

2021-2022 ISO Reliability Assessment - Preliminary Study Results

Study Area: PG&E Bulk

Thermal Overloads



Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Loading % (Baseline Scenarios)							Loading % (Sensitivity Scenarios)			Project & Potential Mitigation Solutions
				2023 Summer Peak	2026 Summer Peak	2031 Summer Peak	2023 Spring Off- Peak	2026 Spring Off- Peak	2031 Spring Off- Peak	2031 Winter Off- Peak	2023 SP Heavy Renewable & Min Gas Gen	2026 SP High CEC Forecast	2023 SpOP Hi Renew & Min Gas Gen	
500 kV LINES														
MALIN-ROUND MTN # 2 500 kV	Diablo unit and Capt Jack-Olinda 500 kV	P3	G-1/L-1	<95%	N/A	N/A	96.7%	<95%	<95%	<95%	<95%	<95%	<95%	Reduce COI flow according to seasonal nomogram
MALIN-ROUND MTN # 2 500 kV	Diablo unit and Malin-Round Mtn # 1 500 kV	P3	G-1/L-1	109.3%	N/A	N/A	107.5%	<95%	<95%	<95%	104.2%	<95%	<95%	
MALIN-ROUND MTN # 1 500 kV	Diablo unit and Malin-Round Mtn # 2 500 kV	P3	G-1/L-1	95.7%	N/A	N/A	<95%	<95%	<95%	<95%	<95%	<95%	<95%	
ROUND MTN –TABLE MTN #1 or #2 500 kV	Rnd Mtn –Table Mtn #2 or # 1 500 kV	P1	L-1	102.7%	N/A	N/A	97.0%	N/A	N/A	<95%	99.9%	N/A	<95%	Install SPS to bypass series capacitors on the remaining Round Mtn-Table Mtn 500 kV line if overload. With Diablo unit out, need to reduce COI flow after first contingency to avoid voltage collapse when series caps are bypassed
	Round Mtn-Table Mtn # 2 or # 1 500 kV and Diablo unit	P3	G-1/L-1	115.8%	N/A	N/A	109.4%	N/A	N/A	<95%	114.1%	N/A	<95%	
	Round Mtn-Table Mtn # 1 and Table Mtn 500/230 kV	P6	L-1/T-1	105.1%	N/A	N/A	100.1%	N/A	N/A	<95%	104.6%	N/A	<95%	
ROUND MTN-TABLE MTN # 1 500 kV	Round Mtn-Table Mtn # 2 and Table Mtn 500/230 kV	P2/P6	BRK	105.0%	N/A	N/A	99.3%	N/A	N/A	<95%	103.9%	N/A	<95%	
ROUND MTN –ROUND MT STATCOM #1 or #2 500 kV	Round Mtn - Round Mtn Statcom # 1 or 2 500 kV	P1	L-1	N/A	112.0%	115.3%	N/A	<95%	<95%	<95%	N/A	112.1%	N/A	bypass series capacitors on Round Mtn and Table Mtn on both lines
TABLE MTN –ROUND MT STATCOM #1 or #2 500 kV	Table Mtn - Round Mtn Statcom # 1 or 2 500 kV	P1	L-1	N/A	103.0%	107.5%	N/A	<95%	<95%	<95%	N/A	102.8%	N/A	
	Round Mtn Statcom - Table Mtn # 1 500 kV and Table Mtn 500/230 kV	P6	L-1/T-1	N/A	105.5%	109.1%	N/A	<95%	<95%	<95%	N/A	105.3%	N/A	
TABLE MTN –ROUND MT STATCOM #1 500 kV	Round Mtn Statcom-Table Mtn # 2 and Table Mtn 500/230 kV	P2	BRK	N/A	105.3%	108.9%	N/A	<95%	<95%	<95%	N/A	105.2%	N/A	
TABLE MTN-TESLA 500 kV	Table Mtn-Vaca Dix 500 kV and Diablo unit	P3	G-1/L-1	<95%	N/A	N/A	<95%	N/A	N/A	N/A	101.3%	N/A	<95%	reduce COI flow after first contingency
MIDWAY-WHIRLWIND # 3 500 kV	Midway-Vincent # 1 and 2 500 kV	P7	L-2	147.4%	<95%	<95%	<95%	<95%	142.3%	<95%	151.0%	<95%	154.7%	944 MW tripped for 2023 Summer peak, 833 MW for 2023 off-peak with high renewables. Need to trip 1400 MW of generation at Midway. Not enough generation to trip in 2023 with high renewables. Insufficient reactive margin in 2023 peak if trip more generation at Midway. Modify RAS for Path 26.
MIDWAY-VINCENT # 1 500 kV	Midway-Vincent # 2 and Midway-Whirlwind	P6	L-1/L-1	108.4%	<95%	<95%	<95%	<95%	108.3%	<95%	103.1%	<95%	114.8%	
MIDWAY-VINCENT # 2 500 kV	Midway-Vincent # 1 and Midway-Whirlwind 500 kV	P6	L-1/L-1	110.2%	<95%	<95%	<95%	<95%	106.2%	<95%	105.4%	<95%	117.1%	
500/230 kV TRANSFORMERS														
	Olinda 500/230 kV transformer	P1	T-1	<95%	<95%	<95%	<95%	118.0%	124.2%	97.1%	<95%	<95%	<95%	
	Captain Jack-Olinda 500 kV	P1	L-1	<95%	<95%	<95%	<95%	107.9%	109.4%	<95%	<95%	<95%	<95%	
	Round Mtn-Statcom # 2 500 kV	P1	L-1	<95%	<95%	<95%	<95%	<95%	<95%	<95%	<95%	<95%	<95%	
	Table Mtn 500/230 kV transformer and Table Mtn-Statcom # 1 or 2 500 kV	P2/P6	BRK	N/A	<95%	<95%	N/A	<95%	98.5%	<95%	N/A	<95%	N/A	

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ROUND MTN 500/230 kV transformer	Captain Jack-Olinda 500 kV and Olinda 500/230 kV transformer	P6	L-1/T-1	<95%	<95%	<95%	<95%	123.6%	128.8%	95.7%	<95%	<95%	<95%	Reduce COI flow according to the nomogram, reduce generation in the area
	Olinda 500/230 kV transformer and Olinda-Tracy 500 kV line	P6	L-1/T-1	<95%	<95%	<95%	<95%	124.0%	131.6%	98.9%	<95%	<95%	<95%	
	Olinda-Tracy 500 kV and Captain Jack-Olinda 500 kV	P6	L-1/L-1	<95%	<95%	<95%	<95%	124.0%	128.5%	95.6%	<95%	<95%	<95%	
	Round Mnt-Round Mnt Statcom # 1 and #2 500 kV	P7	L-2	<95%	<95%	<95%	<95%	123.7%	125.2%	<95%	<95%	<95%	N/A	
	Table Mnt-Round Mnt Statcom # 1 and #2 500 kV	P7	L-2	<95%	<95%	<95%	<95%	125.0%	127.9%	<95%	<95%	<95%	N/A	
	Table Mt -Vaca Dix 500 kV and Table Mt 500/230 kV	P6	L-1/T-1	<95%	<95%	<95%	<95%	<95%	107.6%	<95%	<95%	<95%	<95%	
	Table Mt -Tesla 500 kV and Table Mt 500/230 kV	P6	L-1/T-1	<95%	<95%	<95%	<95%	<95%	103.5%	<95%	<95%	<95%	<95%	
	Malin-Round Mtn #1 and #2 500 kV	P7	L-2	<95%	96.3%	<95%	<95%	<95%	<95%	<95%	<95%	<95%	<95%	
TABLE MTN 500/230 kV transformer	normal conditions	P0	normal	<95%	<95%	<95%	<95%	97.0%	<95%	<95%	<95%	<95%	<95%	Reduce COI flow according to the nomogram, or reduce generation in the area
	Table Mtn-Vaca Dix or Table Mtn-Tesla 500 kV	P1	L-1	<95%	<95%	<95%	<95%	98.3%	<95%	<95%	<95%	<95%	<95%	
	Captain Jack-Olinda 500 kV	P1	L-1	<95%	<95%	<95%	<95%	100.8%	<95%	<95%	<95%	<95%	<95%	
	Olinda 500/230 kV	P1	T-1	<95%	<95%	<95%	<95%	97.6%	<95%	<95%	<95%	<95%	<95%	
	Olinda-Tracy 500 kV	P1	L-1	<95%	<95%	<95%	<95%	98.0%	<95%	<95%	<95%	<95%	<95%	
	Round Mtn 500/230 kV transformer	P1	T-1	<95%	<95%	<95%	<95%	100.8%	<95%	<95%	<95%	<95%	95.0%	
	Vaca Dix 500 kV stuck BRK- lines to Table Mtn & transformer #11	P2/P6	BRK	<95%	<95%	<95%	<95%	99.8%	<95%	<95%	<95%	<95%	<95%	
	Round Mtn 500 kV stuck BRK- line to Table Mtn # 2 & transformer	P2/P6	L-1/T-1	<95%	<95%	<95%	<95%	101.5%	<95%	<95%	<95%	<95%	95.9%	
	Round Mtn 500 kV stuck BRK- line to Malin # 1 & transformer	P2/P6	BRK	<95%	<95%	<95%	<95%	101.3%	<95%	<95%	<95%	<95%	<95%	
	Round Mt -Table Mt # 1 and Round Mt 500/230	P2/P6	BRK	<95%	<95%	<95%	<95%	101.5%	96.3%	<95%	<95%	<95%	96.9%	
	Olinda-Tracy 500 kV and Olinda 500/230 kV transformer	P6	L-1/T-1	<95%	<95%	<95%	<95%	101.4%	95.6%	<95%	<95%	<95%	<95%	
	Table Mtn-Vaca Dix and Table Mtn-Tesla 500 kV	P7	L-2	<95%	<95%	<95%	<95%	104.1%	97.7%	<95%	<95%	<95%	<95%	
	Table Mtn-Tesla and Vaca Dix-Tesla 500 kV	P7	L-2	<95%	<95%	<95%	<95%	102.1%	<95%	<95%	<95%	<95%	<95%	
TESLA 500/230 kV # 6 transformer	Tesla-Metcalf and MossIndg-Los Banos 500 kV	P6	L-1/L-1	<95%	<95%	<95%	<95%	<95%	<95%	<95%	98.3%	<95%	<95%	sensitivity only
METCALF 500/230 kV transformer #11, 12 or 13	Metcalf 500/230 kV Tranformers #11 & #12 or #13	P6	T-1/T-1	99.0%	97.4%	101.7%	104.2%	<95%	<95%	<95%	142.3%	100.4%	<95%	- Increase generation in the area after 1st contingency, - load tripping still might be required to address the P6 overload.
LOS BANOS 500/230 kV transformer	Gates 500/230 kV # 11 and # 12 transformers	P6	T-1/T-1	<95%	<95%	<95%	<95%	<95%	117.6%	<95%	<95%	<95%	<95%	reduce generation in the area

