2031 Summer peak load condition	1	13	798	964	24	25	0	0	14	25
	NCNB-2036-SP-SCRD.epc	2036 Summer peak load condition	1	13	912	964	20	25	101	399	14	25
	2028-WP-SCRD.epc	2028 Winter peak load condition	0	13	944	964	0	25	25	25	14	25
	2031-WP-SCRD.epc	2031 Winter peak load condition	8	13	839	964	-3	25	0	0	14	25
	2041-WP-SCRD.epc	2041 WInter peak load condition	8	13	860	964	6	25	121	399	12	25
	2028-SPOP-SCRD.epc	2028 Spring off-peak load condition	0	13	944	964	0	25	25	25	14	25
	2031-SPOP-SCRD.epc	2031 Spring off-peak load condition	8	13	756	964	-25	25	0	0	10	25
	2036-SOP-SCRD.epc	2036 Summer off-peak load condition	12	13	780	964	-12	25	0	399	10	25
Sensitivity	2028-SPOP-HIRE-SCRD.epc	2028 Spring off-peak load with Hi-renewable dispatch sensitivity	0	13	900	964	0	25	25	25	10	25
	NCNB-2028-SP-Hire-SCRD.epc	2028 Summer peak load with Hi-renewable dispatch sensitivity	12	13	944	964	-25	25	25	25	14	25
	NCNB-2031-SP-Hicec-SCRD.epc	2031 Summer peak load condition with high-cec load sensitivity	1	13	849	964	25	25	0	0	14	25

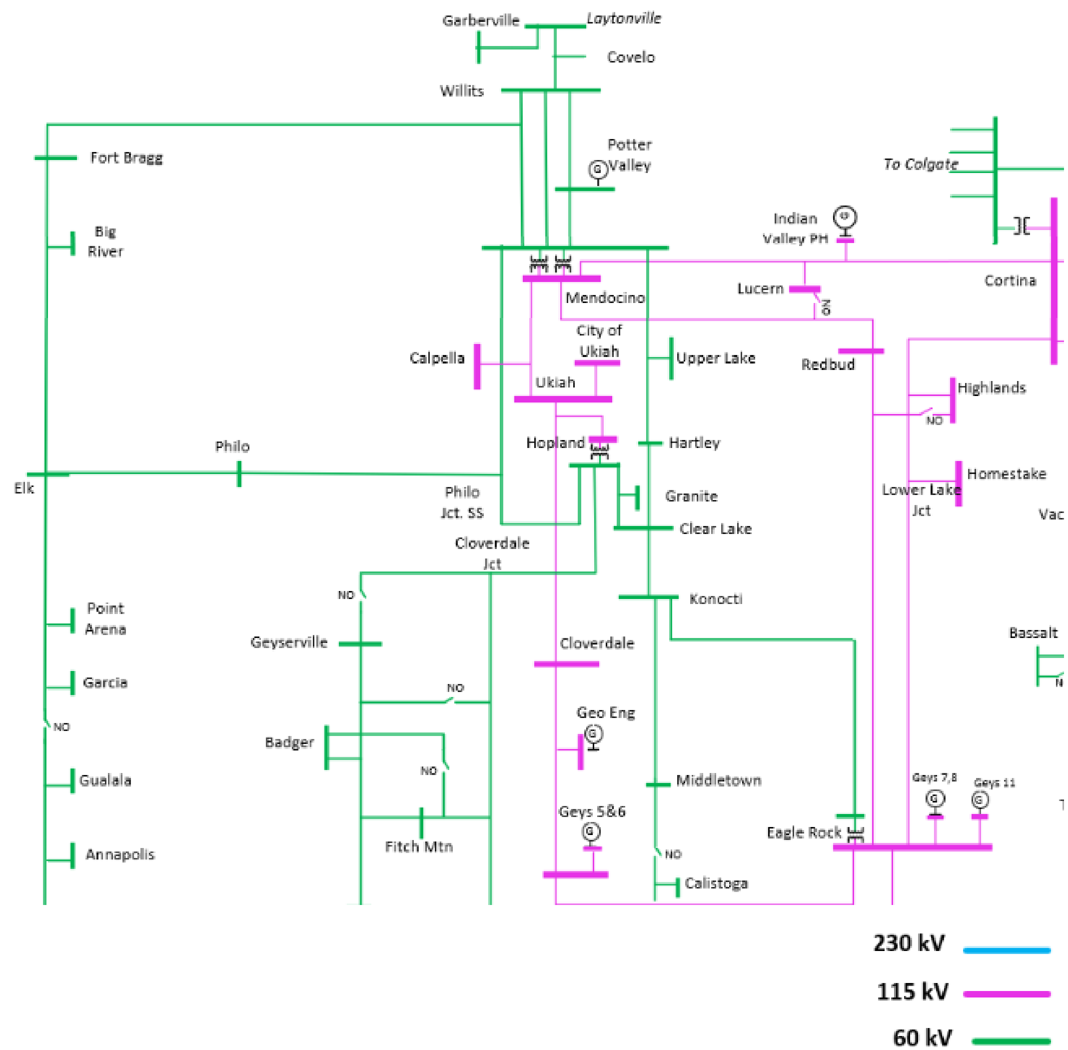
Previously approved transmission projects modelled in base cases

Project Name	Expected In-service Date
Clear Lake 60 kV System Reinforcement	Oct 2030
Ignacio Area Upgrade	Dec 2030
Lakeville 60 kV Area Reinforcement	Dec 2028
Tulucay-Napa #2 60 kV Line Capacity Increase	Dec-2026
Vaca Dixon-Lakeville 230 kV Corridor Series Compensation	Nov 2027
Tulucay-Napa #2 60 kV line Reconductoring project	Jul 2027
Vaca-Plainfield 60 kV Line Reconductoring	May 2030
Santa Rosa 115 kV lines Reconductoring project	May 2032
Covelo 60 kV Voltage Support	May 2030
North tower 115 kV Loop-in project	Nov 2029
Konocti – Eagle Rock 60 kV Line Reconductoring	May-2030
Eagle Rock- Fulton- Silverado 115 kV Line Reconductor	Aug-2029

NCNB – Results Summary

<u>Observations</u>

1. Clear Lake – Konocti 60 kV Line overloads
   - For a NERC Category P2-4 contingency starting near term
2. Hartley – Clear Lake 60 kV
   - Overloads for P2 contingency in long term only



<u>Approved and Potential Mitigations</u>

1. Operation Solution and review existing Fort Bragg UVLS and consider new RAS for P2-4 and P7 if needed.
Project :Clearlake-Hopland 60 KV line reconductoring

2. Continue to monitor

California ISO

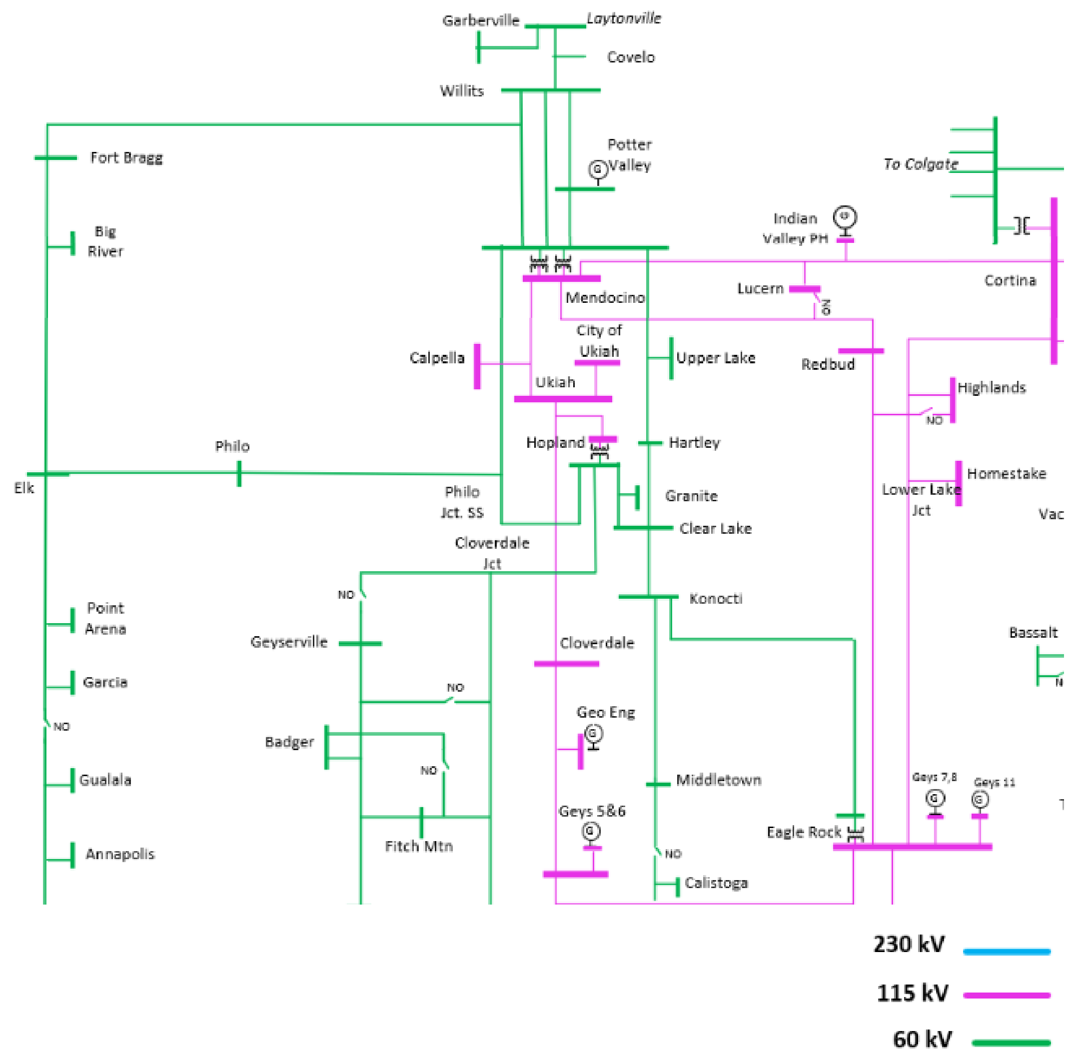
NCNB – Results Summary

<u>Observations</u>

1. Hopland 115/60 kV Transformer Bank #2 overloads
   - For P2-2, P2-3 and P2-4 contingency starting near term.
   - For multiple P2-1, P2-2, P2-3, P4 and P7 contingencies starting mid-term.
   - For multiple P1, and P7 contingencies in long term only.
2. Eagle Rock 115 kV
   - For a P6 and P7 contingency in long term only

<u>Approved and Potential Mitigations</u>

1. Maintenance project to increase capacity on Hopland Transformer Bank #2
2. Continue to monitor



NCNB – Results Summary

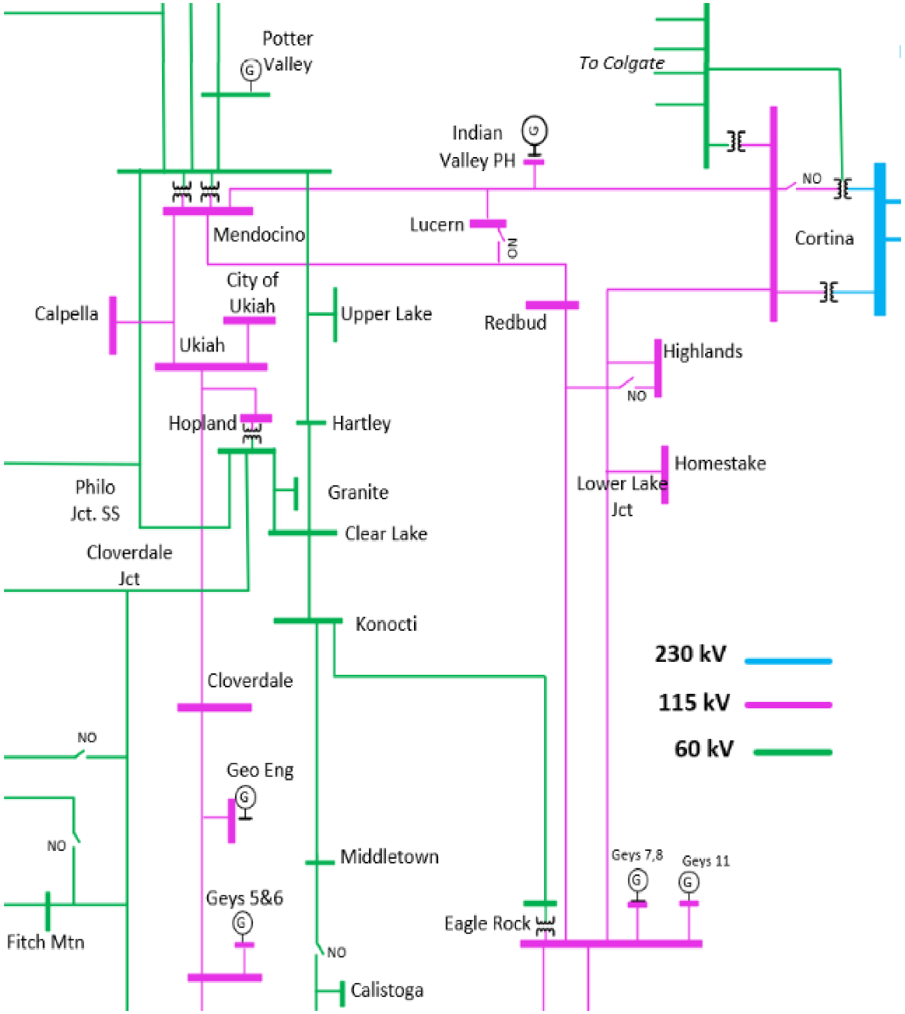
<u>Observations</u>

1. Cortina – Mendocino 115 kV Line
   - Diverges for P2-3 contingency short & long term
   - Overloads for P6 contingencies in short & long term only
2. Geyser #3 – Cloverdale 115 kV Line
   - Overloads for P6 contingencies starting mid-term and long term
3. Ukiah – Hopland – Cloverdale 115 kV Line
   - Overloads P6 contingencies long term only
4. Mendocino – Red Bud 115 kV
   - Overloads for P6 contingency starting mid term.

<u>Approved and Potential Mitigations</u>

1,3,4. Under review/continue to monitor

2. Operation solutions

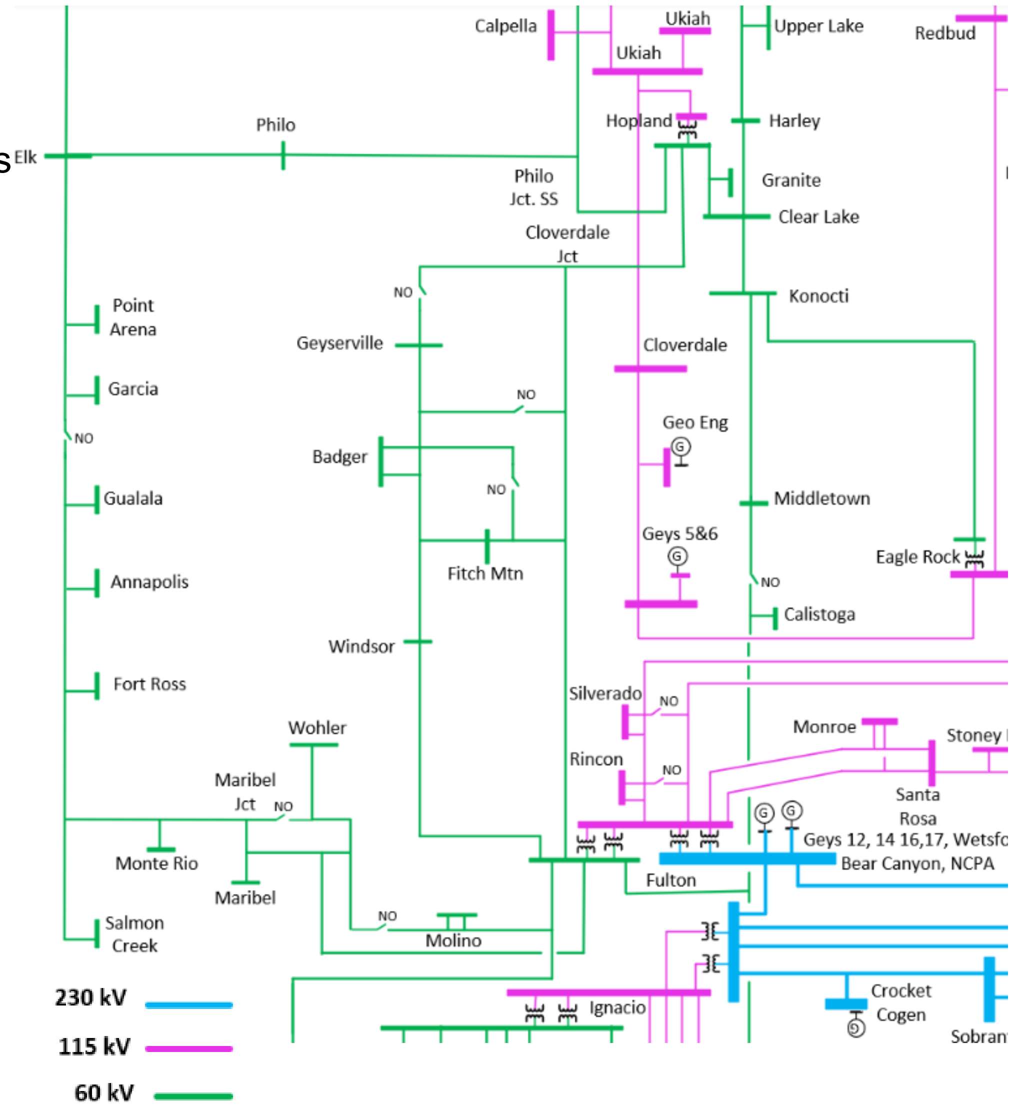


NCNB – Results Summary

<u>Observations</u>

1. Fulton – Pueblo 115 kV
   overloads for multiple P1, P2-1, P2-3 (sensitivity only) and P7 contingencies near term and mid-term.
2. Fulton – Calistoga 60 kV (Fulton Sub – St. Helena Jct 60 kV)
   overloads for a NERC Category P3 contingency for long term only

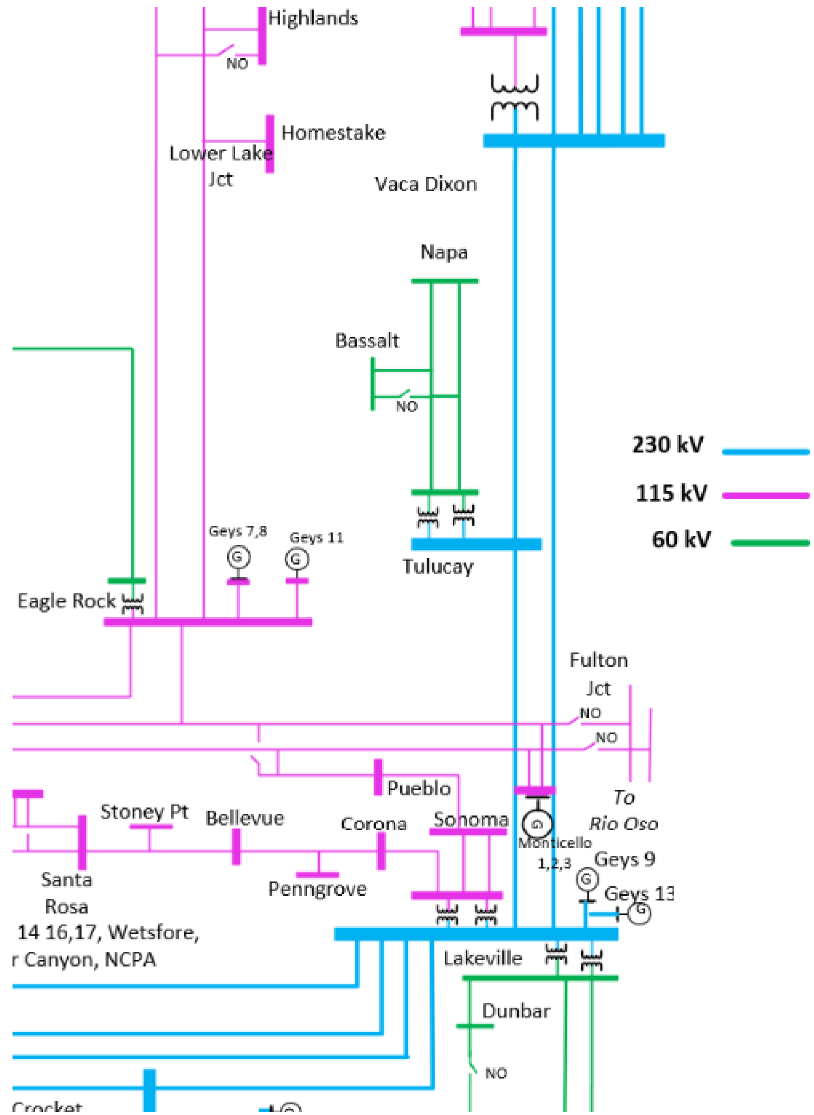
3. Fulton-Santa Rosa #1 and #2 115 kV
   overloads short and long term P6



<u>Approved and Potential Mitigations</u>

1. Clear Lake 60 kV System Reinforcement
2. Continue to monitor
3. Operations solution

NCNB – Results Summary



Observations

1. Sonoma-Pueblo 115 kV Overloads for a P3 contingency in mid term only
2. Lakeville-Sonoma #1 115 kV Overloads for a P6 contingency in mid term only
3. Lakeville-Sonoma #2 115 kV Overloads for a P3 contingency in mid term only sensitivity case

Approved and Potential Mitigations

1,2,3. Continue to monitor

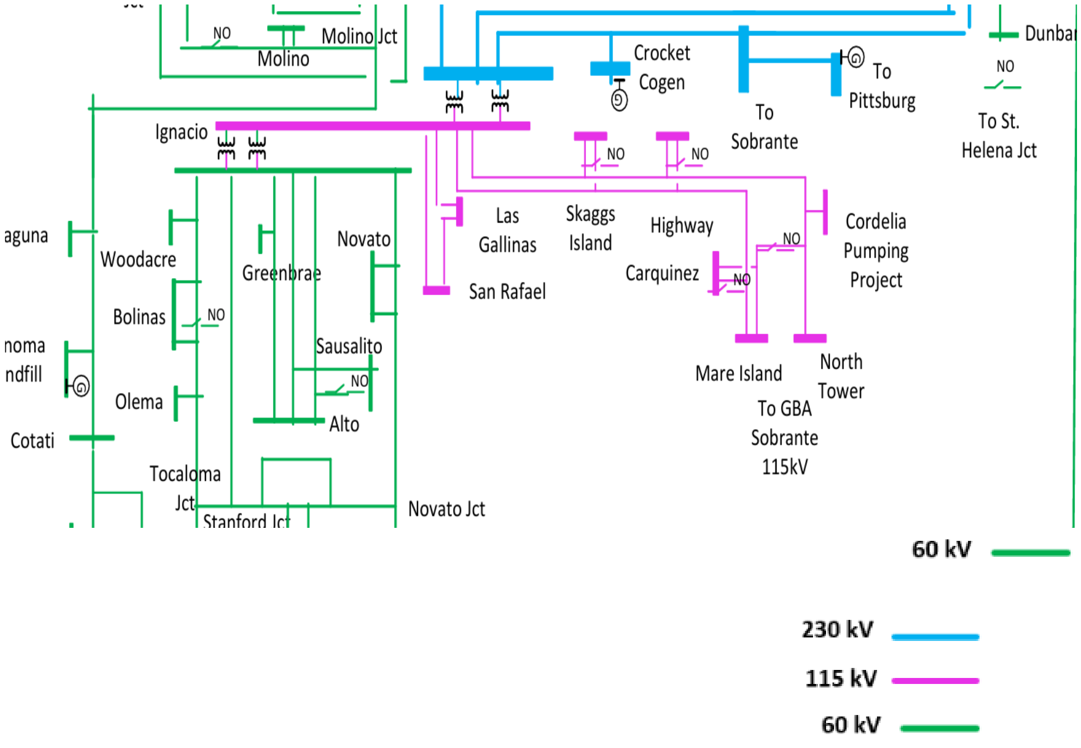
NCNB – Results Summary

<u>Observations</u>

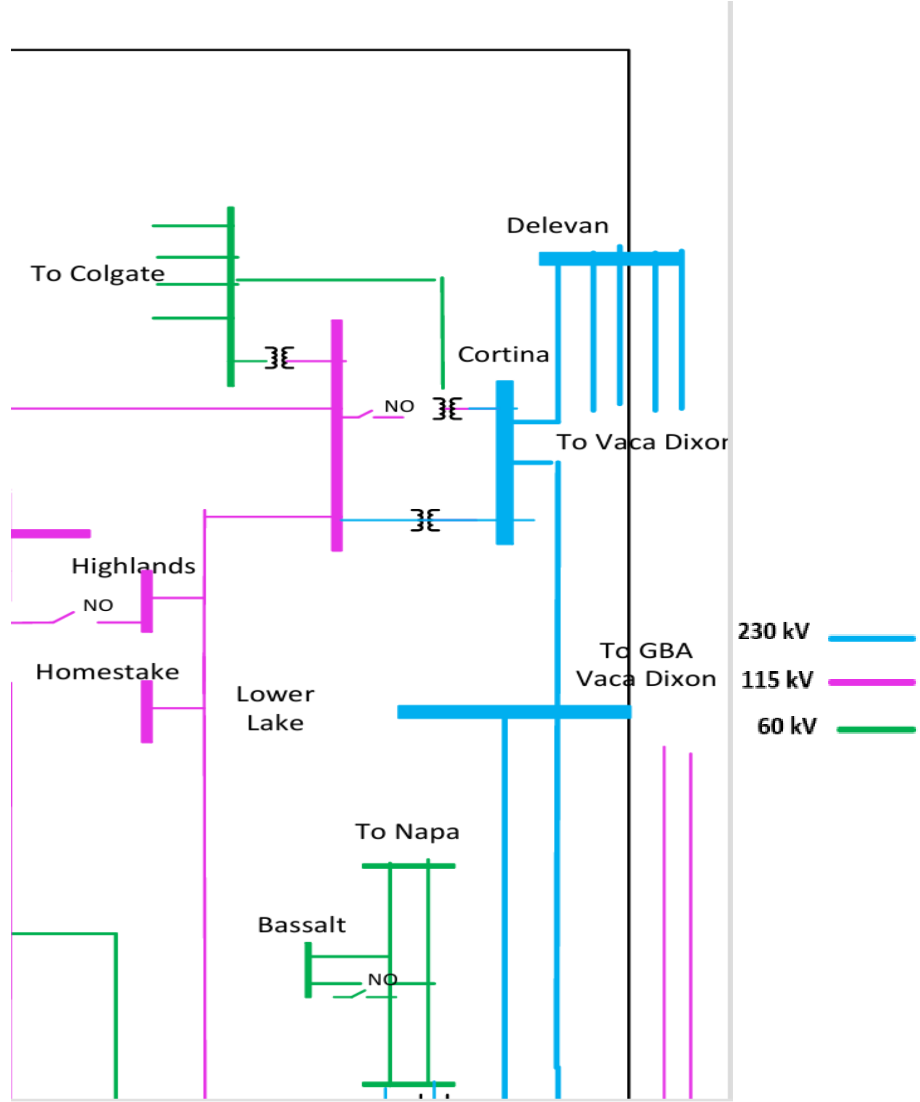
1. Ignacio-San Rafael #1 115 kV
   Overloads for a P6 contingency in short term only

<u>Approved and Potential Mitigations</u>

1. Maintenance project to reconductor Ignacio-Mare Island 115 kV



NCNB – Results Summary



Observations

1. Vaca-Lakeville #1 230 kV
   Overloads for a P3 contingency in short term and long term
2. Vaca-Parkway 230 kV
   Overloads for a P7 contingency in mid term only .

Approved and Potential Mitigations

1. Operating solution

NCNB – P5 Results Summary

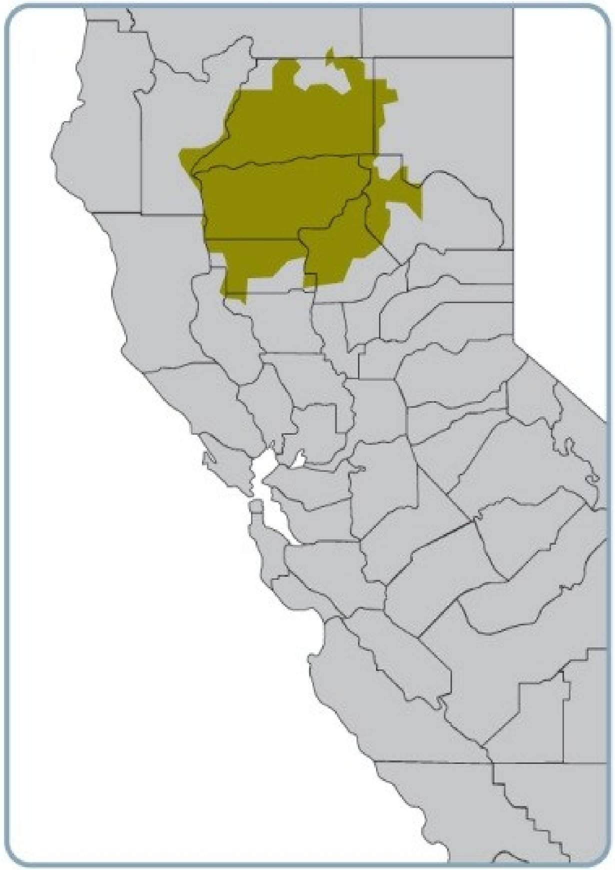
NERC Category	Contingency	Mitigation
P5	CLOVERDALE 115 KV (FAILURE OF NON-REDUNDANT RELAY)	Install redundant relay
P5	FULTON 230 KV BAAH BUS #1 (FAILURE OF NON-REDUNDANT RELAY)	In-flight
P5	MENDOCINO 115 KV BUS 1&2 (FAILURE OF NON-REDUNDANT RELAY)	Install redundant relay
P5	LAKEVILLE 230 KV BUS 1&2 SECTION E (FAILURE OF NON-REDUNDANT RELAY)	In-flight
P5	FULTON 230 KV BAAH BUS #2 (FAILURE OF NON-REDUNDANT RELAY)	In-flight
P5	EAGLE ROCK 115KV (FAILURE OF NON-REDUNDANT RELAY)	Install redundant relay
P5	FULTON BUS 115 KV 1 & 2 SECTION D (FAILURE OF NON-REDUNDANT RELAY)	In-flight
P5	FULTON BUS 115 KV 1 & 2 SECTION E/F (FAILURE OF NON-REDUNDANT RELAY)	In-flight
P5	STATION DC BATTERY SUPPLY EGLE ROCK 115-60KV BATT	Install redundant battery supply
P5	STATION DC BATTERY SUPPLY SILVERADO 115KV BATT	Install redundant battery supply

North Valley Area
Preliminary Reliability Assessment Results

Vignesh Subramanian
Regional Transmission Engineer

2026-2027 Transmission Planning Process Stakeholder Meeting
September 23-24, 2026

North Valley Area



- North Valley Area located in the NE corner of PG&E system
- Major cities: Chico, Redding, Red Bluff, Paradise
- Comprised of 60, 115 & 230 & 500 kV transmission facilities.
- Supply sources include Table Mountain, Cottonwood, and Palermo

Load and Load Modifier Assumptions - North Valley Area

Scenario	Study case	Description	Total Gross Load	BTM-PV Output	BTM-PV Installed Capacity	AAEE Load	AAFS load	AATE Load	Data Server Load (DS)	Known Loads (KL)	Total Net (Managed) Load	Total DR
Base	NVLY-2028-SP-SCRD.epc	2028 Summer peak load condition	875	56	505	-11	12	10	0	29	808	-22
	NVLY-2031-SP-SCRD.epc	2031 Summer peak load condition	932	59	539	-20	34	23	0	22	852	-25
	NVLY-2036-SP-SCRD.epc	2036 Summer peak load condition	1005	42	606	-33	54	49	0	21	929	0
	2028-SPOP-SCRD.epc	2028 Spring off-peak load condition	574	0	505	-21	10	9	0	0	553	-22
	2031-SPOP-SCRD.epc	2031 Spring off-peak load condition	411	350	539	-12	5	13	0	9	49	0
	2036-SOP-SCRD.epc	2036 Summer off-peak load condition	871	394	606	-27	12	71	0	19	450	-28
Sensitivity	2028-SPOP-HIRE-SCRD.epc	2028 Spring off-peak load with Hi-renewable dispatch sensitivity	574	0	505	-21	10	9	0	0	553	-22
	NVLY-2028-SP-HIRE-SCRD.epc	2028 Summer peak load with Hi-renewable dispatch sensitivity	861	500	505	-11	12	10	0	29	349	-22
	NVLY-2031-SP-HICEC-SCRD.epc	2031 Summer peak load condition with high-cec load sensitivity	932	59	539	0	34	23	0	22	872	-25

Generation Assumptions - North Valley Area

			Solar		Wind		Thermal		Geothermal		Hydro	
Scenario	**Study case**	**Description**	**Dispatch (MW)**	**Installed (MW)**	**Dispatch (MW)**	**Installed (MW)**	**Dispatch (MW)**	**Installed (MW)**	**Dispatch (MW)**	**Installed (MW)**	**Dispatch (MW)**	**Installed (MW)**
Base	**NVLY-2028-SP-SCRD.epc**	**2028 Summer peak load condition**	1	8	90	103	548	973	0	0	1118	1797
	NVLY-2031-SP-SCRD.epc	**2031 Summer peak load condition**	1	8	90	103	528	973	0	0	978	1797
	NVLY-2036-SP-SCRD.epc	**2036 Summer peak load condition**	20	328	33	103	768	973	147	151	998	1797
	2028-SPOP-SCRD.epc	**2028 Spring off-peak load condition**	0	8	0	103	351	973	0	0	771	1797
	2031-SPOP-SCRD.epc	**2031 Spring off-peak load condition**	5	8	74	103	140	973	0	0	287	1797
	2036-SOP-SCRD.epc	**2036 Summer off-peak load condition**	312	328	15	103	779	973	151	151	1339	1797
Sensitivity	**2028-SPOP-HIRE-SCRD.epc**	**2028 Spring off-peak load with Hi-renewable dispatch sensitivity**	0	8	0	103	421	973	0	0	662	1797
	NVLY-2028-SP-HIRE-SCRD.epc	**2028 Summer peak load with Hi-renewable dispatch sensitivity**	8	8	90	103	77	973	0	0	564	1797
	NVLY-2031-SP-HICEC-SCRD.epc	**2031 Summer peak load condition with high-cec load sensitivity**	1	8	90	103	647	973	0	0	978	1797

Previously approved transmission projects modelled in base cases

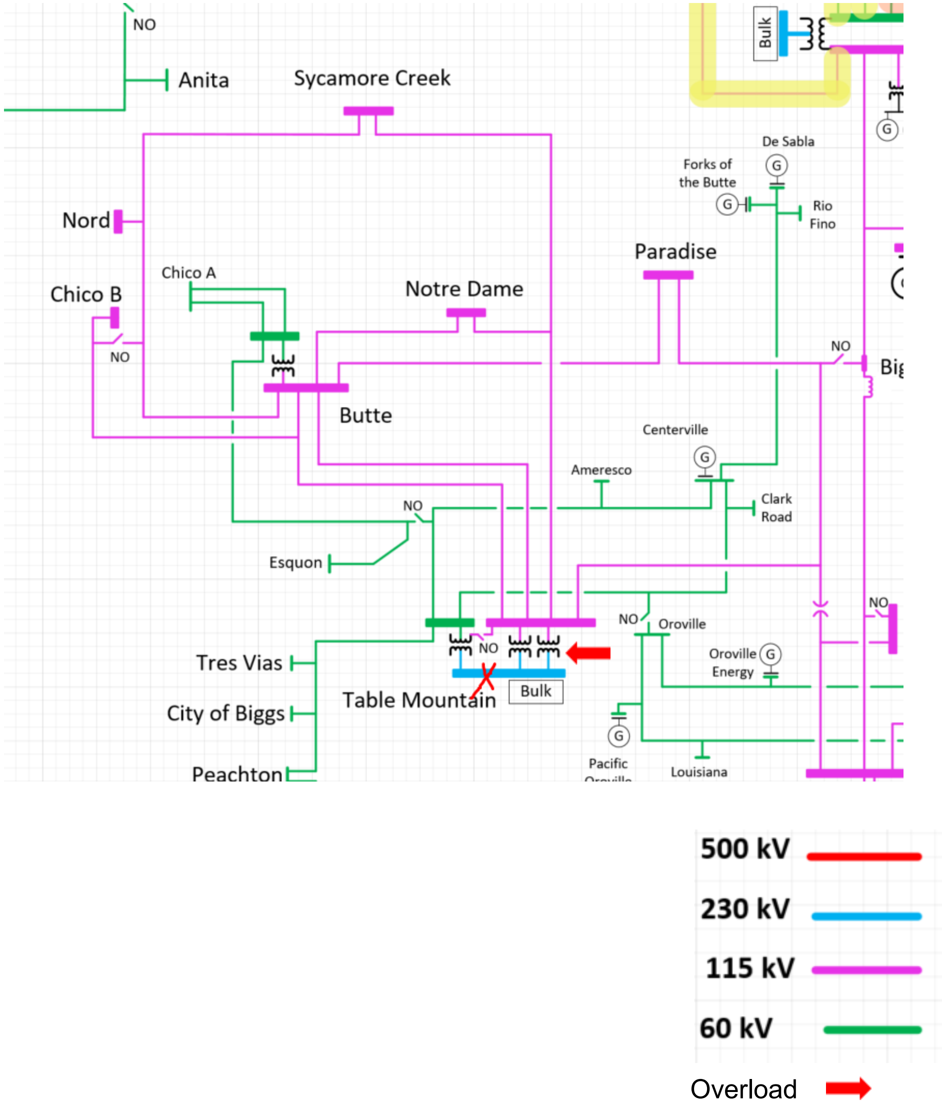
Project Name	Expected ISD modeled in TPP cases
Cascade 115/60 kV No.2 Transformer Project	Apr-2026
Cottonwood 115 kV Bus Sectionalizing Breaker	Aug-2028
Cottonwood 230/115 kV Transformers 1 and 4 Replacement Project	Oct-2028
Tyler 60 kV Shunt Capacitor	Mar-2028
Cortina 230/115/60 kV Transformer Bank No. 1 Replacement Project	Dec-2028
Red Bluff-Coleman 60 kV Reinforcement	Mar-2028

Reliability assessment preliminary results summary

NVLY – Results Summary

Observations

1. Table Mountain #3 230/115 kV Transformer
   Overloads for a NERC Category P2 contingency starting near term
2. Table Mountain 230/115 kV TB 4
   For a NERC Category P2 contingency starting near term for off peak case
3. Table Mountain -Butte #2 115 kV
   For a NERC Category P6 contingency starting near term
4. Table Mountain -Butte #1 115 kV
   For a NERC Category P6 contingency starting near term
5. Sycamore Creek-Norte Table Mountain 115 kV
   For a NERC Category P2 contingency starting short term



Potential Mitigations

1. Table Mountain 500/230kV Bank 5 RAS for 2028 and 2031 and beyond cases.
2. Redispatch Humboldt Gen

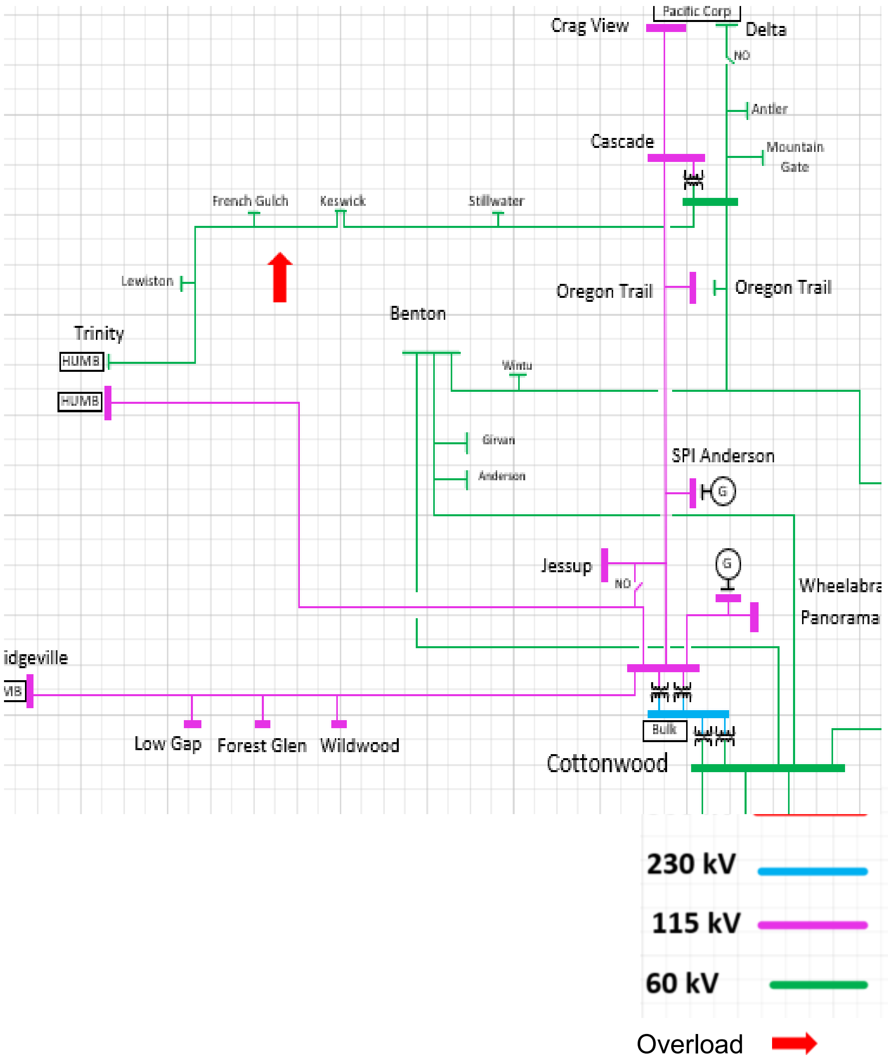
NVLY – Results Summary

Observations

1. Keswick-Cascade 60 kV
   - Divergence for a NERC Category P2
2. Keswick-Stillwater 60 kV line
   - Divergence for a NERC Category P2 contingency starting near term
3. Cascade 115/60 kV TB 60 kV line
   - Divergence for a NERC Category P2, P0 , P6 contingency starting near term

Potential Mitigations

- 1&2 Previously approved Cottonwood 115 kV bus sectionalizing breakers project will mitigate (P2)
- 1&2 Redispatch Humboldt Gen (P6)
- Phase shifter tap under review



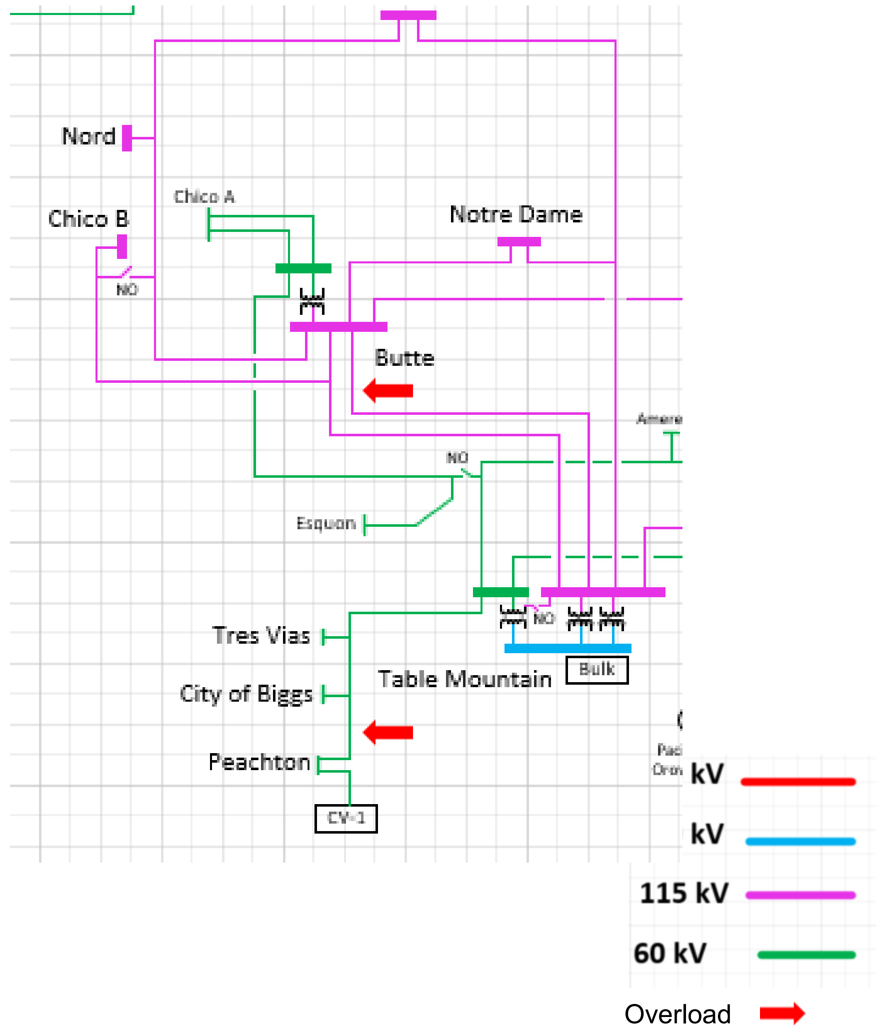
NVLY – Results Summary

<u>Observations</u>

1. Table Mountain -Butte #1 115 kV Line
   1. Divergence for a NERC Category P2-4, contingency starting near term
2. Table Mountain -Butte #2 115 kV Line
   1. Divergence for a NERC Category P2-4, contingency starting near term

<u>Potential Mitigations</u>

1,2 &3 Review Table Mountain RAS scope



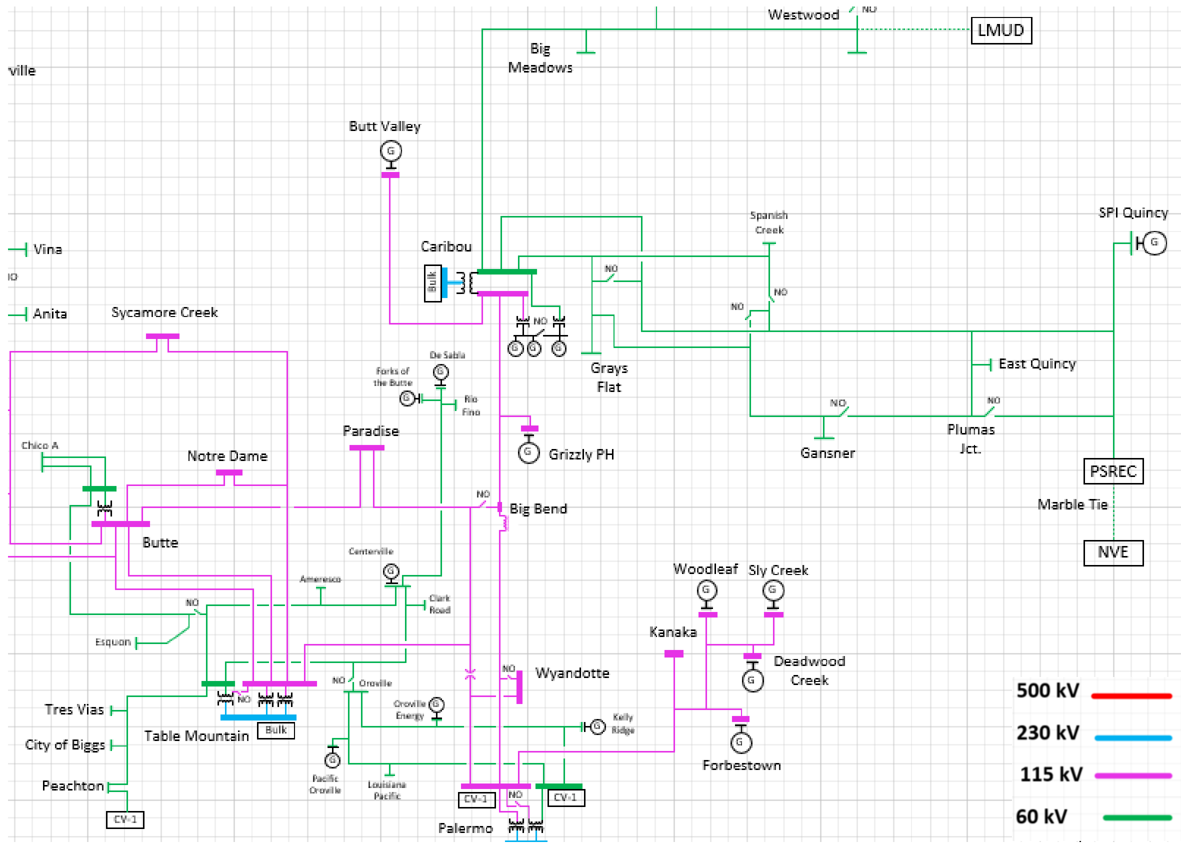
NVLY – Results Summary

<u>Observations</u>

1. P2 Table Mountain bus loss overloading 60 kV lines and in Caribou area
2. And low voltage in 60, 115 and 230 kV buses and in Caribou area.

<u>Potential Mitigations</u>

1&2 Review Caribou RAS scope expansion



NVLY – P5 Results Summary

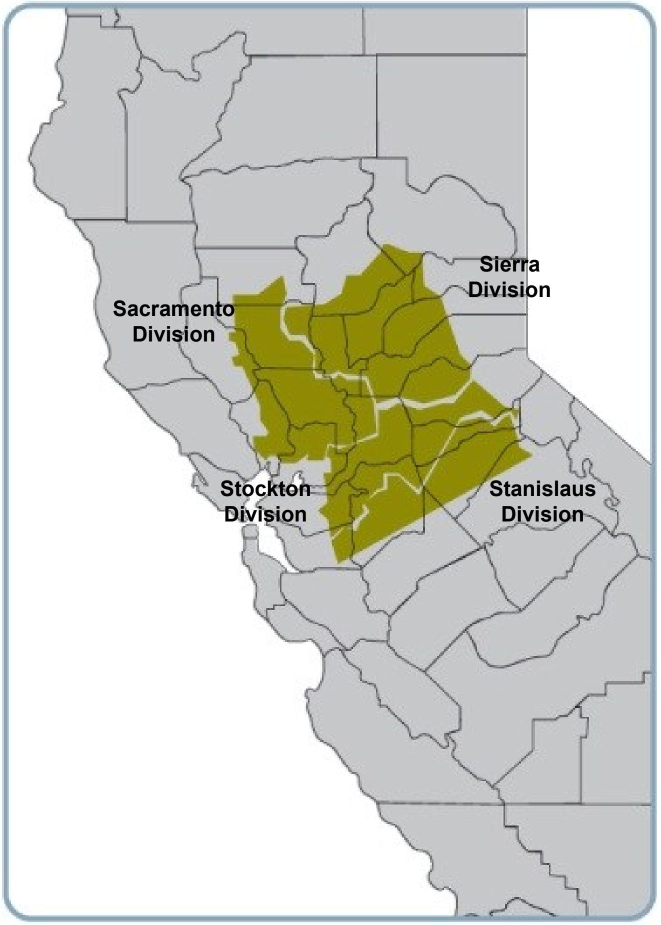
NERC Category	Contingency	Mitigation
P5	COTTONWOOD 115KV BUS 1/BUS 2 (FAILURE OF NON-REDUNDENT RELAY)	Redundant relay installation recommended in previous TPP cycles: Inflight
P5	COTTONWOOD 115KV BATT (FAILURE OF STATION DC BATTERY SUPPLY)	Redundant relay installation recommended in previous TPP cycles
P5	COTTONWOOD 230KV BUS SECTION E (FAILURE OF NON-REDUNDENT RELAY)	Redundant relay installation recommended in previous TPP cycles: Inflight
P5	COTTONWOOD 230KV BATT (FAILURE OF STATION DC BATTERY SUPPLY)	Install redundant battery supply recommended in previous TPP cycles
P5	ROUND MTN 500-230KV BATT (FAILURE OF STATION DC BATTERY SUPPLY)	Install redundant battery supply recommended in previous TPP cycles
P5	ROUND MOUNTAIN 230KV BUS 1 & 2 SEC. (FAILURE OF NON-REDUNDENT RELAY)	Redundant relay installation recommended in previous TPP cycles: Inflight
P5	FULTON BUS 115 KV 1 & 2 SECTION D (FAILURE OF NON-REDUNDANT RELAY)	Redundant relay installation recommended in previous TPP cycles: Inflight
P5	FULTON BUS 115 KV 1 & 2 SECTION E/F (FAILURE OF NON-REDUNDANT RELAY)	Redundant relay installation recommended in previous TPP cycles: Inflight

Central Valley Area
Preliminary Reliability Assessment Results

Patrick Hodgson
Regional Transmission Engineer-North

2026-2027 Transmission Planning Process Stakeholder Meeting
September 23-24, 2026

Central Valley Area



- The Central Valley Area covers the central part of the Sacramento Valley.
- The area is divided into four divisions:
  - Sacramento
  - Sierra
  - Stockton
  - Stanislaus
- Comprised of 60, 115 & 230 & 500 kV transmission facilities.
- Supply sources include Vaca Dixon, Rio Oso, Gold Hill, Atlantic, Brighton, Lockeford, Bellota

Load and Load Modifier Assumptions – Central Valley Area

Scenario	Study case	Description	Total Gross Load	BTM-PV Output	BTM-PV Installed Capacity	AAEE Load	AAFS load	AATE Load	Data Server Load (DS)	Known Loads (KL)	Total Net (Managed) Load	Total DR
Base	CVLY-2028-SP-SCRD.epc	2028 Summer peak load condition	4578	259	2353	-58	58	64	107	297	4203	-31
	CVLY-2031-SP-SCRD.epc	2031 Summer peak load condition	4974	275	2497	-110	172	152	102	295	4543	-34
	CVLY-2036-SP-SCRD.epc	2036 Summer peak load condition	5563	198	2867	-194	298	322	239	271	5135	-1
	2028-SPOP-SCRD.epc	2028 Spring off-peak load condition	2900	0	2353	-119	47	49	150	0	2780	-31
	2031-SPOP-SCRD.epc	2031 Spring off-peak load condition	1807	1623	2497	-64	29	82	34	127	95	0
	2036-SOP-SCRD.epc	2036 Summer off-peak load condition	4615	1863	2867	-155	65	446	69	236	2571	-40
Sensitivity	2028-SPOP-HIRE-SCRD.epc	2028 Spring off-peak load with Hi-renewable dispatch sensitivity	2900	0	2353	-119	47	49	150	0	2780	-31
	CVLY-2028-SP-HIRE-SCRD.epc	2028 Summer peak load with Hi-renewable dispatch sensitivity	4578	2330	2353	-58	58	64	107	297	2133	-31
	CVLY-2031-SP-HICEC-SCRD.epc	2031 Summer peak load condition with high-cec load sensitivity	4974	275	2497	0	172	152	102	295	4652	-34

Generation Assumptions – Central Valley Area

			Solar		Wind		Thermal		Battery		Geothermal		Hydro		Nuclear	
Scenario	**Study case**	**Description**	**Dispatch (MW)**	**Installed (MW)**	**Dispatch (MW)**	**Installed (MW)**	**Dispatch (MW)**	**Installed (MW)**	**Dispatch (MW)**	**Installed (MW)**	**Dispatch (MW)**	**Installed (MW)**	**Dispatch (MW)**	**Installed (MW)**	**Dispatch (MW)**	**Installed (MW)**
Base	**CVLY-2028-SP-SCRD.epc**	**2028 Summer peak load condition**	20	203	1230	1435	1260	1449	932	1154	0	0	1026	1421	0	0
	CVLY-2031-SP-SCRD.epc	**2031 Summer peak load condition**	19	188	1149	1435	1244	1449	1360	1365	0	0	1087	1421	0	0
	CVLY-2036-SP-SCRD.epc	**2036 Summer peak load condition**	11	188	422	1435	1259	1449	1306	1565	0	0	1069	1421	0	0
	2028-SPOP-SCRD.epc	**2028 Spring off-peak load condition**	0	203	1133	1435	660	1449	-895	1154	0	0	1215	1421	0	0
	2031-SPOP-SCRD.epc	**2031 Spring off-peak load condition**	111	188	951	1435	1168	1449	-1361	1365	0	0	951	1421	0	0
	2036-SOP-SCRD.epc	**2036 Summer off-peak load condition**	188	195	1342	1435	1449	1449	-551	1565	0	1419	1419	1421	0	0
Sensitivity	**2028-SPOP-HIRE-SCRD.epc**	**2028 Spring off-peak load with Hi-renewable dispatch sensitivity**	25	203	573	1435	806	1449	-495	1154	0	0	1046	1421	0	0
	CVLY-2028-SP-HIRE-SCRD.epc	**2028 Summer peak load with Hi-renewable dispatch sensitivity**	118	203	1147	1435	858	1449	-1095	1154	0	0	857	1421	0	0
	CVLY-2031-SP-HICEC-SCRD.epc	**2031 Summer peak load condition with high-cec load sensitivity**	19	188	1149	1435	1274	1449	1360	1365	0	0	1094	1421	0	0

Sacramento Division

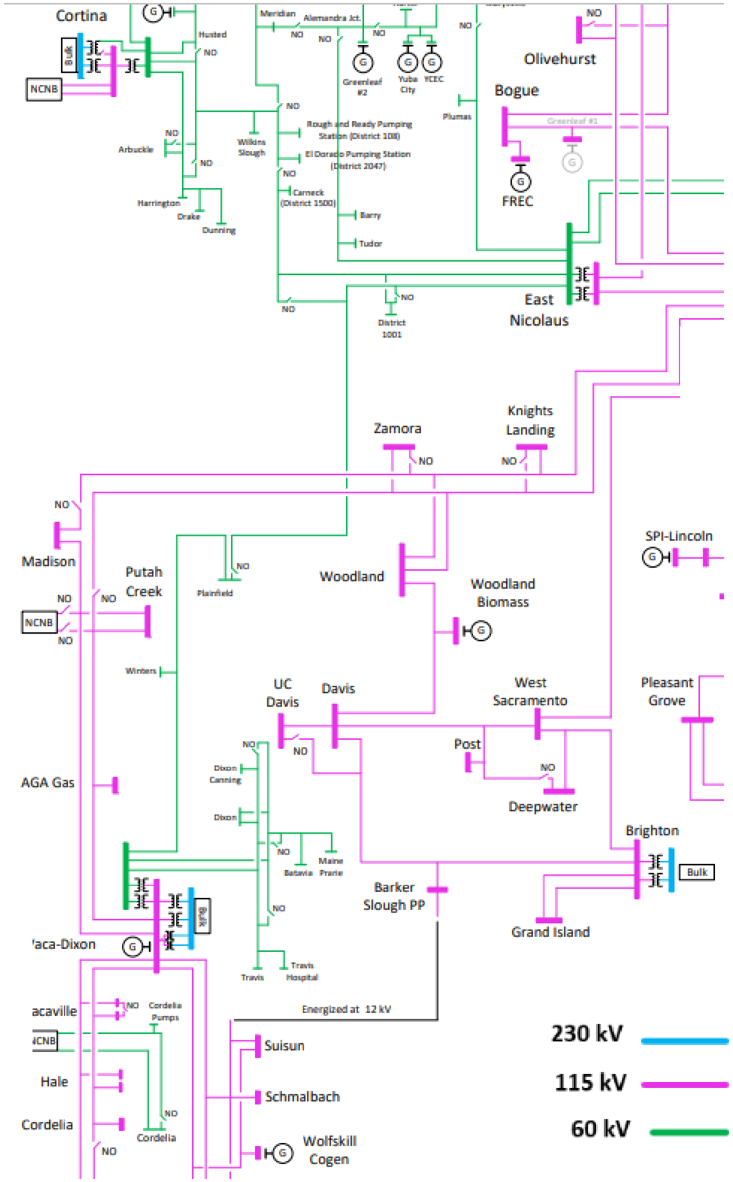
Projects in Sacramento Area

Approved TPP Projects	Expected ISD
Vaca-Plainfield 60 kV Line Reconductoring	Apr-2027
Vaca Dixon Area Reinforcement (INSTALL (2) CAPACITOR BANKS)	Nov-2027
Cortina #1 60 kV Line Reconductoring	May-2028
Cortina 230/115/60 kV Transformer Bank No. 1 Replacement Project	Dec-2028
Rio Oso - W. Sacramento Reconductoring	Sep-2029
Vaca Dixon-Lakeville 230 kV Corridor Series Compensation	May-2030
Cortina #3 60 kV Reconductoring	Dec-2031

Sacramento Results Summary

Operating Solution:

- Brighton-Davis 115 kV overloaded under P2, P6, P7
- Grand Island low voltage under P6
- Brighton 230 kV low voltage under P2



Sierra Division

Projects in Sierra Area

Approved TPP Projects	Expected ISD
Rio Oso Area 230 kV Voltage Support	Oct-2026
Atlantic tage Mitigation	Dec-2028
Gold Hill 230/115 kV Transformer Addition Project	Jan-2030
East Marysville 115/60 kV Project	Jan-2030
Reconductor Rio Oso–SPI Jct–Lincoln 115kV line	Feb-2030
Gold Hill-El Dorado Reinforcement	May-2032
Lincoln-Pleasant Grove 115 kV Reconductoring Project	Jan-2034
Drum - Higgins 115 kV Line Reconductoring	Jan-2034

Sierra Results Summary

Gold Hill 230/115 kV Transformer Addition:
- 115 kV area thermal overloads
- 115 kV and 60 kV area low voltages

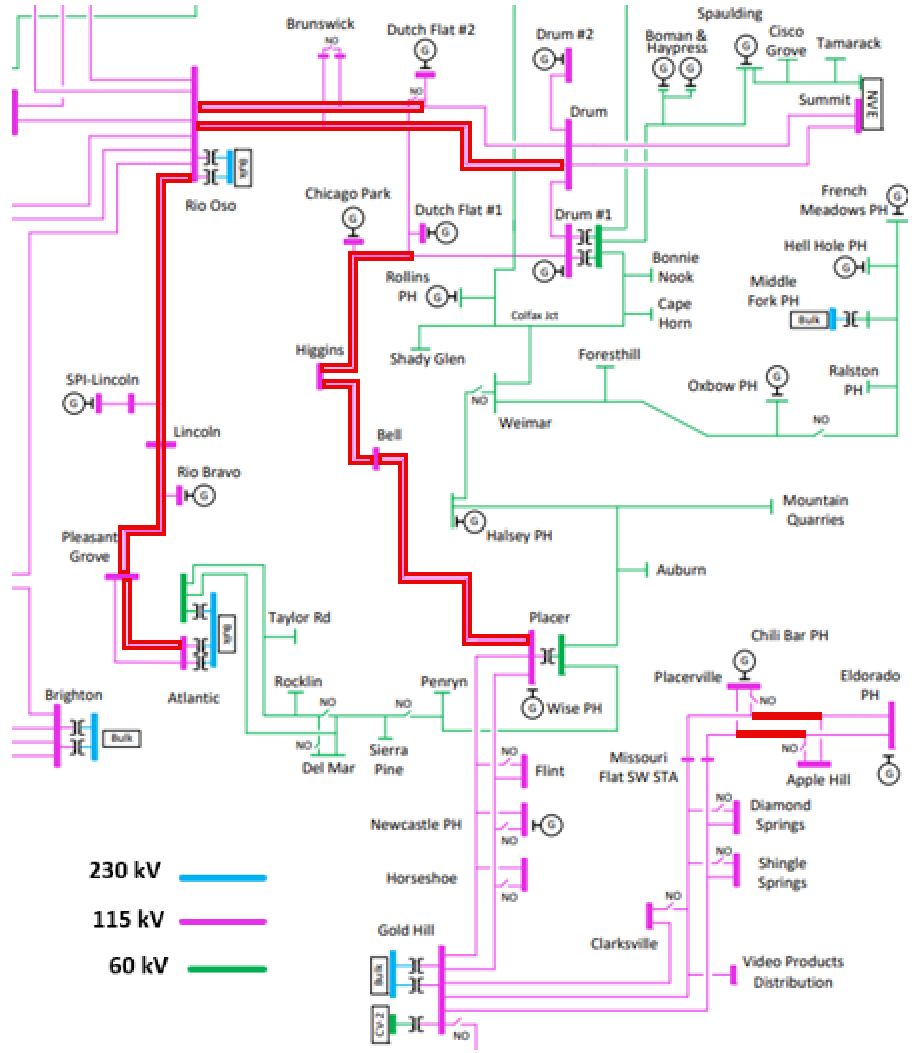
Gold Hill-El Dorado Reinforcement:
- El Dorado-Missouri Flat #1, #2 115 kV overloads
- 115 kV area low voltages

Lincoln-Pleasant Grove 115 kV Reconductoring:
- Lincoln-Pleasant Grove 115 kV thermal overloads

Reconductor Rio Oso–SPI Jct–Lincoln 115kV line:
- Rio Oso-Lincoln-SPI Lincoln 115 kV thermal overloads
    - Under review

Drum-Higgins 115 kV Line Reconductoring:
- Drum-Higgins 115 kV thermal overloads

Under review
- Atlantic-Pleasant Grove #2 115 kV overloaded under P6
- Higgins 115 kV low voltage under P7
- Placer 115 kV low voltage under P6, P7
- Weimar 60 kV low voltage under P3



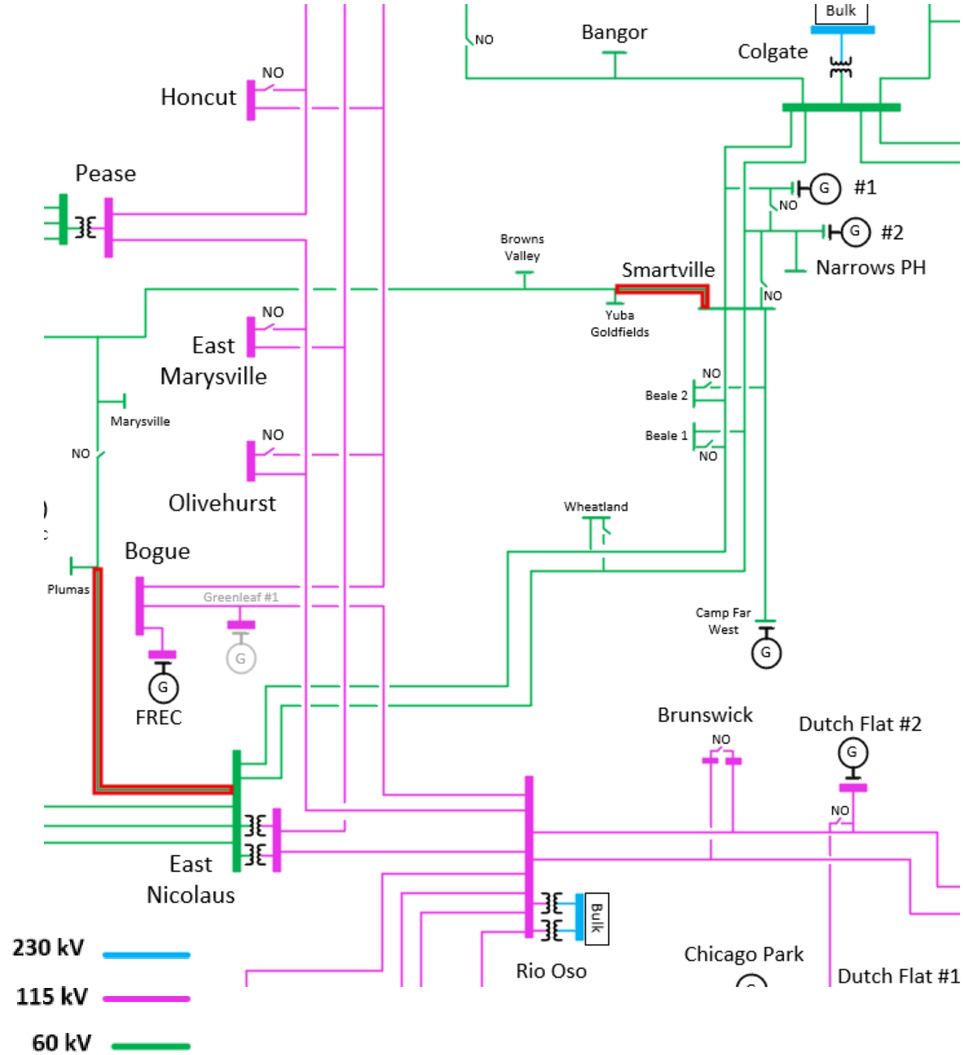
Sierra Results Summary

East Marysville 115/60 kV:

- Nicolaus-Marysville 60 kV thermal overloads

Under review

- Nicolaus-Marysville 60 kV overloaded under P1
- Smartville-Marysville 60 kV overloaded under P1



Stockton/Stanislaus (Tesla – Bellota) Divisions

Projects in Stockton/Stanislaus Area

Approved TPP Projects	Expected ISD
Vierra 115 kV Looping Project	In-service
Mosher Transmission Project	Aug-2027
Manteca-Ripon-Riverbank-Melones Area 115 kV Line Reconductoring Project	Sep-2027
Tesla 115 kV Bus Reconfiguration Project	Dec-2027
Banta 60 kV Bus Voltage Conversion	Jan-2028
French Camp Reinforcement	May-2030
Weber-Mormon Jct 60 kV Line Section Reconductoring Project	May-2031
Lockeford-Lodi Area 230 kV Development	Jun-2031

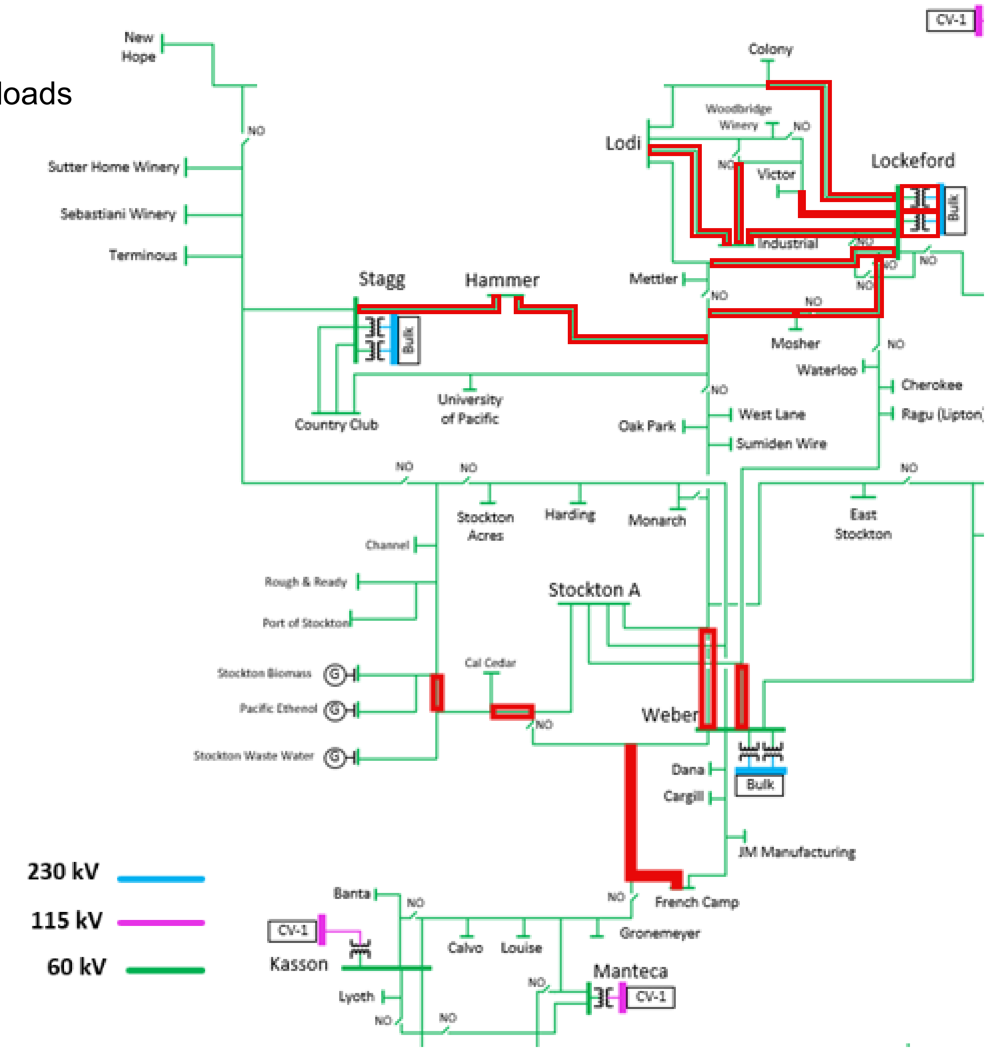
Stockton/Stanislaus Results Summary

Lockeford-Lodi Area 230 kV Development:
- Lockeford-Bellota 230 kV, Rio Oso-Lockeford 230 kV overloads
- Lockeford 230/60 kV TB 2, TB 3 overloads
- 60 kV area lines overloads
- 230 kV and 60 kV area low voltages

French Camp Reinforcement:
- Weber-French Camp #2 60 kV overloaded under P1

Mosher Transmission Project
- 60 kV thermal overloads area low voltages

Under Review
- Hammer-Country Club 60 kV overloaded under P1
- Stockton A-Channel 60 kV overloaded under P1, P3
- Stockton A-Weber #1 60 kV overloaded under P3
- Weber E-Stockton A-Sumiden 60 kV overloaded under P3



