

2016-2017 ISO Reliability Assessment - Preliminary Study Results

Study Area: **PG&E Bulk**

Thermal Overloads



ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)							Potential Mitigation Solutions
					2018 Summer Peak	2021 Summer Peak	2026 Summer Peak	2026 Summer Partial Peak	2018 Spring off-peak	2021 Spring Light Load	2026 Spring Off-Peak	
PGE BIK-T-1	LOS BANOS - QUINTO_SS 230 kV	normal conditions	P0	normal	<95%	<95%	<95%	<95%	101.6%	<95%	97.3%	congestion management: reduce generation from the project connected to the Panoche-Los Banos 230 kV line to the total output of 150 MW. Or consider line upgrade
PGE BIK-T-2	MOSSLANDING-LAS AGUILAS 230 kV	normal conditions	P0	normal	<95%	<95%	<95%	<95%	97.8%	<95%	<95%	congestion management if overload: reduce output of the project connected to Las Aguilas, increase generation from Moss Landing
PGE BIK-T-3	WILSON A-LE GRAND 115 kV	normal conditions	P0	normal	<95%	<95%	<95%	<95%	99.5%	<95%	<95%	congestion management if overload: reduce solar PV output from Chowchilla 115 kV
PGE BIK-T-4	CHICO JCT-ANITA 60 kV	normal conditions	P0	normal	103.4%	111.9%	112.7%	111.9%	<95%	<95%	<95%	radial line, section of Glenn-Anita line, mitigation in area studies
PGE BIK-T-5	GLENN-CAPAY JCT - HEADGATE 60 kV	normal conditions	P0	normal	96.4%	101.9%	102.4%	101.6%	<95%	<95%	<95%	mitigation in area studies
PGE BIK-T-6	TAFT-TX_BV_HILLS 70 kV	normal conditions	P0	normal	96.0%	98.9%	95.1%	96.2%	<95%	<95%	<95%	radial line, section of Taft-Elk Hills 70 kV, mitigation in area studies
PGE BIK-T-7	JCBS TAP-GUR3TPT 70 kV (Guersney-Jacobs Corner)	normal conditions	P0	normal	<95%	<95%	116.5%	132.1%	<95%	<95%	<95%	congestion management, reduce generation from Guersney
PGE BIK-T-8	GUERSNEY-GUR3TPT 70 kV (Guersney-Jacobs Corner)	normal conditions	P0	normal	<95%	<95%	<95%	109.3%	<95%	<95%	<95%	congestion management, reduce generation from Guersney
PGE BIK-T-9	KANSAS JCT-HENRIETTA 70 kV	normal conditions	P0	normal	<95%	<95%	<95%	97.4%	<95%	<95%	<95%	reduce generation at Henrietta, if overload
PGE BIK-T-10	GFFNJCT-GIFFEN 70 kV (Westlands-Helm 70 kV)	normal conditions	P0	normal	<95%	<95%	<95%	<95%	98.2%	<95%	<95%	reduce output for solar PV at Giffen, if overload
PGE BIK-T-11	E. NICOLAUS-PLUMAS 60 kV	normal conditions	P0	normal	<95%	<95%	99.7%	<95%	<95%	<95%	<95%	radial line, mitigation in area studies
PGE BIK-T-12	AVENAL T - KETTLEMAN T 70 kV	normal conditions	P0	normal	<95%	<95%	<95%	<95%	<95%	<95%	177.4%	reduce output from Sun City and/or Sandrag
PGE BIK-T-13	KETTLEMAN T -GATES 70 kV	normal conditions	P0	normal	<95%	<95%	<95%	<95%	<95%	<95%	136.7%	reduce output from Sun City and/or Sandrag
PGE BIK-T-2	MOSSLANDING-LAS AGUILAS 230 kV	Moss Landing -Los Banos 500 kV	P1	L-1	<95%	<95%	<95%	<95%	136.6%	<95%	119.1%	reduce output of the project connected to Las Aguilas, increase generation from Moss Landing, reduce Path 15 flow. Use short-term rating
		Los Banos-Midway 500 kV	P1	L-1	<95%	<95%	<95%	<95%	100.0%	<95%	<95%	
		Los Banos-Gates 500 kV # 1	P1	L-1	<95%	<95%	<95%	<95%	104.6%	<95%	<95%	
		Metcalf-Tesla 500 kV	P1	L-1	<95%	<95%	<95%	<95%	103.1%	<95%	<95%	
		Moss Landing -Metcalf 500 kV	P1	L-1	<95%	<95%	<95%	<95%	102.7%	<95%	<95%	
		Los Banos-Tesla 500 kV	P1	L-1	<95%	<95%	<95%	<95%	101.1%	<95%	<95%	
		Moss Landing 500/230 kV x-former	P1	T-1	<95%	<95%	<95%	<95%	106.9%	<95%	<95%	
PGE BIK-T-1	LOS BANOS - QUINTO_SS 230 kV	Moss Landing -Los Banos 500 kV	P1	L-1	<95%	<95%	<95%	<95%	107.2%	<95%	100.6%	reduce generation from the project connected to the Panoche-Los Banos 230 kV line to the total output of 150 MW under normal conditions, use short-term rating if still overload
		Los Banos-Tracy 500 kV	P1	L-1	<95%	<95%	<95%	<95%	115.6%	<95%	109.6%	
		Moss Landing -Metcalf 500 kV	P1	L-1	<95%	<95%	<95%	<95%	102.7%	<95%	98.1%	

