

APPENDIX A: Reliability Assessment Results


Study Area: PG&E Transient Study - Peak (2016)

ID	Worst Contingency	Undamped Oscillations	unintended loss of load or generation	ISO Proposed Mitigation/Comments
N/A	CptJ_Olinda_500_slo	none	none	none
N/A	Diablo-g1	none	none	none
N/A	Diablo-g2	none	none	none
N/A	Diablo-Midway 500-dlo	none	none	none
N/A	Gates-Gregg, Gates-Mc Call 230 dlo	none	tripped Gates 115 kV load at 1.3 sec to 7% for under-frequency	frequency violations at Gates 115 kV, possible modeling error
N/A	Gates-Midway-slo-ns	none	none	none
N/A	Gates_Diablo_slo	none	none	none
N/A	Gates_tx	none	none	none
N/A	LosBanos-Gates#1-slo	none	none	none
N/A	LosBanos-Gates#3-slo	none	none	none
N/A	LosBanos-Midway-slo	none	none	none
N/A	LosBanosNorth-dlo	none	none	none
N/A	LosBanosSouth-dlo-no RAS	none	none	none
N/A	LosBanos_tx_1	none	none	none

N/A	Malin-RndMt-dlo-ns-2400	none	none	none
N/A	Malin-RoundMt-1-slo	none	none	none
N/A	Malin-RoundMt-2-slo	none	none	none
N/A	Metcalf-xfmer-stuck brk-ns	none	none	none
N/A	Midway-Vincent-dlo-no_Ras	Co-gen Captain (4.3 MW) lost synchronism	none	none
N/A	Midway-Vincent-dlo-Ras4000	none	none	none
N/A	Midway_Diablo_slo	none	none	none
N/A	Midway_tx11	none	none	none
N/A	Midway_tx12	none	none	none
N/A	Midway_tx13	none	none	none
N/A	Midway North no RAS	Co-gen Captain (4.3 MW) lost synchronism	none	none
N/A	Midway_Vincent1-slo	none	none	none
N/A	Midway_Vincent2_slo	none	none	none
N/A	Midway_Vincent3_slo	none	none	none
N/A	MossLanding-Metcalf-slo	none	none	none
N/A	Mosslanding-tx	none	none	none
N/A	Olinda-Tracy-slo-ns	none	none	none
N/A	Olinda_tx_1	none	none	none
N/A	PaloVerde-g2-OL-MA-RAS_1	none	none	none
N/A	PDCI-NS-bipolar-2700 RAS	none	none	none

N/A	PDCI-NS-mono_noRAS	none	none	none
N/A	RoundMt-TableMt-1-slo-ns	none	none	none
N/A	RoundMt-TableMt-2-slo-ns	none	none	none
N/A	RoundMt-TableMt-dlo-2400 RAS	none	none	none
N/A	RoundMt_tx_1	none	none	none
N/A	SONGS-g2	none	none	none
N/A	TableMtSouth-dlo-2100 RAS	none	none	none
N/A	TableMt_Tesla_ns_slo	none	none	none
N/A	TableMt_tx_1, trip Hyatt and Thermalito	none	none	frequency violations at Honey Lake, Richmond, SPI. Don't trip Feather River gen
N/A	TableMt_tx_noRAS	none	none	none
N/A	TableMt_Vaca_ns_slo	none	none	none
N/A	Tesla-Metcalf-slo	none	none	none
N/A	Tesla-Metcalf-slo_DEC	none	none	none
N/A	Tesla-tracy-slo	none	none	none
N/A	TeslaNorth-dlo-no RAS	none	none	none
N/A	TeslaNorth-dlo-ns-600	none	none	none
N/A	Tesla_Losbanos_slo_1	none	none	none
N/A	Tesla_tx2_1	none	none	none
N/A	Tesla_tx4			
	Tesla_tx6	none	none	none
N/A	TracySouth-dlo-ns_no_RAS	Co-gen Captain (4.3 MW) lost synchronism	none	none
N/A	Tracy_LosBanos_slo	none	none	none

N/A	Tracy_tx1_1	none	none	none
N/A	Tracy_tx2_1	none	none	none
N/A	VacaDixon_Tesla_ns_slo	none	none	none
N/A	Vaca_tx_1	none	none	none
N/A	Gates 500 kV stuck breaker 1phase fault	none	none	none
N/A	Los Banos 500 kV stuck breaker 1phase fault	none	none	none
N/A	Midway 500 kV stuck breaker 1phase fault	none	none	none
N/A	Round Mt 500 kV stuck breaker 1phase fault	none	none	none
N/A	Table Mt 500 kV stuck breaker 1phase fault	none	none	none
N/A	Tesla 500 kV stuck breaker 1phase fault	none	none	none
N/A	Vaca Dix 500 kV stuck breaker 1phase fault	none	none	none
N/A	Loss of Larkin substation	none	none	none
N/A	NE/SE separation	no cascading outages	N/A	none
N/A	North CA/South CA separation	no cascading outages	N/A	none

Study Area: PGE Transient Study - Peak (2016)**Frequency violations****Fault at Gates 230 kV, double outage Gates-Gregg, Gates-Mc Call 230**

AREA	BUS NAME	BUS KV	TYPE	Cycles	From	To
30	GATES	115	fbul	11.6	1.017	1.21

Table Mountain 500/230 kV transformer fault and outage with tripping Hyatt and Thermalito generation

AREA	BUS NAME	BUS KV	TYPE	Cycles	From	To
30	RICHMOND	60	fbul	7.7	1.54	1.669
30	MEADOWVW	60	fbul	7.7	1.54	1.669
30	MILLWOOD	60	fbul	7.7	1.54	1.669
30	JELD-WEN	60	fbul	7.7	1.54	1.669
30	CHESTNUT	14.4	fbul	7.7	1.54	1.669
30	WIN&AMDE	9.11	fbug	9	1.54	1.69
30	JELD-WN	9.11	fbug	7.7	1.54	1.669
30	HONEYLKE	9.11	fbug	11.6		
		2.4	fbug	7.7	1.54	1.669

No violations if the generation is not tripped


Study Area: PG&E Transient Study - Off-Peak (2016)

All contingencies had poorly damped oscillations at Helms pumps
need to adjust PSS

Dynamic Stability Study

ID	Worst Contingency	Undamped Oscillations	unintended loss of load or generation	ISO Proposed Mitigation/Comments
N/A	CptJ_Olinda_500_slo	frequency oscillations in BC (AVO 138), possible modeling errors	none	no violations
N/A	Diablo-g1	none	none	no violations
N/A	Diablo-g2	none	WYG 1_G gen in PACE went out of step at 19.5 sec, possible modeling error	no violations
N/A	Diablo-Midway 500-dlo	none	none	no violations
N/A	Gates-Gregg, Gates-Mc Call 230 dlo	none	tripped Gates 115 kV load at 1.3 sec to 7% for under-frequency	frequency violations at Gates 115 kV, possible modeling error
N/A	Gates-Midway-slo-ns	poorly damped voltage oscillations on 70 kV around Gates and frequency on Manchester, Bullard 115 kV	none	no violations
N/A	Gates_Diablo_slo	poorly damped voltage oscillations on 70 kV around Gates and frequency on Manchester, Bullard 115 kV	none	no violations
N/A	Gates_tx	poorly damped voltage oscillations on 70 kV around Gates and frequency on Manchester, Bullard 115 kV	none	no violations
N/A	LosBanos-Gates#1-slo	poorly damped voltage oscillations around Los Banos	none	no violations
N/A	LosBanos-Gates#3-slo	poorly damped voltage oscillations around Los Banos	none	no violations

N/A	LosBanos-Midway-slo	none	none	RPS 65 at Midway high frequency deviation up (solar PV, user-written model)
N/A	LosBanosNorth-dlo	poorly damped voltage oscillations around Los Banos	none	no violations
N/A	LosBanosSouth-dlo- RAS	frequency oscillations at El Cerrito	frequency collapsed at El Cerrito, Catalyst, Chili bar, Hillside, Sri Int, Gen Mill, SJ SCL gen went out-of-step	frequency violations at El Cerrito, don't trip El Cerrito load with RAS
N/A	LosBanosSouth-dlo-RAS 3855 MW 693 MW load drop	none	Chili bar, Hillside, Gen Mill, SJ SCL, Catalist gen went out-of-step	small gen may be tripped, frequency oscillations on Chili Bar
N/A	LosBanos_tx_1	poorly damped voltage oscillations around Los Banos	none	no violations
N/A	Malin-RndMt-dlo-no RAS	frequency oscillations in BC hydro	none	frequency violations in BC Hydro, possible modeling errors
N/A	Malin-RoundMt-1-slo	none	none	no violations
N/A	Malin-RoundMt-2-slo	none	none	no violations
N/A	Metcalf-xfmer-stuck brk-ns	poorly damped oscillations at Helms pumps	generators tripped for undervoltage: at bus 32188 (RPS 20 24.7 MW) t = 1.14, at bus 32177 (RPS 48 108 MW) at t = 1.16, Cardinal gen went out of step	both tripped gen are wind type 2 at Birds Landing
N/A	Midway-Vincent-dlo-no_Ras	poorly damped voltage oscillations around Midway	none	RPS 65 at Midway high frequency deviation up (solar PV, user-written model), also at RPS 111 at Whirlwind and RPS 31 B at Midway-Morro line, solar PV user-written models
N/A	Midway_Diablo_slo	none	none	RPS 65 at Midway high frequency deviation up (solar PV, user-written model)
N/A	Midway_tx11	none	none	RPS 65 at Midway high frequency deviation up (solar PV, user-written model)
N/A	Midway_tx12	none	none	RPS 65 at Midway high frequency deviation up (solar PV, user-written model)
N/A	Midway_tx13	none	none	RPS 65 at Midway high frequency deviation up (solar PV, user-written model)
N/A	Midway North RAS	none	WYG 1_G gen in PACE went out of step at 19.5 sec, possible modeling error	RPS 65 at Midway high frequency deviation up (solar PV, user-written model)

N/A	Midway_Vincent1-slo	poorly damped voltage oscillations around Midway	none	RPS 65 at Midway high frequency deviation up (solar PV, user-written model)
N/A	Midway_Vincent2-slo	poorly damped voltage oscillations around Midway	none	RPS 65 at Midway high frequency deviation up (solar PV, user-written model)
N/A	Midway_Vincent3-slo	none	none	RPS 65 at Midway high frequency deviation up (solar PV, user-written model)
N/A	MossLanding-Metcalf-slo	none	none	no violations
N/A	Mosslanding-tx	none	none	no violations
N/A	Olinda-Tracy-slo-ns	none	none	no violations
N/A	Olinda_tx_1	none	none	no violations
N/A	PaloVerde-g2-OL-MA-RAS_1	none	none	no violations
N/A	PDCI-NS-bipolar-no RAS	none	none	no violations
N/A	PDCI-NS-mono_noRAS	none	none	no violations
N/A	RoundMt-TableMt-1-slo-ns	none	none	no violations
N/A	RoundMt-TableMt-2-slo-ns	none	none	no violations
N/A	RoundMt-TableMt-dlo-2400 RAS	none	none	no violations
N/A	RoundMt_tx_1	none	none	no violations
N/A	SONGS-g2	none	none	no violations
N/A	TableMtSouth-dlo-2100 RAS	none	none	no violations
N/A	TableMt_Tesla_ns_slo	none	none	no violations
N/A	TableMt_tx_1, trip Hyatt and Thermalito	none	none	no violations
N/A	TableMt_tx_noRAS	none	none	no violations
N/A	TableMt_Vaca_ns_slo	none	none	no violations
N/A	Tesla-Metcalf-slo	none	none	no violations

N/A	Tesla-Metcalf-slo_DEC	none	none	no violations
N/A	Tesla-tracy-slo	none	none	no violations
N/A	TeslaNorth-dlo-no RAS	none	none	no violations
N/A	TeslaNorth-dlo-ns-600	none	none	no violations
N/A	Tesla_Losbanos_slo_1	none	none	no violations
N/A	Tesla_tx2_1	none	none	no violations
N/A	Tesla_tx4	none	none	no violations
N/A	Tesla_tx6	none	none	no violations
N/A	TracySouth-dlo-ns_no_RAS	none	none	no violations
N/A	Tracy_LosBanos_slo	none	none	no violations
N/A	Tracy_tx1_1	none	none	no violations
N/A	Tracy_tx2_1	none	none	no violations
N/A	VacaDixon_Tesla_ns_slo	none	none	no violations
N/A	Vaca_tx_1	none	none	no violations
N/A	Gates 500 kV stuck breaker 1phase fault	none	none	no violations
N/A	Los Banos 500 kV stuck breaker 1phase fault	none	none	no violations
N/A	Midway 500 kV stuck breaker 1phase fault	none	none	no violations
N/A	Round Mt 500 kV stuck breaker 1phase fault	none	none	no violations
N/A	Table Mt 500 kV stuck breaker 1phase fault	none	none	no violations
N/A	Tesla 500 kV stuck breaker 1phase fault	none	none	no violations
N/A	Vaca Dix 500 kV stuck breaker 1phase fault	none	none	no violations
N/A	Loss of Larkin substation	none	none	no violations

Study Area: PG&E Transient Study - Off-Peak (2016)

Frequency violations

Fault at Gates 230 kV, double outage Gates-Gregg, Gates-Mc Call 230 less than 59.6 Hz

AREA	BUS NAME	BUS KV	TYPE	Cycles	From	To
30	GATES	115	fbul	11.6	1.017	1.21
30	GUERNSEY	70	fbul	6.4	1.188	1.295
30	ARMSTRNG	70	fbul	9	1.167	1.317
30	RESERVE	70	fbul	9	1.167	1.317
30	AMSTG SW	70	fbus	9	1.167	1.317
30	GWF-PWR.	13.8	fbug	9	1.167	1.317

For a double outage violations only at Gates 115 kV 9 cycles

500 kV Double outage south of Los Banos (LB-Gates, LB-Midway)

FREQUENCY LESS THAN 59.6

AREA	BUS NAME	BUS KV	TYPE	Cycles	From	To
30	ELCRTJ1	115	fbus	11.6	19.805	19.998
30	EL CRRTO	115	fbul	11.7	19.805	20
30	LOMPOCW1	34.5	fbug	6.4	1.676	1.783
30	LOMPOCW2	34.5	fbug	6.4	1.676	1.783

Frequency collapsed at El Cerrito to 39.9 HZ at 19.8 sec

500 kV Double outage Malin-Round Mtn # 1 and 2

LOWEST FREQUENCY

				MaxDig	@time	
50	DFD 138	138	fbul	-32.11	19.805	
50	BAR 138	138	fbus	-38.41	19.719	
50	HYC 4G1	4.16	fbug	-5.608	19.998	

FREQUENCY LESS THAN 59.6

AREA	BUS NAME	BUS KV	TYPE	Cycles	From	To
50	HFY 138	138	fbus	16.7	19.269	19.548

Possible modeling errors in BC Hydro


Study Area: PG&E Post-Transient Study - Peak (2021)
Dynamic Stability Results

ID	Worst Contingency	Undamped Oscillations	unintended loss of load or generation	ISO Proposed Mitigation/Comments
N/A	CptJ_Olinda_500_slo	none	none	no violations
N/A	Diablo-g1	none	none	no violations
N/A	Diablo-g2	in IID: Leathers, Delranch, Jelmore, Salt Sea	none	no violations
N/A	Diablo-Midway 500-dlo	none	none	no violations
N/A	Gates-Gregg, Gates-Mc Call 230 dlo	none	none	frequency violations at Gates 115 kV, possible modeling error
N/A	Gates-Midway-slo-ns	none	none	no violations
N/A	Gates_Diablo_slo	none	none	no violations
N/A	Gates_tx	none	none	no violations
N/A	LosBanos-Gates#1-slo	none	none	no violations
N/A	LosBanos-Gates#3-slo	none	none	no violations
N/A	LosBanos-Midway-slo	none	none	no violations
N/A	LosBanosNorth-dlo	none	none	no violations
N/A	LosBanosSouth-dlo-no RAS	none	none	no violations

N/A	LosBanos_tx_1	none	none	no violations
N/A	Malin-RndMt-dlo-ns-2400	in IID: Leathers, Delranch, Jelmore, Salt Sea	none	no violations
N/A	Malin-RoundMt-1-slo	none	none	no violations
N/A	Malin-RoundMt-2-slo	none	none	no violations
N/A	Metcalf-xfmer-stuck brk-ns	none	none	no violations
N/A	Midway-Vincent-dlo-no_Ras	none	tripped Tehachapi eastwind #1 and 2 for undervoltage (40. 2 MW) at 1.5 sec	no violations
N/A	Midway-Vincent-dlo-Ras4000	none	tripped Tehachapi eastwind #1 and 2 for undervoltage (40. 2 MW) at 1.5 sec	no violations
N/A	Midway_Diablo_slo	none	none	no violations
N/A	Midway_tx11	none	none	no violations
N/A	Midway_tx12	none	none	no violations
N/A	Midway_tx13	none	none	no violations
N/A	Midway North no RAS	none	none	no violations
N/A	Midway_Vincent1-slo	none	none	no violations
N/A	Midway_Vincent2_slo	none	none	no violations
N/A	Midway_Vincent3_slo	none	none	no violations
N/A	MossLanding-Metcalf-slo	none	none	no violations
N/A	Mosslanding-tx	none	none	no violations
N/A	Olinda-Tracy-slo-ns	none	none	no violations
N/A	Olinda_tx_1	none	none	no violations
N/A	PaloVerde-g2-OL-MA-RAS_1	in IID: Leathers, Delranch, Jelmore, Salt Sea	none	no violations

N/A	PDCI-NS-bipolar-2700 RAS	in IID: Leathers, Delranch, Jelmore, Salt Sea	tripped Tehachapi eastwind #1 and 2 for undervoltage (40. 2 MW) at 1.9 sec	no violations
N/A	PDCI-NS-mono_noRAS	in IID: Leathers, Delranch, Jelmore, Salt Sea	none	no violations
N/A	RoundMt-TableMt-1-slo-ns	none	none	no violations
N/A	RoundMt-TableMt-2-slo-ns	none	none	no violations
N/A	RoundMt-TableMt-dlo-2400 RAS	in IID: Leathers, Delranch, Jelmore, Salt Sea	none	no violations
N/A	RoundMt_tx_1	none	none	no violations
N/A	SONGS-g2	in IID: Leathers, Delranch, Jelmore, Salt Sea	tripped Tehachapi eastwind #1 and 2 for undervoltage (40. 2 MW) at 2.5 sec	no violations
N/A	TableMtSouth-dlo-2100 RAS	in IID: Leathers, Delranch, Jelmore, Salt Sea	none	no violations
N/A	TableMt_Tesla_ns_slo	none	none	no violations
N/A	TableMt_tx_1, trip Hyatt and Thermalito	in IID: Leathers, Delranch, Jelmore, Salt Sea	none	frequency violations in N. Valley-Lassen area
N/A	TableMt_tx_noRAS	in IID: Leathers, Delranch, Jelmore, Salt Sea	none	no violations
N/A	TableMt_Vaca_ns_slo	none	none	no violations
N/A	Tesla-Metcalf-slo	none	none	no violations
N/A	Tesla-Metcalf-slo_DEC	in IID: Leathers, Delranch, Jelmore, Salt Sea	none	no violations
N/A	Tesla-tracy-slo	none	none	no violations
N/A	TeslaNorth-dlo-no RAS	none	none	no violations
N/A	TeslaNorth-dlo-ns-600	in IID: Leathers, Delranch, Jelmore, Salt Sea	none	no violations
N/A	Tesla_Losbanos_slo_1	none	none	no violations
N/A	Tesla_tx2_1			
	Tesla_tx4	none	none	no violations
N/A	Tesla_tx6	none	none	no violations

N/A	TracySouth-dlo-ns_no_RAS	none	none	no violations
N/A	Tracy_LosBanos_slo	none	none	no violations
N/A	Tracy_tx1_1	none	none	no violations
N/A	Tracy_tx2_1	none	none	no violations
N/A	VacaDixon_Tesla_ns_slo	none	none	no violations
N/A	Vaca_tx_1	none	none	no violations
N/A	Gates 500 kV stuck breaker 1phase fault	none	none	no violations
N/A	Los Banos 500 kV stuck breaker 1phase fault	none	none	no violations
N/A	Midway 500 kV stuck breaker 1phase fault	none	none	no violations
N/A	Round Mt 500 kV stuck breaker 1phase fault	none	none	no violations
N/A	Table Mt 500 kV stuck breaker 1phase fault	none	none	no violations
N/A	Tesla 500 kV stuck breaker 1phase fault	none	none	no violations
N/A	Vaca Dix 500 kV stuck breaker 1phase fault	none	none	no violations
N/A	Loss of Larkin substation	none	none	no violations

Study Area: PG&E Transient Study - Peak (2021)**Frequency violations**

Table Mountain 500/230 kV transformer fault and outage with tripping Hyatt and Thermalito generation

AREA	BUS NAME	BUS KV	TYPE	CYCLES	FROM	TO
30	WESTWOOD	60	fbus	9	1.519	1.669
30	ULTR WSD	60	fbus	9	1.519	1.669
30	CHESTER	60	fbul	7.7	1.519	1.648
30	HMLTN BR	60	fbul	7.7	1.519	1.648
30	HAMIL.BR	9.11	fbug	7.7	1.519	1.648
30	PE.WWOOD	9.11	fbug	9	1.519	1.669
30	COLLINS	9.11	fbug	7.7	1.519	1.648
30	RICHMOND					1.669
30	MEADOWVW	60	fbul	10.3	1.498	1.669
30	MILLWOOD	60	fbul	11.6	1.498	1.69
30	WIN&AMED	60	fbus	11.6	1.498	1.69
30	JELD-WEN	60	fbul	11.6	1.498	1.69
30	HONEYLAK	60	fbus	12.9	1.476	1.69
30	CHESTNUT	14.4	fbul	10.3	1.498	1.669
30	WIN&AMDE	9.11	fbug	11.6	1.498	1.69
30	JELD-WN	9.11	fbug	11.6	1.498	1.69
30	HONEYLKE	9.11	fbug	14.1	1.476	1.712
30	SPI	2.4	fbug	11.6	1.498	1.69

no violations if generation is not tripped

Gates-Gregg, Gates-Mc Call 230 kV double outage
LOWEST FREQUENCY

AREA	BUS NAME	BUS KV	TYPE	FREQ	TIME
30	GATES	115	fbul	56.18	1.1
30	GATES 1M	230	fbus	56.182	1.1
30	LOMPOCW1	34.5	fbug	59.52	2.431

FREQUENCY LESS THAN 59.6

AREA	BUS NAME	BUS KV	TYPE	CYCLES	FROM	TO
30	GATES 1M	230	fbus	11.6	1.017	1.21
30	GATES	115	fbus	11.6	1.017	1.21
30	GATES 1T	13.2	fbus	11.6	1.017	1.21
30	LOMPOCW1	34.5	fbug	7.7	2.388	2.517
30	LOMPOCW2	34.5	fbug	7.7	2.388	2.517


Study Area: PG&E Post-Transient Study - Peak (2016)
Thermal Overload

ID	Contingency	Overloaded facility	Percent emergency loading (normal for base case)	ISO Proposed Mitigation/Comments
N/A	Captain Jack-Olinda 500kV	none	N/A	no violations
N/A	Diablo-g1	none	N/A	no violations
N/A	Diablo-g2	none	N/A	no violations
N/A	Diablo-Midway 500-dlo	none	N/A	no violations
N/A	Gates-Gregg, Gates-Mc Call 230 dlo	none	N/A	no violations
N/A	Gates-Midway-slo-ns	none	N/A	no violations
N/A	Gates_Diablo_slo	none	N/A	no violations
N/A	Gates_tx	none	N/A	no violations
N/A	LosBanos-Gates#1-slo	none	N/A	no violations
N/A	LosBanos-Gates#3-slo	none	N/A	no violations
N/A	LosBanos-Midway-slo	none	N/A	no violations
N/A	LosBanosNorth-dlo- no RAS	none	N/A	no violations
N/A	LosBanosSouth-dlo-no RAS	none	N/A	no violations
N/A	LosBanos_tx_1	none	N/A	no violations

N/A	Malin-RndMt-dlo-ns-2400	none	N/A	no violations
N/A	Malin-RoundMt-1-slo	none	N/A	no violations, Malin-Round Mt # 2 may overload with higher N.Cal hydro or COI, need to bypass series caps
N/A	Malin-RoundMt-2-slo	none	N/A	no violations
N/A	Metcalf-xfmer-stuck brk-ns	none	N/A	no violations
N/A	Midway North dlo, no RAS	none	N/A	no violations
N/A	Midway-Vincent-dlo-Ras4000	none	N/A	no violations
N/A	Midway_Diablo_slo	none	N/A	no violations
N/A	Midway_tx11	none	N/A	no violations
N/A	Midway_tx12	none	N/A	no violations
N/A	Midway_tx13	none	N/A	no violations
N/A	Midway_Vincent1-slo	none	N/A	no violations
N/A	Midway_Vincent2_slo	none	N/A	no violations
N/A	Midway_Vincent3_slo	none	N/A	no violations
N/A	MossLanding-Metcalf-slo	none	N/A	no violations
N/A	Mosslanding-tx	none	N/A	no violations
N/A	Olinda-Tracy-slo-ns	none	N/A	no violations
N/A	Olinda_tx_1	none	N/A	no violations
N/A	PaloVerde-g2-OL-MA-RAS_1	none	N/A	no violations
N/A	PDCI-NS-bipolar-2700 RAS	none	N/A	voltage deviations in Northwest to higher voltage, need to take off shunts at Celilo

N/A	PDCI-NS-mono_noRAS	none	N/A	no violations
N/A	RoundMt-TableMt-1-slo-ns	none	N/A	may overload with higher N.Cal hydro or COI, need to bypass series caps
N/A	RoundMt-TableMt-2-slo-ns	none	N/A	no violations, parallel Round Mt-Table Mt line may overload with higher N.Cal hydro or COI, need to bypass series caps
N/A	RoundMt-TableMt-dlo-2400 RAS	Delevan-Cortina 230 kV	96.7%	no violations. If CDWR pumps not tripped, loading is 100.8%, need to reduce Colusa generation to mitigate
N/A	RoundMt_tx_1	none	N/A	no violations
N/A	SONGS-g2		refer to SCE main results	refer to SCE main results
N/A	TableMtSouth-dlo-2100 RAS	Table Mtn 500/230 kV bank	98.6%	no violations, revise SPS to trip less Feather River generation in the future. If CDWR pumps not tripped, loading is 101.9% and loading of Delevan-Cortina 230 kV 101.6%. Re-rate Table Mtn 500/230 kV bank
N/A	TableMtSouth-dlo-2400 RAS, no CDWR pumps tripped	Table Mtn 500/230 kV bank	103.2%	revise SPS to trip Colusa generation instead of Feather River (approximately 100 MW). Re-rate Table Mtn bank
N/A		Delevan-Cortina 230 kV	100.9%	
N/A	TableMt_Tesla_ns_slo	none	N/A	no violations
N/A	TableMt_tx_1, trip Hyatt and Thermalito	none	N/A	no violations
N/A	TableMt_tx_noRAS	none	N/A	no violations
N/A	TableMt_Vaca_ns_slo	none	N/A	no violations
N/A	Tesla-Metcalf-slo	none	N/A	no violations
N/A	Tesla-Metcalf-slo_DEC	none	N/A	no violations
N/A	Tesla-tracy-slo	none	N/A	no violations
N/A	TeslaNorth-dlo-ns-600	none	N/A	no violations
N/A	Tesla_Losbanos_slo_1	none	N/A	no violations
N/A	Tesla_tx2_1	none	N/A	no violations
N/A	Tesla_tx4	none	N/A	no violations
N/A	Tesla_tx6	none	N/A	no violations

N/A	TracySouth-dlo-ns_no_RAS	none	N/A	no violations
N/A	Tracy_LosBanos_slo	none	N/A	no violations
N/A	Tracy_tx1_1	none	N/A	no violations
N/A	Tracy_tx2_1	none	N/A	no violations
N/A	VacaDixon_Tesla_ns_slo	none	N/A	no violations
N/A	Vaca_tx_1	none	N/A	no violations
N/A	Gates 500 kV stuck breaker 1phase fault	none	N/A	no violations
N/A	Los Banos 500 kV stuck breaker 1phase fault	none	N/A	no violations
N/A	Midway 500 kV stuck breaker 1phase fault	none	N/A	no violations
N/A	Round Mt 500 kV stuck breaker 1phase fault	none	N/A	no violations
N/A	Table Mt 500 kV stuck breaker 1phase fault	none	N/A	no violations
N/A	Tesla 500 kV stuck breaker 1phase fault	none	N/A	no violations
N/A	Vaca Dix 500 kV stuck breaker 1phase fault	none	N/A	no violations
N/A	Loss of Larkin substation	none	N/A	no violations
N/A	NE/SE separation	no cascading outages	N/A	multiple overloads, need to trip load and generation
N/A	North CA/South CA separation	no cascading outages	N/A	multiple overloads, need to trip load and generation

Study Area: PG&E Post-Transient Study - Peak (2016)**VOLTAGE DIP**

PDCI bipolar outage 2700 MW generation drop in NW

negative deviation, voltage goes up

Bus Name	Voltage Dip	Area
CHENOWTH 115.0	-5.3	area 40
CHENOWTH 230.0	-6.0	area 40
DEMOSS 69.0	-5.1	area 40
FOSSIL 69.0	-5.1	area 40
KINZUA 69.0	-5.2	area 40
MUD CR T 69.0	-5.0	area 40
PARKDALE 230.0	-5.0	area 40
SERVICE 69.0	-5.4	area 40
SPEARFSH 115.0	-5.4	area 40
THE DALS 115.0	-5.1	area 40
ENDERSBY 69.0	-5.5	area 40
PINE HOL 69.0	-5.5	area 40
CELILO3 230.0	-9.3	area 40
CELILO4 230.0	-9.3	area 40
BIGEDDY1 230.0	-6.3	area 40
BIGEDDY2 230.0	-6.3	area 40
BIGEDDY3 230.0	-6.5	area 40
TDA 2122 13.8	-6.3	area 40
TDA PH3 230.0	-6.1	area 40
TDA PH4 230.0	-6.1	area 40

TDA PH5 230.0	-6.3	area 40
TDA PH6 230.0	-6.3	area 40
ARLINGTON 69.0	-5.2	area 40
BLALOK 69.0	-5.2	area 40
GORDNHOL 69.0	-5.1	area 40
WILLOCRK 69.0	-5.2	area 40
2ND ST 115.0	-5.1	area 40
3MILE TP 115.0	-5.0	area 40
CHEIGHTS 115.0	-5.0	area 40
DISCV NW 115.0	-5.3	area 40
DUFUR 69.0	-5.5	area 40
LYLE 115.0	-5.4	area 40
THREEMIL 115.0	-5.0	area 40
THREEMIL 69.0	-5.4	area 40
TYGH VSW 69.0	-5.5	area 40
KLONDIKE 69.0	-5.1	area 40


Study Area: PG&E Post-Transient Study - Off-Peak (2016)
Thermal Overload

ID	Contingency	Overloaded facility	Percent emergency loading (normal for base case)	ISO Proposed Mitigation/Comments
N/A	BASE CASE	no overloads	N/A	N/A
N/A	CptJ_Olinda_500_slo	none	N/A	N/A
N/A	Diablo-g1	none	N/A	N/A
N/A	Diablo-g2	none	N/A	N/A
N/A	Diablo-Midway 500-dlo	none	N/A	N/A
N/A	Gates-Gregg, Gates-Mc Call 230 dlo, trip 2 Helms	Panoche-Gates 230 kV # 1 and 2	121.0%	reconductor Panoche-Gates 230 kV # 1 and 2
N/A	Gates-Gregg, Gates-Mc Call 230 dlo, trip 1 Helms	Panoche-Gates 230 kV # 1 and 2	132.1%	reconductor Panoche-Gates, trip both Helms pump for this outage
N/A		Kearney-Herndon 230 kV	118.7%	
N/A	Gates-Midway-slo-ns	Gates-Midway 230 # 1	97.9%	N/A
N/A	Gates_Diablo_slo	none	N/A	N/A
N/A	Gates_tx	Gates-Midway 230 # 1	104.3%	tip one Helms pump
N/A	LosBanos-Gates#1-slo	Panoche-Gates 230 kV # 1 and 2	97.8%	reconductor Panoche-Gates 230 kV # 1 and 2
N/A	LosBanos-Gates#3-slo	none	N/A	N/A
N/A	LosBanos-Midway-slo	none	N/A	N/A
N/A	LosBanosNorth-dlo-1737 MW RAS no Id drop	Westley-Los Banos 230 kV	98.0%	no violations

N/A	LosBanosNorth-dlo-2298 MW RAS 561 MW load drop	none	N/A	N/A
N/A	LosBanosSouth-dlo-RAS 3162 MW no ld drop	Panoche-Gates 230 kV # 1 and 2	100.9%	reconductor Panoche-Gates 230 kV # 1 and 2
N/A	LosBanosSouth-dlo-RAS 3855 MW 693 MW load drop	none	N/A	no violations of CDWR pumps not tripped
N/A	LosBanosSouth-dlo-RAS 3913 MW 752 MW load drop	none	N/A	N/A
N/A	LosBanos_tx_1	Panoche-Gates 230 kV # 1 and 2	102.4%	reconductor Panoche-Gates # 1 and 2
N/A	Malin-RndMt-dlo-ns-600	none	N/A	N/A
N/A	Malin-RoundMt-1-slo	none	N/A	N/A
N/A	Malin-RoundMt-2-slo	none	N/A	N/A
N/A	Metcalf-xfmer-stuck brk-ns	none	N/A	N/A
N/A	Midway North dlo, 3005 MW RAS, 2 Helms, no load drop	Gates-Midway 230 kV	105.9%	reconductor Gates-Midway 230 kV # 1
N/A	Midway North dlo, 3417 MW RAS, 723 MW load and 1 Helms pump	Gates-Midway 230 kV	101.7%	reconductor Gates-Midway 230 kV # 1, if CDWR pumps not tripped, loading is 102.8%
N/A	Midway North dlo, 3728 MW RAS, 723 MW load and 2 Helms pumps	none	N/A	N/A
N/A	Midway-Vincent-dlo-no RAS	none	N/A	N/A
N/A	Midway_Diablo_slo	none	N/A	N/A
N/A	Midway_tx11	none	N/A	N/A
N/A	Midway_tx12	none	N/A	N/A
N/A	Midway_tx13	none	N/A	N/A
N/A	Midway_Vincent1-slo	none	N/A	N/A

N/A	Midway_Vincent2_slo	none	N/A	N/A
N/A	Midway_Vincent3_slo	none	N/A	N/A
N/A	MossLanding-Metcalf-slo	none	N/A	N/A
N/A	Mosslanding-tx	none	N/A	N/A
N/A	Olinda-Tracy-slo-ns	none	N/A	N/A
N/A	Olinda_tx_1	none	N/A	N/A
N/A	PaloVerde-g2-OL-MA-RAS_1	none	N/A	N/A
N/A	PDCI-NS-bipolar-no RAS	none	N/A	N/A
N/A	PDCI-NS-mono_noRAS	none	N/A	N/A
N/A	RoundMt-TableMt-1-slo-ns	none	N/A	N/A
N/A	RoundMt-TableMt-2-slo-ns	none	N/A	N/A
N/A	RoundMt-TableMt-dlo-no RAS	none	N/A	N/A
N/A	RoundMt_tx_1	none	N/A	N/A
N/A	SONGS-g2	none	N/A	N/A
N/A	TableMtSouth-dlo-no RAS	none	N/A	N/A
N/A	TableMt_Tesla_ns_slo	none	N/A	N/A
N/A	TableMt_tx_1, trip Hyatt and Thermalito	none	N/A	N/A
N/A	TableMt_tx_noRAS	none	N/A	N/A
N/A	TableMt_Vaca_ns_slo	none	N/A	N/A
N/A	Tesla-Metcalf-slo	none	N/A	N/A
N/A	Tesla-Metcalf-slo_DEC	none	N/A	N/A

N/A	Tesla-tracy-slo			
	TeslaNorth-dlo-no RAS	none	N/A	N/A
N/A	TeslaNorth-dlo-ns-600	none	N/A	N/A
N/A	Tesla_Losbanos_slo_1	none	N/A	N/A
N/A	Tesla_tx2_1	none	N/A	N/A
N/A	Tesla_tx4	none	N/A	N/A
N/A	Tesla_tx6	none	N/A	N/A
N/A	TracySouth-dlo-ns_no_RAS	none	N/A	N/A
N/A	Tracy_LosBanos_slo	none	N/A	N/A
N/A	Tracy_tx1_1	none	N/A	N/A
N/A	Tracy_tx2_1	none	N/A	N/A
N/A	VacaDixon_Tesla_ns_slo	none	N/A	N/A
N/A	Vaca_tx_1	none	N/A	N/A
N/A	Gates 500 kV stuck breaker 1phase fault	none	N/A	N/A
N/A	Los Banos 500 kV stuck breaker 1phase fault	none	N/A	N/A
N/A	Midway 500 kV stuck breaker 1phase fault	none	N/A	N/A
N/A	Round Mt 500 kV stuck breaker 1phase fault	none	N/A	N/A
N/A	Table Mt 500 kV stuck breaker 1phase fault	none	N/A	N/A
N/A	Tesla 500 kV stuck breaker 1phase fault	none	N/A	N/A
N/A	Vaca Dix 500 kV stuck breaker 1phase fault	none	N/A	N/A
N/A	Loss of Larkin substation	none	N/A	N/A

Study Area: PGE Post-Transient Study - Off-Peak (2016)

Voltage Dip

Study Area: PG&E Post-Transient Study - Off-Peak (2021)

Voltage Deviation

ID	Contingency	Overloaded facility	Percent emergency loading (normal for base case)	ISO Proposed Mitigation/Comments
N/A	BASE CASE	Weber-Tesla 230 kV	114.8%	need to upgrade the line
N/A	BASE CASE	Borden-Gregg 230 kV	1.005	need to upgrade the line
N/A	CptJ_Olinda_500_slo	none	N/A	no violations
N/A	Diablo-g1	none	N/A	no violations
N/A	Diablo-g2	none	N/A	no violations
N/A	Diablo-Midway 500-dlo	none	N/A	no violations
N/A	Gates-Gregg, Gates-Mc Call 230 dlo	Weber-Tesla 230 kV	102.1%	need to upgrade the line
N/A	Gates-Midway-slo-ns	none	N/A	no violations
N/A	Gates_Diablo_slo	none	N/A	no violations
N/A	Gates_tx	none	N/A	no violations
N/A	LosBanos-Gates#1-slo	none	N/A	no violations
N/A	LosBanos-Gates#3-slo	none	N/A	no violations
N/A	LosBanos-Midway-slo	none	N/A	no violations
N/A	LosBanosNorth-dlo- no RAS	none	N/A	no violations
N/A	LosBanosSouth-dlo-no RAS	none	N/A	no violations
N/A	LosBanos_tx_1	none	N/A	no violations
N/A	Malin-RndMt-dlo-ns-2400	none	N/A	no violations

2011/2012 ISO Transmission Plan			March 14, 2012	
N/A	Malin-RoundMt-1-slo	none	N/A	no violations
N/A	Malin-RoundMt-2-slo	none	N/A	no violations
N/A	Metcalf-xfmer-stuck brk-ns	none	N/A	no violations
N/A	Midway North dlo, no RAS	none	N/A	no violations
N/A	Midway-Vincent-dlo-Ras4000	none	N/A	no violations
N/A	Midway_Diablo_slo	none	N/A	no violations
N/A	Midway_tx11	none	N/A	no violations
N/A	Midway_tx12	none	N/A	no violations
N/A	Midway_tx13	none	N/A	no violations
N/A	Midway_Vincent1-slo	Midway-Vincent 500 kV # 2	98.0%	no violations
N/A	Midway_Vincent2_slo	Midway-Vincent 500 kV # 1	98.3%	no violations
N/A	Midway_Vincent3_slo	none	N/A	no violations
N/A	MossLanding-Metcalf-slo	none	N/A	no violations
N/A	Mosslanding-tx	none	N/A	no violations
N/A	Olinda-Tracy-slo-ns	none	N/A	no violations
N/A	Olinda_tx_1	none	N/A	no violations
N/A	PaloVerde-g2-OL-MA-RAS_1	none	N/A	no violations
N/A	PDCI-NS-bipolar-2700 RAS	not solved	need more reactive support in Southern Cal	need to switch Devers SVS, don't switch off shunts at Sylmar, switch off shunts at Celilo, add all possible reactive support at Vincent and Sylmar
N/A	PDCI-NS-mono_noRAS	none		no violations
N/A	RoundMt-TableMt-1-slo-ns	Round Mtn-Table Mtn 500 kV # 2	97.8%	no violations
N/A	RoundMt-TableMt-2-slo-ns	Round Mtn-Table Mtn 500 kV # 1	97.8%	no violations
N/A	RoundMt-TableMt-dlo-2400 RAS	none	N/A	no violations

2011/2012 ISO Transmission Plan			March 14, 2012	
N/A	RoundMt_tx_1	none	N/A	no violations
N/A	SONGS-g2	not solved	refer to SCE main results	refer to SCE main results
N/A	TableMtSouth-dlo-600 RAS	Table Mtn 500/230 kV bank	108.4%	revise SPS to trip less Feather River generation and trip some of Colusa generation. Re-rate Table Mtn 500/230 kV bank
N/A		Table Mtn-Rio Oso 230 kV	99.1%	
N/A		Cortina-Delevan 230 kV	98.6%	
N/A	TableMtSouth-dlo-2100 RAS	Table Mtn 500/230 kV bank	106.9%	revise SPS to trip less Feather River generation (130 MW less from CRBU) 110.3% if no CDWR pumps dropped (1059 MW), Table Mtn-Rio Oso may OL if less Feather Rvr tripped and pumps not tripped. Re-rate Table Mtn 500/230 kV bank
N/A	TableMtSouth-dlo-2400 RAS	Table Mtn 500/230 kV bank	108.7%	revise SPS to trip less Feather River generation, However, Table Mtn-Rio Oso 230 kV may OL. 112.2% if no CDWR pumps dropped. Re-rate Table Mtn 500/230 kV bank
N/A	TableMt_Tesla_ns_slo	none		no violations
N/A	TableMt_tx_1, trip Hyatt and Thermalito	Weber-Tesla 230 kV	117.2%	need to upgrade Weber-Tesla 230 kV
N/A	TableMt_tx_noRAS	Weber-Tesla 230 kV	102.1%	need to upgrade Weber-Tesla 230 kV
N/A	TableMt_Vaca_ns_slo	none	N/A	no violations
N/A	Tesla-Metcalf-slo	none	N/A	no violations
N/A	Tesla-Metcalf-slo_DEC	none	N/A	no violations
N/A	Tesla-tracy-slo	none	N/A	
			105.6%	need RAS
N/A	TeslaNorth-dlo-ns-600	none	N/A	no violations
N/A	Tesla_Losbanos_slo_1	none	N/A	no violations
N/A	Tesla_tx2_1	none	N/A	no violations
N/A	Tesla_tx4	none	N/A	no violations
N/A	Tesla_tx6	none	N/A	no violations
N/A	TracySouth-dlo-ns_no_RAS	none	N/A	no violations
N/A	Tracy_LosBanos_slo	none	N/A	no violations
N/A	Tracy_tx1_1	none	N/A	no violations
N/A	Tracy_tx2_1	none	N/A	no violations
N/A	VacaDixon_Tesla_ns_slo	none	N/A	no violations

2011/2012 ISO Transmission Plan			March 14, 2012	
N/A	Vaca_tx_1	none	N/A	no violations
N/A	Gates 500 kV stuck breaker 1phase fault	none	N/A	no violations
N/A	Los Banos 500 kV stuck breaker 1phase fault	none	N/A	no violations
N/A	Midway 500 kV stuck breaker 1phase fault	none	N/A	no violations
N/A	Round Mt 500 kV stuck breaker 1phase fault	none	N/A	no violations
N/A	Table Mt 500 kV stuck breaker 1phase fault	none	N/A	no violations
N/A	Tesla 500 kV stuck breaker 1phase fault	none	N/A	no violations
N/A	Vaca Dix 500 kV stuck breaker 1phase fault	none	N/A	no violations
N/A	Loss of Larkin substation	none	N/A	no violations

Study Area: Humboldt Area - Summer peak conditions (2012-2021)

Thermal Overloads

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading %						ISO Proposed Solution
					2012	2013	2014	2015	2016	2021	
HUMB-S-T-001	Humboldt Bay-Humboldt 60 kV Line #1 Between HUMBOLDT and HMBLT JT	Humboldt-Humboldt Bay 60 kV #2	B	L-1	95%	93%	92%	92%	106%	103%	PG&E maintenance project to reconductor the line in Oct 2014. Line may overload with high generation from Humboldt Bay 60 kV and low from Humboldt Bay 115 kV. Implement operating procedure to reduce output from Humboldt Bay Power Plant 60 kV generators after first contingency for C contingencies if there is overload after line upgrade
		Humboldt-Humboldt Bay 60 kV #2 and FAIRHAVEN 13.8 KV	B	G-1/L-1	97%	95%	94%	94%	108%	105%	
		Humboldt-Humboldt Bay 60 kV #2 and any one unit of Humboldt Bay on 115 kV	B	G-1/L-1	97%	95%	94%	94%	108%	105%	
		L-1 Humboldt-Humboldt Bay 60 kV #2 & Humboldt-Humboldt Bay PP 115 kV #1	C	L-2	102%	100%	99%	99%	114%	111%	
HUMB-S-T-002	Humboldt Bay-Humboldt 60 kV line # 1 between HMBLT JC and HUMBOLDT BAY	Humboldt-Humboldt Bay 60 kV #2 60 KV and Humboldt Bay-Eureka 60 KV (more L-1-1 overloads)	C	L-1-1	131%	129%	128%	127%	146%	143%	
HUMB-S-T-003	Humboldt-Humboldt Bay 60 kV #2	Humboldt-Humboldt Bay 60 kV #1 60 KV and Humboldt Bay-Eureka 60 KV (more L-1-1 overloads)	C	L-1-1	118%	116%	115%	114%	131%	129%	Implement operating procedure to reduce output from Humboldt Bay Power Plant 60 kV generators for Category C, reconductor the line with renewable project (in LGIA)
HUMB-S-T-004	Humboldt-Eureka 60 kV between Haris St and Eureka 60 kV	Humboldt-Humboldt Bay 60 kV # 1 and 2	C	L-1-1	161%	157%	154%	151%	182%	172%	Replace limiting equipment at Eureka. Implement operating procedure to reduce output from Humboldt Bay Power Plant 60 kV generators for
HUMB-S-T-005	Humboldt-Eureka 60 kV between Haris and Harris St 60 kV	Humboldt-Humboldt Bay 60 kV # 1 and 2	C	L-1-1	130%	126%	124%	122%	147%	139%	
HUMB-S-T-006	Humboldt Bay - Eureka 60 kV Line #1	Humboldt 60 kV Bus	C	BUS	<95%	<95%	<95%	<95%	101%	102%	Reconductor the line with the new renewable project (in LGIA). Prior to that, implement operating procedure to reduce output from Humboldt Bay 60 kV generation following first contingency for Category C
		Humboldt-Humboldt Bay 60 kV #2 & Humboldt-Humboldt Bay PP 115 kV #1	C	L-2	91%	90%	90%	90%	100%	101%	
		Humboldt-Humboldt Bay #1 and # 2 60 KV (more L-1-1 overloads)	C	L-1-1	154%	152%	151%	150%	171%	168%	
HUMB-S-T-007	Humboldt Bay - Rio Dell Jct 60 kV #1 between Newburg-Rio Dell Tap	Rio Dell Tap - Bridgeville 60 KV	B	L-1	<95%	<95%	<95%	<95%	106%	106%	Reconductor the line with the new renewable project (in LGIA).
		Humboldt 60 kV Bus	C	BUS	108%	108%	108%	106%	101%	<95%	
HUMB-S-T-008	Humboldt Bay - Rio Dell Jct 60 kV #1 between Humboldt Bay and Eel River	Humboldt 60 kV Bus	C	BUS	121%	120%	120%	119%	117%	112%	PG&E maintenance project to upgrade Humboldt bus to breaker-a-a-half in 2014. Reconductor the line with the new renewable project (in LGIA).
HUMB-S-T-009	Humboldt Bay - Rio Dell Jct 60 kV #1 between Newburg and Eel River	Humboldt 60 kV Bus	C	BUS	101%	100%	100%	99%	96%	<95%	

HUMB-S-T-010	Rio Dell Jct-Bridgeville 60 kV between Carlotta-Rio Dell Tap 60 kV	Humboldt- Bridgeville 115 kV	B	L-1	<95%	<95%	<95%	<95%	100%	101%	Install SPS to trip new generation project at Rio Dell for overload
		Humboldt Bay-Rio Dell Jct 60 KV (Newburg-Rio Del Jct)	B	L-1	<95%	<95%	<95%	<95%	108%	108%	
		Humboldt 60 kV Bus	C	BUS	163%	164%	162%	161%	202%	191%	Upgrade Humboldt 60 kV bus to a breaker-and-a-half, PG&E maintenance project
		Humboldt-Bridgeville 115 kV and Humboldt- Trinity 115 kV (more L-1-1 overloads)	C	L-1-1	117%	121%	119%	114%	144%	124%	reduce Humboldt Bay 60 kV generation
HUMB-S-T-011	Rio Dell Jct-Bridgeville 60 kV between Carlotta-Swms Flat - Bridgeville 60 kV	Humboldt Bay-Rio Dell Jct 60 KV (Newburg-Rio Del Jct)	B	L-1	<95%	<95%	<95%	<95%	106%	106%	Install SPS to trip new generation project at Rio Dell for overload
		Humboldt 60 kV Bus	C	BUS	160%	160%	160%	158%	199%	187%	Upgrade Humboldt 60 kV bus to a breaker-and-a-half, PG&E maintenance project
		Humboldt-Bridgeville 115 kV and Humboldt- Trinity 115 kV (more L-1-1 overloads)	C	L-1-1	114%	119%	117%	111%	141%	121%	reduce Humboldt Bay 60 kV generation after first contingency
HUMB-S-T-012	Bridgeville-Garberville 60 kV between Bridgville-Frut Ld Jct 60 kV	normal conditions	A		81%	93%	91%	92%	96%	103%	re-rate the line, possible upgrade
		Humboldt 60 kV Bus	C	BUS	<95%	98%	101%	101%	106%	112%	Upgrade Humboldt 60 kV bus to a breaker-and-a-half, PG&E maintenance project
		Humboldt- Trinity 115 kV and Bridgeville-Cottonwood 115 kV (more L-1-1 and T-1/L-1 overloads)	C	L-1-1	103%	112%	109%	106%	122%	112%	Install SPS to trip new renewable gen for overload, reduce Humb Bay generation.
HUMB-S-T-013	Bridgeville-Garberville 60 kV between Frut Ld Jct and Fort Seward Jct	Humboldt 60 kV Bus	C	BUS	<95%	96%	97%	98%	103%	106%	Upgrade Humboldt 60 kV bus to a breaker-and-a-half in 2014, PG&E maintenance project
		Humboldt- Trinity 115 kV and Bridgeville-Cottonwood 115 kV (more L-1-1 and T-1/L-1 overloads)	C	L-1-1	99%	111%	107%	103%	120%	106%	Install SPS to trip new gen for overload, reduce Humb Bay
HUMB-S-T-014	Bridgeville-Garberville 60 kV between FTSWRDJT-Garberville 60 kV	Humboldt 60 kV Bus	C	BUS	<95%	<95%	<95%	95%	100%	102%	Upgrade Humboldt 60 kV bus to a breaker-and-a-half, PG&E maintenance project
		Humboldt- Trinity 115 kV and Bridgeville-Cottonwood 115 kV (more L-1-1 and T-1/L-1 overloads)	C	L-1-1	96%	108%	105%	100%	117%	103%	Install SPS to trip new gen for overload, reduce Humb Bay
HUMB-S-T-015	Essex Jct - Arcata - Fairhaven 60 kV Line (JANCKTP - ARCATAJ2)	Humboldt No. 1 60 kV Line and BLUELKPP 12.47 Unit ID 1	B	G-1/L-1	92%	93%	93%	94%	96%	104%	upgrade the line after 2016
HUMB-S-T-016	Bridgeville 115/60 kV Bank #1	Humboldt 115 kV Bus	C	BUS	<95%	<95%	<90%	<90%	<90%	103%	PG&E maintenace project to replace Bridgeville bank in 2012. New rating will be 90 MVA
		Humboldt 60 kV Bus	C	BUS	125%	100%	99%	98%	134%	121%	

Study Area: Humboldt Area - Summer Peak (2012-2021)

Low Voltages

ID	Substation	Worst Contingency	Category	Category Description	Min Post-Cont Voltage PU						ISO Proposed Solution
					2012	2013	2014	2015	2016	2021	
HUMB-S-V-001	MAPLE CREEK 60 kV	Humboldt - Maple Creek 60 kV Line	B	L-1	0.89	0.96	0.97	0.97	1.03	1.01	Maple Creek reactive support project (2013) will solve the problem. In interim, use existing PG&E Action Plan
		Humboldt 60 kV bus	C	BUS	0.88	1.02	0.97	0.96	1.03	1.00	
		Humboldt-Trinity 115 kV and Humboldt - Maple Creek 60 kV Lines (more L-1-1)	C	L-1-1	0.87	1.04	0.96	0.98	1.04	1.00	
HUMB-S-V-002	RUSS RANCH 60 kV	Humboldt - Maple Creek 60 kV Line	B	L-1	0.88	0.95	0.96	0.96	1.02	1.00	
		Humboldt 60 kV bus	C	BUS	0.87	1.02	0.96	0.96	1.03	0.99	
		Humboldt-Trinity 115 kV and Humboldt - Maple Creek 60 kV Lines (more L-1-1)	C	L-1-1	0.86	1.03	0.96	0.97	1.03	1.00	
HUMB-S-V-003	WILLOW CRK 60 kV	Humboldt - Maple Creek 60 kV Line	B	L-1	0.85	0.93	0.93	0.93	1.00	0.98	
		Humboldt 60 kV bus	C	BUS	0.84	1.01	0.94	0.93	1.00	0.96	
		Humboldt-Trinity 115 kV and Humboldt - Maple Creek 60 kV Lines (more L-1-1)	C	L-1-1	0.83	1.01	0.93	0.94	1.00	0.97	
HUMB-S-V-004	HOOPA 60 kV	Humboldt - Maple Creek 60 kV Line	B	L-1	0.84	0.91	0.92	0.92	0.99	0.96	
		Humboldt 60 kV bus	C	BUS	0.82	0.99	0.92	0.92	0.99	0.94	
	FRUITLND 60 kV	Humboldt-Trinity 115 kV and Humboldt - Maple Creek 60 kV Lines (more L-1-1)	C	L-1-1	0.82	0.99	0.92	0.93	0.99	0.95	
		BRDGVLL No.1 115/60/12 kV XFMR	B	T-1	0.86	0.97	0.98	0.98	0.96	0.94	
		Garberville - Laytonville 60 kV Line and Bridgeville 115/60 kV (15 more T-1/L-1)	C	L-1/T-1	0.70	1.00	0.99	0.95	0.96	0.95	
HUMB-S-V-005	FRUITLND 60 kV	Humboldt - Bridgeville 115 kV Line and Cottonwood - Bridgeville 115 kV Line (more L-1-1)	C	L-1-1	0.83	0.99	0.99	0.99	0.97	0.94	
		Rio Dell Jct - Bridgeville 60 kV Line and Bridgeville 115/60 KV transformer	C	L-1/T-1	diverged	0.86	0.80	diverged	diverged	diverged	
HUMB-S-V-005	FORT SEWARD 60 kV	Base system (n-0)	A		0.94	1.00	1.02	1.04	1.00	1.00	
		BRDGVLL No.1 115/60/12 kV XFMR	B	T-1	0.86	0.99	0.99	1.00	0.97	0.95	
		Garberville - Laytonville 60 kV Line and Bridgeville 115/60 kV (15 more T-1/L-1)	C	L-1/T-1	0.68	1.01	1.00	0.96	0.97	0.97	
		Humboldt - Bridgeville 115 kV Line and Cottonwood - Bridgeville 115 kV Line (more L-1-1)	C	L-1-1	0.83	1.00	1.00	1.01	0.98	0.95	

V-006		Rio Dell Jct - Bridgeville 60 kV Line and Bridgeville 115/60 KV transformer	C	L-1/T-1	diverged	0.87	0.81	diverged	diverged	diverged
HUMB-S-V-007	GARBERVILLE 60 kV	Base system (n-0)	A		0.94	1.03	1.04	1.05	1.01	1.03
		Bridgeville - Garberville 60 kV Line	B	L-1	0.76	1.05	1.04	1.02	1.00	0.98
		BRDGVILLE No.1 115/60/12 kV XFMR	B	T-1	0.85	1.01	1.01	1.01	0.99	0.97
		Garberville - Laytonville 60 kV Line and Bridgeville 115/60 kV (15 more T-1/L-1)	C	L-1/T-1	0.64	1.03	1.02	0.97	0.98	0.97
		Humboldt - Bridgeville 115 kV Line and Cottonwood - Bridgeville 115 kV Line (more L-1-1)	C	L-1-1	0.82	1.02	1.02	1.02	1.00	0.97
		Rio Dell Jct - Bridgeville 60 kV Line and Bridgeville 115/60 KV transformer	C	L-1/T-1	diverged	0.88	0.82	diverged	diverged	diverged
HUMB-S-V-008	KEKAWAKA 60 kV	Base system (n-0)	A		0.93	1.01	1.02	1.05	1.00	1.01
		Bridgeville - Garberville 60 kV Line	B	L-1	0.79	1.03	1.03	1.01	0.99	0.98
		BRDGVILLE No.1 115/60/12 kV XFMR	B	T-1	0.87	1.01	1.01	1.01	0.99	0.98
		Humboldt - Bridgeville 115 kV Line and Bridgeville 115/60 kV (15 more L-1/T-1)	C	L-1/T-1	0.84	1.02	1.02	1.03	1.00	0.98
		Humboldt - Bridgeville 115 kV Line and Cottonwood - Bridgeville 115 kV Line	C	L-1-1	0.84	1.02	1.02	1.02	1.00	0.97
		Rio Dell Jct - Newburg 60 kV Line and Bridgeville 115/60 KV transformer	C	L-1/T-1	0.87	>0.9				
HUMB-S-V-009	LYTENVILLE 60 kV	Rio Dell Jct - Bridgeville 60 kV Line and Bridgeville 115/60 KV transformer	C	L-1/T-1	diverged	0.88	0.83	diverged	diverged	diverged
	COVELO 60 kV	Bridgeville - Garberville 60 kV Line	B	L-1	0.88	1.00	1.00	0.99	0.98	0.97
		Rio Dell Jct - Bridgeville 60 kV Line and Bridgeville 115/60 KV transformer	C	L-1/T-1	diverged	0.90	0.88	diverged	diverged	diverged
		Garberville - Laytonville 60 kV Line and Bridgeville 115/60 kV (3 more T-1/L-1)	C	L-1/T-1	0.83	0.99	0.99	0.96	0.98	0.96
		Rio Dell Jct - Bridgeville 60 kV Line and Bridgeville 115/60 KV transformer	C	L-1/T-1	diverged	0.86	0.80	diverged	diverged	diverged
		Humboldt - Bridgeville 115 kV Line and Cottonwood - Bridgeville 115 kV Line	C	L-1-1	0.89	0.98	0.99	0.99	0.98	0.96
HUMB-S-V-012	SWNS FLAT 60 kV	Garberville - Laytonville 60 kV Line and Bridgeville 115/60 KV transformer	C	L-1/T-1	0.86	0.99	0.99	0.97	0.98	0.97

Garberville reactive support project (2013) will mitigate. In interim, PG&E Action Plan for 2012 . Dispatching Kekawaka for peak conditions will mitigate the problem. Utilizing PG&E Operating Procedure to open CB 42 at Bridgeville 60 kV bus for Bridgeville bank outage will not eliminate the violations. Trip load at Fruitland, Fort Seward and Garberville if low voltage persists. Or open CB 32 at Garberville for Bridgeville transformer outage. New Bridgeville-Garberville 115kV line

Study Area: Humboldt Area - Summer Peak (2012- 2021)

Voltage Deviations

ID	Substation	Worst Contingency	Category	Category Description	Post Cont Voltage Deviation %						ISO Proposed Solution
					2012	2013	2014	2015	2016	2021	
HUMB-S-VD-001	RIDGE CABIN 60 kV	Humboldt - Maple Creek 60 kV Line	B	L-1	10.5%	<5%	<5%	<5%	<5%	<5%	Maple Creek reactive support project (2013) will solve the problem. In interim, PG&E Action Plan
		Humboldt 60 kV bus	C	BUS	11.9%	<5%	<5%	<5%	<5%	<5%	
		Humboldt - Maple Creek 60 kV Line and Humboldt-Trinity 115 kV line (12 more L-1-1)	C	L-1-1	12.3%	<10%	<10%	<10%	<10%	<10%	
HUMB-S-VD-002	MAPLE CREEK 60 kV	Humboldt - Maple Creek 60 kV Line	B	L-1	13.2%	<5%	<5%	<5%	<5%	<5%	
		Humboldt 60 kV bus	C	BUS	14.7%	<5%	<5%	<5%	<5%	<5%	
		Humboldt - Maple Creek 60 kV Line and Humboldt-Trinity 115 kV line (13 more L-1-1)	C	L-1-1	15.2%	<10%	<10%	<10%	<10%	<10%	
HUMB-S-VD-003	RUSS RANCH 60 kV	Humboldt - Maple Creek 60 kV Line	B	L-1	13.4%	<5%	<5%	<5%	<5%	<5%	
		Humboldt 60 kV bus	C	BUS	14.8%	<5%	<5%	<5%	<5%	<5%	
		Humboldt - Maple Creek 60 kV Line and Humboldt-Trinity 115 kV line (12 more L-1-1)	C	L-1-1	15.3%	<10%	<10%	<10%	<10%	<10%	
HUMB-S-VD-004	HOOPA 60 kV	Humboldt - Maple Creek 60 kV Line	B	L-1	14.1%	<5%	<5%	<5%	<5%	<5%	
		Humboldt 60 kV bus	C	BUS	15.6%	<5%	<5%	<5%	<5%	<5%	
		Humboldt - Maple Creek 60 kV Line and Humboldt-Trinity 115 kV line (12 more L-1-1)	C	L-1-1	16.1%	<10%	<10%	<10%	<10%	<10%	
HUMB-S-VD-005	WILLOW CREEK 60 kV	Humboldt - Maple Creek 60 kV Line	B	L-1	13.8%	<5%	<5%	<5%	<5%	<5%	
		Humboldt 60 kV bus	C	BUS	15.3%	<5%	<5%	<5%	<5%	<5%	
		Humboldt - Maple Creek 60 kV Line and Humboldt-Trinity 115 kV line (13 more L-1-1)	C	L-1-1	15.9%	<10%	<10%	<10%	<10%	<10%	

HUMB-S-VD-006	BRIDGEVILLE 60 kV	BRDGVLL No.1 115/60/12 kV XFMR	B	T-1	11.6%	<5%	<5%	<5%	<5%	6.6%	Garberville reactive support project (2013) will mitigate. In interim, PG&E Action Plan . Dispatching Kekawaka for peak conditions will mitigate the problem. Utilizing PG&E Operating Procedure to open CB 42 at Bridgeville 60 kV bus for Bridgeville bank outage will not eliminate the violations. Trip load at Fruiland, Fort Seward and Garberville if low voltage persists. Or open CB 32 at Garberville for Bridgeville transformer outage. New Bridgeville-Garberville 115 kV line
		Humboldt - Bridgeville 115 kV Line	B	L-1	8.0%	<5%	<5%	<5%	<5%	5.7%	
		Humboldt - Bridgeville 115 kV Line and Cottonwood-Bridgeville 115 kV	C	L-1-1	14.1%	<10%	<10%	<10%	<10%	<10%	
		Garberville - Laytonville 60 kV Line and BRDGVLL 115/60 kV XFMR (18 more T-1/L-1)	C	T-1/L-1	20.8%	<10%	<10%	<10%	<10%	<10%	
		Rio Dell Jct - Bridgeville 60 kV Line and Bridgeville 115/60 KV transformer	C	L-1/T-1	diverged	16.7%	23.1%	diverged	diverged	diverged	
HUMB-S-VD-007	BRIDGEVILLE 115 kV	Humboldt - Bridgeville 115 kV Line and Humboldt-Trinity 115 kV Line	C	L-1-1	11.3%	<10%	<10%	<10%	<10%	<10%	
HUMB-S-VD-008	FRUITLND 60 kV	BRDGVLL No.1 115/60/12 kV XFMR	B	T-1	9.5%	<5%	<5%	<5%	<5%	5.1%	
		Garberville - Laytonville 60 kV Line and BRDGVLL 115/60 kV XFMR (17 more T-1/L-1)	C	T-1/L-1	25.2%	<10%	<10%	<10%	<10%	<10%	
		Rio Dell Jct - Bridgeville 60 kV Line and Bridgeville 115/60 KV transformer	C	L-1/T-1	diverged	14.4%	21.0%	diverged	diverged	diverged	
		Humboldt Bay - Rio Dell Jct 60 kV Line and BRDGVLL 115/60kV XFMR	C	L-1/T-1	<10%	<10%	<10%	<10%	11.5%	14.2%	
HUMB-S-VD-009	FORT SEWARD 60 kV	BRDGVLL No.1 115/60/12 kV XFMR	B	T-1	8.7%	<5%	<5%	<5%	<5%	<5%	
		Garberville - Laytonville 60 kV Line and BRDGVLL 115/60 kV XFMR (5 more T-1/L-1)	C	T-1/L-1	26.3%	<10%	<10%	<10%	<10%	<10%	
		Rio Dell Jct - Bridgeville 60 kV Line and Bridgeville 115/60 KV transformer	C	L-1/T-1	diverged	13.8%	20.2%	diverged	diverged	diverged	
		Humboldt Bay - Rio Dell Jct 60 kV Line and BRDGVLL 115/60kV XFMR	C	L-1/T-1	<10%	<10%	<10%	<10%	10.9%	14.1%	
HUMB-S-VD-010	GRBRVLL 60 kV	Bridgeville - Garberville 60 kV Line	B	L-1	16.6%	<5%	<5%	<5%	<5%	<5%	
		BRDGVLL No.1 115/60/12 kV XFMR	B	T-1	7.6%	<5%	<5%	<5%	<5%	<5%	
		Garberville - Laytonville 60 kV Line and BRDGVLL 115/60 kV XFMR (3 more T-1/L-1)	C	T-1/L-1	28.0%	<10%	<10%	<10%	<10%	<10%	
		Rio Dell Jct - Bridgeville 60 kV Line and Bridgeville 115/60 KV transformer	C	L-1/T-1	diverged	13.2%	19.4%	diverged	diverged	diverged	
HUMB-S-VD-011	KEKAWAKA 60 kV	Bridgeville - Garberville 60 kV Line	B	L-1	14.7%	<5%	<5%	<5%	<5%	<5%	
		BRDGVLL No.1 115/60/12 kV XFMR	B	T-1	6.5%	<5%	<5%	<5%	<5%	<5%	
		Rio Dell Jct - Bridgeville 60 kV Line and Bridgeville 115/60 KV transformer	C	L-1/T-1	diverged	13.1%	18.5%	diverged	diverged	diverged	
HUMB-S-VD-012	LYTNVLL 60 kV	Bridgeville - Garberville 60 kV Line				<5%	<5%	<5%	<5%		
HUMB-S-VD-013	COVELO 60 kV	Bridgeville - Garberville 60 kV Line	B	L-1	7.9%	<5%	<5%	<5%	<5%	<5%	
HUMB-S-VD-014	SWNS FLT 60 kV	BRDGVLL No.1 115/60/12 kV XFMR	B	T-1	9.7%	<5%	<5%	<5%	<5%	<5%	
		Humboldt - Bridgeville 115 kV Line and Cottonwood - Bridgeville 115 kV Line	C	L-1-1	12.1%	<10%	<10%	<10%	<10%	<10%	
		Garberville - Laytonville 60 kV Line and BRDGVLL 115/60 kV XFMR (17 more T-1/L-1)	C	L-1/T-1	17.3%	<10%	<10%	<10%	<10%	<10%	

HUMB-S-VD-015	ARCATA 60 kV	Humboldt No. 1 60 kV Line and Arcata - Humboldt 60 kV Line	C	L-1-1	6.8%	8.8%	9.1%	9.6%	9.8%	12.2%	trip Arcata load for Category C
HUMB-S-VD-016	BLUE CHIP MIL 60 kV	Blue Lake generator and Arcata - Humboldt 60 kV Line	B	G-1/L-1	6.4%	8.5%	8.6%	8.9%	9.1%	10.4%	disable load transfer from Janes Creek for L-1-1 outages. Add reactive support
		Humboldt No. 1 60 kV Line and Arcata - Humboldt 60 kV Line	C	L-1-1	7.3%	9.4%	9.6%	10.2%	10.5%	13.1%	
HUMB-S-VD-017	BIG LAGOON 60 kV	Blue Lake generator and Arcata - Humboldt 60 kV Line	B	G-1/L-1	6.4%					10.4%	
		Humboldt No. 1 60 kV Line and Arcata - Humboldt 60 kV Line	C	L-1-1	7.5%	9.6%	9.9%	10.4%	10.7%	13.3%	
HUMB-S-VD-018	BLUE LAKE 60 kV	Blue Lake generator and Arcata - Humboldt 60 kV Line	B	G-1/L-1	6.9%	9.0%	9.2%	9.5%	9.6%	11.0%	
		Humboldt No. 1 60 kV Line and Arcata - Humboldt 60 kV Line	C	L-1-1	7.2%	9.2%	9.5%	10.1%	10.4%	12.9%	
HUMB-S-VD-019	BLUE LAKE PP 60 kV	Blue Lake generator and Arcata - Humboldt 60 kV Line	B	G-1/L-1	7.0%	9.1%	9.3%	9.6%	9.7%	11.1%	
		Humboldt No. 1 60 kV Line and Arcata - Humboldt 60 kV Line	C	L-1-1	7.1%	9.2%	9.4%	10.0%	10.3%	12.9%	
HUMB-S-VD-020	JANES CREEK 60 kV	Humboldt No. 1 60 kV Line and Arcata - Humboldt 60 kV Line	C	L-1-1	8.4%	10.4%	10.7%	11.3%	11.6%	14.3%	
HUMB-S-VD-021	ORICK 60 kV	Blue Lake generator and Arcata - Humboldt 60 kV Line	B	G-1/L-1	6.4%	8.5%	8.6%	8.9%	9.0%	10.4%	
		Humboldt No. 1 60 kV Line and Arcata - Humboldt 60 kV Line	C	L-1-1	7.5%	9.6%	9.9%	10.5%	10.8%	13.4%	
HUMB-S-VD-022	SIMPSON 60 kV	Blue Lake generator and Arcata - Humboldt 60 kV Line	B	G-1/L-1	6.9%	9.1%	9.2%	9.6%	9.7%	11.1%	
		Humboldt No. 1 60 kV Line and Arcata - Humboldt 60 kV Line	C	L-1-1	7.2%	9.2%	9.5%	10.1%	10.4%	12.9%	
HUMB-S-VD-023	TRINIDAD 60 kV	Blue Lake generator and Arcata - Humboldt 60 kV Line	B	G-1/L-1	6.4%	8.4%	8.6%	8.9%	9.0%	10.4%	
		Humboldt No. 1 60 kV Line and Arcata - Humboldt 60 kV Line	C	L-1-1	7.5%	9.6%	9.9%	10.4%	10.7%	13.3%	

Study Area: Humboldt - Summer Peak (2012-2021)

Single Contingency Load Drop

ID	Worst Contingen	Category	Category Descriptio	Amount of Load Drop (MW)						ISO Proposed
				2012	2013	2014	2015	2016	2021	
HMB-LD-01		B	N-1							

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

Study Area: Humboldt - Summer Peak (2012-2021)

Single source substation with more than 100 MW Load.

ID	Substation	Load Served (MW)						ISO Proposed
		2012	2013	2014	2015	2016	2021	
Humb-LS-01								

no substations with >100 MW load



Study Area: Humboldt Area - Winter Peak (2012 - 2021)

Thermal Overloads

ID	Overloaded Facility	Worst Contingency	Category	Category Descriptio	Loading %						ISO Proposed Solution
					2012	2013	2014	2015	2016	2021	
HUMB-W-T-001	Humboldt Bay - Humboldt 60 kV #1 Between HUMBOLDT - HMBLT JT	L-1 Humboldt-Humboldt Bay 60 kV #2 & L-1 Humboldt Bay-Eureka 60 kV #1 (3 more L-1-1)	C	L-1-1	132%	131%	129%	128%	182%	180%	Humboldt Bay - Humboldt No.1 60 kV Line Reconductoring Project for category B overloads in 2014. Implement operating procedure to reduce output from Humboldt Bay Power Plant 60 kV generators after first contingency for C contingencies if there is overload after line upgrade
HUMB-W-T-002	Humboldt Bay - Humboldt 60 kV #1 Between HUMBOLDT BAY - HMBLT JT	L-1 Humboldt-Humboldt Bay 60 kV #2& L-1 Humboldt Bay-Eureka 60 kV #1	C	L-1-1	<95%	<95%	<95%	<95%	113%	112%	
HUMB-W-T-003	Humboldt Bay - Humboldt 60 kV #2	L-1 Humboldt-Humboldt Bay 60 kV #1 & L-1 Humboldt Bay-Eureka 60 kV #1	C	L-1-1	<95%	<95%	<95%	<95%	114%	112%	Implement operating procedure to reduce output from Humboldt Bay Power Plant 60 kV generators for Category C contingencies, reconductor the line with renewable project (in LGIA)
HUMB-W-T-004	Humboldt Bay - Eureka 60 kV #1	Humboldt - Humboldt Bay No.2 60 kV Line	B	L-1	<95%	<95%	<95%	<95%	100%	101%	Reconductor the line with the new renewable project (in LGIA). Prior to that, implement operating procedure to reduce output from Humboldt Bay 60 kV generation following first contingency for Category C
		Humboldt - Humboldt Bay No.2 60 kV Line and 1 Humb Bay unit on 115 kV	B	L-1/G-1	<95%	<95%	<95%	<95%	101%	102%	
		Humboldt-Humboldt Bay 60 kV # 1 and 2 (8 more L-1-1 overloads)	C	L-1-1	130%	129%	126%	126%	177%	176%	
		Humboldt 60 kV Bus	C	BUS	110%	112%	113%	114%	115%	122%	
HUMB-W-T-005	Humboldt-Eureka 60 kV between Harris St and Eureka	Humboldt Bay - Eureka 60 kV Line	B	L-1	99%	100%	100%	101%	102%	108%	Replace limiting equipment at Eureka. Implement operating procedure to reduce output from Humboldt Bay Power Plant 60 kV generators for Category C contingencies, reconductor the line with
		Humboldt-Humboldt Bay 60 kV # 1 and 2 (more L-1-1 overloads)	C	L-1-1	118%	116%	115%	113%	195%	188%	
HUMB-W-T-006	Bridgeville 115/60 kV Bank #1	Humboldt Bay - Rio Dell Jct 60 kV Line (HMBLT BY to EEL RIVR)	B	L-1	107%	109%	116%	117%	<95%	<95%	PG&E maintenace project to replace Bridgeville bank in 2012. New rating will be 90 MVA. In interim, dispatch all Pacific Lumber generation under peak conditions
		Humboldt Bay - Rio Dell Jct 60 kV Line (HMBLT BY to EEL RIVR) and 1 Pac. Lumber gen	B	L-1/G-1	122%	124%	131%	132%	<95%	<95%	
		T-1 Humboldt 115/60 kV Bank #1 & T-1 Humboldt 115/60 kV Bank #2	C	T-1-1	150%	158%	170%	172%	<95%	116%	
		Humboldt 115 kV bus	C	BUS	116%	126%	136%	141%	<95%	<95%	

HUMB-W-T-007	Humboldt 115/ 60 kV bank # 1	One Humboldt Bay PP 60 kV Unit and HUMBOLDT No.2 115/60 kV XFMR	C	G-1/T-1	110%	111%	<95%	<95%	<95%	<95%	Transmission project to replace Humboldt 115/60 kV transformers, modeled as replaced in 2014. Upgrade Humboldt 60 kV bus to a breaker-and-a-half, PG&E maintenance project
		Humboldt Bay PP -Humboldt Bay 60 kV # 1 and 2	C	L-1-1	127%	128%	<95%	<95%	<95%	<95%	
		Humboldt Bay 60 kV Bus	C	BUS	121%	121%	<95%	<95%	<95%	<95%	
		HUMBOLDT No.2 115/60 kV XFMR and BRDGVLL 115/60 kV XFMR	C	T-2	124%	128%	<95%	<95%	<95%	<95%	
HUMB-W-T-008	Humboldt 115/ 60 kV bank # 2	One Humboldt Bay PP 60 kV Unit and HUMBOLDT No.1 115/60 kV XFMR	C	G-1/T-1	109%	110%	<95%	<95%	<95%	<95%	
		Humboldt Bay 60 kV Bus	C	BUS	113%	114%	<95%	<95%	<95%	<95%	
		Humboldt Bay PP -Humboldt Bay 60 kV # 1 and 2	C	L-1-1	127%	128%	<95%	<95%	<95%	<95%	
		HUMBOLDT No.1 115/60 kV XFMR and BRDGVLL 115/60 kV XFMR	C	T-2	124%	127%	<95%	<95%	<95%	<95%	
HUMB-S-T-009	Humboldt Bay - Rio Dell Jct 60 kV #1 between Newburg-Rio Dell Tap	Rio Dell Tap - Bridgeville 60 KV	B	L-1	<95%	<95%	<95%	<95%	109%	108%	
		Humboldt 115 kV bus # 1	C	BUS	<95%	<95%	<95%	<95%	<95%	107%	
		Bridgeville - Garberville 60 kV Line and BRDGVLL 115/60 kV XFMR	C	L-1/T-1	<95%	<95%	<95%	<95%	106%	105%	
		T-1 Humboldt 115/60 kV Bank #1 & T-1 Humboldt 115/60 kV Bank #2	C	T-1-1	<95%	<95%	<95%	<95%	97%	114%	
HUMB-W-T-010	Rio Dell Jct-Bridgeville 60 kV Between Carlotta-Rio Dell Tap 60 kV	Humboldt Bay - Rio Dell Jct 60 kV Line (NEWBURG to RIODLLTP)	B	L-1	<95%	<95%	<95%	<95%	110%	109%	
		Humboldt 60 kV Bus	C	BUS	<95%	<95%	<95%	<95%	133%	123%	
		Humboldt Bay 60 kV Bus	C	BUS	<95%	<95%	<95%	<95%	110%	109%	
		Humboldt-Bridgeville 115 kV and Humboldt- Trinity 115 kV	C	L-1-1	<95%	<95%	<95%	<95%	108%	97%	
HUMB-W-T-011	Rio Dell Jct-Bridgeville 60 kV between Carlotta-Swns Flat - Bridgeville 60 kV (loading will be higher with higher gen from Humb Bay 60 kV)	Humboldt Bay-Rio Dell Jct 60 KV (Newburg-Rio Del Jct)	B	L-1	<95%	<95%	<95%	<95%	108%	107%	
		Humboldt 60 kV Bus	C	BUS	<95%	<95%	<95%	<95%	130%	121%	
		Humboldt Bay 60 kV Bus	C	BUS	<95%	<95%	<95%	<95%	107%	107%	
		Humboldt-Bridgeville 115 kV and Humboldt- Trinity 115 kV	C	L-1-1	<95%	<95%	<95%	<95%	106%	95%	

Study Area: Humboldt Area - Winter Peak (2012-2021)

Voltage

ID	Substation	Worst Contingency	Category	Category Description	Min Post-Cont Voltage PU						ISO Proposed Solution
					2012	2013	2014	2015	2016	2021	
HUMB-W-V-001	MAPLE CREEK 60 kV	Humboldt - Maple Creek 60 kV Line	B	L-1	0.83	1.02	1.01	1.00	0.99	0.97	Maple Creek reactive support project (2013) will solve the problem. In interim, PG&E Action Plan
		Humboldt - Maple Creek 60 kV Line and Humboldt-Trinity 115 kV line (more L-1-1)	C	L-1-1	0.82	1.03	1.02	1.01	1.00	0.98	
HUMB-W-V-002	RIDGE CABIN 60 kV	Humboldt 60 kV bus	C	BUS	0.79	1.00	0.99	0.98	1.04	1.03	
		Humboldt - Maple Creek 60 kV Line	B	L-1	0.88	1.03	1.02	1.01	1.00	0.99	
		Humboldt - Maple Creek 60 kV and Humboldt-Trinity 115 kV lines (more L-1-1)	C	L-1-1	0.87	1.03	1.03	1.02	1.01	1.00	
HUMB-W-V-003	RUSS RANCH 60 kV	Humboldt 60 kV bus	C	BUS	0.85	1.01	1.00	0.99	1.03	1.02	
		Humboldt - Maple Creek 60 kV Line	B	L-1	0.82	1.01	1.00	0.99	0.98	0.96	
		Humboldt - Maple Creek 60 kV and Humboldt-Trinity 115 kV lines (more L-1-1)	C	L-1-1	0.80	1.02	1.01	1.00	0.99	0.97	
HUMB-W-V-004	WILLOW CRK 60 kV	Humboldt 60 kV bus	C	BUS	0.78	1.00	0.98	0.97	1.03	1.02	
		Humboldt - Maple Creek 60 kV Line	B	L-1	0.78	0.98	0.97	0.96	0.95	0.93	
		Humboldt - Maple Creek 60 kV and Humboldt-Trinity 115 kV lines (more L-1-1)	C	L-1-1	0.76	0.99	0.98	0.97	0.95	0.94	
HUMB-W-V-005	HOOPA 60 kV	Humboldt 60 kV bus	C	BUS	0.74	0.96	0.94	0.94	1.00	0.98	
		Humboldt - Maple Creek 60 kV Line	B	L-1	0.76	0.97	0.95	0.95	0.93	0.91	
		Humboldt - Maple Creek 60 kV and Humboldt-Trinity 115 kV lines (more L-1-1)	C	L-1-1	0.74	0.97	0.96	0.95	0.94	0.92	
HUMB-W-V-006	FRUIT LAND 60 KV	Humboldt 60 kV bus	C	BUS	0.72	0.94	0.93	0.92	0.99	0.97	Garberville reactive support project (2013) will solve the problem. In interim, PG&E Action Plan .
		BRDGVLL No.1 115/60/12 kV XFMR	B	T-1	0.88	0.97	0.98	0.98	0.94	0.92	
		Newburg-Rio Dell Jct 60 kV & Bridgeville 115/60 kV Bank #1	C	L-1/T-1	0.83	0.98	0.98	0.95	Not Solved	Not Solved	Utilize PG&E Operating Procedure to open CB 42 at Bridgeville 60 kV bus for Bridgeville bank outage, dispatch Kekawaka for peak load and trip load at Fruitland, Fort Seward and Garberville for Category C. Or open CB 32 at Garberville for Bridgeville transformer outage
		Bridgeville 115/60 kV XFRM and Kekawaka gen	C	T-1/G-1	0.84	0.96	0.95	0.94	0.90	0.87	
		Humboldt - Bridgeville 115 kV Line and Cottonwood - Bridgeville 115 kV Line	C	L-1-1	0.87	0.97	0.97	0.95	0.92	0.90	
		Humboldt Bay - Rio Dell Jct 60 kV (Eel Rvr) Line and BRDGVLL 115/60 kV XFMR	C	L-1/T-1	Not Solved	Not Solved	Not Solved	Not Solved	0.89	0.87	
Rio Dell Jct-Bridgeville 60kV line & Bridgeville 115/60 kV Bank #1	C	L-1/T-1	Not Solved	Not Solved	Not Solved	Not Solved	Not Solved	Not Solved			

HUMB-W-V-007	FORT SEWARD 60 kV	BRDGVLL No.1 115/60/12 kV XFMR	B	T-1	0.88	0.98	1.00	0.99	0.96	0.93	Garberville reactive support project (2013) will solve the problem. In interim, PG&E Action Plan.
		Humboldt 60 kV bus	C	BUS	0.92	1.00	1.00	1.00	0.90	0.90	
		Newburg-Rio Dell Jct 60 kV & Bridgeville 115/60 kV Bank #1	C	L-1/T-1	0.82	0.99	0.99	0.95	Not Solved	Not Solved	Utilize PG&E Operating Procedure to open CB 42 at Bridgeville 60 kV bus for Bridgeville bank outage, dispatch Kekawaka for peak load and trip load at Fruitland, Fort Seward and Garberville for Category C. Or open CB 32 at Garberville for Bridgeville transformer outage
		Bridgeville 115/60 kV XFRM and Kekawaka gen	C	T-1/G-1	0.83	0.97	0.95	0.95	0.91	0.87	
		Humboldt - Bridgeville 115 kV Line and Cottonwood - Bridgeville 115 kV Line	C	L-1-1	0.87	0.98	0.98	0.96	0.94	0.91	
		Humboldt Bay - Rio Dell Jct 60 kV Line and BRDGVLL 115/60 kV XFMR	C	L-1/T-1	Not Solved	Not Solved	Not Solved	Not Solved	0.90	0.88	
Rio Dell Jct-Bridgeville 60kV line & Bridgeville 115/60 kV Bank #1	C	L-1/T-1	Not Solved	Not Solved	Not Solved	Not Solved	Not Solved	Not Solved			
HUMB-W-V-008	GRBRVLL 60 kV	Base system (n-0)	A		0.95	1.03	1.05	1.05	1.04	1.03	PG&E Action Plan until Garberville reactive support is installed. Dispatching Kekawaka mitigates, but not eliminates low voltages.
		Bridgeville - Garberville 60 kV Line	B	L-1	0.80	1.05	1.03	1.03	1.02	1.01	
		Garberville - Laytonville 60 kV Line	B	L-1	0.88	1.01	1.06	1.05	1.05	0.98	
		BRDGVLL No.1 115/60/12 kV XFMR	B	T-1	0.87	1.00	1.02	1.02	0.98	0.95	
		Newburg-Rio Dell Jct 60 kV & Bridgeville 115/60 kV Bank #1	C	L-1/T-1	0.81	1.00	1.00	0.96	Not Solved	Not Solved	Utilize PG&E Operating Procedure to open CB 42 at Bridgeville 60 kV bus for Bridgeville bank outage, dispatch Kekawaka for peak load and trip load at Fruitland, Fort Seward and Garberville for Category C. Or open CB 32 at Garberville for Bridgeville transformer outage. New Bridgeville-Garberville 115 kV line
		Bridgeville -Garberville 60 kV and Kekawaka gen	B	L-1/G-1	0.70	1.05	1.05	0.96	0.94	0.87	
		Bridgeville 115/60 kV XFRM and Kekawaka gen	C	T-1/G-1	0.82	0.99	0.97	0.97	0.93	0.89	
		Garberville - Bridgeville 115 kV Line and Cottonwood - Bridgeville 115 kV Line (more L-1-1)	C	L-1-1	0.80	1.03	1.04	1.04	1.04	0.87	
Rio Dell Jct-Bridgeville 60kV line & Bridgeville 115/60 kV Bank #1	C	L-1/T-1	Not Solved	Not Solved	Not Solved	Not Solved	Not Solved	Not Solved			
HUMB-W-V-009	KEKAWAKA 60 kV	Bridgeville - Garberville 60 kV Line	B	L-1	0.83	1.04	1.03	1.02	1.01	1.00	PG&E Action Plan until Garberville reactive support is installed. Dispatching Kekawaka mitigates, but not eliminates low voltages.
		BRDGVLL No.1 115/60/12 kV XFMR	B	T-1	0.90	1.01	1.02	1.02	0.99	0.97	
		Bridgeville -Garberville 60 kV and Kekawaka gen	B	L-1/G-1	0.73	1.03	1.04	0.96	0.94	0.86	Utilize PG&E Operating Procedure to open CB 42 at Bridgeville 60 kV bus for Bridgeville bank outage, dispatch Kekawaka for peak load and trip load at Fruitland, Fort Seward and Garberville for Category C. Or open CB 32 at Garberville for Bridgeville
		Newburg-Rio Dell Jct 60 kV & Bridgeville 115/60 kV Bank #1	C	L-1/T-1	0.83	0.99	0.99	0.95	Not Solved	Not Solved	
		Bridgeville 115/60 kV XFRM and Kekawaka gen	C	T-1/G-1	0.85	0.99	0.97	0.97	0.93	0.90	
		Rio Dell Jct-Bridgeville 60kV line & Bridgeville 115/60 kV Bank #1	C	L-1/T-1	Not Solved	Not Solved	Not Solved	Not Solved	Not Solved	Not Solved	

HUMB-W-V-010	ARCATA 60 kV	Humboldt No. 1 60 kV Line and Arcata - Humboldt 60 kV Line	C	L-1-1	0.92	0.91	0.92	0.91	0.90	0.87	disable load transfer from Janes Creek
HUMB-W-V-011	BLUE CHIP MIL 60 kV	Humboldt No. 1 60 kV Line and Arcata - Humboldt 60 kV Line	C	L-1-1	0.91	0.90	0.91	0.90	0.89	0.85	disable load transfer from Janes Creek
HUMB-W-V-012	BIG LAGOON 60 kV	Humboldt No. 1 60 kV Line and Arcata - Humboldt 60 kV Line	C	L-1-1	0.90	0.89	0.89	0.89	0.87	0.84	
HUMB-W-V-013	BLUE LAKE 60 kV	Humboldt No. 1 60 kV Line and Arcata - Humboldt 60 kV Line	C	L-1-1	0.92	0.90	0.91	0.90	0.89	0.86	
HUMB-W-V-014	BLUE LAKE PP 60 kV	Humboldt No. 1 60 kV Line and Arcata - Humboldt 60 kV Line	C	L-1-1	0.92	0.91	0.91	0.91	0.89	0.86	
HUMB-W-V-015	JANES CREEK 60 kV	Humboldt No. 1 60 kV Line and Arcata - Humboldt 60 kV Line	C	L-1-1	0.91	0.89	0.89	0.89	0.88	0.85	
HUMB-W-V-016	ORICK 60 KV	Humboldt No. 1 60 kV Line and Arcata - Humboldt 60 kV Line	C	L-1-1	0.90	0.88	0.89	0.88	0.87	0.83	
HUMB-W-V-017	SIMPSON 60 kV	Humboldt No. 1 60 kV Line and Arcata - Humboldt 60 kV Line	C	L-1-1	0.92	0.90	0.91	0.91	0.89	0.86	
HUMB-W-V-018	TRINIDAD 60 kV	Humboldt No. 1 60 kV Line and Arcata - Humboldt 60 kV Line	C	L-1-1	0.90	0.89	0.89	0.89	0.87	0.84	
HUMB-W-V-019		Newburg-Rio Dell Jct 60 kV & Bridgeville 115/60 kV Bank #1	C	L-1/T-1	0.89	0.99	0.99	0.95	Not Solved	Not Solved	
		Bridgeville 115/60 kV XFRM and Kekawaka gen	C	T-1/G-1	0.89	0.95	0.97	0.93	0.90	0.88	
		Rio Dell Jct-Bridgeville 60kV line & Bridgeville 115/60 kV Bank #1	C	L-1/T-1	Not Solved	Not Solved	Not Solved	Not Solved	Not Solved	Not Solved	
HUMB-W-V-020	COVELO6 60 KV	Bridgeville -Garberville 60 kV line	B	L-1	0.89	0.99	0.98	0.98	0.96	0.91	
		Bridgeville -Garberville 60 kV and Kekawaka gen	B	L-1/G-1	0.86	0.98	0.99	0.92	0.90	0.87	
		Newburg-Rio Dell Jct 60 kV & Bridgeville 115/60 kV Bank #1	C	L-1/T-1	0.88	0.95	0.96	0.92	Not Solved	Not Solved	
		Rio Dell Jct-Bridgeville 60kV line & Bridgeville 115/60 kV Bank #1	C	L-1/T-1	Not Solved	Not Solved	Not Solved	Not Solved	Not Solved	Not Solved	
		Newburg-Rio Dell Jct 60 kV & Bridgeville 115/60 kV Bank #1	C	L-1/T-1	0.89	0.96	0.97	0.93	Not Solved	Not Solved	
		Bridgeville -Garberville 60 kV and Kekawaka gen	B	L-1/T-1	0.87	0.99	1.00	0.93	0.91	0.88	
		Rio Dell Jct-Bridgeville 60kV line & Bridgeville 115/60 kV Bank #1	C	L-1/T-1	Not Solved	Not Solved	Not Solved	Not Solved	Not Solved	Not Solved	

Study Area: Humboldt Area - Winter Peak (2012-2021)

