APPENDIX C: Reliability Assessment Study Results

Intentionally left blank

Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Loading % (Baseline Scenarios)							Loading % (Sensitivity Scenarios)			ISO Approved Projects & 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	
500 kV LINES														
ROUND MTN –TABLE MTN #1 or #2 500 kV	Rnd Mtn –Table Mtn #2 or # 1 500 kV	P1	L-1	105.1%	99.6%	102.7%	<95%	<95%	<95%	<95%	<95%	98.9%	<95%	Reduce COI flow according to seasonal nomogram or bypass series capacitors on the remaining Round Mtn-Table Mtn 500 kV line if overload
ROUND MTN-TABLE MTN # 2 or # 1 500 KV	Round Mtn-Table Mtn # 1 or # 2 and Table Mtn 500/230 kV	P6	L-1/T-1	105.3%	100.2%	102.0%	<95%	<95%	<95%	<95%	<95%	99.5%	<95%	
ROUND MTN-TABLE MTN # 1 500 KV	Round Mtn-Table Mtn # 2 and Table Mtn 500/230 kV	P2	BRK	105.3%	99.9%	101.9%	<95%	<95%	<95%	<95%	<95%	99.5%	<95%	
ROUND MTN-TABLE MTN # 1 or # 2 500 KV	Round Mtn-Table Mtn # 2 or # 1 500 KV and Diablo unit	P3	G-1/L-1	119.4%	111.0%	N/A	<95%	<95%	<95%	<95%	<95%	110.2%	<95%	
CAPTAIN JACK-OLINDA 500 kV	Round Mtn-Table Mtn 500 kV #1 and #2 500 kV	P7	L-2	100.0%	98.2%	99.6%	<95%	<95%	<95%	<95%	<95%	98.4%	<95%	Reduce COI flow according to seasonal nomogram
MIDWAY-VINCENT # 1 500 kV	Midway-Vincent # 2 and Midway-Whirlwind	P6	L-1/L-1	102.3%	<95%	<95%	<95%	<95%	<95%	<95%	<95%	<95%	99.8%	Existing Path 26 procedure under review.
MIDWAY-VINCENT # 2 500 kV	Midway-Vincent # 1 and Midway-Whirlwind 500 kV	P6	L-1/L-1	102.2%	<95%	<95%	<95%	<95%	<95%	<95%	<95%	<95%	100.0%	
500/230 kV TRANSFORMERS														
OLINDA 500/230 kV x-former	Round Mtn 500/230 kV x-former	P1	T-1	<95%	<95%	<95%	103.4%	103.7%	107.3%	<95%	<95%	<95%	<95%	Reduce COI flow according to the nomogram
	Round Mtn 500 kV stuck BRK- line to Table Mtn # 2 & x-former	P2/P6	BRK	<95%	<95%	<95%	106.1%	106.5%	110.3%	<95%	<95%	<95%	<95%	
	Round Mtn 500 kV stuck BRK- line to Table Mtn # 1 & x-former	P2/P6	BRK	<95%	<95%	<95%	105.2%	106.0%	109.7%	<95%	<95%	<95%	<95%	
	Round Mtn 500/230 and Diablo unit	P3	G-1/T-1	<95%	<95%	N/A	104.1%	103.0%	N/A	N/A	<95%	<95%	<95%	
	Malin- Round Mtn #1 and #2 500 kV	P7	L-2	<95%	<95%	<95%	117.1%	120.6%	121.8%	<95%	<95%	<95%	105.6%	
ROUND MTN 500/230 kV x-former	Olinda 500/230 kV x-former	P1	T-1	<95%	<95%	<95%	101.9%	100.9%	104.0%	<95%	<95%	<95%	<95%	Reduce COI flow according to the nomogram
	Round Mtn-Table Mtn #1 and #2 500 kV	P7	L-2	<95%	<95%	<95%	102.2%	111.1%	112.9%	<95%	<95%	<95%	<95%	
	Diablo -unit	P1	G-1	<95%	<95%	<95%	100.0%	<P0	N/A	N/A	<95%	<95%	<P0	
	Table Mtn-Vaca Dix 500 kV	P1	L-1	<95%	<95%	<95%	100.0%	102.0%	102.1%	<95%	<95%	<95%	101.1%	
	Table Mtn-Tesla 500 kV	P1	L-1	<95%	<95%	<95%	<P0	101.9%	101.1%	<95%	<95%	<95%	<P0	
	Capt Jack-Olinda 500 kV	P1	L-1	<95%	<95%	<95%	101.6%	103.9%	103.7%	<95%	<95%	<95%	103.0%	
	Olinda-Tracy 500 kV	P1	L-1	<95%	<95%	<95%	99.8%	101.6%	101.2%	<95%	<95%	<95%	100.9%	

TABLE MTN 500/230 kV x-former	Vaca Dix-Tesla 500 kV	P1	L-1	<95%	<95%	<95%	100.2%	102.5%	<P0	<95%	<95%	<95%	<P0	Reduce COI flow according to the nomogram, upgrade if economic
	Tesla-Los Banos 500 kV	P1	L-1	<95%	<95%	<95%	<P0	101.3%	<P0	<95%	<95%	<95%	<P0	
	Round Mtn 500/230 kV x-former	P1	T-1	<95%	<95%	<95%	102.2%	103.0%	102.9%	<95%	<95%	<95%	102.4%	
	Tesla 500/230 kV x-former	P1	T-1	<95%	<95%	<95%	<P0	101.2%	101.5%	<95%	<95%	<95%	101.8%	
	Los Banos 500 kV stuck BRK-lines to Gates & Tesla	P2/P6	BRK	<95%	<95%	<95%	99.8%	101.5%	100.7%	<95%	<95%	<95%	<P1	
	Tesla 500 kV stuck BRK- lines to Vaca Dix & Los Banos	P2/P6	BRK	<95%	<95%	<95%	100.9%	103.6%	101.2%	<95%	<95%	<95%	<P1	
	Round Mtn 500 kV stuck BRK- line to Table Mtn # 2 & x-former	P2/P6	BRK	<95%	<95%	<95%	100.8%	101.1%	101.0%	<95%	<95%	<95%	101.3%	
	Round Mtn 500 kV stuck BRK- line to Table Mtn # 1 & x-former	P2/P6	BRK	<95%	<95%	<95%	100.3%	101.5%	101.5%	<95%	<95%	<95%	<P1	
	Capt Jack-Olinda 500 kV & Diablo unit	P3	G-1/L-1	<95%	<95%	<95%	102.2%	<P1	N/A	<95%	<95%	<95%	<P1	
	Olinda-Tracy 500 kV & Diablo unit	P3	G-1/L-1	<95%	<95%	<95%	100.5%	<P1	N/A	<95%	<95%	<95%	<P1	
	Olinda 500/230 kV and Diablo unit	P3	G-1/T-1	<95%	<95%	<95%	100.2%	<P1	N/A	<95%	<95%	<95%	<P1	
	Round Mtn 500/230 and Diablo unit	P3	G-1/T-1	<95%	<95%	<95%	103.4%	<P1	N/A	<95%	<95%	<95%	<P1	
	Tracy-Los Banos and Tesla-Los Banos 500 kV	P7	L-2	<95%	<95%	<95%	101.8%	104.5%	102.2%	<95%	<95%	<95%	101.8%	
	Table Mtn-Vaca Dix and Table Mtn-Tesla 500 kV	P7	L-2	<95%	<95%	<95%	105.4%	111.0%	110.1%	<95%	<95%	<95%	105.6%	
	Tracy-Los Banos and Tesla-Los Banos 500 kV	P7	L-2	<95%	<95%	<95%	101.8%	104.5%	102.2%	<95%	<95%	<95%	101.8%	
	Table Mtn-Tesla and Vaca Dix-Tesla 500 kV	P7	L-2	<95%	<95%	<95%	104.3%	109.6%	104.5%	<95%	<95%	<95%	102.7%	
	Bi-pole PDCI outage	P7	DC	<95%	<95%	<95%	<P0	<P0	102.6%	<95%	<95%	<95%	<P0	
METCALF 500/230 kV x-former #11, 12 or 13	Metcalf 500/230 kV Tranformers #11 & #12 or #13	P6	T-1/T-1	<95%	101.5%	110.5%	<95%	<95%	<95%	<95%	123.0%	112.3%	<95%	- For baseline scenarios increase generation in the area after 1st contingency, - Under sensitivity scenario with minimum gas generation, load tripping might be required to address the P6 overload.
GATES 500/230 kV # 1 or 2 x-former	Gates 500/230 kV # 1 or 2 x-former and Diablo unit	P3	G-1/T-1	<95%	<95%	<95%	<95%	<95%	N/A	N/A	<95%	<95%	104.1%	Sensitivity only
230 kV LINES														
COTTONWD E-ROUND MTN 230kV #3	Table Mtn-Vaca Dix and Table Mtn-Tesla 500 kV	P7	L-2	101.6%	107.4%	102.8%	<95%	<95%	<95%	<95%	96.6%	108.4%	<95%	Reduce COI flow according to seasonal nomogram, or upgrade the line if economic.
TABLE MTN-RIO OSO 230 kV	Tbl Mtn-Vaca Dix 500 kV and Table Mtn-Palermo 230 kV	P6	L-1/L-1	106.2%	<95%	<95%	<95%	<95%	<95%	<95%	<95%	<95%	<95%	Project: Rio Oso 230 kV BAAH Bus Upgrade Project ISD: Dec 2022

TABLE MTN-RIO OSO 230 kV	Table Mtn-Vaca Dix and Table Mtn-Tesla 500 kV	P7	L-2	100.8%	<95%	<95%	<95%	<95%	<95%	<95%	<95%	<95%	ISD: Dec 2022 Short term: COI Nomogram
CAYETANO- LONETREE 230 kV	Tesla 500 kV Stuck breaker (line to Metcalf and x-former # 2)	P2/P6	BRK	97.1%	99.0%	103.0%	<95%	<95%	<95%	<95%	<95%	101.5%	<95%	Reduce generation in the area
NEWARK-LOS ESTEROS 230 kV	Tesla-Metcalf and Mosslndg-Los Banos 500 kV	P6	L-1/L-1	<95%	<95%	<95%	<95%	<95%	<95%	<95%	111.4%	<95%	<95%	Sensitivity only
NEWARK-E-F BRK (to LOS ESTEROS) 230 kV	Tesla-Metcalf and Mosslndg-Los Banos 500 kV	P6	L-1/L-1	<95%	<95%	<95%	<95%	<95%	<95%	<95%	112.4%	<95%	<95%	
DELEVAN-CORTINA 230 KV	Olinda-Tracy 500 kV	P1	L-1	98.4%	95.5%	101.5%	<95%	<95%	<95%	<95%	<95%	<95%	<95%	Reduce generation in the area
	Table Mtn 500 kV Stuck breaker (lines to Rnd Mtn and Vaca Dix)	P2/P6	BRK	97.6%	96.0%	101.9%	<95%	<95%	<95%	<95%	<95%	95.9%	<95%	
	Table Mtn-Vaca Dix and Diablo unit	P3	G-1/L-1	100.5%	98.1%	N/A	<95%	<95%	<95%	<95%	<95%	97.9%	<95%	
	Olinda-Tracy 500 kV and Diablo unit	P3	G-1/L-1	106.4%	99.8%	N/A	<95%	<95%	<95%	<95%	<95%	100.7%	<95%	
	Round Mtn-Table Mtn 500 kV #1 and #2 500 kV	P7	L-2	106.3%	101.4%	110.0%	<95%	<95%	<95%	<95%	<95%	101.0%	<95%	
	Table Mtn-Vaca Dix and Table Mtn-Tesla 500 kV	P7	L-2	106.4%	104.9%	111.4%	<95%	<95%	<95%	<95%	<95%	104.5%	<95%	
	Table Mtn-Vaca Dix and Vaca Dix -Tesla 500 kV	P7	L-2	<95%	<95%	102.5%	<95%	<95%	<95%	<95%	98.0%	<95%	<95%	
LOS BANOS-PADRE FLAT SS 230 kV (LOS BANOS-PANOCHE #1)	Los Banos-Gates # 1 and Los Banos-Midway 500 kV	P7	L-2	<95%	<95%	<95%	109.4%	<95%	<95%	<95%	99.3%	<95%	<95%	Reduce generation in the area
MOSSLANDING-LAS AGUILAS 230 kV	Mosslanding-Los Banos 500 kV	P1	L-1	<95%	<95%	<95%	<95%	102.2%	<95%	<95%	95.7%	<95%	<95%	Turning off generation in the area for P6 will not eliminate overloads without turning on Moss Landing generation in some cases. The most critical P6 contingencies, where increase of Mosslanding generation is needed, are shown prior to re-dispatch.
	Tracy-Los Banos & Mosslanding-Los Banos	P6	L-1/L-1	<95%	<95%	<95%	107.1%	118.5%	97.0%	<95%	101.4%	<95%	<95%	
	Tesla-Los Banos & Mosslanding-Los Banos	P6	L-1/L-1	<95%	<95%	<95%	112.3%	125.4%	100.9%	<95%	104.7%	<95%	<95%	
	Mosslanding-Los Banos 500 kV & Tesla-Metcalf 500 kV	P6	L-1/L-1	<95%	<95%	<95%	128.5%	136.7%	115.2%	<95%	162.7%	<95%	111.8%	
230/115 kV TRANSFORMERS and 230/70 kV														
NEWARK 230/115 kV #11	Tesla-Metcalf and Mosslndg-Los Banos 500 kV	P6	L-1/L-1	<95%	98.3%	98.0%	<95%	<95%	<95%	<95%	102.3%	105.0%	<95%	Adjust NRS phase shifter and/or increase generation in the area.
	Tesla-Metcalf 500 kV and Newark -Los Esteros 230 kV kV	P6	L-1/L-1	102.9%	98.5%	99.6%	<95%	<95%	<95%	<95%	<95%	100.6%	<95%	
	Tesla-Metcalf 500 kV and Newark E-F 230 kV kV bus tie (to Los Esteros)	P6	L-1/BRK	108.2%	104.4%	105.4%	<95%	<95%	<95%	<95%	98.4%	106.9%	<95%	
HENRIETTA 230/115 kV	Mustang-Mc Call 230 kV and Diablo unit	P3	L-1/G-1	<95%	<95%	<95%	<95%	<95%	N/A	N/A	<95%	<95%	107.6%	Sensitivity only
115 kV LINES														
DELTA - CASCADE 115 kV	Capt Jack-Olinda 500 kV and Diablo unit	P3	G-1/L-1	97.0%	100.4%	<95%	<95%	<95%	<95%	<95%	<95%	101.7%	<95%	adjust Weed Phase Shifter or limit COI flow within seasonal nomogram
	Malin- Round Mtn #1 and #2 500 kV	P7	L-2	101.1%	112.7%	99.4%	<95%	<95%	<95%	<95%	<95%	113.3%	<95%	

	Round Mtn-Table Mtn 500 kV #1 and #2 500 kV	P7	L-2	<95%	101.1%	<95%	<95%	<95%	<95%	<95%	<95%	102.4%	<95%	
DRUM-BRUNSWICK -RIO OSO 115 kV	Round Mtn-Table Mtn 500 kV #1 and #2 500 kV	P7	L-2	100.1%	<95%	101.6%	<95%	<95%	<95%	<95%	<95%	<95%	<95%	Reduce Drum generation
NEWARK-NRS 115 kV	Tesla-Metcalf 500 kV and Newark E-F 230 kV bus tie (to Los Esteros)	P6	L-1/BRK	<95%	101.7%	<95%	<95%	<95%	<95%	<95%	<95%	105.2%	<95%	Adjust NRS phase shifter
AMES-MT VIEW 115 kV	Tesla-Metcalf and Mosslndg-Los Banos 500 kV	P6	L-1/L-1	<95%	<95%	<95%	<95%	<95%	<95%	<95%	102.0%	<95%	<95%	Sensitivity only
AMES-WHISMAN 115 kV	Tesla-Metcalf and Mosslndg-Los Banos 500 kV	P6	L-1/L-1	<95%	<95%	<95%	<95%	<95%	<95%	<95%	101.6%	<95%	<95%	

Substation	Contingency (All and Worst P6)	Category	Category Description	Post Cont. Voltage, PU (Baseline Scenarios)							Post Cont. Voltage, PU (Sensitivity Scenarios)			ISO Approved Projects & 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	
MAXWELL 500 kV	Normal Conditions	P0	normal	1.057	1.054	1.049	within limits				within limits	1.054	within limits	Installation of Round Mountain 500 kV STATCOM (modeled starting from 2024) improves voltage. Maxwell 500 kV voltage is within PG&E limits, but is still below WAPA limit of 495 kV. Operating COI within seasonal nomogram may help to improve voltages
	Round Mtn-Table Mnt #1 and # 2 500 kV	P7	L-2	0.971	0.989	0.980						0.990		
	Malin-Round Mtn # 1 and # 2 500 kV	P7	L-2	0.968	0.990	>0.99						>0.99		
	Table Mtn-Vaca Dix 500 kV and Diablo unit	P3	L-1/G-1	0.973	>0.99	N/A						>0.99		
	Table Mtn-Tesla 500 kV and Diablo unit	P3	L-1/G-1	0.986	>0.99	N/A						>0.99		
	Malin-Round Mtn # 1 or 2 and Diablo unit	P3	L-1/G-1	0.988	>0.99	N/A						>0.99		
	Round Mtn-Table Mtn # 2 & Round Mtn-Malin # 2 or # 1 500 kV	P6	L-1/L-1	0.980	>0.99	0.981						0.990		
METCALF 500 kV	Normal Conditions	P0	normal	<1.08	<1.08	<1.08	<1.08	<1.08	<1.08	<1.08	<1.08	<1.08	1.082	sensitivity only
GATES 500 kV	Normal Conditions	P0	normal	1.082	<1.08	<1.08	<1.08	<1.08	<1.08	<1.08	1.084	<1.08	<1.08	install reactive support to absorb VARs on Gates , modeled starting from 2024. Turn on shunt reactors in transformer tertiary prior to that
DIABLO 500 kV	Normal Conditions	P0	normal	<1.08	<1.08	1.082	<1.08	<1.08	1.080	1.082	<1.08	<1.08	<1.08	install reactive support to absorb VARs on Gates, modeled starting from 2024. Reduce scheduled voltage on Gates and /or turn on reactors in the Midway tertiary to bring Diablo voltage within the limits

Study Area: PG&E Bulk

Voltage Deviation

Substation	Contingency (All and Worst P6)	Category	Category Description	Post Cont. Voltage Deviation % (Baseline Scenarios)							Post Cont. Voltage Deviation % (Sensitivity Scenarios)			ISO Approved Projects & 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	
NONE over 8%														

Study Area: PG&E Bulk

Transient Stability

Transient Stability Performance (Number of voltage and frequency violations)

Generator/Load	Contingency	Category	Category Description	Baseline scenarios				Sensitivity		Potential Mitigation Solutions
				2024 Summer Peak	2029 Summer Peak	2024 Spring Off-Peak	2029 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	
Tripped Generation										
renewable generator bus 34683 0.38 kV at Mustang 230 kV bus	1 Phase fault on TESLA 500KV BUS - delayed clearing	P2	bus section	modeled off in the case	modeled off in the case	tripped due to high voltage >1.1 p.u. after 2 sec , 90 MW	not tripped with these contingencies	modeled off in the case	tripped due to high voltage >1.1 p.u. after 2 sec , 102 MW	need to investigate and check relay settings
	1 Phase fault on METCALF 500KV BUS - delayed clearing	P2	bus section	modeled off in the case	modeled off in the case	not tripped with these contingencies	tripped due to high voltage >1.1 p.u. after 2 sec , 103 MW	modeled off in the case	tripped due to high voltage >1.1 p.u. after 2 sec , 102 MW	
	1 Phase fault on MOSSLANDING 500KV BUS - delayed clearing	P2	bus section	modeled off in the case	modeled off in the case	tripped due to high voltage >1.1 p.u. after 2 sec , 90 MW	tripped due to high voltage >1.1 p.u. after 2 sec , 103 MW	modeled off in the case	tripped due to high voltage >1.1 p.u. after 2 sec , 102 MW	
renewable generator bus 33102 COLUMBIA 0.36 (East Bay)	3 Phase Fault TRACY or TESLA, 500 kV	P1, P6-7	any	modeled off in the case	modeled off in the case	not tripped in this case, protection not modeled	tripped due to high voltage >1.1 p.u. after 8 sec , 19 MW	modeled off in the case	not tripped in this case, protection not modeled	High voltages in the base case. Consider installing reactors due to high voltages in the area.
	1 Phase fault on TESLA 500KV BUS - delayed clearing	P2	bus section	modeled off in the case	modeled off in the case	not tripped in this case, protection not modeled	tripped due to high voltage >1.1 p.u. after 3 sec , 19 MW	modeled off in the case	not tripped in this case, protection not modeled	
renewable generator bus 36436 TOPAZ B2 0.69 kV	3 Phase fault MIDWAY 500 kV	P1, P6, P7	L-1, T-1, L-1/L-1	modeled off in the case	modeled off in the case	tripped for low voltage <0.9 p.u after 4 sec, 240 MW	tripped for low voltage <0.9 p.u after 4 sec, 245 MW	modeled off in the case	tripped for low voltage <0.9 p.u after 4 sec, 243 MW	May need additional reactive support, low voltages after contingencies
renewable generator bus 365563 Q885 0.36 kV at S. KERN	3 Phase fault MIDWAY 500 kV, Diabloe Midway # 2 and 3 outage	P7	L-2	modeled off in this case	modeled off in this case	not tripped with these contingencies, protection not modeled	not tripped with these contingencies, protection not modeled	modeled off in this case	tripped for high voltage after 7sec, 10 MW	High voltages in the base case. Consider installing reactors due to high voltages in the area.
	3 phase fault on Diablo generator with delayed clearing, Diablo-Midway out	P4	L-1						tripped for high voltage after 3 sec, 10 MW	
generator 35024 DEXEL 13.8 kV	3 Phase fault on MIDWAY 500 kV, contingencies between Midway and Vincent	P1,P6, P7	L-1, L-1/-1	not tripped with these contingencies	tripped by branch overcurrent relay after 3 sec, 20.3 MW	not tripped with these contingencies	not tripped with these contingencies	not tripped with these contingencies	not tripped with these contingencies	need to investigate and check relay settings
renewable at bus 29273 SKY RIVER_G1	2 Phase Fault on LOS BANOS or GATES 500 kV	P1, P6, P7	L-1, T-1, L-1/-1	not modeled in the case	tripped for high voltage with fault, 42 MW	not modeled in the case	tripped for high voltage with fault, 42 MW	not modeled in the case	not modeled in the case	under review
Tripped load, load reduced by composite load model not inlcuded										

Study Area: PG&E Bulk

Transient Stability

Transient Stability Performance (Number of voltage and frequency violations)

Generator/Load	Contingency	Category	Category Description	Baseline scenarios				Sensitivity		Potential Mitigation Solutions
				2024 Summer Peak	2029 Summer Peak	2024 Spring Off-Peak	2029 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	
45070 BRYANT 69.00	3 phase fault ROUND MTN, MALIN, CAPT JACK 500 kV	P1, P6, P7	L-1, T-1, L-1/-1	not tripped	under-vlt load shedding	not tripped	not tripped	not tripped	not tripped	Low voltage due to stalling of induction motors.
45016 BELKNAP 69.00	3 phase fault ROUND MTN, MALIN, CAPT JACK 500 kV	P1, P6, P7	L-1, T-1, L-1/-1	not tripped	under-vlt load shedding	not tripped	not tripped	not tripped	not tripped	
45407 MERLIN 115.00	3 phase fault ROUND MTN, MALIN, CAPT JACK 500 kV	P1, P6, P7	L-1, T-1, L-1/-1	not tripped	under-vlt load shedding	not tripped	not tripped	not tripped	not tripped	
45389 EASY VLY 115.00	3 phase fault ROUND MTN, MALIN, CAPT JACK 500 kV	P1, P6, P7	L-1, T-1, L-1/-1	not tripped	under-vlt load shedding	not tripped	not tripped	not tripped	not tripped	
45271 SAGEROAD 115.00	3 phase fault ROUND MTN, MALIN, CAPT JACK 500 kV	P1, P6, P7	L-1, T-1, L-1/-1	not tripped	under-vlt load shedding	not tripped	not tripped	not tripped	not tripped	
36012 WTSNVLLE 60.00	3 phase fault on METCALF 500 kV, Metcalf-Tesla and Loss Banos-Mosslanding 500 kV outage	P6	L-1/ L-1	not tripped	under-vlt load shedding	not tripped	not tripped	not tripped	not tripped	Low voltage due to stalling of induction motors. Consider installation of dynamic reactive support
36890 Walsh 60.00	3 phase fault on TESLA 500 kV	P1, P6, P7	L-1, T-1, L-1/-1	not tripped with these contingencies	UFLS with fault	not tripped with these contingencies	not tripped	not tripped with these contingencies	not tripped with these contingencies	possible modeling error due to renewale generation in the area. Need to check UFLS relay settings
Criteria Violaions										
NONE										

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.

2019-2020 ISO Reliability Assessment - Study Results

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

2019-2020 ISO Reliability Assessment - Study Results
Study Area: PG&E Humboldt
Thermal Overloads

Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Loading % (Baseline Scenarios)								Loading % (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Winter Peak	2024 Winter Peak	2029 Winter Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	2029 Retirement of QF Generations	
31110 BRDGVLLE 60.0 31120 FRUTLDJT 60.0 1 1	BRIDGEVILLE-COTTONWOOD 115kV	P1	N-1	85	94	95	15	16	49	52	69	92	14	101	95	sensitivity only
	BLUELKPP 12.47kV Gen Unit 1 & BRIDGEVILLE-COTTONWOOD 115kV	P3	G-1/N-1	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	100	<100	sensitivity only

Study Area: PG&E Humboldt

High/Low Voltages

Substation	Contingency (All and Worst P6)	Category	Category Description	Voltage PU (Baseline Scenarios)								Voltage PU (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Winter Peak	2024 Winter Peak	2029 Winter Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	2029 Retirement of QF Generations	
HOOPA 60 kV	HUMBOLDT-MAPLE CREEK 60kV MOAS OPENED on HUMBOLDT-MPLE CRK	P1	N-1	**0.86**	**0.85**	**0.86**	0.96	0.95	**0.79**	**0.79**	**0.83**	**0.84**	0.96	**0.86**	**0.86**	Project: Maple Creek Reactive Support In Service Date: July 2022 Short term: Action Plan Project mitigates all identified low voltages
MPLE CRK 60 kV	HUMBOLDT-MAPLE CREEK 60kV MOAS OPENED on HUMBOLDT-MPLE CRK	P1	N-1	0.90	**0.90**	0.90	0.99	0.98	**0.85**	**0.85**	**0.89**	**0.89**	0.99	0.91	0.90	Project: Maple Creek Reactive Support In Service Date: July 2022 Short term: Action Plan Project mitigates all identified low voltages
NEWBURG 60 kV	HUMBOLDT BAY-RIO DELL JCT 60kV MOAS OPENED on EEL RIVR-NEWBURG	P1	N-1	0.97	0.96	0.95	0.99	0.98	**0.89**	0.93	1.01	0.96	0.98	0.98	0.95	Project: Maple Creek Reactive Support In Service Date: July 2022 Short term: Action Plan Project mitigates all identified low voltages
RDGE CBN 60 kV	HUMBOLDT-MAPLE CREEK 60kV MOAS OPENED on HUMBOLDT-MPLE CRK	P1	N-1	0.94	0.93	0.93	1.01	1.00	**0.89**	**0.90**	0.92	0.93	1.00	0.94	0.93	Project: Maple Creek Reactive Support In Service Date: July 2022 Short term: Action Plan Project mitigates all identified low voltages
RIO DELL 60 kV	HUMBOLDT BAY-RIO DELL JCT 60kV MOAS OPENED on EEL RIVR-NEWBURG	P1	N-1	0.98	0.97	0.95	0.99	0.98	**0.90**	0.94	1.03	0.97	0.98	0.99	0.95	Project: Maple Creek Reactive Support In Service Date: July 2022 Short term: Action Plan Project mitigates all identified low voltages
RUSS RCH 60 kV	HUMBOLDT-MAPLE CREEK 60kV MOAS OPENED on HUMBOLDT-MPLE CRK	P1	N-1	**0.90**	**0.89**	**0.90**	0.98	0.98	**0.84**	**0.84**	**0.88**	**0.88**	0.98	**0.90**	**0.90**	Project: Maple Creek Reactive Support In Service Date: July 2022 Short term: Action Plan Project mitigates all identified low voltages
WILLWCRK 60 kV	HUMBOLDT-MAPLE CREEK 60kV MOAS OPENED on HUMBOLDT-MPLE CRK	P1	N-1	**0.87**	**0.86**	**0.87**	0.97	0.96	**0.81**	**0.81**	**0.85**	**0.85**	0.96	**0.87**	**0.87**	Project: Maple Creek Reactive Support In Service Date: July 2022 Short term: Action Plan Project mitigates all identified low voltages
BRDGVLLE 115 kV	HMBOBAYPPA 13.80kV Gen Unit 1 & HUMBOLDT SVD=v	P3	G-1/N-1	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	**1.12**	>0.9,<1.10	Sensitivity Only
BRDGVLLE 115 kV	HMBOBAYPPB 13.80kV Gen Unit 7 & HUMBOLDT SVD=v	P3	G-1/N-1	**1.12**	**1.12**	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	**1.12**	>0.9,<1.10	**1.12**	>0.9,<1.10	Load power factor correction and voltage support if needed
FRT SWRD 60 kV	HMBOBAYPPA 13.80kV Gen Unit 1 & GRBRVLLE SVD=v	P3	G-1/N-1	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	**1.11**	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	Load power factor correction and voltage support if needed
FRT SWRD 60 kV	HMBOBAYPPB 13.80kV Gen Unit 5 & GRBRVLLE SVD=v	P3	G-1/N-1	**1.10**	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	**1.11**	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	**1.10**	>0.9,<1.10	Load power factor correction and voltage support if needed

Study Area: PG&E Humboldt

High/Low Voltages

Substation	Contingency (All and Worst P6)	Category	Category Description	Voltage PU (Baseline Scenarios)								Voltage PU (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Winter Peak	2024 Winter Peak	2029 Winter Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	2029 Retirement of QF Generations	
FRT SWRD 60 kV	HMBOBAYPPB 13.80kV Gen Unit 7 & GRBRVLLE SVD=v	P3	G-1/N-1	1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	1.11	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	Load power factor correction and voltage support if needed
GRBRVLLE 60 kV	FAIRHAVN 13.80kV Gen Unit 1 & GRBRVLLE SVD=v	P3	G-1/N-1	1.12	1.11	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	1.11	>0.9,<1.10	1.11	>0.9,<1.10	Load power factor correction and voltage support if needed
GRBRVLLE 60 kV	HMBOBAYPPA 13.80kV Gen Unit 3 & GRBRVLLE SVD=v	P3	G-1/N-1	1.12	1.12	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	1.11	>0.9,<1.10	1.12	>0.9,<1.10	1.11	>0.9,<1.10	Load power factor correction and voltage support if needed
GRBRVLLE 60 kV	HMBOBAYPPB 13.80kV Gen Unit 4 & GRBRVLLE SVD=v	P3	G-1/N-1	1.12	1.12	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	1.13	1.11	>0.9,<1.10	1.12	>0.9,<1.10	1.12	>0.9,<1.10	Load power factor correction and voltage support if needed
HMBOBAYPPB 115 kV	HMBOBAYPPA 13.80kV Gen Unit 1 & HUMBOLDT SVD=v	P3	G-1/N-1	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	1.16	>0.9,<1.10	Sensitivity Only
HMBOBAYPPB 115 kV	HMBOBAYPPB 13.80kV Gen Unit 4 & HUMBOLDT SVD=v	P3	G-1/N-1	1.16	1.16	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	1.11	1.12	>0.9,<1.10	1.16	>0.9,<1.10	1.16	>0.9,<1.10	Load power factor correction and voltage support if needed
HMBOBAYPPB 115 kV	HMBOBAYPPC 13.80kV Gen Unit 9 & HUMBOLDT SVD=v	P3	G-1/N-1	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	1.16	>0.9,<1.10	Sensitivity Only
HOOPA 60 kV	BLUELKPP 12.47kV Gen Unit 1 & HUMBOLDT-MAPLE CREEK 60kV MOAS OPENED on HUMBOLDT-MPLE CRK	P3	G-1/N-1	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	0.75	>0.9,<1.10	>0.9,<1.10	0.86	>0.9,<1.10	Project: Maple Creek Reactive Support In Service Date: July 2022 Short term: Action Plan Project mitigates all identified low voltages
HOOPA 60 kV	FAIRHAVN 13.80kV Gen Unit 1 & HUMBOLDT-MAPLE CREEK 60kV MOAS OPENED on HUMBOLDT-MPLE CRK	P3	G-1/N-1	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	0.83	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	Project: Maple Creek Reactive Support In Service Date: July 2022 Short term: Action Plan Project mitigates all identified low voltages
HUMBOLDT 115 kV	HMBOBAYPPA 13.80kV Gen Unit 2 & HUMBOLDT SVD=v	P3	G-1/N-1	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	1.16	>0.9,<1.10	Sensitivity Only
HUMBOLDT 115 kV	HMBOBAYPPA 13.80kV Gen Unit 3 & HUMBOLDT SVD=v	P3	G-1/N-1	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	1.16	>0.9,<1.10	Sensitivity Only
HUMBOLDT 115 kV	HMBOBAYPPB 13.80kV Gen Unit 4 & HUMBOLDT SVD=v	P3	G-1/N-1	1.16	1.16	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	1.11	1.12	>0.9,<1.10	1.16	>0.9,<1.10	1.16	>0.9,<1.10	Load power factor correction and voltage support if needed
HUMBOLDT 115 kV	HMBOBAYPPB 13.80kV Gen Unit 7 & HUMBOLDT SVD=v	P3	G-1/N-1	1.15	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	1.11	1.12	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	1.16	>0.9,<1.10	Load power factor correction and voltage support if needed
HUMBOLDT 115 kV	HMBOBAYPPC 13.80kV Gen Unit 9 & HUMBOLDT SVD=v	P3	G-1/N-1	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	1.16	>0.9,<1.10	Sensitivity Only
KEKAWAKA 60 kV	FAIRHAVN 13.80kV Gen Unit 1 & GRBRVLLE SVD=v	P3	G-1/N-1	1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	Load power factor correction and voltage support if needed
KEKAWAKA 60 kV	HMBOBAYPPB 13.80kV Gen Unit 7 & GRBRVLLE SVD=v	P3	G-1/N-1	1.11	1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	1.12	1.10	>0.9,<1.10	1.10	>0.9,<1.10	1.10	>0.9,<1.10	Load power factor correction and voltage support if needed
LOW GAP1 115 kV	HMBOBAYPPB 13.80kV Gen Unit 4 & HUMBOLDT SVD=v	P3	G-1/N-1	1.10	1.11	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	1.10	>0.9,<1.10	1.11	>0.9,<1.10	Load power factor correction and voltage support if needed
LOW GAP1 115 kV	HMBOBAYPPB 13.80kV Gen Unit 7 & HUMBOLDT SVD=v	P3	G-1/N-1	1.10	1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	1.11	>0.9,<1.10	Load power factor correction and voltage support if needed
LOW GAP1 115 kV	HMBOBAYPPC 13.80kV Gen Unit 10 & HUMBOLDT SVD=v	P3	G-1/N-1	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	1.11	>0.9,<1.10	Sensitivity Only

Study Area: PG&E Humboldt

High/Low Voltages

Substation	Contingency (All and Worst P6)	Category	Category Description	Voltage PU (Baseline Scenarios)								Voltage PU (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Winter Peak	2024 Winter Peak	2029 Winter Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	2029 Retirement of QF Generations	
MPLE CRK 60 kV	BLUELKPP 12.47kV Gen Unit 1 & HUMBOLDT-MAPLE CREEK 60kV MOAS OPENED on HUMBOLDT-MPLE CRK	P3	G-1/N-1	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	0.82	>0.9,<1.10	>0.9,<1.10	0.90	>0.9,<1.10	Project: Maple Creek Reactive Support In Service Date: July 2022 Short term: Action Plan Project mitigates all identified low voltages
WILLWCRK 60 kV	BLUELKPP 12.47kV Gen Unit 1 & HUMBOLDT-MAPLE CREEK 60kV MOAS OPENED on HUMBOLDT-MPLE CRK	P3	G-1/N-1	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	0.76	>0.9,<1.10	>0.9,<1.10	0.87	>0.9,<1.10	Project: Maple Creek Reactive Support In Service Date: July 2022 Short term: Action Plan Project mitigates all identified low voltages
BRDGVLLE 115 kV	HMBLT BY-HARRIS 60kV 0 MOAS OPENED on HARRIS-HARRISST & HUMBOLDT SVD=v	P6	N-1-1	1.12	1.12	>0.9,<1.10	1.13	1.13	1.10	1.11	>0.9,<1.10	1.12	1.13	1.12	>0.9,<1.10	Load power factor correction and voltage support if needed
HMBOBAYPPB 115 kV	HUMBOLDT SHUNT=7h & BRIDGEVILLE-COTTONWOOD 115kV	P6	N-1-1	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	0.88	0.87	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	0.86	>0.9,<1.10	>0.9,<1.10	Voltage support, UVLS and/ or SPS
HMBOBAYPPB 115 kV	HUMBOLDT SVD=v & HUMBOLDT-BRIDGEVILLE 115kV	P6	N-1-1	1.17	1.18	1.12	1.18	1.18	1.16	1.16	>0.9,<1.10	1.18	1.19	1.18	1.12	Load power factor correction and voltage support if needed
HUMBOLDT 115 kV	HUMBOLDT SHUNT=7h & BRIDGEVILLE-COTTONWOOD 115kV	P6	N-1-1	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	0.88	0.87	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	>0.9,<1.10	0.86	>0.9,<1.10	>0.9,<1.10	Voltage support, UVLS and/ or SPS
HUMBOLDT 115 kV	HUMBOLDT-BRIDGEVILLE 115kV & HUMBOLDT SVD=v	P6	N-1-1	1.18	1.19	1.12	1.17	1.18	1.16	1.16	>0.9,<1.10	1.19	1.18	1.22	1.12	Load power factor correction and voltage support if needed
LOW GAP1 115 kV	BRDGVLLE 115/60kV TB 1 & HUMBOLDT SVD=v	P6	N-1-1	1.12	1.12	>0.9,<1.10	1.13	1.12	>0.9,<1.10	1.10	>0.9,<1.10	1.12	1.13	1.12	>0.9,<1.10	Load power factor correction and voltage support if needed

Study Area: PG&E Humboldt

Voltage Deviation

Substation	Contingency (All and Worst P6)	Category	Category Description	Post Cont. Voltage Deviation % (Baseline Scenarios)								Post Cont. Voltage Deviation % (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Winter Peak	2024 Winter Peak	2029 Winter Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	2029 Retirement of QF Generations	
CARLOTTA 60 kV	HUMBOLDT BAY-RIO DELL JCT 60kV MOAS OPENED on EEL RIVR-NEWBURG	P1	N-1	4	4	5	2	3	9	6	1	4	3	3	5	Load power factor correction and voltage support if needed
HMBOBAYPPB 115 kV	HUMBOLDT SHUNT=7h	P1	N-1	1	1	1	8	8	1	1	1	1	8	1	1	Load power factor correction and voltage support if needed
HOOPA 60 kV	HUMBOLDT-MAPLE CREEK 60kV MOAS OPENED on HUMBOLDT-MPLE CRK	P1	N-1	12	12	12	4	5	17	18	13	13	4	12	12	Project: Maple Creek Reactive Support In Service Date: July 2022 Short term: Action Plan Project mitigates all identified voltage issues
HUMBOLDT 115 kV	HUMBOLDT SHUNT=7h	P1	N-1	1	1	2	8	8	1	1	1	1	8	2	2	Load power factor correction and voltage support if needed
MPLE CRK 60 kV	HUMBOLDT-MAPLE CREEK 60kV MOAS OPENED on HUMBOLDT-MPLE CRK	P1	N-1	11	12	11	4	5	16	16	13	12	4	11	11	Project: Maple Creek Reactive Support In Service Date: July 2022 Short term: Action Plan Project mitigates all identified voltage issues
NEWBURG 60 kV	HUMBOLDT BAY-RIO DELL JCT 60kV MOAS OPENED on EEL RIVR-NEWBURG	P1	N-1	5	5	6	3	4	11	7	1	5	3	4	6	Load power factor correction and voltage support if needed
PCLUMBER 60 kV	HUMBOLDT BAY-RIO DELL JCT 60kV MOAS OPENED on EEL RIVR-NEWBURG	P1	N-1	4	4	5	2	3	9	6	1	4	3	3	5	Load power factor correction and voltage support if needed
RDGE CBN 60 kV	HUMBOLDT-MAPLE CREEK 60kV MOAS OPENED on HUMBOLDT-MPLE CRK	P1	N-1	9	9	9	3	4	13	13	10	10	3	9	9	Project: Maple Creek Reactive Support In Service Date: July 2022 Short term: Action Plan Project mitigates all identified voltage issues
RIO DELL 60 kV	HUMBOLDT BAY-RIO DELL JCT 60kV MOAS OPENED on EEL RIVR-NEWBURG	P1	N-1	4	4	5	2	3	10	6	0	4	3	3	5	Load power factor correction and voltage support if needed
RIODLLTP 60 kV	HUMBOLDT BAY-RIO DELL JCT 60kV MOAS OPENED on EEL RIVR-NEWBURG	P1	N-1	4	4	5	2	3	10	6	1	4	3	3	5	Load power factor correction and voltage support if needed
RUSS RCH 60 kV	HUMBOLDT-MAPLE CREEK 60kV MOAS OPENED on HUMBOLDT-MPLE CRK	P1	N-1	11	12	11	4	5	16	17	13	13	4	11	11	Project: Maple Creek Reactive Support In Service Date: July 2022 Short term: Action Plan Project mitigates all identified voltage issues
SCOTIATP 60 kV	HUMBOLDT BAY-RIO DELL JCT 60kV MOAS OPENED on EEL RIVR-NEWBURG	P1	N-1	4	4	5	2	3	10	6	0	4	3	3	5	Load power factor correction and voltage support if needed
SCTIATP2 60 kV	HUMBOLDT BAY-RIO DELL JCT 60kV MOAS OPENED on EEL RIVR-NEWBURG	P1	N-1	4	4	5	2	3	10	6	0	4	3	3	5	Load power factor correction and voltage support if needed
WILLWCRK 60 kV	HUMBOLDT-MAPLE CREEK 60kV MOAS OPENED on HUMBOLDT-MPLE CRK	P1	N-1	12	12	12	4	5	17	17	13	13	4	12	12	Project: Maple Creek Reactive Support In Service Date: July 2022 Short term: Action Plan Project mitigates all identified voltage issues

Study Area: PG&E Humboldt

Transient Stability

Contingency	Category	Category Description	Transient Stability Performance					Potential Mitigation Solutions
			Baseline Scenarios			Sensitivity Scenarios		
			2024 Summer Peak	2029 Summer Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	
LP SAMOA Unit 1 (Bus #31158)	P1-1	N-1	No issue	No issue	No issue	No issue	No issue	No Violation
HMBLDT B - HUMB_BS1 115 kV Line	P1-2	N-1	WECC criteria not met	No issue	No issue	No issue	No issue	Under Review. To be updated in draft TP.
HUMB_BS1/HUMB_G1 115/13.8 kV No.1 Transformer	P1-3	N-1	No issue	No issue	No issue	No issue	No issue	No Violation
Bus Fault at HUMBOLDT 115 kV	P2-2	Bus	No issue	No issue	No issue	No issue	No issue	No Violation
Internal fault at Non-bus-tie-breaker #182 at HUMBOLDT 115 kV	P2-3	Non-Bus-Tie Breaker	No issue	No issue	No issue	No issue	No issue	No Violation
LP SAMOA Unit 1 and HUMB_G1 Unit 1	P3-1	G-1/N-1	No issue	No issue	No issue	No issue	No issue	No Violation
LP SAMOA Unit 1 and HUMBOLDT -HMBLDT B 115 kV No.1 Line	P3-2	G-1/N-1	WECC criteria not met	No issue	No issue	No issue	No issue	Under Review. To be updated in draft TP.
LP SAMOA Unit 1 and HUMB_BS1/HUMB_G1 115/13.8 kV No.1 Transformer	P3-3	G-1/N-1	No issue	No issue	No issue	No issue	No issue	No Violation
LP SAMOA Unit 1 and HUMBOLDT 60 kV ID v SVD	P3-4	G-1/N-1	No issue	No issue	No issue	No issue	No issue	No Violation
Breaker stuck for CB #182 protecting HUMBOLDT-BRDGVLLE 115 kV No.1 Line	P4-2	Stuck Breaker	WECC criteria not met	No issue	WECC criteria not met	No issue	No issue	Under Review. To be updated in draft TP.
Breaker stuck for CB #322 protecting HUMBOLDT/HUMBOLDT 60/115 kV No.2 Transformer	P4-3	Stuck Breaker	No issue	No issue	No issue	WECC criteria not met	No issue	Under Review. To be updated in draft TP.
Breaker stuck for CB #6222 protecting HUMBOLDT 60 kV ID v SVD	P4-4	Stuck Breaker	WECC criteria not met	No issue	No issue	No issue	No issue	Under Review. To be updated in draft TP.
Breaker stuck for CB #172 protecting Bus Section HUMBOLDT 115 kV	P4-5	Stuck Breaker	No issue	No issue	No issue	No issue	No issue	No Violation
Breaker stuck for CB #BAE071 protecting HUMB_G1 Unit 1	P4-1	Stuck Breaker	No issue	No issue	No issue	No issue	No issue	No Violation
HUMB_G1 Unit 1	P5-1	Non-Redundant Relay	No issue	No issue	No issue	No issue	No issue	No Violation
HUMBOLDT -HMBLDT B 115 kV No.1 Line	P5-2	Non-Redundant Relay	No issue	No issue	No issue	No issue	No issue	No Violation
HUMBOLDT/HUMBOLDT 115/60 kV No.2 Transformer	P5-3	Non-Redundant Relay	WECC criteria not met	No issue	No issue	WECC criteria not met	No issue	Protection Upgrade
HUMBOLDT 60 kV ID v SVD	P5-5	Non-Redundant Relay	WECC criteria not met	No issue	WECC criteria not met	No issue	No issue	Protection Upgrade
HUMBOLDT -HMBLDT B 115 kV No.1 Line and HUMBOLDT - BRDGVLLE 115 kV No.1 Line	P6-1	N-1-1	WECC criteria not met	No issue	No issue	WECC criteria not met	No issue	Under Review. To be updated in draft TP.
HUMBOLDT -HMBLDT B 115 kV No.1 Line and HUMBOLDT/HUMBOLDT 115/60 kV No.2 Transformer	P6-2	N-1-1	No issue	No issue	No issue	No issue	No issue	No Violation

Study Area: PG&E Humboldt

Single Contingency Load Drop

Worst Contingency	Category	Category Description	Amount of Load Drop (MW)										Potential Mitigation Solutions
			Select..	Select..	Select..	Select..	Select..	Select..	Select..	Select..	Select..	Select..	

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

2019-2020 ISO Reliability Assessment - Study Results

Study Area: PG&E Humboldt

Single Source Substation with more than 100 MW Load

Substation	Load Served (MW)										Potential Mitigation Solutions
	Select..	Select..	Select..	Select..	Select..	Select..	Select..	Select..	Select..	Select..	

No Single Source Substation with more than 100 MW Load.

2019-2020 ISO Reliability Assessment - Study Results
Study Area: PG&E North Coast & North Bay
Thermal Overloads

Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Loading % (Baseline Scenarios)								Loading % (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Winter Peak	2024 Winter Peak	2029 Winter Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	2029 Retirement of QF Generations	
30435 LAKEVILE 230 30460 VACA-DIX 230 1	LAKEVILE 230kV - Section 2E & 2D	P2	P2-4	<100	<100	108	<100	<100	<100	<100	<100	<100	<100	<100	108	Continue to monitor future load forecast
	TULUCAY-VACA 230kV & GEYSR18-LAKEVILE-GEYSR20-GEYSR13 230kV	P6	N-1-1	<100	<100	102	<100	<100	<100	<100	<100	<100	<100	<100	102	Continue to monitor future load forecast
30440 TULUCAY 230 30460 VACA-DIX 230 1	GEYSERS #12-FULTON & GEYSERS #9-LAKEVILLE LINES	P7	DCTL	<100	<100	103	<100	<100	<100	<100	<100	<100	<100	<100	103	Continue to monitor future load forecast
	IGNACIO-SOBRANTE 230kV & VACA-LAKEVILLE #1 230kV	P6	N-1-1	<100	<100	106	<100	<100	<100	<100	<100	<100	<100	<100	106	Continue to monitor future load forecast
	LAKEVILE 230kV - Section 2E & 1E	P2	P2-4	<100	100	114	<100	<100	<100	<100	<100	103	<100	<100	114	Continue to monitor future load forecast
	VACA-LAKEVILLE #1 230kV & GEYSR18-LAKEVILE-GEYSR20-GEYSR13 230kV	P6	N-1-1	<100	101	<100	<100	<100	<100	<100	<100	104	<100	<100	<100	System upgrade, operating solution or SPS
31200 MENDOCNO 115 31217 LUCERNJ2 115 1	CORTINA-MENDOCINO #1 115kV & GEYSERS #3-CLOVERDALE 115kV	P6	N-1-1	<100	<100	102	<100	<100	<100	<100	<100	<100	<100	<100	102	Continue to monitor future load forecast
31200 MENDOCNO 115 31260 MNDCNO M 115 1	UKIAH-HOPLAND-CLOVERDALE 115kV & MENDOCINO-REDBUD 115kV	P6	N-1-1	<100	<100	<100	<100	<100	<100	103	<100	<100	113	<100	<100	Generation redispatch
31224 INDIN VL 115 31215 LUCERNJ1 115 1	EGLE RCK - MA 115kV & EAGLE ROCK-CORTINA line	P2	P2-3	<100	<100	<100	<100	100	101	<100	<100	<100	<100	<100	<100	Continue to monitor future load forecast
31225 HGHLNDJ1 115 31262 CACHE J2 115 1	CORTINA-MENDOCINO #1 115kV & GEYSERS #3-CLOVERDALE 115kV	P6	N-1-1	<100	<100	107	<100	<100	<100	<100	<100	102	<100	<100	107	Continue to monitor future load forecast
31229 REDBUDJ2 115 31222 REDBUD 115 1	CORTINA-MENDOCINO #1 115kV & GEYSERS #3-CLOVERDALE 115kV	P6	N-1-1	<100	<100	107	<100	<100	<100	<100	<100	102	<100	<100	107	Continue to monitor future load forecast
31236 FULTON 115 31238 MONROE1 115 1	FULTON-SANTA ROSA #2 115kV & CORONA-LAKEVILLE 115kV	P6	N-1-1	120	122	135	111	114	126	<100	<100	126	<100	101	135	Project: RAS Identified in 2018-2019 TPP In-service date: TBD Short term: Action plan
31236 FULTON 115 31239 MONROE2 115 1	FULTON-SANTA ROSA #1 115kV & CORONA-LAKEVILLE 115kV	P6	N-1-1	120	122	134	111	114	125	<100	<100	126	<100	101	134	Project: RAS Identified in 2018-2019 TPP In-service date: TBD Short term: Action plan
31238 MONROE1 115 31240 SNTA RSA 115 1	FULTON-SANTA ROSA #2 115kV & CORONA-LAKEVILLE 115kV	P6	N-1-1	108	109	123	<100	100	112	<100	<100	112	<100	<100	123	System upgrade, operating solution or SPS
31239 MONROE2 115 31240 SNTA RSA 115 1	FULTON-SANTA ROSA #1 115kV & CORONA-LAKEVILLE 115kV	P6	N-1-1	<100	101	110	<100	<100	103	<100	<100	105	<100	<100	110	System upgrade, operating solution or SPS
31240 SNTA RSA 115 31242 STNY PTP 115 1	FULTON 115kV - Section 2D & 1D	P2	P2-4	<100	<100	100	<100	<100	<100	<100	<100	<100	<100	<100	100	Project: RAS Identified in 2018-2019 TPP In-service date: TBD Short term: Action plan
	FULTON-SANTA ROSA #1 & FULTON-SANTA ROSA #2 LINES	P7	DCTL	<100	<100	100	<100	<100	<100	<100	<100	<100	<100	<100	100	Project: RAS Identified in 2018-2019 TPP In-service date: TBD Short term: Action plan
31242 STNY PTP 115 31246 BELLVUE 115 1	FULTON 115kV - Section 2D & 1D	P2	P2-4	<100	<100	103	<100	<100	<100	<100	<100	<100	<100	<100	103	Project: RAS Identified in 2018-2019 TPP In-service date: TBD Short term: Action plan
	FULTON-SANTA ROSA #1 & FULTON-SANTA ROSA #2 LINES	P7	DCTL	<100	<100	103	<100	<100	<100	<100	<100	<100	<100	<100	103	Project: RAS Identified in 2018-2019 TPP In-service date: TBD Short term: Action plan
	FULTON-SANTA ROSA #1 115kV & FULTON-SANTA ROSA #2 115kV	P6	N-1-1	<100	<100	102	<100	<100	<100	<100	<100	<100	<100	<100	102	Project: RAS Identified in 2018-2019 TPP In-service date: TBD Short term: Action plan
	FULTON 115kV - Section 2D & 1D	P2	P2-4	115	117	131	107	110	124	<100	<100	121	<100	<100	131	Project: RAS Identified in 2018-2019 TPP In-service date: TBD Short term: Action plan

2019-2020 ISO Reliability Assessment - Study Results
Study Area: PG&E North Coast & North Bay
Thermal Overloads

California ISO

Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Loading % (Baseline Scenarios)								Loading % (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Winter Peak	2024 Winter Peak	2029 Winter Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	2029 Retirement of QF Generations	
31246 BELLVUE 115 31248 PENNGRVE 115 1	FULTON 230 kV BAAH BUS #1 (FAILURE OF NON-REDUNDENT RELAY)	P5	Non-Redundent Relay	118	<100	<100	101	<100	<100	<100	<100	<100	<100	<100	<100	operating solutions for short-term
	FULTON 230/115kV TB 9 & FULTON 230/115kV TB 4	P6	N-1-1	116	107	120	<100	<100	111	<100	<100	111	<100	<100	120	Project: RAS Identified in 2018-2019 TPP In-service date: TBD Short term: Action plan
	FULTON-SANTA ROSA #1 & FULTON-SANTA ROSA #2 LINES	P7	DCTL	115	116	131	107	110	124	<100	<100	120	<100	<100	131	Project: RAS Identified in 2018-2019 TPP In-service date: TBD Short term: Action plan
31248 PENNGRVE 115 31254 CORONA 115 1	FULTON 115kV - Section 2D & 1D	P2	P2-4	118	121	136	110	113	129	<100	<100	125	<100	<100	136	Project: RAS Identified in 2018-2019 TPP In-service date: TBD Short term: Action plan
	FULTON 230 kV BAAH BUS #1 (FAILURE OF NON-REDUNDENT RELAY)	P5	Non-Redundent Relay	122	<100	<100	104	<100	<100	<100	<100	<100	<100	<100	<100	operating solutions for short-term
	FULTON 230/115kV TB 9 & FULTON 230/115kV TB 4	P6	N-1-1	119	111	126	102	103	116	<100	<100	115	<100	<100	126	Project: RAS Identified in 2018-2019 TPP In-service date: TBD Short term: Action plan
	FULTON-SANTA ROSA #1 & FULTON-SANTA ROSA #2 LINES	P7	DCTL	118	120	137	110	113	129	<100	<100	124	<100	<100	137	Project: RAS Identified in 2018-2019 TPP In-service date: TBD Short term: Action plan
31254 CORONA 115 31255 LAKEVLLE 115 1	FULTON 115kV - Section 2D & 1D	P2	P2-4	111	113	126	115	118	134	<100	<100	117	<100	<100	126	Project: RAS Identified in 2018-2019 TPP In-service date: TBD Short term: Action plan
	FULTON 230 kV BAAH BUS #1 (FAILURE OF NON-REDUNDENT RELAY)	P5	Non-Redundent Relay	114	<100	<100	109	<100	<100	<100	<100	<100	<100	<100	<100	operating solutions for short-term
	FULTON 230/115kV TB 9 & FULTON 230/115kV TB 4	P6	N-1-1	112	104	117	107	108	122	<100	<100	108	<100	<100	117	Project: RAS Identified in 2018-2019 TPP In-service date: TBD Short term: Action plan
	FULTON-SANTA ROSA #1 & FULTON-SANTA ROSA #2 LINES	P7	DCTL	110	112	127	114	117	134	<100	<100	116	<100	<100	127	Project: RAS Identified in 2018-2019 TPP In-service date: TBD Short term: Action plan
31258 SONOMA 115 32564 PUEBLO 115 1	FULTON 230 kV BAAH BUS #1 (FAILURE OF NON-REDUNDENT RELAY)	P5	Non-Redundent Relay	107	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	operating solutions for short-term
	FULTON 230/115kV TB 9 & FULTON 230/115kV TB 4	P6	N-1-1	105	<100	103	<100	<100	<100	<100	<100	<100	<100	<100	103	System upgrade, operating solution or SPS
31262 CACHE J2 115 31229 REDBUDJ2 115 1	CORTINA-MENDOCINO #1 115kV & GEYSERS #3-CLOVERDALE 115kV	P6	N-1-1	<100	<100	107	<100	<100	<100	<100	<100	102	<100	<100	107	Continue to monitor future load forecast
31300 MENDOCNO 60.0 31330 UPPR LKE 60.0 1	EGLE RCK 115/60kV TB 1	P1	N-1	<100	<100	<100	<100	<100	<100	<100	<100	102	<100	<100	<100	Sensitivity only
31300 MENDOCNO 60.0 31330 UPPR LKE 60.0 1	KONOCTI-EAGLE ROCK 60kV	P1	N-1	<100	<100	<100	<100	<100	<100	<100	<100	102	<100	<100	<100	Sensitivity only
31334 CLER LKE 60.0 31335 GRANITE 60.0 1	EGLE RCK 115/60kV TB 1	P1	N-1	102	<100	<100	<100	<100	<100	<100	<100	<100	<100	108	<100	Project: Clear Lake 60kV System Reinforcement In-service date: 2/22 Short-term: Action plan

2019-2020 ISO Reliability Assessment - Study Results
Study Area: PG&E North Coast & North Bay
Thermal Overloads

California ISO

Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Loading % (Baseline Scenarios)								Loading % (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Winter Peak	2024 Winter Peak	2029 Winter Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	2029 Retirement of QF Generations	
~~31334 CLEK LKE 60.0 31335 GRANITE 60.0 1~~	KONOCTI-EAGLE ROCK 60kV	P1	N-1	102	<100	<100	<100	<100	<100	<100	<100	<100	<100	108	<100	Project: Clear Lake 60kV System Reinforcement In-service date: 2/22 Short-term: Action plan
31335 GRANITE 60.0 31336 HPLND JT 60.0 1	EGLE RCK 115/60kV TB 1	P1	N-1	105	<100	<100	<100	<100	<100	<100	<100	<100	<100	112	<100	Project: Clear Lake 60kV System Reinforcement In-service date: 2/22 Short-term: Action plan
	KONOCTI-EAGLE ROCK 60kV	P1	N-1	105	<100	<100	<100	<100	<100	<100	<100	<100	<100	112	<100	Project: Clear Lake 60kV System Reinforcement In-service date: 2/22 Short-term: Action plan
31336 HPLND JT 60.0 31206 HPLND JT 115 2	FULTON 115kV - Section 2F & 1F	P2	P2-4	NConv	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	Bus Upgrade
31336 HPLND JT 60.0 31370 CLVRDLJT 60.0 1	FULTON 115kV - Section 2F & 1F	P2	P2-4	NConv	245	231	166	167	159	206	<100	248	<100	240	231	Bus Upgrade
	FULTON 230/115kV TB 9 & EGLE RCK-FULTON-SILVERDO 115kV	P6	N-1-1	112	100	112	<100	<100	<100	<100	<100	103	<100	<100	112	System upgrade, operating solution or SPS
	GEYSERS #17-FULTON & EAGLE ROCK-FULTON-SILVERADO LINES	P7	DCTL	<100	<100	104	<100	<100	<100	<100	<100	<100	<100	<100	104	Continue to monitor future load forecast
	GEYSERS #9-LAKEVILLE & EAGLE ROCK-FULTON-SILVERADO LINES	P7	DCTL	101	106	114	<100	<100	<100	<100	<100	106	<100	103	114	System upgrade, operating solution or SPS
31370 CLVRDLJT 60.0 31374 GYSRJCT1 60.0 1	FULTON 115kV - Section 2F & 1F	P2	P2-4	NConv	244	231	167	167	159	205	<100	248	<100	240	231	Bus Upgrade
	FULTON 230/115kV TB 9 & EGLE RCK-FULTON-SILVERDO 115kV	P6	N-1-1	112	<100	<100	<100	<100	<100	<100	<100	103	<100	<100	<100	System upgrade, operating solution or SPS
	GEYSERS #17-FULTON & EAGLE ROCK-FULTON-SILVERADO LINES	P7	DCTL	<100	<100	103	<100	<100	<100	<100	<100	<100	<100	<100	103	Continue to monitor future load forecast
	GEYSERS #9-LAKEVILLE & EAGLE ROCK-FULTON-SILVERADO LINES	P7	DCTL	100	106	113	<100	<100	<100	<100	<100	106	<100	103	113	System upgrade, operating solution or SPS
31374 GYSRJCT1 60.0 31382 FTCHMTNP 60.0 1	FULTON 115kV - Section 2F & 1F	P2	P2-4	NConv	220	209	169	169	160	183	68	223	55	216	209	Bus Upgrade
	GEYSERS #9-LAKEVILLE & EAGLE ROCK-FULTON-SILVERADO LINES	P7	DCTL	<100	<100	101	<100	<100	<100	<100	<100	<100	<100	<100	101	Continue to monitor future load forecast
31377 FCHMNTP2 60.0 31380 FTCH MTN 60.0 1	FULTON 115kV - Section 2F & 1F	P2	P2-4	NConv	163	160	124	126	124	129	<100	164	<100	138	160	Bus Upgrade
	FULTON-WINDSOR #1 60kV	P1	N-1	176	181	185	107	110	116	<100	<100	183	<100	<100	185	Project: Fulton-Fitch Mountain 60kV Line Reconductor (Fulton-Hopland 60kv Line) Project In-service date: 3/20 Short-term: Action plan Scope expansion to upgrade limiting equipment
	FULTON-WINDSOR #1 60kV & EGLE RCK-FULTON-SILVERDO 115kV	P6	N-1-1	178	183	188	<100	<100	<100	<100	<100	185	<100	<100	188	Project: Fulton-Fitch Mountain 60kV Line Reconductor (Fulton-Hopland 60kv Line) Project In-service date: 3/20 Short-term: Action plan Scope expansion to upgrade limiting equipment

2019-2020 ISO Reliability Assessment - Study Results
Study Area: PG&E North Coast & North Bay
Thermal Overloads

Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Loading % (Baseline Scenarios)								Loading % (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Winter Peak	2024 Winter Peak	2029 Winter Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	2029 Retirement of QF Generations	
	WINDSOR 60kV Section 1D	P2	P2-2	<100	101	104	<100	<100	<100	<100	<100	103	<100	<100	104	Project: Fulton-Fitch Mountain 60kV Line Reconductor (Fulton-Hopland 60kv Line) Project In-service date: 3/20 Short-term: Action plan Scope expansion to upgrade limiting equipment
	WINDSOR-FCHMNTP2 60kV 0 No Fault	P2	P2-1	<100	102	104	<100	<100	<100	<100	<100	103	<100	<100	104	Project: Fulton-Fitch Mountain 60kV Line Reconductor (Fulton-Hopland 60kv Line) Project In-service date: 3/20 Short-term: Action plan Scope expansion to upgrade limiting equipment
	Base Case	P0		116	120	122	<100	<100	<100	<100	<100	122	<100	<100	122	Project: Fulton-Fitch Mountain 60kV Line Reconductor (Fulton-Hopland 60kv Line) Project In-service date: 3/20 Short-term: Action plan Scope expansion to upgrade limiting equipment
	FITCH MTN #1 TAP 60kV (FTCH MTN-HDSBGTP1)	P2	P2-1	103	107	108	<100	<100	<100	<100	<100	109	<100	<100	108	Project: Fulton-Fitch Mountain 60kV Line Reconductor (Fulton-Hopland 60kv Line) Project In-service date: 3/20 Short-term: Action plan Scope expansion to upgrade limiting equipment
	FITCH MTN #2 TAP 60kV (FCHMNTP2-FTCH MTN)	P2	P2-1	103	106	107	<100	<100	<100	<100	<100	108	<100	<100	107	Project: Fulton-Fitch Mountain 60kV Line Reconductor (Fulton-Hopland 60kv Line) Project In-service date: 3/20 Short-term: Action plan Scope expansion to upgrade limiting equipment
	FULTON - HOPLAND 60 kV & GEYSER 12 - FULTON & GEYSER 17 - FULTON 230 kV LINES	P7	DCTL	104	108	115	<100	<100	<100	<100	<100	110	<100	<100	115	Project: Fulton-Fitch Mountain 60kV Line Reconductor (Fulton-Hopland 60kv Line) Project In-service date: 3/20 Short-term: Action plan Scope expansion to upgrade limiting equipment
	FULTON 115/60kV TB 1 & FULTON 115/60kV TB 2	P6	N-1-1	<100	111	113	<100	<100	<100	<100	<100	112	<100	<100	113	Project: Fulton-Fitch Mountain 60kV Line Reconductor (Fulton-Hopland 60kv Line) Project In-service date: 3/20 Short-term: Action plan Scope expansion to upgrade limiting equipment

2019-2020 ISO Reliability Assessment - Study Results
Study Area: PG&E North Coast & North Bay
Thermal Overloads

Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Loading % (Baseline Scenarios)								Loading % (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Winter Peak	2024 Winter Peak	2029 Winter Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	2029 Retirement of QF Generations	
31379 HDSBGTP2 60.0 31377 FCHMNTP2 60.0 1	FULTON 115kV - Section 2F & 1F	P2	P2-4	NConv	111	113	<100	<100	<100	<100	<100	112	<100	<100	113	Project: Fulton-Fitch Mountain 60kV Line Reconductor (Fulton-Hopland 60kv Line) Project In-service date: 3/20 Short-term: Action plan Scope expansion to upgrade limiting equipment
	FULTON-HOPLAND 60kV	P1	N-1	103	107	108	<100	<100	<100	<100	<100	109	<100	<100	108	Project: Fulton-Fitch Mountain 60kV Line Reconductor (Fulton-Hopland 60kv Line) Project In-service date: 3/20 Short-term: Action plan Scope expansion to upgrade limiting equipment
	FULTON-HOPLAND 60kV & GEYSERS #17-FULTON 230kV & EAGLE ROCK-FULTON-SILVERADO 115kV LINES	P7	DCTL	104	108	110	<100	<100	<100	<100	<100	109	<100	<100	110	Project: Fulton-Fitch Mountain 60kV Line Reconductor (Fulton-Hopland 60kv Line) Project In-service date: 3/20 Short-term: Action plan Scope expansion to upgrade limiting equipment
	FULTON-HOPLAND 60kV (FULTON-FTCHMTNP)	P2	P2-1	103	106	109	<100	<100	<100	<100	<100	108	<100	<100	109	Project: Fulton-Fitch Mountain 60kV Line Reconductor (Fulton-Hopland 60kv Line) Project In-service date: 3/20 Short-term: Action plan Scope expansion to upgrade limiting equipment
	FULTON-WINDSOR #1 60kV	P1	N-1	104	108	111	<100	<100	<100	<100	<100	110	<100	<100	111	Project: Fulton-Fitch Mountain 60kV Line Reconductor (Fulton-Hopland 60kv Line) Project In-service date: 3/20 Short-term: Action plan Scope expansion to upgrade limiting equipment
	GEYSER 12 - FULTON& GEYSER 17 - FULTON 230 kV LINES	P7	DCTL	101	104	110	<100	<100	<100	<100	<100	106	<100	<100	110	Project: Fulton-Fitch Mountain 60kV Line Reconductor (Fulton-Hopland 60kv Line) Project In-service date: 3/20 Short-term: Action plan Scope expansion to upgrade limiting equipment
	GEYSER17 13.80kV Gen Unit 1 & FULTON-GEYSR16-GEYSR12-GEYSR14 230kV	P3	G1/N1	<100	<100	110	<100	<100	<100	<100	<100	<100	<100	<100	110	Project: Fulton-Fitch Mountain 60kV Line Reconductor (Fulton-Hopland 60kv Line) Project In-service date: 3/20 Short-term: Action plan Scope expansion to upgrade limiting equipment

2019-2020 ISO Reliability Assessment - Study Results
Study Area: PG&E North Coast & North Bay
Thermal Overloads

Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Loading % (Baseline Scenarios)								Loading % (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Winter Peak	2024 Winter Peak	2029 Winter Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	2029 Retirement of QF Generations	
	GEYSERS #12-FULTON & GEYSERS #9-LAKEVILLE LINES	P7	DCTL	100	105	110	<100	<100	<100	<100	<100	106	<100	<100	110	Project: Fulton-Fitch Mountain 60kV Line Reconductor (Fulton-Hopland 60kv Line) Project In-service date: 3/20 Short-term: Action plan Scope expansion to upgrade limiting equipment
	GEYSERS #9-LAKEVILLE & EAGLE ROCK-FULTON-SILVERADO LINES	P7	DCTL	101	105	107	<100	<100	<100	<100	<100	107	<100	<100	107	Project: Fulton-Fitch Mountain 60kV Line Reconductor (Fulton-Hopland 60kv Line) Project In-service date: 3/20 Short-term: Action plan Scope expansion to upgrade limiting equipment
32602 NRTH TWR 115 32618 NTWRJCT1 115 1	NRTH TWR 115kV - Section 1E & 1F	P2	P2-4	<100	<100	102	<100	<100	<100	<100	<100	<100	<100	115	102	Continue to monitor future load forecast
	NRTH TWR 115kV - Section 1F & 1G	P2	P2-4	<100	<100	102	<100	<100	<100	<100	<100	<100	<100	115	102	Continue to monitor future load forecast
	NRTH TWR 115kV Section 1E	P2	P2-2	<100	<100	102	<100	<100	<100	<100	<100	<100	<100	115	102	Continue to monitor future load forecast
	NRTH TWR 115kV Section 1F	P2	P2-2	<100	<100	102	<100	<100	<100	<100	<100	<100	<100	115	102	Continue to monitor future load forecast
	NRTH TWR 115kV Section 1G	P2	P2-2	<100	<100	102	<100	<100	<100	<100	<100	<100	<100	115	102	Continue to monitor future load forecast
32618 NTWRJCT1 115 32020 JMSN JCT 115 1	NRTH TWR 115kV - Section 1E & 1F	P2	P2-4	<100	<100	102	<100	<100	<100	<100	<100	<100	<100	116	102	Continue to monitor future load forecast
	NRTH TWR 115kV - Section 1F & 1G	P2	P2-4	<100	<100	102	<100	<100	<100	<100	<100	<100	<100	116	102	Continue to monitor future load forecast
	NRTH TWR 115kV Section 1E	P2	P2-2	<100	<100	102	<100	<100	<100	<100	<100	<100	<100	116	102	Continue to monitor future load forecast
	NRTH TWR 115kV Section 1F	P2	P2-2	<100	<100	102	<100	<100	<100	<100	<100	<100	<100	116	102	Continue to monitor future load forecast
	NRTH TWR 115kV Section 1G	P2	P2-2	<100	<100	102	<100	<100	<100	<100	<100	<100	<100	116	102	Continue to monitor future load forecast
32654 TULUCAY 60.0 32660 BSLT TAP 60.0 1	Base Case	P0		<100	102	110	<100	<100	<100	<100	<100	105	<100	<100	110	Upgrade limiting equipment
32655 TULCAY1 60.0 32662 TULCY JT 60.0 1	TULUCAY-NAPA #2 60kV	P1	N-1	<100	<100	106	<100	<100	106	<100	<100	102	<100	<100	106	Continue to monitor future load forecast

Study Area: PG&E North Coast & North Bay

High/Low Voltages

Substation	Contingency (All and Worst P6)	Category	Category Description	Voltage PU (Baseline Scenarios)								Voltage PU (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Winter Peak	2024 Winter Peak	2029 Winter Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	2029 Retirement of QF Generations	
HighWAY 115 kV	Base Case	P0	Base Case	1.02	1.02	0.96	1.02	1.01	0.97	**1.06**	**1.06**	1.02	**1.06**	1.02	0.96	Load power factor correction and voltage support if needed
ALTO 60 kV	Base Case	P0	Base Case	1.02	1.03	0.96	1.03	1.03	0.98	**1.06**	**1.06**	1.03	**1.07**	1.05	0.96	Load power factor correction and voltage support if needed
ANNAPOLS 60 kV	Base Case	P0	Base Case	1.01	1.02	1.00	0.97	0.98	0.98	1.03	1.04	1.01	1.04	0.97	1.00	Load power factor correction and voltage support if needed
BELLVUE 115 kV	Base Case	P0	Base Case	**1.06**	**1.06**	0.99	**1.06**	**1.06**	1.01	**1.06**	**1.07**	**1.06**	**1.07**	**1.06**	0.99	Load power factor correction and voltage support if needed
BOLINAS 60 kV	Base Case	P0	Base Case	1.04	1.05	0.98	1.05	1.04	0.99	**1.07**	**1.07**	1.04	**1.07**	1.05	0.98	Load power factor correction and voltage support if needed
CALISTGA 60 kV	Base Case	P0	Base Case	**1.09**	**1.09**	0.97	**1.09**	**1.09**	0.97	**1.08**	**1.09**	**1.09**	**1.09**	**1.10**	0.97	Load power factor correction and voltage support if needed
CALPELLA 115 kV	Base Case	P0	Base Case	**1.06**	**1.06**	1.05	**1.06**	**1.06**	**1.05**	**1.06**	**1.06**	**1.06**	**1.06**	**1.06**	1.05	Load power factor correction and voltage support if needed
CARQUINZ 115 kV	Base Case	P0	Base Case	**1.06**	**1.06**	0.98	1.05	1.04	1.00	**1.08**	**1.08**	**1.06**	**1.08**	**1.07**	0.98	Load power factor correction and voltage support if needed
CLOVRDLE 115 kV	Base Case	P0	Base Case	1.05	1.05	1.03	**1.05**	**1.05**	1.04	**1.05**	**1.05**	1.05	**1.05**	1.05	1.03	Load power factor correction and voltage support if needed
EGLE RCK 115 kV	Base Case	P0	Base Case	1.05	1.05	1.03	**1.05**	**1.05**	1.04	**1.06**	**1.05**	1.05	**1.05**	1.05	1.03	Load power factor correction and voltage support if needed
ER_FTNJT 115 kV	Base Case	P0	Base Case	**1.07**	**1.08**	1.01	**1.07**	**1.07**	1.02	**1.08**	**1.08**	**1.07**	**1.08**	**1.07**	1.01	Load power factor correction and voltage support if needed
ERFT5_25 115 kV	Base Case	P0	Base Case	**1.05**	**1.05**	1.02	**1.06**	**1.06**	1.03	**1.06**	**1.06**	**1.05**	**1.06**	1.05	1.02	Load power factor correction and voltage support if needed
FULTON 60 kV	Base Case	P0	Base Case	1.05	**1.05**	1.05	1.05	1.05	1.04	1.05	1.05	1.05	1.05	1.04	1.05	Load power factor correction and voltage support if needed
FULTON 115 kV	Base Case	P0	Base Case	**1.07**	**1.08**	1.01	**1.07**	**1.07**	1.03	**1.08**	**1.08**	**1.07**	**1.08**	**1.07**	1.01	Load power factor correction and voltage support if needed
GEYSERS34 115 kV	Base Case	P0	Base Case	1.05	1.05	1.03	**1.05**	**1.05**	1.04	**1.05**	**1.05**	1.05	**1.05**	1.05	1.03	Load power factor correction and voltage support if needed
GEYSERS56 115 kV	Base Case	P0	Base Case	1.05	1.05	1.03	**1.05**	**1.05**	1.04	**1.05**	**1.05**	1.05	**1.05**	1.05	1.03	Load power factor correction and voltage support if needed
GEYSR11 115 kV	Base Case	P0	Base Case	1.05	1.05	1.03	**1.05**	**1.05**	1.04	**1.05**	**1.05**	1.05	**1.05**	1.05	1.03	Load power factor correction and voltage support if needed
GREENBRE 60 kV	Base Case	P0	Base Case	1.01	1.03	0.97	1.02	1.03	0.98	**1.06**	**1.06**	1.03	**1.07**	1.04	0.97	Load power factor correction and voltage support if needed
GUALALA 60 kV	Base Case	P0	Base Case	1.00	1.00	0.98	0.95	0.96	0.97	1.02	1.04	1.00	1.04	0.95	0.98	Load power factor correction and voltage support if needed
GYSR78TP 115 kV	Base Case	P0	Base Case	1.05	1.05	1.03	**1.05**	**1.05**	1.04	**1.06**	**1.05**	1.05	**1.05**	1.05	1.03	Load power factor correction and voltage support if needed
HGHLAND 115 kV	Base Case	P0	Base Case	1.05	1.05	1.02	**1.07**	**1.06**	1.04	**1.07**	**1.06**	1.05	**1.06**	**1.05**	1.02	Load power factor correction and voltage support if needed
HOMEGRND 115 kV	Base Case	P0	Base Case	1.05	1.05	1.03	**1.07**	**1.06**	1.04	**1.07**	**1.06**	1.05	**1.06**	**1.05**	1.03	Load power factor correction and voltage support if needed

Substation	Contingency (All and Worst P6)	Category	Category Description	Voltage PU (Baseline Scenarios)								Voltage PU (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Winter Peak	2024 Winter Peak	2029 Winter Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	2029 Retirement of QF Generations	
HOMEPROC 115 kV	Base Case	P0	Base Case	1.05	1.05	1.03	**1.07**	**1.06**	1.04	**1.07**	**1.06**	1.05	**1.06**	**1.05**	1.03	Load power factor correction and voltage support if needed
IGNACIO 115 kV	Base Case	P0	Base Case	1.05	**1.05**	1.00	**1.06**	**1.05**	1.01	**1.07**	**1.07**	**1.05**	**1.07**	1.05	1.00	Load power factor correction and voltage support if needed
INDIN VL 115 kV	Base Case	P0	Base Case	**1.05**	**1.06**	1.03	**1.08**	**1.07**	**1.05**	**1.08**	**1.07**	**1.05**	**1.07**	**1.07**	1.03	Load power factor correction and voltage support if needed
JMSCNPMP 115 kV	Base Case	P0	Base Case	**1.05**	**1.06**	0.99	**1.05**	1.05	1.00	**1.07**	**1.08**	**1.06**	**1.08**	**1.06**	0.99	Load power factor correction and voltage support if needed
KONOCTI6 60 kV	Base Case	P0	Base Case	1.04	**1.05**	1.03	**1.05**	1.03	1.01	1.05	**1.05**	1.05	**1.06**	1.04	1.03	Load power factor correction and voltage support if needed
LS GLLNS 115 kV	Base Case	P0	Base Case	1.05	**1.05**	0.99	**1.05**	1.05	1.00	**1.07**	**1.07**	1.05	**1.07**	1.05	0.99	Load power factor correction and voltage support if needed
LUCERNE 115 kV	Base Case	P0	Base Case	**1.05**	**1.05**	1.04	**1.06**	**1.06**	**1.05**	**1.07**	**1.07**	**1.05**	**1.07**	**1.06**	1.04	Load power factor correction and voltage support if needed
MENDOCNO 115 kV	Base Case	P0	Base Case	**1.07**	**1.07**	**1.05**	**1.06**	**1.07**	**1.06**	**1.07**	**1.07**	**1.06**	**1.07**	**1.07**	**1.05**	Load power factor correction and voltage support if needed
MEYERS 115 kV	Base Case	P0	Base Case	**1.06**	**1.06**	0.98	1.05	1.04	1.00	**1.08**	**1.08**	**1.06**	**1.08**	**1.07**	0.98	Load power factor correction and voltage support if needed
MNTCLOPH 115 kV	Base Case	P0	Base Case	**1.07**	**1.08**	1.00	**1.07**	**1.07**	1.01	**1.09**	**1.09**	**1.07**	**1.09**	**1.07**	1.00	Load power factor correction and voltage support if needed
MONTCLLO 115 kV	Base Case	P0	Base Case	**1.07**	**1.08**	1.00	**1.07**	**1.07**	1.01	**1.09**	**1.09**	**1.07**	**1.09**	**1.07**	1.00	Load power factor correction and voltage support if needed
MPE 115 kV	Base Case	P0	Base Case	1.05	1.05	1.03	**1.05**	**1.05**	1.04	**1.05**	**1.05**	1.05	**1.05**	1.05	1.03	Load power factor correction and voltage support if needed
NOVATO 60 kV	Base Case	P0	Base Case	1.05	**1.05**	0.99	**1.05**	**1.05**	1.01	**1.07**	**1.07**	**1.05**	**1.07**	**1.05**	0.99	Load power factor correction and voltage support if needed
NRTH TWR 115 kV	Base Case	P0	Base Case	1.05	**1.05**	1.02	1.05	1.05	1.02	**1.06**	**1.06**	**1.05**	**1.06**	1.04	1.02	Load power factor correction and voltage support if needed
NTWR ALT 115 kV	Base Case	P0	Base Case	1.01	1.02	0.96	1.02	1.01	0.97	**1.06**	**1.06**	1.02	**1.06**	1.02	0.96	Load power factor correction and voltage support if needed
OLEMA 60 kV	Base Case	P0	Base Case	1.03	1.04	0.97	1.04	1.04	0.98	**1.07**	**1.07**	1.04	**1.07**	1.05	0.97	Load power factor correction and voltage support if needed
PENNGRVE 115 kV	Base Case	P0	Base Case	**1.05**	**1.06**	1.00	**1.05**	**1.05**	1.01	**1.05**	**1.06**	**1.05**	**1.06**	**1.05**	1.00	Load power factor correction and voltage support if needed
PUEBLO 115 kV	Base Case	P0	Base Case	1.04	1.04	0.99	1.04	1.04	1.01	**1.05**	**1.05**	1.04	**1.06**	1.03	0.99	Load power factor correction and voltage support if needed
REDBUD 115 kV	Base Case	P0	Base Case	1.05	1.05	1.04	**1.05**	**1.05**	1.04	**1.06**	**1.06**	1.05	**1.06**	1.05	1.04	Load power factor correction and voltage support if needed
RINCON 115 kV	Base Case	P0	Base Case	**1.07**	**1.08**	1.01	**1.07**	**1.07**	1.02	**1.08**	**1.08**	**1.08**	**1.08**	**1.07**	1.01	Load power factor correction and voltage support if needed
SAN RAFL 115 kV	Base Case	P0	Base Case	1.04	**1.05**	0.99	1.05	1.05	1.00	**1.07**	**1.07**	1.05	**1.07**	1.05	0.99	Load power factor correction and voltage support if needed
SAUSALTO 60 kV	Base Case	P0	Base Case	1.01	1.02	0.95	1.02	1.02	0.97	**1.06**	**1.06**	1.02	**1.06**	1.04	0.95	Load power factor correction and voltage support if needed

Substation	Contingency (All and Worst P6)	Category	Category Description	Voltage PU (Baseline Scenarios)								Voltage PU (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Winter Peak	2024 Winter Peak	2029 Winter Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	2029 Retirement of QF Generations	
SILVERDO 115 kV	Base Case	P0	Base Case	**1.07**	**1.07**	1.00	**1.07**	**1.07**	1.01	**1.08**	**1.08**	**1.07**	**1.09**	**1.06**	1.00	Load power factor correction and voltage support if needed
SKAGGS 115 kV	Base Case	P0	Base Case	**1.05**	**1.06**	1.00	**1.05**	1.05	1.01	**1.07**	**1.07**	**1.05**	**1.07**	**1.06**	1.00	Load power factor correction and voltage support if needed
SNTA RSA 115 kV	Base Case	P0	Base Case	**1.07**	**1.07**	0.99	**1.07**	**1.07**	1.01	**1.08**	**1.08**	**1.07**	**1.08**	**1.07**	0.99	Load power factor correction and voltage support if needed
ST.HELNA 60 kV	Base Case	P0	Base Case	**1.07**	**1.08**	1.01	**1.08**	**1.08**	1.01	**1.07**	**1.07**	**1.07**	**1.08**	**1.08**	1.01	Load power factor correction and voltage support if needed
STAFFORD 60 kV	Base Case	P0	Base Case	1.04	1.05	0.97	1.05	1.05	0.99	**1.07**	**1.07**	1.05	**1.07**	1.05	0.97	Load power factor correction and voltage support if needed
STNY PTP 115 kV	Base Case	P0	Base Case	**1.06**	**1.07**	0.99	**1.07**	**1.06**	1.01	**1.07**	**1.07**	**1.06**	**1.07**	**1.06**	0.99	Load power factor correction and voltage support if needed
STONY PT 115 kV	Base Case	P0	Base Case	**1.06**	**1.07**	0.99	**1.06**	**1.06**	1.01	**1.07**	**1.07**	**1.06**	**1.07**	**1.06**	0.99	Load power factor correction and voltage support if needed
TOCALOMA 60 kV	Base Case	P0	Base Case	1.04	1.04	0.97	1.05	1.04	0.99	**1.07**	**1.07**	1.04	**1.07**	1.05	0.97	Load power factor correction and voltage support if needed
TWR2_19 60 kV	Base Case	P0	Base Case	1.04	**1.05**	0.99	1.05	1.05	1.00	**1.07**	**1.07**	1.05	**1.07**	**1.05**	0.99	Load power factor correction and voltage support if needed
TWR2_20 60 kV	Base Case	P0	Base Case	1.04	**1.05**	0.99	1.05	1.05	1.00	**1.07**	**1.07**	1.05	**1.07**	**1.05**	0.99	Load power factor correction and voltage support if needed
UKIAH 115 kV	Base Case	P0	Base Case	**1.05**	**1.06**	1.04	**1.05**	**1.06**	1.05	**1.06**	**1.06**	**1.05**	**1.06**	**1.06**	1.04	Load power factor correction and voltage support if needed
WOODACRE 60 kV	Base Case	P0	Base Case	1.04	1.05	0.99	1.05	1.04	1.00	**1.07**	**1.07**	1.04	**1.07**	1.05	0.99	Load power factor correction and voltage support if needed
HighWAY 115 kV	LAKEVILE 230kV - Section 2E & 2D	P2	P2-4	0.99	0.99	**0.88**	1.00	0.98	0.92	1.05	1.05	0.99	1.06	1.00	**0.88**	Continue to monitor future load forecast
BELLVUE 115 kV	FULTON 115kV - Section 2D & 1D	P2	P2-4	1.01	1.02	**0.87**	1.02	1.02	**0.87**	1.05	1.06	1.01	1.06	1.04	**0.87**	Continue to monitor future load forecast
BELLVUE 115 kV	LAKEVLLE 115kV - Section 1D & 2D	P2	P2-4	1.08	1.08	0.96	1.08	1.08	0.98	1.10	**1.10**	1.08	**1.11**	1.08	0.96	Load power factor correction and voltage support if needed
CORONA 115 kV	LAKEVLLE 115kV - Section 1D & 2D	P2	P2-4	1.08	1.08	0.95	1.07	1.07	0.97	1.10	**1.10**	1.08	**1.11**	1.08	0.95	Load power factor correction and voltage support if needed
CORONA 115 kV	LAKEVLLE 115kV Section 1D	P2	P2-2	1.08	1.09	0.96	1.08	1.08	0.97	1.09	1.10	1.08	**1.10**	1.08	0.96	Load power factor correction and voltage support if needed
HGHLAND 115 kV	EAGLE ROCK-CORTINA 115kV (EGLE RCK-LWRLAKEJ)	P2	P2-1	1.05	1.05	1.01	**1.11**	1.09	1.04	**1.10**	1.07	1.05	1.07	1.06	1.01	Load power factor correction and voltage support if needed
HGHLAND 115 kV	EGLE RCK - MA 115kV & EAGLE ROCK-REDBUD line	P2	P2-3	1.04	1.04	1.01	**1.10**	1.09	1.03	**1.11**	1.08	1.04	1.08	1.06	1.01	Load power factor correction and voltage support if needed
HGHLAND 115 kV	EGLE RCK - MA 115kV & EGLE RCK-FULTON-SILVERDO line	P2	P2-3	1.04	1.04	1.01	**1.10**	1.09	1.03	**1.11**	1.08	1.04	1.08	1.06	1.01	Load power factor correction and voltage support if needed
HGHLAND 115 kV	EGLE RCK 115kV Section MA	P2	P2-2	1.04	1.04	1.01	**1.10**	1.09	1.03	**1.11**	1.08	1.04	1.08	1.06	1.01	Load power factor correction and voltage support if needed
HOMEGRND 115 kV	EAGLE ROCK-CORTINA 115kV (EGLE RCK-LWRLAKEJ)	P2	P2-1	1.05	1.05	1.01	**1.11**	1.09	1.04	**1.10**	1.07	1.05	1.07	1.06	1.01	Load power factor correction and voltage support if needed

Substation	Contingency (All and Worst P6)	Category	Category Description	Voltage PU (Baseline Scenarios)								Voltage PU (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Winter Peak	2024 Winter Peak	2029 Winter Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	2029 Retirement of QF Generations	
HOMEGRND 115 kV	EGLE RCK - MA 115kV & EAGLE ROCK-REDBUD line	P2	P2-3	1.04	1.04	1.01	1.10	1.09	1.03	1.11	1.08	1.04	1.08	1.06	1.01	Load power factor correction and voltage support if needed
HOMEGRND 115 kV	EGLE RCK - MA 115kV & EGLE RCK-FULTON-SILVERDO line	P2	P2-3	1.04	1.04	1.01	1.10	1.09	1.03	1.11	1.08	1.04	1.08	1.06	1.01	Load power factor correction and voltage support if needed
HOMEGRND 115 kV	EGLE RCK 115kV Section MA	P2	P2-2	1.04	1.04	1.01	1.10	1.09	1.03	1.11	1.08	1.04	1.08	1.06	1.01	Load power factor correction and voltage support if needed
HOMEPROC 115 kV	EAGLE ROCK-CORTINA 115kV (EGLE RCK-LWRLAKEJ)	P2	P2-1	1.05	1.05	1.01	1.11	1.09	1.04	1.10	1.07	1.05	1.07	1.06	1.01	Load power factor correction and voltage support if needed
HOMEPROC 115 kV	EGLE RCK - MA 115kV & EAGLE ROCK-REDBUD line	P2	P2-3	1.04	1.04	1.01	1.10	1.09	1.03	1.11	1.08	1.04	1.08	1.06	1.01	Load power factor correction and voltage support if needed
HOMEPROC 115 kV	EGLE RCK - MA 115kV & EGLE RCK-FULTON-SILVERDO line	P2	P2-3	1.04	1.04	1.01	1.10	1.09	1.03	1.11	1.08	1.04	1.08	1.06	1.01	Load power factor correction and voltage support if needed
HOMEPROC 115 kV	EGLE RCK 115kV Section MA	P2	P2-2	1.04	1.04	1.01	1.10	1.09	1.03	1.11	1.08	1.04	1.08	1.06	1.01	Load power factor correction and voltage support if needed
HOMSTKTP 115 kV	EAGLE ROCK-CORTINA 115kV (EGLE RCK-LWRLAKEJ)	P2	P2-1	1.05	1.05	1.01	1.11	1.09	1.04	1.10	1.07	1.05	1.07	1.06	1.01	Load power factor correction and voltage support if needed
HOMSTKTP 115 kV	EGLE RCK - MA 115kV & EAGLE ROCK-REDBUD line	P2	P2-3	1.04	1.04	1.01	1.10	1.09	1.03	1.11	1.08	1.04	1.08	1.06	1.01	Load power factor correction and voltage support if needed
HOMSTKTP 115 kV	EGLE RCK - MA 115kV & EGLE RCK-FULTON-SILVERDO line	P2	P2-3	1.04	1.04	1.01	1.10	1.09	1.03	1.11	1.08	1.04	1.08	1.06	1.01	Load power factor correction and voltage support if needed
HOMSTKTP 115 kV	EGLE RCK 115kV Section MA	P2	P2-2	1.04	1.04	1.01	1.10	1.09	1.03	1.11	1.08	1.04	1.08	1.06	1.01	Load power factor correction and voltage support if needed
LUCERNE 115 kV	MENDOCNO - 1D 115kV & MENDOCINO-REDBUD line	P2	P2-3	1.05	1.06	1.05	1.09	1.07	1.03	1.11	1.10	1.05	1.10	1.07	1.05	Load power factor correction and voltage support if needed
LUCERNE 115 kV	MENDOCNO - 1D 115kV & MENDOCINO-UKIAH line	P2	P2-3	1.05	1.06	1.05	1.09	1.07	1.03	1.11	1.10	1.05	1.10	1.07	1.05	Load power factor correction and voltage support if needed
LUCERNE 115 kV	MENDOCNO 115kV Section 1D	P2	P2-2	1.05	1.06	1.05	1.09	1.07	1.03	1.11	1.10	1.05	1.10	1.07	1.05	Load power factor correction and voltage support if needed
MENDOCNO 115 kV	MENDOCNO - 1D 115kV & MENDOCINO-REDBUD line	P2	P2-3	1.07	1.07	1.07	1.11	1.08	1.03	1.12	1.12	1.07	1.13	1.07	1.07	Load power factor correction and voltage support if needed
MENDOCNO 115 kV	MENDOCNO - 1D 115kV & MENDOCINO-UKIAH line	P2	P2-3	1.07	1.07	1.07	1.11	1.08	1.03	1.12	1.12	1.07	1.13	1.07	1.07	Load power factor correction and voltage support if needed
MENDOCNO 115 kV	MENDOCNO 115kV Section 1D	P2	P2-2	1.07	1.07	1.07	1.11	1.08	1.03	1.12	1.12	1.07	1.13	1.07	1.07	Load power factor correction and voltage support if needed
PENNGRVE 115 kV	LAKEVLLE 115kV - Section 1D & 2D	P2	P2-4	1.07	1.08	0.96	1.07	1.08	0.97	1.10	1.10	1.07	1.11	1.08	0.96	Load power factor correction and voltage support if needed
SNTA RSA 115 kV	FULTON 115kV - Section 2D & 1D	P2	P2-4	1.02	1.03	0.85	1.03	1.03	0.85	1.06	1.07	1.02	1.07	1.04	0.85	Continue to monitor future load forecast
SNTA RSA 115 kV	LAKEVLLE 115kV - Section 1D & 2D	P2	P2-4	1.07	1.08	0.97	1.08	1.08	0.99	1.10	1.10	1.07	1.11	1.08	0.97	Load power factor correction and voltage support if needed
SONOMA 115 kV	LAKEVLLE 115kV - Section 1D & 2D	P2	P2-4	0.96	0.98	0.91	0.97	0.99	0.93	1.11	1.09	0.97	1.10	1.00	0.91	Load power factor correction and voltage support if needed
STNY PTP 115 kV	LAKEVLLE 115kV - Section 1D & 2D	P2	P2-4	1.07	1.08	0.96	1.08	1.08	0.98	1.10	1.10	1.07	1.11	1.08	0.96	Load power factor correction and voltage support if needed

Substation	Contingency (All and Worst P6)	Category	Category Description	Voltage PU (Baseline Scenarios)								Voltage PU (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Winter Peak	2024 Winter Peak	2029 Winter Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	2029 Retirement of QF Generations	
BELLVUE 115 kV	GEYSER11 13.80kV Gen Unit 1 & SANTA ROSA-CORONA 115kV	P3	G1/N1	<1.10	<1.10	<1.10	<1.10	<1.10	<1.10	<1.10	1.10	<1.10	1.11	<1.10	<1.10	Load power factor correction and voltage support if needed
BELLVUE 115 kV	GEYSER11 13.80kV Gen Unit 1 & CORONA-LAKEVILLE 115kV	P3	G1/N1	<1.10	<1.10	<1.10	<1.10	<1.10	<1.10	<1.10	1.10	<1.10	1.11	<1.10	<1.10	Load power factor correction and voltage support if needed
BIG RIVR 60 kV	GEYSER11 13.80kV Gen Unit 1 & BIG RIVR SVD=v	P3	G1/N1	<1.10	<1.10	<1.10	<1.10	<1.10	<1.10	1.13	<1.10	<1.10	<1.10	<1.10	<1.10	Load power factor correction and voltage support if needed
BIG RIVR 60 kV	GEYSER11 13.80kV Gen Unit 1 & BIG RIVR SVD=v	P3	G1/N1	<1.10	<1.10	<1.10	<1.10	<1.10	<1.10	<1.10	1.14	<1.10	<1.10	<1.10	<1.10	Load power factor correction and voltage support if needed
ELK 60 kV	GEYSER11 13.80kV Gen Unit 1 & BIG RIVR SVD=v	P3	G1/N1	<1.10	<1.10	<1.10	<1.10	<1.10	<1.10	1.11	<1.10	<1.10	<1.10	<1.10	<1.10	Load power factor correction and voltage support if needed
ELK 60 kV	GEYSER11 13.80kV Gen Unit 1 & BIG RIVR SVD=v	P3	G1/N1	<1.10	<1.10	<1.10	<1.10	<1.10	<1.10	<1.10	1.12	<1.10	<1.10	<1.10	<1.10	Load power factor correction and voltage support if needed
FRT BRGG 60 kV	GEYSER11 13.80kV Gen Unit 1 & BIG RIVR SVD=v	P3	G1/N1	<1.10	<1.10	<1.10	<1.10	<1.10	<1.10	<1.10	1.11	<1.10	<1.10	<1.10	<1.10	Load power factor correction and voltage support if needed
GARCIA 60 kV	GEYSER11 13.80kV Gen Unit 1 & BIG RIVR SVD=v	P3	G1/N1	<1.10	<1.10	<1.10	<1.10	<1.10	<1.10	1.11	<1.10	<1.10	<1.10	<1.10	<1.10	Load power factor correction and voltage support if needed
GARCIA 60 kV	GEYSER11 13.80kV Gen Unit 1 & BIG RIVR SVD=v	P3	G1/N1	<1.10	<1.10	<1.10	<1.10	<1.10	<1.10	<1.10	1.12	<1.10	<1.10	<1.10	<1.10	Load power factor correction and voltage support if needed
GARCIA J 60 kV	GEYSER11 13.80kV Gen Unit 1 & BIG RIVR SVD=v	P3	G1/N1	<1.10	<1.10	<1.10	<1.10	<1.10	<1.10	1.11	<1.10	<1.10	<1.10	<1.10	<1.10	Load power factor correction and voltage support if needed
GARCIA J 60 kV	GEYSER11 13.80kV Gen Unit 1 & BIG RIVR SVD=v	P3	G1/N1	<1.10	<1.10	<1.10	<1.10	<1.10	<1.10	<1.10	1.12	<1.10	<1.10	<1.10	<1.10	Load power factor correction and voltage support if needed
PNT ARNA 60 kV	GEYSER11 13.80kV Gen Unit 1 & BIG RIVR SVD=v	P3	G1/N1	<1.10	<1.10	<1.10	<1.10	<1.10	<1.10	1.11	<1.10	<1.10	<1.10	<1.10	<1.10	Load power factor correction and voltage support if needed
PNT ARNA 60 kV	GEYSER11 13.80kV Gen Unit 1 & BIG RIVR SVD=v	P3	G1/N1	<1.10	<1.10	<1.10	<1.10	<1.10	<1.10	<1.10	1.12	<1.10	<1.10	<1.10	<1.10	Load power factor correction and voltage support if needed
STNY PTP 115 kV	GEYSER11 13.80kV Gen Unit 1 & SANTA ROSA-CORONA 115kV	P3	G1/N1	<1.10	<1.10	<1.10	<1.10	<1.10	<1.10	<1.10	1.10	<1.10	1.11	<1.10	<1.10	Load power factor correction and voltage support if needed
BELLVUE 115 kV	FULTON 230/115kV TB 4 FULTON 230/115kV TB 9 kV	P6	N-1-1	>0.9	>0.9	0.88	>0.9	>0.9	0.89	>0.9	>0.9	>0.9	>0.9	>0.9	0.88	Continue to monitor future load forecast
CALPELLA 115 kV	GEYSERS #3-CLOVERDALE 115kV MENDOCINO-UKIAH 115kV kV	P6	N-1-1	>0.9	>0.9	0.82	>0.9	0.88	0.82	>0.9	>0.9	>0.9	>0.9	>0.9	0.82	Continue to monitor future load forecast
CLOVRDLE 115 kV	GEYSERS #3-CLOVERDALE 115kV MENDOCINO-UKIAH 115kV kV	P6	N-1-1	>0.9	>0.9	0.86	>0.9	>0.9	0.86	>0.9	>0.9	>0.9	>0.9	>0.9	0.86	Continue to monitor future load forecast
CORONA 115 kV	IGNACIO SVD=r CORONA-LAKEVILLE 115kV kV	P6	N-1-1	>0.9	>0.9	0.00	>0.9	>0.9	>0.9	1.10	1.11	>0.9	1.11	>0.9	>0.9	Continue to monitor future load forecast
HIGHWAY 115 kV	IGNACIO-SOBRANTE 230kV FULTON-GEYSR16-GEYSR12-GEYSR14 230kV kV	P6	N-1-1	>0.9	>0.9	0.89	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	0.89	Continue to monitor future load forecast
LAKEVLLE 115 kV	LAKEVILE 230/115kV TB 1 LAKEVILE 230/115kV TB 2 kV	P6	N-1-1	<1.10	<1.10	<1.10	<1.10	<1.10	<1.10	1.10	1.10	<1.10	1.11	<1.10	<1.10	Load power factor correction and voltage support if needed
MONTCLLO 115 kV	FULTON 230/115kV TB 4 FULTON 230/115kV TB 9 kV	P6	N-1-1	>0.9	>0.9	0.86	>0.9	>0.9	0.87	>0.9	>0.9	>0.9	>0.9	>0.9	0.86	Continue to monitor future load forecast
RINCON 115 kV	FULTON 230/115kV TB 4 FULTON 230/115kV TB 9 kV	P6	N-1-1	>0.9	>0.9	0.87	>0.9	>0.9	0.87	>0.9	>0.9	>0.9	>0.9	>0.9	0.87	Continue to monitor future load forecast

Study Area: PG&E North Coast & North Bay

High/Low Voltages

Substation	Contingency (All and Worst P6)	Category	Category Description	Voltage PU (Baseline Scenarios)								Voltage PU (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Winter Peak	2024 Winter Peak	2029 Winter Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	2029 Retirement of QF Generations	
SILVERDO 115 kV	FULTON 230/115kV TB 4 FULTON 230/115kV TB 9 kV	P6	N-1-1	>0.9	>0.9	0.86	>0.9	>0.9	0.87	>0.9	>0.9	>0.9	>0.9	>0.9	0.86	Continue to monitor future load forecast
SNTA RSA 115 kV	FULTON 230/115kV TB 4 FULTON 230/115kV TB 9 kV	P6	N-1-1	>0.9	>0.9	0.85	>0.9	>0.9	0.86	>0.9	>0.9	>0.9	>0.9	>0.9	0.85	Continue to monitor future load forecast
SONOMA 115 kV	LAKEVILE 230/115kV TB 1 LAKEVILE 230/115kV TB 2 kV	P6	N-1-1	<1.10	<1.10	<1.10	<1.10	<1.10	<1.10	1.10	1.10	<1.10	1.11	<1.10	<1.10	Load power factor correction and voltage support if needed
UKIAH 115 kV	GEYSERS #3-CLOVERDALE 115kV MENDOCINO-UKIAH 115kV kV	P6	N-1-1	>0.9	>0.9	0.85	>0.9	0.88	0.85	>0.9	>0.9	0.90	>0.9	>0.9	0.85	Continue to monitor future load forecast
HighWAY 115 kV	GEYSERS #12-FULTON & GEYSERS #9-LAKEVILLE LINES	P7	DCTL	1.00	1.00	0.89	1.01	0.99	0.93	1.06	1.06	1.00	1.06	1.00	0.89	Continue to monitor future load forecast
BELLVUE 115 kV	FULTON-SANTA ROSA #1 & FULTON-SANTA ROSA #2 LINES	P7	DCTL	1.02	1.02	0.88	1.03	1.02	0.87	1.05	1.06	1.02	1.06	1.04	0.88	Continue to monitor future load forecast
MONROE1 115 kV	FULTON-SANTA ROSA #1 & FULTON-SANTA ROSA #2 LINES	P7	DCTL	1.03	1.03	0.85	1.03	1.03	0.84	1.06	1.07	1.02	1.08	1.05	0.85	Continue to monitor future load forecast
MONROE2 115 kV	FULTON-SANTA ROSA #1 & FULTON-SANTA ROSA #2 LINES	P7	DCTL	1.02	1.03	0.84	1.04	1.03	0.84	1.06	1.07	1.02	1.08	1.05	0.84	Continue to monitor future load forecast
NTWR ALT 115 kV	GEYSERS #12-FULTON & GEYSERS #9-LAKEVILLE LINES	P7	DCTL	0.99	1.00	0.00	1.00	0.99	0.93	1.06	1.06	0.99	1.06	1.00	0.00	Continue to monitor future load forecast
SNTA RSA 115 kV	FULTON-SANTA ROSA #1 & FULTON-SANTA ROSA #2 LINES	P7	DCTL	1.02	1.03	0.85	1.03	1.03	0.85	1.06	1.07	1.02	1.07	1.04	0.85	Continue to monitor future load forecast
STONY PT 115 kV	FULTON-SANTA ROSA #1 & FULTON-SANTA ROSA #2 LINES	P7	DCTL	1.02	1.02	0.87	1.03	1.02	0.86	1.05	1.06	1.02	1.07	1.04	0.87	Continue to monitor future load forecast

Study Area: PG&E North Coast & North Bay

Voltage Deviation

Substation	Contingency (All and Worst P6)	Category	Category Description	Post Cont. Voltage Deviation % (Baseline Scenarios)								Post Cont. Voltage Deviation % (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Winter Peak	2024 Winter Peak	2029 Winter Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	2029 Retirement of QF Generations	
CLER LKE 60 kV	EGLE RCK 115/60kV TB 1	P1	N-1	4	5	8	2	8	8	2	2	6	2	5	8	Continue to monitor future load forecast
CLER LKE 60 kV	KONOCTI-EAGLE ROCK 60kV	P1	N-1	4	5	7	2	8	8	3	2	6	2	5	7	Continue to monitor future load forecast
KONOCTI6 60 kV	EGLE RCK 115/60kV TB 1	P1	N-1	8	7	12	4	12	11	5	4	9	3	8	12	Continue to monitor future load forecast
KONOCTI6 60 kV	KONOCTI-EAGLE ROCK 60kV	P1	N-1	8	8	12	4	13	12	5	4	9	4	8	12	Continue to monitor future load forecast
MIDDLTWN 60 kV	EGLE RCK 115/60kV TB 1	P1	N-1	8	5	10	0	10	5	5	3	7	3	9	10	Load power factor correction and voltage support if needed
MIDDLTWN 60 kV	KONOCTI-EAGLE ROCK 60kV	P1	N-1	8	6	10	0	10	5	5	3	7	3	9	10	Load power factor correction and voltage support if needed

Study Area: PG&E North Coast & North Bay

Transient Stability

Contingency	Category	Category Description	Transient Stability Performance					Potential Mitigation Solutions
			Baseline Scenarios			Sensitivity Scenarios		
			2024 Summer Peak	2029 Summer Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	
Bus fault at LAKEVILE 230kV	P2-2	Bus	No Issues	No Issues	No Issues	No Issues	No Issues	No violation
Internal fault at Non-bus-tie-breaker #222 at LAKEVILE 230kV	P2-3	Non-Bus-Tie Breaker	No Issues	No Issues	No Issues	No Issues	No Issues	No violation
Internal fault at Bus-tie-breaker #422 at LAKEVILE 230kV	P2-4	Bus-Tie Breaker	No Issues	No Issues	No Issues	No Issues	No Issues	No violation
GEYSER11 Unit 1 and LAKEVILE -CR2T3_18 230kV No.1 Line	P3-2	G-1/N-1	No Issues	No Issues	No Issues	No Issues	No Issues	No violation
Breaker stuck for CB #212 protecting LAKEVILE-CR2T3_18 230kV #1 Line	P4-2	Stuck Breaker	No Issues	No Issues	No Issues	No Issues	No Issues	No violation
Breaker stuck for CB #282 protecting LAKEVLLE/LAKEVILE 115/230kV No.2 Transformer	P4-3	Stuck Breaker	No Issues	No Issues	No Issues	No Issues	No Issues	No violation
Breaker stuck for CB #202 protecting LAKEVILE 230 kV Bus #2 SEC E	P4-5	Stuck Breaker	No Issues	No Issues	No Issues	No Issues	No Issues	No violation
Breaker stuck for CB #422 protecting LAKEVILE 230kV Bus #2 SEC E	P4-6	Stuck Breaker	No Issues	No Issues	No Issues	No Issues	No Issues	No violation
LAKEVILE -CR2T3_18 230kV No.1 Line	P5-2	Non-Redundant Relay	No Issues	No Issues	No Issues	No Issues	No Issues	No violation
LAKEVILE/LAKEVLLE 230/115 kV No.1 Transformer	P5-3	Non-Redundant Relay	No Issues	No Issues	No Issues	No Issues	No Issues	No violation
LAKEVILE 230kV SEC E	P5-5	Non-Redundant Relay	No Issues	No Issues	No Issues	No Issues	No Issues	No violation
LAKEVILE -CR2T3_18 230kV No.1 Line and TULUCAY-VACA-DIX 230kV No.1 Line	P6-1	N-1-1	No Issues	No Issues	No Issues	No Issues	No Issues	No violation
LAKEVILE -CR2T3_18 230kV No.1 Line and IGNACIO/IGNACIO 230/115 kV No.6 Transformer	P6-2	N-1-1	No Issues	No Issues	No Issues	No Issues	No Issues	No violation
IGNACIO/IGNACIO 230/115 kV No.6 Transformer	P1-3	N-1	**WECC/NERC criteria not met**	No Issues	No Issues	No Issues	No Issues	Under review. To be updated in draft TP .
PUEBLO 115kV ID. v SVD	P1-4	N-1	No Issues	No Issues	No Issues	No Issues	No Issues	No violation
LP SAMOA Unit 1 and HUMB_BS1/HUMB_G1 115/13.8 kV No.1 Transformer	P3-3	G-1/N-1	No Issues	No Issues	No Issues	No Issues	No Issues	No violation
GEYSER11 Unit 1 and PUEBLO 115 kV ID v SVD	P3-4	G-1/N-1	No Issues	No Issues	No Issues	No Issues	No Issues	No violation
PUEBLO 115 kV ID v SVD and BIG RIVR 60 kV ID v SVD	P6-3	N-1-1	No Issues	No Issues	No Issues	No Issues	No Issues	No violation
Breaker stuck for CB #366 protecting MENDOCNO 115 kV ID v SVD	P4-4	Stuck Breaker	No Issues	No Issues	No Issues	No Issues	No Issues	No violation
MENDOCNO 115 kV ID v SVD	P5-4	Non-Redundant Relay	No Issues	No Issues	No Issues	No Issues	No Issues	No violation
Breaker stuck for CB #182 protecting GEYSER78 Unit 1	P4-1	Stuck Breaker	No Issues	No Issues	No Issues	No Issues	No Issues	No violation
GEYSER78 Unit 1	P5-1	Non-Redundant Relay	No Issues	No Issues	No Issues	No Issues	No Issues	No violation
GEYSER11 Unit 1	P1-1	N-1	No Issues	No Issues	No Issues	No Issues	No Issues	No violation
GEYSER11 Unit 1 and GEYSER13 Unit 1	P3-1	G-1/N-1	No Issues	No Issues	No Issues	No Issues	No Issues	No violation
Successful reclose on fault on Fulton - Lakeville 230 kV Line and Geysers 9 - Lakeville 230 kV Line	P7-1	DCTL	No Issues	No Issues	No Issues	No Issues	No Issues	No violation
Failed reclose on fault on Fulton - Lakeville 230 kV Line and Geysers 9 - Lakeville 230 kV Line	P7-1	DCTL	No Issues	No Issues	No Issues	No Issues	No Issues	No violation

Study Area: PG&E North Coast & North Bay

Single Contingency Load Drop

Worst Contingency	Category	Category Description	Amount of Load Drop (MW)										Potential Mitigation Solutions
			Select..	Select..	Select..	Select..	Select..	Select..	Select..	Select..	Select..	Select..	

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

2019-2020 ISO Reliability Assessment - Study Results

Study Area: PG&E North Coast & North Bay

Single Source Substation with more than 100 MW Load

Substation	Load Served (MW)										Potential Mitigation Solutions
	Select..	Select..	Select..	Select..	Select..	Select..	Select..	Select..	Select..	Select..	

