

Study Area: **PG&E Bulk**

Thermal Overloads



ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)								Potential Mitigation Solutions
					2020 SP Heavy Renewable & Min Gas Gen	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
PGE Blk-T-1	CHICO JCT-ANITA 60 kV	normal conditions	P0	normal	139.2%								radial line, section of Glenn-Anita line, mitigation in area studies
PGE Blk-T-2	GLENN-CAPAY JCT - HEADGATE 60 kV	normal conditions	P0	normal	123.6%								radial line, section of Glenn-Anita line, mitigation in area studies
PGE Blk-T-3	TAFT-TX_BV_HILLS 70 kV	normal conditions	P0	normal	118.4%								radial line, section of Taft-Elk Hills 70 kV, mitigation in area studies
PGE Blk-T-4	HIGHLANDS JCT-LOW LAKE JCT 115 kV	normal conditions	P0	normal	108.0%								section of Eagle Rk-Red Bud 115 kV line, wrong rating
PGE Blk-T-5	VACA DIX- WINTERS-PLAIN FLD 60 kV	normal conditions	P0	normal	111.7%								radial line, low voltage (0.886), moved to 115 kV in 2025, mitigation in area studies
PGE Blk-T-7	E. NICOLAUS-PLUMAS 60 kV	normal conditions	P0	normal	102.4%								radial line, mitigation in area studies
PGE Blk-T-10	WYANDETTE-WYANDETTE JCT (Palermo)115 kV	normal conditions	P0	normal	99.2%								radial line, mitigation in area studies
PGE Blk-T-11	AVENAL T - KETTLEMAN T 70 kV	normal conditions	P0	normal	103.0%								reduce output from Sun City
PGE Blk-T-12	DISCOV TAP-GOLD BEAR 115 kV	normal conditions	P0	normal	108.3%								dispatch Discovery and SERK generation
PGE Blk-T-13	CAL SEDA-ROB-LRNR 60 kV	normal conditions	P0	normal	103.9%								dispatch COG.NTNL generation
PGE Blk-T-14	CAYETANO -USWP-JRW 230 kV	normal conditions	P0	normal	101.7%								reduce output from GRNRDG generator or/and generation at Bird Landng
PGE Blk-T-15	DELEVAN-CORTINA 230 kV	Olinda-Tracy 500 kV	P1	L-1	101.1%								reduce Colusa generation or upgrade/rerate the line
		Table Mtn-Vaca Dix 500 kV	P1	L-1	101.4%								
PGE Blk-T-17	MOSSLND2 - LASAGUIL 230.0 #2	Moss Landing -Los Banos 500 kV	P1	L-1	105.5%								use short-term rating, or trip renewable generation connected to this line
		Moss Landing 500/230 kV x-former	P1	T-1	104.0%								
PGE Blk-T-18	ROUND MTN –TABLE MTN #1 or #2 500 kV	Rnd Mtn –Table Mtn #2 or #1 500 kV	P1	L-1	101.1%								bypass ser caps on the remaining Round Mtn-Table Mtn 500 kV line or Tbl Mtn-Vaca Dix or reduce COI flow according to seasonal nomogram
PGE Blk-T-14	CAYETANO -USWP-JRW 230 kV	C.Costa-Las Positas 230 kV	P1	L-1	104.8%								reduce output from GRNRDG generator or/and generation at Bird Landng under normal conditions
		Tesla-Metcalf 500 kV	P1	L-1	99.5%								
		Tesla-Newark 230 kV	P1	L-1	97.9%								
PGE Blk-T-20	CAYETANO-NDUBLIN 230.0	C.Costa-Las Positas 230 kV	P1	L-1	98.9%								reduce output from GRNRDG generator or/and generation at Bird Landng under normal conditions

