2021-2022 ISO Reliability Assessment - Study Results
Study Area: SCE Main
Thermal Overloads

California ISO

Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Loading % (Baseline Scenarios)					Loading % (Sensitivity Scenarios)			Project & Potential Mitigation Solutions
				B1_2023 Summer Peak	B2_2026 Summer Peak	B3_2031 Summer Peak	B4_2023 Spring Off-Peak	B5_2026 Spring Off-Peak	S1_2026 SP High CEC Forecast	S2_2023 SP Heavy Renewable & Min Gas Gen	S3_2023 OP Heavy Renewable & Min Gas Gen	
29253 DVRS_RB_12 500 24374 REDBLUFF 500 Ckt 1 or 2	P1L-SDGE2_22536 N.GILA-22360 IMPRLVLY 500KV &1 -AND- P1L_50511RAS0_Line DEVERS 500.0 to REDBLUFF 500.0 Ckt 2 or 1	P6	Two overlapping singles	<90	91.93	<90	<90	<90	92.08	97.19	113.26	Colorado River Corridor RAS to trip generating facilities connected to Colorado River and Red Bluff Substations
	P1L_50511RAS1_Line DEVERS 500.0 to REDBLUFF 500.0 Ckt 2 or 1 -AND- P1L-SDGE2_22536 N.GILA-22360 IMPRLVLY 500KV &1 with RAS taking action	P6	Two overlapping singles	<90	<90	<90	<90	<90	<90	<90	98.66	
29400 ANTELOPE 500 29402 WIRLWIND 500 1 1	P1L-50063_Line ANTELOPE 500.0 to WINDHUB 500.0 Ckt 1	P1	Single Contingency	<90	<90	<90	<90	<90	<90	101.35	<90	
	P2_33_Whirlwind500kV_SLG at Vincent 500kV w/ loss of Midway-Whirlwind 500kV & Vincent-Whirlwind 500kV w/ series cap bypass of MW_	P2	Internal Breaker Fault	<90	<90	<90	<90	<90	<90	119.97	<90	modify the planned Tehachapi cRAS to cover the P1/P2/P4 contingencies
	P4_69_Whirlwind_3Ph line fault on Midway-Whirlwind 500 kV with stuck breaker at Whirlwind followed by loss of Vincent-Whirlwind 5	P4	stuck breaker	<90	<90	<90	<90	<90	<90	119.7	<90	
	P1L-50023_Line VINCENT 500.0 to WIRLWIND 500.0 Ckt 3 -AND- P1L-50063_Line ANTELOPE 500.0 to WINDHUB 500.0 Ckt 1	P6	Two overlapping singles	<90	<90	<90	<90	<90	<90	151.93	102.97	
	P1L_50506_Line MIDWAY 500.0 to WIRLWIND 500.0 Ckt 3 -AND- P1L-50063_Line ANTELOPE 500.0 to WINDHUB 500.0 Ckt 1	P6	Two overlapping singles	<90	<90	<90	<90	<90	<90	120.54	<90	

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				B1_2023 Summer Peak	B2_2026 Summer Peak	B3_2031 Summer Peak	B4_2023 Spring Off-Peak	B5_2026 Spring Off-Peak	S1_2026 SP High CEC Forecast	S2_2023 SP Heavy Renewable & Min Gas Gen	S3_2023 OP Heavy Renewable & Min Gas Gen	
	P1DC_PDCI1_PDCI CONVERTER MONOPOLE #1 -AND- P1L-50063_Line ANTELOPE 500.0 to WINDHUB 500.0 Ckt 1	P6	Two overlapping singles	<90	<90	<90	<90	<90	<90	113.21	<90	rely upon the planned Tehachapi cRAS to drop generation in the Tehachapi area, along with operational mitigation after the first contingency to curtail generation in the Wirlwind and Windhub area as needed
	P1L-22001_Line SYLMAR1 230.0 to SYLMAR S 230.0 Ckt 1 -AND- P1L-50063_Line ANTELOPE 500.0 to WINDHUB 500.0 Ckt 1	P6	Two overlapping singles	<90	<90	<90	<90	<90	<90	113.2	<90	
29400 ANTELOPE 500 24156 VINCENT 500 1 1	P1L-50023_Line VINCENT 500.0 to WIRLWIND 500.0 Ckt 3 -AND- P1L-50062_Line ANTELOPE 500.0 to VINCENT 500.0 Ckt 2	P6	Two overlapping singles	<90	<90	<90	<90	<90	<90	140.71	<90	
	P1L-50023_Line VINCENT 500.0 to WIRLWIND 500.0 Ckt 3 -AND- P1L-50061_Line ANTELOPE 500.0 to VINCENT 500.0 Ckt 1	P6	Two overlapping singles	<90	<90	<90	<90	<90	<90	140.66	<90	
24594 MW_WRLWND_32 500 29402 WIRLWIND 500 3 1	P1L-50023_Line VINCENT 500.0 to WIRLWIND 500.0 Ckt 3 -AND- P1L-50064_Line ANTELOPE 500.0 to WIRLWIND 500.0 Ckt 1	P6	Two overlapping singles	<90	<90	<90	<90	<90	<90	112.21	<90	rely upon operational mitigation to curtail generation as system adjustment in the Wirlwind and Windhub areas after the first contingency, and bypass series capacitors as needed
	P1L-50063_Line ANTELOPE 500.0 to WINDHUB 500.0 Ckt 1 -AND- P1L-50064_Line ANTELOPE 500.0 to WIRLWIND 500.0 Ckt 1	P6	Two overlapping singles	<90	<90	<90	<90	<90	<90	108.1	<90	
24594 MW_WRLWND_32 500 29402 WIRLWIND 500 3 1	P1L_50505_Line MIDWAY 500.0 to VINCENT 500.0 Ckt 2 -AND- P1L_50504_Line MIDWAY 500.0 to VINCENT 500.0 Ckt 1	P6	Two overlapping singles	162.02	92.59	92.49	<90	<90	93.43	<90	<90	generation redispatch after the initial contingency, bypass series capacitors, and along with existing Path 26 RAS curtailing generation as needed