No single source substation with of more than 100 MW

2019-2020 ISO Reliability Assessment - Study Results
Study Area: PG&E North Valley
Thermal Overloads

California ISO

Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Loading % (Baseline Scenarios)					Loading % (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2021 SP Heavy Renewable & Min Gas Gen	2024 SpOP Hi Renew & Min Gas Gen	2029 Retirement of QF Generations	
30105 COTWD_E 230 30245 ROUND MT 230 3	P1-3:A3:61:_ROUND MT 500/230kV TB 1 & P1-2:A3:115:_ROUND MTN-COTTONWOOD #2 230kV	P6	N-1/N-1	<100	<100	<100	<100	<100	<100	100	<100	<100	Sensitivity only
31459 OREGNTRL 115 31469 SPI_AND 115 1	P1-3:A3:22:_COTWD_E2 230/60kV TB 2 & P1-3:A3:20:_COTWD_E 230/60kV TB 3	P6	N-1/N-1	111	122	133	<100	<100	126	<100	<100	133	Project: RAS Identified in 2017-2018 TPP In-service date: TBD Short term: Action plan
31464 COTWDPGE 115 31466 JESSUPJ1 115 1	P1-3:A3:22:_COTWD_E2 230/60kV TB 2 & P1-3:A3:20:_COTWD_E 230/60kV TB 3	P6	N-1/N-1	118	<100	<100	<100	<100	<100	<100	<100	<100	Project: RAS Identified in 2017-2018 TPP In-service date: TBD Short term: Action plan
31466 JESSUPJ1 115 31469 SPI_AND 115 1	P1-3:A3:22:_COTWD_E2 230/60kV TB 2 & P1-3:A3:20:_COTWD_E 230/60kV TB 3	P6	N-1/N-1	<100	108	114	<100	<100	112	<100	<100	114	Project: RAS Identified in 2017-2018 TPP In-service date: TBD Short term: Action plan
31468 CASCADE 115 31459 OREGNTRL 115 1	P1-3:A3:22:_COTWD_E2 230/60kV TB 2 & P1-3:A3:20:_COTWD_E 230/60kV TB 3	P6	N-1/N-1	<100	108	120	<100	<100	112	<100	<100	120	Project: RAS Identified in 2017-2018 TPP In-service date: TBD Short term: Action plan
31468 CASCADE 115 31797 CSCDE M 13.5 1	P1-3:A3:22:_COTWD_E2 230/60kV TB 2 & P1-3:A3:20:_COTWD_E 230/60kV TB 3	P6	N-1/N-1	105	<100	<100	<100	<100	<100	<100	<100	<100	Project: Cascade 115/60 kV No. 2 Transformer Project ISD: Jan. 2022 Short term: Action Plan
31478 TBLM JCT 115 31494 BIGBENTP 115 1	P2-2:A3:81:_TBLE MTN 115kV Section 1D	P2	Bus	93	99	109	12	13	101	64	13	109	Continue to monitor future load forecast
	P2-3:A3:134:_TBLE MTN - 1D 115kV & BUTTE-CHICO B-TBLE MTN line	P2	Non-Bus-Tie Breaker	93	98	108	12	12	100	64	12	108	Continue to monitor future load forecast
	P1-2:A3:6:_BUTTE-CHICO B-TBLE MTN 115kV & P1-2:A3:117:_SYCAMORE CREEK-NOTRE DAME-TABLE MTN 115kV	P6	N-1/N-1	<100	<100	103	<100	<100	<100	<100	<100	103	Continue to monitor future load forecast
31480 WYANDTTE 115 31516 WYANDJT2 115 1	P2-3:A3:98:_PALERMO - 1D 115kV & PALERMO-WYANDOTTE line	P2	Non-Bus-Tie Breaker	0	0	129	0	6	0	0	8	129	Existing SPS is under review
31480 WYANDTTE 115 31518 WYANDJT1 115 1	Base Case	P0	Base Case	97	97	102	14	7	99	67	9	102	Continue to monitor future load forecast
31482 PALERMO 115 31516 WYANDJT2 115 2	P2-2:A3:76:_TBL MT D 230kV Section 1D	P2	Bus	Diverge	Diverge	Diverge	Diverge	3	Diverge	Diverge	17	Diverge	Project: RAS Identified in 2017-2018 TPP In-service date: TBD Short term: Action plan
	P2-4:A3:27:_TBL MT D Section 1D & TBL MT E Section 1E 230kV	P2	Bus-Tie Breaker	Diverge	Diverge	Diverge	Diverge	2	Diverge	Diverge	Diverge	Diverge	Project: RAS Identified in 2017-2018 TPP In-service date: TBD Short term: Action plan
31486 CARIBOU 115 30255 CARBOU M 230 11	P1-2:A3:119:_TABLE MTN-PALERMO 230kV MOAS OPENED on TBL MT D_PALERMO	P1	N-1	94	41	34	71	102	41	94	102	34	Generation redispatch
	P2-1:A3:151:_TABLE MTN-PALERMO 230kV (TBL MT D-PALERMO)	P2	Line Section w/o Fault	94	41	34	71	102	41	94	102	34	Generation redispatch
	P2-3:A3:101:_PALERMO 230kV - Ring R2 & R1	P2	Non-Bus-Tie Breaker	94	41	34	71	102	41	94	102	34	Generation redispatch
	P1-1:A3:17:_CRBU 4-5 13.80kV Gen Unit 1 & P1-2:A3:119:_TABLE MTN-PALERMO 230kV MOAS OPENED on TBL MT D_PALERMO	P6	N-1/N-1	<100	<100	<100	<100	100	<100	<100	100	<100	Generation redispatch

2019-2020 ISO Reliability Assessment - Study Results
Study Area: PG&E North Valley
Thermal Overloads

California ISO

Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Loading % (Baseline Scenarios)					Loading % (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2021 SP Heavy Renewable & Min Gas Gen	2024 SpOP Hi Renew & Min Gas Gen	2029 Retirement of QF Generations	
	P7-1:A3:18_Table Mountain(D)-Rio Oso 230 kV Line and Table Mountain(D)-Palermo 230 kV Line	P7	DCTL	94	28	20	71	115	28	94	116	20	Generation redispatch
31486 CARIBOU 115 31488 GRIZ JCT 115 1	P2-4:A3:27:_TBL MT D Section 1D & TBL MT E Section 1E 230kV	P2	Bus-Tie Breaker	Diverge	Diverge	Diverge	Diverge	23	Diverge	Diverge	Diverge	Diverge	Project: RAS Identified in 2017-2018 TPP In-service date: TBD Short term: Action plan
31488 GRIZ JCT 115 31512 BIG BEND 115 1	P2-3:A3:98:_PALERMO - 1D 115kV & PALERMO-WYANDOTTE line	P2	Non-Bus-Tie Breaker	0	0	129	0	10	0	0	12	129	Existing SPS is under review
	P2-4:A3:27:_TBL MT D Section 1D & TBL MT E Section 1E 230kV	P2	Bus-Tie Breaker	Diverge	Diverge	Diverge	Diverge	5	Diverge	Diverge	Diverge	Diverge	Project: RAS Identified in 2017-2018 TPP In-service date: TBD Short term: Action plan
31497 NDAME J 115 31498 SYCAMORE 115 1	P1-2:A3:8:_BUTTE-SYCAMORE CREEK 115kV MOAS OPENED on NORD 1_CHICOTP2	P1	N-1	102	109	115	13	19	111	71	20	115	Load, contingency and line rating are under review
	P2-1:A3:14:_BUTTE-SYCAMORE CREEK 115kV (NORD 1-CHICOTP2)	P2	Line Section w/o Fault	102	109	115	13	19	111	71	20	115	Load and line rating are under review
	P2-2:A3:4:_BUTTE 115kV Section MD	P2	Bus	102	110	115	14	20	112	71	22	115	Load and line rating are under review
	P2-3:A3:134:_TBLE MTN - 1D 115kV & BUTTE-CHICO B-TBLE MTN line	P2	Non-Bus-Tie Breaker	89	95	103	12	17	96	62	18	103	Continue to monitor future load forecast
	P2-3:A3:5:_BUTTE - MD 115kV & BUTTE-CHICO B-TBLE MTN line	P2	Non-Bus-Tie Breaker	132	139	144	20	29	142	89	31	144	Load and line rating are under review
	P2-3:A3:6:_BUTTE - MD 115kV & BUTTE-SYCAMORE CREEK line	P2	Non-Bus-Tie Breaker	102	109	116	13	19	112	71	21	116	Load and line rating are under review
	P2-4:A3:1:_BUTTE 115kV - Section ME & MD	P2	Bus-Tie Breaker	103	110	120	14	20	112	71	21	120	Load and line rating are under review
	P1-2:A3:6:_BUTTE-CHICO B-TBLE MTN 115kV & P1-2:A3:118:_TABLE MTN-BUTTE #2 115kV	P6	N-1/N-1	<100	<100	103	<100	<100	<100	<100	<100	103	Load and line rating are under review
31500 BUTTE 115 31501 CHICOTP1 115 1	P1-2:A3:118:_TABLE MTN-BUTTE #2 115kV & P1-2:A3:117:_SYCAMORE CREEK-NOTRE DAME-TABLE MTN 115kV	P6	N-1/N-1	106	114	126	<100	<100	117	<100	<100	126	Project: RAS Identified in 2017-2018 TPP In-service date: TBD Short term: Action plan
	P7-1:A3:4_Sycamore Creek-Notre Dame-Table Mountain and Table Mountain-Butte No.2 115 kV Lines	P7	DCTL	106	114	126	10	12	117	68	13	126	Project: RAS Identified in 2017-2018 TPP In-service date: TBD Short term: Action plan
31500 BUTTE 115 31504 TBLE MTN 115 2	P1-2:A3:6:_BUTTE-CHICO B-TBLE MTN 115kV & P1-2:A3:117:_SYCAMORE CREEK-NOTRE DAME-TABLE MTN 115kV	P6	N-1/N-1	121	129	144	<100	<100	132	<100	<100	144	Project: RAS Identified in 2017-2018 TPP In-service date: TBD Short term: Action plan
31501 CHICOTP1 115 31504 TBLE MTN 115 1	P2-2:A3:82:_TBLE MTN 115kV Section 2D	P2	Bus	89	94	100	12	14	96	60	16	100	Continue to monitor future load forecast
	P2-3:A3:135:_TBLE MTN - 2D 115kV & PARADISE-TABLE MTN line	P2	Non-Bus-Tie Breaker	89	94	101	12	14	96	60	16	101	Continue to monitor future load forecast
	P2-3:A3:136:_TBLE MTN - 2D 115kV & SYCAMORE CREEK-NOTRE DAME-TABLE MTN line	P2	Non-Bus-Tie Breaker	90	95	102	12	14	97	60	16	102	Continue to monitor future load forecast

2019-2020 ISO Reliability Assessment - Study Results
Study Area: PG&E North Valley
Thermal Overloads

California ISO

Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Loading % (Baseline Scenarios)					Loading % (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2021 SP Heavy Renewable & Min Gas Gen	2024 SpOP Hi Renew & Min Gas Gen	2029 Retirement of QF Generations	
31501 CHICOTP 1 115 31504 TBLE MTN 115 1	P1-2:A3:118:_TABLE MTN-BUTTE #2 115kV & P1-2:A3:103:_PARADISE-TABLE MTN 115kV	P6	N-1/N-1	<100	<100	103	<100	<100	<100	<100	<100	103	Project: RAS Identified in 2017-2018 TPP In-service date: TBD Short term: Action plan
	P7-1:A3:4_Sycamore Creek-Notre Dame-Table Mountain and Table Mountain-Butte No.2 115 kV Lines	P7	DCTL	123	130	144	14	18	134	81	20	144	Project: RAS Identified in 2017-2018 TPP In-service date: TBD Short term: Action plan
31503 CHICOTP2 115 31500 BUTTE 115 1	P1-2:A3:6:_BUTTE-CHICO B-TBLE MTN 115kV & P1-2:A3:117:_SYCAMORE CREEK-NOTRE DAME-TABLE MTN 115kV	P6	N-1/N-1	<100	<100	108	<100	<100	101	<100	<100	108	Project: RAS Identified in 2017-2018 TPP In-service date: TBD Short term: Action plan
31504 TBLE MTN 115 31497 NDAME J 115 1	P2-2:A3:81:_TBLE MTN 115kV Section 1D	P2	Bus	90	96	106	10	13	97	58	14	106	Continue to monitor future load forecast
	P2-3:A3:134:_TBLE MTN - 1D 115kV & BUTTE-CHICO B-TBLE MTN line	P2	Non-Bus-Tie Breaker	90	96	106	10	12	97	58	14	106	Continue to monitor future load forecast
	P1-2:A3:6:_BUTTE-CHICO B-TBLE MTN 115kV & P1-2:A3:118:_TABLE MTN-BUTTE #2 115kV	P6	N-1/N-1	<100	<100	105	<100	<100	<100	<100	<100	105	Project: RAS Identified in 2017-2018 TPP In-service date: TBD Short term: Action plan
31516 WYANDJT2 115 31512 BIG BEND 115 2	P2-3:A3:98:_PALERMO - 1D 115kV & PALERMO-WYANDOTTE line	P2	Non-Bus-Tie Breaker	0	0	130	0	7	0	0	9	130	Existing SPS is under review
	P2-4:A3:27:_TBL MT D Section 1D & TBL MT E Section 1E 230kV	P2	Bus-Tie Breaker	Diverge	Diverge	Diverge	Diverge	3	Diverge	Diverge	Diverge	Diverge	Project: RAS Identified in 2017-2018 TPP In-service date: TBD Short term: Action plan
31522 COTWD_2D 115 31466 JESSUPJ1 115 1	P1-3:A3:22:_COTWD_E2 230/60kV TB 2 & P1-3:A3:20:_COTWD_E 230/60kV TB 3	P6	N-1/N-1	<100	132	142	<100	<100	136	<100	<100	142	Project: RAS Identified in 2017-2018 TPP In-service date: TBD Short term: Action plan
31570 BENTON 60.0 31572 GIRVAN 60.0 1	P2-2:A3:18:_COTTONWD 60kV Section 1D	P2	Bus	NA	92	101	NA	11	93	NA	10	101	Continue to monitor future load forecast
	P2-3:A3:31:_COTTONWD - 1D 60kV & COTTONWOOD #1 line	P2	Non-Bus-Tie Breaker	NA	91	100	NA	11	93	NA	10	100	Continue to monitor future load forecast
	P2-3:A3:37:_COTTONWD - 1D 60kV & COTTONWOOD-RED BLUFF line COPY-21	P2	Non-Bus-Tie Breaker	NA	NA	101	NA	NA	NA	NA	NA	101	Continue to monitor future load forecast
	P2-3:A3:38:_COTTONWD - 1D 60kV & COTTONWOOD-RED BLUFF line COPY-22	P2	Non-Bus-Tie Breaker	NA	NA	100	NA	NA	NA	NA	NA	100	Continue to monitor future load forecast
	P1-3:A3:22:_COTWD_E2 230/60kV TB 2 & P1-3:A3:20:_COTWD_E 230/60kV TB 3	P6	N-1/N-1	103	101	123	<100	<100	105	<100	<100	123	Project: RAS Identified in 2017-2018 TPP In-service date: TBD Short term: Action plan
31576 WNTU PMS 60.0 31570 BENTON 60.0 1	P2-2:A3:27:_COTWD_2E 115kV Section 2E	P2	Bus	NA	54	54	NA	94	58	NA	104	54	Sensitivity only
	P2-4:A3:12:_COTWD_F2 Section 2F & COTWD_E2 Section 2E 230kV	P2	Bus-Tie Breaker	24	34	42	100	7	29	118	34	42	Sensitivity only
	P2-4:A3:6:_COTWD_1E Section 1E & COTWD_2E Section 2E 115kV	P2	Bus-Tie Breaker	NA	54	54	NA	94	58	NA	104	54	Sensitivity only
	P1-3:A3:22:_COTWD_E2 230/60kV TB 2 & P1-3:A3:20:_COTWD_E 230/60kV TB 3	P6	N-1/N-1	163	156	200	<100	<100	163	100	<100	200	Project: RAS Identified in 2017-2018 TPP In-service date: TBD Short term: Action plan
	P1-2:A3:28:_CASCADE-COTTONWOOD 115kV	P1	N-1	48	54	52	90	100	56	72	102	52	Sensitivity only

2019-2020 ISO Reliability Assessment - Study Results
Study Area: PG&E North Valley
Thermal Overloads

California ISO

Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Loading % (Baseline Scenarios)					Loading % (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2021 SP Heavy Renewable & Min Gas Gen	2024 SpOP Hi Renew & Min Gas Gen	2029 Retirement of QF Generations	
31576 WNTU PMS 60.0 31578 LOMS JCT 60.0 1	P2-1:A3:39:_CASCADE-COTTONWOOD 115kV (CASCADE-OREGNTRL)	P2	Line Section w/o Fault	48	55	53	90	100	56	72	102	53	Sensitivity only
	P2-1:A3:42:_CASCADE-COTTONWOOD 115kV (OREGNTRL-SPI_AND)	P2	Line Section w/o Fault	33	44	42	91	101	43	65	105	42	Generation redispatch
	P2-2:A3:27:_COTWD_2E 115kV Section 2E	P2	Bus	NA	48	47	NA	100	51	NA	110	47	Sensitivity only
	P2-3:A3:55:_COTWD_2D - 2D 115kV & CASCADE-COTTONWOOD line	P2	Non-Bus-Tie Breaker	NA	55	52	NA	100	56	NA	102	52	Generation redispatch
	P2-4:A3:12:_COTWD_F2 Section 2F & COTWD_E2 Section 2E 230kV	P2	Bus-Tie Breaker	18	39	36	106	13	34	124	40	36	Project: Cottonwood 115 kV Bus Sectionalizing Breaker ISD: Dec 2022 Short term: Action Plan
	P2-4:A3:6:_COTWD_1E Section 1E & COTWD_2E Section 2E 115kV	P2	Bus-Tie Breaker	NA	48	47	NA	100	51	NA	110	47	Sensitivity only
	P1-2:A3:35:_COLEMAN-SOUTH 60kV & P1-2:A3:28:_CASCADE-COTTONWOOD 115kV	P6	N-1/N-1	<100	<100	<100	101	<100	<100	<100	103	<100	Generation redispatch
31580 CASCADE 60.0 31581 OREGNTRL 60.0 1	P2-2:A3:20:_COTTONWD 60kV Section MA	P2	Bus	Diverge	NA	NA	66	NA	NA	143	NA	NA	Sensitivity only
	P2-2:A3:27:_COTWD_2E 115kV Section 2E	P2	Bus	NA	30	27	NA	86	33	NA	104	27	Sensitivity only
	P2-3:A3:43:_COTTONWD - MA 60kV & COLEMAN-COTTONWOOD line	P2	Non-Bus-Tie Breaker	Diverge	NA	NA	78	NA	NA	123	NA	NA	Sensitivity only
	P2-3:A3:45:_COTTONWD - MA 60kV & COTTONWOOD #2 line	P2	Non-Bus-Tie Breaker	Diverge	NA	NA	66	NA	NA	141	NA	NA	Sensitivity only
	P2-3:A3:46:_COTTONWD - MA 60kV & COTTONWOOD-RED BLUFF line COPY-13	P2	Non-Bus-Tie Breaker	Diverge	NA	NA	66	NA	NA	143	NA	NA	Sensitivity only
	P2-4:A3:12:_COTWD_F2 Section 2F & COTWD_E2 Section 2E 230kV	P2	Bus-Tie Breaker	12	86	13	100	34	81	156	9	13	Sensitivity only
	P2-4:A3:2:_COTTONWD 60kV - Section 1D & 1E	P2	Bus-Tie Breaker	NA	Diverge	Diverge	NA	80	Diverge	NA	51	Diverge	Project: RAS Identified in 2017-2018 TPP In-service date: TBD Short term: Action plan
	P2-4:A3:6:_COTWD_1E Section 1E & COTWD_2E Section 2E 115kV	P2	Bus-Tie Breaker	NA	30	27	NA	86	33	NA	104	27	Sensitivity only
	P1-2:A3:34:_COLEMAN-RED BLUFF 60kV MOAS OPENED on COTTONWD_RED B JT & P1-2:A3:32:_COLEMAN-COTTONWOOD 60kV	P6	N-1/N-1	Diverge	<100	Diverge	<100	<100	<100	<100	<100	Diverge	Project: RAS Identified in 2017-2018 TPP In-service date: TBD Short term: Action plan
	P2-1:A3:42:_CASCADE-COTTONWOOD 115kV (OREGNTRL-SPI_AND)	P2	Line Section w/o Fault	66	78	70	83	90	78	70	100	70	Generation redispatch
	P2-2:A3:20:_COTTONWD 60kV Section MA	P2	Bus	Diverge	NA	NA	64	NA	NA	137	NA	NA	Project: RAS Identified in 2017-2018 TPP In-service date: TBD Short term: Action plan
	P2-2:A3:27:_COTWD_2E 115kV Section 2E	P2	Bus	NA	44	41	NA	89	48	NA	109	41	Generation redispatch
	P2-3:A3:43:_COTTONWD - MA 60kV & COLEMAN-COTTONWOOD line	P2	Non-Bus-Tie Breaker	Diverge	NA	NA	76	NA	NA	116	NA	NA	Project: RAS Identified in 2017-2018 TPP In-service date: TBD Short term: Action plan

2019-2020 ISO Reliability Assessment - Study Results
Study Area: PG&E North Valley
Thermal Overloads

California ISO

Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Loading % (Baseline Scenarios)					Loading % (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2021 SP Heavy Renewable & Min Gas Gen	2024 SpOP Hi Renew & Min Gas Gen	2029 Retirement of QF Generations	
31581 OREGNTRL 60.0 31578 LOMS JCT 60.0 1	P2-3:A3:45:_COTTONWD - MA 60kV & COTTONWOOD #2 line	P2	Non-Bus-Tie Breaker	Diverge	NA	NA	64	NA	NA	137	NA	NA	Project: RAS Identified in 2017-2018 TPP In-service date: TBD Short term: Action plan
	P2-3:A3:46:_COTTONWD - MA 60kV & COTTONWOOD-RED BLUFF line COPY-13	P2	Non-Bus-Tie Breaker	Diverge	NA	NA	64	NA	NA	137	NA	NA	Project: RAS Identified in 2017-2018 TPP In-service date: TBD Short term: Action plan
	P2-4:A3:12:_COTWD_F2 Section 2F & COTWD_E2 Section 2E 230kV	P2	Bus-Tie Breaker	6	71	27	101	31	66	149	14	27	Project: RAS Identified in 2017-2018 TPP In-service date: TBD Short term: Action plan
	P2-4:A3:6:_COTWD_1E Section 1E & COTWD_2E Section 2E 115kV	P2	Bus-Tie Breaker	NA	44	41	NA	89	48	NA	109	41	Sensitivity only
	P1-3:A3:74:_TRINITY 115/60kV TB 1 & P1-2:A3:28:_CASCADE-COTTONWOOD 115kV	P6	N-1/N-1	<100	<100	<100	<100	<100	<100	<100	104	<100	Sensitivity only
31602 COLEMAN 60.0 31606 CLMN JCT 60.0 1	P1-2:A3:34:_COLEMAN-RED BLUFF 60kV MOAS OPENED on COTTONWD_RED B JT	P1	N-1	155	64	70	30	10	65	93	12	70	Project: Coleman - Red Bluff 60 kV Line Upgrade ISD: May 2021 Short term: Action Plan
31606 CLMN JCT 60.0 31608 RED BLFF 60.0 1	P1-2:A3:34:_COLEMAN-RED BLUFF 60kV MOAS OPENED on COTTONWD_RED B JT	P1	N-1	109	45	50	23	8	46	69	9	50	Project: Coleman - Red Bluff 60 kV Line Upgrade ISD: May 2021 Short term: Action Plan
31722 GLENN 60.0 31733 CAPYSWCH 60.0 3	Base Case	P0	Base Case	94	100	92	11	15	100	33	24	92	Sensitivity only
31733 CAPYSWCH 60.0 31731 CAPAYJCT 60.0 3	Base Case	P0	Base Case	94	100	92	11	15	100	33	24	92	Sensitivity only
31735 CHICO JT 60.0 31738 ANITA 60.0 3	Base Case	P0	Base Case	107	114	95	14	19	115	32	28	95	Significant leading power factor in near term
32200 PEASE 115 31506 HONC JT1 115 1	P1-2:A3:67:_TABLE MT 500/230kV TB1 & P1-2:A3:121:_TABLE MTN-RIO OSO 230kV	P6	N-1/N-1	<100	100	Diverge	<100	<100	100	<100	<100	Diverge	Generation redispatch
	P7-1:A3:13_Colgate - Rio Oso 230kV and Table Mountain(D)-Rio Oso 230 kV Line	P7	DCTL	78	81	101	33	27	81	47	34	101	Continue to monitor future load forecast
	P7-1:A3:14_Palermo-Nicolaus 115 kV Line and Palermo-Bogue 115 kV Line	P7	DCTL	81	79	100	25	18	79	50	28	100	Continue to monitor future load forecast
	P1-2:A3:14:_CARIBOU-TABLE MTN 230kV	P1	N-1	Potential Diverge	NA	NA	Potential Diverge	NA	NA	NA	Potential Diverge	NA	Under review

Substation	Contingency (All and Worst P6)	Category	Category Description	VoltagePU (Baseline Scenarios)					VoltagePU (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2021 SP Heavy Renewable & Min Gas Gen	2024 SpOP Hi Renew & Min Gas Gen	2029 Retirement of QF Generations	
ANITA 60kV	Base Case	P0	Base Case	**1.07**	**1.07**	0.99	**1.06**	**1.06**	**1.07**	1.02	**1.07**	0.99	Load power factor correction and voltage support if needed
BCKS CRK 230kV	Base Case	P0	Base Case	1.03	1.04	1.03	**1.05**	1.05	1.04	1.03	**1.05**	1.03	Load power factor correction and voltage support if needed
BELDEN 230kV	Base Case	P0	Base Case	1.03	1.03	1.02	1.05	1.04	1.03	1.03	1.05	1.02	Load power factor correction and voltage support if needed
BIG BAR 60kV	Base Case	P0	Base Case	1.04	1.04	1.03	**1.05**	1.05	1.04	1.05	**1.05**	1.03	Load power factor correction and voltage support if needed
BTTE CRK 60kV	Base Case	P0	Base Case	1.04	**1.05**	1.04	**1.06**	**1.05**	1.05	1.04	1.04	1.04	Load power factor correction and voltage support if needed
BUTTE 115kV	Base Case	P0	Base Case	1.03	1.03	1.02	**1.06**	**1.06**	1.03	1.04	**1.06**	1.02	Load power factor correction and voltage support if needed
CANAL TP 60kV	Base Case	P0	Base Case	**1.06**	1.05	1.04	1.00	1.01	1.04	1.03	1.01	1.04	Load power factor correction and voltage support if needed
CAPAY 60kV	Base Case	P0	Base Case	**1.05**	**1.05**	1.04	**1.06**	**1.06**	**1.05**	1.05	**1.06**	1.04	Load power factor correction and voltage support if needed
CAPYSWCH 60kV	Base Case	P0	Base Case	**1.05**	**1.05**	**1.05**	**1.06**	**1.05**	**1.05**	**1.05**	**1.06**	**1.05**	Load power factor correction and voltage support if needed
CASCADE 60kV	Base Case	P0	Base Case	1.04	1.04	1.02	**1.05**	**1.06**	1.04	1.05	**1.06**	1.02	Load power factor correction and voltage support if needed
CASCADE 115kV	Base Case	P0	Base Case	1.04	1.04	1.02	**1.05**	**1.06**	1.04	1.05	**1.06**	1.02	Load power factor correction and voltage support if needed
CEDR CRK 60kV	Base Case	P0	Base Case	**1.05**	**1.05**	1.04	**1.11**	**1.11**	**1.05**	**1.09**	**1.12**	1.04	Load power factor correction and voltage support if needed
CHALLNGE 60kV	Base Case	P0	Base Case	1.05	**1.06**	1.03	**1.08**	**1.07**	**1.06**	1.05	**1.07**	1.03	Load power factor correction and voltage support if needed
CHICO B 115kV	Base Case	P0	Base Case	1.04	1.04	1.04	**1.05**	**1.05**	1.04	1.04	**1.05**	1.04	Load power factor correction and voltage support if needed
CNTRVLLE 60kV	Base Case	P0	Base Case	1.04	1.05	1.04	**1.05**	1.05	1.05	1.04	1.04	1.04	Load power factor correction and voltage support if needed
CORNSWCH 60kV	Base Case	P0	Base Case	**1.05**	**1.05**	**1.05**	**1.06**	**1.05**	**1.05**	**1.05**	**1.06**	**1.05**	Load power factor correction and voltage support if needed
COWCK TP 60kV	Base Case	P0	Base Case	**1.05**	**1.06**	1.03	**1.09**	**1.09**	**1.06**	**1.07**	**1.10**	1.03	Load power factor correction and voltage support if needed
CR CANAL 60kV	Base Case	P0	Base Case	**1.06**	1.05	1.04	1.00	1.00	1.04	1.03	1.01	1.04	Load power factor correction and voltage support if needed
CRESTA 230kV	Base Case	P0	Base Case	1.03	1.04	1.02	**1.05**	1.05	1.04	1.03	**1.05**	1.02	Load power factor correction and voltage support if needed

Substation	Contingency (All and Worst P6)	Category	Category Description	VoltagePU (Baseline Scenarios)					VoltagePU (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2021 SP Heavy Renewable & Min Gas Gen	2024 SpOP Hi Renew & Min Gas Gen	2029 Retirement of QF Generations	
DE SABLA 60kV	Base Case	P0	Base Case	1.04	**1.05**	1.04	**1.06**	**1.05**	1.05	1.04	1.04	1.04	Load power factor correction and voltage support if needed
DESCHUTS 60kV	Base Case	P0	Base Case	1.04	1.04	1.01	**1.06**	**1.07**	1.04	1.05	**1.07**	1.01	Load power factor correction and voltage support if needed
DIRYVLLE 60kV	Base Case	P0	Base Case	1.01	1.02	0.99	**1.06**	**1.06**	1.02	1.02	**1.07**	0.99	Load power factor correction and voltage support if needed
FRNCHGLH 60kV	Base Case	P0	Base Case	1.04	1.05	1.02	**1.05**	**1.06**	1.05	**1.05**	**1.06**	1.02	Load power factor correction and voltage support if needed
FRSTGLEN 115kV	Base Case	P0	Base Case	**1.05**	**1.06**	1.04	**1.06**	**1.06**	**1.06**	**1.08**	**1.06**	1.04	Load power factor correction and voltage support if needed
GLENN 60kV	Base Case	P0	Base Case	**1.05**	**1.05**	**1.05**	**1.06**	**1.05**	**1.05**	**1.05**	**1.06**	**1.05**	Load power factor correction and voltage support if needed
HATLOSCK 60kV	Base Case	P0	Base Case	**1.05**	**1.08**	**1.07**	1.05	**1.06**	**1.08**	**1.06**	**1.06**	**1.07**	Load power factor correction and voltage support if needed
HEADGATE 60kV	Base Case	P0	Base Case	**1.05**	**1.06**	1.03	**1.06**	**1.06**	**1.05**	1.04	**1.06**	1.03	Load power factor correction and voltage support if needed
HONCUT 115kV	Base Case	P0	Base Case	1.04	1.05	1.03	**1.08**	**1.06**	1.05	1.04	**1.06**	1.03	Load power factor correction and voltage support if needed
HT CRKRG 60kV	Base Case	P0	Base Case	**1.05**	**1.08**	**1.07**	1.05	**1.06**	**1.08**	**1.06**	**1.06**	**1.07**	Load power factor correction and voltage support if needed
HYAMPOM 60kV	Base Case	P0	Base Case	1.03	1.04	1.02	1.04	1.04	1.04	1.04	1.04	1.02	Load power factor correction and voltage support if needed
INSKIP 60kV	Base Case	P0	Base Case	1.04	1.04	1.03	1.05	1.05	1.04	1.04	1.05	1.03	Load power factor correction and voltage support if needed
JESSUP 115kV	Base Case	P0	Base Case	1.04	1.04	1.02	**1.06**	**1.06**	1.04	1.04	**1.06**	1.02	Load power factor correction and voltage support if needed
KESWICK 60kV	Base Case	P0	Base Case	1.04	1.04	1.01	**1.05**	**1.06**	1.04	1.05	**1.06**	1.01	Load power factor correction and voltage support if needed
KILARC 60kV	Base Case	P0	Base Case	**1.06**	**1.06**	1.04	**1.11**	**1.11**	**1.06**	**1.09**	**1.12**	1.04	Load power factor correction and voltage support if needed
NEO REDT 60kV	Base Case	P0	Base Case	**1.06**	1.05	1.04	1.00	1.01	1.04	1.04	1.01	1.04	Load power factor correction and voltage support if needed
NORD 1 115kV	Base Case	P0	Base Case	1.02	1.02	1.01	**1.06**	**1.06**	1.02	1.04	**1.06**	1.01	Load power factor correction and voltage support if needed
NOTRDAME 115kV	Base Case	P0	Base Case	1.03	1.03	1.02	**1.06**	**1.06**	1.03	1.04	**1.06**	1.02	Load power factor correction and voltage support if needed
OREGNTRL 60kV	Base Case	P0	Base Case	1.05	1.05	1.02	**1.05**	**1.06**	1.05	1.05	**1.06**	1.02	Load power factor correction and voltage support if needed

Substation	Contingency (All and Worst P6)	Category	Category Description	VoltagePU (Baseline Scenarios)					VoltagePU (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2021 SP Heavy Renewable & Min Gas Gen	2024 SpOP Hi Renew & Min Gas Gen	2029 Retirement of QF Generations	
OREGNTRL 115kV	Base Case	P0	Base Case	1.04	1.04	1.02	**1.05**	**1.06**	1.04	1.05	**1.06**	1.02	Load power factor correction and voltage support if needed
OWID 115kV	Base Case	P0	Base Case	1.04	1.05	1.04	**1.07**	**1.05**	1.05	1.05	1.03	1.04	Load power factor correction and voltage support if needed
PALERMO 115kV	Base Case	P0	Base Case	1.04	**1.05**	1.03	**1.08**	**1.06**	**1.05**	1.05	**1.07**	1.03	Load power factor correction and voltage support if needed
PANRAMA 115kV	Base Case	P0	Base Case	1.04	1.04	1.03	**1.06**	**1.05**	1.04	1.04	**1.06**	1.03	Load power factor correction and voltage support if needed
PARADSE 115kV	Base Case	P0	Base Case	1.03	1.03	1.02	**1.05**	**1.06**	1.03	1.03	**1.05**	1.02	Load power factor correction and voltage support if needed
POE 230kV	Base Case	P0	Base Case	1.03	1.03	1.02	**1.05**	1.04	1.03	1.03	1.05	1.02	Load power factor correction and voltage support if needed
RASN JNT 60kV	Base Case	P0	Base Case	**1.06**	1.05	1.04	1.00	1.01	1.04	1.03	1.01	1.04	Load power factor correction and voltage support if needed
ROCKCK 1 230kV	Base Case	P0	Base Case	1.03	1.03	1.02	1.05	1.04	1.03	1.03	1.05	1.02	Load power factor correction and voltage support if needed
ROCKCK 2 230kV	Base Case	P0	Base Case	1.03	1.04	1.03	**1.05**	1.05	1.04	1.03	**1.05**	1.03	Load power factor correction and voltage support if needed
SLYCREEK 115kV	Base Case	P0	Base Case	1.05	**1.05**	1.04	**1.07**	**1.06**	**1.05**	**1.05**	**1.06**	1.04	Load power factor correction and voltage support if needed
SMPSN-AN 115kV	Base Case	P0	Base Case	1.04	1.04	1.03	**1.06**	**1.05**	1.04	1.04	**1.06**	1.03	Load power factor correction and voltage support if needed
SOUTH 60kV	Base Case	P0	Base Case	1.04	1.04	1.03	**1.05**	**1.05**	1.04	1.04	**1.05**	1.03	Load power factor correction and voltage support if needed
SPI_AND 115kV	Base Case	P0	Base Case	1.04	1.04	1.02	**1.06**	**1.06**	1.04	1.04	**1.06**	1.02	Load power factor correction and voltage support if needed
SPIAND2 115kV	Base Case	P0	Base Case	1.04	1.04	1.02	**1.06**	**1.06**	1.04	1.04	**1.06**	1.02	Load power factor correction and voltage support if needed
SYCAMORE 115kV	Base Case	P0	Base Case	1.03	1.03	1.01	**1.06**	**1.06**	1.02	1.04	**1.06**	1.01	Load power factor correction and voltage support if needed
TBLE MTN 115kV	Base Case	P0	Base Case	1.04	1.04	1.04	**1.05**	**1.05**	1.04	1.04	1.05	1.04	Load power factor correction and voltage support if needed
TRINITY 60kV	Base Case	P0	Base Case	1.04	**1.05**	1.03	**1.06**	**1.06**	**1.05**	**1.06**	**1.06**	1.03	Load power factor correction and voltage support if needed
TRINITY 115kV	Base Case	P0	Base Case	1.04	**1.05**	1.03	**1.06**	**1.06**	**1.05**	**1.06**	**1.06**	1.03	Load power factor correction and voltage support if needed
TYLER 60kV	Base Case	P0	Base Case	**1.06**	1.05	1.04	1.00	1.01	1.04	1.03	1.01	1.04	Load power factor correction and voltage support if needed

Substation	Contingency (All and Worst P6)	Category	Category Description	VoltagePU (Baseline Scenarios)					VoltagePU (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2021 SP Heavy Renewable & Min Gas Gen	2024 SpOP Hi Renew & Min Gas Gen	2029 Retirement of QF Generations	
VOLTA 60kV	Base Case	P0	Base Case	1.04	1.05	1.03	1.06	1.06	1.05	1.04	1.06	1.03	Load power factor correction and voltage support if needed
WHEELBR 115kV	Base Case	P0	Base Case	1.04	1.04	1.03	1.06	1.05	1.04	1.04	1.06	1.03	Load power factor correction and voltage support if needed
WHITMORE 60kV	Base Case	P0	Base Case	1.06	1.06	1.03	1.10	1.10	1.06	1.08	1.11	1.03	Load power factor correction and voltage support if needed
WILDWOOD 115kV	Base Case	P0	Base Case	1.05	1.05	1.04	1.06	1.06	1.05	1.07	1.06	1.04	Load power factor correction and voltage support if needed
WNTU PMS 60kV	Base Case	P0	Base Case	1.04	1.05	1.02	1.05	1.06	1.05	1.04	1.06	1.02	Load power factor correction and voltage support if needed
WODLF TP 115kV	Base Case	P0	Base Case	1.04	1.05	1.04	1.07	1.06	1.05	1.05	1.06	1.04	Load power factor correction and voltage support if needed
WYANDTTE 115kV	Base Case	P0	Base Case	1.04	1.05	1.03	1.08	1.06	1.05	1.04	1.07	1.03	Load power factor correction and voltage support if needed
ANITA 60kV	P1-3:A3:32:_GLENN 230/60kV TB 2	P1	N-1	1.09	1.17	1.04	1.11	1.14	1.17	1.03	1.15	1.04	Load power factor correction and voltage support if needed
CAPAY 60kV	P1-3:A3:32:_GLENN 230/60kV TB 2	P1	N-1	1.07	1.15	1.08	1.11	1.14	1.15	1.06	1.14	1.08	Load power factor correction and voltage support if needed
CAPYSWCH 60kV	P1-3:A3:32:_GLENN 230/60kV TB 2	P1	N-1	1.07	1.15	1.09	1.11	1.14	1.15	1.06	1.14	1.09	Load power factor correction and voltage support if needed
CEDR CRK 60kV	P1-2:A3:27:_CASCADE-BENTON-DESCHUTES 60kV	P1	N-1	1.04	1.04	0.99	1.17	1.16	1.04	1.10	1.19	0.99	Load power factor correction and voltage support if needed
CORNING 60kV	P1-3:A3:32:_GLENN 230/60kV TB 2	P1	N-1	1.05	1.13	1.04	1.11	1.15	1.13	1.06	1.15	1.04	Load power factor correction and voltage support if needed
CORNSWCH 60kV	P1-3:A3:32:_GLENN 230/60kV TB 2	P1	N-1	1.07	1.15	1.09	1.11	1.14	1.15	1.06	1.14	1.09	Load power factor correction and voltage support if needed
DESCHUTS 60kV	P1-2:A3:27:_CASCADE-BENTON-DESCHUTES 60kV	P1	N-1	1.02	1.02	0.97	1.13	1.12	1.02	1.05	1.14	0.97	Load power factor correction and voltage support if needed
ELKCREEK 60kV	P1-3:A3:32:_GLENN 230/60kV TB 2	P1	N-1	1.03	1.11	1.03	1.10	1.13	1.11	1.03	1.13	1.03	Load power factor correction and voltage support if needed
FRNCHGLH 60kV	P1-2:A3:68:_KESWICK-CASCADE 60kV MOAS OPENED on CASCADE_STLLWATR	P1	N-1	1.03	1.04	0.97	1.07	1.08	1.04	1.04	1.08	0.97	Load power factor correction and voltage support if needed
GLENN 60kV	P1-3:A3:32:_GLENN 230/60kV TB 2	P1	N-1	1.07	1.15	1.10	1.11	1.14	1.15	1.06	1.14	1.10	Load power factor correction and voltage support if needed
HAMILTON 60kV	P1-3:A3:32:_GLENN 230/60kV TB 2	P1	N-1	1.05	1.13	1.07	1.11	1.15	1.13	1.05	1.15	1.07	Load power factor correction and voltage support if needed

Substation	Contingency (All and Worst P6)	Category	Category Description	VoltagePU (Baseline Scenarios)					VoltagePU (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2021 SP Heavy Renewable & Min Gas Gen	2024 SpOP Hi Renew & Min Gas Gen	2029 Retirement of QF Generations	
HEADGATE 60kV	P1-3:A3:32:_GLENN 230/60kV TB 2	P1	N-1	1.07	1.16	1.08	1.11	1.14	1.15	1.05	1.14	1.08	Load power factor correction and voltage support if needed
HONCUT 115kV	P1-2:A3:67:_IDLE LINE - NO DATA 230kV	P1	N-1	1.01	1.03	1.00	1.06	1.06	1.03	1.02	1.07	1.00	Load power factor correction and voltage support if needed
HONCUT 115kV	P1-2:A3:85:_PALERMO-BOGUE 115kV MOAS OPENED on PALERMO_HONC JT3	P1	N-1	1.02	1.02	1.00	1.12	1.07	1.02	1.01	1.08	1.00	Load power factor correction and voltage support if needed
HONCUT 115kV	P1-3:A3:68:_TABLE MT 500/230kV TB 1	P1	N-1	1.03	1.05	1.02	1.08	1.07	1.05	1.03	1.08	1.02	Load power factor correction and voltage support if needed
HONCUT 115kV	P1-4:A3:6:_TB MT 1T SVD=v	P1	N-1	1.04	1.05	1.03	1.08	1.06	1.05	1.04	1.07	1.03	Load power factor correction and voltage support if needed
JACINTO 60kV	P1-3:A3:32:_GLENN 230/60kV TB 2	P1	N-1	1.03	1.12	1.05	1.11	1.15	1.11	1.04	1.15	1.05	Load power factor correction and voltage support if needed
KESWICK 60kV	P1-2:A3:68:_KESWICK-CASCADE 60kV MOAS OPENED on CASCADE_STLLWATR	P1	N-1	1.01	1.03	0.94	1.07	1.09	1.03	1.03	1.09	0.94	Load power factor correction and voltage support if needed. - Continue to monitor future load forecast
KILARC 60kV	P1-2:A3:27:_CASCADE-BENTON-DESCHUTES 60kV	P1	N-1	1.05	1.05	0.99	1.17	1.16	1.04	1.10	1.18	0.99	Load power factor correction and voltage support if needed
ORLAND B 60kV	P1-3:A3:32:_GLENN 230/60kV TB 2	P1	N-1	1.06	1.14	1.08	1.11	1.14	1.14	1.05	1.14	1.08	Load power factor correction and voltage support if needed
OWID 115kV	P1-2:A3:67:_IDLE LINE - NO DATA 230kV	P1	N-1	1.02	1.04	1.02	1.05	1.06	1.04	1.03	1.06	1.02	Load power factor correction and voltage support if needed
OWID 115kV	P1-3:A3:68:_TABLE MT 500/230kV TB 1	P1	N-1	1.04	1.05	1.03	1.07	1.06	1.05	1.04	1.07	1.03	Load power factor correction and voltage support if needed
OWID 115kV	P1-4:A3:6:_TB MT 1T SVD=v	P1	N-1	1.04	1.05	1.03	1.07	1.06	1.05	1.05	1.06	1.03	Load power factor correction and voltage support if needed
PALERMO 115kV	P1-2:A3:67:_IDLE LINE - NO DATA 230kV	P1	N-1	1.01	1.03	1.00	1.06	1.06	1.03	1.03	1.07	1.00	Load power factor correction and voltage support if needed
PALERMO 115kV	P1-3:A3:68:_TABLE MT 500/230kV TB 1	P1	N-1	1.03	1.05	1.02	1.07	1.07	1.05	1.03	1.08	1.02	Load power factor correction and voltage support if needed
PALERMO 115kV	P1-4:A3:6:_TB MT 1T SVD=v	P1	N-1	1.04	1.05	1.03	1.08	1.06	1.05	1.05	1.07	1.03	Load power factor correction and voltage support if needed
RED BLFF 60kV	P1-2:A3:34:_COLEMAN-RED BLUFF 60kV MOAS OPENED on COTTONWD_RED B JT	P1	N-1	0.92	1.01	0.94	1.08	1.08	1.01	0.96	1.09	0.94	Project: Coleman - Red Bluff 60 kV Line Upgrade ISD: May 2021 Short term: Action Plan
SLYCREEK 115kV	P1-2:A3:67:_IDLE LINE - NO DATA 230kV	P1	N-1	1.03	1.04	1.03	1.05	1.06	1.04	1.04	1.06	1.03	Load power factor correction and voltage support if needed

Study Area: PG&E North Valley

High/Low Voltages

Substation	Contingency (All and Worst P6)	Category	Category Description	VoltagePU (Baseline Scenarios)					VoltagePU (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2021 SP Heavy Renewable & Min Gas Gen	2024 SpOP Hi Renew & Min Gas Gen	2029 Retirement of QF Generations	
SLYCREEK 115kV	P1-3:A3:68:_TABLE MT 500/230kV TB 1	P1	N-1	1.04	1.05	1.04	1.07	1.06	1.05	1.04	1.07	1.04	Load power factor correction and voltage support if needed
SLYCREEK 115kV	P1-4:A3:6:_TB MT 1T SVD=v	P1	N-1	1.05	1.05	1.04	1.07	1.06	1.05	1.05	1.06	1.04	Load power factor correction and voltage support if needed
SOUTH 60kV	P1-2:A3:35:_COLEMAN-SOUTH 60kV	P1	N-1	1.07	1.07	1.04	1.10	1.10	1.07	1.07	1.09	1.04	Load power factor correction and voltage support if needed
STLLWATR 60kV	P1-2:A3:68:_KESWICK-CASCADE 60kV MOAS OPENED on CASCADE_STLLWATR	P1	N-1	1.01	1.03	0.92	1.07	1.09	1.02	1.03	1.10	0.92	Load power factor correction and voltage support if needed. - Continue to monitor future load forecast
VOLTA 60kV	P1-2:A3:127:_VOLTA-SOUTH 60kV	P1	N-1	1.06	1.07	1.03	1.09	1.10	1.06	1.07	1.11	1.03	Load power factor correction and voltage support if needed
WHITMORE 60kV	P1-2:A3:27:_CASCADE-BENTON-DESCHUTES 60kV	P1	N-1	1.04	1.04	0.99	1.17	1.16	1.04	1.09	1.18	0.99	Load power factor correction and voltage support if needed
WILLOWS 60kV	P1-3:A3:32:_GLENN 230/60kV TB 2	P1	N-1	1.03	1.11	1.05	1.10	1.13	1.11	1.03	1.14	1.05	Load power factor correction and voltage support if needed
WYANDTTE 115kV	P1-2:A3:67:_IDLE LINE - NO DATA 230kV	P1	N-1	1.01	1.03	1.00	1.06	1.06	1.03	1.03	1.07	1.00	Load power factor correction and voltage support if needed
WYANDTTE 115kV	P1-3:A3:68:_TABLE MT 500/230kV TB 1	P1	N-1	1.03	1.05	1.01	1.07	1.07	1.05	1.03	1.08	1.01	Load power factor correction and voltage support if needed
WYANDTTE 115kV	P1-4:A3:6:_TB MT 1T SVD=v	P1	N-1	1.04	1.05	1.03	1.08	1.06	1.05	1.04	1.07	1.03	Load power factor correction and voltage support if needed
BIG BEND 115kV	P2-2:A3:7:_CARIBOU 115kV Section 1D	P2	Bus	NA	1.08	1.04	NA	1.06	1.08	NA	1.07	1.04	Load power factor correction and voltage support if needed
BIG BEND 115kV	P2-3:A3:19:_CARIBOU - 1D 115kV & BUTT VALLEY-CARIBOU line	P2	Non-Bus-Tie Breaker	NA	1.08	1.04	NA	1.06	1.08	NA	1.07	1.04	Load power factor correction and voltage support if needed
BIG BEND 115kV	P2-3:A3:98:_PALERMO - 1D 115kV & PALERMO-WYANDOTTE line	P2	Non-Bus-Tie Breaker	NA	NA	0.76	NA	1.05	NA	NA	1.06	0.76	Load power factor correction and voltage support if needed. - Continue to monitor future load forecast
CARIBOU 115kV	P2-2:A3:7:_CARIBOU 115kV Section 1D	P2	Bus	NA	1.08	1.05	NA	1.06	1.08	NA	1.07	1.05	Load power factor correction and voltage support if needed
CARIBOU 115kV	P2-3:A3:19:_CARIBOU - 1D 115kV & BUTT VALLEY-CARIBOU line	P2	Non-Bus-Tie Breaker	NA	1.08	1.05	NA	1.06	1.08	NA	1.07	1.05	Load power factor correction and voltage support if needed
COTWD_1D 115kV	P2-2:A3:24:_COTWD_1D 115kV Section 1D	P2	Bus	NA	1.08	1.06	NA	1.07	1.08	NA	1.08	1.06	Load power factor correction and voltage support if needed
COTWD_1D 115kV	P2-4:A3:5:_COTWD_1D Section 1D & COTWD_1E Section 1E 115kV	P2	Bus-Tie Breaker	NA	1.08	1.06	NA	1.07	1.08	NA	1.08	1.06	Load power factor correction and voltage support if needed
COTWD_2E 115kV	P2-2:A3:27:_COTWD_2E 115kV Section 2E	P2	Bus	NA	1.08	1.07	NA	1.05	1.08	NA	1.06	1.07	Load power factor correction and voltage support if needed

Substation	Contingency (All and Worst P6)	Category	Category Description	VoltagePU (Baseline Scenarios)					VoltagePU (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2021 SP Heavy Renewable & Min Gas Gen	2024 SpOP Hi Renew & Min Gas Gen	2029 Retirement of QF Generations	
COTWD_2E 115kV	P2-4:A3:6:_COTWD_1E Section 1E & COTWD_2E Section 2E 115kV	P2	Bus-Tie Breaker	NA	1.08	1.07	NA	1.05	1.08	NA	1.06	1.07	Load power factor correction and voltage support if needed
COTWD_2E 115kV	P2-4:A3:7:_COTWD_2D Section 2D & COTWD_2E Section 2E 115kV	P2	Bus-Tie Breaker	NA	1.08	1.07	NA	1.06	1.08	NA	1.07	1.07	Load power factor correction and voltage support if needed
FRSTGLEN 115kV	P2-1:A3:161:_WILDWOOD-COTWD_2E 115kV No Fault	P2	Line Section w/o Fault	NA	1.06	1.05	NA	1.04	1.06	NA	1.05	1.05	Load power factor correction and voltage support if needed
FRSTGLEN 115kV	P2-1:A3:3:_BRIDGEVILLE-COTTONWOOD 115kV (FRSTGLEN-LOW GAP1)	P2	Line Section w/o Fault	1.05	1.05	1.03	1.07	1.06	1.05	1.05	1.07	1.03	Load power factor correction and voltage support if needed
FRSTGLEN 115kV	P2-1:A3:5:_BRIDGEVILLE-COTTONWOOD 115kV (WILDWOOD-COTWDPGE)	P2	Line Section w/o Fault	1.06	NA	NA	1.03	NA	NA	1.14	NA	NA	Load power factor correction and voltage support if needed
FRSTGLEN 115kV	P2-1:A3:6:_BRIDGEVILLE-COTTONWOOD 115kV (WILDWOOD-FRSTGLEN)	P2	Line Section w/o Fault	1.06	1.06	1.05	1.02	1.03	1.06	1.13	1.04	1.05	Load power factor correction and voltage support if needed
FRSTGLEN 115kV	P2-2:A3:22:_COTWDPGE 115kV Section 2D	P2	Bus	1.06	NA	NA	1.03	NA	NA	1.14	NA	NA	Load power factor correction and voltage support if needed
FRSTGLEN 115kV	P2-2:A3:24:_COTWD_1D 115kV Section 1D	P2	Bus	NA	1.07	1.05	NA	1.07	1.07	NA	1.07	1.05	Load power factor correction and voltage support if needed
FRSTGLEN 115kV	P2-2:A3:25:_COTWD_1D 115kV Section 2D	P2	Bus	NA	1.07	1.05	NA	1.07	1.07	NA	1.07	1.05	Load power factor correction and voltage support if needed
FRSTGLEN 115kV	P2-2:A3:27:_COTWD_2E 115kV Section 2E	P2	Bus	NA	1.08	1.07	NA	1.04	1.07	NA	1.05	1.07	Load power factor correction and voltage support if needed
FRSTGLEN 115kV	P2-3:A3:53:_COTWDPGE - 2D 115kV & CASCADE-COTTONWOOD line	P2	Non-Bus-Tie Breaker	1.06	NA	NA	1.03	NA	NA	1.14	NA	NA	Load power factor correction and voltage support if needed
FRSTGLEN 115kV	P2-4:A3:4:_COTWD_1D 115kV - Section 2D & 1D	P2	Bus-Tie Breaker	NA	1.07	1.05	NA	1.07	1.07	NA	1.07	1.05	Load power factor correction and voltage support if needed
FRSTGLEN 115kV	P2-4:A3:5:_COTWD_1D Section 1D & COTWD_1E Section 1E 115kV	P2	Bus-Tie Breaker	NA	1.07	1.05	NA	1.07	1.07	NA	1.07	1.05	Load power factor correction and voltage support if needed
FRSTGLEN 115kV	P2-4:A3:6:_COTWD_1E Section 1E & COTWD_2E Section 2E 115kV	P2	Bus-Tie Breaker	NA	1.08	1.07	NA	1.04	1.07	NA	1.05	1.07	Load power factor correction and voltage support if needed
FRSTGLEN 115kV	P2-4:A3:7:_COTWD_2D Section 2D & COTWD_2E Section 2E 115kV	P2	Bus-Tie Breaker	NA	1.07	1.07	NA	1.05	1.07	NA	1.06	1.07	Load power factor correction and voltage support if needed
GRIZZLY1 115kV	P2-2:A3:7:_CARIBOU 115kV Section 1D	P2	Bus	NA	1.08	1.05	NA	1.06	1.08	NA	1.07	1.05	Load power factor correction and voltage support if needed
GRIZZLY1 115kV	P2-3:A3:19:_CARIBOU - 1D 115kV & BUTT VALLEY-CARIBOU line	P2	Non-Bus-Tie Breaker	NA	1.08	1.05	NA	1.06	1.08	NA	1.07	1.05	Load power factor correction and voltage support if needed

Substation	Contingency (All and Worst P6)	Category	Category Description	VoltagePU (Baseline Scenarios)					VoltagePU (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2021 SP Heavy Renewable & Min Gas Gen	2024 SpOP Hi Renew & Min Gas Gen	2029 Retirement of QF Generations	
GRIZZLY1 115kV	P2-3:A3:98:_PALERMO - 1D 115kV & PALERMO-WYANDOTTE line	P2	Non-Bus-Tie Breaker	NA	NA	**0.89**	NA	1.05	NA	NA	1.05	**0.89**	Continue to monitor future load forecast
HONCUT 115kV	P2-1:A3:121:_PALERMO-BOGUE 115kV (PALERMO-HONC JT3)	P2	Line Section w/o Fault	1.02	1.02	1.00	**1.12**	**1.07**	1.02	1.01	**1.08**	1.00	Load power factor correction and voltage support if needed
HONCUT 115kV	P2-2:A3:45:_PALERMO 115kV Section 1D	P2	Bus	1.02	1.02	1.00	**1.12**	**1.07**	1.02	1.01	**1.07**	1.00	Load power factor correction and voltage support if needed
HONCUT 115kV	P2-2:A3:80:_TBL MTX1 230kV Section NA	P2	Bus	1.03	1.05	1.02	**1.08**	**1.07**	1.05	1.03	**1.08**	1.02	Load power factor correction and voltage support if needed
HONCUT 115kV	P2-3:A3:84:_PALERMO - 1D 115kV & PALERMO-BOGUE line	P2	Non-Bus-Tie Breaker	1.02	1.02	1.00	**1.12**	**1.07**	1.02	1.01	**1.07**	1.00	Load power factor correction and voltage support if needed
HONCUT 115kV	P2-3:A3:85:_PALERMO - 1D 115kV & PALERMO-NICOLAUS line	P2	Non-Bus-Tie Breaker	1.02	1.02	1.00	**1.12**	**1.07**	1.02	1.01	**1.07**	1.00	Load power factor correction and voltage support if needed
HONCUT 115kV	P2-3:A3:86:_PALERMO - 1D 115kV & PALERMO-PEASE line COPY-11	P2	Non-Bus-Tie Breaker	1.02	NA	NA	**1.12**	NA	NA	1.01	NA	NA	Load power factor correction and voltage support if needed
HONCUT 115kV	P2-3:A3:87:_PALERMO - 1D 115kV & PALERMO-PEASE line COPY-12	P2	Non-Bus-Tie Breaker	1.02	NA	NA	**1.12**	NA	NA	1.01	NA	NA	Load power factor correction and voltage support if needed
HONCUT 115kV	P2-3:A3:98:_PALERMO - 1D 115kV & PALERMO-WYANDOTTE line	P2	Non-Bus-Tie Breaker	1.02	1.03	1.00	**1.12**	**1.07**	1.03	1.01	**1.07**	1.00	Load power factor correction and voltage support if needed
HONCUT 115kV	P2-3:A3:99:_PALERMO - 1D 115kV & WOODLEAF-PALERMO line	P2	Non-Bus-Tie Breaker	1.02	1.02	1.00	**1.12**	**1.07**	1.02	1.01	**1.07**	1.00	Load power factor correction and voltage support if needed
OWID 115kV	P2-2:A3:80:_TBL MTX1 230kV Section NA	P2	Bus	1.04	1.05	1.03	**1.07**	**1.06**	1.05	1.04	**1.07**	1.03	Load power factor correction and voltage support if needed
PALERMO 115kV	P2-2:A3:80:_TBL MTX1 230kV Section NA	P2	Bus	1.03	**1.05**	1.02	**1.07**	**1.07**	**1.05**	1.03	**1.08**	1.02	Load power factor correction and voltage support if needed
PALERMO 115kV	P2-3:A3:98:_PALERMO - 1D 115kV & PALERMO-WYANDOTTE line	P2	Non-Bus-Tie Breaker	NA	NA	**0.52**	NA	**1.08**	NA	NA	**1.08**	**0.52**	Continue to monitor future load forecast
SLYCREEK 115kV	P2-2:A3:80:_TBL MTX1 230kV Section NA	P2	Bus	1.04	**1.05**	1.04	**1.07**	**1.06**	**1.05**	1.04	**1.07**	1.04	Load power factor correction and voltage support if needed
TRINITY 115kV	P2-1:A3:155:_TRINITY-COTTONWOOD 115kV (TRINITY-JESSTAP)	P2	Line Section w/o Fault	1.05	**1.05**	1.03	1.04	1.04	**1.05**	**1.09**	1.04	1.03	Load power factor correction and voltage support if needed
TRINITY 115kV	P2-1:A3:4:_BRIDGEVILLE-COTTONWOOD 115kV (JESSTAP-COTWD_1D)	P2	Line Section w/o Fault	NA	**1.06**	1.04	NA	**1.05**	**1.06**	NA	**1.06**	1.04	Load power factor correction and voltage support if needed
TRINITY 115kV	P2-2:A3:21:_COTWDPGE 115kV Section 1D	P2	Bus	**1.06**	NA	NA	**1.05**	NA	NA	**1.11**	NA	NA	Load power factor correction and voltage support if needed
TRINITY 115kV	P2-2:A3:24:_COTWD_1D 115kV Section 1D	P2	Bus	NA	**1.08**	**1.05**	NA	**1.07**	**1.07**	NA	**1.07**	**1.05**	Load power factor correction and voltage support if needed

Substation	Contingency (All and Worst P6)	Category	Category Description	VoltagePU (Baseline Scenarios)					VoltagePU (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2021 SP Heavy Renewable & Min Gas Gen	2024 SpOP Hi Renew & Min Gas Gen	2029 Retirement of QF Generations	
TRINITY 115kV	P2-2:A3:25:_COTWD_1D 115kV Section 2D	P2	Bus	NA	1.07	1.05	NA	1.06	1.07	NA	1.07	1.05	Load power factor correction and voltage support if needed
TRINITY 115kV	P2-3:A3:50:_COTWDPGE - 1D 115kV & COTTONWOOD-PANORAMA line	P2	Non-Bus-Tie Breaker	1.06	NA	NA	1.05	NA	NA	1.11	NA	NA	Load power factor correction and voltage support if needed
TRINITY 115kV	P2-3:A3:54:_COTWD_1D - 2D 115kV & COTWD_1D-TRINITY line	P2	Non-Bus-Tie Breaker	NA	1.06	1.04	NA	1.05	1.06	NA	1.05	1.04	Load power factor correction and voltage support if needed
TRINITY 115kV	P2-4:A3:12:_COTWD_F2 Section 2F & COTWD_E2 Section 2E 230kV	P2	Bus-Tie Breaker	1.04	1.04	1.01	1.05	1.05	1.04	1.07	1.06	1.01	Load power factor correction and voltage support if needed
TRINITY 115kV	P2-4:A3:4:_COTWD_1D 115kV - Section 2D & 1D	P2	Bus-Tie Breaker	NA	1.07	1.05	NA	1.06	1.07	NA	1.07	1.05	Load power factor correction and voltage support if needed
TRINITY 115kV	P2-4:A3:5:_COTWD_1D Section 1D & COTWD_1E Section 1E 115kV	P2	Bus-Tie Breaker	NA	1.08	1.05	NA	1.07	1.07	NA	1.07	1.05	Load power factor correction and voltage support if needed
WILDWOOD 115kV	P2-1:A3:161:_WILDWOOD-COTWD_2E 115kV No Fault	P2	Line Section w/o Fault	NA	1.07	1.05	NA	1.04	1.06	NA	1.05	1.05	Load power factor correction and voltage support if needed
WILDWOOD 115kV	P2-1:A3:5:_BRIDGEVILLE-COTTONWOOD 115kV (WILDWOOD-COTWDPGE)	P2	Line Section w/o Fault	1.06	NA	NA	1.03	NA	NA	1.15	NA	NA	Load power factor correction and voltage support if needed
WILDWOOD 115kV	P2-2:A3:22:_COTWDPGE 115kV Section 2D	P2	Bus	1.06	NA	NA	1.04	NA	NA	1.14	NA	NA	Load power factor correction and voltage support if needed
WILDWOOD 115kV	P2-2:A3:27:_COTWD_2E 115kV Section 2E	P2	Bus	NA	1.08	1.07	NA	1.05	1.08	NA	1.06	1.07	Load power factor correction and voltage support if needed
WILDWOOD 115kV	P2-3:A3:53:_COTWDPGE - 2D 115kV & CASCADE-COTTONWOOD line	P2	Non-Bus-Tie Breaker	1.06	NA	NA	1.03	NA	NA	1.14	NA	NA	Load power factor correction and voltage support if needed
WILDWOOD 115kV	P2-4:A3:12:_COTWD_F2 Section 2F & COTWD_E2 Section 2E 230kV	P2	Bus-Tie Breaker	1.05	1.04	1.02	1.05	1.05	1.04	1.08	1.06	1.02	Load power factor correction and voltage support if needed
WILDWOOD 115kV	P2-4:A3:6:_COTWD_1E Section 1E & COTWD_2E Section 2E 115kV	P2	Bus-Tie Breaker	NA	1.08	1.07	NA	1.05	1.08	NA	1.06	1.07	Load power factor correction and voltage support if needed
WILDWOOD 115kV	P2-4:A3:7:_COTWD_2D Section 2D & COTWD_2E Section 2E 115kV	P2	Bus-Tie Breaker	NA	1.08	1.07	NA	1.06	1.08	NA	1.07	1.07	Load power factor correction and voltage support if needed
WYANDTTE 115kV	P2-2:A3:80:_TBL MTX1 230kV Section NA	P2	Bus	1.03	1.05	1.01	1.07	1.07	1.05	1.03	1.08	1.01	Load power factor correction and voltage support if needed
WYANDTTE 115kV	P2-3:A3:98:_PALERMO - 1D 115kV & PALERMO-WYANDOTTE line	P2	Non-Bus-Tie Breaker	NA	NA	0.52	NA	1.08	NA	NA	1.08	0.52	Continue to monitor future load forecast
APT ORVC 60kV	P1-1:A3:35:_KELLYRDG 4.16kV Gen Unit 1 & P1-3:A3:49:_PALERMO 230/230kV TB 1	P3	G-1/N-1	>0.9,<1.1	>0.9,<1.1	0.88	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	0.88	Continue to monitor future load forecast

Substation	Contingency (All and Worst P6)	Category	Category Description	VoltagePU (Baseline Scenarios)					VoltagePU (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2021 SP Heavy Renewable & Min Gas Gen	2024 SpOP Hi Renew & Min Gas Gen	2029 Retirement of QF Generations	
CEDR CRK 60kV	P1-1:A3:32:_INSKIP 4.16kV Gen Unit 1 & P1-2:A3:27:_CASCADE-BENTON-DESCHUTES 60kV	P3	G-1/N-1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	1.18	1.17	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	Load power factor correction and voltage support if needed
CLOV TAP 60kV	P1-1:A3:10:_COLEMAN 6.60kV Gen Unit 1 & P1-2:A3:27:_CASCADE-BENTON-DESCHUTES 60kV	P3	G-1/N-1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	1.18	1.17	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	Load power factor correction and voltage support if needed
DESCHUTS 60kV	P1-1:A3:62:_SOUTH G 4.16kV Gen Unit 1 & P1-2:A3:27:_CASCADE-BENTON-DESCHUTES 60kV	P3	G-1/N-1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	1.13	1.13	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	Load power factor correction and voltage support if needed
KILARC 60kV	P1-1:A3:10:_COLEMAN 6.60kV Gen Unit 1 & P1-2:A3:27:_CASCADE-BENTON-DESCHUTES 60kV	P3	G-1/N-1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	1.17	1.16	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	Load power factor correction and voltage support if needed
KLLY RDE 60kV	P1-1:A3:35:_KELLYRDG 4.16kV Gen Unit 1 & P1-3:A3:49:_PALERMO 230/230kV TB 1	P3	G-1/N-1	>0.9,<1.1	>0.9,<1.1	0.88	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	0.88	Continue to monitor future load forecast
LSNA PCC 60kV	P1-1:A3:35:_KELLYRDG 4.16kV Gen Unit 1 & P1-3:A3:49:_PALERMO 230/230kV TB 1	P3	G-1/N-1	>0.9,<1.1	>0.9,<1.1	0.88	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	0.88	Continue to monitor future load forecast
OROVILLE 60kV	P1-1:A3:35:_KELLYRDG 4.16kV Gen Unit 1 & P1-3:A3:49:_PALERMO 230/230kV TB 1	P3	G-1/N-1	>0.9,<1.1	>0.9,<1.1	0.88	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	0.87	Continue to monitor future load forecast
OROVLENRG 60kV	P1-1:A3:35:_KELLYRDG 4.16kV Gen Unit 1 & P1-3:A3:49:_PALERMO 230/230kV TB 1	P3	G-1/N-1	>0.9,<1.1	>0.9,<1.1	0.88	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	0.88	Continue to monitor future load forecast
PALERMO 60kV	P1-1:A3:35:_KELLYRDG 4.16kV Gen Unit 1 & P1-3:A3:49:_PALERMO 230/230kV TB 1	P3	G-1/N-1	>0.9,<1.1	>0.9,<1.1	0.89	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	0.89	Continue to monitor future load forecast
SOUTH 60kV	P1-1:A3:62:_SOUTH G 4.16kV Gen Unit 1 & P1-2:A3:35:_COLEMAN-SOUTH 60kV	P3	G-1/N-1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	1.10	>0.9,<1.1	Sensitivity only
VOLTA 60kV	P1-1:A3:62:_SOUTH G 4.16kV Gen Unit 1 & P1-2:A3:35:_COLEMAN-SOUTH 60kV	P3	G-1/N-1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	1.10	>0.9,<1.1	>0.9,<1.1	1.10	>0.9,<1.1	Continue to monitor future load forecast
WHITMORE 60kV	P1-1:A3:62:_SOUTH G 4.16kV Gen Unit 1 & P1-2:A3:27:_CASCADE-BENTON-DESCHUTES 60kV	P3	G-1/N-1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	1.17	1.16	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	Continue to monitor future load forecast

Substation	Contingency (All and Worst P6)	Category	Category Description	VoltagePU (Baseline Scenarios)					VoltagePU (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2021 SP Heavy Renewable & Min Gas Gen	2024 SpOP Hi Renew & Min Gas Gen	2029 Retirement of QF Generations	
CASCADE 115kV	P1-2:A3:28:_CASCADE-COTTONWOOD 115kV &P1-3:A3:12:_CASCADE 115/60kV TB 1	P6	N-1/N-1	**1.15**	>0.9,<1.1	>0.9,<1.1	**1.12**	>0.9,<1.1	>0.9,<1.1	**1.11**	>0.9,<1.1	>0.9,<1.1	Continue to monitor future load forecast
HONCUT 115kV	P1-2:A3:28:_CASCADE-COTTONWOOD 115kV &P1-2:A3:85:_PALERMO-BOGUE 115kV MOAS OPENED on PALERMO_HONC JT3	P6	N-1/N-1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	**1.13**	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	Continue to monitor future load forecast
OWID 115kV	P1-2:A3:28:_CASCADE-COTTONWOOD 115kV &P1-3:A3:68:_TABLE MT 500/230kV TB 1	P6	N-1/N-1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	**1.11**	>0.9,<1.1	Sensitivity only
PALERMO 115kV	P1-2:A3:28:_CASCADE-COTTONWOOD 115kV &P1-2:A3:67:_IDLE LINE - NO DATA 230kV	P6	N-1/N-1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	**1.10**	>0.9,<1.1	Sensitivity only
SLYCREEK 115kV	P1-2:A3:28:_CASCADE-COTTONWOOD 115kV &P1-3:A3:68:_TABLE MT 500/230kV TB 1	P6	N-1/N-1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	**1.11**	>0.9,<1.1	Sensitivity only
TRINITY 115kV	P1-2:A3:123:_TRINITY-COTTONWOOD 115kV &P1-3:A3:74:_TRINITY 115/60kV TB 1	P6	N-1/N-1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	**1.17**	>0.9,<1.1	>0.9,<1.1	Sensitivity only
WYANDTTE 115kV	P1-2:A3:28:_CASCADE-COTTONWOOD 115kV &P1-3:A3:68:_TABLE MT 500/230kV TB 1	P6	N-1/N-1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	**1.11**	>0.9,<1.1	Sensitivity only

Study Area: PG&E North Valley

Voltage Deviation

Substation	Contingency (All and Worst P6)	Category	Category Description	Post Cont. Voltage Deviation PU (Baseline Scenarios)					Post Cont. Voltage Deviation PU (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2021 SP Heavy Renewable & Min Gas Gen	2024 SpOP Hi Renew & Min Gas Gen	2029 Retirement of QF Generations	
RED BLFF 60kV	P1-2:A3:34:_COLEMAN-RED BLUFF 60kV	P1	N-1	**10**	3	7	-3	-2	3	6	-2	7	Project: Coleman - Red Bluff 60 kV Line Upgrade ISD: May 2021 Short term: Action Plan
STLLWATR 60kV	P1-2:A3:68:_KESWICK-CASCADE 60kV M	P1	N-1	3	2	9	-2	-3	2	2	-4	9	Continue to monitor future load forecast

Study Area: PG&E North Valley

Transient Stability

Contingency	Category	Category Description	Transient Stability Performance					Potential Mitigation Solutions
			Baseline Scenarios			Sensitivity Scenarios		
			2024 Summer Peak	2029 Summer Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	
Colusa gas turbine fault plus relay failure	P5-1	Non-Redundant Relary	No Issues	No Issues	No Issues	No Issues	No Issues	No mitigation required
Colusa Generator fault (steam unit)	P1-1	N-1	No Issues	No Issues	No Issues	No Issues	No Issues	No mitigation required
Colusa generator out and Delevan SVD fault	P3-4	G-1/N-2	No Issues	No Issues	No Issues	No Issues	No Issues	No mitigation required
Colusa generator out and Round Mountain 500/230 kV Transformer	P3-3	G-1/N-1	No Issues	No Issues	No Issues	No Issues	No Issues	No mitigation required
Colusa steam and gas units fault + stuck breaker	P4-1	Stuck Breaker	No Issues	No Issues	No Issues	No Issues	No Issues	No mitigation required
Colusa steam unit out and gas unit fault	P3-1	G-1/G-1	No Issues	No Issues	No Issues	No Issues	No Issues	No mitigation required
Colusa steam unit out and Table Mountain to Thermalito 230 kV line fault	P3-2	G-1/N-1	No Issues	No Issues	No Issues	No Issues	No Issues	No mitigation required
Delevan and Cottonwood SVD faults	P6-3	N-1-1	No Issues	No Issues	No Issues	No Issues	No Issues	No mitigation required
Delevan SVD fault	P1-4	N-1	No Issues	No Issues	No Issues	No Issues	No Issues	No mitigation required
Delevan SVD fault plus relay failure	P5-4	Non-Redundant Relary	No Issues	No Issues	No Issues	No Issues	No Issues	No mitigation required
Delevan SVD fault plus stuck breaker	P4-4	Stuck Breaker	No Issues	No Issues	No Issues	No Issues	No Issues	No mitigation required
Palermo-Pease and Palermo-Rio Oso 115 kV lines - Permanent DCTL fault	P7-1	DCTL	No Issues	No Issues	No Issues	No Issues	No Issues	No mitigation required
Palermo-Pease and Palermo-Rio Oso 115 kV lines - Temporary DCTL fault	P7-1	DCTL	No Issues	No Issues	No Issues	No Issues	No Issues	No mitigation required
Round Mountain 230 kV Bus Section fault	P2-2	Bus	No Issues	No Issues	No Issues	No Issues	No Issues	No mitigation required
Round Mountain 230 kV Bus section fault plus relay failure	P5-5	Non-Redundant Relary	No Issues	No Issues	No Issues	No Issues	No Issues	No mitigation required
Round Mountain 230 kV bus-tie breaker fault	P2-4	Bus-Tie Breaker	No Issues	No Issues	No Issues	No Issues	No Issues	No mitigation required
Round Mountain 230 kV non-bus-tie breaker fault	P2-3	Non-Bus-Tie Breaker	No Issues	No Issues	No Issues	No Issues	No Issues	No mitigation required
Round Mountain 500/230 kV Transformer fault	P1-3	N-1	No Issues	No Issues	No Issues	No Issues	No Issues	No mitigation required
Round Mountain 500/230 kV Transformer fault plus relay failure	P5-3	Non-Redundant Relary	No Issues	No Issues	No Issues	No Issues	No Issues	No mitigation required
Round Mountain and Table Mountain transformer faults	P6-2	N-1-1	No Issues	No Issues	No Issues	No Issues	No Issues	No mitigation required
Round Mountain bus section fault plus stuck breaker (bus-tie breaker)	P4-6	Stuck Breaker	No Issues	No Issues	No Issues	No Issues	No Issues	No mitigation required

Study Area: PG&E North Valley

Transient Stability

Contingency	Category	Category Description	Transient Stability Performance					Potential Mitigation Solutions
			Baseline Scenarios			Sensitivity Scenarios		
			2024 Summer Peak	2029 Summer Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	
Round Mountain bus section fault plus stuck breaker (non-bus-tie breaker)	P4-5	Stuck Breaker	No Issues	No Issues	No Issues	No Issues	No Issues	No mitigation required
Round Mountain transformer and Round Mountain - Cottonwood 230 kV lines + stuck breaker	P4-3	Stuck Breaker	No Issues	No Issues	No Issues	No Issues	No Issues	No mitigation required
Round Mountain Transformer and Round Mountain - Thermalito and Hyatt 230 kV lines	P6-1	N-1-1	No Issues	No Issues	No Issues	No Issues	No Issues	No mitigation required
Table Mountain - Rio Oso 230 kV line fault plus relay failure	P5-2	Non-Redundant Relary	No Issues	No Issues	No Issues	No Issues	No Issues	No mitigation required
Table Mountain -Rio Oso and Table Mountain-Palermo 230 kV line fault + stuck breaker	P4-2	Stuck Breaker	No Issues	No Issues	No Issues	No Issues	No Issues	No mitigation required
Table Mountain to Thermalito 230 kV line fault	P1-2	N-1	No Issues	No Issues	No Issues	No Issues	No Issues	No mitigation required
Tesla 230 kV Bus section fault plus relay failure	P5-5	Non-Redundant Relary	No Issues	No Issues	No Issues	No Issues	No Issues	No mitigation required

Study Area: PG&E North Valley

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	2024 SP High CEC Forecast	2021 SP Heavy Renewable & Min Gas Gen	2024 SpOP Hi Renew & Min Gas Gen	2029 Retirement of QF Generations	

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

2019-2020 ISO Reliability Assessment - Study Results

Study Area: PG&E North Valley

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	2024 SP High CEC Forecast	2021 SP Heavy Renewable & Min Gas Gen	2024 SpOP Hi Renew & Min Gas Gen	2029 Retirement of QF Generations	

No single source substation with more than 100 MW Load

2019-2020 ISO Reliability Assessment - Study Results
Study Area: PG&E Central Valley
Thermal Overloads

California ISO

Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Loading % (Baseline Scenarios)					Loading % (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2021 SP Heavy Renewable & Min Gas Gen	2024 SpOP Hi Renew & Min Gas Gen	2029 Retirement of QF Generations	
30330 RIO OSO 230 30482 LOCKFORD 230 1	P1-2:A11:4:_LOCKEFORD-BELLOTA 230KV & P1-2:A11:84:_HAMMER-COUNTRY CLUB 60KV MOAS OPENED ON MORADAJT_MSHR 60V	P6	N-1/N-1	134	107	<100	<100	<100	139	77	<100	<100	Project: Lockeford-Lodi Area 230 kV Development Project In-Service Date: Jul 2025 Short term: Action plan
30330 RIO OSO 230 30335 ATLANTC 230 1	P2-2:A5:4:_GOLDHILL 230KV SECTION 2D	P2	Bus	103	91	90	29	35	93	70	32	90	Project: Gold Hill 230/115 kV Transformer Addition Project In-Service Date: Dec 2024 Short term: Action plan
	P2-3:A5:5:_GOLDHILL - 2D 230KV & MIDDLE FORK-GOLD HILL LINE	P2	Non-Bus-Tie Breaker	103	91	90	29	35	93	70	32	90	Project: Gold Hill 230/115 kV Transformer Addition Project In-Service Date: Dec 2024 Short term: Action plan
30330 RIO OSO 230 30348 BRIGHTON 230 1	P2-4:A5:5:_RIO OSO 115KV - SECTION 2D & 1D	P2	Bus-Tie Breaker	105	110	98	22	22	109	71	18	99	SPS Recommended in 2017-2018 TPP
30350 LOCKJ2 230 30500 BELLOTA 230 1	P1-2:A4:5:_RIO OSO-BRIGHTON 230KV & P1-2:A11:4:_LOCKEFORD-BELLOTA 230KV	P6	N-1/N-1	<100	<100	100	<100	<100	<100	<100	<100	99	Continue to monitor future load forecast
30460 VACA-DIX 230 30478 LAMBIE 230 1	P2-3:A4:3:_BDLSWSTA 230KV - MIDDLE BREAKER BAY 2	P2	Non-Bus-Tie Breaker	110	109	112	78	4	109	116	92	86	System upgrade, operating procedure, or SPS
30478 LAMBIE 230 30479 BDLSWSTA 230 1	P2-3:A4:3:_BDLSWSTA 230KV - MIDDLE BREAKER BAY 2	P2	Non-Bus-Tie Breaker	91	91	92	78	3	91	116	93	67	Sensitivity only
30482 LOCKFORD 230 30500 BELLOTA 230 1	P1-2:A4:5:_RIO OSO-BRIGHTON 230KV & P1-2:A11:4:_LOCKEFORD-BELLOTA 230KV	P6	N-1/N-1	102	99	<100	<100	<100	100	88	<100	<100	Project: Lockeford-Lodi Area 230 kV Development Project In-Service Date: Jul 2025 Short term: Action plan
30482 LOCKFORD 230 30500 BELLOTA 230 1	P2-4:A11:23:_STAGG-D SECTION 1D & STAGG-E SECTION 1E 230KV	P2	Bus-Tie Breaker	102	98	48	34	34	100	87	30	47	Project: Lockeford-Lodi Area 230 kV Development Project In-Service Date: Jul 2025 Short term: Action plan
30500 BELLOTA 230 30515 WARNERVL 230 1	P1-2:A11:16:_BELLOTA-COTTLE 230KV	P1	N-1	40	13	10	80	36	17	102	34	10	Sensitivity only
	P1-2:A12:2:_COTTLE-MELONES 230KV	P1	N-1	48	17	13	81	36	20	107	34	13	Sensitivity only
	P2-3:A12:20:_COTTLE 230KV - RING R4 & R5	P2	Non-Bus-Tie Breaker	41	14	10	81	36	17	103	34	10	Sensitivity only
	P2-3:A12:21:_COTTLE 230KV - RING R4 & R3	P2	Non-Bus-Tie Breaker	42	14	11	80	36	18	103	34	11	Sensitivity only
	P2-3:A12:22:_COTTLE 230KV - RING R2 & R1	P2	Non-Bus-Tie Breaker	47	16	13	81	36	20	107	34	13	Sensitivity only
	P2-3:A12:23:_COTTLE 230KV - RING R2 & R3	P2	Non-Bus-Tie Breaker	47	17	13	81	36	20	106	34	13	Sensitivity only
31960 MOBILCHE 115 31966 WODLNDJ1 115 1	P1-2:A4:30:_RIO OSO-WOODLAND #2 115KV & P1-2:A4:5:_RIO OSO-BRIGHTON 230KV	P6	N-1/N-1	83	99	101	<100	<100	97	<100	<100	102	Continue to monitor future load forecast
31960 MOBILCHE 115 31970 WOODLD 115 1	P1-2:A4:30:_RIO OSO-WOODLAND #2 115KV & P1-2:A4:5:_RIO OSO-BRIGHTON 230KV	P6	N-1/N-1	82	99	101	<100	<100	97	<100	<100	102	Continue to monitor future load forecast

2019-2020 ISO Reliability Assessment - Study Results
Study Area: PG&E Central Valley
Thermal Overloads

California ISO

Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Loading % (Baseline Scenarios)					Loading % (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2021 SP Heavy Renewable & Min Gas Gen	2024 SpOP Hi Renew & Min Gas Gen	2029 Retirement of QF Generations	
31962 WOODLANDTP 115 31970 WOODLD 115 1	P1-2:A4:44:_RIO OSO-WEST SACRAMENTO 115KV & P1-2:A4:5:_RIO OSO-BRIGHTON 230KV	P6	N-1/N-1	110	<100	<100	<100	<100	<100	<100	<100	<100	Project: Vaca Dixon Area Reinforcement Project In-Service Date: Feb 2022 Short term: Action plan
31962 WOODLANDTP 115 365930 Q653FJCT 115 1	P1-2:A4:44:_RIO OSO-WEST SACRAMENTO 115KV & P1-2:A4:5:_RIO OSO-BRIGHTON 230KV	P6	N-1/N-1	126	<100	<100	<100	<100	<100	81	<100	<100	Project: Vaca Dixon Area Reinforcement Project In-Service Date: Feb 2022 Short term: Action plan
31962 WOODLANDTP 115 31970 WOODLD 115 1	P2-4:A5:5:_RIO OSO 115KV - SECTION 2D & 1D	P2	Bus-Tie Breaker	112	81	34	14	9	83	77	7	35	Project: Vaca Dixon Area Reinforcement Project In-Service Date: Feb 2022 Short term: Action plan
31962 WOODLANDTP 115 365930 Q653FJCT 115 1	P2-2:A4:20:_BRIGHTN 115KV SECTION ME	P2	Bus	104	71	77	20	12	73	85	6	77	Project: Vaca Dixon Area Reinforcement Project In-Service Date: Feb 2022 Short term: Action plan
	P2-3:A4:18:_BRIGHTN - ME 115KV & WEST SACRAMENTO-BRIGHTON LINE	P2	Non-Bus-Tie Breaker	104	72	78	20	12	73	86	6	78	Project: Vaca Dixon Area Reinforcement Project In-Service Date: Feb 2022 Short term: Action plan
	P2-3:A4:19:_BRIGHTN - ME 115KV & BRIGHTN-UCD_TP2-BRKR SLG LINE	P2	Non-Bus-Tie Breaker	103	71	77	19	11	72	84	6	77	Project: Vaca Dixon Area Reinforcement Project In-Service Date: Feb 2022 Short term: Action plan
	P2-4:A4:10:_BRIGHTN 115KV - SECTION ME & MD	P2	Bus-Tie Breaker	104	71	77	20	12	73	85	6	77	Project: Vaca Dixon Area Reinforcement Project In-Service Date: Feb 2022 Short term: Action plan
31964 KNIGHT2 115 31968 WODLNDJ2 115 2	P1-2:A4:41:_UC DAVIS #1 TAP 115KV MOAS OPENED ON BRKRJCT_UCD_TP2 & P1-2:A4:28:_WOODLD-KNIGHTLD-RIO OSO 115KV	P6	N-1/N-1	89	96	107	<100	<100	99	<100	<100	106	Continue to monitor future load forecast
31965 KNIGHT1 115 31966 WODLNDJ1 115 1	P1-2:A4:30:_RIO OSO-WOODLAND #2 115KV & P1-2:A4:5:_RIO OSO-BRIGHTON 230KV	P6	N-1/N-1	83	99	101	<100	<100	97	<100	<100	102	Continue to monitor future load forecast
31978 DPWT_TP2 115 31984 BRIGHTN 115 1	P1-2:A4:29:_WOODLAND-DAVIS 115KV & P1-2:A4:33:_BRIGHTN-UCD_TP2-BRKR SLG 115KV MOAS OPENED ON BRKRJCT_UCD_TP2	P6	N-1/N-1	118	116	127	<100	<100	119	82	<100	127	Project: Vaca Dixon Area Reinforcement Project In-Service Date: Feb 2022 Short term: Action plan
31978 DPWT_TP2 115 31984 BRIGHTN 115 1	P2-2:A5:10:_RIO OSO 115KV SECTION 2D	P2	Bus	100	99	106	8	4	102	67	2	106	Project: Vaca Dixon Area Reinforcement Project In-Service Date: Feb 2022 Short term: Action plan
	P2-3:A5:15:_RIO OSO - 2D 115KV & BOGUE-RIO OSO LINE	P2	Non-Bus-Tie Breaker	100	99	106	8	4	102	67	2	106	Project: Vaca Dixon Area Reinforcement Project In-Service Date: Feb 2022 Short term: Action plan
	P2-3:A5:16:_RIO OSO - 2D 115KV & RIO OSO-WOODLAND #2 LINE	P2	Non-Bus-Tie Breaker	97	96	103	7	4	99	65	3	103	Project: Vaca Dixon Area Reinforcement Project In-Service Date: Feb 2022 Short term: Action plan

2019-2020 ISO Reliability Assessment - Study Results
Study Area: PG&E Central Valley
Thermal Overloads

California ISO

Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Loading % (Baseline Scenarios)					Loading % (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2021 SP Heavy Renewable & Min Gas Gen	2024 SpOP Hi Renew & Min Gas Gen	2029 Retirement of QF Generations	
	P2-3:A5:17:_RIO OSO - 2D 115KV & RIO OSO-DRUM-BRUNSWCK LINE	P2	Non-Bus-Tie Breaker	101	99	106	8	5	102	68	2	106	Project: Vaca Dixon Area Reinforcement Project In-Service Date: Feb 2022 Short term: Action plan
	P2-4:A5:5:_RIO OSO 115KV - SECTION 2D & 1D	P2	Bus-Tie Breaker	144	151	127	14	8	155	98	4	127	Project: Vaca Dixon Area Reinforcement Project In-Service Date: Feb 2022 Short term: Action plan
	P7-1:A4:16_Rio Oso-Woodland #1 115 kV Line & Rio Oso-Woodland #2 115 kV Line	P7	DCTL	96	98	110	5	2	101	63	5	109	Continue to monitor future load forecast
31980 DPWTR_TP 115 31986 W.SCRMNO 115 1	P1-2:A4:33:_BRIGHTN-UCD_TP2-BRKR SLG 115KV MOAS OPENED ON BRKRJCT_UCD_TP2 & P1-2:A4:29:_WOODLAND-DAVIS 115KV	P6	N-1/N-1	94	99	112	<100	<100	101	<100	<100	112	Continue to monitor future load forecast
31980 DPWTR_TP 115 31990 DAVIS 115 1	P1-2:A4:33:_BRIGHTN-UCD_TP2-BRKR SLG 115KV MOAS OPENED ON BRKRJCT_UCD_TP2 & P1-2:A4:29:_WOODLAND-DAVIS 115KV	P6	N-1/N-1	92	97	111	<100	<100	99	<100	<100	111	Continue to monitor future load forecast
31984 BRIGHTN 115 30348 BRIGHTON 230 9	P1-3:A4:3:_BRIGHTON 230/115KV TB 10 & P1-2:A4:29:_WOODLAND-DAVIS 115KV	P6	N-1/N-1	99	97	105	<100	<100	101	<100	<100	105	Continue to monitor future load forecast
31984 BRIGHTN 115 31993 BRKRJCT 115 1	P1-2:A4:29:_WOODLAND-DAVIS 115KV & P1-2:A4:32:_WEST SACRAMENTO-DAVIS 115KV	P6	N-1/N-1	123	132	150	<100	<100	134	78	<100	150	Project: Vaca Dixon Area Reinforcement Project In-Service Date: Feb 2022 Short term: Action plan
31984 BRIGHTN 115 31993 BRKRJCT 115 1	P2-3:A4:20:_W.SCRMNO - DE 115KV & WEST SACRAMENTO-BRIGHTON LINE	P2	Non-Bus-Tie Breaker	101	94	106	11	2	98	59	7	106	Project: Vaca Dixon Area Reinforcement Project In-Service Date: Feb 2022 Short term: Action plan
	P2-4:A5:5:_RIO OSO 115KV - SECTION 2D & 1D	P2	Bus-Tie Breaker	123	130	102	10	6	133	77	5	102	Project: Vaca Dixon Area Reinforcement Project In-Service Date: Feb 2022 Short term: Action plan
	P7-1:A4:16_Rio Oso-Woodland #1 115 kV Line & Rio Oso-Woodland #2 115 kV Line	P7	DCTL	97	101	115	4	2	104	59	5	115	Project: Vaca Dixon Area Reinforcement Project In-Service Date: Feb 2022 Short term: Action plan
	P7-1:A4:17_Rio Oso-West Sacramento 115 kV Line & West Sacramento-Brighton 115 kV Line	P7	DCTL	101	94	104	10	3	98	75	5	104	Project: Vaca Dixon Area Reinforcement Project In-Service Date: Feb 2022 Short term: Action plan
	P7-1:A5:15_Rio Oso-Woodland No. 1 115 kV Line & Rio Oso-Woodland No. 2 115 kV Line	P7	DCTL	97	101	115	4	2	104	59	5	115	Project: Vaca Dixon Area Reinforcement Project In-Service Date: Feb 2022 Short term: Action plan
31993 BRKRJCT 115 32001 UCD_TP2 115 1	P1-2:A4:29:_WOODLAND-DAVIS 115KV & P1-2:A4:32:_WEST SACRAMENTO-DAVIS 115KV	P6	N-1/N-1	122	130	149	<100	<100	133	77	<100	149	Project: Vaca Dixon Area Reinforcement Project In-Service Date: Feb 2022 Short term: Action plan
	P2-3:A4:20:_W.SCRMNO - DE 115KV & WEST SACRAMENTO-BRIGHTON LINE	P2	Non-Bus-Tie Breaker	99	92	105	10	2	97	57	8	105	Continue to monitor future load forecast

2019-2020 ISO Reliability Assessment - Study Results
Study Area: PG&E Central Valley
Thermal Overloads

California ISO

Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Loading % (Baseline Scenarios)					Loading % (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2021 SP Heavy Renewable & Min Gas Gen	2024 SpOP Hi Renew & Min Gas Gen	2029 Retirement of QF Generations	
31993 BRKRJCT 115 32001 UCD_TP2 115 1	P2-4:A5:5:_RIO OSO 115KV - SECTION 2D & 1D	P2	Bus-Tie Breaker	121	128	101	8	4	132	76	6	101	Project: Vaca Dixon Area Reinforcement Project In-Service Date: Feb 2022 Short term: Action plan
	P7-1:A4:16_Rio Oso-Woodland #1 115 kV Line & Rio Oso-Woodland #2 115 kV Line	P7	DCTL	95	100	114	3	1	102	57	7	113	Continue to monitor future load forecast
	P7-1:A4:17_Rio Oso-West Sacramento 115 kV Line & West Sacramento-Brighton 115 kV Line	P7	DCTL	99	92	103	9	1	96	74	6	103	Continue to monitor future load forecast
	P7-1:A5:15_Rio Oso-Woodland No. 1 115 kV Line & Rio Oso-Woodland No. 2 115 kV Line	P7	DCTL	95	100	114	3	1	102	57	7	113	Continue to monitor future load forecast
31998 VACA-DIX 115 31997 SCHMLBCH 115 1	P1-2:A4:38:_VACA-VACAVILLE-JAMESON-NORTH TOWER 115KV MOAS OPENED ON HALE J1_HALE & P1-2:A4:42:_VACA-SUISUN 115KV MOAS OPENED ON VACA-DIX_WEC (2)	P6	N-1/N-1	93	94	108	<100	<100	98	89	<100	109	Continue to monitor future load forecast
32001 UCD_TP2 115 31990 DAVIS 115 1	P1-2:A4:29:_WOODLAND-DAVIS 115KV & P1-2:A4:32:_WEST SACRAMENTO-DAVIS 115KV	P6	N-1/N-1	99	105	121	<100	<100	107	<100	<100	120	Project: Vaca Dixon Area Reinforcement Project In-Service Date: Feb 2022 Short term: Action plan
32001 UCD_TP2 115 31990 DAVIS 115 1	P2-4:A5:5:_RIO OSO 115KV - SECTION 2D & 1D	P2	Bus-Tie Breaker	98	104	81	6	3	106	61	5	82	Project: Vaca Dixon Area Reinforcement Project In-Service Date: Feb 2022 Short term: Action plan
32018 GOLDHILL 115 32231 HORSHE2 115 2	P1-2:A5:16:_PLACER-GOLD HILL #1 115KV & P1-2:A5:34:_DRUM-HIGGINS 115KV MOAS OPENED ON CHCGO PK_HIGGINS	P6	N-1/N-1	94	90	101	<100	<100	93	<100	<100	101	Continue to monitor future load forecast
32056 CORTINA 60.0 30451 CRTNA M 230 1	P1-3:A4:5:_CORTINA 230/115KV TB 4	P1	N-1	116	127	131	48	58	129	70	77	130	Existing operating procedure
	P1-1:A4:13:_WADHAM 13.80KV GEN UNIT 1 & P1-3:A4:5:_CORTINA 230/115KV TB 4	P3	G-1/N-1	134	144	150	<100	<100	146	87	<100	148	Existing operating procedure
32063 ARBJCT 60.0 32078 WLKSLJCT 60.0 2	Base Case	P0	Base Case	75	75	74	101	48	77	62	47	75	Load power factor under review
32088 VACA-DXN 60.0 31998 VACA-DIX 115 5	P1-3:A4:21:_VACA-DIX 115/60KV TB 9	P1	N-1	108	47	51	42	12	48	77	10	53	Project: Vaca Dixon Area Reinforcement Project In-Service Date: Feb 2022 Short term: Action plan
32100 DIXONPGE 60.0 32101 DIXON-J2 60.0 2	P1-2:A4:52:_VACA-DXN-DIXON-J1-TRAVIS 60KV MOAS OPENED ON TRAVIS_TRAVISJT	P1	N-1	133	62	72	36	14	63	101	12	72	Project: Vaca Dixon Area Reinforcement Project In-Service Date: Feb 2022 Short term: Action plan
	P1-1:A4:3:_SOLANO3WIND 1.00KV GEN UNIT 3 & P1-2:A4:52:_VACA-DXN-DIXON-J1-TRAVIS 60KV MOAS OPENED ON TRAVIS_TRAVISJT	P3	G-1/N-1	133	<100	<100	<100	<100	<100	101	<100	<100	Project: Vaca Dixon Area Reinforcement Project In-Service Date: Feb 2022 Short term: Action plan
	P1-2:A4:31:_WEST SACRAMENTO-BRIGHTON 115KV & P1-2:A5:15:_PALERMO-NICOLAUS 115KV MOAS OPENED ON PALERMO_E.MRY J2	P6	N-1/N-1	89	96	115	<100	<100	100	<100	<100	115	Continue to monitor future load forecast

2019-2020 ISO Reliability Assessment - Study Results
Study Area: PG&E Central Valley
Thermal Overloads

California ISO

Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Loading % (Baseline Scenarios)					Loading % (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2021 SP Heavy Renewable & Min Gas Gen	2024 SpOP Hi Renew & Min Gas Gen	2029 Retirement of QF Generations	
32200 PEASE 115 31506 HONC JT1 115 1	P2-4:A5:5:_RIO OSO 115KV - SECTION 2D & 1D	P2	Bus-Tie Breaker	104	<100	<100	28	<100	<100	57	<100	<100	Project: South of Palermo Project In-Service Date: Nov. 2022 Short term: Action plan
	P7-1:A5:13_Palermo-Nicolaus 115 kV Line & Bogue-Rio Oso 115 kV Line	P7	DCTL	92	90	107	27	18	91	44	27	107	Continue to monitor future load forecast
	P7-1:A5:5_Colgate-Rio Oso 230 kV Line & Table Mountain-Rio Oso 230 kV Line	P7	DCTL	90	93	108	33	27	94	47	34	107	Continue to monitor future load forecast
	P7-1:A5:6_Table Mountain-Rio Oso 230 kV Line & Palermo-Colgate 230 kV Line	P7	DCTL	76	79	101	46	43	81	41	50	99	Continue to monitor future load forecast
	P2-4:A5:5:_RIO OSO 115KV - SECTION 2D & 1D	P2	Bus-Tie Breaker	120	<100	<100	15	<100	<100	82	<100	<100	Project: South of Palermo Project In-Service Date: Nov. 2022 Short term: Action plan
	P7-1:A5:5_Colgate-Rio Oso 230 kV Line & Table Mountain-Rio Oso 230 kV Line	P7	DCTL	101	49	47	29	7	48	69	8	47	Project: South of Palermo Project In-Service Date: Nov. 2022 Short term: Action plan
32212 E.NICOLS 115 32214 RIO OSO 115 1	P1-2:A4:31:_WEST SACRAMENTO-BRIGHTON 115KV & P1-2:A5:15:_PALERMO-NICOLAUS 115KV MOAS OPENED ON PALERMO_E.MRY J2	P6	N-1/N-1	104	<100	<100	<100	<100	<100	<100	<100	<100	Project: South of Palermo Project In-Service Date: Nov. 2022 Short term: Action plan
	P1-2:A5:15:_PALERMO-NICOLAUS 115KV MOAS OPENED ON PALERMO_E.MRY J2	P1	N-1	101	30	39	17	15	31	61	16	39	Project: South of Palermo Project In-Service Date: Nov. 2022 Short term: Action plan
	P2-1:A5:5:_PALERMO-NICOLAUS 115KV [3210] (PALERMO-E.MRY J2)	P2	Line Section w/o Fault	101	30	39	17	15	31	61	16	39	Project: South of Palermo Project In-Service Date: Nov. 2022 Short term: Action plan
	P2-4:A5:5:_RIO OSO 115KV - SECTION 2D & 1D	P2	Bus-Tie Breaker	106	<100	<100	26	<100	<100	70	<100	<100	Project: South of Palermo Project In-Service Date: Nov. 2022 Short term: Action plan
	P1-1:A4:14:_WOODLAND 13.80KV GEN UNIT 1 & P1-2:A5:15:_PALERMO-NICOLAUS 115KV MOAS OPENED ON PALERMO_E.MRY J2	P3	G-1/N-1	102	<100	<100	<100	<100	<100	<100	<100	<100	Project: South of Palermo Project In-Service Date: Nov. 2022 Short term: Action plan
32214 RIO OSO 115 30330 RIO OSO 230 1	P1-3:A5:3:_RIO OSO 230/115KV TB 2 & P1-2:A4:5:_RIO OSO-BRIGHTON 230KV	P6	N-1/N-1	110	<100	<100	<100	<100	<100	77	<100	<100	Project: Rio Oso 230/115 kV Transformer Upgrade Project In-Service Date: Jun. 2022 Short term: Action plan
	P5-5:A5:1:_ATLANTIC 230 KV BAAH BUS #1 (FAILURE OF NON-REDUNDENT RELAY)	P5-5	P5-5	101	44	58	37	7	46	62	10	59	Project: Rio Oso 230/115 kV Transformer Upgrade Project In-Service Date: Jun. 2022 Short term: Action plan

2019-2020 ISO Reliability Assessment - Study Results
Study Area: PG&E Central Valley
Thermal Overloads

California ISO

Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Loading % (Baseline Scenarios)					Loading % (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2021 SP Heavy Renewable & Min Gas Gen	2024 SpOP Hi Renew & Min Gas Gen	2029 Retirement of QF Generations	
	P7-1:A5:2_Rio Oso-Atlantic 230 kV Line & Rio Oso-Gold Hill 230 kV Line	P7	DCTL	107	47	52	32	15	49	69	18	53	Project: Rio Oso 230/115 kV Transformer Upgrade Project In-Service Date: Jun. 2022 Short term: Action plan
32214 RIO OSO 115 30330 RIO OSO 230 2	P1-3:A5:2:_RIO OSO 230/115KV TB 1 & P1-2:A4:5:_RIO OSO-BRIGHTON 230KV	P6	N-1/N-1	110	<100	<100	<100	<100	<100	75	<100	<100	Project: Rio Oso 230/115 kV Transformer Upgrade Project In-Service Date: Jun. 2022 Short term: Action plan
	P5-5:A5:1:_ATLANTIC 230 KV BAAH BUS #1 (FAILURE OF NON-REDUNDENT RELAY)	P5-5	P5-5	105	44	58	27	7	46	60	10	59	Project: Rio Oso 230/115 kV Transformer Upgrade Project In-Service Date: Jun. 2022 Short term: Action plan
	P7-1:A5:2_Rio Oso-Atlantic 230 kV Line & Rio Oso-Gold Hill 230 kV Line	P7	DCTL	112	47	52	23	15	49	69	18	53	Project: Rio Oso 230/115 kV Transformer Upgrade Project In-Service Date: Jun. 2022 Short term: Action plan
32214 RIO OSO 115 31964 KNIGHT2 115 2	P1-2:A4:41:_UC DAVIS #1 TAP 115KV MOAS OPENED ON BRKRJCT_UCD_TP2 & P1-2:A4:28:_WOODLD-KNIGHTLD-RIO OSO 115KV	P6	N-1/N-1	89	96	107	<100	<100	99	<100	<100	106	Continue to monitor future load forecast
32214 RIO OSO 115 31965 KNIGHT1 115 1	P1-2:A4:30:_RIO OSO-WOODLAND #2 115KV & P1-2:A4:5:_RIO OSO-BRIGHTON 230KV	P6	N-1/N-1	87	103	106	<100	<100	102	<100	<100	106	Continue to monitor future load forecast
32214 RIO OSO 115 31986 W.SCRMNO 115 1	P1-2:A4:5:_RIO OSO-BRIGHTON 230KV & P1-2:A11:3:_BRIGHTON-BELLOTA 230KV	P6	N-1/N-1	113	<100	<100	<100	<100	<100	94	<100	<100	Project: Vaca Dixon Area Reinforcement Project In-Service Date: Feb 2022 Short term: Action plan
32214 RIO OSO 115 32225 BRNSWKTP 115 1	P1-2:A5:33:_DRUM-HIGGINS 115KV MOAS OPENED ON DRUM_DTCH FL1 & P1-2:A5:31:_RIO OSO-DRUM-BRUNSWCK 115KV	P6	N-1/N-1	<100	<100	<100	171	<100	<100	<100	<100	<100	Existing operating procedure
	P2-1:A5:28:_DRUM-HIGGINS 115KV [4393] (CHCGO PK-HIGGINS)	P2	Line Section w/o Fault	63	68	64	124	21	65	79	31	63	Existing operating procedure
	P2-1:A5:34:_HIGGINS-BELL 115KV [1412] (HIGGINS-BELL PGE)	P2	Line Section w/o Fault	49	54	50	121	21	51	71	28	49	Existing operating procedure
	P2-2:A5:15:_PLACER 115KV SECTION 1D	P2	Bus	32	37	32	118	20	35	60	27	31	Existing operating procedure
	P2-3:A5:24:_PLACER - 1D 115KV & PLACER-GOLD HILL #1 LINE	P2	Non-Bus-Tie Breaker	32	38	32	118	20	35	60	27	31	Existing operating procedure
	P2-3:A5:26:_PLACER - 1D 115KV & BELL-PLACER LINE	P2	Non-Bus-Tie Breaker	32	37	32	118	20	35	60	27	31	Existing operating procedure
	P2-3:A5:85:_BRNSWALT 115KV - RING R4 & R3	P2	Non-Bus-Tie Breaker	45	52	46	206	26	49	74	49	45	Existing operating procedure
	P2-4:A5:3:_GOLDHILL 115KV - SECTION 1F & 2F	P2	Bus-Tie Breaker	39	37	67	137	28	42	37	16	68	Existing operating procedure

2019-2020 ISO Reliability Assessment - Study Results
Study Area: PG&E Central Valley
Thermal Overloads

California ISO

Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Loading % (Baseline Scenarios)					Loading % (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2021 SP Heavy Renewable & Min Gas Gen	2024 SpOP Hi Renew & Min Gas Gen	2029 Retirement of QF Generations	
	P1-1:A5:9:_NEWCSTLE 13.20KV GEN UNIT 1 & P1-2:A5:34:_DRUM-HIGGINS 115KV MOAS OPENED ON CHCGO PK_HIGGINS	P3	G-1/N-1	<100	<100	<100	122	<100	<100	<100	<100	<100	Existing operating procedure
	P7-1:A5:19_Placer-Gold Hill No. 1 115 kV Line and Placer-Gold Hill No. 2 115 kV Line	P7	DCTL	16	21	20	132	23	22	43	20	21	Existing operating procedure
32214 RIO OSO 115 32244 BRNSWCKP 115 2	P1-2:A5:30:_RIO OSO-BRNSWALT-DRUM 115KV & P1-2:A5:34:_DRUM-HIGGINS 115KV MOAS OPENED ON CHCGO PK_HIGGINS	P6	N-1/N-1	56	59	57	196	<100	58	70	<100	57	Existing operating procedure
	P2-1:A5:28:_DRUM-HIGGINS 115KV [4393] (CHCGO PK-HIGGINS)	P2	Line Section w/o Fault	50	54	55	117	18	52	69	32	54	Existing operating procedure
	P2-1:A5:34:_HIGGINS-BELL 115KV [1412] (HIGGINS-BELL PGE)	P2	Line Section w/o Fault	36	41	41	114	18	38	61	29	40	Existing operating procedure
	P2-2:A5:15:_PLACER 115KV SECTION 1D	P2	Bus	19	25	24	111	17	22	49	28	23	Existing operating procedure
	P2-3:A5:24:_PLACER - 1D 115KV & PLACER-GOLD HILL #1 LINE	P2	Non-Bus-Tie Breaker	19	25	24	111	18	22	49	28	23	Existing operating procedure
	P2-3:A5:25:_PLACER - 1D 115KV & PLACER-GOLD HILL #2 LINE	P2	Non-Bus-Tie Breaker	18	25	24	111	17	22	49	28	23	Existing operating procedure
	P2-3:A5:26:_PLACER - 1D 115KV & BELL-PLACER LINE	P2	Non-Bus-Tie Breaker	19	25	24	111	17	22	49	28	23	Existing operating procedure
	P2-4:A5:3:_GOLDHILL 115KV - SECTION 1F & 2F	P2	Bus-Tie Breaker	48	45	77	130	25	51	28	18	77	Existing operating procedure
	P1-1:A5:35:_ELDRADO1 21.60KV GEN UNIT 1 & P1-2:A5:34:_DRUM-HIGGINS 115KV MOAS OPENED ON CHCGO PK_HIGGINS	P3	G-1/N-1	<100	<100	<100	115	<100	<100	<100	<100	<100	Existing operating procedure
	P7-1:A5:19_Placer-Gold Hill No. 1 115 kV Line and Placer-Gold Hill No. 2 115 kV Line	P7	DCTL	23	22	30	125	20	26	33	21	30	Existing operating procedure
32214 RIO OSO 115 32404 SPI JCT 115 1	P1-2:A5:10:_ATLANTIC-GOLD HILL 230KV & P1-2:A5:6:_RIO OSO-ATLANTIC 230KV	P6	N-1/N-1	116	122	146	<100	<100	126	<100	<100	146	SPS Recommended in 2017-2018 TPP
	P5-5:A5:1:_ATLANTIC 230 KV BAAH BUS #1 (FAILURE OF NON-REDUNDENT RELAY)	P5-5	P5-5	116	122	147	16	21	126	62	32	147	SPS Recommended in 2017-2018 TPP
32218 DRUM 115 32220 DTCH FL1 115 1	P1-2:A5:16:_PLACER-GOLD HILL #1 115KV & P1-2:A5:17:_PLACER-GOLD HILL #2 115KV	P6	N-1/N-1	100	94	108	<100	<100	99	<100	<100	108	Continue to monitor future load forecast
	P2-3:A5:83:_DRUM 115KV - RING R5 & R4	P2	Non-Bus-Tie Breaker	67	71	74	106	33	70	64	42	72	Gerneration redispatch
	P2-4:A5:3:_GOLDHILL 115KV - SECTION 1F & 2F	P2	Bus-Tie Breaker	162	151	244	52	24	160	56	39	242	SPS Recommended in 2018-2019 TPP
	P2-4:A5:5:_RIO OSO 115KV - SECTION 2D & 1D	P2	Bus-Tie Breaker	51	57	52	116	32	55	56	45	50	Gerneration redispatch
	P7-1:A5:11_Drum-Rio Oso No. 1 115 kV Line & Drum-Rio Oso No. 2 115 kV Line	P7	DCTL	67	71	74	106	33	70	64	42	72	Gerneration redispatch
	P7-1:A5:19_Placer-Gold Hill No. 1 115 kV Line and Placer-Gold Hill No. 2 115 kV Line	P7	DCTL	101	93	119	45	11	99	27	28	119	Continue to monitor future load forecast

2019-2020 ISO Reliability Assessment - Study Results
Study Area: PG&E Central Valley
Thermal Overloads

California ISO

Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Loading % (Baseline Scenarios)					Loading % (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2021 SP Heavy Renewable & Min Gas Gen	2024 SpOP Hi Renew & Min Gas Gen	2029 Retirement of QF Generations	
32218 DRUM 115 32222 DTCH FL2 115 1	P1-2:A5:31:_RIO OSO-DRUM-BRUNSWCK 115KV & P1-2:A5:34:_DRUM-HIGGINS 115KV MOAS OPENED ON CHCGO PK_HIGGINS	P6	N-1/N-1	144	100	100	119	<100	163	146	<100	100	Existing SPS under review
	P2-3:A5:85:_BRNSWALT 115KV - RING R4 & R3	P2	Non-Bus-Tie Breaker	77	76	81	177	26	74	82	47	79	Existing operating procedure
	P2-4:A5:3:_GOLDHILL 115KV - SECTION 1F & 2F	P2	Bus-Tie Breaker	45	40	79	105	27	46	11	19	79	Existing operating procedure
32218 DRUM 115 32242 DRUM 1M 115 1	P2-1:A5:26:_DRUM-RIO OSO #2 115KV [1430] (DRUM-BRNSWCKP)	P2	Line Section w/o Fault	60	58	61	184	12	58	64	15	60	Existing operating procedure
	P2-2:A5:15:_PLACER 115KV SECTION 1D	P2	Bus	61	59	60	184	15	58	64	15	60	Existing operating procedure
	P2-3:A5:24:_PLACER - 1D 115KV & PLACER-GOLD HILL #1 LINE	P2	Non-Bus-Tie Breaker	61	59	60	184	15	58	64	15	60	Existing operating procedure
	P2-3:A5:25:_PLACER - 1D 115KV & PLACER-GOLD HILL #2 LINE	P2	Non-Bus-Tie Breaker	61	59	60	184	15	58	64	15	60	Existing operating procedure
	P2-3:A5:26:_PLACER - 1D 115KV & BELL-PLACER LINE	P2	Non-Bus-Tie Breaker	61	59	60	184	15	58	64	15	60	Existing operating procedure
	P2-4:A5:3:_GOLDHILL 115KV - SECTION 1F & 2F	P2	Bus-Tie Breaker	67	64	66	184	14	64	67	16	66	Existing operating procedure
	P1-1:A5:19:_HALSEY F 6.60KV GEN UNIT 1 & P1-2:A5:35:_BELL-PLACER 115KV MOAS OPENED ON PLACER_BELL PGE	P3	G-1/N-1	<100	<100	<100	184	<100	<100	<100	<100	<100	Existing operating procedure
	P7-1:A5:19_Placer-Gold Hill No. 1 115 kV Line and Placer-Gold Hill No. 2 115 kV Line	P7	DCTL	64	62	64	184	14	62	65	16	64	Existing operating procedure
32218 DRUM 115 32244 BRNSWCKP 115 2	P1-2:A5:30:_RIO OSO-BRNSWALT-DRUM 115KV & P1-2:A5:34:_DRUM-HIGGINS 115KV MOAS OPENED ON CHCGO PK_HIGGINS	P6	N-1/N-1	100	100	100	202	<100	100	100	<100	100	Existing operating procedure
	P2-1:A5:28:_DRUM-HIGGINS 115KV [4393] (CHCGO PK-HIGGINS)	P2	Line Section w/o Fault	93	95	97	123	22	94	97	29	96	Existing operating procedure
	P2-1:A5:34:_HIGGINS-BELL 115KV [1412] (HIGGINS-BELL PGE)	P2	Line Section w/o Fault	79	81	82	120	22	79	89	27	81	Existing operating procedure
	P2-2:A5:15:_PLACER 115KV SECTION 1D	P2	Bus	61	62	64	117	21	60	77	26	62	Existing operating procedure
	P2-3:A5:24:_PLACER - 1D 115KV & PLACER-GOLD HILL #1 LINE	P2	Non-Bus-Tie Breaker	61	63	64	117	21	61	77	26	63	Existing operating procedure
	P2-3:A5:25:_PLACER - 1D 115KV & PLACER-GOLD HILL #2 LINE	P2	Non-Bus-Tie Breaker	61	62	63	117	21	60	77	26	62	Existing operating procedure
	P2-3:A5:26:_PLACER - 1D 115KV & BELL-PLACER LINE	P2	Non-Bus-Tie Breaker	61	62	64	117	21	60	77	26	62	Existing operating procedure
	P2-4:A5:3:_GOLDHILL 115KV - SECTION 1F & 2F	P2	Bus-Tie Breaker	7	4	43	136	30	2	50	16	42	Existing operating procedure

2019-2020 ISO Reliability Assessment - Study Results
Study Area: PG&E Central Valley
Thermal Overloads

California ISO

Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Loading % (Baseline Scenarios)					Loading % (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2021 SP Heavy Renewable & Min Gas Gen	2024 SpOP Hi Renew & Min Gas Gen	2029 Retirement of QF Generations	
	P1-1:A5:19:_HALSEY F 6.60KV GEN UNIT 1 & P1-2:A5:34:_DRUM-HIGGINS 115KV MOAS OPENED ON CHCGO PK_HIGGINS	P3	G-1/N-1	93	<100	<100	122	<100	<100	98	<100	<100	Existing operating procedure
	P7-1:A5:19_Placer-Gold Hill No. 1 115 kV Line and Placer-Gold Hill No. 2 115 kV Line	P7	DCTL	25	28	23	131	24	25	60	19	22	Existing operating procedure
32220 DTCH FL1 115 32224 CHCGO PK 115 1	P2-4:A5:3:_GOLDHILL 115KV - SECTION 1F & 2F	P2	Bus-Tie Breaker	121	113	178	22	18	120	49	25	177	SPS Recommended in 2018-2019 TPP
32224 CHCGO PK 115 32232 HIGGINS 115 1	P2-4:A5:3:_GOLDHILL 115KV - SECTION 1F & 2F	P2	Bus-Tie Breaker	126	119	178	18	15	125	64	21	177	SPS Recommended in 2018-2019 TPP
	P7-1:A5:19_Placer-Gold Hill No. 1 115 kV Line and Placer-Gold Hill No. 2 115 kV Line	P7	DCTL	90	86	103	14	9	89	49	15	103	Continue to monitor future load forecast
32225 BRNSWKTP 115 32222 DTCH FL2 115 1	P1-2:A5:33:_DRUM-HIGGINS 115KV MOAS OPENED ON DRUM_DTCH FL1 & P1-2:A5:31:_RIO OSO-DRUM-BRUNSWCK 115KV	P6	N-1/N-1	101	100	100	176	<100	100	100	<100	100	Existing operating procedure
	P2-1:A5:28:_DRUM-HIGGINS 115KV [4393] (CHCGO PK-HIGGINS)	P2	Line Section w/o Fault	83	84	89	124	17	82	90	31	88	Existing operating procedure
	P2-1:A5:34:_HIGGINS-BELL 115KV [1412] (HIGGINS-BELL PGE)	P2	Line Section w/o Fault	69	70	74	121	18	68	81	30	73	Existing operating procedure
	P2-2:A5:15:_PLACER 115KV SECTION 1D	P2	Bus	51	51	55	118	18	49	70	29	54	Existing operating procedure
	P2-3:A5:24:_PLACER - 1D 115KV & PLACER-GOLD HILL #1 LINE	P2	Non-Bus-Tie Breaker	52	52	55	118	18	49	70	29	54	Existing operating procedure
	P2-3:A5:26:_PLACER - 1D 115KV & BELL-PLACER LINE	P2	Non-Bus-Tie Breaker	51	51	55	118	18	49	70	29	54	Existing operating procedure
	P2-3:A5:85:_BRNSWALT 115KV - RING R4 & R3	P2	Non-Bus-Tie Breaker	108	108	112	211	26	106	113	48	111	Existing SPS under review
	P2-4:A5:3:_GOLDHILL 115KV - SECTION 1F & 2F	P2	Bus-Tie Breaker	22	13	48	137	27	17	42	20	47	Existing operating procedure
	P1-1:A5:19:_HALSEY F 6.60KV GEN UNIT 1 & P1-2:A5:34:_DRUM-HIGGINS 115KV MOAS OPENED ON CHCGO PK_HIGGINS	P3	G-1/N-1	83	<100	<100	122	<100	<100	90	<100	<100	Existing operating procedure
	P7-1:A5:19_Placer-Gold Hill No. 1 115 kV Line and Placer-Gold Hill No. 2 115 kV Line	P7	DCTL	22	20	16	132	21	17	53	22	14	Existing operating procedure
32228 PLACER 115 32238 BELL PGE 115 1	P2-3:A5:83:_DRUM 115KV - RING R5 & R4	P2	Non-Bus-Tie Breaker	48	54	53	102	28	51	66	26	52	Existing operating procedure
	P2-4:A5:3:_GOLDHILL 115KV - SECTION 1F & 2F	P2	Bus-Tie Breaker	119	110	166	24	16	116	56	22	165	SPS Recommended in 2018-2019 TPP
	P2-4:A5:5:_RIO OSO 115KV - SECTION 2D & 1D	P2	Bus-Tie Breaker	37	43	38	110	28	40	61	27	37	Existing operating procedure
	P7-1:A5:11_Drum-Rio Oso No. 1 115 kV Line & Drum-Rio Oso No. 2 115 kV Line	P7	DCTL	48	54	53	102	28	51	66	26	52	Existing operating procedure
32232 HIGGINS 115 32238 BELL PGE 115 1	P2-4:A5:3:_GOLDHILL 115KV - SECTION 1F & 2F	P2	Bus-Tie Breaker	125	117	175	19	14	123	62	20	174	SPS Recommended in 2018-2019 TPP

2019-2020 ISO Reliability Assessment - Study Results
Study Area: PG&E Central Valley
Thermal Overloads

California ISO

Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Loading % (Baseline Scenarios)					Loading % (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2021 SP Heavy Renewable & Min Gas Gen	2024 SpOP Hi Renew & Min Gas Gen	2029 Retirement of QF Generations	
32250 ELDORAD 115 32481 APLHTAP2 115 2	P2-1:A5:10:_MISSOURI FLAT-GOLD HILL #1 115KV [2660] (GOLDHILL-CPM TAP)	P2	Line Section w/o Fault	22	94	101	17	14	99	15	16	101	Continue to monitor future load forecast
	P2-1:A5:9:_MISSOURI FLAT-GOLD HILL #2 115KV [2670] (GOLDHILL-SHPRING2)	P2	Line Section w/o Fault	171	83	95	8	9	86	92	16	93	Project: Switching Shingle Spring substation load In-Service Date: 2022 Short term: Action plan
32250 ELDORAD 115 32482 APLHTAP1 115 1	P2-1:A5:9:_MISSOURI FLAT-GOLD HILL #2 115KV [2670] (GOLDHILL-SHPRING2)	P2	Line Section w/o Fault	134	60	68	24	6	63	66	12	66	Project: Switching Shingle Spring substation load In-Service Date: 2022 Short term: Action plan
32290 OLIVH J1 115 32288 E.MRY J1 115 1	P2-4:A5:5:_RIO OSO 115KV - SECTION 2D & 1D	P2	Bus-Tie Breaker	119	<100	<100	15	<100	<100	82	<100	<100	Project: South of Palermo Project In-Service Date: Nov. 2022 Short term: Action plan
	P7-1:A5:5_Colgate-Rio Oso 230 kV Line & Table Mountain-Rio Oso 230 kV Line	P7	DCTL	101	49	47	28	7	48	69	8	47	Project: South of Palermo Project In-Service Date: Nov. 2022 Short term: Action plan
32303 PMHYCJCT 60.0 32304 YCECJCT 60.0 1	Base Case	P0	Base Case	102	103	101	0	0	102	75	0	101	Line rating under review
32356 LINCLN 115 32398 ULTRA JT 115 1	P1-2:A5:10:_ATLANTIC-GOLD HILL 230KV & P1-2:A5:6:_RIO OSO-ATLANTIC 230KV	P6	N-1/N-1	94	100	123	<100	<100	103	<100	<100	123	SPS Recommended in 2017-2018 TPP
	P5-5:A5:1:_ATLANTIC 230 KV BAAH BUS #1 (FAILURE OF NON-REDUNDENT RELAY)	P5-5	P5-5	95	100	124	11	12	103	54	20	124	SPS Recommended in 2017-2018 TPP
32356 LINCLN 115 32404 SPI JCT 115 1	P1-2:A5:10:_ATLANTIC-GOLD HILL 230KV & P1-2:A5:6:_RIO OSO-ATLANTIC 230KV	P6	N-1/N-1	121	127	152	<100	<100	131	66	<100	152	SPS Recommended in 2017-2018 TPP
	P5-5:A5:1:_ATLANTIC 230 KV BAAH BUS #1 (FAILURE OF NON-REDUNDENT RELAY)	P5-5	P5-5	121	127	153	11	17	131	66	28	153	SPS Recommended in 2017-2018 TPP
	P7-1:A5:2_Rio Oso-Atlantic 230 kV Line & Rio Oso-Gold Hill 230 kV Line	P7	DCTL	91	101	100	38	40	104	60	36	101	SPS Recommended in 2017-2018 TPP
32398 ULTRA JT 115 32408 PLSNT GR 115 1	P1-2:A5:10:_ATLANTIC-GOLD HILL 230KV & P1-2:A5:6:_RIO OSO-ATLANTIC 230KV	P6	N-1/N-1	106	111	136	<100	<100	115	<100	<100	136	SPS Recommended in 2017-2018 TPP
	P5-5:A5:1:_ATLANTIC 230 KV BAAH BUS #1 (FAILURE OF NON-REDUNDENT RELAY)	P5-5	P5-5	106	111	137	5	10	115	62	14	137	SPS Recommended in 2017-2018 TPP
32481 APLHTAP2 115 32257 PLCRVLT2 115 2	P2-1:A5:10:_MISSOURI FLAT-GOLD HILL #1 115KV [2660] (GOLDHILL-CPM TAP)	P2	Line Section w/o Fault	23	95	101	17	14	99	16	17	101	Continue to monitor future load forecast
	P2-1:A5:9:_MISSOURI FLAT-GOLD HILL #2 115KV [2670] (GOLDHILL-SHPRING2)	P2	Line Section w/o Fault	171	83	95	8	9	86	92	16	93	Project: Switching Shingle Spring substation load In-Service Date: 2022 Short term: Action plan
32482 APLHTAP1 115 32255 PLCRVLT1 115 1	P2-1:A5:9:_MISSOURI FLAT-GOLD HILL #2 115KV [2670] (GOLDHILL-SHPRING2)	P2	Line Section w/o Fault	159	84	93	20	9	88	85	14	91	Project: Switching Shingle Spring substation load In-Service Date: 2022 Short term: Action plan
	P1-2:A11:39:_SCHULTE SW STA-KASSON-MANTECA 115KV & P1-2:A11:54:_SCHULTE SW STA-LAMMERS 115KV	P6	N-1/N-1	150	<100	<100	<100	<100	<100	85	<100	<100	Project: Vierra 115 kV Looping Project In-Service Date: Jan 2023 Short term: Action plan