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					2020 SP Heavy Renewable & Min Gas Gen	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
PGE Blk-T-21	TBL MT D -RIO OSO 230 kV	Table Mtn-Vaca Dixon 500 kV	P1	L-1	99.7%								replace limiting terminal equipment by 2020
PGE Blk-T-15	DELEVAN-CORTINA 230 kV	Vaca Dix 500 kV stuck brk	P4	BRK	103.2%								upgrade/rerate the line or reduce Colusa generation, Colusa dispatch was modeled lower in 2017
		Table Mtn 500 kV stuck brk	P4	BRK	97.9%								
PGE Blk-T-17	MOSSLND2-LASAGUIL 230.0 #2	Mosslanding stuck Brk 500 kV	P4	BRK	105.5%								use short-term rating
PGE Blk-T-17	MOSSLND2 - LASAGUIL 230 kV #2	Tesla-Metcalf 500 kV & Moss Landing-Los Banos 500 kV	P6	L-1/L-1	204.3%								Dispatch generation in San Jose. Sectionalize San Jose system. Turn on all available capacitors. Other mitigation measures are being evaluated.
		Tesla-Metcalf 500 kV & Moss Landing-Los Banos 500 kV w/San Jose gen dispatched	P6	L-1/L-1	186.7%								
		Tesla-Metcalf 500 kV & Moss Landing-Metcalf 500 kV	P6	L-1/L-1	98.1%								use short-term rating if overload
		Moss Landing-Metcalf 500 kV & Moss Landing-Los Banos 500 kV	P6	L-1/L-1	121.1%								Open Mosslanding-Lasaguilass 230 kV line if overload or use short-term rating
		Moss Landing-Tesla 500 kV & Moss Landing-Los Banos 500 kV	P6	L-1/L-1	120.9%								trip renewable generation connected to this line, use short-term rating. Other mitigation measures are being evaluated
		Metcalf-Tesla 500 kV & NEWARK-NEWARK DSTR 230 kV	P6	L-1/L-1	101.9%								use short-term rating if overload
		MossIng-Coburn 230 kV and Mosslanding 500/230 kV x-former	P6	L-1/T-1	125.1%								use short-term rating and trip generation connected to this line
		MossIng-Coburn 230 kV and Mosslanding-Los Banos 500 kV	P6	L-1/L-1	122.5%								use short-term rating and/or trip generation connected to this line
		Tesla-Metcalf 500 kV and Mosslanding 500/230 kV x-former	P6	L-1/T-1	125.0%								use short-term rating and trip generation connected to this line
		Mosslanding-Metcalf 500 kV and Mosslanding 500/230 kV x-former	P6	L-1/T-1	118.5%								use short-term rating if overload
		Mosslanding-Los Banos 500 kV and Mosslanding 500/230 kV x-former	P6	L-1/T-1	117.9%								use short-term rating if overload
		Mosslanding-Los Banos 500 kV and Los Banos 500/230 kV x-former	P6	L-1/T-1	99.4%								use short-term rating if overload
PGE Blk-T-22	LASAGUILASS - PANOCHE 230 1 & 2	Tesla-Metcalf 500 kV & Moss Landing-Los Banos 500 kV	P6	L-1/L-1	102.9%								Dispatch generation in San Jose. Sectionalize San Jose system. Turn on all available capacitors. Other mitigation measures are being evaluated.
PGE Blk-T-27	LONETREE-USWP-JRW 230 kV	Tesla-Metcalf 500 kV & Moss Landing-Los Banos 500 kV	P6	L-1/L-1	99.5%								



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					2020 SP Heavy Renewable & Min Gas Gen	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
PGE Blk-T-28	LS ESTEROS - NWK DIST 230 kV	Tesla-Metcalf 500 kV & Moss Landing-Metcalf 500 kV	P6	L-1/L-1	114.8%								dispatch Ls Esteros peakers after 1st contingency
		Tesla-Metcalf 500 kV & Moss Landing-Los Banos 500 kV	P6	L-1/L-1	147.8%								Dispatch generation in San Jose. Sectionalize San Jose system. Turn on all available capacitors. Other mitigation measures are being evaluated.
		Tesla-Metcalf 500 kV & Moss Landing-Los Banos 500 kV w/San Jose gen dispatched	P6	L-1/L-1	121.5%								
PGE Blk-T-29	METCALF 500/230 kV x-former #13	Metcalf 500/230 kV Tranformers #11 and #12	P6	T-1/T-1	118.1%								dispatch Ls Esteros peakers after 1st contingency, trip load in San Jose if overload persists
PGE Blk-T-30	N.DUBLIN-CAYETANO 230 kV	Tesla-Metcalf 500 kV & Moss Landing-Los Banos 500 kV	P6	L-1/L-1	114.0%								Dispatch generation in San Jose. Sectionalize San Jose system. Turn on all available capacitors. Other mitigation measures are being evaluated.
		Tesla-Metcalf 500 kV & Moss Landing-Los Banos 500 kV w/San Jose gen dispatched	P6	L-1/L-1	106.1%								reduce output from GRNRDG generator or/and generation at Bird Landng
		Tesla-Metcalf 500 kV & Moss Landing-Metcalf 500 kV	P6	L-1/L-1	103.9%								reduce output from GRNRDG generator or/and generation at Bird Landng under normal conditions
		Tesla-Table Mtn and Tesla-Metcalf 500 kV	P6	L-1/L-1	95.4%								
		Tesla-Metcalf 500 kV and C.Cos-Moraga # 1 or 2 230 kV	P6	L-1/L-1	101.0%								
		Tesla-Metcalf 500 kV and C.Cos-Ls Positas 230 kV	P6	L-1/L-1	110.7%								
PGE Blk-T-31	N.DUBLIN-VINEYARD 230 kV	Tesla-Metcalf 500 kV & Moss Landing-Metcalf 500 kV	P6	L-1/L-1	97.0%								reduce output from GRNRDG generator or/and generation at Bird Landng under normal conditions
		Tesla-Metcalf 500 kV & Moss Landing-Los Banos 500 kV w/San Jose gen dispatched	P6	L-1/L-1	99.7%								
		Tesla-Metcalf 500 kV and C.Cos-Ls Positas 230 kV	P6	L-1/L-1	103.8%								
		Tesla-Metcalf 500 kV & Moss Landing-Los Banos 500 kV	P6	L-1/L-1	107.1%								Dispatch generation in San Jose. Sectionalize San Jose system. Turn on all available capacitors. Other mitigation measures are being evaluated.
PGE Blk-T-32	NEWARK 230/115 # 11	Tesla-Metcalf 500 kV & Moss Landing-Los Banos 500 kV	P6	L-1/L-1	105.4%								dispatching generation in San Jose mitigated this overload
		Tesla-Metcalf 500 kV & Moss Landing-Los Banos 500 kV w/San Jose gen dispatched	P6	L-1/L-1	98.6%								

