

Study Area: PG&E Greater Fresno
Thermal Overloads



Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Loading % (Baseline Scenarios)					Loading % (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	2029 Retirement of QF Generations	
30500 BELLOTA 230 30515 WARNERVL 230 1	Warnerville 115kV Bus Section Fault (CCSF)	P2	P2-2	46	19	29	87	39	18	37	121	29	Sensitivity only
	Warnerville 115kV Bus Section Fault with Breaker Failure (CCSF)	P2	P4-5	46	19	29	87	39	18	37	121	29	Sensitivity only
	Warnerville 230kV Bus Section Fault (CCSF)	P2	P2-2	46	19	29	87	39	18	37	121	29	Sensitivity only
30515 WARNERVL 230 30516 WILSONRCTR 230 1	Warnerville 115kV Bus Section Fault (CCSF)	P2	P2-2	86	86	111	85	85	86	85	95	114	Continue to monitor Future load forecast
	Warnerville Breaker 410 Failure (CCSF)	P2	P2-3	86	86	111	85	85	86	85	95	114	Continue to monitor Future load forecast
	Warnerville Breaker 420 Failure (CCSF)	P2	P2-3	86	86	111	85	85	86	85	95	114	Continue to monitor Future load forecast
	Warnerville Breaker 430 Failure (CCSF)	P2	P2-3	86	86	111	85	85	86	85	95	114	Continue to monitor Future load forecast
	Warnerville Breaker 440 Failure (CCSF)	P2	P2-3	86	86	111	85	85	86	85	95	114	Continue to monitor Future load forecast
	Warnerville Breaker 450 Failure (CCSF)	P2	P2-3	86	86	111	85	85	86	85	95	114	Continue to monitor Future load forecast
	GREGG 230 kV BAAH BUS #1 (FAILURE OF NON-REDUNDENT RELAY)	P5	Non-Redundent Relay	109	113	116	80	86	118	87	29	118	Project: Protection upgrade In-service date: 12/20 Short term: Action plan
	MUSTANGSS-GATES #1 230kV & MUSTANGSS-GATES #2 230kV	P7	DCTL	17	30	37	65	72	37	79	100	39	Sensitivity only
	LOSBANOS 500/230kV TB 1 & QUINTO SW STA-WESTLEY 230kV	P6	N-1-1	<100	<100	<100	<100	<100	<100	<100	100.03	<100	Sensitivity only
30765 LOSBANOS 230 30766 PADREFLATSSS 230 1	Base Case	P0	Base Case	9	3	1	100	46	3	49	96	1	Generation redispatch
	MUSTANGSS 230kV - Middle Breaker Bay 3	P2	P2-3	4	<100	<100	102	<100	<100	<100	85	<100	Generation redispatch
	PANOCHÉ 230kV - Section 2E & 2D	P2	P2-4	7	6	9	116	62	7	72	99	9	Generation redispatch
	PANOCHÉ 230kV Section 2E	P2	P2-2	15	7	4	116	63	6	69	109	3	Generation redispatch
	LOS BANOS-PANOCHÉ #2 230kV & DOS AMIGOS PUMPING PLANT-PANOCHÉ 230kV	P6	N-1-1	<100	<100	<100	<100	<100	<100	<100	100.02	<100	Generation redispatch
	MOSS LANDING-PANOCHÉ #2 230kV & DOS AMIGOS PUMPING PLANT-PANOCHÉ 230kV	P6	N-1-1	<100	<100	<100	100	<100	<100	<100	<100	<100	Generation redispatch
	LOS BANOS-PANOCHÉ #2 230kV & LOS BANOS-DOS AMIGOS 230kV	P7	DCTL	10	4	1	109	59	4	66	102	1	Generation redispatch
	LOSBANOS 230kV Section 2D	P2	P2-2	14	13	6	99	105	12	120	91	6	Generation redispatch
30765 LOSBANOS 230 30790 PANOCHÉ 230 2	LOS BANOS-DOS AMIGOS 230kV & LOSBANOS-PADREFLATSSS #1 230kV	P6	N-1-1	<100	<100	<100	<100	100	<100	<100	<100	<100	Generation redispatch
	PANOCHÉ 230kV - Section 2D & 1D	P2	P2-4	18	18	13	62	67	19	102	50	13	Sensitivity only
30875 MC CALL 230 30878 MCCALL3M 115 3	MC CALL 115kV - Middle Breaker Bay 3	P2	P2-3	<100	92	104	<100	22	95	13	<100	104	Continue to monitor Future load forecast
	MUSTANGSS-GATES #2 230kV & GATES-GREGG 230kV	P6	N-1-1	<100	<100	<100	102	101	<100	<100	<100	<100	Generation redispatch
	MUSTANGSS-GATES #1 230kV & GATES-GREGG 230kV	P6	N-1-1	<100	<100	<100	102	101	<100	<100	<100	<100	Generation redispatch
34105 CERTANJ1 115 34121 SHARON T 115 1	HERNDON 115kV - Section 1D & 2D	P2	P2-4	72	76	75	105	108	80	80	56	76	Generation redispatch
	MUSTANGSS 230kV - Middle Breaker Bay 3	P2	P2-3	<100	36	40	<100	103	39	88	<100	40	Generation redispatch
	GREGG 230 kV BAAH BUS #2 (FAILURE OF NON-REDUNDENT RELAY)	P5	Non-Redundent Relay	96	98	90	84	90	102	68	68	92	Project: Protection upgrade In-service date: 12/20 Short term: Action plan
	PANOCHÉ-MENDOTA 115kV & WILSON-LE GRAND 115kV	P6	N-1-1	<100	<100	<100	111	110	<100	<100	<100	<100	Generation redispatch
	HERNDON-KEARNEY 230kV & MERCED 115/70kV TB 2	P6	N-1-1	<100	<100	<100	101	101	<100	<100	<100	<100	Generation redispatch
	PANOCHÉ-MENDOTA 115kV	P1	N-1	50	53	57	105	106	54	174	134	57	Generation redispatch
34116 LE GRAND 115 34198 CHWCHLASLRJT 115 1	MENDOTA 115kV - Middle Breaker Bay 3	P2	P2-3	<100	52	56	<100	42	53	107	<100	56	Generation redispatch
	PANOCHÉ1 - 1D 115kV & PANOCHÉ-CAL PEAK-STARWOOD line	P2	P2-3	50	53	57	105	106	54	174	134	57	Generation redispatch
	PANOCHÉ1 - 1D 115kV & PANOCHÉ-MENDOTA line	P2	P2-3	50	53	57	105	106	54	174	134	57	Generation redispatch
	PANOCHÉ1 - 1D 115kV & PANOCHÉ-SCHINDLER #1 line	P2	P2-3	50	53	57	105	106	54	174	134	57	Generation redispatch
	PANOCHÉ1 115kV Section 1D	P2	P2-2	50	53	57	105	106	54	174	134	57	Generation redispatch
	PANOCHÉ1 Section 1D & PANOCHÉ2 Section 2D 115kV	P2	P2-4	<100	53	57	<100	106	54	174	<100	57	Generation redispatch
	PANOCHÉ-MENDOTA 115kV & TOMATAK-MENDOTA #1 70kV	P6	N-1-1	<100	<100	<100	<100	<100	<100	<100	140	<100	Generation redispatch
	Base Case	P0	Base Case	63	64	59	97	98	65	144	93	59	Sensitivity only
34117 KETLMN T 70.0 34552 GATES 70.0 1	ARCO-TULARE LAKE 70kV	P1	N-1	<100	98	<100	<100	92	100	136	<100	<100	Sensitivity only
34117 KETLMN T 70.0 34552 GATES 70.0 1	PANOCHÉ1 Section 1D & PANOCHÉ2 Section 2D 115kV	P2	P2-4	109	112	125	<100	12	117	6	<100	125	