Voltage Deviations

ID	Substation	Worst Contingency	Category	Category Description	Post Cont Voltage Deviation %						ISO Proposed Solution
					2012	2013	2014	2015	2016	2021	
HUMB-W-VD-001	RIDGE CABIN 60 kV	Humboldt - Maple Creek 60 kV Line	B	L-1	14.2%	<5%	<5%	<5%	<5%	<5%	Maple Creek reactive support project (2013) will solve the problem, but may be insufficient in 2021. PG&E Action Plan prior to Maple Creek Reactive Support Project
		Humboldt-Trinity 115 kV Line and Humboldt - Maple Creek 60 kV Line (8 more L-1-1)	C	L-1-1	15.3%	<10%	<10%	<10%	<10%	<10%	
		Humboldt 60 kV bus	C	BUS	17.7%	<5%	<5%	<5%	<5%	<5%	
HUMB-W-VD-002	MAPLE CREEK 60 kV	Humboldt - Maple Creek 60 kV Line	B	L-1	17.8%	<5%	<5%	<5%	<5%	5.4%	
		Humboldt-Trinity 115 kV Line and Humboldt - Maple Creek 60 kV Line (8 more L-1-1)	C	L-1-1	19.2%	<10%	<10%	<10%	<10%	<10%	
		Humboldt 60 kV bus	C	BUS	21.7%	<5%	<5%	<5%	<5%	<5%	
HUMB-W-VD-003	RUSS RANCH 60 kV	Humboldt - Maple Creek 60 kV Line	B	L-1	18.8%	<5%	<5%	<5%	<5%	5.4%	
		Humboldt-Trinity 115 kV Line and Humboldt - Maple Creek 60 kV Line (8 more L-1-1)	C	L-1-1	19.7%	<10%	<10%	<10%	<10%	<10%	
		Humboldt 60 kV bus	C	BUS	22.0%	<5%	<5%	<5%	<5%	<5%	
HUMB-W-VD-004	HOOPA 60 kV	Humboldt - Maple Creek 60 kV Line	B	L-1	19.3%	<5%	<5%	<5%	<5%	5.8%	
		Humboldt-Trinity 115 kV Line and Humboldt - Maple Creek 60 kV Line (8 more L-1-1)	C	L-1-1	22.1%	<10%	<10%	<10%	<10%	<10%	
		Humboldt 60 kV bus	C	BUS	23.7%	<5%	<5%	5.2%	<5%	<5%	
HUMB-W-VD-005	WILLOW CREEK 60 kV	Humboldt - Maple Creek 60 kV Line	B	L-1	18.9%	<5%	<5%	<5%	<5%	5.7%	
		Humboldt-Trinity 115 kV Line and Humboldt - Maple Creek 60 kV Line (8 more L-1-1)	C	L-1-1	21.3%	<10%	<10%	<10%	<10%	<10%	
		Humboldt 60 kV bus	C	BUS	23.1%	<5%	<5%	5.1%	<5%	<5%	

HUMB-W-VD-006	BRIDGEVILLE 115 kV	Humboldt-Bridgeville 115 kV	B	L-1	5.8%	<5%	<5%	<5%	<5%	<5%	Garberville reactive support project
HUMB-W-VD-007	BRIDGEVILLE 60 kV	BRDGVLL No.1 115/60 kV XFMR	B	T-1	11.3%	5.9%	6.0%	6.1%	8.6%	10.4%	Garberville reactive support project (2013) will help, but not solve the problem. In interim, PG&E Action Plan. Dispatching Kekawaka for peak conditions will help, but not eliminate all violations. Open CB 32 at Garberville for Bridgeville transformer outage. New Bridgeville-Garberville 115 kV line
		BRDGVLL 115/60 kV XFMR and Kekawaka gen (16 more T-1/L-1)	C	T-1/L-1	13.2%	6.4%	7.9%	8.1%	10.6%	12.7%	
		Humboldt - Bridgeville 115 kV Line and Cottonwood - Bridgeville 115 kV Line	C	L-1-1	11.7%	<10%	<10%	<10%	10.1%	11.4%	
		Rio Dell Jct-Bridgeville 60kV line & Bridgeville 115/60 kV Bank #1	C	L-1/T-1	Not Solved	Not Solved	Not Solved	Not Solved	Not Solved	Not Solved	
		Newburg-Rio Dell Jct 60 kV & Bridgeville 115/60 kV Bank #1	C	L-1/T-1	14.2%	<10%	<10%	10.0%	Not Solved	Not Solved	
HUMB-W-VD-008	FRUIT LAND 60 KV	BRDGVLL No.1 115/60kV XFMR	B	T-1	9.0%	<5%	<5%	<5%	7.0%	8.9%	
		BRDGVLL 115/60 kV XFMR and Kekawaka gen (16 more T-1/L-1)	C	T-1/L-1	13.4%	5.2%	7.7%	7.9%	11.2%	13.8%	
		Humboldt - Bridgeville 115 kV Line and Cottonwood - Bridgeville 115 kV Line	C	L-1-1	<10%	<10%	<10%	<10%	<10%	10.6%	
		Humboldt 60 kV bus	C	BUS	<5%	<5%	<5%	<5%	<10%	11.7%	
		Rio Dell Jct-Bridgeville 60kV line & Bridgeville 115/60 kV Bank #1	C	L-1/T-1	Not Solved	Not Solved	Not Solved	Not Solved	Not Solved	Not Solved	
		Newburg-Rio Dell Jct 60 kV & Bridgeville 115/60 kV Bank #1	C	L-1/T-1	14.3%	<10%	<10%	<10%	Not Solved	Not Solved	
HUMB-W-VD-009	FORT SEWARD 60 kV	BRDGVLL No.1 115/60/12 kV XFMR	B	T-1	8.2%	<5%	<5%	<5%	6.4%	8.4%	
		BRDGVLL 115/60 kV XFMR and Kekawaka gen (16 more T-1/L-1)	C	T-1/L-1	13.2%	<5%	7.5%	7.8%	11.0%	13.7%	
		Humboldt 60 kV bus	C	BUS	<10%	<10%	<10%	<10%	<10%	11.7%	
		Rio Dell Jct-Bridgeville 60kV line & Bridgeville 115/60 kV Bank #1	C	L-1/T-1	Not Solved	Not Solved	Not Solved	Not Solved	Not Solved	Not Solved	
		Newburg-Rio Dell Jct 60 kV & Bridgeville 115/60 kV Bank #1	C	L-1/T-1	14.1%	<10%	<10%	<10%	Not Solved	Not Solved	
HUMB-W-VD-010	GARBERVILLE 60 kV	Bridgeville - Garberville 60 kV Line	B	L-1	14.5%	<5%	<5%	<5%	<5%	<5%	
		Bridgeville - Garberville 60 kV Line and Kekawaka gen (more L-1/G-1)	B	L-1/G-1	26.4%	<5%	<5%	8.3%	9.3%	15.7%	
		Garberville - Laytonville 60 kV Line	B	L-1	6.6%	<5%	<5%	<5%	<5%	<5%	
		BRDGVLL No.1 115/60/12 kV XFMR	B	T-1	7.2%	<5%	<5%	<5%	5.6%	7.7%	
		BRDGVLL 115/60 kV XFMR and Kekawaka gen (16 more T-1/L-1)	C	T-1/L-1	12.9%	4.2%	7.4%	7.7%	10.8%	13.5%	
		Humboldt 60 kV bus	C	BUS	<5%	<5%	<5%	<5%	<10%	11.2%	
		Rio Dell Jct-Bridgeville 60kV line & Bridgeville 115/60 kV Bank #1	C	L-1/T-1	Not Solved	Not Solved					
Newburg-Rio Dell Jct 60 kV & Bridgeville 115/60 kV Bank #1	C	L-1/T-1	14.0%	<10%	<10%	<10%	Not Solved	Not Solved			

HUMB-W-VD-011	KEKAWAKA 60 kV	Bridgeville - Garberville 60 kV Line	B	L-1	13.0%	<5%	<5%	<5%	<5%	<5%	
		Bridgeville - Garberville 60 kV Line and Kekawaka gen unit	B	L-1/G-1	23.8%	<5%	<5%	8.0%	9.6%	16.8%	
		BRDGVLL 115/60 kV XFMR and Kekawaka gen (more T-1/L-1)	C	T-1/L-1	12.0%	<5%	7.1%	7.3%	10.0%	12.4%	
		Rio Dell 60 kV Tap and Bridgeville - Garberville 60 kV Line (more L-1-1)	C	L-1-1	13.4%	<10%	<10%	<10%	<10%	<10%	
		BRDGVLL No.1 115/60 kV XFMR	B	T-1	6.2%	<5%	<5%	<5%	<5%	6.4%	
		Rio Dell Jct-Bridgeville 60kV line & Bridgeville 115/60 kV Bank #1	C	L-1/T-1	Not Solved	Not Solved	Not Solved	Not Solved	Not Solved	Not Solved	Not Solved
		Newburg-Rio Dell Jct 60 kV & Bridgeville 115/60 kV Bank #1	C	L-1/T-1	13.2%	<10%	<10%	<10%	Not Solved	Not Solved	
HUMB-W-VD-012	LAYTON VILLE 60 kV	Bridgeville - Garberville 60 kV Line	B	L-1	7.3%	<5%	<5%	<5%	<5%	<5%	
		Bridgeville - Garberville 60 kV Line and any one Humb Bay gen unit	B	L-1/G-1	7.5%	<5%	<5%	<5%	<5%	<5%	
		Bridgeville - Garberville 60 kV Line and Kekawaka gen	B	L-1/G-1	11.2%	<5%	<5%	8.8%	10.5%	13.4%	
		Rio Dell Jct-Bridgeville 60kV line & Bridgeville 115/60 kV Bank #1	C	L-1/T-1	Not Solved	Not Solved	Not Solved	Not Solved	Not Solved	Not Solved	Not Solved
HUMB-W-VD-013	COVELO 60 kV	Bridgeville - Garberville 60 kV Line	B	L-1	7.4%	<5%	<5%	<5%	<5%	<5%	
		Bridgeville - Garberville 60 kV Line and Kekawaka gen	B	L-1/G-1	11.4%	<5%	<5%	9.0%	10.7%	13.6%	
		Bridgeville - Garberville 60 kV Line and any one Humb Bay gen unit	B	L-1/G-1	7.6%	<5%	<5%	<5%	<5%	<5%	
		Rio Dell Jct-Bridgeville 60kV line & Bridgeville 115/60 kV Bank #1	C	L-1/T-1	Not Solved	Not Solved	Not Solved	Not Solved	Not Solved	Not Solved	Not Solved
HUMB-W-VD-014	SWINS FLT 60 kV	BRDGVLL 115/60/12 kV XFMR	B	T-1	9.5%	5.1%	5.2%	5.3%	7.2%	8.6%	
		BRDGVLL 115/60 kV XFMR and Kekawaka gen (more T-1/L-1)	C	T-1/L-1	11.2%	5.6%	6.8%	7.0%	8.9%	10.6%	
		Humboldt 60 kV bus	C	BUS	<5%	<5%	<5%	<5%	<10%	10.1%	Upgrade Humboldt 60 kV bus to a breaker-and-a-half, PG&E maintenance project, 2014
		Humboldt Bay - Rio Dell Jct 60 kV Line and BRDGVLL 115/60 kV XFMR	C	L-1/T-1	Not Solved	Not Solved	Not Solved	Not Solved	11.8%	12.6%	Garberville reactive support project (2013) will help, but not solve the problem. In interim, PG&E Action Plan. Dispatching Kekawaka for peak conditions will help, but not eliminate all violations. Open CB 32 at Garberville for Bridgeville transformer outage

HUMB-W-VD-015	ARCATA 60 kV	Arcata - Humboldt 60 kV Line	B	L-1	<5%	<5%	<5%	<5%	<5%	5.4%	install reactive support on Arcata
		Blue Lake generator and Arcata - Humboldt 60 kV Line	B	G-1/L-1	8.0%	8.1%	8.3%	8.5%	8.7%	9.8%	
		Humboldt No. 1 60 kV Line and Arcata - Humboldt 60 kV Line	C	L-1-1	10.5%	11.0%	11.4%	11.6%	12.6%	15.8%	trip Arcata load for Category C
HUMB-W-VD-016	BLUE CHIP MIL 60 kV	Blue Lake generator and Arcata - Humboldt 60 kV Line	B	G-1/L-1	8.7%	9.0%	9.1%				disable load transfer from Janes Creek for L-1-1 outages. Add reactive support
			C	L-1-1	11.2%	11.9%	12.1%	12.4%	13.5%	16.8%	
HUMB-W-VD-017	BLUE LAKE 60 kV	Blue Lake generator and Arcata - Humboldt 60 kV Line	B	G-1/L-1	9.2%	9.6%	9.6%	9.7%	9.7%	10.9%	
		Humboldt No. 1 60 kV Line and Arcata - Humboldt 60 kV Line	C	L-1-1	11.0%	11.7%	11.9%	12.2%	13.3%	16.7%	
HUMB-W-VD-018	BIG LAGOON 60 kV	Blue Lake generator and Arcata - Humboldt 60 kV Line	B	G-1/L-1	8.7%	9.0%	9.1%	9.3%	9.3%	10.5%	
		Humboldt No. 1 60 kV Line and Arcata - Humboldt 60 kV Line	C	L-1-1	11.5%	12.2%	12.4%	12.7%	13.8%	17.3%	
HUMB-W-VD-019	BLUE LAKE PP 60 kV	Blue Lake generator and Arcata - Humboldt 60 kV Line	B	G-1/L-1	9.3%	9.7%	9.7%	9.9%	9.9%	11.0%	
		Humboldt No. 1 60 kV Line and Arcata - Humboldt 60 kV Line	C	L-1-1	10.9%	11.7%	11.8%	12.1%	13.2%	16.6%	
HUMB-W-VD-020	JANES CREEK 60 kV	Blue Lake generator and Arcata - Humboldt 60 kV Line	B	G-1/L-1	4.6%	4.6%	4.7%	4.8%	4.9%	5.3%	
		Humboldt No. 1 60 kV Line and Arcata - Humboldt 60 kV Line	C	L-1-1	12.3%	12.6%	13.2%	13.5%	14.7%	18.2%	
HUMB-W-VD-021	ORICK 60 kV	Blue Lake generator and Arcata - Humboldt 60 kV Line	B	G-1/L-1	8.7%	9.1%	9.1%	9.3%	9.4%	10.5%	
		Humboldt No. 1 60 kV Line and Arcata - Humboldt 60 kV Line	C	L-1-1	11.5%	12.2%	12.4%	12.7%	13.8%	17.3%	
HUMB-W-VD-022	SIMPSON 60 kV	Blue Lake generator and Arcata - Humboldt 60 kV Line	B	G-1/L-1	9.2%	9.7%	9.6%	9.8%	9.8%	10.9%	
		Humboldt No. 1 60 kV Line and Arcata - Humboldt 60 kV Line	C	L-1-1	11.0%	11.7%	11.9%	12.1%	13.2%	16.6%	
HUMB-W-VD-023	TRINIDAD 60 kV	Blue Lake generator and Arcata - Humboldt 60 kV Line	B	G-1/L-1	8.7%	9.0%	9.1%	9.2%	9.3%	10.5%	
		Humboldt No. 1 60 kV Line and Arcata - Humboldt 60 kV Line	C	L-1-1	11.5%	12.1%	12.4%	12.7%	13.8%	17.2%	

Study Area: Humboldt - Winter Peak (2012-2021)

Single Contingency Load Drop

ID	Worst Contingen	Category	Category Descriptio	Amount of Load Drop (MW)						ISO Proposed Mitigation
				2012	2013	2014	2015	2016	2021	
HMB-LD-01		B	N-1							

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

Study Area: Humboldt - Winter Peak (2012-2021)

Single source substation with more than 100 MW Load.

ID	Substation	Load Served (MW)						ISO Proposed Mitigation
		2012	2013	2014	2015	2016	2021	
Humb-LS-01								

no substations with >100 MW load



Study Area: North Coast and North Bay Area - Summer Peak (2012-2021)

Thermal Overloads

ID	Overloaded Facility Name	Worst Contingency	Category	Category Description	Loading %						ISO Proposed Solution
					2012	2013	2014	2015	2016	2021	
NCNB-S-T-001	Lakeville-Vaca Dix 230 kV	Geyser #9 - Lakeville 230kV and Vaca-Tulucay No.1 230 kV Lines	C	L-1-1	100%	113%	98%	111%	95%	101%	Loading of this line substantially depends on Pittsburg generation, which was different in different cases. No overload with Pittsburg generation at full output. Need to dispatch Bay area generation after first contingency. Reconductoring in 2016
		Geyser #12 - Fulton 230 kV and Vaca - Tulucay No.1 230 kV Lines	C	L-1-1	91%	105%	<90%	102%	<90%	98%	
		Ignacio - Sobrante 230 kV and Vaca - Tulucay No.1 230 kV Lines	C	L-1-1	<90%	100%	<90%	102%	<90%	102%	
		Geyser #9 - Lakeville 230kV and Lakeville - Tulucay 230 kV Lines	C	L-1-1	<90%	101%	<90%	98%	<90%	<90%	
NCNB-S-T-002	Tulucay-Vaca Dix 230 kV	Geyser #9 - Lakeville and Vaca - Lakeville No.1 230 kV Lines	C	L-1-1	99%	112%	98%	110%	95%	102%	Loading of this line substantially depends on Pittsburg generation, which was different in different cases. No overload with Pittsburg generation at full output. Need to dispatch Bay area generation after first contingency. Reconductoring in 2016
		Vaca - Lakeville No.1 and Ignacio - Sobrante 230 kV Lines	C	L-1-1	<90%	99%	<90%	100%	<90%	101%	
		Geyser #12 - Fulton and Vaca - Lakeville No.1 230 kV Lines	C	L-1-1	91%	104%	90%	102%	<90%	98%	
NCNB-S-T-003	Ignacio-San Rafael 115 kV #1	Ignacio - San Rafael No.3 115 kV (Ignacio - Las Gallinas)	B	L-1	103%	104%	104%	106%	107%	115%	limited by disconnect switch, replace the switch in 2012. Conductor 397 Al 4 ft/sec 582-656 A, overload starting from 2017. Ignacio-Alto Voltage Conversion project
		Ignacio - San Rafael No.3 115 kV (Ignacio - Las Gallinas) & Ignacio 230/115 bank # 4 or # 6 (more L-1-1 outages)	C	L-1/T-1	106%	107%	107%	109%	110%	119%	
NCNB-S-T-004	Ignacio - San Rafael #.3 115 kV (between Ignacio and Las Gallinas)	Ignacio-San Rafael 115 kV # 1 line	B	L-1	93%	94%	94%	95%	96%	103%	Ignacio-Alto Voltage Conversion project
		Ignacio - San Rafael No.3 115 kV (Ignacio - Las Gallinas) & Ignacio 230/115.00 bank # 4 or # 6 (more L-1-1 outages)	C	L-1/T-1	95%	96%	96%	98%	98%	106%	
NCNB-S-T-005	Tulucay 1- Tulucay Jtc 60 kV	Tulucay - Napa #2 60 kV Line(Tulucay - Basalt)	B	L-1	124%	124%	125%	126%	126%	131%	limited by disconnect switch. Replace switch, reconductor limiting section
NCNB-S-T-006	Napa- Tulucay Jtc 60 kV	Tulucay - Napa #2 60 kV Line(Tulucay - Basalt)	B	L-1	100%	100%	101%	101%	101%	104%	
NCNB-S-T-007	Hopland 115/60 kV Bank #2	Mendocino 115/60 kV Banks # 1 and 3	C	T-1-1	106%	106%	106%	106%	103%	115%	trip Geo Energy and new renewable generation and load at Elk if overload persists

NCNB-S-T-008	Bridgeville - Garberville 60 kV Line #1 Between BRDGVLLLE - FRUTLDJDT	NORMAL CONDITIONS	A		80%	94%	89%	90%	93%	101%	Implement 2010 summer operating plan to open CB 42 at Garberville. New Bridgeville-Garberville 115 kV line
		Mendocino 115 kV bus outage	C	BUS	93%	101%	101%	101%	102%	109%	
		Eagle Rock-Cortina & Cortina-Mendocino 115kV Lines (one more L-2 overload)	C	L-2	94%	108%	101%	102%	101%	108%	
		Geyser # 3-Cloverdale 115kV (Cloverdale- MPE Tap) & Cortina-Mendocino #1 115 kV (Mendocino Sub 1- Lucern) (11 more L-1-1 outages)	C	L-1-1	95%	111%	107%	107%	110%	115%	
NCNB-S-T-009	Bridgeville - Garberville 60 kV Line #1 Between FRUTLDJDT-FTSWRDJ	Mendocino 115 kV bus outage	C	BUS	90%	99%	100%	100%	100%	103%	
		Eagle Rock-Cortina & Cortina-Mendocino 115kV Lines (One more L-2 overload)	C	L-2	90%	108%	101%	101%	100%	104%	
		Geyser # 3-Cloverdale 115kV (Cloverdale- MPE Tap) & Cortina-Mendocino #1 115 kV (Mendocino Sub 1- Lucern) (4 more L-1-1 outages)	C	L-1-1	96%	111%	106%	106%	109%	112%	
NCNB-S-T-010	Bridgeville - Garberville 60 kV Line #1 Between GRBRVLLLE - FTSWRDJD	Eagle Rock-Cortina & Cortina-Mendocino 115kV Lines (one more L-2 overload)	C	L-2	87%	106%	100%	99%	98%	102%	
		Geyser # 3-Cloverdale 115kV (Cloverdale- MPE Tap) & Cortina-Mendocino #1 115 kV (Mendocino Sub 1- Lucern), 4 more L-1-1 outages	C	L-1-1	99%	109%	104%	104%	107%	109%	
NCNB-S-T-011	Mendocino - Redbud 115 kV #1 Between REDBUD - REDBUDJ1	Geyser # 3-Cloverdale 115kV (Cloverdale- MPE Tap) & Cortina-Mendocino #1 115 kV (Mendocino Sub 1- Lucern)	C	L-1-1	107%	106%	104%	101%	96%	98%	
NCNB-S-T-012	Eagle Rock - Redbud 115 kV #1 Between REDBUD - REDBUDJ2	Geyser # 3-Cloverdale 115kV (Cloverdale- MPE Tap) & Cortina-Mendocino #1 115 kV (Mendocino Sub 1- Lucern)	C	L-1-1	120%	119%	117%	114%	109%	113%	Trip Redbud load for 2nd contingency
NCNB-S-T-013	Eagle Rock - Redbud 115 kV #1 Between REDBUDJ2 - CACHE J2		C	L-1-1	110%	109%	107%	104%	100%	103%	Middletown 115 kV project in 2016, line re-rate in short -term. Or trip Redbud load
NCNB-S-T-014	Eagle Rock - Redbud 115 kV #1 Between HGHLNDJ1 - LWRLAKEJ		C	L-1-1	120%	119%	117%	114%	109%	113%	Trip Redbud load for 2nd contingency
NCNB-S-T-015	Eagle Rock - Redbud 115 kV #1 Between HGHLNDJ1 - CACHE J2		C	L-1-1	103%	102%	100%	98%	93%	96%	Trip Redbud load for 2nd contingency
NCNB-S-T-016	Geysers 3 - Cloverdale 115 kV Line #1 Between CLOVRDLE - MPE TAP		Geyser #3 - Eagle Rock 115 kV	B	L-1	77%	77%	78%	76%	104%	104%
		EAGLE ROCK 115 kV bus	C	BUS	78%	78%	78%	77%	104%	104%	
		Mendocino-Redbud & Cortina-Mendocino 115kV Lines	C	L-2	102%	102%	99%	96%	95%	95%	
		Eagle Rock-Redbud & Cortina-Mendocino 115kV Lines	C	L-2	120%	120%	119%	116%	113%	116%	
		Eagle Rock - Fulton - Silverado 115kV and Eagle Rock - Cortina (Lower Lake) 115 kV	C	L-1-1	102%	104%	101%	99%	98%	98%	
NCNB-S-T-017	Fulton - Santa Rosa 115 kV Line #1 Between FULTON - MONROE1	Fulton-Santa Rosa 115 kV #2 & Corona-Lakeville 115 kV #1 (one more L-1-1 overload)	C	L-1-1	113%	114%	118%	121%	123%	136%	trip load at Monroe 2 115 kV

NCNB-S-T-018	Fulton - Santa Rosa 115 kV Line #2 Between FULTON - MONROE2	Fulton-Santa Rosa 115 kV #1 & Corona-Lakeville 115 kV #1 (one more L-1-1 overload)	C	L-1-1	113%	114%	118%	121%	123%	136%	trip load at Monroe 1 115 kV
NCNB-S-T-019	Santa Rosa - Corona 115 kV Line #1 between BELLVUE - PENNGRVE	Fulton 230/115 kV #4 & Fulton 230/115 kV #9 XFRMRs	C	T-1-1	122%	124%	<90%	<90%	<90%	<90%	Add third Fulton 230/115 kV bank. In interim, implement PG&E action plan after first contingency, third bank modeled in the cases starting from 2014
NCNB-S-T-020	Santa Rosa - Corona 115 kV Line #1 between PENNGRVE-CORONA				126%	128%	<90%	<90%	<90%	<90%	
NCNB-S-T-021	Corona - Lakeville 115 kV Line #1				118%	120%	<90%	<90%	<90%	<90%	
NCNB-S-T-022	Sonoma - Pueblo 115 kV Line #1				117%	118%	<90%	<90%	<90%	<90%	
NCNB-S-T-023	Santa Rosa - Corona 115 kV Between Bellevue-Stony Point Tap				97%	99%	<90%	<90%	<90%	<90%	
NCNB-S-T-024	Fulton - Pueblo 115 kV Line #1 Between PUEBLO - PUEBLO JT	Lakeville-Sonoma 115 kV #1 & Lakeville-Sonoma 115 kV #2	C	L-2	105%	107%	110%	112%	113%	121%	trip load at Pueblo 115 kV (existing Sonoma-Pueblo SPS)
NCNB-S-T-025	Clear Lake-Hopland between Granite-Hopland 60 kV	Mendocino - Clearlake 60 kV and Eagle Rock 115/60 kV Bank No.1	C	L-1/T-1	124%	126%	128%	130%	<90%	<90%	Middletown 115 kV Project. In interim, open CB22 at Clear Lake and close NO CB at Middletown, trip load at Clear Lake 60 kV with second contingency if overload persists.
NCNB-S-T-026	Clear Lake-Hopland between Clear Lake-Granite 60 kV		C	L-1/T-1	118%	120%	123%	124%	<90%	<90%	
NCNB-S-T-027	Mendocino - Clear Lake 60 kV Line #1 between Mendocino - Upper Lake	Eagle Rock 115/60 kV & Clear Lake-Hopland Jct 60 kV #1	C	L-1/T-1	148%	149%	158%	164%	<90%	<90%	Middletown 115 kV Project. In interim, open CB22 at Clear Lake and close NO CB at Middletown, trip load at Clear Lake and Calistoga 60 kV with second contingency if overload persists.
NCNB-S-T-028	Mendocino - Clear Lake 60 kV Line #1 Between Upper Lake-Hartley		C	L-1/T-1	138%	138%	148%	153%	<90%	<90%	
NCNB-S-T-029	Mendocino - Clear Lake 60 kV Between Hartley-Clear Lake		C	L-1/T-1	101%	101%	108%	112%	<90%	<90%	
NCNB-S-T-030	Mendocino -Philo -Hopland 60 kV Between Mendocino-Ukiah Jct	Mendocno-Ukiah 115 kV (Mendocino - CALPELLA) & Geyser # 3-Cloverdale 115kV (Cloverdale - MPE Tap)	C	L-1-1	108%	110%	103%	101%	90%	<90%	Existing SPS opens Hopland 115/60 kV bank and trips Ukiah and Cloverdale load 115 kV
NCNB-S-T-031	Mendocino -Philo -Hopland 60 kV Between Ukiah Jct-Philo Jct		C	L-1-1	108%	110%	103%	101%	90%	<90%	
NCNB-S-T-032	Mendocino -Philo -Hopland 60 kV Between Philo Jct-Hopland Jct	Mendocino 115/60 kV # 1 and 3	C	T-1-1	<90%	<90%	<90%	<90%	97%	107%	trip Philo and Elk load
		Mendocino 115 kV bus	C	BUS	<90%	<90%	<90%	<90%	97%	106%	

NCNB-S-T-033	Clear Lake - Eagle Rock 60 kV Line #1 Between CLERLKE - KONOCTI6	Mendocino 115 kV bus	C	BUS	<90%	<90%	<90%	<90%	90%	104%	PG&E Action Plan. Open CB22 at Clear Lake and close NO CB at Middletown, trip load at Clear Lake 60 kV with second contingency if overload persists.	
		Geyser # 3-Cloverdale 115kV (Cloverdale- MPE Tap) & Eagle Rock-Cortina(Lower Lake) #1 115 kV (8 more L-1-1 overloads)	C	L-1-1	127%	127%	127%	128%	139%	139%		
NCNB-S-T-034	Clear Lake - Eagle Rock 60 kV Line #1 Between KONOCTI6 - EGGLE RCK	Geyser # 3-Cloverdale 115kV (Cloverdale- MPE Tap) & Eagle Rock-Cortina (Lower Lake) 115 kV (7 more L-1-1 overloads in 2012-2015)					121%	118%	<90%	<90%		
		Eagle Rock - Fulton - Silverado 115kV and Eagle Rock - Cortina (Homestake) 115 kV	C	L-1-1	<90%	<90%	<90%	<90%	102%	103%		
NCNB-S-T-035	KONOCTI-LOWER LAKE 60 kV	Eagle Rock - Cortina (Homestake) 115 kV and Fulton - Calistoga 60 kV	C	L-1-1	<90%	<90%	<90%	<90%	100%	114%		trip load at Calistoga
NCNB-S-T-036	Ignacio - Alto 60 kV Line #1 Between IG JCT - SAN RFLJ - GREENBRE 60 kV	Ignacio-Alto-Sausalito 60kV #2 & Ignacio-Alto-Sausalito 60kV #1	C	L-2	152%	154%	155%	158%	159%	179%		Ignacio-Alto 60 kV Voltage Conversion Project. In interim, trip load at Alto 60 kV for Category C contingencies
NCNB-S-T-037	Ignacio - Alto -Sausalito 60 kV # 2 Between ALTO JT2-HMLTN F-Ignacio A	Ignacio-Alto 60 kV (Ignacio A - Ignacio Jct) & Ignacio - Alto - Sausalito # 1 60 kV (IGNACO A - HMLT BFD)	C	L-1-1	97%	100%	100%	105%	106%	Not Solved		
NCNB-S-T-038	Ignacio - Alto -Sausalito 60 kV # 1 Between ALTO JT1-HMLTN FD B-Ignacio A	Ignacio-Alto 60 kV (Ignacio A - Ignacio Jct) & Ignacio - Alto - Sausalito # 2 60 kV (IGNACO A - HMLT FD)	C	L-1-1	97%	100%	100%	105%	106%	Not Solved		
NCNB-S-T-039	Middletwn-Calistoga 60 kV Line #1	Eagle Rock-Fulton-Silverado 115kV & Geysers #17-Fulton 230kV Lines	C	L-2	N.O.	N.O.	N.O.	N.O.	99%	105%		
		Eagle Rock-Fulton-Silverado 115kV & Geysers #12-Fulton 230kV Lines (6	C	L-1-1	N.O.	N.O.	N.O.	N.O.	104%	110%		
		Eagle Rock-Fulton-Silverado (Rincon) 115kV & Geysers #9-Lakeville 230kV	C	L-2	N.O.	N.O.	N.O.	N.O.	107%	112%		
NCNB-S-T-040	Lakeville #2 60kV Line #1 between Lakevl_JCT - PETLMA A	Fulton-Molino-Cotati 60 kV #1 & Petaluma C-Lakeville 60 kV #1	C	L-1-1	130%	131%	133%	137%	139%	154%	trip load at Petaluma A or C 60 kV (Existing SPS)	
NCNB-S-T-041	Lakeville #2 60kV Line #1 between PetalumaJCT - PETLMA A		C	L-1-1	126%	128%	130%	133%	135%	149%		
NCNB-S-T-042	Lakeville #2 60kV Line #1 t between Lakevl_JCT - Lakeville		C	L-1-1	121%	124%	125%	129%	112%	126%		
NCNB-S-T-043	Monte Rio-Fulton 60 kV between Trenton Jct-Molino 60 kV	Fulton-Molino-Cotati 60 kV #1	B	L-1	<90%	<90%	<90%	<90%	91%	103%	upgrade the line (becomes radial with this outage)	
NCNB-S-T-044	Fulton-St. Helena 60 kV	Lakeville #1 60 kV Line (to Dunbar)	B	L-1	94%	97%	98%	101%	42%	47%	Middletown 115 kV project. In interim, close Middletown-Calistoga 60 kV line	
NCNB-S-T-045	Lakeville 230/60 kV bank # 3	Fulton - Molino - Cotati 60 kV and Lakeville 230/60 kV Bank #4	C	T-1/L-1	96%	99%	100%	102%	94%	105%	RPS project at Lakeville modeled in 2016 and 2021, trip load for second contingency	
NCNB-S-T-046	Tulucay 230/60 bank # 1	Tulucay 230/60 bank # 3	B	T-1	97%	101%	101%	101%	102%	106%	replace limiting equipment	
NCNB-S-T-047	Ignacio 230/115 bank # 4	Ignacio 230/115 bank # 6	B	T-1	90%	91%	92%	93%	94%	104%	upgrade the transformer in 2021	
NCNB-S-T-048	Ignacio 230/115 bank # 6	Ignacio 230/115 bank # 4	B	T-1	90%	91%	92%	93%	94%	104%	upgrade the transformer in 2021	

Not Solved OUTAGES

		Fulton 115/60 kV banks # 1 and 2										trip load at Fitch mtn , Heldersberg, Laguna, Mirabel, Cotati, Sonoma Lndfill, Geyserville 60 kV
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Study Area: North Coast and North Bay Area - Summer Peak (2012-2021)

Low Voltages

ID	Substation	Worst Contingency	Category	Category Description	Min Post-Cont Voltage PU						ISO Proposed Solution
					2012	2013	2014	2015	2016	2021	
NCNB-S-V-001	ALTO 60 kV	Ignacio-Alto-Sausilito 60 kV# 1 and 2	C	L-2	0.82	0.81	0.81	0.81	0.81	0.77	trip load at Alto 60 kV for Category C contingencies. Long term-Ignacio-Alto 60 kV voltage conversion
		Lakeville-Ignacio #1 & Ignacio-Sobrante 230kV Lines	C	L-2	>0.9	>0.9	>0.9	>0.9	>0.9	0.90	
		L-1 Ignacio-Alto 60kV #1 & L-1 Ignacio-Alto-Sausilito 60 kV # 1 or 2 (more L-1-1)	C	L-1-1	0.76	0.74	0.74	0.72	0.72	Not Solved	
NCNB-S-V-002	ANNAPOLIS 60 kV	T-1 Fulton 230/115 kV #4 & T-1 Fulton 230/115 kV #9	C	T-1-1	0.82	0.80	>0.95	>0.95	>0.95	>0.95	Add third Fulton 230/115 kV bank (modeled starting from 2014). In interim, implement PG&E action plan after first contingency
NCNB-S-V-003	BELLVIEW 115 kV		C	T-1-1	0.88	0.87	>0.95	>0.95	>0.95	>0.95	
	CALISTOGA 60 kV		C	T-1-1	0.82	0.81	>0.95	>0.95	>0.95	>0.95	
	CALISTOGA 60 kV	Eagle Rock - Cortina (homestake)115 kV and Fulton - Calistoga 60 kV	C	L-1-1	0.98	0.98	0.98	0.98	0.81	0.78	trip load at Calistoga
	CLEAR LAKE 60 kV	Clear Lake- Hopland 60 KV and Eagle Rock 115/60 KV bank (one more L-1-1 outage)	C	L-1/T-1	0.73	0.78	0.73	0.72	0.94	0.96	open CB22 at Clear Lake and close NO CB at Middletown, trip load at Clear Lake 60 kV with second contingency if low voltage persists.
		Clear Lake-Granite 60 kV and Clear Lake-Konocti 60 KV	C	L-1-1	0.89	0.88	0.89	0.89	0.86	0.89	
		Mendocino - Clearlake 60 kV and Eagle Rock 115/60 kV	C	L-1/T-1	0.91	0.91	0.89	0.89	0.96	0.97	
	COVELO 60 kV	Base system (n-0)	A		0.94	1.00	1.01	1.01	0.99	1.02	Garberville reactive support will mitigate. PG&E Action Plan in interim
		Mendocino 115 kV bus	C	BUS	0.86	0.93	0.93	0.94	0.94	0.89	Garberville reactive support will mitigate. Trip load or install reactive support in 2021
		Mendocino 115/60 kV banks # 1 and 3	C	T-1-1	0.88	0.94	0.94	0.94	0.95	0.88	
		Mendocino-Willits 60 kV and Mendocino Willits-Fort Bragg 60 kV	C	L-1-1	0.88	>0.95	>0.95	>0.95	>0.95	>0.95	>0.95
NCNB-S-V-007	COTATI 60 kV	T-1 Fulton 230/115 kV #4 & T-1 Fulton 230/115 kV #9	C	T-1-1	0.84	0.83	>0.95	>0.95	>0.95	>0.95	Add third Fulton 230/115 kV bank (modeled starting from 2014). In interim, implement PG&E action plan after first contingency
NCNB-S-V-008	FITCH MOUNTAIN 60 kV		C	T-1-1	0.85	0.84	>0.95	>0.95	>0.95	>0.95	
NCNB-S-V-009	FORT ROSS 60 kV		C	T-1-1	0.83	0.81	>0.95	>0.95	>0.95	>0.95	
NCNB-S-V-010	FULTON 115 kV		C	T-1-1	0.85	0.84	>0.95	>0.95	>0.95	>0.95	
NCNB-S-V-011	FULTON 60 kV		C	T-1-1	0.90	0.89	>0.95	>0.95	>0.95	>0.95	
NCNB-S-V-012	GEYSER 1-2 60 kV		C	T-1-1	0.85	0.84	>0.95	>0.95	>0.95	>0.95	
NCNB-S-V-013	GEYSERS VILLE 60 kV		C	T-1-1	0.84	0.83	>0.95	>0.95	>0.95	>0.95	
	FORT SEWARD 60 kV	Base system (n-0)	A		0.95	1.02	1.03	1.03	1.01	1.03	
		Mendocino 115 kV bus	C	BUS	0.90	0.98	0.99	0.99	0.98	0.95	

NCNB-S-V-015	GARBERVILLE 60 kV	Base system (n-0)	A		0.93	1.03	1.04	1.04	1.01	1.04	Garberville reactive support will mitigate. PG&E Action Plan in interim
		Eagle Rock-Redbud & Cortina-Mendocino 115kV Lines	C	L-2	0.90	1.01	1.02	1.02	1.02	0.99	
		Eagle Rock-Cortina & Cortina-Mendocino 115kV Lines	C	L-2	0.90	1.01	1.02	1.02	1.02	0.99	
		Mendocino 115 kV bus	C	BUS	0.87	0.98	0.99	1.00	0.99	0.94	
		Mendocino 115/60 kV banks # 1 and 3 (two more N-1-1)	C	T-1-1	0.89	1.00	1.00	1.00	1.00	0.94	
NCNB-S-V-016	GREENBRAE 60 kV	Ignacio - Alto 60 kV Line (Ignacio A Sub to Ignacio Jct)	B	L-1	0.92	0.92	0.92	0.91	0.91	0.90	Trip load at Alto 60 kV for Category C contingencies. Long Term: Ignacio - Alto 60 kV Voltage Conversion
		L-1 Ignacio-Alto-Sausalito 60kV #1 & L-1 Ignacio-Alto-Sausalito 60 kV #2	C	L-2	0.84	0.83	0.83	0.83	0.83	0.79	
		Lakeville-Ignacio #1 & Ignacio-Sobrante 230kV Lines	C	L-2	0.93	0.92	0.92	0.92	0.92	0.90	
		L-1 Ignacio-Alto 60kV #1 & L-1 Ignacio-Alto-Sausalito 60 kV # 1 or 2 (more L-1-1)	C	L-1-1	0.74	0.72	0.72	0.71	0.70	Not Solved	
NCNB-S-V-017	GUALALA 60 kV	T-1 Fulton 230/115 kV #4 & T-1 Fulton 230/115 kV #9	C	T-1-1	0.79	0.78	>0.95	>0.95	>0.95	>0.95	Add third Fulton 230/115 kV bank (modeled starting from 2014). In interim, implement PG&E action plan after first contingency
		Eagle Rock - Fulton - Silverado 115kV and Fulton #1 60kV	C	L-1-1	0.88	0.97	0.97	0.97	0.96	0.95	Garberville reactive support will mitigate. PG&E Action Plan in interim
		Philo - Elk 60 kV and Monte Rio - Fulton 60 kV	C	L-1-1	0.90	0.97	0.97	0.98	0.97	0.97	
NCNB-S-V-018	HARTLEY 60 kV	Clear Lake- Hopland 60 KV and Eagle Rock 115/60 KV bank	C	L-1/T-1	0.76	0.82	0.77	0.75	0.94	0.97	Middletown 115 kV Project. In interim, open CB22 at Clear Lake and close NO CB at Middletown, trip load at Clear Lake 60 kV with second contingency if low voltage persists.
		Mendocino - Clearlake 60 kV and Eagle Rock 115/60 kV	C	L-1/T-1	0.90	0.89	0.88	0.88	0.94	0.96	
NCNB-S-V-019	KONOCTI 60 kV	Clear Lake- Hopland 60 KV and Eagle Rock 115/60 KV bank	C	L-1/T-1	0.70	0.76	0.70	0.68	0.96	0.97	
		Mendocino - Clearlake 60 kV and Eagle Rock 115/60 kV Bank No.1	C	L-1/T-1	0.89	0.88	0.87	0.87	0.95	0.98	
		Ukiah-Hopland-Cloverdale 115 kV and Eagle Rock 115/60 kV Bank No.1	C	L-1/T-1	0.89	0.88	0.92	0.91	0.98	0.98	
NCNB-S-V-020	LAGUNA 60 kV	T-1 Fulton 230/115 kV #4 & T-1 Fulton 230/115 kV #9	C	T-1-1	0.85	0.84	>0.95	>0.95	>0.95	>0.95	Add third Fulton 230/115 kV bank (modeled starting from 2014). In interim, implement PG&E action plan after first contingency
NCNB-S-V-021	LAYTONVILLE 60 kV	Mendocino 115 kV bus	C	BUS	0.87	0.94	0.94	0.95	0.95	0.90	Garberville reactive support will mitigate. PG&E Action Plan in interim. Long-term: new Bridgeville-Garberville 115 kV line
		Mendocino 115/60 kV banks # 1 and 3	C	T-1-1	0.89	0.95	0.95	0.95	0.96	0.89	
		Mendocino-Willits 60 kV and Mendocino Willits-Fort Bragg 60 kV	C	L-1-1	0.89	>0.95	>0.95	>0.95	>0.95	>0.95	

NCNB-S-V-022	KEKAWAKA 60 kV	Base system (n-0)	A		0.93	1.03	1.04	1.03	1.01	1.04	Garberville reactive support will mitigate. PG&E Action Plan in interim
		Eagle Rock-Cortina & Cortina-Mendocino 115kV Lines	C	L-2	0.90	1.00	1.00	1.01	1.01	1.02	
		Mendocino 115 kV bus	C	BUS	0.86	0.97	0.97	0.99	0.98	0.93	
		Mendocino 115/60 kV banks # 1 and 3	C	T-1-1	0.88	0.98	0.99	0.99	0.99	0.93	
NCNB-S-V-023	LOWER LAKE 60 kV	Clear Lake- Hopland 60 KV and Eagle Rock 115/60 KV bank	C	L-1/T-1	0.70	0.76	0.70	0.68	0.99	1.00	Middle town 115 kV Project. In interim, open CB22 at Clear Lake and close NO CB at Middletown, trip load at Clear Lake 60 kV with second contingency if low voltage persists.
		Mendocino - Clearlake 60 kV and Eagle Rock 115/60 kV Bank No.1	C	L-1/T-1	0.89	0.88	0.87	0.87	0.99	1.01	
		Ukiah-Hopland-Cloverdale 115 kV and Eagle Rock 115/60 kV Bank No.1	C	L-1/T-1	0.89	0.88	0.92	0.91	1.00	1.01	
NCNB-S-V-024	MENDOCINO 60 kV	Mendocino 115 kV bus	C	BUS	0.91	0.94	0.94	0.94	0.94	0.89	install reactive support or trip load in 2021
NCNB-S-V-025	MIDDLE TOWN 60 kV	Clear Lake- Hopland 60 KV and Eagle Rock 115/60 KV bank	C	L-1-1	0.70	0.76	0.70	0.69	1.04	1.05	Middle town 115 kV Project. In interim, open CB22 at Clear Lake and close NO CB at Middletown, trip load at Clear Lake 60 kV with second contingency if low voltage persists.
		Mendocino - Clearlake 60 kV and Eagle Rock 115/60 kV Bank No.1	C	L-1/T-1	0.89	0.88	0.87	0.87	1.04	1.05	
		Ukiah-Hopland-Cloverdale 115 kV and Eagle Rock 115/60 kV Bank No.1	C	L-1/T-1	0.89	0.88	0.92	0.91	1.05	1.05	
		Fulton-Calistoga 60 kV and Eagle Rock - Cortina 115 kV	C	L-1-1	0.96	0.97	0.97	0.97	0.85	0.83	Trip load at Calistoga
NCNB-S-V-026	MOLINO 60 kV	T-1 Fulton 230/115 kV #4 & T-1 Fulton 230/115 kV #9	C	T-1-1	0.86	0.85	>0.95	>0.95	>0.95	>0.95	Add third Fulton 230/115 kV bank (modeled starting from 2014). In interim, implement PG&E
NCNB-S-V-027	POTTER VLY 60 kV	Mendocino 115 kV bus	C	BUS	0.91	0.95	0.95	0.95	0.95	0.90	install reactive support or trip load in 2021
NCNB-S-V-028	PUEBLO 115 kV	Lakeville-Sonoma #1 & #2 115kV Lines	C	L-2	0.94	0.94	0.93	0.92	0.91	0.89	existing Pueblo SPS
NCNB-S-V-029	MIRABEL 60 kV	T-1 Fulton 230/115 kV #4 & T-1 Fulton 230/115 kV #9	C	T-1-1	0.88	0.87	>0.95	>0.95	>0.95	>0.95	Add third Fulton 230/115 kV bank (modeled starting from 2014). In interim, implement PG&E action plan after first contingency
NCNB-S-V-030	MONROE1 115 kV		C	T-1-1	0.85	0.84	>0.95	>0.95	>0.95	>0.95	
NCNB-S-V-031	MONROE2 115 kV		C	T-1-1	0.85	0.84	>0.95				
	Monte Cillo PH 115 kV		C	T-1-1	0.87	0.86	>0.95	>0.95	>0.95	>0.95	
NCNB-S-V-033	MONTE CILLO 115 kV		C	T-1-1	0.87	0.86	>0.95	>0.95	>0.95	>0.95	
NCNB-S-V-034	MONTE RIO 60 kV		C	T-1-1	0.85	0.84	>0.95	>0.95	>0.95	>0.95	
NCNB-S-V-035	RINCON 115 kV		C	T-1-1	0.87	0.86	>0.95	>0.95	>0.95	>0.95	
NCNB-S-V-036	SALMON CREEK 60 kV		C	T-1-1	0.83	0.82	>0.95	>0.95	>0.95	>0.95	
NCNB-S-V-037	St HELENA 60 kV		C	T-1-1	0.86	0.84	>0.95	>0.95	>0.95	>0.95	
NCNB-S-V-038	SANTA ROSA 115 kV		C	T-1-1	0.85	0.85	>0.95	>0.95	>0.95	>0.95	

NCNB-S-V-039	SAUSALITO 60 kV	Base system (n-0)	A		0.95	0.95	0.95	0.95	0.95	0.94	Trip load at Alto 60 kV for Category C contingencies. Long term-Ignacio-Alto 60 kV voltage conversion
		Ignacio - Alto 60 kV Line (Ignacio A Sub to Ignacio Jct)	B	L-1	0.92	0.92	0.92	0.91	0.91	0.90	
		L-1 Ignacio-Alto 60kV #1 & L-1 Ignacio-Alto-Sausalito 60 kV # 1 (more L-1-1)	C	L-1-1	0.88	0.88	0.89	0.88	0.88	0.86	
		Ignacio - Alto 60 kV Line and Ignacio - Alto - Sausalito #2 60 kV	C	L-1-1	0.74	0.72	0.73	0.71	0.70	Not Solved	
NCNB-S-V-040	SONOMA 115 kV	Lakeville-Sonoma #1 & #2 115kV Lines	C	L-2	0.92	0.91	0.89	0.89	0.88	0.87	existing Pueblo SPS
NCNB-S-V-041	SILVERDO 115 kV	T-1 Fulton 230/115 kV #4 & T-1 Fulton 230/115 kV #9	C	T-1-1	0.87	0.86	>0.95	>0.95	>0.95	>0.95	Add third Fulton 230/115 kV bank (modeled starting from 2014). In interim, implement PG&E action plan after first contingency
NCNB-S-V-042	SONOMA LANDFILL 60 kV		C	T-1-1	0.84	0.83	>0.95	>0.95	>0.95	>0.95	
NCNB-S-V-043	STONY POINT 115 kV		C	T-1-1	0.87	0.86	>0.95	>0.95	>0.95	>0.95	
NCNB-S-V-044	TRINITY JCT 60 kV		C	T-1-1	0.89	0.88	>0.95	>0.95	>0.95	>0.95	
NCNB-S-V-045	UPPER LAKE 60 kV	Clear Lake- Hopland 60 kV and Eagle Rock 115/60 kV bank	C	L-1/T-1	0.82	0.82	0.82	0.81	0.96	0.99	Middle town 115 kV Project. In interim, open CB22 at Clear Lake and close NO CB at Middletown, trip load at Clear Lake 60 kV with second contingency if low voltage persists.
NCNB-S-V-046	WILLITS 60 kV	Mendocino 115/60 kV banks # 1 and 3	C	T-1-1	0.93	0.95	0.95	0.95	0.96	0.89	New Bridgeville-Garberville 115 kV line
NCNB-S-V-047	WOHLER 60 kV	T-1 Fulton 230/115 kV #4 & T-1 Fulton 230/115 kV #9	C	T-1-1	0.89	0.88	>0.95	>0.95	>0.95	>0.95	Add third Fulton 230/115 kV bank (modeled starting from 2014). In interim, implement PG&E

Not Solved OUTAGES

		Fulton 115/60 kV banks # 1 and 2									trip load at Fitch mtn , Heldersberg, Laguna, Mirabel, Cotati, Sonoma Lndfill, Geyserville 60 kV
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Study Area: North Coast and North Bay Area - Summer Peak (2012-2021)

Voltage Deviations

ID	Substation	Worst Contingency	Category	Category Description	Post Cont Voltage Deviation %						ISO Proposed Solution
					2012	2013	2014	2015	2016	2021	
NCNB-S-VD-001	ALTO 60 KV	Ignacio-Alto 60kV #1 & Ignacio-Alto-Sausalito 60kV #2	C	L-2	14.4%	14.8%	15.0%	15.1%	15.4%	18.7%	trip load at Alto 60 kV for Category C contingencies, long-term: Ignacio-Alto 60 kV voltage conversion
		Ignacio-Alto 60kV #1 & Ignacio-Alto-Sausalito 60kV #1 or 2	C	L-1-1	20.7%	22.5%	22.3%	24.0%	24.4%	Not Solved	
NCNB-S-VD-002	ANNAPOLS 60.00 kV	T-1 Fulton 230/115 kV #4 & T-1 Fulton 230/115 kV #9	C	T-1-1	17.5%	18.5%	<5%	<5%	<5%	<5%	Add third Fulton 230/115 kV bank (modeled starting from 2014). In interim, implement PG&E action plan after first contingency
NCNB-S-VD-003	BELLVUE 115.00 kV		C	T-1-1	14.6%	15.1%	<5%	<5%	<5%	<5%	
NCNB-S-VD-004	BOLINAS 60 kV	Ignacio - Bolinas No.2 60 kV Line (Ignacio -Wood Acre)	B	L-1	<5%	<5%	<5%	<5%	<5%	5.1%	install reactive support in 2021
NCNB-S-VD-005	CALISTOGA 60 kV	Konocti-Lower Lake 60 kV	B	L-1	<5%	<5%	<5%	<5%	<5%	5.6%	open Calistoga-Middle town 60 kV line to feed Calistoga from Fulton
		Eagle Rock - Cortina 115 kV (Eagle Rock to Homestake)	B	L-1	<5%	<5%	<5%	<5%	5.5%	6.0%	
		Lakeville #1 60 kV Line (to Dunbar)	B	L-1	7.9%	8.1%	8.2%	8.3%	<5%	<5%	Middletown 115 kV project. In interim, close Middletown-Calstoga line
		Eagle Rock - Cortina 115 kV and Fulton - Calistoga 60 kV	C	L-1-1	<5%	<5%	<5%	<5%	20.9%	24.1%	trip load at Calistoga
		T-1 Fulton 230/115 kV #4 & T-1 Fulton 230/115 kV #9	C	T-1-1	17.1%	18.1%	<5%	<5%	<5%	<5%	Add third Fulton 230/115 kV bank (modeled starting from 2014). In interim, implement PG&E action plan after first contingency
NCNB-S-VD-006	CLEAR LAKE 60 KV	Clear Lake- Hopland 60 KV and Eagle Rock 115/60 KV bank	C	L-1/T-1	26.0%	26.6%	27.4%	28.9%	<10%	<10%	Middle town 115 kV Project. In interim, open CB22 at Clear Lake and close NO CB at Middletown, trip load at Clear Lake 60 kV with second contingency if low voltage persists.
		Mendocino - Clearlake 60 kV and Eagle Rock 115/60 kV Bank No.1	C	L-1/T-1	<10%	<10%	11.4%	11.5%	<10%	<10%	
		Clear Lake- Hopland 60 KV and Clear Lake-Eagle Rock 60 KV	C	L-1-1	10.1%	12.1%	11.9%	11.9%	14.6%	12.5%	
NCNB-S-VD-007	COVELO 60 kV	Willits - Laytonville 60 kV Line	B	L-1	<5%	<5%	<5%	<5%	<5%	8.3%	Long Term: Build new Bridgeville - Garberville 115 kV Line and add a 115 kV bus and transformer at Garberville
		Mendocino 115 kV bus	C	BUS	<10%	<10%	<10%	<10%	<10%	15.7%	
		Mendocino 115/60 banks # 1 and 3	C	T-1-1	<10%	<10%	<10%	<10%	<10%	13.9%	

NCNB-S-VD-008	COTATI 60 kV	T-1 Fulton 230/115 kV #4 & T-1 Fulton 230/115 kV #9	C	T-1-1	16.8%	17.7%	<5%	<5%	<5%	<5%	Add third Fulton 230/115 kV bank (modeled starting from 2014). In
NCNB-S-VD-009	DUNBAR 60 kV	Lakeville #1 60 kV Line (to Dunbar)	B	L-1	7.9%	8.7%	8.7%	8.9%	<5%	<5%	close Middletown-Calistoga 60 kV line
NCNB-S-VD-010	EAGLE ROCK 60 kV	Eagle Rock 115/60 kV Bank No.1	B	T-1	9.4%	10.3%	10.2%	10.1%	5.6%	5.1%	open Eagle Rock-Konocti 60 kV line for Eagle Rock bank outage
		Eagle Rock 115 kV bus	C	BUS	<10%	9.5%	12.2%	12.6%	10.2%	10.9%	
		Mendocino -Clear Lake 60 kV and Eagle Rock 15/60	C	L-1/T-1	14.9%	16.1%	17.7%	17.9%	<10%	<10%	
		Clear Lake- Hopland 60 KV and Eagle Rock 115/60 KV bank (more N-1-1)	C	L-1-1	33.9%	29.4%	34.2%	35.9%	<10%	<10%	Middle town 115 kV Project. In interim, open CB22 at Clear Lake
NCNB-S-VD-011	ELK 60 kV	Mendocino 115 kV bus	C	BUS	<10%	<10%	<10%	<10%	<10%	10.1%	trip load or install reactive suport in 2021
NCNB-S-VD-012	FORT BRAGG 60 kV	Mendocino 115 kV bus	C	BUS	<10%	<10%	<10%	<10%	<10%	11.2%	
NCNB-S-VD-013	GARCIA 60 kV	Mendocino 115 kV bus	C	BUS	<10%	<10%	<10%	<10%	<10%	10.2%	
NCNB-S-VD-014	FITCH MOUNTAIN 60 kV	T-1 Fulton 230/115 kV #4 & T-1 Fulton 230/115 kV #9	C	T-1-1	16.6%	17.5%	<5%	<5%	<5%	<5%	Add third Fulton 230/115 kV bank (modeled starting from 2014). In interim, implement PG&E action plan after first contingency
NCNB-S-VD-015	FORT ROSS 60 kV		C	T-1-1	17.3%	18.2%	<5%	<5%	<5%	<5%	
NCNB-S-VD-016	FULTON 115 kV		C	T-1-1	19.3%	20.0%	<5%	<5%	<5%	<5%	
NCNB-S-VD-017	FULTON 60 kV		C	T-1-1	15.6%	16.4%	<5%	<5%	<5%	<5%	
NCNB-S-VD-018	GEYSER 1-2 60 kV		C	T-1-1	16.7%	17.6%	<5%	<5%	<5%	<5%	
NCNB-S-VD-019	GEYSER VILLE 60 kV		C	T-1-1	16.8%	17.7%	<5%	<5%	<5%	<5%	
NCNB-S-VD-020	GARBERVILLE 60 kV	Willits - Laytonville 60 kV Line	B	L-1	<5%	<5%	<5%	<5%	<5%	5.3%	new Bridgeville - Garberville 115 kV Line
		Mendocino 115 kV bus	C	BUS	<10%	<10%	<10%	<10%	<10%	11.6%	
NCNB-S-VD-021	GREENBRAE 60 kV	Ignacio - Alto 60 kV Line (Ignacio A - Ignacio Jct)	B	L-1	<5%	<5%	<5%	<5%	<5%	5.6%	Ignacio-Alto voltage conversion
		Ignacio-Alto 60kV #1 & #2	C	L-2	12.6%	13.0%	13.1%	13.2%	13.5%	16.5%	Itrip load at Alto 60 kV for Category C contingencies, long-term:Ignacio-Alto voltage
		L-1 Ignacio-Alto 60kV #1 & L-1 Ignacio-Alto-Sausalito 60kV #1	C	L-1-1	22.1%	23.9%	23.7%	25.5%	26.0%	Not Solved	

NCNB-S-VD-022	GUALALA 60 kV	T-1 Fulton 230/115 kV #4 & T-1 Fulton 230/115 kV #9	C	T-1-1	17.9%	19.0%	<5%	<5%	<5%	<5%	Add third Fulton 230/115 kV bank (modeled starting from 2014). In interim, implement PG&E action plan after first contingency
NCNB-S-VD-023	HARTLEY 60 kV	Clear Lake- Hopland 60 KV and Eagle Rock 115/60 KV bank	C	L-1/T-1	22.0%	23.0%	23.8%	25.2%	<10%	<10%	Middle town 115 kV Project. In interim, open CB22 at Clear Lake
		Clear Lake - Hopland 60 kV and Clear Lake - Eagle Rock 60 kV	C	L-1-1	<10%	10.3%	10.1%	10.2%	12.4%	10.7%	
		Mendocino - Clearlake 60 kV and Eagle Rock 115/60 kV Bank No.1	C	L-1/T-1	<10%	10.9%	12.5%	12.7%	<10%	<10%	trip load at Clear Lake with second contingency
NCNB-S-VD-024	KEKAWAKA 60 kV	Willits - Laytonville 60 kV Line	B	L-1	<5%	<5%	<5%	<5%	<5%	5.9%	new Bridgeville - Garberville 115 kV Line
		Mendocino 115 kV bus	C	BUS	<10%	<10%	<10%	<10%	<10%	12.6%	
		Mendocino 115/60 banks # 1 and 3	C	T-1-1	<10%	<10%	<10%	<10%	<10%	11.1%	
NCNB-S-VD-025	KONOCTI 60 kV	Konocti - Eagle Rock 60 kV Line	B	L-1	6.1%	7.5%	7.2%	7.2%	<5%	<5%	Middle town 115 kV Project. In interim, open CB22 at Clear Lake and close NO CB at Middletown
		Eagle Rock 115/60 kV Bank No.1	B	T-1	6.0%	7.4%	7.1%	7.1%	<5%	<5%	
		Clear Lake- Hopland 60 KV and Eagle Rock 115/60 KV bank	C	L-1/T-1	30.7%	30.9%	31.6%	33.3%	<10%	<10%	Middle town 115 kV Project. In interim, open CB22 at Clear Lake and close NO CB at Middletown, trip load at Clear Lake 60 kV with second contingency if low voltage persists.
		Mendocino - Clearlake 60 kV and Eagle Rock 115/60 kV Bank No.1	C	L-1/T-1	11.7%	13.3%	14.9%	15.0%	<10%	<10%	
		Hopland 115/60 kV and Eagle Rock 115/60 kV banks	C	T-2	9.2%	10.9%	10.5%	10.7%	<10%	<10%	
		Konocti-Lower Lake 60 kV and Eagle Rock 115/60 kV bank	C	L-1/T-1	<10%	<10%	<10%	9.7%	10.7%	9.6%	
NCNB-S-VD-026	LAYTONVILLE 60 kV	Willits - Laytonville 60 kV Line	B	L-1	<5%	<5%	<5%	<5%	<5%	8.2%	new Bridgeville - Garberville 115 kV Line
		Mendocino 115 kV bus	C	BUS	<10%	<10%	<10%	<10%	<10%	15.5%	
NCNB-S-VD-027	LAGUNA 60 kV	T-1 Fulton 230/115 kV #4 & T-1 Fulton 230/115 kV #9	C	T-1-1	16.6%	17.5%	<5%	<5%	<5%	<5%	Add third Fulton 230/115 kV bank (modeled starting from 2014). In interim, implement PG&E action plan after first contingency
NCNB-S-VD-028	LOWER LAKE 60 kV	Konocti - Eagle Rock 60 kV Line	B	L-1	4.2%	5.6%	5.3%	5.3%	<5%	<5%	Middle town 115 kV Project. In interim, open CB22 at Clear Lake and close NO CB at Middletown
		Eagle Rock 115/60 kV Bank No.1	B	T-1	4.1%	5.5%	5.2%	5.2%	<5%	<5%	
		Clear Lake- Hopland 60 KV and Eagle Rock 115/60 KV bank (or Egl Rk-Konocti 60 kV)	C	L-1/T-1	28.9%	24.0%	29.7%	31.3%	<5%	<5%	Middle town 115 kV Project. In interim, open CB22 at Clear Lake and close NO CB at Middletown, trip load at Clear Lake 60 kV with second contingency if low voltage persists.
		Mendocino - Clearlake 60 kV and Konocti - Eagle Rock 60 kV (or Eagle Rk 115/60)	C	L-1-1	9.8%	11.5%	13.0%	13.1%	<10%	<10%	
		Eagle Rock - Cortina 115 kV and Fulton - Calistoga 60 kV	C	L-1-1	<5%	<5%	<5%	<5%	10.3%	12.0%	

NCNB-S-VD-029	MENDOCINO 60 kV	Mendocino 115 kV bus	C	BUS	<10%	<10%	<10%	<10%	<10%	17.8%	install SPS to trip load in 2021
NCNB-S-VD-030	MIDDLE TOWN 60 K	Clear Lake- Hopland 60 KV and Eagle Rock 115/60 KV bank (or Egl Rk-Konocti 60 kV)	C	L-1-1	25.9%	21.1%	26.7%	28.3%	<5%	<5%	Middle town 115 kV Project. In interim, open CB22 at Clear Lake and close NO CB at Middletown, trip load at Clear Lake 60 kV with second contingency if low voltage persists.
		Mendocino - Clearlake 60 kV and Konocti - Eagle Rock 60 kV (or Eagle Rk 115/60)	C	L-1-1	<10%	<10%	10.3%	10.4%	<5%	<5%	
		Eagle Rock - Cortina 115 kV and Fulton - Calistoga 60 kV	C	L-1-1	<5%	<5%	<5%	<5%	18.4%	19.0%	
		Eagle Rock - Cortina 115 kV (Eagle Rock to Homestake)	B	L-1	<5%	<5%	<5%	<5%	7.6%	8.3%	
NCNB-S-VD-031	MIRABEL 60 kV	T-1 Fulton 230/115 kV #4 & T-1 Fulton 230/115 kV #9	C	T-1-1	16.1%	16.9%	<5%	<5%	<5%	<5%	Add third Fulton 230/115 kV bank (modeled starting from 2014). In interim, implement PG&E action plan after first contingency
NCNB-S-VD-032	MONTCILO PH 60 KV		C	T-1-1	15.7%	16.4%	<5%	<5%	<5%	<5%	
NCNB-S-VD-033	MOLINO 60kV		C	T-1-1	16.3%	17.2%	<5%	<5%	<5%	<5%	
NCNB-S-VD-034	MONROE1 115 kV		C	T-1-1	17.9%	18.6%	<5%	<5%	<5%	<5%	
NCNB-S-VD-035	MONROE2 115 kV		C	T-1-1	18.0%	18.6%	<5%	<5%	<5%	<5%	
NCNB-S-VD-036	MONTE CILLO 115 kV		C	T-1-1	15.7%	16.5%	<5%	<5%	<5%	<5%	
NCNB-S-VD-037	MONTE RIO 60 kV		C	T-1-1	16.8%	17.7%	<5%	<5%	<5%	<5%	
NCNB-S-VD-038	PENNGROVE 115kV		C	T-1-1	11.7%	12.1%	<5%	<5%	<5%	<5%	
NCNB-S-VD-039	PUEBLO 115 kV		C	T-1-1	11.2%	11.6%	<5%	<5%	<5%	<5%	
NCNB-S-VD-040	RINCON 115 kV		C	T-1-1	17.1%	17.8%	<5%	<5%	<5%	<5%	
NCNB-S-VD-041	SALMON CREEK 60 kV		C	T-1-1	17.2%	18.1%	<5%	<5%	<5%	<5%	
NCNB-S-VD-042	SANTA ROSA 115 kV		C	T-1-1	17.3%	17.9%	<5%	<5%	<5%	<5%	

NCNB-S-VD-043	PHILO 60 kV	Mendocino 115 kV bus	C	BUS	<10%	<10%	<10%	<10%	<10%	10.9%	trip load or install reactive support in 2021
NCNB-S-VD-044	POINT ARENA 60 kV	Mendocino 115 kV bus	C	BUS	<10%	<10%	<10%	<10%	<10%	10.2%	
NCNB-S-VD-045	POTTER VALLEY 60 kV	Mendocino 115 kV bus Mendocino 115/60 banks # 1 and 3	C	BUS T-1-1	<10% <10%	<10% <10%	<10% <10%	<10% <10%	<10% <10%	16.8% 15.0%	
NCNB-S-VD-046	PUEBLO 115 kV	Lakeville-Sonoma #1 & #2 115kV Lines	C	L-2						11.4% 12.7%	trip load at Pueblo by existing SPS
NCNB-S-VD-047	SAUSALITO 60kV	L-1 Ignacio-Alto 60kV #1 & L-1 Ignacio-Alto-Sausalito 60kV #1	C	L-1-1	20.9%	22.7%	22.5%	24.3%	24.7%	Not Solved	trip load at Alto 60 kV for Category C, long-term:Ignacio-Alto voltage conversion
NCNB-S-VD-048	SILVERADO 115 kV	T-1 Fulton 230/115 kV #4 & T-1 Fulton 230/115 kV #9	C	T-1-1	15.7%	16.5%	<5%	<5%	<5%	<5%	Add third Fulton 230/115 kV bank (modeled starting from 2014). In interim, implement PG&E action plan after first contingency
NCNB-S-VD-049	SONOMA 115 kV	L-1 Lakeville-Sonoma 115 kV #1 & L-1 Lakeville-Sonoma 115 kV #2	C	L-2	11.8%	12.0%	14.4%	14.7%	15.3%	16.7%	trip load at Pueblo by existing SPS
NCNB-S-VD-050	SONOMA LANDFIL 60kV	T-1 Fulton 230/115 kV #4 & T-1 Fulton 230/115 kV #9	C	T-1-1	16.7%	17.7%	<5%	<5%	<5%	<5%	Add third Fulton 230/115 kV bank (modeled starting from 2014). In interim, implement PG&E action plan after first contingency
NCNB-S-VD-051	ST.HELENA 60 kV	Lakeville #1 60 kV Line (to Dunbar)	C	T-1-1	16.4%	17.3%	<5%	<5%	<5%	<5%	close Middletown-Calistoga 60 kV line
NCNB-S-VD-052	STONY POINT 115 kV	T-1 Fulton 230/115 kV #4 & T-1 Fulton 230/115 kV #9	C	T-1-1	15.5%	16.1%	<5%	<5%	<5%	<5%	
NCNB-S-VD-053	TRINITY JUNCTION 60 kV	T-1 Fulton 230/115 kV #4 & T-1 Fulton 230/115 kV #9	C	T-1-1	15.9%	16.8%	<5%	<5%	<5%	<5%	Add third Fulton 230/115 kV bank (modeled starting from 2014). In interim, implement PG&E action plan after first contingency
NCNB-S-VD-054	UPPER LAKE 60 KV	Mendocino 115 kV Bus	C	BUS	<10%	<10%	<10%	<10%	<10%	11.6%	trip load or install reactive support in 2021
		Mendocino 115/60 banks # 1 and 3	C	T-1-1	<10%	<10%	<10%	<10%	<10%	10.2%	
		Clear Lake - Hopland 60 kV and Eagle Rock 115/60 kV Bank No.1	C	L-1/T-1	17.3%	18.1%	19.2%	20.4%	<10%	<10%	Middle town 115 kV Project. In interim, open CB22 at Clear Lake
NCNB-S-VD-055	UKIAH 60 kV	Mendocino 115 kV Bus	C	BUS	<10%	<10%	<10%	<10%	<10%	13.0%	new Bridgeville - Garberville 115 kV Line
NCNB-S-VD-056	WILLITS 60 kV	Mendocino 115 kV Bus Mendocino 115/60 banks # 1 and 3	C C	BUS T-1-1	<10% <10%	<10% <10%	<10% <10%	<10% <10%	<10% <10%	16.7% 14.8%	

NCNB-S-VD-057	WOHLER 60 kV	T-1 Fulton 230/115 kV #4 & T-1 Fulton 230/115 kV #9	C	T-1-1	15.9%	16.8%	<5%	<5%	<5%	<5%	Add third Fulton 230/115 kV bank (modeled starting from 2014). In interim, implement PG&E action plan after first contingency
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Not Solved OUTAGES

		Fulton 115/60 kV banks # 1 and 2									trip load at Fitch mtn , Heldersberg, Laguna, Mirabel, Cotati, Sonoma Lndfill, Geyserville 60 kV
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Study Area: North Coast-Bay- Summer Peak (2012-2021)**Single Contingency Load Drop**

ID	Worst Contingen	Category	Category Descriptio	Amount of Load Drop (MW)						ISO Proposed
				2012	2013	2014	2015	2016	2021	
NCNB-LD-01		B	N-1							

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

Study Area: North Coast-Bay - Summer Peak (2012-2021)***Single source substation with more than 100 MW Load.***

ID	Substation	Load Served (MW)						ISO Proposed Mitigation
		2012	2013	2014	2015	2016	2021	
NCNB-LS-01	Santa Rosa 115 kV						119	not a radial sub
NCNB-LS-01	San Rafael 115 kV						92	not a radial sub



Study Area: North Coast and North Bay Area - Winter peak conditions (2012-2021)

Thermal Overloads

ID	Overloaded Facility	Worst Contingency	Category	Category Descriptio	Loading %						ISO Proposed Solution
					2012	2013	2014	2015	2016	2021	
NCNB-W-T-001	Geysers 3 - Cloverdale 115 kV Line #1 Between CLOVRDLE - MPE TAP	Geyser #3 - Eagle Rock 115 kv)	B	L-1	77%	77%	77%	78%	106%	106%	Geyser No. 3 - Cloverdale 115 kV switch replacement
		Eagle Rock-Red Bud 115 kV and Cortina-Mendocino 115 kV lines	C	L-1-1	99%	100%	97%	98%	95%	98%	
		EAGLE ROCK 115 kV bus	C	BUS	82%	81%	81%	82%	107%	107%	
NCNB-W-T-002	Ignacio - Alto 60 kV Line #1 Between IGNACIO and IG JCT	Ignacio-Alto-Sausalito #2 & #1 60kV Lines	C	L-2	98%	99%	102%	106%	97%	109%	2016 case has higher voltage due a RPS proj at Lakeville. Ignacio-Alto 60 kV Voltage Conversion Project. In interim, trip load at Alto 60 kV for Category C contingencies
NCNB-W-T-003	Ignacio - Alto 60 kV Line #1 Between IG JCT - SAN RFLJ - GREENBRE	Ignacio-Alto-Sausalito #2 & #1 60kV Lines	C	L-2	166%	170%	175%	181%	167%	187%	
NCNB-W-T-004	IGNACIO-SAN RAFL 115 kV	Ignacio - San Rafael No.3 115 kV Ignacio to Las Gallinas	B	L-1	105%	107%	108%	109%	109%	115%	limited by disconnect switch, need to replace the switch (600A). Conductor 397 Al 4 ft/sec 582-656 A, overload starting from 2015 for Cat. B. Ignacio-Alto 60 kV Voltage Conversion
		Ignacio - San Rafael No.3 115 kV & Ignacio 230/115 kV bank #4 (more L-1-1 overloads)	C	L-1-1	108%	109%	111%	112%	111%	117%	
NCNB-W-T-005	Ignacio - Alto- Sausalito 60 kV Line #1 Between	L-1 Ignacio-Alto 60kV #1 & L-1 Ignacio-Alto-Sausalito 60kV #1	C	L-1-1	Not Solved	Not Solved	Not Solved	Not Solved	Not Solved	Not Solved	Ignacio-Alto 60 kV Voltage Conversion Project. In interim, trip load at Alto with second contingency
NCNB-W-T-006	Ignacio - Alto -Sausalito 60 kV Line #2 Between IGNACO A - HMLTNB FD	L-1 Ignacio-Alto 60kV #1 & L-1 Ignacio-Alto-Sausalito 60kV #2	C	L-1-1	Not Solved	Not Solved	Not Solved	Not Solved	Not Solved	Not Solved	
NCNB-W-T-007	Lakeville #2 60kV Line #1 between Lakevl_JCT-PETLMA A	Fulton-Molino-Cotati 60 kV #1 & Petaluma C-Lakeville 60 kV #1	C					116%	118%	128%	trip load at Petaluma A or C 60 kV by existing SPS
NCNB-W-T-008	Lakeville #2 60kV Line #1 between Lakevl_JCT LAKEVILLE		C	L-1-1	96%	97%	99%	101%	<95%	<95%	
NCNB-W-T-009	Lakeville #2 60kV Line #1 between Petaluma Jct - PETLMA A		C	L-1-1	<95%	<95%	<95%	<95%	95%	103%	
NCNB-W-T-010	Monte Rio-Fulton 60 kV between Trenton Jct-Molino 60 kV	Fulton-Molino-Cotati 60 kV	B	L-1	101%	103%	103%	104%	106%	113%	line becomes radial with this outage, need upgrade when load reaches emergency rating, or disable load transfer
NCNB-W-T-011	Clear Lake - Eagle Rock 60 kV Line #1 Between	Geyser # 3-Cloverdale 115kV & Eagle Rock-Cortina (Red Bud)	C	L-1-1	102%	103%	101%	101%	105%	107%	PG&E Action Plan, open CB22 at Clear Lake and close NO CB at

NCNB-W-T-012	Clear Lake - Eagle Rock 60 kV Line #1 Between KONOCTI6 - EGGLE RCK	Geyser # 3-Cloverdale 115kV & Eagle Rock-Cortina (Red Bud) 115 kV #1	C	L-1-1	101%	102%	99%	99%	<95%	<95%	Clear Lake and close NO CB at Middletown, trip load at Clear Lake 60 kV with second contingency if overload persists.
NCNB-W-T-013	Ignacio 230/115 bank # 4	Ignacio 230/115 bank # 6	B	T-1	93%	94%	95%	96%	95%	101%	re-rate or upgrade the bank in 2021
NCNB-W-T-014	Ignacio 230/115 bank # 6	Ignacio 230/115 bank # 4	B	T-1	93%	94%	95%	96%	95%	101%	re-rate or upgrade the bank in 2021
NCNB-W-T-015	Hopland 115/60 kV Bank #2	Mendocino 115 kV bus	C	BUS	<95%	<95%	<95%	<95%	<95%	102%	trip Geyser 5-6 and renewable project generation
		Mendocino 115/60 kV banks # 1 & 3	C	T-1-1	100%	100%	104%	105%	101%	112%	

Not Solved OUTAGES

		Fulton 115/60 kV banks # 1 and 2	C	T-1-1							trip load at Fitch mtn , Heldersberg, Laguna, Mirabel, Cotati, Sonoma Lndfill, Geyserville 60 kV
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Study Area: North Coast and North Bay Area - Winter peak conditions (2012-2021)

Low Voltages

ID	Substation	Worst Contingency	Category	Category Description	Min Post-Cont Voltage PU						ISO Proposed Solution
					2012	2013	2014	2015	2016	2021	
NCNB-W-V-001	ALTO 60kV	Ignacio-Alto-Sausalito #2 & #1 60kV Lines	C	L-2	0.73	0.72	0.71	0.69	0.76	0.71	Trip load at Alto 60 kV for Category C, long-term:Ignacio-Alto Voltage Conversion Project
		Ignacio -Alto 60 kV and Ignacio - Alto - Sausalito # 2 60 kV	C	L-1-1	Not Solved	Not Solved	Not Solved	Not Solved	Not Solved	Not Solved	
		Lakeville-Ignacio #1 & Ignacio-Sobrante 230kV Lines	C	L-2	0.89	0.89	0.89	0.88	0.91	0.90	
		Ignacio -Alto 60 kV and Ignacio - Alto - Sausalito # 1 60 kV	C	L-1-1	Not Solved	Not Solved	Not Solved	Not Solved	Not Solved	Not Solved	
NCNB-W-VD-002	ANNAPOLS 60.00 kV	T-1 Fulton 230/115 kV #4 & T-1 Fulton 230/115 kV #9	C	T-1-1	0.89	0.89	>0.90	>0.90	>0.90	>0.90	Add third Fulton 230/115 kV bank (modeled starting from 2014). In interim, implement PG&E action plan after first contingency
NCNB-W-V-003	CLEAR LAKE 60 kV	Clear Lake-Hopland 60 kV & Eagle Rock 115/60 kV Bank #1 (or Egl Rk_Konocti 60 kV)	C	L-1/T-1	0.85	0.82	0.82	0.82	>0.90	>0.90	Middle town 115 kV Project. In interim, open CB22 at Clear Lake and close NO CB at Middletown, trip load at Clear Lake 60 kV with second contingency if low voltage persists.
NCNB-W-V-004	EAGLE ROCK 60 kV		C	L-1/T-1	0.83	0.80	0.80	0.79	>0.90	>0.90	
NCNB-W-VD-005	COVELO 60 kV	Mendocino-Willits 60 kV and Mendocino_Willits-Fort Bragg 60 kV	C	L-1-1	0.90	>0.95	>0.95	>0.95	>0.95	>0.95	Garberville reactive support will mitigate. In interim, PG&E Action Plan
NCNB-W-VD-006	COTATI 60 kV	T-1 Fulton 230/115 kV #4 & T-1 Fulton 230/115 kV #9	C	T-1-1	0.90	0.89	>0.90	>0.90	>0.90	>0.90	Add third Fulton 230/115 kV bank (modeled starting from 2014). In interim, implement PG&E action plan after first contingency
NCNB-W-VD-007	GARBERVILLE 60 kV	Base system (n-0)	A						1.04	1.03	Garberville reactive support will mitigate. In interim, PG&E Action Plan
		Garberville - Laytonville 60 kV Line(Kekawaka Jct to Laytonville)	B	L-1	0.88	1.01	1.06	1.05	1.05	0.98	
		Mendocino 115 kV bus	C	BUS	0.90	1.02	1.01	1.00	0.99	0.96	
NCNB-W-V-008	GREENBRAE 60 kV	Ignacio - Alto 60 kV Line (Ignacio A Sub to Ignacio Jct)	B	L-1	0.90	0.90	0.90	0.89	0.92	0.91	Trip load at Alto 60 kV for Category C contingencies. Long-term:Ignacio-Alto 60 kV Voltage Conversion Project
		Ignacio -Alto 60 kV & Ignacio - Alto - Sausalito # 1 or 2 60 kV	C	L-1-1	Not Solved	Not Solved	Not Solved	Not Solved	Not Solved	Not Solved	
		Lakeville-Ignacio #1 & Ignacio-Sobrante 230kV Lines	C	L-2	0.89	0.90	0.89	0.89	0.91	0.90	
		Ignacio-Alto-Sausalito #2 & #1 60kV Lines	C	L-2	0.76	0.75	0.74	0.72	0.78	0.73	
NCNB-W-V-009	GUALALA 60 kV	T-1 Fulton 230/115 kV #4 & T-1 Fulton 230/115 kV #9	C	T-1-1	0.88	0.87	>0.90	>0.90	>0.90	>0.90	Add third Fulton 230/115 kV bank (modeled starting from 2014). In interim, implement PG&E action plan after first contingency
NCNB-W-V-010	HARTLEY 60 kV	Clear Lake-Hopland 60 kV & Eagle Rock 115/60 kV Bank #1 (or Egl Rk_Konocti 60 kV)	C	L-1/T-1	0.87	0.84	0.85	0.84	>0.90	>0.90	Middle town 115 kV Project. In interim, open CB22 at Clear Lake and close NO CB at Middletown, trip load at Clear Lake 60 kV with second contingency if low voltage persists.
NCNB-W-V-011	KONOCTI 60 kV		C	L-1/T-1	0.83	0.80	0.80	0.79	>0.90	>0.90	
NCNB-W-V-012	LOWER LAKE 60 kV		C	L-1/T-1	0.83	0.80	0.80	0.79	>0.90	>0.90	
NCNB-W-V-013	MIDDLETOWN 60 kV		C	L-1/T-1	0.83	0.80	0.80	0.79	>0.90	>0.90	

NCNB-W-V-014	SONOMA LANDFILL 60 kV	T-1 Fulton 230/115 kV #4 & T-1 Fulton 230/115 kV #9	C	T-1-1	0.90	0.90	>0.90	>0.90	>0.90	>0.90	Add third Fulton 230/115 kV bank (modeled starting from 2014). In interim, implement PG&E action plan after first contingency
NCNB-W-V-015	SAUSALITO 60 kV	Base system (n-0)	A		0.94	0.94	0.94	0.94	0.95	0.95	Trip load at Alto 60 kV for Category C contingencies. Long-term:Ignacio-Alto 60 kV Voltage Conversion Project
		Ignacio - Alto 60 kV Line (Ignacio A Sub to Ignacio Jct)	B	L-1	0.90	0.90	0.89	0.89	0.91	0.90	
		Ignacio - Alto - Sausalito #2 60 kV Line (Ignacio A Sub to HMLTN FD)	B	L-1	0.90	0.90	0.89	0.89	0.91	0.90	
		Lakeville-Ignacio #1 & Ignacio-Sobrante 230kV Lines	C	L-2	0.87	0.87	0.87	0.87	0.90	0.88	
		L-1 Ignacio-Alto 60 kV & L-1 Ignacio - Alto - Sausalito # 1 or 2 60 kV	C	L-1-1	Not Solved	Not Solved	Not Solved	Not Solved	Not Solved	Not Solved	
NCNB-W-V-016	UPPER LAKE 60 KV	Clear Lake-Hopland 60 kV & Eagle Rock 115/60 kV Bank #1 (or Egl Rk_Konocti 60 kV)	C	L-1/T-1	0.91	0.88	0.88	0.88	>0.90	>0.90	Middle town 115 kV Project. In interim, open CB22 at Clear Lake and close NO CB at Middletown, trip load at Clear Lake 60 kV with second contingency if low voltage persists.
		Not Solved OUTAGES									
		Fulton 115/60 kV banks # 1 and 2	C	T-1-1							trip load at Fitch mtn , Heldersberg, Laguna, Mirabel, Cotati, Sonoma Lndfill, Geyserville 60 kV

Study Area: North Coast and North Bay Area - Winter peak conditions

Voltage Deviations

ID	Substation	Worst Contingency	Category	Category Description	Post Cont Voltage Deviation %						ISO Proposed Solution
					2012	2013	2014	2015	2016	2021	
NCNB-W-VD-001	ALTO 60 kV	Ignacio-Alto-Sausalito # 1 and 2 60kV lines	C	L-2	22.5%	23.2%	24.4%	26.1%	20.8%	25.4%	Trip load at Alto 60 kV for Category C contingencies. Long-term:Ignacio-Alto 60 kV Voltage Conversion Project
		Ignacio -Alto 60 kV and Ignacio - Alto - Sausalito # 1 or 2 60 kV	C	L-1-1	Not Solved	Not Solved	Not Solved	Not Solved	Not Solved	Not Solved	
NCNB-W-VD-002	ANNAPOLS 60 kV	T-1 Fulton 230/115 kV #4 & T-1 Fulton 230/115 kV #9	C	T-1-1	9.8%	10.3%	<5%	<5%	<5%	<5%	Add third Fulton 230/115 kV bank (modeled starting from 2014). In interim, implement PG&E action plan after first
NCNB-W-VD-003	CALISTOGA 60 kV	Lakeville #1 60 kV Line (to Dunbar)	B	L-1	6.9%	7.1%	7.2%	7.3%	<5%	<5%	Middletown 115 kV Project. In interim, close Middletown-Calistoga line
		L-1 Eagle Rock -Cortina 115 kV (Eagle Rock -Homestake) & L-1 Fulton -Calistoga 60 kV (Fulton - St. Helena Jct)	C	L-1-1	<10%	<10%	<10%	<10%	11.5%	12.4%	Open Middletown 115/60 kV xfrmr and trip load at Calistoga
NCNB-W-VD-004	COVELO 60 kV	Willits - Laytonville 60 kV Line	B	L-1	<5%	<5%	<5%	<5%	<5%	9.8%	New Bridgeville-Garberville 115 kV line
NCNB-W-VD-005	COTATI 60 kV	T-1 Fulton 230/115 kV #4 & T-1 Fulton 230/115 kV #9	C	T-1-1	9.7%	10.1%	<5%	<5%	<5%	<5%	Add third Fulton 230/115 kV bank (modeled starting from 2014). In interim, implement PG&E action plan after first contingency
NCNB-W-VD-006	CLEAR LAKE 60 kV	L-1 Clear Lake-Hopland 60 kV (Clear Lake -Granite) & T-1 Eagle Rock 115/60 kV Bank #1	C	L-1/T-1	14.7%	19.0%	18.6%	19.1%	<5%	<5%	Middle town 115 kV Project. In interim, open CB22 at Clear Lake and close NO CB at Middletown, trip load at Clear Lake 60 kV with second contingency if low voltage persists.
NCNB-W-VD-007	EAGLE ROCK 60 kV	Eagle Rock 115/60 kV Bank No.1	B	T-1	8.3%	8.0%	7.7%	7.9%	<5%	<5%	open Eagle Rock-Konocti 60 kV line for Eagle Rock bank outage
		Mendocino-Clear Lake 60 kV and Eagle Rock 115/60 kV bank	C	L-1/T-1	12.4%	12.2%	12.0%	12.2%	<10%	<10%	
NCNB-W-VD-008	DUNBAR 60 kV	Lakeville #1 60 kV Line (to Dunbar)	B	L-1	6.5%	7.3%	7.3%	7.4%	<5%	<5%	Middletown 115 kV Project. In interim, close Middletown-Calistoga line
NCNB-W-VD-009	FORT SEWARD 60 kV	Willits - Laytonville 60 kV Line	B	L-1	<5%	<5%	<5%	<5%	<5%	6.0%	New Bridgeville-Garberville 115 kV line
NCNB-W-VD-010	FRUITLAND 60 kV	Willits - Laytonville 60 kV Line	B	L-1	<5%	<5%	<5%	<5%	<5%	5.1%	New Bridgeville-Garberville 115 kV line
NCNB-W-VD-011	FORT ROSS 60 kV	T-1 Fulton 230/115 kV #4 & T-1 Fulton 230/115 kV #9	C	T-1-1	9.7%	10.1%	<5%	<5%	<5%	<5%	Add third Fulton 230/115 kV bank (modeled starting from 2014). In interim, implement PG&E action plan after first contingency
NCNB-W-VD-012	FULTON 115 kV		C	T-1-1	13.1%	13.5%	<5%	<5%	<5%	<5%	
NCNB-W-VD-013	GARBERVILLE 60 kV	Willits - Laytonville 60 kV Line	B	L-1	<5%	<5%	<5%	<5%	<5%	7.2%	New Bridgeville-Garberville 115 kV line
		Garberville - Laytonville 60 kV Line(Kekawaka Jct to Laytonville)	B	L-1	6.6%	<5%	<5%	<5%	<5%	<5%	Garberville reactive support project will mitigate
		Ignacio - Alto 60 kV Line (Ignacio A Sub to Ignacio Jct)	B	L-1	5.2%	5.6%	5.7%	5.9%	5.2%	5.6%	Trip load at Alto 60 kV for Category C

NCNB-W-VD-014	GREENBRAE 60 kV	L-1 Ignacio -Alto 60 kV & L-1 Ignacio - Alto - Sausalito # 1 or 2 60 kV	C	L-1-1	Not Solved	Not Solved	Not Solved	Not Solved	Not Solved	Not Solved	Trip load at Alto 60 kV for Category C contingencies. Long-term: Ignaco-Alto 60 kV Voltage Conversion
		Ignacio-Alto-Sausalito # 1 and 2 60 kV lines	C	L-2	20.0%	20.7%	21.8%	23.4%	18.7%	23.0%	
NCNB-W-VD-015	GUALALA 60 kV	T-1 Fulton 230/115 kV #4 & T-1 Fulton 230/115 kV #9	C	T-1-1	10.0%	10.5%	<5%	<5%	<5%	<5%	Add third Fulton 230/115 kV bank (modeled starting from 2014). In interim, implement PG&E action plan after first contingency
NCNB-W-VD-016	HARTLEY 60 kV	Clear Lake-Hopland 60 kV & Eagle Rock 115/60 kV Bank #1	C	L-1/T-1	12.0%	16.2%	15.9%	16.2%	<10%	<10%	Middle town 115 kV Project. In interim, open CB22 at Clear Lake and close NO CB at Middletown, trip load at Clear Lake 60 kV with second contingency if low voltage persists.
NCNB-W-VD-017	KEKAWAKA 60 kV	Willits - Laytonville 60 kV Line	B	L-1	<5%	<5%	<5%	<5%	<5%	7.5%	New Bridgeville-Garberville 115 kV line
NCNB-W-VD-018	KONOCTI6 60 kV	L-1 Clear Lake-Hopland 60 kV (Clear Lake 60 KV Sub to Granite Sub 60 kV) & T-1 Eagle Rock 115/60 kV Bank #1	C	L-1/T-1	17.9%	22.2%	21.8%	22.3%	<10%	<10%	Middle town 115 kV Project. In interim, open CB22 at Clear Lake and close NO CB at Middletown, trip load at Clear Lake 60 kV with second contingency if low voltage persists.
		Mendocino - Clearlake 60 kV and Eagle Rock 115/60 kV Bank No.1	C	L-1/T-1	10.4%	10.3%	10.1%	10.3%	<10%	<10%	
		Konocti - Eagle Rock 60 kV Line	B	L-1	6.4%	6.2%	6.0%	6.1%	<5%	<5%	
		EAGLE RK 115/60 kV bank	B	T-1	6.3%	6.1%	5.8%	6.0%	<5%	<5%	
NCNB-W-VD-019	LOWER LAKE 60 kV	Konocti - Eagle Rock 60 kV Line	B	L-1	5.6%	5.3%	5.0%	5.1%	<5%	<5%	
		EAGLE RK 115/60 kV bank	B	T-1	5.5%	5.2%	5.0%	5.0%	<5%	<5%	
		L-1 Clear Lake-Hopland 60 kV (Clear Lake-Granite-) & T-1 Eagle Rock 115/60 kV Bank #1	C	L-1/T-1	17.1%					<10%	
NCNB-W-VD-020	LAYTONVILLE 60 kV	Willits - Laytonville 60 kV Line	B	L-1	<5%	<5%	<5%	<5%	<5%	9.7%	
NCNB-W-VD-021	MENDOCINO 60 kV	Mendocino 115 kV bus	C	BUS	<10%	<10%	<10%	<10%	<10%	10.6%	install reactive support in 2021
NCNB-W-VD-022	MIDDLE TOWN 60 kV	Konocti - Lower Lake 60 kV Line	B	L-1	<5%	<5%	<5%	<5%	5.5%	5.5%	install reactive support in 2016
		Eagle Rock - Cortina 115 kV and Fulton - Calistoga 60 kV	C	L-1-1	<5%	<5%	<5%	<5%	10.1%	11.0%	trip Calistoga load
		Clear Lake-Hopland 60 kV & Eagle Rock 115/60 kV Bank #1	C	L-1/T-1	15.7%	19.9%	19.3%	19.8%	<10%	<10%	Middle town 115 kV Project. In interim, open CB22 at Clear Lake and close NO CB at Middletown, trip load at Clear Lake 60 kV with second contingency if low voltage persists.
NCNB-W-VD-023	MONTCILO PH 60 kV		C	T-1-1	10.6%	10.9%	<5%	<5%	<5%	<5%	Add third Fulton 230/115 kV bank (modeled starting from 2014). In interim, implement PG&E action plan after first contingency
NCNB-W-VD-024	MONROE1 115 kV	T-1 Fulton 230/115 kV #4 & T-1 Fulton 230/115 kV #9	C	T-1-1	12.1%	12.4%	<5%	<5%	<5%	<5%	
NCNB-W-VD-025	MONROE2 115 kV		C	T-1-1	12.1%	12.4%	<5%	<5%	<5%	<5%	
NCNB-W-VD-026	MONTE CILLO 115 kV		C	T-1-1	10.6%	10.9%	<5%	<5%	<5%	<5%	
NCNB-W-VD-027	RINCON 115 kV		C	T-1-1	11.5%	11.9%	<5%	<5%	<5%	<5%	
NCNB-W-VD-028	SALMON CREEK		C	T-1-1	9.6%	10.0%	<5%	<5%	<5%	<5%	
NCNB-W-VD-029	SILVERADO 115 kV		C	T-1-1	10.6%	10.9%	<5%	<5%	<5%	<5%	

NCNB-W-VD-030	SANTA ROSA 115 kV	Fulton 230/115 kV #9	C	T-1-1	11.6%	11.9%	<5%	<5%	<5%	<5%	
NCNB-W-VD-031	SAUSALITO 60 kV	Ignacio -Alto 60 kV and Ignacio - Alto - Sausalito # 1 or 2 60 kV	C	L-1-1	Not Solved	Not Solved	Not Solved	Not Solved	Not Solved	Not Solved	trip load at Alto 60 kV for Category C contingencies. Long-term:Ignacio-Alto Voltage Conversion
NCNB-W-VD-032	SONOMA LANDFILL 60 kV	T-1 Fulton 230/115 kV #4 & T-1	C	T-1-1	9.6%	10.1%	<5%	<5%	<5%	<5%	Add third Fulton 230/115 kV bank (modeled starting from 2014). In interim, implement PG&E action plan after first contingency
NCNB-W-VD-033	STONY POINT 60 KV	Fulton 230/115 kV #9					<5%	<5%	<5%	<5%	
NCNB-W-VD-034	ST. HELENA 60 KV	Lakeville #1 60 kV Line (to Dunbar)	B	L-1	6.8%	6.9%	7.0%	7.1%	<5%	<5%	close Middletown-Calistoga line
NCNB-W-VD-035	UPPER LAKE 60 kV	L-1 Clear Lake-Hopland 60 kV (Clear Lake-Granite-) & T-1 Eagle Rock 115/60 kV Bank #1	C	L-1/T-1	9.1%	13.0%	12.8%	13.1%	<5%	<5%	Middle town 115 kV Project. In interim, open CB22 at Clear Lake and close NO CB at Middletown, trip load at Clear Lake 60 kV with second contingency if low voltage persists.