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					2020 SP Heavy Renewable & Min Gas Gen	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
32		Tesla-Metcalf 500 kV and NEWARK-NEWARK DSTR 230 kV	P6	L-1/L-1	113.3%								dispatch all generation in San Jose after first contingency
		Tesla-Metcalf 500 kV and LS ESTEROS-NEWARK DSTR 230 kV	P6	L-1/L-1	107.7%								
PGE Bk-T-33	NEWARK E - NWK DIST 230 kV	Tesla-Metcalf 500 kV & Moss Landing-Metcalf 500 kV	P6	L-1/L-1	117.3%								Dispatch generation in San Jose. Sectionalize San Jose system. Turn on all available capacitors.
		Tesla-Metcalf 500 kV & Moss Landing-Los Banos 500 kV	P6	L-1/L-1	147.0%								Dispatch generation in San Jose. Sectionalize San Jose system. Turn on all available capacitors. Other mitigation measures are being evaluated.
		Tesla-Metcalf 500 kV & Moss Landing-Los Banos 500 kV w/San Jose gen dispatched	P6	L-1/L-1	123.0%								
PGE Bk-T-34	NEWARK F - LCKHD J1 115 kV	Tesla-Metcalf 500 kV & Moss Landing-Metcalf 500 kV	P6	L-1/L-1	102.2%								Dispatch generation in San Jose. Sectionalize San Jose system. Turn on all available capacitors.
		Tesla-Metcalf 500 kV & Moss Landing-Los Banos 500 kV	P6	L-1/L-1	129.4%								Dispatch generation in San Jose. Sectionalize San Jose system. Turn on all available capacitors. Other mitigation measures are being evaluated.
		Tesla-Metcalf 500 kV & Moss Landing-Los Banos 500 kV w/San Jose gen dispatched	P6	L-1/L-1	124.9%								
PGE Bk-T-35	NEWARK F -DIXON LD 115 kV	Tesla-Metcalf 500 kV & Moss Landing-Los Banos 500 kV	P6	L-1/L-1	109.0%								Dispatch generation in San Jose. Sectionalize San Jose system. Turn on all available capacitors. Other mitigation measures are being evaluated.
		Tesla-Metcalf 500 kV & Moss Landing-Los Banos 500 kV w/San Jose gen dispatched	P6	L-1/L-1	100.9%								
PGE Bk-T-37	TRACY 500 /230 kV x-former #1 or # 2	Tesla-Tracy 500 kV Line and Tracy 500/230 kV x-former # 2 or # 1	P6	L-1/T-1	112.5%								open Tracy-Tesla 230 kV lines if overload, trip Tracy pumps if it persists
PGE Bk-T-38	TRIMBLE-SJB DG 115 kV	Tesla-Metcalf 500 kV & Moss Landing-Los Banos 500 kV	P6	L-1/L-1	129.2%								Dispatch generation in San Jose. Sectionalize San Jose system. Turn on all available capacitors. Other mitigation measures are being evaluated.
		Tesla-Metcalf 500 kV & Moss Landing-Los Banos 500 kV w/San Jose gen dispatched	P6	L-1/L-1	145.3%								
		Tesla-Metcalf 500 kV & Moss Landing-Los Banos 500 kV	P6	L-1/L-1	119.9%								Dispatch generation in San Jose. Sectionalize San Jose system. Turn on all available capacitors. Other mitigation measures are being evaluated.