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GATES 500/230 kV # 11 transformer	Gates 500/230 kV # 12 transformer	P1	T-1	<95%	<95%	<95%	<95%	113.7%	146.3%	<95%	119.9%	<95%	122.6%	reduce generation in the area or install SPS to trip generation at Gates.
	Gates-Diablo 500 kV and Gates 500/230 # 12	P6	L-1/T-1	<95%	<95%	<95%	<95%	<P1	<P1	<95%	123.9%	<95%	131.5%	
	LOSBANOS 230/500kV & GATES 230/500kV # 12	P6	T-1/T-1	<95%	<95%	<95%	<95%	125.6%	165.5%	<95%	129.2%	<95%	133.9%	
	MIDWAY 230/500 kV # 11, 12 or 13 & GATES 230/500kV #12	P6	T-1/T-1	<95%	<95%	<95%	<95%	118.7%	155.8%	<95%	127.1%	<95%	130.3%	
	Any two MIDWAY 230/500kV transformers	P6	T-1/T-1	<95%	<95%	<95%	<95%	<95%	101.0%	<95%	<95%	<95%	<95%	
	Gates 500/230 kV # 12 transformer and Diablo unit	P3	G-1/T-1	<95%	N/A	<95%	<95%	N/A	N/A	N/A	125.1%	<95%	128.9%	
GATES 500/230 kV # 12 transformer	Gates 500/230 kV # 11 transformer	P1	T-1	<95%	<95%	<95%	<95%	115.6%	151.9%	<95%	124.0%	<95%	127.3%	reduce generation in the area or install SPS to trip generation at Gates.
	Los Banos 500/230 kV transformer	P1	T-1	<95%	<95%	<95%	<95%	<95%	105.4%	<95%	<95%	<95%	<95%	
	Midway 500/230 kV transformer # 11,12 or 13	P6	T-1/T-1	<95%	<95%	<95%	<95%	<95%	100.1%	<95%	<95%	<95%	<95%	
	Gates-Diablo 500 kV and Gates 500/230 # 11	P6	L-1/T-1	<95%	<95%	<95%	<95%	<P1	<P1	<95%	128.1%	<95%	131.5%	
	LOSBANOS 230/500kV & GATES 230/500kV #11	P6	T-1/T-1	<95%	<95%	<95%	<95%	128.0%	171.5%	<95%	133.4%	<95%	138.9%	
	MIDWAY 230/500kV & GATES 230/500kV #11	P6	T-1/T-1	<95%	<95%	<95%	<95%	121.0%	161.7%	<95%	131.4%	<95%	135.2%	
	Any two MIDWAY 230/500kV transformers	P6	T-1/T-1	<95%	<95%	<95%	<95%	<95%	112.4%	<95%	<95%	<95%	95.9%	
	Gates 500/230 kV # 11 transformer and Diablo unit	P3	G-1/T-1	<95%	<95%	<95%	<95%	N/A	N/A	N/A	129.9%	<95%	134.2%	
MIDWAY 500/230 kV transformer # 11, 12 or 13	Any two MIDWAY 230/500kV transformers	P6	T-1/T-1	<95%	<95%	<95%	<95%	<95%	107.2%	<95%	<95%	<95%	<95%	reduce generation at Midway after first contingency, or use Midway SPS
230 kV LINES														
COTTONWD E-ROUND MTN 230kV #2	Table Mtn-Vaca Dix and Table Mtn-Tesla 500 kV	P7	L-2	<95%	<95%	98.5%	<95%	<95%	<95%	<95%	107.5%	<95%	<95%	Reduce COI flow according to seasonal nomogram, or upgrade the line if economic.
COTTONWD E-ROUND MTN 230kV #3	Table Mtn-Vaca Dix and Table Mtn-Tesla 500 kV	P7	L-2	104.8%	102.4%	108.6%	<95%	<95%	<95%	<95%	118.5%	102.2%	<95%	
TABLE MTN-RIO OSO 230 kV	Tbl Mtn-Vaca Dix 500 kV and Table Mtn-Palermo 230 kV	P6	L-1/L-1	101.1%	101.4%	111.5%	<95%	<95%	<95%	<95%	<95%	101.9%	<95%	Project: Rio Oso 230 kV BAAH Bus Upgrade Project ISD: Dec 2022, currently delayed, not modeled Short term: COI Nomogram, or redispatch generation after first contingency
	Table Mtn-Vaca Dix and Table Mtn-Tesla 500 kV	P7	L-2	104.7%	103.2%	112.9%	<95%	<95%	<95%	<95%	101.8%	103.5%	<95%	
	Tesla-Vaca Dix 500 kV and Diablo unit	P3	G-1/L-1	95.5%	N/A	N/A	<95%	N/A	N/A	N/A	<95%	N/A	<95%	
	Tesla-Metcalf 500 kV and Diablo unit	P3	G-1/L-1	96.0%	N/A	N/A	<95%	N/A	N/A	N/A	<95%	N/A	<95%	
	Tesla-Metcalf 500 kV and Tesla 500/230 # 2	P2/P6	BRK/or N-2	96.2%	<95%	<95%	<95%	<95%	<95%	<95%	<95%	<95%	<95%	

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CAYETANO- LONETREE 230 kV	Tesla-Metcalf and Metcalf-Moss Landing 500 kV	P6	L-1/L-1	100.7%	<95%	98.2%	<95%	<95%	<95%	<95%	<95%	<95%	<95%	Also, P6 500 kV and 230 kV lines. Reduce generation in the area
	Tesla-Metcalf & Mossland-LosBanos 500 kV	P6	L-1/L-1	100.7%	<95%	97.7%	<95%	<95%	<95%	<95%	<95%	<95%	<95%	
	Tesla-Metcalf & Tesla-Los Banos 500kV	P6	L-1/L-1	96.5%	<95%	95.18%	<95%	<95%	<95%	<95%	<95%	<95%	<95%	
	Vaca Dix-Tesla & Tesla-Metcalf 500 kV	P6	L-1/L-1	100.1%	<95%	98.9%	<95%	<95%	<95%	<95%	<95%	<95%	<95%	
LAS POSITAS-NEWARK 230 KV	Tesla-Metcalf and Metcalf-Moss Lading 500 kV	P6	L-1/L-1	95.2%	<95%	99.2%	<95%	<95%	<95%	<95%	<95%	<95%	<95%	
	Vaca Dix-Tesla & Tesla-Metcalf 500 kV	P6	L-1/L-1	95.4%	<95%	100.5%	<95%	<95%	<95%	<95%	<95%	<95%	<95%	
	Tesla-Metcalf & Mossland-LosBanos 500 kV	P6	L-1/L-1	96.1%	<95%	98.6%	<95%	<95%	<95%	<95%	<95%	<95%	<95%	
NEWARK-LOS ESTEROS 230 kV	Tesla-Metcalf and MossIndg-Los Banos 500 kV	P6	L-1/L-1	<95%	<95%	<95%	<95%	<95%	<95%	<95%	diverged	<95%	<95%	dispatch generation in San Jose(Los Esteros) after first contingency. Use Metcalf RAS to avoid voltage collapse
	Tesla-Metcalf and MossIndg-Metcalf 500 kV	P6	L-1/L-1	<95%	<95%	95.1%	<95%	<95%	<95%	<95%	109.9%	<95%	<95%	
NEWARK-E-F BRK (to LOS ESTEROS) 230 kV	Tesla-Metcalf and MossIndg-Los Banos 500 kV	P6	L-1/L-1	<95%	<95%	96.5%	<95%	<95%	<95%	<95%	diverged	<95%	<95%	
	Tesla-Metcalf and MossIndg-Metcalf 500 kV	P6	L-1/L-1	<95%	<95%	97.8%	<95%	<95%	<95%	<95%	109.5%	<95%	<95%	
NEWARK-TESLA # 2 230 kV	Tesla-Metcalf and MossIndg-Metcalf 500 kV	P6	L-1/L-1	<95%	<95%	<95%	<95%	<95%	<95%	<95%	98.3%	<95%	<95%	
GOLDHILL-EIGHT MILE 230 kV	Table Mtn 500/230 kV	P1	T-1	<95%	<95%	<95%	<95%	<95%	97.7%	<95%	<95%	<95%	<95%	Winter ratings used for the Winter case. Use Table Mtn SPS. Table Mtn RAS modeled for off-peak cases. Reduce Ralston and Middle Fork generation if still overloads
	Table Mtn and Round Mtn 500/230 kV transformer	P6	T-1/T-1	<95%	<95%	<95%	<95%	<95%	95.5%	<95%	<95%	<95%	<95%	
	Table Mtn 500/230 kV and Eight Mile-Lodi 230 kV	P6	T-1/L-1	<95%	<95%	<95%	<95%	130.6%	141.3%	<95%	<95%	<95%	<95%	
	Table Mtn 500/230 kV and Bellota-Weber 230 kV	P6	T-1/T-1	<95%	<95%	<95%	<95%	<95%	101.2%	<95%	<95%	<95%	<95%	
	Table Mtn 500/230 kV and Bellota-Tesla 230 kV	P6	T-1/T-1	<95%	<95%	<95%	<95%	<95%	101.5%	<95%	<95%	<95%	<95%	
	Table Mtn 500/230 kV and Tesla-Weber 230 kV	P6	T-1/T-1	<95%	<95%	<95%	<95%	<95%	101.7%	<95%	<95%	<95%	<95%	
	Table Mtn 500/230 kV and Goldhill-Lodi 230 kV	P6	T-1/L-1	<95%	<95%	<95%	<95%	131.0%	141.3%	<95%	<95%	<95%	<95%	
GOLDHILL-LODI 230 kV	Table Mtn 500/230 kV	P1	T-1	<95%	<95%	<95%	<95%	<95%	98.1%	<95%	<95%	<95%	<95%	
	Table Mtn and Round Mtn 500/230 kV transformer	P6	T-1/T-1	<95%	<95%	<95%	<95%	<95%	96.0%	<95%	<95%	<95%	<95%	
	Table Mtn 500/230 kV and Tesla-Weber 230 kV	P6	T-1/T-1	<95%	<95%	<95%	<95%	<95%	102.2%	<95%	<95%	<95%	<95%	
	Table Mtn 500/230 kV and Tesla-Bellota 230 kV	P6	T-1/T-1	<95%	<95%	<95%	<95%	<95%	102.0%	<95%	<95%	<95%	<95%	
	Table Mtn 500/230 kV and Bellota-Weber 230 kV	P6	T-1/T-1	<95%	<95%	<95%	<95%	<95%	101.7%	<95%	<95%	<95%	<95%	