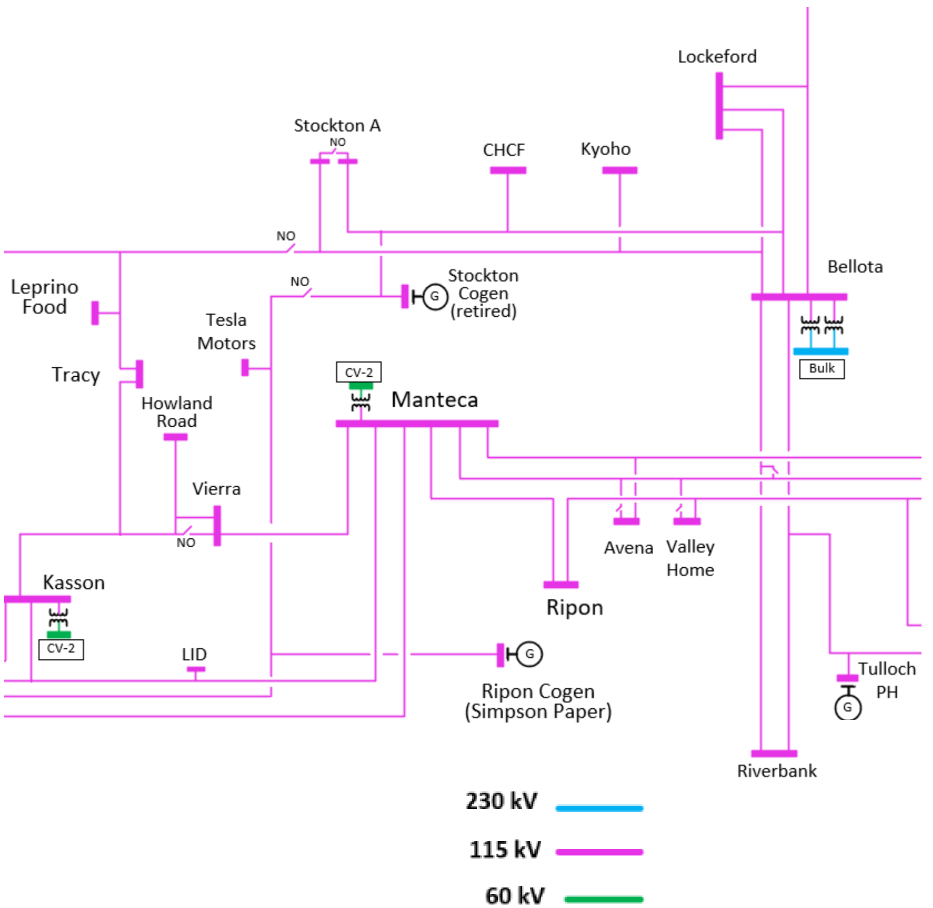
Stockton/Stanislaus Results Summary

Manteca-Ripon-Riverbank-Melones Area 115 kV Line Reconductoring Project
- 115 kV area overloads

Tesla - Newark 230 kV Line No. 2 Reconductoring:
- Tesla-Newark #2 230 kV overloads

Potential Line Capacity Increase:
- Banta-Tracy 115 kV overloaded under P1, P2

Under Review:
- Riverbank-Ripon 115 kV overloaded under P2
- Stockton A-Lockeford-Bellota #2 115 kV overloaded under P2
- Tiger Creek-Electra 230 kV overloaded under P2
- Tiger Creek 230 kV low voltage under P2
- Valley Springs 230 kV low voltage under P1, P2, P6



P5 Results Summary

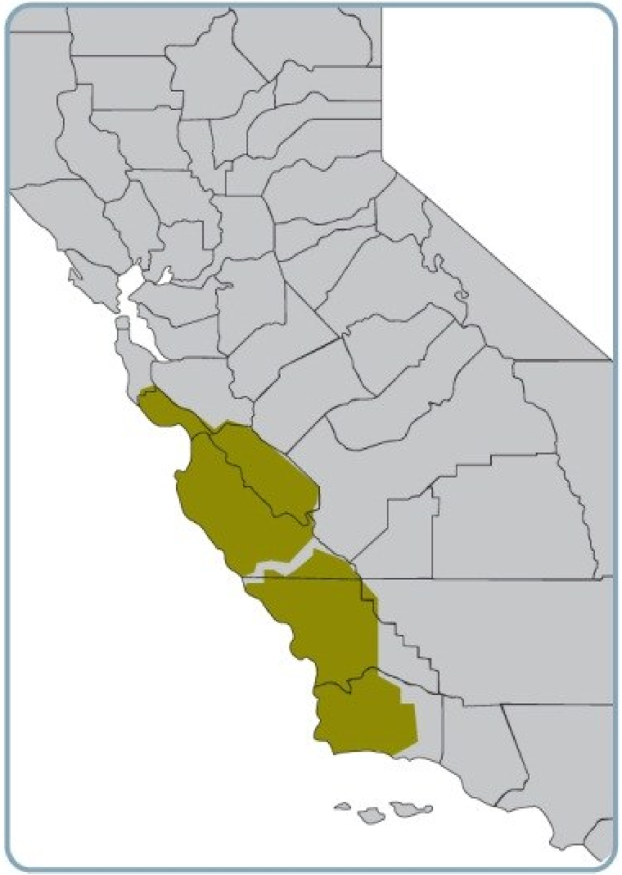
TESLA 230-115KV BATT(FAILURE OF NON-REDUNDANT BATT)	Install redundant battery
TESLA 115KV BUS (FAILURE OF NON-REDUNDANT RELAY)	Inflight
LEPRINO 115KV BATT(FAILURE OF NON-REDUNDANT BATT)	Install redundant battery
GOLD HILL 230 KV BUS (FAILURE OF NON-REDUNDANT RELAY)	Inflight
RIO OSO 230-115KV BATT(FAILURE OF NON-REDUNDANT BATT)	Install redundant battery
BELLOTA 230-115KV BATT(FAILURE OF NON-REDUNDANT BATT)	Install redundant battery
STAGG 230KV BUS (FAILURE OF NON-REDUNDANT RELAY)	Install redundant relay
STUCK BREAKER & NO BF RELAY STAGG 230 KV CB252	Install redundant relay
LOCKEFORD 230-115-60KV BATT(FAILURE OF NON-REDUNDANT BATT)	Install redundant battery
STAGG 230-60KV BATT(FAILURE OF NON-REDUNDANT BATT)	Install redundant battery
KASSON 115KV BUS (FAILURE OF NON-REDUNDANT RELAY)	Inflight
SCHULTE SW STA 115KV BATT(FAILURE OF NON-REDUNDANT BATT)	Install redundant battery
PEASE 115-60KV BATT(FAILURE OF NON-REDUNDANT BATT)	Install redundant battery
RIO OSO 115 KV BUS (FAILURE OF NON-REDUNDANT RELAY)	Install redundant relay
TESLA 500KV BATT(FAILURE OF NON-REDUNDANT BATT)	Install redundant battery
EAST NICOLAUS 115-60KV BATT(FAILURE OF NON-REDUNDANT BATT)	Install redundant battery
BRIGHTON 230KV BUS (FAILURE OF NON-REDUNDANT RELAY)	Install redundant relay
STATION DC BATTERY SUPPLY BRIGHTON 230KV BATT	Install redundant battery
STATION DC BATTERY SUPPLY ZAMORA 115KV BATT	Install redundant battery
STUCK BREAKER & NO BF RELAY GOLD HILL 115KV CB 172 OR 392	Install redundant relay
GOLD HILL 115 KV BUS (FAILURE OF NON-REDUNDANT RELAY)	Inflight
GOLD HILL 230-115-60KV BATT(FAILURE OF NON-REDUNDANT BATT)	Install redundant battery

Central Coast and Los Padres Area Preliminary Reliability Assessment Results

Rahul Iyer
Regional Transmission Engineer

2026-2027 Transmission Planning Process Stakeholder Meeting
September 23-24, 2026

Central Coast/ Los Padres Area



- Central Coast is located south of the Greater Bay Area, it extends along the central coast from Santa Cruz to King City
- Major substations in Central Coast: Moss Landing, Green Valley, Paul Sweet, Salinas, Watsonville, Monterey, Crazy Horse Canyon, Soledad and Hollister
- Central Coast supply sources: Moss Landing, Panoche, King City and Monta Vista
- Central Coast transmission system includes 60, 115, 230 and 500 kV facilities
- Los Padres is located south of the Central Coast Division
- Major substations in Los Padres : Paso Robles, Atascadero, Morro Bay, San Luis Obispo, Mesa, Divide, Santa Maria and Sisquoc
- Key supply sources in Los Padres include Gates, Midway and Morro Bay
- Diablo Canyon nuclear power plant (2400 MW) is located in Los Padres but does not serve the area
- Los Padres transmission system includes 70, 115, 230 and 500 kV facilities

Load and Load Modifier Assumptions – Central Coast/ Los Padres Area

Scenario	Study case	Description	Total Gross Load	BTM-PV Output	BTM-PV Installed Capacity	AAEE Load	AAFS load	AATE Load	Data Server Load (DS)	Known Loads (KL)	Total Net (Managed) Load	Total DR
Base	CCLP-2028-SP-SCRD.epc	2028 Summer peak load condition	1848	84	761	-21	15	41	0	264	1703	-9
	CCLP-2031-SP-SCRD.epc	2031 Summer peak load condition	1916	89	801	-37	44	98	0	270	1763	-10
	CCLP-2036-SP-SCRD.epc	2036 Summer peak load condition	2117	64	914	-61	64	211	0	252	1974	-1
	2028-SPOP-SCRD.epc	2028 Spring off-peak load condition	1073	0	761	-42	13	29	0	0	1031	-9
	2028-WP-SCRD.epc	2028 Winter peak load condition	1228	0	761	-35	15	35	0	0	1194	-9
	2031-WP-SCRD.epc	2031 Winter peak load condition	1761	72	801	-37	133	190	0	172	1647	0
	2041-WP-SCRD.epc	2041 Winter peak load condition	2376	82	1011	-83	424	612	0	147	2207	0
	2031-SPOP-SCRD.epc	2031 Spring off-peak load condition	938	520	801	-33	12	68	0	116	374	0
	2036-SOP-SCRD.epc	2036 Summer off-peak load condition	2104	597	914	-64	21	362	0	220	1430	-11
Sensitivity	2028-SPOP-HIRE-SCRD.epc	2028 Spring off-peak load with Hi-renewable dispatch sensitivity	1073	0	761	-42	13	29	0	0	1031	-9
	CCLP-2028-SP-Hire-SCRD.epc	2028 Summer peak load with Hi-renewable dispatch sensitivity	1822	753	761	-21	15	41	0	264	1007	-9
	CCLP-2031-SP-Hicec-SCRD.epc	2031 Summer peak load condition with high-cec load sensitivity	1916	89	801	0	44	98	0	270	1800	-10

Generation Assumptions - Central Coast/ Los Padres Area

			Solar		Wind		Thermal		Battery		Nuclear	
Scenario	Study case	Description	Dispatch (MW)	Installed (MW)	Dispatch (MW)	Installed (MW)	Dispatch (MW)	Installed (MW)	Dispatch (MW)	Installed (MW)	Dispatch (MW)	Installed (MW)
Base	CCLP-2028-SP-SCRD.epc	2028 Summer peak load condition	83	857	0	101	815	1315	42	302	2380	2400
	CCLP-2031-SP-SCRD.epc	2031 Summer peak load condition	86	857	14	101	563	1315	245	302	0	2400
	CCLP-2036-SP-SCRD.epc	2036 Summer peak load condition	14	2282	0	101	23	1315	245	357	0	2400
	2028-WP-SCRD.epc	2028 Winter peak load condition	0	857	52	101	1295	1315	100	302	160	2400
	2031-WP-SCRD.epc	2031 Winter peak load condition	445	857	0	101	1078	1315	-35	302	0	2400
	2041-WP-SCRD.epc	2041 WInter peak load condition	919	2282	0	101	633	1315	93	422	0	2400
	2028-SPOP-SCRD.epc	2028 Spring off-peak load condition	0	857	94	101	929	1315	0	302	2380	2400
	2031-SPOP-SCRD.epc	2031 Spring off-peak load condition	492	857	0	101	0	1315	-301	302	0	2400
	2036-SOP-SCRD.epc	2036 Summer off-peak load condition	703	2282	15	101	740	1315	-163	477	0	2400
Sensitivity	2028-SPOP-HIRE-SCRD.epc	2028 Spring off-peak load with Hi-renewable dispatch sensitivity	0	857	47	101	195	1315	0	302	2380	2400
	CCLP-2028-SP-Hire-SCRD.epc	2028 Summer peak load with Hi-renewable dispatch sensitivity	497	857	88	101	195	1315	-115	302	2380	2400
	CCLP-2031-SP-Hicec-SCRD.epc	2031 Summer peak load condition with high-cec load sensitivity	86	857	12	101	373	1315	273	302	0	2400

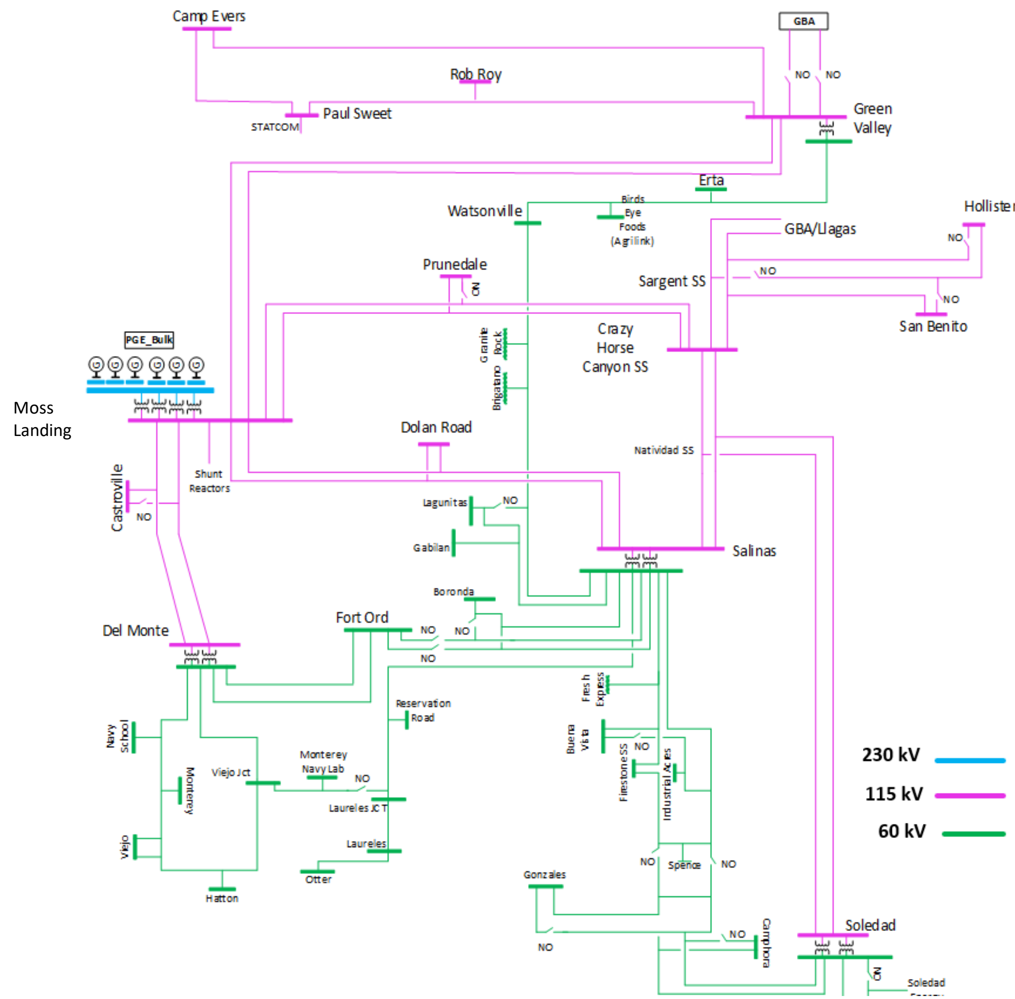
Previously approved transmission projects modelled in base cases

Project Name	Expected In-service Date
Coburn-Oil Fields 60 kV system project	Sep 2031
Crazy Horse Canyon - Salinas - Soledad #1 and #2 115 kV Line Reconductoring	Apr 2030
Diablo Canyon Area 230 kV Voltage Mitigation	Apr 2030
Estrella Substation Project	Mar 2029
Mesa 230/115 kV Spare Transformer	Mar 2029
Morgan Hill Area Reinforcement (formerly Spring 230/115 kV substation)	Jan 2029
Moss Landing – Las Aguilas 230 kV Series Reactor Project	May 2034
Salinas Area Reinforcement	Dec 2032
South of Mesa Upgrade	Dec 2031
San Miguel New 70 kV Line	May 2032

Central Coast - Results Summary

Observations (Thermal):

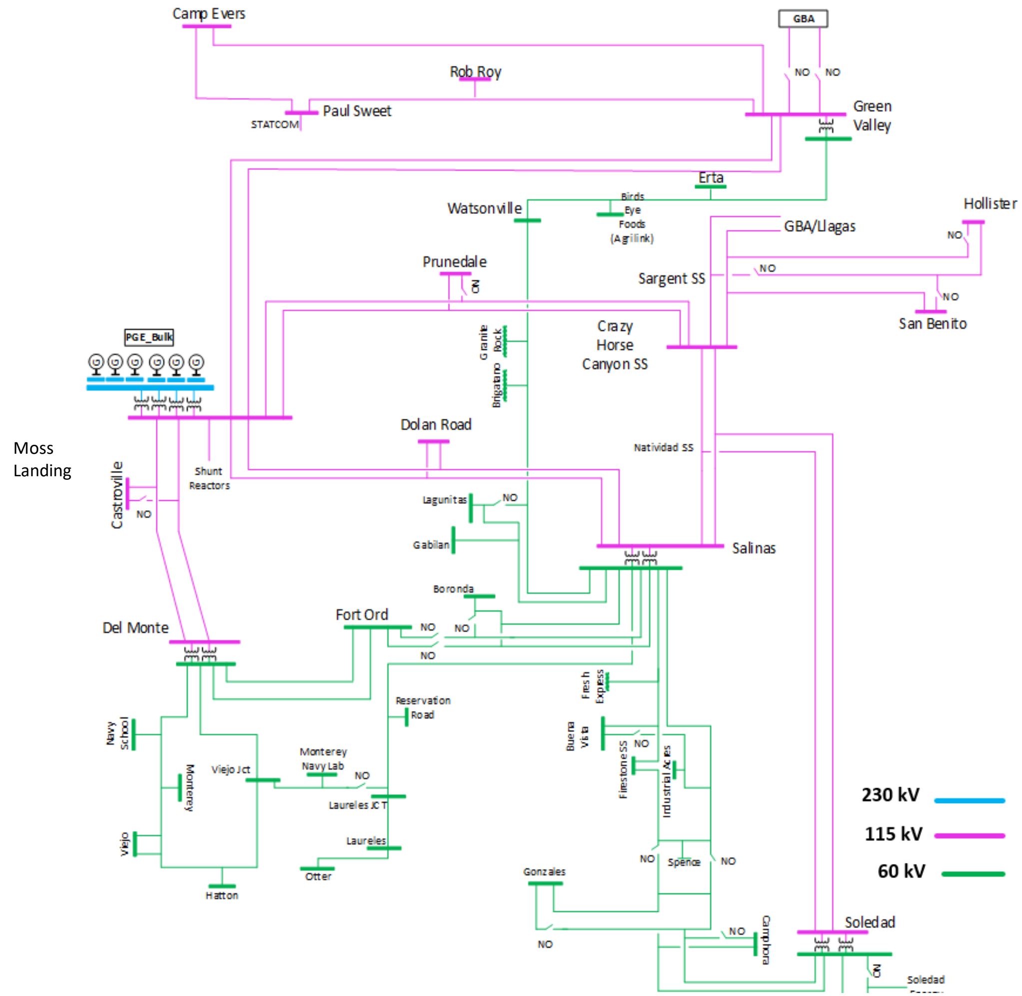
- P1, P2, P3, P6 thermal overloads on Green Valley-Paul Sweet & Green Valley-Camp Evers 115 kV Lines in all years.
- P1, P2, P3 thermal overloads on Moss Landing-Green Valley #2 115 kV line in near term and long term years.



Central Coast - Results Summary

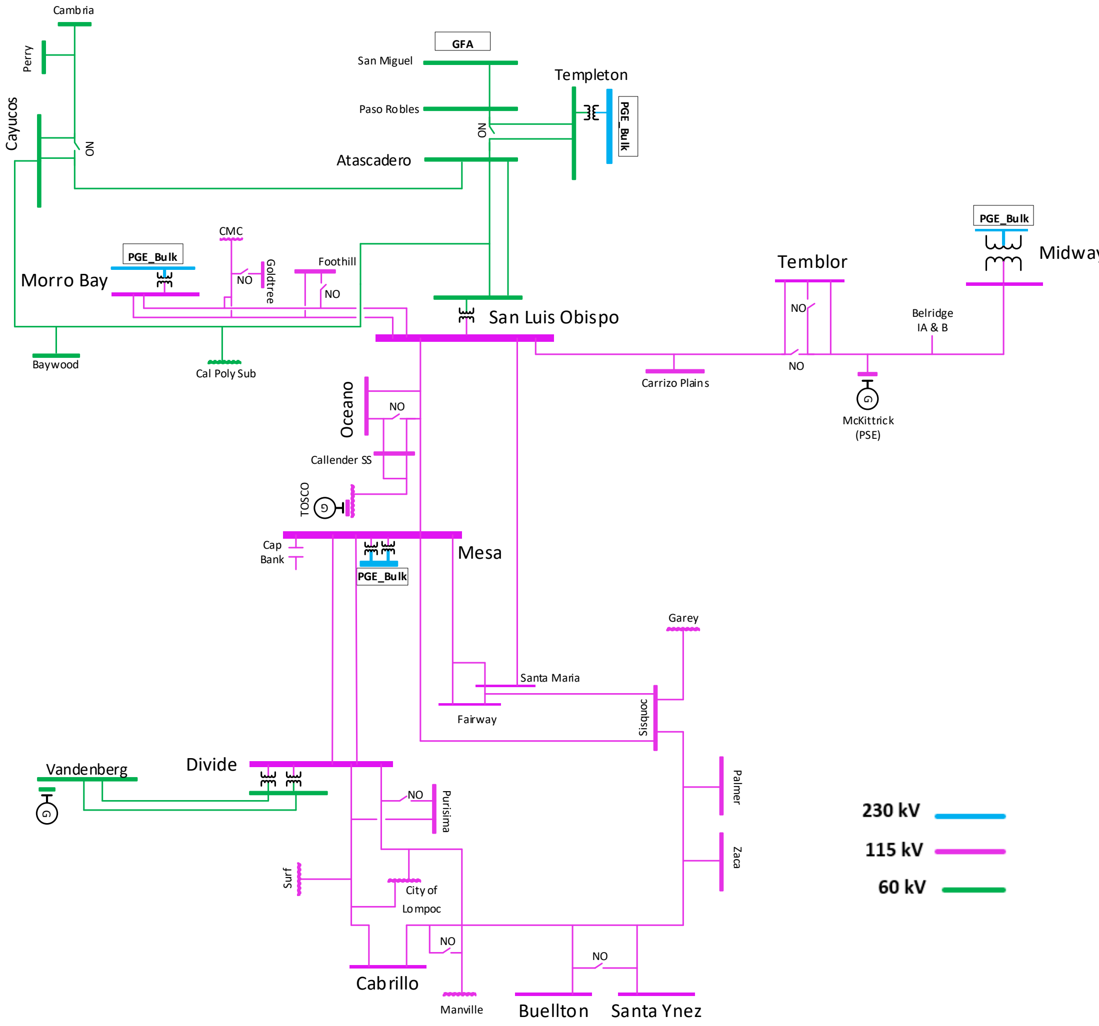
Observations (Thermal):

- P1, P2, P3, P6 thermal overloads on Moss Landing-Del Monte #1 & #2 115 kV lines in mid-term and long term
- P1, P3 thermal overloads on Del Monte – Fort Ord #1 & #2 60 kV line in mid-term and long term.



Los Padres - Results Summary

- P1, P2, P3, P6, P7 thermal overloads on Mesa – Callendar Switching Station 115 kV in all years.
- P1, P2, P3, P6, P7 thermal overloads on Mesa – Santa Maria 115 kV across all years.
- P6, P7 thermal overloads on Mesa - Sisquoc 115 kV in all years.



Central Coast/ Los Padres – P5 Results Summary

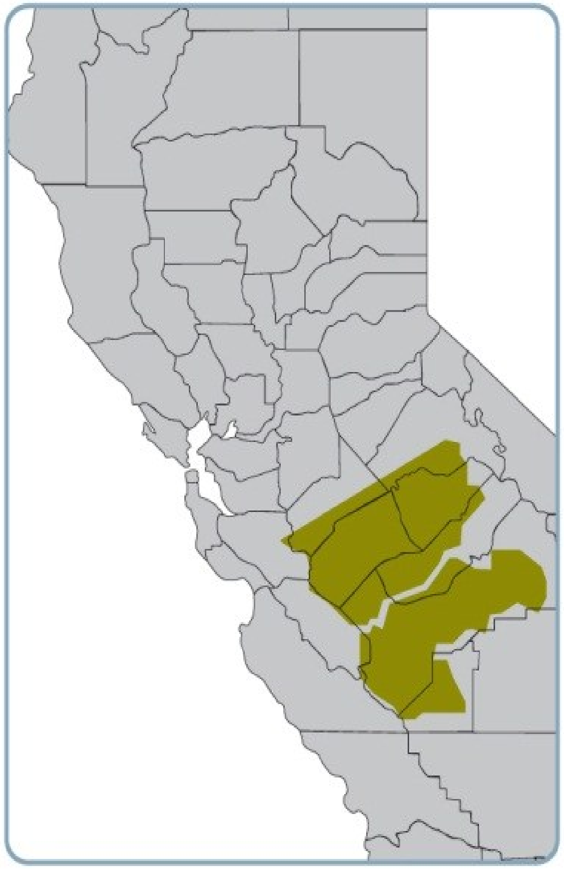
NERC Category	Contingency	Mitigation
P5	CASTROVILLE 115KV BATT(FAILURE OF NON-REDUNDENT BATT)	Install redundant battery supply
P5	MESA 230 KV BAAH BUS #1 OR #2 (FAILURE OF NON-REDUNDENT RELAY)	In flight
P5	MESA 230-115KV BATT(FAILURE OF NON-REDUNDENT BATT)	Install redundant battery supply
P5	MORRO BAY 115KV BUS (FAILURE OF NON-REDUNDENT RELAY)	Install redundant relay
P5	MORRO BAY 230KV BUS (FAILURE OF NON-REDUNDENT RELAY)	Redundant relay installation recommended in 2020-2021 TPP: In flight
P5	MORRO BAY SW 230-115KV BATT(FAILURE OF NON-REDUNDENT BATT)	Redundant battery supply installation recommended in 2022-2023 TPP
P5	MOSS LANDING 230-115KV BATT(FAILURE OF NON-REDUNDENT BATT)	Redundant battery supply installation recommended in 2022-2023 TPP
P5	NO BF RELAY MORRO BAY 115KV CB 112 OR 122	Install redundant relay
P5	NO BF RELAY SAN LUIS OBISPO 115KV CB 112 132 142 152 OR 162	Install redundant relay
P5	SALINAS 115KV BAAH BUS #1 OR #2 (FAILURE OF NON-REDUNDENT RELAY)	Redundant relay installation recommended in 2018-2019 TPP: In flight
P5	SAN LUIS OBISPO 115KV BUS (FAILURE OF NON-REDUNDENT RELAY)	Install redundant relay
P5	SOLAR SW STA 230KV BATT(FAILURE OF NON-REDUNDENT BATT)	Install redundant battery supply
P5	TEMPLETON 230-70KV BATT(FAILURE OF NON-REDUNDENT BATT)	Install redundant battery supply
P5	Rob Roy 115kV BATT(FAILURE OF NON-REDUNDENT BATT)	Continue to Monitor

Greater Fresno Area
Preliminary Reliability Assessment Results

Preethi Rondla
Regional Transmission Engineer Lead

2026-2027 Transmission Planning Process Stakeholder Meeting
September 23-24, 2026

Greater Fresno Area



- Service areas cover Fresno, Kings, Tulare and Madera counties
- Supply Sources: Gates, Los Banos and Wilson and Manning*
- Comprised of 70,115, 230 & 500 kV transmission facilities

Load and Load Modifier Assumptions - Greater Fresno Area

Scenario	Study case	Description	Total Gross Load	BTM-PV Output	BTM-PV Installed Capacity	AAEE Load	AAFS load	AATE Load	Data Server Load (DS)	Known Loads (KL)	Total Net (Managed) Load	Total DR
Base	GFA-2028-SP-SCRD.epc	2028 Summer peak load condition	3673	248	2255	-50	51	29	0	167	3350	-30
	GFA-2031-SP-SCRD.epc	2031 Summer peak load condition	4378	262	2384	-93	149	69	484	180	3984	-31
	GFA-2036-SP-SCRD.epc	2036 Summer peak load condition	4694	190	2739	-149	220	157	509	176	4313	0
	2028-SPOP-SCRD.epc	2028 Spring off-peak load condition	2382	0	2255	-103	40	25	0	0	2279	-30
	2031-SPOP-SCRD.epc	2031 Spring off-peak load condition	1438	1550	2384	-46	17	39	108	78	-185	0
	2036-SOP-SCRD.epc	2036 Summer off-peak load condition	3780	1780	2739	-129	48	217	319	153	1826	-30
Sensitivity	2028-SPOP-HIRE-SCRD.epc	2028 Spring off-peak load with Hi-renewable dispatch sensitivity	2382	0	2255	-103	40	25	0	0	2279	-30
	GFA-2028-SP-HIRE-SCRD.epc	2028 Summer peak load with Hi-renewable dispatch sensitivity	3673	2233	2255	-50	51	29	0	0	1365	-30
	GFA-2031-SP-HICEC-SCRD.epc	2031 Summer peak load condition with high-cec load sensitivity	4378	262	2384	0	149	69	484	180	4077	-31

Generation Assumptions - Greater Fresno Area

			Solar		Wind		Thermal		Battery		Geothermal		Hydro	
Scenario	Study case	Description	Dispatch (MW)	Installed (MW)	Dispatch (MW)	Installed (MW)	Dispatch (MW)	Installed (MW)	Dispatch (MW)	Installed (MW)	Dispatch (MW)	Installed (MW)	Dispatch (MW)	Installed (MW)
Base	GFA-2028-SP-SCRD.epc	2028 Summer peak load condition	544	5458	67	90	1150	1379	1061	2546	0	0	1762	1922
	GFA-2031-SP-SCRD.epc	2031 Summer peak load condition	518	5640	67	90	1079	1379	2610	2685	0	0	1842	1922
	GFA-2036-SP-SCRD.epc	2036 Summer peak load condition	453	8319	0	90	1070	1379	3393	4605	120	150	1828	1922
	2028-SPOP-SCRD.epc	2028 Spring off-peak load condition	0	5458	71	90	1303	1379	-254	2546	0	0	-333	1922
	2031-SPOP-SCRD.epc	2031 Spring off-peak load condition	1707	5640	55	90	472	1379	-2636	2685	0	0	-107	1922
	2036-SOP-SCRD.epc	2036 Summer off-peak load condition	5038	8520	0	90	283	1379	-1691	4605	143	150	811	1922
Sensitivity	2028-SPOP-HIRE-SCRD.epc	2028 Spring off-peak load with Hi-renewable dispatch sensitivity	590	5458	36	90	1221	1379	-312	2546	0	0	-342	1922
	GFA-2028-SP-HIRE-SCRD.epc	2028 Summer peak load with Hi-renewable dispatch sensitivity	4800	5458	67	90	1183	1379	-1999	2546	0	0	-404	1922
	GFA-2031-SP-HICEC-SCRD.epc	2031 Summer peak load condition with high-cec load sensitivity	518	5640	67	90	1070	1379	2671	2685	0	0	1843	1922

Previously approved transmission projects modelled in base cases

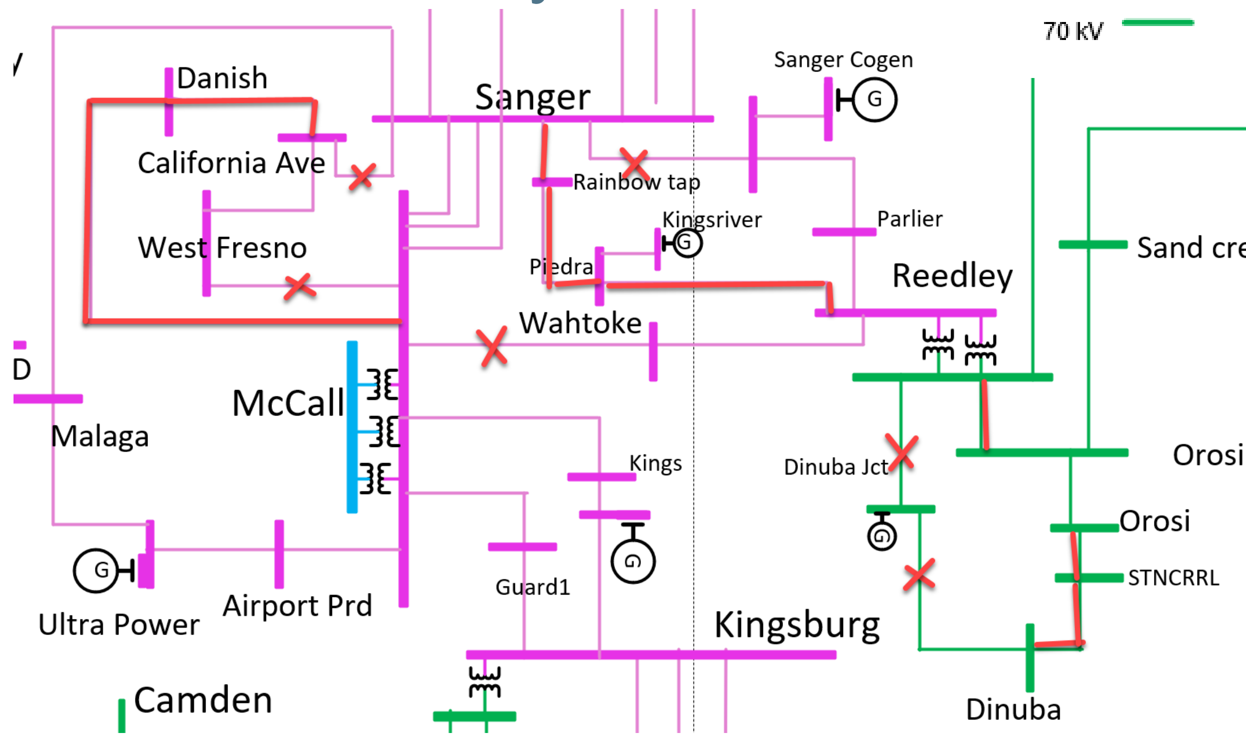
Project	Current In-Service Jan 2026 TDF
Borden 230/70 kV Transformer Bank #1 Capacity Increase	29-Mar
Borden-Storey 230 kV 1 and 2 Line Reconductoring	30-Jan
Camden 70 kV Reinforcement	30-Mar
Coppermine 70 kV Reinforcement Project	30-Apr
Equipment Upgrade at CCSF Owned Warnerville 230 kV Substation	27-Jan
Gates 230/70 kV Transformer Addition	30-May
Henrietta 230/115 kV Bank 3 Replacement	29-Jun
Herndon-Bullard 115 kV Reconductoring Project	28-Feb
Los Banos 230 kV Circuit Breaker Replacement	28-Dec
Los Banos 70 kV Area Reinforcement Project	31-Jan
Manning 500/230 kV Substation Project	28-Apr
Moss Landing – Las Aguilas 230 kV Series Reactor Project	27-Aug
Oro Loma 70 kV Area Reinforcement	28-May
Panoche 115 kV Circuit Breaker Replacement and 230 kV Bus Upgrade project	28-Apr
Reconductor of GWF – Kingsburg 115 kV line	1-May
Reedley 70 kV Capacity Increase	30-May
West Fresno 115 kV Voltage Support	31-May
Wilson 115 kV Area Reinforcement	30-May
Wilson-Oro Loma 115kV Line Reconductoring	28-Jul

Fresno 115/70 kV Results Summary

<u>Observations</u>

1. P1 overloads:
   - GWF-Kingsburg 115 kV line overload for loss of Mustang Sw Station-Gregg 230 kV
   - **Mitigation**: Reconductor of GWF – Kingsburg 115 kV line project
   - Dinuba-Orosi 70 kV or Reedley-Orosi 70 kV line overload for loss of Reedley-Dinuba 70 kV line
   - **Mitigation**: Reedley 70 kV reinforcement project

2. P2 overloads:
   - Multiple overloads in near-term for loss of Wilson A Section 1D & Wilson B Section 2D 115KV
     - **Mitigation**: Wilson Area reinforcement project
   - RioBravo Fresno-Malaga-Mc Call 115 kV line overload for loss of Malaga 115 kV - Section 1F & 1E
     - **Mitigation**: Operation solution



3. P6 overloads:
   - California Ave-Mc call 115 kV line overload for loss of Mc Call-West Fresno 115 kV and Sanger-California Ave 115 kV
   - Kings River-Sanger-Reedley line overload for loss of Mc Call-Reedley 115 kV and Sanger-Reedley 115 kV
   - Mendota 115/70 kV bank overload for loss of Panoche-Mendota 115 kV and Le Grand-Dairyland 115 kV
   - **Mitigation**: Operating solution

Fresno- P5 Results Summary

Gregg 230KV Batt(FAILURE OF NON-REDUNDANT BATT)	Recommended In 2022-2023: In flight
Barton 115KV Batt(FAILURE OF NON-REDUNDANT BATT)	Add redundant battery
BARTON 115KV CB 162 (STUCK BREAKER & NO BF RELAY)	Add redundant relay
Mcmullin 230KV Batt(FAILURE OF NON-REDUNDANT BATT)	Add redundant battery
Wilson 230-115KV Batt(FAILURE OF NON-REDUNDANT BATT)	Recommended In 2022-2023: In flight
Las Palmas 115KV Batt(FAILURE OF NON-REDUNDANT BATT)	Add redundant battery
Manchester 115KV Batt(FAILURE OF NON-REDUNDANT BATT)	Add redundant battery
Kearney 230-70KV Batt(FAILURE OF NON-REDUNDANT BATT)	Add redundant battery
HERNDON #1 & 2 115KV BUS (FAILURE OF NON-REDUNDANT RELAY)	Cancelled
MCCALL #1 & 2 115KV BUS (FAILURE OF NON-REDUNDANT RELAY)	Add redundant relay
Mccall 230-115KV Batt(FAILURE OF NON-REDUNDANT BATT)	Recommended In 2022-2023: In flight
GATES SECTION D & E 230 KV BUS (FAILURE OF NON-REDUNDANT RELAY)	Recommended In 2021-2022: In flight
Panoche 230-115KV Batt(FAILURE OF NON-REDUNDANT BATT)	Recommended In 2022-2023: In flight
Tranquillity SW STA 230KV Batt(FAILURE OF NON-REDUNDANT BATT)	ISO recommended in 2024-2025 TPP: In flight
Gates 500KV Batt(FAILURE OF NON-REDUNDANT BATT)	Recommended In 2022-2023: In flight
Figarden 230KV Batt #1(FAILURE OF NON-REDUNDANT BATT)	ISO recommended in 2023-2024 TPP: In flight
Herndon 230-115KV Batt(FAILURE OF NON-REDUNDANT BATT)	Recommended In 2022-2023: In flight
Mustang SW STA 230KV Batt(FAILURE OF NON-REDUNDANT BATT)	Recommended In 2022-2023: In flight
Henrietta 230-115-70KV Batt(FAILURE OF NON-REDUNDANT BATT)	Recommended In 2022-2023: In flight
Figarden 230KV Batt #2(FAILURE OF NON-REDUNDANT BATT)	ISO recommended in 2023-2024 TPP: In flight
KINGSBURG 115KV CB 112 122 132 152 OR 162 (STUCK BREAKER & NO BF RELAY)	Add redundant relay
Kingsburg 115-70KV Batt(FAILURE OF NON-REDUNDANT BATT)	Add redundant battery
Sanger 115KV Batt(FAILURE OF NON-REDUNDANT BATT)	ISO recommended in 2022-2023 TPP:In flight
Le Grand 115KV Batt(FAILURE OF NON-REDUNDANT BATT)	ISO recommended in 2022-2023 TPP:In flight
Mendota 115KV Batt(FAILURE OF NON-REDUNDANT BATT)	Add redundant battery
Hammonds 115KV Batt(FAILURE OF NON-REDUNDANT BATT)	ISO recommended in 2022-2023 TPP:In flight
Los Banos 230KV Batt(FAILURE OF NON-REDUNDANT BATT)	ISO recommended in 2022-2023 TPP:In flight
Gates 230-70KV Batt(FAILURE OF NON-REDUNDANT BATT)	ISO recommended in 2022-2023 TPP:In flight
Borden 230-70KV Batt(FAILURE OF NON-REDUNDANT BATT)	ISO recommended in 2023-2024 TPP: In flight

Long-term only issues

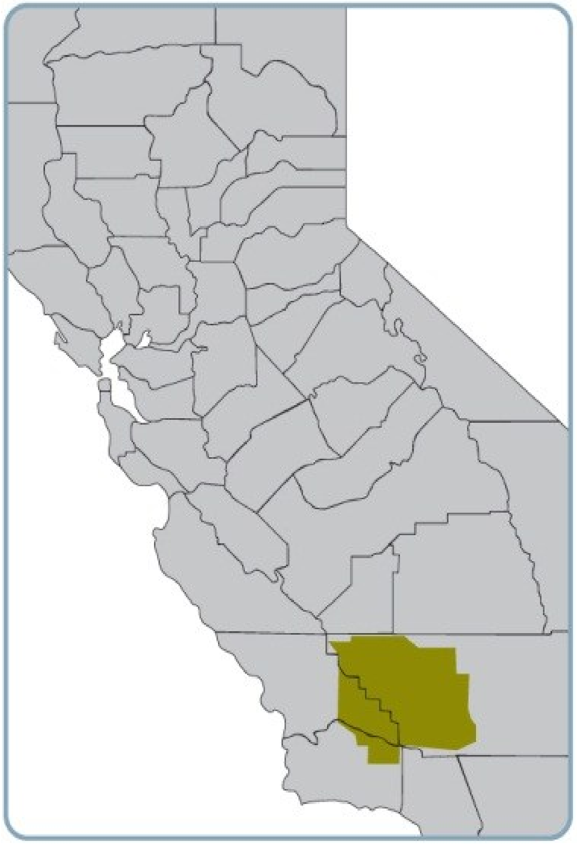
- Gregg-Ashlan 230 kV
- Henrietta 230/70 kV bank4
- Herndon-Ashlan 230 kV
- Leprino-GWF Hanford 115 kV
- Mc Call 230/115kV bank 1
- Mc call-Reedley 115 kV
- Pole Line-Dos Amigos 230 kV line 1 and 2
- San Joaquin-Helm 70 kV
- Wilson-Merced 115 kV line 1 and 2
- Wilson-Oro Loma 115 kV line

Kern Area
Preliminary Reliability Assessment Results

Yara Khalaf
Senior Regional Transmission Engineer

2026-2027 Transmission Planning Process Stakeholder Meeting
September 23-24, 2026

Kern Area



- Located south of the Yosemite-Fresno area and includes southern portion of the PG&E San Joaquin Division
- Major stations include Midway and Kern Power Plant
- Transmission system includes 70, 115 and 230 kV facilities.

Load and Load Modifier Assumptions - Kern

Scenario	Study case	Description	Total Gross Load	BTM-PV Output	BTM-PV Installed Capacity	AAEE Load	AAFS load	AATE Load	Data Server Load (DS)	Known Loads (KL)	Total Net (Managed) Load	Total DR
Base	KERN-2028-SP-SCRD.epc	2028 Summer peak load condition	2685	113	2543	-23	23	13	545	94	2543	-50
	KERN-2031-SP-SCRD.epc	2031 Summer peak load condition	2769	120	2600	-43	67	31	496	92	2600	-55
	KERN-2036-SP-SCRD.epc	2036 Summer peak load condition	2911	87	1252	-68	98	70	513	86	2751	0
	2028-SPOP-SCRD.epc	2028 Spring off-peak load condition	2274	0	2543	-47	18	11	765	0	2210	-50
	2031-SPOP-SCRD.epc	2031 Spring off-peak load condition	1349	725	2600	-17	5	18	134	40	592	0
	2036-SOP-SCRD.epc	2036 Summer off-peak load condition	2800	814	1252	-60	21	98	330	75	1916	-61
Sensitivity	2028-SPOP-HIRE-SCRD.epc	2028 Spring off-peak load with Hi-renewable dispatch sensitivity	2274	0	2543	-47	18	11	765	0	2210	-50
	KERN-2028-SP-HIRE-SCRD.epc	2028 Summer peak load with Hi-renewable dispatch sensitivity	2845	1019	2543	-23	23	13	765	0	1797	-50
	KERN-2031-SP-HICEC-SCRD.epc	2031 Summer peak load condition with high-cec load sensitivity	2769	120	2600	0	67	31	496	92	2643	-55

Generation Assumptions - Kern

			Solar		Thermal		Battery		Geothermal		Hydro	
Scenario	Study case	Description	Dispatch (MW)	Installed (MW)	Dispatch (MW)	Installed (MW)	Dispatch (MW)	Installed (MW)	Dispatch (MW)	Installed (MW)	Dispatch (MW)	Installed (MW)
Base	KERN-2028-SP-SCRD.epc	2028 Summer peak load condition	82	1663	2213	3181	659	820	0	0	23	28
	KERN-2031-SP-SCRD.epc	2031 Summer peak load condition	81	1663	3096	3181	741	820	0	0	22	28
	KERN-2036-SP-SCRD.epc	2036 Summer peak load condition	304	6963	2882	3181	854	1250	22	118	17	28
	2028-SPOP-SCRD.epc	2028 Spring off-peak load condition	0	1663	602	3181	445	820	0	0	17	28
	2031-SPOP-SCRD.epc	2031 Spring off-peak load condition	998	1663	682	3181	-769	820	0	0	17	28
	2036-SOP-SCRD.epc	2036 Summer off-peak load condition	2191	6743	566	3181	-507	1250	0	118	17	28
Sensitivity	2028-SPOP-HIRE-SCRD.epc	2028 Spring off-peak load with Hi-renewable dispatch sensitivity	0	1663	1466	3181	-50	820	0	0	17	28
	KERN-2028-SP-HIRE-SCRD.epc	2028 Summer peak load with Hi-renewable dispatch sensitivity	1323	1663	1184	3181	-701	820	0	0	17	28
	KERN-2031-SP-HICEC-SCRD.epc	2031 Summer peak load condition with high-cec load sensitivity	81	1663	3096	3181	798	820	0	0	22	28

Previously approved transmission projects modelled in base cases

Project	Expected ISD
Midway-Kern PP Nos. 1,3 and 4 230 kV Lines Capacity Increase (Kern PP 230 kV Area Reinforcement Project)	In Service
Kern PP 115 kV Area Reinforcement	Dec-30
Midway – Kern PP #2 230 kV Line (Bakersfield-Kern Reconductor)	Jan-32
Tejon Area Reinforcement Project	Apr 2029
Midway-Kern PP Nos. 1,3 and 4 230 kV Lines Capacity Increase (Midway 230kV Bus Section D Upgrade Project)	Feb-29
North East Kern 115 kV Line Reconductoring	Mar-32
Midway-Temblor 115 kV Line Reconductor and Voltage Support	Feb-29
Wheeler Ridge Junction Substation	May-34

Reliability assessment preliminary results summary

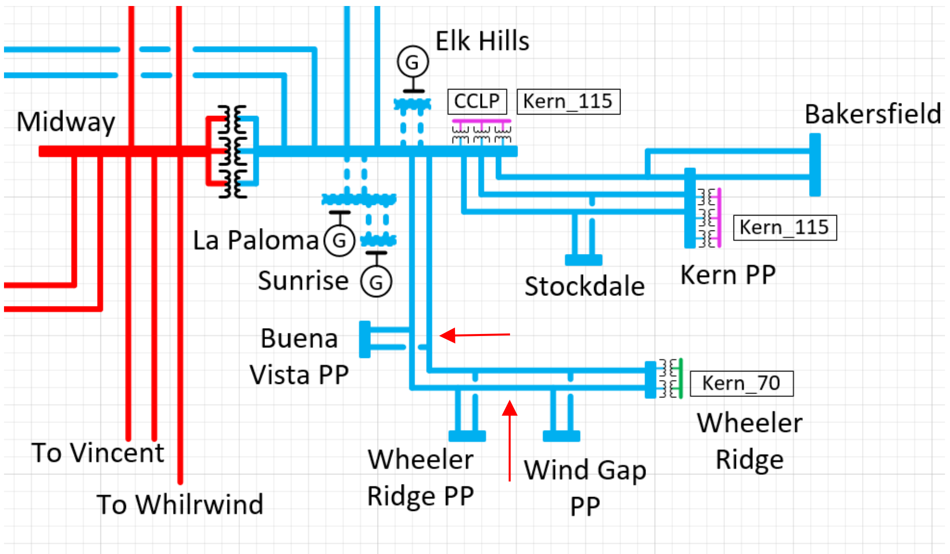
Kern 230 kV – Results Summary

<u>Observations</u>

- P1, P2, P6 overloads on Midway – Wheeler Ridge 230kV #1 and #2 lines in the near-term and mid-term cases

<u>Approved and Potential Mitigations</u>

- Wheeler Ridge Junction project



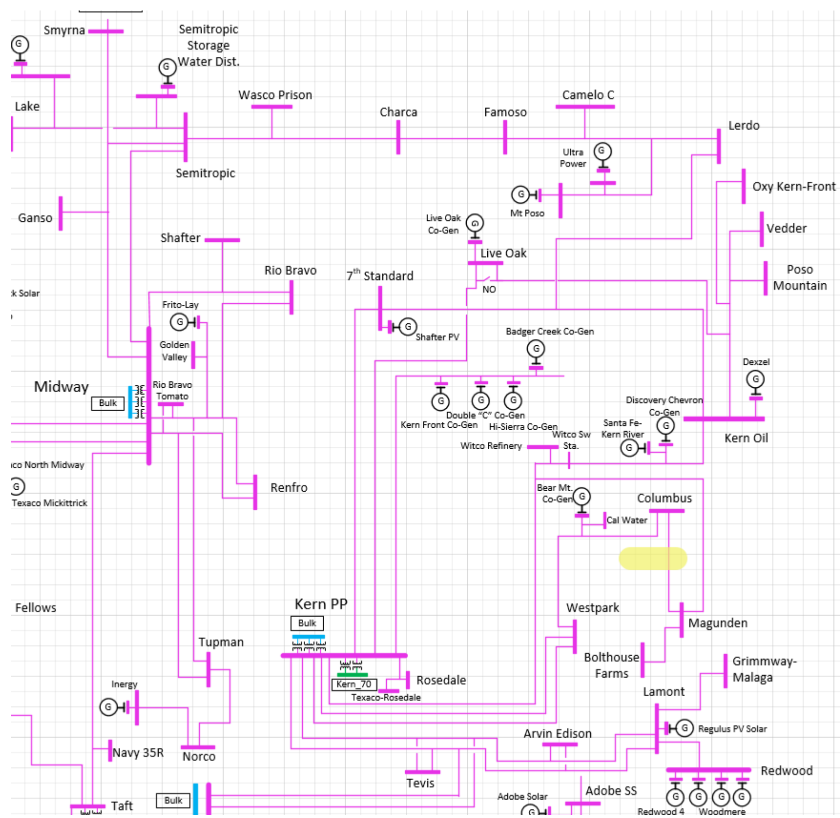
Kern 115kV – Results Summary

Observations

- Midway – Shafter 115 kV line
  - P2, P3, P5, P6 overloads
- Midway-Tupman-Rio Bravo-Renfro 115 kV Line
  - P2-2028
- Kern-Magunden-Witco 115kV line
  - P7, P6-2028, 2031, 2036
  - P3-2036,
- Kern PP-Westpark #1 & 2 115kV lines
  - P6-2028, 2031, 2036
- Semitropic-Charca 115kV line
  - P3-2028, 2031, 2036
- Lerdo-Kern Oil-7th Standard 115kV overload
  - P3-2028, 2031, 2036, and P6- 2036
- Lerdo – Lerdo Jct 115k 115kV v line
  - P3-2028, 2031, 2036, P6-2031, 2036
- Kern-Stoockdale-Lamont 115kv line
  - P2, P6-2028, 2031
  - P3-2031, 2036
- Fellows-Taft & Fellows-Midsun 115kV lines
  - P2-2028, 2031

Approved and Potential Mitigations

Kern 115 Area Reinforcement Project
Kern PP Reconductoring Project
Midway Bus Upgrade



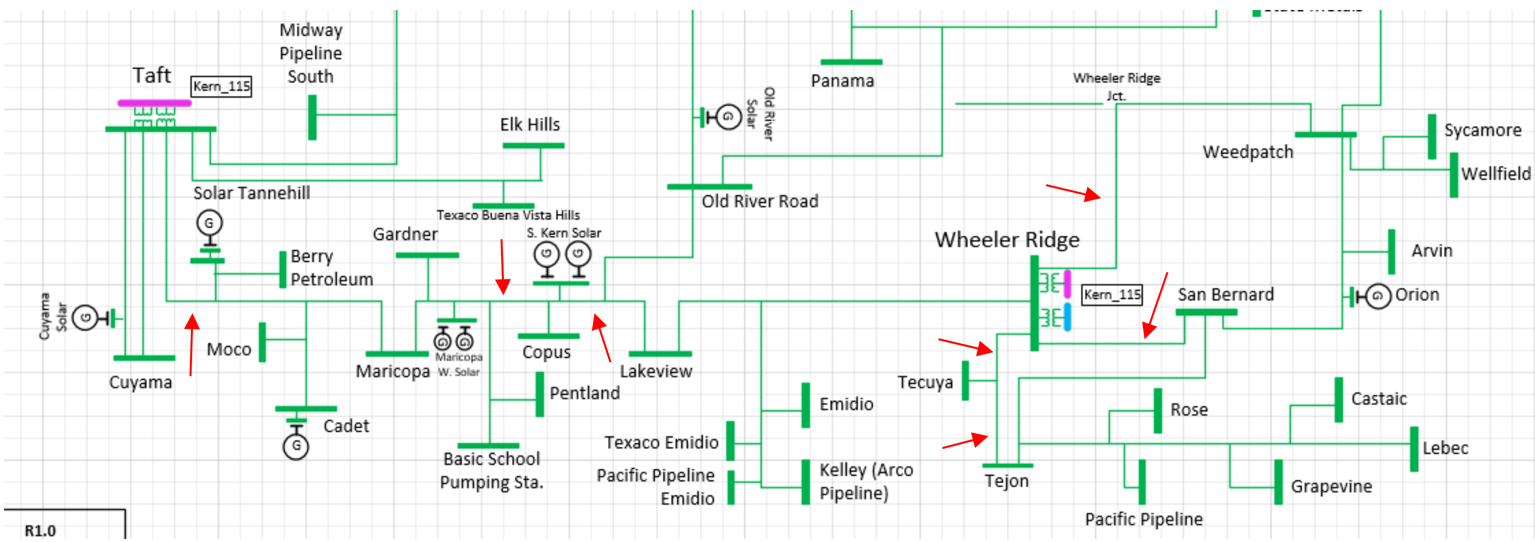
Kern 70kV – Results Summary

Observations

- Wheeler Ridge-Tejon 70kV line
- Wheeler Ridge-San Bernard 70kV line
- Tejon-San Bernard 70kV line
- San Bernard-Weedpatch 70kV line
  - P3, P6-2028, 2036
- Taft-Maricopa 70kV line
  - P2-2028, 2031
- Maricopa-Copus 70kV line
  - P2-2028, 2031
- Copus-Lakeview 70kV line
  - P2-2028, 2031
- Wheeler Ridge-Lakeview 70kV line
  - P2-2028, 2031

Approved and Potential Mitigations

- Tejon Area Reinforcement
- Midway Bus Upgrade



California ISO

P5 Results summary

Contingency	Mitigation
MIDWAY 230-115KV BATT(FAILURE OF NON-REDUNDENT BATT)	Install Redundant Battery Supply
KERN 115KV BATT(FAILURE OF NON-REDUNDENT BATT)	Install Redundant Battery Supply
KERN 230KV BATT(FAILURE OF NON-REDUNDENT BATT)	Install Redundant Battery Supply
RENFRO 115KV BATT #2(FAILURE OF NON-REDUNDENT BATT)	Install Redundant Battery Supply
MIDWAY 500KV BATT(FAILURE OF NON-REDUNDENT BATT)	Install Redundant Battery Supply

Low Voltage Results

<u>Observations</u>

- Kern Ridge 115 kV and 70 kV low voltages are under review

High Voltage Assessment in PG&E System
Status Update

Patrick Hodgson
Regional Transmission Engineer-North

2026-2027 Transmission Planning Process Stakeholder Meeting
September 23-24, 2026

Study Objective and Methodology

- Objective
  - Identify potential mitigation measures to address voltage issues across PG&E system in the planning horizon

- Methodology
  - Identify voltage concerns in the annual TPP reliability assessment.
  - Coordinate with Operations to obtain real time voltage data.
  - Analyze both results to identify high priority areas to address voltage issues.
  - Table 3 in the ISO planning standards was used as voltage criteria
  - If possible, system adjustments such as transformer taps and generator scheduled voltage was used to address the voltage issue.
  - If system adjustments were not sufficient, voltage support project may be needed.

Voltage Criteria

Table 3: System Voltage Limits in PG&E Area

Facility	Nominal Voltage	Steady State Pre-Contingency		Steady State Post-Contingency	
		High (kV/p.u.)	Low (kV/p.u.)	High (kV/p.u.)	Low (kV/p.u.)
DCPP bus	500 kV	545/1.090	512/1.024	550/1.100	512/1.024
All other buses	500 kV	550/1.100	518/1.036	550/1.100	473/0.946
DCPP bus	230 kV	242/1.052	218/0.948	242/1.052	207/0.900
All other buses	230 kV	242/1.052	219/0.952	242/1.052	207/0.900
All buses	115 kV	121/1.052[2]	109/0.948	121/1.052[1]	104/0.904
All buses	70 kV	72.5/1.036	66.5/0.950	72.5/1.036	63.0/0.900
All buses	60 kV	63.0/1.050	57.0/0.950	66.0/1.100	54.0/0.900

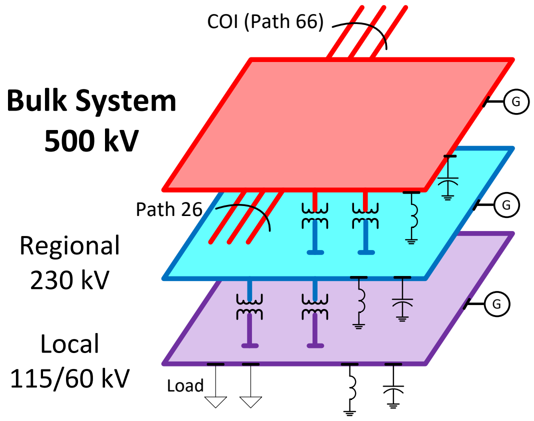
Approved Voltage Support Projects in PG&E System

Projects	Current Expected ISD
Atlantic High Voltage Mitigation	May-29
Banta 60 kV Bus Voltage Conversion	Mar-28
Covelo 60 kV Voltage Support	May-30
Diablo Canyon Area 230 kV High Voltage Mitigation	Jul-29
Mariposa 70 kV Voltage Support	May-32
Midway-Temblor 115 kV Line Reconductor and Voltage Support	Feb-30
Rio Oso Area 230 kV Voltage Support	Oct-26
Round Mountain 500 kV Dynamic Voltage Support (Fern Road Substation)	Jul-26
West Fresno 115 kV Voltage Support	May-31
Willow Creek Voltage Support	Mar-28
Tyler 60 kV Shunt Capacitor	Mar-28
Vaca Dixon Area Reinforcement (INSTALL (2) CAPACITOR BANKS)	Jun-28
Table Mountain Second 500/230 kV Transformer	May-29

Preliminary Study Results for Base Case (P0) and Potential Mitigation Measures

Scenarios for TPP 2026-2027 Voltage Studies

- These base cases have been analyzed to review the voltage results for the 2026-2027 TPP reliability assessment :
  - 2028 Spring Off-Peak
  - 2031 Spring Off-Peak
  - 2036 Winter Off-Peak
  - 2036 Summer off-peak
  - 2028 OP Heavy Renewable & Min Gas Gen
- Entire PGAE area has been analyzed to identify the high priority substation



Substations with base case Voltage concerns identified in TPP studies

- ISO Bulk System
  - none
- Central Valley
  - HERDLYN 60.0 kV
  - SALADO 60.0 kV
  - VACA-DXN 60.0 kV
- Central Coast
  - DIVIDE 70.0 kV
- Fresno
  - BORDEN 70.0 kV
  - COPPRMNE 70.0 kV
  - GLASS 70.0 kV
  - KEARNEY 70.0 kV
  - KNGLOBUS 70.0 kV
  - MADERA 70.0 kV
  - PANOCHE1 115.0 kV
- Greater Bay Area
  - None
- North Coast/North Bay
  - None
- Kern
  - ARCO 70.0 kV
- North Valley
  - PALERMO 115.0 kV
  - WYANDTTE 115.0 kV

Real Time Voltage Data from PGAE

Review of Real Time Voltage Data

- One year (August 2026- May 2026) of real-time voltage data for the PAGE area has been studied.
- CAISO has reviewed data only on 115 kV, 230 kV, and 500 kV substations and observed data for both high and low kV/p.u. conditions.

Facility	Nominal Voltage	Steady State Pre-Contingency		Steady State Post-Contingency	
		High (kV/p.u.)	Low (kV/p.u.)	High (kV/p.u.)	Low (kV/p.u.)
DCPP bus	500 kV	545/1.090	512/1.024	550/1.100	512/1.024
All other buses	500 kV	550/1.100	518/1.036	550/1.100	473/0.946
DCPP bus	230 kV	242/1.052	218/0.948	242/1.052	207/0.900
All other buses	230 kV	242/1.052	219/0.952	242/1.052	207/0.900
All buses	115 kV	121/1.052[2]	109/0.948	121/1.052[1]	104/0.904
All buses	70 kV	72.5/1.036	66.5/0.950	72.5/1.036	63.0/0.900
All buses	60 kV	63.0/1.050	57.0/0.950	66.0/1.100	54.0/0.900

- PG&E Utility Standard (TD1036S) allows 115 kV voltages to operate as high as 126 kV until capital projects can be placed into service to achieve a desired operating limit of 121 kV.
- Substations are color-coded green, yellow, and red according to the number of hours they operate under high-voltage conditions.

115 kV Bus voltage>121 kV										
Month of the year	Aug-25	Sep-25	Oct-25	Nov-25	Dec-25	Jan-26	Feb-26	Mar-26	Apr-26	May-26
Hours of Operation	7116	6677	8461	8408	8961	9716	8552	7842	9868	8784
Substations										
Brighton 115 kV	656	617	733	721	743	678	609	621	694	466
Drum 115 kV	586	616	688	563	524	604	625	476	412	578
East Nicolaus 115 kV	690	695	741	721	742	743	672	740	717	656
Moss Landing 115 kV	313	360	323	350	448	411	489	396	411	342
Pease 115 kV	425	429	617	709	623	657	625	551	649	604
Placer 115 kV	81	214	718	576	637	476	313	658	666	478
Rio Oso 115 kV	647	676	739	721	741	742	672	200	715	643
Vierra 115 kV	131	169	549	529	676	708	645	634	674	502
Chowchilla 115 KV	118	71	149	197	180	278	205	68	206	73
Exchequer 115 KV	580	441	302	360	238	585	634	644	668	653
El Capitan 115 KV	549	376	341	352	334	481	299	255	494	419
Atwater 115 KV	441	312	274	289	308	336	192	178	405	394
Mendota 115 KV	19	3	133	207	251	243	236	169	113	117
Wilson 115 KV	414	275	127	82	115	99	65	83	247	319
Le Grand 115 KV	192	119	146	216	210	264	173	69	226	111
Corcoran 115 KV	0.03	31	91	69	59	190	288	92	62	42
Bellota 115 KV	3	1	8	1	2	1	0.4	0.6	0.4	1
Lockeford 115 KV	88	125	158	232	363	409	219	230	259	233
Melones 115 KV	506	629	742	606	733	743	630	737	720	731
Schulte 115 KV	285	308	600	553	665	684	649	662	594	578
Manteca 115 KV	326	165	196	267	244	169	126	198	603	360
Riverbank 115 KV	66	45	86	87	125	215	186	180	333	484

	115 kV bus voltage > 126 kV									
Month of the year	Aug-25	Sep-25	Oct-25	Nov-25	Dec-25	Jan-26	Feb-26	Mar-26	Apr-26	May-26
Hours of Operation	0.00	2.00	3.30	0.00	0.07	0.05	5.00	0.20	0.00	0.20
Substations										
Brighton 115 kV	0	0	0	0	0	0	0	0	0	0
Drum 115 kV	0	0	0	0	0	0	0	0	0	0
East Nicolaus 115 kV	0	0	0.3	0	0.07	0.02	0	0	0	0
Moss Landing 115 kV	0	0	0	0	0	0	0	0	0	0
Pease 115 kV	0	0	0	0	0	0	0	0	0	0
Placer 115 kV	0	0	0	0	0	0	0	0	0	0
Rio Oso 115 kV	0	0	0	0	0	0	0	0	0	0
Vierra 115 kV	0	0	0	0	0	0	0	0	0	0
Chowchilla 115 KV	0	0	0	0	0	0	0	0	0	0
Exchequer 115 KV	0	1	0	0	0	0	0	0.2	0	0
El Capitan 115 KV	0	0	0	0	0	0	0	0	0	0
Atwater 115 KV	0	0	0	0	0	0	0	0	0	0
Mendota 115 KV	0	0	0	0	0	0	0	0	0	0
Wilson 115 KV	0	0	0	0	0	0	0	0	0	0
Le Grand 115 KV	0	0	0	0	0	0	0	0	0	0
Corcoran 115 KV	0	0	0	0	0	0.03	0	0	0	0.2
Bellota 115 KV	0	0	0	0	0	0	0	0	0	0
Lockeford 115 KV	0	0	0	0	0	0	0	0	0	0
Melones 115 KV	0	0	3	0	0	0	5	0	0	0
Schulte 115 KV	0	0	0	0	0	0	0	0	0	0
Manteca 115 KV	0	1	0	0	0	0	0	0	0	0
Riverbank 115 KV	0	0	0	0	0	0	0	0	0	0

230 KV Bus Voltage>238 kV										
Month of the year	Aug-25	Sep-25	Oct-25	Nov-25	Dec-25	Jan-26	Feb-26	Mar-26	Apr-26	May-26
Hours of Operation	354	751	1853	2124	1098	917	1741	1262	1855	1891
Substations										
Bellota 230 kV	0	0.2	63	17	3	0	0	0	0.2	0
Birds Landing 230 kV	0	0.2	0	0	0	0	0.2	9	21	79
Brighton 230 kV	97	207	490	540	374	213	513	349	467	413
Cortina 230 kV	2	3	0.3	0	0.03	5	22	14	5	27
Cottonwood 230 kV	0	0.3	19	5	7	0.4	0.1	7	0.2	0.1
Gold Hill 230 kV	61	245	454	423	259	177	444	360	484	409
Palermo 230 kV	136	201	333	526	261	248	466	313	483	314
Rio Oso 230 kV	0.2	11	134	218	55	22	67	64	133	456
Table Mtn 230 kV	48	34	30	175	8	5	7	22	75	72
Valley Springs 230 kV	5	12	239	85	41	29	77	46	119	80
McCall 230 kV	5	37	91	135	90	218	145	78	68	41

230 KV Bus Voltage>242 kV										
Month of the year	Aug-25	Sep-25	Oct-25	Nov-25	Dec-25	Jan-26	Feb-26	Mar-26	Apr-26	May-26
Hours of Operation	0	0	4	3	0	0	1	1	1	0
Substations	Aug-25	Sep-25	Oct-25	Nov-25	Dec-25	Jan-26	Feb-26	Mar-26	Apr-26	May-26
Bellota 230 kV	0	0	0	0	0	0	0	0	0	0
Birds Landing 230 kV	0	0	0	0	0	0	0	0	0	0
Brighton 230 kV	0	0	4	0	0	0.02	0	0	1	0.1
Cortina 230 kV	0	0	0	0	0	0	0	0	0	0
Cottonwood 230 kV	0	0	0	0	0	0	0	0	0	0
Gold Hill 230 kV	0	0	0	0	0	0	0	0	0	0
Palermo 230 kV	0	0	0	2	0.03	0	1	1	0.02	0
Rio Oso 230 kV	0.1	0.3	0.2	0.3	0.1	0.1	0.1	0.1	0.2	0
Table Mtn 230 kV	0	0	0	0	0	0	0	0	0	0
Valley Springs 230 kV	0	0	0	0	0	0	0	0	0	0
McCall 230 kV	0	0	0	1	0	0	0	0	0	0

	500 kV Bus Voltage > 551 kV - Number of Hours Per Month									
	Aug-25	Sep-25	Oct-25	Nov-25	Dec-25	Jan-26	Feb-26	Mar-26	Apr-26	May-26
Substations										
Gates 500 KV	0	0	0	0	0	0	0	0	0	0
Round Mtn 500 kV	20	0	0.3	0	0	0	0	0	0	0
Table Mtn 500 kV	0	0	0	0	0	0	0	0	0	0

	500 kV Bus Voltage > 541 kV - Number of Hours Per Month									
	Aug-25	Sep-25	Oct-25	Nov-25	Dec-25	Jan-26	Feb-26	Mar-26	Apr-26	May-26
Substations										
Gates 500 KV	0	0	0	0	0	0	0	0	0	0
Round Mtn 500 kV	244	317	99	366	65	109	90	152	167	2
Table Mtn 500 kV	65	158	75	259	16	56	34	106	97	96

High Level Summary of Results

- With the implementation of the Round Mountain and Gates STATCOM projects, the 500 kV system does not experience any voltage issues under normal or contingency conditions.

- Rio-Oso Voltage support project is expected to resolve the observed issues at Drum, East Nicholas and Rio Oso 115 kV and Palermo 230 kV substations-expected ISD-May 2026.

- Based on the initial assessment of the feasibility of system adjustments to resolve voltage issues, no additional voltage support upgrades are required.

Next Steps

- Perform additional sensitivity scenario analysis.
- Review historical data comprehensively.
- Conduct a detailed examination of power factor assumptions in high-priority areas.
- Determine the optimal size and technology for voltage support.
- Assess the feasibility of implementing the proposed solutions.

- Continue evaluating the feasibility of system adjustments and model validation across the remaining PG&E system.
  - If system adjustments are not feasible, update mitigation measures and propose projects once all required analyses are completed.

