

Study Area: Southern California Bulk



Thermal Overloads

Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Loading % (Baseline Scenarios)						Loading % (Sensitivity Scenarios)				Project & Potential Mitigation Solutions
				B1: 2024 Summer Peak	2027 Summer Peak	B3: 2032 Summer Peak ATE	B4: 2024 Spring Off-Peak	B5: 2027 Spring Off-Peak	B6: 2032 Spring Off-Peak	S1: 2027 SP High CEC Forecast	S2: 2024 SP Heavy Renewable & Min Gas Gen	S3: 2024 OP Sensitivity	S4: 2035 SP ATE	
24593 MW_VINCNT_21 500 24592 MW_VINCNT_22 500 2 1	P1DC_PDCI1_PDCI CONVERTER MONOPOLE #1 or #2 -AND- LP1_100132_Line MIDWAY 500.0 to VINCENT 500.0 Circuit 1	P6*	Overlapping singles	112.82							126.05			The P6 overloads could be mitigated by operational mitigation, such as dispatching generation, reducing import/export via Path 26, and bypassing series capacitors after initial contingency, together with existing Path 26 and PDCI RASs curtailing generation as needed.
	LP1_100132_Line MIDWAY 500.0 to VINCENT 500.0 Circuit 1 -AND- LP1_100134_Line MIDWAY 500.0 to WIRLWIND 500.0 Circuit 3	P6*	Overlapping singles	117.3				101.14			117.07			
	LP1_100116_Line VINCENT 500.0 to WIRLWIND 500.0 Circuit 3 -AND- LP1_100132_Line MIDWAY 500.0 to VINCENT 500.0 Circuit 1	P6*	Overlapping singles	95.17							108.77			
	LP1_100176_Line ANTELOPE 500.0 to WIRLWIND 500.0 Circuit 1 -AND- LP1_100132_Line MIDWAY 500.0 to VINCENT 500.0 Circuit 1	P6*	Overlapping singles	94.7							106.83			
	P1DC_PDCI1_PDCI CONVERTER MONOPOLE #1 or #2 -AND- LP1_100133_Line MIDWAY 500.0 to VINCENT 500.0 Circuit 2	P6*	Overlapping singles	109.56							122.67			
24591 MW_VINCNT_11 500 24590 MW_VINCNT_12 500 1 1	LP1_100133_Line MIDWAY 500.0 to VINCENT 500.0 Circuit 2 -AND- LP1_100134_Line MIDWAY 500.0 to WIRLWIND 500.0 Circuit 3	P6*	Overlapping singles	115.02				99.18			114.82			
	LP1_100133_Line MIDWAY 500.0 to VINCENT 500.0 Circuit 2 -AND- P1DC_PDCI_PDCI CONVERTER MONOPOLE #1 or #2	P6*	Overlapping singles	108.48							121.23			
	LP1_100116_Line VINCENT 500.0 to WIRLWIND 500.0 Circuit 3 -AND- LP1_100133_Line MIDWAY 500.0 to VINCENT 500.0 Circuit 2	P6*	Overlapping singles	92.47							105.73			
24594 MW_WRLWND_32 500 29402 WIRLWIND 500 3 1	LP1_100133_Line MIDWAY 500.0 to VINCENT 500.0 Circuit 2 -AND- LP1_100132_Line MIDWAY 500.0 to VINCENT 500.0 Circuit 1	P6*	Overlapping singles	153.4				138.36	104.98		152.27			
29400 ANTELOPE 500 24156 VINCENT 500 #1 or #2	LP1_100116_Line VINCENT 500.0 to WIRLWIND 500.0 Circuit 3 -AND- LP1_100174_Line ANTELOPE 500.0 to VINCENT 500.0 #2 or #1	P6*	Overlapping singles	95.52							140.99			
	LP1_100131_Line ANTELOPE 230.0 to PARDEE 230.0 Circuit 1 -AND- LP1_100174_Line ANTELOPE 500.0 to VINCENT 500.0 #2 or #1	P6*	Overlapping singles								110.67			
	LP1_100133_Line MIDWAY 500.0 to VINCENT 500.0 Circuit 2 -AND- LP1_100174_Line ANTELOPE 500.0 to VINCENT 500.0 #2 or #1	P6*	Overlapping singles								110.62			
	LP1_100132_Line MIDWAY 500.0 to VINCENT 500.0 Circuit 1 -AND- LP1_100174_Line ANTELOPE 500.0 to VINCENT 500.0 #2 or #1	P6*	Overlapping singles								110.1			
	LP1_100177_Line WIRLWIND 500.0 to WINDHUB 500.0 Circuit 1 -AND- LP1_100174_Line ANTELOPE 500.0 to VINCENT 500.0 #2 or #1	P6*	Overlapping singles								105.51			
	LP1_100175_Line ANTELOPE 500.0 to WINDHUB 500.0 Circuit 1 -AND- LP1_100116_Line VINCENT 500.0 to WIRLWIND 500.0 Circuit 3	P6*	Overlapping singles	102.54							144.12			