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	Table Mtn 500/230 kV and Gold Hill-Eight Mile 230 kV	P6	T-1/T-1	<95%	<95%	<95%	<95%	132.4%	142.9%	<95%	<95%	<95%	<95%	
EIGHT MILE -TESLA 230 kV	Table Mtn 500/230 kV transformer	P1	T-1	<95%	<95%	<95%	<95%	107.8%	121.6%	<95%	<95%	<95%	<95%	Winter ratings used for the Winter case. Table Mtn RAS modeled for off-peak cases. Reduce Ralston and Middle Fork generation and/or separate the system if still overloads
	Diablo unit and Table Mtn 500/230 kV transformer	P3	G-1/T-1	<95%	N/A	N/A	<95%	N/A	N/A	N/A	<95%	<95%	96.1%	
	Table Mtn and Round Mtn 500/230 kV transformer	P6	T-1/T-1	<95%	<95%	<95%	<95%	110.3%	124.2%	<95%	<95%	<95%	<95%	
	Table Mtn 500/230 and Table Mtn-Statcom # 1 or 2 500 kV	P2/P6	BRK	N/A	<95%	<95%	N/A	108.0%	121.4%	<95%	N/A	<95%	N/A	
	Table Mtn 500/230 kV and Bellota-Weber 230 kV	P6	T-1/L-1	<95%	<95%	<95%	<95%	116.8%	132.1%	<95%	<95%	<95%	<95%	
	Table Mtn 500/230 kV and Tesla-Weber 230 kV	P6	T-1/L-1	<95%	<95%	<95%	<95%	118.1%	132.9%	<95%	<95%	<95%	<95%	
	Table Mtn 500/230 kV and Tesla-Bellota 230 kV	P6	T-1/L-1	<95%	<95%	<95%	<95%	117.6%	132.5%	<95%	<95%	<95%	<95%	
	Table Mtn 500/230 kV and Stagg-Eight Mile 230 kV	P6	T-1/L-1	<95%	<95%	<95%	<95%	160.6%	177.3%	111.7%	<95%	<95%	112.9%	
	Table Mtn 500/230 kV and Stagg-Tesla 230 kV, or Stagg BRK	P6	T-1/L-1	<95%	<95%	<95%	<95%	165.1%	167.8%	102.0%	<95%	<95%	97.8%	
STAGG-EIGHT MILE 230 kV	Table Mtn 500/230 kV and Eight Mile-Tesla 230 kV	P6	T-1/L-1	<95%	<95%	<95%	<95%	139.7%	152.3%	107.0%	<95%	<95%	104.0%	
STAGG H - STAGG F BRK 230 kV		P6	T-1/L-1	<95%	<95%	<95%	<95%	114.9%	125.6%	105.2%	<95%	<95%	<95%	
STAGG D - STAGG F BRK 230 kV		P6	T-1/L-1	<95%	<95%	<95%	<95%	114.3%	127.2%	102.8%	<95%	<95%	<95%	
STAGG-TESLA E 230 kV		P6	T-1/L-1	<95%	<95%	<95%	<95%	145.8%	166.3%	<95%	<95%	<95%	<95%	
STAGG-TESLA E 230 kV	Table Mtn 500/230 kV transformer	P1	T-1	<95%	<95%	<95%	<95%	<95%	97.1%	<95%	<95%	<95%	<95%	
	Table Mtn 500/230 kV transformer and Tesla-Weber 230 kV	P6	T-1/L-1	<95%	<95%	<95%	<95%	<95%	102.6%	<95%	<95%	<95%	<95%	
BELLOTA-BRIGHTON 230 kV	Table Mtn 500/230 kV transformer and Diablo unit	P3	G-1/T-1	<95%	N/A	N/A	<95%	N/A	N/A	N/A	<95%	N/A	96.1%	
BELLOTA-COTTLE 230 kV	Gates 500/230 # 11 and # 12	P6	T-1/T-1	<95%	<95%	<95%	<95%	<95%	<95%	<95%	100.8%	<95%	<95%	sensitivity only
BELLOTA-WEBER 230 kV	Table Mtn 500/230 kV and Bellota-Tesla 230 kV	P6	T-1/L-1	<95%	<95%	<95%	<95%	105.3%	120.7%	<95%	<95%	<95%	<95%	Table Mtn 500/230 kV RAS asumed for off peak cases. Reduce generation from Collerville, Electra and Valley Springs
	Table Mtn 500/230 kV and Eight Mile-Tesla 230 kV	P6	T-1/L-1	<95%	<95%	<95%	<95%	<95%	103.8%	<95%	<95%	<95%	<95%	
TESLA-WEBER 230 kV	Table Mtn 500/230 kV and Bellota-Tesla 230 kV	P6	T-1/L-1	<95%	<95%	<95%	<95%	115.5%	127.0%	<95%	<95%	<95%	<95%	
	Table Mtn 500/230 kV and Gold Hill-Eight Mile 230 kV	P6	T-1/L-1	<95%	<95%	<95%	<95%	<95%	103.4%	<95%	<95%	<95%	<95%	
	Table Mtn 500/230 kV transformer	P1	T-1	<95%	<95%	<95%	<95%	<95%	96.2%	<95%	<95%	<95%	<95%	
	Table Mtn and Round Mtn 500/230 kV	P6	T-1/T-1	<95%	<95%	<95%	<95%	<95%	100.1%	<95%	<95%	<95%	<95%	
	Table Mtn and Round Mtn 500/230 kV	P6	T-1/T-1	<95%	<95%	<95%	<95%	<95%	97.7%	<95%	<95%	<95%	<95%	
	Table Mtn 500/230 kV and Bellota-Weber 230 kV	P6	T-1/L-1	<95%	<95%	<95%	<95%	109.5%	123.3%	<95%	<95%	<95%	<95%	



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BELLOTA-TESLA 230 kV	Table Mtn 500/230 kV and Gold Hill-Eight Mile 230 kV	P6	T-1/L-1	<95%	<95%	<95%	<95%	<95%	101.1%	<95%	<95%	<95%	<95%	
	Table Mtn 500/230 kV and Eight Mile-Tesla 230 kV	P6	T-1/L-1	<95%	<95%	<95%	<95%	<95%	101.4%	<95%	<95%	<95%	<95%	
	Table Mtn 500/230 kV and Tesla-Weber 230 kV	P6	T-1/L-1	<95%	<95%	<95%	<95%	113.0%	125.5%	<95%	<95%	<95%	<95%	
DELEVAN-CORTINA 230 KV	Olinda-Tracy 500 kV	P1	L-1	97.3%	<95%	98.03%	<95%	<95%	<95%	<95%	<95%	<95%	<95%	Reduce generation in the area
	Table Mtn-Vaca Dix 500 kV	P1	L-1	95.8%	<95%	<95%	<95%	<95%	<95%	<95%	<95%	<95%	<95%	
	Olinda-Tracy 500 kV and Diablo unit	P3	G-1/L-1	103.8%	N/A	N/A	<95%	N/A	N/A	N/A	<95%	N/A	<95%	
	Table Mtn-Vaca Dix 500 kV and Diablo unit	P3	G-1/L-1	102.0%	N/A	N/A	<95%	N/A	N/A	N/A	<95%	N/A	<95%	
	Table-VacaDix and Table Mt-Round Mt # 1 500 kV	P2/P6	BRK/or L-2	98.0%	<95%	99.3%	<95%	<95%	<95%	<95%	<95%	<95%	<95%	
	Vaca Dix -Table Mtn 500 kV and VacaDix 500/230 # 11	P2/P6	BRK/or N-2	96.2%	<95%	99.1%	<95%	<95%	<95%	<95%	<95%	<95%	<95%	
	Table-Vaca Dix and Table Mt-Round Mtn #2 500 kV	P6	L-1/L-1	98.1%	<95%	99.1%	<95%	<95%	<95%	<95%	<95%	<95%	<95%	
	Table Mtn-Vaca Dix and Vaca Dix-Tesla 500 kV	P6	L-1/L-1	98.0%	<95%	97.9%	<95%	<95%	<95%	<95%	<95%	95.6%	<95%	
	Round Mtn Statcom-Round Mtn 500 kV #2 and Malin-Round Mtn # 2 500 kV	P6	L-1/L-1	N/A	97.7%	<95%	N/A	<95%	<95%	<95%	N/A	99.4%	N/A	
	Round Mtn-Table Mtn 500 kV #1 and #2 500 kV	P7	L-2	104.0%	N/A	N/A	<95%	N/A	N/A	N/A	<95%	N/A	<95%	
	Round Mtn Statcom-Table Mtn 500 kV #1 and #2 500 kV	P7	L-2	N/A	98.0%	105.4%	N/A	<95%	<95%	<95%	N/A	99.5%	N/A	
	Round Mtn-Round Mtn Statcom 500 kV #1 and #2 500 kV	P7	L-2	N/A	98.0%	105.3%	N/A	<95%	<95%	<95%	N/A	99.5%	N/A	
	Table Mtn-Vaca Dix and Table Mtn-Tesla 500 kV	P7	L-2	108.5%	103.3%	112.3%	<95%	<95%	<95%	<95%	<95%	104.7%	<95%	
WARNERVILLE-WILSON 230 kV	Gates 500/230 kV # 11 and 12	P6	L-1/L-1	<95%	<95%	<95%	<95%	<95%	123.1%	<95%	<95%	<95%	<95%	insert Wilson series reactor
MELONES-COTTLE 230 kV	Normal conditions	P0	normal	<95%	<95%	<95%	<95%	<95%	<95%	<95%	100.1%	<95%	<95%	Sensitivity only
	Gates 500/230 kV # 11 and # 12	P6	T-1/T-1	<95%	<95%	<95%	<95%	<95%	<95%	<95%	109.1%	<95%	<95%	
DOS AMIGOS-PANOCHÉ #2 230 kV	Gates 500/230 kV # 11 and # 12	P6	T-1/T-1	<95%	<95%	<95%	<95%	<95%	<95%	<95%	132.0%	<95%	120.1%	Reduce generation in the area(Tranquility and/or Pine Flat, Balch)
	Los Banos-Gates # 1 and # 3 500 kV	P6	L-1/L-1	<95%	<95%	<95%	<95%	<95%	<95%	<95%	97.1%	<95%	<95%	
LOS BANOS-DOS AMIGOS 230 kV	Gates 500/230 kV # 11 and # 12	P6	T-1/T-1	<95%	<95%	<95%	<95%	<95%	107.2%	<95%	105.4%	<95%	<95%	
PADRE FLAT-PANOCHÉ 230 kV	Gates 500/230 kV # 11 and # 12	P6	T-1/T-1	<95%	<95%	<95%	<95%	<95%	<95%	<95%	101.4%	<95%	<95%	
LOS BANOS-PANOCHÉ #2 230 kV	Gates 500/230 kV # 11 and # 12	P6	T-1/T-1	<95%	<95%	<95%	<95%	98.7%	122.5%	<95%	120.8%	<95%	109.2%	

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MUSTANG SS-SWITCH STA 230 kV	Normal conditions	P0	normal	<95%	<95%	<95%	<95%	<95%	<95%	<95%	110.4%	<95%	<95%	Sensitivity only, reduce generation in the area. Radial line
MOSSLANDING-LAS AGUILAS 230 kV	Normal conditions	P0	normal	<95%	<95%	<95%	<95%	99.9%	98.9%	<95%	119.1%	<95%	<95%	Turning off generation in the area for P6 may not eliminate overloads without turning on Moss Landing generation in some cases.
	Tesla-Metcalf 500 kV	P1	L-1	<95%	<95%	<95%	<95%	<95%	<95%	<95%	107.1%	<95%	<95%	
	Mosslanding-Los Banos 500 kV	P1	L-1	<95%	<95%	<95%	<95%	<95%	<95%	<95%	111.6%	<95%	<95%	
	Mosslanding-Los Banos and Tracy-Los Banos 500 kV	P6	L-1/L-1	<95%	<95%	<95%	<95%	103.5%	<95%	<95%	118.1%	<95%	<95%	
	Tesla-Metcalf and Tesla-Table Mtn 500 kV	P6	L-1/L-1	<95%	<95%	<95%	<95%	<95%	<95%	<95%	109.5%	<95%	<95%	
	Moss Landing-Los Banos 500 kV and Los Banos 500/230 kV	P6	L-1/T-1	<95%	<95%	<95%	<95%	99.1%	<95%	<95%	114.8%	<95%	<95%	
	Gates 500/230 kV # 11 and # 12	P6	T-1/T-1	<95%	<95%	<95%	<95%	103.6%	109.1%	<95%	121.9%	<95%	98.6%	
	Moss Landing-Los Banos and Los Banos-Gates 500 kV# 1	P6	L-1/L-1	<95%	<95%	<95%	<95%	<95%	<95%	<95%	115.2%	<95%	<95%	
	Moss Landing-Los Banos and Los Banos-Gates 500 kV# 3	P6	L-1/L-1	<95%	<95%	<95%	<95%	<95%	<95%	<95%	113.1%	<95%	<95%	
	Tesla-Los Banos & Mosslanding-Los Banos 500 kV	P6	L-1/L-1	<95%	<95%	<95%	<95%	107.8%	<95%	<95%	122.0%	<95%	<95%	
Mosslanding-Los Banos 500 kV & Tesla-Metcalf 500 kV	P6	L-1/L-1	<95%	<95%	<95%	<95%	127.2%	101.1%	<95%	diverged	<95%	96.3%		
HENRIETTA-HENTAP (to Mustang and Gregg) 230 kV	Normal conditions	P0	normal	<95%	<95%	<95%	<95%	<95%	104.7%	<95%	<95%	<95%	<95%	reduce generation in the area (Henrietta 230 kV)
	Los Banos 500/230 kV transformer	P1	T-1	<95%	<95%	<95%	<95%	<95%	106.1%	<95%	<95%	<95%	<95%	
230/115 kV TRANSFORMERS and 230/70 kV														
NEWARK 230/115 kV #11	Tesla-Metcalf and Metcalf-Moss Landing 500 kV	P6	L-1/L-1	<95%	<95%	95.3%	<95%	<95%	<95%	<95%	95.6%	<95%	<95%	Adjust NRS phase shifter and/or increasing generation in the area.
	Tesla-Metcalf 500 kV and Newark -Los Esteros 230 kV	P6	L-1/L-1	103.4%	101.1%	113.2%	<95%	<95%	<95%	<95%	106.1%	101.0%	<95%	
	Tesla-Metcalf 500 kV and Newark E-F 230 kV kV bus tie (to Los Esteros)	P6	L-1/BRK	108.7%	105.8%	117.8%	<95%	<95%	<95%	<95%	110.8%	105.7%	<95%	
115 kV LINES														
DELTA - CASCADE 115 kV	Malin-Round Mtn #1 and #2 500 kV	P7	L-2	98.7%	<95%	97.4%	107.4%	<95%	<95%	<95%	98.3%	<95%	<95%	adjust Weed Phase Shifter or limit COI flow within seasonal nomogram
	Round Mtn-Table Mtn # 1 and # 2 500 kV	P7	L-2	<95%	<95%	<95%	98.4%	<95%	<95%	<95%	<95%	<95%	<95%	
NEWARK D-NRS 400 115 kV	Tesla-Metcalf 500 kV and Newark- Newark brk (to Los Esteros) 115 kV	P6	L-1/BRK	96.3%	<95%	143.2%	<95%	<95%	<95%	<95%	114.0%	113.6%	<95%	
	Tesla-Metcalf 500 kV and Newark -Los Esteros 230 kV kV	P6	L-1/L-1	<95%	<95%	135.1%	<95%	<95%	<95%	<95%	105.6%	105.2%	<95%	

