



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



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

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	
	P2-3: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

Study Area:
Thermal Overloads

PG&E Central Valley



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				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

Study Area:
Thermal Overloads

PG&E Central Valley



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

Study Area: PG&E Central Valley
Thermal Overloads



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				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

Study Area:
Thermal Overloads

PG&E Central Valley



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:_NEWCASTLE 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	Gereneration 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	Gereneration 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	Gereneration 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

Study Area:
Thermal Overloads

PG&E Central Valley



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

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	
	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

Study Area:
Thermal Overloads

PG&E Central Valley



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

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	
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	Gereneration redispatch
	P2-2:A11:25:_RIPON 115KV SECTION 1E	P2	Bus	43	24	23	102	103	28	73	98	24	Gereneration redispatch
	P2-2:A11:26:_RIPON 115KV SECTION 1D	P2	Bus	33	13	12	103	104	16	69	100	12	Gereneration 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	Gereneration redispatch
	P2-4:A11:13:_BELLOTA 115KV - SECTION 1D & 2D	P2	Bus-Tie Breaker	16	12	5	101	101	10	44	101	5	Gereneration redispatch
	P2-4:A11:9:_RIPON 115KV - SECTION 1E & 1D	P2	Bus-Tie Breaker	41	22	20	102	103	25	72	98	21	Gereneration 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-RIVRBKIT 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

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	
	P2-3: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
	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
33514 MANTECA 115 33970 INGRM C. 115 1	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

Study Area:
Thermal Overloads

PG&E Central Valley



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



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

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	
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:_GWFRACY-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 VIIV SPS 60 0 33619 AMFOR 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



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:A4:14:_ 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
33932 MELONES 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	193	216	181	<100	<100	202	87	<100	181	Existing operating procedure

Study Area:
Thermal Overloads

PG&E Central Valley



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 FOLLOCH 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

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	
	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 VLYHMP1 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	Gereneration 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	Gereneration 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	Gereneration redispatch
	P2-4:A11:13:_BELLOTA 115KV - SECTION 1D & 2D	P2	Bus-Tie Breaker	9	7	5	104	104	7	42	104	5	Gereneration redispatch
	P2-4:A11:7:_TESLA E 230KV - SECTION 2E & 1E	P2	Bus-Tie Breaker	23	7	5	101	104	9	60	101	6	Gereneration 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



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

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

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	
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

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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	
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

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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	
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

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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

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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	
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

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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	
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

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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

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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	
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

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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	
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
PRDESW 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

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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

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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	
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

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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	
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
VCVLE1J 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
VCVLE2J 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

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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	
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
WSTLNE SW 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

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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

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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	
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

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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	
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

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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	
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

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High/Low Voltages



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				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

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	
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

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	
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

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	
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

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	
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
MDSNVDSW159 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

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	
NEWCASTLE 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

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	
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

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	
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

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	
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

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 C	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.

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