

## **APPENDIX C: Reliability Assessment Study Results**

**Appendix C-1**  
**PG&E Bulk System**

2012/2013 ISO Reliability Assessment - Final Study Results

Study Area: **PG&E Bulk - Summer Peak**



**Post-Transient Thermal Overloads**

ID	Overloaded Facility	Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014	2017	2022	
Bulk-PTT-2	C.COSTA SUB-C.COSTA 230	Vaca Dixon-Tesla 500 kV	B	L-1	96.5%	<95%	<95%	not a violation
Bulk-PTT-5	CAYETANO-USWP JRW 230	Contra Costa-Las Positas 230 kV	B	L-1	97.5%	96.1%	100.2%	congestion management, reduce C. Cos generation or re-rate
Bulk-PTT-8	COTWDWAP-OLINDAW 230 #1&2	Captain Jack -Olinda 500 kV	B	L-1	102.9%	96.9%	<95%	WAPA project to upgrade the line
Bulk-PTT-9	CRAGVIEW - WEED JPS 115	Captain Jack -Olinda 500 kV	B	L-1	104.1%	100.1%	105.9%	adjust Weed phase shifter
Bulk-PTT-10		Malin-Round Mountain 500 kV #1	B	L-1	99.8%	96.5%	102.4%	
Bulk-PTT-11		Malin-Round Mountain 500 kV #2	B	L-1	100.5%	97.1%	103.0%	
Bulk-PTT-14	DELEVAN-CORTINA 230 #1	Olinda-Tracy 500 kV	B	L-1	<95%	<95%	96.2%	not a violation
Bulk-PTT-15	DELTA - CASCADE 115	Captain Jack -Olinda 500 kV	B	L-1	98.8%	97.2%	98.6%	adjust Weed phase shifter
Bulk-PTT-20	INYO - INYO PS 115.0 #1	PDCI bi-pole outage	B	PDCI	105.6%	103.6%	103.0%	adjust Inyo phase shifter
Bulk-PTT-21	LONETREE - USWP JRW 230	Contra Costa-Las Positas 230 kV	B	L-1	97.7%	96.2%	100.3%	congestion management, reduce C. Cos generation or re-rate
Bulk-PTT-23	NRS 400 -SRS 115 #1	Tesla-Metcalf 500 kV	B	L-1	<95%	<95%	97.4%	not a violation
Bulk-PTT-27	ROUND MT-TABLE MT 500 #1	ROUND MT - TABLE MT 500 kV #2	B	L-1	97.6%	96.0%	95.4%	not a violation, COI is at the limit
Bulk-PTT-28	ROUND MT-TABLE MT 500 #2	ROUND MT -TABLE MT 500 kV #1	B	L-1	97.8%	96.1%	95.6%	not a violation, COI is at the limit
Bulk-PTT-1	C.COSTA - WND MSTR 230.0 #1	C. Costa-Las Positas & C. Cos-Lone Tree 230 kV	C	L-2	112.4%	<95%	<95%	add SPS to trip C.Cos generation, upgrade modeled from 2017
Bulk-PTT-3	C.COSTA SUB-C.COSTA 230	500 kV Double outage north of Tesla	C	L-2	100.4%	97.3%	<95%	add tripping C.Cos generation to RAS or re-rate
Bulk-PTT-6	CAYETANO-USWP JRW 230	C. Costa-Brentwood & C. Costa-Delta 230 kV	C	L-2	97.6%	95.7%	96.8%	not a violation
Bulk-PTT-12	CRAGVIEW - WEED JPS 115	Malin-Round Mountain 500 kV #1 & 2	C	L-2	112.7%	107.6%	117.0%	adjust Weed phase shifter
Bulk-PTT-13		Round Mnt -Table Mnt 500 kV # 1 & 2	C	L-2	99.7%	96.5%	105.7%	

**Post-Transient Thermal Overloads**

ID	Overloaded Facility	Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014	2017	2022	
Bulk-PTT-16	DELTA - CASCADE 115	Malin-Round Mountain 500 kV #1 & 2	C	L-2	108.1%	105.1%	110.3%	
Bulk-PTT-17	FGRDN T1 - ASHLAN 230.0 #1 (Ashlan-Herndon)	Gregg - Herndon #1 & #2 230 kV	C	L-2	100.8%	<95%	<95%	assumed 1 Helms tripped in 2014 and 2 in 2017-22, line upgrade modeled for 2022. Trip all Helms prior to upgrade
Bulk-PTT-18	FGRDN T2 - ASHLAN 230.0 #1 (Ashlan-Gregg)	Gregg - Herndon #1 & #2 230 kV	C	L-2	146.4%	110.8%	<95%	
Bulk-PTT-19	GREGG - FGRDN T2 230.0 #1 (Ashlan-Gregg)	Gregg - Herndon #1 & #2 230 kV	C	L-2	170.7%	136.4%	<95%	
Bulk-PTT-22	LONETREE - USWP JRW 230	C. Costa-Brentwood & C. Costa-Delta 230 kV	C	L-2	97.8%	95.8%	96.9%	not a violation
Bulk-PTT-25	PEASE - E.MRY J1 115.0 #1	500 kV Double outage south of Table Mnt	C	L-2	97.6%	<95%	<95%	not a violation, upgrade modeled in 2022
Bulk-PTT-26	PEASE - E.MRY J1 115.0 #1	Tesla CB#612 stuck brk	C	BRK	99.9%	<95%	<95%	trip E. Marysvl load if overload, upgrade modeled in 2022
Bulk-PTT-29	STCKDLJ1- MIDWAY 230 #1	Midway-Kern # 3&4 230 kV	C	L-2	<95%	98.2%	111.5%	trip load in Bakersfield and Stockdale
Bulk-PTT-30	TABLE MTN 500/230 kV # 1	Double outage south of Table Mountain	C	L-2	<95%	<95%	99.7%	modify RAS not to trip Feather River generation
Bulk-PTT-31	WIRLWIND- MIDWAY 500 #3	Midway-Vincent 500 kV # 1 & 2	C	L-2	96.3%	<95%	<95%	not a violation, Path 26 at the limit
Bulk-PTT-32	WND MSTR - DELTAPMP 230.0 #1	C. Costa-Las Positas & C. Cos-Lone Tree 230 kV	C	L-2	104.6%	<95%	<95%	add SPS to trip C.Cos generation, upgrade modeled from 2017
Bulk-PTT-4	C.COSTA SUB-C.COSTA 230	Tesla 500 kV substation	D	SUBST	104.8%	97.8%	<95%	add tripping C.Cos generation to RAS or re-rate
Bulk-PTT-7	CAYETANO-USWP JRW 230	Tesla 500 kV substation	D	SUBST	98.9%	<95%	97.5%	not a violation
Bulk-PTT-24	PANOCHÉ -GATES 230 #1&2	Los Banos 500 kV substation	D	SUBST	111.0%	112.2%	<95%	acceptable for Cat D, trip load
Bulk-PTT-33	NOT SOLVED	NE SE SEPARATION	D	sys sep	diverged	diverged	diverged	system separation according to the scheme
Bulk-PTT-34	NOT SOLVED, SOLVED WITH ADDITIONAL LOAD AND GEN TRIPPING	Midway 500 kV Substation	D	subst	diverged	diverged	no cascading outages	no cascading outages with load and generation tripping

**Post-Transient Thermal Overloads**

ID	Overloaded Facility	Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014	2017	2022	
Bulk-PTT-35	NOT SOLVED, SOLVED WITH ADDITIONAL LOAD AND GEN TRIPPING	Midway 230 kV Substation	D	subst	diverged	diverged	diverged	no cascading outages with load and generation tripping
Bulk-PTT-36	NOT SOLVED, SOLVED WITH ADDITIONAL LOAD AND GEN TRIPPING	Path 26	D	corridor	diverged	diverged	no cascading outages	no cascading outages with load and generation tripping

**Post-Transient Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014	2017	2022	
Bulk-TVD-1	Substations in Northwest, voltage deviation up, up to 10.5%	PDCI BI-pole outage	B	PDCI	<-5%	<-5%	<-5%	trip capacitors at wind plants, consider exemption for deviation up for PDCI outage

**Thermal Overloads**

ID	Overloaded Facility	Contingency	Category	Category Description	Loading (%)				Potential Mitigation Solutions
					2014 Summer Light Load	2017 Summer Partial Peak	2017 Summer Off-Peak	2022 Summer Light Load	
Bulk-OP-T-1	WARNEVL-WILSON 230 # 1	normal conditions	A	base case	<95%	151.7%	<95%	<95%	install series reactor, upgrade the line or congestion management
Bulk-OP-T-36	BELLOTA-WARNEVL 230	normal conditions	A	base case	<95%	108.8%	<95%	<95%	upgrade the line
Bulk-OP-T-6	WARNEVL-WILSON 230 # 1	Gates 500/230 kV transformer	B	T-1	<95%	151.2%	<95%	<95%	install series reactor, upgrade the line or congestion management
Bulk-OP-T-7		PDCI Bi-pole	B	PDCI	<95%	149.6%	<95%	<95%	
Bulk-OP-T-13		Tesla-Los Banos 500 kV	B	L-1	<95%	141.8%	<95%	<95%	
Bulk-OP-T-14		PDCI monopole	B	PDCI	<95%	141.8%	<95%	<95%	
Bulk-OP-T-15		Tracy-Los Banos 500 kV	B	L-1	<95%	140.2%	<95%	<95%	
Bulk-OP-T-19		Los Banos-Gates 500 kV #1	B	L-1	<95%	137.6%	<95%	<95%	
Bulk-OP-T-20		One Diablo unit	B	G-1	<95%	137.2%	<95%	<95%	
Bulk-OP-T-21		One San Onofre unit	B	G-1	<95%	136.4%	<95%	<95%	
Bulk-OP-T-22		Los Banos-Midway 500 kV	B	L-1	<95%	136.3%	<95%	<95%	
Bulk-OP-T-23		Moss Landing-Los Banos 500 kV	B	L-1	<95%	134.5%	<95%	<95%	
Bulk-OP-T-24		Tesla-Metcalf 500 kV	B	L-1	<95%	133.8%	<95%	<95%	
Bulk-OP-T-27		Los Banos-Gates 500 kV #3	B	L-1	<95%	132.4%	<95%	<95%	
Bulk-OP-T-28		Los Banos 500/230 kV transformer	B	L-1	<95%	131.6%	<95%	<95%	

**Thermal Overloads**

ID	Overloaded Facility	Contingency	Category	Category Description	Loading (%)				Potential Mitigation Solutions
					2014 Summer Light Load	2017 Summer Partial Peak	2017 Summer Off-Peak	2022 Summer Light Load	
Bulk-OP-T-29		Vaca Dixon-Tesla 500 kV	B	L-1	<95%	131.4%	<95%	<95%	
Bulk-OP-T-31		Olinda-Tracy 500 kV	B	L-1	<95%	130.8%	<95%	<95%	
Bulk-OP-T-33		Table Mountain –Tesla 500 kV	B	L-1	<95%	130.4%	<95%	<95%	
Bulk-OP-T-34		Tesla-Newark 230 kV	B	L-1	<95%	130.3%	<95%	<95%	
Bulk-OP-T-35		Olinda 500/230 kV transformer	B	T-1	<95%	130.1%	<95%	<95%	
Bulk-OP-T-41	BELLOTA-WARNEVL 230 # 1	PDCI Bi-pole	B	PDCI	<95%	109.4%	<95%	<95%	install series reactor on Warnerville-Wilson, upgrade the line or congestion management
Bulk-OP-T-42		Gates 500/230 kV transformer	B	T-1	<95%	108.2%	<95%	<95%	
Bulk-OP-T-47		Tesla-Los Banos 500 kV	B	L-1	<95%	103.9%	<95%	<95%	
Bulk-OP-T-48		PDCI monopole	B	PDCI	<95%	103.8%	<95%	<95%	
Bulk-OP-T-50		Tracy-Los Banos 500 kV	B	L-1	<95%	102.1%	<95%	<95%	
Bulk-OP-T-53		One Diablo unt	B	G-1	<95%	99.4%	<95%	<95%	
Bulk-OP-T-54		Olinda-Tracy 500 kV	B	L-1	<95%	98.8%	<95%	<95%	
Bulk-OP-T-55		One San Onofre unit	B	G-1	<95%	98.4%	<95%	<95%	
Bulk-OP-T-56		Moss Landing-Los Banos	B	L-1	<95%	97.4%	<95%	<95%	
Bulk-OP-T-57		Vaca Dixon-Tesla 500 kV	B	L-1	<95%	97.3%	<95%	<95%	



**Thermal Overloads**

ID	Overloaded Facility	Contingency	Category	Category Description	Loading (%)				Potential Mitigation Solutions
					2014 Summer Light Load	2017 Summer Partial Peak	2017 Summer Off-Peak	2022 Summer Light Load	
Bulk-OP-T-58		Los Banos-Midway 500 kV	B	L-1	<95%	97.2%	<95%	<95%	
Bulk-OP-T-62	CRAGVIEW - WEED JPS 115 #1	Captain Jack -Olinda 500 kV	B	L-1	<95%	104.7%	<95%	<95%	adjust Weed phase shifter
Bulk-OP-T-63		Malin-Round Mountain 500 kV #2	B	L-1	<95%	101.5%	<95%	<95%	
Bulk-OP-T-64		Malin-Round Mountain 500 kV #1	B	L-1	<95%	101.0%	<95%	<95%	
Bulk-OP-T-67	DELTA - CASCADE 115 #1	Captain Jack -Olinda 500 kV	B	L-1	<95%	100.4%	<95%	<95%	
Bulk-OP-T-68	COTWDWAP -OLINDAW 230 #1 &2	Captain Jack -Olinda 500 kV	B	L-1	<95%	104.7%	<95%	<95%	WAPA project to upgrade
Bulk-OP-T-106	GATES - MIDWAY 230.0 #1	Gates 500/230 kV transformer	B	T-1	<95%	<95%	97.0%	<95%	not a violation
Bulk-OP-T-107		Gates-Midway 500 kV	B	L-1	<95%	<95%	103.0%	<95%	trip one Helms pump or use 30 minutes rating
Bulk-OP-T-3	WARNEVL-WILSON 230 # 1	500 kV double outage north of Los Banos	C	L-2	<95%	173.4%	<95%	<95%	install series reactor, upgrade the line or congestion management
Bulk-OP-T-4		Gates-Gregg&Gates-Mc Call 230 kV	C	L-2	<95%	158.9%	<95%	<95%	
Bulk-OP-T-5		500 kV double outage south of Los Banos	C	L-2	<95%	158.8%	<95%	<95%	
Bulk-OP-T-8		Los Banos CB#832	C	BRK	<95%	147.8%	<95%	<95%	
Bulk-OP-T-12		Haas-McCall and Balch-McCall 230 kV	C	L-2	<95%	143.5%	<95%	<95%	
Bulk-OP-T-16		500 kV double outage north of Midway	C	L-2	<95%	138.1%	<95%	<95%	
Bulk-OP-T-17		500 kV double outage south of Tracy	C	L-2	<95%	138.0%	<95%	<95%	

**Thermal Overloads**

ID	Overloaded Facility	Contingency	Category	Category Description	Loading (%)				Potential Mitigation Solutions
					2014 Summer Light Load	2017 Summer Partial Peak	2017 Summer Off-Peak	2022 Summer Light Load	
Bulk-OP-T-18		Diablo-Midway 500 kV #1&2	C	L-2	<95%	137.6%	<95%	<95%	
Bulk-OP-T-25		Moss Landing CB#722	C	BRK	<95%	133.1%	<95%	<95%	
Bulk-OP-T-26		Gates CB #652	C	BRK	<95%	133.0%	<95%	<95%	
Bulk-OP-T-30		Vaca Dixon CB#732	C	BRK	<95%	131.3%	<95%	<95%	
Bulk-OP-T-32		Tesla CB#612	C	BRK	<95%	130.6%	<95%	<95%	
Bulk-OP-T-38	BELLOTA-WARNEVL 230 # 1	500 kV double outage north of Los Banos	C	L-2	<95%	131.3%	<95%	<95%	install series reactor on Warnerville-Wilson, upgrade the line or congestion management
Bulk-OP-T-39		500 kV double outage south of Los Banos	C	L-2	<95%	112.4%	<95%	<95%	
Bulk-OP-T-40		Gates-Gregg&Gates-Mc Call 230 kV	C	L-2	<95%	111.8%	<95%	<95%	
Bulk-OP-T-43		Los Banos CB#832	C	BRK	<95%	107.3%	<95%	<95%	
Bulk-OP-T-49		Haas-McCall and Balch-McCall 230 kV	C	L-2	<95%	102.6%	<95%	<95%	
Bulk-OP-T-51		500 kV double outage south of Tracy	C	L-2	<95%	101.6%	<95%	<95%	
Bulk-OP-T-52		Diablo-Midway 500 kV #1&2	C	L-2	<95%	99.6%	<95%	<95%	
Bulk-OP-T-59		Vaca Dixon CB#732	C	BRK	<95%	97.2%	<95%	<95%	
Bulk-OP-T-60		500 kV double outage north of Midway	C	L-2	<95%	97.0%	<95%	<95%	
Bulk-OP-T-61			Malin-Round Mntain 500 kV #1 &2	C	L-2	<95%	109.5%	<95%	

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**Thermal Overloads**

ID	Overloaded Facility	Contingency	Category	Category Description	Loading (%)				Potential Mitigation Solutions
					2014 Summer Light Load	2017 Summer Partial Peak	2017 Summer Off-Peak	2022 Summer Light Load	
Bulk-OP-T-65	GRANDVIEW - WEED 500 115 #1	Round Mnt –Table Mnt 500 kV # 1 & 2	C	L-2	<95%	99.0%	<95%	<95%	adjust Weed phase shifter
Bulk-OP-T-66	DELTA - CASCADE 115 #1	Malin-Round Mntain 500 kV #1 &2	C	L-2	<95%	105.6%	<95%	<95%	
Bulk-OP-T-87	WESTLEY-LOS BANOS 230.0 #1	500 kV double outage north of Los Banos	C	L-2	<95%	<95%	115.1%	<95%	upgrade or congestion management
Bulk-OP-T-90	LOSBANOS - DS AMIGO 230.0 #1	500 kV double outage south of Los Banos	C	L-2	<95%	97.6%	<95%	<95%	not a violation
Bulk-OP-T-91	PEASE - E.MRY J1 115.0 #1	500 kV double outage south of Table Mtn	C	L-2	<95%	98.9%	<95%	<95%	upgrade or congestion management, upgrade modeled in 2022
Bulk-OP-T-92	CC SUB - C.COSTA 230.0 #1	500 kV double outage north of Tesla	C	L-2	<95%	101.8%	<95%	<95%	reduce C.Cos sub and Gateway generation or upgrade
Bulk-OP-T-94	ALTM MDW - DELTAPMP 230.0 #1	500 kV double outage north of Tesla	C	L-2	<95%	110.0%	<95%	<95%	
Bulk-OP-T-96	C.COSTA - BRENTWOD 230.0 #1	Contra Costa-Las Positas & C Cos-Lone Tree 230 kV	C	L-2	<95%	97.1%	<95%	<95%	not a violation
Bulk-OP-T-97	NDUBLIN - VINEYD_D 230.0 #1	Contra Costa-Brentwood and C Costa-Delta 230 kV	C	L-2	<95%	97.0%	<95%	<95%	not a violation
Bulk-OP-T-99	STCKDLJ1 - MIDWAY 230.0 #1	Midway-Kern 230 kV # 3 & 4	C	L-2	<95%	115.9%	<95%	<95%	trip load in Bakesfld& Stockdale
Bulk-OP-T-100	GREGG - FGRDN T2 230.0 #1	Gregg-Herndon 230 kV #1&2	C	L-2	<95%	100.3%	<95%	<95%	trip load at Ashlan prior to upgrade (modeled in 2022)
Bulk-OP-T-108	GATES - MIDWAY 230.0 #1	500 kV double outage north of Midway	C	L-2	<95%	<95%	106.4%	<95%	drop renewables at Midway and all Helms pumps or use 30 min rating
Bulk-OP-T-109		Midway CB#812	C	BRK	<95%	<95%	100.3%	<95%	trip one Helms pump or use 30 min rating

**Thermal Overloads**

ID	Overloaded Facility	Contingency	Category	Category Description	Loading (%)				Potential Mitigation Solutions
					2014 Summer Light Load	2017 Summer Partial Peak	2017 Summer Off-Peak	2022 Summer Light Load	
Bulk-OP-T-110	GATES 500/230 # 1	500 kV double outage north of Midway	C	L-2	<95%	119.4%	<95%	<95%	congestion management (dispatch Helms generation) or install second Gates 500/230 kV bank
Bulk-OP-T-111	ARCO - MIDWAY 230.0 #1	500 kV double outage north of Midway	C	L-2	<95%	<95%	96.8%	<95%	drop renewables at Midway and all Helms pumps or use 30 min rating
Bulk-OP-T-2	WARNEVL-WILSON 230 # 1	Los Banos 500 kV Substation	D	Subst	<95%	221.4%	<95%	118.2%	install series reactor, upgrade the line or congestion management
Bulk-OP-T-9		2 Diablo units	D	G-2	<95%	146.7%	<95%	<95%	
Bulk-OP-T-10		2 Palo Verde units	D	G-2	<95%	145.1%	<95%	<95%	
Bulk-OP-T-11		2 San Onofre units	D	G-2	<95%	144.9%	<95%	<95%	
Bulk-OP-T-37	BELLOTA-WARNEVL 230 # 1	Los Banos 500 kV Substation	D	Subst	<95%	161.9%	<95%	<95%	install series reactor on Warnerville-Wilson, upgrade the line or congestion management
Bulk-OP-T-44		2 Diablo units	D	G-2	<95%	107.1%	<95%	<95%	
Bulk-OP-T-45		2 Palo Verde units	D	G-2	<95%	105.1%	<95%	<95%	
Bulk-OP-T-46		2 San Onofre units	D	G-2	<95%	105.1%	<95%	<95%	
Bulk-OP-T-88	WESTLEY-LOS BANOS 230.0 #1	Los Banos 500 kV Substation	D	Subst	<95%	144.1%	105.3%	<95%	upgrade or congestion management
Bulk-OP-T-89		Tesla 500 kV Substation	D	Subst	<95%	<95%	105.8%	<95%	
Bulk-OP-T-93	CC SUB - C.COSTA 230.0 #1	Tesla 500 kV Substation	D	Subst	<95%	104.6%	<95%	<95%	reduce C.Cos sub and Gateway generation or upgrade
Bulk-OP-T-95	ALTM MDW - DELTAPMP 230.0 #1	Tesla 500 kV Substation	D	Subst	<95%	102.3%	<95%	<95%	

**Thermal Overloads**

ID	Overloaded Facility	Contingency	Category	Category Description	Loading (%)				Potential Mitigation Solutions
					2014 Summer Light Load	2017 Summer Partial Peak	2017 Summer Off-Peak	2022 Summer Light Load	
Bulk-OP-T-98	NDUBLIN - VINEYD_D 230.0 #1	Tesla 500 kV Substation	D	Subst	<95%	96.7%	<95%	<95%	not a violation
Bulk-OP-T-101	MOSSLND2- PANOCHE 230.0 #1	Los Banos 500 kV Substation	D	Subst	<95%	128.1%	<95%	<95%	no cascading outages
Bulk-OP-T-102	COBURN -PANOCHE 230.0 #1		D	Subst	<95%	99.5%	<95%	<95%	
Bulk-OP-T-103	PANOCHE -GATES 230.0 #1&2		D	Subst	<95%	132.6%	191.7%	<95%	
Bulk-OP-T-104	STOREY 2 -BORDEN 230.0 #1		D	Subst	<95%	113.0%	<95%	<95%	
Bulk-OP-T-105	STOREY 2 - WILSON 230.0 #1		D	Subst	<95%	122.5%	<95%	<95%	
Bulk-OP-T-110	GATES - MIDWAY 230.0 #1	Midway 500 kV Substation	D	Subst	diverged	diverged	154.9%	126.5%	no cascading outages
Bulk-OP-T-112	ARCO - MIDWAY 230.0 #1		D	Subst	diverged	diverged	137.2%	<95%	
Bulk-OP-T-113	GATES - ARCO 230.0 #1		D	Subst	diverged	diverged	<95%	114.6%	
Bulk-OP-T-114	HENTAP1 - GATES 230.0 #1	Los Banos 500 kV Substation	D	Subst	<95%	<95%	117.6%	<95%	no cascading outages
Bulk-OP-T-115	GATES 500/230 # 1		D	Subst	<95%	<95%	178.7%	<95%	
Bulk-OP-T-116	NOT SOLVED	NE SE SEPARATION	D	sys sep	diverged	diverged	diverged	diverged	system separation according the the scheme
Bulk-OP-T-117	NOT SOLVED, solved with additional load and generation tripping	Midway 500 kV Substation	D	subst	diverged	diverged	no cascading outages	no cascading outages	no cascading outages with load and generation tripping
Bulk-OP-T-118	NOT SOLVED, solved with additional load and generation tripping	Midway 230 kV Substation	D	subst	diverged	diverged	diverged	diverged	no cascading outages with load and generation tripping



**Thermal Overloads**

ID	Overloaded Facility	Contingency	Category	Category Description	Loading (%)				Potential Mitigation Solutions
					2014 Summer Light Load	2017 Summer Partial Peak	2017 Summer Off-Peak	2022 Summer Light Load	
Bulk-OP-T-119	NOT SOLVED, solved with additional load and generation tripping	Path 26	D	corridor	no cascading outages	diverged	no cascading outages	no cascading outages	no cascading outages with load and generation tripping

**Voltage Deviations**

ID	Substation	Contingency	Category	Category Description	Post Cont. Voltage Deviation %				Potential Mitigation Solutions
					2014 Summer Light Load	2017 Summer Partial Peak	2017 Summer Off-Peak	2022 Summer Light Load	
Bulk-OP-V-1	Substations in Northwest , deviation up in partial peak, up to 7.7%	PDCI BI-pole outage	B	PDCI	<5%	<-5%	<5%	<5%	trip capacitors at wind plants, consider exemption for deviation up for PDCI outage

**Transient Stability**

ID	Contingency	Category	Category Description	Transient Stability Performance				Potential Mitigation Solutions
				2014	2017	2022	N/A	
Bulk-TS-1	3-phase fault Cottonwood-Olinda # 1 230 kV	B	L-1	NEO REDB 13.8 KV frq<59.6 for 6.4 cycles	no issues	no issues		NEO REDB modeled off in other cases, consider exemption
Bulk-TS-2	3-phase fault Midway-Kern # 1 (Stockdale1) 230 kV	B	L-1	oscillations on Windgap pumps, freq violations	oscillations on Windgap pumps, freq violations	oscillations on Windgap pumps, freq violations		tripWind Gap # 2 pumps with a fault on Midway 230, consider exemption for slow frequency recovery or install dynamic device
Bulk-TS-3	3-phase fault Midway-Kern # 2 (Stockdale2) 230 kV	B	L-1	oscillations on Windgap pumps, freq violations	oscillations on Windgap pumps, freq violations	oscillations on Windgap pumps, freq violations		tripWind Gap # 2 pumps with a fault on Midway 230, consider exemption for slow frequency recovery or install dynamic device
Bulk-TS-4	3-phase fault Midway-Gates 230 kV or any other outage with 3-phase fault on Midway 230 kV	B	L-1	oscillations on Windgap pumps, freq violations	oscillations on Windgap pumps, freq violations	oscillations on Windgap pumps, freq violations		tripWind Gap # 2 pumps with a fault on Midway 230, consider exemption for slow frequency recovery or install dynamic device
Bulk-TS-5	3-phase fault Contra Costa-Las Positas 230 kV or any outage with three-phase fault on Contra Costa	B	L-1	4 wind type 2 units at Birds Landing tripped for undervoltage	4 wind type 2 units at Birds Landing tripped for undervoltage	4 wind type 2 units at Birds Landing tripped for undervoltage		these are existing wind generators that don't have Low Voltage Ride Through capability
Bulk-TS-6	3-phase fault Gates-Gregg 230 kV or any other outage with a 3-phase fault on Gates 230 kV	B	L-1	underfreq ld trip and freq violations at Gates 115 kV	underfreq ld trip and freq violations at Gates 115 kV	underfreq ld trip and freq violations at Gates 115 kV		get detailed load model at Gates 115 kV. If detailed studies confirm the issue, install SVC at Gates 115 kV or move load to 70 kV
Bulk-TS-7	PDCI bi-pole outage	B	PDCI	under-freq load trip bus 50141	no issues	under-freq load trip bus 50141		change relay setting
Bulk-TS-8	3-phase fault 500 kV double outage south of Table Mountain	C	L-2	under-freq load trip bus 50141	no issues	no issues		change relay setting



**Transient Stability**

ID	Contingency	Category	Category Description	Transient Stability Performance				Potential Mitigation Solutions
				2014	2017	2022	N/A	
Bulk-TS-9	3-phase fault Gates-Gregg, Gates-Mc Call or any other single or double outage with a three-phase fault on Gates 230 kV	C	L-2	underfreq Id trip and freq violations at Gates 115 kV	underfreq Id trip and freq violations at Gates 115 kV	underfreq Id trip and freq violations at Gates 115 kV		get detailed load model at Gates 115 kV. If detailed studies confirm the issue, install SVC at Gates 115 kV or move load to 70 kV
Bulk-TS-10	3-phase fault Contra Costa-Las Positas & C Cos-Lone Tree 230 kV or any contingency with a three-phase fault at Contra Costa 230 kV	C	L-2	4 wind type 2 units at Birds Landing tripped for undervoltage	4 wind type 2 units at Birds Landing tripped for undervoltage	4 wind type 2 units at Birds Landing tripped for undervoltage		these are existing wind generators that don't have Low Voltage Ride Through capability
Bulk-TS-11	3-phase fault Contra Costa-Brentwood and C Costa-Delta 230 kV or any contingency with a three-phase fault at Contra Costa 230 kV	C	L-2	4 wind type 2 units at Birds Landing tripped for undervoltage	4 wind type 2 units at Birds Landing tripped for undervoltage	4 wind type 2 units at Birds Landing tripped for undervoltage		these are existing wind generators that don't have Low Voltage Ride Through capability
Bulk-TS-12	3-phase fault Gates-Arco and Gates-Midway 230 kV or any contingency with a three-phase fault at Gates 230 kV	C	L-2	underfreq Id trip and freq violations at Gates 115 kV	underfreq Id trip and freq violations at Gates 115 kV	underfreq Id trip and freq violations at Gates 115 kV		get detailed load model at Gates 115 kV. If detailed studies confirm the issue, install SVC at Gates 115 kV or move load to 70 kV
Bulk-TS-13	3-phase fault Midway-Kern #3 and 4 230 kV or any contingency with a three-phase fault at Midway230 kV	C	L-2	oscillations on Windgap pumps, freq violations	oscillations on Windgap pumps, freq violations	oscillations on Windgap pumps, freq violations		tripWind Gap # 2 pumps with a fault on Midway 230, consider exemption for slow frequency recovery or install dynamic device
Bulk-TS-14	3-phase fault Gregg - Herndon #1 & #2 230 kV	C	L-2	Helms 3 tripped for under frequency	Helms 3 tripped for under frequency	Helms 3 tripped for under frequency		add tripping of all Helms units to SPS
Bulk-TS-15	3-phase fault Two Diablo generation units	D	G-2	under-voltage load tripping in NW	no issues	no issues		requires more reactive support in NW in 2014
Bulk-TS-16	3-phase fault Two Palo Verde generation units	D	G-2	under-voltage load tripping in NW	no issues	no issues		requires more reactive support in NW in 2014

**Transient Stability**

ID	Contingency	Category	Category Description	Transient Stability Performance				Potential Mitigation Solutions
				2014	2017	2022	N/A	
Bulk-TS-17	3-phase fault Northeast-Southeast separation	D	corridor	system separation, under and over-voltage and frequency load shedding and generation tripping	system separation, under and over-voltage and frequency load shedding and generation tripping	system separation, under and over-voltage and frequency load shedding and generation tripping		no cascading outages
Bulk-TS-18	3-phase fault Path 26 outage	D	corridor	load and generation tripping, large vlt and freq dips	load and generation tripping, large vlt and freq dips	no issues		under review
Bulk-TS-19	Outage of Midway 500 kV substation with 3-phase fault	D	substation	load and generation tripping, large vlt and freq dips	load and generation tripping, large vlt and freq dips	large frequency dips		under review
Bulk-TS-20	Outage of Midway 230 kV substation with 3-phase fault	D	substation	load and generation tripping, large vlt and freq dips	load and generation tripping, large vlt and freq dips	unstable, stable w/d tripping		under review
Bulk-TS-21	Outage of Los Banos 500 kV substation with 3-phase fault	D	substation	load and generation tripping, large vlt dips	no violations with RAS	no issues		no cascading outages

**Transient Stability**

ID	Contingency	Category	Category Description	Transient Stability Performance				Potential Mitigation Solutions
				2014 Summer Light Load	2017 Summer Partial Peak	2017 Summer Off-Peak	2022 Summer Light Load	
Bulk-OP-TS-1	3-phase fault Cottonwood-Olinda # 1 230 kV	B	L-1	wind type 2 on Rio Dell tap tripped for under-vlt	no issues	no issues	no issues	the unit modeled as type 2 without Low Voltage Ride Through capability
Bulk-OP-TS-2	3-phase fault Newark-Ravenswood 230 kV	B	L-1	1 unit wind type 2 at Brds Lndg tripped for under-vlt	no issues	no issues	no issues	the existing unit doesn't have Low Voltage Ride Through capability
Bulk-OP-TS-3	3-phase fault Midway-Kern # 1 (Stockdale1) 230 kV or any other outage with three-phase fault on Midway 230 kV	B	L-1	freq violations, solar plants at Midway off	freq violations, solar plants at Midway off	freq violations, solar plants at Midway off	freq violations, one solar plant at Midway off	tripWind Gap # 2 pumps with a fault on Midway 230, consider exemption for slow frequency recovery or install dynamic device
Bulk-OP-TS-4	3-phase fault Midway-Kern # 2 (Stockdale2) 230 kV or any other outage with three-phase fault on Midway 230 kV	B	L-1	freq violations, solar plants at Midway off	freq violations, solar plants at Midway off	freq violations, solar plants at Midway off	freq violations, one solar plant at Midway off	tripWind Gap # 2 pumps with a fault on Midway 230, consider exemption for slow frequency recovery or install dynamic device
Bulk-OP-TS-5	3-phase fault Midway-Gates 230 kV or any Cat B contingency with three-phase fault on Midway 230 kV	B	L-1	freq violations, solar plants at Midway off	freq violations, solar plants at Midway off	freq violations, solar plants at Midway off	freq violations, one solar plant at Midway off	tripWind Gap # 2 pumps with a fault on Midway 230, consider exemption for slow frequency recovery or install dynamic device
Bulk-OP-TS-6	3-phase fault Contra Costa-Las Positas 230 kV or any outage with three-phase fault on Contra Costa	B	L-1	4 wind type 2 units at Birds Landing tripped for undervoltage	4 wind type 2 units at Birds Landing tripped for undervoltage	3 wind type 2 units at Birds Landing tripped for undervoltage	4 wind type 2 units at Birds Landing tripped for undervoltage	these are existing wind generators that don't have Low Voltage Ride Through capability
Bulk-OP-TS-7	3-phase fault Tesla-Newark	B	L-1	1 unit wind type 2 at Brds Lndg tripped for under-vlt	no issues	no issues	no issues	the existing unit doesn't have Low Voltage Ride Through capability
Bulk-OP-TS-8	3-phase fault Gates-Gregg 230 kV or any other outage with a three-phase fault on Gates 230 kV	B	L-1	underfreq Id trip and freq violations at Gates 115 kV	underfreq Id trip and freq violations at Gates 115 kV	underfreq Id trip and freq violations at Gates 115 kV	underfreq Id trip and freq violations at Gates 115 kV	get detailed load model at Gates 115 kV. If detailed studies confirm the issue, install SVC at Gates 115 kV or move load to 70 kV

**Transient Stability**

ID	Contingency	Category	Category Description	Transient Stability Performance				Potential Mitigation Solutions
				2014 Summer Light Load	2017 Summer Partial Peak	2017 Summer Off-Peak	2022 Summer Light Load	
Bulk-OP-TS-9	3-phase fault Gates-Gregg, Gates-Mc Call or any other single or double outage with a three-phase fault on Gates 230 kV	C	L-2	underfreq Id trip and freq violations at Gates 115 kV	underfreq Id trip and freq violations at Gates 115 kV	underfreq Id trip and freq violations at Gates 115 kV	underfreq Id trip and freq violations at Gates 115 kV	get detailed load model at Gates 115 kV. If detailed studies confirm the issue, install SVC at Gates 115 kV or move load to 70 kV
Bulk-OP-TS-10	3-phase fault Contra Costa-Las Positas & C Cos-Lone Tree 230 kV or any contingency with a three-phase fault at Contra Costa 230 kV	C	L-2	4 wind type 2 units at Birds Landing tripped for undervoltage	4 wind type 2 units at Birds Landing tripped for undervoltage	3 wind type 2 units at Birds Landing tripped for undervoltage	4 wind type 2 units at Birds Landing tripped for undervoltage	these are existing wind generators that don't have Low Voltage Ride Through capability
Bulk-OP-TS-11	3-phase fault Contra Costa-Brentwood and C Costa-Delta 230 kV or any contingency with a three-phase fault at Contra Costa 230 kV	C	L-2	4 wind type 2 units at Birds Landing tripped for undervoltage	4 wind type 2 units at Birds Landing tripped for undervoltage	3 wind type 2 units at Birds Landing tripped for undervoltage	4 wind type 2 units at Birds Landing tripped for undervoltage	these are existing wind generators that don't have Low Voltage Ride Through capability
Bulk-OP-TS-12	3-phase fault Gates-Arco and Gates-Midway 230 kV or any contingency with a three-phase fault at Gates 230 kV	C	L-2	underfreq Id trip and freq violations at Gates 115 kV	underfreq Id trip and freq violations at Gates 115 kV	underfreq Id trip and freq violations at Gates 115 kV	underfreq Id trip and freq violations at Gates 115 kV	get detailed load model at Gates 115 kV. If detailed studies confirm the issue, install SVC at Gates 115 kV or move load to 70 kV
Bulk-OP-TS-13	3-phase fault Midway-Kern #3 and 4 230 kV or any Cat C contingency with a three-phase fault at Midway230 kV	C	L-2	no issues, solar plants at Midway off	no issues, solar plants at Midway off	no issues, solar plants at Midway off	oscillations on Windgap pumps, freq violations	tripWind Gap # 2 pumps with a fault on Midway 230, consider exemption for slow frequency recovery or install dynamic device
Bulk-OP-TS-14	3-phase fault Northeast-Southeast separation	D	corridor	system separation, under and over-voltage and frequency load shedding and generation tripping	system separation, under and over-voltage and frequency load shedding and generation tripping	system separation, under and over-voltage and frequency load shedding and generation tripping	system separation, under and over-voltage and frequency load shedding and generation tripping	no cascading outages
Bulk-OP-TS-15	Path 26 outage with 3-phase fault	D	corridor	no issues, North to South flow	N-S flow, unstable, stable w/load and gen trip, under-frq & under-vlt Id trip	low vlt in Idaho & Sierra, S to N flow	no issues, North to South flow	no cascading outages with additional drop of generation and load

**Transient Stability**

ID	Contingency	Category	Category Description	Transient Stability Performance				Potential Mitigation Solutions
				2014 Summer Light Load	2017 Summer Partial Peak	2017 Summer Off-Peak	2022 Summer Light Load	
Bulk-OP-TS-16	Outage of Midway 500 kV substation with 3-phase fault	D	substation	no cascading outages	unstable	generation tripping in BC, unstable	no cascading outages	no cascading outages with additional drop of generation and load
Bulk-OP-TS-17	Outage of Midway 230 kV substation with 3-phase fault	D	substation	load and generation tripping, large vlt and freq dips	unstable	unstable	unstable	no cascading outages with additional drop of generation and load
Bulk-OP-TS-18	Outage of Los Banos 500 kV substation with 3-phase fault	D	substation	no cascading outages	large voltage dips, no cascading outages	large voltage dips, no cascading outages	no cascading outages	no cascading outages with additional drop of generation and load

**Appendix C-2**  
**Humboldt Area**

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
HUMB-S-T-1	Humboldt Bay-Humboldt 60 kV Line #1 Between HUMBOLDT and HMBLT JT	Humboldt-Humboldt Bay 60 kV #2	B	L-1	110.00%	109%	108%	PG&E maintenance project to reconductor the line. 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	100.00%	99%	98%	
		Humboldt - Eureka 60 kV Line & Humboldt Bay - Humboldt No.2 60 kV Line	C	L-1-1	144%	140%	136%	
		Humboldt Bay - Humboldt No.2 60 kV Line & Humboldt Bay - Eureka 60 kV Line	C	L-1-1	197%	197%	198%	
HUMB-S-T-2	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	C	L-1-1	137%	136%	137%	
HUMB-S-T-3	Rio Dell Jct-Bridgeville 60 kV between Carlotta-Rio Dell Tap 60 kV	Humboldt - Bridgeville 115 kV Line	B	L-1	106%	102%	94%	Install SPS to trip new generation project at Rio Dell for overload
		Humboldt - Bridgeville 115 kV Line & Humboldt-Trinity 115 kV Line (more L-1-1 overloads)	C	L-1-1	161%	149%	132%	Reduce Humboldt Bay 60 kV generation after first contingency
HUMB-S-T-4	Rio Dell Jct-Bridgeville 60 kV between Carlotta-Swms Flat - Bridgeville 60 kV	Humboldt - Bridgeville 115 kV Line	B	L-1	101%	96%	88%	Install SPS to trip new generation project at Rio Dell for overload
		Humboldt - Bridgeville 115 kV Line & Humboldt-Trinity 115 kV Line (more L-1-1 overloads)	C	L-1-1	155%	143%	125%	Reduce Humboldt Bay 60 kV generation after first contingency
HUMB-S-T-5	Bridgeville-Garberville 60 kV between Bridgville-Frut Ld Jct 60 kV	Humboldt- Trinity 115 kV and Bridgeville-Cottonwood 115 kV (more L-1-1 and T-1/L-1 overloads)	C	L-1-1	134%	127%	34%	PG&E project to build a new Bridgeville - Gareberville 115kV line
HUMB-S-T-6	Bridgeville-Garberville 60 kV between Frut Ld Jct and Fort Seward Jct	Humboldt- Trinity 115 kV and Bridgeville-Cottonwood 115 kV (more L-1-1 and T-1/L-1 overloads)	C	L-1-1	135%	127%	17%	PG&E project to build a new Bridgeville - Gareberville 115kV line

2012/2013 ISO Reliability Assessment - Final Study Results

Study Area: **PG&E Humboldt - Summer Peak**



**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
HUMB-S-T-7	Bridgeville-Garberville 60 kV between Frut Ld Jct and Fort Seward Jct	Humboldt- Trinity 115 kV and Bridgeville-Cottonwood 115 kV (more L-1-1 and T-1/L-1 overloads)	C	L-1-1	133%	125%	19%	PG&E project to build a new Bridgeville - Gareberville 115kV line
HUMB-S-T-8	Bridgeville 115/60 kV Bank #1	Bridgeville - Cottonwood 115 kV Line & Rio Dell Jct - Bridgeville 60 kV Line	C	L-1-1	105%	108%	26%	PG&E maintenace project to replace Bridgeville bank in 2012. New rating will be 90 MVA
HUMB-S-T-9	Humboldt Bay - Eureka 60 kV Line #1	Humboldt Bay - Humboldt No.1 60 kV & Humboldt Bay - Humboldt No.2 60 kV Line	C	L-1-1	133%	132%	134%	Recondutor 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
HUMB-S-T-10	Humboldt - Maple Creek	Humboldt-Trinity 115 kV Line & Bridgeville - Cottonwood 115 kV Line	C	L-1-1	102%	91%	53%	Generation adjustment at Humboldt bay



**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Winter Peak	2017 Winter Peak	2022 Winter Peak	
HUMB-W-T-1	Humboldt Bay-Humboldt 60 kV Line #1 Between HUMBOLDT and HMBLT JT	Humboldt Bay - Humboldt No.2 60 kV Line & Humboldt Bay - Eureka 60 kV Line	C	L-1-1	134%	132%	134%	Humboldt Bay - Humboldt No.1 60 kV Line Reconductoring Project for category B overloads in 2012. 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-2	Bridgeville 115/60 kV Bank #1	Humboldt 115/60 No.1 Transformer & Humboldt 115/60 No.2 Transformer	C	T-1-1	105%	128%	88%	PG&E maintenace project to replace Bridgeville bank in 2012. New rating of the xfmr will be 90 MVA.

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Summer Off-Peak	N/A	
HUMB-OP-T-1	Rio Dell Jct-Bridgeville 60 kV between Carlotta-Rio Dell Tap 60 kV	115kV Bus Fault at Humboldt	C	Bus Fault	33%	102%	Adjust generation Humboldt at Humboldt bay	
HUMB-OP-T-2	Rio Dell Jct-Bridgeville 60 kV between Carlotta-Swns Flat 60 kV		C	Bus Fault	36%	105%		
HUMB-OP-T-3	Rio Dell Jct-Bridgeville 60 kV between Swns Flat - Bridgeville 60 kV		C	Bus Fault	36%	105%		
HUMB-OP-T-4	Bridgeville 115/60 kV Bank #1		C	Bus Fault	<95%	114%	PG&E maintenace project to replace Bridgeville bank in 2012. New rating will be 90 MVA	

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
HUMB-S-DV-1	RDGE CBN 60kV	Humboldt - Maple Creek 60 kV Line	B	L-1	-8.68%	1.87%	1.55%	Maple Creek reactive support project
HUMB-S-DV-2	MPLE CRK 60kV		B	L-1	-11.10%	2.83%	2.50%	
HUM-S-DV-3	RUSS RCH 60kV	Humboldt - Maple Creek 60 kV Line	B	L-1	-11.19%	2.84%	2.52%	
HUM-S-DV-4	WILLWCRK 60kV	Humboldt - Maple Creek 60 kV Line	B	L-1	-11.50%	2.91%	2.59%	
HUM-S-DV-5	Hoopla 60kV	Humboldt - Maple Creek 60 kV Line	B	L-1	-11.63%	2.94%	2.62%	
HUMB-S-DV-6	GRBRVLE 60kV	Bridgeville - Garberville 60 kV Line (BRDGVLE-FRUTLDJT)	B	L-1	6.16%	-0.62%	0.85%	Garberville reactive support project

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Winter Peak	2017 Winter Peak	2022 Winter Peak	
HUMB-W-DV-1	Orick 60kV	Humboldt - Arcata 60 kV Line (ARC_JT2X-ARCATA)	B	L-1	-4.00%	-4.47%	-5.30%	Adjust generation at Blue Lake / Humboldt bay.
		Humboldt No.1 60 kV and Arcata - Humboldt 60 kV Lines	C	L-2	5.80%	9.40%	10.90%	
HUMB-W-DV-2	Big Lagoon 60kV	Humboldt - Arcata 60 kV Line (ARC_JT2X-ARCATA)	B	L-1	4.00%	4.50%	5.30%	
		Humboldt No.1 60 kV and Arcata - Humboldt 60 kV Lines	C	L-2	8.50%	9.40%	10.90%	
HUMB-W-DV-3	Trinidad 60kV	Humboldt - Arcata 60 kV Line (ARC_JT2X-ARCATA)	B	L-1	4.00%	4.50%	5.30%	
		Humboldt No.1 60 kV and Arcata - Humboldt 60 kV Lines	C	L-2	8.50%	9.40%	10.90%	
HUMV-W-DV-4	ESSX Jct 60kV	Humboldt - Arcata 60 kV Line (ARC_JT2X-ARCATA)	B	L-1	3.90%	4.40%	5.20%	
		Humboldt No.1 60 kV and Arcata - Humboldt 60 kV Lines	C	L-2	8.30%	9.20%	10.70%	
HUMV-W-DV-5	Blue Lake PP 60kV	Humboldt No.1 60 kV and Arcata - Humboldt 60 kV Lines	C	L-2	8.10%	9.00%	10.60%	
HUMV-W-DV-6	BCHIPMIL 60kV	Humboldt - Arcata 60 kV Line (ARC_JT2X-ARCATA)	B	L-1	3.90%	4.40%	5.20%	
		Humboldt No.1 60 kV and Arcata - Humboldt 60 kV Lines	C	L-2	8.30%	9.20%	10.70%	
HUMV-W-DV-7	Blue Lake 60kV	Humboldt No.1 60 kV and Arcata - Humboldt 60 kV Lines	C	L-2	8.10%	9.00%	10.60%	
HUMV-W-DV-8	SIMPSON 60kV	Humboldt No.1 60 kV and Arcata - Humboldt 60 kV Lines	C	L-2	8.10%	9.00%	10.60%	
HUMV-W-DV-9	ARCATA 60kV	Humboldt - Arcata 60 kV Line (ARC_JT2X-ARCATA)	B	L-1	4.50%	4.90%	5.70%	
		Humboldt No.1 60 kV and Arcata - Humboldt 60 kV Lines	C	L-2	8.10%	8.90%	10.40%	

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Winter Peak	2017 Winter Peak	2022 Winter Peak	
HUM-W-DV-10	RDGE CBN 60kV	Humboldt - Maple Creek 60 kV Line	B	L-1	-9.74%	1.09%	-0.35%	Maple Creek reactive support project
HUM-W-DV-11	MPLC CRK 60kV		B	L-1	-12.29%	1.98%	0.18%	
HUM-W-DV-12	RUSS RCH 60kV		B	L-1	-12.42%	2.00%	0.17%	
HUM-W-DV-13	WILLWCRK 60kV		B	L-1	-12.82%	2.06%	0.19%	
HUM-W-DV-14	Hoopa 60kV		B	L-1	13.00%	2.10%	0.00%	
HUMB-W-DV-15	JANS CRK 60kV	Humboldt No.1 60 kV and Arcata - Humboldt 60 kV Lines	C	L-2	9.40%	10.40%	12.06%	Adjust generation at Blue Lake / Humboldt bay.

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Summer Off-Peak	N/A	

No voltage deviation issues identified.

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
HUMB-S-V-1	Orick 60kV	Essex Jct - Arcata - Fairhaven 60 kV Line (LP_FLKBD-JANS CRK) & Essex Jct - Arcata - Fairhaven 60 kV Line (ARC_JT2X-ARCATA)	C	L-1-1	0.94	0.93	0.88	Disable load transfer from Janes Creek
HUMB-S-V-2	Big Lagoon 60kV		C	L-1-1	0.94	0.93	0.88	
HUMB-S-V-3	Trinidad 60kV		C	L-1-1	0.94	0.93	0.89	
HUMB-S-V-4	Maple Creek 60kV	Humboldt - Bridgeville 115 kV Line & Humboldt - Maple Creek 60 kV Line	C	L-1-1	0.88	1.04	1.03	Maple Creek reactive support project?
HUMB-S-V-5	Russ Ranch 60kV	Humboldt - Maple Creek 60 kV Line	B	L-1	0.89	1.05	1.04	
		Humboldt - Bridgeville 115 kV Line & Humboldt - Maple Creek 60 kV Line	C	L-1-1	0.88	1.04	1.04	
HUMB-S-V-6	Willow Creek 60kV	Humboldt - Maple Creek 60 kV Line	B	L-1	0.87	1.03	1.02	
		Humboldt - Bridgeville 115 kV Line & Humboldt - Maple Creek 60 kV Line	C	L-1-1	0.85	1.01	1	
HUMB-S-V-7	Hoopa 60kV	Humboldt - Maple Creek 60 kV Line	B	L-1	0.86	1.02	1.01	
		Humboldt - Bridgeville 115 kV Line & Humboldt - Maple Creek 60 kV Line	C	L-1-1	0.84	1	0.99	

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014 Winter Peak	2017 Winter Peak	2022 Winter Peak	
HUMB-S-V-1	Orick 60kV	Essex Jct - Arcata - Fairhaven 60 kV Line (LP_FLKBD-JANS CRK) & Essex Jct - Arcata - Fairhaven 60 kV Line (ARC_JT2X-ARCATA)	C	L-1-1	0.90	0.88	0.86	Disable load transfer from Janes Creek
HUMB-S-V-2	Big Lagoon 60kV		C	L-1-1	0.90	0.88	0.86	
HUMB-S-V-3	Trinidad 60kV		C	L-1-1	0.90	0.88	0.86	
HUMB-S-V-4	Maple Creek 60kV	Humboldt - Bridgeville 115 kV Line & Humboldt - Maple Creek 60 kV Line	C	L-1-1	0.89	1.04	1.03	Maple Creek reactive support project?
HUMB-S-V-5	Russ Ranch 60kV	Humboldt - Maple Creek 60 kV Line	B	L-1	0.89	1.04	1.02	
		Humboldt - Bridgeville 115 kV Line & Humboldt - Maple Creek 60 kV Line	C	L-1-1	0.88	1.03	1.02	
HUMB-S-V-6	Willow Creek 60kV	Humboldt - Maple Creek 60 kV Line	B	L-1	0.86	1.02	1	
		Humboldt - Bridgeville 115 kV Line & Humboldt - Maple Creek 60 kV Line	C	L-1-1	0.85	1.01	1	
HUMB-S-V-7	Hoopa 60kV	Humboldt - Maple Creek 60 kV Line	B	L-1	0.85	1.01	0.98	
		Humboldt - Bridgeville 115 kV Line & Humboldt - Maple Creek 60 kV Line	C	L-1-1	0.84	1	0.99	
HUMB-W-V-8	Bridgeville 60kV	Rio Dell Jct - Bridgeville 60 kV Line & Bridgeville 115/60/12 KV transformer	C	L-1/T-1	0.83	Diverged	1.02	New Bridgeville - Garberville 115kV line project. In the interim open line between Lyntonville - Kekawaka 60kV. Drop load at Fort seward, Fruitland & Garberville.
HUMB-W-V-9	Fruitland 60kV		C	L-1/T-1	0.82	Diverged	1.01	
HUMB-W-V-10	Fort Seward 60kV		C	L-1/T-1	0.83	Diverged	1.02	
HUMB-W-V-11	Garberville 60kV		C	L-1/T-1	0.84	Diverged	1.03	
HUMB-W-V-12	Kekawaka 60kV		C	L-1/T-1	0.85	Diverged	1.03	
HUMB-W-V-13	Laytonville 60kV		C	L-1/T-1	0.89	Diverged	0.99	
HUMB-W-V-14	COVELO6 60kV		C	L-1/T-1	0.88	Diverged	0.98	



**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014 Winter Peak	2017 Winter Peak	2022 Winter Peak	
HUMB-W-V-15	JANS CRK 60kV	Essex Jct - Arcata - Fairhaven 60 kV Line (LP_FLKBD-JANS CRK) & Essex Jct - Arcata - Fairhaven 60 kV Line (ARC_JT2X-ARCATA)	C	L-1-1	0.912	0.8999	0.8773	Adjust generation at humboldt bay / Blue Lake
HUMB-W-V-16	BLUE LK PP 60kV	Essex Jct - Arcata - Fairhaven 60 kV Line (LP_FLKBD-JANS CRK) & Essex Jct - Arcata - Fairhaven 60 kV Line (ARC_JT2X-ARCATA)	C	L-1-1	0.9164	0.9044	0.8822	
		Essex Jct - Arcata - Fairhaven 60 kV Line (ARC_JT2X-ARCATA) & BLUELKPP 12.47 Unit ID 1	C	L-1 / G-1	0.9121	0.93	0.8927	
HUMB-W-V-17	BCHIPMIL 60kV	Essex Jct - Arcata - Fairhaven 60 kV Line (LP_FLKBD-JANS CRK) & Essex Jct - Arcata - Fairhaven 60 kV Line (ARC_JT2X-ARCATA)	C	L-1-1	0.9156	0.9037	0.8815	
HUMB-W-V-18	ARCATA 60kV	Essex Jct - Arcata - Fairhaven 60 kV Line (ARC_JT2X-ARCATA)			0.9283	0.9173	0.897	
HUMB-W-V-19	BLUE LAKE 60kV	Essex Jct - Arcata - Fairhaven 60 kV Line (LP_FLKBD-JANS CRK) & Essex Jct - Arcata - Fairhaven 60 kV Line (ARC_JT2X-ARCATA)	C	L-1-1	0.9151	0.903	0.8808	
		Essex Jct - Arcata - Fairhaven 60 kV Line (ARC_JT2X-ARCATA) & BLUELKPP 12.47 Unit ID 1			0.9127	0.93	0.8933	
HUMB-W-V-20	SIMPSON 60kV	Essex Jct - Arcata - Fairhaven 60 kV Line (LP_FLKBD-JANS CRK) & Essex Jct - Arcata - Fairhaven 60 kV Line (ARC_JT2X-ARCATA)			0.9147	0.9027	0.8805	
		Essex Jct - Arcata - Fairhaven 60 kV Line (ARC_JT2X-ARCATA) & BLUELKPP 12.47 Unit ID 1			0.9115	0.93	0.8921	

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Summer Off-Peak	N/A	

No high/low violations identified.

2012/2013 ISO Reliability Assessment - Final Study Results

Study Area: **PG&E Humboldt**



**Single Contingency Load Drop**

ID	Worst Contingency	Category	Category Description	Amount of Load Drop (MW)			Potential Mitigation Solutions
				2014	2017	2022	

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

2012/2013 ISO Reliability Assessment - Final Study Results

Study Area: **PG&E Humboldt**

**Single Source Substation with more than 100 MW Load**



ID	Substation	Load Served (MW)			Potential Mitigation Solutions
		2014	2017	2022	

No single source substation with more than 100 MW Load

**Appendix C-3**  
**North Coast and North Bay**

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
NCNB-S-T-1	Bridgeville - Garberville 60 kV Line #1 Between BRDGVLL - FRUTLDJT	Normal Conditions	A		103%	105%	32%	New Bridgeville - Garberville 115kVline will mitigate the overload. Adjust generation at Humboldt bay in the interim
		GEYSER # 3 - CLOVERDALE 115K (CLOVERDALE 115KV to MPE TAP115KV)	B	L-1	99%	101%	32%	
		BUS FAULT AT EGLE RCK 115 kV	C	Bus	101%	97%	33%	
		BUS FAULT AT MENDOCNO with 115kV CB102 stuck	C	Breaker	107%	101%	32%	
		GEYSER # 3 - CLOVERDALE 115K line & Cortina - Mendocino No.1 115 kV Line	C	L-1-1	116%	118%	35%	
NCNB-S-T-2	Bridgeville - Garberville 60 kV Line #1 Between FRUTLDJT-FTSWRDJ	Normal Conditions	A		104%	105%	32%	New Bridgeville - Garberville 115kVline will mitigate the overload. Adjust generation at Humboldt bay in the interim
		GEYSER # 3 - CLOVERDALE 115K (CLOVERDALE 115KV to MPE TAP115KV)	B	L-1	101%	102%	32%	
		BUS FAULT AT Eagle Rock 115.0kV	C	Bus	104%	98%	33%	
		BUS FAULT AT Mendocino with 115kV breaker # CB102 stuck	C	Breaker	109%	111%	32%	
		GEYSER # 3 - CLOVERDALE 115K line & Cortina - Mendocino No.1 115 kV Line	C	L-1-1	118%	120%	35%	
NCNB-S-T-3	Bridgeville - Garberville 60 kV Line #1 Between GRBRVLL - FTSWRDJT	Normal Conditions	A		102%	103%	32%	New Bridgeville - Garberville 115kVline will mitigate the overload. Adjust generation at Humboldt bay in the interim
		GEYSER # 3 - CLOVERDALE 115K (CLOVERDALE 115KV to MPE TAP115KV)	B	L-1	99%	100%	32%	
		BUS FAULT AT Eagle Rock 115.0kV	C	Bus	102%	96%	33%	
		BUS FAULT AT Mendocino with 115kV breaker # CB102 stuck	C	Breaker	107%	109%	32%	
		GEYSER # 3 - CLOVERDALE 115K line & Cortina - Mendocino No.1 115 kV Line	C	L-1-1	117%	118%	35%	

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
NCNB-S-T-4	GARBERVILLE - LAYTONVILLE 60KV Line between Garberville - Kekawaka	BUS FAULT AT Mendocino with 115kV breaker # CB102 stuck	C	Breaker	60%	59%	106%	Redispatch generation at Humboldt bay
		Eagle Rock-Cortina & Cortina-Mendocino 115kV Lines	C	L-2	58%	58%	108%	
		GEYSER # 3 - CLOVERDALE 115K line & Cortina - Mendocino No.1 115 kV Line	C	L-1-1	68%	66%	126%	
NCNB-S-T-5	GARBERVILLE - LAYTONVILLE 60KV Line between Kekawaka - Laytonville	BUS FAULT AT Mendocino with 115kV breaker # CB102 stuck	C	Breaker	60%	59%	106%	Redispatch generation at Humboldt bay
		Eagle Rock-Cortina & Cortina-Mendocino 115kV Lines	C	L-2	58%	58%	108%	
		GEYSER # 3 - CLOVERDALE 115K line & Cortina - Mendocino No.1 115 kV Line	C	L-1-1	68%	66%	126%	
NCNB-S-T-6	Geysers 3 - Cloverdale 115 kV Line #1 Between CLOVRDLE - MPE TAP	Eagle Rock-Redbud & Cortina-Mendocino 115kV Lines	C	L-2	99%	98%	103%	Geysers No. 3 - Cloverdale 115 kV switch replacement, in interim, trip Geysers 5-6 generation, and load at Ukiah for Category C
		Cortina - Mendocino No.1 115 kV Line & Eagle Rock- Cortina 115 kV Line	C	L-1-1	99%	98%	103%	
NCNB-S-T-7	Mendocino - Redbud 115 kV #1 Between LUCERNJ2 - REDBUDJ1	Geysers # 3-Cloverdale 115kV (Cloverdale-MPE Tap) &Cortina-Mendocino #1 115 kV (Mendocino Sub 1- Lucern)	C	L-1-1	98%	97%	115%	Disable the flip flop scheme at Lucerne. Drop load at Cloverdale, Ukiah and City of Ukiah as necessary if overload persists.
NCNB-S-T-8	Mendocino - Redbud 115 kV #1 Between REDBUD - REDBUDJ1	Geysers # 3-Cloverdale 115kV (Cloverdale-MPE Tap) &Cortina-Mendocino #1 115 kV (Mendocino Sub 1- Lucern)	C	L-1-1	108%	106%	126%	Disable the flip flop scheme at
NCNB-S-T-9	Eagle Rock - Redbud 115 kV #1 Between REDBUD - REDBUDJ2	Geysers # 3-Cloverdale 115kV (Cloverdale-MPE Tap) &Cortina-Mendocino #1 115 kV (Mendocino Sub 1- Lucern)	C	L-1-1	119%	118%	141%	

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
NCNB-S-T-10	Eagle Rock - Redbud 115 kV #1 Between REDBUDJ2 - CACHE J2	Geyser # 3-Cloverdale 115kV (Cloverdale-MPE Tap) &Cortina-Mendocino #1 115 kV (Mendocino Sub 1- Lucern)	C	L-1-1	109%	108%	129%	Lucerne. Trip load at Redbud & Lucerne for second contingency. If overload persists drop load at Ukiah, City of Ukiah and cloverdale as necessary.
NCNB-S-T-11	Eagle Rock - Redbud 115 kV #1 Between HGHLNDJ1 - LWRLAKEJ	Geyser # 3-Cloverdale 115kV (Cloverdale-MPE Tap) &Cortina-Mendocino #1 115 kV (Mendocino Sub 1- Lucern)	C	L-1-1	120%	119%	141%	
NCNB-S-T-12	Eagle Rock - Redbud 115 kV #1 Between HGHLNDJ1 - CACHE J2	Geyser # 3-Cloverdale 115kV (Cloverdale-MPE Tap) &Cortina-Mendocino #1 115 kV (Mendocino Sub 1- Lucern)	C	L-1-1	102%	101%	120%	
NCNB-S-T-13	Fulton - Santa Rosa 115 kV Line #1 Between FULTON - MONROE1	Fulton-Santa Rosa 115 kV #2 & Corona-Lakeville 115 kV #1	C	L-1-1	112%	119%	131%	trip load at Monroe 2 115 kV
NCNB-S-T-14	Fulton - Santa Rosa 115 kV Line #2 Between FULTON - MONROE2		C	L-1-1	112%	119%	131%	
NCNB-S-T-15	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	161%	59%	66%	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-16	Mendocino - Clear Lake 60 kV Line #1 Between Upper Lake-Hartley		C	L-1/T-1	149%	50%	55%	
NCNB-S-T-17	Mendocino - Clear Lake 60 kV Between Hartley-Clear Lake		C	L-1/T-1	110%	15%	16%	
NCNB-S-T-18	Clear Lake-Hopland between Clear Lake-Granite 60 kV	Eagle Rock - Konocti Jct 60kV line	B	L-1	109%	109%	44%	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
		Bus Fault at Eagle Rock 115.0 kV	C	Bus	113%	45%	48%	
		Mendocino -Clearlake 60 kV Line & Eagle Rock - Konocti Jct 60kV line	C	L-1-1	154%	35%	38%	
NCNB-S-T-19	Clear Lake-Hopland between Granite-Hopland 60 kV	Eagle Rock - Konocti Jct 60kV line	B	L-1	118%	47%	52%	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
		Bus Fault at Eagle Rock 115.0 kV	C	Bus	122%	53%	56%	
		Mendocino -Clearlake 60 kV Line & Eagle Rock - Konocti Jct 60kV line	C	L-1-1	162%	43%	46%	



**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
NCNB-S-T-20	Clear Lake - Eagle Rock 60 kV Line #1 Between CLER LKE - KONOCTI6	GEYSER # 3 - CLOVERDALE 115K (CLOVERDALE 115KV to MPE TAP115KV)	B	L-1	75%	94%	101%	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
		BUS FAULT AT MENDOCNO 115KV breaker # CB102 stuck	C	Breaker	84%	106%	116%	
		Eagle Rock-Redbud & Cortina-Mendocino 115kV Lines	C	L-2	82%	105%	112%	
		GEYSER # 3 - CLOVERDALE 115K Line & Cortina - Mendocino #1 115 kV Line	C	L-1-1	118%	145%	193%	
NCNB-S-T-21	Clear Lake - Eagle Rock 60 kV Line #1 Between KONOCTI6 - EGLE RCK	Geyser # 3-Cloverdale 115kV (Cloverdale- MPE Tap) & Eagle Rock- Cortina (Lower Lake) 115 kV	C	L-1-1	126%	96%	101%	
NCNB-S-T-22	KONOCTI-LOWER LAKE 60 kV	Eagle Rock - Cortina (Homestake) 115 kV and Fulton - Calistoga 60 kV	C	L-1-1	<95%	96%	105%	trip load at Calistoga
NCNB-S-T-23	Monte Rio- Fulton 60 KV between TRNTN JT - FULTON	Fulton- Molino- Cotati 60 kV(Molino sub 60 kV to Molino Jct 60 kV)	B	L-1	84%	89%	100%	Existing scheme to close the Molino - Trenton Jct section for the loss of Fulton-Molino-Cotati line. Line will not overload if load is not transferred
NCNB-S-T-24	Fulton - Pueblo 115 kV Line #1 Between PUEBLO - PUEBLOJT	Lakeville 115 kV CB102 stuck	C	Breaker	93%	99%	110%	trip load at Pueblo 115 kV (existing Sonoma-Pueblo SPS)
		Lakeville- Sonoma No.1 115 KV & Lakeville- Sonoma No.2 115 KV	C	L-1-1	93%	99%	109%	
		Lakeville-Sonoma #1 & #2 115kV Lines	C	L-2	93%	99%	109%	
NCNB-S-T-25	Ignacio - San Rafael #.3 115 kV (between Ignacio and Las Gallinas)	Ignacio-San Rafael #2 & Ignacio-San Rafael #1 115kV	C	L-1-1	N/A	109%	115%	Ignacio-Alto Voltage Conversion project. For post project overloads open the 115kV line between San Rafael - Greenbrae

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
NCNB-S-T-26	Ignacio-San Rafael 115 kV # 1	Ignacio - San Rafael No.3 115 kV ( Ignacio - Las Gallinas ) & Ignacio-San Rafael #2 115kV line	C	L-1-1	N/A	113%	119%	Ignacio-Alto Voltage Conversion project. For post project overloads open the 115kV line between San Rafael - Greenbrae.
NCNB-S-T-27	Ignacio-San Rafael 115 kV # 2	Ignacio - San Rafael No.3 115 kV ( Ignacio 115 kv to Las Gallinas sub 115 kv ) & Ignacio - San Rafael No. 3 115 kV	C	L-1-1	N/A	N/A	130%	Ignacio-Alto Voltage Conversion project
NCNB-S-T-28	Ignacio - Alto 60 kV Line #1 Between IG JCT - SAN RFLJ - GREENBRE 60 kV	Ignacio - Alto - Sausalito # 2 60 kV & Ignacio - Alto - Sausalito # 1 60 kV	C	L-1-1	125%	N/A	N/A	Ignacio-Alto Voltage Conversion project. In the interim, drop load at Alto
NCNB-S-T-29	Ignacio - Alto 60 kV Line #1 Between IG JCT - SAN RFLJ - GREENBRE 60 kV		C	L-1-1	125%	N/A	N/A	Ignacio-Alto Voltage Conversion project. In the interim, drop load at Alto
NCNB-S-T-30	San Rafael - Greenbrae 115kV line	Ignacio A 115/60kV bank & Ignacio B 115/60.00 kV Bank	C	T-1-1	N/A	121%	125%	Ignacio - Alto Voltage conversion project.
NCNB-S-T-31	Bridgeville - Garberville 60kV between Bridgeville - Fruitland jct		D	Loss of Substation	102%	105%	33%	Under Review
NCNB-S-T-32	Bridgeville - Garberville 60kV between Fruitland Jct - Fort Seward Jct		D	Loss of Substation	104%	106%	26%	Under Review
NCNB-S-T-33	Bridgeville - Garberville 60kV between Fort Seward Jct - Garberville		D	Loss of Substation	102%	104%	24%	Under Review
NCNB-S-T-34	Garberville - Laytonville 60kV between Garberville - Kekawaka		D	Loss of Substation	52%	52%	102%	Under Review
NCNB-S-T-35	Garberville - Laytonville 60kV between kekawaka - Lytonville		D	Loss of Substation	52%	52%	102%	Under Review

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
NCNB-S-T-36	Eagle Rock - Fulton - Silverado 115kV Between Eagle Rock - ERFT5_25	Loss of Fulton 230kV station + XfmrS	D	Loss of Substation	102%	94%	104%	Under Review
NCNB-S-T-37	Lakeville - Santa Rosa 115kV line Between SNTA RSA - STNY PTP		D	Loss of Substation	85%	86%	106%	Under Review
NCNB-S-T-38	Lakeville - Santa Rosa 115kV line Between STNY PTP - BELLVUE		D	Loss of Substation	85%	87%	107%	Under Review
NCNB-S-T-39	Lakeville - Santa Rosa 115kV line Between BELLVUE - PENNGRVE		D	Loss of Substation	109%	113%	137%	Under Review
NCNB-S-T-40	Lakeville - Santa Rosa 115kV line Between PENNGRVE - CORONA		D	Loss of Substation	114%	118%	143%	Under Review
NCNB-S-T-41	Lakeville - Santa Rosa 115kV line Between CORONA - Lakeville		D	Loss of Substation	108%	112%	135%	Under Review
NCNB-S-T-42	Sonoma - Pueblo 115kV line		D	Loss of Substation	103%	107%	127%	Under Review
NCNB-S-T-43	Monte Rio - Fulton 60kV between WHLR JCT - MONTE RO		D	Loss of Substation	75%	81%	106%	Under Review
NCNB-S-T-44	Fulton - Molino - Cotati 60kV between MLNO JCT - Fulton		D	Loss of Substation	81%	86%	104%	Under Review
NCNB-S-T-45	Lakeville - Sobrante 230kV between Crockett - Ignacio		D	Loss of Substation	107%	114%	124%	Under Review
NCNB-S-T-46	Bridgeville - Garberville 60kV between Bridgeville - Fruitland jct	D	Loss of Substation	104%	109%	33%	Under Review	
NCNB-S-T-47	Bridgeville - Garberville 60kV between Fruitland Jct - Fort Seward Jct	D	Loss of Substation	56%	55%	103%	Under Review	

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
NCNB-S-T-48	Bridgeville - Garberville 60kV between Fort Seward Jct - Garberville	Loss of Lakeville 230kV station + Xfmrs	D	Loss of Substation	55%	55%	103%	Under Review
NCNB-S-T-49	Garberville - Laytonville 60kV between Garberville - Kekawaka		D	Loss of Substation	106%	110%	26%	Under Review
NCNB-S-T-50	Garberville - Laytonville 60kV between kekawaka - Lytonville		D	Loss of Substation	105%	108%	24%	Under Review
NCNB-S-T-51	Eagle Rock - Fulton - Silverado 115kV Between Eagle Rock - ERFT5_25		D	Loss of Substation	103%	96%	94%	Under Review
NCNB-S-T-52	Eagle Rock - Cortina 115kV line between CACHE J1 - TAPP1015		D	Loss of Substation	76%	97%	104%	Under Review

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Winter Peak	2017 Winter Peak	2022 Winter Peak	
NCNB-W-T-1	Mendocino - Clear Lake 60 kV Line #1 between Mendocino - Upper Lake	Clear Lake- Hopland 60 Kv & Eagle Rock 60kV - Konocti6 60kV	C	L-1-1	188%	37%	42%	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-W-T-2	Mendocino - Clear Lake 60 kV Line #1 Between Upper Lake-Hartley		C	L-1-1	180%	32%	36%	
NCNB-W-T-3	Mendocino - Clear Lake 60 kV Between Hartley-Clear Lake		C	L-1-1	133%	7%	9%	
NCNB-W-T-4	Elk 60kV - Philo 60kV	Mendocino- Willits- Fort Bragg 60 kV & Monte Rio- Fulton 60 KV	C	L-1-1	88%	94%	Diverged	Drop Load at Gaulala
NCNB-W-T-5	Clear Lake - Eagle Rock 60 kV Line #1 Between CLER LKE - KONOCTI6	GEYSER # 3 - CLOVERDALE 115K & Eagle Rock- Cortina 115 kV	C	L-1-1	106%	118%	121%	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
NCNB-W-T-6	Clear Lake - Eagle Rock 60 kV Line #1 Between KONOCTI6 - EGGLE RCK		C	L-1-1	105%	86%	89%	
NCNB-W-T-7	Lakeville #2 60kV Line #1 between Lakevl_JCT - PETLMA A	Fulton- Molino- Cotati 60 kV & Lakeville - Petaluma 60kV	C	L-1-1	103%	107%	117%	trip load at Petaluma A or C 60 kV (Existing SPS)
NCNB-W-T-8	Ignacio - San Rafael #.3 115 kV (between Ignacio and Las Gallinas)	Ignacio-San Rafael #2 & Ignacio-San Rafael #1 115kV Lines	C	L-1-1	N/A	106%	109%	Ignacio-Alto Voltage Conversion project
NCNB-W-T-9	Ignacio - San Rafael #.3 115 kV (between Las Gallinas and San Rafael)		C	L-1-1	N/A	104%	106%	Ignacio-Alto Voltage Conversion project
NCNB-W-T-10	Ignacio-San Rafael 115 kV #1	Ignacio - San Rafael No.3 115 kV ( Ignacio - Las Gallinas) & Ignacio-San Rafael #2 115kV line	C	L-1-1	N/A	120%	124%	Ignacio-Alto Voltage Conversion project

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Winter Peak	2017 Winter Peak	2022 Winter Peak	
NCNB-W-T-11	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-1-1	143%	N/A	N/A	Ignacio-Alto 60 kV Voltage Conversion Project. In interim, trip load at Alto 60 kV
NCNB-W-T-12	Ignacio - Alto -Sausalito 60 kV # 2 Between HMLTN FD - ALTO JT2	San Rafael - Green Brae 115kV & Ignacio - Alto - Sausalito # 1 60 kV	C	L-1-1	N/A	107%	108%	Ignacio-Alto 60 kV Voltage Conversion Project. In interim, trip load at Alto 60 kV for Category C contingencies
NCNB-W-T-13	Ignacio - Alto -Sausalito 60 kV # 1 Between ALTO JT1- HMLTN FDB	Ignacio _Alto 60 kV & Ignacio - Alto - Sausalito # 2 60 kV	C	L-1-1	115%	N/A	N/A	
NCNB-W-T-14	Ignacio-San Rafael 115 kV # 2	Ignacio - San Rafael No.3 115 kV ( Ignacio 115 kv to Las Gallinas sub 115 kv) & Ignacio - San Rafael No. 3 115 kV	C	L-1-1	N/A	102%	104%	Ignacio - Alto Voltage conversion project
NCNB-W-T-15	San Rafael - Greenbrae 115kV line	Ignacio A 115/60kV bank & Ignacio B 115/60.00 kV Bank	C	T-1-1	N/A	112%	113%	Ignacio - Alto Voltage conversion project
NCNB-W-T-16	Greenbrae 60kV - Alto 60kV		C	T-1-1	N/A	114%	115%	Ignacio - Alto Voltage conversion project
NCNB-W-T-17	Ignacio A 60kV - Ignacio B 60kV	Ignacio _Bolas No. 2 60 kV & Ignacio A 115kV / 60kV transformer	C	L-1/T-1	104%	54%	55%	Ignacio - Alto Voltage conversion project

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Summer Off-Peak	N/A	
NCNB-OP-T-1	Eagle Rock Cortina 115kV line between Eagle Rock 115kV - Homstk Tap 115kV	Eagle Rock- Fulton- Silverado 115 kV	B	L-1	102%	81%	N/A	Adjust Generation at Geysers
		Fulton-Hopland 60kv & Geysers #17-Fulton 230kv & Eagle Rock-Fulton-Silverado 115kV	C	L-2	114%	88%	N/A	
		Cortina - Mendocino No.1 115 kV & Eagle Rock-Fulton- Silverado 115 kV	C	L-1-1	128%	90%	N/A	
NCNB-OP-T-2	Eagle Rock Cortina 115kV line between Homestk Tap 115kV - Highland Jct2 115kV	Eagle Rock- Fulton- Silverado 115 kV	B	L-1	101%	60%	N/A	Adjust Generation at Geysers
		Fulton-Hopland 60kv & Geysers #17-Fulton 230kv & Eagle Rock-Fulton-Silverado 115kV	C	L-2	114%	65%	N/A	
		Cortina - Mendocino No.1 115 kV & Eagle Rock-Fulton- Silverado 115 kV	C	L-1-1	127%	69%	N/A	
NCNB-OP-T-3	Eagle Rock Cortina 115kV line between Cache J1 115kV - TAPP1015 115kV	Cortina - Mendocino No.1 115 kV & Eagle Rock-Fulton- Silverado 115 kV	C	L-1-1	111%	59%	N/A	Adjust generation at RSP 1015
NCNB-OP-T-4	Eagle Rock Cortina 115kV line between TAPP1015 115kV - Cortina 115kV	Eagle Rock- Fulton- Silverado 115 kV	B	L-1	112%	61%	N/A	Adjust generation at RSP 1015 / Geysers
		Fulton 115 kV Bus Section 2D	C	Bus	105%	52%	N/A	
		Fulton 115 kV CB342 stuck	C	Breaker	104%	51%	N/A	
		Fulton-Hopland 60kv & Geysers #17-Fulton 230kv & Eagle Rock-Fulton-Silverado 115 kV	C	L-2	123%	65%	N/A	
		Cortina - Mendocino No.1 115 kV & Eagle Rock-Fulton- Silverado 115 kV	C	L-1-1	135%	69%	N/A	
NCNB-OP-T-5	Hopland JCT 60kV - Cloverdale Jct 60kV	FULTON 115/60.00 KV BANK NO.1 & FULTON 115/60.00 KV BANK NO.2	C	T-1-1	Diverged	159%	N/A	

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Summer Off-Peak	N/A	
NCNB-OP-T-6	Cloverdale Jct 60kV - Geysers Jct1 60kV	FULTON 115/60.00 KV BANK NO.1 & FULTON 115/60.00 KV BANK NO.2	C	T-1-1	Diverged	150%	N/A	Close the tie line between Petaluma C jct and Cotati sub. Drop load at Cotati.
NCNB-OP-T-7	Geysers Jct1 60kV - Fitch MntnP 60kV	FULTON 115/60.00 KV BANK NO.1 & FULTON 115/60.00 KV BANK NO.2	C	T-1-1	Diverged	151%	N/A	
NCNB-OP-T-8	Fulton 60kV - St.Helna 60kV	FULTON 115/60.00 KV BANK NO.1 & FULTON 115/60.00 KV BANK NO.2	C	T-1-1	Diverged	135%	N/A	
NCNB-OP-T-9	St.Helna 60kV - Calistga 60kV	FULTON 115/60.00 KV BANK NO.1 & FULTON 115/60.00 KV BANK NO.2	C	T-1-1	Diverged	165%	N/A	
NCNB-OP-T-10	Calistga 60kV - Middltnw 60kV	FULTON 115/60.00 KV BANK NO.1 & FULTON 115/60.00 KV BANK NO.2	C	T-1-1	N/A	183%	N/A	
NCNB-OP-T-11	Hopland Jct 115 kV / 60kV Transformer	Ukiah-Hopland-Cloverdale 115 kV (between Ukiah - City of Ukiah 115kv) & Geysers #3 - Eagle Rock 115 kV	C	L-1-1	247%	172%	N/A	Adjust generation at Geysers
NCNB-OP-T-12	Eagle Rock - Cortina 115kV between Eagle rock and Homestk tap	Common Corridor between Eagle Rock - Fulton	D	Loss of all lines in a ROW	110%	85%	N/A	Under Review
NCNB-OP-T-13	Eagle Rock - Cortina 115kV line between Homestk tap - Highland Jct	Common Corridor between Eagle Rock - Fulton	D	Loss of all lines in a ROW	109%	81%	N/A	Under Review
NCNB-OP-T-14	Eagle Rock - Cortina 115kV line between Tap 1015 - Cortina	Common Corridor between Eagle Rock - Fulton	D	Loss of all lines in a ROW	119%	80%	N/A	Under Review



