

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

**APPENDIX C-1**

**PG&E Bulk System Reliability Assessment Study  
Results**

**Transient Stability**

ID	Contingency	Category	Category Description	Transient Stability Performance			Potential Mitigation Solutions
				2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
PGE_Bulk-SP-TS-1	3-Phase 6-cycle fault on the Gates 230 kV bus, cleared by opening any line	B	L-1	UFLS from Gates 115 kV, frequency violation on Gates 115 kV	UFLS from Gates 115 kV, frequency violation on Gates 115 kV	UFLS from Gates 115 kV, frequency violation on Gates 115 kV	local issue, may be modeling error
PGE_Bulk-SP-TS-2	3-Phase 6-cycle fault on the Midway 230 kV bus, cleared by opening any line	B	L-1	oscillations on Midway pumps, pumps tripped by under-frequency protection, UFLS at Smyrna 115 kV, vlt and freq violations	UFLS at Smyrna 115 kV, vlt and freq violations on Midway pumps and around Midway	UFLS at Smyrna 115 kV, vlt and freq violations on Midway pumps and around Midway	need to have fast-acting protection at Midway pumps, may need to change relay settings at Smyrna
PGE_Bulk-SP-TS-3	3 phase fault on Contra Costa cleared by opening C. Cos-Las Positas or any other 230 kV line	B	L-1	4 wind generators, type 2 tripped with the fault	4 wind generators, type 2 tripped with the fault	4 wind generators, type 2 tripped with the fault	these are existing units, don't have Low Voltage Ride Through
PGE_Bulk-SP-TS-4	3 phase fault on Contra Costa cleared by opening C. Cos-Brentwood and C. Cos-Delta 230 kV or any other 2 lines	C	L-2	4 wind generators, type 2 tripped with the fault	4 wind generators, type 2 tripped with the fault	4 wind generators, type 2 tripped with the fault	these are existing units, don't have Low Voltage Ride Through
PGE_Bulk-SP-TS-5	3-Phase 6-cycle fault on the Gates 230 kV bus, cleared by opening any 2 lines	C	L-2	UFLS from Gates 115 kV, frequency violation on Gates 115 kV	UFLS from Gates 115 kV, frequency violation on Gates 115 kV	UFLS from Gates 115 kV, frequency violation on Gates 115 kV	local issue, may be modeling error
PGE_Bulk-SP-TS-6	3-Phase 6-cycle fault on the Midway 230 kV bus, cleared by opening any 2 lines	C	L-2	oscillations on Midway pumps, pumps tripped by under-frequency protection, UFLS at Smyrna 115 kV, vlt and freq violations	UFLS at Smyrna 115 kV, vlt and freq violations around Midway	UFLS at Smyrna 115 kV, vlt and freq violations around Midway	need to have fast-acting protection at Midway pumps, may need to change relay settings at Smyrna

**Post-Transient Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
Bulk-SP-PTT-1	Cayetano-USWP-JRW 230 kV	normal conditions	A	Normal	<95%	100.7%	100.9%	reduce area generation or upgrade the line
Bulk-SP-PTT-2	Oro Loma 115/70 # 2	normal conditions	A	Normal	116.8%	<95%	<95%	mitigation in the area studies
Bulk-SP-PTT-3	Canal Tap-Raisin Jct 60 kV	normal conditions	A	Normal	<95%	102.9%	103.3%	mitigation in the area studies
Bulk-SP-PTT-4	Rnd Mtn -Table Mtn #1 or #2 500 kV	Rnd Mtn -Table Mtn #2 or #1 500 kV	B	L-1	102.9%	101.8%	101.8%	bypass ser caps on the remaining Round Mtn-Table Mtn 500 kV line or Tbl Mtn-Vaca Dix or reduce COI flow according to seasonal nomogram
Bulk-SP-PTT-2	Oro Loma 115/70 # 2	Los Banos 500/230 kV	B	T-1	103.8%	<95%	<95%	mitigation in the area studies
Bulk-SP-PTT-2	Oro Loma 115/70 # 2	Tbl Mtn-Vaca Dix 500 kV	B	L-1	102.4%	<95%	<95%	mitigation in the area studies
Bulk-SP-PTT-1	Cayetano-USWP-JRW 230 kV	Tesla-Metcf 500 kV w/Delta Energy Center off	B	G-1/L-1	<95%	102.2%	101.8%	reduce area generation or upgrade the line
Bulk-SP-PTT-1	Cayetano-USWP-JRW 230 kV	Tesla-Metcalf 500 kV	B	L-1	<95%	99.6%	99.5%	reduce area generation or upgrade the line
Bulk-SP-PTT-1	Cayetano-USWP-JRW 230 kV	Contra Costa-Las Positas 230 kV	B	L-1	<95%	105.0%	105.1%	reduce area generation or upgrade the line
Bulk-SP-PTT-1	Cayetano-USWP-JRW 230 kV	Tesla-Newark 230 kV	B	L-1	<95%	<95%	97.1%	reduce area generation or upgrade the line
Bulk-SP-PTT-5	Cayetano-N.Dublin 230 kV	Contra Costa-Las Positas 230 kV	B	L-1	<95%	100.0%	98.9%	reduce area generation or upgrade the line
Bulk-SP-PTT-6	Delevan-Cortina 230 kV	Olinda-Tracy 500 kV	B	L-1	<95%	<95%	97.8%	upgrade the line, reduce COI import or reduce generation if overload

**Post-Transient Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
Bulk-SP-PTT-8	Captain Jack-Olinda 500 kV	Malin- Round Mtn #1 and #2 500 kV	C	L-2	99.1%	95.0%	95.3%	may require limiting COI flow
Bulk-SP-PTT-8	Captain Jack-Olinda 500 kV	Round Mtn-Table Mtn # 1 and # 2 500 kV	C	L-2	99.9%	<95%	<95%	may require limiting COI flow
Bulk-SP-PTT-9	Copco-Weed Jct 115 kV	Malin- Round Mtn #1 and #2 500 kV	C	L-2	109.7%	<95%	<95%	adjust Weed phase shifter
Bulk-SP-PTT-9	Copco-Weed Jct 115 kV	Round Mtn-Table Mtn # 1 and # 2 500 kV	C	L-2	101.4%	<95%	<95%	adjust Weed phase shifter
Bulk-SP-PTT-10	Delta-Cascade 115 kV	Malin- Round Mtn #1 and #2 500 kV	C	L-2	117.1%	<95%	<95%	adjust Weed phase shifter
Bulk-SP-PTT-10	Delta-Cascade 115 kV	Round Mtn-Table Mtn # 1 and # 2 500 kV	C	L-2	107.2%	<95%	<95%	adjust Weed phase shifter
Bulk-SP-PTT-11	Cragview-Weed 115 kV	Malin- Round Mtn #1 and #2 500 kV	C	L-2	107.3%	<95%	<95%	adjust Weed phase shifter
Bulk-SP-PTT-11	Cragview-Weed 115 kV	Round Mtn-Table Mtn # 1 and # 2 500 kV	C	L-2	98.5%	<95%	<95%	adjust Weed phase shifter
Bulk-SP-PTT-12	Cragview-Delta 115 kV	Round Mtn-Table Mtn # 1 and # 2 500 kV	C	L-2	97.5%	<95%	<95%	adjust Weed phase shifter
Bulk-SP-PTT-6	Delevan-Cortina 230 kV	Round Mtn-Table Mtn # 1 and # 2 500 kV	C	L-2	100.3%	101.3%	104.3%	upgrade the line, or modify RAS to trip other generation
Bulk-SP-PTT-6	Delevan-Cortina 230 kV	Tbl Mtn-Tesla and Tbl Mtn-Vaca Dix 500 kV w/ Hyatt& Thermalito tripped	C	L-2	101.3%	101.9%	105.1%	upgrade the line, or modify RAS to trip other generation
Bulk-SP-PTT-6	Delevan-Cortina 230 kV	Tbl Mtn-Tesla and Tbl Mtn-Vaca Dix 500 kV w/ Hyatt& Thermalito not tripped	C	L-2	103.8%	104.3%	107.3%	upgrade the line, or modify RAS to trip other generation
Bulk-SP-PTT-13	Cottonwd E-Round Mtn 230kV #3	Tbl Mtn-Tesla and Tbl Mtn-Vaca Dix 500 kV w/ Hyatt& Thermalito tripped	C	L-2	97.0%	<95%	<95%	assumed Feather Rivr gen tripping, OL w/out it
Bulk-SP-PTT-13	Cottonwd E-Round Mtn 230kV #3	Tbl Mtn-Tesla and Tbl Mtn-Vaca Dix 500 kV w/ Hyatt& Thermalito not tripped	C	L-2	107.0%	103.8%	103.9%	if CDWR trip not available, upgrade the line, or limit COI import or modify RAS to trip other generation and do switching

**Post-Transient Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
Bulk-SP-PTT-7	Pease-E.Marysville Jct 115 kV	Tbl Mtn-Tesla and Tbl Mtn-Vaca Dix 500 kV w/ Hyatt& Thermalito not tripped	C	L-2	104.2%	<95%	<95%	South of Palermo Project. Prior to the project: if CDWR trip not available, modify RAS to trip other generation and do switching, or limit COI import
Bulk-SP-PTT-18	E. Marysvl Jct-Olivehurst 115 kV	Tbl Mtn-Tesla and Tbl Mtn-Vaca Dix 500 kV w/ Hyatt& Thermalito not tripped	C	L-2	109.1%	<95%	<95%	South of Palermo Project. Prior to the project: if CDWR trip not available, modify RAS to trip other generation and do switching, or limit COI import
Bulk-SP-PTT-19	Olivehurst-Rio Oso 115 kV	Tbl Mtn-Tesla and Tbl Mtn-Vaca Dix 500 kV w/ Hyatt& Thermalito not tripped	C	L-2	108.9%	<95%	<95%	South of Palermo Project. Prior to the project: if CDWR trip not available, modify RAS to trip other generation and do switching, or limit COI import
Bulk-SP-PTT-14	Table Mtn 500/230 kV	Tbl Mtn-Tesla and Tbl Mtn-Vaca Dix 500 kV w/ Hyatt& Thermalito tripped	C	L-2	<95%	96.2%	99.5%	may need to change South of Table Mtn RAS to trip less generation from Feather Rvr
Bulk-SP-PTT-15	Cottonwd E-Round Mtn 230kV #2	Tbl Mtn-Tesla and Tbl Mtn-Vaca Dix 500 kV w/ Hyatt& Thermalito not tripped	C	L-2	96.9%	<95%	<95%	if CDWR trip not available, upgrade the line, or limit COI import or modify RAS to trip other generation and do switching
Bulk-SP-PTT-16	Table Mtn-Rio Oso 230 kV	Tbl Mtn-Tesla and Tbl Mtn-Vaca Dix 500 kV w/ Hyatt& Thermalito not tripped	C	L-2	104.9%	<95%	<95%	Upgrade terminal equipment on this line. Otherwise, up to 100 MW of load tripping may be required if CDWR RAS is not available
Bulk-SP-PTT-17	Eight Mile-Lodi 230 kV	Tbl Mtn-Tesla and Tbl Mtn-Vaca Dix 500 kV w/ Hyatt& Thermalito not tripped	C	L-2	104.5%	106.5%	103.4%	if CDWR trip not available, modify RAS to trip other generation or install series reactor on this line, or upgrade the line
Bulk-SP-PTT-17	Eight Mile-Lodi 230 kV	Tbl Mtn-Tesla and Tbl Mtn-Vaca Dix 500 kV w/ Hyatt& Thermalito tripped	C	L-2	97.2%	98.7%	95.7%	if CDWR trip not available, modify RAS to trip other generation or install series reactor on this line, or upgrade the line
Bulk-SP-PTT-2	Oro Loma 115/70 # 2	Tbl Mtn-Tesla and Tbl Mtn-Vaca Dix 500 kV	C	L-2	107.8%	<95%	<95%	mitigation in area studies

**Post-Transient Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
Bulk-SP-PTT-1	Cayetano-USWP-JRW 230 kV	Tbl Mtn-Tesla and Vaca Dix -Tesla 500 kV, Hyatt and Thermalito not tripped	C	L-2	<95%	102.5%	99.4%	reduce area generation or upgrade the line
Bulk-SP-PTT-1	Cayetano-USWP-JRW 230 kV	C. Costa-Brentwd and C Costa-Delta 230 kV	C	L-2	<95%	101.4%	100.9%	reduce area generation or upgrade the line
Bulk-SP-PTT-5	Cayetano-N.Dublin 230 kV	C. Costa-Brentwd and C Costa-Delta 230 kV	C	L-2	<95%	96.4%	<95%	reduce area generation or upgrade the line

**Transient Stability**

ID	Contingency	Category	Category Description	Transient Stability Performance				Potential Mitigation Solutions
				2015 summer off-peak	2018 summer light load	2023 summer off-peak	2018 Partial Peak	
PGE_Bulk-NP-TS-1	3 phase fault on Contra Costa cleared by opening C. Cos-Las Positas or any other 230 kV line	B	L-1	4 wind generators, type 2 tripped with the fault	4 wind generators, type 2 tripped with the fault	4 wind generators, type 2 tripped with the fault	4 wind generators, type 2 tripped with the fault	these are existing units, don't have Low Voltage Ride Through
PGE_Bulk-NP-TS-2	3-Phase 6-cycle fault on the Gates 230 kV bus, cleared by opening any line	B	L-1	UFLS from Gates 115 kV, frequency violation on Gates 115 kV	UFLS from Gates 115 kV, frequency violation on Gates 115 kV	UFLS from Gates 115 kV, frequency violation on Gates 115 kV	UFLS from Gates 115 kV, frequency violation on Gates 115 kV, slow frq recovery in Midway 70 kV system	local issue, may be modeling error
PGE_Bulk-NP-TS-3	3-Phase 6-cycle fault on the Midway 230 kV bus, cleared by opening any line	B	L-1	oscillations on Midway pumps, pumps tripped by under-frequency protection, UFLS at Smyrna 115 kV, vlt and freq violations	slow frq recovery, frq violations around Midway	oscillations on Midway pumps, pumps tripped by under-frequency protection, UFLS at Smyrna 115 kV, vlt and freq violations	UFLS at Smyrna 115 kV, vlt and freq violations on Midway pumps and 115/70 kV system	need to have fast-acting protection at Midway pumps, may need to change relay settings at Smyrna
PGE_Bulk-NP-TS-4	3-Phase 6-cycle fault on the Tesla 230 kV bus, cleared by opening Newark-Tesla line	B	L-1	no issues	3 wind generators, type 2 tripped with the fault	no issues	no issues	these are existing units, don't have Low Voltage Ride Through
PGE_Bulk-NP-TS-5	3-Phase 6-cycle fault on the Newark 230 kV bus, cleared by opening Newark-Ravenswood line	B	L-1	no issues	3 wind generators, type 2 tripped with the fault	no issues	no issues	these are existing units, don't have Low Voltage Ride Through
PGE_Bulk-NP-TS-6	3 phase fault on Contra Costa cleared by opening C. Cos-Brentwood and C. Cos-Delta 230 kV or any other 2 lines	C	L-2	4 wind generators, type 2 tripped with the fault	4 wind generators, type 2 tripped with the fault	4 wind generators, type 2 tripped with the fault	4 wind generators, type 2 tripped with the fault	these are existing units, don't have Low Voltage Ride Through
PGE_Bulk-NP-TS-7	3-Phase 6-cycle fault on the Midway 230 kV bus, cleared by opening any 2 lines	C	L-2	oscillations on Midway pumps, pumps tripped by under-frequency protection, UFLS at Smyrna 115 kV, vlt and freq violations	freq violations around Midway	oscillations on Midway pumps, pumps tripped by under-frequency protection, UFLS at Smyrna 115 kV, vlt and freq violations	UFLS at Smyrna 115 kV, vlt and freq violations on Midway pumps and 115/70 kV system	need to have fast-acting protection at Midway pumps, may need to change relay settings at Smyrna



**Transient Stability**

ID	Contingency	Category	Category Description	Transient Stability Performance				Potential Mitigation Solutions
				2015 summer off-peak	2018 summer light load	2023 summer off-peak	2018 Partial Peak	
PGE_Bulk-NP-TS-8	3-Phase 6-cycle fault on the Gates 230 kV bus, cleared by opening any 2 lines	C	L-2	UFLS from Gates 115 kV, frequency violation on Gates 115 kV	UFLS from Gates 115 kV, frequency violation on Gates 115 kV	UFLS from Gates 115 kV, frequency violation on Gates 115 kV	UFLS from Gates 115 kV, frequency violation on Gates 115 kV	local issue, may be modeling error

Study Area: **PG&E Bulk System**



**Post-Transient Thermal Overloads**

ID	Overloaded Facility	Contingency	Category	Category Description	Loading (%)				Potential Mitigation Solutions
					2015 off-peak	2018 Light Load	2023 off-peak	2018 Part peak	
BULK-NP-PTT-1	Gates-Midway 500 kV	normal conditions	A	normal	<95%	<95%	99.6%	<95%	may need to limit Path 15 if overload
BULK-NP-PTT-2	Warnerville -Wilson 230 kV	normal conditions	A	normal	<95%	<95%	<95%	119.8%	insert series reactor (approved project), with series reactor 62.6% loading
BULK-NP-PTT-3	Los Banos -2C577SS 230 kV	Los Banos-Tesla and Los Banos-Tracy 500 kV	C	L-2	97.5%	<95%	<95%	<95%	no overload with appropriate RAS
BULK-NP-PTT-4	Panoche-Gates 230 kV # 1 & 2	Los Banos-Gates #1 and Los Banos-Midway 500 kV	C	L-2	99.2%	<95%	<95%	<95%	no overload with appropriate RAS
BULK-NP-PTT-5	Olinda 500/230 kV	Malin-Round Mtn # 1 and # 2 500 kV	C	L-2	100.8%	<95%	102.9%	<95%	use Colusa SPS if overload
BULK-NP-PTT-6	Gates-Midway 230 kV	Midway-Gates and Midway-Los Banos 500 kV	C	L-2	<95%	<95%	99.4%	<95%	may need to limit Path 15 if overload
BULK-NP-PTT-7	Table Mtn 500/230 kV	Table Mtn-Tesla and Table Mtn-Vaca Dix 500 kV	C	L-2	<95%	<95%	<95%	105.7%	revise RAS for this contingency to trip less of Feather River generation
BULK-NP-PTT-8	Oro Loma-El Nido 115 kV	Gates-Gregg and Gates-Mc Call 230 kV	C	L-2	<95%	<95%	<95%	138.7%	build second Gates-Gregg 230 kV line, dispatch Helms gen prior to the project or upgrade the line
BULK-NP-PTT-9	El Nido-Wilson B 115 kV	Gates-Gregg and Gates-Mc Call 230 kV	C	L-2	<95%	<95%	<95%	111.4%	build second Gates-Gregg 230 kV line, dispatch Helms gen prior to the project or upgrade the line
BULK-NP-PTT-10	Hammonds-Panoche J 115 kV	Gates-Gregg and Gates-Mc Call 230 kV	C	L-2	<95%	<95%	<95%	107.7%	build second Gates-Gregg 230 kV line, dispatch Helms gen prior to the project or upgrade the line



**Post-Transient Voltage Deviations**

ID	Substation	Contingency	Category	Category Description	Post Cont. Voltage Deviation %				Potential Mitigation Solutions
					2015 off-peak	2018 Light Load	2023 off-peak	2018 Part peak	

No contingencies resulted in voltage deviation outside the criteria.

**APPENDIX C-2**  
**PG&E Humboldt**  
**Reliability Assessment Study Results**

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
HUMB-SP-T-1	Humboldt Bay - Humboldt #2 60kV line	Humboldt Bay - Humboldt No.1 60 kV Line (HUMBOLDT-HMBLT JT & Humboldt Bay - Eureka 60 kV Line	C3	L-1-1	109%	108%	109%	Adjust generation at Humboldt Bay
HUMB-SP-T-2	Humboldt - Eureka 60kV (Between HARRIS & HARRIS ST)	Humboldt Bay - Humboldt No.1 60 kV Line (HUMBOLDT-HMBLT JT & Humboldt Bay - Humboldt No.2 60 kV Line	C3	L-1-1	117%	114%	111%	Implement operating procedure to reduce output from Humboldt Bay 60 kV generation following first contingency for Category C
HUMB-SP-T-3	Humboldt - Eureka 60kV (HARRIS ST & EUREKA)		C3	L-1-1	124%	121%	118%	
HUMB-SP-T-4	Garberville - Laytonville 60kV line(between Garberville to Kekawaka)	Humboldt Bay - Rio Dell Jact 60kV line & Bridgeville 115/60 kV Transformer	C3	L-1-1	97%	100%	<95%	Bridgeville - Garberville 115kV line
HUMB-SP-T-5	Laytonville - Willits 60kV line		C3	L-1-1	112%	115%	<95%	
HUMB-SP-T-6	Essex Jct - Arcata - Fairhaven 60kV line (Between Janes Crk TP - Arcata JCT2)	Humboldt No.1 60 kV and Arcata - Humboldt 60 kV Lines	C5	L-2	97%	103%	116%	Increase Bluke lake power generation. Drop load at Orick, Big Lagoon if overload persists.
HUMB-SP-T-7	Essex Jct - Arcata - Fairhaven 60kV line (Between Fairhaven - Arcata JCT2)	Humboldt No.1 60 kV and Arcata - Humboldt 60 kV Lines	C5	L-2	106%	114%	128%	Increase output from Blue Lake power. Drop load at Fairhaven if overload persists.
HUMB-SP-T-8	Fairhaven - Humboldt 60kV line(Between Arcata JCT2 - Sierra Pac Lumber Sub Tap)	Humboldt No.1 60 kV and Arcata - Humboldt 60 kV Lines	C5	L-2	<95%	<95%	104%	Increase output from area generation. Drop load at Fairhaven / S.Pac Lumber sub if overload persists.
HUMB-SP-T-9	Fairhaven - Humboldt 60kV line(Between Fairhaven - Sierra Pac Lumber Sub Tap)	Humboldt No.1 60 kV and Arcata - Humboldt 60 kV Lines	C5	L-2	<95%	<95%	102%	

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Winter Peak	2018 Winter Peak	2023 Winter Peak	
HUMB-WP-T-1	Essex Jct - Arcata - Fairhaven 60kV line (Between Fairhaven - Arcata JCT2)	Essex Jct - Arcata - Fairhaven 60 kV Line (LP_FLKBD-JANS CR & Essex Jct - Arcata - Fairhaven 60 kV Line (ARC_JT2X-ARCATA)	C3	L-1-1	<95%	94%	102%	Increase output from Blue Lake power. Drop load at Fairhaven if overload persists.
HUMB-WP-T-2	Essex Jct - Arcata - Fairhaven 60kV line (Between Fairhaven - Arcata JCT2)	Humboldt No.1 60 kV and Arcata - Humboldt 60 kV Lines	C5	L-2	<95%	94%	102%	
HUMB-WP-T-3	Humboldt Bay - Eureka 60kV line	Humboldt Bay - Humboldt No.1 60 kV Line (HUMBOLDT-HMBLT JT & Humboldt Bay - Humboldt No.2 60 kV Line	C3	L-1-1	137%	133%	134%	Implement operating procedure to reduce output from Humboldt Bay 60 kV generation following first contingency for Category C

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Summer Off-Peak	2018 Summer Light Load	Select..	

No thermal violations reported

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
HUMB-SP-VD-1	ORICK 60kV	Essex Jct - Arcata - Fairhaven 60 kV Line (ARC_JT2X-ARCATA)	B	L-1	5.57%	6.27%	7.36%	Adjust output from Blue Lake power.
HUMB-SP-VD-2	ARCATA 60kV		B	L-1	5.81%	6.48%	7.51%	
HUMB-SP-VD-3	SIMPSON 60kV		B	L-1	5.45%	6.14%	7.24%	
HUMB-SP-VD-4	BCHIPMIL 60kV		B	L-1	5.46%	6.14%	7.21%	
HUMB-SP-VD-5	BIG_LAGN 60kV		B	L-1	5.56%	6.25%	7.35%	
HUMB-SP-VD-6	BLUE LKE 60kV		B	L-1	5.45%	6.14%	7.23%	
HUMB-SP-VD-7	TRINIDAD 60kV		B	L-1	5.55%	6.24%	7.33%	
HUMB-SP-VD-8	BRDGVILLE 60kV	Bridgeville 60/12 kV Transformer	B	T-1	6.50%	<5%	<5%	Adjust Humboldt 60kV generation
HUMB-SP-VD-9	SWNS FLT 60kV		B	T-1	5.60%	<5%	<5%	
HUMB-SP-VD-10	COVELO6 60kV	BUS FAULT AT 31110 BRDGVILLE 60.00	C1	Bus	Not Solved	<5%	<5%	Case not solved. Bridgeville - Garberville 115kV line will mitigate the problem. In the interim drop load at Garberville.
HUMB-SP-VD-11	FRT SWRD 60kV		C1	Bus	Not Solved	<5%	<5%	
HUMB-SP-VD-12	FRUITLND 60kV		C1	Bus	Not Solved	<5%	<5%	
HUMB-SP-VD-13	GRBRVILLE 60kV		C1	Bus	Not Solved	<5%	<5%	
HUMB-SP-VD-14	KEKAWAKA 60kV		C1	Bus	Not Solved	<5%	<5%	
HUMB-SP-VD-15	LYTNVILLE 60kV		C1	Bus	Not Solved	<5%	<5%	



**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
HUMB-SP-VD-16	JANS CRK 60kV	Essex Jct - Arcata - Fairhaven 60 kV Line (ARC_JT2X-ARCATA) & Essex Jct - Arcata - Fairhaven 60 kV Line (LP_FLKBD-JANS CR	C3	L-1-1	14.26%	15.85%	19.73%	Adjust output from Blue Lake power.
HUMB-SP-VD-17	ORICK 60kV		C3	L-1-1	10.89%	12.00%	15.85%	
HUMB-SP-VD-18	ARCATA 60kV		C3	L-1-1	10.94%	12.07%	15.61%	
HUMB-SP-VD-19	SIMPSON 60kV		C3	L-1-1	10.75%	11.84%	15.56%	
HUMB-SP-VD-20	BCHIPMIL 60kV		C3	L-1-1	10.69%	11.78%	15.46%	
HUMB-SP-VD-21	BIG_LAGN 60kV		C3	L-1-1	10.87%	11.98%	15.81%	
HUMB-SP-VD-22	BLUE LKE 60kV		C3	L-1-1	10.74%	11.83%	15.55%	
HUMB-SP-VD-23	TRINIDAD 60kV		C3	L-1-1	10.85%	11.96%	15.77%	

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
HUMB-SP-VD-24	BRDGVLE 60kV	Rio Dell Tap 60 kV Line(SCOTIATP-RIODLLTP) & Bridgeville 115/60 kV Transformer	C3	L-1/T-1	34.10%	31.37%	<5%	Bridgeville - Garberville 115kV line
HUMB-SP-VD-25	CARLOTTA 60kV		C3	L-1/T-1	34.28%	31.61%	<5%	
HUMB-SP-VD-26	FRT SWRD 60kV		C3	L-1/T-1	29.62%	28.37%	<5%	
HUMB-SP-VD-27	FRUITLND 60kV		C3	L-1/T-1	30.53%	28.98%	<5%	
HUMB-SP-VD-28	GRBRVLE 60kV		C3	L-1/T-1	28.51%	27.71%	<5%	
HUMB-SP-VD-29	LYTNVLE 60kV		C3	L-1/T-1	15.63%	16.05%	<5%	
HUMB-SP-VD-30	PCLUMBER 60kV		C3	L-1/T-1	34.28%	31.61%	<5%	
HUMB-SP-VD-31	SWNS FLT 60kV		C3	L-1/T-1	34.15%	31.44%	<5%	

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2015 Winter Peak	2018 Winter Peak	2023 Winter Peak	
HUMB-WP-VD_1	ORICK 60kV	Essex Jct - Arcata - Fairhaven 60 kV Line (ARC_JT2X-ARCATA)	B	L-1	<5%	5.32%	6.01%	Adjust Blue Lake power generation
HUMB-WP-VD_2	ARCATA 60kV		B	L-1	<5%	5.65%	6.33%	
HUMB-WP-VD_3	SIMPSON 60kV		B	L-1	<5%	5.11%	5.79%	
HUMB-WP-VD_4	BIG_LAGN 60kV		B	L-1	<5%	5.31%	5.99%	
HUMB-WP-VD_5	BLUE LKE 60kV		B	L-1	<5%	5.12%	5.80%	
HUMB-WP-VD_6	TRINIDAD 60kV		B	L-1	<5%	5.30%	5.98%	
HUMB-WP-VD_7	FRT SWRD 60kV	Bridgeville - Garberville 115kV line	B	L-1	<5%	<5%	5.06%	Adjust Humboldt 60kV generation
HUMB-WP-VD_8	GRBRVLE 60kV		B	L-1	<5%	<5%	5.38%	
HUMB-WP-VD_9	MPLC CRK 60kV	Humboldt - Maple Creek 60 kV Line	B	L-1	9.05%	<5%	<5%	Maple Creek Reactive Support project
HUMB-WP-VD_10	RDGE CBN 60kV		B	L-1	7.15%	<5%	<5%	
HUMB-WP-VD_11	RUSS RCH 60kV		B	L-1	9.12%	<5%	<5%	
HUMB-WP-VD_12	HOOPA 60kV		B	L-1	9.47%	<5%	<5%	
HUMB-WP-VD_13	WILLWCRK 60kV		B	L-1	9.35%	<5%	<5%	

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2015 Winter Peak	2018 Winter Peak	2023 Winter Peak	
HUMB-WP-VD_14	COVELO6 60kV	BUS FAULT AT 31110 BRDGVLE 60.00	C1	Bus	<5%	Not Solved	<5%	Bridgeville - Garberville 115kV line project. In the interim drop load at Garberville to solve for this contingency.
HUMB-WP-VD_15	FRT SWRD 60kV		C1	Bus	<5%	Not Solved	<5%	
HUMB-WP-VD_16	FRUITLND 60kV		C1	Bus	<5%	Not Solved	<5%	
HUMB-WP-VD_17	GRBRVLE 60kV		C1	Bus	<5%	Not Solved	<5%	
HUMB-WP-VD_18	KEKAWAKA 60kV		C1	Bus	<5%	Not Solved	<5%	
HUMB-WP-VD_19	LYTNVLE 60kV		C1	Bus	<5%	Not Solved	<5%	
HUMB-WP-VD_20	JANS CRK 60kV	Essex Jct - Arcata - Fairhaven 60 kV Line (ARC_JT2X-ARCATA) & Essex Jct - Arcata - Fairhaven 60 kV Line (LP_FLKBD-JANS CR	C3	L-1-1	<5%	15.27%	17.93%	Adjust Blue Lake power generation
HUMB-WP-VD_21	ORICK 60kV		C3	L-1-1	<5%	12.17%	14.46%	
HUMB-WP-VD_22	ARCATA 60kV		C3	L-1-1	<5%	12.07%	14.35%	
HUMB-WP-VD_23	SIMPSON 60kV		C3	L-1-1	<5%	12.04%	14.19%	
HUMB-WP-VD_24	BIG_LAGN 60kV		C3	L-1-1	<5%	12.15%	14.43%	
HUMB-WP-VD_25	BLUE LKE 60kV		C3	L-1-1	<5%	12.03%	14.19%	
HUMB-WP-VD_26	TRINIDAD 60kV		C3	L-1-1	<5%	12.13%	14.40%	

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2015 Winter Peak	2018 Winter Peak	2023 Winter Peak	
HUMB-WP-VD_27	HOOPA 60kV	Humboldt - Bridgeville 115 kV Line & Humboldt - Maple Creek 60 kV Line	C3	L-1-1	10.53%	<5%	<5%	Maple Creek Reactive Support project
HUMB-WP-VD_28	MPLE CRK 60kV		C3	L-1-1	10.05%	0.00%	<5%	
HUMB-WP-VD_29	RUSS RCH 60kV		C3	L-1-1	10.14%	<5%	<5%	
HUMB-WP-VD_30	WILLWCRK 60kV		C3	L-1-1	10.40%	<5%	<5%	
HUMB-WP-VD_31	COVELO6 60kV	Rio Dell Tap 60 kV Line(SCOTIATP-RIODLLTP) & Bridgeville 60/12 kV Transformer	C3	L-1/T-1	<5%	18.18%	<5%	Bridgeville - Garberville 115kV line project
HUMB-WP-VD_32	BRDGVILLE 60kV		C3	L-1/T-1	16.00%	35.20%	<5%	
HUMB-WP-VD_33	CARLOTTA 60kV		C3	L-1/T-1	16.18%	35.37%	<5%	
HUMB-WP-VD_34	FRT SWRD 60kV		C3	L-1/T-1	13.28%	31.92%	<5%	
HUMB-WP-VD_35	FRUITLND 60kV		C3	L-1/T-1	13.77%	32.56%	<5%	
HUMB-WP-VD_36	GRBRVLE 60kV		C3	L-1/T-1	12.84%	31.20%	<5%	
HUMB-WP-VD_37	KEKAWAKA 60kV		C3	L-1/T-1	11.99%	28.72%	<5%	
HUMB-WP-VD_38	LYTNVLE 60kV		C3	L-1/T-1	<5%	17.99%	<5%	
HUMB-WP-VD_39	PCLUMBER 60kV		C3	L-1/T-1	16.18%	35.37%	<5%	
HUMB-WP-VD_40	SWNS FLT 60kV		C3	L-1/T-1	16.05%	35.25%	<5%	

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2015 Winter Peak	2018 Winter Peak	2023 Winter Peak	
HUMB-WP-VD_41	ORICK 60kV	Humboldt No.1 60 kV and Arcata - Humboldt 60 kV Lines	C5	L-2	<5%	13.88%	16.51%	Adjust Blue Lake power generation
HUMB-WP-VD_42	ARCATA 60kV		C5	L-2	<5%	12.72%	15.13%	
HUMB-WP-VD_43	SIMPSON 60kV		C5	L-2	<5%	13.52%	16.10%	
HUMB-WP-VD_44	BIG_LAGN 60kV		C5	L-2	<5%	13.86%	16.48%	
HUMB-WP-VD_45	BLUE LKE 60kV		C5	L-2	<5%	13.53%	16.10%	
HUMB-WP-VD_46	JANS CRK 60kV		C5	L-2	<5%	15.27%	17.92%	
HUMB-WP-VD_47	TRINIDAD 60kV		C5	L-2	<5%	13.83%	16.45%	

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2015 Summer Off-Peak	2018 Summer Light Load	N/A	
HUMB-NP-VD-1	BRDGVILLE	Bridgeville 115/60 kV Transformer	B	T-1	<5%	6.05%		Adjust Humboldt 60kV generation
HUMB-NP-VD-2	COVELO6 60kV	Humboldt Bay - Rio Dell Jct 60kV line & Bridgeville 115/60 kV Transformer	C3	L-1/T-1	Not Solved	<10%		Case does not solve. Bridgeville - Garberville 115kV line will mitigate the issue. In the interim drop load at Rio Dell, Carlotta, Bridgeville, Fruitland, Fortseward, Garberville depending on the need.
HUMB-NP-VD-3	BRDGVILLE 60kV		C3	L-1/T-1	Not Solved	<10%		
HUMB-NP-VD-4	CARLOTTA 60kV		C3	L-1/T-1	Not Solved	<10%		
HUMB-NP-VD-5	FRT SWRD 60kV		C3	L-1/T-1	Not Solved	<10%		
HUMB-NP-VD-6	FRUITLND 60kV		C3	L-1/T-1	Not Solved	<10%		
HUMB-NP-VD-7	GRBRVILLE 60kV		C3	L-1/T-1	Not Solved	<10%		
HUMB-NP-VD-8	KEKAWAKA 60kV		C3	L-1/T-1	Not Solved	<10%		
HUMB-NP-VD-9	LYTENVILLE 60kV		C3	L-1/T-1	Not Solved	<10%		
HUMB-NP-VD-10	PCLUMBER 60kV		C3	L-1/T-1	Not Solved	<10%		
HUMB-NP-VD-11	RIO DELL 60kV		C3	L-1/T-1	Not Solved	<10%		
HUMB-NP-VD-12	SWNS FLT 60kV		C3	L-1/T-1	Not Solved	<10%		

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
HUMB-SP-V-1	COVELO6 60kV	BUS FAULT AT 31110 BRDGVILLE 60.00	C1	Bus	0.88	>0.9	>0.9	Bridgeville - Garberville 115kV line
HUMB-SP-V-2	FRT SWRD 60kV		C1	Bus	0.80	>0.9	>0.9	
HUMB-SP-V-3	FRUITLND 60kV		C1	Bus	0.79	>0.9	>0.9	
HUMB-SP-V-4	GRBRVLE 60kV		C1	Bus	0.81	>0.9	>0.9	
HUMB-SP-V-5	KEKAWAKA 60kV		C1	Bus	0.82	>0.9	>0.9	
HUMB-SP-V-6	LYTNVLE 60kV		C1	Bus	0.88	>0.9	>0.9	



**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
HUMB-SP-V-7	COVELO6 60kV	Rio Dell Tap 60 kV Line(SCOTIATP-RIODLLTP) & Bridgeville 115/60 kV Transformer	C3	L-1/T-1	Not Solved	Not Solved	>0.9	Case not solved. Bridgeville - Garberville 115kV line project mitigates the problem. In the interim drop load at Garberville to solve the case.
HUMB-SP-V-8	BRDGVLL 60kV		C3	L-1/T-1	Not Solved	Not Solved	>0.9	
HUMB-SP-V-9	CARLOTTA 60kV		C3	L-1/T-1	Not Solved	Not Solved	>0.9	
HUMB-SP-V-10	FRT SWRD 60kV		C3	L-1/T-1	Not Solved	Not Solved	>0.9	
HUMB-SP-V-11	FRUITLND 60kV		C3	L-1/T-1	Not Solved	Not Solved	>0.9	
HUMB-SP-V-12	GRBRVLL 60kV		C3	L-1/T-1	Not Solved	Not Solved	>0.9	
HUMB-SP-V-13	KEKAWAKA 60kV		C3	L-1/T-1	Not Solved	Not Solved	>0.9	
HUMB-SP-V-14	LYTNVLL 60kV		C3	L-1/T-1	Not Solved	Not Solved	>0.9	
HUMB-SP-V-15	PCLUMBER 60kV		C3	L-1/T-1	Not Solved	Not Solved	>0.9	
HUMB-SP-V-16	SWNS FLT 60kV		C3	L-1/T-1	Not Solved	Not Solved	>0.9	

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
HUMB-SP-V-17	ORICK 60kV	Essex Jct - Arcata - Fairhaven 60 kV Line (LP_FLKBD-JANS CR) & Essex Jct - Arcata - Fairhaven 60 kV Line (ARC_JT2X-ARCATA)	C3	L-1-1	0.88	0.86	0.82	Adjust Blue Lake generation
HUMB-SP-V-18	ARCATA 60kV		C3	L-1-1	>0.9	0.90	0.86	
HUMB-SP-V-19	SIMPSON 60kV		C3	L-1-1	0.89	0.87	0.83	
HUMB-SP-V-20	BCHIPMIL 60kV		C3	L-1-1	0.89	0.88	0.83	
HUMB-SP-V-21	BIG_LAGN 60kV		C3	L-1-1	0.88	0.86	0.82	
HUMB-SP-V-22	BLUE LKE 60kV		C3	L-1-1	0.89	0.87	0.83	
HUMB-SP-V-23	BLUELKPP 60kV		C3	L-1-1	0.89	0.87	0.83	
HUMB-SP-V-24	JANS CRK 60kV		C3	L-1-1	0.89	0.88	0.84	
HUMB-SP-V-25	TRINIDAD 60kV		C3	L-1-1	0.88	0.86	0.82	
HUMB-SP-V-26	NEWBURG 60kV		Humboldt Bay - Rio Dell Jct 60kV line & Bridgeville 115/60 kV Transformer	C3	L-1/T-1	0.89	>0.9	
HUMB-SP-V-27	FRT SWRD 60kV	C3		L-1/T-1	0.81	0.89	>0.9	
HUMB-SP-V-28	KEKAWAKA 60kV	C3		L-1/T-1	0.81	0.89	>0.9	
HUMB-SP-V-29	SWNS FLT 60kV	C3		L-1/T-1	0.86	0.93	>0.9	

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
HUMB-SP-V-30	ORICK 60kV	Humboldt No.1 60 kV and Arcata - Humboldt 60 kV Lines	C5	L-2	0.88	0.86	0.82	Adjust Blue Lake generation
HUMB-SP-V-31	ARCATA 60kV		C5	L-2	0.91	0.90	0.86	
HUMB-SP-V-32	SIMPSON 60kV		C5	L-2	0.89	0.87	0.83	
HUMB-SP-V-33	BCHIPMIL 60kV		C5	L-2	0.89	0.87	0.83	
HUMB-SP-V-34	BIG_LAGN 60kV		C5	L-2	0.88	0.86	0.82	
HUMB-SP-V-35	BLUE LKE 60kV		C5	L-2	0.89	0.87	0.83	
HUMB-SP-V-36	BLUELKPP 60kV		C5	L-2	0.89	0.87	0.83	
HUMB-SP-V-37	JANS CRK 60kV		C5	L-2	0.89	0.87	0.84	
HUMB-SP-V-38	TRINIDAD 60kV		C5	L-2	0.88	0.86	0.82	

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2015 Winter Peak	2018 Winter Peak	2023 Winter Peak	
HUMB-WP-V-1	COVELO6 60kV	BUS FAULT AT Bridgeville 60kV bus	C1	Bus	>0.9	Not Solved	>0.9	Case Not Solved. Open CB 32 at Garberville to open the Bridgeville - Garberville 60kV line at Garberville.
HUMB-WP-V-2	FRT SWRD 60kV		C1	Bus	>0.9	Not Solved	>0.9	
HUMB-WP-V-3	FRUITLND 60kV		C1	Bus	>0.9	Not Solved	>0.9	
HUMB-WP-V-4	GRBRVLE 60kV		C1	Bus	>0.9	Not Solved	>0.9	
HUMB-WP-V-5	KEKAWAKA 60kV		C1	Bus	>0.9	Not Solved	>0.9	
HUMB-WP-V-6	LYTNVLE 60kV		C1	Bus	>0.9	Not Solved	>0.9	
HUMB-WP-V-7	COVELO6 60kV	Rio Dell Tap 60 kV Line(SCOTIATP-RIODLLTP) & Bridgeville 115/60 kV Transformer	C3	L-1/T-1	>0.9	Not Solved	>0.9	2018 case not solved. Bridgeville - Garberville 115kV line Project. In the interim drop load at Garberville.
HUMB-WP-V-8	BRDGVLE 60kV		C3	L-1/T-1	0.89	Not Solved	>0.9	
HUMB-WP-V-9	CARLOTTA 60kV		C3	L-1/T-1	0.88	Not Solved	>0.9	
HUMB-WP-V-10	FRT SWRD 60kV		C3	L-1/T-1	0.91	Not Solved	>0.9	
HUMB-WP-V-11	FRUITLND 60kV		C3	L-1/T-1	0.90	Not Solved	>0.9	
HUMB-WP-V-12	GRBRVLE 60kV		C3	L-1/T-1	0.93	Not Solved	>0.9	
HUMB-WP-V-13	KEKAWAKA 60kV		C3	L-1/T-1	0.93	Not Solved	>0.9	
HUMB-WP-V-14	LYTNVLE 60kV		C3	L-1/T-1	>0.9	Not Solved	>0.9	
HUMB-WP-V-15	PCLUMBER 60kV		C3	L-1/T-1	0.88	Not Solved	>0.9	
HUMB-WP-V-16	SWNS FLT 60kV		C3	L-1/T-1	0.89	Not Solved	>0.9	

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2015 Winter Peak	2018 Winter Peak	2023 Winter Peak	
HUMB-WP-V-17	ORICK 60kV	Essex Jct - Arcata - Fairhaven 60 kV Line (LP_FLKBD-JANS CR) & Essex Jct - Arcata Fairhaven 60 kV Line (ARC_JT2X-ARCATA)	C3	L-1-1	>0.9	0.87	0.84	Adjust Blue Lake generation
HUMB-WP-V-18	ARCATA 60kV		C3	L-1-1	>0.9	0.90	0.88	
HUMB-WP-V-19	SIMPSON 60kV		C3	L-1-1	>0.9	0.88	0.85	
HUMB-WP-V-20	BCHIPMIL 60kV		C3	L-1-1	>0.9	0.88	0.86	
HUMB-WP-V-21	BCHIPMIL 60kV		C3	L-1-1	>0.9	0.88	0.86	
HUMB-WP-V-22	BIG_LAGN 60kV		C3	L-1-1	>0.9	0.87	0.84	
HUMB-WP-V-23	BLUE LKE 60kV		C3	L-1-1	>0.9	0.88	0.85	
HUMB-WP-V-24	BLUELKPP 60kV		C3	L-1-1	>0.9	0.88	0.85	
HUMB-WP-V-25	JANS CRK 60kV		C3	L-1-1	>0.9	0.88	0.85	
HUMB-WP-V-26	TRINIDAD 60kV		C3	L-1-1	>0.9	0.87	0.84	

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2015 Winter Peak	2018 Winter Peak	2023 Winter Peak	
HUMB-WP-V-27	ORICK 60kV	Humboldt No.1 60 kV and Arcata - Humboldt 60 kV Lines	C5	L-2	>0.9	0.87	0.84	Adjust Blue Lake generation
HUMB-WP-V-28	ARCATA 60kV		C5	L-2	>0.9	>0.9	0.88	
HUMB-WP-V-29	SIMPSON 60kV		C5	L-2	>0.9	0.88	0.85	
HUMB-WP-V-30	BCHIPMIL 60kV		C5	L-2	>0.9	0.88	0.86	
HUMB-WP-V-31	BIG_LAGN 60kV		C5	L-2	>0.9	0.87	0.84	
HUMB-WP-V-32	BLUE LKE 60kV		C5	L-2	>0.9	0.88	0.85	
HUMB-WP-V-33	JANS CRK 60kV		C5	L-2	>0.9	0.88	0.85	
HUMB-WP-V-34	TRINIDAD 60kV		C5	L-2	>0.9	0.87	0.84	

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2015 Summer Off-Peak	2018 Summer Light Load	N/A	
HUMB-NP-V-1	COVELO6 60kV	Humboldt Bay - Rio Dell Jct 60kV line & Bridgeville 115/60 kV Transformer	C3	L-1/T-1	Not Solved	>0.9	Case does not solve. Bridgeville - Garberville 115kV line will mitigate the issue. In the interim drop load at Rio Dell, Carlotta, Bridgeville, Fruitland, Fortseward, Garberville depending on the need.	
HUMB-NP-V-2	NEWBURG 60kV		C3	L-1/T-1	Not Solved	>0.9		
HUMB-NP-V-3	BRDGVILLE 60kV		C3	L-1/T-1	Not Solved	>0.9		
HUMB-NP-V-4	CARLOTTA 60kV		C3	L-1/T-1	Not Solved	>0.9		
HUMB-NP-V-5	FRT SWRD 60kV		C3	L-1/T-1	Not Solved	>0.9		
HUMB-NP-V-6	FRUITLND 60kV		C3	L-1/T-1	Not Solved	>0.9		
HUMB-NP-V-7	GRBRVILLE 60kV		C3	L-1/T-1	Not Solved	>0.9		
HUMB-NP-V-8	KEKAWAKA 60kV		C3	L-1/T-1	Not Solved	>0.9		
HUMB-NP-V-9	LYTENVILLE 60kV		C3	L-1/T-1	Not Solved	>0.9		
HUMB-NP-V-10	PCLUMBER 60kV		C3	L-1/T-1	Not Solved	>0.9		
HUMB-NP-V-11	RIO DELL 60kV		C3	L-1/T-1	Not Solved	>0.9		
HUMB-NP-V-12	SWNS FLT 60kV		C3	L-1/T-1	Not Solved	>0.9		

2013/2014 ISO Reliability Assessment - Study Results

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



**Single Contingency Load Drop**

ID	Worst Contingency	Category	Category Description	Amount of Load Drop (MW)			Potential Mitigation Solutions
				Select..	Select..	Select..	
X-SP-SLD-1							

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



2013/2014 ISO Reliability Assessment - Study Results

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



**Single Contingency Load Drop**

ID	Worst Contingency	Category	Category Description	Amount of Load Drop (MW)			Potential Mitigation Solutions
				Select..	Select..	Select..	
X-WP-SLD-1							

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
				Select..	Select..	Select..	
X-NP-SLD-1							

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

2013/2014 ISO Reliability Assessment - Study Results

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



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

ID	Substation	Load Served (MW)			Potential Mitigation Solutions
		Select..	Select..	Select..	
X-WP-SS-1					

No single source substation with more than 100 MW Load

2013/2014 ISO Reliability Assessment - Study Results

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



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

ID	Substation	Load Served (MW)			Potential Mitigation Solutions
		Select..	Select..	Select..	
X-SP-SS-1					

No single source substation with more than 100 MW Load

2013/2014 ISO Reliability Assessment - Study Results

Study Area: **PG&E Humboldt - Summer Off-Peak & Summer Light Load**



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

ID	Substation	Load Served (MW)			Potential Mitigation Solutions
		Select..	Select..	Select..	
X-NP-SS-1					

No single source substation with more than 100 MW Load

**APPENDIX C-3**

**PG&E North Coast & North Bay**

**Reliability Assessment Study Results**

2013/2014 ISO Reliability Assessment - Study Results

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



**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
NCNB-SP-T-1	Clear Lake - Konocti 60kV Line	Geyser # 3 - Cloverdale 115kV Line (Between Cloverdale 115KV to MPE tap1)	B	L-1	<95%	98%	103%	Reconductor the Line by 2023
NCNB-SP-T-2	Clear Lake - Hopland 60kV line (between Clearlake - Granite)	Konocti - Eagle Rock 60kV Line	B	L-1	105%	<95%	<95%	Middletown 115 kV Project. In interim, open CB22 at Clear Lake and close NO CB at Middletown
NCNB-SP-T-3	Clear Lake - Hopland 60kV line (between Granite - Hopland JCT)		B	L-1	110%	<95%	<95%	
NCNB-SP-T-4	Monte Rio - Fulton 60kV (between TRNTN JT - FULTON)	Fulton- Molino- Cotati 60 kV(Molino sub 60 kV to Molino Jct 60kV)	B	L-1	<95%	<95%	102%	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-SP-T-5	Monte Rio - Fulton 60kV (between MOLINO - TRNTN_JC)		B	L-1	91%	96%	106%	
NCNB-SP-T-6	Tulucay - Napa 60kV line #1 (between TULCAY1 - TULCY JT)	Tulucay - Napa #2 60 kV (Tulucay 60 kV to Basalt 60 kV)	B	L-1	110%	<95%	<95%	Napa - Tulucay No. 1 60kV line updgrade will mitigate the overload
NCNB-SP-T-7	Clear Lake - Konocti 60kV Line	Bus Fault at Cloverdale 115kV	C1	Bus	<95%	97%	100%	Reconductor the Line by 2023
NCNB-SP-T-8	Clear Lake - Hopland 60kV line (between Clearlake - Granite)	Bus Fault at Eagle Rock 115kV	C1	Bus	111%	<95%	<95%	Middletown 115 kV Project. In interim, open CB22 at Clear Lake and close NO CB at Middletown
NCNB-SP-T-9	Clear Lake - Hopland 60kV line (between Granite - Hopland JCT)		C1	Bus	117%	<95%	<95%	

2013/2014 ISO Reliability Assessment - Study Results

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



**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
NCNB-SP-T-10	Bridgeville - Garberville 60kV line (Between Bridgeville - Fruitland JCT)	Geyser # 3 - Cloverdale 115KV (Cloverdale 115KV to MPE tap1) & Cortina - Mendocino No.1 115 kV (Mendocino Sub 115kV to Lucerne Jct1)	C3	L-1-1	107%	111%	<95%	New Bridgeville - Garberville 115kVline will mitigate the overload. Adjust generation at Humboldt bay in the interim
NCNB-SP-T-11	Garberville - Laytonville 60kV line (between Garberville - Kekawaka Jct)		C3	L-1-1	<95%	<95%	113%	Adjust Humboldt Bay generation
NCNB-SP-T-12	Bridgeville - Garberville 60kV line (Between Fruitland JCT - Fort Seward Jct)		C3	L-1-1	109%	112%	<95%	New Bridgeville - Garberville 115kVline will mitigate the overload. Adjust generation at Humboldt bay in the interim
NCNB-SP-T-13	Bridgeville - Garberville 60kV line (Between Fort Seward JCT - Garberville)		C3	L-1-1	107%	110%	<95%	
NCNB-SP-T-14	Mendocino - Redbud 115kV line (Between REDBUDJ1 - REDBUD)		C3	L-1-1	108%	105%	111%	Disable the flip flop scheme at Lucerne. Drop load at Cloverdale, Ukiah and City of Ukiah as necessary if overload persists.
NCNB-SP-T-15	Eagle Rock - Redbud 115kV line (between HGHLNDJ1 - CACHE J2)		C3	L-1-1	102%	100%	107%	
NCNB-SP-T-16	Eagle Rock - Redbud 115kV line (between REDBUDJ2 - REDBUD)		C3	L-1-1	120%	118%	125%	
NCNB-SP-T-17	Eagle Rock - Redbud 115kV line (between CACHE J2 - REDBUDJ2)		C3	L-1-1	109%	107%	114%	
NCNB-SP-T-18	Eagle Rock - Redbud 115kV line (between LWRLAKEJ - HGHLNDJ1)		C3	L-1-1	120%	118%	125%	



**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
NCNB-SP-T-19	Konocti - Eagle Rock 60kV Line	Geyser # 3 - Cloverdale 115KV (Cloverdale 115KV to MPE tap1) & Eagle Rock- Redbud 115 kV (Eagle Rock 115kV to Lower Lake 115kV Jct)	C3	L-1-1	126%	<95%	98%	Middletown 115kV project
NCNB-SP-T-20	Eagle Rock 115 / 60kV Transformer		C3	L-1-1	103%	<95%	<95%	
NCNB-SP-T-21	Clear Lake - Konocti 60kV Line	Geyser # 3 - Cloverdale 115KV (Cloverdale 115KV to MPE tap1) & Eagle Rock- Redbud 115 kV (Eagle Rock 115kV to Lower Lake)	C3	L-1-1	133%	159%	174%	Middletown 115kV project. 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-SP-T-22	Clear Lake - Hopland 60kV line (between Granite - Hopland JCT)	Geyser #3 - Eagle Rock 115 kv & Ukiah-Hopland-Cloverdale 115 kV (Ukiah sub 115kv to City of Ukiah sub 115kv)	C3	L-1-1	100%	<95%	<95%	Drop Load at Granite
NCNB-SP-T-23	Clear Lake - Hopland 60kV line (between Clearlake - Granite)	Mendocino - Redbud 115 KV (Mendocino Sub to Lucern Jct2) & Konocti - Eagle Rock 60kV	C3	L-1-1	110%	<95%	<95%	Middletown 115kV project
NCNB-SP-T-24	Clear Lake - Hopland 60kV line (between Granite - Hopland JCT)		C3	L-1-1	115%	<95%	<95%	
NCNB-SP-T-25	Fulton - Hopland 60kV (between Hopland JT - Cloverdale JT)	Ukiah-Hopland-Cloverdale 115 kV (Ukiah sub 115kv to City o & Eagle Rock- Fulton- Silverado 115 kv (Eagle rock sub to Rincon Jct 2 115kV)	C3	L-1-1	104%	109%	110%	Drop Load at Ukaih
NCNB-SP-T-26	Fulton #1 60kV line (between CLVRDLJT - Geysers Jct)		C3	L-1-1	98%	102%	103%	Drop Load at Ukaih
NCNB-SP-T-27	Fulton #1 60kV line (between Geysers Jct - Fitch Mtn Tap)		C3	L-1-1	98%	103%	104%	Drop Load at Ukaih

2013/2014 ISO Reliability Assessment - Study Results

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



**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
NCNB-SP-T-28	Bridgeville - Garberville 60kV line (Between Bridgeville - Fruitland JCT)	Eagle Rock-Cortina 115kV Lines & Cortina-Mendocino No.1 115	C5	L-2	98%	105%	<95%	New Bridgeville - Garberville 115kVline will mitigate the overload. Adjust generation at Humboldt bay in the interim
NCNB-SP-T-29	Garberville - Laytonville 60kV line (between Garberville - Kekawaka Jct)		C5	L-2	<95%	<95%	104%	Adjust Humboldt Generation
NCNB-SP-T-30	Bridgeville - Garberville 60kV line (Between Fruitland JCT - Fort Seward Jct)		C5	L-2	100%	106%	<95%	New Bridgeville - Garberville 115kVline will mitigate the overload. Adjust generation at Humboldt bay in the interim
NCNB-SP-T-31	Bridgeville - Garberville 60kV line (Between Fort Seward JCT - Garberville)		C5	L-2	98%	104%	<95%	
NCNB-SP-T-32	Geyser # 3 - Cloverdale 115KV (between Cloverdale - MPE tap)	Eagle Rock-Redbud & Cortina-Mendocino No.1 115kV	C5	L-2	98%	98%	100%	Adjust Geysers generation
NCNB-SP-T-33	Clear Lake - Konocti 60kV Line		C5	L-2	<95%	110%	112%	Open CB22 at Clear Lake
NCNB-SP-T-34	Ignacio - San Rafael #.3 115 kV (between Ignacio and Las Gallinas)	Ignacio-San Rafael #2 & Ignacio-San Rafael #1 115kV Lines	C5	L-2	<95%	113%	117%	The line is overloaded after the Ignacio-Alto Voltage conversion project is in Service. Reconductor the line to mitigate the overload.
NCNB-SP-T-35	Ignacio-San Rafael 115 kV # 2	Ignacio-San Rafael #1 & Ignacio-Las Gallinas #1 115kV Line	C5	L-2	<95%	129%	133%	Select a higher conductor size for this new line that is being built as a part of the Ignacio - Alto Voltage conversion project

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
NCNB-SP-T-36	Ignacio-San Rafael 60 kV # 1 (Between Ignacio and San Rafael)	Ignacio-Alto-Sausalito #2 & #1 60kV Lines	C5	L-2	134%	<95%	<95%	Ignacia - Alto Voltage Conversion Project
NCNB-SP-T-37	Ignacio - Alto 60 kV Line #1 (Between SAN RFLJ - GREENBRE 60 kV)		C5	L-2	134%	<95%	<95%	
NCNB-SP-T-38	Tulucay - Napa 60kV line #1 (between TULCAY1 - TULCY JT)	Tulacay-Napa #2 & Basalt #1 60kV Lines	C5	L-2	110%	<95%	<95%	Napa - Tulucay No. 1 60kV line updgrade will mitigate the overload

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Winter Peak	2018 Winter Peak	2023 Winter Peak	
NCNB-WP-T-1	Monte Rio - Fulton 60kV (between MOLINO - TRNTN_JC)	Fulton- Molino- Cotati 60 kV(Molino sub 60 kV to Molino Jct)	B	L-1	101%	104%	110%	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-WP-T-2	Clear Lake - Konocti 60kV Line	Geyser # 3 - Cloverdale 115KV (Cloverdale 115KV to MPE tap1) & Eagle Rock- Redbud 115 kV (Eagle Rock 115kV to Lower Lake 115kV Jct)	C3	L-1-1	98%	116%	115%	Reconductor the line by 2023. 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 overload persists.
NCNB-WP-T-3	Ignacio-San Rafael 115 kV # 2	Ignacio-San Rafael #1 & Ignacio-Las Gallinas #1 115kV Line	C5	L-2	<95%	108%	111%	Select a higher conductor size for this new line that is being built as a part of the Ignacio - Alto Voltage conversion project
NCNB-WP-T-4	Ignacio - San Rafael #.3 115 kV (between Ignacio and Las Gallinas)	Ignacio-San Rafael #2 & Ignacio-San Rafael #1 115kV Lines	C5	L-2	<95%	113%	115%	The line is overloaded after the Ignacio-Alto Voltage conversion project is in Service. Reconductor the line to mitigate the overload.
NCNB-WP-T-5	Ignacio - San Rafael #.3 115 kV (between Las Gallinas and San Rafael)		C5	L-2	<95%	111%	113%	
NCNB-WP-T-6	Ignacio - Alto 60 kV Line #1 (Between Ignacio and San Rafael)	Ignacio-Alto-Sausalito #2 & #1 60kV Lines	C5	L-2	151%	<95%	<95%	Ignacio - Alto Voltage conversion project
NCNB-WP-T-7	Ignacio - Alto 60 kV Line #1 (Between SAN RFLJ - GREENBRE 60 kV)		C5	L-2	151%	<95%	<95%	

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Summer Off-Peak	2018 Summer Light Load	N/A	
NCNB-NP-T-1	Clear Lake - Hopland 60kV line (between Clearlake - Granite)	Geysers #3 - Eagle Rock 115 kv & Ukiah-Hopland-Cloverdale 115 kv (Ukiah sub 115kv to City of Ukiah)	C3	L-1-1	101%	102%		Middletown 115 kV Project. In interim, open CB22 at Clear Lake and close NO CB at Middletown
NCNB-NP-T-2	Clear Lake - Hopland 60kV line (between Granite - Hopland JCT)		C3	L-1-1	103%	104%		
NCNB-NP-T-3	Fulton - Hopland 60kV (between Hopland JT - Cloverdale JT)		C3	L-1-1	92%	108%		
NCNB-NP-T-4	Fulton #1 60kV line (between CLVRDLJT - Geysers Jct)		C3	L-1-1	< 95%	102%		
NCNB-NP-T-5	Fulton #1 60kV line (between Geysers Jct - Fitch Mtn Tap)		C3	L-1-1	< 95%	103%		
NCNB-NP-T-6	Eagle Rock - Cortina 115kV line (between EGLE RCK - HOMSTKTP)	Ukiah-Hopland-Cloverdale 115 kv (Ukiah sub 115kv to Hopland Jct 115kv & Eagle Rock-Fulton- Silverado 115 kv (Eagle rock sub to Rincon Jct)	C3	L-1-1	107%	117%		Adjust generation at Geysers
NCNB-NP-T-7	Eagle Rock - Cortina 115kV line (between HOMSTKTP - HGHLNDJ2)		C3	L-1-1	106%	112%		Adjust generation at Geysers
NCNB-NP-T-8	Eagle Rock - Cortina 115kV line (between EGLE RCK - HOMSTKTP)	Fulton-Hopland 60kv & Geysers #17-Fulton 230kv & Eagle Roc	C5	L-2	98%	107%		Adjust generation at Geysers
NCNB-NP-T-9	Eagle Rock - Cortina 115kV line (between HOMSTKTP - HGHLNDJ2)	Fulton-Hopland 60kv & Geysers #17-Fulton 230kv & Eagle Roc	C5	L-2	97%	107%		Adjust generation at Geysers

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



**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
NCNB-SP-VD-1	FRT SWRD 60	GARBERVILLE - LAYTONVILLE 60KV (Kekawaka Jct to Laytonville)	B	L-1	-6.43%	-8.39%	< 5%	Bridgeville - Garberville 115kV line project
NCNB-SP-VD-2	FRUITLND 60		B	L-1	-5.09%	-6.79%	< 5%	
NCNB-SP-VD-3	GRBRVLE 60		B	L-1	-8.12%	-10.47%	< 5%	
NCNB-SP-VD-4	CLOVRDLE 115	GEYSER # 3 - CLOVERDALE 115K (CLOVERDALE 115KV to MPE TAP1)	B	L-1	5.94%	5.74%	7.12%	Adjust generation at Geysers
NCNB-SP-VD-5	HPLND JT 60		B	L-1	< 5%	< 5%	5.31%	
NCNB-SP-VD-6	HPLND JT 115		B	L-1	< 5%	< 5%	5.73%	
NCNB-SP-VD-7	GRANITE 60	Konocti - Eagle Rock 60kV	B	L-1	8.21%	< 5%	< 5%	Middletown 115kV project
NCNB-SP-VD-8	HARTLEY 60		B	L-1	8.57%	< 5%	< 5%	
NCNB-SP-VD-9	CLER LKE 60		B	L-1	9.88%	< 5%	< 5%	
NCNB-SP-VD-10	KONOCT16 60		B	L-1	17.01%	< 5%	5.36%	
NCNB-SP-VD-11	LOWR LKE 60		B	L-1	17.41%	< 5%	< 5%	
NCNB-SP-VD-12	MIDDLTWN 60		B	L-1	17.99%	< 5%	< 5%	
NCNB-SP-VD-13	UPPR LKE 60		B	L-1	7.12%	< 5%	< 5%	
NCNB-SP-VD-14	GUALALA 60	Monte Rio- Fulton 60 KV(Wohler Jct 60 Kv to Monte Rio Sub)	B	L-1	< 5%	< 5%	-5.42%	Install reactive support near Annapolis / Fort Ross

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
NCNB-SP-VD-15	DUNBAR 60	LAKEVILLE #1 60 kV(Lakeville sub 60 kV to Dunbar Sub 60 kV)	B	L-1	5.92%	6.67%	6.80%	Middletown 115kV project
NCNB-SP-VD-16	CALISTGA 60		B	L-1	6.53%	7.01%	7.82%	
NCNB-SP-VD-17	ST.HELNA 60		B	L-1	6.32%	6.77%	7.55%	
NCNB-SP-VD-18	MEYERS 115	Ignacio - Mare Island No.2 (Ignacio sub to Hamilton Wetland)	B	L-1	5.65%	< 5%	< 5%	Ignacio - Alto Voltage conversion project
NCNB-SP-VD-19	CARQUINZ 115		B	L-1	5.65%	< 5%	< 5%	
NCNB-SP-VD-20	LOWR LKE 60	Middle Town - HomeStake 115kV (Middltnw to Homsttp 115kV)	B	L-1	< 5%	5.10%	5.71%	Adjust generation at Geysers
NCNB-SP-VD-21	MIDDLTWN 60		B	L-1	< 5%	9.63%	10.75%	
NCNB-SP-VD-22	MIDDLTWN 115		B	L-1	< 5%	14.16%	14.51%	
NCNB-SP-VD-23	EGLE RCK 60	EAGLE ROCK 115/60 KV BANK NO.1	B	L-1	11.08%	5.70%	7.02%	open Eagle Rock-Konocti 60 kV line for Eagle Rock bank outage

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
NCNB-SP-VD-24	GRANITE 60	BUS FAULT AT EGLE RCK 115.00	C1	Bus	10.42%	< 10%	< 10%	Adjust generation at Geysers
NCNB-SP-VD-25	HARTLEY 60		C1	Bus	10.95%	< 10%	< 10%	
NCNB-SP-VD-26	CLER LKE 60		C1	Bus	12.16%	< 10%	< 10%	
NCNB-SP-VD-27	EGLE RCK 60		C1	Bus	22.45%	< 10%	< 10%	
NCNB-SP-VD-28	KONOCI6 60		C1	Bus	19.24%	< 10%	< 10%	
NCNB-SP-VD-29	LOWR LKE 60		C1	Bus	19.58%	< 10%	< 10%	
NCNB-SP-VD-30	MIDDLTWN 60		C1	Bus	20.07%	< 10%	< 10%	
NCNB-SP-VD-31	MIDDLTWN 115	BUS FAULT AT HOMSTKTP 115.00	C1	Bus	< 10%	13.83%	14.16%	
NCNB-SP-VD-32	GRBRVLL 60	BUS FAULT AT LYTNVLL 60.00	C1	Bus	-8.36%	-10.72%	< 10%	Bridgeville - Garberville 115kV line
NCNB-SP-VD-33	KEKAWAKA 60		C1	Bus	-9.28%	-11.84%	< 10%	
NCNB-SP-VD-34	PUEBLO 115	Lakeville 115 kV CB102 stuck	C2	Breaker	< 10%	< 10%	10.20%	Adjust Monticello Ph generation
NCNB-SP-VD-35	SONOMA 115		C2	Breaker	12.10%	12.12%	13.32%	



Voltage Deviations

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
NCNB-SP-VD-36	ELK 60	Mendocino 60 kV CB42 stuck	C2	Breaker	Not Solved	Not Solved	Not Solved	Case not solved due to voltage collapse. Problem is seen with Big river and Garberville SVCs. Install additional reactive support in the Mendocino area.
NCNB-SP-VD-37	PHILO 60		C2	Breaker	Not Solved	Not Solved	Not Solved	
NCNB-SP-VD-38	GARCIA 60		C2	Breaker	Not Solved	Not Solved	Not Solved	
NCNB-SP-VD-39	COVELO6 60		C2	Breaker	Not Solved	Not Solved	Not Solved	
NCNB-SP-VD-40	WILLITS 60		C2	Breaker	Not Solved	Not Solved	Not Solved	
NCNB-SP-VD-41	BIG RIVR 60		C2	Breaker	Not Solved	Not Solved	Not Solved	
NCNB-SP-VD-42	FRT BRGG 60		C2	Breaker	Not Solved	Not Solved	Not Solved	
NCNB-SP-VD-43	FRT SWRD 60		C2	Breaker	Not Solved	Not Solved	Not Solved	
NCNB-SP-VD-44	FRUITLND 60		C2	Breaker	Not Solved	Not Solved	Not Solved	
NCNB-SP-VD-45	GRBRVLE 60		C2	Breaker	Not Solved	Not Solved	Not Solved	
NCNB-SP-VD-46	KEKAWAKA 60		C2	Breaker	Not Solved	Not Solved	Not Solved	
NCNB-SP-VD-47	LYTNVLE 60		C2	Breaker	Not Solved	Not Solved	Not Solved	
NCNB-SP-VD-48	PNT ARNA 60		C2	Breaker	Not Solved	Not Solved	Not Solved	
NCNB-SP-VD-49	PTTR VLY 60		C2	Breaker	Not Solved	Not Solved	Not Solved	

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



**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
NCNB-SP-VD-50	MENDOCNO 60	BUS FAULT AT 31200 MENDOCNO CB102 stuck 115.00	C2	Breaker	< 10%	< 10%	10.74%	Install a series breaker to 115kV CB102 at Mendocino
NCNB-SP-VD-51	MNDCCNO M 115		C2	Breaker	< 10%	< 10%	10.65%	
NCNB-SP-VD-52	CLER LKE 60	GARBERVILLE - LAYTONVILLE 60KV (Kekawaka Jct to Laytonville) & Konocti - Eagle Rock 60kV	C3	L-1-1	10.00%	< 10%	< 10%	Middletown 115kV project
NCNB-SP-VD-53	KONOCIT6 60		C3	L-1-1	17.19%	< 10%	< 10%	
NCNB-SP-VD-54	LOWR LKE 60		C3	L-1-1	17.58%	< 10%	< 10%	
NCNB-SP-VD-55	MIDDLTWN 60		C3	L-1-1	18.16%	< 10%	< 10%	
NCNB-SP-VD-56	PHILO 60	Mendocno- Ukiah 115 kV(Mendocino 115kV to CALPELLA 115kV) & GEYSER # 3 - CLOVERDALE 115K (CLOVERDALE 115KV to MPE TAP1)	C3	L-1-1	< 10%	< 10%	10.48%	Adjust generation at Geysers
NCNB-SP-VD-57	GRANITE 60		C3	L-1-1	11.95%	11.53%	12.98%	
NCNB-SP-VD-58	HARTLEY 60		C3	L-1-1	9.12%	< 10%	10.06%	
NCNB-SP-VD-59	CLER LKE 60		C3	L-1-1	< 10%	< 10%	10.77%	
NCNB-SP-VD-60	MASONITE 60		C3	L-1-1	< 10%	< 10%	11.36%	

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
NCNB-SP-VD-61	CLER LKE 60	Mendocno- Ukiah 115 kV(Mendocino 115kV to CALPELLA 115kV) & Konocti - Eagle Rock 60kV	C3	L-1-1	10.22%	< 10%	< 10%	Middletown 115kV project
NCNB-SP-VD-62	KONOCTI6 60		C3	L-1-1	17.60%	< 10%	< 10%	
NCNB-SP-VD-63	LOWR LKE 60		C3	L-1-1	17.94%	< 10%	< 10%	
NCNB-SP-VD-64	MIDDLTWN 60		C3	L-1-1	18.43%	< 10%	< 10%	
NCNB-SP-VD-65	ELK 60		C3	L-1-1	< 10%	< 10%	19.29%	
NCNB-SP-VD-66	PHILO 60		C3	L-1-1	< 10%	< 10%	18.84%	
NCNB-SP-VD-67	UKIAH 115		C3	L-1-1	11.10%	10.80%	17.91%	
NCNB-SP-VD-68	GARCIA 60		C3	L-1-1	< 10%	< 10%	19.50%	
NCNB-SP-VD-69	COVELO6 60		C3	L-1-1	10.29%	10.02%	14.89%	
NCNB-SP-VD-70	GRANITE 60		C3	L-1-1	< 10%	< 10%	14.14%	
NCNB-SP-VD-71	HARTLEY 60		C3	L-1-1	< 10%	< 10%	14.05%	
NCNB-SP-VD-72	LUCERNE 115		C3	L-1-1	< 10%	< 10%	12.34%	
NCNB-SP-VD-73	WILLITS 60		C3	L-1-1	10.01%	< 10%	17.71%	
NCNB-SP-VD-74	BIG RIVR 60		C3	L-1-1	< 10%	< 10%	18.85%	
NCNB-SP-VD-75	CALPELLA 115		C3	L-1-1	10.88%	10.58%	17.55%	

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
NCNB-SP-VD-76	CLER LKE 60	MENDOCINO - REDBUD 115 KV (MENDOCINO SUB TO LUCERN JCT2) & GEYSER # 3 - CLOVERDALE 115K (CLOVERDALE 115KV to MPE TAP1)	C3	L-1-1	< 10%	< 10%	12.95%	In addition to Big River and Garberville SVCs, install additional voltage support in the mendocino coast area.
NCNB-SP-VD-77	CLOVRDLE 115		C3	L-1-1	12.75%	12.40%	20.09%	
NCNB-SP-VD-78	FRT BRGG 60		C3	L-1-1	< 10%	< 10%	19.37%	
NCNB-SP-VD-79	HPLND JT 60		C3	L-1-1	11.02%	10.70%	17.12%	
NCNB-SP-VD-80	HPLND JT 115		C3	L-1-1	11.47%	11.15%	18.38%	
NCNB-SP-VD-81	LYTNVLE 60		C3	L-1-1	10.18%	< 10%	14.65%	
NCNB-SP-VD-82	MASONITE 60		C3	L-1-1	10.31%	10.05%	17.66%	
NCNB-SP-VD-83	MENDOCNO 60		C3	L-1-1	10.58%	10.32%	17.38%	
NCNB-SP-VD-84	MENDOCNO 115		C3	L-1-1	10.70%	10.41%	17.26%	
NCNB-SP-VD-85	MNDNO M 115		C3	L-1-1	10.54%	10.28%	17.35%	
NCNB-SP-VD-86	PNT ARNA 60		C3	L-1-1	< 10%	< 10%	19.49%	
NCNB-SP-VD-87	PTTR VLY 60		C3	L-1-1	< 10%	< 10%	16.92%	
NCNB-SP-VD-88	UPPR LKE 60		C3	L-1-1	< 10%	< 10%	14.91%	

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
NCNB-SP-VD-89	CLER LKE 60	MENDOCINO - REDBUD 115 KV (MENDOCINO SUB TO LUCERN JCT2 11 & Konocti - Eagle Rock 60kV	C3	L-1-1	10.66%	< 10%	< 10%	Middletown 115kV project
NCNB-SP-VD-90	KONOCTI6 60		C3	L-1-1	18.00%	< 10%	< 10%	
NCNB-SP-VD-91	LOWR LKE 60		C3	L-1-1	18.36%	< 10%	< 10%	
NCNB-SP-VD-92	MIDDLTWN 60		C3	L-1-1	18.89%	< 10%	< 10%	
NCNB-SP-VD-93	REDBUD 115	Ukiah-Hopland-Cloverdale 115 kV (Ukiah sub 115kv to Hoplan & Eagle Rock- Redbud 115 kV (Eagle Rock 115kV to Lower Lake	C3	L-1-1	< 10%	12.44%	11.58%	In addition to Big River and Garberville SVCs, install additional voltage support in the mendocino coast area.
NCNB-SP-VD-94	GRANITE 60	Ukiah-Hopland-Cloverdale 115 kV (Ukiah sub 115kv to Hopland) & Konocti - Eagle Rock 60kV	C3	L-1-1	14.66%	< 10%	< 10%	Middletown 115kV project
NCNB-SP-VD-95	HARTLEY 60		C3	L-1-1	14.60%	< 10%	< 10%	
NCNB-SP-VD-96	CLER LKE 60		C3	L-1-1	16.30%	< 10%	< 10%	
NCNB-SP-VD-97	HPLND JT 60		C3	L-1-1	10.06%	< 10%	< 10%	
NCNB-SP-VD-98	UPPR LKE 60		C3	L-1-1	12.64%	< 10%	< 10%	
NCNB-SP-VD-99	MIDDLTWN 60	Eagle Rock-Cortina 115kV Lines & Cortina-Mendocino No.1 115	C5	L-2	< 10%	10.21%	11.58%	Adjust generation at Geysers
NCNB-SP-VD-100	MIDDLTWN 115		C5	L-2	< 10%	14.63%	15.21%	