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				B1_2023 Summer Peak	B2_2026 Summer Peak	B3_2031 Summer Peak	B4_2023 Spring Off-Peak	B5_2026 Spring Off-Peak	S1_2026 SP High CEC Forecast	S2_2023 SP Heavy Renewable & Min Gas Gen	S3_2023 OP Heavy Renewable & Min Gas Gen	
24591 MW_VINCNT_11 500 24590 MW_VINCNT_12 500 1 1	P1L_50505_Line MIDWAY 500.0 to VINCENT 500.0 Ckt 2 -AND- P1L_50506_Line MIDWAY 500.0 to WIRLWIND 500.0 Ckt 3	P6	Two overlapping singles	120.47	<90	<90	<90	<90	<90	<90	<90	generation redispatch after the initial contingency, bypass series capacitors, and along with existing Path 26 and PDCI RASs curtailing generation as needed
	P1DC_PDCI1_PDCI CONVERTER MONOPOLE #1 -AND- P1L_50505_Line MIDWAY 500.0 to VINCENT 500.0 Ckt 2	P6	Two overlapping singles	108.1	<90	<90	<90	<90	<90	<90	<90	
	P1DC_PDCI2_PDCI CONVERTER MONOPOLE #2 -AND- P1L_50505_Line MIDWAY 500.0 to VINCENT 500.0 Ckt 2	P6	Two overlapping singles	108.09	<90	<90	<90	<90	<90	<90	<90	
24593 MW_VINCNT_21 500 24592 MW_VINCNT_22 500 2 1	P1L_50504_Line MIDWAY 500.0 to VINCENT 500.0 Ckt 1 -AND- P1L_50506_Line MIDWAY 500.0 to WIRLWIND 500.0 Ckt 3	P6	Two overlapping singles	122.98	<90	<90	<90	<90	<90	<90	<90	
	P1DC_PDCI1_PDCI CONVERTER MONOPOLE #1 -AND- P1L_50504_Line MIDWAY 500.0 to VINCENT 500.0 Ckt 1	P6	Two overlapping singles	111.45	<90	<90	<90	<90	<90	<90	<90	
	P1DC_PDCI2_PDCI CONVERTER MONOPOLE #2 -AND- P1L_50504_Line MIDWAY 500.0 to VINCENT 500.0 Ckt 1	P6	Two overlapping singles	111.44	<90	<90	<90	<90	<90	<90	<90	
24594 MW_WRLWND_32 500 29402 WIRLWIND 500 3 1	P1L-50063_Line ANTELOPE 500.0 to WINDHUB 500.0 Ckt 1 -AND- P1L-50064_Line ANTELOPE 500.0 to WIRLWIND 500.0 Ckt 1	P6	Two overlapping singles	<90	<90	<90	<90	<90	<90	108.1	<90	

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Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Loading % (Baseline Scenarios)					Loading % (Sensitivity Scenarios)			Project & Potential Mitigation Solutions
				B1_2023 Summer Peak	B2_2026 Summer Peak	B3_2031 Summer Peak	B4_2023 Spring Off-Peak	B5_2026 Spring Off-Peak	S1_2026 SP High CEC Forecast	S2_2023 SP Heavy Renewable & Min Gas Gen	S3_2023 OP Heavy Renewable & Min Gas Gen	
24086 LUGO 500 24156 VINCENT 500 1 1	P1L-50022_Line VINCENT 500.0 to MESA CAL 500.0 Ckt 1 -AND- P1L-50014_Line LUGO 500.0 to VINCENT 500.0 Ckt 2	P6	Two overlapping singles	<90	<90	<90	<90	<90	<90	106.43	<90	Operational mitigation to curtail generation in the Tehachapi area after the first contingency, and bypass series capacitors as needed.
24138 SERRANO 500 24184 serran1i 13.8 1 1	P1T-52025_Tran SERRANO 500.00 to SERRANO 230.00 Ckt 2 SERRAN2T 13.80 -AND- P1T-52026_Tran SERRANO 500.00 to SERRANO 230.00 Ckt 3 0.00	P6	Two overlapping singles	102.48	104.89	104.07	<90	<90	102.27	113.24	115.24	
24138 SERRANO 500 24186 serran2i 13.8 2 1	P1T-52024_Tran SERRANO 500.00 to SERRANO 230.00 Ckt 1 SERRAN1T 13.80 -AND- P1T-52026_Tran SERRANO 500.00 to SERRANO 230.00 Ckt 3 0.00	P6	Two overlapping singles	104.4	106.86	106.03	<90	<90	104.19	115.37	117.4	The long term or 30-minute short term emergency ratings of Serrano 500/230 kV banks should be adequate to dispatch available resources including energy storage and demand response (RDRR) after the first or second contingency
24138 SERRANO 500 24137 SERRANO 230 3 1	P1T-52025_Tran SERRANO 500.00 to SERRANO 230.00 Ckt 2 SERRAN2T 13.80 -AND- P1T-52024_Tran SERRANO 500.00 to SERRANO 230.00 Ckt 1 SERRAN1T 13.80	P6	Two overlapping singles	101.34	103.73	103.46	<90	<90	101.14	111.99	113.96	
24076 LAGUBELL 230 24091 MESA CAL 230 1 1	P1G_24060_Gen ALAMT CTG1/CTG2/STG -AND- P1L-22058_Line LITEHIPE 230.0 to MESA CAL 230.0 Ckt 1	P3	G-1 followed by L-1	95.97	<90	103.11	<90	<90	100.87	101.73	<90	
	P1T-52036_Tran MESA CAL 500.00 to MESACALS 230.00 Ckt 3 MESA3T 13.80 -AND- P1T-52037_Tran MESA CAL 500.00 to MESACALS 230.00 Ckt 4 MESA4T 13.80	P6	Two overlapping singles	103.48	102.46	109.82	<90	<90	110.16	109.22	97.38	
	P1L-50010_Line LUGO 500.0 to VICTORVL 500.0 Ckt 1 -AND- P1L-22058_Line LITEHIPE 230.0 to MESA CAL 230.0 Ckt 1	P6	Two overlapping singles	93.75	90.56	103.82	<90	<90	98.9	98.66	<90	Dispatch available resources including energy storage and demand response for pre-contingency, or reconductor Laguna-Bell Mesa No.1 line