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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	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	2029 Retirement of QF Generations	
34118 LE GRNDJ 115 34134 WILSON A 115 1	PANOCHÉ2 - 2D 115kV & PANOCHÉ2-EXCELSIORSS line	P2	P2-3	108	112	124	<100	12	117	7	<100	124	Reconductor Wilson-Oro Loma 115kV line
	PANOCHÉ2 115kV Section 2D	P2	P2-2	108	112	124	<100	12	117	6	<100	124	
	PANOCHÉ2 115kV Section 2D	P2	P2-2	108	112	124	<100	12	117	7	<100	124	
34118 LE GRNDJ 115 34168 EL NIDO 115 1	PANOCHÉ1 Section 1D & PANOCHÉ2 Section 2D 115kV	P2	P2-4	108	112	125	<100	12	117	6	<100	125	Reconductor Wilson-Oro Loma 115kV line
	PANOCHÉ2 - 2D 115kV & PANOCHÉ2-EXCELSIORSS line	P2	P2-3	108	112	124	<100	12	117	6	<100	124	
	PANOCHÉ-ORO LOMA 115kV	P2	P2-1	108	112	124	<101	12	117	6	<101	125	
	PANOCHÉ2 115kV Section 2D	P2	P2-2	108	112	124	<100	12	117	6	<100	124	
34121 SHARON T 115 34128 OAKH_JCT 115 1	HERNDON 115kV - Section 1D & 2D	P2	P2-4	69	73	73	109	112	76	85	53	73	Generation redispatch
	MUSTANGSS 230kV - Middle Breaker Bay 3	P2	P2-3	21	33	37	104	107	36	92	38	38	Generation redispatch
	PANOCHÉ-MENDOTA 115kV & WILSON-LE GRAND 115kV	P6	N-1-1	<100	<100	<100	107	107	<100	<100	<100	<100	Generation redispatch
34134 WILSON A 115 34104 ATWATER 115 1	EL CAPITAN-WILSON 115kV & LIVINGSTON TAP 115kV	P6	N-1-1	117	125	133	<100	<100	127	<100	<100	133	Existing SPS under review
34134 WILSON A 115 34138 EL CAPTN 115 1	LIVINGSTON TAP 115kV & WILSON-ATWATER #2 115kV	P6	N-1-1	<100	114	121	<100	<100	115	<100	<100	121	Existing SPS under review
34134 WILSON A 115 34144 MERCED 115 1	EL CAPITAN-WILSON 115kV & WILSON-MERCED #2 115kV	P6	N-1-1	<100	105	113	<100	<100	108	<100	<100	114	Existing SPS under review
34134 WILSON A 115 34144 MERCED 115 2	EL CAPITAN-WILSON 115kV & WILSON-MERCED #1 115kV	P6	N-1-1	<100	109	117	<100	<100	111	<100	<100	117	Existing SPS under review
34136 WILSON B 115 34138 EL CAPTN 115 1	LIVINGSTON TAP 115kV & WILSON-ATWATER #2 115kV	P6	N-1-1	107	<100	<100	<100	<100	<100	<100	<100	<100	Existing SPS under review
34136 WILSON B 115 34144 MERCED 115 2	EL CAPITAN-WILSON 115kV & WILSON-MERCED #1 115kV	P6	N-1-1	101	<100	<100	<100	<100	<100	<100	<100	<100	Existing SPS under review
34149 CHENYT 115 34158 PANOCHÉ2 115 1	HELMS 1 18.00kV Gen Unit 1 & GATES 230/70kV TB 5	P3	G1/N1	<100	<100	<100	<100	<100	<100	100	<100	<100	Sensitivity only
	HELMS 2 18.00kV Gen Unit 1 & GATES 230/70kV TB 5	P3	G1/N1	<100	<100	<100	<100	<100	<100	100	<100	<100	Sensitivity only
	HELMS 3 18.00kV Gen Unit 1 & GATES 230/70kV TB 5	P3	G1/N1	<100	<100	<100	<100	<100	<100	100	<100	<100	Sensitivity only
	GATES 230/70kV TB 5 & WESTLNDs-EXCELSIORSS #1 115kV	P6	N-1-1	<100	<100	<100	<100	<100	<100	152	<100	<100	Sensitivity only
	PANOCHÉ-SCHINDLER #1 115kV & GATES 230/70kV TB 5	P6	N-1-1	<100	<100	100	<100	<100	<100	<100	<100	100	Continue to monitor Future load forecast
34149 CHENYT 115 34393 EXCELSIORSS 115 2	GATES 230/70kV TB 5 & WESTLNDs-EXCELSIORSS #1 115kV	P6	N-1-1	<100	<100	<100	<100	<100	<100	144	<100	<100	Sensitivity only
	PANOCHÉ-SCHINDLER #1 115kV & GATES 230/70kV TB 5	P6	N-1-1	<100	100	100	<100	<100	100	<100	<100	100	Continue to monitor Future load forecast
34150 NEWHALL 115 34154 DAIRYLND 115 1	PANOCHÉ-MENDOTA 115kV	P1	N-1	25	26	27	95	94	27	143	122	27	Sensitivity only
	PANOCHÉ1 - 1D 115kV & PANOCHÉ-CAL PEAK-STARWOOD line	P2	P2-3	25	26	27	95	94	27	143	122	27	Sensitivity only
	PANOCHÉ1 - 1D 115kV & PANOCHÉ-MENDOTA line	P2	P2-3	25	26	27	95	94	27	143	122	27	Sensitivity only
	PANOCHÉ1 - 1D 115kV & PANOCHÉ-SCHINDLER #1 line	P2	P2-3	25	26	27	95	94	27	143	122	27	Sensitivity only
	PANOCHÉ1 115kV Section 1D	P2	P2-2	25	26	27	95	94	27	143	122	27	Sensitivity only
	PANOCHÉ1 Section 1D & PANOCHÉ2 Section 2D 115kV	P2	P2-4	25	26	27	95	94	27	143	122	27	Sensitivity only
	PANOCHÉ-MENDOTA 115kV & TOMATAK-MENDOTA #1 70kV	P6	N-1-1	<100	<100	<100	<100	<100	<100	<100	128	<100	Sensitivity only
34155 PANOCHÉ1 115 34350 KAMM 115 1	GATES 230/70kV TB 5 & PANOCHÉ2-EXCELSIORSS 115kV	P6	N-1-1	<100	<100	<100	<100	<100	<100	154	<100	<100	Sensitivity only
	PANOCHÉ2-EXCELSIORSS 115kV & GATES 230/70kV TB 5	P6	N-1-1	<100	100	<100	101	<100	100	<100	<100	<100	Continue to monitor Future load forecast
34156 MENDOTA 115 34153 GILLTAP 115 1	PANOCHÉ-MENDOTA 115kV	P1	N-1	6	6	6	77	74	6	111	103	6	Sensitivity only
	PANOCHÉ1 - 1D 115kV & PANOCHÉ-CAL PEAK-STARWOOD line	P2	P2-3	6	6	6	77	74	7	111	103	6	Sensitivity only
	PANOCHÉ1 - 1D 115kV & PANOCHÉ-MENDOTA line	P2	P2-3	6	6	6	77	74	6	111	103	6	Sensitivity only
	PANOCHÉ1 - 1D 115kV & PANOCHÉ-SCHINDLER #1 line	P2	P2-3	6	6	6	77	74	7	111	103	6	Sensitivity only
	PANOCHÉ1 115kV Section 1D	P2	P2-2	6	6	6	77	74	7	111	103	6	Sensitivity only
	PANOCHÉ1 Section 1D & PANOCHÉ2 Section 2D 115kV	P2	P2-4	6	6	6	77	74	7	111	103	6	Sensitivity only
	PANOCHÉ-MENDOTA 115kV & TOMATAK-MENDOTA #1 70kV	P6	N-1-1	<100	<100	<100	<100	<100	<100	<100	107	<100	Sensitivity only
34157 PANOCHÉ1 115 34155 PANOCHÉ1 115 1	DAIRYLAND-MENDOTA 115kV	P1	N-1	8	9	5	79	78	9	110	102	5	Sensitivity only
	LE GRAND-DAIRYLAND 115kV	P1	N-1	<100	36	37	<100	78	35	120	<100	37	Sensitivity only
	WILSON-LE GRAND 115kV	P1	N-1	<100	28	31	<100	84	30	106	<100	31	Sensitivity only
	DAIRYLAND-MENDOTA 115kV (MENDOTA-GILLTAP)	P2	P2-1	8	<100	<100	79	<100	<100	102	<100	<100	Sensitivity only
	DAIRYLND - 1D 115kV & DAIRYLAND-MENDOTA line	P2	P2-3	8	<100	<100	79	<100	<100	102	<100	<100	Sensitivity only
	DAIRYLND - 1E 115kV & LE GRAND-DAIRYLAND line	P2	P2-3	<100	28	28	<100	77	29	110	<100	28	Sensitivity only
	LE GRAND - MA 115kV & LE GRAND-CHOWCHILLA line	P2	P2-3	<100	36	37	<100	78	35	120	<100	37	Sensitivity only
	LE GRAND - MA 115kV & LE GRAND-DAIRYLAND line	P2	P2-3	<100	36	37	<100	78	35	120	<100	37	Sensitivity only
	LE GRAND 115kV Section MA	P2	P2-2	33	36	37	77	78	35	120	94	37	Sensitivity only