2019-2020 ISO Reliability Assessment - Study Results
Study Area: PG&E Central Valley
Thermal Overloads

California ISO

Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Loading % (Baseline Scenarios)					Loading % (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2021 SP Heavy Renewable & Min Gas Gen	2024 SpOP Hi Renew & Min Gas Gen	2029 Retirement of QF Generations	
33500 MELNS JA 115 33509 AVENATP1 115 1	P2-1:A11:19:_RPN JNCN-RIPON 115KV NO FAULT	P2	Line Section w/o Fault	45	26	26	102	103	29	74	98	26	Generation redispatch
	P2-2:A11:25:_RIPON 115KV SECTION 1E	P2	Bus	43	24	23	102	103	28	73	98	24	Generation redispatch
	P2-2:A11:26:_RIPON 115KV SECTION 1D	P2	Bus	33	13	12	103	104	16	69	100	12	Generation redispatch
	P2-3:A11:18:_RIPON - 1D 115KV & MANTECA-RIPON LINE	P2	Non-Bus-Tie Breaker	33	13	12	103	104	16	69	100	12	Generation redispatch
	P2-4:A11:13:_BELLOTA 115KV - SECTION 1D & 2D	P2	Bus-Tie Breaker	16	12	5	101	101	10	44	101	5	Generation redispatch
	P2-4:A11:9:_RIPON 115KV - SECTION 1E & 1D	P2	Bus-Tie Breaker	41	22	20	102	103	25	72	98	21	Generation redispatch
	P7-1:A11:3:_STANISLAUS-MANTECA #2 115KV & STANISLAUS-MELONES SW STA-RIVERBANK JCT SW STA 115KV	P7	DCTL	58	32	31	124	124	37	89	116	31	Existing SPS under review
	P7-1:A12:4:_STANISLAUS-MANTECA #2 115KV & STANISLAUS-MELONES SW STA-RIVERBANK JCT SW STA 115KV	P7	DCTL	58	32	31	124	124	37	89	116	31	Existing SPS under review
33509 AVENATP1 115 33514 MANTECA 115 1	P1-2:A11:39:_SCHULTE SW STA-KASSON-MANTECA 115KV & P1-2:A11:54:_SCHULTE SW STA-LAMMERS 115KV	P6	N-1/N-1	120	<100	<100	<100	<100	<100	<100	<100	<100	Project: Vierra 115 kV Looping Project In-Service Date: Jan 2023 Short term: Action plan
	P7-1:A11:3:_STANISLAUS-MANTECA #2 115KV & STANISLAUS-MELONES SW STA-RIVERBANK JCT SW STA 115KV	P7	DCTL	35	9	8	117	116	13	72	110	9	Existing SPS under review
	P7-1:A11:8:_STANISLAUS-MANTECA #2 115KV & STANISLAUS-MELONES SW STA-RIVERBANK JCT SW STA 115KV (2)	P7	DCTL	35	<100	<100	117	<100	<100	72	<100	<100	Existing SPS under review
	P7-1:A12:4:_STANISLAUS-MANTECA #2 115KV & STANISLAUS-MELONES SW STA-RIVERBANK JCT SW STA 115KV	P7	DCTL	35	9	8	117	116	13	72	110	9	Existing SPS under review
	P7-1:A12:6:_STANISLAUS-MANTECA #2 115KV & RIVERBANK JCT SW STA-MANTECA 115KV	P7	DCTL	27	<100	<100	117	<100	<100	68	<100	<100	Existing SPS under review
33513 LID JCT 115 33526 KSSN-JC1 115 1	P1-2:A11:35:_STANISLAUS-MELONES SW STA-MANTECA #1 115KV MOAS OPENED ON STANISLS_FRGTNTP1 & P1-2:A11:36:_STANISLS-MELONES-RIVRBKJT 115KV	P6	N-1/N-1	116	87	99	<100	<100	86	<100	<100	99	Project: Vierra 115 kV Looping Project In-Service Date: Jan 2023 Short term: Action plan
	P2-2:A11:27:_KASSON 115KV SECTION 1D	P2	Bus	103	73	87	19	15	74	41	19	87	Project: Vierra 115 kV Looping Project In-Service Date: Jan 2023 Short term: Action plan
	P2-3:A11:20:_KASSON - 1D 115KV & VIERRA-TRACY-KASSON LINE	P2	Non-Bus-Tie Breaker	103	73	87	32	22	74	41	27	87	Project: Vierra 115 kV Looping Project In-Service Date: Jan 2023 Short term: Action plan

2019-2020 ISO Reliability Assessment - Study Results
Study Area: PG&E Central Valley
Thermal Overloads

California ISO

Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Loading % (Baseline Scenarios)					Loading % (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2021 SP Heavy Renewable & Min Gas Gen	2024 SpOP Hi Renew & Min Gas Gen	2029 Retirement of QF Generations	
	P2-3:A11:21:_KASSON - 1D 115KV & LAMMERS-KASSON LINE	P2	Non-Bus-Tie Breaker	104	74	88	18	14	75	42	18	88	Project: Vierra 115 kV Looping Project In-Service Date: Jan 2023 Short term: Action plan
33514 MANTECA 115 33513 LID JCT 115 1	P1-3:A11:32:_KASSON 115/60KV TB 1 & P1-2:A11:44:_VIERRA-TRACY-KASSON 115KV	P6	N-1/N-1	113	85	97	<100	<100	84	<100	<100	97	Project: Vierra 115 kV Looping Project In-Service Date: Jan 2023 Short term: Action plan
	P2-2:A11:27:_KASSON 115KV SECTION 1D	P2	Bus	101	71	85	20	16	72	39	20	85	Project: Vierra 115 kV Looping Project In-Service Date: Jan 2023 Short term: Action plan
	P2-3:A11:20:_KASSON - 1D 115KV & VIERRA-TRACY-KASSON LINE	P2	Non-Bus-Tie Breaker	101	71	85	34	23	72	39	28	85	Project: Vierra 115 kV Looping Project In-Service Date: Jan 2023 Short term: Action plan
	P2-3:A11:21:_KASSON - 1D 115KV & LAMMERS-KASSON LINE	P2	Non-Bus-Tie Breaker	102	72	86	19	15	73	40	19	86	Project: Vierra 115 kV Looping Project In-Service Date: Jan 2023 Short term: Action plan
33514 MANTECA 115 33970 INGRM C. 115 1	P1-2:A11:39:_SCHULTE SW STA-KASSON-MANTECA 115KV & P1-2:A11:54:_SCHULTE SW STA-LAMMERS 115KV	P6	N-1/N-1	236	<100	75	<100	<100	<100	95	<100	74	Project: Vierra 115 kV Looping Project In-Service Date: Jan 2023 Short term: Action plan
	P2-3:A11:19:_KASSON - 1D 115KV & SCHULTE SW STA-KASSON-MANTECA LINE	P2	Non-Bus-Tie Breaker	132	49	65	15	13	50	68	15	65	Project: Vierra 115 kV Looping Project In-Service Date: Jan 2023 Short term: Action plan
33517 RPNJ2 115 33514 MANTECA 115 1	P1-3:A11:10:_BELLOTA 230/115KV TB 1 & P1-3:A11:11:_BELLOTA 230/115KV TB 2	P6	N-1/N-1	149	165	161	<100	<100	163	<100	92	161	Existing operating procedure
	P1-2:A11:36:_STANISLS-MELONES-RIVRBKJT 115KV	P1	N-1	92	96	106	3	7	99	51	15	106	Continue to monitor future load forecast
	P1-2:A12:13:_MELONES-RIVRBKJT-STANISLS 115KV	P1	N-1	92	96	106	3	7	99	51	15	106	Continue to monitor future load forecast
	P1-2:A11:38:_STANISLAUS-MELONES SW STA-MANTECA #1 115KV MOAS OPENED ON STANISLS_FRGTNTP1 (2)	P1	N-1	36	57	62	103	108	56	44	109	61	Gerneration redispatch
	P1-2:A12:11:_STANISLAUS-MELONES SW STA-MANTECA #1 115KV MOAS OPENED ON STANISLS_FRGTNTP1	P1	N-1	36	57	62	103	108	56	44	109	61	Gerneration redispatch
	P1-2:A12:3:_STANISLAUS-MANTECA #2 115KV	P1	N-1	34	53	58	98	103	52	42	104	57	Gerneration redispatch
	P2-1:A11:10:_STANISLAUS-MELONES SW STA-MANTECA #1 115KV (MELNS JA-AVENATP1)	P2	Line Section w/o Fault	34	53	58	103	109	53	46	109	57	Gerneration redispatch
	P2-1:A11:15:_STANISLAUS-MELONES SW STA-MANTECA #1 115KV (AVENATP1-MANTECA)	P2	Line Section w/o Fault	38	60	65	102	107	59	40	108	65	Gerneration redispatch
	P2-3:A11:101:_MANTECA 115KV - RING R2 & R3	P2	Non-Bus-Tie Breaker	45	67	73	101	107	66	35	108	73	Gerneration redispatch

2019-2020 ISO Reliability Assessment - Study Results
Study Area: PG&E Central Valley
Thermal Overloads

California ISO

Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Loading % (Baseline Scenarios)					Loading % (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2021 SP Heavy Renewable & Min Gas Gen	2024 SpOP Hi Renew & Min Gas Gen	2029 Retirement of QF Generations	
	P2-3:A11:102:_MANTECA 115KV - RING R2 & R1	P2	Non-Bus-Tie Breaker	45	66	73	101	107	66	35	108	72	Gerneration redispatch
	P2-4:A11:1:_BELLOTA 230KV - SECTION 1E & 2E	P2	Bus-Tie Breaker	149	165	161	88	96	163	53	105	161	SPS Recommended in 2017-2018 TPP
	P2-4:A11:13:_BELLOTA 115KV - SECTION 1D & 2D	P2	Bus-Tie Breaker	61	70	83	106	110	73	22	116	83	Existing operating procedure
	P2-4:A11:7:_TESLA E 230KV - SECTION 2E & 1E	P2	Bus-Tie Breaker	45	68	78	104	110	66	34	112	78	Existing operating procedure
	P1-1:A4:20:_WOLFSKIL 13.80KV GEN UNIT 1 & P1-2:A11:36:_STANISLS-MELONES-RIVRBKJT 115KV	P3	G-1/N-1	<100	<100	106	<100	<100	<100	<100	<100	107	Continue to monitor future load forecast
33517 RPNJ2 115 33520 RIPON 115 1	P1-3:A11:10:_BELLOTA 230/115KV TB 1 & P1-3:A11:11:_BELLOTA 230/115KV TB 2	P6	N-1/N-1	95	105	103	<100	<100	104	<100	<100	103	Existing operating procedure
33518 VIERRA 115 33514 MANTECA 115 1	P1-2:A11:39:_SCHULTE SW STA-KASSON-MANTECA 115KV & P1-2:A11:54:_SCHULTE SW STA-LAMMERS 115KV	P6	N-1/N-1	172	<100	<100	<100	<100	<100	87	<100	<100	Project: Vierra 115 kV Looping Project In-Service Date: Jan 2023 Short term: Action plan
33526 KSSN-JC1 115 33528 KASSON 115 1	P1-2:A11:48:_TESLA-TRACY 115KV MOAS OPENED ON LEPRINO_TRACY JC & P1-2:A11:54:_SCHULTE SW STA-LAMMERS 115KV	P6	N-1/N-1	167	116	<100	<100	<100	119	108	<100	<100	Existing SPS under review
	P1-2:A11:54:_SCHULTE SW STA-LAMMERS 115KV	P1	N-1	115	83	99	18	22	84	66	15	99	Project: Vierra 115 kV Looping Project In-Service Date: Jan 2023 Short term: Action plan
	P2-3:A11:109:_LAMMERS 115KV - RING R4 & R3	P2	Non-Bus-Tie Breaker	100	71	86	17	21	72	56	15	86	Project: Vierra 115 kV Looping Project In-Service Date: Jan 2023 Short term: Action plan
	P2-3:A11:33:_SCHULTE 115KV - MIDDLE BREAKER BAY 2	P2	Non-Bus-Tie Breaker	115	89	96	27	35	90	63	26	96	Project: Vierra 115 kV Looping Project In-Service Date: Jan 2023 Short term: Action plan
	P5-5:A11:1:_SCHULTE 115KV BAAH BUS #1 (FAILURE OF NON-REDUNDENT RELAY)	P5-5	P5-5	106	59	78	10	9	61	63	6	78	Project: Vierra 115 kV Looping Project In-Service Date: Jan 2023 Short term: Action plan
33528 KASSON 115 33531 OWENSTP1 115 1	P1-2:A4:31:_WEST SACRAMENTO-BRIGHTON 115KV & P1-2:A11:48:_TESLA-TRACY 115KV MOAS OPENED ON LEPRINO_TRACY JC	P6	N-1/N-1	110	86	<100	<100	<100	87	<100	<100	<100	Project: Vierra 115 kV Looping Project In-Service Date: Jan 2023 Short term: Action plan
	P7-1:A11:31:_SCHULTE SW STA-KASSON-MANTECA 115KV & TESLA-SALADO-MANTECA 115KV	P7	DCTL	102	68	83	16	10	69	50	13	82	Project: Vierra 115 kV Looping Project In-Service Date: Jan 2023 Short term: Action plan
33529 LAMMERS 115 33531 OWENSTP1 115 1	P1-2:A11:48:_TESLA-TRACY 115KV MOAS OPENED ON LEPRINO_TRACY JC & P1-2:A11:39:_SCHULTE SW STA-KASSON-MANTECA 115KV	P6	N-1/N-1	115	90	<100	<100	<100	92	<100	<100	<100	Project: Vierra 115 kV Looping Project In-Service Date: Jan 2023 Short term: Action plan

2019-2020 ISO Reliability Assessment - Study Results
Study Area: PG&E Central Valley
Thermal Overloads

Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Loading % (Baseline Scenarios)					Loading % (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2021 SP Heavy Renewable & Min Gas Gen	2024 SpOP Hi Renew & Min Gas Gen	2029 Retirement of QF Generations	
	P7-1:A11:31:_SCHULTE SW STA-KASSON-MANTECA 115KV & TESLA-SALADO-MANTECA 115KV	P7	DCTL	106	73	87	9	6	73	55	5	87	Project: Vierra 115 kV Looping Project In-Service Date: Jan 2023 Short term: Action plan
33530 KSSN-JC2 115 33550 HJ HEINZ 115 1	P1-2:A11:48:_TESLA-TRACY 115KV MOAS OPENED ON LEPRINO_TRACY JC & P1-2:A11:39:_SCHULTE SW STA-KASSON-MANTECA 115KV	P6	N-1/N-1	<100	<100	<100	<100	<100	<100	<100	<100	107	Sensitivity only
	P1-2:A11:48:_TESLA-TRACY 115KV MOAS OPENED ON LEPRINO_TRACY JC	P1	N-1	94	97	106	27	20	100	77	15	106	Continue to monitor future load forecast
	P7-1:A11:29:_TESLA-SCHULTE SW STA #2 115KV & TESLA-SCHULTE SW STA #1 115KV	P7	DCTL	16	43	27	126	121	42	0	108	27	Existing SPS under review
	P1-1:A4:20:_WOLFSKIL 13.80KV GEN UNIT 1 & P1-2:A11:48:_TESLA-TRACY 115KV MOAS OPENED ON LEPRINO_TRACY JC	P3	G-1/N-1	<100	<100	106	<100	<100	<100	<100	<100	106	Continue to monitor future load forecast
33533 OWENSTP2 115 33526 KSSN-JC1 115 1	P1-2:A11:54:_SCHULTE SW STA-LAMMERS 115KV	P1	N-1	108	85	100	6	9	86	54	10	100	Project: Vierra 115 kV Looping Project In-Service Date: Jan 2023 Short term: Action plan
	P2-3:A11:33:_SCHULTE 115KV - MIDDLE BREAKER BAY 2	P2	Non-Bus-Tie Breaker	108	92	96	9	17	93	50	9	96	Project: Vierra 115 kV Looping Project In-Service Date: Jan 2023 Short term: Action plan
33537 SFWY_TP1 115 33549 SCHULTE 115 1	P1-2:A11:47:_TESLA-SCHULTE SW STA #2 115KV & P1-2:A11:55:_GWFTRACY-SCHULTE #1 115KV	P6	N-1/N-1	105	75	92	<100	<100	77	<100	<100	92	Project: Vierra 115 kV Looping Project In-Service Date: Jan 2023 Short term: Action plan
33540 TESLA 115 33541 AEC_TP1 115 1	P1-2:A11:50:_LAWRENCE LIVERMORE LAB #1 TAP 115KV & P1-3:A11:16:_TESLA D 230/115KV TB 1	P6	N-1/N-1	136	98	119	<100	<100	100	<100	<100	119	Project: Vierra 115 kV Looping Project In-Service Date: Jan 2023 Short term: Action plan
	P5-5:A11:1:_SCHULTE 115KV BAAH BUS #1 (FAILURE OF NON-REDUNDENT RELAY)	P5-5	P5-5	119	74	92	14	18	75	66	21	93	Project: Vierra 115 kV Looping Project In-Service Date: Jan 2023 Short term: Action plan
33540 TESLA 115 33543 AEC_TP2 115 1	P1-2:A11:46:_TESLA-SCHULTE SW STA #1 115KV & P1-2:A11:55:_GWFTRACY-SCHULTE #1 115KV	P6	N-1/N-1	136	98	119	<100	<100	100	<100	<100	119	Project: Vierra 115 kV Looping Project In-Service Date: Jan 2023 Short term: Action plan
33540 TESLA 115 33574 LLNL TAP 115 1	P1-3:A11:2:_TESLA 500/230KV TB 4 & P1-2:A11:55:_GWFTRACY-SCHULTE #1 115KV	P6	N-1/N-1	<100	<100	<100	81	83	<100	<100	100	<100	Sensitivity only
	P1-3:A11:16:_TESLA D 230/115KV TB 1	P1	N-1	6	8	11	79	84	6	13	100	11	Sensitivity only
	P2-4:A11:8:_TESLA D 230KV - SECTION 1D & 2D	P2	Bus-Tie Breaker	21	35	72	164	171	40	54	201	73	SPS Recommended in 2017-2018 TPP
33540 TESLA 115 33959 TCHRT_T2 115 1	P1-2:A11:43:_MANTECA-VIERRA 115KV & P1-3:A11:16:_TESLA D 230/115KV TB 1	P6	N-1/N-1	227	73	<100	<100	<100	74	74	<100	<100	Project: Vierra 115 kV Looping Project In-Service Date: Jan 2023 Short term: Action plan

2019-2020 ISO Reliability Assessment - Study Results
Study Area: PG&E Central Valley
Thermal Overloads

California ISO

Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Loading % (Baseline Scenarios)					Loading % (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2021 SP Heavy Renewable & Min Gas Gen	2024 SpOP Hi Renew & Min Gas Gen	2029 Retirement of QF Generations	
33540 TESLA 115 33959 TCHRT_T2 115 1	P2-3:A11:19:_KASSON - 1D 115KV & SCHULTE SW STA-KASSON-MANTECA LINE	P2	Non-Bus-Tie Breaker	135	62	76	36	35	64	50	38	76	Project: Vierra 115 kV Looping Project In-Service Date: Jan 2023 Short term: Action plan
33541 AEC_TP1 115 33537 SFWY_TP1 115 1	P1-2:A11:39:_SCHULTE SW STA-KASSON-MANTECA 115KV & P1-2:A11:54:_SCHULTE SW STA-LAMMERS 115KV	P6	N-1/N-1	107	77	93	<100	<100	78	<100	<100	93	Project: Vierra 115 kV Looping Project In-Service Date: Jan 2023 Short term: Action plan
33548 TRACY 115 33550 HJ HEINZ 115 1	P1-2:A11:46:_TESLA-SCHULTE SW STA #1 115KV & P1-2:A11:55:_GWFTRACY-SCHULTE #1 115KV	P6	N-1/N-1	<100	<100	105	<100	<100	<100	<100	<100	105	Continue to monitor future load forecast
	P1-2:A11:48:_TESLA-TRACY 115KV MOAS OPENED ON LEPRINO_TRACY JC	P1	N-1	92	96	105	27	19	98	75	15	105	Continue to monitor future load forecast
	P7-1:A11:29:_TESLA-SCHULTE SW STA #2 115KV & TESLA-SCHULTE SW STA #1 115KV	P7	DCTL	16	42	26	124	119	41	0	106	27	Existing SPS under review
	P1-1:A4:20:_WOLFSKIL 13.80KV GEN UNIT 1 & P1-2:A11:48:_TESLA-TRACY 115KV MOAS OPENED ON LEPRINO_TRACY JC	P3	G-1/N-1	<100	<100	104	<100	<100	<100	<100	<100	105	Continue to monitor future load forecast
33549 SCHULTE 115 33533 OWENSTP2 115 2	P1-2:A11:54:_SCHULTE SW STA-LAMMERS 115KV	P1	N-1	108	85	100	6	9	86	54	10	100	Project: Vierra 115 kV Looping Project In-Service Date: Jan 2023 Short term: Action plan
	P2-3:A11:33:_SCHULTE 115KV - MIDDLE BREAKER BAY 2	P2	Non-Bus-Tie Breaker	108	92	96	9	17	93	50	9	96	Project: Vierra 115 kV Looping Project In-Service Date: Jan 2023 Short term: Action plan
33558 LCKFRDJB 115 33562 BELLOTA 115 1	P2-3:A11:38:_BELLOTA - 1D 115KV & GOLD HILL-BELLOTA-LOCKEFORD LINE	P2	Non-Bus-Tie Breaker	111	124	113	33	26	115	91	20	113	Existing operating procedure
33558 LCKFRDJB 115 33564 LOCKFORD 115 1	P2-3:A11:38:_BELLOTA - 1D 115KV & GOLD HILL-BELLOTA-LOCKEFORD LINE	P2	Non-Bus-Tie Breaker	115	133	117	38	32	120	93	26	116	Existing operating procedure
33562 BELLOTA 115 33950 RVRBK TP 115 1	P1-2:A11:39:_SCHULTE SW STA-KASSON-MANTECA 115KV & P1-2:A11:54:_SCHULTE SW STA-LAMMERS 115KV	P6	N-1/N-1	145	<100	<100	<100	<100	<100	<100	<100	<100	Project: Vierra 115 kV Looping Project In-Service Date: Jan 2023 Short term: Action plan
	P2-4:A11:1:_BELLOTA 230KV - SECTION 1E & 2E	P2	Bus-Tie Breaker	117	129	104	21	15	118	65	10	104	Existing operating procedure
33568 TH.E.DV. 115 33570 SPC JCT. 115 1	P1-2:A11:45:_LAMMERS-KASSON 115KV & P1-2:A11:39:_SCHULTE SW STA-KASSON-MANTECA 115KV	P6	N-1/N-1	<100	133	184	<100	<100	136	<100	<100	184	Existing SPS under review
	P1-2:A11:54:_SCHULTE SW STA-LAMMERS 115KV	P1	N-1	32	77	111	33	50	79	32	53	111	Continue to monitor future load forecast
33570 SPC JCT. 115 33595 VIERATP2 115 1	P1-2:A11:54:_SCHULTE SW STA-LAMMERS 115KV & P1-2:A11:39:_SCHULTE SW STA-KASSON-MANTECA 115KV	P6	N-1/N-1	<100	102	115	<100	<100	105	<100	<100	115	Existing SPS under review
33610 VLLY SPS 60.0 33619 AMEOR SW 60.0 1	P1-2:A11:69:_VALLEY SPRINGS-CLAY 60KV	P1	N-1	138	141	150	39	35	144	105	28	150	Existing operating procedure
	P1-3:A11:41:_PRDESWS 60/7.2KV TB 1	P1	N-1	71	73	76	9	6	75	51	1	102	Sensitivity only

2019-2020 ISO Reliability Assessment - Study Results
Study Area: PG&E Central Valley
Thermal Overloads

California ISO

Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Loading % (Baseline Scenarios)					Loading % (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2021 SP Heavy Renewable & Min Gas Gen	2024 SpOP Hi Renew & Min Gas Gen	2029 Retirement of QF Generations	
[illegible]	P1-1:A4:14:_WOODLAND 13.80KV GEN UNIT 1 & P1-2:A11:69:_VALLEY SPRINGS-CLAY 60KV	P3	G-1/N-1	138	141	150	39	35	144	105	28	150	Existing operating procedure
33619 AMFOR_SW 60.0 33616 MARTELL 60.0 1	P1-2:A11:69:_VALLEY SPRINGS-CLAY 60KV	P1	N-1	120	124	130	28	25	126	89	20	130	Existing operating procedure
	P1-1:A4:14:_WOODLAND 13.80KV GEN UNIT 1 & P1-2:A11:69:_VALLEY SPRINGS-CLAY 60KV	P3	G-1/N-1	120	124	130	28	25	126	89	20	130	Existing operating procedure
33690 ROGH-RDY 60.0 33695 ROGH-RDYJCT 60.0 1	Base Case	P0	Base Case	104	104	102	60	56	107	99	53	102	Line rating under review
33716 HMMR JCT 60.0 33717 MORADAJT 60.0 1	P1-2:A11:4:_LOCKEFORD-BELLOTA 230KV	P1	N-1	97	104	74	17	15	107	70	10	74	Project: Lockeford-Lodi Area 230 kV Development Project In-Service Date: Jul 2025 Short term: Action plan
	P1-2:A11:89:_LOCKEFORD #1 60KV	P1	N-1	108	111	117	21	12	114	83	10	117	SPS under review
	P1-1:A4:12:_DG_VADIX 13.80KV GEN UNIT 1 & P1-2:A11:89:_LOCKEFORD #1 60KV	P3	G-1/N-1	108	111	117	21	12	114	83	10	117	SPS under review
33717 MORADAJT 60.0 33740 MSHR 60V 60.0 1	P1-2:A11:89:_LOCKEFORD #1 60KV	P1	N-1	99	101	107	24	16	104	77	14	107	SPS under review
	P1-1:A4:3:_SOLANO3WIND 1.00KV GEN UNIT 3 & P1-2:A11:89:_LOCKEFORD #1 60KV	P3	G-1/N-1	99	101	107	24	16	104	77	14	107	SPS under review
33742 MANTECA 60.0 33514 MANTECA 115 3	P1-3:A11:32:_KASSON 115/60KV TB 1	P1	N-1	204	218	244	65	75	223	157	68	244	Existing SPS under review
	P1-1:A4:8:_SHILOH 0.60KV GEN UNIT 1 & P1-3:A11:32:_KASSON 115/60KV TB 1	P3	G-1/N-1	204	219	244	<100	<100	223	157	<100	243	Existing SPS under review
33748 MSSDLESW 60.0 33750 CALVO 60.0 1	P1-3:A11:32:_KASSON 115/60KV TB 1	P1	N-1	112	124	151	24	42	127	77	39	151	Existing SPS under review
	P1-1:A4:20:_WOLFSKIL 13.80KV GEN UNIT 1 & P1-3:A11:32:_KASSON 115/60KV TB 1	P3	G-1/N-1	112	124	151	<100	<100	127	<100	<100	151	Existing SPS under review
33750 CALVO 60.0 33756 KASSON 60.0 1	P1-3:A11:32:_KASSON 115/60KV TB 1	P1	N-1	108	119	146	19	37	123	73	35	146	Existing SPS under review
	P1-1:A4:20:_WOLFSKIL 13.80KV GEN UNIT 1 & P1-3:A11:32:_KASSON 115/60KV TB 1	P3	G-1/N-1	108	120	146	<100	<100	123	<100	<100	146	Existing SPS under review
33766 MNTCA JT 60.0 33768 BNTA CRB 60.0 1	Base Case	P0	Base Case	98	98	103	33	31	100	87	29	103	Continue to monitor future load forecast
33912 SPRNG GJ 115 33914 MI-WUK 115 1	P1-3:A11:10:_BELLOTA 230/115KV TB 1 & P1-3:A11:11:_BELLOTA 230/115KV TB 2	P6	N-1/N-1	104	106	109	<100	<100	104	<100	<100	109	Existing operating procedure
	P2-4:A11:1:_BELLOTA 230KV - SECTION 1E & 2E	P2	Bus-Tie Breaker	104	106	109	78	72	104	87	60	109	Existing operating procedure
33916 CURTISS 115 33917 SPISONORAJCT 115 1	P1-3:A11:10:_BELLOTA 230/115KV TB 1 & P1-3:A11:11:_BELLOTA 230/115KV TB 2	P6	N-1/N-1	103	104	104	<100	<100	102	<100	<100	104	Existing operating procedure
	P2-4:A11:1:_BELLOTA 230KV - SECTION 1E & 2E	P2	Bus-Tie Breaker	103	105	104	80	74	102	84	62	104	Existing operating procedure
33932 MELONES 115 33500 MELNS JA 115 1	P1-2:A11:39:_SCHULTE SW STA-KASSON-MANTECA 115KV & P1-2:A11:54:_SCHULTE SW STA-LAMMERS 115KV	P6	N-1/N-1	186	<100	<100	<100	<100	<100	75	<100	<100	Project: Vierra 115 kV Looping Project In-Service Date: Jan 2023 Short term: Action plan
	P2-4:A11:1:_BELLOTA 230KV - SECTION 1E & 2E	P2	Bus-Tie Breaker	120	137	116	62	62	130	50	63	115	Existing operating procedure
[illegible]	P1-3:A11:10:_BELLOTA 230/115KV TB 1 & P1-3:A11:11:_BELLOTA 230/115KV TB 2	P6	N-1/N-1	193	216	181	<100	<100	202	87	<100	181	Existing operating procedure

2019-2020 ISO Reliability Assessment - Study Results
Study Area: PG&E Central Valley
Thermal Overloads

California ISO

Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Loading % (Baseline Scenarios)					Loading % (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2021 SP Heavy Renewable & Min Gas Gen	2024 SpOP Hi Renew & Min Gas Gen	2029 Retirement of QF Generations	
33932 MELONES 115 33934 TULLOCH 115 1	P2-4:A11:1:_BELLOTA 230KV - SECTION 1E & 2E	P2	Bus-Tie Breaker	193	215	181	8	14	202	87	19	181	Existing operating procedure
33932 MELONES 115 33936 MELNS JB 115 1	P1-2:A11:39:_SCHULTE SW STA-KASSON-MANTECA 115KV & P1-2:A11:54:_SCHULTE SW STA-LAMMERS 115KV	P6	N-1/N-1	196	<100	<100	<100	<100	<100	76	<100	<100	Project: Vierra 115 kV Looping Project In-Service Date: Jan 2023 Short term: Action plan
	P2-4:A11:1:_BELLOTA 230KV - SECTION 1E & 2E	P2	Bus-Tie Breaker	124	141	120	62	63	134	50	65	119	SPS Recommended in 2017-2018 TPP
	P1-2:A11:42:_MANTECA-RIPON 115KV	P1	N-1	97	103	116	3	7	106	53	15	116	Continue to monitor future load forecast
	P2-1:A11:20:_RPNJ2-RIPON 115KV [0] NO FAULT	P2	Line Section w/o Fault	97	103	116	3	7	106	53	15	116	Continue to monitor future load forecast
	P2-3:A11:103:_MANTECA 115KV - RING R4 & R5	P2	Non-Bus-Tie Breaker	97	103	116	3	7	107	53	15	116	Continue to monitor future load forecast
	P2-3:A11:105:_MANTECA 115KV - RING R6 & R5	P2	Non-Bus-Tie Breaker	97	103	116	3	7	107	53	15	116	Continue to monitor future load forecast
	P2-3:A11:19:_KASSON - 1D 115KV & SCHULTE SW STA-KASSON-MANTECA LINE	P2	Non-Bus-Tie Breaker	114	55	67	72	74	58	84	67	67	Project: Vierra 115 kV Looping Project In-Service Date: Jan 2023 Short term: Action plan
	P2-4:A11:13:_BELLOTA 115KV - SECTION 1D & 2D	P2	Bus-Tie Breaker	32	27	23	105	104	26	53	101	23	SPS Recommended in 2017-2018 TPP
	P2-4:A11:7:_TESLA E 230KV - SECTION 2E & 1E	P2	Bus-Tie Breaker	48	29	27	103	104	33	72	98	28	SPS Recommended in 2017-2018 TPP
	P1-1:A4:20:_WOLFSKIL 13.80KV GEN UNIT 1 & P1-2:A11:42:_MANTECA-RIPON 115KV	P3	G-1/N-1	97	103	116	<100	<100	106	<100	<100	116	Continue to monitor future load forecast
33936 MELNS JB 115 33947 RIVRBKJT 115 1	P1-2:A11:54:_SCHULTE SW STA-LAMMERS 115KV & P1-2:A11:39:_SCHULTE SW STA-KASSON-MANTECA 115KV	P6	N-1/N-1	187	<100	91	<100	<100	<100	98	<100	91	Project: Vierra 115 kV Looping Project In-Service Date: Jan 2023 Short term: Action plan
33946 RVRBK J1 115 33944 RVRBANK 115 1	P1-2:A11:39:_SCHULTE SW STA-KASSON-MANTECA 115KV & P1-2:A11:54:_SCHULTE SW STA-LAMMERS 115KV	P6	N-1/N-1	118	<100	<100	<100	<100	<100	<100	<100	<100	Project: Vierra 115 kV Looping Project In-Service Date: Jan 2023 Short term: Action plan
33947 RIVRBKJT 115 33951 VLYHMTP1 115 1	P1-2:A11:54:_SCHULTE SW STA-LAMMERS 115KV & P1-2:A11:39:_SCHULTE SW STA-KASSON-MANTECA 115KV	P6	N-1/N-1	179	<100	87	<100	<100	<100	94	<100	87	Project: Vierra 115 kV Looping Project In-Service Date: Jan 2023 Short term: Action plan
	P1-2:A11:42:_MANTECA-RIPON 115KV	P1	N-1	93	99	111	3	7	102	50	14	111	Continue to monitor future load forecast
	P2-1:A11:20:_RPNJ2-RIPON 115KV [0] NO FAULT	P2	Line Section w/o Fault	93	99	111	3	7	102	50	14	111	Continue to monitor future load forecast
	P2-3:A11:103:_MANTECA 115KV - RING R4 & R5	P2	Non-Bus-Tie Breaker	93	99	111	3	7	102	51	14	111	Continue to monitor future load forecast
	P2-3:A11:105:_MANTECA 115KV - RING R6 & R5	P2	Non-Bus-Tie Breaker	93	99	111	3	7	102	50	14	111	Continue to monitor future load forecast
	P2-3:A11:19:_KASSON - 1D 115KV & SCHULTE SW STA-KASSON-MANTECA LINE	P2	Non-Bus-Tie Breaker	109	52	65	68	70	56	80	63	65	Project: Vierra 115 kV Looping Project In-Service Date: Jan 2023 Short term: Action plan

2019-2020 ISO Reliability Assessment - Study Results
Study Area: PG&E Central Valley
Thermal Overloads

California ISO

Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Loading % (Baseline Scenarios)					Loading % (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2021 SP Heavy Renewable & Min Gas Gen	2024 SpOP Hi Renew & Min Gas Gen	2029 Retirement of QF Generations	
	P1-1:A4:20:_WOLFSKIL 13.80KV GEN UNIT 1 & P1-2:A11:42:_MANTECA-RIPON 115KV	P3	G-1/N-1	93	99	111	<100	<100	102	<100	<100	111	Continue to monitor future load forecast
33950 RVRBK TP 115 33934 TULLOCH 115 1	P1-3:A11:10:_BELLOTA 230/115KV TB 1 & P1-3:A11:11:_BELLOTA 230/115KV TB 2	P6	N-1/N-1	229	251	218	<100	<100	238	116	<100	218	Existing operating procedure
	P2-4:A11:1:_BELLOTA 230KV - SECTION 1E & 2E	P2	Bus-Tie Breaker	229	251	218	29	25	238	116	20	218	SPS Recommended in 2017-2018 TPP
33950 RVRBK TP 115 33944 RVRBANK 115 1	P2-4:A11:1:_BELLOTA 230KV - SECTION 1E & 2E	P2	Bus-Tie Breaker	115	124	115	9	15	122	53	15	116	SPS Recommended in 2017-2018 TPP
	P1-3:A11:10:_BELLOTA 230/115KV TB 1 & P1-3:A11:11:_BELLOTA 230/115KV TB 2	P6	N-1/N-1	115	124	116	<100	<100	122	<100	<100	115	Existing operating procedure
33951 VLYHMTP1 115 33516 RPN JNCN 115 1	P1-2:A11:54:_SCHULTE SW STA-LAMMERS 115KV & P1-2:A11:39:_SCHULTE SW STA-KASSON-MANTECA 115KV	P6	N-1/N-1	139	<100	<100	<100	<100	<100	84	<100	<100	Project: Vierra 115 kV Looping Project In-Service Date: Jan 2023 Short term: Action plan
	P1-2:A11:38:_STANISLAUS-MELONES SW STA-MANTECA #1 115KV MOAS OPENED ON STANISLS_FRGTNTP1 (2)	P1	N-1	36	18	17	100	102	21	69	97	17	Gerneration redispatch
	P1-2:A12:11:_STANISLAUS-MELONES SW STA-MANTECA #1 115KV MOAS OPENED ON STANISLS_FRGTNTP1	P1	N-1	36	18	17	100	102	21	69	97	17	Gerneration redispatch
	P2-1:A11:10:_STANISLAUS-MELONES SW STA-MANTECA #1 115KV (MELNS JA-AVENATP1)	P2	Line Section w/o Fault	39	21	20	101	102	24	71	97	21	Gerneration redispatch
	P2-4:A11:13:_BELLOTA 115KV - SECTION 1D & 2D	P2	Bus-Tie Breaker	9	7	5	104	104	7	42	104	5	Gerneration redispatch
	P2-4:A11:7:_TESLA E 230KV - SECTION 2E & 1E	P2	Bus-Tie Breaker	23	7	5	101	104	9	60	101	6	Gerneration redispatch
33959 TCHRT_T2 115 33970 INGRM C. 115 1	P1-2:A11:39:_SCHULTE SW STA-KASSON-MANTECA 115KV & P1-2:A11:54:_SCHULTE SW STA-LAMMERS 115KV	P6	N-1/N-1	227	72	86	<100	<100	74	75	<100	85	Project: Vierra 115 kV Looping Project In-Service Date: Jan 2023 Short term: Action plan
	P2-3:A11:19:_KASSON - 1D 115KV & SCHULTE SW STA-KASSON-MANTECA LINE	P2	Non-Bus-Tie Breaker	135	62	76	37	35	64	50	38	76	Project: Vierra 115 kV Looping Project In-Service Date: Jan 2023 Short term: Action plan
33960 MDSTO CN 115 33962 SALDO TP 115 1	P1-2:A11:39:_SCHULTE SW STA-KASSON-MANTECA 115KV & P1-2:A11:54:_SCHULTE SW STA-LAMMERS 115KV	P6	N-1/N-1	158	<100	<100	<100	<100	<100	<100	<100	<100	Project: Vierra 115 kV Looping Project In-Service Date: Jan 2023 Short term: Action plan
33962 SALDO TP 115 33964 SALADO 115 1	P1-2:A11:39:_SCHULTE SW STA-KASSON-MANTECA 115KV & P1-2:A11:54:_SCHULTE SW STA-LAMMERS 115KV	P6	N-1/N-1	152	<100	<100	<100	<100	<100	<100	<100	<100	Project: Vierra 115 kV Looping Project In-Service Date: Jan 2023 Short term: Action plan
33965 SALADO J 115 33964 SALADO 115 1	P1-2:A11:39:_SCHULTE SW STA-KASSON-MANTECA 115KV & P1-2:A11:54:_SCHULTE SW STA-LAMMERS 115KV	P6	N-1/N-1	122	<100	<100	<100	<100	<100	76	<100	<100	Project: Vierra 115 kV Looping Project In-Service Date: Jan 2023 Short term: Action plan

2019-2020 ISO Reliability Assessment - Study Results
Study Area: PG&E Central Valley
Thermal Overloads

California ISO

Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Loading % (Baseline Scenarios)					Loading % (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2021 SP Heavy Renewable & Min Gas Gen	2024 SpOP Hi Renew & Min Gas Gen	2029 Retirement of QF Generations	
33970 INGRM C. 115 33965 SALADO J 115 1	P1-2:A11:39:_SCHULTE SW STA-KASSON-MANTECA 115KV & P1-2:A11:54:_SCHULTE SW STA-LAMMERS 115KV	P6	N-1/N-1	130	<100	<100	<100	<100	<100	81	<100	<100	Project: Vierra 115 kV Looping Project In-Service Date: Jan 2023 Short term: Action plan
34003 SALADO 60.0 34006 PATTERSN 60.0 1	P1-2:A12:16:_SALADO-CROWCREEK SS 60KV	P1	N-1	122	129	138	42	46	132	23	55	138	Line rating and load forecast under review
	P1-2:A12:17:_NEWMAN-CROWCREEK SS 60KV	P1	N-1	120	126	138	7	5	131	68	13	138	Line rating and load forecast under review
	P1-1:A4:20:_WOLFSKIL 13.80KV GEN UNIT 1 & P1-2:A12:18:_ 60KV	P3	G-1/N-1	121	128	140	<100	<100	132	<100	<100	140	Line rating and load forecast under review
34007 PATTERSN 60.0 34010 CRWS LDJ 60.0 1	P1-2:A12:16:_SALADO-CROWCREEK SS 60KV	P1	N-1	95	100	107	33	36	103	18	43	107	Continue to monitor future load forecast
	P1-2:A12:17:_NEWMAN-CROWCREEK SS 60KV	P1	N-1	93	98	107	6	4	101	53	10	107	Continue to monitor future load forecast
	P1-1:A4:20:_WOLFSKIL 13.80KV GEN UNIT 1 & P1-2:A12:18:_ 60KV	P3	G-1/N-1	94	100	109	<100	<100	103	<100	<100	109	Continue to monitor future load forecast
34009 STNSLSRP 60.0 34009 CROWCREEK SS 60.0 1	P1-2:A12:15:_SALADO-NEWMAN #2 60KV MOAS OPENED ON CRWS LDG_CRWS LDJ	P1	N-1	100	105	115	36	40	109	20	48	115	Disable automatics
	P1-1:A4:8:_SHILOH 0.60KV GEN UNIT 1 & P1-2:A12:15:_SALADO-NEWMAN #2 60KV MOAS OPENED ON CRWS LDG_CRWS LDJ	P3	G-1/N-1	100	105	115	<100	<100	109	<100	<100	116	Disable automatics
34010 CROWCREEK SS 60.0 34016 MEDLIN J 60.0 1	P1-2:A12:15:_SALADO-NEWMAN #2 60KV MOAS OPENED ON CRWS LDG_CRWS LDJ	P1	N-1	100	106	116	6	4	109	57	11	116	Disable automatics
	P1-1:A4:8:_SHILOH 0.60KV GEN UNIT 1 & P1-2:A12:15:_SALADO-NEWMAN #2 60KV MOAS OPENED ON CRWS LDG_CRWS LDJ	P3	G-1/N-1	100	106	116	<100	<100	109	<100	<100	116	Disable automatics
34011 CRWS LDJ 60.0 34012 GUSTN JT 60.0 1	P1-2:A12:16:_SALADO-CROWCREEK SS 60KV	P1	N-1	88	93	101	33	37	95	13	43	101	Continue to monitor future load forecast
	P1-2:A12:17:_NEWMAN-CROWCREEK SS 60KV	P1	N-1	86	91	101	4	5	94	48	11	101	Continue to monitor future load forecast
	P1-1:A4:20:_WOLFSKIL 13.80KV GEN UNIT 1 & P1-2:A12:18:_ 60KV	P3	G-1/N-1	<100	92	102	<100	<100	95	<100	<100	102	Continue to monitor future load forecast
34012 GUSTN JT 60.0 34014 NEWMAN 60.0 1	P1-2:A12:16:_SALADO-CROWCREEK SS 60KV	P1	N-1	88	93	101	33	37	95	13	43	101	Continue to monitor future load forecast
	P1-1:A4:20:_WOLFSKIL 13.80KV GEN UNIT 1 & P1-2:A12:18:_ 60KV	P3	G-1/N-1	<100	92	102	<100	<100	95	<100	<100	102	Continue to monitor future load forecast
34014 NEWMAN 60.0 34018 NWMN JCT 60.0 1	P1-2:A12:15:_SALADO-NEWMAN #2 60KV MOAS OPENED ON CRWS LDG_CRWS LDJ	P1	N-1	93	98	109	4	6	101	52	12	109	Continue to monitor future load forecast
	P1-1:A4:8:_SHILOH 0.60KV GEN UNIT 1 & P1-2:A12:15:_SALADO-NEWMAN #2 60KV MOAS OPENED ON CRWS LDG_CRWS LDJ	P3	G-1/N-1	93	98	109	<100	<100	101	<100	<100	109	Continue to monitor future load forecast
365930 Q653FJCT 115 31990 DAVIS 115 1	P1-2:A4:44:_RIO OSO-WEST SACRAMENTO 115KV & P1-2:A4:5:_RIO OSO-BRIGHTON 230KV	P6	N-1/N-1	102	<100	<100	<100	<100	<100	74	<100	<100	Project: Vaca Dixon Area Reinforcement Project In-Service Date: Feb 2022 Short term: Action plan
37649 LLNLAB 115 33574 LLNL TAP 115 1	P1-3:A11:16:_TESLA D 230/115KV TB 1	P1	N-1	6	8	11	79	84	6	13	100	11	Sensitivity only
	P2-2:A11:18:_TESLA D 230KV SECTION 2D	P2	Bus	14	14	4	80	84	12	7	100	5	Sensitivity only
	P2-3:A11:8:_TESLA D - 2D 230KV & DELTA SWITCHING YARD-TESLA LINE	P2	Non-Bus-Tie Breaker	14	14	4	80	84	12	7	100	5	Sensitivity only
	P2-4:A11:24:_TESLA E SECTION 1E & TESLA D SECTION 1D 230KV	P2	Bus-Tie Breaker	11	11	8	80	84	9	10	101	8	Sensitivity only

2019-2020 ISO Reliability Assessment - Study Results
Study Area: PG&E Central Valley
Thermal Overloads

Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Loading % (Baseline Scenarios)					Loading % (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2021 SP Heavy Renewable & Min Gas Gen	2024 SpOP Hi Renew & Min Gas Gen	2029 Retirement of QF Generations	
	P2-4:A11:8:_TESLA D 230KV - SECTION 1D & 2D	P2	Bus-Tie Breaker	21	35	72	164	171	40	54	201	73	SPS Recommended in 2017-2018 TPP
38206 COTTLE 230 37563 MELONES 230 1	P2-4:A11:4:_BELLOTA 230KV - SECTION 1D & 2D	P2	Bus-Tie Breaker	66	47	45	85	90	51	101	87	45	Sensitivity only
	P2-4:A5:2:_GOLDHILL 230KV - SECTION 2D & 1D	P2	Bus-Tie Breaker	Diverge	Diverge	Diverge	<100	<100	Diverge	Diverge	<100	Diverge	SPS Recommended in 2018-2019 TPP
	P2-4:A11:10:_TESLA 115KV - SECTION 2D & 1D	P2	Bus-Tie Breaker	Diverge	Diverge	Diverge	<100	<100	Diverge	Diverge	<100	Diverge	SPS Recommended in 2017-2018 TPP
	P7-1:A11:25:_RIO OSO-LOCKEFORD 230KV & LOCKEFORD-BELLOTA 230KV	P7	DCTL	Diverge	Diverge	<100	<100	<100	Diverge	Diverge	<100	<100	Project: Lockeford-Lodi Area 230 kV Development Project In-Service Date: Jul 2025 Short term: Action plan

Substation	Contingency (All and Worst P6)	Category	Category Description	Post Cont. Voltage Deviation PU (Baseline Scenarios)					Post Cont. Voltage Deviation PU (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2021 SP Heavy Renewable & Min Gas Gen	2024 SpOP Hi Renew & Min Gas Gen	2029 Retirement of QF Generations	
0227-WD 230	Base Case	P0	Base Case	1.00	1.00	0.98	**1.05**	1.05	1.00	1.00	**1.05**	0.98	Load power factor correction and voltage support if needed
AEC_300 115	Base Case	P0	Base Case	1.03	1.04	1.03	**1.05**	1.05	1.03	1.04	1.05	1.02	Load power factor correction and voltage support if needed
ALLEGHNY 60	Base Case	P0	Base Case	1.03	1.04	1.02	**1.08**	**1.07**	1.04	1.04	**1.08**	1.02	Load power factor correction and voltage support if needed
ALTA-CGE 60	Base Case	P0	Base Case	1.04	1.04	1.04	**1.07**	**1.06**	1.04	1.03	**1.06**	1.04	Load power factor correction and voltage support if needed
AM FORST 60	Base Case	P0	Base Case	1.03	1.04	1.03	1.05	1.05	1.03	1.03	**1.05**	1.02	Load power factor correction and voltage support if needed
AMERIGAS 115	Base Case	P0	Base Case	**1.06**	**1.07**	1.03	**1.09**	**1.08**	**1.07**	**1.07**	**1.08**	1.02	Load power factor correction and voltage support if needed
AMFOR_SW 60	Base Case	P0	Base Case	1.03	1.04	1.03	**1.05**	1.05	1.04	1.03	**1.05**	1.02	Load power factor correction and voltage support if needed
APPLE HL 115	Base Case	P0	Base Case	1.04	**1.05**	1.01	**1.12**	**1.12**	**1.05**	1.05	**1.13**	1.00	Load power factor correction and voltage support if needed
ARBALT 60	Base Case	P0	Base Case	0.97	0.97	0.99	**1.08**	1.00	0.97	1.00	1.00	0.98	Load power factor correction and voltage support if needed
ATLANTC 230	Base Case	P0	Base Case	0.98	1.00	0.97	**1.05**	1.04	1.00	1.00	**1.05**	0.97	Load power factor correction and voltage support if needed
ATLANTI 60	Base Case	P0	Base Case	1.03	1.05	0.98	**1.09**	**1.11**	1.05	**1.06**	**1.12**	0.98	Load power factor correction and voltage support if needed
ATLANTIC 115	Base Case	P0	Base Case	1.01	1.03	0.99	**1.08**	**1.07**	1.02	1.02	**1.07**	0.99	Load power factor correction and voltage support if needed
AVENA 115	Base Case	P0	Base Case	1.02	1.02	0.99	1.05	1.05	1.02	1.03	1.05	0.99	Load power factor correction and voltage support if needed
B.BTHNY- 60	Base Case	P0	Base Case	1.04	1.04	1.03	**1.07**	**1.06**	1.04	1.03	**1.06**	1.03	Load power factor correction and voltage support if needed
BANGOR 60	Base Case	P0	Base Case	1.03	1.04	1.02	**1.09**	**1.08**	1.04	1.04	**1.08**	1.02	Load power factor correction and voltage support if needed
BANTA 60	Base Case	P0	Base Case	**1.05**	**1.06**	1.01	**1.06**	**1.06**	**1.06**	**1.05**	**1.06**	1.01	Load power factor correction and voltage support if needed
BARRY 60	Base Case	P0	Base Case	1.03	1.03	0.99	**1.05**	1.04	1.03	1.03	1.04	0.99	Load power factor correction and voltage support if needed
BEALE_1 60	Base Case	P0	Base Case	1.02	1.03	1.03	**1.05**	1.04	1.03	1.02	1.05	1.03	Load power factor correction and voltage support if needed
BEALE_2 60	Base Case	P0	Base Case	1.02	1.02	1.02	**1.05**	1.04	1.02	1.01	1.05	1.02	Load power factor correction and voltage support if needed

Substation	Contingency (All and Worst P6)	Category	Category Description	Post Cont. Voltage Deviation PU (Baseline Scenarios)					Post Cont. Voltage Deviation PU (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2021 SP Heavy Renewable & Min Gas Gen	2024 SpOP Hi Renew & Min Gas Gen	2029 Retirement of QF Generations	
BELL PGE 115	Base Case	P0	Base Case	1.03	1.03	0.99	**1.11**	**1.10**	1.03	1.03	**1.11**	0.99	Load power factor correction and voltage support if needed
BELLOTA 115	Base Case	P0	Base Case	1.05	1.04	1.04	1.05	1.05	1.04	1.04	1.05	1.04	Load power factor correction and voltage support if needed
BELLOTA 230	Base Case	P0	Base Case	1.00	1.00	0.99	**1.06**	**1.05**	1.00	1.00	**1.06**	0.99	Load power factor correction and voltage support if needed
BOGUE 115	Base Case	P0	Base Case	1.02	1.03	1.02	**1.09**	**1.06**	1.03	1.02	**1.07**	1.01	Load power factor correction and voltage support if needed
BRIGHTN 115	Base Case	P0	Base Case	1.04	1.05	1.04	**1.05**	1.05	1.04	1.04	**1.05**	1.04	Load power factor correction and voltage support if needed
BRIGHTON 230	Base Case	P0	Base Case	0.98	1.00	0.96	**1.06**	1.05	1.00	1.00	**1.05**	0.96	Load power factor correction and voltage support if needed
BRKR SLG 115	Base Case	P0	Base Case	1.02	1.03	1.01	**1.06**	1.05	1.03	1.03	**1.05**	1.01	Load power factor correction and voltage support if needed
BRNSWALT 115	Base Case	P0	Base Case	1.01	1.02	1.03	**1.08**	1.05	1.02	1.02	**1.05**	1.03	Load power factor correction and voltage support if needed
BRUNSWCK 115	Base Case	P0	Base Case	1.02	1.02	1.02	**1.09**	**1.05**	1.02	1.02	**1.06**	1.02	Load power factor correction and voltage support if needed
BRWNS VY 60	Base Case	P0	Base Case	1.03	1.04	1.03	**1.06**	**1.06**	1.04	1.03	**1.06**	1.03	Load power factor correction and voltage support if needed
BUENAVISTA 60	Base Case	P0	Base Case	1.04	1.05	1.04	**1.06**	**1.06**	1.04	1.04	**1.06**	1.02	Load power factor correction and voltage support if needed
CAL CMNT 60	Base Case	P0	Base Case	1.03	1.03	1.03	**1.05**	1.05	1.03	1.03	**1.05**	1.03	Load power factor correction and voltage support if needed
CALVO 60	Base Case	P0	Base Case	1.05	**1.05**	1.01	**1.06**	**1.06**	**1.05**	1.05	**1.06**	1.01	Load power factor correction and voltage support if needed
CAMANCH 230	Base Case	P0	Base Case	1.01	1.01	1.00	**1.08**	**1.07**	1.01	1.00	**1.08**	0.99	Load power factor correction and voltage support if needed
CAMANCHE 115	Base Case	P0	Base Case	1.04	1.04	1.03	1.05	1.04	1.04	1.04	1.05	1.04	Load power factor correction and voltage support if needed
CAMANCPP 230	Base Case	P0	Base Case	1.01	1.01	1.00	**1.08**	**1.07**	1.01	1.00	**1.08**	0.99	Load power factor correction and voltage support if needed
CAMPUS 115	Base Case	P0	Base Case	1.02	1.03	1.00	**1.06**	1.05	1.02	1.03	**1.05**	1.00	Load power factor correction and voltage support if needed
CATARACT 115	Base Case	P0	Base Case	1.03	1.03	1.02	**1.06**	**1.06**	1.03	1.04	**1.06**	1.02	Load power factor correction and voltage support if needed
CDCRSTN 115	Base Case	P0	Base Case	1.03	1.03	1.02	1.04	1.04	1.03	1.02	1.04	1.02	Load power factor correction and voltage support if needed

Substation	Contingency (All and Worst P6)	Category	Category Description	Post Cont. Voltage Deviation PU (Baseline Scenarios)					Post Cont. Voltage Deviation PU (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2021 SP Heavy Renewable & Min Gas Gen	2024 SpOP Hi Renew & Min Gas Gen	2029 Retirement of QF Generations	
CH.STN 115	Base Case	P0	Base Case	1.03	1.02	1.01	1.05	1.05	1.02	1.03	1.06	1.01	Load power factor correction and voltage support if needed
CHCGO PK 115	Base Case	P0	Base Case	1.04	1.04	1.02	1.10	1.07	1.04	1.04	1.08	1.02	Load power factor correction and voltage support if needed
CHLLNGEA 60	Base Case	P0	Base Case	1.05	1.06	1.04	1.08	1.07	1.06	1.05	1.07	1.04	Load power factor correction and voltage support if needed
CISCO GR 60	Base Case	P0	Base Case	1.04	1.04	1.03	1.06	1.03	1.04	1.04	1.02	1.03	Load power factor correction and voltage support if needed
CL AMMNA 115	Base Case	P0	Base Case	1.02	1.03	1.00	1.05	1.04	1.03	1.03	1.05	1.00	Load power factor correction and voltage support if needed
CLAY 60	Base Case	P0	Base Case	1.04	1.05	1.03	1.06	1.06	1.04	1.04	1.06	1.01	Load power factor correction and voltage support if needed
CLMBA HL 60	Base Case	P0	Base Case	1.04	1.05	1.03	1.08	1.07	1.05	1.05	1.07	1.03	Load power factor correction and voltage support if needed
CLRKSVLE 115	Base Case	P0	Base Case	1.03	1.05	1.01	1.12	1.12	1.05	1.04	1.13	1.00	Load power factor correction and voltage support if needed
CLSA CRS 60	Base Case	P0	Base Case	0.98	0.98	0.97	1.04	1.07	0.98	1.07	1.08	0.96	Load power factor correction and voltage support if needed
CMP FRWT 60	Base Case	P0	Base Case	1.04	1.04	1.03	1.05	1.04	1.04	1.03	1.04	1.03	Load power factor correction and voltage support if needed
CNTRY CB 60	Base Case	P0	Base Case	1.04	1.05	1.03	1.05	1.06	1.05	1.04	1.06	1.03	Load power factor correction and voltage support if needed
COLGATE 60	Base Case	P0	Base Case	1.05	1.06	1.04	1.08	1.07	1.05	1.05	1.07	1.04	Load power factor correction and voltage support if needed
COLGATEA 60	Base Case	P0	Base Case	1.05	1.06	1.04	1.08	1.07	1.06	1.05	1.07	1.04	Load power factor correction and voltage support if needed
COLUSA 60	Base Case	P0	Base Case	0.98	0.98	0.97	1.04	1.08	0.98	1.07	1.08	0.95	Load power factor correction and voltage support if needed
CORDELIA 115	Base Case	P0	Base Case	1.06	1.07	1.01	1.09	1.09	1.07	1.06	1.09	1.01	Load power factor correction and voltage support if needed
CORRAL 60	Base Case	P0	Base Case	1.00	1.01	0.99	1.05	1.04	1.00	1.01	1.05	0.99	Load power factor correction and voltage support if needed
CORT_D 115	Base Case	P0	Base Case	1.05	1.05	1.03	1.09	1.08	1.05	1.08	1.08	1.02	Load power factor correction and voltage support if needed
CORTINA 115	Base Case	P0	Base Case	1.05	1.05	1.03	1.09	1.08	1.05	1.08	1.08	1.02	Load power factor correction and voltage support if needed
CPM 115	Base Case	P0	Base Case	1.04	1.06	1.02	1.12	1.11	1.06	1.05	1.12	1.01	Load power factor correction and voltage support if needed

Study Area: PG&E Central Valley

High/Low Voltages

Substation	Contingency (All and Worst P6)	Category	Category Description	Post Cont. Voltage Deviation PU (Baseline Scenarios)					Post Cont. Voltage Deviation PU (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2021 SP Heavy Renewable & Min Gas Gen	2024 SpOP Hi Renew & Min Gas Gen	2029 Retirement of QF Generations	
CRWS LDG 60	Base Case	P0	Base Case	1.01	1.01	0.99	1.05	1.05	1.00	1.03	1.06	0.99	Load power factor correction and voltage support if needed
CURTISS 115	Base Case	P0	Base Case	1.02	1.02	1.00	1.04	1.05	1.02	1.02	1.05	1.00	Load power factor correction and voltage support if needed
DAVIS 115	Base Case	P0	Base Case	1.02	1.03	1.00	1.06	1.05	1.03	1.03	1.05	1.00	Load power factor correction and voltage support if needed
DEEPWATR 115	Base Case	P0	Base Case	1.03	1.04	1.02	1.06	1.05	1.04	1.05	1.05	1.02	Load power factor correction and voltage support if needed
DEL MAR 60	Base Case	P0	Base Case	1.02	1.04	0.96	1.06	1.11	1.04	1.06	1.12	0.96	Load power factor correction and voltage support if needed
DELEVAN 60	Base Case	P0	Base Case	0.98	0.99	0.98	1.04	1.06	0.98	1.06	1.07	0.97	Load power factor correction and voltage support if needed
DIMOND_1 115	Base Case	P0	Base Case	1.05	1.06	1.01	1.12	1.12	1.05	1.05	1.13	1.01	Load power factor correction and voltage support if needed
DIMOND_2 115	Base Case	P0	Base Case	1.03	1.05	1.00	1.12	1.12	1.05	1.04	1.13	1.00	Load power factor correction and voltage support if needed
DIST2047 60	Base Case	P0	Base Case	0.90	0.90	0.92	1.16	0.94	0.90	0.94	0.94	0.91	Load forecast under review
DIXONCAN 60	Base Case	P0	Base Case	1.07	1.08	1.00	1.07	1.07	1.08	1.07	1.08	1.00	Load power factor correction and voltage support if needed
DIXONPGE 60	Base Case	P0	Base Case	1.07	1.08	1.01	1.07	1.08	1.08	1.08	1.08	1.00	Load power factor correction and voltage support if needed
DMND SPR 115	Base Case	P0	Base Case	1.03	1.05	1.00	1.12	1.12	1.05	1.04	1.13	1.00	Load power factor correction and voltage support if needed
DOBBINS 60	Base Case	P0	Base Case	1.05	1.06	1.04	1.08	1.07	1.06	1.05	1.07	1.04	Load power factor correction and voltage support if needed
DRUM 115	Base Case	P0	Base Case	1.04	1.04	1.04	1.09	1.06	1.04	1.04	1.06	1.04	Load power factor correction and voltage support if needed
DTCH FL1 115	Base Case	P0	Base Case	1.04	1.04	1.03	1.09	1.06	1.04	1.04	1.07	1.03	Load power factor correction and voltage support if needed
DTCH FL2 115	Base Case	P0	Base Case	1.03	1.04	1.04	1.09	1.05	1.04	1.04	1.06	1.03	Load power factor correction and voltage support if needed
E.MRYSVE 115	Base Case	P0	Base Case	1.03	1.05	1.02	1.09	1.07	1.05	1.03	1.07	1.02	Load power factor correction and voltage support if needed
E.NICOLS 115	Base Case	P0	Base Case	1.03	1.05	1.03	1.09	1.06	1.04	1.04	1.06	1.03	Load power factor correction and voltage support if needed
EIGHT MI 230	Base Case	P0	Base Case	1.01	1.02	0.99	1.06	1.05	1.02	1.01	1.06	0.99	Load power factor correction and voltage support if needed
ELDORAD 115	Base Case	P0	Base Case	1.04	1.05	1.01	1.12	1.12	1.05	1.05	1.13	1.01	Load power factor correction and voltage support if needed

Substation	Contingency (All and Worst P6)	Category	Category Description	Post Cont. Voltage Deviation PU (Baseline Scenarios)					Post Cont. Voltage Deviation PU (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2021 SP Heavy Renewable & Min Gas Gen	2024 SpOP Hi Renew & Min Gas Gen	2029 Retirement of QF Generations	
ELECTRA 230	Base Case	P0	Base Case	1.02	1.02	1.01	**1.06**	**1.05**	1.02	1.01	**1.06**	1.01	Load power factor correction and voltage support if needed
ELLS GTY 115	Base Case	P0	Base Case	1.03	1.03	1.02	**1.05**	1.05	1.03	1.04	1.05	1.02	Load power factor correction and voltage support if needed
ENVRO_HY 60	Base Case	P0	Base Case	1.00	1.00	0.99	1.05	1.00	1.00	1.01	1.01	0.99	Load power factor correction and voltage support if needed
FLINT 115	Base Case	P0	Base Case	1.03	1.04	1.00	**1.11**	**1.10**	1.04	1.03	**1.11**	1.00	Load power factor correction and voltage support if needed
FLINT1 115	Base Case	P0	Base Case	1.03	1.04	1.00	**1.11**	**1.10**	1.04	1.03	**1.12**	1.00	Load power factor correction and voltage support if needed
FLINT2 115	Base Case	P0	Base Case	1.03	1.04	1.00	**1.11**	**1.10**	1.04	1.03	**1.11**	1.00	Load power factor correction and voltage support if needed
FLOWIND2 230	Base Case	P0	Base Case	1.03	1.03	1.02	**1.05**	1.05	1.03	1.02	**1.05**	1.01	Load power factor correction and voltage support if needed
FLTN JCT 115	Base Case	P0	Base Case	**1.06**	**1.07**	1.03	**1.09**	**1.08**	**1.07**	**1.07**	**1.09**	1.02	Load power factor correction and voltage support if needed
FORST HL 60	Base Case	P0	Base Case	1.00	1.00	0.98	1.05	1.00	1.00	1.00	1.01	0.98	Load power factor correction and voltage support if needed
FROGTOWN 115	Base Case	P0	Base Case	1.03	1.03	1.01	**1.06**	**1.06**	1.03	1.03	**1.06**	1.01	Load power factor correction and voltage support if needed
GLEAF 1 115	Base Case	P0	Base Case	1.03	1.04	1.03	**1.09**	**1.06**	1.04	1.03	**1.06**	1.03	Load power factor correction and voltage support if needed
GOLDHILL 115	Base Case	P0	Base Case	1.04	**1.06**	1.02	**1.12**	**1.11**	**1.06**	1.05	**1.12**	1.02	Load power factor correction and voltage support if needed
GOLDHILL 230	Base Case	P0	Base Case	0.99	1.00	0.97	**1.06**	**1.05**	1.00	1.00	**1.06**	0.97	Load power factor correction and voltage support if needed
GRAND IS 115	Base Case	P0	Base Case	1.02	1.03	1.02	1.05	**1.05**	1.03	1.04	**1.05**	1.02	Load power factor correction and voltage support if needed
GRANITE 115	Base Case	P0	Base Case	1.02	1.03	1.01	1.05	1.04	1.03	1.03	1.05	1.01	Load power factor correction and voltage support if needed
GRSS VLY 60	Base Case	P0	Base Case	1.03	1.04	1.02	**1.08**	**1.07**	1.04	1.03	**1.07**	1.02	Load power factor correction and voltage support if needed
GWFTRACY 115	Base Case	P0	Base Case	1.03	1.04	1.03	**1.06**	**1.05**	1.04	1.03	**1.05**	1.03	Load power factor correction and voltage support if needed
HALE 115	Base Case	P0	Base Case	**1.06**	**1.07**	1.01	**1.09**	**1.09**	**1.07**	**1.06**	**1.09**	1.00	Load power factor correction and voltage support if needed
HALE2 115	Base Case	P0	Base Case	**1.06**	**1.07**	1.01	**1.09**	**1.09**	**1.07**	**1.06**	**1.09**	1.00	Load power factor correction and voltage support if needed

Substation	Contingency (All and Worst P6)	Category	Category Description	Post Cont. Voltage Deviation PU (Baseline Scenarios)					Post Cont. Voltage Deviation PU (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2021 SP Heavy Renewable & Min Gas Gen	2024 SpOP Hi Renew & Min Gas Gen	2029 Retirement of QF Generations	
HAMMER 60	Base Case	P0	Base Case	1.04	1.04	1.03	1.06	1.06	1.04	1.04	1.06	1.03	Load power factor correction and voltage support if needed
HERDLYN 60	Base Case	P0	Base Case	1.04	1.04	1.03	1.07	1.06	1.04	1.03	1.07	1.03	Load power factor correction and voltage support if needed
HIGGINS 115	Base Case	P0	Base Case	1.03	1.03	1.00	1.11	1.09	1.03	1.03	1.10	1.00	Load power factor correction and voltage support if needed
HJ HEINZ 115	Base Case	P0	Base Case	1.02	1.02	1.00	1.04	1.04	1.02	1.02	1.04	1.00	Load power factor correction and voltage support if needed
HORSESHE 115	Base Case	P0	Base Case	1.03	1.05	1.01	1.11	1.11	1.04	1.03	1.12	1.00	Load power factor correction and voltage support if needed
HORSHE1 115	Base Case	P0	Base Case	1.03	1.05	1.01	1.11	1.11	1.04	1.03	1.12	1.00	Load power factor correction and voltage support if needed
HORSHE2 115	Base Case	P0	Base Case	1.04	1.05	1.01	1.11	1.11	1.05	1.04	1.12	1.01	Load power factor correction and voltage support if needed
HUSTD 60	Base Case	P0	Base Case	1.00	1.00	1.02	1.06	1.02	1.00	1.02	1.02	1.01	Load power factor correction and voltage support if needed
INE PRSN 60	Base Case	P0	Base Case	1.03	1.03	1.02	1.05	1.05	1.03	1.03	1.06	1.00	Load power factor correction and voltage support if needed
INE_TP 60	Base Case	P0	Base Case	1.04	1.04	1.03	1.06	1.05	1.04	1.04	1.06	1.01	Load power factor correction and voltage support if needed
JAMESN-A 115	Base Case	P0	Base Case	1.06	1.07	1.01	1.08	1.08	1.07	1.05	1.08	1.01	Load power factor correction and voltage support if needed
JAMESON 115	Base Case	P0	Base Case	1.06	1.07	1.00	1.09	1.09	1.07	1.06	1.09	1.00	Load power factor correction and voltage support if needed
KASSON 60	Base Case	P0	Base Case	1.05	1.06	1.01	1.06	1.06	1.06	1.05	1.06	1.01	Load power factor correction and voltage support if needed
KASSON 115	Base Case	P0	Base Case	1.02	1.03	1.00	1.05	1.04	1.03	1.03	1.04	1.00	Load power factor correction and voltage support if needed
KELSO 230	Base Case	P0	Base Case	1.02	1.02	1.01	1.05	1.04	1.02	1.02	1.05	1.01	Load power factor correction and voltage support if needed
KNIGHT1 115	Base Case	P0	Base Case	1.02	1.03	1.01	1.08	1.05	1.03	1.03	1.05	1.01	Load power factor correction and voltage support if needed
KNIGHT2 115	Base Case	P0	Base Case	1.02	1.03	1.01	1.08	1.05	1.03	1.03	1.05	1.01	Load power factor correction and voltage support if needed
KNIGHTLD 115	Base Case	P0	Base Case	1.02	1.03	1.01	1.08	1.05	1.03	1.03	1.05	1.01	Load power factor correction and voltage support if needed
LAMMERS 115	Base Case	P0	Base Case	1.03	1.03	1.02	1.06	1.05	1.03	1.03	1.05	1.02	Load power factor correction and voltage support if needed

Substation	Contingency (All and Worst P6)	Category	Category Description	Post Cont. Voltage Deviation PU (Baseline Scenarios)					Post Cont. Voltage Deviation PU (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2021 SP Heavy Renewable & Min Gas Gen	2024 SpOP Hi Renew & Min Gas Gen	2029 Retirement of QF Generations	
LEPRINO 115	Base Case	P0	Base Case	1.02	1.02	1.00	1.04	1.04	1.02	1.02	1.04	1.00	Load power factor correction and voltage support if needed
LIMESTNE 60	Base Case	P0	Base Case	1.01	1.02	1.03	**1.05**	**1.05**	1.02	1.02	**1.05**	1.03	Load power factor correction and voltage support if needed
LINCLN 115	Base Case	P0	Base Case	1.02	1.03	1.01	**1.08**	**1.06**	1.03	1.03	**1.06**	1.01	Load power factor correction and voltage support if needed
LLNL TAP 115	Base Case	P0	Base Case	1.03	1.04	1.03	**1.06**	1.05	1.04	1.04	**1.05**	1.02	Load power factor correction and voltage support if needed
LOUISE 60	Base Case	P0	Base Case	1.04	1.05	1.00	1.05	1.05	1.04	1.04	**1.05**	1.00	Load power factor correction and voltage support if needed
LYOTH-SP 60	Base Case	P0	Base Case	**1.05**	**1.06**	1.01	**1.06**	**1.06**	**1.06**	**1.05**	**1.06**	1.01	Load power factor correction and voltage support if needed
MADISON 115	Base Case	P0	Base Case	**1.06**	**1.07**	1.01	**1.09**	**1.09**	**1.07**	**1.06**	**1.09**	1.01	Load power factor correction and voltage support if needed
MAINE-PR 60	Base Case	P0	Base Case	**1.07**	**1.08**	1.02	**1.07**	**1.08**	**1.08**	**1.07**	**1.08**	1.01	Load power factor correction and voltage support if needed
MANTECA 115	Base Case	P0	Base Case	1.02	1.03	0.99	1.04	1.04	1.02	1.02	1.04	0.99	Load power factor correction and voltage support if needed
MARIPOSA 230	Base Case	P0	Base Case	1.02	1.02	1.01	1.05	1.04	1.02	1.02	1.05	1.01	Load power factor correction and voltage support if needed
MARTELL 60	Base Case	P0	Base Case	1.03	1.04	1.03	**1.05**	1.05	1.04	1.03	**1.05**	1.02	Load power factor correction and voltage support if needed
MAXWELL 60	Base Case	P0	Base Case	0.98	0.99	0.98	1.04	**1.06**	0.98	**1.06**	**1.07**	0.97	Load power factor correction and voltage support if needed
MCSP 60	Base Case	P0	Base Case	1.03	1.03	1.02	**1.05**	1.05	1.03	1.03	**1.06**	1.00	Load power factor correction and voltage support if needed
MDSTO CN 115	Base Case	P0	Base Case	1.03	1.03	1.01	**1.05**	1.05	1.03	1.03	1.05	1.01	Load power factor correction and voltage support if needed
MDWYWND 115	Base Case	P0	Base Case	1.04	1.04	1.03	**1.06**	1.05	1.04	1.04	**1.05**	1.03	Load power factor correction and voltage support if needed
MELONES 115	Base Case	P0	Base Case	1.03	1.03	1.01	**1.05**	**1.06**	1.03	1.03	**1.06**	1.01	Load power factor correction and voltage support if needed
MERIDIAN 60	Base Case	P0	Base Case	0.99	0.99	0.98	1.04	**1.06**	0.99	1.03	**1.06**	0.97	Load power factor correction and voltage support if needed
METTLER 60	Base Case	P0	Base Case	1.02	1.03	1.02	**1.05**	**1.06**	1.03	1.03	**1.06**	1.02	Load power factor correction and voltage support if needed
MIDLFORK 230	Base Case	P0	Base Case	1.01	1.02	1.00	**1.06**	**1.05**	1.02	1.02	**1.06**	1.00	Load power factor correction and voltage support if needed

Substation	Contingency (All and Worst P6)	Category	Category Description	Post Cont. Voltage Deviation PU (Baseline Scenarios)					Post Cont. Voltage Deviation PU (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2021 SP Heavy Renewable & Min Gas Gen	2024 SpOP Hi Renew & Min Gas Gen	2029 Retirement of QF Generations	
MILLER 115	Base Case	P0	Base Case	1.02	1.02	1.01	1.06	1.05	1.02	1.04	1.06	1.01	Load power factor correction and voltage support if needed
MIZOU_T1 115	Base Case	P0	Base Case	1.05	1.06	1.01	1.12	1.12	1.05	1.05	1.13	1.01	Load power factor correction and voltage support if needed
MIZOU_T2 115	Base Case	P0	Base Case	1.03	1.05	1.00	1.12	1.12	1.05	1.04	1.13	1.00	Load power factor correction and voltage support if needed
MOBILCHE 115	Base Case	P0	Base Case	1.02	1.03	1.00	1.08	1.05	1.03	1.03	1.05	1.00	Load power factor correction and voltage support if needed
MSHR 60V 60	Base Case	P0	Base Case	1.03	1.03	1.01	1.06	1.06	1.03	1.02	1.06	1.01	Load power factor correction and voltage support if needed
MSSDLESW 60	Base Case	P0	Base Case	1.04	1.05	1.01	1.05	1.05	1.05	1.04	1.05	1.01	Load power factor correction and voltage support if needed
N BRANCH 60	Base Case	P0	Base Case	1.04	1.04	1.04	1.05	1.05	1.04	1.04	1.05	1.04	Load power factor correction and voltage support if needed
N.HOGAN 60	Base Case	P0	Base Case	1.03	1.03	1.02	1.05	1.05	1.03	1.03	1.05	1.02	Load power factor correction and voltage support if needed
NARRWS 1 60	Base Case	P0	Base Case	1.03	1.04	1.02	1.07	1.06	1.04	1.03	1.06	1.02	Load power factor correction and voltage support if needed
NARRWS 2 60	Base Case	P0	Base Case	1.04	1.04	1.03	1.07	1.06	1.04	1.04	1.06	1.03	Load power factor correction and voltage support if needed
NEWCSTL1 115	Base Case	P0	Base Case	1.03	1.04	1.00	1.11	1.10	1.04	1.03	1.12	1.00	Load power factor correction and voltage support if needed
NEWCSTL2 115	Base Case	P0	Base Case	1.03	1.04	1.00	1.11	1.10	1.04	1.04	1.12	1.00	Load power factor correction and voltage support if needed
NEWCSTLE 115	Base Case	P0	Base Case	1.03	1.04	1.00	1.11	1.10	1.04	1.03	1.12	1.00	Load power factor correction and voltage support if needed
OI GLASS 115	Base Case	P0	Base Case	1.03	1.03	1.02	1.06	1.05	1.03	1.03	1.05	1.02	Load power factor correction and voltage support if needed
OLETA 60	Base Case	P0	Base Case	0.97	0.97	1.00	1.06	1.06	0.97	0.98	1.07	1.00	Load power factor correction and voltage support if needed
OLIVHRST 115	Base Case	P0	Base Case	1.01	1.03	1.00	1.06	1.05	1.03	1.02	1.05	1.00	Load power factor correction and voltage support if needed
OXBOW 60	Base Case	P0	Base Case	1.01	1.01	0.99	1.05	1.00	1.00	1.01	1.01	0.99	Load power factor correction and voltage support if needed
P.GRVEJ. 60	Base Case	P0	Base Case	1.04	1.04	1.02	1.07	1.06	1.04	1.03	1.07	1.03	Load power factor correction and voltage support if needed
PARDEE A 60	Base Case	P0	Base Case	1.05	1.05	1.05	1.06	1.05	1.05	1.05	1.06	1.05	Load power factor correction and voltage support if needed

Substation	Contingency (All and Worst P6)	Category	Category Description	Post Cont. Voltage Deviation PU (Baseline Scenarios)					Post Cont. Voltage Deviation PU (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2021 SP Heavy Renewable & Min Gas Gen	2024 SpOP Hi Renew & Min Gas Gen	2029 Retirement of QF Generations	
PATTERSN 60	Base Case	P0	Base Case	1.03	1.02	1.01	1.05	1.05	1.02	1.04	1.06	1.01	Load power factor correction and voltage support if needed
PEASE 115	Base Case	P0	Base Case	1.00	1.02	0.99	1.05	1.04	1.02	1.02	1.05	0.99	Load power factor correction and voltage support if needed
PEORIA 115	Base Case	P0	Base Case	1.02	1.02	1.01	1.05	1.05	1.02	1.03	1.06	1.01	Load power factor correction and voltage support if needed
PIKE CTY 60	Base Case	P0	Base Case	1.04	1.05	1.02	1.08	1.07	1.05	1.05	1.08	1.02	Load power factor correction and voltage support if needed
PLACER 115	Base Case	P0	Base Case	1.03	1.04	0.99	1.11	1.10	1.03	1.03	1.11	0.99	Load power factor correction and voltage support if needed
PLSNT GR 115	Base Case	P0	Base Case	1.01	1.02	0.99	1.08	1.06	1.02	1.02	1.07	0.99	Load power factor correction and voltage support if needed
PLUMAS 60	Base Case	P0	Base Case	1.02	1.02	0.97	1.05	1.05	1.02	1.03	1.05	0.97	Load power factor correction and voltage support if needed
PNE GRVE 60	Base Case	P0	Base Case	1.03	1.04	1.02	1.07	1.06	1.03	1.03	1.07	1.02	Load power factor correction and voltage support if needed
POST 115	Base Case	P0	Base Case	1.03	1.04	1.02	1.06	1.05	1.04	1.05	1.05	1.02	Load power factor correction and voltage support if needed
PPASSWND 230	Base Case	P0	Base Case	1.02	1.03	1.02	1.05	1.05	1.03	1.02	1.05	1.02	Load power factor correction and voltage support if needed
PRDESWS 60	Base Case	P0	Base Case	1.04	1.05	1.04	1.06	1.06	1.04	1.05	1.06	1.03	Load power factor correction and voltage support if needed
PUTH CRK 115	Base Case	P0	Base Case	1.06	1.07	1.03	1.09	1.09	1.07	1.07	1.09	1.02	Load power factor correction and voltage support if needed
PUTHCRK1 115	Base Case	P0	Base Case	1.06	1.07	1.03	1.09	1.08	1.07	1.07	1.09	1.02	Load power factor correction and voltage support if needed
Q1103 115	Base Case	P0	Base Case	1.02	1.02	1.01	1.06	1.06	1.02	1.04	1.06	1.01	Load power factor correction and voltage support if needed
Q653F 115	Base Case	P0	Base Case	1.02	1.03	1.00	1.07	1.05	1.03	1.03	1.05	1.00	Load power factor correction and voltage support if needed
R.TRACK 115	Base Case	P0	Base Case	1.03	1.03	1.01	1.06	1.05	1.02	1.03	1.06	1.01	Load power factor correction and voltage support if needed
RALPH 230	Base Case	P0	Base Case	1.02	1.02	1.01	1.05	1.04	1.02	1.02	1.05	1.01	Load power factor correction and voltage support if needed
RALSTON 230	Base Case	P0	Base Case	1.01	1.02	1.00	1.06	1.05	1.02	1.01	1.06	1.00	Load power factor correction and voltage support if needed
RICE 60	Base Case	P0	Base Case	0.98	0.98	0.98	1.05	1.06	0.98	1.02	1.07	0.98	Load power factor correction and voltage support if needed

Study Area: PG&E Central Valley

High/Low Voltages

Substation	Contingency (All and Worst P6)	Category	Category Description	Post Cont. Voltage Deviation PU (Baseline Scenarios)					Post Cont. Voltage Deviation PU (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2021 SP Heavy Renewable & Min Gas Gen	2024 SpOP Hi Renew & Min Gas Gen	2029 Retirement of QF Generations	
RIO OSO 115	Base Case	P0	Base Case	1.03	1.05	1.04	1.09	1.05	1.04	1.04	1.05	1.04	Load power factor correction and voltage support if needed
ROCKLIN 60	Base Case	P0	Base Case	1.03	1.05	0.98	1.09	1.11	1.05	1.06	1.12	0.98	Load power factor correction and voltage support if needed
RVRBANK 115	Base Case	P0	Base Case	1.04	1.04	1.02	1.05	1.06	1.04	1.04	1.06	1.03	Load power factor correction and voltage support if needed
SAFEWAY 115	Base Case	P0	Base Case	1.03	1.04	1.03	1.06	1.05	1.04	1.03	1.05	1.03	Load power factor correction and voltage support if needed
SALADO 60	Base Case	P0	Base Case	1.04	1.03	1.02	1.05	1.05	1.03	1.05	1.05	1.02	Load power factor correction and voltage support if needed
SALADO 115	Base Case	P0	Base Case	1.02	1.03	1.01	1.05	1.05	1.02	1.03	1.05	1.01	Load power factor correction and voltage support if needed
SALDO TP 115	Base Case	P0	Base Case	1.02	1.03	1.01	1.05	1.05	1.03	1.04	1.05	1.01	Load power factor correction and voltage support if needed
SCHMLBCH 115	Base Case	P0	Base Case	1.06	1.07	1.01	1.08	1.08	1.07	1.05	1.08	1.01	Load power factor correction and voltage support if needed
SCHULTE 115	Base Case	P0	Base Case	1.03	1.04	1.03	1.06	1.05	1.04	1.03	1.05	1.03	Load power factor correction and voltage support if needed
SHPRING 115	Base Case	P0	Base Case	1.04	1.06	1.01	1.12	1.12	1.05	1.04	1.13	1.01	Load power factor correction and voltage support if needed
SHPRING1 115	Base Case	P0	Base Case	1.05	1.06	1.01	1.12	1.12	1.05	1.05	1.13	1.01	Load power factor correction and voltage support if needed
SHPRING2 115	Base Case	P0	Base Case	1.04	1.05	1.01	1.12	1.11	1.05	1.04	1.13	1.01	Load power factor correction and voltage support if needed
SIERRAPI 60	Base Case	P0	Base Case	1.02	1.04	0.96	1.06	1.11	1.04	1.06	1.12	0.96	Load power factor correction and voltage support if needed
SMRTSVLE 60	Base Case	P0	Base Case	1.03	1.04	1.03	1.06	1.05	1.04	1.03	1.06	1.03	Load power factor correction and voltage support if needed
SOUTH BY 60	Base Case	P0	Base Case	1.03	1.03	1.03	1.06	1.06	1.03	1.03	1.06	1.03	Load power factor correction and voltage support if needed
SP CMPNY 115	Base Case	P0	Base Case	1.04	1.04	1.01	1.05	1.05	1.04	1.04	1.05	1.01	Load power factor correction and voltage support if needed
SPICAMIN 115	Base Case	P0	Base Case	1.04	1.05	1.01	1.12	1.12	1.05	1.05	1.13	1.00	Load power factor correction and voltage support if needed
SPI-LINC 115	Base Case	P0	Base Case	1.02	1.03	1.01	1.08	1.06	1.03	1.03	1.06	1.01	Load power factor correction and voltage support if needed
SPISONORA 115	Base Case	P0	Base Case	1.02	1.02	1.00	1.04	1.05	1.02	1.02	1.05	1.00	Load power factor correction and voltage support if needed

Substation	Contingency (All and Worst P6)	Category	Category Description	Post Cont. Voltage Deviation PU (Baseline Scenarios)					Post Cont. Voltage Deviation PU (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2021 SP Heavy Renewable & Min Gas Gen	2024 SpOP Hi Renew & Min Gas Gen	2029 Retirement of QF Generations	
STAGG 60	Base Case	P0	Base Case	1.04	1.05	1.04	**1.05**	**1.06**	1.05	1.04	**1.06**	1.04	Load power factor correction and voltage support if needed
STAGG-D 230	Base Case	P0	Base Case	1.01	1.01	0.99	**1.05**	1.05	1.01	1.01	**1.05**	0.99	Load power factor correction and voltage support if needed
STAGG-E 230	Base Case	P0	Base Case	1.01	1.01	0.99	**1.05**	1.05	1.01	1.01	**1.05**	0.99	Load power factor correction and voltage support if needed
STAGG-F 230	Base Case	P0	Base Case	1.01	1.02	0.99	**1.06**	1.05	1.01	1.01	**1.05**	0.99	Load power factor correction and voltage support if needed
STAGG-H 230	Base Case	P0	Base Case	1.01	1.02	0.99	**1.06**	1.05	1.01	1.01	**1.06**	0.99	Load power factor correction and voltage support if needed
STANISLS 115	Base Case	P0	Base Case	1.04	1.04	1.02	**1.06**	**1.06**	1.04	1.04	**1.06**	1.02	Load power factor correction and voltage support if needed
STKTON A 115	Base Case	P0	Base Case	1.03	1.02	1.01	1.04	1.04	1.02	1.02	1.04	1.02	Load power factor correction and voltage support if needed
STKTON B 115	Base Case	P0	Base Case	1.04	1.04	1.02	1.04	1.04	1.03	1.03	1.05	1.03	Load power factor correction and voltage support if needed
STN COGN 115	Base Case	P0	Base Case	1.03	1.02	1.02	1.04	1.04	1.03	1.02	1.04	1.02	Load power factor correction and voltage support if needed
STNSLSRP 60	Base Case	P0	Base Case	1.04	1.03	1.02	**1.06**	**1.06**	1.03	**1.05**	**1.06**	1.02	Load power factor correction and voltage support if needed
SUISUN 115	Base Case	P0	Base Case	**1.06**	**1.07**	1.01	**1.08**	**1.08**	**1.07**	1.05	**1.08**	1.01	Load power factor correction and voltage support if needed
SUMMIT 60	Base Case	P0	Base Case	1.04	1.04	1.04	**1.07**	1.03	1.04	1.05	1.03	1.04	Load power factor correction and voltage support if needed
TAMARACK 60	Base Case	P0	Base Case	1.04	1.04	1.04	**1.06**	1.03	1.04	1.04	1.02	1.04	Load power factor correction and voltage support if needed
TAYLOR 60	Base Case	P0	Base Case	1.03	**1.05**	0.98	**1.09**	**1.11**	1.05	**1.06**	**1.12**	0.98	Load power factor correction and voltage support if needed
TCHRT_T1 115	Base Case	P0	Base Case	1.03	1.03	1.01	**1.05**	1.05	1.03	1.03	1.05	1.01	Load power factor correction and voltage support if needed
TESLA 115	Base Case	P0	Base Case	1.03	1.04	1.03	**1.06**	1.05	1.04	1.04	**1.05**	1.02	Load power factor correction and voltage support if needed
TESLA &1 230	Base Case	P0	Base Case	1.02	1.03	1.02	1.05	1.05	1.03	1.02	**1.05**	1.02	Load power factor correction and voltage support if needed
TESLA C 230	Base Case	P0	Base Case	1.02	1.03	1.02	**1.05**	**1.05**	1.03	1.02	**1.06**	1.02	Load power factor correction and voltage support if needed
TESLA D 230	Base Case	P0	Base Case	1.02	1.02	1.01	**1.05**	1.04	1.02	1.02	1.05	1.01	Load power factor correction and voltage support if needed

Substation	Contingency (All and Worst P6)	Category	Category Description	Post Cont. Voltage Deviation PU (Baseline Scenarios)					Post Cont. Voltage Deviation PU (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2021 SP Heavy Renewable & Min Gas Gen	2024 SpOP Hi Renew & Min Gas Gen	2029 Retirement of QF Generations	
TESLA E 230	Base Case	P0	Base Case	1.02	1.02	1.00	1.05	1.04	1.02	1.01	1.05	1.00	Load power factor correction and voltage support if needed
TH.E.DV. 115	Base Case	P0	Base Case	1.03	1.03	1.02	**1.05**	1.05	1.03	1.04	1.05	1.02	Load power factor correction and voltage support if needed
TIGR CRK 230	Base Case	P0	Base Case	1.01	1.02	1.01	**1.06**	**1.05**	1.02	1.01	**1.06**	1.00	Load power factor correction and voltage support if needed
TOSCO-PP 60	Base Case	P0	Base Case	1.03	1.04	1.03	**1.06**	**1.06**	1.03	1.03	**1.06**	1.03	Load power factor correction and voltage support if needed
TRACY 115	Base Case	P0	Base Case	1.02	1.02	1.00	1.04	1.04	1.02	1.02	1.04	1.00	Load power factor correction and voltage support if needed
TRAVISJT 60	Base Case	P0	Base Case	1.04	1.05	0.99	1.04	**1.05**	1.05	1.04	**1.05**	0.98	Load power factor correction and voltage support if needed
TULLOCH 115	Base Case	P0	Base Case	1.04	1.03	1.02	**1.05**	**1.05**	1.03	1.04	**1.06**	1.02	Load power factor correction and voltage support if needed
UCDAVSJ1 115	Base Case	P0	Base Case	1.02	1.03	1.00	**1.06**	**1.05**	1.03	1.03	**1.05**	1.00	Load power factor correction and voltage support if needed
ULTR-RCK 120.75	Base Case	P0	Base Case	1.01	1.03	1.00	**1.08**	**1.06**	1.02	1.02	**1.07**	1.00	Load power factor correction and voltage support if needed
UOP 60	Base Case	P0	Base Case	1.04	1.05	1.03	**1.05**	**1.06**	1.05	1.04	**1.06**	1.03	Load power factor correction and voltage support if needed
VACA-CB 115	Base Case	P0	Base Case	**1.08**	**1.08**	**1.06**	**1.10**	**1.10**	**1.08**	**1.08**	**1.10**	**1.06**	Load power factor correction and voltage support if needed
VACA-D&1 115	Base Case	P0	Base Case	**1.06**	**1.07**	1.02	**1.08**	**1.08**	**1.07**	1.05	**1.08**	1.01	Load power factor correction and voltage support if needed
VACA-DIX 115	Base Case	P0	Base Case	**1.07**	**1.07**	1.03	**1.09**	**1.08**	**1.07**	**1.07**	**1.08**	1.02	Load power factor correction and voltage support if needed
VACA-DXN 60	Base Case	P0	Base Case	**1.07**	**1.08**	1.03	**1.08**	**1.09**	**1.08**	**1.07**	**1.09**	1.02	Load power factor correction and voltage support if needed
VACAVLL1 115	Base Case	P0	Base Case	**1.07**	**1.07**	1.02	**1.09**	**1.09**	**1.07**	**1.06**	**1.09**	1.02	Load power factor correction and voltage support if needed
VACAVLL2 115	Base Case	P0	Base Case	**1.06**	**1.07**	1.02	**1.09**	**1.09**	**1.07**	**1.06**	**1.09**	1.02	Load power factor correction and voltage support if needed
VALLY HM 115	Base Case	P0	Base Case	1.01	1.02	0.99	1.04	1.04	1.01	1.02	1.05	0.99	Load power factor correction and voltage support if needed
VCVLLE1J 115	Base Case	P0	Base Case	**1.07**	**1.07**	1.03	**1.09**	**1.09**	**1.07**	**1.07**	**1.09**	1.02	Load power factor correction and voltage support if needed
VCVLLE2J 115	Base Case	P0	Base Case	**1.07**	**1.07**	1.03	**1.09**	**1.09**	**1.07**	**1.07**	**1.09**	1.02	Load power factor correction and voltage support if needed

Substation	Contingency (All and Worst P6)	Category	Category Description	Post Cont. Voltage Deviation PU (Baseline Scenarios)					Post Cont. Voltage Deviation PU (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2021 SP Heavy Renewable & Min Gas Gen	2024 SpOP Hi Renew & Min Gas Gen	2029 Retirement of QF Generations	
VIERRA 115	Base Case	P0	Base Case	1.02	1.03	1.00	1.05	1.04	1.03	1.03	1.05	1.00	Load power factor correction and voltage support if needed
VLLY SPS 60	Base Case	P0	Base Case	1.04	1.05	1.04	1.05	1.05	1.04	1.04	1.05	1.04	Load power factor correction and voltage support if needed
VLLY SPS 230	Base Case	P0	Base Case	1.00	1.01	0.99	1.06	1.05	1.01	1.00	1.06	0.99	Load power factor correction and voltage support if needed
VSLDSW87 60	Base Case	P0	Base Case	1.05	1.05	1.05	1.06	1.05	1.05	1.05	1.06	1.05	Load power factor correction and voltage support if needed
W.SCRMNO 115	Base Case	P0	Base Case	1.03	1.05	1.02	1.06	1.05	1.04	1.05	1.05	1.02	Load power factor correction and voltage support if needed
WDLND_BM 115	Base Case	P0	Base Case	1.02	1.03	1.00	1.07	1.05	1.03	1.03	1.05	1.00	Load power factor correction and voltage support if needed
WEBER 230	Base Case	P0	Base Case	1.00	1.00	0.98	1.05	1.05	1.00	1.00	1.05	0.98	Load power factor correction and voltage support if needed
WEC 115	Base Case	P0	Base Case	1.06	1.07	1.02	1.08	1.08	1.07	1.05	1.08	1.01	Load power factor correction and voltage support if needed
WESCOT1 60	Base Case	P0	Base Case	0.99	1.00	0.99	1.05	1.05	0.99	1.03	1.05	0.98	Load power factor correction and voltage support if needed
WESCOT2 60	Base Case	P0	Base Case	1.01	1.01	1.02	1.05	1.04	1.01	1.04	1.04	1.01	Load power factor correction and voltage support if needed
WEST PNT 60	Base Case	P0	Base Case	1.04	1.04	1.03	1.07	1.07	1.04	1.04	1.07	1.03	Load power factor correction and voltage support if needed
WEST SDE 60	Base Case	P0	Base Case	1.03	1.04	1.03	1.07	1.06	1.03	1.03	1.06	1.03	Load power factor correction and voltage support if needed
WILKINS 60	Base Case	P0	Base Case	0.92	0.92	0.94	1.11	0.96	0.92	0.96	0.96	0.92	Load forecast under review
WILLIAMS 60	Base Case	P0	Base Case	1.01	1.01	1.01	1.05	1.05	1.01	1.03	1.05	1.00	Load power factor correction and voltage support if needed
WILSONAV 60	Base Case	P0	Base Case	0.98	0.98	0.97	1.04	1.08	0.98	1.07	1.08	0.95	Load power factor correction and voltage support if needed
WINTERS 60	Base Case	P0	Base Case	1.02	1.05	0.98	1.06	1.09	1.05	1.04	1.10	0.95	Load power factor correction and voltage support if needed
WODLNDJ1 115	Base Case	P0	Base Case	1.02	1.03	1.01	1.08	1.05	1.03	1.03	1.05	1.01	Load power factor correction and voltage support if needed
WODLNDJ2 115	Base Case	P0	Base Case	1.02	1.03	1.01	1.08	1.05	1.03	1.03	1.05	1.01	Load power factor correction and voltage support if needed
WOODLD 115	Base Case	P0	Base Case	1.02	1.03	1.00	1.07	1.05	1.03	1.03	1.05	1.00	Load power factor correction and voltage support if needed
WSTLNESW 60	Base Case	P0	Base Case	1.04	1.04	1.03	1.05	1.06	1.04	1.04	1.06	1.03	Load power factor correction and voltage support if needed

Study Area: PG&E Central Valley

High/Low Voltages

Substation	Contingency (All and Worst P6)	Category	Category Description	Post Cont. Voltage Deviation PU (Baseline Scenarios)					Post Cont. Voltage Deviation PU (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2021 SP Heavy Renewable & Min Gas Gen	2024 SpOP Hi Renew & Min Gas Gen	2029 Retirement of QF Generations	
YUBAGOLD 60	Base Case	P0	Base Case	1.03	1.04	1.03	1.06	1.05	1.04	1.03	1.06	1.03	Load power factor correction and voltage support if needed
ZAMORA 115	Base Case	P0	Base Case	1.02	1.03	1.00	1.08	1.05	1.03	1.03	1.06	1.00	Load power factor correction and voltage support if needed
ZAMORA1 115	Base Case	P0	Base Case	1.02	1.03	1.01	1.08	1.05	1.03	1.03	1.05	1.01	Load power factor correction and voltage support if needed
ZAMORA2 115	Base Case	P0	Base Case	1.02	1.03	1.00	1.08	1.05	1.03	1.03	1.06	1.00	Load power factor correction and voltage support if needed
APPLE HL 115	P1-4:A5:7:_RIO OSO SVD=V	P1	N-1	NA	1.05	1.00	NA	1.14	1.05	NA	1.16	1.00	Load power factor correction and voltage support if needed
ATLANTI 60	P1-2:A5:80:_DEL MAR-ATLANTIC #2 60KV MOAS OPENED ON ATLANTI_DEL MAR	P1	N-1	1.05	1.07	1.02	1.11	1.10	1.07	1.05	1.11	1.02	Load power factor correction and voltage support if needed
ATLANTI 60	P1-4:A5:7:_RIO OSO SVD=V	P1	N-1	NA	1.05	0.98	NA	1.14	1.05	NA	1.15	0.98	Load power factor correction and voltage support if needed
ATLANTIC 115	P1-4:A5:7:_RIO OSO SVD=V	P1	N-1	NA	1.03	0.99	NA	1.09	1.02	NA	1.10	0.99	Load power factor correction and voltage support if needed
BANTA 60	P1-3:A11:32:_KASSON 115/60KV TB 1	P1	N-1	0.98	0.98	0.89	1.01	0.98	0.98	1.00	0.99	0.89	Continue to monitor future load forecast
BELL PGE 115	P1-2:A5:33:_DRUM-HIGGINS 115KV MOAS OPENED ON DRUM_DTCH FL1	P1	N-1	1.03	1.04	0.99	1.13	1.12	1.03	1.03	1.14	0.99	Load power factor correction and voltage support if needed
BELL PGE 115	P1-2:A5:34:_DRUM-HIGGINS 115KV MOAS OPENED ON CHCGO PK_HIGGINS	P1	N-1	1.02	1.03	0.97	1.14	1.13	1.03	1.03	1.14	0.97	Load power factor correction and voltage support if needed
BELL PGE 115	P1-4:A5:7:_RIO OSO SVD=V	P1	N-1	NA	1.03	0.99	NA	1.12	1.03	NA	1.13	0.99	Load power factor correction and voltage support if needed
CARBONA 60	P1-3:A11:32:_KASSON 115/60KV TB 1	P1	N-1	0.96	0.96	0.87	1.01	0.97	0.95	0.98	0.98	0.87	Continue to monitor future load forecast
CHCGO PK 115	P1-2:A5:33:_DRUM-HIGGINS 115KV MOAS OPENED ON DRUM_DTCH FL1	P1	N-1	1.03	1.04	1.01	1.12	1.11	1.04	1.04	1.15	1.01	Load power factor correction and voltage support if needed
CLRKSVLE 115	P1-4:A5:7:_RIO OSO SVD=V	P1	N-1	NA	1.05	1.01	NA	1.14	1.05	NA	1.15	1.00	Load power factor correction and voltage support if needed
CPM 115	P1-4:A5:7:_RIO OSO SVD=V	P1	N-1	NA	1.06	1.02	NA	1.14	1.06	NA	1.15	1.01	Load power factor correction and voltage support if needed
CROWCREEK SS 60	P1-2:A12:16:_SALADO-CROWCREEK SS 60KV	P1	N-1	0.92	0.92	0.88	1.09	1.11	0.92	1.05	1.11	0.88	Continue to monitor future load forecast
DEL MAR 60	P1-4:A5:7:_RIO OSO SVD=V	P1	N-1	NA	1.04	0.96	NA	1.14	1.04	NA	1.15	0.96	Load power factor correction and voltage support if needed
DIMOND_1 115	P1-4:A5:7:_RIO OSO SVD=V	P1	N-1	NA	1.06	1.01	NA	1.14	1.05	NA	1.16	1.01	Load power factor correction and voltage support if needed

Substation	Contingency (All and Worst P6)	Category	Category Description	Post Cont. Voltage Deviation PU (Baseline Scenarios)					Post Cont. Voltage Deviation PU (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2021 SP Heavy Renewable & Min Gas Gen	2024 SpOP Hi Renew & Min Gas Gen	2029 Retirement of QF Generations	
DIMOND_2 115	P1-4:A5:7:_RIO OSO SVD=V	P1	N-1	NA	1.05	1.00	NA	1.14	1.05	NA	1.16	1.00	Load power factor correction and voltage support if needed
DIST2047 60	P1-3:A4:25:_CORTINA 115/60KV TB 5	P1	N-1	0.94	0.94	0.90	1.16	0.95	0.94	0.95	0.95	0.88	Continue to monitor future load forecast
DMND SPR 115	P1-4:A5:7:_RIO OSO SVD=V	P1	N-1	NA	1.05	1.00	NA	1.14	1.05	NA	1.16	1.00	Load power factor correction and voltage support if needed
DTCH FL1 115	P1-2:A5:33:_DRUM-HIGGINS 115KV MOAS OPENED ON DRUM_DTCH FL1	P1	N-1	1.03	1.03	1.01	1.12	1.11	1.03	1.03	1.15	1.01	Load power factor correction and voltage support if needed
E.MRYSVE 115	P1-2:A5:26:_RIO OSO-NICOLAUS 115KV	P1	N-1	1.03	1.05	0.98	1.09	1.10	1.05	1.02	1.11	0.98	Load power factor correction and voltage support if needed
E.MRYSVE 115	P1-2:A5:38:_PALERMO-NICOLAUS 115KV MOAS OPENED ON E.MRY J2_E.NICOLS	P1	N-1	1.05	1.07	1.02	1.09	1.09	1.07	1.02	1.10	1.02	Load power factor correction and voltage support if needed
E.NICOLS 115	P1-2:A5:26:_RIO OSO-NICOLAUS 115KV	P1	N-1	1.02	1.04	0.96	1.09	1.11	1.04	1.02	1.12	0.96	Load power factor correction and voltage support if needed
ELDORAD 115	P1-4:A5:7:_RIO OSO SVD=V	P1	N-1	NA	1.05	1.01	NA	1.14	1.05	NA	1.16	1.01	Load power factor correction and voltage support if needed
FLINT 115	P1-2:A5:33:_DRUM-HIGGINS 115KV MOAS OPENED ON DRUM_DTCH FL1	P1	N-1	1.03	1.04	0.99	1.13	1.12	1.04	1.03	1.14	0.99	Load power factor correction and voltage support if needed
FLINT 115	P1-2:A5:34:_DRUM-HIGGINS 115KV MOAS OPENED ON CHCGO PK_HIGGINS	P1	N-1	1.02	1.04	0.98	1.14	1.13	1.03	1.03	1.14	0.98	Load power factor correction and voltage support if needed
FLINT 115	P1-4:A5:7:_RIO OSO SVD=V	P1	N-1	NA	1.04	1.00	NA	1.12	1.04	NA	1.14	1.00	Load power factor correction and voltage support if needed
FRONTIERPV 60	P1-2:A12:16:_SALADO-CROWCREEK SS 60KV	P1	N-1	0.92	0.92	0.88	1.09	1.11	0.92	1.06	1.11	0.88	Continue to monitor future load forecast
GOLDHILL 115	P1-4:A5:7:_RIO OSO SVD=V	P1	N-1	NA	1.06	1.02	NA	1.14	1.06	NA	1.15	1.02	Load power factor correction and voltage support if needed
GUSTINE 60	P1-2:A12:15:_SALADO-NEWMAN #2 60KV MOAS OPENED ON CRWS LDG_CRWS LDJ	P1	N-1	0.93	0.92	0.87	1.05	1.07	0.91	1.00	1.07	0.87	Continue to monitor future load forecast
GUSTINE 60	P1-2:A12:16:_SALADO-CROWCREEK SS 60KV	P1	N-1	0.89	0.89	0.85	1.06	1.08	0.89	1.01	1.09	0.85	Load forecast under review
GUSTINE 60	P1-2:A12:17:_NEWMAN-CROWCREEK SS 60KV	P1	N-1	0.93	0.92	0.86	1.04	1.06	0.91	0.99	1.07	0.86	Continue to monitor future load forecast
HIGGINS 115	P1-2:A5:33:_DRUM-HIGGINS 115KV MOAS OPENED ON DRUM_DTCH FL1	P1	N-1	1.02	1.03	0.99	1.13	1.12	1.03	1.03	1.15	0.99	Load power factor correction and voltage support if needed
HIGGINS 115	P1-2:A5:34:_DRUM-HIGGINS 115KV MOAS OPENED ON CHCGO PK_HIGGINS	P1	N-1	1.01	1.03	0.97	1.14	1.13	1.02	1.03	1.14	0.97	Load power factor correction and voltage support if needed

Substation	Contingency (All and Worst P6)	Category	Category Description	Post Cont. Voltage Deviation PU (Baseline Scenarios)					Post Cont. Voltage Deviation PU (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2021 SP Heavy Renewable & Min Gas Gen	2024 SpOP Hi Renew & Min Gas Gen	2029 Retirement of QF Generations	
HORSESHE 115	P1-4:A5:7:_RIO OSO SVD=V	P1	N-1	NA	1.05	1.01	NA	1.13	1.04	NA	1.15	1.00	Load power factor correction and voltage support if needed
KASSON 60	P1-3:A11:32:_KASSON 115/60KV TB 1	P1	N-1	0.98	0.98	0.90	1.01	0.98	0.98	1.00	0.99	0.90	Continue to monitor future load forecast
LOCKFORD 230	P1-2:A11:4:_LOCKEFORD-BELLOTA 230KV	P1	N-1	0.88	0.90	0.97	0.98	0.97	0.90	0.90	0.98	0.97	Project: Lockeford-Lodi Area 230 kV Development Project In-Service Date: Jul 2025 Short term: Action plan
LYOTH-SP 60	P1-3:A11:32:_KASSON 115/60KV TB 1	P1	N-1	0.98	0.98	0.89	1.01	0.98	0.98	1.00	0.99	0.89	Continue to monitor future load forecast
MARTELL 60	P1-2:A11:68:_VALLEY SPRINGS-MARTELL #1 60KV	P1	N-1	1.02	1.03	0.98	1.07	1.07	1.02	1.02	1.08	0.93	Load power factor correction and voltage support if needed
NEWCSTLE 115	P1-2:A5:33:_DRUM-HIGGINS 115KV MOAS OPENED ON DRUM_DTCH FL1	P1	N-1	1.03	1.04	1.00	1.13	1.12	1.04	1.03	1.14	1.00	Load power factor correction and voltage support if needed
NEWCSTLE 115	P1-2:A5:34:_DRUM-HIGGINS 115KV MOAS OPENED ON CHCGO PK_HIGGINS	P1	N-1	1.02	1.04	0.99	1.13	1.13	1.04	1.03	1.14	0.99	Load power factor correction and voltage support if needed
NEWCSTLE 115	P1-4:A5:7:_RIO OSO SVD=V	P1	N-1	NA	1.04	1.00	NA	1.13	1.04	NA	1.14	1.00	Load power factor correction and voltage support if needed
NEWMAN 60	P1-2:A12:15:_SALADO-NEWMAN #2 60KV MOAS OPENED ON CRWS LDG_CRWS LDJ	P1	N-1	0.94	0.94	0.88	1.06	1.07	0.93	1.01	1.08	0.88	Continue to monitor future load forecast
NEWMAN 60	P1-2:A12:16:_SALADO-CROWCREEK SS 60KV	P1	N-1	0.93	0.92	0.89	1.06	1.08	0.92	1.03	1.09	0.89	Continue to monitor future load forecast
NEWMAN 60	P1-2:A12:17:_NEWMAN-CROWCREEK SS 60KV	P1	N-1	0.94	0.93	0.88	1.04	1.06	0.93	1.01	1.07	0.88	Continue to monitor future load forecast
NEWMAN 60	P1-2:A12:18:_ 60KV	P1	N-1	0.94	0.93	0.88	1.05	1.06	0.92	1.00	1.07	0.88	Continue to monitor future load forecast
OLIVHRST 115	P1-2:A5:39:_PEASE-RIO OSO 115KV MOAS OPENED ON OLIVH J1_E.MRY J1 (2)	P1	N-1	1.02	1.03	1.01	1.09	1.06	1.03	1.02	1.07	1.01	Load power factor correction and voltage support if needed
PLACER 115	P1-2:A5:33:_DRUM-HIGGINS 115KV MOAS OPENED ON DRUM_DTCH FL1	P1	N-1	1.03	1.04	0.99	1.13	1.12	1.04	1.03	1.14	0.99	Load power factor correction and voltage support if needed
PLACER 115	P1-2:A5:34:_DRUM-HIGGINS 115KV MOAS OPENED ON CHCGO PK_HIGGINS	P1	N-1	1.02	1.03	0.98	1.14	1.13	1.03	1.03	1.14	0.98	Load power factor correction and voltage support if needed
PLACER 115	P1-4:A5:7:_RIO OSO SVD=V	P1	N-1	NA	1.04	0.99	NA	1.12	1.03	NA	1.14	0.99	Load power factor correction and voltage support if needed

Substation	Contingency (All and Worst P6)	Category	Category Description	Post Cont. Voltage Deviation PU (Baseline Scenarios)					Post Cont. Voltage Deviation PU (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2021 SP Heavy Renewable & Min Gas Gen	2024 SpOP Hi Renew & Min Gas Gen	2029 Retirement of QF Generations	
PLCRVLB2 115	P1-4:A5:7:_RIO OSO SVD=V	P1	N-1	NA	1.05	1.00	NA	1.14	1.05	NA	1.16	1.00	Load power factor correction and voltage support if needed
PLCRVLB3 115	P1-4:A5:7:_RIO OSO SVD=V	P1	N-1	NA	1.05	1.00	NA	1.14	1.05	NA	1.16	1.00	Load power factor correction and voltage support if needed
RIPON 115	P1-2:A11:42:_MANTECA-RIPON 115KV	P1	N-1	0.95	0.94	0.89	1.05	1.05	0.93	0.98	1.06	0.89	Continue to monitor future load forecast
ROCKLIN 60	P1-2:A5:80:_DEL MAR-ATLANTIC #2 60KV MOAS OPENED ON ATLANTI_DEL MAR	P1	N-1	1.05	1.07	1.02	1.11	1.10	1.07	1.06	1.11	1.01	Load power factor correction and voltage support if needed
ROCKLIN 60	P1-4:A5:7:_RIO OSO SVD=V	P1	N-1	NA	1.05	0.98	NA	1.14	1.05	NA	1.15	0.98	Load power factor correction and voltage support if needed
SHPRING 115	P1-4:A5:7:_RIO OSO SVD=V	P1	N-1	NA	1.06	1.01	NA	1.14	1.05	NA	1.15	1.01	Load power factor correction and voltage support if needed
SIERRAPI 60	P1-4:A5:7:_RIO OSO SVD=V	P1	N-1	NA	1.04	0.96	NA	1.14	1.04	NA	1.15	0.96	Load power factor correction and voltage support if needed
SPICAMIN 115	P1-4:A5:7:_RIO OSO SVD=V	P1	N-1	NA	1.05	1.01	NA	1.14	1.05	NA	1.16	1.00	Load power factor correction and voltage support if needed
TAYLOR 60	P1-2:A5:80:_DEL MAR-ATLANTIC #2 60KV MOAS OPENED ON ATLANTI_DEL MAR	P1	N-1	1.05	1.07	1.02	1.11	1.10	1.07	1.06	1.11	1.02	Load power factor correction and voltage support if needed
TAYLOR 60	P1-4:A5:7:_RIO OSO SVD=V	P1	N-1	NA	1.05	0.98	NA	1.14	1.05	NA	1.15	0.98	Load power factor correction and voltage support if needed
WESTLEY 60	P1-2:A11:54:_SCHULTE SW STA-LAMMERS 115KV	P1	N-1	0.89	0.92	0.88	1.01	1.02	0.92	0.93	1.02	0.88	Continue to monitor future load forecast
WESTLEY 60	P1-2:A11:55:_GWFTRACY-SCHULTE #1 115KV	P1	N-1	0.91	0.93	0.87	1.01	1.02	0.92	0.93	1.02	0.87	Continue to monitor future load forecast
WESTLEY 60	P1-3:A11:31:_MANTECA 115/60KV TB 3	P1	N-1	0.91	0.92	0.86	1.01	1.02	0.91	0.93	1.03	0.86	Continue to monitor future load forecast
WESTLEY 60	P1-3:A11:32:_KASSON 115/60KV TB 1	P1	N-1	0.91	0.92	0.86	1.00	0.99	0.91	0.93	1.00	0.86	Continue to monitor future load forecast
WILKINS 60	P1-3:A4:25:_CORTINA 115/60KV TB 5	P1	N-1	0.95	0.96	0.91	1.11	0.97	0.95	0.97	0.97	0.90	Sensitivity only
AMERIGAS 115	P2-2:A4:7:_VACA-DIX 230KV SECTION NA	P2-2	Bus	1.07	1.07	1.01	1.10	1.10	1.07	1.07	1.10	1.00	Sensitivity only
APPLE HL 115	P2-1:A5:10:_MISSOURI FLAT-GOLD HILL #1 115KV (GOLDHILL-CPM TAP)	P2-1	Line Section w/o Fault	1.04	1.02	0.92	1.12	1.14	1.02	1.05	1.15	0.92	Load power factor correction and voltage support if needed
APPLE HL 115	P2-4:A5:2:_GOLDHILL 230KV - SECTION 2D & 1D	P2-4	Bus-Tie Breaker	Diverge	Diverge	0.37	1.22	1.18	Diverge	0.48	1.22	0.37	SPS Recommended in 2018-2019 TPP
BELL PGE 115	P2-1:A5:24:_DRUM-HIGGINS 115KV (DRUM-DTCH FL1)	P2-1	Line Section w/o Fault	1.03	1.04	0.99	1.13	1.12	1.03	1.03	1.14	0.99	Load power factor correction and voltage support if needed

Substation	Contingency (All and Worst P6)	Category	Category Description	Post Cont. Voltage Deviation PU (Baseline Scenarios)					Post Cont. Voltage Deviation PU (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2021 SP Heavy Renewable & Min Gas Gen	2024 SpOP Hi Renew & Min Gas Gen	2029 Retirement of QF Generations	
BELL PGE 115	P2-1:A5:27:_DRUM-HIGGINS 115KV (DTCH FL1-CHCGO PK)	P2-1	Line Section w/o Fault	1.02	1.03	0.98	1.14	1.13	1.03	1.03	1.14	0.98	Load power factor correction and voltage support if needed
BELL PGE 115	P2-1:A5:28:_DRUM-HIGGINS 115KV (CHCGO PK-HIGGINS)	P2-1	Line Section w/o Fault	1.02	1.03	0.97	1.14	1.13	1.03	1.03	1.14	0.97	Load power factor correction and voltage support if needed
BELL PGE 115	P2-1:A5:34:_HIGGINS-BELL 115KV (HIGGINS-BELL PGE)	P2-1	Line Section w/o Fault	1.03	1.04	0.98	1.13	1.12	1.04	1.04	1.13	0.98	Load power factor correction and voltage support if needed
BELL PGE 115	P2-3:A5:85:_BRNSWALT 115KV - RING R4 & R3	P2-3	Non-Bus-Tie Breaker	1.03	1.04	0.99	1.12	1.12	1.03	1.03	1.14	0.99	Load power factor correction and voltage support if needed
BELL PGE 115	P2-3:A5:86:_BRNSWALT 115KV - RING R3 & R6	P2-3	Non-Bus-Tie Breaker	1.03	1.04	0.99	1.13	1.12	1.03	1.03	1.14	0.99	Load power factor correction and voltage support if needed
BELL PGE 115	P2-4:A5:2:_GOLDHILL 230KV - SECTION 2D & 1D	P2-4	Bus-Tie Breaker	Diverge	Diverge	0.45	1.19	1.15	Diverge	0.52	1.18	0.45	SPS Recommended in 2018-2019 TPP
BELL PGE 115	P2-4:A5:3:_GOLDHILL 115KV - SECTION 1F & 2F	P2-4	Bus-Tie Breaker	0.88	0.90	0.57	1.13	1.08	0.88	0.95	1.10	0.58	SPS Recommended in 2018-2019 TPP
BELLOTA 115	P2-4:A11:1:_BELLOTA 230KV - SECTION 1E & 2E	P2-4	Bus-Tie Breaker	0.60	0.55	NA	1.04	1.09	0.59	0.89	1.10	NA	SPS Recommended in 2018-2019 TPP
CAMANCH 230	P2-1:A11:2:_RANCHO SECO-BELLOTA #2 230KV (CAMANCH-BELLOTA)	P2-1	Line Section w/o Fault	1.01	1.01	1.01	1.14	1.13	1.01	1.01	1.14	1.01	Load power factor correction and voltage support if needed
CAMANCH 230	P2-2:A11:10:_BELLOTA 230KV SECTION 2D	P2-2	Bus	1.01	1.01	1.01	1.14	1.14	1.01	1.01	1.14	1.01	Load power factor correction and voltage support if needed
CAMANCH 230	P2-4:A11:1:_BELLOTA 230KV - SECTION 1E & 2E	P2-4	Bus-Tie Breaker	1.01	1.01	NA	1.10	1.09	1.01	1.01	1.09	NA	SPS Recommended in 2018-2019 TPP
CAMANCH 230	P2-4:A11:3:_BELLOTA 230KV - SECTION 2E & 2D	P2-4	Bus-Tie Breaker	1.01	1.02	1.00	1.14	1.14	1.01	1.01	1.14	1.00	SPS Recommended in 2018-2019 TPP
CAMANCH 230	P2-4:A11:4:_BELLOTA 230KV - SECTION 1D & 2D	P2-4	Bus-Tie Breaker	1.02	1.02	1.01	1.30	1.28	1.02	1.02	1.30	1.01	SPS Recommended in 2018-2019 TPP
CAMANCHE 115	P2-4:A11:1:_BELLOTA 230KV - SECTION 1E & 2E	P2-4	Bus-Tie Breaker	0.60	0.55	NA	1.04	1.09	0.58	0.89	1.10	NA	SPS Recommended in 2018-2019 TPP
CAMANCPP 230	P2-1:A11:2:_RANCHO SECO-BELLOTA #2 230KV (CAMANCH-BELLOTA)	P2-1	Line Section w/o Fault	1.01	1.01	1.01	1.14	1.13	1.01	1.01	1.14	1.01	Load power factor correction and voltage support if needed
CAMANCPP 230	P2-2:A11:10:_BELLOTA 230KV SECTION 2D	P2-2	Bus	1.01	1.01	1.01	1.14	1.14	1.01	1.01	1.14	1.01	Load power factor correction and voltage support if needed
CAMANCPP 230	P2-4:A11:1:_BELLOTA 230KV - SECTION 1E & 2E	P2-4	Bus-Tie Breaker	1.01	1.01	NA	1.10	1.09	1.01	1.01	1.09	NA	SPS Recommended in 2018-2019 TPP