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				B1_2023 Summer Peak	B2_2026 Summer Peak	B3_2031 Summer Peak	B4_2023 Spring Off-Peak	B5_2026 Spring Off-Peak	S1_2026 SP High CEC Forecast	S2_2023 SP Heavy Renewable & Min Gas Gen	S3_2023 OP Heavy Renewable & Min Gas Gen	
	P1L-22058_Line LITEHIPE 230.0 to MESA CAL 230.0 Ckt 1 -AND- P1L-22059_Line MESA CAL 230.0 to REDONDO 230.0 Ckt 1	P6	Two overlapping singles/common structure	113.39	109.19	120.56	<90	<90	118.98	120.25	106.38	
	P1L-22093_Line MESACALS 230.0 to LAGUBELL 230.0 Ckt 2 - AND- P1L-22058_Line LITEHIPE 230.0 to MESA CAL 230.0 Ckt 1	P6/P7	Two overlapping singles/common structure	105.72	101.49	109.58	<90	<90	109.49	113.64	105.96	
24114 PARDEE 230 24128 S.CLARA 230 1 1	P1L-22913_Line S.CLARA 230.0 to MOORPARK 230.0 Ckt 1 -AND- P1L-22914_Line S.CLARA 230.0 to MOORPARK 230.0 Ckt 2	P6/P7	Two overlapping singles/common structure	<90	<90	101.71	<90	<90	104.38	109.53	<90	Dispatch available resources including energy storage and demand response (RDRR) in the Ventura/Santa Barbara pre-contingency
24114 PARDEE 230 24217 WARNETAP 230 1 1	P1L-22071_Line PARDEE 230.0 to PASTORIA 230.0 Ckt 1 -AND- P1L-22079_Line PARDEE 230.0 to BAILEY 230.0 Ckt 1	P6	Two overlapping singles	106.61	93.89	<90	<90	<90	<90	111.43	<90	Reduce generation output from Pastoria Energy Facility after the first contingency
24128 S.CLARA 230 24099 MOORPARK 230 2 1	P1L-22072_Line PARDEE 230.0 to S.CLARA 230.0 Ckt 1 -AND- P1L-22913_Line S.CLARA 230.0 to MOORPARK 230.0 Ckt 1	P6	Two overlapping singles	<90	<90	96.16	<90	<90	98.84	101.56	<90	Dispatch available resources including energy storage and/or demand response (RDRR) in the Ventura/Santa Barbara area after the first contingency
24044 ELLIS 230 24134 SANTIAGO 230 1 1	P1L-22035_Line ELLIS 230.0 to JOHANNA 230.0 Ckt 1 -AND- P1L-SDGE2_22536 N.GILA-22360 IMPRLVLY 500KV &1	P6	Two overlapping singles	99.41	<90	98.52	<90	<90	<90	107.21	104.19	Reduce the San Diego import by dispatching available resources in the San Diego-Imperial Valley area after the first contingency
	P1L_SDGE1RAS1A-P1_22930 ECO-22468 MIGUEL 500KV &1 - AND- P1L-22035_Line ELLIS 230.0 to JOHANNA 230.0 Ckt 1	P6	Two overlapping singles	101.71	<90	92.25	<90	<90	<90	109.55	<90	

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				B1_2023 Summer Peak	B2_2026 Summer Peak	B3_2031 Summer Peak	B4_2023 Spring Off-Peak	B5_2026 Spring Off-Peak	S1_2026 SP High CEC Forecast	S2_2023 SP Heavy Renewable & Min Gas Gen	S3_2023 OP Heavy Renewable & Min Gas Gen	
26094 SYLMARLA 230 24147 SYLMAR S 230 bank 'E' or 'F'	P4_53_Sylmar_SLG line fault on Sylmar Bank 'G' 230 kV with stuck breaker at Sylmar followed by loss of Sylmar Bank 'F' or 'E"	P4	stuck breaker	<90	<90	103.45	<90	<90	98.41	<90	<90	Develop operation procedure or short-term emergency ratings to manage power flow via the banks (Path 41) for pre- or post- contingency; Re-configure the switchyard by adding one-and-half breaker schemes if possible; Remove the three banks between LADWP and SCE along with other facility upgrade; Upgrade the banks E and F
	P1T-22013_Tran SYLMARLA 230.00 to SYLMAR S 230.00 Ckt 'F' or 'E' -AND- P1T-22014_Tran SYLMARLA 230.00 to SYLMAR S 230.00 Ckt G	P6	Two overlapping singles	<90	<90	103.46	<90	<90	98.42	<90	<90	