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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	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	2029 Retirement of QF Generations	
	LE GRAND-DAIRYLAND 115kV (CHWCHLASLRJT-DAIRYLND)	P2	P2-1	<100	34	37	<100	78	35	112	<100	37	Sensitivity only
	LE GRAND-DAIRYLAND 115kV (LE GRAND-CHWCHLASLRJT)	P2	P2-1	<100	36	37	<100	78	35	120	<100	37	Sensitivity only
	GREGG 230 kV BAAH BUS #1 (FAILURE OF NON-REDUNDENT RELAY)	P5	Non-Redundent Relay	37	46	54	75	75	47	100	51	54	Sensitivity only
	DAIRYLAND-MENDOTA 115kV & TOMATAK-MENDOTA #1 70kV	P6	N-1-1	<100	<100	<100	<100	<100	<100	<100	106	<100	Sensitivity only
	DAIRYLAND-MENDOTA 115kV & TOMATAK-MENDOTA #1 70kV	P7	DCTL	5	5	4	83	82	5	114	106	4	Sensitivity only
	MUSTANGSS-GATES #1 230kV & MUSTANGSS-GATES #2 230kV	P7	DCTL	21	30	38	76	76	32	103	78	38	Sensitivity only
	PANOCHÉ-TRANQLTYSS #1 230kV & PANOCHÉ-TRANQLTYSS #2 230kV	P7	DCTL	26	34	39	78	78	36	102	79	40	Sensitivity only
34157 PANOCHET 115 34156 MENDOTA 115 1	LE GRAND-DAIRYLAND 115kV	P1	N-1	<100	38	40	<100	83	37	127	<100	40	Sensitivity only
	WILSON-LE GRAND 115kV	P1	N-1	<100	30	33	<100	89	32	113	<100	33	Sensitivity only
	DAIRYLAND-MENDOTA 115kV (GILLTAP-MADERAPR)	P2	P2-1	14	<100	<100	79	<100	<100	<100	102	<100	Sensitivity only
	DAIRYLAND-MENDOTA 115kV (MENDOTA-GILLTAP)	P2	P2-1	9	<100	<100	84	<100	<100	<100	108	<100	Sensitivity only
	DAIRYLAND-MENDOTA 115kV (NEWHALL-MADERAPR)	P2	P2-1	14	<100	<100	79	<100	<100	<100	102	<100	Sensitivity only
	DAIRYLND - 1D 115kV & DAIRYLAND-MENDOTA line	P2	P2-3	9	<100	<100	84	<100	<100	<100	108	<100	Sensitivity only
	DAIRYLND - 1E 115kV & LE GRAND-DAIRYLAND line	P2	P2-3	<100	30	30	<100	82	31	117	<100	30	Sensitivity only
	LE GRAND - MA 115kV & LE GRAND-CHOWCHILLA line	P2	P2-3	<100	38	39	<100	83	37	127	<100	39	Sensitivity only
	LE GRAND - MA 115kV & LE GRAND-DAIRYLAND line	P2	P2-3	<100	38	39	<100	83	37	127	<100	39	Sensitivity only
	LE GRAND 115kV Section MA	P2	P2-2	35	38	39	82	83	37	127	100	39	Sensitivity only
	LE GRAND-DAIRYLAND 115kV (CHWCHLASLRJT-DAIRYLND)	P2	P2-1	<100	36	40	<100	82	37	118	<100	40	Sensitivity only
	LE GRAND-DAIRYLAND 115kV (LE GRAND-CHWCHLASLRJT)	P2	P2-1	<100	38	40	<100	83	37	127	<100	39	Sensitivity only
	MENDOTA 115kV - Middle Breaker Bay 1	P2	P2-3	10	<100	<100	78	<100	<100	<100	102	<100	Sensitivity only
	CALPEAKPNCHE 13.80kV Gen Unit 1 & PANOCHÉ-HELM 230kV	P3	G1/N1	<100	<100	<100	<100	<100	<100	100	<100	<100	Sensitivity only
	Q877PH3 0.63kV Gen Unit 3 & PANOCHÉ-CAL PEAK-STARWOOD 115kV	P3	G1/N1	<100	<100	<100	<100	<100	<100	100	<100	<100	Sensitivity only
	GREGG 230 kV BAAH BUS #1 (FAILURE OF NON-REDUNDENT RELAY)	P5	Non-Redundent Relay	39	48	57	79	79	50	106	54	57	Sensitivity only
	DAIRYLAND-MENDOTA 115kV & TOMATAK-MENDOTA #1 70kV	P6	N-1-1	<100	<100	<100	<100	<100	<100	<100	112	<100	Sensitivity only
	FIVEPOINTSSS-Q532 #1 70kV & PANOCHÉ-CAL PEAK-STARWOOD 115kV	P6	N-1-1	<100	<100	<100	<100	<100	<100	100	<100	<100	Sensitivity only
	BELLOTA-COTTLE 230kV & BELLOTA-WARNERVILLE 230kV	P7	DCTL	20	27	29	80	81	29	105	84	29	Sensitivity only
	COTTLE-MELONES 230kV & BELLOTA-WARNERVILLE 230kV	P7	DCTL	18	26	27	80	81	27	105	85	27	Sensitivity only
	DAIRYLAND-MENDOTA 115kV & TOMATAK-MENDOTA #1 70kV	P7	DCTL	5	5	4	88	87	5	120	112	4	Sensitivity only
	HELMS-GREGG #1 230kV & HELMS-GREGG #2 230kV	P7	DCTL	36	43	49	78	79	44	104	59	49	Sensitivity only
	MUSTANGSS-GATES #1 230kV & MUSTANGSS-GATES #2 230kV	P7	DCTL	22	32	40	80	80	34	110	83	40	Sensitivity only
	PANOCHÉ-TRANQLTYSS #1 230kV & PANOCHÉ-TRANQLTYSS #2 230kV	P7	DCTL	27	36	42	83	83	38	108	84	42	Sensitivity only
34158 PANOCHÉ2 115 30790 PANOCHÉ 230 2	PANOCHÉ 230/115kV TB 1	P1	N-1	23	22	17	54	58	22	110	36	17	Sensitivity only
	PANOCHÉ 230kV - Section 1E & 1D	P2	P2-4	20	22	18	53	57	23	106	34	18	Sensitivity only
	PANOCHÉ 230kV Section 1E	P2	P2-2	22	21	17	52	55	21	107	34	17	Sensitivity only
34162 ORO LOMA 115 34168 EL NIDO 115 1	WILSON 230/115kV TB 1 & WILSON 230/115kV TB 2	P6	N-1-1	107	<100	<100	<100	<100	<100	<100	<100	<100	Project: Wilson 115kV Reinforcement Project In-service date: 05/23 Short term: Action plan
34198 CHWCHLASLRJT 115 34154 DAIRYLND 115 1	PANOCHÉ1 Section 1D & PANOCHÉ2 Section 2D 115kV	P2	P2-4	50	52	57	106	106	54	162	122	57	Generation redispatch
	PANOCHÉ-MENDOTA 115kV & TOMATAK-MENDOTA #1 70kV	P6	N-1-1	<100	<100	<100	<100	<100	<100	<100	128	<100	Sensitivity only
34256 BORDEN 70.0 30805 BORDEN 230 1	BORDEN 230/70kV TB 4	P1	N-1	97	102	99	51	46	104	55	54	99	Upgrade limiting equipment
	FRIANTDM 6.60kV Gen Unit 2 & BORDEN 230/70kV TB 4	P3	G1/N1	106	<100	107	<100	<100	<100	<100	<100	107	Upgrade limiting equipment
	FRIANTDM 6.60kV Gen Unit 3 & BORDEN 230/70kV TB 4	P3	G1/N1	100	<100	103	<100	<100	<100	<100	<100	103	Upgrade limiting equipment