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				B1: 2024 Summer Peak	2027 Summer Peak	B3: 2032 Summer Peak ATE	B4: 2024 Spring Off-Peak	B5: 2027 Spring Off-Peak	B6: 2032 Spring Off-Peak	S1: 2027 SP High CEC Forecast	S2: 2024 SP Heavy Renewable & Min Gas Gen	S3: 2024 OP Sensitivity	S4: 2035 SP ATE	
29400 ANTELOPE 500 29402 WIRLWIND 500 1 1	LP1_100133_Line MIDWAY 500.0 to VINCENT 500.0 #2 or #1 -AND- LP1_100175_Line ANTELOPE 500.0 to WINDHUB 500.0 Circuit 1	P6*	Overlapping singles								111.1			The P6 overloads could be eliminated by operational mitigation curtailing generation in the Wirlwind and Windhub area after the first contingency as needed, and along with the planned Tehachapi cRAS to drop generation in the Tehachapi area. Since the total net amount of generation tripped by RAS for a single contingency cannot exceed 1150 MW based on the ISO planning criteria, up to about 1600 MW of generation in the Windhub area need to be curtailed after the first contingency of losing either Whirlwind - Windhub or Windhub - Antelope 500 kV line. The mitigation for the P2/P4/P5 overloads that are identified in the sensitivity case needs to coordinate with potential policy and economic transmission needs in the area.
	LP1_100133_Line MIDWAY 500.0 to VINCENT 500.0 Circuit 2 -AND- LP1_100132_Line MIDWAY 500.0 to VINCENT 500.0 Circuit 1	P6*	Overlapping singles								109.54			
	LP1_100133_Line MIDWAY 500.0 to VINCENT 500.0 #2 or #1 -AND- LP1_100116_Line VINCENT 500.0 to WIRLWIND 500.0 Circuit 3	P6*	Overlapping singles								109.95			
	P1DC_PDCI_PDCI CONVERTER MONOPOLE #1 or #2 -AND- LP1_100175_Line ANTELOPE 500.0 to WINDHUB 500.0 Circuit 1	P6*	Overlapping singles								109.21			
	LP2_88102_Line MIDWAY 500.0 to WIRLWIND 500.0 Circuit 3 Line WIRLWIND 500.0 to VINCENT 500.0 Circuit 3	P2/P4	internal CB fault/stuck CB								100.8			
	L_T_P4_008_Whirlwind - Vincent 500 kV line and Whirlwind - Midway 500 kV line	P2/P4	internal CB fault/stuck CB								100.8			
	P5_d_TC_004_Midway - Whirlwind 500 kv Line (Non Redundant Trip Coil Whirlwind CB# 8012)	P5	Non-Redundant Relay								100.8			
	P5_d_TC_005_Vincent - Whirlwind 500 kv Line (Non Redundant Trip Coil Whirlwind CB# 8012)	P5	Non-Redundant Relay								100.8			
24156 VINCENT 500 29402 WIRLWIND 500 3 1	LP1_100176_Line ANTELOPE 500.0 to WIRLWIND 500.0 Circuit 1 -AND- LP1_100175_Line ANTELOPE 500.0 to WINDHUB 500.0 Circuit 1	P6*	Overlapping singles								104.25			
24156 VINCENT 500 24386 MESA CAL 500 #1	LP1_100076_Line LUGO 500.0 to VINCENT 500.0 Circuit 1 -AND- LP1_100077_Line LUGO 500.0 to VINCENT 500.0 Circuit 2	P6*	Overlapping singles								117.82			
24086 LUGO 500 24156 VINCENT 500 # or #2	LP1_100115_Line VINCENT 500.0 to MESA CAL 500.0 Circuit 1 -AND- LP1_100077_Line LUGO 500.0 to VINCENT 500.0 #2 or #1	P6*	Overlapping singles	96.93							137.47			
24156 VINCENT 500/230 kV Bank #1, #2, #3, or #4	LP1_100115_Line VINCENT 500.0 to MESA CAL 500.0 Circuit 1 -AND- TP1_100219_Tran VINCENT 500.00 to VINCNT2 230.00 Circuit 4 VINCEN4T 13.80	P6*	Overlapping singles								113.25			The P6 overloads could be eliminated by dispatching available resources including energy storage and demand response (RDRR) after the first contingency. The use of energy storage is subject to verification that it has sufficient MWh capability and can be fully charged when needed in the West LA basin.
	LP1_100115_Line VINCENT 500.0 to MESA CAL 500.0 Circuit 1 -AND- TP1_100217_Tran VINCENT 500.00 to VINCENT 230.00 Circuit 3 0.00	P6*	Overlapping singles	98.46							117.88			
	LP1_100115_Line VINCENT 500.0 to MESA CAL 500.0 Circuit 1 -AND- TP1_100216_Tran VINCENT 500.00 to VINCENT 230.00 Circuit 2 VINCEN2T 13.80	P6*	Overlapping singles	98.46							117.88			
	LP1_100115_Line VINCENT 500.0 to MESA CAL 500.0 Circuit 1 -AND- TP1_100218_Tran VINCENT 500.00 to VINCNT2 230.00 Circuit 1 VINCEN1T 13.80	P6*	Overlapping singles								113.25			

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				B1: 2024 Summer Peak	2027 Summer Peak	B3: 2032 Summer Peak ATE	B4: 2024 Spring Off-Peak	B5: 2027 Spring Off-Peak	B6: 2032 Spring Off-Peak	S1: 2027 SP High CEC Forecast	S2: 2024 SP Heavy Renewable & Min Gas Gen	S3: 2024 OP Sensitivity	S4: 2035 SP ATE	
MESA CAL 500/230 kV Bank #3 or #4	LP1_100070_Line LAGUBELL 230.0 to MESA CAL 230.0 Circuit 1 -AND- TP1_100225_Trans MESA CAL 500.00 to MESACALS 230.00 #4 or #3	P6*	Overlapping singles							93.91	106.48			
24138 SERRANO 500/230 kV Bank #1, #2, or #3	TP1_100209_Trans SERRANO 500.00 to SERRANO 230.00 Circuit 2 SERRAN2T 13.80 -AND- TP1_100210_Trans SERRANO 500.00 to SERRANO 230.00 Circuit 3 0.00	P6*	Overlapping singles		95.08	99.58				100.76	118.16		109.75	The P6 overloads could be eliminated in the 10-year planning horizon by available resources including energy storage procured as RA and dispatchable demand response in Western LA basin and the SDG&E area after the first contingency. However, under the 2035 ATE sensitivity scenario with addition of the 2180 MW of ATE load in Western LA Basin, a reliability-driven transmission mitigation is needed for the Serrano bank overload issue, which will coordinate with the policy and economic transmission needs in the area. The use of energy storage is subject to verification that it has sufficient MWh capability and can be fully charged when needed in the Western LA Basin and the SDG&E area. In addition, the load growth, gas generation retirement, and implementation of the portfolio energy storage resources in Western LA Basin and the SDG&E area need to be watched over, as they affect the timing for the need of mitigation.
	TP1_100210_Trans SERRANO 500.00 to SERRANO 230.00 Circuit 3 0.00 -AND- TP1_100208_Trans SERRANO 500.00 to SERRANO 230.00 Circuit 1 SERRAN1T 13.80	P6*	Overlapping singles		96.9	101.48				102.7	120.36		111.83	
	TP1_100209_Trans SERRANO 500.00 to SERRANO 230.00 Circuit 2 SERRAN2T 13.80 -AND- TP1_100208_Trans SERRANO 500.00 to SERRANO 230.00 Circuit 1 SERRAN1T 13.80	P6*	Overlapping singles		96.82	98.46				102.43	116.83		108.52	
24114 PARDEE 230 24115 PASTORIA 230 1 1	LP1_100101_Line PARDEE 230.0 to BAILEY 230.0 Circuit 1 -AND- LP1_100100_Line PARDEE 230.0 to WARNETAP 230.0 Circuit 1	P6*	Overlapping singles			95.48	127.24	143.02	102.57		138.62	137.02		The P1 and P6 overloads could be eliminated by reducing generation output from Pastoria Energy Facility
	LP1_100131_Line ANTELOPE 230.0 to PARDEE 230.0 Circuit 1 -AND- LP1_100100_Line PARDEE 230.0 to WARNETAP 230.0 Circuit 1	P6*	Overlapping singles				93.49	100.09			104.99	102.9		
24114 PARDEE 230 24217 WARNETAP 230 1 1	LP1_100093_Line PARDEE 230.0 to PASTORIA 230.0 Circuit 1	P1	Single Contingency				95.0	108.4			106.2	100.8		
	LP1_100101_Line PARDEE 230.0 to BAILEY 230.0 Circuit 1 -AND- LP1_100093_Line PARDEE 230.0 to PASTORIA 230.0 Circuit 1	P6*	Overlapping singles	96.39	95.3	108.63	140.62	161.16	113.41	92.13	156.3	152.14		
	LP1_100131_Line ANTELOPE 230.0 to PARDEE 230.0 Circuit 1 -AND- LP1_100093_Line PARDEE 230.0 to PASTORIA 230.0 Circuit 1	P6*	Overlapping singles				103.48	114.63			119.98	114.29		
	P1G_DIABLO1_Diablo Canyon PP No.1 -AND- LP1_100093_Line PARDEE 230.0 to PASTORIA 230.0 Circuit 1	P6*	Overlapping singles											
	P1G_DIABLO1_Diablo Canyon PP No.1 -AND- LP1_100093_Line PARDEE 230.0 to PASTORIA 230.0 Circuit 1	P6*	Overlapping singles											
24114 PARDEE 230 24403 BAILEY 230 1 1	LP1_100093_Line PARDEE 230.0 to PASTORIA 230.0 Circuit 1 -AND- LP1_100100_Line PARDEE 230.0 to WARNETAP 230.0 Circuit 1	P6*	Overlapping singles			90.76	122.21	139.64	100.42		134.03	133.15		