**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
NCNB-S-DV-1	ALTO 60kV	Ignacio-Alto-Sausalito #2 & #1 60kV Lines	C	L-2	-11.07%	-1.13%	-1.23%	Ignacio - Alto voltage conversion project
NCNB-S-DV-2	CALISTGA 60kV	LAKEVILLE #1 60 kV(Lakeville sub 60 kV to Dunbar Sub 60 kV)	B	L-1	-5.91%	-2.24%	-2.56%	Middle town 115kV project
		Homestk Tp - Middletown 115kV	B	L-1	N/A	-4.96%	-5.82%	
		Middletown 115/60kV transformer	B	T-1	N/A	-4.95%	-5.81%	
NCNB-S-DV-3	CLER LKE 60kV	Eagle Rock - KONOCTI6 60kV	B	L-1	-11.13%	-2.44%	-2.84%	
		BUS FAULT AT EGLE RCK 115kV	C	Bus	-11.55%	-3.55%	-2.64%	
		BUS FAULT AT EGLE RCK 60kV	C	Bus	-11.13%	-2.43%	-2.84%	
NCNB-S-DV-4	CLOVRDLE 115kV	GEYSER # 3 - CLOVERDALE 115K (CLOVERDALE 115KV to MPE TAP115KV)	B	L-1	-3.61%	-3.70%	-5.23%	Adjust generation at geysers
NCNB-S-DV-5	COVELO6 60kV	LYTNVILLE - COVELO6 60kV	B	L-1	1.73%	2.47%	5.97%	Garberville reactive support project
		BUS FAULT AT MENDOCNO with 115kV breaker CB102 stuck	C	Breaker	-7.62%	-7.32%	-10.41%	
NCNB-S-DV-6	DUNBAR 60kV	LAKEVILLE #1 60 kV(Lakeville sub 60 kV to Dunbar Sub 60 kV)	B	L-1	-6.81%	-2.62%	-3.31%	Middle town 115kV project
NCNB-S-DV-7	EGLE RCK 60kV	EAGLE ROCK 115/60 KV BANK NO.1	B	T-1	-11.83%	-6.34%	-7.18%	open Eagle Rock-Konocti 60 kV line for Eagle Rock bank outage
		BUS FAULT AT EGLE RCK 115kV	C	Bus	-22.64%	-7.36%	-7.37%	
NCNB-S-DV-8	GRANITE 60kV	Eagle Rock - KONOCTI6 60kV	B	L-1	-9.28%	-1.98%	-2.33%	Middle town 115kV project
NCNB-S-DV-9	HARTLEY 60kV	Eagle Rock - KONOCTI6 60kV	B	L-1	-9.70%	-2.11%	-2.47%	
		BUS FAULT AT EGLE RCK 115kV	C	Bus	-10.07%	-3.37%	-2.22%	
NCNB-S-DV-10	HOMSTKTP 115kV	BUS FAULT AT HOMSTKTP 115kV	C	Bus	-1.69%	-13.75%	-14.49%	Adjust generation near Eagle Rock / Homestk Tap
		Eagle Rock-Cortina & Cortina-Mendocino 115kV Lines	C	L-2	-1.69%	-13.81%	-14.61%	
		Eagle Rock-Redbud & Eagle Rock-Cortina 115kV Lines	C	L-2	-1.69%	-14.01%	-14.14%	

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
NCNB-S-DV-11	KONOCTI6 60kV	Eagle Rock - KONOCTI6 60kV	B	L-1	-18.85%	-4.53%	-5.19%	Middle town 115kV project
		BUS FAULT AT EGLE RCK 115kV	C	Bus	-19.27%	-5.30%	-5.02%	
		BUS FAULT AT EGLE RCK 60kV	C	Bus	-18.85%	-4.52%	-5.19%	
		EAGLE ROCK 115/60 KV BANK NO.1	B	T-1	-8.46%	-4.28%	-4.83%	
NCNB-S-DV-12	LOWR LKE 60kV	Eagle Rock - KONOCTI6 60kV	B	L-1	-19.46%	-2.93%	-3.44%	
		BUS FAULT AT EGLE RCK 115kV	C	Bus	-19.91%	-3.47%	-3.32%	
		BUS FAULT AT EGLE RCK 60kV	C	Bus	-19.46%	-2.92%	-3.44%	
		EAGLE ROCK 115/60 KV BANK NO.1	B	T-1	-6.50%	-2.64%	-3.02%	
NCNB-S-DV-13	MIDDLTWN 60kV	Eagle Rock - KONOCTI6 60kV	B	L-1	-20.35%	-0.18%	-0.41%	
		BUS FAULT AT EGLE RCK 115kV	C	Bus	-20.82%	-0.35%	-0.38%	
		BUS FAULT AT EGLE RCK 60kV	C	Bus	-20.35%	-0.18%	-0.41%	
		Homestk Tp - Middletown 115kV	B	L-1	N/A	-6.90%	-8.05%	
		Middletown 115/60kV transformer	B	T-1	N/A	-6.89%	-8.03%	
NCNB-S-DV-14	MIDDLTWN 115kV	BUS FAULT AT HOMSTKTP 115kV	C	Bus	N/A	-12.31%	-12.82%	
		Eagle Rock-Cortina & Cortina-Mendocino 115kV Lines	C	L-2	N/A	-12.37%	-12.94%	
		Eagle Rock-Redbud & Eagle Rock-Cortina 115kV Lines	C	L-2	N/A	-12.57%	-12.47%	
		Homestk Tp - Middletown 115kV	B	L-1	N/A	-12.54%	-13.03%	
NCNB-S-DV-15	MNDCNO M 115kV	BUS FAULT AT MENDOCNO with 115kV breaker CB102 stuck	C	Breaker	-6.91%	-6.87%	-11.92%	Install a series breaker to 115kV CB102 at Mendocino
NCNB-S-DV-16	PTTR VLY 60kV	BUS FAULT AT MENDOCNO with 115kV breaker CB102 stuck	C	Breaker	-6.26%	-6.17%	-11.32%	
NCNB-S-DV-17	PUEBLO 115kV	Lakeville 115 kV CB102 stuck	C	Breaker	-9.15%	-8.90%	-11.80%	Trip load at Pueblo by existing SPS
		Lakeville-Sonoma #1 & #2 115kV Lines	C	L-2	-8.38%	-9.41%	-10.72%	
NCNB-S-DV-18	RPSP1015 115kV	Eagle rock – Cortina 115kV line (Between Highland Jct - Cortina)	B	L-1	-5.66%	-5.59%	-5.47%	Adjust generation near Eagle Rock / Homestk Tap
NCNB-S-DV-19	SONOMA 115kV	Lakeville 115 kV CB102 stuck	C	Breaker	-12.15%	-12.16%	-15.39%	Trip load at Pueblo by existing SPS
		Lakeville-Sonoma #1 & #2 115kV Lines	C	L-2	-11.36%	-12.68%	-14.28%	
NCNB-S-DV-21	UPPR LKE 60kV	Eagle Rock - KONOCTI6 60kV	B	L-1	-8.13%	-1.75%	-2.06%	Middle town 115kV project

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
NCNB-S-DV-22	WILLITS 60kV	BUS FAULT AT MENDOCNO with 115kV breaker CB102 stuck	C	Breaker	-6.39%	-6.21%	-11.62%	Install a series breaker to 115kV CB102 at Mendocino
		Mendocino- Willits- Fort Bragg 60 kV(Mendocino sub 60kV to Willits Jct 60 kV)	B	L-1	4.04%	4.25%	6.22%	Garberville reactive support project
NCNB-S-DV-23	FULTON		D	Loss of Substation	-20.30%	-20.04%	-26.16%	Under Review
NCNB-S-DV-24	MONROE1		D	Loss of Substation	-19.06%	-18.81%	-24.76%	Under Review
NCNB-S-DV-25	MONROE2		D	Loss of Substation	-19.08%	-18.83%	-24.78%	Under Review
NCNB-S-DV-26	SNTA RSA		D	Loss of Substation	-18.48%	-18.24%	-24.09%	Under Review
NCNB-S-DV-27	STONY PT		D	Loss of Substation	-16.86%	-16.61%	-22.07%	Under Review
NCNB-S-DV-28	BELLVUE		D	Loss of Substation	-16.04%	-15.79%	-21.05%	Under Review
NCNB-S-DV-29	PENNGRVE		D	Loss of Substation	-13.47%	-13.19%	-17.70%	Under Review
NCNB-S-DV-30	RINCON		D	Loss of Substation	-18.04%	-17.80%	-23.21%	Under Review
NCNB-S-DV-31	GUALALA		D	Loss of Substation	-19.91%	-20.51%	-30.88%	Under Review
NCNB-S-DV-32	ANNAPOLS		D	Loss of Substation	-19.30%	-19.84%	-29.33%	Under Review
NCNB-S-DV-33	FORT RSS		D	Loss of Substation	-18.92%	-19.42%	-28.34%	Under Review
NCNB-S-DV-34	SLMN CRK		D	Loss of Substation	-18.79%	-19.27%	-27.92%	Under Review

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
NCNB-S-DV-35	MONTE RO	Loss of Fulton 230kV station + Xfmrs	D	Loss of Substation	-18.25%	-18.67%	-26.67%	Under Review
NCNB-S-DV-36	WOHLER		D	Loss of Substation	-17.15%	-17.43%	-24.15%	Under Review
NCNB-S-DV-37	MIRABEL		D	Loss of Substation	-17.35%	-17.66%	-24.62%	Under Review
NCNB-S-DV-38	MOLINO		D	Loss of Substation	-17.51%	-17.82%	-24.65%	Under Review
NCNB-S-DV-39	GYSRVLE		D	Loss of Substation	-18.01%	-18.43%	-25.76%	Under Review
NCNB-S-DV-40	GYSR 1-2		D	Loss of Substation	-17.91%	-18.32%	-25.56%	Under Review
NCNB-S-DV-41	FULTON		D	Loss of Substation	-16.69%	-16.92%	-23.10%	Under Review
NCNB-S-DV-42	FTCH MTN		D	Loss of Substation	-17.85%	-18.25%	-25.45%	Under Review
NCNB-S-DV-43	LAGUNA		D	Loss of Substation	-17.69%	-18.01%	-24.99%	Under Review
NCNB-S-DV-44	COTATI		D	Loss of Substation	-17.86%	-18.21%	-25.34%	Under Review
NCNB-S-DV-45	SNMALDFL		D	Loss of Substation	-17.83%	-18.17%	-25.29%	Under Review
NCNB-S-DV-46	SILVERDO		D	Loss of Substation	-16.67%	-16.45%	-21.46%	Under Review
NCNB-S-DV-47	MONTCLLO		D	Loss of Substation	-16.65%	-16.43%	-21.44%	Under Review
NCNB-S-DV-48	MNTCLOPH		D	Loss of Substation	-16.63%	-16.41%	-21.41%	Under Review
NCNB-S-DV-49	PUEBLO		D	Loss of Substation	-13.12%	-12.83%	-17.16%	Under Review
NCNB-S-DV-50	ST.HELNA		D	Loss of Substation	-17.55%	-11.67%	-16.45%	Under Review

Voltage Deviations

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Winter Peak	2017 Winter Peak	2022 Winter Peak	
NCNB-W-DV-1	ALTO 60kV	Ignacio-Alto-Sausalito #2 & #1 60kV Lines	C	L-2	-17.19%	-1.33%	-1.36%	Ignacio - Alto Voltage conversion project
NCNB-W-DV-2	EGLE RCK 60kV	EAGLE ROCK 115/60 KV BANK NO.1	B	T-1	-10.11%	-5.32%	-6.01%	Open Eagle Rock-Konocti 60 kV line for Eagle Rock bank outage
		BUS FAULT AT EGLE RCK 115.00	C	Bus	-13.06%	-4.91%	-5.83%	
NCNB-W-DV-3	GREENBRE 60kV	Ignacio-Alto-Sausalito #2 & #1 60kV Lines	C	L-2	-15.17%	-0.15%	-0.18%	Ignacio - Alto Voltage conversion project
NCNB-W-DV-4	HOMSTKTP 115kV	BUS FAULT AT HOMSTKTP 115.00	C	Bus	-1.61%	-10.59%	-11.01%	Adjust generation near Eagle Rock / Homestk Tap
		Eagle Rock-Cortina & Cortina-Mendocino 115kV Lines	C	L-2	-1.61%	-10.65%	-10.92%	
		Eagle Rock-Redbud & Eagle Rock-Cortina 115kV Lines	C	L-2	-1.61%	-10.81%	-10.67%	
NCNB-W-DV-5	KONOCTI6 60kV	EAGLE ROCK 115/60 KV BANK NO.1	B	T-1	-7.75%	-3.69%	-4.13%	Middletown 115kV project
		BUS FAULT AT EGLE RCK 115.00	C	Bus	-10.70%	-3.28%	-3.95%	
		BUS FAULT AT EGLE RCK 60.00	C	Bus	-11.68%	-4.13%	-4.63%	
NCNB-W-DV-6	LOWR LKE 60kV	BUS FAULT AT EGLE RCK 115.00	C	Bus	-10.82%	-2.24%	-2.68%	
		BUS FAULT AT EGLE RCK 60.00	C	Bus	-11.82%	-2.93%	-3.30%	
NCNB-W-DV-7	MIDDLTWN 60kV	BUS FAULT AT EGLE RCK 115.00	C	Bus	-11.01%	-0.50%	-0.54%	
		BUS FAULT AT EGLE RCK 60.00	C	Bus	-12.03%	-0.91%	-1.05%	
NCNB-W-DV-8	MIDDLTWN 115kV	BUS FAULT AT HOMSTKTP 115.00	C	Bus	N/A	-9.71%	-10.05%	
		HomeStk Tp - Middletown 115kV	B	L-1	N/A	-9.97%	-10.33%	
NCNB-W-DV-9	FULTON		D	Loss of Substation	-13.46%	-13.63%	-17.08%	Under Review
NCNB-W-DV-10	MONROE1		D	Loss of Substation	-12.54%	-12.67%	-15.96%	Under Review
NCNB-W-DV-11	MONROE2		D	Loss of Substation	-12.54%	-12.68%	-15.98%	Under Review
NCNB-W-DV-12	SNTA RSA		D	Loss of Substation	-12.12%	-12.23%	-15.45%	Under Review
NCNB-W-DV-13	STONY PT		D	Loss of Substation	-11.01%	-11.06%	-14.05%	Under Review

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Winter Peak	2017 Winter Peak	2022 Winter Peak	
NCNB-W-DV-14	BELLVUE	Loss of Fulton 230kV station + Xfmrs	D	Loss of Substation	-10.45%	-10.48%	-13.35%	Under Review
NCNB-W-DV-15	PENNGRVE		D	Loss of Substation	-8.77%	-8.73%	-11.18%	Under Review
NCNB-W-DV-16	RINCON		D	Loss of Substation	-11.88%	-12.02%	-15.09%	Under Review
NCNB-W-DV-17	GUALALA		D	Loss of Substation	-10.64%	-11.80%	-16.66%	Under Review
NCNB-W-DV-18	ANNAPOLS		D	Loss of Substation	-10.35%	-11.42%	-15.86%	Under Review
NCNB-W-DV-19	FORT RSS		D	Loss of Substation	-10.17%	-11.18%	-15.36%	Under Review
NCNB-W-DV-20	SLMN CRK		D	Loss of Substation	-10.07%	-11.05%	-15.06%	Under Review
NCNB-W-DV-21	MONTE RO		D	Loss of Substation	-9.87%	-10.79%	-14.58%	Under Review
NCNB-W-DV-22	WOHLER		D	Loss of Substation	-9.43%	-10.25%	-13.57%	Under Review
NCNB-W-DV-23	MIRABEL		D	Loss of Substation	-9.52%	-10.35%	-13.75%	Under Review
NCNB-W-DV-24	MOLINO		D	Loss of Substation	-9.68%	-10.52%	-13.87%	Under Review
NCNB-W-DV-25	GYSRVILLE		D	Loss of Substation	-9.76%	-10.64%	-14.10%	Under Review
NCNB-W-DV-26	GYSR 1-2		D	Loss of Substation	-9.73%	-10.59%	-14.03%	Under Review
NCNB-W-DV-27	FULTON		D	Loss of Substation	-9.25%	-10.02%	-13.15%	Under Review
NCNB-W-DV-28	FTCH MTN	D	Loss of Substation	-9.71%	-10.56%	-13.99%	Under Review	

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Winter Peak	2017 Winter Peak	2022 Winter Peak	
NCNB-W-DV-29	LAGUNA		D	Loss of Substation	-9.79%	-10.65%	-14.07%	Under Review
NCNB-W-DV-30	COTATI		D	Loss of Substation	-9.85%	-10.72%	-14.19%	Under Review
NCNB-W-DV-31	SNMALDFL		D	Loss of Substation	-9.84%	-10.70%	-14.16%	Under Review
NCNB-W-DV-32	SILVERDO		D	Loss of Substation	-10.88%	-11.02%	-13.86%	Under Review
NCNB-W-DV-33	MONTCLLO		D	Loss of Substation	-10.87%	-11.01%	-13.86%	Under Review
NCNB-W-DV-34	MNTCLOPH		D	Loss of Substation	-10.86%	-10.99%	-13.84%	Under Review
NCNB-W-DV-35	PUEBLO		D	Loss of Substation	-8.60%	-8.52%	-10.90%	Under Review

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Summer Off-Peak	N/A	
NCNB-OP-DV-1	ANNAPOLS 60kV	Gualala- Monte Rio 60 kV (Gualala sub 60 kV to Annapolis Sub 60 kV)	B	L-1	-7.81%	-7.25%	N/A	Install reactive support at Annapolis / Fort Ross
		Monte Rio- Fulton 60 KV(Wohler Jct 60 Kv to Monte Rio Sub 60 KV)	B	L-1	-7.81%	-7.25%	N/A	
NCNB-OP-DV-2	BIG RIVR 60kV	Mendocino- Willits- Fort Bragg 60 kV(Mendocino sub 60kV to Willits Jct 60 kV)	B	L-1	3.60%	5.22%	N/A	Garberville reactive support project
NCNB-OP-DV-3	CALISTGA 60kV	Fulton -Calistoga 60 kV (Fulton Sub 60 kV to St. Helena Jct 60 kV)	B	L-1	-6.83%	-1.29%	N/A	Middletown 115kV project
NCNB-OP-DV-4	FORT RSS 60kV	Gualala- Monte Rio 60 kV (Gualala sub 60 kV to Annapolis Sub 60 kV)	B	L-1	-7.63%	-7.07%	N/A	Install reactive support at Annapolis / Fort Ross
		Monte Rio- Fulton 60 KV(Wohler Jct 60 Kv to Monte Rio Sub 60 KV)	B	L-1	-7.63%	-7.07%	N/A	
NCNB-OP-DV-5	FRT BRGG 60kV	Mendocino- Willits- Fort Bragg 60 kV(Mendocino sub 60kV to Willits Jct 60 kV)	B	L-1	4.31%	6.19%	N/A	Garberville reactive support project
NCNB-OP-DV-6	GYSR 1-2 60kV	Fulton #1 60kV (Geyserville sub 60 kV to Geyserville Jct 60 KV)	B	L-1	-6.28%	-5.83%	N/A	Adjust generation at Geysers
NCNB-OP-DV-7	GYSRVLE 60kV	Fulton #1 60kV (Geyserville sub 60 kV to Geyserville Jct 60 KV)	B	L-1	-6.29%	-5.80%	N/A	
NCNB-OP-DV-8	MIDDLTWN 115kV	Homestk TP - Middletown 115kV	B	L-1	N/A	-8.37%	N/A	Middletown 115kV project
NCNB-OP-DV-9	MIRABEL 60kV	Monte Rio- Fulton 60 KV(Wohler Jct 60 Kv to Monte Rio Sub 60 KV)	B	L-1	-6.26%	-6.04%	N/A	Adjust generation at Geysers
NCNB-OP-DV-10	MNDCNO M 115kV	MENDOCINO 115/60 KV BANK NO.1	B	T-1	-5.72%	-5.42%	N/A	Big river and Garberville reactive support projects
NCNB-OP-DV-11	MONTE RO 60kV	Monte Rio- Fulton 60 KV(Wohler Jct 60 Kv to Monte Rio Sub 60 KV)	B	L-1	-7.09%	-6.63%	N/A	Install reactive support at Annapolis / Fort Ross
NCNB-OP-DV-12	RPSP1015 115kV	Eagle rock – Cortina 115kV line (Between Highland Jct - Cortina)	B	L-1	-5.33%	-5.55%	N/A	Adjust generation near Eagle Rock / Homestk Tap



**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Summer Off-Peak	N/A	
NCNB-OP-DV-13	SLMN CRK 60kV	Gualala- Monte Rio 60 kV (Gualala sub 60 kV to Annapolis Sub 60 kV)	B	L-1	-7.78%	-7.12%	N/A	Install reactive support at Annapolis / Fort Ross
		Monte Rio- Fulton 60 KV(Wohler Jct 60 Kv to Monte Rio Sub 60 KV)	B	L-1	-7.78%	-7.12%	N/A	
NCNB-OP-DV-14	ST.HELNA 60kV	Fulton -Calistoga 60 kV (Fulton Sub 60 kV to St. Helena Jct 60 kV)	B	L-1	-5.28%	-5.51%	N/A	Middletown 115kV project
NCNB-OP-DV-15	WOHLER 60kV	Monte Rio- Fulton 60 KV(Wohler Jct 60 Kv to Monte Rio Sub 60 KV)	B	L-1	-5.48%	-5.29%	N/A	

High/Low Voltage

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
NCNB-S-V-1	ALTO 60kV	Ignacio - Alto - Sausalito # 2 60 kV & Ignacio - Alto - Sausalito # 1 60 kV	C	L-1-1	0.8714	0.9981	0.9978	trip load at Alto 60 kV for Category C contingencies. Long term-Ignacio-Alto 60 kV voltage conversion
		Ignacio-Alto-Sausalito #2 & #1 60kV Lines	C	L-2	0.8714	0.9981	0.9978	
NCNB-S-V-2	CALISTGA 60kV	Fulton -Calistoga 60 kV & Middletown 115kV / 60kV transformer	C	L-1/T-1	N/A	0.8231	0.7992	Trip load at Calistoga
NCNB-S-V-3	CLER LKE 60kV	Eagle Rock 60kV - KONOCTI6 60kV	B	L-1	0.8814	0.9756	0.9605	Middletown 115kV project. In the 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
		BUS FAULT AT EGLE RCK 115kV	C	Bus	0.8772	0.9645	0.9625	
		BUS FAULT AT EGLE RCK 60kV	C	Bus	0.8814	0.9757	0.9605	
		Mendocino -Clearlake 60 kV & Eagle Rock - KONOCTI6 60kV	C	L-1-1	0.6691	0.9551	0.9411	
NCNB-S-V-4	COVELO6 60kV	BUS FAULT AT MENDOCNO with 115kV breaker CB102 stuck	C	Breaker	0.9166	0.9122	0.8463	Garberville reactive support project
NCNB-S-V-5	EGLE RCK 60kV	BUS FAULT AT EGLE RCK 115kV	C	Bus	0.8171	0.9749	0.9717	Middletown 115 kV Project
		Clear Lake- Hopland 60 Kv & EAGLE ROCK 115/60 KV BANK NO.1	C	L-1/T-1	0.6974	0.9518	0.9338	
NCNB-S-V-6	FRT BRGG 60kV	BUS FAULT AT MENDOCNO with 115kV breaker CB102 stuck	C	Breaker	0.9774	0.9838	0.8918	Garberville reactive support project
NCNB-S-V-7	GARCIA 60kV	BUS FAULT AT MENDOCNO with 115kV breaker CB102 stuck	C	Breaker	0.9758	0.9815	0.8966	Drop load at Garcia. Long term install reactive support at Annapolis / Fort Ross.
NCNB-S-V-8	GRANITE 60kV	Mendocino -Clearlake 60 kV & Eagle Rock - KONOCTI6 60kV	C	L-1-1	0.7302	0.968	0.9548	Middletown 115 kV Project
NCNB-S-V-9	GREENBRE 60kV	Ignacio - Alto - Sausalito # 2 60 kV & Ignacio - Alto - Sausalito # 1 60 kV	C	L-1-1	0.887	1.0121	1.0121	Trip load at Alto 60 kV for Category C contingencies. Long Term: Ignacio - Alto 60 kV Voltage Conversion
		Ignacio-Alto-Sausalito #2 & #1 60kV Lines	C	L-2	0.887	1.0121	1.0121	
NCNB-S-V-10	HARTLEY 60kV	Eagle Rock - KONOCTI6 60kV	B	L-1	0.8922	0.9735	0.9571	Middletown 115 kV Project
		Bus Fault at Eagle Rck 115kV	C	Bus	0.8885	0.9609	0.9596	
		Bus Fault at Eagle Rck 60kV	C	Bus	0.8922	0.9736	0.9571	

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
		Mendocino -Clearlake 60 kV & Eagle Rock - KONOCTI6 60kV	C	L-1-1	0.6527	0.9433	0.9278	Drop load at Hartley / Upper lake
NCNB-S-V-11	HOMEGRND 115kV	Eagle Rock- Cortina 115 kV (between Eagle Rock - Homestake Sub) & Eagle Rock - Cortina 115kV (between Highland Jct - Cortina)	C	L-1-1	1.0111	0.9035	0.8923	Drop load at Homestake.
NCNB-S-V-12	HOMEPROC 115kV		C	L-1-1	1.0132	0.9034	0.8923	
NCNB-S-V-13	KONOCTI6 60kV	Eagle Rock - KONOCTI6 60kV	B	L-1	0.8212	0.9824	0.9698	Middletown 115 kV Project
		Bus Fault at Eagle Rck 115kV	C	Bus	0.817	0.9747	0.9715	
		Bus Fault at Eagle Rck 60kV	C	Bus	0.8212	0.9825	0.9698	
		Mendocino -Clearlake 60 kV & Eagle Rock - KONOCTI6 60kV	C	L-1-1	0.5621	0.9668	0.9564	
NCNB-S-V-14	LOWR LKE 60kV	Eagle Rock - KONOCTI6 60kV	B	L-1	0.796	1.0033	0.9945	Middletown 115 kV Project
		Bus Fault at Eagle Rck 115kV	C	Bus	0.7915	0.9979	0.9957	
		Bus Fault at Eagle Rck 60kV	C	Bus	0.796	1.0034	0.9945	
		Mendocino -Clearlake 60 kV & Eagle Rock - KONOCTI6 60kV	C	L-1-1	0.5141	0.9919	0.9861	
NCNB-S-V-15	LYTNVLE 60kV	BUS FAULT AT MENDOCNO with 115kV CB102 stuck	C	Breaker	0.926	0.9219	0.8595	Garberville reactive support project
NCNB-S-V-16	MENDOCNO 60kV	BUS FAULT AT MENDOCNO with 115kV CB102 stuck	C	Breaker	0.9572	0.9572	0.8931	
NCNB-S-V-17	MIDDLTWN 60kV	Eagle Rock - KONOCTI6 60kV	B	L-1	0.7563	1.0383	1.0361	Middle town 115 kV Project will mitigate the low voltage. 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.
		Bus Fault at Eagle Rck 115kV	C	Bus	0.7516	1.0366	1.0364	
		Bus Fault at Eagle Rck 60kV	C	Bus	0.7563	1.0383	1.0361	
		Mendocino -Clearlake 60 kV & Eagle Rock - KONOCTI6 60kV	C	L-1-1	0.4428	1.0342	1.0367	
NCNB-S-V-18	MIDDLTWN 115kV	Eagle Rock-Cortina & Cortina-Mendocino 115kV Lines	C	L-1-1	N/A	0.8995	0.8881	Middletown 115 kV Project
		Eagle Rock-Redbud & Eagle Rock-Cortina 115kV Lines	C	L-1-1	N/A	0.8975	0.8928	

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
NCNB-S-V-19	MNDCNO M 115kV	BUS FAULT AT MENDOCNO with 115kV CB102 stuck	C	Breaker	0.9556	0.9556	0.8917	Install a series breaker to CB#102
NCNB-S-V-20	OLEMA 60kV	IGNACO A 115/60.00 kV BANK & IGNACO B 115/60.00 kV BANK	C	T-1-1	1.0136	0.9054	0.897	Close the NO tie line between Lakeville Jct - Novato Jct 60kV. Drop load at Novato / Stafford sub as needed.
NCNB-S-V-21	PNT ARNA 60kV	BUS FAULT AT MENDOCNO with 115kV CB102 stuck	C	Breaker	0.9758	0.9815	0.8966	Drop load at Point Arena. Long term, install reactive support at Annapolis / Fort Ross.
NCNB-S-V-22	PTTR VLY 60kV	BUS FAULT AT MENDOCNO with 115kV CB102 stuck	C	Breaker	0.9641	0.9641	0.896	Adjust generation near Eagle Rock / Homstk Tap
NCNB-S-V-23	SAUSALTO 60kV	Ignacio _Alto 60 kV & Ignacio - Alto - Sausalito # 2 60 kV	C	L-1-1	0.8277	N/A	N/A	Ignacio - Alto voltage conversion project. PG&E action plan in the interim.
NCNB-S-V-24	SONOMA 115kV	Lakeville 115 kV CB102 stuck	C	Breaker	0.9173	0.916	0.8857	Trip load at Pueblo by existing SPS
		Lakeville- Sonoma No.1 115 KV & Lakeville- Sonoma No.2 115 KV	C	L-1-1	0.9252	0.9108	0.8968	
		Lakeville-Sonoma #1 & #2 115kV Lines	C	Breaker	0.9252	0.9108	0.8968	
NCNB-S-V-25	WILLITS 60kV	BUS FAULT AT MENDOCNO with 115kV CB102 stuck	C	Breaker	0.9404	0.9399	0.8651	Big river SVC (Mendocino coast reactive support project).
NCNB-S-V-26	GUALALA	Common Corridor between Eagle Rock - Fulton	D	Loss of all lines in a ROW	0.93	0.95	0.89	Under review
NCNB-S-V-27	GUALALA	Common corridor south of Lakeville	D	Loss of all lines in a ROW	0.94	0.95	0.89	Under review
NCNB-S-V-28	FULTON		D	Loss of Station	0.8367	0.8372	0.7815	Under review
NCNB-S-V-29	MONROE1		D	Loss of Station	0.8374	0.8372	0.7815	Under review
NCNB-S-V-30	MONROE2		D	Loss of Station	0.8365	0.8363	0.7805	Under review

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
NCNB-S-V-31	SNTA RSA	Loss of Fulton 230kV station + Xfmrs	D	Loss of Station	0.8396	0.8391	0.7839	Under review
NCNB-S-V-32	BELLVUE		D	Loss of Station	0.8639	0.8636	0.8135	Under review
NCNB-S-V-33	PENNGRVE		D	Loss of Station	0.8943	0.8948	0.8520	Under review
NCNB-S-V-34	RINCON		D	Loss of Station	0.8555	0.8559	0.8057	Under review
NCNB-S-V-35	GUALALA		D	Loss of Station	0.7539	0.7420	0.6134	Under review
NCNB-S-V-36	ANNAPOLS		D	Loss of Station	0.7803	0.7703	0.6563	Under review
NCNB-S-V-37	FORT RSS		D	Loss of Station	0.7949	0.7862	0.6812	Under review
NCNB-S-V-38	SLMN CRK		D	Loss of Station	0.7986	0.7902	0.6896	Under review
NCNB-S-V-39	MONTE RO		D	Loss of Station	0.8206	0.8142	0.7237	Under review
NCNB-S-V-40	WHLR TAP		D	Loss of Station	0.8686	0.8666	0.7960	Under review
NCNB-S-V-41	MIRABEL		D	Loss of Station	0.8606	0.8577	0.7834	Under review
NCNB-S-V-42	MOLINO		D	Loss of Station	0.8456	0.8425	0.7696	Under review
NCNB-S-V-43	GYSRVLLE		D	Loss of Station	0.8228	0.8162	0.7363	Under review
NCNB-S-V-44	GYSR 1-2		D	Loss of Station	0.8290	0.8228	0.7443	Under review
NCNB-S-V-45	FULTON		D	Loss of Station	0.8851	0.8847	0.8220	Under review

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
NCNB-S-V-46	FTCH MTN		D	Loss of Station	0.8317	0.8257	0.7479	Under review
NCNB-S-V-47	COTATI		D	Loss of Station	0.8264	0.8217	0.7438	Under review
NCNB-S-V-48	SNMALDFL		D	Loss of Station	0.8283	0.8238	0.7462	Under review
NCNB-S-V-49	ST.HELNA		D	Loss of Station	0.8426	0.9285	0.8794	Under review
NCNB-S-V-50	SILVERDO		D	Loss of Station	0.8597	0.8595	0.8122	Under review
NCNB-S-V-51	MONTCLLO		D	Loss of Station	0.8624	0.8622	0.8148	Under review
NCNB-S-V-52	MNTCLOPH		D	Loss of Station	0.8643	0.8641	0.8168	Under review
NCNB-S-V-53	PUEBLO		D	Loss of Station	0.8957	0.8959	0.8542	Under review
NCNB-S-V-54	CALISTGA		D	Loss of Station	0.8082	0.9601	0.9243	Under review
NCNB-S-V-55	STONY PT		D	Loss of Station	0.8557	0.8554	0.8035	Under review
NCNB-S-V-56	WOHLER		D	Loss of Station	0.8683	0.8663	0.7956	Under review
NCNB-S-V-57	LAGUNA		D	Loss of Station	0.8359	0.8323	0.7573	Under review

2012/2013 ISO Reliability Assessment - Final Study Results

Study Area: **PG&E North Coast and North Bay- Winter Peak**



**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014 Winter Peak	2017 Winter Peak	2022 Winter Peak	
NCNB-W-V-1	ALTO 60kV	Ignacio _Alto 60 kV & Ignacio - Alto - Sausalito # 2 60 kV	C	L-1-1	0.70	N/A	N/A	Ignacio - Alto voltage conversion project
		Ignacio-Alto-Sausalito #2 & #1 60kV Lines	C	L-2	0.80	0.99	0.99	
NCNB-W-V-2	BOLINAS 60kV	IGNACO A 115/60.00 kV BANK & IGNACO B 115/60.00 kV BANK	C	T-1-1	1.03	0.88	0.88	Close the NO tie line between Lakeville Jct - Novato Jct 60kV. Drop load at Novato / Stafford sub as needed.
NCNB-W-V-3	CLOVRDLE 115kV	Mendocno- Ukiah 115 kV & GEYSER # 3 - CLOVERDALE 115K	C	L-1-1	0.86	0.85	0.83	Drop load at Ukiah and City of Ukiah
NCNB-W-V-4	EGLE RCK 60kV	Clear Lake- Hopland 60 Kv & EAGLE ROCK 115/60 KV BANK NO.1	C	L-1 / T-1	0.81	0.97	0.96	Middletown 115kV project.
NCNB-W-V-5	GREENBRE 60kV	Ignacio _Alto 60 kV & Ignacio - Alto - Sausalito # 2 60 kV	C	L-1-1	0.69	N/A	N/A	Ignacio - Alto voltage conversion project
		Ignacio-Alto-Sausalito #2 & #1 60kV Lines	C	L-2	0.82	1.01	1.01	
NCNB-W-V-6	GUALALA 60kV	Fulton - Ignacio No.1 230 kV & Fulton - Lakeville - Igancio 230 kV	C	L-1-1	0.95	0.96	0.89	Install reactive support at Annapolis / Fort Ross in 2022
		Fulton-Lakeville & Fulton-Ignacio 230kV Lines	C	L-1-1	0.95	0.96	0.89	
NCNB-W-V-7	HARTLEY 60kV	Clear Lake- Hopland 60 Kv & KONOCTI6 - Eagle Rck 60kV	C	L-1-1	0.59	0.96	0.94	Drop load at Hartley
NCNB-W-V-8	HPLND JT 115kV	Mendocno- Ukiah 115 kV & GEYSER # 3 - CLOVERDALE 115K	C	L-1-1	0.86	0.86	0.83	Drop load at Ukiah and City of Ukiah
NCNB-W-V-9	KONOCTI6 60kV	Clear Lake- Hopland 60 Kv & KONOCTI6 - Eagle Rck 60kV	C	L-1-1	0.45	0.97	0.96	Middletown 115kV project
NCNB-W-V-10	LOWR LKE 60kV	KONOCTI6 - Eagle Rck 60kV	B	L-1	0.90	1.01	1.00	
		BUS FAULT AT EGLE RCK 60kV	C	Bus	0.90	1.01	1.00	
		Clear Lake- Hopland 60 Kv & KONOCTI6 - Eagle Rck 60kV	C	L-1-1	0.43	0.99	0.99	
NCNB-W-V-11	MIDDLTWN 60kV	KONOCTI6 - Eagle Rck 60kV	B	L-1	0.88	1.04	1.03	
		BUS FAULT AT EGLE RCK 115kV	C	Bus	0.89	1.04	1.04	
		BUS FAULT AT EGLE RCK 60kV	C	Bus	0.88	1.04	1.03	
		Clear Lake- Hopland 60 Kv & KONOCTI6 - Eagle Rck 60kV	C	L-1-1	0.39	1.04	1.04	

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014 Winter Peak	2017 Winter Peak	2022 Winter Peak	
NCNB-W-V-12	OLEMA 60kV	IGNACO A 115/60.00 kV BANK & IGNACO B 115/60.00 kV BANK	C	T-1-1	1.01	0.87	0.87	Close the NO tie line between Lakeville Jct - Novato Jct 60kV. Drop load at Novato / Stafford sub as needed.
NCNB-W-V-13	SAUSALTO 60kV	Ignacio _Alto 60 kV & Ignacio - Alto - Saulsalito # 2 60 kV	C	L-1-1	0.68	N/A	N/A	
NCNB-W-V-14	STAFFORD 60kV	IGNACO A 115/60.00 kV BANK & IGNACO B 115/60.00 kV BANK	C	T-1-1	1.02	0.88	0.88	Close the NO tie line between Lakeville Jct - Novato Jct 60kV. Drop load at Novato / Stafford sub as needed.
NCNB-W-V-15	TOCALOMA 60kV		C	T-1-1	1.02	0.88	0.87	
NCNB-W-V-16	UKIAH 115kV	Mendocno- Ukiah 115 kV & GEYSER # 3 - CLOVERDALE 115K	C	L-1-1	0.84	0.83	0.81	Drop load at Ukiah and City of Ukiah
NCNB-W-V-17	UPPR LKE 60kV	Clear Lake- Hopland 60 Kv & KONOCT16 - Eagle Rck 60kV	C	L-1-1	0.67	0.97	0.96	Drop load at Upper lake / Hartley
NCNB-W-V-18	WOODACRE 60kV	IGNACO A 115/60.00 kV BANK & IGNACO B 115/60.00 kV BANK	C	T-1-1	1.03	0.89	0.89	Close the NO tie line between Lakeville Jct - Novato Jct 60kV. Drop load at Novato / Stafford sub as needed.
NCNB-W-V-19	GUALALA	Common Corridor between Eagle Rock - Fulton	D	Loss of all lines in a ROW	0.96	0.93	0.89	Under review
NCNB-W-V-20	GUALALA	Common corridor south of Lakeville	D	Loss of all lines in a ROW	0.95	0.94	0.90	Under review
NCNB-W-V-21	FULTON		D	Loss of Station	0.90	0.90	0.87	Under review
NCNB-W-V-22	MONROE1		D	Loss of Station	0.91	0.90	0.87	Under review
NCNB-W-V-23	MONROE2		D	Loss of Station	0.91	0.90	0.87	Under review



**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014 Winter Peak	2017 Winter Peak	2022 Winter Peak	
NCNB-W-V-24	SNTA RSA	Loss of Fulton 230kV station + Xfmrs	D	Loss of Station	0.91	0.91	0.88	Under review
NCNB-W-V-25	RINCON		D	Loss of Station	0.92	0.92	0.89	Under review
NCNB-W-V-26	GUALALA		D	Loss of Station	0.86	0.84	0.76	Under review
NCNB-W-V-27	ANNAPOLS		D	Loss of Station	0.88	0.87	0.80	Under review
NCNB-W-V-28	FORT RSS		D	Loss of Station	0.90	0.88	0.82	Under review
NCNB-W-V-29	SLMN CRK		D	Loss of Station	0.90	0.89	0.83	Under review
NCNB-W-V-30	MONTE RO		D	Loss of Station	0.92	0.90	0.85	Under review
NCNB-W-V-31	MOLINO		D	Loss of Station	0.92	0.92	0.88	Under review
NCNB-W-V-32	GYSRVILLE		D	Loss of Station	0.92	0.91	0.87	Under review
NCNB-W-V-33	GYSR 1-2		D	Loss of Station	0.92	0.91	0.87	Under review
NCNB-W-V-34	FTCH MTN		D	Loss of Station	0.92	0.91	0.87	Under review
NCNB-W-V-35	COTATI		D	Loss of Station	0.91	0.90	0.86	Under review
NCNB-W-V-36	SNMALDFL		D	Loss of Station	0.91	0.90	0.86	Under review
NCNB-W-V-37	SILVERDO		D	Loss of Station	0.92	0.92	0.89	Under review
NCNB-W-V-38	MONTCLLO		D	Loss of Station	0.92	0.92	0.89	Under review
NCNB-W-V-39	MNTCLOPH		D	Loss of Station	0.92	0.92	0.90	Under review
NCNB-W-V-40	LAGUNA		D	Loss of Station	0.91	0.91	0.87	Under review

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Summer Off-Peak	N/A	
NCNB-OP-V-1	ANNAPOLS 60kV	FULTON 115/60.00 KV BANK NO.1 & FULTON 115/60.00 KV BANK NO.2	C	T-1-1	Diverged	Diverged	N/A	Close the tie line between Petaluma C jct and Cotati sub (under off-peak conditions). Drop load at Cotati if overloads exist.
NCNB-OP-V-2	BIG RIVR 60kV	Mendocno- Ukiah 115 kV & Mendocino-Willits- Fort Bragg 60 kV	C	L-1-1	1.30	1.05	N/A	Big river SVC. Adjust generation in the interim
NCNB-OP-V-3	CALISTGA 60kV	FULTON 115/60.00 KV BANK NO.1 & FULTON 115/60.00 KV BANK NO.2	C	T-1-1	Diverged	Diverged	N/A	Close the tie line between Petaluma C jct and Cotati sub (under off-peak conditions). Drop load at Cotati if overloads exist.
NCNB-OP-V-4	CLVRDLJT 60kV		C	T-1-1	Diverged	Diverged	N/A	
NCNB-OP-V-5	COTATI 60kV		C	T-1-1	Diverged	Diverged	N/A	
NCNB-OP-V-6	ELK 60kV	Mendocno- Ukiah 115 kV & Mendocino-Willits- Fort Bragg 60 kV	C	L-1-1	1.23	1.05	N/A	Big river SVC. Adjust generation in the interim
NCNB-OP-V-7	FCHMNT2 60kV	FULTON 115/60.00 KV BANK NO.1 & FULTON 115/60.00 KV BANK NO.2	C	T-1-1	Diverged	Diverged	N/A	Close the tie line between Petaluma C jct and Cotati sub (under off-peak conditions). Drop load at Cotati if overloads exist.
NCNB-OP-V-8	FORT RSS 60kV		C	T-1-1	Diverged	Diverged	N/A	
NCNB-OP-V-9	FRT BRGG 60kV	Mendocno- Ukiah 115 kV & Mendocino-Willits- Fort Bragg 60 kV	C	L-1-1	1.30	1.06	N/A	Big river SVC. Adjust generation in the interim
		Ukiah-Hopland-Cloverdale 115 kV & Cortina-Mendocino No.1 115 kV	C	L-1-1	0.99	1.11	N/A	
NCNB-OP-V-10	FTCH MTN 60kV	FULTON 115/60.00 KV BANK NO.1 & FULTON 115/60.00 KV BANK NO.2	C	T-1-1	Diverged	Diverged	N/A	Close the tie line between Petaluma C jct and Cotati sub (under off-peak conditions). Drop load at Cotati if overloads exist.
NCNB-OP-V-11	FTCHMTNP 60kV		C	T-1-1	Diverged	Diverged	N/A	
NCNB-OP-V-12	FULTON 60kV		C	T-1-1	Diverged	Diverged	N/A	

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Study Area: **PG&E North Coast and North Bay- Summer Light Load & Summer Off-Peak**



**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Summer Off-Peak	N/A	
NCNB-OP-V-13	GARCIA 60kV	Mendocno- Ukiah 115 kV & Mendocino- Willits- Fort Bragg 60 kV	C	L-1-1	1.23	1.05	N/A	Big river SVC. Adjust generation in the interim
		Ukiah-Hopland-Cloverdale 115 kV & Cortina- Mendocino No.1 115 kV	C	L-1-1	1.00	1.11	N/A	
NCNB-OP-V-15	GUALALA 60kV	FULTON 115/60.00 KV BANK NO.1 & FULTON 115/60.00 KV BANK NO.2	C	T-1-1	Diverged	Diverged	N/A	Close the tie line between Petaluma C jct and Cotati sub (under off-peak conditions). Drop load at Cotati if overloads exist.
NCNB-OP-V-16	GYSR 1-2 60kV		C	T-1-1	Diverged	Diverged	N/A	
NCNB-OP-V-17	GYSRJCT1 60kV		C	T-1-1	Diverged	Diverged	N/A	
NCNB-OP-V-18	GYSRJCT2 60kV		C	T-1-1	Diverged	Diverged	N/A	
NCNB-OP-V-19	GYSRVLLE 60kV		C	T-1-1	Diverged	Diverged	N/A	
NCNB-OP-V-20	HDSBGTP1 60kV		C	T-1-1	Diverged	Diverged	N/A	
NCNB-OP-V-21	HDSBGTP2 60kV		C	T-1-1	Diverged	Diverged	N/A	
NCNB-OP-V-22	LAGUNA 60kV		C	T-1-1	Diverged	Diverged	N/A	
NCNB-OP-V-23	LAGUNATP 60kV		C	T-1-1	Diverged	Diverged	N/A	
NCNB-OP-V-24	MIRABEL 60kV		C	T-1-1	Diverged	Diverged	N/A	
NCNB-OP-V-25	MIRBELTP 60kV		C	T-1-1	Diverged	Diverged	N/A	
NCNB-OP-V-26	MLNO JCT 60kV		C	T-1-1	Diverged	Diverged	N/A	
NCNB-OP-V-27	MOLINO 60kV		C	T-1-1	Diverged	Diverged	N/A	
NCNB-OP-V-28	MONTE RO 60kV		C	T-1-1	Diverged	Diverged	N/A	

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Study Area: **PG&E North Coast and North Bay- Summer Light Load & Summer Off-Peak**



High/Low Voltage

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Summer Off-Peak	N/A	
NCNB-OP-V-29	PHILO 60kV	Mendocno- Ukiah 115 kV & Mendocino-Willits- Fort Bragg 60 kV	C	L-1-1	1.16	1.04	N/A	Big River SVC. Adjust Generation to mitigate the high voltage
NCNB-OP-V-30	PNT ARNA 60kV	Mendocno- Ukiah 115 kV & Mendocino-Willits- Fort Bragg 60 kV	C	L-1-1	1.23	1.05	N/A	
		Ukiah-Hopland-Cloverdale 115 kV & Cortina-Mendocino No.1 115 kV	C	L-1-1	1.00	1.11	N/A	
NCNB-OP-V-31	SLMN CRK 60kV	FULTON 115/60.00 KV BANK NO.1 & FULTON 115/60.00 KV BANK NO.2	C	L-1-1	Diverged	Diverged	N/A	Add a new Fulton 115 / 60kV transformer. In the interim drop load at Molino, Mirabel, Heldsberg, Gyserville & Fitch mountain
NCNB-OP-V-32	SLMN JCT 60kV		C	L-1-1	Diverged	Diverged	N/A	
NCNB-OP-V-33	SNMA TAP 60kV		C	L-1-1	Diverged	Diverged	N/A	
NCNB-OP-V-34	SNMALDFL 60kV		C	L-1-1	Diverged	Diverged	N/A	
NCNB-OP-V-35	ST.HELNA 60kV		C	L-1-1	Diverged	Diverged	N/A	
NCNB-OP-V-36	TRNTN JT 60kV		C	L-1-1	Diverged	Diverged	N/A	
NCNB-OP-V-37	TRNTN_JC 60kV		C	L-1-1	Diverged	Diverged	N/A	
NCNB-OP-V-38	WHLR JCT 60kV		C	L-1-1	Diverged	Diverged	N/A	
NCNB-OP-V-39	WHLR TAP 60kV		C	L-1-1	Diverged	Diverged	N/A	
NCNB-OP-V-40	WOHLER 60kV		C	L-1-1	Diverged	Diverged	N/A	



**Single Contingency Load Drop**

ID	Worst Contingency	Category	Category Description	Amount of Load Drop (MW)			Potential Mitigation Solutions
				2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	

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



**Single Contingency Load Drop**

ID	Worst Contingency	Category	Category Description	Amount of Load Drop (MW)			Potential Mitigation Solutions
				2014 Winter Peak	2017 Winter Peak	2022 Winter Peak	

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



**Single Contingency Load Drop**

ID	Worst Contingency	Category	Category Description	Amount of Load Drop (MW)			Potential Mitigation Solutions
				2014 Summer Light Load	2017 Summer Off-Peak	N/A	

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



**Single Source Substation with more than 100 MW Load**

ID	Substation	Load Served (MW)			Potential Mitigation Solutions
		2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	

No single source substation with more than 100 MW Load



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Study Area: **PG&E North Coast and North Bay- Winter Peak**



**Single Source Substation with more than 100 MW Load**

ID	Substation	Load Served (MW)			Potential Mitigation Solutions
		2014 Winter Peak	2017 Winter Peak	2022 Winter Peak	

No single source substation with more than 100 MW Load



**Single Source Substation with more than 100 MW Load**

ID	Substation	Load Served (MW)			Potential Mitigation Solutions
		2014 Summer Light Load	2017 Summer Off-Peak	N/A	

No single source substation with more than 100 MW Load

**Appendix C-4**  
**PG&E North Valley**

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014	2017	2022	
Nvly-T-01	Caribou No.11 230/115/60 kV Transformer	BUS FAULT AT 31482 PALERMO 115.00	C1	Bus	106%	106%	106%	Add bus tie breaker at Palermo 115 kV bus
Nvly-T-02	Sycamore Creek-Notre Dame-Table Mountain 115 kV Line	BUS FAULT AT 31504 TBLE MTN Bus 1 Sec F 115.00	C1	Bus	138%	72%	78%	Interim operating solution
Nvly-T-03	Table Mountain-Butte No.1 115 kV Line	BUS FAULT AT 31504 TBLE MTN Bus 2 Sec E 115.00	C1	Bus	106%	65%	70%	Interim operating solution
Nvly-T-04	Table Mountain-Paradise 115 kV Line	BUS FAULT AT 31504 TBLE MTN Bus 1 Sec F 115.00	C1	Bus	106%	62%	66%	Interim operating solution
Nvly-T-05	Keswick-Cascade 60 kV Line	COTTONWOOD BUS PARALLEL BKR STUCK 115KV	C2	Stuck Bkr	168%	148%	95%	Operating solution
Nvly-T-06	Trinity-Keswick 60 kV Line	COTTONWOOD BUS PARALLEL BKR STUCK 115KV	C2	Stuck Bkr	155%	138%	94%	Operating solution
Nvly-T-07	Butte-Sycamore Creek 115 kV Line	Sycamore Creek-Notre Dame-Table MOUNTAIN-Table Mountain-Butte No.1 115 kV Line	C3	N-1-1	105%	29%	33%	Interim operating solution
Nvly-T-08	Coleman-Red Bluff 60 kV Line	Cottonwood-Red Bluff 60 kV Line _Cottonwood No.1 60 kV Line	C3	N-1-1	134%	36%	36%	Interim operating solution
Nvly-T-09	Cottonwood-Benton No.1 60 kV Line	Cottonwood No.1 230/115 kV Transformer_Cottonwood No.4 230/115 kV Transformer	C3	N-1-1	129%	117%	95%	Operating solution
Nvly-T-10	Keswick-Cascade 60 kV Line	Bridgeville-Cottonwood 115 kV Line _Trinity-Cottonwood 115 kV Line	C3	N-1-1	176%	156%	104%	Operating solution
Nvly-T-11	Round Mountain-Cottonwood(E) No.2 230 kV Line	Cottonwood-Round Mountain 230 kV Line _Round Mountain No.1 500/230 kV Transform	C3	N-1-1	103%	102%	102%	Operating solution
Nvly-T-12	Round Mountain-Cottonwood(E) No.3 230 kV Line	Round Mountain-Cottonwood(E) No.2 230 _Round Mountain No.1 500/230 kV Transform	C3	N-1-1	114%	114%	114%	Operating solution

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Study Area: **PG&E North Valley - Summer Peak**



**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014	2017	2022	
Nvly-T-13	Table Mountain-Butte No.1 115 kV Line	Sycamore Creek-Notre Dame-Table MOUNTAIN-Butte No.2 115 kV Line	C3	N-1-1	144%	95%	103%	Interim operating solution and re-rate.
Nvly-T-14	Table Mountain-Butte No.2 115 kV Line	Sycamore Creek-Notre Dame-Table MOUNTAIN-Butte No.1 115 kV Line	C3	N-1-1	143%	87%	95%	Interim operating solution
Nvly-T-15	Trinity-Keswick 60 kV Line	Bridgeville-Cottonwood 115 kV Line _Trinity-Cottonwood 115 kV Line	C3	N-1-1	161%	144%	100%	Operating solution
Nvly-T-16	Trinity-Maple Creek 60 kV Line	Humboldt-Trinity 115 kV Line _Bridgeville-Cottonwood 115 kV Line	C3	N-1-1	133%	112%	77%	Operating solution
Nvly-T-17	Table Mountain-Butte No.1 115 kV Line	Sycamore Creek-Notre Dame-Table Mountain and Table Mountain-Butte No.2 115 kV Lines	C5	DCTL	144%	95%	103%	Interim operating solution and re-rate.
Nvly-T-18	Cottonwood-Benton No.1 60 kV Line	Loss of Cottonwood 230 kV substation	D8	Loss of Substation	127%	117%	99%	Under Review

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Summer Off-Peak	N/A	
Nvly-OP-T-01	Keswick-Cascade 60 kV Line	Bridgeville-Cottonwood 115 kV Line _Trinity-Cottonwood 115 kV Line	C3	N-1-1	48%	176%		Reduce Humboldt generation.
Nvly-OP-T-02	Trinity-Keswick 60 kV Line	Bridgeville-Cottonwood 115 kV Line _Trinity-Cottonwood 115 kV Line	C3	N-1-1	38%	147%		Reduce Humboldt generation.
Nvly-OP-T-03	Cottonwood-Benton No.1 60 kV Line	Cottonwood No.1 230/115 kV Transformer_Cottonwood No.4 230/115 kV Transformer	C3	N-1-1	113%	69%		Operating solution
Nvly-OP-T-04	Table Mountain-Pease 60 kV Line (Peach-Encinal Tap)	Palermo-Pease 115 kV Line and Pease-Rio Oso 115 kV Line	C5	DCTL	101%	85%		Reduce Pease 60 kV generation

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014	2017	2022	
Nvly-DV-01	BIG MDWS 60 kV	Caribou-Table Mountain 230 kV Line	B	N-1	-5%	-5%	-6%	Existing SPS
Nvly-DV-02	CHESTER 60 kV	Caribou-Table Mountain 230 kV Line	B	N-1	-8%	-8%	-9%	Existing SPS
Nvly-DV-03	GANSNER 60 kV	Caribou-Table Mountain 230 kV Line	B	N-1	-5%	-5%	-5%	Existing SPS
Nvly-DV-04	GRYS FLT 60 kV	Caribou-Table Mountain 230 kV Line	B	N-1	-5%	-5%	-5%	Existing SPS
Nvly-DV-05	HMLTN BR 60 kV	Caribou-Table Mountain 230 kV Line	B	N-1	-5%	-5%	-6%	Existing SPS
Nvly-DV-06	SPANSHCK 60 kV	Caribou-Table Mountain 230 kV Line	B	N-1	-5%	-5%	-5%	Existing SPS
Nvly-DV-07	CHICO B 115 kV	BUS FAULT AT 31504 TBLE MTN Bus 1 Sec F 115.00	C1	Bus	-10%	-1%	-1%	Interim operating solution.
Nvly-DV-08	STLLWATR 60 kV	BUS FAULT AT 31580 CASCADE 60.00	C1	Bus	-10%	-10%	-11%	Voltage support at STLLWATR 60 kV
Nvly-DV-09	FRNCHGLH 60 kV	COTTONWOOD BUS PARALLEL BKR STUCK 115KV	C2	Stuck Bkr	-11%	-8%	-5%	Interim operating solution.
Nvly-DV-10	KESWICK 60 kV	COTTONWOOD BUS PARALLEL BKR STUCK 115KV	C2	Stuck Bkr	-10%	-8%	-6%	Interim operating solution.

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Summer Off-Peak	N/A	
Nvly-OP-DV-01	DIRYVLLLE 60 kV	BUS FAULT AT 31608 RED BLFF 60.00	C1	Bus	-13%	-2%		Interim operating solution
Nvly-OP-DV-02	LP FB SP 60 kV	BUS FAULT AT 31608 RED BLFF 60.00	C1	Bus	-16%	-6%		Interim operating solution
Nvly-OP-DV-03	GERBER 60 kV	BUS FAULT AT 31608 RED BLFF 60.00	C1	Bus	-16%	-6%		Interim operating solution
Nvly-OP-DV-04	LS MLNSJ 60 kV	BUS FAULT AT 31608 RED BLFF 60.00	C1	Bus	-13%	-2%		Interim operating solution
Nvly-OP-DV-05	VINA 60 kV	BUS FAULT AT 31608 RED BLFF 60.00	C1	Bus	-13%	-2%		Interim operating solution



High/Low Voltage

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014	2017	2022	
Nvly-V-01	CAPYSWCH 60 kV	Normal	A	N-0	1.05	1.05	1.05	Under review for possible exemption.
Nvly-V-02	CORNSWCH 60 kV	Normal	A	N-0	1.05	1.05	1.05	Under review for possible exemption.
Nvly-V-03	CR CANAL 60 kV	Normal	A	N-0	0.91	1.02	1.03	Interim operating solution.
Nvly-V-04	GLENN 60 kV	Normal	A	N-0	1.05	1.05	1.05	Under review for possible exemption.
Nvly-V-05	HATLOSCK 60 kV	Normal	A	N-0	1.06	1.06	1.06	Under review for possible exemption.
Nvly-V-06	HT CRKRG 60 kV	Normal	A	N-0	1.06	1.06	1.06	Under review for possible exemption.
Nvly-V-07	MALACHA1 115 kV	Normal	A	N-0	1.05	1.05	1.05	Under review for possible exemption.
Nvly-V-08	RASN JNT 60 kV	Normal	A	N-0	0.92	1.02	1.03	Interim operating solution.
Nvly-V-09	TYLER 60 kV	Normal	A	N-0	0.91	1.02	1.03	Interim operating solution.
Nvly-V-10	BIG BAR 60 kV	Humboldt-Trinity 115 kV Line _Bridgeville-Cottonwood 115 kV Line	C3	N-1-1	0.85	0.93	0.98	Interim operating solution.
Nvly-V-11	CLARK RD 60 kV	Table Mountain No.2 230/115/60 kV Tran_DE SABLA 6.90 Unit ID 1	C3	N-1-1	0.89	0.89	0.88	Operating solution.
Nvly-V-12	CNTRVLE 60 kV	Table Mountain No.2 230/115/60 kV Tran_DE SABLA 6.90 Unit ID 1	C3	N-1-1	0.89	0.89	0.88	Operating solution.
Nvly-V-13	DE SABLA 60 kV	Table Mountain No.2 230/115/60 kV Tran_DE SABLA 6.90 Unit ID 1	C3	N-1-1	0.89	0.89	0.88	Operating solution.
Nvly-V-14	DIRYVLE 60 kV	Cottonwood-Red Bluff 60 kV Line _Cottonwood No.1 60 kV Line	C3	N-1-1	0.90	1.01	1.01	Interim operating solution.
Nvly-V-15	GERBER 60 kV	Coleman-Red Bluff 60 kV Line _Cottonwood-Red Bluff 60 kV Line	C3	N-1-1	0.87	1.01	1.01	Interim operating solution.
Nvly-V-16	GROUSCRK 60 kV	Humboldt-Trinity 115 kV Line _Bridgeville-Cottonwood 115 kV Line	C3	N-1-1	0.83	0.93	0.98	Interim operating solution.
Nvly-V-17	HYAMPOM 60 kV	Humboldt-Trinity 115 kV Line _Bridgeville-Cottonwood 115 kV Line	C3	N-1-1	0.83	0.93	0.98	Interim operating solution.
Nvly-V-18	LP FB SP 60 kV	Coleman-Red Bluff 60 kV Line _Cottonwood-Red Bluff 60 kV Line	C3	N-1-1	0.88	1.02	1.02	Interim operating solution.
Nvly-V-19	LS MLNSJ 60 kV	Cottonwood-Red Bluff 60 kV Line _Cottonwood No.1 60 kV Line	C3	N-1-1	0.89	1.00	1.00	Interim operating solution.
Nvly-V-20	RED BLFF 60 kV	Cottonwood-Red Bluff 60 kV Line _Cottonwood No.1 60 kV Line	C3	N-1-1	0.87	1.03	1.04	Interim operating solution.
Nvly-V-21	TRES VIS 60 kV	Table Mountain No.2 230/115/60 kV Tran_DE SABLA 6.90 Unit ID 1	C3	N-1-1	0.90	0.91	0.90	Operating solution.

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014	2017	2022	
Nvly-V-22	VINA 60 kV	Cottonwood-Red Bluff 60 kV Line _Cottonwood No.1 60 kV Line	C3	N-1-1	0.88	1.00	1.00	Interim operating solution.

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Summer Off-Peak	N/A	
Nvly-OP-V-01	FRSTGLEN 115 kV	Normal	A	N-0	1.05	1.06		Under review for possible exemption.
Nvly-OP-V-02	HYAMPOM 60 kV	Normal	A	N-0	1.05	1.06		Under review for possible exemption.
Nvly-OP-V-03	WILDWOOD 115 kV	Normal	A	N-0	1.06	1.06		Under review for possible exemption.
Nvly-OP-V-04	TRINITY 115 kV	Normal	A	N-0	1.06	1.06		Under review for possible exemption.
Nvly-OP-V-05	PANRAMA 115 kV	Normal	A	N-0	1.06	1.06		Under review for possible exemption.
Nvly-OP-V-06	MALACHA1 115 kV	Normal	A	N-0	1.05	1.05		Under review for possible exemption.
Nvly-OP-V-07	OREGNTRL 115 kV	Normal	A	N-0	1.04	1.05		Under review for possible exemption.
Nvly-OP-V-08	SMPSN-AN 115 kV	Normal	A	N-0	1.06	1.06		Under review for possible exemption.
Nvly-OP-V-09	WHEELBR 115 kV	Normal	A	N-0	1.06	1.06		Under review for possible exemption.
Nvly-OP-V-10	COTWDPGE 115 kV	Normal	A	N-0	1.06	1.06		Under review for possible exemption.
Nvly-OP-V-11	JESSUP 115 kV	Normal	A	N-0	1.05	1.06		Under review for possible exemption.
Nvly-OP-V-12	CASCADE 115 kV	Normal	A	N-0	1.04	1.05		Under review for possible exemption.
Nvly-OP-V-13	SPI_AND 115 kV	Normal	A	N-0	1.05	1.05		Under review for possible exemption.
Nvly-OP-V-14	BIG BAR 60 kV	Normal	A	N-0	1.05	1.06		Under review for possible exemption.
Nvly-OP-V-15	GROUSCRK 60 kV	Normal	A	N-0	1.05	1.06		Under review for possible exemption.

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Summer Off-Peak	N/A	
Nvly-OP-V-16	TRINITY 60 kV	Normal	A	N-0	1.05	1.06		Under review for possible exemption.
Nvly-OP-V-17	FRNCHGLH 60 kV	Normal	A	N-0	1.05	1.05		Under review for possible exemption.
Nvly-OP-V-18	KESWICK 60 kV	Normal	A	N-0	1.04	1.05		Under review for possible exemption.
Nvly-OP-V-19	COWCK TP 60 kV	Normal	A	N-0	1.04	1.05		Under review for possible exemption.
Nvly-OP-V-20	TKO TAP 60 kV	Normal	A	N-0	1.04	1.05		Under review for possible exemption.
Nvly-OP-V-21	HT CRKRG 60 kV	Normal	A	N-0	1.05	1.05		Under review for possible exemption.
Nvly-OP-V-22	HATLOSCK 60 kV	Normal	A	N-0	1.05	1.05		Under review for possible exemption.
Nvly-OP-V-23	NewBus 60 kV	Normal	A	N-0	N/A	1.05		Under review for possible exemption.
Nvly-OP-V-24	DIRYVLL 60 kV	BUS FAULT AT 31608 RED BLFF 60.00	C1	Bus	0.88	1.02		Interim operating solution
Nvly-OP-V-25	LS MLNSJ 60 kV	BUS FAULT AT 31608 RED BLFF 60.00	C1	Bus	0.88	1.02		Interim operating solution
Nvly-OP-V-26	VINA 60 kV	BUS FAULT AT 31608 RED BLFF 60.00	C1	Bus	0.88	1.01		Interim operating solution
Nvly-OP-V-27	RED BLFF 60 kV	BUS FAULT AT 31608 RED BLFF 60.00	C1	Bus	0.85	N/A		Interim operating solution
Nvly-OP-V-28	GERBER 60 kV	BUS FAULT AT 31608 RED BLFF 60.00	C1	Bus	0.85	0.98		Interim operating solution
Nvly-OP-V-29	LP FB SP 60 kV	BUS FAULT AT 31608 RED BLFF 60.00	C1	Bus	0.84	0.98		Interim operating solution



**Transient Stability**

ID	Contingency	Category	Category Description	Transient Stability Performance			Potential Mitigation Solutions
				2014	2017	2022	

No transient stability issues identified.



**Transient Stability**

ID	Contingency	Category	Category Description	Transient Stability Performance			Potential Mitigation Solutions
				2014 Summer Light Load	2017 Summer Off-Peak	N/A	

No transient stability issues identified.

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**Single Contingency Load Drop**

ID	Worst Contingency	Category	Category Description	Amount of Load Drop (MW)			Potential Mitigation Solutions
				2014	2017	2022	

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

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**Single Source Substation with more than 100 MW Load**

ID	Substation	Load Served (MW)			Potential Mitigation Solutions
		2014	2017	2022	

No single source substation with more than 100 MW Load



**Appendix C-5**  
**PG&E Central Valley - Sacramento**

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Study Area: **PG&E Central Valley Sacramento - Summer Peak**



**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
Sac-T-01	Dixon - Vaca 60 kV Line No. 1	Dixon - Vaca 60 kV Line No. 2	B	N-1	101%	N/A	N/A	Interim operating solution.
Sac-T-02	Vaca Dixon 115/60 kV Transformer No. 5	Vaca Dixon 115/60 kV Transformer No. 9	B	N-1	123%	N/A	N/A	Interim operating solution.
Sac-T-03	Rio Oso - West Sacramento 115 kV Line	BUS FAULT AT 31984 BRIGHTN 115.00	C1	Bus	151%	57%	57%	Interim operating solution.
Sac-T-04	Rio Oso - Woodland 115 kV No. 1	BUS FAULT AT 31984 BRIGHTN 115.00	C1	Bus	105%	38%	39%	Interim operating solution.
Sac-T-05	Rio Oso - Woodland 115 kV No. 2	BUS FAULT AT 31984 BRIGHTN 115.00	C1	Bus	107%	40%	40%	Interim operating solution.
Sac-T-06	Woodland - Davis 115 kV Line	BUS FAULT AT 31984 BRIGHTN 115.00	C1	Bus	155%	6%	9%	Interim operating solution.
Sac-T-07	Vaca Dixon 230/115 kV Transformer No. 3	VACA-DIX E 230 kV Bus 2 and VACA-DIX F 230 kV Bus 2 - CB 622 Failure	C2	Stuck Bkr	90%	119%	130%	Operating solution.
Sac-T-08	Vaca Dixon 230/115 kV Transformer No. 4	VACA-DIX E 230 kV Bus 1 and Bus 2 - CB 202 Failure - Vaca-Davis	C2	Stuck Bkr	90%	115%	125%	Operating solution.
Sac-T-09	Brighton - Davis 115 kV Line	Woodland - Davis 115 kV Line _West Sacramento - Davis 115 kV Line	C3	N-1-1	140%	30%	35%	Interim operating solution.
Sac-T-10	Brighton 230/115 kV Transformer No. 9	Woodland - Davis 115 kV Line _Brighton 230/115 kV Transformer No. 10	C3	N-1-1	105%	38%	39%	Interim operating solution.
Sac-T-11	Rio Oso - West Sacramento 115 kV Line	Rio Oso - Brighton 230 kV Line _Woodland - Davis 115 kV Line	C3	N-1-1	122%	60%	57%	Interim operating solution.
Sac-T-12	Vaca Dixon 115/60 kV Transformer No. 5	Dixon - Vaca 60 kV Line No. 2 _Vaca Dixon 115/60 kV Transformer No. 9	C3	N-1-1	126%	N/A	N/A	Interim operating solution.
Sac-T-13	Vaca Dixon 230/115 kV Transformer No. 2	Vaca Dixon 230/115 kV Transformer No. _Vaca Dixon 230/115 kV Transformer No. 4	C3	N-1-1	N/A	117%	129%	Operating solution.

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
Sac-T-14	Vaca Dixon 230/115 kV Transformer No. 3	Vaca Dixon 230/115 kV Transformer No. _Vaca Dixon 230/115 kV Transformer No. 4	C3	N-1-1	N/A	121%	132%	Operating solution.
Sac-T-15	Vaca Dixon 230/115 kV Transformer No. 4	Vaca Dixon 230/115 kV Transformer No. _Vaca Dixon 230/115 kV Transformer No. 3	C3	N-1-1	N/A	121%	132%	Operating solution.
Sac-T-16	Vaca Dixon 230/115 kV Transformer Nos. 2 & 2A	Vaca Dixon 230/115 kV Transformer No. _Vaca Dixon 230/115 kV Transformer No. 4	C3	N-1-1	167%	N/A	N/A	Interim operating solution.
Sac-T-17	West Sacramento - Davis 115 kV Line	Woodland - Davis 115 kV Line _Brighton - Davis 115 kV Line	C3	N-1-1	108%	27%	32%	Interim operating solution.
Sac-T-18	Woodland - Davis 115 kV Line	West Sacramento - Davis 115 kV Line _Brighton - Davis 115 kV Line	C3	N-1-1	152%	N/A	N/A	Interim operating solution.
Sac-T-19	Brighton - Davis 115 kV Line	Rio Oso-West Sacramento 115 kV Line & West Sacramento-Brighton 115 kV Line	C5	DCTL	140%	36%	37%	Interim operating solution.
Sac-T-20	Woodland - Davis 115 kV Line	Rio Oso-West Sacramento 115 kV Line & West Sacramento-Brighton 115 kV Line	C5	DCTL	119%	N/A	N/A	Interim operating solution.
Sac-T-21	Woodland - Davis 115 kV Line	Loss of Rio Oso 115 kV substation	D8	Loss of Substation	101%	N/A	N/A	Under Review
Sac-T-22	West Sacramento - Brighton 115 kV Line	Loss of Rio Oso 115 kV substation	D8	Loss of Substation	110%	45%	47%	Under Review
Sac-T-23	Brighton - Davis 115 kV Line	Loss of Rio Oso 115 kV substation	D8	Loss of Substation	135%	34%	34%	Under Review



**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Summer Off-Peak	N/A	

No thermal overloads identified.

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
Sac-DV-01	MOBILCHE 115 kV	BUS FAULT AT 31984 BRIGHTN 115.00	C1	Bus	-18%	-1%	-1%	Interim operating solution
Sac-DV-02	KNIGHTLD 115 kV	BUS FAULT AT 31984 BRIGHTN 115.00	C1	Bus	-14%	0%	0%	Interim operating solution
Sac-DV-03	WOODLD 115 kV	BUS FAULT AT 31984 BRIGHTN 115.00	C1	Bus	-18%	-1%	-1%	Interim operating solution
Sac-DV-04	ZAMORA 115 kV	BUS FAULT AT 31984 BRIGHTN 115.00	C1	Bus	-14%	0%	0%	Interim operating solution
Sac-DV-05	POST 115 kV	BUS FAULT AT 31984 BRIGHTN 115.00	C1	Bus	-27%	-4%	-4%	Interim operating solution
Sac-DV-06	W.SCRMNO 115 kV	BUS FAULT AT 31984 BRIGHTN 115.00	C1	Bus	-27%	-4%	-4%	Interim operating solution
Sac-DV-07	DEEPWATR 115 kV	BUS FAULT AT 31984 BRIGHTN 115.00	C1	Bus	-27%	-4%	-4%	Interim operating solution
Sac-DV-08	BRKR SLG 115 kV	BUS FAULT AT 31984 BRIGHTN 115.00	C1	Bus	-25%	-3%	-3%	Interim operating solution
Sac-DV-09	DAVIS 115 kV	BUS FAULT AT 31984 BRIGHTN 115.00	C1	Bus	-24%	-2%	-2%	Interim operating solution
Sac-DV-10	CAMPUS 115 kV	BUS FAULT AT 31984 BRIGHTN 115.00	C1	Bus	-24%	-2%	-2%	Interim operating solution
Sac-DV-11	WCRP 115 kV	BUS FAULT AT 31984 BRIGHTN 115.00	C1	Bus	-27%	-4%	-4%	Interim operating solution
Sac-DV-12	POST 115 kV	Rio Oso-West Sacramento 115 kV Line & West Sacramento-Brighton 115 kV Line	C5	DCTL	-13%	-4%	-5%	Interim operating solution
Sac-DV-13	W.SCRMNO 115 kV	Rio Oso-West Sacramento 115 kV Line & West Sacramento-Brighton 115 kV Line	C5	DCTL	-13%	-4%	-5%	Interim operating solution
Sac-DV-14	DEEPWATR 115 kV	Rio Oso-West Sacramento 115 kV Line & West Sacramento-Brighton 115 kV Line	C5	DCTL	-14%	-4%	-5%	Interim operating solution
Sac-DV-15	DAVIS 115 kV	Rio Oso-West Sacramento 115 kV Line & West Sacramento-Brighton 115 kV Line	C5	DCTL	-10%	-2%	-2%	Interim operating solution

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Study Area: **PG&E Central Valley Sacramento - Summer Peak**



**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
Sac-DV-16	CAMPUS 115 kV	Rio Oso-West Sacramento 115 kV Line & West Sacramento-Brighton 115 kV Line	C5	DCTL	-10%	-2%	-2%	Interim operating solution
Sac-DV-17	WCRP 115 kV	Rio Oso-West Sacramento 115 kV Line & West Sacramento-Brighton 115 kV Line	C5	DCTL	-14%	-5%	-5%	Interim operating solution

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Summer Off-Peak	N/A	

No voltage deviations identified.

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Proposed Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
Sac-V-01	CORTINA 115 kV	Normal	A	N-0	1.06	1.06	1.07	Under review for possible exemption.
Sac-V-02	PLAINFLD 115 kV	Vaca Dixon 115/60 kV Transformer No. 9	B	N-1	0.87	N/A	N/A	Interim operating solution.
Sac-V-03	BRKR SLG 115 kV	BUS FAULT AT 31984 BRIGHTN 115.00	C1	Bus	0.75	0.99	0.99	Interim operating solution.
Sac-V-04	CAMPUS 115 kV	BUS FAULT AT 31984 BRIGHTN 115.00	C1	Bus	0.75	0.99	0.99	Interim operating solution.
Sac-V-05	DAVIS 115 kV	BUS FAULT AT 31984 BRIGHTN 115.00	C1	Bus	0.75	0.99	0.99	Interim operating solution.
Sac-V-06	DEEPWATR 115 kV	BUS FAULT AT 31984 BRIGHTN 115.00	C1	Bus	0.75	0.99	0.98	Interim operating solution.
Sac-V-07	KNIGHTLD 115 kV	BUS FAULT AT 31984 BRIGHTN 115.00	C1	Bus	0.86	1.02	1.01	Interim operating solution.
Sac-V-08	MOBILCHE 115 kV	BUS FAULT AT 31984 BRIGHTN 115.00	C1	Bus	0.81	1.00	1.00	Interim operating solution.
Sac-V-09	PLAINFLD 115 kV	BUS FAULT AT 30460 VACA-DIX 230.00 Sec 1F	C1	Bus	0.89	1.00	1.00	Interim operating solution.
Sac-V-10	POST 115 kV	BUS FAULT AT 31984 BRIGHTN 115.00	C1	Bus	0.75	0.99	0.99	Interim operating solution.
Sac-V-11	W.SCRMNO 115 kV	BUS FAULT AT 31984 BRIGHTN 115.00	C1	Bus	0.75	0.99	0.99	Interim operating solution.
Sac-V-12	WCRP 115 kV	BUS FAULT AT 31984 BRIGHTN 115.00	C1	Bus	0.75	0.99	0.99	Interim operating solution.
Sac-V-13	WOODLD 115 kV	BUS FAULT AT 31984 BRIGHTN 115.00	C1	Bus	0.81	1.00	1.00	Interim operating solution.
Sac-V-14	ZAMORA 115 kV	BUS FAULT AT 31984 BRIGHTN 115.00	C1	Bus	0.85	1.01	1.01	Interim operating solution.
Sac-V-15	PLAINFLD 115 kV	VACA-DIX E 230 kV Bus 1 and Bus 2 - CB 202 Failure - Vaca-Davis	C2	Stuck Bkr	0.87	1.00	1.00	Interim operating solution.
Sac-V-16	ARBUCKLE 60 kV	Delevan - Cortina 230 kV Line _Cortina - Vaca 230 kV Line	C3	N-1-1	0.91	0.90	0.89	Cortina voltage support



High/Low Voltage

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Proposed Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
Sac-V-17	CAMPUS 115 kV	West Sacramento - Davis 115 kV Line _Brighton - Davis 115 kV Line	C3	N-1-1	0.82	0.99	0.99	Interim operating solution.
Sac-V-18	COLUSA 60 kV	Delevan - Cortina 230 kV Line _Cortina - Vaca 230 kV Line	C3	N-1-1	0.88	0.87	0.86	Cortina voltage support
Sac-V-19	CORT_D 115 kV	Delevan - Cortina 230 kV Line _Cortina - Vaca 230 kV Line	C3	N-1-1	0.89	0.88	0.88	Cortina voltage support
Sac-V-20	DAVIS 115 kV	West Sacramento - Davis 115 kV Line _Brighton - Davis 115 kV Line	C3	N-1-1	0.82	0.99	0.99	Interim operating solution.
Sac-V-21	DRAKE 60 kV	Delevan - Cortina 230 kV Line _Cortina - Vaca 230 kV Line	C3	N-1-1	0.90	0.89	0.88	Cortina voltage support
Sac-V-22	DUNNIGAN 60 kV	Delevan - Cortina 230 kV Line _Cortina - Vaca 230 kV Line	C3	N-1-1	0.89	0.87	0.86	Cortina voltage support
Sac-V-23	HARINTON 60 kV	Delevan - Cortina 230 kV Line _Cortina - Vaca 230 kV Line	C3	N-1-1	0.91	0.89	0.88	Cortina voltage support
Sac-V-24	MAXWELL 60 kV	Delevan - Cortina 230 kV Line _Cortina - Vaca 230 kV Line	C3	N-1-1	0.90	0.88	0.88	Cortina voltage support
Sac-V-25	MOBILCHE 115 kV	West Sacramento - Davis 115 kV Line _Brighton - Davis 115 kV Line	C3	N-1-1	0.87	1.00	1.00	Interim operating solution.
Sac-V-26	PLAINFLD 115 kV	Vaca Dixon 230/115 kV Transformer No. _Vaca Dixon 230/115 kV Transformer No. 4	C3	N-1-1	0.86	0.99	0.99	Interim operating solution.
Sac-V-27	POST 115 kV	West Sacramento - Brighton 115 kV Line_Brighton - Davis 115 kV Line	C3	N-1-1	0.87	1.02	1.01	Interim operating solution.
Sac-V-28	W.SCRMNO 115 kV	West Sacramento - Brighton 115 kV Line_Brighton - Davis 115 kV Line	C3	N-1-1	0.87	1.02	1.01	Interim operating solution.
Sac-V-29	WOODLD 115 kV	West Sacramento - Davis 115 kV Line _Brighton - Davis 115 kV Line	C3	N-1-1	0.86	1.00	1.00	Interim operating solution.
Sac-V-30	ZAMORA 115 kV	West Sacramento - Davis 115 kV Line _Brighton - Davis 115 kV Line	C3	N-1-1	0.90	1.01	1.01	Interim operating solution.

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Proposed Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
Sac-V-31	CAMPUS 115 kV	Rio Oso-West Sacramento 115 kV Line & West Sacramento-Brighton 115 kV Line	C5	DCTL	0.89	1.00	0.99	Interim operating solution.
Sac-V-32	DAVIS 115 kV	Rio Oso-West Sacramento 115 kV Line & West Sacramento-Brighton 115 kV Line	C5	DCTL	0.89	1.00	0.99	Interim operating solution.
Sac-V-33	DEEPWATR 115 kV	Rio Oso-West Sacramento 115 kV Line & West Sacramento-Brighton 115 kV Line	C5	DCTL	0.88	0.99	0.98	Interim operating solution.
Sac-V-34	PLAINFLD 115 kV	Lambie Sw Sta-Birds Landing Sw Sta 230 kV Line & Peabody-Birds Landing Sw Sta 23	C5	DCTL	0.90	1.01	1.00	Interim operating solution.
Sac-V-35	POST 115 kV	Rio Oso-West Sacramento 115 kV Line & West Sacramento-Brighton 115 kV Line	C5	DCTL	0.89	0.99	0.98	Interim operating solution.
Sac-V-36	W.SCRMNO 115 kV	Rio Oso-West Sacramento 115 kV Line & West Sacramento-Brighton 115 kV Line	C5	DCTL	0.89	0.99	0.98	Interim operating solution.
Sac-V-37	WCRP 115 kV	Rio Oso-West Sacramento 115 kV Line & West Sacramento-Brighton 115 kV Line	C5	DCTL	0.88	0.99	0.98	Interim operating solution.