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		Los Banos-Tesla 500 kV	P1	L-1	<95%	<95%	<95%	<95%	120.7%	<95%	114.1%	
PGE BIK-T-14	ROUND MTN –TABLE MTN #1 or #2 500 kV	Rnd Mtn –Table Mtn #2 or # 1 500 kV	P1	L-1	103.5%	103.4%	101.2%	96.6%	<95%	<95%	<95%	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 BIK-T-15	ROUND MTN 500/230 kV x-former	Olinda 500/230 kV transformer	P1	T-1	<95%	<95%	<95%	<95%	103.0%	<95%	<95%	congestion management, reduce some Pit River generation or add Round Mtn x-former to Colusa SPS
PGE BIK-T-16	OLINDA 500/230 kV x-former	Round Mtn 500/230 kV transformer	P1	T-1	<95%	<95%	<95%	<95%	99.5%	<95%	<95%	use Colusa SPS if overload
PGE BIK-T-1	LOS BANOS - QUINTO_SS 230 kV	Metcalf 500 kV stuck breaker	P4	BRK	<95%	<95%	<95%	<95%	102.3%	<95%	98.0%	congestion management: reduce generation from the project connected to the Panoche-Los Banos 230 kV line to the total output of 150 MW under normal conditions, use short-term raring if still overload
		Moss Landing 500 kV stuck breaker	P4	BRK	<95%	<95%	<95%	<95%	107.2%	<95%	100.6%	
		Los Banos 500 kV stuck breaker	P4	BRK	<95%	<95%	<95%	<95%	119.0%	<95%	112.3%	
PGE BIK-T-2	MOSSLANDING-LAS AGUILAS 230 kV (same as P1)	Los Banos stuck Brk 500 kV	P4	BRK	<95%	<95%	<95%	<95%	111.7%	<95%	97.5%	reduce output of the project connected to Las Aguilas, increase generation from Moss Landing, use short-term rating,
		Mosslanding stuck Brk 500 kV	P4	BRK	<95%	<95%	<95%	<95%	136.63	<95%	119.1%	
PGE BIK-T-3	WILSON A-LE GRAND 115 kV	Los Banos stuck Brk 500 kV	P4	BRK	<95%	<95%	<95%	<95%	98.7%	<95%	<95%	congestion management if overload: reduce solar PV output from Chowchilla 115 kV
PGE BIK-T-14	ROUND MTN –TABLE MTN #1 or #2 500 kV	Table Mtn-Thermalito 230 kV & Round Mtn-Table Mtn #2 or # 1	P6	L-1/L-1	112.6%	114.2%	111.3%	101.3%	<95%	<95%	<95%	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
		Table Mtn 500/230 kV x-former & Round Mtn-Table Mtn #2 or # 1	P6	T-1/L-1	104.8%	105.5%	102.2%	95.0%	<95%	<95%	<95%	
		Tracy-Tesla 500 kV & Round Mtn-Table Mtn #2 or # 1	P6	L-1/L-1	111.3%	111.4%	106.4%	100.6%	<95%	<95%	<95%	
		Table Mtn-Oroville 230 kV & Round Mtn-Table Mtn #2 or # 1	P6	L-1/L-1	111.8%	113.1%	110.5%	100.2%	<95%	<95%	<95%	
		Delevan-Cortina 230 kV & Round Mtn-Table Mtn #2 or # 1	P6	L-1/L-1	108.9%	108.6%	103.7%	98.1%	<95%	<95%	<95%	
		Tracy 500/230 kV x-former kV & Round Mtn-Table Mtn #2 or # 1	P6	T-1/L-1	106.7%	106.6%	105.4%	96.0%	<95%	<95%	<95%	
		Any 230 kV line from Cottonwood & Round Mtn-Table Mtn #2 or # 1	P6	L-1/L-1	up to 104.4%	up to 103.4%	up to 102.7%	<95%	<95%	<95%	<95%	
PGE BIK-T-14	ROUND MT -TABLE MT 500 kV #2 (or #1)	Round Mountain-Table Mountain #1 (or # 2) and Olinda-Tracy 500 kV	P6	L-1/L-1	112.8%	113.1%	112.3%	<95%	<95%	<95%	<95%	Reduce COI flow after first contingency past 3200 MW mandated by Operational Procedure. Bypass series caps on remaining Round Mtn-Table Mtn line if overload
		Round Mountain-Table Mountain #1 (or # 2) and Capt Jack-Olinda 500 kV	P6	L-1/L-1	104.3%	103.5%	102.8%	<95%	<95%	<95%	<95%	
		Olinda-Tracy 500 kV & Capt Jack-Olinda 500 kV	P6	L-1/L-1	<95%	<95%	<95%	<95%	107.0%	<95%	<95%	
		Olinda-Tracy 500 kV & Olinda 500/230 kV x-former	P6	L-1/T-1	<95%	<95%	<95%	<95%	107.4%	<95%	<95%	

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PGE BIK-T-15	ROUND MTN 500/230 kV x-former	Round Mtn-Table Mtn #1 or 2 500 kV & Olinda 500/230 kV x-former	P6	L-1/T-1	<95%	<95%	<95%	<95%	104.4%	<95%	<95%	reduce some Pit River generation after first contingency or add Round Mtn x-former to Colusa SPS
		KE South-Obanion 230 kV & Olinda 500/230 kV x-former	P6	L-1/T-1	<95%	<95%	<95%	<95%	107.4%	<95%	<95%	
		230 kV line in Olinda area & Olinda 500/230 kV x-former	P6	L-1/T-1	<95%	<95%	<95%	<95%	up to 107%	<95%	<95%	
		Capt Jack-Olinda 500 kV and Table Mtn 500/230 kV x-former	P6	T-1/L-1	<95%	<95%	<95%	<95%	99.7%	<95%	<95%	
PGE BIK-T-17	TABLE MTN-TESLA 500 kV	Vaca-Dixon-Tesla 500 kV & Olinda-Tracy 500 kV	P6	L-1/L-1	102.4%	104.1%	97.7%	<95%	<95%	<95%	<95%	reduce COI flow according to nomogram after first contingency
PGE BIK-T-2	MOSSLANDING-LAS AGUILAS 230 kV	Mosslanding-Los Banos 500 kV & Tesla-Metcalf 500 kV	P6	L-1/L-1	<95%	<95%	<95%	<95%	214.1%	<95%	185.1%	Dispatch Moss Landing generation, reduce generation connected to Las Aguilas
		Tesla-Los Banos 500 kV & Mosslanding-Los Banos 500 kV	P6	L-1/L-1	<95%	<95%	<95%	<95%	174.2%	<95%	153.3%	
		Tracy-Los Banos 500 kV & Mosslanding-Los Banos 500 kV	P6	L-1/L-1	<95%	<95%	<95%	<95%	163.2%	<95%	143.6%	
		Mosslanding 500/230 kV x-former & Mosslanding - Coburn 230 kV	P6	L-1/T-1	<95%	<95%	<95%	<95%	133.0%	<95%	109.6%	
		Mosslanding 500/230 kV x-former & other 230 kV lines	P6	L-1/T-1	<95%	<95%	<95%	<95%	up to 120.2%	<95%	up to 119%	
		Tesla-Metcalf 500 kV & Moss Landing-Moss Landing PP	P6	L-1/L-1	<95%	<95%	<95%	<95%	<95%	<95%	107.2%	
		Los Banos-Midway 500 kV & Moss Landing-Moss Landing PP	P6	L-1/L-1	<95%	<95%	<95%	<95%	<95%	<95%	102.9%	
		Moss Landing 500/230 kV x-former & Metcalf-Moss Landing 500 kV	P6	T-1/L-1	<95%	<95%	<95%	<95%	130.7%	<95%	109.6%	
		Moss Landing 500/230 kV x-former & other 500 kV lines	P6	T-1/L-1	<95%	<95%	<95%	<95%	up to 121.2%	<95%	up to 121%	
		Moss Landing 500/230 kV x-former & Moss Landing-Moss Landing PP 230 kV	P6	T-1/L-1	<95%	<95%	<95%	<95%	118.0%	<95%	117.1%	
		Gates-Midway 500 kV & Tranquility-Mc Mullin 230 kV	P6	L-1/L-1	<95%	<95%	<95%	<95%	101.3%	<95%	<95%	
		Los Banos 500/230 kV x-former & 230 kV line Quinto generation	P6	T-1/L-1	<95%	<95%	<95%	<95%	120.1%	<95%	108.8%	
		Tesla (or Tracy) - Los Banos 500 kV & 230 kV line Quinto generation	P6	L-1/L-1	<95%	<95%	<95%	<95%	up to 120.6%	<95%	up to 108.2%	
		Mosslanding-Coburn 230 kV & 500 kV line from Los Banos	P6	L-1/L-1	<95%	<95%	<95%	<95%	up to 162.1%	<95%	up to 143.1%	
		Los Banos 500/230 kV x-former & Westley-Quinto 230 kV	P6	T-1/L-1	<95%	<95%	<95%	<95%	126.0%	<95%	114.1%	
		Moss Landing-Los Banos 500 kV & Westley-Quinto 230 kV	P6	L-1/L-1	<95%	<95%	<95%	<95%	157.5%	<95%	140.5%	
		Moss Landing-Los Banos 500 kV & other 230 kV lines 230 kV	P6	L-1/L-1	<95%	<95%	<95%	<95%	up to 151.2%	<95%	up to 132.0%	