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
NCNB-SP-VD-101	REDBUD 115	Eagle Rock-Redbud & Cortina-Mendocino No.1 115kV	C5	L-2	< 10%	< 10%	12.05%	
NCNB-SP-VD-103	LUCERNE 115		C5	L-2	< 10%	< 10%	11.79%	
NCNB-SP-VD-104	ALTO 60	Ignacio-Alto-Sausalito #2 & #1 60kV Lines	C5	L-2	12.05%	< 10%	< 10%	Ignacio - Alto Voltage conversion project
NCNB-SP-VD-105	GREENBRE 60		C5	L-2	10.46%	< 10%	< 10%	
NCNB-SP-VD-106	SONOMA 115	Lakeville-Sonoma #1 & #2 115kV Lines	C5	L-2	11.20%	11.41%	12.51%	Trip load at Pueblo by existing SPS

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



**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2015 Winter Peak	2018 Winter Peak	2023 Winter Peak	
NCNB-WP-VD-1	HARTLEY 60 kV	Konocti - Eagle Rock 60kV	B	L-1	5.12%	<5%	<5%	Middle town 115kV project
NCNB-WP-VD-2	CLER LKE 60 kV		B	L-1	5.98%	<5%	<5%	
NCNB-WP-VD-3	KONCOCTI6 60 kV		B	L-1	10.80%	<5%	<5%	
NCNB-WP-VD-4	LOWR LKE 60 kV		B	L-1	10.93%	<5%	<5%	
NCNB-WP-VD-5	MIDDLTWN 60 kV		B	L-1	11.11%	<5%	<5%	
NCNB-WP-VD-6	CALISTGA 60 kV	LAKEVILLE #1 60 kV(Lakeville sub 60 kV to Dunbar Sub 60 kV)	B	L-1	5.60%	5.89%	6.42%	Ignacia - Alto Voltage conversion project
NCNB-WP-VD-7	ST.HELNA 60 kV		B	L-1	5.47%	5.75%	6.26%	
NCNB-WP-VD-8	SAUSALTO 60 kV	Ignacio - Alto - Sausalito # 2 60 kV (IGNACO A 60.00 to	B	L-1	4.69%	<5%	<5%	Ignacia - Alto Voltage conversion project
NCNB-WP-VD-9	GREENBRE 60 kV	Ignacio _Alto 60 kV ( Ignacio A 60kv to Ignacio Jct 60 kV)	B	L-1	5.60%	<5%	<5%	
NCNB-WP-VD-10	MIDDLTWN 60 kV	Middle Town - HomeStake 115kV (Middltwn to Homsttp 115kV)	B	L-1	<5%	5.07%	6.25%	Adjust generation at Geysers
NCNB-WP-VD-11	MIDDLTWN 115 kV		B	L-1	<5%	11.33%	11.72%	
NCNB-WP-VD-12	EGLERCK 60 kV	EAGLE ROCK 115/60 KV BANK NO.1	B	L-1	9.35%	<5%	<5%	open Eagle Rock-Konocti 60 kV line for Eagle Rock bank outage

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2015 Winter Peak	2018 Winter Peak	2023 Winter Peak	
NCNB-WP-VD-13	EGLERCK 60 kV	BUS FAULT AT 31220 EGLERCK 115.00	C1	Bus	14.14%	< 10%	< 10%	Middle town 115kV project
NCNB-WP-VD-14	KONOCT16 60 kV		C1	Bus	11.89%	< 10%	< 10%	
NCNB-WP-VD-15	LOWR LKE 60 kV		C1	Bus	12.03%	< 10%	< 10%	
NCNB-WP-VD-16	MIDDLTWN 60 kV		C1	Bus	12.24%	< 10%	< 10%	
NCNB-WP-VD-17	ELK 60 kV	Mendocino 60 kV CB42 stuck	C2	Breaker	< 10%	15.40%	< 10%	Install additional reactive support in the Mendocino area
NCNB-WP-VD-18	PHILO 60 kV		C2	Breaker	< 10%	12.82%	< 10%	
NCNB-WP-VD-19	GARCIA 60 kV		C2	Breaker	< 10%	15.45%	< 10%	
NCNB-WP-VD-20	COVELO6 60 kV		C2	Breaker	13.13%	23.49%	< 10%	
NCNB-WP-VD-21	WILLITS 60 kV		C2	Breaker	11.87%	23.36%	10.74%	
NCNB-WP-VD-22	BIG RIVR 60 kV		C2	Breaker	< 10%	15.50%	< 10%	
NCNB-WP-VD-23	FRT BRGG 60 kV		C2	Breaker	< 10%	17.82%	< 10%	
NCNB-WP-VD-24	FRT SWRD 60 kV		C2	Breaker	10.02%	16.74%	< 10%	
NCNB-WP-VD-25	FRUITLND 60 kV		C2	Breaker	< 10%	14.25%	< 10%	
NCNB-WP-VD-26	GRBRVLE 60 kV		C2	Breaker	11.59%	19.65%	< 10%	
NCNB-WP-VD-27	KEKAWAKA 60 kV		C2	Breaker	11.93%	20.34%	< 10%	



**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2015 Winter Peak	2018 Winter Peak	2023 Winter Peak	
NCNB-WP-VD-28	LYTNVLE 60 kV		C2	Breaker	13.00%	23.29%	< 10%	
NCNB-WP-VD-29	PNT ARNA 60 kV		C2	Breaker	< 10%	15.45%	< 10%	
NCNB-WP-VD-30	PTTR VLY 60 kV		C2	Breaker	11.20%	22.49%	10.25%	
NCNB-WP-VD-31	CLER LKE 60 kV	Ukiah-Hopland-Cloverdale 115 kV (Ukiah sub 115kv to Hopland) & Konocti - Eagle Rock 60kV	C3	L-1-1	10.03%	< 10%	< 10%	Middletown 115kV project
NCNB-WP-VD-32	KONOCI6 60 kV		C3	L-1-1	15.70%	< 10%	< 10%	
NCNB-WP-VD-33	LOWR LKE 60 kV		C3	L-1-1	15.89%	< 10%	< 10%	
NCNB-WP-VD-34	MIDDLTWN 60 kV		C3	L-1-1	16.18%	< 10%	< 10%	
NCNB-WP-VD-35	EGLE RCK 60 kV	Ukiah-Hopland-Cloverdale 115 kV (Ukiah sub 115kv to Hopland) & EAGLE ROCK 115/60 KV BANK NO.1	C3	L-1-1	13.17%	< 10%	< 10%	open Eagle Rock-Konocti 60 kV line for Eagle Rock bank outage
NCNB-WP-VD-36	ALTO 60 kV	Ignacio-Alto-Sausalito #2 & #1 60kV Lines	C5	L-2	18.07%	< 10%	< 10%	Ignacio - Alto voltage conversion project
NCNB-WP-VD-37	GREENBRE 60 kV		C5	L-2	15.98%	< 10%	< 10%	
NCNB-WP-VD-38	SAN RFLJ 60 kV		C5	L-2	13.36%	< 10%	< 10%	

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2015 Summer Off-Peak	2018 Summer Light Load	N/A	

No violations reported

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Study Area: PG&E North Coast & North Bay - Summer Peak



High/Low Voltage

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Winter Peak	2023 Summer Peak	
NCNB-SP-V-1	FRT SWRD 60 kV	GARBERVILLE - LAYTONVILLE 60KV (Kekawaka Jct to Laytonville)	B	L-1	1.09	1.13	> 0.9	Bridgeville - Garberville 115kV line
NCNB-SP-V-2	FRUITLND 60 kV		B	L-1	1.08	1.10	> 0.9	
NCNB-SP-V-3	GRBRVLE 60 kV		B	L-1	1.12	1.16	> 0.9	
NCNB-SP-V-4	CLER LKE 60 kV	Konocti - Eagle Rock 60kV	B	L-1	0.90	> 0.9	> 0.9	Middletown 115kV project
NCNB-SP-V-5	KONOCI16 60 kV		B	L-1	0.84	> 0.9	0.98	
NCNB-SP-V-6	LOWR LKE 60 kV		B	L-1	0.82	> 0.9	> 0.9	
NCNB-SP-V-7	MIDDLTWN 60 kV		B	L-1	0.78	> 0.9	> 0.9	
NCNB-SP-V-8	GRANITE 60 kV	BUS FAULT AT 31220 EGLE RCK 115.00	C1	Bus	0.90	> 0.9	> 0.9	Middletown 115kV project
NCNB-SP-V-9	HARTLEY 60 kV		C1	Bus	0.88	> 0.9	> 0.9	
NCNB-SP-V-10	CLER LKE 60 kV		C1	Bus	0.88	> 0.9	> 0.9	
NCNB-SP-V-11	EGLE RCK 60 kV		C1	Bus	0.82	> 0.9	> 0.9	
NCNB-SP-V-12	KONOCI16 60 kV		C1	Bus	0.82	> 0.9	> 0.9	
NCNB-SP-V-13	LOWR LKE 60 kV		C1	Bus	0.80	> 0.9	> 0.9	
NCNB-SP-V-14	MIDDLTWN 60 kV		C1	Bus	0.76	> 0.9	> 0.9	

High/Low Voltage

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Winter Peak	2023 Summer Peak	
NCNB-SP-V-15	FRT SWRD 60 kV	BUS FAULT AT 31308 LYTNVLE 60.00	C1	Bus	> 0.9	1.13	> 0.9	Bridgeville - Garberville 115kV line
NCNB-SP-V-16	FRUITLND 60 kV		C1	Bus	> 0.9	1.10	> 0.9	
NCNB-SP-V-17	GRBRVLE 60 kV		C1	Bus	1.12	1.16	> 0.9	
NCNB-SP-V-18	KEKAWAKA 60 kV		C1	Bus	1.12	1.16	> 0.9	
NCNB-SP-V-19	ELK 60 kV	Mendocino 60 kV CB42 stuck	C2	Breaker	0.87	0.82	0.81	Install additional reactive support near Mendocino area
NCNB-SP-V-20	PHILO 60 kV		C2	Breaker	0.90	0.87	0.86	
NCNB-SP-V-21	GARCIA 60 kV		C2	Breaker	0.86	0.82	0.80	
NCNB-SP-V-22	COVELO6 60 kV		C2	Breaker	0.74	0.71	0.74	
NCNB-SP-V-23	WILLITS 60 kV		C2	Breaker	0.75	0.71	0.70	
NCNB-SP-V-24	BIG RIVR 60 kV		C2	Breaker	0.86	0.80	0.78	
NCNB-SP-V-25	FRT BRGG 60 kV		C2	Breaker	0.82	0.77	0.75	
NCNB-SP-V-26	FRT SWRD 60 kV		C2	Breaker	0.87	0.86	> 0.9	
NCNB-SP-V-27	FRUITLND 60 kV		C2	Breaker	0.89	0.88	> 0.9	
NCNB-SP-V-28	GRBRVLE 60 kV		C2	Breaker	0.84	0.83	> 0.9	
NCNB-SP-V-29	KEKAWAKA 60 kV		C2	Breaker	0.81	0.80	> 0.9	

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



High/Low Voltage

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Winter Peak	2023 Summer Peak	
NCNB-SP-V-30	LYTNVLE 60 kV		C2	Breaker	0.75	0.72	0.75	
NCNB-SP-V-31	PNT ARNA 60 kV		C2	Breaker	0.86	0.82	0.80	
NCNB-SP-V-32	PTTR VLY 60 kV		C2	Breaker	0.78	0.74	0.73	
NCNB-SP-V-33	COVELO6 60 kV	GARBERVILLE - LAYTONVILLE 60KV (Kekawaka Jct to Laytonvill & GEYSER # 3 - CLOVERDALE 115K (CLOVERDALE 115KV to MPE TAP1)	C3	L-1-1	> 0.9	> 0.9	0.88	Install additional reactive support in the Mendocino area
NCNB-SP-V-34	LYTNVLE 60 kV		C3	L-1-1	> 0.9	> 0.9	0.90	
NCNB-SP-V-35	CLER LKE 60 kV	GARBERVILLE - LAYTONVILLE 60KV (Kekawaka Jct to Laytonville) & Konocti - Eagle Rock 60kV	C3	L-1-1	0.90	> 0.9	> 0.9	Middletown 115kV project
NCNB-SP-V-36	KONOCI16 60 kV		C3	L-1-1	0.84	> 0.9	> 0.9	
NCNB-SP-V-37	LOWR LKE 60 kV		C3	L-1-1	0.82	> 0.9	> 0.9	
NCNB-SP-V-38	MIDDLTWN 60 kV		C3	L-1-1	0.78	> 0.9	> 0.9	

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Winter Peak	2023 Summer Peak	
NCNB-SP-V-39	ELK 60 kV	MENDOCINO - REDBUD 115 KV (MENDOCINO SUB TO LUCERNE JCT2) & GEYSER # 3 - CLOVERDALE 115K (CLOVERDALE 115KV to MPE TAP1)	C3	L-1-1	> 0.9	> 0.9	0.79	Install additional reactive support in the Mendocino area.
NCNB-SP-V-40	PHILO 60 kV		C3	L-1-1	> 0.9	> 0.9	0.80	
NCNB-SP-V-41	UKIAH 115 kV		C3	L-1-1	0.90	0.90	0.82	
NCNB-SP-V-42	GARCIA 60 kV		C3	L-1-1	> 0.9	> 0.9	0.79	
NCNB-SP-V-43	COVELO6 60 kV		C3	L-1-1	0.88	0.89	0.81	
NCNB-SP-V-44	GRANITE 60 kV		C3	L-1-1	> 0.9	> 0.9	0.86	
NCNB-SP-V-45	GUALALA 60 kV		C3	L-1-1	> 0.9	> 0.9	0.89	
NCNB-SP-V-46	HARTLEY 60 kV		C3	L-1-1	> 0.9	> 0.9	0.84	
NCNB-SP-V-47	LUCERNE 115 kV		C3	L-1-1	> 0.9	> 0.9	0.90	
NCNB-SP-V-48	WILLITS 60 kV		C3	L-1-1	0.90	> 0.9	0.80	
NCNB-SP-V-49	BIG RIVR 60 kV		C3	L-1-1	> 0.9	> 0.9	0.81	
NCNB-SP-V-50	CALPELLA 115 kV		C3	L-1-1	0.91	0.91	0.83	
NCNB-SP-V-51	CLER LKE 60 kV		C3	L-1-1	> 0.9	> 0.9	0.86	
NCNB-SP-V-52	CLOVRDLE 115 kV		C3	L-1-1	0.89	0.90	0.82	

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Winter Peak	2023 Summer Peak	
NCNB-SP-V-53	FRT BRGG 60 kV		C3	L-1-1	> 0.9	> 0.9	0.79	
NCNB-SP-V-54	HPLND JT 60 kV		C3	L-1-1	0.91	0.91	0.84	
NCNB-SP-V-55	LYTNVLE 60 kV		C3	L-1-1	0.89	> 0.9	0.82	
NCNB-SP-V-56	MASONITE 60 kV		C3	L-1-1	0.91	0.92	0.83	
NCNB-SP-V-57	MENDOCNO 60 kV		C3	L-1-1	0.92	0.92	0.83	
NCNB-SP-V-58	MENDOCNO 115 kV		C3	L-1-1	0.91	0.92	0.83	
NCNB-SP-V-59	MNDCNO M 115 kV		C3	L-1-1	0.91	0.92	0.83	
NCNB-SP-V-60	PNT ARNA 60 kV		C3	L-1-1	> 0.9	> 0.9	0.79	
NCNB-SP-V-61	PTTR VLY 60 kV		C3	L-1-1	> 0.9	> 0.9	0.83	
NCNB-SP-V-62	UPPR LKE 60 kV		C3	L-1-1	> 0.9	> 0.9	0.84	

2013/2014 ISO Reliability Assessment - Study Results

Study Area: PG&E North Coast & North Bay - Summer Peak



High/Low Voltage

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Winter Peak	2023 Summer Peak	
NCNB-SP-V-63	GRANITE 60 kV	Ukiah-Hopland-Cloverdale 115 kV (Ukiah sub 115kv to Hopland) & Konocti - Eagle Rock 60kV	C3	L-1-1	0.84	> 0.9	> 0.9	Middletown 115kV Project
NCNB-SP-V-64	HARTLEY 60 kV		C3	L-1-1	0.84	> 0.9	> 0.9	
NCNB-SP-V-65	CLER LKE 60 kV		C3	L-1-1	0.82	> 0.9	> 0.9	
NCNB-SP-V-66	KONOCIT6 60 kV		C3	L-1-1	0.77	> 0.9	> 0.9	
NCNB-SP-V-67	LOWR LKE 60 kV		C3	L-1-1	0.75	> 0.9	> 0.9	
NCNB-SP-V-68	MIDDLTWN 60 kV		C3	L-1-1	0.72	> 0.9	> 0.9	
NCNB-SP-V-69	UPPR LKE 60 kV		C3	L-1-1	0.87	> 0.9	> 0.9	
NCNB-SP-V-70	GUALALA 60 kV	Ukiah-Hopland-Cloverdale 115 kV (Ukiah sub 115kv to Hopland) & Fulton #1 60kV (Geyserville sub 60 kV to Geyserville Jct 6	C3	L-1-1	> 0.9	> 0.9	0.89	Install reactive support in 2022 at Annapolis / Gaulala
NCNB-SP-V-71	EGLERCK 60 kV	Ukiah-Hopland-Cloverdale 115 kV (Ukiah sub 115kv to Hopland) & EAGLE ROCK 115/60 KV BANK NO.1	C3	L-1-1	0.88	> 0.9	> 0.9	open Eagle Rock-Konocti 60 kV line for Eagle Rock bank outage
NCNB-SP-V-72	COVELO6 60 kV	Eagle Rock-Redbud & Cortina-Mendocino No.1 115kV	C5	L-2	> 0.9	> 0.9	0.89	Install addition reactive support in Mendocino area
NCNB-SP-V-73	LYTNVLE 60 kV		C5	L-2	> 0.9	> 0.9	0.90	
NCNB-SP-V-74	ALTO 60 kV	Ignacio-Alto-Sausalito #2 & #1 60kV Lines	C5	L-2	0.85	> 0.9	> 0.9	Ignacio - Alto voltage conversion project
NCNB-SP-V-75	GREENBRE 60 kV		C5	L-2	0.87	> 0.9	> 0.9	



2013/2014 ISO Reliability Assessment - Study Results

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



**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Winter Peak	2023 Summer Peak	
NCNB-SP-V-76	SAN RFLJ 60 kV		C5	L-2	0.90	> 0.9	> 0.9	
NCNB-SP-V-77	GUALALA 60 kV	Tulucay-Vaca & Vaca-Lakeville 230kV Lines	C5	L-2	> 0.9	> 0.9	0.89	Install reactive support in 2022 at Annapolis / Gaulala

2013/2014 ISO Reliability Assessment - Study Results

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



**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2015 Winter Peak	2018 Winter Peak	2023 Winter Peak	
NCNB-WP-V-1	MIDDLTWN 60	Bus Fault at EGLE RCK 115.00	C1	Bus	0.89	> 0.9	> 0.9	Middletown 115kV project
NCNB-WP-V-2	ELK 60	Mendocino 60 kV CB42 stuck	C2	Breaker	Not Solved	Not Solved	Not Solved	Install additional reactive support near Mendocino area.
NCNB-WP-V-3	PHILO 60		C2	Breaker	Not Solved	Not Solved	Not Solved	
NCNB-WP-V-4	GARCIA 60		C2	Breaker	Not Solved	Not Solved	Not Solved	
NCNB-WP-V-5	COVELO6 60		C2	Breaker	Not Solved	Not Solved	Not Solved	
NCNB-WP-V-6	WILLITS 60		C2	Breaker	Not Solved	Not Solved	Not Solved	
NCNB-WP-V-7	BIG RIVR 60		C2	Breaker	Not Solved	Not Solved	Not Solved	
NCNB-WP-V-8	FRT BRGG 60		C2	Breaker	Not Solved	Not Solved	Not Solved	
NCNB-WP-V-9	FRT SWRD 60		C2	Breaker	Not Solved	Not Solved	Not Solved	
NCNB-WP-V-10	FRUITLND 60		C2	Breaker	Not Solved	Not Solved	Not Solved	
NCNB-WP-V-11	GRBRVLE 60		C2	Breaker	Not Solved	Not Solved	Not Solved	
NCNB-WP-V-12	KEKAWAKA 60		C2	Breaker	Not Solved	Not Solved	Not Solved	
NCNB-WP-V-13	LYTNVLE 60		C2	Breaker	Not Solved	Not Solved	Not Solved	
NCNB-WP-V-14	PNT ARNA 60		C2	Breaker	Not Solved	Not Solved	Not Solved	
NCNB-WP-V-15	PTTR VLY 60		C2	Breaker	Not Solved	Not Solved	Not Solved	

2013/2014 ISO Reliability Assessment - Study Results

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



**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2015 Winter Peak	2018 Winter Peak	2023 Winter Peak	
NCNB-WP-V-16	KONOCI6 60	Ukiah-Hopland-Cloverdale 115 kV (Ukiah sub 115kv to Hopland) & Konocti - Eagle Rock 60kV	C3	L-1-1	0.87	> 0.9	> 0.9	Middletown 115kV project
NCNB-WP-V-17	LOWR LKE 60		C3	L-1-1	0.86	> 0.9	> 0.9	
NCNB-WP-V-18	MIDDLTWN 60		C3	L-1-1	0.85	> 0.9	> 0.9	
NCNB-WP-V-19	ALTO 60	Ignacio-Alto-Sausalito #2 & #1 60kV Lines	C5	L-2	0.78	> 0.9	> 0.9	Ignacio - Alto voltage conversion project
NCNB-WP-V-20	GREENBRE 60		C5	L-2	0.81	> 0.9	> 0.9	
NCNB-WP-V-21	SAN RFLJ 60		C5	L-2	0.85	> 0.9	> 0.9	

2013/2014 ISO Reliability Assessment - Study Results

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



**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2015 Summer Off-Peak	2018 Summer Light Load	N/A	

No violations reported



**Transient Stability**

ID	Contingency	Category	Category Description	Transient Stability Performance			Potential Mitigation Solutions
				2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	

No violations reported.



**Transient Stability**

ID	Contingency	Category	Category Description	Transient Stability Performance			Potential Mitigation Solutions
				2015 Winter Peak	2018 Winter Peak	2023 Winter Peak	

No violations reported.



**Transient Stability**

ID	Contingency	Category	Category Description	Transient Stability Performance			Potential Mitigation Solutions
				2015 Summer Off-Peak	2018 Summer Light Load	N/A	

No violations reported.

2013/2014 ISO Reliability Assessment - Study Results

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



**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.



2013/2014 ISO Reliability Assessment - Study Results

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



**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.

2013/2014 ISO Reliability Assessment - Study Results

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



**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.

2013/2014 ISO Reliability Assessment - Study Results

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



**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

2013/2014 ISO Reliability Assessment - Study Results

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

**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

2013/2014 ISO Reliability Assessment - Study Results

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



**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-4**  
**PG&E North Valley**  
**Reliability Assessment Study Results**

2013/2014 ISO Reliability Assessment - Study Results

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



**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
NV-SP-T-1	Palermo-Wyandotte 115 kV Line	Normal	A	Normal	<100	<100	108	Reconductor the tap.
NV-SP-T-2	Cottonwood-Red Bluff 60 kV Line	NewBus 230/60 kV Transformer	B	T-1	NA	<100	101	Dispatch local generator
NV-SP-T-3	Cottonwood-Red Bluff 60 kV Line	Coleman-Red Bluff 60 kV Line	B	L-1	104	<100	<100	Interim operating solution
NV-SP-T-4	Caribou No.11 230/115/60 kV Transformer	BUS FAULT AT 31482 PALERMO 115.00	C1	Bus	105	106	106	Add bus tie breaker at Palermo 115 kV bus or new 115/60 kV transformer at Caribou
NV-SP-T-5	Table Mountain-Butte No.1 115 kV Line	BUS FAULT AT 31504 TBLE MTN Bus 2 115.00	C1	Bus	112	<100	<100	Interim operating solution
NV-SP-T-6	Sycamore Creek-Notre Dame-Table Mountain 115 kV Line	BUS FAULT AT 31504 TBLE MTN Bus 1 115.00	C1	Bus	146	<100	<100	Interim operating solution
NV-SP-T-7	Table Mountain-Paradise 115 kV Line	BUS FAULT AT 31504 TBLE MTN Bus 1 115.00	C1	Bus	111	<100	<100	Interim operating solution
NV-SP-T-8	Cottonwood-Red Bluff 60 kV Line	BUS FAULT AT 30107 NewBus 230.00	C1	Bus	NA	<100	102	Dispatch local generator
NV-SP-T-9	Table Mountain-Butte No.1 115 kV Line	TBLE MTN BUS Section F PARALLEL BKR STUCK 115KV	C2	Stuck Bkr	NA	155	156	Upgrade Table Mtn. 115 kV bus
NV-SP-T-10	Sycamore Creek-Notre Dame-Table Mountain 115 kV Line	TBLE MTN BUS 1 PARALLEL BKR STUCK 115KV	C2	Stuck Bkr	NA	150	152	Upgrade Table Mtn. 115 kV bus
NV-SP-T-11	Table Mountain-Paradise 115 kV Line	TBLE MTN BUS 1 PARALLEL BKR STUCK 115KV	C2	Stuck Bkr	NA	115	118	Upgrade Table Mtn. 115 kV bus
NV-SP-T-12	Round Mountain-Cottonwood(E) No.2 230 kV Line	Round Mountain No.1 500/230 kV Transformer & Cottonwood-Round Mountain 230 kV Line	C3	N-1-1	<100	101	101	Congestion Management
NV-SP-T-13	Round Mountain-Cottonwood(E) No.3 230 kV Line	Round Mountain-Cottonwood(E) No.2 230 kV Line & Round Mountain No.1 500/230 kV Transformer	C3	N-1-1	109	113	113	Congestion Management
NV-SP-T-14	Table Mountain-Butte No.1 115 kV Line	Sycamore Creek-Notre Dame-Table Mountain 115 kV Line & Table Mountain-Butte No.2 115 kV Line	C3	N-1-1	134	<100	<100	Interim operating solution
NV-SP-T-15	Table Mountain-Butte No.2 115 kV Line	Sycamore Creek-Notre Dame-Table Mountain 115 kV Line & Table Mountain-Butte No.1 115 kV Line	C3	N-1-1	133	<100	<100	Interim operating solution
NV-SP-T-16	Sycamore Creek-Notre Dame-Table Mountain 115 kV Line	Table Mountain-Butte No.1 115 kV Line & Table Mountain-Butte No.2 115 kV Line	C3	N-1-1	130	<100	<100	Interim operating solution

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
NV-SP-T-17	Coleman-Red Bluff 60 kV Line	NewBus 230/60 kV Transformer & Cottonwood-Red Bluff 60 kV Line	C3	N-1-1	NA	107	119	Dispatch local generator
NV-SP-T-18	Cottonwood-Red Bluff 60 kV Line	Cascade-Benton-Deschutes 60 kV Line & Coleman-Cottonwood 60 kV Line	C3	N-1-1	127	<100	<100	Interim operating solution
NV-SP-T-19	Cottonwood-Red Bluff 60 kV Line	Cottonwood No.1 60 kV Line & NewBus 230/60 kV Transformer	C3	N-1-1	NA	107	120	Dispatch local generator
NV-SP-T-20	Table Mountain-Butte No.1 115 kV Line	Sycamore Creek-Notre Dame-Table Mountain and Table Mount	C5	DCTL	153	<100	<100	Interim operating solution



2013/2014 ISO Reliability Assessment - Study Results

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



**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
NV-SP-VD-1	VINA 60 kV	NewBus 230/60 kV Transformer	B	T-1	NA	<5.0	5.2	Dispatch local generator
NV-SP-VD-2	VINA 60 kV	Cottonwood-Red Bluff 60 kV Line	B	L-1	10.4	<5.0	<5.0	Interim operating solution
NV-SP-VD-3	TYLER 60 kV	NewBus-Tyler 60 kV Line	B	L-1	NA	11.4	12.6	Dispatch local generator
NV-SP-VD-4	ANTLER 60 kV	Cascade No.1 115/60/13.8 kV Transformer	B	T-1	5.7	<5.0	<5.0	Interim operating solution
NV-SP-VD-5	GERBER 60 kV	NewBus 230/60 kV Transformer	B	T-1	NA	6.8	7.3	Dispatch local generator
NV-SP-VD-6	CR CANAL 60 kV	NewBus-Tyler 60 kV Line	B	L-1	NA	11.3	12.6	Dispatch local generator
NV-SP-VD-7	DIRYVLE 60 kV	NewBus 230/60 kV Transformer	B	T-1	NA	<5.0	5.1	Dispatch local generator
NV-SP-VD-8	DIRYVLE 60 kV	Cottonwood-Red Bluff 60 kV Line	B	L-1	10.2	<5.0	<5.0	Interim operating solution
NV-SP-VD-9	LP FB SP 60 kV	NewBus 230/60 kV Transformer	B	T-1	NA	6.7	7.2	Dispatch local generator
NV-SP-VD-10	LS MLNSJ 60 kV	NewBus 230/60 kV Transformer	B	T-1	NA	<5.0	5.2	Dispatch local generator
NV-SP-VD-11	LS MLNSJ 60 kV	Cottonwood-Red Bluff 60 kV Line	B	L-1	10.3	<5.0	<5.0	Interim operating solution
NV-SP-VD-12	MTN GATE 60 kV	Cascade No.1 115/60/13.8 kV Transformer	B	T-1	5.7	<5.0	<5.0	Interim operating solution
NV-SP-VD-13	RASN JNT 60 kV	NewBus-Tyler 60 kV Line	B	L-1	NA	11.1	12.3	Dispatch local generator
NV-SP-VD-14	RED BLFF 60 kV	NewBus 230/60 kV Transformer	B	T-1	NA	6.7	7.2	Dispatch local generator
NV-SP-VD-15	RED BLFF 60 kV	Cottonwood-Red Bluff 60 kV Line	B	L-1	14.0	<5.0	<5.0	Interim operating solution
NV-SP-VD-16	STLLWATR 60 kV	Cascade No.1 115/60/13.8 kV Transformer	B	T-1	5.4	<5.0	<5.0	Interim operating solution
NV-SP-VD-17	SYCAMORE 115 kV	Sycamore Creek-Notre Dame-Table Mountain 115 kV Line	B	L-1	5.2	<5.0	<5.0	Interim operating solution
NV-SP-VD-18	VINA 60 kV	BUS FAULT AT 31604 COTTONWD 60.00	C1	Bus	Diverge	<10.0	<10.0	Interim operating solution
NV-SP-VD-19	TYLER 60 kV	BUS FAULT AT 31597 NewBus 60.00	C1	Bus	NA	12.1	12.4	Dispatch local generator
NV-SP-VD-20	VOLTA 60 kV	BUS FAULT AT 31604 COTTONWD 60.00	C1	Bus	Diverge	<10.0	<10.0	Interim operating solution
NV-SP-VD-21	GIRVAN 60 kV	BUS FAULT AT 31604 COTTONWD 60.00	C1	Bus	Diverge	<10.0	<10.0	Interim operating solution
NV-SP-VD-22	CHICO B 115 kV	BUS FAULT AT 31504 TBLE MTN Bus 1 115.00	C1	Bus	10.7	<10.0	<10.0	Interim operating solution

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
NV-SP-VD-23	ANDERSON 60 kV	BUS FAULT AT 31604 COTTONWD 60.00	C1	Bus	Diverge	<10.0	<10.0	Interim operating solution
NV-SP-VD-24	CLMN FSH 60 kV	BUS FAULT AT 31604 COTTONWD 60.00	C1	Bus	Diverge	<10.0	<10.0	Interim operating solution
NV-SP-VD-25	CR CANAL 60 kV	BUS FAULT AT 31597 NewBus 60.00	C1	Bus	NA	12.1	12.3	Dispatch local generator
NV-SP-VD-26	DESCHUTS 60 kV	BUS FAULT AT 31604 COTTONWD 60.00	C1	Bus	Diverge	<10.0	<10.0	Interim operating solution
NV-SP-VD-27	DIRYVLE 60 kV	BUS FAULT AT 31604 COTTONWD 60.00	C1	Bus	Diverge	<10.0	<10.0	Interim operating solution
NV-SP-VD-28	LS MLNSJ 60 kV	BUS FAULT AT 31604 COTTONWD 60.00	C1	Bus	Diverge	<10.0	<10.0	Interim operating solution
NV-SP-VD-29	RASN JNT 60 kV	BUS FAULT AT 31597 NewBus 60.00	C1	Bus	NA	11.8	12.1	Dispatch local generator
NV-SP-VD-30	RED BLFF 60 kV	BUS FAULT AT 31604 COTTONWD 60.00	C1	Bus	Diverge	<10.0	<10.0	Interim operating solution
NV-SP-VD-31	WNTU PMS 60 kV	BUS FAULT AT 31604 COTTONWD 60.00	C1	Bus	Diverge	<10.0	<10.0	Interim operating solution
NV-SP-VD-32	CHICO B 115 kV	TBLE MTN BUS 1 PARALLEL BKR STUCK 115KV	C2	Stuck Bkr	<10.0	11.4	11.3	Upgrade Table Mtn. 115 kV bus

2013/2014 ISO Reliability Assessment - Study Results

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



High/Low Voltage

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
NV-SP-V-1	TYLER 60 kV	Base Case	A	Normal	0.92	>0.95	>0.95	Dispatch local generator
NV-SP-V-2	RASN JNT 60 kV	Base Case	A	Normal	0.92	>0.95	>0.95	Dispatch local generator
NV-SP-V-3	VINA 60 kV	Cottonwood-Red Bluff 60 kV Line	B	L-1	0.85	>0.9	>0.9	Interim operating solution
NV-SP-V-4	TYLER 60 kV	NewBus-Tyler 60 kV Line	B	L-1	NA	0.91	0.89	Dispatch local generator
NV-SP-V-5	CR CANAL 60 kV	NewBus-Tyler 60 kV Line	B	L-1	NA	0.91	0.89	Dispatch local generator
NV-SP-V-6	DIRYVLE 60 kV	Cottonwood-Red Bluff 60 kV Line	B	L-1	0.87	>0.9	>0.9	Interim operating solution
NV-SP-V-7	LS MLNSJ 60 kV	Cottonwood-Red Bluff 60 kV Line	B	L-1	0.85	>0.9	>0.9	Interim operating solution
NV-SP-V-8	RED BLFF 60 kV	Cottonwood-Red Bluff 60 kV Line	B	L-1	0.84	>0.9	>0.9	Interim operating solution
NV-SP-V-9	VINA 60 kV	BUS FAULT AT 31604 COTTONWD 60.00	C1	Bus	Diverge	>0.9	>0.9	Interim operating solution
NV-SP-V-10	VOLTA 60 kV	BUS FAULT AT 31604 COTTONWD 60.00	C1	Bus	Diverge	>0.9	>0.9	Interim operating solution
NV-SP-V-11	GIRVAN 60 kV	BUS FAULT AT 31604 COTTONWD 60.00	C1	Bus	Diverge	>0.9	>0.9	Interim operating solution
NV-SP-V-12	ANDERSON 60 kV	BUS FAULT AT 31604 COTTONWD 60.00	C1	Bus	Diverge	>0.9	>0.9	Interim operating solution
NV-SP-V-13	CLMN FSH 60 kV	BUS FAULT AT 31604 COTTONWD 60.00	C1	Bus	Diverge	>0.9	>0.9	Interim operating solution
NV-SP-V-14	DESCHUTS 60 kV	BUS FAULT AT 31604 COTTONWD 60.00	C1	Bus	Diverge	>0.9	>0.9	Interim operating solution
NV-SP-V-15	DIRYVLE 60 kV	BUS FAULT AT 31604 COTTONWD 60.00	C1	Bus	Diverge	>0.9	>0.9	Interim operating solution
NV-SP-V-16	LS MLNSJ 60 kV	BUS FAULT AT 31604 COTTONWD 60.00	C1	Bus	Diverge	>0.9	>0.9	Interim operating solution
NV-SP-V-17	RED BLFF 60 kV	BUS FAULT AT 31604 COTTONWD 60.00	C1	Bus	Diverge	>0.9	>0.9	Interim operating solution
NV-SP-V-18	VINA 60 kV	Cottonwood-Red Bluff 60 kV Line & Coleman-Cottonwood 60 kV Line	C3	N-1-1	0.68	>0.9	>0.9	Interim operating solution
NV-SP-V-19	ANTLER 60 kV	Cascade-Benton-Deschutes 60 kV Line & Cascade No.1 115/60/13.8 kV Transformer	C3	N-1-1	0.70	>0.9	>0.9	Interim operating solution
NV-SP-V-20	GERBER 60 kV	Cottonwood-Red Bluff 60 kV Line & NewBus 230/60 kV Transformer	C3	N-1-1	NA	>0.9	0.88	Dispatch local generator
NV-SP-V-21	CHESTER 60 kV	CRBOU2-3 11.50 Unit ID 1 & Caribou-Table Mountain 230 kV Line	C3	N-1-1	0.85	0.85	0.80	Dispatch local generator
NV-SP-V-22	GANSNER 60 kV	CRBOU2-3 11.50 Unit ID 2 & Caribou-Table Mountain 230 kV Line	C3	N-1-1	0.88	0.88	0.85	Dispatch local generator

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
NV-SP-V-23	KESWICK 60 kV	Cascade-Benton-Deschutes 60 kV Line & Cascade No.1 115/60/13.8 kV Transformer	C3	N-1-1	0.77	>0.9	>0.9	Interim operating solution
NV-SP-V-24	BIG MDWS 60 kV	CRBOU2-3 11.50 Unit ID 1 & Caribou-Table Mountain 230 kV Line	C3	N-1-1	0.88	0.87	0.83	Dispatch local generator
NV-SP-V-25	CLARK RD 60 kV	Table Mountain No.2 230/115/60 kV Transformer & DE SABLA Unit ID 1	C3	N-1-1	0.86	0.88	0.86	Table Mtn. 60 kV voltage support
NV-SP-V-26	CNTRVLE 60 kV	Table Mountain No.2 230/115/60 kV Transformer & DE SABLA Unit ID 1	C3	N-1-1	0.86	0.88	0.86	Table Mtn. 60 kV voltage support
NV-SP-V-27	DE SABLA 60 kV	Table Mountain No.2 230/115/60 kV Transformer & DE SABLA Unit ID 1	C3	N-1-1	0.85	0.88	0.85	Table Mtn. 60 kV voltage support
NV-SP-V-28	DIRYVLE 60 kV	Delevan 230 kV Tie Line & Cottonwood-Red Bluff 60 kV Line	C3	N-1-1	0.86	>0.9	>0.9	Interim operating solution
NV-SP-V-29	EST QNCY 60 kV	CRBOU2-3 11.50 Unit ID 1 & Caribou-Table Mountain 230 kV Line	C3	N-1-1	0.89	0.89	0.84	Dispatch local generator
NV-SP-V-30	FRNCHGLH 60 kV	Cascade-Benton-Deschutes 60 kV Line & Cascade No.1 115/60/13.8 kV Transformer	C3	N-1-1	0.86	>0.9	>0.9	Interim operating solution
NV-SP-V-31	GRYS FLT 60 kV	CRBOU2-3 11.50 Unit ID 1 & Caribou-Table Mountain 230 kV Line	C3	N-1-1	0.88	0.87	0.83	Dispatch local generator
NV-SP-V-32	HMLTN BR 60 kV	CRBOU2-3 11.50 Unit ID 1 & Caribou-Table Mountain 230 kV Line	C3	N-1-1	0.88	0.87	0.82	Dispatch local generator
NV-SP-V-33	LS MLNSJ 60 kV	Cottonwood(E)-Logan Creek 230 kV Line & Cottonwood-Red Bluff 60 kV Line	C3	N-1-1	0.85	>0.9	>0.9	Interim operating solution
NV-SP-V-34	LS MLNSJ 60 kV	Cottonwood-Red Bluff 60 kV Line & NewBus 230/60 kV Transformer	C3	N-1-1	NA	>0.9	0.89	Dispatch local generator
NV-SP-V-35	MTN GATE 60 kV	Cascade-Benton-Deschutes 60 kV Line & Cascade No.1 115/60/13.8 kV Transformer	C3	N-1-1	0.70	>0.9	>0.9	Interim operating solution
NV-SP-V-36	PEACHTON 60 kV	Table Mountain No.2 230/115/60 kV Transformer & DE SABLA Unit ID 1	C3	N-1-1	0.89	>0.9	>0.9	Table Mtn. 60 kV voltage support
NV-SP-V-37	RED BLFF 60 kV	Coleman-Cottonwood 60 kV Line & Cottonwood-Red Bluff 60 kV Line	C3	N-1-1	0.68	>0.9	>0.9	Interim operating solution
NV-SP-V-38	SPANSHCK 60 kV	CRBU 1 11.50 Unit ID 1 & Caribou No.11 230/115/60 kV Transformer	C3	N-1-1	0.81	0.78	0.87	Dispatch local generator or new 115/60 kV transformer at Caribou.
NV-SP-V-39	STLLWATR 60 kV	Cascade-Benton-Deschutes 60 kV Line & Cascade No.1 115/60/13.8 kV Transformer	C3	N-1-1	0.73	>0.9	>0.9	Interim operating solution
NV-SP-V-40	TRES VIS 60 kV	Table Mountain No.2 230/115/60 kV Transformer & DE SABLA Unit ID 1	C3	N-1-1	0.87	0.90	0.88	Table Mtn. 60 kV voltage support

2013/2014 ISO Reliability Assessment - Study Results

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



**Transient Stability**

ID	Contingency	Category	Category Description	Transient Stability Performance			Potential Mitigation Solutions
				2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
NV-SP-TS-1	Cottonwood 230 kV Bus SLG fault with delayed clearing	C9	Bus SLG with delayed clearing	25 60 kV buses with voltage dip issues	No issue	No issue	SPS



**Single Contingency Load Drop**

ID	Worst Contingency	Category	Category Description	Amount of Load Drop (MW)			Potential Mitigation Solutions
				2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	

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

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



*Single Source Substation with more than 100 MW Load*

ID	Substation	Load Served (MW)			Potential Mitigation Solutions
		2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	

No single source substation with more than 100 MW Load

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Summer Off-Peak	2018 Summer Light Load	N/A	
NV-NP-T-1	Trinity-Keswick 60 kV Line	COTTONWOOD BUS PARALLEL BKR STUCK 115KV	C2	Stuck Bkr	104	<100		Redispatch Humboldt generation
NV-NP-T-2	Keswick-Cascade 60 kV Line	COTTONWOOD BUS PARALLEL BKR STUCK 115KV	C2	Stuck Bkr	126	<100		Redispatch Humboldt generation
NV-NP-T-3	Keswick-Cascade 60 kV Line	Bridgeville-Cottonwood 115 kV Line & Trinity-Cottonwood 115 kV Line	C3	N-1-1	117	<100		Redispatch Humboldt generation



**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2015 Summer Off-Peak	2018 Summer Light Load	N/A	
NV-NP-VD-1	TYLER 60 kV	NewBus-Tyler 60 kV Line	B	L-1	NA	5.6		Dispatch local generator
NV-NP-VD-2	GERBER 60 kV	NewBus 230/60 kV Transformer	B	T-1	NA	5.2		Dispatch local generator
NV-NP-VD-3	CR CANAL 60 kV	NewBus-Tyler 60 kV Line	B	L-1	NA	5.6		Dispatch local generator
NV-NP-VD-4	EST QNCY 60 kV	Caribou No.11 230/115/60 kV Transformer	B	T-1	7.5	10.3		Dispatch local generator or new 115/60 kV transformer at Caribou
NV-NP-VD-5	LP FB SP 60 kV	NewBus 230/60 kV Transformer	B	T-1	NA	5.2		Dispatch local generator
NV-NP-VD-6	RASN JNT 60 kV	NewBus-Tyler 60 kV Line	B	L-1	NA	5.4		Dispatch local generator
NV-NP-VD-7	RED BLFF 60 kV	NewBus 230/60 kV Transformer	B	T-1	NA	5.3		Dispatch local generator
NV-NP-VD-8	EST QNCY 60 kV	Table Mountain 230 kV Bus Section 1D	C1	Bus	13.2	12.8		Dispatch local generator
NV-NP-VD-9	EST QNCY 60 kV	TABLE MOUNTAIN CB 202 BUS PARALLEL STUCK	C2	Stuck Bkr	16.3	16.0		Dispatch local generator
NV-NP-VD-10	PEACHTON 60 kV	Palermo-Pease 115 kV Line and Pease-Rio Oso 115 kV Line	C5	DCTL	14.6	<10.0		Dispatch local generator

2013/2014 ISO Reliability Assessment - Study Results

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



**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2015 Summer Off-Peak	2018 Summer Light Load	N/A	
NV-NP-V-1	PPL 60 kV	Normal	A	N-0	<1.05	1.06		Under review for possible exemption
NV-NP-V-2	OWID 115 kV	Normal	A	N-0	1.05	1.06		Under review for possible exemption
NV-NP-V-3	VINA 60 kV	Normal	A	N-0	<1.05	1.06		Under review for possible exemption
NV-NP-V-4	BLACK 230 kV	Normal	A	N-0	<1.05	1.06		Under review for possible exemption
NV-NP-V-5	GLENN 230 kV	Normal	A	N-0	1.05	1.06		Under review for possible exemption
NV-NP-V-6	PIT 4 230 kV	Normal	A	N-0	<1.05	1.06		Under review for possible exemption
NV-NP-V-7	PIT 6 230 kV	Normal	A	N-0	<1.05	1.06		Under review for possible exemption
NV-NP-V-8	PIT 7 230 kV	Normal	A	N-0	<1.05	1.06		Under review for possible exemption
NV-NP-V-9	TYLER 60 kV	Normal	A	N-0	<1.05	1.07		Under review for possible exemption
NV-NP-V-10	ANTLER 60 kV	Normal	A	N-0	<1.05	1.06		Under review for possible exemption
NV-NP-V-11	BENTON 60 kV	Normal	A	N-0	<1.05	1.06		Under review for possible exemption
NV-NP-V-12	DELEVN 230 kV	Normal	A	N-0	1.06	1.07		Under review for possible exemption
NV-NP-V-13	GERBER 60 kV	Normal	A	N-0	<1.05	1.07		Under review for possible exemption
NV-NP-V-14	HONCUT 115 kV	Normal	A	N-0	1.05	1.06		Under review for possible exemption
NV-NP-V-15	HRIDGE 230 kV	Normal	A	N-0	<1.05	1.06		Under review for possible exemption
NV-NP-V-16	JESSUP 115 kV	Normal	A	N-0	1.06	1.08		Under review for possible exemption
NV-NP-V-17	KILARC 60 kV	Normal	A	N-0	<1.05	1.08		Under review for possible exemption
NV-NP-V-18	NewBus 60 kV	Normal	A	N-0	<1.05	1.07		Under review for possible exemption
NV-NP-V-19	0105-WD 115 kV	Normal	A	N-0	<1.05	1.08		Under review for possible exemption
NV-NP-V-20	BIG BAR 60 kV	Normal	A	N-0	1.06	1.07		Under review for possible exemption
NV-NP-V-21	CARBERRY 230 kV	Normal	A	N-0	<1.05	1.06		Under review for possible exemption
NV-NP-V-22	CASCADE 60 kV	Normal	A	N-0	1.05	1.06		Under review for possible exemption
NV-NP-V-23	CASCADE 115 kV	Normal	A	N-0	1.05	1.07		Under review for possible exemption
NV-NP-V-24	HYAMPOM 60 kV	Normal	A	N-0	1.05	1.07		Under review for possible exemption
NV-NP-V-25	KESWICK 60 kV	Normal	A	N-0	1.05	1.07		Under review for possible exemption
NV-NP-V-26	PALERMO 60 kV	Normal	A	N-0	<1.05	1.06		Under review for possible exemption
NV-NP-V-27	PALERMO 115 kV	Normal	A	N-0	1.06	1.07		Under review for possible exemption
NV-NP-V-28	PANRAMA 115 kV	Normal	A	N-0	1.07	1.09		Under review for possible exemption
NV-NP-V-29	SPI_AND 115 kV	Normal	A	N-0	1.06	1.08		Under review for possible exemption
NV-NP-V-30	TRINITY 60 kV	Normal	A	N-0	1.07	1.08		Under review for possible exemption

2013/2014 ISO Reliability Assessment - Study Results

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



High/Low Voltage

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2015 Summer Off-Peak	2018 Summer Light Load	N/A	
NV-NP-V-31	TRINITY 115 kV	Normal	A	N-0	1.07	1.08		Under review for possible exemption
NV-NP-V-32	WHEELBR 115 kV	Normal	A	N-0	1.07	1.09		Under review for possible exemption
NV-NP-V-33	APT ORVC 60 kV	Normal	A	N-0	<1.05	1.06		Under review for possible exemption
NV-NP-V-34	CEDR CRK 60 kV	Normal	A	N-0	<1.05	1.08		Under review for possible exemption
NV-NP-V-35	CHALLNGE 60 kV	Normal	A	N-0	<1.05	1.06		Under review for possible exemption
NV-NP-V-36	COTWDPGE 115 kV	Normal	A	N-0	1.07	1.09		Under review for possible exemption
NV-NP-V-37	COVE_RD. 230 kV	Normal	A	N-0	<1.05	1.06		Under review for possible exemption
NV-NP-V-38	COVERDTP 230 kV	Normal	A	N-0	<1.05	1.06		Under review for possible exemption
NV-NP-V-39	COWCK TP 60 kV	Normal	A	N-0	<1.05	1.08		Under review for possible exemption
NV-NP-V-40	CR CANAL 60 kV	Normal	A	N-0	<1.05	1.07		Under review for possible exemption
NV-NP-V-41	DELEVNB1 230 kV	Normal	A	N-0	1.06	1.07		Under review for possible exemption
NV-NP-V-42	DESCHUTS 60 kV	Normal	A	N-0	<1.05	1.06		Under review for possible exemption
NV-NP-V-43	DIRYVLE 60 kV	Normal	A	N-0	<1.05	1.06		Under review for possible exemption
NV-NP-V-44	FRBSTNTP 115 kV	Normal	A	N-0	1.05	1.06		Under review for possible exemption
NV-NP-V-45	FRNCHGLH 60 kV	Normal	A	N-0	1.06	1.07		Under review for possible exemption
NV-NP-V-46	FRSTGLEN 115 kV	Normal	A	N-0	1.06	1.07		Under review for possible exemption
NV-NP-V-47	GROUSCRK 60 kV	Normal	A	N-0	1.05	1.07		Under review for possible exemption
NV-NP-V-48	HATLOSCK 60 kV	Normal	A	N-0	1.06	1.07		Under review for possible exemption
NV-NP-V-49	HT CRKRG 60 kV	Normal	A	N-0	1.06	1.07		Under review for possible exemption
NV-NP-V-50	KLLY RDE 60 kV	Normal	A	N-0	<1.05	1.06		Under review for possible exemption
NV-NP-V-51	LOGAN CR 230 kV	Normal	A	N-0	1.06	1.07		Under review for possible exemption
NV-NP-V-52	LP FB SP 60 kV	Normal	A	N-0	<1.05	1.07		Under review for possible exemption
NV-NP-V-53	LS MLNSJ 60 kV	Normal	A	N-0	<1.05	1.06		Under review for possible exemption
NV-NP-V-54	LSNA PCC 60 kV	Normal	A	N-0	<1.05	1.06		Under review for possible exemption
NV-NP-V-55	MALACHA1 115 kV	Normal	A	N-0	1.06	1.06		Under review for possible exemption
NV-NP-V-56	MTN GATE 60 kV	Normal	A	N-0	<1.05	1.06		Under review for possible exemption
NV-NP-V-57	NEO REDT 60 kV	Normal	A	N-0	<1.05	1.07		Under review for possible exemption
NV-NP-V-58	OLSEN JT 60 kV	Normal	A	N-0	<1.05	1.08		Under review for possible exemption
NV-NP-V-59	OREGNTRL 60 kV	Normal	A	N-0	<1.05	1.06		Under review for possible exemption
NV-NP-V-60	OREGNTRL 115 kV	Normal	A	N-0	1.05	1.07		Under review for possible exemption

2013/2014 ISO Reliability Assessment - Study Results

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



High/Low Voltage

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2015 Summer Off-Peak	2018 Summer Light Load	N/A	
NV-NP-V-61	OROENEGY 60 kV	Normal	A	N-0	<1.05	1.06		Under review for possible exemption
NV-NP-V-62	OROVILLE 60 kV	Normal	A	N-0	<1.05	1.06		Under review for possible exemption
NV-NP-V-63	PIT 4 JT 230 kV	Normal	A	N-0	<1.05	1.06		Under review for possible exemption
NV-NP-V-64	PIT 5 JT 230 kV	Normal	A	N-0	<1.05	1.06		Under review for possible exemption
NV-NP-V-65	PIT 6 JT 230 kV	Normal	A	N-0	<1.05	1.06		Under review for possible exemption
NV-NP-V-66	PIT 7 JT 230 kV	Normal	A	N-0	<1.05	1.06		Under review for possible exemption
NV-NP-V-67	PIT 7JT2 230 kV	Normal	A	N-0	<1.05	1.06		Under review for possible exemption
NV-NP-V-68	RASN JNT 60 kV	Normal	A	N-0	<1.05	1.07		Under review for possible exemption
NV-NP-V-69	RED B JT 60 kV	Normal	A	N-0	<1.05	1.07		Under review for possible exemption
NV-NP-V-70	RED BLFF 60 kV	Normal	A	N-0	<1.05	1.07		Under review for possible exemption
NV-NP-V-71	ROUND MT 230 kV	Normal	A	N-0	<1.05	1.06		Under review for possible exemption
NV-NP-V-72	SLYCREEK 115 kV	Normal	A	N-0	1.05	1.06		Under review for possible exemption
NV-NP-V-73	SMPSPN-AN 115 kV	Normal	A	N-0	1.07	1.09		Under review for possible exemption
NV-NP-V-74	STLLWATR 60 kV	Normal	A	N-0	1.05	1.06		Under review for possible exemption
NV-NP-V-75	WHITMORE 60 kV	Normal	A	N-0	<1.05	1.08		Under review for possible exemption
NV-NP-V-76	WILDWOOD 115 kV	Normal	A	N-0	1.07	1.07		Under review for possible exemption
NV-NP-V-77	WNTU PMS 60 kV	Normal	A	N-0	<1.05	1.06		Under review for possible exemption
NV-NP-V-78	WODLF TP 115 kV	Normal	A	N-0	1.05	1.06		Under review for possible exemption
NV-NP-V-79	WYANDTTE 115 kV	Normal	A	N-0	1.05	1.06		Under review for possible exemption
NV-NP-V-80	GANSNER 60 kV	CRBU 4-5 13.80 Unit ID 1 & Caribou-Table Mountain 230 kV Line	B	G-1/L-1	0.89	>0.9		Dispatch local generator
NV-NP-V-81	SPANSHCK 60 kV	CRBU 4-5 13.80 Unit ID 1 & Caribou-Table Mountain 230 kV Line	B	G-1/L-1	0.89	>0.9		Dispatch local generator
NV-NP-V-82	EST QNCY 60 kV	Table Mountain 230 kV Bus Section 1D	C1	Bus	0.88	0.89		Dispatch local generator
NV-NP-V-83	EST QNCY 60 kV	TABLE MOUNTAIN CB 202 BUS PARALLEL STUCK	C2	Stuck Bkr	0.84	0.86		Dispatch local generator
NV-NP-V-84	EST QNCY 60 kV	Caribou No.2 60 kV Line & Caribou No.11 230/115/60 kV Transformer	C3	N-1-1	0.89	0.85		Dispatch local generator
NV-NP-V-85	PEACHTON 60 kV	Palermo-Pease 115 kV Line and Pease-Rio Oso 115 kV Line	C5	DCTL	0.87	>0.9		Table Mtn. 60 kV area voltage support

2013/2014 ISO Reliability Assessment - Study Results

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



**Transient Stability**

ID	Contingency	Category	Category Description	Transient Stability Performance			Potential Mitigation Solutions
				2015 Summer Off-Peak	2018 Summer Light Load	N/A	

No issues identified

**APPENDIX C-5**

**PG&E Central Valley - Sacramento**

**Reliability Assessment Study Results**

2013/2014 ISO Reliability Assessment - Study Results

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



**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
SAC-SP-T-1	Brighton - Davis 115 kV Line	West Sacramento - Brighton 115 kV Line	B	L-1	106	<100	<100	Interim operating solution
SAC-SP-T-2	Vaca Dixon 115/60 kV Transformer No. 5	Vaca Dixon 115/60 kV Transformer No. 9	B	T-1	119	<100	<100	Interim operating solution
SAC-SP-T-3	Cortina 60 kV Line No. 3	WADHAM Unit ID 1 & Cortina No. 4 60 kV Line	B	G-1/L-1	106	<100	<100	Interim operating solution
SAC-SP-T-4	Woodland - Davis 115 kV Line	BUS FAULT AT 31984 BRIGHTN 115.00	C1	Bus	188	<100	<100	Interim operating solution
SAC-SP-T-5	Rio Oso - Woodland 115 kV No. 2	BUS FAULT AT 31984 BRIGHTN 115.00	C1	Bus	112	<100	<100	Interim operating solution
SAC-SP-T-6	Rio Oso - Woodland 115 kV No. 1	BUS FAULT AT 31984 BRIGHTN 115.00	C1	Bus	110	<100	<100	Interim operating solution
SAC-SP-T-7	Rio Oso - West Sacramento 115 kV Line	BUS FAULT AT 31984 BRIGHTN 115.00	C1	Bus	158	<100	<100	Interim operating solution
SAC-SP-T-8	Vaca Dixon 230/115 kV Transformer No. 3	VACA-DIX E 230 kV Bus 2 and VACA-DIX F 230 kV Bus 2 - CB 62	C2	Stuck Bkr	<100	112	121	Operating solution
SAC-SP-T-9	Vaca Dixon 230/115 kV Transformer No. 4	VACA-DIX E 230 kV Bus 1 and Bus 2 - CB 202 Failure	C2	Stuck Bkr	<100	107	115	Operating solution
SAC-SP-T-10	Rio Oso - Brighton 230 kV Line	C2-5_RIO OSO 115 kV Bus 1 and 2 - CB 102 Failure	C2	Stuck Bkr	108	<100	<100	Interim operating solution
SAC-SP-T-11	Woodland - Davis 115 kV Line	C2-5_RIO OSO 115 kV Bus 1 and 2 - CB 102 Failure	C2	Stuck Bkr	124	<100	<100	Interim operating solution
SAC-SP-T-12	West Sacramento - Brighton 115 kV Line	C2-5_RIO OSO 115 kV Bus 1 and 2 - CB 102 Failure	C2	Stuck Bkr	113	<100	<100	Interim operating solution
SAC-SP-T-13	Brighton - Davis 115 kV Line	C2-5_RIO OSO 115 kV Bus 1 and 2 - CB 102 Failure	C2	Stuck Bkr	140	<100	<100	Interim operating solution
SAC-SP-T-14	Rio Oso - Woodland 115 kV No. 1	Brighton 230/115 kV Transformer No. 10 & Brighton 230/115 kV Transformer No. 9	C3	N-1-1	102	<100	<100	Interim operating solution
SAC-SP-T-15	Woodland - Davis 115 kV Line	Brighton 230/115 kV Transformer No. 10 & Brighton 230/115 kV Transformer No. 9	C3	N-1-1	179	<100	<100	Interim operating solution
SAC-SP-T-16	Rio Oso - Woodland 115 kV No. 2	Brighton 230/115 kV Transformer No. 10 & Brighton 230/115 kV Transformer No. 9	C3	N-1-1	107	<100	<100	Interim operating solution
SAC-SP-T-17	West Sacramento - Davis 115 kV Line	Woodland - Davis 115 kV Line & Brighton - Davis 115 kV Line	C3	N-1-1	112	<100	<100	Interim operating solution
SAC-SP-T-18	Brighton 230/115 kV Transformer No. 9	Woodland - Davis 115 kV Line & Brighton 230/115 kV Transformer No. 10	C3	N-1-1	108	<100	<100	Interim operating solution

2013/2014 ISO Reliability Assessment - Study Results

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



**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Summer Off-Peak	2018 Summer Light Load	N/A	

No issues identified.



2013/2014 ISO Reliability Assessment - Study Results

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



**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2015 Summer Off-Peak	2018 Summer Light Load	Select..	

No issues identified.

2013/2014 ISO Reliability Assessment - Study Results

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



High/Low Voltage

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2015 Summer Off-Peak	2018 Summer Light Load	N/A	
SAC-NP-V-1	HALE 115 kV	Normal	A	N-0	1.07	1.07		Under review for possible exemption
SAC-NP-V-2	DAVIS 115 kV	Normal	A	N-0	<1.05	1.06		Under review for possible exemption
SAC-NP-V-3	HALE2 115 kV	Normal	A	N-0	1.07	1.07		Under review for possible exemption
SAC-NP-V-4	CAMPUS 115 kV	Normal	A	N-0	<1.05	1.06		Under review for possible exemption
SAC-NP-V-5	CORT_D 115 kV	Normal	A	N-0	1.07	1.06		Under review for possible exemption
SAC-NP-V-6	SUISUN 115 kV	Normal	A	N-0	1.07	1.07		Under review for possible exemption
SAC-NP-V-7	TRAVIS 115 kV	Normal	A	N-0	<1.05	1.07		Under review for possible exemption
SAC-NP-V-8	CORTINA 115 kV	Normal	A	N-0	1.07	1.06		Under review for possible exemption
SAC-NP-V-9	CORTINA 230 kV	Normal	A	N-0	<1.05	1.06		Under review for possible exemption
SAC-NP-V-10	JAMESON 115 kV	Normal	A	N-0	1.07	1.07		Under review for possible exemption
SAC-NP-V-11	MADISON 115 kV	Normal	A	N-0	1.08	1.08		Under review for possible exemption
SAC-NP-V-12	VACA-CB 115 kV	Normal	A	N-0	1.08	<1.05		Under review for possible exemption
SAC-NP-V-13	WINTERS 60 kV	Normal	A	N-0	1.07	<1.05		Under review for possible exemption
SAC-NP-V-14	AMERIGAS 115 kV	Normal	A	N-0	1.08	1.08		Under review for possible exemption
SAC-NP-V-15	BTAV-JCT 60 kV	Normal	A	N-0	1.08	<1.05		Under review for possible exemption
SAC-NP-V-16	CORDELIA 115 kV	Normal	A	N-0	1.08	1.08		Under review for possible exemption
SAC-NP-V-17	DIXONCAN 60 kV	Normal	A	N-0	1.07	<1.05		Under review for possible exemption
SAC-NP-V-18	DIXONCAN 115 kV	Normal	A	N-0	<1.05	1.06		Under review for possible exemption
SAC-NP-V-19	DIXONPGE 60 kV	Normal	A	N-0	1.07	<1.05		Under review for possible exemption
SAC-NP-V-20	DIXONPGE 115 kV	Normal	A	N-0	<1.05	1.07		Under review for possible exemption
SAC-NP-V-21	MAINE-PR 60 kV	Normal	A	N-0	1.08	<1.05		Under review for possible exemption
SAC-NP-V-22	PUTH CRK 115 kV	Normal	A	N-0	1.08	1.08		Under review for possible exemption

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



**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2015 Summer Off-Peak	2018 Summer Light Load	N/A	
SAC-NP-V-23	SCHMLBCH 115 kV	Normal	A	N-0	1.07	1.07		Under review for possible exemption
SAC-NP-V-24	TRVS_HPT 115 kV	Normal	A	N-0	<1.05	1.07		Under review for possible exemption
SAC-NP-V-25	VACA-DIX 115 kV	Normal	A	N-0	1.08	1.08		Under review for possible exemption
SAC-NP-V-26	VACA-DXN 60 kV	Normal	A	N-0	1.08	<1.05		Under review for possible exemption
SAC-NP-V-27	VACAVLL1 115 kV	Normal	A	N-0	1.08	1.08		Under review for possible exemption
SAC-NP-V-28	VACAVLL2 115 kV	Normal	A	N-0	1.08	1.08		Under review for possible exemption

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



**Transient Stability**

ID	Contingency	Category	Category Description	Transient Stability Performance			Potential Mitigation Solutions
				2015 Summer Off-Peak	2018 Summer Light Load	N/A	

No issues identified.

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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
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
SAC-SP-T-19	Brighton - Davis 115 kV Line	West Sacramento - Brighton 115 kV Line & Woodland - Davis 115 kV Line	C3	N-1-1	161	<100	<100	Interim operating solution
SAC-SP-T-20	Vaca Dixon 230/115 kV Transformer No. 2	Vaca Dixon 230/115 kV Transformer No. 3 & Vaca Dixon 230/115 kV Transformer No. 4	C3	N-1-1	<100	111	120	Operating solution
SAC-SP-T-21	Vaca Dixon 230/115 kV Transformer No. 3	Vaca Dixon 230/115 kV Transformer No. 2 & Vaca Dixon 230/115 kV Transformer No. 4	C3	N-1-1	<100	114	123	Operating solution
SAC-SP-T-22	Vaca Dixon 230/115 kV Transformer No. 4	Vaca Dixon 230/115 kV Transformer No. 2 & Vaca Dixon 230/115 kV Transformer No. 3	C3	N-1-1	<100	114	123	Operating solution
SAC-SP-T-23	Vaca Dixon 230/115 kV Transformer No. 2	Vaca Dixon 230/115 kV Transformer No. 3 & Vaca Dixon 230/115 kV Transformer No. 4	C3	N-1-1	138	<100	<100	Interim operating solution
SAC-SP-T-24	Vaca Dixon 230/115 kV Transformer No. 2A	Vaca Dixon 230/115 kV Transformer No. 3 & Vaca Dixon 230/115 kV Transformer No. 4	C3	N-1-1	165	<100	<100	Interim operating solution
SAC-SP-T-25	Woodland - Davis 115 kV Line	Rio Oso-Woodland #1 115 kV Line & Rio Oso-Woodland #2 115	C5	DCTL	104	<100	<100	Interim operating solution
SAC-SP-T-26	Brighton - Davis 115 kV Line	Rio Oso-Woodland #1 115 kV Line & Rio Oso-Woodland #2 115	C5	DCTL	111	<100	<100	Interim operating solution

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
SAC-SP-VD-1	POST 115 kV	West Sacramento - Brighton 115 kV Line	B	L-1	7.6	<5.0	<5.0	Interim operating solution
SAC-SP-VD-2	DAVIS 115 kV	West Sacramento - Brighton 115 kV Line	B	L-1	5.2	<5.0	<5.0	Interim operating solution
SAC-SP-VD-3	CAMPUS 115 kV	West Sacramento - Brighton 115 kV Line	B	L-1	5.2	<5.0	<5.0	Interim operating solution
SAC-SP-VD-4	CORT_D 115 kV	Cortina 230/115 kV Transformer No. 4	B	T-1	<5.0	5.4	<5.0	Cortina 60 kV area voltage support
SAC-SP-VD-6	WILKINS 60 kV	Cortina 60 kV Line No. 1	B	L-1	6.2	6.9	7.5	Cortina 60 kV area voltage support
SAC-SP-VD-7	DEEPWATR 115 kV	West Sacramento - Brighton 115 kV Line	B	L-1	7.8	<5.0	<5.0	Interim operating solution
SAC-SP-VD-9	W.SCRMNO 115 kV	West Sacramento - Brighton 115 kV Line	B	L-1	7.6	<10.0	<10.0	Interim operating solution
SAC-SP-VD-10	POST 115 kV	BUS FAULT AT 31984 BRIGHTN 115.00	C1	Bus	22.9	<10.0	<10.0	Interim operating solution
SAC-SP-VD-11	WCRP 115 kV	BUS FAULT AT 31984 BRIGHTN 115.00	C1	Bus	23.4	<10.0	<10.0	Interim operating solution
SAC-SP-VD-12	DAVIS 115 kV	BUS FAULT AT 31984 BRIGHTN 115.00	C1	Bus	20.7	<10.0	<10.0	Interim operating solution
SAC-SP-VD-13	CAMPUS 115 kV	BUS FAULT AT 31984 BRIGHTN 115.00	C1	Bus	20.7	<10.0	<10.0	Interim operating solution
SAC-SP-VD-14	WOODLD 115 kV	BUS FAULT AT 31984 BRIGHTN 115.00	C1	Bus	15.4	<10.0	<10.0	Interim operating solution
SAC-SP-VD-15	ZAMORA 115 kV	BUS FAULT AT 31984 BRIGHTN 115.00	C1	Bus	12.1	<10.0	<10.0	Interim operating solution
SAC-SP-VD-16	BRKR SLG 115 kV	BUS FAULT AT 31984 BRIGHTN 115.00	C1	Bus	21.9	<10.0	<10.0	Interim operating solution
SAC-SP-VD-17	DEEPWATR 115 kV	BUS FAULT AT 31984 BRIGHTN 115.00	C1	Bus	23.5	<10.0	<10.0	Interim operating solution
SAC-SP-VD-18	KNIGHTLD 115 kV	BUS FAULT AT 31984 BRIGHTN 115.00	C1	Bus	11.7	<10.0	<10.0	Interim operating solution
SAC-SP-VD-19	W.SCRMNO 115 kV	BUS FAULT AT 31984 BRIGHTN 115.00	C1	Bus	23.2	<10.0	<10.0	Interim operating solution
SAC-SP-VD-20	WOODLD 115 kV	C2-5_RIO OSO 115 kV Bus 1 and 2 - CB 102 Failure	C2	Stuck Bkr	10.0	<10.0	<10.0	Interim operating solution

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
SAC-SP-VD-21	ZAMORA 115 kV	C2-5_RIO OSO 115 kV Bus 1 and 2 - CB 102 Failure	C2	Stuck Bkr	11.0	<10.0	<10.0	Interim operating solution
SAC-SP-VD-22	KNIGHTLD 115 kV	C2-5_RIO OSO 115 kV Bus 1 and 2 - CB 102 Failure	C2	Stuck Bkr	11.0	<10.0	<10.0	Interim operating solution
SAC-SP-VD-23	POST 115 kV	Rio Oso-West Sacramento 115 kV Line & West Sacramento-Brighton 115 kV Line	C5	DCTL	12.5	<10.0	<10.0	Interim operating solution
SAC-SP-VD-24	DEEPWATR 115 kV	Rio Oso-West Sacramento 115 kV Line & West Sacramento-Brighton 115 kV Line	C5	DCTL	12.7	<10.0	<10.0	Interim operating solution
SAC-SP-VD-25	W.SCRMNO 115 kV	Rio Oso-West Sacramento 115 kV Line & West Sacramento-Brighton 115 kV Line	C5	DCTL	12.5	<10.0	<10.0	Interim operating solution

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



High/Low Voltage

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
SAC-SP-V-1	CORTINA 115 kV	Normal	A	N-0	1.06	1.06	1.05	Under review for possible exemption
SAC-SP-V-2	PLAINFLD 60 kV	Vaca Dixon 115/60 kV Transformer No. 9	B	T-1	0.88	>0.9	>0.9	Interim operating solution
SAC-SP-V-3	POST 115 kV	BUS FAULT AT 31984 BRIGHTN 115.00	C1	Bus	0.78	>0.9	>0.9	Interim operating solution
SAC-SP-V-4	WCRP 115 kV	BUS FAULT AT 31984 BRIGHTN 115.00	C1	Bus	0.78	>0.9	>0.9	Interim operating solution
SAC-SP-V-5	DAVIS 115 kV	BUS FAULT AT 31984 BRIGHTN 115.00	C1	Bus	0.78	>0.9	>0.9	Interim operating solution
SAC-SP-V-6	CAMPUS 115 kV	BUS FAULT AT 31984 BRIGHTN 115.00	C1	Bus	0.78	>0.9	>0.9	Interim operating solution
SAC-SP-V-7	WOODLD 115 kV	BUS FAULT AT 31984 BRIGHTN 115.00	C1	Bus	0.83	>0.9	>0.9	Interim operating solution
SAC-SP-V-8	ZAMORA 115 kV	BUS FAULT AT 31984 BRIGHTN 115.00	C1	Bus	0.86	>0.9	>0.9	Interim operating solution
SAC-SP-V-9	BRKR SLG 115 kV	BUS FAULT AT 31984 BRIGHTN 115.00	C1	Bus	0.78	>0.9	>0.9	Interim operating solution
SAC-SP-V-10	DEEPWATR 115 kV	BUS FAULT AT 31984 BRIGHTN 115.00	C1	Bus	0.78	>0.9	>0.9	Interim operating solution
SAC-SP-V-11	KNIGHTLD 115 kV	BUS FAULT AT 31984 BRIGHTN 115.00	C1	Bus	0.87	>0.9	>0.9	Interim operating solution
SAC-SP-V-12	PLAINFLD 60 kV	BUS FAULT AT 30460 VACA-DIX 230.00 Sec 1F	C1	Bus	0.89	>0.9	>0.9	Interim operating solution
SAC-SP-V-13	W.SCRMNO 115 kV	BUS FAULT AT 31984 BRIGHTN 115.00	C1	Bus	0.78	>0.9	>0.9	Interim operating solution
SAC-SP-V-14	PLAINFLD 60 kV	VACA-DIX E 230 kV Bus 1 and Bus 2 - CB 202 Failure	C2	Stuck Bkr	0.87	>0.9	>0.9	Interim operating solution
SAC-SP-V-15	WOODLD 115 kV	C2-5_RIO OSO 115 kV Bus 1 and 2 - CB 102 Failure	C2	Stuck Bkr	0.88	>0.9	>0.9	Interim operating solution
SAC-SP-V-16	ZAMORA 115 kV	C2-5_RIO OSO 115 kV Bus 1 and 2 - CB 102 Failure	C2	Stuck Bkr	0.87	>0.9	>0.9	Interim operating solution
SAC-SP-V-17	KNIGHTLD 115 kV	C2-5_RIO OSO 115 kV Bus 1 and 2 - CB 102 Failure	C2	Stuck Bkr	0.88	>0.9	>0.9	Interim operating solution
SAC-SP-V-18	POST 115 kV	Rio Oso - Brighton 230 kV Line & Brighton - Bellota 230 kV Line	C3	N-1-1	0.75	>0.9	>0.9	Interim operating solution
SAC-SP-V-19	WCRP 115 kV	Rio Oso - Brighton 230 kV Line & Brighton - Bellota 230 kV Line	C3	N-1-1	0.75	>0.9	>0.9	Interim operating solution



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



High/Low Voltage

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
SAC-SP-V-20	DAVIS 115 kV	Rio Oso - Brighton 230 kV Line & Brighton - Bellota 230 kV Line	C3	N-1-1	0.75	>0.9	>0.9	Interim operating solution
SAC-SP-V-21	DRAKE 60 kV	Cortina 230/115/60 kV Transformer No. 1 & Cortina 230/115 kV Transformer No. 4	C3	N-1-1	>0.9	0.89	0.88	Cortina 60 kV area voltage support
SAC-SP-V-22	CAMPUS 115 kV	Rio Oso - Brighton 230 kV Line & Brighton - Bellota 230 kV Line	C3	N-1-1	0.75	>0.9	>0.9	Interim operating solution
SAC-SP-V-23	COLUSA 60 kV	Cortina 230/115 kV Transformer No. 4 & Cortina 230/115/60 kV Transformer No. 1	C3	N-1-1	0.88	0.87	0.87	Cortina 60 kV area voltage support
SAC-SP-V-24	WOODLD 115 kV	Rio Oso - Brighton 230 kV Line & Brighton - Bellota 230 kV Line	C3	N-1-1	0.80	>0.9	>0.9	Interim operating solution
SAC-SP-V-25	ZAMORA 115 kV	Rio Oso - Brighton 230 kV Line & Brighton - Bellota 230 kV Line	C3	N-1-1	0.84	>0.9	>0.9	Interim operating solution
SAC-SP-V-26	MAXWELL 60 kV	Cortina 230/115 kV Transformer No. 4 & Cortina 230/115/60 kV Transformer No. 1	C3	N-1-1	0.90	0.89	0.88	Cortina 60 kV area voltage support
SAC-SP-V-27	ARBUCKLE 60 kV	Cortina 230/115/60 kV Transformer No. 1 & Cortina 230/115 kV Transformer No. 4	C3	N-1-1	>0.9	>0.9	0.89	Cortina 60 kV area voltage support
SAC-SP-V-28	BRKR SLG 115 kV	Rio Oso - Brighton 230 kV Line & Brighton - Bellota 230 kV Line	C3	N-1-1	0.75	>0.9	>0.9	Interim operating solution
SAC-SP-V-29	DEEPWATR 115 kV	Rio Oso - Brighton 230 kV Line & Brighton - Bellota 230 kV Line	C3	N-1-1	0.75	>0.9	>0.9	Interim operating solution
SAC-SP-V-30	DUNNIGAN 60 kV	Cortina 230/115 kV Transformer No. 4 & Cortina 230/115/60 kV Transformer No. 1	C3	N-1-1	0.89	0.88	0.87	Cortina 60 kV area voltage support
SAC-SP-V-31	GRAND IS 115 kV	Rio Oso - Brighton 230 kV Line & Brighton - Bellota 230 kV Line	C3	N-1-1	0.73	>0.9	>0.9	Interim operating solution
SAC-SP-V-32	HARINTON 60 kV	Cortina 230/115/60 kV Transformer No. 1 & Cortina 230/115 kV Transformer No. 4	C3	N-1-1	>0.9	0.89	0.89	Cortina 60 kV area voltage support
SAC-SP-V-33	KNIGHTLD 115 kV	Rio Oso - Brighton 230 kV Line & Brighton - Bellota 230 kV Line	C3	N-1-1	0.85	>0.9	>0.9	Interim operating solution
SAC-SP-V-34	PLAINFLD 60 kV	Vaca Dixon 230/115 kV Transformer No. 3 & Vaca Dixon 230/115 kV Transformer No. 4	C3	N-1-1	0.86	>0.9	>0.9	Interim operating solution
SAC-SP-V-35	W.SCRMNO 115 kV	Rio Oso - Brighton 230 kV Line & Brighton - Bellota 230 kV Line	C3	N-1-1	0.75	>0.9	>0.9	Interim operating solution
SAC-SP-V-36	POST 115 kV	Rio Oso-West Sacramento 115 kV Line & West Sacramento-Brig	C5	DCTL	0.89	>0.9	>0.9	Interim operating solution

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
SAC-SP-V-37	DAVIS 115 kV	Rio Oso-West Sacramento 115 kV Line & West Sacramento-Brig	C5	DCTL	0.89	>0.9	>0.9	Interim operating solution
SAC-SP-V-38	CAMPUS 115 kV	Rio Oso-West Sacramento 115 kV Line & West Sacramento-Brig	C5	DCTL	0.89	>0.9	>0.9	Interim operating solution
SAC-SP-V-39	DEEPWATR 115 kV	Rio Oso-West Sacramento 115 kV Line & West Sacramento-Brig	C5	DCTL	0.88	>0.9	>0.9	Interim operating solution
SAC-SP-V-40	W.SCRMNO 115 kV	Rio Oso-West Sacramento 115 kV Line & West Sacramento-Brig	C5	DCTL	0.89	>0.9	>0.9	Interim operating solution



**Transient Stability**

ID	Contingency	Category	Category Description	Transient Stability Performance			Potential Mitigation Solutions
				2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	

No issues identified.