Not Solved OUTAGES

		Fulton 115/60 kV banks # 1 and 2	C	T-1-1							trip load at Fitch mtn , Heldersberg, Laguna, Mirabel, Cotati, Sonoma Lndfill, Geyserville 60 kV
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Study Area: North Coast-Bay- Winter Peak (2012-2021)

Single Contingency Load Drop

ID	Worst Contingen	Category	Category Descriptio	Amount of Load Drop (MW)						ISO Proposed
				2012	2013	2014	2015	2016	2021	
NCNB-LD-01		B	N-1							

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

Study Area: North Coast-Bay - Winter Peak (2012-2021)

Single source substation with more than 100 MW Load.

ID	Substation	Load Served (MW)						ISO Proposed
		2012	2013	2014	2015	2016	2021	
NCNB-LS-01	Santa Rosa 115 kV						85	not a radial sub
NCNB-LS-01	San Rafael 115 kV						102	not a radial sub

no radial substations with >100 MW load


Study Area: North Valley - Summer Peak (2012-2021)
Thermal Overload

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)						ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2021	
Nvly-T-1	Cascade-Benton-Deschutes 60 kv line	Cascade-Cottonwood 115 kV Line	B	N-1	106%	105%	16%	14%	35%	33%	Interim operating solution.
Nvly-T-2	Coleman-Red Bluff 60 kv line	Cottonwood-Red Bluff 60 kV Line	B	N-1	149%	153%	86%	87%	39%	39%	
Nvly-T-3	Cottonwood-Red Bluff 60 kv line	Coleman-Red Bluff 60 kV Line	B	N-1	100%	102%	75%	76%	31%	31%	

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)						ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2021	
Nvly-T-4	Keswick-Cascade 60 kv line	Cascade-Cottonwood 115 kV Line _Cascade-Benton-Deschutes 60 kv	C	N-1-1	133%	133%	18%	17%	21%	23%	Interim operating solution.
Nvly-T-5	Keswick-Trinity-Weaverville 60 kv line	Cascade-Cottonwood 115 kV Line _Cascade-Benton-Deschutes 60 kv	C	N-1-1	104%	103%	33%	32%	16%	16%	
Nvly-T-6	Cascade-Benton-Deschutes 60 kv line	Cascade-Cottonwood 115 kV Line _Keswick-Cascade 60 kV Line	C	N-1-1	121%	121%	10%	9%	24%	22%	
Nvly-T-7	Volta-South 60 kv line	Coleman-Cottonwood 60 kV Line _Coleman-Red Bluff 60 kV Line	C	N-1-1	100%	99%	101%	97%	97%	98%	
Nvly-T-8	Cottonwood-Red Bluff 60 kv line	Coleman-Red Bluff 60 kV Line _Cottonwood No.1 60 kV Line	C	N-1-1	100%	102%	101%	103%	30%	30%	
Nvly-T-9	Cottonwood-Benton #1 60 kv line	Cottonwood-Benton No.2 60 kV Line _Cascade No.1 115/60/13.8 kV Transformer	C	N-1-1	126%	129%	83%	86%	94%	103%	Interim operating solution and rerate.
				N-1-1	149%	153%	152%	155%	39%	39%	Interim operating solution.

Nvly-T-11	Round Mountain-Cottonwood #2 230 kv line	Cottonwood-Round Mountain 230 kV Line _Round Mountain No.1 500/230 kV Transform	C	N-1-1	104%	104%	103%	101%	101%	101%	Operating solution.
Nvly-T-12	Round Mountain-Cottonwood #3 230 kv line	Round Mountain-Cottonwood(E) No.2 230 _Round Mountain No.1 500/230 kV Transform	C	N-1-1	116%	117%	115%	112%	113%	112%	Operating solution.
Nvly-T-13	Table Mountain-Butte #2 115 kv line	Sycamore Creek-Notre Dame-Table Mouna_ Table Mountain-Butte No.1 115 kV Line	C	N-1-1	125%	126%	127%	73%	75%	78%	Interim operating solution.
Nvly-T-14	Paradise-Butte 115 kv line	Sycamore Creek-Notre Dame-Table Mountain and Table Mountain-Butte No.2 115 kV Lines	C	DCTL	147%	147%	149%	94%	96%	100%	
Nvly-T-15	Table Mountain-Butte #1 115 kv line	Sycamore Creek-Notre Dame-Table Mountain and Table Mountain-Butte No.2 115 kV Lines	C	DCTL	125%	126%	127%	72%	74%	77%	
Nvly-T-16	Paradise-Table Mtn 115 kv line	Table Mountain 115 kV Bus	C	Bus	107%	107%	109%	75%	76%	79%	
Nvly-T-17	Sycamore Creek-Notre Dame-Table Mtn 115 kv line	Table Mountain 115 kV Bus	C	Bus	140%	141%	142%	84%	84%	89%	
Nvly-T-18	Sycamore Creek-Notre Dame-Table Mtn 115 kv line	Table Mountain-Butte No.1 115 kV Line _Table Mountain-Butte No.2 115 kV Line	C	N-1-1	121%	122%	123%	72%	74%	76%	

Study Area: North Valley - Summer Peak (2012-2021)

Low/High Voltage

ID	Substation	Worst Contingency	Category	Category Description	Min. Post Contingency Voltage (PU)						ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2021	
Nvly-V-01	BIG BAR 60 kV	Normal	A	N-0	1.04	1.04	1.04	1.04	1.04	1.06	Under review for possible exemption.
Nvly-V-02	GROUSCRK 60 kV	Normal	A	N-0	1.03	1.04	1.04	1.04	1.04	1.07	
Nvly-V-03	HYAMPOM 60 kV	Normal	A	N-0	1.03	1.04	1.04	1.04	1.04	1.07	
Nvly-V-04	GLENN 60 kV	Normal	A	N-0	1.04	1.05	1.05	1.06	1.04	1.05	
Nvly-V-05	COTTONWD 60 kV	Normal	A	N-0	1.05	1.04	1.06	1.06	1.05	1.06	
Nvly-V-06	HATLOSCK 60 kV	Normal	A	N-0	1.07	1.06	1.06	1.07	1.07	1.07	
Nvly-V-07	HT CRKRG 60 kV	Normal	A	N-0	1.06	1.06	1.06	1.06	1.06	1.07	
Nvly-V-08	MALACHA1 115 kV	Normal	A	N-0	1.05	1.05	1.05	1.05	1.05	1.07	

ID	Substation	Worst Contingency	Category	Category Description	Min. Post Contingency Voltage (PU)						ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2021	
Nvly-V-09	DIRYVLE 60 kV	Cottonwood-Red Bluff 60 kV Line	B	N-1	0.89	0.88	0.97	0.96	1.01	1.01	Interim operating solution.
Nvly-V-10	RED BLFF 60 kV	Cottonwood-Red Bluff 60 kV Line	B	N-1	0.86	0.85	0.96	0.96	1.03	1.04	
Nvly-V-11	VINA 60 kV	Cottonwood-Red Bluff 60 kV Line	B	N-1	0.88	0.87	0.95	0.95	1.00	1.00	

ID	Substation	Worst Contingency	Category	Category Description	Min. Post Contingency Voltage (PU)						ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2021	
Nvly-V-12	DIRYVLE 60 kV	Cottonwood-Red Bluff 60 kV Line _Cottonwood No.2 230/60 kV Transformer	C	N-1-1	0.86	0.85	0.94	0.93	1.00	1.00	Interim operating solution.
Nvly-V-13	RED BLFF 60 kV	Cottonwood-Red Bluff 60 kV Line _Cottonwood No.2 230/60 kV Transformer	C	N-1-1	0.82	0.81					
Nvly-V-14	VINA 60 kV	Cottonwood-Red Bluff 60 kV Line _Cottonwood No.2 230/60 kV Transformer	C	N-1-1	0.84	0.83	0.92	0.92	0.99	0.99	

Study Area: North Valley - Summer Peak (2012-2021)

Voltage Deviation

	Substation	Worst Contingency	Category		Post Contingency Voltage Deviation (%)						ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2021	
Nvly-DV-01	DIRYVLE 60 kV	Cottonwood-Red Bluff 60 kV Line	B	N-1	-9%	-9%	-3%	-3%	0%	0%	Interim operating solution.
Nvly-DV-02	RED BLFF 60 kV	Cottonwood-Red Bluff 60 kV Line	B	N-1	-13%	-13%	-4%	-4%	0%	0%	
Nvly-DV-03	VINA 60 kV	Cottonwood-Red Bluff 60 kV Line	B	N-1	-9%	-9%	-3%	-3%	0%	0%	

ID	Substation	Worst Contingency	Category	Description	Post Contingency Voltage Deviation (%)						ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2021	
Nvly-DV-04	CHICO B 115 kV	Table Mountain 115 kV Bus	C	Bus	-11%	-10%	-11%	-8%	-6%	-7%	Interim action plan.
Nvly-DV-05	DIRYVLE 60 kV	Cottonwood-Red Bluff 60 kV Line _Cottonwood No.2 230/60 kV Transformer	C	N-1-1	-13%	-13%	-6%	-6%	-1%	-1%	Interim operating solution.
Nvly-DV-06	LS MLNSJ 60 kV	Cottonwood-Red Bluff 60 kV Line _Cottonwood No.2 230/60 kV Transformer	C	N-1-1	-13%	-13%	-6%	-6%	-1%	-1%	
Nvly-DV-07	RED BLFF 60 kV	Cottonwood-Red Bluff 60 kV Line _Cottonwood No.2 230/60 kV Transformer	C	N-1-1	-16%	-17%	-7%	-8%	-1%	-1%	
Nvly-DV-08	VINA 60 kV	Cottonwood-Red Bluff 60 kV Line _Cottonwood No.2 230/60 kV Transformer	C	N-1-1	-13%	-13%	-6%	-6%	-1%	-1%	



Study Area: North Valley - Spring Off-Peak (2012-2021)

Thermal Overload

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			ISO Proposed Mitigation
					2012	2016	2021	
Nvly-OP-T-1	Cascade-Benton-Deschutes 60 kV line	Cascade-Cottonwood 115 kV Line	B	N-1	137%	12%	13%	Interim operating solution.
Nvly-OP-T-2	Humboldt-Trinity 115 kV line	Bridgeville-Cottonwood 115 kV Line	B	N-1	86%	105%	96%	Reduce Humboldt generation.

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			ISO Proposed Mitigation
					2012	2016	2021	
Nvly-OP-T-3	Cascade 115/60 kV line #1	Cottonwood No.1 230/115 kV Transformer_Cottonwood No.4 230/115 kV Transformer	C	N-1-1	124%	N/A	N/A	Interim operating solution.
Nvly-OP-T-4	Cascade-Benton-Deschutes 60 kV line	Trinity-Cottonwood 115 kV Line _Cascade-Cottonwood 115 kV Line	C	N-1-1	181%	7%	9%	
Nvly-OP-T-5	Cottonwood 230/115 kV line #1	Cascade-Benton-Deschutes 60 kV Line _Cottonwood No.4 230/115 kV Transformer	C	N-1-1	114%	57%	59%	
Nvly-OP-T-6	Cottonwood-Benton 60 kV line # 1	Cottonwood No.1 230/115 kV Transformer_Cottonwood No.4 230/115 kV Transformer	C	N-1-1	135%	57%	65%	

Nvly-OP-T-7	Humboldt-Trinity 115 kV line	Bridgeville-Cottonwood 115 kV Line _Trinity-Maple Creek 60 kV Line	C	N-1-1	101%	125%	113%	Reduce Humboldt generation.
Nvly-OP-T-8	Keswick-Cascade 60 kV line	Bridgeville-Cottonwood 115 kV Line _Trinity-Cottonwood 115 kV Line	C	N-1-1	167%	195%	181%	
Nvly-OP-T-9	Keswick-Trinity-Weaverville 60 kV line	Bridgeville-Cottonwood 115 kV Line _Trinity-Cottonwood 115 kV Line	C	N-1-1	147%	174%	159%	
Nvly-OP-T-10	Keswick-Trinity-Weaverville 60 kV line	Bridgeville-Cottonwood 115 kV Line _Trinity-Cottonwood 115 kV Line	C	N-1-1	146%	172%	158%	
Nvly-OP-T-11	Trinity-Maple Creek 60 kV line	Humboldt-Trinity 115 kV Line _Bridgeville-Cottonwood 115 kV Line	C	N-1-1	128%	146%	129%	
Nvly-OP-T-12	Trinity-Maple Creek 60 kV line	Humboldt-Trinity 115 kV Line _Bridgeville-Cottonwood 115 kV Line	C	N-1-1	125%	141%	126%	
Nvly-OP-T-13	Trinity-Maple Creek 60 kV line	Humboldt-Trinity 115 kV Line _Bridgeville-Cottonwood 115 kV Line	C	N-1-1	120%	131%	120%	

Study Area: North Valley - Spring Off-Peak (2012-2021)**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Min. Post Contingency Voltage (PU)			ISO Proposed Mitigation
					2012	2016	2021	
Nvly-OP-V-01	ANDERSON 60 kV	Normal	A	N-0	1.11	1.10	1.10	
Nvly-OP-V-02	ANITA 60 kV	Normal	A	N-0	1.05	1.05	1.05	
Nvly-OP-V-03	ANTLER 60 kV	Normal	A	N-0	1.07	1.07	1.07	
Nvly-OP-V-04	APT ORVC 60 kV	Normal	A	N-0	1.08	1.06	1.07	
Nvly-OP-V-05	BCKS CRK 230 kV	Normal	A	N-0	1.06	1.06	1.06	
Nvly-OP-V-06	BELDEN 230 kV	Normal	A	N-0	1.05	1.05	1.05	
Nvly-OP-V-07	BENTON 60 kV	Normal	A	N-0	1.10	1.09	1.09	
Nvly-OP-V-08	BIG BAR 60 kV	Normal	A	N-0	1.05	1.06	1.07	
Nvly-OP-V-09	BIG BEND 115 kV	Normal	A	N-0	1.06	1.05	1.05	
Nvly-OP-V-10	BLACK 230 kV	Normal	A	N-0	1.06	1.06	1.06	
Nvly-OP-V-11	CAPAY 60 kV	Normal	A	N-0	1.05	1.05	1.05	
Nvly-OP-V-12	CARBERY 230 kV	Normal	A	N-0	1.06	1.06	1.05	
Nvly-OP-V-13	CARIBOU 230 kV	Normal	A	N-0	1.06	1.06	1.05	
Nvly-OP-V-14	CASCADE 115 kV	Normal	A	N-0	1.07	1.08	1.08	
Nvly-OP-V-15	CASCADE 60 kV	Normal	A	N-0	1.08	1.08	1.08	
Nvly-OP-V-16	CEDR CRK 60 kV	Normal	A	N-0	1.09	1.08	1.09	
Nvly-OP-V-17	CHALLNGE 60 kV	Normal	A	N-0	1.07	1.07	1.06	
Nvly-OP-V-18	CLMN FSH 60 kV	Normal	A	N-0	1.10	1.10	1.10	
Nvly-OP-V-19	COLEMAN 60 kV	Normal	A	N-0	1.10	1.09	1.09	
Nvly-OP-V-20	CORNING 60 kV	Normal	A	N-0	1.05	1.04	1.05	
Nvly-OP-V-21	COTTONWD 60 kV	Normal	A	N-0	1.11	1.11	1.11	
Nvly-OP-V-22	COTWD_E 230 kV	Normal	A	N-0	1.05	1.05	1.05	
Nvly-OP-V-23	COTWDPGE 115 kV	Normal	A	N-0	1.08	1.08	1.08	
Nvly-OP-V-24	COVE_RD. 230 kV	Normal	A	N-0	1.06	1.06	1.06	
Nvly-OP-V-25	CR CANAL 60 kV	Normal	A	N-0	1.05	1.08	1.08	
Nvly-OP-V-26	CRESTA 230 kV	Normal	A	N-0	1.06	1.06	1.06	
Nvly-OP-V-27	DELEVN 230 kV	Normal	A	N-0	1.07	1.07	1.06	
Nvly-OP-V-28	DESCHUTS 60 kV	Normal	A	N-0	1.08	1.08	1.08	
Nvly-OP-V-29	DIRYVLE 60 kV	Normal	A	N-0	1.10	1.09	1.09	
Nvly-OP-V-30	FRNCHGLH 60 kV	Normal	A	N-0	1.07	1.07	1.07	
Nvly-OP-V-31	FRSTGLEN 115 kV	Normal	A	N-0	1.07	1.05	1.05	
Nvly-OP-V-32	GERBER 60 kV	Normal	A	N-0	1.10	1.09	1.09	
Nvly-OP-V-33	GIRVAN 60 kV	Normal	A	N-0	1.10	1.09	1.09	
Nvly-OP-V-34	GLENN 230 kV	Normal	A	N-0	1.07	1.06	1.06	

Nvly-OP-V-35	GLENN 60 kV	Normal	A	N-0	1.05	1.05	1.05
Nvly-OP-V-36	GRIZZLY1 115 kV	Normal	A	N-0	1.05	1.05	1.05
Nvly-OP-V-37	GROUSCRK 60 kV	Normal	A	N-0	1.04	1.07	1.08
Nvly-OP-V-38	HAMILTON 60 kV	Normal	A	N-0	1.05	1.04	1.05
Nvly-OP-V-39	HATLOSCK 60 kV	Normal	A	N-0	1.07	1.07	1.07
Nvly-OP-V-40	HEADGATE 60 kV	Normal	A	N-0	1.05	1.05	1.05
Nvly-OP-V-41	HONCUT 115 kV	Normal	A	N-0	1.09	1.06	1.06
Nvly-OP-V-42	HRIDGE 230 kV	Normal	A	N-0	1.06	1.06	1.05
Nvly-OP-V-43	HT CRKRG 60 kV	Normal	A	N-0	1.07	1.07	1.07
Nvly-OP-V-44	HYAMPOM 60 kV	Normal	A	N-0	1.04	1.07	1.08
Nvly-OP-V-45	INSKIP 60 kV	Normal	A	N-0	1.09	1.09	1.09
Nvly-OP-V-46	JESSUP 115 kV	Normal	A	N-0	1.08	1.08	1.08
Nvly-OP-V-47	KESWICK 60 kV	Normal	A	N-0	1.07	1.07	1.08
Nvly-OP-V-48	KILARC 60 kV	Normal	A	N-0	1.09	1.08	1.09
Nvly-OP-V-49	KLLY RDE 60 kV	Normal	A	N-0	1.08	1.06	1.07
Nvly-OP-V-50	LOGAN CR 230 kV	Normal	A	N-0	1.07	1.06	1.06
Nvly-OP-V-51	LP FB SP 60 kV	Normal	A	N-0	1.09	1.09	1.09
Nvly-OP-V-52	LS MLNSJ 60 kV	Normal	A	N-0	1.10	1.09	1.09
Nvly-OP-V-53	LSNA PCC 60 kV	Normal	A	N-0	1.08	1.06	1.07
Nvly-OP-V-54	MALACHA1 115 kV	Normal	A	N-0	1.08	1.08	1.08
Nvly-OP-V-55	MTN GATE 60 kV	Normal	A	N-0	1.07	1.07	1.07
Nvly-OP-V-56	NEO REDT 60 kV	Normal	A	N-0	1.05	1.08	1.08
Nvly-OP-V-57	NewBus 230 kV	Normal	A	N-0	N/A	1.06	1.06
Nvly-OP-V-58	NewBus 60 kV	Normal	A	N-0	N/A	1.09	1.09
Nvly-OP-V-59	OREGNTRL 115 kV	Normal	A	N-0	1.07	1.08	1.08
Nvly-OP-V-60	OREGNTRL 60 kV	Normal	A	N-0	1.08	1.08	1.08
Nvly-OP-V-61	ORLAND B 60 kV	Normal	A	N-0	1.05	1.05	1.05
Nvly-OP-V-62	OROENEGY 60 kV	Normal	A	N-0	1.08	1.06	1.07
Nvly-OP-V-63	OROVILLE 60 kV	Normal	A	N-0	1.08	1.06	1.07
Nvly-OP-V-64	OWID 115 kV	Normal	A	N-0	1.08	1.06	1.06
Nvly-OP-V-65	PALERMO 115 kV	Normal	A	N-0	1.09	1.07	1.07
Nvly-OP-V-66	PALERMO 230 kV	Normal	A	N-0	1.06	1.05	1.05
Nvly-OP-V-67	PALERMO 60 kV	Normal	A	N-0	1.08	1.06	1.07
Nvly-OP-V-68	PANRAMA 115 kV	Normal	A	N-0	1.08	1.08	1.08
Nvly-OP-V-69	PEACHTON 60 kV	Normal	A	N-0	1.05	1.04	1.05
Nvly-OP-V-70	PIT 3 230 kV	Normal	A	N-0	1.05	1.05	1.05
				N-0	1.06	1.06	1.06
Nvly-OP-V-72	PIT 6 230 kV	Normal	A	N-0	1.06	1.06	1.06
Nvly-OP-V-73	PIT 7 230 kV	Normal	A	N-0	1.06	1.06	1.06
Nvly-OP-V-74	POE 230 kV	Normal	A	N-0	1.05	1.06	1.06
Nvly-OP-V-75	PPL 60 kV	Normal	A	N-0	1.07	1.07	1.07

Under review for possible exemption.

Nvly-OP-V-76	RED BLFF 60 kV	Normal	A	N-0	1.10	1.09	1.09
Nvly-OP-V-77	ROCKCK 1 230 kV	Normal	A	N-0	1.05	1.06	1.05
Nvly-OP-V-78	ROCKCK 2 230 kV	Normal	A	N-0	1.06	1.06	1.06
Nvly-OP-V-79	ROUND MT 230 kV	Normal	A	N-0	1.07	1.06	1.06
Nvly-OP-V-80	SLYCREEK 115 kV	Normal	A	N-0	1.07	1.06	1.06
Nvly-OP-V-81	SMPSN-AN 115 kV	Normal	A	N-0	1.08	1.08	1.08
Nvly-OP-V-82	SOUTH 60 kV	Normal	A	N-0	1.08	1.08	1.08
Nvly-OP-V-83	SPI_AND 115 kV	Normal	A	N-0	1.07	1.08	1.08
Nvly-OP-V-84	SPI-BRNY 230 kV	Normal	A	N-0	1.05	1.05	1.05
Nvly-OP-V-85	STLLWATR 60 kV	Normal	A	N-0	1.07	1.08	1.08
Nvly-OP-V-86	TBL MT D 230 kV	Normal	A	N-0	1.07	1.06	1.06
Nvly-OP-V-87	TBLE MTN 115 kV	Normal	A	N-0	1.05	1.05	1.05
Nvly-OP-V-88	TBLE MTN 60 kV	Normal	A	N-0	1.06	1.06	1.05
Nvly-OP-V-89	TKO TAP 60 kV	Normal	A	N-0	1.09	1.08	1.09
Nvly-OP-V-90	TRES VIS 60 kV	Normal	A	N-0	1.06	1.05	1.05
				N-0	1.07	1.06	1.06
Nvly-OP-V-92	TRINITY 60 kV	Normal	A	N-0	1.06	1.06	1.07
Nvly-OP-V-93	TYLER 60 kV	Normal	A	N-0	1.05	1.08	1.08
Nvly-OP-V-94	VINA 60 kV	Normal	A	N-0	1.10	1.09	1.09
Nvly-OP-V-95	VOLTA 60 kV	Normal	A	N-0	1.08	1.08	1.08
Nvly-OP-V-96	WHEELBR 115 kV	Normal	A	N-0	1.08	1.08	1.08
Nvly-OP-V-97	WHITMORE 60 kV	Normal	A	N-0	1.09	1.08	1.09
Nvly-OP-V-98	WILDWOOD 115 kV	Normal	A	N-0	1.07	1.06	1.06
Nvly-OP-V-99	WNTU PMS 60 kV	Normal	A	N-0	1.09	1.09	1.09
Nvly-OP-V-100	WYANDTTE 115 kV	Normal	A	N-0	1.09	1.07	1.07

ID	Substation	Worst Contingency	Category	Category Description	Min. Post Contingency Voltage (PU)			ISO Proposed Mitigation
					2012	2016	2021	
Nvly-OP-V-101	ANDERSON 60 kV	Cascade-Benton-Deschutes 60 kV Line _Cottonwood No.3 230/60 kV Transformer	C	N-1-1	1.14	1.11	1.12	
Nvly-OP-V-102	BENTON 60 kV	Cascade-Benton-Deschutes 60 kV Line _Cottonwood No.3 230/60 kV Transformer	C	N-1-1	1.14	1.10	1.10	
Nvly-OP-V-103	GIRVAN 60 kV	Cascade-Benton-Deschutes 60 kV Line _Cottonwood No.3 230/60 kV Transformer	C	N-1-1	1.14	1.10	1.11	

Nvly-OP-V-104	DESCHUTS 60 kV	Cascade-Craig View 115 kV Line _Cottonwood No.3 230/60 kV Transformer	C	N-1-1	1.10	1.09	1.10
Nvly-OP-V-105	KILARC 60 kV	Cascade-Craig View 115 kV Line _Cottonwood No.3 230/60 kV Transformer	C	N-1-1	1.11	1.09	1.10
Nvly-OP-V-106	OREGNTRL 60 kV	Cascade-Craig View 115 kV Line _Cottonwood No.3 230/60 kV Transformer	C	N-1-1	1.10	1.09	1.09
Nvly-OP-V-107	TKO TAP 60 kV	Cascade-Craig View 115 kV Line _Cottonwood No.3 230/60 kV Transformer	C	N-1-1	1.11	1.10	1.10
Nvly-OP-V-108	VOLTA 60 kV	Cascade-Craig View 115 kV Line _Cottonwood No.3 230/60 kV Transformer	C	N-1-1	1.10	1.09	1.09
Nvly-OP-V-109	WHITMORE 60 kV	Cascade-Craig View 115 kV Line _Cottonwood No.3 230/60 kV Transformer	C	N-1-1	1.11	1.09	1.10
Nvly-OP-V-110	WNTU PMS 60 kV	Cascade-Craig View 115 kV Line _Cottonwood No.3 230/60 kV Transformer	C	N-1-1	1.11	1.10	1.10
Nvly-OP-V-111					1.12	1.11	1.11
Nvly-OP-V-112	DIRYVLE 60 kV	Coleman-South 60 kV Line _Cottonwood No.3 230/60 kV Transformer	C	N-1-1	1.13	1.10	1.10
Nvly-OP-V-113	GERBER 60 kV	Cottonwood No.2 60 kV Line _Cottonwood No.3 230/60 kV Transformer	C	N-1-1	1.12	1.12	1.12
Nvly-OP-V-114	LP FB SP 60 kV	Cottonwood No.2 60 kV Line _Cottonwood No.3 230/60 kV Transformer	C	N-1-1	1.12	1.12	1.12
Nvly-OP-V-115	RED BLFF 60 kV	Cottonwood No.2 60 kV Line _Cottonwood No.3 230/60 kV Transformer	C	N-1-1	1.13	1.12	1.12

Under review for possible exemption.

Nvly-OP-V-116	VINA 60 kV	Cottonwood No.2 60 kV Line _Cottonwood No.3 230/60 kV Transformer	C	N-1-1	1.13	1.12	1.12
Nvly-OP-V-117	COTTONWD 60 kV	Cottonwood-Benton No.2 60 kV Line _Cottonwood No.3 230/60 kV Transformer	C	N-1-1	1.13	1.13	1.13
Nvly-OP-V-118	INSKIP 60 kV	Volta-South 60 kV Line _Cottonwood No.3 230/60 kV Transformer	C	N-1-1	1.12	1.11	1.11
Nvly-OP-V-119	PALERMO 115 kV	Woodleaf-Palermo 115 kV Line _Oroville- Thermalito-Table Mountain No.3	C	N-1-1	1.10	1.08	1.08
Nvly-OP-V-120	WYANDTTE 115 kV	Woodleaf-Palermo 115 kV Line _Oroville- Thermalito-Table Mountain No.3	C	N-1-1	1.10	1.08	1.08

Study Area: North Valley - Spring Off-Peak (2012-2021)

Voltage Deviation

ID	Substation	Worst Contingency	Category	Category Description	Post Contingency			ISO Proposed Mitigation
					2012	2016	2021	
NVly-OP-DV-01	ANTLER 60 kV	Cascade-Benton-Deschutes 60 kV Line _Cascade No.1 115/60/13.8 kV Transformer	C	N-1-1	-12%	0%	0%	Interim operating solution.
NVly-OP-DV-02	CASCADE 60 kV	Cascade-Benton-Deschutes 60 kV Line _Cascade No.1 115/60/13.8 kV Transformer	C	N-1-1	-12%	0%	0%	
NVly-OP-DV-03	MTN GATE 60 kV	Cascade-Benton-Deschutes 60 kV Line _Cascade No.1 115/60/13.8 kV Transformer	C	N-1-1	-12%	0%	0%	
NVly-OP-DV-04	PPL 60 kV	Cascade-Benton-Deschutes 60 kV Line _Cascade No.1 115/60/13.8 kV Transformer	C	N-1-1	-12%	0%	0%	
NVly-OP-DV-05	STLLWATR 60 kV	Cascade-Benton-Deschutes 60 kV Line _Cascade No.1 115/60/13.8 kV Transformer	C	N-1-1	-11%	0%	0%	
NVly-OP-DV-06	BIG BAR 60 kV	Humboldt-Trinity 115 kV Line _Bridgeville-Cottonwood 115 kV Line	C	N-1-1	-14%	-17%	-13%	Reduce Humboldt generation
NVly-OP-DV-07	GROUSCRK 60 kV	Humboldt-Trinity 115 kV Line _Bridgeville-Cottonwood 115 kV Line	C	N-1-1	-16%	-20%	-16%	

Study Area: North Valley - Spring Off-Peak


Study Area: Sacramento - Summer Peak (2012-2021)
Thermal Overload

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)						ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2021	
Sac-T-01	Vaca-Suisun-Jameson 115 kV line	Vaca-Suisun 115 kV Line	B	N-1	90%	91%	92%	95%	95%	105%	Rerate or Reconductor.

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)						ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2021	
Sac-T-02	Brighton-Davis 115 kV line	Rio Oso-West Sacramento 115 kV Line & West Sacramento-Brighton 115 kV Line	C	DCTL	114%	101%	103%	35%	28%	30%	Interim operating solution.
Sac-T-03	Brighton-Davis 115 kV line	Woodland-Davis 115 kV Line _West Sacramento-Davis 115 kV Line	C	N-1-1	123%	125%	126%	20%	27%	30%	Interim operating solution.
Sac-T-04	Rio Oso-West Sacramento 115 kV line	Rio Oso-Brighton 230 kV Line _Woodland-Davis 115 kV Line	C					N/A	N/A	N/A	Interim operating solution.
Sac-T-05	Vaca-Suisun-Jameson 115 kV line	Vaca-Vacaville-Jameson-North Tower 115_Vaca-Suisun 115 kV Line	C	N-1-1	127%	129%	130%	134%	136%	151%	Existing SPS / Operating solution.
Sac-T-06	Vaca Dixon 230/115 kV bank #2	Vaca Dixon 230/115 kV Transformer No. 3_Vaca Dixon 230/115 kV Transformer No. 4	C	N-1-1	148%	150%	152%	101%	107%	120%	Operating solution.
Sac-T-07	Vaca Dixon 230/115 kV bank #3	Vaca Dixon 230/115 kV Transformer No. 4_Vaca Dixon 230/115 kV Transformer No. 2	C	N-1-1	81%	91%	92%	104%	110%	123%	Operating solution.

Sac-T-08	Vaca Dixon 230/115 kV bank #4	Vaca Dixon 230/115 kV Transformer No.3 _Vaca Dixon 230/115 kV Transformer No. 2	C	N-1-1	81%	91%	92%	104%	110%	123%	Operating solution.
Sac-T-09	Woodland-Davis 115 kV Line	Rio Oso-West Sacramento 115 kV Line & West Sacramento-Brighton 115 kV Line	C	DCTL	105%	113%	113%	N/A	N/A	N/A	Interim operating solution.
Sac-T-10	Woodland-Davis 115 kV Line	Rio Oso-Brighton 230 kV Line _Brighton-Bellota 230 kV Line	C	N-1-1	169%	149%	148%	N/A	N/A	N/A	Interim operating solution.

Study Area: Sacramento - Summer Peak (2012-2021)**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Min. Post Contingency Voltage (PU)						ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2021	
Sac-V-01	BRIGHTON 230 kV	Normal	A	N-0	0.96	0.95	0.96	0.96	0.96	0.94	Rio Oso 230 kV voltage support.
Sac-V-02	CORTINA 115 kV	Normal	A	N-0	1.06	1.06	1.07	1.07	1.07	1.07	Under review for possible exemption.
Sac-V-03	PLAINFLD 115 kV	Normal	A	N-0	0.95	0.94	0.95	1.02	1.02	1.01	Interim operating solution.

ID	Substation	Worst Contingency	Category	Category Description	Min. Post Contingency Voltage (PU)						ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2021	
Sac-V-4	BRIGHTN 115 kV	Rio Oso-Brighton 230 kV Line _Brighton-Bellota 230 kV Line	C	N-1-1	0.78	0.90	0.92	1.00	1.00	0.98	West Sac area interim operating solution.
Sac-V-5	BRKR SLG 115 kV	Rio Oso-Brighton 230 kV Line _Brighton-Bellota 230 kV Line	C	N-1-1	0.79	0.91	0.92	1.01	1.00	0.99	
Sac-V-6	CAMPUS 115 kV	Rio Oso-Brighton 230 kV Line _Brighton-Bellota 230 kV Line	C	N-1-1	0.79	0.91	0.92	1.00	1.00	0.99	
Sac-V-7	DAVIS 115 kV	Rio Oso-Brighton 230 kV Line _Brighton-Bellota 230 kV Line	C	N-1-1	0.79	0.91	0.92	1.00	1.00	0.99	
Sac-V-8	DEEPWATR 115 kV	Rio Oso-Brighton 230 kV Line _Brighton-Bellota 230 kV Line	C	N-1-1	0.78	0.91	0.92	1.00	1.00	0.99	
Sac-V-9	GRAND IS 115 kV	Rio Oso-Brighton 230 kV Line _Brighton-Bellota 230 kV Line	C	N-1-1	0.77	0.87	0.90	0.99	0.97	0.95	
Sac-V-10	KNIGHTLD 115 kV	Rio Oso-Brighton 230 kV Line _Brighton-Bellota 230 kV Line	C	N-1-1	0.87	0.97	0.98	1.02	1.02	1.02	
Sac-V-11	MOBILCHE 115 kV	Rio Oso-Brighton 230 kV Line _Brighton-Bellota 230 kV Line	C	N-1-1	0.83	0.94	0.95	1.01	1.01		
			C	N-1-1	0.79	0.91	0.92	1.01	1.01	0.99	
Sac-V-13	W.SCRMNO 115 kV	Rio Oso-Brighton 230 kV Line _Brighton-Bellota 230 kV Line	C	N-1-1	0.79	0.91	0.92	1.01	1.01	0.99	
Sac-V-14	WDLND_BM 115 kV	Rio Oso-Brighton 230 kV Line _Brighton-Bellota 230 kV Line	C	N-1-1	0.82	0.93	0.95	1.01	1.01	1.00	
Sac-V-15	WOODLD 115 kV	Rio Oso-Brighton 230 kV Line _Brighton-Bellota 230 kV Line	C	N-1-1	0.83	0.94	0.95	1.01	1.01	1.00	
Sac-V-16	ZAMORA 115 kV	Rio Oso-Brighton 230 kV Line _Brighton-Bellota 230 kV Line	C	N-1-1	0.86	0.96	0.97	1.02	1.01	1.01	

Study Area: Sacramento - Summer Peak (2012-2021)**Voltage Deviation**

ID	Substation	Worst Contingency	Category	Category Description	Post Contingency Voltage Deviation (%)						ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2021	
Sac-DV-01	WILKINS 60 kV	Cortina No. 1 60 kV Line	B	L-1	-6%	-6%	-6%	-6%	-6%	-6%	Cortina reactive support.
Sac-DV-02	CORTINA 230 kV	Delevan-Cortina 230 kV Line	B	L-1	-5%	-5%	-4%	-5%	-5%	-5%	
Sac-DV-03	DEEPWATR 115 kV	West Sacramento-Brighton 115 kV Line	B	L-1	-6%	-4%	-4%	-2%	-2%	-2%	Interim operating solution.
Sac-DV-04	POST 115 kV	West Sacramento-Brighton 115 kV Line	B	L-1	-6%	-4%	-4%	-2%	-2%	-2%	
Sac-DV-05	W.SCRMNO 115 kV	West Sacramento-Brighton 115 kV Line	B	L-1	-6%	-3%	-4%	-2%	-2%	-2%	

ID	Substation	Worst Contingency	Category	Category Description	Post Contingency Voltage Deviation (%)						ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2021	
Sac-DV-06	BRIGHTN 115 kV	Rio Oso-Brighton 230 kV Line _Brighton-Bellota 230 kV Line	C	N-1-1	-26%	-14%	-13%	-5%	-5%	-6%	Interim operating solution.
Sac-DV-07	BRIGHTON 230 kV	Rio Oso-Brighton 230 kV Line _Brighton-Bellota 230 kV Line	C	N-1-1	-28%	-17%	-16%	-9%	-9%	-9%	
Sac-DV-08	BRKR SLG 115 kV	Rio Oso-Brighton 230 kV Line _Brighton-Bellota 230 kV Line	C	N-1-1	-22%	-12%					
Sac-DV-09	CAMPUS 115 kV	Rio Oso-Brighton 230 kV Line _Brighton-Bellota 230 kV Line	C	N-1-1	-21%	-11%	-10%	-2%	-2%	-2%	
Sac-DV-10	DAVIS 115 kV	Rio Oso-Brighton 230 kV Line _Brighton-Bellota 230 kV Line	C	N-1-1	-21%	-11%	-10%	-2%	-2%	-2%	
Sac-DV-11	DEEPWATR 115 kV	Rio Oso-Brighton 230 kV Line _Brighton-Bellota 230 kV Line	C	N-1-1	-24%	-13%	-12%	-4%	-4%	-5%	
Sac-DV-12	GRAND IS 115 kV	Rio Oso-Brighton 230 kV Line _Brighton-Bellota 230 kV Line	C	N-1-1	-27%	-15%	-13%	-5%	-5%	-6%	
Sac-DV-13	KNIGHTLD 115 kV	Rio Oso-Brighton 230 kV Line _Brighton-Bellota 230 kV Line	C	N-1-1	-12%	-6%	-5%	-1%	-1%	-1%	
Sac-DV-14	MOBILCHE 115 kV	Rio Oso-Brighton 230 kV Line _Brighton-Bellota 230 kV Line	C	N-1-1	-16%	-7%	-6%	-1%	-1%	-1%	
Sac-DV-15	POST 115 kV	Rio Oso-Brighton 230 kV Line _Brighton-Bellota 230 kV Line	C	N-1-1	-24%	-13%	-11%	-4%	-3%	-4%	
Sac-DV-16	W.SCRMNO 115 kV	Rio Oso-Brighton 230 kV Line _Brighton-Bellota 230 kV Line	C	N-1-1	-24%	-13%	-11%	-4%	-4%	-4%	
Sac-DV-17	WOODLD 115 kV	Rio Oso-Brighton 230 kV Line _Brighton-Bellota 230 kV Line	C	N-1-1	-16%	-8%	-7%	-1%	-1%	-1%	
Sac-DV-18	ZAMORA 115 kV	Rio Oso-Brighton 230 kV Line _Brighton-Bellota 230 kV Line	C	N-1-1	-13%	-6%	-5%	-1%	-1%	-1%	

Study Area: Sacramento - Summer Peak (2012-2021)***Single source substation with more than 100 MW Load.***

ID	Substation	Load Served (MW)						ISO Proposed Mitigation
		2012	2013	2014	2015	2016	2021	
Sac-LS-01	Vacaville 115 kV	103	105	106	108	109	118	Upgrade 115 kV lines to be able to normally close the bus sectionalizing breaker


Study Area: Sierra - Summer Peak (2012-2021)
Thermal Overload

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)						ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2021	
Siera-T-01	Drum-Higgins 115 kV line	Normal	A	N-0	90%	96%	97%	100%	97%	103%	New Old Coach Substation
Siera-T-02	Placer 115/60 kV bank #1	Normal	A	N-0	84%	87%	89%	91%	94%	107%	New Old Coach Substation

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)						ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2021	
Siera-T-03	Drum-Grass Valley-Weimar 60 kV line	Colgate-Grass Valley 60 kV Line _ROLLINSF 9.11 Unit ID 1	B	L-1/G-1	105%	113%	114%	117%	120%	137%	New Old Coach Substation
Siera-T-04	Drum-Rio Oso 115 kV line #2	Drum-Bell 115 kV Line (Higgins-Bell)	B	N-1	102%	101%	102%	98%	95%	92%	New Old Coach Substation
Siera-T-05	Pease 115/60 kV line #2	Pease-Marysville-Harter 60 kV Line _GRNLEAF2 13.80 Unit ID 1	B	L-1/G-1	54%	59%	96%	99%	101%	111%	Replace bank

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)						ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2021	
Siera-T-06	Bogue-Rio Oso 115 kV line	Colgate-Rio Oso 230 kV Line & Table Mountain-Rio Oso 230 kV Line	C	DCTL	106%	108%	59%	52%	51%	55%	Interim operating solution
Siera-T-07	Drum-Higgins 115 kV line	Placer-Gold Hill No. 1 115 kV Line & Placer-Gold Hill No. 2 115 kV Line	C	DCTL	124%	122%	126%	133%	142%	Diverge	New Old Coach Substation
Siera-T-08	Drum-Rio Oso 115 kV line #2	Drum-Rio Oso No. 1 115 kV Line _Drum-Bell 115 kV Line (Higgins-Bell)	C	N-1-1	159%	153%	165%	148%	145%	136%	
Siera-T-09	Drum-Rio Oso 115 kV line #1	Drum-Rio Oso No. 2 115 kV Line _Drum-Bell 115 kV Line (Higgins-Bell)	C	N-1-1	190%	186%	193%	180%	178%	168%	

Siera-T-10	Gold Hill 230/115 kV bank #1	Drum-Bell 115 kV Line (Drum-Higgins) _Gold Hill 230/115 kV Transformer No. 2	C	N-1-1	100%	103%	105%	108%	110%	126%	Third Gold Hill bank / New Old Coach Substation
Siera-T-11	Gold Hill 230/115 kV bank #2	Drum-Bell 115 kV Line (Drum-Higgins) _Gold Hill 230/115 kV Transformer No. 1	C	N-1-1	101%	103%	106%	108%	111%	127%	
Siera-T-12	Lincoln-Pleasant Grove 115 kV line	Rio Oso-Atlantic 230 kV Line & Rio Oso-Gold Hill 230 kV Line	C	DCTL	82%	97%	96%	103%	44%	46%	Interim operating solution
Siera-T-13	Lincoln-Pleasant Grove 115 kV line	Rio Oso-Atlantic 230 kV Line _Atlantic-Gold Hill 230 kV Line	C	N-1-1	127%	112%	116%	120%	29%	30%	Interim operating solution
Siera-T-14	Missouri Flat-Gold Hill No. 1 115 kV Line	Gold Hill-Clarksville 115 kV Line _Missouri Flat-Gold Hill No. 2 115 kV Lin	C	N-1-1	134%	138%	110%	112%	114%	130%	New substation.
Siera-T-15	Pease-Rio Oso 115 kV line	Colgate-Rio Oso 230 kV Line & Table Mountain-Rio Oso 230 kV Line	C	DCTL	116%	117%	68%	60%	60%	65%	Interim operating solution
Siera-T-16	Placer-Gold Hill No. 1 115 kV Line	Placer-Gold Hill No. 2 115 kV Line _Drum-Bell 115 kV Line (Drum-Higgins)	C	N-1-1	102%	107%	109%	112%	115%	150%	New Old Coach Substation
Siera-T-17	Placer-Gold Hill No. 2 115 kV Line	Placer-Gold Hill No. 1 115 kV Line _Drum-Bell 115 kV Line (Drum-Higgins)	C	N-1-1	105%	110%	112%	116%	119%	164%	
Siera-T-18	Rio Oso-Lincoln 115 kV line	Rio Oso-Atlantic 230 kV Line & Rio Oso-Gold Hill 230 kV Line	C	DCTL	172%	88%	88%	94%	46%	50%	Interim operating solution
Siera-T-19	Rio Oso-Lincoln 115 kV line	Rio Oso-Atlantic 230 kV Line _Atlantic-Gold Hill 230 kV Line	C	N-1-1	251%	99%	103%	107%	34%	37%	Interim operating solution
Siera-T-20	Atlantic-Gold Hill 230 kV Line	Rio Oso-Gold Hill 230 kV Line & Middlefork - Gold Hill 230 kV Line	C	N-1-1	68%	65%	66%	83%	100%	101%	Operating solution.

Study Area: Sierra - Summer Peak (2012-2021)

High/Low Voltage

ID	Substation	Worst Contingency	Category	Category Description	Min. Post Contingency Voltage (PU)						ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2021	
Siera-V-01	ATLANTC 230 kV	Normal	A	N-0	0.95	0.95	0.95	0.95	0.95	0.93	Rio Oso 230 kV voltage support
Siera-V-02	GOLDHILL 230 kV	Normal	A	N-0	0.96	0.95	0.95	0.96	0.96	0.94	
Siera-V-03	RIO OSO 230 kV	Normal	A	N-0	0.96	0.94	0.95	0.95	0.95	0.93	
Siera-V-04	ATLANTI 60 kV	Normal	A	N-0	0.97	0.96	0.96	0.96	0.96	0.93	
Siera-V-05	DEL MAR 60 kV	Normal	A	N-0	0.95	0.94	0.94	0.94	0.94	0.90	
Siera-V-06	ROCKLIN 60 kV	Normal	A	N-0	0.96	0.96	0.95	0.95	0.96	0.92	
Siera-V-07	SIERRAPI 60 kV	Normal	A	N-0	0.95	0.94	0.94	0.94	0.94	0.90	
Siera-V-08	TAYLOR 60 kV	Normal	A	N-0	0.96	0.96	0.96	0.96	0.96	0.93	

ID	Substation	Worst Contingency	Category	Category Description	Min. Post Contingency Voltage (PU)						ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2021	
Siera-V-09	FORST HL 60 kV	Colgate-Grass Valley 60 kV Line _OXBOW F 9.11 Unit ID 1	B	L-1/G-1	0.91	0.90	0.90	0.90	0.89	0.87	New Old Coach Substation
Siera-V-10	GRSS VLY 60 kV	Colgate-Grass Valley 60 kV Line _ROLLINSF 9.11 Unit ID 1	B	L-1/G-1	0.90	0.90	0.90	0.89	0.89	0.87	
Siera-V-11	DEL MAR 60 kV	Drum-Bell 115 kV Line (Drum-Higgins) _RALSTON 13.80 Unit ID 1	B	L-1/G-1	0.94	0.93	0.93	0.93	0.93	0.88	New Old Coach Substation
Siera-V-12	BELL PGE 115 kV	Drum-Bell 115 kV Line (Drum-Higgins) _WISE 12.00 Unit ID 1	B	L-1/G-1	0.93	0.93	0.93	0.92	0.92	0.87	
Siera-V-13	HIGGINS 115 kV	Drum-Bell 115 kV Line (Drum-Higgins) _WISE 12.00 Unit ID 1	B	L-1/G-1	0.93	0.92	0.92	0.92	0.92	0.86	
Siera-V-14	PLACER 115 kV	Drum-Bell 115 kV Line (Drum-Higgins) _WISE 12.00 Unit ID 1	B	L-1/G-1	0.94	0.93	0.93	0.93	0.93	0.88	

ID	Substation	Worst Contingency	Category	Category Description	Min. Post Contingency Voltage (PU)						ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2021	
Siera-V-15	AUBURN 60 kV	Placer-Gold Hill No. 1 115 kV Line _Drum-Bell 115 kV Line (Drum-Higgins)	C	N-1-1	0.93	0.90	0.90	0.89	0.89	0.70	New Old Coach Substation
Siera-V-16	BELL PGE 115 kV	Placer-Gold Hill No. 1 115 kV Line _Drum-Bell 115 kV Line (Drum-Higgins)	C	N-1-1	0.87	0.85	0.85	0.84	0.83	0.67	
Siera-V-17	DMND SPR 115 kV	Placer-Gold Hill No. 1 115 kV Line _Drum-Bell 115 kV Line (Drum-Higgins)	C	N-1-1	0.97	0.95	0.95	0.95	0.95	0.88	
Siera-V-18	FLINT 115 kV	Placer-Gold Hill No. 1 115 kV Line _Drum-Bell 115 kV Line (Drum-Higgins)	C	N-1-1	0.88	0.86	0.86	0.85	0.85	0.69	
Siera-V-19	HALSEY 60 kV	Placer-Gold Hill No. 1 115 kV Line _Drum-Bell 115 kV Line (Drum-Higgins)	C	N-1-1	0.93	0.90	0.90	0.89	0.88	0.69	
Siera-V-20	HIGGINS 115 kV	Placer-Gold Hill No. 1 115 kV Line _Drum-Bell 115 kV Line (Drum-Higgins)	C	N-1-1	0.86	0.84	0.84	0.83	0.83	0.66	
Siera-V-21	HORSESHE 115 kV	Placer-Gold Hill No. 1 115 kV Line _Drum-Bell 115 kV Line (Drum-Higgins)	C	N-1-1	0.93	0.92	0.92	0.91	0.91	0.80	
Siera-V-22	MTN_QUAR 60 kV	Placer-Gold Hill No. 1 115 kV Line _Drum-Bell 115 kV Line (Drum-Higgins)	C	N-1-1	0.92	0.90	0.90	0.89	0.88	0.69	
Siera-V-23	PENRYN 60 kV	Placer-Gold Hill No. 1 115 kV Line _Drum-Bell 115 kV Line (Drum-Higgins)	C	N-1-1	0.91	0.89	0.89	0.87	0.87	0.67	
Siera-V-24	PLACER 115 kV	Placer-Gold Hill No. 1 115 kV Line _Drum-Bell 115 kV Line (Drum-Higgins)	C	N-1-1	0.87					0.68	
Siera-V-25	PLACER 60 kV	Placer-Gold Hill No. 1 115 kV Line _Drum-Bell 115 kV Line (Drum-Higgins)	C	N-1-1	0.93	0.91	0.90	0.89	0.89	0.70	
Siera-V-26	PLCRVLB2 115 kV	Placer-Gold Hill No. 1 115 kV Line _Drum-Bell 115 kV Line (Drum-Higgins)	C	N-1-1	0.97	0.96	0.95	0.95	0.95	0.88	
Siera-V-27	SIERRAPI 60 kV	Placer-Gold Hill No. 1 115 kV Line _Drum-Bell 115 kV Line (Drum-Higgins)	C	N-1-1	0.94	0.92	0.92	0.92	0.93	0.87	
Siera-V-28	AUBURN 60 kV	Placer-Gold Hill No. 1 115 kV Line & Placer-Gold Hill No. 2 115 kV Line	C	DCTL	0.90	0.91	0.90	0.89	0.88	Diverge	

Siera-V-29	BELL PGE 115 kV	Placer-Gold Hill No. 1 115 kV Line & Placer-Gold Hill No. 2 115 kV Line	C	DCTL	0.87	0.89	0.88	0.86	0.84	Diverge
Siera-V-30	HALSEY 60 kV	Placer-Gold Hill No. 1 115 kV Line & Placer-Gold Hill No. 2 115 kV Line	C	DCTL	0.90	0.91	0.90	0.89	0.88	Diverge
Siera-V-31	HIGGINS 115 kV	Placer-Gold Hill No. 1 115 kV Line & Placer-Gold Hill No. 2 115 kV Line	C	DCTL	0.89	0.91	0.90	0.89	0.87	Diverge
Siera-V-32	MTN_QUAR 60 kV	Placer-Gold Hill No. 1 115 kV Line & Placer-Gold Hill No. 2 115 kV Line	C	DCTL	0.89	0.91	0.90	0.89	0.88	Diverge
Siera-V-33	PENRYN 60 kV	Placer-Gold Hill No. 1 115 kV Line & Placer-Gold Hill No. 2 115 kV Line	C	DCTL	0.89	0.90	0.90	0.88	0.86	Diverge
Siera-V-34	PLACER 60 kV	Placer-Gold Hill No. 1 115 kV Line & Placer-Gold Hill No. 2 115 kV Line	C	DCTL	0.90	0.92	0.91	0.90	0.88	Diverge
Siera-V-35	PLACER 115 kV	Placer-Gold Hill No. 1 115 kV Line & Placer-Gold Hill No. 2 115 kV Line	C	DCTL	0.86	0.88	0.87	0.85	0.83	Diverge
Siera-V-36	NEWCASTLE 115 kV	Placer-Gold Hill No. 2 115 kV Line _Drum-Bell 115 kV Line (Drum-Higgins)	C	N-1-1	0.90	0.89	0.88	0.88	0.88	0.77

Siera-V-37	ATLANTI 60 kV	Rio Oso-Atlantic 230 kV Line _Atlantic-Gold Hill 230 kV Line	C	N-1-1	0.69	0.82	0.81	0.80	0.95	0.91	Interim operating solution
Siera-V-38	ATLANTIC 115 kV	Rio Oso-Atlantic 230 kV Line _Atlantic-Gold Hill 230 kV Line	C	N-1-1	0.81	0.93	0.93	0.92	1.00	1.01	
Siera-V-39	DEL MAR 60 kV	Rio Oso-Atlantic 230 kV Line _Atlantic-Gold Hill 230 kV Line	C	N-1-1	0.66	0.79	0.78	0.77	0.92	0.88	
Siera-V-40	FORMICA 115 kV	Rio Oso-Atlantic 230 kV Line _Atlantic-Gold Hill 230 kV Line	C	N-1-1	0.83	0.95	0.94	0.94	1.01	1.01	
Siera-V-41	LINCLN 115 kV	Rio Oso-Atlantic 230 kV Line _Atlantic-Gold Hill 230 kV Line	C	N-1-1	0.87	0.98	0.98	0.97	1.02	1.02	
Siera-V-42	PLSNT GR 115 kV	Rio Oso-Atlantic 230 kV Line _Atlantic-Gold Hill 230 kV Line	C	N-1-1	0.82	0.94	0.94	0.93	1.00	1.01	
Siera-V-43	ROCKLIN 60 kV	Rio Oso-Atlantic 230 kV Line _Atlantic-Gold Hill 230 kV Line	C	N-1-1	0.68	0.81	0.80	0.79	0.94	0.90	
Siera-V-44	SIERRAPI 60 kV	Rio Oso-Atlantic 230 kV Line _Atlantic-Gold Hill 230 kV Line	C	N-1-1	0.66	0.79	0.78	0.77	0.92	0.88	
Siera-V-45	TAYLOR 60 kV	Rio Oso-Atlantic 230 kV Line _Atlantic-Gold Hill 230 kV Line	C	N-1-1	0.68	0.81	0.80	0.80	0.94	0.90	

Study Area: Sierra - Summer Peak (2012-2021)

Voltage Deviation

ID	Substation	Worst Contingency	Category	Category Description	Post Contingency Voltage Deviation (%)						ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2021	
Siera-DV-01	AUBURN 60 kV	Drum-Bell 115 kV Line (Drum-Higgins)	B	N-1	-1%	-3%	-2%	-3%	-3%	-6%	
Siera-DV-02	BELL PGE 115 kV	Drum-Bell 115 kV Line (Drum-Higgins)	B	N-1	-3%	-4%	-4%	-4%	-4%	-7%	
Siera-DV-03	FLINT 115 kV	Drum-Bell 115 kV Line (Drum-Higgins)	B	N-1	-3%	-3%	-3%	-4%	-3%	-6%	
Siera-DV-04	HALSEY 60 kV	Drum-Bell 115 kV Line	B	N-1	-1%	-2%	-1%	-2%	-2%	-6%	
Siera-DV-05	HIGGINS 115 kV	Drum-Bell 115 kV Line (Drum-Higgins)	B	N-1	-4%	-6%	-6%	-6%	-6%	-9%	
Siera-DV-06	MTN_QUAR 60 kV	Drum-Bell 115 kV Line (Drum-Higgins)	B	N-1	-1%	-2%	-2%	-3%	-3%	-6%	
Siera-DV-07	PENRYN 60 kV	Drum-Bell 115 kV Line (Drum-Higgins)	B	N-1	-1%	-3%	-2%	-3%	-3%	-6%	
Siera-DV-08	PLACER 60 kV	Drum-Bell 115 kV Line (Drum-Higgins)	B	N-1	-1%	-3%	-2%	-3%	-3%	-6%	
Siera-DV-09	PLACER 115 kV	Drum-Bell 115 kV Line (Drum-Higgins)	B	N-1	-3%	-3%	-3%	-4%	-4%	-6%	
Siera-DV-10	E.NICOLS 115 kV	Rio Oso-Nicolaus 115 kV Line	B	N-1	-2%	-5%	-6%	-6%	-7%	-8%	

ID	Substation	Worst Contingency	Category	Category Description	Post Contingency Voltage Deviation (%)						ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2021	
Siera-DV-11	HIGGINS 115 kV	Placer-Gold Hill No. 1 115 kV Line _Drum-Bell 115 kV Line (Drum-Higgins)	C	N-1-1	-12%	-14%	-15%	-16%	-16%	-31%	
Siera-DV-12	AUBURN 60 kV	Placer-Gold Hill No. 1 115 kV Line & Placer-Gold Hill No. 2 115 kV Line	C	DCTL	-15%	-11%	-12%	-11%	-14%	Diverge	
Siera-DV-13	BELL PGE 115 kV	Placer-Gold Hill No. 1 115 kV Line & Placer-Gold Hill No. 2 115 kV Line	C	DCTL	-15%	-11%	-12%	-11%	-14%	Diverge	
Siera-DV-14	HALSEY 60 kV	Placer-Gold Hill No. 1 115 kV Line & Placer-Gold Hill No. 2 115 kV Line	C	DCTL	-14%	-10%	-11%	-11%	-14%	Diverge	

Siera-DV-15	HIGGINS 115 kV	Placer-Gold Hill No. 1 115 kV Line & Placer-Gold Hill No. 2 115 kV Line	C	DCTL	-13%	-9%	-10%	-10%	-12%	Diverge	Substation
Siera-DV-16	MTN_QUAR 60 kV	Placer-Gold Hill No. 1 115 kV Line & Placer-Gold Hill No. 2 115 kV Line	C	DCTL	-15%	-11%	-12%	-11%	-14%	Diverge	
Siera-DV-17	PENRYN 60 kV	Placer-Gold Hill No. 1 115 kV Line & Placer-Gold Hill No. 2 115 kV Line	C	DCTL	-15%	-11%	-12%	-12%	-15%	Diverge	
Siera-DV-18	PLACER 60 kV					-11%	-12%	-12%	-15%	Diverge	
Siera-DV-19	ATLANTI 60 kV	Rio Oso-Atlantic 230 kV Line _Atlantic-Gold Hill 230 kV Line	C	N-1-1	-20%	-9%	-10%	-9%	-1%	-2%	
Siera-DV-20	ATLANTIC 115 kV	Rio Oso-Atlantic 230 kV Line _Atlantic-Gold Hill 230 kV Line	C	N-1-1	-18%	-8%	-9%	-8%	-1%	-2%	
Siera-DV-21	DEL MAR 60 kV	Rio Oso-Atlantic 230 kV Line _Atlantic-Gold Hill 230 kV Line	C	N-1-1	-20%	-9%	-11%	-9%	-1%	-2%	
Siera-DV-22	FORMICA 115 kV	Rio Oso-Atlantic 230 kV Line _Atlantic-Gold Hill 230 kV Line	C	N-1-1	-15%	-7%	-9%	-9%	-1%	-2%	
Siera-DV-23	LINCLN 115 kV	Rio Oso-Atlantic 230 kV Line _Atlantic-Gold Hill 230 kV Line	C	N-1-1	-12%	-4%	-6%	-6%	-1%	-1%	
Siera-DV-24	PLSNT GR 115 kV	Rio Oso-Atlantic 230 kV Line _Atlantic-Gold Hill 230 kV Line	C	N-1-1	-16%	-7%	-10%	-10%	-1%	-2%	
Siera-DV-25	ROCKLIN 60 kV	Rio Oso-Atlantic 230 kV Line _Atlantic-Gold Hill 230 kV Line	C	N-1-1	-20%	-9%	-11%	-9%	-1%	-2%	
Siera-DV-26	SIERRAPI 60 kV	Rio Oso-Atlantic 230 kV Line _Atlantic-Gold Hill 230 kV Line	C	N-1-1	-20%	-9%	-11%	-10%	-1%	-2%	
Siera-DV-27	TAYLOR 60 kV	Rio Oso-Atlantic 230 kV Line _Atlantic-Gold Hill 230 kV Line	C	N-1-1	-20%	-9%	-10%	-9%	-1%	-2%	

Study Area: Sierra - Summer Peak (2012-2021)**Single source substation with more than 100 MW Load.**

ID	Substation	Load Served (MW)						ISO Proposed Mitigation
		2012	2013	2014	2015	2016	2021	
Siera-LS-01	Clarksville 115 kV	96	97	101	103	105	115	Loop the substation with circuit breaker.



Study Area: Sierra - Spring Off-Peak (2012-2021)

Thermal Overload

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			ISO Proposed Mitigation
					2012	2016	2021	
Siera-OP-T-1	Drum-Higgins 115 kV line	Gold Hill 230/115 kV Transformer No. 1_Gold Hill 230/115 kV Transformer No. 2	C	N-1-1	125%	171%	179%	New Old Coach Substation

Study Area: Sierra - Spring Off-Peak (2012-2021)

High/Low Voltage

ID	Substation	Worst Contingency	Category	Category Description	Min. Post Contingency Voltage (PU)			ISO Proposed Mitigation
					2012	2016	2021	
Siera-OP-V-1	ALLEGHNY 60 kV	Normal	A	N-0	1.08	1.09	1.07	
Siera-OP-V-2	APPLE HL 115 kV	Normal	A	N-0	1.11	1.11	1.11	
Siera-OP-V-3	ATLANTC 230 kV	Normal	A	N-0	1.06	1.06	1.05	
Siera-OP-V-4	ATLANTI 60 kV	Normal	A	N-0	1.10	1.11	1.10	
Siera-OP-V-5	ATLANTIC 115 kV	Normal	A	N-0	1.12	1.12	1.14	
Siera-OP-V-6	BANGOR 60 kV	Normal	A	N-0	1.08	1.09	1.07	
Siera-OP-V-7	BEALE_1 60 kV	Normal	A	N-0	1.06	1.08	1.05	
Siera-OP-V-8	BEALE_2 60 kV	Normal	A	N-0	1.06	1.07	1.05	
Siera-OP-V-9	BELL PGE 115 kV	Normal	A	N-0	1.10	1.09	1.09	
Siera-OP-V-10	BOGUE 115 kV	Normal	A	N-0	1.08	1.04	1.04	
Siera-OP-V-11	BONNIE N 60 kV	Normal	A	N-0	1.06	1.04	1.04	
Siera-OP-V-12	BRUNSWCK 115 kV	Normal	A	N-0	1.09	1.06	1.06	
Siera-OP-V-13	BRWNS VY 60 kV	Normal	A	N-0	1.06	1.08	1.05	
Siera-OP-V-14	CAPEHORN 60 kV	Normal	A	N-0	1.05	1.04	1.03	
Siera-OP-V-15	CHCGO PK 115 kV	Normal	A	N-0	1.09	1.08	1.08	
Siera-OP-V-16	CHLLNGEA 60 kV	Normal	A	N-0	1.08	1.09	1.07	
Siera-OP-V-17	CISCO GR 60 kV	Normal	A	N-0	1.05	1.05	1.03	
Siera-OP-V-18	CLMBA HL 60 kV	Normal	A	N-0	1.08	1.09	1.08	
Siera-OP-V-19	CLRKSVLE 115 kV	Normal	A	N-0	1.12	1.12	1.11	
Siera-OP-V-20	CMP FRWT 60 kV	Normal	A	N-0	1.07	1.08	1.06	
Siera-OP-V-21	COLGATE 230 kV	Normal	A	N-0	1.05	1.05	1.04	
Siera-OP-V-22	COLGATE 60 kV	Normal	A	N-0	1.09	1.09	1.08	
Siera-OP-V-23	CPM 115 kV	Normal	A	N-0	1.12	1.12	1.11	
Siera-OP-V-24	DEL MAR 60 kV	Normal	A	N-0	1.10	1.10	1.10	
Siera-OP-V-25	DMND SPR 115 kV	Normal	A	N-0	1.11	1.11	1.11	
Siera-OP-V-26	DOBBINS 60 kV	Normal	A	N-0	1.08	1.09	1.07	
Siera-OP-V-27	DRUM 115 kV	Normal	A	N-0	1.08	1.07	1.07	
Siera-OP-V-28	DRUM 60 kV	Normal	A	N-0	1.06	1.05	1.04	
Siera-OP-V-29	E.MRYSVE 115 kV	Normal	A	N-0	1.08	1.05	1.05	
Siera-OP-V-30	E.NICOLS 115 kV	Normal	A	N-0	1.10	1.05	1.05	
Siera-OP-V-31	ELDORAD 115 kV	Normal	A	N-0	1.11	1.11	1.11	
Siera-OP-V-32	FLINT 115 kV	Normal	A	N-0	1.10	1.10	1.09	

Siera-OP-V-33	FORMICA 115 kV	Normal	A	N-0	1.12	1.11	1.12
Siera-OP-V-34	FRNCH MS 60 kV	Normal	A	N-0	1.10	1.10	1.09
Siera-OP-V-35	GOLDHILL 115 kV	Normal	A	N-0	1.12	1.12	1.11
Siera-OP-V-36	GOLDHILL 230 kV	Normal	A	N-0	1.06	1.06	1.06
Siera-OP-V-37	GRSS VLY 60 kV	Normal	A	N-0	1.08	1.09	1.07
Siera-OP-V-38	HIGGINS 115 kV	Normal	A	N-0	1.09	1.09	1.09
Siera-OP-V-39	HORSESHE 115 kV	Normal	A	N-0	1.11	1.11	1.10
Siera-OP-V-40	LINCLN 115 kV	Normal	A	N-0	1.11	1.08	1.09
Siera-OP-V-41	MDDLE FK 60 kV	Normal	A	N-0	1.10	1.10	1.09
Siera-OP-V-42	MIDLFORK 230 kV	Normal	A	N-0	1.05	1.06	1.05
Siera-OP-V-43	NARRWS 1 60 kV	Normal	A	N-0	1.07	1.08	1.06
Siera-OP-V-44	NARRWS 2 60 kV	Normal	A	N-0	1.07	1.08	1.06
Siera-OP-V-45	NEWCSTLE 115 kV	Normal	A	N-0	1.10	1.10	1.10
Siera-OP-V-46	OLIVHRST 115 kV	Normal	A	N-0	1.09	1.05	1.05
Siera-OP-V-47	PEASE 115 kV	Normal	A	N-0	1.08	1.05	1.05
Siera-OP-V-48	PIKE CTY 60 kV	Normal	A	N-0	1.08	1.09	1.07
Siera-OP-V-49	PLACER 115 kV	Normal	A				
Siera-OP-V-50	PLCRVLB2 115 kV	Normal	A	N-0	1.11	1.11	1.11
Siera-OP-V-51	PLSNT GR 115 kV	Normal	A	N-0	1.12	1.11	1.12
Siera-OP-V-52	RIO OSO 115 kV	Normal	A	N-0	1.10	1.05	1.05
Siera-OP-V-53	RIO OSO 230 kV	Normal	A	N-0	1.06	1.07	1.06
Siera-OP-V-54	ROCKLIN 60 kV	Normal	A	N-0	1.10	1.10	1.10
Siera-OP-V-55	ROLLINS 60 kV	Normal	A	N-0	1.05	1.04	1.04
Siera-OP-V-56	SHADYGLN 60 kV	Normal	A	N-0	1.05	1.04	1.03
Siera-OP-V-57	SHPRING 115 kV	Normal	A	N-0	1.11	1.11	1.11
Siera-OP-V-58	SIERRAPI 60 kV	Normal	A	N-0	1.10	1.10	1.10
Siera-OP-V-59	SMRTSVLE 60 kV	Normal	A	N-0	1.07	1.08	1.06
Siera-OP-V-60	SPICAMIN 115 kV	Normal	A	N-0	1.11	1.11	1.11
Siera-OP-V-61	SUMMIT 60 kV	Normal	A	N-0	1.05	1.05	1.03
Siera-OP-V-62	TAMARACK 60 kV	Normal	A	N-0	1.05	1.05	1.03
Siera-OP-V-63	TAYLOR 60 kV	Normal	A	N-0	1.10	1.10	1.10
Siera-OP-V-64	ULTR-RCK 115 kV	Normal	A	N-0	1.12	1.11	1.12
Siera-OP-V-65	WEMR SWS 60 kV	Normal	A	N-0	1.05	1.03	1.03
Siera-OP-V-66	WHTLNDAL 60 kV	Normal	A	N-0	1.06	1.04	1.05
Siera-OP-V-67	YUBAGOLD 60 kV	Normal	A	N-0	1.06	1.08	1.05

Under review for possible exemption.

ID	Substation	Worst Contingency	Category	Category Description	Min. Post Contingency Voltage (PU)			ISO Proposed Mitigation
					2012	2016	2021	
Siera-OP-V-68	FLINT 115 kV	Atlantic-Gold Hill 230 kV Line _Bell-Placer 115 kV Line	C	N-1-1	1.12	1.13	1.12	
Siera-OP-V-69	HORSESHE 115 kV	Atlantic-Gold Hill 230 kV Line _Bell-Placer 115 kV Line	C	N-1-1	1.13	1.13	1.12	
Siera-OP-V-70	NEWCSTLE 115 kV	Atlantic-Gold Hill 230 kV Line _Bell-Placer 115 kV Line	C	N-1-1	1.12	1.13	1.12	
Siera-OP-V-71	PLACER 115 kV	Atlantic-Gold Hill 230 kV Line _Bell-Placer 115 kV Line	C	N-1-1	1.12	1.13	1.12	
Siera-OP-V-72	HIGGINS 115 kV	Atlantic-Gold Hill 230 kV Line _Drum-Bell 115 kV Line (Drum-Higgins)	C	N-1-1	1.12	1.12	1.11	
Siera-OP-V-73	BELL PGE 115 kV	Atlantic-Gold Hill 230 kV Line _Drum-Bell 115 kV Line (Higgins-Bell)	C	N-1-1	1.12	1.12	1.11	
Siera-OP-V-74	APPLE HL 115 kV	Atlantic-Gold Hill 230 kV Line & Rio Oso-Gold Hill 230 kV Line	C	DCTL	1.13	1.12	1.11	
Siera-OP-V-75	BELL PGE 115 kV	Atlantic-Gold Hill 230 kV Line & Rio Oso-Gold Hill 230 kV Line	C	DCTL	1.11	1.10	1.09	
Siera-OP-V-76	CLRKSVLE 115 kV	Atlantic-Gold Hill 230 kV Line & Rio Oso-Gold Hill 230 kV Line	C	DCTL	1.13	1.12	1.11	
Siera-OP-V-77	CPM 115 kV	Atlantic-Gold Hill 230 kV Line & Rio Oso-Gold Hill 230 kV Line	C	DCTL	1.13	1.12	1.12	
Siera-OP-V-78	DMND SPR 115 kV	Atlantic-Gold Hill 230 kV Line & Rio Oso-Gold Hill 230 kV Line	C	DCTL	1.13	1.11	1.11	
Siera-OP-V-79	ELDORAD 115 kV	Atlantic-Gold Hill 230 kV Line & Rio Oso-Gold Hill 230 kV Line	C	DCTL	1.13	1.12	1.11	

Siera-OP-V-80	FLINT 115 kV	Atlantic-Gold Hill 230 kV Line & Rio Oso-Gold Hill 230 kV Line	C	DCTL	1.11	1.10	1.09
Siera-OP-V-81	FRNCH MS 60 kV	Atlantic-Gold Hill 230 kV Line & Rio Oso-Gold Hill 230 kV Line	C	DCTL	1.11	1.10	1.09
Siera-OP-V-82	GOLDHILL 115 kV	Atlantic-Gold Hill 230 kV Line & Rio Oso-Gold Hill 230 kV Line	C	DCTL	1.13	1.12	1.12
Siera-OP-V-83	HIGGINS 115 kV	Atlantic-Gold Hill 230 kV Line & Rio Oso-Gold Hill 230 kV Line	C	DCTL	1.10	1.09	1.09
Siera-OP-V-84	HORSESHE 115 kV	Atlantic-Gold Hill 230 kV Line & Rio Oso-Gold Hill 230 kV Line	C	DCTL	1.12	1.11	1.11
Siera-OP-V-85	MDDLE FK 60 kV	Atlantic-Gold Hill 230 kV Line & Rio Oso-Gold Hill 230 kV Line	C	DCTL	1.11	1.10	1.09
Siera-OP-V-86	NEWCASTLE 115 kV	Atlantic-Gold Hill 230 kV Line & Rio Oso-Gold Hill 230 kV Line	C	DCTL	1.11	1.10	1.10
Siera-OP-V-87	PLACER 115 kV	Atlantic-Gold Hill 230 kV Line & Rio Oso-Gold Hill 230 kV Line	C	DCTL	1.11	1.10	1.09
Siera-OP-V-88	PLCRVLB2 115 kV	Atlantic-Gold Hill 230 kV Line & Rio Oso-Gold Hill 230 kV Line	C	DCTL	1.12	1.11	1.11
Siera-OP-V-89	SHPRING 115 kV	Atlantic-Gold Hill 230 kV Line & Rio Oso-Gold Hill 230 kV Line	C	DCTL	1.13	1.12	1.11
Siera-OP-V-90	SPICAMIN 115 kV	Atlantic-Gold Hill 230 kV Line & Rio Oso-Gold Hill 230 kV Line	C	DCTL	1.13	1.12	1.11
Siera-OP-V-91	PLSNT GR 115 kV	Bell-Placer 115 kV Line _Lincoln-Pleasant Grove 115 kV Line	C	N-1-1	1.13	1.15	1.16
Siera-OP-V-92	SIERRAPI 60 kV	Bell-Placer 115 kV Line _Lincoln-Pleasant Grove 115 kV Line	C	N-1-1	1.11	1.12	1.11

Siera-OP-V-93	E.MRYSVE 115 kV	Bogue-Rio Oso 115 kV Line _Pease 115/60 kV Transformer No. 2	C	N-1-1	1.11	1.05	1.05
Siera-OP-V-94	OLIVHRST 115 kV	Bogue-Rio Oso 115 kV Line _Pease 115/60 kV Transformer No. 2	C	N-1-1	1.11	1.05	1.05
Siera-OP-V-95	RIO OSO 115 kV	Bogue-Rio Oso 115 kV Line _Pease 115/60 kV Transformer No. 2	C	N-1-1	1.11	1.05	1.05
Siera-OP-V-96	BANGOR 60 kV	Colgate-Smartville No. 1 60 kV Line _COLGATE2 13.80 Unit ID 1	C	N-1-1	1.09	1.11	1.08
Siera-OP-V-97	CLMBA HL 60 kV	Colgate-Smartville No. 1 60 kV Line _Colgate-Smartville No. 2 60 kV Line	C	N-1-1	1.10	1.11	1.09
Siera-OP-V-98	COLGATE 60 kV	Colgate-Smartville No. 1 60 kV Line _Colgate-Smartville No. 2 60 kV Line	C	N-1-1	1.10	1.11	1.09
Siera-OP-V-99	PIKE CTY 60 kV	Colgate-Smartville No. 1 60 kV Line _Colgate-Smartville No. 2 60 kV Line	C	N-1-1	1.10	1.10	1.09
Siera-OP-V-100	ROCKLIN 60 kV	Del Mar-Atlantic No. 1 60 kV Line _Lincoln-Pleasant Grove 115 kV Line	C	N-1-1	1.11	1.12	1.12
Siera-OP-V-101	BOGUE 115 kV	Greenleaf 1 GSU _COLGATE2 13.80 Unit ID 1	C	N-1-1	1.11	1.06	1.06
Siera-OP-V-102	GLEAF 1 115 kV	Greenleaf 1 GSU _COLGATE2 13.80 Unit ID 1	C	N-1-1	1.11	1.06	1.06
Siera-OP-V-103	PEASE 115 kV	Greenleaf 1 GSU _Yuba City GSU	C	N-1-1	1.10	1.06	1.06
Siera-OP-V-104	FRNCH MS 60 kV	MIDLFORK 13.80 Unit ID 1 _MIDLFORK 13.80 Unit ID 2	C	N-1-1	1.12	1.12	1.12

Under review for possible exemption.

Siera-OP-V-105	MDDLE FK 60 kV	MIDLFORK 13.80 Unit ID 1 _MIDLFORK 13.80 Unit ID 2	C	N-1-1	1.12	1.12	1.12
Siera-OP-V-106	DOBBINS 60 kV	Narrows 1 GSU _COLGATE2 13.80 Unit ID 1	C	N-1-1	1.09	1.11	1.09
Siera-OP-V-107	ALLEGHNY 60 kV	Palermo-Colgate 230 kV Line _COLGATE2 13.80 Unit ID 1	C	N-1-1	1.08	1.11	1.08
Siera-OP-V-108	CHLLNGEA 60 kV	Palermo-Colgate 230 kV Line _COLGATE2 13.80 Unit ID 1	C	N-1-1	1.08	1.11	1.08
Siera-OP-V-109	CMP FRWT 60 kV	Palermo-Colgate 230 kV Line _COLGATE2 13.80 Unit ID 1	C	N-1-1	1.06	1.11	1.06
Siera-OP-V-110	GRSS VLY 60 kV	Palermo-Colgate 230 kV Line _COLGATE2 13.80 Unit ID 1	C	N-1-1	1.07	1.11	1.08
Siera-OP-V-111	YUBAGOLD 60 kV	Palermo-Colgate 230 kV Line _COLGATE2 13.80 Unit ID 1	C	N-1-1	1.05	1.10	1.05
Siera-OP-V-112	E.NICOLS 115 kV	Palermo-Nicolaus 115 kV Line & Bogue-Rio Oso 115 kV Line	C	DCTL	1.11	1.05	1.05
Siera-OP-V-113	LINCLN 115 kV	Palermo-Nicolaus 115 kV Line & Bogue-Rio Oso 115 kV Line	C	DCTL	1.11	1.08	1.09
Siera-OP-V-114	RIO OSO 115 kV	Palermo-Nicolaus 115 kV Line & Bogue-Rio Oso 115 kV Line	C	DCTL	1.11	1.05	1.05
Siera-OP-V-115	E.MRYSVE 115 kV	Pease 115 kV Bus Section 2	C	Bus	1.10	1.05	1.05
Siera-OP-V-116	FLINT 115 kV	Pease 115 kV Bus Section 2	C	Bus	1.10	1.10	1.09
Siera-OP-V-117	HORSESHE 115 kV	Pease 115 kV Bus Section 2	C	Bus	1.11	1.11	1.11
Siera-OP-V-118	NEWCASTLE 115 kV	Pease 115 kV Bus Section 2	C	Bus	1.10	1.10	1.10
Siera-OP-V-119	OLIVHRST 115 kV	Pease 115 kV Bus Section 2	C	Bus	1.10	1.05	1.05

Siera-OP-V-120	PLACER 115 kV	Pease 115 kV Bus Section 2	C	Bus	1.10	1.10	1.09
Siera-OP-V-121	RIO OSO 115 kV	Pease 115 kV Bus Section 2	C	Bus	1.11	1.05	1.05
Siera-OP-V-122	APPLE HL 115 kV	Placer 115 kV Bus	C	Bus	1.12	1.13	1.12
Siera-OP-V-123	ATLANTI 60 kV	Placer 115 kV Bus	C	Bus	1.11	1.11	1.11
Siera-OP-V-124	ATLANTIC 115 kV	Placer 115 kV Bus	C	Bus	1.13	1.13	1.14
Siera-OP-V-125	CLRKSVLE 115 kV	Placer 115 kV Bus	C	Bus	1.13	1.13	1.12
Siera-OP-V-126	CPM 115 kV	Placer 115 kV Bus	C	Bus	1.13	1.13	1.13
Siera-OP-V-127	DEL MAR 60 kV	Placer 115 kV Bus	C	Bus	1.11	1.11	1.10
Siera-OP-V-128	DMND SPR 115 kV	Placer 115 kV Bus	C	Bus	1.12	1.12	1.12
Siera-OP-V-129	E.NICOLS 115 kV	Placer 115 kV Bus	C	Bus	1.11	1.05	1.05
Siera-OP-V-130	ELDORAD 115 kV	Placer 115 kV Bus	C	Bus	1.12	1.13	1.12
Siera-OP-V-131	FORMICA 115 kV	Placer 115 kV Bus	C	Bus	1.12	1.11	1.13
Siera-OP-V-132	FRNCH MS 60 kV	Placer 115 kV Bus	C	Bus	1.10	1.11	1.10
Siera-OP-V-133	GOLDHILL 115 kV	Placer 115 kV Bus	C	Bus	1.13	1.13	1.13
Siera-OP-V-134	LINCLN 115 kV	Placer 115 kV Bus	C	Bus	1.11	1.09	1.09
				Bus	1.10	1.11	1.10
Siera-OP-V-136	PLCRVLB2 115 kV	Placer 115 kV Bus	C	Bus	1.12	1.12	1.12
Siera-OP-V-137	PLSNT GR 115 kV	Placer 115 kV Bus	C	Bus	1.12	1.12	1.13
Siera-OP-V-138	ROCKLIN 60 kV	Placer 115 kV Bus	C	Bus	1.11	1.11	1.10
Siera-OP-V-139	SHPRING 115 kV	Placer 115 kV Bus	C	Bus	1.12	1.13	1.12
Siera-OP-V-140	SIERRAPI 60 kV	Placer 115 kV Bus	C	Bus	1.11	1.11	1.10
Siera-OP-V-141	SPICAMIN 115 kV	Placer 115 kV Bus	C	Bus	1.12	1.13	1.12
Siera-OP-V-142	TAYLOR 60 kV	Placer 115 kV Bus	C	Bus	1.11	1.11	1.10
Siera-OP-V-143	ULTR-RCK 115 kV	Placer 115 kV Bus	C	Bus	1.12	1.11	1.12
Siera-OP-V-144	ATLANTI 60 kV	Placer-Gold Hill No. 1 115 kV Line & Placer-Gold Hill No. 2 115 kV Line	C	DCTL	1.11	1.11	1.11
Siera-OP-V-145	ATLANTIC 115 kV	Placer-Gold Hill No. 1 115 kV Line & Placer-Gold Hill No. 2 115 kV Line	C	DCTL	1.13	1.13	1.14
Siera-OP-V-146	DEL MAR 60 kV	Placer-Gold Hill No. 1 115 kV Line & Placer-Gold Hill No. 2 115 kV Line	C	DCTL	1.11	1.11	1.10
Siera-OP-V-147	FORMICA 115 kV	Placer-Gold Hill No. 1 115 kV Line & Placer-Gold Hill No. 2 115 kV Line	C	DCTL	1.12	1.11	1.12

Siera-OP-V-148	PLSNT GR 115 kV	Placer-Gold Hill No. 1 115 kV Line & Placer-Gold Hill No. 2 115 kV Line	C	DCTL	1.12	1.12	1.13
Siera-OP-V-149	ROCKLIN 60 kV	Placer-Gold Hill No. 1 115 kV Line & Placer-Gold Hill No. 2 115 kV Line	C	DCTL	1.11	1.11	1.10
Siera-OP-V-150	SIERRAPI 60 kV	Placer-Gold Hill No. 1 115 kV Line & Placer-Gold Hill No. 2 115 kV Line	C	DCTL	1.11	1.11	1.10
Siera-OP-V-151	TAYLOR 60 kV	Placer-Gold Hill No. 1 115 kV Line & Placer-Gold Hill No. 2 115 kV Line	C	DCTL	1.11	1.11	1.10
Siera-OP-V-152	ULTR-RCK 115 kV	Placer-Gold Hill No. 1 115 kV Line & Placer-Gold Hill No. 2 115 kV Line					1.12
Siera-OP-V-153	COLGATE 60 kV	Rio Oso-Atlantic 230 kV Line & Rio Oso-Gold Hill 230 kV Line	C	DCTL	1.08	1.10	1.08
Siera-OP-V-154	SPI-LINC 115 kV	Rio Oso-Lincoln 115 kV Line _32498 32400 1	C	N-1-1	1.13	1.15	1.16
Siera-OP-V-155	ULTR-RCK 115 kV	Rio Oso-Lincoln 115 kV Line _SPI-Linc GSU	C	N-1-1	1.13	1.14	1.16
Siera-OP-V-156	LINCLN 115 kV	Rio Oso-Lincoln 115 kV Line _SPI-Linc GUC	C	N-1-1	1.13	1.14	1.16
Siera-OP-V-157	BRWNS VY 60 kV	Smartville-Nicolaus No. 1 60 kV Line (_COLGATE2 13.80 Unit ID 1	C	N-1-1	1.06	1.10	1.06
Siera-OP-V-158	NARRWS 1 60 kV	Smartville-Nicolaus No. 1 60 kV Line (_COLGATE2 13.80 Unit ID 1	C	N-1-1	1.08	1.10	1.08
Siera-OP-V-159	OXBOW 60 kV	Weimar No. 1 60 kV Line _MIDLFORK 13.80 Unit ID 1	C	N-1-1	1.11	1.11	1.11

Study Area: Sierra - Spring Off-Peak (2012-2021)

Voltage Deviation

ID	Substation	Worst Contingency	Category	Category Description	Post Contingency			ISO Proposed Mitigation
					2012	2016	2021	
Siera-OP-DV-1	GRSS VLY 60 kV	Colgate 230/60 kV Transformer No. 3	B	N-1	-7%	-7%	-7%	New Old Coach Substation

ID	Substation		Worst Contingency	Category	Category Description	Post Contingency			ISO Proposed Mitigation
						2012	2016	2021	
Siera-OP-DV-14	ATLANTC	230 kV	Rio Oso-Atlantic 230 kV Line _Atlantic-Gold Hill 230 kV Line	C	N-1-1	-6%	-11%	-2%	Atlantic-Placer voltage conversion.
Siera-OP-DV-15	DEL MAR	60 kV	Rio Oso-Atlantic 230 kV Line _Atlantic-Gold Hill 230 kV Line	C	N-1-1	-6%	-12%	-2%	
Siera-OP-DV-16	ROCKLIN	60 kV	Rio Oso-Atlantic 230 kV Line _Atlantic-Gold Hill 230 kV Line	C	N-1-1	-6%	-12%	-2%	
Siera-OP-DV-17	TAYLOR	60 kV	Rio Oso-Atlantic 230 kV Line _Atlantic-Gold Hill 230 kV Line	C	N-1-1	-6%	-12%	-2%	



Study Area: Stockton - Summer Peak (2012-2021)

Thermal Overload

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)						ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2021	
Stoc-T-01	Valley Springs-Martell 60 kV line #2	Base system (n-0)	A	N-0	89%	89%	91%	93%	89%	103%	Rerate
Stoc-T-02	Stockton 'A'-Lockeford-Bellota 115 kV line # 1	Stockton 'A'-Lockeford-Bellota No. 2 1_CPC STCN 12.47 Unit ID 1	B	L-1/G-1	83%	85%	86%	87%	88%	100%	Rerate
Stoc-T-03	Valley Springs 60 kV line #1	Weber-Mormon Jct 60 kV Line _N.HGN DM 12.00 Unit ID 1	B	L-1/G-1	88%	87%	88%	89%	91%	101%	Rerate or reconductor
Stoc-T-04	Weber 230/60 kV bank #2	Weber 230/60 kV Transformer No. 1	B	N-1	114%	N/A	N/A	N/A	N/A	N/A	Interim operating solution
Stoc-T-05	Weber 230/60 kV bank #2a	Weber 230/60 kV Transformer No. 1	B	N-1	113%	N/A	N/A	N/A	N/A	N/A	
Stoc-T-06	Lockeford 230/60 kV bank #2	Hammer-Country Club 60 kV Line _Lockeford 230/60 kV Transformer No. 3	C	N-1-1	95%	94%	94%	96%	97%	103%	Lockeford-Lodi area long-term plan.
Stoc-T-07	Lockeford 230/60 kV bank #3	Hammer-Country Club 60 kV Line _Lockeford 230/60 kV Transformer No. 2	C	N-1-1	95%	93%	94%	96%	97%	103%	
Stoc-T-08	Lockeford-Industrial 60 kV Line	Lockeford-Lodi No. 2 60 kV Line _Lodi-Industrial 60 kV Line	C	N-1-1	124%	126%	126%	127%	127%	132%	
Stoc-T-09	Lockeford-Lodi No. 1 60 kV Line	Lockeford-Lodi No. 2 60 kV Line _Lockeford-Industrial 60 kV Line	C	N-1-1	120%	121%	122%	123%	124%	131%	
Stoc-T-10	Lockeford-Lodi No. 3 60 kV Line	Lockeford-Lodi No. 2 60 kV Line _Lockeford-Industrial 60 kV Line	C	N-1-1	148%	150%	151%	152%	153%	161%	
Stoc-T-11	Lockeford-Lodi No. 2 60 kV Line	Lodi-Industrial 60 kV Line _Lockeford-Industrial 60 kV Line	C	N-1-1	138%	140%	140%	141%	143%	148%	
Stoc-T-12	Lodi-Industrial 60 kV Line	Lockeford-Lodi No. 2 60 kV Line _Lockeford-Industrial 60 kV Line	C	N-1-1	156%	158%	159%	159%	161%	167%	

Stoc-T-13	Schulte-Manteca 115 kV line	Tesla-Tracy 115 kV Line _Schulte Sw Sta-Lammers 115 kV Line	C	N-1-1	N/A	106%	58%	61%	62%	70%	Interim operating solution
Stoc-T-14	Stagg-Country Club No. 1 60 kV Line	Stagg 60 kV Bus Section D	C	Bus	113%	113%	65%	65%	68%	76%	
Stoc-T-15	Stagg-Country Club No. 1 60 kV Line	Stagg-Country Club No. 2 60 kV Line _Stagg-Hammer 60 kV Line No. 1	C	N-1-1	115%	115%	66%	67%	70%	78%	
Stoc-T-16	Stagg-Country Club No. 2 60 kV Line	Stagg-Country Club No. 1 60 kV Line _Stagg-Hammer 60 kV Line No. 1	C	N-1-1	115%	115%	66%	67%	70%	78%	
Stoc-T-17	Stagg-Hammer 60 kV Line # 1	Stagg-Country Club No. 1 60 kV Line _Stagg-Country Club No. 2 60 kV Line	C	N-1-1	116%	116%	62%	64%	67%	75%	
Stoc-T-18	Stanislaus-Manteca No. 2 115 kV line	Stanislaus-Melones Sw Sta- Manteca No. _Stanislaus- Melones Sw Sta-Riverbank Jct	C	N-1-1	109%	109%	110%	106%	106%	104%	SPS to reduce Stanislaus generation
Stoc-T-19	Stanislaus-Melones Sw Sta- Manteca 115 kV line	Stanislaus-Manteca No.2 115 kV & Stanislaus- Melones-Riverbank Jct 115 kV Lines	C	DCTL	109%	109%	109%	108%	108%	107%	
Stoc-T-20	Stanislaus-Melones Sw Sta- Riverbank Jct Sw Sta 115 kV line.	Stanislaus-Melones-Manteca No.1 115 kV & Stanislaus- Manteca No.2 115 kV Lines	C	DCTL	109%	109%	109%	108%	108%	107%	
Stoc-T-21	Stockton 'A'-Lockeford-Bellota 115 kV line # 2	Stockton 'A'-Lockeford- Bellota No. 1 1_Gold Hill- Bellota-Lockeford 115 kV Line	C	N-1-1	92%	95%	96%	97%	99%	112%	Rerate
Stoc-T-22	Stockton 'A'-Weber No. 3 60 kV Line	Stockton 'A'-Weber No. 1 60 kV Line _Stockton 'A'- Weber No. 2 60 kV Line	C	N-1-1	130%	132%	133%	134%	135%	145%	Operating solution or SPS to drop load.
Stoc-T-23	Tesla-Manteca 115 kV line	Tesla-Tracy 115 kV Line _Schulte Sw Sta-Lammers 115 kV Line	C	N-1-1	120%	25%	6%	5%	4%	2%	Interim operating solution
Stoc-T-24	Tesla-Tracy 115 kV line	(Schulte-Manteca) Tesla- Manteca 115 kV_Schulte Sw Sta-Lammers 115 kV Line	C	N-1-1	115%	117%	62%	64%	65%	74%	
Stoc-T-25	Vierra-Tracy-Kasson 115 kV line	(Schulte-Manteca) Tesla- Manteca 115 kV_Schulte Sw Sta-Lammers 115 kV Line	C	N-1-1	113%	116%	31%	33%	35%	44%	