Substation	Contingency (All and Worst P6)	Category	Category Description	Post Cont. Voltage Deviation PU (Baseline Scenarios)					Post Cont. Voltage Deviation PU (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2021 SP Heavy Renewable & Min Gas Gen	2024 SpOP Hi Renew & Min Gas Gen	2029 Retirement of QF Generations	
CAMANCPP 230	P2-4:A11:3:_BELLOTA 230KV - SECTION 2E & 2D	P2-4	Bus-Tie Breaker	1.01	1.02	1.00	1.14	1.14	1.01	1.01	1.14	1.00	SPS Recommended in 2018-2019 TPP
CAMANCPP 230	P2-4:A11:4:_BELLOTA 230KV - SECTION 1D & 2D	P2-4	Bus-Tie Breaker	1.02	1.02	1.01	1.30	1.28	1.02	1.02	1.30	1.01	SPS Recommended in 2018-2019 TPP
CATARACT 115	P2-4:A11:1:_BELLOTA 230KV - SECTION 1E & 2E	P2-4	Bus-Tie Breaker	0.87	0.86	NA	1.06	1.06	0.87	1.01	1.07	NA	SPS Recommended in 2018-2019 TPP
CDCRSTN 115	P2-4:A11:1:_BELLOTA 230KV - SECTION 1E & 2E	P2-4	Bus-Tie Breaker	0.57	0.52	NA	1.03	1.08	0.56	0.86	1.09	NA	SPS Recommended in 2018-2019 TPP
CH.STN 115	P2-4:A11:1:_BELLOTA 230KV - SECTION 1E & 2E	P2-4	Bus-Tie Breaker	0.82	0.80	NA	1.05	1.06	0.82	0.98	1.07	NA	SPS Recommended in 2018-2019 TPP
CH.STN 115	P2-4:A11:10:_TESLA 115KV - SECTION 2D & 1D	P2-4	Bus-Tie Breaker	0.87	1.01	-1.75	0.97	0.88	0.80	-1.15	0.87	-1.75	SPS Recommended in 2018-2019 TPP
CH.STN 115	P2-4:A11:27:_BELLOTA 230KV - SECTION 2E & 1E	P2-4	Bus-Tie Breaker	NA	NA	0.78	NA	NA	NA	NA	NA	0.79	SPS Recommended in 2018-2019 TPP
CHCGO PK 115	P2-1:A5:24:_DRUM-HIGGINS 115KV (DRUM-DTCH FL1)	P2-1	Line Section w/o Fault	1.03	1.04	1.01	1.12	1.11	1.04	1.04	1.15	1.01	Load power factor correction and voltage support if needed
CHCGO PK 115	P2-1:A5:27:_DRUM-HIGGINS 115KV (DTCH FL1-CHCGO PK)	P2-1	Line Section w/o Fault	1.02	1.03	0.97	1.15	1.13	1.03	1.03	1.15	0.97	Load power factor correction and voltage support if needed
CHCGO PK 115	P2-3:A5:85:_BRNSWALT 115KV - RING R4 & R3	P2-3	Non-Bus-Tie Breaker	1.03	1.04	1.01	1.12	1.11	1.04	1.04	1.15	1.01	Load power factor correction and voltage support if needed
CHCGO PK 115	P2-3:A5:86:_BRNSWALT 115KV - RING R3 & R6	P2-3	Non-Bus-Tie Breaker	1.03	1.04	1.01	1.12	1.11	1.04	1.04	1.15	1.01	Load power factor correction and voltage support if needed
CHCGO PK 115	P2-4:A5:2:_GOLDHILL 230KV - SECTION 2D & 1D	P2-4	Bus-Tie Breaker	Diverge	Diverge	0.72	1.14	1.10	Diverge	0.74	1.11	0.72	SPS Recommended in 2018-2019 TPP
CHCGO PK 115	P2-4:A5:3:_GOLDHILL 115KV - SECTION 1F & 2F	P2-4	Bus-Tie Breaker	0.96	0.98	0.78	1.11	1.06	0.97	1.01	1.07	0.79	SPS Recommended in 2018-2019 TPP
CL AMMNA 115	P2-3:A11:19:_KASSON - 1D 115KV & SCHULTE SW STA-KASSON-MANTECA LINE	P2-3	Non-Bus-Tie Breaker	0.90	1.01	0.94	1.03	1.04	1.01	0.99	1.04	0.94	Project: Vierra 115 kV Looping Project In-Service Date: Jan 2023 Short term: Action plan
CLRKSVLE 115	P2-4:A5:2:_GOLDHILL 230KV - SECTION 2D & 1D	P2-4	Bus-Tie Breaker	Diverge	Diverge	0.36	1.22	1.18	Diverge	0.45	1.22	0.37	SPS Recommended in 2018-2019 TPP
CORDELIA 115	P2-2:A4:7:_VACA-DIX 230KV SECTION NA	P2-2	Bus	1.06	1.07	0.99	1.10	1.10	1.07	1.06	1.10	0.99	Sensitivity only
CORTINA 230	P2-3:A4:49:_CORTINA 230KV - RING R2 & R3	P2-3	Non-Bus-Tie Breaker	0.94	0.93	0.89	1.02	0.99	0.93	0.98	1.00	0.89	Continue to monitor future load forecast

Study Area: PG&E Central Valley

High/Low Voltages

Substation	Contingency (All and Worst P6)	Category	Category Description	Post Cont. Voltage Deviation PU (Baseline Scenarios)					Post Cont. Voltage Deviation PU (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2021 SP Heavy Renewable & Min Gas Gen	2024 SpOP Hi Renew & Min Gas Gen	2029 Retirement of QF Generations	
CPM 115	P2-1:A5:10:_MISSOURI FLAT-GOLD HILL #1 115KV (GOLDHILL-CPM TAP)	P2-1	Line Section w/o Fault	1.04	1.01	0.90	1.12	1.14	1.01	1.05	1.16	0.90	Load power factor correction and voltage support if needed
CPM 115	P2-4:A5:2:_GOLDHILL 230KV - SECTION 2D & 1D	P2-4	Bus-Tie Breaker	Diverge	Diverge	0.37	1.22	1.18	Diverge	0.46	1.21	0.38	SPS Recommended in 2018-2019 TPP
CURTISS 115	P2-4:A11:1:_BELLOTA 230KV - SECTION 1E & 2E	P2-4	Bus-Tie Breaker	0.85	0.83	NA	1.04	1.06	0.85	0.98	1.06	NA	SPS Recommended in 2018-2019 TPP
CURTISS 115	P2-4:A11:10:_TESLA 115KV - SECTION 2D & 1D	P2-4	Bus-Tie Breaker	0.90	1.00	-1.72	0.98	0.91	0.83	-1.13	0.90	-1.72	SPS Recommended in 2018-2019 TPP
CURTISS 115	P2-4:A11:27:_BELLOTA 230KV - SECTION 2E & 1E	P2-4	Bus-Tie Breaker	NA	NA	0.81	NA	NA	NA	NA	NA	0.81	SPS Recommended in 2018-2019 TPP
DIMOND_1 115	P2-1:A5:10:_MISSOURI FLAT-GOLD HILL #1 115KV (GOLDHILL-CPM TAP)	P2-1	Line Section w/o Fault	1.04	1.01	0.91	1.12	1.14	1.01	1.05	1.16	0.91	Load power factor correction and voltage support if needed
DIMOND_1 115	P2-4:A5:2:_GOLDHILL 230KV - SECTION 2D & 1D	P2-4	Bus-Tie Breaker	Diverge	Diverge	0.36	1.22	1.18	Diverge	0.47	1.22	0.37	SPS Recommended in 2018-2019 TPP
DIMOND_2 115	P2-4:A5:2:_GOLDHILL 230KV - SECTION 2D & 1D	P2-4	Bus-Tie Breaker	Diverge	Diverge	0.37	1.22	1.18	Diverge	0.46	1.22	0.37	SPS Recommended in 2018-2019 TPP
DMND SPR 115	P2-4:A5:2:_GOLDHILL 230KV - SECTION 2D & 1D	P2-4	Bus-Tie Breaker	Diverge	Diverge	0.37	1.22	1.18	Diverge	0.46	1.22	0.37	SPS Recommended in 2018-2019 TPP
DRUM 115	P2-4:A5:2:_GOLDHILL 230KV - SECTION 2D & 1D	P2-4	Bus-Tie Breaker	Diverge	Diverge	0.87	1.11	1.07	Diverge	0.87	1.08	0.87	SPS Recommended in 2018-2019 TPP
DRUM 1M 115	P2-4:A5:3:_GOLDHILL 115KV - SECTION 1F & 2F	P2-4	Bus-Tie Breaker	0.96	0.97	0.87	0.99	0.98	0.96	0.98	0.98	0.87	SPS Recommended in 2018-2019 TPP
DRUM 2M 115	P2-4:A5:3:_GOLDHILL 115KV - SECTION 1F & 2F	P2-4	Bus-Tie Breaker	0.96	0.97	0.87	1.00	0.98	0.96	0.98	0.98	0.87	SPS Recommended in 2018-2019 TPP
DTCH FL1 115	P2-1:A5:24:_DRUM-HIGGINS 115KV (DRUM-DTCH FL1)	P2-1	Line Section w/o Fault	1.03	1.03	1.01	1.12	1.11	1.03	1.03	1.15	1.01	Load power factor correction and voltage support if needed
DTCH FL1 115	P2-3:A5:85:_BRNSWALT 115KV - RING R4 & R3	P2-3	Non-Bus-Tie Breaker	1.03	1.03	1.01	1.12	1.11	1.03	1.03	1.15	1.01	Load power factor correction and voltage support if needed
DTCH FL1 115	P2-3:A5:86:_BRNSWALT 115KV - RING R3 & R6	P2-3	Non-Bus-Tie Breaker	1.03	1.03	1.01	1.12	1.11	1.03	1.03	1.15	1.01	Load power factor correction and voltage support if needed
DTCH FL1 115	P2-4:A5:2:_GOLDHILL 230KV - SECTION 2D & 1D	P2-4	Bus-Tie Breaker	Diverge	Diverge	0.79	1.13	1.08	Diverge	0.80	1.10	0.79	SPS Recommended in 2018-2019 TPP
DTCH FL1 115	P2-4:A5:3:_GOLDHILL 115KV - SECTION 1F & 2F	P2-4	Bus-Tie Breaker	0.98	0.99	0.84	1.10	1.05	0.98	1.02	1.06	0.84	SPS Recommended in 2018-2019 TPP

Substation	Contingency (All and Worst P6)	Category	Category Description	Post Cont. Voltage Deviation PU (Baseline Scenarios)					Post Cont. Voltage Deviation PU (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2021 SP Heavy Renewable & Min Gas Gen	2024 SpOP Hi Renew & Min Gas Gen	2029 Retirement of QF Generations	
E.MRYSVE 115	P2-1:A5:13:_PALERMO-NICOLAUS 115KV (E.MRYSVE-E.MRY J2)	P2-1	Line Section w/o Fault	NA	1.12	0.88	NA	1.14	1.12	NA	1.14	0.88	Continue to monitor future load forecast
E.MRYSVE 115	P2-2:A5:10:_RIO OSO 115KV SECTION 2D	P2-2	Bus	1.03	1.05	0.98	1.09	1.10	1.05	1.02	1.11	0.98	Load power factor correction and voltage support if needed
E.MRYSVE 115	P2-3:A5:15:_RIO OSO - 2D 115KV & BOGUE-RIO OSO LINE	P2-3	Non-Bus-Tie Breaker	1.03	1.05	0.98	1.09	1.10	1.05	1.02	1.11	0.98	Load power factor correction and voltage support if needed
E.MRYSVE 115	P2-3:A5:16:_RIO OSO - 2D 115KV & RIO OSO-WOODLAND #2 LINE	P2-3	Non-Bus-Tie Breaker	1.03	1.05	0.98	1.09	1.10	1.05	1.02	1.11	0.98	Load power factor correction and voltage support if needed
E.MRYSVE 115	P2-3:A5:17:_RIO OSO - 2D 115KV & RIO OSO-DRUM-BRUNSWCK LINE	P2-3	Non-Bus-Tie Breaker	1.03	1.05	0.98	1.09	1.10	1.05	1.02	1.11	0.98	Load power factor correction and voltage support if needed
E.MRYSVE 115	P2-3:A5:80:_E.NICOLS 115KV - RING R1 & R2	P2-3	Non-Bus-Tie Breaker	1.03	1.05	0.98	1.09	1.10	1.05	1.02	1.11	0.98	Load power factor correction and voltage support if needed
E.MRYSVE 115	P2-4:A5:5:_RIO OSO 115KV - SECTION 2D & 1D	P2-4	Bus-Tie Breaker	1.03	1.05	0.95	1.09	1.11	1.04	1.01	1.11	0.95	SPS Recommended in 2018-2019 TPP
E.NICOLS 115	P2-2:A5:10:_RIO OSO 115KV SECTION 2D	P2-2	Bus	1.02	1.04	0.95	1.10	1.11	1.04	1.01	1.12	0.95	Load power factor correction and voltage support if needed
E.NICOLS 115	P2-3:A5:15:_RIO OSO - 2D 115KV & BOGUE-RIO OSO LINE	P2-3	Non-Bus-Tie Breaker	1.02	1.04	0.95	1.09	1.11	1.04	1.01	1.12	0.95	Load power factor correction and voltage support if needed
E.NICOLS 115	P2-3:A5:16:_RIO OSO - 2D 115KV & RIO OSO-WOODLAND #2 LINE	P2-3	Non-Bus-Tie Breaker	1.02	1.04	0.96	1.09	1.11	1.04	1.01	1.12	0.95	Load power factor correction and voltage support if needed
E.NICOLS 115	P2-3:A5:17:_RIO OSO - 2D 115KV & RIO OSO-DRUM-BRUNSWCK LINE	P2-3	Non-Bus-Tie Breaker	1.02	1.04	0.95	1.10	1.11	1.04	1.01	1.12	0.95	Load power factor correction and voltage support if needed
E.NICOLS 115	P2-3:A5:80:_E.NICOLS 115KV - RING R1 & R2	P2-3	Non-Bus-Tie Breaker	1.02	1.04	0.96	1.09	1.11	1.04	1.02	1.12	0.96	Load power factor correction and voltage support if needed
E.NICOLS 115	P2-4:A5:5:_RIO OSO 115KV - SECTION 2D & 1D	P2-4	Bus-Tie Breaker	1.02	1.04	0.92	1.09	1.11	1.03	1.01	1.12	0.92	SPS Recommended in 2018-2019 TPP
ELDORAD 115	P2-4:A5:2:_GOLDHILL 230KV - SECTION 2D & 1D	P2-4	Bus-Tie Breaker	Diverge	Diverge	0.37	1.22	1.18	Diverge	0.48	1.22	0.38	SPS Recommended in 2018-2019 TPP
FLINT 115	P2-1:A5:24:_DRUM-HIGGINS 115KV (DRUM-DTCH FL1)	P2-1	Line Section w/o Fault	1.03	1.04	0.99	1.13	1.12	1.04	1.03	1.14	0.99	Load power factor correction and voltage support if needed
FLINT 115	P2-1:A5:27:_DRUM-HIGGINS 115KV (DTCH FL1-CHCGO PK)	P2-1	Line Section w/o Fault	1.02	1.04	0.98	1.14	1.13	1.04	1.03	1.14	0.98	Load power factor correction and voltage support if needed
FLINT 115	P2-1:A5:28:_DRUM-HIGGINS 115KV (CHCGO PK-HIGGINS)	P2-1	Line Section w/o Fault	1.02	1.04	0.98	1.14	1.13	1.03	1.03	1.14	0.98	Load power factor correction and voltage support if needed

Substation	Contingency (All and Worst P6)	Category	Category Description	Post Cont. Voltage Deviation PU (Baseline Scenarios)					Post Cont. Voltage Deviation PU (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2021 SP Heavy Renewable & Min Gas Gen	2024 SpOP Hi Renew & Min Gas Gen	2029 Retirement of QF Generations	
FLINT 115	P2-1:A5:34:_HIGGINS-BELL 115KV (HIGGINS-BELL PGE)	P2-1	Line Section w/o Fault	1.03	1.04	0.99	1.13	1.12	1.04	1.04	1.13	0.99	Load power factor correction and voltage support if needed
FLINT 115	P2-2:A5:15:_PLACER 115KV SECTION 1D	P2-2	Bus	1.05	1.06	1.03	1.12	1.12	1.06	1.05	1.13	1.03	Load power factor correction and voltage support if needed
FLINT 115	P2-3:A5:24:_PLACER - 1D 115KV & PLACER-GOLD HILL #1 LINE	P2-3	Non-Bus-Tie Breaker	1.04	1.06	1.01	1.12	1.12	1.05	1.03	1.13	1.01	Load power factor correction and voltage support if needed
FLINT 115	P2-3:A5:26:_PLACER - 1D 115KV & BELL-PLACER LINE	P2-3	Non-Bus-Tie Breaker	1.05	1.06	1.03	1.12	1.12	1.06	1.05	1.13	1.03	Load power factor correction and voltage support if needed
FLINT 115	P2-3:A5:85:_BRNSWALT 115KV - RING R4 & R3	P2-3	Non-Bus-Tie Breaker	1.03	1.04	0.99	1.12	1.12	1.04	1.03	1.14	0.99	Load power factor correction and voltage support if needed
FLINT 115	P2-3:A5:86:_BRNSWALT 115KV - RING R3 & R6	P2-3	Non-Bus-Tie Breaker	1.03	1.04	0.99	1.13	1.12	1.04	1.03	1.14	0.99	Load power factor correction and voltage support if needed
FLINT 115	P2-4:A5:2:_GOLDHILL 230KV - SECTION 2D & 1D	P2-4	Bus-Tie Breaker	**Diverge**	**Diverge**	**0.42**	1.20	1.16	**Diverge**	**0.50**	1.19	**0.43**	SPS Recommended in 2018-2019 TPP
FLINT 115	P2-4:A5:3:_GOLDHILL 115KV - SECTION 1F & 2F	P2-4	Bus-Tie Breaker	**0.88**	**0.90**	**0.56**	1.13	1.08	**0.88**	0.95	1.10	**0.57**	SPS Recommended in 2018-2019 TPP
FROGTOWN 115	P2-4:A11:1:_BELLOTA 230KV - SECTION 1E & 2E	P2-4	Bus-Tie Breaker	**0.85**	**0.84**	NA	1.06	1.07	**0.85**	0.99	1.07	NA	SPS Recommended in 2018-2019 TPP
GLEAF 1 115	P2-4:A5:5:_RIO OSO 115KV - SECTION 2D & 1D	P2-4	Bus-Tie Breaker	1.01	1.02	1.00	1.09	1.08	1.02	1.01	1.10	1.00	SPS Recommended in 2018-2019 TPP
GOLDHILL 115	P2-4:A5:2:_GOLDHILL 230KV - SECTION 2D & 1D	P2-4	Bus-Tie Breaker	**Diverge**	**Diverge**	**0.37**	1.22	1.18	**Diverge**	**0.46**	1.21	**0.38**	SPS Recommended in 2018-2019 TPP
HALE 115	P2-2:A4:7:_VACA-DIX 230KV SECTION NA	P2-2	Bus	1.06	1.07	0.99	1.10	1.10	1.07	1.06	1.10	0.98	Sensitivity only
HALE2 115	P2-2:A4:7:_VACA-DIX 230KV SECTION NA	P2-2	Bus	1.06	1.07	0.99	1.10	1.10	1.07	1.06	1.10	0.98	Sensitivity only
HIGGINS 115	P2-1:A5:24:_DRUM-HIGGINS 115KV (DRUM-DTCH FL1)	P2-1	Line Section w/o Fault	1.02	1.03	0.99	1.13	1.12	1.03	1.03	1.15	0.99	Load power factor correction and voltage support if needed
HIGGINS 115	P2-1:A5:27:_DRUM-HIGGINS 115KV (DTCH FL1-CHCGO PK)	P2-1	Line Section w/o Fault	1.02	1.03	0.97	1.15	1.13	1.03	1.03	1.15	0.97	Load power factor correction and voltage support if needed
HIGGINS 115	P2-1:A5:28:_DRUM-HIGGINS 115KV (CHCGO PK-HIGGINS)	P2-1	Line Section w/o Fault	1.01	1.03	0.97	1.14	1.13	1.02	1.03	1.14	0.97	Load power factor correction and voltage support if needed
HIGGINS 115	P2-3:A5:85:_BRNSWALT 115KV - RING R4 & R3	P2-3	Non-Bus-Tie Breaker	1.02	1.03	0.99	1.12	1.12	1.03	1.03	1.14	0.99	Load power factor correction and voltage support if needed

Substation	Contingency (All and Worst P6)	Category	Category Description	Post Cont. Voltage Deviation PU (Baseline Scenarios)					Post Cont. Voltage Deviation PU (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2021 SP Heavy Renewable & Min Gas Gen	2024 SpOP Hi Renew & Min Gas Gen	2029 Retirement of QF Generations	
HIGGINS 115	P2-3:A5:86:_BRNSWALT 115KV - RING R3 & R6	P2-3	Non-Bus-Tie Breaker	1.02	1.03	0.99	1.13	1.12	1.03	1.03	1.14	0.99	Load power factor correction and voltage support if needed
HIGGINS 115	P2-4:A5:2:_GOLDHILL 230KV - SECTION 2D & 1D	P2-4	Bus-Tie Breaker	Diverge	Diverge	0.52	1.18	1.13	Diverge	0.58	1.16	0.53	SPS Recommended in 2018-2019 TPP
HIGGINS 115	P2-4:A5:3:_GOLDHILL 115KV - SECTION 1F & 2F	P2-4	Bus-Tie Breaker	0.90	0.92	0.63	1.12	1.07	0.90	0.97	1.09	0.64	SPS Recommended in 2018-2019 TPP
HJ HEINZ 115	P2-3:A11:19:_KASSON - 1D 115KV & SCHULTE SW STA-KASSON-MANTECA LINE	P2-3	Non-Bus-Tie Breaker	0.90	1.01	0.94	1.03	1.04	1.01	0.99	1.04	0.94	Project: Vierra 115 kV Looping Project In-Service Date: Jan 2023 Short term: Action plan
HORSESHE 115	P2-1:A5:27:_DRUM-HIGGINS 115KV (DTCH FL1-CHCGO PK)	P2-1	Line Section w/o Fault	1.03	1.05	1.00	1.13	1.13	1.04	1.03	1.14	1.00	Load power factor correction and voltage support if needed
HORSESHE 115	P2-4:A5:2:_GOLDHILL 230KV - SECTION 2D & 1D	P2-4	Bus-Tie Breaker	Diverge	Diverge	0.39	1.21	1.17	Diverge	0.46	1.20	0.39	SPS Recommended in 2018-2019 TPP
HORSESHE 115	P2-4:A5:3:_GOLDHILL 115KV - SECTION 1F & 2F	P2-4	Bus-Tie Breaker	0.87	0.89	0.54	1.13	1.08	0.87	0.92	1.10	0.55	SPS Recommended in 2018-2019 TPP
JAMESON 115	P2-2:A4:7:_VACA-DIX 230KV SECTION NA	P2-2	Bus	1.06	1.07	0.98	1.10	1.10	1.07	1.06	1.11	0.98	Load power factor correction and voltage support if needed
LOCKFORD 115	P2-4:A11:1:_BELLOTA 230KV - SECTION 1E & 2E	P2-4	Bus-Tie Breaker	0.59	0.54	NA	1.04	1.09	0.57	0.88	1.10	NA	SPS Recommended in 2018-2019 TPP
LOCKFORD 230	P2-2:A11:8:_BELLOTA 230KV SECTION 2E	P2-2	Bus	0.88	0.90	0.97	0.98	0.97	0.90	0.90	0.98	0.97	Project: Lockeford-Lodi Area 230 kV Development Project In-Service Date: Jul 2025 Short term: Action plan
LOCKFORD 230	P2-3:A11:88:_LOCKFORD 230KV - RING R3 & R4	P2-3	Non-Bus-Tie Breaker	0.88	0.90	NA	0.98	0.97	0.90	0.91	0.98	NA	Project: Lockeford-Lodi Area 230 kV Development Project In-Service Date: Jul 2025 Short term: Action plan
LOCKFORD 230	P2-3:A11:89:_LOCKFORD 230KV - RING R3 & R2	P2-3	Non-Bus-Tie Breaker	0.88	0.90	NA	0.98	0.97	0.90	0.91	0.98	NA	Project: Lockeford-Lodi Area 230 kV Development Project In-Service Date: Jul 2025 Short term: Action plan
LOCKFORD 230	P2-4:A11:1:_BELLOTA 230KV - SECTION 1E & 2E	P2-4	Bus-Tie Breaker	0.87	0.89	NA	0.98	0.97	0.89	0.90	0.98	NA	SPS Recommended in 2018-2019 TPP
LOCKFORD 230	P2-4:A11:3:_BELLOTA 230KV - SECTION 2E & 2D	P2-4	Bus-Tie Breaker	0.88	0.90	0.96	0.99	0.97	0.89	0.90	0.98	0.96	SPS Recommended in 2018-2019 TPP

Study Area: PG&E Central Valley

High/Low Voltages

Substation	Contingency (All and Worst P6)	Category	Category Description	Post Cont. Voltage Deviation PU (Baseline Scenarios)					Post Cont. Voltage Deviation PU (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2021 SP Heavy Renewable & Min Gas Gen	2024 SpOP Hi Renew & Min Gas Gen	2029 Retirement of QF Generations	
MADISON 115	P2-2:A4:7:_VACA-DIX 230KV SECTION NA	P2-2	Bus	1.06	1.07	1.00	1.10	1.10	1.07	1.06	1.11	0.99	Load power factor correction and voltage support if needed
MANTECA 115	P2-3:A11:19:_KASSON - 1D 115KV & SCHULTE SW STA-KASSON-MANTECA LINE	P2-3	Non-Bus-Tie Breaker	0.89	1.01	0.93	1.03	1.03	1.00	0.98	1.03	0.93	Project: Vierra 115 kV Looping Project In-Service Date: Jan 2023 Short term: Action plan
MDSNVDXSW159 115	P2-2:A4:7:_VACA-DIX 230KV SECTION NA	P2-2	Bus	1.07	1.07	1.01	1.10	1.10	1.07	1.07	1.10	1.00	Sensitivity only
MELONES 115	P2-4:A11:1:_BELLOTA 230KV - SECTION 1E & 2E	P2-4	Bus-Tie Breaker	0.80	0.78	NA	1.05	1.07	0.80	0.97	1.07	NA	SPS Recommended in 2018-2019 TPP
MELONES 115	P2-4:A11:10:_TESLA 115KV - SECTION 2D & 1D	P2-4	Bus-Tie Breaker	0.85	1.00	-1.81	0.96	0.86	0.79	-1.17	0.85	-1.81	SPS Recommended in 2018-2019 TPP
MELONES 115	P2-4:A11:27:_BELLOTA 230KV - SECTION 2E & 1E	P2-4	Bus-Tie Breaker	NA	NA	0.77	NA	NA	NA	NA	NA	0.77	SPS Recommended in 2018-2019 TPP
MI-WUK 115	P2-4:A11:1:_BELLOTA 230KV - SECTION 1E & 2E	P2-4	Bus-Tie Breaker	0.89	0.88	NA	1.04	1.05	0.89	0.99	1.06	NA	SPS Recommended in 2018-2019 TPP
MI-WUK 115	P2-4:A11:27:_BELLOTA 230KV - SECTION 2E & 1E	P2-4	Bus-Tie Breaker	NA	NA	0.85	NA	NA	NA	NA	NA	0.85	SPS Recommended in 2018-2019 TPP
NEWCSTLE 115	P2-1:A5:24:_DRUM-HIGGINS 115KV (DRUM-DTCH FL1)	P2-1	Line Section w/o Fault	1.03	1.04	1.00	1.13	1.12	1.04	1.03	1.14	1.00	Load power factor correction and voltage support if needed
NEWCSTLE 115	P2-1:A5:27:_DRUM-HIGGINS 115KV (DTCH FL1-CHCGO PK)	P2-1	Line Section w/o Fault	1.03	1.04	0.99	1.14	1.13	1.04	1.03	1.14	0.99	Load power factor correction and voltage support if needed
NEWCSTLE 115	P2-1:A5:28:_DRUM-HIGGINS 115KV (CHCGO PK-HIGGINS)	P2-1	Line Section w/o Fault	1.02	1.04	0.99	1.13	1.13	1.04	1.03	1.14	0.99	Load power factor correction and voltage support if needed
NEWCSTLE 115	P2-2:A5:15:_PLACER 115KV SECTION 1D	P2-2	Bus	1.05	1.06	1.03	1.12	1.12	1.06	1.04	1.13	1.03	Load power factor correction and voltage support if needed
NEWCSTLE 115	P2-3:A5:25:_PLACER - 1D 115KV & PLACER-GOLD HILL #2 LINE	P2-3	Non-Bus-Tie Breaker	1.05	1.06	1.03	1.12	1.12	1.06	1.04	1.13	1.03	Load power factor correction and voltage support if needed
NEWCSTLE 115	P2-3:A5:26:_PLACER - 1D 115KV & BELL-PLACER LINE	P2-3	Non-Bus-Tie Breaker	1.05	1.06	1.03	1.12	1.12	1.06	1.04	1.13	1.03	Load power factor correction and voltage support if needed
NEWCSTLE 115	P2-3:A5:85:_BRNSWALT 115KV - RING R4 & R3	P2-3	Non-Bus-Tie Breaker	1.03	1.04	1.00	1.12	1.12	1.04	1.03	1.14	1.00	Load power factor correction and voltage support if needed
NEWCSTLE 115	P2-3:A5:86:_BRNSWALT 115KV - RING R3 & R6	P2-3	Non-Bus-Tie Breaker	1.03	1.04	1.00	1.13	1.12	1.04	1.03	1.14	1.00	Load power factor correction and voltage support if needed
NEWCSTLE 115	P2-4:A5:2:_GOLDHILL 230KV - SECTION 2D & 1D	P2-4	Bus-Tie Breaker	Diverge	Diverge	0.41	1.20	1.16	Diverge	0.49	1.19	0.41	SPS Recommended in 2018-2019 TPP

Substation	Contingency (All and Worst P6)	Category	Category Description	Post Cont. Voltage Deviation PU (Baseline Scenarios)					Post Cont. Voltage Deviation PU (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2021 SP Heavy Renewable & Min Gas Gen	2024 SpOP Hi Renew & Min Gas Gen	2029 Retirement of QF Generations	
NEWCSTLE 115	P2-4:A5:3:_GOLDHILL 115KV - SECTION 1F & 2F	P2-4	Bus-Tie Breaker	0.87	0.89	0.55	1.13	1.08	0.87	0.94	1.10	0.56	SPS Recommended in 2018-2019 TPP
PEORIA 115	P2-4:A11:1:_BELLOTA 230KV - SECTION 1E & 2E	P2-4	Bus-Tie Breaker	0.81	0.80	NA	1.05	1.06	0.81	0.97	1.07	NA	SPS Recommended in 2018-2019 TPP
PEORIA 115	P2-4:A11:10:_TESLA 115KV - SECTION 2D & 1D	P2-4	Bus-Tie Breaker	0.86	1.00	Diverge	0.97	0.87	0.80	Diverge	0.86	Diverge	SPS Recommended in 2018-2019 TPP
PEORIA 115	P2-4:A11:27:_BELLOTA 230KV - SECTION 2E & 1E	P2-4	Bus-Tie Breaker	NA	NA	0.78	NA	NA	NA	NA	NA	0.78	SPS Recommended in 2018-2019 TPP
PLACER 115	P2-1:A5:24:_DRUM-HIGGINS 115KV (DRUM-DTCH FL1)	P2-1	Line Section w/o Fault	1.03	1.04	0.99	1.13	1.12	1.04	1.03	1.14	0.99	Load power factor correction and voltage support if needed
PLACER 115	P2-1:A5:27:_DRUM-HIGGINS 115KV (DTCH FL1-CHCGO PK)	P2-1	Line Section w/o Fault	1.02	1.04	0.98	1.14	1.13	1.03	1.03	1.14	0.98	Load power factor correction and voltage support if needed
PLACER 115	P2-1:A5:28:_DRUM-HIGGINS 115KV (CHCGO PK-HIGGINS)	P2-1	Line Section w/o Fault	1.02	1.03	0.98	1.14	1.13	1.03	1.03	1.14	0.98	Load power factor correction and voltage support if needed
PLACER 115	P2-1:A5:34:_HIGGINS-BELL 115KV (HIGGINS-BELL PGE)	P2-1	Line Section w/o Fault	1.03	1.04	0.98	1.13	1.12	1.04	1.04	1.13	0.98	Load power factor correction and voltage support if needed
PLACER 115	P2-3:A5:85:_BRNSWALT 115KV - RING R4 & R3	P2-3	Non-Bus-Tie Breaker	1.03	1.04	0.99	1.12	1.12	1.04	1.03	1.14	0.99	Load power factor correction and voltage support if needed
PLACER 115	P2-3:A5:86:_BRNSWALT 115KV - RING R3 & R6	P2-3	Non-Bus-Tie Breaker	1.03	1.04	0.99	1.13	1.12	1.04	1.03	1.14	0.99	Load power factor correction and voltage support if needed
PLACER 115	P2-4:A5:2:_GOLDHILL 230KV - SECTION 2D & 1D	P2-4	Bus-Tie Breaker	Diverge	Diverge	0.43	1.20	1.15	Diverge	0.51	1.18	0.43	SPS Recommended in 2018-2019 TPP
PLACER 115	P2-4:A5:3:_GOLDHILL 115KV - SECTION 1F & 2F	P2-4	Bus-Tie Breaker	0.88	0.90	0.56	1.13	1.08	0.88	0.95	1.10	0.57	SPS Recommended in 2018-2019 TPP
PLCRVLB2 115	P2-4:A5:2:_GOLDHILL 230KV - SECTION 2D & 1D	P2-4	Bus-Tie Breaker	Diverge	Diverge	0.37	1.22	1.18	Diverge	0.47	1.22	0.38	SPS Recommended in 2018-2019 TPP
PLCRVLB3 115	P2-4:A5:2:_GOLDHILL 230KV - SECTION 2D & 1D	P2-4	Bus-Tie Breaker	Diverge	Diverge	0.37	1.22	1.18	Diverge	0.47	1.22	0.38	SPS Recommended in 2018-2019 TPP
PUTH CRK 115	P2-2:A4:7:_VACA-DIX 230KV SECTION NA	P2-2	Bus	1.07	1.07	1.01	1.10	1.10	1.07	1.07	1.10	1.00	Sensitivity only
R.TRACK 115	P2-4:A11:1:_BELLOTA 230KV - SECTION 1E & 2E	P2-4	Bus-Tie Breaker	0.80	0.78	NA	1.05	1.07	0.80	0.97	1.07	NA	SPS Recommended in 2018-2019 TPP
R.TRACK 115	P2-4:A11:10:_TESLA 115KV - SECTION 2D & 1D	P2-4	Bus-Tie Breaker	0.84	1.00	-1.81	0.96	0.86	0.78	-1.17	0.84	-1.82	SPS Recommended in 2018-2019 TPP

Substation	Contingency (All and Worst P6)	Category	Category Description	Post Cont. Voltage Deviation PU (Baseline Scenarios)					Post Cont. Voltage Deviation PU (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2021 SP Heavy Renewable & Min Gas Gen	2024 SpOP Hi Renew & Min Gas Gen	2029 Retirement of QF Generations	
R.TRACK 115	P2-4:A11:27:_BELLOTA 230KV - SECTION 2E & 1E	P2-4	Bus-Tie Breaker	NA	NA	0.76	NA	NA	NA	NA	NA	0.77	SPS Recommended in 2018-2019 TPP
RIPON 115	P2-3:A11:19:_KASSON - 1D 115KV & SCHULTE SW STA-KASSON-MANTECA LINE	P2-3	Non-Bus-Tie Breaker	0.90	1.00	0.93	1.03	1.03	1.00	0.98	1.03	0.93	Project: Vierra 115 kV Looping Project In-Service Date: Jan 2023 Short term: Action plan
RVRBANK 115	P2-4:A11:1:_BELLOTA 230KV - SECTION 1E & 2E	P2-4	Bus-Tie Breaker	0.62	0.58	NA	1.04	1.10	0.61	0.90	1.10	NA	SPS Recommended in 2018-2019 TPP
RVRBANK 115	P2-4:A11:13:_BELLOTA 115KV - SECTION 1D & 2D	P2-4	Bus-Tie Breaker	1.02	1.02	0.95	1.05	1.11	1.01	1.03	1.11	0.95	SPS Recommended in 2018-2019 TPP
RVRBANK 115	P2-4:A11:27:_BELLOTA 230KV - SECTION 2E & 1E	P2-4	Bus-Tie Breaker	NA	NA	0.56	NA	NA	NA	NA	NA	0.56	SPS Recommended in 2018-2019 TPP
SHPRING 115	P2-1:A5:10:_MISSOURI FLAT-GOLD HILL #1 115KV (GOLDHILL-CPM TAP)	P2-1	Line Section w/o Fault	1.03	1.01	0.90	1.12	1.14	1.01	1.04	1.16	0.90	Load power factor correction and voltage support if needed
SHPRING 115	P2-4:A5:2:_GOLDHILL 230KV - SECTION 2D & 1D	P2-4	Bus-Tie Breaker	Diverge	Diverge	0.36	1.22	1.18	Diverge	0.46	1.22	0.37	SPS Recommended in 2018-2019 TPP
SPICAMIN 115	P2-1:A5:10:_MISSOURI FLAT-GOLD HILL #1 115KV (GOLDHILL-CPM TAP)	P2-1	Line Section w/o Fault	1.04	1.02	0.92	1.12	1.14	1.02	1.05	1.15	0.92	Sensitivity only
SPICAMIN 115	P2-4:A5:2:_GOLDHILL 230KV - SECTION 2D & 1D	P2-4	Bus-Tie Breaker	Diverge	Diverge	0.37	1.22	1.18	Diverge	0.48	1.22	0.37	SPS Recommended in 2018-2019 TPP
SPISONORA 115	P2-4:A11:1:_BELLOTA 230KV - SECTION 1E & 2E	P2-4	Bus-Tie Breaker	0.85	0.84	NA	1.04	1.06	0.85	0.98	1.06	NA	SPS Recommended in 2018-2019 TPP
SPISONORA 115	P2-4:A11:27:_BELLOTA 230KV - SECTION 2E & 1E	P2-4	Bus-Tie Breaker	NA	NA	0.81	NA	NA	NA	NA	NA	0.81	SPS Recommended in 2018-2019 TPP
STANISLS 115	P2-4:A11:1:_BELLOTA 230KV - SECTION 1E & 2E	P2-4	Bus-Tie Breaker	0.87	0.86	NA	1.06	1.07	0.88	1.01	1.07	NA	SPS Recommended in 2018-2019 TPP
STKTON A 115	P2-4:A11:1:_BELLOTA 230KV - SECTION 1E & 2E	P2-4	Bus-Tie Breaker	0.57	0.52	NA	1.03	1.08	0.55	0.86	1.09	NA	SPS Recommended in 2018-2019 TPP
STKTON B 115	P2-4:A11:1:_BELLOTA 230KV - SECTION 1E & 2E	P2-4	Bus-Tie Breaker	0.59	0.54	NA	1.03	1.09	0.57	0.87	1.10	NA	SPS Recommended in 2018-2019 TPP
STN COGN 115	P2-4:A11:1:_BELLOTA 230KV - SECTION 1E & 2E	P2-4	Bus-Tie Breaker	0.57	0.52	NA	1.03	1.08	0.56	0.86	1.09	NA	SPS Recommended in 2018-2019 TPP
TULLOCH 115	P2-4:A11:1:_BELLOTA 230KV - SECTION 1E & 2E	P2-4	Bus-Tie Breaker	0.73	0.70	NA	1.05	1.07	0.73	0.95	1.08	NA	SPS Recommended in 2018-2019 TPP
TULLOCH 115	P2-4:A11:10:_TESLA 115KV - SECTION 2D & 1D	P2-4	Bus-Tie Breaker	0.90	1.02	-1.42	0.93	0.82	0.85	-0.71	0.81	-1.43	SPS Recommended in 2018-2019 TPP

Substation	Contingency (All and Worst P6)	Category	Category Description	Post Cont. Voltage Deviation PU (Baseline Scenarios)					Post Cont. Voltage Deviation PU (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2021 SP Heavy Renewable & Min Gas Gen	2024 SpOP Hi Renew & Min Gas Gen	2029 Retirement of QF Generations	
TULLOCH 115	P2-4:A11:27:_BELLOTA 230KV - SECTION 2E & 1E	P2-4	Bus-Tie Breaker	NA	NA	**0.69**	NA	NA	NA	NA	NA	**0.70**	SPS Recommended in 2018-2019 TPP
VACA-CB 115	P2-2:A4:7:_VACA-DIX 230KV SECTION NA	P2-2	Bus	1.08	1.08	1.05	**1.11**	**1.11**	1.08	1.08	**1.11**	1.04	Load power factor correction and voltage support if needed
VACA-DIX 115	P2-2:A4:7:_VACA-DIX 230KV SECTION NA	P2-2	Bus	1.07	1.07	1.01	1.10	1.10	1.07	1.07	**1.10**	1.01	Sensitivity only
VACAVLL1 115	P2-2:A4:7:_VACA-DIX 230KV SECTION NA	P2-2	Bus	1.07	1.07	1.01	1.10	1.10	1.07	1.06	**1.10**	1.00	Sensitivity only
VACAVLL2 115	P2-2:A4:7:_VACA-DIX 230KV SECTION NA	P2-2	Bus	1.07	1.07	1.01	**1.10**	1.10	1.07	1.06	**1.10**	1.00	Load power factor correction and voltage support if needed
VALLY HM 115	P2-4:A11:1:_BELLOTA 230KV - SECTION 1E & 2E	P2-4	Bus-Tie Breaker	**0.90**	0.90	NA	1.04	1.04	0.91	1.00	1.05	NA	SPS Recommended in 2018-2019 TPP
VALLY HM 115	P2-4:A11:27:_BELLOTA 230KV - SECTION 2E & 1E	P2-4	Bus-Tie Breaker	NA	NA	**0.86**	NA	NA	NA	NA	NA	**0.86**	SPS Recommended in 2018-2019 TPP
APPLE HL 115	P7-1:A5:7_Atlantic-Gold Hill 230 kV Line & Rio Oso-Gold Hill 230 kV Line	P7	DCTL	1.05	1.05	1.01	**1.14**	**1.14**	1.05	1.05	**1.16**	1.01	Load power factor correction and voltage support if needed
BELL PGE 115	P7-1:A5:19_Placer-Gold Hill No. 1 115 kV Line and Placer-Gold Hill No. 2 115 kV Line	P7	DCTL	0.95	0.96	**0.87**	**1.12**	1.06	0.96	1.02	1.07	**0.87**	Load power factor correction and voltage support if needed - Continue to monitor future load forecast
CAMANCH 230	P7-1:A11:20:_BELLOTA-COTTLE 230KV & BELLOTA-WARNERVILLE 230KV	P7	DCTL	1.01	1.01	0.99	**1.11**	**1.10**	1.01	1.01	**1.11**	0.99	Load power factor correction and voltage support if needed
CAMANCH 230	P7-1:A12:3:_BELLOTA-COTTLE 230KV & BELLOTA-WARNERVILLE 230KV	P7	DCTL	1.01	1.01	0.99	**1.11**	**1.10**	1.01	1.01	**1.11**	0.99	Load power factor correction and voltage support if needed
CAMANCH 230	P7-1:A12:8:_COTTLE-MELONES 230KV & BELLOTA-WARNERVILLE 230KV	P7	DCTL	1.01	1.01	0.99	**1.11**	**1.10**	1.01	1.01	**1.11**	0.99	Load power factor correction and voltage support if needed
CAMANCPP 230	P7-1:A11:20:_BELLOTA-COTTLE 230KV & BELLOTA-WARNERVILLE 230KV	P7	DCTL	1.01	1.01	0.99	**1.11**	**1.10**	1.01	1.01	**1.11**	0.99	Load power factor correction and voltage support if needed
CAMANCPP 230	P7-1:A12:3:_BELLOTA-COTTLE 230KV & BELLOTA-WARNERVILLE 230KV	P7	DCTL	1.01	1.01	0.99	**1.11**	**1.10**	1.01	1.01	**1.11**	0.99	Load power factor correction and voltage support if needed
CAMANCPP 230	P7-1:A12:8:_COTTLE-MELONES 230KV & BELLOTA-WARNERVILLE 230KV	P7	DCTL	1.01	1.01	0.99	**1.11**	**1.10**	1.01	1.01	**1.11**	0.99	Load power factor correction and voltage support if needed
CLRKSVLE 115	P7-1:A5:7_Atlantic-Gold Hill 230 kV Line & Rio Oso-Gold Hill 230 kV Line	P7	DCTL	1.04	1.05	1.01	**1.14**	**1.14**	1.04	1.04	**1.15**	1.01	Load power factor correction and voltage support if needed
CPM 115	P7-1:A5:7_Atlantic-Gold Hill 230 kV Line & Rio Oso-Gold Hill 230 kV Line	P7	DCTL	1.05	1.05	1.02	**1.14**	**1.14**	1.05	1.05	**1.15**	1.02	Load power factor correction and voltage support if needed
DIMOND_1 115	P7-1:A5:7_Atlantic-Gold Hill 230 kV Line & Rio Oso-Gold Hill 230 kV Line	P7	DCTL	1.06	1.05	1.01	**1.14**	**1.14**	1.05	1.05	**1.15**	1.01	Load power factor correction and voltage support if needed

Substation	Contingency (All and Worst P6)	Category	Category Description	Post Cont. Voltage Deviation PU (Baseline Scenarios)					Post Cont. Voltage Deviation PU (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2021 SP Heavy Renewable & Min Gas Gen	2024 SpOP Hi Renew & Min Gas Gen	2029 Retirement of QF Generations	
DIMOND_2 115	P7-1:A5:7_Atlantic-Gold Hill 230 kV Line & Rio Oso-Gold Hill 230 kV Line	P7	DCTL	1.04	1.05	1.01	1.14	1.14	1.05	1.04	1.15	1.01	Load power factor correction and voltage support if needed
DMND SPR 115	P7-1:A5:7_Atlantic-Gold Hill 230 kV Line & Rio Oso-Gold Hill 230 kV Line	P7	DCTL	1.04	1.05	1.01	1.14	1.14	1.05	1.04	1.15	1.01	Load power factor correction and voltage support if needed
E.MRYSVE 115	P7-1:A5:12_Rio Oso-Nicolaus 115 kV Line & Bogue-Rio Oso 115 kV Line	P7	DCTL	1.03	1.05	0.98	1.09	1.10	1.05	1.02	1.11	0.98	Load power factor correction and voltage support if needed
E.NICOLS 115	P7-1:A5:12_Rio Oso-Nicolaus 115 kV Line & Bogue-Rio Oso 115 kV Line	P7	DCTL	1.02	1.04	0.96	1.09	1.11	1.04	1.02	1.12	0.96	Load power factor correction and voltage support if needed
ELDORAD 115	P7-1:A5:7_Atlantic-Gold Hill 230 kV Line & Rio Oso-Gold Hill 230 kV Line	P7	DCTL	1.05	1.05	1.01	1.14	1.14	1.05	1.05	1.15	1.01	Load power factor correction and voltage support if needed
GOLDHILL 115	P7-1:A5:7_Atlantic-Gold Hill 230 kV Line & Rio Oso-Gold Hill 230 kV Line	P7	DCTL	1.05	1.05	1.02	1.13	1.13	1.05	1.04	1.15	1.02	Load power factor correction and voltage support if needed
HIGGINS 115	P7-1:A5:19_Placer-Gold Hill No. 1 115 kV Line and Placer-Gold Hill No. 2 115 kV Line	P7	DCTL	0.97	0.97	0.90	1.12	1.06	0.97	1.02	1.07	0.90	Load power factor correction and voltage support if needed - Continue to monitor future load forecast
HORSESHE 115	P7-1:A5:7_Atlantic-Gold Hill 230 kV Line & Rio Oso-Gold Hill 230 kV Line	P7	DCTL	1.04	1.04	1.01	1.13	1.13	1.04	1.03	1.14	1.01	Load power factor correction and voltage support if needed
LOCKFORD 230	P7-1:A11:12:_BRIGHTON-BELLOTA 230KV & LOCKEFORD-BELLOTA 230KV	P7	DCTL	0.87	0.89	NA	0.98	0.97	0.89	0.90	0.98	NA	Project: Lockeford-Lodi Area 230 kV Development Project In-Service Date: Jul 2025 Short term: Action plan
LOCKFORD 230	P7-1:A11:25:_RIO OSO-LOCKEFORD 230KV & LOCKEFORD-BELLOTA 230KV	P7	DCTL	0.43	0.40	0.97	0.46	0.44	0.38	0.32	0.46	0.97	Project: Lockeford-Lodi Area 230 kV Development Project In-Service Date: Jul 2025 Short term: Action plan
PEASE 115	P7-1:A5:20_Palermo-Pease 115 kV Line amd Pease-Rio Oso 115 kV Line	P7	DCTL	0.94	0.97	0.95	0.77	1.04	0.97	0.94	1.03	0.95	Project: East Marysville 115/60 kV Project In-Service Date: Dec 2022 Short term: Action plan
PLACER 115	P7-1:A5:19_Placer-Gold Hill No. 1 115 kV Line and Placer-Gold Hill No. 2 115 kV Line	P7	DCTL	0.95	0.96	0.87	1.13	1.06	0.95	1.02	1.07	0.87	Load power factor correction and voltage support if needed - Continue to monitor future load forecast
PLCRVLB2 115	P7-1:A5:7_Atlantic-Gold Hill 230 kV Line & Rio Oso-Gold Hill 230 kV Line	P7	DCTL	1.04	1.05	1.01	1.14	1.14	1.05	1.04	1.15	1.01	Load power factor correction and voltage support if needed
PLCRVLB3 115	P7-1:A5:7_Atlantic-Gold Hill 230 kV Line & Rio Oso-Gold Hill 230 kV Line	P7	DCTL	1.04	1.05	1.01	1.14	1.14	1.05	1.04	1.15	1.01	Load power factor correction and voltage support if needed
SHPRING 115	P7-1:A5:7_Atlantic-Gold Hill 230 kV Line & Rio Oso-Gold Hill 230 kV Line	P7	DCTL	1.05	1.05	1.01	1.14	1.14	1.05	1.04	1.15	1.01	Load power factor correction and voltage support if needed

Study Area: PG&E Central Valley

High/Low Voltages

Substation	Contingency (All and Worst P6)	Category	Category Description	Post Cont. Voltage Deviation PU (Baseline Scenarios)					Post Cont. Voltage Deviation PU (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2021 SP Heavy Renewable & Min Gas Gen	2024 SpOP Hi Renew & Min Gas Gen	2029 Retirement of QF Generations	
SPICAMIN 115	P7-1:A5:7_Atlantic-Gold Hill 230 kV Line & Rio Oso-Gold Hill 230 kV Line	P7	DCTL	1.05	1.05	1.01	**1.14**	**1.14**	1.05	1.05	**1.16**	1.01	Load power factor correction and voltage support if needed

2019-2020 ISO Reliability Assessment - Study Results

Study Area: PG&E Central Valley

Voltage Deviation

Substation	Contingency (All and Worst P6)	Category	Category Description	Voltage % (Baseline Scenarios)					Voltage % (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2021 SP Heavy Renewable & Min Gas Gen	2024 SpOP Hi Renew & Min Gas Gen	2029 Retirement of QF Generations	
BANTA 60	P1-3:A11:32:_KASSON 115/60KV TB 1	P1	N-1	7	8	**12**	5	8	8	5	7	**12**	Continue to monitor future load forecast
BNTA JCT 60	P1-3:A11:32:_KASSON 115/60KV TB 1	P1	N-1	7	8	**12**	5	8	8	5	7	**12**	Continue to monitor future load forecast
CALVO 60	P1-3:A11:32:_KASSON 115/60KV TB 1	P1	N-1	7	7	**10**	5	7	7	5	7	**10**	Continue to monitor future load forecast
CARBONA 60	P1-3:A11:32:_KASSON 115/60KV TB 1	P1	N-1	8	8	**12**	5	8	8	5	7	**12**	Continue to monitor future load forecast
CRBNA JC 60	P1-3:A11:32:_KASSON 115/60KV TB 1	P1	N-1	7.4	7.7	**11.6**	5.0	7.7	8.0	5.3	7.4	**11.6**	Continue to monitor future load forecast
CROWCREEK SS 60	P1-2:A12:16:_SALADO-CROWCREEK SS 60KV	P1	N-1	**11.2**	**11.4**	**13.4**	-2.9	-4.5	**11.3**	-0.3	-4.9	**13.5**	Load forecast under review
FRONTIERPV 60	P1-2:A12:16:_SALADO-CROWCREEK SS 60KV	P1	N-1	**11.2**	**11.4**	**13.4**	-2.8	-4.5	**11.3**	-0.3	-4.9	**13.5**	Load forecast under review
GUSTINE 60	P1-2:A12:16:_SALADO-CROWCREEK SS 60KV	P1	N-1	**8.4**	**8.5**	**9.5**	-1.4	-2.4	**8.3**	-0.1	-2.7	**9.5**	Load forecast under review
KASSON 60	P1-3:A11:32:_KASSON 115/60KV TB 1	P1	N-1	7.4	7.7	**11.6**	5.0	7.7	8.0	5.3	7.4	**11.6**	Continue to monitor future load forecast
LOCKFORD 230	P1-2:A11:4:_LOCKEFORD-BELLOTA 230KV	P1	N-1	**9.9**	**9.1**	0.7	6.5	7.2	**9.1**	**8.2**	6.5	0.7	Project: Lockeford-Lodi Area 230 kV Development Project In-Service Date: Jul 2025 Short term: Action plan
LYOTH-SP 60	P1-3:A11:32:_KASSON 115/60KV TB 1	P1	N-1	7.4	7.7	**11.6**	5.0	7.7	8.0	5.3	7.4	**11.6**	Continue to monitor future load forecast
MARTELL 60	P1-2:A11:68:_VALLEY SPRINGS-MARTELL #1 60KV	P1	N-1	1.2	1.3	4.9	-1.7	-2.2	1.3	1.1	-2.6	**9.4**	Sensitivity only'
NEWMAN 60	P1-2:A12:15:_SALADO-NEWMAN #2 60KV MOAS OPENED ON CF	P1	N-1	5.6	6.0	**8.4**	-0.1	-0.9	6.2	1.9	-1.3	**8.4**	Continue to monitor future load forecast
NEWMAN 60	P1-2:A12:16:_SALADO-CROWCREEK SS 60KV	P1	N-1	7.5	7.4	**8.0**	-1.0	-1.9	7.2	0.0	-2.1	**8.1**	Continue to monitor future load forecast
NEWMAN 60	P1-2:A12:17:_NEWMAN-CROWCREEK SS 60KV	P1	N-1	6.0	6.5	**8.8**	1.1	0.1	6.8	2.7	-0.1	**8.8**	Continue to monitor future load forecast
NEWMAN 60	P1-2:A12:18:_ 60KV	P1	N-1	6.5	7.0	**9.0**	0.8	-0.2	7.4	2.8	-0.4	**9.0**	Continue to monitor future load forecast
RIPON 115	P1-2:A11:42:_MANTECA-RIPON 115KV	P1	N-1	6.1	7.8	**9.7**	-1.0	-1.5	**8.1**	3.4	-2.0	**9.7**	Continue to monitor future load forecast

Study Area: PG&E Central Valley

Transient Stability

Contingency	Category	Category Description	Transient Stability Performance					Potential Mitigation Solutions
			Baseline Scenarios			Sensitivity Scenarios		
			2024 Summer Peak	2029 Summer Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	
Colgate Generator 1 Trip	P1-1	N-1	No Issues	No Issues	No Issues	No Issues	No Issues	No mitigation required
Tesla - Newark 230 kV Line Fault	P1-2	N-1	No Issues	No Issues	No Issues	No Issues	No Issues	No mitigation required
Tesla 500/230 kV Transformer Fault	P1-3	N-1	No Issues	No Issues	No Issues	No Issues	No Issues	No mitigation required
Atlantic SVD Fault	P1-4	N-1	No Issues	No Issues	No Issues	No Issues	No Issues	No mitigation required
Tesla 230 kV Bus Fault	P2-2	Bus	No Issues	No Issues	No Issues	No Issues	No Issues	No mitigation required
Tesla 230 kV non-tie-breaker fault	P2-3	Non-Bus-Tie Breaker	No Issues	No Issues	No Issues	No Issues	No Issues	No mitigation required
Tesla 230 kV tie-breaker fault	P2-4	Bus-Tie Breaker	No Issues	No Issues	No Issues	No Issues	No Issues	No mitigation required
Golgate out and GWFTracy Generator fault	P3-1	G-1/G-1	No Issues	No Issues	No Issues	No Issues	No Issues	No mitigation required
Golgate out and Tesla-Newark 230 kV line fault	P3-2	G-1/N-1	No Issues	No Issues	No Issues	No Issues	No Issues	No mitigation required
Colgate out and Tesla 500/230 kV Transformer Fault	P3-3	G-1/N-1	No Issues	No Issues	No Issues	No Issues	No Issues	No mitigation required
Colgate out and Atlantic SVD Fault	P3-4	G-1/N-1	No Issues	No Issues	No Issues	No Issues	No Issues	No mitigation required
USWP-RUS Generator fault plus stuck breaker	P4-1	Stuck Breaker	No Issues	No Issues	No Issues	No Issues	No Issues	No mitigation required
Bellota line fault plus stuck breaker	P4-2	Stuck Breaker	No Issues	No Issues	No Issues	No Issues	No Issues	No mitigation required
Vaca Dixon transformer fault plus stuck breaker	P4-3	Stuck Breaker	No Issues	No Issues	No Issues	No Issues	No Issues	No mitigation required
Atlantic SVD Fault plus stuck breaker	P4-4	Stuck Breaker	No Issues	No Issues	No Issues	No Issues	No Issues	No mitigation required
Tesla 230 kV bus section fault plus stuck breaker	P4-5	Stuck Breaker	No Issues	No Issues	No Issues	No Issues	No Issues	No mitigation required
Tesla 230 kV bus tie-breaker fault	P4-6	Stuck Breaker	No Issues	No Issues	No Issues	No Issues	No Issues	No mitigation required
Solano generator fault plus relay failure	P5-1	Non-Redundant Relary	No Issues	No Issues	No Issues	No Issues	No Issues	No mitigation required
Bellota line fault plus relay failure	P5-2	Non-Redundant Relary	No Issues	No Issues	No Issues	No Issues	No Issues	No mitigation required
Vaca Dixon transformer fault plus relay failure	P5-3	Non-Redundant Relary	No Issues	No Issues	No Issues	No Issues	No Issues	No mitigation required
Atlantic SVD Fault plus relay failure	P5-4	Non-Redundant Relary	No Issues	No Issues	No Issues	No Issues	No Issues	No mitigation required
Tesla transformer out and Tesla-ADCC 230 kV line fault	P6-1	N-1/N-1	No Issues	No Issues	No Issues	No Issues	No Issues	No mitigation required
Tesla transformer out and another Tesla transformer fault	P6-2	N-1/N-1	No Issues	No Issues	No Issues	No Issues	No Issues	No mitigation required
Atlantic SVD out and Vaca Dixon SVD fault	P6-3	N-1/N-1	No Issues	No Issues	No Issues	No Issues	No Issues	No mitigation required
Pease-Palermo and Pease-Rio Oso 115 kV lines (DCTL)- Temporary fault	P7-1	DCTL	No Issues	No Issues	No Issues	No Issues	No Issues	No mitigation required
Pease-Palermo and Pease-Rio Oso 115 kV lines (DCTL)- Permanent fault	P7-1	DCTL	No Issues	No Issues	No Issues	No Issues	No Issues	No mitigation required
Stanislaus-Manteca and Stanislaus-Melones_Riverbank 115 kV lines (DCTL) - Temporary fault	P7-1	DCTL	No Issues	No Issues	No Issues	No Issues	No Issues	No mitigation required
Stanislaus-Manteca and Stanislaus-Melones_Riverbank 115 kV lines (DCTL) - Permanent fault	P7-1	DCTL	No Issues	No Issues	No Issues	No Issues	No Issues	No mitigation required

Study Area: PG&E Central Valley

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	2024 SP High CEC Forecast	2021 SP Heavy Renewable & Min Gas Gen	2024 SpOP Hi Renew & Min Gas Gen	2029 Retirement of QF Generations	

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

2019-2020 ISO Reliability Assessment - Study Results

Study Area: PG&E Central Valley

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	2024 SP High CEC Forecast	2021 SP with Forecasted Load Addition	2024 SpOP Hi Renew & Min Gas Gen	2029 Retirement of QF Generations	

No single source substation with more than 100 MW Load

2019-2020 ISO Reliability Assessment - Study Results
Study Area: PG&E Greater Bay Area
Thermal Overloads

Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Loading % (Baseline Scenarios)								Loading % (Sensitivity Scenarios)					ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2021 Winter Peak	2024 Winter Peak	2029 Winter Peak	2024 SP High CEC Forecast	2021 SP Heavy Renewable & Min Gas Gen	2024 SpOP Hi Renew & Min Gas Gen	2029 Retirement of QF Generations	2029 Summer Peak High SVP Forecasted Load	
AMES-Mountain View 115 kV	MONTA VISTA 115kV BAAH BUS #1 (FAILURE OF NON-REDUNDENT RELAY)	P5	Non-Redundant Relay	138	138	152	72	70	90	104	97	142	115	65	153	158	Protection upgrade
AMES-Whisman 115 kV	MONTA VISTA 115kV BAAH BUS #1 (FAILURE OF NON-REDUNDENT RELAY)	P5	Non-Redundant Relay	144	144	159	70	67	92	107	100	149	116	61	160	165	Protection upgrade
Cayetano-Lone Tree (Lone Tree-USWP) 230kV Line	C.COSTAPPF 230kV - Section 2F & 1F	P2	Bus-Tie-Breaker	93	90	102	17	10	58	59	63	91	53	20	101	97	Continue to monitor future load forecast
	MORAGA 230kV - Section 2D & 1D	P2	Bus-Tie-Breaker	97	97	112	29	26	64	68	70	101	71	30	113	112	Continue to monitor future load forecast
	NEWARK D 230kV Section 1D	P2	Bus	85	88	102	22	22	55	58	61	90	60	24	103	106	Continue to monitor future load forecast
	NEWARK D Section 1D & NEWARK E Section 1E 230kV	P2	Bus-Tie-Breaker	84	93	106	20	20	53	57	68	95	58	22	107	110	Continue to monitor future load forecast
	RUSEL GEN UNITS & CONTRA COSTA-LAS POSITAS 230kV	P3	G-1/N-1	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	101	Sensitivity only
	LAS POSITAS-NEWARK 230kV & PPASSJCT-NEWARK E #2 230kV	P6	N-1-1	<100	<100	101	<100	<100	<100	<100	<100	<100	<100	<100	<100	101	Continue to monitor future load forecast
	Contra Costa-Moraga Nos. 1 & 2 230 kV lines	P7	DCTL	<100	<100	106	<100	<100	<100	<100	68	<100	<100	<100	106	106	Continue to monitor future load forecast
	Tesla-Newark No.1 and Tesla-Ravenswood 230 kV lines	P7	DCTL	88	86	99	28	29	59	63	66	91	66	29	100	102	Sensitivity only
Cayetano-Lone Tree (USWP-Cayetano) 230kV Line	C.COSTAPPF 230kV - Section 2F & 1F	P2	Bus-Tie-Breaker	102	99	102	27	10	60	61	64	100	69	32	101	97	Contra Costa 230 kV bus upgrade or Contra Costa area generation redispatch
	MORAGA 230kV - Section 2D & 1D	P2	Bus-Tie-Breaker	106	106	112	39	26	67	70	71	110	86	42	113	111	Moraga 230 kV bus upgrade or Contra Costa area generation redispatch
	NEWARK D 230kV Section 1D	P2	Bus	94	97	102	32	22	57	60	62	99	76	36	102	106	Continue to monitor future load forecast
	NEWARK D Section 1D & NEWARK E Section 1E 230kV	P2	Bus-Tie-Breaker	92	101	106	31	21	56	59	69	104	74	35	107	110	Continue to monitor future load forecast
	LAS POSITAS-NEWARK 230kV & PPASSJCT-NEWARK E #2 230kV	P6	N-1-1	<100	<100	101	<100	<100	<100	<100	<100	103	<100	<100	<100	101	Continue to monitor future load forecast
	Contra Costa-Moraga Nos. 1 & 2 230 kV lines	P7	DCTL	<100	<100	106	<100	<100	<100	<100	69	<100	<100	<100	106	105	Continue to monitor future load forecast
	Tesla-Newark No.1 and Tesla-Ravenswood 230 kV lines	P7	DCTL	97	95	99	39	29	62	65	67	99	81	41	100	102	Sensitivity only
Christie-Sobrante (Oleum-Sobrante) 115kV Line	SOBRANTE-G #1 115kV & SOBRANTE-G #2 115kV	P6	N-1-1	101	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	Project: Christie - Sobrante 115 kV Line Reconductor In-service date: 12/22 Short term: Action Plan
Contra Costa-Las Positas 230kV Line	C.COSTAPPE 230kV - Section 2E & 1E	P2	Bus-Tie-Breaker	104	100	109	35	18	72	71	72	102	86	38	112	100	Contra Costa 230 kV bus upgrade or Contra Costa area generation redispatch
Eastshore 230/115kV Transformer #1	E. SHORE 230kV - Middle Breaker Bay 3	P2	Non-Bus-Tie Breaker	107	108	113	9	10	102	104	114	109	54	10	111	100	Reconfigure E. Shore 230 kV bus connections
	EVRGRN 115kV Section 1D	P2	Bus	60	66	71	59	65	60	71	64	68	63	57	73	104	Sensitivity only

Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Loading % (Baseline Scenarios)								Loading % (Sensitivity Scenarios)					ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2021 Winter Peak	2024 Winter Peak	2029 Winter Peak	2024 SP High CEC Forecast	2021 SP Heavy Renewable & Min Gas Gen	2024 SpOP Hi Renew & Min Gas Gen	2029 Retirement of QF Generations	2029 Summer Peak High SVP Forecasted Load	
El Patio-San Jose Sta. 'A' 115 kV Line	MTCALF E 115kV - Section 1E & 2E	P2	Bus-Tie-Breaker	93	102	111	73	80	84	106	95	106	88	66	113	150	Continue to monitor future load forecast
	MTCALF E 115kV Section 1X	P2	Non-Bus-Tie Breaker	59	72	76	52	57	57	69	62	75	59	49	79	109	Sensitivity only
	MTCALF E 115kV Section 1Y	P2	Non-Bus-Tie Breaker	60	72	76	52	57	57	70	62	75	59	49	78	109	Sensitivity only
	MTCALF E 115kV Section 2E	P2	Bus	64	70	77	54	59	61	74	67	73	63	51	79	106	Sensitivity only
	NRS 400 115 kV bus tie breaker to NRS 300 115 kV bus	P2	Bus-Tie-Breaker	68	73	78	50	55	60	70	66	75	65	49	80	119	Sensitivity only
	EVRGRN 115kV Section 1D	P2	Bus	60	66	71	59	65	60	71	64	67	63	57	73	104	Sensitivity only
	DVR Gen Units (SVP) & SAN JOSE B-STONE-EVERGREEN 115kV	P3	G-1/N-1	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	104	Sensitivity only
	LOS ESTEROS 115kV BAAH BUS #2 (FAILURE OF NON-REDUNDENT RELAY)	P5	Non-Redundant Relay	72	78	84	47	52	66	78	73	80	69	45	86	108	Sensitivity only
	LOS ESTEROS 230 kV BAAH BUS #1 (FAILURE OF NON-REDUNDENT RELAY)	P5	Non-Redundant Relay	69	74	82	56	62	59	70	66	77	67	54	84	119	Sensitivity only
	LOS ESTEROS 230 kV BAAH BUS #2 (FAILURE OF NON-REDUNDENT RELAY)	P5	Non-Redundant Relay	74	80	88	63	69	64	76	70	82	71	61	91	127	Sensitivity only
	MONTA VISTA 115kV BAAH BUS #1 (FAILURE OF NON-REDUNDENT RELAY)	P5	Non-Redundant Relay	59	64	72	49	55	58	68	62	66	58	45	74	101	Sensitivity only
	PALO ALTO SW. STA. 115kV DBDB BUS #1 (FAILURE OF NON-REDUNDENT RELAY)	P5	Non-Redundant Relay	72	78	85	46	52	66	79	74	81	70	45	86	112	Sensitivity only
	NEWARK E-F BUS TIE 230kV & LOS ESTEROS-METCALF 230kV	P6	N-1-1	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	131	Sensitivity only
	Metcalf - Evergreen #1 and #2 115 kV Lines	P7	DCTL	85	91	99	65	71	77	93	84	94	82	61	102	135	Sensitivity only
	Newark - Los Esteros & Los Esteros - Metcalf 230 kV Lines	P7	DCTL	74	80	88	63	69	64	76	70	82	71	61	91	127	Sensitivity only
	Tesla - Newark No.2 and Metcalf - Los Esteros 230 kV lines	P7	DCTL	60	66	74	55	60	59	69	63	68	61	51	76	104	Sensitivity only
Evergreen-Almaden 60 kV Line	MONTA VISTA-LOS GATOS 60kV	P1	N-1	112	111	124	68	58	88	104	96	117	88	54	124	128	Disable automatic load pickup
FMC-San Jose 'B' 115 kV Line	NRS 400 115 kV bus tie breaker to NRS 300 115 kV bus	P2	Bus-Tie-Breaker	80	83	90	40	48	65	69	74	83	77	45	91	156	Sensitivity only
	LOS ESTEROS-NORTECH 115kV & SSS-NRS 230kV (SVP)	P6	N-1-1	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	108	Sensitivity only
Kifer-Duane 115 kV Line	FMC-SAN JOSE B 115kV & NEWARK F-ZANKER-KRS 115kV	P6	N-1-1	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	106	Sensitivity only
	NRS 400 115 kV bus (SVP)	P2	Bus	36	42	45	33	43	44	43	46	41	40	40	47	104	Sensitivity only

2019-2020 ISO Reliability Assessment - Study Results
Study Area: PG&E Greater Bay Area
Thermal Overloads

Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Loading % (Baseline Scenarios)								Loading % (Sensitivity Scenarios)					ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2021 Winter Peak	2024 Winter Peak	2029 Winter Peak	2024 SP High CEC Forecast	2021 SP Heavy Renewable & Min Gas Gen	2024 SpOP Hi Renew & Min Gas Gen	2029 Retirement of QF Generations	2029 Summer Peak High SVP Forecasted Load	
Kifer-FMC 115 kV Line	NRS 400 115 kV bus tie breaker to NRS 300 115 kV bus	P2	Bus-Tie-Breaker	97	102	109	44	58	87	90	98	102	94	54	112	215	SVP planned breaker upgrade project In-service date: 12/20 Short term: Action plan
	LOS ESTEROS-NORTECH 115kV & SSS-NRS 230kV (SVP)	P6	N-1-1	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	137	Sensitivity only
Las Positas-Newark 230kV Line	C.COSTAPPE 230kV - Section 2E & 1E	P2	Bus-Tie-Breaker	138	132	146	37	11	59	57	60	133	117	48	150	128	Contra Costa 230 kV bus upgrade or Contra Costa area generation redispatch
	C.COSTAPPE Section 2E & C.COSTAPPF Section 2F 230kV	P2	Bus-Tie-Breaker	107	107	114	25	11	48	50	52	108	75	33	114	109	Contra Costa 230 kV bus upgrade or Contra Costa area generation redispatch
	MORAGA 230kV - Section 2D & 1D	P2	Bus-Tie-Breaker	97	100	107	32	19	45	48	49	101	79	39	108	105	Continue to monitor future load forecast
Lawrence - Monta Vista 115 kV	NEWARK F 115kV Section 2Z	P2	Bus	<100	68	78	<100	40	<100	48	44	71	<100	39	79	101	Sensitivity only
Llagas-CHSR 115 kV Line	LLAGAS 115kV - Section 1F & 1E	P2	Bus-Tie-Breaker	<100	145	79	<100	99	<100	136	84	143	<100	3	79	101	Sensitivity only
Llagas-Gilroy Foods 115 kV Line	DVR Gen Units (SVP) & OLEUM-CHRISTIE-NRTH TWR 115kV	P3	G-1/N-1	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	Sensitivity only
	CONTRA COSTA-LAS POSITAS 230kV & OLEUM-CHRISTIE-NRTH TWR 115kV	P6	N-1-1	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	Sensitivity only
Los Esteros-Metcalf 230 kV Line	NEWARK D Section 1D & NEWARK E Section 1E 230kV	P2	Bus-Tie-Breaker	70	73	81	51	54	57	63	60	76	62	49	83	103	Sensitivity only
	NEWARK E 230kV - Section 1E & 2E	P2	Bus-Tie-Breaker	71	74	81	49	52	57	63	59	76	62	47	83	104	Sensitivity only
	NEWARK E-F BUS TIE 230kV & LECEF GEN UNITS	P6	N-1-1	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	106	Sensitivity only
Los Esteros-Montague 115 kV Line	LOS ESTEROS-NORTECH 115kV & LOS ESTEROS-TRIMBLE 115kV	P6	N-1-1	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	108	Sensitivity only
Los Esteros-Nortech 115 kV Line	SSS 230/230kV TB 1	P1	N-1	85	90	97	30	34	58	63	68	91	74	34	97	116	Sensitivity only
	SSS-NRS 230kV (SVP)	P1	N-1	86	91	98	30	33	58	64	68	92	75	34	97	117	Sensitivity only
	LS ESTRS 230kV - Middle Breaker Bay 8	P2	Non-Bus-Tie Breaker	85	90	97	30	34	58	63	68	91	74	34	97	116	Sensitivity only
	NEWARK F 115kV - Section 2F & 1F	P2	Bus-Tie-Breaker	55	61	69	13	15	44	51	56	62	62	17	69	101	Sensitivity only
	NRS 400 115 kV bus (SVP)	P2	Bus	93	99	107	31	36	61	68	73	100	82	37	107	136	SVP planned breaker upgrade project In-service date: 12/20 Short term: Action plan
	DVR Gen Units (SVP) & FMC-SAN JOSE B 115kV	P3	G-1/N-1	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	107	Sensitivity only
	FMC-SAN JOSE B 115kV & SSS-NRS 230kV (SVP)	P6	N-1-1	<100	100	100	<100	<100	<100	<100	<100	<100	<100	<100	<100	136	Continue to monitor future load forecast
	Los Esteros - Trimble & Los Esteros - Montague 115 kV	P7	DCTL	76	81	89	23	23	57	65	68	83	76	26	88	102	Sensitivity only
	Newark - Kifer & FMC - Kifer 115 kV Lines	P7	DCTL	51	57	65	12	18	45	51	56	58	59	17	64	101	Sensitivity only
	Newark - Northern #1 & #2 115 kV Lines	P7	DCTL	56	63	70	12	15	44	52	57	64	65	17	70	106	Sensitivity only
	Newark-Northern Nos. 1 & 2 115 kV lines	P7	DCTL	56	63	70	12	15	44	52	57	64	65	17	70	106	Sensitivity only

2019-2020 ISO Reliability Assessment - Study Results
Study Area: PG&E Greater Bay Area
Thermal Overloads

Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Loading % (Baseline Scenarios)								Loading % (Sensitivity Scenarios)					ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2021 Winter Peak	2024 Winter Peak	2029 Winter Peak	2024 SP High CEC Forecast	2021 SP Heavy Renewable & Min Gas Gen	2024 SpOP Hi Renew & Min Gas Gen	2029 Retirement of QF Generations	2029 Summer Peak High SVP Forecasted Load	
Los Esteros-Silicon Switching Station 230 kV Line	LOS ESTEROS-NORTECH 115kV	P1	N-1	93	94	95	50	51	60	61	63	94	61	51	95	100	Sensitivity only
	LS ESTRS 115kV - Middle Breaker Bay 1	P2	Non-Bus-Tie Breaker	93	94	95	50	51	60	61	63	94	61	51	95	100	Sensitivity only
	DVR Gen Units (SVP) & NORTECH-NORTHERN RECEIVING STATION 115kV	P3	G-1/N-1	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	103	Sensitivity only
	LOS ESTEROS 115kV BAAH BUS #2 (FAILURE OF NON-REDUNDENT RELAY)	P5	Non-Redundant Relay	97	98	100	54	54	64	66	67	99	68	55	100	108	Continue to monitor future load forecast
	PALO ALTO SW. STA. 115kV DBDB BUS #1 (FAILURE OF NON-REDUNDENT RELAY)	P5	Non-Redundant Relay	99	100	101	55	55	65	68	68	101	69	56	101	110	Continue to monitor future load forecast
	LOS ESTEROS-NORTECH 115kV & FMC-SAN JOSE B 115kV	P6	N-1-1	<100	<100	101	<100	<100	<100	<100	<100	100	<100	<100	101	113	Continue to monitor future load forecast
Metcalf 230/115 kV Trans No. 1	METCALF 230kV - Section 2D & 2E	P2	Bus-Tie-Breaker	94	95	119	53	56	95	89	86	99	95	58	120	125	Continue to monitor future load forecast
	METCALF 230/115kV TB 4 & METCALF 230/115kV TB 2	P6	N-1-1	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	103	Sensitivity only
Metcalf 230/115 kV Trans No. 2	METCALF 230kV - Section 1D & 1E	P2	Bus-Tie-Breaker	92	92	110	50	52	91	85	83	96	86	53	111	116	Continue to monitor future load forecast
	METCALF 230/115kV TB 4 & METCALF 230/115kV TB 3	P6	N-1-1	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	105	Sensitivity only
Metcalf 230/115 kV Trans No. 3	METCALF 230kV - Section 2D & 2E	P2	Bus-Tie-Breaker	94	95	118	53	56	94	89	86	99	95	58	120	125	Continue to monitor future load forecast
	METCALF 230/115kV TB 4 & METCALF 230/115kV TB 2	P6	N-1-1	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	103	Sensitivity only
Metcalf 230/115 kV Trans No. 4	METCALF 230kV - Section 1D & 1E	P2	Bus-Tie-Breaker	92	92	111	50	52	92	85	83	96	87	53	112	116	Continue to monitor future load forecast
	METCALF 230/115kV TB 1 & METCALF 230/115kV TB 2	P6	N-1-1	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	103	Sensitivity only
Metcalf 500/230 kV Trans No. 11	METCALF 500/230kV TB 13 & METCALF 500/230kV TB 12	P6	N-1-1	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	108	Sensitivity only
Metcalf 500/230 kV Trans No. 12	METCALF 500/230kV TB 13 & METCALF 500/230kV TB 11	P6	N-1-1	<100	<100	102	<100	<100	<100	<100	<100	<100	<100	<100	102	110	Continue to monitor future load forecast
Metcalf 500/230 kV Trans No. 13	METCALF 500/230kV TB 12 & METCALF 500/230kV TB 11	P6	N-1-1	<100	<100	104	<100	<100	<100	<100	<100	<100	<100	<100	104	113	Continue to monitor future load forecast
Metcalf-El Patio No. 1 115 kV Line	MTCALF D Section 2D & MTCALF E Section 2E 115kV	P2	Bus-Tie-Breaker	76	81	85	53	58	60	76	67	84	71	47	87	109	Sensitivity only
	MTCALF E 115kV - Section 1E & 2E	P2	Bus-Tie-Breaker	77	81	88	52	56	61	76	67	84	72	46	89	110	Sensitivity only
	DVR Gen Units (SVP) & METCALF-EL PATIO #2 115kV	P3	G-1/N-1	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	100	Sensitivity only
	SSS-NRS 230kV (SVP) & METCALF-EL PATIO #2 115kV	P6	N-1-1	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	105	Sensitivity only
	Metcalf - Evergreen #1 and #2 115 kV Lines	P7	DCTL	72	75	82	47	51	57	69	62	78	68	43	83	102	Sensitivity only

2019-2020 ISO Reliability Assessment - Study Results
Study Area: PG&E Greater Bay Area
Thermal Overloads

California ISO

Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Loading % (Baseline Scenarios)								Loading % (Sensitivity Scenarios)					ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2021 Winter Peak	2024 Winter Peak	2029 Winter Peak	2024 SP High CEC Forecast	2021 SP Heavy Renewable & Min Gas Gen	2024 SpOP Hi Renew & Min Gas Gen	2029 Retirement of QF Generations	2029 Summer Peak High SVP Forecasted Load	
Metcalf-El Patio No. 2 115 kV Line	MTCALF D - 1D 115kV & MTCALF D-LLAGAS line	P2	Non-Bus-Tie Breaker	68	80	83	46	50	56	68	61	82	66	43	85	106	Sensitivity only
	MTCALF D - 1D 115kV & MTCALF D-ST TRESA line	P2	Non-Bus-Tie Breaker	70	81	85	48	51	58	69	62	84	67	44	86	108	Sensitivity only
	MTCALF D 115kV Section 1D	P2	Bus	68	79	83	46	50	57	68	61	82	66	43	85	106	Sensitivity only
	MTCALF D Section 1D & MTCALF E Section 1E 115kV	P2	Bus-Tie-Breaker	88	96	104	57	62	73	86	77	99	83	54	106	127	Continue to monitor future load forecast
	MTCALF E 115kV - Section 1E & 2E	P2	Bus-Tie-Breaker	77	81	88	52	56	62	77	69	84	72	46	89	110	Sensitivity only
	MTCALF D - 1D 115kV & MTCALF D-LLAGAS line	P2	Non-Bus-Tie Breaker	68	80	83	46	50	55	66	60	82	66	43	85	106	Sensitivity only
	MTCALF D - 1D 115kV & MTCALF D-ST TRESA line	P2	Non-Bus-Tie Breaker	70	81	85	48	51	56	67	61	84	67	44	86	108	Sensitivity only
	DVR Gen Units (SVP) & METCALF-EL PATIO #1 115kV	P3	G-1/N-1	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	100	Sensitivity only
	SSS-NRS 230kV (SVP) & METCALF-EL PATIO #1 115kV	P6	N-1-1	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	105	Sensitivity only
	Metcalf - Evergreen #1 and #2 115 kV Lines	P7	DCTL	72	75	82	47	51	57	69	62	78	68	43	83	101	Sensitivity only
Metcalf-Evergreen No. 1 115 kV Line	EL PATIO-SAN JOSE A 115kV & EVRGRN 1-MTCALF E #2 115kV	P6	N-1-1	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	107	Sensitivity only
Metcalf-Evergreen No. 2 115 kV Line	MTCALF D Section 1D & MTCALF E Section 1E 115kV	P2	Bus-Tie-Breaker	<100	81	91	<100	53	<100	77	70	84	<100	46	92	108	Sensitivity only
	EL PATIO-SAN JOSE A 115kV & METCALF-EVERGREEN #1 115kV	P6	N-1-1	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	108	Sensitivity only
Metcalf-Hicks 230 kV Line	METCALF 230kV - Section 1D & 1E	P2	Bus-Tie-Breaker	85	88	93	69	73	83	89	79	91	79	68	94	102	Sensitivity only
	Metcalf-Monta Vista No. 3 & Monta Vista-Coyote Sw. Sta. 230 kV Line	P7	DCTL	85	88	92	70	75	84	90	80	91	78	70	93	102	Sensitivity only
Monta Vista 230/115 kV Trans No. 2	MONTAVIS 230/115kV TB 4 & MONTAVIS 230/115kV TB 3	P6	N-1-1	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	106	Sensitivity only
Monta Vista 230/115 kV Trans No. 3	MONTAVIS 230kV - Section 1D & 2D	P2	Bus-Tie-Breaker	78	82	92	75	79	77	86	73	84	72	73	94	108	Sensitivity only
	MONTAVIS 230/115kV TB 2 & MONTAVIS 230/115kV TB 4	P6	N-1-1	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	102	Sensitivity only
Monta Vista 230/115 kV Trans No. 4	MONTAVIS 230/115kV TB 2 & MONTAVIS 230/115kV TB 3	P6	N-1-1	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	106	Sensitivity only
Monta Vista-Hicks 230 kV Line	METCALF 230kV - Section 1D & 1E	P2	Bus-Tie-Breaker	85	89	96	80	88	90	97	85	92	84	82	97	107	Sensitivity only
	Metcalf-Monta Vista No. 3 & Monta Vista-Coyote Sw. Sta. 230 kV Line	P7	DCTL	85	90	95	81	91	91	98	86	93	83	85	96	107	Sensitivity only
Monta Vista-Wolfe 115 kV Line	STELLING-MONTA VISTA 115kV	P1	N-1	98	99	104	54	53	65	76	68	102	86	49	104	104	Continue to monitor future load forecast
	MNTA VSA 115kV - Middle Breaker Bay 2	P2	Non-Bus-Tie Breaker	<100	98	104	<100	53	<100	76	68	101	<100	49	104	105	Continue to monitor future load forecast
	CLARMNT - 2D 115kV & SOBRANTE-GRIZZLY-CLAREMONT #1 line	P2	Non-Bus-Tie Breaker	109	92	99	68	55	97	96	102	50	73	51	99	99	Project: Oakland Clean Energy Initiative In-service date: 8/22 Load forecast in Northern Oakland area is under review.

2019-2020 ISO Reliability Assessment - Study Results
Study Area: PG&E Greater Bay Area
Thermal Overloads

Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Loading % (Baseline Scenarios)								Loading % (Sensitivity Scenarios)					ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2021 Winter Peak	2024 Winter Peak	2029 Winter Peak	2024 SP High CEC Forecast	2021 SP Heavy Renewable & Min Gas Gen	2024 SpOP Hi Renew & Min Gas Gen	2029 Retirement of QF Generations	2029 Summer Peak High SVP Forecasted Load	
Moraga-Claremont #1 115kV Line	CLARMNT - 2D 115kV & SOBRANTE-GRIZZLY-CLAREMONT #2 line	P2	Non-Bus-Tie Breaker	109	92	99	68	55	97	96	102	50	73	51	99	99	Project: Oakland Clean Energy Initiative In-service date: 8/22 Load forecast in Northern Oakland area is under review.
	CLARMNT 115kV Section 2D	P2	Bus	109	92	99	68	55	97	96	102	50	73	51	99	99	Project: Oakland Clean Energy Initiative In-service date: 8/22 Load forecast in Northern Oakland area is under review.
	C-X #2 & #3 115kV	P6	N-1-1	103	91	100	72	54	94	99	92	73	82	45	100	100	Project: Oakland Clean Energy Initiative In-service date: 8/22 Load forecast in Northern Oakland area is under review.
	SOBRANTE 230kV - Section 2D & 1D	P2	Bus-Tie-Breaker	101	87	104	69	60	83	92	94	73	82	45	104	104	Project: Oakland Clean Energy Initiative In-service date: 8/22 Load forecast in Northern Oakland area is under review.
	STATIN X 115kV - Section 2D & 1D	P2	Bus-Tie-Breaker	113	NA	NA	77	NA	102	NA	NA	65	79	54	NA	NA	Project: Oakland Clean Energy Initiative In-service date: 8/22 Load forecast in Northern Oakland area is under review.
Moraga-Claremont #2 115kV Line	C-X #2 & #3 115kV	P6	N-1-1	103	91	100	72	55	94	99	92	73	82	45	100	100	Project: Oakland Clean Energy Initiative In-service date: 8/22 Load forecast in Northern Oakland area is under review.
	SOBRANTE 230kV - Section 2D & 1D	P2	Bus-Tie-Breaker	102	87	104	69	60	83	92	94	73	82	45	104	104	Project: Oakland Clean Energy Initiative In-service date: 8/22 Load forecast in Northern Oakland area is under review.
	STATIN X 115kV - Section 2D & 1D	P2	Bus-Tie-Breaker	113	NA	NA	78	NA	102	NA	NA	65	79	54	NA	NA	Project: Oakland Clean Energy Initiative In-service date: 8/22 Load forecast in Northern Oakland area is under review.
Moraga-Oakland X #1 115kV Line	CLARMNT 115kV - Section 2D & 1D	P2	Bus-Tie-Breaker	106	106	114	68	<100	93	<100	<100	48	70	<100	114	114	Project: Oakland Clean Energy Initiative In-service date: 8/22 Load forecast in Northern Oakland area is under review.
	K-D #1 & #2 115kV	P6	N-1-1	107	106	114	67	<100	93	<100	<100	47	<100	<100	114	114	Project: Oakland Clean Energy Initiative In-service date: 8/22 Load forecast in Northern Oakland area is under review.
Moraga-Oakland X #2 115kV Line	CLARMNT 115kV - Section 2D & 1D	P2	Bus-Tie-Breaker	106	106	114	68	<100	93	<100	<100	<100	<100	<100	114	114	Project: Oakland Clean Energy Initiative In-service date: 8/22 Load forecast in Northern Oakland area is under review.
	K-D #1 & #2 115kV	P6	N-1-1	107	106	114	67	<100	93	<100	<100	48	70	<100	114	114	Project: Oakland Clean Energy Initiative In-service date: 8/22 Load forecast in Northern Oakland area is under review.

2019-2020 ISO Reliability Assessment - Study Results
Study Area: PG&E Greater Bay Area
Thermal Overloads

Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Loading % (Baseline Scenarios)								Loading % (Sensitivity Scenarios)					ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2021 Winter Peak	2024 Winter Peak	2029 Winter Peak	2024 SP High CEC Forecast	2021 SP Heavy Renewable & Min Gas Gen	2024 SpOP Hi Renew & Min Gas Gen	2029 Retirement of QF Generations	2029 Summer Peak High SVP Forecasted Load	
	MORAGA 115kV - Section 1D & 1E	P2	Bus-Tie-Breaker	103	NA	NA	66	NA	91	NA	NA	47	<100	NA	NA	NA	Project: Oakland Clean Energy Initiative In-service date: 8/22 Load forecast in Northern Oakland area is under review.
Moraga-Oakland X #3 115kV Line	CLARMNT 115kV - Section 2D & 1D	P2	Bus-Tie-Breaker	106	106	114	68	<100	93	<100	<100	<100	<100	<100	114	114	Project: Oakland Clean Energy Initiative In-service date: 8/22 Load forecast in Northern Oakland area is under review.
	K-D #1 & #2 115kV	P6	N-1-1	107	106	114	67	<100	93	<100	<100	48	70	<100	114	114	Project: Oakland Clean Energy Initiative In-service date: 8/22 Load forecast in Northern Oakland area is under review.
	MORAGA 115kV - Section 1D & 2D	P2	Bus-Tie-Breaker	119	NA	NA	79	NA	113	NA	NA	47	<100	NA	NA	NA	Project: Oakland Clean Energy Initiative In-service date: 8/22 Load forecast in Northern Oakland area is under review.
Moraga-Oakland X #4 115kV Line	CLARMNT 115kV - Section 2D & 1D	P2	Bus-Tie-Breaker	106	106	114	68	<100	93	<100	<100	<100	105	<100	114	114	Project: Oakland Clean Energy Initiative In-service date: 8/22 Load forecast in Northern Oakland area is under review.
	K-D #1 & #2 115kV	P6	N-1-1	107	106	114	67	<100	93	<100	<100	<100	<100	<100	114	114	Project: Oakland Clean Energy Initiative In-service date: 8/22 Load forecast in Northern Oakland area is under review.
	MORAGA 115kV - Section 1D & 1E	P2	Bus-Tie-Breaker	103	NA	NA	66	NA	91	NA	NA	48	70	NA	NA	NA	Project: Oakland Clean Energy Initiative In-service date: 8/22 Load forecast in Northern Oakland area is under review.
	MORAGA 115kV - Section 1D & 2D	P2	Bus-Tie-Breaker	119	NA	NA	79	NA	113	NA	NA	47	<100	NA	NA	NA	Project: Oakland Clean Energy Initiative In-service date: 8/22 Load forecast in Northern Oakland area is under review.
Moraga-San Leandro #1 115kV Line	MORAGA-SAN LEANDRO #2 115kV & MORAGA-SAN LEANDRO #3 115kV	P6	N-1-1	111	<100	113	<100	<100	<100	<100	<100	<100	<100	<100	114	116	Project: East Shore - Oakland J 115 kV Reconductoring Project Load increase in later years under review
Moraga-San Leandro #2 115kV Line	MORAGA 115kV - Section 1D & 1E	P2	Bus-Tie-Breaker	114	NA	NA	61	NA	85	NA	NA	NA	96	NA	NA	NA	Project: Oakland Clean Energy Initiative In-service date: 8/22 Load forecast in Northern Oakland area is under review.
	MORAGA 115kV Section 1E	P2	Bus	115	NA	NA	62	NA	87	NA	NA	NA	95	NA	NA	NA	Project: Oakland Clean Energy Initiative In-service date: 8/22 Load forecast in Northern Oakland area is under review.
	MORAGA-SAN LEANDRO #1 115kV & MORAGA-SAN LEANDRO #3 115kV	P6	N-1-1	111	<100	114	<100	<100	<100	<100	<100	<100	<100	<100	115	116	Project: East Shore - Oakland J 115 kV Reconductoring Project Load increase in later years under review

2019-2020 ISO Reliability Assessment - Study Results
Study Area: PG&E Greater Bay Area
Thermal Overloads

Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Loading % (Baseline Scenarios)								Loading % (Sensitivity Scenarios)					ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2021 Winter Peak	2024 Winter Peak	2029 Winter Peak	2024 SP High CEC Forecast	2021 SP Heavy Renewable & Min Gas Gen	2024 SpOP Hi Renew & Min Gas Gen	2029 Retirement of QF Generations	2029 Summer Peak High SVP Forecasted Load	
Morgan Hill-Llagas 115 kV Line #2	LLAGAS - 1F 115kV & MTCALF D-LLAGAS line	P2	Non-Bus-Tie Breaker	115	61	27	90	47	19	59	34	60	43	5	27	38	Project: Metcalf - Morgan Hill - Watsonville Area Reinforcement In-service date: 7/21 Short term: Action plan
	MORGAN HILL-LLAGAS 115kV_270 & OLEUM-CHRISTIE-NRTH TWR 115kV	P6	N-1-1	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	Sensitivity only
MOSSLNSW-LASAGUILASS #2 230KV	TESLA-METCALF 500kV & MOSSLAND-LOSBANOS 500kV	P6	N-1-1	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	115	Sensitivity only
Mountain View-Monta Vista 115 kV Line	MTCALF E 115kV - Section 1E & 2E	P2	Bus-Tie-Breaker	67	73	82	75	82	68	75	63	76	64	73	84	101	Sensitivity only
	DVR Gen Units (SVP) & WHISMAN-MTN VIEW 115kV	P3	G-1/N-1	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	101	Sensitivity only
	RAVENSWOOD 230 kV BAAH BUS #2 (FAILURE OF NON-REDUNDENT RELAY)	P5	Non-Redundant Relay	70	73	84	69	75	68	72	66	77	66	68	86	102	Sensitivity only
	NRS-SRS #1 115kV (SVP) & WHISMAN-MTN VIEW 115kV	P6	N-1-1	<100	<100	100	<100	<100	<100	<100	<100	<100	<100	<100	100	112	Continue to monitor future load forecast
	Britton-Monta Vista & Lawrence-Monta Vista 115 kV Lines	P7	DCTL	67	73	82	80	87	68	74	62	76	66	80	84	102	Sensitivity only
	Monta Vista-Jefferson 230 kV Lines No. 1 & 2	P7	DCTL	71	76	84	80	91	75	80	69	79	69	83	87	101	Sensitivity only
	Monta Vista-Jefferson Nos. 1 & 2 230 kV lines	P7	DCTL	71	76	84	79	91	75	80	69	79	69	83	87	101	Sensitivity only
	Newark-Ravenswood 230 kV and Tesla-Ravenswood 230 kV lines	P7	DCTL	73	77	85	81	89	73	78	68	80	74	81	88	102	Sensitivity only
Newark 230/115kV Transformer #11	NEWARK D Section 1D & NEWARK E Section 1E 230kV	P2	Bus-Tie-Breaker	106	117	122	39	29	70	73	97	121	93	38	121	134	Newark 230 kV bus upgrade
	NEWARK E 230kV Section 1E	P2	Bus	77	98	104	29	25	51	55	60	100	69	31	102	114	Newark 230 kV bus upgrade
	NEWARK D 230/115kV TB 7 & NEWARK E-F BUS TIE 230kV	P6	N-1-1	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	103	Sensitivity only
Newark-Applied Materials 115kV Line	NEWARK F-LAWRENCE-LOCKHD 1 115kV & BRITTON-MONTA VISTA 115kV	P6	N-1-1	<100	101	102	<100	<100	<100	<100	<100	104	<100	<100	102	105	Continue to monitor future load forecast
	PIERCY-METCALF 115kV	P1	N-1	107	74	82	47	29	73	63	57	77	82	25	82	84	Project: Metcalf - Piercy & Swift and Newark - Dixon Landing 115 kV Upgrade In-service date: 4/22 Short term: Action plan
	MTCALF D Section 2D & MTCALF E Section 2E 115kV	P2	Bus-Tie-Breaker	107	74	82	47	29	73	63	57	77	82	25	82	84	Project: Metcalf - Piercy & Swift and Newark - Dixon Landing 115 kV Upgrade In-service date: 4/22 Short term: Action plan
	MTCALF E 115kV - Section 1E & 2E	P2	Bus-Tie-Breaker	108	74	83	47	29	73	63	58	78	83	25	84	86	Project: Metcalf - Piercy & Swift and Newark - Dixon Landing 115 kV Upgrade In-service date: 4/22 Short term: Action plan

Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Loading % (Baseline Scenarios)								Loading % (Sensitivity Scenarios)					ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2021 Winter Peak	2024 Winter Peak	2029 Winter Peak	2024 SP High CEC Forecast	2021 SP Heavy Renewable & Min Gas Gen	2024 SpOP Hi Renew & Min Gas Gen	2029 Retirement of QF Generations	2029 Summer Peak High SVP Forecasted Load	
Newark-Dixon Landing 115kV Line	MTCALF E 115kV Section 2E	P2	Bus	107	74	82	47	29	73	63	57	77	82	25	82	84	Project: Metcalf - Piercy & Swift and Newark - Dixon Landing 115 kV Upgrade In-service date: 4/22 Short term: Action plan
	MTCALF E 115kV Section 2X	P2	Non-Bus-Tie Breaker	107	74	82	47	29	73	63	57	77	82	25	82	84	Project: Metcalf - Piercy & Swift and Newark - Dixon Landing 115 kV Upgrade In-service date: 4/22 Short term: Action plan
	MTCALF E 115kV Section 2Y	P2	Non-Bus-Tie Breaker	107	74	82	47	29	73	63	57	77	82	25	82	84	Project: Metcalf - Piercy & Swift and Newark - Dixon Landing 115 kV Upgrade In-service date: 4/22 Short term: Action plan
	Swift - Metcalf & Piercy - Metcalf 115 kV Lines	P7	DCTL	108	74	83	47	29	73	63	57	77	82	25	83	85	Project: Metcalf - Piercy & Swift and Newark - Dixon Landing 115 kV Upgrade In-service date: 4/22 Short term: Action plan
Newark-Kifer 115kV Line	NEWARK E-F BUS TIE 230kV	P1	N-1	45	48	51	7	12	22	29	35	48	49	16	50	103	Sensitivity only
	SSS 230/230kV TB 1	P1	N-1	48	52	56	14	21	29	35	38	53	49	22	54	102	Sensitivity only
	SSS-NRS 230kV (SVP)	P1	N-1	49	53	57	15	21	29	35	39	53	50	23	55	103	Sensitivity only
	NRS 400 115 kV bus (SVP)	P2	Bus	69	73	78	20	28	40	48	53	73	68	30	81	134	Sensitivity only
	Internal breaker fault at Duane Duane-SRS 115 kV and KRS-Duane 115 kV and DVR	P2	Non-Bus-Tie Breaker	59	57	62	17	19	37	40	45	58	61	22	60	101	Sensitivity only
	LS ESTRS 230kV - Middle Breaker Bay 8	P2	Non-Bus-Tie Breaker	48	52	56	14	21	29	35	38	53	49	22	54	102	Sensitivity only
	NEWARK E 230kV Section 1E	P2	Bus	44	48	52	7	12	22	29	35	49	49	16	51	104	Sensitivity only
	NRS 400 115 kV bus (SVP)	P2	Bus	70	75	80	21	29	42	50	55	75	70	31	79	145	Sensitivity only
	NRS 400 115 kV bus tie breaker to NRS 300 115 kV bus	P2	Bus-Tie-Breaker	123	126	136	32	41	76	86	96	127	117	44	135	249	SVP planned breaker upgrade project In-service date: 12/20 Short term: Action plan
	DVR Gen Units (SVP) & LOS ESTEROS-NORTECH 115kV	P3	G-1/N-1	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	117	Sensitivity only
	LOS ESTEROS 115kV BAAH BUS #2 (FAILURE OF NON-REDUNDENT RELAY)	P5	Non-Redundant Relay	45	50	57	3	11	31	39	44	51	52	12	56	106	Sensitivity only
	LOS ESTEROS 230 kV BAAH BUS #1 (FAILURE OF NON-REDUNDENT RELAY)	P5	Non-Redundant Relay	68	72	77	27	34	39	47	51	73	69	36	76	136	Sensitivity only
	LOS ESTEROS 230 kV BAAH BUS #2 (FAILURE OF NON-REDUNDENT RELAY)	P5	Non-Redundant Relay	62	66	72	24	31	35	43	47	67	66	34	71	137	Sensitivity only
	PALO ALTO SW. STA. 115kV DBDB BUS #1 (FAILURE OF NON-REDUNDENT RELAY)	P5	Non-Redundant Relay	52	57	65	6	13	35	44	48	58	58	14	63	114	Sensitivity only
	SSS-NRS 230kV (SVP) & LOS ESTEROS-NORTECH 115kV	P6	N-1-1	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	149	Sensitivity only

Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Loading % (Baseline Scenarios)								Loading % (Sensitivity Scenarios)					ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2021 Winter Peak	2024 Winter Peak	2029 Winter Peak	2024 SP High CEC Forecast	2021 SP Heavy Renewable & Min Gas Gen	2024 SpOP Hi Renew & Min Gas Gen	2029 Retirement of QF Generations	2029 Summer Peak High SVP Forecasted Load	
	Newark - Los Esteros & Los Esteros - Metcalf 230 kV Lines	P7	DCTL	62	66	72	24	31	35	43	47	67	66	34	71	137	Sensitivity only
	Newark - Northern #1 & #2 115 kV Lines	P7	DCTL	38	45	48	6	12	23	33	37	45	53	14	47	119	Sensitivity only
	Newark-Northern Nos. 1 & 2 115 kV lines	P7	DCTL	38	45	48	6	12	23	33	37	45	53	14	47	119	Sensitivity only
	NRS - Scott #1 and #2 115 kV Lines	P7	DCTL	73	73	78	14	20	45	50	56	73	74	23	77	139	Sensitivity only
Newark-Milpitas #2 115kV Line	SWIFT-METCALF 115kV & NEWARK-MILPITAS #1 115kV	P6	N-1-1	<100	<100	102	<100	<100	<100	<100	<100	<100	<100	<100	103	105	Continue to monitor future load forecast
Newark-Newark Dist 230kV section	MOSSLAND-LOSBANOS 500kV & TESLA-METCALF 500kV	P6	N-1-1	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	104	Sensitivity only
Newark-Northern Receiving Station #1 115kV Line	NEWARK E-F BUS TIE 230kV	P1	N-1	56	59	59	8	12	25	34	42	60	61	20	60	107	Sensitivity only
	SSS 230/230kV TB 1	P1	N-1	60	64	65	18	24	33	41	46	64	58	28	65	104	Sensitivity only
	SSS-NRS 230kV (SVP)	P1	N-1	60	65	66	18	24	33	42	46	65	59	29	66	106	Sensitivity only
	LS ESTRS 230kV - Middle Breaker Bay 8	P2	Non-Bus-Tie Breaker	60	64	65	18	24	33	41	46	64	58	28	65	104	Sensitivity only
	NEWARK E 230kV - Section 1E & 2E	P2	Bus-Tie-Breaker	57	60	61	9	13	25	35	43	61	63	22	62	108	Sensitivity only
	NEWARK E 230kV Section 1E	P2	Bus	56	55	54	8	12	24	34	42	55	61	20	55	102	Sensitivity only
	NEWARK F 115kV - Section 2F & 1F	P2	Bus-Tie-Breaker	45	51	55	8	10	21	35	41	52	61	15	57	123	Sensitivity only
	NEWARK F 115kV Section 2Z	P2	Bus	<100	61	64	<100	13	<100	41	47	61	<100	18	65	114	Sensitivity only
	DVR Gen Units (SVP) & LOS ESTEROS-NORTECH 115kV	P3	G-1/N-1	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	121	Sensitivity only
	LOS ESTEROS 115kV BAAH BUS #2 (FAILURE OF NON-REDUNDENT RELAY)	P5	Non-Redundant Relay	55	62	67	2	9	37	49	56	63	64	14	67	109	Sensitivity only
	LOS ESTEROS 230 kV BAAH BUS #1 (FAILURE OF NON-REDUNDENT RELAY)	P5	Non-Redundant Relay	90	94	97	36	43	49	61	65	95	89	48	98	155	Sensitivity only
	LOS ESTEROS 230 kV BAAH BUS #2 (FAILURE OF NON-REDUNDENT RELAY)	P5	Non-Redundant Relay	81	84	88	32	38	42	54	59	86	84	44	90	153	Sensitivity only
	PALO ALTO SW. STA. 115kV DBDB BUS #1 (FAILURE OF NON-REDUNDENT RELAY)	P5	Non-Redundant Relay	66	72	77	6	13	42	56	60	73	73	17	78	121	Sensitivity only
	SSS-NRS 230kV (SVP) & LOS ESTEROS-NORTECH 115kV	P6	N-1-1	<100	102	108	<100	<100	<100	<100	<100	104	<100	<100	108	173	Continue to monitor future load forecast
	Newark - Kifer & FMC - Kifer 115 kV Lines	P7	DCTL	33	39	40	7	13	22	31	36	39	48	17	40	101	Sensitivity only
	Newark - Los Esteros & Los Esteros - Metcalf 230 kV Lines	P7	DCTL	81	84	88	32	38	42	54	59	86	84	44	90	153	Sensitivity only

2019-2020 ISO Reliability Assessment - Study Results
Study Area: PG&E Greater Bay Area
Thermal Overloads

Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Loading % (Baseline Scenarios)								Loading % (Sensitivity Scenarios)					ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2021 Winter Peak	2024 Winter Peak	2029 Winter Peak	2024 SP High CEC Forecast	2021 SP Heavy Renewable & Min Gas Gen	2024 SpOP Hi Renew & Min Gas Gen	2029 Retirement of QF Generations	2029 Summer Peak High SVP Forecasted Load	
Newark-Northern Receiving Station #2 115kV Line	SSS-NRS 230kV (SVP)	P1	N-1	46	51	55	17	24	27	34	37	51	48	26	56	101	Sensitivity only
	NRS 300 115 kV bus (SVP)	P2	Bus	50	61	67	16	28	37	49	55	62	54	28	67	112	Sensitivity only
	NRS 400 115 kV bus (SVP)	P2	Bus	57	64	69	20	29	32	42	46	64	59	32	70	131	Sensitivity only
	NRS 400 115 kV bus tie breaker to NRS 300 115 kV bus	P2	Bus-Tie-Breaker	90	109	117	31	46	61	78	87	109	87	48	118	205	SVP planned breaker upgrade project In-service date: 12/20 Short term: Action plan
	DVR Gen Units (SVP) & SSS 230/230kV TB 1	P3	G-1/N-1	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	116	Sensitivity only
	LOS ESTEROS 230 kV BAAH BUS #1 (FAILURE OF NON-REDUNDENT RELAY)	P5	Non-Redundant Relay	72	77	83	32	41	41	51	54	78	75	43	85	146	Sensitivity only
	LOS ESTEROS 230 kV BAAH BUS #2 (FAILURE OF NON-REDUNDENT RELAY)	P5	Non-Redundant Relay	62	68	75	30	38	34	45	49	69	71	41	77	145	Sensitivity only
	PALO ALTO SW. STA. 115kV DBDB BUS #1 (FAILURE OF NON-REDUNDENT RELAY)	P5	Non-Redundant Relay	47	54	62	3	12	33	44	48	55	57	12	64	112	Sensitivity only
	SSS-NRS 230kV (SVP) & LOS ESTEROS-NORTECH 115kV	P6	N-1-1	<100	<100	106	<100	<100	<100	<100	<100	<100	<100	<100	106	168	Continue to monitor future load forecast
	Newark - Kifer & FMC - Kifer 115 kV Lines	P7	DCTL	23	29	32	11	14	18	26	29	29	40	16	33	103	Sensitivity only
	Newark - Los Esteros & Los Esteros - Metcalf 230 kV Lines	P7	DCTL	62	68	75	30	38	34	45	49	69	71	41	77	145	Sensitivity only
Newark-Trimble 115kV Line	LOS ESTEROS 230 kV BAAH BUS #2 (FAILURE OF NON-REDUNDENT RELAY)	P5	Non-Redundant Relay	59	59	63	37	38	22	29	28	61	53	42	65	100	Sensitivity only
	LOS ESTEROS-METCALF 230kV & NEWARK E-F BUS TIE 230kV	P6	N-1-1	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	101	Sensitivity only
	Newark - Los Esteros & Los Esteros - Metcalf 230 kV Lines	P7	DCTL	59	59	63	37	38	22	29	28	61	53	42	65	100	Sensitivity only
Nortech-NRS 115 kV Line	SSS 230/230kV TB 1	P1	N-1	76	80	85	26	29	61	65	71	80	66	30	84	104	Sensitivity only
	SSS-NRS 230kV (SVP)	P1	N-1	77	80	85	25	28	61	65	71	81	67	29	85	105	Sensitivity only
	LS ESTRS 230kV - Middle Breaker Bay 8	P2	Non-Bus-Tie Breaker	76	80	85	26	29	61	65	71	80	66	30	84	104	Sensitivity only
	NRS 400 115 kV bus (SVP)	P2	Bus	84	89	95	26	30	64	71	77	90	75	32	94	125	Sensitivity only
	SSS-NRS 230kV (SVP) & FMC-SAN JOSE B 115kV	P6	N-1-1	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	124	Sensitivity only
North Dublin-Cayetano 230kV Cable	MORAGA 230kV - Section 2D & 1D	P2	Bus-Tie-Breaker	101	101	106	39	26	72	75	77	105	84	42	107	105	Moraga 230 kV bus upgrade or Contra Costa area generation redispatch
	NEWARK D Section 1D & NEWARK E Section 1E 230kV	P2	Bus-Tie-Breaker	87	96	100	32	23	60	63	74	98	72	36	101	103	Continue to monitor future load forecast
	Contra Costa-Moraga Nos. 1 & 2 230 kV lines	P7	DCTL	<100	<100	100	<100	<100	<100	<100	74	<100	<100	<100	101	99	Continue to monitor future load forecast

Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Loading % (Baseline Scenarios)								Loading % (Sensitivity Scenarios)					ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2021 Winter Peak	2024 Winter Peak	2029 Winter Peak	2024 SP High CEC Forecast	2021 SP Heavy Renewable & Min Gas Gen	2024 SpOP Hi Renew & Min Gas Gen	2029 Retirement of QF Generations	2029 Summer Peak High SVP Forecasted Load	
NRS 230/115kV TB 1	DVR Gen Units (SVP) & LOS ESTEROS-NORTECH 115kV	P3	G-1/N-1	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	102	Sensitivity only
	LOS ESTEROS 115kV BAAH BUS #2 (FAILURE OF NON-REDUNDENT RELAY)	P5	Non-Redundant Relay	96	97	98	54	55	64	66	67	97	68	55	97	104	Sensitivity only
	PALO ALTO SW. STA. 115kV DBDB BUS #1 (FAILURE OF NON-REDUNDENT RELAY)	P5	Non-Redundant Relay	98	99	99	55	55	65	68	68	99	69	56	99	105	Sensitivity only
	LOS ESTEROS-NORTECH 115kV & FMC-SAN JOSE B 115kV	P6	N-1-1	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	108	Sensitivity only
NRS-Scott No. 1 115 kV Line	NRS-SRS #2 115kV (SVP)	P1	N-1	85	83	87	24	25	53	56	61	84	70	27	86	113	Sensitivity only
	NRS 300 115 kV bus (SVP)	P2	Bus	92	95	98	35	39	53	59	64	95	68	41	98	118	Sensitivity only
	DVR Gen Units (SVP) & NRS-SRS #2 115kV (SVP)	P3	G-1/N-1	<100	<100	101	<100	<100	<100	<100	<100	100	<100	<100	101	121	SVP local generation redispatch following first contingency
	NRS-SRS #2 115kV (SVP) & NRS-MISSION 60kV (SVP)	P6	N-1-1	104	112	115	<100	<100	<100	<100	<100	113	<100	<100	115	171	SVP local generation redispatch following first contingency
	Newark - Kifer & FMC - Kifer 115 kV Lines	P7	DCTL	56	58	61	17	23	41	44	48	58	54	23	61	104	Sensitivity only
NRS-Scott No. 2 115 kV Line	NRS-SRS #1 115kV (SVP)	P1	N-1	85	83	86	24	25	53	56	61	84	70	27	86	112	Sensitivity only
	NRS 400 115 kV bus (SVP)	P2	Bus	76	73	77	18	18	52	53	58	73	69	21	77	112	Sensitivity only
	DVR Gen Units (SVP) & NRS-SRS #1 115kV (SVP)	P3	G-1/N-1	<100	<100	101	<100	<100	<100	<100	<100	<100	<100	<100	101	121	SVP local generation redispatch following first contingency
	NRS-SRS #1 115kV (SVP) & NRS-MISSION 60kV (SVP)	P6	N-1-1	104	112	115	<100	<100	<100	<100	<100	113	<100	<100	115	172	SVP local generation redispatch following first contingency
	Newark - Kifer & FMC - Kifer 115 kV Lines	P7	DCTL	55	57	61	17	22	41	44	48	57	53	22	61	103	Sensitivity only
Oakland C - Oakland L #1 115kV Cable	CLARMNT 115kV - Section 2D & 1D	P2	Bus-Tie-Breaker	99	101	109	57	60	111	114	123	105	77	56	109	109	Project: Oakland Clean Energy Initiative In-service date: 8/22 Load forecast in Northern Oakland area is under review.
	K-D #1 & #2 115kV	P6	N-1-1	99	101	109	57	59	111	114	123	105	77	56	109	109	Project: Oakland Clean Energy Initiative In-service date: 8/22 Load forecast in Northern Oakland area is under review.
Oakland C - Oakland X #2 115kV Cable	CLARMNT 115kV - Section 2D & 1D	P2	Bus-Tie-Breaker	114	114	121	76	73	123	123	130	42	76	70	121	121	Project: Oakland Clean Energy Initiative In-service date: 8/22 Load forecast in Northern Oakland area is under review.
	C-X #3 115kV & D-L #1 115kV	P6	N-1-1	121	120	127	80	77	121	121	127	<100	<100	<100	127	127	Project: Oakland Clean Energy Initiative In-service date: 8/22 Load forecast in Northern Oakland area is under review.
	OAK C115 - ME 115kV & OAKLAND C-MARITIME line	P2	Non-Bus-Tie Breaker	94	96	105	54	54	93	97	104	67	70	52	105	105	Project: Oakland Clean Energy Initiative In-service date: 8/22 Load forecast in Northern Oakland area is under review.

Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Loading % (Baseline Scenarios)								Loading % (Sensitivity Scenarios)					ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2021 Winter Peak	2024 Winter Peak	2029 Winter Peak	2024 SP High CEC Forecast	2021 SP Heavy Renewable & Min Gas Gen	2024 SpOP Hi Renew & Min Gas Gen	2029 Retirement of QF Generations	2029 Summer Peak High SVP Forecasted Load	
Oakland D - Oakland L 115kV Cable	MORAGA 230kV - Section 2D & 1D	P2	Bus-Tie-Breaker	85	92	101	55	59	76	79	89	64	68	49	101	101	Project: Oakland Clean Energy Initiative In-service date: 8/22 Load forecast in Northern Oakland area is under review.
	STATIN X 115kV - Section 2D & 1D	P2	Bus-Tie-Breaker	133	NA	NA	92	NA	134	NA	NA	NA	NA	NA	NA	NA	Project: Oakland Clean Energy Initiative In-service date: 8/22 Load forecast in Northern Oakland area is under review.
	OAK C115 115kV Section ME	P2	Bus	91	94	105	54	54	91	94	104	67	70	52	105	105	Project: Oakland Clean Energy Initiative In-service date: 8/22 Load forecast in Northern Oakland area is under review.
	C-X #2 & #3 115kV	P6	N-1-1	120	120	128	79	76	121	120	127	<100	<100	<100	128	127	Project: Oakland Clean Energy Initiative In-service date: 8/22 Load forecast in Northern Oakland area is under review.
Oleum-Christie 115kV Line	UNION CH 9.11kV Gen Unit 1 & CHRISTIE-SOBRANTE 115kV	P3	G-1/N-1	109	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	Project: North Tower 115 kV Looping Project In-service date: 12/21 Short term: Action Plan
	Sobrante-G Nos. 1 & 2 115 kV lines	P7	DCTL	<100	<100	87	<100	<100	<100	<100	54	<100	<100	<100	114	86	Sensitivity only
San Jose B bus tie	NEWARK E-F BUS TIE 230kV & LOS ESTEROS-METCALF 230kV	P6	N-1-1	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	103	Sensitivity only
San Jose 'B'-Stone-Evergreen 115 kV Line	Metcalf - El Patio No. 1 & 2 115 kV Lines	P7	DCTL	66	71	77	66	72	58	67	60	73	74	65	80	110	Sensitivity only
San Jose Sta 'A'-'B' 115 kV Line	EVRGRN 115kV Section 1D	P2	Bus	55	61	67	61	69	52	61	54	63	60	61	69	104	Sensitivity only
	MTCALF E 115kV - Section 1E & 2E	P2	Bus-Tie-Breaker	92	102	111	77	86	75	95	85	106	88	70	114	155	Continue to monitor future load forecast
	MTCALF E 115kV Section 1X	P2	Non-Bus-Tie Breaker	54	69	72	53	59	48	59	53	71	55	51	75	109	Sensitivity only
	MTCALF E 115kV Section 1Y	P2	Non-Bus-Tie Breaker	55	68	72	53	60	48	59	53	71	55	51	75	109	Sensitivity only
	MTCALF E 115kV Section 2E	P2	Bus	60	66	73	55	62	52	63	57	69	60	53	76	106	Sensitivity only
	NRS 400 115 kV bus tie breaker to NRS 300 115 kV bus	P2	Bus-Tie-Breaker	65	70	74	51	57	51	59	56	71	62	52	77	119	Sensitivity only
	DVR Gen Units (SVP) & SAN JOSE B-STONE-EVERGREEN 115kV	P3	G-1/N-1	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	103	Sensitivity only
	LOS ESTEROS 115kV BAAH BUS #2 (FAILURE OF NON-REDUNDENT RELAY)	P5	Non-Redundant Relay	68	75	81	47	54	57	68	63	77	66	47	83	107	Sensitivity only
	LOS ESTEROS 230 kV BAAH BUS #1 (FAILURE OF NON-REDUNDENT RELAY)	P5	Non-Redundant Relay	65	71	79	57	65	50	59	56	73	65	57	82	120	Sensitivity only
	LOS ESTEROS 230 kV BAAH BUS #2 (FAILURE OF NON-REDUNDENT RELAY)	P5	Non-Redundant Relay	71	77	86	66	73	55	65	61	80	69	66	89	129	Sensitivity only
	PALO ALTO SW. STA. 115kV DBDB BUS #1 (FAILURE OF NON-REDUNDENT RELAY)	P5	Non-Redundant Relay	68	75	81	47	54	57	68	64	78	67	47	83	112	Sensitivity only

2019-2020 ISO Reliability Assessment - Study Results
Study Area: PG&E Greater Bay Area
Thermal Overloads

Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Loading % (Baseline Scenarios)								Loading % (Sensitivity Scenarios)					ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2021 Winter Peak	2024 Winter Peak	2029 Winter Peak	2024 SP High CEC Forecast	2021 SP Heavy Renewable & Min Gas Gen	2024 SpOP Hi Renew & Min Gas Gen	2029 Retirement of QF Generations	2029 Summer Peak High SVP Forecasted Load	
	NEWARK E-F BUS TIE 230kV & LOS ESTEROS-METCALF 230kV	P6	N-1-1	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	133	Sensitivity only
	Metcalf - Evergreen #1 and #2 115 kV Lines	P7	DCTL	83	90	98	68	76	69	83	75	93	81	65	101	138	Sensitivity only
	Newark - Los Esteros & Los Esteros - Metcalf 230 kV Lines	P7	DCTL	71	77	86	66	73	55	65	61	80	69	66	89	129	Sensitivity only
	Tesla - Newark No.2 and Metcalf - Los Esteros 230 kV lines	P7	DCTL	55	61	70	56	63	51	58	54	64	57	54	73	103	Sensitivity only
San Leandro - Oakland J #1 115kV Line	GRANT-EDES 115kV & MORAGA-OAKLAND J 115kV	P6	N-1-1	101	<100	<100	<100	<100	101	101	101	<100	<100	<100	<100	<100	Project: East Shore - Oakland J 115 kV Reconductoring Project In-service date: 4/21 Short term: Action plan
San Mateo-Belmont 115kV Line	RAVENSWD 230/115kV TB 1 & RAVENSWD 230/115kV TB 2	P6	N-1-1	<100	<100	100	<100	<100	<100	<100	<100	100	<100	<100	<100	107	Continue to monitor future load forecast
Saratoga-Vasona 230 kV Line	Metcalf-Monta Vista No. 3 & Monta Vista-Coyote Sw. Sta. 230 kV Line	P7	DCTL	84	88	92	74	82	78	85	76	91	79	76	94	104	Sensitivity only
Scott-Duane 115 kV Line	NRS 400 115 kV bus tie breaker to NRS 300 115 kV bus	P2	Bus-Tie-Breaker	66	77	82	32	44	55	67	72	78	64	43	83	141	Sensitivity only
Sobrante-El Cerrito STA G #2 115kV Line	SOBRANTE - 1D 115kV & SOBRANTE-G #1 line	P2	Non-Bus-Tie Breaker	<100	61	82	<100	54	<100	65	56	65	<100	51	103	82	Sensitivity only
	SOBRANTE - 1D 115kV & SOBRANTE-GRIZZLY-CLAREMONT #1 line	P2	Non-Bus-Tie Breaker	<100	61	82	<100	55	<100	65	56	65	<100	52	103	82	Sensitivity only
	SOBRANTE - 1D 115kV & SOBRANTE-NRTH TWR line	P2	Non-Bus-Tie Breaker	<100	61	82	<100	54	<100	65	56	65	<100	51	103	82	Sensitivity only
	SOBRANTE - 1D 115kV & SOBRANTE-R #1 line	P2	Non-Bus-Tie Breaker	<100	61	82	<100	55	<100	65	56	65	<100	52	103	82	Sensitivity only
	SOBRANTE - 1D 115kV & SOBRANTE-SAN PBLO-STD. OIL line	P2	Non-Bus-Tie Breaker	<100	61	82	<100	54	<100	65	56	65	<100	51	103	82	Sensitivity only
	SOBRANTE 115kV - Section 1D & 2D	P2	Bus-Tie-Breaker	97	65	87	63	56	65	69	60	69	88	53	108	86	Sensitivity only
Sobrante-Grizzly-Claremont #2 115kV Line (Hillside-Grizzly JCT)	MORAGA 230kV - Section 2D & 1D	P2	Bus-Tie-Breaker	84	94	109	51	56	59	66	76	65	62	55	109	109	Continue to monitor future load forecast
Trimble-San Jose 'B' 115 kV Line	NRS 400 115 kV bus tie breaker to NRS 300 115 kV bus	P2	Bus-Tie-Breaker	81	80	86	25	20	52	55	66	81	68	29	85	109	Sensitivity only
Whisman-Monta Vista 115 kV Line	MNTA VSA 115kV - Middle Breaker Bay 4	P2	Non-Bus-Tie Breaker	<100	81	92	<100	<100	<100	84	71	83	<100	98	95	117	Sensitivity only

Substation	Contingency (All and Worst P6)	Category	Category Description	Voltage PU (Baseline Scenarios)								Voltage PU (Sensitivity Scenarios)					ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2021 Winter Peak	2024 Winter Peak	2029 Winter Peak	2024 SP High CEC Forecast	2021 SP Heavy Renewable & Min Gas Gen	2024 SpOP Hi Renew & Min Gas Gen	2029 Retirement of QF Generations	2029 Summer Peak High SVP Forecasted Load	
A100US 115 kV	Base Case	P0	Base Case	1.04	1.05	1.04	**1.06**	**1.07**	1.05	1.05	1.04	1.04	1.05	**1.07**	1.05	1.04	Load power factor correction and voltage support if needed
ALHAMBRA 115 kV	Base Case	P0	Base Case	1.05	1.05	1.02	**1.07**	**1.07**	1.05	1.05	1.03	1.05	1.05	**1.07**	1.00	1.02	Load power factor correction and voltage support if needed
ALMADEN 60 kV	Base Case	P0	Base Case	1.00	1.00	0.95	**1.14**	**1.12**	**1.05**	1.03	0.99	1.00	1.02	**1.14**	0.95	0.93	Load power factor correction and voltage support if needed
ALTAMONT 60 kV	Base Case	P0	Base Case	1.03	1.03	1.03	**1.06**	**1.05**	1.04	1.04	1.04	1.03	1.03	**1.06**	1.04	1.03	Load power factor correction and voltage support if needed
AMES BS1 115 kV	Base Case	P0	Base Case	1.03	1.03	1.02	**1.06**	**1.06**	1.04	1.04	1.02	1.03	1.04	**1.06**	1.02	1.01	Load power factor correction and voltage support if needed
AMES BS2 115 kV	Base Case	P0	Base Case	1.03	1.03	1.02	**1.06**	**1.06**	1.04	1.04	1.02	1.03	1.04	**1.06**	1.02	1.01	Load power factor correction and voltage support if needed
AMES DST 115 kV	Base Case	P0	Base Case	1.03	1.03	1.02	**1.06**	**1.06**	1.04	1.04	1.02	1.03	1.04	**1.06**	1.02	1.01	Load power factor correction and voltage support if needed
BAIR 60 kV	Base Case	P0	Base Case	1.03	1.03	1.02	**1.06**	**1.07**	1.04	1.04	1.01	1.03	1.04	**1.07**	1.02	1.02	Load power factor correction and voltage support if needed
BAIR 115 kV	Base Case	P0	Base Case	1.03	1.03	1.02	**1.07**	**1.08**	1.03	1.04	1.02	1.03	1.04	**1.09**	1.02	1.02	Load power factor correction and voltage support if needed
BARTLP 115 kV	Base Case	P0	Base Case	1.02	1.03	1.00	**1.09**	**1.09**	**1.06**	**1.06**	1.02	1.03	1.03	**1.10**	1.00	0.99	Load power factor correction and voltage support if needed
BARTRC 115 kV	Base Case	P0	Base Case	1.03	1.03	1.01	**1.07**	**1.07**	1.04	1.04	1.02	1.03	1.04	**1.08**	1.01	0.99	Load power factor correction and voltage support if needed
BAY MDWS 115 kV	Base Case	P0	Base Case	1.02	1.03	1.01	**1.09**	**1.10**	1.04	1.05	1.02	1.03	1.04	**1.11**	1.02	1.02	Load power factor correction and voltage support if needed
BAYSHOR1 115 kV	Base Case	P0	Base Case	1.03	1.05	1.02	**1.11**	**1.13**	1.05	**1.07**	1.03	1.04	1.05	**1.14**	1.03	1.05	Load power factor correction and voltage support if needed
BAYSHOR2 115 kV	Base Case	P0	Base Case	1.03	1.05	1.02	**1.11**	**1.13**	1.05	**1.07**	1.03	1.04	1.04	**1.14**	1.03	1.05	Load power factor correction and voltage support if needed
BELMONT 115 kV	Base Case	P0	Base Case	1.02	1.03	1.01	**1.08**	**1.09**	1.03	1.04	1.02	1.03	1.04	**1.09**	1.02	1.02	Load power factor correction and voltage support if needed
BERESFRD 60 kV	Base Case	P0	Base Case	1.03	1.04	1.02	**1.09**	**1.11**	1.04	**1.05**	1.02	1.04	1.04	**1.11**	1.02	1.03	Load power factor correction and voltage support if needed
BIXLER 60 kV	Base Case	P0	Base Case	1.02	1.02	1.02	**1.06**	**1.06**	1.04	1.04	1.04	1.02	1.02	**1.06**	1.02	1.01	Load power factor correction and voltage support if needed
BOLLMAN 115 kV	Base Case	P0	Base Case	**1.05**	**1.05**	1.03	**1.08**	**1.08**	**1.05**	**1.05**	1.04	**1.05**	1.05	**1.08**	1.01	1.02	Load power factor correction and voltage support if needed
BURLNGME 115 kV	Base Case	P0	Base Case	1.03	1.04	1.02	**1.09**	**1.11**	1.04	**1.05**	1.02	1.04	1.04	**1.11**	1.02	1.03	Load power factor correction and voltage support if needed
CAL MEC 230 kV	Base Case	P0	Base Case	1.03	1.03	1.01	**1.07**	**1.07**	1.04	1.03	1.02	1.02	1.03	**1.07**	1.01	1.00	Load power factor correction and voltage support if needed
CAL_TAP3 115 kV	Base Case	P0	Base Case	1.03	1.03	1.02	**1.06**	**1.06**	1.04	1.03	1.02	1.03	1.04	**1.06**	1.02	1.00	Load power factor correction and voltage support if needed
CAL_TAP4 115 kV	Base Case	P0	Base Case	1.03	1.03	1.02	**1.06**	**1.06**	1.04	1.03	1.02	1.03	1.04	**1.06**	1.02	1.00	Load power factor correction and voltage support if needed
CALEVRAS 115 kV	Base Case	P0	Base Case	1.03	1.03	1.02	**1.06**	**1.06**	1.04	1.03	1.02	1.03	1.04	**1.06**	1.02	1.00	Load power factor correction and voltage support if needed

Substation	Contingency (All and Worst P6)	Category	Category Description	Voltage PU (Baseline Scenarios)								Voltage PU (Sensitivity Scenarios)					ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2021 Winter Peak	2024 Winter Peak	2029 Winter Peak	2024 SP High CEC Forecast	2021 SP Heavy Renewable & Min Gas Gen	2024 SpOP Hi Renew & Min Gas Gen	2029 Retirement of QF Generations	2029 Summer Peak High SVP Forecasted Load	
CALMAT60 60 kV	Base Case	P0	Base Case	1.04	1.05	1.00	**1.08**	**1.08**	1.05	1.05	1.01	1.05	1.05	**1.09**	0.99	0.98	Load power factor correction and voltage support if needed
CALTRAINSSF 115 kV	Base Case	P0	Base Case	1.02	1.03	1.01	**1.09**	**1.11**	1.03	1.05	1.02	1.03	1.03	**1.12**	1.02	1.03	Load power factor correction and voltage support if needed
CALTRAINSSJ 115 kV	Base Case	P0	Base Case	1.01	1.01	0.99	**1.07**	**1.07**	1.04	1.03	1.01	1.01	1.02	**1.08**	0.99	0.96	Load power factor correction and voltage support if needed
CAROLD1 60 kV	Base Case	P0	Base Case	1.04	1.04	1.02	**1.09**	**1.12**	1.04	**1.05**	1.03	1.04	1.04	**1.13**	1.02	1.02	Load power factor correction and voltage support if needed
CAROLD2 60 kV	Base Case	P0	Base Case	1.04	**1.05**	1.02	**1.10**	**1.14**	**1.05**	**1.06**	1.03	1.05	**1.05**	**1.15**	1.02	1.02	Load power factor correction and voltage support if needed
CAROLNDS 60 kV	Base Case	P0	Base Case	1.03	1.04	1.02	**1.09**	**1.12**	1.04	**1.05**	1.03	1.04	1.04	**1.13**	1.02	1.02	Load power factor correction and voltage support if needed
CASTROVL 230 kV	Base Case	P0	Base Case	1.01	1.01	0.99	**1.06**	**1.06**	1.02	1.02	1.00	1.01	1.01	**1.06**	0.98	0.97	Load power factor correction and voltage support if needed
CHRISTIE 115 kV	Base Case	P0	Base Case	1.04	1.04	1.01	**1.06**	**1.06**	1.04	1.04	1.02	1.04	1.04	**1.06**	1.00	1.01	Load power factor correction and voltage support if needed
CHSR04A 115 kV	Base Case	P0	Base Case	0.00	1.04	1.02	0.00	**1.07**	0.00	1.04	1.03	1.04	0.00	**1.10**	1.02	1.01	Load power factor correction and voltage support if needed
CHSR04B 115 kV	Base Case	P0	Base Case	0.00	1.04	1.02	0.00	**1.07**	0.00	1.04	1.03	1.04	0.00	**1.10**	1.02	1.01	Load power factor correction and voltage support if needed
CHSR04SWSTA 115 kV	Base Case	P0	Base Case	0.00	1.04	1.02	0.00	**1.08**	0.00	1.04	1.03	1.04	0.00	**1.10**	1.02	1.01	Load power factor correction and voltage support if needed
CLAYTN 115 kV	Base Case	P0	Base Case	**1.06**	**1.06**	1.02	**1.09**	**1.09**	**1.06**	**1.07**	1.04	**1.06**	**1.05**	**1.10**	1.02	1.02	Load power factor correction and voltage support if needed
CLMBIAHS 115 kV	Base Case	P0	Base Case	**1.06**	**1.06**	1.03	**1.09**	**1.09**	**1.06**	**1.06**	**1.05**	**1.06**	**1.05**	**1.10**	1.03	1.03	Load power factor correction and voltage support if needed
CLMBIAPV 115 kV	Base Case	P0	Base Case	**1.06**	**1.06**	1.03	**1.09**	**1.09**	**1.06**	**1.06**	**1.05**	**1.06**	**1.05**	**1.10**	1.03	1.03	Load power factor correction and voltage support if needed
CLY LND 115 kV	Base Case	P0	Base Case	1.04	1.04	1.03	**1.08**	**1.09**	1.04	1.05	1.03	1.04	1.05	**1.10**	1.03	1.02	Load power factor correction and voltage support if needed
CON25 115 kV	Base Case	P0	Base Case	1.05	1.05	1.01	**1.06**	**1.06**	1.04	1.04	1.02	1.05	1.05	**1.06**	1.00	1.01	Load power factor correction and voltage support if needed
CRYOGEN 115 kV	Base Case	P0	Base Case	1.04	1.04	1.00	**1.07**	**1.06**	1.04	1.03	1.01	1.04	1.05	**1.07**	1.00	0.98	Load power factor correction and voltage support if needed
CRYSTLSG 60 kV	Base Case	P0	Base Case	1.04	**1.05**	1.02	**1.10**	**1.14**	**1.05**	**1.06**	1.03	1.05	**1.05**	**1.15**	1.02	1.02	Load power factor correction and voltage support if needed
CV BART 230 kV	Base Case	P0	Base Case	1.01	1.01	0.99	**1.06**	**1.06**	1.02	1.02	1.00	1.01	1.01	**1.06**	0.98	0.97	Load power factor correction and voltage support if needed
CYTE PMP 115 kV	Base Case	P0	Base Case	**1.06**	**1.06**	1.04	**1.11**	**1.10**	**1.07**	**1.06**	1.05	**1.05**	**1.06**	**1.11**	1.04	1.02	Load power factor correction and voltage support if needed
DALY CTY 115 kV	Base Case	P0	Base Case	1.03	1.04	1.02	**1.11**	**1.13**	1.04	**1.06**	1.02	1.04	1.04	**1.14**	1.03	1.04	Load power factor correction and voltage support if needed
DIXON LD 115 kV	Base Case	P0	Base Case	1.03	1.03	1.01	**1.08**	**1.07**	1.05	1.04	1.02	1.03	1.03	**1.08**	1.01	0.99	Load power factor correction and voltage support if needed
DLY CTYP 115 kV	Base Case	P0	Base Case	1.03	1.04	1.02	**1.11**	**1.13**	1.05	**1.06**	1.03	1.04	1.04	**1.14**	1.03	1.04	Load power factor correction and voltage support if needed

Substation	Contingency (All and Worst P6)	Category	Category Description	Voltage PU (Baseline Scenarios)								Voltage PU (Sensitivity Scenarios)					ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2021 Winter Peak	2024 Winter Peak	2029 Winter Peak	2024 SP High CEC Forecast	2021 SP Heavy Renewable & Min Gas Gen	2024 SpOP Hi Renew & Min Gas Gen	2029 Retirement of QF Generations	2029 Summer Peak High SVP Forecasted Load	
DUMBARTN 115 kV	Base Case	P0	Base Case	1.04	1.04	1.03	**1.06**	**1.07**	1.04	1.04	1.03	1.04	1.04	**1.07**	1.03	1.02	Load power factor correction and voltage support if needed
DYERWND 60 kV	Base Case	P0	Base Case	1.03	1.03	1.03	**1.06**	1.05	1.04	1.04	1.04	1.03	1.04	**1.06**	1.04	1.03	Load power factor correction and voltage support if needed
E DUBLIN 60 kV	Base Case	P0	Base Case	1.04	1.04	1.00	**1.08**	**1.08**	1.05	**1.05**	1.01	1.04	1.04	**1.09**	0.99	0.99	Load power factor correction and voltage support if needed
E. SHORE 230 kV	Base Case	P0	Base Case	1.03	1.03	1.01	**1.07**	**1.08**	1.03	1.04	1.01	1.03	1.03	**1.08**	1.01	1.00	Load power factor correction and voltage support if needed
EASTSHRE 115 kV	Base Case	P0	Base Case	1.04	1.05	1.04	**1.05**	**1.07**	1.05	1.05	1.04	1.05	1.05	**1.07**	1.05	1.04	Load power factor correction and voltage support if needed
EBMUDGRY 115 kV	Base Case	P0	Base Case	**1.06**	**1.06**	1.01	**1.09**	**1.09**	**1.06**	**1.06**	1.03	**1.06**	**1.06**	**1.09**	1.01	1.01	Load power factor correction and voltage support if needed
EDENVALE 115 kV	Base Case	P0	Base Case	1.05	**1.05**	1.03	**1.10**	**1.10**	**1.07**	**1.06**	1.04	1.05	**1.06**	**1.11**	1.03	1.02	Load power factor correction and voltage support if needed
EDES 115 kV	Base Case	P0	Base Case	1.05	1.05	1.02	1.05	**1.06**	**1.05**	**1.05**	1.03	1.05	**1.05**	**1.06**	1.03	1.02	Load power factor correction and voltage support if needed
EDS GRNT 115 kV	Base Case	P0	Base Case	1.05	1.05	1.02	1.05	**1.06**	1.05	**1.05**	1.03	1.05	**1.05**	**1.06**	1.03	1.02	Load power factor correction and voltage support if needed
EGBERT 230 kV	Base Case	P0	Base Case	0.00	1.04	1.01	0.00	**1.12**	0.00	**1.05**	1.02	1.04	0.00	**1.13**	1.02	1.03	Load power factor correction and voltage support if needed
EL CRRTO 115 kV	Base Case	P0	Base Case	1.04	1.04	1.01	**1.06**	**1.05**	1.04	1.04	1.02	1.04	1.04	**1.06**	1.00	1.01	Load power factor correction and voltage support if needed
EL PATIO 115 kV	Base Case	P0	Base Case	1.02	1.02	1.00	**1.09**	**1.08**	**1.05**	1.04	1.02	1.02	1.03	**1.09**	1.00	0.97	Load power factor correction and voltage support if needed
EMBRCDRD 230 kV	Base Case	P0	Base Case	1.02	1.04	1.01	**1.09**	**1.12**	1.03	**1.05**	1.02	1.03	1.03	**1.13**	1.02	1.03	Load power factor correction and voltage support if needed
EMRLD LE 60 kV	Base Case	P0	Base Case	1.05	**1.05**	1.02	**1.10**	**1.14**	**1.05**	**1.06**	1.03	**1.05**	**1.06**	**1.15**	1.02	1.02	Load power factor correction and voltage support if needed
EST GRND 115 kV	Base Case	P0	Base Case	1.02	1.03	1.01	**1.09**	**1.11**	1.03	1.05	1.02	1.03	1.03	**1.12**	1.02	1.03	Load power factor correction and voltage support if needed
EVERGREN 60 kV	Base Case	P0	Base Case	1.02	1.02	0.98	**1.12**	**1.11**	**1.06**	1.04	1.01	1.01	1.03	**1.12**	0.98	0.96	Load power factor correction and voltage support if needed
EVRGRN 1 115 kV	Base Case	P0	Base Case	1.02	1.02	1.00	**1.09**	**1.09**	**1.06**	1.04	1.02	1.02	1.03	**1.10**	1.00	0.97	Load power factor correction and voltage support if needed
FMC 115 kV	Base Case	P0	Base Case	1.01	1.01	0.99	**1.07**	**1.07**	1.04	1.03	1.01	1.01	1.02	**1.08**	0.99	0.96	Load power factor correction and voltage support if needed
FOREBAYWIND 60 kV	Base Case	P0	Base Case	1.04	1.05	1.01	**1.09**	**1.09**	**1.05**	**1.05**	1.02	1.04	1.05	**1.09**	1.00	0.99	Load power factor correction and voltage support if needed
FREMNT 115 kV	Base Case	P0	Base Case	1.03	1.03	1.01	**1.07**	**1.07**	1.04	1.04	1.02	1.03	1.04	**1.07**	1.01	0.99	Load power factor correction and voltage support if needed
FRICKWND 60 kV	Base Case	P0	Base Case	1.04	1.05	1.01	**1.09**	**1.09**	**1.05**	**1.05**	1.02	1.04	1.05	**1.09**	1.00	0.99	Load power factor correction and voltage support if needed
GILROY 115 kV	Base Case	P0	Base Case	1.04	1.04	1.02	**1.07**	**1.07**	**1.05**	1.04	1.03	1.04	1.04	**1.10**	1.02	1.02	Load power factor correction and voltage support if needed
GILROY F 115 kV	Base Case	P0	Base Case	1.04	1.04	1.02	**1.07**	**1.07**	**1.05**	1.04	1.03	1.04	1.04	**1.10**	1.02	1.02	Load power factor correction and voltage support if needed

Substation	Contingency (All and Worst P6)	Category	Category Description	Voltage PU (Baseline Scenarios)								Voltage PU (Sensitivity Scenarios)					ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2021 Winter Peak	2024 Winter Peak	2029 Winter Peak	2024 SP High CEC Forecast	2021 SP Heavy Renewable & Min Gas Gen	2024 SpOP Hi Renew & Min Gas Gen	2029 Retirement of QF Generations	2029 Summer Peak High SVP Forecasted Load	
GILROYPK 115 kV	Base Case	P0	Base Case	1.04	1.04	1.02	**1.07**	**1.07**	**1.05**	1.04	1.03	1.04	1.04	**1.10**	1.02	1.02	Load power factor correction and voltage support if needed
GILROYTP 115 kV	Base Case	P0	Base Case	1.04	1.04	1.02	**1.07**	**1.07**	**1.05**	1.04	1.03	1.04	1.04	**1.10**	1.02	1.02	Load power factor correction and voltage support if needed
GRANT 115 kV	Base Case	P0	Base Case	1.05	1.05	1.03	**1.05**	**1.06**	1.05	1.05	1.03	1.05	**1.05**	**1.07**	1.04	1.03	Load power factor correction and voltage support if needed
HICKS 230 kV	Base Case	P0	Base Case	1.03	1.04	1.01	**1.09**	**1.09**	1.04	1.04	1.02	1.03	1.04	**1.10**	1.01	0.99	Load power factor correction and voltage support if needed
HILDAL47 60 kV	Base Case	P0	Base Case	1.04	**1.05**	1.02	**1.10**	**1.14**	**1.05**	**1.06**	1.03	1.05	**1.05**	**1.15**	1.02	1.02	Load power factor correction and voltage support if needed
HILDAL49 60 kV	Base Case	P0	Base Case	1.04	1.05	1.02	**1.09**	**1.12**	1.05	**1.06**	1.03	1.04	1.05	**1.13**	1.03	1.02	Load power factor correction and voltage support if needed
HILLSDLE 60 kV	Base Case	P0	Base Case	1.03	1.04	1.02	**1.09**	**1.11**	1.04	**1.05**	1.03	1.04	1.04	**1.12**	1.02	1.02	Load power factor correction and voltage support if needed
HLF MNBY 60 kV	Base Case	P0	Base Case	1.04	1.05	1.03	**1.09**	**1.12**	1.04	**1.06**	1.03	1.04	1.04	**1.13**	1.03	1.03	Load power factor correction and voltage support if needed
HLLSDLJT 60 kV	Base Case	P0	Base Case	1.04	1.05	1.02	**1.09**	**1.12**	1.05	**1.06**	1.03	1.04	1.05	**1.13**	1.03	1.02	Load power factor correction and voltage support if needed
HNTRS PT 115 kV	Base Case	P0	Base Case	1.03	1.04	1.02	**1.11**	**1.13**	1.05	**1.07**	1.03	1.04	1.04	**1.14**	1.03	1.04	Load power factor correction and voltage support if needed
IBM-BALY 115 kV	Base Case	P0	Base Case	**1.05**	**1.05**	1.04	**1.11**	**1.10**	**1.07**	**1.06**	1.05	**1.05**	**1.06**	**1.11**	1.03	1.02	Load power factor correction and voltage support if needed
IBM-CTLE 115 kV	Base Case	P0	Base Case	**1.05**	**1.05**	1.03	**1.10**	**1.10**	**1.07**	**1.06**	1.04	1.05	**1.06**	**1.11**	1.03	1.02	Load power factor correction and voltage support if needed
IBM-HR J 115 kV	Base Case	P0	Base Case	1.05	1.05	1.03	**1.10**	**1.10**	**1.07**	**1.06**	1.04	1.04	**1.05**	**1.11**	1.03	1.01	Load power factor correction and voltage support if needed
IBM-HRRS 115 kV	Base Case	P0	Base Case	**1.05**	**1.05**	1.03	**1.10**	**1.10**	**1.07**	**1.06**	1.04	1.05	**1.06**	**1.11**	1.03	1.02	Load power factor correction and voltage support if needed
IMHOFF 115 kV	Base Case	P0	Base Case	**1.05**	**1.05**	1.03	**1.07**	**1.07**	**1.05**	**1.05**	1.04	**1.05**	1.05	**1.08**	1.01	1.02	Load power factor correction and voltage support if needed
IUKA 60 kV	Base Case	P0	Base Case	1.04	1.04	1.00	**1.08**	**1.08**	1.05	1.05	1.01	1.04	1.05	**1.08**	0.99	0.98	Load power factor correction and voltage support if needed
JARVIS 115 kV	Base Case	P0	Base Case	1.04	1.04	1.00	**1.07**	**1.06**	1.04	1.03	1.01	1.04	1.05	**1.07**	1.00	0.98	Load power factor correction and voltage support if needed
JEFFERSN 230 kV	Base Case	P0	Base Case	1.04	1.05	1.02	**1.11**	**1.13**	**1.05**	**1.06**	1.03	1.04	1.05	**1.13**	1.02	1.01	Load power factor correction and voltage support if needed
JEFRSN_D 60 kV	Base Case	P0	Base Case	1.05	**1.06**	1.02	**1.10**	**1.14**	**1.06**	**1.06**	1.04	**1.05**	**1.06**	**1.15**	1.02	1.02	Load power factor correction and voltage support if needed
JEFRSN_E 60 kV	Base Case	P0	Base Case	1.05	**1.06**	1.02	**1.10**	**1.14**	**1.06**	**1.06**	1.04	**1.05**	**1.06**	**1.15**	1.02	1.02	Load power factor correction and voltage support if needed
JENING J 60 kV	Base Case	P0	Base Case	1.02	1.02	0.98	**1.12**	**1.11**	**1.06**	1.04	1.01	1.01	1.03	**1.12**	0.98	0.95	Load power factor correction and voltage support if needed
JMDAMCX1 230 kV	Base Case	P0	Base Case	1.04	**1.05**	1.02	**1.11**	**1.13**	**1.05**	**1.06**	1.03	1.05	**1.05**	**1.14**	1.02	1.02	Load power factor correction and voltage support if needed
JMDAMCX2 230 kV	Base Case	P0	Base Case	1.04	**1.05**	1.02	**1.11**	**1.13**	**1.05**	**1.06**	1.03	1.05	**1.05**	**1.14**	1.02	1.02	Load power factor correction and voltage support if needed

Substation	Contingency (All and Worst P6)	Category	Category Description	Voltage PU (Baseline Scenarios)								Voltage PU (Sensitivity Scenarios)					ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2021 Winter Peak	2024 Winter Peak	2029 Winter Peak	2024 SP High CEC Forecast	2021 SP Heavy Renewable & Min Gas Gen	2024 SpOP Hi Renew & Min Gas Gen	2029 Retirement of QF Generations	2029 Summer Peak High SVP Forecasted Load	
JV BART 115 kV	Base Case	P0	Base Case	1.04	1.04	1.00	**1.07**	**1.06**	1.04	1.03	1.01	1.04	1.05	**1.07**	1.00	0.98	Load power factor correction and voltage support if needed
KIRKER 115 kV	Base Case	P0	Base Case	**1.06**	**1.06**	1.03	**1.10**	**1.09**	**1.06**	**1.06**	1.05	**1.06**	**1.05**	**1.10**	1.03	1.03	Load power factor correction and voltage support if needed
LAKEWD-C 115 kV	Base Case	P0	Base Case	**1.06**	**1.06**	1.01	**1.09**	**1.09**	**1.06**	**1.06**	1.03	**1.06**	**1.05**	**1.09**	1.01	1.01	Load power factor correction and voltage support if needed
LAKEWD-M 115 kV	Base Case	P0	Base Case	**1.06**	**1.06**	1.01	**1.09**	**1.09**	**1.06**	**1.06**	1.03	**1.06**	**1.05**	**1.09**	1.01	1.01	Load power factor correction and voltage support if needed
LARKIN D 115 kV	Base Case	P0	Base Case	1.03	1.04	1.02	**1.11**	**1.13**	1.05	**1.07**	1.03	1.04	1.04	**1.14**	1.03	1.04	Load power factor correction and voltage support if needed
LARKIN E 115 kV	Base Case	P0	Base Case	1.03	1.04	1.02	**1.11**	**1.13**	1.05	**1.07**	1.03	1.04	1.04	**1.14**	1.03	1.04	Load power factor correction and voltage support if needed
LARKIN F 115 kV	Base Case	P0	Base Case	1.03	1.04	1.02	**1.11**	**1.13**	1.05	**1.07**	1.03	1.04	1.04	**1.14**	1.03	1.04	Load power factor correction and voltage support if needed
LAS PLGS 60 kV	Base Case	P0	Base Case	1.04	1.05	1.01	**1.10**	**1.14**	1.05	**1.06**	1.02	1.04	1.05	**1.15**	1.01	1.01	Load power factor correction and voltage support if needed
LIVERMRE 60 kV	Base Case	P0	Base Case	1.05	1.05	1.00	**1.09**	**1.09**	**1.05**	**1.05**	1.01	1.05	**1.05**	**1.09**	1.00	0.99	Load power factor correction and voltage support if needed
LK_REACT 115 kV	Base Case	P0	Base Case	1.04	1.04	1.02	**1.05**	**1.06**	1.05	**1.05**	1.04	1.04	1.04	**1.06**	1.02	1.02	Load power factor correction and voltage support if needed
LLAGAS 115 kV	Base Case	P0	Base Case	1.04	1.04	1.02	**1.08**	**1.07**	**1.05**	1.04	1.03	1.04	1.04	**1.10**	1.02	1.01	Load power factor correction and voltage support if needed
LMEC 115 kV	Base Case	P0	Base Case	**1.06**	**1.06**	1.04	**1.09**	**1.09**	**1.06**	**1.06**	**1.05**	**1.06**	**1.05**	**1.10**	1.03	1.03	Load power factor correction and voltage support if needed
LONESTAR 115 kV	Base Case	P0	Base Case	1.02	1.03	1.02	**1.07**	**1.08**	1.03	1.04	1.02	1.03	1.04	**1.08**	1.02	1.02	Load power factor correction and voltage support if needed
LOS ALTS 60 kV	Base Case	P0	Base Case	1.04	1.04	1.03	**1.07**	**1.06**	1.04	1.05	1.02	1.04	1.04	**1.07**	1.03	1.03	Load power factor correction and voltage support if needed
LOYOLA 60 kV	Base Case	P0	Base Case	1.04	1.04	1.04	**1.07**	**1.05**	1.04	1.04	1.03	1.04	1.04	**1.06**	1.04	1.04	Load power factor correction and voltage support if needed
LPOSTAS 60 kV	Base Case	P0	Base Case	1.04	1.05	1.01	**1.09**	**1.09**	**1.05**	**1.05**	1.02	1.04	1.05	**1.09**	1.00	1.00	Load power factor correction and voltage support if needed
LS PSTAS 230 kV	Base Case	P0	Base Case	1.01	1.01	0.99	**1.06**	**1.06**	1.03	1.02	1.01	1.01	1.01	**1.06**	0.99	0.98	Load power factor correction and voltage support if needed
MABURY 60 kV	Base Case	P0	Base Case	1.01	1.01	0.98	**1.12**	**1.11**	**1.06**	1.04	1.00	1.01	1.02	**1.12**	0.98	0.95	Load power factor correction and voltage support if needed
MABURY 115 kV	Base Case	P0	Base Case	1.02	1.03	1.00	**1.09**	**1.09**	**1.06**	**1.06**	1.02	1.03	1.03	**1.10**	1.00	0.99	Load power factor correction and voltage support if needed
MARKHAM 115 kV	Base Case	P0	Base Case	1.02	1.02	0.99	**1.08**	**1.08**	1.05	1.03	1.01	1.01	1.02	**1.09**	0.99	0.97	Load power factor correction and voltage support if needed
MARTIN C 115 kV	Base Case	P0	Base Case	1.03	1.04	1.02	**1.11**	**1.13**	1.05	**1.06**	1.03	1.04	1.04	**1.14**	1.03	1.04	Load power factor correction and voltage support if needed
MARTIN C 230 kV	Base Case	P0	Base Case	1.02	1.04	1.01	**1.09**	**1.12**	1.03	**1.05**	1.02	1.04	1.03	**1.13**	1.02	1.03	Load power factor correction and voltage support if needed
MARTN S4 230 kV	Base Case	P0	Base Case	0.00	1.04	1.01	0.00	**1.12**	0.00	**1.05**	1.02	1.04	0.00	**1.13**	1.02	1.03	Load power factor correction and voltage support if needed

Substation	Contingency (All and Worst P6)	Category	Category Description	Voltage PU (Baseline Scenarios)								Voltage PU (Sensitivity Scenarios)					ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2021 Winter Peak	2024 Winter Peak	2029 Winter Peak	2024 SP High CEC Forecast	2021 SP Heavy Renewable & Min Gas Gen	2024 SpOP Hi Renew & Min Gas Gen	2029 Retirement of QF Generations	2029 Summer Peak High SVP Forecasted Load	
MARTN S5 230 kV	Base Case	P0	Base Case	0.00	1.04	1.01	0.00	**1.12**	0.00	**1.05**	1.02	1.04	0.00	**1.13**	1.02	1.03	Load power factor correction and voltage support if needed
MARTNZ D 115 kV	Base Case	P0	Base Case	1.05	**1.05**	1.02	**1.07**	**1.07**	**1.05**	**1.05**	1.03	**1.05**	1.05	**1.07**	1.00	1.02	Load power factor correction and voltage support if needed
MARTNZ E 115 kV	Base Case	P0	Base Case	**1.05**	**1.05**	1.02	**1.07**	**1.07**	**1.05**	**1.05**	1.03	**1.05**	1.05	**1.07**	1.00	1.02	Load power factor correction and voltage support if needed
MCKEE 115 kV	Base Case	P0	Base Case	1.03	1.03	1.01	**1.10**	**1.09**	**1.06**	**1.05**	1.02	1.03	1.04	**1.10**	1.01	0.99	Load power factor correction and voltage support if needed
MEDW LNE 115 kV	Base Case	P0	Base Case	**1.06**	**1.06**	1.01	**1.09**	**1.09**	**1.06**	**1.07**	1.03	**1.06**	**1.06**	**1.10**	1.01	1.01	Load power factor correction and voltage support if needed
METCALF 230 kV	Base Case	P0	Base Case	1.02	1.03	1.01	**1.07**	**1.07**	1.03	1.03	1.02	1.02	1.03	**1.07**	1.01	1.00	Load power factor correction and voltage support if needed
MILLBRAE 60 kV	Base Case	P0	Base Case	1.01	**1.06**	1.01	**1.12**	**1.14**	**1.06**	**1.08**	1.00	1.04	**1.06**	**1.15**	1.02	1.03	Load power factor correction and voltage support if needed
MILLBRAE 115 kV	Base Case	P0	Base Case	1.02	1.04	1.02	**1.10**	**1.12**	1.04	**1.06**	1.02	1.03	1.04	**1.12**	1.02	1.03	Load power factor correction and voltage support if needed
MILPITAS 115 kV	Base Case	P0	Base Case	1.03	1.03	1.01	**1.07**	**1.07**	1.05	1.04	1.02	1.03	1.04	**1.08**	1.01	0.99	Load power factor correction and voltage support if needed
MISSON 115 kV	Base Case	P0	Base Case	1.03	1.04	1.02	**1.11**	**1.13**	1.05	**1.07**	1.03	1.04	1.04	**1.14**	1.03	1.04	Load power factor correction and voltage support if needed
MLLBRETP 60 kV	Base Case	P0	Base Case	1.00	**1.07**	1.00	**1.13**	**1.15**	**1.07**	**1.09**	1.00	1.04	**1.07**	**1.16**	1.02	1.03	Load power factor correction and voltage support if needed
MLLBTP97 60 kV	Base Case	P0	Base Case	1.04	1.04	1.02	**1.09**	**1.12**	1.04	**1.05**	1.03	1.04	1.04	**1.13**	1.02	1.02	Load power factor correction and voltage support if needed
MNTA VSA 60 kV	Base Case	P0	Base Case	**1.05**	**1.05**	**1.06**	**1.06**	1.05	**1.05**	1.05	1.04	**1.05**	1.05	1.05	**1.06**	**1.05**	Load power factor correction and voltage support if needed
MONTAVIS 230 kV	Base Case	P0	Base Case	1.04	1.05	1.01	**1.11**	**1.11**	**1.06**	**1.06**	1.03	1.04	**1.05**	**1.12**	1.01	1.00	Load power factor correction and voltage support if needed
MORAGA 230 kV	Base Case	P0	Base Case	1.00	1.01	0.98	**1.07**	**1.06**	1.02	1.02	1.00	1.01	1.01	**1.06**	0.97	0.97	Load power factor correction and voltage support if needed
MRGN HIL 115 kV	Base Case	P0	Base Case	1.04	1.04	1.02	**1.09**	**1.08**	**1.06**	1.05	1.03	1.04	1.05	**1.10**	1.02	1.01	Load power factor correction and voltage support if needed
MRT RCT2 230 kV	Base Case	P0	Base Case	0.00	1.04	1.01	0.00	**1.12**	0.00	**1.05**	1.02	1.04	0.00	**1.13**	1.02	1.03	Load power factor correction and voltage support if needed
MRT RCTR 230 kV	Base Case	P0	Base Case	1.03	0.00	0.00	**1.10**	0.00	1.04	0.00	0.00	0.00	1.04	0.00	0.00	0.00	Load power factor correction and voltage support if needed
MT EDEN 115 kV	Base Case	P0	Base Case	1.04	1.05	1.04	**1.05**	**1.07**	1.05	1.05	1.04	1.04	1.05	**1.07**	1.04	1.04	Load power factor correction and voltage support if needed
MTCALF D 115 kV	Base Case	P0	Base Case	**1.05**	**1.06**	1.04	**1.11**	**1.10**	**1.07**	**1.06**	1.05	**1.05**	**1.06**	**1.11**	1.04	1.02	Load power factor correction and voltage support if needed
MTCALF E 115 kV	Base Case	P0	Base Case	**1.05**	**1.06**	1.04	**1.11**	**1.10**	**1.07**	**1.06**	1.05	**1.05**	**1.06**	**1.11**	1.04	1.02	Load power factor correction and voltage support if needed
NASA A 115 kV	Base Case	P0	Base Case	1.03	1.03	1.02	**1.06**	**1.06**	1.04	1.04	1.02	1.03	1.04	**1.06**	1.02	1.01	Load power factor correction and voltage support if needed
NASA B 115 kV	Base Case	P0	Base Case	1.03	1.03	1.02	**1.06**	**1.06**	1.04	1.04	1.02	1.03	1.04	**1.06**	1.02	1.01	Load power factor correction and voltage support if needed

Substation	Contingency (All and Worst P6)	Category	Category Description	Voltage PU (Baseline Scenarios)								Voltage PU (Sensitivity Scenarios)					ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2021 Winter Peak	2024 Winter Peak	2029 Winter Peak	2024 SP High CEC Forecast	2021 SP Heavy Renewable & Min Gas Gen	2024 SpOP Hi Renew & Min Gas Gen	2029 Retirement of QF Generations	2029 Summer Peak High SVP Forecasted Load	
NEWARK 60 kV	Base Case	P0	Base Case	1.03	1.03	1.00	**1.07**	**1.07**	1.04	1.04	1.02	1.03	1.04	**1.08**	1.00	0.99	Load power factor correction and voltage support if needed
NEWARK D 115 kV	Base Case	P0	Base Case	1.03	1.03	1.02	**1.07**	**1.06**	1.04	1.04	1.02	1.03	1.04	**1.07**	1.02	1.00	Load power factor correction and voltage support if needed
NEWARK E 115 kV	Base Case	P0	Base Case	1.03	1.03	1.01	**1.07**	**1.07**	1.04	1.04	1.02	1.03	1.04	**1.07**	1.01	1.00	Load power factor correction and voltage support if needed
NEWARK F 115 kV	Base Case	P0	Base Case	1.03	1.03	1.01	**1.07**	**1.07**	1.04	1.04	1.02	1.03	1.04	**1.07**	1.01	1.00	Load power factor correction and voltage support if needed
NUMMI 115 kV	Base Case	P0	Base Case	1.02	1.03	1.01	**1.06**	**1.06**	1.04	1.03	1.02	1.03	1.03	**1.06**	1.01	0.99	Load power factor correction and voltage support if needed
NWRK 2 M 115 kV	Base Case	P0	Base Case	1.03	1.03	1.01	**1.07**	**1.07**	1.04	1.04	1.02	1.03	1.04	**1.07**	1.01	0.99	Load power factor correction and voltage support if needed
OLEUM 115 kV	Base Case	P0	Base Case	1.05	1.05	1.01	**1.06**	**1.06**	1.04	1.04	1.02	1.05	1.05	**1.06**	1.00	1.01	Load power factor correction and voltage support if needed
ORACLE60 60 kV	Base Case	P0	Base Case	1.02	1.03	1.01	**1.07**	**1.08**	1.03	1.04	1.01	1.03	1.04	**1.08**	1.02	1.02	Load power factor correction and voltage support if needed
OX_MTN60 60 kV	Base Case	P0	Base Case	1.04	1.05	1.03	**1.09**	**1.12**	1.05	**1.06**	1.04	1.05	1.04	**1.13**	1.03	1.03	Load power factor correction and voltage support if needed
PARKS 60 kV	Base Case	P0	Base Case	1.04	1.04	1.00	**1.08**	**1.08**	1.05	**1.05**	1.01	1.04	1.04	**1.09**	0.99	0.99	Load power factor correction and voltage support if needed
PIERCY 115 kV	Base Case	P0	Base Case	1.04	1.05	1.02	**1.10**	**1.10**	**1.07**	**1.06**	1.04	1.04	1.05	**1.11**	1.02	1.01	Load power factor correction and voltage support if needed
PITSBURG 115 kV	Base Case	P0	Base Case	**1.06**	**1.06**	1.03	**1.09**	**1.09**	**1.06**	**1.06**	**1.05**	**1.06**	**1.05**	**1.10**	1.03	1.03	Load power factor correction and voltage support if needed
POT_SVC 115 kV	Base Case	P0	Base Case	1.03	1.05	1.02	**1.11**	**1.14**	1.05	**1.07**	1.03	1.04	1.05	**1.14**	1.03	1.05	Load power factor correction and voltage support if needed
POTRERO 115 kV	Base Case	P0	Base Case	1.03	1.05	1.02	**1.11**	**1.14**	1.05	**1.07**	1.03	1.04	1.05	**1.14**	1.03	1.05	Load power factor correction and voltage support if needed
POTRERO 230 kV	Base Case	P0	Base Case	1.02	1.04	1.01	**1.09**	**1.12**	1.02	**1.05**	1.02	1.03	1.03	**1.12**	1.02	1.03	Load power factor correction and voltage support if needed
PP STEEL 115 kV	Base Case	P0	Base Case	1.05	1.05	1.00	**1.05**	1.04	1.03	1.03	1.01	1.05	1.05	1.04	0.98	1.00	Load power factor correction and voltage support if needed
PRAXAIR 115 kV	Base Case	P0	Base Case	**1.06**	**1.06**	1.03	**1.09**	**1.09**	**1.06**	**1.06**	1.05	**1.06**	**1.05**	**1.09**	1.03	1.03	Load power factor correction and voltage support if needed
PT PINLE 115 kV	Base Case	P0	Base Case	1.05	1.05	1.00	**1.05**	1.04	1.03	1.03	1.01	1.05	1.05	1.04	0.98	1.00	Load power factor correction and voltage support if needed
PTPNLT2 115 kV	Base Case	P0	Base Case	1.05	1.05	1.00	**1.05**	1.03	1.03	1.03	1.01	1.05	1.05	1.04	0.97	1.00	Load power factor correction and voltage support if needed
PTR_SHNT 230 kV	Base Case	P0	Base Case	1.02	1.04	1.01	**1.09**	**1.12**	1.02	**1.05**	1.02	1.03	1.03	**1.12**	1.02	1.03	Load power factor correction and voltage support if needed
RADUM 60 kV	Base Case	P0	Base Case	1.04	1.05	1.00	**1.08**	**1.08**	1.05	1.05	1.01	1.04	1.05	**1.09**	0.99	0.98	Load power factor correction and voltage support if needed
RALSTON 60 kV	Base Case	P0	Base Case	1.04	**1.05**	1.02	**1.10**	**1.14**	**1.05**	**1.06**	1.03	1.05	**1.05**	**1.15**	1.02	1.02	Load power factor correction and voltage support if needed
RAVENSWD 230 kV	Base Case	P0	Base Case	1.02	1.02	1.01	**1.06**	**1.06**	1.02	1.03	1.02	1.02	1.03	**1.07**	1.01	1.01	Load power factor correction and voltage support if needed

Substation	Contingency (All and Worst P6)	Category	Category Description	Voltage PU (Baseline Scenarios)								Voltage PU (Sensitivity Scenarios)					ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2021 Winter Peak	2024 Winter Peak	2029 Winter Peak	2024 SP High CEC Forecast	2021 SP Heavy Renewable & Min Gas Gen	2024 SpOP Hi Renew & Min Gas Gen	2029 Retirement of QF Generations	2029 Summer Peak High SVP Forecasted Load	
REDWOOD 60 kV	Base Case	P0	Base Case	1.03	1.03	1.01	**1.06**	**1.06**	1.04	1.04	1.01	1.03	1.04	**1.07**	1.02	1.01	Load power factor correction and voltage support if needed
RESEARCH 230 kV	Base Case	P0	Base Case	1.02	1.02	1.00	**1.06**	**1.06**	1.03	1.03	1.01	1.02	1.02	**1.06**	0.99	0.99	Load power factor correction and voltage support if needed
RLSTN35 60 kV	Base Case	P0	Base Case	1.04	1.05	1.02	**1.10**	**1.13**	1.05	**1.06**	1.03	1.05	1.05	**1.14**	1.02	1.02	Load power factor correction and voltage support if needed
RLSTN45 60 kV	Base Case	P0	Base Case	1.04	**1.05**	1.02	**1.10**	**1.14**	**1.05**	**1.06**	1.03	1.05	**1.05**	**1.15**	1.02	1.02	Load power factor correction and voltage support if needed
ROSSMOOR 230 kV	Base Case	P0	Base Case	1.00	1.01	0.98	**1.06**	**1.06**	1.02	1.02	1.00	1.01	1.01	**1.06**	0.97	0.97	Load power factor correction and voltage support if needed
RUSELCTY 230 kV	Base Case	P0	Base Case	1.03	1.03	1.01	**1.07**	**1.08**	1.03	1.04	1.01	1.03	1.03	**1.08**	1.01	1.01	Load power factor correction and voltage support if needed
RVNSWD D 115 kV	Base Case	P0	Base Case	1.04	1.05	1.03	**1.08**	**1.09**	1.05	**1.05**	1.03	1.04	1.05	**1.09**	1.03	1.03	Load power factor correction and voltage support if needed
RVNSWD E 115 kV	Base Case	P0	Base Case	1.04	1.05	1.03	**1.08**	**1.09**	1.05	**1.05**	1.03	1.04	1.05	**1.09**	1.03	1.03	Load power factor correction and voltage support if needed
S.L.A.C. 60 kV	Base Case	P0	Base Case	1.04	**1.05**	1.01	1.03	**1.18**	1.03	1.04	1.02	1.05	**1.06**	**1.19**	1.01	1.01	Load power factor correction and voltage support if needed
S.L.A.C. 230 kV	Base Case	P0	Base Case	1.03	1.04	1.02	**1.11**	**1.12**	**1.05**	**1.06**	1.03	1.04	1.04	**1.13**	1.02	1.01	Load power factor correction and voltage support if needed
SAN CRLS 60 kV	Base Case	P0	Base Case	1.02	1.03	1.01	**1.06**	**1.07**	1.03	1.04	1.01	1.03	1.04	**1.07**	1.02	1.01	Load power factor correction and voltage support if needed
SAN MATO 60 kV	Base Case	P0	Base Case	1.03	1.04	1.02	**1.09**	**1.10**	1.04	**1.05**	1.02	1.04	1.04	**1.11**	1.02	1.03	Load power factor correction and voltage support if needed
SAN RAMN 60 kV	Base Case	P0	Base Case	1.04	1.04	1.00	**1.09**	**1.08**	1.04	**1.05**	1.02	1.04	1.04	**1.09**	0.99	0.99	Load power factor correction and voltage support if needed
SANMATEO 115 kV	Base Case	P0	Base Case	1.03	1.04	1.02	**1.09**	**1.10**	1.04	**1.05**	1.02	1.03	1.04	**1.11**	1.02	1.03	Load power factor correction and voltage support if needed
SANMATEO 230 kV	Base Case	P0	Base Case	1.02	1.03	1.02	**1.07**	**1.08**	1.03	1.04	1.02	1.03	1.03	**1.09**	1.02	1.02	Load power factor correction and voltage support if needed
SANPAULA 115 kV	Base Case	P0	Base Case	1.02	1.04	1.02	**1.10**	**1.12**	1.04	**1.06**	1.02	1.03	1.04	**1.12**	1.02	1.03	Load power factor correction and voltage support if needed
SANRAMON 230 kV	Base Case	P0	Base Case	1.01	1.01	0.98	**1.06**	**1.06**	1.01	1.03	1.00	1.01	1.01	**1.06**	0.97	0.97	Load power factor correction and voltage support if needed
SARATOGA 230 kV	Base Case	P0	Base Case	1.04	1.04	1.01	**1.10**	**1.10**	**1.05**	**1.05**	1.02	1.04	1.05	**1.11**	1.01	0.99	Load power factor correction and voltage support if needed
SENTER 60 kV	Base Case	P0	Base Case	1.02	1.02	0.98	**1.12**	**1.11**	**1.06**	1.04	1.01	1.01	1.03	**1.12**	0.98	0.96	Load power factor correction and voltage support if needed
SERRMNTE 115 kV	Base Case	P0	Base Case	1.03	1.04	1.02	**1.11**	**1.13**	1.04	**1.06**	1.02	1.04	1.04	**1.14**	1.03	1.04	Load power factor correction and voltage support if needed
SFIA 115 kV	Base Case	P0	Base Case	1.03	1.04	1.02	**1.10**	**1.11**	1.04	**1.06**	1.02	1.04	1.04	**1.12**	1.03	1.03	Load power factor correction and voltage support if needed
SFIA-MA 115 kV	Base Case	P0	Base Case	1.02	1.03	1.01	**1.09**	**1.11**	1.03	1.05	1.02	1.03	1.03	**1.12**	1.02	1.03	Load power factor correction and voltage support if needed
SHAWROAD 115 kV	Base Case	P0	Base Case	1.03	1.04	1.02	**1.10**	**1.12**	1.04	**1.06**	1.02	1.04	1.04	**1.12**	1.03	1.03	Load power factor correction and voltage support if needed

Substation	Contingency (All and Worst P6)	Category	Category Description	Voltage PU (Baseline Scenarios)								Voltage PU (Sensitivity Scenarios)					ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2021 Winter Peak	2024 Winter Peak	2029 Winter Peak	2024 SP High CEC Forecast	2021 SP Heavy Renewable & Min Gas Gen	2024 SpOP Hi Renew & Min Gas Gen	2029 Retirement of QF Generations	2029 Summer Peak High SVP Forecasted Load	
SHREDDER 115 kV	Base Case	P0	Base Case	1.02	1.03	1.02	**1.07**	**1.08**	1.03	1.04	1.02	1.03	1.04	**1.08**	1.02	1.02	Load power factor correction and voltage support if needed
SJB DG 115 kV	Base Case	P0	Base Case	1.02	1.02	0.99	**1.08**	**1.07**	1.04	1.03	1.01	1.01	1.02	**1.08**	0.99	0.96	Load power factor correction and voltage support if needed
SJB EF 115 kV	Base Case	P0	Base Case	1.02	1.02	0.99	**1.08**	**1.07**	1.05	1.03	1.01	1.01	1.02	**1.08**	0.99	0.96	Load power factor correction and voltage support if needed
SMATEO3M 115 kV	Base Case	P0	Base Case	1.03	1.04	1.02	**1.08**	**1.10**	1.04	1.05	1.02	1.03	1.04	**1.11**	1.02	1.02	Load power factor correction and voltage support if needed
SN JSE A 115 kV	Base Case	P0	Base Case	1.02	1.02	0.99	**1.08**	**1.08**	1.05	1.03	1.01	1.01	1.02	**1.08**	0.99	0.96	Load power factor correction and voltage support if needed
SNANDRES 60 kV	Base Case	P0	Base Case	1.00	**1.07**	1.00	**1.14**	**1.16**	**1.08**	**1.10**	0.99	1.04	**1.07**	**1.17**	1.02	1.02	Load power factor correction and voltage support if needed
SNTACLRAWIND 60 kV	Base Case	P0	Base Case	1.04	1.05	1.01	**1.09**	**1.09**	**1.05**	**1.05**	1.02	1.04	1.05	**1.09**	1.00	0.99	Load power factor correction and voltage support if needed
ST TRESA 115 kV	Base Case	P0	Base Case	**1.05**	**1.05**	1.03	**1.10**	**1.10**	**1.07**	**1.06**	1.04	1.05	**1.06**	**1.11**	1.03	1.02	Load power factor correction and voltage support if needed
STANFORD 60 kV	Base Case	P0	Base Case	1.04	**1.05**	1.01	1.02	**1.19**	1.03	1.04	1.02	1.05	**1.06**	**1.20**	1.01	1.01	Load power factor correction and voltage support if needed
STATIN J 115 kV	Base Case	P0	Base Case	1.05	1.05	1.02	1.05	**1.06**	1.05	**1.05**	1.03	1.05	**1.05**	**1.06**	1.02	1.02	Load power factor correction and voltage support if needed
STONE 115 kV	Base Case	P0	Base Case	1.02	1.02	0.99	**1.09**	**1.09**	**1.06**	1.04	1.01	1.01	1.03	**1.10**	0.99	0.97	Load power factor correction and voltage support if needed
SUNOL 60 kV	Base Case	P0	Base Case	1.03	1.04	1.00	**1.08**	**1.08**	1.04	1.04	1.01	1.04	1.04	**1.08**	0.99	0.98	Load power factor correction and voltage support if needed
SWIFT 115 kV	Base Case	P0	Base Case	1.04	1.04	1.02	**1.09**	**1.09**	**1.06**	**1.06**	1.03	1.04	1.05	**1.10**	1.01	1.00	Load power factor correction and voltage support if needed
TASSAJAR 230 kV	Base Case	P0	Base Case	1.02	1.02	0.99	**1.06**	**1.06**	1.03	1.03	1.01	1.02	1.02	**1.06**	0.99	0.99	Load power factor correction and voltage support if needed
TRAN230A 230 kV	Base Case	P0	Base Case	1.04	**1.05**	1.02	**1.11**	**1.13**	**1.05**	**1.06**	1.03	1.05	1.05	**1.14**	1.02	1.02	Load power factor correction and voltage support if needed
TRAN230B 230 kV	Base Case	P0	Base Case	1.04	1.05	1.02	**1.11**	**1.13**	1.05	**1.06**	1.03	1.04	1.05	**1.14**	1.02	1.03	Load power factor correction and voltage support if needed
TRAN-60 60 kV	Base Case	P0	Base Case	1.04	1.04	1.02	**1.09**	**1.12**	1.04	**1.05**	1.03	1.04	1.04	**1.13**	1.02	1.02	Load power factor correction and voltage support if needed
TRES VAQ 230 kV	Base Case	P0	Base Case	1.02	1.03	1.01	**1.06**	**1.05**	1.03	1.03	1.03	1.02	1.02	**1.06**	1.01	1.00	Load power factor correction and voltage support if needed
TRIMBLE 115 kV	Base Case	P0	Base Case	1.03	1.03	1.01	**1.06**	**1.06**	1.04	1.03	1.02	1.03	1.03	**1.06**	1.01	0.98	Load power factor correction and voltage support if needed
UNITEDSP 115 kV	Base Case	P0	Base Case	**1.06**	**1.06**	1.03	**1.10**	**1.09**	**1.06**	**1.06**	1.05	**1.06**	**1.05**	**1.10**	1.03	1.03	Load power factor correction and voltage support if needed
UNOCAL2 115 kV	Base Case	P0	Base Case	1.05	1.05	1.01	**1.06**	**1.06**	1.04	1.04	1.02	1.05	1.05	**1.06**	1.00	1.01	Load power factor correction and voltage support if needed
VALLECTS 60 kV	Base Case	P0	Base Case	1.04	1.04	1.00	**1.08**	**1.08**	1.05	1.04	1.01	1.04	1.04	**1.08**	0.99	0.98	Load power factor correction and voltage support if needed
VALLY VW 115 kV	Base Case	P0	Base Case	1.04	1.04	1.01	**1.06**	**1.06**	1.04	1.04	1.02	1.04	1.04	**1.06**	1.00	1.01	Load power factor correction and voltage support if needed

Substation	Contingency (All and Worst P6)	Category	Category Description	Voltage PU (Baseline Scenarios)								Voltage PU (Sensitivity Scenarios)					ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2021 Winter Peak	2024 Winter Peak	2029 Winter Peak	2024 SP High CEC Forecast	2021 SP Heavy Renewable & Min Gas Gen	2024 SpOP Hi Renew & Min Gas Gen	2029 Retirement of QF Generations	2029 Summer Peak High SVP Forecasted Load	
VASCO 60 kV	Base Case	P0	Base Case	1.04	1.05	1.01	1.09	1.09	1.05	1.05	1.02	1.04	1.05	1.09	1.00	0.99	Load power factor correction and voltage support if needed
VASONA 230 kV	Base Case	P0	Base Case	1.04	1.04	1.01	1.10	1.10	1.05	1.05	1.02	1.04	1.04	1.11	1.01	0.99	Load power factor correction and voltage support if needed
VINEYARD 60 kV	Base Case	P0	Base Case	1.04	1.05	1.00	1.08	1.08	1.05	1.05	1.01	1.04	1.05	1.09	0.99	0.98	Load power factor correction and voltage support if needed
W.P.BART 115 kV	Base Case	P0	Base Case	1.05	1.06	1.03	1.09	1.09	1.06	1.06	1.04	1.05	1.05	1.09	1.02	1.02	Load power factor correction and voltage support if needed
WATRSHED 60 kV	Base Case	P0	Base Case	1.04	1.05	1.02	1.10	1.13	1.05	1.06	1.03	1.05	1.05	1.14	1.02	1.02	Load power factor correction and voltage support if needed
WESTRN_D 115 kV	Base Case	P0	Base Case	1.03	1.03	1.01	1.06	1.06	1.04	1.03	1.02	1.03	1.03	1.06	1.01	0.99	Load power factor correction and voltage support if needed
WHISMAN 115 kV	Base Case	P0	Base Case	1.03	1.03	1.01	1.06	1.06	1.03	1.03	1.02	1.03	1.03	1.06	1.01	1.01	Load power factor correction and voltage support if needed
WOODSIDE 60 kV	Base Case	P0	Base Case	1.04	1.05	1.01	1.10	1.14	1.05	1.06	1.02	1.04	1.05	1.15	1.01	1.01	Load power factor correction and voltage support if needed
WTRSHDTP 60 kV	Base Case	P0	Base Case	1.04	1.05	1.02	1.10	1.13	1.05	1.06	1.03	1.05	1.05	1.14	1.02	1.02	Load power factor correction and voltage support if needed
ZANKER 115 kV	Base Case	P0	Base Case	1.02	1.02	1.00	1.06	1.06	1.04	1.03	1.02	1.02	1.03	1.07	1.00	0.97	Load power factor correction and voltage support if needed
LOS GATS 60 kV	MONTA VISTA-LOS GATOS 60kV	P1	N-1	0.97	0.97	0.90	1.16	1.14	1.04	1.02	0.95	0.96	0.99	1.15	0.90	0.87	Load power factor correction and voltage support if needed
MARTIN 60 kV	MILLBRAE-SNEATH LANE 60kV	P1	N-1	0.95	1.18	0.96	1.25	1.28	1.18	1.20	0.95	1.18	1.18	1.29	0.00	1.17	Load power factor correction and voltage support if needed
PACIFICA 60 kV	MILLBRAE-SNEATH LANE 60kV	P1	N-1	0.95	1.18	0.95	1.25	1.28	1.17	1.19	0.93	1.17	1.18	1.29	1.01	1.16	Load power factor correction and voltage support if needed
SN BRNOT 60 kV	MILLBRAE 115/60kV TB 5	P1	N-1	0.95	1.18	0.94	1.25	1.28	1.17	1.19	0.92	1.17	1.18	1.29	1.01	1.01	Load power factor correction and voltage support if needed
SNTH LNE 60 kV	MILLBRAE-SNEATH LANE 60kV	P1	N-1	0.95	1.18	0.95	1.25	1.28	1.17	1.19	0.93	1.17	1.18	1.29	1.02	1.16	Load power factor correction and voltage support if needed
FMC 115 kV	NRS 400 115 kV bus tie breaker to NRS 300 115 kV bus	P2	Bus-Tie-Breaker	0.99	0.99	0.96	1.07	1.06	1.03	1.01	0.99	0.98	1.00	1.07	0.95	0.86	Sensitivity only
SJB DG 115 kV	NRS 400 115 kV bus tie breaker to NRS 300 115 kV bus	P2	Bus-Tie-Breaker	0.99	0.99	0.96	1.07	1.07	1.03	1.02	0.99	0.99	1.00	1.08	0.96	0.88	Sensitivity only
SJB EF 115 kV	NRS 400 115 kV bus tie breaker to NRS 300 115 kV bus	P2	Bus-Tie-Breaker	0.99	0.99	0.96	1.07	1.07	1.03	1.02	1.00	0.99	1.00	1.08	0.96	0.89	Sensitivity only
SN JSE A 115 kV	NRS 400 115 kV bus tie breaker to NRS 300 115 kV bus	P2	Bus-Tie-Breaker	1.00	1.00	0.97	1.08	1.07	1.04	1.02	1.00	0.99	1.00	1.08	0.96	0.89	Sensitivity only
STONE 115 kV	NRS 400 115 kV bus tie breaker to NRS 300 115 kV bus	P2	Bus-Tie-Breaker	0.97	0.97	0.93	1.08	1.07	1.03	1.01	0.97	0.96	0.98	1.08	0.93	0.88	Sensitivity only
E. SHORE 230 kV	RAVENSWOOD 230 kV BAAH BUS #1 (FAILURE OF NON-REDUNDENT RELAY)	P5	Non-Redundant Relay	1.02	1.03	1.00	1.08	1.10	1.04	1.04	1.01	1.02	1.02	1.11	1.00	1.00	Sensitivity only
JEFFERSN 230 kV	JEFFERSON 230 kV BAAH BUS #2 (FAILURE OF NON-REDUNDENT RELAY)	P5	Non-Redundant Relay	0.94	1.04	1.01	<1.1	1.11	<1.1	1.05	1.03	1.03	0.95	1.12	1.01	0.98	Load power factor correction and voltage support if needed

Study Area: PG&E Greater Bay Area

High/Low Voltages

Substation	Contingency (All and Worst P6)	Category	Category Description	Voltage PU (Baseline Scenarios)								Voltage PU (Sensitivity Scenarios)					ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2021 Winter Peak	2024 Winter Peak	2029 Winter Peak	2024 SP High CEC Forecast	2021 SP Heavy Renewable & Min Gas Gen	2024 SpOP Hi Renew & Min Gas Gen	2029 Retirement of QF Generations	2029 Summer Peak High SVP Forecasted Load	
MRT RCTR 230 kV	SAN MATEO-MARTIN 230kV & P1-4:A9:9:_MRT RCTR SVD=V	P6	N-1-1	<1.1	<1.1	<1.1	**1.14**	<1.1	<1.1	<1.1	<1.1	<1.1	<1.1	<1.1	<1.1	<1.1	Load power factor correction and voltage support if needed
NWK DIST 230 kV	P1-2:A16:18:_NEWARK E-F BUS TIE 230kV & P1-4:A18:1:_LS ESTRS SVD=R	P6	N-1-1	<1.1	<1.1	<1.1	**1.10**	<1.1	<1.1	<1.1	<1.1	<1.1	<1.1	**1.11**	<1.1	<1.1	Load power factor correction and voltage support if needed
VINEYARD 230 kV	VINEYARD-NEWARK 230kV & P1-4:A16:13:_VINEYARD SVD=V	P6	N-1-1	<1.1	<1.1	<1.1	**1.11**	<1.1	<1.1	<1.1	<1.1	<1.1	<1.1	<1.1	<1.1	<1.1	Load power factor correction and voltage support if needed
FMC 115 kV	P1-2:A18:49:_LOS ESTEROS-NORTECH 115kV & P1-2:A18:19:_FMC-SAN JOSE B 115kV	P6	N-1-1	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	**0.88**	Sensitivity only
NORTECH 115 kV	P1-2:A21:1:_SSS-NRS 230kV (SVP) & P1-2:A18:49:_LOS ESTEROS-NORTECH 115kV	P6	N-1-1	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	**0.88**	Sensitivity only

Study Area: PG&E Greater Bay Area

Voltage Deviation

Substation	Contingency (All and Worst P6)	Category	Category Description	Post Cont. Voltage Deviation % (Baseline Scenarios)								Post Cont. Voltage Deviation % (Sensitivity Scenarios)					ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2021 Winter Peak	2024 Winter Peak	2029 Winter Peak	2024 SP High CEC Forecast	2021 SP Heavy Renewable & Min Gas Gen	2024 SpOP Hi Renew & Min Gas Gen	2029 Retirement of QF Generations	2029 Summer Peak High SVP Forecasted Load	
LOS GATS 60 kV	MONTA VISTA-LOS GATOS 60kV	P1	N-1	7	6	**13**	**-9**	**-9**	0	2	7	7	4	**-9**	**13**	**16**	Disable automatic load pickup
PIERCY 115 kV	PIERCY-METCALF 115kV	P1	N-1	6	5	8	2	2	3	2	6	5	5	2	8	**9**	Sensitivity only

Study Area: PG&E Greater Bay Area

Transient Stability

Contingency	Category	Category Description	Transient Stability Performance					Potential Mitigation Solutions
			Baseline Scenarios			Sensitivity Scenarios		
			2024 Summer Peak	2029 Summer Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	
Metcalf 500/230 kV #13 Transformer 3Ø fault with normal clearing.	P1-3	N-1	No issue	No issue	No issue	No issue	No issue	No mitigation required
Metcalf 500/230 kV #13 Transformer 3Ø fault with normal clearing with LMEC offline in the base case.	P3-3	G-1/N-1	No issue	No issue	No issue	No issue	No issue	No mitigation required
Metcalf 500/230 kV #13 Transformer SLG fault with delayed clearing.	P5-3	Non-Redundant Relay	No issue	No issue	No issue	No issue	No issue	No mitigation required
Tesla-Newark 230 kV line 3Ø fault with normal clearing with Metcalf 500/230 kV #13 Transformer offline in the base case.	P6-1	N-1-1	No issue	No issue	No issue	No issue	No issue	No mitigation required
Metcalf 230 kV bus 3Ø fault with normal clearing with Metcalf 500/230 kV #13 Transformer offline in the base case.	P6-2	N-1-1	No issue	No issue	No issue	No issue	No issue	No mitigation required
Contra Costa-Gateway 230 kV SLG fault with delayed clearing.	P5-2	Non-Redundant Relay	No issue	No issue	No issue	No issue	No issue	No mitigation required
Contra Costa-Gateway 230 kV SLG fault expanded to elements lost due to stuck breaker and clear fault from remote breakers with normal clearing time.	P4-2	Stuck Breaker	No issue	No issue	No issue	No issue	No issue	No mitigation required
TBC SLG fault with normal clearing.	P1-5	N-1	No issue	No issue	No issue	No issue	No issue	No mitigation required
TBC SLG fault with normal clearing with LMEC offline in the base case.	P3-5	G-1/N-1	No issue	No issue	No issue	No issue	No issue	No mitigation required
TBC SLG fault with normal clearing with Tesla-Newark 230 kV line offline in the base case.	P6-4	N-1-1	No issue	No issue	No issue	No issue	No issue	No mitigation required
Newark 230 kV 3Ø fault with normal clearing.	P1-2	N-1	No issue	No issue	No issue	No issue	No issue	No mitigation required
Tesla-Newark 230 kV line 3Ø fault with normal clearing with LMEC offline in the base case.	P3-2	G-1/N-1	No issue	No issue	No issue	No issue	No issue	No mitigation required
Monta Vista 230 kV SVD 3Ø fault with normal clearing.	P1-4	N-1	No issue	No issue	No issue	No issue	No issue	No mitigation required
Monta Vista 230 kV SVD 3Ø fault with normal clearing with LMEC offline in the base case.	P3-4	G-1/N-1	No issue	No issue	No issue	No issue	No issue	No mitigation required
Monta Vista 230 kV SVD SLG fault expanded to elements lost due to stuck breaker and clear fault from remote breakers with normal clearing time.	P4-4	Stuck Breaker	No issue	No issue	No issue	No issue	No issue	No mitigation required
Monta Vista 230 kV SVD SLG fault with delayed clearing.	P5-4	Non-Redundant Relay	No issue	No issue	No issue	No issue	No issue	No mitigation required
Ravenswood 230 kV SVD 3Ø fault with normal clearing with Monta Vista 230 kV SVD offline in the base case.	P6-3	N-1-1	No issue	No issue	No issue	No issue	No issue	No mitigation required
Metcalf 230 kV bus SLG fault with normal clearing.	P2-2	Bus	No issue	No issue	No issue	No issue	No issue	No mitigation required
Metcalf 230 kV line breaker SLG fault with normal clearing.	P2-3	Non-Bus-Tie Breaker	No issue	No issue	No issue	No issue	No issue	No mitigation required
Metcalf 230 kV bus-tie breaker SLG fault with normal clearing.	P2-4	Bus-Tie Breaker	No issue	No issue	No issue	No issue	No issue	No mitigation required

Study Area: PG&E Greater Bay Area

Transient Stability

Contingency	Category	Category Description	Transient Stability Performance					Potential Mitigation Solutions
			Baseline Scenarios			Sensitivity Scenarios		
			2024 Summer Peak	2029 Summer Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	
Metcalf 500/230 kV #13 Transformer SLG fault expanded to elements lost due to stuck breaker and clear fault from remote breakers with normal clearing time.	P4-3	Stuck Breaker	No issue	No issue	No issue	No issue	No issue	No mitigation required
Crocket 3Ø fault with normal clearing with LMEC offline in the base case.	P3-1	G-1/N-1	No issue	No issue	No issue	No issue	No issue	No mitigation required
LMEC 3Ø fault with normal clearing.	P1-1	N-1	No issue	No issue	No issue	No issue	No issue	No mitigation required
DEC 3Ø fault with normal clearing.	P1-1	N-1	No issue	No issue	No issue	No issue	No issue	No mitigation required
Metcalf 115 kV bus SVD SLG fault expanded to elements lost due to stuck breaker and clear fault from remote breakers with normal clearing time.	P4-5	Stuck Breaker	No issue	No issue	No issue	No issue	No issue	No mitigation required
Metcalf 115 kV bus-tie breaker SVD SLG fault expanded to elements lost due to stuck breaker and clear fault from remote breakers with normal clearing time.	P4-6	Stuck Breaker	No issue	No issue	No issue	No issue	No issue	No mitigation required
Metcalf 115 kV bus SLG fault with delayed clearing.	P5-5	Non-Redundant Relay	No issue	No issue	No issue	No issue	No issue	No mitigation required
Los Esteros SLG fault expanded to elements lost due to stuck breaker and clear fault from remote breakers with normal clearing time.	P4-1	Stuck Breaker	No issue	No issue	No issue	No issue	No issue	No mitigation required
Los Esteros SLG fault with delayed clearing.	P5-1	Non-Redundant Relay	No issue	No issue	No issue	No issue	No issue	No mitigation required
Contra Costa-Moraga # 1 & 2 230 kV lines SLG fault with successful high speed reclose.	P7-1	DCTL	No issue	No issue	No issue	No issue	No issue	No mitigation required
Contra Costa-Moraga # 1 & 2 230 kV lines SLG fault with unsuccessful high speed reclose.	P7-1	DCTL	No issue	No issue	No issue	No issue	No issue	No mitigation required
Tesla-Newark & Tesla-Ravenswood 230 kV lines SLG fault with successful high speed reclose.	P7-1	DCTL	No issue	No issue	No issue	No issue	No issue	No mitigation required
Tesla-Newark & Tesla-Ravenswood 230 kV lines SLG fault with unsuccessful high speed reclose.	P7-1	DCTL	No issue	No issue	No issue	No issue	No issue	No mitigation required

2019-2020 ISO Reliability Assessment - Study Results

Study Area: PG&E Greater Bay Area

Single Contingency Load Drop

Worst Contingency	Category	Category Description	Amount of Load Drop (MW)										Potential Mitigation Solutions
			Select..	Select..	Select..	Select..	Select..	Select..	Select..	Select..	Select..	Select..	

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

Study Area: PG&E Greater Bay Area

Single Source Substation with more than 100 MW Load

Substation	Load Served (MW)										Potential Mitigation Solutions
	Select..	Select..	Select..	Select..	Select..	Select..	Select..	Select..	Select..	Select..	
Kirker	102	102	103								Mitigation under development

2019-2020 ISO Reliability Assessment - Study Results
Study Area: PG&E Greater Fresno
Thermal Overloads

California ISO

Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Loading % (Baseline Scenarios)					Loading % (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	2029 Retirement of QF Generations	
30500 BELLOTA 230 30515 WARNERVL 230 1	Warnerville 115kV Bus Section Fault (CCSF)	P2	P2-2	46	19	29	87	39	18	37	121	29	Sensitivity only
	Warnerville 115kV Bus Section Fault with Breaker Failure (CCSF)	P2	P4-5	46	19	29	87	39	18	37	121	29	Sensitivity only
	Warnerville 230kV Bus Section Fault (CCSF)	P2	P2-2	46	19	29	87	39	18	37	121	29	Sensitivity only
30515 WARNERVL 230 30516 WILSONRCTR 230 1	Warnerville 115kV Bus Section Fault (CCSF)	P2	P2-2	86	86	111	85	85	86	85	95	114	Continue to monitor Future load forecast
	Warnerville Breaker 410 Failure (CCSF)	P2	P2-3	86	86	111	85	85	86	85	95	114	Continue to monitor Future load forecast
	Warnerville Breaker 420 Failure (CCSF)	P2	P2-3	86	86	111	85	85	86	85	95	114	Continue to monitor Future load forecast
	Warnerville Breaker 430 Failure (CCSF)	P2	P2-3	86	86	111	85	85	86	85	95	114	Continue to monitor Future load forecast
	Warnerville Breaker 440 Failure (CCSF)	P2	P2-3	86	86	111	85	85	86	85	95	114	Continue to monitor Future load forecast
	Warnerville Breaker 450 Failure (CCSF)	P2	P2-3	86	86	111	85	85	86	85	95	114	Continue to monitor Future load forecast
	GREGG 230 kV BAAH BUS #1 (FAILURE OF NON-REDUNDENT RELAY)	P5	Non-Redundent Relay	109	113	116	80	86	118	87	29	118	Project: Protection upgrade In-service date: 12/20 Short term: Action plan
	MUSTANGSS-GATES #1 230kV & MUSTANGSS-GATES #2 230kV	P7	DCTL	17	30	37	65	72	37	79	100	39	Sensitivity only
30755 MOSSLNSW 230 30797 LASAGUILASS 230 2	LOSBANOS 500/230kV TB 1 & QUINTO SW STA-WESTLEY 230kV	P6	N-1-1	<100	<100	<100	<100	<100	<100	<100	100.03	<100	Sensitivity only
30765 LOSBANOS 230 30766 PADREFLATSSS 230 1	Base Case	P0	Base Case	9	3	1	100	46	3	49	96	1	Generation redispatch
	MUSTANGSS 230kV - Middle Breaker Bay 3	P2	P2-3	4	<100	<100	102	<100	<100	<100	85	<100	Generation redispatch
	PANOCHE 230kV - Section 2E & 2D	P2	P2-4	7	6	9	116	62	7	72	99	9	Generation redispatch
	PANOCHE 230kV Section 2E	P2	P2-2	15	7	4	116	63	6	69	109	3	Generation redispatch
	LOS BANOS-PANOCHE #2 230kV & DOS AMIGOS PUMPING PLANT-PANOCHE 230kV	P6	N-1-1	<100	<100	<100	<100	<100	<100	<100	100.02	<100	Generation redispatch
	MOSS LANDING-PANOCHE #2 230kV & DOS AMIGOS PUMPING PLANT-PANOCHE 230kV	P6	N-1-1	<100	<100	<100	100	<100	<100	<100	<100	<100	Generation redispatch
	LOS BANOS-PANOCHE #2 230kV & LOS BANOS-DOS AMIGOS 230kV	P7	DCTL	10	4	1	109	59	4	66	102	1	Generation redispatch
30765 LOSBANOS 230 30790 PANOCHE 230 2	LOSBANOS 230kV Section 2D	P2	P2-2	14	13	6	99	105	12	120	91	6	Generation redispatch
	LOS BANOS-DOS AMIGOS 230kV & LOSBANOS-PADREFLATSSS #1 230kV	P6	N-1-1	<100	<100	<100	<100	100	<100	<100	<100	<100	Generation redispatch
30790 PANOCHE 230 30791 PNCHE 1M 230 1	PANOCHE 230kV - Section 2D & 1D	P2	P2-4	18	18	13	62	67	19	102	50	13	Sensitivity only
30875 MC CALL 230 30878 MCCALL3M 115 3	MC CALL 115kV - Middle Breaker Bay 3	P2	P2-3	<100	92	104	<100	22	95	13	<100	104	Continue to monitor Future load forecast
	MUSTANGSS-GATES #2 230kV & GATES-GREGG 230kV	P6	N-1-1	<100	<100	<100	102	101	<100	<100	<100	<100	Generation redispatch
	MUSTANGSS-GATES #1 230kV & GATES-GREGG 230kV	P6	N-1-1	<100	<100	<100	102	101	<100	<100	<100	<100	Generation redispatch
34105 CERTANJ1 115 34121 SHARON T 115 1	HERNDON 115kV - Section 1D & 2D	P2	P2-4	72	76	75	105	108	80	80	56	76	Generation redispatch
	MUSTANGSS 230kV - Middle Breaker Bay 3	P2	P2-3	<100	36	40	<100	103	39	88	<100	40	Generation redispatch
	GREGG 230 kV BAAH BUS #2 (FAILURE OF NON-REDUNDENT RELAY)	P5	Non-Redundent Relay	96	98	90	84	90	102	68	68	92	Project: Protection upgrade In-service date: 12/20 Short term: Action plan
	PANOCHE-MENDOTA 115kV & WILSON-LE GRAND 115kV	P6	N-1-1	<100	<100	<100	111	110	<100	<100	<100	<100	Generation redispatch
	HERNDON-KEARNEY 230kV & MERCED 115/70kV TB 2	P6	N-1-1	<100	<100	<100	101	101	<100	<100	<100	<100	Generation redispatch
34116 LE GRAND 115 34198 CHWCHLASLRJT 115 1	PANOCHE-MENDOTA 115kV	P1	N-1	50	53	57	105	106	54	174	134	57	Generation redispatch
	MENDOTA 115kV - Middle Breaker Bay 3	P2	P2-3	<100	52	56	<100	42	53	107	<100	56	Generation redispatch
	PANOCHE1 - 1D 115kV & PANOCHE-CAL PEAK-STARWOOD line	P2	P2-3	50	53	57	105	106	54	174	134	57	Generation redispatch
	PANOCHE1 - 1D 115kV & PANOCHE-MENDOTA line	P2	P2-3	50	53	57	105	106	54	174	134	57	Generation redispatch
	PANOCHE1 - 1D 115kV & PANOCHE-SCHINDLER #1 line	P2	P2-3	50	53	57	105	106	54	174	134	57	Generation redispatch
	PANOCHE1 115kV Section 1D	P2	P2-2	50	53	57	105	106	54	174	134	57	Generation redispatch
	PANOCHE1 Section 1D & PANOCHE2 Section 2D 115kV	P2	P2-4	<100	53	57	<100	106	54	174	<100	57	Generation redispatch
	PANOCHE-MENDOTA 115kV & TOMATAK-MENDOTA #1 70kV	P6	N-1-1	<100	<100	<100	<100	<100	<100	<100	140	<100	Generation redispatch
34117 KETLMN T 70.0 34552 GATES 70.0 1	Base Case	P0	Base Case	63	64	59	97	98	65	144	93	59	Sensitivity only
34117 KETLMN T 70.0 34552 GATES 70.0 1	ARCO-TULARE LAKE 70kV	P1	N-1	<100	98	<100	<100	92	100	136	<100	<100	Sensitivity only
	PANOCHE1 Section 1D & PANOCHE2 Section 2D 115kV	P2	P2-4	109	112	125	<100	12	117	6	<100	125	

2019-2020 ISO Reliability Assessment - Study Results
Study Area: PG&E Greater Fresno
Thermal Overloads

California ISO

Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Loading % (Baseline Scenarios)					Loading % (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	2029 Retirement of QF Generations	
34118 LE GRNDJ 115 34134 WILSON A 115 1	PANOCHE2 - 2D 115kV & PANOCHE2-EXCELSIORSS line	P2	P2-3	108	112	124	<100	12	117	7	<100	124	Reconductor Wilson-Oro Loma 115kV line
	PANOCHE2 115kV Section 2D	P2	P2-2	108	112	124	<100	12	117	6	<100	124	
	PANOCHE2 115kV Section 2D	P2	P2-2	108	112	124	<100	12	117	7	<100	124	
34118 LE GRNDJ 115 34168 EL NIDO 115 1	PANOCHE1 Section 1D & PANOCHE2 Section 2D 115kV	P2	P2-4	108	112	125	<100	12	117	6	<100	125	Reconductor Wilson-Oro Loma 115kV line
	PANOCHE2 - 2D 115kV & PANOCHE2-EXCELSIORSS line	P2	P2-3	108	112	124	<100	12	117	6	<100	124	
	PANOCHE-ORO LOMA 115kV	P2	P2-1	108	112	124	<101	12	117	6	<101	125	
	PANOCHE2 115kV Section 2D	P2	P2-2	108	112	124	<100	12	117	6	<100	124	
34121 SHARON T 115 34128 OAKH_JCT 115 1	HERNDON 115kV - Section 1D & 2D	P2	P2-4	69	73	73	109	112	76	85	53	73	Generation redispatch
	MUSTANGSS 230kV - Middle Breaker Bay 3	P2	P2-3	21	33	37	104	107	36	92	38	38	Generation redispatch
	PANOCHE-MENDOTA 115kV & WILSON-LE GRAND 115kV	P6	N-1-1	<100	<100	<100	107	107	<100	<100	<100	<100	Generation redispatch
34134 WILSON A 115 34104 ATWATER 115 1	EL CAPITAN-WILSON 115kV & LIVINGSTON TAP 115kV	P6	N-1-1	117	125	133	<100	<100	127	<100	<100	133	Existing SPS under review
34134 WILSON A 115 34138 EL CAPTN 115 1	LIVINGSTON TAP 115kV & WILSON-ATWATER #2 115kV	P6	N-1-1	<100	114	121	<100	<100	115	<100	<100	121	Existing SPS under review
34134 WILSON A 115 34144 MERCED 115 1	EL CAPITAN-WILSON 115kV & WILSON-MERCED #2 115kV	P6	N-1-1	<100	105	113	<100	<100	108	<100	<100	114	Existing SPS under review
34134 WILSON A 115 34144 MERCED 115 2	EL CAPITAN-WILSON 115kV & WILSON-MERCED #1 115kV	P6	N-1-1	<100	109	117	<100	<100	111	<100	<100	117	Existing SPS under review
34136 WILSON B 115 34138 EL CAPTN 115 1	LIVINGSTON TAP 115kV & WILSON-ATWATER #2 115kV	P6	N-1-1	107	<100	<100	<100	<100	<100	<100	<100	<100	Existing SPS under review
34136 WILSON B 115 34144 MERCED 115 2	EL CAPITAN-WILSON 115kV & WILSON-MERCED #1 115kV	P6	N-1-1	101	<100	<100	<100	<100	<100	<100	<100	<100	Existing SPS under review
34149 CHENYT 115 34158 PANOCHE2 115 1	HELMS 1 18.00kV Gen Unit 1 & GATES 230/70kV TB 5	P3	G1/N1	<100	<100	<100	<100	<100	<100	100	<100	<100	Sensitivity only
	HELMS 2 18.00kV Gen Unit 1 & GATES 230/70kV TB 5	P3	G1/N1	<100	<100	<100	<100	<100	<100	100	<100	<100	Sensitivity only
	HELMS 3 18.00kV Gen Unit 1 & GATES 230/70kV TB 5	P3	G1/N1	<100	<100	<100	<100	<100	<100	100	<100	<100	Sensitivity only
	GATES 230/70kV TB 5 & WESTLNDS-EXCELSIORSS #1 115kV	P6	N-1-1	<100	<100	<100	<100	<100	<100	152	<100	<100	Sensitivity only
	PANOCHE-SCHINDLER #1 115kV & GATES 230/70kV TB 5	P6	N-1-1	<100	<100	100	<100	<100	<100	<100	<100	100	Continue to monitor Future load forecast
34149 CHENYT 115 34393 EXCELSIORSS 115 2	GATES 230/70kV TB 5 & WESTLNDS-EXCELSIORSS #1 115kV	P6	N-1-1	<100	<100	<100	<100	<100	<100	144	<100	<100	Sensitivity only
	PANOCHE-SCHINDLER #1 115kV & GATES 230/70kV TB 5	P6	N-1-1	<100	100	100	<100	<100	100	<100	<100	100	Continue to monitor Future load forecast
34150 NEWHALL 115 34154 DAIRYLND 115 1	PANOCHE-MENDOTA 115kV	P1	N-1	25	26	27	95	94	27	143	122	27	Sensitivity only
	PANOCHE1 - 1D 115kV & PANOCHE-CAL PEAK-STARWOOD line	P2	P2-3	25	26	27	95	94	27	143	122	27	Sensitivity only
	PANOCHE1 - 1D 115kV & PANOCHE-MENDOTA line	P2	P2-3	25	26	27	95	94	27	143	122	27	Sensitivity only
	PANOCHE1 - 1D 115kV & PANOCHE-SCHINDLER #1 line	P2	P2-3	25	26	27	95	94	27	143	122	27	Sensitivity only
	PANOCHE1 115kV Section 1D	P2	P2-2	25	26	27	95	94	27	143	122	27	Sensitivity only
	PANOCHE1 Section 1D & PANOCHE2 Section 2D 115kV	P2	P2-4	25	26	27	95	94	27	143	122	27	Sensitivity only
	PANOCHE-MENDOTA 115kV & TOMATAK-MENDOTA #1 70kV	P6	N-1-1	<100	<100	<100	<100	<100	<100	<100	128	<100	Sensitivity only
34155 PANOCHE1 115 34350 KAMM 115 1	GATES 230/70kV TB 5 & PANOCHE2-EXCELSIORSS 115kV	P6	N-1-1	<100	<100	<100	<100	<100	<100	154	<100	<100	Sensitivity only
	PANOCHE2-EXCELSIORSS 115kV & GATES 230/70kV TB 5	P6	N-1-1	<100	100	<100	101	<100	100	<100	<100	<100	Continue to monitor Future load forecast
34156 MENDOTA 115 34153 GILLTAP 115 1	PANOCHE-MENDOTA 115kV	P1	N-1	6	6	6	77	74	6	111	103	6	Sensitivity only
	PANOCHE1 - 1D 115kV & PANOCHE-CAL PEAK-STARWOOD line	P2	P2-3	6	6	6	77	74	7	111	103	6	Sensitivity only
	PANOCHE1 - 1D 115kV & PANOCHE-MENDOTA line	P2	P2-3	6	6	6	77	74	6	111	103	6	Sensitivity only
	PANOCHE1 - 1D 115kV & PANOCHE-SCHINDLER #1 line	P2	P2-3	6	6	6	77	74	7	111	103	6	Sensitivity only
	PANOCHE1 115kV Section 1D	P2	P2-2	6	6	6	77	74	7	111	103	6	Sensitivity only
	PANOCHE1 Section 1D & PANOCHE2 Section 2D 115kV	P2	P2-4	6	6	6	77	74	7	111	103	6	Sensitivity only
	PANOCHE-MENDOTA 115kV & TOMATAK-MENDOTA #1 70kV	P6	N-1-1	<100	<100	<100	<100	<100	<100	<100	107	<100	Sensitivity only
34157 PANOCHE1 115 34155 PANOCHE1 115 1	DAIRYLAND-MENDOTA 115kV	P1	N-1	8	9	5	79	78	9	110	102	5	Sensitivity only
	LE GRAND-DAIRYLAND 115kV	P1	N-1	<100	36	37	<100	78	35	120	<100	37	Sensitivity only
	WILSON-LE GRAND 115kV	P1	N-1	<100	28	31	<100	84	30	106	<100	31	Sensitivity only
	DAIRYLAND-MENDOTA 115kV (MENDOTA-GILLTAP)	P2	P2-1	8	<100	<100	79	<100	<100	<100	102	<100	Sensitivity only
	DAIRYLND - 1D 115kV & DAIRYLAND-MENDOTA line	P2	P2-3	8	<100	<100	79	<100	<100	<100	102	<100	Sensitivity only
	DAIRYLND - 1E 115kV & LE GRAND-DAIRYLAND line	P2	P2-3	<100	28	28	<100	77	29	110	<100	28	Sensitivity only
	LE GRAND - MA 115kV & LE GRAND-CHOWCHILLA line	P2	P2-3	<100	36	37	<100	78	35	120	<100	37	Sensitivity only
	LE GRAND - MA 115kV & LE GRAND-DAIRYLAND line	P2	P2-3	<100	36	37	<100	78	35	120	<100	37	Sensitivity only
	LE GRAND 115kV Section MA	P2	P2-2	33	36	37	77	78	35	120	94	37	Sensitivity only

2019-2020 ISO Reliability Assessment - Study Results
Study Area: PG&E Greater Fresno
Thermal Overloads

California ISO

Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Loading % (Baseline Scenarios)					Loading % (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	2029 Retirement of QF Generations	
[illegible]	LE GRAND-DAIRYLAND 115kV (CHWCHLASLRJT-DAIRYLND)	P2	P2-1	<100	34	37	<100	78	35	112	<100	37	Sensitivity only
	LE GRAND-DAIRYLAND 115kV (LE GRAND-CHWCHLASLRJT)	P2	P2-1	<100	36	37	<100	78	35	120	<100	37	Sensitivity only
	GREGG 230 kV BAAH BUS #1 (FAILURE OF NON-REDUNDENT RELAY)	P5	Non-Redundent Relay	37	46	54	75	75	47	100	51	54	Sensitivity only
	DAIRYLAND-MENDOTA 115kV & TOMATAK-MENDOTA #1 70kV	P6	N-1-1	<100	<100	<100	<100	<100	<100	<100	106	<100	Sensitivity only
	DAIRYLAND-MENDOTA 115kV & TOMATAK-MENDOTA #1 70kV	P7	DCTL	5	5	4	83	82	5	114	106	4	Sensitivity only
	MUSTANGSS-GATES #1 230kV & MUSTANGSS-GATES #2 230kV	P7	DCTL	21	30	38	76	76	32	103	78	38	Sensitivity only
	PANOCHE-TRANQLTYSS #1 230kV & PANOCHE-TRANQLTYSS #2 230kV	P7	DCTL	26	34	39	78	78	36	102	79	40	Sensitivity only
34157 PANOCHET 115 34156 MENDOTA 115 1	LE GRAND-DAIRYLAND 115kV	P1	N-1	<100	38	40	<100	83	37	127	<100	40	Sensitivity only
	WILSON-LE GRAND 115kV	P1	N-1	<100	30	33	<100	89	32	113	<100	33	Sensitivity only
	DAIRYLAND-MENDOTA 115kV (GILLTAP-MADERAPR)	P2	P2-1	14	<100	<100	79	<100	<100	<100	102	<100	Sensitivity only
	DAIRYLAND-MENDOTA 115kV (MENDOTA-GILLTAP)	P2	P2-1	9	<100	<100	84	<100	<100	<100	108	<100	Sensitivity only
	DAIRYLAND-MENDOTA 115kV (NEWHALL-MADERAPR)	P2	P2-1	14	<100	<100	79	<100	<100	<100	102	<100	Sensitivity only
	DAIRYLND - 1D 115kV & DAIRYLAND-MENDOTA line	P2	P2-3	9	<100	<100	84	<100	<100	<100	108	<100	Sensitivity only
	DAIRYLND - 1E 115kV & LE GRAND-DAIRYLAND line	P2	P2-3	<100	30	30	<100	82	31	117	<100	30	Sensitivity only
	LE GRAND - MA 115kV & LE GRAND-CHOWCHILLA line	P2	P2-3	<100	38	39	<100	83	37	127	<100	39	Sensitivity only
	LE GRAND - MA 115kV & LE GRAND-DAIRYLAND line	P2	P2-3	<100	38	39	<100	83	37	127	<100	39	Sensitivity only
	LE GRAND 115kV Section MA	P2	P2-2	35	38	39	82	83	37	127	100	39	Sensitivity only
	LE GRAND-DAIRYLAND 115kV (CHWCHLASLRJT-DAIRYLND)	P2	P2-1	<100	36	40	<100	82	37	118	<100	40	Sensitivity only
	LE GRAND-DAIRYLAND 115kV (LE GRAND-CHWCHLASLRJT)	P2	P2-1	<100	38	40	<100	83	37	127	<100	39	Sensitivity only
	MENDOTA 115kV - Middle Breaker Bay 1	P2	P2-3	10	<100	<100	78	<100	<100	<100	102	<100	Sensitivity only
	CALPEAKPNCHE 13.80kV Gen Unit 1 & PANOCHE-HELM 230kV	P3	G1/N1	<100	<100	<100	<100	<100	<100	100	<100	<100	Sensitivity only
	Q877PH3 0.63kV Gen Unit 3 & PANOCHE-CAL PEAK-STARWOOD 115kV	P3	G1/N1	<100	<100	<100	<100	<100	<100	100	<100	<100	Sensitivity only
	GREGG 230 kV BAAH BUS #1 (FAILURE OF NON-REDUNDENT RELAY)	P5	Non-Redundent Relay	39	48	57	79	79	50	106	54	57	Sensitivity only
	DAIRYLAND-MENDOTA 115kV & TOMATAK-MENDOTA #1 70kV	P6	N-1-1	<100	<100	<100	<100	<100	<100	<100	112	<100	Sensitivity only
	FIVEPOINTSSS-Q532 #1 70kV & PANOCHE-CAL PEAK-STARWOOD 115kV	P6	N-1-1	<100	<100	<100	<100	<100	<100	100	<100	<100	Sensitivity only
	BELLOTA-COTTLE 230kV & BELLOTA-WARNERVILLE 230kV	P7	DCTL	20	27	29	80	81	29	105	84	29	Sensitivity only
	COTTLE-MELONES 230kV & BELLOTA-WARNERVILLE 230kV	P7	DCTL	18	26	27	80	81	27	105	85	27	Sensitivity only
	DAIRYLAND-MENDOTA 115kV & TOMATAK-MENDOTA #1 70kV	P7	DCTL	5	5	4	88	87	5	120	112	4	Sensitivity only
	HELMS-GREGG #1 230kV & HELMS-GREGG #2 230kV	P7	DCTL	36	43	49	78	79	44	104	59	49	Sensitivity only
	MUSTANGSS-GATES #1 230kV & MUSTANGSS-GATES #2 230kV	P7	DCTL	22	32	40	80	80	34	110	83	40	Sensitivity only
	PANOCHE-TRANQLTYSS #1 230kV & PANOCHE-TRANQLTYSS #2 230kV	P7	DCTL	27	36	42	83	83	38	108	84	42	Sensitivity only
34158 PANOCHE2 115 30790 PANOCHE 230 2	PANOCHE 230/115kV TB 1	P1	N-1	23	22	17	54	58	22	110	36	17	Sensitivity only
	PANOCHE 230kV - Section 1E & 1D	P2	P2-4	20	22	18	53	57	23	106	34	18	Sensitivity only
	PANOCHE 230kV Section 1E	P2	P2-2	22	21	17	52	55	21	107	34	17	Sensitivity only
34162 ORO LOMA 115 34168 EL NIDO 115 1	WILSON 230/115kV TB 1 & WILSON 230/115kV TB 2	P6	N-1-1	107	<100	<100	<100	<100	<100	<100	<100	<100	Project: Wilson 115kV Reinforcement Project In-service date: 05/23 Short term: Action plan
34198 CHWCHLASLRJT 115 34154 DAIRYLND 115 1	PANOCHE1 Section 1D & PANOCHE2 Section 2D 115kV	P2	P2-4	50	52	57	106	106	54	162	122	57	Generation redispatch
	PANOCHE-MENDOTA 115kV & TOMATAK-MENDOTA #1 70kV	P6	N-1-1	<100	<100	<100	<100	<100	<100	<100	128	<100	Sensitivity only
34256 BORDEN 70.0 30805 BORDEN 230 1	BORDEN 230/70kV TB 4	P1	N-1	97	102	99	51	46	104	55	54	99	Upgrade limiting equipment
	FRIANTDM 6.60kV Gen Unit 2 & BORDEN 230/70kV TB 4	P3	G1/N1	106	<100	107	<100	<100	<100	<100	<100	107	Upgrade limiting equipment
	FRIANTDM 6.60kV Gen Unit 3 & BORDEN 230/70kV TB 4	P3	G1/N1	100	<100	103	<100	<100	<100	<100	<100	103	Upgrade limiting equipment

2019-2020 ISO Reliability Assessment - Study Results
Study Area: PG&E Greater Fresno
Thermal Overloads

Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Loading % (Baseline Scenarios)					Loading % (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	2029 Retirement of QF Generations	
	FRIANTDM 6.60kV Gen Unit 4 & BORDEN 230/70kV TB 4	P3	G1/N1	<100	<100	100	<100	<100	<100	<100	<100	100	Upgrade limiting equipment
34350 KAMM 115 34352 CANTUA 115 1	GATES 230/70kV TB 5 & PANOCHE2-EXCELSIORSS 115kV	P6	N-1-1	<100	<100	<100	<100	<100	<100	147	<100	<100	Sensitivity only
34352 CANTUA 115 34432 WESTLNDS 115 1	GATES 230/70kV TB 5 & PANOCHE2-EXCELSIORSS 115kV	P6	N-1-1	<100	<100	<100	<100	<100	<100	143	<100	<100	Sensitivity only
34357 AIRWAYJ1 115 34366 SANGER 115 1	MUSTANGSS 230kV - Middle Breaker Bay 3	P2	P2-3	22	21	16	113	111	21	113	46	16	Operating solution
34357 AIRWAYJ1 115 34368 LASPALMS 115 1	MUSTANGSS 230kV - Middle Breaker Bay 3	P2	P2-3	4	5	12	116	116	7	120	42	12	Operating solution
34359 AIRWAYJ2 115 34408 BARTON 115 1	HERNDON - 2D 115kV & HERNDON-BULLARD #2 line	P2	P2-3	38	40	41	109	107	42	103	34	41	Operating solution
	HERNDON - 2D 115kV & HERNDON-WOODWARD line	P2	P2-3	37	40	41	110	108	41	103	34	40	Operating solution
	HERNDON 115kV Section 2D	P2	P2-2	38	40	41	109	107	42	103	34	41	Operating solution
	MUSTANGSS 230kV - Middle Breaker Bay 3	P2	P2-3	10	10	7	123	122	10	126	47	7	Operating solution
	HELM-MCCALL 230kV & HENTAP2-MUSTANGSS #1 230kV	P7	DCTL	11	25	31	102	98	28	101	7	32	Operating solution
34366 SANGER 115 34359 AIRWAYJ2 115 1	HERNDON - 2D 115kV & HERNDON-BULLARD #2 line	P2	P2-3	21	22	24	107	105	23	99	28	24	Operating solution
	HERNDON - 2D 115kV & HERNDON-WOODWARD line	P2	P2-3	21	22	24	108	106	23	99	27	24	Operating solution
	HERNDON 115kV Section 2D	P2	P2-2	21	22	24	107	105	23	99	28	24	Operating solution
	MUSTANGSS 230kV - Middle Breaker Bay 3	P2	P2-3	21	14	16	121	119	13	122	54	16	Operating solution
	HELM-MCCALL 230kV & HENTAP2-MUSTANGSS #1 230kV	P7	DCTL	8	7	15	100	96	9	97	7	16	Operating solution
34366 SANGER 115 34389 RAINBWTP 115 1	MCCALL-REEDLEY 115kV & SANGER-REEDLEY 115kV	P6	N-1-1	132	147	154	<100	<100	153	<100	<100	154	System upgrade, operating solution or SPS
34370 MC CALL 115 30878 MCCALL3M 115 3	MC CALL 115kV - Middle Breaker Bay 3	P2	P2-3	<100	90	102	<100	21	93	12	<100	102	Continue to monitor future load forecast
34370 MC CALL 115 34385 KINGS J1 115 1	MUSTANGSS 230kV - Middle Breaker Bay 3	P2	P2-3	<100	15	20	<100	95	16	101	<100	21	Sensitivity only
	HENRIETA 230/115kV TB 3 & MCCALL-KINGSBURG #2 115kV	P6	N-1-1	<100	<100	<100	<100	<100	<100	151	<100	<100	Sensitivity only
34380 REEDLEY 115 34394 PIEDRA 115 1	MCCALL-REEDLEY 115kV & SANGER-REEDLEY 115kV	P6	N-1-1	128	140	147	<100	<100	145	<100	<100	147	System upgrade, operating solution or SPS
34382 WAHTOKE 115 34380 REEDLEY 115 1	KINGS RIVER-SANGER-REEDLEY 115kV & SANGER-REEDLEY 115kV	P6	N-1-1	109	116	119	<100	<100	119	<100	<100	119	System upgrade, operating solution or SPS
34385 KINGS J1 115 34417 KINGS J2 115 1	MCCALL-KINGSBURG #2 115kV & HENRIETTA-LEPRINO SW STA 115kV	P6	N-1-1	<100	<100	<100	<100	<100	<100	131	<100	<100	Sensitivity only
34389 RAINBWTP 115 34394 PIEDRA 115 1	MCCALL-REEDLEY 115kV & SANGER-REEDLEY 115kV	P6	N-1-1	115	129	136	<100	<100	135	<100	<100	136	System upgrade, operating solution or SPS
34390 DANISHCM 115 34370 MC CALL 115 1	MCCALL-WEST FRESNO #2 115kV & SANGER-CALIFORNIA AVE 115kV	P6	N-1-1	<100	<100	103	<100	<100	<100	<100	<100	103	Continue to monitor future load forecast
34402 CAL AVE 115 34366 SANGER 115 1	MCCALL 115kV BAAH BUS #2 (FAILURE OF NON-REDUNDENT RELAY)	P5	Non-Redundent Relay	87	93	101	3	4	96	10	61	101	Protection upgrade
	HERNDON 115kV Section 2D	P2	P2-2	88	94	98	120	120	97	117	77	98	Operating solution
	SANGER - ME 115kV & MANCHESTER-AIRWAYS-SANGER line	P2	P2-3	<100	90	100	<100	6	92	12	<100	100	Continue to monitor future load forecast
	HENRIETTA-LEPRINO SW STA 115kV & MANCHESTER-AIRWAYS-SANGER 115kV	P6	N-1-1	<100	<100	<100	<100	100	<100	<100	<100	<100	Operating solution
	HELM-MCCALL 230kV & HENTAP2-MUSTANGSS #1 230kV	P7	DCTL	55	77	87	112	109	81	115	38	87	Sensitivity only
	MUSTANGSS 230kV - Middle Breaker Bay 3	P2	P2-3	5	11	18	132	131	13	136	46	18	Operating solution
	HENRIETTA-LEPRINO SW STA 115kV & BARTON-AIRWAYS-SANGER 115kV	P6	N-1-1	<100	<100	<100	100	<100	<100	<100	<100	<100	Operating solution
	HELM-MCCALL 230kV & HENTAP2-MUSTANGSS #1 230kV	P7	DCTL	14	32	44	109	106	35	110	6	44	Operating solution
34410 MANCHSTR 115 34412 HERNDON 115 1	MUSTANGSS 230kV - Middle Breaker Bay 3	P2	P2-3	45	57	62	123	124	59	131	20	62	Operating solution
	SANGER - ME 115kV & BARTON-AIRWAYS-SANGER line	P2	P2-3	<100	98	102	<100	1	100	6	<100	102	Continue to monitor future load forecast
	HELM-MCCALL 230kV & HENTAP2-MUSTANGSS #1 230kV	P7	DCTL	58	78	87	101	99	82	105	43	87	Operating solution
34412 HERNDON 115 34422 CHLDHOSP 115 1	MUSTANGSS 230kV - Middle Breaker Bay 3	P2	P2-3	38	47	55	100	102	49	99	41	55	Operating solution
	SANGER - ME 115kV & BALCH-SANGER line	P2	P2-3	45	50	53	109	108	51	96	67	53	Operating solution
	SANGER - ME 115kV & BARTON-AIRWAYS-SANGER line	P2	P2-3	45	50	53	111	108	51	96	67	53	Operating solution
	SANGER - ME 115kV & KINGS RIVER-SANGER-REEDLEY line	P2	P2-3	46	51	55	108	107	53	93	66	55	Operating solution
	SANGER - ME 115kV & MANCHESTER-AIRWAYS-SANGER line	P2	P2-3	45	50	54	110	107	52	96	67	54	Operating solution
	SANGER 115kV Section ME	P2	P2-2	45	50	53	109	108	51	96	67	53	Operating solution
	BARTON-AIRWAYS-SANGER 115kV & MANCHESTER-AIRWAYS-SANGER 115kV	P7	DCTL	45	50	54	113	110	51	101	64	54	Operating solution
	HERNDON-BARTON 115kV & HERNDON-MANCHESTER 115kV	P7	DCTL	78	85	91	109	108	87	101	83	91	Operating solution
	HERNDON-BARTON 115kV & MANCHESTER-AIRWAYS-SANGER 115kV	P7	DCTL	64	70	76	112	110	73	102	73	76	Operating solution

2019-2020 ISO Reliability Assessment - Study Results
Study Area: PG&E Greater Fresno
Thermal Overloads

California ISO

Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Loading % (Baseline Scenarios)					Loading % (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	2029 Retirement of QF Generations	
34414 WOODWARD 115 34348 SHEPHERD 115 1	BARTON-AIRWAYS-SANGER 115kV & MANCHESTER-AIRWAYS-SANGER 115kV	P7	DCTL	10	11	22	101	98	11	83	38	22	Operating solution
34414 WOODWARD 115 34422 CHLDHOSP 115 1	MUSTANGSS 230kV - Middle Breaker Bay 3	P2	P2-3	36	45	53	102	104	47	100	41	53	Operating solution
	SANGER - ME 115kV & BARTON-AIRWAYS-SANGER line	P2	P2-3	43	<100	<100	113	<100	<100	<100	66	<100	Operating solution
	SANGER - ME 115kV & MANCHESTER-AIRWAYS-SANGER line	P2	P2-3	43	<100	<100	112	<100	<100	<100	66	<100	Operating solution
	SANGER 115kV Section ME	P2	P2-2	43	48	52	111	110	49	98	66	52	Operating solution
	BARTON-AIRWAYS-SANGER 115kV & MANCHESTER-AIRWAYS-SANGER 115kV	P7	DCTL	43	48	52	114	112	49	103	63	52	Operating solution
	HERNDON-BARTON 115kV & HERNDON-MANCHESTER 115kV	P7	DCTL	76	83	89	111	110	85	102	81	89	Operating solution
	HERNDON-BARTON 115kV & MANCHESTER-AIRWAYS-SANGER 115kV	P7	DCTL	62	69	74	114	112	71	104	72	74	Operating solution
34417 KINGS J2 115 34418 KINGSBURGD 115 1	MCCALL-KINGSBURG #2 115kV & HENRIETTA-LEPRINO SW STA 115kV	P6	N-1-1	<100	<100	<100	<100	<100	<100	131	<100	<100	Sensitivity only
34418 KINGSBURGD 115 34419 KINGSBURGE 115 1	MCCALL-KINGSBURG #1 115kV & HENRIETTA-LEPRINO SW STA 115kV	P6	N-1-1	<100	<100	<100	100	<100	<100	110	<100	<100	Sensitivity only
34418 KINGSBURGD 115 364621 JACKSONSWSTA 115 2	KINGSBURGD-JACKSONSWSTA #3 115kV & HENRIETTA-LEPRINO SW STA 115kV	P6	N-1-1	<100	<100	<100	<100	<100	<100	107	<100	<100	Sensitivity only
34419 KINGSBURGE 115 34423 GAURD J1 115 2	MCCALL-KINGSBURG #1 115kV & HENRIETTA-LEPRINO SW STA 115kV	P6	N-1-1	<100	<100	<100	100	100	<100	131	<100	<100	Sensitivity only
34419 KINGSBURGE 115 364621 JACKSONSWSTA 115 1	KINGSBURGD-JACKSONSWSTA #3 115kV & HENRIETTA-LEPRINO SW STA 115kV	P6	N-1-1	<100	<100	<100	<100	<100	<100	110	<100	<100	Sensitivity only
34423 GAURD J1 115 34370 MC CALL 115 2	MCCALL-KINGSBURG #1 115kV & HENRIETTA-LEPRINO SW STA 115kV	P6	N-1-1	<100	<100	<100	<100	<100	<100	127	<100	<100	Sensitivity only
34429 GWF_HEP 115 34428 CONTADNA 115 1	GREGG 230 kV BAAH BUS #1 (FAILURE OF NON-REDUNDENT RELAY)	P5	Non-Redundent Relay	57	90	107	18	29	92	44	44	108	Project: Protection upgrade In-service date: 12/20 Short term: Action plan
	GREGG 230 kV BAAH BUS #2 (FAILURE OF NON-REDUNDENT RELAY)	P5	Non-Redundent Relay	67	99	109	27	39	102	52	48	110	Project: Protection upgrade In-service date: 12/20 Short term: Action plan
34430 HENRETTA 115 30881 HENRIETA 230 3 1	HERNDON 115kV - Section 1D & 2D	P2	P2-4	20	49	59	85	95	52	107	16	60	Sensitivity only
	HERNDON 230kV - Section 1E & 2E	P2	P2-4	22	51	63	81	91	54	104	12	64	Sensitivity only
	SANGER 115kV - Section ME & MD	P2	P2-4	7	18	24	79	87	20	102	39	25	Sensitivity only
	GREGG 230 kV BAAH BUS #2 (FAILURE OF NON-REDUNDENT RELAY)	P5	Non-Redundent Relay	33	66	76	80	91	69	105	5	77	Sensitivity only
	MCCALL 115kV BAAH BUS #1 (FAILURE OF NON-REDUNDENT RELAY)	P5	Non-Redundent Relay	48	50	60	90	93	52	102	38	61	Sensitivity only
	MCCALL-KINGSBURG #2 115kV & MCCALL-KINGSBURG #1 115kV	P6	N-1-1	<100	<100	<100	<100	<100	<100	102	<100	<100	Sensitivity only
	HELM-MCCALL 230kV & HENTAP2-MUSTANGSS #1 230kV	P7	DCTL	4	45	63	93	104	49	124	37	64	Sensitivity only
	MCCALL-KINGSBURG #1 115kV & MCCALL-KINGSBURG #2 115kV	P7	DCTL	48	50	60	90	93	52	102	38	61	Sensitivity only
34430 HENRETTA 115 34519 LPRNJCTSS 115 1	HERNDON 115kV - Section 1D & 2D	P2	P2-4	20	49	60	83	94	51	107	15	60	Sensitivity only
	HERNDON 230kV - Section 1E & 2E	P2	P2-4	22	51	62	80	91	53	104	12	64	Sensitivity only
	SANGER 115kV - Section ME & MD	P2	P2-4	7	18	24	78	86	19	101	39	25	Sensitivity only
	GREGG 230 kV BAAH BUS #2 (FAILURE OF NON-REDUNDENT RELAY)	P5	Non-Redundent Relay	33	65	74	79	90	68	105	5	74	Sensitivity only
	MCCALL 115kV BAAH BUS #1 (FAILURE OF NON-REDUNDENT RELAY)	P5	Non-Redundent Relay	48	50	59	88	92	51	101	37	61	Sensitivity only
	MCCALL-KINGSBURG #1 115kVMOAS OPENED on KINGS J1-KINGS J2 & MCCALL-KINGSBURG #2 115kV	P6	N-1-1	<100	<100	<100	<100	<100	<100	101	<100	<100	Sensitivity only
	HELM-MCCALL 230kV & HENTAP2-MUSTANGSS #1 230kV	P7	DCTL	4	44	64	92	103	49	123	36	65	Sensitivity only
	MCCALL-KINGSBURG #1 115kV & MCCALL-KINGSBURG #2 115kV	P7	DCTL	48	50	59	88	92	52	101	37	61	Sensitivity only
34432 WESTLNDS 115 34393 EXCELSIORSS 115 1	GATES 230/70kV TB 5 & PANOCHE2-EXCELSIORSS 115kV	P6	N-1-1	<100	<100	<100	<100	<100	<100	144	<100	<100	Sensitivity only

2019-2020 ISO Reliability Assessment - Study Results
Study Area: PG&E Greater Fresno
Thermal Overloads