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NEWARK F-NRS 300 115 kV	Tesla-Metcalf 500 kV and Newark- Newark brk (to Los Esteros) 115 kV	P6	L-1/BRK	<95%	<95%	108.4%	<95%	<95%	<95%	<95%	<95%	<95%	<95%	Adjust NRS phase shifter and/or increasing generation in the area. In 2031, install additional reactive support in San Jose
	Tesla-Metcalf 500 kV and Newark -Los Esteros 230 kV kV	P6	L-1/L-1	<95%	<95%	102.2%	<95%	<95%	<95%	<95%	<95%	<95%	<95%	
NEWARK F-ZANKER-KIFER 115 kV	Tesla-Metcalf 500 kV and Newark- Newark brk (to Los Esteros) 230 kV	P6	L-1/L-1	<95%	<95%	103.7%	<95%	<95%	<95%	<95%	<95%	<95%	<95%	
	Tesla-Metcalf 500 kV and Newark -Los Esteros 230 kV kV	P6	L-1/L-1	<95%	<95%	100.6%	<95%	<95%	<95%	<95%	<95%	<95%	<95%	
NEWARK-LOCKHID J2 (APPLIED MATERIALS) # 1 115 kV	Tesla-Metcalf and Metcalf-Moss Landing 500 kV	P6	L-1/L-1	101.1%	<95%	96.1%	<95%	<95%	<95%	<95%	105.3%	<95%	<95%	Dispatch generation in San Jose (Metcalf) after first contingency, or adjust phase-shifter at NRS
	Tesla-Metcalf & Mossland-LosBanos 500 kV	P6	L-1/L-1	102.5%	<95%	<95%	<95%	<95%	<95%	<95%	diverged	<95%	<95%	
LOS ESTEROS - NORTECH 115 kV	Normal conditions	P0	normal	<95%	<95%	100.7%	<95%	<95%	<95%	<95%	<95%	<95%	<95%	also other P1 contingencies in San Jose and P6 contingencies in the area in the 2031 Summer peak case. Rating limited by substation Bus or Jumper Conductor rating. Consider replacing the jumper. Install additional reactive support for low voltages, this will also mitigate overloads
	Table Mtn-Vaca Dix 500 kV	P1	L-1	<95%	<95%	103.7%	<95%	<95%	<95%	<95%	<95%	<95%	<95%	
	Table Mtn-Tesla 500 kV	P1	L-1	<95%	<95%	103.3%	<95%	<95%	<95%	<95%	<95%	<95%	<95%	
	Metcalf-Tesla 500 kV	P1	L-1	<95%	<95%	102.8%	<95%	<95%	<95%	<95%	<95%	<95%	<95%	
	Olinda-Tracy 500 kV	P1	L-1	<95%	<95%	102.8%	<95%	<95%	<95%	<95%	<95%	<95%	<95%	
	Vaca Dix-Tesla 500 kV	P1	L-1	<95%	<95%	101.7%	<95%	<95%	<95%	<95%	<95%	<95%	<95%	
	Table Mtn-Tesla 500 kV and Los Esteros- Trimble 115 kV	P6	L-1/L-1	<95%	<95%	109.6%	<95%	<95%	<95%	<95%	<95%	<95%	<95%	
	Tesla-Metcalf and Metcalf-Moss Landing 500 kV	P6	L-1/L-1	<95%	<95%	106.8%	<95%	<95%	<95%	<95%	<95%	<95%	<95%	
	Tesla-Metcalf & Mossland-LosBanos 500 kV	P6	L-1/L-1	<95%	<95%	105.8%	<95%	<95%	<95%	<95%	<95%	<95%	<95%	
	Bi-pole PDCI	P7	HVDC	<95%	<95%	105.5%	<95%	<95%	<95%	<95%	<95%	<95%	<95%	
	Table Mtn-Tesla and Tesla-Metcalf 500 kV	P6	L-1/L-1	<95%	<95%	105.1%	<95%	<95%	<95%	<95%	<95%	<95%	<95%	
	Table Mtn-Tesla and Tesla-Los Banos 500 kV	P6	L-1/L-1	<95%	<95%	104.3%	<95%	<95%	<95%	<95%	<95%	<95%	<95%	
	Tesla-Metcalf and Tesla-Losbanos 500 kV	P6	L-1/L-1	<95%	<95%	104.2%	<95%	<95%	<95%	<95%	<95%	<95%	<95%	
	Table Mtn-Vaca Dix and Vaca Dix-Tesla 500 kV	P6	L-1/L-1	<95%	<95%	104.1%	<95%	<95%	<95%	<95%	<95%	<95%	<95%	
	Olinda-Tracy and Tracy-Tesla 500 kV	P6	L-1/L-1	<95%	<95%	104.1%	<95%	<95%	<95%	<95%	<95%	<95%	<95%	
	Tesla-Table Mt and Tesla- Tracy 500 kV	P6	L-1/L-1	<95%	<95%	104.0%	<95%	<95%	<95%	<95%	<95%	<95%	<95%	
	Table-Vaca and Table Mt-DRS #1 or # 2 500 kV	P6	L-1/L-1	<95%	<95%	103.9%	<95%	<95%	<95%	<95%	<95%	<95%	<95%	
	Vaca Dix- Tesla and Tesla-Metcalf 500 kV	P6	L-1/L-1	<95%	<95%	103.7%	<95%	<95%	<95%	<95%	<95%	<95%	<95%	
NORTECH-NRS 300 115 kV	Tesla-Metcalf and Metcalf-Mosslanding 500 kV	P6	L-1/L-1	<95%	<95%	95.7%	<95%	<95%	<95%	<95%	<95%	<95%	<95%	not a violation, monitor



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SPRING GAP-Mi WUK 115 kV	Normal conditions	P0	normal	<95%	<95%	<95%	98.9%	<95%	<95%	<95%	98.6%	98.5%	<95%	not a violation, monitor
KERN FRNT-POSO MTN JCT-LIVE OAK 115 kV	Normal conditions	P0	normal	99.1%	106.2%	<95%	<95%	<95%	<95%	<95%	<95%	107.0%	<95%	reduce generation in the area (Live Oaks)
	Tracy-Los Banos and Los Banos-Gates # 3 500 kV	P6	L-1/L-1	<95%	97.7%	<95%	<95%	<95%	<95%	<95%	<95%	<95%	<95%	
EXCHEQUER-LE GRAND 115 kV	Normal conditions	P0	normal	<95%	<95%	<95%	<95%	97.3%	<95%	<95%	100.1%	<95%	<95%	reduce generation in the area (Exchequer)
MENDOTA-NORTH STAR 115 kV	Normal conditions	P0	normal	<95%	<95%	<95%	<95%	<95%	<95%	<95%	113.9%	<95%	<95%	reduce generation in the area (Northstar)
HERNDON-WOODWARD 115 kV	Normal conditions	P0	normal	<95%	<95%	<95%	<95%	98.2%	115.3%	<95%	<95%	<95%	<95%	reduce generation in the area (Kerkhoff)
	Gates 500/230 kV # 11 and 12	P6	T-1/T-1	<95%	<95%	<95%	<95%	<95%	103.1%	<95%	<95%	<95%	<95%	
	Los Banos-Gates # 1 and Gates-Midway 500 kV	P2/P6	BRK	<95%	<95%	<95%	<95%	<95%	98.5%	<95%	<95%	<95%	<95%	
MENDOTA-PANOCHÉ 115 kV	Table Mtn 500/230 kV transformer	P1	T-1	<95%	<95%	<95%	<95%	<95%	97.5%	<95%	<95%	<95%	<95%	reduce generation in the area (Northstar ) if overload
	Table Mtn 500/230 and Tesla 500/230 # 2, 4 or 6	P6	T-1/T-1	<95%	<95%	<95%	<95%	<95%	98.5%	<95%	<95%	<95%	<95%	
	Table Mtn 500/230 and Round Mtn 500/230	P6	T-1/T-1	<95%	<95%	<95%	<95%	<95%	98.0%	<95%	<95%	<95%	<95%	
BELRDGE - MIDWAY 115 kV	Gates 500/230 kV # 11 and # 12	P6	T-1/T-1	<95%	<95%	<95%	<95%	104.3%	<95%	<95%	<95%	<95%	110.1%	Reduce generation in the area (Pump Jack)
CHENY T-PANOCHÉ 115 kV	Gates 500/230 kV # 11 and # 12	P6	T-1/T-1	<95%	<95%	<95%	<95%	<95%	<95%	<95%	<95%	<95%	100.8%	Reduce generation in the area (Exelsior)
CONTADNA-JACKSON SW 115 kV	Normal conditions	P0	normal	<95%	<95%	<95%	<95%	<95%	102.2%	<95%	<95%	<95%	<95%	reduce generation in the area (Conneted to Jackson Switching station)
MANTECA-AVENAL-MELONES 115 kV	Normal conditions	P0	normal	<95%	<95%	<95%	<95%	<95%	104.9%	<95%	<95%	<95%	<95%	reduce generation in the area (Tulloch or/and Sandbar)
	Table Mtn and Round Mtn 500/230 kV transformer	P6	T-1/T-1	<95%	<95%	<95%	<95%	<95%	103.3%	<95%	<95%	<95%	<95%	
	Table Mtn and Tesla 500/230 kV transformer	P6	T-1/T-1	<95%	<95%	<95%	<95%	<95%	104.5%	<95%	<95%	<95%	<95%	
	Gates 500/230 kV # 11 and # 12	P6	T-1/T-1	<95%	<95%	<95%	<95%	<95%	95.4%	<95%	<95%	<95%	<95%	
	Table Mtn 500/230 kV transformer	P1	T-1	<95%	<95%	<95%	<95%	<95%	101.6%	<95%	<95%	<95%	<95%	
MANTECA-RIPON 115 kV	Normal conditions	P0	normal	<95%	<95%	<95%	<95%	96.2%	106.8%	<95%	<95%	<95%	<95%	reduce generation in the area (Tulloch or/and Sandbar)
	Table Mtn 500/230 kV transformer	P1	T-1	<95%	<95%	<95%	<95%	<95%	102.7%	<95%	<95%	<95%	<95%	
	Round Mtn and Table Mnt 500/230 kV	P6	T-1/T-1	<95%	<95%	<95%	<95%	<95%	104.3%	<95%	<95%	<95%	<95%	
	Gates 500/230 kV # 11 and # 12	P6	T-1/T-1	<95%	<95%	<95%	<95%	<95%	96.8%	<95%	<95%	<95%	<95%	
	TABLE MTN 500/230 and TESLA 500/230 # 2	P6	T-1/T-1	<95%	<95%	<95%	<95%	<95%	105.4%	<95%	<95%	<95%	<95%	
70 kV LINES (normal conditions only)														