**Single Contingency Load Drop**

ID	Worst Contingency	Category	Category Description	Amount of Load Drop (MW)			Potential Mitigation Solutions
				2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	

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

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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
		2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
SAC-SP-SS-1	Vacaville	102	107	116	Upgrade 115 kV lines to be able to normally close bus sectionalizing breaker

**APPENDIX C-6**

**PG&E Central Valley - Sierra**

**Reliability Assessment Study Results**

2013/2014 ISO Reliability Assessment - Study Results

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



**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
SIERA-SP-T-1	Drum - Higgins 115 kV Line	Drum - Rio Oso 115 kV No. 2 Line & CHI.PARK Unit ID 1	B	G-1/L-1	102	<100	<100	Interim operating solution
SIERA-SP-T-2	Colgate - Smartville 60 kV Line No. 2	NARROWS2 Unit ID 1 & Colgate - Smartville 60 kV Line No. 1	B	G-1/L-1	114	118	<100	Serve Wheatland from Nicolaus side.
SIERA-SP-T-3	Drum - Grass Valley - Weimar 60 kV Line	ROLLINSF Unit ID 1 & Colgate-Grass Valley 60 kV Line	B	G-1/L-1	112	118	130	Distribution load transfer / disable automatics
SIERA-SP-T-4	Drum - Rio Oso 115 kV No. 2 Line	Higgins - Bell 115 kV Line	B	L-1	102	100	<100	Operating solution
SIERA-SP-T-5	Pease - Rio Oso 115 kV Line	BUS FAULT AT 30330 RIO OSO 230.00 Bus 1	C1	Bus	102	<100	<100	Interim operating solution
SIERA-SP-T-6	Drum - Rio Oso 115 kV No. 2 Line	BUS FAULT AT 32232 HIGGINS 115.00	C1	Bus	104	103	101	Operating solution
SIERA-SP-T-7	Missouri Flat - Gold Hill 115 kV No. 1 Line	BUS FAULT AT 32018 GOLDHILL 115.00 Section 2E	C1	Bus	<100	103	108	Rearrange or upgrade Gold Hill 115 kV bus
SIERA-SP-T-8	Eldorado - Missouri Flat 115 kV No. 2 Line	BUS FAULT AT 32018 GOLDHILL 115.00 Section 2E	C1	Bus	195	209	218	Rearrange or upgrade Gold Hill 115 kV bus
SIERA-SP-T-9	Eldorado - Missouri Flat 115 kV No. 1 Line	BUS FAULT AT 32018 GOLDHILL 115.00 Section 2E	C1	Bus	191	203	214	Rearrange or upgrade Gold Hill 115 kV bus
SIERA-SP-T-10	Pease - Rio Oso 115 kV Line	RIO OSO 230 kV Bus 1 and 2 - CB 202 Failure	C2	Stuck Bkr	132	<100	<100	Interim operating solution
SIERA-SP-T-11	Palermo - Bogue 115 kV Line	RIO OSO 230 kV Bus 1 and 2 - CB 202 Failure	C2	Stuck Bkr	104	<100	<100	Interim operating solution
SIERA-SP-T-12	Bogue - Rio Oso 115 kV Line	RIO OSO 230 kV Bus 1 and 2 - CB 202 Failure	C2	Stuck Bkr	122	<100	<100	Interim operating solution
SIERA-SP-T-13	East Nicolaus - Rio Oso 115 kV Line	RIO OSO 230 kV Bus 1 and 2 - CB 202 Failure	C2	Stuck Bkr	130	<100	<100	Interim operating solution
SIERA-SP-T-14	NA	GOLDHILL 230 kV Bus 1 and 2 - CB 202 Failure	C2	Stuck Bkr	Diverge	Diverge	Diverge	New SPS (part of Atlantic-Placer 115 kV line project)
SIERA-SP-T-15	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	114	<100	<100	Interim operating solution
SIERA-SP-T-16	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	<100	<100	Interim operating solution

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



**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
SIERA-SP-T-17	Placer - Gold Hill 115 kV Line No. 1	Drum - Higgins 115 kV Line & Placer - Gold Hill 115 kV Line No. 2	C3	N-1-1	118	<100	<100	Interim operating solution
SIERA-SP-T-18	Placer - Gold Hill 115 kV Line No. 2	Drum - Higgins 115 kV Line & Placer - Gold Hill 115 kV Line No. 1	C3	N-1-1	126	<100	<100	Interim operating solution
SIERA-SP-T-19	Pease - Rio Oso 115 kV Line	Table Mountain - Rio Oso 230 kV Line & Colgate - Rio Oso 230 kV Line	C3	N-1-1	110	<100	<100	Interim operating solution
SIERA-SP-T-20	Rio Oso 230/115 kV Bank No. 1	Rio Oso 230/115 kV Bank No. 2 & Rio Oso - Brighton 230 kV Line	C3	N-1-1	103	<100	<100	Interim operating solution
SIERA-SP-T-21	Rio Oso - Lincoln 115 kV Line	Atlantic - Gold Hill 230 kV Line & Rio Oso - Atlantic 230 kV Line No. 1	C3	N-1-1	101	<100	<100	Interim operating solution
SIERA-SP-T-22	Drum - Rio Oso 115 kV No. 2 Line	Higgins - Bell 115 kV Line & Drum - Rio Oso 115 kV No. 1 Line	C3	N-1-1	135	131	126	Operating solution
SIERA-SP-T-23	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	134	133	126	Operating solution
SIERA-SP-T-24	Missouri Flat - Gold Hill 115 kV No. 1 Line	Gold Hill - Clarksville 115 kV Line & Missouri Flat - Gold Hill 115 kV No. 2 Line	C3	N-1-1	155	<100	105	Operating solution
SIERA-SP-T-25	Lincoln - Pleasant Grove 115 kV Line	Atlantic - Gold Hill 230 kV Line & Rio Oso - Atlantic 230 kV Line No. 1	C3	N-1-1	101	<100	<100	Interim operating solution
SIERA-SP-T-26	Pease - Rio Oso 115 kV Line	Colgate-Rio Oso 230 kV Line & Table Mountain-Rio Oso 230 kV	C5	DCTL	109	<100	<100	Interim operating solution
SIERA-SP-T-27	Drum - Higgins 115 kV Line	Placer-Gold Hill No. 1 115 kV Line & Placer-Gold Hill No. 2 115 kV Line	C5	DCTL	153	<100	<100	Interim operating solution
SIERA-SP-T-28	NA	Gold Hill 230/115 kV Transformer No. 1 & Gold Hill 230/115 kV Transformer No. 2	C3	N-1-1	Diverge	Diverge	Diverge	New SPS (part of Atlantic-Placer 115 kV line project)



**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
SIERA-SP-VD-1	HIGGINS 115 kV	Drum - Higgins 115 kV Line	B	L-1	5.7	<5.0	<5.0	Interim operating solution
SIERA-SP-VD-2	ELDORAD 115 kV	BUS FAULT AT 32018 GOLDHILL 115.00 Section 2E	C1	Bus	18.0	17.5	18.6	New SPS (part of Atlantic-Placer 115 kV line project)
SIERA-SP-VD-3	ENCINAL 60 kV	BUS FAULT AT 32332 PEASE 60.00	C1	Bus	<10.0	11.4	11.9	Table Mtn. 60 kV area voltage support
SIERA-SP-VD-4	SHPRING 115 kV	BUS FAULT AT 32018 GOLDHILL 115.00 Section 2E	C1	Bus	25.6	25.9	27.3	New SPS (part of Atlantic-Placer 115 kV line project)
SIERA-SP-VD-5	APPLE HL 115 kV	BUS FAULT AT 32018 GOLDHILL 115.00 Section 2E	C1	Bus	16.0	15.3	16.2	New SPS (part of Atlantic-Placer 115 kV line project)
SIERA-SP-VD-6	DMND SPR 115 kV	BUS FAULT AT 32018 GOLDHILL 115.00 Section 2E	C1	Bus	24.1	24.1	25.5	New SPS (part of Atlantic-Placer 115 kV line project)
SIERA-SP-VD-7	LIVE OAK 60 kV	BUS FAULT AT 32332 PEASE 60.00	C1	Bus	<10.0	10.8	11.3	Table Mtn. 60 kV area voltage support
SIERA-SP-VD-8	PLCRVLB2 115 kV	BUS FAULT AT 32018 GOLDHILL 115.00 Section 2E	C1	Bus	23.2	23.2	24.5	New SPS (part of Atlantic-Placer 115 kV line project)
SIERA-SP-VD-9	PLCRVLB3 115 kV	BUS FAULT AT 32018 GOLDHILL 115.00 Section 2E	C1	Bus	23.2	23.2	24.5	New SPS (part of Atlantic-Placer 115 kV line project)
SIERA-SP-VD-10	SPICAMIN 115 kV	BUS FAULT AT 32018 GOLDHILL 115.00 Section 2E	C1	Bus	16.0	15.3	16.2	New SPS (part of Atlantic-Placer 115 kV line project)
SIERA-SP-VD-11	NA	GOLDHILL 230 kV Bus 1 and 2 - CB 202 Failure	C2	Stuck Bkr	Diverge	Diverge	Diverge	New SPS (part of Atlantic-Placer 115 kV line project)
SIERA-SP-VD-12	AUBURN 60 kV	Placer-Gold Hill No. 1 115 kV Line & Placer-Gold Hill No. 2 115 kV Line	C5	DCTL	18.5	<10.0	<10.0	Interim operating solution
SIERA-SP-VD-13	HALSEY 60 kV	Placer-Gold Hill No. 1 115 kV Line & Placer-Gold Hill No. 2 115 kV Line	C5	DCTL	18.0	<10.0	<10.0	Interim operating solution
SIERA-SP-VD-14	PENRYN 60 kV	Placer-Gold Hill No. 1 115 kV Line & Placer-Gold Hill No. 2 115 kV Line	C5	DCTL	19.0	<10.0	<10.0	Interim operating solution
SIERA-SP-VD-15	PLACER 115 kV	Placer-Gold Hill No. 1 115 kV Line & Placer-Gold Hill No. 2 115 kV Line	C5	DCTL	18.8	<10.0	<10.0	Interim operating solution
SIERA-SP-VD-16	HIGGINS 115 kV	Placer-Gold Hill No. 1 115 kV Line & Placer-Gold Hill No. 2 115 kV Line	C5	DCTL	16.1	<10.0	<10.0	Interim operating solution
SIERA-SP-VD-17	BELL PGE 115 kV	Placer-Gold Hill No. 1 115 kV Line & Placer-Gold Hill No. 2 115 kV Line	C5	DCTL	18.2	<10.0	<10.0	Interim operating solution
SIERA-SP-VD-18	MTN_QUAR 60 kV	Placer-Gold Hill No. 1 115 kV Line & Placer-Gold Hill No. 2 115 kV Line	C5	DCTL	18.6	<10.0	<10.0	Interim operating solution

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



High/Low Voltage

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
SIERA-SP-V-1	DEL MAR 60 kV	Normal	A	N-0	0.94	>0.95	>0.95	Interim operating solution
SIERA-SP-V-2	SIERRAPI 60 kV	Normal	A	N-0	0.94	>0.95	>0.95	Interim operating solution
SIERA-SP-V-3	WHEATLND 60 kV	Normal	A	N-0	>0.95	0.94	>0.95	Serve Wheatland from Nicolaus side.
SIERA-SP-V-4	BEALE_2 60 kV	NARROWS2 Unit ID 1 & Colgate - Smartville 60 kV Line No. 1	B	G-1/L-1	0.89	0.90	>0.9	Serve Wheatland from Nicolaus side.
SIERA-SP-V-5	FORST HL 60 kV	OXBOW F Unit ID 1 & Colgate-Grass Valley 60 kV Line	B	G-1/L-1	>0.9	>0.9	0.88	Distribution load transfer / disable automatics
SIERA-SP-V-6	GRSS VLY 60 kV	ROLLINSF Unit ID 1 & Colgate-Grass Valley 60 kV Line	B	G-1/L-1	>0.9	>0.9	0.88	Distribution load transfer / disable automatics
SIERA-SP-V-7	WHEATLND 60 kV	NARROWS2 Unit ID 1 & Colgate - Smartville 60 kV Line No. 1	B	G-1/L-1	0.88	0.87	>0.9	Serve Wheatland from Nicolaus side.
SIERA-SP-V-8	ELDORAD 115 kV	BUS FAULT AT 32018 GOLDHILL 115.00 Section 2E	C1	Bus	0.80	0.82	0.80	New SPS (part of Atlantic-Placer 115 kV line project)
SIERA-SP-V-9	ENCINAL 60 kV	BUS FAULT AT 32332 PEASE 60.00	C1	Bus	0.89	0.89	0.88	Table Mtn. 60 kV area voltage support
SIERA-SP-V-10	SHPRING 115 kV	BUS FAULT AT 32018 GOLDHILL 115.00 Section 2E	C1	Bus	0.73	0.74	0.71	New SPS (part of Atlantic-Placer 115 kV line project)
SIERA-SP-V-11	APPLE HL 115 kV	BUS FAULT AT 32018 GOLDHILL 115.00 Section 2E	C1	Bus	0.82	0.84	0.82	New SPS (part of Atlantic-Placer 115 kV line project)
SIERA-SP-V-12	DMND SPR 115 kV	BUS FAULT AT 32018 GOLDHILL 115.00 Section 2E	C1	Bus	0.74	0.75	0.72	New SPS (part of Atlantic-Placer 115 kV line project)
SIERA-SP-V-13	LIVE OAK 60 kV	BUS FAULT AT 32332 PEASE 60.00	C1	Bus	0.89	0.89	0.88	Table Mtn. 60 kV area voltage support
SIERA-SP-V-14	PLCRVLB2 115 kV	BUS FAULT AT 32018 GOLDHILL 115.00 Section 2E	C1	Bus	0.74	0.76	0.73	New SPS (part of Atlantic-Placer 115 kV line project)
SIERA-SP-V-15	PLCRVLB3 115 kV	BUS FAULT AT 32018 GOLDHILL 115.00 Section 2E	C1	Bus	0.74	0.76	0.73	New SPS (part of Atlantic-Placer 115 kV line project)
SIERA-SP-V-16	SPICAMIN 115 kV	BUS FAULT AT 32018 GOLDHILL 115.00 Section 2E	C1	Bus	0.82	0.84	0.82	New SPS (part of Atlantic-Placer 115 kV line project)
SIERA-SP-V-17	NA	GOLDHILL 230 kV Bus 1 and 2 - CB 202 Failure	C2	Stuck Bkr	Diverge	Diverge	Diverge	New SPS (part of Atlantic-Placer 115 kV line project)
SIERA-SP-V-18	TAYLOR 60 kV	Atlantic - Gold Hill 230 kV Line & Rio Oso - Atlantic 230 kV Line No. 1	C3	N-1-1	0.76	>0.9	>0.9	Interim operating solution

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



**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
SIERA-SP-V-19	DEL MAR 60 kV	Atlantic - Gold Hill 230 kV Line & Rio Oso - Atlantic 230 kV Line No. 1	C3	N-1-1	0.74	>0.9	>0.9	Interim operating solution
SIERA-SP-V-20	ROCKLIN 60 kV	Atlantic - Gold Hill 230 kV Line & Rio Oso - Atlantic 230 kV Line No. 1	C3	N-1-1	0.76	>0.9	>0.9	Interim operating solution
SIERA-SP-V-21	PLSNT GR 115 kV	Atlantic - Gold Hill 230 kV Line & Rio Oso - Atlantic 230 kV Line No. 1	C3	N-1-1	0.88	>0.9	>0.9	Interim operating solution
SIERA-SP-V-22	SIERRAPI 60 kV	Atlantic - Gold Hill 230 kV Line & Rio Oso - Atlantic 230 kV Line No. 1	C3	N-1-1	0.74	>0.9	>0.9	Interim operating solution
SIERA-SP-V-23	NA	Gold Hill 230/115 kV Transformer No. 1 & Gold Hill 230/115 kV Transformer No. 2	C3	N-1-1	Diverge	Diverge	Diverge	New SPS (part of Atlantic-Placer 115 kV line project)
SIERA-SP-V-24	AUBURN 60 kV	Placer-Gold Hill No. 1 115 kV Line & Placer-Gold Hill No. 2 115 kV Line	C5	DCTL	0.83	>0.9	>0.9	Interim operating solution
SIERA-SP-V-25	HALSEY 60 kV	Placer-Gold Hill No. 1 115 kV Line & Placer-Gold Hill No. 2 115 kV Line	C5	DCTL	0.83	>0.9	>0.9	Interim operating solution
SIERA-SP-V-26	PENRYN 60 kV	Placer-Gold Hill No. 1 115 kV Line & Placer-Gold Hill No. 2 115 kV Line	C5	DCTL	0.81	>0.9	>0.9	Interim operating solution
SIERA-SP-V-27	PLACER 115 kV	Placer-Gold Hill No. 1 115 kV Line & Placer-Gold Hill No. 2 115 kV Line	C5	DCTL	0.79	>0.9	>0.9	Interim operating solution
SIERA-SP-V-28	HIGGINS 115 kV	Placer-Gold Hill No. 1 115 kV Line & Placer-Gold Hill No. 2 115 kV Line	C5	DCTL	0.83	>0.9	>0.9	Interim operating solution
SIERA-SP-V-29	BELL PGE 115 kV	Placer-Gold Hill No. 1 115 kV Line & Placer-Gold Hill No. 2 115 kV Line	C5	DCTL	0.79	>0.9	>0.9	Interim operating solution
SIERA-SP-V-30	MTN_QUAR 60 kV	Placer-Gold Hill No. 1 115 kV Line & Placer-Gold Hill No. 2 115 kV Line	C5	DCTL	0.82	>0.9	>0.9	Interim operating solution

**Transient Stability**

ID	Contingency	Category	Category Description	Transient Stability Performance			Potential Mitigation Solutions
				2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
SIERA-SP-TS-1	Gold Hill 230 kV Bus SLG fault with delayed clearing	C9	Bus SLG with delayed clearing	Diverge	No issue	29 buses with voltage dip issues	Gold Hill T-2 SPS



**Single Contingency Load Drop**

ID	Worst Contingency	Category	Category Description	Amount of Load Drop (MW)			Potential Mitigation Solutions
				2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	

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
		2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
SIERA-SP-SS-1	Clarksville 115 kV	107	114	126	Loop the station

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Summer Off-Peak	2018 Summer Light Load	N/A	
SIERA-NP-T-1	Drum - Higgins 115 kV Line	GOLDHILL 230 kV Bus 1 and 2 - CB 202 Failure	C2	Stuck Bkr	128	<100		New SPS (part of Atlantic-Placer 115 kV line project)
SIERA-NP-T-2	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	127	<100		New SPS (part of Atlantic-Placer 115 kV line project)
SIERA-NP-T-3	Drum - Rio Oso 115 kV No. 2 Line	Higgins - Bell 115 kV Line & Drum - Rio Oso 115 kV No. 1 Line	C3	N-1-1	107	110		Operating solution
SIERA-NP-T-4	Drum - Rio Oso 115 kV No. 1 Line	Higgins - Bell 115 kV Line & Drum - Rio Oso 115 kV No. 2 Line	C3	N-1-1	120	123		Operating solution

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2015 Summer Off-Peak	2018 Summer Light Load	N/A	
SIERA-NP-VD-1	HARTER 60 kV	Pease 115/60 kV Transformer No. 2	B	T-1	16.3	<5.0		Interim operating solution
SIERA-NP-VD-2	ENCINAL 60 kV	Pease 115/60 kV Transformer No. 2	B	T-1	14.2	<5.0		Interim operating solution
SIERA-NP-VD-3	MRYSVLE 60 kV	Pease 115/60 kV Transformer No. 2	B	T-1	16.4	<5.0		Interim operating solution
SIERA-NP-VD-4	LIVE OAK 60 kV	Pease 115/60 kV Transformer No. 2	B	T-1	13.5	<5.0		Interim operating solution
SIERA-NP-VD-5	MRYSVLLE 60 kV	Pease 115/60 kV Transformer No. 2	B	T-1	16.4	<5.0		Interim operating solution
SIERA-NP-VD-6	HARTER 60 kV	BUS FAULT AT 32200 PEASE 115.00	C1	Bus	16.3	<10.0		Interim operating solution
SIERA-NP-VD-7	ENCINAL 60 kV	BUS FAULT AT 32200 PEASE 115.00	C1	Bus	14.2	<10.0		Interim operating solution
SIERA-NP-VD-8	MRYSVLE 60 kV	BUS FAULT AT 32200 PEASE 115.00	C1	Bus	16.4	<10.0		Interim operating solution
SIERA-NP-VD-9	LIVE OAK 60 kV	BUS FAULT AT 32200 PEASE 115.00	C1	Bus	13.5	<10.0		Interim operating solution
SIERA-NP-VD-10	MRYSVLLE 60 kV	BUS FAULT AT 32200 PEASE 115.00	C1	Bus	16.4	<10.0		Interim operating solution
SIERA-NP-VD-11	PEASE 115 kV	Palermo-Pease 115 kV Line & Pease-Rio Oso 115 kV Line	C5	DCTL	27.4	14.7		Dispatch local generator
SIERA-NP-VD-12	HARTER 60 kV	Palermo-Pease 115 kV Line & Pease-Rio Oso 115 kV Line	C5	DCTL	23.7	<10.0		Dispatch local generator
SIERA-NP-VD-13	ENCINAL 60 kV	Palermo-Pease 115 kV Line & Pease-Rio Oso 115 kV Line	C5	DCTL	20.8	<10.0		Dispatch local generator
SIERA-NP-VD-14	MRYSVLE 60 kV	Palermo-Pease 115 kV Line & Pease-Rio Oso 115 kV Line	C5	DCTL	23.7	<10.0		Dispatch local generator
SIERA-NP-VD-15	LIVE OAK 60 kV	Palermo-Pease 115 kV Line & Pease-Rio Oso 115 kV Line	C5	DCTL	19.8	<10.0		Dispatch local generator
SIERA-NP-VD-16	MRYSVLLE 60 kV	Palermo-Pease 115 kV Line & Pease-Rio Oso 115 kV Line	C5	DCTL	23.7	<10.0		Dispatch local generator



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



**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2015 Summer Off-Peak	2018 Summer Light Load	N/A	
SIERA-NP-V-1	CPM 115 kV	Normal	A	N-0	1.07	1.09		Under review for possible exemption
SIERA-NP-V-2	DRUM 115 kV	Normal	A	N-0	1.07	1.07		Under review for possible exemption
SIERA-NP-V-3	FLINT 115 kV	Normal	A	N-0	1.06	1.08		Under review for possible exemption
SIERA-NP-V-4	BANGOR 60 kV	Normal	A	N-0	<1.05	1.06		Under review for possible exemption
SIERA-NP-V-5	LINCLN 115 kV	Normal	A	N-0	1.07	1.06		Under review for possible exemption
SIERA-NP-V-6	PLACER 115 kV	Normal	A	N-0	1.06	1.08		Under review for possible exemption
SIERA-NP-V-7	SUMMIT 60 kV	Normal	A	N-0	1.06	<1.05		Under review for possible exemption
SIERA-NP-V-8	TAYLOR 60 kV	Normal	A	N-0	1.06	1.08		Under review for possible exemption
SIERA-NP-V-9	ATLANTI 60 kV	Normal	A	N-0	1.06	1.08		Under review for possible exemption
SIERA-NP-V-10	COLGATE 60 kV	Normal	A	N-0	<1.05	1.06		Under review for possible exemption
SIERA-NP-V-11	DEL MAR 60 kV	Normal	A	N-0	1.05	1.07		Under review for possible exemption
SIERA-NP-V-12	DOBBINS 60 kV	Normal	A	N-0	<1.05	1.06		Under review for possible exemption
SIERA-NP-V-13	ELDORAD 115 kV	Normal	A	N-0	1.06	1.08		Under review for possible exemption
SIERA-NP-V-14	HIGGINS 115 kV	Normal	A	N-0	1.06	1.08		Under review for possible exemption
SIERA-NP-V-15	RIO OSO 115 kV	Normal	A	N-0	1.07	<1.05		Under review for possible exemption
SIERA-NP-V-16	ROCKLIN 60 kV	Normal	A	N-0	1.06	1.08		Under review for possible exemption
SIERA-NP-V-17	SHPRING 115 kV	Normal	A	N-0	1.06	1.09		Under review for possible exemption
SIERA-NP-V-18	ALLEGHNY 60 kV	Normal	A	N-0	<1.05	1.06		Under review for possible exemption

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



**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2015 Summer Off-Peak	2018 Summer Light Load	N/A	
SIERA-NP-V-19	APPLE HL 115 kV	Normal	A	N-0	1.06	1.09		Under review for possible exemption
SIERA-NP-V-20	ATLANTIC 115 kV	Normal	A	N-0	1.09	1.09		Under review for possible exemption
SIERA-NP-V-21	BELL PGE 115 kV	Normal	A	N-0	1.06	1.08		Under review for possible exemption
SIERA-NP-V-22	BRNSWALT 115 kV	Normal	A	N-0	1.07	1.06		Under review for possible exemption
SIERA-NP-V-23	BRNSWCKP 115 kV	Normal	A	N-0	1.07	1.06		Under review for possible exemption
SIERA-NP-V-24	BRUNSWCK 115 kV	Normal	A	N-0	1.07	1.06		Under review for possible exemption
SIERA-NP-V-25	CHCGO PK 115 kV	Normal	A	N-0	1.07	1.07		Under review for possible exemption
SIERA-NP-V-26	CHLLNGEA 60 kV	Normal	A	N-0	<1.05	1.06		Under review for possible exemption
SIERA-NP-V-27	CISCO GR 60 kV	Normal	A	N-0	1.06	<1.05		Under review for possible exemption
SIERA-NP-V-28	CISCOTAP 60 kV	Normal	A	N-0	1.06	<1.05		Under review for possible exemption
SIERA-NP-V-29	CLMBA HL 60 kV	Normal	A	N-0	<1.05	1.06		Under review for possible exemption
SIERA-NP-V-30	CLRKSVLE 115 kV	Normal	A	N-0	1.07	1.09		Under review for possible exemption
SIERA-NP-V-31	COLGATEA 60 kV	Normal	A	N-0	<1.05	1.06		Under review for possible exemption
SIERA-NP-V-32	DMND SPR 115 kV	Normal	A	N-0	1.06	1.08		Under review for possible exemption
SIERA-NP-V-33	DTCH FL1 115 kV	Normal	A	N-0	1.07	1.07		Under review for possible exemption
SIERA-NP-V-34	DTCH FL2 115 kV	Normal	A	N-0	1.07	1.07		Under review for possible exemption
SIERA-NP-V-35	E.NICOLS 115 kV	Normal	A	N-0	1.07	<1.05		Under review for possible exemption
SIERA-NP-V-36	FRNCH MS 60 kV	Normal	A	N-0	1.06	1.07		Under review for possible exemption

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



**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2015 Summer Off-Peak	2018 Summer Light Load	N/A	
SIERA-NP-V-37	GOLDHILL 115 kV	Normal	A	N-0	1.07	1.09		Under review for possible exemption
SIERA-NP-V-38	GRSS VLY 60 kV	Normal	A	N-0	<1.05	1.06		Under review for possible exemption
SIERA-NP-V-39	HORSESHE 115 kV	Normal	A	N-0	1.06	1.08		Under review for possible exemption
SIERA-NP-V-40	MDDLE FK 60 kV	Normal	A	N-0	1.06	1.07		Under review for possible exemption
SIERA-NP-V-41	MIZOU_T1 115 kV	Normal	A	N-0	1.07	1.09		Under review for possible exemption
SIERA-NP-V-42	MIZOU_T2 115 kV	Normal	A	N-0	1.06	1.08		Under review for possible exemption
SIERA-NP-V-43	NEWCASTLE 115 kV	Normal	A	N-0	1.06	1.08		Under review for possible exemption
SIERA-NP-V-44	PIKE CTY 60 kV	Normal	A	N-0	<1.05	1.06		Under review for possible exemption
SIERA-NP-V-45	PLCRVLB2 115 kV	Normal	A	N-0	1.06	1.08		Under review for possible exemption
SIERA-NP-V-46	PLCRVLB3 115 kV	Normal	A	N-0	1.06	1.08		Under review for possible exemption
SIERA-NP-V-47	PLCRVLT1 115 kV	Normal	A	N-0	1.07	1.09		Under review for possible exemption
SIERA-NP-V-48	PLCRVLT2 115 kV	Normal	A	N-0	1.06	1.08		Under review for possible exemption
SIERA-NP-V-49	PLSNT GR 115 kV	Normal	A	N-0	1.08	1.08		Under review for possible exemption
SIERA-NP-V-50	SIERRAPI 60 kV	Normal	A	N-0	1.05	1.07		Under review for possible exemption
SIERA-NP-V-51	SPICAMIN 115 kV	Normal	A	N-0	1.06	1.09		Under review for possible exemption
SIERA-NP-V-52	SPI-LINC 115 kV	Normal	A	N-0	1.07	1.06		Under review for possible exemption
SIERA-NP-V-53	TAMARACK 60 kV	Normal	A	N-0	1.06	<1.05		Under review for possible exemption
SIERA-NP-V-54	ULTR-RCK 115 kV	Normal	A	N-0	1.08	1.08		Under review for possible exemption

High/Low Voltage

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2015 Summer Off-Peak	2018 Summer Light Load	N/A	
SIERA-NP-V-55	HARTER 60 kV	Pease 115/60 kV Transformer No. 2	B	T-1	0.88	>0.9		Interim operating solution
SIERA-NP-V-56	ENCINAL 60 kV	Pease 115/60 kV Transformer No. 2	B	T-1	0.89	>0.9		Interim operating solution
SIERA-NP-V-57	MRYSVLE 60 kV	Pease 115/60 kV Transformer No. 2	B	T-1	0.87	>0.9		Interim operating solution
SIERA-NP-V-58	LIVE OAK 60 kV	Pease 115/60 kV Transformer No. 2	B	T-1	0.90	>0.9		Interim operating solution
SIERA-NP-V-59	MRYSVLLE 60 kV	Pease 115/60 kV Transformer No. 2	B	T-1	0.87	>0.9		Interim operating solution
SIERA-NP-V-60	HARTER 60 kV	BUS FAULT AT 32200 PEASE 115.00	C1	Bus	0.88	>0.9		Interim operating solution
SIERA-NP-V-61	ENCINAL 60 kV	BUS FAULT AT 32200 PEASE 115.00	C1	Bus	0.89	>0.9		Interim operating solution
SIERA-NP-V-62	MRYSVLE 60 kV	BUS FAULT AT 32200 PEASE 115.00	C1	Bus	0.87	>0.9		Interim operating solution
SIERA-NP-V-63	LIVE OAK 60 kV	BUS FAULT AT 32200 PEASE 115.00	C1	Bus	0.90	>0.9		Interim operating solution
SIERA-NP-V-64	MRYSVLLE 60 kV	BUS FAULT AT 32200 PEASE 115.00	C1	Bus	0.87	>0.9		Interim operating solution
SIERA-NP-V-65	PEASE 115 kV	Pease - Rio Oso 115 kV Line & Palermo - Pease 115 kV Line	C5	DCTL	0.76	>0.9		Dispatch local generator
SIERA-NP-V-66	HARTER 60 kV	Palermo - Pease 115 kV Line & Pease - Rio Oso 115 kV Line	C5	DCTL	0.80	>0.9		Dispatch local generator
SIERA-NP-V-67	ENCINAL 60 kV	Palermo - Pease 115 kV Line & Pease - Rio Oso 115 kV Line	C5	DCTL	0.83	>0.9		Dispatch local generator
SIERA-NP-V-68	MRYSVLE 60 kV	Palermo - Pease 115 kV Line & Pease - Rio Oso 115 kV Line	C5	DCTL	0.80	>0.9		Dispatch local generator
SIERA-NP-V-69	LIVE OAK 60 kV	Palermo - Pease 115 kV Line & Pease - Rio Oso 115 kV Line	C5	DCTL	0.83	>0.9		Dispatch local generator
SIERA-NP-V-70	MRYSVLLE 60 kV	Palermo - Pease 115 kV Line & Pease - Rio Oso 115 kV Line	C5	DCTL	0.80	>0.9		Dispatch local generator

2013/2014 ISO Reliability Assessment - Study Results

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



**Transient Stability**

ID	Contingency	Category	Category Description	Transient Stability Performance			Potential Mitigation Solutions
				2015 Summer Off-Peak	2018 Summer Light Load	N/A	
SIERA-NP-TS-1	Gold Hill 230 kV Bus SLG fault with delayed clearing	C9	Bus SLG with delayed clearing	8 buses with frequency dip issues	No issue		Gold Hill T-2 SPS

**APPENDIX C-7**

**PG&E Central Valley - Stockton and Stanislaus**

**Reliability Assessment Study Results**

2013/2014 ISO Reliability Assessment - Study Results

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



**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
STOC-SP-T-1	Valley Springs No. 1 60 kV Line	Weber - Mormon Jct 60 kV Line	B	L-1	110	117	128	Disable automatics
STOC-SP-T-2	Lockeford No. 1 60 kV Line	Hammer - Country Club 60 kV	B	L-1	165	176	191	Disable automatics
STOC-SP-T-3	Stagg - Hammer 60 kV Line No. 1	BUS FAULT AT 33704 STAGG 60.00 Section E	C1	Bus	153	<100	<100	Upgrade Stagg 60 kV bus
STOC-SP-T-4	Hammer - Country Club 60 kV	BUS FAULT AT 33704 STAGG 60.00 Section E	C1	Bus	106	107	114	Upgrade Stagg 60 kV bus
STOC-SP-T-5	Manteca 115/60 kV Transformer No. 3	BUS FAULT AT 33528 KASSON 115.00	C1	Bus	188	192	200	New Kasson SPS
STOC-SP-T-6	Manteca - Louise 60 kV Line	BUS FAULT AT 33528 KASSON 115.00	C1	Bus	147	148	155	New Kasson SPS
STOC-SP-T-7	Kasson - Louise 60 kV Line	BUS FAULT AT 33528 KASSON 115.00	C1	Bus	110	111	117	New Kasson SPS
STOC-SP-T-8	Bellota-Riverbank-Melones 115 kV Line	BELLOTA 230 kV Bus 1 and Bus 2 - CB 200 Failure	C2	Stuck Bkr	<100	<100	104	Rerate
STOC-SP-T-9	Schulte - Kasson - Manteca 115 kV Line	Schulte - Lammers 115 kV Line & Tesla - Tracy 115 kV Line	C3	N-1-1	138	<100	<100	Interim operating solution
STOC-SP-T-10	Vierra - Tracy - Kasson 115 kV Line	Tesla - Kasson - Manteca 115 kV Line & Schulte - Lammers 115 kV Line	C3	N-1-1	129	<100	<100	Interim operating solution
STOC-SP-T-11	Tesla - Tracy 115 kV Line	Tesla - Kasson - Manteca 115 kV Line & Schulte - Lammers 115 kV Line	C3	N-1-1	126	<100	<100	Interim operating solution
STOC-SP-T-12	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	137	140	149	Reconductor
STOC-SP-T-13	Stagg - Country Club 60 kV Line No. 1	Stagg - Country Club 60 kV Line No. 2 & Stagg - Hammer 60 kV Line No. 1	C3	N-1-1	154	<100	<100	Interim operating solution
STOC-SP-T-14	Stagg - Country Club 60 kV Line No. 2	Stagg - Country Club 60 kV Line No. 1 & Stagg - Hammer 60 kV Line No. 1	C3	N-1-1	154	<100	<100	Interim operating solution
STOC-SP-T-15	Stagg - Hammer 60 kV Line No. 1	Stagg - Country Club 60 kV Line No. 1 & Stagg - Country Club 60 kV Line No. 2	C3	N-1-1	153	<100	<100	Interim operating solution
STOC-SP-T-16	Hammer - Country Club 60 kV	Stagg - Country Club 60 kV Line No. 2 & Stagg - Country Club 60 kV Line No. 1	C3	N-1-1	106	106	114	Rerate

2013/2014 ISO Reliability Assessment - Study Results

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



**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
STOC-SP-T-17	Lockeford 230/60 kV Transformer No. 2	Hammer - Country Club 60 kV & Lockeford 230/60 kV Transformer No. 3	C3	N-1-1	103	104	<100	Interim operating solution
STOC-SP-T-18	Lockeford 230/60 kV Transformer No. 3	Hammer - Country Club 60 kV & Lockeford 230/60 kV Transformer No. 2	C3	N-1-1	103	104	<100	Interim operating solution
STOC-SP-T-19	Lockeford - Lodi 60 kV Line No. 2	Lockeford - Industrial 60 kV Line & Lodi - Industrial 60 kV Line	C3	N-1-1	150	143	<100	Interim operating solution
STOC-SP-T-20	Lockeford - Lodi 60 kV Line No. 3	Lockeford - Lodi 60 kV Line No. 2 & Lockeford - Industrial 60 kV Line	C3	N-1-1	161	152	<100	Interim operating solution
STOC-SP-T-21	Lockeford - Lodi 60 kV Line No. 1	Lockeford - Lodi 60 kV Line No. 2 & Lockeford - Industrial 60 kV Line	C3	N-1-1	130	123	<100	Interim operating solution
STOC-SP-T-22	Lockeford - Industrial 60 kV Line	Lockeford - Lodi 60 kV Line No. 2 & Lodi - Industrial 60 kV Line	C3	N-1-1	135	128	<100	Interim operating solution
STOC-SP-T-23	Lodi - Industrial 60 kV Line	Lockeford - Lodi 60 kV Line No. 2 & Lockeford - Industrial 60 kV Line	C3	N-1-1	170	159	<100	Interim operating solution
STOC-SP-T-24	Lockeford No. 1 60 kV Line	Lockeford - Bellota 230 kV Line & Hammer - Country Club 60 kV	C3	N-1-1	187	191	<100	Interim operating solution
STOC-SP-T-25	Hammer - Country Club 60 kV	Stagg-Hammer 60 kV Line Nos. 1 & 2 (new)	C5	DCTL	<100	<100	106	Rerate



**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
STOC-SP-VD-1	MSHR 60V 60 kV	Hammer - Country Club 60 kV	B	L-1	6.7	8.8	8.4	Disable automatics
STOC-SP-VD-2	WEST PNT 60 kV	WEST PNT 11.50 Unit ID 1	B	G-1	6.1	<5.0	<5.0	Adjust West Point gen terminal voltage
STOC-SP-VD-3	LODI 60 kV	Lockeford - Bellota 230 kV Line	B	L-1	11.4	5.3	<5.0	Interim operating solution
STOC-SP-VD-4	COLONY 60 kV	Lockeford - Bellota 230 kV Line	B	L-1	11.3	5.7	<5.0	Interim operating solution
STOC-SP-VD-5	VICTOR 60 kV	Lockeford - Bellota 230 kV Line	B	L-1	11.2	5.7	<5.0	Interim operating solution
STOC-SP-VD-6	MONDAVI 60 kV	Lockeford - Bellota 230 kV Line	B	L-1	11.4	5.3	<5.0	Interim operating solution

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
STOC-SP-V-1	DONNELLS 115 kV	Normal	A	N-0	1.06	1.06	1.05	Under review for possible exemption
STOC-SP-V-2	LODI 60 kV	Lockeford - Bellota 230 kV Line & Hammer - Country Club 60 kV	C3	N-1-1	0.87	>0.9	>0.9	Interim operating solution
STOC-SP-V-3	COLONY 60 kV	Lockeford - Bellota 230 kV Line & Hammer - Country Club 60 kV	C3	N-1-1	0.88	>0.9	>0.9	Interim operating solution
STOC-SP-V-4	VICTOR 60 kV	Lockeford - Bellota 230 kV Line & Hammer - Country Club 60 kV	C3	N-1-1	0.88	>0.9	>0.9	Interim operating solution
STOC-SP-V-5	MONDAVI 60 kV	Lockeford - Bellota 230 kV Line & Hammer - Country Club 60 kV	C3	N-1-1	0.87	>0.9	>0.9	Interim operating solution
STOC-SP-V-6	MSHR 60V 60 kV	Lockeford - Bellota 230 kV Line & Hammer - Country Club 60 kV	C3	N-1-1	0.78	0.85	>0.9	Interim operating solution



*Transient Stability*

ID	Contingency	Category	Category Description	Transient Stability Performance			Potential Mitigation Solutions
				2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	

No issues identified.



**Single Contingency Load Drop**

ID	Worst Contingency	Category	Category Description	Amount of Load Drop (MW)			Potential Mitigation Solutions
				2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	

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

2013/2014 ISO Reliability Assessment - Study Results

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



*Single Source Substation with more than 100 MW Load*

ID	Substation	Load Served (MW)			Potential Mitigation Solutions
		2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	

No single source substation with more than 100 MW Load

2013/2014 ISO Reliability Assessment - Study Results

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



**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Summer Off-Peak	2018 Summer Light Load	N/A	
STOC-NP-T-1	Stanislaus-Melones-Manteca 115 kV Line No. 1	TESLA 115 kV Bus 1 and Bus 2 - CB 102 Failure	C2	Stuck Bkr	132	<100		Dispatch local generator
STOC-NP-T-2	Manteca-Ripon 115 kV Line	TESLA 115 kV Bus 1 and Bus 2 - CB 102 Failure	C2	Stuck Bkr	116	<100		Dispatch local generator
STOC-NP-T-3	Ripon - Riverbank Jct 115 kV Line	TESLA 115 kV Bus 1 and Bus 2 - CB 102 Failure	C2	Stuck Bkr	129	<100		Dispatch local generator
STOC-NP-T-4	Bellota-Riverbank-Melones 115 kV Line	TESLA 115 kV Bus 1 and Bus 2 - CB 102 Failure	C2	Stuck Bkr	105	<100		Dispatch local generator
STOC-NP-T-5	Stanislaus - Melones Sw 115 kV Line	TESLA 115 kV Bus 1 and Bus 2 - CB 102 Failure	C2	Stuck Bkr	138	<100		Dispatch local generator
STOC-NP-T-6	Stanislaus-Melones-Manteca 115 kV Line No. 1	Bellota-Riverbank-Melones 115 kV Line & Stanislaus - Melones Sw 115 kV Line	C3	N-1-1	<100	110		Generation redispatch
STOC-NP-T-7	Ripon - Riverbank Jct 115 kV Line	Stanislaus-Melones-Manteca 115 kV Line No. 1 & Bellota-Riverbank-Melones 115 kV Line	C3	N-1-1	<100	103		Generation redispatch
STOC-NP-T-8	Stanislaus - Melones Sw 115 kV Line	Stanislaus-Melones-Manteca 115 kV Line No. 1 & Bellota-Riverbank-Melones 115 kV Line	C3	N-1-1	<100	107		Generation redispatch

2013/2014 ISO Reliability Assessment - Study Results

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



**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2015 Summer Off-Peak	2018 Summer Light Load	N/A	
STOC-NP-VD-1	AVENA 115 kV	TESLA 115 kV Bus 1 and Bus 2 - CB 102 Failure	C2	Stuck Bkr	26.2	<10.0		Interim operating solution
STOC-NP-VD-2	BANTA 60 kV	TESLA 115 kV Bus 1 and Bus 2 - CB 102 Failure	C2	Stuck Bkr	26.9	<10.0		Interim operating solution
STOC-NP-VD-3	CALVO 60 kV	TESLA 115 kV Bus 1 and Bus 2 - CB 102 Failure	C2	Stuck Bkr	26.8	<10.0		Interim operating solution
STOC-NP-VD-4	RIPON 115 kV	TESLA 115 kV Bus 1 and Bus 2 - CB 102 Failure	C2	Stuck Bkr	27.4	<10.0		Interim operating solution
STOC-NP-VD-5	TRACY 115 kV	TESLA 115 kV Bus 1 and Bus 2 - CB 102 Failure	C2	Stuck Bkr	32.1	<10.0		Interim operating solution
STOC-NP-VD-6	LOUISE 60 kV	TESLA 115 kV Bus 1 and Bus 2 - CB 102 Failure	C2	Stuck Bkr	26.5	<10.0		Interim operating solution
STOC-NP-VD-7	VIERRA 115 kV	TESLA 115 kV Bus 1 and Bus 2 - CB 102 Failure	C2	Stuck Bkr	30.9	<10.0		Interim operating solution
STOC-NP-VD-8	AEC_300 115 kV	TESLA 115 kV Bus 1 and Bus 2 - CB 102 Failure	C2	Stuck Bkr	33.2	<10.0		Interim operating solution
STOC-NP-VD-9	CARBONA 60 kV	TESLA 115 kV Bus 1 and Bus 2 - CB 102 Failure	C2	Stuck Bkr	27.1	<10.0		Interim operating solution
STOC-NP-VD-10	GRANITE 115 kV	TESLA 115 kV Bus 1 and Bus 2 - CB 102 Failure	C2	Stuck Bkr	29.0	<10.0		Interim operating solution
STOC-NP-VD-11	LAMMERS 115 kV	TESLA 115 kV Bus 1 and Bus 2 - CB 102 Failure	C2	Stuck Bkr	32.6	<10.0		Interim operating solution
STOC-NP-VD-12	LEPRINO 115 kV	TESLA 115 kV Bus 1 and Bus 2 - CB 102 Failure	C2	Stuck Bkr	32.1	<10.0		Interim operating solution
STOC-NP-VD-13	MANTECA 115 kV	TESLA 115 kV Bus 1 and Bus 2 - CB 102 Failure	C2	Stuck Bkr	30.1	<10.0		Interim operating solution
STOC-NP-VD-14	SAFEWAY 115 kV	TESLA 115 kV Bus 1 and Bus 2 - CB 102 Failure	C2	Stuck Bkr	32.9	<10.0		Interim operating solution
STOC-NP-VD-15	BNTA CRB 60 kV	TESLA 115 kV Bus 1 and Bus 2 - CB 102 Failure	C2	Stuck Bkr	26.6	<10.0		Interim operating solution
STOC-NP-VD-16	CL AMMNA 115 kV	TESLA 115 kV Bus 1 and Bus 2 - CB 102 Failure	C2	Stuck Bkr	31.0	<10.0		Interim operating solution
STOC-NP-VD-17	ELLS GTY 115 kV	TESLA 115 kV Bus 1 and Bus 2 - CB 102 Failure	C2	Stuck Bkr	33.4	<10.0		Interim operating solution
STOC-NP-VD-18	FROGTOWN 115 kV	TESLA 115 kV Bus 1 and Bus 2 - CB 102 Failure	C2	Stuck Bkr	16.4	<10.0		Interim operating solution

2013/2014 ISO Reliability Assessment - Study Results

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



**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2015 Summer Off-Peak	2018 Summer Light Load	N/A	
STOC-NP-VD-19	GRONMYER 60 kV	TESLA 115 kV Bus 1 and Bus 2 - CB 102 Failure	C2	Stuck Bkr	26.4	<10.0		Interim operating solution
STOC-NP-VD-20	LYOTH-SP 60 kV	TESLA 115 kV Bus 1 and Bus 2 - CB 102 Failure	C2	Stuck Bkr	26.9	<10.0		Interim operating solution
STOC-NP-VD-21	OI GLASS 115 kV	TESLA 115 kV Bus 1 and Bus 2 - CB 102 Failure	C2	Stuck Bkr	32.6	<10.0		Interim operating solution
STOC-NP-VD-22	STANISLS 115 kV	TESLA 115 kV Bus 1 and Bus 2 - CB 102 Failure	C2	Stuck Bkr	17.2	<10.0		Interim operating solution
STOC-NP-VD-23	CH.STN 115 kV	TESLA 115 kV Bus 1 and Bus 2 - CB 102 Failure	C2	Stuck Bkr	10.4	<10.0		Interim operating solution
STOC-NP-VD-24	MILLER 115 kV	TESLA 115 kV Bus 1 and Bus 2 - CB 102 Failure	C2	Stuck Bkr	28.1	<10.0		Interim operating solution
STOC-NP-VD-25	NEWMAN 60 kV	TESLA 115 kV Bus 1 and Bus 2 - CB 102 Failure	C2	Stuck Bkr	24.8	<10.0		Interim operating solution
STOC-NP-VD-26	PEORIA 115 kV	TESLA 115 kV Bus 1 and Bus 2 - CB 102 Failure	C2	Stuck Bkr	10.7	<10.0		Interim operating solution
STOC-NP-VD-27	GUSTINE 60 kV	TESLA 115 kV Bus 1 and Bus 2 - CB 102 Failure	C2	Stuck Bkr	24.2	<10.0		Interim operating solution
STOC-NP-VD-28	R.TRACK 115 kV	TESLA 115 kV Bus 1 and Bus 2 - CB 102 Failure	C2	Stuck Bkr	12.0	<10.0		Interim operating solution
STOC-NP-VD-29	WESTLEY 60 kV	TESLA 115 kV Bus 1 and Bus 2 - CB 102 Failure	C2	Stuck Bkr	26.9	<10.0		Interim operating solution
STOC-NP-VD-30	CRWS LDG 60 kV	TESLA 115 kV Bus 1 and Bus 2 - CB 102 Failure	C2	Stuck Bkr	25.9	<10.0		Interim operating solution
STOC-NP-VD-31	INGRM C. 115 kV	TESLA 115 kV Bus 1 and Bus 2 - CB 102 Failure	C2	Stuck Bkr	29.1	<10.0		Interim operating solution
STOC-NP-VD-32	TEICHERT 115 kV	TESLA 115 kV Bus 1 and Bus 2 - CB 102 Failure	C2	Stuck Bkr	29.0	<10.0		Interim operating solution
STOC-NP-VD-33	VALLY HM 115 kV	TESLA 115 kV Bus 1 and Bus 2 - CB 102 Failure	C2	Stuck Bkr	24.0	<10.0		Interim operating solution



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



High/Low Voltage

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2015 Summer Off-Peak	2018 Summer Light Load	N/A	
STOC-NP-V-1	TESLA 115 kV	Normal	A	N-0	<1.05	1.07		Under review for possible exemption
STOC-NP-V-2	TRACY 115 kV	Normal	A	N-0	<1.05	1.06		Under review for possible exemption
STOC-NP-V-3	KASSON 115 kV	Normal	A	N-0	<1.05	1.06		Under review for possible exemption
STOC-NP-V-4	VIERRA 115 kV	Normal	A	N-0	<1.05	1.06		Under review for possible exemption
STOC-NP-V-5	AEC_300 115 kV	Normal	A	N-0	<1.05	1.07		Under review for possible exemption
STOC-NP-V-6	CAMANACH 230 kV	Normal	A	N-0	<1.05	1.06		Under review for possible exemption
STOC-NP-V-7	FAYETTE 115 kV	Normal	A	N-0	<1.05	1.07		Under review for possible exemption
STOC-NP-V-8	GRANITE 115 kV	Normal	A	N-0	<1.05	1.06		Under review for possible exemption
STOC-NP-V-9	HERDLYN 60 kV	Normal	A	N-0	1.07	<1.05		Under review for possible exemption
STOC-NP-V-10	LAMMERS 115 kV	Normal	A	N-0	<1.05	1.06		Under review for possible exemption
STOC-NP-V-11	LEPRINO 115 kV	Normal	A	N-0	<1.05	1.06		Under review for possible exemption
STOC-NP-V-12	SAFEWAY 115 kV	Normal	A	N-0	<1.05	1.06		Under review for possible exemption
STOC-NP-V-13	SCHULTE 115 kV	Normal	A	N-0	<1.05	1.06		Under review for possible exemption
STOC-NP-V-14	TESLA D 230 kV	Normal	A	N-0	<1.05	1.06		Under review for possible exemption
STOC-NP-V-15	TESLA E 230 kV	Normal	A	N-0	<1.05	1.06		Under review for possible exemption
STOC-NP-V-16	ALTENRGY 115 kV	Normal	A	N-0	<1.05	1.07		Under review for possible exemption
STOC-NP-V-17	B.BTHNY- 60 kV	Normal	A	N-0	1.07	<1.05		Under review for possible exemption
STOC-NP-V-18	CAMANCPP 230 kV	Normal	A	N-0	<1.05	1.06		Under review for possible exemption
STOC-NP-V-19	CATARACT 115 kV	Normal	A	N-0	1.05	1.07		Under review for possible exemption

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



High/Low Voltage

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2015 Summer Off-Peak	2018 Summer Light Load	N/A	
STOC-NP-V-20	CL AMMNA 115 kV	Normal	A	N-0	<1.05	1.06		Under review for possible exemption
STOC-NP-V-21	ELLS GTY 115 kV	Normal	A	N-0	<1.05	1.07		Under review for possible exemption
STOC-NP-V-22	FROGTOWN 115 kV	Normal	A	N-0	<1.05	1.06		Under review for possible exemption
STOC-NP-V-23	GWFTRACY 115 kV	Normal	A	N-0	<1.05	1.06		Under review for possible exemption
STOC-NP-V-24	HJ HEINZ 115 kV	Normal	A	N-0	<1.05	1.06		Under review for possible exemption
STOC-NP-V-25	MCD_ISLE 60 kV	Normal	A	N-0	<1.05	1.08		Under review for possible exemption
STOC-NP-V-26	MDL_RIVR 60 kV	Normal	A	N-0	<1.05	1.08		Under review for possible exemption
STOC-NP-V-27	OI GLASS 115 kV	Normal	A	N-0	<1.05	1.06		Under review for possible exemption
STOC-NP-V-28	SOUTH BY 60 kV	Normal	A	N-0	1.08	<1.05		Under review for possible exemption
STOC-NP-V-29	SP CMPNY 115 kV	Normal	A	N-0	<1.05	1.05		Under review for possible exemption
STOC-NP-V-30	STANISLS 115 kV	Normal	A	N-0	1.06	1.07		Under review for possible exemption
STOC-NP-V-31	TESLA &1 230 kV	Normal	A	N-0	<1.05	1.06		Under review for possible exemption
STOC-NP-V-32	TH.E.DV. 115 kV	Normal	A	N-0	<1.05	1.06		Under review for possible exemption
STOC-NP-V-33	TOSCO-PP 60 kV	Normal	A	N-0	1.08	<1.05		Under review for possible exemption
STOC-NP-V-34	USWP-PAT 115 kV	Normal	A	N-0	<1.05	1.07		Under review for possible exemption
STOC-NP-V-35	WEST SDE 60 kV	Normal	A	N-0	1.07	<1.05		Under review for possible exemption
STOC-NP-V-36	MILLER 115 kV	Normal	A	N-0	<1.05	1.06		Under review for possible exemption
STOC-NP-V-37	SALADO 60 kV	Normal	A	N-0	<1.05	1.06		Under review for possible exemption

2013/2014 ISO Reliability Assessment - Study Results

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



High/Low Voltage

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2015 Summer Off-Peak	2018 Summer Light Load	N/A	
STOC-NP-V-38	SALADO 115 kV	Normal	A	N-0	<1.05	1.06		Under review for possible exemption
STOC-NP-V-39	SANDBAR 115 kV	Normal	A	N-0	1.06	1.06		Under review for possible exemption
STOC-NP-V-40	BEARDSLY 115 kV	Normal	A	N-0	1.06	1.06		Under review for possible exemption
STOC-NP-V-41	CRWS LDG 60 kV	Normal	A	N-0	<1.05	1.06		Under review for possible exemption
STOC-NP-V-42	DONNELLS 115 kV	Normal	A	N-0	1.06	1.07		Under review for possible exemption
STOC-NP-V-43	INGRM C. 115 kV	Normal	A	N-0	<1.05	1.06		Under review for possible exemption
STOC-NP-V-44	MDSTO CN 115 kV	Normal	A	N-0	<1.05	1.06		Under review for possible exemption
STOC-NP-V-45	PATTERSN 60 kV	Normal	A	N-0	<1.05	1.06		Under review for possible exemption
STOC-NP-V-46	RVRBK J2 115 kV	Normal	A	N-0	<1.05	1.06		Under review for possible exemption
STOC-NP-V-47	SJ COGEN 115 kV	Normal	A	N-0	<1.05	1.06		Under review for possible exemption
STOC-NP-V-48	SPRNG GP 115 kV	Normal	A	N-0	<1.05	1.06		Under review for possible exemption
STOC-NP-V-49	SPRNG GP 115 kV	Normal	A	N-0	1.06	<1.05		Under review for possible exemption
STOC-NP-V-50	STNSLSRP 60 kV	Normal	A	N-0	<1.05	1.06		Under review for possible exemption
STOC-NP-V-51	TEICHERT 115 kV	Normal	A	N-0	<1.05	1.06		Under review for possible exemption
STOC-NP-V-52	AVENA 115 kV	TESLA 115 kV Bus 1 and Bus 2 - CB 102 Failure	C2	Stuck Bkr	0.77	>0.9		Interim operating solution
STOC-NP-V-53	BANTA 60 kV	TESLA 115 kV Bus 1 and Bus 2 - CB 102 Failure	C2	Stuck Bkr	0.78	>0.9		Interim operating solution
STOC-NP-V-54	CALVO 60 kV	TESLA 115 kV Bus 1 and Bus 2 - CB 102 Failure	C2	Stuck Bkr	0.78	>0.9		Interim operating solution
STOC-NP-V-55	RIPON 115 kV	TESLA 115 kV Bus 1 and Bus 2 - CB 102 Failure	C2	Stuck Bkr	0.75	>0.9		Interim operating solution

2013/2014 ISO Reliability Assessment - Study Results

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



High/Low Voltage

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2015 Summer Off-Peak	2018 Summer Light Load	N/A	
STOC-NP-V-56	TRACY 115 kV	TESLA 115 kV Bus 1 and Bus 2 - CB 102 Failure	C2	Stuck Bkr	0.71	>0.9		Interim operating solution
STOC-NP-V-57	LOUISE 60 kV	TESLA 115 kV Bus 1 and Bus 2 - CB 102 Failure	C2	Stuck Bkr	0.79	>0.9		Interim operating solution
STOC-NP-V-58	VIERRA 115 kV	TESLA 115 kV Bus 1 and Bus 2 - CB 102 Failure	C2	Stuck Bkr	0.72	>0.9		Interim operating solution
STOC-NP-V-59	AEC_300 115 kV	TESLA 115 kV Bus 1 and Bus 2 - CB 102 Failure	C2	Stuck Bkr	0.71	>0.9		Interim operating solution
STOC-NP-V-60	CARBONA 60 kV	TESLA 115 kV Bus 1 and Bus 2 - CB 102 Failure	C2	Stuck Bkr	0.77	>0.9		Interim operating solution
STOC-NP-V-61	GRANITE 115 kV	TESLA 115 kV Bus 1 and Bus 2 - CB 102 Failure	C2	Stuck Bkr	0.75	>0.9		Interim operating solution
STOC-NP-V-62	LAMMERS 115 kV	TESLA 115 kV Bus 1 and Bus 2 - CB 102 Failure	C2	Stuck Bkr	0.71	>0.9		Interim operating solution
STOC-NP-V-63	LEPRINO 115 kV	TESLA 115 kV Bus 1 and Bus 2 - CB 102 Failure	C2	Stuck Bkr	0.71	>0.9		Interim operating solution
STOC-NP-V-64	MANTECA 115 kV	TESLA 115 kV Bus 1 and Bus 2 - CB 102 Failure	C2	Stuck Bkr	0.73	>0.9		Interim operating solution
STOC-NP-V-65	SAFEWAY 115 kV	TESLA 115 kV Bus 1 and Bus 2 - CB 102 Failure	C2	Stuck Bkr	0.71	>0.9		Interim operating solution
STOC-NP-V-66	BNTA CRB 60 kV	TESLA 115 kV Bus 1 and Bus 2 - CB 102 Failure	C2	Stuck Bkr	0.77	>0.9		Interim operating solution
STOC-NP-V-67	CL AMMNA 115 kV	TESLA 115 kV Bus 1 and Bus 2 - CB 102 Failure	C2	Stuck Bkr	0.72	>0.9		Interim operating solution
STOC-NP-V-68	ELLS GTY 115 kV	TESLA 115 kV Bus 1 and Bus 2 - CB 102 Failure	C2	Stuck Bkr	0.71	>0.9		Interim operating solution
STOC-NP-V-69	FROGTOWN 115 kV	TESLA 115 kV Bus 1 and Bus 2 - CB 102 Failure	C2	Stuck Bkr	0.88	>0.9		Interim operating solution
STOC-NP-V-70	GRONMYER 60 kV	TESLA 115 kV Bus 1 and Bus 2 - CB 102 Failure	C2	Stuck Bkr	0.79	>0.9		Interim operating solution
STOC-NP-V-71	LYOTH-SP 60 kV	TESLA 115 kV Bus 1 and Bus 2 - CB 102 Failure	C2	Stuck Bkr	0.78	>0.9		Interim operating solution
STOC-NP-V-72	OI GLASS 115 kV	TESLA 115 kV Bus 1 and Bus 2 - CB 102 Failure	C2	Stuck Bkr	0.71	>0.9		Interim operating solution
STOC-NP-V-73	STANISLS 115 kV	TESLA 115 kV Bus 1 and Bus 2 - CB 102 Failure	C2	Stuck Bkr	0.89	>0.9		Interim operating solution

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2015 Summer Off-Peak	2018 Summer Light Load	N/A	
STOC-NP-V-74	MILLER 115 kV	TESLA 115 kV Bus 1 and Bus 2 - CB 102 Failure	C2	Stuck Bkr	0.75	>0.9		Interim operating solution
STOC-NP-V-75	NEWMAN 60 kV	TESLA 115 kV Bus 1 and Bus 2 - CB 102 Failure	C2	Stuck Bkr	0.77	>0.9		Interim operating solution
STOC-NP-V-76	GUSTINE 60 kV	TESLA 115 kV Bus 1 and Bus 2 - CB 102 Failure	C2	Stuck Bkr	0.77	>0.9		Interim operating solution
STOC-NP-V-77	WESTLEY 60 kV	TESLA 115 kV Bus 1 and Bus 2 - CB 102 Failure	C2	Stuck Bkr	0.76	>0.9		Interim operating solution
STOC-NP-V-78	CRWS LDG 60 kV	TESLA 115 kV Bus 1 and Bus 2 - CB 102 Failure	C2	Stuck Bkr	0.76	>0.9		Interim operating solution
STOC-NP-V-79	INGRM C. 115 kV	TESLA 115 kV Bus 1 and Bus 2 - CB 102 Failure	C2	Stuck Bkr	0.74	>0.9		Interim operating solution
STOC-NP-V-80	TEICHERT 115 kV	TESLA 115 kV Bus 1 and Bus 2 - CB 102 Failure	C2	Stuck Bkr	0.75	>0.9		Interim operating solution
STOC-NP-V-81	VALLY HM 115 kV	TESLA 115 kV Bus 1 and Bus 2 - CB 102 Failure	C2	Stuck Bkr	0.79	>0.9		Interim operating solution



*Transient Stability*

ID	Contingency	Category	Category Description	Transient Stability Performance			Potential Mitigation Solutions
				2015 Summer Off-Peak	2018 Summer Light Load	Select..	

No issues identified.

**APPENDIX C-8**

**PG&E Greater Bay Area – East Bay**

**Reliability Assessment Study Results**

2013/2014 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
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
Ebay-SP-T-01	Lone Tree - Cayetano 230 kV Line	Base system (n-0)	A	N-0	<100%	101%	105%	Reduce generation in the Contra Costa Area
Ebay-SP-T-02	Oleum - North Tower - Christie 115 kV Line	B1_8_UNION CH 9.11 Unit ID 1 & B2_9_Christie-Sobrante (Oleum-Sobrante) 115kV Line	B	L-1/G-1	103%	<100%	<100%	Action Plan before the North Tower 115 kV Looping Project completion
Ebay-SP-T-03	Moraga - Claremont #1 115 kV Line	Moraga-Claremont #2 115kV Line _CRCKTCOG 18.00 Unit ID 1	B	L-1/G-1	<100%	<100%	102%	Increase generation in the Oakland Area
Ebay-SP-T-04	Moraga - Claremont #2 115 kV Line	Moraga-Claremont #1 115kV Line _CRCKTCOG 18.00 Unit ID 1	B	L-1/G-1	<100%	<100%	102%	Increase generation in the Oakland Area
Ebay-SP-T-05	Moraga - Oakland "J" 115kV Line	San Leandro-Oakland J 115kV Line & Entire RCEC generation	B	L-1/G-1	<100%	115%	119%	Short Term: Action plan - Open Grant-J line at Oakland J following RCEC outage Long Term: Reconductor Moraga-Oakland J 115 kV Line
Ebay-SP-T-06	Moraga - Claremont #1 115 kV Line	BUS FAULT AT 32786 OAK C115 115.00 Sec D	C1	Bus	<100%	<100%	104%	Increase generation in the Oakland Area
Ebay-SP-T-07	Moraga - Claremont #2 115 kV Line	BUS FAULT AT 32786 OAK C115 115.00 Sec D	C1	Bus	<100%	<100%	104%	Increase generation in the Oakland Area
Ebay-SP-T-08	Moraga - Oakland #1 115 kV Line	BUS FAULT AT 32790 STATIN X 115.00 Bus #1	C1	Bus	<100%	<100%	106%	Increase generation in the Oakland Area
Ebay-SP-T-09	Moraga - Claremont #1 115 kV Line	CB FAULT AT 32790 STATIN X 115 CB372	C2	Breaker	<100%	104%	112%	Increase generation in the Oakland Area
Ebay-SP-T-10	Moraga - Claremont #2 115 kV Line	CB FAULT AT 32790 STATIN X 115 CB372	C2	Breaker	<100%	104%	112%	Increase generation in the Oakland Area
Ebay-SP-T-11	Oakland C-L #1 115 kV Cable	C2-2_CB FAULT AT 32780 CLARMNT 115 CB122	C2	Breaker	106%	108%	113%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate



2013/2014 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
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
Ebay-SP-T-12	Moraga - Claremont #1 115 kV Line	Oakland C - Oakland L #1 115kV Cable _Moraga-Claremont #2 115kV Line	C3	N-1-1	<100%	126%	136%	Increase generation in the Oakland Area
Ebay-SP-T-13	Moraga - Claremont #2 115 kV Line	Oakland C - Oakland L #1 115kV Cable _Moraga-Claremont #1 115kV Line	C3	N-1-1	<100%	126%	136%	Increase generation in the Oakland Area
Ebay-SP-T-14	C-L #1 115 kV Cable	Claremont K - Oakland D #1 115kV Cable & Claremont K - Oakland D #2 115kV Cable	C3	N-1-1	106%	108%	113%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Ebay-SP-T-15	Christie - Sobrante 115 kV Line	Sobrante-EI Cerrito STA G #1 115kV Line _Sobrante-EI Cerrito STA G #2 115kV Line	C3	N-1-1	132%	109%	112%	Action Plan plus the North Tower 115 kV Looping Project completion
Ebay-SP-T-16	Sobrante - "G" #1 115 kV Line	Christie-Sobrante (Oleum-Sobrante) 115kV_Sobrante-EI Cerrito STA G #2 115kV Line	C3	N-1-1	105%	<100%	<100%	Action Plan before the North Tower 115 kV Looping Project completion
Ebay-SP-T-17	Sobrante - "G" #2 115 kV Line	Christie-Sobrante (Oleum-Sobrante) 115kV_Sobrante-EI Cerrito STA G #1 115kV Line	C3	N-1-1	105%	<100%	<100%	Action Plan before the North Tower 115 kV Looping Project completion
Ebay-SP-T-18	Oleum-Christie 115 kV Line	C5_3_Sobrante-G Nos. 1 & 2 115 kV lines	C5	DCTL	<100%	110%	108%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Ebay-SP-T-19	Oleum - North Tower - Christie 115 kV Line	C5_3_Sobrante-G Nos. 1 & 2 115 kV lines	C5	DCTL	120%	<100%	<100%	Action Plan before the North Tower 115 kV Looping Project completion

San Onofre Nuclear Generation Station was retired on June 7, 2013 and therefore was removed from the base cases used for the 2013/14 ISO transmission planning process.

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
EBay-SP-V-01	STD. OIL 115kV	B1_9_ChevGen1 13.80 Unit ID 1 & B2_16_Sobrante-Standard Oil #2 115kV Line	C3	N-1-1	> 0.9	0.89	0.89	Add reactive support

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2015 Summer Off-Peak	2018 Summer Light Load	N/A	
EBay-OP-V-01	UNIN CHM 60kV	Normal	A	N-0	1.06	1.06	-	Under review for possible exemption or reactive device
EBay-OP-V-02	CHRISTIE 60kV	Normal	A	N-0	1.06	1.07	-	Under review for possible exemption or reactive device
EBay-OP-V-03	PRT CSTA 60kV	Normal	A	N-0	1.06	1.06	-	Under review for possible exemption or reactive device
EBay-OP-V-04	FRANKLIN 60kV	Normal	A	N-0	1.06	1.06	-	Under review for possible exemption or reactive device
EBay-OP-V-05	SEQUOIA 60kV	Normal	A	N-0	1.06	1.06	-	Under review for possible exemption or reactive device

2013/2014 ISO Reliability Assessment - Study Results

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



*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.