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		other 500 kV lines & Westley-Quinto 230 kV	P6	L-1/L-1	<95%	<95%	<95%	<95%	up to 122.9%	<95%	up to 110.4%	
PGE BIK-T-18	MOSS LANDING (SPRING)-METCALF 230 kV	Metcalf-Tesla 500 kV & Metcalf-Mosslanding 500 kV	P6	L-1/L-1	<95%	<95%	<95%	<95%	96.6%	<95%	101.7%	reduce Moss Landing or increase Metcalf generation after first contingency
PGE BIK-T-19	MOSS LANDING-COBURN 230 kV	Metcalf-Tesla 500 kV & Mosslanding-Los Banos 500 kV	P6	L-1/L-1	<95%	<95%	<95%	<95%	103.0%	<95%	<95%	Dispatch Moss Landing generation after first contingency
		Moss Landing - Las Aguilas 230 kV & Mosslanding-Los Banos 500 kV	P6	L-1/L-1	<95%	<95%	<95%	<95%	97.0%	<95%	<95%	
PGE BIK-T-1	LOS BANOS - QUINTO_SS 230 kV	Moss Langing-Los Banos 500 kV & Tesla-Los Banos 500 kV	P6	L-1/L-1	<95%	<95%	<95%	<95%	163.8%	<95%	151.7%	dispatch Moss Landing generation, reduce generation from the project connected to the Panoche-Los Banos 230 kV line, use short term rating if still overload. Consider line upgrade
		Moss Langing-Los Banos 500 kV & Tracy-Los Banos 500 kV	P6	L-1/L-1	<95%	<95%	<95%	<95%	152.1%	<95%	141.6%	
		Tesla-Los Banos 500 kV & Metcalf-Moss Landing 500 kV	P6	L-1/L-1	<95%	<95%	<95%	<95%	149.9%	<95%	141.9%	
		Tracy-Los Banos 500 kV & Metcalf-Moss Landing 500 kV	P6	L-1/L-1	<95%	<95%	<95%	<95%	140.6%	<95%	133.7%	
		Moss Langing-Los Banos 500 kV & 230 kV line	P6	L-1/L-1	<95%	<95%	<95%	<95%	up to 116.0%	<95%	up to 111.6%	
		Tesla-Los Banos 500 kV & a 230 kV line	P6	L-1/L-1	<95%	<95%	<95%	<95%	up to 130.0%	<95%	up to 124.7%	
		Tracy-Los Banos & a 230 kV line	P6	L-1/L-1	<95%	<95%	<95%	<95%	up to 125%	<95%	up to 120%	
PGE BIK-T-20	WESTLEY - QUINTO_SS 230 kV	Moss Landing-Los Banos 500 kV & Tesla-Los Banos 500 kV	P6	L-1/L-1	<95%	<95%	<95%	<95%	101.5%	<95%	<95%	reduce generation connected to Los Banos-Westely line after first contingency
PGE BIK-T-21	LOS BANOS-SWITCHING STA 230 kV(Los Banos-Panoche)	Los Banos-Gates 500 kV # 1 and # 3	P6	L-1/L-1	<95%	<95%	<95%	<95%	108.7%	<95%	102.1%	reduce Path 15 flow after first contingency according to the Operational procedure
PGE BIK-T-22	PANOCH-GATES 230 kV # 1 or # 2	Los Banos-Gates 500 kV # 1 and # 3	P6	L-1/L-1	<95%	<95%	<95%	<95%	126.7%	<95%	99.1%	reduce Path 15 flow after 500 kV contingency according to the Operational procedure, or dispatch Panoche generation after 230 kV contingency
		Los Banos-Gates 500 kV # 1 and Panoche-Gates 230 kV # 2 or # 1	P6	L-1/L-1	<95%	<95%	<95%	<95%	108.3%	<95%	<95%	
		Los Banos-Gates 500 kV # 1 and Gates-Gregg 230 kV1	P6	L-1/L-1	<95%	<95%	<95%	<95%	105.4%	<95%	<95%	
PGE BIK-T-23	PALERMO-BIG BEND 115 kV	Table Mtn 500/230 kV x-former & Caribou-Table Mtn 230 kV	P6	T-1/L-1	<95%	<95%	100.8%	<95%	<95%	<95%	<95%	reduce Grizzly generation after first contingency
PGE BIK-T-24	LAS AGUILASS - PANOCH 230kV # 1 or 2	Tesla-Metcalf 500 kV & Moss Landing-Los Banos 500 kV	P6	L-1/L-1	<95%	<95%	<95%	<95%	105.8%	<95%	<95%	Dispatch Moss Landing generation after first contingency
PGE BIK-T-25	METCALF 500/230 kV x-former #11, 12 or 13	Metcalf 500/230 kV Tranformers #11 and #12 or #13	P6	T-1/T-1	up to 98.3%	<95%	<95%	up to 96%	up to 123.0%	<95%	up to 113.6%	dispatch Ls Esteros peakers after 1st contingency, trip load in San Jose if overload persists
PGE BIK-T-26	MIDWAY 500/230 kV x-former #1, 2 or 3	MIDWAY 500/230 kV x-former #1& 2 or 2&3 or 1&3	P6	T-1/T-1	<95%	<95%	<95%	<95%	106.3%	<95%	<95%	reduce generation at Midway 230 kV after first contingency