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					2020 SP Heavy Renewable & Min Gas Gen	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
PGE Blk-T-14	CAYETANO -USWP-JRW 230 kV	Tesla-Metcalf 500 kV & Moss Landing-Los Banos 500 kV w/San Jose gen dispatched	P6	L-1/L-1	112.0%								reduce output from GRNRDG generator or/and generation at Bird Landng
		Tesla-Metcalf 500 kV & Metcalf-Moss Landing 500 kV	P6	L-1/L-1	108.9%								Dispatch generation in San Jose. Sectionalize San Jose system. Turn on all available capacitors. Reduce generation from Bird Landing
		Table Mtn-Tesla and Tesla-Metcalf 500kV	P6	L-1/L-1	101.3%								reduce output from GRNRDG generator or/and generation at Bird Landng under normal conditions
		Tesla-Metcalf 500 kV and C.Cos-Moraga # 1 or 2 230 kV	P6	L-1/L-1	106.8%								
		Tesla-Metcalf 500 kV and C.Cos-Ls Positas 230 kV	P6	L-1/L-1	116.6%								
PGE Blk-T-41	COTTONWD E-ROUND MTN 230kV #3	COTTONWD E-RND MTN 230kV #1 or 2 & Round Mtn 500/230 kV x-former	P6	L-1/T-1	106.9%								upgrade the line, or limit COI import within nomogram
PGE Blk-T-21	TABLE MTN-RIO OSO 230 kV	Table Mtn 500/230 kV x-former and TABLE MTN-PALERMO 230 kV	P6	L-1/T-1	107.0%								Upgrade terminal equipment on this line.
PGE Blk-T-39	CAPTAIN JACK-OLINDA 500 kV	Malin- Round Mtn #1 and #2 500 kV	P7	L-2	104.8%								operate within COI nomogram
		Round Mtn-Table Mtn # 1 & # 2 500 kV	P7	L-2	106.6%								
PGE Blk-T-40	DELTA-CASCADE 115 kV	Malin- Round Mtn #1 and #2 500 kV	P7	L-2	104.7%								adjust Weed phase shifter
		Round Mtn-Table Mtn # 1 & # 2 500 kV	P7	L-2	95.5%								
PGE Blk-T-41	COTTONWD E-ROUND MTN 230kV #3	Tbl Mtn-Tesla and Tbl Mtn-Vaca Dix 500 kV	P7	L-2	108.9%								upgrade the line, or limit COI import within nomogram
PGE Blk-T-42	COTTONWD E-ROUND MTN 230kV #2	Table Mtn-Tesla and Table Mtn-Vaca Dix 500 kV	P7	L-2	100.1%								upgrade the line, or limit COI import within nomogram
PGE Blk-T-15	DELEVAN-CORTINA 230 kV	Round Mtn-Table Mtn # 1 & # 2 500 kV	P7	L-2	111.8%								upgrade/rerate the line, or modify RAS to trip Colusa generation
		Tbl Mtn-Tesla & Tbl Mtn-Vaca Dix 500 kV	P7	L-2	112.3%								
PGE Blk-T-43	DRUM- BRNSWCKP 115 kV #2	Round Mtn-Table Mtn # 1 and # 2 500 kV	P7	L-2	103.0%								reduce DRUM # 5 generation
PGE Blk-T-21	TABLE MTN-RIO OSO 230 kV	Tbl Mtn-Tesla and Tbl Mtn-Vaca Dix 500 kV	P7	L-2	117.3%								Upgrade terminal equipment on this line.
PGE Blk-T-14	CAYETANO -USWP-JRW 230 kV	C.Costa-Brentwood and C.Costa-Delta 230 kV	P7	L-2	99.2%								reduce output from GRNRDG generator or/and generation at Bird Landng under normal conditions
		Table Mtn-Tesla and Vaca Dix-Tesla 500 kV	P7	L-2	100.2%								
PGE Blk-T-47	CAPTAIN JACK-PONDEROSA B 500 kV	PDCI bi-pole	P7	DC bipole	99.8%								don't insert Fort Rock series caps or operate within COI nomogram, contact BPA to discuss