Study Area: PG&E Greater Fresno
Thermal Overloads



Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Loading % (Baseline Scenarios)					Loading % (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	2029 Retirement of QF Generations	
	FRIANTDM 6.60kV Gen Unit 4 & BORDEN 230/70kV TB 4	P3	G1/N1	<100	<100	100	<100	<100	<100	<100	<100	100	Upgrade limiting equipment
34350 KAMM 115 34352 CANTUA 115 1	GATES 230/70kV TB 5 & PANOCHE2-EXCELSIORSS 115kV	P6	N-1-1	<100	<100	<100	<100	<100	<100	147	<100	<100	Sensitivity only
34352 CANTUA 115 34432 WESTLND5 115 1	GATES 230/70kV TB 5 & PANOCHE2-EXCELSIORSS 115kV	P6	N-1-1	<100	<100	<100	<100	<100	<100	143	<100	<100	Sensitivity only
34357 AIRWAYJ1 115 34366 SANGER 115 1	MUSTANGSS 230kV - Middle Breaker Bay 3	P2	P2-3	22	21	16	113	111	21	113	46	16	Operating solution
34357 AIRWAYJ1 115 34368 LASPALMS 115 1	MUSTANGSS 230kV - Middle Breaker Bay 3	P2	P2-3	4	5	12	116	116	7	120	42	12	Operating solution
34359 AIRWAYJ2 115 34408 BARTON 115 1	HERNDON - 2D 115kV & HERNDON-BULLARD #2 line	P2	P2-3	38	40	41	109	107	42	103	34	41	Operating solution
	HERNDON - 2D 115kV & HERNDON-WOODWARD line	P2	P2-3	37	40	41	110	108	41	103	34	40	Operating solution
	HERNDON 115kV Section 2D	P2	P2-2	38	40	41	109	107	42	103	34	41	Operating solution
	MUSTANGSS 230kV - Middle Breaker Bay 3	P2	P2-3	10	10	7	123	122	10	126	47	7	Operating solution
	HELM-MCCALL 230kV & HENTAP2-MUSTANGSS #1 230kV	P7	DCTL	11	25	31	102	98	28	101	7	32	Operating solution
34366 SANGER 115 34359 AIRWAYJ2 115 1	HERNDON - 2D 115kV & HERNDON-BULLARD #2 line	P2	P2-3	21	22	24	107	105	23	99	28	24	Operating solution
	HERNDON - 2D 115kV & HERNDON-WOODWARD line	P2	P2-3	21	22	24	108	106	23	99	27	24	Operating solution
	HERNDON 115kV Section 2D	P2	P2-2	21	22	24	107	105	23	99	28	24	Operating solution
	MUSTANGSS 230kV - Middle Breaker Bay 3	P2	P2-3	21	14	16	121	119	13	122	54	16	Operating solution
	HELM-MCCALL 230kV & HENTAP2-MUSTANGSS #1 230kV	P7	DCTL	8	7	15	100	96	9	97	7	16	Operating solution
34366 SANGER 115 34389 RAINBWTP 115 1	MCCALL-REEDLEY 115kV & SANGER-REEDLEY 115kV	P6	N-1-1	132	147	154	<100	<100	153	<100	<100	154	System upgrade, operating solution or SPS
34370 MC CALL 115 30878 MCCALL3M 115 3	MC CALL 115kV - Middle Breaker Bay 3	P2	P2-3	<100	90	102	<100	21	93	12	<100	102	Continue to monitor future load forecast
34370 MC CALL 115 34385 KINGS J1 115 1	MUSTANGSS 230kV - Middle Breaker Bay 3	P2	P2-3	<100	15	20	<100	95	16	101	<100	21	Sensitivity only
	HENRIETA 230/115kV TB 3 & MCCALL-KINGSBURG #2 115kV	P6	N-1-1	<100	<100	<100	<100	<100	<100	151	<100	<100	Sensitivity only
34380 REEDLEY 115 34394 PIEDRA 115 1	MCCALL-REEDLEY 115kV & SANGER-REEDLEY 115kV	P6	N-1-1	128	140	147	<100	<100	145	<100	<100	147	System upgrade, operating solution or SPS
34382 WAHTOKE 115 34380 REEDLEY 115 1	KINGS RIVER-SANGER-REEDLEY 115kV & SANGER-REEDLEY 115kV	P6	N-1-1	109	116	119	<100	<100	119	<100	<100	119	System upgrade, operating solution or SPS
34385 KINGS J1 115 34417 KINGS J2 115 1	MCCALL-KINGSBURG #2 115kV & HENRIETTA-LEPRINO SW STA 115kV	P6	N-1-1	<100	<100	<100	<100	<100	<100	131	<100	<100	Sensitivity only
34389 RAINBWTP 115 34394 PIEDRA 115 1	MCCALL-REEDLEY 115kV & SANGER-REEDLEY 115kV	P6	N-1-1	115	129	136	<100	<100	135	<100	<100	136	System upgrade, operating solution or SPS
34390 DANISHCM 115 34370 MC CALL 115 1	MCCALL-WEST FRESNO #2 115kV & SANGER-CALIFORNIA AVE 115kV	P6	N-1-1	<100	<100	103	<100	<100	<100	<100	<100	103	Continue to monitor future load forecast
34402 CAL AVE 115 34366 SANGER 115 1	MCCALL 115kV BAAH BUS #2 (FAILURE OF NON-REDUNDENT RELAY)	P5	Non-Redundent Relay	87	93	101	3	4	96	10	61	101	Protection upgrade
	HERNDON 115kV Section 2D	P2	P2-2	88	94	98	120	120	97	117	77	98	Operating solution
	SANGER - ME 115kV & MANCHESTER-AIRWAYS-SANGER line	P2	P2-3	<100	90	100	<100	6	92	12	<100	100	Continue to monitor future load forecast
	HENRIETTA-LEPRINO SW STA 115kV & MANCHESTER-AIRWAYS-SANGER 115kV	P6	N-1-1	<100	<100	<100	<100	100	<100	<100	<100	<100	Operating solution
	HELM-MCCALL 230kV & HENTAP2-MUSTANGSS #1 230kV	P7	DCTL	55	77	87	112	109	81	115	38	87	Sensitivity only
	MUSTANGSS 230kV - Middle Breaker Bay 3	P2	P2-3	5	11	18	132	131	13	136	46	18	Operating solution
	HENRIETTA-LEPRINO SW STA 115kV & BARTON-AIRWAYS-SANGER 115kV	P6	N-1-1	<100	<100	<100	100	<100	<100	<100	<100	<100	Operating solution
	HELM-MCCALL 230kV & HENTAP2-MUSTANGSS #1 230kV	P7	DCTL	14	32	44	109	106	35	110	6	44	Operating solution
34410 MANCHSTR 115 34412 HERNDON 115 1	MUSTANGSS 230kV - Middle Breaker Bay 3	P2	P2-3	45	57	62	123	124	59	131	20	62	Operating solution
	SANGER - ME 115kV & BARTON-AIRWAYS-SANGER line	P2	P2-3	<100	98	102	<100	1	100	6	<100	102	Continue to monitor future load forecast
	HELM-MCCALL 230kV & HENTAP2-MUSTANGSS #1 230kV	P7	DCTL	58	78	87	101	99	82	105	43	87	Operating solution
34412 HERNDON 115 34422 CHLDHOSP 115 1	MUSTANGSS 230kV - Middle Breaker Bay 3	P2	P2-3	38	47	55	100	102	49	99	41	55	Operating solution
	SANGER - ME 115kV & BALCH-SANGER line	P2	P2-3	45	50	53	109	108	51	96	67	53	Operating solution
	SANGER - ME 115kV & BARTON-AIRWAYS-SANGER line	P2	P2-3	45	50	53	111	108	51	96	67	53	Operating solution
	SANGER - ME 115kV & KINGS RIVER-SANGER-REEDLEY line	P2	P2-3	46	51	55	108	107	53	93	66	55	Operating solution
	SANGER - ME 115kV & MANCHESTER-AIRWAYS-SANGER line	P2	P2-3	45	50	54	110	107	52	96	67	54	Operating solution
	SANGER 115kV Section ME	P2	P2-2	45	50	53	109	108	51	96	67	53	Operating solution
	BARTON-AIRWAYS-SANGER 115kV & MANCHESTER-AIRWAYS-SANGER 115kV	P7	DCTL	45	50	54	113	110	51	101	64	54	Operating solution
	HERNDON-BARTON 115kV & HERNDON-MANCHESTER 115kV	P7	DCTL	78	85	91	109	108	87	101	83	91	Operating solution
	HERNDON-BARTON 115kV & MANCHESTER-AIRWAYS-SANGER 115kV	P7	DCTL	64	70	76	112	110	73	102	73	76	Operating solution



Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Loading % (Baseline Scenarios)					Loading % (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	2029 Retirement of QF Generations	
34414 WOODWARD 115 34348 SHEPHERD 115 1	BARTON-AIRWAYS-SANGER 115kV & MANCHESTER-AIRWAYS-SANGER 115kV	P7	DCTL	10	11	22	101	98	11	83	38	22	Operating solution
34414 WOODWARD 115 34422 CHLDHOSP 115 1	MUSTANGSS 230kV - Middle Breaker Bay 3	P2	P2-3	36	45	53	102	104	47	100	41	53	Operating solution
	SANGER - ME 115kV & BARTON-AIRWAYS-SANGER line	P2	P2-3	43	<100	<100	113	<100	<100	<100	66	<100	Operating solution
	SANGER - ME 115kV & MANCHESTER-AIRWAYS-SANGER line	P2	P2-3	43	<100	<100	112	<100	<100	<100	66	<100	Operating solution
	SANGER 115kV Section ME	P2	P2-2	43	48	52	111	110	49	98	66	52	Operating solution
	BARTON-AIRWAYS-SANGER 115kV & MANCHESTER-AIRWAYS-SANGER 115kV	P7	DCTL	43	48	52	114	112	49	103	63	52	Operating solution
	HERNDON-BARTON 115kV & HERNDON-MANCHESTER 115kV	P7	DCTL	76	83	89	111	110	85	102	81	89	Operating solution
	HERNDON-BARTON 115kV & MANCHESTER-AIRWAYS-SANGER 115kV	P7	DCTL	62	69	74	114	112	71	104	72	74	Operating solution
34417 KINGS J2 115 34418 KINGSBURGD 115 1	MCCALL-KINGSBURG #2 115kV & HENRIETTA-LEPRINO SW STA 115kV	P6	N-1-1	<100	<100	<100	<100	<100	<100	131	<100	<100	Sensitivity only
34418 KINGSBURGD 115 34419 KINGSBURGE 115 1	MCCALL-KINGSBURG #1 115kV & HENRIETTA-LEPRINO SW STA 115kV	P6	N-1-1	<100	<100	<100	100	<100	<100	110	<100	<100	Sensitivity only
34418 KINGSBURGD 115 364621 JACKSONSWSTA 115 2	KINGSBURGD-JACKSONSWSTA #3 115kV & HENRIETTA-LEPRINO SW STA 115kV	P6	N-1-1	<100	<100	<100	<100	<100	<100	107	<100	<100	Sensitivity only
34419 KINGSBURGE 115 34423 GAURD J1 115 2	MCCALL-KINGSBURG #1 115kV & HENRIETTA-LEPRINO SW STA 115kV	P6	N-1-1	<100	<100	<100	100	100	<100	131	<100	<100	Sensitivity only
34419 KINGSBURGE 115 364621 JACKSONSWSTA 115 1	KINGSBURGD-JACKSONSWSTA #3 115kV & HENRIETTA-LEPRINO SW STA 115kV	P6	N-1-1	<100	<100	<100	<100	<100	<100	110	<100	<100	Sensitivity only
34423 GAURD J1 115 34370 MC CALL 115 2	MCCALL-KINGSBURG #1 115kV & HENRIETTA-LEPRINO SW STA 115kV	P6	N-1-1	<100	<100	<100	<100	<100	<100	127	<100	<100	Sensitivity only
34429 GWF_HEP 115 34428 CONTADNA 115 1	GREGG 230 kV BAAH BUS #1 (FAILURE OF NON-REDUNDENT RELAY)	P5	Non-Redundent Relay	57	90	107	18	29	92	44	44	108	Project: Protection upgrade In-service date: 12/20 Short term: Action plan
	GREGG 230 kV BAAH BUS #2 (FAILURE OF NON-REDUNDENT RELAY)	P5	Non-Redundent Relay	67	99	109	27	39	102	52	48	110	Project: Protection upgrade In-service date: 12/20 Short term: Action plan
34430 HENRETTA 115 30881 HENRIETA 230 3 1	HERNDON 115kV - Section 1D & 2D	P2	P2-4	20	49	59	85	95	52	107	16	60	Sensitivity only
	HERNDON 230kV - Section 1E & 2E	P2	P2-4	22	51	63	81	91	54	104	12	64	Sensitivity only
	SANGER 115kV - Section ME & MD	P2	P2-4	7	18	24	79	87	20	102	39	25	Sensitivity only
	GREGG 230 kV BAAH BUS #2 (FAILURE OF NON-REDUNDENT RELAY)	P5	Non-Redundent Relay	33	66	76	80	91	69	105	5	77	Sensitivity only
	MCCALL 115kV BAAH BUS #1 (FAILURE OF NON-REDUNDENT RELAY)	P5	Non-Redundent Relay	48	50	60	90	93	52	102	38	61	Sensitivity only
	MCCALL-KINGSBURG #2 115kV & MCCALL-KINGSBURG #1 115kV	P6	N-1-1	<100	<100	<100	<100	<100	<100	102	<100	<100	Sensitivity only
	HELM-MCCALL 230kV & HENTAP2-MUSTANGSS #1 230kV	P7	DCTL	4	45	63	93	104	49	124	37	64	Sensitivity only
	MCCALL-KINGSBURG #1 115kV & MCCALL-KINGSBURG #2 115kV	P7	DCTL	48	50	60	90	93	52	102	38	61	Sensitivity only
34430 HENRETTA 115 34519 LPRNJCTSS 115 1	HERNDON 115kV - Section 1D & 2D	P2	P2-4	20	49	60	83	94	51	107	15	60	Sensitivity only
	HERNDON 230kV - Section 1E & 2E	P2	P2-4	22	51	62	80	91	53	104	12	64	Sensitivity only
	SANGER 115kV - Section ME & MD	P2	P2-4	7	18	24	78	86	19	101	39	25	Sensitivity only
	GREGG 230 kV BAAH BUS #2 (FAILURE OF NON-REDUNDENT RELAY)	P5	Non-Redundent Relay	33	65	74	79	90	68	105	5	74	Sensitivity only
	MCCALL 115kV BAAH BUS #1 (FAILURE OF NON-REDUNDENT RELAY)	P5	Non-Redundent Relay	48	50	59	88	92	51	101	37	61	Sensitivity only
	MCCALL-KINGSBURG #1 115kVMOAS OPENED on KINGS J1-KINGS J2 & MCCALL-KINGSBURG #2 115kV	P6	N-1-1	<100	<100	<100	<100	<100	<100	101	<100	<100	Sensitivity only
	HELM-MCCALL 230kV & HENTAP2-MUSTANGSS #1 230kV	P7	DCTL	4	44	64	92	103	49	123	36	65	Sensitivity only
	MCCALL-KINGSBURG #1 115kV & MCCALL-KINGSBURG #2 115kV	P7	DCTL	48	50	59	88	92	52	101	37	61	Sensitivity only
34432 WESTLND5 115 34393 EXCELSIORSS 115 1	GATES 230/70kV TB 5 & PANOCHE2-EXCELSIORSS 115kV	P6	N-1-1	<100	<100	<100	<100	<100	<100	144	<100	<100	Sensitivity only