Bulk System
Preliminary Reliability Assessment Results

Chris Fuchs
Regional Transmission Engineer Lead-North

2026-2027 Transmission Planning Process Stakeholder Meeting
Sept 23, 2026

PG&E Bulk Transmission System

- Service area from CA-OR border in the north to Vincent 500 kV Sub in the south
- PG&E system is comprised of 60, 115, 230 & 500 kV transmission facilities.
- Base Case Years: 2028, 2031, 2036 & 2041
- Studied 8 base cases and 3 sensitivity cases using governor power flow
- Studied 3 base case and 3 sensitivity cases for dynamic stability
- 1-in-5 heat wave load for peak cases
- Major 500/230 kV substations: Olinda, Round Mountain, Table Mountain, Vaca Dixon, Tesla, Tracy, Metcalf, Moss Landing, Los Banos, Gates, Midway
- Major WECC Paths: COI (Path 66), PDCI (Path 65), Path 15 and Path 26
- P0 eliminated for TPP26-27 via redispatch

Load Assumptions - Bulk

Description	Non-Conforming Load	Total Gross Load	BTM-PV Output	AAEE Load	AAFS Load	AATE Load	AADS Load	Total Net(Managed) Load	Total DR	DR2
2028 Summer Peak High Renewable	4702	25995	10476	-465	361	623	1882	15054	-247	-148
2028 Summer Peak	3669	24931	1164	-465	361	623	933	23302	-247	-148
2028 Spring Off-Peak Hi Renewables	4269	17287	0	-638	221	381	1367	16650	-254	-148
2028 Spring Off-Peak	4269	17287	0	-638	221	381	1367	16650	-254	-148
2028 Winter Peak	4274	19787	0	-531	263	455	1440	19256	-252	-148
2031 Summer Peak Hi-CEC Load	5098	30019	1257	0	989	1337	2421	28763	-297	-165
2031 Summer Peak	5098	30019	1257	-600	989	1337	2421	28162	-297	-165
2031 Spring Off-Peak	3992	13863	7433	-403	166	594	1299	6026	13	0
2031 Winter Peak	5637	27347	1029	-437	1770	1675	3108	25881	17	0
2036 Summer Off-Peak	4891	32548	8575	-907	345	3159	2036	23066	-362	-196
2036 Summer Peak	4887	34996	914	-778	1753	2634	2090	33304	-364	-196
2041 Summer Peak	5116	38496	1014	-761	1975	3496	2154	36721	18	0

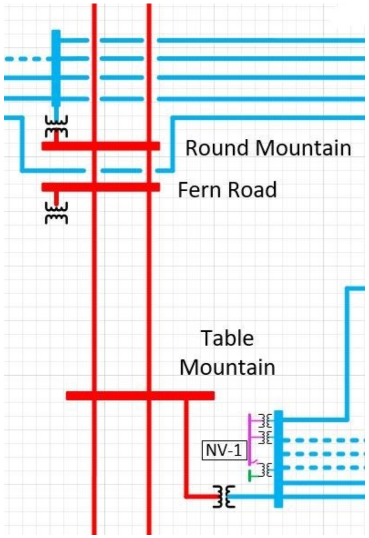
Generation Assumptions - Bulk

Description	Solar		Wind		Hydro		Thermal		Energy Storage	
	Dispatch (MW)	Installed (MW)	Dispatch (MW)	Installed (MW)	Dispatch (MW)	Installed (MW)	Dispatch (MW)	Installed (MW)	Dispatch (MW)	Installed (MW)
2028 Summer Peak High Renewable	6790	7559	1413	1621	1012	3659	7615	8994	-4249	4904
2028 Summer Peak	755	7579	1614	1919	3768	4298	11266	13946	2692	3949
2028 Spring Off-Peak High Renewable	453	531	762	1621	1375	3656	6368	8613	-999	1930
2028 Spring Off-Peak	0	0	1429	1537	1679	3978	7038	8174	-1799	2344
2028 Winter Peak	0	0	979	1919	4662	4952	10671	11954	3316	3591
2031 Summer Peak High CEC loads	718	7446	1443	1732	4291	4539	13229	13742	5486	5929
2031 Summer Peak	688	6910	1547	1815	4357	4524	12799	13809	5253	5929
2031 Spring Off-Peak	3493	5960	1307	1815	1118	2511	7479	9203	-5818	5914
2031 Winter Peak	4978	7966	500	1724	4171	4676	11835	12623	-672	5914
2036 Summer Off-Peak	4189	4473	274	1825	3923	3287	10445	10803	-4015	9179
2036 Summer Peak	414	6901	584	1825	5042	5112	11506	11681	8127	9179
2041 Summer Peak	424	7064	552	1724	4173	4242	12825	13704	8774	9275

Previously Approved Transmission Projects in the PG&E Bulk System Modeled in Base Cases

Project Name	Year Modeled
Gates 500 kV Dynamic Reactive Support (Orchard Road)	2025 (In-Service)
Round Mtn 500 kV Dynamic Reactive Support (Fern Road)	2026 (In-Service)
Harlan 500 kV Substation	2027
Gates - Los Banos Series Capacitor	2028
Collinsville 500 kV Substation	2028
Manning 500 kV Substation	2028
Table Mountain 500/230 kV Transformer	2029
New Humboldt 500 kV Substation with 500 kV line to Collinsville	2034
New Humboldt to Fern Road 500 kV Line	2034
Metcalf 500/230 kV Transformer #14	2035
Metcalf – Manning 500 kV Transmission Line	2035

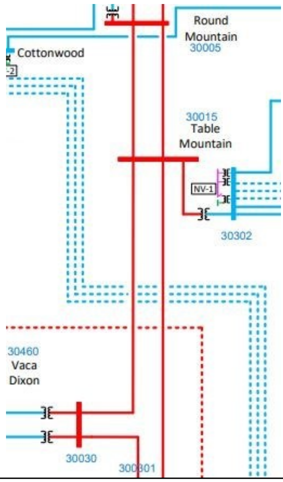
Malin - Round Mtn – Fern Rd – Table Mtn 500 kV



- Outage of a single Malin – Round Mountain – Fern Road – Table Mountain 500 kV line (P2)
- Results shown with RAS triggered (bypasses transmission line series capacitors).
- Adhere to nomograms to be N-1 secure.

Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Loading % (Baseline Scenarios)									Loading % (Sensitivity Scenarios)		
				2028 Summer Peak	2031 Summer Peak	2036 Summer Peak	2041 Summer Peak	2028 Spring Off-Peak	2031 Spring Off-Peak	2036 Summer-Off Peak	2036 Winter Off-Peak	2041 Winter Peak	2028 Spring OP Sensitivity	2031 SpOP Hi Renew & Min Gas Gen	2031 SP High CEC Forecast
300002 MN_RM_11 500 300003 MN_RM_12 500 1 1	P2-1:A0:23:_MALIN-ROUND MTN #2 500kV [6020] (ROUND MT-MN_RM_23)	P2-1	bus-bkr	101.19%	<100%	<100%	<100%	<100%	<100%	<100%	<100%	<100%	<100%	<100%	<100%
	P2-1:A0:2:_MALIN-ROUND MTN #2 500kV [6020] (MALIN-MN_RM_21)	P2-1	bus-bkr	101.16%	<100%	<100%	<100%	<100%	<100%	<100%	<100%	<100%	<100%	<100%	<100%
	P2-3:A0:104:_ROUND MT 500kV - CB 732	P2-3	bus-bkr	103.39%	<100%	<100%	<100%	<100%	<100%	<100%	<100%	<100%	<100%	<100%	<100%
300003 MN_RM_12 500 30005 ROUND MT 500 1 1	P2-1:A0:23:_MALIN-ROUND MTN #2 500kV [6020] (ROUND MT-MN_RM_23)	P2-1	bus-bkr	100.53%	<100%	<100%	<100%	<100%	<100%	<100%	<100%	<100%	<100%	<100%	<100%
	P2-1:A0:2:_MALIN-ROUND MTN #2 500kV [6020] (MALIN-MN_RM_21)	P2-1	bus-bkr	100.51%	<100%	<100%	<100%	<100%	<100%	<100%	<100%	<100%	<100%	<100%	<100%
	P2-3:A0:104:_ROUND MT 500kV - CB 732	P2-3	bus-bkr	102.77%	<100%	<100%	<100%	<100%	<100%	<100%	<100%	<100%	<100%	<100%	<100%

Table Mountain – Vaca Dixon 500kV & Table Mountain – Tesla 500kV

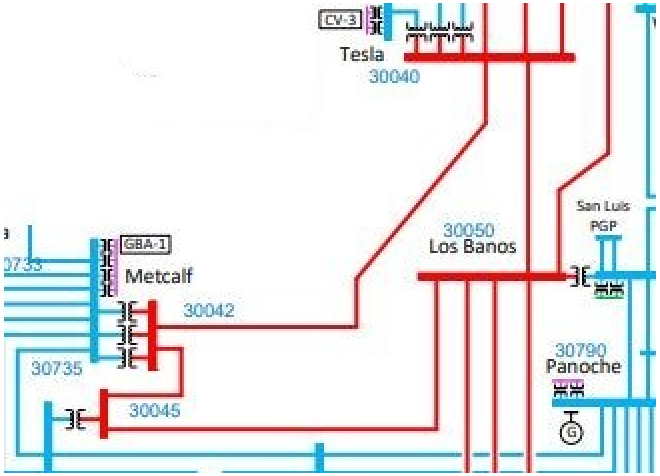


- TableMtn-Tesla 500 kV overloads are mostly resulting from P2-1 in near-term only.
- Olinda – Tracy 500kV & Collinsville-Tesla 500kV contingency overload in 2041 only.
- Non-convergences on other results require investigation.

Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Loading % (Baseline Scenarios)									Loading % (Sensitivity Scenarios)		
				2028 Summer Peak	2031 Summer Peak	2036 Summer Peak	2041 Summer Peak	2028 Spring Off-Peak	2031 Spring Off-Peak	2036 Summer-Off Peak	2036 Winter Off-Peak	2041 Winter Peak	2028 Spring OP Sensitivity	2031 SpOP Hi Renew & Min Gas Gen	2031 SP High CEC Forecast
30015 TABLE MTN 500 300153 TM_TS_11 500 1 1	P2-1:A0:29:_TABLE MTN-VACA 500kV [6090] (TM_VD_12-VACA-DIX)	P2-1	bus-bkr	105.87%	<100%	<100%	<100%	<100%	<100%	<100%	<100%	<100%	<100%	<100%	<100%
	P2-1:A0:8:_TABLE MTN-VACA 500kV [6090] (TABLE MTN-TM_VD_11)	P2-1	bus-bkr	105.99%	<100%	<100%	<100%	<100%	<100%	<100%	<100%	<100%	<100%	<100%	<100%
	P2-3:A0:105:_TABLE MTN 500KV - MIDDLE BREAKER BAY 1	P2-3	bus-bkr	NConv	NConv	<95%	NConv	<95%	<95%	<95%	<95%	<95%	<95%	<95%	NConv
30015 TABLE MTN 500 300153 TM_TS_11 500 1 1	OLINDA-TRACY 500KV [0] & COLLINSVILLE-TESLA E 500KV [0]	P6	L-1/L-1	<100%	<100%	<100%	108.55	<100%	<100%	<100%	<100%	<100%	<100%	<100%	<100%
300154 TM_TS_12 500 30040 TESLA 500 1 1	P2-1:A0:29:_TABLE MTN-VACA 500kV [6090] (TM_VD_12-VACA-DIX)	P2-1	bus-bkr	103.83%	<100%	(null)	(null)	<100%	<100%	(null)	(null)	(null)	<100%	<100%	<100%
	P2-1:A0:8:_TABLE MTN-VACA 500kV [6090] (TABLE MTN-TM_VD_11)	P2-1	bus-bkr	103.88%	<100%	(null)	(null)	<100%	<100%	(null)	(null)	(null)	<100%	<100%	<100%

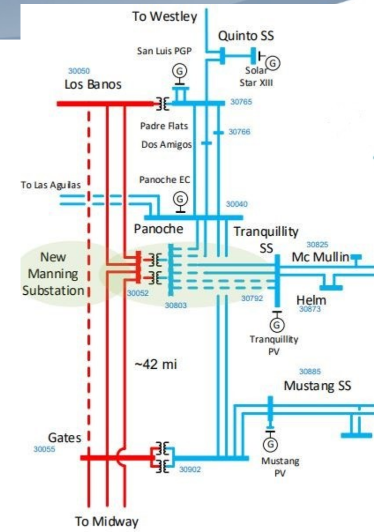
Tesla – Metcalf – Moss Landing 500 kV

- Overloads are mostly in long-term. 2036 overloads are driven by heavy south to north path 26 flow. 2041 overloads are marginal.
- Low dynamic voltages and long recovery times for contingencies in this loop (no criteria violation)
- Voltage dip at Metcalf 500kV. Metcalf-Manning 500 kV line in 2036 improves rise time.



Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Loading % (Baseline Scenarios)									Loading % (Sensitivity Scenarios)		
				2028 Summer Peak	2031 Summer Peak	2036 Summer Peak	2041 Summer Peak	2028 Spring Off-Peak	2031 Spring Off-Peak	2036 Summer-Off Peak	2036 Winter Off-Peak	2041 Winter Peak	2028 Spring OP Sensitivity	2031 SpOP Hi Renew & Min Gas Gen	2031 SP High CEC Forecast
30052 MANNING 500 399110 MNMC_SC1 500 1 1	METCALF-MOSSLANDING 500KV [6050] & LOS MEDANOS CC PLANT	P3	L-1/G-1	<100%	<100%	105.24	<100%	<100%	<100%	<100%	<100%	<100%	<100%	<100%	<100%
30042 METCALF 500 30045 MOSSLAND 500 1 1	MANNING - METCALF 500 kV [0] & TESLA-LOSBANOS 500KV [6100]	P6	L-1/L-1	<100%	<100%	115.83	<100%	<100%	<100%	<100%	<100%	<100%	<100%	<100%	<100%
	TESLA-METCALF 500KV [6110] & MANNING - METCALF 500 kV [0]	P6	L-1/L-1	<100%	<100%	111.22	107.81	<100%	<100%	<100%	<100%	<100%	<100%	<100%	<100%
	MIDWAY-VINCENT 500KV 2[0] & MIDWAY-VINCENT 500KV 1[0]	P6	L-1/L-1	<100%	<100%	<100%	<100%	<100%	106.63	<100%	<100%	<100%	<100%	<100%	<100%
30040 TESLA D 500 30042 METCALF 500 1 1	METCALF-MOSSLANDING 500KV [6050] & MANNING - METCALF 500 kV [0]	P6	L-1/L-1	<100%	<100%	<100%	106.97	<100%	<100%	<100%	<100%	<100%	<100%	<100%	<100%

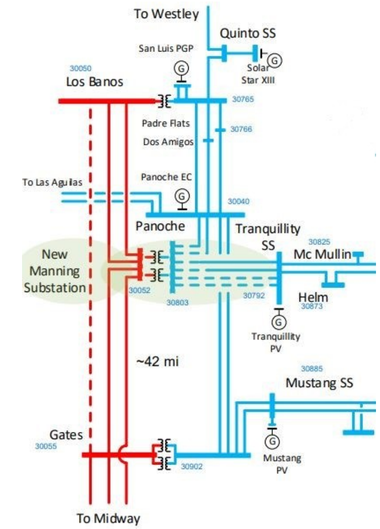
Gates 500 kV



- Overload in 2036 Summer Peak for P1 & P2 contingencies driven mostly by heavy south to north path 26 flow.
- P6 contingencies to be investigated.

Overloaded Facility	Contingency			2028 Summer Peak	2031 Summer Peak	2036 Summer Peak	2041 Summer Peak	2028 Spring Off-Peak	2031 Spring Off-Peak	2036 Summer-Off Peak	2036 Winter Off-Peak	2041 Winter Peak	2028 Spring OP Sensitivity	2031 SpOP Hi Renew & Min Gas Gen	2031 SP High CEC Forecast
30055 GATES 500 300551 GAT_MDW_11 500 1 1	P1-2:A0:23:_MANNING-HARLAN 500KV 2[0]	P1-2	L-1	<100%	<100%	124.02%	<100%	<100%	<100%	105.66%	<100%	<100%	<100%	<100%	<100%
	P1-2:A0:24:_HARLAN-MIDWAY 500KV 2[0]	P1-2	L-1	<100%	<100%	100.48%	<100%	<100%	<100%	<100%	<100%	<100%	<100%	<100%	<100%
300551 GAT_MDW_11 500 30060 MIDWAY 500 1 1	P2-1:A0:16:_MANNING-HARLAN 500KV 2[0] (MANNING-MNG_HAR_21)	P2-1	bus-bkr	<100%	<100%	125.31%	<100%	<100%	<100%	106.90%	<100%	<100%	<100%	<100%	<100%
	P2-1:A0:37:_MANNING-HARLAN 500KV 2[0] (MANNING-MNG_HAR_21)	P2-1	bus-bkr	<100%	<100%	125.31%	<100%	<100%	<100%	106.90%	<100%	<100%	<100%	<100%	<100%
	P2-1:A0:38:_HARLAN-MIDWAY 500KV 2[0] (HRL_MDW_24-MIDWAY)	P2-1	bus-bkr	<100%	<100%	101.67%	<100%	<100%	<100%	<100%	<100%	<100%	<100%	<100%	<100%
	P2-3:A0:152:_MANNING 500kV - Middle Breaker Bay 3	P2-3	bus-bkr	<100%	<100%	125.61%	<100%	<100%	<100%	106.96%	<100%	<100%	<100%	<100%	<100%
	P2-3:A0:153:_HARLAN 500kV - Middle Breaker Bay X	P2-3	bus-bkr	<100%	<100%	114.97%	<100%	<100%	<100%	103.51%	<100%	<100%	<100%	<100%	<100%
300551 GAT_MDW_11 500 30060 MIDWAY 500 1 1	MANNING-HARLAN 500KV 2[0] & DALLAS EC CC PLANT	P3	L-1/G-1	<100%	<100%	133.19	<100%	<100%	<100%	<100%	103.63	<100%	<100%	<100%	<100%
	MANNING-HARLAN 500KV 2[0] & RUSTY EC CC PLANT	P3	L-1/G-1	<100%	<100%	131.02	<100%	<100%	<100%	<100%	107.83	<100%	<100%	<100%	<100%
300512 LB_GT_32 500 30055 GATES 500 3 1	MANNING-GATES 500KV 1[0] & MANNING-HARLAN 500KV 2[0]	P6	L-1/L-1	<100%	<100%	147.87	<100%	<100%	<100%	<100%	<100%	<100%	<100%	<100%	<100%
30055 GATES 500 30057 DIABLOCNYNSS 500 1 1	GATES-MIDWAY 500KV [5990] & MANNING-HARLAN 500KV 2[0]	P6	L-1/L-1	<100%	<100%	116.59	<100%	<100%	<100%	<100%	<100%	<100%	<100%	<100%	<100%

Manning – Gates 500 kV



- Overload in 2036 Summer Peak for P2 contingencies driven mostly by heavy south to north path 26 flow.

Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Loading % (Baseline Scenarios)									Loading % (Sensitivity Scenarios)		
				2028 Summer Peak	2031 Summer Peak	2036 Summer Peak	2041 Summer Peak	2028 Spring Off-Peak	2031 Spring Off-Peak	2036 Summer-Off Peak	2036 Winter Off-Peak	2041 Winter Peak	2028 Spring OP Sensitivity	2031 SpOP Hi Renew & Min Gas Gen	2031 SP High CEC Forecast
300501 MNG_GAT_11 500 30055 GATES 500 1 1	LOSBANOS-GATES 500KV 3[6000] & MANNING-HARLAN 500KV 2[0]	P6	L-1/L-1	<100%	<100%	147.38	<100%	<100%	<100%	<100%	<100%	<100%	<100%	<100%	<100%
	MANNING-HARLAN 500KV 2[0] & LOSBANOS-GATES 500KV 3[6000]	P6	L-1/L-1	<100%	<100%	146.32	<100%	<100%	<100%	100.80	100.92	<100%	<100%	<100%	<100%

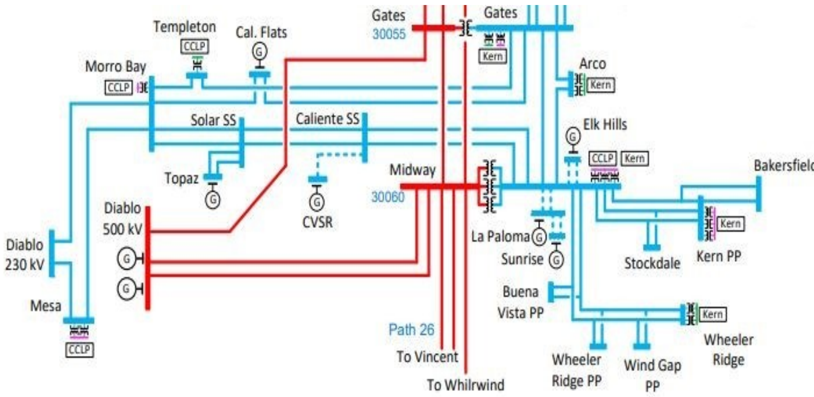
Harlan 500 kV

- Overloads on Manning-Harlan 500 kV and Harlan-Midway 500 kV in 2036 summer peak case driven mostly by heavy south to north path 26 flow

Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Loading % (Baseline Scenarios)									Loading % (Sensitivity Scenarios)		
				2028 Summer Peak	2031 Summer Peak	2036 Summer Peak	2041 Summer Peak	2028 Spring Off-Peak	2031 Spring Off-Peak	2036 Summer-Off Peak	2036 Winter Off-Peak	2041 Winter Peak	2028 Spring OP Sensitivity	2031 SpOP Hi Renew & Min Gas Gen	2031 SP High CEC Forecast
30052 MANNING 500 300562 MNG_HRL_21 500 2 1	P2-1:A0:18:_GATES-MIDWAY 500kV [5990] (GATES-GT_MW_11)	P2-1	bus-bkr	<100%	<100%	117.26%	<100%	<100%	<100%	<100%	<100%	<100%	<100%	<100%	<100%
	P2-1:A0:39:_GATES-MIDWAY 500kV [5990] (MIDWAY-GAT_MDW_11)	P2-1	bus-bkr	<100%	<100%	117.29%	<100%	<100%	<100%	<100%	<100%	<100%	<100%	<100%	<100%
	P2-3:A0:133:_GATES 500kV - Middle Breaker Bay 5	P2-3	bus-bkr	<100%	<100%	101.43%	<100%	<100%	<100%	<100%	<100%	<100%	<100%	<100%	<100%
	P2-3:A0:142:_MIDWAY 500kV - Middle Breaker Bay 4	P2-3	bus-bkr	<100%	<100%	117.62%	<100%	<100%	<100%	<100%	<100%	<100%	<100%	<100%	<100%
	P2-3:A0:30:_GATES 500kV - Middle Breaker Bay 4	P2-3	bus-bkr	<100%	<100%	120.53%	<100%	<100%	<100%	<100%	<100%	<100%	<100%	<100%	<100%
300566 HRL_MDW_23 500 300567 HRL_MDW_24 500 2 1	P2-3:A0:30:_GATES 500kV - Middle Breaker Bay 4	P2-3	bus-bkr	<100%	<100%	101.65%	<100%	<100%	<100%	100.23%	<100%	<100%	<100%	<100%	<100%
300567 HRL_MDW_24 500 30060 MIDWAY 500 2 1	P2-3:A0:30:_GATES 500kV - Middle Breaker Bay 4	P2-3	bus-bkr	<100%	<100%	102.54%	<100%	<100%	<100%	101.10%	<100%	<100%	<100%	<100%	<100%
300567 HRL_MDW_24 500 30060 MIDWAY 500 2 1	GATES-MIDWAY 500KV [5990] & DALLAS EC CC PLANT	P3	L-1/G-1	<100%	<100%	106.82	<100%	<100%	<100%	<100%	<100%	<100%	<100%	<100%	<100%
300566 HRL_MDW_23 500 300567 HRL_MDW_24 500 2 1	GATES-MIDWAY 500KV [5990] & DALLAS EC CC PLANT	P3	L-1/G-1	<100%	<100%	105.89	<100%	<100%	<100%	<100%	<100%	<100%	<100%	<100%	<100%
30052 MANNING 500 300562 MNG_HRL_21 500 2 1	7	P6	L-1/L-1	<100%	<100%	139.00	<100%	<100%	<100%	<100%	102.91	<100%	<100%	<100%	<100%
300567 HRL_MDW_24 500 30060 MIDWAY 500 2 1	Base Case & GATES-MIDWAY 500KV [5990]	P6	L-1/L-1	<100%	<100%	133.54	<100%	<100%	<100%	<100%	<100%	<100%	<100%	<100%	<100%
300567 HRL_MDW_24 500 30060 MIDWAY 500 2 1	GATES-MIDWAY 500KV [5990] & GATES-DIABLO 500KV [5960]	P6	L-1/L-1	<100%	<100%	124.13	<100%	110.65	103.24	<100%	107.04	<100%	<100%	114.51	<100%

Midway-Vincent 1&2 & Midway-Whirlwind 500kV

- Some overloads observed on the Midway-Vincent lines.
- For potential mitigations, please refer to Southern bulk results.



Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Loading % (Baseline Scenarios)									Loading % (Sensitivity Scenarios)		
				2028 Summer Peak	2031 Summer Peak	2036 Summer Peak	2041 Summer Peak	2028 Spring Off-Peak	2031 Spring Off-Peak	2036 Summer-Off Peak	2036 Winter Off-Peak	2041 Winter Peak	2028 Spring OP Sensitivity	2031 SpOP Hi Renew & Min Gas Gen	2031 SP High CEC Forecast
24593 MN_VINCNT_21 500 24592 MN_VINCNT_22 500 2 1	P1-2:A0:29:_MIDWAY-VINCENT 500KV 1[0]	P1-2	L-1	101.75%	100.16%	N/A	N/A	N/A	<100%	<100%	<100%	<100%	<100%	(null)	100.17%
30060 MIDWAY 500 24591 MW_VINCNT_11 500 1 1	P1-2:A0:30:_MIDWAY-VINCENT 500KV 2[0]	P1-2	L-1	<100%	<100%	<100%	119.19%	<100%	<100%	<100%	<100%	<100%	<100%	<100%	<100%
24593 MN_VINCNT_21 500 24592 MN_VINCNT_22 500 2 1	P2-1:A0:19:_MIDWAY-VINCENT #1 500kV [9511] (MIDWAY-MN_VINCNT_11)	P2-1	bus-bkr	101.53%	100.15%	N/A	N/A	N/A	<100%	<100%	<100%	<100%	<100%	(null)	100.16%
	P2-1:A0:49:_MIDWAY-VINCENT #1 500kV [9511] (MN_VINCNT_12-VINCENT)	P2-1	bus-bkr	101.27%	100.03%	N/A	N/A	N/A	<100%	CtgInv	CtgInv	CtgInv	<100%	(null)	100.04%
	P2-3:A0:140:_MIDWAY 500kV - Middle Breaker Bay 2	P2-3	bus-bkr	101.74%	100.00%	N/A	N/A	N/A	<100%	<100%	<100%	<100%	<100%	(null)	100.01%
300567 HRL_MDW_24 500 30060 MIDWAY 500 2 1	GATES-MIDWAY 500KV [5990] & DALLAS EC CC PLANT	P3	L-1/G-1	<100%	<100%	106.82	<100%	<100%	<100%	<100%	<100%	<100%	<100%	<100%	<100%
30060 MIDWAY 500 24591 MW_VINCNT_11 500 1 1	MIDWAY-VINCENT 500KV 2[0] & MOSS LANDING PP BK2 CC PLANT	P3	L-1/G-1	<100%	<100%	<100%	116.02	<100%	<100%	<100%	<100%	<100%	<100%	<100%	<100%

Dynamic Simulation Results

- The dynamic simulations results are under review.
- Slow voltage recovery observed in the Tesla – Metcalf – Moss Landing – Los Banos 500 kV loop
- High voltage response seen on Table Mtn – Malin corridor for some contingencies.

California ISO

Regional Transmission South
Preliminary Reliability Assessment Results

2026-2027 Transmission Planning Process Stakeholder Meeting

September 23-24, 2026

Southern CAISO Bulk
Preliminary Reliability Assessment Results

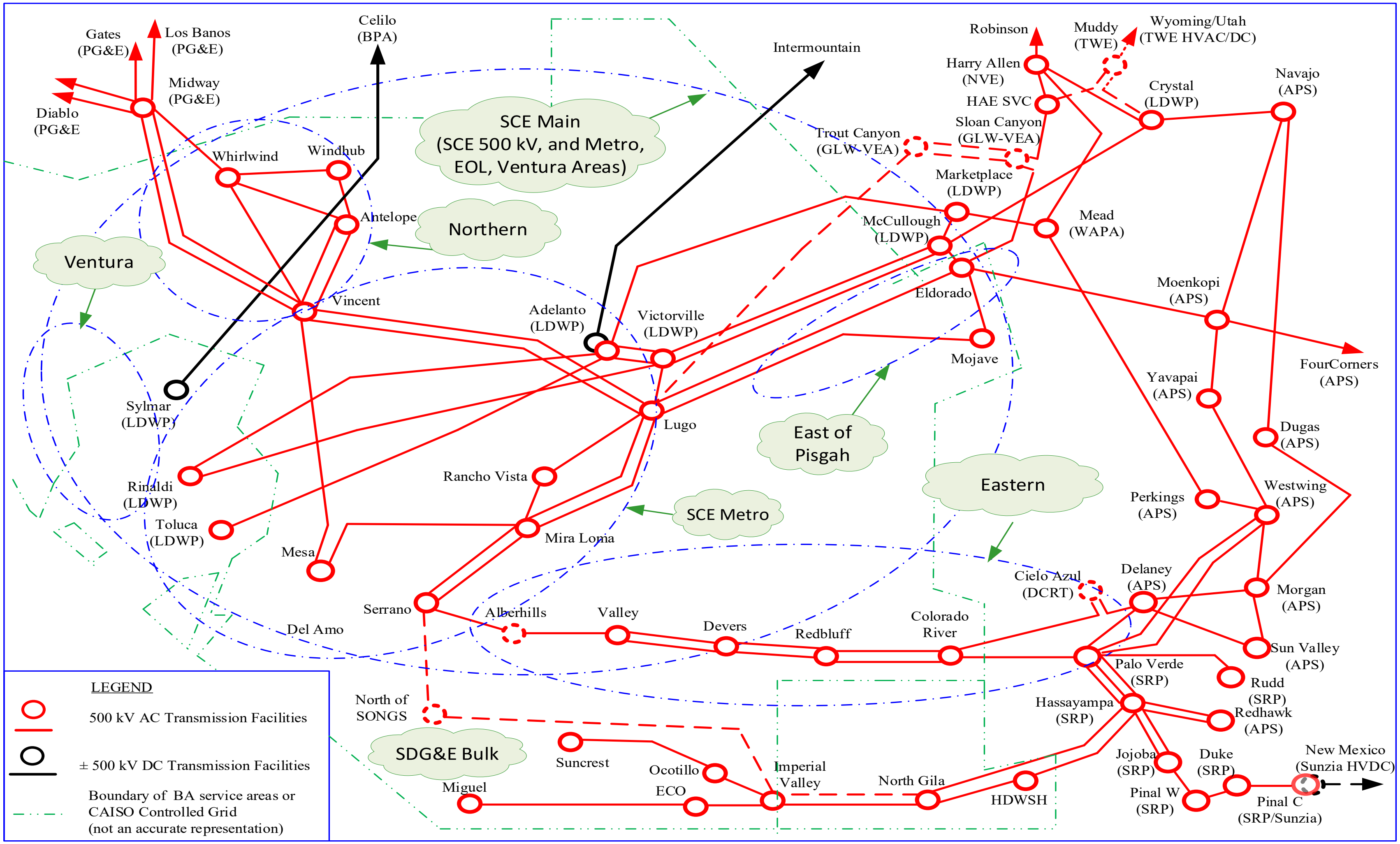
Frank Chen
Sr. Advisor Regional Transmission Engineer

2026-2027 Transmission Planning Process Stakeholder Meeting
September 23-24, 2026

Southern California Bulk System

- Covers SCE, SDG&E, DCRT, and GLW/VEA 500 kV bulk systems
- The SunZia HVDC project delivers 3000 MW of out-of-state wind energy from New Mexico to California via Arizona
- The TransWest Express (TWE) Interregional HVDC and HVAC project transport 3000 MW of out-of-state wind from Wyoming to California via Utah and Nevada

Southern California Bulk System - 2036



Southern California Bulk System Study Scenarios

Baseline Scenario Case

Case ID	Study Case Name	Description
BB1	BB1-28SP	2028 summer peak load at HE15, 9/6
BB2	BB2-31SP	2031 summer peak load at HE15, 9/3
BB3	BB3-36SP	2036 summer peak load at HE18, 9/3
BB4	BB4-41SP	2041 summer peak load at HE18, 9/5
BB5	BB5-36SumOP	2036 summer off-Peak Load Case at HE11, 9/3
BB7	BB7-28OP	2028 spring off-peak load at HE19, 4/29
B8	BB8-36OP	2036 spring off-peak load at HE13, 4/20

Sensitivity Scenario Case

Case ID	Study Case Name	Description
BS1	BS1-31BSP-HLOAD	2031 summer peak with high CEC load forecast
BS2	BS2-28BSP-HiRenew	2028 summer peak with heavy renewable output
BS3	BS3-28OP-BEBS-Charging	2028 spring off-peak with BES charging in load pocket

Load Forecast & Load Modifier Assumptions – Southern Bulk

Study Case	Scenario	Gross Load (MW)	AAEE	AAFS	AATE	DS	KL	BTM-PV		Net Load (MW)	Including		Demand Response*	
								Installed Capacity	Impact		Pump	Loss	D1 (PDR)	D2 (fast RDRR)
BB1-28SP	Baseline	34083	-906	449	980	185	0	9931	-6307	29962	438	2045	-438	-206
BB2-31SP		34869	-1169	1173	2075	268	0	10924	-6996	31771	461	2029	-438	-206
BB3-36SP		29440	-1263	2669	3122	374	0	12816	-603	35732	461	2274	-438	-206
BB4-41SP		30575	-1236	3171	4155	374	0	14532	-685	39031	461	2479	-438	-206
BB5-36SumOP		35585	-1684	528	3865	693	0	12816	-9744	30876	461	2066	-438	-206
BB7-28OP		16644	-300	358	420	76	0	9931	-24	18091	438	714	-438	-206
BB8-31OP		16179	-640	294	950	230	0	10971	-8913	8878	461	603	-438	-206
BS1-31BSP-HLOAD	Sensitivity	36309	-1169	1213	2141	278	0	10924	-6996	33585	461	1905	-438	-206
BS2-28BSP-HiRenew		34083	-906	449	980	185	0	9931	-6307	30167	438	1777	-438	-206
BS3-28OP-BEBS-Charging		16644	-300	358	420	76	0	9931	-24	18966	876	916	-438	-206

Note: DR are modeled offline in starting cases.

Resource and Dispatch Assumptions – Southern Bulk

Study Case	Scenario	Thermal (MW)		Hydro (MW)		Pumped Storage/LDES (MW)		Geothermal (MW)		Solar (MW)		Wind (MW)		Energy Storage (MW)		DC Coupled Hybrid (MW)	
		Pmax	Pgen	Pmax	Pgen	Pmax	Pgen	Pmax	Pgen	Pmax	Pgen	Pmax	Pgen	Pmax	Pgen	Pmax	Pgen
BB1-28SP	Baseline	13413	7792	1541	1192	654	0	374	219	23216	17744	5272	1471	24340	-177	513	398
BB2-31SP	Baseline	13413	12140	1541	1188	654	100	374	219	23308	17891	5294	1472	24999	-974	627	489
BB3-36SP	Baseline	13013	12366	1541	1182	4640	0	494	218	44426	1237	6813	4074	34239	12771	627	417
BB4-41SP	Baseline	12822	11474	1541	1192	4624	553	494	220	47384	1333	8440	5324	34404	10074	627	421
BB5-36SumOP	Baseline	13013	13036	1541	990	4640	-500	494	220	44943	43132	6710	548	34116	-28658	627	537
BB7-28OP	Baseline	13413	12293	1541	1180	654	0	384	219	33174	0	5274	4000	24223	0	585	0
BB8-31OP	Baseline	13419	7816	1541	1189	40	0	384	219	23058	22350	5272	3421	25903	-22646	627	549
BS1-31BSP-HLOAD		13413	12140	1541	1188	654	100	374	219	23308	17891	5294	1472	24999	-974	627	489
BS2-28BSP-HiRenew		13413	7793	1541	1192	654	0	374	219	23216	21767	5292	2923	24340	-1707	513	398
BS3-28OP-BEBS-Charging		13413	13076	1541	1180	654	0	384	219	33174	0	5274	4000	24223	-5637	585	0

Generation Retirement – Southern California Bulk

Study Year	Generation Retirement Assumption			
	Accumulated Capacity Not Retained (MW)	In which		
		SCE CHP Unit	SCE Peaker and CGCC Units	SDG&E Unit
2028	3628	0	0	40
2031	3631	0	0	43
2036	4815	560	624	43
2041	5471	1216	624	43

Major Path Flows in Southern California Bulk

Study Scenario	Southern ISO Bulk Flow Pattern													
	15	26	46	49	61	62	65	66	500	501	712	720	820	831
	Path 15 (S-N)	NORTHERN - SOUTHERN CALIFORNIA	WEST OF COLORADO RIVER (WOR)	EAST OF COLORADO RIVER (EOR)	LUGO - VICTORVILLE 500 KV LINE	ELDORADO - MCCULLOUGH 500 KV	PACIFIC DC INTERTIE (PDCI)	COI (N-S)	Southern CA Imports (Retired)	SDGE IMPORT CUT PLANE	Mesa-LagunaBell Pocket	W. LA Basin LCR Pocket	SUNZIA	TRANSWEST EXPRESS
BB1-28SP	-76	4000	1195	-987	-461	128	3101	2937	10261	2995			2381	NA
BB2-31SP	5032	-3000	6599	1383	1204	355	300	1101	5785	2531			2381	NA
BB3-36SP	2890	-2998	9758	5540	901	-49	300	2629	10342	2195			3021	1230
BB4-41SP	368	4018	7688	1345	657	1080	1600	5102	10494	3018	2848	7806	3021	1230
BB5-36SumOP	3704	-759	11617	118	1566	1183	2000	1866	15942	3552	2849	8343	2207	2880
BB7-28OP	3678	-1758	1688	441	531	63	2806	1864	3424	1574			3021	NA
BB8-31OP	3529	-2649	5352	-175	200	41	-975	-2444	3127	2083			3021	NA

Previously approved projects modeled

Project Name	Transmission Plan Approved	Expected ISD	First Year Modeled
Alberhill 500 kV Substation	2009	April-27	2031
Lugo Substation Install new 500 kV CBs for AA Banks	2008	Dec-24	2031
Lugo – Victorville 500 kV Upgrade (SCE portion)*	2017	Jan-25	2028
Serrano 4AA 500/230 kV Transformer Bank Addition	2022-2023	Dec-27	2036
Sylmar Transformer Replace *	2022-2023	2026	2028
Antelope-Whirlwind 500 kV Line Upgrade Project	2022-2023	Jun-26	2028
Devers-Red Bluff 500 kV 1 and 2 Line Upgrade	2022-2023	May-28	2031
Colorado River-Red Bluff 500 kV 1 Line Upgrade	2022-2023	May-28	2031
Devers-Valley 500 kV 1 Line Upgrade	2022-2023	May-28	2031
Serrano-Alberhill-Valley 500 kV 1 Line Upgrade	2022-2023	May-28	2031
Imperial Valley–North of SONGS 500 kV Line and Substation	2022-2023	2034	2036
North of SONGS–Serrano 500 kV line	2022-2023	2034	2036
Eldorado 230 kV Short Circuit Duty Mitigation Project	2024-2025	2029	2031
Serrano 230 kV GIS Bus Split	2024-2026	2029	2036
Walnut 230 kV CB Upgrade	2025-2026	2030	2031
Etiwanda and Mira Loma 230 kV SCD Upgrade	2025-2026	2031	2031
Mesa - Laguna Bell 230 kV #2 Upgrade	2025-2026	2032	2036
Lugo 500 kV Reactive Power Reinforcement	2025-2026	2032	2036
Trout Canyon – Lugo 500 kV Line	2025-2026	2035	2036
* Joint SCE/LADWP project. Date indicated only includes SCE scope			

Reliability Assessment Results
Southern CAISO Bulk

P1 and P6 Overloads in Midway-Vincent 500KV #1 and #2 Lines

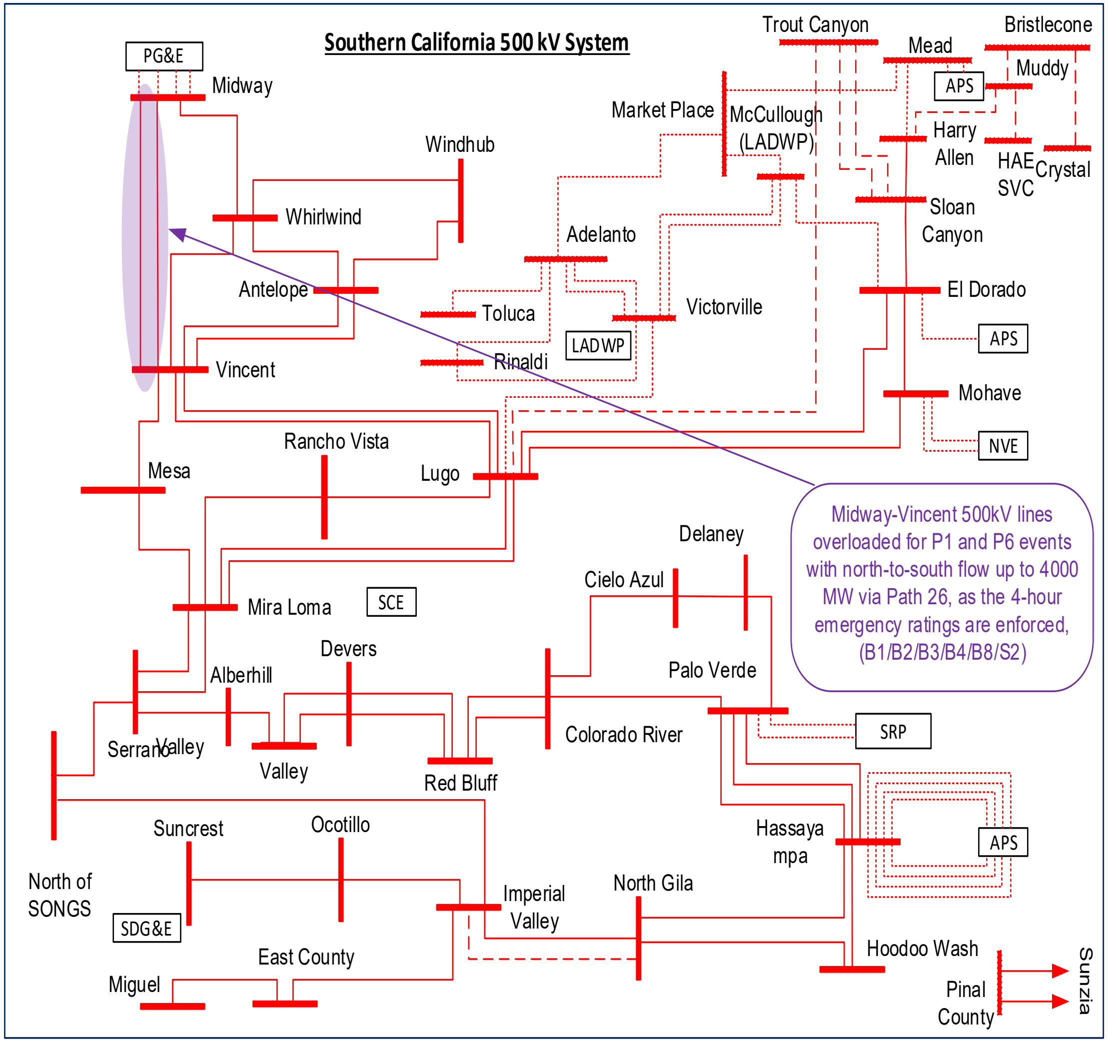
<u>Observations</u>

Midway - Vincent 500kV #1 and #2 lines overloaded for P1 and P6 contingencies due to 4-hour emergency rating enforced:

- 117.5~136.0% for P1 with 4000 MW N2S flow via Path 26 (B1/B4)
- 124.5~176.8% for worst P6 with 4000 MW N2S and 3000 MW S2N flow via Path 26 (B1/B2/B3/B4/B8)

<u>Potential Mitigations</u>

- De-rate Path 26 N2S rating and maintain consistency with ISO Operation Procedure 6410
- Reduce Path 26 import after the 1st contingency of the P6 overloads
- Upgrade Path 26 or eliminate limiting elements of Midway-Vincent 500 kV lines if cost-effective



P0 and P6 Overloads in Midway-Whirlwind 500KV Line

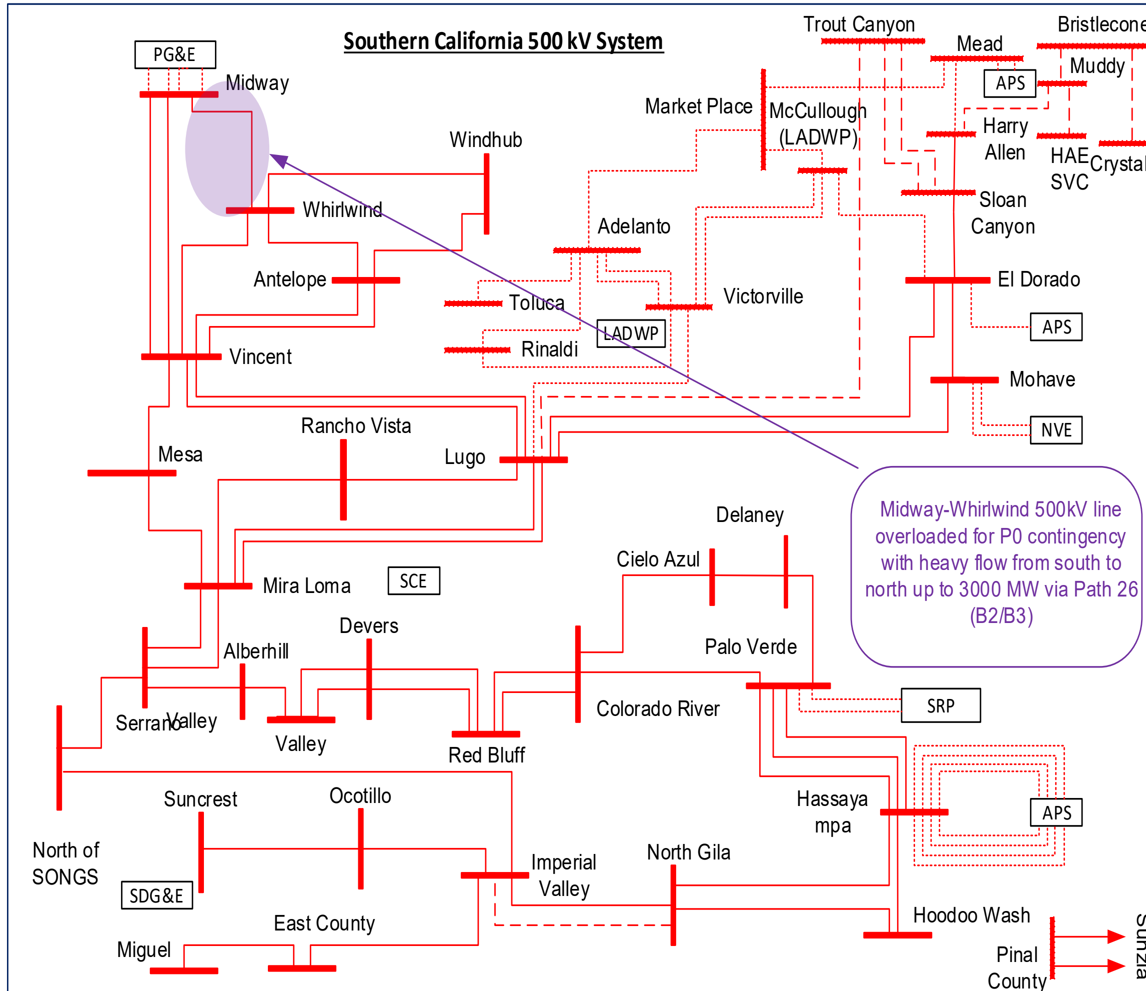
Observations

Midway–Whirlwind 500kV line overloaded for P0, P6, and the credible N-2 events in the following worst scenarios:

- P0 overload with 3000 MW S2N flow via Path 26 (already eliminated by redispatch in B2/B3)
- 112.9% for worst P6 with 4000 MW N2S flow via Path 26 (B4)
- N-2 overloads can be eliminated by exiting Path 26 RAS

Potential Mitigations

- Manage power flow via Path 26 under P0 condition
- Rely on existing Path 26 RAS to address the N2 issue
- Upgrade PG&E-owned section of Midway-Whirlwind 500 kV line if cost-effective



Various Thermal Overloads in SCE Northern 500 kV Lines

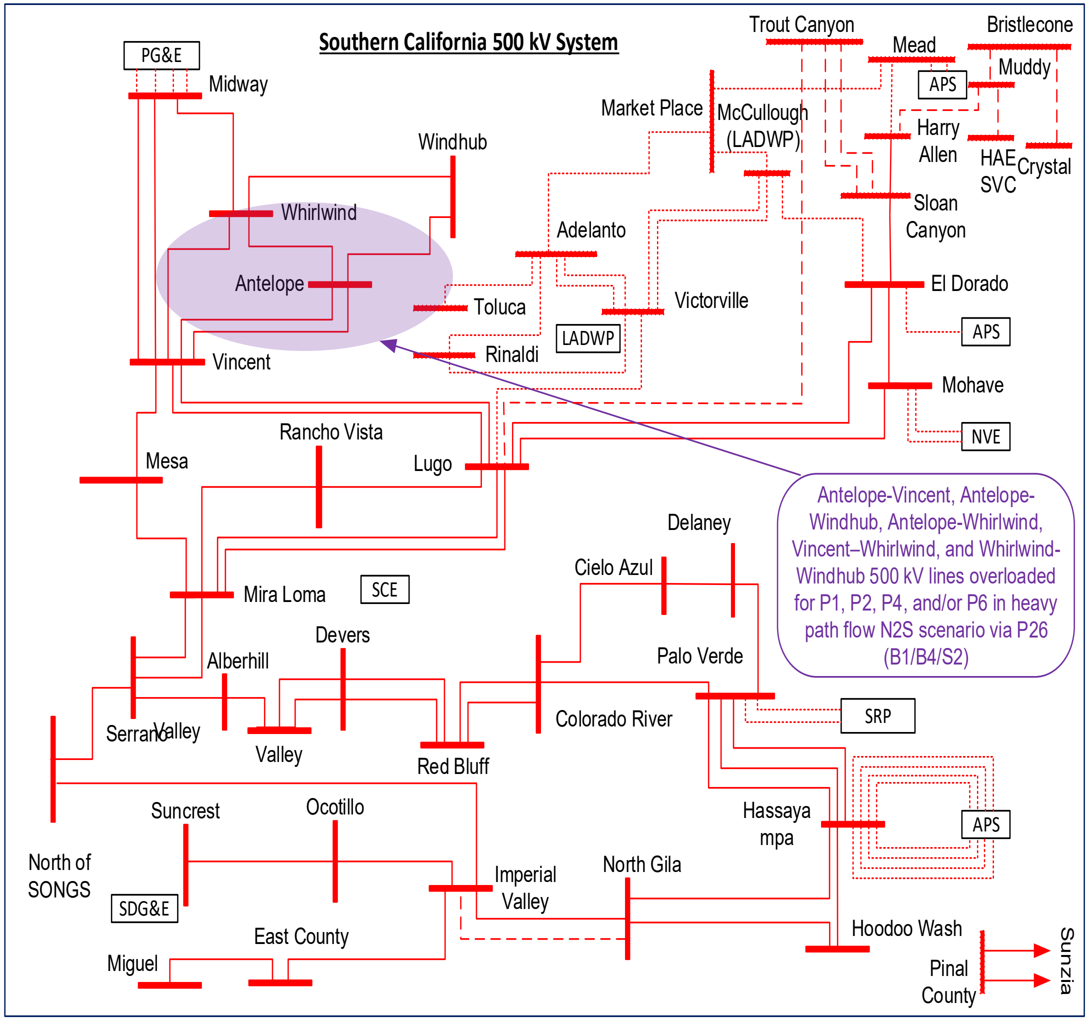
Observations

P1 and P6 thermal overloads were observed in cases B1, B4, and S2 with heavy flow N2S via Path 26

- Whirlwind-Windhub 135% for P1
- Antelope-Windhub 140% for P2/P4
- Antelope-Vincent 110% for P1
- Antelope-Whirlwind (112/% for P2/P4)
- Whirlwind – Vincent (127% for P6)

Potential Mitigations

- Manage pre-contingency flow to address the P1 overloads, along with de-rating Path 26 N2S rating
- Rely on system adjustment after the 1st contingency to address the P6 overloads
- Relocate the 500 kV lines at Whirlwind 500 kV substation to eliminate the P2/P4 Antelope-Whirlwind 500 kV line overload



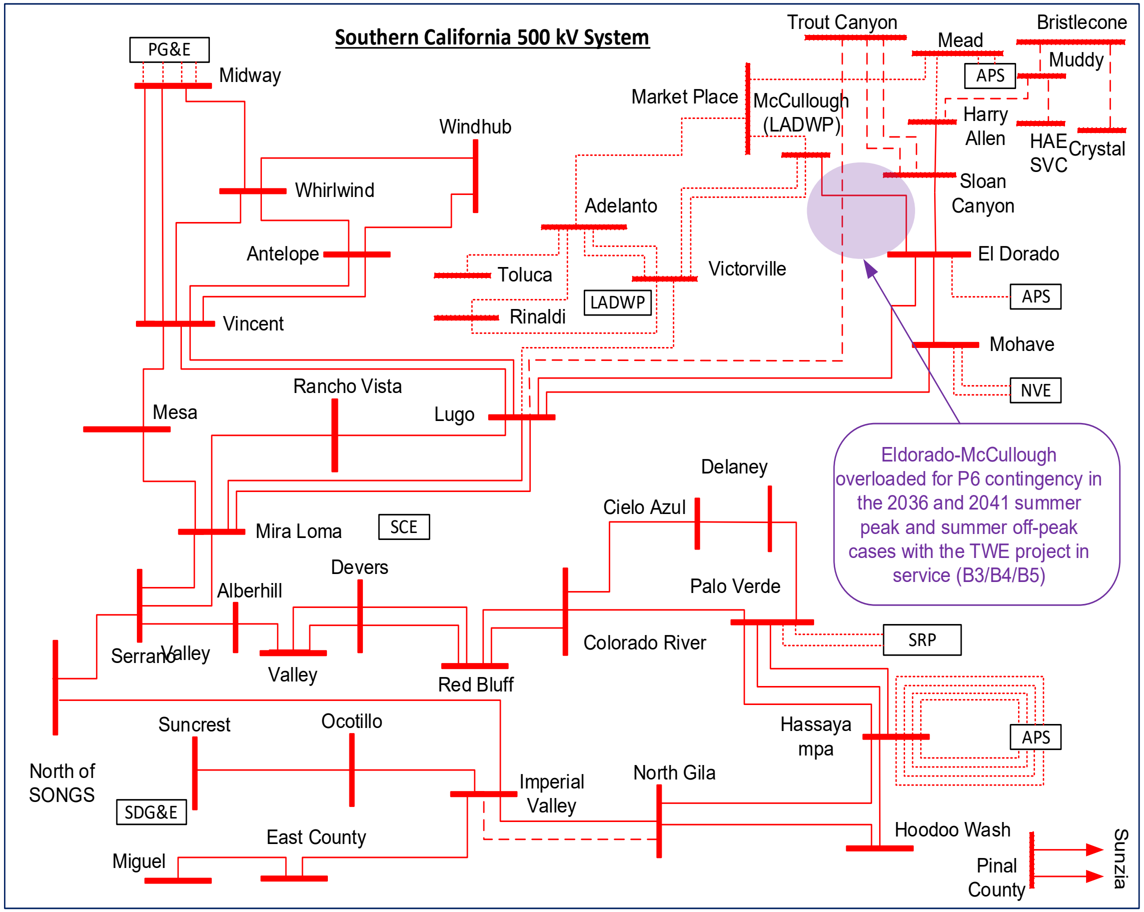
P6 Overload in Eldorado–McCullough 500 kV Ties with LADWP

Observations

- El Dorado–McCullough 500 kV line overloaded for P6 contingencies in the B3/B4/B5 scenarios

Potential Mitigations

- With the completion of the Trout Canyon - Lugo 500 kV project, rely on operational mitigation actions including curtailing generation or reducing import after the 1st contingency of P6 event
- Upgrading the existing Lugo – Victorville RAS as needed



Various Thermal Overloads in SCE Eastern 500 kV Lines

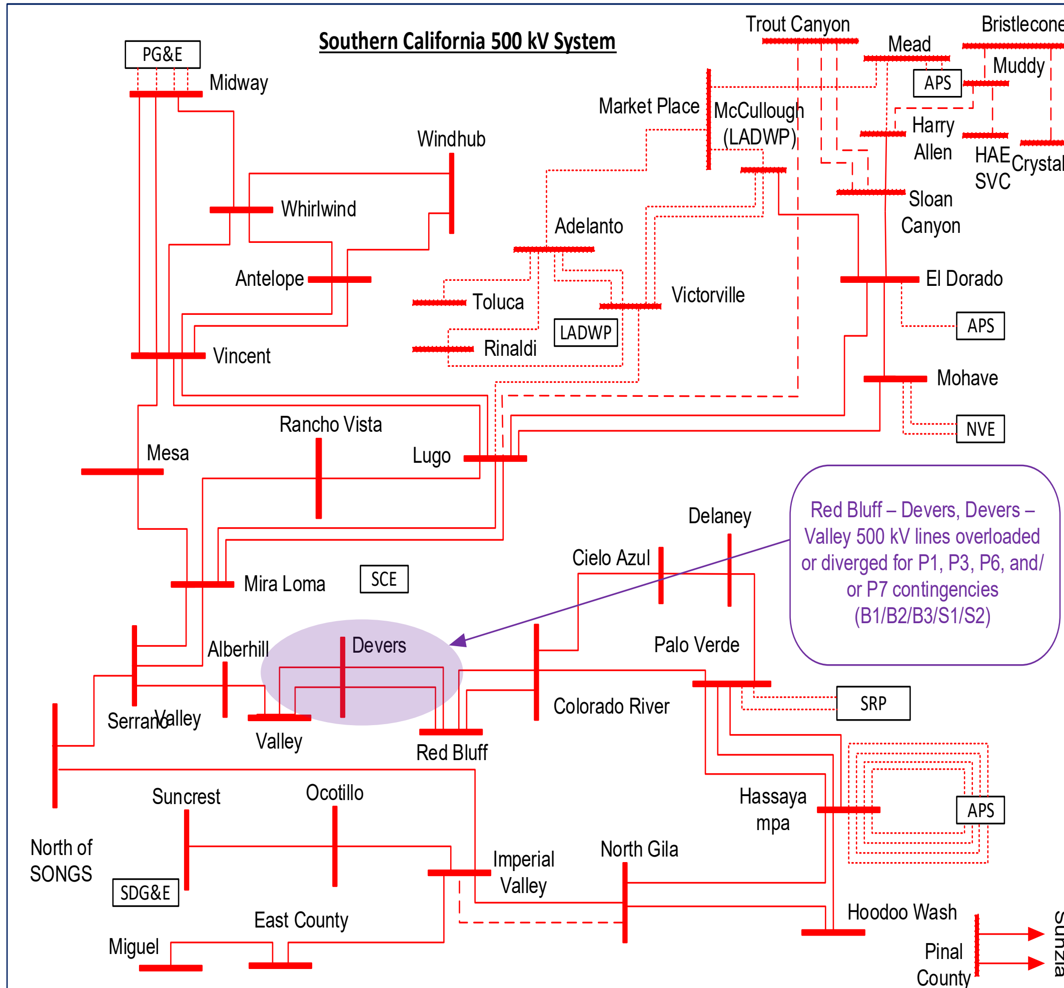
<u>Observations</u>

P1, P3, and P6 thermal overloads were observed in cases B1, B5, S1, and S2:

- Devers - Red Bluff 158% for P1
- Devers - Valley (106% for P1)

<u>Potential Mitigations</u>

- Manage pre-contingency power flow by dispatching generation and reducing import from Path 46 to address the P1 & P3 overloads
- Rely on operation mitigation action including existing RAS



Various Thermal Overloads in SCE Metro 500 kV Lines

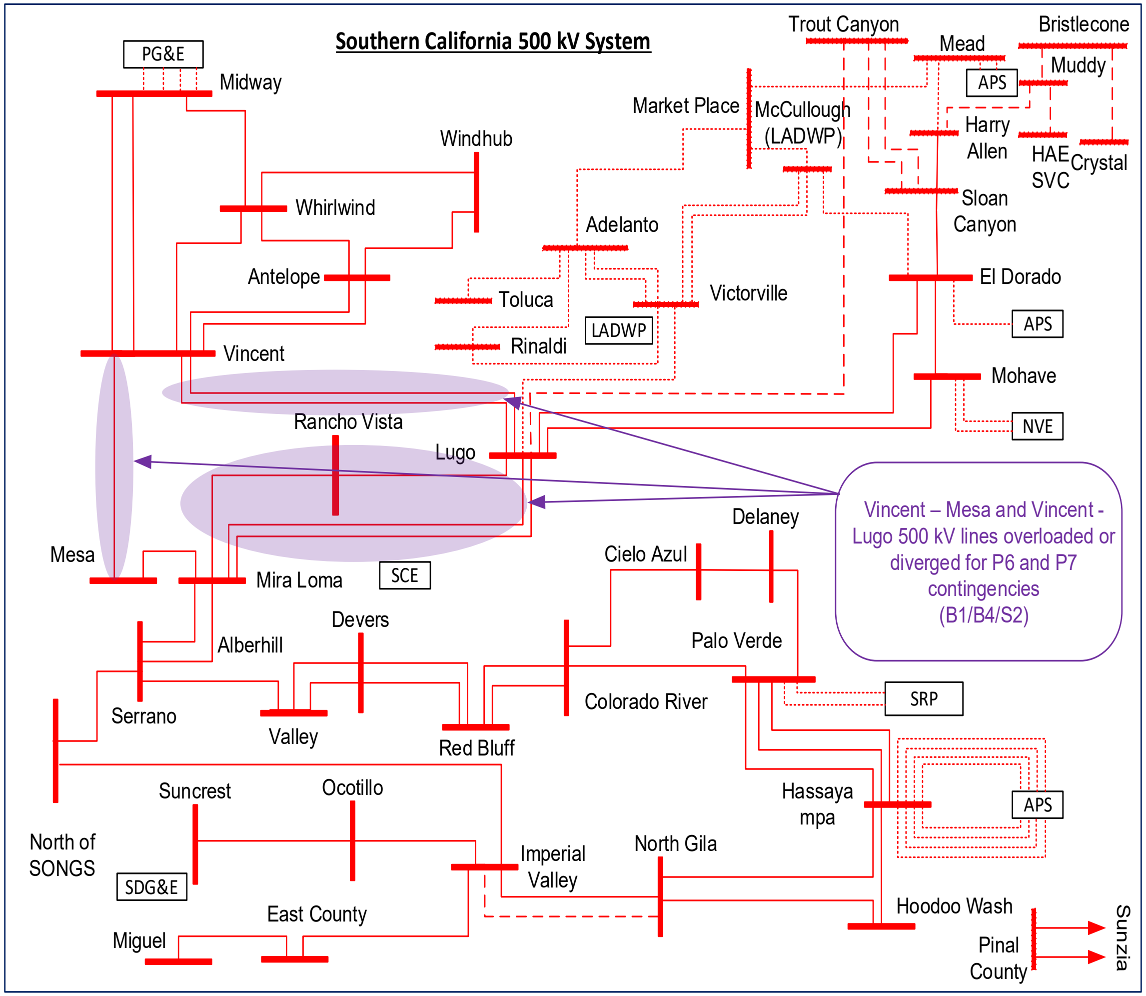
Observations

P6 or P7 thermal overloads were observed on the following 500 kV lines in cases B1, B4, B5, and S2:

- Lugo-Ranch Vista 111% for P7
- Vincent-Mesa 107% for P7
- Vincent-Mesa 122% for P6
- Lugo-Vincent 140% for P6
- Lugo-MiraLoma 120% for P6

Potential Mitigations

- Rely on system adjustment after the 1st contingency to address the P6 overloads
- Manage pre-contingency flow to address the P7 overloads
- Convert the Vincent - Riohondo-Mesa 230 kV line that was built to 500 kV specification to a new Vincent - Mesa 500 kV #2 line



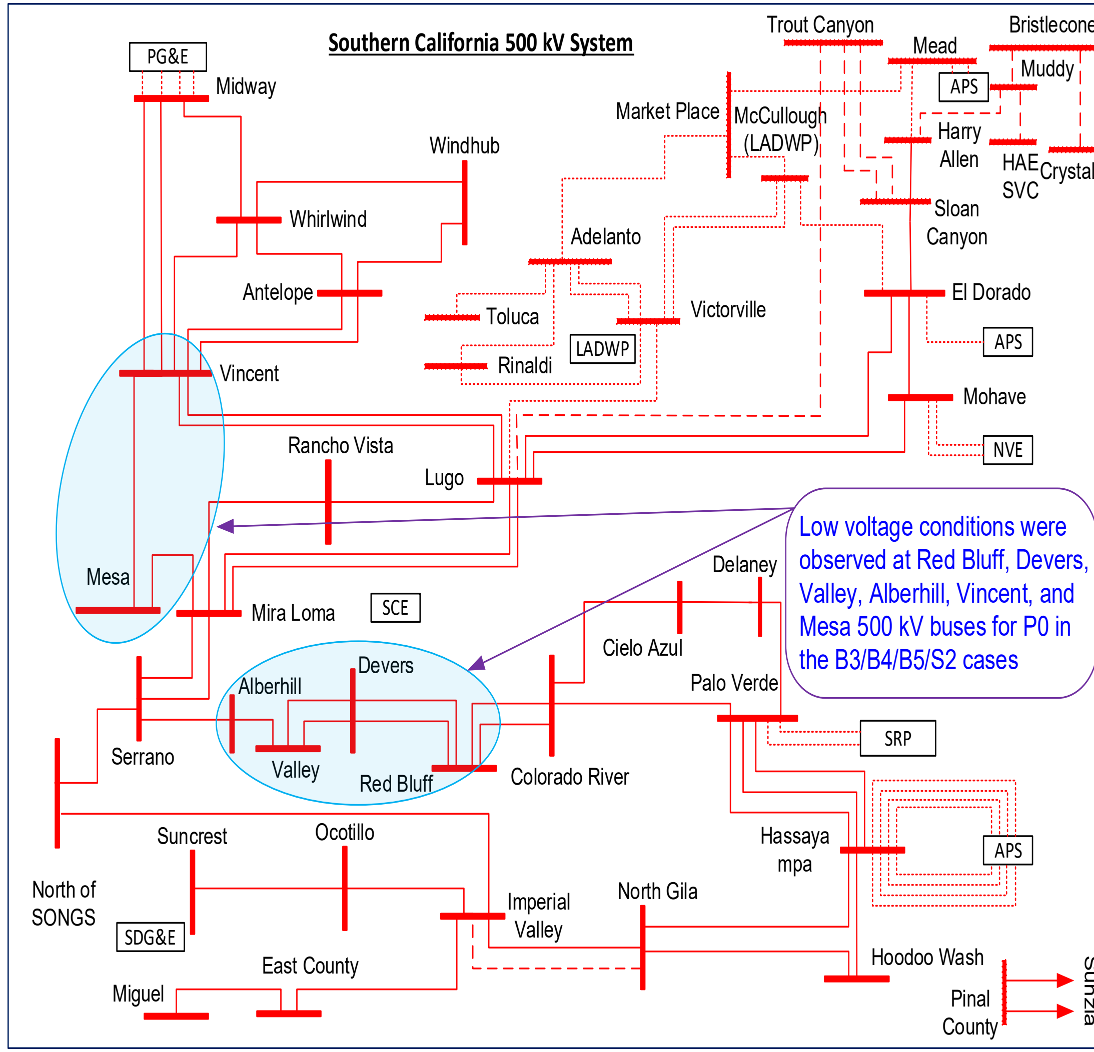
Low Voltage Concerns on SCE 500 kV Bulk

Observations

- Low voltage and deviation violations were identified at SCE 500 kV buses for normal operating condition (P0) (B1, B5, S2)
- The Mohave 500 kV bus experienced high voltages above the applicable criteria during real-time operations

Potential Mitigations

- Add steady-state and dynamic reactive power support facilities at 2–4 locations
- Determine the appropriate Mvar size and location for reactive power facilities in the near-term and long-term
- Re-evaluate the scope of Lugo 500 kV Reactive Reinforcement project that was approved in the 2025-2026 TP.



Transient Stability Analysis

Transient slow voltage recovery at Valley 115 kV load buses was observed for various P1/P4 contingencies in B2/B3/B5/S1 cases. These results indicate a potential concern with compliance to the TPL-001-WECC-CRT R1.3 criteria.

Contingency	Category	Category Description	Transient Stability Performance				Potential Mitigation Solutions
			Baseline Scenarios			Sensitivity Scenarios	
			B2 2031 Summer Peak	B3 2036 Summer Peak	B5 2036 Summer Off-Peak	S1 2031 SP High CEC Load	
01P1_Lugo500kV: P1.3: 3PH 4 cycle fault at Lugo 500kV w/ loss of Lugo-Victorville 500kV	P1	3PG+4Cycle Clear Fault	Valley 115 kV load bus voltage remains below 80% for over 20 seconds	stable	Diverged	Valley 115 kV load bus voltage remains below 80% for over 20 seconds	Potential TPL-001-WECC-CRT R1.3 criteria concern. Further evaluation
1P1_Devers500kV: P1.2: 3PH 4 cycle fault at Devers 230 kV w/ loss of Devers-Valley No.2 500 kV including loss of Devers SVCs & Cap Bank	P1	3PG+4Cycle Clear Fault	Valley 115 kV load bus voltage remains below 80% for over 20 seconds	stable	Valley 115 kV load bus voltage remains below 80% for over 20 seconds	Valley 115 kV load bus voltage remains below 80% for over 20 seconds	
48P4_Vincent500kV: P4.2: SLG 15 cycle fault on Mesa-Vincent 500 kV w/ stuck breaker at Vincent followed by loss of Midway-Vincent No.2 500 kV	P4	SLG+Stuck Breaker	Valley 115 kV load bus voltage remains below 80% for over 20 seconds	Diverged	Diverged	Valley 115 kV load bus voltage remains below 80% for over 20 seconds	
37P4_Lugo500kV: P4.2: SLG 15 cycle fault on Lugo-Vincent No.2 500 kV w/ stuck breaker at Lugo followed by loss of Lugo-Victorville 500 kV	P4	SLG+Stuck Breaker	stable	stable	Diverged	Valley 115 kV load bus voltage remains below 80% for over 20 seconds	

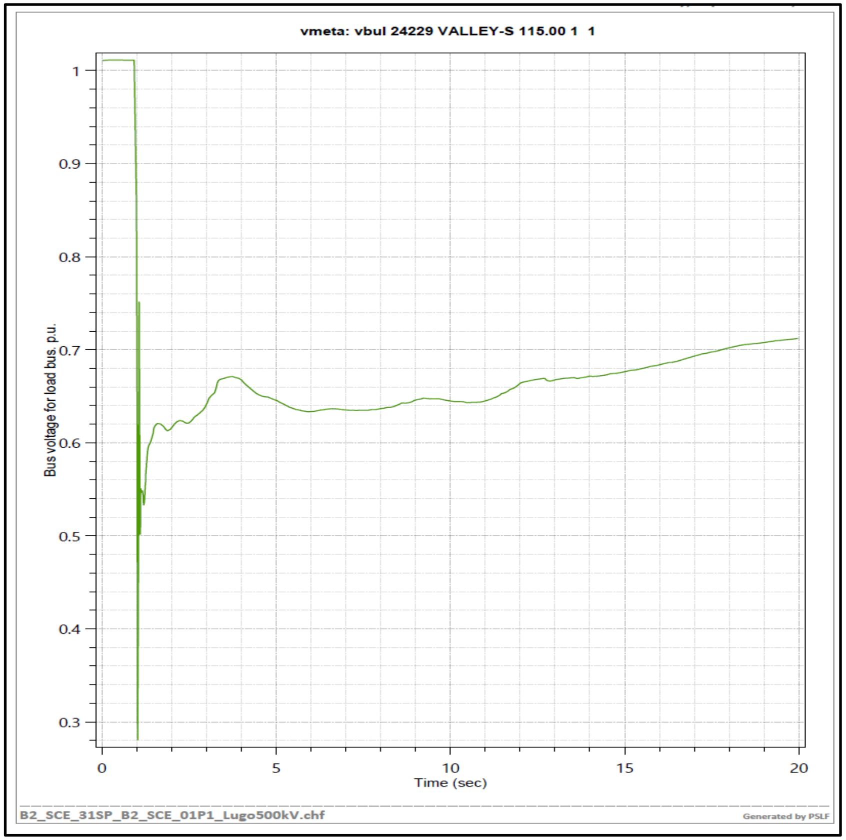
Transient Slow Voltage Recovery at Valley 115 kV

Observations

- Valley 115 kV load bus voltage remains below 80% for over 20 seconds for various P1 and P4 Contingencies in the near-term and long-term planning horizons

Potential Mitigations

- Install steady-state and/or dynamic reactive power support facilities at one of the potential candidate locations: Serrano, Alberhill, Valley, or Devers.