2013/2014 ISO Reliability Assessment - Study Results

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



**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.

2013/2014 ISO Reliability Assessment - Study Results

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



**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

2013/2014 ISO Reliability Assessment - Study Results

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



**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**

**Reliability Assessment Study Results**



**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
Diab-SP-T-01	Pittsburg 230/115 kV Transformer No. 12	B3_8_Pittsburg 230/115kV Transformer #13 & B3_27_LMEC GSU CC2	B	N-1-1	124.00%	< 100%	< 100%	Short Term: curtail load at Clayton Long Term: Pittsburg 230/115 kV Transformer Addition project
Diab-SP-T-02	Pittsburg 230/115 kV Transformer No. 13	B3_7_Pittsburg 230/115kV Transformer #12 & B3_27_LMEC GSU CC2	B	N-1-1	144.00%	< 100%	< 100%	Short Term: curtail load at Clayton Long Term: Pittsburg 230/115 kV Transformer Addition project
Diab-SP-T-03	Pittsburg - Clayton #3 115 kV Line	C1-24_BUS FAULT AT 32970 CLAYTN 115.00 Bus #2	C1	Bus	102%	91%	92%	Pittsburg-Lakewood SPS
Diab-SP-T-04	Lakewood - Meadow Lane - Clayton 115 kV Line	C1-23_BUS FAULT AT 32970 CLAYTN 115.00 Bus #1	C1	Bus	139%	120%	124%	Pittsburg-Lakewood SPS
Diab-SP-T-05	Contra Costa - Moraga #1 230 KV Line	C2-6_CB FAULT AT 30525 C.COSTA 230 CB820	C2	Breaker	115%	< 100%	< 100%	Short Term: Action Plan - Reduce CoCo Area gen Long Term: Contra Costa-Moraga Reconductor Project
Diab-SP-T-06	Moraga 230/115 kV Transformer No. 2	C2-21_CB FAULT AT 33020 MORAGA 115 CB432	C2	Breaker	148%	< 100%	< 100%	Short Term: Action Plan - Drop load at Oakland 115 kV system Long Term: Moraga 230/115 kV Transformrer Replacement project
Diab-SP-T-07	Pittsburg - Clayton #3 115 kV Line	C2-16_CB FAULT AT 32950 PITTSBURG 115 CB222	C2	Breaker	118%	106%	108%	Pittsburg-Lakewood SPS
Diab-SP-T-08	Moraga - Lakewood 115 kV Line	C2-17_CB FAULT AT 32970 CLAYTN 115 CB102	C2	Breaker	243%	244%	245%	Pittsburg-Lakewood SPS (see Diab-SP-T-10)
Diab-SP-T-09	Oleum - Martinez 115 kV Line	C2-12_CB FAULT AT 30540 SOBRANTE 230 CB202	C2	Breaker	108%	< 100%	< 100%	Short Term: Action Plan - curtail load at El Cerrito G Long Term: North Tower 115 kV Looping project

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
Diab-SP-T-10	Sobrante - Grizzly - Claremont #2 115 kV Line	C2-13_CB FAULT AT 30550 MORAGA 230 CB202	C2	Breaker	103%	< 100%	< 100%	Short Term: Action Plan - curtail load at El Cerrito G Long Term: North Tower 115 kV Looping project
Diab-SP-T-11	Sobrante - Morage 115 kV Line	C2-12_CB FAULT AT 30540 SOBRANTE 230 CB202	C2	Breaker	< 100%	102%	106%	Short Term: Action Plan
Diab-SP-T-12	Sobrante - Morage 115 kV Line	C2-13_CB FAULT AT 30550 MORAGA 230 CB202	C2	Breaker	127%	< 100%	< 100%	Action Plan - close Oak J source to Grant and/or curtail load on Oakland 115 kV system
Diab-SP-T-13	Contra Costa - Moraga #1 230 KV Line	B2_17_Contra Costa-Las Positas 230kV Line & B2_13_Contra Costa-Moraga #2 230kV Line	C3	N-1-1	107.00%	< 100%	< 100%	Short Term: Action Plan - reduce Gateway/Marsh Landing generation Long Term: Contra Costa-Moraga 230 kV Reconductor
Diab-SP-T-14	Moraga 230/115 kV Transformer No. 2	B3_16_Moraga 230/115kV Transformer #1 & B3_17_Moraga 230/115kV Transformer #3	C3	N-1-1	149.00%	< 100%	< 100%	Short Term: Action Plan - Drop load at Oakland 115 kV system Long Term: Moraga 230/115 kV Transformer Replacement project
Diab-SP-T-15	Pittsburg - Clayton #4 115 kV Line	B2_46_Pittsburg-Clayton #1 115kV Line & B2_53_Pittsburg-Clayton #3 115 kV Line	C3	N-1-1	123.00%	111.00%	113.00%	Pittsburg-Lakewood SPS
Diab-SP-T-16	Pittsburg - Clayton #3 115 kV Line	B2_46_Pittsburg-Clayton #1 115kV Line & B2_47_Pittsburg-Clayton #4 115kV Line	C3	N-1-1	114.00%	103.00%	105.00%	Pittsburg-Lakewood SPS
Diab-SP-T-17	Oleum - Martinez 115 kV Line	B2_39_Sobrante-El Cerrito STA G #1 115kV Line & B2_40_Sobrante-El Cerrito STA G #2 115kV Line	C3	N-1-1	129.00%	< 100%	< 100%	Short Term: Action Plan - curtail load at El Cerrito G Long Term: Sobrante-R 115 kV Reconductor and Loop project

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
Diab-SP-T-18	Pittsburg - Clayton #1 115 kV Line	C5_24_Pittsburg-Clayton Nos. 3 & 4 115 kV lines	C5	DCTL	108.00%	< 100%	< 100%	Pittsburg-Lakewood SPS
Diab-SP-T-19	Moraga - Lakewood 115 kV Line	C5_27_Lakewood-Clayton and Lakewood-Meadow Lane-Clayton 115 kV line	C5	DCTL	124.00%	< 100%	< 100%	Pittsburg - Lakewood SPS

2013/2014 ISO Reliability Assessment - Study Results

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



**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Summer Off-Peak	2018 Summer Light Load	N/A	
Diab-OP-T-01	Pittsburg - Los Medanos #1 115 kV Line	B3_23_DEC GSU STG1 & B2_49_Pittsburg-Los Mendanos #2 115kV Line	B	L-1/G-1	106%	< 100%	-	Reduce LMEC Generation
Diab-OP-T-02	Pittsburg - Los Medanos #1 115 kV Line	B2_49_Pittsburg-Los Mendanos #2 115kV Line	B	N-1	104%	< 100%	-	Reduce LMEC Generation
Diab-OP-T-03	Pittsburg - Los Medanos #1 115 kV Line	C1-20_BUS FAULT AT 32950 PITSBURG 115.00 Sec 2D	C1	Bus	104%	< 100%	-	Reduce LMEC Generation
Diab-OP-T-04	Pittsburg - Los Medanos #1 115 kV Line	C2-16_CB FAULT AT 32950 PITSBURG 115 CB222	C2	Breaker	104%	< 100%	-	Pittsburg-Lakewood SPS
Diab-OP-T-05	Oleum - Martinez 115 kV Line	B3_7_Pittsburg 230/115kV Transformer #12 & B3_8_Pittsburg 230/115kV Transformer #13	C3	N-1-1	101%	< 100%	-	Short Term: reduce LMEC generation Long Term: North Tower 115 kV Looping project

2013/2014 ISO Reliability Assessment - Study Results

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
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
Diab-SP-DV-01	EBMUDGRY 115kV	C2-17_CB FAULT AT 32970 CLAYTN 115 CB102	C2	Breaker	-19.00%	-18.00%	-19.00%	Pittsburg-Lakewood SPS
Diab-SP-DV-02	LAKEWD-C 115kV	C2-17_CB FAULT AT 32970 CLAYTN 115 CB102	C2	Breaker	-18.00%	-18.00%	-18.00%	Pittsburg-Lakewood SPS
Diab-SP-DV-03	LAKEWD-M 115kV	C2-17_CB FAULT AT 32970 CLAYTN 115 CB102	C2	Breaker	-18.00%	-18.00%	-18.00%	Pittsburg-Lakewood SPS
Diab-SP-DV-04	LK_REACT 115kV	C2-17_CB FAULT AT 32970 CLAYTN 115 CB102	C2	Breaker	-10.00%	-9.00%	-9.00%	Pittsburg-Lakewood SPS
Diab-SP-DV-05	LKWD_JCT 115kV	C2-17_CB FAULT AT 32970 CLAYTN 115 CB102	C2	Breaker	-18.00%	-17.00%	-18.00%	Pittsburg-Lakewood SPS
Diab-SP-DV-06	MEDW LNE 115kV	C2-17_CB FAULT AT 32970 CLAYTN 115 CB102	C2	Breaker	-19.00%	-18.00%	-19.00%	Pittsburg-Lakewood SPS
Diab-SP-DV-07	MRAGA 2M 230kV	C2-13_CB FAULT AT 30550 MORAGA 230 CB202	C2	Breaker	-11.00%	<10%	<10%	Pittsburg-Lakewood SPS

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
Diab-SP-V-01	EBMUDGRY	C2-17_CB FAULT AT 32970 CLAYTN 115 CB102	C2	Breaker	0.80	0.80	0.81	Pittsburg-Lakewood SPS
Diab-SP-V-02	LAKEWD-C	C2-17_CB FAULT AT 32970 CLAYTN 115 CB102	C2	Breaker	0.80	0.81	0.81	Pittsburg-Lakewood SPS
Diab-SP-V-03	LAKEWD-M	C2-17_CB FAULT AT 32970 CLAYTN 115 CB102	C2	Breaker	0.80	0.81	0.81	Pittsburg-Lakewood SPS
Diab-SP-V-04	LK_REACT	C2-17_CB FAULT AT 32970 CLAYTN 115 CB102	C2	Breaker	0.89	0.89	0.89	Pittsburg-Lakewood SPS
Diab-SP-V-05	LKWD_JCT	C2-17_CB FAULT AT 32970 CLAYTN 115 CB102	C2	Breaker	0.80	0.81	0.81	Pittsburg-Lakewood SPS
Diab-SP-V-06	MEDW LNE	C2-17_CB FAULT AT 32970 CLAYTN 115 CB102	C2	Breaker	0.79	0.80	0.80	Pittsburg-Lakewood SPS

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2015 Summer Off-Peak	2018 Summer Light Load	N/A	
Diab-OP-V-01	MARSH 60kV	B3_21_Contra Costa Sub 115/60kV Transformer #2	B	N-1	> 0.95	1.11	-	Review transformer tap settings and voltage schedules
Diab-OP-V-02	MARSH 60kV	C1-28_BUS FAULT AT 33000 CC SUB 115.00 Bus #2	C1	Bus	> 0.9	1.11	-	Review transformer tap settings and voltage schedules
Diab-OP-V-03	CC SUB 60kV	C1-36_BUS FAULT AT 33050 CC SUB 60.00 Bus #2	C1	Bus	> 0.9	1.12	-	Review transformer tap settings and voltage schedules

**Transient Stability**

ID	Contingency	Category	Category Description	Transient Stability Performance			Potential Mitigation Solutions
				2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
Diab-TS-01	SLG fault at DEC with delayed clearing	C6	Generator SLG fault with delayed clearing	Transient Voltage Dip exceeding 30% at some buses; and Transient Voltage Dip exceeding 20% for more than 40 cycles at some load buses in the Pittsburg Area	Transient Voltage Dip exceeding 30% at some buses; and Transient Voltage Dip exceeding 20% for more than 40 cycles at some load buses in the Pittsburg Area	Transient Voltage Dip exceeding 30% at some buses; and Transient Voltage Dip exceeding 20% for more than 40 cycles at some load buses in the Pittsburg Area	Potential Upgrade of the Voltage Support in the Pittsburg Areas



2013/2014 ISO Reliability Assessment - Study Results

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



**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.

2013/2014 ISO Reliability Assessment - Study Results

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



**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.

2013/2014 ISO Reliability Assessment - Study Results

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



**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

2013/2014 ISO Reliability Assessment - Study Results

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



**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-10**

**PG&E Greater Bay Area – San Francisco**

**Reliability Assessment Study Results**

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
SF-SP-T-01	AY-2 115 kV Line	B2_8_Potrero-Mission (AX) 115kV Cable	B	N-1	<100%	107%	101%	Reduce TBC output and/or modify TBC DC Runback scheme
SF-SP-T-02	AX 115 kV Line	B2_7_Potrero-Larkin #2 (AY-2) 115kV Cable	B	N-1	116%	127%	120%	Short Term: Existing TBC DC Runback Scheme Long Term: Modify TBC DC Runback Scheme
SF-SP-T-03	AY-2 115 kV Line	C1-4_BUS FAULT AT 33204 POTRERO 115.00 Sec 2D	C1	Bus	104%	<100%	<100%	Short Term: Action Plan - curtail load at Larkin Long Term: Potrero 115 kV Bus upgrade
SF-SP-T-04	AX 115 kV Line	C1-3_BUS FAULT AT 33204 POTRERO 115.00 Sec 1D	C1	Bus	105%	<100%	<100%	Existing TBC DC Runback Scheme
SF-SP-T-05	AX 115 kV Line	C1-5_BUS FAULT AT 33204 POTRERO 115.00 Sec 1E	C1	Bus	<100%	121%	120%	Short Term: Action Plan - curtail load at Larkin Long Term: Potrero 115 kV Bus upgrade
SF-SP-T-06	AY-2 115 kV Line	C2-4_CB FAULT AT 33204 POTRERO 115 CB102	C2	Breaker	159%	105%	<100%	Short Term: Reduce TBC output Long Term: Potrero 115 kV Bus upgrade
SF-SP-T-07	AX 115 kV Line	C2-2_CB FAULT AT 33204 POTRERO 115 CB412	C2	Breaker	101%	126%	127%	Short Term: Reduce TBC output Long Term: Potrero 115 kV Bus upgrade
SF-SP-T-08	AY-1 115 kV Line	B2_15_Martin-Larkin (HY-1) 115kV Cable & B2_6_Mission-Larkin (XY-1) 115kV Cable	C3	N-1-1	177%	183%	179%	Action Plan - clear line and reenergize Larkin 115 kV bus after first contingency
SF-SP-T-09	XY-1 115 kV Line	B2_5_Potrero-Larkin #1 (AY-1) 115kV Cable & B2_7_Potrero-Larkin #2 (AY-2) 115kV Cable	C3	N-1-1	106%	116%	114%	Action Plan - reduce TBC to 0 MW and drop up to 30 MW of load at Larkin
SF-SP-T-10	AY-2 115 kV Line	B2_5_Potrero-Larkin #1 (AY-1) 115kV Cable & B2_8_Potrero-Mission (AX) 115kV Cable	C3	N-1-1	125%	135%	130%	Action Plan - reduce TBC import and/or modify TBC DC Runback

2013/2014 ISO Reliability Assessment - Study Results

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
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
SF-SP-T-11	AX 115 kV Line	B2_9_Hunters Point-Mission #1 (PX-1) 115kV Cable & B2_7_Potrero-Larkin #2 (AY-2) 115kV Cable	C3	N-1-1	137%	147%	142%	Action Plan - reduce TBC import and/or modify TBC DC Runback

San Onofre Nuclear Generation Station was retired on June 7, 2013 and therefore was removed from the base cases used for the 2013/14 ISO transmission planning process.

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Winter Peak	2018 Winter Peak	2023 Winter Peak	
SF-WP-T-01	AY-2 115 kV Line	B2_8_Potrero-Mission (AX) 115kV Cable	B	N-1	<100%	102%	107%	Reduce TBC output and/or modify TBC DC Runback scheme
SF-WP-T-02	AX 115 kV Line	B2_7_Potrero-Larkin #2 (AY-2) 115kV Cable	B	N-1	110%	121%	127%	Existing TBC DC Runback
SF-WP-T-03	AX 115 kV Line	C1-5_BUS FAULT AT 33204 POTRERO 115.00 Sec 1E	C1	Bus	<100%	120%	122%	Existing TBC DC Runback
SF-WP-T-04	AY-2 115 kV Line	C2-4_CB FAULT AT 33204 POTRERO 115 CB102	C2	Breaker	150%	100%	105%	Reduce TBC output and/or modify TBC DC Runback scheme
SF-WP-T-05	AX 115 kV Line	C2-2_CB FAULT AT 33204 POTRERO 115 CB412	C2	Breaker	<100%	124%	128%	Reduce TBC output and/or modify TBC DC Runback scheme
SF-WP-T-06	AY-1 115 kV Line	B2_15_Martin-Larkin (HY-1) 115kV Cable & B2_6_Mission-Larkin (XY-1) 115kV Cable	C3	N-1-1	165%	172%	182%	Action Plan - clear line and reenergize Larkin 115 kV bus after first contingency
SF-WP-T-07	XY-1 115 kV Line	B2_5_Potrero-Larkin #1 (AY-1) 115kV Cable & B2_7_Potrero-Larkin #2 (AY-2) 115kV Cable	C3	N-1-1	103%	112%	118%	Reduce TBC output and/or modify TBC DC Runback scheme
SF-WP-T-08	AY-2 115 kV Line	B2_8_Potrero-Mission (AX) 115kV Cable & B2_5_Potrero-Larkin #1 (AY-1) 115kV Cable	C3	N-1-1	118%	129%	135%	Reduce TBC output and/or modify TBC DC Runback scheme
SF-WP-T-09	AX 115 kV Line	B2_5_Potrero-Larkin #1 (AY-1) 115kV Cable & B2_7_Potrero-Larkin #2 (AY-2) 115kV Cable	C3	N-1-1	138%	150%	157%	Reduce TBC output and/or modify TBC DC Runback scheme, curtail load at Larkin



**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Summer Off-Peak	2018 Summer Light Load	N/A	
SF-OP-T-01	AY-2 115 kV Line	C2-4_CB FAULT AT 33204 POTRERO 115 CB102	C2	Breaker	123%	<100%	-	Short Term: Reduce TBC output Long Term: Potrero 115 kV Bus upgrade
SF-OP-T-02	AX 115 kV Line	B2_11_Potrero-Hunters Point (AP-1) 115kV Cable & B2_7_Potrero-Larkin #2 (AY-2) 115kV Cable	C3	N-1-1	104%	<100%	-	Existing TBC DC Runback scheme

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
SF-SP-VD-01	MARTIN 60 KV	B2_26_Potrero-Potrero SVC 115kV section	B	N-1	12.00%	12.00%	< 0.95	Review Martin transformer tap and voltage schedule settings
SF-SP-VD-02	MARTIN 60 KV	C1-5_BUS FAULT AT 33204 POTRERO 115.00 Sec 1E	C1	Bus	12.00%	12.00%	< 0.9	Review Martin transformer tap and voltage schedule settings
SF-SP-VD-03	MARTIN 60 KV	C2-1_CB FAULT AT 33204 POTRERO 115 CB302	C2	Breaker	14.00%	14.00%	< 0.9	Review Martin transformer tap and voltage schedule settings
SF-SP-VD-04	MARTIN 60 KV	B2_10_Hunters Point-Mission #2 (PX-2) 115kV Cable & B2_12_Potrero-TBC 115kV section	C3	N-1-1	11.00%	11.00%	< 0.9	Review Martin transformer tap and voltage schedule settings

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2015 Winter Peak	2018 Winter Peak	2023 Winter Peak	
SF-WP-VD-1	MARTIN 60kV	B2_26_Potrero-Potrero SVC 115kV section	B	N-1	< 5%	< 5%	13.00%	Review Martin transformer tap and voltage schedule settings
SF-WP-VD-2	MARTIN 60kV	B2_4_San Mateo-Martin 230kV Line	B	N-1	-15.00%	< 5%	< 0.95	Review Martin transformer tap and voltage schedule settings
SF-WP-VD-3	MARTIN 60kV	C1-3_BUS FAULT AT 33204 POTRERO 115.00 Sec 1D	C1	Bus	-14.00%	< 10%	< 10%	Review Martin transformer tap and voltage schedule settings
SF-WP-VD-4	MARTIN 60kV	C1-5_BUS FAULT AT 33204 POTRERO 115.00 Sec 1E	C1	Bus	< 10%	< 10%	13.00%	Review Martin transformer tap and voltage schedule settings
SF-WP-VD-5	MARTIN 60kV	C2-4_CB FAULT AT 33204 POTRERO 115 CB102	C2	Breaker	-15.00%	< 10%	< 10%	Review Martin transformer tap and voltage schedule settings
SF-WP-VD-6	MARTIN 60kV	B2_1_Martin-Embarcadero #2 (HZ-2) 115kV Cable & B2_2_Martin-Embarcadero #1 (HZ-1) 115kV Cable	C3	N-1-1	< 10%	10.00%	12.00%	Review Martin transformer tap and voltage schedule settings
SF-WP-VD-7	MARTIN 60kV	C5_1_Martin-Daly City Nos. 1 & 2 115 kV lines	C5	DCTL	-16.00%	-9.00%	-8.00%	Review Martin transformer tap and voltage schedule settings

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2015 Summer Off-Peak	2018 Summer Light Load	N/A	
SF-OP-DV-01	MARTIN 60kV	B2_26_Potrero-Potrero SVC 115kV section	B	N-1	-18.00%	< 5%	-	Review Martin transformer tap and voltage schedule settings
SF-OP-DV-02	MARTIN 60kV	B3_5_Martin 115/60kV Transformer #6	B	N-1	< 5%	-12.00%	-	Review Martin transformer tap and voltage schedule settings
SF-OP-DV-03	MARTIN 60kV	C1-5_BUS FAULT AT 33204 POTRERO 115.00 Sec 1E	C1	Bus	-18.00%	< 10%	-	Review Martin transformer tap and voltage schedule settings
SF-OP-DV-04	MARTIN 60kV	C2-2_CB FAULT AT 33204 POTRERO 115 CB412	C2	Breaker	-18.00%	< 10%	-	Review Martin transformer tap and voltage schedule settings
SF-OP-DV-05	MARTIN 60kV	C5_2_Martin-East Grand 115 kV and San Mateo-Martin No. 6 115 kV	C5	DCTL	-11.00%	< 10%	-	Review Martin transformer tap and voltage schedule settings



**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
SF-SP-V-01	MARTIN 60kV	B2_25_Martin-Sneath Lane 60kV Line	B	N-1	1.11	1.12	1.16	Review Martin transformer tap and voltage schedule settings

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2015 Winter Peak	2018 Winter Peak	2023 Winter Peak	
SF-WP-V-1	MARTIN 60kV	B2_4_San Mateo-Martin 230kV Line	B	N-1	1.14	> 0.95	> 0.95	Review Martin transformer tap and voltage schedule settings
SF-WP-V-2	MARTIN 60kV	C1-3_BUS FAULT AT 33204 POTRERO 115.00 Sec 1D	C1	Bus	1.13	1.13	1.13	Review Martin transformer tap and voltage schedule settings
SF-WP-V-3	MARTIN 60kV	C2-4_CB FAULT AT 33204 POTRERO 115 CB102	C2	Breaker	1.14	1.14	1.14	Review Martin transformer tap and voltage schedule settings
SF-WP-V-4	MARTIN 60kV	C5_1_Martin-Daly City Nos. 1 & 2 115 kV lines	C5	DCTL	1.15	1.15	1.15	Review Martin transformer tap and voltage schedule settings

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2015 Summer Off-Peak	2018 Summer Light Load	N/A	
SF-OP-V-01	MARTIN 60kV	B2_25_Martin-Sneath Lane 60kV Line	B	N-1	> 0.95	1.24	-	Review area tap settings and voltage schedules
SF-OP-V-02	MARTIN 60kV	B2_26_Potrero-Potrero SVC 115kV section	B	N-1	1.16	> 0.95	-	Review area tap settings and voltage schedules
SF-OP-V-03	POT_SVC 115kV	B2_4_San Mateo-Martin 230kV Line	B	N-1	> 0.95	1.12	-	Review area tap settings and voltage schedules
SF-OP-V-04	POTRERO 115kV	B2_26_Potrero-Potrero SVC 115kV section	B	N-1	> 0.95	1.13	-	Review area tap settings and voltage schedules
SF-OP-V-05	BAYSHOR1 115kV	B2_26_Potrero-Potrero SVC 115kV section	B	N-1	> 0.95	1.13	-	Review area tap settings and voltage schedules
SF-OP-V-06	EMBRCDRD 230kV	B2_26_Potrero-Potrero SVC 115kV section	B	N-1	> 0.95	1.11	-	Review area tap settings and voltage schedules
SF-OP-V-07	HNTRS PT 115kV	B2_26_Potrero-Potrero SVC 115kV section	B	N-1	> 0.95	1.13	-	Review area tap settings and voltage schedules
SF-OP-V-08	LARKIN D 115kV	B2_26_Potrero-Potrero SVC 115kV section	B	N-1	> 0.95	1.13	-	Review area tap settings and voltage schedules
SF-OP-V-09	LARKIN E 115kV	B2_26_Potrero-Potrero SVC 115kV section	B	N-1	> 0.95	1.13	-	Review area tap settings and voltage schedules
SF-OP-V-10	LARKIN F 115kV	B2_26_Potrero-Potrero SVC 115kV section	B	N-1	> 0.95	1.13	-	Review area tap settings and voltage schedules
SF-OP-V-11	MARTIN C 115kV	B2_26_Potrero-Potrero SVC 115kV section	B	N-1	> 0.95	1.13	-	Review area tap settings and voltage schedules
SF-OP-V-12	MARTIN C 230kV	B2_26_Potrero-Potrero SVC 115kV section	B	N-1	> 0.95	1.11	-	Review area tap settings and voltage schedules
SF-OP-V-13	MRT RC&1 230kV	B2_26_Potrero-Potrero SVC 115kV section	B	N-1	> 0.95	1.11	-	Review area tap settings and voltage schedules
SF-OP-V-14	MARTIN 60kV	C1-5_BUS FAULT AT 33204 POTRERO 115.00 Sec 1E	C1	Bus	1.16	1.23	-	Review area tap settings and voltage schedules
SF-OP-V-15	MISSON 115kV	C1-5_BUS FAULT AT 33204 POTRERO 115.00 Sec 1E	C1	Bus	> 0.9	1.13	-	Review area tap settings and voltage schedules
SF-OP-V-16	POTRERO 115kV	C1-5_BUS FAULT AT 33204 POTRERO 115.00 Sec 1E	C1	Bus	> 0.9	1.13	-	Review area tap settings and voltage schedules
SF-OP-V-17	POTRERO 230kV	C1-5_BUS FAULT AT 33204 POTRERO 115.00 Sec 1E	C1	Bus	> 0.9	1.11	-	Review area tap settings and voltage schedules
SF-OP-V-18	BAYSHOR1 115kV	C1-5_BUS FAULT AT 33204 POTRERO 115.00 Sec 1E	C1	Bus	> 0.9	1.13	-	Review area tap settings and voltage schedules
SF-OP-V-19	BAYSHOR2 115kV	C1-5_BUS FAULT AT 33204 POTRERO 115.00 Sec 1E	C1	Bus	> 0.9	1.13	-	Review area tap settings and voltage schedules

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2015 Summer Off-Peak	2018 Summer Light Load	N/A	
SF-OP-V-20	EMBRCDRD 230kV	C1-5_BUS FAULT AT 33204 POTRERO 115.00 Sec 1E	C1	Bus	> 0.9	1.11	-	Review area tap settings and voltage schedules
SF-OP-V-21	EMBRCDRE 230kV	C1-5_BUS FAULT AT 33204 POTRERO 115.00 Sec 1E	C1	Bus	> 0.9	1.11	-	Review area tap settings and voltage schedules
SF-OP-V-22	HNTRS PT 115kV	C1-5_BUS FAULT AT 33204 POTRERO 115.00 Sec 1E	C1	Bus	> 0.9	1.13	-	Review area tap settings and voltage schedules
SF-OP-V-23	LARKIN D 115kV	C1-5_BUS FAULT AT 33204 POTRERO 115.00 Sec 1E	C1	Bus	> 0.9	1.13	-	Review area tap settings and voltage schedules
SF-OP-V-24	LARKIN E 115kV	C1-5_BUS FAULT AT 33204 POTRERO 115.00 Sec 1E	C1	Bus	> 0.9	1.13	-	Review area tap settings and voltage schedules
SF-OP-V-25	LARKIN F 115kV	C1-5_BUS FAULT AT 33204 POTRERO 115.00 Sec 1E	C1	Bus	> 0.9	1.13	-	Review area tap settings and voltage schedules
SF-OP-V-26	MARTIN C 230kV	C1-5_BUS FAULT AT 33204 POTRERO 115.00 Sec 1E	C1	Bus	> 0.9	1.12	-	Review area tap settings and voltage schedules
SF-OP-V-27	MARTIN C 230kV	C1-5_BUS FAULT AT 33204 POTRERO 115.00 Sec 1E	C1	Bus	> 0.9	1.11	-	Review area tap settings and voltage schedules
SF-OP-V-28	MRT RC&1 230kV	C1-5_BUS FAULT AT 33204 POTRERO 115.00 Sec 1E	C1	Bus	> 0.9	1.10	-	Review area tap settings and voltage schedules
SF-OP-V-29	MRT RC&2 230kV	C1-5_BUS FAULT AT 33204 POTRERO 115.00 Sec 1E	C1	Bus	> 0.9	1.11	-	Review area tap settings and voltage schedules
SF-OP-V-30	MARTIN 60kV	C2-2_CB FAULT AT 33204 POTRERO 115 CB412	C2	Breaker	> 0.9	1.24	-	Review area tap settings and voltage schedules
SF-OP-V-31	MISSON 115kV	C2-2_CB FAULT AT 33204 POTRERO 115 CB412	C2	Breaker	> 0.9	1.13	-	Review area tap settings and voltage schedules
SF-OP-V-32	POTRERO 115kV	C2-2_CB FAULT AT 33204 POTRERO 115 CB412	C2	Breaker	> 0.9	1.13	-	Review area tap settings and voltage schedules
SF-OP-V-33	POTRERO 230kV	C2-2_CB FAULT AT 33204 POTRERO 115 CB412	C2	Breaker	> 0.9	1.11	-	Review area tap settings and voltage schedules
SF-OP-V-34	BAYSHOR1 115kV	C2-2_CB FAULT AT 33204 POTRERO 115 CB412	C2	Breaker	> 0.9	1.13	-	Review area tap settings and voltage schedules
SF-OP-V-35	BAYSHOR2 115kV	C2-2_CB FAULT AT 33204 POTRERO 115 CB412	C2	Breaker	> 0.9	1.13	-	Review area tap settings and voltage schedules
SF-OP-V-36	EMBRCDRD 230kV	C2-2_CB FAULT AT 33204 POTRERO 115 CB412	C2	Breaker	> 0.9	1.11	-	Review area tap settings and voltage schedules
SF-OP-V-37	HNTRS PT 115kV	C2-2_CB FAULT AT 33204 POTRERO 115 CB412	C2	Breaker	> 0.9	1.13	-	Review area tap settings and voltage schedules
SF-OP-V-38	LARKIN D 115kV	C2-2_CB FAULT AT 33204 POTRERO 115 CB412	C2	Breaker	> 0.9	1.13	-	Review area tap settings and voltage schedules



High/Low Voltage

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2015 Summer Off-Peak	2018 Summer Light Load	N/A	
SF-OP-V-39	LARKIN E 115kV	C2-2_CB FAULT AT 33204 POTRERO 115 CB412	C2	Breaker	> 0.9	1.13	-	Review area tap settings and voltage schedules
SF-OP-V-40	LARKIN F 115kV	C2-2_CB FAULT AT 33204 POTRERO 115 CB412	C2	Breaker	> 0.9	1.13	-	Review area tap settings and voltage schedules
SF-OP-V-41	MARTIN C 230kV	C2-2_CB FAULT AT 33204 POTRERO 115 CB412	C2	Breaker	> 0.9	1.12	-	Review area tap settings and voltage schedules
SF-OP-V-42	MARTIN C 230kV	C2-2_CB FAULT AT 33204 POTRERO 115 CB412	C2	Breaker	> 0.9	1.11	-	Review area tap settings and voltage schedules
SF-OP-V-43	MRT RC&1 230kV	C2-2_CB FAULT AT 33204 POTRERO 115 CB412	C2	Breaker	> 0.9	1.10	-	Review area tap settings and voltage schedules
SF-OP-V-44	MRT RC&2 230kV	C2-2_CB FAULT AT 33204 POTRERO 115 CB412	C2	Breaker	> 0.9	1.11	-	Review area tap settings and voltage schedules
SF-OP-V-45	MARTIN 60kV	C5_2_Martin-East Grand 115 kV and San Mateo-Martin No. 6 115 kV	C5	DCTL	> 0.9	1.21	-	Review area tap settings and voltage schedules
SF-OP-V-46	MISSION 115kV	C5_2_Martin-East Grand 115 kV and San Mateo-Martin No. 6 115 kV	C5	DCTL	> 0.9	1.11	-	Review area tap settings and voltage schedules
SF-OP-V-47	POT_SVC 115kV	C5_2_Martin-East Grand 115 kV and San Mateo-Martin No. 6 115 kV	C5	DCTL	> 0.9	1.11	-	Review area tap settings and voltage schedules
SF-OP-V-48	POTRERO 115kV	C5_2_Martin-East Grand 115 kV and San Mateo-Martin No. 6 115 kV	C5	DCTL	> 0.9	1.11	-	Review area tap settings and voltage schedules
SF-OP-V-49	BAYSHOR1 115kV	C5_2_Martin-East Grand 115 kV and San Mateo-Martin No. 6 115 kV	C5	DCTL	> 0.9	1.11	-	Review area tap settings and voltage schedules
SF-OP-V-50	BAYSHOR2 115kV	C5_2_Martin-East Grand 115 kV and San Mateo-Martin No. 6 115 kV	C5	DCTL	> 0.9	1.11	-	Review area tap settings and voltage schedules
SF-OP-V-51	HNTRS PT 115kV	C5_2_Martin-East Grand 115 kV and San Mateo-Martin No. 6 115 kV	C5	DCTL	> 0.9	1.11	-	Review area tap settings and voltage schedules
SF-OP-V-52	LARKIN D 115kV	C5_2_Martin-East Grand 115 kV and San Mateo-Martin No. 6 115 kV	C5	DCTL	> 0.9	1.11	-	Review area tap settings and voltage schedules
SF-OP-V-53	LARKIN E 115kV	C5_2_Martin-East Grand 115 kV and San Mateo-Martin No. 6 115 kV	C5	DCTL	> 0.9	1.11	-	Review area tap settings and voltage schedules
SF-OP-V-54	LARKIN F 115kV	C5_2_Martin-East Grand 115 kV and San Mateo-Martin No. 6 115 kV	C5	DCTL	> 0.9	1.11	-	Review area tap settings and voltage schedules
SF-OP-V-55	MARTIN C 115kV	C5_2_Martin-East Grand 115 kV and San Mateo-Martin No. 6 115 kV	C5	DCTL	> 0.9	1.11	-	Review area tap settings and voltage schedules

2013/2014 ISO Reliability Assessment - Study Results

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



**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.

2013/2014 ISO Reliability Assessment - Study Results

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



**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.



**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.

2013/2014 ISO Reliability Assessment - Study Results

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

**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

2013/2014 ISO Reliability Assessment - Study Results

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



**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

2013/2014 ISO Reliability Assessment - Study Results

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



**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-11**

**PG&E Greater Bay Area – Peninsula**

**Reliability Assessment Study Results**



2013/2014 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
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
Penn-SP-T-01	Jefferson - Stanford 60 kV Line	B1_2_CARDINAL 12.47 Unit ID 1 & B2_52_Cooley Landing-Stanford 60kV Line (Cooley Landing-SRI)	B	N-1-1	130%	<100%	<100%	Short Term: Action Plan Long Term: Jefferson-Stanford No. 2 60 kV Line
Penn-SP-T-02	Cooley Landing - Stanford 60 kV Line	B1_2_CARDINAL 12.47 Unit ID 1 & B2_55_Jefferson-Stanford #1 60kV Line	B	N-1-1	119%	<100%	<100%	Short Term: Action Plan Long Term: Jefferson-Stanford No. 2 60 kV Line
Penn-SP-T-03	Bair 115/60 kV Transformer No. 1	C2-10_CB FAULT AT CLY LNDG 60 CB2	C2	Breaker	112%	121%	127%	Action Plan - curtail load at Bell Haven
Penn-SP-T-04	San Mateo - Belmont 115 kV Line	B3_5_Ravenswood 230/115kV Transformer #2 & B3_4_Ravenswood 230/115kV Transformer #1	C3	N-1-1	116%	111%	114%	Short Term: curtail load at Belmont Long Term: Ames-Palo Alto 115 kV Line and San Mateo-Bair 60 to 115 kV Voltage Conversion projects
Penn-SP-T-05	Millbrae-Sneath Lane 60 kV Line	B2_14_Martin-Millbrae 115kV Line & B2_20_Millbrae-San Mateo #1 115kV Line	C3	N-1-1	109%	112%	119%	Short Term: Action Plan - open Millbrae 115/60 kV Transformer No. 5 after first N-1 contingency Long Term: Install reverse power relay on Millbrae 115/60 Transformer No. 5
Penn-SP-T-06	Millbrae - Pacifica 60 kV Line	B2_48_Hillsdale JCT - Half Moon Bay 60kV Line & B2_17_Martin-Sneath Lane 60kV Line	C3	N-1-1	123%	130%	150%	Action Plan - curtail load at Pacifica
Penn-SP-T-07	Bair 115/60 kV Transformer No. 1	B2_30_Ravenswood-Cooley Landing #2 115kV Line & B3_12_Cooley Landing 115/60kV Transformer #1	C3	N-1-1	105%	116%	121%	Action Plan - curtail load at Bell Haven
Penn-SP-T-08	Cooley Landing 115/60 kV Transformer No. 2	B3_12_Cooley Landing 115/60kV Transformer #1 & B3_10_Bair 115/60kV Transformer #1	C3	N-1-1	106%	<100%	<100%	Action Plan - curtail load at Bell Haven

2013/2014 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
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
Penn-SP-T-09	Ravenswood-Cooley Landing 115 kV Line	C5_22_Ravenswood-Palo Alto Nos. 1 & 2 115 kV lines	C5	DCTL	141%	104%	105%	Short Term: Action Plan - curtail load at Palo Alto Sw Sta Long Term: Ames-Palo Alto 115 kV Line project
Penn-SP-T-10	Cooley Landing - Stanford 60 kV Line	C5_4_Monta Vista-Jefferson Nos. 1 & 2 230 kV lines	C5	DCTL	<100%	<100%	103%	Add 230 kV bay position at Jefferson Substation for the Jefferson-Martin 230 kV Line termination

2013/2014 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
					2015 Winter Peak	2018 Winter Peak	N/A	
Penn-WP-T-01	33401 CLY LN&1 60.0 33382 S.R.I. 60.0 1	B1_2_CARDINAL 12.47 Unit ID 1 & B2_55_Jefferson-Stanford #1 60kV Line	B	L-1/G-1	110%	<100%	-	Short Term: Action Plan - curtail load at Menlo Long Term: Jefferson-Stanford No. 2 60 kV Line
Penn-WP-T-02	33401 CLY LN&1 60.0 33382 S.R.I. 60.0 1	B1_3_CARDINAL 12.47 Unit ID 2 & B2_55_Jefferson-Stanford #1 60kV Line	B	L-1/G-1	110%	<100%	-	Short Term: Action Plan - curtail load at Menlo Long Term: Jefferson-Stanford No. 2 60 kV Line
Penn-WP-T-03	Bair 115/60 kV Transformer No. 1	C2-10_CB FAULT AT CLY LNDG 60 CB2	C2	Breaker	99%	105%	-	Action Plan - curtail load at Bell Haven
Penn-WP-T-04	Millbrae 115/60 kV Transformer No. 5	B2_17_Martin-Sneath Lane 60kV Line & B2_48_Hillsdale JCT - Half Moon Bay 60kV Line	C3	N-1-1	102%	107%	-	Action Plan - curtail load at Half Moon Bay
Penn-WP-T-05	Millbrae 115/60 kV Transformer No. 5	B2_38_Jefferson-Hillsdale JCT 60kV Line & B2_17_Martin-Sneath Lane 60kV Line	C3	N-1-1	<100%	104%	-	Action Plan - curtail load at Pacifica
Penn-WP-T-06	Millbrae-Sneath Lane 60 kV Line	B2_17_Martin-Sneath Lane 60kV Line & B2_48_Hillsdale JCT - Half Moon Bay 60kV Line	C3	N-1-1	104%	111%	-	Action Plan - curtail load at Half Moon Bay
Penn-WP-T-07	Millbrae-Sneath Lane 60 kV Line	B2_38_Jefferson-Hillsdale JCT 60kV Line & B2_17_Martin-Sneath Lane 60kV Line	C3	N-1-1	100%	108%	-	Action Plan - curtail load at Pacifica
Penn-WP-T-08	Millbrae - Pacifica 60 kV Line	B2_17_Martin-Sneath Lane 60kV Line & B2_48_Hillsdale JCT - Half Moon Bay 60kV Line	C3	N-1-1	134%	143%	-	Action Plan - curtail load at Half Moon Bay
Penn-WP-T-09	Millbrae - Pacifica 60 kV Line	B2_38_Jefferson-Hillsdale JCT 60kV Line & B2_17_Martin-Sneath Lane 60kV Line	C3	N-1-1	129%	139%	-	Action Plan - curtail load at Pacifica
Penn-WP-T-10	Bair 115/60 kV Transformer No. 1	B2_30_Ravenswood-Cooley Landing #2 115kV Line & B3_12_Cooley Landing 115/60kV Transformer #1	C3	N-1-1	<100%	102%	-	Action Plan - curtail load at Bell Haven
Penn-WP-T-11	Bair 115/60 kV Transformer No. 1	B3_11_Cooley Landing 115/60kV Transformer #2 & B3_12_Cooley Landing 115/60kV Transformer #1	C3	N-1-1	<100%	102%	-	Action Plan - curtail load at Redwood City

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Winter Peak	2018 Winter Peak	N/A	
Penn-WP-T-12	Jefferson-Stanford 60 kV Line	B1_2_CARDINAL 12.47 Unit ID 1 & B2_52_Cooley Landing-Stanford 60kV Line (Cooley Landing-SRI)	C3	N-1-1	107%	<100%	-	Short Term: Action Plan - curtail load at Menlo Long Term: Jefferson-Stanford No. 2 60 kV Line
Penn-WP-T-13	Jefferson-Stanford 60 kV Line	B1_3_CARDINAL 12.47 Unit ID 2 & B2_52_Cooley Landing-Stanford 60kV Line (Cooley Landing-SRI)	C3	N-1-1	107%	<100%	-	Short Term: Action Plan - curtail load at Menlo Long Term: Jefferson-Stanford No. 2 60 kV Line
Penn-WP-T-14	Jefferson-Stanford 60 kV Line	B2_52_Cooley Landing-Stanford 60kV Line (Cooley Landing-SRI) & B3_15_Cardinal Cogen GSU Transformer	C3	N-1-1	107%	<100%	-	Short Term: Action Plan - curtail load at Menlo Long Term: Jefferson-Stanford No. 2 60 kV Line
Penn-WP-T-15	Cooley Landing-Stanford 60 kV Line	B2_55_Jefferson-Stanford #1 60kV Line & B3_15_Cardinal Cogen GSU Transformer	C3	N-1-1	110%	<100%	-	Short Term: Action Plan - curtail load at Menlo Long Term: Jefferson-Stanford No. 2 60 kV Line
Penn-WP-T-16	Jefferson-Stanford 60 kV Line	B1_2_CARDINAL 12.47 Unit ID 1 & B2_52_Cooley Landing-Stanford 60kV Line (Cooley Landing-SRI)	C3	N-1-1	107%	<100%	-	Short Term: Action Plan - curtail load at Menlo Long Term: Jefferson-Stanford No. 2 60 kV Line
Penn-WP-T-17	Jefferson-Stanford 60 kV Line	B1_3_CARDINAL 12.47 Unit ID 2 & B2_52_Cooley Landing-Stanford 60kV Line (Cooley Landing-SRI)	C3	N-1-1	107%	<100%	-	Short Term: Action Plan - curtail load at Menlo Long Term: Jefferson-Stanford No. 2 60 kV Line

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Summer Off-Peak	2018 Summer Light Load	N/A	
Penn-OP-T-01	Millbrae 115/60 kV Transformer No. 5	B2_17_Martin-Sneath Lane 60kV Line & B2_48_Hillsdale JCT - Half Moon Bay 60kV Line	C3	N-1-1	101%	<100%	-	Action Plan - curtail load at Pacifica

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
Penn-SP-DV-01	CLY LND2 115kV	B2_30_Ravenswood-Cooley Landing #2 115kV Line & B3_12_Cooley Landing 115/60kV Transformer #1	C3	N-1-1	< 10.00%	15.00%	16.00%	Add Reactive Support
Penn-SP-DV-02	MILLBRAE 115kV	B2_20_Millbrae-San Mateo #1 115kV Line & B2_14_Martin-Millbrae 115kV Line	C3	N-1-1	10.00%	10.00%	11.00%	Short Term: Action Plan - open Millbrae 115/60 kV Transformer No. 5 after first N-1 contingency Long Term: Install reverse power relay on Millbrae 115/60 Transformer No. 5
Penn-SP-DV-03	SANPAULA 115kV	B2_14_Martin-Millbrae 115kV Line & B2_20_Millbrae-San Mateo #1 115kV Line	C3	N-1-1	10.00%	10.00%	11.00%	Short Term: Action Plan - open Millbrae 115/60 kV Transformer No. 5 after first N-1 contingency Long Term: Install reverse power relay on Millbrae 115/60 Transformer No. 5

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2015 Winter Peak	2018 Winter Peak	N/A	
Penn-WP-VD-1	HLF MNBV 60kV	B3_14_Millbrae 115/60kV Transformer #5 & B2_48_Hillsdale JCT - Half Moon Bay 60kV Line	C3	N-1-1	-10.00%	-12.00%	-	Review area transformer tap settings and voltage schedule
Penn-WP-VD-2	MILLBRAE 115kV	B2_20_Millbrae-San Mateo #1 115kV Line & B2_14_Martin-Millbrae 115kV Line	C3	N-1-1	-9.00%	-11.00%	-	Review area transformer tap settings and voltage schedule

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2015 Summer Off-Peak	2018 Summer Light Load	N/A	
Penn-OP-DV-1	PACIFICA 60kV	C2-1_CB FAULT AT 30700 SANMATEO 230 CB202	C2	Breaker	-10.00%	< 10.00%	-	Review area transformer tap settings and voltage schedule
Penn-OP-DV-2	SNTH LNE 60kV	C2-1_CB FAULT AT 30700 SANMATEO 230 CB202	C2	Breaker	-10.00%	< 10.00%	-	Review area transformer tap settings and voltage schedule



2013/2014 ISO Reliability Assessment - Study Results

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



High/Low Voltage

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2015 Winter Peak	2018 Winter Peak	N/A	
Penn-WP-V-1	CLY LND2 115kV	B2_30_Ravenswood-Cooley Landing #2 115kV Line & B3_12_Cooley Landing 115/60kV Transformer #1	C3	N-1-1	>0.9	0.87	-	Action Plan - curtail load at Redwood City
Penn-WP-V-2	HLF MNBY 60kV	B3_14_Millbrae 115/60kV Transformer #5 & B2_48_Hillsdale JCT - Half Moon Bay 60kV Line	C3	N-1-1	0.78	0.86	-	Action Plan - curtail load at Pacifica

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2015 Summer Off-Peak	2018 Summer Light Load	N/A	
Penn-OP-V-01	CCSF 115kV	C1-1_BUS FAULT AT 30700 SANMATEO 230.00 Sec 1D	C1	Bus	> 0.9	1.10	-	Review area transformer tap settings and voltage schedules
Penn-OP-V-02	SFIA 115kV	C1-7_BUS FAULT AT 33310 SANMATEO 115.00 Sec 1E	C1	Bus	> 0.9	1.10	-	Review area transformer tap settings and voltage schedules
Penn-OP-V-03	BURLNGME 115kV	C1-8_BUS FAULT AT 33310 SANMATEO 115.00 Sec 2E	C1	Bus	> 0.9	1.10	-	Review area transformer tap settings and voltage schedules
Penn-OP-V-04	CLY LND2 115kV	C1-12_BUS FAULT AT 33315 RVNSWD E 115.00 Sec 2E	C1	Bus	> 0.9	1.12	-	Review area transformer tap settings and voltage schedules
Penn-OP-V-05	EST GRND 115kV	C1-6_BUS FAULT AT 33310 SANMATEO 115.00 Sec 2D	C1	Bus	> 0.9	1.10	-	Review area transformer tap settings and voltage schedules
Penn-OP-V-06	MILLBRAE 60kV	C1-5_BUS FAULT AT 33310 SANMATEO 115.00 Sec 1D	C1	Bus	> 0.9	1.13	-	Review area transformer tap settings and voltage schedules
Penn-OP-V-07	CLY LND 115kV	C2-1_CB FAULT AT 30700 SANMATEO 230 CB202	C2	Breaker	> 0.9	1.11	-	Review area transformer tap settings and voltage schedules
Penn-OP-V-08	MLLBRETP 60kV	C2-4_CB FAULT AT 33310 SANMATEO 115 CB402	C2	Breaker	> 0.9	1.15	-	Review area transformer tap settings and voltage schedules
Penn-OP-V-09	CLY LND 115kV	C5_1_Eastshore-San Mateo 230 kV and Pittsburg-San Mateo 230 kV I	C5	DCTL	> 0.9	1.11	-	Review area transformer tap settings and voltage schedules
Penn-OP-V-10	CLY LND2 115kV	C5_20_Ravenswood-Cooley Landing Nos. 1 & 2 115 kV lines	C5	DCTL	> 0.9	1.13	-	Review area transformer tap settings and voltage schedules
Penn-OP-V-11	DALY CTY 115kV	C5_3_Ravenswood-San Mateo Nos. 1 & 2 230 kV lines	C5	DCTL	> 0.9	1.12	-	Review area transformer tap settings and voltage schedules
Penn-OP-V-12	MILLBRAE 60kV	C5_13_Millbrae-San Mateo No. 1 115 kV and East Grand-San Mateo N	C5	DCTL	> 0.9	1.14	-	Review area transformer tap settings and voltage schedules
Penn-OP-V-13	MILLBRAE 115kV	C5_13_Millbrae-San Mateo No. 1 115 kV and East Grand-San Mateo N	C5	DCTL	> 0.9	1.12	-	Review area transformer tap settings and voltage schedules
Penn-OP-V-14	SAN CRLS 60kV	C5_24_Bair-Cooley Landing Nos. 1 & 2 60 kV lines	C5	DCTL	> 0.9	1.10	-	Review area transformer tap settings and voltage schedules
Penn-OP-V-15	SNANDRES 60kV	C5_13_Millbrae-San Mateo No. 1 115 kV and East Grand-San Mateo N	C5	DCTL	> 0.9	1.15	-	Review area transformer tap settings and voltage schedules

2013/2014 ISO Reliability Assessment - Study Results

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



**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.

2013/2014 ISO Reliability Assessment - Study Results

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



**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.

2013/2014 ISO Reliability Assessment - Study Results

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



**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.

2013/2014 ISO Reliability Assessment - Study Results

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



**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

2013/2014 ISO Reliability Assessment - Study Results

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

**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

2013/2014 ISO Reliability Assessment - Study Results

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



**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-12**

**PG&E Greater Bay Area – Mission**

**Reliability Assessment Study Results**

2013/2014 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
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
Miss-SP-T-01	North Dublin - Cayetano 230 kV Line	B2_1_Contra Costa-Las Positas 230kV Line	B	N-1	<100%	101%	101%	Action Plan - reduce Contra Costa area generation
Miss-SP-T-02	Lone Tree - Cayetano 230 kV Line	B2_1_Contra Costa-Las Positas 230kV Line	B	N-1	<100%	106%	107%	Action Plan - reduce Contra Costa area generation
Miss-SP-T-03	Lone Tree - Cayetano 230 kV Line	C1-4_BUS FAULT AT 30630 NEWARK D 230.00 Sec 1D	C1	Bus	<100%	104%	105%	Action Plan - reduce Contra Costa area generation
Miss-SP-T-04	Lone Tree - Cayetano 230 kV Line	C2-3_CB FAULT AT NEWARK 230 CB810	C2	Breaker	<100%	104%	104%	Action Plan - reduce Contra Costa area generation
Miss-SP-T-05	North Dublin-Vineyard 230 kV Line	B2_16_Tesla-Newark #1 230kV Line & B2_1_Contra Costa-Las Positas 230kV Line	C3	N-1-1	<100%	103%	102%	Action Plan - reduce Contra Costa area generation
Miss-SP-T-06	Lone Tree - Cayetano 230 kV Line	B2_16_Tesla-Newark #1 230kV Line & B2_1_Contra Costa-Las Positas 230kV Line	C3	N-1-1	103%	118%	119%	Action Plan - reduce Contra Costa area generation
Miss-SP-T-07	East Shore 230/115 KV Transformer No. 1	B2_12_Eastshore-San Mateo 230kV Line & B3_6_Eastshore 230/115kV Transformer #2	C3	N-1-1	109%	114%	113%	Action Plan - reduce RCEC generation
Miss-SP-T-08	East Shore 230/115 KV Transformer No. 2	B2_12_Eastshore-San Mateo 230kV Line & B3_5_Eastshore 230/115kV Transformer #1	C3	N-1-1	109%	113%	113%	Action Plan - reduce RCEC generation
Miss-SP-T-09	Newark 115/60 kV Transformer No. 1	B3_7_Las Positas 230/60kV Transformer #4 & B3_1_San Ramon 230/60kV Transformer #1	C3	N-1-1	115%	118%	116%	Action Plan - radialize Tri-Valley 60 kV system follow first contingency
Miss-SP-T-10	Livermore - Las Positas 60 kV Line	B2_7_San Ramon-Moraga 230kV Line & B2_2_Pittsburg-San Ramon 230kV Line	C3	N-1-1	154%	157%	160%	Existing reverse power relay at San Ramon

2013/2014 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
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
Miss-SP-T-11	Radium - Livermore 60 kV Line	B2_7_San Ramon-Moraga 230kV Line & B2_2_Pittsburg-San Ramon 230kV Line	C3	N-1-1	192%	194%	199%	Existing reverse power relay at San Ramon
Miss-SP-T-12	Sam Ramon 230/60 kV Transformer No. 1	B2_1_Contra Costa-Las Positas 230kV Line & B2_15_Las Positas-Newark 230kV Line	C3	N-1-1	119%	115%	118%	Existing reverse power relay at Las Positas
Miss-SP-T-13	Radium - Vallecitos 60 kV Line	B2_2_Pittsburg-San Ramon 230kV Line & B2_7_San Ramon-Moraga 230kV Line	C3	N-1-1	110%	110%	113%	Existing reverse power relay at San Ramon
Miss-SP-T-14	Newark - Vallecitos 60 kV Line	B2_2_Pittsburg-San Ramon 230kV Line & B2_7_San Ramon-Moraga 230kV Line	C3	N-1-1	114%	113%	117%	Existing reverse power relay at San Ramon
Miss-SP-T-15	Las Positas 230/60 kV Transformer No. 4	B2_7_San Ramon-Moraga 230kV Line & B2_2_Pittsburg-San Ramon 230kV Line	C3	N-1-1	126%	129%	133%	Existing reverse power relay at San Ramon
Miss-SP-T-16	San Ramon - Radium 60 kV Line	B2_7_San Ramon-Moraga 230kV Line & B2_2_Pittsburg-San Ramon 230kV Line	C3	N-1-1	171%	173%	178%	Existing reverse power relay at San Ramon
Miss-SP-T-17	Newark - Livermore 60 kV Line	B2_1_Contra Costa-Las Positas 230kV Line & B2_15_Las Positas-Newark 230kV Line	C3	N-1-1	115%	120%	124%	Existing reverse power relay at Las Positas
Miss-SP-T-18	North Dublin - Cayetano 230 kV Line	C5_5_Tesla-Newark No.1 and Tesla-Ravenswood 230 kV lines	C5	DCTL	<100%	102%	102%	Action Plan - reduce Contra Costa area generation
Miss-SP-T-19	Lone Tree - Cayetano 230 kV Line	C5_5_Tesla-Newark No.1 and Tesla-Ravenswood 230 kV lines	C5	DCTL	<100%	106%	108%	Action Plan - reduce Contra Costa area generation

2013/2014 ISO Reliability Assessment - Study Results

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



**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Summer Off-Peak	2018 Summer Light Load	N/A	
Miss-OP-T-01	35203 LIVERMRE 60.0 35220 LPOSTAS 60.0 1	B2_2_Pittsburg-San Ramon 230kV Line & B2_7_San Ramon-Moraga 230kV Line	C3	N-1-1	112%	101%	-	Existing reverse power relay at San Ramon
Miss-OP-T-02	35203 LIVERMRE 60.0 35222 CALMAT60 60.0 1	B2_2_Pittsburg-San Ramon 230kV Line & B2_7_San Ramon-Moraga 230kV Line	C3	N-1-1	125%	109%	-	Existing reverse power relay at San Ramon
Miss-OP-T-03	35205 RADUM 60.0 35222 CALMAT60 60.0 1	B2_2_Pittsburg-San Ramon 230kV Line & B2_7_San Ramon-Moraga 230kV Line	C3	N-1-1	120%	105%	-	Existing reverse power relay at San Ramon
Miss-OP-T-04	35209 SAN RAMN 60.0 35221 E DUBLIN 60.0 1	B2_2_Pittsburg-San Ramon 230kV Line & B2_7_San Ramon-Moraga 230kV Line	C3	N-1-1	118%	101%	-	Existing reverse power relay at San Ramon
Miss-OP-T-05	35221 E DUBLIN 60.0 35223 PARKS TP 60.0 1	B2_2_Pittsburg-San Ramon 230kV Line & B2_7_San Ramon-Moraga 230kV Line	C3	N-1-1	119%	102%	-	Existing reverse power relay at San Ramon
Miss-OP-T-06	35223 PARKS TP 60.0 35205 RADUM 60.0 1	B2_2_Pittsburg-San Ramon 230kV Line & B2_7_San Ramon-Moraga 230kV Line	C3	N-1-1	119%	102%	-	Existing reverse power relay at San Ramon

2013/2014 ISO Reliability Assessment - Study Results

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
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
Miss-SP-VD-1	A100US 115kV	B3_5_Eastshore 230/115kV Transformer #1 & B3_6_Eastshore 230/115kV Transformer #2	C3	N-1-1	-11.00%	<10%	<10%	Action Plan - Utilize RCEC generation after first contingency
Miss-SP-VD-2	CALMAT60	B2_7_San Ramon-Moraga 230kV Line & B2_2_Pittsburg-San Ramon 230kV Line	C3	N-1-1	-27.00%	-26.00%	-27.00%	Existing reverse power relay at San Ramon
Miss-SP-VD-3	E DUBLIN 60kV	B3_7_Las Positas 230/60kV Transformer #4 & B3_1_San Ramon 230/60kV Transformer #1	C3	N-1-1	-16.00%	-15.00%	-14.00%	Action Plan - radialize Tri-Valley 60 kV system follow first contingency
Miss-SP-VD-4	EASTSHRE 115kV	B3_6_Eastshore 230/115kV Transformer #2 & B3_5_Eastshore 230/115kV Transformer #1	C3	N-1-1	-11.00%	<10%	<10%	Action Plan - Utilize RCEC generation after first contingency
Miss-SP-VD-5	IUKA 60kV	B2_2_Pittsburg-San Ramon 230kV Line & B2_7_San Ramon-Moraga 230kV Line	C3	N-1-1	-28.00%	-28.00%	-28.00%	Existing reverse power relay at San Ramon
Miss-SP-VD-6	LS PSTAS 230kV	B2_15_Las Positas-Newark 230kV Line & B2_1_Contra Costa-Las Positas 230kV Line	C3	N-1-1	-32.00%	-33.00%	-33.00%	Existing reverse power relay at Las Positas
Miss-SP-VD-7	MT EDEN 115kV	B3_6_Eastshore 230/115kV Transformer #2 & B3_5_Eastshore 230/115kV Transformer #1	C3	N-1-1	-11.00%	<10%	<10%	Action Plan - Utilize RCEC generation after first contingency
Miss-SP-VD-8	NEWARK 60kV	B3_7_Las Positas 230/60kV Transformer #4 & B3_11_Newark 115/60kV Transformer #1	C3	N-1-1	-10.00%	-12.00%	-11.00%	Action Plan - radialize Tri-Valley 60 kV system follow first contingency
Miss-SP-VD-9	SAN RAMN 60kV	B2_2_Pittsburg-San Ramon 230kV Line & B2_7_San Ramon-Moraga 230kV Line	C3	N-1-1	-46.00%	-46.00%	-47.00%	Existing reverse power relay at San Ramon

2013/2014 ISO Reliability Assessment - Study Results

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
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
Miss-SP-VD-10	SANRAMON 230kV	B2_2_Pittsburg-San Ramon 230kV Line & B2_7_San Ramon-Moraga 230kV Line	C3	N-1-1	-52.00%	-51.00%	-52.00%	Existing reverse power relay at San Ramon
Miss-SP-VD-11	USWP-FRK 60kV	B2_1_Contra Costa-Las Positas 230kV Line & B2_15_Las Positas-Newark 230kV Line	C3	N-1-1	-27.00%	-28.00%	-28.00%	Existing reverse power relay at Las Positas

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2015 Summer Off-Peak	2018 Summer Light Load	N/A	
Miss-OP-DV-01	SAN RAMN 60kV	B2_2_Pittsburg-San Ramon 230kV Line & B2_7_San Ramon-Moraga 230kV Line	C3	N-1-1	-24.00%	-14.00%	-	Existing reverse power relay at San Ramon
Miss-OP-DV-02	SANRAMON 230kV	B2_2_Pittsburg-San Ramon 230kV Line & B2_7_San Ramon-Moraga 230kV Line	C3	N-1-1	-16.00%	-15.00%	-	Existing reverse power relay at San Ramon

2013/2014 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
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
Miss-SP-V-01	CALMAT60 kV	B2_1_Contra Costa-Las Positas 230kV Line & B2_15_Las Positas-Newark 230kV Line	C3	N-1-1	0.79	0.78	0.79	Existing reverse power relay at Las Positas
Miss-SP-V-02	LIVRMR_2 60kV	B2_51_Livermore-Las Positas 60kV Line & B3_1_San Ramon 230/60kV Transformer #1	C3	N-1-1	0.85	0.85	0.87	Action Plan - radialize Tri-Valley 60 kV system follow first contingency
Miss-SP-V-03	LS PSTAS 230kV	B2_1_Contra Costa-Las Positas 230kV Line & B2_15_Las Positas-Newark 230kV Line	C3	N-1-1	0.66	0.65	0.67	Action Plan - radialize Tri-Valley 60 kV system follow first contingency
Miss-SP-V-04	NEWARK 60kV	B3_7_Las Positas 230/60kV Transformer #4 & B3_11_Newark 115/60kV Transformer #1	C3	N-1-1	0.89	0.87	0.89	Action Plan - radialize Tri-Valley 60 kV system follow first contingency
Miss-SP-V-05	PARKS 60kV	B2_52_Radum-Livermore 60kV Line & B3_1_San Ramon 230/60kV Transformer #1	C3	N-1-1	0.88	0.87	0.89	Action Plan - radialize Tri-Valley 60 kV system follow first contingency
Miss-SP-V-06	RADUM 60kV	B2_54_San Ramon-Radum 60kV Line & B3_7_Las Positas 230/60kV Transformer #4	C3	N-1-1	0.82	0.82	0.84	Action Plan - radialize Tri-Valley 60 kV system follow first contingency
Miss-SP-V-07	SANRAMON 230kV	B2_2_Pittsburg-San Ramon 230kV Line & B2_7_San Ramon-Moraga 230kV Line	C3	N-1-1	0.44	0.43	0.44	Existing reverse power relay at San Ramon
Miss-SP-V-08	SEAWEST 60kV	B2_1_Contra Costa-Las Positas 230kV Line & B2_15_Las Positas-Newark 230kV Line	C3	N-1-1	0.72	0.71	0.72	Existing reverse power relay at Las Positas
Miss-SP-V-09	SUNOL 60kV	B2_7_San Ramon-Moraga 230kV Line & B2_2_Pittsburg-San Ramon 230kV Line	C3	N-1-1	0.79	0.79	0.79	Existing reverse power relay at San Ramon



2013/2014 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
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
Miss-SP-V-10	USWP-FRK 60kV	B2_1_Contra Costa-Las Positas 230kV Line & B2_15_Las Positas-Newark 230kV Line	C3	N-1-1	0.72	0.71	0.72	Existing reverse power relay at Las Positas
Miss-SP-V-11	VINEYARD 60kV	B2_2_Pittsburg-San Ramon 230kV Line & B2_7_San Ramon-Moraga 230kV Line	C3	N-1-1	0.69	0.69	0.69	Existing reverse power relay at San Ramon

2013/2014 ISO Reliability Assessment - Study Results

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



**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2015 Summer Off-Peak	2018 Summer Light Load	N/A	
Miss-OP-V-01	VASCO 60kV	B2_49_Wind Farms 60kV Line	B	N-1	> 0.95	1.11	-	Review transformer tap setting and bus schedules
Miss-OP-V-02	SAN RAMN 60kV	B2_2_Pittsburg-San Ramon 230kV Line & B2_7_San Ramon-Moraga 230kV Line	C3	N-1-1	0.79	> 0.9	-	Existing reverse power relay at San Ramon
Miss-OP-V-03	SANRAMON 230kV	B2_2_Pittsburg-San Ramon 230kV Line & B2_7_San Ramon-Moraga 230kV Line	C3	N-1-1	0.74	0.89	-	Existing reverse power relay at San Ramon

2013/2014 ISO Reliability Assessment - Study Results

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



**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.

2013/2014 ISO Reliability Assessment - Study Results

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



**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.

2013/2014 ISO Reliability Assessment - Study Results

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

**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

2013/2014 ISO Reliability Assessment - Study Results

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



**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-13**

**PG&E Greater Bay Area – De Anza**

**Reliability Assessment Study Results**

2013/2014 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
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
DeAn-SP-T-01	Newark-Applied Materials 115 kV Line	C2-1_CB FAULT AT 30705 MONTA VISTA SUB 230 CB202	C2	Breaker	189%	<100%	<100%	Action Plan before Monta Vista 230 kV Bus Upgrade Project is completetd
DeAn-SP-T-02	Lawrence-Monta Vista 115 kV Line	C2-1_CB FAULT AT 30705 MONTA VISTA SUB 230 CB202	C2	Breaker	163%	<100%	<100%	Action Plan before Monta Vista 230 kV Bus Upgrade Project is completetd
DeAn-SP-T-03	Applied Material-Britton 115 kV Line	C2-1_CB FAULT AT 30705 MONTA VISTA SUB 230 CB202	C2	Breaker	137%	<100%	<100%	Action Plan before Monta Vista 230 kV Bus Upgrade Project is completetd
DeAn-SP-T-04	Newark-Lawrence 115 kV Line	Newark-Applied Materials 115 kV Line _Lawrence - Monta Vista 115 kV	C3	N-1-1	118%	125%	128%	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
					2015 Summer Off-Peak	2018 Summer Light Load	N/A	
DeAn-OP-DV-01	LOYOLA 60kV	B2_29_Loyola-Monta Vista 60 kV Line	B	N-1	6.00%	7.00%	-	Add Reactive Support
DeAn-OP-DV-02	LOS ALTS 60kV	B2_29_Loyola-Monta Vista 60 kV Line	B	N-1	5.00%	7.00%	-	Add Reactive Support
DeAn-OP-DV-03	LOS GATS 60kV	B2_32_Monta Vista-Los Gatos 60 kV Line	B	N-1	-5.00%	-7.00%	-	Add Reactive Support



**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
DeAn-SP-V-01	Britton Area	C2-1_CB FAULT AT 30705 MONTA VISTA SUB 230 CB202	C2	Breaker	0.74 - 0.86	>0.90	>0.90	Action Pland before Monta Vista 230 kV Bus Upgrade Project is completed



**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2015 Summer Off-Peak	2018 Summer Light Load	N/A	
DeAn-OP-V-01	LOS GATS 60kV	B2_32_Monta Vista-Los Gatos 60 kV Line	B	N-1	1.11	1.17	-	Add Reactive Support

2013/2014 ISO Reliability Assessment - Study Results

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



**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.

2013/2014 ISO Reliability Assessment - Study Results

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



**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.

2013/2014 ISO Reliability Assessment - Study Results

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

**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

2013/2014 ISO Reliability Assessment - Study Results

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



**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-14**

**PG&E Greater Bay Area – San Jose**

**Reliability Assessment Study Results**



2013/2014 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
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
SanJ-SP-T-01	Piercy-Metcalf 115 kV Line	B2_12_Newark-Dixon Landing 115 kV Line	B	N-1	110%	<100%	<100%	Action Plan before Mabury Voltage Conversion Project is completed
SanJ-SP-T-02	Monta Vista-Los Gatos 60 kV Line	Evergreen 115/60 kV Transformer No. 1	B	T-1	109%	<100%	<100%	Action Plan before Monta Vista-Los Gatos-Evergreen 60kV Line Reconductor Project is completed
SanJ-SP-T-03	Monta Vista-Los Gatos 60 kV Line	Evergreen-Almaden 60 kV Line	B	N-1	109%	<100%	<100%	Action Plan before Monta Vista-Los Gatos-Evergreen 60kV Line Reconductor Project is completed
SanJ-SP-T-04	NRS-SRS 115 kV Line	Los Esteros-Nortech 115 kV Line	B	N-1	101%	<100%	<100%	Action Plan before NRS-Scout #1 115kV Line Reconductor Project is completed
SanJ-SP-T-05	Metcalf-Llagas 115 kV Line	C127b_BUS FAULT AT 35648 LLAGAS F 115.00	C1	Bus	111%	108%	105%	Action Plan
SanJ-SP-T-06	Metcalf 230/115 kV Trans No. 1	C2-2_CB FAULT AT METCALF SUB 230 CB322	C2	Breaker	114%	113%	116%	Action Plan
SanJ-SP-T-07	Metcalf 230/115 kV Trans No. 4	C2-1_CB FAULT AT METCALF SUB 230 CB312	C2	Breaker	104%	105%	106%	Action Plan
SanJ-SP-T-08	Metcalf 230/115 kV Trans No. 2	C2-1_CB FAULT AT METCALF SUB 230 CB312	C2	Breaker	103%	105%	106%	Action Plan
SanJ-SP-T-09	Metcalf 230/115 kV Trans No. 3	C2-2_CB FAULT AT METCALF SUB 230 CB322	C2	Breaker	113%	114%	115%	Action Plan
SanJ-SP-T-10	Swift-Metcalf 115 kV Line	B2_15_Newark-Milpitas 115 kV Line No. 1 & B2_16_Newark-Milpitas 115 kV Line No. 2	C3	N-1-1	102%	<100%	<100%	Action Plan
SanJ-SP-T-11	Evergreen-Mabury 115 kV Line	B2_12_Newark-Dixon Landing 115 kV Line & B2_40_Piercy-Metcalf 115 kV Line	C3	N-1-1	<100%	143%	144%	Action Plan before Evergreen-Mabury Voltage Conversion

2013/2014 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
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
SanJ-SP-T-12	Metcalf 230/115 kV Trans No. 1	B3_7_Metcalf 230/115 kV Trans No. 4 & B3_8_Metcalf 230/115 kV Trans No. 2	C3	N-1-1	104%	105%	106%	Action Plan
SanJ-SP-T-13	Metcalf 230/115 kV Trans No. 4	B3_6_Metcalf 230/115 kV Trans No. 1 & B3_8_Metcalf 230/115 kV Trans No. 2	C3	N-1-1	104%	105%	106%	Action Plan
SanJ-SP-T-14	Metcalf-Morgan Hill 115 kV Line	B2_36_Metcalf-Llagas 115 kV Line & B2_39_Llagas-Gilroy Foods 115 kV Line	C3	N-1-1	103%	107%	110%	Short Term: Action Plan Long Term:
SanJ-SP-T-15	Metcalf-Llagas 115 kV Line	B2_39_Llagas-Gilroy Foods 115 kV Line & B2_35_Metcalf-Morgan Hill 115 kV Line	C3	N-1-1	112%	116%	120%	Short Term: Action Plan Long Term: Morgan Hill Area Reinforcement
SanJ-SP-T-16	Metcalf 230/115 kV Trans No. 2	B3_9_Metcalf 230/115 kV Trans No. 3 & B3_7_Metcalf 230/115 kV Trans No. 4	C3	N-1-1	105%	106%	107%	Action Plan
SanJ-SP-T-17	Metcalf 230/115 kV Trans No. 3	B3_8_Metcalf 230/115 kV Trans No. 2 & B3_7_Metcalf 230/115 kV Trans No. 4	C3	N-1-1	103%	104%	105%	Action Plan
SanJ-SP-T-18	Metcalf-Evergreen No. 2 115 kV Line	B2_20_El Patio-San Jose Sta. 'A' 115 kV Line & B2_31_Metcalf-Evergreen No. 1 115 kV Line	C3	N-1-1	113%	<100%	<100%	Action Plan until Metcalf-Evergreen Reconductor
SanJ-SP-T-19	Los Esteros-Trimble 115 kV Line	B2_43_Los Esteros-Montague 115 kV Line & B2_45_Los Esteros-Nortech 115 kV Line	C3	N-1-1	<100%	104%	104%	Action Plan
SanJ-SP-T-20	Trimble-San Jose 'B' 115 kV Line	C5_16_Metcalf - El Patio No. 1 & 2 115 kV Lines	C5	DCTL	<100%	116%	114%	Action Plan
SanJ-SP-T-21	Piercy-Metcalf 115 kV Line	C5_2_Newark - Dixon Landing & Newark - Milpitas #1 115 kV Lines	C5	DCTL	110%	<100%	<100%	Action Plan before Evergreen-Mabury Voltage Conversion

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
SanJ-SP-VD-1	ALMADEN 60kV	B2_48_Evergreen-Almaden 60 kV Line	B	N-1	-14.00%	-12.00%	-12.00%	Action Plan before Almaden Shunt Capacitor Project is complete
SanJ-SP-VD-2	DIXON LD 60kV	B2_12_Newark-Dixon Landing 115 kV Line	B	N-1	-6.00%	< 5%	< 5%	Action Plan before the Marbury Voltage Conversion Project is completed
SanJ-SP-VD-3	MABURY 115kV	B2_40_Piercy-Metcalf 115 kV Line	B	N-1	-5.00%	< 5%	< 5%	Action Plan before the Marbury Voltage Conversion Project is completed
SanJ-SP-VD-4	MABURY J 115kV	B2_40_Piercy-Metcalf 115 kV Line	B	N-1	-5.00%	< 5%	< 5%	Action Plan before the Marbury Voltage Conversion Project is completed
SanJ-SP-VD-5	MCKEE 115kV	B2_40_Piercy-Metcalf 115 kV Line	B	N-1	-5.00%	< 5%	< 5%	Action Plan before the Marbury Voltage Conversion Project is completed
SanJ-SP-VD-6	PIERCY 115kV	B2_40_Piercy-Metcalf 115 kV Line	B	N-1	-8.00%	-5.00%	-5.00%	Add Reactive Support
SanJ-SP-VD-7	SWIFT 115kV	B2_28_Swift-Metcalf 115 kV Line	B	N-1	< 5%	-5.00%	-5.00%	Add Reactive Support
SanJ-SP-VD-8	ALMADEN 60kV	B2_7_Los Esteros-Metcalf 230 kV Line & B2_48_Evergreen-Almaden 60 kV Line	C3	N-1-1	-14.00%	<10%	<10%	Action Plan before the Almaden Voltage Support Project is completed
SanJ-SP-VD-9	LLAGAS 115kV	B2_35_Metcalf-Morgan Hill 115 kV Line & B2_39_Llagas-Gilroy Foods 115 kV Line	C3	N-1-1	<10%	<10%	-10.00%	Short Term: Action Plan Long Term: Morgan Hill Area Reinforcement Project
SanJ-SP-VD-10	MRGN HIL 115kV	B2_35_Metcalf-Morgan Hill 115 kV Line & B2_39_Llagas-Gilroy Foods 115 kV Line	C3	N-1-1	-11.00%	-12.00%	-12.00%	Short Term: Action Plan Long Term: Morgan Hill Area Reinforcement Project
SanJ-SP-VD-11	PIERCY 115kV	B2_12_Newark-Dixon Landing 115 kV Line & B2_40_Piercy-Metcalf 115 kV Line	C3	N-1-1	<10%	-10.00%	-10.00%	Action Plan

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2015 Summer Off-Peak	2018 Summer Light Load	N/A	
SanJ-OP-DV-01	ALMADEN 60kV	B2_48_Evergreen-Almaden 60 kV Line	B	N-1	-8.00%	< 5%	-	Action Plan before Monta Vista-Los Gatos-Evergreen 60kV Line Reconstructor Project is Completed

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
SanJ-SP-V-01	ALMADEN 60kV	B2_48_Evergreen-Almaden 60 kV Line	B	N-1	0.89	> 0.95	> 0.95	Action Plan before Monta Vista-Los Gatos-Evergreen 60kV Line Reconductor Project is Completed
SanJ-SP-V-02	MRGN HIL 115kV	B2_35_Metcalf-Morgan Hill 115 kV Line & B2_39_Llagas-Gilroy Foods 115 kV Line	C3	N-1-1	0.89	0.89	0.89	Action Plan before Morgan Hill Area Reinforcement Project

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2015 Summer Off-Peak	2018 Summer Light Load	N/A	
SanJ-OP-V-01	ALMADEN 60kV	B2_24_Markham No. 1 115 kV Tap	B	N-1	1.12	1.17	-	Under review for possible exemption or reactive device
SanJ-OP-V-02	EVGRN&1 115kV	B2_1_Newark-Los Esteros 230 kV Line	B	N-1	> 0.95	1.10	-	Under review for possible exemption or reactive device
SanJ-OP-V-03	MORGN J1 115kV	B2_39_Llagas-Gilroy Foods 115 kV Line	B	N-1	> 0.95	1.10	-	Under review for possible exemption or reactive device
SanJ-OP-V-04	ALMADEN 60kV	C112_BUS FAULT AT 35619 SJB EF 115.00	C1	Bus	1.13	1.17	-	Under review for possible exemption or reactive device
SanJ-OP-V-05	EVGRN J 115kV	C118_BUS FAULT AT 35633 EVGRN 2 115.00	C1	Bus	> 0.9	1.10	-	Under review for possible exemption or reactive device
SanJ-OP-V-06	MORGN J1 115kV	C127a_BUS FAULT AT 35648 LLAGAS E 115.00	C1	Bus	> 0.9	1.10	-	Under review for possible exemption or reactive device
SanJ-OP-V-07	STONE &1 115kV	C118_BUS FAULT AT 35633 EVGRN 2 115.00	C1	Bus	> 0.9	1.10	-	Under review for possible exemption or reactive device
SanJ-OP-V-08	ALMADEN 60kV	C2-5_CB FAULT AT SAN JOSE B SUB 115 CB162	C2	Breaker	1.13	1.18	-	Under review for possible exemption or reactive device
SanJ-OP-V-09	MRGN HIL 115kV	C2-9_CB FAULT AT LLAGAS SUB 115 CB166	C2	Breaker	> 0.9	1.10	-	Under review for possible exemption or reactive device
SanJ-OP-V-10	PIERCY 115kV	C5_5_McKee - Piercy & Milpitas - Swift 115 kV Lines	C5	DCTL	> 0.9	1.10	-	Under review for possible exemption or reactive device
SanJ-OP-V-11	ALMADEN 60kV	C5_26_Evergreen - San Jose B & Evergreen - Mabury 115 kV	C5	DCTL	1.13	1.18	-	Under review for possible exemption or reactive device
SanJ-OP-V-12	EVGRN J 60kV	C5_11_Trimble - San Jose B & FMC - San Jose B 115 kV Lines	C5	DCTL	1.13	> 0.9	-	Under review for possible exemption or reactive device
SanJ-OP-V-13	EVGRN&1 115kV	C5_20_Newark - Los Esteros & Los Esteros - Metcalf 230 kV Lines	C5	DCTL	> 0.9	1.10	-	Under review for possible exemption or reactive device
SanJ-OP-V-14	IBM-HR J 115kV	C5_11_Trimble - San Jose B & FMC - San Jose B 115 kV Lines	C5	DCTL	> 0.9	1.10	-	Under review for possible exemption or reactive device
SanJ-OP-V-15	JENNINGS 60kV	C5_11_Trimble - San Jose B & FMC - San Jose B 115 kV Lines	C5	DCTL	1.13	> 0.9	-	Under review for possible exemption or reactive device
SanJ-OP-V-16	MRGN HIL 115kV	C5_19_Morgan Hill - Llagas & Metcalf - Llagas 115 kV Lines	C5	DCTL	> 0.9	1.10	-	Under review for possible exemption or reactive device
SanJ-OP-V-17	SENER J 60kV	C5_26_Evergreen - San Jose B & Evergreen - Mabury 115 kV	C5	DCTL	1.13	1.18	-	Under review for possible exemption or reactive device

2013/2014 ISO Reliability Assessment - Study Results

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



**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.

2013/2014 ISO Reliability Assessment - Study Results

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



**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.



2013/2014 ISO Reliability Assessment - Study Results

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



**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

2013/2014 ISO Reliability Assessment - Study Results

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



**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-15**

**PG&E Greater Fresno Area**

**Reliability Assessment Study Results**

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
Fres-SP-T-1	Oro Loma #2 115/70kV	Base Case	A	N-0	125%	<90%	<90%	Oro Loma 70 kV Area Reinforcement mitigates - Action Plan.
Fres-SP-T-2	Oro Loma #2 115/70kV	Los Banos-Livingston Jct-Canal 70kV	B	L-1	136%	<90%	<90%	Oro Loma 70 kV Area Reinforcement mitigates - Action Plan.
Fres-SP-T-3	Oro Loma #2 115/70kV	Los Banos-Livingston Jct-Canal 70kV and any single Helms PGP unit	B	L-1/G-1	128%	<90%	<90%	Oro Loma 70 kV Area Reinforcement mitigates - Action Plan.
Fres-SP-T-4	Borden-Gregg 230kV	Bus 2 Fault at Herndon 115kV	C1	Bus	105%	<90%	<90%	North Fresno 115kV Reinforcement Project mitigates in later years - Action Plan.
Fres-SP-T-5	Panoche-Oro Loma 115kV	Bus Fault at Los Banos 70kV	C1	Bus	150%	<90%	<90%	Oro Loma 70 kV Area Reinforcement mitigates - Action Plan.
Fres-SP-T-6	Oro Loma #2 115/70kV	Bus Fault at Los Banos 70kV	C1	Bus	321%	<90%	<90%	Oro Loma 70 kV Area Reinforcement mitigates - Action Plan.
Fres-SP-T-7	Oro Loma-Canal #1 70kV (Oro Loma-Dos Palos Section)	Bus Fault at Los Banos 70kV	C1	Bus	146%	<90%	<90%	Oro Loma 70 kV Area Reinforcement mitigates - Action Plan.
Fres-SP-T-8	Los Banos-Canal-Oro Loma #1 70kV (Oro Loma-Mercy Springs Section)	Bus Fault at Los Banos 70kV	C1	Bus	120%	<90%	<90%	Oro Loma 70 kV Area Reinforcement mitigates - Action Plan.
Fres-SP-T-9	Coalinga 1-Coalinga 2 70kV (Coalinga 1-Tornado Tap Section)	Bus Fault at Coalinga 2 70kV	C1	Bus	102%	102%	102%	Reduce generation of the Coalinga 1-Coalinga 2 70kV line

2013/2014 ISO Reliability Assessment - Study Results

Study Area: **PG&E Greater Fresno - Summer Peak**



**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
Fres-SP-T-10	Merced-Merced Falls 70kV	Bus Fault at Le Grand 115kV	C1	Bus	106%	104%	100%	Exchequer SPS mitigates
Fres-SP-T-11	Merced Falls-Exchequer 70kV	Bus Fault at Le Grand 115kV	C1	Bus	134%	132%	128%	Exchequer SPS mitigates
Fres-SP-T-12	Borden-Madera #2 70kV	Bus E Fault at Borden 70kV	C1	Bus	107%	114%	111%	Madera SPS mitigates
Fres-SP-T-13	Herndon-Bullard #1 115kV (Pinedale Jct-Bullard Section)	Bus 1 Fault at Herndon 115kV	C1	Bus	116%	118%	129%	Cut-in Herndon-Bullard 115kV OL SPS.
Fres-SP-T-14	Herndon-Bullard #2 115kV (Herndon-Pinedale Section)	Bus 2 Fault at Herndon 115kV	C1	Bus	138%	146%	149%	Cut-in Herndon-Bullard 115kV OL SPS.
Fres-SP-T-15	Borden-Gregg #1 230kV	Herndon CB202 Failure	C2	Breaker	126%	<90%	<90%	North Fresno 115kV Reinforcement Project mitigates in later years - Action Plan.
Fres-SP-T-16	Chowchilla-Kerckhoff #2 115kV	Herndon CB202 Failure	C2	Breaker	108%	<90%	<90%	North Fresno 115kV Reinforcement Project mitigates in later years - Action Plan.
Fres-SP-T-17	Barton-Airways-Sanger 115kV (Airways-Sanger Section)	Herndon CB202 Failure	C2	Breaker	111%	<90%	98%	North Fresno 115kV Reinforcement Project mitigates in later years - Action Plan.
Fres-SP-T-18	Manchester-Airways-Sanger 115kV	Herndon CB202 Failure	C2	Breaker	102%	<90%	<90%	North Fresno 115kV Reinforcement Project mitigates in later years - Action Plan.
Fres-SP-T-19	Kerckhoff-Clovis-Sanger #1 115kV (Kerckhoff-Woodward Jct Section)	Herndon 230kV CB202 Failure	C2	Breaker	102%	<90%	<90%	North Fresno 115kV Reinforcement Project mitigates in later years - Action Plan.
Fres-SP-T-20	Sanger-McCall #3 115kV	Herndon 230kV CB202 Failure	C2	Breaker	101%	<90%	<90%	North Fresno 115kV Reinforcement Project mitigates in later years - Action Plan.