2021-2022 ISO Reliability Assessment - Preliminary Study Results

Study Area: PG&E Bulk

Thermal Overloads



KETTLEMAN-GATES 70 kV	Normal conditions	P0	normal	<95%	<95%	<95%	<95%	<95%	150.9%	<95%	<95%	<95%	<95%	Mitigation in Fresno local area studies
AVENAL-SUN CITY 70 kV	Normal conditions	P0	normal	<95%	<95%	<95%	<95%	<95%	119.9%	<95%	<95%	<95%	<95%	Mitigation in Fresno local area studies
SCHINDLER-CRESCENT 70 kV	Normal conditions	P0	normal	<95%	<95%	<95%	<95%	<95%	102.2%	<95%	<95%	<95%	<95%	Mitigation in Fresno local area studies
TAFT-TAFT SWITCH STA 70 kV	Normal conditions	P0	normal	<95%	<95%	<95%	<95%	<95%	121.1%	<95%	109.6%	<95%	<95%	Mitigation in Fresno local area studies
60 kV LINES (normal conditions only)														
UOP- WSTLNESW (West Lane) 60 kV	Normal conditions	P0	normal	145.5%	<95%	<95%	96.2%	<95%	<95%	<95%	105.3%	<95%	<95%	Mitigation in Stockton local area studies
Bridgeville-Garberville 60 kV	Normal conditions	P0	normal	113.3%	<95%	<95%	<95%	<95%	<95%	<95%	108.6%	<95%	<95%	Mitigation in North Coast local area studies. Reduce generation from Humboldt. Overload in 2023 and 2031 Summer peak with contingencies up to 10%
Vaca Dix-Winters 60 kV	Normal conditions	P0	normal	112.0%	<95%	<95%	<95%	<95%	<95%	<95%	<95%	96.9%	<95%	Mitigation in Sacramento local area studies
Plain Field-Winters 60 kV	Normal conditions	P0	normal	119.2%	102.1%	<95%	<95%	<95%	<95%	<95%	<95%	106.2%	<95%	Mitigation in Sacramento local area studies
OTHER ISSUES														
Insufficient reactive margin	Mosslanding-Los Banos 500 kV & Tesla-Metcalf 500 kV										voltage instability			dispatch more generation in the Moss landing area aftr first contingency

Study Area: PG&E Bulk

High/Low Voltages



Substation	Contingency (All and Worst P6)	Category	Category Description	Post Cont. Voltage, kV (Baseline Scenarios)							Post Cont. Voltage, kV (Sensitivity Scenarios)			Project & Potential Mitigation Solutions
				2023 Summer Peak	2026 Summer Peak	2031 Summer Peak	2023 Spring Off-Peak	2026 Spring Off-Peak	2031 Spring Off-Peak	2031 Winter Off-Peak	2023 SP Heavy Renewable & Min Gas Gen	2026 SP High CEC Forecast	2023 SpOP Hi Renew & Min Gas Gen	
DIABLO 500 kV	Normal Conditions	P0	normal	within limits	1.083	1.088	within limits	1.082	within limits	1.080	within limits	1.086	within limits	install reactive support to absorb VARs on Gates, modeled starting from 2026. Reduce scheduled voltage on Gates and /or turn on reactors in the Midway tertiary to bring Diablo voltage within the limits. The upper limit is 1.09 under normal and contingency conditions.
	Two Statcoms on Gates	P6	S-1/S-1	N/A	1.101	1.090	N/A	1.100	<1.08	1.095	N/A	1.102	N/A	
GATES 500 kV	Two Statcoms on Gates	P6	S-1/S-1	N/A	1.088	1.080	N/A	1.088	<1.08	1.084	N/A	1.089	N/A	within limits for P6 contingency
MIDWAY 500 kV	Two Statcoms on Gates	P6	S-1/S-1	N/A	1.082	<1.08	N/A	1.081	<1.08	<1.08	N/A	1.084	N/A	within limits for P6 contingency
Low voltages in the Las Aguilas-Moss Landing area	Mosslanding-Los Banos 500 kV & Tesla-Metcalf 500 kV	P6	L-1/L-1								insufficient reactive margin			
Low voltages in the San Jose area	Normal Conditions and contingencies	P0, P1-P7				<0.9								consider installation of reactive support. Mitigation in the local Bay area studies

Study Area: PG&E Bulk

Voltage Deviation



Substation	Contingency (All and Worst P6)	Category	Category Description	Voltage PU (Baseline Scenarios)							Voltage PU (Sensitivity Scenarios)			Project & Potential Mitigation Solutions
				2023 Summer Peak	2026 Summer Peak	2031 Summer Peak	2023 Spring Off-Peak	2026 Spring Off-Peak	2031 Spring Off-Peak	2031 Winter Off-Peak	2023 SP Heavy Renewable & Min Gas Gen	2026 SP High CEC Forecast	2023 SpOP Hi Renew & Min Gas Gen	
NONE over 8%														

Study Area: PG&E Bulk

Transient Stability UNITS



Transient Stability Performance (Tripped generation and load)

AREA	BUS NUMBER	NAME/ POI	TYPE	Contin- gency Category	Contingency	2026 Summer Peak	2031 Summer Peak	2023 Spring Off- Peak	2031 Spring Off- Peak	2026 SP High CEC Forecast	2023 SpOP Hi Renew & Min Gas Gen	reason for tripping	Mitigation/Comments
Generation Trip													
Nevada	18753	GMT1_LV 0.42	solar PV	P1, P6, P7	3 ph fault on Midway, any contingency	108 MW at 2.5 sec	111 MW not tripped	not in the case	modeled off	108 MW at 2.5 sec	not in the case	high voltage	under investigation
Nevada	18756	GMT2_LV 0.42	solar PV	P1, P6, P7	3 ph fault on Midway, any contingency	108 MW at 2.5 sec	111 MW not tripped	not in the case	modeled off	108 MW at 2.5 sec	not in the case	high voltage	under investigation
Nevada	18759	GMT3_LV 0.42	solar PV	P1, P6, P7	3 ph fault on Midway, any contingency	108 MW at 2.5 sec	111 MW not tripped	not in the case	modeled off	108 MW at 2.5 sec	not in the case	high voltage	under investigation
Nevada	18762	GMT4_LV 0.42	solar PV	P1, P6, P7	3 ph fault on Midway, any contingency	76 MW at 2.5 sec	111 MW not tripped	not in the case	modeled off	76 MW at 2.5 sec	not in the case	high voltage	under investigation
IID	21993	MIDWAY G2	solar PV	P1, P6, P7	3 ph on Midway, Los Banos	15 MW at 6 sec	modeled off	31 MW not tripped	29 MW not tripped	16 MW at 6 sec	31 MW not tripped	high voltage	under investigation
SCE	24340	CHARMIN/Santa Clara 66 kV	synchr gen	P1, P6, P7	3 ph fault on Midway	19 MW at 2.5 sec	19 MW at 2.5 sec	not tripped	modeled off	19 MW at 2.5 sec	not tripped	high voltage	high voltage due to composite load reduction in the SCE area
				P1, P6, P7	3 ph fault on Los Banos or Gates	19 MW at 2 sec	19 MW at 2 sec	not tripped	modeled off	not tripped	not tripped	high voltage	
SCE	25079	PRIDGE B/Gold Finger 66 kV	solar PV	P1, P6, P7	3 ph fault Tesla, Los Banos, Gates, Diablo or Midway	modeled off	modeled off	modeled off	20 MW tripped with fault	modeled off	modeled off	high voltage	high voltage w/fault, instant trip at 1.2 p.u.
				P2	1 ph fault Midway w/delayed clearing	modeled off	modeled off	modeled off		modeled off	modeled off	high voltage	high voltage w/fault, instant trip at 1.2 p.u.
SCE	25092	MOJAVE/ Sun Spot 66 kV	solar PV	P1, P2, P4, P6, P7	1ph w/delayed clearing or 3ph normal on Midway, or 3 ph fault on Los Banos, Moss landing, Gates, Metcalf, RM Statcom, Round Mtn or Table Mtn	modeled off	modeled off	19 MW not tripped	19 MW tripped w/fault	modeled off	modeled off	high voltage	high voltage w/fault, instant trip at 1.2 p.u. Possible modeling error
SCE	25169	PRIDGE C/ Gold Finger 66 kV	solar PV	P1, P6, P7	3ph fault on Tracy, Tesla, Los Banos, Gates, Midway, Diablo	modeled off	modeled off	modeled off	12 MW tripped w/fault	modeled off	modeled off	high voltage	high voltage w/fault, instant trip at 1.2 p.u.
LADWP	26943	SOVSRPV 0.38 - Cottonwood 230 kV	solar PV	P1, P6, P7	3ph fault Tesla, Los Banos, Midway, Diablo	not in the case	not in the case	not in the case	161 MW w/fault	not in the case	not in the case	high voltage	instant trip at 1.2 p.u. Possible modeling error
SCE	29308	Center 66 kV	peaker	P1, P6, P7	3 ph fault on Midway	47 MW at 2 sec	47 MW at 2 sec	modeled off	modeled off	47 MW at 2 sec	modeled off	high voltage	large reduction in composite load in SCE
SCE	29307	Mira Loma 66 kV	peaker	P1, P6, P7	3 ph w/normal or 1 ph w/delayed clearing fault on	47 MW at 2 sec	47 MW at 2 sec	modeled off	modeled off	47 MW at 2 sec	modeled off		
SCE	29309	Barre 66 kV	peaker	P1, P6, P7	3 ph w/normal or 1 ph w/delayed clearing fault on	47 MW at 2 sec	47 MW at 2 sec	modeled off	modeled off	47 MW at 2 sec	modeled off		
SCE	29340	Clear Water ST/ Mira Loma 66 kV	co-gen	P1, P6, P7	3ph fault Los Banos, Gates, Midway	7 MW not tripped	8 MW at 8 or 19 sec	8 MW not tripped	modeled off	7 MW not tripped	8 MW not tripped	out of step generic realy	



Study Area: PG&E Bulk

Transient Stability UNITS



Transient Stability Performance (Tripped generation and load)

AREA	BUS NUMBER	NAME/ POI	TYPE	Contin- gency Category	Contingency	2026 Summer Peak	2031 Summer Peak	2023 Spring Off- Peak	2031 Spring Off- Peak	2026 SP High CEC Forecast	2023 SpOP Hi Renew & Min Gas Gen	reason for tripping	Mitigation/Comments
Generation Trip													
SCE	29536	SS1T2_G1 0.34	solar PV	P1, P6, P7	3ph fault Midway, any contingency	modeled off	modeled off	50 MW at 4 sec	78 MW not tripped	modeled off	50 MW not tripped	low voltage	voltage doesn't recover above 0.8 pu after the fault. Under investigation
SCE	29537	SS1T2_G2 0.34	solar PV	P1, P6, P7	3ph fault Midway, any contingency	modeled off	modeled off	50 MW at 4 sec	78 MW not tripped	modeled off	50 MW not tripped	low voltage	voltage doesn't recover above 0.8 pu after the fault. Under investigation
SCE	29391	Camino solar/Manzana 230 kV	solar PV	P1, P6, P7	3 ph on Gates or Midway	modeled off	modeled off	not in the case	43 MW w/fault	modeled off	not in the case	high voltage	high voltage w/fault, possible modeling error, instant trip at 1.2 p.u.
SCE	29590	Voyager1_G 0.64	wind	P1, P2, P6, P7	3ph fault Midway, or 1ph with delayed clearing	52 MW not tripped	52 MW not tripped	not in the case	45 MW w/fault	53 MW not tripped	not in the case	high voltage	high voltage w/fault, possible modeling error, instant trip at 1.2 p.u.
SCE	29606	AVSR_A_G2 0.31	solar PV	P1, P6, P7	3ph fault Midway	modeled off	modeled off	modeled off	50 MW w/fault	modeled off	25 MW not tripped	high voltage	high voltage w/fault, possible modeling error, instant trip at 1.2 p.u.
SCE	29610	AVSR_B_G4 0.31	solar PV	P1, P6, P7	3ph fault Midway	modeled off	modeled off	modeled off	86 MW w/fault	modeled off	45 MW not tripped	high voltage	high voltage w/fault, possible modeling error, instant trip at 1.2 p.u.
SCE	29724	BSKY_G_ABSR 0.38, BIG SKY 230 kV connect to Antelope 230 kV	solar PV	P1, P6, P7	3ph fault Vaca Dixon, Tracy, Tesla, Moss Landing, Metcalf, Los Banos, Gates, Midway, Diablo	modeled off	modeled off	modeled off	19 MW with fault	modeled off	not tripped, 15 MW	high voltage	high voltage w/fault, possible modeling error, instant trip at 1.2 p.u.
PG&E	31846	COVE RD 13.8	hydro	P7	3 phase fault on Tesla	6 MW at 19 sec	modeled off	stable	stable	6 MW at 19 sec	stable	out of step	small unit, possible modeling error
PG&E	31847	ROAMONG 13.8	hydro	P7	3 phase fault on Tesla	2 MW at 18 sec	modeled off	stable	stable	2 MW at 18 sec	stable	out of step	small unit, possible modeling error
PG&E	32181	SHILOH 1/ Birds Landing 230 kV	wind type 3	P1, P6, P7	3ph Fault Tesla	63 MW at 1.3 sec	63 MW at 1.3 sec	30 MW not tripped	not tripped	63 MW at 1.3 sec	96 MW not tripped	low voltage	under investigation
				P1	3ph fault Midway transformer	63 MW at 2 sec	not tripped		not tripped	not tripped		high voltage	under investigation
				P1, P6, P7	3ph fault Table Mtn or Los Banos	not tripped	not tripped		30 MW at 1.2 sec	not tripped		high voltage	under investigation
PG&E	33102	COLUMBIA 0.36	solar PV	P7	PDCI, 3ph fault Round Mtn, RM Statcom, Mosslanding, and all other faults	not tripped	not tripped	not tripped	18 MW at 2-4 sec	not tripped	not tripped	high voltage	high voltage in the base case, turn off shunt capacitors in the area
PG&E	33868	Q709RPWRP2/ Tesla 115 kV	wind	P1, P6, P7	3 ph Malin, Round Mt, RM Statcom, Midway	19MW not tripped	19MW not tripped	9 MW not tripped	9 MW tripped w/fault	19 MW not tripped	29 MW not tripped	high voltage	instant tripping at 1.2 p.u. voltage, high initial voltage off-peak
				P2	1 ph fault on Tesla w/delayed clearing,	19 MW not tripped	19MW not tripped	9 MW not tripped	9 MW tripped w/fault	19 MW not tripped	29 MW not tripped	high voltage	instant tripping at 1.2 p.u. voltage, high initial voltage off-peak