Summary of Potential Upgrades in Southern Bulk

1. Convert the Vincent - Riohondo-Mesa 230 kV line that was built to 500 kV specification to a new Vincent - Mesa 500 kV #2 line to address the P6 and P7 overloads in the Metro 500 kV system

2. Relocate the 500 kV lines at Whirlwind 500 kV substation to eliminate the P2/P4 Antelope-Whirlwind 500 kV line overload

3. Install steady-state and dynamic reactive power support facilities at one or two of the potential candidate locations, to eliminate the P0 low voltage conditions and the P1/P4 transient slow voltage recovery at the Velley 115 kV load bus
    - Serrano 500 kV
    - Alberhill 500 kV
    - Valley 500 kV
    - Devers 500 kV
    - Mohave 500 kV

4. Re-evaluate the scope of Lugo 500 kV Reactive Reinforcement project that was approved in the 2025-2026 TP.

SCE Main System
Preliminary Reliability Assessment Results

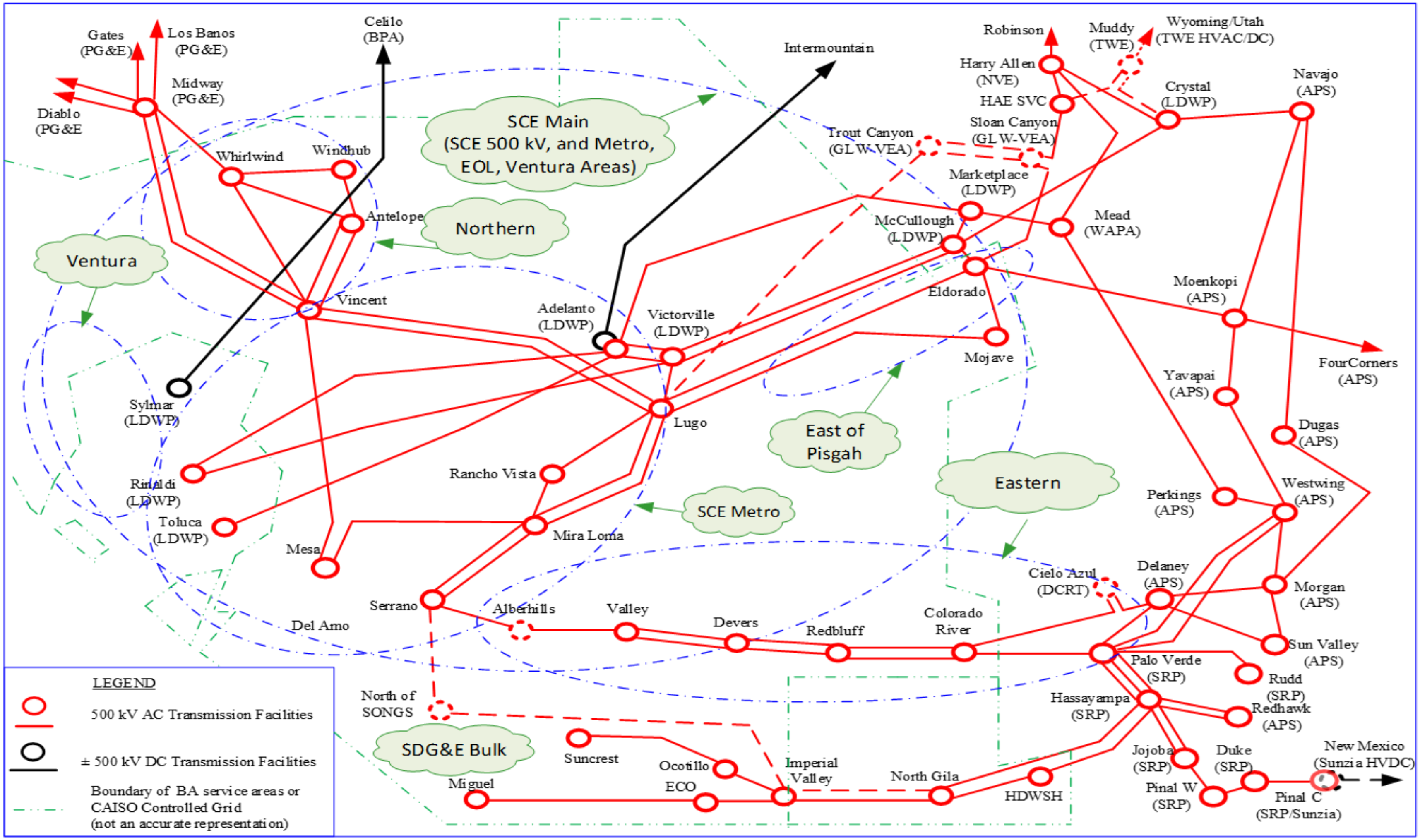
Frank Chen
Sr. Advisor Regional Transmission Engineer

2026-2027 Transmission Planning Process Stakeholder Meeting
September 23-24, 2026

SCE Main System

- Comprised of the SCE 500 kV System and its 230 kV transmission facilities in the SCE Metro, East of Pisgah, and Ventura areas
- Serves approximately 15 million population across Los Angeles, San Bernardino, Northern Orange, Ventura, and Santa Barbara counties
- interconnected with other utilities to enable power exchange and reliability

SCE Main System - 2036



SCE Main System Study Scenarios

Baseline Scenarios

Case ID	Study Case Name	Description
B1	B1-28SP	2028 summer peak load at HE15, 9/6
B2	B2-31SP	2031 summer peak load at HE15, 9/3
B3	B3-36SP	2036 summer peak load at HE15, 9/3
B4	B4-41SP	2041 summer peak load at HE15, 9/4
B5	B5-36SumOP	2036 summer off-Peak Load Case at HE11, 9/3
B6	B6-41WP	2041 winter peak load at HE8, 2/1
B7	B7-28OP	2028 spring off-peak load at HE19, 4/29
B8	B8-36OP	2036 spring off-peak load at HE13, 4/20

Sensitivity Scenarios

Case ID	Study Case Name	Description
S1	S1-31SP-HLOAD	2031 summer peak with high CEC load forecast
S2	S2-28SP-HiRenew	2028 summer peak with heavy renewable output
S3	S3-28OP-BES-Charging	2028 spring off-peak with BES charging in load pocket

Load Forecast and Load Modifier Assumptions - SCE

Study Case	Scenario	Gross Load (MW)	AAEE	AAFS	ATE	DS	KL	BTM-PV		Net Load (MW)	Including		Demand Response*	
								Installed Capacity	Impact		Pump	Loss	D1 (PDR)	D2 (fast RDRR)
B1-28SP	Baseline	29516	-457	246	674	82	1752	7521	-4957	28398	438	1105	-438	-206
B2-31SP		30516	-806	688	1544	403	1811	8330	-5492	30403	461	1278	-438	-206
B3-36SP		31958	-1317	1463	3278	1158	1831	9929	-6434	33808	461	1409	-438	-206
B4-41SP		33279	-1616	2129	4573	1161	1831	11381	-7379	35931	461	1492	-438	-206
B5-36SumOP		30699	-1345	409	3034	693	0	9929	-7896	27182	461	1127	-438	-206
B6-41WP		13136	-1037	7943	4508	1069	819	11381	-894	26992	461	988	-438	-206
B7-28OP		12793	-247	315	253	76	779	7521	0	14955	438	547	-438	-206
B8-31OP		13920	-524	238	745	230	0	8330	-6906	8474	461	310	-438	-206
S1-31SP-HLOAD	Sensitivity	31805	-806	717	1609	421	1887	8330	-5492	31766	461	1163	-438	-206
S2-28SP-HiRenew		29516	-457	246	674	82	1752	7521	-4957	28399	438	1105	-438	-206
S3-28OP-BES-Charging		12793	-247	315	253	76	779	7521	0	14955	438	547	-438	-206

Generation Resource and Dispatch Assumptions -SCE

Study Case	Scenario	Thermal (MW)		Hydro (MW)		Pumped Storage/LDES		Geothermal (MW)		Solar (MW)		Wind (MW)		Energy Storage (MW)		DC Coupled Hybrid (MW)	
		Pmax	Pgen	Pmax	Pgen	Pmax	Pgen	Pmax	Pgen	Pmax	Pgen	Pmax	Pgen	Pmax	Pgen	Pmax	Pgen
B1-28SP	Baseline	9698	9095	1537	1189	614	0	384	219	21047	16182	4252	1410	20947	1674	416	329
B2-31SP	Baseline	9698	9533	1537	1185	614	100	384	219	21014	16272	4274	1411	22149	709	531	419
B3-36SP	Baseline	9298	8124	1537	990	4100	0	494	220	35087	26188	4803	1592	30037	-3612	531	419
B4-41SP	Baseline	9110	6632	1537	1189	4084	553	494	220	37440	27910	5146	1993	30200	-3771	531	419
B5-36SumOP	Baseline	9298	8833	1537	990	4100	0	494	220	35231	33809	4790	433	29913	-24736	531	509
B6-41WP	Baseline	9110	5842	1537	990	4084	308	494	223	37838	15710	5242	1764	30089	-1499	531	234
B7-28OP	Baseline	9698	8840	1537	1180	614	0	384	219	31005	0	4254	3164	21165	1200	488	0
B8-31OP	Baseline	9698	6828	1537	1189	0	0	384	219	20889	20203	4252	2605	22190	-19107	531	520
S1-31SP-HLOAD	Sensitivity	9698	9277	1537	1185	614	100	384	219	21014	16284	4274	1411	22149	709	531	419
S2-28SP-HiRenew	Sensitivity	9698	7424	1537	1189	614	0	384	219	21047	20205	4272	2862	20947	1794	416	329
S3-28OP-BES-Charging	Sensitivity	9698	9135	1537	1180	614	0	384	219	31005	0	4254	3164	21165	-3927	488	0

Generation Retirement – SCE Main

Study Year	Generation Retirement Assumption		
	Accumulated Capacity Not Retained (MW)	In which	
		CHP Unit	Peaker and CGCC Units
2028	3588	0	0
2031	3588	0	0
2036	4772	560	624
2041	5428	1216	624

Major Path Flow Assumption

	Major Path Flow in MW														
Path #	26	41	42	45	46	49	61	62	65	500	501	712	720	820	831
Study Scenario	NORTHERN - SOUTHERN CALIFORNIA	SYLMAR - SCE	IID - SCE	SDG&E - CFE	WEST OF COLORADO RIVER (WOR)	EAST OF COLORADO RIVER (EOR)	LUGO - VICTORVILLE 500 KV LINE	ELDORADO - MCCULLOUGH 500 KV	PACIFIC DC INTERTIE (PDCI)	Southern CA Imports (Retired)	SDGE IMPORT CUT PLANE	Mesa-LagunaBell Pocket	W. LA Basin LCR Pocket	SUNZIA	TRANSWEST EXPRESS
B1-28SP	3997	-1766	481	-593	1178	-1274	-1138	53	3101	9963	2512			2381	NA
B2-31SP	-3005	1050	527	-4	5766	798	1509	176	1800	6245	2231			2381	NA
B3-36SP	-2940	912	806	-599	13813	2381	1715	1017	500	13951	3907	3174	8272	2381	2850
B4-41SP	3930	-734	763	-349	6954	-4688	85	1890	1850	14434	3499	3055	9190	2381	2851
B5-36SumOP	1439	922	618	380	13212	515	2244	1306	2000	18559	3549	3828	10543	2207	2880
B6-41WP	-2949	976	799	5	10789	3665	1594	333	300	10085	3507	3059	8036	3021	2970
B7-28OP	-1758	-496	174	3	1688	441	531	63	2806	3424	1574			3021	NA
B8-31OP	-2649	-14	543	1	5352	-175	200	41	-975	3127	2083			3021	NA

Previously Approved Projects Modeled

Project Name	Transmission Plan Approved	Expected ISD	First Year Modeled
Alberhill 500 kV Substation	2009	April-27	2031
Lugo Substation Install new 500 kV CBs for AA Banks	2008	Dec-24	2031
Lugo – Victorville 500 kV Upgrade (SCE portion)*	2017	Jan-25	2028
Serrano 4AA 500/230 kV Transformer Bank Addition	2022-2023	Dec-27	2036
Sylmar Transformer Replace *	2022-2023	2026	2028
Antelope-Whirlwind 500 kV Line Upgrade Project	2022-2023	Jun-26	2028
Devers-Red Bluff 500 kV 1 and 2 Line Upgrade	2022-2023	May-28	2031
Colorado River-Red Bluff 500 kV 1 Line Upgrade	2022-2023	May-28	2031
Devers-Valley 500 kV 1 Line Upgrade	2022-2023	May-28	2031
Serrano-Alberhill-Valley 500 kV 1 Line Upgrade	2022-2023	May-28	2031
Imperial Valley–North of SONGS 500 kV Line and Substation	2022-2023	2034	2036
North of SONGS–Serrano 500 kV line	2022-2023	2034	2036
Eldorado 230 kV Short Circuit Duty Mitigation Project	2024-2025	2029	2031
Serrano 230 kV GIS Bus Split	2024-2026	2029	2036
Walnut 230 kV CB Upgrade	2025-2026	2030	2031
Etiwanda and Mira Loma 230 kV SCD Upgrade	2025-2026	2031	2031
Mesa - Laguna Bell 230 kV #2 Upgrade	2025-2026	2032	2036
Lugo 500 kV Reactive Power Reinforcement	2025-2026	2032	2036
Trout Canyon – Lugo 500 kV Line	2025-2026	2035	2036
* Joint SCE/LADWP project. Date indicated only includes SCE scope			

Estimate of Energy Storage Curtailment in the Metra area, based on the 2036 Summer Off-Peak case

Study Area	Battery Storage Curtailment Estimate			
SCE Metro Area (Zone 996)	**Total Energy Storage Installed Capacity (MW)**	11000		
		in Which: 4133 MW of existing and in-dev. 6867 MW of generic storage		
	Contingency Category	P0	P1	P7
	Curtailment? (Yes or No)	Yes	No	Yes
	Total Energy Storage Curtailment (MW)	4952	0	1700
		6652 MW in total		

Reliability Assessment Results
SCE Main System

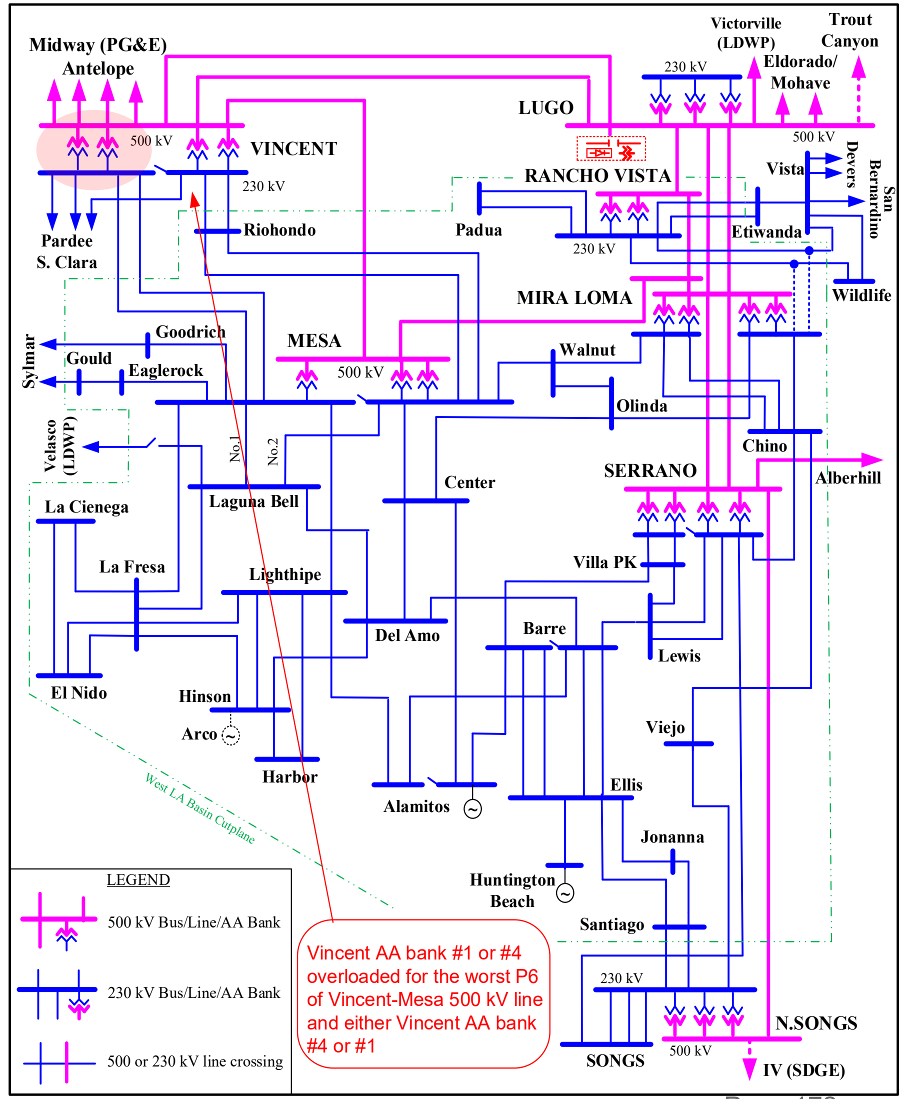
Vincent 500/230 kV AA Banks #1 and #4 Overloads

Observations

- Vincent AA banks #1 or #4 overload as high as 153.5% for the worst P6 of Vincent – Mesa 500 kV line and either Vincent AA bank #4 or #1 contingencies (B1, B4)

Potential Mitigations

- Operational mitigation after the 1st contingency to reduce Path 26 north-to-south (N2S) flow
- Convert the Vincent - Riohondo-Mesa 230 kV line that was built to 500 kV specification to a new Vincent - Mesa 500 kV #2 line
- Pursue a comprehensive solution developing 2,000 MW of HVDC system serving the Western LA Basin, subject to feasibility and cost-effectiveness



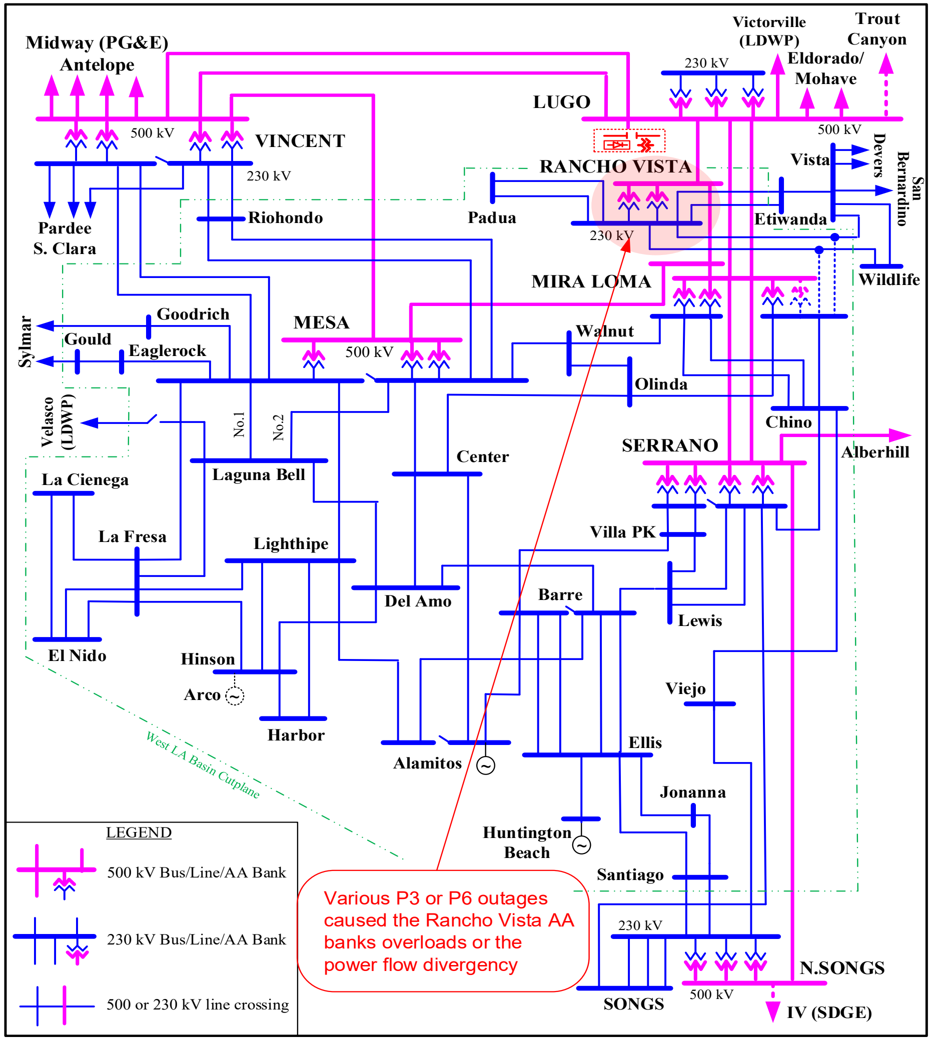
Rancho Vista 500/230 kV AA Banks #2 and #3 Overloads

<u>Observations</u>

- Rancho Vista AA banks #2 or #3 overload as high as 114.4% for the P3 of Mountain View power plant block 1 and Rancho Vista AA bank #3 or #2 contingencies (B4)
- Various P6 contingencies for the loss of the both Rancho Vista AA banks or the two 500 kV lines connecting Rancho Vista 500 kV bus caused power flow divergency (B3, B4, S1)

<u>Potential Mitigations</u>

- Operational mitigation after the 1st contingency of P3 and P6 contingencies to energize Rancho Vista – Mira Loma 230 kV and Miro Loma – Vista/Wildlife 230 kV lines



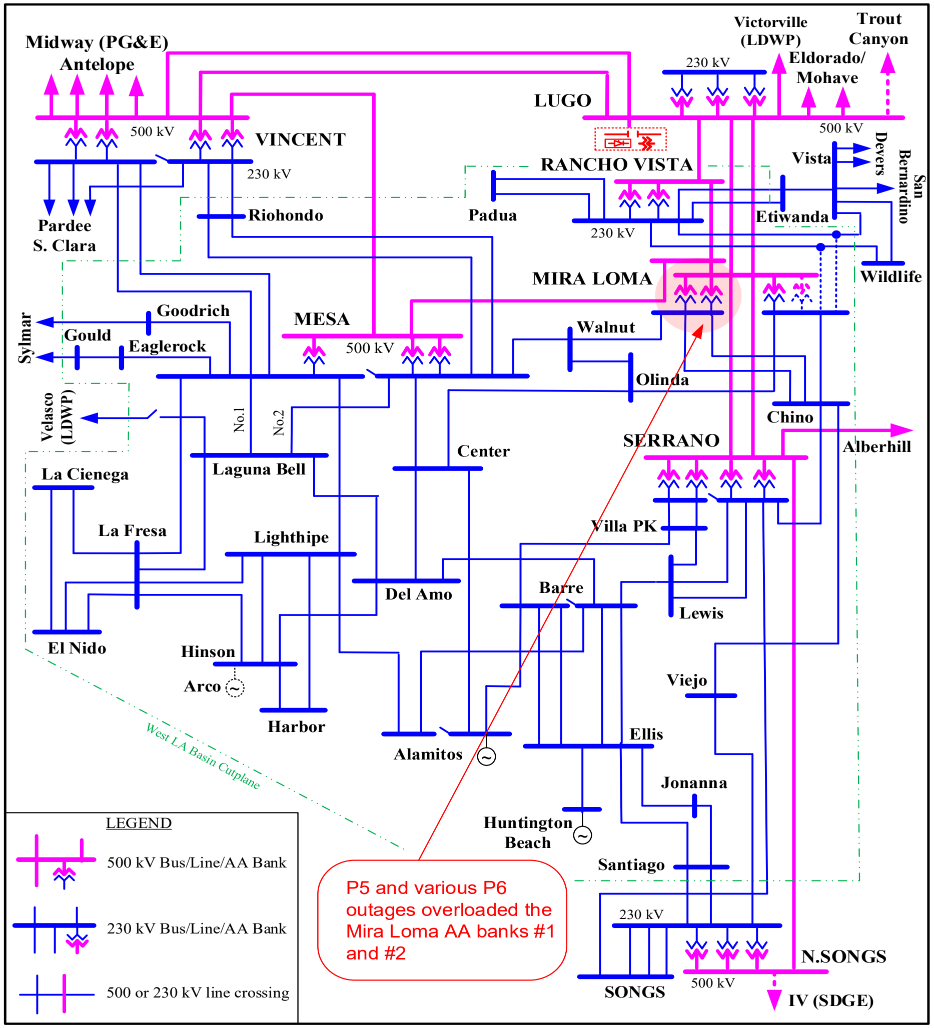
Miro Loma 500/230 kV AA Banks #1, #2 Overloads

Observations

- P6 contingency of the losing two of three Mira Loma AA banks overloaded as high as 120.4% for the remaining AA bank (B3/B4/S1)

Potential Mitigations

- Operational mitigation after the 1st contingency of P6 contingency to dispatch available resources including energy storage subject to storage charging and discharging constrains in the LA Basin
- Pursue a comprehensive solution developing 2,000 MW of HVDC system serving the Western LA Basin, subject to feasibility and cost-effectiveness



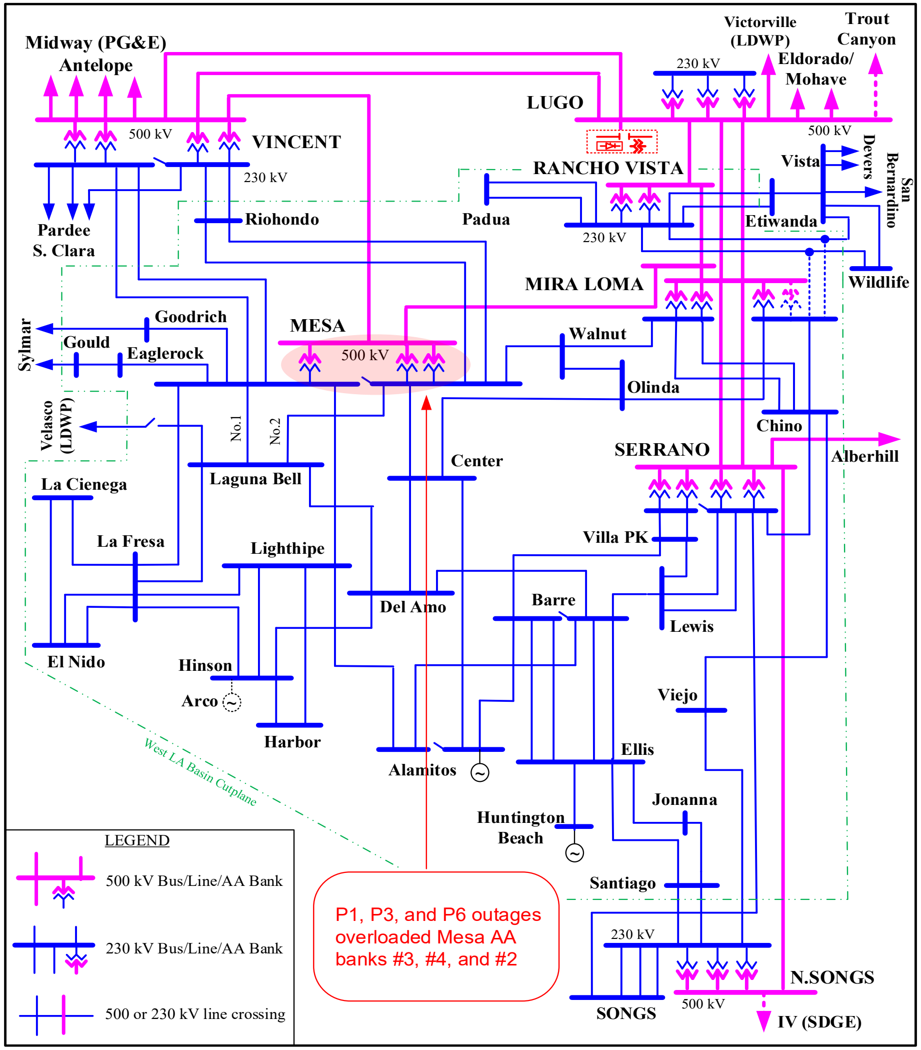
Mesa 500/230 kV AA Banks Overload

Observations

- Mesa AA bank overloads for the P6 contingency of losing two of the three banks (B3, B4, S1) in the high-density urban load area (122% for worst P6)

Potential Mitigations

- Utilize energy storage resource as LCR, subject to storage charging and discharging constraints in the LA Basin
- Add 4th AA bank at Mesa 500/230 kV substation
- Pursue a comprehensive solution developing 2,000 MW of HVDC system serving the Western LA Basin, subject to feasibility and cost-effectiveness



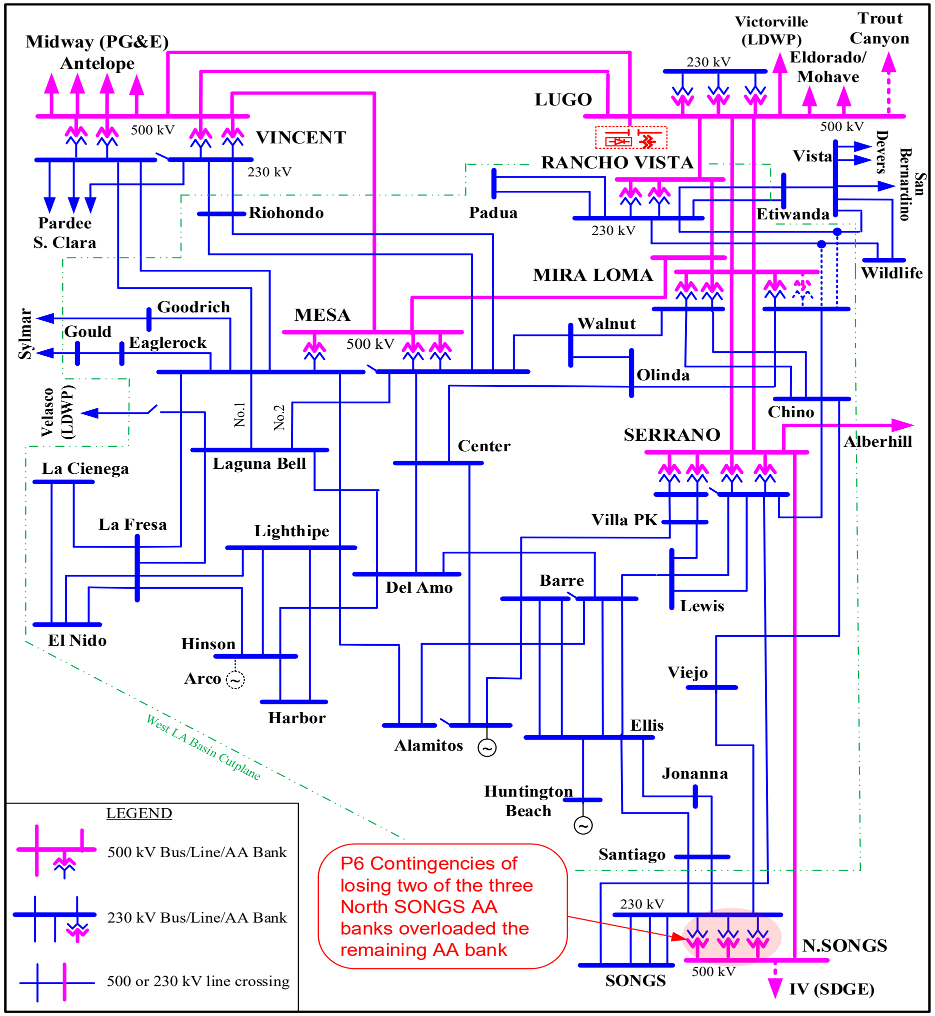
North SONGS 500/230 kV AA Banks Overload

Observations

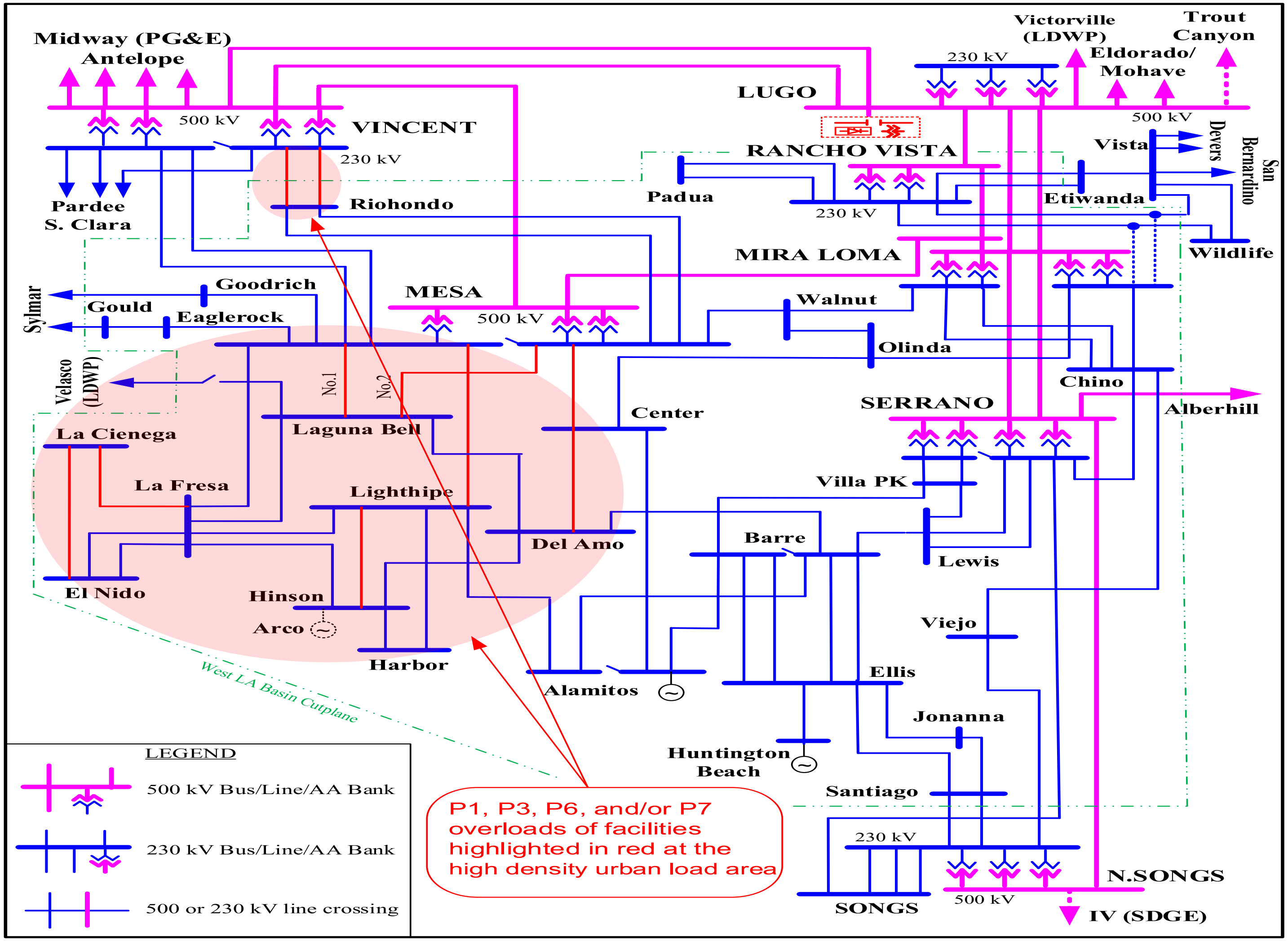
- North SONGS AA bank overloads as high as 110% for the P6 contingency of losing any two of the three banks (B3)

Potential Mitigations

- Operational mitigation dispatching generation resources including energy storage resources after the 1st contingency of the P6 events, subject to storage charging and discharging constraints in the SCE and SDG&E areas
- Pursue a comprehensive solution developing 2,000 MW of HVDC system serving the Western LA Basin, subject to feasibility and cost-effectiveness



Various Thermal Overloads in Western LA Basin



California ISO

Various Thermal Overloads in Western LA Basin – cont'd

Observations

P1, P3, P6, and P7 thermal overloads were identified in various scenarios (B3, B4) on the following 230 kV facilities in the high-density urban load area

- Mesa-Laguna Bell #1 (109% of Rating 2 and 143% of Rating 1 for P7)
- Rewired Mesa-Laguna Bell #2 (104% of Rating 2 and 137% of Rating 1 for P7)
- Mesa - Lighthipe (112% of Rating 2 and 155% of Rating 1 for P7)
- Mesa - Center (128% of Rating 2 for the worst P6)
- Center - Del Amo (106% of Rating 1 for the worst P6)
- Lighthipe-Hinson (106% of Rating 2 and 143% of Rating 1 for the worst P6)
- La Fresa – La Cienega (124% of Rating 2 for P7)
- Vincent – Rio Hondo (106% of Rating 1 for the worst P6)

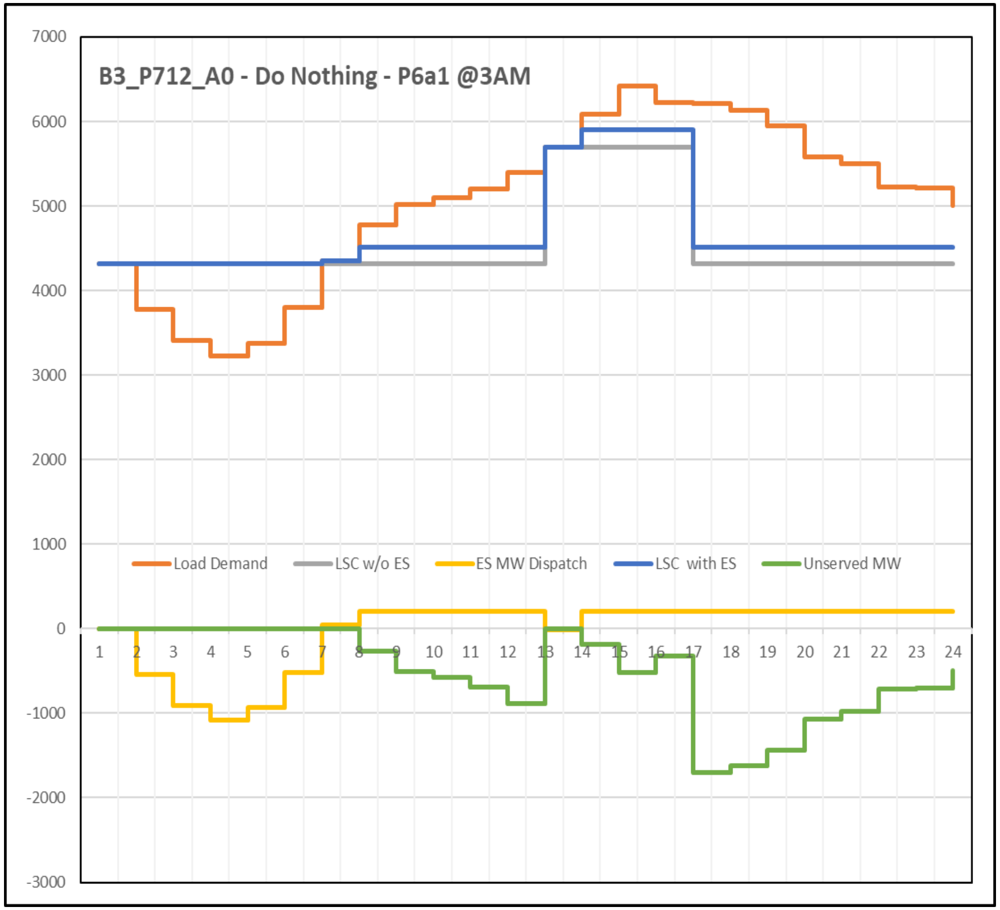
Potential Mitigations

- Utilize energy storage resources to meet LCR, subject to verification of storage charging constraints
- Implement a phased upgrade strategy for the 230 kV transmission system, including rebuilding, reconfiguring, and/or adding new 230 kV facilities as needed
- Pursue a comprehensive transmission solution developing 2,000 MW of HVDC system serving the Western LA Basin, subject to feasibility and cost-effectiveness

Methodology for Evaluating Storage Charging/Discharging Constraints An Illustrative Example

<u>Methodology</u>

- Perform power flow simulation to evaluate the transmission load serve capability without energy storage dispatched at the summer peak under the worst contingency
- Utilize 24-hour load profile and the estimated load serve capability to evaluate energy storage charging and discharging capabilities in MW and MWh
- Estimate the load serve capability with the energy storage discharged and unserved load in MW and MWh



Thermal Overloads on Various 230 kV Lines in Ventura Area

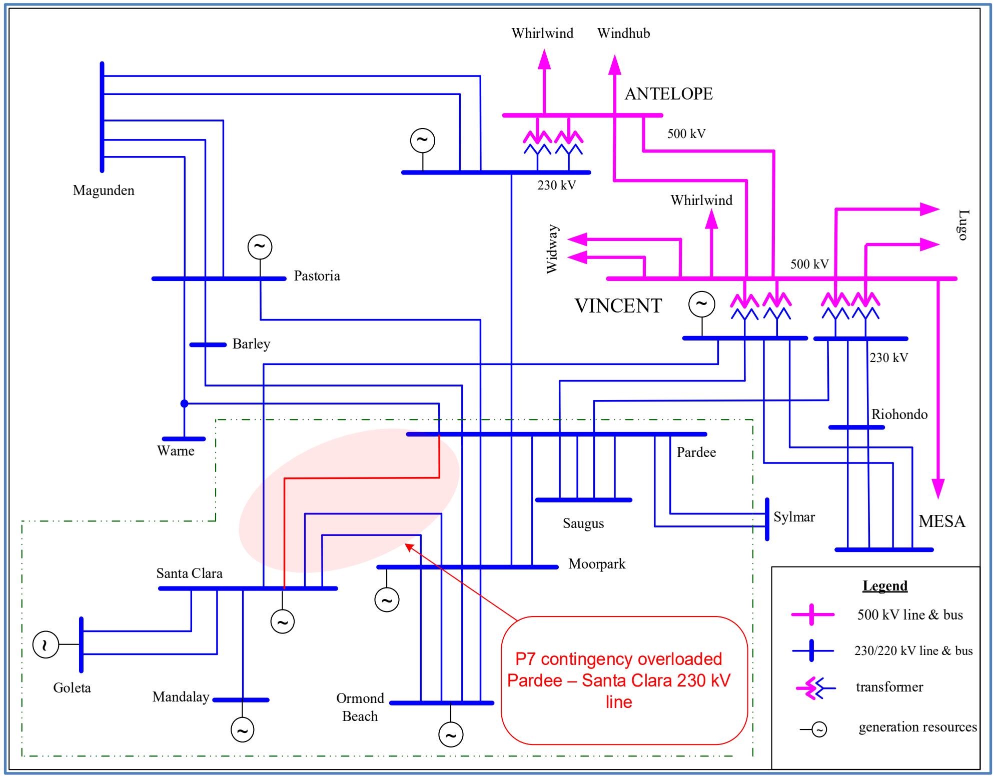
Observations

P7 thermal overloads were identified in B3/B4 scenarios on the following 230 kV facilities

- Pardee - S. Clara (126% for P7)

Potential Mitigations

- Utilize energy storage to address the P7 overloads, subject to charging and discharging constraint



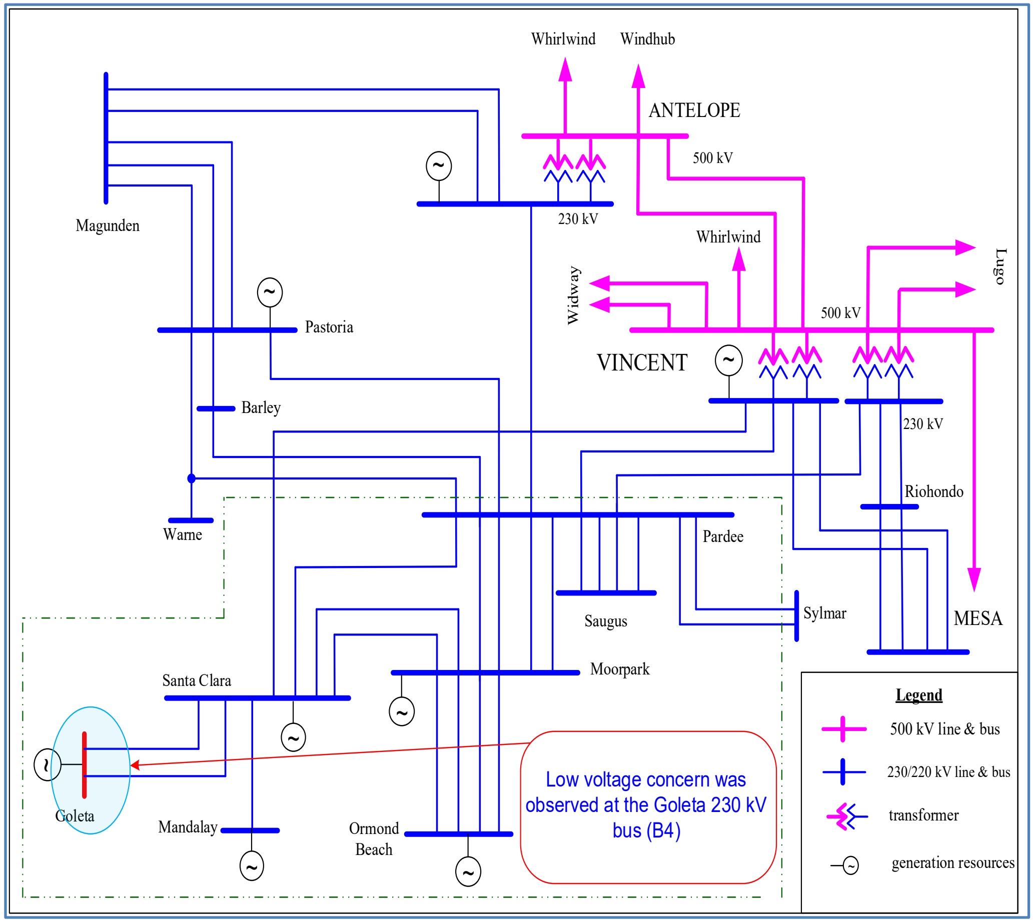
Voltage issue in the Ventura Area

Observations

P7 contingency of losing Moorpark – Santa Clara 230 kV lines caused voltage as low as 0.85 pu at the Goleta 230 kV bus (B4)

Potential Mitigations

- Keep eye on the low voltage concern and add reactive power support facility in the Goleta or Santa Clara 230 kV substation as needed



California ISO

Transient Stability Analysis

Transient slow voltage recovery was observed at the Valley 115 kV load buses under multiple P1 and P4 contingency scenarios in the B2, B3, B5, and S1 study cases. These results indicate a potential concern with compliance to the TPL-001-WECC-CRT R1.3 criteria. Additional details are provided in the Southern Bulk Stability Analysis.

Contingency	Category	Category Description	Transient Stability Performance				Potential Mitigation Solutions
			Baseline Scenarios			Sensitivity Scenarios	
			B2 2031 Summer Peak	B3 2036 Summer Peak	B5 2036 Summer Off-Peak	S1 2031 SP High CEC Load	
01P1_Lugo500kV: P1.3: 3PH 4 cycle fault at Lugo 500kV w/ loss of Lugo-Victorville 500kV	P1	3PG+4Cycle Clear Fault	Valley 115 kV load bus voltage remains below 80% for over 20 seconds	Valley 115 kV load bus voltage remains below 80% for over 20 seconds	Diverged	Valley 115 kV load bus voltage remains below 80% for over 20 seconds	Potential TPL-001-WECC-CRT R1.3 criteria concern
1P1_Devers500kV: P1.2: 3PH 4 cycle fault at Devers 230 kV w/ loss of Devers-Valley No.2 500 kV including loss of Devers SVCs & Cap Bank	P1	3PG+4Cycle Clear Fault	Valley 115 kV load bus voltage remains below 80% for over 20 seconds	Valley 115 kV load bus voltage remains below 80% for over 20 seconds	Valley 115 kV load bus voltage remains below 80% for over 20 seconds	Valley 115 kV load bus voltage remains below 80% for over 20 seconds	
48P4_Vincent500kV: P4.2: SLG 15 cycle fault on Mesa-Vincent 500 kV w/ stuck breaker at Vincent followed by loss of Midway-Vincent No.2 500 kV	P4	SLG+Stuck Breaker	Valley 115 kV load bus voltage remains below 80% for over 20 seconds	Diverged	Diverged	Valley 115 kV load bus voltage remains below 80% for over 20 seconds	
37P4_Lugo500kV: P4.2: SLG 15 cycle fault on Lugo-Vincent No.2 500 kV w/ stuck breaker at Lugo followed by loss of Lugo-Victorville 500 kV	P4	SLG+Stuck Breaker	stable	stable	Diverged	Valley 115 kV load bus voltage remains below 80% for over 20 seconds	

Summary of Potential New Upgrades in SCE Main

- Utilize energy storage resources to meet LCR, subject to verification of storage charging and discharging constraints
- Implement a phased upgrade strategy for the LA Basin system, including rebuilding, reconfiguring, and/or adding new 230 kV facilities as needed, such as
  - add a 4th AA bank at Mesa 500/230 kV substation
  - add a new 230 kV line from Mesa to Laguna Bell or Lighthipe
  - convert the Vincent - Riohondo-Mesa 230 kV line that was built to 500 kV specification to a new Vincent-Mesa 500 kV #2 line
  - rebuild Mesa–Laguna Bell #1 and #2, Mesa–Lighthipe, Mesa - Center, and Center–Del Amo 230 kV transmission lines, and upgrade associated substation equipment as needed
  - re-configure the Western LA Basin 230 KV network
- Pursue a comprehensive transmission solution developing 2,000 MW of HVDC system to Western LA Basin, subject to feasibility and cost-effectiveness
  - convert Antelope – Pardee and Vincent – Pardee 230 kV lines that were built to 500 kV specification to two 500 kV lines, along with adding Pardee 500 kV substation
  - develop a 2000 MW HVDC source to Western LA Basin via submarine route along the Pacific coast or via underground route, subject to feasibility and cost-effectiveness

Big Creek Corridor
Preliminary Reliability Assessment Results

Aayushi Mer, Anuj Hiray
Regional Transmission – South

2026-27 Transmission Planning Process Stakeholder Meeting
September 23-24, 2026

SCE Big Creek Corridor

- Serves the SCE area extending north from the Metro area
- Comprised of 500 kV, 230 kV and 66 kV transmission facilities including the 500/230 kV transformers in the Tehachapi region
- 1-in-10 summer peak net load of 2,934 MW in 2036
- The forecast load includes the impact of 972 MW of BTM PV and 161 MW of AAEE
- Approximately 27,000 MW of existing and committed resources comprised of solar, wind, gas-fired, hydro and storage battery

Load and Load Modifier Assumptions – Big Creek Corridor

Scenario	Study Case	Description	Gross Load (MW)	AAEE (MW)	AAFS (MW)	ATE (MW)	KL (MW)	BTM-PV (MW)		Net Load (MW)	Demand Response Installed (MW)	
								Installed	Output		Fast	Slow
Base	2028SP	Summer Peak for 2028	2666	-51	23	24	87	794	524	2464	-47	0
	2031SP	Summer Peak for 2031	2821	-95	61	55	95	827	546	2618	-47	0
	2036SP	Summer Peak for 2036	3137	-161	126	122	95	972	641	2934	-47	0
	2036SmrOP	Summer Off-Peak for 2036	2823	-175	38	112	0	972	787	2621	-47	0
	2028OP	Spring Off-Peak for 2028	1211	-26	26	9	39	794	0	1009	-47	0
	2031OP	Spring Off-Peak for 2031	1448	-53	25	28	0	827	686	1246	-47	0
Sensitivity	2031SP Hi Load	High CEC Load for 2031 summer peak	2945	-95	61	55	95	827	546	2743	-47	0
	2028SP Hi Ren	High renewable output and minimum gas generation in 2028 summer peak	2666	-51	23	24	87	794	762	2464	-47	0
	2028OP Sen	Spring Off-Peak Sensitivity in 2028	1211	-26	26	9	39	794	0	1009	-47	0

Generation Assumptions – Big Creek Corridor

Scenario	Study Case	Description	Battery		Solar		Wind		Hydro		Thermal	
			Installed	Dispatch	Installed	Dispatch	Installed	Dispatch	Installed	Dispatch	Installed	Dispatch
Base	2028SP	Summer Peak for 2028	5872	0	8329	6580	3454	1140	1119	973	3258	1642
	2031SP	Summer Peak for 2031	6095	-1387	8420	6653	3456	1141	1119	973	3258	1642
	2036SP	Summer Peak for 2036	7003	-3631	12200	9607	3456	1116	1119	774	3258	1329
	2036SmrOP	Summer Off-Peak for 2036	7003	-6863	12200	11706	3454	311	1119	774	3258	1374
	2028OP	Spring Off-Peak for 2028	6090	0	8369	0	3456	2558	1119	964	3258	1642
	2031OP	Spring Off-Peak for 2031	6136	-6063	8420	8220	3454	2106	1119	973	3258	1547
Sensitivity	2031SP Hi Load	High CEC Load for 2031 summer peak	6095	-1387	8420	6653	3456	1141	1119	973	3258	1642
	2028SP Hi Ren	High renewable output and minimum gas generation in 2028 summer peak	5872	0	8329	7995	3454	2314	1119	973	3258	176
	2028OP Sen	Spring Off-Peak Sensitivity in 2028*	6090	0	8369	0	3456	3456	1119	964	3258	1642

*In this sensitivity scenario for the Big Creek Corridor high renewable output for wind was dispatched at 100% in 2028 Spring Off-Peak

Previously approved transmission projects modelled in base cases

Project Name	In-service Year	First Year Modeled
Pardee-Sylmar No. 1 and No. 2 230 kV Lines Rating Increase	2029	2031

Reliability assessment preliminary results summary

230 kV line overloads (P6) for Big Creek 1- Rector and Big Creek 2- Big Creek 3

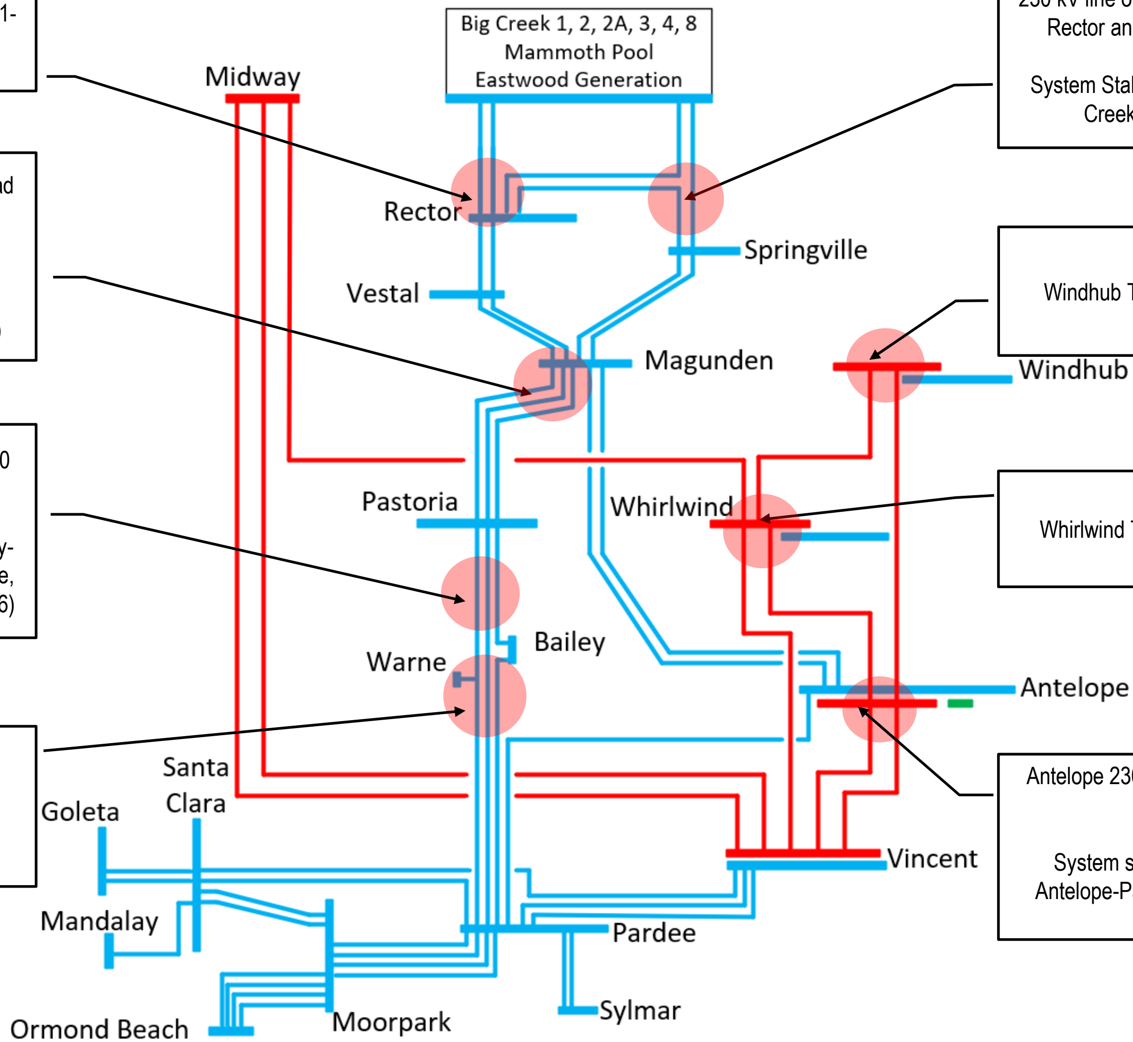
Magunden- Pastoria 230 kV lines overload (P6)

System stability issue for outage of Magunden- Vestal 230 kV lines (P6), Magunden-Springville 230 kV lines (P6)

Pardee – Pastoria, Pardee-Warnetap 230 kV line overloads (P6)

System stability issue for outage of Bailey-Pastoria, Pardee-Pastoria, Bailey- Pardee, and Pastoria-Edmonston 230 kV lines (P6)

Line overload (P6):
1.Neenach- Tap 85 66 kV
2. Bailey- Tap 85 66 kV
3. Bailey – Pastoria 230 kV
4. Pardee – Warne tap 230 kV



230 kV line overloads (P7) for Big Creek 3- Rector and Springville – Big Creek 4

System Stability issues for outage of Big Creek 3 – Rector No 2 (P6)

Windhub Transformer overloads (P6)

Whirlwind Transformer overloads (P6)

Antelope 230/66 kV transformer overload (P6)

System stability issue for outage at Antelope-Pardee, Magunden- Antelope 230 kV line (P6)

Legend:

500 kV

230 kV

66 kV

California ISO

Thermal Loading – Big Creek Corridor

Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Loading % (Baseline Scenarios)						Loading % (Sensitivity Scenarios)			Project & Potential Mitigation Solutions
				2028 Summer Peak	2031 Summer Peak	2036 Summer Peak	2036 Summer-Off Peak	2028 Spring Off-Peak	2031 Spring Off-Peak	2028 SP Heavy Renewable & Min Gas Gen	2031 SP High CEC Forecast	2028 Spring OP Sensitivity	
24087 MAGUNDEN 230 24115 PASTORIA 230 1 1	P6_188_P6 Loss of Magunden-Pastoria No.2 230 kV line and Magunden-Pastoria No.3 230 kV line	P6	N-1-1	120.1	< 100	< 100	< 100	< 100	124.0	134.3	< 100	< 100	Existing Big Creek/San Joaquin Valley RAS and/or system redispatch after initial contingency
24087 MAGUNDEN 230 24115 PASTORIA 230 2 1	P6_96_P6 Loss of Magunden-Pastoria No.1 230 kV line and Magunden-Pastoria No.3 230 kV line	P6	N-1-1	120.5	< 100	< 100	< 100	< 100	124.5	134.8	< 100	< 100	Existing Big Creek/San Joaquin Valley RAS and/or system redispatch after initial contingency
24087 MAGUNDEN 230 24401 ANTELOPE 230 1 1	P6_844_P6 Loss of Magunden-Antelope No.2 230 kV line and Bailey-Pastoria No.1 230 kV line	P6	N-1-1	< 100	< 100	< 100	< 100	112.6	< 100	< 100	< 100	110.2	Existing Pastoria Energy Facility RAS and/or system redispatch after initial contingency
24114 PARDEE 230 24115 PASTORIA 230 1 1	P6_1011_P6 Loss of Pardee-Warnetap No.1 230 kV line and Bailey-Pastoria No.1 230 kV line	P6	N-1-1	143.9	124.0	113.7	< 100	< 100	< 100	< 100	118.7	113.2	Existing Pastoria Energy Facility RAS and/or system redispatch after initial contingency
24114 PARDEE 230 24217 WARNETAP 230 1 1	P6_928_P6 Loss of Pardee-Pastoria No.1 230 kV line and Bailey-Pastoria No.1 230 kV line	P6	N-1-1	131.8	113.6	104.2	< 100	< 100	< 100	< 100	108.8	103.7	Existing Pastoria Energy Facility RAS and/or system redispatch after initial contingency
24114 PARDEE 230 24403 BAILEY 230 1 1	P6_896_P6 Loss of Pardee-Pastoria No.1 230 kV line and Pardee-Warnetap No.1 230 kV line	P6	N-1-1	128.0	105.7	< 100	< 100	< 100	< 100	< 100	< 100	< 100	Existing Pastoria Energy Facility RAS and/or system redispatch after initial contingency

Thermal Loading – Big Creek Corridor (continued)

Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Loading % (Baseline Scenarios)						Loading % (Sensitivity Scenarios)			Project & Potential Mitigation Solutions
				2028 Summer Peak	2031 Summer Peak	2036 Summer Peak	2036 Summer-Off Peak	2028 Spring Off-Peak	2031 Spring Off-Peak	2028 SP Heavy Renewable & Min Gas Gen	2031 SP High CEC Forecast	2028 Spring OP Sensitivity	
24115 PASTORIA 230 24217 WARNETAP 230 1 1	P6_928_P6 Loss of Pardee-Pastoria No.1 230 kV line and Bailey-Pastoria No.1 230 kV line	P6	N-1-1	126.5	108.3	< 100	< 100	< 100	< 100	< 100	103.5	< 100	Existing Pastoria Energy Facility RAS and/or system redispatch after initial contingency
24141 SPRINGVL 230 24304 BIG CRK4 230 1 1	line_BCT_P7_02_Line BIG CRK1 230.0 to RECTOR 230.0 Circuit 1 Line RECTOR 230.0 to BIG CRK3 230.0 Circuit 1	P7	DCTL	< 100	< 100	< 100	< 100	< 100	< 100	101.5	< 100	103.8	Existing Big Creek/San Joaquin Valley RAS and/or system redispatch after initial contingency
24235 RECTOR 230 24303 BIG CRK3 230 2 1	line_BCT_P7_02_Line BIG CRK1 230.0 to RECTOR 230.0 Circuit 1 Line RECTOR 230.0 to BIG CRK3 230.0 Circuit 1	P7	DCTL	110.5	111.0	< 100	< 100	< 100	< 100	109.1	111.7	110.2	Existing Big Creek/San Joaquin Valley RAS and/or system redispatch after initial contingency
24301 BIG CRK1 230 24235 RECTOR 230 1 1	P6_2193_P6 Loss of Rector-Big Crk3 No.2 230 kV line and Big Crk3-Rector No.1 230 kV line	P6	N-1-1	132.9	133.2	< 100	< 100	< 100	< 100	130.8	133.9	131.6	Existing Big Creek/San Joaquin Valley RAS and/or system redispatch after initial contingency
	P6_2453_P6 Loss of Big Crk2-Big Crk3 No.1 230 kV line and Big Crk8-Big Crk3 No.1 230 kV line	P6	N-1-1	127.1	125.4	< 100	< 100	120.3	122.9	127.0	125.3	125.9	System re-dispatch after initial contingency
24302 BIG CRK2 230 24303 BIG CRK3 230 1 1	P6_2261_P6 Loss of Big Crk1-Rector No.1 230 kV line and Big Crk8-Big Crk3 No.1 230 kV line	P6	N-1-1	125.1	123.7	< 100	< 100	123.9	125.9	125.1	123.5	123.9	System re-dispatch after initial contingency

Thermal Loading – Big Creek Corridor (continued)

Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Loading % (Baseline Scenarios)						Loading % (Sensitivity Scenarios)			Project & Potential Mitigation Solutions
				2028 Summer Peak	2031 Summer Peak	2036 Summer Peak	2036 Summer-Off Peak	2028 Spring Off-Peak	2031 Spring Off-Peak	2028 SP Heavy Renewable & Min Gas Gen	2031 SP High CEC Forecast	2028 Spring OP Sensitivity	
24302 BIG CRK2 230 24305 BIG CRK8 230 1 1	P6_2257_P6 Loss of Big Crk1-Rector No.1 230 kV line and Big Crk2-Big Crk3 No.1 230 kV line	P6	N-1-1	115.5	113.9	< 100	< 100	108.6	110.0	115.5	113.7	114.0	System re-dispatch after initial contingency
24303 BIG CRK3 230 24235 RECTOR 230 1 1	P6_2188_P6 Loss of Rector-Big Crk3 No.2 230 kV line and Big Crk1-Rector No.1 230 kV line	P6	N-1-1	139.2	139.9	104.8	< 100	131.9	124.3	137.1	140.8	138.4	Existing Big Creek/San Joaquin Valley RAS and/or system redispatch after initial contingency
24305 BIG CRK8 230 24303 BIG CRK3 230 1 1	P6_2257_P6 Loss of Big Crk1-Rector No.1 230 kV line and Big Crk2-Big Crk3 No.1 230 kV line	P6	N-1-1	132.2	130.7	< 100	< 100	125.4	127.6	132.2	130.5	130.9	System re-dispatch after initial contingency
24401 ANTELOPE 230 24114 PARDEE 230 1 1	P6_3646_P6 Loss of Antelope-Vincent No.1 500 kV line and Antelope-Vincent No.2 500 kV line	P6	N-1-1	< 100	< 100	< 100	< 100	< 100	< 100	112.7	< 100	< 100	System re-dispatch after initial contingency
24402 ANTELOPE 66.0 24401 ANTELOPE 230 4 1	P6_4001_P6 Loss of Antelope No.1 66/230 kV transformer and Antelope No.2 66/230 kV transformer	P6	N-1-1	125.9	109.1	150.0	120.4	107.4	< 100	< 100	120.1	107.4	Energizing existing spare transformer after initial contingency and/or shed load after the second contingency as needed
24402 ANTELOPE 66.0 24420 NEENACH 66.0 1 1	P6_4115_P6 Loss of Bailey No.2 66/230 kV transformer and Bailey No.3 66/230 kV transformer	P6	N-1-1	110.4	115.1	119.6	< 100	104.5	< 100	< 100	115.9	100.5	Split Antelope–Bailey 66 kV System per existing SCE operating procedure after initial contingency

Thermal Loading – Big Creek Corridor (continued)

Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Loading % (Baseline Scenarios)						Loading % (Sensitivity Scenarios)			Project & Potential Mitigation Solutions
				2028 Summer Peak	2031 Summer Peak	2036 Summer Peak	2036 Summer-Off Peak	2028 Spring Off-Peak	2031 Spring Off-Peak	2028 SP Heavy Renewable & Min Gas Gen	2031 SP High CEC Forecast	2028 Spring OP Sensitivity	
24403 BAILEY 230 24115 PASTORIA 230 1 1	P6_896_P6 Loss of Pardee-Pastoria No.1 230 kV line and Pardee-Warnetap No.1 230 kV line	P6	N-1-1	148.9	130.8	120.6	100.8	< 100	< 100	< 100	125.9	118.1	Existing Pastoria Energy Facility RAS and/or system redispatch after initial contingency
24404 BAILEY 66.0 24452 TAP 85 66.0 1 1	P6_4115_P6 Loss of Bailey No.2 66/230 kV transformer and Bailey No.3 66/230 kV transformer	P6	N-1-1	143.1	145.8	150.7	124.1	< 100	< 100	141.7	149.1	< 100	Split Antelope–Bailey 66 kV System per existing SCE operating procedure after initial contingency
24420 NEENACH 66.0 24452 TAP 85 66.0 1 1	P6_4115_P6 Loss of Bailey No.2 66/230 kV transformer and Bailey No.3 66/230 kV transformer	P6	N-1-1	168.9	175.8	181.0	145.8	< 100	< 100	168.0	178.6	< 100	Split Antelope–Bailey 66 kV System per existing SCE operating procedure after initial contingency
24435 WESTPAC 66.0 24452 TAP 85 66.0 1 1	P6_4115_P6 Loss of Bailey No.2 66/230 kV transformer and Bailey No.3 66/230 kV transformer	P6	N-1-1	< 100	102.8	< 100	< 100	< 100	< 100	< 100	103.8	< 100	Split Antelope–Bailey 66 kV System per existing SCE operating procedure after initial contingency
29401 WINDHUB 500 29507 windhb4i 13.8 4 1	P3_5687_P3 Loss of Fress2G1 Unit ID 1 and Windhub No.3 500/230 kV transformer	P3	G-1/N-1	< 100	< 100	< 100	< 100	< 100	< 100	107.7	< 100	< 100	Tehachapi CRAS
29407 WINDHUB_A 230 29513 windhb2i 13.8 2 1	P6_3815_P6 Loss of Wirlwind-Windhub No.1 500 kV line and Windhub No.1 500/230 kV transformer	P6	N-1-1	133.3	114.6	< 100	< 100	< 100	113.2	196.5	114.2	110.1	Tehachapi CRAS

Thermal Loading – Big Creek Corridor (continued)

Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Loading % (Baseline Scenarios)						Loading % (Sensitivity Scenarios)			Project & Potential Mitigation Solutions
				2028 Summer Peak	2031 Summer Peak	2036 Summer Peak	2036 Summer-Off Peak	2028 Spring Off-Peak	2031 Spring Off-Peak	2028 SP Heavy Renewable & Min Gas Gen	2031 SP High CEC Forecast	2028 Spring OP Sensitivity	
29401 WINDHUB 500 29511 windhb1i 13.8 1 1	P6_3851_P6 Loss of Highwind-Mandible No.1 230 kV line and Windhub No.2 500/230 kV transformer	P6	N-1-1	131.4	< 100	< 100	< 100	< 100	113.1	193.2	< 100	112.9	Tehachapi CRAS
	P3_5921_P3 Loss of Fress2G1 Unit ID 1 and Windhub No.2 500/230 kV transformer	P3	G-1/N-1	131.4	112.9	< 100	< 100	< 100	< 100	193.2	< 100	< 100	Tehachapi CRAS
29401 WINDHUB 500 29513 windhb2i 13.8 2 1	P6_3850_P6 Loss of Highwind-Mandible No.1 230 kV line and Windhub No.1 500/230 kV transformer	P6	N-1-1	131.4	< 100	< 100	< 100	< 100	< 100	193.2	< 100	112.9	Tehachapi CRAS
	P3_5848_P3 Loss of Ph9_S20-Pv Unit ID 1 and Windhub No.1 500/230 kV transformer	P3	G-1/N-1	< 100	113.0	< 100	< 100	< 100	113.1	193.2	112.6	< 100	Tehachapi CRAS
29402 WIRLWIND 500 29522 wirlwn4i 13.8 4 1	P3_6002_P3 Loss of Sbh5-G2 Unit ID 1 and Wirlwind No.1 500/230 kV transformer	P3	G-1/N-1	< 100	< 100	< 100	< 100	< 100	< 100	104.3	< 100	< 100	Tehachapi CRAS
	P6_4295_P6 Loss of Wirlwind No.1 500/230 kV transformer and Wirlwind No.3 500/230 kV transformer	P6	N-1-1	167.0	112.8	143.4	174.4	< 100	130.7	211.4	112.8	< 100	Tehachapi CRAS
29408 WIRLWIND 230 29522 wirlwn4i 13.8 4 1	P6_4295_P6 Loss of Wirlwind No.1 500/230 kV transformer and Wirlwind No.3 500/230 kV transformer	P6	N-1-1	169.7	110.4	141.3	172.1	< 100	129.3	213.7	110.4	< 100	Tehachapi CRAS

Low/High Voltage – Big Creek Corridor

Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Voltage PU (Baseline Scenarios)						Voltage PU (Sensitivity Scenarios)			Project & Potential Mitigation Solutions
				2028 Summer Peak	2031 Summer Peak	2036 Summer Peak	2036 Summer-Off Peak	2028 Spring Off-Peak	2031 Spring Off-Peak	2028 SP Heavy Renewable & Min Gas Gen	2031 SP High CEC Forecast	2028 Spring OP Sensitivity	
24404 BAILEY 66 kV	P6_1093_P6 Loss of Pardee-Bailey No.1 230 kV line and Bailey-Pastoria No.1 230 kV line	P6	N-1-1	0.72	0.66	0.62	0.66	0.79	0.9 < V < 1.05	0.73	0.64	0.79	system adjustments after first contingency mitigates the issue
24404 BAILEY 66 kV	P6_4115_P6 Loss of Bailey No.2 66/230 kV transformer and Bailey No.3 66/230 kV transformer	P6	N-1-1	0.72	0.66	0.62	0.66	0.80	0.9 < V < 1.05	0.73	0.64	0.84	system adjustments after first contingency mitigates the issue
24420 NEENACH 66 kV	P6_1093_P6 Loss of Pardee-Bailey No.1 230 kV line and Bailey-Pastoria No.1 230 kV line	P6	N-1-1	0.84	0.81	0.79	0.85	0.86	0.9 < V < 1.05	0.85	0.80	0.86	system adjustments after first contingency mitigates the issue
24420 NEENACH 66 kV	P6_4115_P6 Loss of Bailey No.2 66/230 kV transformer and Bailey No.3 66/230 kV transformer	P6	N-1-1	0.84	0.81	0.79	0.85	0.87	0.9 < V < 1.05	0.85	0.80	0.89	system adjustments after first contingency mitigates the issue
24435 WESTPAC 66 kV	P6_1093_P6 Loss of Pardee-Bailey No.1 230 kV line and Bailey-Pastoria No.1 230 kV line	P6	N-1-1	0.73	0.67	0.63	0.66	0.78	0.9 < V < 1.05	0.74	0.65	0.78	system adjustments after first contingency mitigates the issue
24435 WESTPAC 66 kV	P6_4115_P6 Loss of Bailey No.2 66/230 kV transformer and Bailey No.3 66/230 kV transformer	P6	N-1-1	0.73	0.67	0.63	0.66	0.80	0.9 < V < 1.05	0.74	0.65	0.83	system adjustments after first contingency mitigates the issue
24451 TAP 86 66 kV	P6_1093_P6 Loss of Pardee-Bailey No.1 230 kV line and Bailey-Pastoria No.1 230 kV line	P6	N-1-1	0.72	0.67	0.63	0.66	0.79	0.9 < V < 1.05	0.74	0.65	0.79	system adjustments after first contingency mitigates the issue
24451 TAP 86 66 kV	P6_4115_P6 Loss of Bailey No.2 66/230 kV transformer and Bailey No.3 66/230 kV transformer	P6	N-1-1	0.73	0.67	0.63	0.67	0.81	0.9 < V < 1.05	0.74	0.65	0.84	system adjustments after first contingency mitigates the issue

Low/High Voltage – Big Creek Corridor (continued)

Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Voltage PU (Baseline Scenarios)						Voltage PU (Sensitivity Scenarios)			Project & Potential Mitigation Solutions
				2028 Summer Peak	2031 Summer Peak	2036 Summer Peak	2036 Summer-Off Peak	2028 Spring Off-Peak	2031 Spring Off-Peak	2028 SP Heavy Renewable & Min Gas Gen	2031 SP High CEC Forecast	2028 Spring OP Sensitivity	
24452 TAP 85 66 kV	P6_1093_P6 Loss of Pardee-Bailey No.1 230 kV line and Bailey-Pastoria No.1 230 kV line	P6	N-1-1	0.72	0.67	0.63	0.67	0.79	0.9 < V < 1.05	0.73	0.65	0.79	system adjustments after first contingency mitigates the issue
	P6_4115_P6 Loss of Bailey No.2 66/230 kV transformer and Bailey No.3 66/230 kV transformer	P6	N-1-1	0.73	0.67	0.63	0.67	0.80	0.9 < V < 1.05	0.74	0.65	0.84	system adjustments after first contingency mitigates the issue
25621 OSO 66 kV	P6_1093_P6 Loss of Pardee-Bailey No.1 230 kV line and Bailey-Pastoria No.1 230 kV line	P6	N-1-1	0.72	0.67	0.63	0.66	0.79	0.9 < V < 1.05	0.74	0.65	0.79	system adjustments after first contingency mitigates the issue
	P6_4115_P6 Loss of Bailey No.2 66/230 kV transformer and Bailey No.3 66/230 kV transformer	P6	N-1-1	0.73	0.67	0.63	0.67	0.81	0.9 < V < 1.05	0.74	0.65	0.84	system adjustments after first contingency mitigates the issue
25647 ALAMO SC 66 kV	P6_1093_P6 Loss of Pardee-Bailey No.1 230 kV line and Bailey-Pastoria No.1 230 kV line	P6	N-1-1	0.73	0.67	0.63	0.67	0.80	0.9 < V < 1.05	0.74	0.65	0.80	system adjustments after first contingency mitigates the issue
	P6_4115_P6 Loss of Bailey No.2 66/230 kV transformer and Bailey No.3 66/230 kV transformer	P6	N-1-1	0.73	0.67	0.63	0.67	0.81	0.9 < V < 1.05	0.74	0.66	0.84	system adjustments after first contingency mitigates the issue
29897 ALPINE 66 kV	P6_1093_P6 Loss of Pardee-Bailey No.1 230 kV line and Bailey-Pastoria No.1 230 kV line	P6	N-1-1	0.84	0.81	0.79	0.85	0.86	0.9 < V < 1.05	0.85	0.80	0.86	system adjustments after first contingency mitigates the issue
	P6_4115_P6 Loss of Bailey No.2 66/230 kV transformer and Bailey No.3 66/230 kV transformer	P6	N-1-1	0.84	0.81	0.79	0.85	0.87	0.9 < V < 1.05	0.85	0.81	0.89	system adjustments after first contingency mitigates the issue

Low/High Voltage – Big Creek Corridor (continued)

Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Voltage PU (Baseline Scenarios)						Voltage PU (Sensitivity Scenarios)			Project & Potential Mitigation Solutions
				2028 Summer Peak	2031 Summer Peak	2036 Summer Peak	2036 Summer-Off Peak	2028 Spring Off-Peak	2031 Spring Off-Peak	2028 SP Heavy Renewable & Min Gas Gen	2031 SP High CEC Forecast	2028 Spring OP Sensitivity	
24403 BAILEY 230 kV	P6_1093_P6 Loss of Pardee-Bailey No.1 230 kV line and Bailey-Pastoria No.1 230 kV line	P6	N-1-1	0.70	0.64	0.61	0.65	0.78	0.9 < V < 1.05	0.71	0.63	0.79	system adjustments after first contingency mitigates the issue
24592 MW_VINCNT_22 500 kV	P6_4256_P6 Loss of Windhub No.1 500/230 kV transformer and Windhub No.2 500/230 kV transformer	P6	N-1-1	1.10	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	system adjustments after first contingency mitigates the issue
24595 MW_WRLWND_31 500 kV	P6_3725_P6 Loss of Antelope-Windhub No.1 500 kV line and Antelope-Wirlwind No.1 500 kV line	P6	N-1-1	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	1.10	0.9 < V < 1.05	system adjustments after first contingency mitigates the issue

Transient Stability – Big Creek Corridor

Contingency (All and Worst P6)	Category	Category Description	Loading % (Baseline Scenarios)						Loading % (Sensitivity Scenarios)			Project & Potential Mitigation Solutions
			2028 Summer Peak	2031 Summer Peak	2036 Summer Peak	2036 Summer-Off Peak	2028 Spring Off-Peak	2031 Spring Off-Peak	2028 SP Heavy Renewable & Min Gas Gen	2031 SP High CEC Forecast	2028 Spring OP Sensitivity	
Bailey 66 kv East Bus	P5	Non-Redundant Relay	No issues				WECC criteria not met		No issues		WECC criteria not met	investigate options to address non redundant DC supply
P5.3.13c Antelope 230 kV	P5	Non-Redundant Relay	No issues				WECC criteria not met		No issues		WECC criteria not met	investigate options to address non redundant DC supply
P5.3.13c Bailey 230 kV	P5	Non-Redundant Relay	No issues				WECC criteria not met		No issues		WECC criteria not met	investigate options to address non redundant DC supply
P5.3.13c Big Creek 1	P5	Non-Redundant Relay	WECC criteria not met				WECC criteria not met		Unstable		Unstable	investigate options to address non redundant DC supply
P5.3.13c Big Creek 2	P5	Non-Redundant Relay	WECC criteria not met				WECC criteria not met		Unstable		Unstable	investigate options to address non redundant DC supply
P5.3.13c Big Creek 3	P5	Non-Redundant Relay	WECC criteria not met				WECC criteria not met		Unstable		WECC criteria not met	investigate options to address non redundant DC supply
P5.3.13c Big Creek 4	P5	Non-Redundant Relay	WECC criteria not met				WECC criteria not met		WECC criteria not met		WECC criteria not met	investigate options to address non redundant DC supply
P5.3.13c Big Creek 8	P5	Non-Redundant Relay	WECC criteria not met				WECC criteria not met		Unstable		WECC criteria not met	investigate options to address non redundant DC supply
P5.3.13c Neenach 66 kV	P5	Non-Redundant Relay	No issues				No issues		No issues		WECC criteria not met	investigate options to address non redundant DC supply
P5.3.13c Pardee 230 kV	P5	Non-Redundant Relay	WECC criteria not met				WECC criteria not met		WECC criteria not met		WECC criteria not met	investigate options to address non redundant DC supply
P5.3.13c Pastoria 230 kV	P5	Non-Redundant Relay	WECC criteria not met				WECC criteria not met		WECC criteria not met		Unstable	investigate options to address non redundant DC supply
P5.3.13c Rector 230 kV	P5	Non-Redundant Relay	WECC criteria not met				WECC criteria not met		WECC criteria not met		WECC criteria not met	investigate options to address non redundant DC supply
P5.3.13c Springville 230 kV	P5	Non-Redundant Relay	WECC criteria not met				WECC criteria not met		WECC criteria not met		WECC criteria not met	investigate options to address non redundant DC supply

Transient Stability – Big Creek Corridor (continued)

Contingency (All and Worst P6)	Category	Category Description	Loading % (Baseline Scenarios)						Loading % (Sensitivity Scenarios)			Project & Potential Mitigation Solutions
			2028 Summer Peak	2031 Summer Peak	2036 Summer Peak	2036 Summer-Off Peak	2028 Spring Off-Peak	2031 Spring Off-Peak	2028 SP Heavy Renewable & Min Gas Gen	2031 SP High CEC Forecast	2028 Spring OP Sensitivity	
P5.3.13c Vestal 230 kV	P5	Non-Redundant Relay	No issues				WECC criteria not met		No issues		WECC criteria not met	investigate options to address non redundant DC supply
BIG CREEK 1-RECTOR and BIG CREEK 3-RECTOR NO. 1, FAULT BIG CREEK 1	P6	N-1-1	Unstable	Unstable	No issues	No issues	No issues	No issues	Unstable	Unstable	No issues	Existing Big Creek/San Joaquin Valley RAS
Big Creek 3-Rector No. 2 & Big Creek 1-Rector	P6	N-1-1	Unstable	Unstable	Unstable	Unstable	Unstable	Unstable	Unstable	Unstable	Unstable	Existing Big Creek/San Joaquin Valley RAS
BIG CREEK 3-RECTOR NO.2 and BIG CREEK 4-SPRINGVILLE, FAULT BIG CREEK 3	P6	N-1-1	Unstable	Unstable	No issues	No issues	Unstable	Unstable	Unstable	Unstable	Unstable	Existing Big Creek/San Joaquin Valley RAS
BIG CREEK 4-SPRINGVILLE and RECTOR-SPRINGVILLE, FAULT BIG CREEK 4	P6	N-1-1	No issues	No issues	Unstable	Unstable	No issues	No issues	No issues	No issues	No issues	Existing Big Creek/San Joaquin Valley RAS
RECTOR-VESTAL NOS. 1 & 2, FAULT RECTOR	P6	N-1-1	Unstable	Unstable	No issues	No issues	Unstable	Unstable	Unstable	Unstable	Unstable	Existing Big Creek/San Joaquin Valley RAS
MAGUNDEN-SPRINGVILLE NOS. 1 & 2, FAULT MAGUNDEN	P6	N-1-1	WECC criteria not met	No issues	WECC criteria not met	No issues	No issues	No issues	WECC criteria not met	No issues	No issues	Existing Big Creek/San Joaquin Valley RAS
MAGUNDEN-VESTAL NOS. 1 & 2, FAULT MAGUNDEN	P6	N-1-1	Unstable	Unstable	Unstable	Unstable	Unstable	Unstable	Unstable	Unstable	Unstable	Existing Big Creek/San Joaquin Valley RAS
Bailey-Pastoria and Pardee-Pastoria, FAULT Pastoria	P6	N-1-1	Unstable	Unstable	No issues	No issues	No issues	No issues	Unstable	Unstable	No issues	Existing Pastoria Energy Facility RAS
Bailey-Pastoria and Pardee-Pastoria-Warne, FAULT Pastoria	P6	N-1-1	Unstable	Unstable	Unstable	No issues	Unstable	Unstable	Unstable	Unstable	Unstable	Existing Pastoria Energy Facility RAS
Pardee-Pastoria and Pardee-Pastoria-Warne, FAULT Pastoria	P6	N-1-1	Unstable	Unstable	Unstable	No issues	Unstable	Unstable	Unstable	Unstable	Unstable	Existing Pastoria Energy Facility RAS
Pardee-Pastoria and Bailey-Pardee, FAULT Pardee	P6	N-1-1	No issues	No issues	Unstable	No issues	No issues	No issues	No issues	No issues	No issues	Existing Pastoria Energy Facility RAS

Transient Stability – Big Creek Corridor (continued)

Contingency (All and Worst P6)	Category	Category Description	Loading % (Baseline Scenarios)						Loading % (Sensitivity Scenarios)			Project & Potential Mitigation Solutions
			2028 Summer Peak	2031 Summer Peak	2036 Summer Peak	2036 Summer-Off Peak	2028 Spring Off-Peak	2031 Spring Off-Peak	2028 SP Heavy Renewable & Min Gas Gen	2031 SP High CEC Forecast	2028 Spring OP Sensitivity	
Bailey-Pardee and Pardee-Pastoria-Warne, FAULT Pardee	P6	N-1-1	Unstable	Unstable	WECC criteria not met	WECC criteria not met	Unstable	Unstable	Unstable	Unstable	Unstable	Existing Pastoria Energy Facility RAS
Antelope-Magunden Nos. 1 and 2, FAULT Magunden	P6	N-1-1	Unstable	No issues	No issues	No issues	No issues	No issues	Unstable	No issues	No issues	Existing Pastoria Energy Facility RAS
Antelope-Magunden No. 1 & Pardee-Pastoria-Warne, Fault Location: MAGUNDEN	P6	N-1-1	Unstable	Unstable	Unstable	Unstable	Unstable	Unstable	Unstable	Unstable	Unstable	Existing Pastoria Energy Facility RAS
Antelope-Magunden No. 2 & Pardee-Pastoria-Warne, Fault Location: MAGUNDEN	P6	N-1-1	Unstable	Unstable	Unstable	Unstable	Unstable	Unstable	Unstable	Unstable	Unstable	Existing Pastoria Energy Facility RAS
Antelope-Pardee & Pardee-Pastoria-Warne, Fault Location: PARDEE	P6	N-1-1	Unstable	Unstable	Unstable	No issues	Unstable	Unstable	Unstable	Unstable	Unstable	Existing Pastoria Energy Facility RAS and/or system redispatch after initial contingency
Bailey-Pastoria & Bailey-Pardee, FAULT AT PARDEE	P6	N-1-1	Unstable	Unstable	Unstable	Unstable	No issues	No issues	Unstable	Unstable	No issues	Split Antelope–Bailey 66 kV System per existing SCE operating procedure after initial contingency
Big Creek 1-Rector & Big Creek 2-Big Creek 8, Fault Location: Rector	P6	N-1-1	Unstable	No issues	No issues	No issues	No issues	No issues	Unstable	No issues	No issues	Existing Big Creek/San Joaquin Valley RAS and/or system redispatch after initial contingency
Bailey-Pardee & Pastoria-Edmonston, Fault Location: Pardee	P6	N-1-1	Unstable	Unstable	Unstable	No issues	Unstable	Unstable	Unstable	Unstable	Unstable	Existing Pastoria Energy Facility RAS and/or system redispatch after initial contingency

Transient Stability – Big Creek Corridor (continued)

Contingency (All and Worst P6)	Category	Category Description	Loading % (Baseline Scenarios)						Loading % (Sensitivity Scenarios)			Project & Potential Mitigation Solutions
			2028 Summer Peak	2031 Summer Peak	2036 Summer Peak	2036 Summer-Off Peak	2028 Spring Off-Peak	2031 Spring Off-Peak	2028 SP Heavy Renewable & Min Gas Gen	2031 SP High CEC Forecast	2028 Spring OP Sensitivity	
Bailey-Pardee & Pastoria-Edmonston with mitigation, Fault Location: Pardee	P6	N-1-1	Unstable	Unstable	Unstable	No issues	Unstable	Unstable	Unstable	Unstable	Unstable	Existing Pastoria Energy Facility RAS and/or system redispatch after initial contingency
Bailey-Pastoria & Pastoria-Edmonston, Fault Location: Pastoria	P6	N-1-1	Unstable	Unstable	Unstable	No issues	Unstable	Unstable	Unstable	Unstable	Unstable	Existing Pastoria Energy Facility RAS and/or system redispatch after initial contingency
Bailey-Pastoria & Pastoria-Edmonston with mitigation, Fault Location: Pastoria	P6	N-1-1	Unstable	Unstable	Unstable	No issues	Unstable	Unstable	Unstable	Unstable	Unstable	Existing Pastoria Energy Facility RAS and/or system redispatch after initial contingency
BIG CREEK 4-SPRINGVILLE & BIG CREEK 1-RECTOR, Fault Location: RECTOR	P6	N-1-1	Unstable	Unstable	Unstable	No issues	Unstable	Unstable	Unstable	Unstable	Unstable	Existing Big Creek/San Joaquin Valley RAS
MAGUNDEN-SPRINGVILLE NO. 1 & BIG CREEK 4-SPRINGVILLE, Fault Location: MAGUNDEN	P6	N-1-1	No issues	Unstable	No issues	No issues	No issues	No issues	No issues	Unstable	No issues	Existing Big Creek/San Joaquin Valley RAS and/or system redispatch after initial contingency
BAILEY 1A & 2a, Fault Location: BAILEY	P6	N-1-1	No issues	No issues	No issues	Unstable	No issues	No issues	No issues	No issues	No issues	System redispatch after initial contingency

Summary of potential new upgrades

Concern	Potential Upgrade
None identified	

SCE North of Lugo Area
Preliminary Reliability Assessment Results

Anuj Hiray
Sr. Regional Transmission Engineer

2026-27 Transmission Planning Process Stakeholder Meeting
September 23-24, 2026

SCE North of Lugo (NOL) Area

- Comprised of 55,115 and 230 kV transmission facilities
- 1-in-10 summer peak net load of 2,012 MW in 2036
- The forecast load includes the impact of 653 MW of BTM PV and 41 MW of AAEE
- Approximately 6,210 MW of existing and committed resources comprised of solar, geothermal, hydro, gas-fired and storage battery
- The loads are mainly served from Control, Kramer and Victor substations. The area can be divided into following subareas:
  - North of Control
  - Kramer/North of Kramer/Cool Water
  - Victor

SCE NOL Area Study Scenarios

- Base scenarios

No.	Case	Description
B1	2028 Summer Peak	Summer peak load time (9/6 HE 15 PST)
B2	2031 Summer Peak	Summer peak load time (9/3 HE 15 PST)
B3	2036 Summer Peak	Summer peak load time (9/3 HE 15 PST)
B5	2036 Summer Off-Peak	Summer shoulder load time (9/3 HE 11 PST)
B7	2028 Spring Off-Peak	Spring shoulder load time (4/29 HE 19 PST)
B8	2031 Spring Off-Peak	Spring shoulder load time (4/20 HE 13 PST)

- Sensitivity scenarios

No.	Case	Description
S1	2028 SP High Renewable	2028 summer peak condition with heavy renewable output and minimum gas generation commitment
S2	2031 SP High CEC Forecast	2031 summer peak load condition with high CEC load forecast
S3	2028 Spr OP Sensitivity	2028 spring shoulder-peak condition with heavy renewable output or different import level or storage charging

Load and Load Modifier Assumptions – North of Lugo Area

Study Case		Gross Load (MW)	AAEE (MW)	AAFS (MW)	ATE (MW)	DS (MW)	KL (MW)	BTM-PV (MW)		Net Load (MW)	Demand Response		Pump Load
								Installed	Output		Fast	Slow	
Base	B1	1818	-15	9	21	1	404	532	345	1914	-95	0	0
	B2	1831	-25	25	49	6	452	511	332	1926	-95	0	0
	B3	1917	-41	53	109	27	452	653	313	2012	-95	0	0
	B5	1762	-47	15	100	17	0	539	436	1857	-95	0	0
	B7	732	-9	12	8	1	188	532	0	827	-95	0	0
	B8	773	-21	10	24	4	0	511	417	868	-95	0	0
Sensitivity	S1	1818	-15	9	21	1	404	532	511	1914	-95	0	0
	S2	1902	-25	25	49	6	452	511	332	1997	-95	0	0
	S3	732	-9	12	8	1	188	532	373	827	-95	0	0

Generation Assumptions – North of Lugo Area

Study Case		Energy Storage Installed (MW)	Energy Storage Dispatched (MW) *	Solar Installed (MW)	Solar Dispatched (MW)	Wind Installed (MW)	Wind Dispatched (MW)	Hydro Installed (MW)	Hydro Dispatched (MW)	Thermal Installed (MW)	Thermal Dispatched (MW)
Base	B1	1676	-102	2300	1787	0	0	56	39	869	802
	B2	1676	-18	2300	1787	0	0	63	39	1080	860
	B3	1804	0	2498	1943	0	0	63	39	1080	453
	B5	1804	-1556	2498	2342	0	0	63	39	1080	830
	B7	1676	0	2208	0	0	0	63	39	1080	865
	B8	1676	-1436	2300	2211	0	0	63	39	1080	687
Sensitivity	S1	1676	-102	2300	2171	0	0	56	39	869	802
	S2	1676	-18	2300	1787	0	0	63	39	1080	860
	S3**	1676	0	2208	1744	0	0	63	39	1080	865

Note: *A negative number indicates battery charging
**2028 Spring Off-Peak Sensitivity case condition is with heavy renewable output

Previously approved transmission projects modeled in base cases

Project Name	ISD*	First Year Modeled
New Coolwater 230/115kV Transformer Bank	2029	2031
Inyo 230kV Shunt Reactor	2026	2028
3rd Lugo 500/230kV Transformer	2029	2031
Lugo 230 kV CB Upgrade	2031	2031
Lugo-Victor 230kV Nos. 1, 2, 3 & 4 Lines Reconductor	2028	2031
Kramer-Victor 115kV Lines 230kV Conversion	2033	2036
Kramer-Coolwater 115 kV Line Looping into Tortilla 115 kV Substation	On Hold	Not Modeled
Tortilla 115 kV Capacitor Replacement	2029	2031
Victor 230 kV Switchrack Reconfiguration	2028	2028

* July 2026 Transmission Development Forum

Reliability Assessment Preliminary Results Summary

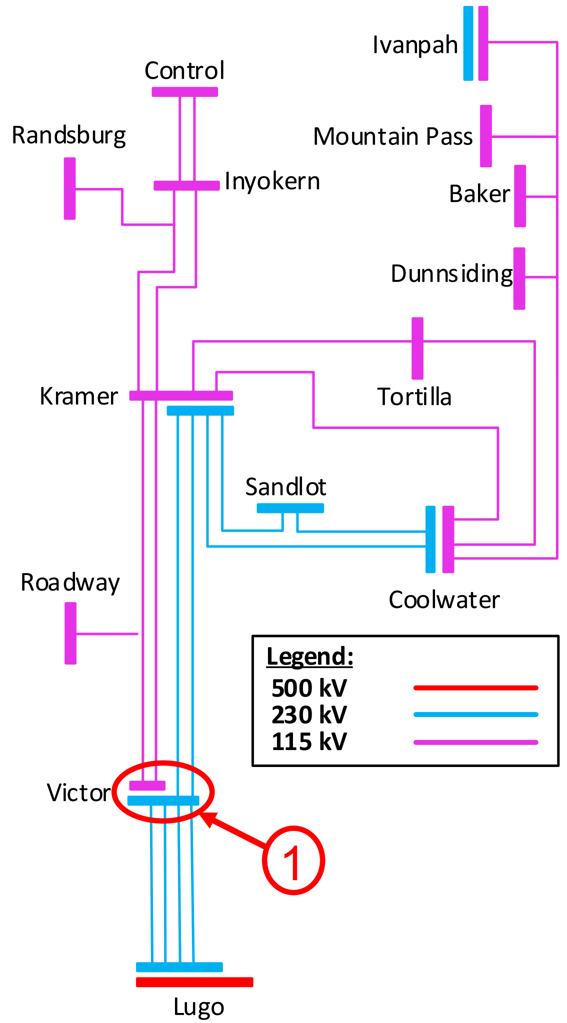
1 Victor 1A, 2A, & 3A 230/115kV Transformer Banks

Observations

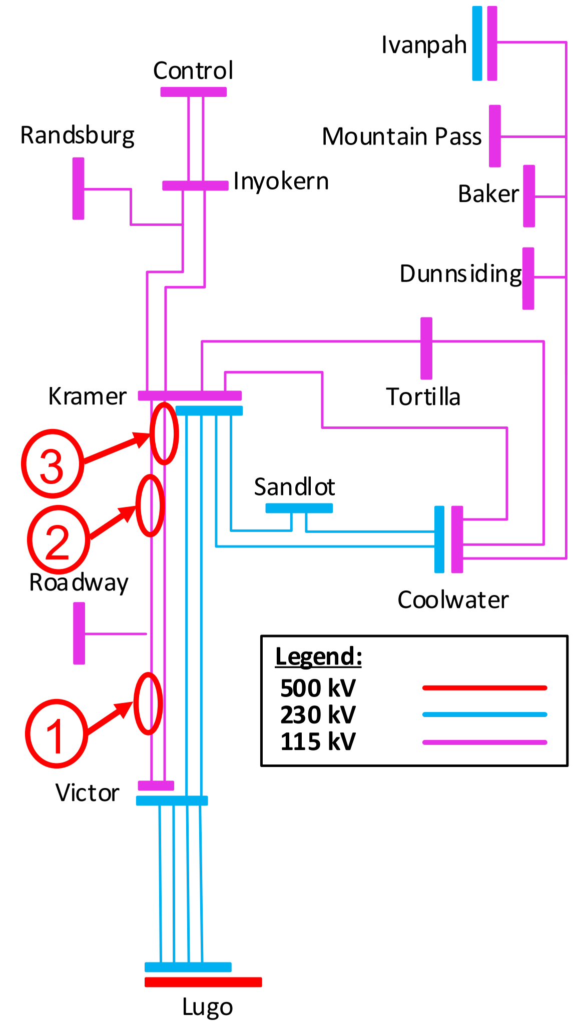
- Victor 1A, 2A and 3A 230/115kV transformer banks become overloaded under:
  - Category P0 outage – Base case overload on Victor 2A bank (2036SP)
  - Category P3 outage – Loss of Baldy Mesa generation followed by the loss of any single Victor 230/115kV transformer will overload remaining transformer bank (2028SP, 2036SP, 2036SmrOP)
  - Category P6 outage – Loss of any two Victor 230/115kV transformers overload the remaining transformer bank (2028SP, 2028SprOP, 2036SP, 2036SmrOP, 2028SP Sens.)

Potential Mitigations

- For P0 contingency, utilize system redispatch and increase generation at Kramer 115kV
- For P3 and P6 contingencies, there are few options being reviewed:
  - Option 1: Utilization of existing spare Victor 230/115kV bank and DR at Victor 115kV
  - Option 2: Victor Bank Replacement
  - Option 3: BESS addition on the 115kV system



①Victor – Roadway 115kV Line, ②Roadway – Kramer 115kV Line & ③Victor – Kramer 115kV Line



Observations

- Victor – Roadway 115kV line, Roadway – Kramer 115kV line and Victor – Kramer 115kV line become overloaded under:
  - Category P0 outage – Base case overload on Victor – Roadway 115kV line (2028SP Sensitivity)
  - Category P3 outage – Loss of Baldy Mesa generation followed by the loss of Kramer - Victor 230 kV line will overload Roadway – Kramer 115kV line (2028SP Sensitivity)
  - Category P6 outage – Loss of Victor – Roadway 115kV and Kramer - Victor 230kV Line will overload Roadway – Kramer 115kV line (2028SP, 2028SP Sensitivity, 2028SprOP)

Potential Mitigations

- For P0 contingency, utilize congestion management.
- For P3 and P6 contingencies, Mohave Desert RAS is sufficient.

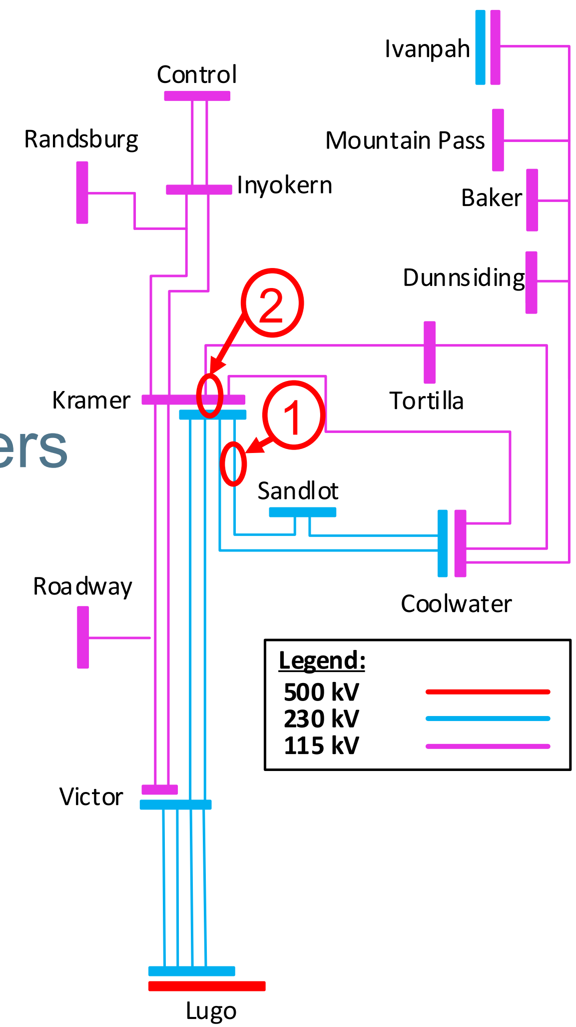
1 Sandlot – Kramer 230 kV Line

Observations

- Sandlot – Kramer 230kV line becomes overloaded under:
  - Category P0 outage – (2028SP Sensitivity)

Potential Mitigations

- Congestion Management



2 Kramer 1A & 2A 230/115 kV Transformers

Observations

- Kramer 1A & 2A 230/115 kV transformers become overloaded under:
  - Category P3 outage – Loss of Resurgence units followed by loss of Kramer 1A or 2A (2028SP and 2028SP Sens.)

Potential Mitigations

- Mojave Desert RAS

1 Coolwater 230/115kV Transformer & 2 Tortilla – Tap 705 115kV Line

Observations

- Coolwater 230/115kV Transformer & Tortilla – Tap 705 115kV line diverges or become overloaded under:
  - Category P6 outage – Loss of Kramer – Coolwater 230kV line and Sandlot – Kramer 230kV line (2036SP – Diverge, 2036SmrOP)
  - Category P7 outage – Loss of Kramer – Coolwater 230kV line and Sandlot – Coolwater 230kV line (2036SP)

Potential Mitigations

- Planned Kramer CRAS

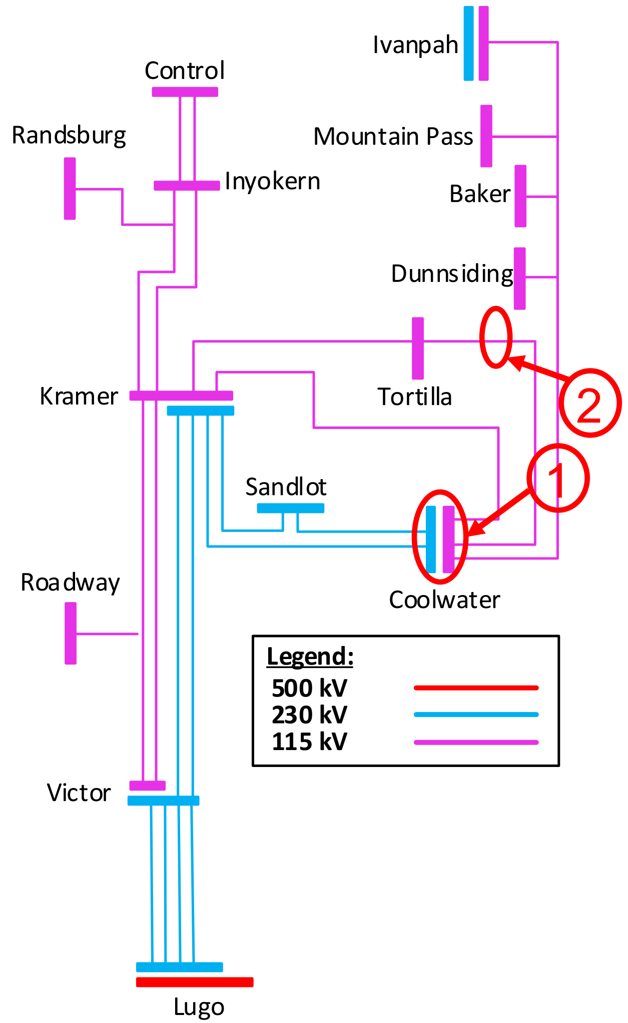
2 Coolwater – Tap705 115kV Line

Observations

- Coolwater – Tap705 115kV line is overloaded under:
  - Category P7 outage – Loss of Kramer – Coolwater 230kV line and Sandlot – Coolwater 230kV line (2036SP)

Potential Mitigations

- Planned Kramer CRAS



California ISO

① Kramer – Coolwater 230kV Line

Observations

- Kramer – Coolwater 230kV line becomes overloaded under:
  - Category P3 outage – Loss of Lockhart generation followed by the loss of Sandlot – Kramer 230kV line (2028SP)

Potential Mitigations

- Mohave Desert RAS
- Redispatching the Kramer 115kV, Coolwater 115kV, Inyokern 115kV and Control 115kV system

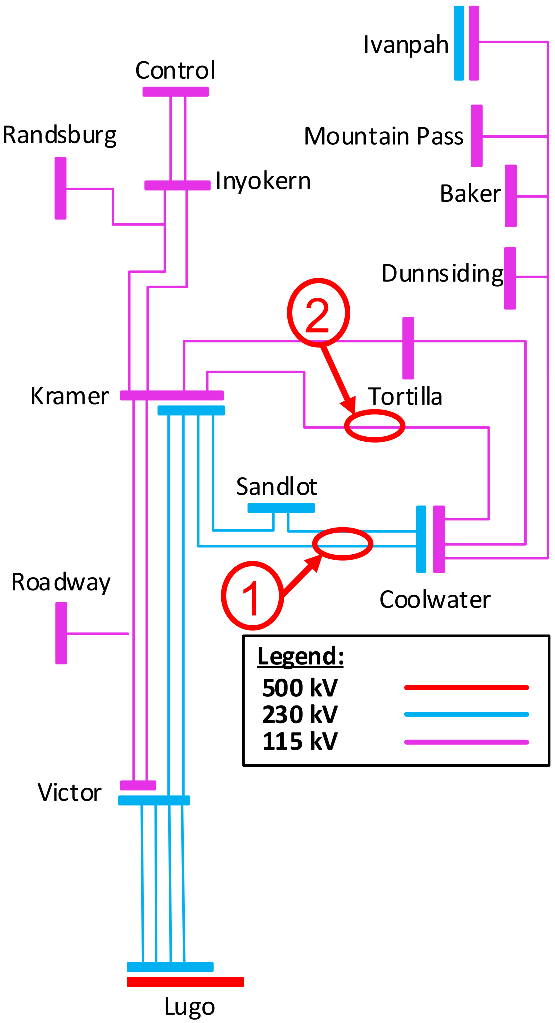
② Kramer – Coolwater 115kV Line

Observations

- Kramer – Coolwater 115kV line becomes overloaded under:
  - Category P6 outage – Loss of Kramer – Accelerate 115kV line and Coolwater 115/230kV transformer (2036SmrOP)

Potential Mitigations

- Redispatching the Kramer 115kV, Coolwater 115kV, Inyokern 115kV and Control 115kV system



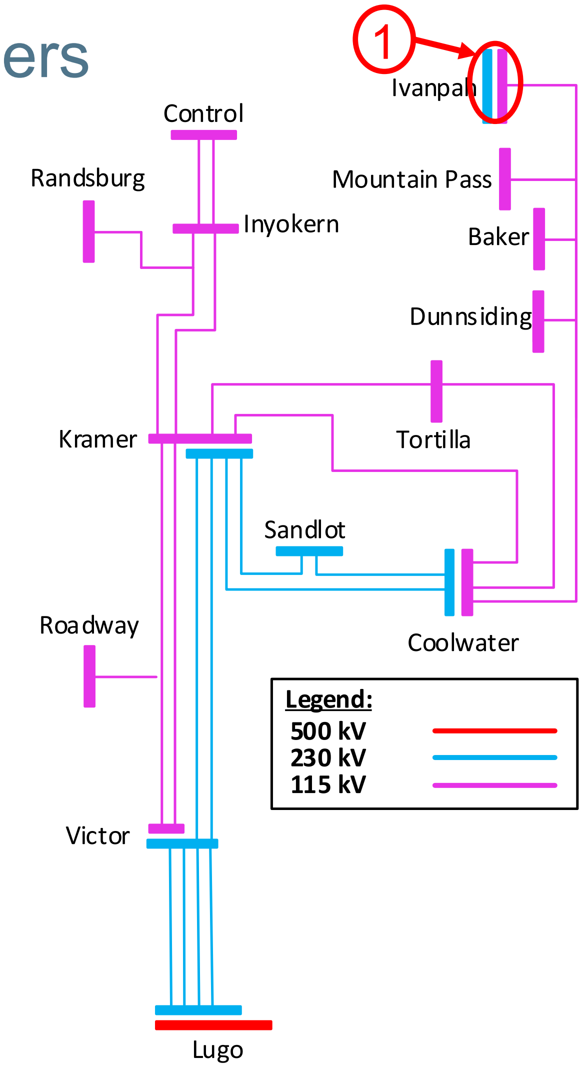
1 Ivanpah 3A & 4A 230/115kV Transformers

Observations

- Ivanpah 3A and 4A 230/115kV transformers become overloaded under:
  - Category P1 outage – Loss of either Ivanpah 3A or 4A 230/115kV Transformer (2031SprOP)
  - Category P3 outage – Loss of Dagget Solar followed by the loss of either Ivanpah 230/115kV Transformers will overload the remaining transformer (2031SprOP)

Potential Mitigations

- Ivanpah Area RAS



California ISO

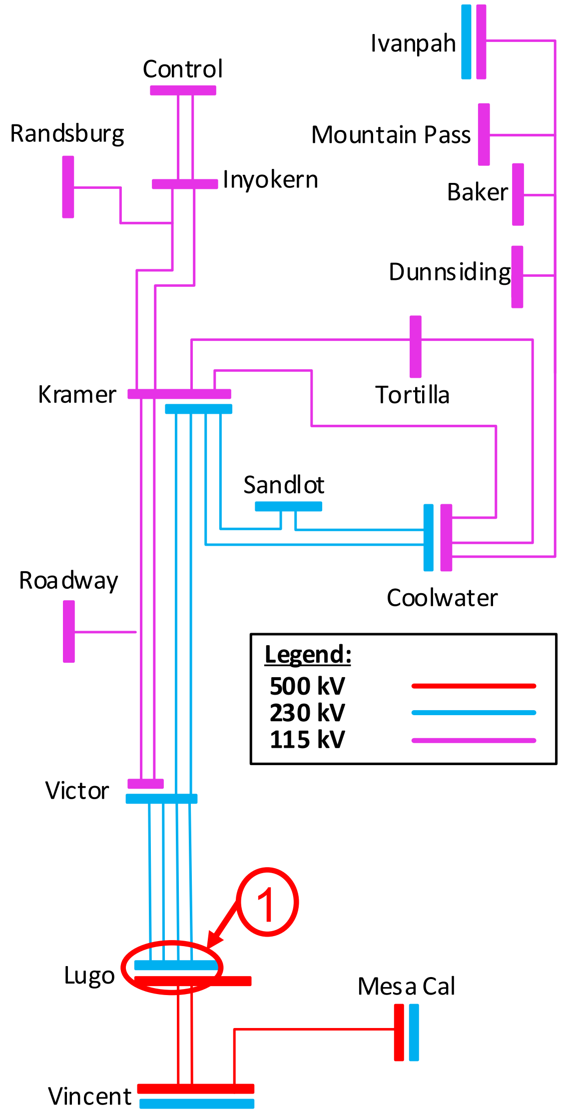
Lugo 500/230kV Transformers

Observations

- Lugo 1AA, 2AA and 3AA 500/230kV transformer becomes overloaded under:
  - Category P0 outage – Base case overload on Lugo 2AA transformer (2028SprOP Sensitivity)
  - Category P6 outage – Loss of Lugo 1AA or 2AA 500/230kV transformer followed by the loss of Lugo – Pisgah 230kV line (2028SP Sensitivity)

Potential Mitigations

- For P0 contingency, utilize Congestion Management
- For P6 contingency, utilize existing High Desert Power Plant RAS or Planned Victor CRAS



Low/High Voltage Issues

Substation	Contingency (All and Worst P6)	Category	Category Description	Voltage PU (Baseline Scenarios)						Voltage PU (Sensitivity Scenarios)		
				2028 Summer Peak	2031 Summer Peak	2036 Summer Peak	2036 Summer-Off Peak	2028 Spring Off-Peak	2031 Spring Off-Peak	2028 SP Heavy Renewable & Min Gas Gen	2031 SP High CEC Forecast	2028 OP Sensitivity
241006 ACCELERATE 115 kV	P1_66_P1.2 Loss of Coolwater-Segs2-Tortilla No.1 115 kV line	P1	N-1	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	1.06	0.9 < V < 1.05
24723 CONTROL 115 kV	Base Case	P0	Base Case	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	1.06	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	1.06
24724 OXBOW B 115 kV	Base Case	P0	Base Case	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	1.06	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	1.06
24727 HOLGATE 115 kV	P1_49_P1.2 Loss of Kramer-Holgate No.1 115 kV line	P1	N-1	0.9 < V < 1.05	1.06	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	1.06	0.9 < V < 1.05
24728 INYO 115 kV	Base Case	P0	Base Case	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	1.06	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	1.06
24762 TAP481 115 kV	P1_49_P1.2 Loss of Kramer-Holgate No.1 115 kV line	P1	N-1	0.9 < V < 1.05	1.06	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	1.06	0.9 < V < 1.05
24769 EDWARDS 115 kV	P1_49_P1.2 Loss of Kramer-Holgate No.1 115 kV line	P1	N-1	0.9 < V < 1.05	1.06	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	1.06	0.9 < V < 1.05
24776 LEE VINE 115 kV	Base Case	P0	Base Case	0.9 < V < 1.05	1.06	0.9 < V < 1.05	0.9 < V < 1.05	1.06	1.06	0.9 < V < 1.05	1.06	1.06
24896 BORAX 115 kV	P1_49_P1.2 Loss of Kramer-Holgate No.1 115 kV line	P1	N-1	0.9 < V < 1.05	1.06	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	1.06	0.9 < V < 1.05
25782 BISHOP3 115 kV	Base Case	P0	Base Case	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	1.06	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	1.06
25784 BISHOP4 115 kV	Base Case	P0	Base Case	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	1.06	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	1.06
	P1_32_P1.2 Loss of Lugo-Victorvil No.1 500 kV line	P1	N-1	0.9 < V < 1.05	1.10	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05

Potential Mitigations

- System redispatch and utilize capacitors at Tortilla, Kramer and Edwards 115kV

Low/High Voltage Issues

Substation	Contingency (All and Worst P6)	Category	Category Description	Voltage PU (Baseline Scenarios)						Voltage PU (Sensitivity Scenarios)		
				2028 Summer Peak	2031 Summer Peak	2036 Summer Peak	2036 Summer-Off Peak	2028 Spring Off-Peak	2031 Spring Off-Peak	2028 SP Heavy Renewable & Min Gas Gen	2031 SP High CEC Forecast	2028 OP Sensitivity
241006 ACCELERATE 115 kV	P2_5_P2.1 Line TORTILLA 115.0 to TAP705 115.0 Circuit 1	P2	Line Section w/o Fault	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	1.06	0.9 < V < 1.05
24723 CONTROL 115 kV	P2_6_P2.1 Line TAP704 115.0 to CONTROL 115.0 Circuit 1	P2	Line Section w/o Fault	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	1.06	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05
24724 OXBOW B 115 kV	P2_6_P2.1 Line TAP704 115.0 to CONTROL 115.0 Circuit 1	P2	Line Section w/o Fault	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	1.06	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05
24774 DUNNSIDE 115 kV	P2_1_P2.1 Line COLWATER 115.0 to DUNNSIDE 115.0 Circuit 1	P2	Line Section w/o Fault	0.9 < V < 1.05	0.90	1.05	1.07	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.90	0.9 < V < 1.05
	P2_8_P2.1 Line BAKER 115.0 to MTN PASS 115.0 Circuit 1	P2	Line Section w/o Fault	0.9 < V < 1.05	0.90	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.89	0.9 < V < 1.05
24777 BAKER 115 kV	P2_1_P2.1 Line COLWATER 115.0 to DUNNSIDE 115.0 Circuit 1	P2	Line Section w/o Fault	0.9 < V < 1.05	0.90	1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.90	0.9 < V < 1.05
	P2_7_P2.1 Line BAKER 115.0 to DUNNSIDE 115.0 Circuit 1	P2	Line Section w/o Fault	0.9 < V < 1.05	0.90	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.90	0.9 < V < 1.05
	P2_8_P2.1 Line BAKER 115.0 to MTN PASS 115.0 Circuit 1	P2	Line Section w/o Fault	0.84	0.81	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.87	0.80	0.9 < V < 1.05
24790 COSO 115 kV	P2_9_P2.1 Line TAP710 115.0 to INYOKERN 115.0 Circuit 1	P2	Line Section w/o Fault	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	1.05	1.06	1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05
24791 TAP710 115 kV	P2_9_P2.1 Line TAP710 115.0 to INYOKERN 115.0 Circuit 1	P2	Line Section w/o Fault	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	1.05	1.06	1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05
24865 TAP188 115 kV	P2_9_P2.1 Line TAP710 115.0 to INYOKERN 115.0 Circuit 1	P2	Line Section w/o Fault	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	1.05	1.07	1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05
	P4_2_Lugo - Victorville 500 kV and Lugo - Vincent No.2 500 kV - SLG 15 cycle fault at Lugo 500	P4	Stuck Breaker	1.11	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	1.11	0.9 < V < 1.05	0.9 < V < 1.05

Potential Mitigations

- System redispatch and utilize capacitors at Tortilla and Kramer. Additionally, adjust Ivanpah transformer tap as needed.

Low/High Voltage Issues

Substation	Contingency (All and Worst P6)	Category	Category Description	Voltage PU (Baseline Scenarios)						Voltage PU (Sensitivity Scenarios)		
				2028 Summer Peak	2031 Summer Peak	2036 Summer Peak	2036 Summer-Off Peak	2028 Spring Off-Peak	2031 Spring Off-Peak	2028 SP Heavy Renewable & Min Gas Gen	2031 SP High CEC Forecast	2028 OP Sensitivity
24729 INYO 230 kV	P3_1054_P3 Loss of Daggett 1 Unit ID 1 and DWP Inyo-Cottonwd No.1 230 kV line	P3	G-1/N-1	0.9 < V < 1.05	0.81	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05
	P3_1311_P3 Loss of Daggett3 Unit ID ALL and DWP Inyo-Cottonwd No.1 230 kV line	P3	G-1/N-1	0.9 < V < 1.05	0.79	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05
	P3_1564_P3 Loss of Resurgence 1 Unit ID ALL and DWP Inyo-Cottonwd No.1 230 kV line	P3	G-1/N-1	0.9 < V < 1.05	0.79	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.80	0.9 < V < 1.05
	P3_1813_P3 Loss of Navy1 Project Unit ID ALL and DWP Inyo-Cottonwd No.1 230 kV line	P3	G-1/N-1	0.9 < V < 1.05	0.77	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05
	P3_2299_P3 Loss of Rush Unit ID 1-2 and DWP Inyo-Cottonwd No.1 230 kV line	P3	G-1/N-1	0.9 < V < 1.05	0.79	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05
	P3_238_P3 Loss of Hi5Solar All Units and DWP Inyo-Cottonwd No.1 230 kV line	P3	G-1/N-1	0.9 < V < 1.05	0.77	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.79	0.9 < V < 1.05
	P3_2418_P3 Loss of Lundy Unit ID 1-2 and DWP Inyo-Cottonwd No.1 230 kV line	P3	G-1/N-1	0.9 < V < 1.05	0.77	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05
	P3_2653_P3 Loss of Bishop Creek 2 Unit ID 1 and DWP Inyo-Cottonwd No.1 230 kV line	P3	G-1/N-1	0.9 < V < 1.05	0.76	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05
	P3_2769_P3 Loss of Bishop Creek 4 Unit ID 1-5 and DWP Inyo-Cottonwd No.1 230 kV line	P3	G-1/N-1	0.9 < V < 1.05	0.72	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.77	0.9 < V < 1.05
	P3_1054_P3 Loss of Daggett 1 Unit ID 1 and DWP Inyo-Cottonwd No.1 230 kV line	P3	G-1/N-1	0.9 < V < 1.05	0.81	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05
	P3_1311_P3 Loss of Daggett3 Unit ID ALL and DWP Inyo-Cottonwd No.1 230 kV line	P3	G-1/N-1	0.9 < V < 1.05	0.79	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.79	0.9 < V < 1.05
	P3_1564_P3 Loss of Resurgence 1 Unit ID ALL and DWP Inyo-Cottonwd	P3	G-1/N-1	0.9 < V < 1.05	0.79	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.80	0.9 < V < 1.05

Potential Mitigations

- System redispatch and utilize Inyo Reactor

Low/High Voltage Issues

Substation	Contingency (All and Worst P6)	Category	Category Description	Voltage PU (Baseline Scenarios)						Voltage PU (Sensitivity Scenarios)		
				2028 Summer Peak	2031 Summer Peak	2036 Summer Peak	2036 Summer-Off Peak	2028 Spring Off-Peak	2031 Spring Off-Peak	2028 SP Heavy Renewable & Min Gas Gen	2031 SP High CEC Forecast	2028 OP Sensitivity
241006 ACCELERATE 115 kV	P3_1561_P3 Loss of Resurgence 1 Unit ID ALL and Colwater-Segs2-Tortilla No.1 115 kV line	P3	G-1/N-1	0.9 < V < 1.05	0.9 < V < 1.05	0.87	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05
	P3_2196_P3 Loss of Rush Unit ID 1-2 and Colwater-Segs2-Tortilla No.1 115 kV line	P3	G-1/N-1	0.9 < V < 1.05	0.9 < V < 1.05	0.88	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05
24759 TORTILLA 115 kV	P3_1561_P3 Loss of Resurgence 1 Unit ID ALL and Colwater-Segs2-Tortilla No.1 115 kV line	P3	G-1/N-1	0.9 < V < 1.05	0.9 < V < 1.05	0.86	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05
	P3_2196_P3 Loss of Rush Unit ID 1-2 and Colwater-Segs2-Tortilla No.1 115 kV line	P3	G-1/N-1	0.9 < V < 1.05	0.9 < V < 1.05	0.87	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05

Potential Mitigations

- System adjustments and utilize capacitors at Tortilla and Kramer

Substation	Contingency (All and Worst P6)	Category	Category Description	Voltage PU (Baseline Scenarios)						Voltage PU (Sensitivity Scenarios)		
				2028 Summer Peak	2031 Summer Peak	2036 Summer Peak	2036 Summer-Off Peak	2028 Spring Off-Peak	2031 Spring Off-Peak	2028 SP Heavy Renewable & Min Gas Gen	2031 SP High CEC Forecast	2028 OP Sensitivity
24716 COLWATER 115 kV	P6_4412_P6 Loss of Kramer-Accelerate No.1 115 kV line and Colwater No.1 115/230 kV transformer	P6	N-1-1	0.9 < V < 1.05	0.9 < V < 1.05	0.84	0.77	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05
24759 TORTILLA 115 kV	P6_4412_P6 Loss of Kramer-Accelerate No.1 115 kV line and Colwater No.1 115/230 kV transformer	P6	N-1-1	0.9 < V < 1.05	0.9 < V < 1.05	0.80	0.76	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05
24765 TAP705 115 kV	P6_4412_P6 Loss of Kramer-Accelerate No.1 115 kV line and Colwater No.1 115/230 kV transformer	P6	N-1-1	0.9 < V < 1.05	0.9 < V < 1.05	0.84	0.77	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05
24771 GALE 115 kV	P6_4412_P6 Loss of Kramer-Accelerate No.1 115 kV line and Colwater No.1 115/230 kV transformer	P6	N-1-1	0.9 < V < 1.05	0.9 < V < 1.05	0.84	0.77	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05
24773 TIEFORT 115 kV	P6_4412_P6 Loss of Kramer-Accelerate No.1 115 kV line and Colwater No.1 115/230 kV transformer	P6	N-1-1	0.9 < V < 1.05	0.9 < V < 1.05	0.82	0.76	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05
24774 DUNNSIDE 115 kV	P6_4412_P6 Loss of Kramer-Accelerate No.1 115 kV line and Colwater No.1 115/230 kV transformer	P6	N-1-1	0.9 < V < 1.05	0.9 < V < 1.05	0.87	0.78	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05

Potential Mitigations

System adjustments and potential New Coolwater CRAS

Low/High Voltage Issues

				Voltage PU (Baseline Scenarios)						Voltage PU (Sensitivity Scenarios)		
Substation	Contingency (All and Worst P6)	Category	Category Description	2028 Summer Peak	2031 Summer Peak	2036 Summer Peak	2036 Summer-Off Peak	2028 Spring Off-Peak	2031 Spring Off-Peak	2028 SP Heavy Renewable & Min Gas Gen	2031 SP High CEC Forecast	2028 OP Sensitivity
24716 COLWATER 115 kV	P6_3760_P6 Loss of Kramer-Colwater No.1 115 kV line and Colwater-Segs2-Tortilla No.1 115 kV line	P6	N-1-1	0.73	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.88	0.9 < V < 1.05	0.76	0.9 < V < 1.05	0.9 < V < 1.05
24728 INYO 115 kV	P6_293_P6 Loss of Oxbow (Dixie Valley) Project and DWP Inyo-Cottonwd No.1 230 kV line	P6	N-1-1	0.89	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05
	P6_293_P6 Loss of Oxbow (Dixie Valley) Project and DWP Inyo-Cottonwd No.1 230 kV line	P6	N-1-1	0.80	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.88	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05
	P6_4846_P6 Loss of BishopCreek34-Control No.1 115 kV line and DWP Inyo-Cottonwd No.1 230 kV line	P6	N-1-1	0.88	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.88	0.9 < V < 1.05	0.9 < V < 1.05
24730 INYO PS 115 kV	P6_4991_P6 Loss of Casa Diablo-Control No.1 115 kV line and DWP Cottonwd-Barren Ridge No.1 230 kV line	P6	N-1-1	0.87	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05
	P6_5569_P6 Loss of DWP Cottonwd-Barren Ridge No.1 230 kV line and Control-Casa Diablo line-shunt capacitor 115.0	P6	N-1-1	0.87	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.88	0.9 < V < 1.05	0.9 < V < 1.05
	P6_5570_P6 Loss of DWP Cottonwd-Barren Ridge No.1 230 kV line and From OxbowB-OxbowA line-shunt capacitor 230.0	P6	N-1-1	0.89	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.89	0.9 < V < 1.05	0.9 < V < 1.05
24771 GALE 115 kV	P6_3760_P6 Loss of Kramer-Colwater No.1 115 kV line and Colwater-Segs2-Tortilla No.1 115 kV line	P6	N-1-1	0.73	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.88	0.9 < V < 1.05	0.76	0.9 < V < 1.05	0.9 < V < 1.05
24773 TIEFORT 115 kV	P6_3760_P6 Loss of Kramer-Colwater No.1 115 kV line and Colwater-Segs2-Tortilla No.1 115 kV line	P6	N-1-1	0.72	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.87	0.9 < V < 1.05	0.74	0.9 < V < 1.05	0.9 < V < 1.05
24774 DUNNSIDE 115 kV	P6_3760_P6 Loss of Kramer-Colwater No.1 115 kV line and Colwater-Segs2-Tortilla No.1 115 kV line	P6	N-1-1	0.78	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.80	0.9 < V < 1.05	0.9 < V < 1.05
24777 BAKER 115 kV	P6_3760_P6 Loss of Kramer-Colwater No.1 115 kV line and Colwater-Segs2-Tortilla No.1 115 kV line	P6	N-1-1	0.82	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.84	0.9 < V < 1.05	0.9 < V < 1.05
	P6_293_P6 Loss of Oxbow (Dixie Valley) Project and DWP Inyo-Cottonwd No.1 230 kV line	P6	N-1-1	0.66	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.76	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05

Potential Mitigations

- System redispatch and utilize Inyo Reactor
- OP-127

Low/High Voltage Issues

Substation	Contingency (All and Worst P6)	Category	Category Description	Voltage PU (Baseline Scenarios)						Voltage PU (Sensitivity Scenarios)		
				2028 Summer Peak	2031 Summer Peak	2036 Summer Peak	2036 Summer-Off Peak	2028 Spring Off-Peak	2031 Spring Off-Peak	2028 SP Heavy Renewable & Min Gas Gen	2031 SP High CEC Forecast	2028 OP Sensitivity
24759 TORTILLA 115 kV	P6_3761_P6 Loss of Kramer-Colwater No.1 115 kV line and Kramer-Tortilla No.1 115 kV line	P6	N-1-1	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.61	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	1.16
24771 GALE 115 kV	P6_3761_P6 Loss of Kramer-Colwater No.1 115 kV line and Kramer-Tortilla No.1 115 kV line	P6	N-1-1	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.61	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	1.15
24773 TIEFORT 115 kV	P6_3761_P6 Loss of Kramer-Colwater No.1 115 kV line and Kramer-Tortilla No.1 115 kV line	P6	N-1-1	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.61	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	1.15
24774 DUNNSIDE 115 kV	P6_3761_P6 Loss of Kramer-Colwater No.1 115 kV line and Kramer-Tortilla No.1 115 kV line	P6	N-1-1	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.71	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	1.10

Proposed Mitigation:

- System redispatch and utilize capacitors at Tortilla
- Potential new Coolwater CRAS

Transient Stability Results

Contingency	Category	Category Description	Transient Stability Performance									Potential Mitigation Solutions
			Baseline Scenarios						Sensitivity Scenarios			
			2028 Summer Peak	2031 Summer Peak	2036 Summer Peak	2036 Summer-Off Peak	2028 Spring Off-Peak	2031 Spring Off-Peak	2028 SP Heavy Renewable & Min Gas Gen	2031 SP High CEC Forecast	2028 OP Sensitivity	
Lugo 1AA or 2AA 500230 kV Transformer Bank	P1	N-1	WECC Criteria Not Met	WECC Criteria Not Met	WECC Criteria Not Met	No Issues	No Issues	No Issues	WECC Criteria Not Met	WECC Criteria Not Met	No Issues	Mohave Desert RAS
Kramer-Victor No. 1 230 kV T/L	P1	N-1	WECC Criteria Not Met	WECC Criteria Not Met	WECC Criteria Not Met	No Issues	WECC Criteria Not Met	WECC Criteria Not Met	WECC Criteria Not Met	WECC Criteria Not Met	WECC Criteria Not Met	Mohave Desert RAS
Kramer-Coolwater 230 kV T/L	P1	N-1	No Issues	No Issues	No Issues	No Issues	WECC Criteria Not Met	WECC Criteria Not Met	No Issues	No Issues	WECC Criteria Not Met	Mohave Desert RAS
Lugo - Pisgah No. 1 220 kV and Lugo - Victor No. 3 220 kV - SLG 15 cycle fault at Lugo 220	P4	Stuck Breaker	No Issues	WECC Criteria Not Met	No Issues	No Issues	No Issues	No Issues	No Issues	WECC Criteria Not Met	No Issues	Existing High Desert Power Project RAS and Planned Victor CRAS
Lugo - Victor No. 4 220 kV and Lugo 2AA Bank - SLG 15 cycle fault at Lugo 220	P4	Stuck Breaker	WECC Criteria Not Met	WECC Criteria Not Met	No Issues	No Issues	No Issues	No Issues	WECC Criteria Not Met	WECC Criteria Not Met	No Issues	Existing High Desert Power Project RAS and Planned Victor CRAS
Kramer - Sandlot 220 kV and Coolwater - Sandlot 220 kV - SLG 15 cycle fault at Sandlot 220	P4	Stuck Breaker	WECC Criteria Not Met	No Issues	No Issues	No Issues	WECC Criteria Not Met	WECC Criteria Not Met	WECC Criteria Not Met	No Issues	WECC Criteria Not Met	Planned Kramer CRAS
Coolwater - Kramer 115 kV and Kramer -Victor 115 kV - SLG 15 cycle fault at Kramer 115	P4	Stuck Breaker	WECC Criteria Not Met	No Issues	No Issues	No Issues	No Issues	No Issues	WECC Criteria Not Met	No Issues	No Issues	Planned Kramer CRAS
Control 115 kv East Bus	P5	Non-Redundant Relay	WECC Criteria Not Met				WECC Criteria Not Met		WECC Criteria Not Met		WECC Criteria Not Met	Investigate Options to Add Redundant Relay
Kramer 115 kv East Bus	P5	Non-Redundant Relay	WECC Criteria Not Met				No Issues		WECC Criteria Not Met		No Issues	Investigate Options to Add Redundant Relay
P5.3.13c Kramer 230 kV	P5	Non-Redundant Relay	WECC Criteria Not Met				No Issues		WECC Criteria Not Met		No Issues	Investigate Options to Add Redundant Relay
Kramer - Victor No. 1 220 kV Line	P5	Non-Redundant Relay	WECC Criteria Not Met				No Issues		WECC Criteria Not Met		No Issues	Investigate Options to Add Redundant Relay
Kramer - Victor No. 2 220 kV Line	P5	Non-Redundant Relay	WECC Criteria Not Met				No Issues		WECC Criteria Not Met		No Issues	Investigate Options to Add Redundant Relay
Victor - Lugo No. 1 220 kV Line	P5	Non-Redundant Relay	WECC Criteria Not Met				No Issues		WECC Criteria Not Met		No Issues	Investigate Options to Add Redundant Relay
Victor - Lugo No. 2 220 kV Line	P5	Non-Redundant Relay	WECC Criteria Not Met				No Issues		WECC Criteria Not Met		No Issues	Investigate Options to Add Redundant Relay
Kramer - Inyokern - Randsburg No. 3 115 kV Line	P5	Non-Redundant Relay	WECC Criteria Not Met				No Issues		WECC Criteria Not Met		No Issues	Investigate Options to Add Redundant Relay
Kramer - Victor 115 kV Line	P5	Non-Redundant Relay	WECC Criteria Not Met				No Issues		WECC Criteria Not Met		No Issues	Investigate Options to Add Redundant Relay
Victor - Roadway 115 kV Line	P5	Non-Redundant Relay	WECC Criteria Not Met				WECC Criteria Not Met		WECC Criteria Not Met		WECC Criteria Not Met	Investigate Options to Add Redundant Relay

Transient Stability Results

Contingency	Category	Category Description	Transient Stability Performance									Potential Mitigation Solutions
			Baseline Scenarios						Sensitivity Scenarios			
			2028 Summer Peak	2031 Summer Peak	2036 Summer Peak	2036 Summer-Off Peak	2028 Spring Off-Peak	2031 Spring Off-Peak	2028 SP Heavy Renewable & Min Gas Gen	2031 SP High CEC Forecast	2028 OP Sensitivity	
Lugo 1AA and 2AA 500/230 kV Transformer Bank	P6	N-1-1	Unstable	No Issues	No Issues	No Issues	Unstable	No Issues	Unstable	No Issues	Unstable	Existing High Desert Power Project RAS and Planned Victor CRAS
Kramer 1A or 2A 230/115 kV Transformer Bank and Kramer-Victor No. 1 or No. 2 230 kV T/L	P6	N-1-1	WECC Criteria Not Met	No Issues	No Issues	No Issues	No Issues	No Issues	WECC Criteria Not Met	No Issues	No Issues	Mohave Desert RAS with an Option to System Redispatch: Increase generation on the 115 kV system (Kramer, Coolwater, Inyokern, Control)
Kramer-Victor No. 1 and No. 2 230 kV T/L	P6	N-1-1	Unstable	Unstable	No Issues	No Issues	No Issues	Unstable	Unstable	Unstable	No Issues	Mohave Desert RAS
Kramer-Inyokern-Randsburg No. 1 115 kV T/L and Kramer-Inyokern-Randsburg No. 3 115 kV T/L	P6	N-1-1	No Issues	No Issues	No Issues	Unstable	Unstable	Unstable	No Issues	No Issues	Unstable	System Redispatch: Increase generation on the 115 kV system (Kramer, Coolwater, Inyokern, Control)
Control-Inyo 115 kV T/L (Path 60) and Control-Coso-Haiwee-Inyokern 115 kV T/L	P6	N-1-1	No Issues	No Issues	No Issues	Unstable	Unstable	Unstable	No Issues	No Issues	Unstable	System Redispatch: Increase generation on the 115 kV system (Kramer, Coolwater, Inyokern, Control)
Lugo - Victor No. 1 and No. 2 230 kV Lines - SLG 15 cycle fault at Lugo 220	P7	DCTL	WECC Criteria Not Met	No Issues	No Issues	No Issues	No Issues	No Issues	WECC Criteria Not Met	No Issues	No Issues	Existing High Desert Power Project RAS and Planned Victor CRAS
Kramer - Victor No. 1 and No. 2 230 kV Lines - SLG 15 cycle fault at Kramer 220	P7	DCTL	Unstable	Unstable	No Issues	No Issues	No Issues	Unstable	Unstable	Unstable	No Issues	Mohave Desert RAS
Kramer- Victor 115 kV and Kramer - Roadway 115 kV - SLG 15 cycle fault at Kramer 115	P7	DCTL	WECC Criteria Not Met	No Issues	No Issues	No Issues	No Issues	No Issues	WECC Criteria Not Met	No Issues	No Issues	Mohave Desert RAS
Kramer - Sandlot 230 kV and Kramer - Coolwater 230 kV - SLG 15 cycle fault at Kramer 220	P7	DCTL	Unstable	No Issues	Unstable	No Issues	Unstable	No Issues	Unstable	No Issues	Unstable	Planned Kramer CRAS
Coolwater- Sandlot 230 kV and Kramer -Coolwater 230 kV - SLG 15 cycle fault at Coolwater 220	P7	DCTL	No Issues	No Issues	Unstable	No Issues	No Issues	No Issues	No Issues	No Issues	No Issues	Planned Kramer CRAS

California ISO

Summary of Potential New Upgrades

Concern	Potential Upgrade
Loss of two Victor 115/230kV transformers causes remaining Victor 115/230kV transformer bank to overload	Option 1: Victor Bank Replacement Option 2: BESS addition on the 115kV system
Overloading on the Kramer – Coolwater, Kramer – Sandlot, Coolwater 230/115 kV transformer bank	New Coolwater CRAS
Multiple P5 (non-redundant DC supply failure, non-redundant trip coil failure, non-redundant bus differential relay failure) contingencies cause WECC stability criteria violations	Add Redundant DC supply, trip coil and bus differential relay

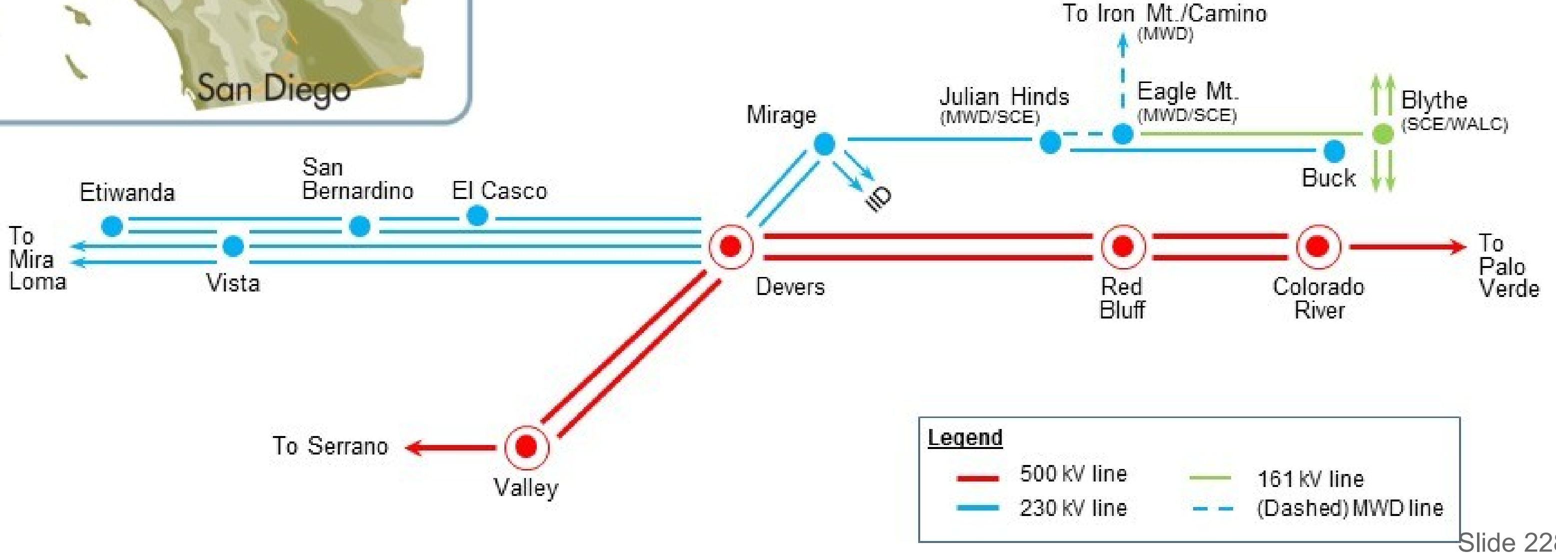
SCE Eastern Area
Preliminary Reliability Assessment Results

Rick Torres
Sr. Regional Transmission Engineer

2026-2027 Transmission Planning Process Stakeholder Meeting
September 23-24, 2026

SCE Eastern Area

- Includes the SCE owned transmission system in the Riverside County around and east of the Devers Substation
- Comprised of 500 kV, 230 kV, and 161 kV transmission facilities
- Summer Peak Net Load of 6,164 MW in 2026



SCE Eastern Area Study Scenarios

- Base scenarios

No.	Case	Description
B1	2028 Summer Peak	Summer peak load time (9/6 HE 15 PST)
B2	2031 Summer Peak	Summer peak load time (9/3 HE 15 PST)
B3	2036 Summer Peak	Summer peak load time (9/3 HE 15 PST)
B5	2036 Summer Off-Peak	Summer shoulder load time (9/3 HE 11 PST)
B7	2028 Spring Off-Peak	Spring shoulder load time (4/29 HE 19 PST)
B8	2031 Spring Off-Peak	Spring shoulder load time (4/20 HE 13 PST)

- Sensitivity scenarios

No.	Case	Description
S1	2031 SP High CEC Load	2031 summer peak load condition with high CEC load forecast
S2	2028 SP High Renewable	2028 summer peak load condition with heavy renewable output and minimum gas generation commitment
S3	2028 Spr OP Storage Charging	2028 spring shoulder-peak condition with heavy renewable output or different import level or storage charging

Load and Load Modifier Assumptions – Eastern Area

Study Case		Gross Load (MW)	AAEE (MW)	AAFS (MW)	ATE (MW)	DS (MW)	BTM-PV (MW)		Net Load (MW)	Demand Response		Pump Load	Known Loads
							Installed	Output		Fast	Slow		
Base	B1	7186	-86	56	118	9	2156	1423	5763	-48	-14	282	536
	B2	7727	-156	162	274	72	2368	1563	6164	-48	-14	282	545
	B3	8546	-257	349	600	141	2699	1781	6765	-48	-14	282	546
	B5	7659	-281	94	555	81	2699	2186	5474	-48	-14	282	0
	B7	2850	-48	75	44	9	2156	0	2850	-48	-14	0	234
	B8	3556	-96	45	132	41	2368	1965	1590	-48	-14	0	0
Sensitivity	S1	8049	-156	169	286	75	2368	1563	6486	-48	-14	282	568
	S2	7186	-86	56	118	9	2156	1423	5763	-48	-14	282	536
	S3	2850	-48	75	44	9	2156	0	2850	-48	-14	0	234

Generation Assumptions – Eastern Area

		Energy Storage		Solar		Wind		Hydro		Thermal	
Study Case		Installed (MW)	Dispatched (MW) *	Installed (MW)	Dispatched (MW)	Installed (MW)	Dispatched (MW)	Installed (MW)	Dispatched (MW)	Installed (MW)	Dispatched (MW)
Base	B1	7214	0	6017	4680	818	270	341	173	3061	1985
	B2	7250	375	6017	4752	818	270	341	186	3061	2412
	B3	7574	-2320	8893	6929	1121	307	341	186	3061	2270
	B5	7450	-7169	9017	8433	1121	99	341	173	3061	2400
	B7	7214	0	6017	0	818	606	341	173	3061	2895
	B8	7250	-6828	6017	5666	818	499	341	173	3061	1633
Sensitivity	S1	7250	375	6017	4772	818	270	341	186	3061	2412
	S2	7214	0	6017	5397	818	548	341	173	3061	1528
	S3	7214	-6896	6017	0	818	606	341	173	3061	2401

Note*: A negative number indicates battery charging

Previously approved transmission projects modelled in base cases

Project Name	ISD*	First Year Modeled
Devers 230 kV Reconfiguration Project	May 2027	2028
Colorado River-Red Bluff 500 kV 1 Line Upgrade	Dec 2028	2028
Devers-Red Bluff 500 kV 1 and 2 Line Upgrade	Dec 2032	2031
Devers-Valley 500 kV 1 Line Upgrade	Dec 2030	2031
Serrano-Alberhill-Valley 500 kV 1 Line Upgrade	June 2031	2036
San Bernardino – Etiwanda 230kV Line Upgrade	Dec 2031	2036
San Bernardino – Vista 230kV Line Upgrade	Dec 2031	2036
Vista – Etiwanda 230kV Line Upgrade	June 2028	2028

* July 2026 Transmission Development Forum

Neighboring system transmission projects modelled in base cases

Project Name	ISD	First Year Modeled
Mirage – Ramon #2 230kV line	2029	2031

Reliability Assessment Preliminary Results Summary

① J. Hinds MWD – Eagle Mtn 230 kV & ② J. Hinds MWD – J. Hinds 230 kV

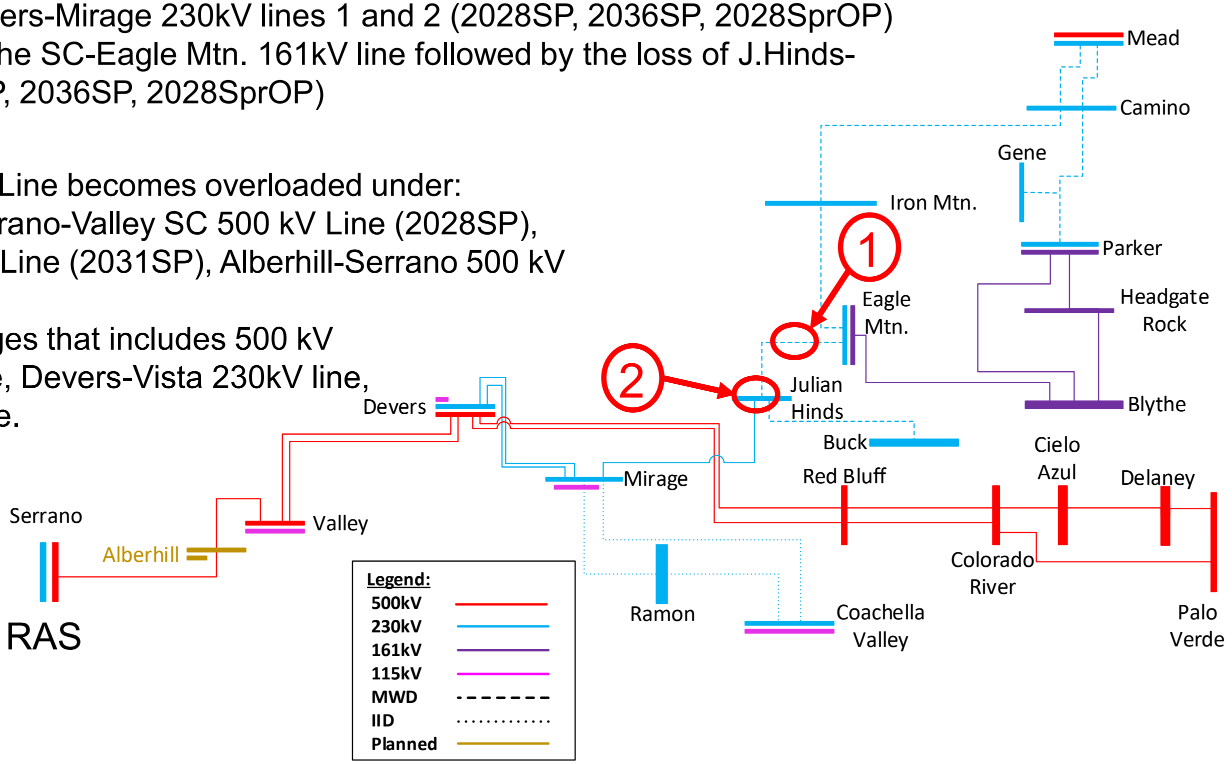
Observations:

- J. Hinds MWD – Eagle Mtn 230 kV Line & J. Hinds MWD – J. Hinds 230 kV Line become overloaded under:
  - Category P1 – Loss of J.Hinds-Mirage 230kV Line (2028SP, 2036SP, 2028SprOP)
  - Category P4 – Loss of J.Hinds-Mirage 230kV line & Mirage-Ramon 230kV line (2028SP, 2036SP, 2028SprOP)
  - Category P5 – Loss of J.Hinds-Mirage 230kV line (2036SP, 2028SprOP)
  - Category P7 – Loss of Devers-Mirage 230kV lines 1 and 2 (2028SP, 2036SP, 2028SprOP)
  - Category P6 – Loss of Blythe SC-Eagle Mtn. 161kV line followed by the loss of J.Hinds-Mirage 230kV line (2028SP, 2036SP, 2028SprOP)

- J. Hinds MWD – J. Hinds 230 kV Line becomes overloaded under:
  - Category P1 – Loss of Serrano-Valley SC 500 kV Line (2028SP), Alberhill-Valley SC 500 kV Line (2031SP), Alberhill-Serrano 500 kV Line (2031SP)
  - Several Category P5 outages that includes 500 kV elements mentioned above, Devers-Vista 230kV line, or Devers-Valley 500kV line.