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
Fres-SP-T-21	Herndon-Barton 115kV	McCall 230kV CB202 Failure	C2	Breaker	130%	<90%	<90%	North Fresno 115kV Reinforcement Project mitigates in later years - Action Plan.
Fres-SP-T-22	Herndon-Manchester 115kV	McCall 230kV CB202 Failure	C2	Breaker	131%	<90%	<90%	North Fresno 115kV Reinforcement Project mitigates in later years - Action Plan.
Fres-SP-T-23	GWF-Kingsburg 115kV	McCall 230kV CB202 Failure	C2	Breaker	103%	<90%	<90%	North Fresno 115kV Reinforcement Project mitigates in later years - Action Plan.
Fres-SP-T-24	Merced Falls-Exchequer 70kV	Wilson 115kV CB102 Failure	C2	Breaker	241%	<90%	<90%	Wilson 115kV Area Reinforcement Project mitigates in later years - Atwater SPS in short term
Fres-SP-T-25	Merced-Merced Falls 70kV	Wilson 115kV CB102 Failure	C2	Breaker	192%	<90%	<90%	Wilson 115kV Area Reinforcement Project mitigates in later years - Atwater SPS in short term
Fres-SP-T-26	Panoche-Oro Loma 115kV	Los Banos #3 & #4 230/70kV	C3	T-1-1	164%	<90%	<90%	Oro Loma 70 kV Area Reinforcement mitigates - Action Plan.
Fres-SP-T-27	Oro Loma-Canal #1 70kV	Los Banos #3 & #4 230/70kV	C3	T-1-1	155%	<90%	<90%	Oro Loma 70 kV Area Reinforcement mitigates - Action Plan.
Fres-SP-T-28	Los Banos-Canal-Oro Loma 70kV	Los Banos #3 & #4 230/70kV	C3	T-1-1	148%	<90%	<90%	Oro Loma 70 kV Area Reinforcement mitigates - Action Plan.

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
Fres-SP-T-29	Los Banos-Livingston Jct-Canal 70kV	Oro Loma #2 115/70kV & Los Banos-Canal-Oro Loma 70kV	C3	L-1/T-1	135%	<90%	<90%	Oro Loma 70 kV Area Reinforcement mitigates - Action Plan.
Fres-SP-T-30	Los Banos #3 230/70kV	Los Banos #4 230/70kV & Oro Loma #2 115/70kV	C3	T-1-1	124%	<90%	<90%	Oro Loma 70 kV Area Reinforcement mitigates - Action Plan.
Fres-SP-T-31	Panoche-Oro Loma 115kV (Panoche-Hammonds Section)	Los Banos #3 & #4 230/70kV	C3	T-1-1	164%	<90%	<90%	Oro Loma-Mendota 115kV Project mitigates. Action Plan.
Fres-SP-T-32	Oro Loma #2 115/70kV	Los Banos #3 & Mercy Springs #1 230/70kV	C3	T-1-1	<90%	112%	119%	Action Plan
Fres-SP-T-33	Los Banos-Livingston Jct-Canal 70kV (Chevron Pipeline-Santa Nella Section worst)	Oro Loma #2 115/70kV & Los Banos-Canal-Oro Loma 70kV	C3	L-1-1	135%	<90%	<90%	Oro Loma 70 kV Area Reinforcement mitigates - Action Plan.
Fres-SP-T-34	Los Banos-Canal-Oro Loma #1 70kV (Oro Loma-Mercy Springs Section) (2015 Case) Oro Loma-Mercy Springs 70kV (2018 & Later)	Los Banos #3 & #4 230/70kV	C3	T-1-1	148%	<90%	<90%	Oro Loma 70 kV Area Reinforcement mitigates - Action Plan.
Fres-SP-T-35	Oro Loma-Canal #1 70kV (Dos Palos-Santa Rita Section)	Los Banos-Canal-Oro Loma 70kV & Los Banos-Livingston Jct-Canal 70kV	C3	L-1-1	159%	<90%	<90%	Oro Loma 70 kV Area Reinforcement mitigates - Action Plan.
Fres-SP-T-36	Oro Loma-Canal #1 70kV (Santa Rita-Canal Section)	Oro Loma-Mendota 115kV & Mercy Spring-Mendota 115kV	C3	L-1-1	N/A	103%	103%	Action Plan
Fres-SP-T-37	Reedley-Orosi 70kV	Reedley-Dinuba 70kV & McCall-Reedley (McCall-Wahtoke Section) 115kV	C3	L-1-1	105%	<90%	<90%	Approved Reedley-Orosi 70kV reconductor mitigates later years. Action Plan

2013/2014 ISO Reliability Assessment - Study Results

Study Area: **PG&E Greater Fresno - Summer Peak**



**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
Fres-SP-T-38	Coalinga 1-Coalinga 2 70kV (Tornado Tap-Pennzier Tap Section worst)	Gates #5 230/70kV & Schindler #1 115/70	C3	T-1-1	138%	139%	142%	Action Plan
Fres-SP-T-39	Schindler-Coalinga #2 70kV (Schindler-Pleasant Valley Section)	Schindler-Huron-Gates 70kV & Gates #5 230/70kV	C3	L-1/T-1	<90%	99%	102%	Action Plan
Fres-SP-T-40	Biola-Glass-Madera 70kV	Borden-Madera #1 & #2 70kV	C3	L-1-1	93%	100%	101%	Madera SPS mitigates
Fres-SP-T-41	Borden-Glass 70kV	Borden-Madera #1 & #2 70kV	C3	L-1-1	109%	116%	117%	Madera SPS mitigates
Fres-SP-T-42	Remaining Borden-Madera 70kV	Borden-Madera #1 OR #2 & Borden-Glass 70kV	C3	L-1-1	109%	116%	116%	Madera SPS mitigates
Fres-SP-T-43	Borden #1 230/70kV	Borden #1 230/70kV & Coppermine-Friant 70kV	C3	L-1-1	104%	110%	99%	Action Plan
Fres-SP-T-44	E2-Shepherd 115kV	Gregg-E1 #1 & #2 230kV	C3/C5	L-2	N/A	126%	122%	Modify Helms RAS, as part of North Fresno 115kV Area Reinforcement Project
Fres-SP-T-45	Woodward-Shepherd 115kV	Gregg-E1 #1 & #2 230kV	C3/C5	L-2	N/A	124%	120%	Modify Helms RAS, as part of North Fresno 115kV Area Reinforcement Project
Fres-SP-T-46	E2-Clovis-Sanger #1 OR #2 115kV (E2-Clovis 2 Jct Section worst)	Gregg-E1 #1 & #2 230kV	C3/C5	L-2	N/A	118%	118%	Modify Helms RAS, as part of North Fresno 115kV Area Reinforcement Project
Fres-SP-T-47	E2 #1 OR #2 230/115kV	Gregg-E1 #1 & #2 230kV	C3/C5	L-2	N/A	141%	141%	Modify Helms RAS, as part of North Fresno 115kV Area Reinforcement Project
Fres-SP-T-48	Chowchilla-Kerckhoff #2 115kV	Kerckhoff -E2 #1 & #2 115kV	C3/C5	L-2	N/A	148%	144%	Modify Kerckhoff 2 PH RAS



**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
Fres-SP-T-49	Chowchilla-Kerckhoff #2 115kV (Sharon Tap-Oakhurst Jct Section worst)	Kerckhoff-Clovis-Sanger No. 1 & 2 115 kV	C3/C5	L-2	150%	N/A	N/A	Kerckhoff 2 PH RAS mitigates
Fres-SP-T-50	Remaining Kerckhoff-Clovis-Sanger 115kV	Kerckhoff-Clovis-Sanger #1 OR #2 & Chowchilla-Kerckhoff #2 115kV	C3/C5	L-1-1	113%	N/A	N/A	North Fresno 115kV Reinforcement Project mitigates in later years - Action Plan.
Fres-SP-T-51	Chowchilla-Kerckhoff 2 115kV (Sharon Tap-Oakhurst Jct Section worst)	Kerckhoff-Clovis-Sanger #1 & #2 115kV	C3/C5	L-2	150%	N/A	N/A	Kerckhoff 2 PH RAS mitigates
Fres-SP-T-52	Chowchilla-Kerckhoff #2 115kV	Kerckhoff-E2 #1 & #2 115kV	C3/C5	L-2	N/A	142%	138%	Modify Kerckhoff 2 PH RAS
Fres-SP-T-53	Wilson-Le Grand 115kV	Wilson #1 & #2 230/115kV	C3	L-1-1	134%	<90%	<90%	Wilson 115kV Area Reinforcement Project mitigates in later years - Atwater SPS in short term
Fres-SP-T-54	Wilson-Le Grand 115kV	Kerckhoff-Clovis-Sanger #1 & #2 115kV	C3/C5	L-2	103%	N/A	N/A	Kerckhoff 2 PH RAS mitigates
Fres-SP-T-55	Wilson-Oro Loma 115kV	Wilson #1 & #2 230/115kV	C3	T-1-1	115%	<90%	<90%	Wilson 115kV Area Reinforcement Project mitigates in later years - Atwater SPS in short term
Fres-SP-T-56	Wilson-Merced #1 115kV	Wilson-Atwater #2 & El Capitan-Wilson 115kV	C3	L-1-1	104%	<90%	<90%	Wilson 115kV Area Reinforcement Project mitigates in later years - Atwater SPS in short term

2013/2014 ISO Reliability Assessment - Study Results

Study Area: **PG&E Greater Fresno - Summer Peak**



**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
Fres-SP-T-57	Atwater-Livingston-Merced 115kV (Atwater-Atwater Jct)	Wilson-Atwater #2 & El Capitan-Wilson 115kV	C3	L-1-1	120%	<90%	<90%	Wilson 115kV Area Reinforcement Project mitigates in later years - Atwater SPS in short term
Fres-SP-T-58	Panoche-Oro Loma 115kV (Panoche-Hammonds Section)	Borden-Gregg & Wilson-Gregg 230kV	C3/C5	L-2	100%	<90%	<90%	Oro Loma-Mendota 115kV Project mitigates. Action Plan.
Fres-SP-T-59	Panoche-Oro Loma 115kV (Panoche-Hammonds Section)	Panoche-Mendota & Dairyland-Le Grand 115kV	C3	L-1-1	<90%	107%	101%	Reconductor Panoche-Oro Loma 115kV
Fres-SP-T-60	Remaining McCall 230/115kV	Two McCall 230/115kV	C3	T-1-1	102%	<90%	<90%	North Fresno 115kV Reinforcement Project mitigates in later years - Action Plan.
Fres-SP-T-61	Kings River-Sanger-Reedley 115kV (Piedra 1 SW-Reedley Section worst)	Sanger-Reedley & McCall-Reedley (McCall-Wahtoke) 115kV	C3	L-1-1	146%	144%	155%	Add new McCall-Reedley #2 115kV line (2013-2014 Request Window Project)
Fres-SP-T-62	Sanger-Reedley 115kV (Sanger Jct-Parlier Section)	Kings River-Sanger-Reedley & McCall-Reedley (McCall-Wahtoke Section) 115kV	C3	L-1-1	94%	95%	102%	Add new McCall-Reedley #2 115kV line (2013-2014 Request Window Project)
Fres-SP-T-63	McCall-Reedley 115kV (Wahtoke-Reedley Section)	Kings River-Sanger-Reedley & Sanger-Reedley 115kV	C3	L-1-1	96%	96%	102%	Add new McCall-Reedley #2 115kV line (2013-2014 Request Window Project)
Fres-SP-T-64	McCall-Kingsburg #1 115kV (Kingsburg Jct 1-Kingsburg Jct 2 Section worst)	GWF-Kingsburg & McCall-Kingsburg #2 115kV	C3	L-1-1	121%	119%	124%	Reconductor McCall-Kingsburg #1 & #2 115kV
Fres-SP-T-65	McCall-Cal Ave 115kV (McCall-Danish Creamery Section worst)	McCall-West Fresno & California Ave-Sanger 115kV	C3	L-1-1	98%	103%	115%	Action Plan
Fres-SP-T-66	Cal Ave-Sanger 115kV	McCall-West Fresno & McCall-California Ave 115kV	C3	L-1-1	96%	100%	108%	Action Plan

2013/2014 ISO Reliability Assessment - Study Results

Study Area: **PG&E Greater Fresno - Summer Peak**



**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
Fres-SP-T-67	West Fresno-McCall 115kV	McCall-Cal Ave & Cal Ave-Sanger 115kV	C3	L-1-1	<90%	94%	104%	Action Plan
Fres-SP-T-68	Cal Ave-Sanger 115kV	McCall-Cal Ave & McCall-West Fresno 115kV	C3/C5	L-2	96%	100%	108%	Action Plan
Fres-SP-T-69	Herndon-Ashlan 230kV (Herndon-Figarden Tap 1 Section)	Gregg-Herndon #1 & #2 230kV	C3/C5	L-2	102%	<90%	<90%	North Fresno 115kV Reinforcement Project mitigates in later years - Action Plan. Helms RAS mitigates
Fres-SP-T-70	Gregg-Ashlan 230kV (Gregg-Figarden 2 Tap worst)	Gregg-Herndon #1 & #2 230kV	C3/C5	L-2	134%	<90%	<90%	North Fresno 115kV Reinforcement Project mitigates in later years - Action Plan. Helms RAS mitigates

San Onofre Nuclear Generation Station was retired on June 7, 2013 and therefore was removed from the base cases used for the 2013/14 ISO transmission planning process.

2013/2014 ISO Reliability Assessment - Study Results

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



**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Summer Off-Peak	2018 Summer Light Load	2018 Summer Partial Peak	
Fres-NP-T-1	Kearney-Herndon 230kV	Gates-Gregg 230kV	B	L-1	<90%	<90%	108%	Short Term: INC Helms PGP. Long Term: Kearney-Herndon 230kV Reconductor Project
Fres-NP-T-2	Gates-Gregg 230kV (Gates-Henrietta Tap Section)	Panoche-Kearney 230kV	B	L-1	<90%	<90%	103%	Short Term: INC Helms PGP. Long Term: Kearney-Herndon 230kV Reconductor Project
Fres-NP-T-3	Exchequer-Le Grand 115kV	Merced-Merced Falls 70kV	B	L-1	<90%	103%	<90%	Exchequer SPS mitigates
Fres-NP-T-4	Panoche-Oro Loma 115kV (Panoche-Hammonds Section)	Panoche-Mendota 115kV	B	L-1	<90%	<90%	114%	Short Term: INC Helms PGP. Long Term: Kearney-Herndon 230kV Reconductor Project
Fres-NP-T-5	Wilson-Oro Loma 115kV (Oro Loma-El Nido Section)	Warnerville-Wilson 230kV	B	L-1	<90%	<90%	103%	Short Term: INC Helms PGP. Long Term: Kearney-Herndon 230kV Reconductor Project
Fres-NP-T-6	Kearney-Kerman 70kV (Fresno WW-Kerman Section worst)	Helm-Kerman 70kV	B	L-1	<90%	229%	<90%	Short Term: INC Fresno WW gen or drop Kerman 70kV load. Long Term: New Kearney-Kerman 70kV Line Reconductor Project (2013-2014 Request Window Project)
Fres-NP-T-7	Merced-Merced Falls 70kV	Bus Fault at Le Grand 115kV	C1	Bus	171%	173%	<90%	Exchequer SPS mitigates
Fres-NP-T-8	Merced Falls-Exchequer 70kV	Bus Fault at Le Grand 115kV	C1	Bus	204%	206%	105%	Exchequer SPS mitigates
Fres-NP-T-9	Merced #2 115/70kV	Bus Fault at Le Grand 115kV	C1	Bus	130%	137%	<90%	Exchequer SPS mitigates

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Summer Off-Peak	2018 Summer Light Load	2018 Summer Partial Peak	
Fres-NP-T-10	Exchequer-Le Grand 115kV	Bus Fault at Merced Falls 70kV	C1	Bus	99%	103%	<90%	Exchequer SPS mitigates
Fres-NP-T-11	Kearney-Herndon 230kV	Bus 1E Fault at Gates 230kV	C1	Bus	97%	<90%	123%	Short Term: INC Helms PGP. Long Term: Kearney-Herndon 230kV Reconductor Project
Fres-NP-T-12	Wilson-Oro Loma 115kV (Oro Loma-El Nido Section)	Bus 1E Fault at Gates 230kV	C1	Bus	<90%	<90%	101%	INC Helms PGP
Fres-NP-T-13	Panoche-Oro Loma 115kV (Panoche-Hammonds Section)	Bus 1 Fault at Panoche 115kV	C1	Bus	<90%	<90%	108%	INC Helms PGP
Fres-NP-T-14	Borden-Madera #2 70kV	Bus E Fault at Borden 70kV	C1	Bus	<90%	<90%	103%	Madera SPS mitigates
Fres-NP-T-15	Oro Loma #2 115/70kV	Bus Fault at Los Banos 70kV	C1	Bus	131%	<90%	<90%	Oro Loma 70 kV Area Reinforcement mitigates - Action Plan.
Fres-NP-T-16	Coalinga #1-Coalinga #2 70kV (Tornado Jct-Coalinga 1 Section)	Bus Fault at Coalinga 2 70kV	C1	Bus	107%	109%	101%	Action Plan: Reduce generation on the Coalinga 1-Coalinga 2 70 kV line
Fres-NP-T-17	Herndon-Bullard #1 115kV (Bullard-Pinedale Section)	Bus 1 Fault at Herndon 115kV	C1	Bus	N/A	N/A	103%	Cut-in Herndon-Bullard 115kV OL SPS
Fres-NP-T-18	Herndon-Bullard #2 115kV (Bullard-Pinedale Section)	Bus 2 Fault at Herndon 115kV	C1	Bus	N/A	N/A	134%	Cut-in Herndon-Bullard 115kV OL SPS
Fres-NP-T-19	Panoche-Gates #1 230kV	Gates 230kV CB312 Failure	C2	Breaker	107%	<90%	<90%	Use congestion management to mitigate.
Fres-NP-T-20	Merced Falls-Exchequer 70kV (McSwain-Exchequer Section worst)	Wilson 115kV CB102 Failure	C2	Breaker	175%	<90%	<90%	North Fresno 115kV Reinforcement Project mitigates in later years - Action Plan.

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Summer Off-Peak	2018 Summer Light Load	2018 Summer Partial Peak	
Fres-NP-T-21	Merced-Merced Falls 70kV	Wilson 115kV CB102 Failure	C2	Breaker	<90%	<90%	152%	Short Term: INC Fresno Generation. Long Term: Wilson 115kV Area Reinforcement Project
Fres-NP-T-22	Oro Loma #2 115/70kV	Los Banos #3 & #4 230/70kV	C3	T-1-1	170%	<90%	<90%	Short Term: INC Helms PGP. Long Term: Oro Loma 70kV Reinforcement Project
Fres-NP-T-23	Oro Loma #2 115/70kV	Panoche-Oro Loma 115kV & Panoche-Mendota 115kV	C3	T-1-1	<90%	<90%	122%	INC Helms PGP
Fres-NP-T-24	Borden-Glass 70kV	Borden-Madera #1 & #2 70kV	C3	L-1-1	<90%	<90%	104%	Madera SPS mitigates
Fres-NP-T-25	Kearney #2 230/70kV	Helm-Kerman 70kV & Kearney #4 230/70kV	C3	L-1/T-1	N/A	<90%	131%	Action Plan
Fres-NP-T-26	Coalinga 1-Coalinga 2 70kV (Tornado Tap-Pennzier Tap Section)	Schindler #1 115/70kV & Gates #5 230/70kV	C3	T-1-1	<90%	<90%	110%	Action Plan
Fres-NP-T-27	Los Banos-Canal-Oro Loma #1 70kV (Oro Loma-Mercy Springs Section) (2015 Case) Oro Loma-Mercy Springs 70kV (2018 & Later)	Panoche Oro-Loma 115kV & Panoche-Mendota 115kV	C3	L-1-1	<90%	<90%	111%	INC Helms PGP and Gates-Gregg 230kV Line Project
Fres-NP-T-28	Panoche-Oro Loma 115kV (Panoche-Hammonds Section)	Warnerville-Wilson 230kV & Panoche-Mendota 115kV	C3	L-1-1	<90%	<90%	144%	INC Helms PGP and Gates-Gregg 230kV Line Project
Fres-NP-T-29	Wilson-Oro Loma 115kV (Oro Loma-El Nido Section)	Warnerville-Wilson & Panoche-Kearney 230kV	C3	L-1-1	<90%	<90%	142%	INC Helms PGP and Gates-Gregg 230kV Line Project

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Summer Off-Peak	2018 Summer Light Load	2018 Summer Partial Peak	
Fres-NP-T-30	Wilson-Le Grand 115kV	Kerckhoff-Clovis-Sanger #1 & #2 115kV	C3/C5	L-2	105%	N/A	N/A	North Fresno 115kV Reinforcement Project mitigates in later years - Action Plan
Fres-NP-T-31	Henrietta #3 230/115kV	Gates-McCall & Helm-McCall 230kV	C3	L-1-1	<90%	<90%	123%	INC McCall 115kV generation
Fres-NP-T-32	Any McCall 230/115kV	Any two McCall 230/115kV	C3	T-1-1	<90%	<90%	143%	INC McCall 115kV generation
Fres-NP-T-33	GWF-Henrietta 115kV (Henrietta-Leprino Foods Jct Section)	Helm-McCall & Gates-McCall 230kV	C3/C5	L-2	<90%	<90%	119%	McCall UVLS may operate. INC generation.
Fres-NP-T-34	GWF-Kingsburg 115kV	Gates-McCall & Helm-McCall 230kV	C3/C5	L-2	<90%	<90%	102%	McCall UVLS may operate. INC generation.
Fres-NP-T-35	Kings River-Sanger-Reedley 115kV (Sanger-Rainbow Tap Section)	Sanger-Reedley and McCall-Reedley (McCall-Wahtoke) 115kV	C3	L-1-1	<90%	<90%	135%	New McCall-Reedley #2 115kV
Fres-NP-T-36	Remaining McCall-Kingsburg 115kV	McCall-Kingsburg #1 OR #2 115kV & Henrietta #3 230/115kV	C3	L-1/T-1	<90%	<90%	121%	Add new McCall-Reedley #2 115kV line (2013-2014 Request Window Project)
Fres-NP-T-37	Wilson-Borden #1 230kV (Wilson-Storey 1 Section)	Gates-Gregg & Gates-McCall 230kV	C3	L-1-1	<90%	<90%	101%	HRAS Mitigates and Gates-Gregg 230kV Line Project
Fres-NP-T-38	Panoche-Helm 230kV	Gates-Gregg & Gates-McCall 230kV	C3/C5	L-2	<90%	<90%	101%	INC Helms PGP and Gates-Gregg 230kV Line Project
Fres-NP-T-39	Manchester-Airways-Sanger 115kV (Manchester-Airways Jct Section worst)	Barton-Airways-Sanger 115kV and Woodward-Shepherd 115kV	C3	L-1-1	109%	<90%	<90%	Trip another Helms PGP pump
Fres-NP-T-40	Barton-Airways-Sanger 115kV (Airways-Sanger Section worst)	Manchester-Airways-Sanger 115kV & Woodward-Shepherd 115kV	C3	L-1-1	109%	<90%	<90%	Trip another Helms PGP pump

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Summer Off-Peak	2018 Summer Light Load	2018 Summer Partial Peak	
Fres-NP-T-41	Borden #1 230/70kV	Borden #2 230/70kV & Coppermine-Friant 70kV	C3	L-1/T-1	<90%	<90%	104%	INC Wishon PH
Fres-NP-T-42	Remaining Borden-Madera 70kV	Borden-Madera #1 OR #2 & Borden-Glass 70kV	C3	L-1-1	<90%	<90%	104%	Madera SPS mitigates
Fres-NP-T-43	Chowchilla-Kerckhoff 2 115kV (Certainteed Jct-Sharon Tap Section)	Gates-Gregg & Gates-McCall 230kV	C3	L-1-1	<90%	<90%	123%	INC Helms PGP and Gates-Gregg 230kV Line Project
Fres-NP-T-44	Exchequer-Le Grand 115kV	Wilson-Le Grand 115kV & Merced-Merced Falls 70kV	C3	L-1-1	<90%	100%	<90%	Exchequer SPS mitigates
Fres-NP-T-45	Gates-Gregg 230kV (Gates-Henrietta Tap Section)	Gates-McCall & Helm-McCall 230kV	C3/C5	L-2	<90%	<90%	127%	INC Helms PGP
Fres-NP-T-46	Gates-McCall 230kV (Gates-Henrietta Tap 2 Section)	Gates-Gregg & Helm-McCall 230kV	C3	L-1-1	<90%	<90%	114%	INC Helms PGP
Fres-NP-T-47	Kearney-Herndon 230kV	Gates-Gregg & Gates-McCall 230kV	C5	L-2	109%	<90%	<90%	Trip another Helms PGP pump
Fres-NP-T-48	Wilson-Gregg 230kV (Wilson-Storey 1 Section)	Gates-Gregg & Gates-McCall 230kV	C3	L-1-1	<90%	<90%	107%	INC Helms PGP and Gates-Gregg 230kV Line Project
Fres-NP-T-49	Wilson-Gregg 230kV (Wilson-Storey 1 Section)	Gates-Gregg & Panoche-Kearney 230kV	C3	L-1-1	<90%	<90%	107%	INC Helms PGP and Gates-Gregg 230kV Line Project
Fres-NP-T-50	Herndon-Kearney 230kV	Gates-Gregg & Gates-McCall 230kV	C3	L-1-1	<90%	<90%	152%	INC Helms PGP and Gates-Gregg 230kV Line Project
Fres-NP-T-51	Panoche-Gates #1 OR #2 230kV	Gates-Gregg & Gates-McCall 230kV	C5	L-2	102%	<90%	<90%	Short Term: Use congestion management to mitigate. Long Term: Gates-Gregg 230kV Line Project
Fres-NP-T-52	Gates-McCall 230kV (Gates-Henrietta Tap 2 Section)	Panoche-Kearney & Gates-Gregg 230kV	C5	L-2	<90%	<90%	108%	INC Helms PGP and Gates-Gregg 230kV Line Project



2013/2014 ISO Reliability Assessment - Study Results

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



**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Summer Off-Peak	2018 Summer Light Load	2018 Summer Partial Peak	
Fres-NP-T-53	Panoche-Oro Loma 115kV (Panoche-Hammonds Section worst)	Panoche-Kearney & Gates-Gregg 230kV	C5	L-2	<90%	<90%	113%	INC Helms PGP and Gates-Gregg 230kV Line Project
Fres-NP-T-54	Barton-Airways-Sanger 115kV	Panoche-Kearney & Gates-Gregg 230kV	C5	L-2	121%	<90%	<90%	Short Term: Action Plan. Long Term: North Fresno 115kV Area Reinforcement
Fres-NP-T-55	Manchester-Airways-Sanger 115kV	Panoche-Kearney & Gates-Gregg 230kV	C5	L-2	125%	<90%	<90%	Short Term: Action Plan. Long Term: North Fresno 115kV Area Reinforcement
Fres-NP-T-56	Wilson-Oro Loma 115kV (Le Grand Jct-El Nido Section worst)	Panoche-Kearney & Gates-Gregg 230kV	C5	L-2	<90%	<90%	137%	INC Helms PGP and Gates-Gregg 230kV Line Project
Fres-NP-T-57	Wilson-Borden #1 230kV (Wilson-Storey 1 Section)	Panoche-Kearney & Gates-Gregg 230kV	C5	L-2	<90%	<90%	105%	INC Helms PGP and Gates-Gregg 230kV Line Project
Fres-NP-T-58	Herndon-Barton 115kV	Panoche-Kearney & Gates-Gregg 230kV	C5	L-2	109%	<90%	<90%	Short Term: Action Plan. Long Term: North Fresno 115kV Area Reinforcement
Fres-NP-T-59	Manchester-Herndon 115kV	Panoche-Kearney & Gates-Gregg 230kV	C5	L-2	102%	<90%	<90%	Short Term: Action Plan. Long Term: North Fresno 115kV Area Reinforcement
Fres-NP-T-60	Gates-Gregg 230kV (Gates-Henrietta Tap Section)	Helm-McCall & Gates-McCall 230kV	C5	L-2	<90%	<90%	127%	INC Helms PGP and Gates-Gregg 230kV Line Project
Fres-NP-T-61	Henrietta #3 230/115kV	Helm-McCall & Gates-McCall 230kV	C5	L-2	<90%	<90%	123%	Action Plan
Fres-NP-T-62	Chowchilla-Kerckhoff #2 115kV	Kerckhoff-E2 #1 & #2 115 kV Lines	C5	L-2	<90%	101%	<90%	Kerckhoff 2 RAS mitigates

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
Fres-SP-VD-1	Mendota 115kV Area (Mendota 115kV worst)	Panoche-Mendota 115kV	B	L-1	12.57%	<5%	<5%	Short Term: Action plan Long Term: Oro Loma-Mendota 115 kV Conversion Project
Fres-SP-VD-2	Exchequer 70kV Area (Mariposa 70kV worst)	Exchequer-Le Grand 115kV	B	L-1	10.85%	10.43%	12.02%	Mariposa UVLS mitigates
Fres-SP-VD-3	Oro Loma 70kV Area (Firebaugh and Oro Loma 70kV worst)	Oro Loma #2 115/70kV	B	T-1	8.07%	N/A	N/A	Oro Loma 70 kV Area Reinforcement mitigates - Action Plan.
Fres-SP-VD-4	Chowchilla 115kV Area (Chowchilla 115kV worst)	Le Grand-Chowchilla 115kV	B	L-1	6.92%	7.24%	7.23%	New project to loop Chowchilla CoGen into Chowchilla 115kV to eliminate tap line or loop Dairyland-Le Grand 115kV through Chowchilla 115kV
Fres-SP-VD-5	Dinuba 70kV	Reedley-Dinuba 70kV	B	L-1	7.79%	<5%	<5%	Future project mitigates later years. Action Plan
Fres-SP-VD-6	Borden 230kV	Borden-Gregg 230kV	B	L-1	5.29%	<5%	<5%	New project that loops Wilson-Gregg 230kV through Borden mitigates deviation.
Fres-SP-VD-7	Kerman 70kV	Helm-Kerman 70kV	B	L-1	<5%	<5%	12.38%	Reconductor Kearney-Kerman 70kV (2013 Request Window Project)
Fres-SP-VD-8	Exchequer 70kV Area (Yosemite 70kV worst)	Exchequer-Le Grand 115kV & McSwain Unit	B	L-1/G-1	15.09%	14.91%	16.68%	Mariposa UVLS mitigates
Fres-SP-VD-9	Los Banos 70kV Area (Ortiga 70kV Worst)	Bus Fault at Los Banos 70kV	C1	Bus	24.40%	<10%	<10%	Oro Loma 70 kV Area Reinforcement mitigates - Action Plan.
Fres-SP-VD-10	Mendota 115kV	Bus 1 Fault at Panoche 115kV	C1	Bus	12.39%	<10%	<10%	Approved project to convert existing line, Oro Loma-Mendota 115kV Conversion, mitigates later years. Action Plan
Fres-SP-VD-11	Mariposa 2 70kV	Bus Fault at Exchequer 115kV	C1	Bus	<10%	<10%	10.96%	Mariposa UVLS mitigates
Fres-SP-VD-12	Herndon 115kV Area (Pinedale 115kV worst)	Bus 2 Fault at Herndon 115kV	C1	Bus	33.56%	35.45%	37.78%	Cut-in Herndon-Bullard OL SPS. This SPS should mitigate OL, LV, & Dev problems.
Fres-SP-VD-13	Wilson 115kV area	Wilson CB102 Breaker Failure	C2	Breaker	0.00%	<10%	<10%	Wilson 115kV Area Reinforcement Project mitigates in later years - Action Plan
Fres-SP-VD-14	McCall 115kV and Reedley 70kV Areas	McCall CB202 Breaker Failure	C2	Breaker	11.20%	<10%	<10%	North Fresno 115kV Reinforcement Project mitigates in later years - Action Plan

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
Fres-SP-VD-15	Mendota 115kV	Panoche CB102 Breaker Failure	C2	Breaker	12.75%	<10%	N/A	Approved project to add new line, Oro Loma-Mendota 115kV, mitigates later years.
Fres-SP-VD-16	Pinedale 115kV	Herndon CB202 Breaker Failure	C2	Breaker	8.83%	<10%	10.11%	Cut-in Herndon-Bullard OL SPS. This SPS should mitigate OL, LV, & Dev problems.
Fres-SP-VD-17	Shepherd 115kV	Gregg-E1 #1 & #2 230kV lines	C3/C5	L-2	N/A	11.00%	<10%	Update Helms RAS as part of North Fresno 115kV Reinforcement Project
Fres-SP-VD-18	Atwater 115kV Area (Atwater 115kV worst)	Wilson #1 & #2 230/115kV	C3	T-1-1	11.81%	N/A	N/A	Wilson 115kV Area Reinforcement Project mitigates in later years - Action Plan
Fres-SP-VD-19	Oro Loma 70kV Area (Los Banos 70kV worst)	Los Banos #3 & #4 230/70kV	C3	T-1-1	37.23%	N/A	N/A	Oro Loma 70 kV Area Reinforcement mitigates - Action Plan.
Fres-SP-VD-20	Coalinga 70kV Area (Schindler 70kV worst)	Gates #5 230/70kV & Schindler #1 115/70kV	C3	T-1-1	23.15%	24.22%	26.03%	Action Plan
Fres-SP-VD-21	Wilson 115kV Area (Gallo 115kV worst)	Wilson #1 & #2 230/115kV	C3	T-1-1	11.93%	N/A	N/A	Wilson 115kV Area Reinforcement Project mitigates in later years - Action Plan
Fres-SP-VD-22	Mendota 115kV	Panoche-Oro Loma & Panoche-Mendota 115kV	C3	L-1-1	12.73%	N/A	N/A	Future project mitigates later years. Action Plan
Fres-SP-VD-23	Newhall 115kV	Panoche-Mendota & Dairyland-Le Grand 115kV	C3	L-1-1	18.09%	N/A	N/A	Future project mitigates later years. Action Plan
Fres-SP-VD-24	Reedley 70kV Area (Dunlap 70kV worst)	Sanger-Reedley & McCall-Reedley (McCall-Wahtoke Section) 115kV	C3	L-1-1	12.44%	10.32%	12.17%	New McCall-Reedley #2 115kV Line (2013 Request Window Project)
Fres-SP-VD-25	West Fresno 115kV Area (West Fresno 115kV Worst)	McCall-West Fresno & Cal Ave-Sanger 115kV	C3	L-1-1	13.94%	15.15%	17.82%	Action Plan

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2015 Summer Off-Peak	2018 Summer Light Load	2018 Summer Partial Peak	
Fres-NP-VD-1	Chowchilla 115kV Area (Chowchilla 115kV worst)	Le Grand-Chowchilla 115kV	B	L-1	<5%	<5%	6.82%	New project to loop Chowchilla CoGen into Chowchilla 115kV to eliminate tap line or loop, Dairyland-Le Grand 115kV through Chowchilla 115kV
Fres-NP-VD-2	Exchequer 70kV Area (Yosemite 70kV worst)	Exchequer-Le Grand 115kV	B	L-1	<5%	<5%	8.43%	Mariposa UVLS mitigates
Fres-NP-VD-3	Mendota 115kV	Panoche-Mendota 115kV	B	L-1	6.59%	<5%	<5%	Short Term: Action Plan. Long Term: Oro Loma-Mendota 115kV Conversion mitigates
Fres-NP-VD-4	Exchequer 70kV Area (Yosemite 70kV worst)	Exchequer-Le Grand 115kV & McSwain Unit	B	L-1/G-1	<5%	<5%	12.78%	Mariposa UVLS mitigates
Fres-NP-VD-5	Coalinga 70kV Area (Avenal 70kV worst)	Gates #5 230kV & Coalinga Generator	B	L-1/G-1	<5%	<5%	10.78%	Action Plan
Fres-NP-VD-6	Kerman 70kV	Helm-Kerman 70kV	B	L-1	<5%	<5%	11.35%	Reconductor Kearney-Kerman 70kV Line. (2013 Request Window Project)
Fres-NP-VD-7	Herndon 115kV Area (Pinedale 115kV worst)	Bus 2 Fault at Herndon 115kV	C1	Bus	<10%	<10%	32.45%	Cut-in Herndon-Bullard OL SPS. This SPS should mitigate OL, LV, & Dev problems.
Fres-NP-VD-8	El Nido 70kV	Bus Fault at Le Grand 115kV	C1	Bus	13.22%	13.53%	<10%	Exchequer PH SPS mitigates
Fres-NP-VD-9	Wilson 115kV Area (Gallo 115kV worst)	Wilson CB102 Failure	C2	Breaker	48.64%	<10%	<10%	Wilson 115kV Area Reinforcement Project mitigates in later years - Action Plan
Fres-NP-VD-10	Cheney 115kV	Panoche CB102 Failure	C2	Breaker	<10%	<10%	11.96%	INC Wellhead Panoche
Fres-NP-VD-11	System Wide Low Voltage	Gates-Gregg & Gates-McCall 230kV	C3/C5	L-2	N/A	N/A	20.00%	Third Gates-Gregg 230kV will mitigate. INC Helms PGP.
Fres-NP-VD-12	Oro Loma 70kV Area (Los Banos 70kV & Pacheco PP worst)	Los Banos #3 & #4 230/70kV	C3	T-1-1	15.41%	N/A	N/A	Short Term: Action Plan. Long Term: Oro Loma 70kV Area Reinforcement mitigates
Fres-NP-VD-13	Firebaugh 70kV	Los Banos-Canal-Oro Loma 70kV & Oro Loma #2 115/70kV	C3	L-1/T-1	10.61%	N/A	N/A	Short Term: Action Plan. Long Term: Oro Loma 70kV Area Reinforcement mitigates
Fres-NP-VD-14	Coalinga 70kV Area (Schindler 70kV worst)	Gates #5 230kV & Schindler #1 115/70kV	C3	T-1-1	N/A	N/A	29.31%	Action Plan

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2015 Summer Off-Peak	2018 Summer Light Load	2018 Summer Partial Peak	
Fres-NP-VD-15	Mendota 115kV	Wilson-Le Grand & Panoche-Mendota 115kV	C3	L-1-1	11.86%	N/A	N/A	Short Term: Action Plan. Long Term: Oro Loma 70kV Area Reinforcement mitigates
Fres-NP-VD-16	Dairyland 115kV	Le Grand-Dairyland & Panoche-Mendota 115kV	C3	L-1-1	<10%	<10%	11.72%	INC Helms PGP
Fres-NP-VD-17	West Fresno 115kV Area (West Fresno 115kV Worst)	McCall-West Fresno & Cal Ave-Sanger 115kV	C3	L-1-1	<10%	<10%	11.74%	Action Plan
Fres-NP-VD-18	Kingsburg 115kV Area (Corcoran 115kV worst)	McCall-Kingsburg #1 & #2 115kV	C5	L-2	N/A	N/A	15.45%	INC GWF Hanford

2013/2014 ISO Reliability Assessment - Study Results

Study Area: **PG&E Greater Fresno - Summer Peak**



**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
Fres-SP-V-1	Firebaugh 70kV	Oro Loma #2 115/70kV	B	T-1	0.90	>0.90	>0.90	Oro Loma 70kV Area Reinforcement Project mitigates later years. Action Plan
Fres-SP-V-2	Mendota 115kV Area (Mendota 115kV worst)	Panoche-Mendota 115kV (Paramount Farms new load interconnection)	B	L-1	0.89	>0.90	>0.90	Oro Loma -Mendota 115kV Conversion Project mitigates later years. Action Plan
Fres-SP-V-3	Exchequer 70kV Area (Mariposa 70kV worst)	Exchequer-Le Grand 115kV	B	L-1	0.89	0.90	0.88	Mariposa UVLS mitigates
Fres-SP-V-4	Mariposa 2 70kV	Bus Fault at Exchequer 115kV	C1	Bus	>0.90	>0.90	0.89	Mariposa UVLS mitigates
Fres-SP-V-5	Bullard 115kV	Bus 2 Fault at Herndon 115kV	C1	Bus	0.65	0.66	0.63	Cut-in Herndon-Bullard OL SPS
Fres-SP-V-6	Reedley 70kV Area (Dunlap 70kV worst)	Bus 2 Fault at Herndon 115kV	C1	Bus	0.89	>0.90	>0.90	Reedley 70kV Area Reinforcement Project mitigates later years. Action Plan
Fres-SP-V-7	Los Banos 70kV Area (Ortiga 70kV Worst)	Bus Fault at Los Banos 70kV	C1	Bus	0.77	>0.90	>0.90	Oro Loma 70kV Area Reinforcement Project mitigates later years. Action Plan
Fres-SP-V-8	Wilson 115kV area	Wilson CB102 Breaker Failure	C2	Breaker	0.00	>0.90	>0.90	Wilson 115kV Area Reinforcement Project mitigates in later years - Action Plan
Fres-SP-V-9	McCall 115kV and Reedley 70kV Areas	McCall CB202 Breaker Failure	C2	Breaker	0.86	>0.90	>0.90	North Fresno 115kV Reinforcement Project mitigates in later years - Action Plan
Fres-SP-V-10	Mendota 115kV	Panoche CB102 Breaker Failure	C2	Breaker	0.89	>0.90	>0.90	Approved project to add new line, Oro Loma-Mendota 115kV Conversion, mitigates later years - Action Plan
Fres-SP-V-11	Pinedale 115kV	Herndon CB202 Breaker Failure	C2	Breaker	0.89	>0.90	0.90	North Fresno 115kV Reinforcement Project mitigates in later years - Action Plan
Fres-SP-V-12	Shepherd 115kV	Gregg-E1 #1 & #2 230kV lines	C5	L-2	>0.90	0.89	>0.90	Update Helms RAS.

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
Fres-SP-V-13	Exchequer 70kV Area (Yosemite 70kV)	Exchequer-Le Grand 115kV & Exchequer-Mariposa 70kV	C3	L-1-1	0.84	0.84	0.82	Modify Exchequer SPS to run back, instead of drop unit for loss of Exchequer-Le Grand 115kV
Fres-SP-V-14	Borden 230kV	Borden-Gregg & Warnerville-Wilson 230kV	C3	L-1-1	0.90	>0.90	>0.90	Approved Pproject to loop Wilson-Gregg 230kV through Borden 230kV mitigates later years. Action Plan
Fres-SP-V-15	Atwater 115kV Area	Wilson#1 & #2 230/115kV	C3	T-1-1	0.89	>0.90	>0.90	Wilson 115kV Area Reinforcement Project mitigates in later years - Action Plan
Fres-SP-V-16	Oro Loma 70kV Area (Los Banos 70kV worst)	Los Banos #3 & #4 230/70kV	C3	T-1-1	0.68	>0.90	>0.90	Mercy Springs 230kV substation mitigates - Action Plan
Fres-SP-V-17	Mendota 115kV	Panoche-Mendota & Wilson-Le Grand 115kV	C3	L-1-1	0.79	>0.90	>0.90	Future project mitigates. Action Plan
Fres-SP-V-18	West Fresno 115kV Area (West Fresno 115kV Worst)	McCall-West Fresno & Cal Ave-Sanger 115kV	C3	L-1-1	0.84	0.83	0.79	Add dynamic reactive support at West Fresno 115kV
Fres-SP-V-19	Reedley 70kV Area (Dunlap 70kV worst)	Sanger-Reedley & McCall-Reedley (McCall-Wahtoke Section) 115kV	C3	L-1-1	0.89	>0.90	0.91	Reedley 70kV Area Reinforcement Project mitigates later years. Action Plan

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2015 Summer Off-Peak	2018 Summer Light Load	2018 Summer Partial Peak	
Fres-NP-V-1	System wide (Oro Loma 70kV worst)	None	A	N-0	<1.05	1.08	<1.05	Study further for possible exemption
Fres-NP-V-2	Exchequer 70kV Area (Yosemite 70kV worst)	Exchequer-Le Grand 115kV & McSwain Unit	B	L-1/G-1	>0.90	>0.90	0.88	Mariposa UVLS mitigates
Fres-NP-V-3	Coalinga 70kV Area (Avenal 70kV worst)	Gates #5 230kV & Coalinga Generator	B	L-1/G-1	>0.90	>0.90	0.87	Action Plan
Fres-NP-V-4	Los Banos 70kV Area (Los Banos 70kV worst)	Los Banos #4 230/70kV	B	T-1	<1.10	1.10%	<1.10	Adjust taps in area to lower precontingency voltage to meet CAISO planning standards for voltage
Fres-NP-V-5	Herndon 115kV Area (Pinedale 115kV worst)	Bus 2 Fault at Herndon 115kV	C1	Bus	>0.90	>0.90	0.68	Cut-in Herndon-Bullard OL SPS. This SPS should mitigate OL, LV, & Dev problems.
Fres-NP-V-6	Kearney 70kV Area (Fresno WW 70kV worst)	Bus 1 Fault at Herndon 230kV	C1	Bus	<1.10	1.12	<1.10	Adjust taps in area to lower precontingency voltage to meet CAISO planning standards for voltage
Fres-NP-V-7	Henrietta 230kV	Bus 1E Fault at Gates 230kV	C1	Bus	>0.90	>0.90	0.89	INC Helms PGP, INC GWF Henrietta generation
Fres-NP-V-8	El Nido 70kV	Bus Fault at Le Grand 115kV	C1	Bus	0.88	>0.90	>0.90	Exchequer PH SPS mitigates
Fres-NP-V-9	Wilson 115kV Area (Gallo 115kV worst)	Wilson CB102 Failure	C2	Breaker	0.53	>0.90	>0.90	Wilson 115kV Area Reinforcement Project mitigates in later years - Action Plan
Fres-NP-V-10	System Wide Low Voltage	Gates-Gregg & Gates-McCall 230kV	C3/C5	L-2	>0.90	>0.90	0.80	Gates-Gregg 230kV Line mitigates later years - Action Plan
Fres-NP-V-11	Oro Loma 70kV Area (Pacheco PP 70kV worst)	Los Banos #3 & #4 230/70kV	C3	T-1-1	0.89	>0.90	>0.90	Action Plan
Fres-NP-V-12	Coalinga 70kV Area (Avenal 70kV worst)	Gates #5 230kV & Schindler #1 115/70kV	C3	T-1-1	>0.90	>0.90	0.68	Action Plan
Fres-NP-V-13	Dairyland 115kV	Le Grand-Dairyland & Panoche-Mendota 115kV	C3	L-1-1	>0.90	>0.90	0.88	INC Helms PGP



**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2015 Summer Off-Peak	2018 Summer Light Load	2018 Summer Partial Peak	
Fres-NP-V-14	West Fresno 115kV Area (West Fresno 115kV Worst)	McCall-West Fresno & Cal Ave-Sanger 115kV	C3	L-1-1	>0.90	>0.90	0.85	Action Plan
Fres-NP-V-15	Kingsburg 115kV Area (Corcoran 115kV worst)	McCall-Kingsburg #1 & #2 115kV	C5	L-2	>0.90	>0.90	0.82	Action Plan

**Post-Transient Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
Fres-SP-PTVD-1	Herndon 115kV Area	Herndon CB202 failure	C9	SLG Bus Section Fault with delayed clearing	NOT SOLVED	N/A	N/A	North Fresno 115kV Area Reinforcement Project mitigates. Action Plan.
Fres-SP-PTVD-2	Reedley, Sanger, & McCall 115kV Areas	McCall CB202 failure	C9	SLG Bus Section Fault with delayed clearing	NOT SOLVED	N/A	N/A	North Fresno 115kV Area Reinforcement Project mitigates. Action Plan.



**Single Contingency Load Drop**

ID	Worst Contingency	Category	Category Description	Amount of Load Drop (MW)			Potential Mitigation Solutions
				2015 Summer Peak	2018 Summer Peak	2023 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
				2015 Summer Off-Peak	2018 Summer Light Load	2018 Summer Partial Peak	

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

2013/2014 ISO Reliability Assessment - Study Results

Study Area: **PG&E Greater Fresno - Summer Peak**

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



ID	Substation	Load Served (MW)			Potential Mitigation Solutions
		2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
Fresno-SP-SS-1	Henrietta 230kV	153	157	167	Momentary load drop for loss of Gates-Gregg 230kV before transfer to Gatest-McCall 230kV. Recommend BAAH at Henrietta 230kV to mitigate. This contingency will activate the Henrietta RAS before switching to alternate 230kV source.

2013/2014 ISO Reliability Assessment - Study Results

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

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



ID	Substation	Load Served (MW)			Potential Mitigation Solutions
		2015 Summer Off-Peak	2018 Summer Light Load	2018 Summer Partial Peak	
Fresno-NP-SS-1	Henrietta 230kV	75	65	143	Momentary load drop for loss of Gates-Gregg 230kV before transfer to Gatest-McCall 230kV. Recommend BAAH at Henrietta 230kV to mitigate. This contingency will activate the Henrietta RAS before switching to alternate 230kV source.
Fresno-NP-SS-2	Clovis 115kV	55	50	112	Recommend BAAH at Clovis to meet CAISO Planning Standard VI-2
Fresno-NP-SS-3	Figarden 230kV	64	58	131	Recommend BAAH at Figarden to meet CAISO Planning Standard VI-2

**APPENDIX C-16**  
**PG&E Kern Area**  
**Reliability Assessment Study Results**

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
Kern-SP-T-1	Midway-Wheeler Ridge #1 230kV (Midway-Buena Vista Section)	Bus 1D Fault at Midway 230kV	C1	Bus	161%	138%	137%	Open other end of Midway-Wheeler Ridge #2 230kV. 2013 Request Window Project - Wheeler Ridge Junction 230kV substation between Kern PP and Wheeler Ridge may mitigate.
Kern-SP-T-2	Midway-Wheeler Ridge #2 230kV (Midway-Buena Vista Section)	Bus 2D Fault at Midway 230kV	C1	Bus	160%	137%	136%	Open other end of Midway-Wheeler Ridge #2 230kV. 2013 Request Window Project - Wheeler Ridge Junction 230kV substation between Kern PP and Wheeler Ridge may mitigate.
Kern-SP-T-3	Semitropic-Midway 115kV	Bus 2E Fault at Midway 115kV	C1	Bus	107%	<90%	<90%	Midway-Semitropic 115kV Reconductor Project mitigates later years. Action Plan
Kern-SP-T-4	Midway-Kern PP #1 230kV	Midway 230kV CB662 Failure	C2	Breaker	123%	130%	147%	Recommend new project to upgrade limiting 230kV line. 2013 Request Window Project - Midway-Kern PP #2 230kV
Kern-SP-T-5	Midway-Wheeler Ridge #1 230kV (Midway-Buena Vista Section)	Midway 230kV CB642 Failure	C2	Breaker	169%	135%	135%	Open other end of Midway-Wheeler Ridge #2 230kV. 2013 Request Window Project - Wheeler Ridge Junction 230kV substation between Kern PP and Wheeler Ridge may mitigate.



2013/2014 ISO Reliability Assessment - Study Results

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



**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
Kern-SP-T-6	Midway-Wheeler Ridge #2 230kV (Midway-Buena Vista Section)	Midway 230kV CB632 Failure	C2	Breaker	161%	137%	136%	Open other end of Midway-Wheeler Ridge #2 230kV. 2013 Request Window Project - Wheeler Ridge Junction 230kV substation between Kern PP and Wheeler Ridge may mitigate.
Kern-SP-T-7	Midway-Shafter 115kV	Midway 115kV CB302 Failure	C2	Breaker	145%	148%	151%	Recommend new project to upgrade limiting 115kV line
Kern-SP-T-8	Midway-Semitropic 115kV	Midway 115kV CB182 Failure	C2	Breaker	107%	<90%	<90%	Midway-Semitropic 115kV Reconductor Project mitigates later years. Action Plan
Kern-SP-T-9	Midway-Kern PP #3 230kV	Midway-Kern PP #1 & #4 230kV	C3	L-1-1	103%	109%	124%	Recommend project to upgrade limiting 230kV line. 2013 Request Window Project - Midway-Kern PP #2 230kV may mitigate
Kern-SP-T-10	Kern PP #4 230/115kV	Kern PP #3 & #5 230/115kV	C3	T-1-1	106%	<90%	<90%	Kern PP 230kV Area Reinforcement Project mitigates later years. Action Plan
Kern-SP-T-11	Kern PP #3 230/115kV	Kern PP #4 & #5 230/115kV	C3	T-1-1	94%	104%	120%	Add "Upgrade limiting terminal equipment on #3 & #5" to scope of Kern PP 230kV Reinforcement Project

San Onofre Nuclear Generation Station was retired on June 7, 2013 and therefore was removed from the base cases used for the 2013/14 ISO transmission planning process.

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Summer Off-Peak	2018 Summer Light Load	N/A	
Kern-NP-T-1	Fellows-Taft 115kV (Fellows-Morgan Section worst)	Midway-Taft 115kV	B	L-1	98%	110%		DEC Texaco Sunset generation
Kern-NP-T-2	Fellows-Taft 115kV (Fellows-Morgan Section)	Midway-Taft 115kV & Carneras-Taft 70kV	C3	L-1-1	111%	121%		DEC Texaco Sunset generation
Kern-NP-T-3	Midsun-Fellows 115kV	Midway-Taft 115kV & Carneras-Taft 70kV	C3	L-1-1	97%	107%		DEC Texaco Sunset generation
Kern-NP-T-4	Fellows-Taft 115kV (Morgan-Midset Section)	Midway-Taft 115kV & Carneras-Taft 70kV	C3	L-1-1	105%	115%		DEC Texaco Sunset generation

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
Kern-SP-VD-1	Kern Ridge 115kV	Midway-Temblor 115kV & Kern Ridge generation	B	L-1/G-1	12.50%	<10%	<10%	Midway-Temblor 115kV reconductor and reactive support mitigates later years. Action Plan
Kern-SP-VD-2	Buena Vista 1 230kV	Bus 1D Fault at Midway 230kV	C1	Bus	21.07%	<10%	<10%	Open other end of Midway-Wheeler Ridge #2 230kV. 2013 Request Window Project - Wheeler Ridge Junction 230kV substation between Kern PP and Wheeler Ridge may mitigate.
Kern-SP-VD-3	Buena Vista 2 230kV	Bus 2D Fault at Midway 230kV	C1	Bus	20.63%	<10%	<10%	Open other end of Midway-Wheeler Ridge #2 230kV. 2013 Request Window Project - Wheeler Ridge Junction 230kV substation between Kern PP and Wheeler Ridge may mitigate.
Kern-SP-VD-4	Buena Vista 1 230kV	Midway 230kV CB632 Failure	C2	Breaker	21.02%	<10%	<10%	Open other end of Midway-Wheeler Ridge #2 230kV. 2013 Request Window Project - Wheeler Ridge Junction 230kV substation between Kern PP and Wheeler Ridge may mitigate.
Kern-SP-VD-5	Buena Vista 2 230kV	Midway 230kV CB642 Failure	C2	Breaker	25.47%	<10%	<10%	Open other end of Midway-Wheeler Ridge #2 230kV. 2013 Request Window Project - Wheeler Ridge Junction 230kV substation between Kern PP and Wheeler Ridge may mitigate.
Kern-SP-VD-6	Rio Bravo Tomato 115kV	Midway 115kV CB302 Failure	C2	Breaker	11.92%	12.15%	12.58%	Add dynamic reactive support

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2015 Summer Off-Peak	2018 Summer Light Load	N/A	
Kern-NP-VD-1	Temblor 115kV	Midway-Temblor 115kV	B	L-1	9.35%	<10%		Midway-Temblor 115kV reconductor and reactive support mitigates later years. Action Plan
Kern-NP-VD-2	Kern Ridge 115kV	Midway-Temblor 115kV & Kern Ridge generation	B	L-1/G-1	13.20%	<10%		Midway-Temblor 115kV reconductor and reactive support mitigates later years. Action Plan

2013/2014 ISO Reliability Assessment - Study Results

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



**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
Kern-SP-V-1	Wheeler Ridge 70kV	None	A	N-0	0.95	>0.90	>0.90	Wheeler Ridge 230kV Voltage Project mitigates later years. Action Plan
Kern-SP-V-2	Nations Petroleum 70kV	None	A	N-0	0.93	>0.90	>0.90	RPS Project mitigates later years. Action Plan
Kern-SP-V-3	Temblor 115kV	Midway-Temblor 115kV & Kern Ridge generation	B	L-1/G-1	0.89	>0.90	>0.90	Midway-Temblor 115kV reconductor project moves PSE-McKittrick from tap on Midway-Temblor 115kV to bay at Temblor 115kV. Action Plan
Kern-SP-V-4	Buena Vista 1 230kV	Bus 1D Fault at Midway 230kV	C1	Bus	0.76	>0.90	>0.90	Open other end of Midway-Wheeler Ridge #2 230kV. 2013 Request Window Project - Wheeler Ridge Junction 230kV substation between Kern PP and Wheeler Ridge may mitigate.
Kern-SP-V-5	Buena Vista 2 230kV	Bus 2D Fault at Midway 230kV	C1	Bus	0.76	>0.90	>0.90	Open other end of Midway-Wheeler Ridge #2 230kV. 2013 Request Window Project - Wheeler Ridge Junction 230kV substation between Kern PP and Wheeler Ridge may mitigate.
Kern-SP-V-6	Buena Vista 1 230kV	Midway 230kV CB632 Failure	C2	Breaker	0.76	>0.90	>0.90	Open other end of Midway-Wheeler Ridge #2 230kV. 2013 Request Window Project - Wheeler Ridge Junction 230kV substation between Kern PP and Wheeler Ridge may mitigate.
Kern-SP-V-7	Buena Vista 2 230kV	Midway 230kV CB642 Failure	C2	Breaker	0.72	>0.90	>0.90	Open other end of Midway-Wheeler Ridge #2 230kV. 2013 Request Window Project - Wheeler Ridge Junction 230kV substation between Kern PP and Wheeler Ridge may mitigate.
Kern-SP-V-8	Wheeler Ridge 70kV	Midway-Wheeler Ridge #1 230kV & Kern Cyn-Magunden-Weedpatch 70kV	C3	L-1-1	<1.10	1.12	<1.10	Use SVC at Wheeler Ridge 230kV to reduce voltage

2013/2014 ISO Reliability Assessment - Study Results

Study Area: **PG&E Kern - Summer Off-Peak & Summer Light Load**



**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2015 Summer Off-Peak	2018 Summer Light Load	N/A	
Kern-NP-V-1	Kern 115kV Area (Taft 115kV worst)	None	A	N-0	<1.05	1.06		DEC area generation to reduce voltage
Kern-NP-V-2	Kern Ridge 115kV	Midway-Temblor 115kV & Texaco Lost Hills Generation	B	L-1/G-1	0.90	>0.90		Midway-Temblor 115kV Reconductor Project mitigates



**Transient Stability**

ID	Contingency	Category	Category Description	Transient Stability Performance			Potential Mitigation Solutions
				2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
Kern-SP-TS-1	Fault on Midway Bus Section and CB632 fails to operate	C9	SLG Bus Section Fault with delayed clearing	30 violations of NERC/WECC Trans Voltage Dip Std (CatC) (30% Voltage Dip)	No NERC/WECC violations - STABLE	No NERC/WECC violations - STABLE	Wheeler Ridge 230kV project mitigates later years

**Post-Transient Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
Kern-SP-PTT-1	Midway-Kern #3 230kV	Fault on Kern #5 230/115kV and CB582 fails to operate	C7	SLG transformer with delayed clearing	<90%	<90%	105%	Add "Upgrade limiting terminal equipment on #3 & #5" to scope of Kern PP 230kV Reinforcement Project
Kern-SP-PTT-2	Midway-Wheeler Ridge #2 230kV	Fault on Midway Bus Section and CB632 fails to operate	C9	SLG Bus Section Fault with delayed clearing	NOT SOLVED	134%	133%	Open other end of Midway-Wheeler Ridge #2 230kV. 2013 Request Window Project - Wheeler Ridge Junction 230kV substation between Kern PP and Wheeler Ridge may mitigate.





**Post-Transient Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
Kern-SP-PTVD-1	Wheeler Ridge 230kV	Midway Bus Fault and CB632 fails to operate	C9	SLG Bus Fault with delayed clearing	NOT SOLVED	<10%	<10%	Wheeler Ridge 230kV Project mitigates later years. Action Plan

**Single Contingency Load Drop**

ID	Worst Contingency	Category	Category Description	Amount of Load Drop (MW)			Potential Mitigation Solutions
				2015 Summer Peak	2018 Summer Peak	2023 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
				2015 Summer Off-Peak	2018 Summer Light Load	N/A	

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

2013/2014 ISO Reliability Assessment - Study Results

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

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



ID	Substation	Load Served (MW)			Potential Mitigation Solutions
		2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
	Bakersfield 230kV	89	94	102	2013 Request Window Project - Wheeler Ridge Jct Substation mitigates.
	Stockdale 230kV	155	164	179	2013 Request Window Project - Wheeler Ridge Jct Substation mitigates.

2013/2014 ISO Reliability Assessment - Study Results

Study Area: **PG&E Kern - Summer Off-Peak & Summer Light Load**



*Single Source Substation with more than 100 MW Load*

ID	Substation	Load Served (MW)			Potential Mitigation Solutions
		2015 Summer Off-Peak	2018 Summer Light Load	N/A	

No single source substation with more than 100 MW Load

**APPENDIX C-17**  
**PG&E Central Coast**  
**Reliability Assessment Study Results**

2013/2014 ISO Reliability Assessment - Study Results

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



**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
CC-SP-T-001	MOSLND D-MOSSLND1 115/230 kV #1 Bank	BUS FAULT AT MOSSLND2 230 kV (Bus Section 2D)	C1	BUS	109	<100	<100	Action Plan/drop load until Moss Landing Bank upgrade
CC-SP-T-002	MOSLND D-MOSSLND2 115/230 kV #2 Bank	BUS FAULT AT MOSSLND1 230 kV (Bus Section 1D)	C1	BUS	109	<100	<100	Action Plan/drop load until Moss Landing Bank upgrade
CC-SP-T-003	MOSLND E-MOSSLND1 115/230 kV #8 Bank	BUS FAULT AT MOSSLND2 230 kV (Bus Section 2D)	C1	BUS	108	<100	<100	Action Plan/drop load until Moss Landing Bank upgrade
CC-SP-T-004	MOSLND E-MOSSLND2 115/230 kV #10 Bank	BUS FAULT AT MOSSLND1 230 kV (Bus Section 1D)	C1	BUS	109	<100	<100	Action Plan/drop load until Moss Landing Bank upgrade
CC-SP-T-005	MOSLND D-MOSSLND1 115/230 kV #1 Bank	CB FAULT AT MOSS LANDING SUB 115 kV CB120	C2	CB	113	<100	<100	Action Plan/drop load until Moss Landing Bank upgrade
CC-SP-T-006	MOSLND D-MOSSLND2 115/230 kV #2 Bank	CB FAULT AT MOSS LANDING SUB 115 kV CB110	C2	CB	114	<100	<100	Action Plan/drop load until Moss Landing Bank upgrade
CC-SP-T-007	MOSLND E-MOSSLND1 115/230 kV #8 Bank	CB FAULT AT MOSS LANDING SUB 115 kV CB120	C2	CB	113	<100	<100	Action Plan/drop load until Moss Landing Bank upgrade
CC-SP-T-008	MOSLND E-MOSSLND2 115/230 kV #10 Bank	CB FAULT AT MOSS LANDING SUB 115 kV CB110	C2	CB	114	<100	<100	Action Plan/drop load until Moss Landing Bank upgrade
CC-SP-T-009	MOSLND D-MOSSLND1 115/230 kV #1 Bank	Moss Landing 230/115 kV Bank #8 & 10	C3	T-1-1	199	<100	<100	Action Plan/drop load until Moss Landing Bank upgrade
CC-SP-T-010	MOSLND D-MOSSLND2 115/230 kV #2 Bank	Moss Landing 230/115 kV Bank #1 & 10	C3	T-1-1	109	<100	<100	Action Plan/drop load until Moss Landing Bank upgrade
CC-SP-T-011	MOSLND E-MOSSLND1 115/230 kV #8 Bank	Moss Landing 230/115 kV Bank #1 & 10	C3	T-1-1	108	<100	<100	Action Plan/drop load until Moss Landing Bank upgrade
CC-SP-T-012	MOSLND E-MOSSLND2 115/230 kV #10 Bank	Moss Landing 230/115 kV Bank #1 & 8	C3	T-1-1	109	<100	<100	Action Plan/drop load until Moss Landing Bank upgrade
CC-SP-T-013	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	<100	<100	102	Monitor line loading due to lead time
CC-SP-T-014	GRN VLY2-MOSLND D 115 kV # 1 Line	Moss Landing-Green Valley #1 115 kV and Crazy Horse-Watsonville 115 kV Lines	C3	L-1-1	<100	<100	103	Monitor line loading due to lead time

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



**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
CC-SP-T-015	GRN VLY1-ERTA JCT 115 kV #1 Line	Moss Landing - Green Valley #1 and #2 115 kV Lines	C3	L-1-1	N/A	114	125	Resize conductors for the Watsonville 115 kV Voltage Conversion Project/ add reactive support
CC-SP-T-016	CIC JCT-ERTA JCT 115 kV #1 Line	Moss Landing - Green Valley #1 and #2 115 kV Lines	C3	L-1-1	N/A	115	125	Resize conductors for the Watsonville 115 kV Voltage Conversion Project/ add reactive support
CC-SP-T-017	CIC JCT-AGRILINK 115 kV #1 Line	Moss Landing - Green Valley #1 and #2 115 kV Lines	C3	L-1-1	N/A	115	125	Resize conductors for the Watsonville 115 kV Voltage Conversion Project/ add reactive support
CC-SP-T-018	WTSNVLE-AGRILINK 115 kV #1 Line	Moss Landing - Green Valley #1 and #2 115 kV Lines	C3	L-1-1	N/A	115	126	Resize conductors for the Watsonville 115 kV Voltage Conversion Project/ add reactive support
CC-SP-T-019	WTSNVLE-GRANT JT 115 kV #1 Line	Moss Landing - Green Valley #1 and #2 115 kV Lines	C3	L-1-1	N/A	124	136	Resize conductors for the Watsonville 115 kV Voltage Conversion Project/ add reactive support
CC-SP-T-020	BRIGTANO-GRANT JT 115 kV #1 Line	Moss Landing - Green Valley #1 and #2 115 kV Lines	C3	L-1-1	N/A	125	136	Resize conductors for the Watsonville 115 kV Voltage Conversion Project/ add reactive support
CC-SP-T-021	CRZY_HRS-BRIGTANO 115 kV #1 Line	Moss Landing - Green Valley #1 and #2 115 kV Lines	C3	L-1-1	N/A	126	137	Resize conductors for the Watsonville 115 kV Voltage Conversion Project/ add reactive support



**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
CC-SP-T-022	CRZY_HRS-NTVD SW1 115 kV #1 Line	Moss Landing-Salinas #1 & 2 115 kV Lines	C3	L-1-1	108	110	107	Expedite the Natividad Substation Project which is presently on hold.
CC-SP-T-023	CRZY_HRS-NTVD SW2 115 kV #1 Line	Moss Landing-Salinas #1 & 2 115 kV Lines	C3	L-1-1	108	110	107	Expedite the Natividad Substation Project which is presently on hold.
CC-SP-T-024	GRN VLY1-ERTA JCT 115 kV #1 Line	Moss Landing - Green Valley #1 and #2 115 kV Lines	C5 DCTL	L-2	N/A	116	128	Resize conductors for the Watsonville 115 kV Voltage Conversion Project/ add reactive support
CC-SP-T-025	CIC JCT-ERTA JCT 115 kV #1 Line	Moss Landing - Green Valley #1 and #2 115 kV Lines	C5 DCTL	L-2	N/A	116	129	Resize conductors for the Watsonville 115 kV Voltage Conversion Project/ add reactive support
CC-SP-T-026	CIC JCT-AGRILINK 115 kV #1 Line	Moss Landing - Green Valley #1 and #2 115 kV Lines	C5 DCTL	L-2	N/A	116	129	Resize conductors for the Watsonville 115 kV Voltage Conversion Project/ add reactive support
CC-SP-T-027	WTSNVLE-AGRILINK 115 kV #1 Line	Moss Landing - Green Valley #1 and #2 115 kV Lines	C5 DCTL	L-2	N/A	116	129	Resize conductors for the Watsonville 115 kV Voltage Conversion Project/ add reactive support
CC-SP-T-028	WTSNVLE-GRANT JT 115 kV #1 Line	Moss Landing - Green Valley #1 and #2 115 kV Lines	C5 DCTL	L-2	N/A	126	140	Resize conductors for the Watsonville 115 kV Voltage Conversion Project/ add reactive support

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



**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
CC-SP-T-029	BRIGTANO-GRANT JT 115 kV #1 Line	Moss Landing - Green Valley #1 and #2 115 kV Lines	C5 DCTL	L-2	N/A	126	140	Resize conductors for the Watsonville 115 kV Voltage Conversion Project/ add reactive support
CC-SP-T-030	CRZY_HRS-BRIGTANO 115 kV #1 Line	Moss Landing - Green Valley #1 and #2 115 kV Lines	C5 DCTL	L-2	N/A	127	142	Resize conductors for the Watsonville 115 kV Voltage Conversion Project/ add reactive support
CC-SP-T-031	CRZY_HRS-NTVD SW1 115 kV #1 Line	Moss Landing-Salinas #1 & 2 115 kV Lines	C5 DCTL	L-2	108	110	107	Expedite the Natividad Substation Project which is presently on hold.
CC-SP-T-032	CRZY_HRS-NTVD SW2 115 kV #1 Line	Moss Landing-Salinas #1 & 2 115 kV Lines	C5 DCTL	L-2	108	110	107	Expedite the Natividad Substation Project which is presently on hold.