DELETE

Study Area: PG&E Bulk

Transient Stability UNITS



Transient Stability Performance (Tripped generation and load)

AREA	BUS NUMBER	NAME/ POI	TYPE	Contingency Category	Contingency	2026 Summer Peak	2031 Summer Peak	2023 Spring Off- Peak	2031 Spring Off- Peak	2026 SP High CEC Forecast	2023 SpOP Hi Renew & Min Gas Gen	reason for tripping	Mitigation/Comments
Generation Trip													
PG&E	34629	KETTLEMANS/ Henrietta 70 kV	solar PV	P1, P2, P6	1ph fault w/delayed clearing on Tesla, Los Banos, Gates or Midway, 3 ph Gates	modeled off	modeled off	modeled off	19 MW w/fault	modeled off	20 MW not tripped	high voltage	instant tripping at 1.2 p.u. voltage
PG&E	34683	MUSTANG 230 kV	solar PV	P2	1 ph fault on Tesla, or Mosslanding w/delayed clearing	modeled off	modeled off	modeled off	modeled off	modeled off	102 MW at 2 sec	high voltage	over-voltage and under-frequency relay settings don't meet PRC -024 Standard, high voltage with contingency. Need to reduce scheduled voltage in the base case. Frequency below relay settings due to Diablo generation loss
				P4-1	1 ph fault on Diablo w/delayed clearing						102 MW at 6 sec	low frequency	
PG&E	34694	KENT_S/ Henrietta 70 kV	solar PV	P1, P6, P7	3 ph fault on Midway	modeled off	modeled off	modeled off	19 MW w/fault	modeled off	20 MW not tripped	high voltage	voltage spike with fault, possible modeling error
				P6	3 ph fault on Gates	modeled off	modeled off	modeled off	19 MW w/fault	modeled off	20 MW not tripped	high voltage	voltage spike with fault, possible modeling error
PG&E	35082	ORION 0.44	solar PV	P1, P6, P7	3ph fault Midway	modeled off	modeled off	modeled off	19 MW w/fault	modeled off	20 MW not tripped	high voltage	voltage spike with fault, possible modeling error
PG&E	35883	MEC STG1	Steam turbine	P1, P6, P7	3 ph fault Tesla	222 MW not tripped	237 MW at 4 sec	222 MW not tripped	modeled off	222 MW not tripped	modeled off	low voltage	Low voltage due to induction motor stalling, low voltage in the base case
PG&E	36411	DIABLO 1 25 kV	nuclear	P4-1	1ph fault Stuck breaker on Diablo 500 kV	N/A	N/A	1190 MW at 2 sec	N/A	N/A	1190 MW at 2 sec	out of step	under investigation
PG&E	36413	UNION OIL 13.8 kV	synchr gen	P1	3 ph fault Gates 500/230 kV # 11 or 12	stable	stable	6 MW at 18 sec	stable	stable	stable	out of step	under investigation
PG&E	38207	MCH_PV_1 0.34	solar PV	P6, P7	3 ph fault Tesla, Tracy	24 MW at 3 sec	24 MW not tripped	24 MW not tripped	24 MW not tripped	24 MW at 3 sec	24 MW not tripped	low voltage	low voltage due to induction motor stalling
PG&E	38552	DONPEDRO2	hydro	P1, P6	3 ph fault Metcalf, or Tesla	undamped oscillations	undamped oscillations	undamped oscillations	undamped oscillations	undamped oscillations	undamped oscillations	undamped oscillations	30 MW, possible modeling error
PG&E	38554	DONPEDRO4	hydro	P1, P6	3 ph fault Metcalf, or Tesla	undamped oscillations	undamped oscillations	undamped oscillations	undamped oscillations	undamped oscillations	undamped oscillations	undamped oscillations	25 MW possible modeling error
PG&E	38562	DAWSON/ Tuolumne 70 kV	hydro	P1, P6	3 ph fault Metcalf, or Tesla	undamped oscillations	undamped oscillations	undamped oscillations	undamped oscillations	undamped oscillations	undamped oscillations	undamped oscillations	small unit (2 MW), possible modeling error
NORTHWEST	44052	T_DALES_F1F3	hydro	P7	3ph fault Table Mtn-Tesla & Table Mtn-Vaca 500 kV	14 MW	stable	stable	stable	stable	stable	out of step	under investigation
NORTHWEST	44153	CHIEF JOE 25	hydro	P7	500 kV DLO from Malin, RM Statcom, Round Mtn, Table Mtn, Tesla	96 MW at 8-9 sec	tripped by RAS	stable	stable	96 MW at 17-18 sec	stable	out of step	need to be modeled as tripped by RAS. Possible modeling error.

Study Area: PG&E Bulk

Transient Stability UNITS



Transient Stability Performance (Tripped generation and load)

AREA	BUS NUMBER	NAME/ POI	TYPE	Contin- gency Category	Contingency	2026 Summer Peak	2031 Summer Peak	2023 Spring Off- Peak	2031 Spring Off- Peak	2026 SP High CEC Forecast	2023 SpOP Hi Renew & Min Gas Gen	reason for tripping	Mitigation/Comments
Generation Trip													
NORTHWEST	44558	GALAPV/ Ponderosa 115 kV	solar PV	P2	1 ph fault on Tesla with delayed clearing	not tripped	not tripped	17 MW at 2 sec	17 MW at 2 sec	not tripped	17 MW at 2 sec	high voltage	voltage above 1.1 after the fault, possible modeling error
PG&E	365534	Q954 0.27 on Gates 230 kV	solar PV	P1, P6, P7	3ph fault on Tracy, Tesla, Gates, Los Banos, Midway	modeled off	modeled off	modeled off	modeled off	modeled off	149 MW w/fault	high voltage	voltage spike with fault, possible modeling error
PG&E	365540	STANDARD OIL 12.47 kV Sobrante 115 kV	synchr gen	P1. P6, P7	3ph fault on Tesla	18 MW at 12 sec	18 MW at 13 sec	18 MW not tripped	18 MW not tripped	18 MW at 12 sec	18 MW not tripped	out of step	large loss of composite load with three-phase faults on Tesla in peak cases
PG&E	365659	Q622BSPV 0.44	solar PV	P1, P6, P7	3ph fault Gates, Diablo or Midway	modeled off	modeled off	modeled off	19 MW at 1.2 sec	modeled off	20 MW w/fault	high voltage	instant trip at 1.2 p.u. Possible modeling error
				P2	1ph fault w/delayed clearing on Midway	modeled off	modeled off	modeled off	19 MW w/fault	modeled off	not tripped	high voltage	
				P1, P6, P7	3ph fault Los Banos,	modeled off	modeled off	modeled off	not tripped	modeled off	20 MW w/fault	high voltage	
PG&E	366394	Q1454B 0.69 KV, connected to Metcalf 115 kV	battery	P1, P6, P7	3ph fault on Round Mtn, RM Statcom, Table Mtn	76 MW at 2 sec	modeled off	modeled off	-77 MW at 3 sec	76 MW at 2 sec	modeled off	high voltage	large loss of composite load with three-phase faults in peak cases
				P1, P6, P7	3ph fault on Tracy, Tesla or Metcalf	76 MW at 12 sec			-77 MW at 8 sec	76 MW at 12 sec			
				P1	3ph fault on Los Banos	not tripped			-77 MW at 3 sec	not tripped			
				P2	1 ph on Tesla or Metcalf w/ delayed clearing	76 MW at 3sec			-77 MW at 4 sec	76 MW at 3sec			
				P1, P6, P7	3ph fault on Vaca Dix	76 MW at 3sec			-77 MW at 4 sec	76 MW at 3sec			
PG&E	366711	Q1472BESS1 34.5	battery	P1, P6, P7	3ph fault on Tesla-Metcalf, or Tracy-Tesla	104 MW at 13 sec	modeled off	104 MW not tripped	104 MW not tripped	104 MW at 13 sec	104 MW not tripped	high voltage	large loss of composite load with three-phase faults on Tesla or Tracy in peak cases
				P2_3	1 ph fault w/delayed clearing on Tesla, Metcalf or Mosslanding	104 MW at 2 sec	modeled off	104 MW not tripped	104 MW not tripped	104 MW at 2 sec	104 MW not tripped	high voltage	
PG&E	366712	Q1472BESS2 34.5	battery	P1, P6, P7	3ph fault on Tesla-Metcalf, or Tracy-Tesla	104 MW at 13 sec	modeled off	104 MW not tripped	104 MW not tripped	104 MW at 13 sec	104 MW not tripped	high voltage	large loss of composite load with three-phase faults on Tesla or Tracy in peak cases
				P2_3	1 ph fault w/delayed clearing on Tesla, Metcalf or Mosslanding	104 MW at 2 sec	modeled off	104 MW not tripped	104 MW not tripped	104 MW at 2 sec	104 MW not tripped	high voltage	

Study Area: PG&E Bulk

Transient Stability UNITS



Transient Stability Performance (Tripped generation and load)