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Voltage Deviations



ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %								Potential Mitigation Solutions
					2020 SP Heavy Renewable & Min Gas Gen	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
PGE Blk-VD-1	HOLLISTR 115.0	Moss Landing 500/230 kV x-former	P1	T-1	6.8%								adjust svds and transformer taps
PGE Blk-VD-2	NTVD SW2 115.0	Moss Landing 500/230 kV x-former	P1	T-1	6.6%								adjust svds and transformer taps
PGE Blk-VD-3	NTVD SW1 115.0	Moss Landing 500/230 kV x-former	P1	T-1	6.6%								adjust svds and transformer taps
PGE Blk-VD-4	Green Vly # 1 and 2 115 kV	Moss Landing 500/230 kV x-former	P1	T-1	6.7%								adjust svds and transformer taps
PGE Blk-VD-5	Camp Evers 115 kV	Moss Landing 500/230 kV x-former	P1	T-1	7.0%								adjust svds and transformer taps
PGE Blk-VD-6	Rob Roy 115 kV	Moss Landing 500/230 kV x-former	P1	T-1	6.8%								adjust svds and transformer taps
PGE Blk-VD-7	Paul Sweet 115 kV	Moss Landing 500/230 kV x-former	P1	T-1	7.0%								adjust svds and transformer taps
PGE Blk-VD-8	PRUNEDLE 115.0	Moss Landing 500/230 kV x-former	P1	T-1	6.4%								adjust svds and transformer taps
PGE Blk-VD-9	SOLEDAD 115.0	Moss Landing 500/230 kV x-former	P1	T-1	7.0%								adjust svds and transformer taps
PGE Blk-VD-10	SALINAS 115.0	Moss Landing 500/230 kV x-former	P1	T-1	6.6%								adjust svds and transformer taps
PGE Blk-VD-11	Moss Landing E and D 115 kV	Moss Landing 500/230 kV x-former	P1	T-1	6.1%								adjust svds and transformer taps
PGE Blk-VD-12	CSTRVLE 115.0	Moss Landing 500/230 kV x-former	P1	T-1	6.2%								adjust svds and transformer taps
PGE Blk-VD-13	Dolan Rd 115 kV	Moss Landing 500/230 kV x-former	P1	T-1	6.2%								adjust svds and transformer taps
PGE Blk-VD-14	DEL MNTE 115.0	Moss Landing 500/230 kV x-former	P1	T-1	6.5%								adjust svds and transformer taps
PGE Blk-VD-15	HOLST D 115.0	Moss Landing 500/230 kV x-former	P1	T-1	6.8%								adjust svds and transformer taps
PGE Blk-VD-16	SNBENITO 115.0	Moss Landing 500/230 kV x-former	P1	T-1	6.7%								adjust svds and transformer taps
PGE Blk-VD-17	WTSNVLE 115.0	Moss Landing 500/230 kV x-former	P1	T-1	6.7%								adjust svds and transformer taps
PGE Blk-VD-18	GRANT RK 115.0	Moss Landing 500/230 kV x-former	P1	T-1	6.7%								adjust svds and transformer taps
PGE Blk-VD-19	BRIGTANO 115.0	Moss Landing 500/230 kV x-former	P1	T-1	6.7%								adjust svds and transformer taps
PGE Blk-VD-20	LGNTS J1 60.0	Moss Landing 500/230 kV x-former	P1	T-1	6.9%								adjust svds and transformer taps
PGE Blk-VD-21	GABILAN 60.0	Moss Landing 500/230 kV x-former	P1	T-1	6.9%								adjust svds and transformer taps
PGE Blk-VD-22	SALINAS2 60.0	Moss Landing 500/230 kV x-former	P1	T-1	6.7%								adjust svds and transformer taps
PGE Blk-VD-23	SALINAS1 60.0	Moss Landing 500/230 kV x-former	P1	T-1	6.7%								adjust svds and transformer taps
PGE Blk-VD-24	BORONDA 60.0	Moss Landing 500/230 kV x-former	P1	T-1	6.7%								adjust svds and transformer taps