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PGE BIK-T-27	LS ESTEROS - NWK DIST 230 kV	Tesla-Metcalf 500 kV & Moss Landing-Los Banos 500 kV	P6	L-1/L-1	<95%	<95%	<95%	<95%	114.0%	114.3%	101.9%	dispatch Ls Esteros peakers after 1st contingency
PGE BIK-T-28	NEWARK E - NWK DIST 230 kV	Tesla-Metcalf 500 kV & Moss Landing-Los Banos 500 kV	P6	L-1/L-1	<95%	<95%	<95%	<95%	111.7%	109.0%	100.0%	Dispatch generation in San Jose after first contingency
PGE BIK-T-16	OLINDA 500/230 kV x-former	Round Mtn 500/230 kV x-former & Olinda-Obanion 230 kV	P6	T-1/L-1	<95%	<95%	<95%	<95%	104.3%	<95%	<95%	use Colusa SPS for off-peak overload
		Round Mtn and Table Mtn 500/230 kV x-formers	P6	T-1/L-1	<95%	<95%	<95%	<95%	103.9%	<95%	<95%	
		Round Mtn 500/230 kV x-former & Round Mtn-Table Mtn 500 kV # 1 or # 2	P6	T-1/L-1	<95%	<95%	<95%	<95%	99.9%	<95%	<95%	
		Round Mtn 500/230 kV x-former & Cortina-Vaca Dix 230 kV	P6	T-1/L-1	<95%	<95%	<95%	<95%	101.9%	<95%	<95%	
		Round Mtn 500/230 kV x-former & Cortina-Delevan 230 kV	P6	T-1/L-1	<95%	<95%	<95%	<95%	104.1%	<95%	<95%	
		Round Mtn 500/230 kV x-former & Cottonwood-Roseville 230 kV	P6	T-1/L-1	<95%	<95%	<95%	<95%	104.0%	<95%	<95%	
PGE BIK-T-29	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	<95%	<95%	<95%	103.1%	<95%	<95%	<95%	open Tracy-Tesla 230 kV lines if overload, trip Tracy pumps if it persists
PGE BIK-T-30	C. COS SUB-BIRDS LANDING 230 kV	Contra-Costa-Birds Landing 230 kV & Vaca Dix-Tesla 500 kV	P6	L-1/L-1	<95%	<95%	<95%	<95%	<95%	110.2%	<95%	congestion management, reduce generation from Birds Landing after 1st contingency
		Contra-Costa-Birds Landing 230 kV & Metcalf-Tesla 500 kV	P6	L-1/L-1	<95%	<95%	<95%	<95%	<95%	97.5%	<95%	
PGE BIK-T-31	CONTRA COSTA-C.COS SUB 230 kV	Contra-Costa-Birds Landing 230 kV & Vaca Dix-Tesla 500 kV	P6	L-1/L-1	<95%	<95%	<95%	<95%	<95%	106.4%	<95%	
PGE BIK-T-32	CONTRA COSTA-BIRDS LANDING 230 kV	C. Cos Sub-Birds Landing 230 kV & Vaca Dix-Tesla 500 kV	P6	L-1/T-1	<95%	<95%	<95%	<95%	<95%	113.1%	<95%	
		C. Cos Sub-Contra Costa 230 kV & Vaca Dix-Tesla 500 kV	P6	L-1/T-1	<95%	<95%	<95%	<95%	<95%	108.0%	<95%	
PGE BIK-T-33	TRIMBLE-SJB DG 115 kV	Tesla-Metcalf 500 kV & Moss Landing-Los Banos 500 kV	P6	L-1/L-1	<95%	106.0%	119.6%	111.7%	118.3%	128.5%	98.7%	Dispatch generation in San Jose after first contingency
		Tesla-Metcalf 500 kV & Moss Landing-Metcalf 500 kV	P6	L-1/L-1	98.6%	99.5%	109.9%	95.3%	<95%	99.9%	<95%	
		Tesla-Metcalf 500 kV & SSS 230 - NRSraser 230	P6	L-1/L-1	<95%	<95%	96.9%	<95%	<95%	<95%	<95%	
PGE BIK-T-34	COTTONWD E-ROUND MTN 230kV #2	COTTONWD E-RND MTN 230kV #1 or 2 & Round Mtn 500/230 kV x-former	P6	L-1/T-1	<95%	<95%	<95%	<95%	98.1%	<95%	<95%	not a violation, monitor this line
		COTTONWD E-RND MTN 230kV #1 or 2 & Captain Jack-Olinda 500 kV	P6	L-1/L-1	98.9%	<95%	<95%	<95%	<95%	<95%	<95%	not a violation, monitor this line
PGE BIK-T-35	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	101.2%	101.5%	101.4%	<95%	110.0%	<95%	<95%	upgrade the line, or limit COI import within nomogram for peak, reduce Pit River generaion after 1st contingency for off-peak and if first contingency is 230 kV line
		Table Mtn 500/230 kV x-former & Captain Jack-Olinda 500 kV	P6	T-1/L-1	103.1%	97.7%	<95%	<95%	<95%	<95%	<95%	