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Summer Off-Peak	N/A	
Sac-OP-V-01	CRTNA M 230 kV	Normal	A	N-0	1.03	1.05		Under review for possible exemption.
Sac-OP-V-02	FLTN JT2 115 kV	Normal	A	N-0	1.07	1.04		Under review for possible exemption.
Sac-OP-V-03	FLTN JCT 115 kV	Normal	A	N-0	1.07	1.04		Under review for possible exemption.
Sac-OP-V-04	CORTINA 115 kV	Normal	A	N-0	1.06	1.06		Under review for possible exemption.
Sac-OP-V-05	CORT_D 115 kV	Normal	A	N-0	1.05	1.08		Under review for possible exemption.
Sac-OP-V-06	PUTH CRK 115 kV	Normal	A	N-0	1.07	1.04		Under review for possible exemption.
Sac-OP-V-07	AMEGTAP 115 kV	Normal	A	N-0	1.07	1.04		Under review for possible exemption.
Sac-OP-V-08	PUTHCRK1 115 kV	Normal	A	N-0	1.07	1.04		Under review for possible exemption.
Sac-OP-V-09	AMERIGAS 115 kV	Normal	A	N-0	1.07	1.04		Under review for possible exemption.
Sac-OP-V-10	CORDELIA 115 kV	Normal	A	N-0	1.07	1.04		Under review for possible exemption.
Sac-OP-V-11	MADISON 115 kV	Normal	A	N-0	1.07	1.04		Under review for possible exemption.
Sac-OP-V-12	HALE 115 kV	Normal	A	N-0	1.06	1.04		Under review for possible exemption.
Sac-OP-V-13	HALE J1 115 kV	Normal	A	N-0	1.06	1.04		Under review for possible exemption.
Sac-OP-V-14	SCHMLBCH 115 kV	Normal	A	N-0	1.06	1.04		Under review for possible exemption.
Sac-OP-V-15	VACA-DIX 115 kV	Normal	A	N-0	1.07	1.04		Under review for possible exemption.

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Summer Off-Peak	N/A	
Sac-OP-V-16	PUTHCRK2 115 kV	Normal	A	N-0	1.07	1.04		Under review for possible exemption.
Sac-OP-V-17	VACA-CB 115 kV	Normal	A	N-0	1.07	N/A		Under review for possible exemption.
Sac-OP-V-18	VACAVLL1 115 kV	Normal	A	N-0	1.07	1.04		Under review for possible exemption.
Sac-OP-V-19	VACAVLL2 115 kV	Normal	A	N-0	1.07	1.04		Under review for possible exemption.
Sac-OP-V-20	VCVLE2J 115 kV	Normal	A	N-0	1.07	1.04		Under review for possible exemption.
Sac-OP-V-21	VCVLE1J 115 kV	Normal	A	N-0	1.07	1.04		Under review for possible exemption.
Sac-OP-V-22	SUISUN 115 kV	Normal	A	N-0	1.06	1.04		Under review for possible exemption.
Sac-OP-V-23	JAMESN-A 115 kV	Normal	A	N-0	1.06	1.04		Under review for possible exemption.
Sac-OP-V-24	JAMESON 115 kV	Normal	A	N-0	1.06	1.04		Under review for possible exemption.
Sac-OP-V-25	WEC 115 kV	Normal	A	N-0	1.06	1.04		Under review for possible exemption.
Sac-OP-V-26	HALE J2 115 kV	Normal	A	N-0	1.07	1.04		Under review for possible exemption.
Sac-OP-V-27	HALE2 115 kV	Normal	A	N-0	1.06	1.04		Under review for possible exemption.
Sac-OP-V-28	JMSN JCT 115 kV	Normal	A	N-0	1.06	1.04		Under review for possible exemption.
Sac-OP-V-29	VACA-DXN 60 kV	Normal	A	N-0	1.07	N/A		Under review for possible exemption.
Sac-OP-V-30	WINTERS 60 kV	Normal	A	N-0	1.06	N/A		Under review for possible exemption.

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Summer Off-Peak	N/A	
Sac-OP-V-31	VACA-JT2 115 kV	Normal	A	N-0	1.07	1.04		Under review for possible exemption.
Sac-OP-V-32	VACA-JT1 115 kV	Normal	A	N-0	1.06	1.04		Under review for possible exemption.
Sac-OP-V-33	DIXON 115 kV	Normal	A	N-0	1.06	1.04		Under review for possible exemption.
Sac-OP-V-34	DIXON-J2 60 kV	Normal	A	N-0	1.06	N/A		Under review for possible exemption.
Sac-OP-V-35	DIXON-J1 60 kV	Normal	A	N-0	1.06	N/A		Under review for possible exemption.
Sac-OP-V-36	DIXONCAN 115 kV	Normal	A	N-0	1.06	1.04		Under review for possible exemption.
Sac-OP-V-37	CACHSTAP 60 kV	Normal	A	N-0	1.07	N/A		Under review for possible exemption.
Sac-OP-V-38	CACHSLJ1 60 kV	Normal	A	N-0	1.06	N/A		Under review for possible exemption.
Sac-OP-V-39	CACHSLJ2 60 kV	Normal	A	N-0	1.07	N/A		Under review for possible exemption.
Sac-OP-V-40	MAINE-PR 60 kV	Normal	A	N-0	1.07	N/A		Under review for possible exemption.
Sac-OP-V-41	BTAJ-VCT 60 kV	Normal	A	N-0	1.07	N/A		Under review for possible exemption.
Sac-OP-V-42	BRIGHTON 230 kV	Rio Oso - Brighton 230 kV Line Brighton - Bellota 230 kV Line	C3	N-1-1	1.10	1.01		Under review for possible exemption.



**Single Contingency Load Drop**

ID	Worst Contingency	Category	Category Description	Amount of Load Drop (MW)			Potential Mitigation Solutions
				2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	

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

2012/2013 ISO Reliability Assessment - Final Study Results

Study Area: **PG&E Central Valley Sacramento - Summer Peak**

*Single Source Substation with more than 100 MW Load*



ID	Substation	Load Served (MW)			Potential Mitigation Solutions
		2014 Summer Peak	2017 Summer Peak	2022	
Sac-LS-1	Vacaville 115 kV	101	106	114	Upgrade 115 kV lines to be able to normally close the bus sectionalizing breaker

**Appendix C-6**  
**PG&E Central Valley - Sierra**



2012/2013 ISO Reliability Assessment - Final Study Results

Study Area: **PG&E Central Valley Sierra - Summer Peak**



**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Proposed Mitigation Solutions
					2014	2017	2022	
Siera-T-01	Drum - Higgins 115 kV Line	Normal	A	N-0	82%	95%	101%	New Atlantic-Placer 115 kV line
Siera-T-02	Placer 115/60 kV Transformer No. 1	Normal	A	N-0	90%	95%	104%	New Atlantic-Placer 115 kV line
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	110%	118%	131%	Overload due to automatic pick-up of radially served load. Potential mitigation is to disable automatic pick-up scheme.
Siera-T-04	Gold Hill 230/115 kV Transformer No. 1	Gold Hill 230/115 kV Transformer No. 2	B	N-1	87%	91%	101%	New Atlantic-Placer 115 kV line
Siera-T-05	Gold Hill 230/115 kV Transformer No. 2	Gold Hill 230/115 kV Transformer No. 1	B	N-1	87%	91%	101%	New Atlantic-Placer 115 kV line
Siera-T-06	Palermo - Pease 115 kV Line	Pease - Marysville - Harter 60 kV Line _GRNLEAF2 13.80 Unit ID 1	B	L-1/G-1	99%	106%	70%	Interim operation solution.
Siera-T-07	Pease 115/60 kV Transformer No. 2	Pease - Marysville - Harter 60 kV Line _GRNLEAF2 13.80 Unit ID 1	B	L-1/G-1	50%	96%	107%	Pease 115/60 kV Transformer Addition and Bus Upgrade
Siera-T-08	Placer 115/60 kV Transformer No. 1	HALSEY F 6.60 Unit ID 1	B	N-1	88%	93%	101%	New Atlantic-Placer 115 kV line
Siera-T-09	Bogue - Rio Oso 115 kV Line	BUS FAULT AT 30330 RIO OSO 230.00 Bus 1	C1	Bus	102%	N/A	N/A	Interim operation solution.
Siera-T-10	Drum - Higgins 115 kV Line	BUS FAULT AT 30337 GOLDHILL 230.00 Bus 2	C1	Bus	84%	98%	110%	New Atlantic-Placer 115 kV line
Siera-T-11	Gold Hill 230/115 kV Transformer No. 2	BUS FAULT AT 32018 GOLDHILL 115.00 Section 1E	C1	Bus	87%	91%	101%	New Atlantic-Placer 115 kV line
Siera-T-12	Pease - Rio Oso 115 kV Line	BUS FAULT AT 30330 RIO OSO 230.00 Bus 1	C1	Bus	110%	N/A	N/A	Interim operation solution.
Siera-T-13	Rio Oso - Atlantic 230 kV Line No. 1	BUS FAULT AT 30337 GOLDHILL 230.00 Bus 2	C1	Bus	101%	60%	65%	Interim operation solution.
Siera-T-14	Bogue - Rio Oso 115 kV Line	RIO OSO 230 kV Bus 1 and 2 - CB 202 Failure	C2	Stuck Bkr	131%	N/A	N/A	Interim operation solution.

2012/2013 ISO Reliability Assessment - Final Study Results

Study Area: **PG&E Central Valley Sierra - Summer Peak**



**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Proposed Mitigation Solutions
					2014	2017	2022	
Siera-T-15	East Nicolaus - Rio Oso 115 kV Line	RIO OSO 230 kV Bus 1 and 2 - CB 202 Failure	C2	Stuck Bkr	132%	N/A	N/A	Interim operation solution.
Siera-T-16	Palermo - Bogue 115 kV Line	RIO OSO 230 kV Bus 1 and 2 - CB 202 Failure	C2	Stuck Bkr	111%	N/A	N/A	Interim operation solution.
Siera-T-17	Palermo - Pease 115 kV Line	RIO OSO 230 kV Bus 1 and 2 - CB 202 Failure	C2	Stuck Bkr	118%	N/A	N/A	Interim operation solution.
Siera-T-18	Pease - Rio Oso 115 kV Line	RIO OSO 230 kV Bus 1 and 2 - CB 202 Failure	C2	Stuck Bkr	142%	N/A	N/A	Interim operation solution.
Siera-T-19	Rio Oso - Brighton 230 kV Line	RIO OSO 115 kV Bus 1 and 2 - CB 102 Failure	C2	Stuck Bkr	109%	N/A	N/A	Interim operation solution.
Siera-T-20	Bogue - Rio Oso 115 kV Line	Table Mountain - Rio Oso 230 kV Line _Colgate - Rio Oso 230 kV Line	C3	N-1-1	108%	102%	56%	Interim operation solution.
Siera-T-21	Drum - Higgins 115 kV Line	Placer - Gold Hill 115 kV Line No. 1 _Placer - Gold Hill 115 kV Line No. 2	C3	N-1-1	157%	Diverge	Diverge	New Atlantic-Placer 115 kV line
Siera-T-22	Drum - Rio Oso 115 kV No. 1 Line	Drum - Rio Oso 115 kV No. 2 Line _Higgins - Bell 115 kV Line	C3	N-1-1	149%	173%	172%	Operating solution.
Siera-T-23	Drum - Rio Oso 115 kV No. 2 Line	Drum - Rio Oso 115 kV No. 1 Line _Higgins - Bell 115 kV Line	C3	N-1-1	131%	154%	156%	Operating solution.
Siera-T-24	East Nicolaus - Rio Oso 115 kV Line	Table Mountain - Rio Oso 230 kV Line _Colgate - Rio Oso 230 kV Line	C3	N-1-1	104%	84%	37%	Interim operation solution.
Siera-T-25	Gold Hill 230/115 kV Transformer No. 1	Drum - Higgins 115 kV Line _Gold Hill 230/115 kV Transformer No. 2	C3	N-1-1	115%	123%	136%	New Atlantic-Placer 115 kV line
Siera-T-26	Gold Hill 230/115 kV Transformer No. 2	Drum - Higgins 115 kV Line _Gold Hill 230/115 kV Transformer No. 1	C3	N-1-1	115%	123%	137%	New Atlantic-Placer 115 kV line
Siera-T-27	Lincoln - Pleasant Grove 115 kV Line	Rio Oso - Atlantic 230 kV Line No. 1 _Atlantic - Gold Hill 230 kV Line	C3	N-1-1	128%	22%	23%	Interim operation solution.
Siera-T-28	Missouri Flat - Gold Hill 115 kV No. 1 Line	Gold Hill - Clarksville 115 kV Line _Missouri Flat - Gold Hill 115 kV No. 2 L	C3	N-1-1	89%	94%	105%	Rerate.
Siera-T-29	Palermo - Pease 115 kV Line	Colgate - Rio Oso 230 kV Line _Pease - Marysville - Harter 60 kV Line	C3	N-1-1	97%	105%	71%	Interim operation solution.

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Proposed Mitigation Solutions
					2014	2017	2022	
Siera-T-30	Pease - Rio Oso 115 kV Line	Table Mountain - Rio Oso 230 kV Line _Colgate - Rio Oso 230 kV Line	C3	N-1-1	119%	112%	65%	Interim operation solution.
Siera-T-31	Placer - Gold Hill 115 kV Line No. 1	Placer - Gold Hill 115 kV Line No. 2 _Drum - Higgins 115 kV Line	C3	N-1-1	121%	128%	149%	New Atlantic-Placer 115 kV line
Siera-T-32	Placer - Gold Hill 115 kV Line No. 2	Placer - Gold Hill 115 kV Line No. 1 _Drum - Higgins 115 kV Line	C3	N-1-1	125%	132%	157%	New Atlantic-Placer 115 kV line
Siera-T-33	Rio Oso - Lincoln 115 kV Line	Rio Oso - Atlantic 230 kV Line No. 1 _Atlantic - Gold Hill 230 kV Line	C3	N-1-1	113%	28%	29%	Interim operation solution.
Siera-T-34	Rio Oso 230/115 kV Bank No. 1	Rio Oso - Brighton 230 kV Line _Rio Oso 230/115 kV Bank No. 2	C3	N-1-1	105%	50%	51%	Interim operation solution.
Siera-T-35	Rio Oso 230/115 kV Bank No. 2	Rio Oso - Brighton 230 kV Line _Rio Oso 230/115 kV Bank No. 1	C3	N-1-1	100%	50%	51%	Interim operation solution.
Siera-T-36	Bogue - Rio Oso 115 kV Line	Colgate-Rio Oso 230 kV Line & Table Mountain- Rio Oso 230 kV Line	C5	DCTL	108%	102%	56%	Interim operation solution.
Siera-T-37	Drum - Higgins 115 kV Line	Placer-Gold Hill No. 1 115 kV Line & Placer- Gold Hill No. 2 115 kV Line	C5	DCTL	157%	Diverge	Diverge	New Atlantic-Placer 115 kV line
Siera-T-38	East Nicolaus - Rio Oso 115 kV Line	Colgate-Rio Oso 230 kV Line & Table Mountain- Rio Oso 230 kV Line	C5	DCTL	104%	84%	37%	Interim operation solution.
Siera-T-39	Pease - Rio Oso 115 kV Line	Colgate-Rio Oso 230 kV Line & Table Mountain- Rio Oso 230 kV Line	C5	DCTL	119%	112%	65%	Interim operation solution.
Siera-T-40	Rio Oso - Brighton 230 kV Line	Loss of Rio Oso 115 kV substation	D8	Loss of substation	109%	64%	63%	Under Review
Siera-T-41	Palermo - Pease 115 kV Line	Loss of Rio Oso 230 kV substation	D8	Loss of substation	118%	110%	77%	Under Review
Siera-T-42	Palermo - Pease 115 kV Line	Loss of Rio Oso 230 kV substation	D8	Loss of substation	118%	110%	77%	Under Review
Siera-T-43	Pease - Rio Oso 115 kV Line	Loss of Rio Oso 230 kV substation	D8	Loss of substation	142%	124%	73%	Under Review
Siera-T-44	Palermo - Bogue 115 kV Line	Loss of Rio Oso 230 kV substation	D8	Loss of substation	111%	97%	108%	Under Review

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Proposed Mitigation Solutions
					2014	2017	2022	
Siera-T-45	Bogue - Rio Oso 115 kV Line	Loss of Rio Oso 230 kV substation	D8	Loss of substation	131%	114%	63%	Under Review
Siera-T-46	East Nicolaus - Rio Oso 115 kV Line	Loss of Rio Oso 230 kV substation	D8	Loss of substation	132%	93%	40%	Under Review
Siera-T-47	Pease - Rio Oso 115 kV Line	Loss of Rio Oso 230 kV substation	D8	Loss of substation	102%	83%	45%	Under Review
Siera-T-48	Pease - Rio Oso 115 kV Line	Loss of Rio Oso 230 kV substation	D8	Loss of substation	128%	108%	61%	Under Review

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Summer Off-Peak	N/A	
Siera-OP-T-01	Pease 115/60 kV Transformer No. 2	Table Mountain - Pease 60 kV Line	B	N-1	103%	96%		Pease 115/60 kV Transformer Addition and Bus Upgrade
Siera-OP-T-02	Table Mountain - Pease 60 kV Line	Pease 115/60 kV Transformer No. 2	B	N-1	115%	104%		Pease 115/60 kV Transformer Addition and Bus Upgrade
Siera-OP-T-03	Drum - Higgins 115 kV Line	GOLDHILL 230 kV Bus 1 and 2 - CB 202 Failure	C2	Stuck Bkr	89%	150%		New Atlantic-Placer 115 kV line
Siera-OP-T-04	Drum - Higgins 115 kV Line	Gold Hill 230/115 kV Transformer No. 1_Gold Hill 230/115 kV Transformer No. 2	C3	N-1-1	59%	108%		New Atlantic-Placer 115 kV line
Siera-OP-T-05	Drum - Rio Oso 115 kV No. 1 Line	Drum - Rio Oso 115 kV No. 2 Line _Higgins - Bell 115 kV Line	C3	N-1-1	129%	137%		Operating solution
Siera-OP-T-06	Drum - Rio Oso 115 kV No. 2 Line	Drum - Rio Oso 115 kV No. 1 Line _Higgins - Bell 115 kV Line	C3	N-1-1	105%	113%		Operating solution
Siera-OP-T-07	Table Mountain - Pease 60 kV Line	Palermo-Pease 115 kV Line & Pease-Rio Oso 115 kV Line	C5	DCTL	101%	85%		Reduce Pease 60 kV generation

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014	2017	2022	
Siera-DV-01	PLACER 115 kV	Placer-Gold Hill No. 1 115 kV Line & Placer-Gold Hill No. 2 115 kV Line	C5	DCTL	-20%	Diverge	Diverge	New Atlantic-Placer 115 kV line
Siera-DV-02	HIGGINS 115 kV	Placer-Gold Hill No. 1 115 kV Line & Placer-Gold Hill No. 2 115 kV Line	C5	DCTL	-17%	Diverge	Diverge	New Atlantic-Placer 115 kV line
Siera-DV-03	BELL PGE 115 kV	Placer-Gold Hill No. 1 115 kV Line & Placer-Gold Hill No. 2 115 kV Line	C5	DCTL	-19%	Diverge	Diverge	New Atlantic-Placer 115 kV line
Siera-DV-04	PENRYN 60 kV	Placer-Gold Hill No. 1 115 kV Line & Placer-Gold Hill No. 2 115 kV Line	C5	DCTL	-21%	Diverge	Diverge	New Atlantic-Placer 115 kV line
Siera-DV-05	HALSEY 60 kV	Placer-Gold Hill No. 1 115 kV Line & Placer-Gold Hill No. 2 115 kV Line	C5	DCTL	-20%	Diverge	Diverge	New Atlantic-Placer 115 kV line
Siera-DV-06	AUBURN 60 kV	Placer-Gold Hill No. 1 115 kV Line & Placer-Gold Hill No. 2 115 kV Line	C5	DCTL	-20%	Diverge	Diverge	New Atlantic-Placer 115 kV line
Siera-DV-07	MTN_QUAR 60 kV	Placer-Gold Hill No. 1 115 kV Line & Placer-Gold Hill No. 2 115 kV Line	C5	DCTL	-20%	Diverge	Diverge	New Atlantic-Placer 115 kV line

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Summer Off-Peak	N/A	
Siera-OP-DV-01	MRYSVLLE 60 kV	Pease 115/60 kV Transformer No. 2	B	N-1	-6%	-5%		Pease 115/60 kV Transformer Addition and Bus Upgrade
Siera-OP-DV-02	MRYSVLE 60 kV	Pease 115/60 kV Transformer No. 2	B	N-1	-6%	-5%		Pease 115/60 kV Transformer Addition and Bus Upgrade
Siera-OP-DV-03	ENCINAL 60 kV	Pease 115/60 kV Transformer No. 2	B	N-1	-7%	-6%		Pease 115/60 kV Transformer Addition and Bus Upgrade
Siera-OP-DV-04	HARTER 60 kV	Pease 115/60 kV Transformer No. 2	B	N-1	-7%	-4%		Pease 115/60 kV Transformer Addition and Bus Upgrade
Siera-OP-DV-05	LIVE OAK 60 kV	Pease 115/60 kV Transformer No. 2	B	N-1	-8%	-6%		Pease 115/60 kV Transformer Addition and Bus Upgrade

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014	2017	2022	
Siera-V-01	GRSS VLY 60 kV	Colgate-Grass Valley 60 kV Line _ROLLINSF 9.11 Unit ID 1	B	L-1/G-1	0.902	0.897	0.879	Low voltage due to automatic pick-up of radially served load. Potential mitigation is to disable automatic pick-up scheme.
Siera-V-02	FORST HL 60 kV	Colgate-Grass Valley 60 kV Line _OXBOW F 9.11 Unit ID 1	B	L-1/G-1	0.903	0.896	0.876	Low voltage due to automatic pick-up of radially served load. Potential mitigation is to disable automatic pick-up scheme.
Siera-V-03	Diverge	BUS FAULT AT 32018 GOLDHILL 115.00 Section 2E	C1	Bus	Diverge	Diverge	Diverge	New Atlantic-Placer 115 kV line
Siera-V-04	Diverge	GOLDHILL 230 kV Bus 1 and 2 - CB 202 Failure	C2	Stuck Bkr	Diverge	Diverge	Diverge	New Atlantic-Placer 115 kV line
Siera-V-05	Diverge	GOLDHILL 115 kV Bus 1 and Bus 2 - CB 102 Failure	C2	Stuck Bkr	Diverge	Diverge	Diverge	New Atlantic-Placer 115 kV line
Siera-V-06	PLACER 115 kV	Placer - Gold Hill 115 kV Line No. 1 _Placer Gold Hill 115 kV Line No. 2	C3	N-1-1	0.776	Diverge	Diverge	New Atlantic-Placer 115 kV line
Siera-V-07	HORSESHE 115 kV	Placer - Gold Hill 115 kV Line No. 1 _Drum - Higgins 115 kV Line	C3	N-1-1	0.904	0.916	0.867	New Atlantic-Placer 115 kV line
Siera-V-08	HIGGINS 115 kV	Placer - Gold Hill 115 kV Line No. 1 _Placer Gold Hill 115 kV Line No. 2	C3	N-1-1	0.816	Diverge	Diverge	New Atlantic-Placer 115 kV line
Siera-V-09	FLINT 115 kV	Placer - Gold Hill 115 kV Line No. 1 _Drum - Higgins 115 kV Line	C3	N-1-1	0.838	0.844	0.772	New Atlantic-Placer 115 kV line
Siera-V-10	BELL PGE 115 kV	Placer - Gold Hill 115 kV Line No. 1 _Placer Gold Hill 115 kV Line No. 2	C3	N-1-1	0.783	Diverge	Diverge	New Atlantic-Placer 115 kV line
Siera-V-11	ROCKLIN 60 kV	Rio Oso - Atlantic 230 kV Line No. 1 _Atlantic - Gold Hill 230 kV Line	C3	N-1-1	0.71	0.975	0.98	Interim operating solution.
Siera-V-12	TAYLOR 60 kV	Rio Oso - Atlantic 230 kV Line No. 1 _Atlantic - Gold Hill 230 kV Line	C3	N-1-1	0.712	0.977	0.982	Interim operating solution.
Siera-V-13	PENRYN 60 kV	Placer - Gold Hill 115 kV Line No. 1 _Placer Gold Hill 115 kV Line No. 2	C3	N-1-1	0.801	Diverge	Diverge	New Atlantic-Placer 115 kV line
Siera-V-14	DEL MAR 60 kV	Rio Oso - Atlantic 230 kV Line No. 1 _Atlantic - Gold Hill 230 kV Line	C3	N-1-1	0.688	0.961	0.965	Interim operating solution.



**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014	2017	2022	
Siera-V-15	SIERRAPI 60 kV	Rio Oso - Atlantic 230 kV Line No. 1 _Atlantic - Gold Hill 230 kV Line	C3	N-1-1	0.688	0.961	0.965	Interim operating solution.
Siera-V-16	LINCLN 115 kV	Rio Oso - Atlantic 230 kV Line No. 1 _Atlantic - Gold Hill 230 kV Line	C3	N-1-1	0.894	1.024	1.027	Interim operating solution.
Siera-V-17	FORST HL 60 kV	ROLLINSF 9.11 Unit ID 1 _OXBOW F 9.11 Unit ID 1	C3	N-1-1	0.892	0.888	0.873	Operating solution
Siera-V-18	HALSEY 60 kV	Placer - Gold Hill 115 kV Line No. 1 _Placer Gold Hill 115 kV Line No. 2	C3	N-1-1	0.814	Diverge	Diverge	New Atlantic-Placer 115 kV line
Siera-V-19	AUBURN 60 kV	Placer - Gold Hill 115 kV Line No. 1 _Placer Gold Hill 115 kV Line No. 2	C3	N-1-1	0.816	Diverge	Diverge	New Atlantic-Placer 115 kV line
Siera-V-20	PLSNT GR 115 kV	Rio Oso - Atlantic 230 kV Line No. 1 _Atlantic - Gold Hill 230 kV Line	C3	N-1-1	0.847	1.018	1.024	Interim operating solution.
Siera-V-21	MTN_QUAR 60 kV	Placer - Gold Hill 115 kV Line No. 1 _Placer Gold Hill 115 kV Line No. 2	C3	N-1-1	0.81	Diverge	Diverge	New Atlantic-Placer 115 kV line
Siera-V-22	Diverge	Gold Hill 230/115 kV Transformer No. 1_Gold Hill 230/115 kV Transformer No. 2	C3	N-1-1	Diverge	Diverge	Diverge	New Atlantic-Placer 115 kV line
Siera-V-23	PLACER 115 kV	Placer-Gold Hill No. 1 115 kV Line & Placer- Gold Hill No. 2 115 kV Line	C5	DCTL	0.776	Diverge	Diverge	New Atlantic-Placer 115 kV line
Siera-V-24	HIGGINS 115 kV	Placer-Gold Hill No. 1 115 kV Line & Placer- Gold Hill No. 2 115 kV Line	C5	DCTL	0.816	Diverge	Diverge	New Atlantic-Placer 115 kV line
Siera-V-25	BELL PGE 115 kV	Placer-Gold Hill No. 1 115 kV Line & Placer- Gold Hill No. 2 115 kV Line	C5	DCTL	0.783	Diverge	Diverge	New Atlantic-Placer 115 kV line
Siera-V-26	PENRYN 60 kV	Placer-Gold Hill No. 1 115 kV Line & Placer- Gold Hill No. 2 115 kV Line	C5	DCTL	0.801	Diverge	Diverge	New Atlantic-Placer 115 kV line
Siera-V-27	HALSEY 60 kV	Placer-Gold Hill No. 1 115 kV Line & Placer- Gold Hill No. 2 115 kV Line	C5	DCTL	0.814	Diverge	Diverge	New Atlantic-Placer 115 kV line
Siera-V-28	AUBURN 60 kV	Placer-Gold Hill No. 1 115 kV Line & Placer- Gold Hill No. 2 115 kV Line	C5	DCTL	0.816	Diverge	Diverge	New Atlantic-Placer 115 kV line
Siera-V-29	MTN_QUAR 60 kV	Placer-Gold Hill No. 1 115 kV Line & Placer- Gold Hill No. 2 115 kV Line	C5	DCTL	0.81	Diverge	Diverge	New Atlantic-Placer 115 kV line
Siera-V-30	Diverge	Placer-Gold Hill No. 1 115 kV Line & Placer- Gold Hill No. 2 115 kV Line	C5	DCTL	Diverge	Diverge	Diverge	New Atlantic-Placer 115 kV line

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014	2017	2022	
Siera-V-31	Diverge	Loss of Gold Hill 230 kV substation	D8	Loss of substation	Diverge	Diverge	Diverge	New Atlantic-Placer 115 kV line

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Summer Off-Peak	N/A	
Siera-OP-V-01	GOLDHILL 115 kV	Normal	A	N-0	1.06	1.04		Under review for possible exemption.
Siera-OP-V-02	E.NICOLS 115 kV	Normal	A	N-0	1.05	1.04		Under review for possible exemption.
Siera-OP-V-03	RIO OSO 115 kV	Normal	A	N-0	1.05	1.04		Under review for possible exemption.
Siera-OP-V-04	DRUM 115 kV	Normal	A	N-0	1.05	1.05		Under review for possible exemption.
Siera-OP-V-05	DTCH FL1 115 kV	Normal	A	N-0	1.05	1.05		Under review for possible exemption.
Siera-OP-V-06	DTCH FL2 115 kV	Normal	A	N-0	1.05	1.05		Under review for possible exemption.
Siera-OP-V-07	CHCGO PK 115 kV	Normal	A	N-0	1.05	1.05		Under review for possible exemption.
Siera-OP-V-08	BRNSWKTP 115 kV	Normal	A	N-0	1.05	1.04		Under review for possible exemption.
Siera-OP-V-09	BRNSWALT 115 kV	Normal	A	N-0	1.05	1.04		Under review for possible exemption.
Siera-OP-V-10	HORSHE1 115 kV	Normal	A	N-0	1.06	1.04		Under review for possible exemption.
Siera-OP-V-11	HORSESHE 115 kV	Normal	A	N-0	1.06	1.04		Under review for possible exemption.
Siera-OP-V-12	HORSHE2 115 kV	Normal	A	N-0	1.06	1.04		Under review for possible exemption.
Siera-OP-V-13	HIGGINS 115 kV	Normal	A	N-0	1.05	1.04		Under review for possible exemption.
Siera-OP-V-14	NEWCSTL1 115 kV	Normal	A	N-0	1.05	1.03		Under review for possible exemption.
Siera-OP-V-15	NEWCSTLE 115 kV	Normal	A	N-0	1.05	1.03		Under review for possible exemption.

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Summer Off-Peak	N/A	
Siera-OP-V-16	NEWCSTL2 115 kV	Normal	A	N-0	1.05	1.04		Under review for possible exemption.
Siera-OP-V-17	FLINT 115 kV	Normal	A	N-0	1.05	1.03		Under review for possible exemption.
Siera-OP-V-18	FLINT2 115 kV	Normal	A	N-0	1.05	1.03		Under review for possible exemption.
Siera-OP-V-19	BRNSWCKP 115 kV	Normal	A	N-0	1.05	1.04		Under review for possible exemption.
Siera-OP-V-20	ELDORAD 115 kV	Normal	A	N-0	1.06	1.04		Under review for possible exemption.
Siera-OP-V-21	APPLE HL 115 kV	Normal	A	N-0	1.06	1.04		Under review for possible exemption.
Siera-OP-V-22	PLCRVLB2 115 kV	Normal	A	N-0	1.06	1.04		Under review for possible exemption.
Siera-OP-V-23	PLCRVLT1 115 kV	Normal	A	N-0	1.06	1.04		Under review for possible exemption.
Siera-OP-V-24	PLCRVLB3 115 kV	Normal	A	N-0	1.05	1.04		Under review for possible exemption.
Siera-OP-V-25	PLCRVLT2 115 kV	Normal	A	N-0	1.06	1.04		Under review for possible exemption.
Siera-OP-V-26	DMND SPR 115 kV	Normal	A	N-0	1.06	1.04		Under review for possible exemption.
Siera-OP-V-27	DIMOND_2 115 kV	Normal	A	N-0	1.06	1.04		Under review for possible exemption.
Siera-OP-V-28	MIZOU_T2 115 kV	Normal	A	N-0	1.06	1.04		Under review for possible exemption.
Siera-OP-V-29	MIZOU_T1 115 kV	Normal	A	N-0	1.06	1.04		Under review for possible exemption.
Siera-OP-V-30	SHPRING1 115 kV	Normal	A	N-0	1.06	1.04		Under review for possible exemption.

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Summer Off-Peak	N/A	
Siera-OP-V-31	CLRKSVLE 115 kV	Normal	A	N-0	1.06	1.04		Under review for possible exemption.
Siera-OP-V-32	CLRKSVLT 115 kV	Normal	A	N-0	1.06	1.04		Under review for possible exemption.
Siera-OP-V-33	SHPRING 115 kV	Normal	A	N-0	1.06	1.04		Under review for possible exemption.
Siera-OP-V-34	DIMOND_1 115 kV	Normal	A	N-0	1.06	1.04		Under review for possible exemption.
Siera-OP-V-35	SHPRING2 115 kV	Normal	A	N-0	1.06	1.04		Under review for possible exemption.
Siera-OP-V-36	CPM TAP 115 kV	Normal	A	N-0	1.06	1.04		Under review for possible exemption.
Siera-OP-V-37	CPM 115 kV	Normal	A	N-0	1.06	1.04		Under review for possible exemption.
Siera-OP-V-38	SPICAMIN 115 kV	Normal	A	N-0	1.06	1.04		Under review for possible exemption.
Siera-OP-V-39	LINCLN 115 kV	Normal	A	N-0	1.06	1.04		Under review for possible exemption.
Siera-OP-V-40	ULTRA JT 115 kV	Normal	A	N-0	1.07	1.04		Under review for possible exemption.
Siera-OP-V-41	ULTR-RCK 115 kV	Normal	A	N-0	1.07	1.04		Under review for possible exemption.
Siera-OP-V-42	SPI JCT 115 kV	Normal	A	N-0	1.06	1.04		Under review for possible exemption.
Siera-OP-V-43	PLSNT GR 115 kV	Normal	A	N-0	1.07	1.04		Under review for possible exemption.
Siera-OP-V-44	ATLANTIC 115 kV	Normal	A	N-0	1.08	1.05		Under review for possible exemption.
Siera-OP-V-45	APLHTAP2 115 kV	Normal	A	N-0	1.06	1.04		Under review for possible exemption.

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Summer Off-Peak	N/A	
Siera-OP-V-46	APLHTAP1 115 kV	Normal	A	N-0	1.06	1.04		Under review for possible exemption.

**Transient Stability**

ID	Contingency	Category	Category Description	Transient Stability Performance			Potential Mitigation Solutions
				2014	2017	2022	
Siera-TS-1	Gold Hill 230 kV Bus SLG fault with delayed clearing	C9	Bus SLG fault with delayed clearing	Unstable	Unstable	Unstable	New Atlantic-Placer 115 kV line

**Transient Stability**

ID	Contingency	Category	Category Description	Transient Stability Performance			Potential Mitigation Solutions
				2014 Summer Light Load	2017 Summer Off-Peak	N/A	
Siera-OP-TS-1	Gold Hill 230 kV Bus SLG fault with delayed clearing	C9	Bus SLG fault with delayed clearing	Unstable	Unstable	Unstable	New Atlantic-Placer 115 kV line



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Study Area: **PG&E Central Valley Sierra**



**Single Contingency Load Drop**

ID	Worst Contingency	Category	Category Description	Amount of Load Drop (MW)			Potential Mitigation Solutions
				2014	2017	2022	

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

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Study Area: **PG&E Central Valley Sierra - Summer Peak**

**Single Source Substation with more than 100 MW Load**



ID	Substation	Load Served (MW)			Potential Mitigation Solutions
		2014	2017	2022	
Siera-LS-01	Clarksville 115 kV	105.80	111.70	123.60	Loop the station.

**Appendix C-7**  
**PG&E Central Valley - Stockton & Stanislaus**

2012/2013 ISO Reliability Assessment - Final Study Results

Study Area: **PG&E Central Valley Stockton - Summer Peak**



**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Proposed Mitigation Solutions
					2014	2017	2022	
Stoc-T-1	Weber - Mormon Jct 60 kV Line	Normal	A	N-0	89%	93%	103%	Rerate
Stoc-T-2	Lockeford No. 1 60 kV Line	Hammer - Country Club 60 kV Line	B	N-1	158%	165%	178%	Overload due to automatic pick-up of radially served load. Potential mitigation is to disable automatic pick-up scheme.
Stoc-T-3	Vally Springs No. 1 60 kV Line	Weber - Mormon Jct 60 kV Line	B	N-1	118%	124%	137%	Overload due to automatic pick-up of radially served load. Potential mitigation is to disable automatic pick-up scheme.
Stoc-T-4	Kasson - Louise 60 kV Line	BUS FAULT AT 33528 KASSON 115.00	C1	Bus	113%	117%	124%	Kasson SPS
Stoc-T-5	Manteca - Louise 60 kV Line	BUS FAULT AT 33528 KASSON 115.00	C1	Bus	151%	155%	163%	Kasson SPS
Stoc-T-6	Manteca 115/60 kV Transformer No. 3	BUS FAULT AT 33528 KASSON 115.00	C1	Bus	191%	198%	209%	Kasson SPS
Stoc-T-7	Tesla - Weber 230 kV Line	BUS FAULT AT 30624 TESLA E 230.00 Bus 2	C1	Bus	84%	93%	106%	Replace limiting component.
Stoc-T-8	Tesla - Weber 230 kV Line	TESLA E 230 kV Bus 2 and TESLA D 230 kV Bus 2 - CB 822 Failure	C2	Stuck Bkr	85%	94%	107%	Replace limiting component.
Stoc-T-9	Bellota-Riverbank-Melones 115 kV Line	BELLOTA 230 kV Bus 1 and Bus 2 - CB 200 Failure	C2	Stuck Bkr	94%	102%	114%	Add sectionalizing breaker at Bellota 230 kV bus
Stoc-T-10	Kasson - Louise 60 kV Line	Schulte - Kasson - Manteca 115 kV Line_Manteca - Vierra 115 kV Line	C3	N-1-1	80%	87%	101%	Rerate.
Stoc-T-11	Lockeford - Industrial 60 kV Line	Lockeford - Lodi 60 kV Line No. 2 _Lodi - Industrial 60 kV Line	C3	N-1-1	140%	145%	150%	Eight Mile-Lockeford 230 kV DCTL
Stoc-T-12	Lockeford - Lodi 60 kV Line No. 1	Lockeford - Lodi 60 kV Line No. 2 _Lockeford - Industrial 60 kV Line	C3	N-1-1	136%	142%	147%	Eight Mile-Lockeford 230 kV DCTL
Stoc-T-13	Lockeford - Lodi 60 kV Line No. 2	Lockeford - Industrial 60 kV Line _Lodi - Industrial 60 kV Line	C3	N-1-1	157%	163%	168%	Eight Mile-Lockeford 230 kV DCTL

2012/2013 ISO Reliability Assessment - Final Study Results

Study Area: **PG&E Central Valley Stockton - Summer Peak**



**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Proposed Mitigation Solutions
					2014	2017	2022	
Stoc-T-14	Lockeford - Lodi 60 kV Line No. 3	Lockeford - Lodi 60 kV Line No. 2 _Lockeford - Industrial 60 kV Line	C3	N-1-1	168%	175%	182%	Eight Mile-Lockeford 230 kV DCTL
Stoc-T-15	Lockeford No. 1 60 kV Line	Lockeford - Bellota 230 kV Line _Hammer - Country Club 60 kV	C3	N-1-1	Diverge	Diverge	Diverge	Overload due to automatic pick-up of radially served load. Potential mitigation is to disable automatic pick-up scheme.
Stoc-T-16	Lodi - Industrial 60 kV Line	Lockeford - Lodi 60 kV Line No. 2 _Lockeford - Industrial 60 kV Line	C3	N-1-1	177%	184%	190%	Eight Mile-Lockeford 230 kV DCTL
Stoc-T-17	Stockton 'A' - Lockeford - Bellota 115 kV Line No. 2	Stockton 'A'-Lockeford-Bellota 115 kV _Gold Hill-Bellota-Lockeford 115 kV Line	C3	N-1-1	91%	96%	102%	Operating solution
Stoc-T-18	Stockton 'A' - Weber 60 kV Line No. 3	Stockton 'A' - Weber 60 kV Line No. 1 _Stockton 'A' - Weber 60 kV Line No. 2	C3	N-1-1	124%	128%	14%	Interim operating solution
Stoc-T-19	Tesla - Weber 230 kV Line	Rio Oso - Lockeford 230 kV Line _Bellota - Tesla 230 kV Line No. 2	C3	N-1-1	82%	91%	104%	Replace limiting component.
Stoc-T-20	Kasson - Louise 60 kV Line	Schulte-Kasson-Manteca 115 kV Line & Manteca-Vierra 115 kV Line	C5	DCTL	80%	87%	101%	Rerate

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Proposed Mitigation Solutions
					2014 Summer Light Load	2017 Summer Off-Peak	N/A	
Stoc-OP-T-01	Bellota-Riverbank-Melones 115 kV Line	TESLA 115 kV Bus 1 and Bus 2 - CB 102 Failure	C2	Stuck Bkr	134%	14%		Interim operating solution.
Stoc-OP-T-02	Riverbank Jct - Manteca 115 kV Line	Stanislaus-Melones-Manteca 115 kV Line_Bellota-Riverbank-Melones 115 kV Line	C3	N-1-1	119%	105%		Reduce Melones area generation

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Proposed Mitigation Solutions
					2014	2017	2022	
Stoc-DV-01	VICTOR 60 kV	Lockeford - Bellota 230 kV Line	B	L-1	-9%	-9%	-9%	Eight Mile-Lockeford 230 kV DCTL
Stoc-DV-02	MONDAVI 60 kV	Lockeford - Bellota 230 kV Line	B	L-1	-9%	-9%	-9%	Eight Mile-Lockeford 230 kV DCTL
Stoc-DV-03	LODI 60 kV	Lockeford - Bellota 230 kV Line	B	L-1	-9%	-9%	-9%	Eight Mile-Lockeford 230 kV DCTL
Stoc-DV-04	COLONY 60 kV	Lockeford - Bellota 230 kV Line	B	L-1	-9%	-9%	-9%	Eight Mile-Lockeford 230 kV DCTL
Stoc-DV-05	STKTON B 115 kV	BELLOTA 230 kV Bus 1 and Bus 2 - CB 200 Failure	C2	Stuck Bkr	-6%	-8%	-12%	Add sectionalizing breaker at Bellota 230 kV bus
Stoc-DV-06	STKTON A 115 kV	BELLOTA 230 kV Bus 1 and Bus 2 - CB 200 Failure	C2	Stuck Bkr	-5%	-7%	-10%	Add sectionalizing breaker at Bellota 230 kV bus
Stoc-DV-07	LOCKFORD 115 kV	BELLOTA 230 kV Bus 1 and Bus 2 - CB 200 Failure	C2	Stuck Bkr	-6%	-8%	-12%	Add sectionalizing breaker at Bellota 230 kV bus
Stoc-DV-08	RVRBANK 115 kV	BELLOTA 230 kV Bus 1 and Bus 2 - CB 200 Failure	C2	Stuck Bkr	-6%	-8%	-11%	Add sectionalizing breaker at Bellota 230 kV bus

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Proposed Mitigation Solutions
					2014 Summer Light Load	2017 Summer Off-Peak	N/A	

No voltage deviation issues identified.



**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Proposed Mitigation Solutions
					2014	2017	2022	
Stoc-V-01	DONNELLS 115 kV	Normal	A	N-0	1.06	1.06	1.05	Under review for possible exemption.
Stoc-V-02	BEARDSLY 115 kV	Normal	A	N-0	1.05	1.05	1.05	Under review for possible exemption.
Stoc-V-03	VICTOR 60 kV	Lockeford - Bellota 230 kV Line _Hammer - Country Club 60 kV	C3	N-1-1	0.84	0.89	0.77	Eight Mile-Lockeford 230 kV DCTL
Stoc-V-04	MONDAVI 60 kV	Lockeford - Bellota 230 kV Line _Hammer - Country Club 60 kV	C3	N-1-1	0.82	0.87	0.75	Eight Mile-Lockeford 230 kV DCTL
Stoc-V-05	LODI 60 kV	Lockeford - Bellota 230 kV Line _Hammer - Country Club 60 kV	C3	N-1-1	0.83	0.87	0.75	Eight Mile-Lockeford 230 kV DCTL
Stoc-V-06	COLONY 60 kV	Lockeford - Bellota 230 kV Line _Hammer - Country Club 60 kV	C3	N-1-1	0.84	0.89	0.76	Eight Mile-Lockeford 230 kV DCTL
Stoc-V-07	MSHR 60V 60 kV	Lockeford - Bellota 230 kV Line _Hammer - Country Club 60 kV	C3	N-1-1	0.78	0.83	0.68	Eight Mile-Lockeford 230 kV DCTL

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Proposed Mitigation Solutions
					2014 Summer Light Load	2017 Summer Off-Peak	N/A	
Stoc-OP-V-01	HERDLYN 60 kV	Normal	A	N-0	1.07	1.04		Under review for possible exemption.
Stoc-OP-V-02	B.BTHNY- 60 kV	Normal	A	N-0	1.07	1.04		Under review for possible exemption.
Stoc-OP-V-03	HRDLNJCT 60 kV	Normal	A	N-0	1.07	1.04		Under review for possible exemption.
Stoc-OP-V-04	TOSCO-PP 60 kV	Normal	A	N-0	1.07	1.05		Under review for possible exemption.
Stoc-OP-V-05	SOUTH BY 60 kV	Normal	A	N-0	1.07	1.05		Under review for possible exemption.
Stoc-OP-V-06	WEST SDE 60 kV	Normal	A	N-0	1.07	1.04		Under review for possible exemption.
Stoc-OP-V-07	VICTOR 60 kV	Rio Oso - Lockeford 230 kV Line _Lockeford - Bellota 230 kV Line	C3	N-1-1	0.93	0.86		Eight Mile-Lockeford 230 kV DCTL
Stoc-OP-V-08	MONDAVI 60 kV	Rio Oso - Lockeford 230 kV Line _Lockeford - Bellota 230 kV Line	C3	N-1-1	0.92	0.85		Eight Mile-Lockeford 230 kV DCTL
Stoc-OP-V-09	LODI 60 kV	Rio Oso - Lockeford 230 kV Line _Lockeford - Bellota 230 kV Line	C3	N-1-1	0.92	0.85		Eight Mile-Lockeford 230 kV DCTL
Stoc-OP-V-10	COLONY 60 kV	Rio Oso - Lockeford 230 kV Line _Lockeford - Bellota 230 kV Line	C3	N-1-1	0.93	0.85		Eight Mile-Lockeford 230 kV DCTL

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Study Area: **PG&E Central Valley Stockton**



**Single Contingency Load Drop**

ID	Worst Contingency	Category	Category Description	Amount of Load Drop (MW)			Proposed Mitigation Solutions
				2014	2017	2022	

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

2012/2013 ISO Reliability Assessment - Final Study Results

Study Area: **PG&E Central Valley Stockton**



**Single Source Substation with more than 100 MW Load**

ID	Substation	Load Served (MW)			Proposed Mitigation Solutions
		2014	2017	2022	

No single source substation with more than 100 MW Load

**Appendix C-8**  
**PG&E Greater Bay Area - East Bay**

2012/2013 ISO Reliability Assessment - Study Results

Study Area: **PG&E Greater Bay Area East Bay - Summer Peak**



**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
Ebay-SP-T-01	San Leandro - Oakland J 115 kV Line	Moraga-Oakland J 115kV Line	B	N-1	100%	81%	86%	East Shore - Oakland J 115 kV Reconductor Project
Ebay-SP-T-02	Oakland C-L 115 kV Cable	CB FAULT AT 32780 CLARMNT 115 CB122	C2	Breaker	108%	112%	118%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Ebay-SP-T-03	San Leandro - Oakland J 115 kV Line	Sobrante-Grizzly-Claremont #1 115kV Li_Moraga-Oakland J 115kV Line	C3	N-1-1	101%	80%	85%	East Shore - Oakland J 115 kV Reconductor Project
Ebay-SP-T-04	San Leandro - Oakland J 115 kV Line	Grant-Oakland J 115 kV Line _Moraga-Oakland J 115kV Line	C3	N-1-1	N/A	104%	110%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Ebay-SP-T-05	Moraga - Oakland J 115 kV Line	Grant-Oakland J 115 kV Line _San Leandro - Oakland J #1 115kV Line	C3	N-1-1	N/A	102%	107%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Ebay-SP-T-06	Oakland C-L 115 kV Cable	Claremont K - Oakland D #1 115kV Cable_Claremont K - Oakland D #2 115kV Cable	C3	N-1-1	108%	112%	118%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Ebay-SP-T-07	Oleum - North Tower - Christie 115 kV Line	Sobrante-G Nos. 1 & 2 115 kV lines	C5	DCTL	101%	N/A	80%	North Tower 115 kV Looping Project
Ebay-SP-T-08	Christie - Sobrante 115 kV Line	Sobrante-G Nos. 1 & 2 115 kV lines	C5	DCTL	112%	89%	96%	North Tower 115 kV Looping Project
Ebay-SP-T-09	Oleum - Martinez 115 kV Line	Sobrante-G Nos. 1 & 2 115 kV lines	C5	DCTL	112%	94%	99%	North Tower 115 kV Looping Project

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Summer Off-Peak	N/A	

No thermal overloads identified.

2012/2013 ISO Reliability Assessment - Study Results

Study Area: **PG&E Greater Bay Area East Bay - Summer Peak**



**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
Ebay-SP-DV-01	EDES 115kV	San Leandro - Oakland J #1 115kV Line	B	N-1	7%	1%	1%	Add reactive support





**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Summer Off-Peak	N/A	

No voltage deviations identified.

2012/2013 ISO Reliability Assessment - Study Results

Study Area: **PG&E Greater Bay Area East Bay - Summer Peak**



**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
Ebay-SP-V-01	STD. OIL 115kV	Normal	A	N-0	0.95	0.95	0.95	Add reactive support
Ebay-SP-V-02	PP STEEL 115kV	Sobrante-Standard Oil #2 115kV Line _ChevGen2 13.80 Unit ID 1	C3	N-1-1	0.90	0.90	0.90	Add reactive support
Ebay-SP-V-03	SAN PBLO 115kV	Sobratne-Standard Oil #1 115kV Line _ChevGen2 13.80 Unit ID 1	C3	N-1-1	0.90	0.91	0.90	Add reactive support
Ebay-SP-V-04	PT PINLE 115kV	Sobrante-Standard Oil #2 115kV Line _ChevGen2 13.80 Unit ID 1	C3	N-1-1	0.90	0.90	0.90	Add reactive support
Ebay-SP-V-05	STD. OIL 115kV	Sobratne-Standard Oil #1 115kV Line _Standard Oil STA - Sandard Oil #1 115kV	C3	N-1-1	0.90	0.90	0.90	Add reactive support

2012/2013 ISO Reliability Assessment - Study Results

Study Area: **PG&E Greater Bay Area East Bay - Summer Light Load & Summer Off-Peak**



**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Summer Off-Peak	N/A	
EBay-OP-V-01	UNIN CHM 60kV	Normal	A	N-0	1.06	1.06		Add reactive support
EBay-OP-V-02	CHRISTIE 60kV	Normal	A	N-0	1.06	1.07		Add reactive support
EBay-OP-V-03	PRT CSTA 60kV	Normal	A	N-0	1.06	1.06		Add reactive support
EBay-OP-V-04	FRANKLIN 60kV	Normal	A	N-0	1.06	1.06		Add reactive support
EBay-OP-V-05	SEQUOIA 60kV	Normal	A	N-0	1.06	1.06		Add reactive support

2012/2013 ISO Reliability Assessment - Study Results

Study Area: **PG&E Greater Bay Area East Bay**



**Single Contingency Load Drop**

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

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

2012/2013 ISO Reliability Assessment - Study Results

Study Area: **PG&E Greater Bay Area East Bay**

**Single Source Substation with more than 100 MW Load**



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

No single source substation with more than 100 MW Load

**Appendix C-9**  
**PG&E Greater Bay Area - Diablo**

2012/2013 ISO Reliability Assessment - Study Results

Study Area: **PG&E Greater Bay Area Diablo- Summer Peak**



**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
Diab-SP-T-01	Contra Costa PP - Contra Costa Sub 230 kV Line	Birds Landing-Contra Costa PP 230kV Li_GATEWAY1 18.00 Unit ID 1	B	L-1/G-1	107%	115%	118%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate or reduce Marsh Landing generation
Diab-SP-T-02	Contra Costa PP - Contra Costa Sub 230 kV Line	BUS FAULT AT 30518 MARSHLND 230.00	C1	Bus	97%	102%	102%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Diab-SP-T-03	Pittsburg - Clayton #3 115 kV Line	BUS FAULT AT 32970 CLAYTN 115.00 Bus #2	C1	Bus	105%	105%	107%	Pittsburg-Lakewood SPS
Diab-SP-T-04	Lakewood - Meadow Lane - Clayton 115 kV Line	BUS FAULT AT 32970 CLAYTN 115.00 Bus #1	C1	Bus	144%	144%	147%	Pittsburg-Lakewood SPS
Diab-SP-T-05	Moraga - San Leandro #1 115 kV Line	BUS FAULT AT 33020 MORAGA 115.00 Sec 2E	C1	Bus	129%	98%	103%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Diab-SP-T-06	Moraga - San Leandro #2 115 kV Line	BUS FAULT AT 33020 MORAGA 115.00 Sec 1E	C1	Bus	150%	120%	127%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Diab-SP-T-07	Moraga - San Leandro #3 115 kV Line	BUS FAULT AT 33020 MORAGA 115.00 Sec 2E	C1	Bus	111%	84%	89%	East Shore - Oakland J 115 kV Reconductor Project
Diab-SP-T-08	Oleum - Martinez 115 kV Line	CB FAULT AT 30540 SOBRANTE 230 CB202	C2	Breaker	103%	N/A	N/A	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Diab-SP-T-09	Contra Costa - Brentwood 230 kV Line	CB FAULT AT 30525 C.COSTA 230 CB820	C2	Breaker	105%	94%	91%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Diab-SP-T-10	Contra Costa - Las Positas 230 kV Line	CB FAULT AT 30525 C.COSTA 230 CB600	C2	Breaker	101%	105%	107%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate

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Study Area: **PG&E Greater Bay Area Diablo- Summer Peak**



**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
Diab-SP-T-11	Contra Costa PP - Contra Costa Sub 230 kV Line	CB FAULT AT 30525 C.COSTA 230 CB400	C2	Breaker	104%	112%	114%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Diab-SP-T-12	Lone Tree - Cayetano 230 kV Line	CB FAULT AT 30525 C.COSTA 230 CB600	C2	Breaker	129%	133%	136%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Diab-SP-T-13	Pittsburg - Clayton #3 115 kV Line	CB FAULT AT 32950 PITSBURG 115 CB222	C2	Breaker	103%	103%	105%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Diab-SP-T-14	Pittsburg - Clayton #3 115 kV Line	CB FAULT AT 32950 PITSBURG 115 CB222	C2	Breaker	120%	120%	123%	Pittsburg - Lakewood SPS
Diab-SP-T-15	Martinez - Sobrante 115 kV Line	CB FAULT AT 30540 SOBRANTE 230 CB202	C2	Breaker	87%	100%	102%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Diab-SP-T-16	Oleum - Martinez 115 kV Line	CB FAULT AT 30540 SOBRANTE 230 CB202	C2	Breaker	110%	92%	95%	North Tower 115 kV Looping Project
Diab-SP-T-17	Sobrante - Grizzly - Claremont #2 115 kV Line	CB FAULT AT 30550 MORAGA 230 CB202	C2	Breaker	103%	87%	92%	North Tower 115 kV Looping Project
Diab-SP-T-18	Moraga - Oakland X #3 115 kV Line	CB FAULT AT 30540 SOBRANTE 230 CB202	C2	Breaker	88%	93%	100%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Diab-SP-T-19	Moraga - Oakland X #4 115 kV Line	CB FAULT AT 30540 SOBRANTE 230 CB202	C2	Breaker	88%	93%	100%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Diab-SP-T-20	Moraga - Lakewood 115 kV Line	CB FAULT AT 32970 CLAYTN 115 CB102	C2	Breaker	261%	263%	272%	Pittsburg-Lakewood SPS



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Study Area: **PG&E Greater Bay Area Diablo- Summer Peak**



**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
Diab-SP-T-21	Moraga - Sobrante 115 kV Line	CB FAULT AT 30550 MORAGA 230 CB202	C2	Breaker	128%	99%	105%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Diab-SP-T-22	Moraga - San Leandro #1 115 kV Line	CB FAULT AT 33020 MORAGA 115 CB442	C2	Breaker	129%	95%	101%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Diab-SP-T-23	Moraga - San Leandro #2 115 kV Line	CB FAULT AT 33020 MORAGA 115 CB432	C2	Breaker	154%	114%	120%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Diab-SP-T-24	Moraga - San Leandro #3 115 kV Line	CB FAULT AT 33020 MORAGA 115 CB442	C2	Breaker	111%	82%	86%	East Shore - Oakland J 115 kV Reconductor Project
Diab-SP-T-25	MORAGA 115/ 230 Bank 2	CB FAULT AT 33020 MORAGA 115 CB432	C2	Breaker	137%	N/A	N/A	Moraga 230/115 kV Transformer Replacement Project
Diab-SP-T-26	Oleum - Martinez 115 kV Line	Sobrante-El Cerrito STA G #1 115kV Lin_Sobrante-El Cerrito STA G #2 115kV Line	C3	N-1-1	112%	N/A	N/A	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Diab-SP-T-27	Contra Costa - Balfour 60 kV Line	CC PP - CC Sub 230kV Line _Willow Pass-Contra Costa 60kV Line	C3	N-1-1	124%	125%	120%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Diab-SP-T-28	Contra Costa - Delta Pumps 230 kV Line	Contra Costa-Brentwood 230kV Line _Contra Costa-Las Positas 230kV Line	C3	N-1-1	111%	N/A	N/A	Oakley Generating Station Network Upgrades
Diab-SP-T-29	Christie - Sobrante 115 kV Line	Sobrante-El Cerrito STA G #1 115kV Lin_Sobrante-El Cerrito STA G #2 115kV Line	C3	N-1-1	112%	89%	96%	North Tower 115 kV Looping Project
Diab-SP-T-30	Pittsburg - Clayton #3 115 kV Line	Pittsburg-Clayton #1 115kV Line _Pittsburg- Clayton #4 115kV Line	C3	N-1-1	117%	118%	120%	Pittsburg - Lakewood SPS
Diab-SP-T-31	Lakewood - Meadow Lane - Clayton 115 kV Line	Clayton-Meadow Lane 115kV Line _Lakewood-Clayton 115kV Line	C3	N-1-1	146%	146%	150%	North Tower 115 kV Looping Project

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Study Area: **PG&E Greater Bay Area Diablo- Summer Peak**



**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
Diab-SP-T-32	Contra Costa - Balfour 60 kV Line	CC PP - CC Sub 230kV Line _Willow Pass-Contra Costa 60kV Line	C3	N-1-1	122%	123%	118%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Diab-SP-T-33	Lakewood - Meadow Lane - Clayton 115 kV Line	Pittsburg-San Ramon 230kV Line _Lakewood-Clayton 115kV Line	C3	N-1-1	98%	98%	100%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Diab-SP-T-34	Moraga - Lakewood 115 kV Line	Lakewood-Clayton 115kV Line _Lakewood-Meadow Lane-Clayton 115kV Line	C3	N-1-1	124%	125%	129%	Pittsburg - Lakewood SPS
Diab-SP-T-35	Lone Tree - Cayetano 230 kV Line	Contra Costa-Delta Switching Yard 230k_Contra Costa-Las Positas 230kV Line	C3	N-1-1	104%	106%	109%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Diab-SP-T-36	Martinez - Sobrante 115 kV Line	Sobrante 230/115kV Transformer #1 _Sobrante 230/115kV Transformer #2	C3	N-1-1	88%	101%	103%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Diab-SP-T-37	Oleum - Martinez 115 kV Line	Sobrante-El Cerrito STA G #1 115kV Lin_Sobrante-El Cerrito STA G #2 115kV Line	C3	N-1-1	120%	101%	106%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Diab-SP-T-38	Moraga - Lakewood 115 kV Line	Lakewood-Clayton 115kV Line _Lakewood-Meadow Lane-Clayton 115kV Line	C3	N-1-1	131%	133%	136%	Pittsburg - Lakewood SPS
Diab-SP-T-39	Moraga - San Leandro #1 115 kV Line	Moraga-San Leandro #2 115kV Line _Moraga-San Leandro #3 115kV Line	C3	N-1-1	150%	123%	130%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Diab-SP-T-40	Moraga - San Leandro #2 115 kV Line	Moraga-San Leandro #1 115kV Line _Moraga-San Leandro #3 115kV Line	C3	N-1-1	150%	124%	130%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate

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Study Area: **PG&E Greater Bay Area Diablo- Summer Peak**



**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
Diab-SP-T-41	Moraga - San Leandro #3 115 kV Line	Moraga-San Leandro #1 115kV Line _Moraga-San Leandro #2 115kV Line	C3	N-1-1	120%	100%	106%	East Shore - Oakland J 115 kV Reconductor Project & Moraga - Oakland J SPS
Diab-SP-T-42	MORAGA 115/230kV Bank 2	Moraga 230/115kV Transformer #1 _Moraga 230/115kV Transformer #3	C3	N-1-1	136%	N/A	N/A	Moraga 230/115 kV Transformer Replacement Project
Diab-SP-T-43	Pittsburg - Clayton #1 115 kV Line	Pittsburg-Clayton #3 115kV Line _Pittsburg-Clayton #4 115kV Line	C3	N-1-1	111%	112%	115%	Pittsburg - Lakewood SPS
Diab-SP-T-44	Pittsburg - Clayton #4 115 kV Line	Pittsburg-Clayton #3 115kV Line _Pittsburg-Clayton #1 115kV Line	C3	N-1-1	126%	127%	130%	Pittsburg - Lakewood SPS
Diab-SP-T-45	Pittsburg - Clayton #3 115 kV Line	Pittsburg-Clayton #1 115kV Line _Pittsburg-Clayton #4 115kV Line	C3	N-1-1	100%	101%	103%	Pittsburg - Lakewood SPS
Diab-SP-T-46	PITTSBURG 115/230kV Bank 12	Pittsburg 230/115kV Transformer #13 _LMEC GSU CC2	C3	N-1-1	127%	N/A	N/A	Pittsburg Transformer No. 14 Addition
Diab-SP-T-47	PITTSBURG 115/230kV Bank 13	Pittsburg 230/115kV Transformer #12 _LMEC GSU CC2	C3	N-1-1	147%	85%	87%	Pittsburg Transformer No. 14 Addition
Diab-SP-T-48	Contra Costa - Delta Pumps 230 kV Line	Contra Costa-Brentwood 230kV Line _Contra Costa-Las Positas 230kV Line	C3	N-1-1	104%	N/A	N/A	Oakley Generating Station Network Upgrades
Diab-SP-T-49	Contra Costa - Delta Pumps 230 kV Line	Contra Costa - Las Positas 230 kV and Contra Costa-Lonetree 230 kV lines	C5	DCTL	111%	N/A	N/A	Oakley Generating Station Network Upgrades
Diab-SP-T-50	Lone Tree - Cayetano 230 kV Line	Contra Costa-Moraga Nos. 1 & 2 230 kV lines	C5	DCTL	95%	99%	103%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Diab-SP-T-51	Moraga - Lakewood 115 kV Line	Lakewood-Clayton and Lakewood-Meadow Lane-Clayton 115 kV lines	C5	DCTL	131%	133%	136%	Pittsburg - Lakewood SPS
Diab-SP-T-52	Moraga - San Leandro #1 115 kV Line	Moraga-Oakland J 115 kV and Moraga-San Leandro No. 3 115 kV lines	C5	DCTL	135%	101%	107%	East Shore - Oakland J 115 kV Reconductor Project & Moraga - Oakland J SPS

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
Diab-SP-T-53	Moraga - San Leandro #2 115 kV Line	Moraga-Oakland J 115 kV and Moraga-San Leandro No. 3 115 kV lines	C5	DCTL	137%	102%	108%	East Shore - Oakland J 115 kV Reconductor Project & Moraga - Oakland J SPS
Diab-SP-T-54	Moraga - San Leandro #3 115 kV Line	Moraga-San Leandro Nos. 1 & 2 115 kV lines	C5	DCTL	120%	100%	104%	East Shore - Oakland J 115 kV Reconductor Project & Moraga - Oakland J SPS
Diab-SP-T-55	Pittsburg - Clayton #1 115 kV Line	Pittsburg-Clayton Nos. 3 & 4 115 kV lines	C5	DCTL	111%	112%	104%	Pittsburg - Lakewood SPS
Diab-SP-T-56	Contra Costa - Delta Pumps 230 kV Line	Contra Costa - Las Positas 230 kV and Contra Costa-Lonetree 230 kV lines	C5	DCTL	104%	N/A	N/A	Oakley Generating Station Network Upgrades

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Summer Off-Peak	N/A	
Diab-OP-T-01	MORAGA 115/230kV Bank 2	CB FAULT AT 33020 MORAGA 115 CB432	C2	Breaker	109%	N/A		Moraga Transformer Replacement Project

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Study Area: **PG&E Greater Bay Area Diablo- Summer Peak**



**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
Diab-SP-DV-01	MEDW LNE 115kV	CB FAULT AT 32970 CLAYTN 115 CB102	C2	Breaker	-20%	-20%	-21%	Add reactive support
Diab-SP-DV-02	EBMUDGRY 115kV	CB FAULT AT 32970 CLAYTN 115 CB102	C2	Breaker	-20%	-19%	-20%	Add reactive support
Diab-SP-DV-03	LAKEWD-C 115kV	CB FAULT AT 32970 CLAYTN 115 CB102	C2	Breaker	-19%	-19%	-20%	Add reactive support
Diab-SP-DV-04	LAKEWD-M 115kV	CB FAULT AT 32970 CLAYTN 115 CB102	C2	Breaker	-19%	-19%	-20%	Add reactive support
Diab-SP-DV-05	LK_REACT 115kV	CB FAULT AT 32970 CLAYTN 115 CB102	C2	Breaker	-11%	-10%	-11%	Add reactive support
Diab-SP-DV-06	LKWD_JCT 115kV	CB FAULT AT 32970 CLAYTN 115 CB102	C2	Breaker	-19%	-19%	-20%	Add reactive support

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Summer Off-Peak	N/A	
Diab-OP-DV-01	RVEC 115kV	Contra Costa #1 115kV Line	B	N-1	-5%	-5%		Add reactive support
Diab-OP-DV-02	BIXLER 60kV	Bixler Tap	B	N-1	-7%	-5%		Add reactive support

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Study Area: **PG&E Greater Bay Area Diablo- Summer Peak**



**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
Diab-SP-V-01	MEDW LNE 115kV	CB FAULT AT 32970 CLAYTN 115 CB102	C2	Bus	0.78	0.79	0.78	Add reactive support
Diab-SP-V-02	EBMUDGRY 115kV	CB FAULT AT 32970 CLAYTN 115 CB102	C2	Bus	0.79	0.80	0.79	Add reactive support
Diab-SP-V-03	LAKEWD-C 115kV	CB FAULT AT 32970 CLAYTN 115 CB102	C2	Bus	0.80	0.80	0.79	Add reactive support
Diab-SP-V-04	LAKEWD-M 115kV	CB FAULT AT 32970 CLAYTN 115 CB102	C2	Bus	0.80	0.81	0.80	Add reactive support
Diab-SP-V-05	LK_REACT 115kV	CB FAULT AT 32970 CLAYTN 115 CB102	C2	Bus	0.88	0.89	0.89	Add reactive support
Diab-SP-V-06	LKWD_JCT 115kV	CB FAULT AT 32970 CLAYTN 115 CB102	C2	Bus	0.80	0.80	0.79	Add reactive support



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Study Area: **PG&E Greater Bay Area Diablo - Summer Light Load & Summer Off-Peak**



**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Summer Off-Peak	N/A	
Diab-OP-V-01	CC SUB 115kV	Normal	A	N-0	1.05	1.05		Add reactive support
Diab-OP-V-02	DOMTAR 115kV	Normal	A	N-0	1.05	1.05		Add reactive support
Diab-OP-V-03	CROWN Z 115kV	Normal	A	N-0	1.05	1.05		Add reactive support
Diab-OP-V-04	RVEC 115kV	Normal	A	N-0	1.05	1.05		Add reactive support
Diab-OP-V-05	CC SUB 60kV	Normal	A	N-0	1.05	1.05		Add reactive support
Diab-OP-V-06	BIXLER 60kV	Normal	A	N-0	1.06	1.03		Add reactive support
Diab-OP-V-07	ANTIOCH 60kV	Normal	A	N-0	1.05	1.05		Add reactive support
Diab-OP-V-08	SFPP CNC 60kV	Normal	A	N-0	1.05	1.05		Add reactive support
Diab-OP-V-09	URICH 60kV	Normal	A	N-0	1.05	1.05		Add reactive support
Diab-OP-V-10	STAUFFER 60kV	Normal	A	N-0	1.05	1.05		Add reactive support
Diab-OP-V-11	PCBRICK 60kV	Normal	A	N-0	1.06	1.06		Add reactive support

*Transient Stability*

ID	Contingency	Category	Category Description	Transient Stability Performance			Potential Mitigation Solutions
				2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	

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Study Area: **PG&E Greater Bay Area Diablo - Summer Light Load & Summer Off-Peak**



*Transient Stability*

ID	Contingency	Category	Category Description	Transient Stability Performance			Potential Mitigation Solutions
				2014 Summer Light Load	2017 Summer Off-Peak	N/A	

No transient stability issues identified.

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Study Area: **PG&E Greater Bay Area Diablo**



**Single Contingency Load Drop**

ID	Worst Contingency	Category	Category Description	Amount of Load Drop (MW)			Potential Mitigation Solutions
				2014	2017	2022	

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

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Study Area: **PG&E Greater Bay Area Diablo**



**Single Source Substation with more than 100 MW Load**

ID	Substation	Load Served (MW)			Potential Mitigation Solutions
		2014	2017	2022	

No single source substation with more than 100 MW Load

**Appendix C-10**  
**PG&E Greater Bay Area - San Francisco**

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
SF-SP-T-01	Potrero - Mission (AX) 115 kV Cable	Potrero-Larkin #2 (AY-2) 115kV Cable	B	N-1	123%	123%	125%	Existing TBC DC Runback Scheme
SF-SP-T-02	Potrero - Mission (AX) 115 kV Cable	Potrero-Larkin #1 (AY-1) 115 kV Cable	B	N-1	93%	102%	103%	Reduce TBC output and/or update TBC DC Runback scheme
SF-SP-T-03	Potrero - Larkin #2 (AY-2) 115 kV Cable	Potrero-Mission (AX) 115 kV Cable	B	N-1	95%	105%	106%	Reduce TBC output and/or update TBC DC Runback scheme
SF-SP-T-04	Potrero - Mission (AX) 115 kV Cable	BUS FAULT AT 33204 POTRERO 115.00 Sec 1D	C1	Bus	101%	109%	111%	Existing TBC DC Runback Scheme
SF-SP-T-05	Potrero - Larkin #2 (AY-2) 115 kV Cable	CB FAULT AT 33204 POTRERO 115 CB102	C2	Breaker	155%	164%	165%	Develop an action plan to transfer loads among substation (NB: reducing TransBay cable output doesn't solve the problem)
SF-SP-T-06	Potrero - Mission (AX) 115 kV Cable	CB FAULT AT 33204 POTRERO 115 CB412	C2	Breaker	97%	106%	109%	TBC DC Runback will automatically initiate for this contingency, reducing overload (loss of AY-2)
SF-SP-T-07	Potrero - Larkin #1 (AY-1) 115 kV Cable	Mission-Larkin (XY-1) 115kV Cable _Martin-Larkin (HY-1) 115kV Cable	C3	N-1-1	179%	186%	198%	Develop an action plan to transfer loads among substation (NB: reducing TransBay cable output doesn't solve the problem)
SF-SP-T-08	Mission - Larkin (XY-1) 115 kV Cable	Potrero-Larkin #1 (AY-1) 115kV Cable _Potrero-Larkin #2 (AY-2) 115kV Cable	C3	N-1-1	117%	125%	129%	TBC DC Runback will automatically initiate for this contingency, reducing overload (loss of AY-2)

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Study Area: **PG&E Greater Bay Area San Francisco - Summer Peak**



**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
SF-SP-T-09	Potrero - Larkin #2 (AY-2) 115 kV Cable	Potrero-Larkin #1 (AY-1) 115kV Cable _Potrero-Mission (AX) 115kV Cable	C3	N-1-1	124%	134%	137%	Develop an action plan to transfer loads among substation or reduce TBC output
SF-SP-T-10	Potrero - Mission (AX) 115 kV Cable	Potrero-Larkin #2 (AY-2) 115kV Cable _Hunters Point-Mission #1 (PX-1) 115kV Ca	C3	N-1-1	132%	142%	146%	TBC DC Runback will automatically initiate for this contingency, reducing overload (loss of AY-2)
SF-SP-T-11	Loss of 115kV Load in San Francisco	Martin 115 kV Substation	D8	Substation	Unsolved	Unsolved	Unsolved	Under Review



**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Winter Peak	2017 Winter Peak	2022 Winter Peak	
SF-WP-T-01	Potrero - Mission (AX) 115 kV Cable	Potrero-Larkin #2 (AY-2) 115kV Cable	B	N-1	123%	123%	125%	Existing TBC DC Runback Scheme
SF-WP-T-02	Potrero - Mission (AX) 115 kV Cable	Potrero-Larkin #1 (AY-1) 115kV Cable	B	N-1	92%	101%	104%	Reduce TBC output and/or update TBC DC Runback scheme
SF-WP-T-03	Potrero - Larkin #2 (AY-2) 115 kV Cable	Potrero - Mission (AX) 115 kV Cable	B	N-1	94%	103%	106%	Reduce TBC output and/or update TBC DC Runback scheme
SF-WP-T-04	Potrero - Larkin #2 (AY-2) 115 kV Cable	CB FAULT AT 33204 POTRERO 115 CB102	C2	Breaker	153%	161%	166%	Develop an action plan to transfer loads among substation (NB: reducing TransBay cable output doesn't solve the problem)
SF-WP-T-05	Potrero-Martin-Bayshore (A-H-W-1) 115 kV Cable	CB FAULT AT 33204 POTRERO 115 CB422	C2	Breaker	101%	N/A	N/A	Existing TBC DC Runback Scheme
SF-WP-T-06	Potrero - Larkin #1 (AY-1) 115 kV Cable	Mission-Larkin (XY-1) 115kV Cable _Martin-Larkin (HY-1) 115kV Cable	C3	N-1-1	179%	186%	198%	Develop an action plan to transfer loads among substation (NB: reducing TransBay cable output doesn't solve the problem)
SF-WP-T-07	Mission - Larkin (XY-1) 115 kV Cable	Potrero-Larkin #1 (AY-1) 115kV Cable _Potrero-Larkin #2 (AY-2) 115kV Cable	C3	N-1-1	117%	125%	129%	TBC DC Runback will automatically initiate for this contingency, reducing overload (loss of AY-2)
SF-WP-T-08	Potrero - Larkin #2 (AY-2) 115 kV Cable	Potrero-Larkin #1 (AY-1) 115kV Cable _Potrero-Mission (AX) 115kV Cable	C3	N-1-1	124%	134%	137%	Develop an action plan to transfer loads among substation or reduce TBC output

2012/2013 ISO Reliability Assessment - Study Results

Study Area: **PG&E Greater Bay Area San Francisco - Winter Peak**



**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Winter Peak	2017 Winter Peak	2022 Winter Peak	
SF-WP-T-09	Potrero - Mission (AX) 115 kV Cable	Potrero-Larkin #2 (AY-2) 115kV Cable _Hunters Point-Mission #1 (PX-1) 115kV Ca	C3	N-1-1	132%	142%	146%	TBC DC Runback will automatically initiate for this contingency, reducing overload (loss of AY-2)
SF-WP-T-10	Loss of 115kV Load in San Francisco	Martin 115 kV Substation	D8	Substation	Unsolved	Unsolved	Unsolved	Under Review

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Summer Off-Peak	N/A	
SF-OP-T-01	LARKIN E - POTRERO 115kV Line 2	CB FAULT AT 33204 POTRERO 115 CB102	C2	Breaker	128%	113%		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-OP-T-02	Loss of 115kV Load in San Francisco	Martin 115 kV Substation	D8	Substation	Unsolved	Unsolved		Under Review



**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	

No voltage deviations identified.

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Winter Peak	2017 Winter Peak	2022 Winter Peak	

No voltage deviations identified.

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Summer Off-Peak	N/A	

No voltage deviations identified.