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					2020 SP Heavy Renewable & Min Gas Gen	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
PGE Blk-VD-25	FORT ORD 60.0	Moss Landing 500/230 kV x-former	P1	T-1	6.6%								adjust svds and transformer taps
PGE Blk-VD-26	DEL MNTE 60.0	Moss Landing 500/230 kV x-former	P1	T-1	6.5%								adjust svds and transformer taps
PGE Blk-VD-27	MONTEREY 60.0	Moss Landing 500/230 kV x-former	P1	T-1	6.6%								adjust svds and transformer taps
PGE Blk-VD-28	NAVY SCHL 60.0	Moss Landing 500/230 kV x-former	P1	T-1	6.5%								adjust svds and transformer taps
PGE Blk-VD-29	VIEJO 60.0	Moss Landing 500/230 kV x-former	P1	T-1	6.6%								adjust svds and transformer taps
PGE Blk-VD-30	HATTON 60.0	Moss Landing 500/230 kV x-former	P1	T-1	6.6%								adjust svds and transformer taps
PGE Blk-VD-31	NAVY LAB 60.0	Moss Landing 500/230 kV x-former	P1	T-1	6.5%								adjust svds and transformer taps
PGE Blk-VD-32	RSVTN RD 60.0	Moss Landing 500/230 kV x-former	P1	T-1	6.9%								adjust svds and transformer taps
PGE Blk-VD-33	LAURELES 60.0	Moss Landing 500/230 kV x-former	P1	T-1	7.2%								adjust svds and transformer taps
PGE Blk-VD-34	OTTER 60.0	Moss Landing 500/230 kV x-former	P1	T-1	7.3%								adjust svds and transformer taps
PGE Blk-VD-35	FRSHXPRS 60.0	Moss Landing 500/230 kV x-former	P1	T-1	6.9%								adjust svds and transformer taps
PGE Blk-VD-36	BNA VSTA 60.0	Moss Landing 500/230 kV x-former	P1	T-1	6.9%								adjust svds and transformer taps
PGE Blk-VD-37	FIRESTNE 60.0	Moss Landing 500/230 kV x-former	P1	T-1	6.9%								adjust svds and transformer taps
PGE Blk-VD-38	SPENCE 60.0	Moss Landing 500/230 kV x-former	P1	T-1	6.9%								adjust svds and transformer taps
PGE Blk-VD-39	SNBRN JT 60.0	Moss Landing 500/230 kV x-former	P1	T-1	6.7%								adjust svds and transformer taps
PGE Blk-VD-40	IND.ACRE 60.0	Moss Landing 500/230 kV x-former	P1	T-1	6.7%								adjust svds and transformer taps
PGE Blk-VD-41	9 ST JCT 60.0	Moss Landing 500/230 kV x-former	P1	T-1	7.2%								adjust svds and transformer taps
PGE Blk-VD-42	CMPHR J2 and J1 60.0	Moss Landing 500/230 kV x-former	P1	T-1	7.1%								adjust svds and transformer taps
PGE Blk-VD-43	GONZALES 60.0	Moss Landing 500/230 kV x-former	P1	T-1	7.3%								adjust svds and transformer taps
PGE Blk-VD-44	CAMPHORA 60.0	Moss Landing 500/230 kV x-former	P1	T-1	7.1%								adjust svds and transformer taps
PGE Blk-VD-45	SOLEDAD 60.0	Moss Landing 500/230 kV x-former	P1	T-1	7.0%								adjust svds and transformer taps
PGE Blk-VD-46	SLD ENRG 12.5	Moss Landing 500/230 kV x-former	P1	T-1	7.0%								adjust svds and transformer taps
PGE Blk-VD-47	CRZY_HRS 115.0	Moss Landing 500/230 kV x-former	P1	T-1	6.5%								adjust svds and transformer taps
PGE Blk-VD-48	NATIVDAD 115.0	Moss Landing 500/230 kV x-former	P1	T-1	6.6%								adjust svds and transformer taps

Study Area: **PG&E Bulk**

High/Low Voltage



ID	Substation	Worst Contingency	Category	Category Description	Voltage (kV)								Potential Mitigation Solutions
					2020 SP Heavy Renewable & Min Gas Gen	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
PGE Blk-V-7	CAPTJACK 500.0	Table Mtn-Tesla and Tesla-Vaca Dix 500 kV	P7	L-2	552								turn off shunt capacitors at CAPT JACK at high voltage
PGE Blk-V-12	GRIZZLY 500.0	Table Mtn-Tesla and Tesla-Vaca Dix 500 kV	P7	L-2	552								turn off shunt capacitors at high voltage
PGE Blk-V-14	JOHN DAY 500.0	Table Mtn-Tesla and Tesla-Vaca Dix 500 kV	P7	L-2	550								turn off shunt capacitors at high voltage
PGE Blk-V-19	MALIN 500.0	Table Mtn-Tesla and Tesla-Vaca Dix 500 kV	P7	L-2	552								turn off shunt capacitors at high voltage
PGE Blk-V-24	PONDROSA 500.0	Table Mtn-Tesla and Table Mtn-Vaca Dix 500 kV	P7	L-2	552								turn off shunt capacitors at high voltage
PGE Blk-V-24	PONDROSA 500.0	Table Mtn-Tesla and Tesla-Vaca Dix 500 kV	P7	L-2	555								turn off shunt capacitors at high voltage
PGE Blk-V-25	PONDROSB 500.0	Table Mtn-Tesla and Tesla-Vaca Dix 500 kV	P7	L-2	553								turn off shunt capacitors at high voltage
PGE Blk-V-30	SUMMER L 500.0	Table Mtn-Tesla and Table Mtn-Vaca Dix 500 kV	P7	L-2	551								turn off shunt capacitors at high voltage
PGE Blk-V-30	SUMMER L 500.0	Table Mtn-Tesla and Tesla-Vaca Dix 500 kV	P7	L-2	554								turn off shunt capacitors at high voltage