Study Area: Stockton - Summer Peak (2012-2021)

High/Low Voltage

ID	Substation	Worst Contingency	Category	Category Description	Min. Post Contingency Voltage (PU)						ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2021	
Stoc-V-01	DONNELLS 115 kV	Normal	A	N-0	1.06	1.06	1.06	1.06	1.06	1.06	Under review for possible exemption
Stoc-V-02	LOCKFORD 230 kV	Lockeford-Bellota 230 kV Line	B	N-1	0.89	0.88	0.88	0.88	0.88	0.86	Rio Oso 230 kV voltage support
Stoc-V-03	MSHR 60V 60 kV	Lockeford-Bellota 230 kV Line _Hammer-Country Club 60 kV Line	C	N-1-1	0.89	0.87	0.88	0.88	0.87	0.77	Lockeford-Lodi area long-term plan.
Stoc-V-04	COLONY 60 kV	Lockeford-Bellota 230 kV Line _Hammer-Country Club 60 kV Line	C	N-1-1	0.93	0.91	0.92	0.92	0.91	0.82	
Stoc-V-05	LODI 60 kV	Lockeford-Bellota 230 kV Line _Hammer-Country Club 60 kV Line	C	N-1-1	0.92	0.90	0.91	0.91			
		Lockeford-Bellota 230 kV Line _Hammer-Country Club 60 kV Line	C	N-1-1	0.92	0.90	0.90	0.91	0.90	0.81	
Stoc-V-07	VICTOR 60 kV	Lockeford-Bellota 230 kV Line _Hammer-Country Club 60 kV Line	C	N-1-1	0.93	0.91	0.92	0.92	0.92	0.83	
Stoc-V-08	LOCKEFRD 60 kV	Lockeford-Bellota 230 kV Line _Hammer-Country Club 60 kV Line	C	N-1-1	0.94	0.92	0.93	0.93	0.92	0.84	
Stoc-V-09	LOCKFORD 230 kV	Lockeford-Bellota 230 kV Line _Hammer-Country Club 60 kV Line	C	N-1-1	0.83	0.81	0.82	0.82	0.82	0.75	
Stoc-V-10	LOCKFORD 230 kV	Lockeford-Bellota 230 kV Line & Brighton-Bellota 230 kV Line	C	DCTL	0.88	0.86	0.87	0.87	0.87	0.85	

Stoc-V-11	EIGHT MI	230 kV	Stagg-Tesla 230 kV Line _Eight Mile Road-Tesla 230 kV Line	C	N-1-1	0.89	0.88	0.89	0.89	0.89	0.84	Stagg area voltage support
Stoc-V-12	STAGG	230 kV	Stagg-Tesla 230 kV Line _Eight Mile Road-Tesla 230 kV Line	C	N-1-1	0.88	0.87	0.88	0.88	0.88	0.83	
Stoc-V-13	EIGHT MI	230 kV	Stagg-Tesla 230 kV Line & Eight Mile Road-Tesla 230 kV Line	C	DCTL	0.89	0.88	0.89	0.88	0.89	0.84	
Stoc-V-14	STAGG	230 kV	Stagg-Tesla 230 kV Line & Eight Mile Road-Tesla 230 kV Line	C	DCTL	0.88	0.87	0.88	0.88	0.88	0.83	

Study Area: Stockton - Summer Peak (2012-2021)

Voltage Deviation

ID	Substation	Worst Contingency	Category	Category Description	Post Contingency Voltage Deviation (%)						ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2021	
Stoc-DV-01	COLONY 60 kV	Lockeford-Bellota 230 kV Line	B	N-1	-3%	-4%	-3%	-4%	-3%	-6%	Lockeford-Lodi area long-term plan.
Stoc-DV-02	LOCKEFRD 60 kV	Lockeford-Bellota 230 kV Line	B	N-1	-3%	-4%	-3%	-4%	-3%	-6%	
Stoc-DV-03	LOCKFORD 230 kV	Lockeford-Bellota 230 kV Line	B	N-1	-9%	-10%	-10%	-10%	-10%	-11%	
Stoc-DV-04	LODI 60 kV	Lockeford-Bellota 230 kV Line	B	N-1	-3%	-4%	-3%	-4%	-3%	-6%	
Stoc-DV-05	LODI AUX 60 kV	Lockeford-Bellota 230 kV Line	B	N-1	-3%	-4%	-3%	-4%	-3%	-6%	
Stoc-DV-06	MONDAVI 60 kV	Lockeford-Bellota 230 kV Line	B	N-1	-3%	-4%	-3%	-4%	-3%	-6%	
Stoc-DV-07	VICTOR 60 kV	Lockeford-Bellota 230 kV Line	B	N-1	-3%	-4%	-3%	-4%	-3%	-6%	
Stoc-DV-08	LAMMERS 115 kV	Schulte Sw Sta-Lammers 115	B	N-1	-6%	-5%	-2%	-2%	-3%	-3%	
Stoc-DV-09	OI GLASS 115 kV	Schulte Sw Sta-Lammers 115	B	N-1	-6%	-4%	-2%	-2%	-2%	-3%	Interim operating solution
Stoc-DV-10	PNE GRVE 60 kV	WEST PNT 11.50 Unit ID 1	B	N-1	-7%	-5%	-1%	-1%	-1%	-1%	
Stoc-DV-11	WEST PNT 60 kV	WEST PNT 11.50 Unit ID 1	B	N-1	-8%	-6%	-2%	-2%	-1%	-2%	Lockeford-Lodi area long-term plan.
Stoc-DV-12	COLONY 60 kV	Lockeford-Bellota 230 kV Line _Hammer-Country Club 60 kV Line	C	N-1-1	-10%	-12%	-12%	-12%	-12%	-21%	
Stoc-DV-13	LOCKEFRD 60 kV	Lockeford-Bellota 230 kV Line _Hammer-Country Club 60 kV Line	C	N-1-1	-10%	-12%	-12%	-12%	-12%	-20%	
Stoc-DV-14	LOCKFORD 230 kV	Lockeford-Bellota 230 kV Line _Hammer-Country Club 60 kV Line	C	N-1-1	-15%	-17%	-16%	-16%	-16%	-22%	
Stoc-DV-15	LODI 60 kV	Lockeford-Bellota 230 kV Line _Hammer-Country Club 60 kV Line	C	N-1-1	-10%	-13%	-12%	-12%	-12%	-21%	
Stoc-DV-16	MONDAVI 60 kV	Lockeford-Bellota 230 kV Line _Hammer-Country Club 60 kV Line	C	N-1-1	-10%	-13%	-12%	-12%	-12%		
			C	N-1-1	-13%	-15%	-15%	-15%	-15%	-25%	
Stoc-DV-18	VICTOR 60 kV	Lockeford-Bellota 230 kV Line _Hammer-Country Club 60 kV Line	C	N-1-1	-10%	-12%	-12%	-12%	-12%	-21%	
Stoc-DV-19	LOCKFORD 230 kV	Lockeford-Bellota 230 kV Line & Brighton-Bellota 230 kV Line	C	DCTL	-11%	-12%	-11%	-11%	-11%	-12%	

Stoc-DV-20	CNTRY CB 60 kV	Stagg-Tesla 230 kV Line _Eight Mile Road-Tesla 230 kV Line	C	N-1-1	-5%	-6%	-6%	-7%	-6%	-11%	Stagg area voltage support
Stoc-DV-21	EIGHT MI 230 kV	Stagg-Tesla 230 kV Line _Eight Mile Road-Tesla 230 kV Line	C	N-1-1	-9%	-10%	-9%	-10%	-10%	-13%	
Stoc-DV-22	HAMMER 60 kV	Stagg-Tesla 230 kV Line _Eight Mile Road-Tesla 230 kV Line	C	N-1-1	-5%	-6%	-6%	-7%	-6%	-11%	
Stoc-DV-23	NEW HOPE 60 kV	Stagg-Tesla 230 kV Line _Eight Mile Road-Tesla 230 kV Line	C	N-1-1	-5%	-7%	-7%	-7%	-6%	-12%	
Stoc-DV-24	SEBASTIA 60 kV	Stagg-Tesla 230 kV Line _Eight Mile Road-Tesla 230 kV Line	C	N-1-1	-5%	-7%	-7%	-7%	-6%	-11%	
Stoc-DV-25	STAGG 60 kV	Stagg-Tesla 230 kV Line _Eight Mile Road-Tesla 230 kV Line	C	N-1-1	-5%	-6%	-6%	-7%	-6%	-11%	
Stoc-DV-26	STAGG 230 kV	Stagg-Tesla 230 kV Line _Eight Mile Road-Tesla 230 kV Line	C	N-1-1	-10%	-10%	-10%	-10%	-11%	-13%	
Stoc-DV-27	TERMNOUS 60 kV	Stagg-Tesla 230 kV Line _Eight Mile Road-Tesla 230 kV Line	C	N-1-1	-5%	-7%	-7%	-7%	-6%	-11%	
Stoc-DV-28	UOP 60 kV	Stagg-Tesla 230 kV Line _Eight Mile Road-Tesla 230 kV Line	C	N-1-1	-5%	-6%	-6%	-7%	-6%	-11%	
Stoc-DV-29					-5%	-6%	-6%	-7%	-6%	-11%	
Stoc-DV-30	CNTRY CB 60 kV	Stagg-Tesla 230 kV Line & Eight Mile Road-Tesla 230 kV Line	C	DCTL	-5%	-6%	-6%	-7%	-6%	-11%	
Stoc-DV-31	EIGHT MI 230 kV	Stagg-Tesla 230 kV Line & Eight Mile Road-Tesla 230 kV Line	C	DCTL	-9%	-9%	-9%	-10%	-10%	-13%	
Stoc-DV-32	HAMMER 60 kV	Stagg-Tesla 230 kV Line & Eight Mile Road-Tesla 230 kV Line	C	DCTL	-5%	-6%	-6%	-7%	-6%	-11%	
Stoc-DV-33	NEW HOPE 60 kV	Stagg-Tesla 230 kV Line & Eight Mile Road-Tesla 230 kV Line	C	DCTL	-5%	-6%	-7%	-8%	-6%	-12%	

Stoc-DV-34	SEBASTIA 60 kV	Stagg-Tesla 230 kV Line & Eight Mile Road-Tesla 230 kV Line	C	DCTL	-5%	-6%	-7%	-7%	-6%	-11%
Stoc-DV-35	STAGG 60 kV	Stagg-Tesla 230 kV Line & Eight Mile Road-Tesla 230 kV Line	C	DCTL	-5%	-6%	-6%	-7%	-6%	-11%
Stoc-DV-36	STAGG 230 kV	Stagg-Tesla 230 kV Line & Eight Mile Road-Tesla 230 kV Line	C	DCTL	-10%	-10%	-10%	-11%	-11%	-13%
Stoc-DV-37	TERMNOUS 60 kV	Stagg-Tesla 230 kV Line & Eight Mile Road-Tesla 230 kV Line	C	DCTL	-5%	-6%	-6%	-7%	-6%	-11%
Stoc-DV-38	UOP 60 kV	Stagg-Tesla 230 kV Line & Eight Mile Road-Tesla 230 kV Line	C	DCTL	-5%	-6%	-6%	-7%	-6%	-11%
Stoc-DV-39	LAMMERS 115 kV	Tesla-Tracy 115 kV Line _Schulte Sw Sta-Lammers 115 kV Line	C	N-1-1	-11%	-8%	-3%	-3%	-3%	-4%
Stoc-DV-40	OI GLASS 115 kV	Tesla-Tracy 115 kV Line _Schulte Sw Sta-Lammers 115 kV Line	C	N-1-1	-11%	-8%	-3%	-3%	-3%	-4%

Interim operating solution



Study Area: Greater Bay Area - San Francisco - Summer Peak (2012-2021)

Thermal Overload

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)						ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2021	
SF-T-01	Potrero - Mission (AX) 115 kV Cable	Potrero-Larkin #2 (AY-2) 115kV Cable	B	L-1	103%	106%	108%	106%	106%	110%	Existing TBC DC Runback Scheme

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)						ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2021	
SF-T-02	Potrero - Larkin #1 (AY-1) 115 kV Cable	Mission-Larkin (XY-1) 115kV Cable _Martin-Larkin (HY-1) 115kV Cable	C	N-1-1	153%	155%	156%	158%	163%	175%	Develop an action plan to transfer loads among substation (NB: reducing TransBay cable output doesn't solve the problem)

SF-T-03	Potrero - Larkin #2 (AY-2) 115 kV Cable	Potrero-Larkin #1 (AY-1) 115kV Cable _Potrero- Mission (AX) 115kV Cable	C	N-1-1	112%	114%	116%	114%	115%	120%	Develop an action plan to transfer loads among substation (NB: reducing TransBay cable output doesn't solve the problem)
		Potrero-Mission (AX) 115kV Cable _Hunters Point- Mission #1 (PX-1) 115kV Ca	C	N-1-1	102%	104%	106%	105%	105%	109%	Develop an action plan to transfer loads among substation, reduce TransBay cable output and if overload still exists, drop load manually or by SPS
		Potrero-Mission (AX) 115kV Cable _Potrero-Hunters Point (AP-1) 115kV Cable	C	N-1-1	103%	105%	107%	104%	105%	108%	Develop an action plan to transfer loads among substation, reduce TransBay cable output and if overload still exists, drop load manually or by SPS
		Potrero 115kV Bus 1D	C	Bus	124%	125%	127%	126%	127%	131%	Develop an action plan to transfer loads among substation, reduce TransBay cable output and if overload still exists, drop load manually or by SPS

SF-T-04	Potrero - Mission (AX) 115 kV Cable	Potrero 115kV Bus 2E	C	Bus	121%	124%	126%	123%	123%	126%	Develop an action plan to transfer loads among substation, reduce TransBay cable output and if overload still exists, drop load manually or by SPS
		Potrero-Larkin #1 (AY-1) 115kV Cable _Potrero-Larkin #2 (AY-2) 115kV Cable	C	N-1-1	112%	114%	115%	117%	118%	126%	TBC DC Runback will automatically initiate for this contingency, reducing overload (loss of AY-2)
		Potrero-Larkin #2 (AY-2) 115kV Cable _HP-Mission #1 (PX-1) 115kV Cable	C	N-1-1	104%	112%	113%	114%	115%	122%	TBC DC Runback will automatically initiate for this contingency, reducing overload (loss of AY-2)
		Potrero-Larkin #2 (AY-2) 115kV Cable _Potrero-Hunters Point (AP-1) 115kV Cable	C	N-1-1	93%	94%	95%	96%	98%	107%	TBC DC Runback will automatically initiate for this contingency, reducing overload (loss of AY-2)


Study Area: Greater Bay Area - Peninsula - Summer Peak (2012-2021)
Thermal Overload

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)						ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2021	
Penn-T-01	Cooley Landing - Stanford 60kV Line	Jefferson-Stanford #1 60kV Line _Cardinal Cogen GSU Transformer	B	L-1/G-1	122%	124%	Less than 80%				A project to mitigate overload has been approved

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)						ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2021	
Penn-T-02	Ravenswood - Palo Alto #1 115 kV Line	Ravenswood 115kV Bus 2E	C	Bus	103%	104%	107%	107%	107%	111%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
		Ravenswood-Cooley Landing #2 115kV Lin_Ravenswood-Palo Alto #2 115kV Line	C	N-1-1	103%	104%	107%	107%	107%	111%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Penn-T-03	Ravenswood - Palo Alto #2 115 kV Line	Ravenswood-Palo Alto No. 1 115 kV and Cooley Landing-Palo Alto 115 kV lines	C	DCTL	103%	104%	107%	107%	107%	111%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Penn-T-04	Cooley Landing - Palo Alto 115 kV Line	Ravenswood-Palo Alto Nos. 1 & 2 115 kV lines	C	DCTL	114%	114%	115%	115%	115%	118%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate

Penn-T-05	Ravenswood - Cooley Landing #2 115 kV Line	Ravenswood-Palo Alto Nos. 1 & 2 115 kV lines	C	DCTL	122%	93%	98%	98%	99%	102%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Penn-T-06	Ravenswood - San Mateo 115 kV Line	Ravenswood-San Mateo Nos. 1 & 2 230 kV lines	C	DCTL	114%	Less than 80%				Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate	
Penn-T-07	San Mateo - Belmont 115 kV Line	Ravenswood-Bair Nos. 1 & 2 115 kV lines	C	DCTL	91%	97%	98%	98%	103%	112%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
		Ravenswood 230/115kV Transformer #1 _Ravenswood 230/115kV Transformer #2	C	N-1-1	106%	118%	118%	119%	119%	133%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Penn-T-08	Bair 115/60 kV Transformer No. 1	Ravenswood-Cooley Landing #1 115kV Lin_Cooley Landing 115/60kV Transformer #2	C	N-1-1	115%	119%	124%	125%	123%	133%	Replace transformer or SPS
Penn-T-09	Bair - Cooley Landing #1 60 kV Line	Bair-Cooley Landing #2 60kV Line _Bair 115/60kV Transformer #1	C	N-1-1	84%	88%	93%	94%	92%	102%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Penn-T-10	Bair - Cooley Landing #2 60 kV Line	San Mateo-Bair 60kV Line _Bair 115/60kV Transformer #1 (N-1-1)	C	N-1-1	Less than	100%	103%	107%	109%	118%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate

Penn-T-11	San Mateo 230/115 kV Transformer No. 7	San Mateo 230/115kV Transformer #5 _San Mateo 230/115kV Transformer #6	C	N-1-1	94%	95%	96%	95%	98%	102%	Replace transformer or SPS to drop load
Penn-T-12	San Mateo - Hillsdale JCT 60kV Line	Jefferson 230/60kV Transformer #1 _Jefferson 230/60kV Transformer #2	C	N-1-1	86%	93%	92%	93%	94%	104%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Penn-T-13	Cooley Landing 115/60kV Xfmer #2	Ravenswood-Cooley Landing #1 115kV Lin_Bair 115/60kV Transformer #1	C	N-1-1	116%	120%	Less than 80%				Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Penn-T-14	Jefferson - Stanford 60kV Line	Cooley Landing-Stanford 60kV Line (Coo_Jefferson-Las Pulgas 60kV Line (Jefferson)	C	N-1-1	110%	113%	109%	110%	110%	120%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Penn-T-15	Jefferson - Stanford 60kV Line	Cooley Landing-Stanford 60kV Line (Coo_Jefferson-Las Pulgas 60kV Line (Jefferson)	C	N-1-1	105%	108%	104%	105%	105%	114%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Penn-T-16	San Mateo - Hillsdale JCT 60kV Line	Jefferson 230/60kV Transformer #1 _Jefferson 230/60kV Transformer #2	C	N-1-1	Less than 80%	102%	103%	86%	105%	116%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Penn-T-17	Jefferson - Stanford 60 kV Line	Cooley Landing-Stanford 60kV Line (Coo_Cardinal Cogen GSU Transformer	C	N-1-1	128%	130%	Less than 80%				Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate

Penn-T-18	Ravenswood - Bair 115kV Line	San Mateo-Belmont 115kV Line _Ravenswood-Bair #2 115kV Line	C	N-1-1	87%	89%	89%	90%	94%	101%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Penn-T-19	Pittsburg - San Mateo 230kV Line	Eastshore-San Mateo 230kV Line _Potrero-TBC 115kV section	C	N-1-1	Less than 80%			85%	86%	106%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Penn-T-20	Ravenswood - San Mateo 115kV Line	Ravenswood-San Mateo #1 230kV Line _Ravenswood-San Mateo #2 230kV Line	C	N-1-1	114%	Less than 80%					Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Penn-T-21	San Mateo 230/115kV Bank #5	San Mateo 230/115kV Transformer #6 _San Mateo 230/115kV Transformer #7	C	N-1-1	95%	105%	106%	108%	109%	120%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Penn-T-22	San Mateo 230/115kV Bank #6	San Mateo 230/115kV Transformer #5 _San Mateo 230/115kV Transformer #7	C	N-1-1	95%	105%	105%	108%	109%	120%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Penn-T-23	San Mateo 230/115kV Bank #7	San Mateo 230/115kV Transformer #5 _San Mateo 230/115kV Transformer #6	C	N-1-1	98%	108%	108%	111%	112%	124%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate


Study Area: Greater Bay Area - East Bay - Summer Peak (2012-2021)
Thermal Overload

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)						ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2021	
Ebay-T-01	Oleum - North Tower - Christie 115 kV Line	Christie Sobrante 115 kV line and Union Chemical Generation offline	B	L-1/G-1	97%	99%	100%	102%	104%	115%	Re-rate or reconductor line.
Ebay-T-02	Oleum - North Tower - Christie 115 kV Line	Christie Sobrante 115 kV line and GWF #5 Generation offline	B	L-1/G-1	105%	107%	109%	111%	112%	123%	Re-rate or reconductor line.
Ebay-T-03	Oleum - Martiez 115 kV line	Martinez - Sobrante 115 kV line and Gateway generation offline	B	L-1/G-1	94%	95%	96%	98%	97%	101%	Re-rate or reconductor line.

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)						ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2021	
EBay-T-04	Oleum - North Tower - Christie 115 kV Line	Christie-Sobrante 115 kV and Martinez-Sobrante 115 kV lines	C	DCTL	94%	96%	97%	99%	101%	112%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
		Christie-Sobrante (Oleum-Sobrante) 115_UNION CH 1 9.11	C	N-1-1	97%	99%	100%	102%	104%	115%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
EBay-T-05	Christie - Sobrante 115 kV Line	Sobrante-G Nos. 1 & 2 115 kV lines	C	DCTL	98%	98%	98%	98%	98%	103%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate

EBay-T-06	Moraga - Oakland "J" 115kV Line	San Leandro U 115kV Bus Sec D	C	Bus	126%	125%	126%	127%	128%	137%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
EBay-T-07	Oakland "C" - Oakland "L" #1 115 kV Cable	Claremont K - Oakland D #1 115kV Cable_Claremont K - Oakland D #2 115kV Cable	C	N-1-1	103%	103%	104%	105%	106%	114%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
EBay-T-08	Oleum - Martinez 115 kV Line	Sobrante-G Nos. 1 & 2 115 kV lines	C	N-1-1	96%	92%	101%	117%	104%	122%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
EBay-T-09	Moraga - Oakland X 115kV Line #1	Claremont K - Oakland D #1 115kV Cable_Claremont K - Oakland D #2 115kV Cable	C	N-1-1	87%	88%	90%	90%	93%	102%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
EBay-T-10	Moraga - Oakland X 115kV Line #2	Claremont K - Oakland D #1 115kV Cable_Claremont K - Oakland D #2 115kV Cable	C	N-1-1	87%	88%	90%	90%	93%	102%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
EBay-T-11	Moraga - Oakland X 115kV Line #3	Claremont K - Oakland D #1 115kV Cable_Claremont K - Oakland D #2 115kV Cable	C	N-1-1	87%	88%	90%	90%			
	Moraga - Oakland X 115kV Line #4	Claremont K - Oakland D #1 115kV Cable_Claremont K - Oakland D #2 115kV Cable	C	N-1-1	87%	88%	90%	90%	93%	102%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate

Study Area: Greater Bay Area - East Bay - Summer Peak (2012-2021)

Low Voltage

ID	Substation	Worst Contingency	Category	Category Description	Min. Post Contingency Voltage (PU)						ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2021	
Ebay-V-01	PP STEEL	Sobrante-Standard Oil #2 115kV Line _Standard Oil STA - Standard Oil #1 115kV	C	N-1-1	90%	92%	92%	92%	92%	91%	Add reactive support
Ebay-V-02	SAN PBLO	Sobrante-Standard Oil #2 115kV Line _Standard Oil STA - Standard Oil #1 115kV	C	N-1-1	90%	92%	92%	91%	92%	91%	Add reactive support
Ebay-V-03	STD. OIL	Sobrante-Standard Oil #2 115kV Line _Standard Oil STA - Standard Oil #1 115kV	C	N-1-1	88%	89%	89%	89%	91%	89%	Add reactive support


Study Area: Greater Bay Area - Diablo- Summer Peak (2012-2021)
Thermal Overload

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)						ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2021	
Diab-T-01	Lakewood - Meadow Lane - Clayton 115kV Line	Lakewood-Clayton 115kV Line	B	Line	Less than 80%		80%	87%	87%	106%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Diab-T-02	Oleum - Martinez 115kV Line	Martinez-Sobrante 115kV Line	B	Line	Less than 80%			90%	83%	106%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Diab-T-03	Contra Costa - Moraga 230 kV Line #1	Contra Costa - Moraga 230 kV Line #2 and DEC offline	B	L-1/G-1	103%	109%	Less than 80%				Congestion Management
Diab-T-04	Contra Costa - Moraga 230 kV Line #2	Contra Costa - Moraga 230 kV Line #1 and DEC offline	B	L-1/G-1	103%	109%	Less than 80%				Congestion Management

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)						ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2021	
Diab-T-05	Moraga - Oakland J 115 kV Line	San Leandro U 115kV Bus Sec D	C	DCTL	126%	125%	126%	127%	128%	137%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Diab-T-06	Contra Costa - Moraga 230 kV Line #2	Contra Costa - Las Positas 230 kV and Contra Costa-Lonetree 230 kV lines	C	DCTL	92%	106%	Less than 80%				Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate

Diab-T-07	Contra Costa - Moraga 230 kV Line #2	Contra Costa-Brentwood 230 kV and Contra Costa-Delta Switching Yard 230 kV lines	C	DCTL	105%	118%	Less than 80%				Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Diab-T-08	Contra Costa - Moraga 230 kV Line #2	Contra Costa-Moraga #1 230kV Line _Contra Costa-Las Positas 230kV Line	C	DCTL	106%	121%	Less than 80%				Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Diab-T-09	Moraga - Lakewood 115 kV Line	Lakewood-Clayton and Lakewood-Meadow Lane-Clayton 115 kV lines	C	DCTL	113%	112%	113%	114%	115%	121%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Diab-T-10	Oleum - Martinez 115 kV Line	Pittsburg-Tidewater 230 kV and Pittsburg-Tesoro SW STA 230 kV lines	C	DCTL	Less than 80%		91%	104%	92%	131%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Diab-T-11	Moraga - San Leandro #1 115 kV Line	Moraga-Oakland J 115 kV and Moraga-San Leandro No. 3 115 kV lines	C	DCTL	118%	118%	119%	120%	121%	130%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
		Moraga-San Leandro #2 115kV Line _Moraga-San Leandro #3 115kV Line	C	N-1-1	130%	132%	133%	134%	136%	145%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
	Moraga - San Leandro #2	Moraga-Oakland J 115 kV and Moraga-San Leandro No. 3 115 kV lines	C	DCTL	120%	119%	120%	121%	122%	131%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate

Diab-T-12	115 kV Line	Moraga-San Leandro #1 115kV Line _Moraga-San Leandro #3 115kV Line	C	N-1-1	132%	131%	133%	134%	134%	144%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Diab-T-13	Moraga - San Leandro #3 115 kV Line	Moraga-San Leandro Nos. 1 & 2 115 kV lines	C	DCTL	105%	105%	106%	107%	107%	116%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
		Moraga-Oakland J 115kV Line _Moraga-San Leandro #1 115kV Line	C	N-1-1	95%	96%	97%	98%	101%	107%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Diab-T-14	Pittsburg - Clayton #1 115 kV Line					98%	103%	106%	107%	119%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Diab-T-15	Moraga - Lakewood 115 kV Line	Lakewood-Clayton and Lakewood-Meadow Lane-Clayton 115 kV lines	C	DCTL	120%	118%	120%	121%	121%	128%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Diab-T-16	Moraga - Castro Valley 230 kV Line	Contra Costa - Las Positas 230 kV and Contra Costa-Lonetree 230 kV lines	C	DCTL	105%	82%	82%	83%	85%	93%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Diab-T-17	Contra Costa - Balfour 60 kV Line	Sobrante-Grizzly-Clairemont #1 115kV Li_Sobrante-Moraga 115kV Line	C	N-1-1	Less than 80%					110%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate

Diab-T-18	Sobrante - Grizzly - Claremont 115 kV Line #2	Sobrante-Grizzly-Claremont #1 115kV Li_Sobrante-Moraga 115kV Line	C	N-1-1	85%	Less than 80%				115%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Diab-T-19	Christie - Sobrante 115 kV Line	Sobrante-G Nos. 1 & 2 115 kV lines	C	DCTL	96%	92%	101%	117%	104%	122%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate

Study Area: Greater Bay Area - Diablo - Summer Peak (2012-2021)**Voltage Deviation**

ID	Substation	Worst Contingency	Category	Category Description	Post Contingency Voltage Deviation (%)						ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2021	
Diab-dV-01	CC JCT	Contra Costa #1 115kV Line	B	L-1	-4.1%	-4.0%	-4.1%	-4.2%	-4.6%	-5.2%	Add reactive support
Diab-dV-02	FIBRBJCT	Contra Costa #2 115kV Line	B	L-1	-4.1%	-4.1%	-4.2%	-4.3%	-4.7%	-5.2%	Add reactive support
Diab-dV-03	RVEC	Contra Costa #1 115kV Line	B	L-1	-4.0%	-4.0%	-4.1%	-4.2%	-4.6%	-5.2%	Add reactive support
Diab-dV-04	RVECTP	Contra Costa #1 115kV Line	B	L-1	-4.0%	-4.0%	-4.1%	-4.2%	-4.6%	-5.2%	Add reactive support

ID	Substation	Worst Contingency	Category	Category Description	Post Contingency Voltage Deviation (%)						ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2021	
Diab-dV-05	CC JCT	Contra Costa Nos. 1 & 2 115 kV	C	DCTL	-4.0%	-4.0%	-4.1%	-4.2%	-4.6%	-5.2%	Add reactive support
Diab-dV-06	FIBRBJCT	Contra Costa Nos. 1 & 2 115 kV	C	DCTL	-4.0%	-4.0%	-4.1%	-4.2%	-4.6%	-5.2%	Add reactive support
Diab-dV-07	RVEC	Contra Costa Nos. 1 & 2 115 kV	C	DCTL	-4.1%	-4.0%	-4.1%	-4.2%	-4.6%	-5.2%	Add reactive support
Diab-dV-08	RVECTP	Contra Costa Nos. 1 & 2 115 kV	C	DCTL	-4.1%	-4.1%	-4.2%	-4.3%	-4.7%	-5.2%	
			C	N-1-1	-6.6%	-5.3%	-6.0%	-5.9%	-6.0%	-5.8%	Add reactive support



Study Area: Greater Bay Area - Mission - Summer Peak (2012-2021)

Thermal Overload

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)						ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2021	
Miss-T-01	Moraga - San Leandro #1 115 kV Line	San Leandro U 115kV Bus Sec E	C	Bus	111%	111%	112%	113%	113%	122%	Re-rate or reconductor line. Drop load either manually or thru
		Moraga-San Leandro #2 115kV Line _Moraga-San Leandro #3 115kV Line	C	N-1-1	131%	131%	132%	133%	134%	144%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Miss-T-02	Moraga - San Leandro #2 115 kV Line	Moraga-San Leandro #1 115kV Line _Moraga-San Leandro #3 115kV Line	C	N-1-1	132%	131%	133%	134%	134%	144%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Miss-T-03	Moraga - San Leandro #3 115 kV Line	Moraga-San Leandro #1 115kV Line _Moraga-San Leandro #2 115kV Line	C	DCTL	105%	105%	106%	107%	107%	116%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Miss-T-04	Newark - Ames Distribution 115 kV Line	Newark-Ravenswood 230 kV and Tesla-Ravenswood 230 kV lines	C	DCTL	127%	105%	Less than 80%				Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Miss-T-05	Newark - Dumbarton 115 kV Line	Eastshore-San Mateo 230 kV and Pittsburg-San Mateo 230 kV lines	C	DCTL	Less than 80%	93%	97%	100%	103%	104%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate

Miss-T-06	Newark - Ames #1 115 kV Line	Newark-Ravenswood 230 kV and Tesla-Ravenswood 230 kV lines	C	DCTL	116%	95%	Less than 80%				Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Miss-T-07	Newark - Ames #2 115 kV Line	Newark-Ravenswood 230 kV and Tesla-Ravenswood 230 kV lines	C	DCTL	125%	103%					Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Miss-T-08	Newark - Ames #3 115 kV Line	Newark-Ravenswood 230 kV and Tesla-Ravenswood 230 kV lines	C	DCTL	128%	106%					Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Miss-T-09	Moraga - Castro Valley 230 kV Line	Contra Costa-Las Positas 230kV Line _Tesla-Newark #2 230kV Line	C	DCTL	107%	80%	80%	82%	84%	93%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Miss-T-10	Newark 230/115 kV Transformer No. 11	Newark-Newark Dist 230kV section _Newark 230/115kV Transformer #7	C	N-1-1	98%	98%	97%	101%	101%	111%	Replace transformer or SPS to drop load
Miss-T-11	East Shore - Grant #1 115 kV Line	San Leandro-Oakland J 115kV Line _Grant-Eastshore #2 115kV Line	C	N-1-1	95%	95%	96%	97%	98%	106%	Congestion Management
Miss-T-12	East Shore - Grant #2 115 kV Line	San Leandro-Oakland J 115kV Line _Grant-Eastshore #1 115kV Line	C	N-1-1	95%	95%	96%	97%	98%	106%	Congestion Management
Miss-T-13	East Shore - Dumbarton 115 kV Line	San Mateo 230kV Bus 2D	C	Bus	Less than 80%	180%	185%	190%	195%	82%	Congestion Management
Miss-T-14	East Shore - Dumbarton 115 kV Line	Eastshore-San Mateo 230 kV and Pittsburg-San Mateo 230 kV lines	C	DCTL	Less than 80%	191%	198%	203%	208%	89%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Miss-T-15	Las Positas - Newark 230 kV Line	Contra Costa-Cayetano 230kV Line _Tesla-Newark #2 230kV Line	C	N-1-1	102%	98%	99%	98%	98%		

Miss-T-16	East Shore - San Mateo 230kV Line #1	Newark-Ravenswood 230 kV and Tesla-Ravenswood 230 kV lines	C	DCTL	89%	147%	148%	149%	152%	105%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Miss-T-17	Newark - Vallecitos 60kV Line	San Ramon 230/60kV Transformer #1 _Las Positas 230/60kV Transformer #4	C	N-1-1	110%	102%	103%	92%	103%	117%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Miss-T-18	Newark - Dumbarton 115kV Line	Pittsburg-Eastshore 230kV Line _Eastshore-San Mateo 230kV Line	C					114%	104%	102%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Miss-T-19	East Shore - San Mateo 230kV Line #1	Eastshore 230/115kV Transformer #1 _Eastshore 230/115kV Transformer #2	C	N-1-1	Less than	146%	150%	153%	157%	110%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Miss-T-20	East Shore 230/115 kV Transformer #1	Eastshore-San Mateo 230kV Line _Eastshore 230/115kV Transformer #2	C	N-1-1	87%	101%	206%	210%	214%	222%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Miss-T-21	East Shore 230/115 kV Transformer #2	Eastshore-San Mateo 230kV Line _Eastshore 230/115kV Transformer #1	C	N-1-1	89%	104%	210%	214%	219%	227%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Miss-T-22	Lonetree - Cayetano 230kV Line	Contra Costa-Las Positas 230kV Line _Tesla-Newark #2 230kV Line	C	N-1-1	102%	100%	100%	99%	100%	103%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate

Miss-T-23	Lonetree - Cayetano 230kV Line	Contra Costa-Las Positas 230kV Line _Tesla-Newark #2 230kV Line	C	N-1-1	102%	99%	100%	99%	100%	102%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
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Study Area: Greater Bay Area - Mission - Summer Peak (2012-2021)

Low Voltage

ID		Worst Contingency	Category								
					2012	2013	2014	2015	2016	2021	
Miss-V-01	SUNOL 60 kV	San Ramon 230/60kV Transformer #1 _Las Positas 230/60kV Transformer #4	C	N-1-1	88%	89%	89%	91%	90%	86%	Develop action plan or use SPS to drop load
Miss-V-02	VALLECTS 60 kV	San Ramon 230/60kV Transformer #1 _Las Positas 230/60kV Transformer #4	C	N-1-1	86%	88%	88%	89%	88%	85%	
Miss-V-03	IUKA 60 kV	San Ramon 230/60kV Transformer #1 _Las Positas 230/60kV Transformer #4	C	N-1-1	83%	85%	84%	86%	85%	81%	
Miss-V-04	LIVRMR_2 60 kV	San Ramon 230/60kV Transformer #1 _Las Positas 230/60kV Transformer #4	C	N-1-1	83%	84%	84%	86%	85%	80%	
Miss-V-05	LIVERMRE 60 kV	San Ramon 230/60kV Transformer #1 _Las Positas 230/60kV Transformer #4	C	N-1-1	83%	84%	84%	86%	85%	80%	
Miss-V-06	VINEYARD 60 kV	San Ramon 230/60kV Transformer #1 _Las Positas 230/60kV Transformer #4	C	N-1-1	82%	84%	84%	86%	84%	80%	
Miss-V-07	RADUM 60 kV	San Ramon 230/60kV Transformer #1 _Las Positas 230/60kV Transformer #4	C	N-1-1	82%	84%	84%	86%	84%	80%	
Miss-V-08	CALMAT60 60 kV	San Ramon 230/60kV Transformer #1 _Las Positas 230/60kV Transformer #4	C	N-1-1	82%	84%	84%	86%	84%	80%	
Miss-V-09	SAN RAMN 60 kV	San Ramon 230/60kV Transformer #1 _Las Positas 230/60kV Transformer #4	C	N-1-1	82%	84%	84%	86%	84%	80%	

Miss-V-11	LPOSTAS 60 kV	San Ramon 230/60kV Transformer #1 _Las Positas 230/60kV Transformer #4	C	N-1-1	82%	84%	84%	86%	84%	80%
Miss-V-12	SEAWEST 60 kV	San Ramon 230/60kV Transformer #1 _Las Positas 230/60kV Transformer #4	C	N-1-1	82%	84%	84%	86%	84%	80%
Miss-V-13	VASCO 60 kV	San Ramon 230/60kV Transformer #1 _Las Positas 230/60kV Transformer #4	C	N-1-1	82%	84%	84%	86%	84%	80%
Miss-V-14	DCTO JCT 60kV	Las Positas 230/60kV Transformer #4 _Newark 115/60kV Transformer #1	C	N-1-1	90%	91%	91%	92%	91%	89%
Miss-V-15	E DUBLIN 60kV	San Ramon 230/60kV Transformer #1 _Las Positas 230/60kV Transformer #4	C	N-1-1	82%	84%	84%	86%	84%	80%
Miss-V-16	E. SHORE 60kV	Pittsburg-Eastshore 230kV Line _Eastshore-San Mateo 230kV Line	C	N-1-1	84%	101%	101%	101%	101%	101%
Miss-V-17	FLOWIND1 60kV	San Ramon 230/60kV Transformer #1 _Las Positas 230/60kV Transformer #4	C	N-1-1	82%	84%	84%	86%	84%	80%
Miss-V-18	NEWARK 60kV	Las Positas 230/60kV Transformer #4 _Newark 115/60kV Transformer #1	C	N-1-1	90%	91%	91%	92%	91%	89%

Study Area: Greater Bay Area - Mission - Summer Peak (2012-20

Voltage Deviation

ID	Substation	Worst Contingency	Category	Category Description	Post Contingency Voltage Deviation (%)						ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2021	
Miss-dV-01	VINEYARD 60kV	Radum-Vallecitos 60kV Line	B	L-1	-4.5%	-4.8%	-4.8%	-4.9%	-5.3%	-4.1%	Add reactive support
Miss-dV-02	LPOSTAS 60kV	Las Positas 230/60kV Transformer #4	B	L-1	-4.7%	-4.4%	-4.5%	-4.1%	-4.6%	-5.2%	Add reactive support
Miss-dV-03	FLOWIND1 60kV	Las Positas 230/60kV Transformer #4	B	L-1	-4.7%	-4.4%	-4.5%	-4.0%	-4.6%	-5.2%	Add reactive support
Miss-dV-04	IUKA 60kV	Radum-Vallecitos 60kV Line	B	L-1	-4.7%	-5.0%	-4.9%				
Miss-dV-05	VASCJCT. 60kV	Las Positas 230/60kV Transformer #4	B	T-1	-4.7%	-4.4%	-4.5%	-4.0%	-4.6%	-5.2%	Add reactive support
Miss-dV-06	USWP-FRK 60kV	Las Positas 230/60kV Transformer #4	B	T-1	-4.7%	-4.4%	-4.5%	-4.0%	-4.6%	-5.2%	Add reactive support
Miss-dV-07	ZONDWD 60kV	Las Positas 230/60kV Transformer #4	B	T-1	-4.7%	-4.4%	-4.5%	-4.1%	-4.6%	-5.2%	Add reactive support
Miss-dV-08	VASCO 60kV	Las Positas 230/60kV Transformer #4	B	T-1	-4.7%	-4.4%	-4.5%	-4.1%	-4.6%	-5.2%	Add reactive support
Miss-dV-09	SEAWEST 60kV	Las Positas 230/60kV Transformer #4	B	T-1	-4.7%	-4.4%	-4.5%	-4.0%	-4.6%	-5.2%	Add reactive support

ID	Substation	Worst Contingency	Category	Category Description	Post Contingency Voltage Deviation (%)						ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2021	
Miss-dV-10	MT EDEN 115kV	Eastshore-Mt Eden Nos. 1 & 2 115 kV lines	C	DCTL	-4.2%	-5.3%	-5.1%	-5.2%	-5.2%	-4.6%	Add reactive support
Miss-dV-11	GRANT 115kV	Grant-Eastshore Nos. 1 & 2 115 kV lines	C	DCTL	-4.6%	-5.7%	-5.4%	-5.6%	-5.5%	-4.9%	Add reactive support
Miss-dV-12	E DUBLIN 60 kV	San Ramon 230/60kV Transformer #1 _Las Positas 230/60kV Transformer #4	C	N-1-1	-17.1%	-15.6%	-16.0%	-13.9%	-15.8%	-18.9%	Add reactive support
Miss-dV-13	SAN RAMN 60 kV	San Ramon 230/60kV Transformer #1 _Las Positas 230/60kV Transformer #4	C	N-1-1	-17.7%	-16.1%	-16.5%	-14.4%	-16.3%	-19.4%	Add reactive support

Miss-dV-14	LPOSTAS	60 kV	San Ramon 230/60kV Transformer #1 _Las Positas 230/60kV Transformer #4	C	N-1-1	-17.9%	-16.4%	-16.7%	-14.6%	-16.7%	-19.9%	Add reactive support
Miss-dV-15	SEAWEST	60 kV	San Ramon 230/60kV Transformer #1 _Las Positas 230/60kV Transformer #4	C	N-1-1	-17.9%	-16.4%	-16.7%	-14.5%	-16.7%	-19.9%	Add reactive support
Miss-dV-16	VASCO	60 kV	San Ramon 230/60kV Transformer #1 _Las Positas 230/60kV Transformer #4	C	N-1-1	-17.9%	-16.4%	-16.8%	-14.6%	-16.7%	-19.9%	Add reactive support


Study Area: Greater Bay Area - San Jose - Summer Peak (2012-2021)
Thermal Overload

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)						ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2021	
SanJ-T-01	Newark-Dixon Landing 115kV Line	Piercy-Metcalf 115kV Line	B	L-1	113%	116%	119%	Less than 80%			Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
SanJ-T-02	Piercy-Metcalf 115kV Line	Newark-Dixon Landing 115 kV Line	B	L-1	104%	106%	108%	Less than 80%			Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
SanJ-T-03	Monta Vista - Los Gatos 60 kV Line	Evergreen 115/60 kV Transformer No. 1	B	T-1	119%	121%	121%	123%	124%	95%	Short term: Action Plan Long term: Monta Vista - Los Gatos-Evergreen reconductor project

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)						ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2021	
SanJ-T-04	Metcalf 230/115 kV Transformer No. 1	Metcalf 230/115 kV Transformer No. 4 _Metcalf 230/115 kV Transformer No. 2	C	N-1-1	91%	91%	95%	99%	98%	109%	Congestion Management
SanJ-T-05	Metcalf 230/115 kV Transformer No. 2	Metcalf 230kV Bus 1D	C	Bus	95%	94%	99%	103%	102%	113%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
		Metcalf 230/115 kV Trans No. 1 _Metcalf 230/115 kV Trans No. 4	C	N-1-1	98%	Less than 80%	97%	100%	102%	116%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
SanJ-T-06	Metcalf 230/115 kV Transformer No. 3	Metcalf 230kV Bus 1D	C	Bus	88%	88%	92%	96%	95%	105%	Congestion Management
		Metcalf 230/115 kV Trans No. 4 _Metcalf 230/115 kV Trans No. 2	C	N-1-1	Less than 80%				95%	108%	Congestion Management

SanJ-T-07	Metcalfe 500/230 kV Transformer No. 13	Metcalfe 500/230 kV Transformer No. 11 _Metcalfe 500/230 kV Transformer No. 12	C	N-1-1	98%	105%	101%	105%	103%	118%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
SanJ-T-08	Newark - Milpitas #1 115 kV Line	Newark-Milpitas 115 kV Line No. 2 _Swift-Metcalfe 115 kV Line	C	N-1-1	137%	139%	140%	95%	96%	105%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
SanJ-T-09	Hicks - Metcalfe 230 kV Line	Metcalfe-Monta Vista No. 3 230 kV Line _Monta Vista-Coyote Sw. Sta. 230 kV Line	C	N-1-1	90%	87%	91%	91%	92%	101%	Congestion Management
SanJ-T-10	TRIMBLE - SJB DG 115kV Line	Metcalfe - El Patio No. 1 & 2 115 kV Lines	C	DCTL	94%	98%	97%	96%	95%	103%	Congestion Management
SanJ-T-11	EVGRN J - MTCALF E 115kV Line #2	Markham No. 1 115 kV Tap _Metcalfe-Evergreen No. 1 115 kV Line	C	N-1-1	105%	106%	108%	82%	83%	90%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
SanJ-T-12	EVGRN 1 - MTCALF E 115kV Line #1	Markham No. 2 115 kV Tap _Piercy-Metcalfe 115 kV Line	C	N-1-1	Less than 80%			93%	93%	101%	Congestion Management
SanJ-T-13	EVGRN 2 - JENING J Line #1	Newark-Dixon Landing 115 kV Line _Piercy-Metcalfe 115 kV Line	C	N-1-1	Less than 80%			147%	150%		
		Metcalfe-Morgan Hill 115 kV Line _Llagas-Gilroy Foods 115 kV Line	C	N-1-1	116%	117%	118%	119%	120%	131%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
SanJ-T-15	LS ESTRS - MONTAGUE 115kV Line	Los Esteros-Trimble 115 kV Line _Nortech-NRS 115 kV Line	C	N-1-1	94%	95%	95%	96%	96%	105%	Congestion Management
SanJ-T-16	EVGRN 1 - MTCALF E 115kV Line #1	Markham No. 2 115 kV Tap _Piercy-Metcalfe 115 kV Line	C	N-1-1	Less than 80%			93%	93%	101%	Congestion Management
SanJ-T-17	MABURY - JENING J 115kV Line	Newark-Dixon Landing 115 kV Line _Piercy-Metcalfe 115 kV Line	C	N-1-1	Less than 80%			147%	150%	164%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
SanJ-T-18	MABURY J - MABURY 115kV Line	Newark-Dixon Landing 115 kV Line _Piercy-Metcalfe 115 kV Line	C	N-1-1	Less than 80%			129%	131%	144%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate

SanJ-T-19	EVRGRN 1 - MTCALF E 115kV Line #1	Newark-Dixon Landing 115 kV Line _Piercy-Metcalf 115 kV Line	C	N-1-1	Less than 80%			100%	100%	110%	Congestion Management
SanJ-T-20	MCKEE - PIERCY 115kV Line	Newark-Dixon Landing 115 kV Line _Mabury- Jennings J. 115 kV Line	C	N-1-1	Less than 80%			98%	100%	106%	Congestion Management
SanJ-T-21	MORGN J1 - MORGN J2 115kV Line	Metcalf-Morgan Hill 115 kV Line _Llagas-Gilroy Foods 115 kV Line	C	N-1-1	108%	109%	109%	110%	111%	121%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
SanJ-T-22	MTCALF D - MRGN HIL 115kV Line	Metcalf-Llagas 115 kV Line _Llagas-Gilroy Foods 115 kV Line	C	N-1-1	101%	102%	102%	103%	104%	112%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
SanJ-T-23	MTCALF D - MORGN J1 115kV Line	Metcalf-Morgan Hill 115 kV Line _Llagas-Gilroy Foods 115 kV Line					109%	110%	111%	121%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate

Study Area: Greater Bay Area - San Jose - Summer Peak (2012-2021)

Low Voltage

ID	Substation	Worst Contingency	Category	Category Description	Min. Post Contingency Voltage (PU)						ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2021	
SanJ-V-01	MRGN HIL 115kV	Metcalf-Morgan Hill 115 kV Line _Llagas-Gilroy Foods 115 kV Line	C	N-1-1	92%	92%	92%	92%	92%	90%	Add reactive support

Study Area: Greater Bay Area - San Jose - Summer Peak (2012-2021)**Voltage Deviation**

ID	Substation	Worst Contingency	Category	Category Description	Post Contingency Voltage Deviation (%)						ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2021	
SanJ-dV-01	SWIFT 115kV	Swift-Metcalf 115 kV Line	B	L-1	-4%	-4%	-4%	-5%	-5%	-5%	Add reactive support
SanJ-dV-02	PIERCY 115kV	Piercy-Metcalf 115 kV Line	B	L-1	-7%	-7%	-7%	-5%	-5%	-5%	Add reactive support
SanJ-dV-03	ALMADEN 60kV	Evergreen 115/60 kV Transformer No. 1	B	T-1	-15%	-15%	-15%	-16%	-16%	-13%	Add reactive support

ID	Substation	Worst Contingency	Category	Category Description	Post Contingency Voltage Deviation (%)						ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2021	
SanJ-dV-04	PIERCY 115kV	Swift - Metcalf & Piercy - Metcalf 115 kV Lines	C	N-1-1	-7%	-7%	-7%	-5%	-5%	-6%	Add reactive support
SanJ-dV-05	MCKEE 115kV	Swift - Metcalf & Piercy - Metcalf 115 kV Lines	C	N-1-1	-5%	-5%	-5%	-3%	-3%	-4%	Add reactive support
SanJ-dV-06	SWIFT 115kV	Swift - Metcalf & Piercy - Metcalf 115 kV Lines	C	N-1-1	-4%	-5%	-5%	-5%	-5%	-6%	Add reactive support
SanJ-dV-07	MRGN HIL 115kV	Metcalf-Morgan Hill 115 kV Line _Llagas-Gilroy Foods 115 kV Line	C	N-1-1	-10%	-10%	-10%	-10%	-10%	-12%	Add reactive support
SanJ-dV-08	PIERCY 115kV	Newark-Dixon Landing 115 kV Line _Piercy-Metcalf 115 kV Line	C	N-1-1	-2%	-2%	-2%	-10%	-10%	-12%	Add reactive support



Study Area: Greater Bay Area - De Anza - Summer Peak (2012-2021)

Thermal Overload

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)						ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2021	
DeAn-T-01	CLY LNDG - WSTNG JT60kV	Monta Vista-Los Altos 60 kV Line(Loyola-Monta Vista)	B	N-1	95%	81%	96%	96%	97%	112%	Will be mitigated by the Cooley Landing-Los Altos Reconductoring Project
DeAn-T-02	CLY LNDG - WSTNG JT60kV	Monta Vista 230/60 kV Trans No. 5	B	N-1	95%	81%	96%	96%	97%	112%	Will be mitigated by the Cooley Landing-Los Altos Reconductoring Project
DeAn-T-03	Evergreen - Almaden 60 kV Line	Monta Vista 230/60 kV Trans No. 5	B	N-1	108%	109%	109%	110%	111%	87%	Short term: Action Plan Long term: Monta Vista -Los Gatos-Evergreen reconductor project

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)						ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2021	
DeAn-T-04	SARATOGA - VASONA 230kV Line	Metcalf-Monta Vista No. 3 & Monta Vista-Coyote Sw. Sta. 230 kV Line	C	DCTL	91%	88%	92%	92%	92%	102%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
DeAn-T-05	NEWARK F - LCKHD J2 115 kV Line	Newark-Lawrence 115 kV Line _Britton-Monta Vista 115 kV Line	C	N-1-1	87%	91%	94%	97%	100%	110%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
DeAn-T-06	CLY LNDG - WSTNG JT 60kV Line	Monta Vista-Coyote Sw. Sta. 230 kV Lin_Monta Vista 230/60 kV Trans No. 5	C	N-1-1	95%	81%	96%	97%	97%	112%	Will be mitigated by the Cooley Landing-Los Altos Reconductoring Project



Study Area: Kern - Summer Peak (2012-2021)

Thermal Overload

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)					ISO Proposed Mitigation	
					2012	2013	2014	2015	2016		2021
Kern-T-01	KERN-LAMONT - From Kern PP To 4/28	Normal	A	N-0	95.2%	95.1%	95.4%	96.2%	97.2%	105.5%	Reconductor/ Rerate the Transmissoin line
Kern-T-02	KERN-LAMONT - From Kern PP To 4/28	KERN PWR 115kV - TEVISJ1 115kV #1	B	N-1	107.7%	107.9%	108.6%	109.7%	111.7%	123.1%	Reconductor
Kern-T-03	Midway-LaPaloma #2	MIDWAY 230kV - LAPALOMA 230kV #1	B	N-1	112.2%	109.9%	109.3%	108.7%	110.1%	111.3%	Reconductor/Limit Generation at Midway
Kern-T-04	Midway-LaPaloma #1	MIDWAY 230kV - LAPALOMA 230kV #2	B	N-1	112.2%	109.9%	109.3%	108.7%	110.1%	111.3%	Reconductor/Limit Generation at Midway
Kern-T-05	SEMITROPIC-MIDWAY #1 - From Semitropic Sub To Midway Sub	SMYRNA 115kV - MCKIBBEN 115kV #1	B	N-1	100.0%	100.2%	99.6%	99.5%	103.8%	96.5%	Reconductor
		SMYRNA 115kV - MCKIBBEN 115kV #1 _MT POSO 13.80 Unit ID 1	B	G-1/L-1	120.4%	120.6%	119.9%	119.9%	124.0%	122.9%	
Kern-T-06	Taft Bank # 2	TAFT 115kV - TAFT A 70kV #1	B	N-1	93.5%	94.9%	96.3%	98.7%	98.1%	105.1%	Replace the bank with a Higher capacity bank.
		TAFT 115kV - TAFT A 70kV #1 _SLR-TANN 9.11 Unit ID 1	B	G-1/L-1	109.1%	110.7%	111.7%	114.3%	113.4%	115.6%	
Kern-T-07	WHEELER RIDGE-WEEDPATCH - From W6/7 To Weedpatch	WEEDPTCH 70kV - MAGNDN J 70kV #1	B	N-1	98.8%	97.2%	96.1%	95.6%	97.4%	103.4%	Reconductor
Kern-T-08	KERN-MAGUNDEN-WITCO - From 6/42 To Magunden Sub	WESTPARK 115kV - BEAR TAP 115kV #1	B	N-1	125.0%	126.0%	127.0%	128.6%	131.9%	148.0%	Reconductor/New line
Kern-T-09	KERN-MAGUNDEN-WITCO - From Kern PP To 6/42	WESTPARK 115kV - BEAR TAP 115kV #1 _OILDALE 9.11 Unit ID 1	B	G-1/L-1	103.5%	102.1%	103.3%	105.3%	104.1%	105.0%	Reconductor
Kern-T-10	KERN-MAGUNDEN-WITCO - From 6/42 To Magunden Sub	Kern PP-Westpark No. 1 & 2 115 kV Lines	C5	DCTL	171.4%	173.7%	175.9%	179.4%	185.8%	216.9%	Develop operating procedure to curtail load manually or automatically (SPS)/ Rerate the line
Kern-T-11	34724KRN OL J 34798KERNWATR	Kern PP-Westpark No. 1 & 2 115 kV Lines	C5	DCTL	112.0%	111.8%	113.9%	117.3%	117.7%	125.0%	Develop operating procedure to curtail load manually or automatically (SPS)/ Rerate the line
Kern-T-12	WESTPARK-MAGUNDEN - From Columbus Sub To 11/64	Kern PP-Westpark No. 1 & 2 115 kV Lines	C5	DCTL	91.0%	92.7%	94.2%	96.6%	101.0%	121.1%	Develop operating procedure to curtail load manually or automatically (SPS)/ Rerate the line
Kern-T-13	WESTPARK-MAGUNDEN - From 11/64 To Magunden Sub	Kern PP-Westpark No. 1 & 2 115 kV Lines	C5	DCTL	96.5%	98.0%	99.5%	101.7%	105.6%	125.4%	Develop operating procedure to curtail load manually or automatically (SPS)/ Rerate the line
Kern-T-14	34752KERN PWR 34798KERNWATR	Kern PP-Westpark No. 1 & 2 115 kV Lines	C5	DCTL	116.8%	116.7%	118.8%	122.3%	122.4%	130.1%	Develop operating procedure to curtail load manually or automatically (SPS)/ Rerate the line
Kern-T-15	MIDWAY-KERN #3 - From Midway to 20/103	Midway-Kern No. 1 & Midway-Kern No. 4 230 kV Lines	C5	DCTL	126.0%	74.1%	75.7%	77.9%	79.3%	89.7%	Long Term Midway-Kern PP # 3 & # 4 capacity increase project approved last year.
Kern-T-16	MIDWAY-KERN #1 - From Midway to 20/120	Midway-Kern No. 3 & Midway-Kern No. 4 230 kV Lines	C5	DCTL	102.5%	103.4%	105.4%	108.2%	110.5%		
		Midway 115kV CB 172	C2	Breaker	123.0%	82.4%	80.2%	<80%	<80%	<80%	Develop operating procedure to curtail load manually or automatically (SPS)/ Rerate the line
Kern-T-18	LERDO-FAMOSO - From F7/5 To Famoso Sub	Midway 115kV CB 392	C2	Breaker	110.7%	<80%	<80%	<80%	<80%	<80%	Develop operating procedure to curtail load manually or automatically (SPS)/ Rerate the line
Kern-T-19	34784CAWELO C 34715OGLE JCT	Midway 115kV CB 392	C2	Breaker	111.3%	<80%	<80%	<80%	<80%	<80%	Develop operating procedure to curtail load manually or automatically (SPS)/ Rerate the line
Kern-T-20	SEMITROPIC-WASCO - From Semitropic To Wasco	Midway 115kV CB 392	C2	Breaker	<80%	<80%	<80%	<80%	<80%	101.5%	Develop operating procedure to curtail load manually or automatically (SPS)/ Rerate the line

Kern-T-21	Midway-LaPaloma # 1	Midway 230kV CB 262	C2	Breaker	112.2%	110.2%	109.6%	109.1%	110.6%	111.6%	Develop operating procedure to curtail load manually or automatically (SPS)/ Rerate the line/Limit Generation at Midway
Kern-T-22	MIDWAY-KERN #1 - From Midway to 20/120	STCKDLEB 230kV - STCKDLJ2 230kV #1 _KERN PP 230kV - BKRSFDJ2 230kV #1	C3	N-1-1	102.5%	103.4%	105.4%	108.2%	110.5%	<80%	Operational action plan /SPS to trip load/rerate the line
Kern-T-23	MIDWAY-KERN #3 - From Midway to 20/103	STCKDLEA 230kV - STCKDLJ1 230kV #1 _KERN PP 230kV - BKRSFDJ2 230kV #1	C3	N-1-1	126.0%	<80%	<80%	<80%	<80%	<80%	Long Term Midway-Kern PP # 3 & # 4 capacity increase project approved last year.
Kern-T-24	MIDWAY-KERN #3 - From Midway to 20/103	STCKDLEA 230kV - STCKDLJ1 230kV #1 _PSE-3 115kV - KERN PWR 115kV #1	C3	N-1-1	100.3%	<80%	<80%	<80%	<80%	<80%	Long Term Midway-Kern PP # 3 & # 4 capacity increase project approved last year.
Kern-T-25	SEMITROPIC-MIDWAY #1 - From Semitropic Sub To Midway Sub	SMYRNA 115kV - MCKIBBEN 115kV #1 _FAMOSO 115kV - CAWELO C 115kV #1	C3	N-1-1	131.8%	130.9%	130.0%	129.7%	132.2%	130.8%	Operational action plan /SPS to trip load/rerate the line
Kern-T-26	KERN-WESTPARK #1 - From Kern PP To Westpark Sub	WESTPARK 115kV - KERN PWR 115kV #2 _KRN OL J 115kV - MAGUNDEN 115kV #1	C3	N-1-1	110.0%	111.8%	113.3%	115.6%	118.7%	120.3%	Operational action plan /SPS to trip load/rerate the line
Kern-T-27	KERN-MAGUNDEN-WITCO - From 6/42 To Magunden Sub	WESTPARK 115kV - KERN PWR 115kV #1 _WESTPARK 115kV - KERN PWR 115kV #2	C3	N-1-1	171.4%	173.7%	175.9%	179.3%	185.8%	187.6%	Operational action plan /SPS to trip load/rerate the line
Kern-T-28	WESTPARK-MAGUNDEN - From Columbus Sub To 11/64	WESTPARK 115kV - KERN PWR 115kV #1 _WESTPARK 115kV - KERN PWR 115kV #2	C3	N-1-1	91.0%	92.7%	94.2%	96.6%	101.0%	102.3%	Operational action plan /SPS to trip load/rerate the line
Kern-T-29	WESTPARK-MAGUNDEN - From 11/64 To Magunden Sub	WESTPARK 115kV - KERN PWR 115kV #1 _WESTPARK 115kV - KERN PWR 115kV #2	C3	N-1-1	96.5%	98.0%	99.5%	101.7%	105.6%	106.8%	Operational action plan /SPS to trip load/rerate the line
Kern-T-30	SMYRNA-SEMITROPIC-MIDWAY - From 81/634 To Midway Sub	SEMITRPC 115kV - MIDWAY 115kV #1 _FAMOSO 115kV - CAWELO C 115kV #1	C3	N-1-1	103.2%	<80%	<80%	<80%	<80%	<80%	Operational action plan /SPS to trip load/rerate the line
Kern-T-31	KERN-LAMONT - From Kern PP To 4/28	KERN PWR 115kV - TEVISJ1 115kV #1 _KERN PWR 115kV - KERN PP 230kV #5	C3	N-1-1	108.6%	108.9%	109.6%	110.7%	112.7%	112.7%	Operational action plan /SPS to trip load/rerate the line
Kern-T-32	Kern PP Bank # 4	KERN PWR 115kV - KERN PP 230kV #3 _KERN PWR 115kV - KERN PP 230kV #5	C3	N-1-1	134.9%	138.2%	142.3%	147.9%	146.3%	151.6%	Operational action plan /SPS to trip load
Kern-T-33	34752KERN PWR 34798 KERN Water	WESTPARK 115kV - BEAR TAP 115kV #1 _PTL JCT 115kV - LIVE OAK 115kV #1	C3	N-1-1	124.1%	121.8%	123.3%	125.8%	123.8%	124.8%	Operational action plan /SPS to trip load/rerate the line
Kern-T-34	WHEELER RIDGE-WEEDPATCH - From W6/7 To Weedpatch	WEEDPTCH 70kV - MAGNDN J 70kV #1 _BUENAVJ1 230kV - MIDWAY 230kV #1	C3	N-1-1	107.8%	105.8%	104.5%	103.8%	106.5%	104.3%	Operational action plan /SPS to trip load/rerate the line
Kern-T-35	Kern 230 kV Area	Kern PP 230 kV CB 402	C2	Breaker	Not solve	Not solve	Not solve	Not solve	Not solve	Not solved	Operational action plan /SPS to trip load/Station upgrade

Study Area: Kern - Summer Peak (2012-2021)

Voltage Summary

ID	Substation	Worst Contingency	Category	Category Description	Min. Post Contingency Voltage (PU)						ISO Proposed Mitigation
					2012.0	2013.0	2014.0	2015.0	2016.0	2021.0	
Kern-V-01	3EMIDIO 70	Normal	A	N-0	0.94	0.95	0.95	0.96	0.94	0.93	Install Reactive Support at Wheeler Ridge area
Kern-V-02	ARVIN 70	Normal	A	N-0	0.94	0.95	0.95	0.96	0.94	0.93	Install Reactive Support at Wheeler Ridge area
Kern-V-03	CASTAC 70	Normal	A	N-0	0.93	0.94	0.94	0.95	0.93	0.91	Install Reactive Support at Wheeler Ridge area
Kern-V-04	COPUS 70	Normal	A	N-0	0.91	0.92	0.92	0.92	0.91	0.89	Install Reactive Support at Kern PP 70 kV area
Kern-V-05	CUYAMA2 70	Normal	A	N-0	0.96	0.96	0.96	0.96	0.95	0.93	Install Reactive Support at Wheeler Ridge area
Kern-V-06	EMDO JCT 70	Normal	A	N-0	0.95	0.96	0.96	0.97	0.95	0.94	Install Reactive Support at Wheeler Ridge area
Kern-V-07	GRAPEVNE 70	Normal	A	N-0	0.93	0.94	0.95	0.95	0.94	0.92	Install Reactive Support at Wheeler Ridge area
Kern-V-08	GRIMWAY 115	Normal	A	N-0	0.96	0.97	0.97	0.97	0.96	0.94	Install Reactive Support at Wheeler Ridge area
Kern-V-09	GRMWWY_SM 70	Normal	A	N-0	0.93	0.95	0.95	0.95	0.94	0.92	Install Reactive Support at Wheeler Ridge area
Kern-V-10	KELLEY 70	Normal	A	N-0	0.93	0.94	0.95	0.95	0.94	0.92	Install Reactive Support at Wheeler Ridge area
Kern-V-11	LAKEVIEW 70	Normal	A	N-0	0.95	0.96	0.96	0.97	0.95	0.93	Install Reactive Support at Wheeler Ridge area
Kern-V-12	LAMONT 115	Normal	A	N-0	0.96	0.97	0.97	0.97	0.96	0.95	Install Reactive Support at Wheeler Ridge area
Kern-V-13	LEBEC 70	Normal	A	N-0	0.92	0.93	0.94	0.94	0.93	0.91	Install Reactive Support at Wheeler Ridge area
Kern-V-14	OLD RIVR 70	Normal	A	N-0	0.96	0.97	0.97	0.97	0.96	0.94	Install Reactive Support at Wheeler Ridge area
Kern-V-15	PACL_PIP 70	Normal	A	N-0	0.93	0.94	0.95	0.95	0.94	0.92	Install Reactive Support at Wheeler Ridge area
Kern-V-16	ROSE 70	Normal	A	N-0	0.94	0.95	0.96	0.96	0.95	0.93	Install Reactive Support at Wheeler Ridge area
Kern-V-17	SAN EMDO 70	Normal	A	N-0	0.94	0.94	0.95	0.95	0.94	0.92	Install Reactive Support at Wheeler Ridge area
Kern-V-18	SN BRNRD 70	Normal	A	N-0	0.95	0.96	0.96	0.97	0.95	0.93	Install Reactive Support at Wheeler Ridge area
Kern-V-19	STALLION 70	Normal	A	N-0	0.94	0.95	0.96	0.96	0.95	0.93	Install Reactive Support at Wheeler Ridge area
Kern-V-20	TECUYA 70	Normal	A	N-0	0.95	0.96	0.96	0.97	0.95	0.93	Install Reactive Support at Wheeler Ridge area
Kern-V-21	TEJON 70	Normal	A	N-0	0.95	0.96	0.96	0.97	0.95	0.93	Install Reactive Support at Wheeler Ridge area
Kern-V-22	VALPREDO 70	Normal	A	N-0	0.94	0.95	0.96	0.96	0.95	0.93	Install Reactive Support at Wheeler Ridge area
Kern-V-23	WEEDPTCH 70					0.95	0.96	0.96	0.95	0.93	Install Reactive Support at Wheeler Ridge area
Kern-V-24	WELLFILD 70	Normal	A	N-0	0.93	0.94	0.95	0.95	0.94	0.92	Install Reactive Support at Wheeler Ridge area
Kern-V-25	WHEELER 230	Normal	A	N-0	0.95	0.96	0.97	0.97	0.96	0.94	Install Reactive Support at Wheeler Ridge area
Kern-V-26	WHEELER 115	Normal	A	N-0	0.95	0.96	0.96	0.97	0.95	0.94	Install Reactive Support at Wheeler Ridge area
Kern-V-27	WHEELER 70	Normal	A	N-0	0.96	0.97	0.97	0.98	0.96	0.95	Install Reactive Support at Wheeler Ridge area
Kern-V-28	3EMIDIO 70	BUENAVJ2 230kV - MIDWAY 230kV #1	B	N-1	0.90	0.91	0.91	0.92	0.90	0.88	Install Reactive Support at Wheeler Ridge area
Kern-V-29	ARVIN 70	BUENAVJ2 230kV - MIDWAY 230kV #1	B	N-1	0.90	0.91	0.91	0.92	0.90	0.88	Install Reactive Support at Wheeler Ridge area
		WHEELER 70kV - SN BRNRD 70kV #1	B	N-1	0.90	0.91	0.92	0.93	0.91	0.89	Install Reactive Support at Wheeler Ridge area

Kern-V-30	CASTAC 70	BUENAVJ1 230kV - MIDWAY 230kV #1	B	N-1	0.91	0.92	0.92	0.93	0.92	0.89	Install Reactive Support at Wheeler Ridge area
		BUENAVJ2 230kV - MIDWAY 230kV #1	B	N-1	0.88	0.89	0.90	0.90	0.89	0.87	
		WHEELER 70kV - TECUYA T 70kV #1	B	N-1	0.88	0.89	0.89	0.90	0.88	0.86	
Kern-V-31	COPUS 70	CARNAT T 70kV - KERN PW2 70kV #1	B	N-1	0.87	0.88	0.88	0.89	0.87	0.84	Install Reactive Support at Kern PP 70 kV area
		FAMOSO 115kV - CAWELO C 115kV #1	B	N-1	0.90	0.91	0.92	0.92	0.91	0.89	
		KERN PP 230kV - BKRSFDJ2 230kV #1	B	N-1	0.90	0.91	0.91	0.92	0.90	0.88	
		KERN PW1 70kV - KERN1 M 13.2kV #1	B	N-1	0.90	0.91	0.91	0.92	0.90	0.88	
		KERN PW2 70kV - KERN2 M 13.2kV #1	B	N-1	0.90	0.91	0.91	0.92	0.90	0.88	
		KERN PWR 115kV - KERN PP 230kV #4	B	N-1	0.90	0.91	0.91	0.91	0.90	0.88	
		KERN PWR 115kV - KERN PP 230kV #5	B	N-1	0.90	0.91	0.91	0.91	0.90	0.88	
		MIDWAY 230kV - LAPALOMA 230kV #1	B	N-1	0.90	0.91	0.92	0.92	0.91	0.89	
		MIDWAY 230kV - LAPALOMA 230kV #2	B	N-1	0.90	0.91	0.92	0.92	0.91	0.89	
		OLD RIVR 70kV - KERN PW1 70kV #1	B	N-1	0.83	0.84	0.84	0.85	0.83	0.79	
		PSE-3 115kV - KERN PWR 115kV #1	B	N-1	0.91	0.92	0.92	0.93	0.91	0.89	
		PSE-BEAR 9.11 Unit ID 1	B	N-1	0.91	0.91	0.92	0.92	0.91	0.89	
		STCKDLEA 230kV - STCKDLJ1 230kV #1	B	N-1	0.90	0.91	0.91	0.91	0.90	0.88	
STCKDLEB 230kV - STCKDLJ2 230kV #1	B	N-1	0.90	0.91	0.91	0.92	0.90	0.88			
UNIONJCT 70kV - OLD RIVR 70kV #1	B	N-1	0.89	0.90	0.90	0.91	0.89	0.87			
Kern-V-32	GRMWY_SM 70	BUENAVJ1 230kV - MIDWAY 230kV #1	B	N-1	0.89	0.90	0.90	0.91	0.90	0.87	Install Reactive Support at Wheeler Ridge area
		BUENAVJ2 230kV - MIDWAY 230kV #1	B	N-1	0.90	0.91	0.91	0.92	0.91	0.89	Install Reactive Support at Wheeler Ridge area
		WHEELER 70kV - TECUYA T 70kV #1	B	N-1	0.87	0.89	0.89	0.90	0.88	0.86	Install Reactive Support at Wheeler Ridge area
Kern-V-33	KELLEY 70	BUENAVJ2 230kV - MIDWAY 230kV #1	B	N-1	0.89	0.90	0.90	0.91	0.90	0.87	Install Reactive Support at Wheeler Ridge area
Kern-V-34	KERNRDGE 115	MIDWAY 115kV - BELRIDGE 115kV #1	B	N-1	1.01	1.00	1.02	0.89	1.00	1.00	Install Reactive Support at Midway area
Kern-V-35	LAKEVIEW 70	BUENAVJ2 230kV - MIDWAY 230kV #1	B	N-1	0.90	0.91	0.92	0.92	0.91	0.89	Install Reactive Support at Wheeler Ridge area

Kern-V-36	LEBEC 70	BUENAVJ1 230kV - MIDWAY 230kV #1	B	N-1	0.91	0.92	0.92	0.93	0.91	0.89	Install Reactive Support at Wheeler Ridge area
		BUENAVJ2 230kV - MIDWAY 230kV #1	B	N-1	0.88	0.89	0.89	0.90	0.89	0.86	
		WEEDPTCH 70kV - MAGNDNJ 70kV #1	B	N-1	0.91	0.92	0.93	0.93	0.92	0.90	
		WHEELER 70kV - TECUYA T 70kV #1	B	N-1	0.87	0.88	0.89	0.90	0.88	0.86	
		WHEELER 70kV - WHEELER 230kV #3	B	N-1	0.90	0.91	0.93	0.93	0.92	0.90	
		WHEELER 70kV - WHEELER 230kV #4	B	N-1	0.91	0.92	0.93	0.93	0.92	0.90	
Kern-V-37	OLD RIVR 70	CARNAT T 70kV - KERN PW2 70kV #1	B	N-1	0.9255	0.9316	0.9353	0.939	0.9236	0.8945	Install Reactive Support at Wheeler Ridge area
Kern-V-38	PACI_PIP 70	OLD RIVR 70kV - KERN PW1 70kV #1	B	N-1	0.8866	0.8924	0.897	0.9013	0.8857	0.8553	Install Reactive Support at Wheeler Ridge area
		BUENAVJ1 230kV - MIDWAY 230kV #1	B	N-1	0.9153	0.9251	0.9284	0.9355	0.92	0.8997	Install Reactive Support at Wheeler Ridge area
		BUENAVJ2 230kV - MIDWAY 230kV #1	B	N-1	0.8872	0.8974	0.9012	0.9088	0.8925	0.8701	
Kern-V-39	PANAMA 70	WHEELER 70kV - TECUYA T 70kV #1	B	N-1	0.8814	0.8914	0.8969	0.9048	0.889	0.8663	Install Reactive Support at Wheeler Ridge area
		CARNAT T 70kV - KERN PW2 70kV #1	B	N-1	0.9156	0.9215	0.9248	0.9282	0.9115	0.8778	
Kern-V-40	ROSE 70	BUENAVJ2 230kV - MIDWAY 230kV #1	B	N-1	0.8979	0.908	0.9117	0.9192	0.9028	0.881	Install Reactive Support at Wheeler Ridge area
		WHEELER 70kV - TECUYA T 70kV #1	B	N-1	0.8922	0.9021	0.9075	0.9153	0.8993	0.8773	
Kern-V-41	SAN EMDO 70	CARNAT T 70kV - KERN PW2 70kV #1	B	N-1	0.9025	0.9089	0.9127	0.9165	0.9004	0.8697	Install Reactive Support at Wheeler Ridge area
		OLD RIVR 70kV - KERN PW1 70kV #1	B	N-1	0.8623	0.8684	0.8732	0.8776	0.8612	0.8291	
Kern-V-42	SN BRNRD 70	BUENAVJ2 230kV - MIDWAY 230kV #1	B	N-1	0.9033	0.9133	0.9169	0.9244	0.9077	0.8862	Install Reactive Support at Wheeler Ridge area
		WHEELER 70kV - SN BRNRD 70kV #1	B	N-1	0.9121	0.9218	0.9276	0.9349	0.9187	0.8984	Install Reactive Support at Wheeler Ridge area
Kern-V-43	STALLION 70	BUENAVJ2 230kV - MIDWAY 230kV #1	B	N-1	0.8996	0.9094	0.9132	0.9207	0.9038	0.8819	Install Reactive Support at Wheeler Ridge area
		WHEELER 70kV - SN BRNRD 70kV #1	B	N-1	0.9085	0.918	0.9239	0.9312	0.9148	0.8942	Install Reactive Support at Wheeler Ridge area
Kern-V-44	TECUYA 70	BUENAVJ2 230kV - MIDWAY 230kV #1	B	N-1	0.9038	0.9139	0.9175	0.925	0.9085	0.8871	Install Reactive Support at Wheeler Ridge area
Kern-V-45	TEJON 70	BUENAVJ2 230kV - MIDWAY 230kV #1	B	N-1	0.9028	0.9128	0.9165	0.924	0.9075	0.886	Install Reactive Support at Wheeler Ridge area
		WHEELER 70kV - TECUYA T 70kV #1	B	N-1	0.8971	0.9069	0.9124	0.9201	0.904	0.8823	Install Reactive Support at Wheeler Ridge area
Kern-V-46	TEMBLOR 115	MIDWAY 115kV - BELRIDGE 115kV #1	B	N-1	1.0106	0.9965	1.0144	0.8894	0.9969	0.9956	Install Reactive Support at Midway area
Kern-V-47	VALPREDO 70	BUENAVJ2 230kV - MIDWAY 230kV #1	B	N-1	0.8989	0.9087	0.9124	0.9199	0.9035	0.882	Install Reactive Support at Wheeler Ridge area

Kern-V-48	WEEDPTCH 70	BUENAVJ2 230kV - MIDWAY 230kV #1	B	N-1	0.8985	0.909	0.9128	0.9203	0.9035	0.8804	Install Reactive Support at Wheeler Ridge area
		KERNCNYN 9.11 Unit ID 1	B	N-1	0.9047	0.916	0.9226	0.9299	0.9137	0.8944	Install Reactive Support at Wheeler Ridge area
		WEEDPTCH 70kV - MAGNDN J 70kV #1	B	N-1	0.8825	0.8941	0.9014	0.909	0.8923	0.8721	Install Reactive Support at Wheeler Ridge area
Kern-V-49	WELLFILD 70	BUENAVJ1 230kV - MIDWAY 230kV #1	B	N-1	0.9158	0.9262	0.9295	0.9365	0.9205	0.8989	Install Reactive Support at Wheeler Ridge area
		BUENAVJ2 230kV - MIDWAY 230kV #1	B	N-1	0.8874	0.8982	0.902	0.9095	0.8927	0.8689	
		KERNCNYN 9.11 Unit ID 1	B	N-1	0.8938	0.9052	0.9119	0.9193	0.903	0.883	
		WEEDPTCH 70kV - MAGNDN J 70kV #1	B	N-1	0.8712	0.883	0.8904	0.8981	0.8813	0.8605	
Kern-V-50	WHEELER 115	BUENAVJ2 230kV - MIDWAY 230kV #1	B	N-1	0.907	0.9171	0.9207	0.928	0.9117	0.8915	Install Reactive Support at Wheeler Ridge area
Kern-V-51	WHEELER 230	BUENAVJ2 230kV - MIDWAY 230kV #1	B	N-1	0.913	0.9232	0.9252	0.9324	0.9164	0.8979	Install Reactive Support at Wheeler Ridge area
Kern-V-52	WHEELER 70	BUENAVJ2 230kV - MIDWAY 230kV #1	B	N-1	0.9145	0.9247	0.9283	0.9357	0.9192	0.8989	Install Reactive Support at Wheeler Ridge area
Kern-V-53	COPUS 70	Midway-Kern No. 3 & Midway-Kern No. 4 230 kV Lines	C5	N-2	0.88	0.89	0.89	0.90	0.88	0.85	Install Reactive Support at Kern PP 70 kV area
		Midway-Kern No. 3 & Midway-Kern No. 1 230 kV Lines	C5	N-2	0.89	0.90	0.90	0.90	0.89	0.86	
		Midway-Kern No. 1 & Midway-Kern No. 4 230 kV Lines	C5	N-2	0.89	0.89	0.90	0.90	0.89	0.85	
Kern-V-54	SAN EMDO 70	Midway-Kern No. 3 & Midway-Kern No. 4 230 kV Lines	C5	N-2	0.91	0.92	0.92	0.93	0.91	0.89	Install Reactive Support at Wheeler Ridge area
		Midway-Kern No. 3 & Midway-Kern No. 1 230 kV Lines	C5	N-2	0.92	0.93	0.93	0.93	0.92	0.90	
		Midway-Kern No. 1 & Midway-Kern No. 4 230 kV Lines	C5	N-2	0.92	0.92	0.93	0.93	0.92	0.89	
Kern-V-55	COPUS 70	KERN PP 230 KV BUS 1	C1	Bus	0.90	0.91	0.91	0.91	0.90	0.88	Install Reactive Support at Kern PP 70 kV area
		KERN PP 230 KV BUS 2	C1	Bus	0.89	0.89	0.90	0.90	0.89	0.86	
Kern-V-56	WHEELER 230	Midway 230kV CB 262	C2	Breaker	0.95	0.92	0.93	0.93	0.92	0.90	Install Reactive Support at Wheeler Ridge area
Kern-V-57	SMYRNA 115	Midway 115kV CB 392	C2	Breaker	0.90	0.93	0.94	0.94	0.95	1.01	Install Reactive Support at Wheeler Ridge area
Kern-V-58	MCKIBBEN 115	Midway 115kV CB 392	C2	Breaker	0.90	0.93	0.94	0.94	0.95	1.00	Install Reactive Support at Wheeler Ridge area
Kern-V-59	GANSO 115	Midway 115kV CB 392	C2	Breaker	0.90	0.93	0.94	0.93	0.95	1.00	Install Reactive Support at Wheeler Ridge area
Kern-V-60	WHEELER 115	Midway 230kV CB 262	C2	Breaker	0.94	0.91	0.92	0.93	0.91	0.89	Install Reactive Support at Wheeler Ridge area

Kern-V-61	COPUS 70	Midway 230kV CB 252	C2	Breaker	0.91	0.91	0.92	0.92	0.91	0.89	Install Reactive Support at Kern PP 70 kV area
		Midway 230kV CB 262	C2	Breaker	0.90	0.90	0.90	0.90	0.89	0.87	
		Midway 230kV CB 692	C2	Breaker	0.90	0.91	0.91	0.92	0.90	0.88	
		Midway 230kV CB 682	C2	Breaker	0.90	0.90	0.90	0.91	0.89	0.87	
		Midway 230kV CB 652	C2	Breaker	0.91	0.91	0.92	0.92	0.91	0.89	
		Kern Oil 115kV CB 162	C2	Breaker	0.91	0.91	0.92	0.92	0.91	0.89	
		Semitropic 115kV CB 152	C2	Breaker	0.91	0.91	0.92	0.92	0.91	0.89	
		Midway 115kV CB 172	C2	Breaker	0.91	0.91	0.92	0.92	0.91	0.89	
		Midway 115kV CB 182	C2	Breaker	0.91	0.91	0.92	0.92	0.91	0.89	
		Midway 115kV CB 392	C2	Breaker	0.90	0.91	0.91	0.92	0.90	0.89	
Kern-V-62	LAKEVIEW 70	Midway 230kV CB 252	C2	Breaker	0.94	0.92	0.92	0.93	0.91	0.90	Install Reactive Support at Wheeler Ridge area
		Midway 230kV CB 262	C2	Breaker	0.94	0.91	0.92	0.92	0.91	0.89	
		Midway 230kV CB 692	C2	Breaker	0.94	0.92	0.92	0.93	0.91	0.90	
		Midway 230kV CB 682	C2	Breaker	0.94	0.92	0.92	0.93	0.91	0.89	
		Midway 230kV CB 652	C2	Breaker	0.94	0.92	0.93	0.93	0.92	0.90	
		Semitropic 115kV CB 152	C2	Breaker	0.95	0.92	0.93	0.94	0.92	0.90	
Kern-V-63	TEJON 70	Midway 230kV CB 252	C2	Breaker	0.94	0.92	0.93	0.93	0.91	0.90	Install Reactive Support at Wheeler Ridge area
		Midway 230kV CB 262	C2	Breaker	0.94	0.91	0.92	0.92	0.91	0.89	
		Midway 230kV CB 692	C2	Breaker	0.94	0.92	0.92	0.93	0.91	0.90	
		Midway 230kV CB 682	C2	Breaker	0.94	0.92	0.92	0.93	0.91	0.89	
		Midway 230kV CB 652	C2	Breaker	0.94	0.92	0.93	0.93	0.92	0.90	
		Semitropic 115kV CB 152	C2	Breaker	0.95	0.92	0.93	0.94	0.92	0.90	
Kern-V-64	SN BRNRD 70	Midway 230kV CB 252	C2	Breaker	0.94	0.92	0.93	0.93	0.92	0.90	Install Reactive Support at Wheeler Ridge area
		Midway 230kV CB 262	C2	Breaker	0.94	0.91	0.92	0.92	0.91	0.89	
		Midway 230kV CB 692	C2	Breaker	0.94	0.92	0.92	0.93	0.91	0.90	
		Midway 230kV CB 682	C2	Breaker	0.94	0.92	0.92	0.93	0.91	0.89	
		Midway 230kV CB 652	C2	Breaker	0.94	0.92	0.93	0.93	0.92	0.90	
	ARVIN 70	Midway 230kV CB 252	C2	Breaker	0.94	0.91	0.92	0.92	0.91	0.89	Install Reactive Support at Wheeler Ridge area
Kern-V-65	ARVIN 70	Midway 230kV CB 262	C2	Breaker	0.93	0.90	0.91	0.91	0.90	0.88	Install Reactive Support at Wheeler Ridge area
		Midway 230kV CB 692	C2	Breaker	0.93	0.91	0.92	0.92	0.90	0.89	
		Midway 230kV CB 682	C2	Breaker	0.93	0.91	0.92	0.92	0.91	0.89	
		Midway 230kV CB 652	C2	Breaker	0.94	0.91	0.92	0.93	0.91	0.89	
		Kern Oil 115kV CB 162	C2	Breaker	0.94	0.92	0.92	0.93	0.91	0.89	
		Semitropic 115kV CB 152	C2	Breaker	0.94	0.92	0.92	0.93	0.91	0.89	
		Midway 115kV CB 172	C2	Breaker	0.94	0.92	0.92	0.93	0.91	0.90	
		Midway 115kV CB 182	C2	Breaker	0.94	0.92	0.92	0.93	0.91	0.89	
		Midway 115kV CB 392	C2	Breaker	0.94	0.92	0.92	0.93	0.91	0.89	
		Midway 115kV CB 302	C2	Breaker	0.94	0.92	0.92	0.93	0.92	0.89	

Kern-V-66	WEEDPTCH 70	Midway 230kV CB 252	C2	Breaker	0.94	0.92	0.92	0.93	0.91	0.89	Install Reactive Support at Wheeler Ridge area
		Midway 230kV CB 262	C2	Breaker	0.93	0.91	0.91	0.92	0.90	0.88	
		Midway 230kV CB 692	C2	Breaker	0.94	0.91	0.92	0.93	0.91	0.89	
		Midway 230kV CB 682	C2	Breaker	0.94	0.91	0.92	0.93	0.91	0.89	
		Midway 230kV CB 652	C2	Breaker	0.94	0.92	0.92	0.93	0.91	0.89	
		Kern Oil 115kV CB 162	C2	Breaker	0.94	0.92	0.92	0.93	0.92	0.90	
		Semitropic 115kV CB 152	C2	Breaker	0.94	0.92	0.93	0.93	0.92	0.89	
		Midway 115kV CB 172	C2	Breaker	0.94	0.92	0.93	0.94	0.92	0.90	
		Midway 115kV CB 182	C2	Breaker	0.94	0.92	0.93	0.93	0.92	0.90	
		Midway 115kV CB 392	C2	Breaker	0.94	0.92	0.93	0.93	0.92	0.90	
		Midway 115kV CB 302	C2	Breaker	0.94	0.92	0.93	0.94	0.92	0.90	
		Midway 230kV CB 252	C2	Breaker	0.93	0.91	0.91	0.92	0.90	0.88	
		Midway 230kV CB 262	C2	Breaker	0.93	0.90	0.90	0.91	0.89	0.87	
Kern-V-67	GRMWY_SM 70	Midway 230kV CB 692	C2	Breaker	0.93	0.90	0.91	0.92	0.90	0.88	Install Reactive Support at Wheeler Ridge area
		Midway 230kV CB 682	C2	Breaker	0.93	0.91	0.91	0.92	0.90	0.88	
		Midway 230kV CB 652	C2	Breaker	0.93	0.91	0.91	0.92	0.90	0.88	
		Kern Oil 115kV CB 162	C2	Breaker	0.93	0.91	0.92	0.92	0.91	0.89	
		Semitropic 115kV CB 152	C2	Breaker	0.93	0.91	0.92	0.92	0.91	0.89	
		Midway 115kV CB 172	C2	Breaker	0.94	0.91	0.92	0.93	0.91	0.89	
		Midway 115kV CB 182	C2	Breaker	0.94	0.91	0.92	0.92	0.91	0.89	
		Midway 115kV CB 392	C2	Breaker	0.93	0.91	0.92	0.92	0.91	0.89	
		Midway 115kV CB 302	C2	Breaker	0.94	0.91	0.92	0.93	0.91	0.89	
		Kern-V-68	WELLFILD 70	Midway 230kV CB 252	C2	Breaker	0.93	0.90	0.91	0.92	
Midway 230kV CB 262	C2			Breaker	0.92	0.89	0.90	0.91	0.89	0.87	
Midway 230kV CB 692	C2			Breaker	0.93	0.90	0.91	0.91	0.90	0.88	
Midway 230kV CB 682	C2			Breaker	0.93	0.90	0.91	0.92	0.90	0.88	
Midway 230kV CB 652	C2			Breaker	0.93	0.90	0.91	0.92	0.90	0.88	
Kern Oil 115kV CB 162	C2			Breaker	0.93	0.91	0.91	0.92	0.91	0.88	
Semitropic 115kV CB 152	C2			Breaker	0.93	0.91	0.91	0.92	0.91	0.88	
Midway 115kV CB 172	C2			Breaker	0.93	0.91	0.92	0.92	0.91	0.89	
Midway 115kV CB 182	C2			Breaker	0.93	0.91	0.92	0.92	0.91	0.88	
Midway 115kV CB 392	C2			Breaker	0.93	0.91	0.91	0.92	0.91	0.89	
Kern-V-69	WASCO 70	Midway 115kV CB 392	C2	Breaker	0.89	0.93	0.93	0.93	0.94	0.97	Install Reactive Support at Wheeler Ridge area
Kern-V-70	SEMITRPC 70	Midway 115kV CB 392	C2	Breaker	0.89	0.93	0.93	0.93	0.95	0.99	Install Reactive Support at Wheeler Ridge area