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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
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
CC-SP-V-001	CMP EVRS 115 kV	Moss Landing-Green Valley #1 & 2 115 kV Lines	C3	L-1-1	-	-	0.85	Activate Camp Evers 20 MVar Shunt Caps (Santa Cruz Reinforcement project)
CC-SP-V-002	PAUL SWT 115 kV	Moss Landing-Green Valley #1 & 2 115 kV Lines	C3	L-1-1	-	-	0.86	Activate Paul Sweet STATCOM
CC-SP-V-003	ROB ROY 115 kV	Moss Landing-Green Valley #1 & 2 115 kV Lines	C3	L-1-1	-	0.90	0.85	Activate Paul Sweet STATCOM
CC-SP-V-004	GRN VLY1 115 kV	Moss Landing-Green Valley #1 & 2 115 kV Lines	C3	L-1-1	-	0.90	0.85	Activate Paul Sweet STATCOM
CC-SP-V-005	GRN VLY2 115 kV	Moss Landing-Green Valley #1 & 2 115 kV Lines	C3	L-1-1	-	0.90	0.85	Activate Paul Sweet STATCOM
CC-SP-V-006	ERTA 115 kV	Moss Landing-Green Valley #1 & 2 115 kV Lines	C3	L-1-1	N/A	0.90	0.85	Resize conductors for the Watsonville 115 kV Voltage Conversion Project/ add reactive support
CC-SP-V-007	AGRILINK 115 kV	Moss Landing-Green Valley #1 & 2 115 kV Lines	C3	L-1-1	N/A	0.90	0.86	Resize conductors for the Watsonville 115 kV Voltage Conversion Project/ add reactive support
CC-SP-V-008	WTSNVLL 115 kV	Moss Landing-Green Valley #1 & 2 115 kV Lines	C3	L-1-1	N/A	-	0.86	Resize conductors for the Watsonville 115 kV Voltage Conversion Project/ add reactive support
CC-SP-V-009	CMP EVRS 115 kV	Moss Landing-Green Valley #1 & 2 115 kV Lines	C5 DCTL	L-2	-	0.89	0.82	Activate Camp Evers 20 MVar Shunt Caps (Santa Cruz Reinforcement project)
CC-SP-V-010	PAUL SWT 115 kV	Moss Landing-Green Valley #1 & 2 115 kV Lines	C5 DCTL	L-2	-	0.89	0.82	Activate Paul Sweet STATCOM
CC-SP-V-011	ROB ROY 115 kV	Moss Landing-Green Valley #1 & 2 115 kV Lines	C5 DCTL	L-2	-	0.88	0.82	Activate Paul Sweet STATCOM
CC-SP-V-012	GRN VLY1 115 kV	Moss Landing-Green Valley #1 & 2 115 kV Lines	C5 DCTL	L-2	-	0.88	0.82	Activate Paul Sweet STATCOM
CC-SP-V-013	GRN VLY2 115 kV	Moss Landing-Green Valley #1 & 2 115 kV Lines	C5 DCTL	L-2	-	0.88	0.82	Activate Paul Sweet STATCOM

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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
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
CC-SP-V-014	ERTA 115 kV	Moss Landing-Green Valley #1 & 2 115 kV Lines	C5 DCTL	L-2	N/A	0.88	0.83	Resize conductors for the Watsonville 115 kV Voltage Conversion Project/ add reactive support
CC-SP-V-015	AGRILINK 115 kV	Moss Landing-Green Valley #1 & 2 115 kV Lines	C5 DCTL	L-2	N/A	0.89	0.84	Resize conductors for the Watsonville 115 kV Voltage Conversion Project/ add reactive support
CC-SP-V-016	WTSNVILLE 115 kV	Moss Landing-Green Valley #1 & 2 115 kV Lines	C5 DCTL	L-2	N/A	0.89	0.84	Resize conductors for the Watsonville 115 kV Voltage Conversion Project/ add reactive support
CC-SP-V-017	GRANT RK 115 kV	Moss Landing-Green Valley #1 & 2 115 kV Lines	C5 DCTL	L-2	N/A	-	0.89	Resize conductors for the Watsonville 115 kV Voltage Conversion Project/ add reactive support
CC-SP-V-018	BRIGTANO 115 kV	Moss Landing-Green Valley #1 & 2 115 kV Lines	C5 DCTL	L-2	N/A	-	0.89	Resize conductors for the Watsonville 115 kV Voltage Conversion Project/ add reactive support

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
CC-SP-VD-001	CMP EVRS 115 kV	Moss Landing-Green Valley #1 & 2 115 kV Lines	C3	L-1-1	-	12	15	Activate Camp Evers 20 MVar Shunt Caps (Santa Cruz Reinforcement project)
CC-SP-VD-002	PAUL SWT 115 kV	Moss Landing-Green Valley #1 & 2 115 kV Lines	C3	L-1-1	-	12	14	Activate Paul Sweet STATCOM
CC-SP-VD-003	ROB ROY 115 kV	Moss Landing-Green Valley #1 & 2 115 kV Lines	C3	L-1-1	-	12	15	Activate Paul Sweet STATCOM
CC-SP-VD-004	GRN VLY1 115 kV	Moss Landing-Green Valley #1 & 2 115 kV Lines	C3	L-1-1	-	12	15	Resize conductors for the Watsonville 115 kV Voltage Conversion Project/ add reactive support
CC-SP-VD-005	GRN VLY2 115 kV	Moss Landing-Green Valley #1 & 2 115 kV Lines	C3	L-1-1	-	12	15	Resize conductors for the Watsonville 115 kV Voltage Conversion Project/ add reactive support
CC-SP-VD-006	ERTA 115 kV	Moss Landing-Green Valley #1 & 2 115 kV Lines	C3	L-1-1	N/A	12	15	Resize conductors for the Watsonville 115 kV Voltage Conversion Project/ add reactive support
CC-SP-VD-007	AGRILINK 115 kV	Moss Landing-Green Valley #1 & 2 115 kV Lines	C3	L-1-1	N/A	12	15	Resize conductors for the Watsonville 115 kV Voltage Conversion Project/ add reactive support
CC-SP-VD-008	WTSNVLE 115 kV	Moss Landing-Green Valley #1 & 2 115 kV Lines	C3	L-1-1	N/A	12	15	Resize conductors for the Watsonville 115 kV Voltage Conversion Project/ add reactive support
CC-SP-VD-009	GRANT RK 115 kV	Moss Landing-Green Valley #1 & 2 115 kV Lines	C3	L-1-1	N/A	-	11	Resize conductors for the Watsonville 115 kV Voltage Conversion Project/ add reactive support
CC-SP-VD-010	BRIGTANO 115 kV	Moss Landing-Green Valley #1 & 2 115 kV Lines	C3	L-1-1	N/A	-	11	Resize conductors for the Watsonville 115 kV Voltage Conversion Project/ add reactive support
CC-SP-VD-011	CMP EVRS 115 kV	Moss Landing-Green Valley #1 & 2 115 kV Lines	C5 DCTL	L-2	-	14	18	Activate Camp Evers 20 MVar Shunt Caps (Santa Cruz Reinforcement project)
CC-SP-VD-012	PAUL SWT 115 kV	Moss Landing-Green Valley #1 & 2 115 kV Lines	C5 DCTL	L-2	-	13	18	Activate Paul Sweet STATCOM

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



**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
CC-SP-VD-013	ROB ROY 115 kV	Moss Landing-Green Valley #1 & 2 115 kV Lines	C5 DCTL	L-2	-	14	19	Activate Paul Sweet STATCOM
CC-SP-VD-014	GRN VLY1 115 kV	Moss Landing-Green Valley #1 & 2 115 kV Lines	C5 DCTL	L-2	-	14	19	Resize conductors for the Watsonville 115 kV Voltage Conversion Project/ add reactive support
CC-SP-VD-015	GRN VLY2 115 kV	Moss Landing-Green Valley #1 & 2 115 kV Lines	C5 DCTL	L-2	-	14	19	Resize conductors for the Watsonville 115 kV Voltage Conversion Project/ add reactive support
CC-SP-VD-016	ERTA 115 kV	Moss Landing-Green Valley #1 & 2 115 kV Lines	C5 DCTL	L-2	N/A	14	19	Resize conductors for the Watsonville 115 kV Voltage Conversion Project/ add reactive support
CC-SP-VD-017	AGRILINK 115 kV	Moss Landing-Green Valley #1 & 2 115 kV Lines	C5 DCTL	L-2	N/A	14	18	Resize conductors for the Watsonville 115 kV Voltage Conversion Project/ add reactive support
CC-SP-VD-018	WTSNVILLE 115 kV	Moss Landing-Green Valley #1 & 2 115 kV Lines	C5 DCTL	L-2	N/A	14	18	Resize conductors for the Watsonville 115 kV Voltage Conversion Project/ add reactive support
CC-SP-VD-019	GRANT RK 115 kV	Moss Landing-Green Valley #1 & 2 115 kV Lines	C5 DCTL	L-2	N/A	10	13	Resize conductors for the Watsonville 115 kV Voltage Conversion Project/ add reactive support
CC-SP-VD-020	BRIGTANO 115 kV	Moss Landing-Green Valley #1 & 2 115 kV Lines	C5 DCTL	L-2	N/A	10	13	Resize conductors for the Watsonville 115 kV Voltage Conversion Project/ add reactive support

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Summer Off-Peak	2018 Summer Light Load	2023 Summer Off-Peak	
CC-NP-T-001	MOSLND D-MOSSLND1 115/230 kV #1 Bank	Moss Landing 230/115 kV Bank #8 & 10	C3	T-1-1	106	<100	<100	Action Plan/drop load until Moss Landing Bank upgrade
CC-NP-T-002	MOSLND D-MOSSLND2 115/230 kV #2 Bank	Moss Landing 230/115 kV Bank #8 & 10	C3	T-1-1	106	<100	<100	Action Plan/drop load until Moss Landing Bank upgrade

2013/2014 ISO Reliability Assessment - Study Results

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



**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2015 Summer Off-Peak	2018 Summer Light Load	2023 Summer Off-Peak	
CC-NP-V-001	ERTA 60 kV	N/A	A	Normal	1.07	N/A	N/A	Review for possible exemption
CC-NP-V-002	AGRILINK 60 kV	N/A	A	Normal	1.07	N/A	N/A	Review for possible exemption
CC-NP-V-003	WTSNVLL 60 kV	N/A	A	Normal	1.07	N/A	N/A	Review for possible exemption
CC-NP-V-004	GRANT RK 60 kV	N/A	A	Normal	1.06	N/A	N/A	Review for possible exemption
CC-NP-V-005	BRIGTANO 60 kV	N/A	A	Normal	1.06	N/A	N/A	Review for possible exemption
CC-NP-V-006	CMP EVRS 115 kV	N/A	A	Normal	-	1.07	-	Review for possible exemption
CC-NP-V-007	PAUL SWT 115 kV	N/A	A	Normal	-	1.07	-	Review for possible exemption
CC-NP-V-008	ROB ROY 115 kV	N/A	A	Normal	-	1.08	-	Review for possible exemption
CC-NP-V-009	GRN VLY1 115 kV	N/A	A	Normal	-	1.08	-	Review for possible exemption
CC-NP-V-010	GRN VLY2 115 kV	N/A	A	Normal	-	1.08	-	Review for possible exemption
CC-NP-V-011	ERTA 115 kV	N/A	A	Normal	N/A	1.08	-	Review for possible exemption
CC-NP-V-012	AGRILINK 115 kV	N/A	A	Normal	N/A	1.08	-	Review for possible exemption
CC-NP-V-013	WTSNVLL 115 kV	N/A	A	Normal	N/A	1.08	-	Review for possible exemption
CC-NP-V-014	GRANT RK 115 kV	N/A	A	Normal	N/A	1.08	-	Review for possible exemption
CC-NP-V-015	BRIGTANO 115 kV	N/A	A	Normal	N/A	1.08	-	Review for possible exemption



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



**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2015 Summer Off-Peak	2018 Summer Light Load	2023 Summer Off-Peak	
CC-NP-V-016	SNBENITO 115 kV	N/A	A	Normal	-	1.08	-	Review for possible exemption
CC-NP-V-017	SALINAS 115 kV	N/A	A	Normal	-	1.08	-	Review for possible exemption
CC-NP-V-018	SOLEDAD 115 kV	N/A	A	Normal	-	1.08	-	Review for possible exemption
CC-NP-V-019	DEL MNTE 115 kV	N/A	A	Normal	-	1.07	-	Review for possible exemption
CC-NP-V-020	HOLLISTR 115 kV	N/A	A	Normal	1.05	1.09	-	Review for possible exemption
CC-NP-V-021	BIG BASN 60 kV	N/A	A	Normal	1.06	1.09	1.05	Review for possible exemption
CC-NP-V-022	CRUSHER 60 kV	N/A	A	Normal	1.05	1.09	1.05	Review for possible exemption
CC-NP-V-023	LONE STR 60 kV	N/A	A	Normal	1.05	1.09	1.05	Review for possible exemption
CC-NP-V-024	PT MRTTI 60 kV	N/A	A	Normal	1.05	1.09	1.05	Review for possible exemption
CC-NP-V-025	CSTRVLE 115 kV	N/A	A	Normal	1.06	1.09	1.06	Review for possible exemption
CC-NP-V-026	DOLAN RD 115 kV	N/A	A	Normal	1.06	1.09	1.06	Review for possible exemption
CC-NP-V-027	PRUNEDLE 115 kV	N/A	A	Normal	1.05	1.08	1.05	Review for possible exemption

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2015 Summer Off-Peak	2018 Summer Light Load	2023 Summer Off-Peak	
CC-NP-VD-001	VIEJO 60 kV	Del Monte 115/60 kV Bank #4	B	T-1	-	-7	-	Action plan for summer light load conditions/Monitor voltage profile
CC-NP-VD-002	HATTON 60 Kv	Del Monte 115/60 kV Bank #4	B	T-1	-	-7	-	Action plan for summer light load conditions/Monitor voltage profile
CC-NP-VD-003	DEL MNTE 60 kV	Del Monte 115/60 kV Bank #4	B	T-1	-	-7	-	Action plan for summer light load conditions/Monitor voltage profile
CC-NP-VD-004	FORT ORD 60 kV	Del Monte 115/60 kV Bank #4	B	T-1	-	-7	-	Action plan for summer light load conditions/Monitor voltage profile
CC-NP-VD-005	MANZANTA 60 kV	Del Monte 115/60 kV Bank #4	B	T-1	-	-7	-	Action plan for summer light load conditions/Monitor voltage profile
CC-NP-VD-006	MONTEREY 60 kV	Del Monte 115/60 kV Bank #4	B	T-1	-	-7	-	Action plan for summer light load conditions/Monitor voltage profile
CC-NP-VD-007	NAVY LAB 60 kV	Del Monte 115/60 kV Bank #4	B	T-1	-	-7	-	Action plan for summer light load conditions/Monitor voltage profile
CC-NP-VD-008	NVY SCHL 60 kV	Del Monte 115/60 kV Bank #4	B	T-1	-	-7	-	Action plan for summer light load conditions/Monitor voltage profile
CC-NP-VD-009	PAUL SWT 115 kV	Del Monte 115/60 kV Bank #4	B	T-1	-	-	-5	Action plan for summer light load conditions/Monitor voltage profile

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



**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.

2013/2014 ISO Reliability Assessment - Study Results

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



**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.

2013/2014 ISO Reliability Assessment - Study Results

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



**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.

2013/2014 ISO Reliability Assessment - Study Results

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

**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

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



**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

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



*Single Source Substation with more than 100 MW Load*

ID	Substation	Load Served (MW)			Potential Mitigation Solutions
		Select..	Select..	Select..	
X-NP-SS-1					

No single source substation with more than 100 MW Load



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



**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Winter Peak	2018 Winter Peak	2023 Winter Peak	
CC-WP-T-001	GRN VLY1-MOSLND D 115 kV # 1 Line	Moss Landing-Green Valley #2 115 kV Line	B	L-1	101	<100	<100	Monitor facility loading/rerate/interim action plan. Green Valley 115 kV Bus Upgrade (BAAH scheme)
CC-WP-T-002	GRN VLY2-MOSLND D 115 kV # 1 Line	Moss Landing-Green Valley #1 115 kV Line	B	L-1	101	<100	<100	Monitor facility loading/rerate/interim action plan. Green Valley 115 kV Bus Upgrade (BAAH scheme)
CC-WP-T-003	GRN VLY2-MOSLND D 115 kV # 1 Line	BUS FAULT AT MOSSLND2 115 kV Bus Section 1D	C1	BUS	102	<100	<100	Monitor facility loading/rerate/interim action plan. Green Valley 115 kV Bus Upgrade (BAAH scheme)
CC-WP-T-004	GRN VLY2-MOSLND D 115 kV # 1 Line	CB FAULT AT MOSS LANDING SUB 115 kV CB110	C2	CB	104	<100	<100	Monitor facility loading/rerate/interim action plan. Green Valley 115 kV Bus Upgrade (BAAH scheme)
CC-WP-T-005	MOSLND D-MOSSLND1 115/230 kV #1 Bank	Moss Landing 230/115 kV Bank #8 & 10	C3	T-1-1	171	174	<100	Action Plan/drop load until Moss Landing Bank upgrade
CC-WP-T-006	MOSLND D-MOSSLND2 115/230 kV #2 Bank	Moss Landing 230/115 kV Bank #8 & 10	C3	T-1-1	171	173	<100	Action Plan/drop load until Moss Landing Bank upgrade
CC-WP-T-007	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	<100	102	110	Monitor line loading due to lead time/Modify Watsonville 115 kV Voltage Conversion Project scope. Also Green Valley 115 kV Bus Upgrade (BAAH scheme)

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Winter Peak	2018 Winter Peak	2023 Winter Peak	
CC-WP-T-008	GRN VLY2-MOSLND D 115 kV # 1 Line	Moss Landing-Green Valley #1 115 kV and Crazy Horse-Watsonville 115 kV Lines	C3	L-1-1	<100	102	110	Monitor line loading due to lead time/Modify Watsonville 115 kV Voltage Conversion Project scope. Also Green Valley 115 kV Bus Upgrade (BAAH scheme)
CC-WP-T-009	GRN VLY1-ERTA JCT 115 kV #1 Line	Moss Landing - Green Valley #1 and #2 115 kV Lines	C3	L-1-1	N/A	127	134	Resize conductors for the Watsonville 115 kV Voltage Conversion Project/ add reactive support
CC-WP-T-010	CIC JCT-ERTA JCT 115 kV #1 Line	Moss Landing - Green Valley #1 and #2 115 kV Lines	C3	L-1-1	N/A	127	134	Resize conductors for the Watsonville 115 kV Voltage Conversion Project/ add reactive support
CC-WP-T-011	CIC JCT-AGRILINK 115 kV #1 Line	Moss Landing - Green Valley #1 and #2 115 kV Lines	C3	L-1-1	N/A	127	134	Resize conductors for the Watsonville 115 kV Voltage Conversion Project/ add reactive support
CC-WP-T-012	WTSNVLE-AGRILINK 115 kV #1 Line	Moss Landing - Green Valley #1 and #2 115 kV Lines	C3	L-1-1	N/A	127	134	Resize conductors for the Watsonville 115 kV Voltage Conversion Project/ add reactive support
CC-WP-T-013	WTSNVLE-GRANT JT 115 kV #1 Line	Moss Landing - Green Valley #1 and #2 115 kV Lines	C3	L-1-1	N/A	138	145	Resize conductors for the Watsonville 115 kV Voltage Conversion Project/ add reactive support

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Winter Peak	2018 Winter Peak	2023 Winter Peak	
CC-WP-T-014	BRIGTANO-GRANT JT 115 kV #1 Line	Moss Landing - Green Valley #1 and #2 115 kV Lines	C3	L-1-1	N/A	138	145	Resize conductors for the Watsonville 115 kV Voltage Conversion Project/ add reactive support
CC-WP-T-015	CRZY_HRS-BRIGTANO 115 kV #1 Line	Moss Landing - Green Valley #1 and #2 115 kV Lines	C3	L-1-1	N/A	139	146	Resize conductors for the Watsonville 115 kV Voltage Conversion Project/ add reactive support
CC-WP-T-016	GRN VLY1-ERTA JCT 115 kV #1 Line	Moss Landing - Green Valley #1 and #2 115 kV Lines	C5 DCTL	L-2	N/A	127	140	Resize conductors for the Watsonville 115 kV Voltage Conversion Project/ add reactive support
CC-WP-T-017	CIC JCT-ERTA JCT 115 kV #1 Line	Moss Landing - Green Valley #1 and #2 115 kV Lines	C5 DCTL	L-2	N/A	127	140	Resize conductors for the Watsonville 115 kV Voltage Conversion Project/ add reactive support
CC-WP-T-018	CIC JCT-AGRILINK 115 kV #1 Line	Moss Landing - Green Valley #1 and #2 115 kV Lines	C5 DCTL	L-2	N/A	127	140	Resize conductors for the Watsonville 115 kV Voltage Conversion Project/ add reactive support
CC-WP-T-019	WTSNVLE-AGRILINK 115 kV #1 Line	Moss Landing - Green Valley #1 and #2 115 kV Lines	C5 DCTL	L-2	N/A	127	141	Resize conductors for the Watsonville 115 kV Voltage Conversion Project/ add reactive support
CC-WP-T-020	WTSNVLE-GRANT JT 115 kV #1 Line	Moss Landing - Green Valley #1 and #2 115 kV Lines	C5 DCTL	L-2	N/A	138	152	Resize conductors for the Watsonville 115 kV Voltage Conversion Project/ add reactive support

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Winter Peak	2018 Winter Peak	2023 Winter Peak	
CC-WP-T-021	BRIGTANO-GRANT JT 115 kV #1 Line	Moss Landing - Green Valley #1 and #2 115 kV Lines	C5 DCTL	L-2	N/A	138	152	Resize conductors for the Watsonville 115 kV Voltage Conversion Project/ add reactive support
CC-WP-T-022	CRZY_HRS-BRIGTANO 115 kV #1 Line	Moss Landing - Green Valley #1 and #2 115 kV Lines	C5 DCTL	L-2	N/A	139	154	Resize conductors for the Watsonville 115 kV Voltage Conversion Project/ add reactive support

2013/2014 ISO Reliability Assessment - Study Results

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



**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2015 Winter Peak	2018 Winter Peak	2023 Winter Peak	
CC-WP-V-001	ERTA 60 kV	N/A	A	Normal	1.06	N/A	N/A	Review for possible exemption
CC-WP-V-002	AGRILINK 60 kV	N/A	A	Normal	1.05	N/A	N/A	Review for possible exemption
CC-WP-V-003	WTSNVLL 60 kV	N/A	A	Normal	1.05	N/A	N/A	Review for possible exemption
CC-WP-V-004	PRUNEDLE 115 kV	N/A	A	Normal	1.05	-	-	Review for possible exemption
CC-WP-V-005	CSTRVLL 115 kV	N/A	A	Normal	1.06	1.05	1.05	Review for possible exemption
CC-WP-V-006	DOLAN RD 115 kV	N/A	A	Normal	1.06	1.05	1.05	Review for possible exemption
CC-WP-V-007	CAMPORA 60 kV	Metcalf-Moss Landing 230 kV #1 Line & Moss Landing 500/230 kV #9 Bank	C3	L-1/T-1	0.90	-	-	Monitor voltage/action plan
CC-WP-V-008	GONZALES 60 kV	Metcalf-Moss Landing 230 kV #1 Line & Moss Landing 500/230 kV #9 Bank	C3	L-1/T-1	0.89	-	-	Monitor voltage/action plan
CC-WP-V-009	CMP EVRS 115 kV	Moss Landing-Green Valley #1 & 2 115 kV Lines	C3	L-1-1	N/A	0.85	0.85	Activate Camp Evers 20 MVar Shunt Caps (Santa Cruz Reinforcement project)
CC-WP-V-010	PAUL SWT 115 kV	Moss Landing-Green Valley #1 & 2 115 kV Lines	C3	L-1-1	N/A	0.85	0.85	Activate Paul Sweet STATCOM
CC-WP-V-011	ROB ROY 115 kV	Moss Landing-Green Valley #1 & 2 115 kV Lines	C3	L-1-1	N/A	0.85	0.85	Activate Paul Sweet STATCOM. Santa Cruz Reinforcement Project rebuilds Green Valley-Rob Roy 115 kV Line into DCTL with 20 MVar Shunt Caps at Camp Evers
CC-WP-V-012	GRN VLY1 115 kV	Moss Landing-Green Valley #1 & 2 115 kV Lines	C3	L-1-1	N/A	0.85	0.85	Activate Paul Sweet STATCOM
CC-WP-V-013	GRN VLY2 115 kV	Moss Landing-Green Valley #1 & 2 115 kV Lines	C3	L-1-1	N/A	0.85	0.85	Activate Paul Sweet STATCOM

2013/2014 ISO Reliability Assessment - Study Results

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



**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2015 Winter Peak	2018 Winter Peak	2023 Winter Peak	
CC-WP-V-014	ERTA 115 kV	Moss Landing-Green Valley #1 & 2 115 kV Lines	C3	L-1-1	N/A	0.85	0.85	Resize conductors for the Watsonville 115 kV Voltage Conversion Project/ add reactive support
CC-WP-V-015	AGRILINK 115 kV	Moss Landing-Green Valley #1 & 2 115 kV Lines	C3	L-1-1	N/A	0.86	0.86	Resize conductors for the Watsonville 115 kV Voltage Conversion Project/ add reactive support
CC-WP-V-016	WTSNVILLE 115 kV	Moss Landing-Green Valley #1 & 2 115 kV Lines	C3	L-1-1	N/A	0.86	0.86	Resize conductors for the Watsonville 115 kV Voltage Conversion Project/ add reactive support
CC-WP-V-017	CMP EVRS 115 kV	Moss Landing-Green Valley #1 & 2 115 kV Lines	C5	L-2	-	0.85	0.79	Activate Camp Evers 20 MVar Shunt Caps (Santa Cruz Reinforcement project)
CC-WP-V-018	PAUL SWT 115 kV	Moss Landing-Green Valley #1 & 2 115 kV Lines	C5	L-2	-	0.85	0.80	Activate Paul Sweet STATCOM
CC-WP-V-019	ROB ROY 115 kV	Moss Landing-Green Valley #1 & 2 115 kV Lines	C5	L-2	-	0.85	0.80	Activate Paul Sweet STATCOM
CC-WP-V-020	GRN VLY1 115 kV	Moss Landing-Green Valley #1 & 2 115 kV Lines	C5	L-2	-	0.85	0.80	Activate Paul Sweet STATCOM
CC-WP-V-021	GRN VLY2 115 kV	Moss Landing-Green Valley #1 & 2 115 kV Lines	C5	L-2	-	0.85	0.80	Activate Paul Sweet STATCOM

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2015 Winter Peak	2018 Winter Peak	2023 Winter Peak	
CC-WP-VD-001	CMP EVRS 115 kV	Moss Landing-Green Valley #1 & 2 115 kV Lines	C3	L-1-1	-	17.5	15.2	Activate Camp Evers 20 MVar Shunt Caps (Santa Cruz Reinforcement project)
CC-WP-VD-002	PAUL SWT 115 kV	Moss Landing-Green Valley #1 & 2 115 kV Lines	C3	L-1-1	-	17.3	14.9	Activate Paul Sweet STATCOM
CC-WP-VD-003	ROB ROY 115 kV	Moss Landing-Green Valley #1 & 2 115 kV Lines	C3	L-1-1	-	17.4	15.8	Activate Paul Sweet STATCOM
CC-WP-VD-004	GRN VLY1 115 kV	Moss Landing-Green Valley #1 & 2 115 kV Lines	C3	L-1-1	-	17.4	16.1	Activate Paul Sweet STATCOM
CC-WP-VD-005	GRN VLY2 115 kV	Moss Landing-Green Valley #1 & 2 115 kV Lines	C3	L-1-1	-	17.5	16.1	Activate Paul Sweet STATCOM
CC-WP-VD-006	ERTA 115 kV	Moss Landing-Green Valley #1 & 2 115 kV Lines	C3	L-1-1	N/A	17.1	15.9	Resize conductors for the Watsonville 115 kV Voltage Conversion Project/ add reactive support
CC-WP-VD-007	AGRILINK 115 kV	Moss Landing-Green Valley #1 & 2 115 kV Lines	C3	L-1-1	N/A	16.6	15.5	Resize conductors for the Watsonville 115 kV Voltage Conversion Project/ add reactive support
CC-WP-VD-008	WTSNVLL 115 kV	Moss Landing-Green Valley #1 & 2 115 kV Lines	C3	L-1-1	N/A	16.5	15.4	Resize conductors for the Watsonville 115 kV Voltage Conversion Project/ add reactive support
CC-WP-VD-009	GRANT RK 115 kV	Moss Landing-Green Valley #1 & 2 115 kV Lines	C3	L-1-1	N/A	12.3	11.6	Resize conductors for the Watsonville 115 kV Voltage Conversion Project/ add reactive support
CC-WP-VD-010	BRIGTANO 115 kV	Moss Landing-Green Valley #1 & 2 115 kV Lines	C3	L-1-1	N/A	12.1	11.4	Resize conductors for the Watsonville 115 kV Voltage Conversion Project/ add reactive support
CC-WP-VD-011	CMP EVRS 115 kV	Moss Landing-Green Valley #1 & 2 115 kV Lines	C5 DCTL	L-2	-	17.7	20.8	Activate Camp Evers 20 MVar Shunt Caps (Santa Cruz Reinforcement project)
CC-WP-VD-012	PAUL SWT 115 kV	Moss Landing-Green Valley #1 & 2 115 kV Lines	C5 DCTL	L-2	-	17.3	20.3	Activate Paul Sweet STATCOM
CC-WP-VD-013	ROB ROY 115 kV	Moss Landing-Green Valley #1 & 2 115 kV Lines	C5 DCTL	L-2	-	18.0	21.5	Activate Paul Sweet STATCOM

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2015 Winter Peak	2018 Winter Peak	2023 Winter Peak	
CC-WP-VD-014	GRN VLY1 115 kV	Moss Landing-Green Valley #1 & 2 115 kV Lines	C5 DCTL	L-2	-	18.2	21.9	Activate Paul Sweet STATCOM
CC-WP-VD-015	GRN VLY2 115 kV	Moss Landing-Green Valley #1 & 2 115 kV Lines	C5 DCTL	L-2	-	18.3	22.0	Activate Paul Sweet STATCOM
CC-WP-VD-016	ERTA 115 kV	Moss Landing-Green Valley #1 & 2 115 kV Lines	C5 DCTL	L-2	N/A	17.9	21.5	Resize conductors for the Watsonville 115 kV Voltage Conversion Project/ add reactive support
CC-WP-VD-017	AGRILINK 115 kV	Moss Landing-Green Valley #1 & 2 115 kV Lines	C5 DCTL	L-2	N/A	17.4	20.8	Resize conductors for the Watsonville 115 kV Voltage Conversion Project/ add reactive support
CC-WP-VD-018	WTSNVLE 115 kV	Moss Landing-Green Valley #1 & 2 115 kV Lines	C5 DCTL	L-2	N/A	17.3	20.6	Resize conductors for the Watsonville 115 kV Voltage Conversion Project/ add reactive support
CC-WP-VD-019	GRANT RK 115 kV	Moss Landing-Green Valley #1 & 2 115 kV Lines	C5 DCTL	L-2	N/A	12.9	15.0	Resize conductors for the Watsonville 115 kV Voltage Conversion Project/ add reactive support
CC-WP-VD-020	BRIGTANO 115 kV	Moss Landing-Green Valley #1 & 2 115 kV Lines	C5 DCTL	L-2	N/A	12.6	14.7	Resize conductors for the Watsonville 115 kV Voltage Conversion Project/ add reactive support



2013/2014 ISO Reliability Assessment - Study Results

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



**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.

2013/2014 ISO Reliability Assessment - Study Results

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



**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.

2013/2014 ISO Reliability Assessment - Study Results

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



**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.

2013/2014 ISO Reliability Assessment - Study Results

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

**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

2013/2014 ISO Reliability Assessment - Study Results

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

**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

2013/2014 ISO Reliability Assessment - Study Results

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



**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-18**  
**PG&E Los Padres**  
**Reliability Assessment Study Results**

2013/2014 ISO Reliability Assessment - Study Results

Study Area: **PG&E Los Padres - Summer Peak**



**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
LP_SP_T_001	MORRO BAY 230/115 kV # 6 Bank	CB Fault at Mesa Sub 115 kV CB102	C2	CB FAULT (Bus tie)	111	<100	<100	Action plan/drop load in the interim until Morro Bay transformer Addition Project is in service
LP_SP_T_002	SN LS OB-SNTA MRA 115 kV #1 Line	CB Fault at Mesa Sub 115 kV CB102	C2	CB FAULT (Bus tie)	184	190	<100	Modify Santa Maria/Mesa SPS/UVLS in the interim until Midway-Andrew Project is in service in 2019
LP_SP_T_003	SNTA MRA-FRWAYTP 115 kV #1 Line	CB Fault at Mesa Sub 115 kV CB102	C2	CB FAULT (Bus tie)	104	108	<100	Modify Santa Maria/Mesa SPS/UVLS in the interim until Midway-Andrew Project is in service in 2019
LP_SP_T_004	S.YNZ JT-ZACA 115 kV #1 Line	CB Fault at Mesa Sub 115 kV CB102	C2	CB FAULT (Bus tie)	102	104	<100	Modify Divide SPS/UVLS in the interim until Midway-Andrew Project is in service in 2019
LP_SP_T_005	MORRO BY-GLDTRJC1 115 kV #1 Line	CB Fault at Mesa Sub 115 kV CB102	C2	CB FAULT (Bus tie)	107	107	<100	Modify Santa Maria/Mesa SPS/UVLS in the interim until Midway-Andrew Project is in service in 2019
LP_SP_T_006	MORRO BY-GLDTRJC2 115 kV #1 Line	CB Fault at Mesa Sub 115 kV CB102	C2	CB FAULT (Bus tie)	105	105	<100	Modify Santa Maria/Mesa SPS/UVLS in the interim until Midway-Andrew Project is in service in 2019
LP_SP_T_007	GLDTRJC2-FTHILTP1 115 kV #1 Line	CB Fault at Mesa Sub 115 kV CB102	C2	CB FAULT (Bus tie)	105	105	<100	Modify Santa Maria/Mesa SPS/UVLS in the interim until Midway-Andrew Project is in service in 2019



2013/2014 ISO Reliability Assessment - Study Results

Study Area: **PG&E Los Padres - Summer Peak**



**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
LP_SP_T_008	SAN MIGL-PSA RBLS 70 kV #1 Line	Morro Bay-Templeton and Templeton-Gates 230 kV Lines	C3	L-1-1	88	113	115	Build Estrella Substation Project with only a single 230 kV line loop-in.
LP_SP_T_009	TEMPL7-TEMPL J2 70 kV #1 Line	Morro Bay-Templeton and Templeton-Gates 230 kV Lines	C3	L-1-1	121	129	135	Build Estrella Substation Project with only a single 230 kV line loop-in.
LP_SP_T_010	TEMPL J2-ATASCDRO 70 kV #1 Line	Morro Bay-Templeton and Templeton-Gates 230 kV Lines	C3	L-1-1	120	129	134	Build Estrella Substation Project with only a single 230 kV line loop-in.
LP_SP_T_011	ATASCDRO-CACOS J2 70 kV #1 Line	Morro Bay-Templeton and Templeton-Gates 230 kV Lines	C3	L-1-1	150	136	141	Build Estrella Substation Project with only a single 230 kV line loop-in.
LP_SP_T_012	CACOS J2-CAYUCOS 70 kV #1 Line	Morro Bay-Templeton and Templeton-Gates 230 kV Lines	C3	L-1-1	138	125	130	Build Estrella Substation Project with only a single 230 kV line loop-in.
LP_SP_T_013	MUSTNG J-SN LS OB 70 kV #1 Line	Morro Bay-Templeton and Templeton-Gates 230 kV Lines	C3	L-1-1	115	112	116	Build Estrella Substation Project with only a single 230 kV line loop-in.
LP_SP_T_014	S.YNZ JT-CABRILLO 115 kV #1 Line	Andrew-Sisquoc 115 kV #1 & 2 Lines	C3	L-1-1	N/A	N/A	101	Monitor facility loading due to long lead time
LP_SP_T_015	ATASCDRO-SN LS OB 70 kV #1 Line	Morro Bay-Templeton and Templeton-Gates 230 kV Lines	C3	L-1-1	142	<100	<100	Drop load. Estrella Substation Project strengthens the area.
LP_SP_T_016	MORRO BAY 230/115 kV #6 Bank	Morro Bay-Diablo and Morro Bay-Mesa 230 kV Lines	C3	L-1-1	135	<100	<100	Action plan/drop load in the interim until Morro Bay transformer Addition Project is in service

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
LP_SP_T_017	MORRO BY-GLDTRJC1 115 kV #1 Line	Morro Bay-Diablo and Morro Bay-Mesa 230 kV Lines	C3	L-1-1	113	128	<100	Modify Santa Maria SPS/UVLS in the interim until Midway-Andrew Project is in service in 2019
LP_SP_T_018	FTHILTP2-SN LS OB 115 kV #1 Line	Morro Bay-Diablo and Morro Bay-Mesa 230 kV Lines	C3	L-1-1	105	120	<100	Modify Santa Maria/Mesa SPS/UVLS in the interim until Midway-Andrew Project is in service in 2019
LP_SP_T_019	SN LS OB-OCEANO 115 kV #1 Line	Morro Bay-Diablo and Morro Bay-Mesa 230 kV Lines	C3	L-1-1	126	157	<100	Activate existing Mesa/Santa Maria SPS/UVLS until Midway-Andrew Project is in service in 2019
LP_SP_T_020	OCEANO-UNION OL 115 kV #1 Line	Morro Bay-Diablo and Morro Bay-Mesa 230 kV Lines	C3	L-1-1	116	159	<100	Modify Santa Maria/Mesa SPS/UVLS in the interim until Midway-Andrew Project is in service in 2019
LP_SP_T_021	MESA_PGE-UNION OL 115 kV #1 Line	Morro Bay-Diablo and Morro Bay-Mesa 230 kV Lines	C3	L-1-1	108	149	<100	Modify Santa Maria/Mesa SPS/UVLS in the interim until Midway-Andrew Project is in service in 2019
LP_SP_T_022	SN LS OB-SNTA MRA 115 kV #1 Line	Morro Bay-Diablo and Morro Bay-Mesa 230 kV Lines	C3	L-1-1	168	212	<100	Modify Santa Maria/Mesa SPS/UVLS in the interim until Midway-Andrew Project is in service in 2019
LP_SP_T_023	SNTA MRA-FRWAYTP 115 kV #1 Line	Mesa-Divide 115kV #1 & 2 Lines	C3	L-1-1	107	109	<100	Modify Santa Maria/Mesa SPS/UVLS in the interim until Midway-Andrew Project is in service in 2019

2013/2014 ISO Reliability Assessment - Study Results

Study Area: **PG&E Los Padres - Summer Peak**



**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
LP_SP_T_02 4	SISQUOC-PALMR 115 kV #1 Line	Mesa-Divide 115 kV #1 & #2 Lines	C3	L-1-1	150	153	<100	Activate existing Divide SPS until Midway-Andrew Project is in service in 2019
LP_SP_T_02 5	PALMR-ZACA 115 kV #1 Line	Mesa-Divide 115 kV #1 & #2 Lines	C3	L-1-1	148	151	<100	Activate existing Divide SPS until Andrew Project is in service in 2019
LP_SP_T_02 6	S.YNZ JT-ZACA 115 kV #1 Line	Mesa-Divide 115 kV #1 & #2 Lines	C3	L-1-1	161	164	<100	Activate existing Divide SPS until Andrew Project is in service in 2019
LP_SP_T_02 7	S.YNZ JT-CABRILLO 115 kV #1 Line	Mesa-Divide 115 kV #1 & #2 Lines	C3	L-1-1	116	117	<100	Activate existing Divide SPS until Andrew Project is in service in 2019
LP_SP_T_02 8	S.YNZ JT-CABRILLO 115 kV #1 Line	Andrew-Sisquoc No.1 and 2 115 kV Line	C5 DCTL	L-2	N/A	N/A	101	Monitor facility loading due to long lead time/Rerate/Reconductor
LP_SP_T_02 9	FTHILTP2-SN LS OB 115 kV #1 Line	Morro Bay-Diablo and Morro Bay-Mesa 230 kV Lines	C5 DCTL	L-2	105	120	<100	Modify Santa Maria/Mesa SPS/UVLS in the interim until Midway-Andrew Project is in service in 2019
LP_SP_T_03 0	MORRO BAY 230/115 kV Bank #6	Morro Bay-Diablo and Morro Bay-Mesa 230 kV Lines	C5 DCTL	L-2	135	<100	<100	Action plan/drop load in the interim until Morro Bay transformer Addition Project is in service
LP_SP_T_03 1	MORRO BY-GLDTRJC1 115 kV #1 Line	Morro Bay-Diablo and Morro Bay-Mesa 230 kV Lines	C5 DCTL	L-2	113	128	<100	Modify Santa Maria/Mesa SPS/UVLS in the interim until Midway-Andrew Project is in service in 2019

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
LP_SP_T_03_2	SN LS OB-OCEANO 115 kV #1 Line	Morro Bay-Diablo and Morro Bay-Mesa 230 kV Lines	C5 DCTL	L-2	126	157	<100	Modify Santa Maria/Mesa SPS/UVLS in the interim until Midway-Andrew Project is in service in 2019
LP_SP_T_03_3	OCEANO-UNION OL 115 kV #1 Line	Morro Bay-Diablo and Morro Bay-Mesa 230 kV Lines	C5 DCTL	L-2	116	159	<100	Modify Santa Maria/Mesa SPS/UVLS in the interim until Midway-Andrew Project is in service in 2019
LP_SP_T_03_4	MESA_PGE-UNION OL 115 kV #1 Line	Morro Bay-Diablo and Morro Bay-Mesa 230 kV Lines	C5 DCTL	L-2	108	148	<100	Modify Santa Maria/Mesa SPS/UVLS in the interim until Midway-Andrew Project is in service in 2019
LP_SP_T_03_5	SN LS OB-SNTA MRA 115 kV #1 Line	Morro Bay-Diablo and Morro Bay-Mesa 230 kV Lines	C5 DCTL	L-2	168	212	<100	Modify Santa Maria/Mesa SPS/UVLS in the interim until Midway-Andrew Project is in service in 2019
LP_SP_T_03_6	SNTA MRA-FRWAYTP 115 kV #1 Line	Mesa-Divide 115kV #1 & 2 Lines	C5 DCTL	L-2	10680%	10950%	<100	Modify Santa Maria/Mesa SPS/UVLS in the interim until Midway-Andrew Project is in service in 2019
LP_SP_T_03_7	SISQUOC-PALMR 115 kV #1 Line	Mesa-Divide 115 kV #1 & #2 Lines	C5 DCTL	L-2	14950%	15220%	<100	Activate existing Divide SPS until Andrew Project is in service in 2019
LP_SP_T_03_8	PALMR-ZACA 115 kV #1 Line	Mesa-Divide 115 kV #1 & #2 Lines	C5 DCTL	L-2	14760%	15040%	<100	Activate existing Divide SPS until Andrew Project is in service in 2019

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
LP_SP_T_039	S.YNZ JT-ZACA 115 kV #1 Line	Mesa-Divide 115 kV #1 & #2 Lines	C5 DCTL	L-2	16100%	16370%	<100	Activate existing Divide SPS until Andrew Project is in service in 2019
LP_SP_T_040	S.YNZ JT-CABRILLO 115 kV #1 Line	Mesa-Divide 115 kV #1 & #2 Lines	C5 DCTL	L-2	11630%	11730%	<100	Activate existing Divide SPS until Andrew Project is in service in 2019

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**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
LP-SP-V-001	PURISIMA 115 kV	Bus 1 Fault at MESA_PGE 115 kV Sub	C1	BUS	0.88	0.89	-	Action plan/modify existing Divide SPS/UVLS until Midway-Andrew Project is in service in 2019
LP-SP-V-002	SURF 115 kV	Bus 1 Fault at MESA_PGE 115 kV Sub	C1	BUS	0.87	0.88	-	Action plan/modify existing Divide SPS/UVLS until Midway-Andrew Project is in service in 2019
LP-SP-V-003	LMPC-CTY 115 kV	Bus 1 Fault at MESA_PGE 115 kV Sub	C1	BUS	0.87	0.88	-	Action plan/modify existing Divide SPS/UVLS until Midway-Andrew Project is in service in 2019
LP-SP-V-004	CABRILLO 115 kV	Bus 1 Fault at MESA_PGE 115 kV Sub	C1	BUS	0.88	0.89	-	Action plan/modify existing Divide SPS/UVLS until Midway-Andrew Project is in service in 2019
LP-SP-V-005	MANVILLE 115 kV	Bus 1 Fault at MESA_PGE 115 kV Sub	C1	BUS	0.87	0.88	-	Action plan/modify existing Divide SPS/UVLS until Midway-Andrew Project is in service in 2019
LP-SP-V-006	BUELLTON 115 kV	Bus 1 Fault at MESA_PGE 115 kV Sub	C1	BUS	0.88	0.89	-	Action plan/modify existing Divide SPS/UVLS until Midway-Andrew Project is in service in 2019
LP-SP-V-007	SNTA YNZ 115 kV	Bus 1 Fault at MESA_PGE 115 kV Sub	C1	BUS	0.88	0.88	-	Action plan/modify existing Divide SPS/UVLS until Midway-Andrew Project is in service in 2019
LP-SP-V-008	ZACA 115 kV	Bus 1 Fault at MESA_PGE 115 kV Sub	C1	BUS	0.88	0.89	-	Action plan/modify existing Divide SPS/UVLS until Midway-Andrew Project is in service in 2019
LP-SP-V-009	PURISIMA 115 kV	CB Fault at Mesa Sub 115 kV CB102	C2	CB Fault (Bus-tie)	0.41	0.41	0.84	Action plan/modify existing Divide SPS/UVLS until Midway-Andrew Project is in service in 2019
LP-SP-V-010	SURF 115 kV	CB Fault at Mesa Sub 115 kV CB102	C2	CB Fault (Bus-tie)	0.43	0.43	0.83	Action plan/modify existing Divide SPS/UVLS until Midway-Andrew Project is in service in 2019

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
LP-SP-V-011	LMPC-CTY 115 kV	CB Fault at Mesa Sub 115 kV CB102	C2	CB Fault (Bus-tie)	0.40	0.41	0.83	Action plan/modify existing Divide SPS/UVLS until Midway-Andrew Project is in service in 2019
LP-SP-V-012	CABRILLO 115 kV	CB Fault at Mesa Sub 115 kV CB102	C2	CB Fault (Bus-tie)	0.44	0.44	0.84	Action plan/modify existing Divide SPS/UVLS until Midway-Andrew Project is in service in 2019
LP-SP-V-013	MANVILLE 115 kV	CB Fault at Mesa Sub 115 kV CB102	C2	CB Fault (Bus-tie)	0.40	0.41	0.83	Action plan/modify existing Divide SPS/UVLS until Midway-Andrew Project is in service in 2019
LP-SP-V-014	BUELLTON 115 kV	CB Fault at Mesa Sub 115 kV CB102	C2	CB Fault (Bus-tie)	0.47	0.47	0.84	Action plan/modify existing Divide SPS/UVLS until Midway-Andrew Project is in service in 2019
LP-SP-V-015	SNTA YNZ 115 kV	CB Fault at Mesa Sub 115 kV CB102	C2	CB Fault (Bus-tie)	0.46	0.47	0.84	Action plan/modify existing Divide SPS/UVLS until Midway-Andrew Project is in service in 2019
LP-SP-V-016	ZACA 115 kV	CB Fault at Mesa Sub 115 kV CB102	C2	CB Fault (Bus-tie)	0.49	0.50	0.85	Action plan/modify existing Divide SPS/UVLS until Midway-Andrew Project is in service in 2019
LP-SP-V-017	PALMR 115 kV	CB Fault at Mesa Sub 115 kV CB102	C2	CB Fault (Bus-tie)	0.56	0.57	0.88	Action plan/modify existing Divide SPS/UVLS until Midway-Andrew Project is in service in 2019
LP-SP-V-018	SISQUOC 115 kV	CB Fault at Mesa Sub 115 kV CB102	C2	CB Fault (Bus-tie)	0.58	0.59	0.89	Action plan/modify existing Divide SPS/UVLS until Midway-Andrew Project is in service in 2019
LP-SP-V-019	SN LS OB 115 kV	CB Fault at Mesa Sub 115 kV CB102	C2	CB Fault (Bus-tie)	0.86	0.88	-	Action plan/modify existing Divide SPS/UVLS until Midway-Andrew Project is in service in 2019
LP-SP-V-020	SNTA MRA 115 kV	CB Fault at Mesa Sub 115 kV CB102	C2	CB Fault (Bus-tie)	0.62	0.63	0.89	Action plan/modify existing Santa Maria/Mesa SPS/UVLS until Midway-Andrew Project is in service in 2019

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**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
LP-SP-V-021	FAIRWAY 115 kV	CB Fault at Mesa Sub 115 kV CB102	C2	CB Fault (Bus-tie)	0.61	0.62	0.88	Action plan/modify existing Divide SPS/UVLS until Midway-Andrew Project is in service in 2019
LP-SP-V-022	OCEANO 115 kV	CB Fault at Mesa Sub 115 kV CB102	C2	CB Fault (Bus-tie)	0.83	0.85	-	Action plan/modify existing Santa Maria/Mesa SPS/UVLS until Midway-Andrew Project is in service in 2019
LP-SP-V-023	UNION OL 115 kV	CB Fault at Mesa Sub 115 kV CB102	C2	CB Fault (Bus-tie)	0.83	0.85	-	Action plan/modify existing Santa Maria/Mesa SPS/UVLS until Midway-Andrew Project is in service in 2019
LP-SP-V-024	MORRO BY 115 kV	CB FAULT AT MORRO BAY SUB 230 kV CB622	C2	CB Fault	0.86	-	-	Action plan/modify existing Santa Maria/Mesa SPS/UVLS until Midway-Andrew Project is in service in 2019
LP-SP-V-025	GOLDTREE 115 kV	CB FAULT AT MORRO BAY SUB 230 kV CB622	C2	CB Fault	0.84	0.86	-	Action plan/modify existing Santa Maria/Mesa SPS/UVLS until Midway-Andrew Project is in service in 2019
LP-SP-V-026	FOOTHILL 115 kV	CB FAULT AT MORRO BAY SUB 230 kV CB622	C2	CB Fault	0.86	-	-	Action plan/modify existing Santa Maria/Mesa SPS/UVLS until Midway-Andrew Project is in service in 2019
LP-SP-V-027	MESA PGE 230 kV	CB FAULT AT MORRO BAY SUB 230 kV CB622	C2	CB Fault	0.88	-	-	Action plan/modify existing Santa Maria/Mesa SPS/UVLS until Midway-Andrew Project is in service in 2019
LP-SP-V-028	DIVIDE 70 kV	CB Fault at Mesa Sub 115 kV CB102	C2	CB Fault (Bus-tie)	0.43	0.44	0.89	Action plan/modify existing Divide SPS/UVLS until Midway-Andrew Project is in service in 2019
LP-SP-V-029	VAFB SSA 70 kV	CB Fault at Mesa Sub 115 kV CB102	C2	CB Fault (Bus-tie)	0.42	0.43	0.88	Action plan/modify existing Divide SPS/UVLS until Midway-Andrew Project is in service in 2019
LP-SP-V-030	TEMPLETN 230 kV	Morro Bay-Templeton and Templeton-Gates 230 kV Lines	C3	L-1-1	0.63	0.64	0.63	Activate existing Paso Robles UVLS until Estrella Substation Project is built
LP-SP-V-031	SAN MIGL 70 kV	Morro Bay-Templeton and Templeton-Gates 230 kV Lines	C3	L-1-1	0.77	0.76	0.76	Activate existing Paso Robles UVLS until Estrella Substation Project is built



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Study Area: **PG&E Los Padres - Summer Peak**



High/Low Voltage

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
LP-SP-V-032	PSA RBLS 70 kV	Morro Bay-Templeton and Templeton-Gates 230 kV Lines	C3	L-1-1	0.74	0.75	0.74	Activate existing Paso Robles UVLS until Estrella Substation Project is built
LP-SP-V-033	ATASCDRO 70 kV	Morro Bay-Templeton and Templeton-Gates 230 kV Lines	C3	L-1-1	0.82	0.85	0.84	Activate existing Paso Robles UVLS until Estrella Substation Project is built
LP-SP-V-034	MUSTANG 70 kV	Morro Bay-Templeton and Templeton-Gates 230 kV Lines	C3	L-1-1	0.87	0.86	0.87	Action plan until Estrella Substation Project is in service
LP-SP-V-035	CAYUCOS 70 kV	Morro Bay-Templeton and Templeton-Gates 230 kV Lines	C3	L-1-1	0.90	-	-	Action plan until Cayucos 70 kV Shunt Caps are in service. Also Estrella Substation Project alleviate the concern
LP-SP-V-036	PERRY 70 kV	Morro Bay-Templeton and Templeton-Gates 230 kV Lines	C3	L-1-1	0.89	-	-	Action plan until Cayucos 70 kV Shunt Caps are in service. Also Estrella Substation Project alleviate the concern
LP-SP-V-037	CAMBRIA 70 kV	Morro Bay-Templeton and Templeton-Gates 230 kV Lines	C3	L-1-1	0.89	-	-	Action plan until Cayucos 70 kV Shunt Caps are in service. Also Estrella Substation Project alleviate the concern
LP-SP-V-038	DIVIDE 70 kV	Diablo-Mesa and Morro Bay-Mesa 230 kV Lines	C3	L-1-1	0.68	0.69	-	Activate existing Divide SPS until Andrew Project is in service in 2019
LP-SP-V-039	VAFB SSA 70 kV	Mesa-Divide 115 kV #1&#2 Lines	C3	L-1-1	0.67	0.67	-	Activate existing Divide SPS until Andrew Project is in service in 2019
LP-SP-V-040	PURISIMA 115 kV	Mesa-Divide 115 kV #1&#2 Lines	C3	L-1-1	0.64	0.64	-	Activate existing Divide SPS until Andrew Project is in service in 2019
LP-SP-V-041	SURF 115 kV	Diablo-Mesa and Morro Bay-Mesa 230 kV Lines	C3	L-1-1	0.67	0.68	-	Activate existing Santa Maria/Mesa SPS until Andrew Project is in service in 2019
LP-SP-V-042	LMPC-CTY 115 kV	Diablo-Mesa and Morro Bay-Mesa 230 kV Lines	C3	L-1-1	0.67	0.67	-	Activate existing Santa Maria/Mesa SPS until Andrew Project is in service in 2019
LP-SP-V-043	CABRILLO 115 kV	Diablo-Mesa and Morro Bay-Mesa 230 kV Lines	C3	L-1-1	0.67	0.68	-	Activate existing Santa Maria/Mesa SPS until Andrew Project is in service in 2019

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
LP-SP-V-044	MANVILLE 115 kV	Diablo-Mesa and Morro Bay-Mesa 230 kV Lines	C3	L-1-1	0.67	0.67	-	Activate existing Santa Maria/Mesa SPS until Andrew Project is in service in 2019
LP-SP-V-045	BUELLTON 115 kV	Diablo-Mesa and Morro Bay-Mesa 230 kV Lines	C3	L-1-1	0.67	0.68	-	Activate existing Santa Maria/Mesa SPS until Andrew Project is in service in 2019
LP-SP-V-046	SNTA YNZ 115 kV	Diablo-Mesa and Morro Bay-Mesa 230 kV Lines	C3	L-1-1	0.67	0.67	-	Activate existing Santa Maria/Mesa SPS until Andrew Project is in service in 2019
LP-SP-V-047	ZACA 115 kV	Diablo-Mesa and Morro Bay-Mesa 230 kV Lines	C3	L-1-1	0.68	0.68	-	Activate existing Santa Maria/Mesa SPS until Andrew Project is in service in 2019
LP-SP-V-048	PALMR 115 kV	Diablo-Mesa and Morro Bay-Mesa 230 kV Lines	C3	L-1-1	0.70	0.70	-	Activate existing Santa Maria/Mesa SPS until Andrew Project is in service in 2019
LP-SP-V-049	SISQUOC 115 kV	Diablo-Mesa and Morro Bay-Mesa 230 kV Lines	C3	L-1-1	0.70	0.71	-	Activate existing Santa Maria/Mesa SPS until Andrew Project is in service in 2019
LP-SP-V-050	SNTA MRA 115 kV	Diablo-Mesa and Morro Bay-Mesa 230 kV Lines	C3	L-1-1	0.71	0.72	-	Activate existing Santa Maria/Mesa SPS until Andrew Project is in service in 2019
LP-SP-V-051	FAIRWAY 115 kV	Diablo-Mesa and Morro Bay-Mesa 230 kV Lines	C3	L-1-1	0.70	0.71	-	Activate existing Santa Maria/Mesa SPS until Andrew Project is in service in 2019
LP-SP-V-052	SN LS OB 115 kV	Morro Bay-Diablo and Morro Bay-Mesa 230 kV Lines	C3	L-1-1	0.85	0.86	-	Activate existing Santa Maria/Mesa SPS until Andrew Project is in service in 2019
LP-SP-V-053	UNION OL 115 kV	Diablo-Mesa and Morro Bay-Mesa 230 kV Lines	C3	L-1-1	0.74	0.75	-	Activate existing Santa Maria/Mesa SPS until Andrew Project is in service in 2019

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
LP-SP-VD-001	ZACA 115 kV	N/A	A	Normal	-	-	5	Monitor voltage deviation due to longer lead time
LP-SP-VD-002	MORRO BY 115 kV	Morro Bay 230/115 kV Bank #6	B	T-1	8	-	-	Develop action plan. Morro Bay Transformer Addition
LP-SP-VD-003	GOLDTREE 115 kV	Morro Bay 230/115 kV Bank #6	B	T-1	7	-	-	Modify Santa Maria/Mesa SPS/UVLS in the interim until Midway-Andrew Project is in service in 2019
LP-SP-VD-004	FOOTHILL 115 kV	Morro Bay 230/115 kV Bank #6	B	T-1	7	-	-	Modify Santa Maria/Mesa SPS/UVLS in the interim until Midway-Andrew Project is in service in 2019
LP-SP-VD-005	SN LS OB 115 kV	Morro Bay 230/115 kV Bank #6	B	T-1	6	-	-	Modify Santa Maria/Mesa SPS/UVLS in the interim until Midway-Andrew Project is in service in 2019
LP-SP-VD-006	VAFB SSA 70 kV	CB Fault at Mesa Sub 115 kV CB102	C2	CB Fault (Bus tie)	59	59	15	Modify Santa Maria/Mesa SPS/UVLS in the interim. 2019 Midway-Andrew Project strengthens the area
LP-SP-VD-007	VAFB SSB 70 kV	CB Fault at Mesa Sub 115 kV CB102	C2	CB Fault (Bus tie)	59	59	15	Modify Santa Maria/Mesa SPS/UVLS in the interim. 2019 Midway-Andrew Project strengthens the area
LP-SP-VD-008	DIVIDE 70 kV	CB Fault at Mesa Sub 115 kV CB102	C2	CB Fault (Bus tie)	59	60	15	Modify Santa Maria/Mesa SPS/UVLS in the interim. 2019 Midway-Andrew Project strengthens the area
LP-SP-VD-009	PURISIMA 115 kV	CB Fault at Mesa Sub 115 kV CB102	C2	CB Fault (Bus tie)	56	56	15	Modify Santa Maria/Mesa SPS/UVLS in the interim. 2019 Midway-Andrew Project strengthens the area
LP-SP-VD-010	SURF 115 kV	CB Fault at Mesa Sub 115 kV CB102	C2	CB Fault (Bus tie)	53	53	14	Modify Santa Maria/Mesa SPS/UVLS in the interim. 2019 Midway-Andrew Project strengthens the area
LP-SP-VD-011	LMPC-CTY 115 kV	CB Fault at Mesa Sub 115 kV CB102	C2	CB Fault (Bus tie)	56	56	15	Modify Santa Maria/Mesa SPS/UVLS in the interim. 2019 Midway-Andrew Project strengthens the area

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
LP-SP-VD-012	CABRILLO 115 kV	CB Fault at Mesa Sub 115 kV CB102	C2	CB Fault (Bus tie)	53	53	14	Modify Santa Maria/Mesa SPS/UVLS in the interim. 2019 Midway-Andrew Project strengthens the area
LP-SP-VD-013	MANVILLE 115 kV	CB Fault at Mesa Sub 115 kV CB102	C2	CB Fault (Bus tie)	56	56	15	Modify Santa Maria/Mesa SPS/UVLS in the interim. 2019 Midway-Andrew Project strengthens the area
LP-SP-VD-014	BUELLTON 115 kV	CB Fault at Mesa Sub 115 kV CB102	C2	CB Fault (Bus tie)	50	50	14	Modify Santa Maria/Mesa SPS/UVLS in the interim. 2019 Midway-Andrew Project strengthens the area
LP-SP-VD-015	SNTA YNZ 115 kV	CB Fault at Mesa Sub 115 kV CB102	C2	CB Fault (Bus tie)	50	50	14	Modify Santa Maria/Mesa SPS/UVLS in the interim. 2019 Midway-Andrew Project strengthens the area
LP-SP-VD-016	ZACA 115 kV	CB Fault at Mesa Sub 115 kV CB102	C2	CB Fault (Bus tie)	48	48	13	Modify Santa Maria/Mesa SPS/UVLS in the interim. 2019 Midway-Andrew Project strengthens the area
LP-SP-VD-017	PALMR 115 kV	CB Fault at Mesa Sub 115 kV CB102	C2	CB Fault (Bus tie)	42	42	12	Modify Santa Maria/Mesa SPS/UVLS in the interim. 2019 Midway-Andrew Project strengthens the area
LP-SP-VD-018	SISQUOC 115 kV	CB Fault at Mesa Sub 115 kV CB102	C2	CB Fault (Bus tie)	41	40	11	Modify Santa Maria/Mesa SPS/UVLS in the interim. 2019 Midway-Andrew Project strengthens the area
LP-SP-VD-019	GAREY 115 kV	CB Fault at Mesa Sub 115 kV CB102	C2	CB Fault (Bus tie)	56	56	15	Modify Santa Maria/Mesa SPS/UVLS in the interim. 2019 Midway-Andrew Project strengthens the area
LP-SP-VD-020	FAIRWAY 115 kV	CB Fault at Mesa Sub 115 kV CB102	C2	CB Fault (Bus tie)	38	37	12	Modify Santa Maria/Mesa SPS/UVLS in the interim. 2019 Midway-Andrew Project strengthens the area
LP-SP-VD-021	SNTA MRA 115 kV	CB Fault at Mesa Sub 115 kV CB102	C2	CB Fault (Bus tie)	37	36	11	Modify Santa Maria/Mesa SPS/UVLS in the interim. 2019 Midway-Andrew Project strengthens the area

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**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
LP-SP-VD-022	S. MASSO 115 kV	CB Fault at Mesa Sub 115 kV CB102	C2	CB Fault (Bus tie)	37	36	11	Modify Santa Maria/Mesa SPS/UVLS in the interim. 2019 Midway-Andrew Project strengthens the area
LP-SP-VD-023	ANDREW 115 kV	CB Fault at Mesa Sub 115 kV CB102	C2	CB Fault (Bus tie)	-	-	11	Monitor due to long lead time. 2019 Midway-Andrew Project will help
LP-SP-VD-024	SN LS OB 115 kV	CB Fault at Mesa Sub 115 kV CB102	C2	CB Fault (Bus tie)	13	11	-	Modify Santa Maria/Mesa SPS/UVLS in the interim until Midway-Andrew Project is in service in 2019
LP-SP-VD-025	UNION OL 115 kV	CB Fault at Mesa Sub 115 kV CB102	C2	CB Fault (Bus tie)	16	15	-	Modify Santa Maria/Mesa SPS/UVLS in the interim until Midway-Andrew Project is in service in 2019
LP-SP-VD-026	OCEANO 115 kV	CB Fault at Mesa Sub 115 kV CB102	C2	CB Fault (Bus tie)	15	14	-	Modify Santa Maria/Mesa SPS/UVLS in the interim until Midway-Andrew Project is in service in 2019
LP-SP-VD-027	MESA PGE 230 kV	CB Fault at Mesa Sub 115 kV CB102	C2	CB Fault (Bus tie)	12	-	-	Modify Santa Maria/Mesa SPS/UVLS in the interim until Midway-Andrew Project is in service in 2019
LP-SP-VD-028	MORRO BY 115 kV	CB Fault at Mesa Sub 115 kV CB102	C2	CB Fault (Bus tie)	14	-	-	Modify Santa Maria/Mesa SPS/UVLS in the interim until Midway-Andrew Project is in service in 2019
LP-SP-VD-029	GOLDTREE 115 kV	CB Fault at Mesa Sub 115 kV CB102	C2	CB Fault (Bus tie)	15	13	-	Modify Santa Maria/Mesa SPS/UVLS in the interim until Midway-Andrew Project is in service in 2019
LP-SP-VD-030	FOOTHILL 115 kV	CB Fault at Mesa Sub 115 kV CB102	C2	CB Fault (Bus tie)	15	14	-	Modify Santa Maria/Mesa SPS/UVLS in the interim until Midway-Andrew Project is in service in 2019
LP-SP-VD-031	CAMBRIA 70 kV	Morro Bay-Templeton and Templeton-Gates 230 kV Lines	C3	L-1-1	12	10	10	Action plan/ctivate Cayucos 70kV Shunt Caps/Paso Robles UVLS. Build Estrella Substation Project

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
LP-SP-VD-032	PERRY 70 kV	Morro Bay-Templeton and Templeton-Gates 230 kV Lines	C3	L-1-1	12	10	10	Action plan/ctivate Cayucos 70kV Shunt Caps/Paso Robles UVLS. Build Estrella Substation Project
LP-SP-VD-033	CAYUCOS 70 kV	Morro Bay-Templeton and Templeton-Gates 230 kV Lines	C3	L-1-1	12	10	10	Action plan/ctivate Cayucos 70kV Shunt Caps/Paso Robles UVLS. Build Estrella Substation Project
LP-SP-VD-034	BAYWOOD 70 kV	Templeton-Gates and Morro Bay-Templeton 230 kV Lines	C3	L-1-1	12	10	10	Action plan/ctivate Cayucos 70kV Shunt Caps/Paso Robles UVLS. Build Estrella Substation Project
LP-SP-VD-035	ATASCDRO 70 kV	Morro Bay-Templeton and Templeton-Gates 230 kV Lines	C3	L-1-1	19	16	16	Action plan/ctivate Cayucos 70kV Shunt Caps/Paso Robles UVLS. Build Estrella Substation Project
LP-SP-VD-036	TEMPLETN 230 kV	Morro Bay-Templeton and Templeton-Gates 230 kV Lines	C3	L-1-1	36	35	36	Action plan/ctivate Cayucos 70kV Shunt Caps/Paso Robles UVLS. Build Estrella Substation Project
LP-SP-VD-037	PSA RBLS 70 kV	Morro Bay-Templeton and Templeton-Gates 230 kV Lines	C3	L-1-1	24	23	23	Action plan/ctivate Cayucos 70kV Shunt Caps/Paso Robles UVLS. Build Estrella Substation Project
LP-SP-VD-038	SAN MIGL 70 kV	Morro Bay-Templeton and Templeton-Gates 230 kV Lines	C3	L-1-1	21	21	21	Action plan/ctivate Cayucos 70kV Shunt Caps/Paso Robles UVLS. Build Estrella Substation Project
LP-SP-VD-039	VAFB SSA 70 kV	Mesa-Divide 115 kV #1 & #2 Lines	C3	L-1-1	32	32	-	Activate existing Divide SPS until Midway-Andrew Project is in sevice in 2019
LP-SP-VD-040	VAFB SSB 70 kV	Mesa-Divide 115 kV #1 & #2 Lines	C3	L-1-1	32	32	-	Activate existing Divide SPS until Midway-Andrew Project is in sevice in 2019
LP-SP-VD-041	DIVIDE 70 kV	Mesa-Divide 115 kV #1 & #2 Lines	C3	L-1-1	32	32	-	Activate existing Divide SPS until Midway-Andrew Project is in sevice in 2019
LP-SP-VD-042	DIVVIDE 115 kV	Mesa-Divide 115 kV #1 & #2 Lines	C3	L-1-1	30	30	-	Activate existing Divide SPS until Midway-Andrew Project is in sevice in 2019
LP-SP-VD-043	PURISIMA 115 kV	Mesa 230/115 kV #2 & #3 Bank	C3	T-1-1	30	30	-	Activate existing Divide SPS until Midway-Andrew Project is in sevice in 2019

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
LP-SP-VD-044	LMPC-CTY 115 kV	Mesa 230/115 kV #2 & #3 Bank	C3	T-1-1	28	28	-	Activate existing Divide SPS until Midway-Andrew Project is in service in 2019
LP-SP-VD-045	CABRILLO 115 kV	Mesa 230/115 kV #2 & #3 Bank	C3	T-1-1	28	28	-	Activate existing Divide SPS until Midway-Andrew Project is in service in 2019
LP-SP-VD-046	MANVILLE 115 kV	Mesa-Divide 115 kV #1 & #2 Lines	C3	L-1-1	30	30	-	Activate existing Divide SPS until Midway-Andrew Project is in service in 2019
LP-SP-VD-047	SURF 115 kV	Morro Bay-Diablo and Morro Bay-Mesa 230 kV Lines	C3	L-1-1	29	28	-	Activate existing Santa Maria/Mesa SPS until Andrew Project is in service in 2019
LP-SP-VD-048	BUELLTON 115 kV	Morro Bay-Diablo and Morro Bay-Mesa 230 kV Lines	C3	L-1-1	29	21	-	Activate existing Santa Maria/Mesa SPS until Andrew Project is in service in 2019
LP-SP-VD-049	SNTA YNZ 115 kV	Diablo-Mesa and Morro Bay-Mesa 230 kV Lines	C3	L-1-1	28	28	-	Activate existing Santa Maria/Mesa SPS until Andrew Project is in service in 2019

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Summer Off-Peak	2018 Summer Light Load	2023 Summer Off-Peak	
LP-NP-T-001	SN LS OB-SNTA MRA 115 kV #1 Line	CB Fault at Mesa Sub 115 kV CB102	C2	CB Fault (Bus tie)	124	118	<100	Modify Santa Maria/Mesa SPS/UVLS in the interim until Midway-Andrew Project is in service in 2019
LP-NP-T-002	S.YNZ JT-ZACA 115 kV #1 Line	Mesa-Divide 115 kV #1 and 2 Lines	C3	L-1-1	115	<100	<100	Activate existing Divide SPS until Midway-Andrew Project is in service in 2019
LP-NP-T-003	PALMR-ZACA 115 kV #1 Line	Mesa-Divide 115 kV #1 and 2 Lines	C3	L-1-1	103	<100	<100	Activate existing Divide SPS until Midway-Andrew Project is in service in 2019
LP-NP-T-004	SISQUOC-PALMR 115 kV #1 Line	Mesa-Divide 115 kV #1 and 2 Lines	C3	L-1-1	103	<100	<100	Activate existing Divide SPS until Midway-Andrew Project is in service in 2019
LP-NP-T-005	S.YNZ JT-ZACA 115 kV #1 Line	Mesa-Divide 115 kV #1 and 2 Lines	C5 DCTL	L-2	115	<100	<100	Activate existing Divide SPS until Midway-Andrew Project is in service in 2019
LP-NP-T-006	PALMR-ZACA 115 kV #1 Line	Mesa-Divide 115 kV #1 and 2 Lines	C5 DCTL	L-2	102	<100	<100	Activate existing Divide SPS until Midway-Andrew Project is in service in 2019
LP-NP-T-007	SISQUOC-PALMR 115 kV #1 Line	Mesa-Divide 115 kV #1 and 2 Lines	C5 DCTL	L-2	103	<100	<100	Activate existing Divide SPS until Midway-Andrew Project is in service in 2019



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Study Area: **PG&E Los Padres - Summer Off-Peak & Summer Light Load**



**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2015 Summer Off-Peak	2018 Summer Light Load	2023 Summer Off-Peak	
LP-NP-V-001	DIVIDE 70 kV	N/A	A	Normal	1.06	1.07	1.07	Review for possible exemption
LP-NP-V-002	VAFB SSA 70 kV	N/A	A	Normal	-	1.06	1.06	Review for possible exemption
LP-NP-V-003	VAFB SSB 70 kV	N/A	A	Normal	1.06	1.07	1.07	Review for possible exemption
LP-NP-V-004	FOOTHILL 115 kV	CB Fault at Mesa Sub 115 kV CB102	C2	CB FAULT (Bus tie)	0.90	-	-	Modify Santa Maria/Mesa SPS/UVLS in the interim until Midway-Andrew Project is in service in 2019
LP-NP-V-005	GOLDTREE 115 kV	CB Fault at Mesa Sub 115 kV CB102	C2	CB FAULT (Bus tie)	0.90	-	-	Modify Santa Maria/Mesa SPS/UVLS in the interim until Midway-Andrew Project is in service in 2019
LP-NP-V-006	SN LS OB 115 kV	CB Fault at Mesa Sub 115 kV CB102	C2	CB FAULT (Bus tie)	0.88	-	-	Modify Santa Maria/Mesa SPS/UVLS in the interim until Midway-Andrew Project is in service in 2019
LP-NP-V-007	OCEANO 115 kV	CB Fault at Mesa Sub 115 kV CB102	C2	CB FAULT (Bus tie)	0.89	-	-	Modify Santa Maria/Mesa SPS/UVLS in the interim until Midway-Andrew Project is in service in 2019
LP-NP-V-008	UNION OL 115 kV	CB Fault at Mesa Sub 115 kV CB102	C2	CB FAULT (Bus tie)	0.89	-	-	Modify Santa Maria/Mesa SPS/UVLS in the interim until Midway-Andrew Project is in service in 2019
LP-NP-V-009	DIVIDE 70 kV	CB Fault at Mesa Sub 115 kV CB102	C2	CB FAULT (Bus tie)	0.59	0.75	-	Modify Santa Maria/Mesa SPS/UVLS in the interim until Midway-Andrew Project is in service in 2019
LP-NP-V-010	VAFB SSA 70 kV	CB Fault at Mesa Sub 115 kV CB102	C2	CB FAULT (Bus tie)	0.58	0.74	-	Modify Santa Maria/Mesa SPS/UVLS in the interim until Midway-Andrew Project is in service in 2019
LP-NP-V-011	LMPC-CTY 115 kV	CB Fault at Mesa Sub 115 kV CB102	C2	CB FAULT (Bus tie)	0.56	0.71	-	Modify Santa Maria/Mesa SPS/UVLS in the interim until Midway-Andrew Project is in service in 2019