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				B1: 2024 Summer Peak	2027 Summer Peak	B3: 2032 Summer Peak ATE	B4: 2024 Spring Off-Peak	B5: 2027 Spring Off-Peak	B6: 2032 Spring Off-Peak	S1: 2027 SP High CEC Forecast	S2: 2024 SP Heavy Renewable & Min Gas Gen	S3: 2024 OP Sensitivity	S4: 2035 SP ATE	
24114 PARDEE 230 26098 SYLMAR220 230 #1 or #2	P1L_LDWP03_Line ADELANTO 500.0 to TOLUCA 500.0 Ckt 1 -AND-LP1_100184_Line PARDEE 230.0 to SYLMAR220 230.0 #2 or #1	P6*	Overlapping singles									109.11		
24040 EL NIDO 230 24082 LCIENEGA 230 1 1	LP1_100071_Line LCIENEGA 230.0 to LA FRESA 230.0 Circuit 1	P1	Single Contingency										100.93	The available resources in the area would be inadequate to eliminate the overloads for P1/P2/P4/P5/P6/P7 contingencies on La Cienega–La Fresa and El Nido–La Cienega 230 kV lines in the 2035 SP ATE sensitivity case. The reliability concerns are local reliability concerns due to the ATE load addition in the 2035 sensitivity case and therefore need to be watched over in the next planning cycle.
	LP2_48_Line LCIENEGA 230.0 to LA FRESA 230.0 Circuit 1 svd LCIENEGA 230.00 ei	P2/P4	internal CB fault/stuck CB										100.90	
	P5_ab_TL_038_La Fresa - La Cienega No. 1 230 kv Line	P5	Non-Redundant Relay										100.90	
	P5_d_TC_098_La Cienega - La Fresa 220 kv Line (Non Redundant Trip Coil La Cienega CB# 422)	P5	Non-Redundant Relay										100.90	
	P5_d_TC_108_La Cienega - La Fresa 220 kv Line (Non Redundant Trip Coil La Fresa CB# 4042)	P5	Non-Redundant Relay										100.90	
24082 LCIENEGA 230 24074 LA FRESA 230 1 1	LP1_100049_Line EL NIDO 230.0 to LCIENEGA 230.0 Circuit 1	P1	Single Contingency										101.63	
	LP2_564_Line EL NIDO 230.0 to LCIENEGA 230.0 Circuit 1 Tran EL NIDO .00 to EL NIDO .00 Circuit 3	P2/P4	internal CB fault/stuck CB										101.91	
	LP2_563_Line EL NIDO 230.0 to LCIENEGA 230.0 Circuit 1 Tran EL NIDO .00 to EL NIDO .00 Circuit 1 svd EL NIDO	P2/P4	internal CB fault/stuck CB										101.91	
	LP2_47_Line EL NIDO 230.0 to LCIENEGA 230.0 Circuit 1 Tran LCIENEGA .00 to LCIENEGA .00 Circuit 2	P2/P4	internal CB fault/stuck CB										102.97	
	P5_d_TC_097_El Nido - La Cienega 220 kv Line (Non Redundant Trip Coil La Cienega CB# 532)	P5	Non-Redundant Relay										102.97	
	LP1_100047_Line EL NIDO 230.0 to LA FRESA 230.0 Circuit 3-AND-LP1_100048_Line EL NIDO 230.0 to LA FRESA 230.0 Circuit 4	P6*	Overlapping singles								124.51		105.51	
	LP1_100049_Line EL NIDO 230.0 to LCIENEGA 230.0 Circuit 1-AND-LP1_100066_Line LA FRESA 230.0 to HINSON 230.0 Circuit 1	P6*	Overlapping singles										100.77	
	LP1_100115_Line VINCENT 500.0 to MESA CAL 500.0 Circuit 1-AND-LP1_100049_Line EL NIDO 230.0 to LCIENEGA 230.0 Circuit 1	P6*	Overlapping singles										100.77	
	LP1_100049_Line EL NIDO 230.0 to LCIENEGA 230.0 Circuit 1-AND-LP1_100067_Line LA FRESA 230.0 to LAGUBELL 230.0 Circuit 1	P6*	Overlapping singles										100.70	
	L_M_P7_0041_Line LA FRESA 230.0 to EL NIDO 230.0 Circuit 3 Line LA FRESA 230.0 to EL NIDO 230.0 Circuit 4	P7	common structure								123.90		105.72	