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Thermal Overloads



ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)							Potential Mitigation Solutions
					2018 Summer Peak	2021 Summer Peak	2026 Summer Peak	2026 Summer Partial Peak	2018 Spring off-peak	2021 Spring Light Load	2026 Spring Off-Peak	
		COTTONWD E-RND MTN 230kV #1 or 2 & Captain Jack-Olinda 500 kV	P6	L-1/L-1	110.2%	104.2%	96.6%	<95%	<95%	<95%	<95%	if first contingency is 230 kV line
PGE BIK-T-36	OLINDAW - COTWWAP2 230 kV	Round Mtn 500/230 kV x-former and OLINDAW- COTWDWAP 230 kV	P6	L-1/T-1	<95%	<95%	<95%	<95%	109.9%	<95%	<95%	reduce Shasta generation
	OLINDAW - COTWWAP 230 kV	Round Mtn 500/230 kV x-former and OLINDAW- COTWDWAP2 230 kV	P6	L-1/T-1	<95%	<95%	<95%	<95%	109.0%	<95%	<95%	
		Round Mtn 500/230 kV x-former and COTWWAP2 - COTWD_F2 230	P6	L-1/T-1	<95%	<95%	<95%	<95%	105.1%	<95%	<95%	
		Capt Jack-Olinda 500 kV and COTWWAP2 - COTWD_F2 230	P6	L-1/T-1	98.4%	98.7%	100.7%	<95%	<95%	<95%	<95%	
PGE BIK-T-37	DELEVAN-CORTINA 230 kV	Olinda-Tracy 500 kV & Round 500/230 kV x-former	P6	L-1/T-1	98.1%	100.1%	99.9%	<95%	<95%	<95%	<95%	reduce Colusa generation after 1st conitngency, if overload
		Olinda-Tracy 500 kV & Delevan-Vaca-Dixon 230 kV	P6	L-1/L-1	97.1%	98.1%	100.2%	96.9%	<95%	<95%	<95%	
PGE BIK-T-38	EIGHT MILE-TESLA 230 kV	Table Mtn 500/230 kV x-former and STAGG-TESLA 230 kV	P6	L-1/T-1	110.7%	<95%	<95%	104.3%	<95%	<95%	<95%	reduce generation in Lodi after first contingency
PGE BIK-T-39	STAGG-TESLA 230 kV	Table Mtn 500/230 kV x-former and EIGHT MILE-TESLA 230 kV	P6	L-1/T-1	102.4%	<95%	<95%	<95%	<95%	<95%	<95%	reduce generation in Lodi after first contingency
PGE BIK-T-40	TABLE MTN-RIO OSO 230 kV	Table Mtn-Vaca Dix 500 kV & Olinda-Tracy 500 kV	P6	L-1/T-1	98.5%	<95%	<95%	<95%	<95%	<95%	<95%	Upgrade terminal equipment on this line.
PGE BIK-T-41	RIO OSO-GREENLEAF TAP 115 kV	Tesla 500/230 kV x-former & Table Mtn D-E 230 kV BRK	P6	T-1/L-1	100.0%	<95%	<95%	<95%	<95%	<95%	<95%	South of Palermo Project. Prior to the project, reduce Green Leaf generation
		Tesla & Round Mtn 500/230 kV x-formers	P6	T-1/T-1	100.0%	<95%	<95%	<95%	<95%	<95%	<95%	
PGE BIK-T-42	MORROBAY- SOLARSS 230 kV # 1 or # 2	Gates-Midway 500 kV & Morro Bay-Solar SS 230 kV # 2 or # 1	P6	L-1/L-1	<95%	<95%	<95%	<95%	118.6%	<95%	108.0%	reduce generation from Topaz Solar after first contingency
		Midway 500/230 kV x-former # 11,12 or 13 & Morro Bay-Solar SS 230 kV #2 or #1	P6	L-1/L-1	<95%	<95%	<95%	<95%	108.8%	<95%	96.1%	
		Gates-Diablo 500 kV & Morro Bay-Solar SS 230 kV # 2 or # 1	P6	L-1/L-1	<95%	<95%	<95%	<95%	105.0%	<95%	<95%	
		Los Banos-Midway 500 kV & Morro Bay-Solar SS 230 kV # 2 or # 1	P6	L-1/L-1	<95%	<95%	<95%	<95%	110.0%	<95%	97.6%	
PGE BIK-T-43	GATES -CALFLATSSS 230 kV	Gates-Midway 500 kV and GATES-TEMPLTON 230 kV	P6	L-1/L-1	<95%	<95%	<95%	<95%	97.3%	<95%	111.8%	reduce generation from renewable project connected to Estrella-Gates 230 kV line
		Gates-Midway 500 kV and Gates-Diablo 500 kV	P6	L-1/L-1	<95%	<95%	<95%	<95%	100.3%	<95%	105.1%	
		Gates-Midway 500 kV and Morro BAY-TEMPLTON 230 kV	P6	L-1/L-1	<95%	<95%	<95%	<95%	104.1%	<95%	106.9%	
PGE BIK-T-44	LOS BANOS-MIDWAY 500kV	Gates-Diablo 500 kV & Gates-Midway 500 kV	P6	L-1/L-1	<95%	<95%	<95%	<95%	112.8%	<95%	104.8%	use Operational Procedure for Path 15
		Los Banos-Gates # 1 and # 3 500 kV	P6	L-1/L-1	<95%	<95%	<95%	<95%	114.8%	<95%	104.4%	
PGE BIK-T-45	LOS BANOS-GATES # 1 500kV	Los Banos-Gates # 3 500 kV and Los Banos-Midway 500 kV	P6	L-1/L-1	<95%	<95%	<95%	<95%	124.2%	<95%	110.2%	use Operational Procedure for Path 15, reduce Path 15 flow after 1st contingency
PGE BIK-T-46	GATES-MIDWAY 500 kV	Gates-Diablo 500 kV and Los Banos-Midway 500 kV	P6	L-1/L-1	<95%	<95%	<95%	<95%	116.5%	<95%	109.4%	