2012/2013 ISO Reliability Assessment - Study Results

Study Area: **PG&E Greater Bay Area San Francisco - Summer Peak**



*High/Low Voltage*

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
SF-WP-V-01	MARTIN 60kV	Normal	A	N-0	1.05	1.05	1.05	Reactive Support

2012/2013 ISO Reliability Assessment - Study Results

Study Area: **PG&E Greater Bay Area San Francisco - Winter Peak**



**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014 Winter Peak	2017 Winter Peak	2022 Winter Peak	
SF-WP-V-01	MARTIN 60kV	Normal	A	N-0	1.05	1.05	1.05	Reactive Support



2012/2013 ISO Reliability Assessment - Study Results

Study Area: **PG&E Greater Bay Area San Francisco - Summer Light Load & Summer Off-Peak**



**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Summer Off-Peak	N/A	
SF-OP-V-01	MARTIN 60kV	Normal	A	N-0	1.06	1.07		Reactive Support

2012/2013 ISO Reliability Assessment - Study Results

Study Area: **PG&E Greater Bay Area San Francisco**



**Single Contingency Load Drop**

ID	Worst Contingency	Category	Category Description	Amount of Load Drop (MW)			Potential Mitigation Solutions
				2014	2017	2022	

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

2012/2013 ISO Reliability Assessment - Study Results

Study Area: **PG&E Greater Bay Area San Francisco**

**Single Source Substation with more than 100 MW Load**



ID	Substation	Load Served (MW)			Potential Mitigation Solutions
		2014	2017	2022	

No single source substation with more than 100 MW Load

**Appendix C-11**  
**PG&E Greater Bay Area - Peninsula**

2012/2013 ISO Reliability Assessment - Study Results

Study Area: **PG&E Greater Bay Area Peninsula - Summer Peak**



**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
Penn-SP-T-01	Bair - Cooley Landing #1 60 kV Line	BUS FAULT AT 33375 CLY LNDG 60.00 Bus #1	C1	Bus	95%	103%	111%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Penn-SP-T-02	Bair - Cooley Landing #2 60 kV Line	BUS FAULT AT 33367 BAIR 60.00	C1	Bus	95%	102%	109%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Penn-SP-T-03	Ravenswood - Palo Alto #2 115 kV Line	CB FAULT AT RVNSWD 115 CB522	C2	Breaker	120%	124%	132%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Penn-SP-T-04	Ravenswood - Cooley Landing #1 115 kV Line	CB FAULT AT RVNSWD 115 CB532	C2	Breaker	101%	N/A	N/A	Ravenswood - Cooley Landing Reconductor Project
Penn-SP-T-05	Bair - Cooley Landing #1 60 kV Line	CB FAULT AT CLY LNDG 60 CB2	C2	Breaker	97%	105%	113%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Penn-SP-T-06	SANMATEO 115/230 kV Bank 6	CB FAULT AT 30700 SANMATEO 230 CB712	C2	Breaker	100%	102%	108%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Penn-SP-T-07	BAIR 60/115kV Bank 1	CB FAULT AT CLY LNDG 60 CB2	C2	Breaker	120%	129%	138%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Penn-SP-T-08	BAIR 60/115kV Bank 1	Ravenswood-Cooley Landing #2 115kV Lin_Cooley Landing 115/60kV Transformer #1	C3	N-1-1	113%	121%	129%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Penn-SP-T-09	San Mateo - Hillsdale JCT 60 kV Line	Jefferson 230/60kV Transformer #1 _Jefferson 230/60kV Transformer #2	C3	N-1-1	90%	95%	108%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
Penn-SP-T-10	Bair - Cooley Landing #1 60 kV Line	Bair-Cooley Landing #2 60kV Line _Bair 115/60kV Transformer #1	C3	N-1-1	89%	95%	103%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Penn-SP-T-11	Cooley Landing - Palo Alto 115 kV Line	Ravenswood-Palo Alto #1 115kV Line _Ravenswood-Palo Alto #2 115kV Line	C3	N-1-1	124%	125%	131%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Penn-SP-T-12	Cooley Landing - Stanford 60 kV Line	Jefferson 230/60kV Transformer #1 _Jefferson 230/60kV Transformer #2	C3	N-1-1	88%	92%	102%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Penn-SP-T-13	Cooley Landing 115/60 kV Transformer No. 2	Bair 115/60kV Transformer #1 _Cooley Landing 115/60kV Transformer #1	C3	N-1-1	116%	121%	130%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Penn-SP-T-14	Jefferson - Stanford 60 kV Line	Cooley Landing-Stanford 60kV Line (Coo_Jefferson-Las Pulgas 60kV Line (Jefferso	C3	N-1-1	104%	111%	120%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Penn-SP-T-15	Cooley Landing - Stanford 60 kV Line	Jefferson 230/60kV Transformer #1 _Jefferson 230/60kV Transformer #2	C3	N-1-1	89%	94%	104%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Penn-SP-T-16	Martin - Sneath Lane 60 kV Line	Martin-Millbrae 115kV Line _Millbrae- San Mateo #1 115kV Line	C3	N-1-1	164%	173%	186%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Penn-SP-T-17	Bair - Cooley Landing #2 60 kV Line	Bair-Cooley Landing #1 60kV Line _Bair 115/60kV Transformer #1	C3	N-1-1	95%	101%	109%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Penn-SP-T-18	Bair - Cooley Landing #1 60 kV Line	Bair-Cooley Landing #2 60kV Line _Bair 115/60kV Transformer #1	C3	N-1-1	89%	94%	103%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate

2012/2013 ISO Reliability Assessment - Study Results

Study Area: **PG&E Greater Bay Area Peninsula - Summer Peak**



**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
Penn-SP-T-19	Bair - Cooley Landing #2 60 kV Line	San Mateo-Bair 60kV Line _Bair 115/60kV Transformer #1	C3	N-1-1	99%	106%	114%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Penn-SP-T-20	Ravenswood - Palo Alto #1 115 kV Line	Ravenswood-Palo Alto #2 115kV Line _Ravenswood-Cooley Landing #1 115kV Line	C3	N-1-1	118%	122%	130%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Penn-SP-T-21	San Mateo - Hillsdale JCT 60 kV Line	Jefferson 230/60kV Transformer #1 _Jefferson 230/60kV Transformer #2	C3	N-1-1	89%	93%	105%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Penn-SP-T-22	San Mateo - Belmont 115 kV Line	Ravenswood 230/115kV Transformer #1 _Ravenswood 230/115kV Transformer #2	C3	N-1-1	121%	123%	127%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Penn-SP-T-23	SANMATEO 115/230kV Bank5	San Mateo 230/115kV Transformer #6 _San Mateo 230/115kV Transformer #7	C3	N-1-1	108%	110%	116%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Penn-SP-T-24	SANMATEO 115/230kV Bank6	San Mateo 230/115kV Transformer #5 _San Mateo 230/115kV Transformer #7	C3	N-1-1	107%	110%	116%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Penn-SP-T-25	SANMATEO 115/230kV Bank7	San Mateo 230/115kV Transformer #5 _San Mateo 230/115kV Transformer #6	C3	N-1-1	110%	113%	119%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Penn-SP-T-26	SANMATEO 60/115 kV Bank3	San Mateo-Bair 60kV Line (San Carlos-B) _San Mateo 115/60kV Transformer #8	C3	N-1-1	88%	92%	100%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Penn-SP-T-27	Millbrae - Sneath Lane 60 kV Line	Martin-Millbrae 115kV Line _Millbrae-San Mateo #1 115kV Line	C3	N-1-1	110%	116%	125%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
Penn-SP-T-28	San Mateo - Hillsdale JCT 60 kV Line	Monta Vista-Jefferson Nos. 1 & 2 230 kV lines	C5	DCTL	87%	92%	104%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Penn-SP-T-29	Cooley Landing - Palo Alto 115 kV Line	Ravenswood-Palo Alto Nos. 1 & 2 115 kV lines	C5	DCTL	124%	125%	131%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Penn-SP-T-30	Cooley Landing - Stanford 60 kV Line	Monta Vista-Jefferson Nos. 1 & 2 230 kV lines	C5	DCTL	90%	95%	105%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Penn-SP-T-31	East Shore - San Mateo 230 kV Line	Newark-Ravenswood 230 kV and Tesla-Ravenswood 230 kV lines	C5	DCTL	100%	105%	109%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate or reduce RCEC generation
Penn-SP-T-32	Cooley Landing - Stanford 60 kV Line	Monta Vista-Jefferson Nos. 1 & 2 230 kV lines	C5	DCTL	92%	97%	107%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Penn-SP-T-33	San Mateo - Belmont 115 kV Line	Ravenswood-Bair Nos. 1 & 2 115 kV lines	C5	DCTL	98%	102%	103%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Penn-SP-T-34	Ravenswood - Palo Alto #2 115 kV Line	Ravenswood-Palo Alto No. 1 115 kV and Cooley Landing-Palo Alto 115 kV lines	C5	DCTL	104%	105%	109%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Penn-SP-T-35	Ravenswood - Cooley Landing #1 115 kV Line	Ravenswood-Palo Alto Nos. 1 & 2 115 kV lines	C5	DCTL	144%	111%	120%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Penn-SP-T-36	San Mateo - Hillsdale JCT 60 kV Line	Monta Vista-Jefferson Nos. 1 & 2 230 kV lines	C5	DCTL	86%	91%	102%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate



**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Winter Peak	2017 Winter Peak	2022 Winter Peak	
Penn-WP-T-01	Ravenswood - Palo Alto #2 115 kV Line	CB FAULT AT RVNSWD 115 CB522	C2	Breaker	93%	96%	102%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Penn-WP-T-02	Bair 115/60 kV Transformer No. 1	CB FAULT AT CLY LNDG 60 CB2	C2	Breaker	104%	111%	119%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Penn-WP-T-03	San Mateo 230/115 kV Transformer No. 5	San Mateo 230/115kV Transformer #6 _San Mateo 230/115kV Transformer #7	C3	N-1-1	101%	102%	109%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Penn-WP-T-04	San Mateo 230/115 kV Transformer No. 6	San Mateo 230/115kV Transformer #5 _San Mateo 230/115kV Transformer #7	C3	N-1-1	100%	102%	109%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Penn-WP-T-05	San Mateo 230/115 kV Transformer No. 7	San Mateo 230/115kV Transformer #5 _San Mateo 230/115kV Transformer #6	C3	N-1-1	103%	105%	112%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Penn-WP-T-06	Martin 115/60 kV Transformer No. 6	Martin-Millbrae 115kV Line _Millbrae-San Mateo #1 115kV Line	C3	N-1-1	94%	99%	106%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Penn-WP-T-07	Bair 115/60 kV Transformer No. 1	Ravenswood-Cooley Landing #2 115kV Line _Cooley Landing 115/60kV Transformer #1	C3	N-1-1	103%	108%	116%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Penn-WP-T-08	Cooley Landing 115/60 kV Transformer No. 2	Bair 115/60kV Transformer #1 _Cooley Landing 115/60kV Transformer #1	C3	N-1-1	106%	111%	119%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Penn-WP-T-09	San Mateo 115/60 kV Transformer No. 3	San Mateo-Bair 60kV Line (San Carlos-Bai_San Mateo 115/60kV Transformer #8	C3	N-1-1	95%	97%	109%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate

2012/2013 ISO Reliability Assessment - Study Results

Study Area: **PG&E Greater Bay Area Peninsula - Winter Peak**



**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Winter Peak	2017 Winter Peak	2022 Winter Peak	
Penn-WP-T-10	Millbrae 115/60 kV Transformer No. 5	Martin-Sneath Lane 60kV Line _Hillsdale JCT - Half Moon Bay 60kV Line	C3	N-1-1	101%	105%	124%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Penn-WP-T-11	Martin-Sneath Lane 60 kV Line	Martin-Millbrae 115kV Line _Millbrae- San Mateo #1 115kV Line	C3	N-1-1	132%	139%	150%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Penn-WP-T-12	Millbrae-Sneath Lane 60 kV Line	Martin-Sneath Lane 60kV Line _Hillsdale JCT - Half Moon Bay 60kV Line	C3	N-1-1	104%	108%	131%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Penn-WP-T-13	Millbrae - Pacifica 60 kV Line	Martin-Sneath Lane 60kV Line _Hillsdale JCT - Half Moon Bay 60kV Line	C3	N-1-1	133%	139%	167%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Penn-WP-T-14	San Mateo - Hillsdale JCT 60 kV Line	Jefferson 230/60kV Transformer #1 _Jefferson 230/60kV Transformer #2	C3	N-1-1	89%	93%	106%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Penn-WP-T-15	San Mateo - Hillsdale JCT 60 kV Line	Monta Vista-Jefferson Nos. 1 & 2 230 kV lines	C5	DCTL	88%	92%	105%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Penn-WP-T-16	Ravenswood-Cooley Landing 115 kV Line	Ravenswood-Palo Alto Nos. 1 & 2 115 kV lines	C5	DCTL	114%	88%	93%	Ravenswood - Cooley Landing Reconductor Project

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Summer Off-Peak	N/A	

No thermal overloads identified.

2012/2013 ISO Reliability Assessment - Study Results

Study Area: **PG&E Greater Bay Area Peninsula - Summer Peak**



**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
Penn-SP-DV-01	MILLBRAE 115kV	Martin-Millbrae 115kV Line San Mateo #1 115kV Line	C3	_Millbrae- N-1-1	-10%	-11%	-12%	Reactive Support
Penn-SP-DV-02	SANPAULA 115kV	Martin-Millbrae 115kV Line San Mateo #1 115kV Line	C3	_Millbrae- N-1-1	-10%	-11%	-12%	Reactive Support

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Winter Peak	2017 Winter Peak	2022 Winter Peak	

No voltage deviations identified.

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Summer Off-Peak	N/A	

No voltage deviations identified.

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	

No high/low voltage issues identified.

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014 Winter Peak	2017 Winter Peak	2022 Winter Peak	

No high/low voltage issues identified.



2012/2013 ISO Reliability Assessment - Study Results

Study Area: **PG&E Greater Bay Area Peninsula - Summer Light Load & Summer Off-Peak**



**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Summer Off-Peak	N/A	
Penn-OP-V-01	RVNSWD E 115kV	Normal	A	N-0	1.06	1.04		Reactive Support
Penn-OP-V-02	CLY LND2 115kV	Normal	A	N-0	1.05	1.04		Reactive Support
Penn-OP-V-03	CLY LND 115kV	Normal	A	N-0	1.06	1.05		Reactive Support
Penn-OP-V-04	RVNSWD D 115kV	Normal	A	N-0	1.06	1.04		Reactive Support
Penn-OP-V-05	CCSF_TAP 115kV	Normal	A	N-0	1.06	1.04		Reactive Support
Penn-OP-V-06	CCSF 115kV	Normal	A	N-0	1.06	1.04		Reactive Support



**Transient Stability**

ID	Contingency	Category	Category Description	Transient Stability Performance			Potential Mitigation Solutions
				2014 Summer Light Load	2017 Summer Off-Peak	N/A	

No single source substation with more than 100 MW Load

2012/2013 ISO Reliability Assessment - Study Results

Study Area: **PG&E Greater Bay Area Peninsula**



**Single Contingency Load Drop**

ID	Worst Contingency	Category	Category Description	Amount of Load Drop (MW)			Potential Mitigation Solutions
				2014	2017	2022	

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

2012/2013 ISO Reliability Assessment - Study Results

Study Area: **PG&E Greater Bay Area Peninsula - Summer Peak**



**Transient Stability**

ID	Contingency	Category	Category Description	Transient Stability Performance			Potential Mitigation Solutions
				2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	

No single source substation with more than 100 MW Load

2012/2013 ISO Reliability Assessment - Study Results

Study Area: **PG&E Greater Bay Area Peninsula**

**Single Source Substation with more than 100 MW Load**



ID	Substation	Load Served (MW)			Potential Mitigation Solutions
		2014	2017	2022	

No single source substation with more than 100 MW Load

**Appendix C-12**  
**PG&E Greater Bay Area - Mission**

2012/2013 ISO Reliability Assessment - Study Results

Study Area: **PG&E Greater Bay Area Mission - Summer Peak**



**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
Miss-SP-T-01	Dumbarton - Newark 115 kV Line	Eastshore-San Mateo 230kV Line	B	N-1	102%	N/A	N/A	East Shore - Oakland J 115 kV Reconductor project
Miss-SP-T-02	Moraga - San Leandro #1 115 kV Line	BUS FAULT AT 35101 SN LNDRO 115.00 Sec E	C1	Bus	126%	108%	114%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Miss-SP-T-03	East Shore - San Mateo 230 kV Line	CB FAULT AT 35105 EASTSHRE 115 CB302	C2	Breaker	103%	103%	104%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate or reduce RCEC generation
Miss-SP-T-04	NEWARK F 115/230kV Bank 11	CB FAULT AT NEWARK 230 CB810	C2	Breaker	107%	111%	116%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Miss-SP-T-05	Newark - Ames #1 115 kV Line	Eastshore-San Mateo 230kV Line _Newark-Ravenswood 230kV Line	C3	N-1-1	107%	N/A	N/A	South of San Mateo SPS South of San Mateo Capacity Project
Miss-SP-T-06	North Dublin - Cayetano 230 KV Line	Contra Costa-Las Positas 230kV Line _Tesla-Newark #2 230kV Line	C3	N-1-1	95%	99%	102%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Miss-SP-T-07	Newark - Vallecitos 60 kV Line	Radum-Livermore 60kV Line _San Ramon 230/60kV Transformer #1	C3	N-1-1	114%	118%	125%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Miss-SP-T-08	Dumbarton - Newark 115 kV Line	Pittsburg-Eastshore 230kV Line _Eastshore-San Mateo 230kV Line	C3	N-1-1	122%	N/A	N/A	East Shore - Oakland J 115 kV Reconductor project
Miss-SP-T-09	Dumbarton - Newark 115 kV Line	Eastshore-San Mateo 230kV Line _Oakland J - Grant 115kV Line	C3	N-1-1	102%	101%	N/A	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate or reduce RCEC generation

2012/2013 ISO Reliability Assessment - Study Results

Study Area: **PG&E Greater Bay Area Mission - Summer Peak**



**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
Miss-SP-T-10	East Shore - San Mateo 230 kV Line	Eastshore 230/115kV Transformer #1 _Eastshore 230/115kV Transformer #2	C3	N-1-1	104%	103%	104%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Miss-SP-T-11	EASTSHRE - E. SHORE 115/230kV Bank 1	Eastshore-San Mateo 230kV Line _Eastshore 230/115kV Transformer #2	C3	N-1-1	112%	127%	129%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate or reduce RCEC generation
Miss-SP-T-12	EASTSHRE - E. SHORE 115/230kV Bank 2	Eastshore-San Mateo 230kV Line _Eastshore 230/115kV Transformer #1	C3	N-1-1	113%	127%	129%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate or reduce RCEC generation
Miss-SP-T-13	Grant - Oakland J 115 kV Line	Eastshore-San Mateo 230kV Line _Eastshore-Dumbarton 115kV Line	C3	N-1-1	N/A	123%	123%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate or reduce RCEC generation
Miss-SP-T-14	Grant - East Shore #1 115 kV Line	Eastshore-San Mateo 230kV Line _Grant-Eastshore #2 115kV Line	C3	N-1-1	N/A	104%	107%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate or reduce RCEC generation
Miss-SP-T-15	Grant - East Shore #2 115 kV Line	Eastshore-San Mateo 230kV Line _Grant-Eastshore #1 115kV Line	C3	N-1-1	N/A	104%	107%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate or reduce RCEC generation
Miss-SP-T-16	Newark - Livermore 60 kV Line	San Ramon 230/60kV Transformer #1 _Las Positas 230/60kV Transformer #4	C3	N-1-1	N/A	N/A	106%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate



2012/2013 ISO Reliability Assessment - Study Results

Study Area: **PG&E Greater Bay Area Mission - Summer Peak**



**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
Miss-SP-T-17	Lone Tree - Cayetano 230 kV Line	Contra Costa-Las Positas 230kV Line _Moraga-Castro Valley 230kV Line	C3	N-1-1	102%	104%	108%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Miss-SP-T-18	Moraga - San Leandro #1 115 kV Line	Moraga-San Leandro #2 115kV Line _Moraga-San Leandro #3 115kV Line	C3	N-1-1	150%	123%	130%	Moraga - Oakland J SPS
Miss-SP-T-19	Moraga - San Leandro #2 115 kV Line	Moraga-San Leandro #1 115kV Line _Moraga-San Leandro #3 115kV Line	C3	N-1-1	150%	124%	130%	Moraga - Oakland J SPS
Miss-SP-T-20	Moraga - San Leandro #3 115 kV Line	Moraga-San Leandro #1 115kV Line _Moraga-San Leandro #2 115kV Line	C3	N-1-1	120%	100%	106%	Moraga - Oakland J SPS
Miss-SP-T-21	Newark 115/60 kV Bank 2	San Ramon 230/60kV Transformer #1 _Las Positas 230/60kV Transformer #4	C3	N-1-1	100%	105%	114%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Miss-SP-T-22	Newark - Ames #3 115 kV Line	Eastshore-San Mateo 230kV Line _Newark-Ravenswood 230kV Line	C3	N-1-1	106%	N/A	N/A	South of San Mateo Capacity Project
Miss-SP-T-23	Newark - Ames #2 115 kV Line	Eastshore-San Mateo 230kV Line _Newark-Ravenswood 230kV Line	C3	N-1-1	108%	N/A	N/A	South of San Mateo Capacity Project
Miss-SP-T-24	NEWARK F 115/230kV Bank 11	Newark-Newark Dist 230kV section _Newark 230/115kV Transformer #7	C3	N-1-1	101%	107%	111%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Miss-SP-T-25	Newark - Vallecitos 60 kV Line	Radum-Livermore 60kV Line _San Ramon 230/60kV Transformer #1	C3	N-1-1	114%	118%	125%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Miss-SP-T-26	Lone Tree - Cayetano 230 kV Line	Contra Costa-Las Positas 230kV Line _Moraga-Castro Valley 230kV Line	C3	N-1-1	102%	104%	108%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Miss-SP-T-27	East Shore - San Mateo 230 kV Line	Newark-Ravenswood 230 kV and Tesla-Ravenswood 230 kV lines	C5	DCTL	100%	105%	109%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate



**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
Miss-SP-T-28	Dumbarton - Newark 115 kV Line	Eastshore-San Mateo 230 kV and Pittsburg-San Mateo 230 kV lines	C5	DCTL	111%	88%	86%	East Shore - Oakland J 115 kV Reconductor project

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Summer Off-Peak	N/A	

No thermal Overloads Identified.

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
Miss-SP-DV-01	GRANT 115kV	CB FAULT AT 35105 EASTSHRE 115 CB302	C2	Breaker	-6%	-9%	-10%	Add reactive support
Miss-SP-DV-02	CALMAT60 60kV	Livermore-Las Positas 60kV Line _San Ramon 230/60kV Transformer #1	C3	N-1-1	-14%	-15%	-16%	Add reactive support
Miss-SP-DV-04	E DUBLIN 60kV	San Ramon 230/60kV Transformer #1 _Las Positas 230/60kV Transformer #4	C3	N-1-1	-15%	-16%	-18%	Add reactive support
Miss-SP-DV-05	GRANT 115kV	Grant-Eastshore #1 115kV Line _Grant-Eastshore #2 115kV Line	C3	N-1-1	-6%	-9%	-11%	Add reactive support
Miss-SP-DV-06	IUKA 60kV	Livermore-Las Positas 60kV Line _San Ramon 230/60kV Transformer #1	C3	N-1-1	-14%	-15%	-16%	Add reactive support
Miss-SP-DV-07	LIVERMRE 60kV	San Ramon 230/60kV Transformer #1 _Las Positas 230/60kV Transformer #4	C3	N-1-1	-15%	-16%	-18%	Add reactive support
Miss-SP-DV-08	LIVRMR_2 60kV	San Ramon 230/60kV Transformer #1 _Las Positas 230/60kV Transformer #4	C3	N-1-1	-15%	-16%	-18%	Add reactive support
Miss-SP-DV-09	LPOSTAS 60kV	San Ramon 230/60kV Transformer #1 _Las Positas 230/60kV Transformer #4	C3	N-1-1	-16%	-17%	-19%	Add reactive support
Miss-SP-DV-10	NEWARK 60kV	Las Positas 230/60kV Transformer #4 _Newark 115/60kV Transformer #1	C3	N-1-1	-11%	-11%	-12%	Add reactive support
Miss-SP-DV-11	PARKS 60kV	Livermore-Las Positas 60kV Line _San Ramon 230/60kV Transformer #1	C3	N-1-1	-14%	-15%	-16%	Add reactive support
Miss-SP-DV-12	RADUM 60kV	San Ramon 230/60kV Transformer #1 _Las Positas 230/60kV Transformer #4	C3	N-1-1	-15%	-16%	-18%	Add reactive support
Miss-SP-DV-13	SAN RAMN 60kV	San Ramon 230/60kV Transformer #1 _Las Positas 230/60kV Transformer #4	C3	N-1-1	-16%	-17%	-19%	Add reactive support
Miss-SP-DV-14	SEAWEST 60kV	San Ramon 230/60kV Transformer #1 _Las Positas 230/60kV Transformer #4	C3	N-1-1	-16%	-17%	-19%	Add reactive support
Miss-SP-DV-15	VASCO 60kV	San Ramon 230/60kV Transformer #1 _Las Positas 230/60kV Transformer #4	C3	N-1-1	-16%	-17%	-19%	Add reactive support
Miss-SP-DV-16	ZONDWD 60kV	San Ramon 230/60kV Transformer #1 _Las Positas 230/60kV Transformer #4	C3	N-1-1	-16%	-17%	-19%	Add reactive support

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Study Area: **PG&E Greater Bay Area Mission - Summer Peak**



**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
Miss-SP-DV-17	USWP-FRK 60kV	San Ramon 230/60kV Transformer #1 _Las Positas 230/60kV Transformer #4	C3	N-1-1	-16%	-17%	-19%	Add reactive support
Miss-SP-DV-18	VALLECTS 60kV	San Ramon 230/60kV Transformer #1 _Las Positas 230/60kV Transformer #4	C3	N-1-1	-11%	-12%	-14%	Add reactive support
Miss-SP-DV-19	SUNOL 60kV	San Ramon 230/60kV Transformer #1 _Las Positas 230/60kV Transformer #4	C3	N-1-1	-10%	-11%	-12%	Add reactive support
Miss-SP-DV-20	VINEYARD 60kV	San Ramon 230/60kV Transformer #1 _Las Positas 230/60kV Transformer #4	C3	N-1-1	-15%	-16%	-18%	Add reactive support

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Summer Off-Peak	N/A	
Miss-OP-DV-01	SEAWEST 60kV	Wind Farms 60kV Line	B	N-1	-6%	-5%		Add reactive support
Miss-OP-DV-02	USWP-WKR 60kV	Vasco-Herdlyn 60kV Line	B	N-1	-6%	-3%		Add reactive support
Miss-OP-DV-03	ZONDWD 60kV	Wind Farms 60kV Line	B	N-1	-6%	-5%		Add reactive support
Miss-OP-DV-04	PARKS 60kV	San Ramon-Radum 60kV Line	B	N-1	-8%	-7%		Add reactive support
Miss-OP-DV-05	USWP-FRK 60kV	Wind Farms 60kV Line	B	N-1	-6%	-5%		Add reactive support
Miss-OP-DV-06	ALTAMONT 60kV	Vasco-Herdlyn 60kV Line	B	N-1	-6%	-3%		Add reactive support
Miss-OP-DV-07	IUKA 60kV	Radum-Vallecitos 60kV Line	B	N-1	-9%	-8%		Add reactive support
Miss-OP-DV-08	SUNOL 60kV	Newark-Vallecitos 60kV Line	B	N-1	-9%	-7%		Add reactive support
Miss-OP-DV-09	FLOWIND1 60kV	Wind Farms 60kV Line	B	N-1	-6%	-5%		Add reactive support
Miss-OP-DV-10	E DUBLIN 60kV	San Ramon-Radum 60kV Line	B	N-1	-8%	-7%		Add reactive support
Miss-OP-DV-11	CALMAT60 60kV	Radum-Livermore 60kV Line	B	N-1	-9%	-8%		Add reactive support
Miss-OP-DV-12	VINEYARD 60kV	Radum-Vallecitos 60kV Line	B	N-1	-9%	-8%		Add reactive support

2012/2013 ISO Reliability Assessment - Study Results

Study Area: **PG&E Greater Bay Area Mission - Summer Peak**



**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
Miss-SP-V-01	CALMAT 60 kV	San Ramon 230/60kV Transformer #1 _Las Positas 230/60kV Transformer #4	C3	N-1-1	0.84	0.83	0.81	Add reactive support
Miss-SP-V-02	DCTO JCT 60kV	Las Positas 230/60kV Transformer #4 _Newark 115/60kV Transformer #1	C3	N-1-1	0.89	0.89	0.88	Add reactive support
Miss-SP-V-03	E DUBLIN 60kV	San Ramon 230/60kV Transformer #1 _Las Positas 230/60kV Transformer #4	C3	N-1-1	0.84	0.83	0.81	Add reactive support
Miss-SP-V-04	FLOWIND1 60kV	San Ramon 230/60kV Transformer #1 _Las Positas 230/60kV Transformer #4	C3	N-1-1	0.84	0.83	0.81	Add reactive support
Miss-SP-V-05	IUKA 60kV	San Ramon 230/60kV Transformer #1 _Las Positas 230/60kV Transformer #4	C3	N-1-1	0.85	0.83	0.81	Add reactive support
Miss-SP-V-06	LIVERMRE 60kV	San Ramon 230/60kV Transformer #1 _Las Positas 230/60kV Transformer #4	C3	N-1-1	0.84	0.83	0.81	Add reactive support
Miss-SP-V-07	LIVRMR_2 60kV	San Ramon 230/60kV Transformer #1 _Las Positas 230/60kV Transformer #4	C3	N-1-1	0.84	0.83	0.81	Add reactive support
Miss-SP-V-08	LPOSTAS 60kV	San Ramon 230/60kV Transformer #1 _Las Positas 230/60kV Transformer #4	C3	N-1-1	0.84	0.83	0.81	Add reactive support
Miss-SP-V-09	SEAWEST 60kV	San Ramon 230/60kV Transformer #1 _Las Positas 230/60kV Transformer #4	C3	N-1-1	0.84	0.83	0.81	Add reactive support
Miss-SP-V-10	VASCO 60kV	San Ramon 230/60kV Transformer #1 _Las Positas 230/60kV Transformer #4	C3	N-1-1	0.84	0.83	0.81	Add reactive support
Miss-SP-V-11	ZONDWD 60kV	San Ramon 230/60kV Transformer #1 _Las Positas 230/60kV Transformer #4	C3	N-1-1	0.84	0.83	0.81	Add reactive support
Miss-SP-V-12	RADUM 60kV	San Ramon 230/60kV Transformer #1 _Las Positas 230/60kV Transformer #4	C3	N-1-1	0.84	0.83	0.81	Add reactive support
Miss-SP-V-13	PARKS 60kV	San Ramon 230/60kV Transformer #1 _Las Positas 230/60kV Transformer #4	C3	N-1-1	0.84	0.83	0.81	Add reactive support
Miss-SP-V-14	USWP-FRK 60kV	San Ramon 230/60kV Transformer #1 _Las Positas 230/60kV Transformer #4	C3	N-1-1	0.84	0.83	0.81	Add reactive support
Miss-SP-V-15	SAN RAMN 60kV	San Ramon 230/60kV Transformer #1 _Las Positas 230/60kV Transformer #4	C3	N-1-1	0.84	0.83	0.81	Add reactive support

2012/2013 ISO Reliability Assessment - Study Results

Study Area: **PG&E Greater Bay Area Mission - Summer Peak**



**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
Miss-SP-V-16	VALLECTS 60kV	San Ramon 230/60kV Transformer #1 _Las Positas 230/60kV Transformer #4	C3	N-1-1	0.88	0.86	0.85	Add reactive support
Miss-SP-V-17	SUNOL 60kV	San Ramon 230/60kV Transformer #1 _Las Positas 230/60kV Transformer #4	C3	N-1-1	0.89	0.88	0.86	Add reactive support
Miss-SP-V-18	VINEYARD 60kV	San Ramon 230/60kV Transformer #1 _Las Positas 230/60kV Transformer #4	C3	N-1-1	0.84	0.83	0.81	Add reactive support



2012/2013 ISO Reliability Assessment - Study Results

Study Area: **PG&E Greater Bay Area Mission - Summer Light Load & Summer Off-Peak**



**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Summer Off-Peak	N/A	
Miss-OP-V-01	NEWARK D 115kV	Normal	A	N-0	1.05	1.03		Add reactive support
Miss-OP-V-02	USWP-WKR 60kV	Normal	A	N-0	1.08	1.05		Add reactive support
Miss-OP-V-03	ALTAMONT 60kV	Normal	A	N-0	1.08	1.05		Add reactive support

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Study Area: **PG&E Greater Bay Area Mission**



*Single Contingency Load Drop*

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

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

2012/2013 ISO Reliability Assessment - Study Results

Study Area: **PG&E Greater Bay Area Mission**



**Single Source Substation with more than 100 MW Load**

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

No single source substation with more than 100 MW Load



**Transient Stability**

ID	Contingency	Category	Category Description	Transient Stability Performance			Potential Mitigation Solutions
				2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	

No transient stability issues identified.

**Transient Stability**

ID	Contingency	Category	Category Description	Transient Stability Performance			Potential Mitigation Solutions
				2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	

No transient stability issues identified.

**Appendix C-13**  
**PG&E Greater Bay Area - De Anza**

2012/2013 ISO Reliability Assessment - Study Results

Study Area: **PG&E Greater Bay Area De Anza - Summer Peak**



**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
DeAn-SP-T-01	Newark-Applied Materials 115 kV Line	Britton-Monta Vista 115 kV Line	B	N-1	94%	104%	108%	Re-rate or reconductor line.
DeAn-SP-T-02	Monta Vista-Wolfe 115 kV Line	Stelling-Monta Vista 115 kV Line	B	N-1	99%	104%	110%	Re-rate or reconductor line.
DeAn-SP-T-03	Lockheed No. 1 Tap	Newark-Applied Materials 115 kV Line	B	N-1	88%	101%	103%	Re-rate or reconductor line.
DeAn-SP-T-04	Lockheed No. 2-Lockheed Jct 2 115 kV Line	Newark-Lawrence 115 kV Line _Britton-Monta Vista 115 kV Line	C3	N-1-1	87%	100%	102%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
DeAn-SP-T-05	Lockheed No. 1 Tap	Newark-Applied Materials 115 kV Line _Lawrence - Monta Vista 115 kV	C3	N-1-1	86%	100%	102%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
DeAn-SP-T-06	Newark-Applied Materials 115 kV Line	Newark-Lawrence 115 kV Line _Britton-Monta Vista 115 kV Line	C3	N-1-1	104%	114%	119%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
DeAn-SP-T-07	Newark-Applied Materials 115 kV Line	Britton-Monta Vista & Lawrence-Monta Vista 115 kV Lines	C5	DCTL	94%	104%	109%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
DeAn-SP-T-08	Lockheed No. 1 Tap	Newark-Applied Materials & Lawrence-Monta Vista 115 kV Lines	C5	DCTL	90%	103%	105%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
DeAn-SP-T-09	Lockheed No. 1-Moffett Field Jct 115 kV Line	Newark-Applied Materials & Lawrence-Monta Vista 115 kV Lines	C5	DCTL	86%	100%	102%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Summer Off-Peak	N/A	
DeAn-OP-T-01	NEWARK F - LCKHD J2 115kV Line 1	CB FAULT AT 30705 MONTA VISTA SUB 230 CB202	C2	Breaker	N/A	102%		Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate



**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	

No voltage deviations identified.

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Summer Off-Peak	N/A	
DeAn-OP-DV-01	LOYOLA 60kV	Loyola-Monta Vista 60 kV Line	B	N-1	-5%	-3%		Add Reactive Support

2012/2013 ISO Reliability Assessment - Study Results

Study Area: **PG&E Greater Bay Area De Anza - Summer Peak**



**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
DeAn-SP-V-01	Britton Area	CB FAULT AT 30705 MONTA VISTA SUB 230 CB202	C2	Breaker	Below 0.7 pu	Below 0.7 pu	Below 0.7 pu	Monta Vista Substation Upgrade

2012/2013 ISO Reliability Assessment - Study Results

Study Area: **PG&E Greater Bay Area De Anza - Summer Light Load & Summer Off-Peak**



**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Summer Off-Peak	N/A	
DeAn-OP-V-01	AMES DST 115kV	Normal	A	N-0	1.05	1.03		Add Reactive Support
DeAn-OP-V-02	AMES BS1 115kV	Normal	A	N-0	1.05	1.03		Add Reactive Support
DeAn-OP-V-03	AMES BS2 115kV	Normal	A	N-0	1.05	1.03		Add Reactive Support
DeAn-OP-V-04	LOS ALTS 60kV	Normal	A	N-0	1.05	1.03		Add Reactive Support
DeAn-OP-V-05	LOYOLA 60kV	Normal	A	N-0	1.05	1.03		Add Reactive Support
DeAn-OP-V-06	MNTA VSA 60kV	Normal	A	N-0	1.06	1.04		Add Reactive Support
DeAn-OP-V-07	PRMNT J3 60kV	Normal	A	N-0	1.06	1.04		Add Reactive Support
DeAn-OP-V-08	PRMNT J1 60kV	Normal	A	N-0	1.05	1.03		Add Reactive Support
DeAn-OP-V-09	LOS GATS 60kV	Normal	A	N-0	1.05	1.03		Add Reactive Support

2012/2013 ISO Reliability Assessment - Study Results

Study Area: **PG&E Greater Bay Area De Anza**



**Single Contingency Load Drop**

ID	Worst Contingency	Category	Category Description	Amount of Load Drop (MW)			Potential Mitigation Solutions
				2014	2017	2022	

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

2012/2013 ISO Reliability Assessment - Study Results

Study Area: **PG&E Greater Bay Area De Anza**

**Single Source Substation with more than 100 MW Load**



ID	Substation	Load Served (MW)			Potential Mitigation Solutions
		2014	2017	2022	

No single source substation with more than 100 MW Load

**Appendix C-14**  
**PG&E Greater Bay Area - San Jose**

2012/2013 ISO Reliability Assessment - Study Results

Study Area: **PG&E Greater Bay Area San Jose - Summer Peak**



**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
SanJ-SP-T-01	Newark-Dixon Landing 115 kV Line	Piercy-Metcalf 115 kV Line	B	N-1	109%	N/A	N/A	Mitigated by Mabury Voltage Conversion Project
SanJ-SP-T-02	Piercy-Metcalf 115 kV Line	Newark-Dixon Landing 115 kV Line	B	N-1	101%	88%	93%	Mitigated by Mabury Voltage Conversion Project
SanJ-SP-T-03	Los Esteros-Montague 115 kV Line	Los Esteros-Trimble 115 kV Line	B	N-1	94%	98%	102%	Re-rate or reconductor line.
SanJ-SP-T-04	Markham No. 1 115 kV Tap	Markham No. 2 115 kV Tap	B	N-1	98%	106%	110%	Re-rate or reconductor line.
SanJ-SP-T-05	NRS-Scott No. 1 115 kV Line	Los Esteros-Nortech 115 kV Line _DVR	B	L-1/G-1	102%	108%	112%	Re-rate or reconductor line.
SanJ-SP-T-06	NRS-Scott No. 1 115 kV Line	Nortech-NRS 115 kV Line _DVR	B	L-1/G-1	97%	103%	106%	Re-rate or reconductor line.
SanJ-SP-T-07	NRS-Scott No. 1 115 kV Line	NRS-Scott No. 2 115 kV Line _DVR	B	L-1/G-1	97%	102%	106%	Re-rate or reconductor line.
SanJ-SP-T-08	Newark-Dixon Landing 115 kV Line	BUS FAULT AT 35643 MTCALF 2E 115.00	C1	Bus	109%	N/A	N/A	Mitigated by Mabury Voltage Conversion Project
SanJ-SP-T-09	Metcalf-Llagas 115 kV Line	BUS FAULT AT 35648 LLAGAS F 115.00	C1	Bus	100%	99%	98%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
SanJ-SP-T-10	Green Valley - Llagas 115 kV Line (LLAGAS - MORGN J2)	BUS FAULT AT 35648 LLAGAS F 115.00	C1	Bus	108%	107%	106%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
SanJ-SP-T-11	Green Valley - Llagas 115 kV Line (MORGN J1 - MORGN J2)	BUS FAULT AT 35648 LLAGAS F 115.00	C1	Bus	100%	99%	98%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
SanJ-SP-T-12	Metcalf 230/115 kV Trans No. 4	CB FAULT AT METCALF SUB 230 CB312	C2	Breaker	95%	100%	108%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate



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Study Area: **PG&E Greater Bay Area San Jose - Summer Peak**



**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
SanJ-SP-T-13	Metcalf 230/115 kV Trans No. 2	CB FAULT AT METCALF SUB 230 CB312	C2	Breaker	N/A	100%	108%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
SanJ-SP-T-14	Metcalf 230/115 kV Trans No. 1	CB FAULT AT METCALF SUB 230 CB322	C2	Breaker	N/A	99%	107%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
SanJ-SP-T-15	Metcalf 230/115 kV Trans No. 3	CB FAULT AT METCALF SUB 230 CB322	C2	Breaker	106%	112%	120%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
SanJ-SP-T-16	Newark-Dixon Landing 115 kV Line	CB FAULT AT METCALF SUB 115 CB492	C2	Breaker	109%	N/A	N/A	Mitigated by Mabury Voltage Conversion Project
SanJ-SP-T-17	Evergreen-Mabury 115 kV Line	Newark-Dixon Landing 115 kV Line _Piercy-Metcalf 115 kV Line	C3	N-1-1	N/A	146%	154%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
SanJ-SP-T-18	Metcalf-Evergreen No. 2 115 kV Line	Markham No. 1 115 kV Tap _Metcalf-Evergreen No. 1 115 kV Line	C3	N-1-1	110%	N/A	N/A	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
SanJ-SP-T-19	Green Valley - Llagas 115 kV Line (LLAGAS - MORGJ2)	Metcalf-Morgan Hill 115 kV Line _Llagas-Gilroy Foods 115 kV Line	C3	N-1-1	123%	128%	138%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
SanJ-SP-T-20	Los Esteros-Montague 115 kV Line	Los Esteros-Trimble 115 kV Line _Los Esteros-Nortech 115 kV Line	C3	N-1-1	114%	118%	123%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
SanJ-SP-T-21	Los Esteros-Trimble 115 kV Line	Los Esteros-Montague 115 kV Line _Los Esteros-Nortech 115 kV Line	C3	N-1-1	101%	105%	109%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
SanJ-SP-T-22	Mabury-Jennings J. 115 kV Line	Newark-Dixon Landing 115 kV Line _Piercy-Metcalf 115 kV Line	C3	N-1-1	N/A	146%	153%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
SanJ-SP-T-23	Mabury 115 kV Tap	Newark-Dixon Landing 115 kV Line _Piercy-Metcalf 115 kV Line	C3	N-1-1	N/A	126%	133%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
SanJ-SP-T-24	McKee-Piercy 115 kV Line	Newark-Dixon Landing 115 kV Line _Mabury-Jennings J. 115 kV Line	C3	N-1-1	N/A	100%	104%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
SanJ-SP-T-25	Metcalf 500/230 kV Trans No. 13	Metcalf 500/230 kV Trans No. 11 _Metcalf 500/230 kV Trans No. 12	C3	N-1-1	94%	101%	111%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
SanJ-SP-T-26	Green Valley - Llagas 115 kV Line (MORGN J1 - MORGN J2)	Metcalf-Morgan Hill 115 kV Line _Llagas-Gilroy Foods 115 kV Line	C3	N-1-1	114%	119%	128%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
SanJ-SP-T-27	Metcalf-Morgan Hill 115 kV Line	Metcalf-Llagas 115 kV Line _Llagas-Gilroy Foods 115 kV Line	C3	N-1-1	105%	109%	116%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
SanJ-SP-T-28	Metcalf-Llagas 115 kV Line	Metcalf-Morgan Hill 115 kV Line _Llagas-Gilroy Foods 115 kV Line	C3	N-1-1	114%	119%	128%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
SanJ-SP-T-29	Metcalf 230/115 kV Trans No. 4	Metcalf 230/115 kV Trans No. 2 _Metcalf 230/115 kV Trans No. 3	C3	N-1-1	99%	104%	111%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
SanJ-SP-T-30	Metcalf 230/115 kV Trans No. 2	Metcalf 230/115 kV Trans No. 4 _Metcalf 230/115 kV Trans No. 3	C3	N-1-1	101%	106%	113%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate

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Study Area: **PG&E Greater Bay Area San Jose - Summer Peak**



**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
SanJ-SP-T-31	Metcalfe 230/115 kV Trans No. 3	Metcalfe 230/115 kV Trans No. 4 230/115 kV Trans No. 2	C3	N-1-1	99%	104%	111%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
SanJ-SP-T-32	Newark-Dixon Landing 115 kV Line	Newark-Los Esteros 230 kV Line Metcalfe 115 kV Line	C3	N-1-1	109%	N/A	N/A	Mitigated by Mabury Voltage Conversion Project
SanJ-SP-T-33	Newark-Milpitas 115 kV Line No. 1	Newark-Milpitas 115 kV Line No. 2 Metcalfe 115 kV Line	C3	N-1-1	141%	100%	107%	
SanJ-SP-T-34	Newark-Milpitas 115 kV Line No. 2	Newark-Milpitas 115 kV Line No. 1 Metcalfe 115 kV Line	C3	N-1-1	118%	123%	133%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
SanJ-SP-T-35	Piercy-Metcalfe 115 kV Line	Newark-Los Esteros 230 kV Line Dixon Landing 115 kV Line	C3	N-1-1	101%	89%	94%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
SanJ-SP-T-36	Piercy-Metcalfe 115 kV Line	Newark-Dixon Landing 115 kV Line Mabury-Jennings J. 115 kV Line	C3	N-1-1	N/A	118%	123%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
SanJ-SP-T-37	Swift-Metcalfe 115 kV Line	Newark-Milpitas 115 kV Line No. 1 Milpitas 115 kV Line No. 2	C3	N-1-1	104%	109%	117%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
SanJ-SP-T-38	Trimble-San Jose 'B' 115 kV Line	Los Esteros-Nortech 115 kV Line 230/115 kV Transformer	N-1-1	N-1-1	112%	119%	122%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
SanJ-SP-T-39	Newark-Dixon Landing 115 kV Line	Swift - Metcalfe & Piercy - Metcalfe 115 kV Lines	C5	DCTL	110%	N/A	N/A	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
SanJ-SP-T-40	Trimble-San Jose 'B' 115 kV Line	Metcalfe - El Patio No. 1 & 2 115 kV Lines	C5	DCTL	111%	115%	120%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
SanJ-SP-T-41	Piercy-Metcalf 115 kV Line	Newark - Dixon Landing & Newark - Milpitas #1 115 kV Lines	C5	DCTL	101%	88%	93%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Summer Off-Peak	N/A	

No thermal overloads identified.

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
SanJ-SP-DV-01	ALMADEN 60kV	Evergreen-Almaden 60 kV Line	B	N-1	-10%	-11%	-11%	Reactive Support
SanJ-SP-DV-02	ALMADEN 60kV	Evergreen 115/60 kV Transformer No. 1	B	N-1	-10%	-11%	-11%	Reactive Support
SanJ-SP-DV-03	LOS GATOS 60 kV	Monta Vista-Los Gatos 115 kV Line	B	N-1	-5%	-6%	-6%	Reactive Support
SanJ-SP-DV-04	ALMADEN 60kV	Newark-Los Esteros 230 kV Line _Evergreen-Almaden 60 kV Line	C3	N-1-1	-10%	-11%	-11%	Reactive Support
SanJ-SP-DV-05	LLAGAS 115kV	Metcalf-Morgan Hill 115 kV Line _Llagas-Gilroy Foods 115 kV Line	C3	N-1-1	-10%	-11%	-13%	Reactive Support
SanJ-SP-DV-06	MARGN HIL 115kV	Metcalf-Morgan Hill 115 kV Line _Llagas-Gilroy Foods 115 kV Line	C3	N-1-1	-13%	-14%	-15%	Reactive Support

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Study Area: **PG&E Greater Bay Area San Jose - Summer Light Load & Summer Off-Peak**



**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Summer Off-Peak	N/A	
SanJ-OP-DV-01	ZANKER 115kV	Newark-Kifer 115 kV Line(Newark-Zinker J2)	B	N-1	-6%	-4%		Reactive Support
SanJ-OP-DV-02	ELPT_SJ2 115kV	El Patio-San Jose Sta. 'A' 115 kV Line	B	N-1	-5%	-3%		Reactive Support
SanJ-OP-DV-03	IBM-HR J 115kV	Metcalf-El Patio No. 1 115 kV Line	B	N-1	-5%	-3%		Reactive Support
SanJ-OP-DV-04	MABURY J 115kV	Dixon Landing-McKee 115 kV Line	B	N-1	-6%	-4%		Reactive Support
SanJ-OP-DV-05	MABURY 115kV	Dixon Landing-McKee 115 kV Line	B	N-1	-6%	0%		Reactive Support
SanJ-OP-DV-06	MARKHM J 115kV	Markham No. 1 115 kV Tap	B	N-1	-6%	-4%		Reactive Support
SanJ-OP-DV-07	MARKHAM 115kV	Markham No. 1 115 kV Tap	B	N-1	-6%	-4%		Reactive Support
SanJ-OP-DV-08	IBM-CTLE 115kV	Edenvale-IBM Cottle 115 kV Line	B	N-1	-6%	-4%		Reactive Support
SanJ-OP-DV-09	EDNVL J1 115kV	Metcalf-Edenvale No. 1 115 kV Line	B	N-1	-5%	-3%		Reactive Support
SanJ-OP-DV-10	EVRGRN J 115kV	Markham No. 2 115 kV Tap	B	N-1	-6%	-4%		Reactive Support
SanJ-OP-DV-11	EDNVL J3 115kV	Edenvale-IBM Cottle 115 kV Line	B	N-1	-5%	-3%		Reactive Support
SanJ-OP-DV-12	GILROYTP 115kV	Llagas-Gilroy Foods 115 kV Line	B	N-1	-6%	-4%		Reactive Support
SanJ-OP-DV-13	GILROYPK 115kV	Llagas-Gilroy Foods 115 kV Line	B	N-1	-6%	-4%		Reactive Support
SanJ-OP-DV-14	STONE 115kV	Markham No. 2 115 kV Tap	B	N-1	-6%	-4%		Reactive Support

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
SanJ-SP-V-01	JENNINGS 115kV	Normal	A	N-0	1.05	0.99	0.99	Reactive Support
SanJ-SP-V-02	JENING J 115kV	Normal	A	N-0	1.05	0.99	0.99	Reactive Support
SanJ-SP-V-03	EVERGREN 60kV	Normal	A	N-0	1.06	1.06	1.05	Reactive Support
SanJ-SP-V-04	EVRGRN J 60kV	Normal	A	N-0	1.06	Not Run	Not Run	Reactive Support
SanJ-SP-V-05	SENER 60kV	Normal	A	N-0	1.06	1.05	1.05	Reactive Support
SanJ-SP-V-06	SENER J 60kV	Normal	A	N-0	1.06	1.06	1.05	Reactive Support
SanJ-SP-V-07	ALMADEN 60kV	Evergreen 115/60 kV Transformer No. 1	B	N-1	0.91	0.90	0.89	Reactive Support
SanJ-SP-V-08	DIXON LD 115kV	Newark-Dixon Landing 115 kV Line _Piercy-Metcalf 115 kV Line	C3	N-1-1	1.00	0.90	0.89	Reactive Support
SanJ-SP-V-09	MCKEE 115kV	Newark-Dixon Landing 115 kV Line _Piercy-Metcalf 115 kV Line	C3	N-1-1	0.99	0.91	0.90	Reactive Support
SanJ-SP-V-10	MRGN HIL 115kV	Metcalf-Morgan Hill 115 kV Line _Llagas-Gilroy Foods 115 kV Line	C3	N-1-1	0.89	0.87	0.86	Reactive Support
SanJ-SP-V-11	LLAGAS 115kV	Metcalf-Morgan Hill 115 kV Line _Llagas-Gilroy Foods 115 kV Line	C3	N-1-1	0.91	0.90	0.89	Reactive Support
SanJ-SP-V-12	PIERCY 115kV	Newark-Dixon Landing 115 kV Line _Piercy-Metcalf 115 kV Line	C3	N-1-1	1.00	0.90	0.89	Reactive Support



**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Summer Off-Peak	N/A	
SanJ-OP-V-01	MTCALF D 115kV	Normal	A	N-0	1.06	1.04		Reactive Support

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Study Area: **PG&E Greater Bay Area San Jose**



**Single Contingency Load Drop**

ID	Worst Contingency	Category	Category Description	Amount of Load Drop (MW)			Potential Mitigation Solutions
				2014	2017	2022	

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

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Study Area: **PG&E Greater Bay Area San Jose**

**Single Source Substation with more than 100 MW Load**



ID	Substation	Load Served (MW)			Potential Mitigation Solutions
		2014	2017	2022	

No single source substation with more than 100 MW Load



*Transient Stability*

ID	Contingency	Category	Category Description	Transient Stability Performance			Potential Mitigation Solutions
				2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	



*Transient Stability*

ID	Contingency	Category	Category Description	Transient Stability Performance			Potential Mitigation Solutions
				2014 Summer Light Load	2017 Summer Off-Peak	N/A	

**Appendix C-15**  
**PG&E Greater Fresno Area**

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
Fres-Pk T-01	Kearney-Caruthers 70kV line	None	A	N-0	96%	97%	108%	Reconductor Kearney-Caruthers 70kV
Fres-Pk T-02	Kearney #2 230/70kV transformer	Helm-Kerman 70kV line	B	T-1	108%	109%	114%	Add parallel 230/70kV transformer at Kearney
Fres-Pk T-03	Gregg-Herndon #2 230kV line	Bus 1 fault at Herndon 230kV	C1	Bus	96%	99%	103%	Reconductor Gregg-Herndon #2 230kV line
Fres-Pk T-04	Herndon #2 230/115kV transformer	Bus 1 fault at Herndon 230kV	C1	Bus	103%	106%	114%	Consider 4th 230/115kV transformer at Herndon or 115kV back-tie to Kerckhoff 2 PH
Fres-Pk T-05	Herndon-Bullard #1 115kV line	Bus 1 fault at Herndon 115kV	C1	Bus	115%	122%	132%	Reconductor Herndon-Bullard 115kV lines
Fres-Pk T-06	Manchester-Herndon 115kV line	McCall 230kV CB202 failure	C2	CB	138%	N/A	N/A	Consider SPS to drop load in the McCall 115kV area
Fres-Pk T-07	Panoche-Oro Loma 115kV	Dairyland-Le Grand 115kV & Panoche-Mendota 115kV lines	C3	L-1-1	73%	111%	119%	Reconductor Panoche-Oro Loma-Wilson 115kV path
Fres-Pk T-08	Warnerville-Wilson 230kV line	Helms-Gregg #1 & #2 lines	C3/C5	L-1-1	93%	105%	102%	Reconductor Bellota-Warnerville-Wilson 230kV path
Fres-Pk T-09	Gregg-Herndon #2 230kV line	Gregg-Herndon #1 & Gregg-Ashlan 230kV lines	C3	L-1-1	107%	110%	115%	Reconductor Gregg-Herndon #2 230kV line
Fres-Pk T-10	Gregg-Ashlan 230kV line	Gregg-Herndon #1 & #2 lines	C3/C5	L-1-1/L-2	173%	177%	84%	Reconductor Gregg-Ashlan 230kV line (Already modeled in 2022 case)
Fres-Pk T-11	Oro Loma-Canal 70kV line	Mercy Springs-Oro Loma 70kV line and Oro Loma 115/70kV transformer	C3	L-1/T-1	N/A	100%	103%	Add parallel 230/70kV transformer at Oro Loma or reconductor Oro Loma-Canal 70kV line

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
Fres-Pk T-12	McCall-Cal Ave 115kV	Cal Ave-Sanger 115kV & McCall-West Fresno 115kV	C3/C5	L-1-1	97%	105%	119%	Add second Sanger-Cal Ave 115kV or add second McCall-West Fresno 115kV
Fres-Pk T-13	West Fresno-McCall 115kV	McCall-Cal Ave 115kV & Cal Ave-Sanger 115kV	C3	L-1-1	89%	95%	106%	Add second Sanger-Cal Ave 115kV or add second McCall-West Fresno 115kV
Fres-Pk T-14	Cal Ave-Sanger 115kV	McCall-Cal Ave 115kV & McCall-West Fresno 115kV	C3	L-1-1	95%	100%	110%	Reconductor Cal Ave-Sanger 115kV
Fres-Pk T-15	Sanger-Kings River-Reedley 115kV (Reedley-Piedra)	Sanger-Reedley 115kV & McCall-Reedley 115kV	C3	L-1-1	140%	149%	163%	New project to reconductor Sanger-Kings River-Reedley and install reactive support at Reedley 115kV
Fres-Pk T-16	Wilson-LeGrand 115kV	Kerckhoff-Clovis-Sanger #1 & #2 115kV	C3/C5	L-1-1	109%	107%	113%	Kerckhoff SPS already mitigates.
Fres-Pk T-17	Reedley #2 115/70kV transformer	Reedley #4 115/70kV & Reedley-Dinuba 70kV	C3	L-1-1	94%	98%	105%	New transformer at Reedley
Fres-Pk T-18	Herndon #2 230/115kV transformer	Herndon #1 & #3 230/115kV transformers	C3	T-1-1	100%	105%	114%	Operational action plan/SPS to drop load
Fres-Pk T-19	Warnerville-Wilson 230kV	Helms-Gregg #1 & #2 230kV	C3	L-1-1	93%	105%	102%	Reconductor Bellota-Wilson 230kV Path
Fres-Pk T-20	Kearney-Biola 70kV & Borden #2 230/70kV transformer	Borden #1 230/70kV transformer	C3	L-1/T-1	94%	97%	101%	Upgrade Borden #1 230/70kV transformer. Note: Model rating is lower than one-line dwg rating
Fres-Pk T-21	Gregg-Herndon#2 230kV	Gregg-Herndon #1 230kV & Gregg-Ashlan 230kV	C3	L-1-1	107%	110%	115%	Trip two Helms units
Fres-Pk T-22	Los Banos-Canal 70kV	Mercy Springs #1 230/70kV and Oro Loma #2 115/70kV	C3	T-1-1	N/A	97%	105%	Possible RAS. Add another transformer at Oro Loma or Mercy Springs



**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Summer Off-Peak	2017 Partial Peak	
Fres-OfPk T-01	Warnerville-Wilson 230kV	Base Case Overload	A	L-0	50%	36%	157%	Turn on Helms if available
Fres-OfPk T-02	Midway-Gates 230kV	Gates #11 500/230kV transformer	B	T-1	N/A	107%	N/A	Add second Gates 500/230kV transformer
Fres-OfPk T-03	Merced-Merced Falls 70kV line	Exchequer-Le Grand 115kV line (Exchequer SPS not modeled)	B	L-1	N/A	104%	N/A	DEC Exchequer PH
Fres-OfPk T-04	Herndon-Bullard #1 115kV	Herndon 115kV bus 1 fault	C1	Bus	N/A	N/A	103%	Consider SPS to drop Bullard 115kV load
Fres-OfPk T-05	Merced Falls-Exchequer 70kV	Le Grand 115kV bus fault	C1	Bus	N/A	209%	159%	DEC Exchequer PH
Fres-OfPk T-06	Schindler-Coalinga 2 70kV	Gates 1D 230kV bus fault	C1	Bus	N/A	N/A	105%	Consider SPS to drop load on Gates 70kV
Fres-OfPk T-07	Kearney-Herndon 230kV	Gates 1E 230kV bus fault	C1	Bus	N/A	N/A	105%	INC Helms PGP
Fres-OfPk T-08	Exchequer-Le Grand 115kV	Merced Falls 70kV bus fault	C1	Bus	N/A	104%	82%	DEC Exchequer PH
Fres-OfPk T-09	Oro Loma-Mercy Springs 70kV	Panoche 230kV CB202 failure	C2	Breaker	N/A	76%	180%	Consider sectionalizing Panoche 230kV bus to minimize impact
Fres-OfPk T-10	Panoche-Gates #1 230kV	Gates 230kV CB202 failure	C2	Breaker	N/A	N/A	118%	Reconductor Gates-Panoche 230kV path
Fres-OfPk T-11	Gates-Gregg 230kV	McCall 230kV CB202 failure	C2	Breaker	N/A	109%	N/A	Consider BAAH upgrade at Henrietta
Fres-OfPk T-12	Panoche-Gates #1 230kV	Gates 230kV CB312 failure	C2	Breaker	N/A	114%	N/A	Reconductor Gates-Panoche 230kV path
Fres-OfPk T-13	Oro Loma-Mercy Springs 70kV	Panoche 115kV CB102 failure	C2	Breaker	N/A	80%	107%	Consider sectionalizing Panoche 115kV bus to minimize impact

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Summer Off-Peak	2017 Partial Peak	
Fres-OfPk T-14	Panoche-Schindler #1 OR #2 115kV	Panoche-Schindler #2 OR #1 115kV & Gates #5 230/70kV	C3	L-1-1	N/A	N/A	131%	Add second Gates 230/70kV transformer
Fres-OfPk T-15	Exchequer-Le Grand 115kV	Merced-Merced Falls 70kV & Exchequer-Yosemite 70kV	C3	L-1-1	N/A	109%	87%	DEC Exchequer PH
Fres-OfPk T-16	Manchester-Airways-Sanger 115kV	Kerckhoff-Clovis-Sanger #1 & #2	C3	L-1-1	N/A	110%	N/A	DEC Kerckhoff PH
Fres-OfPk T-17	Kearney-Herndon 230kV	Warnerville-Wilson 230kV & Gates-Gregg 230kV	C3	L-1-1	N/A	80%	116%	INC Helms PP
Fres-OfPk T-18	Wilson-Legrand 115kV	Warnerville-Wilson 230kV & Melones-North Merced 230kV	C3	L-1-1	N/A	N/A	101%	INC Helms PP or reconductor El Nido-Wilson 115kV
Fres-OfPk T-19	Oro Loma-El Nido 115kV	Warnerville-Wilson 230kV & Melones-North Merced 230kV	C3	L-1-1	N/A	77%	128%	INC Helms PP or reconductor Oro Loma-El Nido 115kV
Fres-OfPk T-20	Panoche-Oro Loma 115kV	Warnerville-Wilson 230kV & Panoche-Mendota 115kV	C3	L-1-1	N/A	88%	123%	INC Helms PP or reconductor Panoche-Oro Loma 115kV
Fres-OfPk T-21	Panoche-Gates 230kV	Panoche-Gates #2 & Los Banos 500/230kV	C3	L-1/T-1	N/A	109%	N/A	INC Panoche EC
Fres-OfPk T-22	Wilson-Borden 230kV	Panoche-Kearney 230kV & Wilson-Gregg 230kV	C3	L-1-1	N/A	N/A	129%	INC Helms PP or reconductor Bellota_Warnerville-Gregg 230kV Path
Fres-OfPk T-23	Coalinga 1-Coalinga 2 70kV	Templeton-Gates 230kV & Gates-Coalinga 1 70kV	C3	L-1-1	N/A	71%	102%	Reconductor Coalinga 1-Coalinga 2 70kV
Fres-OfPk T-24	Gregg-Ahslan 230kV	Gregg-Herndon #1 & #2 230kV	C3	L-1-1	N/A	N/A	101%	Reconductor Gregg-Ahslan 230kV
Fres-OfPk T-25	Kerckhoff 2-Chowchilla 115kV	Kerckhoff-Clovis-Sanger #1 & #2	C3	L-1-1	164%	103%	131%	DEC Kerckhoff PH
Fres-OfPk T-26	Los Banos-Canal 70kV	Los Banos-Canal-Oro Loma 70kV & Mercy Spring #1 230/70kV	C3	L-1/T-1	N/A	N/A	105%	Reconductor Los Banos-Canal 70kV

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Summer Off-Peak	2017 Partial Peak	
Fres-OfPk T-27	Gates-Midway 230kV	Gates-Arco 230kV & Gates #11 500/230kV	C3	L-1/T-1	N/A	115%	N/A	Redispatch generation
Fres-OfPk T-28	Barton-Airways-Sanger 115kV	Manchester-Airways-Sanger 115kV & Woodward-Shepherd 115kV	C3	L-1-1	N/A	109%	N/A	Trip a Helms pump
Fres-OfPk T-29	Los Banos-Dos Amigos 230kV	Warnerville-Wilson 230kV & Gates #11 500/230kV	C3	L-1/T-1	N/A	N/A	109%	Trip Dos Amigos PP load

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
Fres-Pk D-01	Mariposa 70kV	Exchequer-Le Grand 115kV line (Exchequer SPS modeled)	B	L-1/G-1	-0.082	-0.086	-0.097	Update Exchequer SPS to run back instead of drop Exchequer PH for loss of Exchequer-Le Grand 115kV line
Fres-Pk D-02	Borden 230kV	Borden-Gregg 230kV	B	L-1	-0.055	-0.056	N/A	Upgrade Borden earlier
Fres-Pk D-03	Chowchilla 115kV	Le Grand-Chowchilla 115kV	B	L-1	-0.057	-0.054	-0.056	Add reactive support at Chowchilla
Fres-Pk D-04	Bonita 70kV	Merced #2 115/70kV and El Nido unit	B	L-1/G-1	-0.044	-0.049	-0.057	Add second transformer at Merced Falls 115/70kV
Fres-Pk D-05	Oakhurst 115kV	Kerckhoff-Oakhurst 115kV line & Kerckhoff #1	B	L-1/G-1	N/A	-0.056	-0.06	Install reactive support at Oakhurst
Fres-Pk D-06	Oakhurst 115kV	Bus Fault at Kerckhoff 2	C1	Bus	-0.097	-0.124	-0.135	Add reactive support at Oakhurst
Fres-Pk D-07	McCall 115kV	McCall CB202 230kV CB202 failure	C2	Breaker	-0.186	N/A	N/A	Low voltages throughout McCall area. Consider SPS to drop load in McCall 115kV area
Fres-Pk D-08	West Fresno	Cal Ave-Sanger 115kV & McCall-West Fresno 115kV	C3	L-1-1	-0.154	-0.172	-0.21	Add second Cal Ave-Sanger 115kV line or second McCall-West Fresno 115kV (Also mitigates overloads)
Fres-Pk D-09	Coalinga 1	Coalinga 1-Coalinga 2 70kV & Gates-Coalinga 1 70kV	C3	L-1-1	-0.166	-0.168	-0.192	Install reactive support at Coalinga
Fres-Pk D-10	Yosemite 70kV	Exchequer-Le Grand 115kV & Exchequer-Mariposa 70kV	C3	L-1-1	-0.135	-0.144	-0.164	Reconductor Exchequer-Merced Falls 70kV to eliminate Exchequer SPS
Fres-Pk D-11	Oro Loma 70kV	Mercy Springs-Oro Loma 70kV & Oro Loma #2 115/70kV	C3	L-1/T-1	N/A	-0.157	-0.163	Install reactive support at Oro Loma
Fres-Pk D-12	Wahtoke 115kV	Sanger-Reedley 115kV & McCall-Reedley 115kV	C3	L-1-1	-0.111	-0.123	-0.141	New project to reconductor Sanger-Kings River-Reedley 115kV and install reactive support (Also mitigates overloads)
Fres-Pk D-13	Henrietta 230kV	Gates-Gregg 230kV & Gates-McCall 230kV	C3	L-1-1	-0.112	-0.116	-0.121	Upgrade Henrietta to BAAH

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
Fres-Pk D-14	Mendota 115kV	Panoche-Mendota 115kV and Oro Loma #2 115/70kV	C3	L-1/T-1	-0.091	-0.113	-0.103	Install reactive support at Mendota 115kV
Fres-Pk D-15	Dinosaur Point Junction 70kV tap	Los Banos #3 & #4 230/70kV transformers	C3	T-1-1	N/A	-0.083	-0.087	Install reactive support at Los Banos 70kV or third 230/70kV transformer
Fres-Pk D-16	Oro Loma 70kV	Mercy Springs 230/70kV and Oro Loma #2 115/70kV	C3	T-1-1	N/A	-0.053	0.06	Install second transformer at Mercy Springs or Oro Loma
Fres-Pk D-17	Corcoran 115kV	McCall-Kingsburg #1 115kV and Kingsburg-Corcoran #2 115kV	C3	L-1-1	-0.057	-0.058	-0.059	Install reactive support at Corcoran
Fres-Pk D-18	Borden	Warnerville-Wilson 230kV & Borden-Gregg 230kV	C3	L-1-1	-0.077	-0.086	0.016	Install reactive support at Borden earlier
Fres-Pk D-19	Oro Loma	Mercy Springs-Oro Loma 70kV & Oro Loma #2 115/70kV	C3	L-1/T-1	N/A	-0.157	-0.163	Install reactive support at Oro Loma

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Summer Off-Peak	2017 Partial Peak	
Fres-OfPk D-01	Avenal	Gates #5 230/70kV transformer	B	T-1	0.011	0.011	-0.0875	Add second Gates 230/70kV transformer
Fres-OfPk D-02	Maripos, Yosemite, Saxon Creek	Exchequer-Le Grand 115kV and McSwain Unit 1	B	L-1/G-1	-0.018	-0.035	-0.144	Update Exchequer SPS to runback instead of drop for loss of Exchequer-LeGrand 115kV
Fres-OfPk D-03	Bonita	Le Grand 115kV bus fault	C1	Bus	0.003	-0.13	-0.09	Increase reactive support at Merced
Fres-OfPk D-04	Oakhurst	Kerckhoff 2 115kV bus fault	C1	Bus	-0.04	-0.05	-0.114	Add reactive support at Chowchilla or Le Grand
Fres-OfPk D-05	Panoche 1 115kV bus	Panoche 230kV CB202 failure	C2	Breaker	-0.036	-0.065	-0.166	Consider sectionalizing Panoche 230kV bus
Fres-OfPk D-06	Coalinga 1	Coalinga 1-Coalinga 2 70kV & Gates-Coalinga #1 70kV	C3	L-1-1	0.017	-0.038	-0.144	Add reactive support at Coalinga 1
Fres-OfPk D-07	Poso J1, Firebaugh, and Mendota	Panoche-Mendota 115kV & Oro Loma #2 115/70kV	C3	L-1/T-1	0.013	-0.076	-0.171	Add reactive support at Mendota
Fres-OfPk D-08	Dairyland, Mendota	Dairyland-Le Grand 115kV & Panoche-Mendota 115kV	C3	L-1-1	0.006	-0.067	-0.162	Add reactive support at Mendota
Fres-OfPk D-09	Oro Loma	Mercy Spring-Oro Loma 70kV & Oro Loma #2 115/70kV	C3	L-1-1	N/A	-0.049	-0.125	Add reactive support at Oro Loma or second transformer at Oro Loma 115/70kV
Fres-OfPk D-10	Avenal, Sun City, Kettleman	Panoche-Schindler #2 115kV & Gates #5 230/70kV	C3	L-1/T-1	0.005	0.01	-0.165	Add second transformer at Gates 230/70kV
Fres-OfPk D-11	Borden	Warnerville-Wilson 230kV & Borden-Gregg 230kV	C3	L-1-1	-0.54	-0.03	-0.112	Consider running a Helms unit after first contingency

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
Fres-Pk V-01	Mariposa 70kV	Exchequer-Le Grand 115kV	B	L-1	0.903	0.898	0.885	Update Exchequer SPS to run back instead of drop for loss of Exchequer-Le Grand 115kV line
Fres-Pk V-02	Oakhurst 115kV	Kerckhoff 2 bus fault	C1	Bus	0.903	0.897	0.889	Add reactive support at Oakhurst
Fres-Pk V-03	McCall 115kV	McCall 230kV CB202 failure	C2	Breaker	0.846	N/A	N/A	Low voltages throughout McCall area. Consider SPS to drop load in McCall 115kV area
Fres-Pk V-04	West Fresno 115kV	California Ave-Sanger 115kV & McCall-West Fresno 115kV	C3	L-1-1	0.849	0.828	0.788	Add second Cal Ave-Sanger 115kV line or second McCall-West Fresno 115kV line and add reactive support at Cal Ave (Second line also mitigates overloads in the area)
Fres-Pk V-05	Coalinga 1	Coalinga 1-Coalinga 2 70kV & Gates-Coalinga 1 70kV	C3	L-1-1	0.833	0.832	0.808	Install reactive support at Coalinga
Fres-Pk V-06	Oro Loma	Mercy Springs-Oro Loma 70kV & Oro Loma #2 115/70kV	C3	L-1/T-1	N/A	0.869	0.864	Install reactive support at Oro Loma
Fres-Pk V-07	Firebaugh	Oro Loma #2 115/70kV and multiple	C3	L-1-1	0.899	N/A	N/A	Short term action plan until Oro Loma 70kV reinforcement in place



High/Low Voltage

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Summer Off-Peak	2017 Partial Peak	
Fres-OfPk V-01	Bear Valley, Exchequer, Yosemite	Exchequer-Le Grand 115kV & McSwain Unit 1	B	L-1/G-1	0.993	0.983	0.84	Update Exchequer SPS to runback instead of drop for loss of Exchequer-Le Grand 115kV
Fres-OfPk V-02	Avenal	Gates #5 230/70kV transformer	B	T-1	0.998	1.02	0.888	Add second transformer at Gates 230/70kV
Fres-OfPk V-03	Henrietta 230kV	Gates #1E 230kV bus fault	C1	Bus	1.008	0.95	0.877	Consider BAAH looping Henrietta through Gates-Gregg 230kV and Gates-McCall 230kV lines
Fres-OfPk V-04	Avenal 70kV	Gates #1D 230kV bus fault	C1	Bus	1	1.02	0.887	Consider SPS to drop load on Gates 70kV system
Fres-OfPk V-05	Oakhurst	Kerckhoff 2 115kV bus fault	C1	Bus	0.995	0.972	0.884	Add reactive support at Chowchilla or Le Grand
Fres-OfPk V-06	Bonita	Le Grand 115kV bus fault	C1	Bus	1.02	0.86	0.855	Increase reactive support at Merced
Fres-OfPk V-07	Avenal, Coalinga 1	Panoche-Schindler #1 OR #2 & Gates #5 230/70kV	C3	L-1/G-1	0.992	1.019	0.812	Add second transformer at Gates 230/70kV
Fres-OfPk V-08	Coalinga 1	Coalinga 1-Coalinga 2 70kV & Gates-Coalinga #1 70kV	C3	L-1-1	1.016	0.961	0.837	Add reactive support at Coalinga 1
Fres-OfPk V-09	Firebaugh, Mendota	Dairyland-Le Grand 115kV & Panoche-Mendota 115kV	C3	L-1-1	1.034	0.951	0.84	Add reactive support at Mendota
Fres-OfPk V-10	Firebaugh, Mendota	Panoche-Mendota 115kV & Oro Loma #2 115/70kV	C3	L-1/T-1	0.964	0.949	0.843	Add reactive support at Mendota
Fres-OfPk V-11	Oro Loma	Mercy Spring-Oro Loma 70kV & Oro Loma #2 115/70kV	C3	L-1/T-1	N/A	0.974	0.883	Add reactive support at Oro Loma
Fres-OfPk V-12	Helms PP	Warnerville-Wilson 230kV & Helms-Gregg #2 230kV	C3	L-1-1	1.032	0.878	0.974	Consider runnign Helms after first contingency
Fres-OfPk V-13	Borden	Warnerville-Wilson 230kV & Borden-Gregg 230kV	C3	L-1-1	0.96	0.951	0.871	Consider runnign Helms after first contingency
Fres-OfPk V-14	Henrietta	Gates-Gregg 230kV & Gates-McCall 230kV	C3	L-1-1	0.824	0.858	N/A	Loop Henrietta 230kV through Gates-Gregg 230kV & Gates-McCall 230kV

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Summer Off-Peak	2017 Partial Peak	
Fres-OfPk V-15	Mendota	Wilson-Le Grand 115kV & Panoche-Mendota 115kV	C3	L-1-1	0.868	0.985	0.949	Short term plan
Fres-OfPk V-16	Los Banos	Los Banos-Canal-Oro Loma 70kV & Los Banos #4 230/70kV	C3	L-1/T-1	1.1007	1.051	1.053	Under review for possible exemptions
Fres-OfPk V-17	Herndon 115kV	Panoche-Kearney 230kV & Gates-Gregg 230kV lines	C3/C5	L-1-1	0.999	N/A	0.856	Add reactive support at Herndon and Gregg



**Transient Stability**

ID	Contingency	Category	Category Description	Transient Stability Performance			Potential Mitigation Solutions
				2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	

No transient stability issues identified.

**Transient Stability**

ID	Contingency	Category	Category Description	Transient Stability Performance			Potential Mitigation Solutions
				2014 Summer Light Load	2017 Summer Off-Peak	2017 Partial Peak	
Fres-OfPk TS-01	SLG on Herndon #1 230/115kV and Herndon CB272 fails to operate	C7	SLG with stuck breaker	stable	unstable	stable	Further study needed.
Fres-OfPk TS-02	SLG on McCall #1 230/115kV and McCall CB 272 fails to operate	C7	SLG with stuck breaker	stable	unstable	stable	Further study needed.
Fres-OfPk TS-03	SLG on Helms-Gregg #1 230kV and Gregg CB332 fails to operate	C8	SLG with stuck breaker	stable	unstable	stable	Further study needed.
Fres-OfPk TS-04	SLG on Borden-Gregg 230kV and Gregg CB512 fails to operate	C8	SLG with stuck breaker	stable	unstable	stable	Further study needed.
Fres-OfPk TS-05	SLG on Haas-McCall 230kV and McCall CB262 fails to operate	C8	SLG with stuck breaker	stable	unstable	stable	Further study needed.
Fres-OfPk TS-06	SLG on Herndon #1 230kV bus and Herndon CB202 fails to operate	C9	SLG with stuck breaker	stable	unstable	stable	Further study needed.
Fres-OfPk TS-07	SLG on McCall #1 230kV bus and McCall CB202 fails to operate	C9	SLG with stuck breaker	stable	unstable	stable	Further study needed.

2012/2013 ISO Reliability Assessment - Final Study Results

Study Area: **PG&E San Joaquin Valley Greater Fresno**



**Single Contingency Load Drop**

ID	Worst Contingency	Category	Category Description	Amount of Load Drop (MW)			Potential Mitigation Solutions
				2014	2017	2022	

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

2012/2013 ISO Reliability Assessment - Final Study Results

Study Area: **PG&E San Joaquin Valley Greater Fresno**

**Single Source Substation with more than 100 MW Load**



ID	Substation	Load Served (MW)			Potential Mitigation Solutions
		2014	2017	2022	

No single source substation with more than 100 MW Load

**Appendix C-16**  
**PG&E Kern Area**

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
Kern-Pk T-01	Kern-Kern Oil-Famoso 70kV	Semitropic-Wasco 70kV	B	L-1	78%	78%	102%	Reconductor Kern-Kern Oil-Famoso 70kV or install second 115/70kV at Semitropic
Kern-Pk T-02	Kern-Magunden-Witco 115kV	West Park-Magunden 115kV	B	L-1	98%	103%	114%	Reconductor Kern-Magunden-Witco 115kV
Kern-Pk T-03	Kern-Kern Oil-Famoso 70kV	Semitropic-Wasco 70kV	B	L-1	78%	78%	102%	Reconductor Kern-Kern Oil-Famoso 70kV or install second 115/70kV at Semitropic
Kern-Pk T-04	Midway-La Paloma #1 230kV	Midway 1D 230kV bus fault	C1	Bus	N/A	109%	109%	Trip La Paloma unit
Kern-Pk T-05	Midway-La Paloma #2 230kV	Midway 2E 230kV bus fault	C1	Bus	110%	109%	109%	Trip La Paloma unit
Kern-Pk T-06	Midway-Semitropic 115kV	Midway 2E 115kV bus fault	C1	Bus	100%	N/A	N/A	Reconductor Midway-Semitropic 115kV line
Kern-Pk T-07	Tejon-San Bernard 70kV	Wheeler Ridge D 70kV bus fault	C1	Bus	102%	102%	103%	Upgrade Wheeler Ridge 70kV system from 1/0 Cu to larger conductor
Kern-Pk T-08	Kern-Kern Oil-Famoso 70kV	Semitropic D 70kV bus fault	C1	Bus	77%	78%	102%	Reconductor Kern-Kern Oil-Famoso 70kV
Kern-Pk T-09	Midway-Wheeler Ridge #1 230kV	Midway 2D 230kV bus fault	C1	Bus	N/A	143%	144%	Trip CDWR pump load on Midway-Wheeler Ridge 230kV path
Kern-Pk T-10	Midway-Shafter 115kV	Midway 115kV CB301 failure	C2	Breaker	161%	165%	176%	Reconductor Midway-Shafter 115kV, Shafter-Rio Bravo 115kV and Midway-Rio Bravo-Renfro 115kV lines



**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
Kern-Pk T-11	Midway-Wheeler Ridge #1 230kV	Midway 230kV CB642 failure	C2	Breaker	N/A	146%	148%	Trip CDWR pump load on Midway-Wheeler Ridge 230kV path
Kern-Pk T-12	Midway-Wheeler Ridge #1 230kV	Midway 230kV CB632 failure	C2	Breaker	N/A	145%	146%	Trip CDWR pump load on Midway-Wheeler Ridge 230kV path
Kern-Pk T-13	Kern-Lerdo-Kern Oil 115kV	Midway 115kV CB392 failure	C2	Breaker	89%	89%	112%	Reconductor Kern-Lerdo-Kern Oil 115kV
Kern-Pk T-14	Midway-La Paloma #2 230kV	Midway 230kV CB662 failure	C2	Breaker	110%	109%	110%	Trip La Paloma unit
Kern-Pk T-15	Lerdo-Famoso 115kV	Semitropic 115kV CB152 failure	C2	Breaker	78%	79%	105%	Reconductor Lerdo-Famoso 115kV
Kern-Pk T-16	Midway #1 230/115kV	Midway 230kV CB182 failure	C2	Breaker	90%	96%	103%	Upgrade Midway #1 230/115kV
Kern-Pk T-17	Kern-Lerdo-Kern Oil 115kV	Kern PP 115kV CB262 failure	C2	Breaker	91%	95%	102%	Reconductor Kern-Lerdo-Kern Oil 115kV
Kern-Pk T-18	Midway #1 230/115kV	Midway #2 & #3 230/115kV	C3	T-1-1	109%	115%	115%	Upgrade Midway #1 230/115kV transformer
Kern-Pk T-19	Kern PP #4 230/115kV	Kern PP #3 & #5 230/115kV	C3	T-1-1	128%	N/A	104%	Rerate Kern PP #4 230/115kV
Kern-Pk T-20	Midway -Kern #1 230kV	Midway -Kern #4 & #4 230kV	C3/C5	L-1-1	97%	101%	114%	Reconductor Midway-Kern #1 230kV
Kern-Pk T-21	Kern Oil-Witco 115kV	Kern PP-Westpark #1 & #2 115kV	C5	L-2	80%	78%	112%	Reconductor Kern Oil-Witco 115kV

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Summer Off-Peak	2017 Partial Peak	
Kern-OfPk T-01	Midsun-Midway 115kV	Copus-Old River 70 kV Line	B	L-1	N/A	N/A	114%	Reconductor Midway-Midsun-Taft 115kV path
Kern-OfPk T-02	Midway-Wheeler Ridge #1 230kV	Midway 1D 230kV bus fault	C1	Bus	119%	N/A	114%	Trip CDWR pump load on Midway-Wheeler Ridge 230kV path
Kern-OfPk T-03	Midway-Wheeler Ridge #1 230kV	Midway 2D 230kV bus fault	C1	Bus	119%	70%	111%	Trip CDWR pump load on Midway-Wheeler Ridge 230kV path
Kern-OfPk T-04	Midway-Shafter 115kV	Midway 115kV CB302 failure	C2	Breaker	80%	99%	149%	Reconductor Midway-Shafter 115kV
Kern-OfPk T-05	Midway #2 230/115kV	Midway 230kV CB632 failure	C2	Breaker	N/A	N/A	136%	Upgrade Midway #2 230/115kV
Kern-OfPk T-06	Lerdo-Famoso 115kV	Midway 115kV CB392 failure	C2	Breaker	N/A	N/A	136%	Reconductor Lerdo-Famoso 115kV
Kern-OfPk T-07	Midway-Wheeler Ridge #1 230kV	Midway 230kV CB642 failure	C2	Breaker	121%	71%	114%	Trip CDWR pump load on Midway-Wheeler Ridge 230kV path
Kern-OfPk T-08	Midway #1 230/115kV	Midway 115kV CB182 failure	C2	Breaker	N/A	N/A	109%	Upgrade Midway #1 230/115kV xfmr
Kern-OfPk T-09	Kern PP #4 230/11kV	Kern PP #3 & #5 230/115kV	C3	T-1-1	105%	N/A	120%	Upgrade Kern PP #4 230/115kV or parallel another transformer
Kern-OfPk T-10	Live Oak-Kern Oil 115kV	Semitropic-Famoso & Kern Oil-Witco 115kV	C3	L-1-1	N/A	N/A	122%	Reconductor Live Oak-Kern Oil 115kV
Kern-OfPk T-11	Midway-Kern #1 230kV	Midway-Kern #3 & #4 230kV	C3/C5	L-1-1	N/A	N/A	116%	Reconductor Midway-Kern #1 230kV
Kern-OfPk T-12	Kern Oil-Witco 115kV	Kern PP-Westpark #1 & #2 115kV lines	C5	L-2	79%	78%	112%	Reconductor Kern Oil-Witco 115kV

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
Kern-Pk D-01	Carrizo 115kV	Midway-Temblor 115kV	B	L-1	-0.104	-0.108	-0.111	Reconductor Midway-Temblor-San Luis Obispo 115kV path
Kern-Pk D-02	Wasco 70kV	Semitropic 115/70kV	B	T-1	-0.076	-0.081	-0.108	Add reactive support at Semitropic or parallel transformer
Kern-Pk D-03	Wasco 70kV	Semitropic-Wasco 70kV	B	L-1	-0.076	-0.081	-0.108	Add reactive support at Wasco or parallel line from Semitropic
Kern-Pk D-04	Temblor 115kV	Midway-Temblor 115kV	B	L-1	-0.143	-0.147	-0.154	Add reactive support at Temblor
Kern-Pk D-05	Magunden Junction 70kV	Semitropic 115/70kV & Kern Canyon Unit 1	B	L-1/G-1	-0.056	0.048	-0.051	Add reactive support at Kern PP
Kern-Pk D-06	Kern Ridge 115kV	Midway-Temblor 115kV	B	L-1	-0.14	-0.143	-0.15	Add reactive support at Temblor
Kern-Pk D-07	Tupman 115kV	Midway 115kV CB302 failure	C2	Breaker	-0.128	-0.132	-0.142	Trip Tupman load
Kern-Pk D-08	Wasco 70kV	Semitropic 115kV CB152	C2	Breaker	-0.075	-0.08	-0.107	Add reactive support at Wasco 70kV

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Summer Off-Peak	2017 Partial Peak	
Kern-OfPk D-01	Temblor 115kV	Midway-Temblor 115kV	B	L-1	-0.1043	-0.1295	-0.2009	Reconductor Midway-Temblor-San Luis Obispo 115kV path
Kern-OfPk D-02	Taft 70kV	Copus-Old River 70kV	B	L-1	-0.0013	-0.0006	0.217	Add reactive support at Taft 115kV
Kern-OfPk D-03	Wasco 70kV	Semitropic D 115kV	C1	Bus	-0.075	-0.08	-0.107	Add reactive support at Wasco 70kV
Kern-OfPk D-04	Tupman 115kV	Midway 115kV CB302 failure	C2	Breaker	-0.05	-0.057	-0.0132	Trip Tupman load
Kern-OfPk D-05	Ganso 115kV	Midway 115kV CB392 failure	C2	Breaker	-0.068	-0.023	-0.184	Add reactive support at Ganso 115kV or Smyrna 115kV
Kern-OfPk D-06	Temblor 115kV	Midsun-Midway 115kV & Midway-Temblor 115kV lines	C5	L-2	-0.1039	-0.1292	-0.1449	Reconductor Midway-Temblor-San Luis Obispo 115kV path

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
Kern-Pk V-01	Cuyama	Base Case	A	N-0	0.919	0.935	0.932	Install reactive support on Taft 70kV subsystem
Kern-Pk V-02	Wellfield	Base Case	A	N-0	0.924	0.991	0.987	Short term plan
Kern-Pk V-03	Kern Ridge	Midway-Temblor 115kV	B	L-1	0.876	0.876	0.866	Add reactive support at Temblor
Kern-Pk V-04	Wasco 70kV	Semitropic 115/70kV	B	T-1	0.917	0.923	0.884	Install reactive support on Semitropic-Kern 70kV subsystem
Kern-Pk V-05	Temblor	Midway-Temblor 115kV & Texaco Lost Hills Unit 1	B	L-1/G-1	1.022	0.805	1.023	Add reactive support at Temblor
Kern-Pk V-06	Ogle Tap	Lerdo-Kern Oil-7th Standard 115kV	B	L-1	1.054	1.058	1.055	Under review for possible exemptions
Kern-Pk V-07	Wasco 70kV	Semitropic D 115kV bus fault	C1	Bus	0.918	0.923	0.885	Add reactive support at Wasco 70kV
Kern-Pk V-08	Tupman 115kV	Midway 115kV CB302 failure	C2	Breaker	0.898	0.9008	0.885	Trip Tupman load
Kern-Pk V-09	Wasco 70kV	Semitropic 115kV CB152 failure	C2	Breaker	0.918	0.924	0.885	Add reactive support at Wasco 70kV

**Transient Stability**

ID	Contingency	Category	Category Description	Transient Stability Performance			Potential Mitigation Solutions
				2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
Kern-Pk TS-01	SLG on Midway 1D 230kV bus and Midway CB632 fails to operate	C9	SLG with stuck breaker	unstable	unstable	unstable	Further study needed.