Proposed mitigation:

Existing Blythe Energy gen drop RAS



1 Eagle Mtn – Iron Mtn 230 kV Line & 2 Iron Mtn – Camino 230 kV Line

Observations:

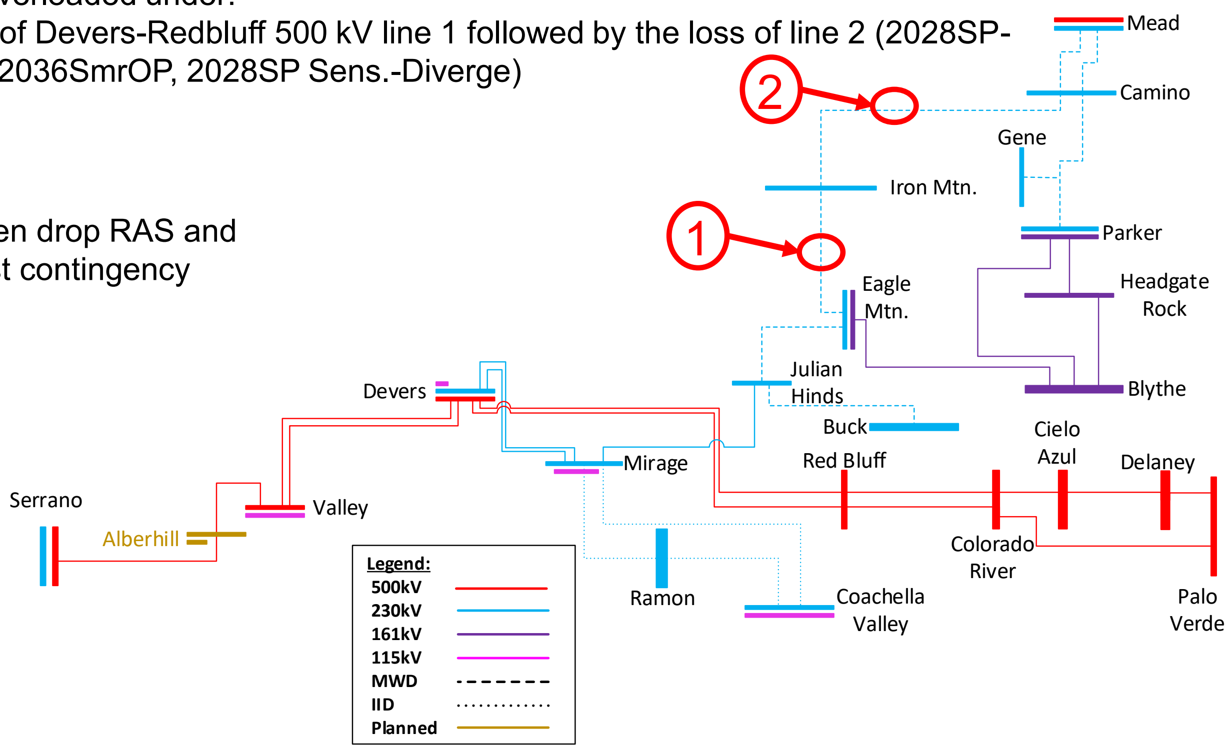
- Eagle Mtn – Iron Mtn 230 kV Line & Iron Mtn – Camino 230 kV Line become overloaded under:
  - Category P1 – Loss of J.Hinds-Mirage 230kV line (2028SprOP)
  - Category P4 – Loss of J.Hinds-Mirage 230kV line and Mirage-Ramon 230kV line (2028SprOP)
  - Worst Category P6 (facility 1) – Loss of Blythe SC-Eagle Mtn. 161kV line followed by the loss of J.Hinds-Mirage 230kV line (2028SP, 2036SP, 2028SprOP-Diverge)

- Iron Mtn – Camino 230 kV Line is overloaded under:
  - Worst Category P6 – Loss of Devers-Redbluff 500 kV line 1 followed by the loss of line 2 (2028SP-Diverge, 2036SP-Diverge, 2036SmrOP, 2028SP Sens.-Diverge)

Proposed mitigation:

P1 and P4 – Existing Blythe Energy gen drop RAS and

P6 – System adjustments after the first contingency

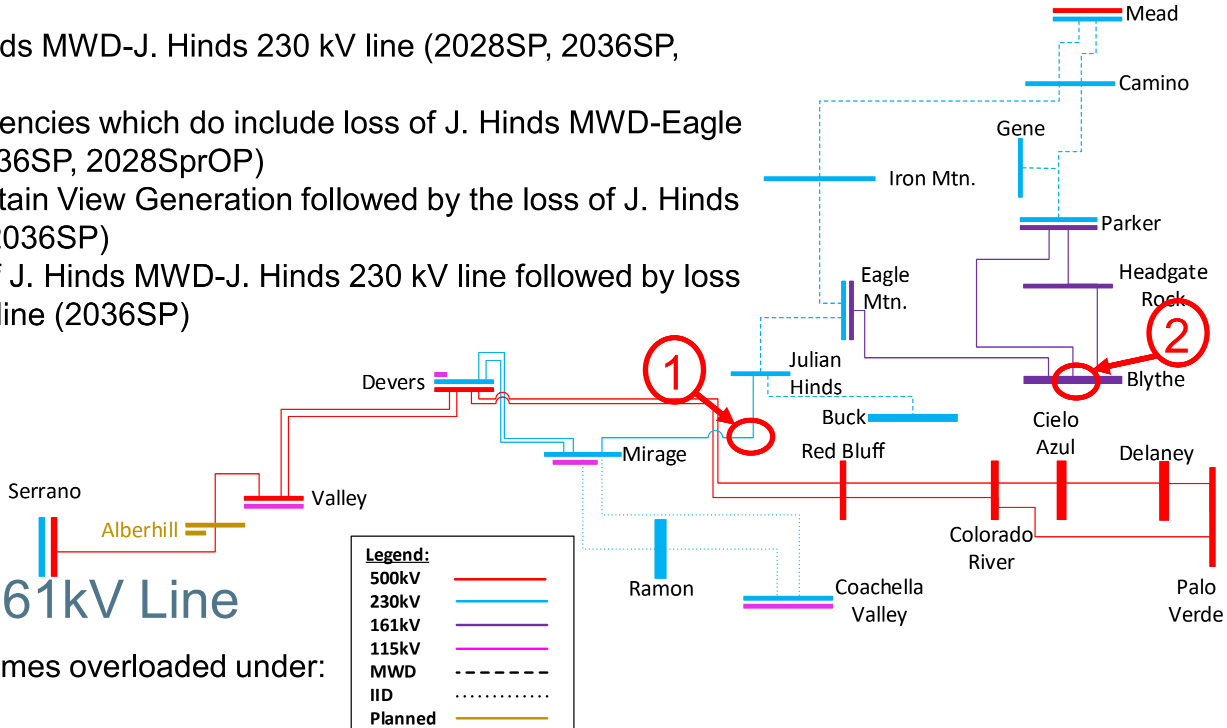


1 J. Hinds - Mirage 230kV Line

Observations:

- J. Hinds - Mirage 230kV becomes overloaded under:
  - Category P1 – Loss of J. Hinds MWD-Eagle Mtn 230 kV line (2028SP, 2036SP, 2028SprOP)
  - Category P1 – Loss of J. Hinds MWD-J. Hinds 230 kV line (2028SP, 2036SP, 2028SprOP)
  - Several Category P2 contingencies which do include loss of J. Hinds MWD-Eagle Mtn 230 kV line (2028SP, 2036SP, 2028SprOP)
  - Category P3 – Loss of Mountain View Generation followed by the loss of J. Hinds MWD-J. Hinds 230 kV line (2036SP)
  - Worst Category P6 – Loss of J. Hinds MWD-J. Hinds 230 kV line followed by loss of Alberhill-ValleySC 500 kV line (2036SP)

Proposed mitigation:
Existing Blythe Energy gen drop RAS



2 Blythe – BlytheSC 161kV Line

- Blythe – BlytheSC 161kV Line becomes overloaded under:
  - Category P6 outage – Loss of Devers-Red Bluff 500 kV line 1 followed by the loss of line 2 (2028SP-Div, 2036SP-Div, 2036SmrOP, 2031SP Sens., 2028SP Sens. - Div)

Proposed mitigation: System adjustments after the first contingency

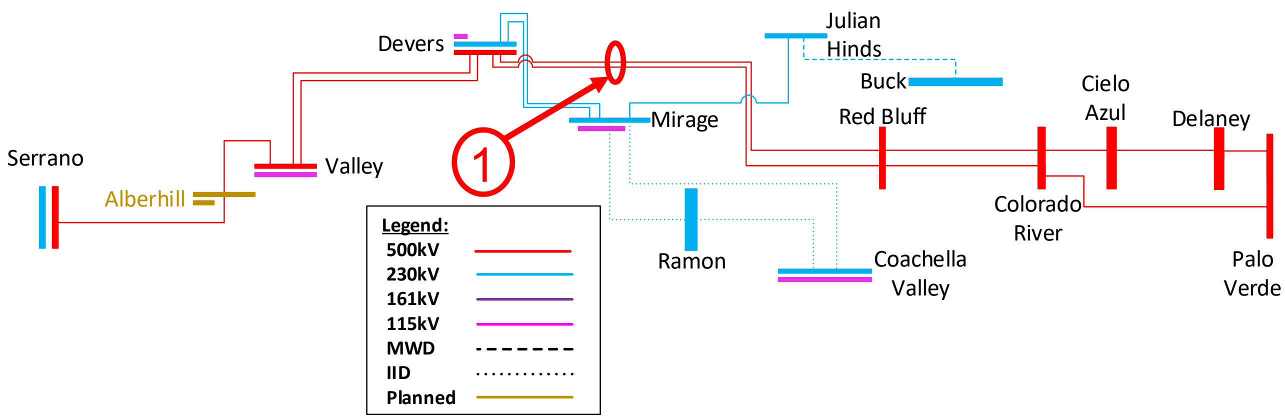
1 Devers – Red Bluff 500kV lines 1 & 2

Observations:

- Devers – Red Bluff 500kV lines 1 & 2 become overloaded under:
  - Category P1 – Loss of either Devers-Red Bluff 500kV lines will overload the remaining Devers-Red Bluff line (2028SP, 2036SP, 2028SP Sens.)
  - Category P3 – Loss of Sentinel Generation followed by the loss of either Devers-Red Bluff 500kV lines will overload the remaining Devers-Red Bluff 500kV line (2028SP, 2036SP, 2028SP Sens.)
  - Category P4 – Loss of Devers-Red Bluff No. 2 and Devers 500/230kV 1AA Bank (2028SP, 2036SP, 2028SP Sens.)
  - Category P5 – Loss of Devers-Red Bluff line 2 (2028SP, 2036SP, 2028SP Sens.)
  - Worst Category P6 – Loss of either Devers-Red Bluff 500kV lines followed by the loss of North Gila-Imperial Valley 500 kV Line will overload the remaining Devers-Red Bluff 500kV line (2028SP, 2036SP, 2028SP Sens.)

Proposed mitigation:

WOCR CRAS and congestion management



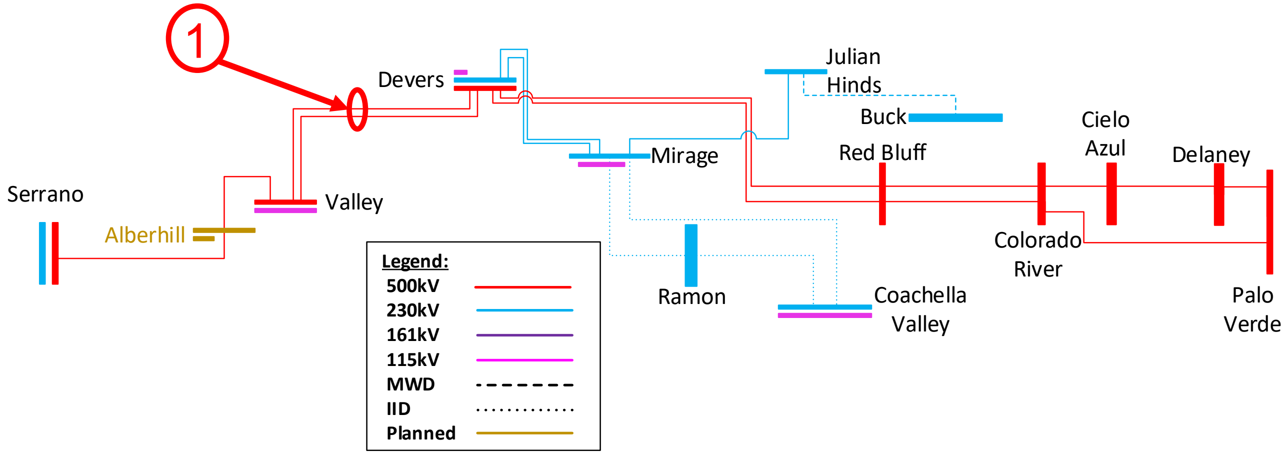
① Devers – Valley 500kV line 1

Observations:

- Devers – Valley 500kV line 1 becomes overloaded under:
  - Category P6 – Loss of Devers-Valley 500 kV line 2 followed by the loss of North Gila-Imperial Valley 500 kV line (2028SP Sens.)

Proposed mitigation:

IDE CRAS



1 Red Bluff 1AA or 2AA 500/230kV Transformer Banks
2 Colorado River 1AA or 2AA 500/230kV Transformer Banks

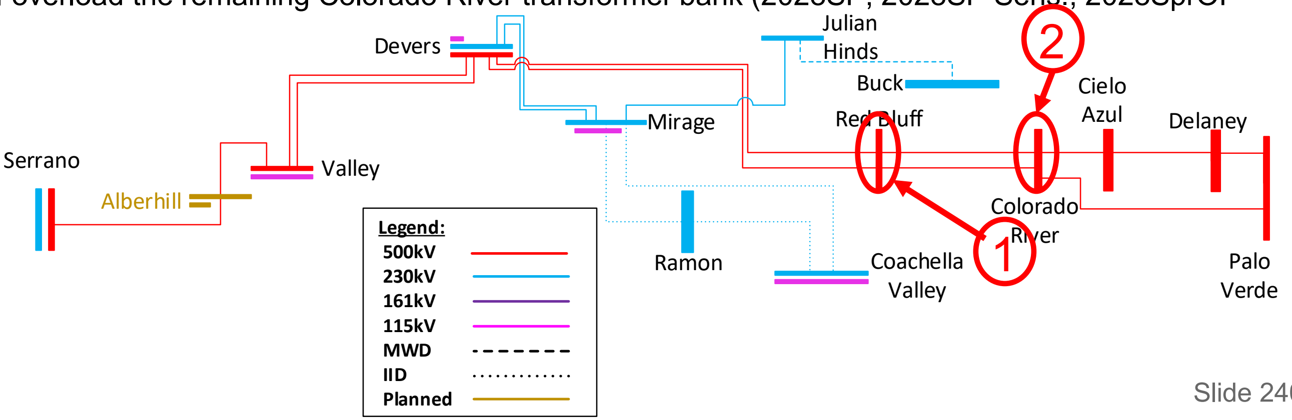
Observations:

- Red Bluff 1AA or 2AA 500/230kV Transformer Banks become overloaded under:
  - Category P1 – Loss of either Red Bluff 500/230kV transformer banks will overload the remaining Red Bluff transformer bank (2028SP, 2031SP, 2036SP, 2031SP Sens., 2028SP Sens)
  - Category P4 – Loss of Colorado River-Red Bluff 500kV line No. 2 and Red Bluff 1AA 500/230kV transformer bank (2028SP, 2031SP, 2036SP, 2031SP Sens., 2028SP Sens)
  - Category P5 – Loss of Red Bluff 500/230 kV 1AA transformer bank (2028SP, 2031SP, 2036SP, 2031SP Sens., 2028SP Sens)
  - Worst Category P6 – Loss of Devers-Red Bluff 500kV line followed by the loss of either Red Bluff 500/230kV transformer banks will overload the remaining Red Bluff transformer bank (2028SP, 2031SP, 2036SP, 2031SP Sens., 2028SP Sens.)

- Colorado River 1AA or 2AA 500/230kV Transformer Banks become overloaded under:
  - Category P1 – Loss of either Colorado River 500/230kV transformer banks will overload the remaining Colorado River transformer bank (2028SP, 2031SP, 2036SP, 2036SmrOP, 2031SP Sens., 2028SP Sens., 2028SprOP Sens.)
  - Category P3 – Loss of Sentinel generation followed by the loss of either Colorado River 500/230kV transformer banks will overload the remaining Colorado River transformer bank (2036SP, 2036SmrOP)
  - Category P5 – Loss of Colorado River 500/230 kV 1AA transformer bank (2028SP, 2031SP, 2036SP, 2036SmrOP, 2031SP Sens., 2028SP Sens, 2028SprOP Sens.)
  - Worst Category P6 – Loss of Cielo Azul-Colorado River 500kV line followed by the loss of either Colorado River 500/230kV transformer banks will overload the remaining Colorado River transformer bank (2028SP, 2028SP Sens., 2028SprOP Sens.)

Proposed mitigation:

WOCR CRAS



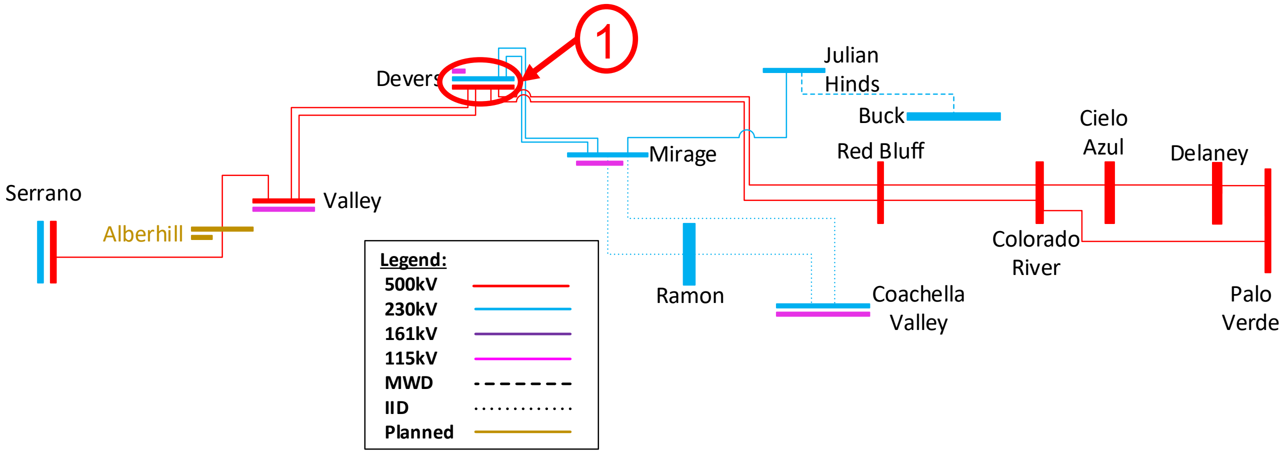
1 Devers 1AA or 2AA 500/230kV Transformer Banks

Observations:

- Devers 1AA or 2AA 500/230kV Transformer Banks become overloaded under :
  - Category P3 – Loss of Sentinel generation followed by the loss of either Devers 500/230kV transformer banks will overload the remaining Devers 500/230kV transformer bank (2028SP Sens.)
  - Worst Category P6 – Loss of Serrano – Valley 500kV line followed by the loss of either Devers 500/230kV transformer banks will overload the remaining Devers 500/230kV transformer bank (2028SP, 2028SP Sens., 2028SprOP Sens.)

Proposed mitigation:

System adjustments after the first contingency



Additional Observations

1 **Observations:**
- Category P6 – Loss of Devers-Red Bluff line 1 followed by the loss of line 2 overload several IID lines.

Proposed mitigation: System adjustments after the first contingency

2 **Observations:**
- Category P6 – Loss of Coachella Valley-Mirage 230kV line followed by the loss of Ramon-Mirage 230kV line overloads several IID lines
- Category P7 – Loss of Devers-Mirage 230kV lines 1 and 2 overload several IID lines

Proposed mitigation: Path 42 RAS

3 **Observations:**
- Several divergence issues under the following contingencies:
  - Category P6 loss of Colriver No. 1 & No. 2 500/230 kV transformer banks (WOCR CRAS)
  - Category P6 loss of Redbluff No.1 & No. 2 500/230 kV transformer banks (WOCR CRAS)
  - Category P6 loss of Palo Verde-Colorado River 500 kV line followed by the loss of Serrano-Valley 500 kV line (reduce BESS charging)
  - Category P6 loss of Palo Verde-Colorado 500 kV line followed by the loss of Cielo Azul-Colorado River 500 kV line (reduce BESS charging)
  - Category P6 loss of Serrano-Valley 500 kV line followed by the loss of Cielo Azul-Colorado River 500 kV line (reduce BESS charging)

Low/High Voltage issues

Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Voltage PU (Baseline Scenarios)						Voltage PU (Sensitivity Scenarios)		
				B1_2028-SmrPk	B2_2031-SmrPk	B3_2036-SmrPk	B5_2036-SmrOP	B7_2028-SprOP	B8_2031-SprOP	S1_2031-SP	S2_2028-SP	S3_2028-SprOP
25401 EAGLEMTN 230 kV	P6_1034_P6.1.1 Loss of J.Hinds-Mirage No.1 230 kV line and Parker-Gene No.1 230 kV line	P6	N-1-1	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.89	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05
System	P6_1046_P6.1.2 Loss of J.Hinds-Mirage No.1 230 kV line and Eaglemtn No.5 161/230 kV transformer	P6	N-1-1	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	NotConv	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05

Proposed mitigation: : Blythe Energy RAS (Generation drop)

Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Voltage PU (Baseline Scenarios)						Voltage PU (Sensitivity Scenarios)		
				B1_2028-SmrPk	B2_2031-SmrPk	B3_2036-SmrPk	B5_2036-SmrOP	B7_2028-SprOP	B8_2031-SprOP	S1_2031-SP	S2_2028-SP	S3_2028-SprOP
25401 EAGLEMTN 230 kV	P1_27_P1.2 Loss of J.Hinds-Mirage No.1 230 kV line	P1	N-1	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.90	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	1.08
25401 EAGLEMTN 230 kV	P4_04_P4 Julian Hinds- Mirage 230 kV Line & Mirage-Ramon 230 kV Line	P4	Internal Breaker Fault /stuck breaker	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.90	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	1.08

Proposed mitigation: : Blythe Energy RAS (Generation drop) / OP7720 - Close in Eagle Mtn and/or Julian Hinds Shunt Reactors

Low/High Voltage issues

Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Voltage PU (Baseline Scenarios)						Voltage PU (Sensitivity Scenarios)		
				B1_2028-SmrPk	B2_2031-SmrPk	B3_2036-SmrPk	B5_2036-SmrOP	B7_2028-SprOP	B8_2031-SprOP	S1_2031-SP	S2_2028-SP	S3_2028-SprOP
25401 EAGLEMTN 230 kV	P1_25_P1.2 Loss of Eaglemtn-Iron Mtn No.1 230 kV line AND P1_27_P1.2 Loss of J.Hinds-Mirage No.1 230 kV line	P6	N-1-1	NotConv	NotConv	NotConv	NotConv	NotConv	0.81	NotConv	NotConv	1.15
25512 JHINDMWD 230 kV	P1_5_P1.2 Loss of Camino-Gene-Iron Mtn-Mead 230 kV line AND P1_27_P1.2 Loss of J.Hinds-Mirage No.1 230 kV line	P6	N-1-1	NotConv	NotConv	NotConv	NotConv	NotConv	0.82	NotConv	NotConv	1.19

<u>Proposed mitigation</u>: OP7720 - Blythe Energy Gen dispatch adjustments

Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Voltage PU (Baseline Scenarios)						Voltage PU (Sensitivity Scenarios)		
				B1_2028-SmrPk	B2_2031-SmrPk	B3_2036-SmrPk	B5_2036-SmrOP	B7_2028-SprOP	B8_2031-SprOP	S1_2031-SP	S2_2028-SP	S3_2028-SprOP
25512 JHINDMWD 230 kV	P1_25_P1.2 Loss of Eaglemtn-Iron Mtn No.1 230 kV line AND P1_29_P1.2 Loss of Jhindmwd-J.Hinds No.r1 230 kV line	P6	N-1-1	NotConv	NotConv	NotConv	NotConv	1.10	0.78	NotConv	NotConv	1.10
25512 JHINDMWD 230 kV	P1_5_P1.2 Loss of Camino-Gene-Iron Mtn-Mead 230 kV line AND P1_29_P1.2 Loss of Jhindmwd-J.Hinds No.r1 230 kV line	P6	N-1-1	NotConv	NotConv	NotConv	NotConv	1.12	0.79	NotConv	NotConv	NotConv

<u>Proposed mitigation</u>: OP7720 - Open Blythe - Eagle Mtn. 161 kV line

Low/High Voltage issues

Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Voltage PU (Baseline Scenarios)						Voltage PU (Sensitivity Scenarios)		
				B1_2028-SmrPk	B2_2031-SmrPk	B3_2036-SmrPk	B5_2036-SmrOP	B7_2028-SprOP	B8_2031-SprOP	S1_2031-SP	S2_2028-SP	S3_2028-SprOP
25406 J.HINDS 230 kV	P1LLT_428_P1LLT Loss of J.Hinds-Mirage No.1 230 kV line and Miraloma SVD ID ei	LLT	LLT	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	1.08
25406 J.HINDS 230 kV	P1LLT_429_P1LLT Loss of J.Hinds-Mirage No.1 230 kV line and Miralomw SVD ID ei	LLT	LLT	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	1.08
25406 J.HINDS 230 kV	P1LLT_431_P1LLT Loss of J.Hinds-Mirage No.1 230 kV line and Sanbrdno SVD ID ei	LLT	LLT	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	1.08
25512 JHINDMWD 230 kV	P1_29_P1.2 Loss of Jhindmwd-J.Hinds No.r1 230 kV line	P1	N-1	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	1.06	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	1.05
25512 JHINDMWD 230 kV	P3_58_P3.2 Loss of Sentinel Block and Jhindmwd-J.Hinds No.r1 230 kV line	P3	G-1 / N-1	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	1.05
25405 IRON MTN 230 kV	P5P4-51_MrgJh-stkM-1CT_1ph&stuckCB@Mirage Loss of Julian Hinds-Mirage 230kV Blythe RAS	P5	Non-Redundant Relay	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	1.06
25405 IRON MTN 230 kV	P5P4-54_JhMrg-stkJ-1CT_1ph&stuckCB@JHinds Loss of Julian Hinds-Mirage 230kV Blythe RAS	P5	Non-Redundant Relay	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	1.06
25401 EAGLEMTN 230 kV	P5P4-51_MrgJh-stkM-1CT_1ph&stuckCB@Mirage Loss of Julian Hinds-Mirage 230kV Blythe RAS	P5	Non-Redundant Relay	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	1.08
25401 EAGLEMTN 230 kV	P5P4-54_JhMrg-stkJ-1CT_1ph&stuckCB@JHinds Loss of Julian Hinds-Mirage 230kV Blythe RAS	P5	Non-Redundant Relay	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	1.08
25512 JHINDMWD 230 kV	P5P4-51_MrgJh-stkM-1CT_1ph&stuckCB@Mirage Loss of Julian Hinds-Mirage 230kV Blythe RAS	P5	Non-Redundant Relay	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	1.08
25512 JHINDMWD 230 kV	P5P4-54_JhMrg-stkJ-1CT_1ph&stuckCB@JHinds Loss of Julian Hinds-Mirage 230kV Blythe RAS	P5	Non-Redundant Relay	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	1.08
25406 J.HINDS 230 kV	P5P4-51_MrgJh-stkM-1CT_1ph&stuckCB@Mirage Loss of Julian Hinds-Mirage 230kV Blythe RAS	P5	Non-Redundant Relay	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	1.08
25406 J.HINDS 230 kV	P5P4-54_JhMrg-stkJ-1CT_1ph&stuckCB@JHinds Loss of Julian Hinds-Mirage 230kV Blythe RAS	P5	Non-Redundant Relay	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	1.08

Proposed mitigation: OP7720 - Close in Eagle Mtn and/or Julian Hinds Shunt Reactors

Low/High Voltage issues

Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Voltage PU (Baseline Scenarios)						Voltage PU (Sensitivity Scenarios)		
				B1_2028-SmrPk	B2_2031-SmrPk	B3_2036-SmrPk	B5_2036-SmrOP	B7_2028-SprOP	B8_2031-SprOP	S1_2031-SP	S2_2028-SP	S3_2028-SprOP
24806 MIRAGE 230 kV	P7_03_P7 Line DEVERS - MIRAGE 230.00 kV No.1 & No.2	P7	DCTL	1.06	1.07	1.06	1.06	0.9 < V < 1.05	1.06	1.06	1.07	1.05
25568 RP_Mirage_H 230 kV	P7_03_P7 Line DEVERS - MIRAGE 230.00 kV No.1 & No.2	P7	DCTL	0.9 < V < 1.05	0.9 < V < 1.05	1.06	1.06	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05

<u>Proposed mitigation</u>: Path 42 RAS

Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Voltage PU (Baseline Scenarios)						Voltage PU (Sensitivity Scenarios)		
				B1_2028-SmrPk	B2_2031-SmrPk	B3_2036-SmrPk	B5_2036-SmrOP	B7_2028-SprOP	B8_2031-SprOP	S1_2031-SP	S2_2028-SP	S3_2028-SprOP
25401 EAGLEMTN 230 kV	EST_MWD_Line_31_CBs-J.HindsSCE. J-Mirage GenTie-Buck Blvd Jh & Eagle Shunt Reactor	P2	Internal Breaker Fault/stuck breaker	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	1.07	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05
25406 J.HINDS 230 kV	EST_MWD_Line_31_CBs-J.HindsSCE. J-Mirage GenTie-Buck Blvd Jh & Eagle Shunt Reactor	P2	Internal Breaker Fault/stuck breaker	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	1.06	1.07	0.9 < V < 1.05	0.9 < V < 1.05	1.05
25512 JHINDMWD 230 kV	EST_MWD_Line_31_CBs-J.HindsSCE. J-Mirage GenTie-Buck Blvd Jh & Eagle Shunt Reactor	P2	Internal Breaker Fault/stuck breaker	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	0.9 < V < 1.05	1.06	1.07	0.9 < V < 1.05	0.9 < V < 1.05	1.05

<u>Proposed mitigation</u>: Further Evaluation Needed

Low/High Voltage issues

Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Voltage PU (Baseline Scenarios)						Voltage PU (Sensitivity Scenarios)		
				B1_2028-SmrPk	B2_2031-SmrPk	B3_2036-SmrPk	B5_2036-SmrOP	B7_2028-SprOP	B8_2031-SprOP	S1_2031-SP	S2_2028-SP	S3_2028-SprOP
240020 OBERON 500 kV	Base Case	Base Case	Base Case	1.04 < V < 1.08	1.04 < V < 1.08	1.04	1.04 < V < 1.08	1.04 < V < 1.08	1.04 < V < 1.08	1.04 < V < 1.08	1.04 < V < 1.08	1.04 < V < 1.08
24138 SERRANO 500 kV	Base Case	Base Case	Base Case	1.04 < V < 1.08	1.04 < V < 1.08	1.04 < V < 1.08	1.04 < V < 1.08	1.04 < V < 1.08	1.04 < V < 1.08	1.04 < V < 1.08	1.04 < V < 1.08	1.04
24230 WILDLIFE 230 kV	Base Case	Base Case	Base Case	0.95 < V < 1.05	0.95 < V < 1.05	0.95	0.95 < V < 1.05	0.95 < V < 1.05	0.95 < V < 1.05	0.95 < V < 1.05	0.95 < V < 1.05	0.95 < V < 1.05
24374 REDBLUFF 500 kV	Base Case	Base Case	Base Case	1.04 < V < 1.08	1.04 < V < 1.08	1.04	1.04 < V < 1.08	1.04 < V < 1.08	1.04 < V < 1.08	1.04 < V < 1.08	1.04 < V < 1.08	1.04 < V < 1.08
24801 DEVERS 500 kV	Base Case	Base Case	Base Case	1.04 < V < 1.08	1.04 < V < 1.08	1.04 < V < 1.08	1.04 < V < 1.08	1.04 < V < 1.08	1.04 < V < 1.08	1.04 < V < 1.08	1.04	1.04 < V < 1.08
29253 DVRS_RB_12 500 kV	Base Case	Base Case	Base Case	1.04 < V < 1.08	1.04 < V < 1.08	1.04	1.04 < V < 1.08	1.04 < V < 1.08	1.04 < V < 1.08	1.04 < V < 1.08	1.04 < V < 1.08	1.04 < V < 1.08
29255 DVRS_RB_22 500 kV	Base Case	Base Case	Base Case	1.04 < V < 1.08	1.04 < V < 1.08	1.04	1.04 < V < 1.08	1.04 < V < 1.08	1.04 < V < 1.08	1.04 < V < 1.08	1.04 < V < 1.08	1.04 < V < 1.08

Proposed mitigation: Further evaluation needed

Voltage Deviation Violations

Contingency (All and Worst P6)	Category	Category Description	Post Cont. Voltage Deviation % (Baseline Scenarios)						Post Cont. Voltage Deviation % (Sensitivity		
			B1_2028-SmrPk	B2_2031-SmrPk	B3_2036-SmrPk	B5_2036-SmrOP	B7_2028-SprOP	B8_2031-SprOP	S1_2031-SP	S2_2028-SP	S3_2028-SprOP
P1_27_P1.2 Loss of J.Hinds-Mirage No.1 230 kV line	P1	N-1	< 8	< 8	< 8	< 8	10.28	< 8	< 8	< 8	< 8
P1_27_P1.2 Loss of J.Hinds-Mirage No.1 230 kV line	P1	N-1	< 8	< 8	< 8	< 8	9.70	< 8	< 8	< 8	< 8
P1_27_P1.2 Loss of J.Hinds-Mirage No.1 230 kV line	P1	N-1	< 8	< 8	< 8	< 8	8.88	< 8	< 8	< 8	< 8
P1_27_P1.2 Loss of J.Hinds-Mirage No.1 230 kV line	P1	N-1	< 8	< 8	< 8	< 8	10.28	< 8	< 8	< 8	< 8
P1_27_P1.2 Loss of J.Hinds-Mirage No.1 230 kV line	P1	N-1	< 8	< 8	< 8	< 8	10.28	< 8	< 8	< 8	< 8
P1_27_P1.2 Loss of J.Hinds-Mirage No.1 230 kV line	P1	N-1	< 8	< 8	< 8	< 8	8.90	< 8	< 8	< 8	< 8
P1_27_P1.2 Loss of J.Hinds-Mirage No.1 230 kV line	P1	N-1	< 8	< 8	< 8	< 8	8.90	< 8	< 8	< 8	< 8
P1_27_P1.2 Loss of J.Hinds-Mirage No.1 230 kV line	P1	N-1	< 8	< 8	< 8	< 8	8.90	< 8	< 8	< 8	< 8
P3_54_P3.2 Loss of Sentinel Block and J.Hinds-Mirage No.1 230 kV line	P3	G-1 / N-1	< 8	< 8	< 8	< 8	8.87	< 8	< 8	< 8	< 8

Proposed mitigation: Blythe Energy RAS (Gen Drop)

Transient Stability Results

Contingency	Category	Category Description	Transient Stability Performance						Potential Mitigation Solutions
			Baseline Scenarios				Sensitivity Scenarios		
			B2_2031-SmrPk	B3_2036-SmrPk	B5_2036-SmrOP	B7_2028-SprOP	S1_2031-SP	S3_2028-SprOP	
3ph fault@Jhind, loss J.Hinds-Mirage 230kV	P1	N-1	No Issues	No Issues	No Issues	Diverge	No Issues	No Issues	Blythe Energy RAS
3ph fault@Jhind, loss JHINDMWD-EAGLEMTN 230kV	P1	N-1	No Issues	No Issues	No Issues	Diverge	No Issues	No Issues	Blythe Energy RAS
SLG near Mirage, Loss Julian Hinds-Mirage 230 kV line	P5	Non-Redundant Relay	No Issues	No Issues	No Issues	Diverge	No Issues	No Issues	Blythe Energy RAS
SLG@DV500Bus, Devers DC sytem fail, persistent fault	P5	Non-Redundant DC Supply	WECC Criteria Not Met	WECC Criteria Not Met	WECC Criteria Not Met	WECC Criteria Not Met	WECC Criteria Not Met	WECC Criteria Not Met	Add redundant DC Supply
SLG@ElCascoBus, ElCasco DC sytem fail, persistent fault	P5	Non-Redundant DC Supply	WECC Criteria Not Met	WECC Criteria Not Met	WECC Criteria Not Met	WECC Criteria Not Met	WECC Criteria Not Met	WECC Criteria Not Met	Add redundant DC Supply
SLG@Etiwanda230Bus, Etiwanda DC sytem fail, persistent fault	P5	Non-Redundant DC Supply	WECC Criteria Not Met	WECC Criteria Not Met	WECC Criteria Not Met	WECC Criteria Not Met	WECC Criteria Not Met	WECC Criteria Not Met	Add redundant DC Supply
SLG@JHinds230Bus, JHinds DC sytem fail, persistent fault	P5	Non-Redundant DC Supply	WECC Criteria Not Met	WECC Criteria Not Met	WECC Criteria Not Met	WECC Criteria Not Met	WECC Criteria Not Met	WECC Criteria Not Met	Add redundant DC Supply
SLG@SanBernardinoBus, SanBernardino DC sytem fail, persistent fault	P5	Non-Redundant DC Supply	WECC Criteria Not Met	WECC Criteria Not Met	WECC Criteria Not Met	WECC Criteria Not Met	WECC Criteria Not Met	WECC Criteria Not Met	Add redundant DC Supply
SLG@Valley500Bus, Valley DC sytem fail, persistent fault	P5	Non-Redundant DC Supply	WECC Criteria Not Met	WECC Criteria Not Met	WECC Criteria Not Met	WECC Criteria Not Met	WECC Criteria Not Met	WECC Criteria Not Met	Add redundant DC Supply
SLG@VistaBus, Vista DC sytem fail, persistent fault	P5	Non-Redundant DC Supply	WECC Criteria Not Met	WECC Criteria Not Met	WECC Criteria Not Met	WECC Criteria Not Met	WECC Criteria Not Met	WECC Criteria Not Met	Add redundant DC Supply
3ph@Devers, Loss DEVERS-REDBLUFF 500.0 #1 & #2	P6	N-1-1	No Issues	Diverge	No Issues	No Issues	No Issues	No Issues	System adjustments after the first contingency
EagleMTN-IronMTN line outage followed by 3ph@J.Hinds, lose J.Hinds-Mirage 230 kV line	P6	N-1-1	Diverge	Diverge	Diverge	Diverge	Diverge	No Issues	OP 7720 / Blythe Energy RAS
EagleMTN-IronMTN line outage followed by 3ph@J.Hinds, lose J.Hinds-Mirage 230 kV line, ISO7720	P6	N-1-1	Diverge	No Issues	Diverge	No Issues	Diverge	No Issues	OP 7720 / Blythe Energy RAS
1ph@ Devers, Loss of Devers-Mirage 230-kV #1 & #2	P7	DCTL	No Issues	Diverge	No Issues	No Issues	No Issues	No Issues	Path 42 RAS & Blythe Energy RAS
3ph@CV, Loss CVSUB230-RAMON & CVSUB230-MIRAGE 230.0 Lines	P7	DCTL	Oscillations	No Issues	No Issues	No Issues	No Issues	No Issues	Path 42 RAS
3ph@CV, Loss CVSUB230-RAMON & CVSUB230-MIRAGE 230.0 Lines, Path42 and Blythe RAS	P7	DCTL	Oscillations	No Issues	No Issues	No Issues	No Issues	No Issues	Path 42 RAS

Summary of Potential New Upgrades

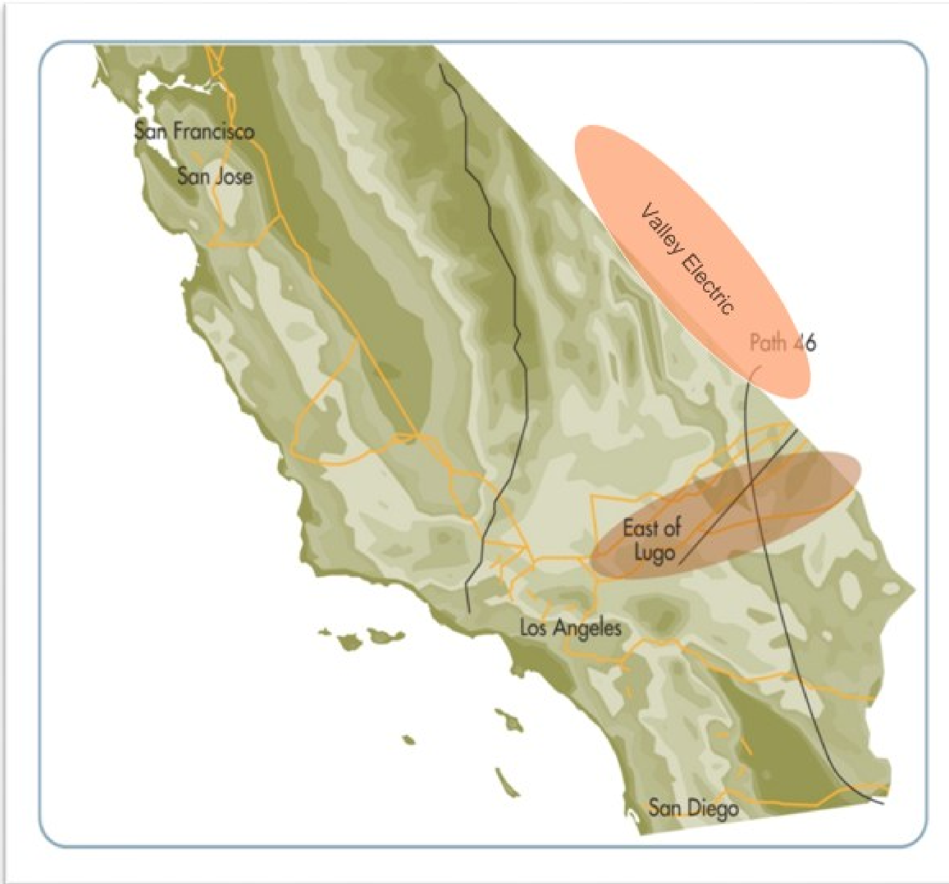
Concern	Potential Upgrade
Multiple non-redundant DC supply failure contingencies cause WECC stability criteria violations. DC supply failures were at the following buses: • Julian Hinds 230kV bus • Etiwanda 230kV bus • Eagle Mtn. 230 kV bus • Vista 230kV bus • San Bernardino 230kV bus • El Casco 230kV bus • Devers 500kV bus • Valley 500kV bus	Add Redundant DC supply

Valley Electric Association
Preliminary Reliability Assessment Results

Rick Torres
Sr. Regional Transmission Engineer

2026-27 Transmission Planning Process Stakeholder Meeting
September 23-24, 2026

Valley Electric Association (VEA) Area



- VEA system is comprised of 138 kV and 230 kV transmission facilities under ISO control
- Gridliance West (GLW) is the Transmission Owner for the 230 kV facilities in the VEA area
- Connects to SCE's Eldorado 230kV substation, WAPA's Mead 230kV substation, WAPA's Amargosa 138kV substation, NV Energy's Northwest 230kV substation and shares buses at Jackass 138kV and Mercury 138kV stations
- 514 MW of existing generation.
- Forecasted 1-in-10 summer peak loads for 2028, 2031, 2036, and 2041 are 255 MW, 757 MW, 1256 MW, and 1276 MW respectively.

VEA Area Study Scenarios

- Base scenarios

No.	Case	Description
B1	2028 Summer Peak	Summer peak load time (7/26 HE 16 PST)
B2	2031 Summer Peak	Summer peak load time (7/22 HE 16 PST)
B3	2036 Summer Peak	Summer peak load time (7/23 HE 16 PST)
B4	2041 Summer Peak	Summer peak load time (7/24 HE 16 PST)
B5	2036 Summer Off-Peak	Summer shoulder load time (9/3 HE 11 PST)
B6	2041 Winter Peak	Winter peak load time (2/1 HE 10 PST)
B7	2028 Spring Off-Peak	Spring shoulder load time (4/29 HE 19 PST)
B8	2031 Spring Off-Peak	Spring shoulder load time (4/20 HE 13 PST)

- Sensitivity scenarios

No	Case	Change From Base Assumption
S1	2031 SP with forecasted load addition	2031 Summer Peak with load increased to reflect future load service requests
S3	2028 SPrOP BESS charging	2028 spring off-peak condition with battery storage in charging mode

Load and Load Modifier Assumptions – VEA Area

StudyCase		Gross Load (MW)	AAEE (MW)	AAFS (MW)	ATE (MW)	DS (MW)	BTM-PV (MW)		Net Load (MW)	Demand Response		Known Loads
							Installed	Output		Fast	Slow	
Base	B1	255	0	0	0	0	0	0	255	0	0	0
	B2	757	0	0	0	0	0	0	757	0	0	0
	B3	1256	0	0	0	0	0	0	1256	0	0	0
	B4	1276	0	0	0	0	0	0	1276	0	0	0
	B5	1165	0	0	0	0	0	0	1165	0	0	0
	B6	1218	0	0	0	0	0	0	1218	0	0	0
	B7	157	0	0	0	0	0	0	157	0	0	0
	B8	566	0	0	0	0	0	0	566	0	0	0
Sensitivity	S1	789	0	0	0	0	0	0	789	0	0	0
	S3	157	0	0	0	0	0	0	157	0	0	0

Generation Assumptions – VEA Area

Study Case		Energy Storage		Solar		Wind		Hydro		Thermal	
		Installed (MW)	Dispatched (MW)	Installed (MW)	Dispatched (MW)	Installed (MW)	Dispatched (MW)	Installed (MW)	Dispatched (MW)	Installed (MW)	Dispatched (MW)
Base	B1	639	0	1032	443	0	0	0	0	0	0
	B2	694	32	1137	489	0	0	0	0	0	0
	B3	1096	0	4483	1927	171	120	0	0	0	0
	B4	1096	-400	4483	1927	171	120	0	0	0	0
	B5	1096	-991	4483	4303	171	15	0	0	0	0
	B6	1096	0	4483	1300	171	41	0	0	0	0
	B7	639	0	1032	0	0	0	0	0	0	0
	B8	694	0	1137	1114	0	0	0	0	0	0
Sensitivity	S1	694	0	1137	0	0	0	0	0	0	0
	S3	639	-629	1032	0	0	0	0	0	0	0

Previously approved transmission projects modeled in base cases

Project Name	In-service Year	First Year Modeled
Beatty 230kV Project	2028	2028
GLW/VEA area upgrades - revised scope	2028	2028

Reliability Assessment Preliminary Results Summary

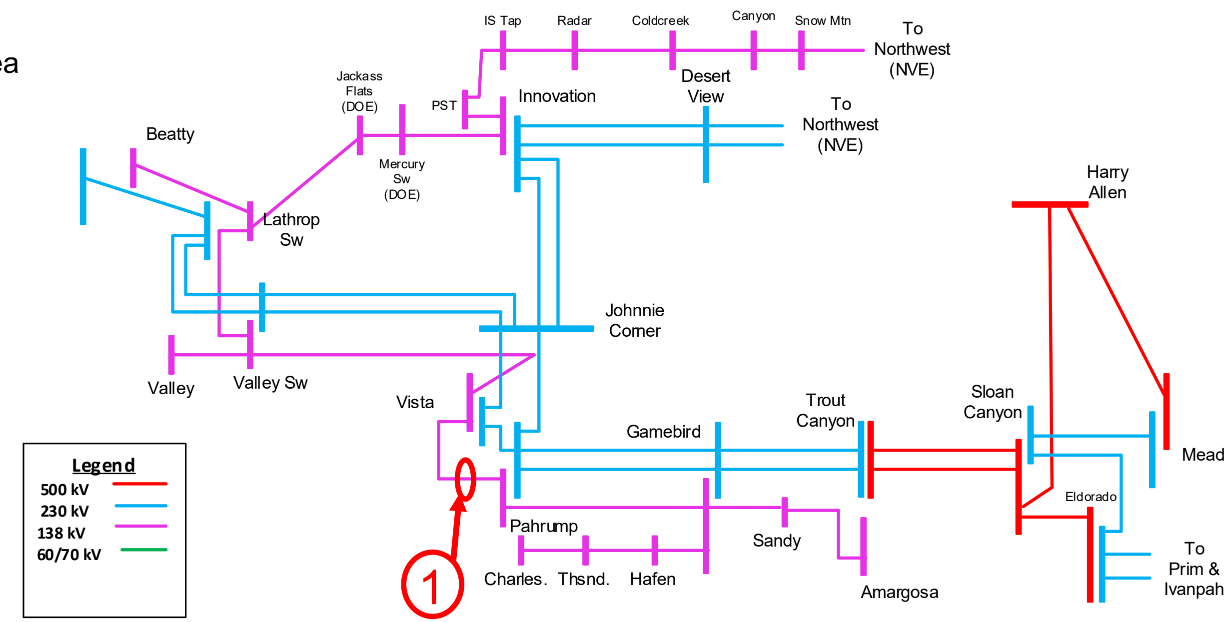
1 Pahrump – Vista 138 kV line

Observations:

- Pahrump – Vista 138 kV line becomes overloaded under:
  - Category P1 – Loss of Thousandaire-Hafen 138 kV line (2041SP, 2041WP, 2031SP Sens.)
  - Category P1 – Loss of Gamebird-Hafen 138 kV line (2031SP, 2036SP, 2041SP, 2041WP, 2031SP Sens.)
  - Category P3 – Loss of Gamebird-Hafen 138 kV line followed by the loss of Sunshine Valley generation (2031SP, 2036SP, 2041SP, 2036SmrOP, 2041WP)
  - Several Category P4 outages which include loss of Gamebird-Hafen 138 kV line or Gamebird 230/138 kV transformer bank (2031SP, 2036SP, 2041SP, 2041WP, 2031SP Sens.)
  - Category P6 – Loss of Vista-Johnnie 138 kV line followed by the loss of Gamebird-Hafen 138 kV line (2031SP, 2036SP, 2041SP, 2036SmrOP, 2041WP)

Potential mitigation:

Reinforcements into Charleston Park Area



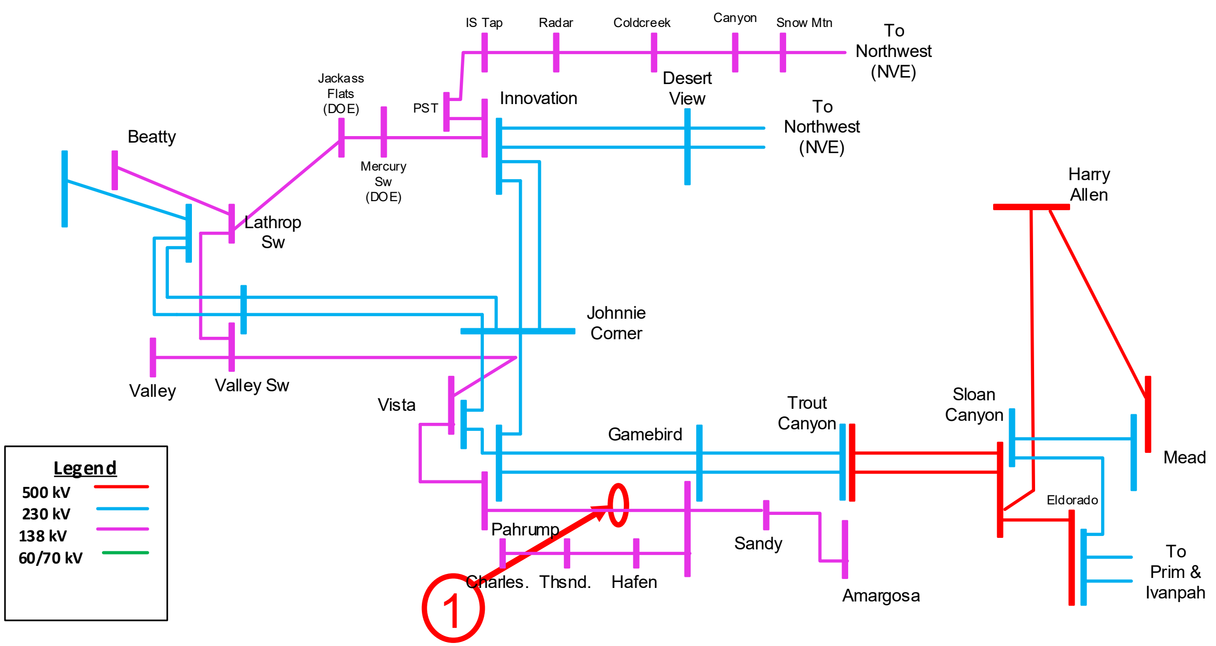
1 Gamebird – Pahrump 138 kV Line

Observations:

- Gamebird – Pahrump 138 kV line becomes overloaded under:
  - Category P1 – Loss of Gamebird 230/138 kV transformer bank (2041SP)
  - Several Category P4 outages which include either loss of Pahrump 230/138 kV transformer bank or Gamebird 230/138 kV transformer bank (2036SP, 2041SP, 2041WP)
  - Category P6 – Loss of Vista-Leslie 138 kV line followed by the loss of Gamebird 230/138 kV transformer bank (2036SP, 2041SP, 2041WP)
  - Category P7 – Loss of Gamebird-Wheeler Pass 230 kV lines 1 and 2 (2036SmrOP)

Potential mitigation:

Reinforcements into Charleston Park Area



1 Gamebird – Hafen 138 kV Line

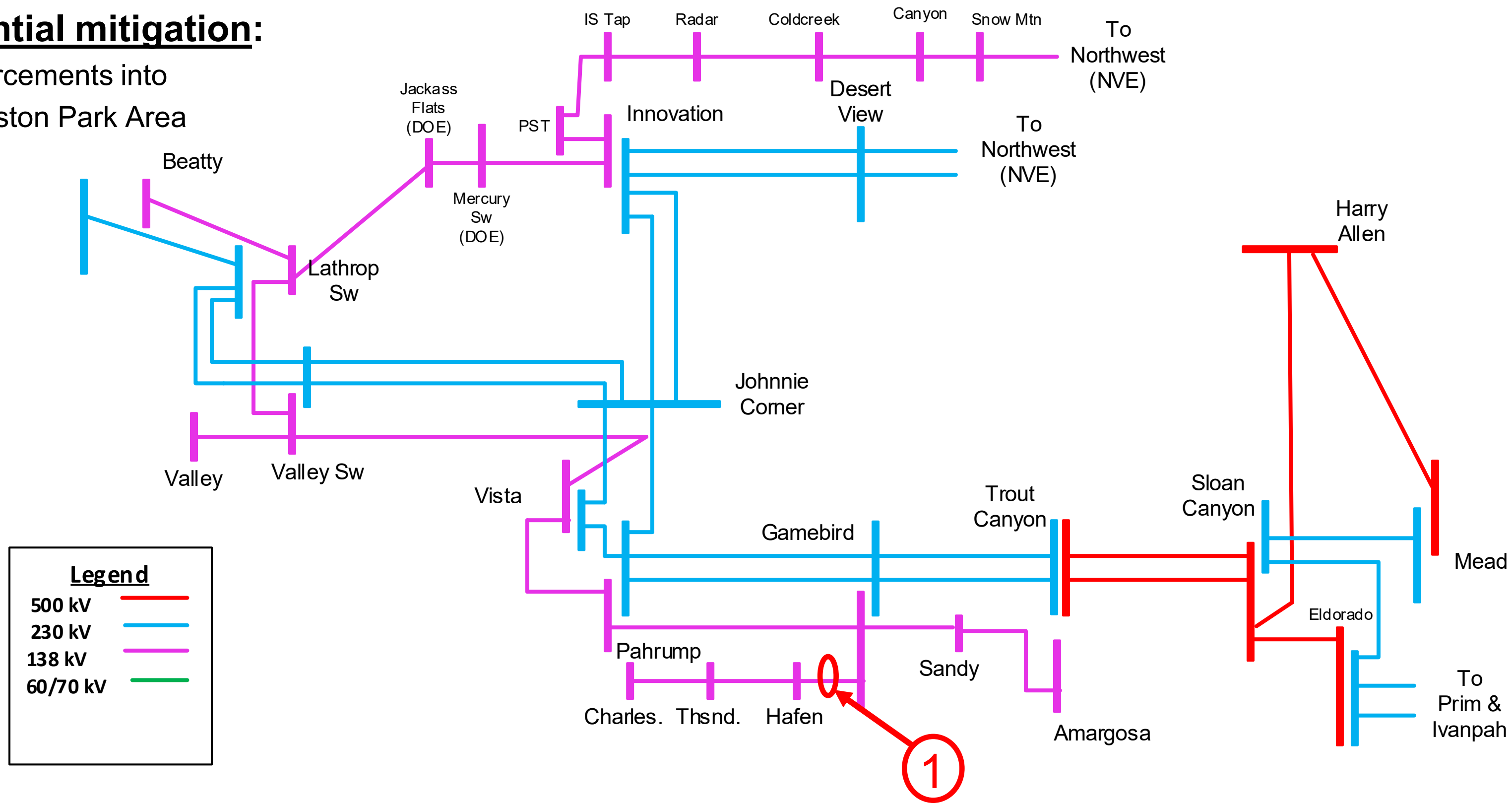
Observations:

- Gamebird – Hafen 138 kV line becomes overloaded under:
  - Category P6 – Loss of Pahrump-Vista 138 kV line followed by the loss of Innovation-Mercury 138 kV line (2041SP, 2041WP, 2031SP Sens.)
  - Category P6 – Loss of Pahrump-Vista 138 kV line followed by the loss of Vista-Johnnie 138 kV line (2041SP, 2041WP)

Potential mitigation:

Reinforcements into

Charleston Park Area



① Amargosa – Sandy 138 kV Line

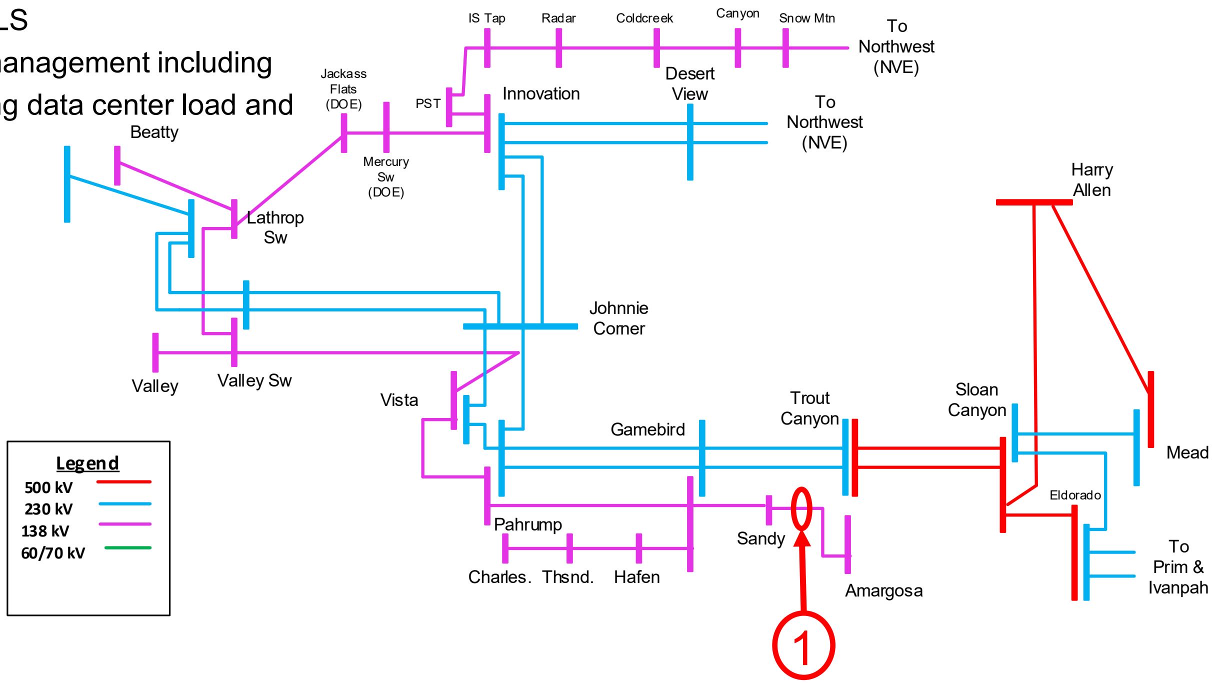
Observations:

- Amorgosa – Sandy becomes overloaded under:
  - Category P4 – Loss of Pahrump 230/138 kV transformer bank and Pahrump-Gamebird 138 kV line (2028 SP)
  - Category P6 – Loss of Pahrump-Gamebird 138 kV line followed by the loss of Gamebird 230/138 kV transformer bank (2028 SP)
  - Category P7 – Loss of Gamebird-Trout Canyon 230 kV lines 1 and 2 (2036SmrOP-Diverge, 2031SP Sens.)
  - Category P7 – Loss of Trout Canyon-Sloan Canyon 500 kV lines 1 and 2 (2031SP Sens.)

Potential mitigation:

P4 & P6 – VEA UVLS

P7 – Congestion management including reducing or shedding data center load and Existing RAS



California ISO

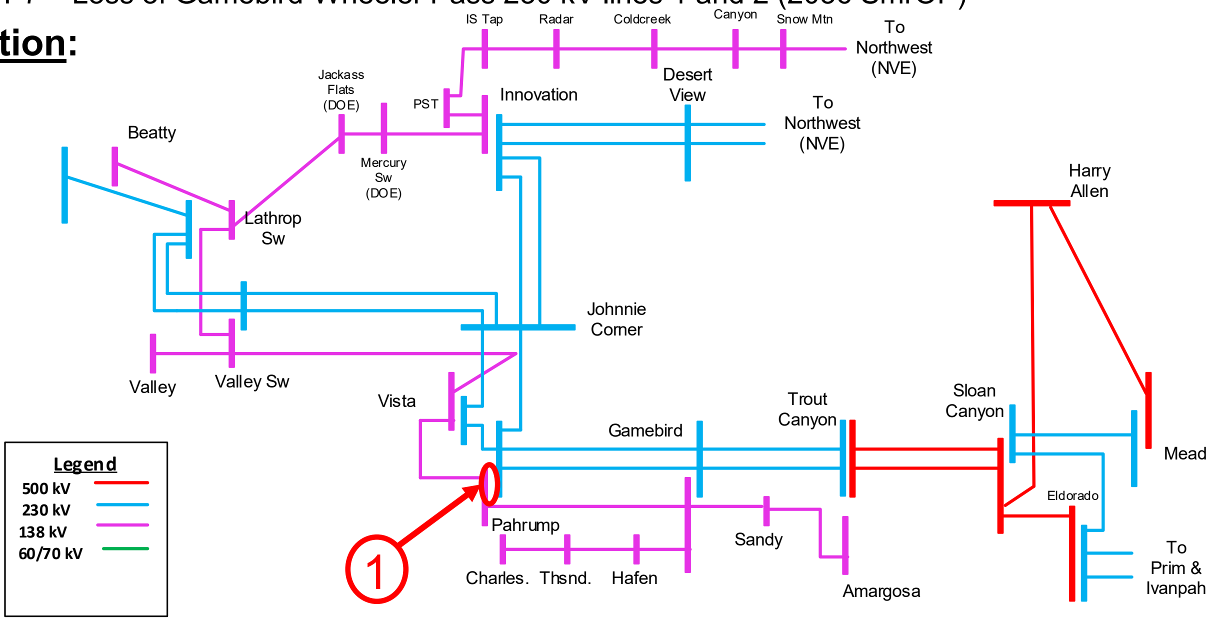
1 Pahrump 230/138 kV Transformer Banks 1 or 2

Observations:

- Pahrump 230/138 kV transformer banks 1 or 2 become overloaded under:
  - Category P1 – Loss of Gamebird 230/138 kV transformer bank (2031SP, 2036SP, 2041SP, 2041WP, 2031SP Sens.)
  - Category P3 – Loss of Gamebird 230/138 kV transformer bank followed by the loss of Sunshine Valley generation (2031SP, 2036SP, 2041SP, 2036SmrOP, 2041WP)
  - Several Category P4 outages which include either loss of Pahrump 230/138 kV transformer bank 1 or 2, Gamebird 230/138 kV transformer bank, or Gamebird-Hafen 138 kV line (2031SP, 2036SP, 2041SP, 2041WP, 2031SP Sens.)
  - Category P6 – Loss of Pahrump 230/138 kV transformer bank 1 or 2 followed by the loss of Gamebird 230/138 kV transformer bank (2028SP, 2031SP, 2036SP, 2041SP, 2036SmrOP, 2041WP, 2031SP Sens.)
  - Category P7 – Loss of Gamebird-Wheeler Pass 230 kV lines 1 and 2 (2036 SmrOP)

Potential mitigation:

Reinforcements into Charleston Park Area



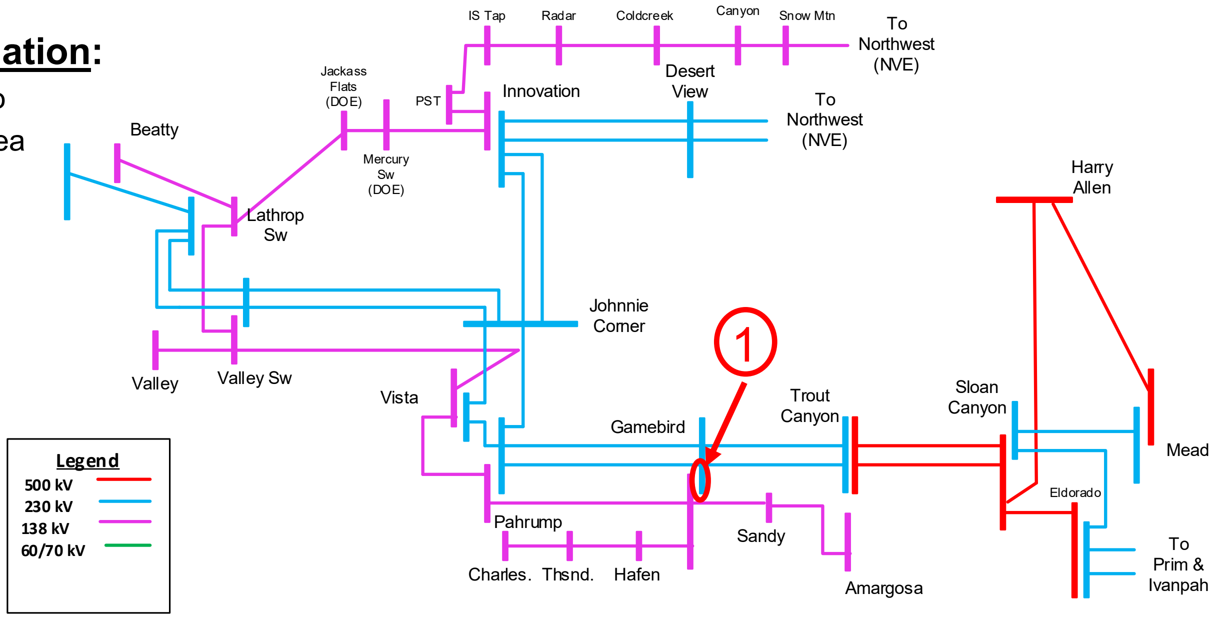
① Gamebird 230/138 kV Transformer

Observations:

- Gamebird 230/138 kV transformer bank becomes overloaded under:
  - Category P1 – Loss of Pahrump 230/138 kV transformer bank (2036SP, 2041SP, 2041WP, 2031SP Sens.)
  - Category P3 – Loss of Pahrump 230/138 kV transformer bank followed by the loss of Sunshine Valley generation (2031SP, 2036SP, 2041SP, 2041WP)
  - Several Category P4 outages which include either loss of Pahrump 230/138 kV transformer bank or Pahrump-Gamebird 138 kV line (2036SP, 2041SP, 2041WP, 2031SP Sens.)
  - Category P6 – Loss of Pahrump 230/138 kV transformer bank 1 and 2 (2028SP, 2031SP, 2036SP, 2041SP, 2036SmrOP, 2041WP, 2031SP Sens.)
  - Category P7 – Loss of Gamebird-Wheeler Pass 230 kV lines 1 and 2 (2028SP, 2031SP, 2031SP Sens.)