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Thermal Overloads



ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)							Potential Mitigation Solutions
					2018 Summer Peak	2021 Summer Peak	2026 Summer Peak	2026 Summer Partial Peak	2018 Spring off-peak	2021 Spring Light Load	2026 Spring Off-Peak	
PGE BIK-T-47	GATES-MIDWAY 230 kV	Gates-Diablo 500 kV and Gates-Midway 500 kV	P6	L-1/L-1	<95%	<95%	<95%	<95%	116.5%	<95%	110.3%	reduce Path 15 flow after first contingency (loading with short term rating shown)
		Arco-Midway 230 kV and Gates-Midway 500 kV	P6	L-1/L-1	<95%	<95%	<95%	<95%	<95%	<95%	100.8%	
PGE BIK-T-48	TESLA-LOS BANOS 500 kV	Tracy-Los Banos 500 kV and Moss Landing-Los Banos 500 kV	P6	L-1/L-1	<95%	<95%	<95%	<95%	106.7%	<95%	96.5%	dispatch generation at Metcalf Energy Center after first contingency
PGE BIK-T-49	MIDWAY-VINCENT # 1 500 kV	Midway-Vincent #2 500 kV & Midway-Whirlwind 500 kV	P6	L-1/L-1	115.8%	103.7%	<95%	<95%	<95%	<95%	<95%	reduce Path 26 flow after 1st contingency
PGE BIK-T-50	MIDWAY-VINCENT # 2 500 kV	Midway-Vincent #1 500 kV & Midway-Whirlwind 500 kV	P6	L-1/L-1	118.1%	105.7%	<95%	<95%	<95%	<95%	<95%	
PGE BIK-T-51	CAPTAIN JACK-OLINDA 500 kV	Malin- Round Mtn #1 and #2 500 kV	P7	L-2	103.3%	103.9%	99.6%	100.4%	<95%	<95%	<95%	operate within COI seasonal nomogram
		Round Mtn-Table Mtn # 1 & # 2 500 kV	P7	L-2	104.4%	105.2%	101.1%	100.2%	<95%	<95%	<95%	
PGE BIK-T-52	OLINDA-TRACY 500 KV	Round Mtn-Table Mtn # 1 & # 2 500 kV	P7	L-2	97.0%	98.1%	95.2%	<95%	<95%	<95%	<95%	not a violation, monitor this line. Operate within COI nomogram
PGE BIK-T-1	LOS BANOS - QUINTO_SS 230 kV	Los Banos-Tesla and Los Banos-Tracy 500 kV with RAS	P7	L-2	<95%	<95%	<95%	<95%	140.3%	<95%	127.6%	congestion management: reduce generation from the project connected to the Panoche-Los Banos 230 kV line to the total output of 150 MW under normal conditions, use short-term raring if still overload
		Tracy-Tesla and Los Banos-Tracy 500 kV	P7	L-2	<95%	<95%	<95%	<95%	119.3%	<95%	113.5%	
PGE BIK-T-2	MOSSLANDING-LAS AGUILAS 230 kV	Los Banos-Gates #1 and Los Banos-Midway 500 kV	P7	L-2	<95%	<95%	<95%	<95%	107.4%	<95%	<95%	use short-term rating , or trip renewable generation connected to this line, or trip 3rd Helms pump
		Gates-Mustang 230 kV # 1 and 2	P7	L-2	<95%	<95%	<95%	<95%	100.9%	<95%	<95%	
PGE BIK-T-21	LOS BANOS-SWITCHING STA 230 kV(Los Banos-Panoche)	Los Banos-Gates #1 and Los Banos-Midway 500 kV	P7	L-2	<95%	<95%	<95%	<95%	103.8%	<95%	97.6%	trip renewable generation connected to this line, or trip 3rd Helms pump if overload
PGE BIK-T-35	COTTONWD E-ROUND MTN 230kV #3	Tbl Mtn-Tesla and Tbl Mtn-Vaca Dix 500 kV	P7	L-2	103.4%	104.1%	98.7%	<95%	<95%	<95%	<95%	upgrade the line, or limit COI import within nomogram
PGE BIK-T-53	MIDWAY-WHIRLWIND 500 kV # 3	Midway-Vincent 500 kV # 1 and # 2 w/RAS for N-S, no RAS for S-N	P7	L-2	103.2%	<95%	<95%	108.8%	<95%	<95%	97.0%	trip load in SCE as part of RAS in 2018 peak (modeled with tripping 1400 MW of generation at Midway and no load tripping). Or use 1 hr emergency rating for N-S and S-N flow
PGE BIK-T-41	RIO OSO-GREENLEAF TAP 115 kV	Tbl Mtn-Tesla & Tbl Mtn-Vaca Dix 500 kV	P7	L-2	101.4%	101.1%	<95%	<95%	<95%	<95%	<95%	South of Palermo Project. Prior to the project: limit COI import within nomogram
PGE BIK-T-40	TABLE MTN-RIO OSO 230 kV	Tbl Mtn-Tesla and Tbl Mtn-Vaca Dix 500 kV	P7	L-2	105.1%	<95%	<95%	<95%	<95%	<95%	<95%	Upgrade terminal equipment on this line.
PGE BIK-T-54	PEASE-E. MARYSVL J - OLIVEHN J 115 kV (Pease-Rio Oso)	Tbl Mtn-Tesla and Tbl Mtn-Vaca Dix 500 kV	P7	L-2	101.8%	109.5%	<95%	<95%	<95%	<95%	<95%	South of Palermo Project. Prior to the project: limit COI import within nomogram

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Voltage Deviations



ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %							Potential Mitigation Solutions
					2018 Summer Peak	2021 Summer Peak	2026 Summer Peak	2026 Summer Partial Peak	2018 Spring off-peak	2021 Spring Light Load	2026 Spring Off-Peak	
PGE Blk-VD-1	buses in NW 115 kV and below	PDCI mono-pole outage	P1	PDCI	none	deviations up to 8.7% (Northcst 69 kV)	none	none	none	none	none	adjust svds and transformer taps



ID	Substation	Worst Contingency	Category	Category Description	Voltage (kV)							Potential Mitigation Solutions
					2018 Summer Peak	2021 Summer Peak	2026 Summer Peak	2026 Summer Partial Peak	2018 Spring off-peak	2021 Spring Light Load	2026 Spring Off-Peak	
PGE Blk-V-1	500 kV in NW	normal conditions and all contingencies	P0-P7	normal & outages	no violations	no violations	no violations	no violations	up to 553 kV Rock Crk, BPA	up to 549 kV, Bell BPA	up to 553 kV, Bell BPA	consider installing additional reactors
PGE Blk-V-2	Diablo 500kV	normal conditions and all contingencies	P0-P7	normal & outages	no violations	no violations	>=553 kV	>=548 KV	no violations	no violations	>=539 kV	consider installing shunt reactor on Diablo or Gates 500 kV after Diablo Canyon plant retires and opening one of the Diablo-Midway 500kV lines
PGE Blk-V-3	Midway 500 kV	normal conditions and all contingencies	P0-P7	normal & outages	no violations	no violations	>543 kV	540 kV	no violations	no violations	no violations	
PGE Blk-V-4	Gates 500 kV	normal conditions and all contingencies	P0-P7	normal & outages	no violations	no violations	>546 kV	>=541 kV	no violations	no violations	no violations	
PGE Blk-V-5	Pit River 1 area 60 kV	normal conditions and all contingencies	P0-P7	normal & outages	no violations	up to 65.3 kV	no violations	up to 64.2 kV	up to 65.5 kV	no violations	up to 65.2 kV	mitigation in area studies
PGE Blk-V-6	Vaca Dix 115 kV and adjacent buses	normal conditions	P0-P7	normal & outages	no violations	no violations	no violations	no violations	122 kV	no violations	no violations	mitigation in area studies
PGE Blk-V-7	Gold Hill-Newcastle-Placer 115 kV area	normal conditions	P0-P7	normal & outages	no violations	no violations	no violations	no violations	no violations	up to 124 kV	uo to 123.6 kV	mitigation in area studies
PGE Blk-V-8	Atlantic-Rocklin 60 kV area	normal conditions	P0-P7	normal & outages	no violations	no violations	no violations	no violations	no violations	up to 64.8 kV	up to 64.6 kV	mitigation in area studies
PGE Blk-V-9	500 kV buses in NW	Table Mtn-Tesla & Table Mtn-Vaca Dix 500 kV	P0-P7	normal & outages	no violations	no violations	no violations	up to 552 kV Knight, Summer Lake	no violations	no violations	no violations	turn off shunt capacitors at high voltage