**Transient Stability**

ID	Contingency	Category	Category Description	Transient Stability Performance			Potential Mitigation Solutions
				2014 Summer Light Load	2017 Summer Off-Peak	2017 Partial Peak	
Kern-OfPk TS-01	SLG on Kern PP #5 230/115kV and Kern PP CB572 fails to operate	C7	SLG with stuck breaker	stable	unstable	stable	Further study needed.
Kern-OfPk TS-02	SLG on Midway #1 500/230kV and Midway CB732 fails to operate	C7	SLG with stuck breaker	stable	unstable	stable	Further study needed.
Kern-OfPk TS-03	SLG on Midway 1D 230kV bus and Midway CB632 fails to operate	C9	SLG with stuck breaker	unstable	unstable	stable	Further study needed.

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Summer Off-Peak	2017 Partial Peak	
Kern-OfPk V-01	Cuyama 70kV	Base Case	A	N-0	0.987	0.973	0.944	Base Case
Kern-OfPk V-02	Temblor 115kV	Midway-Temblor 115kV	B	L-1	0.9225	0.8824	0.8027	Reconductor Midway-Temblor-San Luis Obispo 115kV path
Kern-OfPk V-03	Wasco 70kV	Semitropic 115/70kV	B	T-1	0.9229	0.9283	0.8921	Add reactive support at Wasco 70kV
Kern-OfPk V-04	Semitropic 115kV	Midway 115kV CB392 failure	C2	Breaker	0.975	0.999	0.835	Add reactive support at Smyrna and Semitropic
Kern-OfPk V-05	Tupman 115kV	Midway 115kV CB302 failure	C2	Breaker	1.006	0.979	0.891	Trip Tupman load
Kern-OfPk V-06	Cuyama	Taft-Chalk Cliff 115kV & Taft #2 115/70kV	C3	L-1/T-1	0.9734	0.9485	0.8718	Install second transformer at Taft 115/70kV
Kern-OfPk V-07	Temblor 115kV	Midsun-Midway 115kV & Midway-Temblor 115kV lines	C5	L-2	0.927	0.886	0.809	Reconductor Midway-Temblor-San Luis Obispo 115kV path



2012/2013 ISO Reliability Assessment - Final Study Results

Study Area: **PG&E San Joaquin Valley Kern**



**Single Contingency Load Drop**

ID	Worst Contingency	Category	Category Description	Amount of Load Drop (MW)			Potential Mitigation Solutions
				2014	2017	2022	

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

2012/2013 ISO Reliability Assessment - Final Study Results

Study Area: **PG&E San Joaquin Valley Kern - Summer Peak**



**Single Source Substation with more than 100 MW Load**

ID	Substation	Load Served (MW)			Potential Mitigation Solutions
		2014	2017	2022	

No single source substation with more than 100 MW Load

**Appendix C-17**  
**PG&E Central Coast Area**

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
CC-S-T-001	GRN VLY1-MOSLND D 115 kV # 1 Line	Moss Landing-Green Valley #2 115 kV Line	B	L-1	105.1%	<100%	82.1%	Action plan/2015 Watsonville 115 kV Voltage Conversion Project helps
CC-S-T-002	GRN VLY2-MOSLND D 115 kV # 1 Line	Moss Landing-Green Valley #1 115 kV Line	B	L-1	105.1%	N/A	N/A	Action plan/2015 Watsonville 115 kV Voltage Conversion Project helps
CC-S-T-003	GRN VLY1-MOSLND D 115 kV # 1 Line	Moss Landing 115 kV Bus Section 2D	C1	Bus	105.7%	<100%	<100%	Same as Category B: Action Plan
CC-S-T-004	GRN VLY2-MOSLND D 115 kV # 1 Line	Moss Landing 115 kV Bus Section 1D	C1	Bus	105.6%	N/A	N/A	Same as Category B: Action Plan
CC-S-T-005	LGNTSSW1-NTVD SW1 115 kV #1 Line	Moss Landing 115 kV Bus Section 2D	C1	Bus	101.6%	N/A	N/A	Action plan
CC-S-T-006	NTVD SW1-SALINAS 115 kV #1 Line	Moss Landing 115 kV Bus Section 2D	C1	Bus	120.1%	<100%	<100%	Action plan/Crazy Horse 115 kV project helps
CC-S-T-014	MOSLND E-MOSSLND2 115/230 kV #10 Bank	CB FAULT AT MOSS LANDING SUB 115 CB110	C1	Bus	110.4%	<100%	<100%	Same as Category C1: Increase capacity of existing project replacing Moss Landing 115/230 kV Bank #1 & 2
CC-S-T-012	MOSLND D-MOSSLND2 115/230 kV #2 Bank	CB FAULT AT MOSS LANDING SUB 115 CB110	C1	Bus	110.1%	<100%	<100%	Same as Category C1: Increase capacity of existing project replacing Moss Landing 115/230 kV Bank #1 & 2
CC-S-T-013	MOSLND E-MOSSLND1 115/230 kV #8 Bank	CB FAULT AT MOSS LANDING SUB 115 CB120	C1	Bus	109.9%	<100%	<100%	Same as Category C1: Increase capacity of existing project replacing Moss Landing 115/230 kV Bank #1 & 2

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
CC-S-T-011	MOSLND D-MOSSLND1 115/230 kV #1 Bank	CB FAULT AT MOSS LANDING SUB 115 CB120	C1	Bus	110.1%	<100%	<100%	Same as Category C1: Increase capacity of existing project replacing Moss Landing 115/230 kV Bank #1 & 2
CC-S-T-007	CSTRVLJ2-DEL MNTE 115 kV #1 Line	CB FAULT AT MOSS LANDING SUB 115 CB110	C2	CB	88.1%	92.6%	100.4%	Monitor line loading/rerate/drop load/action plan
CC-S-T-008	GRN VLY2-MOSLND D 115 kV #1 Line	CB FAULT AT MOSS LANDING SUB 115 CB120	C2	CB	108.8%	N/A	N/A	Action plan
CC-S-T-009	LGNTSSW1-NTVD SW1 115 kV #1 Line	CB FAULT AT MOSS LANDING SUB 115 CB120	C2	CB	109.2%	N/A	N/A	Action plan
CC-S-T-010	LGNTSSW2-NTVD SW2 115 kV #1 Line	CB FAULT AT MOSS LANDING SUB 115 CB120	C2	CB	149.5%	N/A	N/A	Action plan
CC-S-T-011	MOSLND D-MOSSLND1 115/230 kV #1 Bank	CB FAULT AT MOSS LANDING SUB 115 CB120	C2	CB	116.7%	<100%	<100%	Same as Category C1: Increase capacity of existing project replacing Moss Landing 115/230 kV Bank #1 & 2
CC-S-T-012	MOSLND D-MOSSLND2 115/230 kV #2 Bank	CB FAULT AT MOSS LANDING SUB 115 CB110	C2	CB	115.7%	<100%	<100%	Same as Category C1: Increase capacity of existing project replacing Moss Landing 115/230 kV Bank #1 & 2
CC-S-T-013	MOSLND E-MOSSLND1 115/230 kV #8 Bank	CB FAULT AT MOSS LANDING SUB 115 CB120	C2	CB	116.4%	<100%	<100%	Same as Category C1: Increase capacity of existing project replacing Moss Landing 115/230 kV Bank #1 & 2
CC-S-T-014	MOSLND E-MOSSLND2 115/230 kV #10 Bank	CB FAULT AT MOSS LANDING SUB 115 CB110	C2	CB	115.9%	<100%	<100%	Same as Category C1: Increase capacity of existing project replacing Moss Landing 115/230 kV Bank #1 & 2

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
CC-S-T-015	NTVD SW1-SALINAS 115 kV #1 Line	CB FAULT AT MOSS LANDING SUB 115 CB120	C2	CB	124.6%	<100%	<100%	Action plan/Crazy Horse 115 kV project helps
CC-S-T-016	BRIGTANO-GRANT JT 115 kV #1 Line	Moss Landing-Green Valley #1 & 2 115 kV Lines	C3	L-1-1	N/A	159.2%	179.6%	Increase capacity of the approved 2015 Watsonville 115 kV Voltage Conversion Project
CC-S-T-017	CIC JCT-AGRILINK 115 kV #1 Line	Moss Landing-Green Valley #1 & 2 115 kV Lines	C3	L-1-1	N/A	141.9%	160.2%	Increase capacity of the approved 2015 Watsonville 115 kV Voltage Conversion Project
CC-S-T-018	CIC JCT-ERTA JCT 115 kV #1 Line	Moss Landing-Green Valley #1 & 2 115 kV Lines	C3	L-1-1	N/A	141.9%	160.2%	Increase capacity of the approved 2015 Watsonville 115 kV Voltage Conversion Project
CC-S-T-019	CRZY_HRS-BRIGTANO 115 kV #1 Line	Moss Landing-Green Valley #1 & 2 115 kV Lines	C3	L-1-1	N/A	160.5%	181.2%	Increase capacity of the approved 2015 Watsonville 115 kV Voltage Conversion Project
CC-S-T-020	CRZY_HRS-NTVD SW2 115 kV #1 Line	Moss Landing-Salinas #1 & 2 115 kV Lines	C3	L-1-1	N/A	148.8%	159.3%	Action plan/Reconsider the on-hold 2017 Natividad Sub project
CC-S-T-021	GRN VLY1-ERTA JCT 115 kV #1 Line	Moss Landing-Green Valley #1 & 2 115 kV Lines	C3	L-1-1	N/A	140.7%	159.0%	Increase capacity of the approved 2015 Watsonville 115 kV Voltage Conversion Project
CC-S-T-022	GRN VLY1-MOSLND D 115 kV #2 Line	Moss Landing-Green Valley #1 115 kV and Crazy Horse-Watsonville 115 kV Lines	C3	L-1-1	N/A	104.4%	111.5%	Monitor/drop load/rerate
CC-S-T-023	GRN VLY1-MOSLND D 115 kV #1 Line	Moss Landing-Green Valley #2 115 kV and Crazy Horse-Watsonville 115 kV Lines	C3	L-1-1	N/A	104.4%	111.5%	Monitor/drop load/rerate
CC-S-T-024	GRN VLY1-MOSLND D 115 kV #1 Line	Moss Landing-Green Valley #2 115 kV Line and Paul Sweet Statcom	C3	L-1/N-1	112.0%	<100%	<100%	Action plan/rerate/upgrade limiting equipment
CC-S-T-025	GRN VLY2-MOSLND D 115 kV #1 Line	Moss Landing-Green Valley #1 115 kV Line and PSWTSTCM #1	C3	L-1/N-1	108.4%	N/A	N/A	Action plan/rerate/upgrade limiting equipment

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
CC-S-T-026	LGNTSSW1-NTVD SW1 115 kV #1 Line	Moss Landing-Salinas #1 & 2 115 kV Lines	C3	L-1-1	126.7%	N/A	N/A	Use existing action plan if necessary
CC-S-T-027	LGNTSSW2-NTVD SW2 115 kV #1 Line	Moss Landing-Salinas #1 & 2 115 kV Lines	C3	L-1-1	162.4%	N/A	N/A	Use existing action plan if necessary
CC-S-T-028	MOSLND D-MOSSLND1 115/230 kV #1 Bank	Moss Landing 230/115 kV Bank #10 & 8	C3	T-1-1	192.7%	<100%	<100%	Same as Category C1: Increase capacity of existing project replacing Moss Landing 115/230 kV Bank #1 & 2
CC-S-T-029	MOSLND D-MOSSLND2 115/230 kV #2 Bank	Moss Landing 230/115 kV Bank #10 & 8	C3	T-1-1	191.9%	<100%	<100%	Same as Category C1: Increase capacity of existing project replacing Moss Landing 115/230 kV Bank #1 & 2
CC-S-T-030	MOSLND E-MOSSLND1 115/230 kV #8 Bank	Moss Landing 230/115 kV Bank #10 & 2	C3	T-1-1	107.8%	<100%	<100%	Same as Category C1: Increase capacity of existing project replacing Moss Landing 115/230 kV Bank #1 & 2
CC-S-T-031	MOSLND E-MOSSLND2 115/230 kV #10 Bank	Moss Landing 230/115 kV Bank #8 & 1	C3	T-1-1	108.2%	<100%	<100%	Same as Category C1: Increase capacity of existing project replacing Moss Landing 115/230 kV Bank #1 & 2
CC-S-T-032	NTVD SW1-SALINAS 115 kV #1 Line	Moss Landing-Salinas #1 & 2 115 kV Lines	C3	L-1-1	96.7%	115.3%	123.4%	Reconsider the on-hold 2017 Natividad Sub project
CC-S-T-033	WTSNVLE-GRANT JT 115 kV #1 Line	Moss Landing-Green Valley #1 & 2 115 kV Lines	C3	L-1-1	N/A	154.1%	174.1%	Increase capacity of the approved 2014 Watsonville 115 kV Voltage Conversion Project
CC-S-T-034	LGNTSSW1-NTVD SW1 115 kV #1 Line	Moss Landing - Salinas #1 and #2 115 kV Lines	C5	L-2	126.7%	N/A	N/A	Drop load and follow existing Action Plan if needed

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
CC-S-T-035	LGNTSSW2-NTVD SW2 115 kV #1 Line	Moss Landing - Salinas #1 and #2 115 kV Lines	C5	L-2	162.4%	N/A	N/A	Drop load and follow existing Action Plan if needed
CC-S-T-036	NTVD SW2-SALINAS 115 kV #1 Line	Moss Landing - Salinas #1 and #2 115 kV Lines	C5	L-2	127.5%	114.5%	122.4%	Drop load/consider the on-hold 2017 Natividad Sub project
CC-S-T-037	NTVD SW1-SALINAS 115 kV #1 Line	Moss Landing - Salinas #1 and #2 115 kV Lines	C5	L-2	96.7%	114.5%	122.4%	Drop load/consider the on-hold 2017 Natividad Sub project
CC-S-T-038	GRN VLY1-ERTA JCT 115 kV #1 Line	Moss Landing - Green Valley #1 and #2 115 kV	C5	L-2	N/A	138.2%	154.0%	Drop load/Increase capacity of the approved 2015 Watsonville 115 kV Voltage Conversion project
CC-S-T-039	CIC JCT-ERTA JCT 115 kV #1 Line	Moss Landing - Green Valley #1 and #2 115 kV	C5	L-2	N/A	139.3%	155.2%	Drop load/Increase capacity of the approved 2015 Watsonville 115 kV Voltage Conversion project
CC-S-T-040	CIC JCT-AGRILINK 115 kV #1 Line	Moss Landing - Green Valley #1 and #2 115 kV	C5	L-2	N/A	139.3%	155.2%	Drop load/Increase capacity of the approved 2015 Watsonville 115 kV Voltage Conversion project
CC-S-T-041	WTSNVLE-GRANT JT 115 kV #1 Line	Moss Landing - Green Valley #1 and #2 115 kV	C5	L-2	N/A	151.3%	168.5%	Drop load/Increase capacity of the approved 2015 Watsonville 115 kV Voltage Conversion project
CC-S-T-042	WTSNVLE-AGRILINK 115 kV #1 Line	Moss Landing - Green Valley #1 and #2 115 kV	C5	L-2	N/A	139.4%	155.3%	Drop load/Increase capacity of the approved 2015 Watsonville 115 kV Voltage Conversion project



**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
CC-S-T-043	BRIGTANO-GRANT JT 115 kV #1 Line	Moss Landing - Green Valley #1 and #2 115 kV	C5	L-2	N/A	156.2%	173.9%	Drop load/Increase capacity of the approved 2015 Watsonville 115 kV Voltage Conversion project
CC-S-T-044	CRZY_HRS-NTVD SW2 115 kV #1 Line	Moss Landing - Salinas #1 and #2 115 kV Lines	C5	L-2	N/A	147.7%	158.1%	Drop load/Increase capacity of the approved 2015 Watsonville 115 kV Voltage Conversion project
CC-S-T-045	CRZY_HRS-NTVD SW1 115 kV #1 Line	Moss Landing - Salinas #1 and #2 115 kV Lines	C5	L-2	N/A	147.7%	158.1%	Drop load/Increase capacity of the approved 2015 Watsonville 115 kV Voltage Conversion project
CC-S-T-046	CRZY_HRS-BRIGTANO 115 kV #1 Line	Moss Landing - Green Valley #1 and #2 115 kV	C5	L-2	N/A	157.6%	175.4%	Drop load/Increase capacity of the approved 2015 Watsonville 115 kV Voltage Conversion project

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Winter Peak	2017 Winter Peak	2022 Winter Peak	
CC-W-T-001	GRN VLY2 -MOSLND D 115 kV #1 Line	CB FAULT AT MOSS LANDING SUB 115 kV CB110	C2	CB	100.1%	N/A	N/A	Monitor/rerate/drop load
CC-W-T-002	BRIGTANO-GRANT JT 115 #1 Line	Moss Landing-Green Valley #1 and Moss Landing-Green Valley #2 115 kV Lines	C3	L-1-1	N/A	129.5%	156.8%	Increase capacity of the approved 2015 Watsonville 115 kV voltage conversion project
CC-W-T-003	CIC JCT-AGRILINK 115 #1 Line	Moss Landing-Green Valley #1 and Moss Landing-Green Valley #2 115 kV Lines	C3	L-1-1	N/A	115.6%	140.1%	Increase capacity of the approved 2015 Watsonville 115 kV voltage conversion project
CC-W-T-004	CIC JCT-ERTA JCT 115 #1 Line	Moss Landing-Green Valley #1 and Moss Landing-Green Valley #2 115 kV Lines	C3	L-1-1	N/A	115.6%	140.1%	Increase capacity of the approved 2015 Watsonville 115 kV voltage conversion project
CC-W-T-005	CRZY_HRS-BRIGTANO 115 #1 Line	Moss Landing-Green Valley #1 and Moss Landing-Green Valley #2 115 kV Lines	C3	L-1-1	N/A	130.6%	158.1%	Increase capacity of the approved 2015 Watsonville 115 kV voltage conversion project
CC-W-T-006	GRN VLY1-ERTA JCT 115 #1 Line	Moss Landing-Green Valley #1 and Moss Landing-Green Valley #2 115 kV Lines	C3	L-1-1	N/A	115.1%	139.4%	Increase capacity of the approved 2015 Watsonville 115 kV voltage conversion project
CC-W-T-007	GRN VLY1-MOSLND D 115 #2 Line	Moss Landing-Green Valley #1 and Crazy Horse-Watsonville 115 kV Lines	C3	L-1-1	N/A	96.4%	103.8%	Monitor facility loading/drop load/rerate/drop load
CC-W-T-008	GRN VLY1-MOSLND D 115 #1 Line	Moss Landing-Green Valley #2 and Crazy Horse-Watsonville 115 kV Lines	C3	L-1-1	N/A	96.4%	103.8%	Monitor facility loading/drop load/rerate/drop load
CC-W-T-009	GRN VLY1-MOSLND D 115 #1 Line	Moss Landing-Green Valley #2 115 kV Line and Paul Sweet Statcom	C3	L-1/N-1	105.1%	<100%	<100%	Monitor line loading/drop load
CC-W-T-010	GRN VLY2-MOSLND D 115 #1 Line	Moss Landing-Green Valley #1 115 kV Line and Paul Sweet Statcom	C3	L-1/N-1	105.1%	N/A	N/A	Monitor line loading/drop load

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Winter Peak	2017 Winter Peak	2022 Winter Peak	
CC-W-T-011	MOSLND D-MOSSLND1 115/230 #1 Bank	Moss Landing 230/115 kV Bank #10 and Moss Landing 230/115 kV Bank #8	C3	T-1-1	168.3%	<100%	<100%	Action plan/drop load/revise existing project to replace Moss Landing 115/230 kV #1 & 2 Banks
CC-W-T-012	MOSLND D-MOSSLND2 115/230 #2 Bank	Moss Landing 230/115 kV Bank #10 and Moss Landing 230/115 kV Bank #8	C3	T-1-1	167.7%	<100%	<100%	Action plan/drop load/revise existing project to replace Moss Landing 115/230 kV #1 & 2 Banks
CC-W-T-013	WTSNVLE-AGRILINK 115 #1 Line	Moss Landing-Green Valley #1 and Moss Landing-Green Valley #2 115 kV Lines	C3	L-1-1	N/A	115.7%	140.2%	Increase capacity of the approved 2015 Watsonville 115 kV voltage conversion project
CC-W-T-014	WTSNVLE-GRANT JT 115 #1 Line	Moss Landing-Green Valley #1 and Moss Landing-Green Valley #2 115 kV Lines	C3	L-1-1	N/A	125.7%	152.3%	Increase capacity of the approved 2015 Watsonville 115 kV voltage conversion project
CC-W-T-015	GRN VLY1-ERTA JCT 115 kV #1 Line	Moss Landing - Green Valley #1 and #2 115 kV	C5	L-2	N/A	112.9%	131.0%	Increase capacity of the approved 2015 Watsonville 115 kV Voltage Conversion project
CC-W-T-016	CIC JCT-ERTA JCT 115 kV #1 Line	Moss Landing - Green Valley #1 and #2 115 kV	C5	L-2	N/A	113.5%	131.6%	Increase capacity of the approved 2015 Watsonville 115 kV Voltage Conversion project
CC-W-T-017	CIC JCT-AGRILINK115 kV #1 Line	Moss Landing - Green Valley #1 and #2 115 kV	C5	L-2	N/A	113.5%	131.6%	Increase capacity of the approved 2015 Watsonville 115 kV Voltage Conversion project
CC-W-T-018	WTSNVLE-GRANT JT 115 kV #1 Line	Moss Landing - Green Valley #1 and #2 115 kV	C5	L-2	N/A	123.3%	143.0%	Increase capacity of the approved 2015 Watsonville 115 kV Voltage Conversion project

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Winter Peak	2017 Winter Peak	2022 Winter Peak	
CC-W-T-019	WTSNVLE-AGRILINK 115 kV #1 Line	Moss Landing - Green Valley #1 and #2 115 kV	C5	L-2	N/A	113.6%	131.7%	Increase capacity of the approved 2015 Watsonville 115 kV Voltage Conversion project
CC-W-T-020	BRIGTANO-GRANT JT 115 kV #1 Line	Moss Landing - Green Valley #1 and #2 115 kV	C5	L-2	N/A	127.0%	147.2%	Increase capacity of the approved 2015 Watsonville 115 kV Voltage Conversion project
CC-W-T-021	CRZY_HRS-BRIGTANO 115 kV #1 Line	Moss Landing - Green Valley #1 and #2 115 kV	C5	L-2	N/A	128.0%	148.4%	Increase capacity of the approved 2015 Watsonville 115 kV Voltage Conversion project



**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Summer Off-Peak	N/A	

No thermal overloads identified.

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
CC-S-VD-001	HOLLISTR 115 kV	Crazy Horse-Hollister #2 115 kV Line	B	L-1	N/A	-4.78%	-5.04%	Monitor voltage deviation
CC-S-VD-002	CSTRVLE 115 kV	CB FAULT AT MOSS LANDING SUB 115 CB110	C2	CB	-9.1%	-9.6%	-11.6%	Monitor voltage deviation/load drop
CC-S-VD-003	DOLAN RD 115 kV	CB FAULT AT MOSS LANDING SUB 115 CB110	C2	CB	-9.0%	-8.8%	-10.2%	Monitor voltage deviation/load drop
CC-S-VD-004	HOLST D 115 kV	CB FAULT AT MOSS LANDING SUB 115 CB120	C2	CB	-11.7%	-6.0%	-7.1%	Monitor voltage deviation/load drop
CC-S-VD-005	LGNTSSW1 115 kV	CB FAULT AT MOSS LANDING SUB 115 CB120	C2	CB	-11.0%	N/A	N/A	Monitor voltage deviation/load drop
CC-S-VD-006	PRUNEDLE 115 kV	CB FAULT AT MOSS LANDING SUB 115 CB120	C2	CB	-12.0%	-6.7%	-7.8%	Monitor voltage deviation/load drop
CC-S-VD-007	SNBENITO 115 kV	CB FAULT AT MOSS LANDING SUB 115 CB120	C2	CB	-11.4%	-5.9%	-7.0%	Monitor voltage deviation/load drop
CC-S-VD-008	SARG CYN 60 kV	Coburn-Oil Fields #1 60 kV Line and SALNR GN Unit #1	C3	(L-1/G-1)/G-1	-9.4%	-10.1%	-10.5%	Monitor voltage deviation/load drop
CC-S-VD-009	AGRILINK 115 kV	Moss Landing-Green Valley #1 115 kV and Moss Landing-Green Valley #2 115 kV Lines	C3	L-1-1	N/A	-12.2%	-17.4%	Monitor voltage deviation/load drop
CC-S-VD-010	BRIGTANO 115 kV	Moss Landing-Green Valley #1 115 kV and Moss Landing-Green Valley #2 115 kV Lines	C3	L-1-1	N/A	-9.0%	-12.5%	Monitor voltage deviation/load drop
CC-S-VD-011	CMP EVRS 115 kV	Moss Landing-Green Valley #1 115 kV and Moss Landing-Green Valley #2 115 kV Lines	C3	L-1-1	N/A	-12.2%	-18.4%	Monitor voltage deviation/load drop
CC-S-VD-012	ERTA 115 kV	Moss Landing-Green Valley #1 115 kV and Moss Landing-Green Valley #2 115 kV Lines	C3	L-1-1	N/A	-12.5%	-18.0%	Monitor voltage deviation/load drop
CC-S-VD-013	GRANT RK 115 kV	Moss Landing-Green Valley #1 115 kV and Moss Landing-Green Valley #2 115 kV Lines	C3	L-1-1	N/A	-9.2%	-12.8%	Monitor voltage deviation/load drop

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
CC-S-VD-014	GRN VLY1 115 kV	Moss Landing-Green Valley #1 115 kV and Moss Landing-Green Valley #2 115 kV Lines	C3	L-1-1	N/A	-12.7%	-18.3%	Monitor voltage deviation/load drop
CC-S-VD-015	PAUL SWT 115 kV	Moss Landing-Green Valley #1 115 kV and Moss Landing-Green Valley #2 115 kV Lines	C3	L-1-1	N/A	-11.9%	-18.1%	Monitor voltage deviation/load drop
CC-S-VD-016	PAUL SWT 115 kV	Moss Landing-Green Valley #2 115 kV Line and Paul Sweet Statcom	C3	L-1/N-1	-10.0%	-6.1%	-7.1%	Monitor voltage deviation/load drop
CC-S-VD-017	ROB ROY 115 kV	Moss Landing-Green Valley #1 115 kV and Moss Landing-Green Valley #2 115 kV Lines	C3	L-1-1	N/A	-12.5%	-18.3%	Monitor voltage deviation/load drop
CC-S-VD-018	WTSNVILLE 115 kV	Moss Landing-Green Valley #1 115 kV and Moss Landing-Green Valley #2 115 kV Lines	C3	L-1-1	N/A	-12.1%	-17.3%	Monitor voltage deviation/load drop
CC-S-VD-019	GRN VLY1 115 kV	Moss Landing - Green Valley #1 and #2 115 kV Lines	C5	L-2	-0.60%	-11.2%	-15.8%	Monitor/drop load
CC-S-VD-020	CMP EVRS 115 kV	Moss Landing - Green Valley #1 and #2 115 kV Lines	C5	L-2	-0.06%	-10.2%	-15.5%	Monitor/drop load
CC-S-VD-021	PAUL SWT 115 kV	Moss Landing - Green Valley #1 and #2 115 kV Lines	C5	L-2	0.00%	-10.1%	-15.2%	Monitor/drop load
CC-S-VD-022	ROB ROY 115 kV	Moss Landing - Green Valley #1 and #2 115 kV Lines	C5	L-2	0.40%	-10.9%	-15.7%	Monitor/drop load
CC-S-VD-023	ERTA 115 kV	Moss Landing - Green Valley #1 and #2 115 kV Lines	C5	L-2	N/A	-11.0%	-15.6%	Monitor/drop load/consider adding reactive support to the 2015 Watsonville 115 kV Voltage Conversion Project
CC-S-VD-024	WTSNVILLE 115 kV	Moss Landing - Green Valley #1 and #2 115 kV Lines	C5	L-2	N/A	-10.7%	-15.0%	Monitor/drop load/consider adding reactive support to the 2015 Watsonville 115 kV Voltage Conversion Project
CC-S-VD-025	GRANT RK 115 kV	Moss Landing - Green Valley #1 and #2 115 kV Lines	C5	L-2	N/A	-8.1%	-11.0%	Monitor/drop load/consider adding reactive support to the 2015 Watsonville 115 kV Voltage Conversion Project

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
CC-S-VD-026	AGRILINK 115 kV	Moss Landing - Green Valley #1 and #2 115 kV Lines	C5	L-2	N/A	-10.8%	-15.1%	Monitor/drop load/consider adding reactive support to the 2015 Watsonville 115 kV Voltage Conversion Project
CC-S-VD-027	BRIGTANO 115 kV	Moss Landing - Green Valley #1 and #2 115 kV Lines	C5	L-2	N/A	-7.9%	-10.8%	Monitor/drop load/consider adding reactive support to the 2015 Watsonville 115 kV Voltage Conversion Project



**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Winter Peak	2017 Winter Peak	2022 Winter Peak	
CC-W-VD-001	CSTRVLE 115 kV	CB FAULT AT MOSS LANDING SUB 115 kV CB110	C2	CB	-8.89%	-8.73%	-10.30%	Monitor voltage deviation/drop load
CC-W-VD-002	AGRILINK 115 kV	Moss Landing-Green Valley #1 and Moss Landing-Green Valley #2 115 kV Lines	C3	L-1-1	N/A	-12.47%	-22.65%	Monitor voltage deviation/drop load
CC-W-VD-003	BRIGTANO 60 kV	Moss Landing-Green Valley #1 115 kV Line and Paul Sweet Statcom	C3	L-1/N-1	-10.05%	N/A	N/A	Monitor/follow existing action plan if needed
CC-W-VD-004	BRIGTANO 115 kV	Moss Landing-Green Valley #1 and Moss Landing-Green Valley #2 115 kV Lines	C3	L-1-1	N/A	-9.32%	-16.30%	Monitor voltage deviation/drop load
CC-W-VD-005	CMP EVRS 115 kV	Moss Landing-Green Valley #1 and Moss Landing-Green Valley #2 115 kV Lines	C3	L-1-1	N/A	-11.64%	-23.43%	Monitor voltage deviation/drop load
CC-W-VD-006	ERTA 115 kV	Moss Landing-Green Valley #1 and Moss Landing-Green Valley #2 115 kV Lines	C3	L-1-1	N/A	-12.77%	-23.39%	Monitor voltage deviation/drop load
CC-W-VD-007	GRANT RK 60 kV	Moss Landing-Green Valley #1 115 kV Line and Paul Sweet Statcom	C3	L-1/N-1	-10.12%	N/A	N/A	Monitor/follow existing action plan if needed
CC-W-VD-008	GRANT RK 115 kV	Moss Landing-Green Valley #1 and Moss Landing-Green Valley #2 115 kV Lines	C3	L-1-1	N/A	-9.53%	-16.69%	Monitor voltage deviation/drop load
CC-W-VD-009	GRN VLY1 115 kV	Moss Landing-Green Valley #1 and Moss Landing-Green Valley #2 115 kV Lines	C3	L-1-1	N/A	-12.91%	-23.79%	Monitor voltage deviation/drop load
CC-W-VD-010	PAUL SWT 115 kV	Moss Landing-Green Valley #1 and Moss Landing-Green Valley #2 115 kV Lines	C3	L-1-1	N/A	-11.42%	-23.28%	Monitor voltage deviation/drop load
CC-W-VD-011	PAUL SWT 115 kV	Moss Landing-Green Valley #2 115 kV Line and Paul Sweet Statcom	C3	L-1/N-1	-10.39%	-4.51%	-6.03%	Monitor voltage deviation/drop load
CC-W-VD-012	ROB ROY 115 kV	Moss Landing-Green Valley #1 and Moss Landing-Green Valley #2 115 kV Lines	C3	L-1-1	N/A	-12.50%	-23.72%	Monitor voltage deviation/drop load
CC-W-VD-013	WTSNVLE 115 kV	Moss Landing-Green Valley #1 and Moss Landing-Green Valley #2 115 kV Lines	C3	L-1-1	N/A	-12.40%	-22.46%	Monitor voltage deviation/drop load
CC-W-VD-014	GRN VLY1 115 kV	Moss Landing - Green Valley #1 and #2 115 kV Lines	C5	L-2	-1.05%	-11.36%	-18.94%	Monitor/drop load/add reactive support to the 2015 Watsonville 115 kV Voltage Conversion project
CC-W-VD-015	CMP EVRS 115 kV	Moss Landing - Green Valley #1 and #2 115 kV Lines	C5	L-2	0.09%	-9.79%	-18.07%	Monitor/drop load

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Winter Peak	2017 Winter Peak	2022 Winter Peak	
CC-W-VD-016	PAUL SWT 115 kV	Moss Landing - Green Valley #1 and #2 115 kV Lines	C5	L-2	0.00%	-9.52%	-17.87%	Monitor/drop load
CC-W-VD-017	ROB ROY 115 kV	Moss Landing - Green Valley #1 and #2 115 kV Lines	C5	L-2	0.10%	-10.84%	-18.68%	Monitor/drop load
CC-W-VD-018	ERTA 115 kV	Moss Landing - Green Valley #1 and #2 115 kV Lines	C5	L-2	N/A	-11.25%	-18.63%	Monitor/drop load/add reactive support to the 2015 Watsonville 115 kV Voltage Conversion project
CC-W-VD-019	CIC JCT 115 kV	Moss Landing - Green Valley #1 and #2 115 kV Lines	C5	L-2	N/A	-11.08%	-18.20%	Monitor/drop load/add reactive support to the 2015 Watsonville 115 kV Voltage Conversion project
CC-W-VD-020	WTSNVLE 115 kV	Moss Landing - Green Valley #1 and #2 115 kV Lines	C5	L-2	N/A	-10.96%	-17.94%	Monitor/drop load/add reactive support to the 2015 Watsonville 115 kV Voltage Conversion project
CC-W-VD-021	GRANT RK 115 kV	Moss Landing - Green Valley #1 and #2 115 kV Lines	C5	L-2	N/A	-8.42%	-13.35%	Monitor/drop load/add reactive support to the 2015 Watsonville 115 kV Voltage Conversion project
CC-W-VD-022	AGRILINK 115 kV	Moss Landing - Green Valley #1 and #2 115 kV Lines	C5	L-2	N/A	-11.02%	-18.08%	Monitor/drop load/add reactive support to the 2015 Watsonville 115 kV Voltage Conversion project
CC-W-VD-023	BRIGTANO 115 kV	Moss Landing - Green Valley #1 and #2 115 kV Lines	C5	L-2	N/A	-8.23%	-13.03%	Monitor/drop load/add reactive support to the 2015 Watsonville 115 kV Voltage Conversion project

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Summer Off-Peak	N/A	
CC-NPK-VD-001	BRIGTANO 60 kV	Green Valley 115/60 Bank #1	B	T-1	-5.14%	N/A		Action plan/existing Watsonville UVLS may operate
CC-NPK-VD-002	CAMPHORA 60 kV	Soledad #2 60 kV Line(Gonzales 60 kV Tap #2)	B	L-1	-6.20%	-0.58%		Monitor/Follow existing Action Plan if needed
CC-NPK-VD-003	CMP EVRS 115 kV	PSWTSTCM 8.00 Unit ID 1	B	N-1	5.11%	0.60%		Under review for possible exemption
CC-NPK-VD-004	DEL MNTE 60 kV	Del Monte 115/60 kV Bank #4	B	T-1	6.13%	-0.02%		Under review for possible exemption
CC-NPK-VD-005	DUKE ML1 230 kV	Duke Moss Landing 1-Moss Landing 230 kV Line	B	L-1	1.29%	5.28%		Monitor voltage deviation
CC-NPK-VD-006	FORT ORD 60 kV	Del Monte 115/60 kV Bank #4	B	T-1	6.14%	-0.02%		Under review for possible exemption
CC-NPK-VD-007	GONZALES 60 kV	Soledad #1 60 kV Line(Gonzales 60 kV Tap #1)	B	L-1	-6.51%	-0.69%		Monitor
CC-NPK-VD-008	HATTON 60 kV	Del Monte 115/60 kV Bank #4	B	T-1	6.14%	-0.03%		Under review for possible exemption
CC-NPK-VD-009	HOLLISTR 115 kV	ML-SD-SL #2 115 kV Line	B	L-1	-6.89%	N/A		Monitor
CC-NPK-VD-010	HOLST D 115 kV	San Benito-Hollister 115 kV Line	B	L-1	-6.60%	N/A		Monitor
CC-NPK-VD-011	LGNTSSW1 115 kV	ML-SD-SL #1 115 kV Line	B	L-1	-7.36%	N/A		Monitor
CC-NPK-VD-012	LGNTSSW2 115 kV	ML-SD-SL #2 115 kV Line	B	L-1	-7.48%	N/A		Monitor
CC-NPK-VD-013	MANZANTA 60 kV	Del Monte 115/60 kV Bank #4	B	T-1	6.13%	-0.03%		Under review for possible exemption
CC-NPK-VD-014	MONTEREY 60 kV	Del Monte 115/60 kV Bank #4	B	T-1	6.14%	-0.02%		Under review for possible exemption
CC-NPK-VD-015	NAVY LAB 60 kV	Del Monte 115/60 kV Bank #4	B	T-1	6.13%	N/A		Under review for possible exemption

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Summer Off-Peak	N/A	
CC-NPK-VD-016	NTVD SW1 115 kV	ML-SD-SL #1 115 kV Line	B	L-1	-5.02%	N/A		Monitor
CC-NPK-VD-017	NTVD SW2 115 kV	ML-SD-SL #2 115 kV Line	B	L-1	-5.57%	N/A		Monitor
CC-NPK-VD-018	NVY SCHL 60 kV	Del Monte 115/60 kV Bank #4	B	T-1	6.13%	-0.02%		Under review for possible exemption
CC-NPK-VD-019	PAUL SWT 115 kV	PSWTSTCM 8.00 Unit ID 1	B	N-1	5.62%	0.67%		Under review for possible exemption
CC-NPK-VD-020	SLDAD 4M 115 kV	Soledad 115/60 Bank 4M	B	T-1	-6.09%	-0.59%		Monitor
CC-NPK-VD-021	SLDAD 5M 115 kV	Soledad 115/60 Bank 5M	B	T-1	-6.19%	-0.69%		Monitor
CC-NPK-VD-022	SNBENITO 115 kV	ML-SD-SL #1 115 kV Line	B	L-1	-7.00%	N/A		Monitor
CC-NPK-VD-023	VIEJO 60 kV	Del Monte 115/60 kV Bank #4	B	T-1	6.15%	-0.02%		Under review for possible exemption

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
CC-S-V-001	SNBENITO 115 kV	CB FAULT AT MOSS LANDING SUB 115 CB120	C2	CB	0.88	0.95	0.94	Monitor/load drop
CC-S-V-002	GONZALES 60 kV	CB FAULT AT MOSS LANDING SUB 115 CB120	C2	CB	0.89	0.91	0.94	Monitor/load drop
CC-S-V-003	HOLST D 115 kV	CB FAULT AT MOSS LANDING SUB 115 CB120	C2	CB	0.86	0.95	0.93	Monitor/load drop
CC-S-V-004	OILFLDS 60 kV	Coburn-Oil Fields #1 60 kV Line and SALNR GN Unit #1	C3	(L-1/G-1)/G-1	0.901	0.893	0.89	Monitor and follow existing Action Plan if needed/adjust equipment voltage settings
CC-S-V-005	SALN RVR 60 kV	Coburn-Oil Fields #1 60 kV Line and SALNR GN Unit #1	C3	(L-1/G-1)/G-1	0.9	0.893	0.889	Monitor and follow existing Action Plan if needed/adjust equipment voltage settings
CC-S-V-006	TEXACO 60 kV	Coburn-Oil Fields #1 60 kV Line and SALNR GN Unit # 1	C3	(L-1/G-1)/G-1	0.9	0.892	0.889	Monitor and follow existing Action Plan if needed/adjust equipment voltage settings
CC-S-V-007	AGRILINK 115 kV	Moss Landing-Green Valley #1 115 kV and Moss Landing-Green Valley #2 115 kV Lines	C3	L-1-1	N/A	0.898	0.844	Monitor/load drop/consider adding reactive support to the 2015 Watsonville 115 kV Voltage Conversion project
CC-S-V-008	BRIGTANO 115 kV	Moss Landing-Green Valley #1 115 kV and Moss Landing-Green Valley #2 115 kV Lines	C3	L-1-1	N/A	0.927	0.89	Monitor/load drop/consider adding reactive support to the 2015 Watsonville 115 kV Voltage Conversion project
CC-S-V-009	CMP EVRS 115 kV	Moss Landing-Green Valley #1 115 kV and Moss Landing-Green Valley #2 115 kV Lines	C3	L-1-1	N/A	0.904	0.842	Monitor/load drop
CC-S-V-010	CRYHSE60 60 kV	PSWTSTCM Unit # 1 and DUKMOSS1 Unit # 1	C3	N-1/G-1	1.029	0.999	N/A	Monitor voltage/load drop
CC-S-V-011	ERTA 115 kV	Moss Landing-Green Valley #1 115 kV and Moss Landing-Green Valley #2 115 kV Lines	C3	L-1-1	N/A	0.896	0.839	Monitor/load drop/consider adding reactive support to the 2015 Watsonville 115 kV Voltage Conversion project
CC-S-V-012	GRANT RK 60 kV	Moss Landing-Green Valley #1 115 kV Line and Paul Sweet Statcom	C3	L-1/N-1	0.895	N/A	N/A	Monitor and follow existing Action Plan if needed

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
CC-S-V-013	GRANT RK 115 kV	Moss Landing-Green Valley #1 115 kV and Moss Landing-Green Valley #2 115 kV Lines	C3	L-1-1	N/A	0.923	0.885	Monitor/load drop/consider adding reactive support to the 2015 Watsonville 115 kV Voltage Conversion project
CC-S-V-014	GRN VLY1 115 kV	Moss Landing-Green Valley #1 115 kV and Moss Landing-Green Valley #2 115 kV Lines	C3	L-1-1	N/A	0.895	0.837	Monitor voltage/load drop
CC-S-V-015	PAUL SWT 115 kV	Moss Landing-Green Valley #1 115 kV and Moss Landing-Green Valley #2 115 kV Lines	C3	L-1-1	N/A	0.906	0.844	Monitor voltage/load drop
CC-S-V-016	ROB ROY 115 kV	Moss Landing-Green Valley #1 115 kV and Moss Landing-Green Valley #2 115 kV Lines	C3	L-1-1	N/A	0.897	0.837	Monitor voltage/load drop
CC-S-V-017	SARG CYN 60 kV	Coburn-Oil Fields #1 60 kV and Oil Fields-Salinas River 60 kV Lines	C3	L-1-1	0.908	0.901	0.897	Monitor voltage/load drop
CC-S-V-018	WTSNVLL 115 kV	Moss Landing-Green Valley #1 115 kV and Moss Landing-Green Valley #2 115 kV Lines	C3	L-1-1	N/A	0.899	0.845	Monitor/load drop/consider adding reactive support to the 2015 Watsonville 115 kV Voltage Conversion project
CC-S-V-019	GRN VLY1 115 kV	Moss Landing - Green Valley #1 and #2 115 kV Lines	C5	L-2	1.015	0.913	0.865	Monitor/drop load
CC-S-V-020	CMP EVRS 115 kV	Moss Landing - Green Valley #1 and #2 115 kV Lines	C5	L-2	1.025	0.922	0.871	Monitor/drop load
CC-S-V-021	PAUL SWT 115 kV	Moss Landing - Green Valley #1 and #2 115 kV Lines	C5	L-2	1.025	0.924	0.873	Monitor/drop load
CC-S-V-022	ROB ROY 115 kV	Moss Landing - Green Valley #1 and #2 115 kV Lines	C5	L-2	1.025	0.915	0.866	Monitor/drop load
CC-S-V-023	ERTA 115 kV	Moss Landing - Green Valley #1 and #2 115 kV Lines	C5	L-2	N/A	0.913	0.867	Monitor/drop load/consider adding reactive support to the 2015 Watsonville 115 kV Voltage Conversion Project
CC-S-V-024	WTSNVLL 115 kV	Moss Landing - Green Valley #1 and #2 115 kV Lines	C5	L-2	N/A	0.916	0.872	Monitor/drop load/consider adding reactive support to the 2015 Watsonville 115 kV Voltage Conversion Project

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Study Area: **PG&E Central Coast - Summer Peak**



*High/Low Voltage*

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
CC-S-V-025	AGRILINK 115 kV	Moss Landing - Green Valley #1 and #2 115 kV Lines	C5	L-2	N/A	0.915	0.871	Monitor/drop load/consider adding reactive support to the 2015 Watsonville 115 kV Voltage Conversion Project

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014 Winter Peak	2017 Winter Peak	2022 Winter Peak	
CC-W-V-001	HOLLISTR 115 kV	-	A	Normal	1.052	1.038	1.034	Monitor/Adjust generator and transformer voltage settings
CC-W-V-002	MOSLND E 115 kV	-	A	Normal	1.054	1.057	1.054	Monitor/Adjust generator and transformer voltage settings
CC-W-V-003	MOSLND D 115 kV	-	A	Normal	1.054	1.056	1.053	Monitor/Adjust generator and transformer voltage settings
CC-W-V-004	CSTRVLE 115 kV	-	A	Normal	1.050	1.052	1.049	Monitor/Adjust generator and transformer voltage settings
CC-W-V-005	DOLAN RD 115 kV	-	A	Normal	1.053	1.055	1.052	Monitor/Adjust generator and transformer voltage settings
CC-W-V-006	AGRILINK 115 kV	Moss Landing-Green Valley #1 and Moss Landing-Green Valley #2 115 kV Lines	C3	L-1-1	N/A	0.906	0.801	Monitor/drop load/consider adding reactive support to the 2015 Watsonville 115 kV Voltage Conversion project
CC-W-V-007	BRIGTANO 115 kV	Moss Landing-Green Valley #1 and Moss Landing-Green Valley #2 115 kV Lines	C3	L-1-1	N/A	0.941	0.868	Monitor/drop load/consider adding reactive support to the 2015 Watsonville 115 kV Voltage Conversion project
CC-W-V-008	CMP EVRS 115 kV	Moss Landing-Green Valley #1 and Moss Landing-Green Valley #2 115 kV Lines	C3	L-1-1	N/A	0.909	0.79	Monitor voltage/drop load
CC-W-V-009	ERTA 115 kV	Moss Landing-Green Valley #1 and Moss Landing-Green Valley #2 115 kV Lines	C3	L-1-1	N/A	0.903	0.794	Monitor/drop load/consider adding reactive support to the 2015 Watsonville 115 kV Voltage Conversion project
CC-W-V-010	GRANT RK 115 kV	Moss Landing-Green Valley #1 and Moss Landing-Green Valley #2 115 kV Lines	C3	L-1-1	N/A	0.937	0.862	Monitor/drop load/consider adding reactive support to the 2015 Watsonville 115 kV Voltage Conversion project
CC-W-V-011	GRN VLY1 115 kV	Moss Landing-Green Valley #1 and Moss Landing-Green Valley #2 115 kV Lines	C3	L-1-1	N/A	0.902	0.79	Monitor voltage/drop load
CC-W-V-012	PAUL SWT 115 kV	Moss Landing-Green Valley #1 and Moss Landing-Green Valley #2 115 kV Lines	C3	L-1-1	N/A	0.911	0.792	Monitor voltage/drop load



**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014 Winter Peak	2017 Winter Peak	2022 Winter Peak	
CC-W-V-013	ROB ROY 115 kV	Moss Landing-Green Valley #1 and Moss Landing-Green Valley #2 115 kV Lines	C3	L-1-1	N/A	0.903	0.789	Monitor voltage/drop load
CC-W-V-014	WTSNVILLE 115 kV	Moss Landing-Green Valley #1 and Moss Landing-Green Valley #2 115 kV Lines	C3	L-1-1	N/A	0.907	0.803	Monitor/drop load/consider adding reactive support to the 2015 Watsonville 115 kV Voltage Conversion project
CC-W-V-015	GRANT RK 60 kV	Moss Landing-Green Valley #1 115 kV Line and Paul Sweet Statcom	C3	L-1/N-1	0.894	N/A	N/A	Monitor and follow existing Action Plan if needed
CC-W-V-016	GRN VLY1 115 kV	Moss Landing - Green Valley #1 and #2 115 kV Lines	C5	L-2	1.015	0.920	0.842	Monitor/drop load/consider adding reactive support to the Watsonville 115 kV Voltage Conversion project
CC-W-V-017	CMP EVRS 115 kV	Moss Landing - Green Valley #1 and #2 115 kV Lines	C5	L-2	1.025	0.928	0.844	Monitor/drop load
CC-W-V-018	PAUL SWT 115 kV	Moss Landing - Green Valley #1 and #2 115 kV Lines	C5	L-2	1.025	0.930	0.846	Monitor/drop load
CC-W-V-019	ROB ROY 115 kV	Moss Landing - Green Valley #1 and #2 115 kV Lines	C5	L-2	1.025	0.922	0.841	Monitor/drop load
CC-W-V-020	ERTA 115 kV	Moss Landing - Green Valley #1 and #2 115 kV Lines	C5	L-2	N/A	0.922	0.845	Monitor/drop load/consider adding reactive support to the Watsonville 115 kV Voltage Conversion project
CC-W-V-021	WTSNVILLE 115 kV	Moss Landing - Green Valley #1 and #2 115 kV Lines	C5	L-2	N/A	0.925	0.852	Monitor/drop load/consider adding reactive support to the Watsonville 115 kV Voltage Conversion project
CC-W-V-022	GRANT RK 115 kV	Moss Landing - Green Valley #1 and #2 115 kV Lines	C5	L-2	N/A	0.952	0.900	Monitor/drop load/consider adding reactive support to the Watsonville 115 kV Voltage Conversion project
CC-W-V-023	AGRILINK 115 kV	Moss Landing - Green Valley #1 and #2 115 kV Lines	C5	L-2	N/A	0.924	0.850	Monitor/drop load/consider adding reactive support to the Watsonville 115 kV Voltage Conversion project

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Summer Off-Peak	N/A	
CC-NPK-LV-001	AGRILINK 60 kV	-	A	Normal	1.075	N/A		Under review for possible exemption
CC-NPK-LV-002	BIG BASN 60 kV	-	A	Normal	1.052	1.031		Under review for possible exemption
CC-NPK-LV-003	BRIGTANO 60 kV	-	A	Normal	1.051	N/A		Under review for possible exemption
CC-NPK-LV-004	BURNS 60 kV	-	A	Normal	1.051	1.030		Under review for possible exemption
CC-NPK-LV-005	CAMPHORA 60 kV	-	A	Normal	1.067	1.011		Under review for possible exemption
CC-NPK-LV-006	COBURN 230 kV	-	A	Normal	1.059	1.013		Under review for possible exemption
CC-NPK-LV-007	CRYHSE60 60 kV	-	A	Normal	1.081	0.999		Under review for possible exemption
CC-NPK-LV-008	CSTRVLE 115 kV	-	A	Normal	1.076	1.031		Under review for possible exemption
CC-NPK-LV-009	DEL MNTE 115 kV	-	A	Normal	1.064	1.025		Under review for possible exemption
CC-NPK-LV-010	DOLAN RD 115 kV	-	A	Normal	1.077	1.031		Under review for possible exemption
CC-NPK-LV-011	GONZALES 60 kV	-	A	Normal	1.067	1.009		Under review for possible exemption
CC-NPK-LV-012	GREN VLY 60 kV	-	A	Normal	1.085	N/A		Under review for possible exemption
CC-NPK-LV-013	GRN VLY1 115 kV	-	A	Normal	1.051	1.024		Under review for possible exemption
CC-NPK-LV-014	GRN VLY2 115 kV	-	A	Normal	1.051	N/A		Under review for possible exemption
CC-NPK-LV-015	HOLLISTR 115 kV	-	A	Normal	1.074	1.017		Under review for possible exemption

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Summer Off-Peak	N/A	
CC-NPK-LV-016	HOLST D 115 kV	-	A	Normal	1.066	1.017		Under review for possible exemption
CC-NPK-LV-017	LGNTSSW1 115 kV	-	A	Normal	1.074	N/A		Under review for possible exemption
CC-NPK-LV-018	LGNTSSW2 115 kV	-	A	Normal	1.075	N/A		Under review for possible exemption
CC-NPK-LV-019	LONE STR 60 kV	-	A	Normal	1.050	1.029		Under review for possible exemption
CC-NPK-LV-020	MOSLND D 115 kV	-	A	Normal	1.077	1.031		Under review for possible exemption
CC-NPK-LV-021	MOSLND E 115 kV	-	A	Normal	1.078	1.032		Under review for possible exemption
CC-NPK-LV-022	NTVD SW1 115 kV	-	A	Normal	1.073	1.022		Under review for possible exemption
CC-NPK-LV-023	NTVD SW2 115 kV	-	A	Normal	1.074	1.022		Under review for possible exemption
CC-NPK-LV-024	PRUNEDLE 115 kV	-	A	Normal	1.075	1.026		Under review for possible exemption
CC-NPK-LV-025	PT MRTTI 60 kV	-	A	Normal	1.050	1.029		Under review for possible exemption
CC-NPK-LV-026	SALINAS 115 kV	-	A	Normal	1.073	1.022		Under review for possible exemption
CC-NPK-LV-027	SLDAD 4M 115 kV	-	A	Normal	1.069	1.014		Under review for possible exemption
CC-NPK-LV-028	SLDAD 5M 115 kV	-	A	Normal	1.069	1.014		Under review for possible exemption
CC-NPK-LV-029	SNBENITO 115 kV	-	A	Normal	1.070	1.019		Under review for possible exemption
CC-NPK-LV-030	SOLEDAD 60 kV	-	A	Normal	1.070	1.015		Under review for possible exemption

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Summer Off-Peak	N/A	
CC-NPK-LV-031	SOLEDAD 115 kV	-	A	Normal	1.069	1.014		Under review for possible exemption
CC-NPK-LV-032	WTSNVILLE 60 kV	-	A	Normal	1.074	N/A		Under review for possible exemption
CC-NPK-LV-033	WTSNVILLE 60 kV	PSWTSTCM Unit #1	B	N-1	1.109	N/A		Under review for possible exemption
CC-NPK-LV-034	GREN VLY 60 kV	PSWTSTCM Unit #1	B	N-1	1.120	N/A		Under review for possible exemption
CC-NPK-LV-035	CRYHSE60 60 kV	PSWTSTCM Unit #1	B	N-1	1.116	1.000		Under review for possible exemption
CC-NPK-LV-036	CRYHSE60 60 kV	Paul Sweet Statcom	B	N-1	1.101	0.998		Under review for possible exemption
CC-NPK-LV-037	AGRILINK 60 kV	PSWTSTCM Unit #1	B	N-1	1.110	N/A		Under review for possible exemption
CC-NPK-LV-038	WTSNVILLE 60 kV	Camp Evers-Paul Sweet and Green Valley - Paul Sweet 115 kV Lines	C5-DCTL	L-2	1.10	N/A		Under review for possible exemption
CC-NPK-LV-039	GREN VLY 60 kV	Camp Evers-Paul Sweet and Green Valley - Paul Sweet 115 kV Lines	C5-DCTL	L-2	1.11	N/A		Under review for possible exemption
CC-NPK-LV-040	CRYHSE60 60 kV	Camp Evers-Paul Sweet and Green Valley - Paul Sweet 115 kV Lines	C5-DCTL	L-2	1.11	N/A		Under review for possible exemption
CC-NPK-LV-041	AGRILINK 60 kV	Camp Evers-Paul Sweet and Green Valley - Paul Sweet 115 kV Lines	C5-DCTL	L-2	1.10	N/A	N/A	Under review for possible exemption
CC-NPK-LV-042	WTSNVILLE 60 kV	Watsonville-Salinas 60 kV Line and PSWTSTCM Unit # 1	C3	L-1/N-1	1.13	N/A		Under review for possible exemption
CC-NPK-LV-043	GREN VLY 60 kV	Green Valley-Watsonville 60 kV Line and PSWTSTCM Unit #1	C3	L-1/N-1	1.14	N/A		Under review for possible exemption
CC-NPK-LV-044	CRYHSE60 60 kV	Watsonville-Salinas 60 kV Line and PSWTSTCM Unit #1	C3	L-1/N-1	1.14	N/A		Under review for possible exemption
CC-NPK-LV-045	AGRILINK 60 kV	Watsonville-Salinas 60 kV Line and PSWTSTCM Unit #1	C3	L-1/N-1	1.13	N/A		Under review for possible exemption

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Study Area: **PG&E Central Coast**



**Single Contingency Load Drop**

ID	Worst Contingency	Category	Category Description	Amount of Load Drop (MW)			Potential Mitigation Solutions
				2014	2017	2022	

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

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**Single Source Substation with more than 100 MW Load**

ID	Substation	Load Served (MW)			Potential Mitigation Solutions
		2014	2017	2022	

No single source substation with more than 100 MW Load

**Appendix C-18**  
**PG&E Los Padres Area**

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
LP-S-T-001	MESA_PGE-UNION OL 115 kV #1 Line	Morro Bay 230/115 Bank #6 & 7	C3	T-1-1	91.7%	98.0%	102.5%	Monitor/drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-T-002	PALMR-ZACA 115 kV #1 Line	Mesa-Divide 115 kV #1 & 2 Lines	C3	L-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV Line
LP-S-T-003	S.YNZ JT-CABRILLO 115 kV #1 Line	Mesa-Divide 115 kV #1 & 2 Lines	C3	L-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV Line
LP-S-T-004	S.YNZ JT-ZACA 115 kV #1 Line	Mesa-Divide 115 kV #1 & 2 Lines	C3	L-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV Line
LP-S-T-005	SISQUOC-PALMR 115 kV #1 Line	Mesa-Divide 115 kV #1 & 2 Lines	C3	L-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV Line
LP-S-T-006	SN LS OB-SNTA MRA 115 kV #1 Line	Mesa 230/115 Bank #2 & 3	C3	T-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV Line
LP-S-T-007	SN LS OB-SNTA MRA 115 kV #1 Line	Morro Bay-Diablo 230 kV Line and Morro Bay-Mesa 230 kV Line	C3	L-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV Line



**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
LP-S-T-008	SN LS OB-SNTA MRA 115 kV #1 Line	Morro Bay-Mesa 230 kV Line and iablo-Mesa 230 kV Line	C3	L-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV Line
LP-S-T-009	SN LS OB-SNTA MRA 115 kV #1 Line	Morro Bay-Mesa and Morro Bay-Diablo 230 kV Lines	C5-DCTL	L-2	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV Line
LP-S-T-010	SN LS OB-SNTA MRA 115 kV #1 Line	Morro Bay-Mesa and Diablo-Mesa 230 kV Lines	C5-DCTL	L-2	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV Line
LP-S-T-011	SISQUOC-PALMR 115 kV #1 Line	Mesa-Divide #1 and #2 115 kV Lines	C5-DCTL	L-2	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV Line
LP-S-T-012	S.YNZ JT-ZACA 115 kV #1 Line	Mesa-Divide #1 and #2 115 kV Lines	C5-DCTL	L-2	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV Line
LP-S-T-013	S.YNZ JT-CABRILLO 115 kV #1 Line	Mesa-Divide #1 and #2 115 kV Lines	C5-DCTL	L-2	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV Line
LP-S-T-014	PALMR-ZACA 115 kV #1 Line	Mesa-Divide #1 and #2 115 kV Lines	C5-DCTL	L-2	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV Line



**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	

Please note the winter scenario for the Los Padres area was not studied per the 2012/2013 Study Plan.

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Summer Off-Peak	N/A	
LP-NPK-T-001	SN LS OB-SNTA MRA 115 kV #1 Line	Morro Bay-Mesa and Morro Bay-Diablo 230 kV Lines	C5-DCTL	L-2	<100%	115.5%		Monitor loading level/drop load/existing SPS
LP-NPK-T-002	SN LS OB-SNTA MRA 115 kV #1 Line	Morro Bay-Mesa and Diablo-Mesa 230 kV Lines	C5-DCTL	L-2	<100%	115.3%		Monitor loading level/drop load/existing SPS
LP-NPK-T-003	SISQUOC-PALMR 115 kV #1 Line	Mesa-Divide #1 and #2 115 kV Lines	C5-DCTL	L-2	<100%	141.7%		Monitor loading level/drop load/existing SPS
LP-NPK-T-004	S.YNZ JT-ZACA 115 kV #1 Line	Mesa-Divide #1 and #2 115 kV Lines	C5-DCTL	L-2	<100%	157.4%		Monitor loading level/drop load/existing SPS
LP-NPK-T-005	S.YNZ JT-CABRILLO 115 kV #1 Line	Mesa-Divide #1 and #2 115 kV Lines	C5-DCTL	L-2	<100%	131.8%		Monitor loading level/drop load/existing SPS
LP-NPK-T-006	PALMR-ZACA 115 kV #1 Line	Mesa-Divide #1 and #2 115 kV Lines	C5-DCTL	L-2	<100%	140.9%		Monitor loading level/drop load/existing SPS
LP-NPK-T-007	SN LS OB-SNTA MRA 115 kV #1 Line	Morro Bay-Diablo 230 kV Line and Morro Bay-Mesa 230 kV Line	C3	L-1-1	<100%	115.5%		Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV Line
LP-NPK-T-008	SISQUOC-PALMR 115 kV #1 Line	Mesa-Divide 115 kV #1 & 2 Lines	C3	L-1-1	<100%	141.7%		Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV Line
LP-NPK-T-009	S.YNZ JT-ZACA 115 kV #1 Line	Mesa-Divide 115 kV #1 & 2 Lines	C3	L-1-1	<100%	157.4%		Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV Line

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Summer Off-Peak	N/A	
LP-NPK-T-010	S.YNZ JT-CABRILLO 115 kV #1 Line	Mesa-Divide 115 kV #1 & 2 Lines	C3	L-1-1	<100%	131.8%		Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV Line
LP-NPK-T-011	PALMR-ZACA 115 kV #1 Line	Mesa-Divide 115 kV #1 & 2 Lines	C3	L-1-1	<100%	140.9%		Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV Line

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
LP-S-VD-001	CHOLAME 70 kV	Arco-Cholame 70 kV Line	B	L-1	3.9%	4.6%	5.1%	Monitor voltage deviation
LP-S-VD-002	VAFB SSA 70 kV	Divide-Vandenberg 70 kV #1 Line	B	L-1	-6.0%	-5.9%	-6.0%	Instal reactive support
LP-S-VD-003	BUELLTON 115 kV	CB FAULT AT MESA SUB 115 CB102	C2	CB (Bus-tie)	Diverged	Diverged	Diverged	Sectionalize Mesa 115 kV bus/close-in idle Midway-Santa Maria 115 kV Line/drop load. Convert to 230 kV line
LP-S-VD-004	CABRILLO 115 kV	CB FAULT AT MESA SUB 115 CB102	C2	CB (Bus-tie)	Diverged	Diverged	Diverged	Sectionalize Mesa 115 kV bus/close-in idle Midway-Santa Maria 115 kV Line/drop load. Convert to 230 kV line
LP-S-VD-005	DIVIDE 70 kV	CB FAULT AT MESA SUB 115 CB102	C2	CB (Bus-tie)	Diverged	Diverged	Diverged	Sectionalize Mesa 115 kV bus/close-in idle Midway-Santa Maria 115 kV Line/drop load. Convert to 230 kV line
LP-S-VD-006	DIVVIDE 115 kV	CB FAULT AT MESA SUB 115 CB102	C2	CB (Bus-tie)	Diverged	Diverged	Diverged	Sectionalize Mesa 115 kV bus/close-in idle Midway-Santa Maria 115 kV Line/drop load. Convert to 230 kV line
LP-S-VD-007	FAIRWAY 115 kV	CB FAULT AT MESA SUB 115 CB102	C2	CB (Bus-tie)	Diverged	Diverged	Diverged	Sectionalize Mesa 115 kV bus/close-in idle Midway-Santa Maria 115 kV Line/drop load. Convert to 230 kV line
LP-S-VD-008	GAREY 115 kV	CB FAULT AT MESA SUB 115 CB102	C2	CB (Bus-tie)	Diverged	Diverged	Diverged	Sectionalize Mesa 115 kV bus/close-in idle Midway-Santa Maria 115 kV Line/drop load. Convert to 230 kV line
LP-S-VD-009	LMPC-CTY 115 kV	CB FAULT AT MESA SUB 115 CB102	C2	CB (Bus-tie)	Diverged	Diverged	Diverged	Sectionalize Mesa 115 kV bus/close-in idle Midway-Santa Maria 115 kV Line/drop load. Convert to 230 kV line
LP-S-VD-010	MANVILLE 115 kV	CB FAULT AT MESA SUB 115 CB102	C2	CB (Bus-tie)	Diverged	Diverged	Diverged	Sectionalize Mesa 115 kV bus/close-in idle Midway-Santa Maria 115 kV Line/drop load. Convert to 230 kV line
LP-S-VD-011	PALMR 115 kV	CB FAULT AT MESA SUB 115 CB102	C2	CB (Bus-tie)	Diverged	Diverged	Diverged	Sectionalize Mesa 115 kV bus/close-in idle Midway-Santa Maria 115 kV Line/drop load. Convert to 230 kV line

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
LP-S-VD-012	PURISIMA 115 kV	CB FAULT AT MESA SUB 115 CB102	C2	CB (Bus-tie)	Diverged	Diverged	Diverged	Sectionalize Mesa 115 kV bus/close-in idle Midway-Santa Maria 115 kV Line/drop load. Convert to 230 kV line
LP-S-VD-013	S.M.ASSO 115 kV	CB FAULT AT MESA SUB 115 CB102	C2	CB (Bus-tie)	Diverged	Diverged	Diverged	Sectionalize Mesa 115 kV bus/close-in idle Midway-Santa Maria 115 kV Line/drop load. Convert to 230 kV line
LP-S-VD-014	SISQUOC 115 kV	CB FAULT AT MESA SUB 115 CB102	C2	CB (Bus-tie)	Diverged	Diverged	Diverged	Sectionalize Mesa 115 kV bus/close-in idle Midway-Santa Maria 115 kV Line/drop load. Convert to 230 kV line
LP-S-VD-015	SNTA MRA 115 kV	CB FAULT AT MESA SUB 115 CB102	C2	CB (Bus-tie)	Diverged	Diverged	Diverged	Sectionalize Mesa 115 kV bus/close-in idle Midway-Santa Maria 115 kV Line/drop load. Convert to 230 kV line
LP-S-VD-016	SNTA YNZ 115 kV	CB FAULT AT MESA SUB 115 CB102	C2	CB (Bus-tie)	Diverged	Diverged	Diverged	Sectionalize Mesa 115 kV bus/close-in idle Midway-Santa Maria 115 kV Line/drop load. Convert to 230 kV line
LP-S-VD-017	SURF 115 kV	CB FAULT AT MESA SUB 115 CB102	C2	CB (Bus-tie)	Diverged	Diverged	Diverged	Sectionalize Mesa 115 kV bus/close-in idle Midway-Santa Maria 115 kV Line/drop load. Convert to 230 kV line
LP-S-VD-018	VAFB SSA 70 kV	CB FAULT AT MESA SUB 115 CB102	C2	CB (Bus-tie)	Diverged	Diverged	Diverged	Sectionalize Mesa 115 kV bus/close-in idle Midway-Santa Maria 115 kV Line/drop load. Convert to 230 kV line
LP-S-VD-019	VAFB SSB 70 kV	CB FAULT AT MESA SUB 115 CB102	C2	CB (Bus-tie)	Diverged	Diverged	Diverged	Sectionalize Mesa 115 kV bus/close-in idle Midway-Santa Maria 115 kV Line/drop load. Convert to 230 kV line
LP-S-VD-020	ZACA 115 kV	CB FAULT AT MESA SUB 115 CB102	C2	CB (Bus-tie)	Diverged	Diverged	Diverged	Sectionalize Mesa 115 kV bus/close-in idle Midway-Santa Maria 115 kV Line/drop load. Convert to 230 kV line
LP-S-VD-021	BUELLTON 115 kV	Mesa-Divide #1 and #2 115 kV Lines	C5-DCTL	L-2	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
LP-S-VD-022	CABRILLO 115 kV	Mesa-Divide #1 and #2 115 kV Lines	C5-DCTL	L-2	Diverged	Diverged	Diverged	Action plan/drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line
LP-S-VD-023	DIABLOCN 230 kV	Morro Bay-Mesa and Morro Bay-Diablo 230 kV Lines	C5-DCTL	L-2	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-VD-024	DIVIDE 70 kV	Mesa-Divide #1 and #2 115 kV Lines	C5-DCTL	L-2	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-VD-025	DIVVIDE 115 kV	Mesa-Divide #1 and #2 115 kV Lines	C5-DCTL	L-2	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-VD-026	FAIRWAY 115 kV	Morro Bay-Mesa and Diablo-Mesa 230 kV Lines	C5-DCTL	L-2	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-VD-027	GAREY 115 kV	Morro Bay-Mesa and Diablo-Mesa 230 kV Lines	C5-DCTL	L-2	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-VD-028	LMPC-CTY 115 kV	Mesa-Divide #1 and #2 115 kV Lines	C5-DCTL	L-2	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-VD-029	MANVILLE 115 kV	Mesa-Divide #1 and #2 115 kV Lines	C5-DCTL	L-2	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-VD-030	MESA PGE 230 kV	Morro Bay-Mesa and Diablo-Mesa 230 kV Lines	C5-DCTL	L-2	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-VD-031	MESA_PGE 115 kV	Morro Bay-Mesa and Diablo-Mesa 230 kV Lines	C5-DCTL	L-2	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
LP-S-VD-032	OCEANO 115 kV	Morro Bay-Mesa and Diablo-Mesa 230 kV Lines	C5-DCTL	L-2	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-VD-033	PALMR 115 kV	Morro Bay-Mesa and Diablo-Mesa 230 kV Lines	C5-DCTL	L-2	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-VD-034	PURISIMA 115 kV	Mesa-Divide #1 and #2 115 kV Lines	C5-DCTL	L-2	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-VD-035	S.M.ASSO 115 kV	Morro Bay-Mesa and Diablo-Mesa 230 kV Lines	C5-DCTL	L-2	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-VD-036	SISQUOC 115 kV	Morro Bay-Mesa and Diablo-Mesa 230 kV Lines	C5-DCTL	L-2	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-VD-037	SN LS OB 115 kV	Morro Bay-Mesa and Diablo-Mesa 230 kV Lines	C5-DCTL	L-2	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-VD-038	SNTA MRA 115 kV	Morro Bay-Mesa and Diablo-Mesa 230 kV Lines	C5-DCTL	L-2	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-VD-039	SNTA YNZ 115 kV	Mesa-Divide #1 and #2 115 kV Lines	C5-DCTL	L-2	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-VD-040	SURF 115 kV	Mesa-Divide #1 and #2 115 kV Lines	C5-DCTL	L-2	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-VD-041	UNION OL 115 kV	Morro Bay-Mesa and Diablo-Mesa 230 kV Lines	C5-DCTL	L-2	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line



**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
LP-S-VD-042	VAFB SSA 70 kV	Mesa-Divide #1 and #2 115 kV Lines	C5-DCTL	L-2	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-VD-043	VAFB SSB 70 kV	Mesa-Divide #1 and #2 115 kV Lines	C5-DCTL	L-2	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-VD-044	ZACA 115 kV	Mesa-Divide #1 and #2 115 kV Lines	C5-DCTL	L-2	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-VD-045	BUELLTON 115 kV	Mesa 230/115 Bank #2 & 3	C3	T-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-VD-046	BUELLTON 115 kV	Mesa-Divide 115 kV Line #1 & 2	C3	L-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-VD-047	BUELLTON 115 kV	Morro Bay-Mesa 230 kV Line and Diablo-Mesa 230 kV Line	C3	L-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-VD-048	CABRILLO 115 kV	Mesa 230/115 Bank #2 & 3	C3	T-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-VD-049	CABRILLO 115 kV	Mesa-Divide 115 kV Line #1 & 2	C3	L-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-VD-050	CABRILLO 115 kV	Morro Bay-Mesa 230 kV Line and Diablo-Mesa 230 kV Line	C3	L-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-VD-051	DIVIDE 70 kV	Mesa 230/115 Bank #2 & 3	C3	T-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
LP-S-VD-052	DIVIDE 70 kV	Mesa-Divide 115 kV Line #1 & 2	C3	L-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-VD-053	DIVIDE 70 kV	Morro Bay-Mesa 230 kV Line and Diablo-Mesa 230 kV Line	C3	L-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-VD-054	DIVIDE 115 kV	Mesa 230/115 Bank #2 & 3	C3	T-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-VD-055	DIVIDE 115 kV	Mesa-Divide 115 kV Line #1 & 2	C3	L-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-VD-056	DIVIDE 115 kV	Morro Bay-Mesa 230 kV Line and Diablo-Mesa 230 kV Line	C3	L-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-VD-057	FAIRWAY 115 kV	Mesa 230/115 Bank #2 & 3	C3	T-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-VD-058	FAIRWAY 115 kV	Morro Bay-Mesa 230 kV Line and Diablo-Mesa 230 kV Line	C3	L-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-VD-059	GAREY 115 kV	Mesa 230/115 Bank #2 & 3	C3	T-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-VD-060	GAREY 115 kV	Mesa-Sisquoc 115 kV Line and Santa Maria-Sisquoc 115 kV Line	C3	L-1-1	-8.7%	-9.0%	-10.5%	Monitor voltage deviation
LP-S-VD-061	GAREY 115 kV	Morro Bay-Mesa 230 kV Line and Diablo-Mesa 230 kV Line	C3	L-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
LP-S-VD-062	LMPC-CTY 115 kV	Mesa 230/115 Bank #2 & 3	C3	T-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-VD-063	LMPC-CTY 115 kV	Mesa-Divide 115 kV Line #1 & 2	C3	L-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-VD-064	LMPC-CTY 115 kV	Morro Bay-Mesa 230 kV Line and Diablo-Mesa 230 kV Line	C3	L-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-VD-065	MANVILLE 115 kV	Mesa 230/115 Bank #2 & 3	C3	T-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-VD-066	MANVILLE 115 kV	Mesa-Divide 115 kV Line #1 & 2	C3	L-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-VD-067	MANVILLE 115 kV	Morro Bay-Mesa 230 kV Line and Diablo-Mesa 230 kV Line	C3	L-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-VD-068	MESA PGE 230 kV	Morro Bay-Mesa 230 kV Line and Diablo-Mesa 230 kV Line	C3	L-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-VD-069	MESA_PGE 115 kV	Mesa 230/115 Bank #2 & 3	C3	T-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-VD-070	MESA_PGE 115 kV	Morro Bay-Mesa 230 kV Line and Diablo-Mesa 230 kV Line	C3	L-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-VD-071	OCEANO 115 kV	Morro Bay-Mesa 230 kV Line and Diablo-Mesa 230 kV Line	C3	L-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
LP-S-VD-072	PALMR 115 kV	Mesa 230/115 Bank #2 & 3	C3	T-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-VD-073	PALMR 115 kV	Morro Bay-Mesa 230 kV Line and Diablo-Mesa 230 kV Line	C3	L-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-VD-074	PURISIMA 115 kV	Mesa 230/115 Bank #2 & 3	C3	T-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-VD-075	PURISIMA 115 kV	Mesa-Divide 115 kV Line #1 & 2	C3	L-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-VD-076	PURISIMA 115 kV	Morro Bay-Mesa 230 kV Line and Diablo-Mesa 230 kV Line	C3	L-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-VD-077	RPSP1013 115 kV	Mesa 230/115 Bank #2 & 3	C3	T-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-VD-078	RPSP1013 115 kV	Mesa-Divide 115 kV Line #1 & 2	C3	L-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-VD-079	RPSP1013 115 kV	Morro Bay-Mesa 230 kV Line and Diablo-Mesa 230 kV Line	C3	L-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-VD-080	S.M.ASSO 115 kV	Mesa 230/115 Bank #2 & 3	C3	T-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-VD-081	S.M.ASSO 115 kV	Morro Bay-Mesa 230 kV Line and Diablo-Mesa 230 kV Line	C3	L-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
LP-S-VD-082	SISQUOC 115 kV	Mesa 230/115 Bank #2 & 3	C3	T-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-VD-083	SISQUOC 115 kV	Mesa-Sisquoc 115 kV Line and Santa Maria-Sisquoc 115 kV Line	C3	L-1-1	-8.7%	-9.0%	-10.5%	Monitor voltage deviation
LP-S-VD-084	SISQUOC 115 kV	Morro Bay-Mesa 230 kV Line and Diablo-Mesa 230 kV Line	C3	L-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-VD-085	SNTA MRA 115 kV	Mesa 230/115 Bank #2 & 3	C3	T-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-VD-086	SNTA MRA 115 kV	Morro Bay-Mesa 230 kV Line and Diablo-Mesa 230 kV Line	C3	L-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-VD-087	SNTA YNZ 115 kV	Mesa 230/115 Bank #2 & 3	C3	T-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-VD-088	SNTA YNZ 115 kV	Mesa-Divide 115 kV Line #1 & 2	C3	L-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-VD-089	SNTA YNZ 115 kV	Morro Bay-Mesa 230 kV Line and Diablo-Mesa 230 kV Line	C3	L-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-VD-090	SURF 115 kV	Mesa 230/115 Bank #2 & 3	C3	T-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-VD-091	SURF 115 kV	Mesa-Divide 115 kV Line #1 & 2	C3	L-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
LP-S-VD-092	SURF 115 kV	Morro Bay-Mesa 230 kV Line and Diablo-Mesa 230 kV Line	C3	L-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-VD-093	TEMPLETN 230 kV	Templeton-Gates 230 kV Line and Morro Bay-Templeton 230 kV Line	C3	L-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-VD-094	UNION OL 115 kV	Mesa 230/115 Bank #2 & 3	C3	T-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-VD-095	UNION OL 115 kV	Morro Bay-Mesa 230 kV Line and Diablo-Mesa 230 kV Line	C3	L-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-VD-096	VAFB A-N 70 kV	Mesa 230/115 Bank #2 & 3	C3	T-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-VD-097	VAFB A-N 70 kV	Mesa-Divide 115 kV Line #1 & 2	C3	L-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-VD-098	VAFB A-N 70 kV	Morro Bay-Mesa 230 kV Line and Diablo-Mesa 230 kV Line	C3	L-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-VD-099	VAFB SSA 70 kV	Mesa 230/115 Bank #2 & 3	C3	T-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-VD-100	VAFB SSA 70 kV	Mesa-Divide 115 kV Line #1 & 2	C3	L-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-VD-101	VAFB SSA 70 kV	Morro Bay-Mesa 230 kV Line and Diablo-Mesa 230 kV Line	C3	L-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
LP-S-VD-102	VAFB SSB 70 kV	Mesa 230/115 Bank #2 & 3	C3	T-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-VD-103	VAFB SSB 70 kV	Mesa-Divide 115 kV Line #1 & 2	C3	L-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-VD-104	VAFB SSB 70 kV	Morro Bay-Mesa 230 kV Line and Diablo-Mesa 230 kV Line	C3	L-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-VD-105	ZACA 115 kV	Mesa 230/115 Bank #2 & 3	C3	T-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-VD-106	ZACA 115 kV	Mesa-Divide 115 kV Line #1 & 2	C3	L-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-VD-107	ZACA 115 kV	Morro Bay-Mesa 230 kV Line and Diablo-Mesa 230 kV Line	C3	L-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Summer Off-Peak	N/A	
LP-NPK-VD-001	PSA RBL5 70 kV	Paso Robles-Templeton 70 kV Line	B	L-1	-5.78%	-2.63%		Adjust equipment voltage settings
LP-NPK-VD-002	PSA RBL5 70 kV	Templeton 230/70 kV Bank	B	T-1	-5.67%	-2.53%		Adjust equipment voltage settings
LP-NPK-VD-003	DIVIDE 70 kV	Morro Bay PP Unit 3 GSU Bank	B	T-1	-5.10%	0.15%		Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-NPK-VD-004	S.M.ASSO 115 kV	CB FAULT AT MESA SUB 115 CB102	C2	CB	-0.1044	Diverged		Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-NPK-VD-005	SISQUOC 115 kV	CB FAULT AT MESA SUB 115 CB102	C2	CB	-0.1025	Diverged		Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-NPK-VD-006	GAREY 115 kV	CB FAULT AT MESA SUB 115 CB102	C2	CB	-0.1026	Diverged		Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-NPK-VD-007	SNTA MRA 115 kV	CB FAULT AT MESA SUB 115 CB102	C2	CB	-0.0977	Diverged		Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-NPK-VD-008	DIVVIDE 115 kV	CB FAULT AT MESA SUB 115 CB102	C2	CB	-0.1306	Diverged		Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-NPK-VD-009	FAIRWAY 115 kV	CB FAULT AT MESA SUB 115 CB102	C2	CB	-0.1002	Diverged		Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-NPK-VD-010	BUELLTON 115 kV	CB FAULT AT MESA SUB 115 CB102	C2	CB	-0.1272	Diverged		Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line