High/Low Voltages

Substation	Contingency (All and Worst P6)	Category	Category Description	Voltage PU (Baseline Scenarios)					Voltage PU (Sensitivity Scenarios)			Project & Potential Mitigation Solutions
				B1_2023 Summer Peak	B2_2026 Summer Peak	B3_2031 Summer Peak	B4_2023 Spring Off-Peak	B5_2026 Spring Off-Peak	S1_2026 SP High CEC Forecast	S2_2023 SP Heavy Renewable & Min Gas Gen	S3_2023 OP Heavy Renewable & Min Gas Gen	
MOHAVE 500 kV	P1L_50508_Line LUGO 500.0 to MOHAVE 500.0 Ckt 1 -AND- P1L-50018_Line MOHAVE 500.0 to ELDORDO 500.0 Ckt 1	P6	Two overlapping singles	0.44	0.46	no issue	0.56	0.55	0.47	0.41	0.55	Exiting NVE RAS to protect its 69 kV system
GOLETA 230 kV	P1L-22909_Line S.CLARA 230.0 to GOLETA 230.0 Ckt 1 -AND- P1SVD_24321_SVD S.CLARA 230	P6	Two overlapping singles	no issue	no issue	no issue	no issue	no issue	no issue	0.86	no issue	Dispatch available resources including energy storage and demand response (RDRR) in the Goleta/S.Clara area after the first contingency
GOLETA 230 kV	P1SVD_24321_SVD S.CLARA 230 -AND- P1L-22909_Line S.CLARA 230.0 to GOLETA 230.0 Ckt 1	P6	Two overlapping singles	no issue	no issue	no issue	no issue	no issue	no issue	0.86	no issue	

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Voltage Deviation

Substation	Contingency (All and Worst P6)	Category	Category Description	Post Cont. Voltage Deviation % (Baseline Scenarios)					Post Cont. Voltage Deviation % (Sensitivity Scenarios)			Project & Potential Mitigation Solutions
				B1_2023 Summer Peak	B2_2026 Summer Peak	B3_2031 Summer Peak	B4_2023 Spring Off-Peak	B5_2026 Spring Off-Peak	S1_2026 SP High CEC Forecast	S2_2023 SP Heavy Renewable & Min Gas Gen	S3_2023 OP Heavy Renewable & Min Gas Gen	

No voltage deviation issues were identified

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Transient Stability

Contingency	Category	Category Description	Transient Stability Performance					Potential Mitigation Solutions
			Baseline Scenarios			Sensitivity Scenarios		
			B2_2026 Summer Peak	B3_2031 Summer Peak	B4_2023 Spring Off-Peak	S1_2026 SP High CEC Forecast	S3_2023 OP Heavy Renewable & Min Gas Gen	
01_Lugo500kV_P1.3: 3PH 4 cycle fault at Lugo 500kV w/ loss of Lugo-Victorville 500kV	p1	Single Contingency	stable	stable	stable	stable	stable	WECC Criteria met
02_IV500kV_P1.3: 3PH 4 cycle fault at Imperial Valley 500kV w/ loss of Imperial Valley-North Gila 500kV	p1	Single Contingency	stable	stable	stable	stable	stable	WECC Criteria met
03_PV500kV_P1.1: 3PH 4 cycle fault at Palo Verde w/ loss of Palo Verde Unit No.1	p1	Single Contingency	stable	stable	stable	stable	stable	WECC Criteria met
09_Vincent500kV_P1.2: 3PH 4 cycle fault at Vincent 500kV w/ loss of Vincent-Whirlwind 500kV & series cap bypass of MW_Vincent_12-Vincent 500kV	p1	Single Contingency	stable	stable	stable	stable	stable	WECC Criteria met
14_Miraloma500kV_P1.2: 3PH 4 cycle fault at Miraloma 500kV w/ loss of Miraloma-Serrano No.2 500kV & EastTS-MiraLoma 500kV line shunt	p1	Single Contingency	stable	stable	stable	stable	stable	WECC Criteria met
24_N.Gila500kV_P1.2: 3PH 4 cycle fault at N.Gila 500kV w/ loss of Hoodoo Wash-N.Gila 500kV w/ loss of Santiago Synchronous Condensers	p1	Single Contingency	stable	stable	stable	stable	stable	WECC Criteria met
30_N.Gila500kV_P1.2: 3PH 4 cycle fault at N.Gila 500kV w/ loss of Hoodoo Wash-N.Gila 500kV including loss of Devers SVCs & Cap Bank	p1	Single Contingency	stable	stable	stable	stable	stable	WECC Criteria met
31_Vincent500kV_P2.3: 1PH 4 cycle fault at Vincent 500kV w/ loss of Mesa-Vincent 500kV & Midway-Vincent No.2 500kV w/ series cap bypass of MW_Vincent_12-Vincent500kV	p2	Internal Breaker Fault	stable	stable	stable	stable	stable	WECC Criteria met
33_Whirlwind500kV_P2.3: 1PH 4 cycle fault at Vincent 500kV w/ loss of Midway-Whirlwind 500kV & Vincent-Whirlwind 500kV w/ series cap bypass of MW_Vincent_12-Vincent500kV	p2	Internal Breaker Fault	stable	stable	stable	stable	stable	WECC Criteria met
34_Lugo500kV_P2.3: 1PH 4 cycle fault at Lugo 500kV w/ loss of Lugo-Rancho Vista 500kV & Lugo-Vincent No.1 500kV w/ series cap bypass of Eld_Lugo_14-Lugo500kV	p2	Internal Breaker Fault	stable	stable	stable	stable	stable	WECC Criteria met