Potential mitigation:

Reinforcements into Charleston Park Area



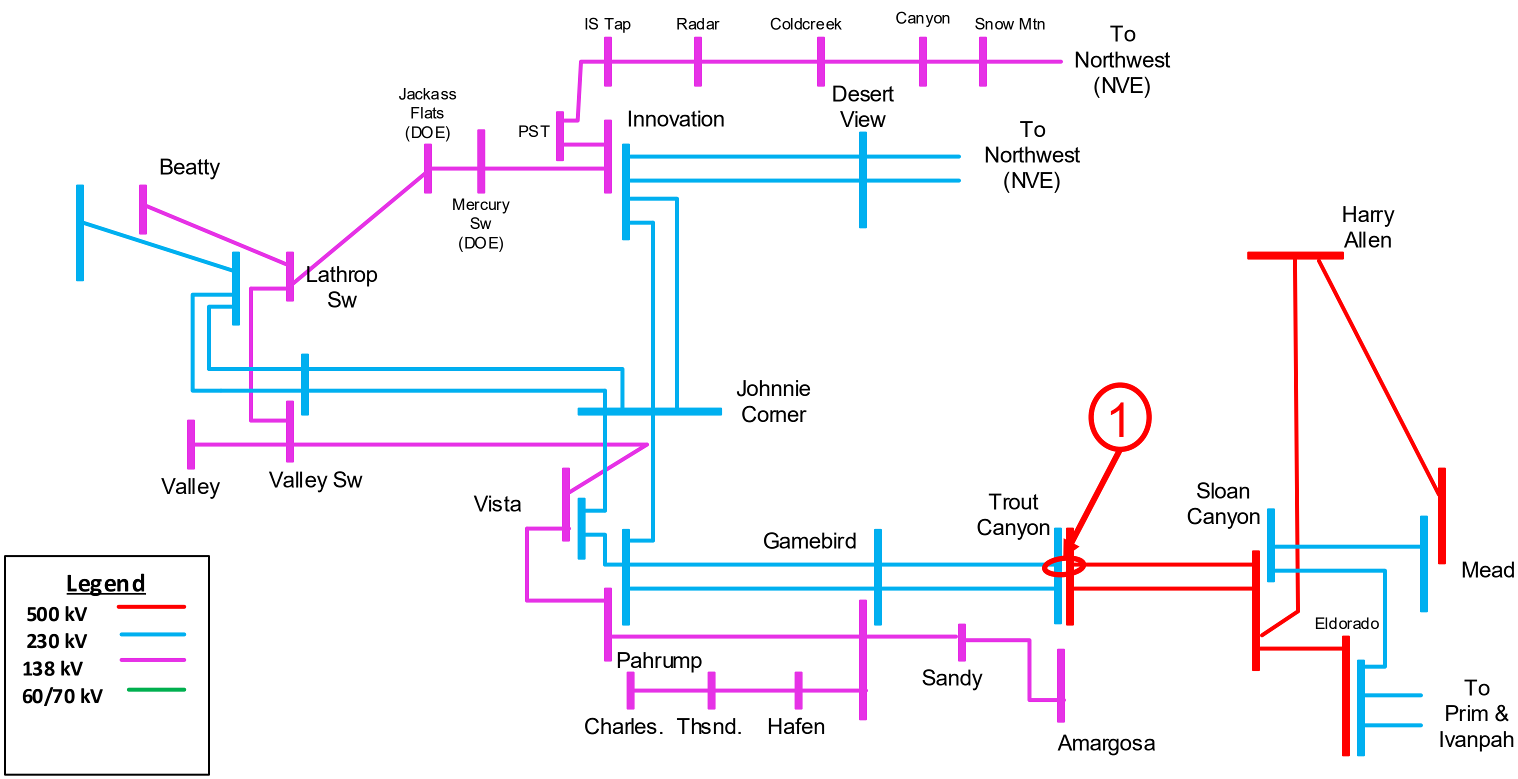
① Trout Canyon 500/230 kV Transformer Banks 1, 2, or 3

Observations:

- Trout Canyon 500/230 kV Transformer Banks become overloaded under:
  - Category P6 – Loss of any two Trout Canyon 500/230 kV transformer banks (2036SmrOP)

Potential mitigation:

System adjustments after the first contingency



Additional Observations

1 **Observations**:

- Category P6 – Loss of Pahrump – Vista 138 kV line followed by the loss of Gamebird – Hafen 138 kV line causes an overload on the following lines:
  - Lathrop – Jackass Flats 138 kV line (2041SP, 2031SP Sens.)
  - Valley – Lathrop 138 kV line (2031 SP Sens.)
  - Valley – Johnnie 138 kV line (2031SP, 2036SP, 2041SP, 2036SmrOP, 2041WP)
  - Innovation – Mercury 138 kV line (2031SP, 2036SP, 2041SP, 2041WP, 2031SP Sens.)
  - Jackass Flats – Mercury 138 kV line (2031SP, 2036SP, 2041SP, 2041WP, 2031SP Sens.)
  - Innovation 230/138 kV Transformer Bank (2031SP, 2036SP, 2041SP, 2041WP, 2031SP Sens.)

Potential mitigation: Reinforcements into Charleston Park Area

2 **Observations**:

- Category P6 – Loss of Pahrump-Vista 138 kV line followed by the loss of the Innovation 230/138 kV transformer bank caused overloads on several 138 kV lines (2028SprOP, 2028SprOP Sens.-Diverged)

Potential mitigation: VEA UVLS

Undervoltage issues

1 **Observations:**

- Low voltage was observed at many 138 kV buses in most cases under contingencies that included either of the following:
  - Loss of Gamebird – Hafen 138 kV line
  - Loss of Thousandaire – Hafen 138 kV line
  - Loss of Pahrump-Vista 138 kV line
  - Gamebird 230/138kV transformer bank
  - Innovation 230/138kV transformer bank
  - Pahrump 230/138kV transformer bank

Potential mitigation: VEA UVLS, system adjustments after the first contingency, or Reinforcements into Charleston Park Area

2 **Observations:**

- Low voltage was observed at many 138 kV and 230 kV buses in 2031SP and 2031SP Sens. under the category P7 loss of Gamebird-Trout Canyon 230 kV lines 1 and 2.

Potential mitigation: Congestion management including reducing or shedding data center load and Gamebird RAS

3 **Observations:**

- Low voltage was observed at many 138 kV and 230 kV buses in 2031SP Sens. under the category P7 loss of Trout Canyon – Sloan Canyon 500 kV lines 1 and 2.

Potential mitigation: Congestion management including reducing or shedding data center load and Trout Canyon RAS

Overvoltage issues

1 **Observations:**

- High voltage was observed at TRCN_LUGO 500 kV bus in the 2036SP, 2041SP, 2036SmrOP, and 2041WP scenarios under contingencies that included the following:
  - N-0 conditions
  - Sloan Canyon – El Dorado 500 kV line
  - Sloan Canyon – Trout Canyon 500 kV line
  - Innovation – Johnnie 230 kV line
  - Innovation – Desert View 1 and 2
  - NWEST – Desert View 1 and 2

Potential mitigation: Close in Trout Canyon – Lugo Line Shunt Reactor pre-contingency

2 **Observations:**

- High voltage was observed at several 230 kV buses in the 2028SprOP scenario under the category P7 loss of NWEST-Desert View 230 kV lines 1 and 2.

Potential mitigation: Adjust pre-contingency voltage to mitigate existing high voltage conditions

3 **Observations:**

- High voltage was observed at several 230 kV buses in the 2028SprOP and 2028SprOP Sens. scenarios under the category P6 loss of El Dorado-Sloan Canyon 230 kV line followed by the loss of El Dorado 5AA Bank

Potential mitigation: Ivanpah Area RAS

Voltage Deviation

Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Post Cont. Voltage Deviation % (Baseline Scenarios)								Post Cont. Voltage Deviation %		Project & Potential Mitigation Solutions
				B1_2028-SmrPk	B2_2031-SmrPk	B3_2036-SmrPk	B4_2041-SmrPk	B5_2036-SmrOP	B6_2041-WtrPk	B7_2028-SprOP	B8_2031-SprOP	S1_2031-SP	S3_2028-SprOP	
189024 CHARLSTN 138 kV	P1_16b_DU_Line THSNDAIR 138.0 to HAFEN 138.0 Circuit 1	P1	N-1	< 8	12.53	12.40	11.83	< 8	12.72	< 8	< 8	15.46	< 8	Reinforcements into Charleston Park Area
189070 LESLIE 138 kV	P1_16a_DU_Line GAMEBIRD 138.0 to HAFEN 138.0 Circuit 1	P1	N-1	< 8	12.61	15.41	15.88	10.65	16.38	< 8	< 8	15.60	< 8	
189024 CHARLSTN 138 kV	P1_16a_DU_Line GAMEBIRD 138.0 to HAFEN 138.0 Circuit 1	P1	N-1	< 8	15.68	19.42	19.88	13.21	20.34	< 8	< 8	19.15	< 8	
189022 THSNDAIR 138 kV	P1_16b_DU_Line THSNDAIR 138.0 to HAFEN 138.0 Circuit 1	P1	N-1	< 8	16.75	16.83	15.94	< 8	16.89	< 8	< 8	20.47	< 8	
189022 THSNDAIR 138 kV	P1_16a_DU_Line GAMEBIRD 138.0 to HAFEN 138.0 Circuit 1	P1	N-1	< 8	20.84	26.20	26.52	17.57	26.89	< 8	< 8	25.15	< 8	
189050 HAFEN 138 kV	P1_16a_DU_Line GAMEBIRD 138.0 to HAFEN 138.0 Circuit 1	P1	N-1	< 8	21.48	27.09	27.49	18.12	27.79	< 8	< 8	25.93	< 8	
189013 VISTA 138 kV	P1_16a_DU_Line GAMEBIRD 138.0 to HAFEN 138.0 Circuit 1	P1	N-1	< 8	< 8	12.01	12.48	< 8	12.99	< 8	< 8	12.59	< 8	
189013 VISTA 138 kV	P1_16b_DU_Line THSNDAIR 138.0 to HAFEN 138.0 Circuit 1	P1	N-1	< 8	< 8	< 8	< 8	< 8	< 8	< 8	< 8	10.10	< 8	
189018 JOHNNIE 138 kV	P1_16a_DU_Line GAMEBIRD 138.0 to HAFEN 138.0 Circuit 1	P1	N-1	< 8	< 8	10.20	10.63	< 8	11.17	< 8	< 8	11.29	< 8	
189018 JOHNNIE 138 kV	P1_16b_DU_Line THSNDAIR 138.0 to HAFEN 138.0 Circuit 1	P1	N-1	< 8	< 8	< 8	< 8	< 8	< 8	< 8	< 8	< 8	< 8	
189070 LESLIE 138 kV	P1_16b_DU_Line THSNDAIR 138.0 to HAFEN 138.0 Circuit 1	P1	N-1	< 8	< 8	9.84	9.43	< 8	10.28	< 8	< 8	12.54	< 8	
189018 JOHNNIE 138 kV	P1_16a_DU_GAME_HAFE_138_Ckt1+P1_70_Gen_Sunshine_Val_34.5_Un_	P3	N-1 / G-1	< 8	11.94	< 8	< 8	11.36	< 8	< 8	< 8	< 8	< 8	
189010 VALLEYVE 138 kV	P1_16a_DU_GAME_HAFE_138_Ckt1+P1_70_Gen_Sunshine_Val_34.5_Un_	P3	N-1 / G-1	< 8	< 8	< 8	11.52	< 8	11.66	< 8	< 8	< 8	< 8	
189011 VALLEYTP 138 kV	P1_16a_DU_GAME_HAFE_138_Ckt1+P1_70_Gen_Sunshine_Val_34.5_Un_	P3	N-1 / G-1	< 8	< 8	< 8	10.92	< 8	11.12	< 8	< 8	< 8	< 8	
189013 VISTA 138 kV	P1_16a_DU_GAME_HAFE_138_Ckt1+P1_70_Gen_Sunshine_Val_34.5_Un_	P3	N-1 / G-1	< 8	< 8	< 8	< 8	12.41	< 8	< 8	< 8	< 8	< 8	
189013 VISTA 138 kV	P1_16b_DU_THSN_HAFE_138_Ckt1+P1_70_Gen_Sunshine_Val_34.5_Un_	P3	N-1 / G-1	< 8	< 8	10.10	10.00	< 8	< 8	< 8	< 8	< 8	< 8	
189018 JOHNNIE 138 kV	P1_16b_DU_THSN_HAFE_138_Ckt1+P1_70_Gen_Sunshine_Val_34.5_Un_	P3	N-1 / G-1	< 8	< 8	< 8	9.34	< 8	9.74	< 8	< 8	< 8	< 8	
189022 THSNDAIR 138 kV	P1_16b_DU_THSN_HAFE_138_Ckt1+P1_70_Gen_Sunshine_Val_34.5_Un_	P3	N-1 / G-1	< 8	< 8	< 8	< 8	14.11	< 8	< 8	< 8	< 8	< 8	
189024 CHARLSTN 138 kV	P1_16b_DU_THSN_HAFE_138_Ckt1+P1_70_Gen_Sunshine_Val_34.5_Un_	P3	N-1 / G-1	< 8	< 8	< 8	< 8	11.32	< 8	< 8	< 8	< 8	< 8	
189050 HAFEN 138 kV	P1_16a_DU_GAME_HAFE_138_Ckt1+P1_70_Gen_Sunshine_Val_34.5_Un_	P3	N-1 / G-1	< 8	< 8	< 8	< 8	22.49	< 8	< 8	< 8	< 8	< 8	
189068 T2 138 kV	P1_16a_DU_GAME_HAFE_138_Ckt1+P1_70_Gen_Sunshine_Val_34.5_Un_	P3	N-1 / G-1	< 8	< 8	< 8	11.58	< 8	11.71	< 8	< 8	< 8	< 8	
189070 LESLIE 138 kV	P1_16a_DU_GAME_HAFE_138_Ckt1+P1_84_Gen_BEATTY_PV_34.5_Unit_	P3	N-1 / G-1	< 8	< 8	< 8	< 8	10.47	< 8	< 8	< 8	< 8	< 8	
189070 LESLIE 138 kV	P1_16b_DU_THSN_HAFE_138_Ckt1+P1_75_Gen_Q1800_PVG_1_0.6_Unit_	P3	N-1 / G-1	< 8	< 8	9.76	< 8	< 8	< 8	< 8	< 8	< 8	< 8	
189070 LESLIE 138 kV	P1_16b_DU_THSN_HAFE_138_Ckt1+P1_77_Gen_Q1800_PVG_2_0.6_Unit_	P3	N-1 / G-1	< 8	< 8	9.76	< 8	< 8	< 8	< 8	< 8	< 8	< 8	

Transient Stability Analysis

- Performed for 2031SP, 2036SP, 2036SmrOP, 2028SprOP, 2031SP Sens., and 2028SprOP Sens.
- 123-129 contingencies evaluated depending on the study year (P1, P4, P5, P6 and P7)
- Several divergence issues are still under review with the PTO including category P1, P6 and P7 contingencies

Summary of Potential New Upgrades

- Some thermal and voltage issues identified in this reliability assessment could be mitigated by the existing UVLS scheme, existing RAS, and system adjustments after the first contingency.
- For the remaining issues, congestion management (including reducing or shedding data center load) along with transmission reinforcements into the Charleston Park Area may be a potential solution, pending further evaluation.

San Diego Gas & Electric Area
Preliminary Reliability Assessment Results

Rene Romo de Santos
Regional Transmission Engineer Lead

2026-2027 Transmission Planning Process Stakeholder Meeting
September 23-24, 2026

SDG&E Transmission System

- The San Diego Gas and Electric (SDG&E) system is comprised of a 500/230 kV main and a 138/69 kV sub-transmission systems.
- The 500 kV system consists of Southwest Powerlink (SWPL) and Sunrise Powerlink (SRPL).
- The 230 kV transmission lines form an outer loop located along the Pacific coast and around downtown San Diego with an underlying 138 kV and 69 kV sub-transmission system. Rural customers in the eastern part of San Diego County are served by a sparse 69 kV system.
- Provides energy service to 3.7 million consumers in San Diego and Southern Orange counties.

Study Scenarios, Load and Generation Assumptions, and Approved Projects Modeled Summary

SDG&E Area Study Scenarios

- Base scenarios

No.	Case	Description
B1	2028 Summer Peak	Summer peak load time (9/6 HE 18)
B2	2031 Summer Peak	Summer peak load time (9/3 HE 18)
B3	2036 Summer Peak	Summer peak load time (9/3 HE 18)
B4	2041 Summer Peak	Summer peak load time (9/4 HE 24)
B5	2036 Summer Off-Peak	Summer off-peak time (9/3 HE 11)
B6	2041 Winter Peak	Winter peak load time (2/6 HE 1)
B7	2028 Spring Off-Peak	Spring off-peak time (4/27 HE 19)
B8	2031 Spring Off-Peak	Spring off-peak time (4/20 HE 13)

- Sensitivity scenarios

No.	Case	Change From Base Assumption
S1	2028 Summer Peak	Heavy renewable output and minimum gas generation commitment
S2	2028 Spring Off-Peak	Storage charging in load pockets
S3	2031 Summer Peak	1-in-20 load forecast

Load Forecast and Load Modifier Assumptions

Study Case	Scenario	Gross Load (MW)	AAEE (MW)	AAFS (MW)	TE (MW)	KL (MW)	DS (MW)	BTM-PV (MW)		Net Load (MW)
								Installed Capacity	Output	
B1-2028SP	Base	4804	87	50	100	189	0	2410	121	4936
B2-2031SP	Base	4995	157	126	227	189	3	2594	130	5253
B3-2036SP	Base	5226	263	247	458	199	7	2887	115	5758
B4-2041SP	Base	3821	167	126	2702	135	6	3151	0	6623
B5-2036OP	Base	5400	339	120	831	0	0	2887	1848	4163
B6-2041WP	Base	2591	149	648	2505	95	6	3151	0	5696
B7-2028OP	Base	3049	53	43	167	126	0	2410	24	3307
B8-2031OP	Base	2406	113	51	196	0	0	2594	1971	568
S1-2028SP	Sensitivity	4792	87	50	100	189	0	2410	2314	2731
S2-2028OP	Sensitivity	3176	53	43	167	126	0	2410	24	3434
S3-2031SP	Sensitivity	5137	157	126	227	189	3	2594	130	5395

AAEE → Additional Achievable Energy Efficiency (Value is subtracted to calculate the Net Load)
AAFS → Additional Achievable Fuel Substitution
TE → Transportation Electrification (Includes Baseline and Additional Achievable Transport Electrification)
KL → Known Loads
DS → Data Center Loads
BTM-PV → Behind-the-meter Solar Photovoltaic Generation (Value is subtracted to calculate the Net Load)

Generation Resource Assumptions

Study Case	Battery Energy Storage (MW)		Solar (MW)		Wind (MW)		Thermal (MW)		Hydro (MW)		Long Duration Energy Storage (MW)	
	Installed	Dispatch	Installed	Dispatch	Installed	Dispatch	Installed	Dispatch	Installed	Dispatch	Installed	Dispatch
B1-2028SP	3365	0	2265	45	1020	694	3720	2976	4	3	0	0
B2-2031SP	3757	0	2265	45	1020	694	3720	2976	4	3	0	0
B3-2036SP	4247	0	9808	196	2010	1367	3720	2976	4	3	500	0
B4-2041SP	4247	0	10040	0	3312	2749	3716	2973	4	3	500	0
B5-2036OP	4247	-4179	9808	9413	2010	80	3720	3683	4	0	500	-500
B6-2041WP	4247	0	10040	0	3312	2186	3716	2654	4	0	500	0
B7-2028OP	3102	0	2265	0	1020	836	3720	2489	4	0	0	0
B8-2031OP	3757	-3689	2265	2241	1020	816	3720	75	4	0	0	0
S1-2028SP	3365	0	2265	2152	1020	816	3720	79	4	3	0	0
S2-2028OP	3102	-2797	2265	0	1020	836	3720	2952	4	0	0	0
S3-2031SP	3757	0	2265	45	1020	694	3720	2976	4	3	0	0

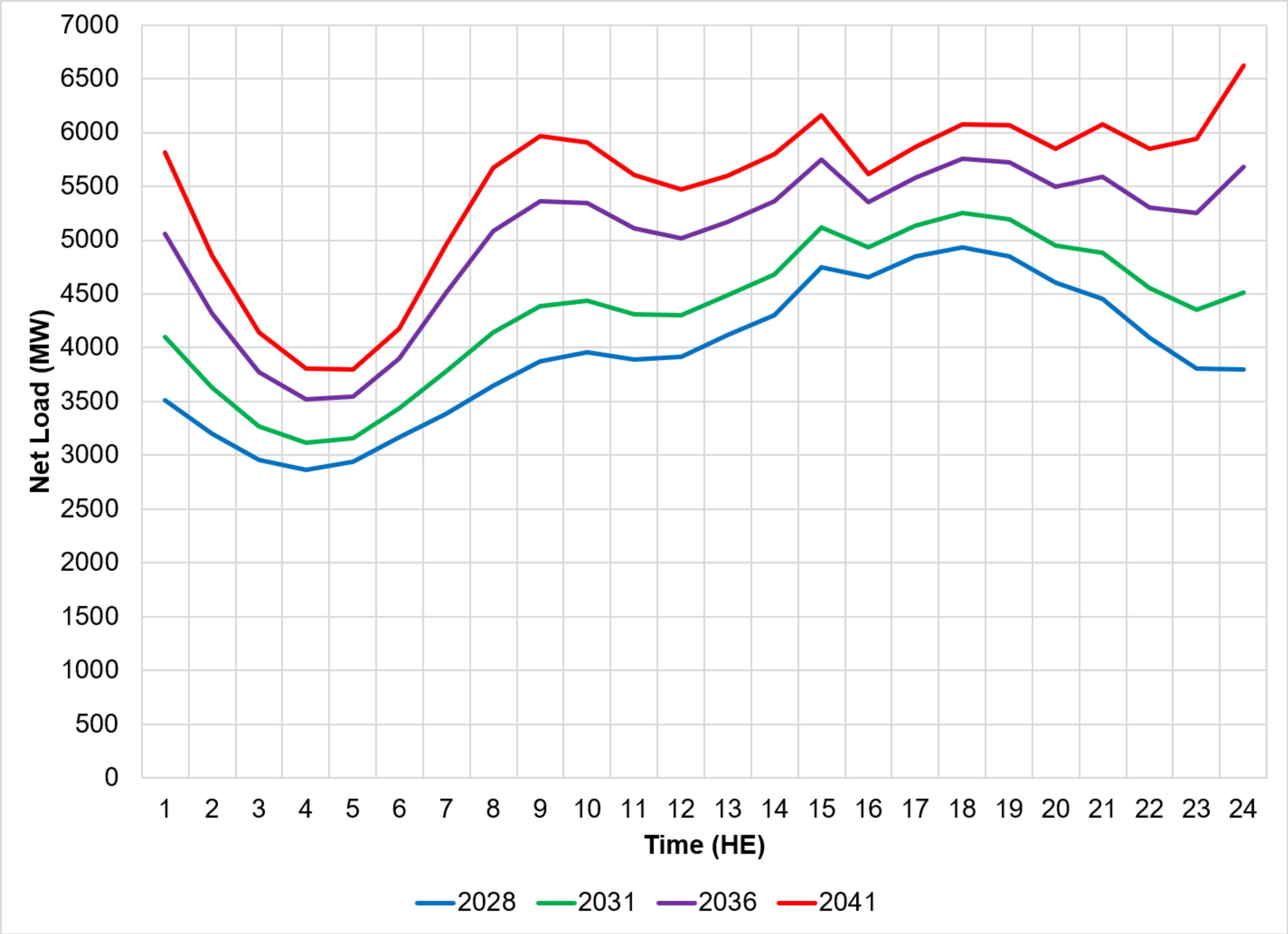
Approved Transmission Projects Modeled in Base Cases

Project Name	In-service Date	First Year Modeled
SG and OT Redundant Bus Differential Relay	Jun-26	2028
TL632 Granite Loop-In and TL6914 Reconfiguration	Feb-27	2028
Sweetwater Reliability Enhancement	Mar-27	2028
San Ysidro 69 kV Reconductoring (TL623C)	Mar-27	2028
3 Ohm Series Reactor on Sycamore-Penasquitos 230 kV line	Jul-27	2028
Coronado Island Reliability Reinforcement Phase I	Q3-27	2028
Short Circuit Mitigation for Miguel 230 kV Circuit Breakers Project	Feb-28	2028
TL695B Japanese Mesa - Talega Tap Reconductor	May-28	2028
Coronado Island Reliability Reinforcement Phase II	Aug-28	2028
TL690E, Stuart Tap - Las Pulgas 69 kV Reconductor	Jul-29	2031
Downtown Reliability Reinforcement (SG Spare Bank and S CBs)	Dec-29	2031
Valley Center System Improvement	Jan-31	2031
Rearrange TL23013 PQ-OT and TL6959 PQ-Mira Sorrento	Aug-31	2031
Reconductor TL680C San Marcos-Melrose Tap	Sep-31	2031
Upgrade TL13820 Sycamore-Chicarita 138 kV	Sep-31	2031
TL690B & TL697 Reconductor	2031	2031
Penasquitos-Mira Sorrento 69 kV #2 line	2031	2031
TL600B Reconductor	2031	2031

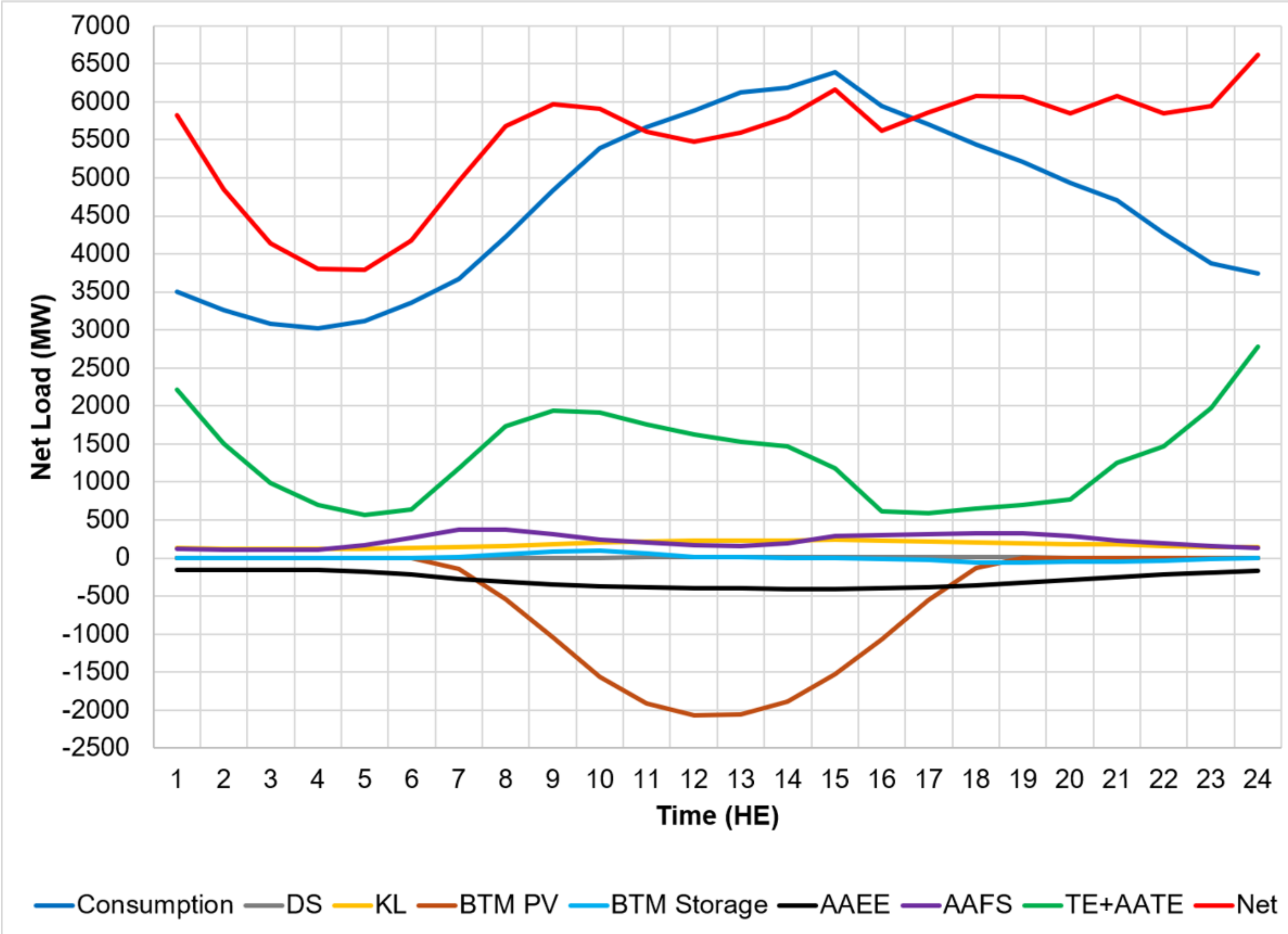
Approved Transmission Projects Modeled in Base Cases

Project Name	In-service Date	First Year Modeled
North Gila–Imperial Valley 500 kV line	Dec-31	2036
Upgrade on Hoodoo Wash-North Gila and Hassayampa-North Gila TLs	May-32	2036
Recon Substation	Oct-32	2036
Imperial Valley–Recon 500 kV Line	Oct-32	2036
Miguel-Sycamore Canyon (TL23021) 230 kV line Loop-in to Suncrest	Dec-32	2036
Recon–Serrano 500 kV line	2032	2036
TL623C Reconductor	2032	2036
Short Circuit Mitigation for Imperial Valley 230 kV Circuit Breakers Project	Oct-35	2036
Downtown Reliability Reinforcement (Vine Expansion)	2037	2041

SDG&E Area 1-in-10 Peak Day Net Load Profile



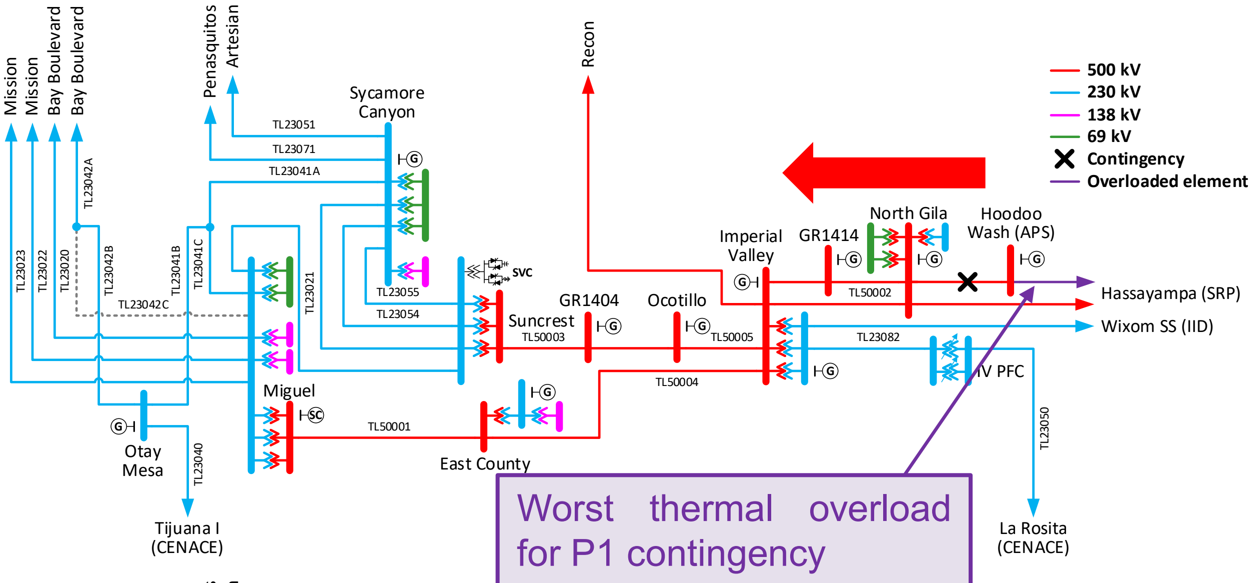
2041 SDG&E Area 1-in-10 Peak Day Net Load Profile



California ISO

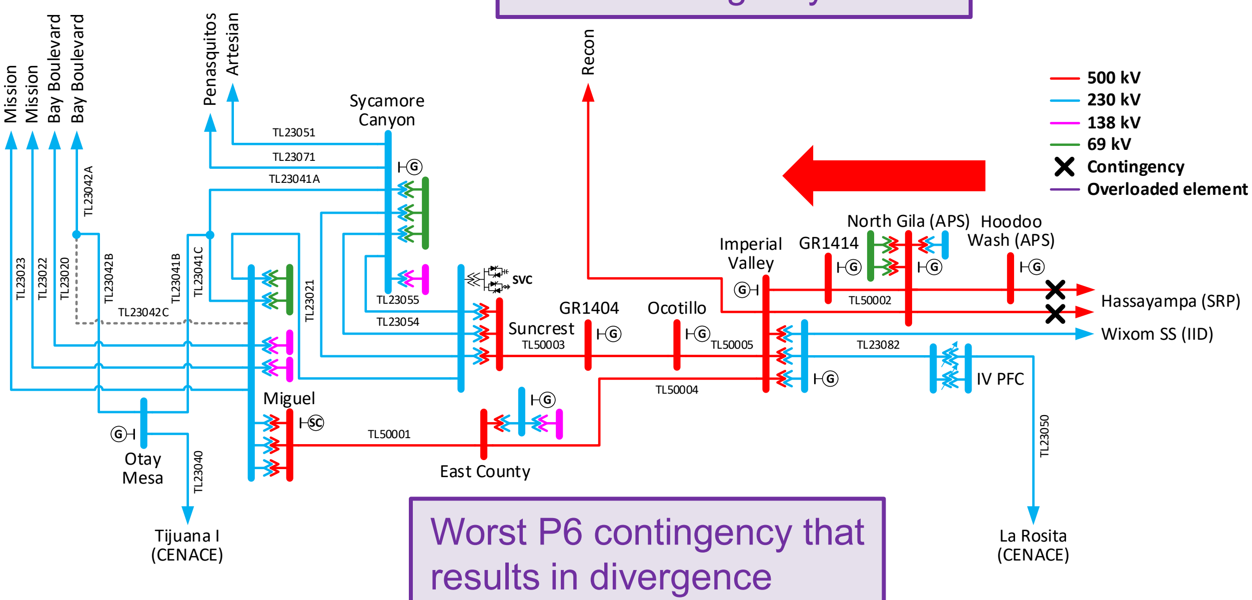
Reliability Assessment Preliminary Results Summary

Heavy East to West flows



Reliability Concern

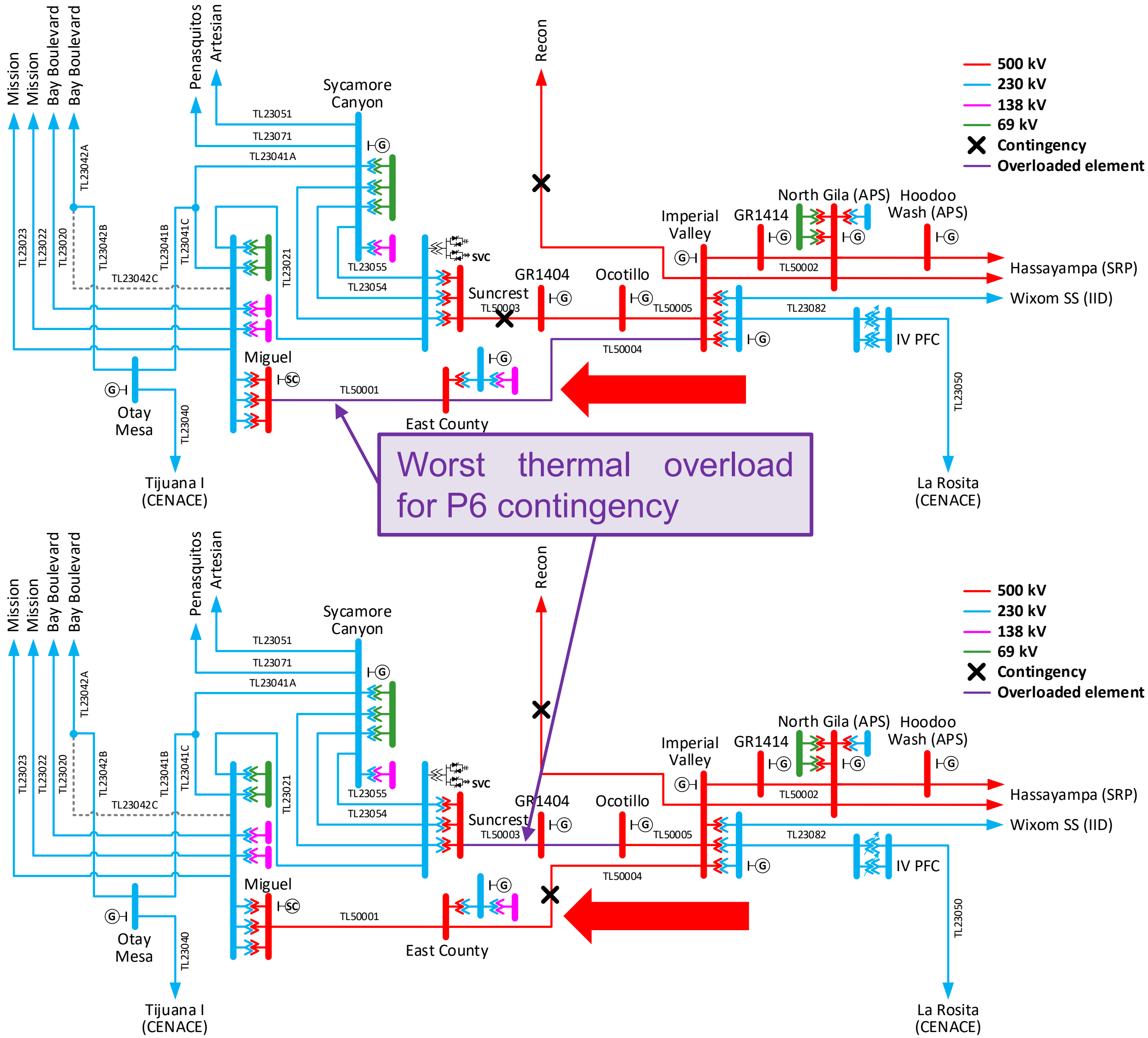
- P1 thermal overload: 106% → 108% of normal rating for HAA-HDW and HDW-NG in B5 case
- Some P3 and P6 contingencies resulted in divergence in B5 case
- P3 and P6 thermal overload:106% → 111% of normal rating for HAA-HDW and HDW-NG in B5 case



Potential Mitigation

- Congestion management
  - Reduce gen output of Hoodoo Wash solar resources for P1 contingencies
  - Further reduction of Hoodoo Wash, North Gila, and/or GR1414 solar resources for P3 and P6 contingencies

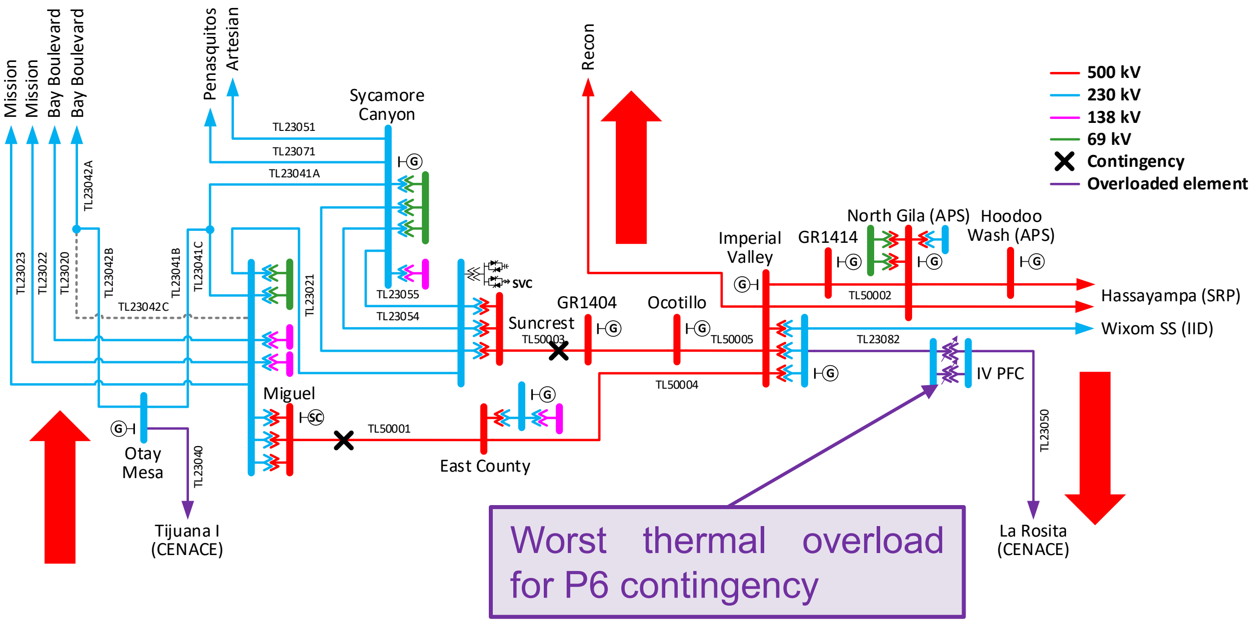
Heavy Imports into San Diego Metro Area (1/3)



Reliability Concern

- P6 thermal overload: 100% →110% of normal rating for TL50001 in B4, B5, and B6 cases
- P6 thermal overload: 103% of normal rating for TL50004 in B5 case
- P6 thermal overload: 102% of normal rating for TL50003 in B5 case

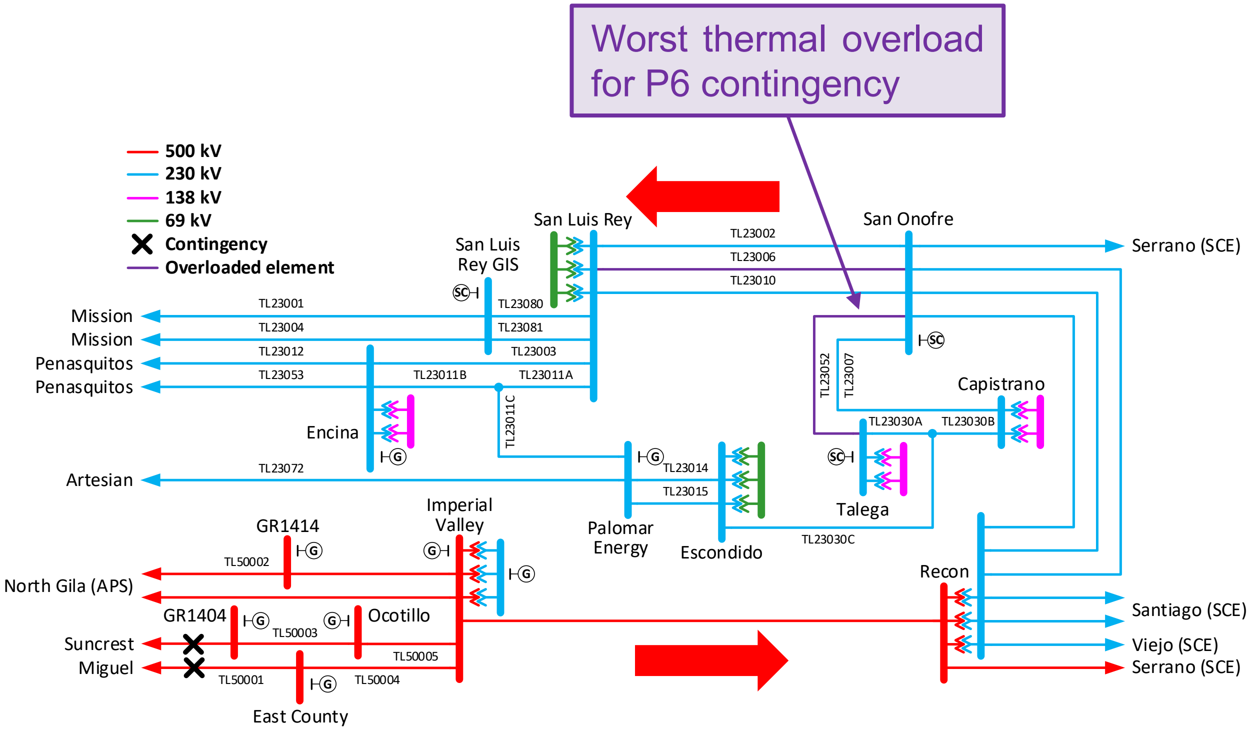
Heavy Imports into San Diego Metro Area (2/3)



Reliability Concern

- P6 thermal overload: 107% →119% of normal rating for TL23050/TL23082 in B4 and B5 cases
- P6 thermal overload: 109% →132% of 24-hr rating for IV PSTs in B3 to B6 cases
- P6 thermal overload: 105% →121% of 4-hr rating for TL23040 in B5 case

Heavy Imports into San Diego Metro Area (3/3)



Reliability Concern

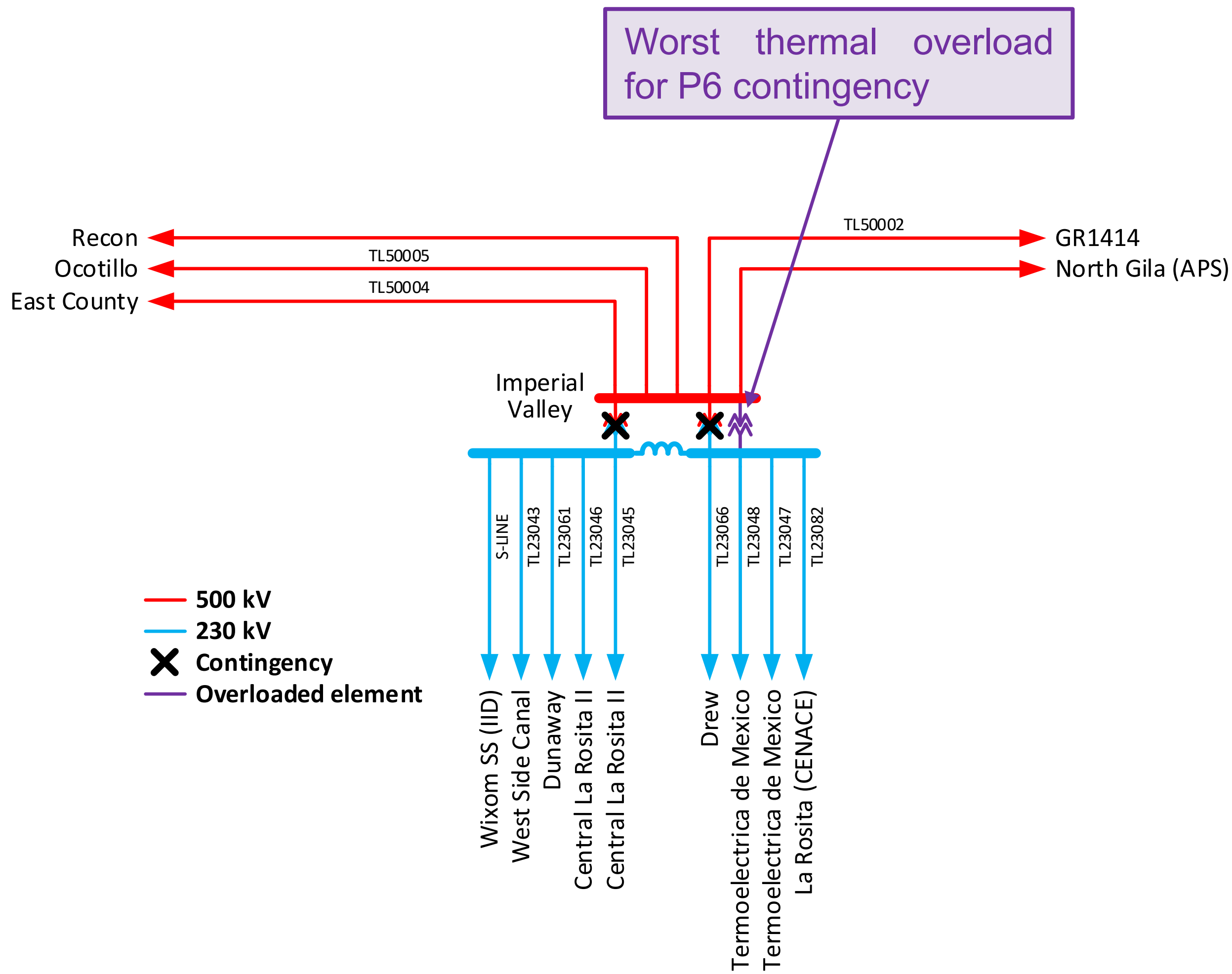
- P6 thermal overload: 101% of 250-hr rating for TL23006 in B4 case
- P6 thermal overload: 104% → 115% of 250-hr rating for TL23052 in B4 and B5 cases

Potential Mitigation

- Congestion management and system adjustments
  - Reduce gen output in the greater Imperial Valley area
  - B3, B4 and B6 cases: Dispatch gas gen, and/or BESS in the San Diego metro area, and adjust Imperial Valley PSTs
  - B5 case: Reduce BESS charging in San Diego metro area

California ISO

Imperial Valley 500/230 kV Banks 80, 81 and 82



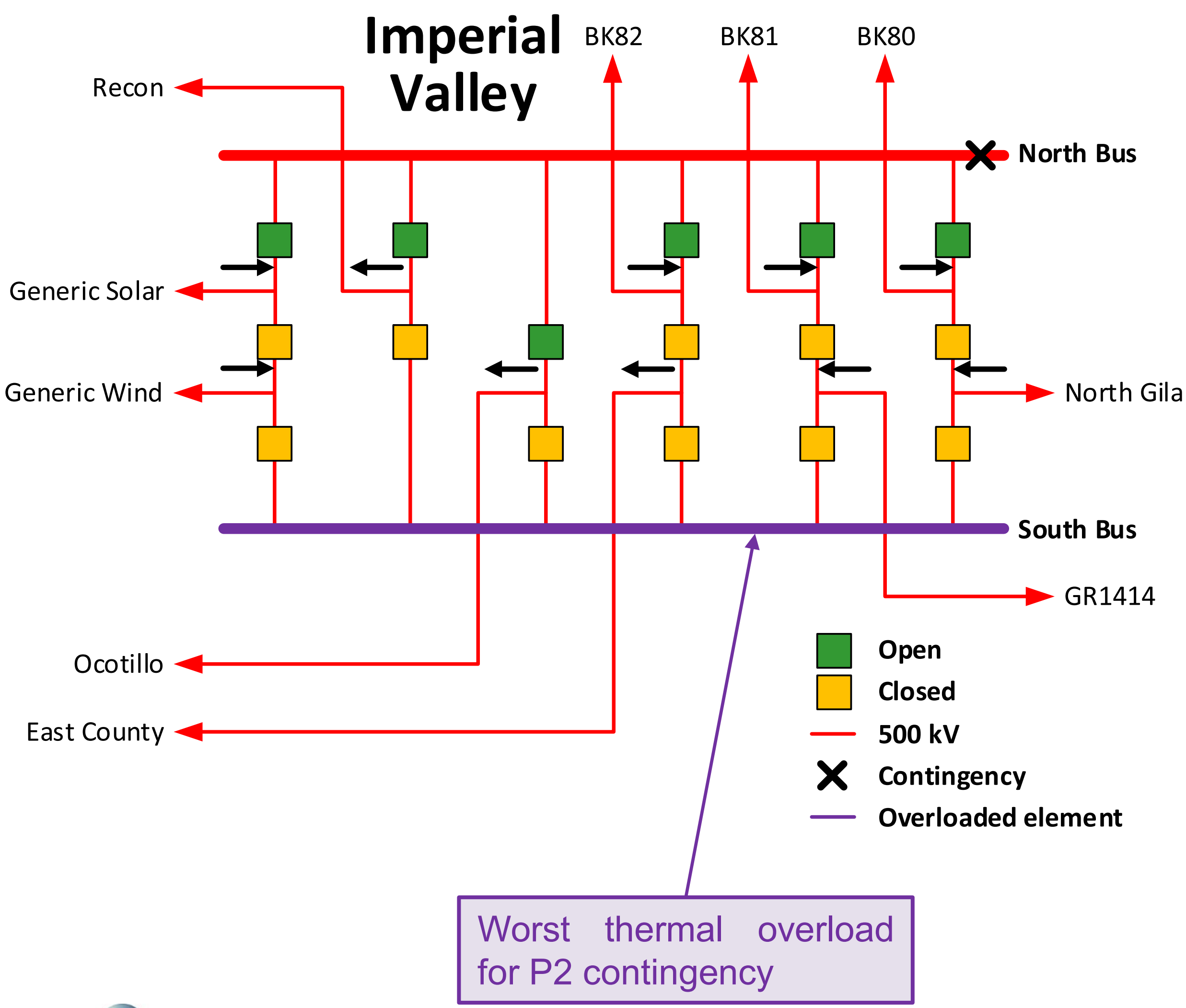
Reliability Concern

- P3 thermal overload: 100% → 102% of 24-hr rating in B5 case
- P4 thermal overload: 105% of 24-hr rating in B5 case
- P6 thermal overload: 122% → 139% of 24-hr rating in B5 case

Potential Mitigation

- 30-min emergency rating
- Congestion management
  - Reduce gen output at Imperial Valley 230 kV substation

Imperial Valley 500 kV Bus Overload



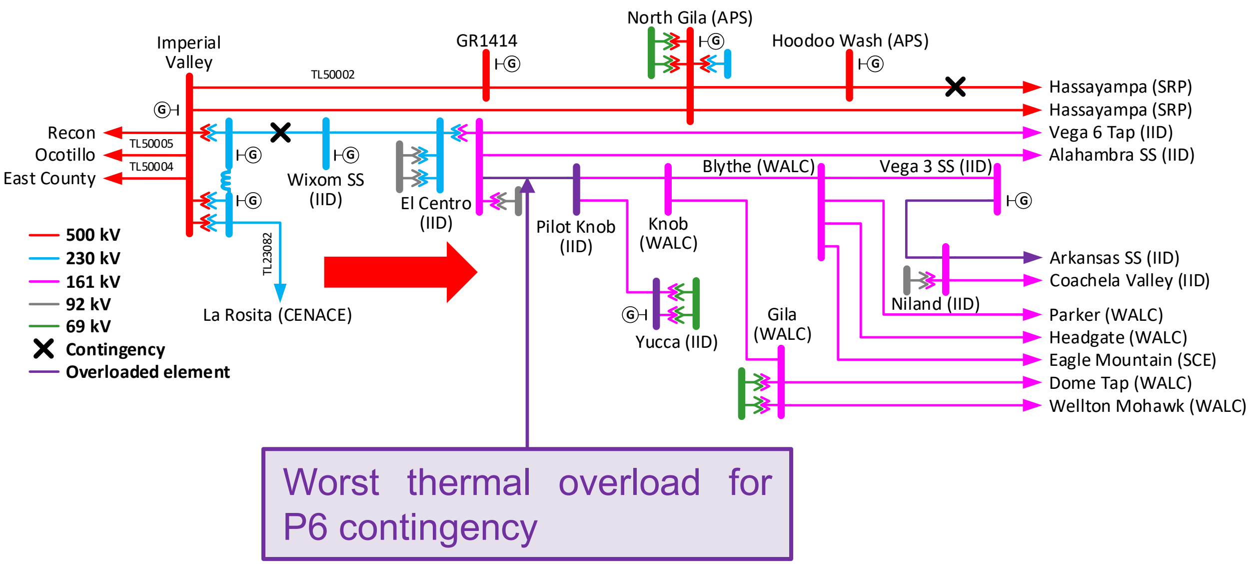
Reliability Concern

- P2 thermal overload: 121% of normal rating in B5 case

Potential Mitigation

- 30-min emergency rating
- Congestion management
  - Reduce gen output at North Gila, GR1414, Hoodoo Wash, Hassayampa, and/or Imperial Valley substations
  - Reduce BESS charging in San Diego metro area

IID facilities thermal overloads and low voltages



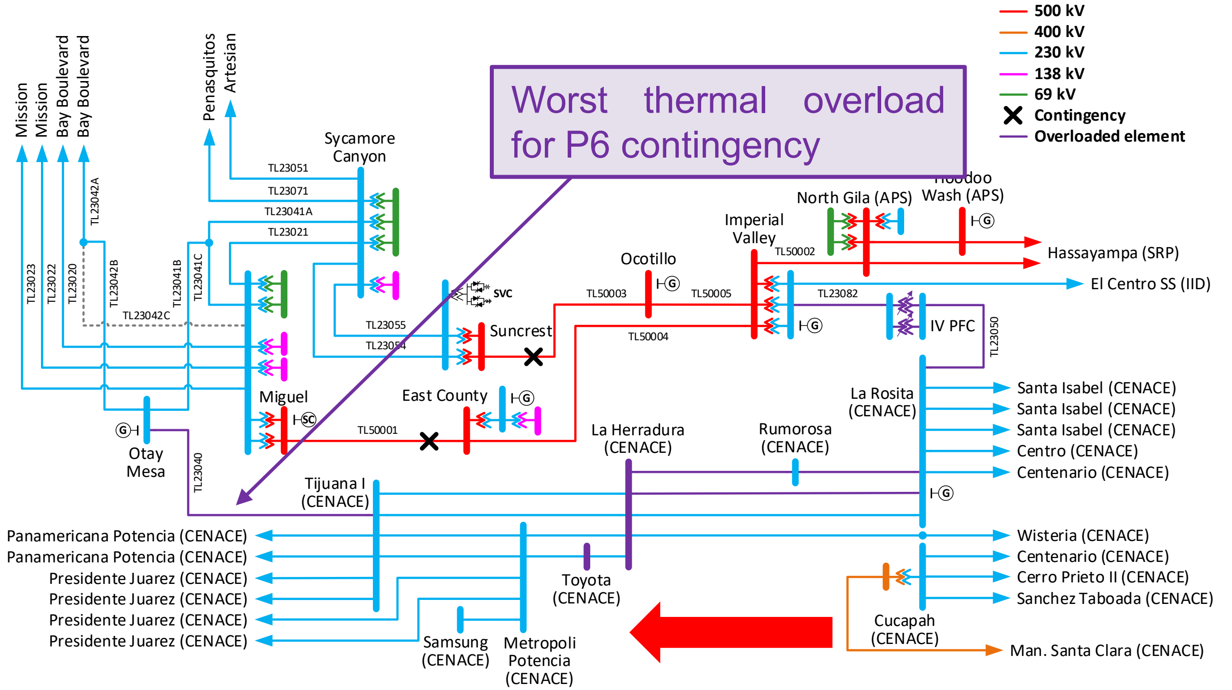
Reliability Concern

- P1, P3, P4 and P6 thermal overloads: 100% → 138% of emergency rating for El Centro – Pilot Knob in B3, B4, B5 and B6 cases
- P6 thermal overload: 106% of emergency rating for Vega 3 SS – Niland in B5 case
- P1 and P6 thermal overloads: 100% → 104% of emergency rating for Niland – Arkansas SS in B5 case
- P6 low voltages: 0.89 p.u. at Pilot Knob and Yucca 161 kV buses in B5 case

Potential Mitigation

- B5 case: Review with IID planned S-Line RAS to trip only solar when BESS are in charging mode
- B3, B4 and B6 cases: Add generic geothermal resources mapped at Wixom SS to the planned S-Line RAS

Path 45 and CENACE’s facilities thermal overloads



Reliability Concern

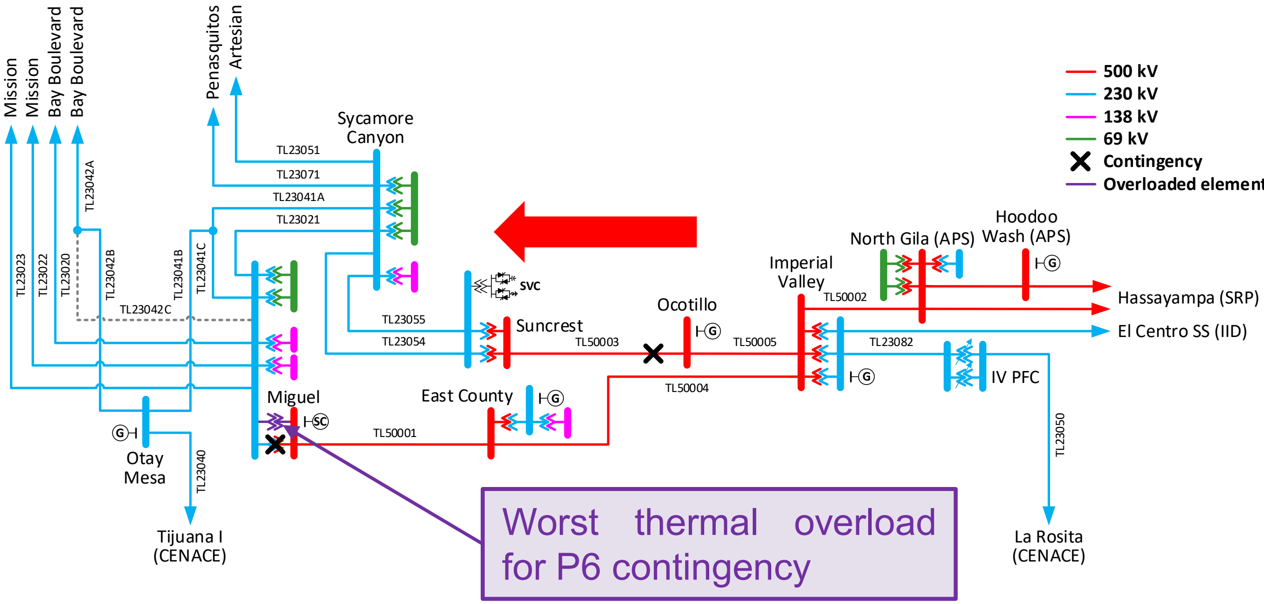
- P6 thermal overload: 107% → 128%* of normal rating for IV-ROA
- P6 thermal overload: 105% → 163%* of 4-hr rating for OM-TJI
- P6 thermal overload: 101% → 143%* of 24-hr rating for IV PSTs
- P3 and P6 thermal overloads: 104% → 131%* of emergency rating of ROA-RUM, RUM-HRA, ROA-HRA
- P6 low voltages: 0.89 p.u. at HRA and TOY 230 kV buses in S1 case

Potential Mitigation

- Existing TL50001 Gen Drop RAS or TL50003 Gen Drop RAS in near-term cases
- Imperial Valley–Recon 500 kV Line and Recon Substation (ISD Oct-2032)
- Congestion management and system adjustments
  - Reduce gen output in the greater Imperial Valley area
  - Dispatch conventional gas gen, and BESS in San Diego metro area in Summer Peak cases
  - Reduce BESS charging in San Diego metro area in Off-Peak cases
  - Adjust Imperial Valley PSTs
  - Bypass series capacitors Hassayampa/Hoodoo Wash – North Gila 500 kV transmission lines in near-term cases

*Considering both base and sensitivity scenarios

Miguel 500/230 kV Banks 80 and 81



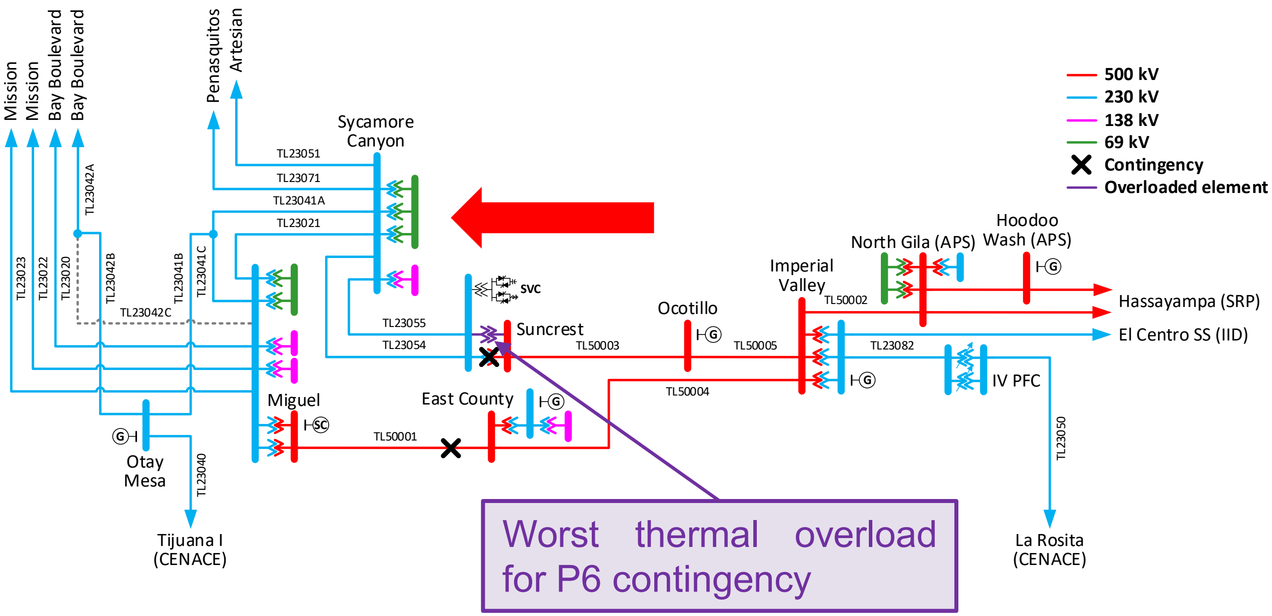
Reliability Concern

- P1 thermal overload: 105% → 106% of 24-hr rating in S1 case
- P3 thermal overload: 101% → 107% of 24-hr rating in S1 and S3 cases
- P4 thermal overload: 105% of 24-hr rating in S1 case
- P6 thermal overload: 106% → 147% of 24-hr rating in B1, B2, B4, S1 and S3 cases

Potential Mitigation

- Existing Miguel BK 80/81 RAS
- 30-min emergency rating
- Congestion management and system adjustments
  - Reduce gen output in the greater Imperial Valley area
  - Dispatch conventional gas gen, and BESS in San Diego metro area
  - Adjust Imperial Valley PSTs
  - Bypass series capacitors Hassayampa/Hoodoo Wash – North Gila 500 kV transmission lines
- Miguel-Sycamore Canyon 230 kV line Loop-in to Suncrest (Third Miguel 500/230 kV bank) (ISD Dec-2032)

Suncrest 500/230 kV Banks 80 and 81



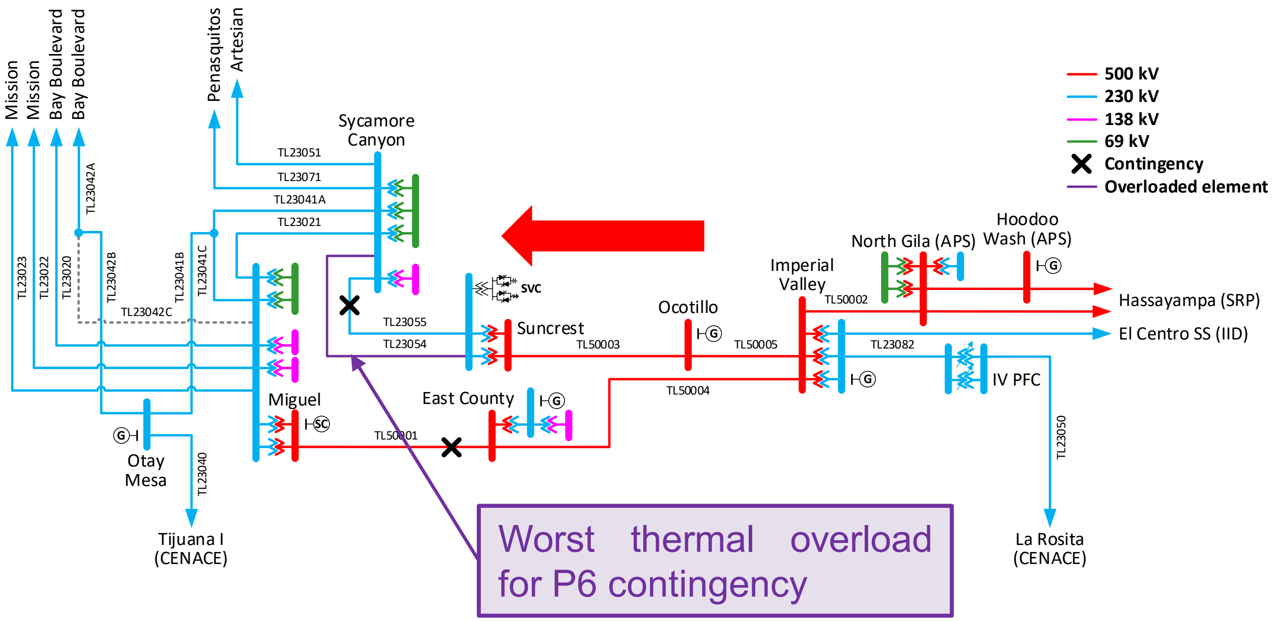
Reliability Concern

- P6 thermal overload: 110% → 123% of 24-hr rating in B2, S1, and S3 cases

Potential Mitigation

- 30-min emergency rating
- Congestion management and system adjustments
  - Reduce gen output in the greater Imperial Valley area
  - Dispatch conventional gas gen, and BESS in San Diego metro area
  - Adjust Imperial Valley PSTs
  - Bypass series capacitors Hassayampa/Hoodoo Wash – North Gila 500 kV transmission lines
- Miguel-Sycamore Canyon 230 kV line Loop-in to Suncrest (Third Suncrest 500/230 kV bank) (ISD Dec-2032)

230 kV TL23054/TL23055 Suncrest – Sycamore Canyon



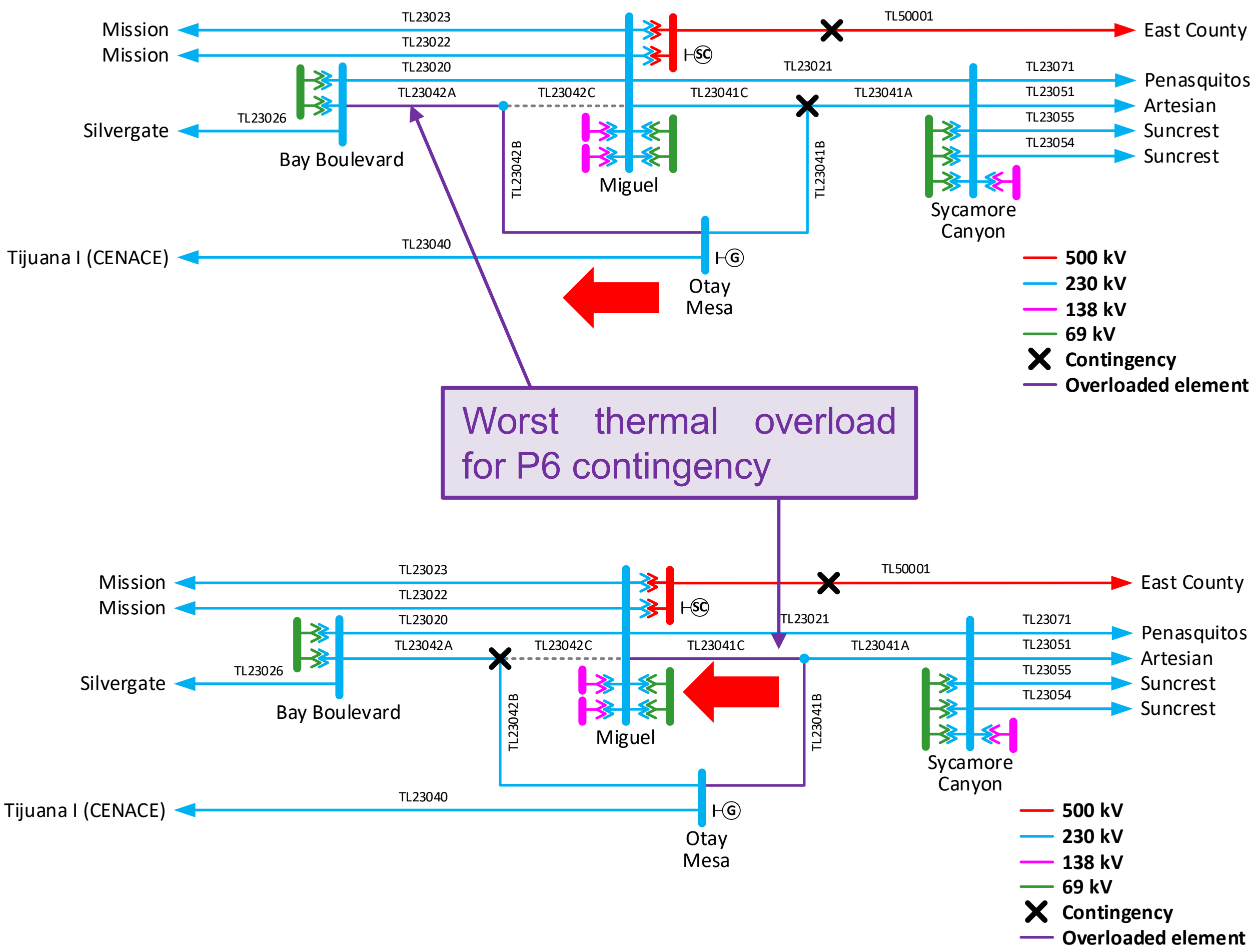
Reliability Concern

- P6 thermal overload: 105% → 164% of normal rating in B1, B2, S1, and S3 cases

Potential Mitigation

- Existing TL23054/23055 RAS
- 30-min emergency rating
- Congestion management and system adjustments
  - Reduce gen output in the greater Imperial Valley area
  - Dispatch conventional gas gen, and BESS in San Diego metro area
  - Adjust Imperial Valley PSTs
  - Bypass series capacitors Hassayampa/Hoodoo Wash – North Gila 500 kV transmission lines
- Miguel-Sycamore Canyon 230 kV line Loop-in to Suncrest (ISD Dec-2032)

230 kV TL23041 Sycamore Canyon – Otay Mesa – Miguel and TL23042 Bay Boulevard – Otay Mesa – Miguel