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				B1: 2024 Summer Peak	2027 Summer Peak	B3: 2032 Summer Peak ATE	B4: 2024 Spring Off-Peak	B5: 2027 Spring Off-Peak	B6: 2032 Spring Off-Peak	S1: 2027 SP High CEC Forecast	S2: 2024 SP Heavy Renewable & Min Gas Gen	S3: 2024 OP Sensitivity	S4: 2035 SP ATE	
24021 CENTER 230 24393 MESACALS 230 1 1	P5_ab_BD_001_Serrano 500 kv East Bus	P5	Non-Redundant								104.8			Dispatch available resources including energy storage and demand response in the West LA Basin after the 1st contingency. The use of storage is subject to verification that it has sufficient MWh capability and can be fully charged when needed. The P5 overload is identified in the sensitivity case and could be mitigated by upgrading the Serrano 500 kV East bus protection, which needs further investigation.
	LP1_100070_Line LAGUBELL 230.0 to MESA CAL 230.0 Circuit 1 -AND- LP1_100127_Line MESACALS 230.0 to LAGUBELL 230.0 Circuit 2	P6*	Overlapping singles								112.28			
	LP1_100127_Line MESACALS 230.0 to LAGUBELL 230.0 Circuit 2 -AND- TP1_100224_Tran MESA CAL 500.00 to MESA CAL 230.00 Circuit 2 MESA2T 13.80	P6*	Overlapping singles								106.8			
	LP1_100130_Line MESACALS 230.0 to WALNUT 230.0 Circuit 1 -AND- LP1_100127_Line MESACALS 230.0 to LAGUBELL 230.0 Circuit 2	P6*	Overlapping singles								103.74			
	LP1_100044_Line DELAMO 230.0 to LAGUBELL 230.0 Circuit 1 -AND- LP1_100073_Line LITEHIPE 230.0 to MESA CAL 230.0 Circuit 1	P6*	Overlapping singles								101.28			
	L_M_P7_0012_Line LITEHIPE 230.0 to MESA CAL 230.0 Circuit 1 Line DELAMO 230.0 to LAGUBELL 230.0 Circuit 1	P7	common structure								100.5			
24084 LITEHIPE 230 24091 MESA CAL 230 1 1	LP1_100070_Line LAGUBELL 230.0 to MESA CAL 230.0 Circuit 1 -AND- LP1_100081_Line MESA CAL 230.0 to REDONDO 230.0 Circuit 1	P6*	Overlapping singles								111.52			Dispatch available resources including energy storage and demand response (RDRR) in the West LA Basin after the 1st event of P6 contingency or pre-contingency for the P7 contingencies; The use of energy storage is subject to verification that it has sufficient MWh capability and can be fully charged when needed in the West LA basin.
	LP1_100067_Line LA FRESA 230.0 to LAGUBELL 230.0 Circuit 1 -AND- LP1_100081_Line MESA CAL 230.0 to REDONDO 230.0 Circuit 1	P6*	Overlapping singles								105.39			
	L_M_P7_0013_Line REDONDO 230.0 to MESA CAL 230.0 Circuit 1 Line LAGUBELL 230.0 to MESACAL 230.0 Circuit 1	P7	common structure								110.6			
	L_M_P7_0011_Line REDONDO 230.0 to MESA CAL 230.0 Circuit 1 Line LA FRESA 230.0 to LAGUBELL 230.0 Circuit 1	P7	common structure								104.6			
24393 MESACALS 230 24076 LAGUBELL 230 2 1	LP1_100070_Line LAGUBELL 230.0 to MESA CAL 230.0 Circuit 1 -AND- LP1_100073_Line LITEHIPE 230.0 to MESA CAL 230.0 Circuit 1	P6*	Overlapping singles								113.14			
	LP1_100070_Line LAGUBELL 230.0 to MESA CAL 230.0 Circuit 1 -AND- LP1_100037_Line CENTER 230.0 to MESACALS 230.0 Circuit 1	P6*	Overlapping singles								112.72			
	LP1_100070_Line LAGUBELL 230.0 to MESA CAL 230.0 Circuit 1 -AND- LP1_100081_Line MESA CAL 230.0 to REDONDO 230.0 Circuit 1	P6*	Overlapping singles								107.12			
	L_M_P7_0013_Line REDONDO 230.0 to MESA CAL 230.0 Circuit 1 Line LAGUBELL 230.0 to MESACAL 230.0 Circuit 1	P7	common structure								106.3			
24091 MESA CAL 230 24125 REDONDO 230 1 1	LP1_100073_Line LITEHIPE 230.0 to MESA CAL 230.0 Circuit 1 -AND- LP1_100070_Line LAGUBELL 230.0 to MESA CAL 230.0 Circuit 1	P6*	Overlapping singles								104.15			
26094 SYLMAR 230 26098 SYLMAR220 230 E or F	LP2_8849_Line SYLMAR 230.0 to SYLMAR220 230.0 Circuit G Tran SYLMAR .00 to SYLMAR220 .00 F or E	P2/P4	internal CB fault/stuck CB	144.0				97.3	138.0		127.5	112.5		Upgrade the Sylmar banks E and F, and develop operation procedure to restrict power flow via Path

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26094 SYLMAR 230 26098 SYLMAR220 230 E or F	L_M_P4_0059_Line SYLMAR 230.0 to SYLMAR220 230.0 Circuit G Tran SYLMAR 230.0 to SYLMAR220 230.0 F or E	P2/P4	internal CB fault/stuck CB	144.0				97.3	138.0		127.5	112.5		operation procedure to restrict power flow via Path 41 for pre-contingency as an interim solution

Note (*): P6 results are reported without System adjustment between the two single P1 events

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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: 2024 Summer Peak	2027 Summer Peak	B3: 2032 Summer Peak ATE	B4: 2024 Spring Off-Peak	B5: 2027 Spring Off-Peak	B6: 2032 Spring Light Load	S1: 2027 SP High CEC Forecast	S2: 2024 SP Heavy Renewable & Min Gas Gen	S3: 2024 OP Sensitivity	S4: 2035 SP ATE	
PISGAH 230	TP1_100202_Tran LUGO 500.00 to LUGO 230.00 Circuit 1 LUGO 1T 13.80 -AND- TP1_100203_Tran LUGO 500.00 to LUGO 230.00 Circuit 2 LUGO 2T 13.80	P6	Overlapping singles		0.88	0.79	0.80			0.84				North of Lugo CRAS tripping generation
Mohave 500 kV	LP1_100087_Line MOHAVE 500.0 to ELDORDO 500.0 Circuit 1 -AND- LP1_100080_Line LUGO 500.0 to MOHAVE 500.0 Circuit 1	P6	Overlapping singles	0.43	0.47		0.51	0.58		0.46	0.39	0.52		Exiting NVE RAS to protect its 69 kV system

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Voltage Deviation



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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	Post Cont. Voltage Deviation % (Baseline Scenarios)						Post Cont. Voltage Deviation % (Sensitivity Scenarios)		
				B1: 2024 Summer Peak	2027 Summer Peak	B3: 2032 Summer Peak ATE	B4: 2024 Spring Off-Peak	B5: 2027 Spring Off-Peak	B6: 2032 Spring Light Load	S1: 2027 SP High CEC Forecast	S2: 2024 SP Heavy Renewable & Min Gas Gen	S3: 2024 OP Sensitivity	S4: 2035 SP ATE		B1: 2024 Summer Peak	2027 Summer Peak	B3: 2032 SP with Additional Transportation Electrification	B4: 2024 Spring Off-Peak	B5: 2027 Spring Off-Peak	B6: 2032 Spring Light Load	S1: 2027 SP High CEC Forecast	S2: 2024 SP Heavy Renewable & Min Gas Gen	S3: 2024 OP Sensitivity