2013/2014 ISO Reliability Assessment - Study Results

Study Area: **PG&E Los Padres - Summer Off-Peak & Summer Light Load**



**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2015 Summer Off-Peak	2018 Summer Light Load	2023 Summer Off-Peak	
LP-NP-V-012	FAIRWAY 115 kV	CB Fault at Mesa Sub 115 kV CB102	C2	CB FAULT (Bus tie)	0.75	0.85	-	Modify Santa Maria/Mesa SPS/UVLS in the interim until Midway-Andrew Project is in service in 2019
LP-NP-V-013	SNTA MRA 115 kV	CB Fault at Mesa Sub 115 kV CB102	C2	CB FAULT (Bus tie)	0.75	0.86	-	Modify Santa Maria/Mesa SPS/UVLS in the interim until Midway-Andrew Project is in service in 2019
LP-NP-V-014	MANVILLE 115 kV	CB Fault at Mesa Sub 115 kV CB102	C2	CB FAULT (Bus tie)	0.56	0.70	-	Modify Santa Maria/Mesa SPS/UVLS in the interim until Midway-Andrew Project is in service in 2019
LP-NP-V-015	PURISIMA 115 kV	CB Fault at Mesa Sub 115 kV CB102	C2	CB FAULT (Bus tie)	0.56	0.71	-	Modify Santa Maria/Mesa SPS/UVLS in the interim until Midway-Andrew Project is in service in 2019
LP-NP-V-016	SURF 115 kV	CB Fault at Mesa Sub 115 kV CB102	C2	CB FAULT (Bus tie)	0.58	0.72	-	Modify Santa Maria/Mesa SPS/UVLS in the interim until Midway-Andrew Project is in service in 2019
LP-NP-V-017	CABRILLO 115 kV	CB Fault at Mesa Sub 115 kV CB102	C2	CB FAULT (Bus tie)	0.59	0.73	-	Modify Santa Maria/Mesa SPS/UVLS in the interim until Midway-Andrew Project is in service in 2019
LP-NP-V-018	SNTA YNZ 115 kV	CB Fault at Mesa Sub 115 kV CB102	C2	CB FAULT (Bus tie)	0.62	0.75	-	Modify Santa Maria/Mesa SPS/UVLS in the interim until Midway-Andrew Project is in service in 2019
LP-NP-V-019	BUELLTON 115 kV	CB Fault at Mesa Sub 115 kV CB102	C2	CB FAULT (Bus tie)	0.62	0.75	-	Modify Santa Maria/Mesa SPS/UVLS in the interim until Midway-Andrew Project is in service in 2019
LP-NP-V-020	ZACA 115 kV	CB Fault at Mesa Sub 115 kV CB102	C2	CB FAULT (Bus tie)	0.64	0.77	-	Modify Santa Maria/Mesa SPS/UVLS in the interim until Midway-Andrew Project is in service in 2019
LP-NP-V-021	PALMR 115 kV	CB Fault at Mesa Sub 115 kV CB102	C2	CB FAULT (Bus tie)	0.70	0.82	-	Modify Santa Maria/Mesa SPS/UVLS in the interim until Midway-Andrew Project is in service in 2019

2013/2014 ISO Reliability Assessment - Study Results

Study Area: **PG&E Los Padres - Summer Off-Peak & Summer Light Load**



**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2015 Summer Off-Peak	2018 Summer Light Load	2023 Summer Off-Peak	
LP-NP-V-022	SISQUOC 115 kV	CB Fault at Mesa Sub 115 kV CB102	C2	CB FAULT (Bus tie)	0.72	0.83	-	Modify Santa Maria/Mesa SPS/UVLS in the interim until Midway-Andrew Project is in service in 2019
LP-NP-V-023	SURF 115 kV	Mesa-Divide 115 kV #1&#2 Lines	C3	L-1-1	0.79	-	-	Activate existing Divide SPS until Midway-Andrew Project is in service in 2019
LP-NP-V-024	ZACA 115 kV	Mesa-Divide 115 kV #1&#2 Lines	C3	L-1-1	0.87	-	-	Activate existing Divide SPS until Midway-Andrew Project is in service in 2019
LP-NP-V-025	DIVIDE 70 kV	Mesa-Divide 115 kV #1&#2 Lines	C3	L-1-1	0.80	-	-	Activate existing Divide SPS until Midway-Andrew Project is in service in 2019
LP-NP-V-026	BUELLTON 115 kV	Mesa-Divide 115 kV #1&#2 Lines	C3	L-1-1	0.84	-	-	Activate existing Divide SPS until Midway-Andrew Project is in service in 2019
LP-NP-V-027	CABRILLO 115 kV	Mesa-Divide 115 kV #1&#2 Lines	C3	L-1-1	0.80	-	-	Activate existing Divide SPS until Midway-Andrew Project is in service in 2019
LP-NP-V-028	LMPC-CTY 115 kV	Mesa-Divide 115 kV #1&#2 Lines	C3	L-1-1	0.75	0.89	-	Activate existing Divide SPS until Midway-Andrew Project is in service in 2019
LP-NP-V-029	MANVILLE 115 kV	Mesa-Divide 115 kV #1&#2 Lines	C3	L-1-1	0.75	0.89	-	Activate existing Divide SPS until Midway-Andrew Project is in service in 2019
LP-NP-V-030	PURISIMA 115 kV	Mesa-Divide 115 kV #1&#2 Lines	C3	L-1-1	0.75	0.89	-	Activate existing Divide SPS until Midway-Andrew Project is in service in 2019
LP-NP-V-031	SNTA YNZ 115 kV	Mesa-Divide 115 kV #1&#2 Lines	C3	L-1-1	0.84	-	-	Activate existing Divide SPS. 2019 Midway-Andrew Project also helps
LP-NP-V-032	VAFB SSA 70 kV	Mesa-Divide 115 kV #1&#2 Lines	C3	L-1-1	0.79	-	-	Activate existing Divide SPS. 2019 Midway-Andrew Project also helps

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2015 Summer Off-Peak	2018 Summer Light Load	2023 Summer Off-Peak	
LP-NP-V-033	SURF 115 kV	Mesa-Divide 115 kV #1&#2 Lines	C5 DCTL	L-2	0.79	-	-	Activate existing Divide SPS. 2019 Midway-Andrew Project also helps
LP-NP-V-034	ZACA 115 kV	Mesa-Divide 115 kV #1&#2 Lines	C5 DCTL	L-2	0.87	-	-	Activate existing Divide SPS. 2019 Midway-Andrew Project also helps
LP-NP-V-035	DIVIDE 70 kV	Mesa-Divide 115 kV #1&#2 Lines	C5 DCTL	L-2	0.80	-	-	Activate existing Divide SPS. 2019 Midway-Andrew Project also helps
LP-NP-V-036	BUELLTON 115 kV	Mesa-Divide 115 kV #1&#2 Lines	C5 DCTL	L-2	0.84	-	-	Activate existing Divide SPS. 2019 Midway-Andrew Project also helps
LP-NP-V-037	CABRILLO 115 kV	Mesa-Divide 115 kV #1&#2 Lines	C5 DCTL	L-2	0.80	-	-	Activate existing Divide SPS. 2019 Midway-Andrew Project also helps
LP-NP-V-038	LMPC-CTY 115 kV	Mesa-Divide 115 kV #1&#2 Lines	C5 DCTL	L-2	0.75	0.89	-	Activate existing Divide SPS until Midway-Andrew Project is in service in 2019

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2015 Summer Off-Peak	2018 Summer Light Load	2023 Summer Off-Peak	
LP-NP-VD-001	FOOTHILL 115 kV	CB Fault at Mesa Sub 115 kV CB102	C2	CB FAULT (Bus tie)	12	-	-	Modify Santa Maria/Mesa SPS/UVLS in the interim until Midway-Andrew Project is in service in 2019
LP-NP-VD-002	GOLDTREE 115 kV	CB Fault at Mesa Sub 115 kV CB102	C2	CB FAULT (Bus tie)	11	-	-	Modify Santa Maria/Mesa SPS/UVLS in the interim until Midway-Andrew Project is in service in 2019
LP-NP-VD-003	OCEANO	CB Fault at Mesa Sub 115 kV CB102	C2	CB FAULT (Bus tie)	12	-	-	Modify Santa Maria/Mesa SPS/UVLS in the interim until Midway-Andrew Project is in service in 2019
LP-NP-VD-004	UNION OL 115 kV	CB Fault at Mesa Sub 115 kV CB102	C2	CB FAULT (Bus tie)	12	-	-	Modify Santa Maria/Mesa SPS/UVLS in the interim until Midway-Andrew Project is in service in 2019
LP-NP-VD-005	DIVIDE 70 kV	CB Fault at Mesa Sub 115 kV CB102	C2	CB FAULT (Bus tie)	46	33	-	Modify Santa Maria/Mesa SPS/UVLS in the interim until Midway-Andrew Project is in service in 2019
LP-NP-VD-006	DIVVIDE 115 kV	CB Fault at Mesa Sub 115 kV CB102	C2	CB FAULT (Bus tie)	44	31	-	Modify Santa Maria/Mesa SPS/UVLS in the interim until Midway-Andrew Project is in service in 2019
LP-NP-VD-007	VAFB SSA 70 kV	CB Fault at Mesa Sub 115 kV CB102	C2	CB FAULT (Bus tie)	46	33	-	Modify Santa Maria/Mesa SPS/UVLS in the interim until Midway-Andrew Project is in service in 2019
LP-NP-VD-008	VAFB SSB 70 kV	CB Fault at Mesa Sub 115 kV CB102	C2	CB FAULT (Bus tie)	46	33	-	Modify Santa Maria/Mesa SPS/UVLS in the interim until Midway-Andrew Project is in service in 2019
LP-NP-VD-009	LMPC-CTY 115 kV	CB Fault at Mesa Sub 115 kV CB102	C2	CB FAULT (Bus tie)	44	31	-	Modify Santa Maria/Mesa SPS/UVLS in the interim until Midway-Andrew Project is in service in 2019
LP-NP-VD-010	FAIRWAY 115 kV	CB Fault at Mesa Sub 115 kV CB102	C2	CB FAULT (Bus tie)	27	17	-	Modify Santa Maria/Mesa SPS/UVLS in the interim until Midway-Andrew Project is in service in 2019

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2015 Summer Off-Peak	2018 Summer Light Load	2023 Summer Off-Peak	
LP-NP-VD-011	SNTA MRA	CB Fault at Mesa Sub 115 kV CB102	C2	CB FAULT (Bus tie)	26	17	-	Modify Santa Maria/Mesa SPS/UVLS in the interim until Midway-Andrew Project is in service in 2019
LP-NP-VD-012	S.M.ASSO	CB Fault at Mesa Sub 115 kV CB102	C2	CB FAULT (Bus tie)	30	20	-	Modify Santa Maria/Mesa SPS/UVLS in the interim until Midway-Andrew Project is in service in 2019
LP-NP-VD-013	MANVILLE 115 kV	CB Fault at Mesa Sub 115 kV CB102	C2	CB FAULT (Bus tie)	44	31	-	Modify Santa Maria/Mesa SPS/UVLS in the interim until Midway-Andrew Project is in service in 2019
LP-NP-VD-014	PURISIMA 115 kV	CB Fault at Mesa Sub 115 kV CB102	C2	CB FAULT (Bus tie)	44	31	-	Modify Santa Maria/Mesa SPS/UVLS in the interim until Midway-Andrew Project is in service in 2019
LP-NP-VD-015	SURF 115 kV	CB Fault at Mesa Sub 115 kV CB102	C2	CB FAULT (Bus tie)	41	29	-	Modify Santa Maria/Mesa SPS/UVLS in the interim until Midway-Andrew Project is in service in 2019
LP-NP-VD-016	CABRILLO 115 kV	CB Fault at Mesa Sub 115 kV CB102	C2	CB FAULT (Bus tie)	41	29	-	Modify Santa Maria/Mesa SPS/UVLS in the interim until Midway-Andrew Project is in service in 2019
LP-NP-VD-017	SNTA YNZ 115 kV	CB Fault at Mesa Sub 115 kV CB102	C2	CB FAULT (Bus tie)	38	27	-	Modify Santa Maria/Mesa SPS/UVLS in the interim until Midway-Andrew Project is in service in 2019
LP-NP-VD-018	BUELLTON 115 kV	CB Fault at Mesa Sub 115 kV CB102	C2	CB FAULT (Bus tie)	38	27	-	Modify Santa Maria/Mesa SPS/UVLS in the interim until Midway-Andrew Project is in service in 2019
LP-NP-VD-019	ZACA 115 kV	CB Fault at Mesa Sub 115 kV CB102	C2	CB FAULT (Bus tie)	36	25	-	Modify Santa Maria/Mesa SPS/UVLS in the interim until Midway-Andrew Project is in service in 2019
LP-NP-VD-020	PALMR 115 kV	CB Fault at Mesa Sub 115 kV CB102	C2	CB FAULT (Bus tie)	31	21	-	Modify Santa Maria/Mesa SPS/UVLS in the interim until Midway-Andrew Project is in service in 2019

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2015 Summer Off-Peak	2018 Summer Light Load	2023 Summer Off-Peak	
LP-NP-VD-021	SISQUOC 115 kV	CB Fault at Mesa Sub 115 kV CB102	C2	CB FAULT (Bus tie)	30	19	-	Modify Santa Maria/Mesa SPS/UVLS in the interim until Midway-Andrew Project is in service in 2019
LP-NP-VD-022	GAREY 115 kV	CB Fault at Mesa Sub 115 kV CB102	C2	CB FAULT (Bus tie)	30	19	-	Modify Santa Maria/Mesa SPS/UVLS in the interim until Midway-Andrew Project is in service in 2019
LP-NP-VD-023	VAFB SSA 70 kV	Mesa-Divide 115 kV #1&#2 Lines	C3	L-1-1	24	13	-	Activate existing Divide SPS until Midway-Andrew Project is in service in 2019
LP-NP-VD-024	DIVIDE 70 kV	Mesa-Divide 115 kV #1&#2 Lines	C3	L-1-1	24	13	-	Activate existing Divide SPS until Midway-Andrew Project is in service in 2019
LP-NP-VD-025	PURISIMA 115 kV	Mesa-Divide 115 kV #1&#2 Lines	C3	L-1-1	23	12	-	Activate existing Divide SPS until Midway-Andrew Project is in service in 2019
LP-NP-VD-026	SURF 115 kV	Mesa-Divide 115 kV #1&#2 Lines	C3	L-1-1	20	11	-	Activate existing Divide SPS until Midway-Andrew Project is in service in 2019
LP-NP-VD-027	LMPC-CTY 115 kV	Mesa-Divide 115 kV #1&#2 Lines	C3	L-1-1	23	12	-	Activate existing Divide SPS until Midway-Andrew Project is in service in 2019
LP-NP-VD-028	CABRILLO 115 kV	Mesa-Divide 115 kV #1&#2 Lines	C3	L-1-1	19	10	-	Activate existing Divide SPS until Midway-Andrew Project is in service in 2019
LP-NP-VD-029	MANVILLE 115 kV	Mesa-Divide 115 kV #1&#2 Lines	C3	L-1-1	23	12	-	Activate existing Divide SPS until Midway-Andrew Project is in service in 2019
LP-NP-VD-030	BUELLTON 115 kV	Mesa-Divide 115 kV #1&#2 Lines	C3	L-1-1	15	-	-	Activate existing Divide SPS. 2019 Midway-Andrew Project also helps
LP-NP-VD-031	SNTA YNZ 115 kV	Mesa-Divide 115 kV #1&#2 Lines	C3	L-1-1	15	-	-	Activate existing Divide SPS. 2019 Midway-Andrew Project also helps
LP-NP-VD-032	ZACA 115 kV	Mesa-Divide 115 kV #1&#2 Lines	C3	L-1-1	13	-	-	Activate existing Divide SPS. 2019 Midway-Andrew Project also helps
LP-NP-VD-033	VAFB SSA 70 kV	Mesa-Divide 115 kV #1&#2 Lines	C5 DCTL	L-2	26	14	-	Activate existing Divide SPS until Midway-Andrew Project is in service in 2019
LP-NP-VD-034	VAFB SSB 70 kV	Mesa-Divide 115 kV #1&#2 Lines	C5 DCTL	L-2	26	14	-	Activate existing Divide SPS until Midway-Andrew Project is in service in 2019

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2015 Summer Off-Peak	2018 Summer Light Load	2023 Summer Off-Peak	
LP-NP-VD-035	DIVIDE 70 kV	Mesa-Divide 115 kV #1&#2 Lines	C5 DCTL	L-2	26	14	-	Activate existing Divide SPS until Midway-Andrew Project is in service in 2019
LP-NP-VD-036	PURISIMA 115 kV	Mesa-Divide 115 kV #1&#2 Lines	C5 DCTL	L-2	24	13	-	Activate existing Divide SPS until Midway-Andrew Project is in service in 2019
LP-NP-VD-037	SURF 115 kV	Mesa-Divide 115 kV #1&#2 Lines	C5 DCTL	L-2	21	11	-	Activate existing Divide SPS until Midway-Andrew Project is in service in 2019
LP-NP-VD-038	LMPC-CTY 115 kV	Mesa-Divide 115 kV #1&#2 Lines	C5 DCTL	L-2	24	13	-	Activate existing Divide SPS until Midway-Andrew Project is in service in 2019
LP-NP-VD-039	CABRILLO 115 kV	Mesa-Divide 115 kV #1&#2 Lines	C5 DCTL	L-2	20	11	-	Activate existing Divide SPS until Midway-Andrew Project is in service in 2019
LP-NP-VD-040	MANVILLE 115 kV	Mesa-Divide 115 kV #1&#2 Lines	C5 DCTL	L-2	24	13	-	Activate existing Divide SPS until Midway-Andrew Project is in service in 2019
LP-NP-VD-041	BUELLTON 115 kV	Mesa-Divide 115 kV #1&#2 Lines	C5 DCTL	L-2	16	-	-	Activate existing Divide SPS. 2019 Midway-Andrew Project also helps
LP-NP-VD-042	SNTA YNZ 115 kV	Mesa-Divide 115 kV #1&#2 Lines	C5 DCTL	L-2	16	-	-	Activate existing Divide SPS. 2019 Midway-Andrew Project also helps
LP-NP-VD-043	ZACA 115 kV	Mesa-Divide 115 kV #1&#2 Lines	C5 DCTL	L-2	14	-	-	Activate existing Divide SPS. 2019 Midway-Andrew Project also helps



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Study Area: **PG&E Los Padres - Summer Peak**



**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.

2013/2014 ISO Reliability Assessment - Study Results

Study Area: **PG&E Los Padres - Winter Peak**



**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.



**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.

2013/2014 ISO Reliability Assessment - Study Results

Study Area: **PG&E Los Padres - Summer Peak**



**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

2013/2014 ISO Reliability Assessment - Study Results

Study Area: **PG&E Los Padres - Winter Peak**



**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

2013/2014 ISO Reliability Assessment - Study Results

Study Area: **PG&E Los Padres - Summer Off-Peak & Summer Light Load**



**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-19**

**SCE Tehachapi and Big Creek Corridor**

**Reliability Assessment Study Results**



**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	

No thermal overload concerns were identified.

San Onofre Nuclear Generation Station was retired on June 7, 2013 and therefore was removed from the base cases used for the 2013/14 ISO transmission planning process.



**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Summer Off-Peak	2018 Summer Light Load	N/A	

No thermal overload concerns were identified.



**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	

No voltage deviation concerns were identified.

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2015 Summer Off-Peak	2018 Summer Light Load	N/A	

No voltage deviation concerns were identified.



**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	

No high/low voltage concerns were identified.



**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2015 Summer Off-Peak	2018 Summer Light Load	N/A	

No high/low voltage concerns were identified.



**Transient Stability**

ID	Contingency	Category	Category Description	Transient Stability Performance			Potential Mitigation Solutions
				2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	

No transient stability concerns were identified.

2013/2014 ISO Reliability Assessment - Study Results

Study Area: **SCE Tehachapi & Big Creek Corridor - Summer Off-Peak & Summer Light Load**



**Transient Stability**

ID	Contingency	Category	Category Description	Transient Stability Performance			Potential Mitigation Solutions
				2015 Summer Off-Peak	2018 Summer Light Load	N/A	

No transient stability concerns were identified.



**Single Contingency Load Drop**

ID	Worst Contingency	Category	Category Description	Amount of Load Drop (MW)			Potential Mitigation Solutions
				2015 Summer Peak	2018 Summer Peak	2023 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
				2015 Summer Off-Peak	2018 Summer Light Load	N/A	

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

2013/2014 ISO Reliability Assessment - Study Results

Study Area: **SCE Tehachapi & Big Creek Corridor - Summer Peak**



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

ID	Substation	Load Served (MW)			Potential Mitigation Solutions
		2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	

No single source substation with more than 100 MW Load.

2013/2014 ISO Reliability Assessment - Study Results

Study Area: **SCE Tehachapi & Big Creek Corridor - Summer Off-Peak & Summer Light Load**



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

ID	Substation	Load Served (MW)			Potential Mitigation Solutions
		2015 Summer Off-Peak	2018 Summer Light Load	N/A	

No single source substation with more than 100 MW Load.

**APPENDIX C-20**  
**SCE Antelope-Bailey**  
**Reliability Assessment Study Results**



**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	

No thermal overload concerns were identified.

San Onofre Nuclear Generation Station was retired on June 7, 2013 and therefore was removed from the base cases used for the 2013/14 ISO transmission planning process.



**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Summer Off-Peak	2018 Summer Light Load	N/A	

No thermal overload concerns were identified.

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	

No voltage deviation concerns were identified.



**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2015 Summer Off-Peak	2018 Summer Light Load	N/A	

No voltage deviation concerns were identified.



**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	

No high/low voltage concerns were identified.

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2015 Summer Off-Peak	2018 Summer Light Load	N/A	

No high/low voltage concerns were identified.



**Transient Stability**

ID	Contingency	Category	Category Description	Transient Stability Performance			Potential Mitigation Solutions
				2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	

No transient stability concerns were identified.



**Transient Stability**

ID	Contingency	Category	Category Description	Transient Stability Performance			Potential Mitigation Solutions
				2015 Summer Off-Peak	2018 Summer Light Load	N/A	

No transient stability concerns were identified.



**Single Contingency Load Drop**

ID	Worst Contingency	Category	Category Description	Amount of Load Drop (MW)			Potential Mitigation Solutions
				2015 Summer Peak	2018 Summer Peak	2023 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
				2015 Summer Off-Peak	2018 Summer Light Load	N/A	

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

2013/2014 ISO Reliability Assessment - Study Results

Study Area: **SCE Antelope-Bailey - Summer Peak**



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

ID	Substation	Load Served (MW)			Potential Mitigation Solutions
		2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	

No single source substation with more than 100 MW Load.

2013/2014 ISO Reliability Assessment - Study Results

Study Area: **SCE Antelope-Bailey - Summer Off-Peak & Summer Light Load**



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

ID	Substation	Load Served (MW)			Potential Mitigation Solutions
		2015 Summer Off-Peak	2018 Summer Light Load	N/A	

No single source substation with more than 100 MW Load.



**APPENDIX C-21**  
**SCE North of Lugo**  
**Reliability Assessment Study Results**

2013/2014 ISO Reliability Assessment - Study Results

Study Area: **SCE North of Lugo - Summer Peak**



**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
NOL-SP-T-1	24602 VICTOR 115 - 24702 KRAMER 115 - Ckt 1	Line ROADWAY 115.0 to KRAMER _Line KRAMER 230.0 to LUGO #1	C	N-1-1	120%	82%	100%	Curtail gen after the first contingency
NOL-SP-T-2	24602 VICTOR 115 - 24702 KRAMER 115 - Ckt 1	Line ROADWAY 115.0 to KRAMER _Line KRAMER 230.0 to LUGO #2	C	N-1-1	120%	82%	100%	Curtail gen after the first contingency
NOL-SP-T-3	24602 VICTOR 115 - 24702 KRAMER 115 - Ckt 1	Line KRAMER 230.0 to LUGO #1 _Line COLWATER 230.0 to JASPER	C	N-1-1	NA	86%	104%	Curtail gen after the first contingency
NOL-SP-T-4	24602 VICTOR 115 - 24702 KRAMER 115 - Ckt 1	Line KRAMER 230.0 to LUGO #2 _Line COLWATER 230.0 to JASPER	C	N-1-1	NA	86%	104%	Curtail gen after the first contingency
NOL-SP-T-5	24607 ROADWAY 115 - 24702 KRAMER 115 - Ckt 1	Line VICTOR 115.0 to KRAMER _Line KRAMER 230.0 to LUGO #1	C	N-1-1	122%	84%	102%	Curtail gen after the first contingency
NOL-SP-T-6	24607 ROADWAY 115 - 24702 KRAMER 115 - Ckt 1	Line VICTOR 115.0 to KRAMER _Line KRAMER 230.0 to LUGO #2	C	N-1-1	122%	84%	102%	Curtail gen after the first contingency
NOL-SP-T-7	24607 ROADWAY 115 - 24702 KRAMER 115 - Ckt 1	Line KRAMER 230.0 to LUGO _Line COLWATER 230.0 to JASPER	C	N-1-1	NA	89%	108%	Curtail gen after the first contingency
NOL-SP-T-8	24607 ROADWAY 115 - 24702 KRAMER 115 - Ckt 1	Line KRAMER 230.0 to LUGO #1 _Line COLWATER 230.0 to JASPER	C	N-1-1	NA	89%	108%	Curtail gen after the first contingency
NOL-SP-T-9	24701 KRAMER 230 - 24085 LUGO 230 - Ckt 1	Line KRAMER 230.0 to LUGO #2 _Line COLWATER 230.0 to JASPER	C	N-1-1	NA	94%	108%	Curtail gen after the first contingency
NOL-SP-T-10	24701 KRAMER 230 - 24085 LUGO 230 - Ckt 2	Line KRAMER 230.0 to LUGO _Line COLWATER 230.0 to JASPER	C	N-1-1	NA	94%	108%	Curtail gen after the first contingency

San Onofre Nuclear Generation Station was retired on June 7, 2013 and therefore was removed from the base cases used for the 2013/14 ISO transmission planning process.

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Summer Off-Peak	2018 Summer Light Load	N/A	
X-NP-T-1	24731 INYOKERN 115 - 24702 KRAMER 115 - Ckt 1	line KRAMER-INYOKERN-RANDSB 115 ck 1	B	N-1	102%	14%	N/A	Re-adjust generation pre-contingency (Congestion management ) OR Modify Kramer N-1 RAS to protect for both Kramer-Inyoker-Randsberg conitngencies

Voltage Deviations

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
NOL-SP-VD-1	24731 INYOKERN 115 kV	Line INYOKERN 115.0 to KRAMER 115.0 ck 1	B	N-1	-4%	-4%	-5%	Modify the RAS to trip Bishop Hydro or Control area gen. (Including the new RPS gen) OR an exception
NOL-SP-VD-2	24768 RANDBRG 115 kV	Line INYOKERN 115.0 to KRAMER 115.0 ck 1	B	N-1	-5%	-5%	-6%	Modify the RAS to trip Bishop Hydro or Control area gen. (Including the new RPS gen) OR an exception
NOL-SP-VD-3	24731 INYOKERN 115 kV	Line CONTROL 115.0 to INYO _Line INYOKERN 115.0 to KRAMER	C	N-1-1	-6%	-5%	-16%	Curtail Control area gen after the first conitngency. (including the new RPS generation in the area) OR Modify Kramer RAS to drop generation in Control area
NOL-SP-VD-4	24768 RANDBRG 115 kV	Line CONTROL 115.0 to INYO _Line INYOKERN 115.0 to KRAMER	C	N-1-1	-6%	-5%	-13%	Curtail Control area gen after the first conitngency. (including the new RPS generation in the area) OR Modify Kramer RAS to drop generation in Control area
NOL-SP-VD-5	24790 COSO 115 kV	Line CONTROL 115.0 to INYO _Line INYOKERN 115.0 to KRAMER	C	N-1-1	-5%	-4%	-16%	Curtail Control area gen after the first conitngency. (including the new RPS generation in the area) OR Modify Kramer RAS to drop generation in Control area
NOL-SP-VD-6	24792 DOWNS 115 kV	Line CONTROL 115.0 to INYO _Line INYOKERN 115.0 to KRAMER	C	N-1-1	-5%	-5%	-14%	Curtail Control area gen after the first conitngency. (including the new RPS generation in the area) OR Modify Kramer RAS to drop generation in Control area
NOL-SP-VD-7	24731 INYOKERN 115 kV	Line INYOKERN 115.0 to KRAMER _line DOWNS-SEARLES-MCGEN 115 ck 1	C	N-1-1	-8%	-9%	-12%	Curtail Control area gen after the first conitngency. (including the new RPS generation in the area) OR Modify Kramer RAS to drop generation in Control area
NOL-SP-VD-8	24792 DOWNS 115 kV	Line INYOKERN 115.0 to KRAMER _line DOWNS-SEARLES-MCGEN 115 ck 1	C	N-1-1	-11%	-11%	-15%	Curtail Control area gen after the first conitngency. (including the new RPS generation in the area) OR Modify Kramer RAS to drop generation in Control area

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2015 Summer Off-Peak	2018 Summer Light Load	N/A	
NOL-NP-VD-1	24728 INYO 115 kV	Line CONTROL 115.0 to INYO ck 1	B	N-1	2%	6%		Dynamic reactive support OR an exception
NOL-NP-VD-2	24731 INYOKERN 115 kV	Line INYOKERN 115.0 to KRAMER 115.0 ck 1	B	N-1	-5%	-2%		Modify Kramer RAS to drop generation in Control area or an exception
NOL-NP-VD-3	24768 RANDBRG 115 kV	Line INYOKERN 115.0 to KRAMER 115.0 ck 1	B	N-1	-6%	-1%		Modify Kramer RAS to drop generation in Control area or an exception
NOL-NP-VD-4	24792 DOWNS 115 kV	Line INYOKERN 115.0 to KRAMER 115.0 ck 1	B	N-1	-5%	-2%		Modify Kramer RAS to drop generation in Control area or an exception
NOL-NP-VD-5	24731 INYOKERN 115 kV	Line CONTROL 115.0 to INYO _Line INYOKERN 115.0 to KRAMER	C	N-1-1	-12%	0%		Curtail Control area gen after the first conitngency. (including the new RPS generation in the area) OR Modify Kramer RAS to drop generation in Control area
NOL-NP-VD-6	24768 RANDBRG 115 kV	Line CONTROL 115.0 to INYO _Line INYOKERN 115.0 to KRAMER	C	N-1-1	-12%	0%		Curtail Control area gen after the first conitngency. (including the new RPS generation in the area) OR Modify Kramer RAS to drop generation in Control area
NOL-NP-VD-7	24723 CONTROL 115 kV	Line CONTROL 115.0 to INYOKERN _Tran INYO 115.00 to INYO PS	C	N-1-1	-3%	-10%		Adjust shunt reactors and other reactive devices in the area after the first contingency and curtail generation North of Control OR under light load condition, instead of tripping BS Hydro, bring one unit online after the first contingency OR add reactive support
NOL-NP-VD-8	24724 OXBOW B 115 kV	Line CONTROL 115.0 to INYOKERN _Tran INYO 115.00 to INYO PS	C	N-1-1	-3%	-10%		Adjust shunt reactors and other reactive devices in the area after the first contingency and curtail generation North of Control OR under light load condition, instead of tripping BS Hydro, bring one unit online after the first contingency OR add reactive support

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2015 Summer Off-Peak	2018 Summer Light Load	N/A	
NOL-NP-VD-9	24731 INYOKERN 115 kV	Line INYOKERN 115.0 to KRAMER _line DOWNS-SEARLES-MCGEN 115 ck 1	C	N-1-1	-10%	-3%		Existing Kramer N-1 RAS drops McGen and/or CalGen and makes this problem worse. Modify Kramer RAS to drop generation in Control area or Curtail Control area gen after the first conitngency. (including the new RPS generation in the area)
NOL-NP-VD-10	24792 DOWNS 115 kV	Line INYOKERN 115.0 to KRAMER _line DOWNS-SEARLES-MCGEN 115 ck 1	C	N-1-1	-12%	-3%		Existing Kramer N-1 RAS drops McGen and/or CalGen and makes this problem worse. Modify Kramer RAS to drop generation in Control area or Curtail Control area gen after the first conitngency. (including the new RPS generation in the area)
NOL-NP-VD-11	24702 KRAMER 115 kV	Tran KRAMER 230.00 to KRAMER _Tran KRAMER 230.00 to KRAMER	C	N-1-1	-2%	-13%		Reactive device adjustments (switch in caps at Kramer and Tortilla after the first contingency) OR make sure that QFs in this area are online during light-load condition
NOL-NP-VD-12	24716 COLWATER 115 kV	Tran KRAMER 230.00 to KRAMER _Tran KRAMER 230.00 to KRAMER	C	N-1-1	-1%	-11%		Reactive device adjustments (switch in caps at Kramer and Tortilla after the first contingency) OR make sure that QFs in this area are online during light-load condition
NOL-NP-VD-13	24727 HOLGATE 115 kV	Tran KRAMER 230.00 to KRAMER _Tran KRAMER 230.00 to KRAMER	C	N-1-1	-1%	-13%		Reactive device adjustments (switch in caps at Kramer and Tortilla after the first contingency) OR make sure that QFs in this area are online during light-load condition
NOL-NP-VD-14	24731 INYOKERN 115 kV	Tran KRAMER 230.00 to KRAMER _Tran KRAMER 230.00 to KRAMER	C	N-1-1	-1%	-12%		Reactive device adjustments (switch in caps at Kramer and Tortilla after the first contingency) OR make sure that QFs in this area are online during light-load condition

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2015 Summer Off-Peak	2018 Summer Light Load	N/A	
NOL-NP-VD-15	24749 SEARLES 115 kV	Tran KRAMER 230.00 to KRAMER _Tran KRAMER 230.00 to KRAMER	C	N-1-1	0%	-12%		Reactive device adjustments (switch in caps at Kramer and Tortilla after the first contingency) OR make sure that QFs in this area are online during light-load condition
NOL-NP-VD-16	24759 TORTILLA 115 kV	Tran KRAMER 230.00 to KRAMER _Tran KRAMER 230.00 to KRAMER	C	N-1-1	-1%	-11%		Reactive device adjustments (switch in caps at Kramer and Tortilla after the first contingency) OR make sure that QFs in this area are online during light-load condition
NOL-NP-VD-17	24767 ROCKET 115 kV	Tran KRAMER 230.00 to KRAMER _Tran KRAMER 230.00 to KRAMER	C	N-1-1	-2%	-13%		Reactive device adjustments (switch in caps at Kramer and Tortilla after the first contingency) OR make sure that QFs in this area are online during light-load condition
NOL-NP-VD-18	24768 RANDBERG 115 kV	Tran KRAMER 230.00 to KRAMER _Tran KRAMER 230.00 to KRAMER	C	N-1-1	-1%	-12%		Reactive device adjustments (switch in caps at Kramer and Tortilla after the first contingency) OR make sure that QFs in this area are online during light-load condition
NOL-NP-VD-19	24769 EDWARDS 115 kV	Tran KRAMER 230.00 to KRAMER _Tran KRAMER 230.00 to KRAMER	C	N-1-1	-1%	-14%		Reactive device adjustments (switch in caps at Kramer and Tortilla after the first contingency) OR make sure that QFs in this area are online during light-load condition
NOL-NP-VD-20	24770 SOUTHBAS 115 kV	Tran KRAMER 230.00 to KRAMER _Tran KRAMER 230.00 to KRAMER	C	N-1-1	-1%	-14%		Reactive device adjustments (switch in caps at Kramer and Tortilla after the first contingency) OR make sure that QFs in this area are online during light-load condition
NOL-NP-VD-21	24771 GALE 115 kV	Tran KRAMER 230.00 to KRAMER _Tran KRAMER 230.00 to KRAMER	C	N-1-1	-1%	-10%		Reactive device adjustments (switch in caps at Kramer and Tortilla after the first contingency) OR make sure that QFs in this area are online during light-load condition

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2015 Summer Off-Peak	2018 Summer Light Load	N/A	
NOL-NP-VD-22	24773 TIEFORT 115 kV	Tran KRAMER 230.00 to KRAMER _Tran KRAMER 230.00 to KRAMER	C	N-1-1	-1%	-11%		Reactive device adjustments (switch in caps at Kramer and Tortilla after the first contingency) OR make sure that QFs in this area are online during light-load condition
NOL-NP-VD-23	24792 DOWNS 115 kV	Tran KRAMER 230.00 to KRAMER _Tran KRAMER 230.00 to KRAMER	C	N-1-1	-1%	-12%		Reactive device adjustments (switch in caps at Kramer and Tortilla after the first contingency) OR make sure that QFs in this area are online during light-load condition



2013/2014 ISO Reliability Assessment - Study Results

Study Area: **SCE North of Lugo - Summer Peak**



**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
NOL-SP-VD-1	24043 ELDORDO 115 kV	Base system (n-0)	A	N-0	0.93	0.92	0.92	Tap adjustment on Eldorado 230/115kV transformer
NOL-SP-VD-2	24646 ELDORDO2 230 kV	Base system (n-0)	A	N-0	1.06	1.02	1.01	Tap adjustment on Eldorado 500/230kV and Ivanpah 230/115kV transformers
NOL-SP-VD-3	24647 IVANPAH 230 kV	Base system (n-0)	A	N-0	1.06	1.03	1.02	Tap adjustment on Eldorado 500/230kV and Ivanpah 230/115kV transformers
NOL-SP-VD-4	24774 DUNNSIDE 115 kV	Base system (n-0)	A	N-0	1.03	1.02	1.05	Tap adjustment on Eldorado 500/230kV and Ivanpah 230/115kV transformers
NOL-SP-VD-5	24790 COSO 115 kV	Base system (n-0)	A	N-0	0.98	0.97	0.93	Boost voltage setpoints of generators connected to Inyokern
NOL-SP-VD-6	94414 RPSC0015 115 kV	Base system (n-0)	A	N-0	NA	NA	1.06	RPS gen to provide +/- 0.95 PF
NOL-SP-VD-7	94157 RPSC0016 115 kV	Base system (n-0)	A	N-0	NA	NA	1.07	RPS gen to provide +/- 0.95 PF
NOL-SP-VD-8	24790 COSO 115 kV	Line CONTROL 115.0 to INYO 115.0 ck 1	B	N-1	0.98	0.97	0.89	Boost voltage setpoints of generators connected to Inyokern
NOL-SP-VD-9	24731 INYOKERN 115 kV	Line INYOKERN 115.0 to KRAMER _line DOWNS-SEARLES-MCGEN 115 ck 1	C	N-1-1	0.90	0.89	0.84	Modify the existing operating procedure to maintain McGen dispatch pre-contingency and/or add reactive support. Existing Kramer N-1 RAS drops McGen and/or CalGen and makes this problem worse. Review the RAS for long-term study horizon.

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
NOL-SP-VD-10	24768 RANDSBRG 115 kV	Line INYOKERN 115.0 to KRAMER _line DOWNS-SEARLES-MCGEN 115 ck 1	C	N-1-1	0.92	0.92	0.89	Modify the existing operating procedure to maintain McGen dispatch pre-contingency and/or add reactive support. Existing Kramer N-1 RAS drops McGen and/or CalGen and makes this problem worse. Review the RAS for long-term study horizon.
NOL-SP-VD-11	24792 DOWNS 115 kV	Line INYOKERN 115.0 to KRAMER _line DOWNS-SEARLES-MCGEN 115 ck 1	C	N-1-1	0.88	0.87	0.82	Modify the existing operating procedure to maintain McGen dispatch pre-contingency and/or add reactive support. Existing Kramer N-1 RAS drops McGen and/or CalGen and makes this problem worse. Review the RAS for long-term study horizon.
NOL-SP-VD-12	24768 RANDSBRG 115 kV	Line INYOKERN 115.0 to KRAMER _line INYOKERN-SEARLES-MCGEN 115 ck 1	C	N-1-1	0.93	0.92	0.90	Modify the existing operating procedure to maintain McGen dispatch pre-contingency and/or add reactive support. Existing Kramer N-1 RAS drops McGen and/or CalGen and makes this problem worse. Review the RAS for long-term study horizon.
NOL-SP-VD-13	24792 DOWNS 115 kV	Line INYOKERN 115.0 to KRAMER _line INYOKERN-SEARLES-MCGEN 115 ck 1	C	N-1-1	0.92	0.92	0.88	Modify the existing operating procedure to maintain McGen dispatch pre-contingency and/or add reactive support. Existing Kramer N-1 RAS drops McGen and/or CalGen and makes this problem worse. Review the RAS for long-term study horizon.

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
NOL-SP-VD-14	24792 DOWNS 115 kV	Line INYOKERN 115.0 to KRAMER _Tran INYO 115.00 to INYO PS	C	N-1-1	0.93	0.93	0.85	Modify the existing operating procedure to maintain McGen dispatch pre-contingency and/or add reactive support. Existing Kramer N-1 RAS drops McGen and/or CalGen and makes this problem worse. Review the RAS for long-term study horizon.
NOL-SP-VD-15	24792 DOWNS 115 kV	Line CONTROL 115.0 to INYO _line DOWNS-SEARLES-MCGEN 115 ck 1	C	N-1-1	0.94	0.94	0.89	Modify the existing operating procedure to maintain McGen dispatch pre-contingency and/or add reactive support.
NOL-SP-VD-16	24792 DOWNS 115 kV	line DOWNS-SEARLES-MCGEN 115 ck 1 _line CAL GEN to INYOKERN 115 ck 1	C	N-1-1	0.93	0.92	0.90	Modify the existing operating procedure to maintain McGen dispatch pre-contingency and/or add reactive support.
NOL-SP-VD-17	24792 DOWNS 115 kV	line DOWNS-SEARLES-MCGEN 115 ck 1 _Tran INYO 115.00 to INYO PS	C	N-1-1	0.94	0.94	0.90	Modify the existing operating procedure to maintain McGen dispatch pre-contingency and/or add reactive support.
NOL-SP-VD-18	24792 DOWNS 115 kV	Line CONTROL 115.0 to INYO _Line INYOKERN 115.0 to KRAMER	C	N-1-1	0.93	0.93	0.83	Curtail Control area gen after the first contingency. (including the new RPS generation in the area) OR Modify Kramer RAS to drop generation in Control area.
NOL-SP-VD-19	24731 INYOKERN 115 kV	Line INYOKERN 115.0 to KRAMER _Line INYOKERN 115.0 to DOWNS	C	N-1-1	0.93	0.92	0.89	Curtail Control area gen after the first contingency. (including the new RPS generation in the area) OR Modify Kramer RAS to drop generation in Control area.

2013/2014 ISO Reliability Assessment - Study Results

Study Area: **SCE North of Lugo - Summer Peak**



High/Low Voltage

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
NOL-SP-VD-20	24731 INYOKERN 115 kV	Line INYOKERN 115.0 to KRAMER _line INYOKERN-SEARLES-MCGEN 115 ck 1	C	N-1-1	0.91	0.90	0.86	Curtail Control area gen after the first conitngency. (including the new RPS generation in the area) OR Modify Kramer RAS to drop generation in Control area.
NOL-SP-VD-21	24731 INYOKERN 115 kV	Line INYOKERN 115.0 to KRAMER _Tran INYO 115.00 to INYO PS	C	N-1-1	0.92	0.92	0.83	Curtail Control area gen after the first conitngency. (including the new RPS generation in the area) OR Modify Kramer RAS to drop generation in Control area.
NOL-SP-VD-22	24731 INYOKERN 115 kV	Line INYOKERN 115.0 to KRAMER _Tran INYO 230.00 to INYO PS	C	N-1-1	0.94	0.93	0.90	Curtail Control area gen after the first conitngency. (including the new RPS generation in the area) OR Modify Kramer RAS to drop generation in Control area.
NOL-SP-VD-23	24731 INYOKERN 115 kV	Line CONTROL 115.0 to INYO _Line INYOKERN 115.0 to KRAMER	C	N-1-1	0.92	0.92	0.81	Curtail Control area gen after the first conitngency. (including the new RPS generation in the area) OR Modify Kramer RAS to drop generation in Control area.

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2015 Summer Off-Peak	2018 Summer Light Load	N/A	
NOL-NP-V-1	24647 IVANPAH 230 kV	Base system (n-0)	A	N-0	1.02	1.05		Tap adjustment on Eldorado and Ivanpah transformers.
NOL-NP-V-2	24731 INYOKERN 115 kV	Line INYOKERN 115.0 to KRAMER 115.0 ck 1	B	N-1	0.93	0.98		Modify Kramer RAS to drop generation in Control area.. (including the new RPS generation in the area)
NOL-NP-V-3	24768 RANDSBRG 115 kV	Line INYOKERN 115.0 to KRAMER 115.0 ck 1	B	N-1	0.92	0.99		Modify Kramer RAS to drop generation in Control area.. (including the new RPS generation in the area)
NOL-NP-V-4	24772 SHERWIN 115 kV	Line CONTROL 115.0 to INYO _Line CONTROL 115.0 to INYOKERN	C	N-1-1	0.98	0.89		Adjust shunt reactors and other reactive devices in the area after the first contingency. OR under light load condition, instead of tripping BS Hydro, bring one unit online after the first contingency OR Curtail Control area generation after the first contingency
NOL-NP-V-5	24772 SHERWIN 115 kV	Line CONTROL 115.0 to INYO _line CONTROL-COSO-INYOKERN 115 ck 2	C	N-1-1	0.98	0.90		Adjust shunt reactors and other reactive devices in the area after the first contingency. OR under light load condition, instead of tripping BS Hydro, bring one unit online after the first contingency OR Curtail Control area generation after the first contingency
NOL-NP-V-6	24772 SHERWIN 115 kV	Line CONTROL 115.0 to INYOKERN _Tran INYO 115.00 to INYO PS	C	N-1-1	0.98	0.90		Adjust shunt reactors and other reactive devices in the area after the first contingency. OR under light load condition, instead of tripping BS Hydro, bring one unit online after the first contingency OR Curtail Control area generation after the first contingency

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2015 Summer Off-Peak	2018 Summer Light Load	N/A	
NOL-NP-V-7	24772 SHERWIN 115 kV	line CONTROL-COSO-INYOKERN 115 ck 2 _Tran INYO 115.00 to INYO PS	C	N-1-1	0.98	0.90		Adjust shunt reactors and other reactive devices in the area after the first contingency. OR under light load condition, instead of tripping BS Hydro, bring one unit online after the first contingency OR Curtail Control area generation after the first contingency
NOL-NP-V-8	24792 DOWNS 115 kV	Line INYOKERN 115.0 to KRAMER _line DOWNS-SEARLES-MCGEN 115 ck 1	C	N-1-1	0.87	0.97		Curtail Control area gen after the first conitngency. (including the new RPS generation in the area) OR Modify Kramer RAS to drop generation in Control area
NOL-NP-V-9	24792 DOWNS 115 kV	Line INYOKERN 115.0 to KRAMER _line INYOKERN-SEARLES-MCGEN 115 ck 1	C	N-1-1	0.91	0.98		Curtail Control area gen after the first conitngency. (including the new RPS generation in the area) OR Modify Kramer RAS to drop generation in Control area
NOL-NP-V-10	24792 DOWNS 115 kV	Line INYOKERN 115.0 to KRAMER _Tran INYO 115.00 to INYO PS	C	N-1-1	0.89	1.00		Curtail Control area gen after the first conitngency. (including the new RPS generation in the area) OR Modify Kramer RAS to drop generation in Control area
NOL-NP-V-11	24727 HOLGATE 115 kV	Tran KRAMER 230.00 to KRAMER _Tran KRAMER 230.00 to KRAMER	C	N-1-1	1.01	0.86		Reactive device adjustments (switch in caps at Kramer and Tortilla after the first contingency) OR make sure that QFs in this area are online during light-load condition

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2015 Summer Off-Peak	2018 Summer Light Load	N/A	
NOL-NP-V-12	24731 INYOKERN 115 kV	Tran KRAMER 230.00 to KRAMER _Tran KRAMER 230.00 to KRAMER	C	N-1-1	0.97	0.88		Reactive device adjustments (switch in caps at Kramer and Tortilla after the first contingency) OR make sure that QFs in this area are online during light-load condition
NOL-NP-V-13	24767 ROCKET 115 kV	Tran KRAMER 230.00 to KRAMER _Tran KRAMER 230.00 to KRAMER	C	N-1-1	0.98	0.87		Reactive device adjustments (switch in caps at Kramer and Tortilla after the first contingency) OR make sure that QFs in this area are online during light-load condition
NOL-NP-V-14	24769 EDWARDS 115 kV	Tran KRAMER 230.00 to KRAMER _Tran KRAMER 230.00 to KRAMER	C	N-1-1	0.99	0.84		Reactive device adjustments (switch in caps at Kramer and Tortilla after the first contingency) OR make sure that QFs in this area are online during light-load condition
NOL-NP-V-15	24770 SOUTHBAS 115 kV	Tran KRAMER 230.00 to KRAMER _Tran KRAMER 230.00 to KRAMER	C	N-1-1	0.99	0.84		Reactive device adjustments (switch in caps at Kramer and Tortilla after the first contingency) OR make sure that QFs in this area are online during light-load condition
NOL-NP-V-16	24771 GALE 115 kV	Tran KRAMER 230.00 to KRAMER _Tran KRAMER 230.00 to KRAMER	C	N-1-1	1.00	0.90		Reactive device adjustments (switch in caps at Kramer and Tortilla after the first contingency) OR make sure that QFs in this area are online during light-load condition
NOL-NP-V-17	24773 TIEFORT 115 kV	Tran KRAMER 230.00 to KRAMER _Tran KRAMER 230.00 to KRAMER	C	N-1-1	0.98	0.89		Reactive device adjustments (switch in caps at Kramer and Tortilla after the first contingency) OR make sure that QFs in this area are online during light-load condition

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2015 Summer Off-Peak	2018 Summer Light Load	N/A	
NOL-NP-V-18	24790 COSO 115 kV	Tran KRAMER 230.00 to KRAMER _Tran KRAMER 230.00 to KRAMER	C	N-1-1	0.97	0.90		Reactive device adjustments (switch in caps at Kramer and Tortilla after the first contingency) OR make sure that QFs in this area are online during light-load condition
NOL-NP-V-19	24716 COLWATER 115 kV	Tran KRAMER 230.00 to KRAMER _Tran KRAMER 230.00 to KRAMER	C	N-1-1	1.00	0.90		Reactive device adjustments (switch in caps at Kramer and Tortilla after the first contingency) OR make sure that QFs in this area are online during light-load condition
NOL-NP-V-20	24749 SEARLES 115 kV	Tran KRAMER 230.00 to KRAMER _Tran KRAMER 230.00 to KRAMER	C	N-1-1	1.03	0.89		Reactive device adjustments (switch in caps at Kramer and Tortilla after the first contingency) OR make sure that QFs in this area are online during light-load condition
NOL-NP-V-21	24792 DOWNS 115 kV	Tran KRAMER 230.00 to KRAMER _Tran KRAMER 230.00 to KRAMER	C	N-1-1	0.98	0.88		Reactive device adjustments (switch in caps at Kramer and Tortilla after the first contingency) OR make sure that QFs in this area are online during light-load condition
NOL-NP-V-22	24759 TORTILLA 115 kV	Tran KRAMER 230.00 to KRAMER _Tran KRAMER 230.00 to KRAMER	C	N-1-1	0.99	0.89		Reactive device adjustments (switch in caps at Kramer and Tortilla after the first contingency) OR make sure that QFs in this area are online during light-load condition
NOL-NP-V-23	24768 RANDBERG 115 kV	Tran KRAMER 230.00 to KRAMER _Tran KRAMER 230.00 to KRAMER	C	N-1-1	0.97	0.88		Reactive device adjustments (switch in caps at Kramer and Tortilla after the first contingency) OR make sure that QFs in this area are online during light-load condition



**Transient Stability**

ID	Contingency	Category	Category Description	Transient Stability Performance			Potential Mitigation Solutions
				2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
NOL-SP-TS-1	Lugo - Victor N-2	C5	N-2	Voltage dip below 0.7 pu and no recovery in Kramer 115kV area	Voltage dip below 0.7 pu and no recovery in Kramer 115kV area	Voltage dip below 0.7 pu and no recovery in Kramer 115kV area	Victor Loop in Kramer-Lugo OR Modify existing HDPP RAS to drop load

2013/2014 ISO Reliability Assessment - Study Results

Study Area: **SCE North of Lugo - Summer Peak**



**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.

2013/2014 ISO Reliability Assessment - Study Results

Study Area: **SCE North of Lugo - Summer Off-Peak & Summer Light Load**



**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.

2013/2014 ISO Reliability Assessment - Study Results

Study Area: **SCE North of Lugo - Summer Peak**

**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

2013/2014 ISO Reliability Assessment - Study Results

Study Area: **SCE North of Lugo - Summer Off-Peak & Summer Light Load**



**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-22**  
**SCE East of Lugo**  
**Reliability Assessment Study Results**

2013/2014 ISO Reliability Assessment - Study Results

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



**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
EOL-SP-T-1	24086 LUGO - 500 26105 VICTORVL 500 - Ckt 1	Line HASSYAMP 500.0 to HDWSH _Line PALOVRDE 500.0 to COLRIVER	C	N-1-1	101%	<100%	<100%	Curtail WOR AND/OR curtail East of Pisgah generation after the first contingency. A transmission project approved in 2012-2013 ISO Transmission Plan mitigates this overload in later years.
EOL-SP-T-2	24086 LUGO - 500 26105 VICTORVL 500 - Ckt 1	Line HDWSH 500.0 to N.GILA _Line PALOVRDE 500.0 to COLRIVER	C	N-1-1	105%	<100%	<100%	Curtail WOR AND/OR curtail East of Pisgah generation after the first contingency. A transmission project approved in 2012-2013 ISO Transmission Plan mitigates this overload in later years.

San Onofre Nuclear Generation Station was retired on June 7, 2013 and therefore was removed from the base cases used for the 2013/14 ISO transmission planning process.

2013/2014 ISO Reliability Assessment - Study Results

Study Area: **SCE Eastern area - Summer Peak**



**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.



2013/2014 ISO Reliability Assessment - Study Results

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



**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.

2013/2014 ISO Reliability Assessment - Study Results

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

**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

2013/2014 ISO Reliability Assessment - Study Results

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



**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-23**  
**SCE Eastern Area**  
**Reliability Assessment Study Results**

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
Eastern-SP-T-1	Julian Hinds SCE–MWD 230 kV bus tie	Julian Hinds–Mirage 230 kV line (Bythe RAS tripping one CTG unit )	B	L-1	<100	102	102	The following mitigations are proposed to address all of the issues identified in this area: (1) Increase the rating of the Julian Hinds bus section and the Blythe Energy RAS set-point (2) Permanently close Mead–Camino West 230 kV line (MWD) (3) Open Eagle Mountain–Blythe 161 kV line after first contingency
		Julian Hinds–Mirage & Iron Mountain–Camino–Mead–Gene 230 kV lines (Bythe RAS tripping one CTG unit )(Note 1)	C	L-1/L-1	<100	107	104	
		Julian Hinds–Mirage & Eagle Mountain–Iron Mountain 230 kV lines (Bythe RAS tripping one CTG unit )(Note 1)	C	L-1/L-1	<100	109	106	
		Julian Hinds–Mirage & Parker–Gene 230 kV lines (Bythe RAS tripping one CTG unit ) (Note 1)	C	L-1/L-1	<100	102	102	
Eastern-SP-T-2	Eagle Mountain–Blythe 161 kV line	Julian Hinds–Mirage & Iron Mountain–Camino–Mead–Gene 230 kV lines (Bythe RAS tripping one CTG unit ) (Note 1)	C	L-1/L-1	<100	109	106	
		Julian Hinds–Mirage & Eagle Mountain–Iron Mountain 230 kV lines (Bythe RAS tripping one CTG unit ) (Note 1)	C	L-1/L-1	<100	122	118	

Note 1: The existing Blythe RAS is designed to trip the Blythe gen tie if the overload persists after one unit is tripped. This RAS action could lead to instability in the area.

San Onofre Nuclear Generation Station was retired on June 7, 2013 and therefore was removed from the base cases used for the 2013/14 ISO transmission planning process.

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Mitigation Solutions
					2015 Summer Off-Peak	2018 Summer Light Load	N/A	
Eastern-NP-T-1	Julian Hinds SCE-MWD 230 kV bus tie	Julian Hinds-Mirage 230 kV line (Bythe RAS tripping one CTG unit )	B	L-1	<100	103	-	Same as above
		Julian Hinds-Mirage & Iron Mountain-Camino-Mead-Gene 230 kV lines (Bythe RAS tripping one CTG unit )(Note 1)	C	L-1/L-1	<100	110	-	
		Julian Hinds-Mirage & Eagle Mountain-Iron Mountain 230 kV lines (Bythe RAS tripping one CTG unit )(Note 1)	C	L-1/L-1	<100	112	-	
		Julian Hinds-Mirage & Parker-Gene 230 kV lines (Bythe RAS tripping one CTG unit ) (Note 1)	C	L-1/L-1	<100	103	-	
Eastern-NP-T-2	Eagle Mountain-Blythe 161 kV line	Julian Hinds-Mirage & Iron Mountain-Camino-Mead-Gene 230 kV lines (Bythe RAS tripping one CTG unit ) (Note 1)	C	L-1/L-1	<100	107	-	Same as above
		Julian Hinds-Mirage & Eagle Mountain-Iron Mountain 230 kV lines (Bythe RAS tripping one CTG unit ) (Note 1)	C	L-1/L-1	<100	119	-	

Note 1: The existing Blythe RAS is designed to trip the Blythe gen tie if the overload persists after one unit is tripped. This RAS action could lead to instability in the area.



**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
Eastern-SP-VD-1	Intake (MWD) substation	Gene-Parker 230 kV line (RAS not activated)	B	L-1	5	5	5	Same as above
Eastern-SP-VD-2	Multiple MWD substations	Gene-Parker & Julian Hinds-Mirage 230 kV lines (RAS opening Blythe gen tie)	C	L-1/L-1	>10%	>10%	>10%	Same as above

**Transient Stability**

ID	Contingency	Category	Category Description	Transient Stability Performance			Potential Mitigation Solutions
				2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
Eastern-SP-TS-1	Gene-Parker 230 kV line (RAS not activated)	B	L-1	Voltage dip at Intake substation (MWD) did not meet requirements	Voltage dip at Intake substation (MWD) did not meet requirements	Voltage dip at Intake substation (MWD) did not meet requirements	Same as above
Eastern-SP-TS-2	Gene-Parker & Julian Hinds-Mirage 230 kV lines (RAS opening Blythe gen tie)	C	L-1/L-1	Voltage and frequency dip at Multiple MWD substations did not meet requirements	Voltage and frequency dip at Multiple MWD substations did not meet requirements	Voltage and frequency dip at Multiple MWD substations did not meet requirements	Same as above



2013/2014 ISO Reliability Assessment - Study Results

Study Area: **SCE Eastern area - Summer Peak**



**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.

2013/2014 ISO Reliability Assessment - Study Results

Study Area: **SCE Eastern area - Summer Off-Peak & Summer Light Load**



**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.

2013/2014 ISO Reliability Assessment - Study Results

Study Area: **SCE Eastern area - Summer Peak**

**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

2013/2014 ISO Reliability Assessment - Study Results

Study Area: **SCE Eastern area - Summer Off-Peak & Summer Light Load**



**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-24**

**SCE Los Angeles Metro Area**

**Reliability Assessment Study Results**

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
LAB-SP-T-1	Barre–Lewis 230 kV line	Barre–Villa Park 230 kV line	B	L-1	<100	<100	109	The following "Post-SONGS Developments" are being/will be evaluated to address these post-SONGS loading concerns:  1. Additional local capacity in Western LA Basin and San Diego areas (SONGS Area) as authorized by the CPUC  2. The Mesa 500 kV Loop-In & Ellis Corridor Upgrade Projects  3. Other SONGS Area transmission upgrades  4. A combination of 1 thru 3 above
		Barre–Villa Park 230 kV & Eco–Miguel 500 kV lines (also Barre–Villa Park & Mira Loma–Olinda 230 kV lines)	C	L-1/L-1	<100	<100	123	
LAB-SP-T-2	Vincent 500/230 kV #1 Bank	PDCI Monopole (also Eco–Miguel or Vincent–Mira Loma 500 kV lines)	B	L-1	<100	<100	104	
		Barre–Lewis & Barre–Villa Park 230 kV lines	C	L-2	<100	<100	111	
		PDCI Monopole & Vincent 500/230 kV #3 or #4 Bank before available spare is energized	C	L-1/T-1	<100	105	141	
		Vincent 500/230 kV #3 & #4 Banks with available spare energized	C	T-1/T-1	<100	<100	130	
LAB-SP-T-3	Serrano 500/230 kV Banks	One Serrano 500/230 kV bank & Eco–Miguel 500 kV (or Imperial Valley–N.Gila 500 kV) line	C	T-1/L-1	<100	<100	108	
		Two Serrano 500/230 kV banks	C	T-1/T-1	100	110	135	
LAB-SP-T-4	Barre–Villa Park 230 kV line	Barre–Lewis 230 kV & Eco–Miguel 500 kV lines (also Barre–Lewis & Mira Loma–Olinda 230 kV lines)	C	L-1/L-1	<100	<100	110	
LAB-SP-T-5	Serrano–Villa Park #1 (or #2) 230 kV line	Serrano–Villa Park #2 (or #1) & Lewis–Serrano #1 or #2 230 kV lines	C	L-2	<100	<100	108 (101)	
LAB-SP-T-6	Lewis–Villa Park 230 kV line	Serrano–Lewis #1 & #2	C	L-2	<100	<100	115	
LAB-SP-T-7	Mira Loma 500/230 kV #1 (or #2) Bank	Chino–Mira Loma # 3 230 kV line & Mira Loma 500/230 kV #2 (or #1) Bank	C	T-1/L-1	<100	<100	105	
LAB-SP-T-8	Ellis–Santiago 230 kV line	N.Gila–Imperial Valley 500 kV & Ellis–Johanna 230 kV	C	L-1/L-1	<100	108	<100	

2013/2014 ISO Reliability Assessment - Study Results

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



**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
LAB-SP-T-9	Ellis–Johanna 230 kV line	N.Gila–Imperial Valley 500 kV & Ellis—Santiago 230 kV line	C	L-1/L-1	<100	103	<100	
LAB-SP-T-10	Chino–Mira Loma # 3 230 kV line	Mira Loma 500/230 kV #1 & #2 Banks	C	T-1/T-1	<100	<100	109	Short term: operating solution Longer term: Post-SONGS Developments

San Onofre Nuclear Generation Station was retired on June 7, 2013 and therefore was removed from the base cases used for the 2013/14 ISO transmission planning process.

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	

No voltage deviations were identified.





**Single Contingency Load Drop**

ID	Worst Contingency	Category	Category Description	Amount of Load Drop (MW)			Potential Mitigation Solutions
				2015 Summer Peak	2018 Summer Peak	2023 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
				2015 Summer Off-Peak	2018 Summer Light Load	2023 Summer Off-Peak	

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

2013/2014 ISO Reliability Assessment - Study Results

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



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

ID	Substation	Load Served (MW)			Potential Mitigation Solutions
		2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	

No single source substation with more than 100 MW Load

2013/2014 ISO Reliability Assessment - Study Results

Study Area: **SCE Metro - Summer Light Load & Spring Off-Peak**



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

ID	Substation	Load Served (MW)			Potential Mitigation Solutions
		2015 Summer Off-Peak	2018 Summer Light Load	2023 Summer Off-Peak	

No single source substation with more than 100 MW Load

**APPENDIX C-25**

**San Diego Gas & Electric**

**Reliability Assessment Study Results**

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
SD-A-SP-T-1	22356 IMPRLVLY 230 21025 ELCENTRO 230 1	L_50006_Line N.GILA 500.0 to IMPRLVLY 500.0 Ckt 1	B	L-1	100%			Post-SONGS Mitigation Plan including following alternatives under investigation:  1. Transmission alternatives including but not limited to: (a) 500kV AC line or HVDC line connecting SCE and SDG&E system; (b) 500kV AC line or HVDC line connecting Imperial Valley to a new substation in the northeast San Diego area; (c) Submarine cable connecting SCE and SDG&E system; (d) Flow control device between SDG&E and CFE and IID
SD-A-SP-T-2	22356 IMPRLVLY 230 21025 ELCENTRO 230 1	L_50006_Line N.GILA 500.0 to IMPRLVLY 500.0 Ckt 1 With OtayMesa Outage	B	G-1/L-1	110%	109%		
SD-A-SP-T-3	22356 IMPRLVLY 230 21025 ELCENTRO 230 1 (PSLF)	L_50006_Line N.GILA 500.0 to IMPRLVLY 500.0 Ckt 1 with TMD Plant outage	B	G-1/L-1	113%	107%		
SD-A-SP-T-4	22610 OTAYME&1 230 20149 TJI-230 230 1	L_50004_Line IMPRLVLY 500.0 to OCOTILLO 500.0 Ckt 1	B	L-1	103%	109%		
SD-A-SP-T-5	22610 OTAYME&1 230 20149 TJI-230 230 1	L_50004_Line IMPRLVLY 500.0 to OCOTILLO 500.0 Ckt 1 With OtayMesa Outage	B	G-1/L-1	108%	121%	101%	

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
SD-A-SP-T-6	22610 OTAYME&1 230 20149 TJI-230 230 1	L_50005_Line IMPRLVLY 500.0 to ECO 500.0 Ckt 1	B	L-1	122%	123%	107%	2. Non-conventional mitigation alternatives including energy efficiency, demand response, distributed generation and storage  3. Resource need by itself or with combination of the above  4. Other mitigation options such as existing SPS modification and/or operating procedures
SD-A-SP-T-7	22610 OTAYME&1 230 20149 TJI-230 230 1	L_50005_Line IMPRLVLY 500.0 to ECO 500.0 Ckt 1 With OtayMesa Outage	B	G-1/L-1	129%	139%	122%	
SD-A-SP-T-8	22610 OTAYME&1 230 20149 TJI-230 230 1	L_50007_Line OCOTILLO 500.0 to SUNCREST 500.0 Ckt 1	B	L-1	103%	109%		
SD-A-SP-T-9	22610 OTAYME&1 230 20149 TJI-230 230 1	L_50007_Line OCOTILLO 500.0 to SUNCREST 500.0 Ckt 1 With OtayMesa Outage	B	G-1/L-1	108%	120%	102%	
SD-A-SP-T-10	22610 OTAYME&1 230 20149 TJI-230 230 1	L_50008_Line ECO 500.0 to MIGUEL 500.0 Ckt 1	B	L-1	122%	123%	107%	
SD-A-SP-T-11	22610 OTAYME&1 230 20149 TJI-230 230 1	L_50008_Line ECO 500.0 to MIGUEL 500.0 Ckt 1 With OtayMesa Outage	B	G-1/L-1	129%	139%	122%	
SD-A-SP-T-12	22610 OTAYME&1 230 20149 TJI-230 230 1	L_50007_Line OCOTILLO 500.0 to SUNCREST 500.0 Ckt 1	B	L-1	103%	109%		
SD-A-SP-T-13	22930 ECO 500 22468 MIGUEL 500 1	L_50007_Line OCOTILLO 500.0 to SUNCREST 500.0 Ckt 1 with cross tripping IV-La Rosita 230 kV tie with CFE (PSLF)	B	L-1		102%	105%	

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
SD-A-SP-T-14	22930 ECO 500 22468 MIGUEL 500 1	L_50007_Line OCOTILLO 500.0 to SUNCREST 500.0 Ckt 1 With OtayMesa Outage, along with cross tripping IV-La Rosita 230 kV tie with CFE (PSLF)	B	G-1/L-1	101%	112%	114%	
SD-A-SP-T-15	22886 SUNCREST 230 228860 SUNCREST TP1 230 1	L_50008_Line ECO 500.0 to MIGUEL 500.0 Ckt 1 with cross tripping IV-La Rosita 230 kV tie with CFE (PSLF)	B	L-1	101%	111%	115%	
SD-A-SP-T-16	22886 SUNCREST 230 228860 SUNCREST TP1 230 1	L_50008_Line ECO 500.0 to MIGUEL 500.0 Ckt 1 With OtayMesa Outage, along with cross tripping IV-La Rosita 230 kV tie with CFE (PSLF)	B	G-1/L-1	111%	123%	127%	
SD-A-SP-T-17	22886 SUNCREST 230 228860 SUNCREST TP1 230 2	L_50008_Line ECO 500.0 to MIGUEL 500.0 Ckt 1 with cross tripping IV-La Rosita 230 kV tie with CFE (PSLF)	B	L-1	101%	111%	115%	
SD-A-SP-T-18	22886 SUNCREST 230 228860 SUNCREST TP1 230 2	L_50008_Line ECO 500.0 to MIGUEL 500.0 Ckt 1 With OtayMesa Outage, along with cross tripping IV-La Rosita 230 kV tie with CFE (PSLF)	B	G-1/L-1	111%	123%	127%	
SD-A-SP-T-19	23310 OCOTILLO 500.0 22885 SUNCREST 500.0 1	L_50008_Line ECO 500.0 to MIGUEL 500.0 Ckt 1 With OtayMesa Outage, along with cross tripping IV-La Rosita 230 kV tie with CFE (PSLF)	B	G-1/L-1		101%	104%	



**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions	
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak		
SD-A-SP-T-20	22609 OTAYMESA 230 22464 MIGUEL 230 1	L_20023_Line OTAYMESA 230.0 to MIGUEL 230.0 Ckt 2	B	L-1		112%		Modify the existing SPS to shed generation in the Otay Mesa area	
SD-A-SP-T-21	22609 OTAYMESA 230 22464 MIGUEL 230 2	L_20022_Line OTAYMESA 230.0 to MIGUEL 230.0 Ckt 1	B	L-1		112%			
SD-A-SP-T-22	22692 ROSCYNTP 69.0 22696 ROSE CYN 69.0 1	L_21063_Line PACFCBCH 69.0 to OLD TOWN 69.0 Ckt 1	B	L-1		101%	106%	Rose Canyon Tap Removal	
SD-A-SP-T-23	22512 MONSRATE 69.0 22016 AVCADOTP 69.0 1	L_24028_Line PENDLETN 69.0 to SANLUSRY 69.0 Ckt 1	B	L-1			105%	Relay resetting to achieve a 102 MVA rating - in work per Protection	
SD-A-SP-T-24	22588 OCNSDETP 69.0 22708 SANLUSRY 69.0 1	L_24032_Line SANLUSRY 69.0 to OCEANSDE 69.0 Ckt 1	B	L-1			107%	112%	Wood to Steel reconductor San Luis Rey-Ocean Tap 69 kV line and Stuart Tap-Las Pulgas 69 kV line
SD-A-SP-T-25	22808 STUARTTP 69.0 22400 LASPULGS 69.0 1	L_26019_Line BASILONE 69.0 to TALEGATP 69.0 Ckt 1	B	L-1			112%		
SD-A-SP-T-26	22808 STUARTTP 69.0 22400 LASPULGS 69.0 1	T_26029_Tran TALEGA 69.00 to TALEGA 138.00 Ckt 1	B	L-1	103%	124%	133%		
SD-A-SP-T-27	22808 STUARTTP 69.0 22400 LASPULGS 69.0 1	TL0695_TL0695 CRSTNTS-BASILONE- TALEGA ck 1	B	L-1		112%	121%		
SD-A-SP-T-28	22360 IMPRLVLY 500 22930 ECO 500 1	L_20009_Line IMPRLVLY 230.0 to ROA-230 230.0 Ckt 1 & L_50007_Line OCOTILLO 500.0 to SUNCREST 500.0 Ckt 1	C3	L-1-1				103%	

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
SD-A-SP-T-29	22360 IMPRLVLY 500 22930 ECO 500 1	L_20021_Line OTAYMESA 230.0 to TJI-230 230.0 Ckt 1 & L_50007_Line OCOTILLO 500.0 to SUNCREST 500.0 Ckt 1	C3	L-1-1			103%	Post-SONGS Mitigation Plan including following alternatives under investigation:  1. Transmission alternatives including but not limited to: (a) 500kV AC line or HVDC line connecting SCE and SDG&E system; (b) 500kV AC line or HVDC line connecting Imperial Valley to a new substation in the northeast San Diego area; (c) Submarine cable connecting SCE and SDG&E system; (d) Flow control device between SDG&E and CFE and IID
SD-A-SP-T-30	22930 ECO 500 22468 MIGUEL 500 1	L_20009_Line IMPRLVLY 230.0 to ROA-230 230.0 Ckt 1 & L_50007_Line OCOTILLO 500.0 to SUNCREST 500.0 Ckt 1	C3	L-1-1			103%	
SD-A-SP-T-31	22930 ECO 500 22468 MIGUEL 500 1	L_20021_Line OTAYMESA 230.0 to TJI-230 230.0 Ckt 1 & L_50007_Line OCOTILLO 500.0 to SUNCREST 500.0 Ckt 1	C3	L-1-1			104%	
SD-A-SP-T-32	22356 IMPRLVLY 230 21025 ELCENTRO 230 1	L_20000_Line DIXIE230 230.0 to IMPRLVLY 230.0 Ckt 1 & L_50006_Line N.GILA 500.0 to IMPRLVLY 500.0 Ckt 1	C3	L-1-1				

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
SD-A-SP-T-33	22356 IMPRLVLY 230 20118 ROA-230 230 1	L_50007_Line OCOTILLO 500.0 to SUNCREST 500.0 Ckt 1 & L_50008_Line ECO 500.0 to MIGUEL 500.0 Ckt 1	C3	L-1-1	129%	137%	134%	2. Non-conventional mitigation alternatives including energy efficiency, demand response, distributed generation and storage  3. Resource need by itself or with combination of the above  4. Other mitigation options such as existing SPS modification and/or operating procedures
SD-A-SP-T-34	22610 OTAYME&1 230 20149 TJI-230 230 1	L_20046_Line BAY BLVD 230.0 to MIGUEL 230.0 Ckt 1 & L_50008_Line ECO 500.0 to MIGUEL 500.0 Ckt 1	C3	L-1-1	111%	118%	103%	
SD-A-SP-T-35	22610 OTAYME&1 230 20149 TJI-230 230 1	L_50003_Line HDWSH 500.0 to N.GILA 500.0 Ckt 1 & L_50008_Line ECO 500.0 to MIGUEL 500.0 Ckt 1	C3	L-1-1		118%	103%	
SD-A-SP-T-36	22610 OTAYME&1 230 20149 TJI-230 230 1	L_40033_Line ELLIS 230.0 to JOHANNA 230.0 Ckt 1 & L_50008_Line ECO 500.0 to MIGUEL 500.0 Ckt 1	C3	L-1-1	116%	123%	109%	
SD-A-SP-T-37	22610 OTAYME&1 230 20149 TJI-230 230 1	L_40084_Line S.ONOFRE 230.0 to SERRANO 230.0 Ckt 1 & L_50008_Line ECO 500.0 to MIGUEL 500.0 Ckt 1	C3	L-1-1	116%	124%	110%	
SD-A-SP-T-38	22610 OTAYME&1 230 20149 TJI-230 230 1	L_20035_Line SYCAMORE 230.0 to PENSQTOS 230.0 Ckt 1 & L_50008_Line ECO 500.0 to MIGUEL 500.0 Ckt 1	C3	L-1-1		124%	109%	

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
SD-A-SP-T-39	22610 OTAYME&1 230 20149 TJI-230 230 1	L_40106_Line VIEJOSC 230.0 to CHINO 230.0 Ckt 1 & L_50008_Line ECO 500.0 to MIGUEL 500.0 Ckt 1	C3	L-1-1	119%	126%	112%	
SD-A-SP-T-40	22610 OTAYME&1 230 20149 TJI-230 230 1	L_45002_Line PALOVRDE 500.0 to COLRIVER 500.0 Ckt 1 & L_50008_Line ECO 500.0 to MIGUEL 500.0 Ckt 1	C3	L-1-1	123%	129%	114%	
SD-A-SP-T-41	22610 OTAYME&1 230 20149 TJI-230 230 1	L_45002_Line PALOVRDE 500.0 to COLRIVER 500.0 Ckt 1 & L_50007_Line OCOTILLO 500.0 to SUNCREST 500.0 Ckt 1	C3	L-1-1	103%	114%		
SD-A-SP-T-42	22610 OTAYME&1 230 20149 TJI-230 230 1	L_50007_Line OCOTILLO 500.0 to SUNCREST 500.0 Ckt 1 & L_50008_Line ECO 500.0 to MIGUEL 500.0 Ckt 1	C3	L-1-1	178%	193%	181%	
SD-A-SP-T-43	22886 SUNCREST 230 228860 SUNCREST TP1 230 1	L_20009_Line IMPRLVLY 230.0 to ROA-230 230.0 Ckt 1 & L_50008_Line ECO 500.0 to MIGUEL 500.0 Ckt 1	C3	L-1-1		111%	116%	
SD-A-SP-T-44	22886 SUNCREST 230 228860 SUNCREST TP1 230 1	L_20021_Line OTAYMESA 230.0 to TJI-230 230.0 Ckt 1 & L_50008_Line ECO 500.0 to MIGUEL 500.0 Ckt 1	C3	L-1-1		110%	116%	
SD-A-SP-T-45	22886 SUNCREST 230 228861 SUNCREST TP2 230 2	L_20009_Line IMPRLVLY 230.0 to ROA-230 230.0 Ckt 1 & L_50008_Line ECO 500.0 to MIGUEL 500.0 Ckt 1	C3	L-1-1		111%	116%	
SD-A-SP-T-46	22886 SUNCREST 230 228861 SUNCREST TP2 230 2	L_20021_Line OTAYMESA 230.0 to TJI-230 230.0 Ckt 1 & L_50008_Line ECO 500.0 to MIGUEL 500.0 Ckt 1	C3	L-1-1		110%	116%	