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Contingency	Category	Category Description	Transient Stability Performance					Potential Mitigation Solutions
			Baseline Scenarios			Sensitivity Scenarios		
			B2_2026 Summer Peak	B3_2031 Summer Peak	B4_2023 Spring Off-Peak	S1_2026 SP High CEC Forecast	S3_2023 OP Heavy Renewable & Min Gas Gen	
36_Lugo500kV_P2.3: 1PH 4 cycle fault at Lugo 500kV w/ loss of Lugo-Mira Loma No.2 500kV & Eldorado-Lugo 500kV w/ series cap bypass of Lugo-Lgo_Mohve_11_500kV	p2	Internal Breaker Fault	stable	stable	stable	stable	stable	WECC Criteria met
38_Lugo500kV_P2.3: 1PH 4 cycle fault at Lugo 500kV w/ loss of Lugo-Rancho Vista 500kV & Lugo-Vincent No.1 500kV w/ loss of Eld_Lugo_14-Lugo500kV line shunt	p2	Internal Breaker Fault	stable	stable	stable	stable	stable	WECC Criteria met
40_Lugo500kV_P2.3: 1PH 4 cycle fault at Lugo 500kV w/ loss of Lugo-Miraloma No.2 500kV & Eldorado-Lugo 500kV w/ loss of Lugo-Lgo_Mohve_11 500kV line shunt	p2	Internal Breaker Fault	stable	stable	stable	stable	stable	WECC Criteria met
42_Miraloma500kV_P2.3: 1PH 4 cycle fault at Mira Loma 500kV w/ loss of Mira Loma-Rancho Vista 500kV & Mira Loma-Serrano No.1 500kV w/ loss of EastTS-MiraLoma 500kV line shunt	p2	Internal Breaker Fault	stable	stable	stable	stable	stable	WECC Criteria met
44_Devers500kV_P2.3: 1PH 4 cycle fault at Devers 500kV w/ loss of Devers-Red Bluff No.1 500kV & Devers-Valley No.1 500kV including loss of Devers SVCs & Cap Bank	p2	Internal Breaker Fault	stable	stable	stable	stable	stable	WECC Criteria met
46_Sylmar230kV_3Ph line fault on Pardee-Sylmar No.1 230 kV with stuck breaker at Sylmar followed by loss of Gould-Sylmar 230 kV	p4	stuck breaker	stable	stable	stable	stable	stable	WECC Criteria met
48_Sylmar230kV_3Ph line fault on Gould-Sylmar 230 kV with stuck breaker at Sylmar followed by loss of Sylmar Bank 'E'	p4	stuck breaker	stable	stable	stable	stable	stable	WECC Criteria met
50_Sylmar230kV_3Ph line fault on Pardee-Sylmar No.1 230 kV with stuck breaker at Sylmar followed by loss of Sylmar Bank 'F'	p4	stuck breaker	stable	stable	stable	stable	stable	WECC Criteria met
52_Sylmar230kV_1-Ph fault on Sylmar Bank 'G' 230 kV with stuck breaker at Sylmar followed by loss of Sylmar Bank 'E'	p4	stuck breaker	stable	stable	stable	stable	stable	WECC Criteria met
54_Devers500kV_3Ph line fault on Devers-Red Bluff No.1 500 kV with stuck breaker at Devers followed by loss of Devers-Valley No.1 500 kV	p4	stuck breaker	stable	stable	stable	stable	stable	WECC Criteria met

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			Baseline Scenarios			Sensitivity Scenarios		
			B2_2026 Summer Peak	B3_2031 Summer Peak	B4_2023 Spring Off-Peak	S1_2026 SP High CEC Forecast	S3_2023 OP Heavy Renewable & Min Gas Gen	
55_Lugo500kV_3Ph line fault on Lugo-Rancho Vista 500 kV with stuck breaker at Lugo followed by loss of Lugo-Vincent No.1 500 kV	p4	stuck breaker	stable	stable	stable	stable	stable	WECC Criteria met
56_Lugo500kV_3Ph line fault on Lugo-Vincent No.2 500 kV with stuck breaker at Lugo followed by loss of Lugo-Victorville 500 kV	p4	stuck breaker	stable	stable	stable	stable	stable	WECC Criteria met
57_MiraLoma500kV_3Ph line fault on Mira Loma-Rancho Vista 500 kV with stuck breaker at Mira Loma followed by loss of Mira Loma-Serrano No.1 500 kV	p4	stuck breaker	stable	stable	stable	stable	stable	WECC Criteria met
59_MiraLoma230kV_3Ph line fault on Mira Loma-Olinda 230 kV with stuck breaker at Mira Loma followed by loss of Chino-Mira Loma No.3 230 kV	p4	stuck breaker	stable	stable	stable	stable	stable	WECC Criteria met
61_RanchoVista230kV_3Ph line fault on Etiwanda-Rancho Vista No.1 230 kV with stuck breaker at Rancho Vista followed by loss of Mira Loma-Rancho Vista No.2 230 kV	p4	stuck breaker	stable	stable	stable	stable	stable	WECC Criteria met. However, dynamic models (repc_a and repc_b) of some IBR resources need to be tuned
63_Serrano230kV_3Ph line fault on Chino-Serrano 230 kV with stuck breaker at Serrano followed by loss of Lewis-Serrano No.1 230 kV	p4	stuck breaker	stable	stable	stable	stable	stable	WECC Criteria met
65_Vincent500kV_3Ph line fault on Mesa-Vincent 500 kV with stuck breaker at Vincent followed by loss of Midway-Vincent No.2 500 kV	p4	stuck breaker	stable	stable	stable	stable	stable	WECC Criteria met. However, dynamic models (repc_a and repc_b) of some IBR resources need to be tuned
67_Vincent230kV_3Ph line fault on Mesa-Vincent No.2 230 kV with stuck breaker at Vincent followed by loss of Santa Clara-Vincent 230 kV	p4	stuck breaker	stable	stable	stable	stable	stable	WECC Criteria met
69_Whirlwind230kV_3Ph line fault on Midway-Whirlwind 500 kV with stuck breaker at Whirlwind followed by loss of Vincent-Whirlwind 500 kV	p4	stuck breaker	stable	stable	stable	stable	stable	WECC Criteria met
70_Chino230kV_3Ph line fault on Chino-Viejo 230 kV with stuck breaker at Chino followed by loss of Chino-Serrano 230 kV	p4	stuck breaker	stable	stable	stable	stable	stable	WECC Criteria met