California ISO

Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Loading % (Baseline Scenarios)					Loading % (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	2029 Retirement of QF Generations	
34487 SNGRJCT 115 34490 PARLIER 115 1	KINGS RIVER-SANGER-REEDLEY 115kV & MCCALL-REEDLEY 115kV	P6	N-1-1	101	108	112	<100	<100	111	<100	<100	112	System upgrade, operating solution or SPS
34490 PARLIER 115 34380 REEDLEY 115 1	KINGS RIVER-SANGER-REEDLEY 115kV & MCCALL-REEDLEY 115kV	P6	N-1-1	<100	<100	101	<100	<100	100	<100	<100	101	System upgrade, operating solution or SPS
34492 REEDLEY 70.0 34380 REEDLEY 115 2	REEDLEY 115/70kV TB 4	P1	N-1	103	109	109	8	8	111	14	71	109	Project: Reedley 70 kV Reinforcement (Dinuba Battery Energy Storage) In-service date: 05/21 Short term: Action plan; Project mitigates the overload identified in 2021. For 2024 and 2029, continue to monitor future load forecast.
	REEDLEY 115/70kV TB 4 & REEDLEY-DINUBA #1 70kV	P6	N-1-1	114	121	119	<100	<100	123	<100	<100	119	
34492 REEDLEY 70.0 34380 REEDLEY 115 4 1	DINUBA E 13.80kV Gen Unit 1 & REEDLEY 115/70kV TB 2	P3	G1/N1	<100	101	<100	<100	<100	103	<100	<100	<100	Project: Reedley 70 kV Reinforcement (Dinuba Battery Energy Storage) In-service date: 05/21 Short term: Action plan; Project mitigates the identified overload.
	REEDLEY-DINUBA #1 70kV & REEDLEY 115/70kV TB 2	P6	N-1-1	101	108	105	<100	<100	110	<100	<100	106	
34492 REEDLEY 70.0 34497 DNUBAJCT 70.0 1	REEDLEY-OROSI 70kV (OROSI-ORSI JCT)	P2	P2-1	99	106	112	<100	<100	109	<100	<100	112	
	REEDLEY-OROSI 70kV (REEDLEY-ORSI JCT)	P2	P2-1	112	119	127	<100	<100	122	<100	<100	127	
	REEDLEY-OROSI 70kV	P1	N-1	<100	106	112	<100	8	109	16	<100	112	Project: Reedley 70 kV Reinforcement (Dinuba Battery Energy Storage) In-service date: 05/21 Short term: Action plan; Project mitigates the overloads identified in 2024 and 2029.
	DINUBA E 13.80kV Gen Unit 1 & REEDLEY-OROSI 70kV	P3	G1/N1	106	113	119	<100	<100	115	<100	<100	119	Project: Reedley 70 kV Reinforcement (Dinuba Battery Energy Storage) In-service date: 05/21 Short term: Action plan; Project mitigates the overload in 2021 and 2024. For 2029, continue to monitor future load forecast.
34492 REEDLEY 70.0 34526 ORSI JCT 70.0 1	REEDLEY-DINUBA #1 70kV	P1	N-1	102	109	116	2	4	111	10	66	116	Project: Reedley 70 kV Reinforcement (Dinuba Battery Energy Storage) In-service date: 05/21 Short term: Action plan; Project mitigates the overload in 2021 and 2024. For 2029, continue to monitor future load forecast.
	REEDLEY-DINUBA #1 70kV (DNUBAJCT-DINUBA)	P2	P2-1	101	108	115	<100	<100	111	<100	<100	115	
	REEDLEY-DINUBA #1 70kV (REEDLEY-DNUBAJCT)	P2	P2-1	95	102	108	<100	<100	104	<100	<100	108	
	REEDLEY-DINUBA #1 70kV & MCCALL-REEDLEY 115kV	P6		107	115	122	<100	<100	118	<100	<100	123	
34496 STCRRL J 70.0 34500 DINUBA 70.0 1	REEDLEY-DINUBA #1 70kV	P1	N-1	<100	106	113	<100	10	108	18	<100	114	Project: Reedley 70 kV Reinforcement (Dinuba Battery Energy Storage) In-service date: 05/21 Short term: Action plan; Project mitigates the overloads identified in 2024 and 2029.
364621 JACKSONSWSTA 115 34428 CONTADNA 115 1	GREGG 230 kV BAAH BUS #1 (FAILURE OF NON-REDUNDENT RELAY)	P5	Non-Redundent Relay	<100	87	103	<100	32	89	47	<100	104	Project: Protection upgrade In-service date: 12/20 Short term: Action plan

2019-2020 ISO Reliability Assessment - Study Results
Study Area: PG&E Greater Fresno
Thermal Overloads

Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Loading % (Baseline Scenarios)					Loading % (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	2029 Retirement of QF Generations	
304021 JACKSONSW3TA 115 34428 CONTADNA 115 1	GREGG 230 kV BAAH BUS #2 (FAILURE OF NON-REDUNDENT RELAY)	P5	Non-Redundent Relay	<100	96	106	<100	43	99	56	<100	107	Project: Protection upgrade In-service date: 12/20 Short term: Action plan

Study Area: PG&E Greater Fresno

High/Low Voltages

Substation	Contingency (All and Worst P6)	Category	Category Description	Voltage PU (Baseline Scenarios)					Voltage PU (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	2029 Retirement of QF Generations	
ADAMS_E 70 kV	Base Case	P0	Base Case	1.02	1.03	1.03	1.05	**1.05**	1.02	**1.05**	1.04	1.03	Load power factor correction and voltage support if needed
AGRICO 70 kV	Base Case	P0	Base Case	1.03	1.04	1.03	1.04	**1.06**	1.04	**1.06**	1.05	1.03	Load power factor correction and voltage support if needed
AIRPROD 115 kV	Base Case	P0	Base Case	1.04	1.04	1.03	**1.06**	**1.06**	1.04	**1.07**	1.05	1.03	Load power factor correction and voltage support if needed
AIRWAYS 115 kV	Base Case	P0	Base Case	1.03	1.03	1.01	1.05	**1.06**	1.03	**1.06**	1.05	1.01	Load power factor correction and voltage support if needed
AIRWAYS2 115 kV	Base Case	P0	Base Case	1.01	1.01	1.01	**1.05**	**1.06**	1.01	**1.06**	1.03	1.01	Load power factor correction and voltage support if needed
ANGIOLA 70 kV	Base Case	P0	Base Case	1.00	1.02	1.01	**1.09**	**1.07**	1.02	**1.07**	1.04	1.00	Load power factor correction and voltage support if needed
AUBERRY 70 kV	Base Case	P0	Base Case	1.00	0.99	0.99	**1.05**	1.05	0.99	**1.05**	1.02	0.99	Load power factor correction and voltage support if needed
AUBRYTP 70 kV	Base Case	P0	Base Case	1.00	1.00	1.00	**1.05**	1.05	1.00	**1.05**	1.02	1.00	Load power factor correction and voltage support if needed
BALCH 115 kV	Base Case	P0	Base Case	1.04	1.04	1.03	**1.06**	**1.07**	1.04	**1.06**	1.05	1.03	Load power factor correction and voltage support if needed
BARTON 115 kV	Base Case	P0	Base Case	1.04	1.03	1.01	1.05	**1.05**	1.03	**1.05**	**1.05**	1.01	Load power factor correction and voltage support if needed
BOSWELL 70 kV	Base Case	P0	Base Case	1.01	1.03	1.02	**1.09**	**1.07**	1.03	**1.07**	1.05	1.01	Load power factor correction and voltage support if needed
BULLARD 115 kV	Base Case	P0	Base Case	1.04	1.04	1.00	**1.06**	**1.06**	1.04	**1.06**	**1.06**	1.00	Load power factor correction and voltage support if needed
CAL AVE 115 kV	Base Case	P0	Base Case	1.03	1.03	1.01	**1.06**	**1.06**	1.03	**1.07**	1.04	1.01	Load power factor correction and voltage support if needed
CAL_TAP3 115 kV	Base Case	P0	Base Case	1.04	1.03	1.03	**1.05**	**1.05**	1.03	**1.06**	1.03	1.03	Load power factor correction and voltage support if needed
CAL_TAP4 115 kV	Base Case	P0	Base Case	1.04	1.04	1.03	**1.05**	**1.05**	1.03	**1.06**	1.03	1.03	Load power factor correction and voltage support if needed
CALEVRAS 115 kV	Base Case	P0	Base Case	1.04	1.03	1.03	**1.05**	**1.05**	1.03	**1.06**	1.03	1.03	Load power factor correction and voltage support if needed
CAMDEN 70 kV	Base Case	P0	Base Case	1.01	1.00	0.97	**1.07**	**1.07**	1.00	**1.07**	1.03	0.97	Load power factor correction and voltage support if needed
CHLDHOSP 115 kV	Base Case	P0	Base Case	1.03	1.03	1.02	1.04	**1.05**	1.03	**1.06**	**1.08**	1.02	Load power factor correction and voltage support if needed

Study Area: PG&E Greater Fresno

High/Low Voltages

Substation	Contingency (All and Worst P6)	Category	Category Description	Voltage PU (Baseline Scenarios)					Voltage PU (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	2029 Retirement of QF Generations	
CHSR10A 115 kV	Base Case	P0	Base Case	<1.05	1.03	1.02	<1.05	**1.05**	1.03	**1.05**	<1.05	1.02	Load power factor correction and voltage support if needed
CHSR10B 115 kV	Base Case	P0	Base Case	<1.05	1.03	1.02	<1.05	**1.05**	1.03	**1.05**	<1.05	1.02	Load power factor correction and voltage support if needed
CLOVIS-1 115 kV	Base Case	P0	Base Case	1.03	1.03	1.02	**1.06**	**1.06**	1.03	**1.06**	**1.06**	1.02	Load power factor correction and voltage support if needed
CLOVIS-2 115 kV	Base Case	P0	Base Case	1.04	1.03	1.01	**1.06**	**1.06**	1.03	**1.07**	**1.05**	1.01	Load power factor correction and voltage support if needed
CONTADNA 115 kV	Base Case	P0	Base Case	1.04	1.03	1.02	1.05	**1.05**	1.03	1.05	1.04	1.02	Load power factor correction and voltage support if needed
COPPRMNE 70 kV	Base Case	P0	Base Case	1.02	1.02	1.02	**1.05**	1.05	1.02	1.05	1.03	1.02	Load power factor correction and voltage support if needed
CORCORAN 70 kV	Base Case	P0	Base Case	1.02	1.03	1.02	**1.09**	**1.07**	1.03	**1.07**	**1.05**	1.02	Load power factor correction and voltage support if needed
CORCORAN 115 kV	Base Case	P0	Base Case	1.00	1.02	1.01	**1.07**	**1.06**	1.02	**1.06**	1.05	1.01	Load power factor correction and voltage support if needed
CORCORANPV_P 115 kV	Base Case	P0	Base Case	1.01	1.02	1.01	**1.07**	**1.06**	1.02	**1.06**	1.05	1.01	Load power factor correction and voltage support if needed
DANISHCM 115 kV	Base Case	P0	Base Case	1.03	1.03	1.01	**1.06**	**1.06**	1.03	**1.07**	1.04	1.01	Load power factor correction and voltage support if needed
DNUBAEGY 70 kV	Base Case	P0	Base Case	1.02	1.02	1.02	**1.07**	**1.08**	1.01	**1.08**	1.04	1.01	Load power factor correction and voltage support if needed
DUNLAP 70 kV	Base Case	P0	Base Case	0.99	0.98	0.98	**1.07**	**1.07**	0.98	**1.08**	1.01	0.98	Load power factor correction and voltage support if needed
GRDNGLS1WB 115 kV	Base Case	P0	Base Case	1.04	1.04	1.03	**1.06**	**1.06**	1.04	**1.06**	1.05	1.03	Load power factor correction and voltage support if needed
GRDNGLS2EB 115 kV	Base Case	P0	Base Case	1.04	1.04	1.03	**1.06**	**1.06**	1.04	**1.06**	1.05	1.03	Load power factor correction and voltage support if needed
HARDWICK 70 kV	Base Case	P0	Base Case	1.02	1.02	1.01	**1.07**	**1.07**	1.02	**1.07**	1.04	1.01	Load power factor correction and voltage support if needed
HERNDON 115 kV	Base Case	P0	Base Case	1.04	1.03	1.02	1.05	1.05	1.03	1.05	**1.05**	1.02	Load power factor correction and voltage support if needed
HNFRD SW 70 kV	Base Case	P0	Base Case	1.03	1.03	1.01	**1.07**	**1.07**	1.02	**1.07**	1.04	1.01	Load power factor correction and voltage support if needed
JACKSONSWSTA 115 kV	Base Case	P0	Base Case	<1.05	1.03	1.02	<1.05	**1.05**	1.03	**1.05**	<1.05	1.02	Load power factor correction and voltage support if needed

Study Area: PG&E Greater Fresno

High/Low Voltages

Substation	Contingency (All and Worst P6)	Category	Category Description	Voltage PU (Baseline Scenarios)					Voltage PU (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	2029 Retirement of QF Generations	
JGBSWLL 70 kV	Base Case	P0	Base Case	1.01	1.03	1.02	**1.09**	**1.07**	1.03	**1.07**	1.04	1.01	Load power factor correction and voltage support if needed
KERCKHF1 115 kV	Base Case	P0	Base Case	1.04	1.04	1.03	**1.05**	**1.06**	1.04	**1.05**	**1.05**	1.03	Load power factor correction and voltage support if needed
KERCKHF2 115 kV	Base Case	P0	Base Case	1.04	1.04	1.03	**1.05**	**1.06**	1.04	**1.06**	**1.05**	1.03	Load power factor correction and voltage support if needed
KERMAN1 70 kV	Base Case	P0	Base Case	1.03	1.03	1.02	1.03	**1.06**	1.03	**1.06**	**1.05**	1.02	Load power factor correction and voltage support if needed
KERMAN2 70 kV	Base Case	P0	Base Case	1.03	1.03	1.02	1.03	**1.06**	1.03	**1.06**	**1.05**	1.02	Load power factor correction and voltage support if needed
KINGSBURGD 115 kV	Base Case	P0	Base Case	1.04	1.04	1.02	**1.06**	**1.06**	1.03	**1.06**	1.05	1.02	Load power factor correction and voltage support if needed
KINGSBURGE 115 kV	Base Case	P0	Base Case	1.04	1.04	1.02	**1.06**	**1.06**	1.03	**1.06**	1.05	1.02	Load power factor correction and voltage support if needed
KNGLOBUS 70 kV	Base Case	P0	Base Case	1.04	1.03	1.02	**1.06**	**1.06**	1.03	**1.06**	1.04	1.02	Load power factor correction and voltage support if needed
KNGSCOGN 115 kV	Base Case	P0	Base Case	1.04	1.04	1.03	**1.06**	**1.06**	1.04	**1.06**	1.05	1.03	Load power factor correction and voltage support if needed
KNGSRVR1 115 kV	Base Case	P0	Base Case	1.04	1.04	1.03	**1.06**	**1.06**	1.04	**1.07**	1.04	1.03	Load power factor correction and voltage support if needed
KRCDP 115 kV	Base Case	P0	Base Case	1.04	1.04	1.03	**1.06**	**1.06**	1.04	**1.07**	1.05	1.03	Load power factor correction and voltage support if needed
LASPALMS 115 kV	Base Case	P0	Base Case	1.02	1.02	1.01	**1.05**	**1.06**	1.01	**1.06**	1.03	1.01	Load power factor correction and voltage support if needed
LEMOORE 70 kV	Base Case	P0	Base Case	1.02	1.02	1.00	1.04	**1.05**	1.02	1.05	1.03	1.00	Load power factor correction and voltage support if needed
LIVNGSTN 70 kV	Base Case	P0	Base Case	1.04	1.04	0.98	**1.05**	1.04	1.03	1.04	1.01	0.98	Load power factor correction and voltage support if needed
MALAGA 115 kV	Base Case	P0	Base Case	1.04	1.04	1.03	**1.06**	**1.06**	1.04	**1.07**	1.05	1.03	Load power factor correction and voltage support if needed
MALAGATP 115 kV	Base Case	P0	Base Case	1.04	1.04	1.03	**1.06**	**1.06**	1.04	**1.07**	1.05	1.03	Load power factor correction and voltage support if needed
MANCHSTR 115 kV	Base Case	P0	Base Case	1.02	1.02	1.00	**1.06**	**1.06**	1.01	**1.06**	1.04	1.00	Load power factor correction and voltage support if needed
MC CALL 115 kV	Base Case	P0	Base Case	1.05	1.05	1.04	**1.07**	**1.07**	1.04	**1.07**	**1.05**	1.04	Load power factor correction and voltage support if needed

Study Area: PG&E Greater Fresno

High/Low Voltages

Substation	Contingency (All and Worst P6)	Category	Category Description	Voltage PU (Baseline Scenarios)					Voltage PU (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	2029 Retirement of QF Generations	
OROSI 70 kV	Base Case	P0	Base Case	1.00	1.00	1.00	**1.07**	**1.08**	1.00	**1.08**	1.03	1.00	Load power factor correction and voltage support if needed
PARLIER 115 kV	Base Case	P0	Base Case	1.03	1.02	1.01	**1.06**	**1.07**	1.02	**1.07**	1.04	1.01	Load power factor correction and voltage support if needed
PIEDRA 1 115 kV	Base Case	P0	Base Case	1.03	1.03	1.02	**1.06**	**1.06**	1.02	**1.07**	1.04	1.02	Load power factor correction and voltage support if needed
PIEDRA 2 115 kV	Base Case	P0	Base Case	1.04	1.03	1.02	**1.06**	**1.07**	1.03	**1.06**	1.05	1.02	Load power factor correction and voltage support if needed
PNEDLE 115 kV	Base Case	P0	Base Case	1.04	1.04	1.00	**1.05**	**1.05**	1.03	**1.06**	**1.05**	1.00	Load power factor correction and voltage support if needed
PNEDLE2 115 kV	Base Case	P0	Base Case	1.04	1.04	1.00	**1.05**	**1.05**	1.04	**1.06**	**1.06**	1.00	Load power factor correction and voltage support if needed
PPG 115 kV	Base Case	P0	Base Case	1.04	1.04	1.03	**1.06**	**1.06**	1.04	**1.07**	1.05	1.03	Load power factor correction and voltage support if needed
Q529 115 kV	Base Case	P0	Base Case	1.01	1.03	1.01	**1.07**	**1.06**	1.02	**1.06**	1.05	1.01	Load power factor correction and voltage support if needed
Q529TP 115 kV	Base Case	P0	Base Case	1.01	1.03	1.01	**1.07**	**1.06**	1.02	**1.06**	1.05	1.01	Load power factor correction and voltage support if needed
Q558 115 kV	Base Case	P0	Base Case	1.01	1.02	1.01	**1.07**	**1.06**	1.02	**1.06**	1.05	1.01	Load power factor correction and voltage support if needed
Q632B 70 kV	Base Case	P0	Base Case	1.04	1.04	1.04	1.04	**1.05**	1.04	**1.05**	1.04	1.04	Load power factor correction and voltage support if needed
RAINBW 115 kV	Base Case	P0	Base Case	1.03	1.03	1.02	**1.06**	**1.06**	1.03	**1.07**	1.04	1.02	Load power factor correction and voltage support if needed
RAINBWTP 115 kV	Base Case	P0	Base Case	1.03	1.03	1.02	**1.06**	**1.06**	1.03	**1.07**	1.04	1.02	Load power factor correction and voltage support if needed
RANCHRS 115 kV	Base Case	P0	Base Case	1.04	1.04	1.03	**1.06**	**1.06**	1.04	**1.06**	1.05	1.03	Load power factor correction and voltage support if needed
REEDLEY 70 kV	Base Case	P0	Base Case	1.02	1.02	1.02	**1.07**	**1.08**	1.02	**1.08**	1.04	1.02	Load power factor correction and voltage support if needed
REEDLEY 115 kV	Base Case	P0	Base Case	1.02	1.02	1.01	**1.06**	**1.07**	1.01	**1.07**	1.03	1.01	Load power factor correction and voltage support if needed
SAN JOQN 70 kV	Base Case	P0	Base Case	1.04	1.04	1.04	1.04	**1.05**	1.04	1.05	1.04	1.04	Load power factor correction and voltage support if needed
SANDCRK 70 kV	Base Case	P0	Base Case	0.99	0.99	0.98	**1.07**	**1.07**	0.99	**1.08**	1.02	0.98	Load power factor correction and voltage support if needed

Study Area: PG&E Greater Fresno

High/Low Voltages

Substation	Contingency (All and Worst P6)	Category	Category Description	Voltage PU (Baseline Scenarios)					Voltage PU (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	2029 Retirement of QF Generations	
SANGER 115 kV	Base Case	P0	Base Case	1.04	1.03	1.02	**1.06**	**1.06**	1.03	**1.07**	1.05	1.02	Load power factor correction and voltage support if needed
SCWAX 115 kV	Base Case	P0	Base Case	1.04	1.04	1.03	**1.06**	**1.06**	1.04	**1.06**	1.05	1.03	Load power factor correction and voltage support if needed
SESWTF 115 kV	Base Case	P0	Base Case	1.03	1.03	1.01	1.05	**1.06**	1.03	**1.06**	1.05	1.01	Load power factor correction and voltage support if needed
SESWTFTP 115 kV	Base Case	P0	Base Case	1.03	1.03	1.01	1.05	**1.06**	1.03	**1.06**	1.05	1.01	Load power factor correction and voltage support if needed
SHEPHERD 115 kV	Base Case	P0	Base Case	1.04	1.03	1.03	1.04	**1.06**	1.03	**1.06**	**1.09**	1.03	Load power factor correction and voltage support if needed
SNGRCOGN 115 kV	Base Case	P0	Base Case	1.03	1.03	1.02	**1.06**	**1.06**	1.03	**1.07**	1.04	1.02	Load power factor correction and voltage support if needed
SNJQTP 70 kV	Base Case	P0	Base Case	1.04	1.04	1.04	1.04	**1.05**	1.04	1.05	1.04	1.04	Load power factor correction and voltage support if needed
STCRRL J 70 kV	Base Case	P0	Base Case	1.00	1.00	1.00	**1.07**	**1.08**	1.00	**1.08**	1.02	1.00	Load power factor correction and voltage support if needed
STONCRRL 70 kV	Base Case	P0	Base Case	0.99	0.99	0.99	**1.07**	**1.07**	0.98	**1.08**	1.02	0.99	Load power factor correction and voltage support if needed
STROUD 70 kV	Base Case	P0	Base Case	1.04	1.04	1.03	1.05	**1.06**	1.04	**1.06**	1.04	1.03	Load power factor correction and voltage support if needed
SUNMAID 115 kV	Base Case	P0	Base Case	1.04	1.04	1.03	**1.06**	**1.06**	1.04	**1.06**	1.05	1.03	Load power factor correction and voltage support if needed
TLRE LKE 70 kV	Base Case	P0	Base Case	0.99	1.00	0.99	1.05	**1.05**	1.00	**1.05**	1.02	0.99	Load power factor correction and voltage support if needed
TVY VLLY 70 kV	Base Case	P0	Base Case	1.01	1.00	1.01	**1.07**	**1.08**	1.00	**1.08**	1.03	1.01	Load power factor correction and voltage support if needed
ULTPWRJ 115 kV	Base Case	P0	Base Case	1.04	1.04	1.03	**1.06**	**1.06**	1.04	**1.07**	1.05	1.03	Load power factor correction and voltage support if needed
WAHTOKE 115 kV	Base Case	P0	Base Case	1.03	1.03	1.02	**1.07**	**1.07**	1.02	**1.07**	1.04	1.02	Load power factor correction and voltage support if needed
WAUKENA_SS 115 kV	Base Case	P0	Base Case	1.01	1.02	1.01	**1.07**	**1.06**	1.02	**1.06**	1.05	1.01	Load power factor correction and voltage support if needed
WISHON 70 kV	Base Case	P0	Base Case	1.00	1.00	0.99	**1.05**	1.05	1.00	1.05	1.02	0.99	Load power factor correction and voltage support if needed
WOODWARD 115 kV	Base Case	P0	Base Case	1.03	1.03	1.02	1.03	**1.06**	1.03	**1.06**	**1.11**	1.02	Load power factor correction and voltage support if needed

Study Area: PG&E Greater Fresno

High/Low Voltages

Substation	Contingency (All and Worst P6)	Category	Category Description	Voltage PU (Baseline Scenarios)					Voltage PU (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	2029 Retirement of QF Generations	
WST FRSO 115 kV	Base Case	P0	Base Case	1.03	1.03	1.01	1.06	1.06	1.02	1.07	1.04	1.01	Load power factor correction and voltage support if needed
AVENAL 70 kV	GATES 230/70kV TB 5	P1	N-1	0.98	0.97	0.86	1.06	1.06	0.96	1.07	1.06	0.86	Continue to monitor future load forecast
AVNLPARK 70 kV	GATES 230/70kV TB 5	P1	N-1	0.98	0.97	0.86	1.06	1.06	0.96	1.07	1.06	0.86	Continue to monitor future load forecast
CANAL 70 kV	LOS BANOS-LIVINGSTON JCT-CANAL 70kV	P1	N-1	>0.9	1.03	0.89	>0.9	1.05	1.03	1.05	>0.9	0.89	Continue to monitor future load forecast
CHEVPLIN 70 kV	GATES 230/70kV TB 5	P1	N-1	0.98	0.97	0.87	1.06	1.06	0.96	1.06	1.05	0.87	Continue to monitor future load forecast
CHLDHOSP 115 kV	KERCKHOFF-CLOVIS-SANGER #1 115kV	P1	N-1	1.03	<1.1	<1.1	1.05	<1.1	<1.1	<1.1	1.11	<1.1	Sensitivity only
CHLDHOSP 115 kV	WOODWARD-SHEPHERD #1 115kV	P1	N-1	1.02	<1.1	<1.1	1.03	<1.1	<1.1	<1.1	1.12	<1.1	Sensitivity only
COLNGA 1 70 kV	GATES 230/70kV TB 5	P1	N-1	0.99	0.98	0.89	1.03	1.04	0.97	1.04	1.02	0.89	Continue to monitor future load forecast
COLNGA 2 70 kV	GATES 230/70kV TB 5	P1	N-1	0.99	0.98	0.89	1.03	1.04	0.97	1.04	1.02	0.89	Continue to monitor future load forecast
DERRICK 70 kV	GATES 230/70kV TB 5	P1	N-1	0.99	0.98	0.89	1.03	1.04	0.97	1.04	1.03	0.89	Continue to monitor future load forecast
FIREBAGH 70 kV	PANOCHE-ORO LOMA 115kV	P1	N-1	>0.9	0.93	0.88	>0.9	1.04	0.93	1.05	>0.9	0.88	Continue to monitor future load forecast
GATES 70 kV	GATES 230/70kV TB 5	P1	N-1	0.99	0.98	0.89	1.04	1.04	0.97	1.04	1.03	0.89	Continue to monitor future load forecast
HURON 70 kV	GATES 230/70kV TB 5	P1	N-1	0.99	0.98	0.89	1.03	1.04	0.97	1.04	1.03	0.89	Continue to monitor future load forecast
JACALITO 70 kV	GATES 230/70kV TB 5	P1	N-1	0.99	0.97	0.89	1.04	1.05	0.97	1.04	1.03	0.89	Continue to monitor future load forecast
JAYNESWSTA 70 kV	GATES 230/70kV TB 5	P1	N-1	0.99	0.98	0.89	1.04	1.04	0.97	1.04	1.03	0.89	Continue to monitor future load forecast
KETTLEMN 70 kV	GATES 230/70kV TB 5	P1	N-1	0.98	0.97	0.87	1.06	1.06	0.96	1.06	1.06	0.87	Continue to monitor future load forecast
OIL CITYT 70 kV	GATES 230/70kV TB 5	P1	N-1	0.99	0.98	0.89	1.03	1.04	0.97	1.04	1.03	0.89	Continue to monitor future load forecast
PENNZIER 70 kV	GATES 230/70kV TB 5	P1	N-1	0.99	0.98	0.89	1.03	1.04	0.97	1.04	1.03	0.89	Continue to monitor future load forecast
Q633 70 kV	GATES 230/70kV TB 5	P1	N-1	0.99	0.98	0.89	1.04	1.04	0.97	1.04	1.03	0.89	Continue to monitor future load forecast
SHEPHERD 115 kV	HERNDON-WOODWARD 115kV	P1	N-1	1.05	>0.9	>0.9	1.03	>0.9	>0.9	>0.9	1.15	>0.9	Sensitivity only
SHEPHERD 115 kV	KERCKHOFF-CLOVIS-SANGER #1 115kV	P1	N-1	1.03	>0.9	>0.9	1.05	>0.9	>0.9	>0.9	1.15	>0.9	Sensitivity only
SUN CITY 70 kV	GATES 230/70kV TB 5	P1	N-1	0.98	0.97	0.86	1.06	1.06	0.96	1.07	1.06	0.86	Continue to monitor future load forecast
TORNADO 70 kV	GATES 230/70kV TB 5	P1	N-1	0.98	0.97	0.89	1.03	1.04	0.97	1.03	1.02	0.89	Continue to monitor future load forecast
WOODWARD 115 kV	HERNDON-WOODWARD 115kV	P1	N-1	1.04	<1.1	<1.1	1.02	<1.1	<1.1	<1.1	1.19	<1.1	Sensitivity only
WOODWARD 115 kV	KERCKHOFF-CLOVIS-SANGER #1 115kV	P1	N-1	1.03	<1.1	<1.1	1.04	<1.1	<1.1	<1.1	1.15	<1.1	Sensitivity only
WOODWARD 115 kV	WOODWARD-SHEPHERD #1 115kV	P1	N-1	1.02	<1.1	<1.1	1.02	<1.1	<1.1	<1.1	1.15	<1.1	Sensitivity only
ATWATER 115 kV	WILSON A Section 1D & WILSON B Section 2D 115kV	P2	P2-4	-4.95	NA	NA	1.23	NA	NA	NA	0.09	NA	Project: Wilson 115kV Reinforcement Project In-service date: 05/23 Short term: Action plan

Study Area: PG&E Greater Fresno

High/Low Voltages

Substation	Contingency (All and Worst P6)	Category	Category Description	Voltage PU (Baseline Scenarios)					Voltage PU (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	2029 Retirement of QF Generations	
ATWATR J 115 kV	WILSON A Section 1D & WILSON B Section 2D 115kV	P2	P2-4	>0.9	NA	NA	**1.23**	NA	NA	NA	>0.9	NA	Project: Wilson 115kV Reinforcement Project In-service date: 05/23 Short term: Action plan
CHLDHOSP 115 kV	KERCKHOFF-CLOVIS-SANGER #1 115kV (WWARD JT-SHEPHERD)	P2	P2-1	1.03	1.03	1.02	1.05	1.06	1.04	1.06	**1.11**	1.02	Sensitivity only
CHLDHOSP 115 kV	HERNDON-WOODWARD 115kV (HERNDON-CHLDHOSP)	P2	P2-1	1.04	1.04	1.01	1.02	1.08	1.03	1.08	**1.18**	1.01	Sensitivity only
CHLDHOSP 115 kV	HERNDON 115kV Section 2D	P2	P2-2	1.04	1.03	1.01	1.02	1.08	1.03	1.08	**1.18**	1.01	Sensitivity only
CHLDHOSP 115 kV	SHEPHERD 115kV - Ring R4 & R3	P2	P2-3	1.02	<1.1	<1.1	1.03	<1.1	<1.1	<1.1	**1.12**	<1.1	Sensitivity only
CHLDHOSP 115 kV	SHEPHERD 115kV - Ring R2 & R3	P2	P2-3	1.02	<1.1	<1.1	1.03	<1.1	<1.1	<1.1	**1.12**	<1.1	Sensitivity only
CHLDHOSP 115 kV	SHEPHERD 115kV - Ring R2 & R4	P2	P2-3	1.02	<1.1	<1.1	1.03	<1.1	<1.1	<1.1	**1.12**	<1.1	Sensitivity only
CHLDHOSP 115 kV	KERCKHF2 - 1D 115kV & KERCKHOFF-CLOVIS-SANGER #1 line	P2	P2-3	1.03	<1.1	<1.1	1.05	<1.1	<1.1	<1.1	**1.11**	<1.1	Sensitivity only
CHLDHOSP 115 kV	CLOVIS-1 - 1D 115kV & KERCKHOFF-CLOVIS-SANGER #1 line	P2	P2-3	1.03	<1.1	<1.1	1.05	<1.1	<1.1	<1.1	**1.11**	<1.1	Sensitivity only
CHLDHOSP 115 kV	SANGER - MD 115kV & KERCKHOFF-CLOVIS-SANGER #1 line	P2	P2-3	1.03	<1.1	<1.1	1.05	<1.1	<1.1	<1.1	**1.11**	<1.1	Sensitivity only
CHLDHOSP 115 kV	HERNDON - 2D 115kV & HERNDON-BULLARD #2 line	P2	P2-3	1.04	<1.1	<1.1	1.02	<1.1	<1.1	<1.1	**1.18**	<1.1	Sensitivity only
CHLDHOSP 115 kV	HERNDON 115kV - Section 1D & 2D	P2	P2-4	1.03	1.02	1.00	1.02	1.08	1.02	1.08	**1.18**	1.00	Sensitivity only
CLOVIS-1 115 kV	SANGER - MD 115kV & KERCKHOFF-CLOVIS-SANGER #1 line	P2	P2-3	1.02	<1.1	<1.1	1.07	<1.1	<1.1	<1.1	**0.86**	<1.1	Sensitivity only
CLOVIS-2 115 kV	SANGER - MD 115kV & KERCKHOFF-CLOVIS-SANGER #1 line	P2	P2-3	1.02	<1.1	<1.1	1.07	<1.1	<1.1	<1.1	**0.86**	<1.1	Sensitivity only
CLOVISJ2 115 kV	SANGER - MD 115kV & KERCKHOFF-CLOVIS-SANGER #1 line	P2	P2-3	1.02	<1.1	<1.1	1.07	<1.1	<1.1	<1.1	**0.00**	<1.1	Sensitivity only
CORSGOLD 115 kV	SANGER - MD 115kV & KERCKHOFF-CLOVIS-SANGER #1 line	P2	P2-3	1.02	<1.1	<1.1	1.05	<1.1	<1.1	<1.1	**0.87**	<1.1	Sensitivity only
CRESSEY 115 kV	WILSON A Section 1D & WILSON B Section 2D 115kV	P2	P2-4	**Diverged**	NA	NA	**1.23**	NA	NA	NA	**Diverged**	NA	Project: Wilson 115kV Reinforcement Project In-service date: 05/23 Short term: Action plan
DFS 115 kV	PANOCHE2 115kV Section 2D	P2	P2-2	>0.9	0.95	**0.87**	>0.9	1.02	0.95	1.03	>0.9	**0.87**	Continue to monitor future load forecast
DFS 115 kV	PANOCHE2 - 2D 115kV & PANOCHE2-EXCELSIORSS line	P2	P2-3	>0.9	0.95	**0.87**	>0.9	1.02	0.95	1.03	>0.9	**0.87**	Continue to monitor future load forecast

Study Area: PG&E Greater Fresno

High/Low Voltages

Substation	Contingency (All and Worst P6)	Category	Category Description	Voltage PU (Baseline Scenarios)					Voltage PU (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	2029 Retirement of QF Generations	
DFS 115 kV	PANOCHE1 Section 1D & PANOCHE2 Section 2D 115kV	P2	P2-4	>0.9	0.95	**0.87**	>0.9	1.02	0.95	1.02	>0.9	**0.87**	Continue to monitor future load forecast
EL CAPTN 115 kV	WILSON A Section 1D & WILSON B Section 2D 115kV	P2	P2-4	**Diverged**	NA	NA	**1.23**	NA	NA	NA	**Diverged**	NA	Project: Wilson 115kV Reinforcement Project In-service date: 05/23 Short term: Action plan
HAMMONDS 115 kV	PANOCHE2 115kV Section 2D	P2	P2-2	>0.9	0.96	**0.87**	>0.9	1.02	0.95	1.03	>0.9	**0.87**	Continue to monitor future load forecast
HAMMONDS 115 kV	PANOCHE2 - 2D 115kV & PANOCHE2-EXCELSIORSS line	P2	P2-3	>0.9	0.96	**0.87**	>0.9	1.02	0.95	1.03	>0.9	**0.87**	Continue to monitor future load forecast
HAMMONDS 115 kV	PANOCHE1 Section 1D & PANOCHE2 Section 2D 115kV	P2	P2-4	>0.9	0.96	**0.86**	>0.9	1.02	0.95	1.02	>0.9	**0.86**	Continue to monitor future load forecast
JR WOOD 115 kV	WILSON A Section 1D & WILSON B Section 2D 115kV	P2	P2-4	**Diverged**	NA	NA	**1.23**	NA	NA	NA	**Diverged**	NA	Project: Wilson 115kV Reinforcement Project In-service date: 05/23 Short term: Action plan
LIVNGSTN 115 kV	WILSON A Section 1D & WILSON B Section 2D 115kV	P2	P2-4	**Diverged**	NA	NA	**1.23**	NA	NA	NA	**Diverged**	NA	Project: Wilson 115kV Reinforcement Project In-service date: 05/23 Short term: Action plan
LUIS_#3 115 kV	PANOCHE2 115kV Section 2D	P2	P2-2	>0.9	0.95	**0.87**	>0.9	1.01	0.95	1.02	>0.9	**0.87**	Continue to monitor future load forecast
LUIS_#3 115 kV	PANOCHE2 - 2D 115kV & PANOCHE2-EXCELSIORSS line	P2	P2-3	>0.9	0.95	**0.87**	>0.9	1.01	0.95	1.02	>0.9	**0.87**	Continue to monitor future load forecast
LUIS_#3 115 kV	PANOCHE1 Section 1D & PANOCHE2 Section 2D 115kV	P2	P2-4	>0.9	0.95	**0.86**	>0.9	1.01	0.95	1.02	>0.9	**0.86**	Continue to monitor future load forecast
LUIS_#5 115 kV	PANOCHE2 115kV Section 2D	P2	P2-2	>0.9	0.95	**0.87**	>0.9	1.01	0.95	1.02	>0.9	**0.87**	Continue to monitor future load forecast
LUIS_#5 115 kV	PANOCHE2 - 2D 115kV & PANOCHE2-EXCELSIORSS line	P2	P2-3	>0.9	0.95	**0.87**	>0.9	1.01	0.95	1.02	>0.9	**0.87**	Continue to monitor future load forecast
LUIS_#5 115 kV	PANOCHE1 Section 1D & PANOCHE2 Section 2D 115kV	P2	P2-4	>0.9	0.95	**0.86**	>0.9	1.01	0.95	1.02	>0.9	**0.86**	Continue to monitor future load forecast
MERCED 115 kV	WILSON A Section 1D & WILSON B Section 2D 115kV	P2	P2-4	**Diverged**	NA	NA	**1.22**	NA	NA	NA	**Diverged**	NA	Project: Wilson 115kV Reinforcement Project In-service date: 05/23 Short term: Action plan
OAKH_JCT 115 kV	SANGER - MD 115kV & KERCKHOFF-CLOVIS-SANGER #1 line	P2	P2-3	1.03	>0.9	>0.9	1.05	>0.9	>0.9	>0.9	**0.00**	>0.9	Sensitivity only
OAKHURST 115 kV	SANGER - MD 115kV & KERCKHOFF-CLOVIS-SANGER #1 line	P2	P2-3	1.02	>0.9	>0.9	1.04	>0.9	>0.9	>0.9	**0.87**	>0.9	Sensitivity only

Study Area: PG&E Greater Fresno

High/Low Voltages

Substation	Contingency (All and Worst P6)	Category	Category Description	Voltage PU (Baseline Scenarios)					Voltage PU (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	2029 Retirement of QF Generations	
ORO LOMA 115 kV	PANOCHE2 115kV Section 2D	P2	P2-2	>0.9	0.95	**0.87**	>0.9	1.02	0.94	1.03	>0.9	**0.87**	Continue to monitor future load forecast
ORO LOMA 115 kV	PANOCHE2 - 2D 115kV & PANOCHE2-EXCELSIORSS line	P2	P2-3	>0.9	0.95	**0.87**	>0.9	1.02	0.94	1.03	>0.9	**0.87**	Continue to monitor future load forecast
ORO LOMA 115 kV	PANOCHE1 Section 1D & PANOCHE2 Section 2D 115kV	P2	P2-4	>0.9	0.95	**0.87**	>0.9	1.02	0.94	1.03	>0.9	**0.87**	Continue to monitor future load forecast
OXFORD 115 kV	PANOCHE2 115kV Section 2D	P2	P2-2	>0.9	0.95	**0.87**	>0.9	1.01	0.95	1.02	>0.9	**0.87**	Continue to monitor future load forecast
OXFORD 115 kV	PANOCHE2 - 2D 115kV & PANOCHE2-EXCELSIORSS line	P2	P2-3	>0.9	0.95	**0.87**	>0.9	1.01	0.95	1.02	>0.9	**0.87**	Continue to monitor future load forecast
OXFORD 115 kV	PANOCHE1 Section 1D & PANOCHE2 Section 2D 115kV	P2	P2-4	>0.9	0.95	**0.86**	>0.9	1.01	0.95	1.02	>0.9	**0.86**	Continue to monitor future load forecast
SHEPHERD 115 kV	KERCKHOFF-CLOVIS-SANGER #1 115kV (WWARD JT-SHEPHERD)	P2	P2-1	1.03	1.03	1.03	1.05	1.06	1.05	1.06	**1.15**	1.03	Sensitivity only
SHEPHERD 115 kV	HERNDON-WOODWARD 115kV (HERNDON-CHLDHOSP)	P2	P2-1	1.05	1.04	1.02	1.03	1.08	1.04	1.08	**1.15**	1.02	Sensitivity only
SHEPHERD 115 kV	HERNDON-WOODWARD 115kV (WOODWARD-CHLDHOSP)	P2	P2-1	1.05	1.04	1.02	>0.9	1.08	1.04	1.08	**1.15**	1.02	Under Review
SHEPHERD 115 kV	HERNDON 115kV Section 2D	P2	P2-2	1.04	1.04	1.01	1.03	1.08	1.04	1.08	**1.15**	1.01	Sensitivity only
SHEPHERD 115 kV	WOODWARD 115kV Section 1D	P2	P2-2	>0.9	1.03	1.04	1.05	1.07	1.03	1.07	**1.16**	1.04	Under Review
SHEPHERD 115 kV	SHEPHERD 115kV - Ring R4 & R3	P2	P2-3	1.02	<1.1	<1.1	1.02	<1.1	<1.1	<1.1	**1.15**	<1.1	Sensitivity only
SHEPHERD 115 kV	KERCKHF2 - 1D 115kV & KERCKHOFF-CLOVIS-SANGER #1 line	P2	P2-3	1.03	<1.1	<1.1	1.05	<1.1	<1.1	<1.1	**1.15**	<1.1	Sensitivity only
SHEPHERD 115 kV	CLOVIS-1 - 1D 115kV & KERCKHOFF-CLOVIS-SANGER #1 line	P2	P2-3	1.03	<1.1	<1.1	>0.9	<1.1	<1.1	<1.1	**1.15**	<1.1	Sensitivity only
SHEPHERD 115 kV	SANGER - MD 115kV & KERCKHOFF-CLOVIS-SANGER #1 line	P2	P2-3	1.03	<1.1	<1.1	1.05	<1.1	<1.1	<1.1	**1.15**	<1.1	Sensitivity only
SHEPHERD 115 kV	WOODWARD - 1D 115kV & HERNDON-WOODWARD line	P2	P2-3	1.04	<1.1	<1.1	1.05	<1.1	<1.1	<1.1	**1.16**	<1.1	Sensitivity only
SHEPHERD 115 kV	HERNDON 115kV - Section 1D & 2D	P2	P2-4	>0.9	1.03	1.00	1.03	1.08	1.03	1.08	**1.15**	1.00	Sensitivity only
SHEPHERD 115 kV	WOODWARD 115kV - Section 1D & 1E	P2	P2-4	1.03	1.02	1.03	1.06	1.06	1.02	1.06	**1.17**	1.03	Sensitivity only
WOODWARD 115 kV	KERCKHOFF-CLOVIS-SANGER #1 115kV (WWARD JT-SHEPHERD)	P2	P2-1	>0.9	1.02	1.02	1.04	1.06	1.04	1.06	**1.15**	1.02	Sensitivity only
WOODWARD 115 kV	HERNDON-WOODWARD 115kV (HERNDON-CHLDHOSP)	P2	P2-1	1.04	1.04	1.01	1.02	1.08	1.03	1.08	**1.18**	1.01	Sensitivity only
WOODWARD 115 kV	HERNDON-WOODWARD 115kV (WOODWARD-CHLDHOSP)	P2	P2-1	1.04	1.04	1.01	>0.9	1.08	1.04	1.08	**1.19**	1.01	Sensitivity only
WOODWARD 115 kV	WOODWARD 115kV Section 1D	P2	P2-2	>0.9	1.03	1.03	1.05	1.07	1.03	1.07	**1.19**	1.03	Sensitivity only
WOODWARD 115 kV	SHEPHERD 115kV - Ring R2 & R3	P2	P2-3	1.02	<1.1	<1.1	1.02	<1.1	<1.1	<1.1	**1.15**	<1.1	Sensitivity only

Study Area: PG&E Greater Fresno

High/Low Voltages

Substation	Contingency (All and Worst P6)	Category	Category Description	Voltage PU (Baseline Scenarios)					Voltage PU (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	2029 Retirement of QF Generations	
WOODWARD 115 kV	SHEPHERD 115kV - Ring R2 & R4	P2	P2-3	1.02	<1.1	<1.1	>0.9	<1.1	<1.1	<1.1	1.15	<1.1	Sensitivity only
WOODWARD 115 kV	KERCKHF2 - 1D 115kV & KERCKHOFF-CLOVIS-SANGER #1 line	P2	P2-3	1.03	<1.1	<1.1	1.04	<1.1	<1.1	<1.1	1.15	<1.1	Sensitivity only
WOODWARD 115 kV	CLOVIS-1 - 1D 115kV & KERCKHOFF-CLOVIS-SANGER #1 line	P2	P2-3	1.03	<1.1	<1.1	>0.9	<1.1	<1.1	<1.1	1.15	<1.1	Sensitivity only
WOODWARD 115 kV	SANGER - MD 115kV & KERCKHOFF-CLOVIS-SANGER #1 line	P2	P2-3	>0.9	<1.1	<1.1	1.04	<1.1	<1.1	<1.1	1.15	<1.1	Sensitivity only
WOODWARD 115 kV	HERNDON - 2D 115kV & HERNDON-WOODWARD line	P2	P2-3	1.04	<1.1	<1.1	1.02	<1.1	<1.1	<1.1	1.18	<1.1	Sensitivity only
WOODWARD 115 kV	WOODWARD - 1D 115kV & HERNDON-WOODWARD line	P2	P2-3	1.04	<1.1	<1.1	1.05	<1.1	<1.1	<1.1	1.19	<1.1	Sensitivity only
WOODWARD 115 kV	WOODWARD 115kV - Section 1D & 1E	P2	P2-4	1.03	1.02	1.03	1.06	1.06	1.02	1.06	1.20	1.03	Sensitivity only
WSTLD1RA 115 kV	PANOCHE2 115kV Section 2D	P2	P2-2	>0.9	0.95	0.87	>0.9	1.01	0.95	1.02	>0.9	0.87	Continue to monitor future load forecast
WSTLD1RA 115 kV	PANOCHE2 - 2D 115kV & PANOCHE2-EXCELSIORSS line	P2	P2-3	>0.9	0.95	0.87	>0.9	1.01	0.95	1.02	>0.9	0.87	Continue to monitor future load forecast
WSTLD1RA 115 kV	PANOCHE1 Section 1D & PANOCHE2 Section 2D 115kV	P2	P2-4	>0.9	0.95	0.86	>0.9	1.01	0.95	1.02	>0.9	0.86	Continue to monitor future load forecast
WWARD JT 115 kV	HERNDON-WOODWARD 115kV (HERNDON-CHLDHOSP)	P2	P2-1	1.04	1.04	1.02	1.04	1.07	1.03	1.07	1.11	1.02	Sensitivity only
WWARD JT 115 kV	HERNDON-WOODWARD 115kV (WOODWARD-CHLDHOSP)	P2	P2-1	1.04	1.04	1.02	1.04	1.07	1.03	1.07	1.11	1.02	Sensitivity only
WWARD JT 115 kV	HERNDON 115kV Section 2D	P2	P2-2	1.04	1.03	1.01	1.04	1.07	1.03	1.07	1.11	1.01	Sensitivity only
WWARD JT 115 kV	WOODWARD 115kV Section 1D	P2	P2-2	1.04	1.03	1.03	1.06	1.07	1.03	1.07	1.12	1.03	Sensitivity only
WWARD JT 115 kV	HERNDON - 2D 115kV & HERNDON-BULLARD #2 line	P2	P2-3	1.04	<1.1	<1.1	1.04	<1.1	<1.1	<1.1	1.11	<1.1	Sensitivity only
WWARD JT 115 kV	HERNDON - 2D 115kV & HERNDON-WOODWARD line	P2	P2-3	1.04	<1.1	<1.1	1.04	<1.1	<1.1	<1.1	1.11	<1.1	Sensitivity only
WWARD JT 115 kV	WOODWARD - 1D 115kV & HERNDON-WOODWARD line	P2	P2-3	1.04	<1.1	<1.1	1.06	<1.1	<1.1	<1.1	1.12	<1.1	Sensitivity only
WWARD JT 115 kV	HERNDON 115kV - Section 1D & 2D	P2	P2-4	1.03	1.03	1.00	1.04	1.07	1.02	1.07	1.10	1.00	Sensitivity only
WWARD JT 115 kV	WOODWARD 115kV - Section 1D & 1E	P2	P2-4	1.03	1.03	1.02	1.06	1.06	1.03	1.06	1.12	1.02	Sensitivity only
CANAL 70 kV	WRIGHT D 12.47kV Gen Unit QF & LOS BANOS-LIVINGSTON JCT-CANAL 70kV	P3	G1/N1	>0.9	>0.9	0.89	>0.9	>0.9	>0.9	>0.9	>0.9	0.89	Continue to monitor future load forecast
DINUBA 70 kV	KINGSRIV 13.80kV Gen Unit 1 & REEDLEY-DINUBA #1 70kV	P3	G1/N1	>0.9	>0.9	0.89	>0.9	>0.9	>0.9	>0.9	>0.9	0.89	Continue to monitor future load forecast
DINUBA 70 kV	MCCALL1T 13.20kV Gen Unit 1 & REEDLEY-DINUBA #1 70kV	P3	G1/N1	>0.9	>0.9	0.89	>0.9	>0.9	>0.9	>0.9	>0.9	0.89	Continue to monitor future load forecast

Study Area: PG&E Greater Fresno

High/Low Voltages

Substation	Contingency (All and Worst P6)	Category	Category Description	Voltage PU (Baseline Scenarios)					Voltage PU (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	2029 Retirement of QF Generations	
DINUBA 70 kV	KRCDPCT1 13.80kV Gen Unit 1 & REEDLEY-DINUBA #1 70kV	P3	G1/N1	>0.9	>0.9	**0.90**	>0.9	>0.9	>0.9	>0.9	>0.9	**0.90**	Continue to monitor future load forecast
DINUBA 70 kV	KRCDPCT2 13.80kV Gen Unit 1 & REEDLEY-DINUBA #1 70kV	P3	G1/N1	>0.9	>0.9	**0.90**	>0.9	>0.9	>0.9	>0.9	>0.9	**0.90**	Continue to monitor future load forecast
DINUBA 70 kV	KERCKHOF 13.80kV Gen Unit 1 & REEDLEY-DINUBA #1 70kV	P3	G1/N1	>0.9	>0.9	**0.89**	>0.9	>0.9	>0.9	>0.9	>0.9	**0.89**	Continue to monitor future load forecast
FIREBAGH 70 kV	ELNIDO 13.80kV Gen Unit 1 & PANOCHE-ORO LOMA 115kV	P3	G1/N1	>0.9	>0.9	**0.88**	>0.9	>0.9	>0.9	>0.9	>0.9	**0.88**	Continue to monitor future load forecast
FIREBAGH 70 kV	CHOWCOGN 13.80kV Gen Unit 1 & PANOCHE-ORO LOMA 115kV	P3	G1/N1	>0.9	>0.9	**0.88**	>0.9	>0.9	>0.9	>0.9	>0.9	**0.88**	Continue to monitor future load forecast
FIREBAGH 70 kV	KERCKHOF 13.80kV Gen Unit 1 & PANOCHE-ORO LOMA 115kV	P3	G1/N1	>0.9	>0.9	**0.88**	>0.9	>0.9	>0.9	>0.9	>0.9	**0.88**	Continue to monitor future load forecast
CAL AVE 115 kV	MCCALL-WEST FRESNO #2 115kV & SANGER-CALIFORNIA AVE 115kV	P6	N-1-1	>0.9	>0.9	**0.86**	>0.9	>0.9	>0.9	>0.9	>0.9	**0.86**	Continue to monitor future load forecast
CERTTEED 115 kV	LE GRAND-DAIRYLAND 115kV & WILSON-LE GRAND 115kV	P6	N-1-1	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	**0.89**	>0.9	Continue to monitor future load forecast
DANISHCM 115 kV	MCCALL-WEST FRESNO #2 115kV & SANGER-CALIFORNIA AVE 115kV	P6	N-1-1	>0.9	>0.9	**0.86**	>0.9	>0.9	>0.9	>0.9	>0.9	**0.86**	Continue to monitor future load forecast
LE GRAND 115 kV	LE GRAND-DAIRYLAND 115kV & WILSON-LE GRAND 115kV	P6	N-1-1	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	**0.88**	>0.9	Sensitivity only
ORO LOMA 115 kV	WILSON A SVD=v & PANOCHE-ORO LOMA 115kV	P6	N-1-1	>0.9	>0.9	**0.89**	>0.9	>0.9	>0.9	>0.9	>0.9	**0.89**	Continue to monitor future load forecast
REEDLEY 115 kV	SANGER-REEDLEY 115kV & MCCALL-REEDLEY 115kV	P6	N-1-1	**0.88**	**0.86**	**0.85**	>0.9	>0.9	>0.9	>0.9	>0.9	**0.85**	Operating solution or SPS
WAHTOKE 115 kV	SANGER-REEDLEY 115kV & MCCALL-REEDLEY 115kV	P6	N-1-1	**0.88**	**0.85**	**0.84**	>0.9	>0.9	**0.84**	>0.9	>0.9	**0.84**	Operating solution or SPS
WST FRSO 115 kV	MCCALL-WEST FRESNO #2 115kV & SANGER-CALIFORNIA AVE 115kV	P6	N-1-1	>0.9	>0.9	**0.85**	>0.9	>0.9	>0.9	>0.9	>0.9	**0.84**	Continue to monitor future load forecast
CHLDHOSP 115 kV	KERCKHOFF-CLOVIS-SANGER #1 115kV & KERCKHOFF-CLOVIS-SANGER #2 115kV	P7	DCTL	1.03	1.03	1.02	1.05	1.06	1.04	1.06	**1.11**	1.02	Sensitivity only
SHEPHERD 115 kV	KERCKHOFF-CLOVIS-SANGER #1 115kV & KERCKHOFF-CLOVIS-SANGER #2 115kV	P7	DCTL	1.03	1.03	1.03	1.05	1.06	1.05	1.06	**1.15**	1.03	Sensitivity only
SHEPHERD 115 kV	HERNDON-WOODWARD 115kV & BORDEN-COPPERMINE 70kV	P7	DCTL	1.05	1.04	1.02	1.03	1.08	1.04	1.08	**1.15**	1.02	Sensitivity only

Study Area: PG&E Greater Fresno

High/Low Voltages

Substation	Contingency (All and Worst P6)	Category	Category Description	Voltage PU (Baseline Scenarios)					Voltage PU (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	2029 Retirement of QF Generations	
WOODWARD 115 kV	KERCKHOFF-CLOVIS-SANGER #1 115kV & KERCKHOFF-CLOVIS-SANGER #2 115kV	P7	DCTL	1.03	1.02	1.02	1.04	1.06	1.04	1.06	**1.15**	1.02	Sensitivity only
WOODWARD 115 kV	HERNDON-WOODWARD 115kV & BORDEN-COPPERMINE 70kV	P7	DCTL	1.04	1.04	1.01	1.02	1.08	1.04	1.08	**1.19**	1.01	Sensitivity only
WWARD JT 115 kV	HERNDON-WOODWARD 115kV & BORDEN-COPPERMINE 70kV	P7	DCTL	1.04	1.04	1.02	1.04	1.07	1.04	1.07	**1.11**	1.02	Sensitivity only

Study Area: PG&E Greater Fresno

Voltage Deviation

Substation	Contingency (All and Worst P6)	Category	Category Description	Post Cont. Voltage Deviation % (Baseline Scenarios)					Post Cont. Voltage Deviation % (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	2029 Retirement of QF Generations	
AVENAL 70 kV	GATES 230/70kV TB 5	P1	N-1	1	3	11	-2	-2	3	-3	-1	11	Continue to monitor future load forecast
AVNLPARK 70 kV	GATES 230/70kV TB 5	P1	N-1	1	3	11	-2	-2	3	-3	-1	11	Continue to monitor future load forecast
CALFLAX 70 kV	GATES 230/70kV TB 5	P1	N-1	1	2	10	-2	-2	3	-3	-1	10	Continue to monitor future load forecast
CANAL 70 kV	LOS BANOS-LIVINGSTON JCT-CANAL 70kV	P1	N-1	<8	0	8	<8	-2	0	-2	<8	8	Continue to monitor future load forecast
CHEVPLIN 70 kV	GATES 230/70kV TB 5	P1	N-1	1	3	11	-2	-3	3	-3	-2	11	Continue to monitor future load forecast
COLNGA 1 70 kV	GATES 230/70kV TB 5	P1	N-1	1	2	9	-2	-2	3	-2	-1	9	Continue to monitor future load forecast
COLNGA 2 70 kV	GATES 230/70kV TB 5	P1	N-1	1	2	10	-1	-2	3	-2	-1	10	Continue to monitor future load forecast
DERRICK 70 kV	GATES 230/70kV TB 5	P1	N-1	1	2	10	-1	-2	3	-2	-1	10	Continue to monitor future load forecast
DOS PALS 70 kV	PANOCHE-ORO LOMA 115kV	P1	N-1	<8	7	10	<8	0	7	-1	<8	10	Continue to monitor future load forecast
FIREBAGH 70 kV	PANOCHE-ORO LOMA 115kV	P1	N-1	<8	7	10	<8	0	7	-1	<8	10	Continue to monitor future load forecast
GATES 70 kV	GATES 230/70kV TB 5	P1	N-1	1	3	11	-3	-4	3	-4	-2	11	Continue to monitor future load forecast
HURON 70 kV	GATES 230/70kV TB 5	P1	N-1	1	2	10	-2	-3	3	-4	-2	10	Continue to monitor future load forecast
JACALITO 70 kV	GATES 230/70kV TB 5	P1	N-1	1	3	10	-2	-3	3	-3	-2	10	Continue to monitor future load forecast
JAYNESWSTA 70 kV	GATES 230/70kV TB 5	P1	N-1	1	3	11	-3	-4	3	-4	-2	11	Continue to monitor future load forecast
KETTLEMN 70 kV	GATES 230/70kV TB 5	P1	N-1	1	3	11	-2	-3	3	-3	-2	11	Continue to monitor future load forecast
OIL CITYT 70 kV	GATES 230/70kV TB 5	P1	N-1	1	2	10	-1	-2	3	-2	-1	10	Continue to monitor future load forecast
ORO LOMA 70 kV	PANOCHE-ORO LOMA 115kV	P1	N-1	<8	7	9	<8	0	7	-1	<8	9	Continue to monitor future load forecast
ORO LOMA 115 kV	PANOCHE-ORO LOMA 115kV	P1	N-1	<8	7	9	<8	0	7	-1	<8	9	Continue to monitor future load forecast
PENNZIER 70 kV	GATES 230/70kV TB 5	P1	N-1	1	2	10	-1	-2	3	-2	-1	10	Continue to monitor future load forecast
PLSNTVLY 70 kV	GATES 230/70kV TB 5	P1	N-1	1	2	8	-1	-1	2	-1	-1	8	Continue to monitor future load forecast

Study Area: PG&E Greater Fresno

Voltage Deviation

Substation	Contingency (All and Worst P6)	Category	Category Description	Post Cont. Voltage Deviation % (Baseline Scenarios)					Post Cont. Voltage Deviation % (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	2029 Retirement of QF Generations	
Q633 70 kV	GATES 230/70kV TB 5	P1	N-1	1	3	**11**	-3	-4	3	-4	-2	**11**	Continue to monitor future load forecast
SNTA RTA 70 kV	PANOCHE-ORO LOMA 115kV	P1	N-1	<8	7	**10**	<8	0	7	-1	<8	**10**	Continue to monitor future load forecast
SUN CITY 70 kV	GATES 230/70kV TB 5	P1	N-1	1	3	**11**	-2	-2	3	-3	-1	**11**	Continue to monitor future load forecast
TORNADO 70 kV	GATES 230/70kV TB 5	P1	N-1	1	2	**10**	-1	-2	3	-2	-1	**10**	Continue to monitor future load forecast
CANAL 70 kV	WRIGHT D 12.47kV Gen Unit QF & LOS BANOS-LIVINGSTON JCT-CANAL 70kV	P3	G1/N1	0	0	**8**	0	0	0	0	0	**8**	Continue to monitor future load forecast
DINUBA 70 kV	KINGSRIV 13.80kV Gen Unit 1 & REEDLEY-DINUBA #1 70kV	P3	G1/N1	0	0	**10**	0	0	0	0	0	**10**	Continue to monitor future load forecast
DINUBA 70 kV	MCCALL1T 13.20kV Gen Unit 1 & REEDLEY-DINUBA #1 70kV	P3	G1/N1	0	0	**10**	0	0	0	0	0	**10**	Continue to monitor future load forecast
DINUBA 70 kV	MCCALL3T 13.20kV Gen Unit 1 & REEDLEY-DINUBA #1 70kV	P3	G1/N1	0	0	**10**	0	0	0	0	0	0	Continue to monitor future load forecast
DINUBA 70 kV	ULTR.PWR 9.11kV Gen Unit 1 & REEDLEY-DINUBA #1 70kV	P3	G1/N1	0	0	**10**	0	0	0	0	0	0	Continue to monitor future load forecast
DINUBA 70 kV	KRCDPCT1 13.80kV Gen Unit 1 & REEDLEY-DINUBA #1 70kV	P3	G1/N1	0	0	**10**	0	0	0	0	0	**10**	Continue to monitor future load forecast
DINUBA 70 kV	KRCDPCT2 13.80kV Gen Unit 1 & REEDLEY-DINUBA #1 70kV	P3	G1/N1	0	0	**10**	0	0	0	0	0	**10**	Continue to monitor future load forecast
DINUBA 70 kV	KERCKHOF 13.80kV Gen Unit 1 & REEDLEY-DINUBA #1 70kV	P3	G1/N1	0	0	**10**	0	0	0	0	0	**10**	Continue to monitor future load forecast
FIREBAGH 70 kV	ELNIDO 13.80kV Gen Unit 1 & PANOCHE-ORO LOMA 115kV	P3	G1/N1	0	0	**10**	0	0	0	0	0	**10**	Continue to monitor future load forecast
FIREBAGH 70 kV	CHOWCOGN 13.80kV Gen Unit 1 & PANOCHE-ORO LOMA 115kV	P3	G1/N1	0	0	**10**	0	0	0	0	0	**10**	Continue to monitor future load forecast
FIREBAGH 70 kV	KERCKHOF 13.80kV Gen Unit 1 & PANOCHE-ORO LOMA 115kV	P3	G1/N1	0	0	**10**	0	0	0	0	0	**10**	Continue to monitor future load forecast

Study Area: PG&E Greater Fresno

Transient Stability

Contingency	Category	Category Description	Transient Stability Performance					Potential Mitigation Solutions
			Baseline Scenarios			Sensitivity Scenarios		
			2024 Summer Peak	2029 Summer Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	
Helms unit 1	P1-1	N-1	No Issues	No Issues	No Issues	No Issues	No Issues	No Violation
Gates 500/230kV Transformer #11	P1-3	T-1	No Issues	No Issues	No Issues	No Issues	No Issues	No Violation
Gates 500/230kV Transformer #12	P1-3	T-1	No Issues	No Issues	No Issues	No Issues	No Issues	No Violation
Wilson 230/115kV TB #1	P1-3	T-2	No Issues	No Issues	No Issues	No Issues	No Issues	No Violation
Gates 230kV Bus	P2-4	Bus Breaker	No Issues	No Issues	No Issues	No Issues	No Issues	No Violation
McCall 230kV Bus	P2-4	Bus Breaker	No Issues	No Issues	No Issues	No Issues	No Issues	No Violation
Borden 230kV Bus	P2-4	Bus Breaker	No Issues	No Issues	No Issues	No Issues	No Issues	No Violation
McCall 115kV Middle breaker	P2-4	Bus Breaker	No Issues	No Issues	No Issues	No Issues	No Issues	No Violation
McCall 230kV TB plus Helms unit 1	P3-3	G-1/T-1	No Issues	No Issues	No Issues	No Issues	No Issues	No Violation
GREGG 230 KV BAAH BUS #1 with delayed clearing time	P5	Non-Redundant Relay	No Issues	No Issues	No Issues	No Issues	No Issues	No Violation
GREGG 230 KV BAAH BUS #2 with delayed clearing time	P5	Non-Redundant Relay	No Issues	No Issues	No Issues	No Issues	WECC Criteria Not Met	Protection Upgrade
Wilson 230/115kV TB #1 & #2	P6	N-1-1	No Issues	No Issues	No Issues	No Issues	No Issues	No Violation
Bellota-Warnerville 230kV and Warnerville-Wilson 230kV lines	P7-1	DCTL	No Issues	No Issues	No Issues	No Issues	No Issues	No Violation
Panoche-Tranquility #1 and #2 230kV Lines	P7-1	DCTL	No Issues	No Issues	No Issues	No Issues	No Issues	No Violation
Gates-McCall 230kV and Helms-McCall 230kV Lines	P7-1	DCTL	No Issues	No Issues	No Issues	No Issues	No Issues	No Violation
Gregg-Helms #1 and #2 230kV Lines Temporary	P7-1	DCTL	No Issues	No Issues	No Issues	No Issues	No Issues	No Violation
Gregg-Helms #1 and #2 230kV Lines Permanent	P7-1	DCTL	No Issues	No Issues	No Issues	No Issues	No Issues	No Violation
Gates-Mustang #1 and #2	P7-1	DCTL	No Issues	No Issues	No Issues	No Issues	No Issues	No Violation
Herndon-Barton 115kV Line and Sanger-Manchester 115kV line	P7-1	DCTL	WECC Criteria Not Met	WECC Criteria Not Met	WECC Criteria Not Met	WECC Criteria Not Met	WECC Criteria Not Met	Under Review. To be updated in draft TP.
McCall-Reedley 115kV Line and McCall- Sanger #1 115kV Line	P7-1	DCTL	No Issues	No Issues	No Issues	No Issues	No Issues	No Violation

Study Area: PG&E Greater Fresno

Single Contingency Load Drop

Worst Contingency	Category	Category Description	Amount of Load Drop (MW)										Potential Mitigation Solutions
			Select..	Select..	Select..	Select..	Select..	Select..	Select..	Select..	Select..	Select..	

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

2019-2020 ISO Reliability Assessment - Study Results

Study Area: PG&E Greater Fresno

Single Source Substation with more than 100 MW Load

Substation	Load Served (MW)										Potential Mitigation Solutions
	Select..	Select..	Select..	Select..	Select..	Select..	Select..	Select..	Select..	Select..	

No single substation with more than 100 MW load

2019-2020 ISO Reliability Assessment - Study Results
Study Area: PG&E Kern
Thermal Overloads

California ISO

Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Loading % (Baseline Scenarios)								Loading % (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Winter Peak	2024 Winter Peak	2029 Winter Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	2029 Retirement of QF Generations	
30945 KERN PP 230 30942 STCKDLJ1 230 1	P1-2:A15:30:_KERN PP-BKRSFLDB-MIDWAY 230kV & P1-2:A15:88:_STCKDLEB-KERN PP-MIDWAY 230kV	P6	N-1-1	128	<100	<100	NA	NA	NA	75	<100	<100	<100	<100	<100	Project : Midway-Kern PP 230 kV line capacity increase project and Midway-Kern PP #2 230kV Line project ;Phase 1(Tap Removal) In-Service Date : 03/2021; Phase 2: Line reconductor (03/2023) Short term: Action Plan
	P7-1:A15:12:_Midway-Kern No. 3 & Midway-Kern No. 4 230 kV Lines	P7	DCTL	132	NA	NA	NA	NA	NA	75	NA	NA	NA	42	NA	Project : Midway-Kern PP 230 kV line capacity increase project and Midway-Kern PP #2 230kV Line project ;Phase 1(Tap Removal) In-Service Date : 03/2021; Phase 2: Line reconductor (03/2023) Short term: Action Plan
30970 MIDWAY 230 30942 STCKDLJ1 230 1	P1-2:A15:30:_KERN PP-BKRSFLDB-MIDWAY 230kV & P1-2:A15:88:_STCKDLEB-KERN PP-MIDWAY 230kV	P6	N-1-1	115	<100	<100	NA	NA	NA	<100	<100	<100	<100	<100	<100	Project : Midway-Kern PP 230 kV line capacity increase project and Midway-Kern PP #2 230kV Line project ;Phase 1(Tap Removal) In-Service Date : 03/2021; Phase 2: Line reconductor (03/2023) Short term: Action Plan
	P7-1:A15:12:_Midway-Kern No. 3 & Midway-Kern No. 4 230 kV Lines	P7	DCTL	118	NA	NA	NA	NA	NA	50	NA	NA	NA	45	NA	Project : Midway-Kern PP 230 kV line capacity increase project and Midway-Kern PP #2 230kV Line project ;Phase 1(Tap Removal) In-Service Date : 03/2021; Phase 2: Line reconductor (03/2023) Short term: Action Plan
	P2-4:A15:20:_MIDWAY 230kV - Section 2F & 2E	P2	P2-4	103	NA	NA	NA	NA	NA	43	NA	NA	NA	39	NA	Project : Midway-Kern PP 230 kV line capacity increase project and Midway-Kern PP #2 230kV Line project ;Phase 1(Tap Removal) In-Service Date : 03/2021; Phase 2: Line reconductor (03/2023) Short term: Action Plan
30970 MIDWAY 230 30943 STCKDLJ2 230 1	P1-2:A15:30:_KERN PP-BKRSFLDB-MIDWAY 230kV & P1-2:A15:87:_STCKDLEA-KERN PP-MIDWAY 230kV	P6	N-1-1	100	<100	<100	NA	NA	NA	<100	<100	<100	<100	<100	<100	Project : Midway-Kern PP 230 kV line capacity increase project and Midway-Kern PP #2 230kV Line project ;Phase 1(Tap Removal) In-Service Date : 03/2021; Phase 2: Line reconductor (03/2023) Short term: Action Plan
	P2-1:A15:97:_MIDWAY-TEMBLOR 115kV [2630] (TEMBLOR-PSE MCKJ)	P2	P2-1	43	27	26	NA	NA	NA	105	64	27	65	105	26	Project : Midway-Temblor 115 kV Line Reconductor and Voltage Project; In-Service Date:12/2022 Short term: Action Plan
	P2-2:A15:63:_TEMBLOR 115kV Section 1D	P2	P2-2	43	27	26	NA	NA	NA	105	64	27	65	104	26	Project : Midway-Temblor 115 kV Line Reconductor and Voltage Project; In-Service Date:12/2022 Short term: Action Plan

2019-2020 ISO Reliability Assessment - Study Results
Study Area: PG&E Kern
Thermal Overloads

California ISO

Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Loading % (Baseline Scenarios)								Loading % (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Winter Peak	2024 Winter Peak	2029 Winter Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	2029 Retirement of QF Generations	
34225 BELRDG J 115 34774 MIDWAY 115 1	P2-3:A15:124:_TEMBLOR - 1D 115kV & TEMBLOR-SAN LUIS OBISPO line	P2	P2-3	43	27	26	NA	NA	NA	105	64	27	65	104	26	Project : Midway-Temblor 115 kV Line Reconductor and Voltage Project; In-Service Date:12/2022 Short term: Action Plan
	P1-2:A15:97:_TEMBLOR-KERNRIDGE 115kV & P1-2:A15:98:_TEMBLOR-SAN LUIS OBISPO 115kV	P6	N-1-1	<100	<100	<100	NA	NA	NA	100	<100	<100	<100	98	<100	Project : Midway-Temblor 115 kV Line Reconductor and Voltage Project; In-Service Date:12/2022 Short term: Action Plan
	P7-1:A15:16:_Caliente Sw Sta - Midway #1 & #2 230 kV Lines	P7	DCTL	28	27	24	NA	NA	NA	139	81	26	91	124	24	Project : Midway-Temblor 115 kV Line Reconductor and Voltage Project; In-Service Date:12/2022 Short term: Action Plan
34709 7STNDRD 115 34752 KERN PWR 115 1	P2-2:A15:25:_KERN PWR 115kV Section 2E	P2	P2-2	105	NA	NA	NA	NA	NA	29	NA	NA	NA	62	NA	Contingency not valid in future years(Kern 115 kV Bus upgrade). Short Term: Action Plan
	P2-4:A15:7:_KERN PWR 115kV - Section 1E & 2E	P2	P2-4	105	NA	NA	NA	NA	NA	29	NA	NA	NA	62	NA	
34716 LRDO JCT 115 34718 KERN OIL 115 1	P2-2:A15:25:_KERN PWR 115kV Section 2E	P2	P2-2	118	NA	NA	NA	NA	NA	6	NA	NA	NA	86	NA	Contingency not valid in future years(Kern 115 kV Bus upgrade). Short Term: Action Plan
	P2-4:A15:7:_KERN PWR 115kV - Section 1E & 2E	P2	P2-4	118	NA	NA	NA	NA	NA	6	NA	NA	NA	86	NA	
34741 STCKDLJ 115 34807 ARVINJ2 115 1	P2-1:A15:74:_KERN-TEVIS-STOCKDALE 115kV [1990] (KERN PWR-TEVISJ1)	P2	P2-1	112	NA	NA	NA	NA	NA	76	NA	NA	NA	24	NA	Project : Wheeler Ridge Junction Station Project; In-Service Date:05/2024 Short term: Action Plan
	P2-2:A15:22:_KERN PWR 115kV Section 1D	P2	P2-2	113	NA	NA	NA	NA	NA	76	NA	NA	NA	24	NA	Contingency not valid in future years(Kern 115 kV Bus upgrade). Short Term: Action Plan
	P2-4:A15:6:_KERN PWR 115kV - Section 1E & 1D	P2	P2-4	113	NA	NA	NA	NA	NA	76	NA	NA	NA	23	NA	
34749 TPMNTP1 115 34750 TUPMAN 115 1	P2-4:A15:12:_MIDWAY 115kV - Section 2E & 1E	P2	P2-4	115	126	152	NA	NA	NA	12	13	130	4	72	154	Summer Setup proposed in 2017-2018 TPP
34751 TPMNTP2 115 34750 TUPMAN 115 1	P2-4:A15:12:_MIDWAY 115kV - Section 2E & 1E	P2	P2-4	99	107	126	NA	NA	NA	13	12	109	6	62	126	Summer Setup proposed in 2017-2018 TPP
34752 KERN PWR 115 30945 KERN PP 230 3	P1-3:A15:26:_KERN PP 230/115kV TB 4 & P1-3:A15:27:_KERN PP 230/115kV TB 5	P6	N-1-1	102	70	100	NA	NA	NA	83	<100	73	<100	<100	100	Project : Wheeler Ridge Junction Station Project; In-Service Date:05/2024; Rely on SPS and gen dispatach for overloads in later year Short term: Action Plan and SPS
	P1-3:A15:25:_KERN PP 230/115kV TB 3 & P1-3:A15:27:_KERN PP 230/115kV TB 5	P6	N-1-1	102	71	101	NA	NA	NA	83	<100	74	<100	<100	101	Project : Wheeler Ridge Junction Station Project; In-Service Date:05/2024; Rely on SPS and gen dispatach for overloads in later year Short term: Action Plan and SPS
	P2-4:A15:9:_KERN PWR 115kV - Section 2E & 2D	P2	P2-4	104	NA	NA	NA	NA	NA	35	NA	NA	NA	30	NA	Contingency not valid in future years(Kern 115 kV Bus upgrade). Short Term: Action Plan

2019-2020 ISO Reliability Assessment - Study Results
Study Area: PG&E Kern
Thermal Overloads

California ISO

Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Loading % (Baseline Scenarios)								Loading % (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Winter Peak	2024 Winter Peak	2029 Winter Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	2029 Retirement of QF Generations	
	P1-3:A15:25:_KERN PP 230/115kV TB 3 & P1-3:A15:26:_KERN PP 230/115kV TB 4	P6	N-1-1	102	71	101	NA	NA	NA	83	<100	74	<100	<100	101	Project : Wheeler Ridge Junction Station Project; In-Service Date:05/2024 Short term: Action Plan
34752 KERN PWR 115 34753 TEVISJ1 115 1	P1-2:A15:43:_KERN-TEVIS-STOCKDALE-LAMONT 115kV	P1	N-1	122	74	75	NA	NA	NA	82	6	75	3	35	75	Project : Wheeler Ridge Junction Station Project; In-Service Date:05/2024 Short term: Action Plan
	P2-1:A15:75:_KERN-TEVIS-STOCKDALE-LAMONT 115kV [1940] (KERN PWR-TEVISJ2)	P2	P2-1	131	72	73	NA	NA	NA	75	6	73	3	27	73	Project : Wheeler Ridge Junction Station Project; In-Service Date:05/2024 Short term: Action Plan
	P2-2:A15:24:_KERN PWR 115kV Section 2D	P2	P2-2	131	NA	NA	NA	NA	NA	75	NA	NA	NA	27	NA	Contingency not valid in future years(Kern 115 kV Bus upgrade). Short Term: Action Plan
	P2-3:A15:126:_TEVIS2 - 1E 115kV & KERN-TEVIS-STOCKDALE-LAMONT line	P2	P2-3	122	74	75	NA	NA	NA	82	6	75	3	35	75	Project : Wheeler Ridge Junction Station Project; In-Service Date:05/2024 Short term: Action Plan
	P2-3:A15:40:_KERN PWR - 2D 115kV & KERN-KERN FRONT line	P2	P2-3	131	NA	NA	NA	NA	NA	75	NA	NA	NA	27	NA	Contingency not valid in future years(Kern 115 kV Bus upgrade). Short Term: Action Plan
	P2-3:A15:55:_LAMONT 115kV - Middle Breaker Bay 3	P2	P2-3	122	44	44	NA	NA	NA	44	4	44	2	34	44	Project : Wheeler Ridge Junction Station Project; In-Service Date:05/2024 Short term: Action Plan
	P2-4:A15:9:_KERN PWR 115kV - Section 2E & 2D	P2	P2-4	131	NA	NA	NA	NA	NA	76	NA	NA	NA	27	NA	Contingency not valid in future years(Kern 115 kV Bus upgrade). Short Term: Action Plan
	P1-1:A15:32:_PSE-BEAR 13.80kV Gen Unit 1 & P1-2:A15:43:_KERN-TEVIS-STOCKDALE-LAMONT 115kV	P3	G-1/N-1	122	<100	<100	NA	NA	NA	<100	<100	<100	<100	<100	<100	Project : Wheeler Ridge Junction Station Project; In-Service Date:05/2024 Short term: Action Plan
	P1-2:A15:88:_STCKDLEB-KERN PP-MIDWAY 230kV & P1-2:A15:43:_KERN-TEVIS-STOCKDALE-LAMONT 115kV	P6	N-1-1	123	<100	<100	NA	NA	NA	<100	<100	<100	<100	<100	<100	Project : Wheeler Ridge Junction Station Project; In-Service Date:05/2024 Short term: Action Plan
	P1-2:A15:42:_KERN-TEVIS-STOCKDALE 115kV	P1	N-1	132	74	75	NA	NA	NA	73	6	75	3	21	75	Project : Wheeler Ridge Junction Station Project; In-Service Date:05/2024 Short term: Action Plan

2019-2020 ISO Reliability Assessment - Study Results
Study Area: PG&E Kern
Thermal Overloads

California ISO

Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Loading % (Baseline Scenarios)								Loading % (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Winter Peak	2024 Winter Peak	2029 Winter Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	2029 Retirement of QF Generations	
34752 KERN PWR 115 34755 TEVISJ2 115 1	P2-1:A15:74:_KERN-TEVIS-STOCKDALE 115kV [1990] (KERN PWR-TEVISJ1)	P2	P2-1	136	72	73	NA	NA	NA	75	6	73	3	19	73	Project : Wheeler Ridge Junction Station Project; In-Service Date:05/2024 Short term: Action Plan
	P2-2:A15:22:_KERN PWR 115kV Section 1D	P2	P2-2	136	NA	NA	NA	NA	NA	75	NA	NA	NA	18	NA	Contingency not valid in future years(Kern 115 kV Bus upgrade). Short Term: Action Plan
	P2-3:A15:105:_STOCKDLE - 1D 115kV & KERN-TEVIS-STOCKDALE line	P2	P2-3	130	52	58	NA	NA	NA	75	12	53	13	33	58	Project : Wheeler Ridge Junction Station Project; In-Service Date:05/2024 Short term: Action Plan
	P2-3:A15:125:_TEVIS - 1D 115kV & KERN-TEVIS-STOCKDALE line	P2	P2-3	132	74	75	NA	NA	NA	73	6	75	3	21	75	Project : Wheeler Ridge Junction Station Project; In-Service Date:05/2024 Short term: Action Plan
	P2-3:A15:38:_KERN PWR - 1D 115kV & KERN-TEVIS-STOCKDALE line	P2	P2-3	133	NA	NA	NA	NA	NA	73	NA	NA	NA	19	NA	Contingency not valid in future years(Kern 115 kV Bus upgrade). Short Term: Action Plan
	P2-4:A15:6:_KERN PWR 115kV - Section 1E & 1D	P2	P2-4	137	NA	NA	NA	NA	NA	75	NA	NA	NA	17	NA	Contingency not valid in future years(Kern 115 kV Bus upgrade). Short Term: Action Plan
	P1-2:A15:26:_GRIMMWAY-MALAGA TAP 115kV & P1-2:A15:42:_KERN-TEVIS-STOCKDALE 115kV	P6	N-1-1	123	<100	<100	NA	NA	NA	80	<100	<100	<100	<100	<100	Project : Wheeler Ridge Junction Station Project; In-Service Date:05/2024 Short term: Action Plan
34753 TEVISJ1 115 34740 STOCKDLE 115 1	P2-1:A15:75:_KERN-TEVIS-STOCKDALE-LAMONT 115kV [1940] (KERN PWR-TEVISJ2)	P2	P2-1	107	47	43	NA	NA	NA	78	15	47	14	33	43	Project : Wheeler Ridge Junction Station Project; In-Service Date:05/2024 Short term: Action Plan
	P2-2:A15:24:_KERN PWR 115kV Section 2D	P2	P2-2	107	NA	NA	NA	NA	NA	79	NA	NA	NA	33	NA	Contingency not valid in future years(Kern 115 kV Bus upgrade). Short Term: Action Plan
	P2-3:A15:40:_KERN PWR - 2D 115kV & KERN-KERN FRONT line	P2	P2-3	107	NA	NA	NA	NA	NA	79	NA	NA	NA	33	NA	Contingency not valid in future years(Kern 115 kV Bus upgrade). Short Term: Action Plan
	P2-4:A15:9:_KERN PWR 115kV - Section 2E & 2D	P2	P2-4	107	NA	NA	NA	NA	NA	79	NA	NA	NA	32	NA	Contingency not valid in future years(Kern 115 kV Bus upgrade). Short Term: Action Plan
34755 TEVISJ2 115 34741 STCKDLJ 115 1	P2-2:A15:22:_KERN PWR 115kV Section 1D	P2	P2-2	112	NA	NA	NA	NA	NA	76	NA	NA	NA	24	NA	Contingency not valid in future years(Kern 115 kV Bus upgrade). Short Term: Action Plan
	P2-4:A15:6:_KERN PWR 115kV - Section 1E & 1D	P2	P2-4	113	NA	NA	NA	NA	NA	75	NA	NA	NA	23	NA	Contingency not valid in future years(Kern 115 kV Bus upgrade). Short Term: Action Plan
34758 LAMONT 115 34805 ARVINJ1 115 1	P1-2:A15:26:_GRIMMWAY-MALAGA TAP 115kV & P1-2:A15:47:_LAMONT-WHEELR_J 115kV	P6	N-1-1	<100	<100	<100	NA	NA	NA	<100	99	<100	103	<100	<100	Sensitivity Only
	P1-2:A15:71:_MIDWAY-TUPMAN-RIO BRAVO-RENFRO 115kV	P1	N-1	82	88	100	NA	NA	NA	9	13	91	10	56	100	Short term: Not an issue; Long Term : Monitor Overload

2019-2020 ISO Reliability Assessment - Study Results
Study Area: PG&E Kern
Thermal Overloads

California ISO

Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Loading % (Baseline Scenarios)								Loading % (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Winter Peak	2024 Winter Peak	2029 Winter Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	2029 Retirement of QF Generations	
34766 SHAFTER 115 34774 MIDWAY 115 1	P2-1:A15:100:_MIDWAY-TUPMAN-RIO BRAVO-RENFRO 115kV [2600] (RENFRJCT-RIO BRVO)	P2	P2-1	82	89	100	NA	NA	NA	9	13	91	10	56	100	Short term: Not an issue; Long Term : Monitor Overload
	P2-3:A15:75:_MIDWAY - 1E 115kV & MIDWAY-TUPMAN-RIO BRAVO-RENFRO line	P2	P2-3	82	89	101	NA	NA	NA	9	13	91	10	56	101	Short term: Not an issue; Long Term : Monitor Overload
	P2-3:A15:93:_RENFRO2 - 1F 115kV & MIDWAY-TUPMAN-RIO BRAVO-RENFRO line	P2	P2-3	82	88	100	NA	NA	NA	9	13	91	10	56	100	Short term: Not an issue; Long Term : Monitor Overload
	P1-1:A15:10:_ELKHIL1G 18.00kV Gen Unit 1 & P1-2:A15:71:_MIDWAY-TUPMAN-RIO BRAVO-RENFRO 115kV	P3	G-1/N-1	<100	<100	101	NA	NA	NA	<100	<100	<100	<100	<100	101	Short term: Not an issue; Long Term : Monitor Overload
	P1-4:A15:16:_WHEELER SVD=v & P1-2:A15:71:_MIDWAY-TUPMAN-RIO BRAVO-RENFRO 115kV	P6	N-1-1	<100	<100	101	NA	NA	NA	<100	<100	<100	<100	<100	101	Short term: Not an issue; Long Term : Monitor Overload
34774 MIDWAY 115 30970 MIDWAY 230 2	P2-4:A15:10:_MIDWAY 115kV - Section 1E & 1D	P2	P2-4	78	88	101	NA	NA	NA	66	61	90	72	27	101	Short term: Not an issue; Long Term : Monitor Overload
	P2-4:A15:15:_MIDWAY 230kV - Section 1E & 1D	P2	P2-4	82	93	107	NA	NA	NA	68	64	95	76	28	107	Short term: Not an issue; Long Term : Monitor Overload
34775 RENFRJCT 115 34760 RIO BRVO 115 1	P2-4:A15:12:_MIDWAY 115kV - Section 2E & 1E	P2	P2-4	83	90	106	NA	NA	NA	9	13	92	9	57	106	Short term: Not an issue; Long Term : Monitor Overload
	P2-4:A15:13:_MIDWAY 115kV - Section 2E & 2D	P2	P2-4	81	88	102	NA	NA	NA	9	12	91	9	56	102	Short term: Not an issue; Long Term : Monitor Overload
34776 TAFT 115 34860 TAFT A 70.0 2	P1-3:A15:76:_TAFT 115/70kV TB 1	P1	N-1	89	89	111	NA	NA	NA	52	42	92	66	37	111	Potential Mitigation Required (System Upgrade/ Preferred Resources)
	P2-3:A15:113:_TAFT 115kV - Ring R2 & R3	P2	P2-3	88	89	112	NA	NA	NA	48	41	92	65	33	112	Short term: Not an issue; Long Term : Monitor Overload
	P2-3:A15:114:_TAFT 115kV - Ring R4 & R3	P2	P2-3	89	89	111	NA	NA	NA	51	42	92	67	38	111	Short term: Not an issue; Long Term : Monitor Overload
	P1-1:A15:54:_SLR-TANN 9.11kV Gen Unit 1 & P1-3:A15:76:_TAFT 115/70kV TB 1	P3	G-1/N-1	109	109	111	NA	NA	NA	<100	<100	112	<100	<100	<100	Potential Mitigation Required (System Upgrade/ Preferred Resources)
	P1-2:A15:2:_ARCO-CARNERAS 70kV & P1-3:A15:76:_TAFT 115/70kV TB 1	P6	N-1-1	101	103	127	NA	NA	NA	<100	<100	106	<100	<100	127	Potential Mitigation Required (System Upgrade/ Preferred Resources)
	P1-2:A15:69:_MIDWAY-TAFT 115kV	P1	N-1	2	3	NA	NA	NA	NA	102	101	3	118	75	NA	Short term: Overload seen in Non-Peak(Off and sensitivity scenarios) Studies. Redispatch not possible due to QF units in the area. Long Term: Propose Solution/ SPS to trip QF units
	P2-2:A15:35:_MIDWAY 115kV Section 2D	P2	P2-2	1	2	14	NA	NA	NA	103	101	3	118	75	14	Short term: Overload seen in Non-Peak(Off and sensitivity scenarios) Studies. Redispatch not possible due to QF units in the area. Long Term: Propose Solution/ SPS to trip QF units

Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Loading % (Baseline Scenarios)								Loading % (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Winter Peak	2024 Winter Peak	2029 Winter Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	2029 Retirement of QF Generations	
34777 FELLOWSG 115 34800 SANTA FE SUB 115 1	P2-3:A15:112:_TAFT 115kV - Ring R2 & R1	P2	P2-3	23	23	11	NA	NA	NA	107	105	21	121	91	11	Short term: Overload seen in Non-Peak(Off and sensitivity scenarios) Studies. Redispatch not possible due to QF units in the area. Long Term: Propose Solution/ SPS to trip QF units
	P2-3:A15:113:_TAFT 115kV - Ring R2 & R3	P2	P2-3	1	2	15	NA	NA	NA	102	100	3	117	74	15	Short term: Overload seen in Non-Peak(Off and sensitivity scenarios) Studies. Redispatch not possible due to QF units in the area. Long Term: Propose Solution/ SPS to trip QF units
	P2-3:A15:78:_MIDWAY - 2D 115kV & MIDWAY-RENFRO-TUPMAN line	P2	P2-3	1	2	14	NA	NA	NA	103	101	3	118	75	14	Short term: Overload seen in Non-Peak(Off and sensitivity scenarios) Studies. Redispatch not possible due to QF units in the area. Long Term: Propose Solution/ SPS to trip QF units
	P2-3:A15:79:_MIDWAY - 2D 115kV & MIDWAY-TEMBLOR line	P2	P2-3	1	2	14	NA	NA	NA	103	101	3	118	75	14	Short term: Overload seen in Non-Peak(Off and sensitivity scenarios) Studies. Redispatch not possible due to QF units in the area. Long Term: Propose Solution/ SPS to trip QF units
	P2-4:A15:13:_MIDWAY 115kV - Section 2E & 2D	P2	P2-4	2	2	15	NA	NA	NA	103	101	3	118	75	15	Short term: Overload seen in Non-Peak(Off and sensitivity scenarios) Studies. Redispatch not possible due to QF units in the area. Long Term: Propose Solution/ SPS to trip QF units
	P1-1:A15:3:_CHEV.USA 9.11kV Gen Unit 1 & P1-2:A15:69:_MIDWAY-TAFT 115kV	P3	G-1/N-1	<100	<100	<100	NA	NA	NA	98	96	<100	113	71	<100	Short term: Overload seen in Non-Peak(Off and sensitivity scenarios) Studies. Redispatch not possible due to QF units in the area. Long Term: Propose Solution/ SPS to trip QF units
	P1-2:A15:69:_MIDWAY-TAFT 115kV & P1-2:A15:95:_TAFT-ELK HILLS 70kV	P6	N-1-1	<100	<100	<100	NA	NA	NA	92	91	<100	124	83	<100	Short term: Overload seen in Non-Peak(Off and sensitivity scenarios) Studies. Redispatch not possible due to QF units in the area. Long Term: Propose Solution/ SPS to trip QF units
	P1-2:A15:69:_MIDWAY-TAFT 115kV	P1	N-1	11	12	NA	NA	NA	NA	103	102	15	121	70	NA	Short term: Overload seen in Non-Peak(Off and sensitivity scenarios) Studies. Redispatch not possible due to QF units in the area. Long Term: Propose Solution/ SPS to trip QF units
	P2-2:A15:35:_MIDWAY 115kV Section 2D	P2	P2-2	12	12	27	NA	NA	NA	103	102	15	121	70	27	Short term: Overload seen in Non-Peak(Off and sensitivity scenarios) Studies. Redispatch not possible due to QF units in the area. Long Term: Propose Solution/ SPS to trip QF units

2019-2020 ISO Reliability Assessment - Study Results
Study Area: PG&E Kern
Thermal Overloads

California ISO

Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Loading % (Baseline Scenarios)								Loading % (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Winter Peak	2024 Winter Peak	2029 Winter Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	2029 Retirement of QF Generations	
34777 FELLOWSG 115 39070 AEVICTORYJT 115 1	P2-3:A15:112:_TAFT 115kV - Ring R2 & R1	P2	P2-3	11	11	3	NA	NA	NA	107	106	9	124	86	3	Short term: Overload seen in Non-Peak(Off and sensitivity scenarios) Studies. Redispatch not possible due to QF units in the area. Long Term: Propose Solution/ SPS to trip QF units
	P2-3:A15:113:_TAFT 115kV - Ring R2 & R3	P2	P2-3	12	12	26	NA	NA	NA	103	102	15	120	69	26	Short term: Overload seen in Non-Peak(Off and sensitivity scenarios) Studies. Redispatch not possible due to QF units in the area. Long Term: Propose Solution/ SPS to trip QF units
	P2-3:A15:78:_MIDWAY - 2D 115kV & MIDWAY-RENFRO-TUPMAN line	P2	P2-3	12	12	27	NA	NA	NA	103	102	15	121	70	27	Short term: Overload seen in Non-Peak(Off and sensitivity scenarios) Studies. Redispatch not possible due to QF units in the area. Long Term: Propose Solution/ SPS to trip QF units
	P2-3:A15:79:_MIDWAY - 2D 115kV & MIDWAY-TEMBLOR line	P2	P2-3	12	12	27	NA	NA	NA	103	102	15	121	70	27	Short term: Overload seen in Non-Peak(Off and sensitivity scenarios) Studies. Redispatch not possible due to QF units in the area. Long Term: Propose Solution/ SPS to trip QF units
	P2-4:A15:13:_MIDWAY 115kV - Section 2E & 2D	P2	P2-4	11	12	26	NA	NA	NA	103	103	15	122	70	26	Short term: Overload seen in Non-Peak(Off and sensitivity scenarios) Studies. Redispatch not possible due to QF units in the area. Long Term: Propose Solution/ SPS to trip QF units
	P1-1:A15:3:_CHEV.USA 9.11kV Gen Unit 1 & P1-2:A15:69:_MIDWAY-TAFT 115kV	P3	G-1/N-1	<100	<100	<100	NA	NA	NA	99	98	<100	117	<100	<100	Short term: Overload seen in Non-Peak(Off and sensitivity scenarios) Studies. Redispatch not possible due to QF units in the area. Long Term: Propose Solution/ SPS to trip QF units
	P1-2:A15:69:_MIDWAY-TAFT 115kV & P1-2:A15:95:_TAFT-ELK HILLS 70kV	P6	N-1-1	<100	<100	<100	NA	NA	NA	93	93	<100	127	78	<100	Short term: Overload seen in Non-Peak(Off and sensitivity scenarios) Studies. Redispatch not possible due to QF units in the area. Long Term: Propose Solution/ SPS to trip QF units
34780 CYMRIC 115 34781 TEXCO_NM 115 1	P1-2:A15:69:_MIDWAY-TAFT 115kV & P1-2:A15:91:_TAFT-CHALK CLIFF 115kV	P6	N-1-1	100	99	<100	NA	NA	NA	<100	<100	99	<100	<100	<100	Continue to monitor future load forecast
	P1-2:A15:69:_MIDWAY-TAFT 115kV	P1	N-1	1	3	NA	NA	NA	NA	88	87	3	101	64	NA	Short term: Overload seen in Non-Peak(Off and sensitivity scenarios) Studies. Redispatch not possible due to QF units in the area. Long Term: Propose Solution/ SPS to trip QF units

Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Loading % (Baseline Scenarios)								Loading % (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Winter Peak	2024 Winter Peak	2029 Winter Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	2029 Retirement of QF Generations	
34800 SANTA FE SUB 115 34802 MIDSET 115 1	P2-2:A15:35:_MIDWAY 115kV Section 2D	P2	P2-2	1	2	12	NA	NA	NA	88	87	3	101	64	12	Short term: Overload seen in Non-Peak(Off and sensitivity scenarios) Studies. Redispatch not possible due to QF units in the area. Long Term: Propose Solution/ SPS to trip QF units
	P2-3:A15:112:_TAFT 115kV - Ring R2 & R1	P2	P2-3	20	20	9	NA	NA	NA	92	90	18	104	78	9	Short term: Overload seen in Non-Peak(Off and sensitivity scenarios) Studies. Redispatch not possible due to QF units in the area. Long Term: Propose Solution/ SPS to trip QF units
	P2-3:A15:113:_TAFT 115kV - Ring R2 & R3	P2	P2-3	1	2	13	NA	NA	NA	88	86	2	101	64	13	Short term: Overload seen in Non-Peak(Off and sensitivity scenarios) Studies. Redispatch not possible due to QF units in the area. Long Term: Propose Solution/ SPS to trip QF units
	P2-3:A15:78:_MIDWAY - 2D 115kV & MIDWAY-RENFRO-TUPMAN line	P2	P2-3	1	2	12	NA	NA	NA	88	87	3	101	64	12	Short term: Overload seen in Non-Peak(Off and sensitivity scenarios) Studies. Redispatch not possible due to QF units in the area. Long Term: Propose Solution/ SPS to trip QF units
	P2-3:A15:79:_MIDWAY - 2D 115kV & MIDWAY-TEMBLOR line	P2	P2-3	1	2	12	NA	NA	NA	88	87	2	101	64	12	Short term: Overload seen in Non-Peak(Off and sensitivity scenarios) Studies. Redispatch not possible due to QF units in the area. Long Term: Propose Solution/ SPS to trip QF units
	P2-4:A15:13:_MIDWAY 115kV - Section 2E & 2D	P2	P2-4	2	1	13	NA	NA	NA	88	87	2	102	65	13	Short term: Overload seen in Non-Peak(Off and sensitivity scenarios) Studies. Redispatch not possible due to QF units in the area. Long Term: Propose Solution/ SPS to trip QF units
	P1-2:A15:69:_MIDWAY-TAFT 115kV & P1-2:A15:95:_TAFT-ELK HILLS 70kV	P6	N-1-1	<100	<100	<100	NA	NA	NA	79	78	<100	107	72	<100	Short term: Overload seen in Non-Peak(Off and sensitivity scenarios) Studies. Redispatch not possible due to QF units in the area. Long Term: Propose Solution/ SPS to trip QF units
	P1-2:A15:69:_MIDWAY-TAFT 115kV	P1	N-1	2	3	NA	NA	NA	NA	89	88	3	102	65	NA	Short term: Overload seen in Non-Peak(Off and sensitivity scenarios) Studies. Redispatch not possible due to QF units in the area. Long Term: Propose Solution/ SPS to trip QF units
	P2-1:A15:128:_TAFT-CUYAMA #1 70kV [9200] (Q356JCT-CUYAMA)	P2	P2-1	2	2	12	NA	NA	NA	89	87	2	102	65	12	Short term: Overload seen in Non-Peak(Off and sensitivity scenarios) Studies. Redispatch not possible due to QF units in the area. Long Term: Propose Solution/ SPS to trip QF units

2019-2020 ISO Reliability Assessment - Study Results
Study Area: PG&E Kern
Thermal Overloads

California ISO

Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Loading % (Baseline Scenarios)								Loading % (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Winter Peak	2024 Winter Peak	2029 Winter Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	2029 Retirement of QF Generations	
34802 MIDSET 115 34776 TAFT 115 1	P2-2:A15:35:_MIDWAY 115kV Section 2D	P2	P2-2	20	21	10	NA	NA	NA	93	91	19	105	79	10	Short term: Overload seen in Non-Peak(Off and sensitivity scenarios) Studies. Redispatch not possible due to QF units in the area. Long Term: Propose Solution/ SPS to trip QF units
	P2-3:A15:111:_TAFT 115kV - Ring R1 & R5	P2	P2-3	2	2	12	NA	NA	NA	88	87	2	101	65	12	Short term: Overload seen in Non-Peak(Off and sensitivity scenarios) Studies. Redispatch not possible due to QF units in the area. Long Term: Propose Solution/ SPS to trip QF units
	P2-3:A15:112:_TAFT 115kV - Ring R2 & R1	P2	P2-3	2	2	12	NA	NA	NA	89	87	2	102	65	12	Short term: Overload seen in Non-Peak(Off and sensitivity scenarios) Studies. Redispatch not possible due to QF units in the area. Long Term: Propose Solution/ SPS to trip QF units
	P2-3:A15:78:_MIDWAY - 2D 115kV & MIDWAY-RENFRO-TUPMAN line	P2	P2-3	2	2	12	NA	NA	NA	89	88	2	102	65	12	Short term: Overload seen in Non-Peak(Off and sensitivity scenarios) Studies. Redispatch not possible due to QF units in the area. Long Term: Propose Solution/ SPS to trip QF units
	P2-3:A15:79:_MIDWAY - 2D 115kV & MIDWAY-TEMBLOR line	P2	P2-3	3	2	12	NA	NA	NA	89	88	2	102	66	12	Short term: Overload seen in Non-Peak(Off and sensitivity scenarios) Studies. Redispatch not possible due to QF units in the area. Long Term: Propose Solution/ SPS to trip QF units
	P1-2:A15:69:_MIDWAY-TAFT 115kV & P1-2:A15:95:_TAFT-ELK HILLS 70kV	P6	N-1-1	<100	<100	<100	NA	NA	NA	80	79	<100	107	72	<100	Short term: Overload seen in Non-Peak(Off and sensitivity scenarios) Studies. Redispatch not possible due to QF units in the area. Long Term: Propose Solution/ SPS to trip QF units
34849 TAFT_SW_TAFC 70.0 34943 Q356JCT 70.0 1	Base Case	P0	N-0	35	34	35	NA	NA	NA	74	71	36	116	97	35	Sensitivity Only
	P2-1:A15:128:_TAFT-CUYAMA #1 70kV [9200] (Q356JCT-CUYAMA)	P2	P2-1	2	2	2	NA	NA	NA	74	71	2	110	111	2	Sensitivity Only
34860 TAFT A 70.0 34849 TAFT_SW_TAFC 70.0 1	Base Case	P0	N-0	35	34	35	NA	NA	NA	73	70	36	115	96	35	Sensitivity Only
	P2-1:A15:128:_TAFT-CUYAMA #1 70kV [9200] (Q356JCT-CUYAMA)	P2	P2-1	2	2	2	NA	NA	NA	73	70	2	109	110	2	Sensitivity Only
34873 LOSTHILLTP 70.0 34850 BLACKWLL 70.0 1	Base Case	P0	N-0	24	27	29	NA	NA	NA	92	92	27	102	84	29	Sensitivity Only

2019-2020 ISO Reliability Assessment - Study Results
Study Area: PG&E Kern
Thermal Overloads

California ISO

Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Loading % (Baseline Scenarios)								Loading % (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Winter Peak	2024 Winter Peak	2029 Winter Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	2029 Retirement of QF Generations	
34876 TEJON 70.0 34143 TECUYA T 70.0 1	P1-3:A15:88:_WHEELER 230/70kV TB 4 & P1-3:A15:89:_WHEELER 230/70kV TB 5	P6	N-1-1	102	106	110	NA	NA	NA	<100	<100	106	<100	<100	106	Use the appropriate Summer Setup. (Magunden CB 22)
34886 MAGNDN J 70.0 34902 MAGUNDEN 70.0 1	P1-1:A15:19:_KERNCNYN 11.00kV Gen Unit 1 & P1-2:A15:108:_WHEELER RIDGE-WEEDPATCH 70kV	P3	G-1/N-1	86	95	107	NA	NA	NA	<100	<100	96	<100	<100	123	Potential Mitigation Required (System Upgrade/ Preferred Resources)/System readjustment as needed
34891 WEEDPATCH_SF 70.0 34886 MAGNDN J 70.0 1	P1-2:A15:108:_WHEELER RIDGE-WEEDPATCH 70kV	P1	N-1	94	102	114	NA	NA	NA	26	29	103	25	76	116	Use the appropriate Summer Setup. (Magunden CB 22)
34892 WEEDPATCH_SF 70.0 34886 MAGNDN J 70.0 1	P1-1:A15:19:_KERNCNYN 11.00kV Gen Unit 1 & P1-2:A15:108:_WHEELER RIDGE-WEEDPATCH 70kV	P3	G-1/N-1	98	107	120	NA	NA	NA	<100	<100	109	<100	79	123	Potential Mitigation Required (System Upgrade/ Preferred Resources)/System readjustment as needed
34898 BAKRSFLD 70.0 34902 MAGUNDEN 70.0 1	P1-1:A15:19:_KERNCNYN 11.00kV Gen Unit 1 & P1-2:A15:108:_WHEELER RIDGE-WEEDPATCH 70kV	P3	G-1/N-1	86	95	107	NA	NA	NA	<100	<100	96	<100	<100	123	Potential Mitigation Required (System Upgrade/ Preferred Resources)/System readjustment as needed
38600 BUENAVJ1 230 30970 MIDWAY 230 1	P2-2:A15:40:_MIDWAY 230kV Section 2D	P2	P2-2	102	60	68	NA	NA	NA	74	25	60	24	85	68	Project : Wheeler Ridge Junction Station Project; In-Service Date:05/2024 Short term: Action Plan
	P2-3:A15:80:_MIDWAY - 2D 230kV & MIDWAY-MIDWAY-R12 #1 line	P2	P2-3	102	60	68	NA	NA	NA	74	25	60	27	85	68	Project : Wheeler Ridge Junction Station Project; In-Service Date:05/2024 Short term: Action Plan
	P2-4:A15:19:_MIDWAY 230kV - Section 2E & 2D	P2	P2-4	103	67	78	NA	NA	NA	74	24	68	23	85	78	Project : Wheeler Ridge Junction Station Project; In-Service Date:05/2024 Short term: Action Plan
38605 BUENAVJ2 230 30970 MIDWAY 230 1	P2-2:A15:37:_MIDWAY 230kV Section 1D	P2	P2-2	103	67	77	NA	NA	NA	74	25	68	23	85	78	Project : Wheeler Ridge Junction Station Project; In-Service Date:05/2024 Short term: Action Plan
	P2-3:A15:74:_MIDWAY - 1D 230kV & STCKDLEB-KERN PP-MIDWAY line	P2	P2-3	103	NA	NA	NA	NA	NA	74	NA	NA	NA	85	NA	Project : Wheeler Ridge Junction Station Project; In-Service Date:05/2024 Short term: Action Plan
	P2-3:A15:85:_MIDWAY 230kV Section 1D & MIDWAY-MIDWAY-R12 #1 line	P2	P2-3	103	67	78	NA	NA	NA	74	25	68	26	85	78	Project : Wheeler Ridge Junction Station Project; In-Service Date:05/2024 Short term: Action Plan
	P2-4:A15:15:_MIDWAY 230kV - Section 1E & 1D	P2	P2-4	103	73	86	NA	NA	NA	74	24	74	22	85	86	Project : Wheeler Ridge Junction Station Project; In-Service Date:05/2024 Short term: Action Plan

Study Area: PG&E Kern

High/Low Voltages

Substation	Contingency (All and Worst P6)	Category	Category Description	Voltage PU (Baseline Scenarios)								Voltage PU (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Winter Peak	2024 Winter Peak	2029 Winter Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	2029 Retirement of QF Generations	
HighSRA 115 kV	Base Case	P0	Basecase	1.05	1.05	1.03	NA	NA	NA	1.05	1.05	1.05	1.05	1.04	1.03	Load power factor correction and voltage support if needed
7STNDRD 115 kV	Base Case	P0	Basecase	1.04	1.04	1.03	NA	NA	NA	1.05	1.05	1.05	1.05	1.04	1.03	Load power factor correction and voltage support if needed
ANTELOPE 70 kV	Base Case	P0	Basecase	1.03	1.03	1.03	NA	NA	NA	1.05	1.05	1.03	1.05	1.03	1.03	Load power factor correction and voltage support if needed
ANTLP JC 70 kV	Base Case	P0	Basecase	1.03	1.03	1.03	NA	NA	NA	1.05	1.05	1.03	1.05	1.03	1.03	Load power factor correction and voltage support if needed
BDGRCRKJ 115 kV	Base Case	P0	Basecase	1.05	1.05	1.03	NA	NA	NA	1.05	1.05	1.05	1.05	1.04	1.03	Load power factor correction and voltage support if needed
BDGRCRKP 115 kV	Base Case	P0	Basecase	1.05	1.05	1.03	NA	NA	NA	1.05	1.05	1.05	1.05	1.04	1.03	Load power factor correction and voltage support if needed
BEAR MTN 115 kV	Base Case	P0	Basecase	1.05	1.05	1.03	NA	NA	NA	1.04	1.05	1.05	1.05	1.03	1.03	Load power factor correction and voltage support if needed
BEAR TAP 115 kV	Base Case	P0	Basecase	1.05	1.05	1.02	NA	NA	NA	1.04	1.05	1.05	1.05	1.03	1.02	Load power factor correction and voltage support if needed
BRRNDA A 70 kV	Base Case	P0	Basecase	1.03	1.03	1.03	NA	NA	NA	1.05	1.05	1.03	1.05	1.03	1.03	Load power factor correction and voltage support if needed
BRRNDA C 70 kV	Base Case	P0	Basecase	1.03	1.03	1.03	NA	NA	NA	1.05	1.05	1.03	1.05	1.03	1.03	Load power factor correction and voltage support if needed
CALWATER 115 kV	Base Case	P0	Basecase	1.04	1.04	1.02	NA	NA	NA	1.04	1.05	1.05	1.05	1.03	1.02	Load power factor correction and voltage support if needed
CALWTRTP 115 kV	Base Case	P0	Basecase	1.05	1.05	1.03	NA	NA	NA	1.04	1.05	1.05	1.05	1.03	1.02	Load power factor correction and voltage support if needed
CARNAT T 70 kV	Base Case	P0	Basecase	1.03	1.03	1.03	NA	NA	NA	1.05	1.05	1.04	1.05	1.04	1.03	Load power factor correction and voltage support if needed
CARNATIO 70 kV	Base Case	P0	Basecase	1.03	1.03	1.03	NA	NA	NA	1.05	1.05	1.04	1.05	1.04	1.03	Load power factor correction and voltage support if needed
CAWELO C 115 kV	Base Case	P0	Basecase	1.04	1.04	1.03	NA	NA	NA	1.05	1.05	1.04	1.05	1.04	1.03	Load power factor correction and voltage support if needed
CHLME JT 70 kV	Base Case	P0	Basecase	1.03	1.03	1.03	NA	NA	NA	1.05	1.05	1.03	1.05	1.04	1.03	Load power factor correction and voltage support if needed
COLUMBUS 115 kV	Base Case	P0	Basecase	1.05	1.05	1.02	NA	NA	NA	1.04	1.05	1.05	1.05	1.03	1.02	Load power factor correction and voltage support if needed
DEXZEL 115 kV	Base Case	P0	Basecase	1.03	1.04	1.02	NA	NA	NA	1.05	1.05	1.04	1.05	1.03	1.02	Load power factor correction and voltage support if needed
DISCOVER 115 kV	Base Case	P0	Basecase	1.04	1.04	1.02	NA	NA	NA	1.05	1.05	1.04	1.05	1.03	1.02	Load power factor correction and voltage support if needed
DOUBLECJ 115 kV	Base Case	P0	Basecase	1.04	1.05	1.03	NA	NA	NA	1.05	1.05	1.05	1.05	1.04	1.03	Load power factor correction and voltage support if needed
DSCVRYTP 115 kV	Base Case	P0	Basecase	1.03	1.04	1.02	NA	NA	NA	1.05	1.05	1.04	1.05	1.03	1.02	Load power factor correction and voltage support if needed
EANDB 115 kV	Base Case	P0	Basecase	1.04	1.05	1.03	NA	NA	NA	1.05	1.05	1.05	1.05	1.04	1.03	Load power factor correction and voltage support if needed

Study Area: PG&E Kern

High/Low Voltages

Substation	Contingency (All and Worst P6)	Category	Category Description	Voltage PU (Baseline Scenarios)								Voltage PU (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Winter Peak	2024 Winter Peak	2029 Winter Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	2029 Retirement of QF Generations	
EANDBJT 115 kV	Base Case	P0	Basecase	1.04	1.05	1.03	NA	NA	NA	1.05	1.05	1.05	1.05	1.04	1.03	Load power factor correction and voltage support if needed
FRITO LY 115 kV	Base Case	P0	Basecase	1.04	1.04	1.02	NA	NA	NA	1.05	1.04	1.04	1.04	1.04	1.02	Load power factor correction and voltage support if needed
FRTLYTP 115 kV	Base Case	P0	Basecase	1.04	1.04	1.02	NA	NA	NA	1.05	1.04	1.05	1.04	1.04	1.02	Load power factor correction and voltage support if needed
GODN_BER 115 kV	Base Case	P0	Basecase	1.03	1.04	1.02	NA	NA	NA	1.05	1.05	1.04	1.05	1.03	1.02	Load power factor correction and voltage support if needed
INERGY 115 kV	Base Case	P0	Basecase	1.04	1.05	1.01	NA	NA	NA	1.05	1.04	1.05	1.04	1.04	1.01	Load power factor correction and voltage support if needed
KERN OIL 115 kV	Base Case	P0	Basecase	1.03	1.04	1.02	NA	NA	NA	1.05	1.05	1.04	1.05	1.03	1.02	Load power factor correction and voltage support if needed
KERN PWR 115 kV	Base Case	P0	Basecase	1.04	1.05	1.03	NA	NA	NA	1.05	1.05	1.05	1.06	1.04	1.03	Load power factor correction and voltage support if needed
KERNWATR 115 kV	Base Case	P0	Basecase	1.04	1.04	1.03	NA	NA	NA	1.05	1.05	1.05	1.05	1.03	1.02	Load power factor correction and voltage support if needed
KRN OL J 115 kV	Base Case	P0	Basecase	1.03	1.04	1.02	NA	NA	NA	1.05	1.05	1.04	1.05	1.03	1.02	Load power factor correction and voltage support if needed
LERDO 115 kV	Base Case	P0	Basecase	1.03	1.04	1.02	NA	NA	NA	1.05	1.05	1.04	1.05	1.03	1.02	Load power factor correction and voltage support if needed
LIVE OAK 115 kV	Base Case	P0	Basecase	1.04	1.04	1.03	NA	NA	NA	1.05	1.05	1.04	1.05	1.04	1.03	Load power factor correction and voltage support if needed
LRDO JCT 115 kV	Base Case	P0	Basecase	1.04	1.04	1.02	NA	NA	NA	1.05	1.05	1.04	1.05	1.03	1.02	Load power factor correction and voltage support if needed
MAGUNDEN 115 kV	Base Case	P0	Basecase	1.02	1.04	1.02	NA	NA	NA	1.05	1.05	1.04	1.05	1.02	1.02	Load power factor correction and voltage support if needed
MC FRLND 70 kV	Base Case	P0	Basecase	1.00	1.00	0.98	NA	NA	NA	1.05	1.05	1.00	1.05	1.01	0.98	Load power factor correction and voltage support if needed
MCFRLD T 70 kV	Base Case	P0	Basecase	1.01	1.01	1.00	NA	NA	NA	1.05	1.05	1.01	1.05	1.02	1.00	Load power factor correction and voltage support if needed
MIDWAY 115 kV	Base Case	P0	Basecase	1.04	1.05	1.04	NA	NA	NA	1.05	1.04	1.05	1.04	1.05	1.04	Load power factor correction and voltage support if needed
NORCO 115 kV	Base Case	P0	Basecase	1.04	1.04	1.02	NA	NA	NA	1.05	1.04	1.05	1.04	1.04	1.02	Load power factor correction and voltage support if needed
NORCO_TA 115 kV	Base Case	P0	Basecase	1.04	1.04	1.02	NA	NA	NA	1.05	1.04	1.05	1.04	1.04	1.02	Load power factor correction and voltage support if needed
OGLE JCT 115 kV	Base Case	P0	Basecase	1.04	1.04	1.03	NA	NA	NA	1.05	1.05	1.04	1.05	1.04	1.03	Load power factor correction and voltage support if needed
OGLE TAP 115 kV	Base Case	P0	Basecase	1.04	1.04	1.03	NA	NA	NA	1.05	1.05	1.04	1.05	1.04	1.03	Load power factor correction and voltage support if needed
OLD RIVR 70 kV	Base Case	P0	Basecase	1.03	1.03	1.02	NA	NA	NA	1.05	1.06	1.04	1.06	1.04	1.02	Load power factor correction and voltage support if needed
OLD_RVR1 70 kV	Base Case	P0	Basecase	1.03	1.03	1.03	NA	NA	NA	1.05	1.06	1.04	1.06	1.04	1.03	Load power factor correction and voltage support if needed

Study Area: PG&E Kern

High/Low Voltages

Substation	Contingency (All and Worst P6)	Category	Category Description	Voltage PU (Baseline Scenarios)								Voltage PU (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Winter Peak	2024 Winter Peak	2029 Winter Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	2029 Retirement of QF Generations	
OLD_RVR1_TP 70 kV	Base Case	P0	Basecase	1.03	1.03	1.03	NA	NA	NA	1.05	1.06	1.04	1.06	1.04	1.03	Load power factor correction and voltage support if needed
PSE-3 115 kV	Base Case	P0	Basecase	1.05	1.05	1.03	NA	NA	NA	1.05	1.05	1.05	1.05	1.04	1.03	Load power factor correction and voltage support if needed
PTRL JCT 115 kV	Base Case	P0	Basecase	1.03	1.04	1.02	NA	NA	NA	1.05	1.05	1.04	1.05	1.03	1.02	Load power factor correction and voltage support if needed
Q972 115 kV	Base Case	P0	Basecase	1.04	1.04	1.04	NA	NA	NA	1.05	1.04	1.04	1.04	1.05	1.04	Load power factor correction and voltage support if needed
RASMSNTP 115 kV	Base Case	P0	Basecase	1.04	1.04	1.02	NA	NA	NA	1.05	1.05	1.04	1.05	1.03	1.02	Load power factor correction and voltage support if needed
RASMUSEN 115 kV	Base Case	P0	Basecase	1.04	1.04	1.02	NA	NA	NA	1.05	1.05	1.04	1.05	1.03	1.02	Load power factor correction and voltage support if needed
RENFRJCT 115 kV	Base Case	P0	Basecase	1.03	1.04	1.02	NA	NA	NA	1.05	1.04	1.04	1.04	1.04	1.02	Load power factor correction and voltage support if needed
RENFRO2 115 kV	Base Case	P0	Basecase	1.03	1.04	1.01	NA	NA	NA	1.05	1.05	1.04	1.04	1.04	1.01	Load power factor correction and voltage support if needed
RIO BRVO 115 kV	Base Case	P0	Basecase	1.03	1.04	1.01	NA	NA	NA	1.05	1.04	1.04	1.04	1.04	1.01	Load power factor correction and voltage support if needed
RIOBRVTM 115 kV	Base Case	P0	Basecase	1.04	1.05	1.03	NA	NA	NA	1.05	1.04	1.05	1.04	1.05	1.03	Load power factor correction and voltage support if needed
RNFROTP2 115 kV	Base Case	P0	Basecase	1.03	1.04	1.01	NA	NA	NA	1.05	1.05	1.04	1.04	1.04	1.01	Load power factor correction and voltage support if needed
ROSEDAL 115 kV	Base Case	P0	Basecase	1.04	1.05	1.03	NA	NA	NA	1.05	1.06	1.05	1.06	1.04	1.03	Load power factor correction and voltage support if needed
S_KERN 70 kV	Base Case	P0	Basecase	1.04	1.04	1.03	NA	NA	NA	1.09	1.09	1.04	1.09	1.07	1.03	Load power factor correction and voltage support if needed
S_KERN_TP 70 kV	Base Case	P0	Basecase	1.04	1.04	1.03	NA	NA	NA	1.09	1.09	1.04	1.09	1.07	1.03	Load power factor correction and voltage support if needed
SAN EMDO 70 kV	Base Case	P0	Basecase	1.03	1.03	1.03	NA	NA	NA	1.07	1.08	1.04	1.08	1.06	1.03	Load power factor correction and voltage support if needed
SHAFTER 115 kV	Base Case	P0	Basecase	1.03	1.04	1.01	NA	NA	NA	1.05	1.04	1.04	1.04	1.04	1.01	Load power factor correction and voltage support if needed
STCKDLJ 115 kV	Base Case	P0	Basecase	1.04	1.04	1.03	NA	NA	NA	1.05	1.05	1.05	1.05	1.03	1.03	Load power factor correction and voltage support if needed
STOCKDLE 115 kV	Base Case	P0	Basecase	1.03	1.04	1.03	NA	NA	NA	1.05	1.05	1.05	1.05	1.03	1.03	Load power factor correction and voltage support if needed
SW85 J1 70 kV	Base Case	P0	Basecase	1.03	1.03	1.03	NA	NA	NA	1.05	1.05	1.03	1.05	1.04	1.03	Load power factor correction and voltage support if needed
TEVIS 115 kV	Base Case	P0	Basecase	1.03	1.04	1.02	NA	NA	NA	1.05	1.06	1.05	1.06	1.03	1.02	Load power factor correction and voltage support if needed
TEVIS2 115 kV	Base Case	P0	Basecase	1.04	1.04	1.02	NA	NA	NA	1.05	1.05	1.05	1.05	1.03	1.02	Load power factor correction and voltage support if needed
TEVISJ1 115 kV	Base Case	P0	Basecase	1.03	1.04	1.03	NA	NA	NA	1.05	1.05	1.05	1.06	1.03	1.03	Load power factor correction and voltage support if needed