No high or low voltage violation identified

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Transient Stability



Contingency	Category	Category Description	Transient Stability Performance						Potential Mitigation Solutions
			Baseline Scenarios				Sensitivity Scenarios		
			B4: 2024 Spring Off-Peak	B2: 2027 Summer Peak	B3: 2032 Summer Peak ATE	B6: 2032 Spring Off-Peak	S1: 2027 SP High CEC Forecast	S3: 2024 OP Sensitivity	
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	stable	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	stable	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	stable	criteria met
04_Sant230kV_P1.1: 3PH 4 cycle fault at Santiago 230 kV w/ loss of Santiago Synchronous Condensers	P1	Single Contingency	stable	stable	stable	stable	stable	stable	criteria met
05_Eldorado230kV_P1.3: 3PH 4 cycle fault at Eldorado 230 kV w/ loss of Cima-Eldorado-Pisgah No.1 230 kV	P1	Single Contingency	stable	stable	stable	stable	stable	stable	criteria met
06_Pisgah230kV_P1.3: 3PH 4 cycle fault at Pisgah 230 kV w/ loss of Cima-Eldorado-Pisgah No.1 230 kV	P1	Single Contingency	stable	stable	stable	stable	stable	stable	criteria met
07_Lugo230kV_P1.3: 3PH 4 cycle fault at Lugo 230 kV w/ loss of Lugo-Pisgah No.2 230 kV	P1	Single Contingency	stable	stable	stable	stable	stable	stable	criteria met
08_Pisgah230kV_P1.3: 3PH 4 cycle fault at Pisgah 230 kV w/ loss of Lugo-Pisgah No.2 230 kV	P1	Single Contingency	stable	stable	stable	stable	stable	stable	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-	P1	Single Contingency	stable	stable	stable	stable	stable	stable	criteria met
10_Whirlwind500kV_P1.2: 3PH 4 cycle fault at Whirlwind 500kV w/ loss of Windhub-Whirlwind 500kV & series cap bypass of	P1	Single Contingency	stable	stable	stable	stable	stable	stable	criteria met
11_Whirlwind500kV_P1.2: 3PH 4 cycle fault at Whirlwind 500kV w/ loss of Antelope-Whirlwind 500kV & series cap bypass of	P1	Single Contingency	stable	stable	stable	stable	stable	stable	criteria met
12_Eldorado500kV_P1.2: 3PH 4 cycle fault at Eldorado 500kV w/ loss of Eldorado-Mohave 500kV & series cap bypass of Eldordo-	P1	Single Contingency	stable	stable	stable	stable	stable	stable	criteria met
13_Eldorado500kV_P1.2: 3PH 4 cycle fault at Eldorado 500kV w/ loss of Eldorado-Mohave 500kV & Lugo-Mohave 500kV line shunt	P1	Single Contingency	stable	stable	stable	stable	stable	stable	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	P1	Single Contingency	stable	stable	stable	stable	stable	stable	criteria met
15_Valley500kV_P1.2: 3PH 4 cycle fault at Valley 500kV w/ loss of Alberhill-Valley 500kV w/ loss of Santiago Synchronous Condensers	P1	Single Contingency	stable	stable	stable	stable	stable	stable	criteria met
16_RanchoVista500kV_P1.2: 3PH 4 cycle fault at Rancho Vista 500kV w/ loss of Rancho Vista-Serrano 500kV w/ loss of Santiago	P1	Single Contingency	stable	stable	stable	stable	stable	stable	criteria met
17_Serrano500kV_P1.2: 3PH 4 cycle fault at Serrano 500kV w/ loss of Mira Loma-Serrano 500kV w/ loss of Santiago Synchronous	P1	Single Contingency	stable	stable	stable	stable	stable	stable	criteria met
18_Santiago230kV_P1.2: 3PH 4 cycle fault at Santiago 230kV w/ loss of San Onofre-Santiago No.1 230kV w/ loss of Santiago Synchronous	P1	Single Contingency	stable	stable	stable	stable	stable	stable	criteria met
19_SanOnofre230kV_P1.2: 3PH 4 cycle fault at San Onofre 230kV w/ loss of San Onofre-Santiago No.2 230kV w/ loss of Santiago	P1	Single Contingency	stable	stable	stable	stable	stable	stable	criteria met
20_Johanna230kV_P1.2: 3PH 4 cycle fault at Johanna 230kV w/ loss of Johanna-Santiago 230kV w/ loss of Santiago Synchronous	P1	Single Contingency	stable	stable	stable	stable	stable	stable	criteria met
21_Ellis230kV_P1.2: 3PH 4 cycle fault at Ellis 230kV w/ loss of Ellis-Santiago 230kV w/ loss of Santiago Synchronous Condensers	P1	Single Contingency	stable	stable	stable	stable	stable	stable	criteria met
22_SanOnofre230kV_P1.2: 3PH 4 cycle fault at San Onofre 230kV w/ loss of San Onofre-Viejo 230kV w/ loss of Santiago Synchronous	P1	Single Contingency	stable	stable	stable	stable	stable	stable	criteria met
23_Viejo230kV_P1.2: 3PH 4 cycle fault at Viejo 230kV w/ loss of Chino-Viejo 230kV w/ loss of Santiago Synchronous Condensers	P1	Single Contingency	stable	stable	stable	stable	stable	stable	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	P1	Single Contingency	stable	stable	stable	stable	stable	stable	criteria met