**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Summer Off-Peak	N/A	
LP-NPK-VD-011	SURF 115 kV	CB FAULT AT MESA SUB 115 CB102	C2	CB	-0.1306	Diverged		Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-NPK-VD-012	PALMR 115 kV	CB FAULT AT MESA SUB 115 CB102	C2	CB	-0.107	Diverged		Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-NPK-VD-013	ZACA 115 kV	CB FAULT AT MESA SUB 115 CB102	C2	CB	-0.1216	Diverged		Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-NPK-VD-014	SNTA YNZ 115 kV	CB FAULT AT MESA SUB 115 CB102	C2	CB	-0.1272	Diverged		Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-NPK-VD-015	MANVILLE 115 kV	CB FAULT AT MESA SUB 115 CB102	C2	CB	-0.1116	Diverged		Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-NPK-VD-016	CABRILLO 115 kV	CB FAULT AT MESA SUB 115 CB102	C2	CB	-0.1296	Diverged		Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-NPK-VD-017	PURISIMA 115 kV	CB FAULT AT MESA SUB 115 CB102	C2	CB	-0.1176	Diverged		Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-NPK-VD-018	DIVIDE 70 kV	CB FAULT AT MESA SUB 115 CB102	C2	CB	-0.1377	Diverged		Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-NPK-VD-019	VAFB SSA 70 kV	CB FAULT AT MESA SUB 115 CB102	C2	CB	-0.1399	Diverged		Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-NPK-VD-020	VAFB SSB 70 kV	CB FAULT AT MESA SUB 115 CB102	C2	CB	-0.1383	Diverged		Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Summer Off-Peak	N/A	
LP-NPK-VD-021	LMPC-CTY 115 kV	CB FAULT AT MESA SUB 115 CB102	C2	CB	-0.1143	Diverged		Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-NPK-VD-022	BUELLTON 115 kV	Mesa-Divide #1 and #2 115 kV Lines	C5-DCTL	L-2	-3.40%	-19.11%		Monitor voltage deviation/drop load
LP-NPK-VD-023	CABRILLO 115 kV	Mesa-Divide #1 and #2 115 kV Lines	C5-DCTL	L-2	-4.14%	-22.95%		Monitor voltage deviation/drop load
LP-NPK-VD-024	DIVIDE 70 kV	Mesa-Divide #1 and #2 115 kV Lines	C5-DCTL	L-2	-5.19%	-28.14%		Monitor voltage deviation/action plan/drop load
LP-NPK-VD-025	DIVVIDE 115 kV	Mesa-Divide #1 and #2 115 kV Lines	C5-DCTL	L-2	-4.92%	-26.65%		Monitor voltage deviation/drop load
LP-NPK-VD-026	FAIRWAY 115 kV	Morro Bay-Mesa and Diablo-Mesa 230 kV Lines	C5-DCTL	L-2	-1.53%	-15.25%		Monitor voltage deviation/drop load
LP-NPK-VD-027	GAREY 115 kV	Morro Bay-Mesa and Diablo-Mesa 230 kV Lines	C5-DCTL	L-2	-1.48%	-15.17%		Monitor voltage deviation/drop load
LP-NPK-VD-028	LMPC-CTY 115 kV	Mesa-Divide #1 and #2 115 kV Lines	C5-DCTL	L-2	-3.96%	-27.03%		Monitor voltage deviation/drop load
LP-NPK-VD-029	MANVILLE 115 kV	Mesa-Divide #1 and #2 115 kV Lines	C5-DCTL	L-2	-3.80%	-27.13%		Monitor voltage deviation/drop load
LP-NPK-VD-030	MESA PGE 230 kV	Morro Bay-Mesa and Diablo-Mesa 230 kV Lines	C5-DCTL	L-2	-1.15%	-15.98%		Monitor voltage deviation/drop load
LP-NPK-VD-031	OCEANO 115 kV	Morro Bay-Mesa and Diablo-Mesa 230 kV Lines	C5-DCTL	L-2	-0.78%	-11.07%		Monitor voltage deviation/drop load
LP-NPK-VD-032	PALMR 115 kV	Morro Bay-Mesa and Diablo-Mesa 230 kV Lines	C5-DCTL	L-2	-1.48%	-15.30%		Monitor voltage deviation/drop load
LP-NPK-VD-033	PURISIMA 115 kV	Mesa-Divide #1 and #2 115 kV Lines	C5-DCTL	L-2	-4.16%	-26.96%		Monitor voltage deviation/drop load
LP-NPK-VD-034	S.M.ASSO 115 kV	Morro Bay-Mesa and Diablo-Mesa 230 kV Lines	C5-DCTL	L-2	-1.44%	-15.52%		Monitor voltage deviation/drop load

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Summer Off-Peak	N/A	
LP-NPK-VD-035	SISQUOC 115 kV	Morro Bay-Mesa and Diablo-Mesa 230 kV Lines	C5-DCTL	L-2	-1.48%	-15.16%		Monitor voltage deviation/drop load
LP-NPK-VD-036	SNTA MRA 115 kV	Morro Bay-Mesa and Diablo-Mesa 230 kV Lines	C5-DCTL	L-2	-1.63%	-14.67%		Monitor voltage deviation/drop load
LP-NPK-VD-037	SNTA YNZ 115 kV	Mesa-Divide #1 and #2 115 kV Lines	C5-DCTL	L-2	-3.40%	-19.11%		Monitor voltage deviation/drop load
LP-NPK-VD-038	SURF 115 kV	Mesa-Divide #1 and #2 115 kV Lines	C5-DCTL	L-2	-4.27%	-23.66%		Monitor voltage deviation/drop load
LP-NPK-VD-039	UNION OL 115 kV	Morro Bay-Mesa and Diablo-Mesa 230 kV Lines	C5-DCTL	L-2	-1.03%	-12.47%		Monitor voltage deviation/drop load
LP-NPK-VD-040	VAFB SSA 70 kV	Mesa-Divide #1 and #2 115 kV Lines	C5-DCTL	L-2	-5.27%	-28.74%		Monitor voltage deviation/action plan/drop load
LP-NPK-VD-041	VAFB SSB 70 kV	Mesa-Divide #1 and #2 115 kV Lines	C5-DCTL	L-2	-5.21%	-28.28%		Monitor voltage deviation/action plan/drop load
LP-NPK-VD-042	ZACA 115 kV	Mesa-Divide #1 and #2 115 kV Lines	C5-DCTL	L-2	-2.71%	-16.41%		Monitor voltage deviation/drop load
LP-NPK-VD-043	BUELLTON 115 kV	Mesa-Divide #1 and #2 115 kV Lines	C3	L-1-1	-3.4%	-19.1%		Monitor voltage deviation/drop load
LP-NPK-VD-044	CABRILLO 115 kV	Mesa-Divide #1 and #2 115 kV Lines	C3	L-1-1	-4.1%	-23.0%		Monitor voltage deviation/drop load
LP-NPK-VD-045	DIVIDE 70 kV	Mesa-Divide #1 and #2 115 kV Lines	C3	L-1-1	-5.2%	-28.1%		Monitor voltage deviation/drop load
LP-NPK-VD-046	DIVVIDE 115 kV	Mesa-Divide #1 and #2 115 kV Lines	C3	L-1-1	-4.9%	-26.6%		Monitor voltage deviation/drop load
LP-NPK-VD-047	FAIRWAY 115 kV	Morro Bay-Mesa and Diablo-Mesa 230 kV Lines	C3	L-1-1	-1.5%	-15.2%		Monitor voltage deviation/drop load
LP-NPK-VD-048	GAREY 115 kV	Morro Bay-Mesa and Diablo-Mesa 230 kV Lines	C3	L-1-1	-1.5%	-15.2%		Monitor voltage deviation/drop load
LP-NPK-VD-049	LMPC-CTY 115 kV	Mesa-Divide #1 and #2 115 kV Lines	C3	L-1-1	-4.0%	-27.0%		Monitor voltage deviation/drop load

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Summer Off-Peak	N/A	
LP-NPK-VD-050	MANVILLE 115 kV	Mesa-Divide #1 and #2 115 kV Lines	C3	L-1-1	-3.8%	-27.1%		Monitor voltage deviation/drop load
LP-NPK-VD-051	MESA PGE 230 kV	Morro Bay-Mesa and Diablo-Mesa 230 kV Lines	C3	L-1-1	-1.2%	-16.0%		Monitor voltage deviation/drop load
LP-NPK-VD-052	OCEANO 115 kV	Morro Bay-Mesa and Diablo-Mesa 230 kV Lines	C3	L-1-1	-0.8%	-11.1%		Monitor voltage deviation/drop load
LP-NPK-VD-053	PALMR 115 kV	Morro Bay-Mesa and Diablo-Mesa 230 kV Lines	C3	L-1-1	-1.5%	-15.3%		Monitor voltage deviation/drop load
LP-NPK-VD-054	PURISIMA 115 kV	Mesa-Divide #1 and #2 115 kV Lines	C3	L-1-1	-4.2%	-27.0%		Monitor voltage deviation/drop load
LP-NPK-VD-055	RPSP1013 115 kV	Mesa-Divide #1 and #2 115 kV Lines	C3	L-1-1	-3.1%	-27.1%		Monitor voltage deviation/drop load
LP-NPK-VD-056	S.M.ASSO 115 kV	Morro Bay-Mesa and Diablo-Mesa 230 kV Lines	C3	L-1-1	-1.4%	-15.5%		Monitor voltage deviation/drop load
LP-NPK-VD-057	SISQUOC 115 kV	Morro Bay-Mesa and Diablo-Mesa 230 kV Lines	C3	L-1-1	-1.5%	-15.2%		Monitor voltage deviation/drop load
LP-NPK-VD-058	SNTA MRA 115 kV	Morro Bay-Mesa and Diablo-Mesa 230 kV Lines	C3	L-1-1	-1.6%	-14.7%		Monitor voltage deviation/drop load
LP-NPK-VD-059	SNTA YNZ 115 kV	Mesa-Divide #1 and #2 115 kV Lines	C3	L-1-1	-3.4%	-19.1%		Monitor voltage deviation/drop load
LP-NPK-VD-060	SURF 115 kV	Mesa-Divide #1 and #2 115 kV Lines	C3	L-1-1	-4.3%	-23.7%		Monitor voltage deviation/drop load
LP-NPK-VD-061	TEMPLETN 230 kV	Templeton-Gates 230 kV Line and Morro Bay-Templeton 230 kV Line	C3	L-1-1	-4.8%	-17.6%		Existing Paso Robles SPS may operate
LP-NPK-VD-062	UNION OL 115 kV	Morro Bay-Mesa and Diablo-Mesa 230 kV Lines	C3	L-1-1	-1.0%	-12.5%		Monitor voltage deviation/drop load
LP-NPK-VD-063	VAFB SSA 70 kV	Mesa-Divide #1 and #2 115 kV Lines	C3	L-1-1	-5.3%	-28.7%		Monitor voltage deviation/drop load
LP-NPK-VD-064	VAFB SSB 70 kV	Mesa-Divide #1 and #2 115 kV Lines	C3	L-1-1	-5.2%	-28.3%		Monitor voltage deviation/drop load

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Summer Off-Peak	N/A	
LP-NPK-VD-065	ZACA 115 kV	Mesa-Divide #1 and #2 115 kV Lines	C3	L-1-1	-2.7%	-16.4%		Monitor voltage deviation/drop load

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
LP-S-LV-001	BUELLTON 115 kV	Mesa-Divide #1 and #2 115 kV Lines	C5-DCTL	L-2	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-LV-002	DIVIDE 70 kV	Mesa-Divide #1 and #2 115 kV Lines	C5-DCTL	L-2	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-LV-003	DIVVIDE 115 kV	Mesa-Divide #1 and #2 115 kV Lines	C5-DCTL	L-2	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-LV-004	FAIRWAY 115 kV	Morro Bay-Mesa and Diablo-Mesa 230 kV Lines	C5-DCTL	L-2	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-LV-005	GAREY 115 kV	Morro Bay-Mesa and Diablo-Mesa 230 kV Lines	C5-DCTL	L-2	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-LV-006	LMPC-CTY 115 kV	Mesa-Divide #1 and #2 115 kV Lines	C5-DCTL	L-2	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-LV-007	MANVILLE 115 kV	Mesa-Divide #1 and #2 115 kV Lines	C5-DCTL	L-2	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-LV-008	MESA PGE 230 kV	Morro Bay-Mesa and Diablo-Mesa 230 kV Lines	C5-DCTL	L-2	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-LV-009	OCEANO 115 kV	Morro Bay-Mesa and Diablo-Mesa 230 kV Lines	C5-DCTL	L-2	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-LV-010	PALMR 115 kV	Morro Bay-Mesa and Diablo-Mesa 230 kV Lines	C5-DCTL	L-2	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
LP-S-LV-011	PURISIMA 115 kV	Mesa-Divide #1 and #2 115 kV Lines	C5-DCTL	L-2	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-LV-012	S.M.ASSO 115 kV	Morro Bay-Mesa and Diablo-Mesa 230 kV Lines	C5-DCTL	L-2	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-LV-013	SISQUOC 115 kV	Morro Bay-Mesa and Diablo-Mesa 230 kV Lines	C5-DCTL	L-2	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-LV-014	SNTA MRA 115 kV	Morro Bay-Mesa and Diablo-Mesa 230 kV Lines	C5-DCTL	L-2	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-LV-015	SNTA YNZ 115 kV	Mesa-Divide #1 and #2 115 kV Lines	C5-DCTL	L-2	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-LV-016	SURF 115 kV	Mesa-Divide #1 and #2 115 kV Lines	C5-DCTL	L-2	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-LV-017	UNION OL 115 kV	Morro Bay-Mesa and Diablo-Mesa 230 kV Lines	C5-DCTL	L-2	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-LV-018	VAFB SSA 70 kV	Mesa-Divide #1 and #2 115 kV Lines	C5-DCTL	L-2	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-LV-019	VAFB SSB 70 kV	Mesa-Divide #1 and #2 115 kV Lines	C5-DCTL	L-2	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-LV-020	ZACA 115 kV	Mesa-Divide #1 and #2 115 kV Lines	C5-DCTL	L-2	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-LV-021	BUELLTON 115 kV	Mesa 230/115 Bank #2 & 3	C3	T-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
LP-S-LV-022	BUELLTON 115 kV	Mesa-Divide 115 kV #1 & 2 Lines	C3	L-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-LV-023	BUELLTON 115 kV	Morro Bay-Diablo 230 kV Line and Morro Bay-Mesa 230 kV Line	C3	L-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-LV-024	BUELLTON 115 kV	Morro Bay-Mesa 230 kV Line and Diablo-Mesa 230 kV Line	C3	L-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-LV-025	CABRILLO 115 kV	Mesa 230/115 Bank #2 & 3	C3	T-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-LV-026	CABRILLO 115 kV	Mesa-Divide 115 kV #1 & 2 Lines	C3	L-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-LV-027	CABRILLO 115 kV	Morro Bay-Diablo 230 kV Line and Morro Bay-Mesa 230 kV Line	C3	L-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-LV-028	CABRILLO 115 kV	Morro Bay-Mesa 230 kV Line and Diablo-Mesa 230 kV Line	C3	L-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-LV-029	DIVIDE 70 kV	Mesa 230/115 Bank #2 & 3	C3	T-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-LV-030	DIVIDE 70 kV	Mesa-Divide 115 kV #1 & 2 Lines	C3	L-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-LV-031	DIVIDE 70 kV	Morro Bay-Mesa 230 kV Line and Diablo-Mesa 230 kV Line	C3	L-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line



**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
LP-S-LV-032	DIVVIDE 115 kV	Mesa 230/115 Bank #2 & 3	C3	T-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-LV-033	DIVVIDE 115 kV	Mesa-Divide 115 kV #1 & 2 Lines	C3	L-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-LV-034	DIVVIDE 115 kV	Morro Bay-Diablo 230 kV Line and Morro Bay-Mesa 230 kV Line	C3	L-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-LV-035	DIVVIDE 115 kV	Morro Bay-Mesa 230 kV Line and Diablo-Mesa 230 kV Line	C3	L-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-LV-036	FAIRWAY 115 kV	Mesa 230/115 Bank #2 & 3	C3	T-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-LV-037	FAIRWAY 115 kV	Morro Bay-Mesa 230 kV Line and Diablo-Mesa 230 kV Line	C3	L-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-LV-038	GAREY 115 kV	Mesa 230/115 Bank #2 & 3	C3	T-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-LV-039	GAREY 115 kV	Mesa-Sisquoc 115 kV Line and Santa Maria-Sisquoc 115 kV Line	C3	L-1-1	0.918	0.914	0.893	Monitor voltage/drop load
LP-S-LV-040	GAREY 115 kV	Morro Bay-Mesa 230 kV Line and Diablo-Mesa 230 kV Line	C3	L-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-LV-041	LMPC-CTY 115 kV	Mesa 230/115 Bank #2 & 3	C3	T-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
LP-S-LV-042	LMPC-CTY 115 kV	Mesa-Divide 115 kV #1 & 2 Lines	C3	L-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-LV-043	LMPC-CTY 115 kV	Morro Bay-Diablo 230 kV Line and Morro Bay-Mesa 230 kV Line	C3	L-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-LV-044	LMPC-CTY 115 kV	Morro Bay-Mesa 230 kV Line and Diablo-Mesa 230 kV Line	C3	L-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-LV-045	MANVILLE 115 kV	Mesa 230/115 Bank #2 & 3	C3	T-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-LV-046	MANVILLE 115 kV	Mesa-Divide 115 kV #1 & 2 Lines	C3	L-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-LV-047	MANVILLE 115 kV	Morro Bay-Diablo 230 kV Line and Morro Bay-Mesa 230 kV Line	C3	L-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-LV-048	MANVILLE 115 kV	Morro Bay-Mesa 230 kV Line and Diablo-Mesa 230 kV Line	C3	L-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-LV-049	MESA PGE 230 kV	Morro Bay-Mesa 230 kV Line and Diablo-Mesa 230 kV Line	C3	L-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-LV-050	MESA_PGE 115 kV	Mesa 230/115 Bank #2 & 3	C3	T-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-LV-051	MESA_PGE 115 kV	Morro Bay-Mesa 230 kV Line and Diablo-Mesa 230 kV Line	C3	L-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
LP-S-LV-052	OCEANO 115 kV	Mesa 230/115 Bank #2 & 3	C3	T-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-LV-053	OCEANO 115 kV	Morro Bay-Mesa 230 kV Line and Diablo-Mesa 230 kV Line	C3	L-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-LV-054	PALMR 115 kV	Mesa 230/115 Bank #2 & 3	C3	T-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-LV-055	PALMR 115 kV	Mesa-Sisquoc 115 kV Line and Santa Maria-Sisquoc 115 kV Line	C3	L-1-1	0.922	0.917	0.896	Monitor voltage/drop load
LP-S-LV-056	PALMR 115 kV	Morro Bay-Mesa 230 kV Line and Diablo-Mesa 230 kV Line	C3	L-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-LV-057	PURISIMA 115 kV	Mesa 230/115 Bank #2 & 3	C3	T-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-LV-058	PURISIMA 115 kV	Mesa-Divide 115 kV #1 & 2 Lines	C3	L-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-LV-059	PURISIMA 115 kV	Morro Bay-Diablo 230 kV Line and Morro Bay-Mesa 230 kV Line	C3	L-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-LV-060	PURISIMA 115 kV	Morro Bay-Mesa 230 kV Line and Diablo-Mesa 230 kV Line	C3	L-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-LV-061	RPSP1013 115 kV	Mesa 230/115 Bank #2 & 3	C3	T-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
LP-S-LV-062	RPSP1013 115 kV	Mesa-Divide 115 kV #1 & 2 Lines	C3	L-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-LV-063	RPSP1013 115 kV	Morro Bay-Diablo 230 kV Line and Morro Bay-Mesa 230 kV Line	C3	L-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-LV-064	RPSP1013 115 kV	Morro Bay-Mesa 230 kV Line and Diablo-Mesa 230 kV Line	C3	L-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-LV-065	S.M.ASSO 115 kV	Mesa 230/115 Bank #2 & 3	C3	T-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-LV-066	S.M.ASSO 115 kV	Morro Bay-Mesa 230 kV Line and Diablo-Mesa 230 kV Line	C3	L-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-LV-067	SISQUOC 115 kV	Mesa 230/115 Bank #2 & 3	C3	T-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-LV-068	SISQUOC 115 kV	Mesa-Sisquoc 115 kV Line and Santa Maria-Sisquoc 115 kV Line	C3	L-1-1	0.919	0.914	0.893	Monitor voltage/drop load
LP-S-LV-069	SISQUOC 115 kV	Morro Bay-Mesa 230 kV Line and Diablo-Mesa 230 kV Line	C3	L-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-LV-070	SNTA MRA 115 kV	Mesa 230/115 Bank #2 & 3	C3	T-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-LV-071	SNTA MRA 115 kV	Morro Bay-Mesa 230 kV Line and Diablo-Mesa 230 kV Line	C3	L-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
LP-S-LV-072	SNTA YNZ 115 kV	Mesa 230/115 Bank #2 & 3	C3	T-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-LV-073	SNTA YNZ 115 kV	Mesa-Divide 115 kV #1 & 2 Lines	C3	L-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-LV-074	SNTA YNZ 115 kV	Morro Bay-Diablo 230 kV Line and Morro Bay-Mesa 230 kV Line	C3	L-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-LV-075	SNTA YNZ 115 kV	Morro Bay-Mesa 230 kV Line and Diablo-Mesa 230 kV Line	C3	L-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-LV-076	SURF 115 kV	Mesa 230/115 Bank #2 & 3	C3	T-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-LV-077	SURF 115 kV	Mesa-Divide 115 kV #1 & 2 Lines	C3	L-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-LV-078	SURF 115 kV	Morro Bay-Diablo 230 kV Line and Morro Bay-Mesa 230 kV Line	C3	L-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-LV-079	SURF 115 kV	Morro Bay-Mesa 230 kV Line and Diablo-Mesa 230 kV Line	C3	L-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-LV-080	TEMPLETN 230 kV	Templeton-Gates 230 kV Line and Morro Bay-Templeton 230 kV Line	C3	L-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-LV-081	UNION OL 115 kV	Mesa 230/115 Bank #2 & 3	C3	T-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
LP-S-LV-082	UNION OL 115 kV	Morro Bay-Mesa 230 kV Line and Diablo-Mesa 230 kV Line	C3	L-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-LV-083	VAFB A-N 70 kV	Mesa 230/115 Bank #2 & 3	C3	T-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-LV-084	VAFB A-N 70 kV	Mesa-Divide 115 kV #1 & 2 Lines	C3	L-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-LV-085	VAFB A-N 70 kV	Morro Bay-Mesa 230 kV Line and Diablo-Mesa 230 kV Line	C3	L-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-LV-086	VAFB SSA 70 kV	Mesa 230/115 Bank #2 & 3	C3	T-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-LV-087	VAFB SSA 70 kV	Mesa-Divide 115 kV #1 & 2 Lines	C3	L-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-LV-088	VAFB SSA 70 kV	Morro Bay-Mesa 230 kV Line and Diablo-Mesa 230 kV Line	C3	L-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-LV-089	VAFB SSB 70 kV	Mesa 230/115 Bank #2 & 3	C3	T-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-LV-090	VAFB SSB 70 kV	Mesa-Divide 115 kV #1 & 2 Lines	C3	L-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-LV-091	VAFB SSB 70 kV	Morro Bay-Mesa 230 kV Line and Diablo-Mesa 230 kV Line	C3	L-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
LP-S-LV-092	ZACA 115 kV	Mesa 230/115 Bank #2 & 3	C3	T-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-LV-093	ZACA 115 kV	Mesa-Divide 115 kV #1 & 2 Lines	C3	L-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-LV-094	ZACA 115 kV	Morro Bay-Diablo 230 kV Line and Morro Bay-Mesa 230 kV Line	C3	L-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line
LP-S-LV-095	ZACA 115 kV	Morro Bay-Mesa 230 kV Line and Diablo-Mesa 230 kV Line	C3	L-1-1	Diverged	Diverged	Diverged	Drop load/provide another source by closing idle Midway-Santa Maria 115 kV Line. Convert to 230 kV line

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Summer Off-Peak	N/A	
LP-NPK_LV-001	ATASCDRO 70 kV	-	A	Normal	1.053	1.02		Under consideration for possible review
LP-NPK_LV-002	CAYUCOS 70 kV	-	A	Normal	1.054	1.03		Under consideration for possible review
LP-NPK_LV-003	PERRY 70 kV	-	A	Normal	1.053	1.03		Under consideration for possible review
LP-NPK_LV-004	CAMBRIA 70 kV	-	A	Normal	1.052	1.03		Under consideration for possible review
LP-NPK_LV-005	BAYWOOD 70 kV	-	A	Normal	1.056	1.03		Under consideration for possible review
LP-NPK_LV-006	MUSTANG 70 kV	-	A	Normal	1.058	1.02		Under consideration for possible review
LP-NPK_LV-007	SN LS OB 70 kV	-	A	Normal	1.064	1.03		Under consideration for possible review
LP-NPK_LV-008	DIVIDE 70 kV	-	A	Normal	1.090	1.03		Under consideration for possible review
LP-NPK_LV-009	VAFB SSA 70 kV	-	A	Normal	1.078	1.02		Under consideration for possible review
LP-NPK_LV-010	VAFB SSB 70 kV	-	A	Normal	1.089	1.03		Under consideration for possible review
LP-NPK_LV-011	VAFB SSB 70 kV	Divide 115/70 Bank #2	B	T-1	1.101	1.04		Under consideration for possible review
LP-NPK_LV-012	DIVIDE 70 kV	Divide 115/70 Bank #2	B	T-1	1.102	1.04		Under consideration for possible review



2012/2013 ISO Reliability Assessment - Final Study Results

Study Area: **PG&E Los Padres**



**Single Contingency Load Drop**

ID	Worst Contingency	Category	Category Description	Amount of Load Drop (MW)			Potential Mitigation Solutions
				2014	2017	2022	

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

2012/2013 ISO Reliability Assessment - Final Study Results

Study Area: **PG&E Los Padres**

**Single Source Substation with more than 100 MW Load**



ID	Substation	Load Served (MW)			Potential Mitigation Solutions
		2014	2017	Select..	

No single source substation with more than 100 MW Load

**Appendix C-19**  
**SCE Big Creek Corridor without Renewables**

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	

No thermal overloads were identified

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	

No voltage deviations were identified

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	

No high/low voltage were identified



**Transient Stability**

ID	Contingency	Category	Category Description	Transient Stability Performance			Potential Mitigation Solutions
				2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	

No transient stability issues identified.



**Post-Transient Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	

No post-transient thermal overloads identified.





**Post-Transient Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	

No post-transient voltage deviations identified.

2012/2013 ISO Reliability Assessment - Final Study Results

Study Area: **SCE Big Creek Corridor - without Renewables**



**Single Contingency Load Drop**

ID	Worst Contingency	Category	Category Description	Amount of Load Drop (MW)			Potential Mitigation Solutions
				2014	2017	2022	

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

2012/2013 ISO Reliability Assessment - Final Study Results

Study Area: **SCE Big Creek Corridor - without Renewables**

**Single Source Substation with more than 100 MW Load**



ID	Substation	Load Served (MW)			Potential Mitigation Solutions
		2014	2017	2022	

No single source substation with more than 100 MW Load

**Appendix C-20**  
**SCE Big Creek Corridor with Renewables**



**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	

No thermal overloads were identified

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Spring Off-Peak	N/A	

No thermal overloads were identified

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	

No voltage deviations were identified

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Spring Off-Peak	N/A	

No voltage deviations were identified



**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	

No high/low voltage were identified

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Spring Off-Peak	N/A	

No high/low voltage were identified

**Transient Stability**

ID	Contingency	Category	Category Description	Transient Stability Performance			Potential Mitigation Solutions
				2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	

No transient stability issues identified.

**Transient Stability**

ID	Contingency	Category	Category Description	Transient Stability Performance			Potential Mitigation Solutions
				2014 Summer Light Load	2017 Spring Off-Peak	N/A	

No transient stability issues identified.

**Post-Transient Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	

No post-transient thermal overloads identified.

**Post-Transient Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Spring Off-Peak	N/A	

No post-transient thermal overloads identified.



**Post-Transient Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	

No post-transient voltage deviations identified.

**Post-Transient Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Spring Off-Peak	N/A	

No post-transient voltage deviations identified.



2012/2013 ISO Reliability Assessment - Final Study Results

Study Area: **SCE Big Creek Corridor - with Renewables**



**Single Contingency Load Drop**

ID	Worst Contingency	Category	Category Description	Amount of Load Drop (MW)			Potential Mitigation Solutions
				2014	2017	2022	

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

2012/2013 ISO Reliability Assessment - Final Study Results

Study Area: **SCE Big Creek Corridor - with Renewables**

**Single Source Substation with more than 100 MW Load**



ID	Substation	Load Served (MW)			Potential Mitigation Solutions
		2014	2017	2022	

No single source substation with more than 100 MW Load

**Appendix C-21**  
**SCE Antelope-Bailey without Renewables**

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
AB-T-1	LANCASTER - TAP 69 66kV ck.1	Line ANTELOPE/LANCASTER/OASIS 66.0/TAP 68 66.0 Circuit 1,Line DEL SUR/LANCASTER/RITEAID/TAP 50 66.0 Circuit 1	C	L-1/L-1	106%	109%	110%	Operating procedure to manually shed load at Lancaster 66kV after the first contingency.



**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
AB-DV-1	SHUTTLE 66kV	Line ANTELOPE/LANCSTR/LANPRI/SHUTTLE/TAP 70/69 66.0 Circuit 1,Line ANTELOPE/QUARTZHILL/SHUTTLE/TAP 93 66.0 Circuit 1	C	L-1/L-1	10.41%	14.13%	13.43%	Operating procedure to manually switch in shunt caps in Antelope-Bailey area after the first contingency.

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
AB-V-1	SHUTTLE 66kV	Line ANTELOPE/LANCSTR/LANPRI/SHUTTLE/TAP 70/69 66.0 Circuit 1,Line ANTELOPE/QUARTZHILL/SHUTTLE/TAP 93 66.0 Circuit 1	C	L-1/L-1	>.90	0.87	0.89	Operating procedure to manually switch in shunt caps in Antelope-Bailey area after the first contingency.



**Transient Stability**

ID	Contingency	Category	Category Description	Transient Stability Performance			Potential Mitigation Solutions
				2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	

No transient stability issues identified.



**Post-Transient Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	

No post- transient thermal overloads identified.





**Post-Transient Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	

No post-transient voltage deviations identified.

2012/2013 ISO Reliability Assessment - Final Study Results

Study Area: **SCE Antelope-Bailey - without Renewables**



**Single Contingency Load Drop**

ID	Worst Contingency	Category	Category Description	Amount of Load Drop (MW)			Potential Mitigation Solutions
				2014	2017	2022	

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

2012/2013 ISO Reliability Assessment - Final Study Results

Study Area: **SCE Antelope-Bailey - without Renewables**

**Single Source Substation with more than 100 MW Load**



ID	Substation	Load Served (MW)			Potential Mitigation Solutions
		2014	2017	2022	

No single source substation with more than 100 MW Load

**Appendix C-22**  
**SCE Antelope-Bailey with Renewables**

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
AB-RPS-T-1	LANCASTER - TAP 69 66kV ck.1	Line ANTELOPE/LANCASTER/OASIS 66.0/TAP 68 66.0 Circuit 1,Line DEL SUR/LANCASTER/RITEAID/TAP 50 66.0 Circuit 1	C	L-1/L-1	105%	109%	111%	Operating procedure to manually shed load at Lancaster 66kV after the first contingency.

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Spring Off-Peak	N/A	

No thermal overloads identified.

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
AB-RPS-DV-1	SHUTTLE 66kV	Line ANTELOPE/LANCSTR/LANPRI/SHUTTLE/TAP 70/69 66.0 Circuit 1,Line ANTELOPE/QUARTZHILL/SHUTTLE/TAP 93 66.0 Circuit 1	C	L-1/L-1	<10%	14.14%	14.07%	Operating procedure to manually switch in shunt caps in Antelope-Bailey area after the first contingency.

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Spring Off-Peak	N/A	

No voltage deviations were identified.



**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
AB-RPS-V-1	SHUTTLE 66kV	Line ANTELOPE/LANCSTR/LANPRI/SHUTTLE/TAP 70/69 66.0 Circuit 1,Line ANTELOPE/QUARTZHILL/SHUTTLE/TAP 93 66.0 Circuit 1	C	L-1/L-1	>.90	0.87	0.88	Operating procedure to manually switch in shunt caps in Antelope-Bailey area after the first contingency.



**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Spring Off-Peak	N/A	

No high/low voltage were identified.



**Transient Stability**

ID	Contingency	Category	Category Description	Transient Stability Performance			Potential Mitigation Solutions
				2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	

No transient stability issues identified.



**Transient Stability**

ID	Contingency	Category	Category Description	Transient Stability Performance			Potential Mitigation Solutions
				2014 Summer Light Load	2017 Spring Off-Peak	N/A	

No transient stability issues identified.



**Post-Transient Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	

No post-transient thermal overloads identified.

**Post-Transient Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Spring Off-Peak	N/A	

No post-transient thermal overloads identified.



**Post-Transient Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	

No post-transient voltage deviations identified.

**Post-Transient Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Spring Off-Peak	N/A	

No post-transient voltage deviations identified.



2012/2013 ISO Reliability Assessment - Study Results

Study Area: **SCE Antelope-Bailey - with Renewables**



**Single Contingency Load Drop**

ID	Worst Contingency	Category	Category Description	Amount of Load Drop (MW)			Potential Mitigation Solutions
				2014	2017	2022	

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

2012/2013 ISO Reliability Assessment - Study Results

Study Area: **SCE Antelope-Bailey - with Renewables**

**Single Source Substation with more than 100 MW Load**



ID	Substation	Load Served (MW)			Potential Mitigation Solutions
		2014	2017	2022	

No single source substation with more than 100 MW Load

**Appendix C-23**  
**SCE North of Lugo without Renewables**

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	

No thermal overloads identified.

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
NOL-DV-1	TORTILLA 115kV	line COLWATER-SEG2-TORTILLA 115 ck 1	B	L-1	<5%	<5%	5.33%	Install shunt cap at Tortilla 115kV substation.

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
NOL-V-1	N/A	Tran CONTROL 115.00 to CONTROL 55.00 ck 1, Tran CONTROL 115.00 to CONTROL 55.00 ck 3	C	T-1/T-1	N/A	DIVERGE	DIVERGE	SPS to shed load at Control 55kV substation.



**Transient Stability**

ID	Contingency	Category	Category Description	Transient Stability Performance			Potential Mitigation Solutions
				2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	

No transient stability issues identified.



**Post-Transient Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	

No post-transient thermal overloads identified.





**Post-Transient Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	

No post-transient voltage deviations identified.

2012/2013 ISO Reliability Assessment - Final Study Results

Study Area: **SCE North of Lugo - without Renewables**



**Single Contingency Load Drop**

ID	Worst Contingency	Category	Category Description	Amount of Load Drop (MW)			Potential Mitigation Solutions
				2014	2017	2022	

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

2012/2013 ISO Reliability Assessment - Final Study Results

Study Area: **SCE North of Lugo - without Renewables**

**Single Source Substation with more than 100 MW Load**



ID	Substation	Load Served (MW)			Potential Mitigation Solutions
		2014	2017	2022	

No single source substation with more than 100 MW Load

**Appendix C-24**  
**SCE North of Lugo with Renewables**

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	

No thermal overloads identified.

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Spring Off-Peak	N/A	

No thermal overloads identified.

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	

No voltage deviations identified.

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Spring Off-Peak	N/A	

No voltage deviations identified.



**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
NOL-RPS-V-1	N/A	Tran CONTROL 115.00 to CONTROL 55.00 ck 1, Tran CONTROL 115.00 to CONTROL 55.00 ck 3	C	T-1/T-1	N/A	DIVERGE	DIVERGE	SPS to shed load at Control 55kV substation.

High/Low Voltage

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Spring Off-Peak	N/A	
NOL-RPS-V-2	CONTROL 55kV	Line CSA DIAB 115.0 to CONTROL 115.0 ck 1, Line CSA DIAB-SHERWIN-CONTROL 115.0 ck 1	C	L-1/L-1	1.10	<1.10		Install shunt reactor in Control area.
NOL-RPS-V-3	CONTROL 115kV	Line CSA DIAB 115.0 to CONTROL 115.0 ck 1, Line CSA DIAB-SHERWIN-CONTROL 115.0 ck 1	C	L-1/L-1	1.11	<1.10		Install shunt reactor in Control area.
NOL-RPS-V-4	INYO 115kV	Line CSA DIAB 115.0 to CONTROL 115.0 ck 1, Line CSA DIAB-SHERWIN-CONTROL 115.0 ck 1	C	L-1/L-1	1.11	<1.10		Install shunt reactor in Control area.
NOL-RPS-V-5	INYO PS 115kV	Line CSA DIAB 115.0 to CONTROL 115.0 ck 1, Line CSA DIAB-SHERWIN-CONTROL 115.0 ck 1	C	L-1/L-1	1.10	<1.10		Install shunt reactor in Control area.



**Transient Stability**

ID	Contingency	Category	Category Description	Transient Stability Performance			Potential Mitigation Solutions
				2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	

No transient stability issues identified.



**Transient Stability**

ID	Contingency	Category	Category Description	Transient Stability Performance			Potential Mitigation Solutions
				2014 Summer Light Load	2017 Spring Off-Peak	N/A	

No transient stability issues identified.

**Post-Transient Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	

No post-transient thermal overloads identified.

**Post-Transient Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Spring Off-Peak	N/A	

No post-transient thermal overloads identified.

**Post-Transient Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	

No post-transient voltage deviation issues identified.

**Post-Transient Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Spring Off-Peak	N/A	

No post-transient voltage deviation issues identified.



2012/2013 ISO Reliability Assessment - Final Study Results

Study Area: **SCE North of Lugo - with Renewables**



**Single Contingency Load Drop**

ID	Worst Contingency	Category	Category Description	Amount of Load Drop (MW)			Potential Mitigation Solutions
				2014	2017	2022	

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

2012/2013 ISO Reliability Assessment - Final Study Results

Study Area: **SCE North of Lugo - with Renewables**

**Single Source Substation with more than 100 MW Load**



ID	Substation	Load Served (MW)			Potential Mitigation Solutions
		2014	2017	2022	

No single source substation with more than 100 MW Load

**Appendix C-25**  
**SCE East of Lugo without Renewables**

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Off-Peak	2022 Summer Peak	
EOP-T-8	PAHRUMP_1 230 kV---PAHRUMP 138 kV Bank #2	Tran ELDORDO 500.0 to ELDORDO2 230.0 Ckt 1_Tran PAHRUMP_1 230.00 to PAHRUMP 138.00 bank #1 0.00	C	T-1/T-1	93%	103%	117%	Eliminated by the Innovation-Mercury Switch 138 kV Line and Innovation 230/138 kV Sub project
EOP-T-9	PAHRUMP_1 230 kV---PAHRUMP 138 kV Bank #1	Tran ELDORDO 500.0 to ELDORDO2 230.0 Ckt 1_Tran PAHRUMP_1 230.00 to PAHRUMP 138.00 bank #2 0.00	C	T-1/T-1	93%	105%	117%	

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
VEA-VD-297	BOB TAP 230 kV Bus	Tran ELDORDO 500.0 to ELDORDO2 230.0 Ckt 1_Line MEAD S 230.0 to BOB TAP 230.0 Ckt 1	C	L-1/L-1	-2.66%	-11.31%	-11.55%	Notice VEA. Modify Crazy Eye SPS identified in Cluster Alpha and Ivanpah-Eldorado SPS identified in GIP, or apply congestion management to curtail generation after first contingency
VEA-VD-298	ELDORDO2 230 kV Bus		C	L-1/L-1	0.00%	-11.14%	-11.47%	
VEA-VD-299	PAHRUMP_1 230 kV Bus		C	L-1/L-1	-1.65%	-10.44%	-10.19%	

2012/2013 ISO Reliability Assessment - Study Results

Study Area: **SCE East of Lugo - Summer Peak without Renewables**



**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
VEA-V-267	CRAZY EYE TP230 kV Bus	Tran ELDORDO 500.0 to ELDORDO2 230.0 Ckt 1_Line MEAD S 230.0 to BOB TAP 230.0 Ckt 1	C	T-1/L-1	0.98	0.89	0.89	Non-load buses but eliminated by modifying Crazy Eye SPS identified in Cluster Alpha and Ivanpah-Eldorado SPS identified in GIP, or apply congestion management to curtail generation after first contingency
VEA-V-268	PAHRUMP_1 230 kV Bus		C	T-1/L-1	0.98	0.90	0.90	

2012/2013 ISO Reliability Assessment - Study Results

Study Area: **SCE East of Lugo - Summer Peak without Renewables**



**Single Contingency Load Drop**

ID	Worst Contingency	Category	Category Description	Amount of Load Drop (MW)			Potential Mitigation Solutions
				2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	

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

2012/2013 ISO Reliability Assessment - Study Results

Study Area: **SCE East of Lugo - Summer Peak without Renewables**



**Single Source Substation with more than 100 MW Load**

ID	Substation	Load Served (MW)			Potential Mitigation Solutions
		2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	

No single source substation with more than 100 MW Load



**Appendix C-26**  
**SCE East of Lugo with Renewables**

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Off-Peak	2022 Summer Peak	
EOP-T-1	PISGAH 230 kV---LUGO 230 kV	Line JASPER 230.0 to LUGO 230.0 Circuit 1	B	L-1	74%	64%	105%	Modify SPS previously identified in GIP to trip generation
EOP-T-2	ELDORDO 500 kV---LUGO 500 kV Ckt #1	Line LUGO 500.0 to VICTORVL 500.0 Ckt 1_Line PALOVRDE 500.0 to COLRIVER 500.0 Ckt 1	C	L-1/L-1	98%	91%	101%	Extend Operating Procedure No. 6610 (SOB T-135)
EOP-T-3	VEA Area - EOP 230 kV System	Tran ELDORDO 500.0 to ELDORDO2 230.0 Ckt 1_Line MEAD S 230.0 to BOB TAP 230.0 Ckt 1	C	T-1/L-1	NA	<100%	Not Solved	Notice VEA. Modify VEA's Crazy Eye SPS identified in Cluster Alpha and Ivanpah-Eldorado SPS identified in GIP to trip generation, or curtail generation after first contingency
EOP-T-4	MEAD S 230 kV---BOB TAP 230 kV Ckt #1	Tran ELDORDO 500.0 to ELDORDO2 230.0 Ckt 1_Line PAHRUMP_1 230.0 to CRAZY EYE TP 230.0 Ckt 1	C	T-1/L-1	6%	98%	153%	modify Ivanpah-Eldorado SPS identified in GIP by ignoring the Category B outage of the SCE new Eldorado AA bank, and apply congestion management to curtail generation after 1st contingency
EOP-T-5	PAHRUMP_1 230 kV---PAHRUMP 138 kV Ckt #2	Tran ELDORDO 500.0 to ELDORDO2 230.0 Ckt 1_Tran PAHRUMP_1 230.00 to PAHRUMP 138.00 Ckt 1 0.00	C	T-1/T-1	93%	104%	95%	Eliminated by the Innovation-Mercury Switch 138 kV Line and Innovation 230/138 kV Sub project
EOP-T-6	PAHRUMP_1 230 kV---PAHRUMP 138 kV Ckt #1	Tran ELDORDO 500.0 to ELDORDO2 230.0 Ckt 1_Tran PAHRUMP_1 230.00 to PAHRUMP 138.00 Ckt 2 0.00	C	T-1/T-1	94%	105%	95%	Eliminated by the Innovation-Mercury Switch 138 kV Line and Innovation 230/138 kV Sub project

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Spring Off-Peak	N/A	
EOP-T-7	MEAD S 230 kV---BOB TAP 230 kV Ckt #1	Tran ELDORDO 500.0 to ELDORDO2 230.0 Ckt 1_Line PAHRUMP_1 230.0 to CRAZY EYE TP 230.0 Ckt 1	C	T-1/L-1	6%	101%		modify Ivanpah-Eldorado SPS identified in GIP by ignoring the Category B outage of the SCE new Eldorado AA bank, and apply congestion management to curtail generation after 1st contingency

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
EOP-VD-1	BOB TAP 230 kV Bus	Tran ELDORDO 500.0 to ELDORDO2 230.0 Ckt 1_Line MEAD S 230.0 to BOB TAP 230.0 Ckt 1	C	L-1/L-1	NA	-11.22%	Not Solved	Notice VEA. Modify Crazy Eye SPS identified in Cluster Alpha and Ivanpah-Eldorado SPS identified in GIP, or apply congestion management to curtail generation after first contingency
EOP-VD-2	ELDORDO2 230 kV Bus		C	L-1/L-1	NA	-11.07%	Not Solved	
EOP-VD-3	PAHRUMP_1 230 kV Bus		C	L-1/L-1	-1.61%	-10.36%	Not Solved	

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Spring Off-Peak	N/A	
EOP-VD-4	BOB TAP 230 kV Bus	Tran ELDORDO 500.0 to ELDORDO2 230.0 Ckt 1_Line MEAD S 230.0 to BOB TAP 230.0 Ckt 1	C	L-1/L-1	NA	-10.99%	Notice VEA. Modify Crazy Eye SPS identified in Cluster Alpha and Ivanpah-Eldorado SPS identified in GIP, or apply congestion management to curtail generation after first contingency	
EOP-VD-5	ELDORDO2 230 kV Bus		C	L-1/L-1	NA	-10.85%		
EOP-VD-6	PAHRUMP_1 230 kV Bus		C	L-1/L-1	-0.03%	-11.51%		

2012/2013 ISO Reliability Assessment - Study Results

Study Area: **SCE East of Lugo - Summer Peak with Renewables**



High/Low Voltage

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
EOP-V-1	CRAZY EYE TP230 kV Bus	Titan ELDORDO 500.0 to ELDORDOZ 230.0 Ckt 1_Line MEAD S 230.0 to BOB	C	T-1/L-1	0.98	0.89	Not Solved	Notice VEA. Modify Crazy Eye SPS identified in Cluster Alpha and Ivanpah-Eldorado SPS identified in GIP, or apply
EOP-V-2	PAHRUMP_1 230 kV Bus	TAP 230.0 Ckt 1	C	T-1/L-1	0.98	0.90	Not Solved	



**Single Contingency Load Drop**

ID	Worst Contingency	Category	Category Description	Amount of Load Drop (MW)			Potential Mitigation Solutions
				2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	

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

2012/2013 ISO Reliability Assessment - Study Results

Study Area: **SCE East of Lugo - Summer Light Load & Spring Off-Peak with Renewables**



**Single Contingency Load Drop**

ID	Worst Contingency	Category	Category Description	Amount of Load Drop (MW)			Potential Mitigation Solutions
				2014 Summer Light Load	2017 Spring Off-Peak	N/A	

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



2012/2013 ISO Reliability Assessment - Study Results

Study Area: **SCE East of Lugo - Summer Peak with Renewables**



**Single Source Substation with more than 100 MW Load**

ID	Substation	Load Served (MW)			Potential Mitigation Solutions
		2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	

No single source substation with more than 100 MW Load

2012/2013 ISO Reliability Assessment - Study Results

Study Area: **SCE East of Lugo - Summer Peak with Renewables**



**Single Source Substation with more than 100 MW Load**

ID	Substation	Load Served (MW)			Potential Mitigation Solutions
		2014 Summer Light Load	2017 Spring Off-Peak	N/A	

No single source substation with more than 100 MW Load

**Appendix C-27**  
**SCE Eastern without Renewables**

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
E-SpWOR-TO-001	Mirage - Santa Rosa 115 kV	Mirage - Concho 115 kV	B	L-1	92.70%	95.40%	103.80%	Continue monitoring loading in future planning cycles and 1) reconductor existing line or 2) build a new line in a timely fashion.
E-SpWOR-TO-002	Garnet - Tap 817 115 kV	Devers - Farrell - Windland 115 kV & Devers - Garnet 115 kV	C	L-1/L-1	96.30%	101.80%	112.50%	30 minute rating (110%) allows manual adjustment after the second contingency per SCE SOB 004 until well after 2017. Continue monitoring loading in future planning cycles and modify planned Devers 115 kV RAS to include this contingency if necessary.
E-SpWOR-TO-003	Garnet - Tap 817 115 kV	Devers - Eisenhower - Thornhill 115 kV & Devers - Garnet 115 kV	C	L-1/L-1	94.50%	97.10%	109.90%	Same as above
E-SpWOR-TO-004	Mirage 230/115 kV No. 4 bank	Mirage No.1 & No.3 230/115 kV banks	C	T-1/T-1	115.60%	120.00%	128.50%	1) Include contingency in the planned Mirage 115 kV RAS 2) Manual adjustment after the initial contingency per SCE SOB 004.
E-SpWOR-TO-005	Mirage 230/115 kV No. 3 bank	Mirage No.1 & No.4 230/115 kV banks	C	T-1/T-1	115.60%	120.00%	128.50%	Same as above
E-SpWOR-TO-006	Mirage 230/115 kV No. 1 bank	Mirage No.3 & No.4 230/115 kV banks	C	T-1/T-1	115.60%	120.00%	128.50%	Same as above

Note: Mirage and Devers 115 kV facilities are expected to become non-ISO facilities once the system is split in 2013.



**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Summer Off-Peak	N/A	

No thermal overloads identified.

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Off-Peak	2022 Summer Peak	

No voltage deviations identified.

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Summer Off-Peak	N/A	

No voltage deviations identified.

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	

No high/low voltage issues identified.



**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Summer Off-Peak	N/A	

No high/low voltage issues identified.

**Transient Stability**

ID	Contingency	Category	Category Description	Transient Stability Performance			Potential Mitigation Solutions
				2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
E-SpWOR-TS-001	Julian Hinds - Mirage 230 kV	B	N-1	Stable but frequency dip at Julian Hinds MWD 6.9 kV buses exceeds limits	Stable but frequency dip at Julian Hinds MWD 6.9 kV buses exceeds limits	Stable but frequency dip at Julian Hinds MWD 6.9 kV buses exceeds limits	SCE/MWD established a less stringent frequency dip criteria (59.3 Hz for 6 cycles) at affected 6.9 kV buses in a letter submitted to WECC and accepted by the SRWG Compliance Committee Chair

**Transient Stability**

ID	Contingency	Category	Category Description	Transient Stability Performance			Potential Mitigation Solutions
				2014 Summer Light Load	2017 Summer Off-Peak	N/A	
E-SopWOR-TS-001	Julian Hinds - Mirage 230 kV	B	N-1	Stable but frequency dip at MWD's Julian Hinds 6.9 kV buses exceeds limits	Stable but frequency dip at MWD's Julian Hinds 6.9 kV buses exceeds limits		SCE/MWD established a less stringent frequency dip criteria (59.3 Hz for 6 cycles) at affected 6.9 kV buses in a letter submitted to WECC and accepted by the SRWG Compliance Committee Chair
E-SopWOR-TS-002	Iron Mountain - Camino - Mead- Gene 230 kV & Julian Hinds - Mirage 230 kV	C	L-1/L-1	Diverged	Diverged		Operating solution
E-SopWOR-TS-003	Eagle Mountain - Iron Mountain 230 kV & Julian Hinds - Mirage 230 kV		L-1/L-1	Diverged	Diverged		Same as above

**Post-Transient Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	

No post-transient thermal overload issues identified.



**Post-Transient Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					Select..	Select..	Select..	

No post-transient thermal overloads identified.

**Post-Transient Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
E-SpWOR-PT-001	Eagle Mountain	Palo Verde - Colorado River 500 kV (Full Blythe plant tripped)	B	L-1	7.70%	6.60%	9.70%	Operating solution
E-SpWOR-PT-002	Iron Mountain	Palo Verde - Colorado River 500 kV (Full Blythe plant tripped)	B	L-1	7.60%	5.70%	9.40%	Same as above
E-SpWOR-PT-003	Camino	Palo Verde - Colorado River 500 kV (Full Blythe plant tripped)	B	L-1	5.10%	< 5%	5.70%	Same as above
E-SpWOR-PT-004	Julian Hinds	Palo Verde - Colorado River 500 kV (Full Blythe plant tripped)	B	L-1	5.90%	< 5%	8.20%	Same as above

**Post-Transient Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Spring Off-Peak	N/A	
E-SopWOR-PT-001	N/A	Iron Montain - Camino - Mead- Gene 230 kV & Julian Hinds - Mirage 230 kV	C	L-1/L-1	Diverged	Diverged		Operating solution
E-SopWOR-PT-002	N/A	Eagle Mountain - Iron Mountain 230 kV & Julian Hinds - Mirage 230 kV	C	L-1/L-1	Diverged	Diverged		Same as above

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Study Area: **SCE Eastern area - without renewables**



**Single Contingency Load Drop**

ID	Worst Contingency	Category	Category Description	Amount of Load Drop (MW)			Potential Mitigation Solutions
				2014	2017	2022	

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



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Study Area: **SCE Eastern area - without renewables**

**Single Source Substation with more than 100 MW Load**



ID	Substation	Load Served (MW)			Potential Mitigation Solutions
		2014	2017	2022	

No single source substation with more than 100 MW Load

**Appendix C-28**  
**SCE Eastern with Renewables**

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
E-SpWR-TO-001	Mirage - Santa Rosa 115 kV	Mirage - Concho 115 kV	B	L-1	92.90%	95.60%	104.40%	Continue monitoring loading in future planning cycles and 1) reconductor existing line or 2) build a new line in a timely fashion.
E-SpWR-TO-002	Garnet - Tap 817 115 kV	Devers - Farrell - Windland 115 kV & Devers - Garnet 115 kV	C	L-1/L-1	95.70%	102.20%	102.80%	30 minute rating (110%) allows manual adjustment after the second contingency per SCE SOB 004 until 2022. Continue monitoring loading in future planning cycles and modify planned Devers 115 kV RAS to include this contingency if necessary.
E-SpWR-TO-003	Garnet - Tap 817 115 kV	Devers - Eisenhower - Thornhill 115 kV & Devers - Garnet 115 kV	C	L-1/L-1	93.90%	97.40%	100.60%	Same as above
E-SpWR-TO-004	Mirage 230/115 kV No. 4 bank	Mirage No.1 & No.3 230/115 kV banks	C	T-1/T-1	115.60%	119.90%	128.30%	1) Include contingency in the planned Mirage 115 kV RAS 2) Manual adjustment after the initial contingency per SCE SOB 004.
E-SpWR-TO-005	Mirage 230/115 kV No. 3 bank	Mirage No.1 & No.4 230/115 kV banks	C	T-1/T-1	115.60%	119.90%	128.40%	Same as above
E-SpWR-TO-006	Mirage 230/115 kV No. 1 bank	Mirage No.3 & No.4 230/115 kV banks	C	T-1/T-1	115.60%	119.90%	128.40%	Same as above

Note: Mirage and Devers 115 kV facilities are expected to become non-ISO facilities once the system is split in 2013.

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Summer Off-Peak	N/A	

No thermal overloads identified.

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	

No voltage deviations identified.

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Summer Off-Peak	N/A	

No voltage deviations identified.

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					Select..	Select..	Select..	

No high/low voltage issues identified.

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Summer Off-Peak	N/A	



**Transient Stability**

ID	Contingency	Category	Category Description	Transient Stability Performance			Potential Mitigation Solutions
				2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
E-SPWR-TS-001	Julian Hinds - Mirage 230 kV	B	N-1	Stable but frequency dip at MWD's Julian Hinds and Eagle Mountain 6.9 kV buses exceeds limits	Stable but frequency dip at MWD's Julian Hinds and Eagle Mountain 6.9 kV buses exceeds limits	Stable but frequency dip at MWD's Julian Hinds 6.9 kV buses exceeds limits	SCE/MWD established a less stringent frequency dip criteria (59.3 Hz for 6 cycles) at affected 6.9 kV buses in a letter submitted to WECC and accepted by the SRWG Compliance Committee Chair

**Transient Stability**

ID	Contingency	Category	Category Description	Transient Stability Performance			Potential Mitigation Solutions
				2014 Summer Light Load	2017 Summer Off-Peak	N/A	
E-SopWR-TS-001	Julian Hinds - Mirage 230 kV	B	N-1	Stable but frequency dip at MWD's Julian Hinds 6.9 kV buses exceeds limits	Stable but frequency dip at MWD's Julian Hinds and Eagle Mountain 6.9 kV buses exceeds limits		SCE/MWD established a less stringent frequency dip criteria (59.3 Hz for 6 cycles) at affected 6.9 kV buses in a letter submitted to WECC and accepted by the SRWG Compliance Committee Chair
E-SopWR-TS-002	Iron Mountain - Camino - Mead- Gene 230 kV & Julian Hinds - Mirage 230 kV	C	L-1/L-1	Diverged	Stable		Operating solution
E-SopWR-TS-003	Eagle Mountain - Iron Mountain 230 kV & Julian Hinds - Mirage 230 kV	C	L-1/L-1	Diverged	Stable		Same as above

**Post-Transient Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	

No post-transient thermal overloads identified.

**Post-Transient Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Summer Off-Peak	N/A	

No post-transient thermal overloads identified.

**Post-Transient Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	

No post-transient voltage deviations identified.

**Post-Transient Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Summer Off-Peak	N/A	
E-SopWR-PTVD-001	N/A	Iron Mountain - Camino - Mead- Gene 230 kV & Julian Hinds - Mirage 230 kV	C	L-1/L-1	Diverged	Within limits		Operating solution
E-SopWR-PTVD-002	N/A	Eagle Mountain - Iron Mountain 230 kV & Julian Hinds - Mirage 230 kV	C	L-1/L-1	Diverged	Within limits		Same as above

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Study Area: **SCE Eastern area - with Renewables**



**Single Contingency Load Drop**

ID	Worst Contingency	Category	Category Description	Amount of Load Drop (MW)			Potential Mitigation Solutions
				2014	2017	2022	

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

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Study Area: **SCE Eastern area - with Renewables**

**Single Source Substation with more than 100 MW Load**



ID	Substation	Load Served (MW)			Potential Mitigation Solutions
		2014	2017	2022	

No single source substation with more than 100 MW Load



**Appendix C-29**  
**SCE Metro Area**

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
MTR-T-1	Barre - Del Amo 230 kV Line	Alamitos - Center 230 kV Line, Alamitos - Lighthipe 230 kV Line	C	N-2	<100%	<100%	106%	SPS to reduce generation



**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Spring Off-Peak	N/A	

No thermal overloads identified.

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Study Area: **SCE Metro - Summer Peak with Renewables**



**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
MTR-DV-1	Viejo 230 kV	One SONGS Unit, SONGS - Viejo 230 kV Line	B	G-1/L-1	<5%	<5%	5.20%	Add shunt capacitor at Viejo

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Spring Off-Peak	N/A	

No voltage deviations identified.



**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	

No high/low voltage issues identified

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Spring Off-Peak	N/A	

No high/low voltage issues identified.

**Transient Stability**

ID	Contingency	Category	Category Description	Transient Stability Performance			Potential Mitigation Solutions
				2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	



**Transient Stability**

ID	Contingency	Category	Category Description	Transient Stability Performance			Potential Mitigation Solutions
				2014 Summer Light Load	2017 Spring Off-Peak	N/A	

**Post-Transient Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	

No post-transient thermal overloads identified.

**Post-Transient Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Spring Off-Peak	N/A	

No post-transient thermal overloads identified.

**Post-Transient Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	

**Post-Transient Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Spring Off-Peak	N/A	

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Study Area: **SCE Metro**



**Single Contingency Load Drop**

ID	Worst Contingency	Category	Category Description	Amount of Load Drop (MW)			Potential Mitigation Solutions
				2014	2017	2022	

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

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Study Area: **SCE Metro**



**Single Source Substation with more than 100 MW Load**

ID	Substation	Load Served (MW)			Potential Mitigation Solutions
		2014	2017	2022	

No single source substation with more than 100 MW Load

**Appendix C-30**  
**SDG&E System**



**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014	2017	2022	
SD-T-001	22644 PENSQTOS 69 - 22856 TOREYPNS 69 - ckt 1	TL0666 PQ-DM-DB-DH-TP ck 1	B	N-1	87%	94%	102%	Re-evaluate in future planning cycles. Investigate the potential for re-rating this line.
SD-T-002	22664 POMERADO 69 - 22828 SYCAMORE 69 - ckt 1	TL06924 POMERADO -SYCAMORE ck 2	B	N-1	98%	96%	103%	Dispatch local generation. Re-evaluate in future planning cycles
SD-T-003	22664 POMERADO 69 - 22828 SYCAMORE 69 - ckt 2	TL06915 POMERADO -SYCAMORE ck 1	B	N-1	98%	96%	103%	Dispatch local generation. Re-evaluate in future planning cycles
SD-T-004	22740 SANYSYRO 69 - 22608 OTAY TP 69 - ckt 1	TL0649 BD-OY-SYO ck 1	B	N-1	85%	92%	100%	Re-evaluate in future planning cycles. Reconfigure and reconductor overloaded elements in the metro area 69kV system.
SD-T-005	22740 SANYSYRO 69 - 22616 OTAYLKTP 69 - ckt 1	TL0623 OY-SYO-IB ck 1	B	N-1	85%	92%	100%	Re-evaluate in future planning cycles. Reconfigure and reconductor overloaded elements in the metro area 69kV system.
SD-T-006	22828 SYCAMORE 69 - 22756 SCRIPPS 69 - ckt 1	TL23042 OTAYMESA - BAY BLVD ck 1 (MIGUEL - BAY BLVD in 2022)	B	N-1	101%	106%	97%	Generation re-dispatch or reconductor.
SD-T-007	22831 SYCAMORE 138 - 22124 CHCARITA 138 - ckt 1	EA BK 60 230/138	B	N-1	< 80%	< 80%	106%	Generation re-dispatch or reconductor. Re-evaluate in future planning cycles
SD-T-008	22820 SWEETWTR 69 - 22824 SWTWTRTP 69 - ckt 1	Silvergate - Bay Blvd 230kV + Divbision QF	B	G-1/N-1	89%	101..4%	106%	Sweetwater reliability project
SD-T-009	22112 CAPSTRNO 138 - 22396 LAGNA NL 138 - ckt 1	13831/36 N-2 TRIP 13812 SPS8.4C	C	N-2	255%	< 80%	< 80%	Pico loop-in (operational solution) or SPS to drop load
SD-T-010	22112 CAPSTRNO 138 - 22860 TRABUCO 138 - ckt 1	13831/36 N-2 TRIP 13812 SPS8.4C	C	N-2	142%	< 80%	< 80%	Pico loop-in (operational solution) or SPS to drop load

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014	2017	2022	
SD-T-011	22160 DEL MAR 69 - 22164 DELMARTP 69 - ckt 1	Del Mar 69kV E Bus	C	Bus	121%	131%	136%	Reconductor or SPS to drop local network load post-contingency or system reconfiguration
SD-T-012	22188 DOUBLTTP 69 - 22164 DELMARTP 69 - ckt 1	PQ-TP + PQ-GE	C	N-2	93%	100%	109%	Reconductor or SPS to drop load post-contingency
SD-T-013	22200 DUNHILTP 69 - 22188 DOUBLTTP 69 - ckt 1	PQ-TP + PQ-GE	C	N-2	93%	100%	109%	Reconductor or SPS to drop load post-contingency
SD-T-014	22208 EL CAJON 69 - 22408 LOSCOCHS 69 - ckt 1	Murray 69kV N Bus	C	Bus	116%	125%	90%	Reconductor or SPS to drop load post-contingency
SD-T-015	22272 ESCO 69 - 22876 WARCYNTP 69 - ckt 1	POM-SX #1+#2	C	N-2	107%	96%	105%	Reconductor or SPS to drop load post-contingency
SD-T-016	22306 GARFIELD 69 - 22208 EL CAJON 69 - ckt 1	Murray 69kV N Bus	C	Bus	122%	132%	143%	Reconductor or SPS to drop load post-contingency
SD-T-017	22420 SILVERGT 69 - 22868 URBAN 69 - ckt 1	SG-CR + SG-B	C	N-2	84%	100%	118%	Re-evaluate in future planning cycles.
SD-T-018	22440 MELROSE 69 - 22442 MELRSETP 69 - ckt 1	TL69YY SANLUSRY to OCEAN RANCH ck 1 and ck 2	C	N-2	N/A	116%	110%	Re-rate and dispatch generation or SPS to drop load post-contingency
SD-T-019	22456 MIGUEL 69 - 22364 JAMACHA 69 - ckt 2	Miguel 69kV S Bus	C	Bus	93%	90%	102%	Re-evaluate in future planning cycles.
SD-T-020	22512 MONSRATE 69 - 22016 AVCADOTP 69 - ckt 1	Lilac 69kV S Bus	C	Bus	95%	102%	< 80%	Re-rate and dispatch existing generation or SPS to drop load post-contingency
SD-T-021	22532 MURRAY 69 - 22306 GARFIELD 69 - ckt 1	Murray 69kV N Bus	C	Bus	101%	109%	118%	Reconductor or SPS to drop load post-contingency
SD-T-022	22604 OTAY 69 - 22616 OTAYLKTP 69 - ckt 1	ML-SW-SU-PD-BD-SS + ML-BD	C	N-2	< 80%	< 80%	101%	Also seen as a cat-B issue. Re-evaluate in future planning cycles.

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014	2017	2022	
SD-T-023	22640 PENDLETN 69 - 22708 SANLUSRY 69 - ckt 1	Lilac 69kV S Bus	C	Bus	103%	108%	< 80%	Re-rate and dispatch existing generation or SPS to drop load post-contingency
SD-T-024	22644 PENSQTOS 69 - 22164 DELMARTP 69 - ckt 1	PQ-TP + PQ-GE	C	N-2	104%	112%	121%	Re-rate the line or SPS to drop local post-contingency
SD-T-025	22644 PENSQTOS 69 - 22856 TOREYPNS 69 - ckt 1	Penasquitos 69kV SW Bus	C	Bus	93%	101%	109%	Reconductor or re-rate or SPS to drop load post-contingency
SD-T-026	22664 POMERADO 69 - 22828 SYCAMORE 69 - ckt 2	Sycamore 69kV S Bus	C	Bus	145%	137%	148%	Install SPS to drop local area load post contingency or expand an existing SPS at Rancho Carmel
SD-T-027	22668 POWAY 69 - 22664 POMERADO 69 - ckt 1	PEN-ES #1 + #2 230 kV	C	N-2	119%	109%	107%	Not an N-2. Operational action plan (e.g. generation dispatch or switching solution or local network load drop after the first contingency)
SD-T-028	22668 POWAY 69 - 22676 R.CARMEL 69 - ckt 1	SX-PEN 230 kV + AR-SX 69 kV B	C	N-2	104%	86%	94%	Install SPS to drop load post-contingency
SD-T-029	22668 POWAY 69 - 22676 R.CARMEL 69 - ckt 1	SX-AR + SX-BE	C	N-2	-	125%	135%	Install SPS to drop load post-contingency
SD-T-030	22740 SANYSRO 69 - 22616 OTAYLKTP 69 - ckt 1	Otay 69kV E Bus	C	Bus	< 80%	< 80%	120%	Also seen as a cat-B issue. Reconductor or system reconfiguration. Re-evaluate in future planning cycles
SD-T-031	22768 BAY BLVD 69 - 22604 OTAY 69 - ckt 1	Bay Blvd 69kV SW Bus	C	Bus	99%	107%	< 80%	Install SPS to drop load post-contingency
SD-T-032	22828 SYCAMORE 69 - 22756 SCRIPPS 69 - ckt 1	MR-PQ + PQ-MRM	C	N-2	107%	112%	105%	Re-rate (short-term) and dispatch local generation or Install an SPS to drop load post-contingency

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014	2017	2022	
SD-T-033	22831 SYCAMORE 138 - 22124 CHCARITA 138 - ckt 1	ENCINA 230 kV 1E CB	C	CB	< 80%	< 80%	107%	Re-evaluate in future planning cycles.
SD-T-034	22831 SYCAMORE 138 - 22124 CHCARITA 138 - ckt 1	ENCINA 230 kV 2E CB	C	CB	< 80%	< 80%	107%	Re-evaluate in future planning cycles.
SD-T-035	22840 TALEGA 138 - 22656 PICO 138 - ckt 1	TA-PICO 1 + TA-RMV 1 138 kV	C	N-2	113%	< 80%	< 80%	Pico loop-in (operational solution) or SPS to drop load
SD-T-036	22840 TALEGA 138 - 22841 TA TAP 138 - ckt 1	13831/36 N-2 TRIP 13812 SPS8.4C	C	N-2	178%	N/A	N/A	Previously approved M-SOCRUP will mitigate this issue. Install SPS or operational solution in the interim
SD-T-037	22840 TALEGA 138 - 22842 TA TAP33 138 - ckt 1	TALEGA 138 kV 8T CB	C	CB	114%	N/A	N/A	Previously approved M-SOCRUP will mitigate this issue. Install SPS or operational solution in the interim
SD-T-038	22841 TA TAP 138 - 22396 LAGNA NL 138 - ckt 1	13831/36 N-2 TRIP 13812 SPS8.4C	C	N-2	332%	N/A	N/A	Previously approved M-SOCRUP will mitigate this issue. Install SPS or operational solution in the interim
SD-T-039	22856 TOREYPNS 69 - 22200 DUNHILTP 69 - ckt 1	PQ-TP + PQ-GE	C	N-2	99%	107%	116%	Re-rate the line or install SPS to drop load post-contingency
SD-T-040	22884 WARNERS 69 - 22688 RINCON 69 - ckt 1	DE-ST-BC + CRE-ST	C	N-2	105%	116%	125%	Re-rate the line or install SPS to drop load post-contingency
SD-T-041	22842 TA TAP33 138 - 22656 PICO 138 - ckt 1	TALEGA 138 kV 8T CB	C	CB	111%	N/A	N/A	Previously approved M-SOCRUP will mitigate this issue. Install SPS or operational solution in the interim
SD-T-042	22256 ESCNDIDO 69 - 22260 ESCNDIDO 230 - ckt 2	ESCNDIDO 230 kV 2N CB	C	CB	128%	128%	107%	Upgrade or SPS to drop load post-contingency

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Study Area: **San Diego Area - Summer Peak**



**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014	2017	2022	
SD-T-043	22844 TALEGA 230 - 22840 TALEGA 138 - ckt 1	TALEGA 230 kV 4W CB	C	CB	120%	N/A	N/A	Previously approved M-SOCRUP will mitigate this issue. Install SPS or operational solution in the interim
SD-T-044	22708 SANLUSRY 69 - 22582 OCEAN RANCH 69 - ckt 1	San Luis Rey 69kV SW Bus	C	Bus	N/A	136%	121%	Reconfiguration or SPS to droplload post-contingency
SD-T-045	22771 BAY BLVD 230 - 22464 MIGUEL 230 - ckt 1	ML-MS 230 kV #1&#2	C	N-2	N/A	N/A	100%	Re-evaluate in future planning cycles.
SD-T-046	22771 BAY BLVD 230 - 22464 MIGUEL 230 - ckt 1	MISSION 230 kV 5T CB	C	CB	N/A	N/A	100%	Re-evaluate in future planning cycles.
SD-T-047	22008 ASH 69 - 22012 ASH TP 69 - ckt 1	TL0679 ESCNDIDO-FELICITA ck 1 _TL0689 ES-FE-BR ck 1	C	N-1-1	<80%	<80%	125%	Re-evaluate in future planning cycles. (drop local network load prior to the second contingency or implement a short-term rating and drop load after the second contingency or install SPS)
SD-T-048	22084 BORREGO 69 - 22540 NARROWS 69 - ckt 1	TL0681 ASH-FE-VC ck 1 _TL0683 RINCON-LILAC ck 1	C	N-1-1	<80%	117%	Diverged	Drop local network load after prior to the second contingency or re-rate the line and drop local network load after the second contingency or install an SPS to drop load post-contingency
SD-T-049	22112 CAPSTRNO 138 - 22656 PICO 138 - ckt 1	TL13830 MARGARTA-TRABUCO ck 1 _TL13835 SANMATEO-LAGNA NL-TA TAP B	C	N-1-1	111%	N/A	N/A	Pico loop-in (operational solution) or SPS to drop load
SD-T-050	22112 CAPSTRNO 138 - 22860 TRABUCO 138 - ckt 1	TL13831 TALEGA-R.MSNVJO ck 1 _TL13833 CAPSTRNO-TRABUCO ck 1	C	N-1-1	146%	<80%	<80%	Pico loop-in (operational solution) or SPS to drop load

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014	2017	2022	
SD-T-051	22152 CREELMAN 69 - 22828 SYCAMORE 69 - ckt 1	TL13821 SYCAMORE-SANTEE ck 1 _TL13824 TELECYN-ML60 TAP-LOSCOCHS ck 1	C	N-1-1	115%	122%	120%	Dispatch local generation and drop local network load prior to the second contingency or implement a short-term rating and drop load after the second contingency or install SPS
SD-T-052	22188 DOUBLTTP 69 - 22164 DELMARTP 69 - ckt 1	TL0662 PENSQTOS -TOREYPNS ck 1 _TL0665 MIRASNT0-GENESEE ck 1	C	N-1-1	<80%	<80%	113%	Re-evaluate in future planning cycles
SD-T-053	22200 DUNHILTP 69 - 22188 DOUBLTTP 69 - ckt 1	TL0662 PENSQTOS -TOREYPNS ck 1 _TL0665 MIRASNT0-GENESEE ck 1	C	N-1-1	<80%	<80%	113%	Re-evaluate in future planning cycles
SD-T-054	22252 ENCNITAS 69 - 22685 R.SNTTP1 69 - ckt 1	TL0617 PB-RN-LJ ck 1 _TL06952 NORTHCTY-PENSQTOS 69 ck 1	C	N-1-1	<80%	91%	102%	Re-evaluate in future planning cycles
SD-T-055	22252 ENCNITAS 69 - 22160 DEL MAR 69 - ckt 1	TL0617 PB-RN-LJ ck 1 _TL06952 NORTHCTY-PENSQTOS 69 ck 1	C	N-1-1	<80%	140%	156%	Generation dispatch or switching solution or local network load drop prior to the second contingency
SD-T-056	22602 OMWD 69.00 - 22256 ESCNDIDO 69.00 - ckt 1	TL0660 ENCNITAS-DEL MAR ck 1 _TL06952 NORTHCTY-PENSQTOS 69 ck 1	C	N-1-1	89%	190%	132%	Generation dispatch or switching solution or local network load drop prior to the second contingency
SD-T-057	22602 OMWD 69.00 - 22603 Lkhodges 69.00 - ckt 1	TL0660 ENCNITAS-DEL MAR ck 1 _TL06952 NORTHCTY-PENSQTOS 69 ck 1	C	N-1-1	<80%	184%	126%	Generation dispatch or switching solution or local network load drop prior to the second contingency
SD-T-058	22603 Lkhodges 69.00 - 22060 BERNDOTP 69.00	TL0660 ENCNITAS-DEL MAR ck 1 _TL06952 NORTHCTY-PENSQTOS 69 ck 1	C	N-1-1	<80%	184%	178%	Generation dispatch or switching solution or local network load drop prior to the second contingency

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014	2017	2022	
SD-T-059	22256 ESCNDIDO 69 - 22260 ESCNDIDO 230 - ckt 1	ES BK 71 69/230 _ES 72 BK 69/230	C	N-1-1	126%	127%	106%	Dispatch local generation
SD-T-060	22256 ESCNDIDO 69 - 22260 ESCNDIDO 230 - ckt 2	ES BK 70 69/230 _ES 72 BK 69/230	C	N-1-1	127%	86%	107%	Dispatch local generation
SD-T-061	22256 ESCNDIDO 69 - 22260 ESCNDIDO 230 - ckt 3	ES BK 70 69/230 _ES BK 71 69/230	C	N-1-1	129%	129%	108%	Dispatch local generation
SD-T-062	22256 ESCNDIDO 69 - 22272 ESCO 69 - ckt 1	TL06913 POWAY-POMERADO ck 1 _TL06918 ESCO-GOALLINE ck 1	C	N-1-1	<80%	95%	105%	Re-evaluate in future planning cycles.
SD-T-063	22256 ESCNDIDO 69 - 22724 SANMRCOS 69 - ckt 1	LD_ME OPEN 680A PEAK ME _LD_ME OPEN 693 PEAK ME/SM	C	N-1-1	<80%	136%	129%	Generation dispatch or switching solution or local network load drop prior to the second contingency
SD-T-064	22272 ESCO 69 - 22876 WARCYNTP 69 - ckt 1	TL06915 POMERADO -SYCAMORE ck 1 _TL06924 POMERADO -SYCAMORE ck 2	C	N-1-1	<80%	<80%	105%	Re-evaluate in future planning cycles.
SD-T-065	22306 GARFIELD 69 - 22208 EL CAJON 69 - ckt 1	TL0618 MISSION-MURRAY ck 1 _TL0619 MISSION-MURRAY ck 2	C	N-1-1	122%	132%	143%	Reconfigure the system by switching actions
SD-T-066	22316 GENESEE 69 - 22644 PENSQTOS 69 - ckt 2	TL0665 MIRASNTO-GENESEE ck 1 _TL069 TOREYPNS to UCM ck 1	C	N-1-1	<80%	<80%	119%	Re-evaluate in future planning cycles
SD-T-067	22336 GRANITE 69 - 22340 GRANITTP 69 - ckt 1	TL0620 MURRAY-GARFIELD ck 1 _TL0631 EL CAJON-LOSCOCHS ck 1	C	N-1-1	97%	103%	86%	Dispatch local generation
SD-T-068	22356 IMPRLVLY 230 - 22360 IMPRLVLY 500 - ckt 2	IV BK 81 230/500 _IV BK 82 230/500	C	N-1-1	114%	104%	109%	Re-dispatch local generation
SD-T-069	22408 LOSCOCHS 69 - 22004 ALPINE 69 - ckt 1	TL06914 LOVELAND-LOSCOCHS ck 1 _TL06917 CREELMAN-SYCAMORE ck 1	C	N-1-1	<80%	90%	102%	Re-evaluate in future planning cycles.
SD-T-070	22408 LOSCOCHS 69 - 22216 ELLIOTT 69 - ckt 1	TL13821 SYCAMORE-SANTEE ck 1 _TL13824 TELECYN-ML60 TAP-LOSCOCHS ck 1	C	N-1-1	108%	119%	109%	Dispatch local generation



**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014	2017	2022	
SD-T-071	22420 SILVERGT 69 - 22868 URBAN 69 - ckt 1	OT BK 70 69/230 _OT BK 71 69/230	C	N-1-1	100%	108%	120%	Generation dispatch or switching solution or local network load drop prior to the second contingency
SD-T-072	22440 MELROSE 69 - 22442 MELRSETP 69 - ckt 1	DIV QF 13.80 _LD_ME OPEN 693 PEAK ME/SM	C	N-1-1	<80%	117%	103%	Dispatch local generation
SD-T-073	22456 MIGUEL 69 - 22340 GRANITTP 69 - ckt 1	TL13821 SYCAMORE-SANTEE ck 1 _TL13824 TELECYN-ML60 TAP-LOSCOCHS ck 1	C	N-1-1	93%	98%	106%	Re-evaluate in future planning cycles.
SD-T-074	22464 MIGUEL 230 - 22461 MIGUEL60 138 - ckt 1	TL23042A BAY BLVD - MIGUEL ck 1 _TL13826 PRCTRVLVY-MIGUEL ck 1	C	N-1-1	88%	95%	121%	Re-evaluate in future planning cycles.
SD-T-075	22464 MIGUEL 230 - 22468 MIGUEL 500 - ckt 2	IV BK 82 230/500 _ML BK 80 230/500 ck 1	C	N-1-1	89%	90%	106%	Re-evaluate in future planning cycles.
SD-T-076	22464 MIGUEL 230 - 22472 MIGUELMP 500 - ckt 1	LC BK 50 138/69 _ML BK 81 230/500 ck 2	C	N-1-1	91%	90%	107%	Re-evaluate in future planning cycles.
SD-T-077	22464 MIGUEL 230 - 22504 MISSION 230 - ckt 1	TL23004 SANLUSRY - MISSION ck 2 _TL23042A BAY BLVD - MIGUEL ck 1	C	N-1-1	<80%	<80%	101%	Re-evaluate in future planning cycles.
SD-T-078	22464 MIGUEL 230 - 22504 MISSION 230 - ckt 2	TL23003 SANLUSRY - ENCINA ck 1 _TL23042A BAY BLVD - MIGUEL ck 1	C	N-1-1	<80%	<80%	101%	Re-evaluate in future planning cycles.
SD-T-079	22476 MIGUELTP 69 - 22456 MIGUEL 69 - ckt 1	TL23042A BAY BLVD - MIGUEL ck 1 _TL0621 PARADISE-MIGUEL ck 1	C	N-1-1	<80%	80%	104%	Re-evaluate in future planning cycles.
SD-T-080	22480 MIRAMAR 69 - 22296 FENTONTP 69 - ckt 1	TL06914 LOVELAND-LOSCOCHS ck 1 _LD_MRM OPEN 675 PEAK MRM/MR/SS	C	N-1-1	<80%	<80%	110%	Re-evaluate in future planning cycles.
SD-T-081	22480 MIRAMAR 69 - 22644 PENSQTOS 69 - ckt 1	TL0675 PENSQTOS-MESA RIM ck 1 _TL06916 SYCAMORE-SCRIPPS ck 1	C	N-1-1	113%	<80%	<80%	Dispatch local generation
SD-T-082	22500 MISSION 138 - 22496 MISSION 69 - ckt 1	MS BK 51 138/69 _MS BK 52 138/69	C	N-1-1	95%	106%	107%	Generation dispatch or switching solution or local network load drop prior to the second contingency



**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014	2017	2022	
SD-T-083	22500 MISSION 138 - 22496 MISSION 69 - ckt 2	MS BK 50 138/69                      _MS BK 52 138/69	C	N-1-1	123%	138%	140%	Generation dispatch or switching solution or local network load drop prior to the second contingency
SD-T-084	22500 MISSION 138 - 22496 MISSION 69 - ckt 3	ML BK 81 230/500                      ck 2   _MS BK 51 138/69	C	N-1-1	<80%	116%	83%	Generation dispatch or switching solution or local network load drop prior to the second contingency
SD-T-085	22512 MONSRATE 69 - 22016 AVCADOTP 69 - ckt 1	LD_ME OPEN 680A PEAK ME _LD_ME OPEN 693 PEAK ME/SM	C	N-1-1	<80%	147%	87%	Dispatch local generation
SD-T-086	22512 MONSRATE 69 - 22524 MORHILTP 69 - ckt 1	TL06908 ESCNDIDO-ESCO   ck 1 _TL06932 LILAC -PALA       ck 1	C	N-1-1	134%	<80%	<80%	Dispatch local generation
SD-T-087	22524 MORHILTP 69 - 22440 MELROSE 69 - ckt 1	TL06908 ESCNDIDO-ESCO   ck 1 _TL06932 LILAC -PALA       ck 1	C	N-1-1	145%	<80%	<80%	Dispatch local generation
SD-T-088	22532 MURRAY 69 - 22306 GARFIELD 69 - ckt 1	TL0618 MISSION-MURRAY   ck 1 _TL0619 MISSION-MURRAY   ck 2	C	N-1-1	101%	109%	118%	Reconfigure the system
SD-T-089	22540 NARROWS 69 - 22884 WARNERS 69 - ckt 1	TL0681 ASH-FE-VC                      ck 1   _TL0683 RINCON-LILAC   ck 1	C	N-1-1	<80%	106%	Diverged	Drop local network load prior to the second contingency or re-rate the line and drop local network load after the second contingency or install an SPS to drop load post-contingency
SD-T-090	22604 OTAY 69 - 22608 OTAY TP 69 ckt 1	TL0647 BAY BLVD - IMPRLBCH   ck 1 _TL0649 BD-OY-SYO                      ck 1	C	N-1-1	94%	102%	111%	Generation dispatch or switching solution or local network load drop prior to the second contingency
SD-T-091	22604 OTAY 69 - 22616 OTAYLKTP 69 - ckt 1	TL0643 MIGUEL - JAMACHA   ck 2 _TL06910 SALT CREEK - BORDER   ck 1	C	N-1-1	<80%	<80%	102%	Re-evaluate in future planning cycles.