Study Area: PG&E Kern

High/Low Voltages

Substation	Contingency (All and Worst P6)	Category	Category Description	Voltage PU (Baseline Scenarios)								Voltage PU (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Winter Peak	2024 Winter Peak	2029 Winter Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	2029 Retirement of QF Generations	
TEVISJ2 115 kV	Base Case	P0	Basecase	1.04	1.04	1.03	NA	NA	NA	1.05	1.05	1.05	1.05	1.04	1.03	Load power factor correction and voltage support if needed
TPMNTP1 115 kV	Base Case	P0	Basecase	1.04	1.04	1.02	NA	NA	NA	1.05	1.04	1.05	1.04	1.04	1.02	Load power factor correction and voltage support if needed
TPMNTP2 115 kV	Base Case	P0	Basecase	1.04	1.04	1.02	NA	NA	NA	1.05	1.04	1.04	1.04	1.04	1.02	Load power factor correction and voltage support if needed
TUPMAN 115 kV	Base Case	P0	Basecase	1.04	1.04	1.02	NA	NA	NA	1.05	1.04	1.04	1.04	1.04	1.02	Load power factor correction and voltage support if needed
TX_ROSDL 115 kV	Base Case	P0	Basecase	1.04	1.05	1.03	NA	NA	NA	1.05	1.06	1.05	1.06	1.04	1.03	Load power factor correction and voltage support if needed
WESTPARK 115 kV	Base Case	P0	Basecase	1.04	1.05	1.03	NA	NA	NA	1.05	1.05	1.05	1.05	1.03	1.03	Load power factor correction and voltage support if needed
WESTPLAT 115 kV	Base Case	P0	Basecase	1.04	1.04	1.02	NA	NA	NA	1.05	1.04	1.04	1.04	1.04	1.02	Load power factor correction and voltage support if needed
PANAMA 70 kV	P1-2:A15:32:_KERN PW2-PANMJCT2 70kV MOAS OPENED on PANMJCT2_CARNAT T	P1	N-1	0.98	0.97	0.94	NA	NA	NA	1.08	1.10	0.96	1.10	1.00	0.94	Load power factor correction and voltage support if needed
S_KERN 70 kV	P1-2:A15:39:_KERN-OLD RIVER #1 70kV	P1	N-1	1.02	1.01	0.98	NA	NA	NA	1.11	1.12	1.01	1.13	1.06	0.98	Load power factor correction and voltage support if needed
S_KERN_TP 70 kV	P1-2:A15:39:_KERN-OLD RIVER #1 70kV	P1	N-1	1.02	1.01	0.98	NA	NA	NA	1.11	1.12	1.01	1.13	1.06	0.98	Load power factor correction and voltage support if needed
SAN EMDO 70 kV	P1-2:A15:39:_KERN-OLD RIVER #1 70kV	P1	N-1	1.02	1.01	0.98	NA	NA	NA	1.09	1.11	1.01	1.11	1.04	0.98	Load power factor correction and voltage support if needed
GRMWY_SM 70 kV	P1-1:A15:19:_KERNCNYN 11.00kV Gen Unit 1 & P1-2:A15:108:_WHEELER RIDGE-WEEDPATCH 70kV	P3	G-1/N-1	NA	NA	0.88	NA	NA	NA	NA	NA	0.90	NA	NA	0.85	Use the appropriate Summer Setup. (Magunden CB 22)
KERNRDGE_L04 69 kV	P1-1:A15:22:_KERNRDG332G3 13.80kV Gen Unit 3 & P1-2:A15:70:_MIDWAY-TEMBLOR 115kV	P3	G-1/N-1	0.86	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.87	NA	Short Term: Load Power Factor correction Long Term: Project: Midway-Temblor 115 kV Line Reconductor and Voltage Support
KERNRDGE_L04 69 kV	P1-1:A15:23:_KERNRDGE32G1 13.80kV Gen Unit 1 & P1-2:A15:70:_MIDWAY-TEMBLOR 115kV	P3	G-1/N-1	0.86	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.87	NA	Short Term: Load Power Factor correction Long Term: Project: Midway-Temblor 115 kV Line Reconductor and Voltage Support
KERNRDGE_L04 69 kV	P1-1:A15:24:_KERNRDGE32G2 13.80kV Gen Unit 2 & P1-2:A15:70:_MIDWAY-TEMBLOR 115kV	P3	G-1/N-1	0.86	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.87	NA	Short Term: Load Power Factor correction Long Term: Project: Midway-Temblor 115 kV Line Reconductor and Voltage Support
KERNRDGE_L06 69 kV	P1-1:A15:22:_KERNRDG332G3 13.80kV Gen Unit 3 & P1-2:A15:70:_MIDWAY-TEMBLOR 115kV	P3	G-1/N-1	0.87	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.87	NA	Short Term: Load Power Factor correction Long Term: Project: Midway-Temblor 115 kV Line Reconductor and Voltage Support

Substation	Contingency (All and Worst P6)	Category	Category Description	Voltage PU (Baseline Scenarios)								Voltage PU (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Winter Peak	2024 Winter Peak	2029 Winter Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	2029 Retirement of QF Generations	
KERNRDGE_L06 69 kV	P1-1:A15:23:_KERNRDGE32G1 13.80kV Gen Unit 1 & P1-2:A15:70:_MIDWAY-TEMBLOR 115kV	P3	G-1/N-1	0.87	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.87	NA	Short Term: Load Power Factor correction Long Term: Project: Midway-Temblor 115 kV Line Reconductor and Voltage Support
KERNRDGE_L06 69 kV	P1-1:A15:24:_KERNRDGE32G2 13.80kV Gen Unit 2 & P1-2:A15:70:_MIDWAY-TEMBLOR 115kV	P3	G-1/N-1	0.87	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.87	NA	Short Term: Load Power Factor correction Long Term: Project: Midway-Temblor 115 kV Line Reconductor and Voltage Support
KERNRDGE_L19 69 kV	P1-1:A15:22:_KERNRDG332G3 13.80kV Gen Unit 3 & P1-2:A15:70:_MIDWAY-TEMBLOR 115kV	P3	G-1/N-1	0.86	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.87	NA	Short Term: Load Power Factor correction Long Term: Project: Midway-Temblor 115 kV Line Reconductor and Voltage Support
KERNRDGE_L19 69 kV	P1-1:A15:23:_KERNRDGE32G1 13.80kV Gen Unit 1 & P1-2:A15:70:_MIDWAY-TEMBLOR 115kV	P3	G-1/N-1	0.86	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.87	NA	Short Term: Load Power Factor correction Long Term: Project: Midway-Temblor 115 kV Line Reconductor and Voltage Support
KERNRDGE_L19 69 kV	P1-1:A15:24:_KERNRDGE32G2 13.80kV Gen Unit 2 & P1-2:A15:70:_MIDWAY-TEMBLOR 115kV	P3	G-1/N-1	0.86	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.87	NA	Short Term: Load Power Factor correction Long Term: Project: Midway-Temblor 115 kV Line Reconductor and Voltage Support
KERNRDGELH 69 kV	P1-1:A15:22:_KERNRDG332G3 13.80kV Gen Unit 3 & P1-2:A15:70:_MIDWAY-TEMBLOR 115kV	P3	G-1/N-1	0.86	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.87	NA	Short Term: Load Power Factor correction Long Term: Project: Midway-Temblor 115 kV Line Reconductor and Voltage Support
KERNRDGELH 69 kV	P1-1:A15:23:_KERNRDGE32G1 13.80kV Gen Unit 1 & P1-2:A15:70:_MIDWAY-TEMBLOR 115kV	P3	G-1/N-1	0.86	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.87	NA	Short Term: Load Power Factor correction Long Term: Project: Midway-Temblor 115 kV Line Reconductor and Voltage Support
KERNRDGELH 69 kV	P1-1:A15:24:_KERNRDGE32G2 13.80kV Gen Unit 2 & P1-2:A15:70:_MIDWAY-TEMBLOR 115kV	P3	G-1/N-1	0.86	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.87	NA	Short Term: Load Power Factor correction Long Term: Project: Midway-Temblor 115 kV Line Reconductor and Voltage Support
OLD RIVR 70 kV	P1-1:A15:58:_S_KERN 0.36kV Gen Unit 1 & P1-2:A15:39:_KERN-OLD RIVER #1 70kV	P3	G-1/N-1	NA	NA	NA	NA	NA	NA	NA	1.11	NA	1.11	NA	NA	Load power factor correction and voltage support if needed
PANAMA 70 kV	P1-1:A15:29:_OLD_RVR1 12.47kV Gen Unit 1 & P1-2:A15:32:_KERN PW2-PANMJCT2 70kV MOAS OPENED on PANMJCT2_CARNAT T	P3	G-1/N-1	NA	NA	NA	NA	NA	NA	NA	1.11	NA	1.11	NA	NA	Load power factor correction and voltage support if needed
PANAMA 70 kV	P1-1:A15:48:_Q885 0.36kV Gen Unit 1 & P1-2:A15:32:_KERN PW2-PANMJCT2 70kV MOAS OPENED on PANMJCT2_CARNAT T	P3	G-1/N-1	NA	NA	NA	NA	NA	NA	NA	1.10	NA	1.11	NA	NA	Load power factor correction and voltage support if needed

Substation	Contingency (All and Worst P6)	Category	Category Description	Voltage PU (Baseline Scenarios)								Voltage PU (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Winter Peak	2024 Winter Peak	2029 Winter Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	2029 Retirement of QF Generations	
PANAMA 70 kV	P1-1:A15:58:_S_KERN 0.36kV Gen Unit 1 & P1-2:A15:32:_KERN PW2-PANMJCT2 70kV MOAS OPENED on PANMJCT2_CARNAT T	P3	G-1/N-1	NA	NA	NA	NA	NA	NA	NA	1.11	NA	1.11	NA	NA	Load power factor correction and voltage support if needed
PANMJCT2 70 kV	P1-1:A15:29:_OLD_RVR1 12.47kV Gen Unit 1 & P1-2:A15:32:_KERN PW2-PANMJCT2 70kV MOAS OPENED on PANMJCT2_CARNAT T	P3	G-1/N-1	NA	NA	NA	NA	NA	NA	NA	1.11	NA	1.11	NA	NA	Load power factor correction and voltage support if needed
PANMJCT2 70 kV	P1-1:A15:48:_Q885 0.36kV Gen Unit 1 & P1-2:A15:32:_KERN PW2-PANMJCT2 70kV MOAS OPENED on PANMJCT2_CARNAT T	P3	G-1/N-1	NA	NA	NA	NA	NA	NA	NA	1.10	NA	1.11	NA	NA	Load power factor correction and voltage support if needed
PANMJCT2 70 kV	P1-1:A15:58:_S_KERN 0.36kV Gen Unit 1 & P1-2:A15:32:_KERN PW2-PANMJCT2 70kV MOAS OPENED on PANMJCT2_CARNAT T	P3	G-1/N-1	NA	NA	NA	NA	NA	NA	NA	1.11	NA	1.11	NA	NA	Load power factor correction and voltage support if needed
S_KERN 70 kV	P1-1:A15:29:_OLD_RVR1 12.47kV Gen Unit 1 & P1-2:A15:32:_KERN PW2-PANMJCT2 70kV MOAS OPENED on PANMJCT2_CARNAT T	P3	G-1/N-1	NA	NA	NA	NA	NA	NA	NA	1.12	NA	1.12	NA	NA	Load power factor correction and voltage support if needed
S_KERN_TP 70 kV	P1-1:A15:29:_OLD_RVR1 12.47kV Gen Unit 1 & P1-2:A15:32:_KERN PW2-PANMJCT2 70kV MOAS OPENED on PANMJCT2_CARNAT T	P3	G-1/N-1	NA	NA	NA	NA	NA	NA	NA	1.12	NA	1.12	NA	NA	Load power factor correction and voltage support if needed
SAN EMDO 70 kV	P1-1:A15:29:_OLD_RVR1 12.47kV Gen Unit 1 & P1-2:A15:32:_KERN PW2-PANMJCT2 70kV MOAS OPENED on PANMJCT2_CARNAT T	P3	G-1/N-1	NA	NA	NA	NA	NA	NA	NA	1.10	NA	1.10	NA	NA	Load power factor correction and voltage support if needed
SAN EMDO 70 kV	P1-1:A15:58:_S_KERN 0.36kV Gen Unit 1 & P1-2:A15:39:_KERN-OLD RIVER #1 70kV	P3	G-1/N-1	NA	NA	NA	NA	NA	NA	NA	1.11	NA	1.12	NA	NA	Load power factor correction and voltage support if needed
UNIONJCT 70 kV	P1-1:A15:29:_OLD_RVR1 12.47kV Gen Unit 1 & P1-2:A15:32:_KERN PW2-PANMJCT2 70kV MOAS OPENED on PANMJCT2_CARNAT T	P3	G-1/N-1	NA	NA	NA	NA	NA	NA	NA	1.11	NA	1.11	NA	NA	Load power factor correction and voltage support if needed
UNIONJCT 70 kV	P1-1:A15:48:_Q885 0.36kV Gen Unit 1 & P1-2:A15:32:_KERN PW2-PANMJCT2 70kV MOAS OPENED on PANMJCT2_CARNAT T	P3	G-1/N-1	NA	NA	NA	NA	NA	NA	NA	1.10	NA	1.10	NA	NA	Load power factor correction and voltage support if needed
UNIONJCT 70 kV	P1-1:A15:58:_S_KERN 0.36kV Gen Unit 1 & P1-2:A15:32:_KERN PW2-PANMJCT2 70kV MOAS OPENED on PANMJCT2_CARNAT T	P3	G-1/N-1	NA	NA	NA	NA	NA	NA	NA	1.11	NA	1.11	NA	NA	Load power factor correction and voltage support if needed

Substation	Contingency (All and Worst P6)	Category	Category Description	Voltage PU (Baseline Scenarios)								Voltage PU (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Winter Peak	2024 Winter Peak	2029 Winter Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	2029 Retirement of QF Generations	
WEEDPATCH_SF 70 kV	P1-1:A15:19:_KERNCNYN 11.00kV Gen Unit 1 & P1-2:A15:108:_WHEELER RIDGE-WEEDPATCH 70kV	P3	G-1/N-1	NA	NA	0.89	NA	NA	NA	NA	NA	NA	NA	NA	0.86	Use the appropriate Summer Setup. (Magunden CB 22)
WEEDPTCH 70 kV	P1-1:A15:19:_KERNCNYN 11.00kV Gen Unit 1 & P1-2:A15:108:_WHEELER RIDGE-WEEDPATCH 70kV	P3	G-1/N-1	NA	NA	0.89	NA	NA	NA	NA	NA	NA	NA	NA	0.86	Use the appropriate Summer Setup. (Magunden CB 22)
WELLFILD 70 kV	P1-1:A15:19:_KERNCNYN 11.00kV Gen Unit 1 & P1-2:A15:108:_WHEELER RIDGE-WEEDPATCH 70kV	P3	G-1/N-1	NA	NA	0.88	NA	NA	NA	NA	NA	0.90	NA	NA	0.85	Use the appropriate Summer Setup. (Magunden CB 22)
ADOBESWSTA 115 kV	P1-3:A15:88:_WHEELER 230/70kV TB 4 & P1-3:A15:89:_WHEELER 230/70kV TB 5	P6	N-1-1	0.46	0.44	0.43	NA	NA	NA	NA	NA	0.44	NA	NA	0.41	Use the appropriate Summer Setup. (Magunden CB 22)
KERNRDGE 115 kV	P1-2:A15:11:_CALIENTE SW STA-MIDWAY #1 230kV [5216] & P1-2:A15:70:_MIDWAY-TEMBLOR 115kV	P6	N-1-1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.79	NA	Short Term: Load Power Factor correction Long Term: Project: Midway-Temblor 115 kV Line Reconductor and Voltage Support
KERNRDGE_G32 115 kV	P1-2:A15:11:_CALIENTE SW STA-MIDWAY #1 230kV [5216] & P1-2:A15:70:_MIDWAY-TEMBLOR 115kV	P6	N-1-1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.79	NA	Short Term: Load Power Factor correction Long Term: Project: Midway-Temblor 115 kV Line Reconductor and Voltage Support
KERNRDGE_L11 115 kV	P1-2:A15:11:_CALIENTE SW STA-MIDWAY #1 230kV [5216] & P1-2:A15:70:_MIDWAY-TEMBLOR 115kV	P6	N-1-1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.78	NA	Short Term: Load Power Factor correction Long Term: Project: Midway-Temblor 115 kV Line Reconductor and Voltage Support
KERNRDGE_L18 115 kV	P1-2:A15:11:_CALIENTE SW STA-MIDWAY #1 230kV [5216] & P1-2:A15:70:_MIDWAY-TEMBLOR 115kV	P6	N-1-1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.78	NA	Short Term: Load Power Factor correction Long Term: Project: Midway-Temblor 115 kV Line Reconductor and Voltage Support
KERNRDGE_L32 115 kV	P1-2:A15:11:_CALIENTE SW STA-MIDWAY #1 230kV [5216] & P1-2:A15:70:_MIDWAY-TEMBLOR 115kV	P6	N-1-1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.78	NA	Short Term: Load Power Factor correction Long Term: Project: Midway-Temblor 115 kV Line Reconductor and Voltage Support
KERNRDGE_L34 115 kV	P1-2:A15:11:_CALIENTE SW STA-MIDWAY #1 230kV [5216] & P1-2:A15:70:_MIDWAY-TEMBLOR 115kV	P6	N-1-1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.78	NA	Short Term: Load Power Factor correction Long Term: Project: Midway-Temblor 115 kV Line Reconductor and Voltage Support
KERNRDGE_S17 115 kV	P1-2:A15:11:_CALIENTE SW STA-MIDWAY #1 230kV [5216] & P1-2:A15:70:_MIDWAY-TEMBLOR 115kV	P6	N-1-1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.78	NA	Short Term: Load Power Factor correction Long Term: Project: Midway-Temblor 115 kV Line Reconductor and Voltage Support
KERNRDGE_S20 115 kV	P1-2:A15:11:_CALIENTE SW STA-MIDWAY #1 230kV [5216] & P1-2:A15:70:_MIDWAY-TEMBLOR 115kV	P6	N-1-1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.78	NA	Short Term: Load Power Factor correction Long Term: Project: Midway-Temblor 115 kV Line Reconductor and Voltage Support

Substation	Contingency (All and Worst P6)	Category	Category Description	Voltage PU (Baseline Scenarios)								Voltage PU (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Winter Peak	2024 Winter Peak	2029 Winter Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	2029 Retirement of QF Generations	
Q622B 115 kV	P1-3:A15:88:_WHEELER 230/70kV TB 4 & P1-3:A15:89:_WHEELER 230/70kV TB 5	P6	N-1-1	0.46	0.44	0.43	NA	NA	NA	NA	NA	0.44	NA	NA	0.41	Use the appropriate Summer Setup. (Magunden CB 22)
TEMBLOR 115 kV	P1-2:A15:11:_CALIENTE SW STA-MIDWAY #1 230kV [5216] & P1-2:A15:70:_MIDWAY-TEMBLOR 115kV	P6	N-1-1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.79	NA	Short Term: Load Power Factor correction Long Term: Project: Midway-Temblor 115 kV Line Reconductor and Voltage Support
WHEELER 115 kV	P1-3:A15:88:_WHEELER 230/70kV TB 4 & P1-3:A15:89:_WHEELER 230/70kV TB 5	P6	N-1-1	0.46	0.44	0.43	NA	NA	NA	NA	NA	0.44	NA	NA	0.41	Use the appropriate Summer Setup. (Magunden CB 22)
ADOBESWSTA 115 kV	P7-1:A15:18:_Midway-Wheeler Ridge #1 & #2 230 kV Lines	P7	DCTL	1.38	1.02	1.02	NA	NA	NA	0.93	1.02	1.04	1.02	0.13	1.02	Project : Wheeler Ridge Voltage Support Project In-Service Date: 12/20 Short term: Action Plan
WHEELER 115 kV	P7-1:A15:18:_Midway-Wheeler Ridge #1 & #2 230 kV Lines	P7	DCTL	1.38	1.02	1.02	NA	NA	NA	0.93	1.02	1.04	1.02	0.13	1.02	Project : Wheeler Ridge Voltage Support Project In-Service Date: 12/20 Short term: Action Plan
WHEELER 230 kV	P7-1:A15:18:_Midway-Wheeler Ridge #1 & #2 230 kV Lines	P7	DCTL	1.28	1.01	1.01	NA	NA	NA	0.94	1.02	1.03	1.01	0.18	1.01	Project : Wheeler Ridge Voltage Support Project In-Service Date: 12/20 Short term: Action Plan

Study Area: PG&E Kern

Voltage Deviation

Substation	Contingency (All and Worst P6)	Category	Category Description	Post Cont. Voltage Deviation % (Baseline Scenarios)								Post Cont. Voltage Deviation % (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Winter Peak	2024 Winter Peak	2029 Winter Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	2029 Retirement of QF Generations	
GRMMWY T 70 kV	P1-2:A15:108:_WHEELER RIDGE-WEEDPATCH 70kV	P1	N-1	4	5	7	NA	NA	NA	0	1	6	1	4	9	Use the appropriate Summer Setup. (Magunden CB 22)
GRMWY_SM 70 kV	P1-2:A15:108:_WHEELER RIDGE-WEEDPATCH 70kV	P1	N-1	4	5	7	NA	NA	NA	0	1	6	1	4	9	Use the appropriate Summer Setup. (Magunden CB 22)
PANAMA 70 kV	P1-2:A15:32:_KERN PW2-PANMJCT2 70kV MOAS OPENED on PANMJCT2_CARNAT T	P1	N-1	5	6	8	NA	NA	NA	-3	-4	7	-4	3	8	Use the appropriate Summer Setup. (Magunden CB 22)
PANMJCT2 70 kV	P1-2:A15:32:_KERN PW2-PANMJCT2 70kV MOAS OPENED on PANMJCT2_CARNAT T	P1	N-1	6	6	9	NA	NA	NA	-3	-5	7	-5	3	9	Use the appropriate Summer Setup. (Magunden CB 22)
UNIONJCT 70 kV	P1-2:A15:32:_KERN PW2-PANMJCT2 70kV MOAS OPENED on PANMJCT2_CARNAT T	P1	N-1	5	6	8	NA	NA	NA	-3	-4	6	-4	3	8	Use the appropriate Summer Setup. (Magunden CB 22)
WEEDPATCH_SF 70 kV	P1-2:A15:108:_WHEELER RIDGE-WEEDPATCH 70kV	P1	N-1	4	5	7	NA	NA	NA	0	1	6	1	4	9	Use the appropriate Summer Setup. (Magunden CB 22)
WEEDPTCH 70 kV	P1-2:A15:108:_WHEELER RIDGE-WEEDPATCH 70kV	P1	N-1	4	5	7	NA	NA	NA	0	1	6	1	4	9	Use the appropriate Summer Setup. (Magunden CB 22)
WELLFILD 70 kV	P1-2:A15:108:_WHEELER RIDGE-WEEDPATCH 70kV	P1	N-1	4	5	7	NA	NA	NA	0	1	6	1	4	9	Use the appropriate Summer Setup. (Magunden CB 22)

Study Area: PG&E Kern

Transient Stability

Contingency	Category	Category Description	Transient Stability Performance					Potential Mitigation Solutions
			Baseline Scenarios			Sensitivity Scenarios		
			2024 Summer Peak	2029 Summer Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	
Midway-Caliente Sw. Station 230 kV line	P1-2	L-1	No Issues	No Issues	No Issues	No Issues	No Issues	No Violation
Kern PP 230/115 kV #13 Transformer 3Ø fault with normal clearing.	P1-3	T-1	No Issues	No Issues	No Issues	No Issues	No Issues	No Violation
Midway 230/115 Bank Transformer 3Ø fault with normal clearing.	P1-3	T-1	No Issues	No Issues	No Issues	No Issues	No Issues	No Violation
Wheeler 230 kV Cap Bank 3Ø fault with normal clearing.	P1-4	N-1	No Issues	No Issues	No Issues	No Issues	No Issues	No Violation
Midway 230 kV bus SLG fault with normal clearing.	P2-2	Bus Section Fault	No Issues	No Issues	No Issues	No Issues	No Issues	No Violation
Midway 115 kV bus-tie breaker SLG fault with normal clearing.	P2-4	Internal Breaker Fault(Bus Tie Fault)	No Issues	No Issues	No Issues	No Issues	No Issues	No Violation
Kern Power to 7 Standard 115 kV line fault with normal clearing with Mt. Poso Offline in the case	P3-2	G-1/L-1	No Issues	WECC/NERC Minimum voltage duration criteria violation at Old River 70 kV Bus	No Issues	No Issues	No Issues	Under Review. To be updated in draft TP.
Tx Sunset SLG fault expanded to elements lost due to stuck breaker and clear fault from remote breakers with normal clearing time.	P4-1	Stuck Breaker	No Issues	No Issues	No Issues	No Issues	No Issues	No Violation
Kern Power to 7 Standard 115 kv line expanded to elements lost due to stuck breaker and clear fault from remote breakers with normal clearing time.	P4-2	Stuck Breaker	No Issues	WECC/NERC Minimum voltage duration criteria violation at Old River 70 kV Bus	No Issues	No Issues	No Issues	Under Review. To be updated in draft TP.
La Paloma SLG Fault with delayed clearing	P5-1	Non Redundant Relay	No Issues	No Issues	No Issues	No Issues	No Issues	No Violation
Midway-Wheeler Ridge #1 & #2 230 kV Lines SLG fault with successful high speed reclose.	P7	DCTL	No Issues	No Issues	No Issues	No Issues	No Issues	No Violation

2019-2020 ISO Reliability Assessment - Study Results

Study Area: PG&E Kern

Single Contingency Load Drop

Worst Contingency	Category	Category Description	Amount of Load Drop (MW)										Potential Mitigation Solutions
			Select..	Select..	Select..	Select..	Select..	Select..	Select..	Select..	Select..	Select..	

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

Study Area: PG&E Kern

Single Source Substation with more than 100 MW Load

Substation	Load Served (MW)										Potential Mitigation Solutions
	Select..	Select..	Select..	Select..	Select..	Select..	Select..	Select..	Select..	Select..	

No single source substation with of more than 100 MW

2019-2020 ISO Reliability Assessment - Study Results
Study Area: PG&E Central Coast
Thermal Overloads PG&E Los Padres

California ISO

Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Loading % (Baseline Scenarios)								Loading % (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Winter Peak	2024 Winter Peak	2029 Winter Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	2029 Retirement of QF Generations	
30760 COBURN 230 36075 COBURN 60.0 1	COBURN 230/60kV TB 2	P1	N-1	32	69	9	63	64	37	72	19	67	101	50	9	sensitivity only
	COBURN 230kV Section 1E	P2-2	Bus	32	69	7	63	65	37	72	19	67	101	50	7	sensitivity only
35910 CRZY_HRS 115 35913 NTVD SW2 115 1	Moss Landing - Salinas #1 and #2 115 kV Lines	P7	DCTL	129	132	138	36	35	83	92	93	139	29	73	138	Project: RAS Identified in 2018-2019 TPP In-service date: TBD Short term: Action plan
	CRAZY HORSE CANYON-SALINAS-SOLEDAD #1 115kV & MOSS LANDING-SALINAS #2 115kV	P6	N-1-1	111	113	<100	<100	<100	<100	<100	<100	118	<100	<100	<100	Project: RAS Identified in 2018-2019 TPP In-service date: TBD Short term: Action plan
	MOSS LANDING-SALINAS #2 115kV & SALINAS-MOSSLNSW-DOLAN RD 115kV	P6	N-1-1	128	132	<100	<100	<100	<100	<100	<100	139	<100	<100	<100	Project: RAS Identified in 2018-2019 TPP In-service date: TBD Short term: Action plan
35910 CRZY_HRS 115 35914 NTVD SW1 115 1	Moss Landing - Salinas #1 and #2 115 kV Lines	P7	DCTL	129	132	138	36	35	83	92	93	139	29	73	138	Project: RAS Identified in 2018-2019 TPP In-service date: TBD Short term: Action plan
	CRAZY HORSE CANYON-SALINAS-SOLEDAD #2 115kV & MOSS LANDING-SALINAS #2 115kV	P6	N-1-1	111	113	<100	<100	<100	<100	<100	<100	118	<100	<100	<100	Project: RAS Identified in 2018-2019 TPP In-service date: TBD Short term: Action plan
	MOSS LANDING-SALINAS #2 115kV & SALINAS-MOSSLNSW-DOLAN RD 115kV	P6	N-1-1	128	132	<100	<100	<100	<100	<100	<100	139	<100	<100	<100	Project: RAS Identified in 2018-2019 TPP In-service date: TBD Short term: Action plan
35913 NTVD SW2 115 35920 SALINAS 115 1	Moss Landing - Salinas #1 and #2 115 kV Lines	P7	DCTL	114	115	120	34	33	74	82	82	120	29	67	120	Project: RAS Identified in 2018-2019 TPP In-service date: TBD Short term: Action plan
	SALINAS-MOSSLNSW-DOLAN RD 115kV & MOSS LANDING-SALINAS #2 115kV	P6	N-1-1	113	114	<100	<100	<100	<100	<100	<100	120	<100	<100	<100	Project: RAS Identified in 2018-2019 TPP In-service date: TBD Short term: Action plan
35914 NTVD SW1 115 35920 SALINAS 115 1	Moss Landing - Salinas #1 and #2 115 kV Lines	P7	DCTL	114	115	120	34	33	74	82	82	120	29	67	120	Project: RAS Identified in 2018-2019 TPP In-service date: TBD Short term: Action plan
	MOSS LANDING-SALINAS #2 115kV & SALINAS-MOSSLNSW-DOLAN RD 115kV	P6	N-1-1	113	114	<100	<100	<100	<100	<100	<100	120	<100	<100	<100	Project: RAS Identified in 2018-2019 TPP In-service date: TBD Short term: Action plan
36048 B.VSTA J 60.0 36050 FIRESTNE 60.0 1	SALINAS-FIRESTONE #2 60kV MOAS OPENED on SPNCE J1-SPENCE	P1	N-1	108	NA	102	30	NA	41	NA	47	NA	NA	56	102	Possible Reconductor or rerate of the Salinas-Firestone #2 Line
	DIABLO 2 25.00kV Gen Unit 1 & SALINAS-FIRESTONE #2 60kV MOAS OPENED on SPNCE J1-SPENCE	P3	G-1/N-1	108	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	Possible Reconductor or rerate of the Salinas-Firestone #2 Line
	DUKMOSS1 18.00kV & DUKMOSS2 18.00kV & DUKMOSS3 18.00kV Gen Units & SALINAS-FIRESTONE #2 60kV MOAS OPENED on SPNCE J1-SPENCE	P3	G-1/N-1	108	<100	103	<100	<100	<100	<100	<100	<100	<100	<100	103	Possible Reconductor or rerate of the Salinas-Firestone #2 Line
36251 FTHILTP2 115 36254 SN LS OB 115 1 1	DIABLO-MESA 230kV & MORRO BAY-MESA 230kV	P6	N-1-1	Diverge	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	Project: South of Mesa Upgrades In-service date: 2023 Short term: Action plan
	MESA PGE 230/115kV TB 2 & MESA PGE 230/115kV TB 3	P6	N-1-1	101	Diverge	Diverge	<100	<100	<100	<100	<100	Diverge	<100	<100	Diverge	Project: North of Mesa Upgrades (On Hold) In-service date: TBD Short term: Action plan
	MESA-PGE 115kV - Section 2D & 1D	P2-4	Bus-Tie-Breaker	123	112	122	42	40	74	79	90	125	35	Diverge	124	Project: North of Mesa Upgrades (On Hold) In-service date: TBD Short term: Action plan
	MORROBAY 230kV - Section 1E & 2E	P2-4	Bus-Tie-Breaker	Diverge	64	61	59	19	Diverge	63	60	66	19	106	62	Project: South of Mesa Upgrades In-service date: 2023 Short term: Action plan

2019-2020 ISO Reliability Assessment - Study Results
Study Area: PG&E Central Coast
Thermal Overloads PG&E Los Padres

California ISO

Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Loading % (Baseline Scenarios)								Loading % (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Winter Peak	2024 Winter Peak	2029 Winter Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	2029 Retirement of QF Generations	
36252 MORRO BY 115 30915 MORROBAY 230 6 1	Morro Bay-Mesa and Diablo-Mesa 230 kV Lines	P7	DCTL	Diverge	69	NA	66	29	Diverge	52	NA	72	26	111	NA	Project: South of Mesa Upgrades In-service date: 2023 Short term: Action plan
	Morro Bay-Mesa and Morro Bay-Diablo 230 kV Lines	P7	DCTL	Diverge	69	70	70	29	Diverge	52	49	72	26	117	71	Project: South of Mesa Upgrades In-service date: 2023 Short term: Action plan
	DIABLO-MESA 230kV & MORRO BAY-MESA 230kV	P6	N-1-1	Diverge	<100	<100	<100	<100	Diverge	<100	<100	<100	<100	101	<100	Project: South of Mesa Upgrades In-service date: 2023 Short term: Action plan
	MESA PGE 230/115kV TB 2 & MESA PGE 230/115kV TB 3	P6	N-1-1	161	Diverge	Diverge	<100	<100	103	Diverge	Diverge	Diverge	<100	<100	Diverge	Project: North of Mesa Upgrades (On Hold) In-service date: TBD Short term: Action plan
36252 MORRO BY 115 36303 GLDTRJC1 115 1 1	DIABLO-MESA 230kV & MORRO BAY-MESA 230kV	P6	N-1-1	Diverge	<100	<100	<100	<100	Diverge	<100	<100	<100	<100	<100	<100	Project: South of Mesa Upgrades In-service date: 2023 Short term: Action plan
	MESA PGE 230/115kV TB 2 & MESA PGE 230/115kV TB 3	P6	N-1-1	109	Diverge	Diverge	<100	<100	<100	Diverge	Diverge	Diverge	<100	<100	Diverge	Project: North of Mesa Upgrades (On Hold) In-service date: TBD Short term: Action plan
36252 MORRO BY 115 36304 GLDTRJC2 115 1 1	DIABLO-MESA 230kV & MORRO BAY-MESA 230kV	P6	N-1-1	Diverge	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	Project: South of Mesa Upgrades In-service date: 2023 Short term: Action plan
	MESA PGE 230/115kV TB 2 & MESA PGE 230/115kV TB 3	P6	N-1-1	107	Diverge	Diverge	<100	<100	<100	<100	<100	Diverge	<100	<100	Diverge	Project: North of Mesa Upgrades (On Hold) In-service date: TBD Short term: Action plan
36253 FTHILTP1 115 36254 SN LS OB 115 1 1	DIABLO-MESA 230kV & MORRO BAY-MESA 230kV	P6	N-1-1	Diverge	<100	<100	<100	<100	Diverge	<100	<100	<100	<100	<100	<100	Project: South of Mesa Upgrades In-service date: 2023 Short term: Action plan
	MESA PGE 230/115kV TB 2 & MESA PGE 230/115kV TB 3	P6	N-1-1	103	Diverge	Diverge	<100	<100	<100	Diverge	Diverge	Diverge	<100	<100	Diverge	Project: North of Mesa Upgrades (On Hold) In-service date: TBD Short term: Action plan
36254 SN LS OB 115 34796 CARRIZO 115 1 1	DIABLO-MESA 230kV & MORRO BAY-MESA 230kV	P6	N-1-1	Diverge	<100	<100	<100	<100	Diverge	<100	<100	<100	<100	<100	<100	Project: South of Mesa Upgrades In-service date: 2023 Short term: Action plan
	MESA PGE 230/115kV TB 2 & MESA PGE 230/115kV TB 3	P6	N-1-1	<100	Diverge	Diverge	<100	<100	<100	Diverge	<100	Diverge	<100	<100	Diverge	Project: North of Mesa Upgrades (On Hold) In-service date: TBD Short term: Action plan
36254 SN LS OB 115 36266 SNTA MRA 115 1	MESA-PGE 115kV - Section 2D & 1D	P2-4	Bus-Tie-Breaker	229	205	237	68	73	135	156	204	250	65	Diverge	236	Project: North of Mesa Upgrades (On Hold) In-service date: TBD Short term: Action plan
	MORROBAY 230kV - Section 1E & 2E	P2-4	Bus-Tie-Breaker	Diverge	81	85	95	37	Diverge	63	67	86	33	159	87	Project: South of Mesa Upgrades In-service date: 2023 Short term: Action plan
	Morro Bay-Mesa and Diablo-Mesa 230 kV Lines	P7	DCTL	Diverge	72	NA	88	32	Diverge	66	NA	75	29	145	NA	Project: South of Mesa Upgrades In-service date: 2023 Short term: Action plan
	Morro Bay-Mesa and Morro Bay-Diablo 230 kV Lines	P7	DCTL	Diverge	72	75	94	32	Diverge	66	65	75	29	153	76	Project: South of Mesa Upgrades In-service date: 2023 Short term: Action plan
	DIABLO-MESA 230kV & MORRO BAY-MESA 230kV	P6	N-1-1	Diverge	<100	<100	<100	<100	Diverge	<100	<100	<100	<100	134	<100	Project: South of Mesa Upgrades In-service date: 2023 Short term: Action plan

2019-2020 ISO Reliability Assessment - Study Results
Study Area: PG&E Central Coast
Thermal Overloads PG&E Los Padres

California ISO

Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Loading % (Baseline Scenarios)								Loading % (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Winter Peak	2024 Winter Peak	2029 Winter Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	2029 Retirement of QF Generations	
	MESA PGE 230/115kV TB 2 & MESA PGE 230/115kV TB 3	P6	N-1-1	281	Diverge	Diverge	<100	<100	175	Diverge	Diverge	Diverge	<100	125	Diverge	Project: North of Mesa Upgrades (On Hold) In-service date: TBD Short term: Action plan
	MESA-SISQUOC 115kV & MESA-PGE-SNTA MRA 115kV	P6	N-1-1	100	103	109	<100	<100	<100	<100	<100	108	<100	<100	109	Project: North of Mesa Upgrades (On Hold) In-service date: TBD Short term: Action plan
	MORRO BAY-DIABLO 230kV & MORRO BAY-MESA 230kV	P6	N-1-1	Diverge	<100	<100	<100	<100	239	<100	<100	<100	<100	142	<100	Project: South of Mesa Upgrades In-service date: 2023 Short term: Action plan
	MORRO BAY-MESA 230kV & DIABLO-MESA 230kV	P6	N-1-1	<100	<100	<100	<100	<100	Diverge	<100	<100	<100	<100	<100	<100	Project: South of Mesa Upgrades In-service date: 2023 Short term: Action plan
36254 SN LS OB 115 36278 OCEANO 115 1	MORROBAY 230kV - Section 1E & 2E	P2-4	Bus-Tie-Breaker	Diverge	61	64	68	25	Diverge	45	48	65	21	114	66	Project: South of Mesa Upgrades In-service date: 2023 Short term: Action plan
	Morro Bay-Mesa and Diablo-Mesa 230 kV Lines	P7	DCTL	Diverge	55	NA	63	22	Diverge	48	NA	57	18	104	NA	Project: South of Mesa Upgrades In-service date: 2023 Short term: Action plan
	Morro Bay-Mesa and Morro Bay-Diablo 230 kV Lines	P7	DCTL	Diverge	55	55	68	22	Diverge	48	46	57	18	109	58	Project: South of Mesa Upgrades In-service date: 2023 Short term: Action plan
	DIABLO-MESA 230kV & MORRO BAY-MESA 230kV	P6	N-1-1	Diverge	<100	<100	<100	<100	Diverge	<100	<100	<100	<100	<100	<100	Project: South of Mesa Upgrades In-service date: 2023 Short term: Action plan
	MESA PGE 230/115kV TB 2 & MESA PGE 230/115kV TB 3	P6	N-1-1	<100	Diverge	Diverge	<100	<100	<100	Diverge	Diverge	Diverge	<100	<100	Diverge	Project: North of Mesa Upgrades (On Hold) In-service date: TBD Short term: Action plan
	MORRO BAY-MESA 230kV & DIABLO-MESA 230kV	P6	N-1-1	<100	<100	<100	<100	<100	Diverge	<100	<100	<100	<100	<100	<100	Project: South of Mesa Upgrades In-service date: 2023 Short term: Action plan
	MORRO BAY-MESA 230kV & MORRO BAY-DIABLO 230kV	P6	N-1-1	Diverge	<100	<100	<100	<100	<100	<100	<100	<100	<100	102	<100	Project: South of Mesa Upgrades In-service date: 2023 Short term: Action plan
36256 MESA_PGE 115 36280 CALLENDERSS 115 1	MORROBAY 230kV - Section 1E & 2E	P2-4	Bus-Tie-Breaker	Diverge	45	50	75	22	Diverge	29	33	47	21	127	50	Project: South of Mesa Upgrades In-service date: 2023 Short term: Action plan
	Morro Bay-Mesa and Diablo-Mesa 230 kV Lines	P7	DCTL	Diverge	34	NA	68	18	Diverge	30	NA	36	19	112	NA	Project: South of Mesa Upgrades In-service date: 2023 Short term: Action plan
	Morro Bay-Mesa and Morro Bay-Diablo 230 kV Lines	P7	DCTL	Diverge	34	44	74	18	Diverge	30	33	36	19	120	46	Project: South of Mesa Upgrades In-service date: 2023 Short term: Action plan
	DIABLO-MESA 230kV & MORRO BAY-MESA 230kV	P6	N-1-1	Diverge	<100	<100	<100	<100	Diverge	<100	<100	<100	<100	102	<100	Project: South of Mesa Upgrades In-service date: 2023 Short term: Action plan
	MESA PGE 230/115kV TB 2 & MESA PGE 230/115kV TB 3	P6	N-1-1	<100	Diverge	Diverge	<100	<100	<100	Diverge	Diverge	Diverge	<100	<100	Diverge	Project: North of Mesa Upgrades (On Hold) In-service date: TBD Short term: Action plan
	MORRO BAY-MESA 230kV & DIABLO-MESA 230kV	P6	N-1-1	<100	<100	<100	<100	<100	Diverge	<100	<100	<100	<100	<100	<100	Project: South of Mesa Upgrades In-service date: 2023 Short term: Action plan

2019-2020 ISO Reliability Assessment - Study Results
Study Area: PG&E Central Coast
Thermal Overloads PG&E Los Padres

California ISO

Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Loading % (Baseline Scenarios)								Loading % (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Winter Peak	2024 Winter Peak	2029 Winter Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	2029 Retirement of QF Generations	
	MORRO BAY-MESA 230kV & MORRO BAY-DIABLO 230kV	P6	N-1-1	Diverge	<100	<100	<100	<100	<100	<100	<100	<100	<100	110	<100	Project: South of Mesa Upgrades In-service date: 2023 Short term: Action plan
36260 SISQUOC 115 36286 PALMR 115 1	MESA-PGE 115kV - Section 2D & 1D	P2-4	Bus-Tie-Breaker	127	59	63	42	26	64	39	49	71	23	Diverge	63	Project: South of Mesa Upgrades In-service date: 2023 Short term: Action plan
	Mesa-Divide #1 and #2 115 kV Lines	P7	DCTL	76	41	42	92	50	55	33	31	42	48	134	42	sensitivity only
	MESA PGE 230/115kV TB 2 & MESA PGE 230/115kV TB 3	P6	N-1-1	110	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	Project: South of Mesa Upgrades In-service date: 2023 Short term: Action plan
	MESA-DIVIDE #2 115kV & MESA-DIVIDE #1 115kV	P6	N-1-1	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	113	<100	sensitivity only
36264 S.YNZ JT 115 36288 ZACA 115 1	MESA-PGE 115kV - Section 2D & 1D	P2-4	Bus-Tie-Breaker	98	41	43	28	18	51	28	33	48	15	Diverge	43	sensitivity only
	Mesa-Divide #1 and #2 115 kV Lines	P7	DCTL	59	29	29	86	41	43	23	22	29	38	128	29	sensitivity only
	MESA-DIVIDE #2 115kV & MESA-DIVIDE #1 115kV	P6	N-1-1	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	104	<100	sensitivity only
36266 SNTA MRA 115 36269 FRWAYTP 115 1	MESA-PGE 115kV - Section 2D & 1D	P2-4	Bus-Tie-Breaker	133	117	127	44	48	87	102	126	141	43	Diverge	126	Project: North of Mesa Upgrades (On Hold) In-service date: TBD Short term: Action plan
	MESA PGE 230/115kV TB 2 & MESA PGE 230/115kV TB 3	P6	N-1-1	177	<100	<100	<100	<100	141	<100	<100	<100	<100	<100	<100	Project: South of Mesa Upgrades In-service date: 2023 Short term: Action plan
	MORRO BAY-DIABLO 230kV & MORRO BAY-MESA 230kV	P6	N-1-1	<100	<100	<100	<100	<100	197	<100	<100	<100	<100	<100	<100	Project: South of Mesa Upgrades In-service date: 2023 Short term: Action plan
36269 FRWAYTP 115 36260 SISQUOC 115 1 1	MESA PGE 230/115kV TB 2 & MESA PGE 230/115kV TB 3	P6	N-1-1	118	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	Project: South of Mesa Upgrades In-service date: 2023 Short term: Action plan
	MORRO BAY-DIABLO 230kV & MORRO BAY-MESA 230kV	P6	N-1-1	<100	<100	<100	<100	<100	101	<100	<100	<100	<100	<100	<100	Project: South of Mesa Upgrades In-service date: 2023 Short term: Action plan
36278 OCEANO 115 36280 CALLENDERSS 115 1	MORROBAY 230kV - Section 1E & 2E	P2-4	Bus-Tie-Breaker	Diverge	46	50	79	26	Diverge	29	32	47	25	131	50	Project: South of Mesa Upgrades In-service date: 2023 Short term: Action plan
	Morro Bay-Mesa and Diablo-Mesa 230 kV Lines	P7	DCTL	Diverge	35	NA	72	21	Diverge	29	NA	37	21	116	NA	Project: South of Mesa Upgrades In-service date: 2023 Short term: Action plan
	Morro Bay-Mesa and Morro Bay-Diablo 230 kV Lines	P7	DCTL	Diverge	35	43	79	21	Diverge	29	32	37	21	124	44	Project: South of Mesa Upgrades In-service date: 2023 Short term: Action plan
	DIABLO-MESA 230kV & MORRO BAY-MESA 230kV	P6	N-1-1	Diverge	<100	<100	<100	<100	Diverge	<100	<100	<100	<100	106	<100	Project: South of Mesa Upgrades In-service date: 2023 Short term: Action plan
	MESA PGE 230/115kV TB 2 & MESA PGE 230/115kV TB 3	P6	N-1-1	<100	Diverge	Diverge	<100	<100	<100	Diverge	Diverge	Diverge	<100	<100	Diverge	Project: North of Mesa Upgrades (On Hold) In-service date: TBD Short term: Action plan
	MORRO BAY-MESA 230kV & DIABLO-MESA 230kV	P6	N-1-1	<100	<100	<100	<100	<100	Diverge	<100	<100	<100	<100	<100	<100	Project: South of Mesa Upgrades In-service date: 2023 Short term: Action plan
	MORRO BAY-MESA 230kV & MORRO BAY-DIABLO 230kV	P6	N-1-1	Diverge	<100	<100	<100	<100	<100	<100	<100	<100	<100	114	<100	Project: South of Mesa Upgrades In-service date: 2023 Short term: Action plan

2019-2020 ISO Reliability Assessment - Study Results
Study Area: PG&E Central Coast
Thermal Overloads PG&E Los Padres

California ISO

Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Loading % (Baseline Scenarios)								Loading % (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Winter Peak	2024 Winter Peak	2029 Winter Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	2029 Retirement of QF Generations	
36286 PALMR 115 36287 AECCEORTP 115 1	MESA-PGE 115kV - Section 2D & 1D	P2-4	Bus-Tie-Breaker	118	56	59	40	24	60	37	46	66	22	Diverge	59	Project: South of Mesa Upgrades In-service date: 2023 Short term: Action plan
	Mesa-Divide #1 and #2 115 kV Lines	P7	DCTL	71	39	40	90	49	51	31	30	40	46	130	40	sensitivity only
	MESA PGE 230/115kV TB 2 & MESA PGE 230/115kV TB 3	P6	N-1-1	102	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	Project: South of Mesa Upgrades In-service date: 2023 Short term: Action plan
	MESA-DIVIDE #2 115kV & MESA-DIVIDE #1 115kV	P6	N-1-1	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	108	<100	sensitivity only
36287 AECCEORTP 115 36288 ZACA 115 1	MESA-PGE 115kV - Section 2D & 1D	P2-4	Bus-Tie-Breaker	95	46	49	27	19	49	31	37	54	16	Diverge	48	sensitivity only
	Mesa-Divide #1 and #2 115 kV Lines	P7	DCTL	57	33	33	76	42	42	26	24	33	39	115	33	sensitivity only
36303 GLDTRJC1 115 36251 FTHILTP2 115 1 1	DIABLO-MESA 230kV & MORRO BAY-MESA 230kV	P6	N-1-1	Diverge	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	Project: South of Mesa Upgrades In-service date: 2023 Short term: Action plan
	MESA PGE 230/115kV TB 2 & MESA PGE 230/115kV TB 3	P6	N-1-1	101	Diverge	Diverge	<100	<100	<100	<100	<100	Diverge	<100	<100	Diverge	Project: North of Mesa Upgrades (On Hold) In-service date: TBD Short term: Action plan
36304 GLDTRJC2 115 36253 FTHILTP1 115 1 1	DIABLO-MESA 230kV & MORRO BAY-MESA 230kV	P6	N-1-1	Diverge	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	Project: South of Mesa Upgrades In-service date: 2023 Short term: Action plan
	MESA PGE 230/115kV TB 2 & MESA PGE 230/115kV TB 3	P6	N-1-1	107	Diverge	Diverge	<100	<100	<100	<100	<100	Diverge	<100	<100	Diverge	Project: North of Mesa Upgrades (On Hold) In-service date: TBD Short term: Action plan
36354 SAN MIGL 70.0 34574 COLNGA 1 70.0 1	PASO ROBLES-TEMPLETON 70kV	P1	N-1	Diverge	38	29	91	6	69	19	22	39	16	66	29	Project: Estrella In Service Date: Nov 2023 Short term: Action Plan
	DIABLO 1 25.00kV Gen Unit 1 & PASO ROBLES-TEMPLETON 70kV	P3	G-1/N-1	Diverge	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	Project: Estrella In Service Date: Nov 2023 Short term: Action Plan
	TEMPLETON 230kV/70kV	P1	N-1	Diverge	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	Project: Estrella In Service Date: Nov 2023 Short term: Action Plan
PASO ROBLES-TEMPLETON 70kV	TEMPLETON 230kV/70kV	P1	N-1	Diverge	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	Project: Estrella In Service Date: Nov 2023 Short term: Action Plan
SAN MIGUEL-PASO ROBLES 70kV	TEMPLETON 230kV/70kV	P1	N-1	Diverge	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	Project: Estrella In Service Date: Nov 2023 Short term: Action Plan
	PASO ROBLES-TEMPLETON 70kV	P1	N-1	Diverge	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	Project: Estrella In Service Date: Nov 2023 Short term: Action Plan

Study Area: PG&E Central Coast
PG&E Los Padres

High/Low Voltages

Substation	Contingency (All and Worst P6)	Category	Category Description	Voltage PU (Baseline Scenarios)								Voltage PU (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Winter Peak	2024 Winter Peak	2029 Winter Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	2029 Retirement of QF Generations	
1257-RD 70 kV	Base Case	P0	Basecase	1.02	1.02	1.05	1.04	1.05	1.02	1.03	1.04	1.02	1.05	1.03	1.04	Load power factor correction and voltage support if needed
AERA_ENG 60 kV	Base Case	P0	Basecase	1.04	1.03	1.03	1.05	1.04	1.05	1.05	1.03	1.03	1.04	1.04	1.03	Load power factor correction and voltage support if needed
AERA_MTR 60 kV	Base Case	P0	Basecase	1.04	1.03	1.03	1.05	1.04	1.05	1.05	1.03	1.03	1.04	1.04	1.03	Load power factor correction and voltage support if needed
AERA_TP1 60 kV	Base Case	P0	Basecase	1.04	1.03	1.03	1.05	1.04	1.05	1.05	1.03	1.03	1.04	1.04	1.03	Load power factor correction and voltage support if needed
AERA_TP2 60 kV	Base Case	P0	Basecase	1.04	1.03	1.03	1.05	1.04	1.05	1.05	1.03	1.03	1.04	1.04	1.03	Load power factor correction and voltage support if needed
AERA_TP3 60 kV	Base Case	P0	Basecase	1.04	1.03	1.03	1.05	1.04	1.05	1.05	1.03	1.03	1.04	1.04	1.03	Load power factor correction and voltage support if needed
BA FOOD1 60 kV	Base Case	P0	Basecase	1.05	1.04	1.04	1.05	1.05	1.05	1.04	1.03	1.04	1.04	1.05	1.04	Load power factor correction and voltage support if needed
BA FOOD2 60 kV	Base Case	P0	Basecase	1.05	1.04	1.04	1.05	1.05	1.05	1.04	1.03	1.04	1.04	1.05	1.04	Load power factor correction and voltage support if needed
BIG BASN 60 kV	Base Case	P0	Basecase	1.03	1.04	1.04	1.05	1.05	1.05	1.04	1.03	1.04	1.05	1.06	1.04	Load power factor correction and voltage support if needed
BURNS 60 kV	Base Case	P0	Basecase	1.02	1.04	1.04	1.05	1.05	1.05	1.04	1.03	1.03	1.05	1.06	1.04	Load power factor correction and voltage support if needed
BURNS J1 60 kV	Base Case	P0	Basecase	1.02	1.04	1.04	1.05	1.05	1.05	1.04	1.03	1.03	1.05	1.06	1.04	Load power factor correction and voltage support if needed
BURNS J2 60 kV	Base Case	P0	Basecase	1.02	1.04	1.04	1.05	1.05	1.05	1.04	1.03	1.03	1.05	1.06	1.04	Load power factor correction and voltage support if needed
CHOLAME 70 kV	Base Case	P0	Basecase	1.02	1.02	1.02	1.05	1.05	1.05	1.05	1.02	1.02	1.05	1.02	1.02	Load power factor correction and voltage support if needed
CHVSANARDO 60 kV	Base Case	P0	Basecase	1.04	1.03	1.03	1.05	1.04	1.05	1.05	1.03	1.03	1.04	1.04	1.03	Load power factor correction and voltage support if needed
CMP EVRS 115 kV	Base Case	P0	Basecase	1.04	1.04	1.04	1.06	1.06	1.04	1.03	1.01	1.04	1.06	1.04	1.04	Load power factor correction and voltage support if needed
COBURN 60 kV	Base Case	P0	Basecase	1.05	1.05	1.04	1.05	1.05	1.05	1.04	1.03	1.05	1.04	1.05	1.04	Load power factor correction and voltage support if needed
COBURN J 60 kV	Base Case	P0	Basecase	1.05	1.05	1.04	1.05	1.05	1.05	1.05	1.03	1.05	1.04	1.05	1.04	Load power factor correction and voltage support if needed
CRUSHER 60 kV	Base Case	P0	Basecase	1.02	1.03	1.04	1.05	1.05	1.05	1.04	1.03	1.03	1.05	1.06	1.04	Load power factor correction and voltage support if needed
DIVIDE 70 kV	Base Case	P0	Basecase	1.03	1.04	1.05	1.04	1.05	1.03	1.03	1.04	1.03	1.05	1.03	1.04	Load power factor correction and voltage support if needed
GRN VLLY 115 kV	Base Case	P0	Basecase	1.04	1.04	1.03	1.06	1.05	1.03	1.03	1.02	1.04	1.05	1.03	1.03	Load power factor correction and voltage support if needed
JOLON 60 kV	Base Case	P0	Basecase	1.06	1.05	1.03	1.06	1.07	1.06	1.05	1.02	1.05	1.06	1.10	1.03	Load power factor correction and voltage support if needed
JOLON TP 60 kV	Base Case	P0	Basecase	1.05	1.04	1.03	1.05	1.05	1.05	1.05	1.03	1.04	1.05	1.06	1.03	Load power factor correction and voltage support if needed
KCTY_TAP 60 kV	Base Case	P0	Basecase	1.05	1.04	1.04	1.05	1.05	1.05	1.04	1.03	1.04	1.04	1.05	1.04	Load power factor correction and voltage support if needed
KING CTY 60 kV	Base Case	P0	Basecase	1.05	1.04	1.03	1.05	1.05	1.05	1.04	1.03	1.04	1.05	1.06	1.03	Load power factor correction and voltage support if needed

Study Area: PG&E Central Coast
PG&E Los Padres

High/Low Voltages

Substation	Contingency (All and Worst P6)	Category	Category Description	Voltage PU (Baseline Scenarios)								Voltage PU (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Winter Peak	2024 Winter Peak	2029 Winter Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	2029 Retirement of QF Generations	
L.STAR J 60 kV	Base Case	P0	Basecase	1.02	1.03	1.04	1.05	1.04	1.05	1.04	1.03	1.03	1.05	1.06	1.04	Load power factor correction and voltage support if needed
LCCHS J1 60 kV	Base Case	P0	Basecase	1.06	1.05	1.02	1.06	1.06	1.06	1.05	1.02	1.05	1.06	1.07	1.02	Load power factor correction and voltage support if needed
LCCHS J2 60 kV	Base Case	P0	Basecase	1.05	1.04	1.03	1.05	1.05	1.05	1.05	1.02	1.04	1.05	1.06	1.03	Load power factor correction and voltage support if needed
LONE STR 60 kV	Base Case	P0	Basecase	1.02	1.03	1.04	1.05	1.04	1.04	1.04	1.03	1.03	1.05	1.06	1.04	Load power factor correction and voltage support if needed
LOS CCHS 60 kV	Base Case	P0	Basecase	1.06	1.05	1.02	1.06	1.06	1.06	1.05	1.02	1.05	1.06	1.07	1.02	Load power factor correction and voltage support if needed
LOS OSTS 60 kV	Base Case	P0	Basecase	1.05	1.04	1.03	1.05	1.05	1.05	1.05	1.02	1.04	1.05	1.06	1.03	Load power factor correction and voltage support if needed
M 115 kV	Base Case	P0	Basecase	1.03	1.03	1.03	1.06	1.06	1.04	1.03	1.01	1.03	1.06	1.04	1.03	Load power factor correction and voltage support if needed
OILFLDS 60 kV	Base Case	P0	Basecase	1.04	1.03	1.03	1.05	1.04	1.05	1.05	1.03	1.03	1.04	1.04	1.03	Load power factor correction and voltage support if needed
ORCHRD J 60 kV	Base Case	P0	Basecase	1.05	1.04	1.03	1.05	1.05	1.05	1.05	1.03	1.04	1.05	1.06	1.03	Load power factor correction and voltage support if needed
PAUL SWT 115 kV	Base Case	P0	Basecase	1.03	1.03	1.03	1.06	1.06	1.04	1.03	1.01	1.03	1.06	1.04	1.03	Load power factor correction and voltage support if needed
PT MRTTI 60 kV	Base Case	P0	Basecase	1.02	1.03	1.04	1.05	1.05	1.05	1.04	1.03	1.03	1.05	1.06	1.04	Load power factor correction and voltage support if needed
ROB ROY 115 kV	Base Case	P0	Basecase	1.04	1.04	1.03	1.06	1.06	1.04	1.03	1.01	1.04	1.06	1.04	1.03	Load power factor correction and voltage support if needed
S ARDOJ1 60 kV	Base Case	P0	Basecase	1.04	1.04	1.03	1.05	1.04	1.05	1.05	1.03	1.04	1.04	1.04	1.03	Load power factor correction and voltage support if needed
S ARDOJ2 60 kV	Base Case	P0	Basecase	1.04	1.03	1.03	1.05	1.04	1.05	1.04	1.03	1.03	1.04	1.04	1.03	Load power factor correction and voltage support if needed
SALN RVR 60 kV	Base Case	P0	Basecase	1.04	1.04	1.03	1.05	1.04	1.05	1.05	1.03	1.03	1.04	1.04	1.03	Load power factor correction and voltage support if needed
SAN ARDO 60 kV	Base Case	P0	Basecase	1.04	1.03	1.03	1.05	1.04	1.05	1.04	1.03	1.03	1.04	1.04	1.03	Load power factor correction and voltage support if needed
SARG CYN 60 kV	Base Case	P0	Basecase	1.04	1.03	1.03	1.05	1.04	1.05	1.05	1.03	1.03	1.04	1.04	1.03	Load power factor correction and voltage support if needed
TEMPL J 70 kV	Base Case	P0	Basecase	1.03	1.02	1.01	1.05	1.03	1.02	1.03	1.01	1.02	1.03	1.02	1.01	Load power factor correction and voltage support if needed
TEMPLT7 70 kV	Base Case	P0	Basecase	1.03	1.02	1.01	1.05	1.03	1.03	1.03	1.01	1.02	1.03	1.02	1.01	Load power factor correction and voltage support if needed
TEXCO J1 60 kV	Base Case	P0	Basecase	1.04	1.03	1.03	1.05	1.04	1.05	1.05	1.03	1.03	1.04	1.04	1.03	Load power factor correction and voltage support if needed
TEXCO J2 60 kV	Base Case	P0	Basecase	1.04	1.03	1.03	1.05	1.04	1.05	1.05	1.03	1.03	1.04	1.04	1.03	Load power factor correction and voltage support if needed
VAFB A-N 70 kV	Base Case	P0	Basecase	1.02	1.02	1.05	1.04	1.05	1.02	1.03	1.04	1.02	1.05	1.04	1.04	Load power factor correction and voltage support if needed
VAFB SSA 70 kV	Base Case	P0	Basecase	1.02	1.02	1.05	1.04	1.05	1.02	1.03	1.04	1.02	1.05	1.03	1.04	Load power factor correction and voltage support if needed
VAFB SSB 70 kV	Base Case	P0	Basecase	1.02	1.02	1.05	1.04	1.05	1.02	1.03	1.04	1.02	1.05	1.03	1.04	Load power factor correction and voltage support if needed

Study Area: PG&E Central Coast
PG&E Los Padres

High/Low Voltages

Substation	Contingency (All and Worst P6)	Category	Category Description	Voltage PU (Baseline Scenarios)								Voltage PU (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Winter Peak	2024 Winter Peak	2029 Winter Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	2029 Retirement of QF Generations	
AGRILINK 60 kV	WTSNVLLE-SALINAS2 60kV	P1	N-1	1.08	1.08	1.07	1.11	1.11	1.08	1.08	1.06	1.08	1.11	1.08	1.07	Continue to monitor
CIC JCT 60 kV	WTSNVLLE-SALINAS2 60kV	P1	N-1	1.08	1.08	1.07	1.11	1.11	1.08	1.08	1.06	1.08	1.11	1.08	1.07	Continue to monitor
ERTA 60 kV	WTSNVLLE-SALINAS2 60kV	P1	N-1	1.08	1.08	1.07	1.11	1.11	1.08	1.08	1.06	1.08	1.11	1.08	1.07	Continue to monitor
ERTA JCT 60 kV	WTSNVLLE-SALINAS2 60kV	P1	N-1	1.08	1.08	1.07	1.11	1.11	1.08	1.08	1.06	1.08	1.11	1.08	1.07	Continue to monitor
GREN VLY 60 kV	GREEN VALLEY-WATSONVILLE 60kV	P1	N-1	1.09	1.09	1.08	1.11	1.11	1.08	1.08	1.07	1.09	1.11	1.08	1.08	Continue to monitor
GREN VLY 60 kV	WTSNVLLE-SALINAS2 60kV	P1	N-1	1.08	1.08	1.07	1.11	1.11	1.08	1.08	1.06	1.08	1.11	1.08	1.07	Continue to monitor
JOLON 60 kV	COBURN 230/60kV TB 1	P1	N-1	1.06	1.05	1.02	1.07	1.07	1.06	1.06	1.01	1.05	1.07	1.11	1.02	sensitivity only
PASO ROBLES AREA 60 kV	TEMPLETON 230kV/70kV	P1	N-1	Diverge	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	Project: Estrella In Service Date: Nov 2023 Short term: Action Plan
PSA RBLS 70 kV	PASO ROBLES-TEMPLETON 70kV	P1	N-1	0.73	1.01	0.99	1.05	1.04	0.82	1.02	0.99	1.01	1.04	0.85	0.99	Project: Estrella In Service Date: Nov 2023 Short term: Action Plan
SAN MIGL 70 kV	PASO ROBLES-TEMPLETON 70kV	P1	N-1	0.76	1.00	0.99	1.03	1.03	0.84	1.02	0.99	1.00	1.03	0.88	0.99	Project: Estrella In Service Date: Nov 2023 Short term: Action Plan
WTSNVLLE 60 kV	WTSNVLLE-SALINAS2 60kV	P1	N-1	1.08	1.08	1.07	1.11	1.11	1.08	1.08	1.06	1.08	1.11	1.08	1.07	Continue to monitor
AECCEOR 115 kV	MESA-PGE 115kV - Section 2D & 1D	P2-4	Bus-Tie-Breaker	0.61	0.72	0.53	0.99	1.03	0.87	0.89	0.56	0.58	1.02	0.50	0.53	Project: North of Mesa Upgrades (On Hold) In-service date: TBD Short term: Action plan
AECCEOR 115 kV	MORROBAY 230kV - Section 1E & 2E	P2-4	Bus-Tie-Breaker	0.35	1.02	0.94	1.02	1.02	0.48	1.04	0.90	1.00	1.03	1.03	0.93	Project: North of Mesa Upgrades (On Hold) In-service date: TBD Short term: Action plan
AECCEORTP 115 kV	MESA-PGE 115kV - Section 2D & 1D	P2-4	Bus-Tie-Breaker	0.61	0.72	0.53	0.99	1.03	0.87	0.89	0.56	0.58	1.02	0.50	0.53	Project: North of Mesa Upgrades (On Hold) In-service date: TBD Short term: Action plan
AECCEORTP 115 kV	MORROBAY 230kV - Section 1E & 2E	P2-4	Bus-Tie-Breaker	0.35	1.02	0.94	1.02	1.02	0.48	1.04	0.90	1.00	1.03	1.03	0.93	Project: North of Mesa Upgrades (On Hold) In-service date: TBD Short term: Action plan
BUELLTON 115 kV	MESA-PGE 115kV - Section 2D & 1D	P2-4	Bus-Tie-Breaker	0.59	0.72	0.52	0.99	1.04	0.87	0.90	0.55	0.57	1.03	0.45	0.52	Project: North of Mesa Upgrades (On Hold) In-service date: TBD Short term: Action plan
BUELLTON 115 kV	MORROBAY 230kV - Section 1E & 2E	P2-4	Bus-Tie-Breaker	0.34	1.02	0.94	1.02	1.02	0.47	1.04	0.90	1.00	1.03	1.02	0.92	Project: North of Mesa Upgrades (On Hold) In-service date: TBD Short term: Action plan
CABRILLO 115 kV	MESA-PGE 115kV - Section 2D & 1D	P2-4	Bus-Tie-Breaker	0.59	0.73	0.53	0.99	1.05	0.87	0.91	0.55	0.58	1.03	0.41	0.52	Project: North of Mesa Upgrades (On Hold) In-service date: TBD Short term: Action plan
CALLENDERSS 115 kV	MESA-PGE 115kV - Section 2D & 1D	P2-4	Bus-Tie-Breaker	0.86	0.89	0.81	1.03	1.03	0.96	0.95	0.82	0.84	1.03	0.89	0.80	Project: North of Mesa Upgrades (On Hold) In-service date: TBD Short term: Action plan
DIABLOCN 230 kV	MORROBAY 230kV - Section 1E & 2E	P2-4	Bus-Tie-Breaker	0.37	0.98	0.93	1.04	1.02	0.49	1.01	0.89	0.96	1.02	1.01	0.92	Project: North of Mesa Upgrades (On Hold) In-service date: TBD Short term: Action plan

Study Area: PG&E Central Coast
PG&E Los Padres

High/Low Voltages

Substation	Contingency (All and Worst P6)	Category	Category Description	Voltage PU (Baseline Scenarios)								Voltage PU (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Winter Peak	2024 Winter Peak	2029 Winter Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	2029 Retirement of QF Generations	
FOOTHILL 115 kV	MESA-PGE 115kV - Section 2D & 1D	P2-4	Bus-Tie-Breaker	0.90	0.93	**0.87**	1.03	1.03	0.99	0.98	**0.88**	**0.89**	1.03	0.92	**0.86**	Project: North of Mesa Upgrades (On Hold) In-service date: TBD Short term: Action plan
FOOTHILL 115 kV	MORROBAY 230kV - Section 1E & 2E	P2-4	Bus-Tie-Breaker	**0.69**	0.99	0.93	1.03	1.02	**0.71**	1.01	**0.90**	0.97	1.03	1.01	0.92	Project: North of Mesa Upgrades (On Hold) In-service date: TBD Short term: Action plan
FRWAYTP 115 kV	MESA-PGE 115kV - Section 2D & 1D	P2-4	Bus-Tie-Breaker	**0.64**	**0.73**	**0.57**	1.00	1.02	**0.88**	**0.88**	**0.59**	**0.60**	1.02	**0.59**	**0.56**	Project: North of Mesa Upgrades (On Hold) In-service date: TBD Short term: Action plan
FTHILTP1 115 kV	MESA-PGE 115kV - Section 2D & 1D	P2-4	Bus-Tie-Breaker	0.90	0.93	**0.87**	1.03	1.03	0.99	0.98	**0.88**	**0.89**	1.03	0.92	**0.86**	Project: North of Mesa Upgrades (On Hold) In-service date: TBD Short term: Action plan
FTHILTP1 115 kV	MORROBAY 230kV - Section 1E & 2E	P2-4	Bus-Tie-Breaker	**0.69**	0.99	0.93	1.03	1.02	**0.71**	1.01	**0.90**	0.97	1.03	1.01	0.92	Project: North of Mesa Upgrades (On Hold) In-service date: TBD Short term: Action plan
FTHILTP2 115 kV	MESA-PGE 115kV - Section 2D & 1D	P2-4	Bus-Tie-Breaker	0.90	0.93	**0.87**	1.03	1.03	0.99	0.98	**0.88**	**0.89**	1.03	0.92	**0.86**	Project: North of Mesa Upgrades (On Hold) In-service date: TBD Short term: Action plan
FTHILTP2 115 kV	MORROBAY 230kV - Section 1E & 2E	P2-4	Bus-Tie-Breaker	**0.69**	0.99	0.93	1.03	1.02	**0.71**	1.01	**0.90**	0.97	1.03	1.01	0.92	Project: North of Mesa Upgrades (On Hold) In-service date: TBD Short term: Action plan
GAREY 115 kV	MESA-PGE 115kV - Section 2D & 1D	P2-4	Bus-Tie-Breaker	**0.63**	**0.73**	**0.56**	0.99	1.02	**0.88**	**0.89**	**0.58**	**0.59**	1.02	**0.57**	**0.55**	Project: North of Mesa Upgrades (On Hold) In-service date: TBD Short term: Action plan
GLDTRJC1 115 kV	MESA-PGE 115kV - Section 2D & 1D	P2-4	Bus-Tie-Breaker	0.91	0.93	**0.87**	1.03	1.03	0.99	0.98	**0.88**	**0.89**	1.03	0.92	**0.87**	Project: North of Mesa Upgrades (On Hold) In-service date: TBD Short term: Action plan
GLDTRJC1 115 kV	MORROBAY 230kV - Section 1E & 2E	P2-4	Bus-Tie-Breaker	**0.70**	0.99	0.93	1.03	1.02	**0.71**	1.01	**0.90**	0.97	1.03	1.01	0.92	Project: North of Mesa Upgrades (On Hold) In-service date: TBD Short term: Action plan
GLDTRJC2 115 kV	MESA-PGE 115kV - Section 2D & 1D	P2-4	Bus-Tie-Breaker	0.92	0.94	**0.88**	1.03	1.03	0.99	0.98	**0.89**	0.90	1.03	0.93	**0.88**	Project: North of Mesa Upgrades (On Hold) In-service date: TBD Short term: Action plan
GLDTRJC2 115 kV	MORROBAY 230kV - Section 1E & 2E	P2-4	Bus-Tie-Breaker	**0.71**	0.99	0.94	1.03	1.02	**0.73**	1.01	**0.90**	0.97	1.03	1.01	0.92	Project: North of Mesa Upgrades (On Hold) In-service date: TBD Short term: Action plan
GOLDTREE 115 kV	MESA-PGE 115kV - Section 2D & 1D	P2-4	Bus-Tie-Breaker	0.91	0.93	**0.87**	1.03	1.03	0.99	0.98	**0.88**	**0.89**	1.03	0.92	**0.86**	Project: North of Mesa Upgrades (On Hold) In-service date: TBD Short term: Action plan
GOLDTREE 115 kV	MORROBAY 230kV - Section 1E & 2E	P2-4	Bus-Tie-Breaker	**0.70**	0.99	0.93	1.03	1.02	**0.71**	1.01	**0.90**	0.97	1.03	1.02	0.92	Project: North of Mesa Upgrades (On Hold) In-service date: TBD Short term: Action plan
LOMPCJ2 115 kV	MORROBAY 230kV - Section 1E & 2E	P2-4	Bus-Tie-Breaker	NA	1.00	0.94	1.01	1.01	**0.46**	1.03	**0.89**	0.98	1.02	1.02	0.92	Project: North of Mesa Upgrades (On Hold) In-service date: TBD Short term: Action plan
MANVILLE 115 kV	MORROBAY 230kV - Section 1E & 2E	P2-4	Bus-Tie-Breaker	**NA**	1.00	0.93	1.01	1.01	**0.46**	1.02	**0.89**	0.98	1.01	1.02	0.92	Project: North of Mesa Upgrades (On Hold) In-service date: TBD Short term: Action plan

Study Area: PG&E Central Coast
PG&E Los Padres

High/Low Voltages

Substation	Contingency (All and Worst P6)	Category	Category Description	Voltage PU (Baseline Scenarios)								Voltage PU (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Winter Peak	2024 Winter Peak	2029 Winter Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	2029 Retirement of QF Generations	
MESA PGE 230 kV	MORROBAY 230kV - Section 1E & 2E	P2-4	Bus-Tie-Breaker	0.36	0.97	0.90	1.04	1.01	0.47	1.02	0.86	0.94	1.02	0.98	0.88	Project: North of Mesa Upgrades (On Hold) In-service date: TBD Short term: Action plan
OCEANO 115 kV	MESA-PGE 115kV - Section 2D & 1D	P2-4	Bus-Tie-Breaker	0.87	0.89	0.81	1.03	1.03	0.96	0.95	0.82	0.85	1.03	0.89	0.80	Project: North of Mesa Upgrades (On Hold) In-service date: TBD Short term: Action plan
OCEANO 115 kV	MORROBAY 230kV - Section 1E & 2E	P2-4	Bus-Tie-Breaker	0.64	1.01	0.94	1.03	1.03	0.56	1.03	0.90	0.99	1.03	1.03	0.92	Project: North of Mesa Upgrades (On Hold) In-service date: TBD Short term: Action plan
PALMR 115 kV	MESA-PGE 115kV - Section 2D & 1D	P2-4	Bus-Tie-Breaker	0.62	0.72	0.55	0.99	1.03	0.88	0.89	0.57	0.58	1.02	0.53	0.55	Project: North of Mesa Upgrades (On Hold) In-service date: TBD Short term: Action plan
PURISIMA 115 kV	MORROBAY 230kV - Section 1E & 2E	P2-4	Bus-Tie-Breaker	NA	1.01	0.94	1.01	1.01	0.46	1.03	0.89	0.98	1.02	1.02	0.92	Project: North of Mesa Upgrades (On Hold) In-service date: TBD Short term: Action plan
PURSMAJ1 115 kV	MORROBAY 230kV - Section 1E & 2E	P2-4	Bus-Tie-Breaker	NA	1.01	0.94	1.01	1.01	0.46	1.03	0.89	0.98	1.02	1.02	0.92	Project: North of Mesa Upgrades (On Hold) In-service date: TBD Short term: Action plan
S.M.ASSO 115 kV	MESA-PGE 115kV - Section 2D & 1D	P2-4	Bus-Tie-Breaker	0.63	0.73	0.56	0.99	1.02	0.88	0.89	0.58	0.59	1.02	0.56	0.55	Project: North of Mesa Upgrades (On Hold) In-service date: TBD Short term: Action plan
S.YNZ JT 115 kV	MESA-PGE 115kV - Section 2D & 1D	P2-4	Bus-Tie-Breaker	0.60	0.72	0.52	0.99	1.04	0.87	0.90	0.55	0.58	1.03	0.45	0.52	Project: North of Mesa Upgrades (On Hold) In-service date: TBD Short term: Action plan
S.YNZ JT 115 kV	MORROBAY 230kV - Section 1E & 2E	P2-4	Bus-Tie-Breaker	0.34	1.02	0.94	1.02	1.02	0.48	1.04	0.90	1.00	1.03	1.02	0.92	Project: North of Mesa Upgrades (On Hold) In-service date: TBD Short term: Action plan
SISQUOC 115 kV	MESA-PGE 115kV - Section 2D & 1D	P2-4	Bus-Tie-Breaker	0.63	0.73	0.56	0.99	1.02	0.88	0.89	0.58	0.59	1.02	0.57	0.55	Project: North of Mesa Upgrades (On Hold) In-service date: TBD Short term: Action plan
SN LS OB 115 kV	MESA-PGE 115kV - Section 2D & 1D	P2-4	Bus-Tie-Breaker	0.89	0.91	0.84	1.03	1.03	0.98	0.97	0.85	0.87	1.03	0.90	0.84	Project: North of Mesa Upgrades (On Hold) In-service date: TBD Short term: Action plan
SN LS OB 115 kV	MORROBAY 230kV - Section 1E & 2E	P2-4	Bus-Tie-Breaker	0.67	1.00	0.93	1.03	1.03	0.69	1.02	0.90	0.98	1.03	1.01	0.92	Project: North of Mesa Upgrades (On Hold) In-service date: TBD Short term: Action plan
SNTA MRA 115 kV	MESA-PGE 115kV - Section 2D & 1D	P2-4	Bus-Tie-Breaker	0.66	0.74	0.59	1.00	1.02	0.88	0.88	0.61	0.62	1.01	0.63	0.58	Project: North of Mesa Upgrades (On Hold) In-service date: TBD Short term: Action plan
SNTA YNZ 115 kV	MESA-PGE 115kV - Section 2D & 1D	P2-4	Bus-Tie-Breaker	0.59	0.72	0.52	0.99	1.04	0.87	0.90	0.55	0.58	1.03	0.44	0.52	Project: North of Mesa Upgrades (On Hold) In-service date: TBD Short term: Action plan
SNTA YNZ 115 kV	MORROBAY 230kV - Section 1E & 2E	P2-4	Bus-Tie-Breaker	0.34	1.02	0.94	1.02	1.02	0.47	1.04	0.90	1.00	1.03	1.02	0.92	Project: North of Mesa Upgrades (On Hold) In-service date: TBD Short term: Action plan
SURF 115 kV	MORROBAY 230kV - Section 1E & 2E	P2-4	Bus-Tie-Breaker	NA	1.02	0.94	1.01	1.02	0.47	1.04	0.89	1.00	1.02	1.02	0.92	Project: North of Mesa Upgrades (On Hold) In-service date: TBD Short term: Action plan

Study Area: PG&E Central Coast
PG&E Los Padres

High/Low Voltages

Substation	Contingency (All and Worst P6)	Category	Category Description	Voltage PU (Baseline Scenarios)								Voltage PU (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Winter Peak	2024 Winter Peak	2029 Winter Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	2029 Retirement of QF Generations	
SW149CBOSNYZ 115 kV	MESA-PGE 115kV - Section 2D & 1D	P2-4	Bus-Tie-Breaker	0.59	0.73	0.53	0.99	1.05	0.87	0.91	0.55	0.58	1.03	0.41	0.52	Project: North of Mesa Upgrades (On Hold) In-service date: TBD Short term: Action plan
SW149MANVLTA 115 kV	MORROBAY 230kV - Section 1E & 2E	P2-4	Bus-Tie-Breaker	NA	1.00	0.94	1.01	1.01	0.46	1.03	0.89	0.98	1.01	1.02	0.92	Project: North of Mesa Upgrades (On Hold) In-service date: TBD Short term: Action plan
UNIONOIL 115 kV	MESA-PGE 115kV - Section 2D & 1D	P2-4	Bus-Tie-Breaker	0.86	0.89	0.81	1.03	1.03	0.96	0.95	0.82	0.84	1.03	0.89	0.80	Project: North of Mesa Upgrades (On Hold) In-service date: TBD Short term: Action plan
ZACA 115 kV	MESA-PGE 115kV - Section 2D & 1D	P2-4	Bus-Tie-Breaker	0.61	0.72	0.53	0.99	1.04	0.87	0.90	0.55	0.58	1.03	0.48	0.53	Project: North of Mesa Upgrades (On Hold) In-service date: TBD Short term: Action plan
ZACA 115 kV	MORROBAY 230kV - Section 1E & 2E	P2-4	Bus-Tie-Breaker	0.35	1.02	0.94	1.02	1.02	0.48	1.04	0.90	1.00	1.03	1.02	0.92	Project: North of Mesa Upgrades (On Hold) In-service date: TBD Short term: Action plan
SALINAS 115 kV	Salinas 115kV BAAH Bus #2 (failure of non-redundent relay)	P5	Non-Redundant Relay	-5.51	-5.50	-5.61	0.45	0.46	0.25	-4.95	0.21	-5.85	0.50	0.31	-5.61	Protection Upgrade
AECCEOR 115 kV	MESA PGE 230/115kV TB 2 & MESA PGE 230/115kV TB 3	P6	N-1-1	0.52	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	Project: South of Mesa Upgrades In-service date: 2023 Short term: Action plan
AECCEOR 115 kV	MESA PGE 230/115kV TB 3 & MESA PGE 230/115kV TB 2	P6	N-1-1	0.52	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	Project: South of Mesa Upgrades In-service date: 2023 Short term: Action plan
BUELLTON 115 kV	MESA PGE 230/115kV TB 2 & MESA PGE 230/115kV TB 3	P6	N-1-1	0.51	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	Project: South of Mesa Upgrades In-service date: 2023 Short term: Action plan
BUELLTON 115 kV	MESA PGE 230/115kV TB 3 & MESA PGE 230/115kV TB 2	P6	N-1-1	0.51	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	Project: South of Mesa Upgrades In-service date: 2023 Short term: Action plan
CABRILLO 115 kV	MESA PGE 230/115kV TB 2 & MESA PGE 230/115kV TB 3	P6	N-1-1	0.51	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	Project: South of Mesa Upgrades In-service date: 2023 Short term: Action plan
CABRILLO 115 kV	MESA PGE 230/115kV TB 3 & MESA PGE 230/115kV TB 2	P6	N-1-1	0.51	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	Project: South of Mesa Upgrades In-service date: 2023 Short term: Action plan
CALLENDERSS 115 kV	CALLENDAR SW STA-MESA 115kV & P1-3:A20:10:_MORROBAY 230/115kV TB 6	P6	N-1-1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	0.88	sensitivity only
CALLENDERSS 115 kV	MESA PGE 230/115kV TB 2 & MESA PGE 230/115kV TB 3	P6	N-1-1	0.79	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	Project: South of Mesa Upgrades In-service date: 2023 Short term: Action plan
CALLENDERSS 115 kV	MESA PGE 230/115kV TB 3 & MESA PGE 230/115kV TB 2	P6	N-1-1	0.79	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	Project: South of Mesa Upgrades In-service date: 2023 Short term: Action plan
CALLENDERSS 115 kV	MORROBAY 230/115kV TB 6 & P1-2:A20:9:_CALLENDAR SW STA-MESA 115kV	P6	N-1-1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	0.91	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	0.89	sensitivity only

Study Area: PG&E Central Coast
PG&E Los Padres

High/Low Voltages

Substation	Contingency (All and Worst P6)	Category	Category Description	Voltage PU (Baseline Scenarios)								Voltage PU (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Winter Peak	2024 Winter Peak	2029 Winter Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	2029 Retirement of QF Generations	
CMP EVRS 115 kV	MOSS LANDING-GREEN VALLEY #1 115kV & MOSS LANDING-GREEN VALLEY #2 115kV	P6	N-1-1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	1.10	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	Continue to monitor
CMP EVRS 115 kV	MOSS LANDING-GREEN VALLEY #1 115kV & P1-2:A19:34:_MOSS LANDING-GREEN VALLEY #2 115kV	P6	N-1-1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	1.12	>0.9,<1.1	>0.9,<1.1	sensitivity only
CMP EVRS 115 kV	MOSS LANDING-GREEN VALLEY #2 115kV & MOSS LANDING-GREEN VALLEY #1 115kV	P6	N-1-1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	1.10	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	Continue to monitor
CMP EVRS 115 kV	MOSS LANDING-GREEN VALLEY #2 115kV & P1-2:A19:33:_MOSS LANDING-GREEN VALLEY #1 115kV	P6	N-1-1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	1.12	>0.9,<1.1	>0.9,<1.1	Continue to monitor
DIVVIDE 115 kV	MESA-DIVIDE #1 115kV & MESA-DIVIDE #2 115kV	P6	N-1-1	>0.9,<1.1	>0.9,<1.1	0.90	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	Project: South of Mesa Upgrades In-service date: 2023 Short term: Action plan
DIVVIDE 115 kV	MESA-DIVIDE #2 115kV & MESA-DIVIDE #1 115kV	P6	N-1-1	>0.9,<1.1	>0.9,<1.1	0.90	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	Project: South of Mesa Upgrades In-service date: 2023 Short term: Action plan
FAIRWAY 115 kV	MESA PGE 230/115kV TB 2 & MESA PGE 230/115kV TB 3	P6	N-1-1	0.57	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	Project: South of Mesa Upgrades In-service date: 2023 Short term: Action plan
FAIRWAY 115 kV	MESA PGE 230/115kV TB 2 & P1-3:A20:9:_MESA PGE 230/115kV TB 3	P6	N-1-1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	1.16	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	Project: South of Mesa Upgrades In-service date: 2023 Short term: Action plan
FAIRWAY 115 kV	MESA PGE 230/115kV TB 3 & MESA PGE 230/115kV TB 2	P6	N-1-1	0.57	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	Project: South of Mesa Upgrades In-service date: 2023 Short term: Action plan
FAIRWAY 115 kV	MESA PGE 230/115kV TB 3 & P1-3:A20:8:_MESA PGE 230/115kV TB 2	P6	N-1-1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	1.16	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	Project: South of Mesa Upgrades In-service date: 2023 Short term: Action plan
FOOTHILL 115 kV	MESA PGE 230/115kV TB 2 & MESA PGE 230/115kV TB 3	P6	N-1-1	0.84	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	Project: South of Mesa Upgrades In-service date: 2023 Short term: Action plan
FOOTHILL 115 kV	MESA PGE 230/115kV TB 3 & MESA PGE 230/115kV TB 2	P6	N-1-1	0.84	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	Project: South of Mesa Upgrades In-service date: 2023 Short term: Action plan
GAREY 115 kV	MESA PGE 230/115kV TB 2 & MESA PGE 230/115kV TB 3	P6	N-1-1	0.54	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	Project: South of Mesa Upgrades In-service date: 2023 Short term: Action plan
GAREY 115 kV	MESA PGE 230/115kV TB 3 & MESA PGE 230/115kV TB 2	P6	N-1-1	0.54	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	Project: South of Mesa Upgrades In-service date: 2023 Short term: Action plan
GOLDTREE 115 kV	MESA PGE 230/115kV TB 2 & MESA PGE 230/115kV TB 3	P6	N-1-1	0.84	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	Project: South of Mesa Upgrades In-service date: 2023 Short term: Action plan
GOLDTREE 115 kV	MESA PGE 230/115kV TB 3 & MESA PGE 230/115kV TB 2	P6	N-1-1	0.84	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	Project: South of Mesa Upgrades In-service date: 2023 Short term: Action plan

Study Area: PG&E Central Coast
PG&E Los Padres

High/Low Voltages

Substation	Contingency (All and Worst P6)	Category	Category Description	Voltage PU (Baseline Scenarios)								Voltage PU (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Winter Peak	2024 Winter Peak	2029 Winter Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	2029 Retirement of QF Generations	
GRN VLLY 115 kV	MOSS LANDING-GREEN VALLEY #1 115kV & P1-2:A19:34:_MOSS LANDING-GREEN VALLEY #2 115kV	P6	N-1-1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	1.12	>0.9,<1.1	>0.9,<1.1	sensitivity only
GRN VLLY 115 kV	MOSS LANDING-GREEN VALLEY #2 115kV & P1-2:A19:33:_MOSS LANDING-GREEN VALLEY #1 115kV	P6	N-1-1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	1.12	>0.9,<1.1	>0.9,<1.1	sensitivity only
M 115 kV	MOSS LANDING-GREEN VALLEY #1 115kV & MOSS LANDING-GREEN VALLEY #2 115kV	P6	N-1-1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	1.10	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	Continue to monitor
M 115 kV	MOSS LANDING-GREEN VALLEY #1 115kV & P1-2:A19:34:_MOSS LANDING-GREEN VALLEY #2 115kV	P6	N-1-1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	1.12	>0.9,<1.1	>0.9,<1.1	sensitivity only
M 115 kV	MOSS LANDING-GREEN VALLEY #2 115kV & MOSS LANDING-GREEN VALLEY #1 115kV	P6	N-1-1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	1.10	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	Continue to monitor
M 115 kV	MOSS LANDING-GREEN VALLEY #2 115kV & P1-2:A19:33:_MOSS LANDING-GREEN VALLEY #1 115kV	P6	N-1-1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	1.12	>0.9,<1.1	>0.9,<1.1	sensitivity only
MANVILLE 115 kV	MESA-DIVIDE #1 115kV & MESA-DIVIDE #2 115kV	P6	N-1-1	>0.9,<1.1	>0.9,<1.1	0.88	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	Project: South of Mesa Upgrades In-service date: 2023 Short term: Action plan
MANVILLE 115 kV	MESA-DIVIDE #1 115kV & P1-2:A20:21:_MESA-DIVIDE #2 115kV	P6	N-1-1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	0.89	sensitivity only
MANVILLE 115 kV	MESA-DIVIDE #2 115kV & MESA-DIVIDE #1 115kV	P6	N-1-1	>0.9,<1.1	>0.9,<1.1	0.88	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	Project: South of Mesa Upgrades In-service date: 2023 Short term: Action plan
MANVILLE 115 kV	MESA-DIVIDE #2 115kV & P1-2:A20:20:_MESA-DIVIDE #1 115kV	P6	N-1-1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	0.89	sensitivity only
MANVILLE 115 kV	MESA-PGE SVD=v & P1-2:A20:25:_MORRO BAY-MESA 230kV	P6	N-1-1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	0.91	0.92	>0.9,<1.1	>0.9,<1.1	0.90	sensitivity only
MESA PGE 230 kV	MESA-PGE SVD=v & MORRO BAY-MESA 230kV	P6	N-1-1	0.89	>0.9,<1.1	0.88	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	Project: South of Mesa Upgrades In-service date: 2023 Short term: Action plan
MESA PGE 230 kV	MESA-PGE SVD=v & P1-2:A20:25:_MORRO BAY-MESA 230kV	P6	N-1-1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	0.89	0.90	>0.9,<1.1	>0.9,<1.1	0.87	Project: South of Mesa Upgrades In-service date: 2023 Short term: Action plan
MESA PGE 230 kV	MORRO BAY-MESA 230kV & MESA-PGE SVD=v	P6	N-1-1	0.92	0.91	0.89	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	Project: South of Mesa Upgrades In-service date: 2023 Short term: Action plan
MESA PGE 230 kV	MORRO BAY-MESA 230kV & P1-4:A20:4:_MESA-PGE SVD=v	P6	N-1-1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	0.89	0.91	>0.9,<1.1	>0.9,<1.1	0.89	Project: South of Mesa Upgrades In-service date: 2023 Short term: Action plan
MESA_PGE 115 kV	MESA PGE 230/115kV TB 2 & MESA PGE 230/115kV TB 3	P6	N-1-1	0.58	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	Project: South of Mesa Upgrades In-service date: 2023 Short term: Action plan
MESA_PGE 115 kV	MESA PGE 230/115kV TB 2 & P1-3:A20:9:_MESA PGE 230/115kV TB 3	P6	N-1-1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	1.16	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	Project: South of Mesa Upgrades In-service date: 2023 Short term: Action plan

Study Area: PG&E Central Coast
PG&E Los Padres

High/Low Voltages

Substation	Contingency (All and Worst P6)	Category	Category Description	Voltage PU (Baseline Scenarios)								Voltage PU (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Winter Peak	2024 Winter Peak	2029 Winter Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	2029 Retirement of QF Generations	
MESA_PGE 115 kV	MESA PGE 230/115kV TB 3 & MESA PGE 230/115kV TB 2	P6	N-1-1	0.58	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	Project: South of Mesa Upgrades In-service date: 2023 Short term: Action plan
MESA_PGE 115 kV	MESA PGE 230/115kV TB 3 & P1-3:A20:8:_MESA PGE 230/115kV TB 2	P6	N-1-1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	1.16	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	Project: South of Mesa Upgrades In-service date: 2023 Short term: Action plan
MORRO BY 115 kV	MESA PGE 230/115kV TB 2 & MESA PGE 230/115kV TB 3	P6	N-1-1	0.89	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	Project: South of Mesa Upgrades In-service date: 2023 Short term: Action plan
MORRO BY 115 kV	MESA PGE 230/115kV TB 3 & MESA PGE 230/115kV TB 2	P6	N-1-1	0.89	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	Project: South of Mesa Upgrades In-service date: 2023 Short term: Action plan
OCEANO 115 kV	CALLENDAR SW STA-MESA 115kV & P1-3:A20:10:_MORROBAY 230/115kV TB 6	P6	N-1-1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	0.89	sensitivity only
OCEANO 115 kV	MESA PGE 230/115kV TB 2 & MESA PGE 230/115kV TB 3	P6	N-1-1	0.79	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	Project: South of Mesa Upgrades In-service date: 2023 Short term: Action plan
OCEANO 115 kV	MESA PGE 230/115kV TB 3 & MESA PGE 230/115kV TB 2	P6	N-1-1	0.79	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	Project: South of Mesa Upgrades In-service date: 2023 Short term: Action plan
OCEANO 115 kV	MORROBAY 230/115kV TB 6 & P1-2:A20:9:_CALLENDAR SW STA-MESA 115kV	P6	N-1-1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	0.91	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	0.89	sensitivity only
PALMR 115 kV	MESA PGE 230/115kV TB 2 & MESA PGE 230/115kV TB 3	P6	N-1-1	0.53	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	Project: South of Mesa Upgrades In-service date: 2023 Short term: Action plan
PALMR 115 kV	MESA PGE 230/115kV TB 3 & MESA PGE 230/115kV TB 2	P6	N-1-1	0.53	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	Project: South of Mesa Upgrades In-service date: 2023 Short term: Action plan
PAUL SWT 115 kV	MOSS LANDING-GREEN VALLEY #1 115kV & MOSS LANDING-GREEN VALLEY #2 115kV	P6	N-1-1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	1.10	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	Continue to monitor
PAUL SWT 115 kV	MOSS LANDING-GREEN VALLEY #1 115kV & P1-2:A19:34:_MOSS LANDING-GREEN VALLEY #2 115kV	P6	N-1-1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	1.12	>0.9,<1.1	>0.9,<1.1	sensitivity only
PAUL SWT 115 kV	MOSS LANDING-GREEN VALLEY #2 115kV & MOSS LANDING-GREEN VALLEY #1 115kV	P6	N-1-1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	1.10	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	Continue to monitor
PAUL SWT 115 kV	MOSS LANDING-GREEN VALLEY #2 115kV & P1-2:A19:33:_MOSS LANDING-GREEN VALLEY #1 115kV	P6	N-1-1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	1.12	>0.9,<1.1	>0.9,<1.1	sensitivity only
PURISIMA 115 kV	MESA-DIVIDE #1 115kV & MESA-DIVIDE #2 115kV	P6	N-1-1	>0.9,<1.1	>0.9,<1.1	0.89	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	Project: South of Mesa Upgrades In-service date: 2023 Short term: Action plan
PURISIMA 115 kV	MESA-DIVIDE #1 115kV & P1-2:A20:21:_MESA-DIVIDE #2 115kV	P6	N-1-1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	0.89	sensitivity only

Study Area: PG&E Central Coast
PG&E Los Padres

High/Low Voltages

Substation	Contingency (All and Worst P6)	Category	Category Description	Voltage PU (Baseline Scenarios)								Voltage PU (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Winter Peak	2024 Winter Peak	2029 Winter Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	2029 Retirement of QF Generations	
PURISIMA 115 kV	MESA-DIVIDE #2 115kV & MESA-DIVIDE #1 115kV	P6	N-1-1	>0.9,<1.1	>0.9,<1.1	0.89	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	Project: South of Mesa Upgrades In-service date: 2023 Short term: Action plan
PURISIMA 115 kV	MESA-DIVIDE #2 115kV & P1-2:A20:20:_MESA-DIVIDE #1 115kV	P6	N-1-1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	0.89	sensitivity only
ROB ROY 115 kV	MOSS LANDING-GREEN VALLEY #1 115kV & P1-2:A19:34:_MOSS LANDING-GREEN VALLEY #2 115kV	P6	N-1-1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	1.12	>0.9,<1.1	>0.9,<1.1	sensitivity only
ROB ROY 115 kV	MOSS LANDING-GREEN VALLEY #2 115kV & P1-2:A19:33:_MOSS LANDING-GREEN VALLEY #1 115kV	P6	N-1-1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	1.12	>0.9,<1.1	>0.9,<1.1	sensitivity only
S.M.ASSO 115 kV	MESA PGE 230/115kV TB 2 & MESA PGE 230/115kV TB 3	P6	N-1-1	0.56	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	Project: South of Mesa Upgrades In-service date: 2023 Short term: Action plan
S.M.ASSO 115 kV	MESA PGE 230/115kV TB 2 & P1-3:A20:9:_MESA PGE 230/115kV TB 3	P6	N-1-1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	1.13	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	Project: South of Mesa Upgrades In-service date: 2023 Short term: Action plan
S.M.ASSO 115 kV	MESA PGE 230/115kV TB 3 & MESA PGE 230/115kV TB 2	P6	N-1-1	0.56	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	Project: South of Mesa Upgrades In-service date: 2023 Short term: Action plan
S.M.ASSO 115 kV	MESA PGE 230/115kV TB 3 & P1-3:A20:8:_MESA PGE 230/115kV TB 2	P6	N-1-1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	1.13	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	Project: South of Mesa Upgrades In-service date: 2023 Short term: Action plan
SISQUOC 115 kV	MESA PGE 230/115kV TB 2 & MESA PGE 230/115kV TB 3	P6	N-1-1	0.54	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	Project: South of Mesa Upgrades In-service date: 2023 Short term: Action plan
SISQUOC 115 kV	MESA PGE 230/115kV TB 3 & MESA PGE 230/115kV TB 2	P6	N-1-1	0.54	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	Project: South of Mesa Upgrades In-service date: 2023 Short term: Action plan
SN LS OB 115 kV	MESA PGE 230/115kV TB 2 & MESA PGE 230/115kV TB 3	P6	N-1-1	0.81	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	Project: South of Mesa Upgrades In-service date: 2023 Short term: Action plan
SN LS OB 115 kV	MESA PGE 230/115kV TB 3 & MESA PGE 230/115kV TB 2	P6	N-1-1	0.81	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	Project: South of Mesa Upgrades In-service date: 2023 Short term: Action plan
SNTA MRA 115 kV	MESA PGE 230/115kV TB 2 & MESA PGE 230/115kV TB 3	P6	N-1-1	0.55	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	Project: South of Mesa Upgrades In-service date: 2023 Short term: Action plan
SNTA MRA 115 kV	MESA PGE 230/115kV TB 3 & MESA PGE 230/115kV TB 2	P6	N-1-1	0.55	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	Project: South of Mesa Upgrades In-service date: 2023 Short term: Action plan
SNTA MRA 115 kV	MORRO BAY-DIABLO 230kV & MORRO BAY-MESA 230kV	P6	N-1-1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	0.88	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	Project: South of Mesa Upgrades In-service date: 2023 Short term: Action plan
SNTA YNZ 115 kV	MESA PGE 230/115kV TB 2 & MESA PGE 230/115kV TB 3	P6	N-1-1	0.51	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	Project: South of Mesa Upgrades In-service date: 2023 Short term: Action plan

Study Area: PG&E Central Coast
PG&E Los Padres

High/Low Voltages

Substation	Contingency (All and Worst P6)	Category	Category Description	Voltage PU (Baseline Scenarios)								Voltage PU (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Winter Peak	2024 Winter Peak	2029 Winter Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	2029 Retirement of QF Generations	
SNTA YNZ 115 kV	MESA PGE 230/115kV TB 3 & MESA PGE 230/115kV TB 2	P6	N-1-1	**0.51**	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	Project: South of Mesa Upgrades In-service date: 2023 Short term: Action plan
SW149CBOSNYZ115 kV	MESA PGE 230/115kV TB 2 & MESA PGE 230/115kV TB 3	P6	N-1-1	**0.51**	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	Project: South of Mesa Upgrades In-service date: 2023 Short term: Action plan
SW149CBOSNYZ115 kV	MESA PGE 230/115kV TB 3 & MESA PGE 230/115kV TB 2	P6	N-1-1	**0.51**	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	Project: South of Mesa Upgrades In-service date: 2023 Short term: Action plan
SW149MANVLTA115 kV	MESA-DIVIDE #1 115kV & MESA-DIVIDE #2 115kV	P6	N-1-1	>0.9,<1.1	>0.9,<1.1	**0.89**	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	Project: South of Mesa Upgrades In-service date: 2023 Short term: Action plan
SW149MANVLTA115 kV	MESA-DIVIDE #1 115kV & P1-2:A20:21:_MESA-DIVIDE #2 115kV	P6	N-1-1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	**0.89**	sensitivity only
SW149MANVLTA115 kV	MESA-DIVIDE #2 115kV & MESA-DIVIDE #1 115kV	P6	N-1-1	>0.9,<1.1	>0.9,<1.1	**0.89**	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	Project: South of Mesa Upgrades In-service date: 2023 Short term: Action plan
SW149MANVLTA115 kV	MESA-DIVIDE #2 115kV & P1-2:A20:20:_MESA-DIVIDE #1 115kV	P6	N-1-1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	**0.89**	sensitivity only
SW149MANVLTA115 kV	MESA-PGE SVD=v & P1-2:A20:25:_MORRO BAY-MESA 230kV	P6	N-1-1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	0.92	0.92	>0.9,<1.1	>0.9,<1.1	**0.90**	sensitivity only
UNIONOIL 115 kV	CALLENDAR SW STA-MESA 115kV & P1-3:A20:10:_MORROBAY 230/115kV TB 6	P6	N-1-1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	**0.88**	sensitivity only
UNIONOIL 115 kV	MESA PGE 230/115kV TB 2 & MESA PGE 230/115kV TB 3	P6	N-1-1	**0.79**	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	Project: South of Mesa Upgrades In-service date: 2023 Short term: Action plan
UNIONOIL 115 kV	MESA PGE 230/115kV TB 3 & MESA PGE 230/115kV TB 2	P6	N-1-1	**0.79**	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	Project: South of Mesa Upgrades In-service date: 2023 Short term: Action plan
UNIONOIL 115 kV	MORROBAY 230/115kV TB 6 & P1-2:A20:9:_CALLENDAR SW STA-MESA 115kV	P6	N-1-1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	0.91	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	**0.89**	sensitivity only
ZACA 115 kV	MESA PGE 230/115kV TB 2 & MESA PGE 230/115kV TB 3	P6	N-1-1	**0.52**	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	Project: South of Mesa Upgrades In-service date: 2023 Short term: Action plan
ZACA 115 kV	MESA PGE 230/115kV TB 3 & MESA PGE 230/115kV TB 2	P6	N-1-1	**0.52**	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	>0.9,<1.1	Project: South of Mesa Upgrades In-service date: 2023 Short term: Action plan
CMP EVRS 115 kV	Moss Landing - Green Valley #1 and #2 115 kV Lines	P7	DCTL	1.04	1.04	1.03	1.10	1.10	1.05	1.05	1.00	1.04	**1.12**	1.05	1.03	sensitivity only
GRN VLLY 115 kV	Moss Landing - Green Valley #1 and #2 115 kV Lines	P7	DCTL	1.04	1.04	1.02	1.10	1.09	1.05	1.04	1.00	1.04	**1.12**	1.05	1.02	sensitivity only
M 115 kV	Moss Landing - Green Valley #1 and #2 115 kV Lines	P7	DCTL	1.03	1.03	1.03	1.10	1.10	1.05	1.05	1.00	1.03	**1.12**	1.05	1.03	sensitivity only
PAUL SWT 115 kV	Moss Landing - Green Valley #1 and #2 115 kV Lines	P7	DCTL	1.03	1.03	1.03	1.10	1.10	1.05	1.05	1.00	1.03	**1.12**	1.05	1.03	sensitivity only
ROB ROY 115 kV	Moss Landing - Green Valley #1 and #2 115 kV Lines	P7	DCTL	1.04	1.04	1.03	1.10	1.09	1.05	1.04	1.00	1.04	**1.12**	1.05	1.03	sensitivity only

Study Area: PG&E Central Coast
PG&E Los Padres

Voltage Deviation

Substation	Contingency (All and Worst P6)	Category	Category Description	Post Cont. Voltage Deviation % (Baseline Scenarios)								Post Cont. Voltage Deviation % (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Winter Peak	2024 Winter Peak	2029 Winter Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	2029 Retirement of QF Generations	
AGRILINK 60 kV	GRN VLLY 115/60kV TB 1	P1	N-1	14	14	9	14	12	12	13	8	10	12	13	9	Load power factor correction and voltage support if needed
BRIGTANO 60 kV	GREEN VALLEY-WATSONVILLE 60kV	P1	N-1	9	9	9	9	8	8	8	5	9	8	8	8	Load power factor correction and voltage support if needed
BRIGTANO 60 kV	GRN VLLY 115/60kV TB 1	P1	N-1	9	9	6	9	8	8	9	5	7	8	9	6	Load power factor correction and voltage support if needed
CIC JCT 60 kV	GRN VLLY 115/60kV TB 1	P1	N-1	14	14	10	14	12	13	13	9	10	12	13	10	Load power factor correction and voltage support if needed
ERTA 60 kV	GRN VLLY 115/60kV TB 1	P1	N-1	15	14	10	14	13	13	14	9	11	13	14	10	Load power factor correction and voltage support if needed
ERTA JCT 60 kV	GRN VLLY 115/60kV TB 1	P1	N-1	15	14	10	14	13	13	14	9	11	13	14	10	Load power factor correction and voltage support if needed
GRANT JT 60 kV	GREEN VALLEY-WATSONVILLE 60kV	P1	N-1	9	9	9	9	8	8	9	5	9	8	8	9	Load power factor correction and voltage support if needed
GRANT JT 60 kV	GRN VLLY 115/60kV TB 1	P1	N-1	9	9	6	9	8	8	9	6	7	8	9	6	Load power factor correction and voltage support if needed
GRANT RK 60 kV	GREEN VALLEY-WATSONVILLE 60kV	P1	N-1	9	9	9	9	8	8	9	5	9	8	8	9	Load power factor correction and voltage support if needed
GRANT RK 60 kV	GRN VLLY 115/60kV TB 1	P1	N-1	9	9	6	9	8	8	9	6	7	8	9	6	Load power factor correction and voltage support if needed
GREN VLY 60 kV	GRN VLLY 115/60kV TB 1	P1	N-1	15	15	11	15	14	14	15	10	11	14	14	11	Load power factor correction and voltage support if needed
PSA RBLS 70 kV	PASO ROBLES-TEMPLETON 70kV	P1	N-1	29	0	2	2	0	20	1	1	1	0	16	1	Project: Estrella In Service Date: Nov 2023 Short term: Action Plan
SAN MIGL 70 kV	PASO ROBLES-TEMPLETON 70kV	P1	N-1	25	0	1	2	0	17	0	1	0	0	13	1	Project: Estrella In Service Date: Nov 2023 Short term: Action Plan
SAN MIGL 70 kV	SAN MIGL-ESTRELLA #1 70kV	P1	N-1	NA	9	9	NA	2	NA	4	9	9	2	NA	8	Project: Estrella In Service Date: Nov 2023 Short term: Action Plan
SAN MIGL 70 kV	SAN MIGUEL-PASO ROBLES 70kV	P1	N-1	9	NA	NA	4	NA	6	NA	NA	NA	NA	4	NA	Project: Estrella In Service Date: Nov 2023 Short term: Action Plan
WTSNVLLE 60 kV	GREEN VALLEY-WATSONVILLE 60kV	P1	N-1	13	13	13	13	12	12	13	7	13	12	12	13	Load power factor correction and voltage support if needed
WTSNVLLE 60 kV	GRN VLLY 115/60kV TB 1	P1	N-1	14	14	9	13	12	12	13	8	10	12	13	9	Load power factor correction and voltage support if needed

Study Area: PG&E Central Coast
PG&E Los Padres

Transient Stability

Contingency	Category	Category Description	Transient Stability Performance					Potential Mitigation Solutions
			Baseline Scenarios			Sensitivity Scenarios		
			2024 Summer Peak	2029 Summer Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	
Diablo 3Ø fault with normal clearing.	P1-1	N-1	No issue	No issue	No issue	No issue	No issue	No Violation
Mosslanding Sw Station 3Ø fault with normal clearing.	P1-2	N-1	No issue	No issue	No issue	No issue	No issue	No Violation
Mosslanding Sw Station 230/115 kV Bank #4 3Ø fault with normal clearing.	P1-3	N-1	No issue	No issue	No issue	No issue	No issue	No Violation
Mesa 115 kv SVD 3Ø fault with normal clearing.	P1-4	N-1	No issue	No issue	No issue	No issue	No issue	No Violation
Mosslanding Sw Sta 230 kV line breaker SLG fault with normal clearing.	P2-3	Non-Bus-Tie Breaker	No issue	No issue	No issue	No issue	No issue	No Violation
Mosslanding Sw Station 115kv bus-tie breaker SLG fault with normal clearing.	P2-4	Bus-Tie Breaker	No issue	No issue	WECC criteria not met	No issue	No issue	Under Review. To be updated in draft TP.
Diablo 1 3Ø fault with normal clearing with Diablo 2 offline in the base case.	P3-1	G-1/N-1	No issue	No issue	No issue	No issue	No issue	No Violation
Mosslndswsta-Lasaguilas 230 kV line 3Ø fault with normal clearing with Diablo Unit #2 offline in the base case.	P3-2	G-1/N-1	No issue	No issue	No issue	No issue	No issue	No Violation
Mosslndswsta 230/115 kVBank # 4 3Ø fault with normal clearing with Diablo Unit #2 offline in the base case.	P3-3	G-1/N-1	No issue	No issue	No issue	No issue	No issue	No Violation
Mesa 115 kV SVD 3Ø fault with normal clearing with Diablo offline in the base case.	P3-4	G-1/N-1	No issue	No issue	No issue	No issue	No issue	No Violation
Duke Moss SLG fault expanded to elements lost due to stuck breaker and clear fault from remote breakers with normal clearing time.	P4-1	Stuck Breaker	No issue	No issue	No issue	No issue	No issue	No Violation
Mosslanding Switching Station SLG fault wih stuck breaker expanded o Mosslnsw-Duke Moss and Mosslndsw-Mecalf	P4-2	Stuck Breaker	No issue	No issue	No issue	No issue	No issue	No Violation
Mosslanding Switching Station #4 115/230 kv transformer SLG fault wih stuck breaker	P4-3	Stuck Breaker	No issue	No issue	No issue	No issue	No issue	No Violation
Mesa 115 kV SVD SLG fault expanded to elements lost due to stuck breaker and clear fault from remote breakers with normal clearing time.	P4-4	Stuck Breaker	No issue	No issue	No issue	No issue	No issue	No Violation
Mosslanding Sw Station 115 kV bus SVD SLG fault expanded to elements lost due to stuck breaker and clear fault from remote breakers with normal clearing time.	P4-5	Stuck Breaker	No issue	No issue	No issue	No issue	No issue	No Violation
Mosslanding Sw Station 115 kV bus-tie breaker SVD SLG fault expanded to elements lost due to stuck breaker and clear fault from remote breakers with normal clearing time.	P4-6	Stuck Breaker	No issue	No issue	WECC criteria not met	No issue	No issue	Under Review. To be updated in draft TP.
Duke Moss #6 unit with delayed clearing	P5-1	Non-Redundant Relay	No issue	No issue	No issue	No issue	No issue	No Violation
Mosslanding Switching Station -Duke Moss 230 KV line SLG Fault with delayed clearing	P5-2	Non-Redundant Relay	No issue	No issue	No issue	No issue	No issue	No Violation

Study Area: PG&E Central Coast
PG&E Los Padres

Transient Stability

Contingency	Category	Category Description	Transient Stability Performance					Potential Mitigation Solutions
			Baseline Scenarios			Sensitivity Scenarios		
			2024 Summer Peak	2029 Summer Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	
Mosslanding Switching Station 230/115 KV Transformer Bank # 4 SLG fault with delayed clearing.	P5-3	Non-Redundant Relay	No issue	No issue	No issue	No issue	No issue	No Violation
Mesa 115 KV SVD SLG fault with delayed clearing.	P5-4	Non-Redundant Relay	No issue	No issue	No issue	No issue	No issue	No Violation
Moss Landing #1 or #2 115 kV bus fault. Delayed clearing due to failure of a non-redundent relay.	P5-5	Non-Redundant Relay	No issue	No issue	No issue	No issue	No issue	No Violation
Mosslndswsta-Coburn 230 kV line 3Ø fault with normal clearing with Metcalf 500/230 kV #13 Transformer offline in the base case.	P6-1	N-1-1	No issue	No issue	No issue	No issue	No issue	No Violation
Mosslndswsta 230 kV bus 3Ø fault with normal clearing with Mosslndswsta 500/230 kV #9 Transformer offline in the base case.	P6-2	N-1-1	No issue	No issue	No issue	No issue	No issue	No Violation
Diablo 230 kV SVD 3Ø fault with normal clearing with Mesa 115 kV SVD offline in the base case.	P6-3	N-1-1	No issue	WECC criteria not met	No issue	No issue	No issue	Under Review. To be updated in draft TP.

Study Area: PG&E Central Coast
PG&E Los Padres

Single Contingency Load Drop

Worst Contingency	Category	Category Description	Amount of Load Drop (MW)										Potential Mitigation Solutions
			Select..	Select..	Select..	Select..	Select..	Select..	Select..	Select..	Select..	Select..	

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

Study Area: PG&E Central Coast
PG&E Los Padres

Single Source Substation with more than 100 MW Load

Substation	Load Served (MW)										Potential Mitigation Solutions
	Select..	Select..	Select..	Select..	Select..	Select..	Select..	Select..	Select..	Select..	