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Transient Stability



Contingency	Category	Category Description	Transient Stability Performance						Potential Mitigation Solutions
			Baseline Scenarios				Sensitivity Scenarios		
			B4: 2024 Spring Off-Peak	B2: 2027 Summer Peak	B3: 2032 Summer Peak ATE	B6: 2032 Spring Off-Peak	S1: 2027 SP High CEC Forecast	S3: 2024 OP Sensitivity	
25_Valley500kV_P1.2: 3PH 4 cycle fault at Valley 500kV w/ loss of Alberhill-Valley 500kV including loss of Devers SVCs & Cap Bank	P1	Single Contingency	stable	stable	stable	stable	stable	stable	criteria met
26_RanchoVista500kV_P1.2: 3PH 4 cycle fault at Rancho Vista 500kV w/ loss of Rancho Vista-Serrano 500kV including loss of Devers SVCs	P1	Single Contingency	stable	stable	stable	stable	stable	stable	criteria met
27_Serrano500kV_P1.2: 3PH 4 cycle fault at Serrano 500kV w/ loss of Mira Loma-Serrano 500kV including loss of Devers SVCs & Cap Bank	P1	Single Contingency	stable	stable	stable	stable	stable	stable	criteria met
28_Devers500kV_P1.2: 3PH 4 cycle fault at Devers 230kV w/ loss of Devers-Valley No.2 500kV including loss of Devers SVCs & Cap Bank	P1	Single Contingency	stable	stable	stable	stable	stable	stable	criteria met
29_Devers500kV_P1.2: 3PH 4 cycle fault at Devers 500kV w/ loss of Devers-Red Bluff No.2 500kV including loss of Devers SVCs & Cap	P1	Single Contingency	stable	stable	stable	stable	stable	stable	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	stable	criteria met
88_Pisgah230kV_P1.3: 3PH 4 cycle fault at Eldorado 230 kV w/ loss of Cima-Eldorado-Pisgah 230 kV	P1	Single Contingency	stable	stable	stable	stable	stable	stable	criteria met
89_Lugo230kV_P1.3: 3PH 4 cycle fault at Lugo 230 kV w/ loss of Lugo-Pisgah 230 kV	P1	Single Contingency	stable	stable	stable	stable	stable	stable	criteria met
31_Vincent500kV_P2.3_LLT: 1PH 4 cycle fault at Vincent 500kV w/ loss of Mesa-Vincent 500kV & Midway-Vincent No.2 500kV w/ series	P2	Internal Breaker Fault	stable	stable	stable	stable	stable	stable	criteria met
32_Vincent500kV_P2.3_LLT: 1PH 4 cycle fault at Vincent 500kV w/ loss of Antelope-Vincent No.1 500kV & Lugo-Vincent No.2 500kV w/	P2	Internal Breaker Fault	stable	stable	stable	stable	stable	stable	criteria met
33_Whirlwind500kV_P2.3_LLT: 1PH 4 cycle fault at Vincent 500kV w/ loss of Midway-Whirlwind 500kV & Vincent-Whirlwind 500kV w/	P2	Internal Breaker Fault	stable	stable	stable	stable	stable	stable	criteria met
34_Lugo500kV_P2.3_LLT: 1PH 4 cycle fault at Lugo 500kV w/ loss of Lugo-Rancho Vista 500kV & Lugo-Vincent No.1 500kV w/ series cap	P2	Internal Breaker Fault	stable	stable	stable	stable	stable	stable	criteria met
35_Lugo500kV_P2.3_LLT: 1PH 4 cycle fault at Lugo 500kV w/ loss of Lugo-Vincent No.2 500kV & Lugo-Victorville 500kV w/ series cap	P2	Internal Breaker Fault	stable	stable	stable	stable	stable	stable	criteria met
36_Lugo500kV_P2.3_LLT: 1PH 4 cycle fault at Lugo 500kV w/ loss of Lugo-Mira Loma No.2 500kV & Eldorado-Lugo 500kV w/ series cap	P2	Internal Breaker Fault	stable	stable	stable	stable	stable	stable	criteria met
37_Lugo500kV_P2.3_LLT: 1PH 4 cycle fault at Lugo 500kV w/ loss of Lugo-Mira Loma No.3 500kV & Lugo-Mohave 500kV w/ series cap	P2	Internal Breaker Fault	stable	stable	stable	stable	stable	stable	criteria met
38_Lugo500kV_P2.3_LLT: 1PH 4 cycle fault at Lugo 500kV w/ loss of Lugo-Rancho Vista 500kV & Lugo-Vincent No.1 500kV w/ loss of	P2	Internal Breaker Fault	stable	stable	stable	stable	stable	stable	criteria met
39_Lugo500kV_P2.3_LLT: 1PH 4 cycle fault at Lugo 500kV w/ loss of Lugo-Vincent No.2 500kV & Lugo-Victorville 500kV w/ loss of Lugo-	P2	Internal Breaker Fault	stable	stable	stable	stable	stable	stable	criteria met
40_Lugo500kV_P2.3_LLT: 1PH 4 cycle fault at Lugo 500kV w/ loss of Lugo-Miraloma No.2 500kV & Eldorado-Lugo 500kV w/ loss of Lugo-	P2	Internal Breaker Fault	stable	stable	stable	stable	stable	stable	criteria met
41_Lugo500kV_P2.3_LLT: 1PH 4 cycle fault at Lugo 500kV w/ loss of Lugo-Miraloma No.3 500kV & Lugo-Mohave 500kV w/ loss of	P2	Internal Breaker Fault	stable	stable	stable	stable	stable	stable	criteria met
42_Miraloma500kV_P2.3_LLT: 1PH 4 cycle fault at Mira Loma 500kV w/ loss of Mira Loma-Rancho Vista 500kV & Mira Loma-Serrano No.1	P2	Internal Breaker Fault	stable	stable	stable	stable	stable	stable	criteria met
43_Santiago230kV_P2.3_LLT: 1PH 4 cycle fault at Santiago 230kV w/ loss of Ellis-Santiago 230kV & San Onofre-Santiago No.2 230kV & loss	P2	Internal Breaker Fault	stable	stable	stable	stable	stable	stable	criteria met
44_Devers500kV_P2.3_LLT: 1PH 4 cycle fault at Devers 500kV w/ loss of Devers-Red Bluff No.1 500kV & Devers-Valley No.1 500kV including	P2	Internal Breaker Fault	stable	stable	stable	stable	stable	stable	criteria met
45_MiraLoma500kV_P2.3_LLT: 1PH 4 cycle fault at Mira Loma 500kV w/ loss of Mira Loma-Rancho Vista 500kV & Mira Loma-Serrano No.1	P2	Internal Breaker Fault	stable	stable	stable	stable	stable	stable	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	stable	criteria met

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Transient Stability



Contingency	Category	Category Description	Transient Stability Performance						Potential Mitigation Solutions
			Baseline Scenarios				Sensitivity Scenarios		
			B4: 2024 Spring Off-Peak	B2: 2027 Summer Peak	B3: 2032 Summer Peak ATE	B6: 2032 Spring Off-Peak	S1: 2027 SP High CEC Forecast	S3: 2024 OP Sensitivity	
47_Sylmar230kV_3Ph line fault on Pardee-Sylmar No.2 230 kV with stuck breaker at Sylmar followed by loss of Eagle Rock-Sylmar 230 kV	P4	stuck breaker	stable	stable	stable	stable	stable	stable	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	stable	criteria met
49_Sylmar230kV_3Ph line fault on Eagle Rock-Sylmar 230 kV with stuck breaker at Sylmar followed by loss of Sylmar Bank 'E'	P4	stuck breaker	stable	stable	stable	stable	stable	stable	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	stable	criteria met
51_Sylmar230kV_3Ph line fault on Pardee-Sylmar No.2 230 kV with stuck breaker at Sylmar followed by loss of Sylmar Bank 'F'	P4	stuck breaker	stable	stable	stable	stable	stable	stable	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	stable	criteria met
53_Sylmar230kV_1-Ph line fault on Sylmar Bank 'G' 230 kV with stuck breaker at Sylmar followed by loss of Sylmar Bank 'F'	P4	stuck breaker	stable	stable	stable	stable	stable	stable	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	stable	criteria met
58_MiraLoma230kV_3Ph line fault on Mira Loma-Walnut 230 kV with stuck breaker at Mira Loma followed by loss of Chino-Mira Loma No.2	P4	stuck breaker	stable	stable	stable	stable	stable	stable	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	P4	stuck breaker	stable	stable	stable	stable	stable	stable	criteria met
60_MiraLoma230kV_3Ph line fault on Mira Loma-Rancho Vista No.1 230 kV with stuck breaker at Mira Loma followed by loss of Mira	P4	stuck breaker	stable	stable	stable	stable	stable	stable	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	P4	stuck breaker	stable	stable	stable	stable	stable	stable	criteria met
62_RanchoVista230kV_3Ph line fault on Padua-Rancho Vista No.1 230 kV with stuck breaker at Rancho Vista followed by loss of	P4	stuck breaker	stable	stable	stable	stable	stable	stable	criteria met
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	stable	criteria met
64_Serrano230kV_3Ph line fault on Lewis-Serrano No.2 230 kV with stuck breaker at Serrano followed by loss of SONGS-Serrano 230 kV	P4	stuck breaker	stable	stable	stable	stable	stable	stable	criteria met
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	P4	stuck breaker	stable	stable	stable	stable	stable	stable	criteria met
68_Vincent230kV_3Ph line fault on Pardee-Vincent No.1 230 kV with stuck breaker at Vincent followed by loss of Mesa-Vincent No.1 230	P4	stuck breaker	stable	stable	stable	stable	stable	stable	criteria met
69_Whirlwind500kV_3Ph line fault on Midway-Whirlwind 500 kV with stuck breaker at Whirlwind followed by loss of Vincent-	P4	stuck breaker	stable	stable	stable	stable	stable	stable	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	stable	criteria met
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	stable	criteria met
72_Ellis230kV_3Ph line fault on Ellis-Johanna 230 kV with stuck breaker at Ellis followed by loss of Barre-Ellis No.1 230 kV	P4	stuck breaker	stable	stable	stable	stable	stable	stable	criteria met
73_Goodrich230kV_3Ph line fault on Goodrich-Gould 230 kV with stuck breaker at Goodrich followed by loss of Goodrich-Mesa 230 kV	P4	stuck breaker	stable	stable	stable	stable	stable	stable	criteria met
74_Hinson230kV_3Ph line fault on Hinson-Lighthipe 230 kV with stuck breaker at Hinson followed by loss of Hinson-Harborgen 230 kV	P4	stuck breaker	stable	stable	stable	stable	stable	stable	criteria met
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	stable	criteria met