Study Area: **PG&E Bulk**

Transient Stability



ID	Generator/Load	Contingency	Category	Category Description	Transient Stability Performance								Potential Mitigation Solutions
					2020 SP Heavy Renewable & Min Gas Gen	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
PGE Blk-TS-1	wind generators at High Winds # 3 (bus 32171)	3 Ph fault Contra Costa-La Positas 230 KV	P1	L-1	tripped for undervoltage (38 MW)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	these are old induction generator units that don't have LVRT, they may trip with faults close to these units
		3Ph fault C.-Costa-Brentwood and C.Costa-Delta 230 kV	P7	L-2	tripped for undervoltage	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
		3 Ph fault Contra Costa-La Positas and C.Costa-Lone Tree 230 KV	P7	L-2	tripped for undervoltage	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
		Vaca Dix 500 kV stuck breaker	P4	BRK	tripped for undervoltage	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
PGE Blk-TS-2	wind generators at Shilo # 2 (bus 32177)	3Ph fault Contra-Costa-Brentwood and Contra Costa-Delta 230 kV	P7	L-2	tripped for undervoltage (150 MW)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	these are old induction generator units that don't have LVRT, they may trip with faults close to these units
		3 Ph fault C. Costa-La Positas 230 KV	P1	L-1	tripped for undervoltage	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
		Vaca Dix 500 kV stuck breaker	P4	BRK	tripped for undervoltage	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
		3 Ph fault Contra Costa-La Positas and C.Costa-Lone Tree 230 KV	P7	L-2	tripped for undervoltage	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
PGE Blk-TS-3	STAR GT # 1 and 2 (Calpeak Panoche, buses 34328 and 34329)	all contingencies	P1	L-1	none, exciters modeled with typical data	N/A	N/A	N/A	N/A	N/A	N/A	N/A	possible modeling error of exciters, EXAC8B. Need to contact generator's owners and request results of exciter testing.
PGE Blk-TS-6	Solar PV bus 34694 RPS	3ph fault Gates 230 kV, Gates-Midway 230 kV	P1	L-1	tripped for low voltage with fault (20 MW)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Old wt4g, wt4e models. Under-voltage protection trips in 0.02 sec with vlt 0.5 p.u. Need to discuss protection settings and the plant model parameters with the generation owner.
		3ph fault Gates 230 kV Gates-Arco and Gates-Midway 230 kV	P7	L-2		N/A	N/A	N/A	N/A	N/A	N/A	N/A	
		3 ph Gates 230 kV, Gates-Greg and Gates- MCal	P7	L-2		N/A	N/A	N/A	N/A	N/A	N/A	N/A	
PGE Blk-TS-7	Load on Gates 115 kV	3Ph fault on Gates 230 kV, Gates-Midway 230 kV	P1	L-1	UFLS reduced load to 6%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	slow frequency recovery, load tripped with fault, modeling issue because of low impedance between the fault and load. Low load in off-peak cases
		3Ph fault on Gates 230 kV, Gates-Gregg, Gates-Mc Call 230 kV	P7	L-2		N/A	N/A	N/A	N/A	N/A	N/A	N/A	
		3Ph Fault Gates-Arco, Gates-Midway 230 kV	P7	L-2		N/A	N/A	N/A	N/A	N/A	N/A	N/A	
PGE Blk-TS-8	Load on Gates-distr 12.5 kV	3Ph fault on Gates 230 kV, Gates-Midway 230 kV	P1	L-1	UFLS reduced to 33%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	slow frequency recovery, load tripped with fault, modeling issue because of low impedance between the fault and load
		3Ph fault on Gates 230 kV, Gates-Gregg, Gates-Mc Call 230 kV	P7	L-2		N/A	N/A	N/A	N/A	N/A	N/A	N/A	
		3Ph Fault Gates-Arco, Gates-Midway 230 kV	P7	L-2		N/A	N/A	N/A	N/A	N/A	N/A	N/A	
PGE Blk-TS-9	Solar PV bus 35021 RPS	3Ph fault on Midway 230 kV, Gates-Midway 230 kV	P1	L-1	tripped for low voltage with fault (20 MW)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Old wt4g, wt4e models. Under-voltage protection trips in 0.02 sec with vlt 0.5 p.u. Need to discuss protection settings and the plant model parameters with the generation owner.
		3Ph fault Midway230 kV, Midway-Kern # 1 and 2 230 kV	P7	L-2		N/A	N/A	N/A	N/A	N/A	N/A	N/A	