Study Area: SCE Main

Transient Stability

Contingency	Category	Category Description	Transient Stability Performance					Potential Mitigation Solutions
			Baseline Scenarios			Sensitivity Scenarios		
			B2_2026 Summer Peak	B3_2031 Summer Peak	B4_2023 Spring Off-Peak	S1_2026 SP High CEC Forecast	S3_2023 OP Heavy Renewable & Min Gas Gen	
71_Ellis230kV_3Ph line fault on Barre-Ellis No.2 230 kV with stuck breaker at Ellis followed by loss of Ellis-Santiago 230 kV	p4	stuck breaker	stable	stable	stable	stable	stable	WECC Criteria met. However, dynamic models (repc_a and repc_b) of some IBR resources need to be tuned
75_Olinda230kV_3Ph line fault on Olinda-Walnut 230 kV with stuck breaker at Olinda followed by loss of Mira Loma-Olinda 230 kV	p4	stuck breaker	stable	stable	stable	stable	stable	WECC Criteria met. However, dynamic models (repc_a and repc_b) of some IBR resources need to be tuned
76_RioHondo230kV_3Ph line fault on Mesa-Rio Hondo No.2 230 kV with stuck breaker at Rio Hondo followed by loss of Rio Hondo-Vincent No.2 230 kV	p4	stuck breaker	stable	stable	stable	stable	stable	WECC Criteria met. However, dynamic models (repc_a and repc_b) of some IBR resources need to be tuned
77_SantaClara230kV_3Ph line fault on Moorpark-Santa Clara No.1 230 kV with stuck breaker at Santa Clara followed by loss of Goleta-Santa Clara No.1 230 kV	p4	stuck breaker	stable	stable	stable	stable	stable	WECC Criteria met. However, dynamic models (repc_a and repc_b) of some IBR resources need to be tuned
79_Santiago230kV_3Ph line fault on SONGS-Santiago No.2 230 kV with stuck breaker at Santiago followed by loss of Ellis-Santiago 230 kV	p4	stuck breaker	stable	stable	stable	stable	stable	WECC Criteria met
80_Pardee230kV_3Ph line fault on Bailey-Pardee 230 kV with stuck breaker at Pardee followed by loss of Pardee-Vincent No.1 230 kV	p4	stuck breaker	stable	stable	stable	stable	stable	WECC Criteria met
82_Pardee230kV_3Ph line fault on Pardee-Santa Clara 230 kV with stuck breaker at Pardee followed by loss of Pardee-Pastoria-Warne 230 kV	p4	stuck breaker	stable	stable	stable	stable	stable	WECC Criteria met
84_Pardee230kV_3Ph line fault on Pardee-Sylmar No.1 230 kV with stuck breaker at Pardee followed by loss of Moor Park-Pardee No.3 230 kV	p4	stuck breaker	stable	stable	stable	stable	stable	WECC Criteria met
85_VillaPark230kV_3Ph line fault on Barre-Villa Park 230 kV with stuck breaker at Villa Park followed by loss of Serrano-Villa Park No.1 230 kV	p4	stuck breaker	stable	stable	stable	stable	stable	WECC Criteria met
86_Lewis230kV_3Ph line fault on Barre-Lewis 230 kV with stuck breaker at Lewis followed by loss of Lewis-Serrano No.2 230 kV	p4	stuck breaker	stable	stable	stable	stable	stable	WECC Criteria met

Study Area: SCE Main

Transient Stability

Contingency	Category	Category Description	Transient Stability Performance					Potential Mitigation Solutions
			Baseline Scenarios			Sensitivity Scenarios		
			B2_2026 Summer Peak	B3_2031 Summer Peak	B4_2023 Spring Off-Peak	S1_2026 SP High CEC Forecast	S3_2023 OP Heavy Renewable & Min Gas Gen	
101_Lighthipe_NR230kV_P5 1-PH Fault on Lighthipe Bus, N-RBD Relay, delayed clearing 29 cycles	P5.5	non-redundant relay	stable	stable	stable	stable	stable	WECC Criteria met
99_P5_LagunaBell_NR230kV_P5 1-PH Fault on Laguna Bell Bus, N-RBD Relay, delayed clearing 29 cycles	P5.5	non-redundant relay	stable	stable	stable	stable	stable	WECC Criteria met
106_Antelope500kV_P6.1: 3PH 4 cycle fault at Antelope 500kV w/ loss of Antelope-Whirlwind and Antelope-Vincent No.1	p6	Two overlapping singles	stable	stable	stable	stable	stable	WECC Criteria met
107_Antelope500kV_P6.1: 3PH 4 cycle fault at Antelope 500kV w/ loss of Antelope-Whirlwind and Antelope-Windhub	p6	Two overlapping singles	stable	stable	stable	stable	stable	WECC Criteria met
109_Eldorado500kV_P6.1: 3PH 4 cycle fault at Eldorado 500kV w/ loss of Eldorado-Lugo and Eldorado-Mohave	p6	Two overlapping singles	stable	stable	stable	stable	stable	WECC Criteria met
110_Lugo500kV_P6.1: 3PH 4 cycle fault at Lugo 500kV w/ Eldorado-Lugo and Lugo-Mohave	p6	Two overlapping singles	stable	stable	stable	stable	stable	WECC Criteria met
111_Devers500kV_P6.1: 3PH 4 cycle fault at Devers 500kV w/ loss of Devers-RedBluff No.1 & No.2 500 kV	p6	Two overlapping singles	stable	stable	stable	stable	stable	WECC Criteria met
112_Devers500kV_P6.1: 3PH 4 cycle fault at Devers 500kV w/ loss of Devers-Valley No.1 & No.2 500 kV	p6	Two overlapping singles	stable	stable	stable	stable	stable	WECC Criteria met
113_ECO500kV_P6.1: 3PH 4 cycle fault at ECO 500 w/ loss of ECO-Miguel & Ocotillo-Suncrest 500 kV	p6	Two overlapping singles	stable	stable	stable	stable	stable	WECC Criteria met
114_MiraLoma500kV_P6.1: 3PH 4 cycle fault at Mira Loma 500kV w/ loss of Mesa-Mira Loma 500kV & Mira Loma 4AA Bank	p6	Two overlapping singles	stable	stable	stable	stable	stable	WECC Criteria met
116_Mohave500kV_P6.1: 3PH 4 cycle fault at Mohave 500kV w/ loss of Eldorado-Mohave and Lugo-Mohave	p6	Two overlapping singles	stable	stable	stable	stable	stable	WECC Criteria met. However, dynamic models (repc_a and repc_b) of some IBR resources need to be tuned
117_RanchoVista500kV_P6.1: 3PH 4 cycle fault at Rancho Vista 500kV w/ loss of Lugo-Rancho Vista & Rancho Vista-Serrano No.1	p6	Two overlapping singles	stable	stable	stable	stable	stable	WECC Criteria met