ID	Generator/Load	Contingency	Category	Category Description	Transient Stability Performance							Potential Mitigation Solutions					
					2018 Summer Peak	2021 Summer Peak	2026 Summer Peak	2026 Summer Partial Peak	2018 Spring off-peak	2021 Spring Light Load	2026 Spring Off-Peak						
PGE Blk-TS-1	Solar PV COLUMBIA 0.36 kV (bus 33102), capacity 19.2 MW	3 Ph fault Contra Costa-La Positas 230 KV	P1	L-1	4.8 MW output, no tripping	4.8 MW output, no tripping	tripped for high voltage at 2.3 sec. 4.8 MW output, 1.083 p.u. voltage in the base case	the unit is off in the base case	18.2 MW output, tripped for high voltage in 2.3 sec	the unit is off in the base case	18.8 MW output, no tripping	Modeled with old solar PV model (wt4g, wt4e), protection trips at 1.1 pu in 1 sec, no issues if shunt capacitor on the collector system is turned off, or generator can absorb reactive power in power flow. Consider having voltage regulation requirement for this project. Need to contact generation owner and update the models					
		3 Ph fault Newark-Ravenswood 230 kV	P1	L-1													
		3ph fault Pittsburg 230 kV, Pittsb-Tesla # 1 and 2	P7	L-2									tripped for high volt at 2.3 sec				
		3 Ph fault Tesla-Newark 230 kV	P1	L-1	no tripping				4.8 MW output, no tripping				tripped for high voltage at 2.3 sec. 4.8 MW output, 1.083 p.u. voltage in the base case	the unit is off in the base case	not tripped	18.8 MW output, no tripping	Modeled with old solar PV model (wt4g, wt4e), protection trips at 1.1 pu in 1 sec, no issues if shunt capacitor on the collector system is turned off, or generator can absorb reactive power in power flow. Consider having voltage regulation requirement for this project. Need to contact generation owner and update the models
		3ph fault Vaca Dix 500/230 kV x-former	P1	T-1													
		Tesla 500 kV stuck breaker	P4	BRK													
		3Ph fault C.-Costa-Brentwood and C.Costa-Delta 230 kV	P7	L-2											tripped for high voltage at 2.3 sec		
		3 Ph fault Contra Costa-La Positas and C.Costa-Lone Tree 230 KV	P7	L-2													
PGE Blk-TS-2	wind generators at Shilo # 2 (bus 32177), capacity 150 MW	3Ph fault Contra-Costa-Brentwood and Contra Costa-Delta 230 kV	P7	L-2	tripped for low voltage	tripped for low voltage	tripped for low voltage, output 49.5 MW	the unit is off in this case	tripped for low voltage, output 150 MW	tripped for low voltage	tripped for low voltage	these are old induction generator units that don't have LVRT, they may trip with faults close to these units					
		Tesla 500 kV stuck breaker	P4	BRK	not tripped	not tripped	not tripped			not tripped	not tripped						
		3 Ph fault C. Costa-La Positas 230 KV	P1	L-1	tripped for low voltage	tripped for low voltage	tripped for low voltage			tripped for low voltage, output 150 MW	tripped for low voltage, output 150 MW						
		3 Ph fault Tesla-Newark 230 KV	P1	L-1	not tripped, output 49.5 MW	not tripped, output 49.5 MW	not tripped				not tripped						
		3 Ph fault Newark 230 KV, Newark-Ravenswood	P1	L-1													
		3 Ph fault Contra Costa-La Positas and C.Costa-Lone Tree 230 KV	P7	L-2	tripped for low voltage	tripped for low voltage	tripped for low voltage			tripped for low voltage							
			Solar PV Q829 # 1 and 2 (bus 34347), total capacity 244 MW	3 ph fault on Gates 230 kV, any outage	P7	L-2	tripped for high voltage with fault			tripped for high voltage with fault	tripped for high voltage with fault		units are off in this case	not tripped	units are off in this case	tripped for high voltage with fault, output 239 MW	need to contact generation owner and to check the models and protection settings
3Ph fault on Gates 500 kV, any outage	P1			L-1, T-1	not tripped, output 60 MW	not tripped, output 60 MW	not tripped, output 60 MW	tripped for high voltage w/fault									
3Ph fault on Los Banos 500 kV, any single outage	P1			L-1, T-1													
3Ph fault on Los Banos 500 kV, DLO North of Los Banos	P7			L-2													
3Ph fault on Midway 500 kV, Midway-Gates 500 kV	P1			L-1													
3Ph fault on Midway 500 kV, Midway-Vincent 500 kV #1&2	P7			L-2													
3Ph fault on Midway 500 kV, DLO North of Midway	P7			L-2				tripped for high voltage with fault, output 232 MW									
3Ph fault on Tesla 500 kV, any outage	P1, P7			L-1, L-2													
3Ph fault on Tesla 230 kV, Tesla-Newark 230 kV	P1			L-1													
3Ph fault on Tracy 500 kV, Tracy-Los Banos 500 kV	P1			L-1													
3Ph fault on Los Banos 500 kV, 500/230 kV x-former	P1			T-1													

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Transient Stability



ID	Generator/Load	Contingency	Category	Category Description	Transient Stability Performance							Potential Mitigation Solutions		
					2018 Summer Peak	2021 Summer Peak	2026 Summer Peak	2026 Summer Partial Peak	2018 Spring off-peak	2021 Spring Light Load	2026 Spring Off-Peak			
PGE Blk-TS-3		3Ph fault on MossLanding 500 kV, Mosslanding-Metcalf 500 kV	P1	L-1							not tripped			
		3Ph fault on Metcalf 500 kV, 500/230 kV x-former	P1	T-1							not tripped			
		3Ph fault on Tracy or Tesla 500 kV, 500/230 kV x-former	P1	T-1					tripped for high voltage w/fault		tripped for high voltage w/fault			
		3Ph fault on Tracy 500 kV, DLO south of Tracy 500 kV	P7	L-2										
		3Ph fault on Tesla 500 kV, DLO north of Tesla 500 kV	P7	L-2										
PGE Blk-TS-4	Solar PV KANSAS 12.47 (bus 34680), capacity 20 MW	3Ph fault on Gates 230 kV, any single or double contingency	P1, P7	L-1, L-2	not tripped, output 5 MW	not tripped, output 5 MW	not tripped, output 5 MW	the unit is off in this case	tripped for low voltage w/fault	the unit is off in this case	tripped for low voltage w/fault, output 19.8 MW	Modeled with old solar PV model (wt4g, wt4e). Need to contact generation owner and update the models and check protection settings		
PGE Blk-TS-5	Solar PV KENT_S (bus 34694), capcity 20 MW	3ph fault Gates 230 kV, Gates-Midway 230 kV	P1	L-1	not tripped, output 7.9 MW	not tripped, output 5 MW	not tripped, output 5 MW	the unit is off in this case	tripped for low voltage w/fault	the unit is off in this case	tripped for low voltage w/fault	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 Los Banos 500 kV, Gates-Los Banos 500 kV # 1 or 3	P1	L-1					tripped for high frequency with fault, output 19 MW		tripped for high frequency with fault, output 19.6 MW			
		3ph fault Los Banos 500 kV, Los Banos-Midway 500 kV	P1	L-1										
		3ph fault Los Banos 500 kV, Los Banos-Moss landing 500 kV	P1	L-1										
		3ph fault Los Banos 500 kV, Los Banos 500/230 kV x-former	P1	T-1										
		3ph fault Los Banos 500 kV, DLO north of Los Banos	P7	L-2					tripped for low voltage w/fault		tripped for low voltage w/fault			
		3ph fault Los Banos 500 kV, DLO south of Los Banos	P7	L-2										
		3ph fault Gates 230 kV Gates-Arco and Gates-Midway 230 kV	P7	L-2										
		3 ph Gates 230 kV, Gates-Greg and Gates-MCal	P7	L-2										
PGE Blk-TS-6	Solar PV REGULUS 0.38 kV (Bus 35019), capacity 60.5 MW	3Ph fault on Midway 500 kV or 230 kV, any contingency	P1, P7	L-1, L-2	not tripped, output 25.7 MW	not tripped, output 15 MW	not tripped, output 15 MW	the unit is off in this case	tripped for high frequency with fault, output 57.5 MW	the unit is off in this case	no tripping, output 59.3 MW	Modeled with old solar PV model (wt4g, wt4e). Need to contact generation owner and update the models and check protection settings		
PGE Blk-TS-7	Wind generator NSR_WND1 0.69 kV (bus 29474), capacity 162 MW	1 Diablo unit	P1	G-1	the unit is off in this case	tripped for high voltage with fault, output 160 MW	the unit is off in this case	the unit is off in this case	the unit is off in this case	the unit is off in this case	N/A	This generator is on the SCE system. Need to discuss generator model and study results with SCE		
		any contingency w/3 ph fault on Diablo 500 kV	P1,P7	L-1/L-2							tripped for high voltage with fault, output 70 MW			
		any contingency w/3 ph fault on Los Banos 500 kV	P1,P7	L-1/L-2										
		any contingency w/3 ph fault on Midway 500 kV	P1,P7	L-1/L-2										
		any contingency w/3 ph fault on Gates 500 kV	P1,P7	L-1/L-2										