Kern-V-71	3EMIDIO 70	Midway 230kV CB 252	C2	Breaker	0.94	0.91	0.92	0.92	0.91	0.89	Install Reactive Support at Wheeler Ridge area
		Midway 230kV CB 262	C2	Breaker	0.93	0.90	0.91	0.91	0.90	0.88	
		Midway 230kV CB 692	C2	Breaker	0.93	0.91	0.92	0.92	0.91	0.89	
		Midway 230kV CB 682	C2	Breaker	0.93	0.91	0.92	0.92	0.91	0.89	
		Midway 230kV CB 652	C2	Breaker	0.94	0.91	0.92	0.93	0.91	0.89	
		Kern Oil 115kV CB 162	C2	Breaker	0.94	0.92	0.92	0.93	0.91	0.89	
		Semitropic 115kV CB 152	C2	Breaker	0.94	0.92	0.92	0.93	0.91	0.89	
		Midway 115kV CB 172	C2	Breaker	0.94	0.92	0.92	0.93	0.92	0.90	
		Midway 115kV CB 182	C2	Breaker	0.94	0.92	0.92	0.93	0.91	0.89	
		Midway 115kV CB 392	C2	Breaker	0.94	0.92	0.92	0.93	0.91	0.90	
		Midway 115kV CB 302	C2	Breaker	0.94	0.92	0.92	0.93	0.92	0.90	
Kern-V-72	VALPREDO 70	Midway 230kV CB 252	C2	Breaker	0.94	0.91	0.92	0.93	0.91	0.89	Install Reactive Support at Wheeler Ridge area
		Midway 230kV CB 262	C2	Breaker	0.93	0.91	0.91	0.92	0.90	0.88	
		Midway 230kV CB 692	C2	Breaker	0.94	0.91	0.92	0.93	0.91	0.89	
		Midway 230kV CB 682	C2	Breaker	0.94	0.91	0.92	0.93	0.91	0.89	
		Midway 230kV CB 652	C2	Breaker	0.94	0.92	0.92	0.93	0.91	0.89	
		Kern Oil 115kV CB 162	C2	Breaker	0.94	0.92	0.92	0.93	0.92	0.90	
		Semitropic 115kV CB 152	C2	Breaker	0.94	0.92	0.92	0.93	0.92	0.90	
		Midway 115kV CB 172	C2	Breaker	0.94	0.92	0.93	0.93	0.92	0.90	
		Midway 115kV CB 182	C2	Breaker	0.94	0.92	0.93	0.93	0.92	0.90	
		Midway 115kV CB 392	C2	Breaker	0.94	0.92	0.92	0.93	0.92	0.90	
		Midway 115kV CB 302	C2	Breaker	0.94	0.92	0.93	0.94	0.92	0.90	
Kern-V-73	ROSE 70	Midway 230kV CB 252	C2	Breaker	0.94	0.91	0.92	0.93	0.91	0.89	Install Reactive Support at Wheeler Ridge area
		Midway 230kV CB 262	C2	Breaker	0.93	0.90	0.91	0.92	0.90	0.88	
		Midway 230kV CB 692	C2	Breaker	0.94	0.91	0.92	0.92	0.91	0.89	
		Midway 230kV CB 682	C2	Breaker	0.94	0.91	0.92	0.93	0.91	0.89	
		Midway 230kV CB 652	C2	Breaker	0.94	0.91	0.92	0.93	0.91	0.89	
		Kern Oil 115kV CB 162	C2	Breaker	0.94	0.92	0.92	0.93	0.92	0.90	
		Semitropic 115kV CB 152	C2	Breaker	0.94	0.92	0.92	0.93	0.92	0.90	
		Midway 115kV CB 172	C2	Breaker	0.94	0.92	0.93	0.93	0.92	0.90	
		Midway 115kV CB 182	C2	Breaker	0.94	0.92	0.92	0.93	0.92	0.90	
		Midway 115kV CB 392	C2	Breaker	0.94	0.92	0.92	0.93	0.92	0.90	
		Midway 115kV CB 302	C2	Breaker	0.94	0.92	0.93	0.93	0.92	0.90	

Kern-V-74	PACL_PIP 70	Midway 230kV CB 252	C2	Breaker	0.93	0.90	0.91	0.92	0.90	0.88	Install Reactive Support at Wheeler Ridge area
		Midway 230kV CB 262	C2	Breaker	0.92	0.89	0.90	0.91	0.89	0.87	
		Midway 230kV CB 692	C2	Breaker	0.93	0.90	0.91	0.91	0.90	0.88	
		Midway 230kV CB 682	C2	Breaker	0.93	0.90	0.91	0.92	0.90	0.88	
		Midway 230kV CB 652	C2	Breaker	0.93	0.90	0.91	0.92	0.90	0.88	
		Kern Oil 115kV CB 162	C2	Breaker	0.93	0.91	0.91	0.92	0.91	0.88	
		Semitropic 115kV CB 152	C2	Breaker	0.93	0.91	0.91	0.92	0.91	0.88	
		Midway 115kV CB 172	C2	Breaker	0.93	0.91	0.92	0.92	0.91	0.89	
		Midway 115kV CB 182	C2	Breaker	0.93	0.91	0.91	0.92	0.91	0.89	
		Midway 115kV CB 392	C2	Breaker	0.93	0.91	0.91	0.92	0.91	0.89	
Midway 115kV CB 302	C2	Breaker	0.93	0.91	0.92	0.92	0.91	0.89			
Kern-V-75	TECUYA 70	Midway 230kV CB 252	C2	Breaker	0.94	0.92	0.93	0.93	0.92	0.90	Install Reactive Support at Wheeler Ridge area
		Midway 230kV CB 262	C2	Breaker	0.94	0.91	0.92	0.92	0.91	0.89	
		Midway 230kV CB 692	C2	Breaker	0.94	0.92	0.92	0.93	0.91	0.90	
		Midway 230kV CB 682	C2	Breaker	0.94	0.92	0.92	0.93	0.91	0.90	
		Midway 230kV CB 652	C2	Breaker	0.94	0.92	0.93	0.93	0.92	0.90	
Kern-V-76	GRAPEVNE 70	Midway 230kV CB 252	C2	Breaker	0.93	0.90	0.91	0.91	0.90	0.88	Install Reactive Support at Wheeler Ridge area
		Midway 230kV CB 262	C2	Breaker	0.92	0.89	0.90	0.91	0.89	0.87	
		Midway 230kV CB 692	C2	Breaker	0.92	0.90	0.91	0.91	0.90	0.88	
		Midway 230kV CB 682	C2	Breaker	0.93	0.90	0.91	0.91	0.90	0.88	
		Midway 230kV CB 652	C2	Breaker	0.93	0.90	0.91	0.92	0.90	0.88	
		Kern Oil 115kV CB 162	C2	Breaker	0.93	0.91	0.91	0.92	0.90	0.88	
		Semitropic 115kV CB 152	C2	Breaker	0.93	0.91	0.91	0.92	0.90	0.88	
		Midway 115kV CB 172	C2	Breaker	0.93	0.91	0.91	0.92	0.91	0.89	
		Midway 115kV CB 182	C2	Breaker	0.93	0.91	0.91	0.92	0.91	0.88	
		Midway 115kV CB 392	C2	Breaker	0.93	0.91	0.91	0.92	0.90	0.89	
Midway 115kV CB 302	C2	Breaker	0.93	0.91	0.92	0.92	0.91	0.89			
Kern-V-77	STALLION 70	Midway 230kV CB 252	C2	Breaker	0.94	0.92	0.92	0.93	0.91	0.89	Install Reactive Support at Wheeler Ridge area
		Midway 230kV CB 262	C2	Breaker	0.93	0.91	0.91	0.92	0.90	0.88	
		Midway 230kV CB 692	C2	Breaker	0.94	0.91	0.92	0.93	0.91	0.89	
		Midway 230kV CB 682	C2	Breaker	0.94	0.91	0.92	0.93	0.91	0.89	
		Midway 230kV CB 652	C2	Breaker	0.94	0.92	0.92	0.93	0.91	0.89	
		Kern Oil 115kV CB 162	C2	Breaker	0.94	0.92	0.93	0.93	0.92	0.90	
		Semitropic 115kV CB 152	C2	Breaker	0.94	0.92	0.93	0.93	0.92	0.90	
		Midway 115kV CB 172	C2	Breaker	0.94	0.92	0.93	0.94	0.92	0.90	
		Midway 115kV CB 182	C2	Breaker	0.94	0.92	0.93	0.93	0.92	0.90	
		Midway 115kV CB 392	C2	Breaker	0.94	0.92	0.93	0.93	0.92	0.90	
Midway 115kV CB 302	C2	Breaker	0.95	0.92	0.93	0.94	0.92	0.90			

Kern-V-78	LEBEC 70	Midway 230kV CB 252	C2	Breaker	0.92	0.90	0.90	0.91	0.89	0.87	Install Reactive Support at Wheeler Ridge area
		Midway 230kV CB 262	C2	Breaker	0.92	0.89	0.89	0.90	0.88	0.86	
		Midway 230kV CB 692	C2	Breaker	0.92	0.89	0.90	0.91	0.89	0.87	
		Midway 230kV CB 682	C2	Breaker	0.92	0.89	0.90	0.91	0.89	0.87	
		Midway 230kV CB 652	C2	Breaker	0.92	0.90	0.90	0.91	0.89	0.87	
		Kern Oil 115kV CB 162	C2	Breaker	0.92	0.90	0.91	0.91	0.90	0.88	
		Semitropic 115kV CB 152	C2	Breaker	0.92	0.90	0.91	0.91	0.90	0.88	
		Midway 115kV CB 172	C2	Breaker	0.93	0.90	0.91	0.92	0.90	0.88	
		Midway 115kV CB 182	C2	Breaker	0.92	0.90	0.91	0.91	0.90	0.88	
		Midway 115kV CB 392	C2	Breaker	0.92	0.90	0.91	0.91	0.90	0.88	
		Midway 115kV CB 302	C2	Breaker	0.93	0.90	0.91	0.92	0.90	0.88	
Kern-V-79	CASTAC 70	Midway 230kV CB 252	C2	Breaker	0.92	0.90	0.91	0.91	0.90	0.88	Install Reactive Support at Wheeler Ridge area
		Midway 230kV CB 262	C2	Breaker	0.92	0.89	0.90	0.90	0.89	0.87	
		Midway 230kV CB 692	C2	Breaker	0.92	0.90	0.90	0.91	0.89	0.88	
		Midway 230kV CB 682	C2	Breaker	0.92	0.90	0.90	0.91	0.89	0.87	
		Midway 230kV CB 652	C2	Breaker	0.92	0.90	0.91	0.91	0.90	0.88	
		Kern Oil 115kV CB 162	C2	Breaker	0.93	0.90	0.91	0.92	0.90	0.88	
		Semitropic 115kV CB 152	C2	Breaker	0.93	0.90	0.91	0.92	0.90	0.88	
		Midway 115kV CB 172	C2	Breaker	0.93	0.90	0.91	0.92	0.90	0.88	
		Midway 115kV CB 182	C2	Breaker	0.93	0.90	0.91	0.92	0.90	0.88	
		Midway 115kV CB 392	C2	Breaker					0.90	0.88	
		Midway 115kV CB 302	C2	Breaker	0.93	0.91	0.91	0.92	0.90	0.88	
Kern-V-80	KELLEY 70	Midway 230kV CB 252	C2	Breaker	0.93	0.91	0.91	0.92	0.90	0.88	Install Reactive Support at Wheeler Ridge area
		Midway 230kV CB 262	C2	Breaker	0.93	0.90	0.90	0.91	0.89	0.88	
		Midway 230kV CB 692	C2	Breaker	0.93	0.90	0.91	0.92	0.90	0.88	
		Midway 230kV CB 682	C2	Breaker	0.93	0.90	0.91	0.92	0.90	0.88	
		Midway 230kV CB 652	C2	Breaker	0.93	0.91	0.91	0.92	0.90	0.89	
		Kern Oil 115kV CB 162	C2	Breaker	0.93	0.91	0.92	0.92	0.91	0.89	
		Semitropic 115kV CB 152	C2	Breaker	0.93	0.91	0.92	0.92	0.91	0.89	
		Midway 115kV CB 172	C2	Breaker	0.94	0.91	0.92	0.93	0.91	0.89	
		Midway 115kV CB 182	C2	Breaker	0.94	0.91	0.92	0.92	0.91	0.89	
		Midway 115kV CB 392	C2	Breaker	0.93	0.91	0.92	0.92	0.91	0.89	
		Midway 115kV CB 302	C2	Breaker	0.94	0.91	0.92	0.93	0.91	0.89	
Kern-V-81	LEBEC 70	BUENAVJ1 230kV - MIDWAY 230kV #1 _WHEELER 70kV - WHEELER 230kV #3	C3	N-1-1	0.81	0.82	0.84	0.85	0.83	0.86	Install Reactive Support at Wheeler Ridge area/
Kern-V-82	CASTAC 70	MIDWAY 230kV - LAPALOMA 230kV #1 _WHEELER 70kV - TECUYA T 70kV #1	C3	N-1-1	0.83	0.84	0.85	0.85	0.84	0.85	Install Reactive Support at Wheeler Ridge area/

Kern-V-83	GRAPEVNE 70	WEEDPTCH 70kV - MAGNDN J 70kV #1 _BUENAVJ1 230kV - MIDWAY 230kV #1	C3	N-1-1	0.81	0.82	0.83	0.84	0.82	0.84	Install Reactive Support at Wheeler Ridge area/
Kern-V-84	PACI_PIP 70	WEEDPTCH 70kV - MAGNDN J 70kV #1 _BUENAVJ1 230kV - MIDWAY 230kV #1	C3	N-1-1	0.83	0.84	0.85	0.85	0.84	0.85	Install Reactive Support at Wheeler Ridge area/
Kern-V-85	STALLION 70	WHEELER 70kV - SN BRNRD 70kV #1 _BUENAVJ1 230kV - MIDWAY 230kV #1	C3	N-1-1	0.82	0.83	0.84	0.84	0.83	0.84	Install Reactive Support at Wheeler Ridge area/
Kern-V-86	TECUYA 70	GATES 230kV - ARCO 230kV #1 _BUENAVJ1 230kV - MIDWAY 230kV #1	C3	N-1-1	0.87	0.88	0.88	0.89	0.87	0.88	Install Reactive Support at Wheeler Ridge area/
Kern-V-87	KELLEY 70	WEEDPTCH 70kV - MAGNDN J 70kV #1 _BUENAVJ1 230kV - MIDWAY 230kV #1	C3	N-1-1	0.82	0.83	0.84	0.84	0.82	0.82	Install Reactive Support at Wheeler Ridge area/
Kern-V-88	3EMIDIO 70	WEEDPTCH 70kV - MAGNDN J 70kV #1 _BUENAVJ1 230kV - MIDWAY 230kV #1	C3	N-1-1	0.82					0.84	Install Reactive Support at Wheeler Ridge area/
Kern-V-89	ARVIN 70	WHEELER 70kV - SN BRNRD 70kV #1 _BUENAVJ1 230kV - MIDWAY 230kV #1	C3	N-1-1	0.82	0.83	0.83	0.84	0.82	0.83	Install Reactive Support at Wheeler Ridge area/
Kern-V-90	COPUS 70	OLD RIVR 70kV - KERN PW1 70kV #1 _KERN PW2 70kV - KERN2 M 13.2kV #1	C3	N-1-1	0.81	0.82	0.82	0.83	0.81	0.82	Install Reactive Support at Kern PP 70 kV area/
Kern-V-91	LAKEVIEW 70	WEEDPTCH 70kV - MAGNDN J 70kV #1 _BUENAVJ1 230kV - MIDWAY 230kV #1	C3	N-1-1	0.83	0.84	0.85	0.86	0.84	0.85	Install Reactive Support at Wheeler Ridge area/
Kern-V-92	WHEELER 115	WEEDPTCH 70kV - MAGNDN J 70kV #1 _BUENAVJ1 230kV - MIDWAY 230kV #2	C3	N-1-1	0.84	0.85	0.85	0.86	0.84	0.86	Install Reactive Support at Wheeler Ridge area/
Kern-V-93	OLD RIVR 70	OLD RIVR 70kV - KERN PW1 70kV #1 _KERN PW2 70kV - KERN2 M 13.2kV #1	C3	N-1-1	0.87	0.88	0.88	0.88	0.87	0.88	Install Reactive Support at Wheeler Ridge area/
Kern-V-94	PACI_PIP 70	MIDWAY 230kV - LAPALOMA 230kV #1 _WHEELER 70kV - TECUYA T 70kV #1	C3	N-1-1	0.84	0.84	0.85	0.86	0.84	0.86	Install Reactive Support at Wheeler Ridge area/
Kern-V-95	PANAMA 70	STCKDLEA 230kV - STCKDLJ1 230kV #1 _CARNAT T 70kV - KERN PW2 70kV #1	C3	N-1-1	0.90	0.91	0.91	0.91	0.90	0.90	Install Reactive Support at Wheeler Ridge area/

Kern-V-96	ROSE 70	WEEDPTCH 70kV - MAGNDN J 70kV #1 _BUENAVJ1 230kV - MIDWAY 230kV #1	C3	N-1-1	0.82	0.84	0.84	0.85	0.83	0.85	Install Reactive Support at Wheeler Ridge area/
Kern-V-97	SAN EMDO 70	OLD RIVR 70kV - KERN PW1 70kV #1 _KERN PW2 70kV - KERN2 M 13.2kV #1	C3	N-1-1	0.85	0.85	0.86	0.86	0.84	0.85	Install Reactive Support at Wheeler Ridge area/
Kern-V-98	TEJON 70	WEEDPTCH 70kV - MAGNDN J 70kV #1 _BUENAVJ1 230kV - MIDWAY 230kV #1	C3	N-1-1	0.83	0.84	0.85	0.86	0.84	0.85	Install Reactive Support at Wheeler Ridge area/
Kern-V-99	WELLFILD 70	WEEDPTCH 70kV - MAGNDN J 70kV #1 _BUENAVJ1 230kV - MIDWAY 230kV #1	C3	N-1-1	0.76	0.77	0.78	0.79	0.77	0.79	Install Reactive Support at Wheeler Ridge area/

Study Area: Kern - Summer Peak (2012-2021)

Voltage Deviation

ID	Substation	Worst Contingency	Category	Category Description	Post Contingency Voltage Deviation (%)						ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2021	
Kern-DV-01	COPUS 70	CARNAT T 70kV - KERN PW2 70kV #1	B	N-1	-3.7%	-3.8%	-3.8%	-3.6%	-3.9%	-5.2%	Install Reactive Support at Wheeler Ridge area at Kern PP 70 kV area
		OLD RIVR 70kV - KERN PW1 70kV #1	B	N-1	-7.9%	-8.0%	-7.9%	-7.7%	-8.0%	-9.5%	
Kern-DV-02	LAKEVIEW 70	BUENAVJ1 230kV - MIDWAY 230kV #1	B	N-1	-4.5%	-4.5%	-4.6%	-4.2%	-4.4%	-5.1%	Install Reactive Support at Wheeler Ridge area
Kern-DV-03	TEJON 70	WHEELER 70kV - TECUYA T 70kV #1	B	N-1	-5.2%	-5.2%	-5.2%	-4.7%	-4.8%	-5.4%	Install Reactive Support at Wheeler Ridge area
		BUENAVJ1 230kV - MIDWAY 230kV #1	B	N-1	-4.5%	-4.5%	-4.6%	-4.2%	-4.4%	-5.0%	
Kern-DV-04	SN BRNRD 70	BUENAVJ1 230kV - MIDWAY 230kV #1	B	N-1	-4.5%	-4.5%	-4.6%	-4.2%	-4.4%	-5.1%	Install Reactive Support at Wheeler Ridge area
Kern-DV-05	SAN EMDO 70	CARNAT T 70kV - KERN PW2 70kV #1	B	N-1	-3.5%	-3.6%	-3.7%	-3.5%	-3.8%	-5.0%	Install Reactive Support at Wheeler Ridge area
		OLD RIVR 70kV - KERN PW1 70kV #1	B	N-1	-7.6%	-7.7%	-7.6%	-7.4%	-7.7%	-9.1%	
Kern-DV-06	ARVIN 70	BUENAVJ1 230kV - MIDWAY 230kV #1	B	N-1	-4.6%	-4.6%	-4.7%	-4.2%	-4.5%	-5.1%	Install Reactive Support at Wheeler Ridge area
Kern-DV-07	WEEDPTCH 70	WEEDPTCH 70kV - MAGNDN J 70kV #1	B	N-1	-6.5%	-6.4%	-6.2%	-5.7%	-5.8%	-6.1%	Install Reactive Support at Wheeler Ridge area
		BUENAVJ1 230kV - MIDWAY 230kV #1	B	N-1	-4.6%	-4.6%	-4.7%	-4.3%	-4.5%	-5.2%	
Kern-DV-08	KRN CNYN 70	KERNCNYN 9.11 Unit ID 1	B	N-1	-6.5%	-6.4%	-6.3%	-5.8%	-5.9%	-6.1%	Install Reactive Support at Wheeler Ridge area
Kern-DV-09	RIOBRVQF 70	KERNCNYN 9.11 Unit ID 1	B	N-1	-6.3%	-6.2%	-6.0%	-5.6%	-5.7%	-5.9%	Install Reactive Support at Wheeler Ridge area
Kern-DV-10	OLD RIVR 70	OLD RIVR 70kV - KERN PW1 70kV #1	B	N-1	-7.4%	-7.5%	-7.4%	-7.2%	-7.5%	-8.8%	Install Reactive Support at Wheeler Ridge area
Kern-DV-11	PANAMA 70	CARNAT T 70kV - KERN PW2 70kV #1	B	N-1	-5.4%	-5.5%	-5.5%	-5.4%	-5.9%	-7.5%	Install Reactive Support at Wheeler Ridge area
Kern-DV-12	GRMWY_SM 70	WEEDPTCH 70kV - MAGNDN J 70kV #1	B	N-1	-6.6%	-6.5%	-6.2%	-5.8%	-5.9%	-6.2%	Install Reactive Support at Wheeler Ridge area
		BUENAVJ1 230kV - MIDWAY 230kV #1	B	N-1	-4.7%	-4.7%	-4.8%	-4.3%	-4.5%	-5.2%	
Kern-DV-13	WELLFILD 70	WEEDPTCH 70kV - MAGNDN J 70kV #1	B	N-1	-6.6%	-6.5%	-6.2%	-5.8%	-5.9%	-6.2%	Install Reactive Support at Wheeler Ridge area
		BUENAVJ1 230kV - MIDWAY 230kV #1	B	N-1	-4.7%	-4.7%	-4.8%	-4.3%	-4.6%	-5.2%	
Kern-DV-14	WASCO 70	WASCO 70kV - SEMITRPC 70kV #1	B	N-1	-6.6%	-6.9%	-6.9%	-6.8%	-7.0%	-7.3%	Install Reactive Support at Wheeler Ridge area
		SEMTRPC 70kV - SEMITRPC 115kV #2	B	N-1	-6.6%	-6.9%	-6.9%	-6.8%	-7.0%	-7.3%	
Kern-DV-15	3EMIDIO 70	BUENAVJ1 230kV - MIDWAY 230kV #1	B	N-1	-4.6%	-4.6%	-4.7%	-4.2%	-4.4%	-5.1%	Install Reactive Support at Wheeler Ridge area
Kern-DV-16	VALPREDO 70	BUENAVJ1 230kV - MIDWAY 230kV #1	B	N-1	-4.5%	-4.5%	-4.7%	-4.2%	-4.4%	-5.1%	Install Reactive Support at Wheeler Ridge area
Kern-DV-17	ROSE 70	WHEELER 70kV - TECUYA T 70kV #1	B	N-1	-5.2%	-5.2%	-5.2%	-4.8%	-4.9%	-5.4%	Install Reactive Support at Wheeler Ridge area
		BUENAVJ1 230kV - MIDWAY 230kV #1	B	N-1	-4.5%	-4.5%	-4.7%	-4.2%	-4.4%	-5.1%	
Kern-DV-18	PACIPIP 70	WHEELER 70kV - TECUYA T 70kV #1	B	N-1	-5.2%	-5.3%	-5.3%	-4.8%	-4.9%	-5.5%	Install Reactive Support at

			BUENAVJ1 230kV - MIDWAY 230kV #1	B	N-1	-4.6%	-4.6%	-4.7%	-4.3%	-4.5%	-5.2%	Wheeler Ridge area
Kern-DV-19	TECUYA 70		BUENAVJ1 230kV - MIDWAY 230kV #1	B	N-1	-4.5%	-4.5%	-4.6%	-4.2%	-4.4%	-5.0%	Install Reactive Support at Wheeler Ridge area
Kern-DV-20	GRAPEVNE 70		WHEELER 70kV - TECUYA T 70kV #1	B	N-1	-5.3%	-5.3%	-5.3%	-4.8%	-4.9%	-5.5%	Install Reactive Support at Wheeler Ridge area
			BUENAVJ1 230kV - MIDWAY 230kV #1	B	N-1	-4.6%	-4.6%	-4.7%	-4.3%	-4.5%	-5.2%	Install Reactive Support at Wheeler Ridge area
Kern-DV-21	STALLION 70		BUENAVJ1 230kV - MIDWAY 230kV #1	B	N-1	-4.5%	-4.5%	-4.7%	-4.2%	-4.4%	-5.1%	Install Reactive Support at Wheeler Ridge area
Kern-DV-22	LEBEC 70		WHEELER 70kV - TECUYA T 70kV #1	B	N-1	-5.3%	-5.4%	-5.3%	-4.9%	-4.9%	-5.5%	Install Reactive Support at Wheeler Ridge area
			BUENAVJ1 230kV - MIDWAY 230kV #1	B	N-1	-4.7%	-4.7%	-4.8%	-4.3%	-4.5%	-5.2%	Install Reactive Support at Wheeler Ridge area
Kern-DV-23	CASTAC 70		WHEELER 70kV - TECUYA T 70kV #1	B	N-1	-5.3%	-5.3%	-5.3%	-4.8%	-4.9%	-5.5%	Install Reactive Support at Wheeler Ridge area
			BUENAVJ1 230kV - MIDWAY 230kV #1	B	N-1	-4.6%	-4.6%	-4.7%	-4.3%	-4.5%	-5.2%	Install Reactive Support at Wheeler Ridge area
Kern-DV-24	KELLEY 70		BUENAVJ1 230kV - MIDWAY 230kV #1	B	N-1	-4.6%	-4.6%	-4.7%	-4.3%	-4.5%	-5.1%	Install Reactive Support at Wheeler Ridge area
Kern-DV-25	KERNRDGE 115		Midsun-Midway & Midway-Temblor 115 kV Lines	C5	DCTL	-0.9%	-2.7%	-1.0%	-13.6%	-2.5%	-1.6%	Install Reactive Support at Wheeler Ridge area
Kern-DV-26	TEMBLOR 115		Midsun-Midway & Midway-Temblor 115 kV Lines	C5	DCTL	-1.5%	-3.3%	-1.6%	-14.0%	-3.0%	-2.1%	Install Reactive Support at Wheeler Ridge area
Kern-DV-27	CARRIZO 115		Midsun-Midway & Midway-Temblor 115 kV Lines	C5	DCTL	-0.9%	-2.2%	-0.5%	-10.1%	-2.0%	-1.3%	Install Reactive Support at Wheeler Ridge area
Kern-DV-28	SMYRNA 115		Midway 115kV CB 392	C2	Breaker	-11.1%	-8.7%	-8.7%	-9.2%	-7.0%	0.0%	Install Reactive Support at Wheeler Ridge area
Kern-DV-29	GOSE LKE 115		Midway 115kV CB 392	C2	Breaker	-10.6%	-7.8%	-7.9%	-8.2%	-5.9%	-0.1%	Install Reactive Support at Wheeler Ridge area
Kern-DV-30	SEMITRPC 115		Midway 115kV CB 392	C2	Breaker	-10.5%	-7.7%	-7.9%	-8.1%	-5.8%	-0.1%	Install Reactive Support at Wheeler Ridge area
Kern-DV-31	WSCOPRSN 115		Midway 115kV CB 392	C2	Breaker	-10.0%	-7.3%	-7.4%	-7.7%	-5.5%	-0.1%	Install Reactive Support at Wheeler Ridge area
Kern-DV-32	MCKIBBEN 115		Midway 115kV CB 392	C2	Breaker	-11.1%	-8.7%	-8.8%	-9.2%	-7.0%	0.0%	Install Reactive Support at Wheeler Ridge area
Kern-DV-33	GANSO 115		Midway 115kV CB 392	C2	Breaker	-11.8%	-9.2%	-9.4%	-9.8%	-7.4%	-0.2%	Install Reactive Support at Wheeler Ridge area
Kern-DV-34	CARRIZO 115		MIDWAY 115kV - BELRIDGE 115kV #1 _KERNRDGE 9.11 Unit ID 1	C3	N-1-1	-10.8%	-10.5%	-11.0%	-10.2%	-9.8%	-9.7%	Install Reactive Support at Wheeler Ridge area
Kern-DV-35	CASTAC 70		WHEELER 70kV - TECUYA T 70kV #1 _BUENAVJ1 230kV - MIDWAY 230kV #1	C3	N-1-1	-10.3%	NA	NA	NA	NA	NA	Install Reactive Support at Wheeler Ridge area
Kern-DV-36	KERNRDGE 115		MIDWAY 115kV - BELRIDGE 115kV #1 _KERNRDGE 9.11 Unit ID 1	C3	N-1-1	-14.9%	-14.4%	-15.8%	-13.6%	-13.4%	-13.3%	Install Reactive Support at Wheeler Ridge area
Kern-DV-37	KRN CNYN 70		BUENAVJ1 230kV - MIDWAY 230kV #1 _KERN CNYN 9.11 Unit ID 1	C3	N-1-1	-12.3%	-12.2%	-12.1%	-11.6%	-12.0%	-12.0%	Install Reactive Support at Wheeler Ridge area
Kern-DV-38	RIOBRVQF 70		BUENAVJ1 230kV - MIDWAY 230kV #1 _KERN CNYN 9.11 Unit ID 1	C3	N-1-1	-12.1%	-12.0%	-11.9%	-11.4%	-11.8%	-11.8%	Install Reactive Support at Wheeler Ridge area
Kern-DV-39	TEMBLOR 115		MIDWAY 115kV - BELRIDGE 115kV #1 _KERNRDGE 9.11 Unit ID 1	C3	N-1-1	-14.9%	-14.6%	-15.8%	-14.0%	-13.5%	-13.6%	Install Reactive Support at Wheeler Ridge area
Kern-DV-40	WEEDPTCH 70		WEEDPTCH 70kV - MAGNDN J 70kV #1 _BUENAVJ1 230kV - MIDWAY 230kV #1	C3	N-1-1	-13.4%	-13.3%	-13.0%	-12.5%	-13.1%	-12.6%	Install Reactive Support at Wheeler Ridge area
Kern-DV-41	WELLFILD 70		WEEDPTCH 70kV - MAGNDN J 70kV #1 _BUENAVJ1 230kV - MIDWAY 230kV #1	C3	N-1-1	-13.6%	-13.4%	-13.2%	-12.7%	-13.3%	-13.3%	Install Reactive Support at Wheeler Ridge area



Study Area: **Fresno - Summer Peak (2012-2021)**

Thermal Overload

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)						ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2021	
Fres-T-01	HELM-KERMAN - From 9/4 To KERMAN	NORMAL	A	N-0	93.6%	94.6%	95.8%	97.6%	99.2%	108.3%	Reconductor
Fres-T-02	PANOCHET 115kV - PANOCHETA1 PANOCHET 115kV - PANOCHETA1 115kV #1		B	N-1	89.7%	91.2%	91.6%	94.6%	80.8%	101.7%	Reconductor
Fres-T-03	REEDLEY-OROSI	REEDLEY-DINUBA #1	B	N-1	91.2%	90.8%	92.6%	94.6%	96.7%	109.8%	Reconductor
Fres-T-04	DINUBA-OROSI	REEDLEY-DINUBA #1	B	N-1	92.2%	92.0%	93.8%	95.6%	97.8%	110.6%	Reconductor
Fres-T-05	KEARNEY 230/70 T/F Bank # 2	SNJQTP 70kV - SAN JOQN 70kV #1	B	N-1	91.5%	92.5%	93.2%	94.6%	95.6%	102.5%	Replace bank with the higher capacity bank.
Fres-T-06	PANOCHET 115kV - PANOCHETA1 PANOCHET 115kV - PANOCHETA1 115kV #1	PANOCHET 115kV - PANOCHETA1 PANOCHET 115kV - PANOCHETA1 115kV #1	B	G-1/L-1	<100%	<100%	<100%	<100%	<100%	100.0%	Reconductor
Fres-T-06	GREGG-ASHLAN - From Buss to A3/28	Gregg - Herndon #1 & #2 230 kV Lines (C5_25)	C5	DCTL	173.6%	164.6%	166.0%	166.7%	167.3%	80.7%	Short Term Action plan in place/ Long Term Gregg-Ashlan Reconductor projectproposed in earlier TPP.
Fres-T-07	GREGG-ASHLAN - From A3/28 To BUSS	Gregg - Herndon #1 & #2 230 kV Lines(C5_25)	C5	DCTL	143.0%	133.4%	134.2%	134.4%	134.3%	NA	Short Term Action plan in place/ Long Term Gregg-Ashlan Reconductor projectproposed in earlier TPP.
Fres-T-08	CHOWCHILLA-KERCKHOFF - From Chowchilla Sub To 2/16C	Kerckhoff-Clovis-Sanger No. 1 & 2 115 kV Lines	C5	DCTL	119.6%	116.8%	120.0%	139.3%	108.7%	100.4%	Existing Kerckhoff PH2 Run Back Scheme (SPS) will mitigate the overload.
Fres-T-09	CHOWCHILLA-KERCKHOFF - From 2/16C To 34/9	Kerckhoff-Clovis-Sanger No. 1 & 2 115 kV Lines	C5	DCTL	119.8%	117.0%	120.3%	139.5%	108.9%	100.5%	Existing Kerckhoff PH2 Run Back Scheme (SPS) will mitigate the overload.
Fres-T-10	WILSON-LE GRAND - From Wilson Sub To Le Grand Sub	Kerckhoff-Clovis-Sanger No. 1 & 2 115 kV Lines	C5	DCTL	109.5%	109.6%	108.7%	100.0%	108.7%	NA	Existing Kerckhoff PH2 Run Back Scheme (SPS) will mitigate the overload.
Fres-T-11	CHOWCHILLA-KERCKHOFF - From 34/9 To 7/11	Kerckhoff-Clovis-Sanger No. 1 & 2 115 kV Lines	C5	DCTL	127.1%	124.4%	127.2%	146.8%	116.3%	108.7%	Existing Kerckhoff PH2 Run Back Scheme (SPS) will mitigate the overload.
Fres-T-12	CHOWCHILLA-KERCKHOFF - From 0/1 To Kerckhoff #2 PH	Kerckhoff-Clovis-Sanger No. 1 & 2 115 kV Lines	C5	DCTL	101.2%	100.4%	102.8%	98.4%	83.5%	82.7%	Existing Kerckhoff PH2 Run Back Scheme (SPS) will mitigate the overload.
Fres-T-13	CHOWCHILLA-KERCKHOFF - From 7/11 To 0/1	Kerckhoff-Clovis-Sanger No. 1 & 2 115 kV Lines	C5	DCTL	101.2%	100.4%	102.8%	98.4%	83.5%	82.7%	Existing Kerckhoff PH2 Run Back Scheme (SPS) will mitigate the overload.
Fres-T-14	ATWATER-ATWTRJ_115_BR_1_1	El Capitan - Wilson & Wilson - Atwater #2 115 kV Lines(C5_13)	C5	DCTL	NA	81.4%	83.0%	85.6%	87.4%	101.4%	Develop operating procedure to curtail load manually or automatically (SPS)/ Rerate the line
		Atwater - El Capitan & Wilson - Atwater #2 115 kV Lines(C5_14)	C5	DCTL	80.1%	82.2%	83.7%	86.3%	88.1%	102.1%	
Fres-T-15	ATWATER-MERCED - From 12/3 To Merced Sub	El Capitan - Wilson & Wilson - Atwater #2 115 kV Lines	C5	DCTL	80.5%	82.4%	83.8%	86.2%	87.5%	100.7%	Develop operating procedure to curtail load manually or automatically (SPS)/ Rerate the line
		Atwater - El Capitan & Wilson - Atwater #2 115 kV Lines	C5	DCTL	81.2%	83.2%	84.5%	86.9%	88.2%	101.5%	
Fres-T-16	WILSON-MERCED #1 - From Wilson Sub To Merced Sub	El Capitan - Wilson & Wilson - Atwater #2 115 kV Lines	C5	DCTL	80.7%	82.3%	83.8%	91.9%	87.3%	100.7%	Develop operating procedure to curtail load manually or automatically (SPS)/ Rerate the line
		Atwater - El Capitan & Wilson - Atwater #2 115 kV Lines	C5	DCTL	81.2%	82.9%	84.4%	92.5%	87.9%	101.4%	
Fres-T-20	LOS BANOS-LIVINGSTON JCT-CANAL - From Los Banos To S0/14	Mercy Springs-Canal 70kV & Mercy Springs-Ortiga 70kV Lines	C5	DCTL	NA	NA	NA	92.4%	92.2%	107.8%	Develop operating procedure to curtail load manually or automatically (SPS)/ Rerate the line
Fres-T-21	WARNERVILLE-WILSON 230 kV Line #1	Helms-Gregg #1 & #2 230 kV Lines	C5	DCTL	101%	104%	96%	110%	110%	112%	Short Term Action plan

Fres-T-21	COALINGA #1-COALINGA #2 - From BUSS To 4/16	GATES 70kV Bus	C1	Bus	94.3%	<100%	117.0%	106.2%	<100%	<100%	Short Term Action plan
Fres-T-22	Herndon 230/115 Bank 2H	Herndon 230 KV BUS 2	C1	Bus	99.0%	94.4%	97.3%	100.9%	97.3%	103.7%	Develop operating procedure to curtail load manually or automatically (SPS)
Fres-T-23	LE GRAND-CHOWCHILLA - From C2/16 To Chowchilla Sub	Kerckhoff PH2 115kV Bus	C1	Bus	98.5%	100.2%	<100%	<100%	<100%	<100%	Develop operating procedure to curtail load manually or automatically (SPS)/ Rerate the line
Fres-T-24	CHOWCHILLA-KERCKHOFF - From Chowchilla Sub To 2/16C	Kerckhoff PH2 115kV Bus	C1	Bus	<100%	<100%	<100%	<100%	92.6%	121.0%	Develop operating procedure to curtail load manually or automatically (SPS)/ Rerate the line
Fres-T-25	CHOWCHILLA-KERCKHOFF - From 2/16C To 34/9	Kerckhoff PH2 115kV Bus	C1	Bus	<100%	<100%	<100%	<100%	92.7%	121.2%	Develop operating procedure to curtail load manually or automatically (SPS)/ Rerate the line
Fres-T-26	CHOWCHILLA-KERCKHOFF - From 34/9 To 7/11	Kerckhoff PH2 115kV Bus	C1	Bus	<100%	<100%	<100%	<100%	<100%	109.1%	Develop operating procedure to curtail load manually or automatically (SPS)/ Rerate the line
Fres-T-27	OAKHURST TAP - From 7/11. To 9/1	Kerckhoff PH2 115kV Bus	C1	Bus	<100%	<100%	<100%	91.1%	94.8%	125.2%	Develop operating procedure to curtail load manually or automatically (SPS)/ Rerate the line
Fres-T-28	MERCED-MERCED FALLS	Le Grand 115kV Bus	C1	Bus	136.8%	135.1%	133.5%	<100%	130.7%	121.2%	Existing Excehequer SPS and Mariposa UVLS will mitigate the overload
Fres-T-29	MERCED FALLS-EXCHEQUER - From Merced Falls To 13/10	Le Grand 115kV Bus	C1	Bus	146.9%	146.0%	145.2%	<100%	144.1%	138.8%	Existing Excehequer SPS and Mariposa UVLS will mitigate the overload
Fres-T-30	MERCED FALLS-EXCHEQUER - From 13/10 To 6/14	Le Grand 115kV Bus	C1	Bus	173.0%	171.9%	170.8%	98.7%	169.2%	162.0%	Existing Excehequer SPS and Mariposa UVLS will mitigate the overload
Fres-T-31	Merced 115/70 Bank # 2	Le Grand 115kV Bus	C1	Bus	122.4%	121.0%	120.0%	<100%	117.5%	109.4%	Existing Excehequer SPS and Mariposa UVLS will mitigate the overload
Fres-T-32	BORDEN-GREGG	Herndon 230kV CB 202	C2	Breaker	129.7%	135.4%	126.1%	134.0%	141.8%	Not Solved	Develop operating procedure to curtail load manually or automatically (SPS)/ Rerate the line
Fres-T-33	LE GRAND-CHOWCHILLA - From C2/16 To Chowchilla Sub	Herndon 230kV CB 202	C2	Breaker	121.0%	110.9%	<100%	<100%	<100%	Not Solved	Develop operating procedure to curtail load manually or automatically (SPS)/ Rerate the line
Fres-T-34	ATWATER -CASTLE 115 kV line	Wilson 115kV CB 102	C2	Breaker	Not Solved	Not Solved	Not Solved	111.1%	103.5%	122.9%	Develop operating procedure to curtail load manually or automatically (SPS)/ Rerate the line
Fres-T-35	CHOWCHILLA-KERCKHOFF - From Chowchilla Sub To 2/16C	Herndon 230kV CB 202	C2	Breaker	115.4%	102.8%	113.3%	113.0%	109.8%	Not Solved	Develop operating procedure to curtail load manually or automatically (SPS)/ Rerate the line
Fres-T-36	CHOWCHILLA-KERCKHOFF - From 2/16C To 34/9	Herndon 230kV CB 202	C2	Breaker	115.4%	102.8%	113.3%	113.0%	109.8%	Not Solved	Develop operating procedure to curtail load manually or automatically (SPS)/ Rerate the line
Fres-T-37	CASTLE - EL CAPTN 115 kV line	Wilson 115kV CB 102	C2	Breaker	Not Solved	Not Solved	Not Solved	110.9%	103.3%	122.7%	Develop operating procedure to curtail load manually or automatically (SPS)/ Rerate the line
Fres-T-38	CHOWCHILLA-KERCKHOFF - From 34/9 To 7/11	Herndon 230kV CB 202	C2	Breaker	107.4%	95.0%	106.0%	105.4%	102.5%	Not Solved	Develop operating procedure to curtail load manually or automatically (SPS)/ Rerate the line
Fres-T-39	LOS BANOS-CANAL-ORO LOMA - From 12/7 To Oro Loma	Panoche 115kV CB 102	C2	Breaker	<100%	<100%	<100%	79.5%	78.8%	115.5%	Develop operating procedure to curtail load manually or automatically (SPS)/ Rerate the line
Fres-T-40	LOS BANOS-LIVINGSTON JCT-CANAL - From Los Banos To S0/14	Panoche 115kV CB 102	C2	Breaker	97.8%	101.0%	103.0%	70.1%	<100%	86.9%	Develop operating procedure to curtail load manually or automatically (SPS)/ Rerate the line
Fres-T-41	34256BORDEN 34262CASSIDY	Herndon 230kV CB 202	C2	Breaker	108.4%	103.1%	100.1%	136.2%	101.0%	Not Solved	Develop operating procedure to curtail load manually or automatically (SPS)/ Rerate the line

Fres-T-42	BORDEN-CASSDY 70 kV	McCall 230kV CB 202	C2	Breaker	<100%	<100%	<100%	103.8%	71.7%	Not Solved	Develop operating procedure to curtail load manually or automatically (SPS)/ Rerate the line
Fres-T-43	BORDEN-COPPERMINE - From 10/1B To 11/13	Herndon 230kV CB 202	C2	Breaker	103.5%	97.0%	93.3%	134.9%	93.6%	Not Solved	Develop operating procedure to curtail load manually or automatically (SPS)/ Rerate the line
Fres-T-44	KERCKHOFF-CLOVIS-SANGER #1 - From Kerckhoff #2 PH To 12/5	Herndon 230kV CB 202	C2	Breaker	103.3%	98.9%	98.6%	111.1%	99.5%	Not Solved	Develop operating procedure to curtail load manually or automatically (SPS)/ Rerate the line
Fres-T-45	BARTON-AIRWAYS-SANGER - From 15/135A to Sanger	Herndon 230kV CB 202	C2	Breaker	102.8%	103.9%	106.6%	109.6%	112.7%	Not Solved	Develop operating procedure to curtail load manually or automatically (SPS)/ Rerate the line
Fres-T-46	SANGER-LSPLMS 115 kV line	Herndon 230kV CB 202	C2	Breaker	96.3%	97.1%	99.1%	101.9%	104.5%	Not Solved	Develop operating procedure to curtail load manually or automatically (SPS)/ Rerate the line
Fres-T-47	MCCALL-SANGER #1 - From McCall Sub To Sanger Sub	Herndon 230kV CB 202	C2	Breaker	90.9%	93.7%	94.0%	95.1%	100.4%	Not Solved	Develop operating procedure to curtail load manually or automatically (SPS)/ Rerate the line
Fres-T-48	BARTON-HERNDN 115 kV line	McCall 230kV CB 202	C2	Breaker	116.2%	113.1%	116.3%	120.2%	116.5%	Not Solved	Develop operating procedure to curtail load manually or automatically (SPS)/ Rerate the line
Fres-T-49	MANCHESTER-AIRWAYS-SANGER - From Manchester Sub To 15/135A	Herndon 230kV CB 202	C2	Breaker	94.2%	95.2%	97.8%	100.4%	103.4%	Not Solved	Develop operating procedure to curtail load manually or automatically (SPS)/ Rerate the line
Fres-T-50	HERNDON-MANCHESTER - From Herndon Sub To Manchester Sub	McCall 230kV CB 202	C2	Breaker	117.7%	114.7%	117.8%	121.6%	118.0%	Not Solved	Develop operating procedure to curtail load manually or automatically (SPS)/ Rerate the line
Fres-T-51	GWF-KINGSBURG - From GWF Sub To 17/9	McCall 230kV CB 202	C2	Breaker	99.1%	96.5%	93.6%	96.9%	104.3%	Not Solved	Develop operating procedure to curtail load manually or automatically (SPS)/ Rerate the line
Fres-T-52	BORDEN-COPPERMINE - From 11/13 To Coppermine Sub	Herndon 230kV CB 202	C2	Breaker	99.7%	93.3%	<100%	131.2%	90.1%	Not Solved	Develop operating procedure to curtail load manually or automatically (SPS)/ Rerate the line
Fres-T-53	COALINGA #1-SAN MIGUEL - From BUSS To BUSS	GATES 230 KV CB 202	C2	Breaker	<100%	<100%	111.7%	86.9%	<100%	<100%	Develop operating procedure to curtail load manually or automatically (SPS)/ Rerate the line
Fres-T-54	SCHINDLER-HURON-GATES - From 9/2 To 16/12	Panoche 115kV CB 102	C2	Breaker	<100%	<100%	<100%	<100%	<100%	103.2%	Develop operating procedure to curtail load manually or automatically (SPS)/ Rerate the line
Fres-T-55	GREGG-HERNDON #1	GREGG 230kV - HERNDON 230kV #1 _GREGG 230kV - FGRDN T2 230kV #1	C3	N-1-1	108.7%	102.7%	103.6%	99.9%	105.0%	111.3%	Operational action plan /SPS to trip load/rerate the line
Fres-T-56	GREGG-ASHLAN 230 kV LINE	GREGG 230kV - HERNDON 230kV #1 _GREGG 230kV - HERNDON 230kV #2	C3	N-1-1	173.8%	164.8%	166.2%	167.0%	169.0%	<100%	Short term action plan, Long term Gregg-Ashlan Reconductor project proposed in earlier TPP.
Fres-T-57	Herndon 230/115 Bank 2H	HERNDON 115kV - HERNDON 230kV #3 _HERNDON 230kV - HERNDN1M 115kV #1	C3	N-1-1	93.4%	90.4%	94.5%	94.5%	94.3%	103.2%	Operational action plan /SPS to trip load
Fres-T-58	Herndon 230/115 Bank 2H	HERNDON 115kV - HERNDON 230kV #3 _HERNDON 230kV - HERNDN2M 115kV #2	C3	N-1-1	93.1%	90.1%	94.1%	94.1%	94.0%	102.9%	Operational action plan /SPS to trip load
Fres-T-59	GREGG-ASHLAN - From A3/28 To BUSS	GREGG 230kV - HERNDON 230kV #1 _GREGG 230kV - HERNDON 230kV #2	C3	N-1-1	143.2%	133.6%	134.3%	135.0%	136.1%	<100%	Short term action plan, Long term Gregg-Ashlan Reconductor project proposed in earlier TPP.
Fres-T-60	MC CALL 230kV - MCCALL2M 115kV #1	MC CALL 230kV - MCCALL2M 115kV #2 _MC CALL 230kV - MCCALL3M 115kV #3	C3	N-1-1	<100%	93.1%	92.7%	94.0%	96.6%	113.0%	Operational action plan /SPS to trip load/rerate the line

Fres-T-61	LE GRAND-CHOWCHILLA - From Le Grand Sub To C2/16	KERCKHF2 115kV - WWARD JT 115kV #1 _CLOVIS-2 115kV - CLOVISJ2 115kV #1	C3	N-1-1	145.5%	143.0%	<100%	<100%	<100%	<100%	Exisitng Kerckhoff PH2 Run Back Scheme (SPS) will mitigate the overload.
Fres-T-62	ATWTER-ATWTRJ_115_BR_1_1	ATWATER 115kV - CASTLE 115kV #1 _WILSON A 115kV - ATWATER 115kV #1	C3	N-1-1	<100%	<100%	<100%	<100%	<100%	102.2%	Operational action plan /SPS to trip load/erate the line
		WILSON A 115kV - ATWATER 115kV #1 _WILSON B 115kV - EL CAPTN 115kV #1	C3	N-1-1	147.6%	150.5%	152.0%	154.4%	<100%	<100%	Short term action plan for interim. Wilson 115 kV Area reinforcement program approved in last year TPP.
Fres-T-64	CHOWCHILLA-KERCKHOFF - From Chowchilla Sub To 2/16C	KERCKHF2 115kV - WWARD JT 115kV #1 _CLOVIS-2 115kV - CLOVISJ2 115kV #1	C3	N-1-1	120.4%	117.6%	120.9%	120.1%	114.1%	105.9%	Exisitng Kerckhoff PH2 Run Back Scheme (SPS) will mitigate the overload.
Fres-T-65	CHOWCHILLA-KERCKHOFF - From 2/16C To 34/9	KERCKHF2 115kV - WWARD JT 115kV #1 _CLOVIS-2 115kV - CLOVISJ2 115kV #1	C3	N-1-1	120.6%	120.6%	120.6%	120.0%	114.2%	106.0%	Exisitng Kerckhoff PH2 Run Back Scheme (SPS) will mitigate the overload.
Fres-T-66	ATWATER-MERCED - From 12/3 To Merced Sub	ATWATER 115kV - CASTLE 115kV #1 _WILSON A 115kV - ATWATER 115kV #1	C3	N-1-1	<100%	<100%	<100%	<100%	<100%	101.6%	Operational action plan /SPS to trip load/erate the line
		WILSON A 115kV - ATWATER 115kV #1 _WILSON B 115kV - EL CAPTN 115kV #1	C3	N-1-1	129.2%	131.7%	133.1%	NA	<100%	<100%	Operational action plan /SPS to trip load/erate the line
Fres-T-68	EXCHEQUER-LE GRAND - From Exchequer Sub To Le Grand Sub	EXCHEQUR 70kV - BER VLLY 70kV #1 _MERCED 115kV - MERCED M 115kV #2	C3	N-1-1	102.6%	101.8%	101.2%	101.2%	99.6%	95.2%	Short term action plan to Reduce Exchequer Generation after first contingency
Fres-T-69	WILSON-LE GRAND - From Wilson Sub To Le Grand Sub	WILSON A 115kV - WILSON 230kV #1 _WILSON B 115kV - WILSON 230kV #2	C3	N-1-1	156.1%	159.4%	159.2%	161.3%	<100%	<100%	Operational action plan /SPS to trip load/erate the line
Fres-T-70	CHOWCHILLA-KERCKHOFF - From 34/9 To 7/11	KERCKHF2 115kV - WWARD JT 115kV #1 _CLOVIS-2 115kV - CLOVISJ2 115kV #1	C3	N-1-1	127.9%					114.1%	Exisitng Kerckhoff PH2 Run Back Scheme (SPS) will mitigate the overload.
Fres-T-71	CHOWCHILLA-KERCKHOFF - From 0/1 To Kerckhoff #2 PH	KERCKHF2 115kV - WWARD JT 115kV #1 _CLOVIS-2 115kV - CLOVISJ2 115kV #2	C3	N-1-1	101.6%	100.8%	103.2%	103.5%	<100%	<100%	Exisitng Kerckhoff PH2 Run Back Scheme (SPS) will mitigate the overload.
Fres-T-72	CHOWCHILLA-KERCKHOFF - From 7/11 To 0/1	KERCKHF2 115kV - WWARD JT 115kV #1 _CLOVIS-2 115kV - CLOVISJ2 115kV #3	C3	N-1-1	101.6%	100.8%	103.2%	103.5%	<100%	<100%	Exisitng Kerckhoff PH2 Run Back Scheme (SPS) will mitigate the overload.
Fres-T-73	WILSON-MERCED #2 - From Wilson Sub To Merced Sub	WILSON A 115kV - ATWATER 115kV #1 _WILSON B 115kV - EL CAPTN 115kV #1	C3	N-1-1	113.2%	115.4%	116.8%	118.7%	<100%	<100%	Operational action plan /SPS to trip load/erate the line
Fres-T-74	WILSON-MERCED #1 - From Wilson Sub To Merced Sub	EXCHEQUR 115kV - LE GRAND 115kV #1 _WILSON A 115kV - MERCED 115kV #1	C3	N-1-1	97.5%	99.6%	101.5%	103.6%	94.6%	106.6%	Operational action plan /SPS to trip load/erate the line
Fres-T-75	PANOCHÉ-ORO LOMA - From 1/12 To Hammonds Sub	WILSON A 115kV - WILSON 230kV #1 _WILSON B 115kV - WILSON 230kV #2	C3	N-1-1	104.1%	114.2%	113.7%	NA	<100%	<100%	Short term action plan for interim. Wilson 115 kV Area reinforcement program approved in last year TPP.
Fres-T-76	PANOCHÉ-ORO LOMA - From 1/12 To Hammonds Sub	LE GRAND 115kV - DAIRYLND 115kV #1 _PANOCHET 115kV - PANOCHÉ1 115kV #1	C3	N-1-1	<100%	<100%	<100%	<100%	96.3%	125.9%	Operational action plan /SPS to trip load/erate the line
Fres-T-77	PANOCHÉ-ORO LOMA - From Hammonds Sub To 13/2	WILSON A 115kV - WILSON 230kV #1 _WILSON B 115kV - WILSON 230kV #2	C3	N-1-1	94.4%	104.5%	104.1%	110.7%	<100%	<100%	Short term action plan for interim. Wilson 115 kV Area reinforcement program approved in last year TPP.

Fres-T-78	PANOCHÉ-ORO LOMA - From Hammonds Sub To 13/2	LE GRAND 115kV - DAIRYLND 115kV #1 _PANOCHET 115kV - PANOCHÉ1 115kV #1	C3	N-1-1	<100%	<100%	<100%	<100%	<100%	116.2%	Operational action plan /SPS to trip load/erate the line
Fres-T-79	PANOCHÉ-ORO LOMA - From 13/2 To Oro Loma Sub	WILSON A 115kV - WILSON 230kV #1 _WILSON B 115kV - WILSON 230kV #2	C3	N-1-1	92.0%	102.1%	101.7%	108.3%	<100%	<100%	Short term action plan for interim. Wilson 115 kV Area reinforcement program approved in last year TPP.
Fres-T-80	WILSON-ORO LOMA - From 14/11 To Oro Loma Sub	WILSON A 115kV - WILSON 230kV #1 _WILSON B 115kV - WILSON 230kV #2	C3	N-1-1	111.5%	116.9%	119.4%	123.8%	<100%	<100%	Short term action plan for interim. Wilson 115 kV Area reinforcement program approved in last year TPP.
Fres-T-81	KEARNEY 230/70 Bank # 2	SNJQTP 70kV - SAN JOQN 70kV #1 _FRESNOWW 12.47 Unit ID 2	C3	N-1-1	94.8%	95.7%	96.5%	97.4%	98.7%	105.6%	Operational action plan /SPS to trip load
Fres-T-82	34492 REEDLEY 34526 ORSI JCT	MC CALL 115kV - WAHTOKE 115kV #1 _REEDLEY 70kV - DNUBAJCT 70kV #1	C3	N-1-1	94.1%	93.4%	95.2%	95.4%	99.8%	114.3%	Operational action plan /SPS to trip load/erate the line
Fres-T-83	DINUBA-OROSI - From BUSS To 12/3	MC CALL 115kV - WAHTOKE 115kV #1 _REEDLEY 70kV - DNUBAJCT 70kV #1	C3	N-1-1	95.1%	94.5%	96.3%	96.4%	100.8%	115.2%	Operational action plan /SPS to trip load/erate the line
Fres-T-86	ORO LOMA 115/70 Bank # 2	LIVNGSTN 70kV - LVNGSTNT 70kV #1 _WRIGHT T 70kV - WRGHT PP 70kV #1	C3	N-1-1	105.2%	110.7%	113.6%	118.3%	<100%	<100%	Short term action plan for interim. Oro Loma 70 kV Area reinforcement program approved in last year TPP for long term.

Study Area: Fresno - Summer Peak (2012-2021)

Voltage Normal

ID	Substation	Worst Contingency	Category	Category Description	Min. Post Contingency Voltage (PU)						ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2021	
Fresno-V-01	EXCHEQUR 115 kV	Normal	A	N-0	1.06	1.05	1.05	1.05	1.05	1.05	Under review for possible exemptions
Fresno-V-02	WESIX	Normal	A	N-0	1.05	1.05	1.05	1.05	1.05	1.05	Under review for possible exemptions
Fresno-V-03	WESTLAND	Normal	A	N-0	1.05	1.05	1.05	1.05	1.05	1.05	Under review for possible exemptions
Fresno-V-04	CHEVPIPE	Normal	A	N-0	1.04	1.05	1.05	1.05	1.05	1.04	Under review for possible exemptions
Fresno-V-05	SNTA NLA	Normal	A	N-0	1.04	1.05	1.05	1.05	1.05	1.04	Under review for possible exemptions
Fresno-V-06	LOS BANS	Normal	A	N-0	1.05	1.05	1.06	1.06	1.05	1.05	Under review for possible exemptions
Fresno-V-07	EXCHEQUR	Normal	A	N-0	1.06	1.06	1.06	1.06	1.06	1.05	Under review for possible exemptions
Fresno-V-08	BORDEN	Normal	A	N-0	1.03	1.04	1.06	1.04	1.04	1.05	Under review for possible exemptions
Fresno-V-09	MENDOTA	Normal	A	N-0	1.06	1.06	1.06	1.07	1.06	1.06	Under review for possible exemptions
Fresno-V-11	BIOMASS	Normal	A	N-0	1.06	1.06	1.06	1.06	1.06	1.06	Under review for possible exemptions
Fresno-V-13	WRGHT PP	Normal	A	N-0	1.04	1.05	1.05	1.05	1.05	1.04	Under review for possible exemptions
Fresno-V-14	BIOLA	Normal	A	N-0	1.03	1.05	1.05	1.05	1.04	1.05	Under review for possible exemptions
Fresno-V-15	BOWLES	Normal	A	N-0	1.04	1.06	1.06	1.06	1.05	1.06	Under review for possible exemptions
Fresno-V-16	SNJQJCT	Normal	A	N-0	1.05	1.06	1.06	1.05	1.06	1.06	Under review for possible exemptions
Fresno-V-17	SAN JOQN	Normal	A	N-0	1.05	1.06	1.06	1.06	1.06	1.06	Under review for possible exemptions
Fresno-V-18	SNJQTP	Normal	A	N-0	1.05	1.06	1.06	1.06	1.06	1.06	Under review for possible exemptions
Fresno-V-19	HELM	Normal	A	N-0	1.05	1.06	1.06	1.06	1.06	1.06	Under review for possible exemptions
Fresno-V-21	AGRICO	Normal	A	N-0	1.05	1.05	1.05	1.05	1.05	1.05	Under review for possible exemptions
Fresno-V-22	KEARNEY	Normal	A	N-0	1.05	1.08	1.08	1.08	1.07	1.08	Under review for possible exemptions
Fresno-V-23	FRWWTAP	Normal	A	N-0	1.05	1.08	1.08	1.08	1.07	1.08	Under review for possible exemptions
Fresno-V-24	OLDKERN	Normal	A	N-0	1.05	1.08	1.08	1.08	1.07	1.08	Under review for possible exemptions
Fresno-V-25	FRESNOWW	Normal	A	N-0	1.05	1.08	1.08	1.08	1.07	1.08	Under review for possible exemptions
Fresno-V-27	STROUD	Normal	A	N-0	1.04	1.05	1.05	1.05	1.05	1.05	Under review for possible exemptions
Fresno-V-28	CALRENEW	Normal	A	N-0	1.06	1.06	1.06	1.06	1.06	1.06	Under review for possible exemptions
Fresno-V-29	TOMATAK 115	MENDOTA 70kV - MENDOTA 115kV #1	B	N-1	0.90	0.90	0.90	1.02	1.02	1.01	Short Term Action plan, Long term Oroloma-Mendota 70 to 115 kV conversion (2010 Project)
Fresno-V-30	MENDOTA 70	MENDOTA 70kV - MENDOTA 115kV #1	B	N-1	0.90	0.90	0.90	1.06	1.06	1.06	Install Reactive Support
Fresno-V-32	BORDEN 230	BORDEN 230kV - GREGG 230kV #1	B	N-1	0.92	0.92	0.92	0.91	0.91	0.89	Install Reactive Support
Fresno-V-34	BORDEN 230	Borden - Gregg & Wilson - Gregg 230 kV Lines	C5	DCTL	0.90	0.90	0.90	0.89	0.89	0.86	Install Reactive Support
Fresno-V-35	CAMDEN 70	McCall - Kingsburg #1 & #2 115 kV Lines	C5	DCTL	0.89	1.01	1.01	1.01	1.01	1.00	Install Reactive Support
Fresno-V-35	CHWCHLLA 115	Kerckhoff PH2 115kV Bus	C1	Bus	0.98	0.98	0.98	0.98	0.98		
		Kerckhoff PH2 115kV Bus	C1	Bus	0.98	0.98	0.98	0.98	0.98	0.88	Install Reactive Support

Fresno-V-41	CHWCGN 115	Kerckhoff PH2 115kV Bus	C1	Bus	0.99	0.99	0.99	0.99	0.99	0.89	Install Reactive Support
Fresno-V-42	CHWCHLA2 115	Kerckhoff PH2 115kV Bus	C1	Bus	0.99	0.99	0.99	0.99	0.99	0.89	Install Reactive Support
Fresno-V-43	SHARON 115	Kerckhoff PH2 115kV Bus	C1	Bus	0.96	0.96	0.96	0.96	0.96	0.86	Install Reactive Support
Fresno-V-45	OAKHURST 115	Kerckhoff PH2 115kV Bus	C1	Bus	0.88	0.87	0.87	0.88	0.86	0.72	Install Reactive Support
Fresno-V-47	CORSGOLD 115	Kerckhoff PH2 115kV Bus	C1	Bus	0.89	0.88	0.88	0.88	0.87	0.73	Install Reactive Support
Fresno-V-49	KERCKHF2 115	Kerckhoff PH2 115kV Bus	C1	Bus	1.07	1.07	1.07	0.88	1.07	1.07	Install Reactive Support
Fresno-V-50	ATWATER 115	Wilson 115kV CB 102	C2	Breaker	Not Solved	Not Solved	Not Solved	0.89	0.89	0.87	Install Reactive Support
Fresno-V-51	CASTLE 115	Wilson 115kV CB 102	C2	Breaker	Not Solved	Not Solved	Not Solved	0.90	0.90	0.88	Install Reactive Support
Fresno-V-53	JRWD GEN 115	Wilson 115kV CB 102	C2	Breaker	Not Solved	Not Solved	Not Solved	0.89	0.89	0.87	Install Reactive Support
Fresno-V-54	JR WOOD 115	Wilson 115kV CB 102	C2	Breaker	Not Solved	Not Solved	Not Solved	0.89	0.89	0.87	Install Reactive Support
Fresno-V-55	LIVNGSTN 115	Wilson 115kV CB 102	C2	Breaker	Not Solved	Not Solved	Not Solved	0.87	0.87	0.84	Install Reactive Support
Fresno-V-56	GALLO 115	Wilson 115kV CB 102	C2	Breaker	Not Solved	Not Solved	Not Solved	0.87	0.86	0.83	Install Reactive Support
				Breaker	Not Solved	Not Solved	Not Solved	0.89	0.89	0.86	Install Reactive Support
Fresno-V-58	MERCED 115	Wilson 115kV CB 102	C2	Breaker	Not Solved	Not Solved	Not Solved	0.89	0.88	0.86	Install Reactive Support
Fresno-V-59	MENDOTA 115	Panoche 115kV CB 102	C2	Breaker	0.90	0.90	0.90	0.97	0.96	0.91	Install Reactive Support
Fresno-V-62	QUEBEC 115	Midway 115kV CB 392	C2	Breaker	0.85	0.86	0.86	0.85	0.95	1.00	Install Reactive Support
Fresno-V-65	PNEDLE 115	Herndon 230kV CB 202	C2	Breaker	0.89	0.90	0.92	0.90	0.90	Not Solved	Install Reactive Support
Fresno-V-66	BULLARD 115	Herndon 230kV CB 202	C2	Breaker	0.89	0.90	0.91	0.90	0.90	Not Solved	Install Reactive Support
Fresno-V-67	CORCORAN 115	McCall 230kV CB 202	C2	Breaker	0.88	0.90	0.91	0.91	0.91	Not Solved	Install Reactive Support
Fresno-V-68	ALPAUGH 115	Midway 115kV CB 392	C2	Breaker	0.86	0.86	0.87	0.86	0.96	1.00	Install Reactive Support
Fresno-V-69	RPS40F 115	Midway 115kV CB 392	C2	Breaker	0.86	NA	NA	NA	NA	NA	Install Reactive Support
Fresno-V-70	DUNLAP 70	McCall 230kV CB 202	C2	Breaker	0.89	0.91	0.92	0.92	0.92	Not Solved	Install Reactive Support
Fresno-V-71	SANDCRK 70	McCall 230kV CB 202	C2	Breaker	0.89	0.92	0.93	0.92	0.92	Not Solved	Install Reactive Support
Fresno-V-72	CAMDEN 70	McCall 230kV CB 202	C2	Breaker	0.87	1.00	1.00	1.00	0.99	Not Solved	Install Reactive Support
Fresno-V-74	RPS41B 115	McCall 230kV CB 202	C2	Breaker	0.89	0.91	0.91	0.91	0.91	Not Solved	Install Reactive Support
Fresno-V-75	RPS41C 115	McCall 230kV CB 202	C2	Breaker	0.89	0.91	0.91	0.91	0.91	Not Solved	Install Reactive Support
Fresno-V-76	ATWATER 115	WILSON A 115kV - WILSON 230kV #1 _WILSON B 115kV - WILSON 230kV #2	C3	N-1-1	0.84	0.82	0.82	0.81	0.98	0.96	Short Term Action plan, Long Term Wilson 115 kV Area Reinforcement (2010 project)

Fresno-V-77	BER VLLY 70	EXCHEQUR 115kV - LE GRAND 115kV #1 _MCSWAIN 9.11 Unit ID 1	C3	N-1-1	0.93	0.93	0.92	0.92	0.92	0.87	Exchequer SPS and Mariposa UVLS
Fresno-V-78	BONITA 70	WARNERVL 230kV - WILSON 230kV #1 _BORDEN 230kV - GREGG 230kV #1	C3	N-1-1	0.95	0.95	0.96	0.96	0.94	0.90	Install Reactive Support
Fresno-V-79	BORDEN 230	WARNERVL 230kV - WILSON 230kV #1 _BORDEN 230kV - GREGG 230kV #1	C3	N-1-1	0.89	0.89	0.89	0.89	0.88	0.85	Short Term Action plan for interim/ Install reactive support for longer term.
Fresno-V-80	CAL AVE 115	CAL AVE 115kV - SANGER 115kV #1 _WST FRSO 115kV - MC CALL 115kV #1	C3	N-1-1	0.91	0.92	0.91	0.92	0.91	0.89	Install Reactive Support
Fresno-V-81	CAMDEN 70	MC CALL 115kV - KINGS J1 115kV #1 _KINGSBRG 115kV - GAURD J1 115kV #1	C3	N-1-1	0.89	1.01	1.01	1.08	1.00	1.00	Install Reactive Support
Fresno-V-82	CANAL 70	LIVNGSTN 70kV - LVNGSTNT 70kV #1 _WRIGHT T 70kV - WRGHT PP 70kV #1	C3	N-1-1	0.73	0.72	0.71	0.70	0.99	0.98	Short Term Action plan, Long Term Wilson 115 kV Area Reinforcement (2010 project)
Fresno-V-83	CASTLE 115	WILSON A 115kV - WILSON 230kV #1 _WILSON B 115kV - WILSON 230kV #2	C3	N-1-1	0.84	0.82	0.82	0.81	0.98	0.96	Short Term Action plan, Long Term Wilson 115 kV Area Reinforcement (2010 project)
Fresno-V-84	CRESSEY 115	WILSON A 115kV - WILSON 230kV #1 _WILSON B 115kV - WILSON 230kV #2	C3	N-1-1	0.83	0.82	0.82	0.81	0.98	0.95	Short Term Action plan, Long Term Wilson 115 kV Area Reinforcement (2010 project)
Fresno-V-85	DAIRYLND 115	LE GRAND 115kV - DAIRYLND 115kV #1 _PANOCHET 115kV - PANOCH1 115kV #1	C3	N-1-1	0.00	0.00	0.00	0.00	0.91	0.77	Short Term Action plan, Long Term Oro Loma-Mendotta 70 kV to 115 kV Area Conversion (2010 project)
Fresno-V-86	DANISHCM 115	CAL AVE 115kV - SANGER 115kV #1 _WST FRSO 115kV - MC CALL 115kV #1	C3	N-1-1	0.92	0.92	0.92	0.92	0.92	0.89	Install Reactive Support

Fresno-V-87	DOS PALS 70	MENDOTA 70kV - MENDOTA 115kV #1 _ORO LOMA 70kV - ORO LOMA 115kV #2	C3	N-1-1	0.90	0.90	0.91	0.92	0.00	0.00	Short Term Action plan, Long Term Oro Loma 70 kV Area Reinforcement (2010 project)
Fresno-V-88	EL CAPTN 115	WILSON A 115kV - WILSON 230kV #1 _WILSON B 115kV - WILSON 230kV #2	C3	N-1-1	0.84	0.83	0.83	0.82	0.99	0.97	Short Term Action plan, Long Term Wilson 115 kV Area Reinforcement (2010 project)
Fresno-V-89	EL NIDO 115	WILSON A 115kV - WILSON 230kV #1 _WILSON B 115kV - WILSON 230kV #2	C3	N-1-1	0.89	0.88	0.88	0.87	1.00	0.98	Short Term Action plan, Long Term Wilson 115 kV Area Reinforcement (2010 project)
Fresno-V-90	EXCHEQUR 115	EXCHEQUR 115kV - LE GRAND 115kV #1 _MCSWAIN 9.11 Unit ID 1	C3	N-1-1	0.94	0.93	0.93	0.92	0.92	0.88	Exchequer SPS and Mariposa UVLS
Fresno-V-91	GILLRAN 115	LE GRAND 115kV - WILSON A 115kV #1 _PANOCHET 115kV - PANOCH1 115kV #1	C3	N-1-1	0.89	0.89	0.90	0.90	0.98	0.91	Short Term Action plan, Long Term Oro Loma-Mendotta 70 kV to 115 kV Area Conversion (2010 project)
Fresno-V-92	INDN FLT 70	EXCHEQUR 115kV - LE GRAND 115kV #1 _MARIPOS2 70kV - EXCHEQUR 70kV #1	C3	N-1-1	0.91	0.90	0.90	0.89	0.89	0.84	Exchequer SPS and Mariposa UVLS
Fresno-V-93	JR WOOD 115	WILSON A 115kV - WILSON 230kV #1 _WILSON B 115kV - WILSON 230kV #2	C3	N-1-1	0.84	0.82	0.82	0.81	0.98	0.96	Short Term Action plan, Long Term Wilson 115 kV Area Reinforcement (2010 project)
Fresno-V-94	JRWD GEN 115	WILSON A 115kV - WILSON 230kV #1 _WILSON B 115kV - WILSON 230kV #2	C3	N-1-1	0.84	0.82	0.82				
Fresno-V-95	LE GRAND 115	WILSON A 115kV - WILSON 230kV #1 _WILSON B 115kV - WILSON 230kV #2	C3	N-1-1	0.91	0.90	0.90	0.89	1.00	0.98	Short Term Action plan, Long Term Wilson 115 kV Area Reinforcement (2010 project)
Fresno-V-96	LIVNGSTN 115	WILSON A 115kV - WILSON 230kV #1 _WILSON B 115kV - WILSON 230kV #2	C3	N-1-1	0.82	0.80	0.80	0.79	0.96	0.94	Short Term Action plan, Long Term Wilson 115 kV Area Reinforcement (2010 project)

Fresno-V-97	MADERAPR 115	LE GRAND 115kV - WILSON A 115kV #1 _PANOCHET 115kV - PANOCH1 115kV #1	C3	N-1-1	0.90	0.89	0.90	0.90	0.99	0.92	Short Term Action plan, Long Term Wilson 115 kV Area Reinforcement (2010 project)
Fresno-V-98	MENDOTA 70	NEWHALL 115kV - DAIRYLND 115kV #1 _PANOCHET 115kV - PANOCH1 115kV #1	C3	N-1-1	0.70	0.71	0.71	0.72	1.05	1.04	Short Term Action plan, Long Term Oro Loma-Mendotta 70 kV to 115 kV Area Conversion (2010 project)
Fresno-V-99	MENDOTA 115	NEWHALL 115kV - DAIRYLND 115kV #1 _PANOCHET 115kV - PANOCH1 115kV #1	C3	N-1-1	0.65	0.65	0.66	0.66	0.97	0.97	Short Term Action plan, Long Term Oro Loma-Mendotta 70 kV to 115 kV Area Conversion (2010 project)
Fresno-V-100	MERCED 115	WILSON A 115kV - WILSON 230kV #1 _WILSON B 115kV - WILSON 230kV #2	C3	N-1-1	0.85	0.84	0.84	0.83	0.99	0.97	Short Term Action plan, Long Term Oro Loma-Mendotta 70 kV to 115 kV Area Conversion (2010 project)
Fresno-V-101	NEWHALL 115	LE GRAND 115kV - WILSON A 115kV #1 _PANOCHET 115kV - PANOCH1 115kV #1	C3	N-1-1	0.90	0.90	0.90	0.90	0.99	0.92	Short Term Action plan, Long Term Oro Loma 70 kV Area Reinforcement (2010 project)
Fresno-V-102	ORO LOMA 70	MENDOTA 70kV - MENDOTA 115kV #1 _ORO LOMA 70kV - ORO LOMA 115kV #2	C3	N-1-1	0.90	0.90	0.91	0.92	0.00	0.00	Short Term Action plan, Long Term Oro Loma 70 kV Area Reinforcement (2010 project)

Study Area: Fresno - Summer Peak (2012-2021)

Voltage Deviation

ID	Substation	Worst Contingency	Category	Category Description	Post Contingency Voltage Deviation (%)						ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2021	
Fresno-DV-01	STOREY 2 230	BORDEN 230kV - GREGG 230kV #1	B	L-1	-6.1%	-6.5%	-6.9%	-7.1%	-6.8%	-7.8%	Install Reactive support
Fresno-DV-02	BORDEN 230	BORDEN 230kV - GREGG 230kV #1	B	L-1	-6.6%	-7.1%	-7.4%	-7.7%	-7.4%	-8.4%	Install Reactive support
Fresno-DV-03	CHWCHLLA 115	CHWCHLLA 115kV - CERTAN T 115kV #1	B	L-1	-5.8%	-5.9%	-5.4%	-4.3%	-4.2%	-3.3%	Exchequer SPS and Mariposa UVLS
Fresno-DV-04	EXCHEQUR 115	EXCHEQUR 115kV - LE GRAND 115kV #1	B	L-1	-7.9%	-8.2%	-8.3%	-10.0%	-9.0%	-11.5%	Short Term Action Plan, Long Term Kerckhoff PH2-Oakhurst 115 kV Line Addition (2010 Project)
Fresno-DV-05	SHARON 115	CHWCHLLA 115kV - CERTAN T 115kV #1	B	L-1	-5.1%	-5.2%	-4.7%	-3.8%	-3.7%	-2.9%	Short Term Action Plan, Long Term Oro Loma-Mendota 70 to 115 kV Conversion (2010 Project)
Fresno-DV-06	NEWHALL 115	PANOCHET 115kV - PANOCHE1 115kV #1	B	L-1	-7.6%	-7.5%	-7.5%	-1.5%	-1.9%	-4.0%	Short Term Action Plan, Long Term Oro Loma-Mendota 70 to 115 kV Conversion (2010 Project)
Fresno-DV-07	MENDOTA 115	PANOCHET 115kV - PANOCHE1 115kV #1	B	L-1	-11.2%	-11.1%	-11.0%	-3.0%	-3.5%	-6.0%	Exchequer SPS and Mariposa UVLS
Fresno-DV-08	MADERAPR 115	PANOCHET 115kV - PANOCHE1 115kV #1	B	L-1	-8.2%	-8.1%	-8.1%	-1.7%	-2.1%	-4.4%	Exchequer SPS and Mariposa UVLS
Fresno-DV-09	MC SWAIN 70	EXCHEQUR 115kV - LE GRAND 115kV #1	B	L-1	-5.0%	-5.2%	-5.1%	-7.1%	-5.9%	-8.2%	Exchequer SPS and Mariposa UVLS
Fresno-DV-10	MARIPOS2 70	EXCHEQUR 115kV - LE GRAND 115kV #1	B	L-1	-8.0%	-8.3%	-8.4%	-10.3%	-9.2%	-11.9%	Exchequer SPS and Mariposa UVLS
Fresno-DV-11	MRCDFLLS 70	EXCHEQUR 115kV - LE GRAND 115kV #1	B	L-1	-5.0%	-5.2%	-5.1%	-7.0%	-5.9%	-8.2%	Exchequer SPS and Mariposa UVLS
Fresno-DV-12	EXCHEQUR 70	EXCHEQUR 115kV - LE GRAND 115kV #1	B	L-1	-7.8%	-8.1%	-8.1%	-10.0%	-8.9%	-11.5%	Exchequer SPS and Mariposa UVLS
Fresno-DV-13	BER VLLY 70	EXCHEQUR 115kV - LE GRAND 115kV #1	B	L-1	-7.8%	-8.2%	-8.2%	-10.1%	-9.0%	-11.6%	Exchequer SPS and Mariposa UVLS
Fresno-DV-14	SAXONCRK 70	EXCHEQUR 115kV - LE GRAND 115kV #1	B	L-1	-7.9%	-8.2%	-8.3%	-10.2%	-9.1%	-11.7%	Exchequer SPS and Mariposa UVLS
Fresno-DV-15	INDN FLT 70	EXCHEQUR 115kV - LE GRAND 115kV #1	B	L-1	-8.0%	-8.3%	-8.3%	-10.3%	-9.2%	-11.9%	Exchequer SPS and Mariposa UVLS
Fresno-DV-16	YOSEMITE 70	EXCHEQUR 115kV - LE GRAND 115kV #1	B	L-1	-8.0%	-8.3%	-8.4%	-10.3%	-9.2%	-11.9%	Short Term Action Plan, Long Term Oro Loma-Mendota 70 to 115 kV Conversion (2010 Project)
Fresno-DV-17	FIREBAGH 115	PANOCHET 115kV - PANOCHE1 115kV #1	B	L-1	-6.8%	-7.1%	-7.1%	-2.4%	-2.8%	-4.9%	Short Term Action Plan, Long Term Oro Loma-Mendota 70 to 115 kV Conversion (2010 Project)
		MENDOTA 70kV - MENDOTA 115kV #1	B	L-1	-12.5%	-12.3%	-12.2%	0.0%	0.2%	0.2%	Short Term Action Plan, Long Term Oro Loma-Mendota 70 to 115 kV Conversion (2010 Project)

Fresno-DV-18	TOMATAK 115	PANOCHET 115kV - PANOCHE1 115kV #1	B	L-1	-7.2%	-7.5%	-7.5%	-2.5%	-2.9%	-5.1%	Short Term Action Plan, Long Term Oro Loma-Mendota 70 to 115 kV Conversion (2010 Project)
		MENDOTA 70kV - MENDOTA 115kV #1	B	L-1	-13.3%	-13.1%	-13.0%	0.0%	0.2%	0.2%	Short Term Action Plan, Long Term Oro Loma-Mendota 70 to 115 kV Conversion (2010 Project)
Fresno-DV-19	MENDOTA 70	PANOCHET 115kV - PANOCHE1 115kV #1	B	L-1	-8.7%	-9.0%	-9.0%	-1.6%	-1.3%	-3.6%	Short Term Action Plan, Long Term Oro Loma-Mendota 70 to 115 kV Conversion (2010 Project)
		MENDOTA 70kV - MENDOTA 115kV #1	B	L-1	-16.3%	-16.2%	-16.0%	-0.8%	-0.3%	-0.1%	Fresnoww is inside the protection zone being cleared and will be dropped for this contingency.
Fresno-DV-20	FRESNOWW 70	KEARNEY 70kV - FRWWTAP 70kV #1	B	L-1	-5.5%	-7.6%	-7.6%	-7.9%	-6.8%	-7.6%	Install Reactive support
		KEARNEY 70kV - KEARNEY 230kV #2	B	L-1	-5.5%	-7.6%	-7.6%	-7.9%	-6.8%	-7.6%	
Fresno-DV-21	DINUBA 70	REEDLEY 70kV - DNUBAJCT 70kV #1	B	L-1	-6.9%	-5.1%	-5.8%	-5.9%	-6.2%	-7.9%	Install Reactive support
Fresno-DV-22	STAR_PAN 115	PANOCHE1 115kV - STAR_PAN 115kV #1	B	L-1	-5.1%	-4.7%	-4.9%	-5.0%	-4.7%	-4.5%	Star_Pan is inside the protection zone being cleared and will be dropped for this contingency
Fresno-DV-23	CALRENEW 70	WESTLAND 70kV - WESIX 70kV #1	B	L-1	-5.9%	-6.0%	-6.0%	-6.1%	-6.0%	-6.1%	Cal-Renew Solar is inside the protection zone being cleared and will be dropped for this contingency
		HELM 70kV - HELM 230kV #1	B	L-1	-5.9%	-6.0%	-6.0%	-6.1%	-6.0%	-6.1%	Cal-Renew Solar will be dropped for this contingency, Helms 230/70 kV transformer is operated radially during summer
Fresno-DV-24	GILLRAN 115	PANOCHET 115kV - PANOCHE1 115kV #1	B	L-1	-8.4%	-8.3%	-8.3%	-1.8%	-2.2%	-4.5%	Short Term Action Plan, Long Term Oro Loma-Mendota 70 to 115 kV Conversion (2010 Project)
Fresno-DV-25	STOREY 2 230	Borden - Gregg & Wilson - Gregg 230 kV Lines	C5	DCTL	-7.8%	-8.5%	-8.7%	-9.5%	-9.2%	-10.6%	Install Reactive support
Fresno-DV-26	BORDEN 230	Borden - Gregg & Wilson - Gregg 230 kV Lines	C5	DCTL	-8.3%	-9.0%	-9.2%	-10.1%	-9.7%	-11.2%	Install Reactive support
Fresno-DV-27	CHWCHLLA 115	Kerckhoff PH2 115kV Bus	C1	Bus	-3.6%	-3.8%	-3.8%	-4.1%	-4.4%	-11.3%	Install Reactive Support
Fresno-DV-28	CERTAN T 115	Kerckhoff PH2 115kV Bus	C1	Bus	-3.6%	-3.7%	-3.8%	-4.1%	-4.3%	-11.2%	Install Reactive Support
Fresno-DV-29	CERTTEED 115	Kerckhoff PH2 115kV Bus	C1	Bus	-3.4%	-3.6%	-3.6%	-3.9%	-4.2%	-11.2%	Install Reactive Support
Fresno-DV-30	CHWCGNJT 115	Kerckhoff PH2 115kV Bus	C1	Bus	-3.4%	-3.6%	-3.6%	-3.9%	-4.1%	-11.2%	Install Reactive Support
Fresno-DV-31	CHWCGN 115	Kerckhoff PH2 115kV Bus	C1	Bus	-3.3%	-3.4%	-3.5%	-3.7%	-4.0%	-11.2%	Install Reactive Support
Fresno-DV-32	SHARON 115	Kerckhoff PH2 115kV Bus	C1	Bus	-5.1%	-5.4%	-5.5%	-5.8%	-6.3%	-14.1%	Install Reactive Support
Fresno-DV-33	OAKHURST 115	Kerckhoff PH2 115kV Bus	C1	Bus	-12.5%	-13.1%	-13.4%	-15.4%	-16.8%	-29.4%	Install Reactive Support
Fresno-DV-34	CORSGOLD 115	Kerckhoff PH2 115kV Bus	C1	Bus	-12.4%	-13.0%	-13.3%	-14.7%	-16.0%	-28.3%	Install Reactive Support

Fresno-DV-35	ATWATER 115	Wilson 115kV CB 102	C2	Breaker	Not Solved	Not Solved	Not Solved	-11.0%	-10.9%	-12.3%	Install Reactive Support
Fresno-DV-36	CASTLE 115	Wilson 115kV CB 102	C2	Breaker	Not Solved	Not Solved	Not Solved	-10.2%	-10.1%	-11.4%	Install Reactive Support
Fresno-DV-37	JRWD GEN 115	Wilson 115kV CB 102	C2	Breaker	Not Solved	Not Solved	Not Solved	-11.0%	-10.9%	-12.4%	Install Reactive Support
Fresno-DV-38	JR WOOD 115	Wilson 115kV CB 102	C2					-11.0%	-10.9%	-12.4%	Install Reactive Support
Fresno-DV-39	LIVNGSTN 115	Wilson 115kV CB 102	C2	Breaker	Not Solved	Not Solved	Not Solved	-11.9%	-11.8%	-13.3%	Install Reactive Support
Fresno-DV-40	GALLO 115	Wilson 115kV CB 102	C2	Breaker	Not Solved	Not Solved	Not Solved	-11.9%	-11.8%	-13.4%	Install Reactive Support
Fresno-DV-41	CRESSEY 115	Wilson 115kV CB 102	C2	Breaker	Not Solved	Not Solved	Not Solved	-11.0%	-10.9%	-12.4%	Install Reactive Support
Fresno-DV-42	MERCED 115	Wilson 115kV CB 102	C2	Breaker	Not Solved	Not Solved	Not Solved	-13.4%	-13.5%	-15.0%	Install Reactive Support
Fresno-DV-43	MC CALL 115	McCall 230kV CB 202	C2	Breaker	-11.4%	-9.9%	-9.2%	-10.1%	-9.9%	Not Solved	Install Reactive Support
Fresno-DV-44	QUEBEC 115	Midway 115kV CB 392	C2	Breaker	-14.3%	-14.6%	-14.7%	-15.3%	-6.7%	-0.3%	Install Reactive Support
Fresno-DV-45	HERNDON 115	Herndon 230kV CB 202	C2	Breaker	-10.9%	-10.5%	-9.1%	-10.7%	-10.9%	Not Solved	Install Reactive Support
Fresno-DV-46	PNEDLE 115	Herndon 230kV CB 202	C2	Breaker	-11.1%	-10.7%	-9.4%	-11.0%	-11.2%	Not Solved	Install Reactive Support
Fresno-DV-47	BULLARD 115	Herndon 230kV CB 202	C2	Breaker	-11.2%	-10.8%	-9.4%	-11.1%	-11.2%	Not Solved	Install Reactive Support
Fresno-DV-48	CHLDHOSP 115	Herndon 230kV CB 202	C2	Breaker	-9.9%	-9.4%	-8.3%	-10.1%	-10.2%	Not Solved	Install Reactive Support
Fresno-DV-49	ALPAUGH 115	Midway 115kV CB 392	C2	Breaker	-14.2%	-14.5%	-14.6%	-15.2%	-6.7%	-0.3%	Install Reactive Support
Fresno-DV-50	BORDEN 230	WARNERVL 230kV - WILSON 230kV #1 _BORDEN 230kV - GREGG 230kV #1	C3	N-1-1	-9.3%	-9.6%	-9.8%	-9.8%	-10.6%	-13.2%	Install Reactive Support
Fresno-DV-51	STOREY 2 230	WARNERVL 230kV - WILSON 230kV #1 _BORDEN 230kV - GREGG 230kV #1	C3	N-1-1	-8.8%	-9.1%	-9.3%	-9.5%	-10.1%	-12.6%	Install Reactive Support
Fresno-DV-52	ATWATER 115	WILSON A 115kV - WILSON 230kV #1 _WILSON B 115kV - WILSON 230kV #2	C3	N-1-1	-17.1%	-18.4%	-18.4%	-19.3%	-2.2%	-3.2%	Short Term Action Plan, Long Term Wilson 115 kV Area Reinforcement (2010 Project)
Fresno-DV-53	EXCHEQUR 115	EXCHEQUR 115kV - LE GRAND 115kV #1 _MCSWAIN 9.11 Unit ID 1	C3	N-1-1	-12.0%	-12.4%	-12.6%	-12.9%	-13.5%	-16.9%	Exchequer SPS and Mariposa UVLS
Fresno-DV-54	FIREBAGH 115	NEWHALL 115kV - DAIRYLND 115kV #1 _PANOCHET 115kV - PANOCHET 115kV #1	C3	N-1-1	-28.2%	-27.6%	-27.5%	-27.2%	-4.1%	-3.7%	Short Term Action Plan, Long Term Oro Loma-Mendota 70 to 115 kV Conversion (2010 Project)
Fresno-DV-55	MENDOTA 115	NEWHALL 115kV - DAIRYLND 115kV #1 _PANOCHET 115kV - PANOCHET 115kV #1	C3	N-1-1	-37.7%	-36.8%	-36.6%	-36.0%	-5.3%	-4.8%	Short Term Action Plan, Long Term Oro Loma-Mendota 70 to 115 kV Conversion (2010 Project)
Fresno-DV-56	TOMATAK 115	NEWHALL 115kV - DAIRYLND 115kV #1 _PANOCHET 115kV - PANOCHET 115kV #1	C3	N-1-1	-29.8%	-29.2%	-29.1%	-28.7%	-4.3%	-3.9%	Short Term Action Plan, Long Term Oro Loma-Mendota 70 to 115 kV Conversion (2010 Project)
Fresno-DV-57	BER VLLY 70	EXCHEQUR 115kV - LE GRAND 115kV #1 _MCSWAIN 9.11 Unit ID 1	C3	N-1-1	-12.0%	-12.5%	-12.6%	-12.9%	-13.6%	-17.1%	Exchequer SPS and Mariposa UVLS
Fresno-DV-58	BIOLA 70	BORDEN 230kV - GREGG 230kV #1 _BIOLA 70kV - OLDKERN 70kV #1	C3	N-1-1	-7.3%	-9.7%	-9.5%	-11.1%	-9.3%	-13.2%	Borden-Gregg 230 kV Line Addition (New Project)

Fresno-DV-59	DOS PALS 70	LIVNGSTN 70kV - LVNGSTNT 70kV #1 _WRIGHT T 70kV - WRGHT PP 70kV #1	C3	N-1-1	-10.6%	-11.2%	-11.8%	-12.5%	-1.3%	-1.5%	Short Term Action Plan, Long Term Oro Loma 70 kV Area Reinforcement (2010 Project)
Fresno-DV-60	INDN FLT 70	EXCHEQUR 115kV - LE GRAND 115kV #1 _MARIPOS2 70kV - EXCHEQUR 70kV #1	C3	N-1-1	-13.0%	-13.4%	-13.7%	-14.0%	-14.8%	-19.3%	Exchequer SPS and Mariposa UVLS


Study Area: Fresno - Summer Off Peak (2012-2021)
Thermal Overload

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			ISO Proposed Mitigation
					2012	2016	2021	
Fres-OP-T-01	GATES-PANOCHÉ #1	Gates-Gregg 230 kV Gates-Mccall 230 kV	C5	DCTL	112.6%	108.2%	108.8%	Operational action plan/Congestion Management/Rerate
Fres-OP-T-02	GATES-PANOCHÉ #2	Gates-Gregg 230 kV Gates-Mccall 230 kV	C5	DCTL	112.6%	108.2%	108.8%	Operational action plan/Congestion Management/Rerate
Fres-OP-T-03	GATES-MCCALL - From Henrietta Tap to McCall	Gates-Panoche #1 and #2	C5	DCTL	101.7%	<100%	<100%	Short Term Action Plan for the interim/ Long Term Fresno Reliability Transmission project.
Fres-OP-T-04	CALFLAX -HURON JUNCTION 70 kV	Gates-Panoche #1 and #2	C5	DCTL	102.1%	92.9%	102.0%	Operational action plan/Congestion Management/Rerate
Fres-OP-T-05	McCall 230/115 Bank # 2	McCall 230 kV Bus 1	C1	Bus	94.0%	95.0%	101.0%	Operational action plan/Congestion Management/Rerate
Fres-OP-T-06	SCHINDLER-HURON-GATES - From 9/2 To 16/12	PANOCHÉ 230 KV BUS 1	C1	Bus	115.0%	101.0%	107.0%	Operational action plan/Congestion Management/Rerate