Reliability Concern

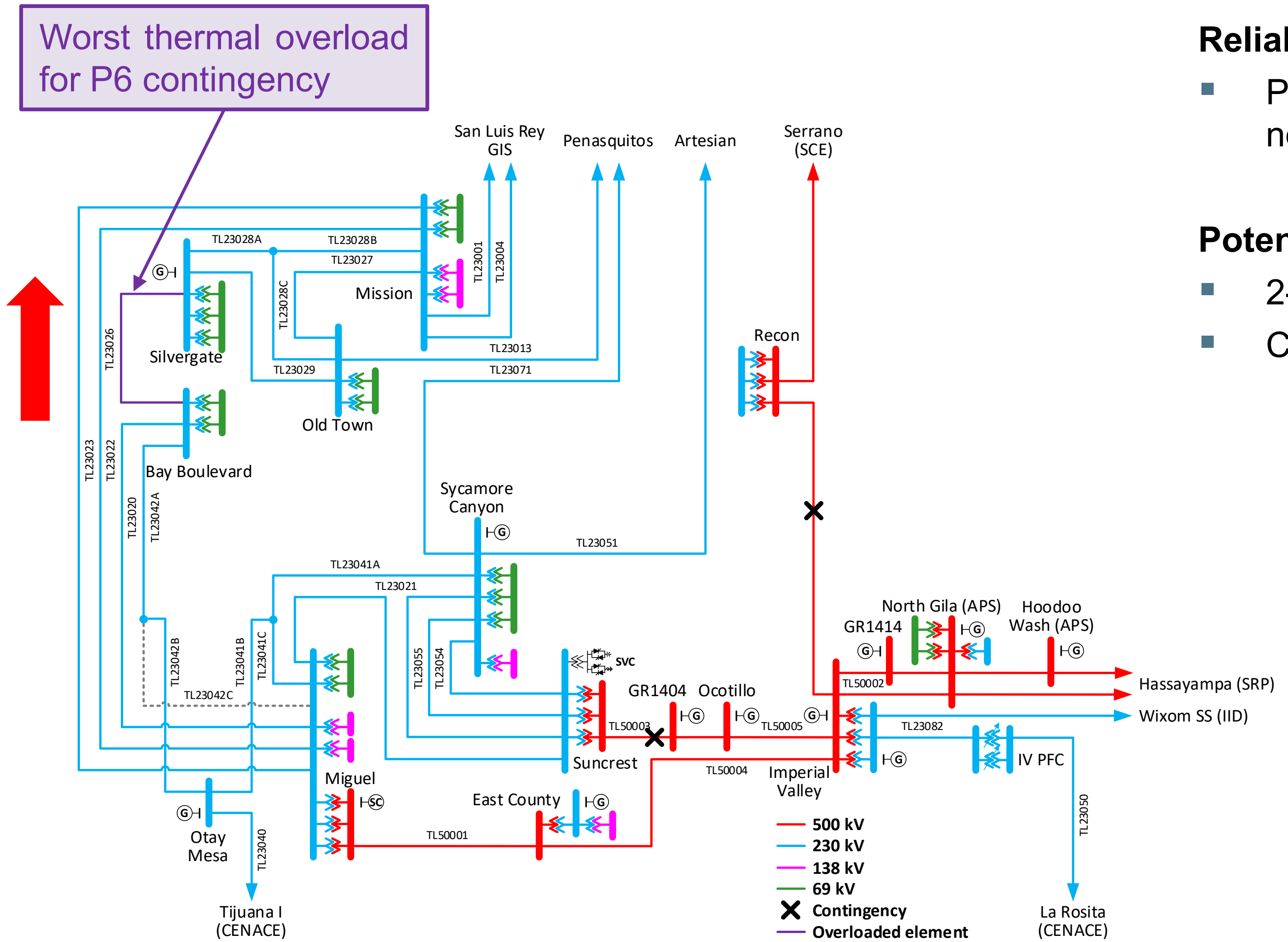
- P6 thermal overload: 105% → 116%* of normal rating for TL23041B
- P6 thermal overload: 102% → 121%* of normal rating for TL23041C
- P6 thermal overload: 106% → 111%* of normal rating for TL23042A
- P6 thermal overload: 103% → 108%* of normal rating for TL23042B

Potential Mitigation

- Existing TL23041/TL23042 RAS
- Congestion management
  - Reduce generation output at Otay Mesa

* Overloads in B1, B2, B6 and S3 cases

230 kV TL23026 Silvergate – Bay Boulevard



Reliability Concern

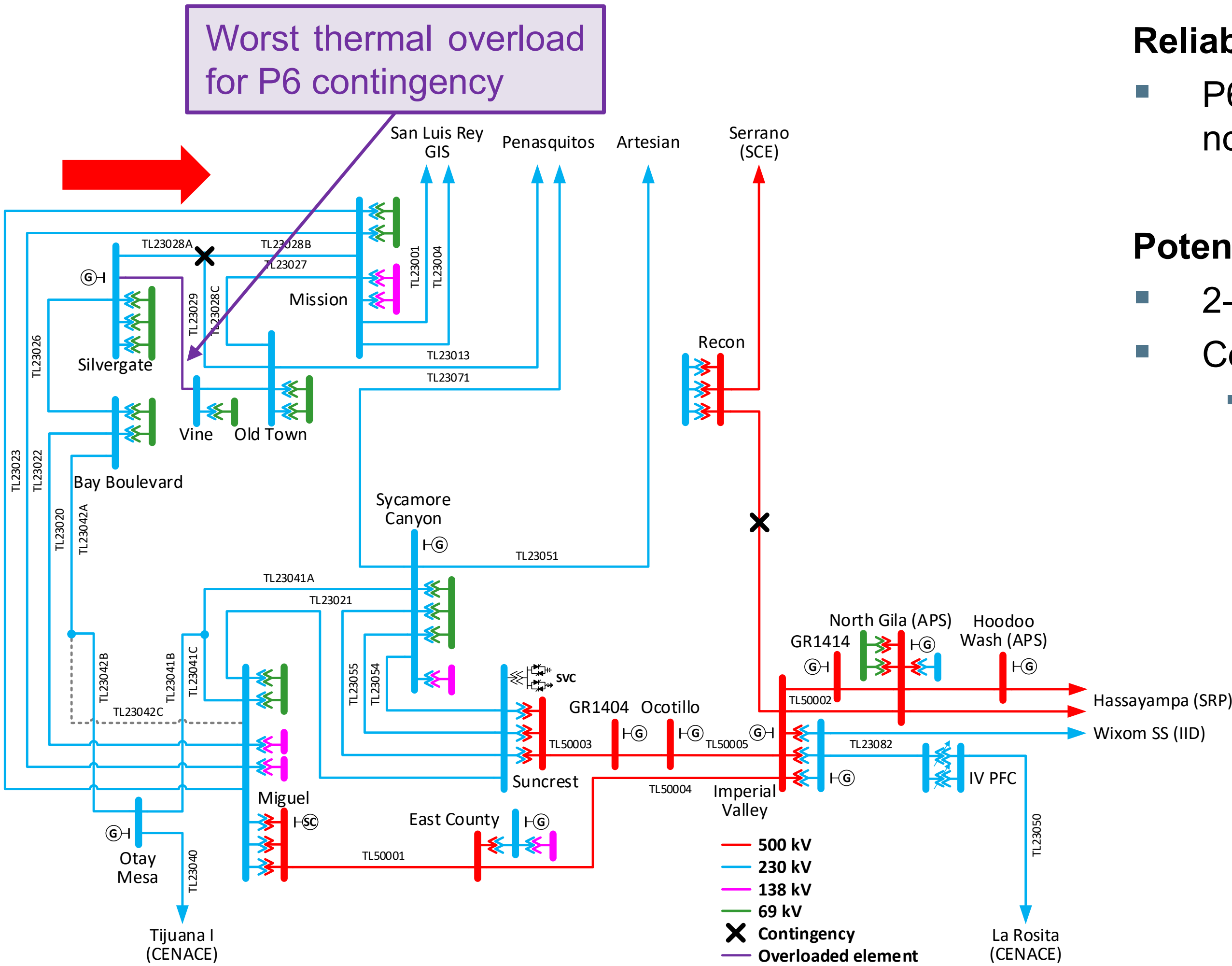
- P6 thermal overload: 103% of normal rating in B5 case

Potential Mitigation

- 2-hr emergency rating
- Congestion management
  - Reduce BESS charging at Silvergate substation

California ISO

230 kV TL23029 Loop-in Silvergate – Vine



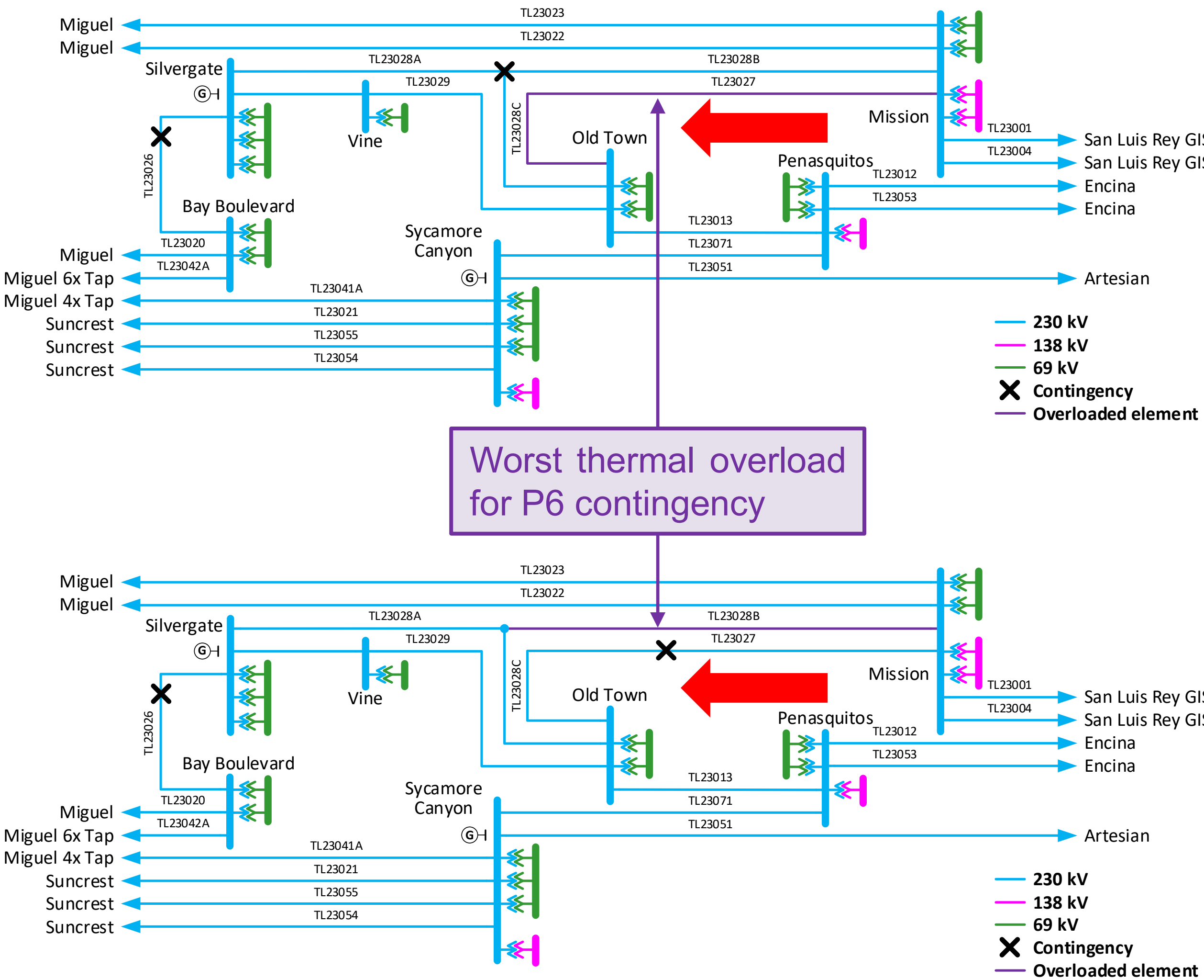
Reliability Concern

- P6 thermal overload: 104% of normal rating in B6 case

Potential Mitigation

- 2-hr emergency rating
- Congestion management
  - Reduce generation output at Otay Mesa substation

230 kV TL23027 Old Town – Mission and TL23028B Old Town Tap – Mission



Reliability Concern

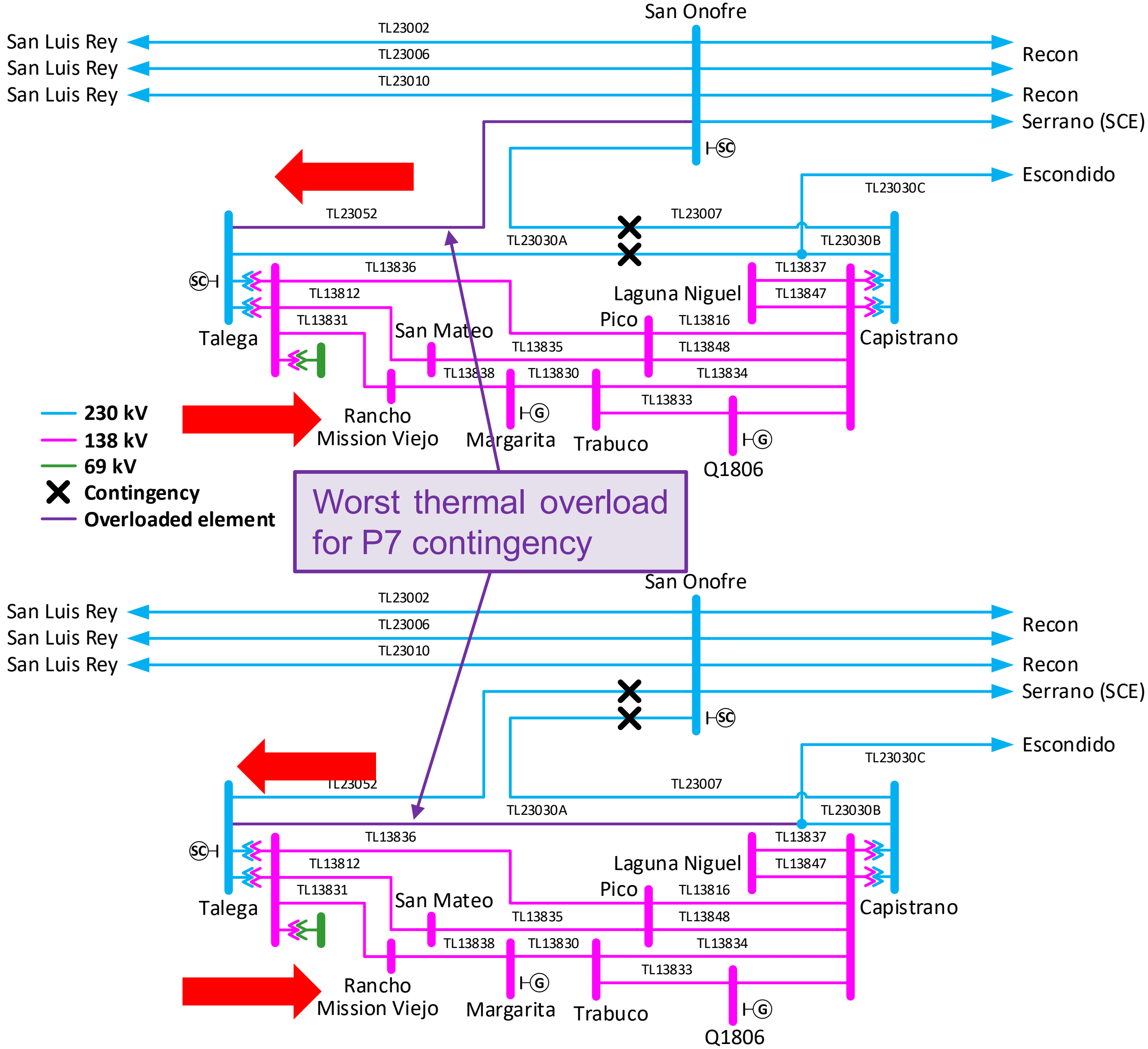
- P6 thermal overload: 101% of normal rating for TL23027 in B5 case
- P6 thermal overload: 102% → 103% of normal rating for TL23028B in B4 and B5 cases

Potential Mitigation

- Congestion management
  - B4 case: Dispatch Silvergate BESS
  - B5 case: Reduce Silvergate BESS charging

California ISO

Southern Orange County Load Pocket (1/3)



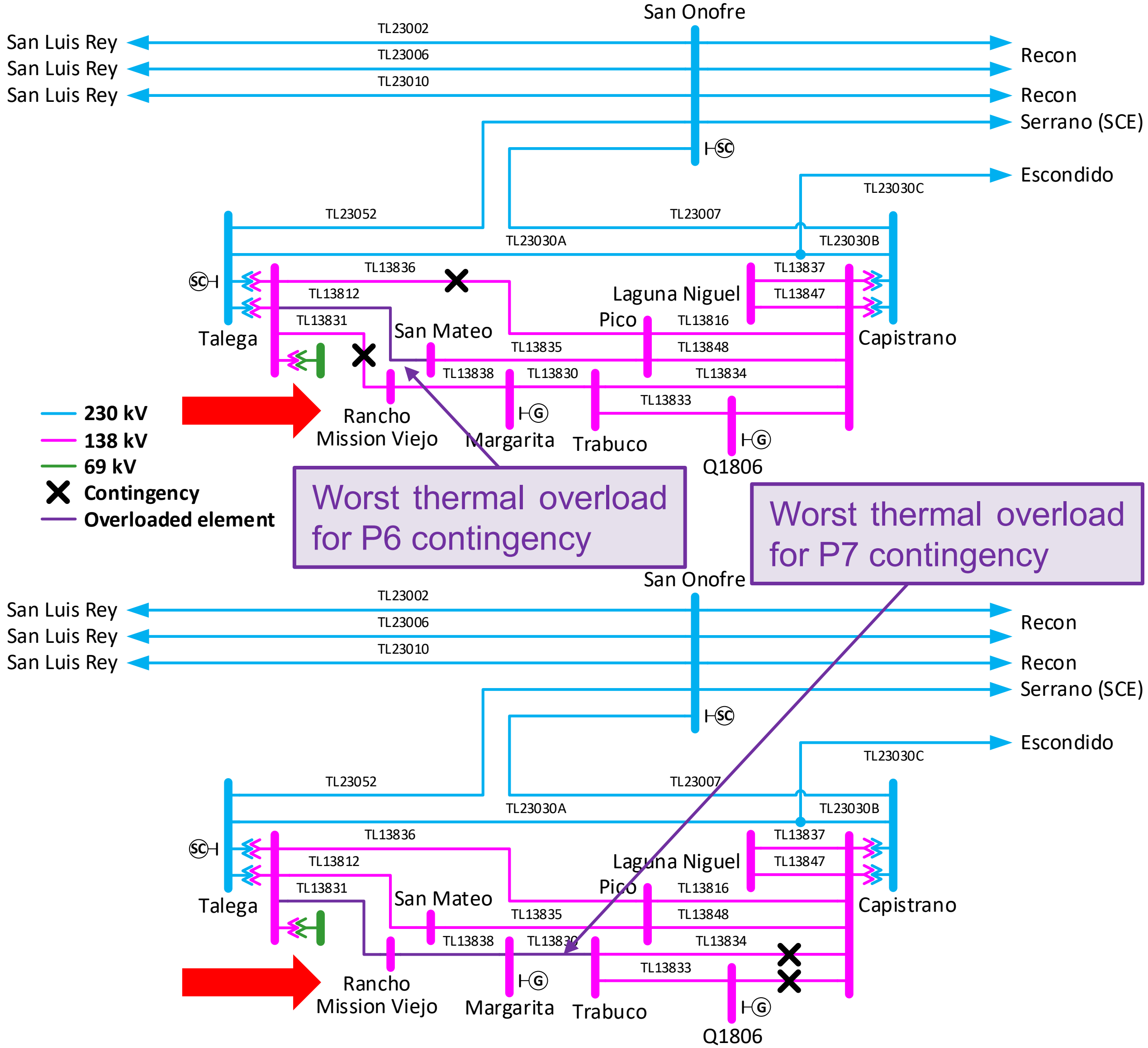
Reliability Concern

- P6 thermal overload: 102% → 114% of 250-hr rating for TL23007 in B4 and B5 cases
- P3, P6 and P7 thermal overload: 101% → 118% of 250-hr rating for TL23052 in B4 and B5 cases
- P6 and P7 thermal overload: 101% → 116% of normal rating for TL23030A in B4 and B5 cases

Potential Mitigation

- Congestion management
  - B4 case: Dispatch Q1806 BESS to protect against always credible P7 of TL23007 and TL23030
  - B5 case: Reduce Q1806 BESS charging to protect against always credible P7 of TL23007 and TL23030

Southern Orange County Load Pocket (2/3)



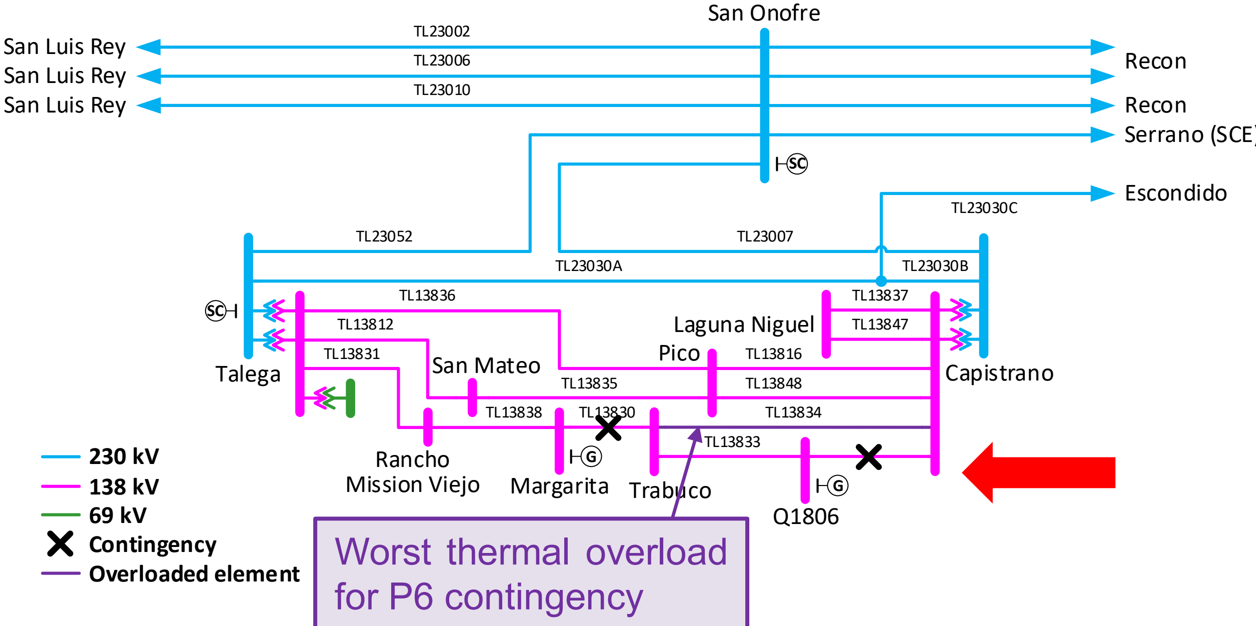
Reliability Concern

- P6 thermal overload: 105% → 119% of normal rating for TL13812 in B4 and B6 cases
- P6 and P7 thermal overload: 111% of normal rating for TL13831 in B5 case
- P6 and P7 thermal overload: 103% of normal rating for TL13838 in B5 case
- P6 and P7 thermal overload: 118% of 9-hr rating for TL13830 in B5 case

Potential Mitigation

- Congestion management
  - B4 and B6 cases: Dispatch Q1806 BESS to protect against always credible P7 of TL23007 and TL23030
  - B5 case: Reduce Q1806 BESS charging to protect against always credible P7 of TL23007 and TL23030

Southern Orange County Load Pocket (3/3)

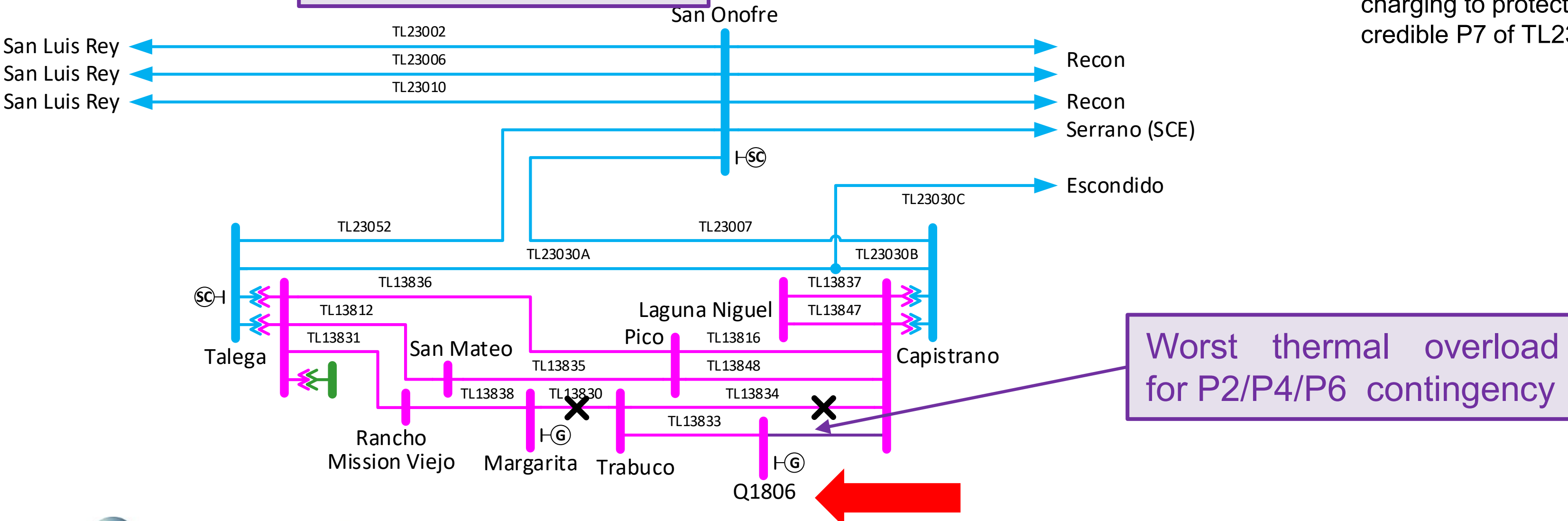


Reliability Concern

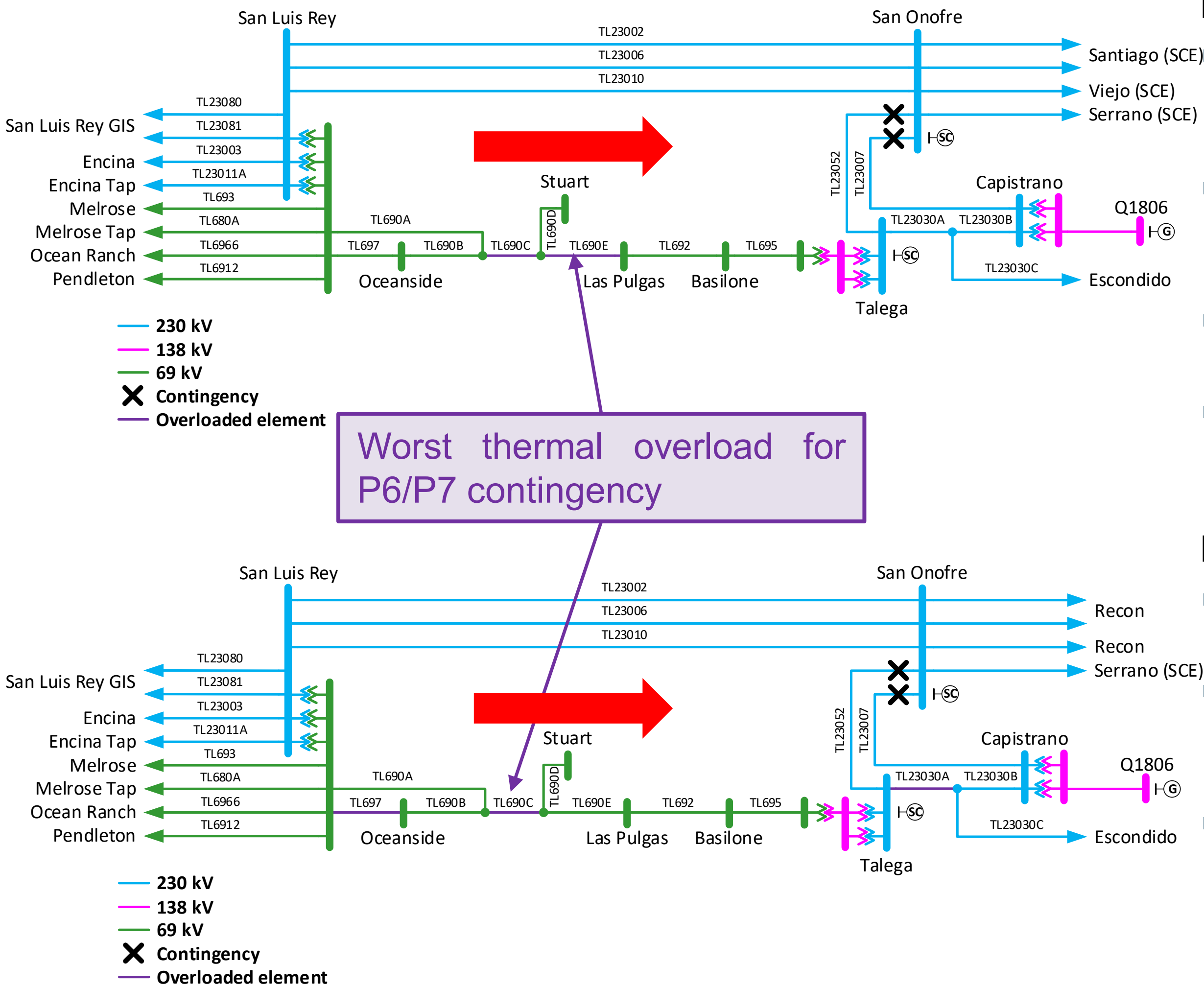
- P2, P3, P4 and P6 thermal overload: 109% → 118% of normal rating for TL13833 in B5 case
- P3 and P6 thermal overload: 101% → 119% of normal rating for TL13834 in B5 case

Potential Mitigation

- Congestion management
  - B5 case: Reduce Q1806 BESS charging to protect against always credible P7 of TL23007 and TL23030



69 kV TL690E Stuart Tap – Las Pulgas, TL90C Oceanside Tap – Stuart Tap and TL697 San Luis Rey – Oceanside



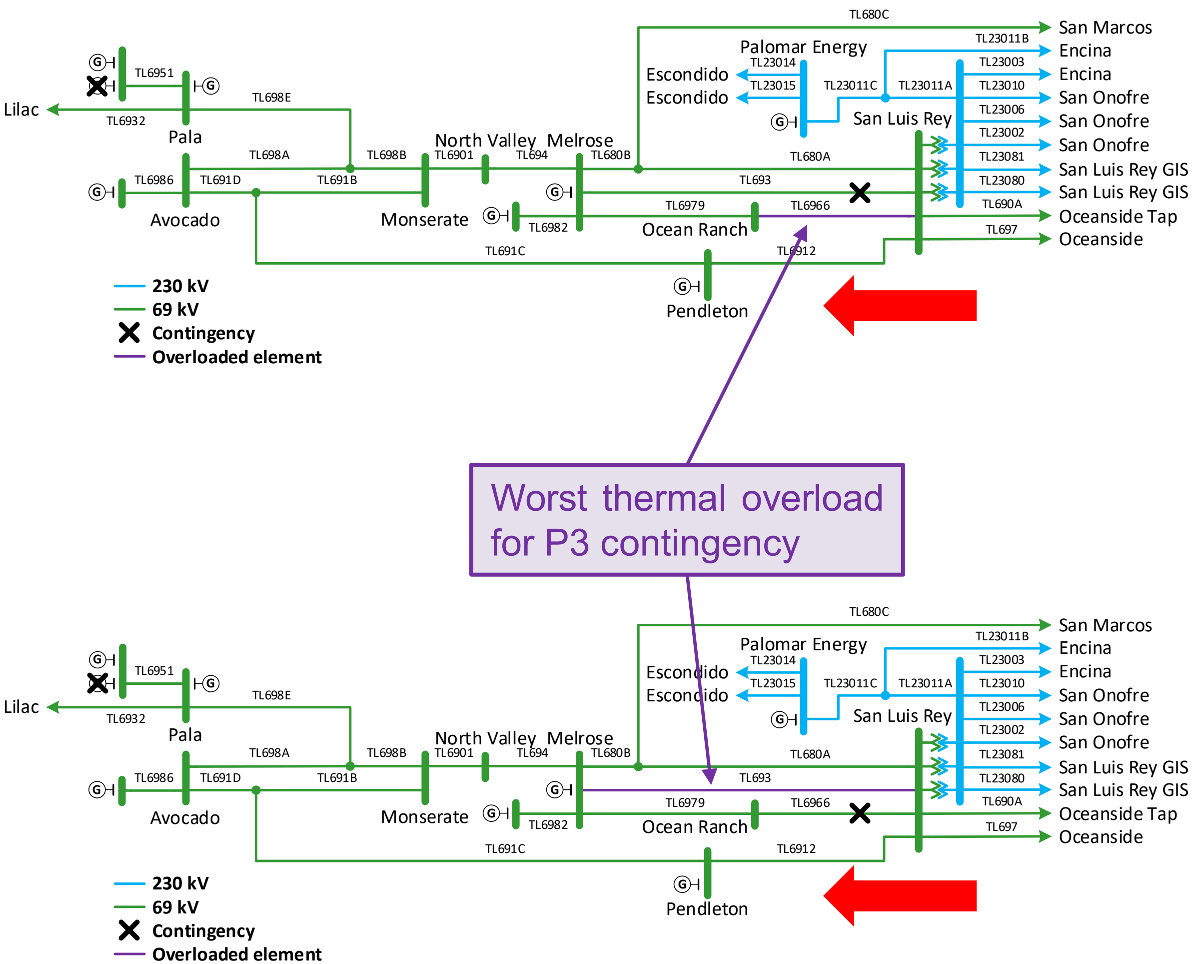
Reliability Concern

- P6 and P7 thermal overloads: 150% → 172% of normal rating for TL690E in B1 and S2 cases
- P6 and P7 thermal overloads: 110% → 145% of normal rating for TL690C in B4, B5, B6 and B8 cases
- P6 and P7 thermal overloads: 103% of normal rating for TL697 in B4 case
- Existing TL695 at TA overload scheme will be retired once TL695 is reconductored (ISD May 2028)

Potential Mitigation

- TL690E, Stuart Tap-Las Pulgas 69 kV Reconductor project (ISD July 2029)
- Consider conditionally credible P7 contingency of TL23007 and TL23052 as always credible
- Congestion management
  - B1, B4, B6 and S2 cases: Dispatch Q1806 BESS to protect against P7 of TL23007 and TL23052
  - B5 and B8 cases: Reduce Q1806 BESS charging to protect against P7 of TL23007 and TL23052

Pala Load Pocket – 69 kV Thermal Overloads (1/2)



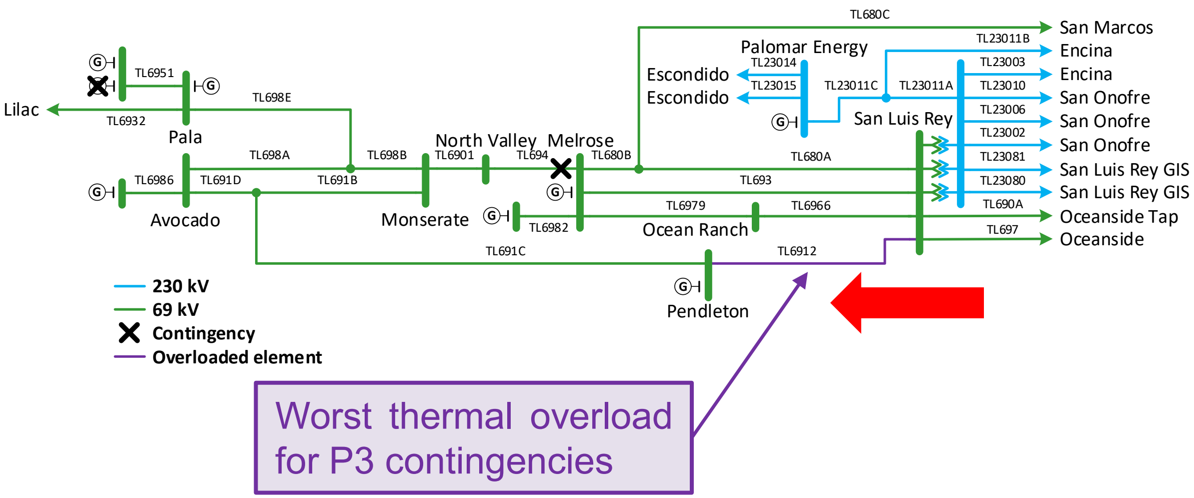
Reliability Concern

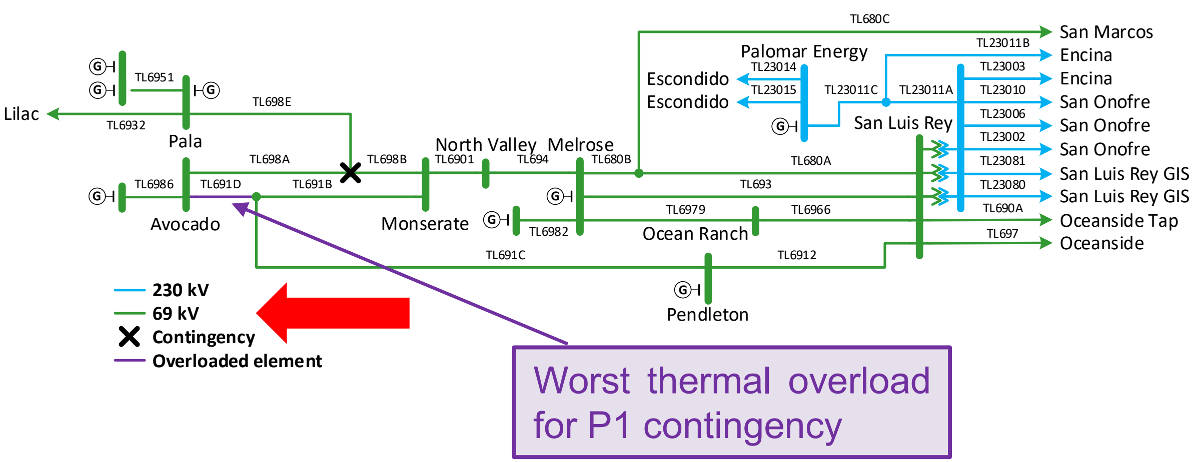
- P1, P2, P3, P4, P5 and P6 thermal overloads: 100% → 134% of normal rating for TL6966 in B3, B4, B5, B6 and S2 cases
- P1 and P3 thermal overloads: 104% → 111% of normal rating for TL693 in B4 and S2 cases

Potential Mitigation

- Congestion management
  - B3 case: Increase Pala gas gen and dispatch Melrose BESS before P1 contingency and increase Melrose BESS and dispatch Avocado BESS after P1 contingency
  - B5 and S2 cases: Limit the charging of Melrose and Avocado BESS
- B4 and B6 cases: Reconductor TL6966 and congestion management for TL693

Pala Load Pocket – 69 kV Thermal Overloads (2/2)





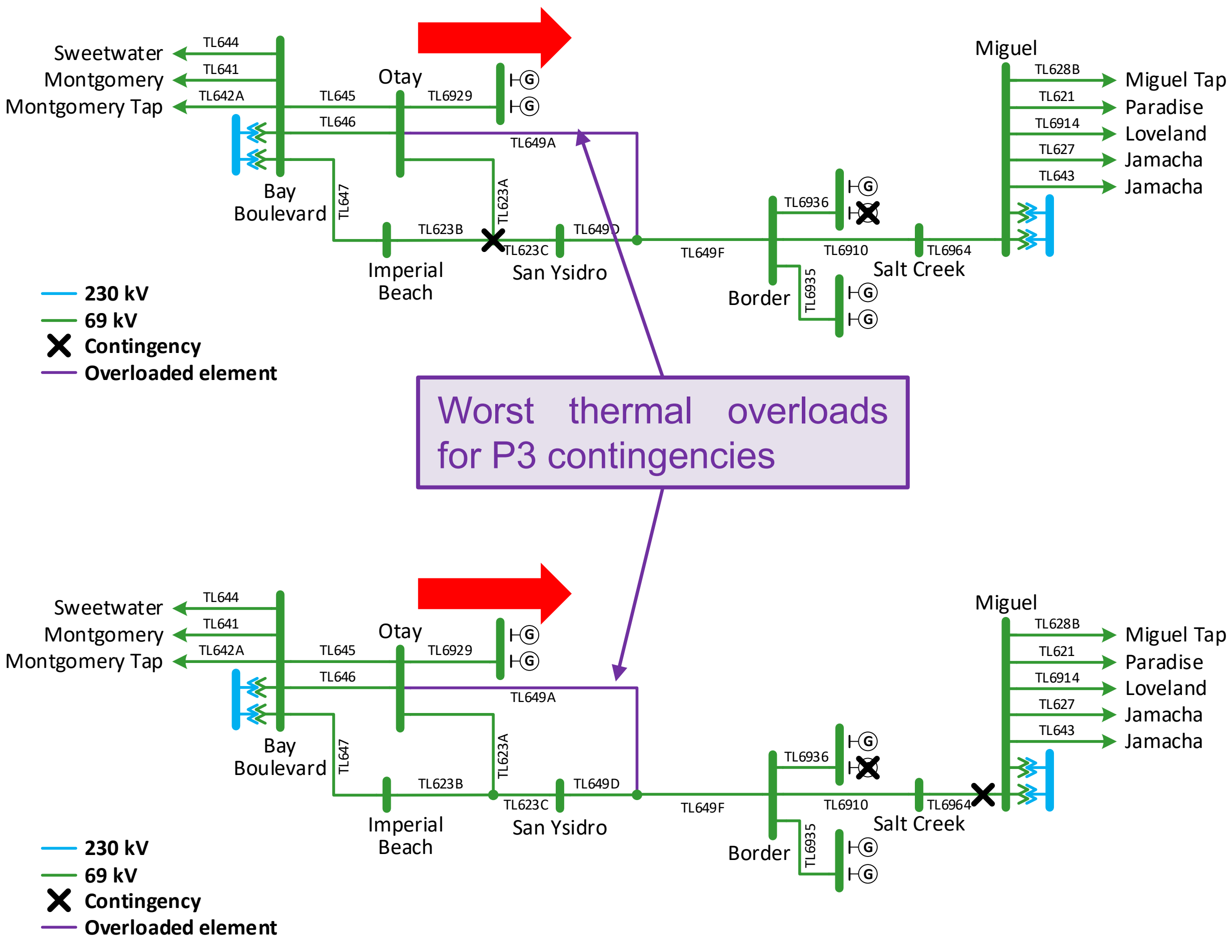
Reliability Concern

- P1, P2, P3 and P6 thermal overloads: 103% → 131% of 9-hr rating for TL6912 in B4, B5 and S2 cases
- P3 thermal overloads: 111% of 9-hr rating for TL6901 in S2 case
- P1 and P3 thermal overloads: 101% → 119% of normal rating for TL694 in B4, B5 and S2 cases
- P1 and P2 thermal overloads: 115% → 122% of normal rating for TL691D in B5 and S2 cases
- P1 thermal overload: 100% of 9-hr rating for TL691B in B5 case

Potential Mitigation

- Existing Avocado RAS for TL698 contingency and TL691D overload
- Congestion management
  - B4 case: Increase Pala gas gen and dispatch Avocado BESS
  - B5 and S2 cases: Limit the charging of Melrose, Avocado and Pendleton BESS before P1 contingencies that are not monitored by the Avocado RAS and additional Avocado and Pendleton BESS charging reduction after P1 contingencies

Border Load Pocket – 69 kV Thermal Overloads (1/2)



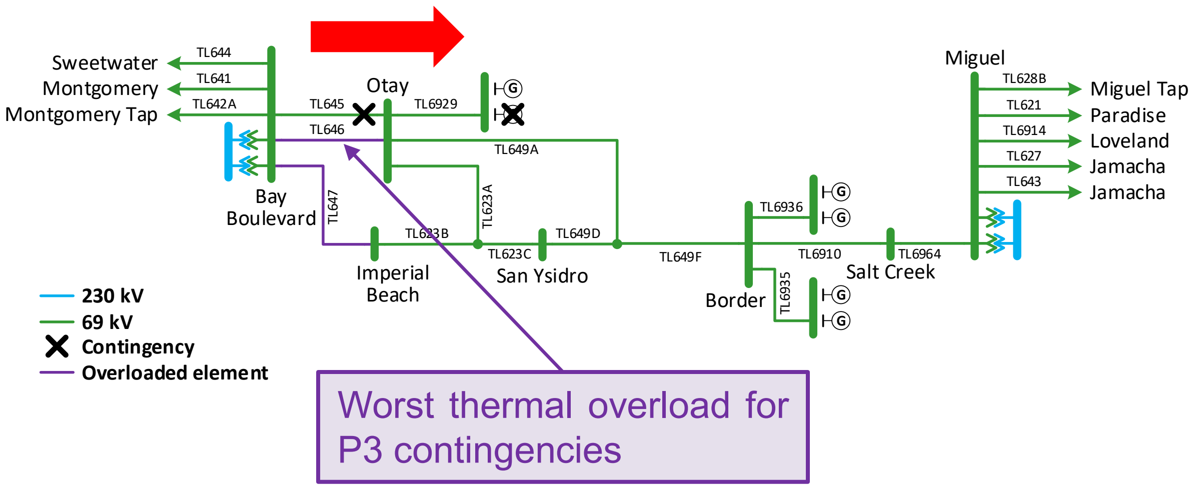
Reliability Concern

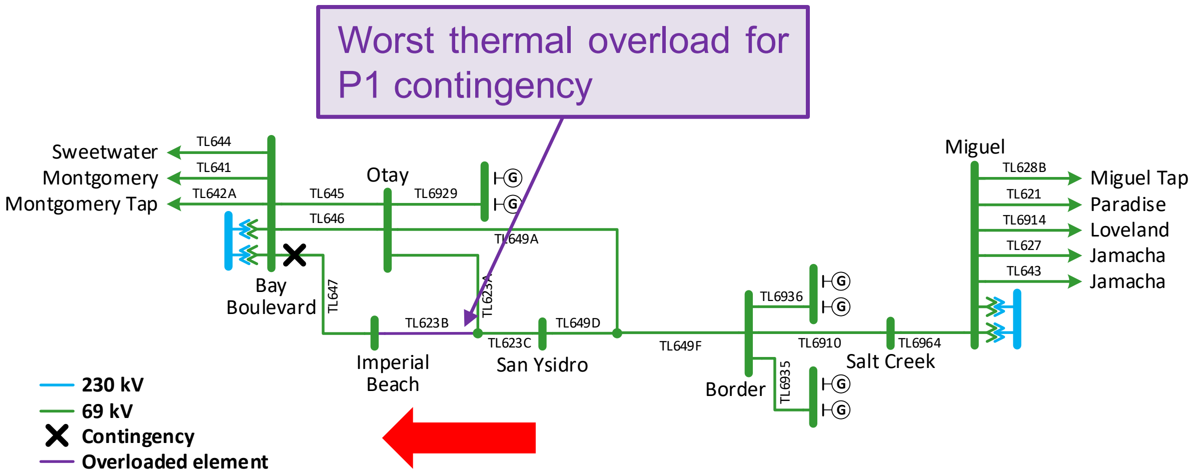
- P0, P1, P3, P4 and P6 thermal overloads: 102% → 285% of normal rating for TL649A in B3, B4, B5, B6, B8, S1, S2 and S3 cases

Potential Mitigation

- Congestion management
  - B3, S1 and S3 cases: Increase Border gas gen and/or dispatch Border BESS
  - B5, B8 and S2 cases: TL649 RAS to reduce Border BESS charging
- B4 and B6: Reconductor TL649A
- The mitigation identified for B3 case might not be sufficient for the load pocket peak load in 2036, which would occur at HE 24, driven by TE load.

Border Load Pocket – 69 kV Thermal Overloads (2/2)





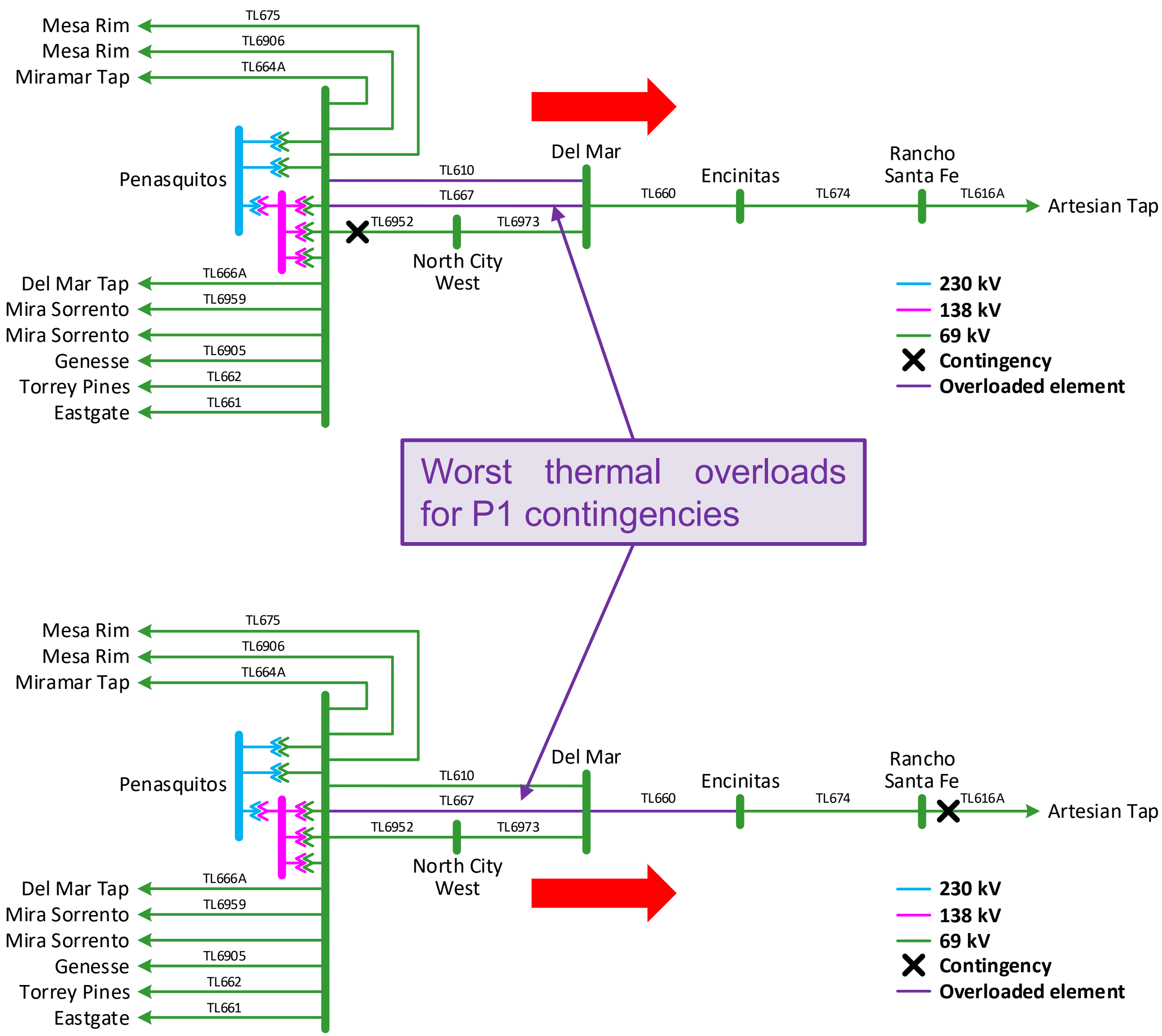
Reliability Concern

- P1 and P3 thermal overloads: 102% → 171% of normal rating for TL645 in B4 and B6 cases
- P1, P3, P4 and P6 thermal overloads: 100% → 181% of normal rating for TL646 in B4, B5, and B6 cases
- P0, P1, P3, P4 and P6 thermal overloads: 101% → 175% of normal rating for TL647 in B3, B4 and B6 cases
- P1 thermal overload: 112% of normal rating for TL623B in B4 case

Potential Mitigation

- B3 case: 30-min emergency rating for TL647
- Congestion management
  - B3 case: Dispatch Border or Otay BESS
  - B5 case: Limit Border or Otay BESS charging
- B4 and B6: Reconductor TL623B, TL645, TL646 and TL647
- The mitigation identified for B3 case might not be sufficient for the load pocket peak load in 2036, which would occur at HE 24, driven by TE load.

Del Mar Load Pocket – 69 kV Thermal Overloads



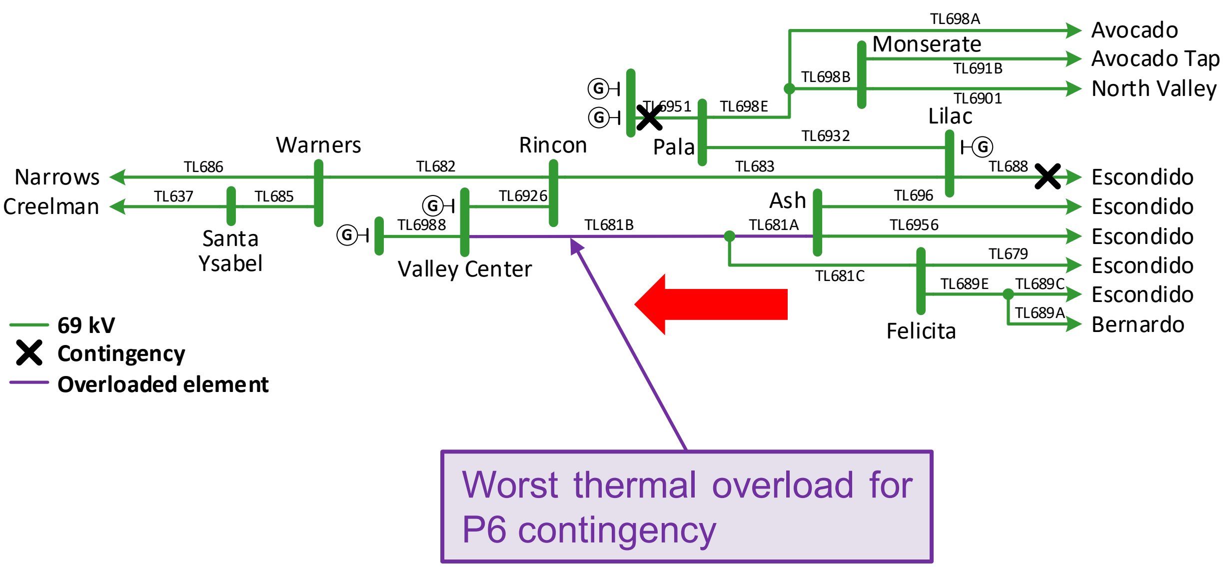
Reliability Concern

- P1, P2 and P3 thermal overloads: 114% → 128% of normal rating for TL610 in B4 and B6 cases
- P1, P3, P4, P5, P6 and P7 thermal overloads: 100% → 167% of normal rating for TL667 in B4 and B6 cases
- P1 thermal overloads: 103% → 110% of 9-hr rating for TL660 in B4 and B6 cases
- P1 thermal overload: 103% of normal rating for TL6952 in B4 case

Potential Mitigation

- B4 and B6: Reconductor TL610, TL667, TL660 and TL6952 or new transmission line, if feasible
- There might be a need to reconductor some these lines by 2036 since the load pocket peak load would occur at HE 24, driven by TE load.

Valley Center BESS charging – 69 kV Thermal Overloads



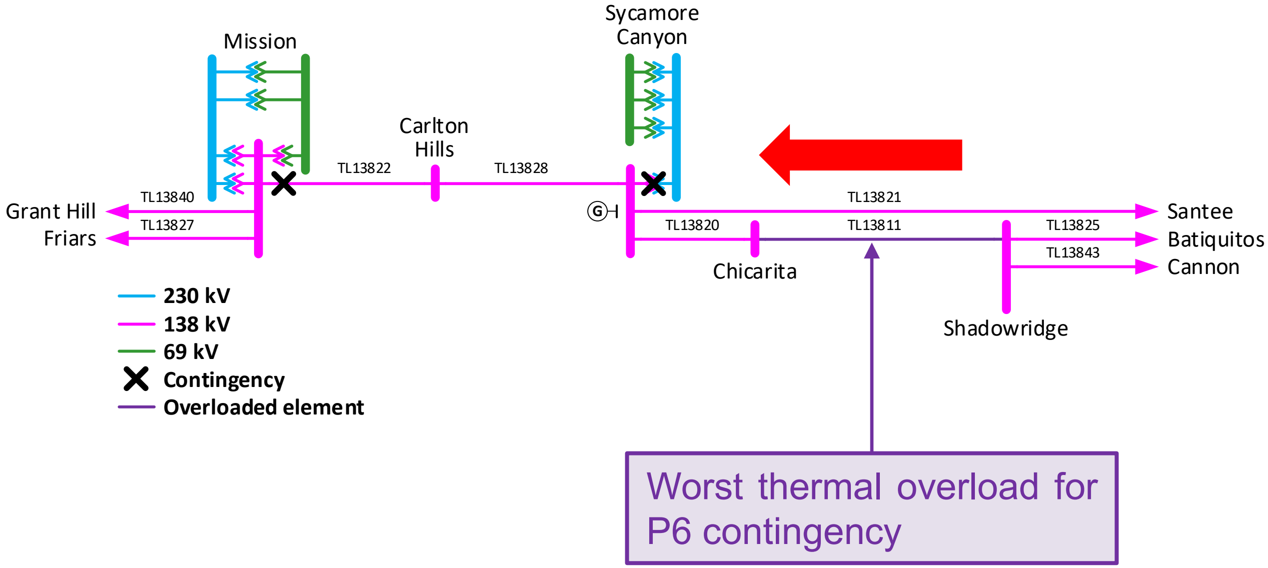
Reliability Concern

- Congestion management was needed to mitigate P0 overload of TL681B in S2 case
- P1, P2, P3, P6 and P7 thermal overloads: 100% → 130% of 9-hr rating for TL681B in S2 case
- P6 thermal overload: 104% of 9-hr rating for TL681A in S2 case
- P1 thermal overload: 100% of normal rating for TL6926 in S2 case
- P3 thermal overloads: 103% of normal rating for TL688 in S2 case

Potential Mitigation

- Congestion management
  - On the short-term, limit the charging of BESS, mainly outside daylight hours, to protect against the P0 overloads.
  - Existing Valley Center RAS to mitigate remaining P1 overloads
- Valley Center System Improvement project (ISD Jan-2031)

138 kV TL13811 Chicarita – Shadowridge



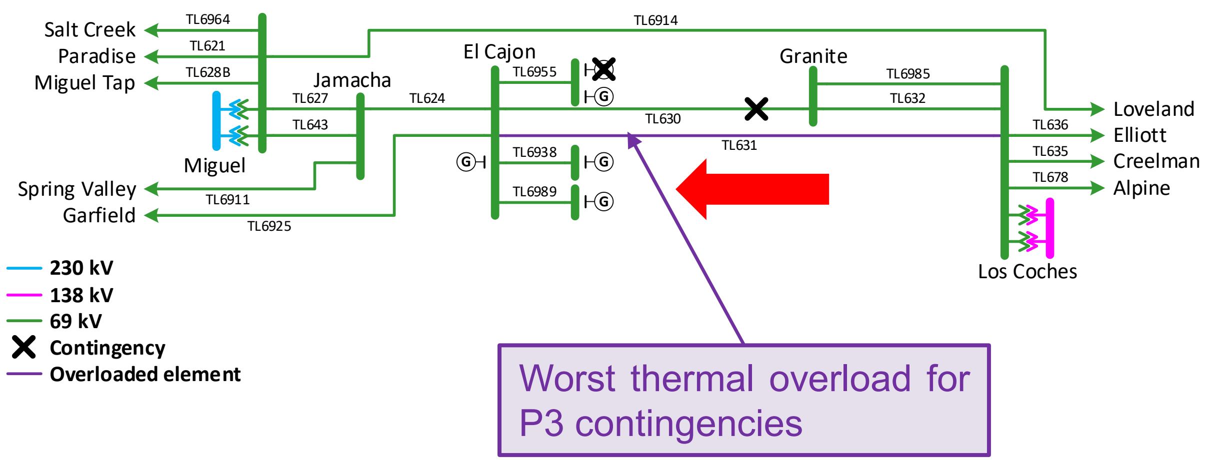
Reliability Concern

- P6 thermal overload: 101% of normal rating for TL13811 in B5 case

Potential Mitigation

- Congestion management
  - Reduce charging of Sycamore Canyon BESS

El Cajon Load Pocket – 69 kV Thermal Overloads



Reliability Concern

- P2 and P3 thermal overloads: 101% → 104% of normal rating for TL631 in B5 and S1 cases

Potential Mitigation

- Congestion management
  - B5 case: Limit the charging of El Cajon BESS
- S1 case: Continue to monitor P2 overload

Other 2041 Summer and Winter Peak Overloads in Sub-transmission system

Overloaded Element	Contingencies	B4	B6
TL690D Stuart – Stuart Tap	P0	X	
TL13837 Capistrano – Laguna Niguel	P1 and P4	X	
TL13847 Capistrano – Laguna Niguel	P1 and P4	X	
TL629B Glencliff – Glencliff Tap	P3	X	
TL6914 Miguel – Loveland	P3	X	
Escondido 230/69 kV BK 71	P4	X	X
TL6916 Sycamore Canyon – Scripps	P6	X	
TL13826 Miguel – Proctor Valley	P6	X	

Substation	Contingencies	B4	B6
Alpine 69 kV	P3	X	
Barrett 69 kV	P3	X	
Cameron 69 kV	P3	X	
Descanso 69 kV	P3	X	
Glencliff 69 kV	P3	X	
Loveland 69 kV	P3	X	
Crestwood 69 kV	P3	X	
Kumeyaay 69 kV	P3	X	

- The thermal overloads were marginal in 2041 Summer and Winter Peak cases.
- The voltage deviation at these substations exceed 8% in the 2041 Summer Peak case. Due to the radial nature of these 69 kV substations, no system adjustments can be performed to reduce the post contingency voltage deviation.
- The ISO will continue to monitor them in future planning cycles.

Transient Stability Analysis

- Performed for B2, B3, B5, B7, S2, and S3 cases

- 80 credible contingencies were evaluated for all cases and 6 additional contingencies in the B3 and B5 cases due to the addition of the North Gila – Imperial Valley No. 2, Imperial Valley – Recon, and Recon – Serrano 500 kV transmission lines and 230 kV transmission lines that loop-in into Recon substation
  - Includes P1, P3, P5.5, P6 and P7

- High-frequency oscillations were observed in the B3 and B5 cases when faults were applied at the Imperial Valley Substation. These oscillations were caused by the dynamic models representing the generic geothermal resources connected at IID's Wixom Substation

- No WECC criteria violations were observed

Summary of potential new upgrades

- The ISO and the PTO will perform load pocket studies to determine whether transmission upgrades will be required within the 10-year planning horizon due to transportation electrification-driven load growth.

- For mitigations that rely on BESS dispatch, the ISO will verify that the BESS has sufficient energy capacity (MWh) and can be fully charged when needed.

Energy-Only Resources Assessment Preliminary Findings

Binaya Shrestha
Manager, Regional Transmission Engineer-North

2026-2027 Transmission Planning Process Stakeholder Meeting
September 23-24, 2026

Background

- Several parties propose recognizing Energy Only (EO) resources under the CPUC's Slice of Day framework to support battery charging sufficiency beyond their POI and, in some proposals, RA requirements.
- The ISO can inform this discussion by evaluating whether EO resources can reliably deliver energy across the transmission system to charge batteries during off-peak hours and identifying associated transmission constraints.
- In the 2026–2027 TPP Study Plan, the ISO identified the 2036 summer off-peak scenario to serve dual purpose, first to serve as an off-peak study condition to meet the TPL-001 requirement and second to evaluate EO resources' ability to reliably support battery charging.
- The 2036 summer off-peak scenario was developed with: Maximum battery charging, to the extent feasible; Load representing typical late morning on a summer peak day; and High dispatch of solar and other FCDS resources.
- Preliminary results posted on August 14 identified thermal overloads and voltage concerns across the scenarios studied, including the 2036 summer off-peak scenario.
- This presentation provides additional analysis of EO resource curtailment associated with the identified overloads to assess the extent to which EO generation contributes to transmission constraints.

2036 Summer Off-Peak Scenario North Area Energy-Only Resources Assessment

Energy Only Generation Curtailment				
Study Area	**Energy Only Solar (MW) Installed Capacity**	**Contingency Type**		
		P0	**P1**	**P7**
Humboldt	559	No	No	No
NCNB	0	N/A	N/A	N/A
NVLY	545	No	No	No
GBA	554	No	Yes	Yes
CVLY	309	No	No	No
Fresno	2,565	Yes	Yes	Yes
Kern	2,125	No	Yes	Yes
CCLP	595	Yes	Yes	Yes

2036 Summer Off-Peak Scenario South Area Energy-Only Resources Assessment

Energy Only Generation Curtailment				
Study Area	**Energy Only Solar (MW) Installed Capacity**	**Contingency Type**		
		P0	**P1**	**P7**
Tehachapi/Big Creek	2,702	No	No	No
NOL	683	No	No	No
Eastern	12,777	No	No	No
Metro	483	No	No	No
Ventura	0	No	No	No
East Of Pisgah	2,128	No	No	Yes
VEA	1,599	No	No	Yes
SDG&E	5,420	No	Yes	No

Next Steps

November stakeholder meeting:

- Additional information on EO curtailment amounts and locations.
- Information on FCDS curtailment amounts and locations.
- Information on BESS being unable to charge due to transmission constraints and locations.
- Preliminary conclusions based on all available information.

Coordination with CPUC and other Local Regulatory Agencies.

Inclusion in the 2026-27 draft transmission plan.

Transmission Program Impact on High Voltage TAC *Estimating Model – 2025-2026 TPP Version*

Yara Khalaf
Senior Regional Transmission Planner

2026-27 Transmission Planning Process Stakeholder Meeting

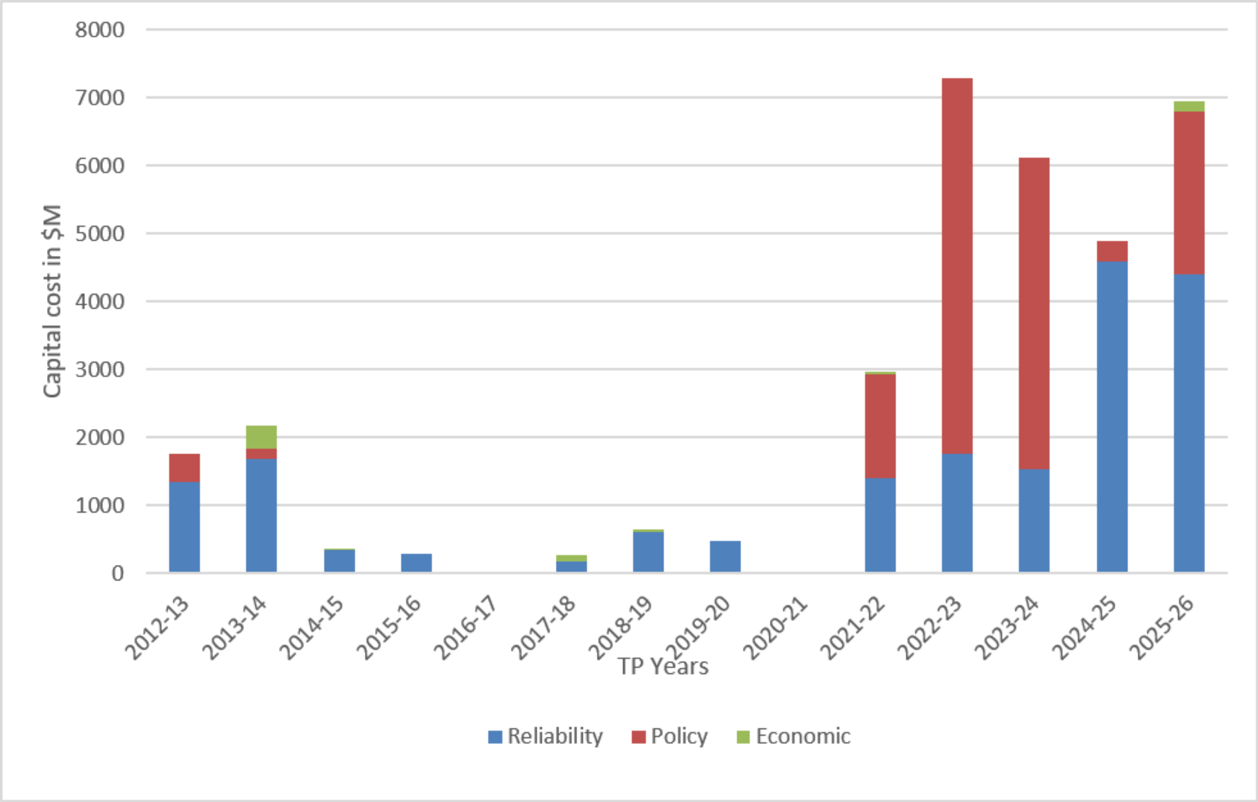
Background

- Forecasting tool developed for the 2012-2013 Transmission Plan in response to concerns over increasing upward pressure on transmission costs.
  - Replacing aging infrastructure
  - Complying with NERC planning standards
  - Meeting California energy policy goals
- Goal is to estimate future high voltage transmission access costs in an objective and transparent manner.
  - Strike a balance of top down estimates with bottom up details
  - Provides transparency to costs related to reliability, policy, and economic driven projects
  - Establish a baseline and allows the flexibility to customize each future project individually
  - Is not a precise forecast of any individual PTO's revenue requirement or any individual project's revenue requirement

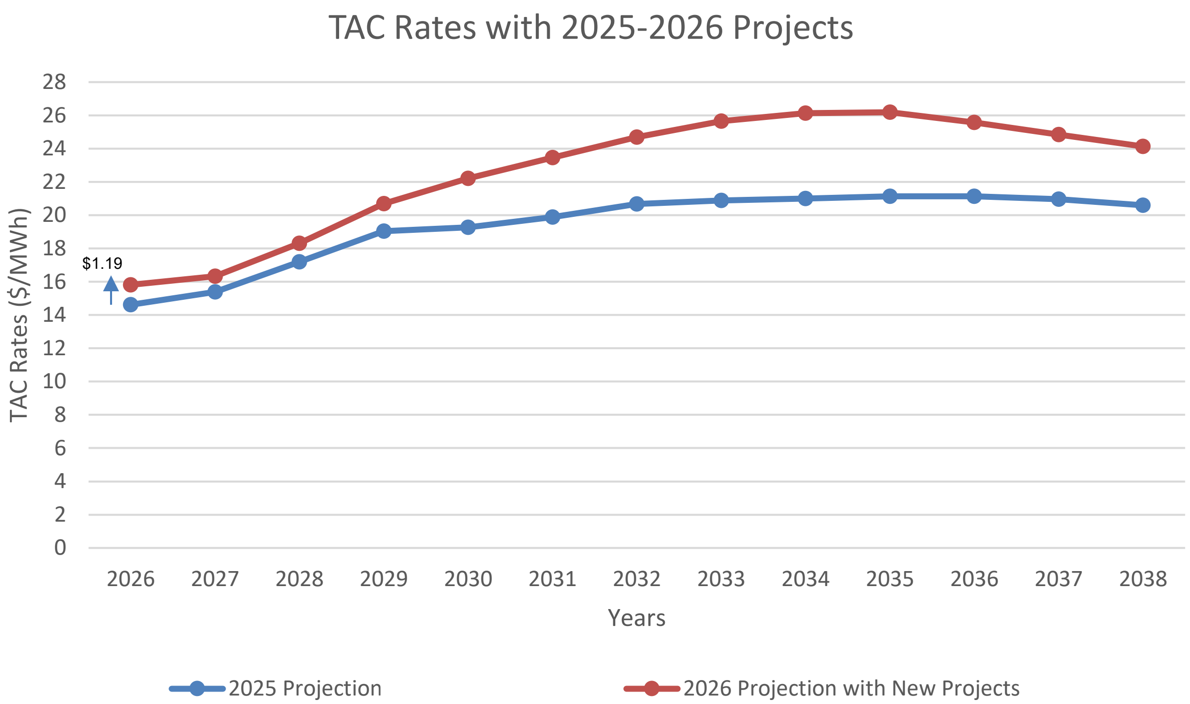
Model and modeling assumptions essentially unchanged from previous years, except for the gross load growth rate:

- O&M costs escalated at 2% per year.
- Non-ISO capital estimated at 2% of gross plant per year
- “Typical” return and depreciation rates applied.

Comparison of capital projects approved in the 2024-2025 plan and ten previous years:



Regional high voltage transmission access charge projection trended from January 1, 2025 values:



* Existing returns are maintained for existing PTO rate base, and 11% return on equity is assumed for new transmission capital.

Compared to the 2024-2025 model:

- The 2025-2026 projections are higher than 2024-2025 projections which is primarily attributable to:
  – increase of $1.19 from last year’s projection for January 1, 2026 to this year’s actuals reflects the increase in Transmission Revenue Balancing Account Adjustments (TRBAA) and TRR above historical projections.

- The projection also includes capital projects in 2025-2026 plan and all other transmission plan projects not already energized.

Next Steps

- Continue to refine assumptions and costs based on comments received for use in the 2025-2026 transmission plan
- Provide incremental annual updates as part of the annual transmission planning process
- Please submit your comments through the ISO’s commenting tool, using the template provided on the process webpage: https://stakeholdercenter.caiso.com/RecurringStakeholderProcesses

2026-2027 TPP Stakeholder Meeting - Agenda

Topic	Presenter
Day 1 - September 23	
Overview	Andrew Rivera
Preliminary Reliability Assessment - North	RT North Engineers
Preliminary Reliability Assessment - South	RT South Engineers
High Voltage TAC Update	Yara Khalaf
Day 2 - September 24	
PTO Proposed Reliability Solutions	PG&E, SCE, GLW, SDG&E
Policy Driven Assessment Update	Meng Zhang
Economic Driven Assessment Update	Yi Zhang
Wrap up	Yelena Kopylov-Alford