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Transient Stability



Contingency	Category	Category Description	Transient Stability Performance						Potential Mitigation Solutions
			Baseline Scenarios				Sensitivity Scenarios		
			B4: 2024 Spring Off-Peak	B2: 2027 Summer Peak	B3: 2032 Summer Peak ATE	B6: 2032 Spring Off-Peak	S1: 2027 SP High CEC Forecast	S3: 2024 OP Sensitivity	
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-	P4	stuck breaker	stable	stable	stable	stable	stable	stable	criteria met
77_SantaClara230kV_3Ph line fault on Moorpark-Santa Clara No.1 230 kV with stuck breaker at Santa Clara followed by loss of Goleta-	P4	stuck breaker	stable	stable	stable	stable	stable	stable	criteria met
78_SantaClara230kV_3Ph line fault on Goleta-Santa Clara No.2 230 kV with stuck breaker at Santa Clara followed by loss of Moorpark-	P4	stuck breaker	stable	stable	stable	stable	stable	stable	criteria met
79_Santiago230kV_3Ph line fault on SONGS-Santiago No.2 230 kV with stuck breaker at Santiago followed by loss of Ellis-Santiago 230	P4	stuck breaker	stable	stable	stable	stable	stable	stable	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	stable	criteria met
81_Pardee230kV_3Ph line fault on Pardee-Vincent No.2 230 kV with stuck breaker at Pardee followed by loss of Pardee-Pastoria 230 kV	P4	stuck breaker	stable	stable	stable	stable	stable	stable	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	P4	stuck breaker	stable	stable	stable	stable	stable	stable	criteria met
83_Pardee230kV_3Ph line fault on Moor Park-Pardee No.2 230 kV with stuck breaker at Pardee followed by loss of Pardee-Sylmar No.2	P4	stuck breaker	stable	stable	stable	stable	stable	stable	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	P4	stuck breaker	stable	stable	stable	stable	stable	stable	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	P4	stuck breaker	stable	stable	stable	stable	stable	stable	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	stable	criteria met
87_Lewis230kV_3Ph line fault on Lewis-Serrano No.1 230 kV with stuck breaker at Lewis followed by loss of Lewis-Villa Park 230 kV	P4	stuck breaker	stable	stable	stable	stable	stable	stable	criteria met
P5_ab_BD_001_Serrano 500 kv East Bus	P5	Non-Redundant Relay	stable	stable	stable	stable	stable	stable	criteria met
P5_ab_BD_003_Alamitos 220 kv North Bus Sec A	P5	Non-Redundant Relay	stable	stable	stable	stable	stable	stable	criteria met
P5_ab_BD_004_Alamitos 220 kv North Bus Sec B	P5	Non-Redundant Relay	stable	stable	stable	stable	stable	stable	criteria met
P5_ab_BD_007_Barre 220 kv North Bus	P5	Non-Redundant Relay	stable	stable	stable	stable	stable	stable	criteria met
P5_ab_BD_009_Center 220 kv North Bus	P5	Non-Redundant Relay	stable	stable	stable	stable	stable	stable	criteria met
P5_ab_BD_011_Chevmain 220 kv North Bus	P5	Non-Redundant Relay	stable	stable	stable	stable	stable	stable	criteria met
P5_ab_BD_013_Eagle Rock 220 kv North Bus	P5	Non-Redundant Relay	stable	stable	stable	stable	stable	stable	criteria met
P5_ab_BD_015_Hinson 220 kv North Bus	P5	Non-Redundant Relay	stable	stable	stable	stable	stable	stable	criteria met
P5_ab_BD_017_Laguna Bell 220 kv North Bus	P5	Non-Redundant Relay	stable	stable	stable	stable	stable	stable	criteria met
P5_ab_BD_019_Lewis 220 kv North Bus	P5	Non-Redundant Relay	stable	stable	stable	stable	stable	stable	criteria met
P5_ab_BD_021_Lighthipe 220 kv North Bus	P5	Non-Redundant Relay	stable	stable	stable	stable	stable	stable	criteria met
P5_ab_BD_023_Olinda 220 kv East Bus	P5	Non-Redundant Relay	stable	stable	stable	stable	stable	stable	criteria met