Study Area: SCE Main

Transient Stability

Contingency	Category	Category Description	Transient Stability Performance					Potential Mitigation Solutions
			Baseline Scenarios			Sensitivity Scenarios		
			B2_2026 Summer Peak	B3_2031 Summer Peak	B4_2023 Spring Off-Peak	S1_2026 SP High CEC Forecast	S3_2023 OP Heavy Renewable & Min Gas Gen	
119_Serrano500kV_P6.1: 3PH 4 cycle fault at Serrano 500kV w/ loss of Alberhill-Serrano & Rancho Vista-Serrano No.1	p6	Two overlapping singles	stable	stable	stable	stable	stable	WECC Criteria met
120_Serrano500kV_P6.1: 3PH 4 cycle fault at Serrano 500kV w/ loss of Alberhill-Serrano & Mira Loma-Serrano No.2	p6	Two overlapping singles	stable	stable	stable	stable	stable	WECC Criteria met
122_Midway500kV_P6.1: 3PH 4 cycle fault at Midway 500 kV w/ loss of Midway-Vincent No.1 & Midway-Whirlwind No.3 + No RAS	p6	Two overlapping singles	stable	stable	stable	stable	stable	WECC Criteria met
123_SONGS230kV_P6.1: 3PH 4 cycle fault at SONGS 230 kV w/ loss of SONGS-San Luis Rey No.1 & No.2 230kV	p6	Two overlapping singles	stable	stable	stable	stable	stable	WECC Criteria met
124_Vincent500kV_P6.1: 3PH 4 cycle fault at Vincent 500kV w/ loss of Lugo-Vincent No.1 & No.2	p6	Two overlapping singles	stable	stable	stable	stable	stable	WECC Criteria met
125_Whirlwind500kV_P6.1: 3PH 4 cycle fault at Whirlwind 500kV w/ loss of Midway-Whirlwind No.3 & Windhub-Whirlwind	p6	Two overlapping singles	stable	stable	stable	stable	stable	WECC Criteria met
126_Whirlwind500kV_P6.1: 3PH 4 cycle fault at Whirlwind 500kV w/ loss of Whirlwind-Windhub & Antelope-Whirlwind	p6	Two overlapping singles	stable	stable	stable	stable	stable	WECC Criteria met
127_Mesa500kV_P6.1: 3PH 4 cycle fault at Mesa 500kV w/ loss of Mesa-Vincent 500kV & Mesa-Miraloma	p6	Two overlapping singles	stable	stable	stable	stable	stable	WECC Criteria met
128_IPPDC_bipole_P7.2: SLG fault at Adelanto 500kV followed by loss of IPP Bipole Converters with North-to-South flow	p7	common structure	stable	stable	stable	stable	stable	WECC Criteria met
129_PDCI_bipole_SPS_P7.2: SLG fault at Sylmar SCE followed by loss of PDCI Bipole with North-to-South flow	p7	common structure	stable	stable	stable	stable	stable	WECC Criteria met
130_Center230kV_P7.1: 1PH 4 cycle fault at Center 230kV w/ loss of Alamitos-Center and Center-Del Amo	p7	common structure	stable	stable	stable	stable	stable	WECC Criteria met
131_Center230kV_P7.1: 1PH 4 cycle fault at Center 230kV w/ loss of Center-Mesa and Center-Olinda	p7	common structure	stable	stable	stable	stable	stable	WECC Criteria met