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014	2017	2022	
SD-T-092	22636 PARADISE 69 - 22812 SUNYSDTP 69 - ckt 1	TL0621 PARADISE-MIGUEL ck 1 _TL06911 JAMACHA-SPRNGVLY ck 1	C	N-1-1	<80%	<80%	114%	Re-evaluate in future planning cycles.
SD-T-093	22640 PENDLETN 69 - 22016 AVCADOTP 69 - ckt 1	TL0680 SA-ME-SM ck 1 _LD_ME OPEN 680A PEAK ME	C	N-1-1	<80%	121%	<80%	Generation dispatch or switching solution or local network load drop prior to the second contingency
SD-T-094	22644 PENSQTOS 69 - 22164 DELMARTP 69 - ckt 1	TL0662 PENSQTOS -TOREYPNS ck 1 _TL0665 MIRASNT0-GENESEE ck 1	C	N-1-1	<80%	<80%	124%	Re-evaluate in future planning cycles.
SD-T-095	22644 PENSQTOS 69 - 22648 PENSQTOS 138 - ckt 2	PQ BK 70 230/69 _PQ BK 71 230/69	C	N-1-1	92%	101%	91%	Dispatch local generation
SD-T-096	22644 PENSQTOS 69 - 22856 TOREYPNS 69 - ckt 1	TL23012 PENSQTOS - ENCINA ck 1 _TL0666 PQ-DM-DB-DH-TP ck 1	C	N-1-1	88%	94%	103%	Re-evaluate in future planning cycles.
SD-T-097	22648 PENSQTOS 138 - 22644 PENSQTOS 69 - ckt 1	PQ BK 70 230/69 _PQ BK 71 230/69	C	N-1-1	91%	100%	96%	Dispatch local generation
SD-T-098	22652 PENSQTOS 230 - 22644 PENSQTOS 69 - ckt 2	PQ60 PENSQTOS-PENSQTOS ck 1 _PQ BK 70 230/69	C	N-1-1	98%	100%	98%	Dispatch local generation
SD-T-099	22668 POWAY 69 - 22664 POMERADO 69 - ckt 1	TL23014 PEN-ESCNDIDO ck 1 _TL23015 PEN-ESCNDIDO ck 2	C	N-1-1	119%	109%	107%	Generation dispatch or switching solution or local network load drop prior to the second contingency
SD-T-100	22668 POWAY 69 - 22676 R.CARMEL 69 - ckt 1	TL06939 BERNARDO-ARTESN ck 1 _TL06961 SYCAMORE-BERNARDO 69 ck 1	C	N-1-1	N/A	106%	114%	Generation dispatch or switching solution or local network load drop prior to the second contingency
SD-T-101	22680 R.SNTAFE 69 - 22685 R.SNTTP1 69 - ckt 1	TL0660 ENCITAS-DEL MAR ck 1 _TL06952 NORTHCTY-PENSQTOS 69 ck 1	C	N-1-1	101%	<80%	<80%	Generation dispatch or switching solution or local network load drop prior to the second contingency
SD-T-102	22716 SANLUSRY 230 - 22708 SANLUSRY 69 - ckt 1	SA BK 71 69/230 _SA BK 72 69/230	C	N-1-1	97%	100%	102%	Re-evaluate in future planning cycles.

2012/2013 ISO Reliability Assessment - Final Study Results

Study Area: **San Diego Area - Summer Peak**



**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014	2017	2022	
SD-T-103	22740 SANYS DRO 69 - 22608 OTAY TP 69 - ckt 1	TL0612 OLD TOWN-POINTLMA ck 2 _TL0649 BD-OY-SYO ck 1	C	N-1-1	85%	92%	101%	Re-evaluate in future planning cycles.
SD-T-104	22740 SANYS DRO 69 - 22616 OTAYLKTP 69 - ckt 1	TL0600 CM-KY-RN ck 1 SALT CREEK - BORDER ck 1 _TL06910	C	N-1-1	<80%	<80%	113%	Re-evaluate in future planning cycles.
SD-T-105	22768 BAY BLVD 69 - 22352 IMPRLBCH 69 - ckt 1	TL0645 BAY BLVD-OTAY ck 1 _TL0646 BAY BLVD - OTAY ck 2	C	N-1-1	127%	136%	<80%	Dispatch local generation
SD-T-106	22768 BAY BLVD 69 - 22604 OTAY 69 - ckt 1	TL0646 BAY BLVD - OTAY ck 2 _TL0647 BAY BLVD - IMPRLBCH ck 1	C	N-1-1	98%	106%	<80%	Dispatch local generation
SD-T-107	22768 BAY BLVD 69 - 22604 OTAY 69 - ckt 2	TL0645 BAY BLVD-OTAY ck 1 _TL0647 BAY BLVD - IMPRLBCH ck 1	C	N-1-1	99%	108%	<80%	Dispatch local generation
SD-T-108	22771 BAY BLVD 230 - 22464 MIGUEL 230 - ckt 1	TL23004 SANLUSRY - MISSION ck 2 _TL23022 MIGUEL - MISSION ck 1	C	N-1-1	N/A	N/A	100%	Re-evaluate in future planning cycles.
SD-T-109	22820 SWEETWTR 69 - 22824 SWTWTRTP 69 - ckt 1	TL23022 MIGUEL - MISSION ck 1 _TL23026 SILVERGT - BAY BLVD ck 1	C	N-1-1	91%	103%	118%	Generation dispatch or switching solution or local network load drop prior to the second contingency
SD-T-110	22832 SYCAMORE 230 - 22828 SYCAMORE 69 - ckt 1	SX BK 71 230/69 _SX BK 72 230/69	C	N-1-1	110%	123%	132%	Generation dispatch or switching solution or local network load drop prior to the second contingency
SD-T-111	22832 SYCAMORE 230 - 22828 SYCAMORE 69 - ckt 2	SX BK 70 230/69 _SX BK 71 230/69	C	N-1-1	115%	129%	138%	Generation dispatch or switching solution or local network load drop prior to the second contingency
SD-T-112	22832 SYCAMORE 230 - 22828 SYCAMORE 69 - ckt 3	LC BK 51 69/138 _SX BK 70 230/69	C	N-1-1	85%	95%	102%	Re-evaluate in future planning cycles.

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014	2017	2022	
SD-T-113	22840 TALEGA 138 - 22656 PICO 138 - ckt 1	TL13834 CAPSTRNO-TRABUCO ck 1 _TL13846 TALEGA-TA TAP33-PICO-SMO	C	N-1-1	113%	N/A	N/A	Previously approved M-SOCRUP will mitigate this issue. Install SPS or operational solution in the interim
SD-T-114	22840 TALEGA 138 - 22842 TA TAP33 138 - ckt 1	TL13828 SYCAMORE-CARLTNHS ck 1 _TL13836 TALEGA-PICO ck 1	C	N-1-1	114%	N/A	N/A	Previously approved M-SOCRUP will mitigate this issue. Install SPS or operational solution in the interim
SD-T-115	22842 TA TAP33 138 - 22656 PICO 138 - ckt 1	TL13828 SYCAMORE-CARLTNHS ck 1 _TL13836 TALEGA-PICO ck 1	C	N-1-1	111%	N/A	N/A	Previously approved M-SOCRUP will mitigate this issue. Install SPS or operational solution in the interim
SD-T-116	22844 TALEGA 230 - 22840 TALEGA 138 - ckt 1	TA BK 62 230/138                      _TA BK 63 230/138	C	N-1-1	120%	N/A	N/A	Previously approved M-SOCRUP will mitigate this issue. Install SPS or operational solution in the interim
SD-T-117	22844 TALEGA 230 - 22840 TALEGA 138 - ckt 3	TA BK 62 230/138                      _TA BK 63 230/138	C	N-1-1	118%	N/A	N/A	Previously approved M-SOCRUP will mitigate this issue. Install SPS or operational solution in the interim
SD-T-118	22856 TOREYPNS 69 - 22200 DUNHILTP 69 - ckt 1	TL0662 PENSQTOS -TOREYPNS ck 1 _TL0665 MIRASNT0-GENESEE ck 1	C	N-1-1	<80%	<80%	120%	Re-evaluate in future planning cycles.
SD-T-119	22856 TOREYPNS 69 - 22200 DUNHILTP 69 - ckt 1	TL06905 GENESEE -PENSQTOS ck 2 _TL06959 MIRASNT0-PENSQTOS ck 1	C	N-1-1	<80%	102%	<80%	Generation dispatch or switching solution or local network load drop prior to the second contingency
SD-T-120	22856 TOREYPNS 69 - 22864 UCM 69 - ckt 1	TL06905 GENESEE -PENSQTOS ck 2 _TL06959 MIRASNT0-PENSQTOS ck 1	C	N-1-1	<80%	109%	<80%	Generation dispatch or switching solution or local network load drop prior to the second contingency

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014	2017	2022	
SD-T-121	22884 WARNERS 69 - 22736 SANTYSBL 69 - ckt 1	TL0681 ASH-FE-VC ck 1 _TL0683 RINCON-LILAC ck 1	C	N-1-1	213%	273%	Diverged	Drop local network load prior to the second contingency or re-rate the line and drop local network load after the second contingency or install an SPS to drop load post-contingency
SD-T-122	22884 WARNERS 69 - 22736 SANTYSBL 69 - ckt 1	TL0682 WARNERS-RINCON ck 1 _TL06926 RINCON -VALCNTR ck 1	C	N-1-1	<80%	<80%	153%	Generation dispatch or switching solution or local network load drop prior to the second contingency

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Summer Off-Peak	2022 Summer Light Load	
SD-T-121	22841 TA TAP 138 - 22396 LAGNA NL 138 - ckt 1	13831/36 N-2 TRIP 13812 SPS8.4C	C	N-2	107%	N/A	N/A	Previously approved M-SOCRUP will mitigate this issue. Install SPS or operational solution in the interim

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014	2017	2022	
SD-dV-01	AVCADOTP 69 kV	TL06912 PENDLETN-SANLUSRY ck 1	B	N-1	-5.41%	-5.70%	-3.61%	Upgrade the 69kV system from Pendleton to Rincon-Warners area and/or change tap settings at Escondido, Talega, San Luis Rey. Distribution caps in automatic mode can also mitigate the deviations.
SD-dV-02	AVOCADO 69 kV	TL06912 PENDLETN-SANLUSRY ck 1	B	N-1	-5.24%	-5.53%	-3.43%	Upgrade the 69kV system from Pendleton to Rincon-Warners area and/or change tap settings at Escondido, Talega, San Luis Rey. Distribution caps in automatic mode can also mitigate the deviations.
SD-dV-03	KETTNER 69 kV	TL0609 KETTNER-B ck 1	B	N-1	-3.12%	-4.98%	-5.12%	Re-evaluate in future planning cycles
SD-dV-04	MNSRATTP 69 kV	TL06912 PENDLETN-SANLUSRY ck 1	B	N-1	-5.03%	-5.31%	-3.22%	Upgrade the 69kV system from Pendleton to Rincon-Warners area and/or change tap settings at Escondido, Talega, San Luis Rey. Distribution caps in automatic mode can also mitigate the deviations.
SD-dV-05	MONSRATE 69 kV	TL06912 PENDLETN-SANLUSRY ck 1	B	N-1	-5.03%	-5.32%	-3.22%	Upgrade the 69kV system from Pendleton to Rincon-Warners area and/or change tap settings at Escondido, Talega, San Luis Rey. Distribution caps in automatic mode can also mitigate the deviations.
SD-dV-06	NORTHCTY 69 kV	TL06952 NORTHCTY-PENSQTOS 69 ck 1	B	N-1	-3.86%	-6.01%	-5.09%	Additional dynamic reactive support or adjust taps on Penasquitos banks. Adjust set points of reactive power sources.
SD-dV-07	PENDLETN 69 kV	TL06912 PENDLETN-SANLUSRY ck 1	B	N-1	-7.38%	-7.67%	-5.58%	Upgrade the 69kV system from Pendleton to Rincon-Warners area and/or change tap settings at Escondido, Talega, San Luis Rey. Distribution caps in automatic mode can also mitigate the deviations.
SD-dV-08	POWAY 69 kV	TL06913 POWAY-POMERADO ck 1	B	N-1	-4.89%	-4.79%	-6.01%	Re-evaluate in future planning cycles
SD-dV-09	WARCYNTP 69 kV	TL06913 POWAY-POMERADO ck 1	B	N-1	-4.18%	-4.05%	-5.06%	Re-evaluate in future planning cycles
SD-dV-10	WARENCYN 69 kV	TL06913 POWAY-POMERADO ck 1	B	N-1	-4.19%	-4.05%	-5.06%	Re-evaluate in future planning cycles

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014	2017	2022	
SD-dV-11	LILAC 69 kV	Lilac 69kV S Bus	C	Bus	-10.80%	-7.90%	-2.20%	Dynamic reactive support or SPS to drop load post-contingency
SD-dV-12	MARGARTA 138 kV	13831/36 N-2 TRIP 13812 SPS8.4C	C	N-2	-10.10%	-0.50%	-0.60%	Dynamic reactive support or SPS to drop load post-contingency
SD-dV-13	PICO 138 kV	13831/36 N-2 TRIP 13812 SPS8.4C	C	N-2	-10.20%	-0.10%	-0.10%	Dynamic reactive support or SPS to drop load post-contingency
SD-dV-14	POMERADO 69 kV	POM-SX #1+#2	C	N-2	-10.00%	-10.60%	-12.30%	Dynamic reactive support or SPS to drop load post-contingency
SD-dV-15	R.MSNVJO 138 kV	13831/36 N-2 TRIP 13812 SPS8.4C	C	N-2	-10.20%	-0.70%	-0.80%	Dynamic reactive support or SPS to drop load post-contingency
SD-dV-16	AVCADOTP 69 kV	TL06912 PENDLETN-SANLUSRY ck 1 _TL06932 LILAC -PALA ck 1	C	N-1-1	-14.70%	-1.20%	-4.00%	Dispatch local generation after the first contingency
SD-dV-17	AVOCADO 69 kV	TL06912 PENDLETN-SANLUSRY ck 1 _TL06932 LILAC -PALA ck 1	C	N-1-1	-14.60%	-1.20%	-3.80%	Dispatch local generation after the first contingency
SD-dV-18	BLDCRKTP 69 kV	TL0681 ASH-FE-VC ck 1 _TL0683 RINCON-LILAC ck 1	C	N-1-1	-4.40%	-11.10%	Diverged	Local network load reduction prior to the second contingency or SPS to drop load after the second contingency
SD-dV-19	BOLDRCRK 69 kV	TL0681 ASH-FE-VC ck 1 _TL0683 RINCON-LILAC ck 1	C	N-1-1	-4.40%	-11.10%	Diverged	Local network load reduction prior to the second contingency or SPS to drop load after the second contingency
SD-dV-20	MNSRATTP 69 kV	TL06912 PENDLETN-SANLUSRY ck 1 _TL06932 LILAC -PALA ck 1	C	N-1-1	-14.30%	-1.30%	-3.60%	Dispatch local generation after the first contingency
SD-dV-21	MONSRATE 69 kV	TL06912 PENDLETN-SANLUSRY ck 1 _TL06932 LILAC -PALA ck 1	C	N-1-1	-14.30%	-1.20%	-3.60%	Dispatch local generation after the first contingency
SD-dV-22	NARROWS 69 kV	TL0681 ASH-FE-VC ck 1 _TL0683 RINCON-LILAC ck 1	C	N-1-1	-4.90%	-10.50%	Diverged	Local network load reduction prior to the second contingency or SPS to drop load after the second contingency
SD-dV-23	PALA 69 kV	TL06912 PENDLETN-SANLUSRY ck 1 _TL06932 LILAC -PALA ck 1	C	N-1-1	-15.40%	-2.10%	-1.80%	Dispatch local generation after the first contingency
SD-dV-24	PA99MW 69 kV	TL06912 PENDLETN-SANLUSRY ck 1 _TL06932 LILAC -PALA ck 1	C	N-1-1	-15.40%	-2.10%	-1.70%	Dispatch local generation after the first contingency
SD-dV-25	PENDLETN 69 kV	TL06912 PENDLETN-SANLUSRY ck 1 _TL06932 LILAC -PALA ck 1	C	N-1-1	-16.80%	-0.90%	-6.00%	Dispatch local generation after the first contingency



**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014	2017	2022	
SD-dV-26	POMERADO 69 kV	TL06915 POMERADO -SYCAMORE ck 1 _TL06924 POMERADO -SYCAMORE ck 2	C	N-1-1	-0.80%	-0.70%	-12.30%	Operational action plan (Dispatch local generation after the first contingency) or rely on the existing SPS which drops load at Rancho Carmel.
SD-dV-27	RINCON 69 kV	TL0681 ASH-FE-VC ck 1 _TL0683 RINCON-LILAC ck 1	C	N-1-1	-11.50%	-32.70%	Diverged	Local network load reduction prior to the second contingency or SPS to drop load after the second contingency
SD-dV-28	SANTYSBL 69 kV	TL0681 ASH-FE-VC ck 1 _TL0683 RINCON-LILAC ck 1	C	N-1-1	-5.70%	-14.10%	Diverged	Local network load reduction prior to the second contingency or SPS to drop load after the second contingency
SD-dV-29	VALCNTR 69 kV	TL0681 ASH-FE-VC ck 1 _TL0683 RINCON-LILAC ck 1	C	N-1-1	-11.50%	-33.20%	Diverged	Local network load reduction prior to the second contingency or SPS to drop load after the second contingency
SD-dV-30	WARNERS 69 kV	TL0681 ASH-FE-VC ck 1 _TL0683 RINCON-LILAC ck 1	C	N-1-1	-5.10%	-16.70%	Diverged	Local network load reduction prior to the second contingency or SPS to drop load after the second contingency

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Summer Off-Peak	2022 Summer Light Load	
SD-dV-31	BARRETT 69 kV	TL06957 LL-BAR ck 1	B	N-1	3.10%	1.50%	-5.20%	Re-evaluate in future planning cycles

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014	2017	2022	
SD-V-01	ALPINE 69 kV	Base system (n-0)	A	N-0	1.06	1.03	1.02	Voltage schedules to be adjusted appropriately and/or use of voltage control devices to maintain voltages within desired operating range.
SD-V-02	BARRETT 69 kV	Base system (n-0)	A	N-0	1.07	1.03	1.03	
SD-V-03	BLDCRKTP 69 kV	Base system (n-0)	A	N-0	1.05	1.03	1.02	
SD-V-04	BOLDRCRK 69 kV	Base system (n-0)	A	N-0	1.05	1.03	1.02	
SD-V-05	CAMERNTP 69 kV	Base system (n-0)	A	N-0	1.09	1.03	1.02	
SD-V-06	BOULEVRD 69 kV	Base system (n-0)	A	N-0	1.07	1.06	1.07	
SD-V-07	CAMERON 69 kV	Base system (n-0)	A	N-0	1.08	1.03	1.02	
SD-V-08	DESCANSO 69 kV	Base system (n-0)	A	N-0	1.07	1.03	1.02	
SD-V-09	GLENCLIF 69 kV	Base system (n-0)	A	N-0	1.08	1.03	1.02	
SD-V-10	GLNCLFTP 69 kV	Base system (n-0)	A	N-0	1.08	1.03	1.02	
SD-V-11	LOSCOCHS 69 kV	Base system (n-0)	A	N-0	1.05	1.04	1.03	
SD-V-12	LOVELAND 69 kV	Base system (n-0)	A	N-0	1.06	1.03	1.02	
SD-V-13	CRESTWD 69 kV	Base system (n-0)	A	N-0	1.11	1.03	1.03	
SD-V-14	KUMEYAA 69 kV	Base system (n-0)	A	N-0	1.11	1.03	1.03	
SD-V-15	LILAC 69 kV	Lilac 69kV S Bus	C	Bus	0.89	0.92	0.98	
SD-V-16	AVCADOTP 69 kV	TL06912 PENDLETN-SANLUSRY ck 1 _TL06932 LILAC -PALA ck 1	C	N-1-1	0.85	0.98	0.95	Dispatch local generation after the first contingency
SD-V-17	AVOCADO 69 kV	TL06912 PENDLETN-SANLUSRY ck 1 _TL06932 LILAC -PALA ck 1	C	N-1-1	0.84	0.97	0.94	Dispatch local generation after the first contingency
SD-V-18	MNSRATTP 69 kV	TL06912 PENDLETN-SANLUSRY ck 1 _TL06932 LILAC -PALA ck 1	C	N-1-1	0.85	0.98	0.95	Dispatch local generation after the first contingency
SD-V-19	MNSRATTP 69 kV	TL06912 PENDLETN-SANLUSRY ck 1 _TL06932 LILAC -PALA ck 1	C	N-1-1	0.85	0.98	0.95	Dispatch local generation after the first contingency
SD-V-20	MONSRATE 69 kV	TL06912 PENDLETN-SANLUSRY ck 1 _TL06932 LILAC -PALA ck 1	C	N-1-1	0.85	0.98	0.95	Dispatch local generation after the first contingency
SD-V-21	PALA 69 kV	TL06912 PENDLETN-SANLUSRY ck 1 _TL06932 LILAC -PALA ck 1	C	N-1-1	0.84	0.97	0.97	Dispatch local generation after the first contingency
SD-V-22	PA99MW 69 kV	TL06912 PENDLETN-SANLUSRY ck 1 _TL06932 LILAC -PALA ck 1	C	N-1-1	0.84	0.97	0.97	Dispatch local generation after the first contingency
SD-V-23	PENDLETN 69 kV	TL06912 PENDLETN-SANLUSRY ck 1 _TL06932 LILAC -PALA ck 1	C	N-1-1	0.83	0.99	0.94	Dispatch local generation after the first contingency

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014	2017	2022	
SD-V-24	RINCON 69 kV	TL0681 ASH-FE-VC ck 1 _TL0683 RINCON-LILAC ck 1	C	N-1-1	0.90	0.68	Diverged	Load reduction in the local area network prior to the second contingency or SPS to drop load after the second contingency
SD-V-25	SANTYSBL 69 kV	TL0681 ASH-FE-VC ck 1 _TL0683 RINCON-LILAC ck 1	C	N-1-1	0.99	0.88	Diverged	Load reduction in the local area network prior to the second contingency or SPS to drop load after the second contingency
SD-V-26	VALCNTR 69 kV	TL0681 ASH-FE-VC ck 1 _TL0683 RINCON-LILAC ck 1	C	N-1-1	0.89	0.67	Diverged	Load reduction in the local area network prior to the second contingency or SPS to drop load after the second contingency
SD-V-27	WARNERS 69 kV	TL0681 ASH-FE-VC ck 1 _TL0683 RINCON-LILAC ck 1	C	N-1-1	0.99	0.86	Diverged	Load reduction in the local area network prior to the second contingency or SPS to drop load after the second contingency

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Summer Off-Peak	2022 Summer Light Load	
SD-V-28	ALPINE 69 kV	Base system (n-0)	A	N-0	1.11	1.05	1.08	Voltage schedules to be adjusted appropriately and/or use of voltage control devices to maintain voltages within desired operating range.
SD-V-29	BOLDRCRK 69 kV	Base system (n-0)	A	N-0	1.09	1.04	1.07	Same as above
SD-V-30	LRKSP_BD 69 kV	Base system (n-0)	A	N-0	1.06	1.03	1.06	Same as above
SD-V-31	BORDER 69 kV	Base system (n-0)	A	N-0	1.06	1.03	1.06	Same as above
SD-V-32	BORREGO 69 kV	Base system (n-0)	A	N-0	1.11	1.02	1.09	Same as above
SD-V-33	CAMERON 69 kV	Base system (n-0)	A	N-0	1.12	1.06	1.06	Same as above
SD-V-34	CHOLLAS 69 kV	Base system (n-0)	A	N-0	1.05	1.02	1.05	Same as above
SD-V-35	CLAIRMNT 69 kV	Base system (n-0)	A	N-0	1.06	1.04	1.07	Same as above
SD-V-36	EC GEN1 69 kV	Base system (n-0)	A	N-0	1.09	1.04	1.08	Same as above
SD-V-37	CREELMAN 69 kV	Base system (n-0)	A	N-0	1.08	1.04	1.07	Same as above
SD-V-38	DEL MAR 69 kV	Base system (n-0)	A	N-0	1.08	1.04	1.08	Same as above
SD-V-39	DESCANSO 69 kV	Base system (n-0)	A	N-0	1.11	1.05	1.08	Same as above
SD-V-40	DOUBLET 69 kV	Base system (n-0)	A	N-0	1.08	1.04	1.08	Same as above
SD-V-41	DUNHILL 69 kV	Base system (n-0)	A	N-0	1.08	1.04	1.08	Same as above
SD-V-42	EASTGATE 69 kV	Base system (n-0)	A	N-0	1.07	1.04	1.07	Same as above
SD-V-43	EL CAJON 69 kV	Base system (n-0)	A	N-0	1.09	1.04	1.08	Same as above
SD-V-44	ELLIOTT 69 kV	Base system (n-0)	A	N-0	1.06	1.05	1.07	Same as above
SD-V-45	ENCNITAS 69 kV	Base system (n-0)	A	N-0	1.07	1.04	1.07	Same as above
SD-V-46	F 69 kV	Base system (n-0)	A	N-0	1.06	1.05	1.08	Same as above
SD-V-47	FENTON 69 kV	Base system (n-0)	A	N-0	1.06	1.03	1.07	Same as above
SD-V-48	GARFIELD 69 kV	Base system (n-0)	A	N-0	1.08	1.04	1.08	Same as above
SD-V-49	GENESEE 69 kV	Base system (n-0)	A	N-0	1.08	1.04	1.07	Same as above
SD-V-50	GLENCLIF 69 kV	Base system (n-0)	A	N-0	1.12	1.06	1.06	Same as above
SD-V-51	GRANITE 69 kV	Base system (n-0)	A	N-0	1.09	1.04	1.09	Same as above
SD-V-52	IMPRLBCH 69 kV	Base system (n-0)	A	N-0	1.06	1.03	1.05	Same as above
SD-V-53	IMPRLVLY 500 kV	Base system (n-0)	A	N-0	1.04	1.05	1.04	Same as above
SD-V-54	JAMACHA 69 kV	Base system (n-0)	A	N-0	1.07	1.03	1.07	Same as above
SD-V-55	KEARNY 69 kV	Base system (n-0)	A	N-0	1.06	1.05	1.07	Same as above

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Summer Off-Peak	2022 Summer Light Load	
SD-V-56	KYOCERA 69 kV	Base system (n-0)	A	N-0	1.06	1.05	1.07	Same as above
SD-V-57	LA JOLLA 69 kV	Base system (n-0)	A	N-0	1.06	1.03	1.06	Same as above
SD-V-58	LOSCOCHS 69 kV	Base system (n-0)	A	N-0	1.11	1.06	1.09	Same as above
SD-V-59	LOVELAND 69 kV	Base system (n-0)	A	N-0	1.11	1.05	1.08	Same as above
SD-V-60	MESA RIM 69 kV	Base system (n-0)	A	N-0	1.06	1.03	1.07	Same as above
SD-V-61	MESAHGTS 69 kV	Base system (n-0)	A	N-0	1.06	1.05	1.07	Same as above
SD-V-62	MIGUEL 69 kV	Base system (n-0)	A	N-0	1.05	1.03	1.05	Same as above
SD-V-63	MIRAMAR 69 kV	Base system (n-0)	A	N-0	1.06	1.03	1.07	Same as above
SD-V-64	MIRAMAR1 69 kV	Base system (n-0)	A	N-0	1.06	1.04	1.07	Same as above
SD-V-65	MISSION 69 kV	Base system (n-0)	A	N-0	1.07	1.05	1.08	Same as above
SD-V-66	MONTGMRY 69 kV	Base system (n-0)	A	N-0	1.06	1.04	1.05	Same as above
SD-V-67	MURRAY 69 kV	Base system (n-0)	A	N-0	1.08	1.04	1.08	Same as above
SD-V-68	N.GILA 500 kV	Base system (n-0)	A	N-0	1.05	1.07	1.06	Same as above
SD-V-69	NARROWS 69 kV	Base system (n-0)	A	N-0	1.10	1.03	1.09	Same as above
SD-V-70	NORTHCTY 69 kV	Base system (n-0)	A	N-0	1.07	1.04	1.07	Same as above
SD-V-71	Lkhodges 69 kV	Base system (n-0)	A	N-0	1.05	1.02	1.05	Same as above
SD-V-72	OTAY 69 kV	Base system (n-0)	A	N-0	1.06	1.04	1.05	Same as above
SD-V-73	OTAYLAKE 69 kV	Base system (n-0)	A	N-0	1.06	1.03	1.06	Same as above
SD-V-74	OY GEN 69 kV	Base system (n-0)	A	N-0	1.06	1.04	1.05	Same as above
SD-V-75	PARADISE 69 kV	Base system (n-0)	A	N-0	1.05	1.03	1.05	Same as above
SD-V-76	PENSQTOS 69 kV	Base system (n-0)	A	N-0	1.08	1.04	1.08	Same as above
SD-V-77	R.SNTAFE 69 kV	Base system (n-0)	A	N-0	1.06	1.03	1.06	Same as above
SD-V-78	RINCON 69 kV	Base system (n-0)	A	N-0	1.05	1.01	1.05	Same as above
SD-V-79	ROSE CYN 69 kV	Base system (n-0)	A	N-0	1.06	1.04	1.07	Same as above
SD-V-80	SANTYSBL 69 kV	Base system (n-0)	A	N-0	1.08	1.03	1.07	Same as above
SD-V-81	SANYSDRO 69 kV	Base system (n-0)	A	N-0	1.06	1.03	1.05	Same as above
SD-V-82	SCRIPPS 69 kV	Base system (n-0)	A	N-0	1.05	1.03	1.06	Same as above
SD-V-83	BAY BLVD 69 kV	Base system (n-0)	A	N-0	1.06	1.04	1.05	Same as above
SD-V-84	SPRNGVLY 69 kV	Base system (n-0)	A	N-0	1.06	1.03	1.06	Same as above
SD-V-85	SUNYSIDE 69 kV	Base system (n-0)	A	N-0	1.05	1.03	1.05	Same as above
SD-V-86	SWEETWTR 69 kV	Base system (n-0)	A	N-0	1.05	1.03	1.05	Same as above

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Summer Off-Peak	2022 Summer Light Load	
SD-V-87	TOREYPNS 69 kV	Base system (n-0)	A	N-0	1.08	1.04	1.08	Same as above
SD-V-88	UCM 69 kV	Base system (n-0)	A	N-0	1.08	1.04	1.07	Same as above
SD-V-89	WARNERS 69 kV	Base system (n-0)	A	N-0	1.08	1.03	1.07	Same as above
SD-V-90	CRESTWD 69 kV	Base system (n-0)	A	N-0	1.13	1.08	1.05	Same as above
SD-V-91	KUMEYAAY 69 kV	Base system (n-0)	A	N-0	1.13	1.08	1.05	Same as above
SD-V-92	CALPK_BD 69 kV	Base system (n-0)	A	N-0	1.06	1.03	1.06	Same as above
SD-V-93	EC GEN2 69 kV	Base system (n-0)	A	N-0	1.09	1.04	1.08	Same as above
SD-V-94	MIRASNT0 69 kV	Base system (n-0)	A	N-0	1.08	1.04	1.08	Same as above
SD-V-95	SALT CREEK 69 kV	Base system (n-0)	A	N-0	N/A	1.03	1.05	Same as above

**Post-Transient Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014	2017	2022	
PSTR-local-SD-T-01	MIGUEL 230.0 - BAY BLVD 230.0 #1	Miguel - Mission 230kV line #1 and #2	C	N-2	<100%	<100%	100.20%	Generation curtailment or Re-rate the line or Reconductor. Re-evaluate in future planning cycles.
PSTR-local-SD-T-02	ESCNDIDO 230.0 - TA230 TA 230.0 #1	SONGS - Capistrano and SONGS - Talega 230kV lines	C	N-2	N/A	<100%	107.00%	Re-rate the line or SPS to shed local network load post-contingency. Re-evaluate in future planning cycles.
PSTR-bulk-SD-T-01	MIGUEL 230 - BAY BLVD 230 #1	Base case	A	N-0	<100%	<100%	104%	Generation curtailment or Re-rate the line or Reconductor. Re-evaluate in future planning cycles.
PSTR-bulk-SD-T-02	MIGUEL 230.0 BAY BLVD 230.0 #1	Miguel - Mission 230kV line #1 and #2	C	N-2	<100%	<100%	109.00%	Generation curtailment or Re-rate the line or Reconductor. Re-evaluate in future planning cycles.
PSTR-bulk-SD-T-03	ESCNDIDO 230.0 TA230 TA 230.0 #1	SONGS - Capistrano and SONGS - Talega 230kV lines	C	N-2	N/A	<100%	104%	Re-rate the line or SPS to shed local network load post-contingency. Re-evaluate in future planning cycles.



**Post-Transient Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					Select..	Select..	Select..	

No post-transient thermal overloads identified.

**Post-Transient Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Summer Off-Peak	2022 Summer Light Load	
PSTR-local-SD-dV-01	Miguel 500kV	Miguel - ECO 500KV line	B	N-1	5.80%	6.40%	<5%	Operate local SVDs in automatic mode and/or add dynamic reactive support
PSTR-bulk-SD-dV-01	Miguel 500kV	Miguel - ECO 500KV line	B	N-1	5.80%	<5%	<5%	Operate local SVDs in automatic mode and/or add dynamic reactive support
PSTR-bulk-SD-dV-02	Eastern and central 69kV system	Miguel-ECO 500kV with CFE cross-trip	B	N-1	N/A	N/A	6% to 9%	Operate SVDs and distribution capacitors in automatic mode under peak load conditions to mitigate the deviations and/or add dynamic reactive support
PSTR-bulk-SD-dV-03 (ADD)	-	Sunrise Power Link + Miguel - ECO	C	N-1-1	<10%	<10%	Diverged	Dynamic reactive support in SDG&E and/or additional internal generation in San Diego area

**Post-Transient Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					Select..	Select..	Select..	

No post-transient voltage deviations identified.

2012/2013 ISO Reliability Assessment - Final Study Results

Study Area: **San Diego Area**



**Single Contingency Load Drop**

ID	Worst Contingency	Category	Category Description	Amount of Load Drop (MW)			Potential Mitigation Solutions
				2014	2017	2022	

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

2012/2013 ISO Reliability Assessment - Final Study Results

Study Area: **San Diego Area**



**Single Source Substation with more than 100 MW Load**

ID	Substation	Load Served (MW)			Potential Mitigation Solutions
		2014	2017	2022	

No single source substation with more than 100 MW Load

**Appendix C-31**  
**VEA without Renewables**

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
VEA-T-74	CANYON 138 kV---COLDCREK 138 kV Ckt #1	Line PAHRUMP 138.0 to VISTA 138.0 Circuit 1	B	L-1	100%	52%	49%	Eliminated by the Innovation-Mercury Switch 138 kV Line and Innovation 230/138 kV Sub project. Prior to the project, request NVE to operate the Nwest 138 kV bus voltage at about 1.03 pu
VEA-T-75	CANYON 138 kV---SNOW MTN 138 kV Ckt #1		B	L-1	101%	53%	50%	
VEA-T-76	NWEST 138 kV---SNOW MTN 138 kV Ckt #1		B	L-1	102%	69%	65%	
VEA-T-77	PAHRUMP_1 230 kV---PAHRUMP 138 kV Ckt #2	Tran PAHRUMP_1 230.00 to PAHRUMP 138.00 Circuit 1 0.00	B	L-1	93%	98%	107%	Eliminated by the Innovation-Mercury Switch 138 kV Line and Innovation 230/138 kV Sub project.
VEA-T-78	PAHRUMP_1 230 kV---PAHRUMP 138 kV Ckt #1	Tran PAHRUMP_1 230.00 to PAHRUMP 138.00 Circuit 2 0.00	B	L-1	93%	99%	107%	Eliminated by the Innovation-Mercury Switch 138 kV Line and Innovation 230/138 kV Sub project.
VEA-T-79	CANYON 138 kV---COLDCREK 138 kV Ckt #1	Brkr Fail VISTA-PAHRUMP 138 & VISTA-CHARLESTON 138 1.000 CatC BKR Flt	C	Breaker Failure	NA	109%	96%	Eliminated by the Innovation-Mercury Switch 138 kV Line and Innovation 230/138 kV Sub project.
VEA-T-80	CANYON 138 kV---SNOW MTN 138 kV Ckt #1		C	Breaker Failure	NA	109%	97%	
VEA-T-81	COLDCREK 138 kV---RADAR 138 kV Ckt #1		C	Breaker Failure	NA	105%	91%	
VEA-T-82	IS TAP 138 kV---RADAR 138 kV Ckt #1		C	Breaker Failure	NA	104%	90%	
VEA-T-83	NWEST 138 kV---SNOW MTN 138 kV Ckt #1		C	Breaker Failure	NA	110%	98%	

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
VEA-T-84	CANYON 138 kV---COLDCREK 138 kV Ckt #1	Brkr Fail PAHRUMP-VISTA 138 & PAHRUMP-GAMEBIRD 138 1.000 CatC BKR Flt	C	Breaker Failure	100%	90%	89%	Eliminated by the Innovation-Mercury Switch 138 kV Line and Innovation 230/138 kV Sub project.
VEA-T-85	CANYON 138 kV---SNOW MTN 138 kV Ckt #1		C	Breaker Failure	101%	91%	89%	
VEA-T-86	NWEST 138 kV---SNOW MTN 138 kV Ckt #1		C	Breaker Failure	102%	92%	91%	
VEA-T-87	CANYON 138 kV---COLDCREK 138 kV Ckt #1	Line PAHRUMP 138.0 to VISTA 138.0 Ckt 1_Line GAMEBIRD 138.0 to THSNDAIR 138.0 Ckt 1	C	L-1/L-1	100%	Not Solved	Not Solved	Eliminated by the Innovation-Mercury Switch 138 kV Line and Innovation 230/138 kV Sub project
VEA-T-88	CANYON 138 kV---SNOW MTN 138 kV Ckt #1		C	L-1/L-1	101%	Not Solved	Not Solved	
VEA-T-89	NWEST 138 kV---SNOW MTN 138 kV Ckt #1		C	L-1/L-1	102%	Not Solved	Not Solved	
VEA-T-90	CANYON 138 kV---SNOW MTN 138 kV Ckt #1	Line PAHRUMP 138.0 to VISTA 138.0 Ckt 1_Line THSNDAIR 138.0 to CHARLSTN 138.0 Ckt 1	C	L-1/L-1	101%	132%	118%	Eliminated by the Innovation-Mercury Switch 138 kV Line and Innovation 230/138 kV Sub project
VEA-T-91	IS TAP 138 kV---RADAR 138 kV Ckt #1		C	L-1/L-1	96%	126%	111%	
VEA-T-92	NWEST 138 kV---SNOW MTN 138 kV Ckt #1		C	L-1/L-1	102%	133%	119%	
VEA-T-93	CANYON 138 kV---COLDCREK 138 kV Ckt #1	Line NWEST 230.0 to DESERT VIEW 230.0 Ckt 1_Line PAHRUMP_1 230.0 to CRAZY EYE TP 230.0 Ckt 1	C	L-1/L-1	123%	128%	134%	operate the 138 kV system in radial with three independent supplies from Amargosa, Pahrump, and Jackass Flat transmission sources after first contingency to isolate potential impact on the vicinity area (Zone 183/187)
VEA-T-94	COLDCREK 138 kV---RADAR 138 kV Ckt #1		C	L-1/L-1	118%	123%	126%	
VEA-T-95	IS TAP 138 kV---MERCERYSW 138 kV Ckt #1		C	L-1/L-1	111%	115%	116%	
VEA-T-96	IS TAP 138 kV---RADAR 138 kV Ckt #1		C	L-1/L-1	118%	123%	126%	
VEA-T-97	NWEST 138 kV---SNOW MTN 138 kV Ckt #1		C	L-1/L-1	124%	130%	136%	



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**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
VEA-T-98	COLDCREK 138 kV---RADAR 138 kV Ckt #1	Line NWEST 230.0 to DESERT VIEW 230.0 Ckt 1_Line CRAZY EYE TP 230.0 to BOB TAP 230.0 Ckt 1	C	L-1/L-1	117%	122%	125%	operate the 138 kV system in radial with three independent supplies from Amargosa, Pahrump, and Jackass Flat transmission sources after first contingency to isolate impact on the vicinity area (Zone 183/187)
VEA-T-99	IS TAP 138 kV---MERCERYSW 138 kV Ckt #1		C	L-1/L-1	110%	114%	115%	
VEA-T-100	IS TAP 138 kV---RADAR 138 kV Ckt #1		C	L-1/L-1	117%	122%	125%	
VEA-T-101	NWEST 138 kV---SNOW MTN 138 kV Ckt #1		C	L-1/L-1	123%	129%	134%	
VEA-T-102	AMARGOSA 230 kV---AMARGOSA 138 kV Ckt #1	Line PAHRUMP_1 230.0 to DESERT VIEW 230.0 Ckt 1_Line PAHRUMP_1 230.0 to CRAZY EYE TP 230.0 Ckt 1	C	L-1/L-1	141%	153%	159%	operate the 138 kV system in radial with three independent supplies from Amargosa, Pahrump, and Jackass Flat transmission sources after first contingency to isolate potential impact on the vicinity area (Zone 183/187)
VEA-T-103	CANYON 138 kV---COLDCREK 138 kV Ckt #1		C	L-1/L-1	129%	135%	142%	
VEA-T-104	CANYON 138 kV---SNOW MTN 138 kV Ckt #1		C	L-1/L-1	129%	135%	142%	
VEA-T-105	COLDCREK 138 kV---RADAR 138 kV Ckt #1		C	L-1/L-1	123%	129%	134%	
VEA-T-106	IS TAP 138 kV---MERCERYSW 138 kV Ckt #1		C	L-1/L-1	116%	121%	123%	
VEA-T-107	IS TAP 138 kV---RADAR 138 kV Ckt #1		C	L-1/L-1	123%	129%	133%	
VEA-T-108	NWEST 138 kV---SNOW MTN 138 kV Ckt #1		C	L-1/L-1	130%	136%	143%	

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
VEA-T-109	AMARGOSA 230 kV---AMARGOSA 138 kV Ckt #1	Line PAHRUMP_1 230.0 to DESERT VIEW 230.0 Ckt 1_Line CRAZY EYE TP 230.0 to BOB TAP 230.0 Ckt 1	C	L-1/L-1	140%	151%	157%	operate the 138 kV system in radial with three independent supplies from Amargosa, Pahrump, and Jackass Flat transmission sources after first contingency to isolate potential impact on the vicinity area (Zone 183/187)
VEA-T-110	CANYON 138 kV---COLDCREK 138 kV Ckt #1		C	L-1/L-1	127%	133%	140%	
VEA-T-111	CANYON 138 kV---SNOW MTN 138 kV Ckt #1		C	L-1/L-1	128%	133%	140%	
VEA-T-112	COLDCREK 138 kV---RADAR 138 kV Ckt #1		C	L-1/L-1	122%	127%	132%	
VEA-T-113	IS TAP 138 kV---MERCERYSW 138 kV Ckt #1		C	L-1/L-1	115%	120%	122%	
VEA-T-114	IS TAP 138 kV---RADAR 138 kV Ckt #1		C	L-1/L-1	122%	127%	132%	
VEA-T-115	NWEST 138 kV---SNOW MTN 138 kV Ckt #1		C	L-1/L-1	129%	134%	142%	
VEA-T-116	AMARGOSA 230 kV---AMARGOSA 138 kV Ckt #1	Tran PAHRUMP_1 230.00 to PAHRUMP 138.00 Ckt 1 0.00_Tran PAHRUMP_1 230.00 to PAHRUMP 138.00 Ckt 2 0.00	C	T-1/T-1	141%	153%	159%	Eliminated by the Innovation-Mercury Switch 138 kV Line and Innovation 230/138 kV Sub project
VEA-T-117	CANYON 138 kV---COLDCREK 138 kV Ckt #1		C	T-1/T-1	129%	135%	142%	
VEA-T-118	CANYON 138 kV---SNOW MTN 138 kV Ckt #1		C	T-1/T-1	129%	135%	142%	
VEA-T-119	COLDCREK 138 kV---RADAR 138 kV Ckt #1		C	T-1/T-1	123%	129%	133%	
VEA-T-120	IS TAP 138 kV---MERCERYSW 138 kV Ckt #1		C	T-1/T-1	116%	122%	123%	
VEA-T-121	IS TAP 138 kV---RADAR 138 kV Ckt #1		C	T-1/T-1	123%	129%	133%	
VEA-T-122	NWEST 138 kV---SNOW MTN 138 kV Ckt #1		C	T-1/T-1	130%	136%	143%	

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Study Area: **Valley Electric Association - Summer Peak**



**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
VEA-T-123	PAHRUMP_1 230 kV---PAHRUMP 138 kV Ckt #2	Line AMARGOSA 138.0 to SANDY 138.0 Ckt 1_Tran PAHRUMP_1 230.00 to PAHRUMP 138.00 Ckt 1 0.00	C	T-1/L-1	107%	115%	118%	Eliminated by the Innovation-Mercury Switch 138 kV Line and Innovation 230/138 kV Sub project
VEA-T-124	PAHRUMP_1 230 kV---PAHRUMP 138 kV Ckt #1	Line AMARGOSA 138.0 to SANDY 138.0 Ckt 1_Tran PAHRUMP_1 230.00 to PAHRUMP 138.00 Ckt 2 0.00	C	T-1/L-1	107%	115%	118%	Eliminated by the Innovation-Mercury Switch 138 kV Line and Innovation 230/138 kV Sub project
VEA-T-125	PAHRUMP_1 230 kV---PAHRUMP 138 kV Ckt #2	Line GAMEBIRD 138.0 to GAMEBIRD_PST 138.0 Ckt bp_Tran PAHRUMP_1 230.00 to PAHRUMP 138.00 Ckt 1 0.00	C	T-1/L-1	103%	111%	114%	Eliminated by the Innovation-Mercury Switch 138 kV Line and Innovation 230/138 kV Sub project
VEA-T-126	PAHRUMP_1 230 kV---PAHRUMP 138 kV Ckt #1	Line GAMEBIRD 138.0 to GAMEBIRD_PST 138.0 Ckt bp_Tran PAHRUMP_1 230.00 to PAHRUMP 138.00 Ckt 2 0.00	C	T-1/L-1	103%	111%	114%	Eliminated by the Innovation-Mercury Switch 138 kV Line and Innovation 230/138 kV Sub project
VEA-T-127	PAHRUMP_1 230 kV---PAHRUMP 138 kV Ckt #2	Line SANDY 138.0 to GAMEBIRD_PST 138.0 Ckt 1_Tran PAHRUMP_1 230.00 to PAHRUMP 138.00 Ckt 1 0.00	C	T-1/L-1	103%	111%	114%	Eliminated by the Innovation-Mercury Switch 138 kV Line and Innovation 230/138 kV Sub project
VEA-T-128	PAHRUMP_1 230 kV---PAHRUMP 138 kV Ckt #1	Line SANDY 138.0 to GAMEBIRD_PST 138.0 Ckt 1_Tran PAHRUMP_1 230.00 to PAHRUMP 138.00 Ckt 2 0.00	C	T-1/L-1	103%	111%	114%	Eliminated by the Innovation-Mercury Switch 138 kV Line and Innovation 230/138 kV Sub project
VEA-T-129	PAHRUMP_1 230 kV---PAHRUMP 138 kV Ckt #2	Tran AMARGOSA 230.00 to AMARGOSA 138.00 Ckt 1 0.00_Tran PAHRUMP_1 230.00 to PAHRUMP 138.00 Ckt 1 0.00	C	T-1/T-1	106%	114%	118%	Eliminated by the Innovation-Mercury Switch 138 kV Line and Innovation 230/138 kV Sub project

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
VEA-T-130	PAHRUMP_1 230 kV---PAHRUMP 138 kV Ckt #1	Tran AMARGOSA 230.00 to AMARGOSA 138.00 Ckt 1 0.00_Tran PAHRUMP_1 230.00 to PAHRUMP 138.00 Ckt 2 0.00	C	T-1/T-1	107%	114%	118%	Eliminated by the Innovation-Mercury Switch 138 kV Line and Innovation 230/138 kV Sub project
VEA-T-131	PAHRUMP_1 230 kV---PAHRUMP 138 kV Ckt #2	Tran PAHRUMP_1 230.00 to PAHRUMP 138.00 Ckt 1 0.00_Line IS TAP 138.0 to MERCRYSW 138.0 Ckt 1	C	T-1/L-1	108%	112%	117%	Eliminated by the Innovation-Mercury Switch 138 kV Line and Innovation 230/138 kV Sub project
VEA-T-132	PAHRUMP_1 230 kV---PAHRUMP 138 kV Ckt #2	Tran PAHRUMP_1 230.00 to PAHRUMP 138.00 Ckt 1 0.00_Line CANYON 138.0 to COLDCREK 138.0 Ckt 1	C	T-1/L-1	115%	119%	127%	Eliminated by the Innovation-Mercury Switch 138 kV Line and Innovation 230/138 kV Sub project
VEA-T-133	PAHRUMP_1 230 kV---PAHRUMP 138 kV Ckt #2	Tran PAHRUMP_1 230.00 to PAHRUMP 138.00 Ckt 1 0.00_Line CANYON 138.0 to SNOW MTN 138.0 Ckt 1	C	T-1/L-1	115%	119%	127%	Eliminated by the Innovation-Mercury Switch 138 kV Line and Innovation 230/138 kV Sub project
VEA-T-134	PAHRUMP_1 230 kV---PAHRUMP 138 kV Ckt #2	Tran PAHRUMP_1 230.00 to PAHRUMP 138.00 Ckt 1 0.00_Line COLDCREK 138.0 to RADAR 138.0 Ckt 1	C	T-1/L-1	111%	116%	122%	Eliminated by the Innovation-Mercury Switch 138 kV Line and Innovation 230/138 kV Sub project
VEA-T-135	PAHRUMP_1 230 kV---PAHRUMP 138 kV Ckt #2	Tran PAHRUMP_1 230.00 to PAHRUMP 138.00 Ckt 1 0.00_Line IS TAP 138.0 to RADAR 138.0 Ckt 1	C	T-1/L-1	111%	116%	122%	Eliminated by the Innovation-Mercury Switch 138 kV Line and Innovation 230/138 kV Sub project
VEA-T-136	PAHRUMP_1 230 kV---PAHRUMP 138 kV Ckt #2	Tran PAHRUMP_1 230.00 to PAHRUMP 138.00 Ckt 1 0.00_Line NWEST 138.0 to SNOW MTN 138.0 Ckt 1	C	T-1/L-1	115%	120%	128%	Eliminated by the Innovation-Mercury Switch 138 kV Line and Innovation 230/138 kV Sub project

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**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
VEA-T-137	PAHRUMP_1 230 kV---PAHRUMP 138 kV Ckt #1	Tran PAHRUMP_1 230.00 to PAHRUMP 138.00 Ckt 2 0.00_Line IS TAP 138.0 to MERCYSW 138.0 Ckt 1	C	T-1/L-1	108%	113%	117%	Eliminated by the Innovation-Mercury Switch 138 kV Line and Innovation 230/138 kV Sub project
VEA-T-138	PAHRUMP_1 230 kV---PAHRUMP 138 kV Ckt #1	Tran PAHRUMP_1 230.00 to PAHRUMP 138.00 Ckt 2 0.00_Line CANYON 138.0 to COLDCREK 138.0 Ckt 1	C	T-1/L-1	115%	120%	127%	Eliminated by the Innovation-Mercury Switch 138 kV Line and Innovation 230/138 kV Sub project
VEA-T-139	PAHRUMP_1 230 kV---PAHRUMP 138 kV Ckt #1	Tran PAHRUMP_1 230.00 to PAHRUMP 138.00 Ckt 2 0.00_Line CANYON 138.0 to SNOW MTN 138.0 Ckt 1	C	T-1/L-1	115%	120%	127%	Eliminated by the Innovation-Mercury Switch 138 kV Line and Innovation 230/138 kV Sub project
VEA-T-140	PAHRUMP_1 230 kV---PAHRUMP 138 kV Ckt #1	Tran PAHRUMP_1 230.00 to PAHRUMP 138.00 Ckt 2 0.00_Line COLDCREK 138.0 to RADAR 138.0 Ckt 1	C	T-1/L-1	111%	116%	122%	Eliminated by the Innovation-Mercury Switch 138 kV Line and Innovation 230/138 kV Sub project
VEA-T-141	PAHRUMP_1 230 kV---PAHRUMP 138 kV Ckt #1	Tran PAHRUMP_1 230.00 to PAHRUMP 138.00 Ckt 2 0.00_Line IS TAP 138.0 to RADAR 138.0 Ckt 1	C	T-1/L-1	111%	116%	122%	Eliminated by the Innovation-Mercury Switch 138 kV Line and Innovation 230/138 kV Sub project
VEA-T-142	PAHRUMP_1 230 kV---PAHRUMP 138 kV Ckt #1	Tran PAHRUMP_1 230.00 to PAHRUMP 138.00 Ckt 2 0.00_Line NWEST 138.0 to SNOW MTN 138.0 Ckt 1	C	T-1/L-1	115%	121%	128%	Eliminated by the Innovation-Mercury Switch 138 kV Line and Innovation 230/138 kV Sub project
VEA-T-143	PAHRUMP_1 230 kV---PAHRUMP 138 kV Ckt #2	Tran ELDORDO 500.0 to ELDORDO2 230.0 Ckt 1_Tran PAHRUMP_1 230.00 to PAHRUMP 138.00 Ckt 1 0.00	C	T-1/T-1	93%	103%	117%	Eliminated by the Innovation-Mercury Switch 138 kV Line and Innovation 230/138 kV Sub project

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
VEA-T-144	PAHRUMP_1 230 kV---PAHRUMP 138 kV Ckt #1	Tran ELDORDO 500.0 to ELDORDO2 230.0 Ckt 1_Tran PAHRUMP_1 230.00 to PAHRUMP 138.00 Ckt 2 0.00	C	T-1/T-1	93%	105%	117%	Eliminated by the Innovation-Mercury Switch 138 kV Line and Innovation 230/138 kV Sub project

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
VEA-VD-156	BEATTY 138 kV Bus	Line PAHRUMP 138.0 to VISTA 138.0 Circuit 1	B	L-1	-6.47%	-0.92%	-0.85%	Eliminated by the Innovation-Mercury Switch 138 kV Line and Innovation 230/138 kV Sub project. Prior to the project, request NVE to operate the Nwest 138 kV bus voltage at about 1.03 pu
VEA-VD-157	BONDGDTP 138 kV Bus		B	L-1	-6.47%	-0.92%	-0.85%	
VEA-VD-158	FRENCHMN 138 kV Bus		B	L-1	-5.58%	-0.79%	-0.73%	
VEA-VD-159	GROOM LK 138 kV Bus		B	L-1	-5.97%	-0.86%	-0.79%	
VEA-VD-160	JACKASSF 138 kV Bus		B	L-1	-6.28%	-0.90%	-0.84%	
VEA-VD-161	JOHNNIE 138 kV Bus		B	L-1	-7.20%	-0.95%	-0.88%	
VEA-VD-162	LTHRPWLS 138 kV Bus		B	L-1	-6.44%	-0.92%	-0.85%	
VEA-VD-163	MERCRYSW 138 kV Bus		B	L-1	-5.32%	-0.75%	-0.70%	
VEA-VD-164	MERCURY 138 kV Bus		B	L-1	-5.32%	-0.76%	-0.70%	
VEA-VD-165	NTSCANYN 138 kV Bus		B	L-1	-6.24%	-0.90%	-0.83%	
VEA-VD-166	RAINIER 138 kV Bus		B	L-1	-6.04%	-0.86%	-0.80%	
VEA-VD-167	STOCKADE 138 kV Bus		B	L-1	-6.12%	-0.89%	-0.81%	
VEA-VD-168	VALLEYNT 138 kV Bus		B	L-1	-5.97%	-0.86%	-0.79%	
VEA-VD-169	VALLEYTP 138 kV Bus		B	L-1	-6.53%	-0.93%	-0.86%	
VEA-VD-170	VALLEYVE 138 kV Bus		B	L-1	-6.53%	-0.93%	-0.86%	

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
VEA-VD-171	VISTA 138 kV Bus		B	L-1	-7.21%	-0.91%	-0.83%	
VEA-VD-172	YUCCAFLT 138 kV Bus		B	L-1	-5.80%	-0.83%	-0.77%	
VEA-VD-173	CHARLSTN 138 kV Bus		B	L-1	-13.19%	-1.60%	-1.30%	
VEA-VD-174	GAMEBIRD 138 kV Bus	Line PAHRUMP 138.0 to GAMEBIRD 138.0 Circuit 1	B	L-1	-13.09%	-2.56%	-2.29%	Prior to Charleston-Vista 138 kV line, adopt interim 8% voltage deviation criteria and work with WAPA to boost 138 kV bus voltage by re-setting NLTC of Amargosa bank
VEA-VD-175	SANDY 138 kV Bus		B	L-1	-10.46%	-2.03%	-1.79%	
VEA-VD-176	THSNDAIR 138 kV Bus		B	L-1	-13.14%	-2.28%	-2.01%	
VEA-VD-177	PAHRUMP_1 230 kV Bus	Line PAHRUMP_1 230.0 to CRAZY EYE TP 230.0 Circuit 1	B	L-1	-4.24%	-4.11%	-5.40%	be waived due to non-load bus by requests, or consider higher voltage deviation criteria (7%)
VEA-VD-178	PAHRUMP_1 230 kV Bus	Line CRAZY EYE TP 230.0 to BOB TAP 230.0 Circuit 1	B	L-1	-3.68%	-3.54%	-5.06%	be waived due to non-load bus by requests, or consider higher voltage deviation criteria (7%)
VEA-VD-179	CHARLSTN 138 kV Bus		C	Breaker Failure	-13.20%	-9.79%	-9.71%	
VEA-VD-180	GAMEBIRD 138 kV Bus		C	Breaker Failure	-13.10%	-10.16%	-10.06%	
VEA-VD-181	GAMEBIRD_PST138 kV Bus		C	Breaker Failure	-13.09%	-10.16%	-10.04%	
VEA-VD-182	JOHNNIE 138 kV Bus	Brkr Fail PAHRUMP-VISTA 138 & PAHRUMP-GAMEBIRD 138 1.000 CatC BKR Flt	C	Breaker Failure	-7.16%	-9.18%	-9.16%	Eliminated by the Innovation-Mercury Switch 138 kV Line and Innovation 230/138 kV Sub project.
VEA-VD-183	SANDY 138 kV Bus		C	Breaker Failure	-10.47%	-8.17%	-8.03%	
VEA-VD-184	THSNDAIR 138 kV Bus		C	Breaker Failure	-13.15%	-10.08%	-9.98%	



**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
VEA-VD-185	VISTA 138 kV Bus		C	Breaker Failure	-7.17%	-9.44%	-9.40%	
VEA-VD-186	AMARGOSA 138 kV Bus	Line NWEST 230.0 to DESERT VIEW 230.0 Ckt 1_Line PAHRUMP_1 230.0 to CRAZY EYE TP 230.0 Ckt 1	C	L-1/L-1	-6.50%	-6.97%	-7.82%	operate the 138 kV system in radial with three independent supplies from Amargosa, Pahrump, and Jackass Flat transmission sources after first contingency to isolate potential impact on the vicinity area (Zone 183/187)
VEA-VD-187	BEATTY 138 kV Bus		C	L-1/L-1	-15.91%	-16.98%	-19.30%	
VEA-VD-188	BONDGDTP 138 kV Bus		C	L-1/L-1	-15.91%	-16.97%	-19.28%	
VEA-VD-189	CHARLSTN 138 kV Bus		C	L-1/L-1	-19.20%	-20.00%	-22.68%	
VEA-VD-190	DESERT VIEW 230 kV Bus		C	L-1/L-1	-24.05%	-26.14%	-27.25%	
VEA-VD-191	FRENCHMN 138 kV Bus		C	L-1/L-1	-12.64%	-13.54%	-15.15%	
VEA-VD-192	GAMEBIRD 138 kV Bus		C	L-1/L-1	-19.03%	-19.98%	-22.60%	
VEA-VD-193	GROOM LK 138 kV Bus		C	L-1/L-1	-13.65%	-14.62%	-16.41%	
VEA-VD-194	IND SPR 138 kV Bus		C	L-1/L-1	-7.07%	-7.66%	-8.38%	
VEA-VD-195	IS TAP 138 kV Bus		C	L-1/L-1	-7.07%	-7.66%	-8.37%	
VEA-VD-196	JACKASSF 138 kV Bus		C	L-1/L-1	-14.75%	-15.76%	-17.78%	
VEA-VD-197	JOHNNIE 138 kV Bus		C	L-1/L-1	-18.38%	-19.53%	-22.21%	
VEA-VD-198	LTHRPWLS 138 kV Bus		C	L-1/L-1	-15.83%	-16.88%	-19.18%	
VEA-VD-199	MERCRYSW 138 kV Bus		C	L-1/L-1	-12.00%	-12.86%	-14.36%	

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
VEA-VD-200	MERCURY 138 kV Bus		C	L-1/L-1	-12.00%	-12.87%	-14.36%	
VEA-VD-201	NTSCANYN 138 kV Bus		C	L-1/L-1	-14.59%	-15.59%	-17.58%	
VEA-VD-202	PAHRUMP 138 kV Bus		C	L-1/L-1	-19.68%	-20.70%	-23.41%	
VEA-VD-203	PAHRUMP_1 230 kV Bus		C	L-1/L-1	-24.18%	-26.27%	-28.42%	
VEA-VD-204	RAINIER 138 kV Bus		C	L-1/L-1	-13.82%	-14.79%	-16.61%	
VEA-VD-205	SANDY 138 kV Bus		C	L-1/L-1	-15.58%	-16.47%	-18.55%	
VEA-VD-206	STOCKADE 138 kV Bus		C	L-1/L-1	-14.03%	-15.02%	-16.87%	
VEA-VD-207	THSND AIR 138 kV Bus		C	L-1/L-1	-19.12%	-20.03%	-22.68%	
VEA-VD-208	VALLEYNT 138 kV Bus		C	L-1/L-1	-13.65%	-14.61%	-16.40%	
VEA-VD-209	VALLEYTP 138 kV Bus		C	L-1/L-1	-16.61%	-17.70%	-20.17%	
VEA-VD-210	VALLEYVE 138 kV Bus		C	L-1/L-1	-16.63%	-17.71%	-20.20%	
VEA-VD-211	VISTA 138 kV Bus		C	L-1/L-1	-18.73%	-19.88%	-22.57%	
VEA-VD-212	YUCCAFLT 138 kV Bus		C	L-1/L-1	-13.19%	-14.12%	-15.83%	
VEA-VD-213	DESERT VIEW 230 kV Bus		C	L-1/L-1	-24.05%	-26.14%	-27.25%	
VEA-VD-214	PAHRUMP_1 230 kV Bus		C	L-1/L-1	-24.18%	-26.27%	-28.42%	

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
VEA-VD-215	CRAZY EYE TP230 kV Bus	Line N WEST 230.0 to DESERT VIEW 230.0 Ckt 1_Line CRAZY EYE TP 230.0 to BOB TAP 230.0 Ckt 1	C	L-1/L-1	-23.64%	-25.64%	-28.00%	operate the 138 kV system in radial with three independent supplies from Amargosa, Pahrump, and Jackass Flat transmission sources after first contingency to isolate potential impact on the vicinity area (Zone 183/187)
VEA-VD-216	DESERT VIEW 230 kV Bus		C	L-1/L-1	-22.95%	-25.01%	-26.10%	
VEA-VD-217	LTHRPWLS 138 kV Bus		C	L-1/L-1	-15.06%	-16.07%	-18.31%	
VEA-VD-218	MERCRYSW 138 kV Bus		C	L-1/L-1	-11.47%	-12.31%	-13.76%	
VEA-VD-219	MERCURY 138 kV Bus		C	L-1/L-1	-11.48%	-12.32%	-13.76%	
VEA-VD-220	NTSCANYN 138 kV Bus		C	L-1/L-1	-13.92%	-14.89%	-16.82%	
VEA-VD-221	PAHRUMP 138 kV Bus		C	L-1/L-1	-18.62%	-19.59%	-22.23%	
VEA-VD-222	PAHRUMP_1 230 kV Bus		C	L-1/L-1	-23.10%	-25.15%	-27.29%	
VEA-VD-223	RAINIER 138 kV Bus		C	L-1/L-1	-13.21%	-14.14%	-15.91%	
VEA-VD-224	STOCKADE 138 kV Bus		C	L-1/L-1	-13.41%	-14.36%	-16.16%	
VEA-VD-225	THSND AIR 138 kV Bus		C	L-1/L-1	-18.09%	-18.97%	-21.54%	
VEA-VD-226	VALLEYNT 138 kV Bus		C	L-1/L-1	-13.04%	-13.97%	-15.71%	
VEA-VD-227	VALLEYTP 138 kV Bus		C	L-1/L-1	-15.77%	-16.82%	-19.22%	
VEA-VD-228	VALLEYVE 138 kV Bus		C	L-1/L-1	-15.79%	-16.83%	-19.24%	
VEA-VD-229	VISTA 138 kV Bus		C	L-1/L-1	-17.73%	-18.83%	-21.44%	

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
VEA-VD-230	YUCCAFLT 138 kV Bus		C	L-1/L-1	-12.61%	-13.50%	-15.17%	operate the 138 kV system in radial with three independent supplies from Amargosa, Pahrump, and Jackass Flat transmission sources after first contingency to isolate potential impact on the vicinity area (Zone 183/187)
VEA-VD-231	CRAZY EYE TP230 kV Bus		C	L-1/L-1	-23.64%	-25.64%	-28.00%	
VEA-VD-232	DESERT VIEW 230 kV Bus		C	L-1/L-1	-22.95%	-25.01%	-26.10%	
VEA-VD-233	PAHRUMP_1 230 kV Bus		C	L-1/L-1	-23.10%	-25.15%	-27.29%	
VEA-VD-234	BEATTY 138 kV Bus	Line PAHRUMP_1 230.0 to DESERT VIEW 230.0 Ckt 1_Line PAHRUMP_1 230.0 to CRAZY EYE TP 230.0 Ckt 1	C	L-1/L-1	-19.75%	-20.61%	-23.78%	
VEA-VD-235	GROOM LK 138 kV Bus		C	L-1/L-1	-16.69%	-17.41%	-19.95%	
VEA-VD-236	JACKASSF 138 kV Bus		C	L-1/L-1	-18.13%	-18.91%	-21.73%	
VEA-VD-237	JOHNNIE 138 kV Bus		C	L-1/L-1	-23.08%	-24.07%	-27.65%	
VEA-VD-238	LTHRPWLS 138 kV Bus		C	L-1/L-1	-19.65%	-20.49%	-23.63%	
VEA-VD-239	MERCRYSW 138 kV Bus		C	L-1/L-1	-14.64%	-15.23%	-17.43%	
VEA-VD-240	MERCURY 138 kV Bus		C	L-1/L-1	-14.64%	-15.25%	-17.44%	
VEA-VD-241	NTSCANYN 138 kV Bus		C	L-1/L-1	-17.91%	-18.69%	-21.46%	
VEA-VD-242	PAHRUMP 138 kV Bus		C	L-1/L-1	-24.90%	-25.73%	-29.32%	
VEA-VD-243	PAHRUMP_1 230 kV Bus		C	L-1/L-1	-29.43%	-31.35%	-34.06%	
VEA-VD-244	RAINIER 138 kV Bus		C	L-1/L-1	-16.90%	-17.62%	-20.20%	

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
VEA-VD-245	SANDY 138 kV Bus		C	L-1/L-1	-19.63%	-20.37%	-23.18%	
VEA-VD-246	STOCKADE 138 kV Bus		C	L-1/L-1	-17.16%	-17.91%	-20.53%	
VEA-VD-247	THSND AIR 138 kV Bus		C	L-1/L-1	-24.17%	-24.87%	-28.40%	
VEA-VD-248	VALLEYNT 138 kV Bus		C	L-1/L-1	-16.68%	-17.40%	-19.94%	
VEA-VD-249	VALLEYTP 138 kV Bus		C	L-1/L-1	-20.76%	-21.66%	-25.00%	
VEA-VD-250	VALLEYVE 138 kV Bus		C	L-1/L-1	-20.78%	-21.68%	-25.03%	
VEA-VD-251	VISTA 138 kV Bus		C	L-1/L-1	-23.65%	-24.66%	-28.23%	
VEA-VD-252	YUCCAFLT 138 kV Bus		C	L-1/L-1	-16.11%	-16.79%	-19.24%	
VEA-VD-253	PAHRUMP_1 230 kV Bus		C	L-1/L-1	-29.43%	-31.35%	-34.06%	
VEA-VD-254	BEATTY 138 kV Bus			C	L-1/L-1	-19.03%	-19.83%	
VEA-VD-255	GROOM LK 138 kV Bus	C		L-1/L-1	-16.12%	-16.79%	-19.25%	
VEA-VD-256	JACKASSF 138 kV Bus	C		L-1/L-1	-17.50%	-18.22%	-20.94%	
VEA-VD-257	JOHNNIE 138 kV Bus	C		L-1/L-1	-22.19%	-23.12%	-26.56%	
VEA-VD-258	LTHRPWLS 138 kV Bus	C		L-1/L-1	-18.93%	-19.72%	-22.74%	
VEA-VD-259	MERCYSW 138 kV Bus	C		L-1/L-1	-14.14%	-14.70%	-16.82%	

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
VEA-VD-260	MERCURY 138 kV Bus	Line PAHRUMP_1 230.0 to DESERT VIEW 230.0 Ckt 1_Line CRAZY EYE TP 230.0 to BOB TAP 230.0 Ckt 1	C	L-1/L-1	-14.15%	-14.71%	-16.82%	operate the 138 kV system in radial with three independent supplies from Amargosa, Pahrump, and Jackass Flat transmission sources after first contingency to isolate potential impact on the vicinity area (Zone 183/187)
VEA-VD-261	NTSCANYN 138 kV Bus		C	L-1/L-1	-17.29%	-18.01%	-20.68%	
VEA-VD-262	PAHRUMP 138 kV Bus		C	L-1/L-1	-23.91%	-24.69%	-28.15%	
VEA-VD-263	PAHRUMP_1 230 kV Bus		C	L-1/L-1	-28.44%	-30.30%	-32.94%	
VEA-VD-264	RAINIER 138 kV Bus		C	L-1/L-1	-16.32%	-16.99%	-19.48%	
VEA-VD-265	SANDY 138 kV Bus		C	L-1/L-1	-18.88%	-19.57%	-22.26%	
VEA-VD-266	STOCKADE 138 kV Bus		C	L-1/L-1	-16.58%	-17.27%	-19.80%	
VEA-VD-267	THSNDAIR 138 kV Bus		C	L-1/L-1	-23.22%	-23.87%	-27.26%	
VEA-VD-268	VALLEYNT 138 kV Bus		C	L-1/L-1	-16.11%	-16.78%	-19.23%	
VEA-VD-269	VALLEYTP 138 kV Bus		C	L-1/L-1	-19.98%	-20.82%	-24.04%	
VEA-VD-270	VALLEYVE 138 kV Bus		C	L-1/L-1	-20.00%	-20.83%	-24.07%	
VEA-VD-271	VISTA 138 kV Bus		C	L-1/L-1	-22.73%	-23.66%	-27.11%	
VEA-VD-272	YUCCAFLT 138 kV Bus		C	L-1/L-1	-15.57%	-16.19%	-18.56%	
VEA-VD-273	CRAZY EYE TP230 kV Bus		C	L-1/L-1	-28.99%	-30.79%	-33.66%	
VEA-VD-274	PAHRUMP_1 230 kV Bus		C	L-1/L-1	-28.44%	-30.30%	-32.94%	

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
VEA-VD-275	BEATTY 138 kV Bus	Tran PAHRUMP_1 230.00 to PAHRUMP 138.00 Ckt 1 0.00_Tran PAHRUMP_1 230.00 to PAHRUMP 138.00 Ckt 2 0.00	C	T-1/T-1	-19.60%	-20.88%	-23.57%	Eliminated by the Innovation-Mercury Switch 138 kV Line and Innovation 230/138 kV Sub project
VEA-VD-276	BONDGDTP 138 kV Bus		C	T-1/T-1	-19.59%	-20.87%	-23.55%	
VEA-VD-277	CHARLSTN 138 kV Bus		C	T-1/T-1	-24.13%	-25.05%	-28.19%	
VEA-VD-278	FRENCHMN 138 kV Bus		C	T-1/T-1	-15.28%	-16.35%	-18.20%	
VEA-VD-279	GAMEBIRD 138 kV Bus		C	T-1/T-1	-23.91%	-25.03%	-28.10%	
VEA-VD-280	GROOM LK 138 kV Bus		C	T-1/T-1	-16.54%	-17.69%	-19.75%	
VEA-VD-281	JACKASSF 138 kV Bus		C	T-1/T-1	-17.97%	-19.19%	-21.52%	
VEA-VD-282	JOHNNIE 138 kV Bus		C	T-1/T-1	-22.93%	-24.31%	-27.44%	
VEA-VD-283	LTHRPWLS 138 kV Bus		C	T-1/T-1	-19.49%	-20.76%	-23.42%	
VEA-VD-284	MERCRYSW 138 kV Bus		C	T-1/T-1	-14.48%	-15.51%	-17.23%	
VEA-VD-285	MERCURY 138 kV Bus		C	T-1/T-1	-14.49%	-15.53%	-17.24%	
VEA-VD-286	NTSCANYN 138 kV Bus		C	T-1/T-1	-17.76%	-18.96%	-21.25%	
VEA-VD-287	PAHRUMP 138 kV Bus		C	T-1/T-1	-24.75%	-25.95%	-29.12%	
VEA-VD-288	RAINIER 138 kV Bus		C	T-1/T-1	-16.74%	-17.90%	-20.00%	
VEA-VD-289	SANDY 138 kV Bus		C	T-1/T-1	-19.51%	-20.54%	-23.01%	

2012/2013 ISO Reliability Assessment - Study Results

Study Area: **Valley Electric Association - Summer Peak**



**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
VEA-VD-290	STOCKADE 138 kV Bus		C	T-1/T-1	-17.01%	-18.19%	-20.32%	
VEA-VD-291	THSND AIR 138 kV Bus		C	T-1/T-1	-24.03%	-25.09%	-28.20%	
VEA-VD-292	VALLEYNT 138 kV Bus		C	T-1/T-1	-16.53%	-17.68%	-19.74%	
VEA-VD-293	VALLEYTP 138 kV Bus		C	T-1/T-1	-20.61%	-21.92%	-24.79%	
VEA-VD-294	VALLEYVE 138 kV Bus		C	T-1/T-1	-20.63%	-21.94%	-24.82%	
VEA-VD-295	VISTA 138 kV Bus		C	T-1/T-1	-23.51%	-24.89%	-28.03%	
VEA-VD-296	YUCCAFLT 138 kV Bus		C	T-1/T-1	-15.96%	-17.07%	-19.04%	
VEA-VD-297	BOB TAP 230 kV Bus	Tran ELDORDO 500.0 to ELDORDO2 230.0 Ckt 1_Line MEAD S 230.0 to BOB TAP 230.0 Ckt 1	C	L-1/L-1	-2.66%	-11.31%	-11.55%	modify Ivanpah-Eldorado SPS and Crazy Eye SPS previously identified, or apply congestion management to curtail generation after 1st contingency
VEA-VD-298	ELDORDO2 230 kV Bus		C	L-1/L-1	0.00%	-11.14%	-11.47%	
VEA-VD-299	PAHRUMP_1 230 kV Bus		C	L-1/L-1	-1.65%	-10.44%	-10.19%	



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Study Area: **Valley Electric Association - Summer Peak**



**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
VEA-V-139	CHARLSTN 138 kV Bus	Line PAHRUMP 138.0 to GAMEBIRD 138.0 Circuit 1	B	L-1	0.89	1.00	1.00	Prior to Charleston-Vista 138 kV line, work with WAPA to re-set NLTC of Amargosa bank
VEA-V-140	GAMEBIRD 138 kV Bus		B	L-1	0.89	1.00	1.00	
VEA-V-141	THSND AIR 138 kV Bus		B	L-1	0.89	1.00	1.00	
VEA-V-142	CHARLSTN 138 kV Bus	Brkr Fail PAHRUMP-VISTA 138 & PAHRUMP-GAMEBIRD 138 1.000 CatC BKR Fit	C	Breaker Failure	0.89	0.92	0.92	Eliminated by the Innovation-Mercury Switch 138 kV Line and Innovation 230/138 kV Sub project.
VEA-V-143	GAMEBIRD 138 kV Bus		C	Breaker Failure	0.89	0.92	0.92	
VEA-V-144	GAMEBIRD_PST138 kV Bus		C	Breaker Failure	0.89	0.92	0.92	
VEA-V-145	THSND AIR 138 kV Bus		C	Breaker Failure	0.89	0.92	0.92	
VEA-V-146	BEATTY 138 kV Bus	Line N WEST 230.0 to DESERT VIEW 230.0 Ckt 1_Line PAHRUMP_1 230.0 to CRAZY EYE TP 230.0 Ckt 1	C	L-1/L-1	0.86	0.85	0.83	operate the 138 kV system in radial with three independent supplies from Amargosa, Pahrump, and Jackass Flat transmission sources after first contingency to isolate potential impact on the vicinity area (Zone 183/187)
VEA-V-147	BONDGDTP 138 kV Bus		C	L-1/L-1	0.86	0.85	0.83	
VEA-V-148	CHARLSTN 138 kV Bus		C	L-1/L-1	0.83	0.82	0.79	
VEA-V-149	DESERT VIEW 230 kV Bus		C	L-1/L-1	0.76	0.75	0.72	
VEA-V-150	FRENCHMN 138 kV Bus		C	L-1/L-1	0.89	0.88	0.87	
VEA-V-151	GAMEBIRD 138 kV Bus		C	L-1/L-1	0.83	0.82	0.79	
VEA-V-152	GROOM LK 138 kV Bus		C	L-1/L-1	0.89	0.88	0.86	
VEA-V-153	JACKASSF 138 kV Bus		C	L-1/L-1	0.87	0.86	0.85	
VEA-V-154	JOHNNIE 138 kV Bus		C	L-1/L-1	0.84	0.83	0.80	
VEA-V-155	LTHRPWLS 138 kV Bus		C	L-1/L-1	0.87	0.86	0.83	
VEA-V-156	MERCRYSW 138 kV Bus		C	L-1/L-1	0.89	0.89	0.88	
VEA-V-157	MERCURY 138 kV Bus		C	L-1/L-1	0.89	0.89	0.88	
VEA-V-158	NTSCANYN 138 kV Bus		C	L-1/L-1	0.87	0.87	0.85	
VEA-V-159	PAHRUMP 138 kV Bus		C	L-1/L-1	0.83	0.82	0.79	
VEA-V-160	PAHRUMP_1 230 kV Bus		C	L-1/L-1	0.75	0.74	0.71	
VEA-V-161	RAINIER 138 kV Bus		C	L-1/L-1	0.88	0.88	0.86	
VEA-V-162	SANDY 138 kV Bus		C	L-1/L-1	0.86	0.85	0.83	
VEA-V-163	THSND AIR 138 kV Bus	C	L-1/L-1	0.83	0.82	0.79		
VEA-V-164	VALLEYNT 138 kV Bus	C	L-1/L-1	0.89	0.88	0.86		
VEA-V-165	VALLEYTP 138 kV Bus	C	L-1/L-1	0.86	0.85	0.82		