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

Study Area: PG&E Greater Fresno
Thermal Overloads



Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Loading % (Baseline Scenarios)					Loading % (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	2029 Retirement of QF Generations	
504021 JACKSON SW STA 115 34428 CONTADNA 115 1	GREGG 230 KV BAAH BUS #2 (FAILURE OF NON-REDUNDENT RELAY)	P5	Non-Redundent Relay	<100	96	106	<100	43	99	56	<100	107	Project: Protection upgrade In-service date: 12/20 Short term: Action plan

Study Area: PG&E Greater Fresno

High/Low Voltages



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

Study Area: PG&E Greater Fresno

High/Low Voltages



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

Study Area: PG&E Greater Fresno

High/Low Voltages



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

Study Area: PG&E Greater Fresno

High/Low Voltages



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

Study Area: PG&E Greater Fresno

High/Low Voltages



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

Study Area: PG&E Greater Fresno

High/Low Voltages



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

Study Area: PG&E Greater Fresno

High/Low Voltages



Substation	Contingency (All and Worst P6)	Category	Category Description	Voltage PU (Baseline Scenarios)					Voltage PU (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	2029 Retirement of QF Generations	
ATWATR J 115 kV	WILSON A Section 1D & WILSON B Section 2D 115kV	P2	P2-4	>0.9	NA	NA	1.23	NA	NA	NA	>0.9	NA	Project: Wilson 115kV Reinforcement Project In-service date: 05/23 Short term: Action plan
CHLDHOSP 115 kV	KERCKHOFF-CLOVIS-SANGER #1 115kV (WWARD JT-SHEPHERD)	P2	P2-1	1.03	1.03	1.02	1.05	1.06	1.04	1.06	1.11	1.02	Sensitivity only
CHLDHOSP 115 kV	HERNDON-WOODWARD 115kV (HERNDON-CHLDHOSP)	P2	P2-1	1.04	1.04	1.01	1.02	1.08	1.03	1.08	1.18	1.01	Sensitivity only
CHLDHOSP 115 kV	HERNDON 115kV Section 2D	P2	P2-2	1.04	1.03	1.01	1.02	1.08	1.03	1.08	1.18	1.01	Sensitivity only
CHLDHOSP 115 kV	SHEPHERD 115kV - Ring R4 & R3	P2	P2-3	1.02	<1.1	<1.1	1.03	<1.1	<1.1	<1.1	1.12	<1.1	Sensitivity only
CHLDHOSP 115 kV	SHEPHERD 115kV - Ring R2 & R3	P2	P2-3	1.02	<1.1	<1.1	1.03	<1.1	<1.1	<1.1	1.12	<1.1	Sensitivity only
CHLDHOSP 115 kV	SHEPHERD 115kV - Ring R2 & R4	P2	P2-3	1.02	<1.1	<1.1	1.03	<1.1	<1.1	<1.1	1.12	<1.1	Sensitivity only
CHLDHOSP 115 kV	KERCKHF2 - 1D 115kV & KERCKHOFF-CLOVIS-SANGER #1 line	P2	P2-3	1.03	<1.1	<1.1	1.05	<1.1	<1.1	<1.1	1.11	<1.1	Sensitivity only
CHLDHOSP 115 kV	CLOVIS-1 - 1D 115kV & KERCKHOFF-CLOVIS-SANGER #1 line	P2	P2-3	1.03	<1.1	<1.1	1.05	<1.1	<1.1	<1.1	1.11	<1.1	Sensitivity only
CHLDHOSP 115 kV	SANGER - MD 115kV & KERCKHOFF-CLOVIS-SANGER #1 line	P2	P2-3	1.03	<1.1	<1.1	1.05	<1.1	<1.1	<1.1	1.11	<1.1	Sensitivity only
CHLDHOSP 115 kV	HERNDON - 2D 115kV & HERNDON-BULLARD #2 line	P2	P2-3	1.04	<1.1	<1.1	1.02	<1.1	<1.1	<1.1	1.18	<1.1	Sensitivity only
CHLDHOSP 115 kV	HERNDON 115kV - Section 1D & 2D	P2	P2-4	1.03	1.02	1.00	1.02	1.08	1.02	1.08	1.18	1.00	Sensitivity only
CLOVIS-1 115 kV	SANGER - MD 115kV & KERCKHOFF-CLOVIS-SANGER #1 line	P2	P2-3	1.02	<1.1	<1.1	1.07	<1.1	<1.1	<1.1	0.86	<1.1	Sensitivity only
CLOVIS-2 115 kV	SANGER - MD 115kV & KERCKHOFF-CLOVIS-SANGER #1 line	P2	P2-3	1.02	<1.1	<1.1	1.07	<1.1	<1.1	<1.1	0.86	<1.1	Sensitivity only
CLOVISJ2 115 kV	SANGER - MD 115kV & KERCKHOFF-CLOVIS-SANGER #1 line	P2	P2-3	1.02	<1.1	<1.1	1.07	<1.1	<1.1	<1.1	0.00	<1.1	Sensitivity only
CORSGOLD 115 kV	SANGER - MD 115kV & KERCKHOFF-CLOVIS-SANGER #1 line	P2	P2-3	1.02	<1.1	<1.1	1.05	<1.1	<1.1	<1.1	0.87	<1.1	Sensitivity only
CRESSEY 115 kV	WILSON A Section 1D & WILSON B Section 2D 115kV	P2	P2-4	Diverged	NA	NA	1.23	NA	NA	NA	Diverged	NA	Project: Wilson 115kV Reinforcement Project In-service date: 05/23 Short term: Action plan
DFS 115 kV	PANOCH2 115kV Section 2D	P2	P2-2	>0.9	0.95	0.87	>0.9	1.02	0.95	1.03	>0.9	0.87	Continue to monitor future load forecast
DFS 115 kV	PANOCH2 - 2D 115kV & PANOCH2-EXCELSIORSS line	P2	P2-3	>0.9	0.95	0.87	>0.9	1.02	0.95	1.03	>0.9	0.87	Continue to monitor future load forecast