Study Area: **PG&E Bulk**

Transient Stability



ID	Generator/Load	Contingency	Category	Category Description	Transient Stability Performance								Potential Mitigation Solutions
					2020 SP Heavy Renewable & Min Gas Gen	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
PGE BIK-TS-10	Solar PV bus 35082 RPS	3Ph fault on Midway 230 kV, Gates-Midway 230 kV	P1	L-1	tripped for low voltage with fault (20 MW)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Old wt4g, wt4e models. Under-voltage protection trips in 0.02 sec with vlt 0.5 p.u. Over-frequency trips for 60. 5 Hz in 0.02 sec. Need to discuss protection settings and the plant model parameters with the generation owner.
		3Ph fault on Midway 230 kV, Midway - Kern PP# 2 and 3 230 kV	P7	L-2	tripped for low voltage with fault (20 MW)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
PGE BIK-TS-11	Solar PV bus 39184 RPS	3Ph fault on Midway 230 kV, Gates-Midway 230 kV	P1	L-1	tripped for low freq w/fault (20 MW)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Frequency protection trips the unit at 60.5 Hz or 59.3 Hz in 0.02 sec. Need to check the models with the generation owner. Inverter control model wasn't provided. Same refers to the Pumpjack plant (bus 39176)
		3Ph fault on Midway 230 kV, Midway - Kern PP# 2 and 3 230 kV	P7	L-2		N/A	N/A	N/A	N/A	N/A	N/A	N/A	
PGE BIK-TS-12	Generator Fritolay (35048)	3Ph fault on Midway 230 kV, Gates-Midway 230 kV	P1	L-1	tripped for out of step	N/A	N/A	N/A	N/A	N/A	N/A	N/A	small unit, 6 MW,lost synchronism with fault. Possible numerical issue because of not clean convergence
		3Ph fault on Midway 230 kV, Midway - Kern PP# 2 & 3 230 kV	P7	L-2		N/A	N/A	N/A	N/A	N/A	N/A	N/A	
PGE BIK-TS-14	Solar PV bus 35015 RPS	3Ph fault on Midway 230 kV, Gates-Midway 230 kV	P1	L-1	tripped for low freq. (19.8 MW)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Old wt4g and wt4e models. Protection trips for freq 59.5 Hz in 0.16 seconds. Need to discuss protection settings and the plant model parameters with the generation owner.
		3Ph fault on Midway 230 kV, Midway - Kern PP# 2 & 3 230 kV	P7	L-2		N/A	N/A	N/A	N/A	N/A	N/A	N/A	
PGE BIK-TS-16	Buena Vista pumps	3Ph fault on Midway 230 kV, Gates-Midway 230 kV	P1	L-1	vlt dip up to 29%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	no issues if pumps at Midway tripped. Will be tripped by under-voltage relays with three-phase faults. Modeling issue.
PGE BIK-TS-17	Wheeler Ridge pumps	3Ph fault on Midway 230 kV, Gates-Midway 230 kV	P1	L-1	vlt dip up to 41%, may be tripped by under-voltage relays	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
PGE BIK-TS-18	Wind Gap pumps	3Ph fault on Midway 230 kV, Gates-Midway 230 kV	P1	L-1	vlt dip up to 34%, may be tripped by under-voltage relays	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
PGE BIK-TS-17	Wheeler Ridge pumps	3Ph fault on Midway 230 kV, Midway - Kern PP# 2 & 3 230 kV	P7	L-2	Vlt dip 32.9-40.9%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
PGE BIK-TS-18	Wind Gap pumps	3Ph fault on Midway 230 kV, Midway - Kern PP# 2 & 3 230 kV	P7	L-2	tripped by undervoltage relays	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
PGE BIK-TS-19	SMYRNA 115 kV	3Ph fault on Midway 230 kV, Midway - Gates 230 kV	P1	L-1	UFLS	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
PGE BIK-TS-19	SMYRNA 115 kV	3Ph fault on Midway 230 kV, Midway - Kern PP# 2 & 3 230 kV	P7	L-2	UFLS	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
PGE BIK-TS-20	FAMOSO 115 kV	3Ph fault on Midway 230 kV, Midway - Gates 230 kV	P1	L-1	UFLS	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
PGE BIK-TS-20	FAMOSO 115 kV	3Ph fault on Midway 230 kV, Midway - Kern PP# 2 & 3 230 kV	P7	L-2	UFLS	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
PGE BIK-TS-21	CHARKA 115 kV	3Ph fault on Midway 230 kV, Midway - Gates 230 kV	P1	L-1	UFLS	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
PGE BIK-TS-21	CHARKA 115 kV	3Ph fault on Midway 230 kV, Midway - Kern PP# 2 & 3 230 kV	P7	L-2	UFLS	N/A	N/A	N/A	N/A	N/A	N/A	N/A	

Study Area: **PG&E Bulk**

Transient Stability



ID	Generator/Load	Contingency	Category	Category Description	Transient Stability Performance								Potential Mitigation Solutions
					2020 SP Heavy Renewable & Min Gas Gen	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
PGE BIK-TS-22	SN BERNARD	3Ph fault on Midway 230 kV, Midway - Kern PP# 2 & 3 230 kV	P7	L-2	UFLS	N/A	N/A	N/A	N/A	N/A	N/A	N/A	