No single source substation with of more than 100 MW

2019-2020 ISO Reliability Assessment - Study Results
Study Area: SCE Bulk
Thermal Overloads

Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Loading % (Baseline Scenarios)					Loading % (Sensitivity Scenarios)			ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	
MW_VINCNT_12 - VINCENT 500 kV	MIDWAY - WIRLWIND No. 3 and MIDWAY - VINCENT No. 2 500 kV lines	P6	N-1-1	120	120	<100	<100	<100	118	<100	<100	Midway-Vincent RAS, System adjustment after first contingency
MW_VINCNT_11 - MW_VINCNT_12	MIDWAY - WIRLWIND No. 3 and MIDWAY - VINCENT No. 2 500 kV lines	P6	N-1-1	126	125	<100	<100	<100	123	<100	<100	Midway-Vincent RAS, System adjustment after first contingency
MW_VINCNT_21 - MW_VINCNT_22	MIDWAY - WIRLWIND No. 3 and MIDWAY - VINCENT No. 1 500 kV lines	P6	N-1-1	129	128	<100	<100	<100	126	<100	<100	Midway-Vincent RAS, System adjustment after first contingency
MW_WRLWND_32 - WIRLWIND 50	MIDWAY - VINCENT No. 1 and MIDWAY - VINCENT No. 2 500 kV lines	P7	DCTL	172	171	<100	<100	<100	169	<100	<100	30 minute line rating is sufficient
MW_WRLWND_31 - MW_WRLWNI	MIDWAY - VINCENT No. 1 and MIDWAY - VINCENT No. 2 500 kV lines	P7	DCTL	110	109	<100	<100	<100	107	<100	<100	Midway-Vincent RAS
ANTELOPE - WIRLWIND 500 kV	ANTELOPE - WINDHUB No. 1 and VINCENT - WIRLWIND No. 3 500 kV lines	P6	N-1-1	<100	<100	<100	<100	<100	<100	<100	105	Sensitivity Only, Re-dispatch resources after initial contingency
MIDWAY- MW_VINCNT_21 500 kV	MIDWAY - WIRLWIND No. 3 and MIDWAY - VINCENT No. 1 500 kV lines	P6	N-1-1	121	121	<100	<100	<100	119	<100	<100	Midway-Vincent RAS, System adjustment after first contingency
MIDWAY - MW_WRLWND_31 500 I	MIDWAY - VINCENT No. 1 and MIDWAY - VINCENT No. 2 500 kV lines	P7	DCTL	118	117	<100	<100	<100	115	<100	<100	Midway-Vincent RAS

Study Area: SCE Bulk

High/Low Voltages

Substation	Contingency (All and Worst P6)	Category	Category Description	Post Cont. Voltage Deviation % (Baseline Scenarios)					t Cont. Voltage Deviation % (Sensitivity Scenar			ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	
MW_VINCNT_22 500 kV	MIDWAY - WIRLWIND No. 3 & MIDWAY - VINCENT No. 1 500 kV lines	P6	N-1-1	**1.1721**	**1.1618**	>0.9 & <1.1	>0.9 & <1.1	>0.9 & <1.1	**1.1638**	>0.9 & <1.1	>0.9 & <1.1	Midway-Vincent RAS, System adjustment after first contingency
MW_WRLWND_31 500 kV	MIDWAY - VINCENT No. 1 & MIDWAY - VINCENT No. 2 500 kV lines	P7	DCTL	**1.1107**	**1.1046**	>0.9 & <1.1	>0.9 & <1.1	>0.9 & <1.1	**1.1047**	>0.9 & <1.1	>0.9 & <1.1	Midway-Vincent RAS

Study Area: SCE Bulk

Voltage Deviation

Substation	Contingency (All and Worst P6)	Category	Category Description	Voltage PU (Baseline Scenarios)					Voltage PU (Sensitivity Scenarios)			ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	

No voltage deviation issues were identified

Study Area: SCE Bulk

Transient Stability

Contingency	Category	Category Description	Transient Stability Performance					Potential Mitigation Solutions
			Baseline Scenarios			Sensitivity Scenarios		
			2024 Summer Peak	2029 Summer Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	
Imperial Valley–N.Gila 500 kV; 3-Phase fault @ Imperial Valley, normal clearing	P1	N-1	No Issues	No Issues	No Issues	No Issues	No Issues	No violation
Lugo–Victorville 500 kV, 3-Phase fault @ Lugo, normal clearing	P1	N-1	No Issues	No Issues	No Issues	No Issues	No Issues	No violation
Paloverde–Colorado River 500 kV; 3-Phase fault @ Paloverde, normal clearing	P1	N-1	No Issues	No Issues	No Issues	No Issues	No Issues	No violation
PDCI Monopole; 3-Phase fault @ Sylmar, normal clearing	P1	N-1	No Issues	No Issues	No Issues	No Issues	No Issues	No violation
Serrano–Valley 500 kV; 3-Phase fault @ Valley, normal clearing	P1	N-1	No Issues	No Issues	No Issues	No Issues	No Issues	No violation
Palo Verde G-1; 3-Phase fault @ 500 kV, normal clearing	P1	G-1	No Issues	No Issues	No Issues	No Issues	No Issues	No violation
Devers-Valley No.1 500 kV & Serrano-Valley 500 kV; 3-Phase fault @ Valley, normal clearing	P6	N-1-1	No Issues	No Issues	No Issues	No Issues	No Issues	No violation
Lugo–Eldorado & Lugo–Mohave 500 kV; 3-Phase fault @ Lugo, normal clearing	P6	N-1-1	No Issues	No Issues	No Issues	No Issues	No Issues	No violation
Colorado River–Paloverde & Imperial Valley–N.Gila 500 kV; 3-Phase fault @ Paloverde, normal clearing	P6	N-1-1	No Issues	No Issues	No Issues	No Issues	No Issues	No violation
Sunrise & SWPL 500 kV; 3-Phase fault @ Suncrest, normal clearing	P6	N-1-1	No Issues	No Issues	No Issues	No Issues	No Issues	No violation
Midway–Vincent # 1 & Midway - Whirlwind #3 500 kV with RAS; 3-Phase fault @ Midway, normal clearing	P7	DCTL	No Issues	No Issues	No Issues	No Issues	No Issues	No violation
Midway - Vincent No. 1 & 2 500 kV with RAS; 3-Phase fault @ Midway, normal clearing	P7	DCTL	No Issues	No Issues	No Issues	No Issues	No Issues	No violation
Vincent–Miraloma & Lugo–Rancho Vista 500 kV; 3-Phase fault @ Mira Loma, normal clearing	P7	DCTL	No Issues	No Issues	No Issues	No Issues	No Issues	No violation
Colorado River–Red Bluff 500kV #1 & #2; 3-Phase fault @ Red Bluff, normal clearing	P7	DCTL	No Issues	No Issues	No Issues	No Issues	No Issues	No violation
Devers–Red Bluff 500 kV #1 & #2; 3-Phase fault @ Devers, normal clearing	P7	DCTL	No Issues	No Issues	No Issues	No Issues	No Issues	No violation
Lugo–Vincent 500 KV #1 & #2; 3-Phase fault @ Vincent, normal clearing	P7	DCTL	No Issues	No Issues	No Issues	No Issues	No Issues	No violation
Antelope–Vincent #1 & #2 500 kV; 3-Phase fault @ Vincent, normal clearing	P7	DCTL	No Issues	No Issues	No Issues	No Issues	No Issues	No violation
Loss of PDCI Bipole Converters; 3-Phase fault @ Sylmar, normal clearing	P7	DCTL	No Issues	No Issues	No Issues	No Issues	No Issues	No violation
Loss of IPPDC Bipole; 3-Phase fault @ Adelanto, normal clearing	P7	DCTL	No Issues	No Issues	No Issues	No Issues	No Issues	No violation
Lugo–Miraloma & Lugo–Rancho Vista 500 kV; 3-Phase fault @ Lugo, normal clearing	P7	DCTL	No Issues	No Issues	No Issues	No Issues	No Issues	No violation
Serrano–Mira Loma & Serrano–Rancho Vista 500 kV; 3-Phase fault @ Serrano, normal clearing	P7	DCTL	No Issues	No Issues	No Issues	No Issues	No Issues	No violation

2019-2020 ISO Reliability Assessment - Study Results

Study Area: SCE Bulk

Single Contingency Load Drop

Worst Contingency	Category	Category Description	Amount of Load Drop (MW)										Potential Mitigation Solutions
			Select..	Select..	Select..	Select..	Select..	Select..	Select..	Select..	Select..	Select..	

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

2019-2020 ISO Reliability Assessment - Study Results

Study Area: SCE Bulk

Single Source Substation with more than 100 MW Load

Substation	Load Served (MW)										Potential Mitigation Solutions
	Select..	Select..	Select..	Select..	Select..	Select..	Select..	Select..	Select..	Select..	

No single source substation with more than 100 MW

2019-2020 ISO Reliability Assessment - Study Results
Study Area: SCE Tehachapi & Big Creek Corridor
Thermal Overloads

California ISO

Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Loading % (Baseline Scenarios)					Loading % (Sensitivity Scenarios)			ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	
BAILEY - PASTORIA 230 kV	PARDEE - WARNETAP 230 kV line	P1	N-1	<100	<100	<100	102	105	<100	<100	<100	Modify Pastoria Energy RAS equation
	PARDEE-PASTORIA-WARNE 230 kV line	P1	N-1	<100	<100	<100	<100	101	<100	<100	<100	Modify Pastoria Energy RAS equation
	PASTORIA - WARNETAP 230 kV line	P1	N-1	<100	<100	<100	<100	101	<100	<100	<100	Modify Pastoria Energy RAS equation
BIG CRK1 - RECTOR 230 kV	BIG CRK3 - RECTOR No.1 and BIG CRK4 - BIG CRK3 No. 1 230 kV lines	P6	N-1-1	113	112	111	114	112	111	<100	<100	Big Creek RAS
	BIG CRK2 - BIG CRK3 No. 1 and BIG CRK8 - BIG CRK3 No. 1 230 kV lines	P6	N-1-1	141	140	140	142	141	140	<100	<100	Big Creek RAS
	RECTOR - BIG CRK3 No. 2 and BIG CRK4 - BIG CRK3 No. 1 230 kV lines	P6	N-1-1	101	100	<100	102	101	101	<100	<100	Big Creek RAS
	SPRINGVL - BIG CRK4 No. 1 and RECTOR - BIG CRK3 No. 2 230 kV lines	P6	N-1-1	115	114	113	<100	114	115	<100	<100	Big Creek RAS
BIG CRK2 - BIG CRK3 230 kV	BIG CRK1 - RECTOR No. 1 and BIG CRK8 - BIG CRK3 No. 1 230 kV lines	P6	N-1-1	138	136	136	144	137	136	<100	<100	Redispatch resources after initial contingency
BIG CRK3 - RECTOR 230 kV	BIG CRK1 - RECTOR No. 1 and BIG CRK4 - BIG CRK3 No. 1 230 kV lines	P6	N-1-1	123	120	120	123	121	120	<100	<100	Big Creek RAS
	MAGUNDEN - VESTAL No. 1 and RECTOR - BIG CRK3 No. 2 230 kV lines	P6	N-1-1	102	101	100	<100	<100	105	<100	<100	Big Creek RAS
	RECTOR - BIG CRK3 230 kV line	P1	N-1	101	<100	<100	<100	<100	102	<100	<100	Big Creek RAS
	RECTOR - BIG CRK3 No. 2 and BIG CRK1 - BIG CRK2 No. 1 230 kV lines	P6	N-1-1	109	108	107	<100	103	111	<100	<100	Big Creek RAS
	RECTOR - BIG CRK3 No. 2 and BIG CRK4 - BIG CRK3 No. 1 230 kV lines	P6	N-1-1	118	117	116	118	117	117	<100	<100	Big Creek RAS
	SPRINGVL - BIG CRK4 No. 1 and RECTOR - BIG CRK3 No. 2 230 kV lines	P6	N-1-1	135	134	133	<100	134	135	<100	<100	Big Creek RAS
	SPRINGVL - RECTOR No. 1 and RECTOR - BIG CRK3 No. 2 230 kV lines	P6	N-1-1	104	103	103	<100	<100	109	<100	<100	Big Creek RAS
BIG CRK8 - BIG CRK3 230 kV	BIG CRK1 - RECTOR No. 1 and BIG CRK2 - BIG CRK3 No. 1 230 kV lines	P6	N-1-1	139	138	138	146	145	140	<100	<100	Big Creek RAS
MAGUNDEN - ANTELOPE No. 1 230	MAGUNDEN - ANTELOPE No. 2 and PARDEE - WARNETAP No. 1 230 kV lines	P6	N-1-1	<100	<100	<100	104	<100	<100	<100	<100	Pastoria Energy RAS
	MAGUNDEN - ANTELOPE No. 2 and PARDEE-PASTORIA-WARNE No. 1 230 kV lines	P6	N-1-1	<100	<100	<100	<100	<100	<100	<100	102	Sensitivity only, Redispatch resources after initial contingency

2019-2020 ISO Reliability Assessment - Study Results
Study Area: SCE Tehachapi & Big Creek Corridor
Thermal Overloads

Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Loading % (Baseline Scenarios)					Loading % (Sensitivity Scenarios)			ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	
	MAGUNDEN - ANTELOPE No. 2 and PASTORIA - WARNETAP No. 1 230 kV lines	P6	N-1-1	<100	<100	<100	100	<100	<100	<100	<100	Pastoria Energy RAS
MAGUNDEN - PASTORIA 230 kV	MAGUNDEN - PASTORIA No. 2 and MAGUNDEN - PASTORIA No. 3 230 kV lines	P6	N-1-1	102	<100	<100	123	<100	<100	<100	<100	Big Creek RAS
MAGUNDEN - SPRINGVL 230 kV	VESTAL - RECTOR No. 1 and RECTOR - VESTAL No. 2 230 kV lines	P6	N-1-1	<100	<100	<100	106	<100	<100	<100	<100	Big Creek RAS
PASTORIA - WARNETAP 230 kV	PARDEE - PASTORIA No. 1 and BAILEY - PASTORIA No. 1 230 kV lines	P6	N-1-1	<100	<100	<100	104	<100	<100	<100	<100	Pastoria Energy RAS
	PARDEE - PASTORIA No. 1 and PARDEE - BAILEY No. 1 230 kV lines	P6	N-1-1	<100	<100	<100	102	<100	<100	<100	<100	Pastoria Energy RAS
SPRINGVL - BIG CRK4 230 kV	VESTAL - RECTOR No. 1 and RECTOR - VESTAL 230.0 No. 2	P6	N-1-1	<100	<100	<100	106	<100	<100	<100	<100	Big Creek RAS- Generation Runback

Study Area: SCE Tehachapi & Big Creek Corridor

High/Low Voltages

Substation	Contingency (All and Worst P6)	Category	Category Description	Post Cont. Voltage Deviation % (Baseline Scenarios)					t Cont. Voltage Deviation % (Sensitivity Scenar			ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	
BAILEY 230 kV	PARDEE - BAILEY No. 1 and BAILEY - PASTORIA No. 1 230 kV	P6	N-1-1	>0.9	>0.9	>0.9	>0.9	>0.9	0.8561	0.6208	>0.9	Sensitivity only, Redispatch resources after initial contingency
NEENACH 66 kV	PARDEE - BAILEY No. 1 and BAILEY - PASTORIA No. 1 230 kV	P6	N-1-1	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	0.8588	>0.9	Sensitivity only, Redispatch resources after initial contingency
SPRINGVL 230 kV	VESTAL - RECTOR No. 1 and RECTOR - VESTAL No. 2 230 kV	P6	N-1-1	>0.9	>0.9	>0.9	0.8822	>0.9	>0.9	>0.9	>0.9	Redispatch resources after initial contingency

Study Area: SCE Tehachapi & Big Creek Corridor

Voltage Deviation

Substation	Contingency (All and Worst P6)	Category	Category Description	Voltage PU (Baseline Scenarios)								Voltage PU (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Winter Peak	2024 Winter Peak	2029 Winter Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	2029 Retirement of QF Generations	

No voltage deviation issues were identified

Study Area: SCE Tehachapi & Big Creek Corridor

Transient Stability

Contingency	Category	Category Description	Transient Stability Performance					Potential Mitigation Solutions
			Baseline Scenarios			Sensitivity Scenarios		
			2024 Summer Peak	2029 Summer Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	
Big Creek 1 (Bus) NRBD	P5	Non-redundant bus-differential	No Issues	No Issues	No Issues	No Issues	No Issues	No violation
Big Creek 2 (Bus) NRBD	P5	Non-redundant bus-differential	No Issues	No Issues	No Issues	No Issues	No Issues	No violation
Big Creek 4 (Bus) NRBD	P5	Non-redundant bus-differential	No Issues	No Issues	No Issues	No Issues	No Issues	No violation
Big Creek 8 (Bus) NRBD	P5	Non-redundant bus-differential	No Issues	No Issues	No Issues	No Issues	No Issues	No violation
Springville NRBD	P5	Non-redundant bus-differential	No Issues	No Issues	No Issues	No Issues	No Issues	No violation
Big Creek 1-Rector & Rector-Vestal No.1	P4	1 Phase	No Issues	No Issues	No Issues	No Issues	No Issues	No violation
Big Creek 3-Rector No.1 & Rector-Vestal No.2	P4	1 Phase	No Issues	No Issues	No Issues	No Issues	No Issues	No violation
Big Creek 4-Springville & Magunden-Springville No.2	P6	3 Phase	No Issues	No Issues	No Issues	No Issues	No Issues	No violation
Big Creek 1-Rector & Big Creek 3-Rector No.1	P6	3 Phase	No Issues	No Issues	No Issues	No Issues	No Issues	No violation
Big Creek 3-Rector No.2 & Big Creek 4-Springville	P6	3 Phase	No Issues	No Issues	No Issues	No Issues	No Issues	No violation
Big Creek 4-Springville & Rector-Springville	P6	3 Phase	No Issues	No Issues	No Issues	No Issues	No Issues	No violation
Rector-Vestal No.1 & Rector-Vestal No.2	P6	3 Phase	No Issues	No Issues	No Issues	No Issues	No Issues	No violation
Magunden-Springville No.1 & Magunden-Springville No.2	P6	3 Phase	No Issues	No Issues	No Issues	No Issues	No Issues	No violation
Magunden-Vestal No.1 & Magunden-Vestal No.2	P6	3 Phase	No Issues	No Issues	No Issues	No Issues	No Issues	No violation
Big Creek 3-Rector No.2 & Rector-Springville	P7	1 Phase	No Issues	No Issues	No Issues	No Issues	No Issues	No violation
Magunden-Pastoria No. 1 & Bailey-Pastoria	P4	1 Phase	No Issues	No Issues	No Issues	No Issues	No Issues	No violation
Magunden-Pastoria No. 2 & Pardee-Pastoria	P4	1 Phase	No Issues	No Issues	No Issues	No Issues	No Issues	No violation
Magunden-Pastoria No. 3 & Pardee-Pastoria-Warne	P4	1 Phase	No Issues	No Issues	No Issues	No Issues	No Issues	No violation
Pardee-Pastoria & Pardee-Vincent No.2	P4	1 Phase	No Issues	No Issues	No Issues	No Issues	No Issues	No violation
Bailey-Pardee & Pardee-Vincent No.1	P4	1 Phase	No Issues	No Issues	No Issues	No Issues	No Issues	No violation
Pardee-Pastoria-Warne & Pardee-Santa clara	P4	1 Phase	No Issues	No Issues	No Issues	No Issues	No Issues	No violation
Mesa-Vincent No.2 & Santa Clara-Vincent	P4	1 Phase	No Issues	No Issues	No Issues	No Issues	No Issues	No violation
Magunden-Pastoria No. 1 & Magunden-Pastoria No. 2	P6	3 Phase	No Issues	No Issues	No Issues	No Issues	No Issues	No violation
Magunden-Pastoria No. 1 & Magunden-Pastoria No. 3	P6	3 Phase	No Issues	No Issues	No Issues	No Issues	No Issues	No violation
Magunden-Pastoria No. 2 & Magunden-Pastoria No. 3	P6	3 Phase	No Issues	No Issues	No Issues	No Issues	No Issues	No violation
Bailey-Pastoria & Pardee-Pastoria	P6	3 Phase	No Issues	No Issues	No Issues	No Issues	No Issues	No violation
Bailey-Pastoria & Pardee-Pastoria-Warne	P6	3 Phase	No Issues	No Issues	No Issues	No Issues	No Issues	No violation
Pardee-Pastoria & Pardee-Pastoria-Warne	P6	3 Phase	No Issues	No Issues	No Issues	No Issues	No Issues	No violation
Pardee-Pastoria & Bailey-Pardee	P6	3 Phase	No Issues	No Issues	No Issues	No Issues	No Issues	No violation
Pardee-Pastoria-Warne & Bailey-Pardee	P6	3 Phase	No Issues	No Issues	No Issues	No Issues	No Issues	No violation
Antelope-Magunden No. 1 & Antelope-Magunden No. 2	P6	3 Phase	No Issues	No Issues	No Issues	No Issues	No Issues	No violation
Pardee-Vincent No. 1 & Pardee-Vincent No. 2	P6	3 Phase	No Issues	No Issues	No Issues	No Issues	No Issues	No violation

Study Area: SCE Tehachapi & Big Creek Corridor

Single Contingency Load Drop

Worst Contingency	Category	Category Description	Amount of Load Drop (MW)										Potential Mitigation Solutions
			Select..	Select..	Select..	Select..	Select..	Select..	Select..	Select..	Select..	Select..	

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

2019-2020 ISO Reliability Assessment - Study Results

Study Area: SCE Tehachapi & Big Creek Corridor

Single Source Substation with more than 100 MW Load

Substation	Load Served (MW)										Potential Mitigation Solutions
	Select..	Select..	Select..	Select..	Select..	Select..	Select..	Select..	Select..	Select..	

No single source substation with more than 100 MW

2019-2020 ISO Reliability Assessment - Study Results

Study Area: SCE North of Lugo

Thermal Overloads

Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Loading % (Baseline Scenarios)					Loading % (Sensitivity Scenarios)			ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	
Control-Inyokern 115kV Line	Control EAST BUS	P2	Bus Fault	<100	<100	<100	113.26	105.68	<100	<100	<100	Bishop RAS; SCE Operating Procedure SOB-4
Victor 230/115kV Transformer #3	Victor 115kV N/S Bus Section Fault	P5	Non-Redundant Relay	<100	<100	<100	<100	<100	114.69	<100	<100	Install redundant relay
The remaining Victor 230/115kV Transformer	Loss of the other two Victor 230/115kV transformers	P6	N-1-1	<100	<100	<100	<100	<100	115.08	<100	<100	Utilize existing fast Demand Response
Control-Inyo 115kV Line	INYOKERN - KRAMER 115.0 ck 1 and KRAMER-INYOKERN-RANDSB 115 ck 1	P6	N-1-1	Nonconv	135.75%	Nonconv	Nonconv	Nonconv	<100	<100	<100	Operating Procedure 7690

Study Area: **SCE North of Lugo**

High/Low Voltages

Substation	Contingency (All and Worst P6)	Category	Category Description	Voltage PU (Baseline Scenarios)					Voltage PU (Sensitivity Scenarios)			ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	
Inyo 115kV	CONTROL - INYO 115.0 ck 1 and OXBOW B - CONTROL 115.0 ck 1	P6	N-1-1	1.1204	1.0604	1.1012	<1.052	1.1156	<1.052	<1.052	1.1198	Working with SCE on further analysis
	Control West Bus or Control East Bus	P2	Bus Fault	1.1204	1.0604	1.1012	<1.052	1.1156	<1.052	<1.052	1.1198	
Inyokern 115kV	INYOKERN - KRAMER 115.0 ck 1 and KRAMER-INYOKERN-RANDSB 115 ck 1	P6	N-1-1	Nonconv	>0.9	Nonconv	Nonconv	Nonconv	<1.1	1.1084	<1.1	Operating Procedure 7690
	INYOKERN - KRAMER 115.0 ck 1 and CAL GEN - INYOKERN 115 ck 1	P6	N-1-1	0.8928	>0.9	>0.9	0.8839	0.8847	>0.9	>0.9	>0.9	Install capacitor bank at Inyokern

2019-2020 ISO Reliability Assessment - Study Results

Study Area: **SCE North of Lugo**

Voltage Deviation

Substation	Contingency (All and Worst P6)	Category	Category Description	Post Cont. Voltage Deviation % (Baseline Scenarios)					Post Cont. Voltage Deviation % (Sensitivity Scenarios)			ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	

No violations

Study Area: SCE North of Lugo

Transient Stability

Contingency	Category	Category Description	Transient Stability Performance					Potential Mitigation Solutions
			Baseline Scenarios			Sensitivity Scenarios		
			2024 Summer Peak	2029 Summer Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	
Control-Casa Diablo 1150kV (1PH fault at Control)	P4.2	Stuck Breaker	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
Control-Casa Diablo 1150kV (1PH fault at Casa Diablo)	P4.2	Stuck Breaker	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
Control-Coso-Haiwee-Inyokern 115kV (1PH fault at Inyokern)	P4.2	Stuck Breaker	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
Control-Coso-Haiwee-Inyokern 115kV (1PH fault at Control)	P4.2	Stuck Breaker	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
Control-Haiwee-Inyokern (Fault at Control)	P4.2	Stuck Breaker	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
Control-Haiwee-Inyokern (Fault at Inyokern)	P4.2	Stuck Breaker	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
Control-Inyo 115kV (Fault at Control)	P4.2	Stuck Breaker	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
Inyokern-Downs 115kV (Fault at Inyokern)	P4.2	Stuck Breaker	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
Inyokern-McGen-Searles 15kV (Fault at Inyokern)	P4.2	Stuck Breaker	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
Kramer-Roadway 115kV (Fault 20% from Kramer)	P4.2	Stuck Breaker	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
Kramer-Roadway 115kV (Fault 20% from Roadway)	P4.2	Stuck Breaker	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
Kramer-Victor 115kV (Fault 20% from Kramer)	P4.2	Stuck Breaker	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
Kramer-Victor 115kV (Fault 20% from Victor)	P4.2	Stuck Breaker	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
Control 115/55kV Transforemer Banks	P6	Normal clearing	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
Kramer 230/115kV Transformer Banks	P6	Normal clearing	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
Lugo 500/230kV Transformer Banks no RAS	P6	Normal clearing	Unstable	Unstable	Stable/WECC criteria met	Unstable	Stable/WECC criteria met	HDPP RAS
Lugo 500/230kV Transformer Banks RAS	P6	Normal clearing	WECC Criteria Not Met	Stable/WECC criteria met	Stable/WECC criteria met	WECC Criteria Not Met	Stable/WECC criteria met	Review RAS scheme
Kramer-Inyokern-Randsburg Nos.1 & 3 115kV	P6	Normal clearing	Unstable	Unstable	Unstable	Stable/WECC criteria met	Stable/WECC criteria met	Operating Procedure 7690
Coolwater-Kramer & Coolwater-Seg2-Tortilla 115kV (Fault at Coolwater)	P6	Normal clearing	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
Coolwater-Kramer & Coolwater-Seg2-Tortilla 115kV_OP (Fault at Coolwater)	P6	Normal clearing	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation

2019-2020 ISO Reliability Assessment - Study Results

Study Area: **SCE North of Lugo**

Transient Stability

Contingency	Category	Category Description	Transient Stability Performance					Potential Mitigation Solutions
			Baseline Scenarios			Sensitivity Scenarios		
			2024 Summer Peak	2029 Summer Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	
Coolwater-Kramer & Kramer-Tortilla 115kV (Fault at Kramer)	P6	Normal clearing	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
Coolwater-Kramer & Kramer-Tortilla 115kV_OP (Fault at Kramer)	P6	Normal clearing	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
Kramer-Victor 230kV Nos.1 & 2 no RAS	P7	Normal clearing	Unstable	Unstable	Unstable	Stable/WECC criteria met	Stable/WECC criteria met	Mojave RAS
Kramer-Victor 230kV Nos.1 & 2 RAS	P7	Normal clearing	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
Lugo-Victor 230kV Nos.1 & 2 no RAS	P7	Normal clearing	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
Lugo-Victor 230kV Nos.1 & 2 RAS	P7	Normal clearing	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
Control-Coso-Inyokern & Control-Inyokern 115kV no RAS	P7	Normal clearing	WECC Criteria Not Met	WECC Criteria Not Met	WECC Criteria Not Met	WECC Criteria Not Met	WECC Criteria Not Met	Bishop RAS
Control-Coso-Inyokern & Control-Inyokern 115kV RAS	P7	Normal clearing	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
Kramer-Victor & Roadway-Victor 115kV	P7	Normal clearing	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
Kramer-Victor & Kramer-Roadway 115kV	P7	Normal clearing	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
Kramer 230kV Sub with RAS	Extreme	Normal clearing	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
Kramer-Victor 115kV (Fault at Kramer)	P4.2	Stuck Breaker	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
Roadway-Victor 115kV (Fault at Roadway)	P4.2	Stuck Breaker	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
Control-SIlverPeak 55kV (Fault at Silver Peak)	P4.2	Stuck Breaker	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
Coolwater-Kramer 115kV (Fault on Kramer 115kV bus)	P5.2	Delayed clearing	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
Coolwater-SEGS-Tortilla (Fault on Tortilla 115kV bus)	P5.2	Delayed clearing	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
Roadway 115kV bus	P5.5	No Redundant Relay	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
Tortilla 115kV bus	P5.5	No Redundant Relay	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
Victor 115kV bus	P5.5	No Redundant Relay	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation

2019-2020 ISO Reliability Assessment - Study Results

Study Area: **SCE North of Lugo**

Single Contingency Load Drop

Worst Contingency	Category	Category Description	Amount of Load Drop (MW)										Potential Mitigation Solutions
			Select..	Select..	Select..	Select..	Select..	Select..	Select..	Select..	Select..	Select..	

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

2019-2020 ISO Reliability Assessment - Study Results

Study Area: SCE North of Lugo

Single Source Substation with more than 100 MW Load

Substation	Load Served (MW)										Potential Mitigation Solutions
	Select..	Select..	Select..	Select..	Select..	Select..	Select..	Select..	Select..	Select..	

No single source substation with more than 100 MW

2019-2020 ISO Reliability Assessment - Study Results

Study Area: SCE East of Lugo

Thermal Overloads

Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Loading % (Baseline Scenarios)					Loading % (Sensitivity Scenarios)			ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	
System Divergence	Eldorado-Mohave & Lugo-Mohave 500kV lines	P6	N-1-1	Nonconv	Nonconv	Nonconv	Nonconv	Nonconv	Nonconv	Nonconv	Nonconv	NVEnergy operating procedure

Study Area: SCE East of Lugo

High/Low Voltages

Substation	Contingency (All and Worst P6)	Category	Category Description	Voltage PU (Baseline Scenarios)					Voltage PU (Sensitivity Scenarios)			ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	

No violation

Study Area: SCE East of Lugo

Voltage Deviation

Substation	Contingency (All and Worst P6)	Category	Category Description	Post Cont. Voltage Deviation % (Baseline Scenarios)					Post Cont. Voltage Deviation % (Sensitivity Scenarios)			ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	

No violation

Study Area: SCE East of Lugo

Transient Stability

Contingency	Category	Category Description	Transient Stability Performance					Potential Mitigation Solutions
			Baseline Scenarios			Sensitivity Scenarios		
			2024 Summer Peak	2029 Summer Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	
Lugo-Victorville 500kV Line	P1	Normal clearing	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
Eldorado-Lugo and Eldorado-Mohave 500kV lines	P6	Normal clearing	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
Eldorado-Lugo and Lugo-Mohave 500kV lines	P6	Normal clearing	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
Eldorado-Mohave and Lugo-Mohave 500kV lines	P6	Normal clearing	Stable/WECC criteria met	Diverge	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	NVEnergy operating procedure

2019-2020 ISO Reliability Assessment - Study Results

Study Area: SCE East of Lugo

Single Contingency Load Drop

Worst Contingency	Category	Category Description	Amount of Load Drop (MW)										Potential Mitigation Solutions
			Select..	Select..	Select..	Select..	Select..	Select..	Select..	Select..	Select..	Select..	

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

2019-2020 ISO Reliability Assessment - Study Results

Study Area: SCE East of Lugo

Single Source Substation with more than 100 MW Load

Substation	Load Served (MW)										Potential Mitigation Solutions
	Select..	Select..	Select..	Select..	Select..	Select..	Select..	Select..	Select..	Select..	

No single source substation with more than 100 MW

2019-2020 ISO Reliability Assessment - Study Results
Study Area: SCE Eastern area
Thermal Overloads

Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Loading % (Baseline Scenarios)					Loading % (Sensitivity Scenarios)			ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	
CVSUB230 - RAMON 230 kV	line_10024_Line CVSUB230 230.0 to MIRAGE 230.0 Ckt 1	P1	N-1	<100	<100	110	<100	<100	<100	<100	<100	Modifying existing RAS to trip portfolio generation at IID
	line_10024_Line CVSUB230 230.0 to MIRAGE 230.0 Ckt 1 AND gen_10057_Gen MountainView Block 1	P3	N-1, G-1	<100	<100	112	<100	<100	<100	<100	<100	
	line_10024_Line CVSUB230 230.0 to MIRAGE 230.0 Ckt 1 AND line_10027_Line PALOVRDE 500.0 to COLRIVER 500.0 Ckt 1	P6	N-1-1	<100	<100	112	<100	<100	<100	<100	<100	
Eagle Mountain 230/161 kV Transformer	line_10003a J.Hinds-Mirage 230 kV with 1 CT out	P1	N-1	108	<100	<100	<100	<100	<100	<100	<100	1-hour rating, Generation Re-dispatch
	line_10002_Line EAGLEMTN - IRON MTN 230 kV AND line_10003a_Line J.HINDS - MIRAGE 230 kV 1CT out	P6	N-1-1	239	<100	<100	<100	<100	<100	<100	167	
J.Hinds-Mirage 230 kV	Devers-Mirage 230 kV ckt 1 and 2	P7	N-2	<100	<100	100	<100	<100	<100	<100	<100	Potential RAS to trip generation at IID
Ramon-Mirage 230 kV	line_10024_Line CVSUB230 230.0 to MIRAGE 230.0 Ckt 1	P1	N-1	<100	<100	127	<100	<100	<100	<100	<100	Modifying existing RAS to trip portfolio generation at IID
	line_10024_Line CVSUB230 230.0 to MIRAGE 230.0 Ckt 1 AND gen_10057_Gen MountainView Block 1	P3	N-1, G-1	<100	<100	131	<100	<100	<100	<100	<100	
	line_10024_Line CVSUB230 230.0 to MIRAGE 230.0 Ckt 1 AND line_10027_Line PALOVRDE 500.0 to COLRIVER 500.0 Ckt 1	P6	N-1-1	<100	<100	130	<100	<100	<100	<100	<100	

Study Area: SCE Eastern area

High/Low Voltages

Substation	Contingency (All and Worst P6)	Category	Category Description	Voltage PU (Baseline Scenarios)					Voltage PU (Sensitivity Scenarios)			ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	
None	None											

Study Area: SCE Eastern area

Voltage Deviation

Substation	Contingency (All and Worst P6)	Category	Category Description	Post Cont. Voltage Deviation % (Baseline Scenarios)					Post Cont. Voltage Deviation % (Sensitivity Scenarios)			ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	
None	None											

Study Area: SCE Eastern area

Transient Stability

Contingency	Category	Category Description	Transient Stability Performance					Potential Mitigation Solutions
			Baseline Scenarios			Sensitivity Scenarios		
			2024 Summer Peak	2029 Summer Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	
3 Phase Fault at BlytheSCE 230 Bus, tripping BlytheSCE-BlytheWALC 161 kV	P1	Normal Clearing	Stable	Stable	Stable	Stable	Stable	No Violation
3 Phase Fault at Colorado River 500 kV, tripping Colorado River-Delaney 500 kV	P1	Normal Clearing	Stable	Stable	Stable	Stable	Stable	No Violation
3 Phase Fault at EagleMTN 161 kV Bus, tripping EagleMTN-BlytheSCE 161 kV	P1	Normal Clearing	Stable	Stable	Stable	Stable	Stable	No Violation
3 Phase Fault at EagleMTN 161 kV Bus, tripping EagleMTN-BlytheSCE 161 kV & Blythe 1CT	P1	Normal Clearing	Stable	Stable	Stable	Stable	Stable	No Violation
3 Phase Fault at EagleMTN 230 kV Bus, tripping EagleMTN-IronMTN 230 kV	P1	Normal Clearing	Stable	Stable	Stable	Stable	Stable	No Violation
3 Phase Fault at Julian Hinds 230 kV Bus, tripping Julian Hinds-EagleMTN 230 kV	P1	Normal Clearing	Stable	Stable	Stable	Stable	Stable	No Violation
3 Phase Fault at Julian Hinds 230 kV Bus, tripping Julian Hinds-EagleMTN 230 kV & Blythe 1CT trip (RAS)	P1	Normal Clearing	Stable	Stable	Stable	Stable	Stable	No Violation
3 Phase Fault at Julian Hinds 230 kV Bus, tripping Julian Hinds-Mirage 230 kV & Blythe 1CT trip (RAS)	P1	Normal Clearing	Stable	Stable	Stable	Stable	Stable	No Violation
3 Phase Fault at Julian Hinds 230 kV Bus, tripping Julian Hinds-Mirage 230 kV	P1	Normal Clearing	Stable	Stable	Unstable	Stable	Stable	Stable after tripping generators through Blythe RAS
3 Phase Fault at Palo Verde 500 kV Bus, tripping Colorado River-Palo Verde 500 kV	P1	Normal Clearing	Stable	Stable	Stable	Stable	Stable	No Violation
3 Phase Fault at EagleMTN 161 kV Bus, tripping EagleMTN 230/161 kV Transformer #5	P1	Normal Clearing	Stable	Stable	Stable	Stable	Stable	No Violation
SLG Fault at Julian Hinds 230 kV Bus, tripping Julian Hinds Bus tie CB faul, loss Julian Hinds	P2	Breaker Fault	Stable	Stable	Stable	Stable	Stable	No Violation
SLG Fault at Devers 230 kV, tripping Devers - Vista 230 kV #1 with stuck breaker followed by Devers 3A bank	P4	Delayed Clearing	Stable	Stable	Stable	Stable	Stable	No Violation
SLG Fault at Devers 230 kV, tripping Devers - Vista 230 kV #2 with stuck breaker followed by Devers-San Bernardino 230 kV	P4	Delayed Clearing	Stable	Stable	Stable	Stable	Stable	No Violation
SLG Fault at El Casco 230 kV, tripping Devers - El Casco 230 kV with stuck breaker followed by El Casco 2A bank	P4	Delayed Clearing	Stable	Stable	Stable	Stable	Stable	No Violation
SLG Fault at Devers 500 kV, tripping Devers - Red Bluff 500 kV #1 with stuck breaker followed by Devers-Valley 500 kV #1	P4	Delayed Clearing	Stable	Stable	Stable	Stable	Stable	No Violation
SLG Fault at Devers 500 kV, tripping Devers - Red Bluff 500 kV #2 with stuck breaker followed by Devers 1AA bank	P4	Delayed Clearing	Stable	Stable	Stable	Stable	Stable	No Violation
SLG Fault at Valley 500 kV, tripping Valley-Serrano 500 kV with stuck breaker followed by Valley 4AA Bank	P4	Delayed Clearing	Stable	Stable	Stable	Stable	Stable	No Violation
SLG Fault at Mirage 230 kV, tripping Devers - Mirage 230 kV with stuck breaker followed by Coachell Valley-Mirage 230 kV	P4	Delayed Clearing	Stable	Stable	Stable	Stable	Stable	No Violation

Study Area: SCE Eastern area

Transient Stability

Contingency	Category	Category Description	Transient Stability Performance					Potential Mitigation Solutions
			Baseline Scenarios			Sensitivity Scenarios		
			2024 Summer Peak	2029 Summer Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	
SLG Fault at BlytheSCE 161 kV, tripping BlytheSCE-EagleMTN 161 kV, CB 872 stuck at BlytheSCE	P4	Breaker Failure	Stable	Stable	Stable	Stable	Stable	No Violation
SLG Fault at BlytheSCE 161 kV, tripping BlytheSCE-EagleMTN 161 kV, CB 872 stuck at BlytheSCE & Blythe 1CT trip (RAS)	P4	Breaker Failure	Stable	Stable	Stable	Stable	Stable	No Violation
SLG Fault at EagleMTN 161 kV , tripping BlytheSCE-EagleMTN 161 kV, CB 70 stuck at EagleMTN	P4	Breaker Failure	Stable	Stable	Stable	Stable	Stable	No Violation
SLG Fault at EagleMTN 161 kV , tripping BlytheSCE-EagleMTN 161 kV, CB 70 stuck at EagleMTN & Blythe 1CT trip (RAS)	P4	Breaker Failure	Stable	Stable	Stable	Stable	Stable	No Violation
SLG Fault at EagleMTN 230 kV Bus, tripping EagleMTN-IronMTN 230 kV, CB 407 stuck at EagleMTN	P4	Breaker Failure	Stable	Stable	Stable	Stable	Stable	No Violation
SLG Fault at EagleMTN 230 kV Bus, tripping EagleMTN-IronMTN 230 kV, CB 407 stuck at EagleMTN & Blythe 1CT trip (RAS)	P4	Breaker Failure	Stable	Stable	Stable	Stable	Stable	No Violation
SLG Fault at IronMTN 230 kV Bus, tripping EagleMTN-IronMTN 230 kV, CB 307 stuck (close to Iron)	P4	Breaker Failure	Stable	Stable	Stable	Stable	Stable	No Violation
SLG Fault at EagleMTN 230 kV Bus, tripping Julian Hinds-EagleMTN 230 kV, CB 405 stuck at EagleMTN	P4	Breaker Failure	Stable	Stable	Stable	Stable	Stable	No Violation
SLG Fault at EagleMTN 230 kV Bus, tripping Julian Hinds-EagleMTN 230 kV, CB 405 stuck at EagleMTN & Blythe 1CT trip (RAS)	P4	Breaker Failure	Stable	Stable	Stable	Stable	Stable	No Violation
SLG Fault at Julian Hinds 230 kV Bus, tripping Julian Hinds-Mirage 230 kV, Stuck CB 509 at J.Hinds	P4	Breaker Failure	Stable	Stable	Stable	Stable	Stable	No Violation
SLG Fault at Mirage 230 kV, tripping Mirage-J.Hinds 230 kV with stuck breaker followed by Mirage-Ramon 230 kV Blythe 1CT trip (RAS)	P4	Delayed Clearing	Stable	Stable	Stable	Stable	Stable	No Violation
SLG Fault at Mirage 230 kV, tripping Mirage-J.Hinds 230 kV with stuck breaker followed by Mirage-Ramon 230 kV	P4	Delayed Clearing	Stable	Stable	Unstable	Stable	Stable	Stable after tripping generators through Blythe RAS
SLG Fault at EagleMTN 230 kV Bus, tripping EagleMTN 230/161 kV Transformer #5, Stuck CB432 at EagleMTN	P4	Breaker Failure	Stable	Stable	Stable	Stable	Stable	No Violation
SLG Fault at 20% from BlytheSCE 161 Bus, tripping BlytheSCE-EagleMTN 161 kV, non-redundant pilot relay fail	P5	Zone2 Clearing	Stable	Stable	Stable	Stable	Stable	No Violation
SLG Fault at 20% from EagleMTN 161 kV Bus, tripping BlytheSCE-EagleMTN 161 kV, non-redundant pilot relay fail	P5	Zone2 Clearing	Stable	Stable	Stable	Stable	Stable	No Violation
SLG Fault at 20% from EagleMTN 230 kV Bus, tripping EagleMTN-IronMTN 230 kV, non-redundant pilot relay fail	P5	Zone2 Clearing	Stable	Stable	Stable	Stable	Stable	No Violation

Study Area: SCE Eastern area

Transient Stability

Contingency	Category	Category Description	Transient Stability Performance					Potential Mitigation Solutions
			Baseline Scenarios			Sensitivity Scenarios		
			2024 Summer Peak	2029 Summer Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	
SLG Fault at 20% from IronMTN 230 kV Bus, tripping EagleMTN-IronMTN 230 kV, non-redundant pilot relay fail	P5	Zone2 Clearing	Stable	Stable	Stable	Stable	Stable	No Violation
SLG Fault at EagleMTN 230 kV Bus, tripping EagleMTN Bus, non-redundant relayfail	P5	Bus relay Failure	Stable	Stable	Stable	Stable	Stable	No Violation
SLG Fault at EagleMTN 230 kV Bus, tripping EagleMTN Bus & Blythe 1CT trip, non-redundant relay fail	P5	Bus relay Failure	Stable	Stable	Stable	Stable	Stable	No Violation
SLG Fault at 20% from EagleMTN 230 kV Bus, tripping Julian Hinds-EagleMTN 230 kV, non-redundant pilot relay fail	P5	Zone2 Clearing	Stable	Unstable	Unstable	Stable	Stable	Stable after tripping generators through Blythe RAS
SLG Fault at 20% from EagleMTN 230 kV Bus, tripping Julian Hinds-EagleMTN 230 kV & Blythe 1CT trip (RAS), non-redundant pilot relay fail	P5	Zone2 Clearing	Stable	Stable	Stable	Stable	Stable	No Violation
SLG Fault at 20% from Julian Hinds 230 kV Bus, tripping Julian Hinds-EagleMTN 230 kV, non-redundant pilot relay fail	P5	Zone2 Clearing	Stable	Stable	Stable	Stable	Stable	No Violation
SLG Fault at 20% from Julian Hinds 230 kV Bus, tripping Julian Hinds-EagleMTN 230 kV & Blythe 1CT trip (RAS), non-redundant pilot relay fail	P5	Zone2 Clearing	Stable	Stable	Stable	Stable	Stable	No Violation
SLG Fault at 20% from Julian Hinds 230 kV Bus, tripping Julian Hinds-Mirage 230 kV, non-redundant pilot relay fail	P5	Zone2 Clearing	Stable	Stable	Unstable	Stable	Stable	Stable after tripping generators through Blythe RAS
SLG Fault at 20% from Julian Hinds 230 kV Bus, tripping Julian Hinds-Mirage 230 kV & Blythe 1CT trip (RAS),non-redundant pilot relay fail	P5	Zone2 Clearing	Stable	Stable	Stable	Stable	Stable	No Violation
SLG Fault at 20% from Mirage 230 kV Bus, tripping Julian Hinds-Mirage 230 kV, , non-redundant pilot relay fail	P5	Zone2 Clearing	Stable	Stable	Unstable	Stable	Stable	Stable after tripping generators through Blythe RAS
SLG Fault at 20% from Mirage 230 kV Bus, tripping Julian Hinds-Mirage 230 kV & Blythe 1CT trip (RAS), , non-redundant pilot relay fail	P5	Zone2 Clearing	Stable	Stable	Stable	Stable	Stable	No Violation
SLG Fault at Devers 230 kV, tripping Devers Substation 230 kV Bus & AA Banks	P5	Delayed Clearing	Stable	Unstable	Stable	Stable	Stable	Potential RAS to trip generation at IID
SLG Fault at Etiwanda 230 kV, tripping Etiwanda Substation 230 kV	P5	Delayed Clearing	Stable	Stable	Stable	Stable	Stable	No Violation
3 Phase Fault at Red Bulff 500 kV, tripping Colorado River - Red Bluff 500 kV #1 & #2	P6	Normal Clearing	Stable	Stable	Stable	Stable	Stable	No Violation
3 Phase Fault at Devers 500 kV, tripping Devers - Red Bluff 500 kV #1 & #2	P6	Normal Clearing	Stable	Stable	Stable	Stable	Stable	No Violation
3 Phase Fault at Valley 500 kV, tripping Devers Valley 500 kV #1 & #2	P6	Normal Clearing	Stable	Stable	Stable	Stable	Stable	No Violation
3 Phase Fault at El Casco 230 kV, tripping Etiwanda - San Bernardino & Devers - El Cosco 230kV	P6	Normal Clearing	Stable	Stable	Stable	Stable	Stable	No Violation

Study Area: SCE Eastern area

Transient Stability

Contingency	Category	Category Description	Transient Stability Performance					Potential Mitigation Solutions
			Baseline Scenarios			Sensitivity Scenarios		
			2024 Summer Peak	2029 Summer Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	
3 Phase Fault at San Bernardino 230 kV, tripping Etiwanda - San Bernardino & El Casco-San Bernardino 230kV	P6	Normal Clearing	Stable	Stable	Stable	Stable	Stable	No Violation
3 Phase Fault at El Casco 230 kV, tripping San Bernardino - Vista & Devers - El Cosco 230kV	P6	Normal Clearing	Stable	Stable	Stable	Stable	Stable	No Violation
3 Phase Fault at San Bernardino 230 kV, tripping San Bernardino - Vista & Devers - San Bernardino 230kV	P6	Normal Clearing	Stable	Stable	Stable	Stable	Stable	No Violation
3 Phase Fault at Julian Hinds 230 kV Bus, tripping Julian Hinds-EagleMTN & Gene-Parker 230 kV	P6	Normal Clearing	Stable	Stable	Stable	Stable	Stable	No Violation
3 Phase Fault at Julian Hinds 230 kV Bus, tripping Julian Hinds-EagleMTN & Gene-Parker 230 kV & Blythe 1CT trip	P6	Normal Clearing	Stable	Stable	Stable	Stable	Stable	No Violation
3 Phase Fault at Julian Hinds 230 kV Bus, tripping Julian Hinds-Mirage & Camino-IronMTN-Gene-Mead 230 kV	P6	Normal Clearing	Unstable	Unstable	Unstable	Unstable	Stable	Operation Procedure GCC128/ISO7720
3 Phase Fault at Julian Hinds 230 kV Bus, tripping Julian Hinds-Mirage & Camino-IronMTN-Gene-Mead 230 kV & Blythe 1CT trip	P6	Normal Clearing	Unstable	Stable	Unstable	Stable	Stable	Operation Procedure GCC128/ISO7720
3 Phase Fault at Julian Hinds 230 kV Bus, tripping Julian Hinds-Mirage & Camino-IronMTN-Gene-Mead 230 kV & Blythe 2CTs trip (RAS)	P6	Normal Clearing	Unstable	Stable	Stable	Stable	Stable	Operation Procedure GCC128/ISO7720
3 Phase Fault at Julian Hinds 230 kV Bus, tripping Julian Hinds-Mirage & EagleMTN-IronMTN 230 kV	P6	Normal Clearing	Unstable	Unstable	Unstable	Unstable	Stable	Operation Procedure GCC128/ISO7720
3 Phase Fault at Julian Hinds 230 kV Bus, tripping Julian Hinds-Mirage & EagleMTN-IronMTN 230 kV & Blythe 1CT trip (RAS)	P6	Normal Clearing	Unstable	Stable	Unstable	Stable	Stable	Operation Procedure GCC128/ISO7720
3 Phase Fault at Julian Hinds 230 kV Bus, tripping Julian Hinds-Mirage & EagleMTN-IronMTN 230 kV & Blythe 2CTs trip (RAS)	P6	Normal Clearing	Unstable	Stable	Stable	Stable	Stable	Operation Procedure GCC128/ISO7720
3 Phase Fault at Julian Hinds 230 kV Bus, tripping Julian Hinds-Mirage & Gene-Parker 230 kV	P6	Normal Clearing	Stable	Stable	Unstable	Stable	Stable	Stable after tripping generators through Blythe RAS
3 Phase Fault at Julian Hinds 230 kV Bus, tripping Julian Hinds-Mirage & Gene-Parker 230 kV & Blythe 1CT trip	P6	Normal Clearing	Stable	Stable	Stable	Stable	Stable	No Violation
3 Phase Fault at Colorado River 500 kV, tripping Colorado River - Palo Verde 500 kV & Delaney-Colorado River 500 kV	P6	Normal Clearing	Stable	Stable	Stable	Stable	Stable	No Violation
3 Phase Fault at Mirage 230 kV, tripping Mirage-Ramon & Coachella Valley-Mirage 230 kV	P6	Normal Clearing	Unstable	Unstable	Unstable	Unstable	Unstable	Further discussion and investigation with IID
3 Phase Fault at Mirage 230 kV, tripping Mirage-Ramon & Coachella Valley-Mirage 230 kV with RAS	P6	Normal Clearing	Unstable	Unstable	Stable	Unstable	Stable	Further discussion and investigation with IID
SLG Fault at Mirage 230 kV, tripping Mirage-Ramon & Coachella Valley-Mirage 230 kV	P7*	Normal Clearing	Stable	Unstable	Stable	Stable	Stable	Further discussion and investigation with IID

Study Area: SCE Eastern area

Transient Stability

Contingency	Category	Category Description	Transient Stability Performance					Potential Mitigation Solutions
			Baseline Scenarios			Sensitivity Scenarios		
			2024 Summer Peak	2029 Summer Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	
SLG Fault at Mirage 230 kV, tripping Mirage-Ramon & Coachella Valley-Mirage 230 kV with RAS	P7*	Normal Clearing	Stable	Unstable	Stable	Stable	Stable	Further discussion and investigation with IID
3 Phase Fault at Devers 230 kV, tripping Devers - El Cosco & Devers - Vista 230kV #2	P7	Normal Clearing	Stable	Stable	Stable	Stable	Stable	No Violation
3 Phase Fault at Devers 230 kV, tripping Devers - Mirage 230 kV #1 & #2	P7	Normal Clearing	Stable	Unstable	Stable	Stable	Stable	Further discussion and investigation with IID
3 Phase Fault at Devers 230 kV, tripping Devers - Mirage 230 kV #1 & #2 & RAS tripping IID generation	P7	Normal Clearing	Stable	Stable	Stable	Stable	Stable	No Violation
3 Phase Fault at Vista 230 kV, tripping Devers - Vista 230 kV # 1 & #2	P7	Normal Clearing	Stable	Stable	Stable	Stable	Stable	No Violation
3 Phase Fault at San Bernardino 230 kV, tripping El Casco-San Bernardino & San Bernardino - Vista 230 kV	P7	Normal Clearing	Stable	Stable	Stable	Stable	Stable	No Violation
3 Phase Fault at San Bernardino 230 kV, tripping Devers-San Bernardino & Etiwanda-San Bernardino 230 kV	P7	Normal Clearing	Stable	Stable	Stable	Stable	Stable	No Violation
3 Phase Fault at San Bernardino 230 kV, tripping Etiwanda-San Bernardino & San Bernardino-Vista 230 kV	P7	Normal Clearing	Stable	Stable	Stable	Stable	Stable	No Violation
3 Phase Fault at San Bernardino 230 kV, tripping Etiwanda-San Bernardino & San Bernardino-Vista230 kV & trip MV #3 (RAS)	P7	Normal Clearing	Stable	Stable	Stable	Stable	Stable	No Violation
3 Phase Fault at Vista 230 kV, tripping Mira Loma-Vista 230 kV #1 & #2	P7	Normal Clearing	Stable	Stable	Stable	Stable	Stable	No Violation

2019-2020 ISO Reliability Assessment - Study Results

Study Area: SCE Eastern area

Single Contingency Load Drop

Worst Contingency	Category	Category Description	Amount of Load Drop (MW)										Potential Mitigation Solutions
			Select..	Select..	Select..	Select..	Select..	Select..	Select..	Select..	Select..	Select..	

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

2019-2020 ISO Reliability Assessment - Study Results

Study Area: SCE Eastern area

Single Source Substation with more than 100 MW Load

Substation	Load Served (MW)										Potential Mitigation Solutions
	Select..	Select..	Select..	Select..	Select..	Select..	Select..	Select..	Select..	Select..	

No single source substation with of more than 100 MW.

2019-2020 ISO Reliability Assessment - Study Results
Study Area: SCE Metro
Thermal Overloads

California ISO

Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Loading % (Baseline Scenarios)						Loading % (Sensitivity Scenarios)			ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2029 CAISO Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	
Pardee - Sylmar 230 kV #1 or #2	Remaining Pardee - Sylmar 230 kV line	P1	L-1	<100	<100	97	129	<100	<100	<100	<100	<100	The ratings of the Pardee–Sylmar lines are currently limited due to terminal elements at Pardee and LADWP's Sylmar substations. Increasing the ratings to the full rating of the conductors (145% increase) is sufficient to address the P1 and P3 overloads (142%). Omar and Sycamore generating plants, which were assumed to be retired due to the 40-year age criteria, or equivalent replacement local capacity resources along with existing/procured DR and storage in the Big Creek-Ventura area can address the P6 overloads.
	Victorville - Lugo 500 kV line	P1	L-1	<100	<100	<100	100	<100	<100	<100	<100	<100	
	Pastoria Block 1 & Remaining Pardee - Sylmar 230 kV line	P3	G-1/L-1	<100	<100	109	142	<100	<100	<100	<100	<100	
	Remaining Pardee - Sylmar 230 kV line & Victorville - Lugo 500 kV line	P6	L-1/L-1	<100	<100	123	170	<100	<100	<100	<100	<100	
Barre–Villa Park 230 kV	Huntington Beach RP Block & Barre–Lewis 230 kV	P3	G-1/L-1	104	<100	<100	<100	<100	<100	<100	<100	105	Redispatch resources after initial contingency until Mesa 500 kV Substation is in service (2022)
Barre–Lewis 230 kV	Huntington Beach RP Block & Barre–Villa Park 230 kV	P3	G-1/L-1	104	<100	<100	<100	<100	<100	<100	<100	106	
Ellis–Johanna 230 230 kV	Imperial Valley–North Gilla 500 kV & Ellis–Santiago 230 kV	P6	L-1/L-1	<100	<100	<100	<100	<100	<100	<100	101	<100	Redispatch resources after initial contingency
Ellis–Santiago 230 kV	Imperial Valley–North Gilla 500 kV & Ellis–Johanna 230 230 kV	P6	L-1/L-1	<100	<100	<100	<100	<100	<100	<100	107	<100	
Mesa - Laguna Bell 230 kV #1	Mesa - Lighthipe & Mesa - La Fresa 230 kV lines	P6	L-1/L-1	<100	107	110	<100	<100	<100	113	<100	<100	Dispatch energy storage and demand response resources pre-contingency (P7) or after initial contingency (P6); monitor LCR impact in local capacity studies and economic impact in production simulation studies
	Mesa - Lighthipe & Mesa - Laguna Bell #2 230 kV lines	P7	L-2	100	106	108	<100	<100	<100	113	<100	<100	
Mesa - Laguna Bell 230 kV #2	Mesa - Lighthipe & Mesa - Laguna Bell #1 230 kV lines with 230 kV bus tie closed	P6	L-1/L-1	N/A	106	107	<100	<100	<100	115	<100	N/A	
	Mesa - La Fresa 230 kV & Mesa - Laguna Bell #1 230 kV lines with 230 kV bus tie closed	P7	L-2	N/A	99	100	<100	N/A	<100	107	<100	N/A	
Mira Loma 500/230 kV Transformer #1 or #2	Mira Loma - Serrano 500 kV & Mira Loma 500/230 kV Transformer #2 or #1	P6	T-1/L-1	116	<100	<100	<100	<100	<100	<100	<100	115	System adjustment per OP 7580 after initial or second contingency until Mesa 500 kV Substation is in service (2022)
Mira Loma 500/230 kV Transformer #4	Lugo - Rancho Vista & Mira Loma - Serrano 500 kV lines	P6	L-1/L-1	129	<100	<100	<100	<100	<100	<100	<100	129	
Serrano 500/230 kV Transformers	Two Serrano 500/230 kV Transformers	P6	T-1/T-1	130	<100	<100	<100	<100	<100	103	<100	130	System adjustment per OP 7590 after initial or second contingency until Mesa 500 kV Substation is in service (2022)
Vincent 500/230 kV Transformer #2 or #3	Vincent – Mira Loma 500 kV or Vincent–Mesa 230 kV & Vincent 500/230 kV Transformer #3 or #2	P6	L-1/T-1	109	<100	<100	<100	<100	<100	<100	<100	108	System adjustment per OP 7550 after initial or second contingency until Mesa 500 kV Substation is in service (2022)
Vincent 500/230 kV Transformer #1 or #4	Vincent – Mira Loma 500 kV & Vincent 500/230 kV Transformer #4 or #1	P6	L-1/T-1	106	<100	<100	<100	<100	<100	<100	<100	105	

Study Area: SCE Metro

High/Low Voltages

Substation	Contingency (All and Worst P6)	Category	Category Description	Voltage PU (Baseline Scenarios)						Voltage PU (Sensitivity Scenarios)			ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2029 CAISO Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	
Goleta	Santa Clara–Goleta #1 or #2 230 kV & Santa Clara 230 kV Shunt Capacitor	P6	N-1/L-1	0.91	0.90	0.91	>0.9	>0.90	>0.90	**0.88**	>0.90	0.91	Planned energy storage resources being procured under the Santa Clara area RFO (ISD 2021)

2019-2020 ISO Reliability Assessment - Study Results

Study Area: SCE Metro

Voltage Deviation

Substation	Contingency (All and Worst P6)	Category	Category Description	Post Cont. Voltage Deviation % (Baseline Scenarios)					Post Cont. Voltage Deviation % (Sensitivity Scenarios)			ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	

No voltage deviation issues were identified

Study Area: SCE Metro

Transient Stability

Contingency	Category	Category Description	Transient Stability Performance					Potential Mitigation Solutions
			2024 Summer Peak	2029 Summer Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	
Lugo-Victorville 500 kV, 3-PH Fault @ Lugo 500 kV, Normal Clearing	P1.2	Single contingency	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
Imperial Valley-N.Gila 500 kV, 3-PH Fault @ Imperial Valley 500 kV, Normal Clearing	P1.2	Single contingency	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
Loss of Palo Verde Unit No.1, 3-PH Fault @ Palo Verde 500 kV, Normal Clearing	P6.3	Two overlapping events	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
Loss of Santiago Synchronous Condensers, 3-PH Fault @ Santiago 230 kV, Normal Clearing	P1.3	Single contingency	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
Lugo-Victorville 500 kV & Lugo-Vincent No. 2 500 kV , 1-PH Bus Fault @ Lugo 500 kV, Delayed Clearing	P4.2	Stuck Breaker	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
Lugo-Vincent No.1 500 kV & Lugo-Rancho Vista 500 kV , 1-PH Bus Fault @ Lugo 500 kV, Delayed Clearing	P4.2	Stuck Breaker	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
Lugo-Mira Loma No.2 500 kV & Eldorado-Lugo 500 kV , 1-PH Bus Fault @ Lugo 500 kV, Delayed Clearing	P4.2	Stuck Breaker	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
Lugo-Mira Loma No.3 500 kV & Lugo-Mohave 500 kV , 1-PH Bus Fault @ Lugo 500 kV, Delayed Clearing	P4.2	Stuck Breaker	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
Lugo-Mira Loma No.3 500 kV & Mira Loma 4AA Bank, 1-PH Bus Fault @ Mira Loma 500 kV, Delayed Clearing	P4.2	Stuck Breaker	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
Chino-Mira Loma No.2 230 kV & Mira Loma 4AA Bank, 1-PH Bus Fault @ Mira Loma 230 kV, Delayed Clearing	P4.2	Stuck Breaker	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
Lugo-Rancho Vista 500 kV & Rancho Vista 4AA Bank, 1-PH Bus Fault @ Rancho Vista 500 kV, Delayed Clearing	P4.2	Stuck Breaker	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
Rancho Vista-Serrano 500 kV & Serrano 1AA Bank, 1-PH Bus Fault @ Serrano 500 kV, Delayed Clearing	P4.2	Stuck Breaker	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
Mira Loma-Serrano No.2 500 kV & Serrano 2AA Bank, 1-PH Bus Fault @ Serrano 500 kV, Delayed Clearing	P4.2	Stuck Breaker	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
Serrano-Alberhill 500 kV & Serrano 3AA Bank, 1-PH Bus Fault @ Serrano 500 kV, Delayed Clearing	P4.2	Stuck Breaker	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation

Study Area: SCE Metro

Transient Stability

Contingency	Category	Category Description	Transient Stability Performance					Potential Mitigation Solutions
			2024 Summer Peak	2029 Summer Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	
Chino-Serrano 230 kV & Serrano-Lewis No.1 230 kV, 1-PH Bus Fault @ Serrano 230 kV, Delayed Clearing	P4.2	Stuck Breaker	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
Ellis-Santiago 230 kV & San Onofre-Santiago No.2 230 kV , 1-PH Bus Fault @ Santiago 230 kV, Delayed Clearing	P4.2	Stuck Breaker	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
Midway-Vincent No.2 500 kV & Mesa-Vincent 500 kV , 1-PH Bus Fault @ Vincent 500 kV, Delayed Clearing	P4.2	Stuck Breaker	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
Whirlwind-Vincent 500 kV & Vincent 4AA Bank, 1-PH Bus Fault @ Vincent 500 kV, Delayed Clearing	P4.2	Stuck Breaker	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
Antelope-Vincent No.1 500 kV & Lugo No.2 Vincent 500 kV, 1-PH Bus Fault @ Vincent 500 kV, Delayed Clearing	P4.2	Stuck Breaker	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
Lugo-Vincent No.1 500 kV & Vincent 3AA Bank , 1-PH Bus Fault @ Vincent 500 kV, Delayed Clearing	P4.2	Stuck Breaker	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
Alamitos (Sec. "A"), 1-PH Bus Fault @ Alamitos "A" 230 kV, Delayed Clearing	P5.5	Non-Redundant Bus Diff Relay Failure	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
Alamitos (Sec. "B"), 1-PH Bus Fault @ Alamitos "B" 230 kV, Delayed Clearing	P5.5	Non-Redundant Bus Diff Relay Failure	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
Barre (N/S bus), 1-PH Bus Fault @ Barre 230 kV, Delayed Clearing	P5.5	Non-Redundant Bus Diff Relay Failure	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
Center (N/S bus), 1-PH Bus Fault @ Center 230 kV, Delayed Clearing	P5.5	Non-Redundant Bus Diff Relay Failure	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
Chino (E/W bus), 1-PH Bus Fault @ Chino 230 kV, Delayed Clearing	P5.5	Non-Redundant Bus Diff Relay Failure	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
Eagle Rock (N/S bus), 1-PH Bus Fault @ Eagle Rock 230 kV, Delayed Clearing	P5.5	Non-Redundant Bus Diff Relay Failure	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
El Nido (N/S bus), 1-PH Bus Fault @ El Nido 230 kV, Delayed Clearing	P5.5	Non-Redundant Bus Diff Relay Failure	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
Harborgen, 1-PH Bus Fault @ Harbor 230 kV, Delayed Clearing	P5.5	Non-Redundant Bus Diff Relay Failure	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation

Study Area: SCE Metro

Transient Stability

Contingency	Category	Category Description	Transient Stability Performance					Potential Mitigation Solutions
			2024 Summer Peak	2029 Summer Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	
Hinson, 1-PH Bus Fault @ Hinson 230 kV, Delayed Clearing	P5.5	Non-Redundant Bus Diff Relay Failure	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
Laguna Bell, 1-PH Bus Fault @ Laguna Bell 230 kV, Delayed Clearing	P5.5	Non-Redundant Bus Diff Relay Failure	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
Lewis, 1-PH Bus Fault @ Lewis 230 kV, Delayed Clearing	P5.5	Non-Redundant Bus Diff Relay Failure	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
Lighthipe, 1-PH Bus Fault @ Lighthipe 230 kV, Delayed Clearing	P5.5	Non-Redundant Bus Diff Relay Failure	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
Mesa, 1-PH Bus Fault @ Mesa 230 kV, Delayed Clearing	P5.5	Non-Redundant Bus Diff Relay Failure	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
Olinda, 1-PH Bus Fault @ Olinda 230 kV, Delayed Clearing	P5.5	Non-Redundant Bus Diff Relay Failure	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
Walnut , 1-PH Bus Fault @ Walnut 230 kV, Delayed Clearing	P5.5	Non-Redundant Bus Diff Relay Failure	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
El Segundo (N/S bus), 1-PH Bus Fault @ El Segundo 230 kV, Delayed Clearing	P5.5	Non-Redundant Bus Diff Relay Failure	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
Goodrich, 1-PH Bus Fault @ Goodrich 230 kV, Delayed Clearing	P5.5	Non-Redundant Bus Diff Relay Failure	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
Mesa-Vincent 500 kV & Mesa-Mira Loma 500 kV , 3-PH Bus Fault @ Mesa 500 kV, Normal Clearing	P6.1	Two overlapping events	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
ECO-Miguel 500 kV & Ocotillo-Suncrest 500 kV, 3-PH Bus Fault @ ECO 500 kV, Normal Clearing	P6.1	Two overlapping events	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
Mira Loma-Mesa 500 kV & Mira Loma 4AA bank, 3-PH Bus Fault @ Mira Loma 500 kV, Normal Clearing	P6.1	Two overlapping events	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
Mira Loma-Serrano No.2 500 kV & Mira Loma 4AA bank, 3-PH Bus Fault @ Mira Loma 500 kV, Normal Clearing	P6.1	Two overlapping events	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
Rancho Vista-Serrano 500 kV & Lugo-Rancho Vista 500 kV, 3-PH Bus Fault @ Rancho Vista 500 kV, Normal Clearing	P6.1	Two overlapping events	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation

Study Area: SCE Metro

Transient Stability

Contingency	Category	Category Description	Transient Stability Performance					Potential Mitigation Solutions
			2024 Summer Peak	2029 Summer Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	
Rancho Vista 3AA & 4AA bank, 3-PH Bus Fault @ Rancho Vista 500 kV, Normal Clearing	P6.1	Two overlapping events	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
Serrano-Alberhill 500 kV & Rancho Vista-Serrano 500 kV, 3-PH Bus Fault @ Serrano 500 kV, Normal Clearing	P6.1	Two overlapping events	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
Serrano- Alberhill 500 kV & Mira Loma-Serrano No. 2 500 kV, 3-PH Bus Fault @ Serrano 500 kV, Normal Clearing	P6.1	Two overlapping events	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
Serrano 2AA bank & Serrano 3AA bank, 3-PH Bus Fault @ Serrano 500 kV, Normal Clearing	P6.1	Two overlapping events	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
SONGS-San Luis Rey No.1 & No.2 230 kV, 3-PH Bus Fault @ SONGS 230 kV, Normal Clearing	P6.1	Two overlapping events	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
Lugo-Vincent No.1 & No.2 500 kV, 3-PH Bus Fault @ Vincent 500 kV, Normal Clearing	P6.1	Two overlapping events	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
Loss of PDCI Bipole Converters, 1-PH Bus Fault @ Sylmar(SCE) 230 kV, Normal Clearing	P7.2	Bipolar DC	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
Loss of IPPDC Bipole, 1-PH Bus Fault @ Adelanto 500 kV, Normal Clearing	P7.2	Bipolar DC	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
Alamitos-Center 230 kV & Center-Del Amo 230 kV, 1-PH Bus Fault @ Center 230 kV, Normal Clearing	P7.1	DCTL	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
Center-Mesa 230 kV & Center-Olinda 230 kV, 1-PH Bus Fault @ Center 230 kV, Normal Clearing	P7.1	DCTL	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
Ellis-Santiago 230 kV & Ellis-Johanna 230 kV , 1-PH Bus Fault @ Johanna 230 kV, Normal Clearing	P7.1	DCTL	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
Center-Mesa 230 kV & Mesa-Walnut 230 kV, 1-PH Bus Fault @ Mesa 230 kV, Normal Clearing	P7.1	DCTL	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
Goodrich-Mesa 230 kV & Mesa-Vincent No. 1 230 kV, 1-PH Bus Fault @ Mesa 230 kV, Normal Clearing	P7.1	DCTL	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
Center-Olinda 230 kV & Mesa-Walnut 230 kV , 1-PH Bus Fault @ Mesa 230 kV, Normal Clearing	P7.1	DCTL	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation

Study Area: SCE Metro

Transient Stability

Contingency	Category	Category Description	Transient Stability Performance					Potential Mitigation Solutions
			2024 Summer Peak	2029 Summer Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	
La Fresa-Mesa 230 kV & Lighthipe-Harrison 230 kV, 1-PH Bus Fault @ Mesa 230 kV, Normal Clearing	P7.1	DCTL	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
La Fresa-Mesa 230 kV & Harrison-La Fresa 230 kV, 1-PH Bus Fault @ Mesa 230 kV, Normal Clearing	P7.1	DCTL	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
La Fresa-Mesa 230 kV & La Fresa-Laguna Bell 230 kV , 1-PH Bus Fault @ Mesa 230 kV, Normal Clearing	P7.1	DCTL	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
La Fresa-Laguna Bell 230 kV & Lighthipe-Mesa 230 kV, 1-PH Bus Fault @ Mesa 230 kV, Normal Clearing	P7.1	DCTL	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
Lighthipe-Mesa 230 kV & Del Amo-Laguna Bell 230 kV , 1-PH Bus Fault @ Mesa 230 kV, Normal Clearing	P7.1	DCTL	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
La Fresa-Mesa 230 kV & Laguna Bell-Mesa No.1 230 kV , 1-PH Bus Fault @ Mesa 230 kV, Normal Clearing	P7.1	DCTL	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
Lighthipe-Mesa 230 kV & Laguna Bell-Mesa No.2 230 kV , 1-PH Bus Fault @ Mesa 230 kV, Normal Clearing	P7.1	DCTL	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
Mesa-Rio Hondo No.1 & No.2 230 kV , 1-PH Bus Fault @ Mesa 230 kV, Normal Clearing	P7.1	DCTL	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
Goodrich-Gould 230 kV & Mesa-Vincent No.2 230 kV , 1-PH Bus Fault @ Mesa 230 kV, Normal Clearing	P7.1	DCTL	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
Mesa-Vincent No.1 230 kV & Goodrich-Mesa 230 kV , 1-PH Bus Fault @ Mesa 230 kV, Normal Clearing	P7.1	DCTL	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
Mira Loma-Mesa 500 kV & Chino-Mira Loma No.3 230 kV, 1-PH Bus Fault @ Mira Loma 500 kV, Normal Clearing	P7.1	DCTL	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
Mira Loma-Walnut 230 kV & Mira Loma-Olinda 230 kV , 1-PH Bus Fault @ Mira Loma 230 kV, Normal Clearing	P7.1	DCTL	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
Mira Loma-Rancho Vista No.1 & No.2 230 kV, 1-PH Bus Fault @ Rancho Vista 230 kV, Normal Clearing	P7.1	DCTL	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
Ellis-Santiago 230 kV & Johanna-Santiago 230 kV , 1-PH Bus Fault @ Santiago 230 kV, Normal Clearing	P7.1	DCTL	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation

Study Area: SCE Metro

Transient Stability

Contingency	Category	Category Description	Transient Stability Performance					Potential Mitigation Solutions
			2024 Summer Peak	2029 Summer Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	
Mira Loma Serrano No.2 500 kV & Rancho Vista-Serrano 500 kV, 1-PH Bus Fault @ Serrano 500 kV, Normal Clearing	P7.1	DCTL	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
Serrano-Villa Park No.1 & No.2 230 kV, 1-PH Bus Fault @ Serrano 230 kV, Normal Clearing	P7.1	DCTL	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
San Onofre-Serrano 230 kV & Chino-Viejo 230 kV, 1-PH Bus Fault @ Viejo 230 kV, Normal Clearing	P7.1	DCTL	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
Rio Hondo-Vincent No.1 & No.2 230 kV, 1-PH Bus Fault @ Vincent 230 kV, Normal Clearing	P7.1	DCTL	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
La Fresa-Laguna Bell No.2 230 kV & Lighthipe-Harrison 230 kV, 1-PH Bus Fault @ La Fresa 230 kV, Normal Clearing	P7.1	DCTL	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
La Fresa-Laguna Bell No.2 230 kV & La Fresa-Harrison 230 kV, 1-PH Bus Fault @ La Fresa 230 kV, Normal Clearing	P7.1	DCTL	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
Mesa-Lighthipe No.1 & No.2 500kV, 1-PH Bus Fault @ Mesa 500 kV, Normal Clearing	P7.1	DCTL	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
Laguna Bell-Lighthipe No1 & No.2 230 kV, 1-PH Bus Fault @ Laguna Bell 230 kV, Normal Clearing	P7.1	DCTL	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
La Fresa-Laguna Bell No.2 230 kV & Del Amo-Laguna Bell 230 kV, 1-PH Bus Fault @ Laguna Bell 230 kV, Normal Clearing	P7.1	DCTL	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
La Fresa-Lighthipe 230 kV & La Fresa-Hinson 230 kV, 1-PH Bus Fault @ La Fresa 230 kV, Normal Clearing	P7.1	DCTL	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
La Fresa-Lighthipe 230 kV & Del Amo-Hinson 230 kV, 1-PH Bus Fault @ La Fresa 230 kV, Normal Clearing	P7.1	DCTL	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation
Mesa-Vincent No.2 230 kV & Eagle Rock-Mesa 230 kV, 1-PH Bus Fault @ Mesa 230 kV, Normal Clearing	P7.1	DCTL	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No violation

2019-2020 ISO Reliability Assessment - Study Results

Study Area: SCE Metro

Single Contingency Load Drop

Worst Contingency	Category	Category Description	Amount of Load Drop (MW)								Potential Mitigation Solutions
			Select..	Select..	Select..	Select..	Select..	Select..	Select..	Select..	

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

2019-2020 ISO Reliability Assessment - Study Results

Study Area: SCE Metro

Single Source Substation with more than 100 MW Load

Substation	Load Served (MW)								Potential Mitigation Solutions
	Select..	Select..	Select..	Select..	Select..	Select..	Select..	Select..	

No single source substation with more than 100 MW

2019-2020 ISO Reliability Assessment - Study Results
Study Area: Valley Electric Association
Thermal Overloads

California ISO

Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Loading % (Baseline Scenarios)					Loading % (Sensitivity Scenarios)			Project & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2021 SP with Forecasted Load Addition	2024 SP with Forecasted Load Addition	2024 Summer OP Hi Renew & Min Gas Gen	
Amargosa 230/138kV Transformer	Gamebird-Pahrump 138kV Line	P1	N-1	111.28	109.95	119.42	<100	<100	119.04	137.7	<100	Option 1: New Gamebird Transformer Project Option 2: New Charleston-Vista 138kV Line Option 3: Amargosa transformer upgrade
	Northwest-Desert View 230kV Line	P1	N-1	<100	<100	<100	<100	<100	<100	<100	110.29	Sensitivity case only. Utilize Innovation RAS
	Trout Canyon-Sloan Canyon 230kV Line	P1	N-1	N/A	N/A	<100	N/A	N/A	N/A	N/A	109.48	Sensitivity case only. Utilize Sloan Canyon RAS
	Pahrump-Gamebird & Pahrump-Vista 138kV lines; BKR PA222	P4	Stuck Breaker	111.25	109.92	119.42	<100	<100	119	137.75	<100	Option 1: New Gamebird Transformer Project Option 2: New Charleston-Vista 138kV Line Option 3: Amargosa transformer upgrade
	PAHRUMP 138/230kV Tran Bnk. 1 & PAHRUMP-GAMEBIRD 138; BKR PA232	P4	Stuck Breaker	111.28	109.96	119.46	<100	<100	119.03	137.7	<100	
	Northwest-Desert View & Pahrump-Sloan Canyon/Sloan Canyon-Trout Canyon 230kV lines	P6	N-1-1	108.36	109.24	172.07	<100	105.59	113.26	131.75	Nonconv	New Gamebird Transformer Project. Existing UVLS 2024OP High Renewable scenario: utilize Innovation RAS and Sloan Canyon RAS
	Pahrump-Gamebird 138kV and Sloan Canyon-Mead 230kV lines	P7	DCTL	111.28	109.95	119.42	<100	<100	119.04	137.7	<100	Option 1: New Gamebird Transformer Project Option 2: New Charleston-Vista 138kV Line Option 3: Amargosa transformer upgrade
Pahrump 230/138kV Transformer No.1	Pahrump 230/138kV Transformer No.2	P1	N-1	<100	<100	101.56	<100	<100	<100	<100	<100	New Gamebird Transformer Project
	PAHRUMP 138/230kV Tran Bnk. 2 & PAHRUMP-INNOVATION 230; BKR PA122	P4	Stuck Breaker	<100	<100	<100	<100	<100	<100	<100	110.12	Sensitivity case only. Utilize Sloan Canyon RAS
	Pahrump230/138kV Transformer No.2 & Vista-Johnnie-ValleyTP 138kV lines	P6	N-1-1	<100	105.88	120.74	<100	<100	<100	123.83	<100	New Gamebird Transformer Project
Pahrump 230/138kV Transformer No.2	Pahrump 230/138kV Transformer No.1	P1	N-1	<100	<100	101.27	<100	<100	<100	<100	<100	New Gamebird Transformer Project
	PAHRUMP 138/230kV Tran Bnk. 1 & PAHRUMP-INNOVATION 230; BKR PA132	P4	Stuck Breaker	<100	<100	<100	<100	<100	<100	<100	108.41	Sensitivity case only. Utilize Sloan Canyon RAS
	Pahrump230/138kV Transformer No.1 & Vista-Johnnie-ValleyTP 138kV lines	P6	N-1-1	<100	105.94	120.13	<100	<100	<100	123.03	<100	New Gamebird Transformer Project
Jackass-Mercury SW 138kV Line	Pahrump-Vista 138kV line	P1	N-1	<100	<100	101.3	168.24	<100	<100	<100	140.13	Congestion management, RAS to curtail generation and line upgrade
	Vista-Johnnie-ValleyTP 138kV line	P1	N-1	<100	<100	<100	155.57	<100	<100	<100	147.4	
	Stockade Wash-Jackass 138kV line	P1	N-1	<100	<100	<100	105.17	<100	<100	<100	<100	
	Pahrump-Innovation 230kV line	P1	N-1	<100	<100	<100	<100	<100	<100	<100	143.93	Sensitivity case only. Utilize Innovation RAS
	Sloan Canyon 230kV breaker	P4	Stuck Breaker	<100	<100	<100	<100	<100	<100	<100	130.12	Sensitivity case only. Utilize Sloan Canyon RAS
	PAHRUMP-VISTA 138 & PAHRUMP-GAMEBIRD 138; BKR PA222	P4	Stuck Breaker	<100	<100	101.02	168.67	<100	<100	<100	140.35	Congestion management, RAS to curtail generation and line upgrade
	PAHRUMP 138/230kV Tran Bnk. 2 & PAHRUMP-VISTA 138-kV Line; BKR PA212	P4	Stuck Breaker	<100	<100	101.37	168.21	<100	<100	<100	140.13	
	Pahrump-Vista 138kV & Pahrump-Innovation 230kV lines	P7	DCTL	<100	<100	100.79	168.33	<100	<100	<100	139.37	
	Vista-Johnnie-ValleyTP 138kV & Pahrump-Innovation 230kV lines	P7	DCTL	<100	<100	<100	155.76	<100	<100	<100	146.64	
Pahrump-Carpenter Canyon 230kV Line	Trout Canyon-Sloan Canyon 230kV line	P1	N-1	N/A	N/A	<100	N/A	N/A	N/A	N/A	136.85	Sensitivity case only. Utilize Sloan Canyon RAS
	Sloan Canyon 230kV breaker	P4	Stuck Breaker	N/A	N/A	<100	N/A	N/A	N/A	N/A	136.85	
	Trout Canyon-Sloan-Canyon 230kV & ValleyTP-Lathrop SS 138kV lines	P6	N-1-1	N/A	N/A	<100	N/A	N/A	N/A	N/A	138.58	
	Northwest-Desert View 230kV line	P1	N-1	N/A	N/A	<100	N/A	N/A	N/A	N/A	119.95	Sensitivity case only. Utilize Innovation RAS
	Innovation-Desert View 230kV line	P1	N-1	N/A	N/A	<100	N/A	N/A	N/A	N/A	108.12	
	Pahrump-Carpenter Canyon 230kV line	P1	N-1	N/A	N/A	<100	N/A	N/A	N/A	N/A	136.84	Sensitivity case only. Utilize Sloan Canyon RAS

2019-2020 ISO Reliability Assessment - Study Results
Study Area: Valley Electric Association
Thermal Overloads

Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Loading % (Baseline Scenarios)					Loading % (Sensitivity Scenarios)			Project & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2021 SP with Forecasted Load Addition	2024 SP with Forecasted Load Addition	2024 Summer OP Hi Renew & Min Gas Gen	
Trout Canyon-Sloan Canyon 230kV Line	INNOVATION -PAHRUMP 230 & INNNOVATION-DESERT VIEW 230 & INNOVATION TRANS	P4	Stuck Breaker	N/A	N/A	<100	N/A	N/A	N/A	N/A	136.85	Sensitivity case only. Utilize Innovation RAS
	PAHRUMP 138/230kV Tran Bnk. 1 & PAHRUMP-INNOVATION 230; BKR PA132	P4	Stuck Breaker	N/A	N/A	<100	N/A	N/A	N/A	N/A	104.6	
	PAHRUMP 138/230kV Tran Bnk. 2 & PAHRUMP-INNOVATION 230; BKR PA122	P4	Stuck Breaker	N/A	N/A	<100	N/A	N/A	N/A	N/A	104.12	
	Pahrump-Carpenter Canyon 230kV & Gamebird-Sandy 138kV lines	P7	DCTL	N/A	N/A	<100	N/A	N/A	N/A	N/A	136.85	Sensitivity case only. Utilize Sloan Canyon RAS
Amargosa-Sandy-Gamebird 138kV Line	Carpenter Canyon-Trout Canyon & Northwest-Desert View 230kV lines	P6	N-1-1	N/A	N/A	<100	N/A	N/A	N/A	N/A	102.36	Sensitivity case only. Utilize Innovation RAS and Sloan Canyon RAS
Innovation 230/138kV Transformer	Carpenter Canyon-Trout Canyon & Northwest-Desert View 230kV lines	P6	N-1-1	N/A	N/A	<100	N/A	N/A	N/A	N/A	127.54	
Innovation-Desert View 230kV Line	Pahrump-Gamebird 138kV & Carpenter Canyon-Trout Canyon 230kV lines	P6	N-1-1	N/A	N/A	<100	N/A	N/A	N/A	N/A	120.36	Sensitivity case only. Utilize Sloan Canyon RAS

Study Area: Valley Electric Association

High/Low Voltages

Substation	Contingency (All and Worst P6)	Category	Category Description	Voltage PU (Baseline Scenarios)					Voltage PU (Sensitivity Scenarios)			Project & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2021 SP with Forecasted Load Addition	2024 SP with Forecasted Load Addition	2024 Summer OP Hi Renew & Min Gas Gen	
Charleston-Thousandaire-Gamebird-Sandy 138kV buses	Pahrump-Gamebird 138kV line	P1	N-1	0.855	0.818	0.7995	>0.9	0.8929	0.8425	0.7447	0.8908	Option 1: New Gamebird Transformer Project Option 2: New Charleston-Vista 138kV Line Option 3: Amargosa transformer upgrade and reactive support
Charleston-Thousandaire-Gamebird, Vista-Jackass138kV buses	Northwest-Desert View & Pahrump-Sloan Canyon/Sloan Canyon-Trout Canyon 230kV lines	P6	N-1-1	>0.9	0.8983	0.6709	>0.9	0.8511	>0.9	0.8456	Nonconv	New Gamebird Transformer Project Existing UVLS Or Amargosa transformer upgrade and reactive support 2024OP High Renewable: Innovation RAS and Sloan Canyon RAS

Study Area: Valley Electric Association

Voltage Deviation

Substation	Contingency (All and Worst P6)	Category	Category Description	Post Cont. Voltage Deviation % (Baseline Scenarios)					Post Cont. Voltage Deviation % (Sensitivity Scenarios)			Project & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2021 SP with Forecasted Load Addition	2024 SP with Forecasted Load Addition	2024 Summer OP Hi Renew & Min Gas Gen	

No violations

Study Area: Valley Electric Association

Transient Stability

Contingency	Category	Category Description	Transient Stability Performance					Potential Mitigation Solutions
			Baseline Scenarios			Sensitivity Scenarios		
			2024 Summer Peak	2029 Summer Peak	2024 Spring Off-Peak	2024 SP with Forecasted Load Addition	2024 Summer OP Hi Renew & Min Gas Gen	
Pahrump-Innovation 230kV Fault	P1	Normal Clearing	Stable	Stable	Stable	Stable	Stable	No Violation
Pahrump-Sloan Canyon/Carpenter Canyon 230kV	P1	Normal Clearing	Stable	Stable	Stable	Stable	Stable	No Violation
Pahrump 230/138kV Transformer No.1	P1	Normal Clearing	Stable	Stable	Stable	Stable	Stable	No Violation
Pahrump 230/138kV Transformer No.2	P1	Normal Clearing	Stable	Stable	Stable	Stable	Stable	No Violation
Amargosa-Sandy 138kV	P1	Normal Clearing	Stable	Stable	Stable	Stable	Stable	No Violation
Pahrump-Vista 138kV	P1	Normal Clearing	Stable	Stable	Stable	Stable	Stable	No Violation
Pahrump-Gamebird 138kV	P1	Normal Clearing	Stable	Stable	Stable	Stable	Stable	No Violation
Vista-Johnnie-Valley 138kV	P1	Normal Clearing	Stable	Stable	Stable	Stable	Stable	No Violation
Innovation-Desert View 230kV	P1	Normal Clearing	Stable	Stable	Stable	Stable	Stable	No Violation
Innovation 230/138kV Transformer	P1	Normal Clearing	Stable	Stable	Stable	Stable	Stable	No Violation
Northwest-Desert View 230kV	P1	Normal Clearing	Stable	Stable	Stable	Stable	Stable	No Violation
PAHRUMP-VISTA 138 & PAHRUMP-GAMEBIRD 138; BKR PA222	P4	Stuck Breaker	Stable	Stable	Stable	Stable	Stable	No Violation
PAHRUMP 138/230kV Tran Bnk. 1 & PAHRUMP-Sloan Canyon/Carpenter Canyon 230-kV Line; BKR PA112	P4	Stuck Breaker	Stable	Stable	Stable	Stable	Stable	No Violation
PAHRUMP 138/230kV Tran Bnk. 1 & PAHRUMP-INNOVATION 230; BKR PA132	P4	Stuck Breaker	Stable	Stable	Stable	Stable	Stable	No Violation
PAHRUMP 138/230kV Tran Bnk. 2 & PAHRUMP-INNOVATION 230; BKR PA122	P4	Stuck Breaker	Stable	Stable	Stable	Stable	Stable	No Violation
PAHRUMP 138/230kV Tran Bnk. 2 & PAHRUMP-Sloan Canyon/Carpenter Canyon 230; BKR PA142	P4	Stuck Breaker	Stable	Stable	Stable	Stable	Stable	No Violation
PAHRUMP 138/230kV Tran Bnk. 2 & PAHRUMP-VISTA 138-kV Line; BKR PA212	P4	Stuck Breaker	Stable	Stable	Stable	Stable	Stable	No Violation
PAHRUMP 138/230kV Tran Bnk. 1 & PAHRUMP-GAMEBIRD 138; BKR PA232	P4	Stuck Breaker	Stable	Stable	Stable	Stable	Stable	No Violation
INNOVATION -PAHRUMP 230 & INNNOVATION-DESERT VIEW 230 & INNOVATION TRANS	P4	Stuck Breaker	Stable	Stable	Stable	Stable	Stable	No Violation
Pahrump 230kV Bus	P5.5	Non-Redundant Relay	Stable	Stable	Stable	Stable	Stable	No Violation
Sloan Canyon 230kV Bus	P5.5	Non-Redundant Relay	Stable	Stable	Stable	Stable	Stable	No Violation
Desert View 230kV Bus	P5.5	Non-Redundant Relay	Stable	Stable	Stable	Stable	Stable	No Violation
Innovation 230kV Bus	P5.5	Non-Redundant Relay	Stable	Stable	Stable	Stable	Stable	No Violation
Innovation 138kV Bus	P5.5	Non-Redundant Relay	Stable	Stable	Stable	Stable	Stable	No Violation
Pahrump 138kV Bus	P5.5	Non-Redundant Relay	Stable	Stable	Stable	Stable	Stable	No Violation
Amargosa 138kV Bus	P5.5	Non-Redundant Relay	Stable	Stable	Stable	Stable	Stable	No Violation
Lathrop 138kV Bus	P5.5	Non-Redundant Relay	Stable	Stable	Stable	Stable	Stable	No Violation
Sandy 138kV Bus	P5.5	Non-Redundant Relay	Stable	Stable	Stable	Stable	Stable	No Violation
Valley 138kV Bus	P5.5	Non-Redundant Relay	Stable	Stable	Stable	Stable	Stable	No Violation
Valley SS 138kV Bus	P5.5	Non-Redundant Relay	Stable	Stable	Stable	Stable	Stable	No Violation

Study Area: Valley Electric Association

Transient Stability

Contingency	Category	Category Description	Transient Stability Performance					Potential Mitigation Solutions
			Baseline Scenarios			Sensitivity Scenarios		
			2024 Summer Peak	2029 Summer Peak	2024 Spring Off-Peak	2024 SP with Forecasted Load Addition	2024 Summer OP Hi Renew & Min Gas Gen	
Vista 138kV Bus	P5.5	Non-Redundant Relay	Stable	Stable	Stable	Stable	Stable	No Violation
Gamebird 138kV Bus	P5.5	Non-Redundant Relay	Stable	Stable	Stable	Stable	Stable	No Violation
Thousandaire 138kV Bus	P5.5	Non-Redundant Relay	Stable	Stable	Stable	Stable	Stable	No Violation
Pahrump-Innovation 230kV & Pahrump-Sloan Canyon/Carpenter Canyon 230kV	P6	Normal Clearing	Stable	Stable	Stable	Stable	Stable	No Violation
Northwestt-Desert View 230kV & Pahrump-Sloan Canyon/Carpenter Canyon 230kV	P6	Normal Clearing	Stable	Stable	Stable	Stable	Stable	No Violation
Pahrump-Sloan Canyon/Carpenter Canyon 230kV & Pahrump-Gamebird 138kV	P7	Normal Clearing	Stable	Stable	Stable	Stable	Stable	No Violation
Pahrump-Sloan Canyon/Carpenter Canyon 230kV & Gamebird-Sandy 138kV	P7	Normal Clearing	Stable	Stable	Stable	Stable	Stable	No Violation
Pahrump-Innovation 230kV & Pahrump-Vista 138kV	P7	Normal Clearing	Stable	Stable	Stable	Stable	Stable	No Violation
Pahrump-Innovation 230kV & Vista-ValleySS 138kV	P7	Normal Clearing	Stable	Stable	Stable	Stable	Stable	No Violation

Study Area: Valley Electric Association

Single Contingency Load Drop

Worst Contingency	Category	Category Description	Amount of Load Drop (MW)										Potential Mitigation Solutions
			Select..	Select..	Select..	Select..	Select..	Select..	Select..	Select..	Select..	Select..	

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

2019-2020 ISO Reliability Assessment - Study Results

Study Area: Valley Electric Association

Single Source Substation with more than 100 MW Load

Substation	Load Served (MW)										Potential Mitigation Solutions
	Select..	Select..	Select..	Select..	Select..	Select..	Select..	Select..	Select..	Select..	

No single source substation with of more than 100 MW.

Study Area: San Diego Area

Thermal Overloads

Overloaded Facility	Contingency	Category	Category Description	Loading % (Baseline Scenarios)					Loading % (Sensitivity Scenarios)			ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	
22192 DOUBLTTP 138 22300 FRIARS 138 1 1	P1L-23026_22652 PENSQTOS-22596 OLD TOWN 230 1 -AND- P1L-23033_22832 SYCAMORE-22652 PENSQTOS 230 1	P6*	L-1/L-1	<90	<90	<90	<90	<90	<90	103.2	97.7	Rely on the market congestion management to reduce import from CENACE for the P6 and P7 overloads in the off-peak case; and eliminate the P7 contingency if cost-effective
	P7-TL23013+23071_Lines PQ-OT 230kV ck 1 + SX-PQ 230kV ck 1	P7	L-2	<90	<90	<90	<90	<90	<90	102.9	97.8	
22046 BASILONE 69.0 22368 JAP MESA 69.0 1 1	P5-SA230_SAN LUIS REY 230 kV Bus	P5	Non-Redundant Relay	133.4	<90	<90	<90	<90	<90	<90	172.9	Will be eliminated by previously approved projects or potential upgrade of the San Luis Rey 230 kV bus protection relay. Existing 69kV TL 695A at TA is an interim mitigation
22808 STUARTTP 69.0 22400 LASPULGS 69.0 1 1	P5-SA230_SAN LUIS REY 230 kV Bus	P5	Non-Redundant Relay	118.3	236.9	<90	<90	271.1	302.9	178.4	155.4	
22256 ESCNDIDO 69.0 22724 SANMRCOS 69.0 1 1	P5-SA230_SAN LUIS REY 230 kV Bus	P5	Non-Redundant Relay	101.6	101.6	109.0	<90	96.3	117.6	100.3	91.0	Upgrade the San Luis Rey 230 kV bus protection with redundant relay; and evaluate other mitigations if cost-effective
22256 ESCNDIDO 69.0 22724 SANMRCOS 69.0 2 1	P5-SA230_SAN LUIS REY 230 kV Bus	P5	Non-Redundant Relay	95.4	95.4	102.4	<90	90.5	110.4	94.3	<90	
22440 MELROSE 69.0 22442 MELRSETP 69.0 1 1	P5-SA230_SAN LUIS REY 230 kV Bus	P5	Non-Redundant Relay	96.4	96.7	103.4	<90	106.2	113.0	108.4	<90	
22442 MELRSETP 69.0 22724 SANMRCOS 69.0 1 1	P5-SA230_SAN LUIS REY 230 kV Bus	P5	Non-Redundant Relay	182.4	177.0	188.2	96.2	188.0	205.4	197.0	157.2	
22430 SILVERGT 230 22596 OLD TOWN 230 1 1	P5-MS230_Mission 230 kV Bus	P5	Non-Redundant Relay	<90	90.7	<90	<90	<90	92.9	103.1	104.1	The short term emergency rating of the lines can be relied upon in allowing operation action to reduce generation in the Otay Mesa and Pio Pico area in the summer peak case and curtail import from CENACE in the off-peak case after the P5 contingency
22430 SILVERGT 230 22596 OLD TOWN 230 1 1	P1ML-23019_22596 MISSION-OLD TOWN-SILVERGT 3T 230 1 -AND- P1L-23033_22832 SYCAMORE-22652 PENSQTOS 230 1	P6*	L-1/L-1	95.3	105.1	97.8	<90	91.4	107.5	123.5	124.2	The short term emergency rating of the lines can be relied upon in allowing operation action as System adjustment to reduce generation in the Otay Mesa and Pio Pico area in the summer peak case and curtail import from CENACE in the off-peak case after the P6 contingencies
	P1ML-23019_22596 MISSION-OLD TOWN-SILVERGT 3T 230 1 -AND- P1L-50003RAS0_23310 OCOTILLO-22885 SUNCREST 500KV &1	P6*	L-1/L-1	94.5	107.4	101.3	<90	95.9	110.5	127.8	125.7	
22430 SILVERGT 230 22597 OLDTWNTP 230 1 1	P1L-23011_22430 SILVERGT-22596 OLD TOWN 230 1 -AND- P1L-23033_22832 SYCAMORE-22652 PENSQTOS 230 1	P6*	L-1/L-1	94.2	103.4	96.2	<90	<90	105.6	122.1	122.3	
	P1L-23011_22430 SILVERGT-22596 OLD TOWN 230 1 -AND- P1L-50003RAS0_23310 OCOTILLO-22885 SUNCREST 500KV &1	P6*	L-1/L-1	94.1	106.5	100.4	<90	95.1	109.4	127.3	124.7	
22430 SILVERGT 230 22771 BAY BLVD 230 1 1	P1ML-23017_22464 MIGUEL-SYCAMORE-OTAYMESA 3T 230 1 -AND- P1L-50003RAS0_23310 OCOTILLO-22885 SUNCREST 500KV &1	P6*	L-1/L-1	<90	96.8	94.2	<90	<90	102.0	105.5	108.3	
	P1L-23015_22464 MIGUEL-22504 MISSION 230 2 -AND- P1L-50003RAS0_23310 OCOTILLO-22885 SUNCREST 500KV &1	P6*	L-1/L-1	<90	96.3	93.7	<90	<90	101.4	104.3	107.2	
	P1L-23032_22832 SYCAMORE-22464 MIGUEL 230 1 -AND- P1L-50003RAS0_23310 OCOTILLO-22885 SUNCREST 500KV &1	P6*	L-1/L-1	<90	95.8	93.2	<90	<90	100.9	104.5	107.0	
22832 SYCAMORE 230 22652 PENSQTOS 230 1 1	P1L-50001RAS0_22930 ECO-22468 MIGUEL 500KV &1 -AND- P1L-23060_22010 ARTESN-22832 SYCAMORE 230 1	P6*	L-1/L-1	<90	<90	<90	<90	<90	<90	96.7	100.2	Rely on System adjustment to curtail renewable generation in the greater IV area after the first contingency in the sensitivity case with high renewable output
22886 SUNCREST 230 228860 SUNCREST 230 1 1 and 22886 SUNCREST 230 228861 SUNCREST 230 2 1	P1L-50001RAS0_22930 ECO-22468 MIGUEL 500KV &1	P1	L-1	<90	93.8	<90	<90	90.9	100.9	114.7	126.2	Market congestion management, operation procedure, and the 30-minute short term emergency ratings of the lines can be relied upon to perform generation resources redispatch in the SDGE area and adjustment of the IV phase shifters;
	P1G_OT_OTAY MESA Plant G-1 -AND- P1L-50001RAS0_22930 ECO-22468 MIGUEL 500KV &1	P3*	G-1/L-1	<90	99.1	94.7	<90	94.7	106.5	<90	133.6	
	P4-ECO-500-4T_CB EAST COUNTY 500KV 4T	P4	Fault+Stuck Breaker	<90	<90	<90	<90	<90	96.6	108.8	120.1	
22886 SUNCREST 230 228861 SUNCREST 230 2 1	P1L-23054RAS0_22886 SUNCREST-22832 SYCAMORE 230KV 1 1	P1	L-1	<90	94.1	<90	<90	<90	100.7	104.6	119.9	The 30-minute short term emergency ratings of the lines can be relied upon in allowing operation action to redispatch generation in the SDGE area and/or adjust the IV phase shifters after the contingency
22886 SUNCREST 230 228860 SUNCREST 230 1 1	P4-SX-230-22T_CB SYCAMORE CANYON 230KV 22T	P4	Fault+Stuck Breaker	<90	96.1	<90	<90	<90	102.8	107.6	122.0	
22886 SUNCREST 230 228861 SUNCREST 230 2 1	P1L-50001RAS0_22930 ECO-22468 MIGUEL 500KV &1 -AND- P1L-23054RAS2-P1P6_22886 SUNCREST-22832 SYCAMORE 230KV 1 1	P6*	L-1/L-1	123.2	162.9	152.8	<90	160.6	177.8	206.8	232.1	Market congestion management, operation procedure, and the 30-minute short term emergency ratings of the lines can be relied upon to redispatch generation resources including preferred resources and energy storage, curtail import, adjust the IV phase shifters, along with existing TL23054/TL23055 RAS.
	P1L-50001RAS0_22930 ECO-22468 MIGUEL 500KV &1 -AND- P1L-23054RAS2-P1P6_22886 SUNCREST-22832 SYCAMORE 230KV 1 1 -WITH- System adjustment between two overlapping P1 events	P6*	L-1/L-1	123.7	117.9	122.5	<90	<90	124.4	122.6	124.7	
22464 MIGUEL 230 22472 MIGUELMP 500 1 1	P4-ML-230-2T_CB MIGUEL 230KV 2T	P4	Fault+Stuck Breaker	<90	97.5	<90	<90	<90	104.0	107.7	126.6	Existing Miguel BK 80 / BK 81 RAS can be relied upon to eliminate the P4 overload
22464 MIGUEL 230 22468 MIGUEL 500 2 1	P1L-50003RAS0_23310 OCOTILLO-22885 SUNCREST 500KV &1 -AND- P1T-50012RAS2-PPSD_22464 MIGUEL BK80 500/230KV	P6*	L-1/T-1	97.2	126.6	120.2	<90	124.5	135.5	157.9	174.9	Market congestion management and operation procedure can be relied upon to redispatch generation resources including preferred resources and energy storage, curtail import, and adjust the IV phase shifters, along with existing Miguel BK 80 / BK 81 RAS.
	P1L-50003RAS0_23310 OCOTILLO-22885 SUNCREST 500KV &1 -AND- P1T-50012RAS2-PPSD_22464 MIGUEL BK80 500/230KV -WITH- System adjustment between two overlapping P1 events	P6*	L-1/T-1	99.8	93.6	96.8	<90	<90	98.1	94.4	99.2	
22886 SUNCREST 230 22888 SNCRSMP1 500 1 1	P1L-50001RAS0_22930 ECO-22468 MIGUEL 500KV &1 -AND- P1T-50022RAS0_22885 SUNCREST BK81 500/230KV	P6*	L-1/T-1	104.7	130.9	124.7	<90	127.7	137.2	155.5	152.4	Market congestion management and operation procedure can be relied upon to redispatch generation resources including preferred resources and energy storage, curtail import, and adjust the IV phase shifters
22930 ECO 500 22468 MIGUEL 500 1 1	P1L-50003RAS0_23310 OCOTILLO-22885 SUNCREST 500KV &1	P1	L-1	<90	<90	<90	<90	<90	<90	90.5	102.3	Rely on the market congestion management and operation action to re-dispatch generation resources in the SDGE area and adjust the IV phase shifting transformers. Consider modifying existing TL 23040 IV 500kV N-1 RAS to reduce renewable generation curtailment
	P1G_OT_OTAY MESA Plant G-1 -AND- P1L-50003RAS0_23310 OCOTILLO-22885 SUNCREST 500KV &1	P3*	G-1/L-1	<90	<90	<90	<90	<90	<90	<90	109.1	
22609 OTAYMESA 230 20149 TJI-230 230 1 1	P1L-50003RAS0_23310 OCOTILLO-22885 SUNCREST 500KV &1 -AND- P1L-50001RAS2-P6_22930 ECO-22468 MIGUEL 500KV &1	P6*	L-1/L-1	<90	128.6	115.4	<90	129.4	140.2	171.8	90.8	Rely on the market congestion management and operation action to redispatch generation resources in the SDGE area, curtail import, and adjust the IV phase
22357 IV PFC1 230 22358 IV PFC 230 1 1 and 22357 IV PFC1 230 22358 IV PFC 230 2 1	P1L-50003RAS0_23310 OCOTILLO-22885 SUNCREST 500KV &1 -AND- P1L-50001RAS2-P6_22930 ECO-22468 MIGUEL 500KV &1	P6*	L-1/L-1	<90	113.2	102.3	<90	<90	121.5	122.0	109.5	

Study Area: San Diego Area

Thermal Overloads

Overloaded Facility	Contingency	Category	Category Description	Loading % (Baseline Scenarios)					Loading % (Sensitivity Scenarios)			ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	
22357 IV PFC1 230 22358 IV PFC 230 1 1 and 22357 IV PFC1 230 22358 IV PFC 230 2 1	P1L-50001RAS0_22930 ECO-22468 MIGUEL 500KV &1 -AND- P1L-50003RAS2-P6_23310 OCOTILLO-22885 SUNCREST 500KV &1	P6*	L-1/L-1	<90	94.7	<90	<90	<90	101.0	103.5	<90	generation resources in the SDGE area, curtail import, and adjust the IV phase shifting transformers, along with existing RAS for TL50001 and TL50003
22358 IV PFC 230 20118 ROA-230 230 1 1	P1L-50003RAS0_23310 OCOTILLO-22885 SUNCREST 500KV &1 -AND- P1L-50001RAS2-P6_22930 ECO-22468 MIGUEL 500KV &1	P6*	L-1/L-1	<90	99.1	<90	<90	<90	109.0	107.5	96.9	
22844 TALEGA 230 24131 S.ONOFRE 230 1 1	P1L-TIE23_22113 CAPSTRNO-24131 S.ONOFRE 230 1 -AND- P1L-50002_22536 N.GILA-22360 IMPRLVLY 500KV &1	P6*	L-1/L-1	<90	108.0	115.8	<90	91.4	122.9	<90	<90	The short term emergency rating of the lines can be relied upon to allow time for operation action as system adjustment to reduce reactive power output from the synchronous condensers at Talega
24072 JOHANNA 230 24134 SANTIAGO 230 1 1	P1L-SCE06_ 24044 ELLIS-24134 SANTIAGO 230 1 -AND- P1L-50002_22536 N.GILA-22360 IMPRLVLY 500KV &1	P6*	L-1/L-1	<90	98.8	111.5	<90	94.6	113.9	<90	<90	Rely on the market congestion management and operation action to dispatch generation resources including preferred resources in the San Diego area and south Orange county after the first contingency
24044 ELLIS 230 24072 JOHANNA 230 1 1	P1L-SCE06_ 24044 ELLIS-24134 SANTIAGO 230 1 -AND- P1L-50002_22536 N.GILA-22360 IMPRLVLY 500KV &1	P6*	L-1/L-1	<90	102.9	112.5	<90	101.4	114.7	<90	<90	
24044 ELLIS 230 24134 SANTIAGO 230 1 1	P1L-SCE05_ 24044 ELLIS-24072 JOHANNA 230 1 -AND- P1L-50002_22536 N.GILA-22360 IMPRLVLY 500KV &1	P6*	L-1/L-1	<90	109.4	119.6	<90	107.5	122.5	<90	<90	
22356 IMPRLVLY 230 21025 ELCENTSW 230 2 1	P1L-50002_22536 N.GILA-22360 IMPRLVLY 500KV &1	P1	L-1	108.1	<90	<90	<90	<90	<90	<90	<90	Will be mitigated by the approved S-line upgrade project with estimated in-service date of December 2021. Existing ISO operation procedure can be used to eliminate the overload concern as an interim solution
22356 IMPRLVLY 230 21025 ELCENTSW 230 2 1	P1G_TDM_TDM Plant G-1 -AND- P1L-50002_22536 N.GILA-22360 IMPRLVLY 500KV &1	P3*	G-1/L-1	143.4	<90	<90	<90	<90	<90	<90	95.9	
22356 IMPRLVLY 230 21025 ELCENTSW 230 2 1	P4-IV-500-8022_CB IMPERIAL VALLEY 500KV 8022	P4	Fault+Stuck Breaker	106.5	<90	<90	<90	<90	<90	<90	<90	

Note: P3 and P6 results are reported without System adjustment between the two single P1 events, unless indicated otherwise in the Contingency description

Study Area: San Diego Area

High/Low Voltages

Substation	Contingency (All and Worst P6)	Category	Category Description	Voltage PU (Baseline Scenarios)					Voltage PU (Sensitivity Scenarios)			ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Winter Peak	2024 Winter Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	
NONE high/low voltage concern												

2019-2020 ISO Reliability Assessment - Study Results

Study Area: San Diego Area

Voltage Deviation

Substation	Contingency (All and Worst P6)	Category	Category Description	Voltage Deviation % (Baseline Scenarios)					Voltage Deviation % (Sensitivity Scenarios)			ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	
NONE voltage deviation concern												

Contingency	Category	Category Description	Transient Stability Performance					Potential Mitigation Solutions
			Baseline Scenarios			Sensitivity Scenarios		
			2024 Summer Peak	2029 Summer Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	
P5-SA230_SAN LUIS REY 230 kV bus fault with relay failure to operate	P5	SLG Fault+Relay Failure	stable	stable	stable	stable	stable	No violation
P5-MS230_Mission 230 kV bus fault with relay failure to operate	P5	SLG Fault+Relay Failure	stable	stable	stable	stable	stable	No violation
P5-SG230_Silvergate 230 kV bus fault with relay failure to operate	P5	SLG Fault+Relay Failure	stable	stable	stable	stable	stable	No violation
P5-PEN230_Palamar 230 kV bus fault with relay failure to operate	P5	SLG Fault+Relay Failure	stable	stable	stable	stable	stable	No violation
ECO-MIGUEL 500 KV line out of service followed by the loss of Ocotillo-Suncrest 500 kV line that triggers 500 kV line TL50003 Gen Drop RAS, with system adjustment between the two events	P6	3Ø Fault @ Suncrest 500 kV	stable	stable	stable	stable	stable	No violation
ECO-MIGUEL 500 KV line out of service followed by the loss of Sycamore-Suncrest 230 kV line that triggers newly implemented TL23054/TL23055 RAS, with system adjustment between the two events	P6	3Ø Fault @ Sycamore 230 kV	stable	stable	stable	stable	stable	No violation
Ocotillo-Suncrest 500 KV line out of service followed by the loss of ECO-Miguel 500 kV line that triggers 500 kV line TL50001 Gen Drop RAS, with system adjustment between the two events	P6	3Ø Fault @ Miguel 500 kV	stable	stable	stable	stable	stable	No violation

Study Area: San Diego Area

Single Contingency Load Drop

Worst Contingency	Category	Category Description	Amount of Load Drop (MW)										Potential Mitigation Solutions
			Select..	Select..	Select..	Select..	Select..	Select..	Select..	Select..	Select..	Select..	
No single contingency resulted in total load drop of more than 250 MW													

2019-2020 ISO Reliability Assessment - Study Results

Study Area: San Diego Area

Single Source Substation with more than 100 MW Load

Substation	Load Served (MW)										Potential Mitigation Solutions
	Select..	Select..	Select..	Select..	Select..	Select..	Select..	Select..	Select..	Select..	
No single source substation with load more than 100 MW											

2019-2020 ISO Reliability Assessment - Study Results

Study Area: San Diego Sub-Transmission

Thermal Overloads

Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Loading % (Baseline Scenarios)					Loading % (Sensitivity Scenarios)			ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	
22016 AVCADOTP 69.0 22020 AVOCADO 69.0 1 1	TL698_Line AVOCADO-MNSRATTP 69kV ck 1	P1	N-1	<90	<90	<90	151	187	<90	186	<90	Potential RAS to trip battery charging at Avocado
	TL0698A AVOCADO-MNSRATTP ck 1	P2.1	N-1	<90	<90	<90	150	186	<90	185	<90	
	TL0698B MONSRATE-MNSRATTP ck 1	P2.1	N-1	<90	<90	<90	99	141	<90	129	<90	
	TL0691B AVCADOTP-MONSRATE ck 1	P2.1	N-1	<90	<90	<90	<90	102	<90	95	<90	
22020 AVOCADO 69.0 22508 MNSRATTP 69.0 1 1	TL691_Line MONSRATE-AVOCADOTP 69kV ck 1	P1	N-1	<90	<90	<90	151	191	<90	190	<90	Potential RAS to trip battery charging at Avocado
	TL6912_Line PANDLETN-SANLUSRY 69kV ck 1	P1	N-1	<90	<90	<90	91	111	<90	110	<90	
	TL0691D AVOCADO-AVCADOTP ck 1	P2.1	N-1	<90	<90	<90	149	184	<90	183	<90	
	TL0691C AVCADOTP-PENDLETN ck 1	P2.1	N-1	<90	<90	<90	<90	112	<90	111	<90	
22046 BASILONE 69.0 22368 JAP MESA 69.0 1 1	TL23007_Line TALEGA-S.ONOFRE 230kV ck 1 AND TL23052_Line TALEGA-S.ONOFRE 230kV ck 2	P7	N-2	126	<90	<90	<90	<90	<90	<90	144	Upgrade Basilone-Jap Mesa 69 kV, as previously approved, in 2022, existing SPS to trip TL 695 in the interim
22112 CAPSTRNO 138 22860 TRABUCO 138 1 1	TL13831_Line TALEGA-R.MSNVJO 138kV ck 1 AND TL13833_Line PICO-TRABUCO 138kV ck 1	P6	N-1-1	116	<90	<90	<90	<90	<90	<90	111	SOCRE project as previously approved in transmission plan, Operation Procedure in the interim
	TL13833_Line PICO-TRABUCO 138kV ck 1 AND TL13838_Line R.MSNVJO-MARGARTA 138kV ck 1	P6	N-1-1	105	<90	<90	<90	<90	<90	<90	100	
22192 DOUBLTTP 138 22300 FRIARS 138 1 1	TL23013_Line PENSQTOS-OLD TOWN 230kV ck 1 AND TL23071_Line SYCAMORE-PENSQTOS 230kV ck 1	P7	N-2	<90	<90	<90	<90	<90	<90	103	98	Generation Re-dispatch/Potential RAS to trip generation
22416 LOVELAND 69.0 22168 DESCANSO 69.0 1 1	TL6958_Line CAMERON-CRESTWD 69kV ck 1	P1	N-1	<90	<90	<90	115	104	<90	104	95	Existing Crestwood RAS to trip generation
	TL6923_Line BARRETT-CAMERON 69kV ck 1	P1	N-1	<90	<90	<90	111	95	<90	95	<90	
	TL6957_Line BARRETT-LOVELAND 69kV ck 1	P1	N-1	<90	<90	<90	108	<90	<90	<90	<90	
22524 MORHILTP 69.0 22440 MELROSE 69.0 1 1	TL6912_Line PENDLETN-SANLUSRY 69 kV ck 1	P1	N-1	<90	<90	<90	<90	102	<90	95	<90	Potential RAS to trip battery charging at Avocado
	TL6912_Line PENDLETN-SANLUSRY 69 kV ck 1 AND TL23051 SYCAMORE - ARTESN ck 1	P6	N-1-1	<90	<90	<90	<90	105	<90	99	<90	
22604 OTAY 69.0 22616 OTAYLKTP 69.0 1 1	TL6910_Line BORDER-SALT CREEK 69kV ck 1	P1	N-1	119	115	115	<90	<90	107	<90	117	30-min rating, Generation Re-dispatch
	TL0649D OTAYLKTP-SANYSDRO ck 1	P2.1	N-1	110	115	115	<90	<90	113	<90	115	
22640 PENDLETN 69.0 22708	TL694_Line MORHILTP-MELROSE 69 kV ck 1	P1	N-1	<90	<90	<90	<90	103	<90	96	<90	
	TL0694A MELROSE-MORHILTP ck 1	P2.1	N-1	<90	<90	<90	<90	107	<90	100	<90	

2019-2020 ISO Reliability Assessment - Study Results

Study Area: San Diego Sub-Transmission

Thermal Overloads

Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Loading % (Baseline Scenarios)					Loading % (Sensitivity Scenarios)			ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	
~~22840 PENDLETN 69.0 22700~~ SANLUSRY 69.0 1 1	TL0694B MONSRATE-MORHILTP ck 1	P2.1	N-1	<90	<90	<90	<90	103	<90	96	<90	Potential RAS to trip battery charging at Avocado
	TL694_Line MORHILTP-MELROSE 69 kV ck 1 AND TL23051 SYCAMORE - ARTESN ck 1	P6	N-1-1	<90	<90	<90	<90	105	<90	100	<90	
22808 STUARTTP 69.0 22400 LASPULGS 69.0 1 1	TL23007_Line TALEGA-S.ONOFRE 230kV ck 1 AND TL23052_Line TALEGA-S.ONOFRE 230kV ck 2	P7	N-2	147	<90	<90	<90	<90	<90	<90	160	Upgrade Las Pulgas - Stuart Tap 69 kV, as previously approved, in 2022, existing SPS to trip TL 695 in the interim
22841 LAGNA NL TAP 138 22396 LAGNA NL 138 1 1	Bus PICO 138kV East	P2		115	<90	<90	<90	<90	<90	<90	114	SOCRE project as previously approved in transmission plan, Operation Procedure in the interim
	PICO TCB 138 kV 13836/46/16/48	P4		113	<90	<90	<90	<90	<90	<90	112	
	TL13816_Line CAPSTRNO-PICO 138 kV ck 1 AND TL13831_Line TALEGA-R.MSNVJO 138kV ck 1	P6	N-1-1	105	<90	<90	<90	<90	<90	<90	105	
	TL13816_Line CAPSTRNO-PICO 138 kV ck 1 AND TL13838_Line R.MSNVJO-MARGARTA 138kV ck 1	P6	N-1-1	100	<90	<90	<90	<90	<90	<90	100	
	TL13836_Line TALEGA-PICO 138kV ck 1 AND TL13846_Line PICO-TA TAP33 138kV ck 1	P7	N-2	115	<90	<90	<90	<90	<90	<90	114	
22306 GARFIELD 69.0 22208 EL CAJON 69.0 1 1	Murray 69kV North Bus	P2		110	114	112	<90	<90	125	<90	112	Prefered resources, Load Reduction, Reconductor the line
22208 EL CAJON 69.0 22408 LOSCOCHS 69.0 1 1	LOSCOCHS-GRANITE 69 kV ck 1 AND LOSCOCHS-GRANITE 69 kV ck 2	P6	N-2	93	102	95	<90	109	116	114	104	30-min rating, Generation Re-dispatch
	TL620_Line MURRAY-GARFIELD 69 kV ck 1 AND TL624_Line EL CAJON-JAMACHA 69 kV ck 1	P6	N-2	<90	<90	<90	<90	105	<90	105	<90	

Study Area: San Diego Sub-Transmission

High/Low Voltages

Substation	Contingency (All and Worst P6)	Category	Category Description	Voltage PU (Baseline Scenarios)					Voltage PU (Sensitivity Scenarios)			ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	
None	None											

Study Area: San Diego Sub-Transmission

Voltage Deviation

Substation	Contingency (All and Worst P6)	Category	Category Description	Voltage Deviation % (Baseline Scenarios)					Voltage Deviation % (Sensitivity Scenarios)			ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	
None	None											

Study Area: San Diego Sub-Transmission

Transient Stability

Contingency	Category	Category Description	Transient Stability Performance					Potential Mitigation Solutions
			Baseline Scenarios			Sensitivity Scenarios		
			2024 Summer Peak	2029 Summer Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	
None	None							

Study Area: San Diego Sub-Transmission

Single Contingency Load Drop

Worst Contingency	Category	Category Description	Amount of Load Drop (MW)										Potential Mitigation Solutions
			Select..	Select..	Select..	Select..	Select..	Select..	Select..	Select..	Select..	Select..	

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

2019-2020 ISO Reliability Assessment - Study Results

Study Area: San Diego Sub-Transmission

Single Source Substation with more than 100 MW Load

Substation	Load Served (MW)										Potential Mitigation Solutions
	Select..	Select..	Select..	Select..	Select..	Select..	Select..	Select..	Select..	Select..	

No single source substation with of more than 100 MW.