Study Area: PG&E Greater Fresno

High/Low Voltages



Substation	Contingency (All and Worst P6)	Category	Category Description	Voltage PU (Baseline Scenarios)					Voltage PU (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	2029 Retirement of QF Generations	
DFS 115 kV	PANOCHÉ1 Section 1D & PANOCHÉ2 Section 2D 115kV	P2	P2-4	>0.9	0.95	0.87	>0.9	1.02	0.95	1.02	>0.9	0.87	Continue to monitor future load forecast
EL CAPTN 115 kV	WILSON A Section 1D & WILSON B Section 2D 115kV	P2	P2-4	Diverged	NA	NA	1.23	NA	NA	NA	Diverged	NA	Project: Wilson 115kV Reinforcement Project In-service date: 05/23 Short term: Action plan
HAMMONDS 115 kV	PANOCHÉ2 115kV Section 2D	P2	P2-2	>0.9	0.96	0.87	>0.9	1.02	0.95	1.03	>0.9	0.87	Continue to monitor future load forecast
HAMMONDS 115 kV	PANOCHÉ2 - 2D 115kV & PANOCHÉ2-EXCELSIORSS line	P2	P2-3	>0.9	0.96	0.87	>0.9	1.02	0.95	1.03	>0.9	0.87	Continue to monitor future load forecast
HAMMONDS 115 kV	PANOCHÉ1 Section 1D & PANOCHÉ2 Section 2D 115kV	P2	P2-4	>0.9	0.96	0.86	>0.9	1.02	0.95	1.02	>0.9	0.86	Continue to monitor future load forecast
JR WOOD 115 kV	WILSON A Section 1D & WILSON B Section 2D 115kV	P2	P2-4	Diverged	NA	NA	1.23	NA	NA	NA	Diverged	NA	Project: Wilson 115kV Reinforcement Project In-service date: 05/23 Short term: Action plan
LIVNGSTN 115 kV	WILSON A Section 1D & WILSON B Section 2D 115kV	P2	P2-4	Diverged	NA	NA	1.23	NA	NA	NA	Diverged	NA	Project: Wilson 115kV Reinforcement Project In-service date: 05/23 Short term: Action plan
LUIS_#3 115 kV	PANOCHÉ2 115kV Section 2D	P2	P2-2	>0.9	0.95	0.87	>0.9	1.01	0.95	1.02	>0.9	0.87	Continue to monitor future load forecast
LUIS_#3 115 kV	PANOCHÉ2 - 2D 115kV & PANOCHÉ2-EXCELSIORSS line	P2	P2-3	>0.9	0.95	0.87	>0.9	1.01	0.95	1.02	>0.9	0.87	Continue to monitor future load forecast
LUIS_#3 115 kV	PANOCHÉ1 Section 1D & PANOCHÉ2 Section 2D 115kV	P2	P2-4	>0.9	0.95	0.86	>0.9	1.01	0.95	1.02	>0.9	0.86	Continue to monitor future load forecast
LUIS_#5 115 kV	PANOCHÉ2 115kV Section 2D	P2	P2-2	>0.9	0.95	0.87	>0.9	1.01	0.95	1.02	>0.9	0.87	Continue to monitor future load forecast
LUIS_#5 115 kV	PANOCHÉ2 - 2D 115kV & PANOCHÉ2-EXCELSIORSS line	P2	P2-3	>0.9	0.95	0.87	>0.9	1.01	0.95	1.02	>0.9	0.87	Continue to monitor future load forecast
LUIS_#5 115 kV	PANOCHÉ1 Section 1D & PANOCHÉ2 Section 2D 115kV	P2	P2-4	>0.9	0.95	0.86	>0.9	1.01	0.95	1.02	>0.9	0.86	Continue to monitor future load forecast
MERCED 115 kV	WILSON A Section 1D & WILSON B Section 2D 115kV	P2	P2-4	Diverged	NA	NA	1.22	NA	NA	NA	Diverged	NA	Project: Wilson 115kV Reinforcement Project In-service date: 05/23 Short term: Action plan
OAKH_JCT 115 kV	SANGER - MD 115kV & KERCKHOFF-CLOVIS-SANGER #1 line	P2	P2-3	1.03	>0.9	>0.9	1.05	>0.9	>0.9	>0.9	0.00	>0.9	Sensitivity only
OAKHURST 115 kV	SANGER - MD 115kV & KERCKHOFF-CLOVIS-SANGER #1 line	P2	P2-3	1.02	>0.9	>0.9	1.04	>0.9	>0.9	>0.9	0.87	>0.9	Sensitivity only

Study Area: PG&E Greater Fresno

High/Low Voltages



Substation	Contingency (All and Worst P6)	Category	Category Description	Voltage PU (Baseline Scenarios)					Voltage PU (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	2029 Retirement of QF Generations	
ORO LOMA 115 kV	PANOCH2 115kV Section 2D	P2	P2-2	>0.9	0.95	0.87	>0.9	1.02	0.94	1.03	>0.9	0.87	Continue to monitor future load forecast
ORO LOMA 115 kV	PANOCH2 - 2D 115kV & PANOCH2-EXCELSIORSS line	P2	P2-3	>0.9	0.95	0.87	>0.9	1.02	0.94	1.03	>0.9	0.87	Continue to monitor future load forecast
ORO LOMA 115 kV	PANOCH1 Section 1D & PANOCH2 Section 2D 115kV	P2	P2-4	>0.9	0.95	0.87	>0.9	1.02	0.94	1.03	>0.9	0.87	Continue to monitor future load forecast
OXFORD 115 kV	PANOCH2 115kV Section 2D	P2	P2-2	>0.9	0.95	0.87	>0.9	1.01	0.95	1.02	>0.9	0.87	Continue to monitor future load forecast
OXFORD 115 kV	PANOCH2 - 2D 115kV & PANOCH2-EXCELSIORSS line	P2	P2-3	>0.9	0.95	0.87	>0.9	1.01	0.95	1.02	>0.9	0.87	Continue to monitor future load forecast
OXFORD 115 kV	PANOCH1 Section 1D & PANOCH2 Section 2D 115kV	P2	P2-4	>0.9	0.95	0.86	>0.9	1.01	0.95	1.02	>0.9	0.86	Continue to monitor future load forecast
SHEPHERD 115 kV	KERCKHOFF-CLOVIS-SANGER #1 115kV (WWARD JT-SHEPHERD)	P2	P2-1	1.03	1.03	1.03	1.05	1.06	1.05	1.06	1.15	1.03	Sensitivity only
SHEPHERD 115 kV	HERNDON-WOODWARD 115kV (HERNDON-CHLDHOSP)	P2	P2-1	1.05	1.04	1.02	1.03	1.08	1.04	1.08	1.15	1.02	Sensitivity only
SHEPHERD 115 kV	HERNDON-WOODWARD 115kV (WOODWARD-CHLDHOSP)	P2	P2-1	1.05	1.04	1.02	>0.9	1.08	1.04	1.08	1.15	1.02	Under Review
SHEPHERD 115 kV	HERNDON 115kV Section 2D	P2	P2-2	1.04	1.04	1.01	1.03	1.08	1.04	1.08	1.15	1.01	Sensitivity only
SHEPHERD 115 kV	WOODWARD 115kV Section 1D	P2	P2-2	>0.9	1.03	1.04	1.05	1.07	1.03	1.07	1.16	1.04	Under Review
SHEPHERD 115 kV	SHEPHERD 115kV - Ring R4 & R3	P2	P2-3	1.02	<1.1	<1.1	1.02	<1.1	<1.1	<1.1	1.15	<1.1	Sensitivity only
SHEPHERD 115 kV	KERCKHF2 - 1D 115kV & KERCKHOFF-CLOVIS-SANGER #1 line	P2	P2-3	1.03	<1.1	<1.1	1.05	<1.1	<1.1	<1.1	1.15	<1.1	Sensitivity only
SHEPHERD 115 kV	CLOVIS-1 - 1D 115kV & KERCKHOFF-CLOVIS-SANGER #1 line	P2	P2-3	1.03	<1.1	<1.1	>0.9	<1.1	<1.1	<1.1	1.15	<1.1	Sensitivity only
SHEPHERD 115 kV	SANGER - MD 115kV & KERCKHOFF-CLOVIS-SANGER #1 line	P2	P2-3	1.03	<1.1	<1.1	1.05	<1.1	<1.1	<1.1	1.15	<1.1	Sensitivity only
SHEPHERD 115 kV	WOODWARD - 1D 115kV & HERNDON-WOODWARD line	P2	P2-3	1.04	<1.1	<1.1	1.05	<1.1	<1.1	<1.1	1.16	<1.1	Sensitivity only
SHEPHERD 115 kV	HERNDON 115kV - Section 1D & 2D	P2	P2-4	>0.9	1.03	1.00	1.03	1.08	1.03	1.08	1.15	1.00	Sensitivity only
SHEPHERD 115 kV	WOODWARD 115kV - Section 1D & 1E	P2	P2-4	1.03	1.02	1.03	1.06	1.06	1.02	1.06	1.17	1.03	Sensitivity only
WOODWARD 115 kV	KERCKHOFF-CLOVIS-SANGER #1 115kV (WWARD JT-SHEPHERD)	P2	P2-1	>0.9	1.02	1.02	1.04	1.06	1.04	1.06	1.15	1.02	Sensitivity only
WOODWARD 115 kV	HERNDON-WOODWARD 115kV (HERNDON-CHLDHOSP)	P2	P2-1	1.04	1.04	1.01	1.02	1.08	1.03	1.08	1.18	1.01	Sensitivity only
WOODWARD 115 kV	HERNDON-WOODWARD 115kV (WOODWARD-CHLDHOSP)	P2	P2-1	1.04	1.04	1.01	>0.9	1.08	1.04	1.08	1.19	1.01	Sensitivity only
WOODWARD 115 kV	WOODWARD 115kV Section 1D	P2	P2-2	>0.9	1.03	1.03	1.05	1.07	1.03	1.07	1.19	1.03	Sensitivity only
WOODWARD 115 kV	SHEPHERD 115kV - Ring R2 & R3	P2	P2-3	1.02	<1.1	<1.1	1.02	<1.1	<1.1	<1.1	1.15	<1.1	Sensitivity only