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Transient Stability



Contingency	Category	Category Description	Transient Stability Performance						Potential Mitigation Solutions
			Baseline Scenarios				Sensitivity Scenarios		
			B4: 2024 Spring Off-Peak	B2: 2027 Summer Peak	B3: 2032 Summer Peak ATE	B6: 2032 Spring Off-Peak	S1: 2027 SP High CEC Forecast	S3: 2024 OP Sensitivity	
P5_ab_BD_025_Padua 220 kv East Bus	P5	Non-Redundant Relay	stable	stable	stable	stable	stable	stable	criteria met
P5_ab_BD_027_Rancho Vista 220 kv East Bus	P5	Non-Redundant Relay	stable	stable	stable	stable	stable	stable	criteria met
P5_ab_BD_029_Viejo 220 kv North Bus	P5	Non-Redundant Relay	stable	stable	stable	stable	stable	stable	criteria met
106_Antelope500kV_P6.1: 3PH 4 cycle fault at Antelope 500kV w/ loss of Antelope-Whirlwind and Antelope-Vincent No.1	P6	Overlapping singles	stable	stable	stable	stable	stable	stable	criteria met
107_Antelope500kV_P6.1: 3PH 4 cycle fault at Antelope 500kV w/ loss of Antelope-Whirlwind and Antelope-Windhub	P6	Overlapping singles	stable	stable	stable	stable	stable	stable	criteria met
108_Antelope500kV_P6.1: 3PH 4 cycle fault at Antelope 500kV w/ loss of Antelope-Windhub and Antelope-Vincent No.1	P6	Overlapping singles	stable	stable	stable	stable	stable	stable	criteria met
109_Eldorado500kV_P6.1: 3PH 4 cycle fault at Eldorado 500kV w/ loss of Eldorado-Lugo and Eldorado-Mohave	P6	Overlapping singles	stable	stable	stable	stable	stable	stable	criteria met
110_Lugo500kV_P6.1: 3PH 4 cycle fault at Lugo 500kV w/ Eldorado-Lugo and Lugo-Mohave	P6	Overlapping singles	stable	stable	stable	stable	stable	stable	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	Overlapping singles	stable	stable	stable	stable	stable	stable	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	Overlapping singles	stable	stable	stable	stable	stable	stable	criteria met
113_ECO500kV_P6.1: 3PH 4 cycle fault at ECO 500 w/ loss of ECO-Miguel & Ocotillo-Suncrest 500 kV	P6	Overlapping singles	stable	stable	stable	stable	stable	stable	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	Overlapping singles	stable	stable	stable	stable	stable	stable	criteria met
115_MiraLoma500kV_P6.1: 3PH 4 cycle fault at Mira Loma 500kV w/ loss of Mira Loma-Serrano No.2 & Mira Loma 4AA Bank	P6	Overlapping singles	stable	stable	stable	stable	stable	stable	criteria met
116_Mohave500kV_P6.1: 3PH 4 cycle fault at Mohave 500kV w/ loss of Eldorado-Mohave and Lugo-Mohave	P6	Overlapping singles	Diverged	Diverged	Diverged	Diverged	Diverged	Diverged	Exiting NVE RAS to protect its 69 kV system
117_RanchoVista500kV_P6.1: 3PH 4 cycle fault at Rancho Vista 500kV w/ loss of Lugo-Rancho Vista & Rancho Vista-Serrano No.1	P6	Overlapping singles	stable	stable	stable	stable	stable	stable	criteria met
118_RanchoVista500kV_P6.1: 3PH 4 cycle fault at Rancho Vista 500kV w/ loss of Rancho Vista 3AA & 4AA Banks	P6	Overlapping singles	stable	stable	stable	stable	stable	stable	criteria met
119_Serrano500kV_P6.1: 3PH 4 cycle fault at Serrano 500kV w/ loss of Alberhill-Serrano & Rancho Vista-Serrano No.1	P6	Overlapping singles	stable	stable	stable	stable	stable	stable	criteria met
120_Serrano500kV_P6.1: 3PH 4 cycle fault at Serrano 500kV w/ loss of Alberhill-Serrano & Mira Loma-Serrano No.2	P6	Overlapping singles	stable	stable	stable	stable	stable	stable	criteria met
121_Serrano500kV_P6.1: 3PH 4 cycle fault at Serrano 500kV w/ loss of Serrano 2AA & 3AA Banks	P6	Overlapping singles	stable	stable	stable	stable	stable	stable	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	Overlapping singles	stable	stable	stable	stable	stable	stable	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	Overlapping singles	stable	stable	stable	stable	stable	stable	criteria met
124_Vincent500kV_P6.1: 3PH 4 cycle fault at Vincent 500kV w/ loss of Lugo-Vincent No.1 & No.2	P6	Overlapping singles	stable	stable	stable	stable	stable	stable	criteria met
125_Whirlwind500kV_P6.1: 3PH 4 cycle fault at Whirlwind 500kV w/ loss of Midway-Whirlwind No.3 & Windhub-Whirlwind	P6	Overlapping singles	stable	stable	stable	stable	stable	stable	criteria met
126_Whirlwind500kV_P6.1: 3PH 4 cycle fault at Whirlwind 500kV w/ loss of Whirlwind-Windhub & Antelope-Whirlwind	P6	Overlapping singles	stable	stable	stable	stable	stable	stable	criteria met

Study Area: Southern California Bulk

Transient Stability



Contingency	Category	Category Description	Transient Stability Performance						Potential Mitigation Solutions
			Baseline Scenarios				Sensitivity Scenarios		
			B4: 2024 Spring Off-Peak	B2: 2027 Summer Peak	B3: 2032 Summer Peak ATE	B6: 2032 Spring Off-Peak	S1: 2027 SP High CEC Forecast	S3: 2024 OP Sensitivity	
127_Mesa500kV_P6.1: 3PH 4 cycle fault at Mesa 500kV w/ loss of Mesa-Vincent 500kV & Mesa-Miraloma	P6	Overlapping singles	stable	stable	stable	stable	stable	stable	criteria met
200_Antelope500kV_P6.1: 3PH 4 cycle fault at Antelope 500kV w/ loss of Windhub-Whirlwind and Antelope-Windhub	P6	Overlapping singles	stable	stable	stable	stable	stable	stable	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	stable	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	stable	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	stable	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	stable	criteria met
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	stable	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	stable	criteria met
134_Mesa230kV_P7.1: 1PH 4 cycle fault at Mesa 230kV w/ loss of Mesa-Vincent No.1 230kV & Mesa-Goodrich	P7	common structure	stable	stable	stable	stable	stable	stable	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	stable	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	stable	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	stable	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	stable	criteria met
139_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	stable	criteria met
140_Mesa230kV_P7.1 1PH 4 cycle fault at Mesa 230kV w/Mesa-Redondo 230 kV & Laguna Bell-Mesa No.1 230 kV	P7	common structure	stable	stable	stable	stable	stable	stable	criteria met
141_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	stable	criteria met
142_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	stable	criteria met
143_Mesa230kV_P7.1 1PH 4 cycle fault at Mesa 230kV w/Goodrich-Gould 230 kV & Mesa-Vincent No.1 230 kV	P7	common structure	stable	stable	stable	stable	stable	stable	criteria met
144_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	stable	criteria met
145_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	stable	criteria met
146_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	stable	criteria met
147_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	stable	criteria met
148_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	stable	criteria met
149_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	stable	criteria met

Study Area: Southern California Bulk

Transient Stability



Contingency	Category	Category Description	Transient Stability Performance						Potential Mitigation Solutions
			Baseline Scenarios				Sensitivity Scenarios		
			B4: 2024 Spring Off-Peak	B2: 2027 Summer Peak	B3: 2032 Summer Peak ATE	B6: 2032 Spring Off-Peak	S1: 2027 SP High CEC Forecast	S3: 2024 OP Sensitivity	
150_Serrano230kV_P7.1: 1PH 4 cycle fault at Serrano 230kV w/ Lewis-Serrano No.1 & No.2 230 kV	P7	common structure	stable	stable	stable	stable	stable	stable	criteria met

Study Area: Southern California Bulk



Single Contingency Load Drop

Worst Contingency	Category	Category Description	Amount of Load Drop (MW)										Potential Mitigation Solutions
			B1: 2024 Summer Peak	2027 Summer Peak	B3: 2032 Summer Peak ATE	B4: 2024 Spring Off-Peak	B5: 2027 Spring Off-Peak	B6: 2032 Spring Light Load	S1: 2027 SP High CEC Forecast	S2: 2024 SP Heavy Renewable & Min Gas Gen	S3: 2024 OP Sensitivity	S4: 2035 SP ATE	

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

Study Area: **Southern California Bulk**

Single Source Substation with more than 100 MW Load



Substation	Load Served (MW)										Potential Mitigation Solutions
	B1: 2024 Summer Peak	2027 Summer Peak	B3: 2032 Summer Peak ATE	B4: 2024 Spring Off-Peak	B5: 2027 Spring Off-Peak	B6: 2032 Spring Light Load	S1: 2027 SP High CEC Forecast	S2: 2024 SP Heavy Renewable & Min Gas Gen	S3: 2024 OP Sensitivity	S4: 2035 SP ATE	

No single source substation with more than 100 MW