Study Area: SCE Main

Transient Stability

Contingency	Category	Category Description	Transient Stability Performance					Potential Mitigation Solutions
			Baseline Scenarios			Sensitivity Scenarios		
			B2_2026 Summer Peak	B3_2031 Summer Peak	B4_2023 Spring Off-Peak	S1_2026 SP High CEC Forecast	S3_2023 OP Heavy Renewable & Min Gas Gen	
132_Johanna230kV_P7.1: 1PH 4 cycle fault at Johanna 230kV w/ loss of Ellis-Santiago & Ellis-Johanna	p7	common structure	stable	stable	stable	stable	stable	WECC Criteria met
133_Mesa230kV_P7.1: 1PH 4 cycle fault at Mesa 230kV w/ loss of Center-Mesa & Mesa-Walnut	p7	common structure	stable	stable	stable	stable	stable	WECC Criteria met
135_Mesa230kV_P7.1: 1PH 4 cycle fault at Mesa 230kV w/ loss of Mesa-Walnut & Center-Olinda	p7	common structure	stable	stable	stable	stable	stable	WECC Criteria met
136_Redondo230kV_P7.1: 1PH 4 cycle fault at Redondo 230kV w/ loss of La Fresa-Redondo No.1 & No.2	p7	common structure	stable	stable	stable	stable	stable	WECC Criteria met
137_Redondo230kV_P7.1: 1PH 4 cycle fault at Mesa 230kV w/ loss of Mesa-Redondo & Lighthipe-Redondo	p7	common structure	stable	stable	stable	stable	stable	WECC Criteria met
138_Mesa230kV_P7.1: 1PH 4 cycle fault at Mesa 230kV w/ loss of Mesa-Redondo & La Fresa-Laguna Bell	p7	common structure	stable	stable	stable	stable	stable	WECC Criteria met
140_Mesa230kV_P7.1: 1PH 4 cycle fault at Mesa 230kV w/ loss of Litehipe-Mesa & Del Amo-Laguna Bell	p7	common structure	stable	stable	stable	stable	stable	WECC Criteria met
142_Mesa230kV_P7.1: 1PH 4 cycle fault at Mesa 230kV w/ loss of Litehipe-Mesa & Laguna Bell-Mesa No.2	p7	common structure	stable	stable	stable	stable	stable	WECC Criteria met
143_Mesa230kV_P7.1: 1PH 4 cycle fault at Mesa 230kV w/ loss of Mesa-Rio Hondo No.1 & No.2	p7	common structure	stable	stable	stable	stable	stable	WECC Criteria met
144_Mesa230kV_P7.1: 1PH 4 cycle fault at Mesa 230kV w/ loss of Mesa-Vincent No.2 230kV & Goodrich-Gould	p7	common structure	stable	stable	stable	stable	stable	WECC Criteria met
145_Mesa230kV_P7.1: 1PH 4 cycle fault at Mesa 230kV w/ loss of Mesa-Vincent No.1 & Goodrich-Mesa	p7	common structure	stable	stable	stable	stable	stable	WECC Criteria met
146_MiraLoma500kV_P7.1: 1PH 4 cycle fault at Mira Loma 500kV w/ loss of Mesa-Mira Loma 500kV & Chino-Mira Loma No.3 230kV	p7	common structure	stable	stable	stable	stable	stable	WECC Criteria met

Study Area: SCE Main

Transient Stability

Contingency	Category	Category Description	Transient Stability Performance					Potential Mitigation Solutions
			Baseline Scenarios			Sensitivity Scenarios		
			B2_2026 Summer Peak	B3_2031 Summer Peak	B4_2023 Spring Off-Peak	S1_2026 SP High CEC Forecast	S3_2023 OP Heavy Renewable & Min Gas Gen	
147_MiraLoma230kV_P7.1: 1PH 4 cycle fault at Mira Loma 230kV w/ loss of Mira Loma-Walnut 230kV & Mira Loma-Olinda	p7	common structure	stable	stable	stable	stable	stable	WECC Criteria met
148_RanchoVista230kV_P7.1: 1PH 4 cycle fault at Rancho Vista 230kV w/ loss of Mira Loma-Rancho Vista No.1 & No.2 230kV	p7	common structure	stable	stable	stable	stable	stable	WECC Criteria met
149_Santiago230kV_P7.1: 1PH 4 cycle fault at Santiago 230kV w/ loss of Ellis-Santiago & Johanna-Santiago	p7	common structure	stable	stable	stable	stable	stable	WECC Criteria met
150_Serrano500kV_P7.1: 1PH 4 cycle fault at Serrano 500kV w/ loss of Mira Loma-Serrano No.2 500kV & Rancho Vista-Serrano No.1 500kV	p7	common structure	stable	stable	stable	stable	stable	WECC Criteria met
151_Serrano230kV_P7.1: 1PH 4 cycle fault at Serrano 230kV w/ loss of Serrano-Villa Park No.1 & No.2 230kV	p7	common structure	stable	stable	stable	stable	stable	WECC Criteria met
152_Viejo230kV_P7.1: 1PH 4 cycle fault at Viejo 230kV w/ loss of San Onofre-Serrano 230kV & Chino-Viejo 230kV	p7	common structure	stable	stable	stable	stable	stable	WECC Criteria met
153_Vincent230kV_P7.1: 1PH 4 cycle fault at Vincent 230kV w/ Rio Hondo-Vincent No.1 & No.2 230kV	p7	common structure	stable	stable	stable	stable	stable	WECC Criteria met

Study Area: **SCE Main**

Single Contingency Load Drop

Worst Contingency	Category	Category Description	Amount of Load Drop (MW)								Potential Mitigation Solutions
			B1_2023 Summer Peak	B2_2026 Summer Peak	B3_2031 Summer Peak	B4_2023 Spring Off-Peak	B5_2026 Spring Off-Peak	S1_2026 SP High CEC Forecast	S2_2023 SP Heavy Renewable & Min Gas Gen	S3_2023 OP Heavy Renewable & Min Gas Gen	

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

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Study Area: **SCE Main**

Single Source Substation with more than 100 MW Load

Substation	Load Served (MW)								Potential Mitigation Solutions
	B1_2023 Summer Peak	B2_2026 Summer Peak	B3_2031 Summer Peak	B4_2023 Spring Off-Peak	B5_2026 Spring Off-Peak	S1_2026 SP High CEC Forecast	S2_2023 SP Heavy Renewable & Min Gas Gen	S3_2023 OP Heavy Renewable & Min Gas Gen	

No single source substation with more than 100 MW