Study Area: Fresno - Summer Off Peak (2012-2021)**Voltage Summary**

ID	Substation	Worst Contingency	Category	Category Description	Min. Post Contingency Voltage (PU)			ISO Proposed Mitigation
					2012	2016	2021	
Fresno-OPK-V-01	EXCHEQUR 115	NA	A	Normal	1.0	1.0	1.1	Under review for possible exemptions
Fresno-OPK-V-02	OAKHURST 115	NA	A	Normal	1.0	1.0	1.1	Under review for possible exemptions
Fresno-OPK-V-03	CORSGOLD 115	NA	A	Normal	1.0	1.0	1.1	Under review for possible exemptions
Fresno-OPK-V-04	WILSON A 115	NA	A	Normal	1.0	1.1	1.1	Under review for possible exemptions
Fresno-OPK-V-05	WILSON B 115	NA	A	Normal	1.0	1.1	1.1	Under review for possible exemptions
Fresno-OPK-V-06	MERCED 115	NA	A	Normal	1.0	1.0	1.1	Under review for possible exemptions
Fresno-OPK-V-07	MERCED M 115	NA	A	Normal	1.0	1.1	1.1	Under review for possible exemptions
Fresno-OPK-V-08	WESIX 70	NA	A	Normal	1.1	1.1	1.1	Under review for possible exemptions
Fresno-OPK-V-09	WESTLAND 70	NA	A	Normal	1.1	1.1	1.1	Under review for possible exemptions
Fresno-OPK-V-10	CHEVPIPE 70	NA	A	Normal	1.1	1.1	1.1	Under review for possible exemptions
Fresno-OPK-V-11	SNTA NLA 70	NA	A	Normal	1.1	1.1	1.1	Under review for possible exemptions
Fresno-OPK-V-12	LOS BANS 70	NA	A	Normal	1.1	1.1	1.1	Under review for possible exemptions
Fresno-OPK-V-13	MC SWAIN 70	NA	A	Normal	1.0	1.0	1.1	Under review for possible exemptions
Fresno-OPK-V-14	MRCDFLLS 70	NA	A	Normal	1.0	1.0	1.1	Under review for possible exemptions
Fresno-OPK-V-15	EXCHEQUR 70	NA	A	Normal	1.0	1.0	1.1	Under review for possible exemptions
Fresno-OPK-V-16	BER VLLY 70	NA					1.1	Under review for possible exemptions
Fresno-OPK-V-17	SAXONCRK 70	NA	A	Normal	1.0	1.0	1.1	Under review for possible exemptions
Fresno-OPK-V-18	MADERA 70	NA	A	Normal	1.0	1.1	1.1	Under review for possible exemptions
Fresno-OPK-V-19	BORDEN 70	NA	A	Normal	1.0	1.1	1.1	Under review for possible exemptions
Fresno-OPK-V-20	MENDOTA 70	NA	A	Normal	1.1	1.1	1.1	Under review for possible exemptions
Fresno-OPK-V-21	BIOMASS 70	NA	A	Normal	1.1	1.1	1.1	Under review for possible exemptions
Fresno-OPK-V-22	WRGHT PP 70	NA	A	Normal	1.1	1.1	1.1	Under review for possible exemptions
Fresno-OPK-V-23	PCHCO PP 70	NA	A	Normal	1.1	1.0	1.1	Under review for possible exemptions
Fresno-OPK-V-24	INTL TUR 70	NA	A	Normal	1.1	1.0	1.1	Under review for possible exemptions
Fresno-OPK-V-25	KERCKHF1 115	NA	A	Normal	1.0	1.0	1.1	Under review for possible exemptions
Fresno-OPK-V-26	KERCKHF2 115	NA	A	Normal	1.0	1.0	1.1	Under review for possible exemptions
Fresno-OPK-V-27	BIOLA 70	NA	A	Normal	1.0	1.1	1.1	Under review for possible exemptions
Fresno-OPK-V-28	BOWLES 70	NA	A	Normal	1.0	1.1	1.1	Under review for possible exemptions

Fresno-OPK-V-29	SAN JOQN 70	NA	A	Normal	1.1	1.1	1.1	Under review for possible exemptions
Fresno-OPK-V-30	HELM 70	NA	A	Normal	1.1	1.1	1.1	Under review for possible exemptions
Fresno-OPK-V-31	KEARNEY 70	NA	A	Normal	1.1	1.1	1.1	Under review for possible exemptions
Fresno-OPK-V-32	OLDKERN 70	NA	A	Normal	1.1	1.1	1.1	Under review for possible exemptions
Fresno-OPK-V-33	FRESNOWW 70	NA	A	Normal	1.1	1.1	1.1	Under review for possible exemptions
Fresno-OPK-V-34	REEDLEY 70	NA	A	Normal	1.0	1.0	1.1	Under review for possible exemptions
Fresno-OPK-V-35	DNUBAEGY 70	NA	A	Normal	1.0	1.1	1.1	Under review for possible exemptions
Fresno-OPK-V-36	DINUBA 70	NA	A	Normal	1.0	1.1	1.1	Under review for possible exemptions
Fresno-OPK-V-37	OROSI 70	NA	A	Normal				
Fresno-OPK-V-38	CARUTHRS 70	NA	A	Normal	1.0	1.1	1.1	Under review for possible exemptions
Fresno-OPK-V-39	STROUD 70	NA	A	Normal	1.0	1.0	1.1	Under review for possible exemptions
Fresno-OPK-V-40	CALRENEW 70	NA	A	Normal	1.1	1.1	1.1	Under review for possible exemptions
Fresno-OPK-V-41	SHEPHERD 115	NA	A	Normal	Not Run	1.0	1.1	Under review for possible exemptions

Study Area: Fresno - Summer Off Peak (2012-2021)**Single Contingency Load Drop**

ID	Substation	Worst Contingency	Category	Category Description	Load Drop (MW)			ISO Proposed Mitigation
					2012	2016	2021	
Fres-Loaddrop-01	Helms 230	Gates-Gregg 230 kV	B	N-1	310	310	310	Reconductor/New Line
Fres-Loaddrop-02	Helms 230	Gates-McCall 230 kV	B	N-1	310	310	310	Reconductor/New Line
Fres-Loaddrop-03	Helms 230	Panoche-Helm 230 kV	B	N-1	310	310	310	Reconductor/New Line
Fres-Loaddrop-04	Helms 230	Panoche-Kearney 230 kV	B	N-1	310	310	310	Reconductor/New Line
Fres-Loaddrop-05	Helms 230	Gates 500/230 T/F # 11	B	N-1	310	310	310	Reconductor/New Line



Study Area: Central Coast - Summer Peak (2012-2021)

Thermal Overloads

ID	Overloaded Facility	Worst Contingency	Category	Category Descriptio	Loading (%)						ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2021	
CC-S-T-001	GRN VLY1 - MOSLND D 115 kV #1 Line	Moss Landing-Green Valley #2 115 kV Line	B	L-1	99.82%	101.38%	Not Rec	Not Rec	80.29%	86.48%	Rerate/Develop action plan
CC-S-T-002	GRN VLY2 - MOSLND D 115 kV #1 Line	Moss Landing-Green Valley #1 115 kV Line	B	L-1	99.80%	101.36%	N/A	N/A	N/A	N/A	Rerate/Develop action plan

ID	Overloaded Facility	Worst Contingency	Category	Category Descriptio	Loading (%)						ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2021	
CC-S-T-001	GRN VLY1 - ERTA JCT 115 kV #1 Line	Moss Landing-Green Valley 115 kV #1 and 2 Lines	C3	L-1-1	N/A	N/A	141.3%	143.1%	146.3%	168.6%	Install higher rating conductor as part of the 2014 Watsonville 115 kV Voltage Conversion Project/Upgrade limiting equipment
CC-S-T-002	WTSNVILLE - GRANT JT 115 kV #1 Line	Moss Landing-Green Valley 115 kV #1 and 2 Lines	C3	L-1-1	N/A	N/A	153.9%	155.8%	159.3%	183.8%	Install higher rating conductor as part of the 2014 Watsonville 115 kV Voltage Conversion Project/Upgrade limiting equipment
CC-S-T-003	BRIGTANO - GRANT JT 115 kV #1 Line	Moss Landing-Green Valley 115 kV #1 and 2 Lines	C3	L-1-1	N/A	N/A	158.8%	160.6%	164.0%	189.3%	Install higher rating conductor as part of the 2014 Watsonville 115 kV Voltage Conversion Project/Upgrade limiting equipment
CC-S-T-004	MOSS LANDING 115/230 kV #1 Bank	Moss Landing 230/115 kV Bank #10 and 8	C3	T-1-1	206.7%	213.2%	212.0%	215.3%	217.7%	234.9%	Mitigated by existing project to replace Moss Landing 115/230 kV Bank #1 & 2
CC-S-T-005	MOSS LANDING 115/230 kV #2 Bank	Moss Landing 230/115 kV Bank #10 and 8	C3	T-1-1	206.0%	213.0%	211.4%	214.5%	217.1%	234.2%	Mitigated by existing project to replace Moss Landing 115/230 kV Bank #1 & 2
CC-S-T-006	GRN VLY1 - MOSLND D 115 kV #2 Line	Moss Landing-Green Valley 115 kV #1 and Crazy Horse-Watsonville 115 kV Lines	C3	L-1-1	N/A	N/A	106.0%	107.3%	108.8%	117.6%	Upgrade limiting equipment/re-rate/Load drop
CC-S-T-007	GRN VLY1 - MOSLND D 115 kV #1 Line	Moss Landing-Green Valley 115 kV #2 and Crazy Horse-Watsonville 115 kV Lines	C3	L-1-1	N/A	N/A	106.0%	107.3%	108.8%	117.6%	Upgrade limiting equipment/re-rate/Load drop
CC-S-T-008	GRN VLY1 - MOSLND D 115 kV #1 Line	Moss Landing-Green Valley #2 115 kV Li_Paul Sweet Statcom	C3	N-1-1	106.0%	108.0%	Not Rec	80.6%	81.7%	88.5%	Develop action plan/Load drop/rerate
CC-S-T-009	GRN VLY2 - MOSLND D 115 kV #1 Line	Moss Landing-Green Valley #1 115 kV Li_Paul Sweet Statcom	C3	N-1-1	106.0%	108.0%	N/A	N/A	N/A	N/A	Develop action plan/Load drop/rerate
CC-S-T-010	MOSS LANDING 115/230 kV #10 Bank	Moss Landing 230/115 kV Bank #8 and 1	C3	T-1-1	112.4%	115.7%	115.6%	118.0%	119.1%	127.0%	Mitigated by existing project to replace Moss Landing 115/230 kV Bank #1 & 2

CC-S-T-011	MOSS LANDING 115/230 kV #8 Bank	Moss Landing 230/115 kV Bank #10 and 2	C3	T-1-1	112.0%	115.2%	115.1%	117.5%	118.6%	126.5%	Mitigated by existing project to replace Moss Landing 115/230 kV Bank #1 & 2
CC-S-T-012	CRZY_HRS - NTVD SW1 115 kV #1 Line	Crazy Horse-Soledad 115 kV Line and Moss Landing-Salinas #1 115 kV Lines	C3	L-1-1	N/A	N/A	116.2%	117.6%	119.2%	130.0%	Upgrade limiting equipment/Load drop
CC-S-T-013	CRZY_HRS - NTVD SW2 115 kV #1 Line	Moss Landing-Salinas 115 kV #1 and 2 Lines	C3	L-1-1	N/A	N/A	151.5%	153.5%	155.4%	168.7%	Upgrade limiting equipment/Load drop
CC-S-T-014	LGNTSSW1 - NTVD SW1 115 kV #1 Line	Moss Landing-Salinas 115 kV #1 and 2 Lines	C3	L-1-1	144.0%	144.2%	N/A	N/A	N/A	N/A	Develop action plan
CC-S-T-015	LGNTSSW2 - NTVD SW2 115 kV #1 Line	Moss Landing-Salinas 115 kV #1 and 2 Lines	C3	L-1-1	155.2%	160.0%	N/A	N/A	N/A	N/A	Develop action plan
CC-S-T-016	NTVD SW1 - SALINAS 115 kV #1 Line	Moss Landing-Salinas 115 kV #1 and 2 Lines	C3	L-1-1	109.6%	109.6%	116.1%	117.6%	118.9%	129.2%	Action plan until 2017 implemetation of Natividad project
CC-S-T-017	NTVD SW2 - SALINAS 115 kV #1 Line	Moss Landing-Salinas 115 kV #1 and 2 Lines	C3	L-1-1	119.4%	123.3%	116.1%	117.6%	118.9%	129.2%	Action plan until 2017 implemetation of Natividad project
CC-S-T-018	GRN VLY1 - MOSLND D 115 kV #1 Line	Moss Landing 115 kV Bus 2D	C1	Bus Out	101.3%	103.0%	84.7%	85.8%	86.9%	93.6%	
			C1	Bus Out	101.6%	103.4%	N/A	N/A	N/A	N/A	Rerate/Develop action plan/Load drop
CC-S-T-020	NTVD SW1 - SALINAS 115 kV #1 Line	Moss Landing 115 kV Bus 1D	C1	Bus Out	99.7%	108.5%	Not Rec	Not Rec	Not Rec	Not Rec	Rerate/Develop action plan/Load drop
CC-S-T-021	CSTRVLJ2 - DEL MNTE 115 kV #1 Line	Moss Landing 115 kV Bus 1E	C1	Bus Out	87.6%	91.8%	90.5%	94.2%	95.2%	100.5%	Rerate/Develop action plan/Load drop
CC-S-T-022	MOSS LANDING 115/230 kV #10 Bank	Moss Landing 115 kV Bus 1E	C1	Bus Out	88.4%	91.1%	90.9%	92.8%	93.7%	100.1%	Mitigated by existing project to replace Moss Landing 115/230 kV Bank #1 & 2
CC-S-T-023	MOSS LANDING 115/230 kV #2 Bank	Moss Landing 115 kV Bus 2E	C1	Bus Out	88.3%	91.2%	90.9%	92.8%	93.7%	100.0%	Mitigated by existing project to replace Moss Landing 115/230 kV Bank #1 & 2
CC-S-T-024	MOSS LANDING 115/230 kV #1 Bank	Moss Landing 115 kV Bus 1E	C1	Bus Out	89.3%	91.5%	91.8%	93.8%	94.6%	101.0%	Mitigated by existing project to replace Moss Landing 115/230 kV Bank #1 & 2
CC-S-T-025	LGNTSSW1 - NTVD SW1 115 kV #1 Line	Moss Landing - Salinas #1 and #2 115 kV Lines	C5	DCTL	144.0%	144.2%	N/A	N/A	N/A	N/A	Develop action plan/Load drop
CC-S-T-026	LGNTSSW2 - NTVD SW2 115 kV #1 Line	Moss Landing - Salinas #1 and #2 115 kV Lines	C5	DCTL	155.2%	160.0%	N/A	N/A	N/A	N/A	Develop action plan/Load drop
CC-S-T-027	NTVD SW2 - SALINAS 115 kV #1 Line	Moss Landing - Salinas #1 and #2 115 kV Lines	C5	DCTL	119.4%	123.3%	116.1%	117.6%	119.0%	129.2%	Develop action plan until Natividad Sub Project is completed in 2017
CC-S-T-028	NTVD SW1 - SALINAS 115 kV #1 Line	Moss Landing - Salinas #1 and #2 115 kV Lines	C5	DCTL	109.6%	109.6%	116.1%	117.6%	119.0%	129.2%	Develop action plan until Natividad Sub Project is completed in 2017
CC-S-T-029	GRN VLY1 - ERTA JCT 115 kV #1 Line	Moss Landing - Green Valley #1 and #2 115 kV Lines	C5	DCTL	N/A	N/A	141.3%	Not Rec	Not Rec	Not Rec	Install higher rating conductor as part of the 2014 Watsonville 115 kV Voltage Conversion Project/Upgrade limiting equipment
CC-S-T-030	CIC JCT - ERTA JCT 115 kV #1 Line	Moss Landing - Green Valley #1 and #2 115 kV Lines	C5	DCTL	N/A	N/A	142.4%	Not Rec	Not Rec	Not Rec	Install higher rating conductor as part of the 2014 Watsonville 115 kV Voltage Conversion Project/Upgrade limiting equipment

CC-S-T-031	CIC JCT - AGRILINK 115 kV #1 Line	Moss Landing - Green Valley #1 and #2 115 kV Lines	C5	DCTL	N/A	N/A	142.4%	Not Rec	Not Rec	Not Rec	Install higher rating conductor as part of the 2014 Watsonville 115 kV Voltage Conversion Project/Upgrade limiting equipment
CC-S-T-032	WTSNVLLE - GRANT JT 115 kV #1 Line	Moss Landing - Green Valley #1 and #2 115 kV Lines	C5	DCTL	N/A	N/A	153.9%	Not Rec	Not Rec	Not Rec	Install higher rating conductor as part of the 2014 Watsonville 115 kV Voltage Conversion Project/Upgrade limiting equipment
CC-S-T-033	WTSNVLLE - AGRILINK 115 kV #1 Line	Moss Landing - Green Valley #1 and #2 115 kV Lines	C5	DCTL	N/A	N/A	142.6%	Not Rec	Not Rec	Not Rec	Install higher rating conductor as part of the 2014 Watsonville 115 kV Voltage Conversion Project/Upgrade limiting equipment
CC-S-T-034	BRIGTANO - GRANT JT 115 kV #1 Line	Moss Landing - Green Valley #1 and #2 115 kV Lines	C5	DCTL	N/A	N/A	158.7%	Not Rec	Not Rec	Not Rec	Install higher rating conductor as part of the 2014 Watsonville 115 kV Voltage Conversion Project/Upgrade limiting equipment
CC-S-T-035	CRZY_HRS - NTVD SW2 115 kV #1 Line	Moss Landing - Salinas #1 and #2 115 kV Lines	C5	DCTL	N/A	N/A	151.5%	153.5%	155.4%	168.8%	Develop action plan until Natividad Sub Project is completed in 2017
CC-S-T-036	CRZY_HRS - NTVD SW1 115 kV #1 Line	Moss Landing - Salinas #1 and #2 115 kV Lines	C5	DCTL	N/A	N/A	151.5%	153.5%	155.4%	168.8%	Develop action plan until Natividad Sub Project is completed in 2017
CC-S-T-037	CRZY_HRS - BRIGTANO 115 kV #1 Line	Moss Landing - Green Valley #1 and #2 115 kV Lines	C5	DCTL	N/A	N/A	160.0%	Not Rec	Not Rec	Not Rec	Install higher rating conductor as part of the 2014 Watsonville 115 kV Voltage Conversion Project/Upgrade limiting equipment

Study Area: Central Coast - Summer Peak (2012-2021)

Low Voltage

ID	Overloaded Facility	Worst Contingency	Category	Category Descriptio	Post Contingency Voltage (p.u.)						ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2021	
CC-S-LV-001	GREN VLY 60 kV	Green Valley 115/60 Bank #1	B	T-1	0.86	0.85	N/A	N/A	N/A	N/A	Develop action plan/Existing Watsonville UVLS will activate
CC-S-LV-002	ERTA 60 kV	Green Valley 115/60 Bank #1	B	T-1	0.86	0.85	N/A	N/A	N/A	N/A	Develop action plan/Existing Watsonville UVLS will activate
CC-S-LV-003	WTSNVLLE 60 kV	Green Valley 115/60 Bank #1	B	T-1	0.86	0.85	N/A	N/A	N/A	N/A	Develop action plan/Existing Watsonville UVLS will activate
CC-S-LV-004	GRANT RK 60 kV	Green Valley 115/60 Bank #1	B	T-1	0.88	0.87	N/A	N/A	N/A	N/A	Develop action plan/Existing Watsonville UVLS will activate
CC-S-LV-005	AGRILINK 60 kV	Green Valley 115/60 Bank #1	B	T-1	0.86	0.85	N/A	N/A	N/A	N/A	Develop action plan/Existing Watsonville UVLS will activate
CC-S-LV-006	BRIGTANO 60 kV	Green Valley-Watsonville 60 kV Line	B	L-1	0.90	0.89	N/A	N/A	N/A	N/A	Develop action plan/Existing Watsonville UVLS will activate

ID	Overloaded Facility	Worst Contingency	Category	Category Descriptio	Post Contingency Voltage (p.u.)						ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2021	
CC-S-LV-007	CMP EVRS 115 kV	Moss Landing - Green Valley #1 and #2 115 kV Lines	C3	L-1-1	Not Solved	Not Solved	0.93	0.94	0.92	0.85	Develop action plan/Load drop
CC-S-LV-008	PAUL SWT 115 kV	Moss Landing - Green Valley #1 and #2 115 kV Lines	C3	L-1-1	Not Solved	Not Solved	0.93				
CC-S-LV-009	ROB ROY 115 kV	Moss Landing - Green Valley #1 and #2 115 kV Lines	C3	L-1-1	Not Solved	Not Solved	0.92	0.93	0.91	0.84	Develop action plan/Load drop
CC-S-LV-010	GRN VLY1 115 kV	Moss Landing - Green Valley #1 and #2 115 kV Lines	C3	L-1-1	Not Solved	Not Solved	0.92	0.92	0.91	0.84	Develop action plan/Load drop
CC-S-LV-011	ERTA 115 kV	Moss Landing - Green Valley #1 and #2 115 kV Lines	C3	L-1-1	N/A	N/A	0.92	0.92	0.91	0.84	Develop action plan/Load drop
CC-S-LV-012	AGRILINK 115 kV	Moss Landing - Green Valley #1 and #2 115 kV Lines	C3	L-1-1	N/A	N/A	0.92	0.92	0.91	0.84	Develop action plan/Load drop
CC-S-LV-013	WTSNVLLE 115 kV	Moss Landing - Green Valley #1 and #2 115 kV Lines	C3	L-1-1	N/A	N/A	0.92	0.92	0.91	0.84	Develop action plan/Load drop
CC-S-LV-014	GRANT RK 115 kV	Moss Landing - Green Valley #1 and #2 115 kV Lines	C3	L-1-1	N/A	N/A	0.94	0.94	0.93	0.88	Develop action plan/Load drop
CC-S-LV-015	BRIGTANO 115 kV	Moss Landing - Green Valley #1 and #2 115 kV Lines	C3	L-1-1	N/A	N/A	0.94	0.94	0.93	0.89	Develop action plan/Load drop
CC-S-LV-016	GREN VLY 60 kV	Moss Landing-Salinas #1 115 kV Line and Green Valley 115/60 Bank #1	C3	L-1/T-1	0.84	0.84	N/A	N/A	N/A	N/A	Existing Watsonville UVLS will activate
CC-S-LV-017	ERTA 60 kV	Moss Landing-Salinas #1 115 kV Line and Green Valley 115/60 Bank #1	C3	L-1/T-1	0.84	0.84	N/A	N/A	N/A	N/A	Existing Watsonville UVLS will activate
CC-S-LV-018	AGRILINK 60 kV	Moss Landing-Salinas #1 115 kV Line and Green Valley 115/60 Bank #1	C3	L-1/T-1	0.84	0.84	N/A	N/A	N/A	N/A	Existing Watsonville UVLS will activate
CC-S-LV-019	WTSNVLLE 60 kV	Moss Landing-Salinas #1 115 kV Line and Green Valley 115/60 Bank #1	C3	L-1/T-1	0.84	0.84	N/A	N/A	N/A	N/A	Existing Watsonville UVLS will activate
CC-S-LV-020	GRANT RK 60 kV	Moss Landing-Salinas #1 115 kV Line and Green Valley 115/60 Bank #1	C3	L-1/T-1	0.86	0.86	N/A	N/A	N/A	N/A	Existing Watsonville UVLS will activate

CC-S-LV-021	BRIGTANO 60 kV	Moss Landing-Salinas #1 115 kV Line and Green Valley 115/60 Bank #1	C3	L-1/T-1	0.87	0.87	N/A	N/A	N/A	N/A	Existing Watsonville UVLS will activate
CC-S-LV-022	AGRILINK 60 kV	Moss Landing - Green Valley #1 and #2 115 kV Lines	C5	DCTL	0.86	0.86	N/A	N/A	N/A	N/A	Existing Watsonville UVLS will activate
CC-S-LV-023	BRIGTANO 60 kV	Moss Landing - Green Valley #1 and #2 115 kV Lines	C5	DCTL	0.89	0.89	N/A	N/A	N/A	N/A	Existing Watsonville UVLS will activate
CC-S-LV-024	ERTA 60 kV	Moss Landing - Green Valley #1 and #2 115 kV Lines	C5	DCTL	0.86	0.86	N/A	N/A	N/A	N/A	Existing Watsonville UVLS will activate
CC-S-LV-025	GRANT RK 60 kV	Moss Landing - Green Valley #1 and #2 115 kV Lines	C5	DCTL	0.88	0.88	N/A	N/A	N/A	N/A	Existing Watsonville UVLS will activate
CC-S-LV-026	GREN VLY 60 kV	Moss Landing - Green Valley #1 and #2 115 kV Lines	C5	DCTL	0.86	0.86	N/A	N/A	N/A	N/A	Existing Watsonville UVLS will activate
CC-S-LV-027	WTSNVLL 60 kV	Moss Landing - Green Valley #1 and #2 115 kV Lines	C5	DCTL	0.86	0.86	N/A	N/A	N/A	N/A	Existing Watsonville UVLS will activate

Study Area: **Central Coast - Summer Peak (2012-2021)**

Voltage Deviations

ID	Overloaded Facility	Worst Contingency	Category	Category Descriptio	Post Contingency Voltage Deviation (%)						ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2021	
CC-S-VD-001	CMP EVRS 115 kV	Paul Sweet Statcom	B	N-1	-4.96%	-5.27%	-1.65%	-1.67%	-2.17%	-2.86%	Develop action plan
CC-S-VD-002	PAUL SWT 115 kV	Paul Sweet Statcom	B	N-1	-5.55%	-5.88%	-2.10%	-2.13%	-2.43%	-3.19%	Develop action plan
CC-S-VD-003	GREN VLY 60 kV	Green Valley 115/60 Bank #1	B	T-1	-18.17%	-18.47%	N/A	N/A	N/A	N/A	Develop action plan/Existing Watsonville UVLS will activate
CC-S-VD-004	ERTA 60 kV	Green Valley 115/60 Bank #1	B	T-1	-17.56%	-17.85%	N/A	N/A	N/A	N/A	Develop action plan/Existing Watsonville UVLS will activate
CC-S-VD-006	WTSNVLLE 60 kV	Green Valley 115/60 Bank #1	B	T-1	-16.49%	-16.77%	N/A	N/A	N/A	N/A	Develop action plan/Existing Watsonville UVLS will activate
CC-S-VD-008	GRANT RK 60 kV	Green Valley 115/60 Bank #1	B	T-1	-11.54%	-11.75%	N/A	N/A	N/A	N/A	Develop action plan/Existing Watsonville UVLS will activate
CC-S-VD-009	AGRILINK 60 kV	Green Valley 115/60 Bank #1	B	T-1	-16.66%	-16.94%	N/A	N/A	N/A	N/A	Develop action plan/Existing Watsonville UVLS will activate
CC-S-VD-010	BRIGHTANO 60 kV	Green Valley-Watsonville 60 kV Line	B	L-1	-10.24%	-10.41%	N/A	N/A	N/A	N/A	Develop action plan/Existing Watsonville UVLS will activate

ID	Overloaded Facility	Worst Contingency	Category	Category Descriptio	Post Contingency Voltage Deviation (%)						ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2021	
CC-S-VD-011	CMP EVRS 115 kV	Moss Landing-Green Valley #1 115 kV Li_Paul Sweet Statcom	C3	N-1-1	-10.6%	-11.1%	-4.1%	-4.2%	-4.7%	-5.8%	Develop actionplan/Load drop
CC-S-VD-012	CMP EVRS 115 kV	Moss Landing-Green Valley #1 115 kV Li_Moss Landing-Green Valley #2 115 kV Line	C3	L-1-1	Not Solved	Not Solved	-9.5%	-8.9%	-10.3%	-17.7%	Develop actionplan/Load drop
CC-S-VD-013	PAUL SWT 115 kV	Moss Landing-Green Valley #1 115 kV Li_Paul Sweet Statcom	C3	N-1-1	-11.2%	-11.7%	-4.5%	-4.6%	-5.0%	-6.1%	Develop actionplan/Load drop
CC-S-VD-014	PAUL SWT 115 kV	Moss Landing-Green Valley #1 115 kV Li_Moss Landing-Green Valley #2 115 kV Line	C3	L-1-1	Not Solved	Not Solved	-9.4%	-8.7%	-10.0%	-17.4%	Develop actionplan/Load drop
CC-S-VD-015	ROB ROY 115 kV	Moss Landing-Green Valley #1 115 kV Li_Paul Sweet Statcom	C3	N-1-1	-9.6%	-10.2%	-3.7%	-3.8%	-4.1%	-5.0%	Develop actionplan/Load drop
CC-S-VD-016	ROB ROY 115 kV	Moss Landing-Green Valley #1 115 kV Li_Moss Landing-Green Valley #2 115 kV Line	C3	L-1-1	Not Solved	Not Solved	-10.2%	-9.7%	-10.8%	-17.9%	Develop actionplan/Load drop
CC-S-VD-017	ERTA 115 kV	Moss Landing-Green Valley #1 115 kV Li_Moss Landing-Green Valley #2 115 kV Line	C3	L-1-1	N/A	N/A	-10.5%	-10.0%	-11.1%	-17.8%	Develop actionplan/Load drop
CC-S-VD-018	AGRILINK 115 kV	Moss Landing-Green Valley #1 115 kV Li_Moss Landing-Green Valley #2 115 kV Line	C3	L-1-1	N/A	N/A	-10.3%	-9.9%	-10.9%	-17.4%	Develop actionplan/Load drop
CC-S-VD-019	WTSNVLLE 115 kV	Moss Landing-Green Valley #1 115 kV Li_Moss Landing-Green Valley #2 115 kV Line	C3	L-1-1	N/A	N/A	-10.2%	-9.9%	-10.9%	-17.2%	Develop actionplan/Load drop
CC-S-VD-020	GRANT RK 115 kV	Moss Landing-Green Valley #1 115 kV Li_Moss Landing-Green Valley #2 115 kV Line	C3	L-1-1	N/A	N/A	-8.1%	-7.8%	-8.6%	-13.1%	Develop actionplan/Load drop
CC-S-VD-021	BRIGHTANO 115 kV	Moss Landing-Green Valley #1 115 kV Li_Moss Landing-Green Valley #2 115 kV Line	C3	L-1-1	N/A	N/A	-7.9%	-7.7%	-8.4%	-12.7%	Develop actionplan/Load drop
CC-S-VD-022	GREN VLY 60 kV	Moss Landing-Salinas #1 115 kV Line _Green Valley 115/60 Bank #1	C3	L-1/T-1	-19.5%	-19.9%	N/A	N/A	N/A	N/A	Develop actionplan/Load drop
CC-S-VD-023	ERTA 60 kV	Moss Landing-Salinas #1 115 kV Line and Green Valley 115/60 Bank #1	C3	L-1/T-1	-18.9%	-19.3%					Develop actionplan/Load drop

CC-S-VD-024	AGRILINK 60 kV	Moss Landing-Salinas #1 115 kV Line and Green Valley 115/60 Bank #1	C3	L-1/T-1	-18.0%	-18.4%	N/A	N/A	N/A	N/A	Develop actionplan/Load drop
CC-S-VD-025	WTSNVILLE 60 kV	Moss Landing-Salinas #1 115 kV Line and Green Valley 115/60 Bank #1	C3	L-1/T-1	-17.8%	-18.2%	N/A	N/A	N/A	N/A	Develop actionplan/Load drop
CC-S-VD-026	GRANT RK 60 kV	Moss Landing-Salinas #1 115 kV Line and Green Valley 115/60 Bank #1	C3	L-1/T-1	-12.9%	-13.2%	N/A	N/A	N/A	N/A	Develop actionplan/Load drop
CC-S-VD-027	BRIGTANO 60 kV	Moss Landing-Salinas #1 115 kV Line and Green Valley 115/60 Bank #1	C3	L-1/T-1	-12.6%	-12.9%	N/A	N/A	N/A	N/A	Develop actionplan/Load drop
CC-S-VD-028	BRIGTANO 60 kV	Moss Landing - Green Valley #1 and #2 115 kV Lines	C5	DCTL	-11.1%	-11.1%	N/A	N/A	N/A	N/A	Develop actionplan/Load drop
CC-S-VD-029	AGRILINK 60 kV	Moss Landing - Green Valley #1 and #2 115 kV Lines	C5	DCTL	-16.4%	-16.5%	N/A	N/A	N/A	N/A	Develop actionplan/Load drop
CC-S-VD-030	GRANT RK 60 kV	Moss Landing - Green Valley #1 and #2 115 kV Lines	C5	DCTL	-11.3%	-11.3%	N/A	N/A	N/A	N/A	Develop actionplan/Load drop
CC-S-VD-031	WTSNVILLE 60 kV	Moss Landing - Green Valley #1 and #2 115 kV Lines	C5	DCTL	-16.3%	-16.3%	N/A	N/A	N/A	N/A	Develop actionplan/Load drop
CC-S-VD-032	ERTA 60 kV	Moss Landing - Green Valley #1 and #2 115 kV Lines	C5	DCTL	-17.3%	-17.4%	N/A	N/A	N/A	N/A	Develop actionplan/Load drop
CC-S-VD-033	GREN VLY 60 kV	Moss Landing - Green Valley #1 and #2 115 kV Lines	C5	DCTL	-17.9%	-18.0%	N/A	N/A	N/A	N/A	Develop actionplan/Load drop
CC-S-VD-034	BRIGTANO 115 kV	Moss Landing - Green Valley #1 and #2 115 kV Lines	C5	DCTL	N/A	N/A	-7.9%	0.0%	-0.1%	-0.2%	Develop actionplan/Load drop
CC-S-VD-035	AGRILINK 115 kV	Moss Landing - Green Valley #1 and #2 115 kV Lines	C5	DCTL	N/A	N/A	-10.3%	-0.2%	-0.3%	-0.5%	Develop actionplan/Load drop
CC-S-VD-036	GRANT RK 115 kV	Moss Landing - Green Valley #1 and #2 115 kV Lines	C5	DCTL	N/A	N/A	-8.0%	0.0%	-0.1%	-0.2%	Develop actionplan/Load drop
CC-S-VD-037	WTSNVILLE 115 kV	Moss Landing - Green Valley #1 and #2 115 kV Lines	C5	DCTL	N/A	N/A	-10.2%	-0.2%	-0.3%	-0.5%	Develop actionplan/Load drop
CC-S-VD-038	ERTA 115 kV	Moss Landing - Green Valley #1 and #2 115 kV Lines	C5	DCTL	N/A	N/A	-10.4%	-0.3%	-0.4%	-0.6%	Develop actionplan/Load drop
CC-S-VD-039	ROB ROY 115 kV	Moss Landing - Green Valley #1 and #2 115 kV Lines	C5	DCTL	0.6%	0.7%	-10.2%	-0.3%	-0.4%	-0.6%	Develop actionplan/Load drop
CC-S-VD-040	PAUL SWT 115 kV	Moss Landing - Green Valley #1 and #2 115 kV Lines	C5	DCTL	0.0%	0.0%	-9.4%	0.0%	0.0%	0.0%	Develop actionplan/Load drop
CC-S-VD-041	CMP EVRS 115 kV	Moss Landing - Green Valley #1 and #2 115 kV Lines	C5	DCTL	0.5%	0.5%	-9.5%	0.1%	-0.1%	0.0%	Develop actionplan/Load drop
CC-S-VD-042	GRN VLY1 115 kV	Moss Landing - Green Valley #1 and #2 115 kV Lines	C5	DCTL	-0.2%					-0.6%	Develop actionplan/Load drop



Study Area: Central Coast - Winter Peak (2012-2021)

Thermal Overloads

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)					ISO Proposed Mitigation	
					2012	2013	2014	2015	2016		2021
CC-W-T-001	GRN VLY1 - ERTA JCT 115 kV #1 Line	Moss Landing-Green Valley 115 #1 and 2 kV Lines	C3	L-1-1	N/A	N/A	117.48%	119.38%	121.54%	Not Solved	Install higher rating conductor as part of the 2014 Watsonville Voltage Conversion Project/upgrade limiting equipment
CC-W-T-002	CIC JCT - ERTA JCT 115 kV #1 Line	Moss Landing-Green Valley 115 #1 and 2 kV Lines	C3	L-1-1	N/A	N/A	118.36%	120.28%	122.45%	Not Solved	Install higher rating conductor as part of the 2014 Watsonville Voltage Conversion Project/upgrade limiting equipment
CC-W-T-003	CIC JCT - AGRILINK 115 kV #1 Line	Moss Landing-Green Valley 115 #1 and 2 kV Lines	C3	L-1-1	N/A	N/A	118.36%	120.28%	122.45%	Not Solved	Install higher rating conductor as part of the 2014 Watsonville Voltage Conversion Project/upgrade limiting equipment
CC-W-T-004	WTSNVLE - GRANT JT 115 kV #1 Line	Moss Landing-Green Valley 115 #1 and 2 kV Lines	C3	L-1-1	N/A	N/A	128.16%	130.27%	132.62%	Not Solved	Install higher rating conductor as part of the 2014 Watsonville Voltage Conversion Project/upgrade limiting equipment
CC-W-T-005	BRIGTANO - GRANT JT 115 kV #1 Line	Moss Landing-Green Valley 115 #1 and 2 kV Lines	C3	L-1-1	N/A	N/A	131.77%	133.92%	136.31%	Not Solved	Install higher rating conductor as part of the 2014 Watsonville Voltage Conversion Project/upgrade limiting equipment
CC-W-T-006	CRZY_HRS - BRIGTANO 115 kV #1 Line	Moss Landing-Green Valley 115 #1 and 2 kV Lines	C3	L-1-1	N/A	N/A	132.78%	134.95%	137.36%	Not Solved	Install higher rating conductor as part of the 2014 Watsonville Voltage Conversion Project/upgrade limiting equipment
CC-W-T-007	GRN VLY1 - MOSLND D 115 kV #1 Line	Moss Landing-Green Valley 115 kV #2 and Crazy Horse-Watsonville 115 kV Lines	C3	L-1-1	N/A	N/A	98.38%	98.85%	99.78%	107.70%	Load drop/erate/ upgrade limiting equipment
CC-W-T-008	GRN VLY1 - MOSLND D 115 kV #1 Line	Moss Landing-Green Valley #2 115 kV Line and Paul Sweet Statcom	C3	N-1-1	98.70%	100.49%	Not Rec	Not Rec	Not Rec	Not Rec	Rerate/ upgrate limiting equipment/develop action plan
CC-W-T-009	GRN VLY2 - MOSLND D 115 kV #1 Line	Moss Landing-Green Valley #1 115 kV Line and Paul Sweet Statcom					N/A	N/A	N/A	N/A	Rerate/ upgrate limiting equipment/develop action plan
CC-W-T-010	GRN VLY1 - MOSLND D 115 kV #2 Line	Moss Landing-Green Valley 115 kV #1 and Crazy Horse-Watsonville 115 kV Lines	C3	L-1-1	N/A	N/A	98.38%	98.85%	99.78%	107.70%	Rerate/ upgrate limiting equipment/develop action plan
CC-W-T-011	MOSS LANDING 115/230 kV #1 Bank	Moss Landing 230/115 kV Bank #10 and 8	C3	T-1-1	178.74%	184.03%	182.58%	185.25%	187.00%	200.01%	Mitigated by existing project to replace Moss Landing 115/230 kV Bank #1 & 2
CC-W-T-012	MOSS LANDING 115/230 kV #2 Bank	Moss Landing 230/115 kV Bank #10 and 8	C3	T-1-1	178.15%	183.02%	181.93%	184.51%	186.28%	199.21%	Mitigated by existing project to replace Moss Landing 115/230 kV Bank #1 & 2
CC-W-T-013	MOSS LANDING 115/230 kV #8 Bank	Moss Landing 230/115 kV Bank #10 and 1	C3	T-1-1	97.42%	100.07%	99.74%	101.77%	102.62%	108.89%	Mitigated by existing project to replace Moss Landing 115/230 kV Bank #1 & 2
CC-W-T-014	MOSS LANDING 115/230 kV #10 Bank	Moss Landing 230/115 kV Bank #8 and 1	C3	T-1-1	97.91%	100.48%	100.23%	102.23%	103.09%	109.38%	Mitigated by existing project to replace Moss Landing 115/230 kV Bank #1 & 2

CC-W-T-015	GRN VLY1 - ERTA JCT 115kV #1 Line	Moss Landing - Green Valley #1 and #2 115 kV Lines	C5	DCTL	N/A	N/A	117.47%	Not Rec	Not Rec	Not Rec	Install higher rating conductor as part of the 2014 Watsonville Voltage Conversion Project/upgrade limiting equipment
CC-W-T-016	CIC JCT - ERTA JCT 115kV #1 Line	Moss Landing - Green Valley #1 and #2 115 kV Lines	C5	DCTL	N/A	N/A	118.36%	Not Rec	Not Rec	Not Rec	Install higher rating conductor as part of the 2014 Watsonville Voltage Conversion Project/upgrade limiting equipment
CC-W-T-017	CIC JCT- AGRILINK 115kV #1 Line	Moss Landing - Green Valley #1 and #2 115 kV Lines	C5	DCTL	N/A	N/A	118.36%	Not Rec	Not Rec	Not Rec	Install higher rating conductor as part of the 2014 Watsonville Voltage Conversion Project/upgrade limiting equipment
CC-W-T-018	WTSNVLE - GRANT JT 115kV #1 Line	Moss Landing - Green Valley #1 and #2 115 kV Lines	C5	DCTL	N/A	N/A	128.16%	Not Rec	Not Rec	Not Rec	Install higher rating conductor as part of the 2014 Watsonville Voltage Conversion Project/upgrade limiting equipment
CC-W-T-019	WTSNVLE - AGRILINK 115kV #1 Line	Moss Landing - Green Valley #1 and #2 115 kV Lines	C5	DCTL	N/A	N/A	118.44%	Not Rec	Not Rec	Not Rec	Install higher rating conductor as part of the 2014 Watsonville Voltage Conversion Project/upgrade limiting equipment
CC-W-T-020	BRIGTANO - GRANT JT 115kV #1 Line	Moss Landing - Green Valley #1 and #2 115 kV Lines	C5	DCTL	N/A	N/A	131.77%	Not Rec	Not Rec	Not Rec	Install higher rating conductor as part of the 2014 Watsonville Voltage Conversion Project/upgrade limiting equipment
CC-W-T-021	CRZY_HRS - BRIGTANO 115kV #1 Line	Moss Landing - Green Valley #1 and #2 115 kV Lines	C5	DCTL	N/A	N/A	132.77%	Not Rec	Not Rec	Not Rec	Install higher rating conductor as part of the 2014 Watsonville Voltage Conversion Project/upgrade limiting equipment
CC-W-T-022	Moss Landing - Green Valley #1 and Paul Sw	Moss Landing-Green Valley # 1 and Paul Sw	C3	N-1-1	98.00%	100.00%	N/A	N/A	N/A	N/A	Rerate/Develop action plan

Study Area: **Central Coast - Winter Peak (2012-2021)**

Low Voltage

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Post Contingency Voltage (p.u.)						ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2021	
CC-W-LV-001	AGRILINK 60 kV	Green Valley 115/60 Bank #1	B	T-1	0.89	0.88	N/A	N/A	N/A	N/A	Action plan/Existing Watsonville UVLS will activate
CC-W-LV-002	WTSNVILLE 60 kV	Green Valley 115/60 Bank #1	B	T-1	0.89	0.88	N/A	N/A	N/A	N/A	Action plan/Existing Watsonville UVLS will activate
CC-W-LV-003	ERTA 60 kV	Green Valley 115/60 Bank #1	B	T-1	0.89	0.88	N/A	N/A			
	GRN VLY 60 kV	Green Valley 115/60 Bank #1	B	T-1	0.89	0.88	N/A	N/A	N/A	N/A	Action plan/Existing Watsonville UVLS will activate

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Contingency Voltage (p.u.)						ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2021	
CC-W-LV-005	CMP EVRS 115 kV	Moss Landing-Green Valley 115 kV #1 and 2 Lines	C3	L-1-1	Not Solved	Not Solved	0.89	0.89	0.88	Not Solved	Develop action plan/Load drop
CC-W-LV-006	PAUL SWT 115 kV	Moss Landing-Green Valley 115 kV #1 and 2 Lines	C3	L-1-1	Not Solved	Not Solved	0.90	0.89	0.88	Not Solved	Develop action plan/Load drop
CC-W-LV-007	ROB ROY 115 kV	Moss Landing-Green Valley 115 kV #1 and 2 Lines	C3	L-1-1	Not Solved	Not Solved	0.89	0.88	0.87	Not Solved	Develop action plan/Load drop
CC-W-LV-008	GRN VLY1 115 kV	Moss Landing-Green Valley 115 kV #1 and 2 Lines	C3	L-1-1	Not Solved	Not Solved	0.89	0.88	0.87	Not Solved	Develop action plan/Load drop
CC-W-LV-009	ERTA 115 kV	Moss Landing-Green Valley 115 kV #1 and 2 Lines	C3	L-1-1	N/A	N/A	0.89	0.88	0.87	Not Solved	Develop action plan/Load drop
CC-W-LV-010	AGRILINK 115 kV	Moss Landing-Green Valley 115 kV #1 and 2 Lines	C3	L-1-1	N/A	N/A	0.89	0.89	0.88	Not Solved	Develop action plan/Load drop
CC-W-LV-011	WTSNVILLE 115 kV	Moss Landing-Green Valley 115 kV #1 and 2 Lines	C3	L-1-1	N/A	N/A	0.89	0.89	0.88	Not Solved	Develop action plan/Load drop
CC-W-LV-012	GRN VLY 60 kV	Moss Landing-Salinas #1 115 kV Line and Green Valley 115/60 Bank #1	C3	L-1/T-1	0.88	0.87	N/A	N/A	N/A	N/A	Existing Watsonville UVLS will operate
CC-W-LV-013	ERTA 60 kV	Moss Landing-Salinas #1 115 kV Line and Green Valley 115/60 Bank #1	C3	L-1/T-1	0.88	0.87	N/A	N/A	N/A	N/A	Existing Watsonville UVLS will operate
CC-W-LV-014	AGRILINK 60 kV	Moss Landing-Salinas #1 115 kV Line and Green Valley 115/60 Bank #1	C3	L-1/T-1	0.88	0.87	N/A	N/A	N/A	N/A	Existing Watsonville UVLS will operate
CC-W-LV-015	WTSNVILLE 60 kV	Moss Landing-Salinas #1 115 kV Line and Green Valley 115/60 Bank #1	C3	L-1/T-1	0.88	0.87	N/A	N/A	N/A	N/A	Existing Watsonville UVLS will operate
CC-W-LV-016	GRANT RK 60 kV	Moss Landing-Salinas #1 115 kV Line and Green Valley 115/60 Bank #1	C3	L-1/T-1	0.90	0.89	N/A	N/A	N/A	N/A	Existing Watsonville UVLS will operate
CC-W-LV-017	GRN VLY 60 kV	Moss Landing - Green Valley #1 and #2 115 kV Lines	C5	DCTL	0.89	0.89	N/A	N/A	N/A	N/A	Existing Watsonville UVLS will operate
CC-W-LV-018	ERTA 60 kV	Moss Landing - Green Valley #1 and #2 115 kV Lines	C5	DCTL	0.89	0.89	N/A	N/A	N/A	N/A	Existing Watsonville UVLS will operate
CC-W-LV-019	AGRILINK 60 kV	Moss Landing - Green Valley #1 and #2 115 kV Lines	C5	DCTL	0.90	0.89	N/A	N/A	N/A	N/A	Existing Watsonville UVLS will operate
CC-W-LV-020	WTSNVILLE 60 kV	Moss Landing - Green Valley #1 and #2 115 kV Lines	C5	DCTL	0.90	0.89	N/A	N/A	N/A	N/A	Existing Watsonville UVLS will operate
CC-W-LV-021	GRN VLY1 115 kV	Moss Landing - Green Valley #1 and #2 115 kV Lines	C5	DCTL	1.01	1.01	0.89	1.03	1.03	1.03	Develop action plan/Load drop
CC-W-LV-022	ERTA 115 kV	Moss Landing - Green Valley #1 and #2 115 kV Lines	C5	DCTL	N/A	N/A	0.89	1.03	1.03	1.03	Develop action plan/Load drop
CC-W-LV-023	AGRILINK 115 kV	Moss Landing - Green Valley #1 and #2 115 kV Lines	C5	DCTL	N/A	N/A	0.89	1.03	1.03	1.03	Develop action plan/Load drop
CC-W-LV-024	WTSNVILLE 115 kV	Moss Landing - Green Valley #1 and #2 115 kV Lines	C5	DCTL	N/A	N/A	0.89	1.03	1.03	1.02	Develop action plan/Load drop

CC-W-LV-025	ROB ROY 115 kV	Moss Landing - Green Valley #1 and #2 115 kV Lines	C5	DCTL	1.02	1.02	0.89	1.03	1.03	1.03	Develop action plan/Load drop
CC-W-LV-026	CMP EVRS 115 kV	Moss Landing - Green Valley #1 and #2 115 kV Lines	C5	DCTL	1.02	1.02	0.89	1.02	1.02	1.02	Develop action plan/Load drop

Study Area: **Central Coast - Winter Peak (2012-2021)**

Voltage Deviations

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Post Contingency Voltage Deviation (%)						ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2021	
CC-W-VD-001	GREN VLY 60 kV	Green Valley 115/60 Bank #1	B	T-1	-15.80%	-16.57%	N/A	N/A	N/A	N/A	Action plan/Existing Watsonville UVLS will activate
CC-W-VD-002	ERTA 60 kV	Green Valley 115/60 Bank #1	B	T-1	-15.25%	-16.01%	N/A	N/A	N/A	N/A	Action plan/Existing Watsonville UVLS will activate
CC-W-VD-003	AGRILINK 60 kV	Green Valley 115/60 Bank #1	B	T-1	-14.45%	-15.16%	N/A	N/A	N/A	N/A	Action plan/Existing Watsonville UVLS will activate
CC-W-VD-004	WTSNVLL 60 kV	Green Valley 115/60 Bank #1	B	T-1	-14.31%	-15.01%	N/A	N/A	N/A	N/A	Action plan/Existing Watsonville UVLS will activate
CC-W-VD-005	GRANT RK 60 kV	Green Valley 115/60 Bank #1	B	T-1	-9.94%	-10.43%	N/A	N/A	N/A	N/A	Action plan/Existing Watsonville UVLS will activate
CC-W-VD-006	BRIGTANO 60 kV	Green Valley 115/60 Bank #1	B	T-1	-9.72%	-10.21%	N/A	N/A	N/A	N/A	Action plan/Existing Watsonville UVLS will activate
CC-W-VD-007	PAUL SWT 115 kV	Paul Sweet Statcom	B	N-1	-5.77%	-5.98%	-2.70%	-2.66%	-2.77%	-3.42%	Develop action plan
CC-W-VD-008	CMP EVRS 115 kV	Paul Sweet Statcom	B	N-1	-5.17%	-5.37%	-2.20%	-2.15%	-2.26%	-3.09%	Develop action plan

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Post Contingency Voltage Deviation (%)						ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2021	
CC-W-VD-009	GRN VLY1 115 kV	Moss Landing-Green Valley 115 kV #1 and 2 Lines	C3	L-1-1	Not Solved	Not Solved	-13.88%	-14.51%	-15.36%	Not Solved	Provide action plan/ Load drop
CC-W-VD-010	HOLLISTR 115 kV	Moss Landing-Green Valley 115 kV #1 and 2 Lines	C3	L-1-1	Not Solved	Not Solved	-4.64%	-4.75%	-5.01%	Not Solved	Provide action plan/ Load drop
CC-W-VD-011	CMP EVRS 115 kV	Moss Landing-Green Valley #1 115 kV Li_Paul Sweet Statcom	C3	N-1-1	-11.82%	-12.29%	-5.04%	-5.03%	-5.18%	-6.42%	Provide action plan/ Load drop
CC-W-VD-012	CMP EVRS 115 kV	Moss Landing-Green Valley 115 kV #1 and 2 Lines	C3	L-1-1	Not Solved	Not Solved	-13.10%	-13.73%	-14.67%	Not Solved	Provide action plan/ Load drop
CC-W-VD-013	PAUL SWT 115 kV	Moss Landing-Green Valley #1 115 kV Li_Paul Sweet Statcom	C3	N-1-1	-12.45%	-12.92%	-5.54%	-5.53%	-5.69%	-6.74%	Provide action plan/ Load drop
CC-W-VD-014	PAUL SWT 115 kV	Moss Landing-Green Valley 115 kV #1 and 2 Lines	C3	L-1-1	Not Solved	Not Solved	-13.00%	-13.63%	-14.57%	Not Solved	Provide action plan/ Load drop
CC-W-VD-015	35908 ROB ROY 115 kV	Moss Landing-Green Valley #1 115 kV Li_Paul Sweet Statcom					-4.54%	-4.54%	-4.66%	-5.51%	Provide action plan/ Load drop
CC-W-VD-016	ROB ROY 115 kV	Moss Landing-Green Valley 115 kV #1 and 2 Lines	C3	L-1-1	Not Solved	Not Solved	-13.66%	-14.28%	-15.17%	Not Solved	Provide action plan/ Load drop
CC-W-VD-017	ERTA 115 kV	Moss Landing-Green Valley 115 kV #1 and 2 Lines	C3	L-1-1	N/A	N/A	-13.70%	-14.30%	-15.14%	Not Solved	Develop action plan/Load drop
CC-W-VD-018	AGRILINK 115 kV	Moss Landing-Green Valley 115 kV #1 and 2 Lines	C3	L-1-1	N/A	N/A	-13.33%	-13.89%	-14.69%	Not Solved	Develop action plan/Load drop
CC-W-VD-019	WTSNVLL 115 kV	Moss Landing-Green Valley 115 kV #1 and 2 Lines	C3	L-1-1	N/A	N/A	-13.24%	-13.79%	-14.59%	Not Solved	Develop action plan/Load drop
CC-W-VD-020	GRANT RK 115 kV	Moss Landing-Green Valley 115 kV #1 and 2 Lines	C3	L-1-1	N/A	N/A	-9.94%	-10.31%	-10.87%	Not Solved	Develop action plan/Load drop
CC-W-VD-021	BRIGTANO 115 kV	Moss Landing-Green Valley 115 kV #1 and 2 Lines	C3	L-1-1	N/A	N/A	-9.71%	-10.07%	-10.61%	Not Solved	Develop action plan/Load drop
CC-W-VD-022	GREN VLY 60 kV	Moss Landing-Salinas #1 115 kV Line and Green Valley 115/60 Bank #1	C3	L-1/T-1	-17.26%	-18.09%	N/A	N/A	N/A	N/A	Develop action plan/Existing Watsonville UVLS will operate
CC-W-VD-023	ERTA 60 kV	Moss Landing-Salinas #1 115 kV Line and Green Valley 115/60 Bank #1	C3	L-1/T-1	-16.72%	-17.52%	N/A	N/A	N/A	N/A	Develop action plan/Existing Watsonville UVLS will operate
CC-W-VD-024	AGRILINK 60 kV	Moss Landing-Salinas #1 115 kV Line and Green Valley 115/60 Bank #1	C3	L-1/T-1	-15.91%	-16.68%	N/A	N/A	N/A	N/A	Develop action plan/Existing Watsonville UVLS will operate
CC-W-VD-025	WTSNVLL 60 kV	Moss Landing-Salinas #1 115 kV Line and Green Valley 115/60 Bank #1	C3	L-1/T-1	-15.77%	-16.53%	N/A	N/A	N/A	N/A	Develop action plan/Existing Watsonville UVLS will operate

CC-W-VD-026	36015 GRANT RK 60 kV	Moss Landing-Salinas #1 115 kV Line and Green Valley 115/60 Bank #1	C3	L-1/T-1	-11.37%	-11.91%	N/A	N/A	N/A	N/A	Develop action plan/Existing Watsonville UVLS will operate
CC-W-VD-027	BRIGTANO 60 kV	Moss Landing-Salinas #1 115 kV Line and Green Valley 115/60 Bank #1	C3	L-1/T-1	-11.14%	-11.67%	N/A	N/A	N/A	N/A	Develop action plan/Existing Watsonville UVLS will operate
CC-W-VD-028	GREN VLY 60 kV	Moss Landing - Green Valley #1 and #2 115 kV Lines	C5	DCTL	-15.34%	-15.89%	N/A	N/A	N/A	N/A	Develop action plan/Existing Watsonville UVLS will operate
CC-W-VD-029	ERTA 60 kV	Moss Landing - Green Valley #1 and #2 115 kV Lines	C5	DCTL	-14.80%	-15.32%	N/A	N/A	N/A	N/A	Develop action plan/Existing Watsonville UVLS will operate
CC-W-VD-030	AGRILINK 60 kV	Moss Landing - Green Valley #1 and #2 115 kV Lines	C5	DCTL	-13.99%	-14.48%	N/A	N/A	N/A	N/A	Develop action plan/Existing Watsonville UVLS will operate
CC-W-VD-031	WTSNVLL 60 kV	Moss Landing - Green Valley #1 and #2 115 kV Lines	C5	DCTL	-13.85%	-14.32%	N/A	N/A	N/A	N/A	Develop action plan/Existing Watsonville UVLS will operate
CC-W-VD-032	ERTA 115 kV	Moss Landing - Green Valley #1 and #2 115 kV Lines	C5	DCTL	N/A	N/A	-13.70%	0.19%	0.18%	0.08%	Develop action plan/Load drop
CC-W-VD-033	WTSNVLL 115 kV	Moss Landing - Green Valley #1 and #2 115 kV Lines	C5	DCTL	N/A	N/A	-13.24%	0.20%	0.19%	0.10%	Develop action plan/Load drop
CC-W-VD-034	AGRILINK 115 kV	Moss Landing - Green Valley #1 and #2 115 kV Lines	C5	DCTL	N/A	N/A	-13.33%	0.20%	0.19%	0.10%	Develop action plan/Load drop
CC-W-VD-035	ROB ROY 115 kV	Moss Landing - Green Valley #1 and #2 115 kV Lines	C5	DCTL	0.30%	0.31%	-13.66%	0.34%	0.33%	0.21%	Develop action plan/Load drop
CC-W-VD-036	PAUL SWT 115 kV	Moss Landing - Green Valley #1 and #2 115 kV Lines	C5	DCTL	0.00%	0.00%	-13.00%	0.00%	0.00%	0.00%	Develop action plan/Load drop
CC-W-VD-037	CMP EVRS 115 kV	Moss Landing - Green Valley #1 and #2 115 kV Lines	C5	DCTL	0.41%	0.41%	-13.10%	0.11%	0.11%	-0.07%	Develop action plan/Load drop
CC-W-VD-038	GRN VLY1 115 kV	Moss Landing - Green Valley #1 and #2 115 kV Lines	C5	DCTL	-0.81%	-0.81%	-13.88%	0.18%	0.17%	0.07%	Develop action plan/Load drop



Study Area: Los Padres - Summer Peak (2012-2021)

Thermal Overloads

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)						ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2021	
LP-S-T-001	ATASCDRO - SN LS OB 70 kV #1 Line	Morro Bay-Templeton 230 kV Line	B	L-1	<100%	<100%	<100%	<100%	<100%	103.6%	Rerate/upgrade limiting equipment

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)						ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2021	
LP-S-T-002	ATASCDRO - SN LS OB 70 kV #1 Line	Morro Bay-Gates 230 kV #2 and Morro Bay-Templeton 230 kV Line	C3	L-1-1	<100%	<100%	<100%	<100%	<100%	136.07%	Develop action plan/Load drop
LP-S-T-003	MESA_PGE - UNION OL 115 kV #1 Line	Morro Bay 230/115 Bank #6 and #7	C3	T-1-1	N/A	<100%	87.97%	93.04%	86.91%	102.52%	Rerate/Develop action plan/Load drop
LP-S-T-004	MESA_PGE - UNION OL 115 kV #1 Line	Temblor-San Luis Obispo 115 kV Line and Morro Bay 230/115 Bank #6	C3	L-1/T-1	108.86%	<100%	<100%	<100%	<100%	<100%	Rerate/Develop action plan/Load drop
LP-S-T-005	OCEANO - UNION OL 115 kV #1 Line	Temblor-San Luis Obispo 115 kV Line and Morro Bay 230/115 Bank #6	C3	L-1/T-1	105.67%	<100%	<100%	<100%	<100%	<100%	Rerate/Develop action plan/Load drop
LP-S-T-006	S.YNZ JT - CABRILLO 115 kV #1 Line	Mesa-Sisquoc 115 kV Line and Santa Maria-Sisquoc 115 kV Line	C3	L-1-1	93.20%	99.77%	93.99%	95.58%	94.94%	105.69%	Rerate/Develop action plan/Load drop
LP-S-T-007	TEMPLETN - MORROBAY 230 kV #1 Line	T0239SS - MIDWAY 230 kV #1 and #2 Lines	C3	L-1-1	N/A	N/A	<100%	<100%	<100%	118.77%	Upgrade limiting equipment/Load drop
LP-S-T-008	TEMPLETN - MORROBAY 230 kV #1 Line	MIDWAY-T0239 230.00 kV #1 and #2 Lines	DCTL	L-2	N/A	N/A	<100%	<100%	<100%	118.78%	Upgrade limiting equipment/Load drop
LP-S-T-009	ATASCDRO - SN LS OB 70 kV #1 Line	Morro Bay-Gates and Morro Bay-Templeton 230 kV Lines	DCTL	L-2	<100%	<100%	<100%	<100%	<100%	136.33%	Upgrade limiting equipment/Load drop
LP-S-T-010	TASCDRO - SN LS OB 70 kV #1 Line	Morro Bay 230 kV Bus 1D	C1	Bus Out	<100%	<100%	<100%	<100%	<100%	103.66%	Rerate/Develop action plan/Load drop
LP-S-T-011	Mesa-Sisquoc 115 kV Line					112.00%	<100%	<100%	<100%	<100%	Rerate/Develop action plan/Load drop

Study Area: Los Padres - Summer Peak (2012-2021)

Voltage Deviation

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Post Contingency Voltage (p.u.)						ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2021	
LP-S-LV-001	ATASCDRO 70 kV	Templeton-Atascadero 70 kV Line and Atascadero-San Luis Obispo 70 kV Line	C3	L-1-1	0.89	0.99	0.99	0.99	0.99	0.99	Develop action plan
LP-S-LV-002	CAMBRIA 70 kV	Templeton-Atascadero 70 kV Line and Morro Bay 230/115 Bank #6	C3	L-1/T-1	0.88	0.93	1.02	1.02	1.02	1.02	Develop action plan
LP-S-LV-003	GAREY 115 kV	Mesa-Sisquoc 115 kV Line and Santa Maria-Sisquoc 115 kV Line	C3	L-1-1	0.90	0.85	0.91	0.91	0.93	0.91	Develop action plan
LP-S-LV-004	GOLDTREE 115 kV	Callender Sw. Sta-Mesa 115 kV Line and Morro Bay 230/115 Bank #6	C3	L-1/T-1	0.89	0.95	1.00	1.00	1.00	0.99	Develop action plan
LP-S-LV-005	MORRO BY 115 kV	Callender Sw. Sta-Mesa 115 kV Line and Morro Bay 230/115 Bank #6	C3	L-1/T-1	0.89	0.96	1.01	1.01	1.01	1.00	Develop action plan
LP-S-LV-006	OCEANO 115 kV	Callender Sw. Sta-Mesa 115 kV Line and Morro Bay 230/115 Bank #6	C3	L-1/T-1	0.86	0.91	0.96	0.96	0.96	0.95	Develop action plan
LP-S-LV-007	PERRY 70 kV	Templeton-Atascadero 70 kV Line and Morro Bay 230/115 Bank #6	C3	L-1/T-1	0.88	0.93	1.02	1.02	1.02	1.02	Develop action plan
LP-S-LV-008	SISQUOC 115 kV	Mesa-Sisquoc 115 kV Line and Santa Maria-Sisquoc 115 kV Line	C3	L-1-1	0.90	0.85	0.91	0.91	0.93	0.91	Develop action plan

LP-S-LV-009	SNTA YNZ 115 kV	Morro Bay-Mesa 230 kV Line and Morro Bay 230/115 Bank #6	C3	L-1/T-1	0.89	0.90	0.97	0.96	0.98	0.97	Develop action plan
LP-S-LV-010	SURF 115 kV	Morro Bay-Mesa 230 kV Line and Morro Bay 230/115 Bank #6	C3	L-1/T-1	0.89	0.90	0.97	0.96	0.99	0.97	Develop action plan
LP-S-LV-011	UNION OL 115 kV	Callender Sw. Sta- Mesa 115 kV Line and Morro Bay 230/115 Bank #6	C3	L-1/T-1	0.86	0.91	0.96	0.96	0.96	0.95	Develop action plan
LP-S-LV-012	LMPC-CTY 115 kV	Mesa 115 kV Bus 1	C1	Bus Out	0.89	0.91	0.91	0.90	0.94	0.93	Develop action plan
LP-S-LV-013	PURISIMA 115 kV	Mesa 115 kV Bus 1	C1	Bus Out	0.89	0.91	0.91	0.91	0.94	0.93	Develop action plan
LP-S-LV-014	CABRILLO 115 kV	Mesa 115 kV Bus 1	C1	Bus Out	0.89	0.84	0.91	0.91	0.93	0.91	Develop action plan
LP-S-LV-015	MANVILLE 115 kV	Mesa 115 kV Bus 1	C1	Bus Out	0.88	0.83	0.90	0.90	0.94	0.93	Develop action plan
LP-S-LV-016	SNTA YNZ 115 kV	Mesa 115 kV Bus 1	C1	Bus Out	0.89	0.83	0.91	0.90	0.92	0.91	Develop action plan
LP-S-LV-017	ZACA 115 kV	Mesa 115 kV Bus 1	C1	Bus Out	0.89	0.84	0.92	0.91	0.93	0.91	Develop action plan
LP-S-LV-018	SURF 115 kV	Mesa 115 kV Bus 1	C1	Bus Out	0.88	0.83	0.90	0.90	0.92	0.91	Develop action plan
LP-S-LV-019	BUELLTON 115 kV	Mesa 115 kV Bus 1	C1	Bus Out	0.89	0.83	0.91	0.90	0.92	0.91	Develop action plan
LP-S-LV-020	36268 DIVVIDE 115 kV	Mesa 115 kV Bus 1	C1	Bus Out	0.90	0.85	0.92	0.92	0.94	0.93	Develop action plan

Study Area: Los Padres - Summer Peak (2012-2021)

Voltage Deviation

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation (%)						ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2021	
LP-S-VD-001	VAFB SSA 70 kV	Divide-Vandenberg 70 kV Line No. 1	B	L-1	-6.14%	-6.56%	-6.00%	-5.91%	-5.48%	-5.84%	Develop action plan
LP-S-VD-002	PSA RBLS 70 kV	Paso Robles-Templeton 70 kV Line	B	L-1	-4.27%	-5.29%	-5.82%	-5.65%	-5.42%	-6.34%	Develop action plan
LP-S-VD-003	SAN MIGL 70 kV	San Miguel-Paso Robles 70 kV Line	B	L-1	-3.51%	-2.65%	-4.91%	-4.77%	-4.59%	-5.37%	Develop action plan
LP-S-VD-004	GOLDTREE 115 kV	Morro Bay 230/115 Bank #6	B	T-1	-5.13%	-0.36%	-0.19%	-0.14%	-0.09%	-0.07%	Develop action plan
LP-S-VD-005	MORRO BY 115 kV	Morro Bay 230/115 Bank #6	B	T-1	-5.91%	-0.40%	-0.22%	-0.17%	-0.11%	-0.08%	Develop action plan
LP-S-VD-006	FOOTHILL 115 kV	Morro Bay 230/115 Bank #6	B	T-1	-5.08%	-0.35%	-0.19%	-0.13%	-0.08%	-0.06%	Develop action plan
LP_S_VD_-007	SN LS OB 70 kV	San Luis Obispo 115/70 kV Bank #3	B	T-1	-4.15%	-5.19%	-5.71%	-5.54%	-5.32%	-5.21%	Develop action plan
LP_S_VD_-008	MUSTANG 70 kV	San Luis Obispo 115/70 kV Bank #3	B	T-1	-4.40%	-6.38%					Develop action plan
LP_S_VD_-009	BAYWOOD 70 kV	San Luis Obispo 115/70 kV Bank #3	B	T-1	-3.46%	-5.41%	-2.85%	-1.79%	-1.92%	-1.92%	Develop action plan
LP_S_VD_-010	CHOLAME 70 kV	Arco-Cholame 70 kV Line	B	L-1	4.49%	5.71%	5.94%	6.02%	5.69%	5.69%	Under review for exemption
LP_S_VD_-011	GOLDTREE 115 kV	Morro Bay-San Luis Obispo 115 kV Line No. 2	B	L-1	5.12%	8.14%	3.41%	3.61%	3.65%	4.47%	Under review for exemption

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Post Contingency Voltage Deviation (%)						ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2021	
LP-S-VD-001	ATASCDRO 70 kV	Templeton-Atascadero 70 kV Line _Atascadero-San Luis Obispo 70 kV Line	C3	L-1-1	-10.9%	-10.5%	-3.3%	-3.0%	-2.9%	-2.6%	Develop action plan/Load drop

Study Area: SCE Main, North of Magunden, Eastern - Summer Peak (2012-2021)

Thermal Overload

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)								ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2016 SOCAL*	2021	2021 SOCAL	
SCE-T-1	Chino-Mira Loma #3 230kV Line	Mira Loma #1 500/230 kV AA Transformer	B	T-1	<100%	<100%	<100%	<100%	<100%	<100%	112%	103%	No further mitigation is required as Chino-Mira Loma 230kV lines will be upgraded in 2015 as par of TRTP.
SCE-T-2	Chino-Mira Loma #3 230kV Line	Mira Loma #1 & #2 500/230 kV AA Transformers	C	T-1/T-1	115%	128%	125%	131%	126%	140%	178%	163%	Update and use SCE OP 104 to make manual adjustments after first contingency until line is upgraded in 2015 as part of the TRTP.
SCE-T-3	Mira Loma #1 500/230 kV Transformer	Chino-Mira Loma #3 230kV Line and Mira Loma #2 500/230 kV AA Transformer	C	L-1/T-1	<100%	<100%	97%	106%	107%	107%	125%	119%	Loading is within the 1 hour rating of the transformer bank. Use ISO OP 7580 to make manual system adjustments after the N-1-1 contingency.
SCE-T-4	Barre-Ellis 230 kV Line	SONGS-Santiago #1 & #2 230kV Lines (SPS not modeled)	C	L-2	112%	Diverge	Diverge	Diverge	Diverge	137%	Diverge	Diverge	Loop Del Amo-Ellis 230kV Line into Barre substation. The existing Santiago RAS mitigates the voltage concern.

*SOCAL: Consolidated Southern California base case

Study Area: SCE Main, North of Magunden, Eastern - Summer Peak (2021-2021)

High/Low Voltage

ID	Substation	Worst Contingency	Category	Category Description	Post Contingency Voltage (PU)								ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2016 SOCIAL	2021	2021 SOCIAL	
SCE-V-1	Red Bluff 500 kV	Base Case	A	N-0	<1.05	<1.05	<1.05	<1.05	1.053	<1.05	<1.05	<1.05	SCE proposed exemption from the ISO high voltage standard and requested using a high voltage limit of 550 kV under normal conditions. The ISO has accepted the exemption.
SCE-V-2	Viejo 230 kV	One SONGS Unit offLine and SONGS-Viejo 230kV Line out	B	G-1/L-1	>0.90	>0.90	>0.90	0.897	0.891	0.92	0.845	0.864	Add a capacitor bank at Viejo or loop the San Onofre-Serrano 230kV line through Viejo. Preferred development will be identified after further evaluation.

Study Area: SCE Main, North of Magunden, Eastern - Summer Peak (2012)

Voltage Deviation

ID	Substation	Worst Contingency	Category	Category Description	Post Contingency Voltage Deviation (%)								ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2016 SOCAL	2021	2021 SOCAL	
SCE-DV-1	Viejo	One SONGS Unit offLine and SONGS-Viejo 230kV Line out	B	G-1/L-1	>-5.0%	-6.9%	-6.8%	-7.8%	-8.2%	-6.2%	-12.7%	-11.0%	Add a capacitor bank at Viejo or loop the San Onofre-Serrano 230kV line through Viejo. Preferred development will be identified after further evaluation. CAISO has accepted SCE's request for a temporary exemption from the voltage deviation standard.

Study Area: SCE Main, North of Magunden, Eastern - Off Peak (2012-2021)

Thermal Overload

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)								ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2016 SOCAL	2021	2021 SOCAL	
SCE-T-5	San Bernardino-Devers 230kV Line	Base Case	A	N-0	<100%	<100%	<100%	<100%	100%	<100%	<100%	<100%	Dispatch LA Basin Generation to prevent line overloading.
SCE-T-6	Ramon-Mirage 230kV Line	Coachella Valley-Mirage 230kV Line and Ormond Beach Unit #1	B	G-1/L-1	<100%	<100%	105%	<100%	<100%	<100%	<100%	<100%	No further mitigation is required as the line is planned to be upgraded as part of the Path 42 transmission project with an in-service date of Q4 2013.

Study Area: SCE Main, North of Magunden, Eastern - Off Peak (2012-21

High/Low Voltage

ID	Substation	Worst Contingency	Category	Category Description	Post Contingency Voltage (PU)								ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2016 SOCAL	2021	2021 SOCAL	
	None	None		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	

Study Area: SCE Main, North of Magunden, Eastern - Off Peak (2012-2021)

Voltage Deviation

ID	Substation	Worst Contingency			Post Contingency Voltage Deviation (%)								ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2016 SOCAL	2021	2021 SOCAL	
SCE-DV-2	Viejo	One SONGS unit off and SONGS-Viejo 230kV Line out	B	G-1/L-1	-5.2%	>-5.0%	>-5.0%	-5.3%	-7.3%	>-5.0%	>-5.0%	>-5.0%	Add a capacitor bank at Viejo or loop the San Onofre-Serrano 230kV line through Viejo. Preferred development will be identified after further evaluation. CAISO has accepted SCE's request for a temporary exemption from the voltage deviation standard.

Study Area: SCE Main, North of Magunden, Eastern (2012-2021)

Transient Stability

Worst Contingency	Voltage Performance	Frequency Performance	ISO Proposed Mitigation
L-1-1 contingency involving an outage of Camino-Iron Mountain 230 kV line and a sustained 3-phase fault on Julian Hinds-Mirage 230 kV line (Blythe Energy Plant @ 520 MW after the first contingency)	System unstable with the Blythe RAS tripping one CT or the entire Blythe Energy Plant (beginning 2012).	System unstable with the Blythe RAS tripping one CT or the entire Blythe Energy Plant (beginning 2012).	Develop operating procedures to reduce Blythe Energy generation after the first contingency.
L-1-1 contingency involving an outage of Julian Hinds-Mirage 230 kV line and a sustained 3-phase fault on Iron Mountain-Camino-Mead 230 kV line (Blythe Energy Plant @ 340 MW after the first contingency)	System unstable with no Blythe RAS action (beginning 2012).	System unstable with no Blythe RAS action (beginning 2012).	
L-1-1 contingency involving an outage of the Blythe-Blythe SC 161 kV tie and a sustained 3-phase fault on Julian Hinds-Mirage 230 kV line (Blythe Energy Plant @ 520 MW after the first contingency)	Transient voltage dip at two MWD buses exceeded 30% with the Blythe RAS tripping one CT (beginning 2012).	Met performance requirements.	
	Transient voltage dip at three MWD and SCE buses exceeded 30% with the Blythe RAS tripping the whole plant. (beginning 2012)	Met performance requirements.	

Post-Transient (Peak)

Worst Contingency	2012	2013	2014	2015	2016		
SONGS-G2	Met performance requirement	Met performance requirement	Met performance requirement	Met performance requirement	Diverged	Diverged	Increase generation in LA Basin
L-1-1 contingency involving Camino-Iron Mountain 230 kV line outage followed by a sustained fault on Julian Hinds-Mirage 230 kV line (Blythe Energy Plant @ 520 MW after the first contingency)	Met voltage requirements - with Blythe Energy RAS tripping one CT. 108% loading on Julian Hinds-MWD tie	Met voltage requirements - with Blythe Energy RAS tripping one CT. 108% loading on Julian Hinds-MWD tie	Met voltage requirements - with Blythe Energy RAS tripping one CT. 108% loading on Julian Hinds-MWD tie	Met voltage requirements - with Blythe Energy RAS tripping one CT. 108% loading on Julian Hinds-MWD tie	Met voltage requirements - with Blythe Energy RAS tripping one CT. 108% loading on Julian Hinds-MWD tie	Met voltage requirements - with Blythe Energy RAS tripping one CT. 108% loading on Julian Hinds-MWD tie	
	Diverged when the remaining units were tripped	Diverged when the remaining units were tripped	Diverged when the remaining units were tripped	Diverged when the remaining units were tripped	Diverged when the remaining units were tripped	Diverged when the remaining units were tripped	
L-1-1 contingency involving a Blythe-BlytheSC 161 kV tie outage followed by a sustained fault on Julian Hinds-Mirage 230 kV line (Blythe Energy Plant @ 520 MW after the first contingency)	Met voltage requirements - with Blythe Energy RAS tripping one CT. 104% loading on Julian Hinds-MWD tie	Met voltage requirements - with Blythe Energy RAS tripping one CT. 104% loading on Julian Hinds-MWD tie	Met voltage requirements - with Blythe Energy RAS tripping one CT. 104% loading on Julian Hinds-MWD tie	Met voltage requirements - with Blythe Energy RAS tripping one CT. 104% loading on Julian Hinds-MWD tie	Met voltage requirements - with Blythe Energy RAS tripping one CT. 104% loading on Julian Hinds-MWD tie	Met voltage requirements - with Blythe Energy RAS tripping one CT. 104% loading on Julian Hinds-MWD tie	
	Diverged when the remaining units were tripped	Diverged when the remaining units were tripped	Diverged when the remaining units were tripped	Diverged when the remaining units were tripped	Diverged when the remaining units were tripped	Diverged when the remaining units were tripped	

Study Area: SCE Main, North of Magunden, Eastern (2012-2021)

Post-Transient (Off-Peak)

Worst Contingency	2012	2013	2014	2015	2016	2021	ISO Proposed Mitigation
L-1-1 contingency involving Camino Iron Mountain 230 kV line outage followed by a sustained fault on Julian Hinds-Mirage 230 kV line (Blythe Energy @ 435 MW (2012) and 410 MW (2013) after the first contingency)	Post transient voltage dip did not meet requirement with one Blythe Energy CT tripped. (maximum voltage dip is 11.7 % at Eagle Mountain 161 kV bus)	Diverged with Blythe Energy RAS tripping one CT					Develop operating procedures to reduce Blythe Energy generation after the first contingency.
L-1-1 contingency involving a Julian Hinds-Mirage 230 kV line outage followed by a sustained fault on Camino-Iron Mountain 230 kV line (Blythe Energy @ 340 MW after the first contingency)	Diverged with no RAS action. Thermal overload on Eagle Mountain-Blythe SC 161 kV line	Diverged with no RAS action. Thermal overload on Eagle Mountain-Blythe SC 161 kV line					
L-1-1 contingency involving a Blythe 161 kV tie outage followed by a sustained fault on Julian Hinds-Mirage 230 kV line (Blythe Energy @ 440 MW after the first contingency)	Met performance requirements with Blythe Energy RAS tripping one CT	Met performance requirements with Blythe Energy RAS tripping one CT					

Study Area: SCE Main, North of Magunden, Eastern (2012-2021)

Single Contingency Load Drop

ID	Worst Contingency	Category	Category Description	Amount of Load Drop (MW)					ISO Proposed Mitigation
				2012	2013	2014	2015	2016	

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

Study Area: SCE Main, North of Magunden, Eastern (2012-2021)***Single source substation with more than 100 MW Load.***

ID	Substation	Load Served (MW)						ISO Proposed Mitigation
		2012	2013	2014	2015	2016	2021	

No single sourced substation with more than 100 MW.

Study Area: SCE South of Magunden - Summer Peak (2012-2021)

Thermal Overload

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)						ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2021	
SOM-T-01	Vincent No.1 500/230 kV transformer	Vincent No.3 & No.4 500/230 kV transformers	C	T-1/T-1	131%	104%	<100%	<100%	<100%	<100%	Switch in Vincent No.2 500/230 kV transformer after first contingency

Study Area: SCE South of Magunden - Summer Peak (2012-2021)

High/Low Voltage

ID	Substation	Worst Contingency	Category	Category Description	Post Contingency Voltage (PU)						ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2021	
SOM-V-01	ANTELOPE 500 kV	Base case	A	N-0	1.058	1.050	1.059	1.059	1.048	1.051	SCE proposed an exception for these buses to the voltage standard in the ISO Planning Standards and proposed using a high voltage limit of 550 kV under normal conditions. The ISO concurred with this exception.
SOM-V-02	WINDHUB 500 kV	Base case	A	N-0	1.059	1.051	1.061	1.061	1.050	1.052	
SOM-V-03	WIRLWIND 500 kV	Base case	A	N-0	1.058	1.051	1.061	1.060	1.049	1.052	
SOM-V-04	VINCENT 500 kV	Base case	A	N-0	1.055	1.049	1.057	1.056	1.046	1.050	

Study Area: SCE South of Magunden - Summer Peak (2012-2021)

Voltage Deviation

ID	Substation	Worst Contingency	Category	Category Description	Post Contingency Voltage Deviation (%)						ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2021	

No problem identified

Study Area: SCE South of Magunden - Off Peak

Thermal Overload

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)		ISO Proposed Mitigation
					2016	2021	

No problem identified

Study Area: SCE South of Magunden - Off Peak

High/Low Voltage

ID	Substation	Worst Contingency	Category	Category Description	Post Contingency Voltage (PU)		ISO Proposed Mitigation
					2016	2021	

No problem identified

Study Area: SCE South of Magunden - Off Peak

Voltage Deviation

ID	Substation	Worst Contingency	Category	Category Description	Post Contingency Voltage Deviation (%)		ISO Proposed Mitigation
					2016	2021	

No problem identified

Study Area: SCE South of Magunden

Single Contingency Load Drop

ID	Worst Contingency	Category	Category Description	2012	Amount of Load Drop (MW)					ISO Proposed Mitigation
					2013	2014	2015	2016	2021	

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

Study Area: SCE South of Magunden

Single source substation with more than 100 MW Load.

ID	Substation	Load Served (MW)						ISO Proposed Mitigation
		2012	2013	2014	2015	2016	2021	

No single sourced substation with more than 100 MW.



Study Area: SCE South of Magunden with renewables - Summer Peak

Thermal Overload

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			ISO Proposed Mitigation
					2014	2016	2021	
SOM-RPS-T-01	Antelope No.1 500/230 kV transformer	Antelope No.2 500/230 kV transformer, Pastorial Energy Facility combined-cycle module #1	B	G-1/L-1	<100%	<100%	117%	Transformer loading exceeds 24-hr rating but is within 1-hr rating. Operating procedure to reduce generation in Tehachapi area and/or in north of Path 26 post contingency.
SOM-RPS-T-02	Antelope No.2 500/230 kV transformer	Antelope No.1 500/230 kV transformer, Pastorial Energy Facility combined-cycle module #1	B	G-1/L-1	<100%	<100%	118%	
SOM-RPS-T-03	Vincent No.1 500/230 kV transformer	Vincent No.3 500/230 KV transformer, Vincent No.4 500/230 KV transformer	C	T-1/T-1	129%	121%	146%	Switch in Vincent No.2 500/230 kV transformer after first contingency
SOM-RPS-T-04	Antelope No.1 500/230 kV transformer	Antelope No.2 500/230 kV transformer, Pastorial-Lebec 230 kV line	C	L-1/T-1	105%	100%	126%	Transformer loading exceeds 24-hr rating but is within 1-hr rating. Operating procedure to reduce generation in Tehachapi area and/or in north of Path 26 post contingency.
SOM-RPS-T-05	Antelope No.2 500/230 kV transformer	Antelope No.1 500/230 kV transformer, Pastorial-Lebec 230 kV line	C	L-1/T-1	105%	100%	126%	
SOM-RPS-T-06	Pardee-Vincent No.2 230 kV line	Antelope No.1 500/230 KV transformer, Antelope No.2 500/230 KV transformer	C	T-1/T-1	<100%	<100%	105%	Operating procedure to reduce generation in Tehachapi area and/or in north of Path 26 after first contingency
SOM-RPS-T-07	Santa Clara-Vincent No.1 230 kV line	Antelope No.1 500/230 KV transformer, Antelope No.2 500/230 KV transformer	C	T-1/T-1	<100%	<100%	103%	

Study Area: SCE South of Magunden with renewables - Summer Peak

High/Low Voltage

ID	Substation	Worst Contingency	Category	Category Description	Post Contingency Voltage (PU)			ISO Proposed Mitigation
					2014	2016	2021	
SOM-RPS-V-01	WINDHUB 500 kV	Base case	A	N-0	1.034	1.037	1.051	SCE proposed an exemption for this bus to the voltage standard in the ISO Planning Standards and proposed using a high voltage limit of 550 kV under normal conditions. The ISO concurred with this exemption.

Study Area: SCE South of Magunden with renewables - Summer Peak

Voltage Deviation

ID	Substation	Worst Contingency	Category	Category Description	Post Contingency Voltage Deviation (%)			ISO Proposed Mitigation
					2014	2016	2021	
SOM-RPS-DV-01	PASTORIA 230 kV	Pastoria-Lebec 230 kV line	B	L-1	-4.1%	-2.1%	-5.4%	The ISO is considering installing reactive support at the Pastoria 230 kV Substation as a conceptual mitigation. Because the voltage deviation seen in 2021 is less than 6%, the ISO recommends further evaluation in a future planning cycle.
SOM-RPS-DV-02	EDMONSTN 230 kV	Pastoria-Lebec 230 kV line	B	L-1	-4.1%	-2.1%	-5.4%	
SOM-RPS-DV-03	EDMONSTN 14.4 kV	Pastoria-Lebec 230 kV line	B	L-1	-4.2%	-2.0%	-5.7%	



Study Area: SCE South of Magunden with renewables - Off Peak

Thermal Overload

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)		ISO Proposed Mitigation
					2016	2021	
SOM-RPS-T-08	Antelope-Magunden No.1 230 kV line	Antelope-Magunden No.2 230 kV line, Pastorial Energy Facility combined-cycle module #1	B	G-1/L-1	105%	<100%	Operating procedure to increase generation north of Pastoria when Edmonston pumping load is high and Pastoria generation is low
SOM-RPS-T-09	Vincent No.1 500/230 kV transformer	Vincent No.3 500/230 KV transformer, Vincent No.4 500/230 KV transformer	C	T-1/T-1	101%	<100%	Switch in Vincent No.2 500/230 kV transformer after first contingency

Study Area: SCE South of Magunden with renewables - Off Peak

High/Low Voltage

ID	Substation	Worst Contingency	Category	Category Description	Post Contingency Voltage (PU)		ISO Proposed Mitigation
					2016	2021	

No problem identified

Study Area: SCE South of Magunden with renewables - Off Peak

Voltage Deviation

ID	Substation	Worst Contingency	Category	Category Description	Post Contingency Voltage Deviation (%)		ISO Proposed Mitigation
					2016	2021	

No problem identified

Study Area: SCE South of Magunden with renewables

Single Contingency Load Drop

ID	Worst Contingency	Category	Category Description	Amount of Load Drop (MW)			ISO Proposed Mitigation
				2014	2016	2021	

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

Study Area: SCE South of Magunden with renewables

Single source substation with more than 100 MW Load.

ID	Substation	Load Served (MW)			ISO Proposed Mitigation
		2014	2016	2021	

No single sourced substation with more than 100 MW.



Study Area: SCE Antelope-Bailey - Summer Peak (2012-2021)

Thermal Overload

ID	Overloaded Facility	Worst Contingency	Category	Category Descriptio	Loading (%)						ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2021	
AB-T-1	N/A	Line ANTELOPE 66.0 to CALCMENT 66.0 Circuit 1,Line CALCEMENT/MONOLITH/ROSAMOND/WINDFARM 66.0 to TAP 79 66.0 Circuit 1	C	L-1/L-1	Not Solved	Not Solved	Not Solved	Not Solved	Not Solved	N/A	Short term solution Cap switching and long term solution is load shedding at Goldtown and/or Lancaster 66 kV. The long term solution could be EKWRA.
AB-T-2	ANTELOPE - ROSAMOND 66/66kV No.1	Line ANTELOPE 66.0 to CALCMENT 66.0 Circuit 1,Line ANTELOPE/DELSUR/ROSAMOND/TAP 71 66.0 Circuit 1	C	L-1/L-1	108%	115%	115%	117%	119%	N/A	LPS to shed load at Cal Cement 66.0 kV. The long term solution could be EKWRA.
AB-T-3	ANTELOPE - TAP 70 66/66kV No.1	Line ANTELOPE 66.0 to DEL SUR 66.0 Circuit 1,Line ANTELOPE/SHUTTLE/QUARTZHILL/TAP 93 66.0 Circuit 1	C	L-1/L-1	98%	104%	108%	111%	114%	N/A	LPS to shed load at Shuttle 66.0 kV. The long term solution could be EKWRA.
AB-T-4	ANTELOPE - TAP 70 66/66kV No.1	Line ANTELOPE 66.0 to DEL SUR 66.0 Circuit 1,Line OASIS SC/QUARTZHILL/PALMDALE/TAP 65 66.0 Circuit 1	C	L-1/L-1	88%	93%	97%	99%	102%	N/A	LPS to shed load at Shuttle 66.0 kV. The long term solution could be EKWRA.
AB-T-5	ANTELOPE - TAP 70 66/66kV No.1	Line ANTELOPE/LANCASTER/OASIS 66.0/TAP 68 66.0 Circuit 1,Line ANTELOPE/SHUTTLE/QUARTZHILL/TAP 93 66.0 Circuit 1	C	L-1/L-1	98%	104%	108%	110%	112%	N/A	LPS or OP to shed load at Shuttle 66 kV.
AB-T-6	ANTELOPE - TAP 70 66/66kV No.1	Line ANTELOPE/LANCASTER/OASIS 66.0/TAP 68 66.0 Circuit 1,Line DEL SUR/RITEAID/LANCASTER/TAP 50 66.0 Circuit 1	C	L-1/L-1	96%	101%	105%	107%	109%	N/A	LPS approved last year to shed load at Lancaster 66.0 kV; LPS will be in service in August 2011.
AB-T-7	ANTELOPE - TAP 70 66/66kV No.1	Line ANTELOPE 66.0 to DEL SUR 66.0 Circuit 1,Line ANTELOPE/LANCASTER/OASIS 66.0/TAP 68 66.0 Circuit 1	C	L-1/L-1	104%	110%	114%	117%	120%	N/A	OP approved last year to mitigate until 2014; long term solution is EKWRA.
AB-T-8	DEL SUR - TAP 50 66/66kV No.1	Line ANTELOPE/LANPRI/LANCSTR/SHUTTLE/TAP 70/69 66.0 Circuit 1,Line ANTELOPE/LANCASTER/OASIS 66.0/TAP 68 66.0 Circuit 1	C	L-1/L-1	131%	139%	142%	145%	148%	N/A	LPS approved last year to shed load at Lancaster 66.0 kV; LPS will be in service in August 2011.
AB-T-9	DEL SUR - TAP 50 66/66kV No.1	Line ANTELOPE/LANPRI/LANCSTR/SHUTTLE/TAP 70/69 66.0 Circuit 1,Line ANTELOPE/SHUTTLE/QUARTZHILL/TAP 93 66.0 Circuit 1	C	L-1/L-1	88%	94%	97%	98%	101%	N/A	LPS or OP to cap switching.

AB-T-10	DEL SUR - TAP 50 66/66kV No.1	Line ANTELOPE/LANPRI/LANCSTR/SHUTTLE/TAP 70/69 66.0 Circuit 1,Line OASIS SC/QUARTZHILL/PALMDALE/TAP 65 66.0 Circuit 1	C	L-1/L-1	95%	100%	103%	105%	107%	N/A	LPS to shed load at Lancaster 66.0 kV.
AB-T-11	DEL SUR - TAP 50 66/66kV No.1	Line ANTELOPE/LANCASTER/OASIS 66.0/TAP 68 66.0 Circuit 1,Line ANTELOPE/SHUTTLE/QUARTZHILL/TAP 93 66.0 Circuit 1	C	L-1/L-1	95%	100%	103%	104%	106%	N/A	LPS to shed load at Lancaster 66.0 kV.
AB-T-12	HELIJET - TAP 60 66/66kV No.1	Line OASIS SC/QUARTZHILL/PALMDALE/TAP 65 66.0 Circuit 1,Line ACTON/RITTER No. 1 66.0 Circuit 1	C	L-1/L-1	92%	96%	98%	99%	100%	N/A	LPS or OP to cap switching.
AB-T-13	HELIJET - TAP 61 66/66kV No.1	Line OASIS SC/QUARTZHILL/PALMDALE/TAP 65 66.0 Circuit 1,Line ACTON/PALMDALE/SHUTTLE 66.0 Circuit 1	C	L-1/L-1	123%	131%	136%	138%	141%	N/A	LPS approved last year to shed load at Palmdale 66.0 kV; LPS will be in service in August 2011.
AB-T-14	HELIJET - TAP 60 66/66kV No.1	Line OASIS SC/QUARTZHILL/PALMDALE/TAP 65 66.0 Circuit 1,Line ACTON/PALMDALE/SHUTTLE 66.0 Circuit 1	C	L-1/L-1	118%	124%	127%	129%	131%	N/A	LPS approved last year to shed load at Palmdale 66.0 kV; LPS will be in service in August 2011.
AB-T-15	LANCSTR - TAP 69 66/66kV No.1	Line ANTELOPE 66.0 to DEL SUR 66.0 Circuit 1,Line ANTELOPE/LANCASTER/OASIS 66.0/TAP 68 66.0 Circuit 1	C	L-1/L-1	154%	162%	167%	172%	178%	N/A	OP approved last year to mitigate until 2014; long term solution is EKWRA.
AB-T-16	LANCSTR - TAP 69 66/66kV No.1	Line ANTELOPE 66.0 to DEL SUR 66.0 Circuit 1,Line ANTELOPE 66.0 to CALCMENT 66.0 Circuit 1	C	L-1/L-1	93%	98%	101%	104%	107%	N/A	LPS to shed load at Lancaster 66.0 kV.
AB-T-17	LANCSTR - TAP 69 66/66kV No.1	Line ANTELOPE 66.0 to DEL SUR 66.0 Circuit 1,Line OASIS SC/QUARTZHILL/PALMDALE/TAP 65 66.0 Circuit 1	C	L-1/L-1	112%	118%	122%	126%	130%	N/A	LPS to shed load at Lancaster 66.0 kV.
AB-T-18	LANCSTR - TAP 69 66/66kV No.1	Line ANTELOPE/LANCASTER/OASIS 66.0/TAP 68 66.0 Circuit 1,Line DEL SUR/RITEAID/LANCASTER/TAP 50 66.0 Circuit 1	C	L-1/L-1	133%	139%	143%	146%	149%	N/A	OP approved last year to shed load at Lancaster 66.0 kV.
AB-T-19	LANCSTR - TAP 69 66/66kV No.1	Line ANTELOPE/LANCASTER/OASIS 66.0/TAP 68 66.0 Circuit 1,Line LITTLEK/PALMDALE/ROCKAIR/HELIJET/TAP 62/61 66.0 Circuit 1	C	L-1/L-1	89%	93%	96%	99%	101%	N/A	LPS to shed load at Lancaster 66.0 kV.