Study Area: PG&E Greater Fresno

High/Low Voltages



Substation	Contingency (All and Worst P6)	Category	Category Description	Voltage PU (Baseline Scenarios)					Voltage PU (Sensitivity Scenarios)				ISO Approved Projects & Potential Mitigation Solutions
				2021 Summer Peak	2024 Summer Peak	2029 Summer Peak	2021 Spring Off-Peak	2024 Spring Off-Peak	2024 SP High CEC Forecast	2024 SpOP Hi Renew & Min Gas Gen	2021 SP Heavy Renewable & Min Gas Gen	2029 Retirement of QF Generations	
WOODWARD 115 kV	SHEPHERD 115kV - Ring R2 & R4	P2	P2-3	1.02	<1.1	<1.1	>0.9	<1.1	<1.1	<1.1	1.15	<1.1	Sensitivity only
WOODWARD 115 kV	KERCKHF2 - 1D 115kV & KERCKHOFF-CLOVIS-SANGER #1 line	P2	P2-3	1.03	<1.1	<1.1	1.04	<1.1	<1.1	<1.1	1.15	<1.1	Sensitivity only
WOODWARD 115 kV	CLOVIS-1 - 1D 115kV & KERCKHOFF-CLOVIS-SANGER #1 line	P2	P2-3	1.03	<1.1	<1.1	>0.9	<1.1	<1.1	<1.1	1.15	<1.1	Sensitivity only
WOODWARD 115 kV	SANGER - MD 115kV & KERCKHOFF-CLOVIS-SANGER #1 line	P2	P2-3	>0.9	<1.1	<1.1	1.04	<1.1	<1.1	<1.1	1.15	<1.1	Sensitivity only
WOODWARD 115 kV	HERNDON - 2D 115kV & HERNDON-WOODWARD line	P2	P2-3	1.04	<1.1	<1.1	1.02	<1.1	<1.1	<1.1	1.18	<1.1	Sensitivity only
WOODWARD 115 kV	WOODWARD - 1D 115kV & HERNDON-WOODWARD line	P2	P2-3	1.04	<1.1	<1.1	1.05	<1.1	<1.1	<1.1	1.19	<1.1	Sensitivity only
WOODWARD 115 kV	WOODWARD 115kV - Section 1D & 1E	P2	P2-4	1.03	1.02	1.03	1.06	1.06	1.02	1.06	1.20	1.03	Sensitivity only
WSTLD1RA 115 kV	PANOCH2 115kV Section 2D	P2	P2-2	>0.9	0.95	0.87	>0.9	1.01	0.95	1.02	>0.9	0.87	Continue to monitor future load forecast
WSTLD1RA 115 kV	PANOCH2 - 2D 115kV & PANOCH2-EXCELSIORSS line	P2	P2-3	>0.9	0.95	0.87	>0.9	1.01	0.95	1.02	>0.9	0.87	Continue to monitor future load forecast
WSTLD1RA 115 kV	PANOCH1 Section 1D & PANOCH2 Section 2D 115kV	P2	P2-4	>0.9	0.95	0.86	>0.9	1.01	0.95	1.02	>0.9	0.86	Continue to monitor future load forecast
WWARD JT 115 kV	HERNDON-WOODWARD 115kV (HERNDON-CHLDHOSP)	P2	P2-1	1.04	1.04	1.02	1.04	1.07	1.03	1.07	1.11	1.02	Sensitivity only
WWARD JT 115 kV	HERNDON-WOODWARD 115kV (WOODWARD-CHLDHOSP)	P2	P2-1	1.04	1.04	1.02	1.04	1.07	1.03	1.07	1.11	1.02	Sensitivity only
WWARD JT 115 kV	HERNDON 115kV Section 2D	P2	P2-2	1.04	1.03	1.01	1.04	1.07	1.03	1.07	1.11	1.01	Sensitivity only
WWARD JT 115 kV	WOODWARD 115kV Section 1D	P2	P2-2	1.04	1.03	1.03	1.06	1.07	1.03	1.07	1.12	1.03	Sensitivity only
WWARD JT 115 kV	HERNDON - 2D 115kV & HERNDON-BULLARD #2 line	P2	P2-3	1.04	<1.1	<1.1	1.04	<1.1	<1.1	<1.1	1.11	<1.1	Sensitivity only
WWARD JT 115 kV	HERNDON - 2D 115kV & HERNDON-WOODWARD line	P2	P2-3	1.04	<1.1	<1.1	1.04	<1.1	<1.1	<1.1	1.11	<1.1	Sensitivity only
WWARD JT 115 kV	WOODWARD - 1D 115kV & HERNDON-WOODWARD line	P2	P2-3	1.04	<1.1	<1.1	1.06	<1.1	<1.1	<1.1	1.12	<1.1	Sensitivity only
WWARD JT 115 kV	HERNDON 115kV - Section 1D & 2D	P2	P2-4	1.03	1.03	1.00	1.04	1.07	1.02	1.07	1.10	1.00	Sensitivity only
WWARD JT 115 kV	WOODWARD 115kV - Section 1D & 1E	P2	P2-4	1.03	1.03	1.02	1.06	1.06	1.03	1.06	1.12	1.02	Sensitivity only
CANAL 70 kV	WRIGHT D 12.47kV Gen Unit QF & LOS BANOS-LIVINGSTON JCT-CANAL 70kV	P3	G1/N1	>0.9	>0.9	0.89	>0.9	>0.9	>0.9	>0.9	>0.9	0.89	Continue to monitor future load forecast
DINUBA 70 kV	KINGSRIV 13.80kV Gen Unit 1 & REEDLEY-DINUBA #1 70kV	P3	G1/N1	>0.9	>0.9	0.89	>0.9	>0.9	>0.9	>0.9	>0.9	0.89	Continue to monitor future load forecast
DINUBA 70 kV	MCCALL1T 13.20kV Gen Unit 1 & REEDLEY-DINUBA #1 70kV	P3	G1/N1	>0.9	>0.9	0.89	>0.9	>0.9	>0.9	>0.9	>0.9	0.89	Continue to monitor future load forecast

Study Area: PG&E Greater Fresno

High/Low Voltages



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

Study Area: PG&E Greater Fresno

High/Low Voltages



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

Study Area: PG&E Greater Fresno

Voltage Deviation



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

Study Area: PG&E Greater Fresno

Voltage Deviation



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

Study Area: PG&E Greater Fresno

Transient Stability



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

Study Area: PG&E Greater Fresno



Single Contingency Load Drop

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

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

Study Area: PG&E Greater Fresno



Single Source Substation with more than 100 MW Load

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

No single substation with more than 100 MW load