AREA	BUS NUMBER	NAME/ POI	TYPE	Contin- gency Category	Contingency	2026 Summer Peak	2031 Summer Peak	2023 Spring Off- Peak	2031 Spring Off- Peak	2026 SP High CEC Forecast	2023 SpOP Hi Renew & Min Gas Gen	reason for tripping	Mitigation/Comments
Generation Trip													
PG&E	366713	Q1472BESS3 34.5	battery	P1, P6, P7	3ph fault on Tesla-Metcalf, or Tracy-Tesla	101 MW at 13 sec	modeled off	101 MW not tripped	101 MW not tripped	101 MW at 13 sec	101 MW not tripped	high voltage	large loss of composite load with three-phase faults on Tesla or Tracy in peak cases
				P2_3	1 ph fault w/delayed clearing on Tesla, Metcalf or Mosslanding	101 MW at 2 sec	modeled off	101 MW not tripped	101 MW not tripped	101 MW at 2 sec	101 MW not tripped	high voltage	
ALBERTA	575002	SOL25S_01_1	solar PV	P7	PDCI bipolar	30 MW at 5 sec	30 MW at 5 sec	not in the case	not in the case	30 MW at 5 sec	not in the case	low voltage	possible modeling error
LOAD TRIP													
PG&E	36012	WATSONVILLE # 1	net load	P1, P6, P7	3 ph fault on Tesla 500 kV, any contingency	7.6 MW, at 4 sec	7.7 MW, at 4 sec	7.4 MW not tripped	-2 MW not tripped	8.2 MW, at 4 sec	3.7 MW not tripped	undervoltage	0.9 p.u. 3 sec relay settings for under-voltage load tripping
				P1, P6, P7	3 ph fault on Metcalf 500 kV, any contingency	7.6 MW, not tripped	7.7 MW, at 4 sec	7.4 MW not tripped	-2 MW not tripped	8.2 MW, at 4 sec	3.7 MW not tripped	undervoltage	0.9 p.u. 3 sec relay settings for under-voltage load tripping
				P1, P6, P7	3 ph fault Moss Landing 500 kV, any contingency	7.6 MW, not tripped	7.7 MW, at 4 sec	7.4 MW not tripped	-2 MW not tripped	8.2 MW, not tripped	3.7 MW not tripped	undervoltage	0.9 p.u. 3 sec relay settings for under-voltage load tripping
PG&E	36857	Mission 60.0 # 1	net load	P1, P6, P7	3 ph fault RM Statcom, Table Mtn, Vaca Dix	reduced to 84% w/fault	not tripped	not tripped	not tripped	reduced to 84% w/fault	not tripped	overfrequency	Frequency drop with fault, possible modeling error
PG&E	36860	Palm 60.0 # 1	net load	P6, P7	3 ph fault RM Statcom, Table Mtn	reduced to 68% w/fault	not tripped	not tripped	not tripped	reduced to 68% w/fault	not tripped	overfrequency	Frequency drop with fault, possible modeling error
PG&E	36860	Palm 60.0 # 2	net load	P6, P7	3 ph fault RM Statcom, Table Mtn	reduced to 58% w/fault	not tripped	not tripped	not tripped	reduced to 58% w/fault	not tripped	overfrequency	Frequency drop with fault, possible modeling error
PG&E	36890	Walsh 60.0 # 1	net load	P6, P7	3 ph fault Round Mtn, RM Statcom, Table Mtn, Tracy	reduced to 96% w/fault	not tripped	not tripped	not tripped	reduced to 96% w/fault	not tripped	overfrequency	Frequency drop with fault, possible modeling error
PG&E	36891	Zeno 60.0 # 2	net load	P1, P6, P7	3 ph fault Round Mtn, RM Statcom, Table Mtn, Tracy, Vaca Dix	reduced to 74% w/fault	not tripped	not tripped	not tripped	reduced to 74% w/fault	not tripped	overfrequency	Frequency drop with fault, possible modeling error
PG&E	38905	Kenneth 60.0 # 1	net load	P6, P7	3 ph fault Round Mtn, RM Statcom, Table Mtn	reduced to 41% w/fault	not tripped	not tripped	not tripped	reduced to 41% w/fault	not tripped	overfrequency	Frequency drop with fault, possible modeling error
PG&E	38146	LEAVITT	net load	P6	Table Mt-DRS # 1 and Table MT 500/230	not tripped	not tripped	not tripped	not tripped	not tripped	reduced to 93% at 2 sec	underfrequency	large frequency swing
NORTHWEST	45016	BELKNAP	load	P1	3 ph fault on Malin or Capt Jack	8 MW at 3 sec	8 MW at 3 sec	not tripped	not tripped	not tripped	not tripped	undervoltage	
			load	P1, P6, P7	3 ph fault on Round Mtn,	8 MW at 3 sec	not tripped	not tripped	not tripped	not tripped	not tripped	undervoltage	

Study Area: PG&E Bulk

Transient Stability UNITS



Transient Stability Performance (Tripped generation and load)

AREA	BUS NUMBER	NAME/ POI	TYPE	Contin- gency Category	Contingency	2026 Summer Peak	2031 Summer Peak	2023 Spring Off- Peak	2031 Spring Off- Peak	2026 SP High CEC Forecast	2023 SpOP Hi Renew & Min Gas Gen	reason for tripping	Mitigation/Comments
Generation Trip													
NORTHWEST	45070	BRYANT	load	P6, P7	3 ph fault on Round Mtn, Round Mtn Statcom	26 MW at 3 sec	26 MW at 3 sec	not tripped	not tripped	not tripped	not tripped	undervoltage	0.89 p.u 2 sec relay settings for under-voltage load tripping
				P1	3 ph fault on Malin or Capt Jack, Round Mtn, Round Mtn Statcom	26 MW at 3 sec	26 MW at 3 sec	not tripped	not tripped	not tripped	not tripped	undervoltage	
NORTHWEST	45389	EASY VLY	load	P6, P7	3 ph fault on Round Mtn, Round Mt Statcom,	15 MW at 3 sec	not tripped	not tripped	not tripped	15 MW at 3 sec	not tripped	undervoltage	
				P1	3 ph fault on Round Mtn, Malin or Capt Jack	15 MW at 3 sec	16 MW at 3 sec			15 MW at 3 sec		undervoltage	
NORTHWEST	45343	WHITE CTY	load	P1	3 ph fault on Malin or Capt Jack	25 MW at 3 sec	26 MW at 3 sec	not tripped	not tripped	not tripped	not tripped	undervoltage	
NORTHWEST	45501	TALENT	load	P1	3 ph fault on Malin or Capt Jack	23 MW at 3 sec	23 MW at 3 sec	not tripped	not tripped	not tripped	not tripped	undervoltage	
NORTHWEST	45533	WINCHESTER	load	P1	3 ph fault on Malin or Capt Jack	7 MW at 3 sec	not tripped	not tripped	not tripped	not tripped	not tripped	undervoltage	
NORTHWEST	45271	SAGEROAD	load	P1	3 ph fault on Malin or Capt Jack	29 MW at 3 sec	not tripped	not tripped	not tripped	not tripped	not tripped	undervoltage	
NORTHWEST	45407	MERLIN	load	P1, P6, P7	3 ph fault on Round Mtn	18 MW at 3 sec	not tripped	not tripped	not tripped	18 MW at 3 sec	not tripped	undervoltage	
				P1	3 ph fault on Malin or Capt Jack		19 MW at 3 sec					undervoltage	





Transient Stability

ONLY CONTINGENCIES WITH POTENTIAL VIOLATIONS ARE LISTED

			Transient Stability Performance (Number of voltage and frequency violations)						
Contingency	Category	Category Description	Baseline scenarios				Sensitivity		Potential Mitigation Solutions/ Comments
			2026 Summer Peak	2031 Summer Peak	2023 Spring Off- Peak	2031 Spring Off- Peak	2026 SP High CEC Forecast	2023 SpOP Hi Renew & Min Gas Gen	
P1_2-0. RPS-MOSSLAND #1 500kV, fault on MOSSLANDING	P1	L-1	no issues	Potential WECC/NERC criteria violation	no issues	no issues	no issues	no issues	Change UVLS relay settings on Watsonville load (Peak cases).
P1_2-1, or P1_2-2. ROUND MTN-TABLE MTN 500 kV, fault on TABLE MTN	P1	L-1	Potential WECC/NERC criteria violation	no issues	no issues	no issues	Potential WECC/NERC criteria violation	no issues	Review UVLS settings in Northwest so that load would not trip
P1_2-3. TABLE MTN-VACA DIX 500 kV , fault on TABLE MTN	P1	L-1	Potential WECC/NERC criteria violation	no issues	no issues	no issues	Potential WECC/NERC criteria violation	no issues	Review for possible modelling errors for UFLS in San Jose with the fault
P1_2-4. TABLE MTN-TESLA 500 kV, fault on TABLE MTN	P1	L-1	Potential WECC/NERC criteria violation	no issues	no issues	no issues	Potential WECC/NERC criteria violation	no issues	Review for possible modelling errors for UFLS in San Jose with the fault
P1_2-6. VACA DIX-TESLA 500 kV, fault on VACA DIX	P1	L-1	Potential WECC/NERC criteria violation	no issues	no issues	no issues	Potential WECC/NERC criteria violation	no issues	Review for possible modelling errors for UFLS in San Jose with the fault
P1_2-7. TRACY-TESLA 500 kV, fault on TRACY	P1	L-1	Potential WECC/NERC criteria violation	no issues	no issues	no issues	Potential WECC/NERC criteria violation	no issues	Change UVLS relay settings on Watsonville load (Peak cases). Review Dawson and San Pedro #2 and #4 units models because of undamped oscillations, also in other cases. Review for possible modelling errors for UFLS in San Jose with the fault . May need additional dynamic reactive support in the Bay Area
P1_2-8. TRACY-LOS BANOS 500 kV, fault on TRACY	P1	L-1	Potential WECC/NERC criteria violation	no issues	no issues	no issues	no issues	no issues	
P1_2-9. TESLA-METCALF 500 kV,fault on TESLA	P1	L-1	Potential WECC/NERC criteria violation	Potential WECC/NERC criteria violation	Potential WECC/NERC criteria violation	Potential WECC/NERC criteria violation	Potential WECC/NERC criteria violation	Potential WECC/NERC criteria violation	Change UVLS relay settings on Watsonville load (Peak cases). Review steam unit at Sobrante Standard Oil models for errors because of out-of-step tripping. Review Dawson and San Pedro #2 and #4 units models because of undamped oscillations, also in other cases. May need additional dynamic reactive support in the Bay Area
P1-2-10 TESLA - LOSBANOS 500 kV, fault on TESLA	P1	L-1	Potential WECC/NERC criteria violation	Potential WECC/NERC criteria violation	Potential WECC/NERC criteria violation	Potential WECC/NERC criteria violation	Potential WECC/NERC criteria violation	Potential WECC/NERC criteria violation	
P1-2-11 METCALF - MOSSLAND 500 kV, fault on METCALF	P1	L-1	Potential WECC/NERC criteria violation	Potential WECC/NERC criteria violation	Potential WECC/NERC criteria violation	Potential WECC/NERC criteria violation	Potential WECC/NERC criteria violation	Potential WECC/NERC criteria violation	Change UVLS relay settings on Watsonville load (Peak cases). Review Dawson and San Pedro #2 and #4 units models because of undamped oscillations, also in other cases
P1-2-12 MOSSLANDING - LOSBANOS 500 kV, fault on MOSSLANDING	P1	L-1	no issues	Potential WECC/NERC criteria violation	no issues	no issues	no issues	no issues	Change UVLS relay settings on Watsonville load (Peak cases)
P1-2-13 LOSBANOS -GATES 500 kV # 3, fault on LOS BANOS	P1	L-1	no issues	Potential WECC/NERC criteria violations	no issues	no issues	no issues	no issues	Review Clearwater (SCE) generator model for errors because of out-of-step tripping
P1-2-14 LOSBANOS -GATES 500 kV # 1, fault on LOS BANOS	P1	L-1	no issues	Potential WECC/NERC criteria violations	no issues	no issues	no issues	no issues	Review Clearwater (SCE) generator model for errors because of out-of-step tripping
P1-2-15 LOSBANOS - MIDWAY 500 kV, fault on LOS BANOS	P1	L-1	no issues	Potential WECC/NERC criteria violations	no issues	no issues	no issues	no issues	Review Clearwater (SCE) generator model for errors because of out-of-step tripping
P1-2-16 GATES - DIABLO 500 kV, fault on GATES	P1	L-1	no issues	Potential WECC/NERC criteria violations	no issues	no issues	no issues	no issues	Review Clearwater (SCE) generator model for errors because of out-of-step tripping
P1_2-17 GATES - MIDWAY 500 kV, fault on GATES	P1	L-1	no issues	Potential WECC/NERC criteria violations	no issues	no issues	no issues	no issues	Review Clearwater (SCE) generator model for errors because of out-of-step tripping
P1-2-20, P1_2-21 MIDWAY - VINCENT 500 kV # 1, fault on MIDWAY	P1	L-1	no issues	Potential WECC/NERC criteria violations	no issues	Potential WECC/NERC criteria violations	no issues	no issues	Review Clearwater (SCE) generator model for errors because of out-of-step tripping in 2031 peak. Undamped oscillations on 25378 RP_WWB_G renewable in 2031 off-peak. Possible modeling error
P1-2-22 MIDWAY-WHIRLWIND 500 kV, fault on MIDWAY	P1	L-1	no issues	Potential WECC/NERC criteria violations	no issues	Potential WECC/NERC criteria violations	no issues	no issues	Review Clearwater (SCE) generator model for errors because of out-of-step tripping in 2031 peak. Undamped oscillations on 25378 RP_WWB_G renewable in 2031 off-peak. Possible modeling error