ID	Generator/Load	Contingency	Category	Category Description	Transient Stability Performance							Potential Mitigation Solutions
					2018 Summer Peak	2021 Summer Peak	2026 Summer Peak	2026 Summer Partial Peak	2018 Spring off-peak	2021 Spring Light Load	2026 Spring Off-Peak	
PGE Blk-TS-8	Solar PV AD SOLAR 0.26 kV (bus 26949), capacity 10 MW	any contingency w/3 ph fault on Midway 500 kV	P1,P7	L-1/L-2	not tripped, output 10 MW	not tripped, output 7.5 MW	tripped for high volt after 9 sec, output 7.5 MW	not tripped, output 7.5 MW	off in this case	off in this case	off in this case	This generator is on the LADWP system. Need to discuss generator model and study results with LADWP
PGE Blk-TS-9	Solar PV Q622 B (35021), capacity 20 MW	3Ph fault on Midway 230 kV, Gates-Midway 230 kV	P1	L-1	tripped for low voltage with fault, output 5 MW	tripped for low voltage with fault, output 5 MW	tripped for low voltage with fault, output 5 MW	the unit is off in this case	tripped for low voltage with fault, output 19 MW	the unit is off in this case	tripped for low voltage with fault, output 19 MW	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								
		3Ph fault Midway 500 kV, any contingency	P1, P7	L-1, L-2	not tripped	not tripped	not tripped		tripped for high frequency with fault		not tripped	
PGE Blk-TS-10	Solar PV ORION (35082), capacity 20 MW	3Ph fault on Midway 230 kV, Gates-Midway 230 kV	P1	L-1	tripped for low voltage with fault, output 5 MW	tripped for low voltage with fault, output 5 MW	tripped for low voltage with fault, output 5 MW	the unit is off in this case	tripped for low voltage with fault, output 19 MW	the unit is off in this case	tripped for low voltage with fault, output 19.6 MW	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								
		3Ph fault Midway 500 kV, any contingency	P1, P7	L-1, T-1, L-2	not tripped	not tripped	not tripped		tripped for high frequency with fault		tripped for high frequency with fault	
PGE Blk-TS-11	Solar PV Q654 Willwood (39184), capacity 20 MW	3Ph fault on Midway 230 kV, Gates-Midway 230 kV	P1	L-1	tripped for high frequency with fault, output 5 MW	not tripped, output 5 MW	not tripped, output 5 MW	the unit is off in this case	tripped for high frequency with fault, output 19 MW	the unit is off in this case	output 19.6 MW, no tripping	Frequency protection trips the unit at 60.5 Hz or 59.3 Hz in 0.02 sec. Need to discuss the models and protection settings with the generation owner. 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								
PGE Blk-TS-12	Load on Gates 115 kV	3Ph fault on Gates 230 kV, Gates-Midway 230 kV	P1	L-1	tripped by UFLS	not tripped	tripped by UFLS	tripped by UFLS	tripped by UFLS	not tripped	tripped by UFLS	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	tripped by UFLS		not tripped	tripped by UFLS	tripped by UFLS		tripped by UFLS	
		3Ph Fault Gates-Arco, Gates-Midway 230 kV	P7	L-2	tripped by UFLS			tripped by UFLS	tripped by UFLS		tripped by UFLS	
PGE Blk-TS-13	Load on Gates-distr 12.5 kV	3Ph fault on Gates 230 kV, Gates-Midway 230 kV	P1	L-1	tripped by UFLS	tripped by UFLS	tripped by UFLS	tripped by UFLS	not tripped	not tripped	not tripped	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	tripped by UFLS	tripped by UFLS	tripped by UFLS	tripped by UFLS				
		3Ph Fault Gates-Arco, Gates-Midway 230 kV	P7	L-2	tripped by UFLS	tripped by UFLS	tripped by UFLS	tripped by UFLS				
PGE Blk-TS-14	70 kV and 115 kV buses around Midway	3Ph fault on Midway 230 kV, any contingency	P1	L-1	slow voltage and frequency recovery							This is a possible numerical issue because of slow convergence due to large amount of inverter-based generation in the area and composite load models. Large voltage dips observed around 0.1 sec after fault clearing. Also slow frequency recovery after the fault in Midway area. According to the new standard, these are not violations
PGE Blk-TS-15	Buena Vista pumps		P1	L-1								
PGE Blk-TS-16	Wheeler Ridge pumps		P1	L-1								
PGE Blk-TS-17	Wind Gap pumps		P1	L-1								

Study Area: **PG&E Bulk**

Single Contingency Load Drop



ID	Worst Contingency	Category	Category Description	Amount of Load Drop (MW)								Potential Mitigation Solutions
				Select..	Select..	Select..	Select..	Select..	Select..	Select..	Select..	
PGE Bulk-SLD-1	NONE											

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

Study Area: **PG&E Bulk**



Single Source Substation with more than 100 MW Load

ID	Substation	Load Served (MW)								Potential Mitigation Solutions
		Select..	Select..	Select..	Select..	Select..	Select..	Select..	Select..	
PGE Bulk-SS-1	NONE									

No single source substation with more than 100 MW Load