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
VEA-V-166	VALLEYVE 138 kV Bus		C	L-1/L-1	0.86	0.85	0.82	
VEA-V-167	VISTA 138 kV Bus		C	L-1/L-1	0.84	0.82	0.79	
VEA-V-168	YUCCAFLT 138 kV Bus		C	L-1/L-1	0.89	0.88	0.87	
VEA-V-169	DESERT VIEW 230 kV Bus		C	L-1/L-1	0.76	0.75	0.72	
VEA-V-170	PAHRUMP_1 230 kV Bus		C	L-1/L-1	0.75	0.74	0.71	
VEA-V-171	BEATTY 138 kV Bus	Line NWEST 230.0 to DESERT VIEW 230.0 Ckt 1_Line CRAZY EYE TP 230.0 to BOB TAP 230.0 Ckt 1	C	L-1/L-1	0.87	0.86	0.84	operate the 138 kV system in radial with three independent supplies from Amargosa, Pahrump, and Jackass Flat transmission sources after first contingency to isolate potential impact on the vicinity area (Zone 183/187)
VEA-V-172	BONDGDTP 138 kV Bus		C	L-1/L-1	0.87	0.86	0.84	
VEA-V-173	CHARLSTN 138 kV Bus		C	L-1/L-1	0.84	0.83	0.80	
VEA-V-174	CRAZY EYE TP230 kV Bus		C	L-1/L-1	0.77	0.76	0.73	
VEA-V-175	DESERT VIEW 230 kV Bus		C	L-1/L-1	0.77	0.76	0.73	
VEA-V-176	FRENCHMN 138 kV Bus		C	L-1/L-1	0.90	0.89	0.88	
VEA-V-177	GAMEBIRD 138 kV Bus		C	L-1/L-1	0.84	0.83	0.81	
VEA-V-178	GROOM LK 138 kV Bus		C	L-1/L-1	0.89	0.88	0.87	
VEA-V-179	JACKASSF 138 kV Bus		C	L-1/L-1	0.88	0.87	0.85	
VEA-V-180	JOHNNIE 138 kV Bus		C	L-1/L-1	0.85	0.84	0.81	
VEA-V-181	LTHRPWLS 138 kV Bus		C	L-1/L-1	0.87	0.86	0.84	
VEA-V-182	MERCURYSW 138 kV Bus		C	L-1/L-1	0.90	0.89	0.88	
VEA-V-183	MERCURY 138 kV Bus		C	L-1/L-1	0.90	0.89	0.88	
VEA-V-184	NTSCANYN 138 kV Bus		C	L-1/L-1	0.88	0.87	0.86	
VEA-V-185	PAHRUMP 138 kV Bus		C	L-1/L-1	0.84	0.83	0.80	
VEA-V-186	PAHRUMP_1 230 kV Bus		C	L-1/L-1	0.77	0.75	0.73	
VEA-V-187	RAINIER 138 kV Bus		C	L-1/L-1	0.89	0.88	0.87	
VEA-V-188	SANDY 138 kV Bus		C	L-1/L-1	0.87	0.86	0.84	
VEA-V-189	THSNDAIR 138 kV Bus		C	L-1/L-1	0.84	0.83	0.80	
VEA-V-190	VALLEYNT 138 kV Bus		C	L-1/L-1	0.89	0.88	0.87	
VEA-V-191	VALLEYTP 138 kV Bus	C	L-1/L-1	0.87	0.86	0.83		
VEA-V-192	VALLEYVE 138 kV Bus	C	L-1/L-1	0.87	0.86	0.83		
VEA-V-193	VISTA 138 kV Bus	C	L-1/L-1	0.85	0.83	0.81		
VEA-V-194	YUCCAFLT 138 kV Bus	C	L-1/L-1	0.89	0.89	0.87		
VEA-V-195	CRAZY EYE TP230 kV Bus	C	L-1/L-1	0.77	0.76	0.73		
VEA-V-196	DESERT VIEW 230 kV Bus	C	L-1/L-1	0.77	0.76	0.73		

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
VEA-V-197	PAHRUMP_1 230 kV Bus		C	L-1/L-1	0.77	0.75	0.73	
VEA-V-198	BEATTY 138 kV Bus		C	L-1/L-1	0.83	0.82	0.79	
VEA-V-199	BONDGDTP 138 kV Bus		C	L-1/L-1	0.83	0.82	0.79	
VEA-V-200	CHARLSTN 138 kV Bus		C	L-1/L-1	0.77	0.77	0.73	
VEA-V-201	FRENCHMN 138 kV Bus		C	L-1/L-1	0.86	0.86	0.84	
VEA-V-202	GAMEBIRD 138 kV Bus		C	L-1/L-1	0.78	0.77	0.74	
VEA-V-203	GROOM LK 138 kV Bus		C	L-1/L-1	0.86	0.85	0.83	
VEA-V-204	JACKASSF 138 kV Bus		C	L-1/L-1	0.84	0.83	0.81	
VEA-V-205	JOHNNIE 138 kV Bus		C	L-1/L-1	0.80	0.78	0.75	
VEA-V-206	LTHRPWLS 138 kV Bus		C	L-1/L-1	0.83	0.82	0.79	
VEA-V-207	MERCRYSW 138 kV Bus		C	L-1/L-1	0.87	0.86	0.85	
VEA-V-208	MERCURY 138 kV Bus	Line PAHRUMP_1 230.0 to DESERT	C	L-1/L-1	0.87	0.86	0.85	operate the 138 kV system in radial with three independent supplies from Amargosa, Pahrump, and Jackass Flat transmission sources after first contingency to isolate potential impact on the vicinity area (Zone 183/187)
VEA-V-209	NTSCANYN 138 kV Bus	VIEW 230.0 Ckt 1_Line PAHRUMP_1	C	L-1/L-1	0.84	0.84	0.81	
VEA-V-210	PAHRUMP 138 kV Bus	230.0 to CRAZY EYE TP 230.0 Ckt 1	C	L-1/L-1	0.78	0.77	0.73	
VEA-V-211	PAHRUMP_1 230 kV Bus		C	L-1/L-1	0.70	0.69	0.66	
VEA-V-212	RAINIER 138 kV Bus		C	L-1/L-1	0.85	0.85	0.83	
VEA-V-213	SANDY 138 kV Bus		C	L-1/L-1	0.82	0.81	0.78	
VEA-V-214	THSNDAIR 138 kV Bus		C	L-1/L-1	0.78	0.77	0.73	
VEA-V-215	VALLEYNT 138 kV Bus		C	L-1/L-1	0.86	0.85	0.83	
VEA-V-216	VALLEYTP 138 kV Bus		C	L-1/L-1	0.82	0.81	0.78	
VEA-V-217	VALLEYVE 138 kV Bus		C	L-1/L-1	0.82	0.81	0.77	
VEA-V-218	VISTA 138 kV Bus		C	L-1/L-1	0.79	0.78	0.74	
VEA-V-219	YUCCAFLT 138 kV Bus		C	L-1/L-1	0.86	0.85	0.83	
VEA-V-220	PAHRUMP_1 230 kV Bus		C	L-1/L-1	0.70	0.69	0.66	
VEA-V-221	BEATTY 138 kV Bus		C	L-1/L-1	0.83	0.82	0.80	
VEA-V-222	BONDGDTP 138 kV Bus		C	L-1/L-1	0.83	0.83	0.80	
VEA-V-223	CHARLSTN 138 kV Bus		C	L-1/L-1	0.78	0.78	0.75	
VEA-V-224	CRAZY EYE TP230 kV Bus		C	L-1/L-1	0.71	0.70	0.67	
VEA-V-225	FRENCHMN 138 kV Bus		C	L-1/L-1	0.87	0.87	0.85	
VEA-V-226	GAMEBIRD 138 kV Bus		C	L-1/L-1	0.79	0.78	0.75	
VEA-V-227	GROOM LK 138 kV Bus		C	L-1/L-1	0.86	0.86	0.84	

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions		
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak			
VEA-V-228	JACKASSF 138 kV Bus	Line PAHRUMP_1 230.0 to DESERT VIEW 230.0 Ckt 1_Line CRAZY EYE TP 230.0 to BOB TAP 230.0 Ckt 1	C	L-1/L-1	0.84	0.84	0.81	operate the 138 kV system in radial with three independent supplies from Amargosa, Pahump, and Jackass Flat transmission sources after first contingency to isolate potential impact on the vicinity area (Zone 183/187)		
VEA-V-229	JOHNNIE 138 kV Bus		C	L-1/L-1	0.80	0.79	0.76			
VEA-V-230	LTHRPWLS 138 kV Bus		C	L-1/L-1	0.83	0.83	0.80			
VEA-V-231	MERCURYSW 138 kV Bus		C	L-1/L-1	0.87	0.87	0.85			
VEA-V-232	MERCURY 138 kV Bus		C	L-1/L-1	0.87	0.87	0.85			
VEA-V-233	NTSCANYN 138 kV Bus		C	L-1/L-1	0.85	0.84	0.82			
VEA-V-234	PAHRUMP 138 kV Bus		C	L-1/L-1	0.79	0.78	0.74			
VEA-V-235	PAHRUMP_1 230 kV Bus		C	L-1/L-1	0.71	0.70	0.67			
VEA-V-236	RAINIER 138 kV Bus		C	L-1/L-1	0.86	0.85	0.83			
VEA-V-237	SANDY 138 kV Bus		C	L-1/L-1	0.83	0.82	0.79			
VEA-V-238	THSNDAIR 138 kV Bus		C	L-1/L-1	0.79	0.78	0.75			
VEA-V-239	VALLEYNT 138 kV Bus		C	L-1/L-1	0.86	0.86	0.84			
VEA-V-240	VALLEYTP 138 kV Bus		C	L-1/L-1	0.83	0.82	0.79			
VEA-V-241	VALLEYVE 138 kV Bus		C	L-1/L-1	0.83	0.82	0.78			
VEA-V-242	VISTA 138 kV Bus		C	L-1/L-1	0.80	0.79	0.75			
VEA-V-243	YUCCAFLT 138 kV Bus		C	L-1/L-1	0.87	0.86	0.84			
VEA-V-244	CRAZY EYE TP230 kV Bus		C	L-1/L-1	0.71	0.70	0.67			
VEA-V-245	PAHRUMP_1 230 kV Bus		C	L-1/L-1	0.71	0.70	0.67			
VEA-V-246	BEATTY 138 kV Bus		Tran PAHRUMP_1 230.00 to PAHRUMP 138.00 Ckt 1 0.00_Tran PAHRUMP_1 230.00 to PAHRUMP 138.00 Ckt 2 0.00	C	T-1/T-1	0.83	0.81		0.79	Eliminated by the Innovation-Mercury Switch 138 kV Line and Innovation 230/138 kV Sub project.
VEA-V-247	BONDGDTP 138 kV Bus			C	T-1/T-1	0.83	0.81		0.79	
VEA-V-248	CHARLSTN 138 kV Bus	C		T-1/T-1	0.78	0.77	0.74			
VEA-V-249	FRENCHMN 138 kV Bus	C		T-1/T-1	0.87	0.86	0.84			
VEA-V-250	GAMEBIRD 138 kV Bus	C		T-1/T-1	0.78	0.77	0.74			
VEA-V-251	GROOM LK 138 kV Bus	C		T-1/T-1	0.86	0.85	0.83			
VEA-V-252	JACKASSF 138 kV Bus	C		T-1/T-1	0.84	0.83	0.81			
VEA-V-253	JOHNNIE 138 kV Bus	C		T-1/T-1	0.80	0.78	0.75			
VEA-V-254	LTHRPWLS 138 kV Bus	C		T-1/T-1	0.83	0.82	0.79			
VEA-V-255	MERCURYSW 138 kV Bus	C		T-1/T-1	0.87	0.86	0.85			
VEA-V-256	MERCURY 138 kV Bus	C		T-1/T-1	0.87	0.86	0.85			
VEA-V-257	NTSCANYN 138 kV Bus	C		T-1/T-1	0.84	0.83	0.81			
VEA-V-258	PAHRUMP 138 kV Bus	C		T-1/T-1	0.78	0.77	0.73			

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
VEA-V-259	RAINIER 138 kV Bus		C	T-1/T-1	0.86	0.85	0.83	
VEA-V-260	SANDY 138 kV Bus		C	T-1/T-1	0.82	0.81	0.78	
VEA-V-261	THSNDAIR 138 kV Bus		C	T-1/T-1	0.78	0.77	0.74	
VEA-V-262	VALLEYNT 138 kV Bus		C	T-1/T-1	0.86	0.85	0.83	
VEA-V-263	VALLEYTP 138 kV Bus		C	T-1/T-1	0.82	0.81	0.78	
VEA-V-264	VALLEYVE 138 kV Bus		C	T-1/T-1	0.82	0.81	0.78	
VEA-V-265	VISTA 138 kV Bus		C	T-1/T-1	0.79	0.77	0.74	
VEA-V-266	YUCCAFLT 138 kV Bus		C	T-1/T-1	0.86	0.85	0.84	
VEA-V-267	CRAZY EYE TP230 kV Bus		C	T-1/L-1	0.98	0.89	0.89	
VEA-V-268	PAHRUMP_1 230 kV Bus	Tran ELDORDO 500.0 to ELDORDO2 230.0 Ckt 1_Line MEAD S 230.0 to BOB TAP 230.0 Ckt 1	C	T-1/L-1	0.98	0.90	0.90	modify Ivanpah-Eldorado SPS and Crazy Eye SPS previously identified, or apply congestion management to curtail generation after 1st contingency



**Single Contingency Load Drop**

ID	Worst Contingency	Category	Category Description	Amount of Load Drop (MW)			Potential Mitigation Solutions
				2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	

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

2012/2013 ISO Reliability Assessment - Study Results

Study Area: **Valley Electric Association - Summer Peak**

**Single Source Substation with more than 100 MW Load**



ID	Substation	Load Served (MW)			Potential Mitigation Solutions
		2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	

No single source substation with more than 100 MW Load

**Appendix C-32**  
**VEA with Renewables**



**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
VEA-T-1	CANYON 138 kV---COLDCREK 138 kV Ckt #1	Line PAHRUMP 138.0 to VISTA 138.0 Circuit 1	B	L-1	101%	53%	4%	Eliminated by the Innovation-Mercury Switch 138 kV Line and Innovation 230/138 kV Sub project. Prior to the project, request NVE to operate the NWest 138 kV bus voltage at about 1.03 pu
VEA-T-2	CANYON 138 kV---SNOW MTN 138 kV Ckt #1		B	L-1	101%	53%	4%	
VEA-T-3	NWEST 138 kV---SNOW MTN 138 kV Ckt #1		B	L-1	102%	69%	5%	
VEA-T-4	CANYON 138 kV---COLDCREK 138 kV Ckt #1	Brkr Fail VISTA-PAHRUMP 138 & VISTA-CHARLESTON 138 1.000 CatC BKR Flt	C	Breaker Failure	NA	109%	96%	Eliminated by the Innovation-Mercury Switch 138 kV Line and Innovation 230/138 kV Sub project recently included in the FERC approved Amendment to Transition Agreement
VEA-T-5	CANYON 138 kV---SNOW MTN 138 kV Ckt #1		C	Breaker Failure	NA	109%	96%	
VEA-T-6	COLDCREK 138 kV---RADAR 138 kV Ckt #1		C	Breaker Failure	NA	104%	91%	
VEA-T-7	IS TAP 138 kV---RADAR 138 kV Ckt #1		C	Breaker Failure	NA	104%	90%	
VEA-T-8	NWEST 138 kV---SNOW MTN 138 kV Ckt #1		C	Breaker Failure	NA	110%	98%	
VEA-T-9	CANYON 138 kV---COLDCREK 138 kV Ckt #1	Brkr Fail PAHRUMP-VISTA 138 & PAHRUMP-GAMEBIRD 138 1.000 CatC BKR Flt	C	Breaker Failure	100%	90%	85%	Eliminated by the Innovation-Mercury Switch 138 kV Line and Innovation 230/138 kV Sub project recently included in the FERC approved Amendment to Transition Agreement
VEA-T-10	CANYON 138 kV---SNOW MTN 138 kV Ckt #1		C	Breaker Failure	101%	91%	85%	
VEA-T-11	NWEST 138 kV---SNOW MTN 138 kV Ckt #1		C	Breaker Failure	102%	91%	87%	
VEA-T-12	CANYON 138 kV---COLDCREK 138 kV Ckt #1	Line PAHRUMP 138.0 to VISTA 138.0 Ckt 1_Line GAMEBIRD 138.0 to THSNDAIR 138.0 Ckt 1	C	L-1/L-1	100%	Not Solved	Not Solved	Eliminated by the Innovation-Mercury Switch 138 kV Line and Innovation 230/138 kV Sub project recently included in the FERC approved Amendment to Transition Agreement
VEA-T-13	CANYON 138 kV---SNOW MTN 138 kV Ckt #1		C	L-1/L-1	101%	Not Solved	Not Solved	
VEA-T-14	NWEST 138 kV---SNOW MTN 138 kV Ckt #1		C	L-1/L-1	102%	Not Solved	Not Solved	

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
VEA-T-15	CANYON 138 kV---SNOW MTN 138 kV Ckt #1	Line PAHRUMP 138.0 to VISTA 138.0 Ckt 1_Line THSND AIR 138.0 to CHARLSTN 138.0 Ckt 1	C	L-1/L-1	101%	132%	118%	Eliminated by the Innovation-Mercury Switch 138 kV Line and Innovation 230/138 kV Sub project recently included in the FERC approved Amendment to Transition Agreement
VEA-T-16	IS TAP 138 kV---RADAR 138 kV Ckt #1		C	L-1/L-1	96%	126%	111%	
VEA-T-17	NWEST 138 kV---SNOW MTN 138 kV Ckt #1		C	L-1/L-1	102%	133%	119%	
VEA-T-18	CANYON 138 kV---COLDCREK 138 kV Ckt #1	Line NWEST 230.0 to DESERT VIEW 230.0 Ckt 1_Line PAHRUMP_1 230.0 to CRAZY EYE TP 230.0 Ckt 1	C	L-1/L-1	123%	128%	153%	operate the 138 kV system in radial with three independent supplies from Amargosa, Pahrump, and Jackass Flat transmission sources after first contingency to isolate potential impact on the vicinity area (Zone 183/187)
VEA-T-19	COLDCREK 138 kV---RADAR 138 kV Ckt #1		C	L-1/L-1	118%	123%	145%	
VEA-T-20	IS TAP 138 kV---MERCERYSW 138 kV Ckt #1		C	L-1/L-1	111%	115%	135%	
VEA-T-21	IS TAP 138 kV---RADAR 138 kV Ckt #1		C	L-1/L-1	118%	123%	145%	
VEA-T-22	NWEST 138 kV---SNOW MTN 138 kV Ckt #1		C	L-1/L-1	124%	130%	155%	
VEA-T-23	COLDCREK 138 kV---RADAR 138 kV Ckt #1		C	L-1/L-1	117%	122%	Not Solved	
VEA-T-24	IS TAP 138 kV---MERCERYSW 138 kV Ckt #1	C	L-1/L-1	111%	114%	Not Solved	For 2014/2017, operate the VEA 138 kV system in radial after 1st outage to isolate potential impact on the vicinity area. For 2022, modify the Crazy Eye SPS to cover this L-1-1 event, or apply congestion management after 1st outage	
VEA-T-25	IS TAP 138 kV---RADAR 138 kV Ckt #1	C	L-1/L-1	117%	122%	Not Solved		
VEA-T-26	NWEST 138 kV---SNOW MTN 138 kV Ckt #1	C	L-1/L-1	124%	129%	Not Solved		

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
VEA-T-27	AMARGOSA 230 kV---AMARGOSA 138 kV Ckt #1	Line PAHRUMP_1 230.0 to DESERT VIEW 230.0 Ckt 1_Line PAHRUMP_1 230.0 to CRAZY EYE TP 230.0 Ckt 1	C	L-1/L-1	141%	153%	Not Solved	operate the 138 kV system in radial with three independent supplies from Amargosa, Pahrump, and Jackass Flat transmission sources after first contingency to isolate potential impact on the vicinity area (Zone 183/187)
VEA-T-28	CANYON 138 kV---COLDCREK 138 kV Ckt #1		C	L-1/L-1	129%	135%	Not Solved	
VEA-T-29	CANYON 138 kV---SNOW MTN 138 kV Ckt #1		C	L-1/L-1	129%	135%	Not Solved	
VEA-T-30	COLDCREK 138 kV---RADAR 138 kV Ckt #1		C	L-1/L-1	124%	129%	Not Solved	
VEA-T-31	IS TAP 138 kV---MERCERYSW 138 kV Ckt #1		C	L-1/L-1	117%	121%	Not Solved	
VEA-T-32	IS TAP 138 kV---RADAR 138 kV Ckt #1		C	L-1/L-1	123%	129%	Not Solved	
VEA-T-33	NWEST 138 kV---SNOW MTN 138 kV Ckt #1		C	L-1/L-1	130%	136%	Not Solved	
VEA-T-34	AMARGOSA 230 kV---AMARGOSA 138 kV Ckt #1	Line PAHRUMP_1 230.0 to DESERT VIEW 230.0 Ckt 1_Line CRAZY EYE TP 230.0 to BOB TAP 230.0 Ckt 1	C	L-1/L-1	140%	151%	Not Solved	For 2014/2017, operate the VEA 138 kV system in radial after 1st outage to isolate potential impact on the vicinity area. For 2022, modify the Crazy Eye SPS to cover this L-1-1 event, or apply congestion management after 1st outage
VEA-T-35	CANYON 138 kV---COLDCREK 138 kV Ckt #1		C	L-1/L-1	128%	133%	Not Solved	
VEA-T-36	CANYON 138 kV---SNOW MTN 138 kV Ckt #1		C	L-1/L-1	128%	133%	Not Solved	
VEA-T-37	COLDCREK 138 kV---RADAR 138 kV Ckt #1		C	L-1/L-1	122%	127%	Not Solved	
VEA-T-38	IS TAP 138 kV---MERCERYSW 138 kV Ckt #1		C	L-1/L-1	116%	120%	Not Solved	
VEA-T-39	IS TAP 138 kV---RADAR 138 kV Ckt #1		C	L-1/L-1	122%	127%	Not Solved	
VEA-T-40	NWEST 138 kV---SNOW MTN 138 kV Ckt #1		C	L-1/L-1	130%	136%	Not Solved	

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
VEA-T-41	AMARGOSA 230 kV---AMARGOSA 138 kV Ckt #1	Tran PAHRUMP_1 230.00 to PAHRUMP 138.00 Ckt 1 0.00 Tran PAHRUMP_1 230.00 to PAHRUMP 138.00 Ckt 2 0.00	C	T-1/T-1	141%	153%	Not Solved	Eliminated by the Innovation-Mercury Switch 138 kV Line and Innovation 230/138 kV Sub project recently included in the FERC approved Amendment to Transition Agreement
VEA-T-42	CANYON 138 kV---COLDCREK 138 kV Ckt #1		C	T-1/T-1	129%	135%	Not Solved	
VEA-T-43	CANYON 138 kV---SNOW MTN 138 kV Ckt #1		C	T-1/T-1	129%	135%	Not Solved	
VEA-T-44	COLDCREK 138 kV---RADAR 138 kV Ckt #1		C	T-1/T-1	124%	129%	Not Solved	
VEA-T-45	IS TAP 138 kV---MERCYSW 138 kV Ckt #1		C	T-1/T-1	117%	122%	Not Solved	
VEA-T-46	IS TAP 138 kV---RADAR 138 kV Ckt #1		C	T-1/T-1	123%	129%	Not Solved	
VEA-T-47	NWEST 138 kV---SNOW MTN 138 kV Ckt #1		C	T-1/T-1	130%	136%	Not Solved	
VEA-T-48	PAHRUMP_1 230 kV---PAHRUMP 138 kV Ckt #2	Line AMARGOSA 138.0 to SANDY 138.0 Ckt 1 Tran PAHRUMP_1 230.00 to PAHRUMP 138.00 Ckt 1 0.00	C	T-1/L-1	107%	115%	80%	Eliminated by the Innovation-Mercury Switch 138 kV Line and Innovation 230/138 kV Sub project
VEA-T-49	PAHRUMP_1 230 kV---PAHRUMP 138 kV Ckt #1	Line AMARGOSA 138.0 to SANDY 138.0 Ckt 1 Tran PAHRUMP_1 230.00 to PAHRUMP 138.00 Ckt 2 0.00	C	T-1/L-1	107%	115%	80%	Eliminated by the Innovation-Mercury Switch 138 kV Line and Innovation 230/138 kV Sub project
VEA-T-50	PAHRUMP_1 230 kV---PAHRUMP 138 kV Ckt #2	Line GAMEBIRD 138.0 to GAMEBIRD_PST 138.0 Ckt bp Tran PAHRUMP_1 230.00 to PAHRUMP 138.00 Ckt 1 0.00	C	T-1/L-1	103%	111%	85%	Eliminated by the Innovation-Mercury Switch 138 kV Line and Innovation 230/138 kV Sub project

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
VEA-T-51	PAHRUMP_1 230 kV---PAHRUMP 138 kV Ckt #1	Line GAMEBIRD 138.0 to GAMEBIRD_PST 138.0 Ckt bp_Tran PAHRUMP_1 230.00 to PAHRUMP 138.00 Ckt 2 0.00	C	T-1/L-1	103%	111%	85%	Eliminated by the Innovation-Mercury Switch 138 kV Line and Innovation 230/138 kV Sub project
VEA-T-52	PAHRUMP_1 230 kV---PAHRUMP 138 kV Ckt #2	Line SANDY 138.0 to GAMEBIRD_PST 138.0 Ckt 1_Tran PAHRUMP_1 230.00 to PAHRUMP 138.00 Ckt 1 0.00	C	T-1/L-1	103%	111%	78%	Eliminated by the Innovation-Mercury Switch 138 kV Line and Innovation 230/138 kV Sub project
VEA-T-53	PAHRUMP_1 230 kV---PAHRUMP 138 kV Ckt #1	Line SANDY 138.0 to GAMEBIRD_PST 138.0 Ckt 1_Tran PAHRUMP_1 230.00 to PAHRUMP 138.00 Ckt 2 0.00	C	T-1/L-1	103%	111%	78%	Eliminated by the Innovation-Mercury Switch 138 kV Line and Innovation 230/138 kV Sub project
VEA-T-54	PAHRUMP_1 230 kV---PAHRUMP 138 kV Ckt #2	Tran AMARGOSA 230.00 to AMARGOSA 138.00 Ckt 1 0.00_Tran PAHRUMP_1 230.00 to PAHRUMP 138.00 Ckt 1 0.00	C	T-1/T-1	106%	114%	80%	Eliminated by the Innovation-Mercury Switch 138 kV Line and Innovation 230/138 kV Sub project
VEA-T-55	PAHRUMP_1 230 kV---PAHRUMP 138 kV Ckt #1	Tran AMARGOSA 230.00 to AMARGOSA 138.00 Ckt 1 0.00_Tran PAHRUMP_1 230.00 to PAHRUMP 138.00 Ckt 2 0.00	C	T-1/T-1	106%	114%	80%	Eliminated by the Innovation-Mercury Switch 138 kV Line and Innovation 230/138 kV Sub project
VEA-T-56	PAHRUMP_1 230 kV---PAHRUMP 138 kV Ckt #2	Tran PAHRUMP_1 230.00 to PAHRUMP 138.00 Ckt 1 0.00_Line IS TAP 138.0 to MERCRYSW 138.0 Ckt 1	C	T-1/L-1	108%	112%	76%	Eliminated by the Innovation-Mercury Switch 138 kV Line and Innovation 230/138 kV Sub project
VEA-T-57	PAHRUMP_1 230 kV---PAHRUMP 138 kV Ckt #2	Tran PAHRUMP_1 230.00 to PAHRUMP 138.00 Ckt 1 0.00_Line CANYON 138.0 to COLDCREK 138.0 Ckt 1	C	T-1/L-1	115%	119%	81%	Eliminated by the Innovation-Mercury Switch 138 kV Line and Innovation 230/138 kV Sub project

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
VEA-T-58	PAHRUMP_1 230 kV---PAHRUMP 138 kV Ckt #2	Tran PAHRUMP_1 230.00 to PAHRUMP 138.00 Ckt 1 0.00_Line CANYON 138.0 to SNOW MTN 138.0 Ckt 1	C	T-1/L-1	115%	119%	81%	Eliminated by the Innovation-Mercury Switch 138 kV Line and Innovation 230/138 kV Sub project
VEA-T-59	PAHRUMP_1 230 kV---PAHRUMP 138 kV Ckt #2	Tran PAHRUMP_1 230.00 to PAHRUMP 138.00 Ckt 1 0.00_Line COLDCREK 138.0 to RADAR 138.0 Ckt 1	C	T-1/L-1	111%	116%	79%	Eliminated by the Innovation-Mercury Switch 138 kV Line and Innovation 230/138 kV Sub project
VEA-T-60	PAHRUMP_1 230 kV---PAHRUMP 138 kV Ckt #2	Tran PAHRUMP_1 230.00 to PAHRUMP 138.00 Ckt 1 0.00_Line IS TAP 138.0 to RADAR 138.0 Ckt 1	C	T-1/L-1	111%	115%	79%	Eliminated by the Innovation-Mercury Switch 138 kV Line and Innovation 230/138 kV Sub project
VEA-T-61	PAHRUMP_1 230 kV---PAHRUMP 138 kV Ckt #2	Tran PAHRUMP_1 230.00 to PAHRUMP 138.00 Ckt 1 0.00_Line NWEST 138.0 to SNOW MTN 138.0 Ckt 1	C	T-1/L-1	115%	120%	82%	Eliminated by the Innovation-Mercury Switch 138 kV Line and Innovation 230/138 kV Sub project
VEA-T-62	PAHRUMP_1 230 kV---PAHRUMP 138 kV Ckt #1	Tran PAHRUMP_1 230.00 to PAHRUMP 138.00 Ckt 2 0.00_Line IS TAP 138.0 to MERCYSW 138.0 Ckt 1	C	T-1/L-1	108%	113%	76%	Eliminated by the Innovation-Mercury Switch 138 kV Line and Innovation 230/138 kV Sub project
VEA-T-63	PAHRUMP_1 230 kV---PAHRUMP 138 kV Ckt #1	Tran PAHRUMP_1 230.00 to PAHRUMP 138.00 Ckt 2 0.00_Line CANYON 138.0 to COLDCREK 138.0 Ckt 1	C	T-1/L-1	115%	120%	81%	Eliminated by the Innovation-Mercury Switch 138 kV Line and Innovation 230/138 kV Sub project
VEA-T-64	PAHRUMP_1 230 kV---PAHRUMP 138 kV Ckt #1	Tran PAHRUMP_1 230.00 to PAHRUMP 138.00 Ckt 2 0.00_Line CANYON 138.0 to SNOW MTN 138.0 Ckt 1	C	T-1/L-1	115%	120%	81%	Eliminated by the Innovation-Mercury Switch 138 kV Line and Innovation 230/138 kV Sub project

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
VEA-T-65	PAHRUMP_1 230 kV---PAHRUMP 138 kV Ckt #1	Tran PAHRUMP_1 230.00 to PAHRUMP 138.00 Ckt 2 0.00_Line COLDCREK 138.0 to RADAR 138.0 Ckt 1	C	T-1/L-1	112%	116%	79%	Eliminated by the Innovation-Mercury Switch 138 kV Line and Innovation 230/138 kV Sub project
VEA-T-66	PAHRUMP_1 230 kV---PAHRUMP 138 kV Ckt #1	Tran PAHRUMP_1 230.00 to PAHRUMP 138.00 Ckt 2 0.00_Line IS TAP 138.0 to RADAR 138.0 Ckt 1	C	T-1/L-1	111%	116%	79%	Eliminated by the Innovation-Mercury Switch 138 kV Line and Innovation 230/138 kV Sub project
VEA-T-67	PAHRUMP_1 230 kV---PAHRUMP 138 kV Ckt #1	Tran PAHRUMP_1 230.00 to PAHRUMP 138.00 Ckt 2 0.00_Line NWEST 138.0 to SNOW MTN 138.0 Ckt 1	C	T-1/L-1	116%	121%	82%	Eliminated by the Innovation-Mercury Switch 138 kV Line and Innovation 230/138 kV Sub project
VEA-T-68	PAHRUMP_1 230 kV---PAHRUMP 138 kV Ckt #2	Tran ELDORDO 500.0 to ELDORDO2 230.0 Ckt 1_Tran PAHRUMP_1 230.00 to PAHRUMP 138.00 Ckt 1 0.00	C	T-1/T-1	93%	104%	95%	Eliminated by the Innovation-Mercury Switch 138 kV Line and Innovation 230/138 kV Sub project
VEA-T-69	PAHRUMP_1 230 kV---PAHRUMP 138 kV Ckt #1	Tran ELDORDO 500.0 to ELDORDO2 230.0 Ckt 1_Tran PAHRUMP_1 230.00 to PAHRUMP 138.00 Ckt 2 0.00	C	T-1/T-1	94%	105%	95%	Eliminated by the Innovation-Mercury Switch 138 kV Line and Innovation 230/138 kV Sub project
VEA-T-70	PAHRUMP 138 kV---VISTA 138 kV Ckt #1	Line PAHRUMP 138.0 to GAMEBIRD 138.0 Ckt 1_Line CRAZY EYE TP 230.0 to BOB TAP 230.0 Ckt 1	C	L-1/L-1	24%	31%	169%	Modify previous identified Crazy Eye SPS to trip more generation after second contingency, or apply congestion management to curtail generation after one of the three units are tripped by the SPS



**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
VEA-T-71	VEA Area - EOP 230 kV System	Tran ELDORDO 500.0 to ELDORDO2 230.0 Ckt 1_Line MEAD S 230.0 to BOB TAP 230.0 Ckt 1	C	T-1/L-1	NA	<100%	Not Solved	modify Ivanpah-Eldorado SPS and Crazy Eye SPS previously identified, or apply congestion management to curtail generation after 1st contingency
VEA-T-72	MEAD S 230 kV---BOB TAP 230 kV Ckt #1	Tran ELDORDO 500.0 to ELDORDO2 230.0 Ckt 1_Line PAHRUMP_1 230.0 to CRAZY EYE TP 230.0 Ckt 1	C	T-1/L-1	6%	98%	153%	modify Ivanpah-Eldorado SPS identified in GIP by ignoring the Category B outage of the SCE new Eldorado AA bank, and apply congestion management to curtail generation after 1st contingency



**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Summer Off-Peak	N/A	
VEA-T-73	MEAD S 230 kV---BOB TAP 230 kV Ckt #1	Tran ELDORDO 500.0 to ELDORDO2 230.0 Ckt 1_Line PAHRUMP_1 230.0 to CRAZY EYE TP 230.0 Ckt 1	C	T1-L1	6%	101%		modify Ivanpah-Eldorado SPS identified in GIP by ignoring the Category B outage of the SCE new Eldorado AA bank, and apply congestion management to curtail generation after 1st contingency

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
VEA-VD-1	BEATTY 138 kV Bus	Line PAHRUMP 138.0 to VISTA 138.0 Circuit 1	B	L-1	-6.42%	-0.92%	-0.30%	Eliminated by the Innovation-Mercury Switch 138 kV Line and Innovation 230/138 kV Sub project. But prior to completion of this project, it is recommended to coordinate with NVE and request to operate the Nwest 138 kV bus voltage at about 1.03 pu under summer peak normal condition in 2013
VEA-VD-2	BONDGDTP 138 kV Bus		B	L-1	-6.42%	-0.92%	-0.30%	
VEA-VD-3	FRENCHMN 138 kV Bus		B	L-1	-5.54%	-0.79%	-0.25%	
VEA-VD-4	GROOM LK 138 kV Bus		B	L-1	-5.95%	-0.86%	-0.31%	
VEA-VD-5	JACKASSF 138 kV Bus		B	L-1	-6.24%	-0.90%	-0.32%	
VEA-VD-6	JOHNNIE 138 kV Bus		B	L-1	-7.15%	-0.96%	-0.37%	
VEA-VD-7	LTHRPWLS 138 kV Bus		B	L-1	-6.40%	-0.92%	-0.31%	
VEA-VD-8	MERCRYSW 138 kV Bus		B	L-1	-5.29%	-0.75%	-0.22%	
VEA-VD-9	MERCURY 138 kV Bus		B	L-1	-5.29%	-0.76%	-0.21%	
VEA-VD-10	NTSCANYN 138 kV Bus		B	L-1	-6.21%	-0.90%	-0.33%	
VEA-VD-11	RAINIER 138 kV Bus		B	L-1	-6.01%	-0.87%	-0.32%	
VEA-VD-12	STOCKADE 138 kV Bus		B	L-1	-6.09%	-0.89%	-0.33%	
VEA-VD-13	VALLEYNT 138 kV Bus		B	L-1	-5.94%	-0.86%	-0.30%	
VEA-VD-14	VALLEYTP 138 kV Bus		B	L-1	-6.49%	-0.93%	-0.31%	
VEA-VD-15	VALLEYVE 138 kV Bus		B	L-1	-6.49%	-0.93%	-0.31%	
VEA-VD-16	VISTA 138 kV Bus		B	L-1	-7.15%	-0.92%	-0.32%	
VEA-VD-17	YUCCAFLT 138 kV Bus		B	L-1	-5.76%	-0.83%	-0.28%	
VEA-VD-18	CHARLSTN 138 kV Bus	Line PAHRUMP 138.0 to GAMEBIRD 138.0 Circuit 1	B	L-1	-13.26%	-1.60%	-1.79%	Prior to Charleston-Vista 138 kV line, adopt interim 8% voltage deviation criteria and work with WAPA to boost 138 kV bus voltage by re-setting NLTC of Amargosa bank
VEA-VD-19	GAMEBIRD 138 kV Bus		B	L-1	-13.15%	-2.57%	-2.55%	
VEA-VD-20	SANDY 138 kV Bus		B	L-1	-10.51%	-2.04%	-1.65%	
VEA-VD-21	THSNDAIR 138 kV Bus		B	L-1	-13.21%	-2.28%	-2.32%	
VEA-VD-22	PAHRUMP_1 230 kV Bus	Line PAHRUMP_1 230.0 to CRAZY EYE TP 230.0 Circuit 1	B	L-1	-4.21%	-4.10%	-6.65%	Waived due to non-load bus by requests, or consider higher voltage deviation criteria (7%)
VEA-VD-23	PAHRUMP_1 230 kV Bus	Line CRAZY EYE TP 230.0 to BOB TAP 230.0 Circuit 1	B	L-1	-3.64%	-3.53%	-5.15%	Waived due to non-load bus by requests, or consider higher voltage deviation criteria (7%)
VEA-VD-24	CHARLSTN 138 kV Bus		C	Breaker Failure	-13.27%	-9.80%	-10.85%	
VEA-VD-25	GAMEBIRD 138 kV Bus		C	Breaker Failure	-13.17%	-10.17%	-11.30%	

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
VEA-VD-26	GAMEBIRD_PST 138 kV Bus	Brkr Fail PAHRUMP-VISTA 138 & PAHRUMP-GAMEBIRD 138 1.000 CatC BKR Fit	C	Breaker Failure	-13.16%	-10.16%	-11.30%	Eliminated by the Innovation-Mercury Switch 138 kV Line and Innovation 230/138 kV Sub project and re-setting NLTC of the Amargosa 230/138 kV transformer
VEA-VD-27	JOHNNIE 138 kV Bus		C	Breaker Failure	-7.10%	-9.19%	-10.45%	
VEA-VD-28	SANDY 138 kV Bus		C	Breaker Failure	-10.53%	-8.18%	-8.74%	
VEA-VD-29	THSNDAIR 138 kV Bus		C	Breaker Failure	-13.22%	-10.09%	-11.20%	
VEA-VD-30	VISTA 138 kV Bus		C	Breaker Failure	-7.11%	-9.45%	-10.45%	
VEA-VD-31	AMARGOSA 138 kV Bus	Line N WEST 230.0 to DESERT VIEW 230.0 Ckt 1_Line PAHRUMP_1 230.0 to CRAZY EYE TP 230.0 Ckt 1	C	L-1/L-1	-6.56%	-6.98%	-10.38%	operate the 138 kV system in radial with three independent supplies from Amargosa, Pahrump, and Jackass Flat transmission sources after first contingency to isolate potential impact on the vicinity area (Zone 183/187)
VEA-VD-32	BEATTY 138 kV Bus		C	L-1/L-1	-16.05%	-16.98%	-28.06%	
VEA-VD-33	BONDGDTP 138 kV Bus		C	L-1/L-1	-16.05%	-16.98%	-28.04%	
VEA-VD-34	CHARLSTN 138 kV Bus		C	L-1/L-1	-19.33%	-20.02%	-32.67%	
VEA-VD-35	DESERT VIEW 230 kV Bus		C	L-1/L-1	-24.23%	-26.16%	-36.39%	
VEA-VD-36	FRENCHMN 138 kV Bus		C	L-1/L-1	-12.77%	-13.55%	-21.97%	
VEA-VD-37	GAMEBIRD 138 kV Bus		C	L-1/L-1	-19.17%	-20.00%	-32.59%	
VEA-VD-38	GROOM LK 138 kV Bus		C	L-1/L-1	-13.80%	-14.63%	-23.89%	
VEA-VD-39	IND SPR 138 kV Bus		C	L-1/L-1	-7.18%	-7.66%	-12.06%	
VEA-VD-40	IS TAP 138 kV Bus		C	L-1/L-1	-7.18%	-7.66%	-12.06%	
VEA-VD-41	JACKASSF 138 kV Bus		C	L-1/L-1	-14.89%	-15.76%	-25.88%	
VEA-VD-42	JOHNNIE 138 kV Bus		C	L-1/L-1	-18.52%	-19.54%	-32.13%	
VEA-VD-43	LTHRPWLS 138 kV Bus		C	L-1/L-1	-15.97%	-16.89%	-27.87%	
VEA-VD-44	MERCURYSW 138 kV Bus		C	L-1/L-1	-12.13%	-12.87%	-20.79%	
VEA-VD-45	MERCURY 138 kV Bus		C	L-1/L-1	-12.13%	-12.88%	-20.78%	
VEA-VD-46	NTSCANYN 138 kV Bus		C	L-1/L-1	-14.72%	-15.60%	-25.60%	
VEA-VD-47	PAHRUMP 138 kV Bus		C	L-1/L-1	-19.82%	-20.70%	-33.57%	
VEA-VD-48	PAHRUMP_1 230 kV Bus		C	L-1/L-1	-24.31%	-26.27%	-38.56%	
VEA-VD-49	RADAR 138 kV Bus		C	L-1/L-1	-6.89%	-7.35%	-11.56%	
VEA-VD-50	RAINIER 138 kV Bus		C	L-1/L-1	-13.95%	-14.79%	-24.19%	
VEA-VD-51	SANDY 138 kV Bus		C	L-1/L-1	-15.69%	-16.49%	-25.12%	

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
VEA-VD-52	STOCKADE 138 kV Bus		C	L-1/L-1	-14.17%	-15.03%	-24.60%	
VEA-VD-53	THSNDAIR 138 kV Bus		C	L-1/L-1	-19.26%	-20.04%	-32.70%	
VEA-VD-54	VALLEYNT 138 kV Bus		C	L-1/L-1	-13.78%	-14.62%	-23.86%	
VEA-VD-55	VALLEYTP 138 kV Bus		C	L-1/L-1	-16.75%	-17.71%	-29.32%	
VEA-VD-56	VALLEYVE 138 kV Bus		C	L-1/L-1	-16.77%	-17.73%	-29.36%	
VEA-VD-57	VISTA 138 kV Bus		C	L-1/L-1	-18.88%	-19.90%	-32.45%	
VEA-VD-58	YUCCAFLT 138 kV Bus		C	L-1/L-1	-13.32%	-14.13%	-22.99%	
VEA-VD-59	DESERT VIEW 230 kV Bus		C	L-1/L-1	-24.23%	-26.16%	-36.39%	
VEA-VD-60	PAHRUMP_1 230 kV Bus		C	L-1/L-1	-24.31%	-26.27%	-38.56%	
VEA-VD-61	CRAZY EYE TP230 kV Bus			C	L-1/L-1	NA	NA	
VEA-VD-62	DESERT VIEW 230 kV Bus	C		L-1/L-1	-23.14%	-25.03%	Not Solved	
VEA-VD-63	LTHRPWLS 138 kV Bus	C		L-1/L-1	-15.20%	-16.08%	Not Solved	
VEA-VD-64	MERCRYSW 138 kV Bus	C		L-1/L-1	-11.60%	-12.31%	Not Solved	
VEA-VD-65	MERCURY 138 kV Bus	C		L-1/L-1	-11.60%	-12.32%	Not Solved	
VEA-VD-66	NTSCANYN 138 kV Bus	C		L-1/L-1	-14.06%	-14.90%	Not Solved	
VEA-VD-67	PAHRUMP 138 kV Bus	C		L-1/L-1	-18.75%	-19.60%	Not Solved	

2012/2013 ISO Reliability Assessment - Study Results

Study Area: **Valley Electric Association - Summer Peak**



**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
VEA-VD-68	PAHRUMP_1 230 kV Bus	Line N WEST 230.0 to DESERT VIEW 230.0 Ckt 1_Line CRAZY EYE TP 230.0 to BOB TAP 230.0 Ckt 1	C	L-1/L-1	-23.23%	-25.16%	Not Solved	For 2014/2017, operate the VEA 138 kV system in radial after 1st outage to isolate potential impact on the vicinity area. For 2022, modify the Crazy Eye SPS to cover this L-1-1 event, or apply congestion management after 1st outage
VEA-VD-69	RAINIER 138 kV Bus		C	L-1/L-1	-13.34%	-14.14%	Not Solved	
VEA-VD-70	STOCKADE 138 kV Bus		C	L-1/L-1	-13.54%	-14.37%	Not Solved	
VEA-VD-71	THSNDAIR 138 kV Bus		C	L-1/L-1	-18.23%	-18.98%	Not Solved	
VEA-VD-72	VALLEYNT 138 kV Bus		C	L-1/L-1	-13.17%	-13.98%	Not Solved	
VEA-VD-73	VALLEYTP 138 kV Bus		C	L-1/L-1	-15.91%	-16.83%	Not Solved	
VEA-VD-74	VALLEYVE 138 kV Bus		C	L-1/L-1	-15.93%	-16.85%	Not Solved	
VEA-VD-75	VISTA 138 kV Bus		C	L-1/L-1	-17.87%	-18.85%	Not Solved	
VEA-VD-76	YUCCAFLT 138 kV Bus		C	L-1/L-1	-12.74%	-13.51%	Not Solved	
VEA-VD-77	CRAZY EYE TP230 kV Bus		C	L-1/L-1	NA	NA	Not Solved	
VEA-VD-78	DESERT VIEW 230 kV Bus		C	L-1/L-1	-23.14%	-25.03%	Not Solved	
VEA-VD-79	PAHRUMP_1 230 kV Bus		C	L-1/L-1	-23.23%	-25.16%	Not Solved	
VEA-VD-80	BEATTY 138 kV Bus			C	L-1/L-1	-19.90%	-20.62%	
VEA-VD-81	GROOM LK 138 kV Bus	C		L-1/L-1	-16.84%	-17.41%	Not Solved	
VEA-VD-82	JACKASSF 138 kV Bus	C		L-1/L-1	-18.27%	-18.92%	Not Solved	

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
VEA-VD-83	JOHNNIE 138 kV Bus	Line PAHRUMP_1 230.0 to DESERT VIEW 230.0 Ckt 1_Line PAHRUMP_1 230.0 to CRAZY EYE TP 230.0 Ckt 1	C	L-1/L-1	-23.23%	-24.09%	Not Solved	operate the 138 kV system in radial with three independent supplies from Amargosa, Pahrump, and Jackass Flat transmission sources after first contingency to isolate potential impact on the vicinity area (Zone 183/187)
VEA-VD-84	LTHRPWLS 138 kV Bus		C	L-1/L-1	-19.79%	-20.50%	Not Solved	
VEA-VD-85	MERCRYSW 138 kV Bus		C	L-1/L-1	-14.77%	-15.24%	Not Solved	
VEA-VD-86	MERCURY 138 kV Bus		C	L-1/L-1	-14.77%	-15.25%	Not Solved	
VEA-VD-87	NTSCANYN 138 kV Bus		C	L-1/L-1	-18.06%	-18.69%	Not Solved	
VEA-VD-88	PAHRUMP 138 kV Bus		C	L-1/L-1	-25.04%	-25.74%	Not Solved	
VEA-VD-89	PAHRUMP_1 230 kV Bus		C	L-1/L-1	-29.57%	-31.36%	Not Solved	
VEA-VD-90	RAINIER 138 kV Bus		C	L-1/L-1	-17.04%	-17.62%	Not Solved	
VEA-VD-91	SANDY 138 kV Bus		C	L-1/L-1	-19.75%	-20.39%	Not Solved	
VEA-VD-92	STOCKADE 138 kV Bus		C	L-1/L-1	-17.30%	-17.91%	Not Solved	
VEA-VD-93	THSNDAIR 138 kV Bus		C	L-1/L-1	-24.32%	-24.89%	Not Solved	
VEA-VD-94	VALLEYNT 138 kV Bus		C	L-1/L-1	-16.82%	-17.40%	Not Solved	
VEA-VD-95	VALLEYTP 138 kV Bus		C	L-1/L-1	-20.91%	-21.67%	Not Solved	
VEA-VD-96	VALLEYVE 138 kV Bus		C	L-1/L-1	-20.93%	-21.69%	Not Solved	
VEA-VD-97	VISTA 138 kV Bus		C	L-1/L-1	-23.80%	-24.68%	Not Solved	

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
VEA-VD-98	YUCCAFLT 138 kV Bus		C	L-1/L-1	-16.25%	-16.79%	Not Solved	
VEA-VD-99	PAHRUMP_1 230 kV Bus		C	L-1/L-1	-29.57%	-31.36%	Not Solved	
VEA-VD-100	BEATTY 138 kV Bus	Line PAHRUMP_1 230.0 to DESERT VIEW 230.0 Ckt 1_Line CRAZY EYE TP 230.0 to BOB TAP 230.0 Ckt 1	C	L-1/L-1	-19.16%	-19.84%	Not Solved	For 2014/2017, operate the VEA 138 kV system in radial after 1st outage to isolate potential impact on the vicinity area. For 2022, modify the Crazy Eye SPS to cover this L-1-1 event, or apply congestion management after 1st outage
VEA-VD-101	GROOM LK 138 kV Bus		C	L-1/L-1	-16.26%	-16.80%	Not Solved	
VEA-VD-102	JACKASSF 138 kV Bus		C	L-1/L-1	-17.63%	-18.23%	Not Solved	
VEA-VD-103	JOHNNIE 138 kV Bus		C	L-1/L-1	-22.33%	-23.14%	Not Solved	
VEA-VD-104	LTHRPWLS 138 kV Bus		C	L-1/L-1	-19.06%	-19.72%	Not Solved	
VEA-VD-105	MERCRYSW 138 kV Bus		C	L-1/L-1	-14.27%	-14.71%	Not Solved	
VEA-VD-106	MERCURY 138 kV Bus		C	L-1/L-1	-14.27%	-14.72%	Not Solved	
VEA-VD-107	NTSCANYN 138 kV Bus		C	L-1/L-1	-17.42%	-18.02%	Not Solved	
VEA-VD-108	PAHRUMP 138 kV Bus		C	L-1/L-1	-24.04%	-24.69%	Not Solved	
VEA-VD-109	PAHRUMP_1 230 kV Bus		C	L-1/L-1	-28.56%	-30.31%	Not Solved	
VEA-VD-110	RAINIER 138 kV Bus		C	L-1/L-1	-16.45%	-17.00%	Not Solved	
VEA-VD-111	SANDY 138 kV Bus		C	L-1/L-1	-18.98%	-19.58%	Not Solved	
VEA-VD-112	STOCKADE 138 kV Bus		C	L-1/L-1	-16.71%	-17.28%	Not Solved	

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
VEA-VD-113	THSNDAIR 138 kV Bus		C	L-1/L-1	-23.35%	-23.88%	Not Solved	
VEA-VD-114	VALLEYNT 138 kV Bus		C	L-1/L-1	-16.24%	-16.79%	Not Solved	
VEA-VD-115	VALLEYTP 138 kV Bus		C	L-1/L-1	-20.12%	-20.83%	Not Solved	
VEA-VD-116	VALLEYVE 138 kV Bus		C	L-1/L-1	-20.14%	-20.85%	Not Solved	
VEA-VD-117	VISTA 138 kV Bus		C	L-1/L-1	-22.86%	-23.68%	Not Solved	
VEA-VD-118	YUCCAFLT 138 kV Bus		C	L-1/L-1	-15.69%	-16.20%	Not Solved	
VEA-VD-119	CRAZY EYE TP230 kV Bus		C	L-1/L-1	NA	NA	Not Solved	
VEA-VD-120	PAHRUMP_1 230 kV Bus		C	L-1/L-1	-28.56%	-30.31%	Not Solved	
VEA-VD-121	BEATTY 138 kV Bus			C	T-1/T-1	-19.73%	-20.89%	
VEA-VD-122	BONDGDTP 138 kV Bus	C		T-1/T-1	-19.72%	-20.88%	Not Solved	
VEA-VD-123	CHARLSTN 138 kV Bus	C		T-1/T-1	-24.26%	-25.07%	Not Solved	
VEA-VD-124	FRENCHMN 138 kV Bus	C		T-1/T-1	-15.40%	-16.36%	Not Solved	
VEA-VD-125	GAMEBIRD 138 kV Bus	C		T-1/T-1	-24.04%	-25.04%	Not Solved	
VEA-VD-126	GROOM LK 138 kV Bus	C		T-1/T-1	-16.67%	-17.70%	Not Solved	
VEA-VD-127	JACKASSF 138 kV Bus	C		T-1/T-1	-18.11%	-19.19%	Not Solved	



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Study Area: **Valley Electric Association - Summer Peak**



**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
VEA-VD-128	JOHNNIE 138 kV Bus	Tran PAHRUMP_1 230.00 to PAHRUMP 138.00 Ckt 1 0.00_Tran PAHRUMP_1 230.00 to PAHRUMP 138.00 Ckt 2 0.00	C	T-1/T-1	-23.06%	-24.33%	Not Solved	Eliminated by the Innovation-Mercury Switch 138 kV Line and Innovation 230/138 kV Sub project recently included in the FERC approved Amendment to Transition Agreement
VEA-VD-129	LTHRPWLS 138 kV Bus		C	T-1/T-1	-19.62%	-20.77%	Not Solved	
VEA-VD-130	MERCURYSW 138 kV Bus		C	T-1/T-1	-14.61%	-15.52%	Not Solved	
VEA-VD-131	MERCURY 138 kV Bus		C	T-1/T-1	-14.61%	-15.53%	Not Solved	
VEA-VD-132	NTSCANYN 138 kV Bus		C	T-1/T-1	-17.89%	-18.97%	Not Solved	
VEA-VD-133	PAHRUMP 138 kV Bus		C	T-1/T-1	-24.88%	-25.96%	Not Solved	
VEA-VD-134	RAINIER 138 kV Bus		C	T-1/T-1	-16.87%	-17.90%	Not Solved	
VEA-VD-135	SANDY 138 kV Bus		C	T-1/T-1	-19.61%	-20.56%	Not Solved	
VEA-VD-136	STOCKADE 138 kV Bus		C	T-1/T-1	-17.14%	-18.19%	Not Solved	
VEA-VD-137	THSNDAIR 138 kV Bus		C	T-1/T-1	-24.16%	-25.11%	Not Solved	
VEA-VD-138	VALLEYNT 138 kV Bus		C	T-1/T-1	-16.65%	-17.68%	Not Solved	
VEA-VD-139	VALLEYTP 138 kV Bus		C	T-1/T-1	-20.74%	-21.93%	Not Solved	
VEA-VD-140	VALLEYVE 138 kV Bus		C	T-1/T-1	-20.76%	-21.96%	Not Solved	
VEA-VD-141	VISTA 138 kV Bus		C	T-1/T-1	-23.64%	-24.91%	Not Solved	
VEA-VD-142	YUCCAFLT 138 kV Bus		C	T-1/T-1	-16.08%	-17.07%	Not Solved	

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Study Area: **Valley Electric Association - Summer Peak**



**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
VEA-VD-143	BOB TAP 230 kV Bus	Tran ELDORDO 500.0 to ELDORDO2 230.0 Ckt 1_Line MEAD S 230.0 to BOB TAP 230.0 Ckt 1	C	L-1/L-1	NA	-11.22%	Not Solved	modify Ivanpah-Eldorado SPS and Crazy Eye SPS previously identified, or apply congestion management to curtail generation after 1st contingency
VEA-VD-144	ELDORDO2 230 kV Bus		C	L-1/L-1	NA	-11.07%	Not Solved	
VEA-VD-145	PAHRUMP_1 230 kV Bus		C	L-1/L-1	-1.61%	-10.36%	Not Solved	

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Summer Off-Peak	N/A	
VEA-VD-146	DESERT VIEW 230 kV Bus	Line NWEST 230.0 to DESERT VIEW 230.0 Circuit 1	C	L-1	7.48%	3.78%		be waived due to non-load bus by requests
VEA-VD-147	PAHRUMP_1 230 kV Bus	Line NWEST 230.0 to DESERT VIEW 230.0 Ckt 1_Line PAHRUMP_1 230.0 to CRAZY EYE TP 230.0 Ckt 1	C	L-1/L-1	15.77%	-13.14%		Develop operation procedure to lock On Load Tap Changer (OLTC) of the Pahrump 230/138 kV transformers for light load condition.
VEA-VD-148	DESERT VIEW 230 kV Bus		C	L-1/L-1	19.55%	-11.42%		
VEA-VD-149	DESERT VIEW 230 kV Bus	Line NWEST 230.0 to DESERT VIEW 230.0 Ckt 1_Line CRAZY EYE TP 230.0 to BOB TAP 230.0 Ckt 1	C	L-1/L-1	NA	-10.41%		operate the VEA 138 kV system in radial after 1st outage to isolate potential impact on the vicinity area
VEA-VD-150	PAHRUMP_1 230 kV Bus		C	L-1/L-1	NA	-12.14%		
VEA-VD-151	PAHRUMP_1 230 kV Bus	Line PAHRUMP_1 230.0 to DESERT VIEW 230.0 Ckt 1_Line PAHRUMP_1 230.0 to CRAZY EYE TP 230.0 Ckt 1	C	L-1/L-1	-12.48%	-16.44%		operate the VEA 138 kV system in radial after 1st outage to isolate potential impact on the vicinity area
VEA-VD-152	PAHRUMP_1 230 kV Bus	Line PAHRUMP_1 230.0 to DESERT VIEW 230.0 Ckt 1_Line CRAZY EYE TP 230.0 to BOB TAP 230.0 Ckt 1	C	L-1/L-1	-11.55%	-15.51%		operate the VEA 138 kV system in radial after 1st outage to isolate potential impact on the vicinity area
VEA-VD-153	BOB TAP 230 kV Bus	Tran ELDORDO 500.0 to ELDORDO2 230.0 Ckt 1_Line MEAD S 230.0 to BOB TAP 230.0 Ckt 1	C	L-1/L-1	NA	-10.99%		modify Ivanpah-Eldorado SPS and Crazy Eye SPS previously identified, or apply congestion management to curtail generation after 1st contingency
VEA-VD-154	ELDORDO2 230 kV Bus		C	L-1/L-1	NA	-10.85%		
VEA-VD-155	PAHRUMP_1 230 kV Bus		C	L-1/L-1	-0.03%	-11.51%		

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Study Area: **Valley Electric Association - Summer Peak**



High/Low Voltage

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
VEA-V-1	CHARLSTN 138 kV Bus	Line PAHRUMP 138.0 to GAMEBIRD 138.0 Circuit 1	B	L-1	0.88	1.00	1.00	Prior to Charleston-Vista 138 kV line, work with WAPA to re-set NLTC of Amargosa bank
VEA-V-2	GAMEBIRD 138 kV Bus		B	L-1	0.89	1.00	0.99	
VEA-V-3	THSND AIR 138 kV Bus		B	L-1	0.89	1.00	0.99	
VEA-V-4	CHARLSTN 138 kV Bus	Brkr Fail PAHRUMP-VISTA 138 & PAHRUMP-GAMEBIRD 138 1.000 CatC BKR Fit	C	Breaker Failure	0.88	0.92	0.91	Eliminated by the Innovation-Mercury Switch 138 kV Line and Innovation 230/138 kV Sub project
VEA-V-5	GAMEBIRD 138 kV Bus		C	Breaker Failure	0.89	0.92	0.91	
VEA-V-6	GAMEBIRD_PST138 kV Bus		C	Breaker Failure	0.89	0.92	0.90	
VEA-V-7	THSND AIR 138 kV Bus		C	Breaker Failure	0.89	0.92	0.90	
VEA-V-8	AMARGOSA 138 kV Bus	Line N WEST 230.0 to DESERT VIEW 230.0 Ckt 1_Line PAHRUMP_1 230.0 to CRAZY EYE TP 230.0 Ckt 1	C	L-1/L-1	0.94	0.94	0.89	operate the 138 kV system in radial with three independent supplies from Amargosa, Pahrump, and Jackass Flat transmission sources after first contingency to isolate potential impact on the vicinity area (Zone 183/187)
VEA-V-9	BEATTY 138 kV Bus		C	L-1/L-1	0.86	0.85	0.75	
VEA-V-10	BONDGDTP 138 kV Bus		C	L-1/L-1	0.86	0.85	0.75	
VEA-V-11	CHARLSTN 138 kV Bus		C	L-1/L-1	0.82	0.82	0.69	
VEA-V-12	DESERT VIEW 230 kV Bus		C	L-1/L-1	0.76	0.75	0.63	
VEA-V-13	FRENCHMN 138 kV Bus		C	L-1/L-1	0.89	0.88	0.81	
VEA-V-14	GAMEBIRD 138 kV Bus		C	L-1/L-1	0.83	0.82	0.69	
VEA-V-15	GROOM LK 138 kV Bus		C	L-1/L-1	0.88	0.88	0.80	
VEA-V-16	IND SPR 138 kV Bus		C	L-1/L-1	0.94	0.94	0.90	
VEA-V-17	IS TAP 138 kV Bus		C	L-1/L-1	0.94	0.94	0.90	
VEA-V-18	JACKASSF 138 kV Bus		C	L-1/L-1	0.87	0.86	0.77	
VEA-V-19	JOHNNIE 138 kV Bus		C	L-1/L-1	0.84	0.83	0.71	
VEA-V-20	LTHRPWLS 138 kV Bus		C	L-1/L-1	0.86	0.85	0.75	
VEA-V-21	MERCYSW 138 kV Bus		C	L-1/L-1	0.89	0.89	0.82	
VEA-V-22	MERCURY 138 kV Bus		C	L-1/L-1	0.89	0.89	0.82	
VEA-V-23	NTSCANYN 138 kV Bus		C	L-1/L-1	0.87	0.87	0.78	
VEA-V-24	PAHRUMP 138 kV Bus		C	L-1/L-1	0.83	0.82	0.69	
VEA-V-25	PAHRUMP_1 230 kV Bus		C	L-1/L-1	0.75	0.74	0.62	
VEA-V-26	RAINIER 138 kV Bus		C	L-1/L-1	0.88	0.88	0.80	
VEA-V-27	SANDY 138 kV Bus	C	L-1/L-1	0.86	0.85	0.76		

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Study Area: **Valley Electric Association - Summer Peak**



**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions		
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak			
VEA-V-28	THSNDAIR 138 kV Bus		C	L-1/L-1	0.83	0.82	0.69			
VEA-V-29	VALLEYNT 138 kV Bus		C	L-1/L-1	0.88	0.88	0.80			
VEA-V-30	VALLEYTP 138 kV Bus		C	L-1/L-1	0.86	0.85	0.74			
VEA-V-31	VALLEYVE 138 kV Bus		C	L-1/L-1	0.86	0.85	0.74			
VEA-V-32	VISTA 138 kV Bus		C	L-1/L-1	0.84	0.82	0.70			
VEA-V-33	YUCCAFLT 138 kV Bus		C	L-1/L-1	0.89	0.88	0.81			
VEA-V-34	DESERT VIEW 230 kV Bus		C	L-1/L-1	0.76	0.75	0.63			
VEA-V-35	PAHRUMP_1 230 kV Bus		C	L-1/L-1	0.75	0.74	0.62			
VEA-V-36	BEATTY 138 kV Bus		Line NWEST 230.0 to DESERT VIEW 230.0 Ckt 1_Line CRAZY EYE TP 230.0 to BOB TAP 230.0 Ckt 1	C	L-1/L-1	0.87	0.86		Not Solved	For 2014/2017, operate the VEA 138 kV system in radial after 1st outage to isolate potential impact on the vicinity area. For 2022, modify the Crazy Eye SPS to cover this L-1-1 event, or apply congestion management after 1st outage
VEA-V-37	BONDGDTP 138 kV Bus			C	L-1/L-1	0.87	0.86		Not Solved	
VEA-V-38	CHARLSTN 138 kV Bus	C		L-1/L-1	0.83	0.83	Not Solved			
VEA-V-39	CRAZY EYE TP230 kV Bus	C		L-1/L-1	0.76	0.76	Not Solved			
VEA-V-40	DESERT VIEW 230 kV Bus	C		L-1/L-1	0.77	0.76	Not Solved			
VEA-V-41	FRENCHMN 138 kV Bus	C		L-1/L-1	0.90	0.89	Not Solved			
VEA-V-42	GAMEBIRD 138 kV Bus	C		L-1/L-1	0.84	0.83	Not Solved			
VEA-V-43	GROOM LK 138 kV Bus	C		L-1/L-1	0.89	0.88	Not Solved			
VEA-V-44	JACKASSF 138 kV Bus	C		L-1/L-1	0.88	0.87	Not Solved			
VEA-V-45	JOHNNIE 138 kV Bus	C		L-1/L-1	0.85	0.84	Not Solved			
VEA-V-46	LTHRPWLS 138 kV Bus	C		L-1/L-1	0.87	0.86	Not Solved			
VEA-V-47	MERCRYSW 138 kV Bus	C		L-1/L-1	0.90	0.89	Not Solved			
VEA-V-48	MERCURY 138 kV Bus	C		L-1/L-1	0.90	0.89	Not Solved			
VEA-V-49	NTSCANYN 138 kV Bus	C		L-1/L-1	0.88	0.87	Not Solved			
VEA-V-50	PAHRUMP 138 kV Bus	C		L-1/L-1	0.84	0.83	Not Solved			
VEA-V-51	PAHRUMP_1 230 kV Bus	C		L-1/L-1	0.76	0.75	Not Solved			
VEA-V-52	RAINIER 138 kV Bus	C		L-1/L-1	0.89	0.88	Not Solved			
VEA-V-53	SANDY 138 kV Bus	C		L-1/L-1	0.87	0.86	Not Solved			
VEA-V-54	THSNDAIR 138 kV Bus	C		L-1/L-1	0.84	0.83	Not Solved			
VEA-V-55	VALLEYNT 138 kV Bus	C		L-1/L-1	0.89	0.88	Not Solved			
VEA-V-56	VALLEYTP 138 kV Bus	C	L-1/L-1	0.87	0.86	Not Solved				
VEA-V-57	VALLEYVE 138 kV Bus	C	L-1/L-1	0.87	0.86	Not Solved				
VEA-V-58	VISTA 138 kV Bus	C	L-1/L-1	0.85	0.83	Not Solved				

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
VEA-V-59	YUCCAFLT 138 kV Bus		C	L-1/L-1	0.89	0.89	Not Solved	
VEA-V-60	CRAZY EYE TP230 kV Bus		C	L-1/L-1	0.76	0.76	Not Solved	
VEA-V-61	DESERT VIEW 230 kV Bus		C	L-1/L-1	0.77	0.76	Not Solved	
VEA-V-62	PAHRUMP_1 230 kV Bus		C	L-1/L-1	0.76	0.75	Not Solved	
VEA-V-63	BEATTY 138 kV Bus	Line PAHRUMP_1 230.0 to DESERT VIEW 230.0 Ckt 1_Line PAHRUMP_1 230.0 to CRAZY EYE TP 230.0 Ckt 1	C	L-1/L-1	0.82	0.82	Not Solved	operate the 138 kV system in radial with three independent supplies from Amargosa, Pahrump, and Jackass Flat transmission sources after first contingency to isolate potential impact on the vicinity area (Zone 183/187)
VEA-V-64	BONDGTP 138 kV Bus		C	L-1/L-1	0.82	0.82	Not Solved	
VEA-V-65	CHARLSTN 138 kV Bus		C	L-1/L-1	0.77	0.77	Not Solved	
VEA-V-66	FRENCHMN 138 kV Bus		C	L-1/L-1	0.86	0.86	Not Solved	
VEA-V-67	GAMEBIRD 138 kV Bus		C	L-1/L-1	0.78	0.77	Not Solved	
VEA-V-68	GROOM LK 138 kV Bus		C	L-1/L-1	0.85	0.85	Not Solved	
VEA-V-69	JACKASSF 138 kV Bus		C	L-1/L-1	0.84	0.83	Not Solved	
VEA-V-70	JOHNNIE 138 kV Bus		C	L-1/L-1	0.79	0.78	Not Solved	
VEA-V-71	LTHRPWLS 138 kV Bus		C	L-1/L-1	0.83	0.82	Not Solved	
VEA-V-72	MERCRYSW 138 kV Bus		C	L-1/L-1	0.87	0.86	Not Solved	
VEA-V-73	MERCURY 138 kV Bus		C	L-1/L-1	0.87	0.86	Not Solved	
VEA-V-74	NTSCANYN 138 kV Bus		C	L-1/L-1	0.84	0.84	Not Solved	
VEA-V-75	PAHRUMP 138 kV Bus		C	L-1/L-1	0.78	0.77	Not Solved	
VEA-V-76	PAHRUMP_1 230 kV Bus		C	L-1/L-1	0.70	0.69	Not Solved	
VEA-V-77	RAINIER 138 kV Bus		C	L-1/L-1	0.85	0.85	Not Solved	
VEA-V-78	SANDY 138 kV Bus		C	L-1/L-1	0.82	0.81	Not Solved	
VEA-V-79	THSNDAIR 138 kV Bus		C	L-1/L-1	0.78	0.77	Not Solved	
VEA-V-80	VALLEYNT 138 kV Bus		C	L-1/L-1	0.85	0.85	Not Solved	
VEA-V-81	VALLEYTP 138 kV Bus		C	L-1/L-1	0.82	0.81	Not Solved	
VEA-V-82	VALLEYVE 138 kV Bus		C	L-1/L-1	0.82	0.81	Not Solved	
VEA-V-83	VISTA 138 kV Bus	C	L-1/L-1	0.79	0.78	Not Solved		
VEA-V-84	YUCCAFLT 138 kV Bus	C	L-1/L-1	0.86	0.85	Not Solved		
VEA-V-85	PAHRUMP_1 230 kV Bus	C	L-1/L-1	0.70	0.69	Not Solved		
VEA-V-86	BEATTY 138 kV Bus	C	L-1/L-1	0.83	0.82	Not Solved		
VEA-V-87	BONDGTP 138 kV Bus	C	L-1/L-1	0.83	0.82	Not Solved		
VEA-V-88	CHARLSTN 138 kV Bus	C	L-1/L-1	0.78	0.78	Not Solved		
VEA-V-89	CRAZY EYE TP230 kV Bus	C	L-1/L-1	0.71	0.70	Not Solved		

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
VEA-V-90	FRENCHMN 138 kV Bus	Line PAHRUMP_1 230.0 to DESERT VIEW 230.0 Ckt 1_Line CRAZY EYE TP 230.0 to BOB TAP 230.0 Ckt 1	C	L-1/L-1	0.87	0.87	Not Solved	For 2014/2017, operate the VEA 138 kV system in radial after 1st outage to isolate potential impact on the vicinity area. For 2022, modify the Crazy Eye SPS to cover this L-1-1 event, or apply congestion management after 1st outage
VEA-V-91	GAMEBIRD 138 kV Bus		C	L-1/L-1	0.79	0.78	Not Solved	
VEA-V-92	GROOM LK 138 kV Bus		C	L-1/L-1	0.86	0.86	Not Solved	
VEA-V-93	JACKASSF 138 kV Bus		C	L-1/L-1	0.84	0.84	Not Solved	
VEA-V-94	JOHNNIE 138 kV Bus		C	L-1/L-1	0.80	0.79	Not Solved	
VEA-V-95	LTHRPWLS 138 kV Bus		C	L-1/L-1	0.83	0.83	Not Solved	
VEA-V-96	MERCORYSW 138 kV Bus		C	L-1/L-1	0.87	0.87	Not Solved	
VEA-V-97	MERCURY 138 kV Bus		C	L-1/L-1	0.87	0.87	Not Solved	
VEA-V-98	NTSCANYN 138 kV Bus		C	L-1/L-1	0.85	0.84	Not Solved	
VEA-V-99	PAHRUMP 138 kV Bus		C	L-1/L-1	0.79	0.78	Not Solved	
VEA-V-100	PAHRUMP_1 230 kV Bus		C	L-1/L-1	0.71	0.70	Not Solved	
VEA-V-101	RAINIER 138 kV Bus		C	L-1/L-1	0.86	0.85	Not Solved	
VEA-V-102	SANDY 138 kV Bus		C	L-1/L-1	0.83	0.82	Not Solved	
VEA-V-103	THSNDAIR 138 kV Bus		C	L-1/L-1	0.79	0.78	Not Solved	
VEA-V-104	VALLEYNT 138 kV Bus		C	L-1/L-1	0.86	0.86	Not Solved	
VEA-V-105	VALLEYTP 138 kV Bus		C	L-1/L-1	0.82	0.82	Not Solved	
VEA-V-106	VALLEYVE 138 kV Bus		C	L-1/L-1	0.82	0.82	Not Solved	
VEA-V-107	VISTA 138 kV Bus		C	L-1/L-1	0.80	0.79	Not Solved	
VEA-V-108	YUCCAFLT 138 kV Bus		C	L-1/L-1	0.86	0.86	Not Solved	
VEA-V-109	CRAZY EYE TP230 kV Bus		C	L-1/L-1	0.71	0.70	Not Solved	
VEA-V-110	PAHRUMP_1 230 kV Bus	C	L-1/L-1	0.71	0.70	Not Solved		

High/Low Voltage

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
VEA-V-111	BEATTY 138 kV Bus	Tran PAHRUMP_1 230.00 to PAHRUMP 138.00 Ckt 1 PAHRUMP_1 230.00 to PAHRUMP 138.00 Ckt 2	C	T-1/T-1	0.82	0.81	Not Solved	Eliminated by the Innovation-Mercury Switch 138 kV Line and Innovation 230/138 kV Sub project recently included in the FERC approved Amendment to Transition Agreement
VEA-V-112	BONDGTP 138 kV Bus		C	T-1/T-1	0.83	0.81	Not Solved	
VEA-V-113	CHARLSTN 138 kV Bus		C	T-1/T-1	0.77	0.77	Not Solved	
VEA-V-114	FRENCHMN 138 kV Bus		C	T-1/T-1	0.86	0.86	Not Solved	
VEA-V-115	GAMEBIRD 138 kV Bus		C	T-1/T-1	0.78	0.77	Not Solved	
VEA-V-116	GROOM LK 138 kV Bus		C	T-1/T-1	0.86	0.85	Not Solved	
VEA-V-117	JACKASSF 138 kV Bus		C	T-1/T-1	0.84	0.83	Not Solved	
VEA-V-118	JOHNNIE 138 kV Bus		C	T-1/T-1	0.80	0.78	Not Solved	
VEA-V-119	LTHRPWLS 138 kV Bus		C	T-1/T-1	0.83	0.82	Not Solved	
VEA-V-120	MERCYSW 138 kV Bus		C	T-1/T-1	0.87	0.86	Not Solved	
VEA-V-121	MERCURY 138 kV Bus		C	T-1/T-1	0.87	0.86	Not Solved	
VEA-V-122	NTSCANYN 138 kV Bus		C	T-1/T-1	0.84	0.83	Not Solved	
VEA-V-123	PAHRUMP 138 kV Bus		C	T-1/T-1	0.78	0.77	Not Solved	
VEA-V-124	RAINIER 138 kV Bus		C	T-1/T-1	0.85	0.85	Not Solved	
VEA-V-125	SANDY 138 kV Bus		C	T-1/T-1	0.82	0.81	Not Solved	
VEA-V-126	THSNDAIR 138 kV Bus		C	T-1/T-1	0.78	0.77	Not Solved	
VEA-V-127	VALLEYNT 138 kV Bus		C	T-1/T-1	0.86	0.85	Not Solved	
VEA-V-128	VALLEYTP 138 kV Bus		C	T-1/T-1	0.82	0.81	Not Solved	
VEA-V-129	VALLEYVE 138 kV Bus		C	T-1/T-1	0.82	0.81	Not Solved	
VEA-V-130	VISTA 138 kV Bus		C	T-1/T-1	0.79	0.77	Not Solved	
VEA-V-131	YUCCAFLT 138 kV Bus	C	T-1/T-1	0.86	0.85	Not Solved		
VEA-V-132	CRAZY EYE TP230 kV Bus	C	T-1/L-1	0.98	0.89	Not Solved	modify Ivanpah-Eldorado SPS and Crazy Eye SPS previously identified, or apply congestion management to curtail generation after 1st contingency	
VEA-V-133	PAHRUMP_1 230 kV Bus	C	T-1/L-1	0.98	0.90	Not Solved		



**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Summer Off-Peak	N/A	
VEA-V-134	DESERT VIEW 230 kV Bus	Line NWEST 230.0 to DESERT VIEW 230.0 Ckt 1_Line PAHRUMP_1 230.0 to CRAZY EYE TP 230.0 Ckt 1	C	L-1/L-1	1.18	0.90	Develop operation procedure to lock Load Tap Changer (LTC) of the Pahrump 230/138 kV transformers for light load condition	
VEA-V-135	PAHRUMP_1 230 kV Bus		C	L-1/L-1	1.16	0.89		
VEA-V-136	DESERT VIEW 230 kV Bus	Line NWEST 230.0 to DESERT VIEW 230.0 Ckt 1_Line CRAZY EYE TP 230.0 to BOB TAP 230.0 Ckt 1	C	L-1/L-1	1.20	0.91	Develop operation procedure to lock Load Tap Changer (LTC) of the Pahrump 230/138 kV transformers for light load condition	
VEA-V-137	PAHRUMP_1 230 kV Bus		C	L-1/L-1	1.18	0.90		
VEA-V-138	PAHRUMP_1 230 kV Bus	Line PAHRUMP_1 230.0 to DESERT VIEW 230.0 Ckt 1_Line PAHRUMP_1 230.0 to CRAZY EYE TP 230.0 Ckt 1	C	L-1/L-1	0.88	0.86	be waived by request due to non-load bus	
VEA-V-139	CRAZY EYE TP230 kV Bus	Line PAHRUMP_1 230.0 to DESERT VIEW 230.0 Ckt 1_Line CRAZY EYE TP 230.0 to BOB TAP 230.0 Ckt 1	C	L-1/L-1	NA	0.87	be waived by request due to non-load bus	
VEA-V-140	PAHRUMP_1 230 kV Bus		C	L-1/L-1	0.89	0.87		

**Transient Stability**

ID	Contingency	Category	Category Description	Transient Stability Performance			Potential Mitigation Solutions
				2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
VEA-TS-1	Crazy Eye Tap-Bob Tap 230 kV line is out with system adjustment to trip one unit at Crazy Eye, followed by a 3PH fault at Pahrump 230 kV bus that results in Pahrump-Desert View 230 kV line tripped and 2nd generator tripped by SPS	C	L-1/L-1	NA	NA	Highest voltage dip: 12.8% Lowest Frequency: 59.455	modify previous identified Crazy Eye SPS to cover this L1/L-1 event, or apply congestion management to curtail generation after one of three generators are tripped by the SPS
VEA-TS-2	Pahrump-Desert View 230 kV line is out without system adjustemnt, foollowed by a 3PH fault at Crazy Eye 230 kV bus, that results in Crazy Eye-Bob Tap 230 kV line tripped and 2 units tripped out by SPS	C	L-1/L-1	NA	NA	Lowest Frequency: 59.54	modify previous identified Crazy Eye SPS to cover this L1/L-1 event, or apply congestion management to curtail generation after one of three generators are tripped by the SPS

**Post-Transient Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
VEA-PVD-1	COLDCREK 138.0	Pahrump-Desert View 230 kV line is out without system adjustemnt, followed by a 3PH fault at Crazy Eye 230 kV bus, that results in Crazy Eye-Bob Tap 230 kV line tripped and 1 unit tripped out by SPS	C	L-1/L-1	NA	NA	10	modify previous identified Crazy Eye SPS to cover this L1/L-1 event, or apply congestion management to curtail generation after one of three generators are tripped by the SPS
VEA-PVD-2	FRENCHMN 138.0		C	L-1/L-1	NA	NA	18.4	
VEA-PVD-3	GROOM LK 138.0		C	L-1/L-1	NA	NA	18.6	
VEA-PVD-4	IND SPR 138.0		C	L-1/L-1	NA	NA	13.1	
VEA-PVD-5	IS TAP 138.0		C	L-1/L-1	NA	NA	13.1	
VEA-PVD-6	JACKASSF 138.0		C	L-1/L-1	NA	NA	19.2	
VEA-PVD-7	MERCYSW 138.0		C	L-1/L-1	NA	NA	18.2	
VEA-PVD-8	MERCURY 138.0		C	L-1/L-1	NA	NA	18.2	
VEA-PVD-9	NTSCANYN 138.0		C	L-1/L-1	NA	NA	19.1	
VEA-PVD-10	RADAR 138.0		C	L-1/L-1	NA	NA	12.7	
VEA-PVD-11	RAINIER 138.0		C	L-1/L-1	NA	NA	18.6	
VEA-PVD-12	STOCKADE 138.0		C	L-1/L-1	NA	NA	18.7	
VEA-PVD-13	VALLEYNT 138.0		C	L-1/L-1	NA	NA	18.6	
VEA-PVD-14	YUCCAFLT 138.0		C	L-1/L-1	NA	NA	18.6	
VEA-PVD-15	PAHRUMP1 230.0		C	L-1/L-1	NA	NA	8.9	
VEA-PVD-16	AMARGOSA 138.0		C	L-1/L-1	NA	NA	15.1	
VEA-PVD-17	BEATTY 138.0		C	L-1/L-1	NA	NA	19.8	
VEA-PVD-18	BONDGDTP 138.0		C	L-1/L-1	NA	NA	19.8	
VEA-PVD-19	LTHRPWLS 138.0		C	L-1/L-1	NA	NA	19.7	
VEA-PVD-20	PAHRUMP 138.0		C	L-1/L-1	NA	NA	11.8	

**Post-Transient Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
VEA-PVD-21	SANDY 138.0		C	L-1/L-1	NA	NA	16.7	
VEA-PVD-22	VALLEYVE 138.0		C	L-1/L-1	NA	NA	19.2	
VEA-PVD-23	VALLEYTP 138.0		C	L-1/L-1	NA	NA	19.2	
VEA-PVD-24	VISTA 138.0		C	L-1/L-1	NA	NA	15.1	
VEA-PVD-25	JOHNNIE 138.0		C	L-1/L-1	NA	NA	16.2	
VEA-PVD-26	GAMEBIRD 138.0		C	L-1/L-1	NA	NA	14.2	
VEA-PVD-27	GAMEBIRD 138.0		C	L-1/L-1	NA	NA	13.7	
VEA-PVD-28	THSNDAIR 138.0		C	L-1/L-1	NA	NA	14.1	
VEA-PVD-29	CHARLSTN 138.0		C	L-1/L-1	NA	NA	14.6	



**Single Contingency Load Drop**

ID	Worst Contingency	Category	Category Description	Amount of Load Drop (MW)			Potential Mitigation Solutions
				2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	

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

2012/2013 ISO Reliability Assessment - Study Results

Study Area: **Valley Electric Association - Summer Peak**



**Single Source Substation with more than 100 MW Load**

ID	Substation	Load Served (MW)			Potential Mitigation Solutions
		2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	

No single source substation with more than 100 MW Load