Transient Stability

ONLY CONTINGENCIES WITH POTENTIAL VIOLATIONS ARE LISTED

			Transient Stability Performance (Number of voltage and frequency violations)						
Contingency	Category	Category Description	Baseline scenarios				Sensitivity		Potential Mitigation Solutions/ Comments
			2026 Summer Peak	2031 Summer Peak	2023 Spring Off- Peak	2031 Spring Off- Peak	2026 SP High CEC Forecast	2023 SpOP Hi Renew & Min Gas Gen	
P1_2-23 or P1_2-24 MALIN-ROUND MTN 500 kV, fault on MALIN	P1	L-1	Potential WECC/NERC criteria violations	no issues	no issues	no issues	Potential WECC/NERC criteria violations	no issues	Review UVLS settings in Northwest so that load would not trip
P1_2-25 CAPT JACK-OLINDA 500 kV, fault on CAPT JACK	P1	L-1	Potential WECC/NERC criteria violations	no issues	no issues	no issues	Potential WECC/NERC criteria violations	no issues	Review UVLS settings in Northwest so that load would not trip
P1_3-2 TRACY 500/230 kV transformer # 1 , fault on TRACY 500 kV	P1	T-1	no issues	no issues	no issues	no issues	no issues	no issues	May need additional dynamic reactive support in the Bay Area
P1_3-7,8,9 TESLA 500/230 kV transformer # 2, 4 or 6, fault on TESLA 500 kV	P1	T-1	Potential WECC/NERC criteria violations	Potential WECC/NERC criteria violations	Potential WECC/NERC criteria violations	Potential WECC/NERC criteria violations	Potential WECC/NERC criteria violations	Potential WECC/NERC criteria violations	Change UVLS relay settings on Watsonville load (Peak cases). Review steam unit at Sobrante Standard Oil models for errors because of out-of-step tripping. Review Dawson and San Pedro #2 and #4 units models because of undamped oscillations, also in other cases. May need additional dynamic reactive support in the Bay Area. Review steam unit at Sobrante Standard Oil models for errors because of out-of-step tripping.
P1_3-11 METCALF 500/230 kV transformer # 11, fault on METCLAF 500 kV	P1	T-1	no issues	Potential WECC/NERC criteria violations	no issues	no issues	Potential WECC/NERC criteria violations	no issues	Change UVLS relay settings on Watsonville load (Peak cases).
P1_3-13 MOSSLANDING 500/230 kV transformer # 11, fault on MOSSLANDING 500 kV	P1	T-1	no issues	Potential WECC/NERC criteria violations	no issues	no issues	no issues	no issues	Change UVLS relay settings on Watsonville load (Peak cases).
P1_3-14 LOS BANOS 500/230 kV transformer, fault on LOS BANOS 500 kV	P1	T-1	no issues	Potential WECC/NERC criteria violations	no issues	no issues	no issues	no issues	Review Clearwater (SCE) generator model for errors because of out-of-step tripping
P1_3-15 GATES 500/230 kV transformer # 11, fault on GATES 500 kV	P1	T-1	no issues	Potential WECC/NERC criteria violations	no issues	no issues	no issues	no issues	Review Clearwater (SCE) generator model for errors because of out-of-step tripping
P1_3-18 MIDWAY 500/230 kV transformer # 11	P1	T-1	no issues	Potential WECC/NERC criteria violations	no issues	Potential WECC/NERC criteria violations	no issues	no issues	Review Clearwater (SCE) generator model for errors because of out-of-step tripping in 2031 peak. Undamped oscillations on 25378 RP_WWB_G renewable in 2031 off-peak. Possible modeling error
P4_1-0 3 PHASE FAULT, DELAYED CLEARING ON DIABLO GENERATOR FAULT ON DIABLO 500KV BUS	P4	3ph delayed clearing	no issues	no issues	Potential WECC/NERC criteria violations	no issues	no issues	Potential WECC/NERC criteria violations	out of step tripping of Diablo generator
P6_1_1-22 TESLA-TABLE MTN 500 kV and TESLA-TRACY 500 kV, fault on TESLA 500 kV	P6	L-1/L-1	Acceptable for P6	Acceptable for P6	no issues	no issues	Acceptable for P6	no issues	May need additional dynamic reactive support in the Bay Area
P6_1_1-23 TESLA-TABLE MTN 500 kV and TESLA-METCALF 500 kV, fault on TESLA 500 kV	P6	L-1/L-1	Acceptable for P6	Acceptable for P6	no issues	no issues	Acceptable for P6	no issues	May need additional dynamic reactive support in the Bay Area
P6_1_1-24 TESLA-TABLE MTN 500 kV and TESLA-LOS BANOS 500 kV, fault on TESLA 500 kV	P6	L-1/L-1	Acceptable for P6	Acceptable for P6	no issues	no issues	Acceptable for P6	no issues	May need additional dynamic reactive support in the Bay Area
P6_1_1-25 TESLA-VACA DIX 500 kV and TESLA-TRACY 500 kV, fault on TESLA 500 kV	P6	L-1/L-1	Acceptable for P6	Acceptable for P6	no issues	no issues	Acceptable for P6	no issues	May need additional dynamic reactive support in the Bay Area
P6_1_1-26 TESLA-VACA DIX 500 kV and TESLA-METCALF 500 kV, fault on TESLA 500 kV	P6	L-1/L-1	Acceptable for P6	Acceptable for P6	no issues	no issues	Acceptable for P6	no issues	May need additional dynamic reactive support in the Bay Area
P6_1_1-27 TESLA-VACA DIX 500 kV and TESLA-LOS BANOS 500 kV, fault on TESLA 500 kV	P6	L-1/L-1	Acceptable for P6	Acceptable for P6	no issues	no issues	Acceptable for P6	no issues	May need additional dynamic reactive support in the Bay Area
P6_1_1-28 TESLA-TRACY 500 kV and TESLA-METCALF 500 kV, fault on TESLA 500 kV	P6	L-1/L-1	Acceptable for P6	Acceptable for P6	no issues	no issues	Acceptable for P6	no issues	May need additional dynamic reactive support in the Bay Area
P6_1_1-29 TESLA-TRACY 500 kV and TESLA-LOS BANOS 500 kV, fault on TESLA 500 kV	P6	L-1/L-1	Acceptable for P6	Acceptable for P6	no issues	no issues	Acceptable for P6	no issues	May need additional dynamic reactive support in the Bay Area
P6_1_1-30 TESLA-METCALF 500 kV and TESLA-LOS BANOS 500 kV, fault on TESLA 500 kV	P6	L-1/L-1	Acceptable for P6	Acceptable for P6	no issues	no issues	Acceptable for P6	no issues	May need additional dynamic reactive support in the Bay Area
P6_1_1-83 TRACY-OLINDA and TRACY-LOS BANOS 500 kV, fault on TRACY	P6	L-1/L-1	Acceptable for P6	Acceptable for P6	no issues	no issues	Acceptable for P6	no issues	May need additional dynamic reactive support in the Bay Area
P6_1_1-84 TRACY-TESLA and TRACY-LOS BANOS 500 kV, fault on TRACY	P6	L-1/L-1	Acceptable for P6	Acceptable for P6	no issues	no issues	Acceptable for P6	no issues	May need additional dynamic reactive support in the Bay Area



Transient Stability ONLY CONTINGENCIES WITH POTENTIAL VIOLATIONS ARE LISTED

			Transient Stability Performance (Number of voltage and frequency violations)						
Contingency	Category	Category Description	Baseline scenarios				Sensitivity		Potential Mitigation Solutions/ Comments
			2026 Summer Peak	2031 Summer Peak	2023 Spring Off- Peak	2031 Spring Off- Peak	2026 SP High CEC Forecast	2023 SpOP Hi Renew & Min Gas Gen	
P6_1_2-10 TESLA - TABLE MTN 500 kV and TESLA 500/230 kV transformer	P6	L-1/T-1	Acceptable for P6	Acceptable for P6	no issues	no issues	Acceptable for P6	no issues	May need additional dynamic reactive support in the Bay Area
P6_1_2-11 TESLA - VACA DIX 500 kV and TESLA 500/230 kV transformer	P6	L-1/T-1	Acceptable for P6	Acceptable for P6	no issues	no issues	Acceptable for P6	no issues	May need additional dynamic reactive support in the Bay Area
P6_1_2-12 TESLA - METCALF 500 kV and TESLA 500/230 kV transformer	P6	L-1/T-1	Acceptable for P6	Acceptable for P6	no issues	no issues	Acceptable for P6	no issues	May need additional dynamic reactive support in the Bay Area
P6_1_2-13 TESLA - METCALF 500 kV and TESLA # 2 500/230 kV transformer, fault on TESLA	P6	L-1/T-1	Acceptable for P6	Acceptable for P6	no issues	no issues	Acceptable for P6	no issues	May need additional dynamic reactive support in the Bay Area
P6_1_2-14 TESLA - LOSBANOS 500 kV and TESLA 500/230 kV transformer, fault on TESLA 500 kV	P6	L-1/T-1	Acceptable for P6	Acceptable for P6	no issues	no issues	Acceptable for P6	no issues	May need additional dynamic reactive support in the Bay Area
P6_1_2-17 TESLA-METCALF #1 500kV Line & METCALF 230/500kV #11	P6	L-1/T-1	Acceptable for P6	Acceptable for P6	no issues	no issues	Acceptable for P6	no issues	May need additional dynamic reactive support in the Bay Area
P6_1_2-41 TRACY-OLINDA 500 kV and TRACY 500/230 kV transformer, fault on TRACY	P6	L-1/T-1	no issues	no issues	no issues	no issues	no issues	no issues	May need additional dynamic reactive support in the Bay Area
P6_1_2-42 TRACY-TESLA 500 kV and TRACY 500/230 kV transformer, fault on TRACY	P6	L-1/T-1	no issues	no issues	no issues	no issues	no issues	no issues	May need additional dynamic reactive support in the Bay Area
P6_1_2-43 TRACY-LOS BANOS 500 kV and TRACY 500/230 kV transformer, fault on TRACY	P6	L-1/T-1	no issues	no issues	no issues	no issues	no issues	no issues	May need additional dynamic reactive support in the Bay Area
P6_2_2-0 TESLA 500/230 kV transformers # 2 and 4, fault on TESLA 500 kV	P6	T-1/T-1	Acceptable for P6	Acceptable for P6	no issues	no issues	Acceptable for P6	no issues	May need additional dynamic reactive support in the Bay Area
P6_2_2-5 TRACY 500/230 kV transformers # 1 and 2, fault on TRACY	P6	T-1/T-1	Acceptable for P6	Acceptable for P6	no issues	no issues	Acceptable for P6	no issues	May need additional dynamic reactive support in the Bay Area
P7_1_1-21 TESLA-TABLE MTN 500 kV and TESLA-VACA DIX 500 kV, fault on TESLA 500 kV	P7	L-2	Acceptable for P6	Acceptable for P6	no issues	no issues	Acceptable for P6	no issues	May need additional dynamic reactive support in the Bay Area

Study Area: PG&E Bulk



Single Contingency Load Drop

Worst Contingency	Category	Category Description	Amount of Load Drop (MW)										Potential Mitigation Solutions
			2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off- Peak	2024 Spring Off- Peak	2029 Spring Off- Peak	2029 Winter Off- Peak	2021 SP Heavy Renewable & Min Gas Gen	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	
N/A													

No single contingency resulted in total load drop of more than 250 MW.

Study Area: PG&E Bulk



Single Source Substation with more than 100 MW Load

Substation	Load Served (MW)										Potential Mitigation Solutions
	2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off- Peak	2024 Spring Off- Peak	2029 Spring Off- Peak	2029 Winter Off- Peak	2021 SP Heavy Renewable & Min Gas Gen	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	
N/A											

No single source substation with more than 100 MW Load