AB-T-20	LANCSTR - TAP 69 66/66kV No.1	Line DEL SUR/RITEAID/LANCASTER/TAP 50 66.0 Circuit 1,Line OASIS SC/QUARTZHILL/PALMDALE/TAP 65 66.0 Circuit 1	C	L-1/L-1	97%	103%	106%	108%	110%	N/A	LPS to shed load at Lancaster 66.0 kV.
AB-T-21	LANCSTR - TAP 50 66/66kV No.1	Line ANTELOPE/LANPRI/LANCSTR/SHUTT LE/TAP 70/69 66.0 Circuit 1,Line ANTELOPE/LANCASTER/OASIS 66.0/TAP 68 66.0 Circuit 1	C	L-1/L-1	121%	128%	131%	134%	137%	N/A	LPS approved last year to shed load at Lancaster 66.0 kV; LPS will be in service in August 2011.
AB-T-22	PALMDALE - TAP 62 66/66kV No.1	Line OASIS SC/QUARTZHILL/PALMDALE/TAP 65 66.0 Circuit 1,Line ACTON/PALMDALE/SHUTTLE 66.0 Circuit 1	C	L-1/L-1	93%	100%	103%	104%	106%	N/A	LPS approved last year to shed load at Palmdale 66.0 kV; LPS will be in service in August 2011.
AB-T-23	ROSAMOND - TAP 71 66/66kV No.1	Line ANTELOPE 66.0 to CALCMENT 66.0 Circuit 1,Line ANTELOPE 66.0 to ROSAMOND 66.0 Circuit 1	C	L-1/L-1	97%	103%	97%	98%	100%	N/A	LPS to cap switching.
AB-T-24	TAP 69 - TAP 70 66/66kV No.1	Line ANTELOPE/SHUTTLE/QUARTZHILL/T AP 93 66.0 Circuit 1,Line DEL SUR/RITEAID/LANCASTER/TAP 50 66.0 Circuit 1	C	L-1/L-1	90%	96%	99%	101%	103%	N/A	LPS to shed load at Lancaster 66.0 kV.
AB-T-25	TAP 69 - TAP 70 66/66kV No.1	Line ANTELOPE/SHUTTLE/QUARTZHILL/T AP 93 66.0 Circuit 1,Line OASIS SC/QUARTZHILL/PALMDALE/TAP 65 66.0 Circuit 1	C	L-1/L-1	90%	95%	99%	101%	103%	N/A	LPS to shed load at Lancaster 66.0 kV.
AB-T-26	TAP 61 - TAP 62 66/66kV No.1	Line OASIS SC/QUARTZHILL/PALMDALE/TAP 65 66.0 Circuit 1,Line ACTON/PALMDALE/SHUTTLE 66.0 Circuit 1	C	L-1/L-1	122%	130%	134%	136%	139%	N/A	LPS approved last year to shed load at Palmdale 66.0 kV; LPS will be in service in August 2011.

Study Area: SCE Antelope-Bailey - Summer Peak (2012-2021)

High/Low Voltage

ID	Substation	Worst Contingency	Category	Category Description	Post Contingency Voltage (PU)						ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2021	
AB-V-1	GORMAN 66kV	Line BAILEY 66.0 to GORMAN 66.0 Circuit 1, Gen KERNRVR 66.0 Unit ID 1	B	L-1/G-1	0.946	0.923	0.882	0.756	0.858	N/A	Short term solution to switch shunts; Long term solution to install Frazier park dynamic voltage support.
AB-V-2	FRAZPARK 66kV	Line BAILEY 66.0 to GORMAN 66.0 Circuit 1, Gen KERNRVR 66.0 Unit ID 1	B	L-1/G-1	0.941	0.916	0.872	0.743	0.850	N/A	Short term solution to switch shunts; Long term solution to install Frazier park dynamic voltage support.
AB-V-3	KERNRVR 66kV	Line BAILEY 66.0 to GORMAN 66.0 Circuit 1, Gen KERNRVR 66.0 Unit ID 1	B	L-1/G-1	0.974	0.960	0.933	0.843	0.912	N/A	Short term solution to switch shunts; Long term solution to install Frazier park dynamic voltage support.

ID	Substation	Worst Contingency	Category	Category Description	Post Contingency Voltage (PU)						ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2021	
AB-V-4	MONOLITH 66kV	Line CUMMINGS 66.0 to MONOLITH 66.0 Circuit 1, Line MONOLITH/CALCEMENT/WINDPARKS/TAP 76/77/90 66.0 Circuit 1	C	L-1/L-1	1.083	1.097	1.107	1.108	1.104	N/A	Local Protection Scheme (LPS) or Operating Procedure (OP) to cap switching.
AB-V-5	GOLDTOWN 66kV	Line MONOLITH/CALCEMENT/GOLDTOWN/WINDLAND /TAP 75/73/74 66.0 Circuit 1, Line LANSTR 66.0 to GOLDTOWN 66.0 Circuit 1	C	L-1/L-1	0.999	0.994	1.103	1.101	1.097	N/A	LPS or OP to cap switching.
AB-V-6	ARBWIND	Line CUMMINGS 66.0 to MONOLITH 66.0 Circuit 1, Line MONOLITH/CALCEMENT/GOLDTOWN/WINDLAND /TAP 75/73/74 66.0 Circuit 1	C	L-1/L-1	1.082	1.108	1.085	1.086	1.082	N/A	LPS or OP to cap switching or the long term solution could be EKWRA.
AB-V-7	BREEZE	Line CUMMINGS 66.0 to MONOLITH 66.0 Circuit 1, Line MONOLITH/CALCEMENT/GOLDTOWN/WINDLAND /TAP 75/73/74 66.0 Circuit 1	C	L-1/L-1	1.086	1.110	1.094	1.095	1.091	N/A	LPS or OP to cap switching or the long term solution could be EKWRA.
AB-V-8	MONOLITH	Line CUMMINGS 66.0 to MONOLITH 66.0 Circuit 1, Line MONOLITH/CALCEMENT/GOLDTOWN/WINDLAND /TAP 75/73/74 66.0 Circuit 1	C	L-1/L-1	1.086	1.111	1.095	1.095	1.092	N/A	LPS or OP to cap switching or the long term solution could be EKWRA.
AB-V-9	DUTCHWND	Line CUMMINGS 66.0 to MONOLITH 66.0 Circuit 1, Line MONOLITH/CALCEMENT/GOLDTOWN/WINDLAND /TAP 75/73/74 66.0 Circuit 1	C	L-1/L-1	1.077	1.100	1.074	1.074	1.071	N/A	LPS or OP to cap switching or the long term solution could be EKWRA.

AB-V-10	ENCANWND	Line CUMMINGS 66.0 to MONOLITH 66.0 Circuit 1,Line MONOLITH/CALCEMENT/GOLDTOWN/WINDLAND /TAP 75/73/74 66.0 Circuit 1	C	L-1/L-1	1.079	1.106	1.078	1.078	1.075	N/A	LPS or OP to cap switching or the long term solution could be EKWRA.
AB-V-11	FLOWIND	Line CUMMINGS 66.0 to MONOLITH 66.0 Circuit 1,Line MONOLITH/CALCEMENT/GOLDTOWN/WINDLAND /TAP 75/73/74 66.0 Circuit 1	C	L-1/L-1	1.077	1.102	1.075	1.075	1.072	N/A	LPS or OP to cap switching or the long term solution could be EKWRA.
AB-V-12	HAVILAH	Line CUMMINGS 66.0 to MONOLITH 66.0 Circuit 1,Line MONOLITH/CALCEMENT/GOLDTOWN/WINDLAND /TAP 75/73/74 66.0 Circuit 1	C	L-1/L-1	1.077	1.102	1.085	1.086	1.082	N/A	LPS or OP to cap switching or the long term solution could be EKWRA.
AB-V-13	LORAINE	Line CUMMINGS 66.0 to MONOLITH 66.0 Circuit 1,Line MONOLITH/CALCEMENT/GOLDTOWN/WINDLAND /TAP 75/73/74 66.0 Circuit 1	C	L-1/L-1	1.082	1.106	1.090	1.091	1.087	N/A	LPS or OP to cap switching or the long term solution could be EKWRA.
AB-V-14	NORTHWND	Line CUMMINGS 66.0 to MONOLITH 66.0 Circuit 1,Line MONOLITH/CALCEMENT/GOLDTOWN/WINDLAND /TAP 75/73/74 66.0 Circuit 1	C	L-1/L-1	1.081	1.104	1.085	1.085	1.082	N/A	LPS or OP to cap switching or the long term solution could be EKWRA.
AB-V-15	OAKWIND	Line CUMMINGS 66.0 to MONOLITH 66.0 Circuit 1,Line MONOLITH/CALCEMENT/GOLDTOWN/WINDLAND /TAP 75/73/74 66.0 Circuit 1	C	L-1/L-1	1.081	1.103	1.081	1.081	1.078	N/A	LPS or OP to cap switching or the long term solution could be EKWRA.
AB-V-16	SOUTHWND	Line CUMMINGS 66.0 to MONOLITH 66.0 Circuit 1,Line MONOLITH/CALCEMENT/GOLDTOWN/WINDLAND /TAP 75/73/74 66.0 Circuit 1	C	L-1/L-1	1.081	1.103	1.081	1.081	1.078	N/A	LPS or OP to cap switching or the long term solution could be EKWRA.
AB-V-17	VARWIND	Line CUMMINGS 66.0 to MONOLITH 66.0 Circuit 1,Line MONOLITH/CALCEMENT/GOLDTOWN/WINDLAND /TAP 75/73/74 66.0 Circuit 1	C	L-1/L-1	1.079	1.106	1.078	1.078	1.075	N/A	LPS or OP to cap switching or the long term solution could be EKWRA.
AB-V-18	WALKERBN	Line CUMMINGS 66.0 to MONOLITH 66.0 Circuit 1,Line MONOLITH/CALCEMENT/GOLDTOWN/WINDLAND /TAP 75/73/74 66.0 Circuit 1	C	L-1/L-1	1.079	1.103	1.087	1.088	1.084	N/A	LPS or OP to cap switching or the long term solution could be EKWRA.
AB-V-19	ZONDWIND	Line CUMMINGS 66.0 to MONOLITH 66.0 Circuit 1,Line MONOLITH/CALCEMENT/GOLDTOWN/WINDLAND /TAP 75/73/74 66.0 Circuit 1	C	L-1/L-1	1.081	1.104	1.085	1.085	1.082	N/A	LPS or OP to cap switching or the long term solution could be EKWRA.

Study Area: SCE Antelope-Bailey - Summer Peak (2012-2021)

Voltage Deviation

ID	Substation	Worst Contingency	Category	Category Description	Post Contingency Voltage Deviation (%)						ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2021	
AB-DV-1	DEL SUR 66kV	Line ANTELOPE 66.0 to DEL SUR 66.0 Circuit 1	B	L-1	-4%	-5%	-5%	-5%	-5%	N/A	LPS or OP to cap switching or the long term solution could be EKWRA.
AB-DV-2	GORMAN 66kV	Line BAILEY 66.0 to GORMAN 66.0 Circuit 1	B	L-1	-4%	-5%	-6%	-8%	-6%	N/A	Frazier park dynamic voltage support project.
AB-DV-3	FRAZPARK 66kV	Line BAILEY 66.0 to GORMAN 66.0 Circuit 1	B	L-1	-4%	-5%	-6%	-8%	-6%	N/A	Frazier park dynamic voltage support project.
AB-DV-4	GORMAN 66kV	Line BAILEY 66.0 to GORMAN 66.0 Circuit 1,Gen KERNRVR 66.0 Unit ID 1	B	L-1/G-1	-8%	-10%	-14%	-27%	-16%	N/A	Short term solution to switch shunts; Long term solution to install Frazier park dynamic voltage support.
AB-DV-5	FRAZPARK 66kV	Line BAILEY 66.0 to GORMAN 66.0 Circuit 1,Gen KERNRVR 66.0 Unit ID 1	B	L-1/G-1	-8%	-10%	-14%	-27%	-17%	N/A	Short term solution to switch shunts; Long term solution to install Frazier park dynamic voltage support.
AB-DV-6	KERNRVR 66kV	Line BAILEY 66.0 to GORMAN 66.0 Circuit 1,Gen KERNRVR 66.0 Unit ID 1	B	L-1/G-1	-4%	-5%	-8%	-17%	-10%	N/A	Short term solution to switch shunts; Long term solution to install Frazier park dynamic voltage support.

ID	Substation	Worst Contingency	Category	Category Description	Post Contingency Voltage Deviation (%)						ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2021	
AB-DV-7	SHUTTLE 66kV	Line ANTELOPE/LANPRI/LANCSTR/SHUTTLE/TAP 70/69 66.0 Circuit 1,Line ANTELOPE/SHUTTLE/QUARTZHILL/TAP 93 66.0 Circuit 1	C	L-1/L-1	-8%	-10%	-11%	-11%	-12%	N/A	LPS or OP to shed load at Shuttle 66 kV.



Study Area: SCE Antelope-Bailey - Off Peak (2012-2021)

Thermal Overload

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)						ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2021	
AB-T-27	LANCSTR - GOLDTOWN 66/66kV No.1	Normal	A	N-0	N/A	N/A	N/A	N/A	110%	N/A	Existing OP or the long term solution could be EKWRA.

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)						ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2021	
AB-T-28	ANTELOPE - ROSAMOND 66/66kV No.1	Line ANTELOPE 66.0 to CALCMENT 66.0 Circuit 1	B	L-1	N/A	N/A	N/A	N/A	107%	N/A	Existing OP or the long term solution could be EKWRA.
AB-T-29	LANCSTR - GOLDTOWN 66/66kV No.1	Line ANTELOPE 66.0 to CALCMENT 66.0 Circuit 1	B	L-1	N/A	N/A	N/A	N/A	127%	N/A	
AB-T-30	ROSAMOND - TAP 52 66/66kV No.1	Line ANTELOPE 66.0 to CALCMENT 66.0 Circuit 1	B	L-1	N/A	N/A	N/A	N/A	107%	N/A	
AB-T-31	GOLDTOWN - TAP 74 66/66kV No.1	Line ANTELOPE 66.0 to CALCMENT 66.0 Circuit 1	B	L-1	N/A	N/A	N/A	N/A	116%	N/A	

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)						ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2021	
AB-T-32	ANTELOPE - CALCMENT 66/66kV No.1	Line ANTELOPE/DELSUR/ROSAMOND/TAP 71 66.0 Circuit 1,Line LANCSTR 66.0 to GOLDTOWN 66.0 Circuit 1	C	L-1/L-1	N/A	N/A	N/A	N/A	117%	N/A	Existing OP or the long term solution could be EKWRA.
AB-T-33	ANTELOPE - ROSAMOND 66/66kV No.1	Line ANTELOPE 66.0 to CALCMENT 66.0 Circuit 1,Line BAILEY/OSO/ALAMO 66.0 to TAP 86 66.0 Circuit 1	C	L-1/L-1	N/A	N/A	N/A	N/A	108%	N/A	
AB-T-34	ANTELOPE - ROSAMOND 66/66kV No.1	Line ANTELOPE 66.0 to CALCMENT 66.0 Circuit 1,Line LANCSTR/LITTLE ROCK/PIUTE/TAP 72 66.0 Circuit 1	C	L-1/L-1	N/A	N/A	N/A	N/A	108%	N/A	
AB-T-35	ANTELOPE - ROSAMOND 66/66kV No.1	Line ANTELOPE/DELSUR/ROSAMOND/TAP 71 66.0 Circuit 1,Line CUMMINGS 66.0 to MONOLITH 66.0 Circuit 1	C	L-1/L-1	N/A	N/A	N/A	N/A	121%	N/A	
AB-T-36	ANTELOPE - ROSAMOND 66/66kV No.1	Line ANTELOPE/DELSUR/ROSAMOND/TAP 71 66.0 Circuit 1,Line LANCSTR 66.0 to GOLDTOWN 66.0 Circuit 1	C	L-1/L-1	N/A	N/A	N/A	N/A	157%	N/A	

AB-T-37	ANTELOPE - TAP 71 66/66kV No.1	Line ANTELOPE 66.0 to ROSAMOND 66.0 Circuit 1,Line LANCSTR 66.0 to GOLDTOWN 66.0 Circuit 1	C	L-1/L-1	N/A	N/A	N/A	N/A	102%	N/A
AB-T-38	LANCSTR - GOLDTOWN 66/66kV No.1	Line ANTELOPE 66.0 to NEENACH 66.0 Circuit 1,Line ANTELOPE 66.0 to CALCMENT 66.0 Circuit 1	C	L-1/L-1	N/A	N/A	N/A	N/A	126%	N/A
AB-T-39	LANCSTR - GOLDTOWN 66/66kV No.1	Line ANTELOPE 66.0 to QUARTZHL 66.0 Circuit 1,Line ANTELOPE 66.0 to CALCMENT 66.0 Circuit 1	C	L-1/L-1	N/A	N/A	N/A	N/A	128%	N/A
AB-T-40	LANCSTR - GOLDTOWN 66/66kV No.1	Line ANTELOPE 66.0 to CALCMENT 66.0 Circuit 1,Line ANTELOPE/SHUTTLE/QUARTZHILL/TAP 93 66.0 Circuit 1	C	L-1/L-1	N/A	N/A	N/A	N/A	129%	N/A
AB-T-41	LANCSTR - GOLDTOWN 66/66kV No.1	Line ANTELOPE 66.0 to ROSAMOND 66.0 Circuit 1,Line BAILEY 66.0 to GORMAN 66.0 Circuit 1	C	L-1/L-1	N/A	N/A	N/A	N/A	109%	N/A
AB-T-42	LANCSTR - GOLDTOWN 66/66kV No.1	Line GORMAN 66.0 to KERNRVR 66.0 Circuit 1,Line GOLDTOWN 66.0 to CORUM 66.0 Circuit 1	C	L-1/L-1	N/A	N/A	N/A	N/A	109%	N/A
AB-T-43	ROSAMOND - TAP 71 66/66kV No.1	Line ANTELOPE 66.0 to ROSAMOND 66.0 Circuit 1,Line LANCSTR 66.0 to GOLDTOWN 66.0 Circuit 1	C	L-1/L-1	N/A	N/A	N/A	N/A	131%	N/A
AB-T-44	ROSAMOND - TAP 71 66/66kV No.1	Line ANTELOPE 66.0 to ROSAMOND 66.0 Circuit 1,Line GORMAN 66.0 to KERNRVR 66.0 Circuit 1	C	L-1/L-1	N/A	N/A	N/A	N/A	114%	N/A
AB-T-45	ROSAMOND - TAP 52 66/66kV No.1	Line ANTELOPE 66.0 to CALCMENT 66.0 Circuit 1,Line ANTELOPE/SHUTTLE/QUARTZHILL/TAP 93 66.0 Circuit 1	C	L-1/L-1	N/A	N/A	N/A	N/A	108%	N/A
AB-T-46	ROSAMOND - TAP 52 66/66kV No.1	Line ANTELOPE 66.0 to CALCMENT 66.0 Circuit 1,Line LANCSTR/LITTLE ROCK/PIUTE/TAP 72 66.0 Circuit 1	C	L-1/L-1	N/A	N/A	N/A	N/A	108%	N/A
AB-T-47	ROSAMOND - TAP 52 66/66kV No.1	Line BAILEY 66.0 to GORMAN 66.0 Circuit 1,Line MONOLITH/CALCEMENT/GOLDTOWN/WINDLAND/TAP 75/73/74 66.0 Circuit 1	C	L-1/L-1	N/A	N/A	N/A	N/A	116%	N/A
AB-T-48	GOLDTOWN - TAP 74 66/66kV No.1	Line ANTELOPE 66.0 to CALCMENT 66.0 Circuit 1,Line ANTELOPE/SHUTTLE/QUARTZHILL/TAP 93 66.0 Circuit 1	C	L-1/L-1	N/A	N/A	N/A	N/A	117%	N/A
AB-T-49	GOLDTOWN - TAP 74 66/66kV No.1	Line ANTELOPE 66.0 to NEENACH 66.0 Circuit 1,Line ANTELOPE 66.0 to CALCMENT 66.0 Circuit 1	C	L-1/L-1	N/A	N/A	N/A	N/A	115%	N/A
AB-T-50	GOLDTOWN - TAP 74 66/66kV No.1	Line ANTELOPE 66.0 to QUARTZHL 66.0 Circuit 1,Line ANTELOPE 66.0 to CALCMENT 66.0 Circuit 1	C	L-1/L-1	N/A	N/A	N/A	N/A	116%	N/A

Existing OP or the long term solution could be EKWRA.

Study Area: SCE Antelope-Bailey - Off Peak (2012-2021)

High/Low Voltage

ID	Substation	Worst Contingency	Category	Category Description	Post Contingency Voltage (PU)						ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2021	
AB-V-20	ARBWIND 66KV	Line ANTELOPE 66.0 to CALCMENT 66.0 Circuit 1	B	L-1	N/A	N/A	N/A	N/A	0.871	N/A	
AB-V-21	ARBWIND 66KV	Gen ENCANWND 66.0 Unit ID 1	B	G-1	N/A	N/A	N/A	N/A	1.147	N/A	
AB-V-22	BOREL 66KV	Line CALCEMENT/MONOLITH/ROSAMOND/WINDFARM 66.0 to TAP 79 66.0 Circuit 1	B	L-1	N/A	N/A	N/A	N/A	1.205	N/A	
AB-V-23	BREEZE 66KV	Line ANTELOPE 66.0 to CALCMENT 66.0 Circuit 1	B	L-1	N/A	N/A	N/A	N/A	0.879	N/A	
AB-V-24	BREEZE 66KV	Line CALCEMENT/MONOLITH/ROSAMOND/WINDFARM 66.0 to TAP 79 66.0 Circuit 1	B	L-1	N/A	N/A	N/A	N/A	1.166	N/A	
AB-V-25	CALCMENT 66KV	Line ANTELOPE 66.0 to CALCMENT 66.0 Circuit 1	B	L-1	N/A	N/A	N/A	N/A	0.864	N/A	
AB-V-26	CALCMENT 66KV	Line CALCEMENT/MONOLITH/ROSAMOND/WINDFARM 66.0 to TAP 79 66.0 Circuit 1	B	L-1	N/A	N/A	N/A	N/A	1.147	N/A	
AB-V-27	CALCMENT 66KV	Gen ENCANWND 66.0 Unit ID 1	B	G-1	N/A	N/A	N/A	N/A	1.137	N/A	
AB-V-28	CORUM 66KV	Gen ENCANWND 66.0 Unit ID 1	B	G-1	N/A	N/A	N/A	N/A	1.125	N/A	
AB-V-29	CUMMINGS 66KV	Line ANTELOPE 66.0 to CALCMENT 66.0 Circuit 1	B	L-1	N/A	N/A	N/A	N/A	0.881	N/A	
AB-V-30	CUMMINGS 66KV	Line CALCEMENT/MONOLITH/ROSAMOND/WINDFARM	B	L-1	N/A	N/A	N/A	N/A	1.151	N/A	
AB-V-31	DUTCHWND 66KV	Line ANTELOPE 66.0 to CALCMENT 66.0 Circuit 1	B	L-1	N/A	N/A	N/A	N/A	0.863	N/A	
AB-V-32	DUTCHWND 66KV	Gen ENCANWND 66.0 Unit ID 1	B	G-1	N/A	N/A	N/A	N/A	1.140	N/A	
AB-V-33	ENCANWND 66KV	Line ANTELOPE 66.0 to CALCMENT 66.0 Circuit 1	B	L-1	N/A	N/A	N/A	N/A	0.864	N/A	
AB-V-34	ENCANWND 66KV	Gen ENCANWND 66.0 Unit ID 1	B	G-1	N/A	N/A	N/A	N/A	1.145	N/A	
AB-V-35	FLOWIND 66KV	Line ANTELOPE 66.0 to CALCMENT 66.0 Circuit 1	B	L-1	N/A	N/A	N/A	N/A	0.863	N/A	
AB-V-36	FLOWIND 66KV	Gen ENCANWND 66.0 Unit ID 1	B	G-1	N/A	N/A	N/A	N/A	1.141	N/A	
AB-V-37	GOLDTOWN 66KV	Line ANTELOPE 66.0 to CALCMENT 66.0 Circuit 1	B	L-1	N/A	N/A	N/A	N/A	0.882	N/A	
AB-V-38	GOLDTOWN 66KV	Line CALCEMENT/MONOLITH/ROSAMOND/WINDFARM 66.0 to TAP 79 66.0 Circuit 1	B	L-1	N/A	N/A	N/A	N/A	1.136	N/A	
AB-V-39	GREATLKS 66KV	Gen ENCANWND 66.0 Unit ID 1	B	G-1	N/A	N/A	N/A	N/A	1.115	N/A	

AB-V-40	HAVILAH 66KV	Line CALCEMENT/MONOLITH/ROSAMOND/WINDFARM 66.0 to TAP 79 66.0 Circuit 1	B	L-1	N/A	N/A	N/A	N/A	1.196	N/A
AB-V-41	LORAIN 66KV	Line CALCEMENT/MONOLITH/ROSAMOND/WINDFARM 66.0 to TAP 79 66.0 Circuit 1	B	L-1	N/A	N/A	N/A	N/A	1.180	N/A
AB-V-42	MIDWIND 66KV	Line ANTELOPE 66.0 to CALCEMENT 66.0 Circuit 1	B	L-1	N/A	N/A	N/A	N/A	0.868	N/A
AB-V-43	MIDWIND 66KV	Line CALCEMENT/MONOLITH/ROSAMOND/WINDFARM 66.0 to TAP 79 66.0 Circuit 1	B	L-1	N/A	N/A	N/A	N/A	1.152	N/A
AB-V-44	MONOLITH 66KV	Line ANTELOPE 66.0 to CALCEMENT 66.0 Circuit 1	B	L-1	N/A	N/A	N/A	N/A	0.880	N/A
AB-V-45	MONOLITH 66KV	Line CALCEMENT/MONOLITH/ROSAMOND/WINDFARM 66.0 to TAP 79 66.0 Circuit 1	B	L-1	N/A	N/A	N/A	N/A	1.166	N/A
AB-V-46	MORWIND 66KV	Line ANTELOPE 66.0 to CALCEMENT 66.0 Circuit 1	B	L-1	N/A	N/A	N/A	N/A	0.867	N/A
AB-V-47	MORWIND 66KV	Line CALCEMENT/MONOLITH/ROSAMOND/WINDFARM 66.0 to TAP 79 66.0 Circuit 1	B	L-1	N/A	N/A	N/A	N/A	1.142	N/A
AB-V-48	NORTHWND 66KV	Line ANTELOPE 66.0 to CALCEMENT 66.0 Circuit 1	B	L-1	N/A	N/A	N/A	N/A	0.871	N/A
AB-V-49	NORTHWND 66KV	Line CALCEMENT/MONOLITH/ROSAMOND/WINDFARM 66.0 to TAP 79 66.0 Circuit 1	B	L-1	N/A	N/A	N/A	N/A	1.158	N/A
AB-V-50	ROSAMOND 66KV	Gen ENCANWND 66.0 Unit ID 1	B	G-1	N/A	N/A	N/A	N/A	1.117	N/A
AB-V-51	SOUTHWND 66KV	Line ANTELOPE 66.0 to CALCEMENT 66.0 Circuit 1	B	L-1	N/A	N/A	N/A	N/A	0.867	N/A
AB-V-52	SOUTHWND 66KV	Line CALCEMENT/MONOLITH/ROSAMOND/WINDFARM 66.0 to TAP 79 66.0 Circuit 1	B	L-1	N/A	N/A	N/A	N/A	1.154	N/A
AB-V-53	CORRECT 66KV	Line ANTELOPE 66.0 to CALCEMENT 66.0 Circuit 1	B	L-1	N/A	N/A	N/A	N/A	0.884	N/A
AB-V-54	CORRECT 66KV	Line CALCEMENT/MONOLITH/ROSAMOND/WINDFARM 66.0 to TAP 79 66.0 Circuit 1	B	L-1	N/A	N/A	N/A	N/A	1.146	N/A
AB-V-55	VARWIND 66KV	Line ANTELOPE 66.0 to CALCEMENT 66.0 Circuit 1	B	L-1	N/A	N/A	N/A	N/A	0.865	N/A
AB-V-56	VARWIND 66KV	Gen ENCANWND 66.0 Unit ID 1	B	G-1	N/A	N/A	N/A	N/A	1.145	N/A
AB-V-57	WALKERBN 66KV	Line CALCEMENT/MONOLITH/ROSAMOND/WINDFARM 66.0 to TAP 79 66.0 Circuit 1	B	L-1	N/A	N/A	N/A	N/A	1.191	N/A
AB-V-58	ZONDWIND 66KV	Line ANTELOPE 66.0 to CALCEMENT 66.0 Circuit 1	B	L-1	N/A	N/A	N/A	N/A	0.871	N/A

EKWRA

AB-V-59	ZONWIND 66KV	Line CALCEMENT/MONOLITH/ROSAMOND/WINDFARM 66.0 to TAP 79 66.0 Circuit 1	B	L-1	N/A	N/A	N/A	N/A	1.158	N/A
AB-V-60	OAKWIND 66KV	Line ANTELOPE 66.0 to CALCEMENT 66.0 Circuit 1	B	L-1	N/A	N/A	N/A	N/A	0.867	N/A
AB-V-61	OAKWIND 66KV	Line CALCEMENT/MONOLITH/ROSAMOND/WINDFARM 66.0 to TAP 79 66.0 Circuit 1	B	L-1	N/A	N/A	N/A	N/A	1.154	N/A
AB-V-62	BANDUCCI 66KV	Line ANTELOPE 66.0 to CALCEMENT 66.0 Circuit 1	B	L-1	N/A	N/A	N/A	N/A	0.888	N/A
AB-V-63	BANDUCCI 66KV	Line CALCEMENT/MONOLITH/ROSAMOND/WINDFARM 66.0 to TAP 79 66.0 Circuit 1	B	L-1	N/A	N/A	N/A	N/A	1.143	N/A
AB-V-64	ARBWIND 66KV	Line ANTELOPE 66.0 to CALCEMENT 66.0 Circuit 1,Gen ENCANWND 66.0 Unit ID 1	B	L-1/G-1	N/A	N/A	N/A	N/A	1.210	N/A
AB-V-65	DUTCHWND 66KV	Line ANTELOPE 66.0 to CALCEMENT 66.0 Circuit 1,Gen ENCANWND 66.0 Unit ID 1	B	L-1/G-1	N/A	N/A	N/A	N/A	1.201	N/A
AB-V-66	ENCANWND 66KV	Line ANTELOPE 66.0 to CALCEMENT 66.0 Circuit 1,Gen ENCANWND 66.0 Unit ID 1	B	L-1/G-1	N/A	N/A	N/A	N/A	1.207	N/A
AB-V-67	FLOWIND 66KV	Line ANTELOPE 66.0 to CALCEMENT 66.0 Circuit 1,Gen ENCANWND 66.0 Unit ID 1	B	L-1/G-1	N/A	N/A	N/A	N/A	1.202	N/A
AB-V-68	FRAZPARK 66KV	Line BAILEY 66.0 to GORMAN 66.0 Circuit 1,Gen ENCANWND 66.0 Unit ID 1	B	L-1/G-1	N/A	N/A	N/A	N/A	1.209	N/A
AB-V-69	GORMAN 66KV	Line BAILEY 66.0 to GORMAN 66.0 Circuit 1,Gen ENCANWND 66.0 Unit ID 1	B	L-1/G-1	N/A	N/A	N/A	N/A	1.211	N/A
AB-V-70	GREATLKS 66KV	Line ANTELOPE/DELSUR/ROSAMOND/TAP 71 66.0 Circuit 1,Gen ENCANWND 66.0 Unit 1	B	L-1/G-1	N/A	N/A	N/A	N/A	1.153	N/A
AB-V-71	KERNRVR 66KV	Line BAILEY 66.0 to GORMAN 66.0 Circuit 1,Gen ENCANWND 66.0 Unit ID 1	B	L-1/G-1	N/A	N/A	N/A	N/A	1.217	N/A
AB-V-72	ROSAMOND 66KV	Line ANTELOPE/DELSUR/ROSAMOND/TAP 71 66.0 Circuit 1,Gen ENCANWND 66.0 Unit 1	B	L-1/G-1	N/A	N/A	N/A	N/A	1.154	N/A
AB-V-73	VARWIND 66KV	Line ANTELOPE 66.0 to CALCEMENT 66.0 Circuit 1,Gen ENCANWND 66.0 Unit ID 1	B	L-1/G-1	N/A	N/A	N/A	N/A	1.207	N/A

ID	Substation	Worst Contingency	Category	Category Description	Post Contingency Voltage (PU)						ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2021	
AB-V-74	ARBWIND 66KV	Line BAILEY 66.0 to GORMAN 66.0 Circuit 1,Line MONOLITH/CALCEMENT/GOLDTOWN/WINDLAND/ TAP 75/73/74 66.0 Circuit 1	C	L-1/L-1	N/A	N/A	N/A	N/A	0.742	N/A	
AB-V-75	BANDUCCI 66KV	Line BAILEY 66.0 to GORMAN 66.0 Circuit 1,Line MONOLITH/CALCEMENT/GOLDTOWN/WINDLAND/ TAP 75/73/74 66.0 Circuit 1	C	L-1/L-1	N/A	N/A	N/A	N/A	0.781	N/A	

AB-V-76	BANDUCCI 66KV	Line CALCEMENT/MONOLITH/ROSAMOND/WINDFARM 66.0 to TAP 79 66.0 Circuit 1,Line MONOLITH/CALCEMENT/GOLDTOWN/WINDLAND/ TAP 75/73/74 66.0 Circuit 1	C	L-1/L-1	N/A	N/A	N/A	N/A	1.274	N/A
AB-V-77	BOREL 66KV	Line BAILEY 66.0 to GORMAN 66.0 Circuit 1,Line MONOLITH/CALCEMENT/GOLDTOWN/WINDLAND/ TAP 75/73/74 66.0 Circuit 1	C	L-1/L-1	N/A	N/A	N/A	N/A	0.828	N/A
AB-V-78	BOREL 66KV	Line CALCEMENT/MONOLITH/ROSAMOND/WINDFARM 66.0 to TAP 79 66.0 Circuit 1,Line MONOLITH/CALCEMENT/GOLDTOWN/WINDLAND/ TAP 75/73/74 66.0 Circuit 1	C	L-1/L-1	N/A	N/A	N/A	N/A	1.348	N/A
AB-V-79	BREEZE 66KV	Line BAILEY 66.0 to GORMAN 66.0 Circuit 1,Line MONOLITH/CALCEMENT/GOLDTOWN/WINDLAND/ TAP 75/73/74 66.0 Circuit 1	C	L-1/L-1	N/A	N/A	N/A	N/A	0.751	N/A
AB-V-80	BREEZE 66KV	Line CALCEMENT/MONOLITH/ROSAMOND/WINDFARM 66.0 to TAP 79 66.0 Circuit 1,Line MONOLITH/CALCEMENT/GOLDTOWN/WINDLAND/ TAP 75/73/74 66.0 Circuit 1	C	L-1/L-1	N/A	N/A	N/A	N/A	1.310	N/A
AB-V-81	CALCMENT 66KV	Line BAILEY 66.0 to GORMAN 66.0 Circuit 1,Line MONOLITH/CALCEMENT/GOLDTOWN/WINDLAND/ TAP 75/73/74 66.0 Circuit 1	C	L-1/L-1	N/A	N/A	N/A	N/A	0.740	N/A
AB-V-82	CALCMENT 66KV	Line CALCEMENT/MONOLITH/ROSAMOND/WINDFARM 66.0 to TAP 79 66.0 Circuit 1,Line MONOLITH/CALCEMENT/GOLDTOWN/WINDLAND/ TAP 75/73/74 66.0 Circuit 1	C	L-1/L-1	N/A	N/A	N/A	N/A	1.258	N/A
AB-V-83	CORRECT 66KV	Line BAILEY 66.0 to GORMAN 66.0 Circuit 1,Line MONOLITH/CALCEMENT/GOLDTOWN/WINDLAND/ TAP 75/73/74 66.0 Circuit 1	C	L-1/L-1	N/A	N/A	N/A	N/A	0.773	N/A
AB-V-84	CORRECT 66KV	Line CALCEMENT/MONOLITH/ROSAMOND/WINDFARM 66.0 to TAP 79 66.0 Circuit 1,Line MONOLITH/CALCEMENT/GOLDTOWN/WINDLAND/ TAP 75/73/74 66.0 Circuit 1	C	L-1/L-1	N/A	N/A	N/A	N/A	1.279	N/A
AB-V-85	CORUM 66KV	Line ANTELOPE 66.0 to CALCMENT 66.0 Circuit 1,Line CALCEMENT/MONOLITH/ROSAMOND/WINDFARM 66.0 to TAP 79 66.0 Circuit 1	C	L-1/L-1	N/A	N/A	N/A	N/A	1.174	N/A

AB-V-86	CORUM 66KV	Line LANCSTR 66.0 to GOLDTOWN 66.0 Circuit 1,Line ROSAMOND 66.0 to CORUM 66.0 Circuit 1	C	L-1/L-1	N/A	N/A	N/A	N/A	0.866	N/A
AB-V-87	CUMMINGS 66KV	Line BAILEY 66.0 to GORMAN 66.0 Circuit 1,Line MONOLITH/CALCEMENT/GOLDTOWN/WINDLAND/TAP 75/73/74 66.0 Circuit 1	C	L-1/L-1	N/A	N/A	N/A	N/A	0.766	N/A
AB-V-88	CUMMINGS 66KV	Line CALCEMENT/MONOLITH/ROSAMOND/WINDFARM 66.0 to TAP 79 66.0 Circuit 1,Line MONOLITH/CALCEMENT/GOLDTOWN/WINDLAND/TAP 75/73/74 66.0 Circuit 1	C	L-1/L-1	N/A	N/A	N/A	N/A	1.288	N/A
AB-V-89	DUTCHWND 66KV	Line BAILEY 66.0 to GORMAN 66.0 Circuit 1,Line MONOLITH/CALCEMENT/GOLDTOWN/WINDLAND/TAP 75/73/74 66.0 Circuit 1	C	L-1/L-1	N/A	N/A	N/A	N/A	0.735	N/A
AB-V-90	ENCANWND 66KV	Line BAILEY 66.0 to GORMAN 66.0 Circuit 1,Line MONOLITH/CALCEMENT/GOLDTOWN/WINDLAND/TAP 75/73/74 66.0 Circuit 1	C	L-1/L-1	N/A	N/A	N/A	N/A	0.735	N/A
AB-V-91	FLOWIND 66KV	Line BAILEY 66.0 to GORMAN 66.0 Circuit 1,Line MONOLITH/CALCEMENT/GOLDTOWN/WINDLAND/TAP 75/73/74 66.0 Circuit 1	C	L-1/L-1	N/A	N/A	N/A	N/A	0.734	N/A
AB-V-92	GOLDTOWN 66KV	Line ANTELOPE 66.0 to CALCEMENT 66.0 Circuit 1,Line CALCEMENT/MONOLITH/ROSAMOND/WINDFARM 66.0 to TAP 79 66.0 Circuit 1	C	L-1/L-1	N/A	N/A	N/A	N/A	1.215	N/A
AB-V-93	GOLDTOWN 66KV	Line LANCSTR 66.0 to GOLDTOWN 66.0 Circuit 1,Line GOLDTOWN 66.0 to CORUM 66.0 Circuit 1	C	L-1/L-1	N/A	N/A	N/A	N/A	0.862	N/A
AB-V-94	GREATLKS 66KV	Line BAILEY 66.0 to GORMAN 66.0 Circuit 1,Line MONOLITH/CALCEMENT/GOLDTOWN/WINDLAND/TAP 75/73/74 66.0 Circuit 1	C	L-1/L-1	N/A	N/A	N/A	N/A	0.898	N/A
AB-V-95	HAVILAH 66KV	Line BAILEY 66.0 to GORMAN 66.0 Circuit 1,Line MONOLITH/CALCEMENT/GOLDTOWN/WINDLAND/TAP 75/73/74 66.0 Circuit 1	C	L-1/L-1	N/A	N/A	N/A	N/A	0.812	N/A
AB-V-96	HAVILAH 66KV	Line CALCEMENT/MONOLITH/ROSAMOND/WINDFARM 66.0 to TAP 79 66.0 Circuit 1,Line MONOLITH/CALCEMENT/GOLDTOWN/WINDLAND/TAP 75/73/74 66.0 Circuit 1	C	L-1/L-1	N/A	N/A	N/A	N/A	1.340	N/A

EKWRA

AB-V-97	LORAIN 66KV	Line BAILEY 66.0 to GORMAN 66.0 Circuit 1,Line MONOLITH/CALCEMENT/GOLDTOWN/WINDLAND/ TAP 75/73/74 66.0 Circuit 1	C	L-1/L-1	N/A	N/A	N/A	N/A	0.777	N/A
AB-V-98	LORAIN 66KV	Line CALCEMENT/MONOLITH/ROSAMOND/WINDFARM 66.0 to TAP 79 66.0 Circuit 1,Line MONOLITH/CALCEMENT/GOLDTOWN/WINDLAND/ TAP 75/73/74 66.0 Circuit 1	C	L-1/L-1	N/A	N/A	N/A	N/A	1.324	N/A
AB-V-99	MIDWIND 66KV	Line ANTELOPE 66.0 to CALCMENT 66.0 Circuit 1,Line ANTELOPE/SHUTTLE/QUARTZHILL/TAP 93 66.0 Circuit 1	C	L-1/L-1	N/A	N/A	N/A	N/A	0.859	N/A
AB-V-100	MIDWIND 66KV	Line ANTELOPE 66.0 to CALCMENT 66.0 Circuit 1,Line CALCEMENT/MONOLITH/ROSAMOND/WINDFARM 66.0 to TAP 79 66.0 Circuit 1	C	L-1/L-1	N/A	N/A	N/A	N/A	1.251	N/A
AB-V-101	MONOLITH 66KV	Line BAILEY 66.0 to GORMAN 66.0 Circuit 1,Line MONOLITH/CALCEMENT/GOLDTOWN/WINDLAND/ TAP 75/73/74 66.0 Circuit 1	C	L-1/L-1	N/A	N/A	N/A	N/A	0.751	N/A
AB-V-102	MONOLITH 66KV	Line CALCEMENT/MONOLITH/ROSAMOND/WINDFARM 66.0 to TAP 79 66.0 Circuit 1,Line MONOLITH/CALCEMENT/GOLDTOWN/WINDLAND/ TAP 75/73/74 66.0 Circuit 1	C	L-1/L-1	N/A	N/A	N/A	N/A	1.310	N/A
AB-V-103	MORWIND 66KV	Line ANTELOPE 66.0 to CALCMENT 66.0 Circuit 1,Line ANTELOPE/SHUTTLE/QUARTZHILL/TAP 93 66.0 Circuit 1	C	L-1/L-1	N/A	N/A	N/A	N/A	0.858	N/A
AB-V-104	MORWIND 66KV	Line ANTELOPE 66.0 to CALCMENT 66.0 Circuit 1,Line CALCEMENT/MONOLITH/ROSAMOND/WINDFARM 66.0 to TAP 79 66.0 Circuit 1	C	L-1/L-1	N/A	N/A	N/A	N/A	1.234	N/A
AB-V-105	NORTHWND 66KV	Line BAILEY 66.0 to GORMAN 66.0 Circuit 1,Line MONOLITH/CALCEMENT/GOLDTOWN/WINDLAND/ TAP 75/73/74 66.0 Circuit 1	C	L-1/L-1	N/A	N/A	N/A	N/A	0.740	N/A
AB-V-106	NORTHWND 66KV	Line CALCEMENT/MONOLITH/ROSAMOND/WINDFARM 66.0 to TAP 79 66.0 Circuit 1,Line MONOLITH/CALCEMENT/GOLDTOWN/WINDLAND/ TAP 75/73/74 66.0 Circuit 1	C	L-1/L-1	N/A	N/A	N/A	N/A	1.290	N/A
AB-V-107	OAKWIND 66KV	Line BAILEY 66.0 to GORMAN 66.0 Circuit 1,Line MONOLITH/CALCEMENT/GOLDTOWN/WINDLAND/ TAP 75/73/74 66.0 Circuit 1	C	L-1/L-1	N/A	N/A	N/A	N/A	0.735	N/A

AB-V-108	OAKWIND 66KV	Line CALCEMENT/MONOLITH/ROSAMOND/WINDFARM 66.0 to TAP 79 66.0 Circuit 1,Line MONOLITH/CALCEMENT/GOLDTOWN/WINDLAND/ TAP 75/73/74 66.0 Circuit 1	C	L-1/L-1	N/A	N/A	N/A	N/A	1.278	N/A
AB-V-109	ROSAMOND 66KV	Line BAILEY 66.0 to GORMAN 66.0 Circuit 1,Line MONOLITH/CALCEMENT/GOLDTOWN/WINDLAND/ TAP 75/73/74 66.0 Circuit 1	C	L-1/L-1	N/A	N/A	N/A	N/A	0.900	N/A
AB-V-110	SOUTHWND 66KV	Line BAILEY 66.0 to GORMAN 66.0 Circuit 1,Line MONOLITH/CALCEMENT/GOLDTOWN/WINDLAND/ TAP 75/73/74 66.0 Circuit 1	C	L-1/L-1	N/A	N/A	N/A	N/A	0.735	N/A
AB-V-111	SOUTHWND 66KV	Line CALCEMENT/MONOLITH/ROSAMOND/WINDFARM 66.0 to TAP 79 66.0 Circuit 1,Line MONOLITH/CALCEMENT/GOLDTOWN/WINDLAND/ TAP 75/73/74 66.0 Circuit 1	C	L-1/L-1	N/A	N/A	N/A	N/A	1.278	N/A
AB-V-112	VARWIND 66KV	Line BAILEY 66.0 to GORMAN 66.0 Circuit 1,Line MONOLITH/CALCEMENT/GOLDTOWN/WINDLAND/ TAP 75/73/74 66.0 Circuit 1	C	L-1/L-1	N/A	N/A	N/A	N/A	0.736	N/A
AB-V-113	WALKERBN 66KV	Line BAILEY 66.0 to GORMAN 66.0 Circuit 1,Line MONOLITH/CALCEMENT/GOLDTOWN/WINDLAND/ TAP 75/73/74 66.0 Circuit 1	C	L-1/L-1	N/A	N/A	N/A	N/A	0.799	N/A
AB-V-114	WALKERBN 66KV	Line CALCEMENT/MONOLITH/ROSAMOND/WINDFARM 66.0 to TAP 79 66.0 Circuit 1,Line MONOLITH/CALCEMENT/GOLDTOWN/WINDLAND/ TAP 75/73/74 66.0 Circuit 1	C	L-1/L-1	N/A	N/A	N/A	N/A	1.334	N/A
AB-V-115	ZONDWIND 66KV	Line BAILEY 66.0 to GORMAN 66.0 Circuit 1,Line MONOLITH/CALCEMENT/GOLDTOWN/WINDLAND/ TAP 75/73/74 66.0 Circuit 1	C	L-1/L-1	N/A	N/A	N/A	N/A	0.740	N/A
AB-V-116	ZONDWIND 66KV	Line CALCEMENT/MONOLITH/ROSAMOND/WINDFARM 66.0 to TAP 79 66.0 Circuit 1,Line MONOLITH/CALCEMENT/GOLDTOWN/WINDLAND/ TAP 75/73/74 66.0 Circuit 1	C	L-1/L-1	N/A	N/A	N/A	N/A	1.290	N/A

Study Area: SCE Antelope-Bailey - Off Peak (2012-2021)

Voltage Deviation

ID	Substation	Worst Contingency	Category	Category Description	Post Contingency Voltage Deviation (%)						ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2021	
AB-DV-8	ARBWIND 66KV	Line ANTELOPE 66.0 to CALCMNT 66.0 Circuit 1	B	L-1	N/A	N/A	N/A	N/A	-15%	N/A	EKWRA
AB-DV-9	BANDUCCI 66KV	Line ANTELOPE 66.0 to CALCMNT 66.0 Circuit 1	B	L-1	N/A	N/A	N/A	N/A	-12%	N/A	
AB-DV-10	BREEZE 66KV	Line ANTELOPE 66.0 to CALCMNT 66.0 Circuit 1	B	L-1	N/A	N/A	N/A	N/A	-15%	N/A	
AB-DV-11	CALCMNT 66KV	Line ANTELOPE 66.0 to CALCMNT 66.0 Circuit 1	B	L-1	N/A	N/A	N/A	N/A	-15%	N/A	
AB-DV-12	CORRECT 66KV	Line ANTELOPE 66.0 to CALCMNT 66.0 Circuit 1	B	L-1	N/A	N/A	N/A	N/A	-13%	N/A	
AB-DV-13	CORUM 66KV	Line ANTELOPE 66.0 to CALCMNT 66.0 Circuit 1	B	L-1	N/A	N/A	N/A	N/A	-13%	N/A	
AB-DV-14	CUMMINGS 66KV	Line ANTELOPE 66.0 to CALCMNT 66.0 Circuit 1	B	L-1	N/A	N/A	N/A	N/A	-13%	N/A	
AB-DV-15	DUTCHWND 66KV	Line ANTELOPE 66.0 to CALCMNT 66.0 Circuit 1	B	L-1	N/A	N/A	N/A	N/A	-15%	N/A	
AB-DV-16	ENCANWND 66KV	Line ANTELOPE 66.0 to CALCMNT 66.0 Circuit 1	B	L-1	N/A	N/A	N/A	N/A	-15%	N/A	
AB-DV-17	FLOWIND 66KV	Line ANTELOPE 66.0 to CALCMNT 66.0 Circuit 1	B	L-1	N/A	N/A	N/A	N/A	-15%	N/A	
AB-DV-18	GOLDTOWN 66KV	Line ANTELOPE 66.0 to CALCMNT 66.0 Circuit 1	B	L-1	N/A	N/A	N/A	N/A	-14%	N/A	
AB-DV-19	GREATLKS 66KV	Line ANTELOPE 66.0 to CALCMNT 66.0 Circuit 1	B	L-1	N/A	N/A	N/A	N/A	-10%	N/A	
AB-DV-20	HAVILAH 66KV	Line ANTELOPE 66.0 to CALCMNT 66.0 Circuit 1	B	L-1	N/A	N/A	N/A	N/A	-6%	N/A	
AB-DV-21	LORAIN 66KV	Line ANTELOPE 66.0 to CALCMNT 66.0 Circuit 1	B	L-1	N/A	N/A	N/A	N/A	-11%	N/A	
AB-DV-22	MIDWIND 66KV	Line ANTELOPE 66.0 to CALCMNT 66.0 Circuit 1	B	L-1	N/A	N/A	N/A	N/A	-15%	N/A	
AB-DV-23	MONOLITH 66KV	Line ANTELOPE 66.0 to CALCMNT 66.0 Circuit 1	B	L-1	N/A	N/A	N/A	N/A	-15%	N/A	
AB-DV-24	MORWIND 66KV	Line ANTELOPE 66.0 to CALCMNT 66.0 Circuit 1	B	L-1	N/A	N/A	N/A	N/A	-15%	N/A	
AB-DV-25	NORTHWND 66KV	Line ANTELOPE 66.0 to CALCMNT 66.0 Circuit 1	B	L-1	N/A	N/A	N/A	N/A	-15%	N/A	
AB-DV-26	OAKWIND 66KV	Line ANTELOPE 66.0 to CALCMNT 66.0 Circuit 1	B	L-1	N/A	N/A	N/A	N/A	-15%	N/A	
AB-DV-27	ROSAMOND 66KV	Line ANTELOPE 66.0 to CALCMNT 66.0 Circuit 1	B	L-1	N/A	N/A	N/A	N/A	-10%	N/A	
AB-DV-28	SOUTHWND 66KV	Line ANTELOPE 66.0 to CALCMNT 66.0 Circuit 1	B	L-1	N/A	N/A	N/A	N/A	-15%	N/A	
AB-DV-29	VARWIND 66KV	Line ANTELOPE 66.0 to CALCMNT 66.0 Circuit 1	B	L-1	N/A	N/A	N/A	N/A	-15%	N/A	
AB-DV-30	WALKERBN 66KV	Line ANTELOPE 66.0 to CALCMNT 66.0 Circuit 1	B	L-1	N/A	N/A	N/A	N/A	-8%	N/A	

AB-DV-31	ZONDWIND 66KV	Line ANTELOPE 66.0 to CALCMENT 66.0 Circuit 1	B	L-1	N/A	N/A	N/A	N/A	-15%	N/A
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ID	Substation	Worst Contingency	Category	Category Description	Post Contingency Voltage Deviation (%)						ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2021	
AB-DV-32	ARBWIND 66KV	Line BAILEY 66.0 to GORMAN 66.0 Circuit 1,Line MONOLITH/CALCEMENT/GOLDTOWN/WINDLAND/TAP 75/73/74 66.0 Circuit 1	C	L-1/L-1	N/A	N/A	N/A	N/A	-28%	N/A	
AB-DV-33	BANDUCCI 66KV	Line BAILEY 66.0 to GORMAN 66.0 Circuit 1,Line MONOLITH/CALCEMENT/GOLDTOWN/WINDLAND/TAP 75/73/74 66.0 Circuit 1	C	L-1/L-1	N/A	N/A	N/A	N/A	-23%	N/A	
AB-DV-34	BOREL 66KV	Line BAILEY 66.0 to GORMAN 66.0 Circuit 1,Line MONOLITH/CALCEMENT/GOLDTOWN/WINDLAND/TAP 75/73/74 66.0 Circuit 1	C	L-1/L-1	N/A	N/A	N/A	N/A	-21%	N/A	
AB-DV-35	BREEZE 66KV	Line BAILEY 66.0 to GORMAN 66.0 Circuit 1,Line MONOLITH/CALCEMENT/GOLDTOWN/WINDLAND/TAP 75/73/74 66.0 Circuit 1	C	L-1/L-1	N/A	N/A	N/A	N/A	-27%	N/A	
AB-DV-36	CALCMENT 66KV	Line BAILEY 66.0 to GORMAN 66.0 Circuit 1,Line MONOLITH/CALCEMENT/GOLDTOWN/WINDLAND/TAP 75/73/74 66.0 Circuit 1	C	L-1/L-1	N/A	N/A	N/A	N/A	-28%	N/A	
AB-DV-37	CORRECT 66KV	Line BAILEY 66.0 to GORMAN 66.0 Circuit 1,Line MONOLITH/CALCEMENT/GOLDTOWN/WINDLAND/TAP 75/73/74 66.0 Circuit 1	C	L-1/L-1	N/A	N/A	N/A	N/A	-24%	N/A	
AB-DV-38	CORUM 66KV	Line LANCSTR 66.0 to GOLDTOWN 66.0 Circuit 1,Line ROSAMOND 66.0 to CORUM 66.0 Circuit 1	C	L-1/L-1	N/A	N/A	N/A	N/A	-16%	N/A	
AB-DV-39	CUMMINGS 66KV	Line BAILEY 66.0 to GORMAN 66.0 Circuit 1,Line MONOLITH/CALCEMENT/GOLDTOWN/WINDLAND/TAP 75/73/74 66.0 Circuit 1	C	L-1/L-1	N/A	N/A	N/A	N/A	-25%	N/A	
AB-DV-40	DUTCHWND 66KV	Line BAILEY 66.0 to GORMAN 66.0 Circuit 1,Line MONOLITH/CALCEMENT/GOLDTOWN/WINDLAND/TAP 75/73/74 66.0 Circuit 1	C	L-1/L-1	N/A	N/A	N/A	N/A	-28%	N/A	
AB-DV-41	ENCANWND 66KV	Line BAILEY 66.0 to GORMAN 66.0 Circuit 1,Line MONOLITH/CALCEMENT/GOLDTOWN/WINDLAND/TAP 75/73/74 66.0 Circuit 1	C	L-1/L-1	N/A	N/A	N/A	N/A	-28%	N/A	
AB-DV-42	FLOWIND 66KV	Line BAILEY 66.0 to GORMAN 66.0 Circuit 1,Line MONOLITH/CALCEMENT/GOLDTOWN/WINDLAND/TAP 75/73/74 66.0 Circuit 1	C	L-1/L-1	N/A	N/A	N/A	N/A	-28%	N/A	

AB-DV-43	GOLDTOWN 66KV	Line LANCASTER 66.0 to GOLDTOWN 66.0 Circuit 1,Line GOLDTOWN 66.0 to CORUM 66.0 Circuit 1	C	L-1/L-1	N/A	N/A	N/A	N/A	-16%	N/A
AB-DV-44	GREATLKS 66KV	Line BAILEY 66.0 to GORMAN 66.0 Circuit 1,Line MONOLITH/CALCEMENT/GOLDTOWN/WINDLAND/TAP 75/73/74 66.0 Circuit 1	C	L-1/L-1	N/A	N/A	N/A	N/A	-14%	N/A
AB-DV-45	HAVILAH 66KV	Line BAILEY 66.0 to GORMAN 66.0 Circuit 1,Line MONOLITH/CALCEMENT/GOLDTOWN/WINDLAND/TAP 75/73/74 66.0 Circuit 1	C	L-1/L-1	N/A	N/A	N/A	N/A	-23%	N/A
AB-DV-46	LORAINE 66KV	Line BAILEY 66.0 to GORMAN 66.0 Circuit 1,Line MONOLITH/CALCEMENT/GOLDTOWN/WINDLAND/TAP 75/73/74 66.0 Circuit 1	C	L-1/L-1	N/A	N/A	N/A	N/A	-25%	N/A
AB-DV-47	MIDWIND 66KV	Line ANTELOPE 66.0 to CALCEMENT 66.0 Circuit 1,Line ANTELOPE/SHUTTLE/QUARTZHILL/TAP 93 66.0 Circuit 1	C	L-1/L-1	N/A	N/A	N/A	N/A	-16%	N/A
AB-DV-48	MONOLITH 66KV	Line BAILEY 66.0 to GORMAN 66.0 Circuit 1,Line MONOLITH/CALCEMENT/GOLDTOWN/WINDLAND/TAP 75/73/74 66.0 Circuit 1	C	L-1/L-1	N/A	N/A	N/A	N/A	-27%	N/A
AB-DV-49	MORWIND 66KV	Line ANTELOPE 66.0 to CALCEMENT 66.0 Circuit 1,Line ANTELOPE/SHUTTLE/QUARTZHILL/TAP 93 66.0 Circuit 1	C	L-1/L-1	N/A	N/A	N/A	N/A	-16%	N/A
AB-DV-50	NORTHWND 66KV	Line BAILEY 66.0 to GORMAN 66.0 Circuit 1,Line MONOLITH/CALCEMENT/GOLDTOWN/WINDLAND/TAP 75/73/74 66.0 Circuit 1	C	L-1/L-1	N/A	N/A	N/A	N/A	-28%	N/A
AB-DV-51	OAKWIND 66KV	Line BAILEY 66.0 to GORMAN 66.0 Circuit 1,Line MONOLITH/CALCEMENT/GOLDTOWN/WINDLAND/TAP 75/73/74 66.0 Circuit 1	C	L-1/L-1	N/A	N/A	N/A	N/A	-28%	N/A
AB-DV-52	ROSAMOND 66KV	Line BAILEY 66.0 to GORMAN 66.0 Circuit 1,Line MONOLITH/CALCEMENT/GOLDTOWN/WINDLAND/TAP 75/73/74 66.0 Circuit 1	C	L-1/L-1	N/A	N/A	N/A	N/A	-14%	N/A
AB-DV-53	SOUTHWND 66KV	Line BAILEY 66.0 to GORMAN 66.0 Circuit 1,Line MONOLITH/CALCEMENT/GOLDTOWN/WINDLAND/TAP 75/73/74 66.0 Circuit 1	C	L-1/L-1	N/A	N/A	N/A	N/A	-28%	N/A
AB-DV-54	VARWIND 66KV	Line BAILEY 66.0 to GORMAN 66.0 Circuit 1,Line MONOLITH/CALCEMENT/GOLDTOWN/WINDLAND/TAP 75/73/74 66.0 Circuit 1	C	L-1/L-1	N/A	N/A	N/A	N/A	-28%	N/A
AB-DV-55	WALKERBN 66KV	Line BAILEY 66.0 to GORMAN 66.0 Circuit 1,Line MONOLITH/CALCEMENT/GOLDTOWN/WINDLAND/TAP 75/73/74 66.0 Circuit 1	C	L-1/L-1	N/A	N/A	N/A	N/A	-24%	N/A

EKWRA

AB-DV-56	ZONDWIND 66KV	Line BAILEY 66.0 to GORMAN 66.0 Circuit 1,Line MONOLITH/CALCEMENT/GOLDTOWN/WINDLAND/ TAP 75/73/74 66.0 Circuit 1	C	L-1/L-1	N/A	N/A	N/A	N/A	-28%	N/A	
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Study Area: SCE Antelope-Bailey

Single Contingency Load Drop

ID	Worst Contingency	Category	Category Description	Amount of Load Drop (MW)						ISO Proposed Mitigation
				2012	2013	2014	2015	2016	2021	

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

Study Area: SCE Antelope-Bailey

Single source substation with more than 100 MW Load.

ID	Substation	Load Served (MW)						ISO Proposed Mitigation
		2012	2013	2014	2015	2016	2021	

No single sourced substation with more than 100 MW.

Study Area: SCE Antelope-Bailey (2012-2021)**Stability**

Switching File	Voltage Performance	Frequency Performance
Bailey-bank2 (op, p)	Met performance requirement	Met performance requirement
Antelope-bank1 (op, p)	Met performance requirement	Met performance requirement


Study Area: SCE Antelope-Bailey with Renewables - Summer Peak (2012-2021)
Thermal Overload

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)						ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2021	
AB-RPS-T-1	WESTPAC - TAP 85 66/66kV No.1	Normal	A	N-0	N/A	N/A	110%	N/A	95%	109%	The updated line rating was modeled in the cases, and no thermal overloading concerns were identified.

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)						ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2021	
AB-RPS-T-2	WESTPAC - TAP 85 66/66kV No.1	Line ANTELOPE 66.0 to NEENACH 66.0 Circuit 1	B	L-1	N/A	N/A	111%	N/A	96%	110%	The updated line rating was modeled in the cases, and no thermal overloading concerns were identified.
AB-RPS-T-3	WESTPAC - TAP 85 66/66kV No.1	Line ANTELOPE 66.0 to NEENACH 66.0 Circuit 1, Gen ALAMO SC 66.0 Unit ID 1	B	L-1	N/A	N/A	112%	N/A	96%	111%	

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)						ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2021	
AB-RPS-T-4	DEL SUR - TAP 50 66/66kV No.1	Line ANTELOPE/LANPRI/LANCSTR/SHUTTLE/TAP 70/69 66.0 Circuit 1, Line ANTELOPE/LANCASTER/OASIS 66.0/TAP 68 66.0 Circuit 1	C	L-1/L-1	N/A	N/A	96%	N/A	100%	110%	LPS approved last year to shed load at LANCASTER 66.0 kV; LPS will be in service in August 2011.
AB-RPS-T-5	HELIJET - TAP 60 66/66kV No.1	Line LANCSTR/LITTLEROCK/PIUTE/TAP 72 66.0 Circuit 1, Line OASIS SC/QUARTZHILL/PALMDALE/TAP	C	L-1/L-1	N/A	N/A	87%	N/A	94%	103%	LPS to shed load at PALMDALE 66.0 kV.
AB-RPS-T-6	HELIJET - TAP 60 66/66kV No.1	Line LANCSTR/LITTLEROCK/PIUTE/TAP 72 66.0 Circuit 1, Line ACTON/PALMDALE/SHUTTLE 66.0	C	L-1/L-1	N/A	N/A	88%	N/A	94%	102%	LPS to shed load at PALMDALE 66.0 kV.
AB-RPS-T-7	HELIJET - TAP 60 66/66kV No.1	Line OASIS SC/QUARTZHILL/PALMDALE/TAP 65 66.0 Circuit 1, Line ACTON/RITTER No. 1 66.0 Circuit	C	L-1/L-1	N/A	N/A	88%	N/A	94%	100%	LPS to shed load at PALMDALE 66.0 kV.
AB-RPS-T-8	HELIJET - TAP 60 66/66kV No.1	Line OASIS SC/QUARTZHILL/PALMDALE/TAP 65 66.0 Circuit 1, Line ACTON/PALMDALE/SHUTTLE 66.0	C	L-1/L-1	N/A	N/A	117%	N/A	121%	137%	LPS approved last year to shed load at PALMDALE 66.0 kV; LPS will be in service in August 2011.
AB-RPS-T-9	TAP61 - TAP 62 66/66kV No.1	Line OASIS SC/QUARTZHILL/PALMDALE/TAP 65 66.0 Circuit 1, Line ACTON/PALMDALE/SHUTTLE 66.0	C	L-1/L-1	N/A	N/A	90%	N/A	87%	108%	LPS approved last year to shed load at PALMDALE 66.0 kV; LPS will be in service in August 2011.

Study Area: SCE Antelope-Bailey with Renewables - Summer Peak**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Post Contingency Voltage (PU)						ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2021	
AB-RPS-V-1	HELIJET 66kV	Line ANTELOPE/ANAVERDE/HELIJET/TAP 60 66.0 Circuit 1,Line OASIS SC/QUARTZHILL/PALMDALE/TAP 65 66.0 Circuit 1	C	L-1/L-1	N/A	N/A	0.950	N/A	1.026	0.891	Local Protection Scheme (LPS) to shed load at HELIJET 66 kV.
AB-RPS-V-2	LITTLERK 66kV	Line OASIS SC/QUARTZHILL/PALMDALE/TAP 65 66.0 Circuit 1,Line ACTON/PALMDALE/SHUTTLE 66.0 Circuit 1	C	L-1/L-1	N/A	N/A	0.950	N/A	0.981	0.887	LPS approved last year to shed load at PALMDALE 66.0 kV; LPS will be in service in August 2011.
AB-RPS-V-3	LITTLERK 66kV	Line ANTELOPE/LANPRI/LANCSTR/SHUTTLE/TAP 70/69 66.0 Circuit 1,Line ANTELOPE/SHUTTLE/QUARTZHILL/TAP 93 66.0 Circuit 1	C	L-1/L-1	N/A	N/A	0.964	N/A			
	LITTLERK 66kV	Line ANTELOPE/ANAVERDE/HELIJET/TAP 60 66.0 Circuit 1,Line LANCSTR/LITTLEROCK/PIUTE/TAP 72 66.0 Circuit 1	C	L-1/L-1	N/A	N/A	0.960	N/A	1.012	0.897	LPS to shed load at LITTLERK 66.0 kV.
AB-RPS-V-5	PALMDALE 66kV	Line OASIS SC/QUARTZHILL/PALMDALE/TAP 65 66.0 Circuit 1,Line ACTON/PALMDALE/SHUTTLE 66.0 Circuit 1	C	L-1/L-1	N/A	N/A	0.941	N/A	0.984	0.870	LPS approved last year to shed load at PALMDALE 66.0 kV; LPS will be in service in August 2011.
AB-RPS-V-6	ROCKAIR 66kV	Line ANTELOPE/ANAVERDE/HELIJET/TAP 60 66.0 Circuit 1,Line OASIS SC/QUARTZHILL/PALMDALE/TAP 65 66.0 Circuit 1	C	L-1/L-1	N/A	N/A	0.955	N/A	1.016	0.893	LPS to shed load at HELIJET 66.0 kV.
AB-RPS-V-7	ROCKAIR 66kV	Line ANTELOPE/ANAVERDE/HELIJET/TAP 60 66.0 Circuit 1,Line ACTON/PALMDALE/SHUTTLE 66.0 Circuit 1	C	L-1/L-1	N/A	N/A	0.950	N/A	1.017	0.894	LPS to shed load at HELIJET 66.0 kV.
AB-RPS-V-8	ROCKAIR 66kV	Line OASIS SC/QUARTZHILL/PALMDALE/TAP 65 66.0 Circuit 1,Line ACTON/PALMDALE/SHUTTLE 66.0 Circuit 1	C	L-1/L-1	N/A	N/A	0.949	N/A	0.992	0.883	LPS approved last year to shed load at PALMDALE 66.0 kV; LPS will be in service in August 2011.
AB-RPS-V-9	SHUTTLE 66kV	Line ANTELOPE/LANPRI/LANCSTR/SHUTTLE/TAP 70/69 66.0 Circuit 1,Line ANTELOPE/SHUTTLE/QUARTZHILL/TAP 93 66.0 Circuit 1	C	L-1/L-1	N/A	N/A	0.967	N/A	0.986	0.879	LPS to shed load at SHUTTLE 66 kV.
AB-RPS-V-10	WILSONA 66kV	Line OASIS SC/QUARTZHILL/PALMDALE/TAP 65 66.0 Circuit 1,Line ACTON/PALMDALE/SHUTTLE 66.0 Circuit 1	C	L-1/L-1	N/A	N/A	0.945	N/A	0.977	0.882	LPS approved last year to shed load at PALMDALE 66.0 kV; LPS will be in service in August 2011.

AB-RPS-V-11	WILSONA 66kV	Line ANTELOPE/LANPRI/LANCSTR/SHUTTLE/TAP 70/69 66.0 Circuit 1,Line ANTELOPE/SHUTTLE/QUARTZHILL/TAP 93 66.0 Circuit 1	C	L-1/L-1	N/A	N/A	0.960	N/A	0.979	0.892	LPS to shed load at SHUTTLE 66.0 kV.
AB-RPS-V-12	WILSONA 66kV	Line ANTELOPE/ANAVERDE/HELIJET/TAP 60 66.0 Circuit 1,Line LANCSTR/LITTLE ROCK/PIUTE/TAP 72 66.0 Circuit 1	C	L-1/L-1	N/A	N/A	0.956	N/A	1.008	0.892	LPS to shed load at LITTLE ROCK 66.0 kV.

Study Area: SCE Antelope-Bailey with Renewables - Summer Peak

Voltage Deviation

			Category	Category Description	Post Contingency Voltage Deviation (%)						
					2012	2013	2014	2015	2016	2021	
AB-RPS-DV-1	PALMDALE 66kV	Line OASIS SC/QUARTZHILL/PALMDALE/TAP 65 66.0 Circuit 1,Line ACTON/PALMDALE/SHUTTLE 66.0 Circuit 1	C	L-1/L-1	N/A	N/A	-8%	N/A	-5%	-11%	LPS approved last year to shed load at PALMDALE 66.0 kV; LPS will be in service in August 2011.
AB-RPS-DV-2	SHUTTLE 66kV	Line ANTELOPE/LANPRI/LANCSTR/SHUTTLE/TAP P 70/69 66.0 Circuit 1,Line ANTELOPE/SHUTTLE/QUARTZHILL/TAP 93 66.0 Circuit 1	C	L-1/L-1	N/A	N/A	-6%	N/A	-5%	-12%	LPS to shed load at SHUTTLE 66 kV.

Study Area: SCE Antelope-Bailey with Renewables - Off Peak

Thermal Overload

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)						ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2021	

Study Area: SCE Antelope-Bailey with Renewables - Off Peak

High/Low Voltage

ID	Substation	Worst Contingency	Category	Category Description	Post Contingency Voltage (PU)						ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2021	

Study Area: SCE Antelope-Bailey with Renewables - Off Peak

Voltage Deviation

ID	Substation	Worst Contingency	Category	Category Description	Post Contingency Voltage Deviation (%)						ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2021	

Study Area: SCE Antelope-Bailey with Renewables

Single Contingency Load Drop

ID	Worst Contingency	Category	Category Description	Amount of Load Drop (MW)					ISO Proposed Mitigation
				2012	2013	2014	2015	2016	

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

Study Area: SCE Antelope-Bailey with Renewables

Single source substation with more than 100 MW Load.

ID	Substation	Load Served (MW)					ISO Proposed Mitigation
		2012	2013	2014	2015	2016	

No single sourced substation with more than 100 MW.

Study Area: SCE Antelope-Bailey with Renewables (2012-2021)**Stability**

Switching File	Voltage Performance	Frequency Performance
Bailey-bank2 (op, p)	Met performance requirement	Met performance requirement
Antelope-bank1 (op, p)	Met performance requirement	Met performance requirement



Study Area: SCE North of Lugo - Summer Peak

Thermal Overload

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)						ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2021	
NOL-T-1	N/A	line INYOKERN to KRAMER 115 ck 1, line KRAMER-INYOKERN-RANDB 115 ck 1	C	L-2	Not Solved	Not Solved	Not Solved	Not Solved	Not Solved	Not Solved	Modify existing Kramer-Remedial Action Scheme (RAS).

Study Area: SCE North of Lugo - Summer Peak

High/Low Voltage

ID	Substation	Worst Contingency	Category	Category Description	Post Contingency Voltage (PU)						ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2021	
NOL-V-1	INYO 230kV	Normal	A	N-0	1.070	1.070	1.057	1.059	1.057	1.056	SCE proposed an exception for these buses to the voltage standard in the ISO Planning Standards and to use a high voltage limit 1.1 p.u. under normal conditions. The ISO concurred with this exception.

ID	Substation	Worst Contingency	Category	Category Description	Post Contingency Voltage (PU)						ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2021	
NOL-V-2	CONTROL 55kV	line CSA DIAB to CONTROL 115 ck 1, line CONTROL-SHERWIN-CSA DIAB 115 ck 1	C	L-1/L-1	1.144	1.143	1.128	1.128	1.128	1.121	SCE submitted updated reactive capabilities for the BS Hydro 2 and 6 and BS Hydro 3 and 4 units and also informed that SCE has agreement with Oxbow Generation Company not to deliver any MVAR's at the connecting point of OXBOW B 115 kV. After further analysis, no voltage performance concerns under the Category C voltage were identified.
NOL-V-3	CONTROL 115kV	line CSA DIAB to CONTROL 115 ck 1, line CONTROL-SHERWIN-CSA DIAB 115 ck 1	C	L-1/L-1	1.136	1.135	1.124	1.120	1.122	1.114	
NOL-V-4	INYO 115kV	line CSA DIAB to CONTROL 115 ck 1, line CONTROL-SHERWIN-CSA DIAB 115 ck 1	C	L-1/L-1	1.134	1.133	1.121	1.118	1.120	1.112	
NOL-V-5	INYO PS 115kV	line CSA DIAB to CONTROL 115 ck 1, line CONTROL-SHERWIN-CSA DIAB 115 ck 1	C	L-1/L-1	1.119	1.118	1.106	1.103	1.104	1.098	
NOL-V-6	OXBOW A 230kV	line CONTROL-SHERWIN-CSA DIAB 115 ck 1, tran INYO 115 to INYO PS 115 ck 1	C	L-1/T-1	1.078	1.078	1.116	1.114	1.113	1.098	
NOL-V-7	OXBOW A 230kV	line KRAMER to LUGO 230 ck 1, line CONTROL-SHERWIN-CSA DIAB 115 ck 1	C	L-1/L-1	1.089	1.089					
NOL-V-8	OXBOW A 230kV	line CONTROL-SHERWIN-CSA DIAB 115 ck 1, tran KRAMER 230 to KRAMER 115 ck 1	C	L-1/T-1	1.092	1.092	1.106	1.106	1.106	1.098	
NOL-V-9	TORTILLA 115kV	line KRAMER to LUGO 230 ck 1, line COLWATER-SEG2-TORTILLA 115 ck 1	C	L-1/L-1	0.936	0.930	0.927	0.923	0.921	0.893	

Study Area: SCE North of Lugo - Summer Peak

Voltage Deviation

ID	Substation	Worst Contingency	Category	Category Description	Post Contingency Voltage Deviation (%)						ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2021	
NOL-DV-1	TORTILLA 115kV	line COLWATER-SEG2-TORTILLA 115 ck 1	B	L-1	-6%	-6%	-6%	-7%	-7%	-9%	Install shunt capacitor at Tortilla.

ID	Substation	Worst Contingency	Category	Category Description	Post Contingency Voltage Deviation (%)						ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2021	
NOL-DV-2	TORTILLA 115kV	line KRAMER to LUGO 230 ck 1, line COLWATER-SEG2-TORTILLA 115 ck 1	C	L-1/L-1	-7%	-7%	-8%	-8%	-8%	-10%	Install shunt capacitor at Tortilla.

Study Area: SCE North of Lugo - Off Peak

Thermal Overload

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)						ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2021	
NOL-T-2	N/A	line INYOKERN to KRAMER 115 ck 1,line KRAMER-INYOKERN-RANDB 115 ck 1	C	L-2	N/A	N/A	N/A	N/A	Not Solved	Not Solved	Modify existing Kramer-RAS.

Study Area: SCE North of Lugo - Off Peak

High/Low Voltage

ID	Substation	Worst Contingency	Category	Category Description	Post Contingency Voltage (PU)						ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2021	
NOL-V-10	INYO 230kV	normal	A	N-0	N/A	N/A	N/A	N/A	1.0585	1.0495	SCE proposed an exception for these buses to the voltage standard in the ISO Planning Standards and to use a high voltage limit 1.1 p.u. under normal conditions. The ISO concurred with this exception.

ID	Substation	Worst Contingency	Category	Category Description	Post Contingency Voltage (PU)						ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2021	
NOL-V-11	OXBOW A 230kV	line CONTROL-SHERWIN-CSA DIAB 115 ck 1,tran VICTOR 230 to VICTOR 115 ck 2	C	L-1/T-1	N/A	N/A	N/A				SCE submitted updated reactive capabilities for the BS Hydro 2 and 6 and BS Hydro 3 and 4 units and also informed that SCE has agreement with Oxbow Generation Company not to deliver any MVAR's at the connecting point of OXBOW B 115 kV. After further analysis, no
	OXBOW A 230kV	line KRAMER to LUGO 230 ck 1,line CSA DIAB to CONTROL 115 ck 1	C	L-1/L-1	N/A	N/A	N/A	N/A	1.113	1.107	
NOL-V-13	OXBOW A 230kV	line CONTROL-SHERWIN-CSA DIAB 115 ck 1,tran KRAMER 230 to KRAMER 115 ck 1	C	L-1/T-1	N/A	N/A	N/A	N/A	1.123	1.118	
NOL-V-14	INYO 115kV	line CSA DIAB to CONTROL 115 ck 1,line CONTROL-SHERWIN-CSA DIAB 115 ck 1	C	L-1/L-1	N/A	N/A	N/A	N/A	1.101	1.096	
NOL-V-15	CONTROL 55kV	line CSA DIAB to CONTROL 115 ck 1,line CONTROL-SHERWIN-CSA DIAB 115 ck 1	C	L-1/L-1	N/A	N/A	N/A	N/A	1.109	1.106	
NOL-V-16	CONTROL 115kV	line CSA DIAB to CONTROL 115 ck 1,line CONTROL-SHERWIN-CSA DIAB 115 ck 1	C	L-1/L-1	N/A	N/A	N/A	N/A	1.103	1.098	

Study Area: SCE North of Lugo - Off Peak

Voltage Deviation

ID	Substation	Worst Contingency	Category	Category Description	Post Contingency Voltage Deviation (%)						ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2021	

Study Area: SCE North of Lugo

Single Contingency Load Drop

ID	Worst Contingency	Category	Category Description	Amount of Load Drop (MW)						ISO Proposed Mitigation
				2012	2013	2014	2015	2016	2021	

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

Study Area: SCE North of Lugo

Single source substation with more than 100 MW Load.

ID	Substation	Load Served (MW)						ISO Proposed Mitigation
		2012	2013	2014	2015	2016	2021	

No single sourced substation with more than 100 MW.

Stability

OUTAGE	2012 peak	
	TRANSIENT	POST-TRANSIENT
KRAMER-LUGO 230kV N-2	Met performance requirement	Met performance requirement
LUGO 500/230kV T-2	Met performance requirement with modified RAS	Diverge;Modify existing RAS
VICTOR-LUGO 230kV N-2	30 Voltage performance problems in zones 246/247; Modify existing HDPP RAS	Met performance requirement

OUTAGE	2013 peak	
	TRANSIENT	POST-TRANSIENT
KRAMER-LUGO 230kV N-2	Met performance requirement	Met performance requirement
LUGO 500/230kV T-2	Met performance requirement with modified RAS	Diverge;Modify existing RAS
VICTOR-LUGO 230kV N-2	31 Voltage performance problems in zones 246/247; Modify existing HDPP RAS	Met performance requirement

OUTAGE	2014 peak	
	TRANSIENT	POST-TRANSIENT
KRAMER-LUGO 230kV N-2	Met performance requirement	Met performance requirement
LUGO 500/230kV T-2	Met performance requirement with modified RAS	Diverge;Modify existing RAS
VICTOR-LUGO 230kV N-2	29 Voltage performance problems in 246/247; Modify existing HDPP RAS	Met performance requirement

OUTAGE	2015 peak	
	TRANSIENT	POST-TRANSIENT
KRAMER-LUGO 230kV N-2	Met performance requirement	Met performance requirement
LUGO 500/230kV T-2	Met performance requirement with modified RAS	Diverge;Modify existing RAS
VICTOR-LUGO 230kV N-2	29 Voltage performance problems in zones 246/247; Modify existing HDPP RAS	Met performance requirement

OUTAGE	2016 peak		2016 off-peak	
	TRANSIENT	POST-TRANSIENT	TRANSIENT	POST-TRANSIENT
KRAMER-LUGO 230kV N-2	Met performance requirement	Met performance requirement	Met performance requirement	Met performance requirement
LUGO 500/230kV T-2	Met performance requirement with modified RAS	Diverge;Modify existing RAS	Met performance requirement with modified RAS	Diverge;Modify existing RAS
VICTOR-LUGO 230kV N-2	29 Voltage performance problems in zones 246/247; Modify existing HDPP RAS	Met performance requirement	26 Voltage and 13 Frequency performance problems in zones 246/247; Modify existing HDPP RAS	Met performance requirement

OUTAGE	2021 peak		2021 off-peak	
	TRANSIENT	POST-TRANSIENT	TRANSIENT	POST-TRANSIENT
KRAMER-LUGO 230kV N-2	Met performance requirement	Met performance requirement	Met performance requirement	Met performance requirement
LUGO 500/230kV T-2	Modify existing RAS	Diverge;Modify existing RAS	Met performance requirement with modified RAS	Diverge;Modify existing RAS
VICTOR-LUGO 230kV N-2	30 Voltage performance problems in zones 246/247; Modify existing HDPP RAS	Met performance requirement	30 Voltage and 15 Frequency performance problems in zones 246/247; Modify existing HDPP RAS	Met performance requirement



Study Area: SCE North of Lugo with Renewables - Summer Peak

Thermal Overload

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)						ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2021	
NOL-RPS-T-1	N/A	line INYOKERN to KRAMER 115 ck 1, line KRAMER-INYOKERN-RANDSB 115 ck 1	C	L-2	N/A	N/A	diverge	N/A	diverge	diverge	Modify existing Kramer-Remedial Action Scheme (RAS).

Study Area: SCE North of Lugo with Renewables - Summer Peak

High/Low Voltage

ID	Substation	Worst Contingency	Category	Category Description	Post Contingency Voltage (PU)						ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2021	
NOL-RPS-V-1	CONTROL 55kV	Normal	A	N-0	N/A	N/A	1.045	N/A	1.058	1.049	SCE proposed an exception for these buses to the voltage standard in the ISO Planning Standards and to use a high voltage limit 1.1 p.u. under normal conditions. The ISO concurred with this exception.
NOL-RPS-V-2	INYO 230kV	Normal	A	N-0	N/A	N/A	1.056	N/A	1.057	1.056	

ID	Substation	Worst Contingency	Category	Category Description	Post Contingency Voltage (PU)						ISO Proposed Mitigation
					2012	2013	2014	2015			
		line CSA DIAB to CONTROL 115 ck 1,line CONTROL-SHERWIN-CSA DIAB 115 ck 1	C	L-1/L-1	N/A	N/A	1.151	N/A	1.151	1.136	SCE submitted updated reactive capabilities for the BS Hydro 2 and 6 and BS Hydro 3 and 4 units and also informed that SCE has agreement with Oxbow Generation Company not to deliver any MVAR's at the connecting point of OXBOW B 115 kV. After further analysis, no voltage performance concerns under the Category C voltage were identified.
NOL-V-RPS-4	CONTROL 115kV	line CSA DIAB to CONTROL 115 ck 1,line CONTROL-SHERWIN-CSA DIAB 115 ck 1	C	L-1/L-1	N/A	N/A	1.143	N/A	1.143	1.129	
NOL-V-RPS-5	INYO 115kV	line CSA DIAB to CONTROL 115 ck 1,line CONTROL-SHERWIN-CSA DIAB 115 ck 1	C	L-1/L-1	N/A	N/A	1.140	N/A	1.140	1.126	
NOL-V-RPS-6	INYO PS 115kV	line CSA DIAB to CONTROL 115 ck 1,line CONTROL-SHERWIN-CSA DIAB 115 ck 1	C	L-1/L-1	N/A	N/A	1.119	N/A	1.119	1.109	
NOL-V-RPS-7	OXBOW B 230kV	line CONTROL-SHERWIN-CSA DIAB 115 ck 1,tran INYO 115 to INYO PS 115 ck 1	C	L-1/T-1	N/A	N/A	1.093	N/A	1.112	1.106	
NOL-V-RPS-8	OXBOW A 230kV	line CONTROL-SHERWIN-CSA DIAB 115 ck 1,tran INYO 115 to INYO PS 115 ck 1	C	L-1/T-1	N/A	N/A	1.121	N/A	1.146	1.136	
NOL-V-RPS-9	OXBOW A 230kV	line KRAMER to LUGO 230 ck 1,line CSA DIAB to CONTROL 115 ck 1	C	L-1/L-1	N/A	N/A	1.082	N/A	1.120	1.118	
NOL-V-RPS-10	OXBOW A 230kV	line CONTROL-SHERWIN-CSA DIAB 115 ck 1,tran KRAMER 230 to KRAMER 115 ck 1	C	L-1/T-1	N/A	N/A	1.099	N/A	1.129	1.125	

Study Area: SCE North of Lugo with Renewables - Summer Peak

Voltage Deviation

ID	Substation	Worst Contingency	Category	Category Description	Post Contingency Voltage Deviation (%)						ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2021	



Study Area: SCE North of Lugo with Renewables - Off Peak

Thermal Overload

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)						ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2021	
NOL-RPS-T-2	N/A	line INYOKERN to KRAMER 115 ck 1, line KRAMER-INYOKERN-RANDSB 115 ck 1	C	L-2	N/A	N/A	N/A	N/A	diverge	diverge	Modify existing Kramer-RAS.

Study Area: SCE North of Lugo with Renewables - Off Peak

High/Low Voltage

ID	Substation	Worst Contingency	Category	Category Description	Post Contingency Voltage (PU)						ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2021	
NOL-RPS-V-11	CONTROL 55kV	Normal	A	N-0	N/A	N/A	N/A	N/A	1.058	1.045	SCE proposed an exception for these buses to the voltage standard in the ISO Planning Standards and to use a high voltage limit 1.1 p.u. under normal conditions. The ISO concurred with this exception.
NOL-RPS-V-12	CONTROL 115kV	Normal	A	N-0	N/A	N/A	N/A	N/A	1.051	1.034	
NOL-RPS-V-13	INYO 115kV	Normal					N/A	N/A	1.052	1.033	
NOL-RPS-V-14	INYO 230kV	Normal	A	N-0	N/A	N/A	N/A	N/A	1.060	1.049	
NOL-RPS-V-15	INYO PS 115kV	Normal	A	N-0	N/A	N/A	N/A	N/A	1.054	1.037	

ID	Substation	Worst Contingency	Category	Category Description	Post Contingency Voltage (PU)						ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2021	
NOL-RPS-V-16	CONTROL 55kV	line CSA DIAB to CONTROL 115 ck 1,line CONTROL-SHERWIN-CSA DIAB 115 ck 1	C	L-1/L-1	N/A	N/A	N/A	N/A	1.164	1.144	SCE submitted updated reactive capabilities for the BS Hydro 2 and 6 and BS Hydro 3 and 4 units and also informed that SCE has agreement with Oxbow Generation Company not to deliver any MVAR's at the connecting point of OXBOW B 115 kV. After further analysis, no voltage performance concerns under the Category C voltage were identified.
NOL-RPS-V-17	CONTROL 115kV	line CSA DIAB to CONTROL 115 ck 1,line CONTROL-SHERWIN-CSA DIAB 115 ck 1	C	L-1/L-1	N/A	N/A	N/A	N/A	1.161	1.139	
NOL-RPS-V-18	CONTROL 55kV	line CSA DIAB to RUSH 115 ck 1,tran INYO 115 to INYO PS 115 ck 1	C	L-1/T-1	N/A	N/A	N/A	N/A	1.109	1.069	
NOL-RPS-V-19	CONTROL 115kV	line CSA DIAB to RUSH 115 ck 1,tran INYO 115 to INYO PS 115 ck 1	C	L-1/T-1	N/A	N/A	N/A	N/A	1.106	1.059	
NOL-RPS-V-20	CSA DIAB 115kV	line CSA DIAB to RUSH 115 ck 1,tran INYO 115 to INYO PS 115 ck 1	C	L-1/T-1	N/A	N/A	N/A	N/A	1.102	1.046	
NOL-RPS-V-21	INYO 115kV	line CSA DIAB to CONTROL 115 ck 1,line CONTROL-SHERWIN-CSA DIAB 115 ck 1	C	L-1/L-1	N/A	N/A	N/A	N/A	1.158	1.135	
NOL-RPS-V-22	INYO 115kV	line CSA DIAB to RUSH 115 ck 1,tran INYO 115 to INYO PS 115 ck 1	C	L-1/T-1	N/A	N/A	N/A	N/A	1.106	1.059	
NOL-RPS-V-23	INYO PS 115kV	line CSA DIAB to CONTROL 115 ck 1,line CONTROL-SHERWIN-CSA DIAB 115 ck 1	C	L-1/L-1	N/A	N/A	N/A	N/A	1.133	1.114	
NOL-RPS-V-24	SHERWIN 115kV	line CSA DIAB to RUSH 115 ck 1,tran INYO 115 to INYO PS 115 ck 1	C	L-1/T-1	N/A	N/A	N/A	N/A	1.104	1.053	
NOL-RPS-V-25	SHERWIN 115kV	line CONTROL to INYO 115 ck 1,line CSA DIAB to RUSH 115 ck 1	C	L-1/L-1	N/A	N/A	N/A	N/A	1.102	1.052	
NOL-RPS-V-26	OXBOW A 230kV	line CONTROL-SHERWIN-CSA DIAB 115 ck 1,tran INYO 115 to INYO PS 115 ck 1	C	L-1/T-1	N/A	N/A	N/A	N/A	1.165	1.146	
NOL-RPS-V-27	OXBOW B 230kV	line CSA DIAB to RUSH 115 ck 1,tran INYO 115 to INYO PS 115 ck 1	C	L-1/T-1	N/A	N/A	N/A	N/A	1.131	1.084	

Study Area: SCE North of Lugo with Renewables - Off Peak

Voltage Deviation

ID	Substation	Worst Contingency	Category	Category Description	Post Contingency Voltage Deviation (%)						ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2021	

Study Area: SCE North of Lugo with Renewables

Single Contingency Load Drop

ID	Worst Contingency	Category	Category Description	Amount of Load Drop (MW)					ISO Proposed Mitigation
				2012	2013	2014	2015	2016	

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

Study Area: SCE North of Lugo with Renewables

Single source substation with more than 100 MW Load.

ID	Substation	Load Served (MW)						ISO Proposed Mitigation
		2012	2013	2014	2015	2016	2021	

No single sourced substation with more than 100 MW.

Study Area: SCE North of Lugo with Renewables

Stability

OUTAGE	2014 peak	
	TRANSIENT	POST-TRANSIENT
KRAMER-LUGO 230kV N-2	Met performance requirement	Met performance requirement
LUGO 500/230kV T-2	Met performance requirement with modified RAS	Diverge;Modify existing RAS
VICTOR-LUGO 230kV N-2	Met performance requirement	Met performance requirement

OUTAGE	2016 peak		2016 off-peak	
	TRANSIENT	POST-TRANSIENT	TRANSIENT	POST-TRANSIENT
KRAMER-LUGO 230kV N-2	Met performance requirement	Met performance requirement	Met performance requirement	Met performance requirement
LUGO 500/230kV T-2	Met performance requirement with modified RAS	Diverge;Modify existing RAS	Met performance requirement	Met performance requirement
VICTOR-LUGO 230kV N-2	Met performance requirement	Met performance requirement	25 Voltage performace problems in zones 246/247; Modify existing HDPP RAS	Met performance requirement

OUTAGE	2021 peak		2021 off-peak	
	TRANSIENT	POST-TRANSIENT	TRANSIENT	POST-TRANSIENT
KRAMER-LUGO 230kV N-2	Met performance requirement	Met performance requirement	Met performance requirement	Met performance requirement
LUGO 500/230kV T-2	Met performance requirement with modified RAS	Diverge;Modify existing RAS	15 Voltage and 2 Frequency performace problems in zones 246/247; Modify existing Kramer-RAS	Diverge;Modify existing RAS
VICTOR-LUGO 230kV N-2	30 Voltage performace problems in zones 246/247; Modify existing HDPP RAS	Met performance requirement	Met performance requirement	Met performance requirement



Study Area: SCE East of Lugo - Summer Peak

Thermal Overload

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)							ISO Proposed Mitigation	
					2012	2013	2014	2015	2016	2021	2016SOCAL*		2021SOCAL
EOL-T-1	Lugo - Victorville 500 kV T/L Ckt #1	Eldorado - Lugo 500kV T/L Ckt #1 & Palo Verde - Devers 500.0 kV T/L Ckt #1	C	L-1/L-1	104.3%	107.1%	<100%	<100%	<100%	<100%	<100%	<100%	Existing Operating Procedure No. 6610 (SCE's SOB T-135)
EOL-T-2		LUGO - MOHAVE 500 kV Ckt #1 & Eldorado - MOHAVE 500 kV Ckt #1	C	L-1/L-1	Diverged	Diverged	Diverged	Diverged	Diverged	Diverged	Diverged	Diverged	Shedding about 50 MW loads in the Mohave area due to the week supply from the 69 kV source at MEAD

*SOCAL: Consolidated Southern California base case

Study Area: SCE East of Lugo - Summer Peak

High/Low Voltage

ID	Substation	Worst Contingency	Category	Category Description	Post Contingency Voltage (PU)								ISO Proposed Mitigation
					2012	2013	2014	2015	2016	2021	2016SOCAL	2021SOCAL	
EOL-T-3	Eldorado 500 kV Bus	Base Case	A	N-0	1.065	1.057	1.054	1.059	1.055	1.053	1.057	1.054	SCE proposed an exemption for this bus to the voltage standard in the ISO Planning Standards and proposed using a high voltage limit of 550 kV under normal conditions. The ISO concurred with this exemption.

Study Area: SCE East of Lugo - Summer Peak

Voltage Deviation

ID	Substation	Worst Contingency	Category	Category Description	Post Contingency Voltage Deviation (%)							ISO Proposed Mitigation	
					2012	2013	2014	2015	2016	2021	2016SOCAL		2021SOCAL
	None												

Study Area: SCE East of Lugo - Off Peak

Thermal Overload

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)								ISO Proposed Mitigation	
					2012	2013	2014	2015	2016	2021	2016SOCAL	2021SOCA		
EOL-T-4		LUGO - MOHAVE 500 kV Ckt #1 & Eldorado - MOHAVE 500 kV Ckt #1	C	L-1/L-1	Diverged	Diverged	Diverged	Diverged	Diverged	Diverged	Diverged	Diverged	Diverged	Shedding about 30 MW loads in the Mohave area due to the week supply from the 69 kV source at MEAD

Study Area: SCE East of Lugo - Off Peak

High/Low Voltage

ID	Substation	Worst Contingency	Category	Category Description	Post Contingency Voltage (PU)								ISO Proposed Mitigation	
					2012	2013	2014	2015	2016	2021	2016SOCAL	2021SOCAL		
	None													

Study Area: SCE East of Lugo - Off Peak

Voltage Deviation

			Category	Category Description	Post Contingency Voltage Deviation (%)								
					2012	2013	2014	2015	2016	2021	2016SOCAL	2021SOCAL	
	None												

Study Area: SCE East of Lugo

Transient Stability

Switching File	

Study Area: SCE East of Lugo

Post-Transient Result

Met performance requirement

Study Area: SCE East of Lugo

Single Contingency Load Drop

ID	Worst Contingency	Category	Category Description	Amount of Load Drop (MW)								ISO Proposed Mitigation	
				2012	2013	2014	2015	2016	2021	2016SOCAL	2021SOCAL		
	No single contingency resulted in total load drop of more than 250 MW.												

Study Area: SCE East of Lugo

Single source substation with more than 100 MW Load.

ID	Substation	Load Served (MW)								ISO Proposed Mitigation
		2012	2013	2014	2015	2016	2021	2016SOCAL	2021SOCAL	
	No single sourced substation with more than 100 MW.									

Study Area: **San Diego - Summer Peak (2012-2021)****Thermal Overload**

ID	Overloaded Facility	Worst Contingency	Rating (MVA)	Category	Category Description	Loading (%)						ISO Recommended Mitigation
						2012	2013	2014	2015	2016	2021	
SDGE-T-01	22056 BERNARDO 69kV - 22676 R.CARMEL 69kV - ck 1	TL06913 POWAY-POMERADO ck 1	68.0	B	N-1	82.6%	87.0%	91.9%	101.3%	102.7%	109.1%	Reconductor
SDGE-T-02	22208 EL CAJON 69kV - 22408 LOSCOCHS 69kV - ck 1	LD_GR OPEN 632 PK JM/EC/GA	70.0	B	N-1	95.3%	120.7%	116.2%	120.7%	121.6%	99.8%	Reconductor
SDGE-T-03	22368 JAP MESA 69kV - 22848 TALEGATP 69kV - ck 1	TL0690 SA-OS-STU-LP ck 1	24.0	B	N-1	<80%	<80%	<80%	97.1%	106.5%	116.5%	Reconductor
SDGE-T-04	22588 OCNSDETP 69kV - 22808 STUARTTP 69kV - ck 1	TA BK 50 69/138	32.0	B	N-1	<80%	<80%	<80%	86.8%	93.7%	101.1%	Re-evaluate in future planning cycle.
SDGE-T-05	22640 PENDLETN 69kV - 22708 SANLUSRY 69kV - ck 1	TL0694 MN-MHTAP-MH-ME ck 1	102.0	B	N-1	91.5%	95.9%	99.0%	98.9%	100.2%	99.5%	Re-dispatch existing generation.
SDGE-T-06	22644 PENSQTOS 69kV - 22856 TOREYPNS 69kV - ck 1	TL0666 PQ-DM-DB-DH-TP ck 1	105.0	B	N-1	82.3%	89.9%	92.1%	96.0%	97.3%	102.8%	Re-evaluate in future planning cycle.
SDGE-T-07	22740 SANYSYRO 69kV - 22608 OTAY TP 69kV - ck 1	TL0649 BD-OY-SYO ck 1	50.0	B	N-1	86.1%	91.1%	92.4%	95.3%	96.7%	100.6%	Re-evaluate in future planning cycle.
SDGE-T-08	22820 SWEETWTR 69kV - 22520 MONTGYTP 69kV - ck 1	TL23026 SILVERGT - BAY BLVD ck 1	185.0	B	N-1	N/A	N/A	91.1%	89.0%	96.3%	119.3%	Terminal Miguel tap reconfiguration (C1C2 pending LGIA)
SDGE-T-09	22820 SWEETWTR 69kV - 22824 SWTWTRTP 69kV - ck 1	TL23026 SILVERGT - BAY BLVD ck 1	215.0	B	N-1	N/A	N/A	81.3%	80.3%	87.3%	119.7%	Miguel tap reconfiguration (C1C2 pending LGIA)
SDGE-T-10	22836 TALEGA 69kV - 22848 TALEGATP 69kV - ck 1	TL0690 SA-OS-STU-LP ck 1	24.0	B	N-1	<80%	<80%	<80%	110.0%	119.4%	130.0%	Upgrade Talega Bank 50
SDGE-T-11	22771 BAY BLVD 230kV - 22466 MLMS3TAP 230kV - ck 1	Base system (n-0)	912.0	A	N-0	N/A	N/A	82.8%	80.5%	86.9%	100.0%	Miguel tap reconfiguration (C1C2 pending LGIA)
SDGE-T-12	22524 MORHILTP 69 - 22440 MELROSE 69 - ck 1	TL06912 PENDLETN-SANLUSRY ck 1 _PEN 2x1 18	102.1	B	L-1/G-1	<80%	<80%	<80%	100.3%	101.5%	101.0%	Re-dispatch existing generation.
SDGE-T-13	22664 POMERADO 69 - 22828 SYCAMORE 69 - ck 1	TL06924 POMERADO - SYCAMORE ck 2 _PEN 2x1 18	179.0	B	L-1/G-1	86.0%	90.1%	101.4%	93.3%	94.7%	102.1%	Re-dispatch existing generation.

ID	Overloaded Facility	Worst Contingency	Rating (MVA)	Category	Category Description	Loading (%)						ISO Recommended Mitigation
						2012	2013	2014	2015	2016	2021	
SDGE-T-14	22664 POMERADO 69 - 22828 SYCAMORE 69 - ck 2	TL06915 POMERADO - SYCAMORE ck 1 _PEN 2x1 18	179.0	B	L-1/G-1	86.0%	90.1%	101.5%	93.4%	94.8%	102.2%	Re-dispatch existing generation.
SDGE-T-15	22668 POWAY 69 - 22664 POMERADO 69 - ck 1	TL06908 ESCNDIDO- ESCO ck 1 - GOALLINE 69	148.0	B	L-1/G-1	100.3%	105.3%	116.2%	108.4%	109.9%	116.6%	Re-rate this line to 174 MVA
SDGE-T-16	22740 SANYSRO 69 - 22616 OTAYLKTP 69 - ck 1	TL0623 IB-OY-SYO ck 1 _SONGS unit3 22	50.0	B	L-1/G-1	<80%	<80%	<80%	96.6%	97.9%	101.0%	Re-evaluate in future planning cycle.
SDGE-T-17	22828 SYCAMORE 69 - 22756 SCRIPPS 69 - ck 1	TL23042A OTAYMESA - BAY BLVD ck 1 _SONGS unit3 22	174.0	B	L-1/G-1	<80%	<80%	<80%	101.4%	102.6%	102.8%	Miguel tap reconfiguration (C1C2 pending LGIA)
SDGE-T-18	22856 TOREYPNS 69 - 22200 DUNHILTP 69 - ck 1	TL0662 PENSQTOS - TOREYPNS ck 1 _SONGS unit3 22	114.0	B	L-1/G-1	<80%	<80%	<80%	94.0%	95.2%	100.7%	Re-evaluate in future planning cycle.
SDGE-T-19	22832 SYCAMORE 230 - 22467 MLSXTAP 230 - ck 1	TL23042B OTAYMESA - BAY BLVD ck 1 _IV BK 81 230/500	912.0	C	N-1-1	<80%	<80%	<80%	<80%	84.0%	101.6%	Re-evaluate in future planning cycle.
SDGE-T-20	22056 BERNARDO 69kV - 22284 FELCTATP 69kV - ck 1	Poway 69kV Bus	102.0	C	Bus	93.3%	101.2%	104.3%	87.8%	88.1%	83.2%	Poway bus outage results in loss of load which mitigates the overload
SDGE-T-21	22056 BERNARDO 69kV - 22676 R.CARMEL 69kV - ck 1	Poway 69kV Bus	68.0	C	Bus	170.1%	178.8%	186.6%	187.7%	189.8%	195.7%	Reconductor recommended for Cat-B overload
SDGE-T-22	22112 CAPSTRNO 138kV - 22656 PICO 138kV - ck 1	TA-TB 1 + TA-RMV 1 138 kV	185.0	C	N-2	119.1%	125.0%	129.0%	130.8%	N/A	N/A	Pico loop-in (operational solution) mitigates this overload
SDGE-T-23	22112 CAPSTRNO 138kV - 22860 TRABUCO 138kV - ck 1	TA-TB 1 + TA-RMV 1 138 kV	157.0	C	N-2	139.4%	149.1%	150.9%	153.8%	N/A	N/A	Pico loop-in (operational solution) mitigates this overload
SDGE-T-24	22188 DOUBLTTP 69kV - 22164 DELMARTP 69kV - ck 1	PQ-TP + PQ-GE	136.0	C	N-2	87.8%	96.3%	98.8%	102.9%	104.4%	110.6%	Install SPS to drop load
SDGE-T-25	22200 DUNHILTP 69kV - 22188 DOUBLTTP 69kV - ck 1	PQ-TP + PQ-GE	136.0	C	N-2	87.8%	96.3%	98.8%	102.9%	104.4%	110.6%	Install SPS to drop load
SDGE-T-26	22256 ESCNDIDO 69kV - 22260 ESCNDIDO 230kV - ck 2	ESCNDIDO 230 kV 2N CB	261.0	C	CB	123.7%	132.8%	131.9%	128.3%	129.0%	119.0%	Re-dispatch existing generation and/or use 15-min emergency rating for post-contingency switching
SDGE-T-27	22256 ESCNDIDO 69kV - 22288 FELICITA 69kV - ck 1	Escondido 69kV NE Bus	102.0	C	Bus	150.4%	95.2%	95.9%	89.4%	89.8%	88.9%	Mitigated by existing Escondido - Ash #2 project
SDGE-T-28	22331 MIRASNT 69kV - 22644 PENSQTOS 69kV - ck 1	PQ-TP + PQ-GE	136.0	C	N-2	<80%	90.0%	92.2%	95.5%	96.8%	102.4%	Re-evaluate in future planning cycle.

ID	Overloaded Facility	Worst Contingency	Rating (MVA)	Category	Category Description	Loading (%)						ISO Recommended Mitigation
						2012	2013	2014	2015	2016	2021	
SDGE-T-29	22368 JAP MESA 69kV - 22848 TALEGATP 69kV - ck 1	STU-OC-SA-LP + SA-PE	24.0	C	N-2	<80%	<80%	<80%	97.1%	106.5%	116.6%	Reconductor recommended for Cat-B overload
SDGE-T-30	22420 SILVERGT 69kV - 22868 URBAN 69kV - ck 1	Station B 69kV N Bus	100.0	C	Bus	81.2%	86.5%	87.4%	90.6%	92.8%	100.8%	Re-evaluate in future planning cycle.
SDGE-T-31	22440 MELROSE 69kV - 22442 MELRSETP 69kV - ck 1	SA-ME + ME-SA	102.0	C	N-2	N/A	108.5%	112.8%	115.0%	116.9%	125.4%	The contingency lines are not on common structure, so this is an N-1-1 outage. Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)
SDGE-T-32	22442 MELRSETP 69kV - 22724 SANMRCOS 69kV - ck 1	PEN-ES #1 + #2 230 kV	102.0	C	N-2	87.4%	100.6%	99.0%	94.2%	98.3%	85.6%	Reconductor or install SPS
SDGE-T-33	22448 MESAHTGS 69kV - 22496 MISSION 69kV - ck 1	Mission 69kV N Bus	204.0	C	Bus	105.1%	108.9%	113.4%	N/A	N/A	80.1%	Reconductor project already approved. SPS as an interim solution.
SDGE-T-34	22512 MONSRATE 69kV - 22016 AVCADOTP 69kV - ck 1	Lilac 69kV S Bus	58.0	C	Bus	N/A	93.8%	98.6%	100.1%	101.5%	108.0%	Obtain emergency rating and re-dispatch existing generation
SDGE-T-35	22640 PENDLETN 69kV - 22016 AVCADOTP 69kV - ck 1	Lilac 69kV S Bus	77.0	C	Bus	N/A	98.5%	103.9%	105.5%	107.0%	113.8%	Obtain emergency rating and re-dispatch existing generation
SDGE-T-36	22640 PENDLETN 69kV - 22708 SANLUSRY 69kV - ck 1	Lilac 69kV S Bus	102.0	C	Bus	84.2%	101.4%	106.5%	107.8%	109.2%	115.6%	Obtain emergency rating and re-dispatch existing generation
SDGE-T-37	22644 PENSQTOS 69kV - 22164 DELMARTP 69kV - ck 1	PQ-TP + PQ-GE	129.0	C	N-2	104.3%	114.1%	117.4%	121.5%	123.3%	129.8%	Re-rate the line
SDGE-T-38	22664 POMERADO 69kV - 22828 SYCAMORE 69kV - ck 2	Sycamore 69kV S Bus	179.0	C	Bus	95.6%	100.2%	111.5%	98.5%	100.1%	109.0%	Install SPS to drop local area load post contingency or expand OLS 8.1 at Rancho Carmel
SDGE-T-39	22668 POWAY 69kV - 22664 POMERADO 69kV - ck 1	PEN-ES #1 + #2 230 kV	148.0	C	N-2	113.9%	121.0%	135.5%	117.6%	121.2%	131.3%	Not an N-2. Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)
SDGE-T-40	22668 POWAY 69kV - 22676 R.CARMEL 69kV - ck 1	AR-SX + SX-BE	114.0	C	N-2	N/A	N/A	N/A	106.8%	108.6%	118.4%	Install SPS to drop load post-contingency
SDGE-T-41	22708 SANLUSRY 69kV - 22584 OCEANSDE 69kV - ck 1	San Luis Rey 69kV NW Bus	54.0	C	Bus	<80%	<80%	<80%	99.8%	102.6%	112.9%	Develop emergency rating for TL697 and install SPS to drop load @ Oceanside

ID	Overloaded Facility	Worst Contingency	Rating (MVA)	Category	Category Description	Loading (%)						ISO Recommended Mitigation
						2012	2013	2014	2015	2016	2021	
SDGE-T-42	22768 BAY BLVD 69kV - 22352 IMPRLBCH 69kV - ck 1	Otay 69kV E Bus	70.0	C	Bus	91.1%	99.3%	111.1%	115.8%	118.3%	-	Rearrangement of components at Otay 69kV substation mitigates this overload
SDGE-T-43	22768 BAY BLVD 69kV - 22604 OTAY 69kV - ck 2	Bay Blvd 69kV N Bus	100.0	C	Bus	N/A	N/A	120.6%	125.2%	128.2%	84.1%	Install SPS to drop load post-contingency
SDGE-T-44	22828 SYCAMORE 69kV - 22756 SCRIPPS 69kV - ck 1	MR-PQ + PQ-MRM	174.0	C	N-2	98.1%	101.6%	102.7%	103.9%	104.9%	92.2%	Re-dispatch existing generation
SDGE-T-45	22836 TALEGA 69kV - 22848 TALEGATP 69kV - ck 1	STU-OC-SA-LP + SA-PE	24.0	C	N-2	<80%	<80%	<80%	110.0%	119.5%	130.1%	Reconductor recommended for Cat-B overload
SDGE-T-46	22840 TALEGA 138kV - 22656 PICO 138kV - ck 1	TA-TB 1 + TA-RMV 1 138 kV	204.0	C	N-2	127.8%	134.8%	138.3%	140.3%	N/A	N/A	Pico loop-in (operational solution) mitigates this overload
SDGE-T-47	22841 TA TAP 138kV - 22396 LAGNA NL 138kV - ck 1	CP-TB 1 + TA-PI 1 138 kV	136.5	C	N-2	131.6%	139.8%	141.2%	142.2%	N/A	N/A	Previously approved M-SOCRUP will mitigate this issue. Install SPS in the interim
SDGE-T-48	22841 TA TAP 138kV - 22396 LAGNA NL 138kV - ck 1	TALEGA 138 kV 8T CB	136.5	C	CB	133.7%	140.5%	144.8%	143.2%	N/A	N/A	Previously approved M-SOCRUP will mitigate this issue. Install SPS in the interim
SDGE-T-49	22844 TALEGA 230kV - 22840 TALEGA 138kV - ck 1	TALEGA 230 kV 4W CB	195.0	C	CB	115.4%	120.7%	125.1%	127.3%	N/A	N/A	Previously approved M-SOCRUP will mitigate this issue. Install SPS in the interim
SDGE-T-50	22844 TALEGA 230kV - 22840 TALEGA 138kV - ck 3	TALEGA 230 kV 4W CB	192.0	C	CB	113.3%	118.5%	122.8%	125.0%	N/A	N/A	Previously approved M-SOCRUP will mitigate this issue. Install SPS in the interim
SDGE-T-51	22856 TOREYPNS 69kV - 22200 DUNHILTP 69kV - ck 1	PQ-TP + PQ-GE	114.0	C	N-2	103.1%	113.2%	116.1%	121.0%	122.8%	130.2%	Re-rate the line
SDGE-T-52	22884 WARNERS 69kV - 22688 RINCON 69kV - ck 1	DE-ST-BC + CRE-ST	32.0	C	N-2	105.3%	107.8%	110.0%	117.6%	117.8%	120.4%	Existing SPS 6.10
SDGE-T-53	22008 ASH 69 - 22012 ASH TP 69 - ck 1	TL0679 ESCNDIDO-FELICITA ck 1 _TL0689 ES-FE-BR ck 1	86.0	C	N-1-1	102.5%	119.3%	121.6%	124.2%	125.5%	132.0%	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)
				C	N-1-1	<100%	<100%	<100%	<100%	<100%	107.5%	Re-evaluate in future planning cycle.

ID	Overloaded Facility	Worst Contingency	Rating (MVA)	Category	Category Description	Loading (%)						ISO Recommended Mitigation
						2012	2013	2014	2015	2016	2021	
SDGE-T-55	22056 BERNARDO 69 - 22284 FELCTATP 69 - ck 1	TL0648 POWAY- R.CARMEL ck 1 _TL06961 SYCAMORE- BERNARDO 69 ck 1	102.0	C	N-1-1	<100%	<100%	<100%	114.8%	115.8%	116.3%	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency) Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)
SDGE-T-56	22056 BERNARDO 69 - 22676 R.CARMEL 69 - ck 1	TL06908 ESCNDIDO- ESCO ck 1 _TL06913 POWAY- POMERADO ck 1	68.0	C	N-1-1	187.2%	201.1%	213.8%	215.9%	219.1%	230.3%	
SDGE-T-57	22060 BERNDOTP 69 - 22680 R.SNTAFE 69 - ck 1	TL0660 ENCNITAS-DEL MAR ck 1 _TL06952 NORTHCTY-PENSQTOS 69 ck 1	136.0	C	N-1-1	<100%	<100%	<100%	118.0%	121.9%	114.7%	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)
SDGE-T-58	22064 BLDCKRTP 69 - 22168 DESCANSO 69 - ck 1	TL06904 LOVELAND- ALPINE ck 1 _TL06914 LOVELAND- LOSCOCHS ck 1	32.0	C	N-1-1	<100%	<100%	<100%	<100%	<100%	112.5%	Re-evaluate in future planning cycle.
SDGE-T-59	22064 BLDCKRTP 69 - 22736 SANTYSBL 69 - ck 1	TL06904 LOVELAND- ALPINE ck 1 _TL06914 LOVELAND- LOSCOCHS ck 1	32.0	C	N-1-1	<100%	<100%	<100%	<100%	<100%	112.6%	Re-evaluate in future planning cycle.
SDGE-T-60	22112 CAPSTRNO 138 - 22656 PICO 138 - ck 1	TL13831 TALEGA- R.MSNVJO ck 1 _TL13833 TALEGA- TRABUCO ck 1	185.0	C	N-1-1	119.1%	125.0%	129.0%	130.8%	N/A	N/A	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)
SDGE-T-61	22112 CAPSTRNO 138 - 22860 TRABUCO 138 - ck 1	TL13831 TALEGA- R.MSNVJO ck 1 _TL13833 TALEGA- TRABUCO ck 1	157.0	C	N-1-1	139.4%	149.1%	150.9%	153.8%	N/A	N/A	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)
SDGE-T-62	22132 CHOLLAS 69 - 22820 SWEETWTR 69 - ck 1	TL23026 SILVERGT - BAY BLVD ck 1 _TL0603 NC- NSM-SW ck 1	100.0	C	N-1-1	N/A	N/A	107.8%	105.6%	113.0%	138.5%	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)
SDGE-T-63	22136 CLAIMNT 69 - 22140 CLARMTTP 69 - ck 1	TL0663 KEARNY - MISSION ck 1 _TL0676 MESAHTGS- MISSION ck 1	50.0	C	N-1-1	<100%	<100%	102.8%	140.9%	142.0%	143.1%	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)
SDGE-T-64	22152 CREELMAN 69 - 22828 SYCAMORE 69 - ck 1	TL13821 SYCAMORE- SANTEE ck 1 _TL13824 LOSCOCHS- TELCYN-ML60 ck 1	90.0	C	N-1-1	114.3%	121.3%	120.6%	121.5%	123.0%	124.8%	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)

ID	Overloaded Facility	Worst Contingency	Rating (MVA)	Category	Category Description	Loading (%)						ISO Recommended Mitigation
						2012	2013	2014	2015	2016	2021	
SDGE-T-65	22160 DEL MAR 69 - 22164 DELMARTP 69 - ck 1	TL0610 DEL MAR-PENSQTOS ck 1 _TL0667 DEL MAR-PENSQTOS ck 2	50.0	C	N-1-1	122.2%	129.4%	134.7%	134.7%	137.0%	138.3%	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)
SDGE-T-66	22188 DOUBLTTP 69 - 22164 DELMARTP 69 - ck 1	TL0662 PENSQTOS - TOREYPNS ck 1 _TL06959 MIRASNTOPENSQTOS ck 1	136.0	C	N-1-1	N/A	105.9%	108.7%	113.0%	114.6%	120.9%	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)
SDGE-T-67	22200 DUNHILTP 69 - 22188 DOUBLTTP 69 - ck 1	TL0662 PENSQTOS - TOREYPNS ck 1 _TL06959 MIRASNTOPENSQTOS ck 1	136.0	C	N-1-1	N/A	105.9%	108.7%	113.0%	114.6%	120.9%	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)
SDGE-T-68	22208 EL CAJON 69 - 22408 LOSCOCHS 69 - ck 1	TL0624 EL CAJON-JAMACHA ck 1 _TL0632 ML-GR-LC ck 1	70.0	C	N-1-1	125.8%	146.8%	155.3%	157.9%	158.9%	136.6%	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)
SDGE-T-69	22252 ENCNITAS 69 - 22160 DEL MAR 69 - ck 1	TL0616 Lkhodges-R.Santa Fe ck 1 _TL06952 NORTHCTY-PENSQTOS 69 ck 1	100.0	C	N-1-1	122.0%	120.3%	127.8%	132.6%	135.1%	142.2%	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)
SDGE-T-70	22256 ESCNDIDO 69 - 22260 ESCNDIDO 230 - ck 1	ES BK 71 69/230 _ES 72 BK 69/230	262.0	C	N-1-1	122.0%	131.0%	130.1%	126.5%	127.2%	117.2%	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)
SDGE-T-71	22256 ESCNDIDO 69 - 22260 ESCNDIDO 230 - ck 2	ES BK 70 69/230 _ES 72 BK 69/230	261.0	C	N-1-1	122.8%	131.8%	130.9%	127.3%	128.0%	118.0%	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)
SDGE-T-72	22256 ESCNDIDO 69 - 22260 ESCNDIDO 230 - ck 3	ES BK 70 69/230 _ES BK 71 69/230	261.0	C	N-1-1	124.2%	133.3%	132.4%	128.8%	129.5%	119.4%	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)
SDGE-T-73	22256 ESCNDIDO 69 - 22272 ESCO 69 - ck 1	TL0633 BERNARDO-R.CARMEL ck 1 _TL06913 POWAY-POMERADO ck 1	102.0	C	N-1-1	133.4%	140.9%	154.7%	155.7%	158.2%	165.9%	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)

ID	Overloaded Facility	Worst Contingency	Rating (MVA)	Category	Category Description	Loading (%)						ISO Recommended Mitigation
						2012	2013	2014	2015	2016	2021	
SDGE-T-74	22256 ESCNDIDO 69 - 22404 LILAC 69 - ck 1	TL0691 AVCDTP-AVCAD- PND-MNSRT ck 1 _TL0694 MN-MHTAP-MH- ME ck 1	129.0	C	N-1-1	<100%	<100%	100.5%	103.1%	105.1%	112.9%	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)
SDGE-T-75	22272 ESCO 69 - 22876 WARCYNTP 69 - ck 1	TL0633 BERNARDO- R.CARMEL ck 1 _TL06913 POWAY- POMERADO ck 1	86.0	C	N-1-1	151.3%	156.7%	170.6%	171.4%	173.7%	179.9%	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)
SDGE-T-76	22288 FELICITA 69 - 22012 ASH TP 69 - ck 1	TL0696 ESCNDIDO-ASH ck 1 _TL06596 ESCNDIDO-ASH ck 2	102.0	C	N-1-1	<100%	<100%	<100%	100.7%	102.0%	108.6%	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)
SDGE-T-77	22306 GARFIELD 69 - 22208 EL CAJON 69 - ck 1	TL0618 MISSION- MURRAY ck 1 _TL0619 MISSION- MURRAY ck 2	102.0	C	N-1-1	118.6%	128.3%	129.2%	133.1%	134.8%	136.7%	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)
SDGE-T-78	22316 GENESEE 69 - 22644 PENSQTOS 69 - ck 2	TL069 TOREYPNS to UCM ck 1 _TL06959 MIRASNT0-PENSQTOS ck 1	130.0	C	N-1-1	N/A	124.8%	127.5%	132.5%	134.8%	145.7%	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)
SDGE-T-79	22316 GENESEE 69 - 22864 UCM 69 - ck 1	TL0662 PENSQTOS - TOREYPNS ck 1 _TL0666 PQ-DM-DB-DH- TP ck 1	129.0	C	N-1-1	100.0%	106.4%	109.0%	114.9%	117.0%	124.7%	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)
SDGE-T-80	22331 MIRASNT0 69 - 22316 GENESEE 69 - ck 1	TL06905 GENESEE - PENSQTOS ck 2 _TL069 TOREYPNS to UCM ck 1	136.0	C	N-1-1	<100%	<100%	<100%	98.5%	100.7%	111.2%	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)
SDGE-T-81	22331 MIRASNT0 69 - 22644 PENSQTOS 69 - ck 1	TL06905 GENESEE - PENSQTOS ck 2 _TL069 TOREYPNS to UCM ck 1	136.0	C	N-1-1	N/A	118.0%	120.4%	125.1%	127.3%	137.5%	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)
SDGE-T-82	22336 GRANITE 69 - 22340 GRANITTP 69 - ck 1	TL0618 MISSION- MURRAY ck 1 _TL0619 MISSION- MURRAY ck 2	130.0	C	N-1-1	<100%	100.4%	100.2%	102.7%	103.7%	<100%	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)

ID	Overloaded Facility	Worst Contingency	Rating (MVA)	Category	Category Description	Loading (%)						ISO Recommended Mitigation
						2012	2013	2014	2015	2016	2021	
SDGE-T-83	22352 IMPRLBCH 69 - 22608 OTAY TP 69 - ck 1	TL0645 BAY BLVD-OTAY ck 1 _TL0646 BAY BLVD-OTAY ck 2	55.0	C	N-1-1	<100%	100.3%	119.6%	125.4%	129.3%	<100%	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)
SDGE-T-84	22356 IMPRLVLY 230 - 20118 ROA-230 230 - ck 1	50004 IMPRLVLY-ECO ck 1 _50003 IMPRLVLY-SUNCREST ck 1	1035.0	C	N-1-1	N/A	111.3%	101.4%	104.2%	111.2%	<100%	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)
SDGE-T-85	22356 IMPRLVLY 230 - 22360 IMPRLVLY 500 - ck 2	IV BK81 & OMEC-TJI CFE SPS _IV BK 82 230/500	732.0	C	N-1-1	139.4%	139.4%	126.0%	127.5%	145.3%	245.1%	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)
SDGE-T-86	22356 IMPRLVLY 230 - 22360 IMPRLVLY 500 - ck 3	IV BK 80 230/500 _IV BK81 & IV-ROA CFE SPS	1344.0	C	N-1-1	<100%	<100%	<100%	<100%	<100%	140.2%	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)
SDGE-T-87	22368 JAP MESA 69 - 22848 TALEGATP 69 - ck 1	TL23052 TALEGA - S.ONOFRE ck 2 _TL0690 SA-OS-STU-LP ck 1	24.0	C	N-1-1	<100%	<100%	<100%	<100%	108.2%	117.9%	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)
SDGE-T-88	22372 KEARNY 69 - 22140 CLARMTTP 69 - ck 1	TL0663 KEARNY - MISSION ck 1 _TL0676 MESAHGTS- MISSION ck 1	100.0	C	N-1-1	125.9%	130.4%	138.0%	141.2%	142.6%	145.8%	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)
SDGE-T-89	22404 LILAC 69 - 22624 PALA 69 - ck 1	TL0691 AVCDTP-AVCAD- PND-MNSRT ck 1 _TL0694 MN-MHTAP-MH- ME ck 1	103.0	C	N-1-1	108.2%	109.7%	118.3%	121.8%	125.1%	138.0%	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)
SDGE-T-90	22408 LOSCOCHS 69 - 22004 ALPINE 69 - ck 1	TL0637 SANTYSBL - CREELMAN ck 1 _TL06914 LOVELAND- LOSCOCHS ck 1	77.0	C	N-1-1	<100%	<100%	<100%	<100%	<100%	104.5%	Re-evaluate in future planning cycle.
SDGE-T-91	22408 LOSCOCHS 69 - 22216 ELLIOTT 69 - ck 1	TL13821 SYCAMORE- SANTEE ck 1 _TL13824 LOSCOCHS- TELCYN-ML60 ck 1	68.0	C	N-1-1	115.1%	124.8%	122.7%	123.9%	125.6%	120.6%	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)

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						2012	2013	2014	2015	2016	2021	
SDGE-T-92	22412 LOSCOCHS 138 - 22408 LOSCOCHS 69 - ck 1	TL06917 CREELMAN- SYCAMORE ck 1 _LC BK 51 69/138	239.0	C	N-1-1	102.0%	<100%	100.0%	101.9%	102.8%	102.1%	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)
SDGE-T-93	22412 LOSCOCHS 138 - 22408 LOSCOCHS 69 - ck 2	TL06917 CREELMAN- SYCAMORE ck 1 _LC BK 50 138/69	239.0	C	N-1-1	N/A	<100%	100.0%	101.9%	102.8%	102.1%	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)
SDGE-T-94	22412 LOSCOCHS 138 - 22734 SANTEE 138 - ck 1	50001 MIGUEL-ECO ck 1 _TL23021 MIGUEL - SYCAMORE ck 1	200.0	C	N-1-1	<100%	101.1%	<100%	<100%	100.5%	100.8%	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)
SDGE-T-95	22416 LOVELAND 69 - 22168 DESCANSO 69 - ck 1	TL0637 SANTYSBL - CREELMAN ck 1 _TL06957 LL-BAR ck 1	32.0	C	N-1-1	<100%	<100%	<100%	<100%	<100%	108.1%	Re-evaluate in future planning cycle.
SDGE-T-96	22420 SILVERGT 69 - 22548 NATNLCTY 69 - ck 1	TL23026 SILVERGT - BAY BLVD ck 1 _TL0658 SAMPSON-DIVISION ck 1	100.0	C	N-1-1	N/A	N/A	115.4%	115.0%	126.5%	174.6%	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)
SDGE-T-97	22420 SILVERGT 69 - 22868 URBAN 69 - ck 1	TL0602 B-SILVERGT ck 1 _TL0699 B - SILVERGT ck 2	100.0	C	N-1-1	N/A	N/A	103.7%	104.5%	103.1%	119.5%	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)
SDGE-T-98	22440 MELROSE 69 - 22442 MELRSETP 69 - ck 1	TL0693 MELROSE to SANLUSRY ck 1 _TL0694D SA-ME ck 2	102.0	C	N-1-1	N/A	108.5%	112.8%	115.0%	116.9%	125.4%	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)
SDGE-T-99	22440 MELROSE 69 - 22708 SANLUSRY 69 - ck 1	TL0680 SA-ME-SM ck 1 _TL0694D SA-ME ck 2	102.0	C	N-1-1	N/A	117.5%	122.1%	123.8%	125.9%	132.3%	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)
SDGE-T-100	22440 MELROSE 69 - 22708 SANLUSRY 69 - ck 2	TL0680 SA-ME-SM ck 1 _TL0693 MELROSE to SANLUSRY ck 1	102.1	C	N-1-1	N/A	117.4%	122.0%	123.7%	125.8%	132.2%	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)
SDGE-T-101	22456 MIGUEL 69 - 22340 GRANITTP 69 - ck 1	TL13821 SYCAMORE- SANTEE ck 1 _TL13824 LOSCOCHS- TELCYN-ML60 ck 1	102.0	C	N-1-1	<100%	<100%	<100%	<100%	<100%	102.2%	Re-evaluate in future planning cycle.

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						2012	2013	2014	2015	2016	2021	
SDGE-T-102	22464 MIGUEL 230 - 22461 MIGUEL60 138 - ck 1	ML BK 61 230/138 _SX BK 60 230/138	468.0	C	N-1-1	<100%	<100%	<100%	<100%	<100%	106.8%	Re-evaluate in future planning cycle.
SDGE-T-103	22464 MIGUEL 230 - 22468 MIGUEL 500 - ck 2	50003 IMPRLVLY-SUNCREST ck 1 _ML BK 80 230/500 ck 1	1344.0	C	N-1-1	108.8%	108.8%	104.4%	112.6%	111.0%	<100%	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)
SDGE-T-104	22464 MIGUEL 230 - 22472 MIGUELMP 500 - ck 1	50003 IMPRLVLY-SUNCREST ck 1 _ML BK 81 230/500 ck 2	1329.0	C	N-1-1	111.0%	111.0%	105.8%	113.6%	111.8%	<100%	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)
SDGE-T-105	22468 MIGUEL 500 - 22472 MIGUELMP 500 - ck 1	50003 IMPRLVLY-SUNCREST ck 1 _ML BK 81 230/500 ck 2	1329.0	C	N-1-1	110.7%	111.0%	106.5%	114.9%	113.2%	<100%	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)
SDGE-T-106	22468 MIGUEL 500 - 22472 MIGUELMP 500 - ck 1	TL23055 SUNCREST-SYCAMORE 230 ck 2 _ML BK 81 230/500 ck 2	1329.0	C	N-1-1	<100%	<100%	<100%	<100%	<100%	103.3%	Re-evaluate in future planning cycle.
SDGE-T-107	22476 MIGUELTP 69 - 22456 MIGUEL 69 - ck 1	TL23042A OTAYMESA - BAY BLVD ck 1 _TL0621 PARADISE-MIGUEL ck 1	136.0	C	N-1-1	<100%	<100%	<100%	<100%	<100%	110.5%	Re-evaluate in future planning cycle.
SDGE-T-108	22480 MIRAMAR 69 - 22296 FENTONTP 69 - ck 1	TL0675 PENSQTOS-MESA RIM ck 1 _TL06916 SYCAMORE-SCRIPPS ck 1	136.0	C	N-1-1	<100%	<100%	<100%	<100%	<100%	117.3%	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)
SDGE-T-109	22480 MIRAMAR 69 - 22644 PENSQTOS 69 - ck 1	TL0675 PENSQTOS-MESA RIM ck 1 _TL06916 SYCAMORE-SCRIPPS ck 1	114.0	C	N-1-1	109.0%	113.1%	116.2%	119.0%	120.8%	<100%	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)
SDGE-T-110	22484 MIRAMAR1 69 - 22296 FENTONTP 69 - ck 1	TL0675 PENSQTOS-MESA RIM ck 1 _TL06916 SYCAMORE-SCRIPPS ck 1	136.0	C	N-1-1	<100%	<100%	<100%	<100%	<100%	119.6%	Re-evaluate in future planning cycle.
SDGE-T-111	22500 MISSION 138 - 22496 MISSION 69 - ck 1	MS BK 51 138/69 _MS BK 52 138/69	269.0	C	N-1-1	<100%	<100%	100.5%	102.8%	102.9%	<100%	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)

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						2012	2013	2014	2015	2016	2021	
SDGE-T-112	22500 MISSION 138 - 22496 MISSION 69 - ck 2	MS BK 50 138/69 _MS BK 52 138/69	134.0	C	N-1-1	121.7%	125.7%	130.9%	131.2%	132.2%	129.4%	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)
SDGE-T-113	22500 MISSION 138 - 22496 MISSION 69 - ck 3	MS BK 50 138/69 _MS BK 51 138/69	239.0	C	N-1-1	103.0%	106.4%	110.5%	113.1%	113.1%	109.4%	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)
SDGE-T-114	22512 MONSRATE 69 - 22016 AVCADOTP 69 - ck 1	TL0694 MN-MHTAP-MH- ME ck 1 _TL06932 LILAC -PALA ck 1	58.0	C	N-1-1	124.7%	132.7%	134.3%	136.2%	138.0%	147.3%	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)
SDGE-T-115	22512 MONSRATE 69 - 22524 MORHILTP 69 - ck 1	TL06912 PENDLETN- SANLUSRY ck 1 _TL06932 LILAC -PALA ck 1	102.0	C	N-1-1	125.4%	145.1%	146.8%	149.4%	152.1%	165.7%	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)
SDGE-T-116	22524 MORHILTP 69 - 22440 MELROSE 69 - ck 1	TL0688 ESCNDIDO-LILAC ck 1 _TL06912 PENDLETN-SANLUSRY ck 1	102.1	C	N-1-1	N/A	124.7%	131.1%	132.5%	134.6%	138.9%	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)
SDGE-T-117	22532 MURRAY 69 - 22306 GARFIELD 69 - ck 1	TL0618 MISSION- MURRAY ck 1 _TL0619 MISSION- MURRAY ck 2	97.0	C	N-1-1	101.6%	111.3%	110.8%	114.2%	115.7%	117.4%	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)
SDGE-T-118	22548 NATNLCTY 69 - 22824 SWTWTRTP 69 - ck 1	TL23026 SILVERGT - BAY BLVD ck 1 _TL0658 SAMPSON-DIVISION ck 1	102.0	C	N-1-1	N/A	N/A	114.2%	113.7%	125.1%	172.3%	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)
SDGE-T-119	22556 NAVSTMTR 69 - 22824 SWTWTRTP 69 - ck 1	TL23026 SILVERGT - BAY BLVD ck 1 _TL23041B OTAYMESA - SYCAMORE	215.0	C	N-1-1	<100%	<100%	<100%	<100%	<100%	118.7%	Re-evaluate in future planning cycle.
SDGE-T-120	22588 OCNSDETP 69 - 22708 SANLUSRY 69 - ck 1	TL0697 SANLUSRY- OCEANSDE ck 1 _TA BK 50 69/138	68.0	C	N-1-1	<100%	<100%	<100%	102.0%	105.8%	112.4%	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)
SDGE-T-121	22588 OCNSDETP 69 - 22808 STUARTTP 69 - ck 1	SA BK 51 138/69 _TA BK 50 69/138	32.0	C	N-1-1	<100%	<100%	<100%	<100%	<100%	103.8%	Re-evaluate in future planning cycle.

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						2012	2013	2014	2015	2016	2021	
SDGE-T-122	22596 OLD TOWN 230 - 22504 MISSION 230 - ck 1	TL23028 SILVERGT - OT - MISSION _TL23042A OTAYMESA - BAY BLVD ck 1	456.0	C	N-1-1	<100%	<100%	117.4%	119.7%	119.5%	133.7%	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)
SDGE-T-123	22597 OLDTWNT 230 - 22504 MISSION 230 - ck 1	TL23027 OLD TOWN - MISSION ck 1 _TL23042A OTAYMESA - BAY BLVD ck 1	482.0	C	N-1-1	<100%	<100%	111.0%	113.6%	114.7%	126.4%	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)
SDGE-T-124	22602 OMWD 69 - 22256 ESCNDIDO 69 - ck 1	TL0660 ENCINITAS-DEL MAR ck 1 _TL06952 NORTHCTY-PENSQTOS 69 ck 1	102.0	C	N-1-1	<100%	<100%	<100%	162.6%	167.9%	109.7%	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)
SDGE-T-125	22602 OMWD 69 - 22603 Lkhodges 69 - ck 1	TL0660 ENCINITAS-DEL MAR ck 1 _TL06952 NORTHCTY-PENSQTOS 69 ck 1	102.0	C	N-1-1	<100%	<100%	<100%	157.3%	162.5%	103.9%	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)
SDGE-T-126	22603 Lkhodges 69 - 22060 BERNDOTP 69 - ck 1	TL0660 ENCINITAS-DEL MAR ck 1 _TL06952 NORTHCTY-PENSQTOS 69 ck 1	102.0	C	N-1-1	<100%	<100%	<100%	157.3%	162.6%	152.9%	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)
SDGE-T-127	22604 OTAY 69 - 22608 OTAY TP 69 - ck 1	TL0647 BAY BLVD- IMPRLBCH ck 1 _TL0649 BD-OY-SYO ck 1	86.0	C	N-1-1	<100%	<100%	<100%	102.7%	103.9%	106.9%	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)
SDGE-T-128	22604 OTAY 69 - 22616 OTAYLKTP 69 - ck 1	TL0623 IB-OY-SYO ck 1 _TL06910 MIGUEL - BORDER ck 1	61.0	C	N-1-1	126.3%	137.9%	140.0%	151.0%	154.7%	<100%	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)
SDGE-T-129	22609 OTAYMESA 230 - 22466 MLMS3TAP 230 - ck 1	50001 MIGUEL-ECO ck 1 _TL23041B OTAYMESA - SYCAMORE	1255.0	C	N-1-1	<100%	<100%	<100%	<100%	<100%	112.5%	Re-evaluate in future planning cycle.
SDGE-T-130	22636 PARADISE 69 - 22812 SUNYSDTP 69 - ck 1	TL0621 PARADISE- MIGUEL ck 1 _TL06911 JAMACHA- SPRNGVLY ck 1	100.0	C	N-1-1	<100%	<100%	<100%	<100%	<100%	101.5%	Re-evaluate in future planning cycle.
SDGE-T-131	22640 PENDLETN 69 - 22016 AVCADOTP 69 - ck 1	TL0681 ASH-FE-VC ck 1 _TL0688 ESCNDIDO-LILAC ck 1	77.0	C	N-1-1	<100%	113.7%	118.4%	120.4%	122.2%	128.1%	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)

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						2012	2013	2014	2015	2016	2021	
SDGE-T-132	22640 PENDLETN 69 - 22708 SANLUSRY 69 - ck 1	TL0694 MN-MHTAP-MH-ME ck 1 _TL06932 LILAC -PALA ck 1	102.0	C	N-1-1	120.2%	128.2%	129.4%	131.0%	132.6%	140.9%	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)
SDGE-T-133	22644 PENSQTOS 69 - 22164 DELMARTP 69 - ck 1	TL0662 PENSQTOS - TOREYPNS ck 1 _TL06959 MIRASNTO-PENSQTOS ck 1	129.0	C	N-1-1	N/A	123.8%	127.4%	131.8%	133.6%	140.2%	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)
SDGE-T-134	22644 PENSQTOS 69 - 22444 MESA RIM 69 - ck 1	TL06906 MIRAMAR-PENSQTOS ck 1 _TL06916 SYCAMORE-SCRIPPS ck 1	136.0	C	N-1-1	100.9%	104.2%	107.0%	109.4%	111.0%	<100%	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)
SDGE-T-135	22644 PENSQTOS 69 - 22492 MIRAMRTP 69 - ck 1	TL0675 PENSQTOS-MESA RIM ck 1 _TL06916 SYCAMORE-SCRIPPS ck 1	102.0	C	N-1-1	104.2%	107.9%	112.5%	112.8%	114.5%	<100%	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)
SDGE-T-136	22644 PENSQTOS 69 - 22856 TOREYPNS 69 - ck 1	TL0666 PQ-DM-DB-DH-TP ck 1 _TL06907 GENESEE -UCM ck 1	105.0	C	N-1-1	121.7%	129.7%	132.4%	139.5%	142.0%	151.3%	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)
SDGE-T-137	22652 PENSQTOS 230 - 22644 PENSQTOS 69 - ck 2	TL06916 SYCAMORE-SCRIPPS ck 1 _PQ BK 70 230/69	269.0	C	N-1-1	<100%	100.6%	<100%	101.4%	101.9%	<100%	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)
SDGE-T-138	22664 POMERADO 69 - 22828 SYCAMORE 69 - ck 1	TL06924 POMERADO - SYCAMORE ck 2 _TL06961 SYCAMORE-BERNARDO 69 ck 1	179.0	C	N-1-1	<100%	<100%	<100%	<100%	100.4%	109.6%	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)
SDGE-T-139	22664 POMERADO 69 - 22828 SYCAMORE 69 - ck 2	TL06915 POMERADO - SYCAMORE ck 1 _TL06961 SYCAMORE-BERNARDO 69 ck 1	179.0	C	N-1-1	<100%	<100%	<100%	<100%	100.5%	109.7%	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)
SDGE-T-140	22668 POWAY 69 - 22664 POMERADO 69 - ck 1	TL23014 PEN-ESCNDIDO ck 1 _TL23015 PEN-ESCNDIDO ck 2	148.0	C	N-1-1	113.9%	121.0%	135.5%	117.6%	121.2%	131.3%	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)

ID	Overloaded Facility	Worst Contingency	Rating (MVA)	Category	Category Description	Loading (%)						ISO Recommended Mitigation
						2012	2013	2014	2015	2016	2021	
SDGE-T-141	22668 POWAY 69 - 22676 R.CARMEL 69 - ck 1	TL06920 ARTESN-SYCAMORE ck 1 _TL06961 SYCAMORE-BERNARDO 69 ck 1	114.0	C	N-1-1	<100%	<100%	<100%	106.8%	108.6%	118.4%	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency) Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)
SDGE-T-142	22668 POWAY 69 - 22876 WARCYNTP 69 - ck 1	TL0633 BERNARDO-R.CARMEL ck 1 _TL06913 POWAY-POMERADO ck 1	102.0	C	N-1-1	123.1%	127.6%	138.9%	139.6%	141.6%	146.8%	
SDGE-T-143	22680 R.SNTAFE 69 - 22685 R.SNTTP1 69 - ck 1	TL0660 ENCNITAS-DELMAR ck 1 _TL06952 NORTHCTY-PENSQTOS 69 ck 1	103.0	C	N-1-1	<100%	<100%	103.2%	123.2%	127.4%	119.9%	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)
SDGE-T-144	22688 RINCON 69 - 22870 VALCNTR 69 - ck 1	TL0688 ESCNDIDO-LILAC ck 1 _TL0698 MN-AV-PA ck 1	68.0	C	N-1-1	103.7%	112.1%	112.9%	116.3%	117.8%	121.1%	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)
SDGE-T-145	22700 SAMPSON 69 - 22172 DIVISION 69 - ck 1	TL23026 SILVERGT - BAY BLVD ck 1 _TL23041A OTAYMESA-SYCAMORE	172.0	C	N-1-1	<100%	<100%	<100%	<100%	104.5%	140.1%	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)
SDGE-T-146	22712 SANLUSRY 138 - 22708 SANLUSRY 69 - ck 1	SA BK 70 69/230 _SA BK 72 69/230	160.0	C	N-1-1	<100%	<100%	<100%	<100%	<100%	102.1%	Re-evaluate in future planning cycle.
SDGE-T-147	22736 SANTYSBL 69 - 22152 CREELMAN 69 - ck 1	TL0681 ASH-FE-VC ck 1 _TL0688 ESCNDIDO-LILAC ck 1	43.0	C	N-1-1	<100%	<100%	<100%	102.9%	104.1%	116.3%	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)
SDGE-T-148	22740 SANYS DRO 69 - 22608 OTAY TP 69 - ck 1	50001 MIGUEL-ECO ck 1 _TL0649 BD-OY-SYO ck 1	50.0	C	N-1-1	<100%	<100%	<100%	<100%	<100%	104.0%	Re-evaluate in future planning cycle.
SDGE-T-149	22740 SANYS DRO 69 - 22616 OTAYLKTP 69 - ck 1	50001 MIGUEL-ECO ck 1 _TL0623 IB-OY-SYO ck 1	50.0	C	N-1-1	<100%	<100%	<100%	<100%	<100%	102.9%	Re-evaluate in future planning cycle.
SDGE-T-150	22768 BAY BLVD 69 - 22352 IMPRLBCH 69 - ck 1	TL0645 BAY BLVD-OTAY ck 1 _TL0646 BAY BLVD-OTAY ck 2	70.0	C	N-1-1	125.1%	135.0%	150.2%	156.4%	159.9%	105.3%	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)

ID	Overloaded Facility	Worst Contingency	Rating (MVA)	Category	Category Description	Loading (%)						ISO Recommended Mitigation
						2012	2013	2014	2015	2016	2021	
SDGE-T-151	22768 BAY BLVD 69 - 22516 MONTGMRY 69 - ck 1	TL23026 SILVERGT - BAY BLVD ck 1 _TL0644 BAY BLVD - SWEETWTR ck 1	103.0	C	N-1-1	N/A	N/A	107.5%	105.7%	113.0%	136.1%	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)
SDGE-T-152	22768 BAY BLVD 69 - 22520 MONTGYTP 69 - ck 1	TL23026 SILVERGT - BAY BLVD ck 1 _TL0644 BAY BLVD - SWEETWTR ck 1	180.0	C	N-1-1	N/A	N/A	113.8%	111.8%	119.7%	144.8%	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)
SDGE-T-153	22768 BAY BLVD 69 - 22604 OTAY 69 - ck 1	TL0646 BAY BLVD-OTAY ck 2 _TL0647 BAY BLVD-IMPRLBCH ck 1	100.0	C	N-1-1	<100%	104.2%	116.6%	121.3%	124.1%	<100%	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)
SDGE-T-154	22768 BAY BLVD 69 - 22604 OTAY 69 - ck 2	TL0645 BAY BLVD-OTAY ck 1 _TL0647 BAY BLVD-IMPRLBCH ck 1	100.0	C	N-1-1	<100%	105.7%	118.2%	122.9%	125.7%	<100%	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)
SDGE-T-155	22768 BAY BLVD 69 - 22820 SWEETWTR 69 - ck 1	TL23026 SILVERGT - BAY BLVD ck 1 _TL0642 MG - SW - BAY BLVD ck 1	204.0	C	N-1-1	N/A	N/A	125.4%	122.4%	132.1%	163.3%	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)
SDGE-T-156	22771 BAY BLVD 230 - 22466 MLMS3TAP 230 - ck 1	50001 MIGUEL-ECO ck 1 _TL23041A OTAYMESA-SYCAMORE	1176.0	C	N-1-1	<100%	<100%	<100%	<100%	<100%	120.1%	Re-evaluate in future planning cycle.
SDGE-T-157	22771 BAY BLVD 230 - 22768 BAY BLVD 69 - ck 1	TL23026 SILVERGT - BAY BLVD ck 1 _BB BK 72 230/69	332.0	C	N-1-1	N/A	N/A	118.3%	118.0%	123.7%	132.8%	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)
SDGE-T-158	22771 BAY BLVD 230 - 22768 BAY BLVD 69 - ck 2	TL23026 SILVERGT - BAY BLVD ck 1 _BB BK 70 230/69	332.0	C	N-1-1	N/A	N/A	118.3%	118.0%	123.7%	132.8%	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)
SDGE-T-159	22820 SWEETWTR 69 - 22520 MONTGYTP 69 - ck 1	TL23026 SILVERGT - BAY BLVD ck 1 _TL0644 BAY BLVD - SWEETWTR ck 1	185.0	C	N-1-1	N/A	N/A	147.4%	144.0%	155.5%	192.2%	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)

ID	Overloaded Facility	Worst Contingency	Rating (MVA)	Category	Category Description	Loading (%)						ISO Recommended Mitigation
						2012	2013	2014	2015	2016	2021	
SDGE-T-160	22820 SWEETWTR 69 - 22824 SWTWTRTP 69 - ck 1	TL23026 SILVERGT - BAY BLVD ck 1 _TL23041A OTAYMESA-SYCAMORE	215.0	C	N-1-1	N/A	N/A	124.9%	117.8%	131.8%	176.6%	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)
SDGE-T-161	22828 SYCAMORE 69 - 22216 ELLIOTT 69 - ck 1	50004 IMPRLVLY-ECO ck 1 _TL23042A OTAYMESA - BAY BLVD ck 1	124.0	C	N-1-1	N/A	124.3%	119.9%	120.3%	122.2%	131.9%	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)
SDGE-T-162	22828 SYCAMORE 69 - 22756 SCRIPPS 69 - ck 1	50004 IMPRLVLY-ECO ck 1 _TL23042A OTAYMESA - BAY BLVD ck 1	174.0	C	N-1-1	N/A	111.3%	112.5%	112.6%	113.9%	114.3%	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)
SDGE-T-163	22832 SYCAMORE 230 - 22467 MLSXTAP 230 - ck 1	50004 IMPRLVLY-ECO ck 1 _TL23042A OTAYMESA - BAY BLVD ck 1	912.0	C	N-1-1	N/A	101.0%	<100%	<100%	103.2%	123.3%	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)
SDGE-T-164	22832 SYCAMORE 230 - 22828 SYCAMORE 69 - ck 1	SX BK 71 230/69 _SX BK 72 230/69	285.0	C	N-1-1	103.0%	106.3%	106.8%	113.4%	114.6%	120.6%	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)
SDGE-T-165	22832 SYCAMORE 230 - 22828 SYCAMORE 69 - ck 2	SX BK 70 230/69 _SX BK 71 230/69	269.0	C	N-1-1	107.8%	111.2%	111.7%	118.6%	119.9%	126.2%	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)
SDGE-T-166	22832 SYCAMORE 230 - 22828 SYCAMORE 69 - ck 3	SX BK 70 230/69 _SX BK 72 230/69	269.0	C	N-1-1	111.1%	114.6%	115.2%	122.3%	123.6%	130.1%	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)
SDGE-T-167	22832 SYCAMORE 230 - 22831 SYCAMORE 138 - ck 1	50004 IMPRLVLY-ECO ck 1 _TL23042B OTAYMESA - BAY BLVD ck 1	477.0	C	N-1-1	N/A	107.7%	101.1%	103.3%	103.9%	114.8%	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)
SDGE-T-168	22836 TALEGA 69 - 22848 TALEGATP 69 - ck 1	TL23052 TALEGA - S.ONOFRE ck 2 _TL0690 SA-OS-STU-LP ck 1	24.0	C	N-1-1	<100%	<100%	<100%	110.5%	121.4%	131.5%	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)

ID	Overloaded Facility	Worst Contingency	Rating (MVA)	Category	Category Description	Loading (%)						ISO Recommended Mitigation
						2012	2013	2014	2015	2016	2021	
SDGE-T-169	22840 TALEGA 138 - 22656 PICO 138 - ck 1	TL13831 TALEGA-R.MSNVJO ck 1 _TL13833 TALEGA-TRABUCO ck 1	204.0	C	N-1-1	127.8%	134.8%	138.3%	140.3%	N/A	N/A	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)
SDGE-T-170	22841 TA TAP 138 - 22396 LAGNA NL 138 - ck 1	TL13831 TALEGA-R.MSNVJO ck 1 _TL13836 TALEGA-PICO ck 1	136.5	C	N-1-1	133.7%	140.5%	144.8%	143.2%	N/A	N/A	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)
SDGE-T-171	22844 TALEGA 230 - 22840 TALEGA 138 - ck 1	TA BK 62 230/138 _TA BK 63 230/138	195.0	C	N-1-1	115.4%	120.7%	125.1%	127.3%	N/A	N/A	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)
SDGE-T-172	22844 TALEGA 230 - 22840 TALEGA 138 - ck 3	TA BK 62 230/138 _TA BK 63 230/138	192.0	C	N-1-1	113.3%	118.5%	122.8%	125.0%	N/A	N/A	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)
SDGE-T-173	22856 TOREYPNS 69 - 22200 DUNHILTP 69 - ck 1	TL06905 GENESEE - PENSQTOS ck 2 _TL06959 MIRASNTO-PENSQTOS ck 1	114.0	C	N-1-1	N/A	118.2%	121.3%	126.2%	128.0%	135.7%	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)
SDGE-T-174	22856 TOREYPNS 69 - 22864 UCM 69 - ck 1	TL06905 GENESEE - PENSQTOS ck 2 _TL06959 MIRASNTO-PENSQTOS ck 1	129.0	C	N-1-1	N/A	124.7%	127.5%	132.5%	134.8%	145.5%	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)
SDGE-T-175	22870 VALCNTR 69 - 22012 ASH TP 69 - ck 1	TL0688 ESCNDIDO-LILAC ck 1 _TL0698 MN-AV-PA ck 1	102.0	C	N-1-1	<100%	<100%					Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)
SDGE-T-176	22884 WARNERS 69 - 22688 RINCON 69 - ck 1	TL0626 ST-BC-DE ck 1 _TL0637 SANTYSBL - CREELMAN ck 1	32.0	C	N-1-1	105.3%	107.8%	110.0%	117.6%	117.8%	120.4%	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)
SDGE-T-177	22884 WARNERS 69 - 22736 SANTYSBL 69 - ck 1	TL0681 ASH-FE-VC ck 1 _TL0688 ESCNDIDO-LILAC ck 1	32.0	C	N-1-1	131.8%	143.3%	157.0%	163.1%	165.4%	189.6%	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)
SDGE-T-178	22885 SUNCREST 500 - 22888 SNCRSTMP 500 - ck 1	50001 MIGUEL-ECO ck 1 _SUNCREST BK81 230/500	1329.0	C	N-1-1	<100%	<100%	<100%	<100%	<100%	109.3%	Re-evaluate in future planning cycle.

ID	Overloaded Facility	Worst Contingency	Rating (MVA)	Category	Category Description	Loading (%)						ISO Recommended Mitigation
						2012	2013	2014	2015	2016	2021	
SDGE-T-179	22885 SUNCREST 500 - 22888 SNCRSTMP 500 - ck 2	50001 MIGUEL-ECO ck 1 _SUNCREST BK80 230/500	1329.0	C	N-1-1	<100%	<100%	<100%	<100%	<100%	109.3%	Re-evaluate in future planning cycle.
SDGE-T-180	22886 SUNCREST 230 - 22832 SYCAMORE 230 - ck 1	50001 MIGUEL-ECO ck 1 _TL23055 SUNCREST-SYCAMORE 230 ck 2	1176.0	C	N-1-1	<100%	101.3%	<100%	104.4%	102.3%	114.6%	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)
SDGE-T-181	22886 SUNCREST 230 - 22832 SYCAMORE 230 - ck 2	50001 MIGUEL-ECO ck 1 _TL23054 SUNCREST-SYCAMORE 230 ck 1	1176.0					<100%	104.4%	102.3%	114.6%	Operational action plan (e.g. generation dispatch or switching solution or load drop after the first contingency)
SDGE-T-182	22886 SUNCREST 230 - 22888 SNCRSTMP 500 - ck 1	50001 MIGUEL-ECO ck 1 _SUNCREST BK81 230/500	1329.0	C	N-1-1	<100%	<100%	<100%	<100%	<100%	107.3%	Re-evaluate in future planning cycle.
SDGE-T-183	22886 SUNCREST 230 - 22888 SNCRSTMP 500 - ck 2	50001 MIGUEL-ECO ck 1 _SUNCREST BK80 230/500	1329.0	C	N-1-1	<100%	<100%	<100%	<100%	<100%	107.3%	Re-evaluate in future planning cycle.


Study Area: San Diego - Summer Off-Peak (2012-2021)
Thermal Overload

ID	Overloaded Facility	Worst Contingency	Rating (Amps)	Category	Category Description	Loading (%)						ISO Recommended Mitigation
						2012	2013	2014	2015	2016	2021	
SDGE-T-184	22208 EL CAJON 69kV - 22408 LOSCOCHS 69kV - ck 1	LD_GR OPEN 632 PK JM/EC/GA	70.0	B	N-1	<100%	<100%	101.7%	101.4%	<100%	103.0%	Reconductor
SDGE-T-185	22056 BERNARDO 69kV - 22676 R.CARMEL 69KV - ck 1	Poway 69kV Bus	68.0	C	Bus	103.2%	109.7%	110.5%	110.8%	112.8%	116.5%	Reconductor



Study Area: San Diego - Summer Peak (2012-2021)

High/Low Voltages

ID	Substation	Worst Contingency	Category	Category Description	Min. Post Contingency Voltage (PU)						ISO Recommended Mitigation
					2012	2013	2014	2015	2016	2021	
SDGE-V-01	22088 BOULEVRD 69kV	Base system (n-0)	A	N-0	1.019	1.071	1.059	1.057	1.058	1.064	Voltage schedules to be adjusted appropriately and/or use of voltage control devices to maintain voltages within desired operating range.
SDGE-V-02	22360 IMPRLVLY 500kV	Base system (n-0)	A	N-0	1.045	1.049	1.042	1.041	1.043	1.051	
SDGE-V-03	22536 N.GILA 500kV	Base system (n-0)	A	N-0	1.039	1.041	1.063	1.061	1.063	1.074	
SDGE-V-04	22885 SUNCREST 500kV	Base system (n-0)	A	N-0	1.037	1.040	1.030	1.024	1.025	1.050	
SDGE-V-05	14013 HDWSH 500kV	Base system (n-0)	A	N-0	1.042	1.043	1.061	1.060	1.061	1.069	
SDGE-V-06	23288 BOULEVRD 138kV	Base system (n-0)	A	N-0	NA	1.050	1.038	1.037	1.037	1.044	
SDGE-V-07	23257 RPS1I 500kV	Base system (n-0)	A	N-0	NA	NA	1.061	1.060	1.061	1.069	
SDGE-V-08	23310 RPS400 500kV	Base system (n-0)	A	N-0	NA	NA	NA	NA	NA	1.051	
SDGE-V-09	23311 RPS400_1 500kV	Base system (n-0)	A	N-0	NA	NA	NA	NA	NA	1.051	
SDGE-V-10	23315 RPS400_4 500kV	Base system (n-0)	A	N-0	NA	NA	NA	NA	NA	1.051	
SDGE-V-11	22020 AVOCADO 69	TL06912 PENDLETN-SANLUSRY ck 1 _SONGS unit2 22	B	L-1/G-1	>0.90	>0.90	>0.90	0.899	0.898	0.896	Voltage schedule adjustment or reactive support. Further evaluation in future planning cycles.
SDGE-V-12	22640 PENDLETN 69	TL06912 PENDLETN-SANLUSRY ck 1 _SONGS unit2 22	B	L-1/G-1	>0.90	>0.90	>0.90	0.897	0.896	0.894	Voltage schedule adjustment or reactive support. Further evaluation in future planning cycles.
SDGE-V-13	22016 AVCADOTP 69	TL06912 PENDLETN-SANLUSRY ck 1 _TL06932 LILAC -PALA ck 1	C	N-1-1	0.887	0.813	0.812	0.803	0.796	0.771	Operational Action Plan - Voltage control actions after the first contingency
SDGE-V-14	22020 AVOCADO 69	TL0691 AVCDTP-AVCAD-PND-MNSRT ck 1 _TL0694 MN-MHTAP-MH-ME ck 1	C	N-1-1	0.759	0.804	0.746	0.729	0.715	0.683	Operational Action Plan - Voltage control actions after the first contingency
SDGE-V-15	22060 BERNDOTP 69	TL0660 ENCNITAS-DEL MAR ck 1 _TL06952 NORTHCTY-PENSQTOS 69 ck 1	C	N-1-1	>0.90	>0.90	>0.90	0.807	0.795	0.886	Operational Action Plan - Voltage control actions after the first contingency
SDGE-V-16	22088 BOULEVRD 69	ML BK 80 230/500 ck 1 _ML BK 81 230/500 ck 2	C	N-1-1	0.987	1.102	1.092	1.099	1.102	1.076	Operational Action Plan - Voltage control actions after the first contingency
SDGE-V-17	22252 ENCNITAS 69	TL0660 ENCNITAS-DEL MAR ck 1 _TL06952 NORTHCTY-PENSQTOS 69 ck 1	C	N-1-1	0.905	0.902	0.861	0.726	0.710	0.810	Operational Action Plan - Voltage control actions after the first contingency
SDGE-V-18	22272 ESCO 69	TL06908 ESCNDIDO-ESCO ck 1 _TL06913 POWAY-POMERADO ck 1	C	N-1-1	0.899	0.897	0.863	0.857	0.852	0.853	Operational Action Plan - Voltage control actions after the first contingency
SDGE-V-19	22332 GOALLINE 69	TL06908 ESCNDIDO-ESCO ck 1 _TL06913 POWAY-POMERADO ck 1	C	N-1-1	0.900	0.898	0.864	0.858	0.853	0.854	Operational Action Plan - Voltage control actions after the first contingency

ID	Substation	Worst Contingency	Category	Category Description	Min. Post Contingency Voltage (PU)						ISO Recommended Mitigation
					2012	2013	2014	2015	2016	2021	
SDGE-V-20	22404 LILAC 69	TL0681 ASH-FE-VC ck 1 _TL0688 ESCNDIDO-LILAC ck 1	C	N-1-1	0.922	0.962	0.881	0.877	0.871	0.850	Operational Action Plan - Voltage control actions after the first contingency
SDGE-V-21	22508 MNSRATTP 69	TL0691 AVCDTP-AVCAD-PND-MNSRT ck 1 _TL0694 MN-MHTAP-MH-ME ck 1	C	N-1-1	0.778	0.823	0.762	0.746	0.733	0.702	Operational Action Plan - Voltage control actions after the first contingency
SDGE-V-22	22512 MONSRATE 69	TL0691 AVCDTP-AVCAD-PND-MNSRT ck 1 _TL0694 MN-MHTAP-MH-ME ck 1	C	N-1-1	0.778	0.823	0.762	0.746	0.733	0.702	Operational Action Plan - Voltage control actions after the first contingency
SDGE-V-23	22524 MORHILTP 69	TL06912 PENDLETN-SANLUSRY ck 1 _TL06932 LILAC -PALA ck 1	C	N-1-1	0.955	0.893	0.888	0.881	0.876	0.861	Operational Action Plan - Voltage control actions after the first contingency
SDGE-V-24	22528 MOROHILL 69	TL06912 PENDLETN-SANLUSRY ck 1 _TL06932 LILAC -PALA ck 1	C	N-1-1	0.955	0.893	0.888	0.881	0.876	0.861	Operational Action Plan - Voltage control actions after the first contingency
SDGE-V-25	22581 NORTHCTY 69	TL0660 ENCINITAS-DEL MAR ck 1 _TL06952 NORTHCTY-PENSQTOS 69 ck 1	C	N-1-1	0.906	0.905	0.875	0.744	0.729	0.826	Operational Action Plan - Voltage control actions after the first contingency
SDGE-V-26	22602 OMWD 69	TL06930 OMWD-ESCNDIDO ck 1 _TL06952 NORTHCTY-PENSQTOS 69 ck 1	C	N-1-1	>0.90	>0.90	>0.90				
SDGE-V-27	22603 Lkhodges 69	TL0660 ENCINITAS-DEL MAR ck 1 _TL06952 NORTHCTY-PENSQTOS 69 ck 1	C	N-1-1	>0.90	>0.90	>0.90	0.844	0.834	0.920	Operational Action Plan - Voltage control actions after the first contingency
SDGE-V-28	22624 PALA 69	TL0691 AVCDTP-AVCAD-PND-MNSRT ck 1 _TL0694 MN-MHTAP-MH-ME ck 1	C	N-1-1	0.830	0.860	0.810	0.796	0.785	0.762	Operational Action Plan - Voltage control actions after the first contingency
SDGE-V-29	22627 PA99MW 69	TL0691 AVCDTP-AVCAD-PND-MNSRT ck 1 _TL0694 MN-MHTAP-MH-ME ck 1	C	N-1-1	0.830	0.860	0.810	0.796	0.785	0.762	Operational Action Plan - Voltage control actions after the first contingency
SDGE-V-30	22640 PENDLETN 69	TL06912 PENDLETN-SANLUSRY ck 1 _TL06932 LILAC -PALA ck 1	C	N-1-1	0.879	0.803	0.803	0.794	0.787	0.761	Operational Action Plan - Voltage control actions after the first contingency
SDGE-V-31	22664 POMERADO 69	TL06915 POMERADO -SYCAMORE ck 1 _TL06924 POMERADO -SYCAMORE ck 2	C	N-1-1	0.914	0.919	0.900	0.898	0.895	0.900	Operational Action Plan - Voltage control actions after the first contingency
SDGE-V-32	22668 POWAY 69	TL0633 BERNARDO-R.CARMEL ck 1 _TL06913 POWAY-POMERADO ck 1	C	N-1-1	0.859	0.870	0.820	0.817	0.812	0.813	Operational Action Plan - Voltage control actions after the first contingency
SDGE-V-33	22676 R.CARMEL 69	TL0633 BERNARDO-R.CARMEL ck 1 _TL06913 POWAY-POMERADO ck 1	C	N-1-1	0.849	0.863	0.809	0.805	0.800	0.801	Operational Action Plan - Voltage control actions after the first contingency
SDGE-V-34	22680 R.SNTAFE 69	TL0660 ENCINITAS-DEL MAR ck 1 _TL06952 NORTHCTY-PENSQTOS 69 ck 1	C	N-1-1	0.924	0.920	0.899	0.775	0.761	0.856	Operational Action Plan - Voltage control actions after the first contingency

ID	Substation	Worst Contingency	Category	Category Description	Min. Post Contingency Voltage (PU)						ISO Recommended Mitigation
					2012	2013	2014	2015	2016	2021	
SDGE-V-35	22685 R.SNTTP1 69	TL0660 ENCINITAS-DEL MAR ck 1 _TL06952 NORTHCTY-PENSQTOS 69 ck 1	C	N-1-1	0.912	0.910	0.881	0.751	0.736	0.833	Operational Action Plan - Voltage control actions after the first contingency
SDGE-V-36	22688 RINCON 69	TL0681 ASH-FE-VC ck 1 _TL0688 ESCNDIDO-LILAC ck 1	C	N-1-1	0.927	0.967	0.883	0.881	0.875	0.849	Operational Action Plan - Voltage control actions after the first contingency
SDGE-V-37	22870 VALCNTR 69	TL0681 ASH-FE-VC ck 1 _TL0688 ESCNDIDO-LILAC ck 1	C	N-1-1	0.919	0.966	0.874	0.871	0.865	0.838	Operational Action Plan - Voltage control actions after the first contingency
SDGE-V-38	22876 WARCYNTP 69	TL0633 BERNARDO-R.CARMEL ck 1 _TL06913 POWAY-POMERADO ck 1	C	N-1-1	0.880	0.888	0.845	0.842	0.837	0.839	Operational Action Plan - Voltage control actions after the first contingency
SDGE-V-39	22880 WARENCYN 69	TL0633 BERNARDO-R.CARMEL ck 1 _TL06913 POWAY-POMERADO ck 1	C	N-1-1	0.880	0.888	0.845	0.842	0.837	0.839	Operational Action Plan - Voltage control actions after the first contingency



Study Area: San Diego - Summer Off-Peak (2012-2021)

High/Low Voltages

ID	Substation	Worst Contingency	Category	Category Description	Min. Post Contingency Voltage (PU)						ISO Recommended Mitigation
					2012	2013	2014	2015	2016	2021	
SDGE-V-40	ALPINE 69kV	Base system (n-0)	A	N-0	1.068	1.053	1.055	1.056	1.040	1.053	Voltage schedules to be adjusted appropriately and/or use of voltage control devices to maintain voltages within desired operating range.
SDGE-V-41	BARRETT 69kV	Base system (n-0)	A	N-0	1.061	1.050	1.052	1.053	1.036	1.048	
SDGE-V-42	BARRETTTP 69kV	Base system (n-0)	A	N-0	1.065	1.025	N/A	N/A	N/A	N/A	
SDGE-V-43	CAMERNTP 69kV	Base system (n-0)	A	N-0	1.061	1.051	1.053	1.054	1.037	1.048	
SDGE-V-44	BOULEVRD 69kV	Base system (n-0)	A	N-0	1.060	1.056	1.080	1.079	1.067	1.056	
SDGE-V-45	CAMERON 69kV	Base system (n-0)	A	N-0	1.060	1.049	1.051	1.052	1.036	1.047	
SDGE-V-46	CREELMAN 69kV	Base system (n-0)	A	N-0	1.052	1.045	1.047	1.048	1.035	1.045	
SDGE-V-47	DESCANSO 69kV	Base system (n-0)	A	N-0	1.058	1.047	1.048	1.050	1.034	1.046	
SDGE-V-48	ELLIOTT 69kV	Base system (n-0)	A	N-0	1.052	1.051	1.050	1.050	1.045	1.049	
SDGE-V-49	F 69kV	Base system (n-0)	A	N-0	1.056	1.055	1.053	1.053	1.049	1.053	
SDGE-V-50	GLENCILF 69kV	Base system (n-0)	A	N-0	1.059	1.048	1.049	1.050	1.034	1.045	
SDGE-V-51	GLNCLFTP 69kV	Base system (n-0)	A	N-0	1.059	1.048	1.049	1.050	1.034	1.045	
SDGE-V-52	GRANITTP 69kV	Base system (n-0)	A	N-0	1.053	1.040	1.042	1.043	1.033	1.041	
SDGE-V-53	IMPRLVLY 500kV	Base system (n-0)	A	N-0	1.043	1.055	1.069	1.068	1.064	1.058	
SDGE-V-54	LOSCOCHS 69kV	Base system (n-0)	A	N-0	1.073	1.057	1.060	1.061	1.044	1.059	
SDGE-V-55	LOVELAND 69kV	Base system (n-0)	A	N-0	1.068	1.053	1.055	1.056	1.040	1.053	
SDGE-V-56	MISSION 69kV	Base system (n-0)	A	N-0	1.056					1.054	
SDGE-V-57	N.GILA 500kV	Base system (n-0)	A	N-0	1.058	1.073	1.079	1.078	1.101	1.100	
SDGE-V-58	SUNCREST 500kV	Base system (n-0)	A	N-0	1.028	1.053	1.066	1.069	1.045	1.061	
SDGE-V-59	SNCRSTMP 500kV	Base system (n-0)	A	N-0	1.023	1.051	1.063	1.067	1.041	1.057	
SDGE-V-60	CRESTWD 69kV	Base system (n-0)	A	N-0	1.063	1.054	1.055	1.056	1.040	1.051	
SDGE-V-61	KUMEYAAY 69kV	Base system (n-0)	A	N-0	1.063	1.054	1.055	1.056	1.040	1.051	
SDGE-V-62	HDWSH 500kV	Base system (n-0)	A	N-0	1.058	1.070	1.073	1.073	1.096	1.095	
SDGE-V-63	ECO 500kV	Base system (n-0)	A	N-0	N/A	1.039	1.062	1.059	1.048	1.036	
SDGE-V-64	ECO 138kV	Base system (n-0)	A	N-0	N/A	1.036	1.059	1.057	1.045	1.031	
SDGE-V-65	BOULEVRD 138kV	Base system (n-0)	A	N-0	N/A	1.036	1.059	1.058	1.046	1.035	
SDGE-V-66	RPS1I 500kV	Base system (n-0)	A	N-0	N/A	N/A	1.073	1.073	1.096	1.095	
SDGE-V-67	RPS25B 138kV	Base system (n-0)	A	N-0	N/A	N/A	N/A	1.059	1.046	1.035	
SDGE-V-68	RPS400 500kV	Base system (n-0)	A	N-0	N/A	N/A	N/A	N/A	N/A	1.059	
SDGE-V-69	RPS400_1 500kV	Base system (n-0)	A	N-0	N/A	N/A	N/A	N/A	N/A	1.059	
SDGE-V-70	RPS400_4 500kV	Base system (n-0)	A	N-0	N/A	N/A	N/A	N/A	N/A	1.059	


Study Area: San Diego - Summer Peak (2012-2021)
Voltage Deviation

ID	Substation	Worst Contingency	Category	Category Description	Post Contingency Voltage Deviation (%)						ISO Recommended Mitigation
					2012	2013	2014	2015	2016	2021	
SDGE-DV-01	22016 AVCADOTP 69kV	TL06912 PENDLETN-SANLUSRY ck 1	B	N-1	-4.0%	-4.8%	-5.4%	-5.5%	-5.6%	-5.9%	Adjust taps on Escondido 230/69kV and Talega 138/69kV banks.
SDGE-DV-02	22088 BOULEVRD 69kV	ECO BK 80 230/500	B	N-1	<5%	-7.1%	-5.9%	-5.7%	-5.8%	-6.4%	Adjust taps on Boulevard 138/69kV bank
SDGE-DV-03	22108 CANNON 138kV	TL13801 CANNON-ENCINA ck 1	B	N-1	-5.7%	-6.1%	-6.2%	-6.3%	-6.5%	-6.9%	Adjust taps on San Luis Rey 138/69kV bank and 230/69kV bank
SDGE-DV-04	22344 HORNO 69kV	TL0690 SA-OS-STU-LP ck 1	B	N-1	-1.1%	0.7%	-0.8%	-4.8%	-5.2%	-5.8%	Adjust taps on Talega 138/69kV bank
SDGE-DV-05	22348 HORNO TP 69kV	TL0690 SA-OS-STU-LP ck 1	B	N-1	-1.1%	0.8%	-0.8%	-4.8%	-5.2%	-5.8%	Adjust taps on Talega 138/69kV bank
SDGE-DV-06	22400 LASPULGS 69kV	TL0690 SA-OS-STU-LP ck 1	B	N-1	-1.1%	0.8%	-0.8%	-5.2%	-5.6%	-6.2%	Adjust taps on Talega 138/69kV bank
SDGE-DV-07	22508 MNSRATTP 69kV	TL06912 PENDLETN-SANLUSRY ck 1	B	N-1	-3.7%	-4.5%	-5.0%	-5.2%	-5.3%	-5.5%	Adjust taps on Escondido 230/69kV and Talega 138/69kV banks.
SDGE-DV-08	22512 MONSRATE 69kV	TL06912 PENDLETN-SANLUSRY ck 1	B	N-1	-3.7%	-4.5%	-5.0%	-5.2%	-5.3%	-5.5%	Adjust taps on Escondido 230/69kV and Talega 138/69kV banks.
SDGE-DV-09	22540 NARROWS 69kV	TL0687 BORREGO-NARROWS ck 1	B	N-1	3.5%	4.8%	6.4%	1.6%	1.7%	3.0%	Further evaluation in future planning cycles.
SDGE-DV-10	22581 NORTHCTY 69kV	TL06952 NORTHCTY-PENSQTOS 69 ck 1	B	N-1	-4.7%	-4.7%	-5.6%	-5.5%	-5.6%	-4.5%	Adjust taps on Penasquitos 230/69kV and 138/69kV banks
SDGE-DV-11	22640 PENDLETN 69kV	TL06912 PENDLETN-SANLUSRY ck 1	B	N-1	-5.6%	-6.5%	-7.3%	-7.4%	-7.6%	-7.8%	Adjust taps on Escondido 230/69kV and Talega 138/69kV banks.
SDGE-DV-12	22668 POWAY 69kV	TL06913 POWAY-POMERADO ck 1	B	N-1	-4.1%	-4.2%	-5.3%	-4.5%	-4.5%	-4.8%	Further evaluation in future planning cycles.

SDGE-DV-13	22888 SNCRSTMP 500kV	TL50001 SPS+IVGens+23040 SPS6.2B	B	N-1	-4.5%	-4.5%	-	-2.2%	-2.1%	-5.0%	Further evaluation in future planning cycles.
SDGE-DV-14	23288 BOULEVRD 138kV	ECO BK 80 230/500	B	N-1	-	-5.0%	-3.8%	-3.7%	-3.7%	-4.4%	Adjust taps on Boulevard 138/69kV bank
SDGE-DV-15	LILAC 69kV	Lilac 69kV S Bus	C	Bus	-6.8%	-3.5%	-8.6%	-8.9%	-9.0%	-10.5%	Further evaluation in future planning cycles. Potential Special Protection Scheme.
SDGE-DV-16	POMERADO 69kV	POM-SX #1+#2	C	N-2	-10.3%	-9.9%	-10.9%	-9.8%	-10.0%	-10.6%	Special Protection Scheme
SDGE-DV-17	22016 AVCADOTP 69	TL06912 PENDLETN- SANLUSRY ck 1 _TL06932 LILAC -PALA ck 1	C	N-1-1	-10.0%	-17.4%	-16.4%	-16.9%	-17.4%	-20.1%	Operational Action Plan - Voltage control actions after the first contingency
SDGE-DV-18	22020 AVOCADO 69	TL0691 AVCDTP-AVCAD-PND- MNSRT ck 1 _TL0694 MN- MHTAP-MH-ME ck 1	C	N-1-1	-21.9%	-17.4%	-22.3%	-23.6%	-24.7%	-28.2%	Operational Action Plan - Voltage control actions after the first contingency
SDGE-DV-19	22060 BERNDOTP 69	TL0660 ENCNITAS-DEL MAR ck 1 _TL06952 NORTHCTY- PENSQTOS 69 ck 1	C	N-1-1	<10%	<10%	<10%	-18.7%	-19.6%	-13.1%	Operational Action Plan - Voltage control actions after the first contingency
SDGE-DV-20	22252 ENCNITAS 69	TL0660 ENCNITAS-DEL MAR ck 1 _TL06952 NORTHCTY- PENSQTOS 69 ck 1	C	N-1-1	-11.5%	-11.8%	-15.1%	-27.1%	-28.4%	-20.5%	Operational Action Plan - Voltage control actions after the first contingency
SDGE-DV-21	22272 ESCO 69	TL06908 ESCNDIDO-ESCO ck 1 _TL06913 POWAY- POMERADO ck 1	C	N-1-1	-10.4%	-10.3%	-13.1%	-13.3%	-13.6%	-14.3%	Operational Action Plan - Voltage control actions after the first contingency
SDGE-DV-22	22332 GOALLINE 69	TL06908 ESCNDIDO-ESCO ck 1 _TL06913 POWAY- POMERADO ck 1	C	N-1-1	-10.4%	-10.3%	-13.1%	-13.3%	-13.6%	-14.3%	Operational Action Plan - Voltage control actions after the first contingency
SDGE-DV-23	22404 LILAC 69	TL0681 ASH-FE-VC ck 1 _TL0688 ESCNDIDO-LILAC ck 1	C	N-1-1	-7.7%	-4.7%	-10.7%	-10.7%	-11.1%	-13.6%	Operational Action Plan - Voltage control actions after the first contingency
SDGE-DV-24	22508 MNSRATTP 69	TL0691 AVCDTP-AVCAD-PND- MNSRT ck 1 _TL0694 MN- MHTAP-MH-ME ck 1	C	N-1-1	-20.8%	-16.4%	-21.3%	-22.5%	-23.6%	-26.9%	Operational Action Plan - Voltage control actions after the first contingency
SDGE-DV-25	22512 MONSRATE 69	TL0691 AVCDTP-AVCAD-PND- MNSRT ck 1 _TL0694 MN- MHTAP-MH-ME ck 1	C	N-1-1	-20.8%	-16.4%	-21.3%	-22.5%	-23.6%	-26.9%	Operational Action Plan - Voltage control actions after the first contingency
SDGE-DV-26	22524 MORHILTP 69	TL06912 PENDLETN- SANLUSRY ck 1 _TL06932 LILAC -PALA ck 1	C	N-1-1	-5.0%	-10.4%	-9.9%	-10.2%	-10.5%	-12.3%	Operational Action Plan - Voltage control actions after the first contingency

SDGE-DV-27	22528 MOROHILL 69	TL06912 PENDLETN- SANLUSRY ck 1 _TL06932 LILAC -PALA ck 1	C	N-1-1	-5.0%	-10.4%	-9.9%	-10.2%	-10.5%	-12.3%	Operational Action Plan - Voltage control actions after the first contingency
SDGE-DV-28	22581 NORTHCTY 69	TL0660 ENCINITAS-DEL MAR ck 1 _TL06952 NORTHCTY- PENSQTOS 69 ck 1	C	N-1-1	-11.5%	-11.7%	-14.5%	-26.3%	-27.5%	-19.8%	Operational Action Plan - Voltage control actions after the first contingency
SDGE-DV-29	22602 OMWD 69	TL06930 OMWD-ESCNDIDO ck 1 _TL06952 NORTHCTY- PENSQTOS 69 ck 1	C	N-1-1	<10%	<10%	<10%	-12.0%	-12.5%	0.2%	Operational Action Plan - Voltage control actions after the first contingency
SDGE-DV-30	22603 Lkhodges 69	TL0660 ENCINITAS-DEL MAR ck 1 _TL06952 NORTHCTY- PENSQTOS 69 ck 1	C	N-1-1	<10%	<10%	<10%	-15.0%	-15.8%	-9.9%	Operational Action Plan - Voltage control actions after the first contingency
SDGE-DV-31	22624 PALA 69	TL0691 AVCDTP-AVCAD-PND- MNSRT ck 1 _TL0694 MN- MHTAP-MH-ME ck 1	C	N-1-1	-15.9%	-12.9%	-16.7%	-17.8%	-18.6%	-21.3%	Operational Action Plan - Voltage control actions after the first contingency
SDGE-DV-32	22627 PA99MW 69	TL0691 AVCDTP-AVCAD-PND- MNSRT ck 1 _TL0694 MN- MHTAP-MH-ME ck 1	C	N-1-1	-15.9%	-12.9%					Operational Action Plan - Voltage control actions after the first contingency
SDGE-DV-33	22640 PENDLETN 69	TL06912 PENDLETN- SANLUSRY ck 1 _TL06932 LILAC -PALA ck 1	C	N-1-1	-11.7%	-19.2%	-18.4%	-18.9%	-19.4%	-22.2%	Operational Action Plan - Voltage control actions after the first contingency
SDGE-DV-34	22664 POMERADO 69	TL06915 POMERADO - SYCAMORE ck 1 _TL06924 POMERADO -SYCAMORE ck 2	C	N-1-1	-10.3%	-9.9%	-10.9%	-9.8%	-10.0%	-10.6%	Operational Action Plan - Voltage control actions after the first contingency
SDGE-DV-35	22668 POWAY 69	TL0633 BERNARDO-R.CARMEL ck 1 _TL06913 POWAY- POMERADO ck 1	C	N-1-1	-13.9%	-12.8%	-17.4%	-16.8%	-17.0%	-17.9%	Operational Action Plan - Voltage control actions after the first contingency
SDGE-DV-36	22676 R.CARMEL 69	TL0633 BERNARDO-R.CARMEL ck 1 _TL06913 POWAY- POMERADO ck 1	C	N-1-1	-14.1%	-12.7%	-17.5%	-17.0%	-17.3%	-18.1%	Operational Action Plan - Voltage control actions after the first contingency
SDGE-DV-37	22680 R.SNTAFE 69	TL0660 ENCINITAS-DEL MAR ck 1 _TL06952 NORTHCTY- PENSQTOS 69 ck 1	C	N-1-1	-8.1%	-8.3%	-10.1%	-22.1%	-23.2%	-16.1%	Operational Action Plan - Voltage control actions after the first contingency
SDGE-DV-38	22685 R.SNTTP1 69	TL0660 ENCINITAS-DEL MAR ck 1 _TL06952 NORTHCTY- PENSQTOS 69 ck 1	C	N-1-1	-10.4%	-10.6%	-13.2%	-25.1%	-26.3%	-18.7%	Operational Action Plan - Voltage control actions after the first contingency

SDGE-DV-39	22688 RINCON 69	TL0681 ASH-FE-VC ck 1 _TL0688 ESCNDIDO-LILAC ck 1	C	N-1-1	-8.1%	-4.9%	-11.3%	-11.3%	-11.7%	-14.7%	Operational Action Plan - Voltage control actions after the first contingency
SDGE-DV-40	22870 VALCNTR 69	TL0681 ASH-FE-VC ck 1 _TL0688 ESCNDIDO-LILAC ck 1	C	N-1-1	-8.0%	-4.2%	-11.5%	-11.4%	-11.8%	-15.0%	Operational Action Plan - Voltage control actions after the first contingency
SDGE-DV-41	22876 WARCYNTP 69	TL0633 BERNARDO-R.CARMEL ck 1 _TL06913 POWAY-POMERADO ck 1	C	N-1-1	-11.8%	-11.0%	-14.9%	-14.3%	-14.6%	-15.3%	Operational Action Plan - Voltage control actions after the first contingency
SDGE-DV-42	22880 WARENCYN 69	TL0633 BERNARDO-R.CARMEL ck 1 _TL06913 POWAY-POMERADO ck 1	C	N-1-1	-11.8%	-11.0%	-14.9%	-14.3%	-14.6%	-15.3%	Operational Action Plan - Voltage control actions after the first contingency


Study Area: San Diego - Summer Off-Peak (2012-2021)
Voltage Deviation

ID	Substation	Worst Contingency	Category	Category Description	Post Contingency Voltage Deviation (%)						ISO Recommended Mitigation
					2012	2013	2014	2015	2016	2021	
SDGE-DV-43	BOULEVRD 69kV	ECO BK 80 230/500	B	N-1	<10%	-5.6%	-8.0%	-7.9%	-6.7%	-5.6%	Reactive support and/or voltage control equipment.
SDGE-DV-44	MESA RIM 69kV	LD_MRM OPEN 675 PEAK MRM/MR/SS	B	N-1	-5.5%					-4.9%	Reactive support and/or voltage control equipment.
SDGE-DV-45	NARROWS 69kV	TL0686 WARNERS-NARROWS ck 1	B	N-1	-5.9%	-5.0%	-4.6%	-5.2%	-3.6%	-4.5%	Reactive support and/or voltage control equipment.
SDGE-DV-46	CRESTWD 69kV	TL0629 BU-CW-CN-GC ck 1	B	N-1	-6.3%	-5.4%	-5.5%	-5.6%	-4.0%	-5.1%	Reactive support and/or voltage control equipment.
SDGE-DV-47	KUMEYAAY 69kV	TL06946 CRESTWD-KUMEYAAY 69 ck1	B	N-1	-6.3%	-5.4%	-5.5%	-5.6%	-4.0%	-5.1%	Reactive support and/or voltage control equipment.



Study Area: SDG&E Bulk System Assessment

Post-transient Stability Assessment

Contingency	System Performance	ISO Proposed Mitigation
Southwest Power Link (SWPL)	Case Diverged (2021 peak)	Install additional reactive support / Evaluate in future planning cycles
Southwest Power Link + Sunrise Power Link (N-2)	Case Diverged (2016 peak)	Appropriate design and modification of N-2 SPS
SONGS g-2	Refer to SCE system assessment	Refer to SCE system assessment