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
SD-A-SP-T-47	22828 SYCAMORE 69.0 22756 SCRIPPS 69.0 1	L_20046_Line BAY BLVD 230.0 to MIGUEL 230.0 Ckt 1 & L_20035_Line SYCAMORE 230.0 to PENSQTOS 230.0 Ckt 1	C3	L-1-1		107%	111%	re-arrange the PQ-Mesa Rim-Miramar 69 kV system, or strengthen Sycamore-Scripps 69 kV line (TL6916)
SD-A-SP-T-48	22597 OLDTWNTP 230 22504 MISSION 230 1	L_20046_Line BAY BLVD 230.0 to MIGUEL 230.0 Ckt 1 & L_20019_Line OLD TOWN 230.0 to MISSION 230.0 Ckt 1 (PSLF)	C3	L-1-1	137%			a temporary SPS/OP to shed load, or developing higher short term emergency line rating until SX-PQ 230 kV line is in service.
SD-A-SP-T-49	22596 OLDTWN 230 22504 MISSION 230 1	L_20046_Line BAY BLVD 230.0 to MIGUEL 230.0 Ckt 1 & L_20019_Line OLDTOWNTP 230.0 to MISSION 230.0 Ckt 1 (PSLF)	C3	L-1-1	147%			a temporary SPS/OP to shed load, or developing higher short term emergency line rating until SX-PQ 230 kV line is in service.
SD-A-SP-T-50	22808 STUARTTP 69.0 22400 LASPULGS 69.0 1	L_20070_Line S.ONOFRE 230.0 to SONGSMESA 230.0 Ckt 2 & L_20069_Line S.ONOFRE 230.0 to SONGSMESA 230.0 Ckt 1	C3	L-1-1		172%	196%	Wood to Steel reconductor Stuart Tap-Las Pulgas 69 kV line (TL690E)
SD-A-SP-T-51	22808 STUARTTP 69.0 22400 LASPULGS 69.0 1	L_20068_Line SONGSMESA 230.0 to CAPSTRNO 230.0 Ckt 1 & L_20066_Line SONGSMESA 230.0 to TALEGA 230.0 Ckt 1	C3	L-1-1		172%	196%	
SD-A-SP-T-52	22808 STUARTTP 69.0 22400 LASPULGS 69.0 1	L_20160_Line TALEGA 230.0 to S.ONOFRE 230.0 Ckt 1 & L_20159_Line TALEGA 230.0 to S.ONOFRE 230.0 Ckt 2	C3	L-1-1	156%			

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
SD-A-SP-T-53	22841 TA TAP 138 22396 LAGNA NL 138 1	L_26004_Line CAPSTRNO 138.0 to TRABUCO 138.0 Ckt 1 & L_26002_Line CAPSTRNO 138.0 to PICO 138.0 Ckt 1	C3	L-1-1	109%			Mitigated by the approved southern Orange county upgrade
SD-A-SP-T-54	22841 TA TAP 138 22396 LAGNA NL 138 1	L_26035_Line PICO 138.0 to TRABUCO 138.0 Ckt 1 & L_26002_Line CAPSTRNO 138.0 to PICO 138.0 Ckt 1	C3	L-1-1	117%			Mitigated by the approved southern Orange county upgrade
SD-A-SP-T-55	22841 TA TAP 138 22396 LAGNA NL 138 1	L_26010_Line R.MSNVJO 138.0 to MARGARTA 138.0 Ckt 1 & L_26002_Line CAPSTRNO 138.0 to PICO 138.0 Ckt 1	C3	L-1-1	115%			Mitigated by the approved southern Orange county upgrade
SD-A-SP-T-56	22841 TA TAP 138 22396 LAGNA NL 138 1	L_26002_Line CAPSTRNO 138.0 to PICO 138.0 Ckt 1 & L_26015_Line TALEGA 138.0 to R.MSNVJO 138.0 Ckt 1	C3	L-1-1	119%			Mitigated by the approved southern Orange county upgrade
SD-A-SP-T-57	22112 CAPSTRNO 138 22656 PICO 138 1	L_26010_Line R.MSNVJO 138.0 to MARGARTA 138.0 Ckt 1 & L_26035_Line PICO 138.0 to TRABUCO 138.0 Ckt 1	C3	L-1-1	112%			Mitigated by the approved southern Orange county upgrade
SD-A-SP-T-58	22112 CAPSTRNO 138 22860 TRABUCO 138 1	L_26010_Line R.MSNVJO 138.0 to MARGARTA 138.0 Ckt 1 & L_26035_Line PICO 138.0 to TRABUCO 138.0 Ckt 1	C3	L-1-1	133%			Mitigated by the approved southern Orange county upgrade
SD-A-SP-T-59	22841 TA TAP 138 22396 LAGNA NL 138 1	L_26013_Line TALEGA 138.0 to PICO 138.0 Ckt 1 & L_26014_Line TALEGA 138.0 to PICO 138.0 Ckt 2	C3	L-1-1	132%			Mitigated by the approved southern Orange county upgrade

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
SD-A-SP-T-60	22840 TALEGA 138 22656 PICO 138 2	L_26013_Line TALEGA 138.0 to PICO 138.0 Ckt 1 & L_26015_Line TALEGA 138.0 to R.MSNVJO 138.0 Ckt 1	C3	L-1-1	113%			Mitigated by the approved southern Orange county upgrade
SD-A-SP-T-61	22840 TALEGA 138 22656 PICO 138 1	L_26014_Line TALEGA 138.0 to PICO 138.0 Ckt 2 & L_26015_Line TALEGA 138.0 to R.MSNVJO 138.0 Ckt 1	C3	L-1-1	111%			Mitigated by the approved southern Orange county upgrade
SD-A-SP-T-62	22112 CAPSTRNO 138 22656 PICO 138 1	L_26015_Line TALEGA 138.0 to R.MSNVJO 138.0 Ckt 1 & L_26035_Line PICO 138.0 to TRABUCO 138.0 Ckt 1	C3	L-1-1	118%			Mitigated by the approved southern Orange county upgrade
SD-A-SP-T-63	22112 CAPSTRNO 138 22860 TRABUCO 138 1	L_26015_Line TALEGA 138.0 to R.MSNVJO 138.0 Ckt 1 & L_26035_Line PICO 138.0 to TRABUCO 138.0 Ckt 1	C3	L-1-1	144%			Mitigated by the approved southern Orange county upgrade
SD-A-SP-T-64	22844 TALEGA 230 22840 TALEGA 138 1	T_26030_Tran TALEGA 230.00 to TALEGA 138.00 Ckt 2 & T_26031_Tran TALEGA 230.00 to TALEGA 138.00 Ckt 4	C3	L-1-1	119%			Mitigated by the approved southern Orange county upgrade
SD-A-SP-T-65	22844 TALEGA 230 22840 TALEGA 138 3	T_26030_Tran TALEGA 230.00 to TALEGA 138.00 Ckt 2 & T_26031_Tran TALEGA 230.00 to TALEGA 138.00 Ckt 4	C3	L-1-1	117%			Mitigated by the approved southern Orange county upgrade
SD-A-SP-T-66	22112 CAPSTRNO 138 22860 TRABUCO 138 1	L_26010_Line R.MSNVJO 138.0 to MARGARTA 138.0 Ckt 1 & L_26005_Line CAPSTRNO 138.0 to TRABUCO 138.0 Ckt 2	C3	L-1-1		134%	142%	Upgrade TL13834 section from Trabuco to Capistrano, or SPS to

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
SD-A-SP-T-67	22112 CAPSTRNO 138 22860 TRABUCO 138 1	L_26005_Line CAPSTRNO 138.0 to TRABUCO 138.0 Ckt 2 & L_26015_Line TALEGA 138.0 to R.MSNVJO 138.0 Ckt 1	C3	L-1-1		157%	167%	shed load
SD-A-SP-T-68	22008 ASH 69.0 22012 ASH TP 69.0 1	L_25022_Line ESCNDIDO 69.0 to FELICITA 69.0 Ckt 1 & L_25032_Line FELCTATP 69.0 to FELICITA 69.0 Ckt 1	C3	L-1-1	109%	118%	127%	Consider DG, OP, and/or higher emergency rating on the local network as needed
SD-A-SP-T-69	22056 BERNARDO 69.0 22676 R.CARMEL 69.0 1	L_25020_Line ESCNDIDO 69.0 to ESCO 69.0 Ckt 1 & L_25048_Line POWAY 69.0 to POMERADO 69.0 Ckt 1	C3	L-1-1			111%	Build a new Artesian 230/69 kV sub on TL23051 and re-arrange the 69 kV network to make two 69 kV lines between Artesian and Bernardo along with OP as needed
SD-A-SP-T-70	22256 ESCNDIDO 69.0 22272 ESCO 69.0 1	L_25006_Line BERNARDO 69.0 to R.CARMEL 69.0 Ckt 1 & L_25048_Line POWAY 69.0 to POMERADO 69.0 Ckt 1	C3	L-1-1	130%	151%	165%	Consider OP to operate the 69 kV system in radial mode, and/or higher emergency rating on the local network as needed
SD-A-SP-T-71	22512 MONSRATE 69.0 22016 AVCADOTP 69.0 1	L_25003_Line AVOCADO 69.0 to MNSRATTP 69.0 Ckt 1 & L_24028_Line PENDLETN 69.0 to SANLUSRY 69.0 Ckt 1	C3	L-1-1	139%	141%	152%	Consider DG, OP, and/or higher emergency rating on the local network as needed
SD-A-SP-T-72	22640 PENDLETN 69.0 22708 SANLUSRY 69.0 1	L_25043_Line PALA 69.0 to MNSRATTP 69.0 Ckt 1 & L_24021_Line MORHILTP 69.0 to MELROSE 69.0 Ckt 1	C3	L-1-1	126%	134%	144%	Consider DG, OP, and/or higher emergency rating on the local network as needed



**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
SD-A-SP-T-73	22668 POWAY 69.0 22676 R.CARMEL 69.0 1	L_25005_Line BERNARDO 69.0 to FELCTATP 69.0 Ckt 1 & L_21079_Line SYCAMORE 69.0 to BERNARDO 69.0 Ckt 1	C3	L-1-1	106%	115%	123%	Build a new Artesian 230/69 kV sub on TL23051 and re-arrange the 69 kV network to make two 69 kV lines between Artesian and Bernardo along with OP as needed
SD-A-SP-T-74	22708 SANLUSRY 69.0 22582 OCEAN RANCH 69.0 2	L_25024_Line ESCNDIDO 69.0 to SANMRCOS 69.0 Ckt 1 & L_24033_Line SANLUSRY 69.0 to OCEAN RANCH 69.0 Ckt 1	C3	L-1-1		110%	119%	Consider DG, OP, and/or higher emergency rating on the local network as needed
SD-A-SP-T-75	22736 SANTYSBL 69.0 22152 CREELMAN 69.0 1	L_25051_Line RINCON 69.0 to LILAC 69.0 Ckt 1 & L_25056_Line VALCNTR 69.0 to ASH TP 69.0 Ckt 1	C3	L-1-1		105%	113%	Consider DG, OP, and/or higher emergency rating on the local network as needed
SD-A-SP-T-76	22884 WARNERS 69.0 22688 RINCON 69.0 1	L_25051_Line RINCON 69.0 to LILAC 69.0 Ckt 1 & L_25056_Line VALCNTR 69.0 to ASH TP 69.0 Ckt 1	C3	L-1-1	144%	163%	174%	Consider DG, OP, and/or higher emergency rating on the local network as needed
SD-A-SP-T-77	22884 WARNERS 69.0 22736 SANTYSBL 69.0 1	L_25051_Line RINCON 69.0 to LILAC 69.0 Ckt 1 & L_25056_Line VALCNTR 69.0 to ASH TP 69.0 Ckt 1	C3	L-1-1	165%	182%	198%	Consider DG, OP, and/or higher emergency rating on the local network as needed
SD-A-SP-T-78	22512 MONSRATE 69.0 22524 MORHILTP 69.0 1	L_24028_Line PENDLETN 69.0 to SANLUSRY 69.0 Ckt 1 & L_25043_Line PALA 69.0 to MNSRATTP 69.0 Ckt 1	C3	L-1-1	132%	138%	148%	Consider DG, OP, and/or higher emergency rating on the local network as needed
SD-A-SP-T-79	22524 MORHILTP 69.0 22440 MELROSE 69.0 1	L_24028_Line PENDLETN 69.0 to SANLUSRY 69.0 Ckt 1 & L_25043_Line PALA 69.0 to MNSRATTP 69.0 Ckt 1	C3	L-1-1	142%	149%	160%	Consider DG, OP, and/or higher emergency rating on the local network as needed

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
SD-A-SP-T-80	22624 PALA 69.0 22508 MNSRATTP 69.0 1	L_24021_Line MORHILTP 69.0 to MELROSE 69.0 Ckt 1 & L_24028_Line PENDLETN 69.0 to SANLUSRY 69.0 Ckt 1	C3	L-1-1	107%	109%	115%	Consider DG, OP, and/or higher emergency rating on the local network as needed
SD-A-SP-T-81	22640 PENDLETN 69.0 22708 SANLUSRY 69.0 1	L_24020_Line MONSRATE 69.0 to MORHILTP 69.0 Ckt 1 & L_25043_Line PALA 69.0 to MNSRATTP 69.0 Ckt 1	C3	L-1-1	114%	121%	131%	Consider DG, OP, and/or higher emergency rating on the local network as needed
SD-A-SP-T-82	22712 SANLUSRY 138 22708 SANLUSRY 69.0 1	T_24046_Tran ENCINA 230.00 to ENCINA 138.00 Ckt 1 & L_21001_Line BATIQTP 138.0 to PENSQTOS 138.0 Ckt 1	C3	L-1-1	123%			Consider DG, OP, and/or higher emergency rating on the local network as needed
SD-A-SP-T-83	22306 GARFIELD 69.0 22208 EL CAJON 69.0 1	L_23032_Line MISSION 69.0 to MURRAY 69.0 Ckt 2 & L_21053_Line MISSION 69.0 to MURRAY 69.0 Ckt 1	C3	L-1-1	120%	127%	135%	Consider DG, OP, and/or higher emergency rating on the local network as needed
SD-A-SP-T-84	22408 LOSCOCHS 69.0 22216 ELLIOTT 69.0 1	L_23038_Line SYCAMORE 138.0 to SANTEE 138.0 Ckt 1 & L_22027_Line ML60 TAP 138.0 to JAMUL 138.0 Ckt 1	C3	L-1-1		107%	117%	Consider DG, OP, and/or higher emergency rating on the local network as needed
SD-A-SP-T-85	22416 LOVELAND 69.0 22168 DESCANSO 69.0 1	L_23009_Line CREELMAN 69.0 to LOSCOCHS 69.0 Ckt 1 & L_21006_Line CREELMAN 69.0 to SYCAMORE 69.0 Ckt 1	C3	L-1-1	113%	122%	117%	Consider DG, OP, and/or higher emergency rating on the local network as needed
SD-A-SP-T-86	22416 LOVELAND 69.0 22168 DESCANSO 69.0 1	L_23020_Line LOSCOCHS 69.0 to ALPINE 69.0 Ckt 1 & L_23023_Line LOSCOCHS 69.0 to LOVELAND 69.0 Ckt 1	C3	L-1-1	122%	115%	109%	Consider DG, OP, and/or higher emergency rating on the local network as needed

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
SD-A-SP-T-87	22532 MURRAY 69.0 22306 GARFIELD 69.0 1	L_23032_Line MISSION 69.0 to MURRAY 69.0 Ckt 2 & L_21053_Line MISSION 69.0 to MURRAY 69.0 Ckt 1	C3	L-1-1		111%	118%	Consider DG, OP, and/or higher emergency rating on the local network as needed
SD-A-SP-T-88	22736 SANTYSBL 69.0 22152 CREELMAN 69.0 1	L_23009_Line CREELMAN 69.0 to LOSCOCHS 69.0 Ckt 1 & L_21006_Line CREELMAN 69.0 to SYCAMORE 69.0 Ckt 1	C3	L-1-1	185%	180%	192%	Consider DG, OP, and/or higher emergency rating on the local network as needed
SD-A-SP-T-89	22884 WARNERS 69.0 22688 RINCON 69.0 1	L_23009_Line CREELMAN 69.0 to LOSCOCHS 69.0 Ckt 1 & L_21006_Line CREELMAN 69.0 to SYCAMORE 69.0 Ckt 1	C3	L-1-1	150%	144%	153%	Consider DG, OP, and/or higher emergency rating on the local network as needed
SD-A-SP-T-90	22884 WARNERS 69.0 22736 SANTYSBL 69.0 1	L_23009_Line CREELMAN 69.0 to LOSCOCHS 69.0 Ckt 1 & L_21006_Line CREELMAN 69.0 to SYCAMORE 69.0 Ckt 1	C3	L-1-1	133%	130%	131%	Consider DG, OP, and/or higher emergency rating on the local network as needed
SD-A-SP-T-91	22152 CREELMAN 69.0 22828 SYCAMORE 69.0 1	L_22027_Line ML60 TAP 138.0 to JAMUL 138.0 Ckt 1 & L_21084_Line SYCAMORE 138.0 to SANTEE 138.0 Ckt 1	C3	L-1-1			116%	Consider DG, OP, and/or higher emergency rating on the local network as needed
SD-A-SP-T-92	22408 LOSCOCHS 69.0 22216 ELLIOTT 69.0 1	L_22027_Line ML60 TAP 138.0 to JAMUL 138.0 Ckt 1 & L_21084_Line SYCAMORE 138.0 to SANTEE 138.0 Ckt 1	C3	L-1-1		107%	117%	Consider DG, OP, and/or higher emergency rating on the local network as needed
SD-A-SP-T-93	22420 SILVERGT 69.0 22868 URBAN 69.0 1	L_22001_Line B 69.0 to SILVERGT 69.0 Ckt 1 & L_22002_Line B 69.0 to SILVERGT 69.0 Ckt 2	C3	L-1-1	108%	130%	136%	Consider DG, OP, and/or higher emergency rating on the local network as needed

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
SD-A-SP-T-94	22548 NATNLCTY 69.0 22820 SWEETWTR 69.0 1	L_22036_Line NAVSTMTR 69.0 to SWEETWTR 69.0 Ckt 1 & T_22077_Tran SILVERGT 230.00 to SILVERGT 69.0 Ckt 2	C3	L-1-1		111%	121%	Consider DG, OP, and/or higher emergency rating on the local network as needed
SD-A-SP-T-95	22768 BAY BLVD 69.0 22516 MONTGMRY 69.0 1	L_22063_Line BAY BLVD 69.0 to SWEETWTR 69.0 Ckt 1 & L_22060_Line BAY BLVD 69.0 to MONTGYTP 69.0 Ckt 1	C3	L-1-1	165%	183%	193%	Consider DG, OP, and/or higher emergency rating on the local network as needed
SD-A-SP-T-96	22064 BLDCRKTP 69.0 22168 DESCANSO 69.0 1	L_21006_Line CREELMAN 69.0 to SYCAMORE 69.0 Ckt 1 & L_23009_Line CREELMAN 69.0 to LOSCOCHS 69.0 Ckt 1	C3	L-1-1	150%	153%	168%	Consider DG, OP, and/or higher emergency rating on the local network as needed
SD-A-SP-T-97	22064 BLDCRKTP 69.0 22736 SANTYSBL 69.0 1	L_21006_Line CREELMAN 69.0 to SYCAMORE 69.0 Ckt 1 & L_23009_Line CREELMAN 69.0 to LOSCOCHS 69.0 Ckt 1	C3	L-1-1	150%	153%	168%	Consider DG, OP, and/or higher emergency rating on the local network as needed
SD-A-SP-T-98	22136 CLAIMNT 69.0 22140 CLARMTTP 69.0 1	L_21031_Line KEARNY 69.0 to MISSION 69.0 Ckt 1 & L_21041_Line MESAHGTS 69.0 to MISSION 69.0 Ckt 1	C3	L-1-1	117%	142%	142%	Consider DG, OP, and/or higher emergency rating on the local network as needed
SD-A-SP-T-99	22160 DEL MAR 69.0 22644 PENSQTOS 69.0 1	L_21009_Line DEL MAR 69.0 to PENSQTOS 69.0 Ckt 2 & L_21057_Line NORTHCTY 69.0 to PENSQTOS 69.0 Ckt 1	C3	L-1-1	109%	129%	137%	Consider DG, OP, and/or higher emergency rating on the local network as needed
SD-A-SP-T-100	22160 DEL MAR 69.0 22644 PENSQTOS 69.0 2	L_21008_Line DEL MAR 69.0 to PENSQTOS 69.0 Ckt 1 & L_21057_Line NORTHCTY 69.0 to PENSQTOS 69.0 Ckt 1	C3	L-1-1	111%	130%	138%	Consider DG, OP, and/or higher emergency rating on the local network as needed

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
SD-A-SP-T-101	22188 DOUBLTTP 69.0 22164 DELMARTP 69.0 1	L_21026_Line GENESEE 69.0 to UCM 69.0 Ckt 1 & L_21068_Line PENSQTOS 69.0 to TOREYPNS 69.0 Ckt 1	C3	L-1-1	106%	114%	120%	Consider DG, OP, and/or higher emergency rating on the local network as needed
SD-A-SP-T-102	22188 DOUBLTTP 69.0 22164 DELMARTP 69.0 1	L_21028_Line MIRASNTO 69.0 to PENSQTOS 69.0 Ckt 1 & L_21068_Line PENSQTOS 69.0 to TOREYPNS 69.0 Ckt 1	C3	L-1-1		120%	126%	Consider DG, OP, and/or higher emergency rating on the local network as needed
SD-A-SP-T-103	22192 DOUBLTTP 138 22300 FRIARS 138 1	T_21108_Tran PENSQTOS 230.00 to PENSQTOS 69.00 Ckt 2 & T_21109_Tran PENSQTOS 230.00 to PENSQTOS 138.00 Ckt 1	C3	L-1-1		104%	106%	Consider DG, OP, and/or higher emergency rating on the local network as needed
SD-A-SP-T-104	22200 DUNHILTP 69.0 22188 DOUBLTTP 69.0 1	L_21025_Line GENESEE 69.0 to PENSQTOS 69.0 Ckt 2 & L_21028_Line MIRASNTO 69.0 to PENSQTOS 69.0 Ckt 1	C3	L-1-1		115%	121%	Consider DG, OP, and/or higher emergency rating on the local network as needed
SD-A-SP-T-105	22200 DUNHILTP 69.0 22188 DOUBLTTP 69.0 1	L_21026_Line GENESEE 69.0 to UCM 69.0 Ckt 1 & L_21068_Line PENSQTOS 69.0 to TOREYPNS 69.0 Ckt 1	C3	L-1-1	106%	114%	120%	Consider DG, OP, and/or higher emergency rating on the local network as needed
SD-A-SP-T-106	22200 DUNHILTP 69.0 22188 DOUBLTTP 69.0 1	L_21028_Line MIRASNTO 69.0 to PENSQTOS 69.0 Ckt 1 & L_21068_Line PENSQTOS 69.0 to TOREYPNS 69.0 Ckt 1	C3	L-1-1		120%	126%	Consider DG, OP, and/or higher emergency rating on the local network as needed
SD-A-SP-T-107	22306 GARFIELD 69.0 22208 EL CAJON 69.0 1	L_21053_Line MISSION 69.0 to MURRAY 69.0 Ckt 1 & L_21054_Line MISSION 69.0 to MURRAY 69.0 Ckt 2	C3	L-1-1	120%	127%	135%	Consider DG, OP, and/or higher emergency rating on the local network as needed

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
SD-A-SP-T-108	22316 GENESEE 69.0 22644 PENSQTOS 69.0 2	L_21028_Line MIRASNTO 69.0 to PENSQTOS 69.0 Ckt 1 & L_21089_Line TOREYPNS 69.0 to UCM 69.0 Ckt 1	C3	L-1-1	104%	146%	155%	Consider DG, OP, and/or higher emergency rating on the local network as needed
SD-A-SP-T-109	22316 GENESEE 69.0 22864 UCM 69.0 1	L_21012_Line DOUBLTTP 69.0 to DELMARTP 69.0 Ckt 1 & L_21068_Line PENSQTOS 69.0 to TOREYPNS 69.0 Ckt 1	C3	L-1-1	113%	123%	129%	Consider DG, OP, and/or higher emergency rating on the local network as needed
SD-A-SP-T-110	22331 MIRASNTO 69.0 22316 GENESEE 69.0 1	L_21025_Line GENESEE 69.0 to PENSQTOS 69.0 Ckt 2 & L_21089_Line TOREYPNS 69.0 to UCM 69.0 Ckt 1	C3	L-1-1		111%	117%	Consider DG, OP, and/or higher emergency rating on the local network as needed
SD-A-SP-T-111	22331 MIRASNTO 69.0 22644 PENSQTOS 69.0 1	L_21025_Line GENESEE 69.0 to PENSQTOS 69.0 Ckt 2 & L_21089_Line TOREYPNS 69.0 to UCM 69.0 Ckt 1	C3	L-1-1		138%	146%	Consider DG, OP, and/or higher emergency rating on the local network as needed
SD-A-SP-T-112	22372 KEARNY 69.0 22140 CLARMTTP 69.0 1	L_21031_Line KEARNY 69.0 to MISSION 69.0 Ckt 1 & L_21041_Line MESAHGTS 69.0 to MISSION 69.0 Ckt 1	C3	L-1-1	131%	151%	160%	Consider DG, OP, and/or higher emergency rating on the local network as needed
SD-A-SP-T-113	22416 LOVELAND 69.0 22168 DESCANSO 69.0 1	L_21006_Line CREELMAN 69.0 to SYCAMORE 69.0 Ckt 1 & L_23009_Line CREELMAN 69.0 to LOSCOCHS 69.0 Ckt 1	C3	L-1-1	113%	122%	117%	Consider DG, OP, and/or higher emergency rating on the local network as needed
SD-A-SP-T-114	22480 MIRAMAR 69.0 22296 FENTONTP 69.0 1	L_21066_Line PENSQTOS 69.0 to MESA RIM 69.0 Ckt 1 & L_21081_Line SYCAMORE 69.0 to SCRIPPS 69.0 Ckt 1	C3	L-1-1		113%	116%	Consider DG, OP, and/or higher emergency rating on the local network as needed

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
SD-A-SP-T-115	22484 MIRAMAR1 69.0 22296 FENTONTP 69.0 1	L_21066_Line PENSQTOS 69.0 to MESA RIM 69.0 Ckt 1 & L_21081_Line SYCAMORE 69.0 to SCRIPPS 69.0 Ckt 1	C3	L-1-1		116%	119%	Consider DG, OP, and/or higher emergency rating on the local network as needed
SD-A-SP-T-116	22500 MISSION 138 22496 MISSION 69.0 2	T_21096_Tran MISSION 138.00 to MISSION 69.00 Ckt 1 & T_21098_Tran MISSION 138.00 to MISSION 69.00 Ckt 3	C3	L-1-1		104%	113%	Add a new 230/69 kV bank and get rid of the aged Banks 51 & 50
SD-A-SP-T-117	22532 MURRAY 69.0 22306 GARFIELD 69.0 1	L_21053_Line MISSION 69.0 to MURRAY 69.0 Ckt 1 & L_21054_Line MISSION 69.0 to MURRAY 69.0 Ckt 2	C3	L-1-1		111%	118%	Consider DG, OP, and/or higher emergency rating on the local network as needed
SD-A-SP-T-118	22644 PENSQTOS 69.0 22164 DELMARTP 69.0 1	L_21028_Line MIRASNTO 69.0 to PENSQTOS 69.0 Ckt 1 & L_21068_Line PENSQTOS 69.0 to TOREYPNS 69.0 Ckt 1	C3	L-1-1		120%	126%	Consider DG, OP, and/or higher emergency rating on the local network as needed
SD-A-SP-T-119	22644 PENSQTOS 69.0 22856 TOREYPNS 69.0 1	L_21015_Line DUNHILTP 69.0 to DOUBLTTP 69.0 Ckt 1 & L_21026_Line GENESEE 69.0 to UCM 69.0 Ckt 1	C3	L-1-1	107%	149%	121%	TL662 should have 136MVA emergency rating. In the works to change relay settings.
SD-A-SP-T-120	22644 PENSQTOS 69.0 22856 TOREYPNS 69.0 1	L_21028_Line MIRASNTO 69.0 to PENSQTOS 69.0 Ckt 1 & L_21064_Line PENSQTOS 69.0 to DELMARTP 69.0 Ckt 1	C3	L-1-1		148%	120%	TL662 should have 136MVA emergency rating. In the works to change relay settings.
SD-A-SP-T-121	22644 PENSQTOS 69.0 22856 TOREYPNS 69.0 1	L_21088_Line TOREYPNS 69.0 to DUNHILTP 69.0 Ckt 1 & L_21026_Line GENESEE 69.0 to UCM 69.0 Ckt 1	C3	L-1-1	105%	146%	119%	TL662 should have 136MVA emergency rating. In the works to change relay settings.



**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
SD-A-SP-T-122	22644 PENSQTOS 69.0 22856 TOREYPNS 69.0 1	L_21025_Line GENESEE 69.0 to PENSQTOS 69.0 Ckt 2 & L_21064_Line PENSQTOS 69.0 to DELMARTP 69.0 Ckt 1	C3	L-1-1		134%	109%	TL662 should have 136MVA emergency rating. In the works to change relay settings.
SD-A-SP-T-123	22652 PENSQTOS 230 22644 PENSQTOS 69.0 2	T_21107_Tran PENSQTOS 230.00 to PENSQTOS 69.00 Ckt 1 & T_21109_Tran PENSQTOS 230.00 to PENSQTOS 138.00 Ckt 1	C3	L-1-1		105%	113%	Consider DG, OP, and/or higher emergency rating on the local network as needed
SD-A-SP-T-124	22668 POWAY 69.0 22676 R.CARMEL 69.0 1	L_21000_Line ARTESN 69.0 to SYCAMORE 69.0 Ckt 1 & L_21079_Line SYCAMORE 69.0 to BERNARDO 69.0 Ckt 1	C3	L-1-1	108%	114%	121%	Consider DG, OP, and/or higher emergency rating on the local network as needed
SD-A-SP-T-125	22692 ROSCYNTP 69.0 22696 ROSE CYN 69.0 1	L_21063_Line PACFCBCH 69.0 to OLD TOWN 69.0 Ckt 1 & L_21035_Line LA JOLLA 69.0 to ROSE CYN 69.0 Ckt 1	C3	L-1-1	116%	127%	134%	Consider DG, OP, and/or higher emergency rating on the local network as needed
SD-A-SP-T-126	22768 BAY BLVD 69.0 22516 MONTGMRY 69.0 1	T_21102_Tran OLD TOWN 69.00 to OLD TOWN 230.00 Ckt 1 & L_22060_Line BAY BLVD 69.0 to MONTGYTP 69.0 Ckt 1	C3	L-1-1	115%	128%	135%	Consider DG, OP, and/or higher emergency rating on the local network as needed
SD-A-SP-T-127	22832 SYCAMORE 230 22828 SYCAMORE 69.0 2	T_21110_Tran SYCAMORE 230.00 to SYCAMORE 69.00 Ckt 1 & T_21111_Tran SYCAMORE 230.00 to SYCAMORE 69.00 Ckt 3	C3	L-1-1	117%	106%	112%	Build a new Artesian 230/69 kV sub on TL23051



**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
SD-A-SP-T-128	22832 SYCAMORE 230 22828 SYCAMORE 69.0 3	T_21110_Tran SYCAMORE 230.00 to SYCAMORE 69.00 Ckt 1 & T_21111_Tran SYCAMORE 230.00 to SYCAMORE 69.00 Ckt 2	C3	L-1-1	117%	106%	112%	Build a new Artesian 230/69 kV sub on TL23051 and re-arrange the 69 kV network to make two 69 kV lines between Artesian and Bernardo
SD-A-SP-T-129	22856 TOREYPNS 69.0 22200 DUNHILT 69.0 1	L_21028_Line MIRASNTO 69.0 to PENSQTOS 69.0 Ckt 1 & L_21068_Line PENSQTOS 69.0 to TOREYPNS 69.0 Ckt 1	C3	L-1-1	105%	128%	135%	Consider DG, OP, and/or higher emergency rating on the local network as needed
SD-A-SP-T-130	22856 TOREYPNS 69.0 22864 UCM 69.0 1	L_21028_Line MIRASNTO 69.0 to PENSQTOS 69.0 Ckt 1 & L_21025_Line GENESEE 69.0 to PENSQTOS 69.0 Ckt 2	C3	L-1-1	104%	146%	154%	Consider DG, OP, and/or higher emergency rating on the local network as needed
SD-A-SP-T-131	22884 WARNERS 69.0 22688 RINCON 69.0 1	L_21006_Line CREELMAN 69.0 to SYCAMORE 69.0 Ckt 1 & L_23009_Line CREELMAN 69.0 to LOSCOCHS 69.0 Ckt 1	C3	L-1-1	150%	144%	153%	Consider DG, OP, and/or higher emergency rating on the local network as needed
SD-A-SP-T-132	22256 ESCNDIDO 69.0 22724 SANMRCOS 69.0 1	Line ESCNDIDO 230.0 to TA230 TA 230.0 Ckt 1 & Line ENCINA-ENCINATP-PEN 230.0 Ckt 1 (PSLF)	C	L-1-1		109%	120%	Energize an existing abandoned 138 kV line and make it the 2nd 69 kV line between Escondido and San Marcos (the overload was observed based on the posted supplemental Post-SONGS base cases)
SD-A-SP-T-133	22609 OTAYMESA 230 20149 TJI-230 230 1	IV-8032_IV 8032 50004 & BK82 CB	C	Breaker Failure	105%	111%		Post-SONGS Transmission Strengthen Plan TBD

2013/2014 ISO Reliability Assessment - Study Results

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



**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
SD-A-SP-T-134	22844 TALEGA 230 22840 TALEGA 138 1	TA-5W_TALEGA 138 kV 5W CB	C	Breaker Failure	121%			Mitigated by the approved southern Orange county upgrade
SD-A-SP-T-135	22844 TALEGA 230 22840 TALEGA 138 3	TA-5W_TALEGA 138 kV 5W CB	C	Breaker Failure	119%			Mitigated by the approved southern Orange county upgrade
SD-A-SP-T-136	22112 CAPSTRNO 138 22656 PICO 138 1	13835/13831_TA-TA TAP33-PICO 1 + TA-RMV 1 138 kV	C	common structure	104%			Mitigated by the approved southern Orange county upgrade
SD-A-SP-T-137	22808 STUARTTP 69.0 22400 LASPULGS 69.0 1	TA-5W_TALEGA 138 kV 5W CB	C	Breaker Failure	104%	124%	133%	Wood to Steel reconductor TL690D, or OP to operate the 69 kV system in radial mode

San Onofre Nuclear Generation Station was retired on June 7, 2013 and therefore was removed from the base cases used for the 2013/14 ISO transmission planning process.

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Summer Off-Peak	2018 Summer Light Load	N/A	
SD-A-NP-T-1	22610 OTAYME&1 230 20149 TJI-230 230 1	L_50005_Line IMPRLVLY 500.0 to ECO 500.0 Ckt 1	B	L-1	104%			Post-SONGS Mitigation Plan TBD
SD-A-NP-T-2	22610 OTAYME&1 230 20149 TJI-230 230 1	L_50008_Line ECO 500.0 to MIGUEL 500.0 Ckt 1	B	L-1	105%			Post-SONGS Mitigation Plan TBD
SD-A-NP-T-3	22040 BARRETT 69.0 22104 CAMERON 69.0 1	TL0629_TL0629 CW-DE-GC ck 1	B	L-1		103%		Existing RAS to trip Kumeyaay wind farm
SD-A-NP-T-4	22064 BLDCRKTP 69.0 22168 DESCANSO 69.0 1	Bus_LL69_Loveland 69kV Bus	C	Bus Section		118%		Existing RAS to trip Kumeyaay wind farm
SD-A-NP-T-5	22064 BLDCRKTP 69.0 22736 SANTYSBL 69.0 1	Bus_LL69_Loveland 69kV Bus	C	Bus Section		118%		Existing RAS to trip Kumeyaay wind farm

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
SD-A-SP-VD-1	OCOTILLO 500 KV	L_50004_Line IMPRLVLY 500.0 to OCOTILLO 500.0 Ckt 1	B	L-1	-6.09%			Put the existing shunt reactors at Suncrest 500 kV sub in auto mode
SD-A-SP-VD-2	OCOTILLO 500 KV	L_50004_Line IMPRLVLY 500.0 to OCOTILLO 500.0 Ckt 1	B	G-1/L-1	-6.35%		-5.86%	Put the existing shunt reactors at Suncrest 500 kV sub in auto mode
SD-A-SP-VD-3	SUNCREST 500 KV	L_50004_Line IMPRLVLY 500.0 to OCOTILLO 500.0 Ckt 1	B	L-1	-6.06%			Put the existing shunt reactors at Suncrest 500 kV sub in auto mode
SD-A-SP-VD-4	SUNCREST 500 KV	L_50004_Line IMPRLVLY 500.0 to OCOTILLO 500.0 Ckt 1	B	G-1/L-1	-6.02%	-5.21%	-6.55%	Put the existing shunt reactors at Suncrest 500 kV sub in auto mode
SD-A-SP-VD-5	BASILONE 69 KV	L_26018_Line BASILONE 69.0 to JAP MESA 69.0 Ckt 1	B	L-1		-7.45%		Put distribution cap banks in auto mode
SD-A-SP-VD-6	BASILONE 69 KV	L_26018_Line BASILONE 69.0 to JAP MESA 69.0 Ckt 1	B	G-1/L-1		-7.34%		Put distribution cap banks in auto mode
SD-A-SP-VD-7	ENCNITAS 69 KV	L_24015_Line ENCNITAS 69.0 to DEL MAR 69.0 Ckt 1	B	L-1	5.60%	5.17%	7.42%	Put distribution cap banks in auto mode
SD-A-SP-VD-8	ENCNITAS 69 KV	L_24015_Line ENCNITAS 69.0 to DEL MAR 69.0 Ckt 1	B	G-1/L-1	5.79%	5.60%	7.34%	Put distribution cap banks in auto mode
SD-A-SP-VD-9	PENDLETN 69 KV	L_24028_Line PENDLETN 69.0 to SANLUSRY 69.0 Ckt 1	B	L-1	6.57%	5.04%	5.46%	Put distribution cap banks in auto mode
SD-A-SP-VD-10	PENDLETN 69 KV	L_24028_Line PENDLETN 69.0 to SANLUSRY 69.0 Ckt 1	B	G-1/L-1	6.65%	5.11%	5.42%	Put distribution cap banks in auto mode
SD-A-SP-VD-11	CREELMAN 69 KV	L_25015_Line CREELMAN 69.0 to LOSCOCHS 69.0 Ckt 1 L_21006_Line CREELMAN 69.0 to SYCAMORE 69.0 Ckt 1	C	L-1-1	25.29%	27.58%	29.07%	Put distribution cap banks in auto mode and/or consider OP to manage voltage issue as needed
SD-A-SP-VD-12	SANTYSBL 69 KV	L_25015_Line CREELMAN 69.0 to LOSCOCHS 69.0 Ckt 1 L_21006_Line CREELMAN 69.0 to SYCAMORE 69.0 Ckt 1	C	L-1-1	12.40%	15.08%	15.85%	Put distribution cap banks in auto mode and/or consider OP to manage voltage issue as needed

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
SD-A-SP-VD-13	WARNERS 69 KV	L_21006_Line CREELMAN 69.0 to SYCAMORE 69.0 Ckt 1 L_23009_Line CREELMAN 69.0 to LOSCOCHS 69.0 Ckt 1	C	L-1-1		11.16%	12.39%	Put distribution cap banks in auto mode and/or consider OP to manage voltage issue as needed
SD-A-SP-VD-14	BLDCRKTP 69 KV	L_21006_Line CREELMAN 69.0 to SYCAMORE 69.0 Ckt 1 L_23009_Line CREELMAN 69.0 to LOSCOCHS 69.0 Ckt 1	C	L-1-1		11.14%	12.38%	Put distribution cap banks in auto mode and/or consider OP to manage voltage issue as needed
SD-A-SP-VD-15	BOLDRCRK 69 KV	L_21006_Line CREELMAN 69.0 to SYCAMORE 69.0 Ckt 1 L_23009_Line CREELMAN 69.0 to LOSCOCHS 69.0 Ckt 1	C	L-1-1		11.14%	12.38%	Put distribution cap banks in auto mode and/or consider OP to manage voltage issue as needed
SD-A-SP-VD-16	SANTYSBL 69 KV	L_21006_Line CREELMAN 69.0 to SYCAMORE 69.0 Ckt 1 L_23009_Line CREELMAN 69.0 to LOSCOCHS 69.0 Ckt 1	C	L-1-1	12.48%	14.48%	16.29%	Put distribution cap banks in auto mode and/or consider OP to manage voltage issue as needed
SD-A-SP-VD-17	ALPINE 69 KV	L_23020_Line LOSCOCHS 69.0 to ALPINE 69.0 Ckt 1 L_23023_Line LOSCOCHS 69.0 to LOVELAND 69.0 Ckt 1	C	L-1-1	30.09%	33.45%	36.90%	Put distribution cap banks in auto mode and/or consider OP to manage voltage issue as needed
SD-A-SP-VD-18	BARRETT 69 KV	L_23020_Line LOSCOCHS 69.0 to ALPINE 69.0 Ckt 1 L_23023_Line LOSCOCHS 69.0 to LOVELAND 69.0 Ckt 1	C	L-1-1	29.60%	32.96%	36.18%	Put distribution cap banks in auto mode and/or consider OP to manage voltage issue as needed
SD-A-SP-VD-19	BARRETT 69 KV	L_23026_Line LOVELAND 69.0 to ALPINE 69.0 Ckt 1 L_23023_Line LOSCOCHS 69.0 to LOVELAND 69.0 Ckt 1	C	L-1-1		11.78%	13.98%	Put distribution cap banks in auto mode and/or consider OP to manage voltage issue as needed

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
SD-A-SP-VD-20	CAMERON 69 KV	L_23026_Line LOVELAND 69.0 to ALPINE 69.0 Ckt 1 L_23023_Line LOSCOCHS 69.0 to LOVELAND 69.0 Ckt 1	C	L-1-1		11.37%	13.18%	Put distribution cap banks in auto mode and/or consider OP to manage voltage issue as needed
SD-A-SP-VD-21	CRESTWD 69 KV	L_23020_Line LOSCOCHS 69.0 to ALPINE 69.0 Ckt 1 L_23023_Line LOSCOCHS 69.0 to LOVELAND 69.0 Ckt 1	C	L-1-1	28.09%	31.43%	34.00%	Put distribution cap banks in auto mode and/or consider OP to manage voltage issue as needed
SD-A-SP-VD-22	CRESTWD 69 KV	L_23026_Line LOVELAND 69.0 to ALPINE 69.0 Ckt 1 L_23023_Line LOSCOCHS 69.0 to LOVELAND 69.0 Ckt 1	C	L-1-1		11.16%	12.76%	Put distribution cap banks in auto mode and/or consider OP to manage voltage issue as needed
SD-A-SP-VD-23	BLDCRKTP 69 KV	L_23020_Line LOSCOCHS 69.0 to ALPINE 69.0 Ckt 1 L_23023_Line LOSCOCHS 69.0 to LOVELAND 69.0 Ckt 1	C	L-1-1	17.11%	19.21%	20.99%	Put distribution cap banks in auto mode and/or consider OP to manage voltage issue as needed
SD-A-SP-VD-24	DESCANSO 69 KV	L_23020_Line LOSCOCHS 69.0 to ALPINE 69.0 Ckt 1 L_23023_Line LOSCOCHS 69.0 to LOVELAND 69.0 Ckt 1	C	L-1-1	27.82%	30.62%	33.46%	Put distribution cap banks in auto mode and/or consider OP to manage voltage issue as needed
SD-A-SP-VD-25	DESCANSO 69 KV	L_23026_Line LOVELAND 69.0 to ALPINE 69.0 Ckt 1 L_23023_Line LOSCOCHS 69.0 to LOVELAND 69.0 Ckt 1	C	L-1-1		11.23%	13.13%	Put distribution cap banks in auto mode and/or consider OP to manage voltage issue as needed
SD-A-SP-VD-26	GLENCLIF 69 KV	L_23020_Line LOSCOCHS 69.0 to ALPINE 69.0 Ckt 1 L_23023_Line LOSCOCHS 69.0 to LOVELAND 69.0 Ckt 1	C	L-1-1	27.98%	31.00%	33.72%	Put distribution cap banks in auto mode and/or consider OP to manage voltage issue as needed

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
SD-A-SP-VD-27	GLENCLIF 69 KV	L_23026_Line LOVELAND 69.0 to ALPINE 69.0 Ckt 1 L_23023_Line LOSCOCHS 69.0 to LOVELAND 69.0 Ckt 1	C	L-1-1		11.22%	12.99%	Put distribution cap banks in auto mode and/or consider OP to manage voltage issue as needed
SD-A-SP-VD-28	GLNCLFTP 69 KV	L_23020_Line LOSCOCHS 69.0 to ALPINE 69.0 Ckt 1 L_23023_Line LOSCOCHS 69.0 to LOVELAND 69.0 Ckt 1	C	L-1-1	27.98%	31.00%	33.72%	Put distribution cap banks in auto mode and/or consider OP to manage voltage issue as needed
SD-A-SP-VD-29	GLNCLFTP 69 KV	L_23026_Line LOVELAND 69.0 to ALPINE 69.0 Ckt 1 L_23023_Line LOSCOCHS 69.0 to LOVELAND 69.0 Ckt 1	C	L-1-1		11.22%	12.99%	Put distribution cap banks in auto mode and/or consider OP to manage voltage issue as needed
SD-A-SP-VD-30	KUMEYAAY 69 KV	L_23020_Line LOSCOCHS 69.0 to ALPINE 69.0 Ckt 1 L_23023_Line LOSCOCHS 69.0 to LOVELAND 69.0 Ckt 1	C	L-1-1	28.08%	31.43%	34.00%	Put distribution cap banks in auto mode and/or consider OP to manage voltage issue as needed
SD-A-SP-VD-31	KUMEYAAY 69 KV	L_23026_Line LOVELAND 69.0 to ALPINE 69.0 Ckt 1 L_23023_Line LOSCOCHS 69.0 to LOVELAND 69.0 Ckt 1	C	L-1-1		11.16%	12.76%	Put distribution cap banks in auto mode and/or consider OP to manage voltage issue as needed
SD-A-SP-VD-32	LOVELAND 69 KV	L_23020_Line LOSCOCHS 69.0 to ALPINE 69.0 Ckt 1 L_23023_Line LOSCOCHS 69.0 to LOVELAND 69.0 Ckt 1	C	L-1-1	30.04%	33.47%	36.93%	Put distribution cap banks in auto mode and/or consider OP to manage voltage issue as needed
SD-A-SP-VD-33	LOVELAND 69 KV	L_23026_Line LOVELAND 69.0 to ALPINE 69.0 Ckt 1 L_23023_Line LOSCOCHS 69.0 to LOVELAND 69.0 Ckt 1	C	L-1-1		11.93%	14.34%	Put distribution cap banks in auto mode and/or consider OP to manage voltage issue as needed

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
SD-A-SP-VD-34	SANTYSBL 69 KV	L_23020_Line LOSCOCHS 69.0 to ALPINE 69.0 Ckt 1 L_23023_Line LOSCOCHS 69.0 to LOVELAND 69.0 Ckt 1	C	L-1-1		11.85%	12.97%	Put distribution cap banks in auto mode and/or consider OP to manage voltage issue as needed
SD-A-SP-VD-35	PENDLETN 69 KV	L_25044_Line PA GEN 69.0 to PALA 69.0 Ckt 1 L_24028_Line PENDLETN 69.0 to SANLUSRY 69.0 Ckt 1	C	L-1-1	9.82%	8.88%	10.08%	Put distribution cap banks in auto mode and/or consider OP to manage voltage issue as needed
SD-A-SP-VD-36	POWAY 69 KV	L_25006_Line BERNARDO 69.0 to R.CARMEL 69.0 Ckt 1 L_25048_Line POWAY 69.0 to POMERADO 69.0 Ckt 1	C	L-1-1	12.02%	16.05%	17.74%	Put distribution cap banks in auto mode and/or consider OP to manage voltage issue as needed
SD-A-SP-VD-37	R.CARMEL 69 KV	L_25006_Line BERNARDO 69.0 to R.CARMEL 69.0 Ckt 1 L_25048_Line POWAY 69.0 to POMERADO 69.0 Ckt 1	C	L-1-1	12.13%	16.29%	18.01%	Put distribution cap banks in auto mode and/or consider OP to manage voltage issue as needed
SD-A-SP-VD-38	WARCYNTP 69 KV	L_25006_Line BERNARDO 69.0 to R.CARMEL 69.0 Ckt 1 L_25048_Line POWAY 69.0 to POMERADO 69.0 Ckt 1	C	L-1-1	10.23%	13.65%	15.10%	Put distribution cap banks in auto mode and/or consider OP to manage voltage issue as needed
SD-A-SP-VD-39	WARENCYN 69 KV	L_25006_Line BERNARDO 69.0 to R.CARMEL 69.0 Ckt 1 L_25048_Line POWAY 69.0 to POMERADO 69.0 Ckt 1	C	L-1-1	10.23%	13.66%	15.11%	Put distribution cap banks in auto mode and/or consider OP to manage voltage issue as needed



**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2015 Summer Off-Peak	2018 Summer Light Load	N/A	
SD-A-NP-VD-1	SUNCREST 500 KV	L_50004_Line IMPRLVLY 500.0 to OCOTILLO 500.0 Ckt 1	B	L-1	-6.0%			Put the existing shunt reactors at Suncrest 500 kV sub in auto mode
SD-A-NP-VD-2	OCOTILLO 500 KV	L_50004_Line IMPRLVLY 500.0 to OCOTILLO 500.0 Ckt 1	B	L-1	-5.9%			Put the existing shunt reactors at Suncrest 500 kV sub in auto mode
SD-A-NP-VD-3	OCOTILLO 1 500 KV	L_50004_Line IMPRLVLY 500.0 to OCOTILLO 500.0 Ckt 1	B	L-1	-5.9%			Put the existing shunt reactors at Suncrest 500 kV sub in auto mode
SD-A-NP-VD-4	CRSTNTS 69 KV	L_26018_Line BASILONE 69.0 to JAP MESA 69.0 Ckt 1	B	L-1		-6.7%		Put distribution cap banks in auto mode
SD-A-NP-VD-5	BASILONE 69 KV	L_26018_Line BASILONE 69.0 to JAP MESA 69.0 Ckt 1	B	L-1		-7.4%		Put distribution cap banks in auto mode
SD-A-NP-VD-6	ENCNITAS 69 KV	L_24015_Line ENCNITAS 69.0 to DEL MAR 69.0 Ckt 1	B	L-1	5.3%			Put distribution cap banks in auto mode
SD-A-NP-VD-7	JAP MESA 69 KV	L_26008_Line LASPULGS 69.0 to JAP MESA 69.0 Ckt 1	B	L-1		-6.5%		Put distribution cap banks in auto mode
SD-A-NP-VD-8	MESA RIM 69 KV	LD_MRMA_LD_MRM OPEN 675 PEAK MRM/MR/SS	B	L-1	5.4%	6.7%		Put distribution cap banks in auto mode

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
SD-SP-V-1	MIGUEL 500 KV	Normal condition (All elements in service)	A	N-0		0.97	0.99	Install up to 375 MVAR of reactive support (i.e., shunt capacitors) at Miguel substation
SD-SP-V-2	ECO 500 KV	Normal condition (All elements in service)	A	N-0		1.00		Install up to 375 MVAR of reactive support (i.e., shunt capacitors) at Miguel substation
SD-SP-V-3	OCOTILLO 500 KV	L_50004_Line IMPRLVLY 500.0 to OCOTILLO 500.0 Ckt 1	B	L-1	1.12			Put the existing shunt reactors at Suncrest 500 kV sub in auto mode
SD-SP-V-4	OCOTILLO 500 KV	L_50004_Line IMPRLVLY 500.0 to OCOTILLO 500.0 Ckt 1	B	G-1/L-1	1.13	1.11		Put the existing shunt reactors at Suncrest 500 kV sub in auto mode
SD-SP-V-5	SNCRSMP1 500 KV	L_50004_Line IMPRLVLY 500.0 to OCOTILLO 500.0 Ckt 1	B	L-1	1.11			Put the existing shunt reactors at Suncrest 500 kV sub in auto mode
SD-SP-V-6	SNCRSMP1 500 KV	L_50004_Line IMPRLVLY 500.0 to OCOTILLO 500.0 Ckt 1	B	G-1/L-1	1.12	1.11		Put the existing shunt reactors at Suncrest 500 kV sub in auto mode
SD-SP-V-7	SNCRSMP2 500 KV	L_50004_Line IMPRLVLY 500.0 to OCOTILLO 500.0 Ckt 1	B	L-1	1.11			Put the existing shunt reactors at Suncrest 500 kV sub in auto mode
SD-SP-V-8	SNCRSMP2 500 KV	L_50004_Line IMPRLVLY 500.0 to OCOTILLO 500.0 Ckt 1	B	G-1/L-1	1.12	1.11		Put the existing shunt reactors at Suncrest 500 kV sub in auto mode
SD-SP-V-9	SUNCREST 500 KV	L_50004_Line IMPRLVLY 500.0 to OCOTILLO 500.0 Ckt 1	B	L-1	1.12			Put the existing shunt reactors at Suncrest 500 kV sub in auto mode
SD-SP-V-10	SUNCREST 500 KV	L_50004_Line IMPRLVLY 500.0 to OCOTILLO 500.0 Ckt 1	B	G-1/L-1	1.13	1.12	1.07	Put the existing shunt reactors at Suncrest 500 kV sub in auto mode
SD-SP-V-11	OCOTILLO 1 500 KV	L_50004_Line IMPRLVLY 500.0 to OCOTILLO 500.0 Ckt 1	B	L-1	1.12			Put the existing shunt reactors at Suncrest 500 kV sub in auto mode
SD-SP-V-12	OCOTILLO 1 500 KV	L_50004_Line IMPRLVLY 500.0 to OCOTILLO 500.0 Ckt 1	B	G-1/L-1	1.13	1.11		Put the existing shunt reactors at Suncrest 500 kV sub in auto mode
SD-SP-V-13	BOULEVRD 69 KV	L_50008_Line ECO 500.0 to MIGUEL 500.0 Ckt 1	B	L-1	1.11			Re-set transformer tap position

High/Low Voltage

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
SD-SP-V-14	BOULEVRD 69 KV	L_50008_Line ECO 500.0 to MIGUEL 500.0 Ckt 1 L_50003_Line HDWSH 500.0 to N.GILA 500.0 Ckt 1	C	L-1-1	1.13			Re-set transformer tap position
SD-SP-V-15	BOULEVRD 69 KV	L_50006_Line N.GILA 500.0 to IMPRLVLY 500.0 Ckt 1 L_50008_Line ECO 500.0 to MIGUEL 500.0 Ckt 1	C	L-1-1	1.11			Re-set transformer tap position
SD-SP-V-16	BOULEVRD 138 KV	L_50008_Line ECO 500.0 to MIGUEL 500.0 Ckt 1 L_50003_Line HDWSH 500.0 to N.GILA 500.0 Ckt 1	C	L-1-1	1.11			Re-set transformer tap position
SD-SP-V-17	ECO 138 KV	L_50008_Line ECO 500.0 to MIGUEL 500.0 Ckt 1 L_50003_Line HDWSH 500.0 to N.GILA 500.0 Ckt 1	C	L-1-1	1.11			Re-set transformer tap position
SD-SP-V-18	WARNERS 69 KV	L_23009_Line CREELMAN 69.0 to LOSCOCHS 69.0 Ckt 1 L_21006_Line CREELMAN 69.0 to SYCAMORE 69.0 Ckt 1	C	L-1-1		0.88	0.88	Put distribution cap banks in auto mode and/or consider OP to manage voltage issue as needed
SD-SP-V-19	BLDCRKTP 69 KV	L_23009_Line CREELMAN 69.0 to LOSCOCHS 69.0 Ckt 1 L_21006_Line CREELMAN 69.0 to SYCAMORE 69.0 Ckt 1	C	L-1-1		0.88	0.88	Put distribution cap banks in auto mode and/or consider OP to manage voltage issue as needed
SD-SP-V-20	BOLDRCRK 69 KV	L_23009_Line CREELMAN 69.0 to LOSCOCHS 69.0 Ckt 1 L_21006_Line CREELMAN 69.0 to SYCAMORE 69.0 Ckt 1	C	L-1-1		0.88	0.88	Put distribution cap banks in auto mode and/or consider OP to manage voltage issue as needed

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
SD-SP-V-21	SANTYSBL 69 KV	L_23009_Line CREELMAN 69.0 to LOSCOCHS 69.0 Ckt 1 L_21006_Line CREELMAN 69.0 to SYCAMORE 69.0 Ckt 1	C	L-1-1		0.84	0.85	Put distribution cap banks in auto mode and/or consider OP to manage voltage issue as needed
SD-SP-V-22	BLDCRKTP 69 KV	L_23020_Line LOSCOCHS 69.0 to ALPINE 69.0 Ckt 1 L_23023_Line LOSCOCHS 69.0 to LOVELAND 69.0 Ckt 1	C	L-1-1	0.86	0.79	0.79	Put distribution cap banks in auto mode and/or consider OP to manage voltage issue as needed
SD-SP-V-23	BOLDRCRK 69 KV	L_23020_Line LOSCOCHS 69.0 to ALPINE 69.0 Ckt 1 L_23023_Line LOSCOCHS 69.0 to LOVELAND 69.0 Ckt 1	C	L-1-1	0.86	0.79	0.79	Put distribution cap banks in auto mode and/or consider OP to manage voltage issue as needed
SD-SP-V-24	DESCANSO 69 KV	L_23020_Line LOSCOCHS 69.0 to ALPINE 69.0 Ckt 1 L_23023_Line LOSCOCHS 69.0 to LOVELAND 69.0 Ckt 1	C	L-1-1	0.75	0.66	0.65	Put distribution cap banks in auto mode and/or consider OP to manage voltage issue as needed
SD-SP-V-25	GLNCLFTP 69 KV	L_23020_Line LOSCOCHS 69.0 to ALPINE 69.0 Ckt 1 L_23023_Line LOSCOCHS 69.0 to LOVELAND 69.0 Ckt 1	C	L-1-1	0.74	0.66	0.65	Put distribution cap banks in auto mode and/or consider OP to manage voltage issue as needed
SD-SP-V-26	GLENCLIF 69 KV	L_23020_Line LOSCOCHS 69.0 to ALPINE 69.0 Ckt 1 L_23023_Line LOSCOCHS 69.0 to LOVELAND 69.0 Ckt 1	C	L-1-1	0.74	0.66	0.65	Put distribution cap banks in auto mode and/or consider OP to manage voltage issue as needed
SD-SP-V-27	KUMEYAAY 69 KV	L_23020_Line LOSCOCHS 69.0 to ALPINE 69.0 Ckt 1 L_23023_Line LOSCOCHS 69.0 to LOVELAND 69.0 Ckt 1	C	L-1-1	0.73	0.65	0.64	Put distribution cap banks in auto mode and/or consider OP to manage voltage issue as needed

2013/2014 ISO Reliability Assessment - Study Results

Study Area: San Diego Area - Summer Peak



High/Low Voltage

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
SD-SP-V-28	CRESTWD 69 KV	L_23020_Line LOSCOCHS 69.0 to ALPINE 69.0 Ckt 1 L_23023_Line LOSCOCHS 69.0 to LOVELAND 69.0 Ckt 1	C	L-1-1	0.73	0.65	0.64	Put distribution cap banks in auto mode and/or consider OP to manage voltage issue as needed
SD-SP-V-29	CAMERON 69 KV	L_23020_Line LOSCOCHS 69.0 to ALPINE 69.0 Ckt 1 L_23023_Line LOSCOCHS 69.0 to LOVELAND 69.0 Ckt 1	C	L-1-1	0.73	0.64	0.63	Put distribution cap banks in auto mode and/or consider OP to manage voltage issue as needed
SD-SP-V-30	BARRETT 69 KV	L_23020_Line LOSCOCHS 69.0 to ALPINE 69.0 Ckt 1 L_23023_Line LOSCOCHS 69.0 to LOVELAND 69.0 Ckt 1	C	L-1-1	0.73	0.63	0.62	Put distribution cap banks in auto mode and/or consider OP to manage voltage issue as needed
SD-SP-V-31	LOVELAND 69 KV	L_23020_Line LOSCOCHS 69.0 to ALPINE 69.0 Ckt 1 L_23023_Line LOSCOCHS 69.0 to LOVELAND 69.0 Ckt 1	C	L-1-1	0.73	0.63	0.62	Put distribution cap banks in auto mode and/or consider OP to manage voltage issue as needed
SD-SP-V-32	ALPINE 69 KV	L_23020_Line LOSCOCHS 69.0 to ALPINE 69.0 Ckt 1 L_23023_Line LOSCOCHS 69.0 to LOVELAND 69.0 Ckt 1	C	L-1-1	0.72	0.62	0.61	Put distribution cap banks in auto mode and/or consider OP to manage voltage issue as needed
SD-SP-V-33	SANTYSBL 69 KV	L_23020_Line LOSCOCHS 69.0 to ALPINE 69.0 Ckt 1 L_23023_Line LOSCOCHS 69.0 to LOVELAND 69.0 Ckt 1	C	L-1-1		0.87	0.87	Put distribution cap banks in auto mode and/or consider OP to manage voltage issue as needed
SD-SP-V-34	PENDLETN 69 KV	L_25044_Line PA GEN 69.0 to PALA 69.0 Ckt 1 L_24028_Line PENDLETN 69.0 to SANLUSRY 69.0 Ckt 1	C	L-1-1	0.90	0.88	0.87	Put distribution cap banks in auto mode and/or consider OP to manage voltage issue as needed

High/Low Voltage

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
SD-SP-V-35	MNSRATTP 69 KV	L_25044_Line PA GEN 69.0 to PALA 69.0 Ckt 1 L_24028_Line PENDLETN 69.0 to SANLUSRY 69.0 Ckt 1	C	L-1-1		0.89	0.89	Put distribution cap banks in auto mode and/or consider OP to manage voltage issue as needed
SD-SP-V-36	MONSRATE 69 KV	L_25044_Line PA GEN 69.0 to PALA 69.0 Ckt 1 L_24028_Line PENDLETN 69.0 to SANLUSRY 69.0 Ckt 1	C	L-1-1		0.89	0.89	Put distribution cap banks in auto mode and/or consider OP to manage voltage issue as needed
SD-SP-V-37	AVCADOTP 69 KV	L_25044_Line PA GEN 69.0 to PALA 69.0 Ckt 1 L_24028_Line PENDLETN 69.0 to SANLUSRY 69.0 Ckt 1	C	L-1-1		0.89	0.89	Put distribution cap banks in auto mode and/or consider OP to manage voltage issue as needed
SD-SP-V-38	AVOCADO 69 KV	L_25044_Line PA GEN 69.0 to PALA 69.0 Ckt 1 L_24028_Line PENDLETN 69.0 to SANLUSRY 69.0 Ckt 1	C	L-1-1		0.88	0.88	Put distribution cap banks in auto mode and/or consider OP to manage voltage issue as needed
SD-SP-V-39	R.CARMEL 69 KV	L_25006_Line BERNARDO 69.0 to R.CARMEL 69.0 Ckt 1 L_25048_Line POWAY 69.0 to POMERADO 69.0 Ckt 1	C	L-1-1	0.89	0.81	0.80	Put distribution cap banks in auto mode and/or consider OP to manage voltage issue as needed
SD-SP-V-40	WARENCYN 69 KV	L_25006_Line BERNARDO 69.0 to R.CARMEL 69.0 Ckt 1 L_25048_Line POWAY 69.0 to POMERADO 69.0 Ckt 1	C	L-1-1		0.85	0.84	Put distribution cap banks in auto mode and/or consider OP to manage voltage issue as needed
SD-SP-V-41	POWAY 69 KV	L_25006_Line BERNARDO 69.0 to R.CARMEL 69.0 Ckt 1 L_25048_Line POWAY 69.0 to POMERADO 69.0 Ckt 1	C	L-1-1		0.82	0.81	Put distribution cap banks in auto mode and/or consider OP to manage voltage issue as needed

2013/2014 ISO Reliability Assessment - Study Results

Study Area: **San Diego Area- Summer Off-Peak & Summer Light Load**



**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2015 Summer Off-Peak	2018 Summer Light Load	N/A	
SD-A-NP-V-1	CRSTNTS 69 KV	L_26018_Line BASILONE 69.0 to JAP MESA 69.0 Ckt 1	B	L-1	1.11	-	-	Put distribution cap banks in auto mode
SD-A-NP-V-2	BOULEVRD 69 KV	L_50001_Line HASSYAMP 500.0 to HDWSH 500.0 Ckt 1	B	L-1	1.12	-	-	Re-set transformer tap position
SD-A-NP-V-3	LASPULGS 69 KV	L_24025_Line OCNSDETP 69.0 to STUARTTP 69.0 Ckt 1	B	L-1	1.11	-	-	Put distribution cap banks in auto mode
SD-A-NP-V-4	PENDLETN 69 KV	L_24028_Line PENDLETN 69.0 to SANLUSRY 69.0 Ckt 1	B	L-1	1.12	-	-	Put distribution cap banks in auto mode

**Post-Transient Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
X-SP-PTVD-1	SDGE System	Otay Mesa Plant outage followed by N.GILA 500.0 to IMPRLVLY 500.0 Ckt 1 Outage with Otaymesa-TJI cross-tripping	C	G-1/L-1	diverged	diverged	diverged	Post-SONGS Mitigation Plan TBD
X-SP-PTVD-2	SDGE System	OCOTILLO to SUNCREST 500KV Ckt 1 Outage followed by ECO to MIGUEL 500kV Ckt 1	C	L-1-1	diverged	diverged	diverged	Post-SONGS Mitigation Plan TBD



2013/2014 ISO Reliability Assessment - Study Results

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



**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.

2013/2014 ISO Reliability Assessment - Study Results

Study Area: **San Diego Area- Summer Off-Peak & Summer Light Load**



**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.

2013/2014 ISO Reliability Assessment - Study Results

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

**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

2013/2014 ISO Reliability Assessment - Study Results

Study Area: **San Diego Area- Summer Off-Peak & Summer Light Load**



**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-26**

**Valley Electric Association**

**Reliability Assessment Study Results**

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
VEA-SP-T-1	18003 AMARGOSA 230 - 18030 AMARGOSA 138 - Ckt 1	NWEST -DESERT VIEW 230-kV Ckt 1 _PAHRUMP -CRAZY EYE SS 230-kV Ckt 1	C	N-1-1	114%	Diverged	Diverged	Till 2015 - UVLS will drop 1 load block and will mitigate the issue. 2015 onwards - Operate the 138 kV system in radial with three independent supplies from Amargosa, Pahrump, and Jackass Flat transmission sources after first contingency so that the next 230kV line (N-1) will result in consequential loss of load.
VEA-SP-T-2	18023 PAHRUMP 230 - 18085 PAHRUMP 138 - Ckt 1	AMARGOSA 230/138-kV Tran Bnk 1 _PAHRUMP 230/138-kV Tran Bnk 2	C	N-1-1	94%	101%	83%	Radialize 138kV system after the first contingency to limit the amount of load being served from Pahrump OR drop load after the second contingency if the bank has short-term emergency rating
VEA-SP-T-3	18023 PAHRUMP 230 - 18085 PAHRUMP 138 - Ckt 1	AMARGOSA -SANDY 138-kV Ckt 1 _PAHRUMP 230/138-kV Tran Bnk 2	C	N-1-1	94%	101%	83%	Radialize 138kV system after the first contingency to limit the amount of load being served from Pahrump OR drop load after the second contingency if the bank has short-term emergency rating

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
VEA-SP-T-4	18023 PAHRUMP 230 - 18085 PAHRUMP 138 - Ckt 1	INNOVATION -MERCERYSW 138-kV Ckt 1 _PAHRUMP 230/138-kV Tran Bnk 2	C	N-1-1	94%	108%	88%	Radialize 138kV system after the first contingency to limit the amount of load being served from Pahrump OR drop load after the second contingency if the bank has short-term emergency rating
VEA-SP-T-5	18023 PAHRUMP 230 - 18085 PAHRUMP 138 - Ckt 1	JACKASSF -LTHRPWLS 138-kV Ckt 1 _PAHRUMP 230/138-kV Tran Bnk 2	C	N-1-1	96%	105%	82%	Radialize 138kV system after the first contingency to limit the amount of load being served from Pahrump OR drop load after the second contingency if the bank has short-term emergency rating
VEA-SP-T-6	18023 PAHRUMP 230 - 18085 PAHRUMP 138 - Ckt 1	JACKASSF -MERCERYSW 138-kV Ckt 1 _PAHRUMP 230/138-kV Tran Bnk 2	C	N-1-1	94%	101%	81%	Radialize 138kV system after the first contingency to limit the amount of load being served from Pahrump OR drop load after the second contingency if the bank has short-term emergency rating
VEA-SP-T-7	18023 PAHRUMP 230 - 18085 PAHRUMP 138 - Ckt 1	LTHRPWLS -VALLEYTP 138-kV Ckt 1 _PAHRUMP 230/138-kV Tran Bnk 2	C	N-1-1	96%	105%	81%	Radialize 138kV system after the first contingency to limit the amount of load being served from Pahrump OR drop load after the second contingency if the bank has short-term emergency rating

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
VEA-SP-T-8	18023 PAHRUMP 230 - 18085 PAHRUMP 138 - Ckt 1	PAHRUMP 230/138-kV Tran Bnk 2 _INNOVATION 230/138-kV Tran Bnk 1	C	N-1-1	94%	108%	88%	Radialize 138kV system after the first contingency to limit the amount of load being served from Pahrump OR drop load after the second contingency if the bank has short-term emergency rating
VEA-SP-T-9	18023 PAHRUMP 230 - 18085 PAHRUMP 138 - Ckt 2	AMARGOSA 230/138-kV Tran Bnk 1 _PAHRUMP 230/138-kV Tran Bnk 1	C	N-1-1	94%	101%	83%	Radialize 138kV system after the first contingency to limit the amount of load being served from Pahrump OR drop load after the second contingency if the bank has short-term emergency rating
VEA-SP-T-10	18023 PAHRUMP 230 - 18085 PAHRUMP 138 - Ckt 2	AMARGOSA -SANDY 138-kV Ckt 1 _PAHRUMP 230/138-kV Tran Bnk 1	C	N-1-1	94%	101%	83%	Radialize 138kV system after the first contingency to limit the amount of load being served from Pahrump OR drop load after the second contingency if the bank has short-term emergency rating
VEA-SP-T-11	18023 PAHRUMP 230 - 18085 PAHRUMP 138 - Ckt 2	INNOVATION -MERCYSW 138-kV Ckt 1 _PAHRUMP 230/138-kV Tran Bnk 1	C	N-1-1	93%	108%	88%	Radialize 138kV system after the first contingency to limit the amount of load being served from Pahrump OR drop load after the second contingency if the bank has short-term emergency rating



**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
VEA-SP-T-12	18023 PAHRUMP 230 - 18085 PAHRUMP 138 - Ckt 2	JACKASSF -LTHRPWLS 138-kV Ckt 1 _PAHRUMP 230/138-kV Tran Bnk 1	C	N-1-1	97%	105%	82%	Radialize 138kV system after the first contingency to limit the amount of load being served from Pahrump OR drop load after the second contingency if the bank has short-term emergency rating
VEA-SP-T-13	18023 PAHRUMP 230 - 18085 PAHRUMP 138 - Ckt 2	LTHRPWLS -VALLEYTP 138-kV Ckt 1 _PAHRUMP 230/138-kV Tran Bnk 1	C	N-1-1	95%	104%	81%	Radialize 138kV system after the first contingency to limit the amount of load being served from Pahrump OR drop load after the second contingency if the bank has short-term emergency rating
VEA-SP-T-14	18023 PAHRUMP 230 - 18085 PAHRUMP 138 - Ckt 2	PAHRUMP 230/138-kV Tran Bnk 1 _INNOVATION 230/138-kV Tran Bnk 1	C	N-1-1	93%	108%	88%	Radialize 138kV system after the first contingency to limit the amount of load being served from Pahrump OR drop load after the second contingency if the bank has short-term emergency rating

2013/2014 ISO Reliability Assessment - Study Results

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



**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
VEA-SP-T-15	18045 CANYON 138 - 18050 COLDCREK 138 - Ckt 1	NWEST -DESERT VIEW 230-kV Ckt 1 _PAHRUMP -CRAZY EYE SS 230-kV Ckt 1	C	N-1-1	130%	Diverged	Diverged	Till 2015 - UVLS will drop 1 load block and will mitigate the issue. 2015 onwards - Operate the 138 kV system in radial with three independent supplies from Amargosa, Pahrump, and Jackass Flat transmission sources after first contingency so that the next 230kV line (N-1) will result in consequential loss of load.
VEA-SP-T-16	18045 CANYON 138 - 18102 SNOW MTN 138 - Ckt 1	NWEST -DESERT VIEW 230-kV Ckt 1 _PAHRUMP -CRAZY EYE SS 230-kV Ckt 1	C	N-1-1	131%	Diverged	Diverged	Till 2015 - UVLS will drop 1 load block and will mitigate the issue. 2015 onwards - Operate the 138 kV system in radial with three independent supplies from Amargosa, Pahrump, and Jackass Flat transmission sources after first contingency so that the next 230kV line (N-1) will result in consequential loss of load.

2013/2014 ISO Reliability Assessment - Study Results

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



**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
VEA-SP-T-17	18050 COLDCREK 138 - 18091 RADAR 138 - Ckt 1	NWEST -DESERT VIEW 230-kV Ckt 1 _PAHRUMP -CRAZY EYE SS 230-kV Ckt 1	C	N-1-1	125%	Diverged	Diverged	Till 2015 - UVLS will drop 1 load block and will mitigate the issue. 2015 onwards - Operate the 138 kV system in radial with three independent supplies from Amargosa, Pahrump, and Jackass Flat transmission sources after first contingency so that the next 230kV line (N-1) will result in consequential loss of load.
VEA-SP-T-18	18073 IS TAP 138 - 18078 MERCYSW 138 - Ckt 1	NWEST -DESERT VIEW 230-kV Ckt 1 _PAHRUMP -CRAZY EYE SS 230-kV Ckt 1	C	N-1-1	114%	Diverged	Diverged	Till 2015 - UVLS will drop 1 load block and will mitigate the issue. 2015 onwards - Operate the 138 kV system in radial with three independent supplies from Amargosa, Pahrump, and Jackass Flat transmission sources after first contingency so that the next 230kV line (N-1) will result in consequential loss of load.

2013/2014 ISO Reliability Assessment - Study Results

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



**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
VEA-SP-T-19	18073 IS TAP 138 - Ckt 1 138 - 18091 RADAR	NWEST -DESERT VIEW 230-kV Ckt 1 _PAHRUMP -CRAZY EYE SS 230-kV Ckt 1	C	N-1-1	124%	Diverged	Diverged	Till 2015 - UVLS will drop 1 load block and will mitigate the issue. 2015 onwards - Operate the 138 kV system in radial with three independent supplies from Amargosa, Pahrump, and Jackass Flat transmission sources after first contingency so that the next 230kV line (N-1) will result in consequential loss of load.
VEA-SP-T-20	18084 NWEST SNOW MTN 138 - Ckt 1 138 - 18102	NWEST -DESERT VIEW 230-kV Ckt 1 _PAHRUMP -CRAZY EYE SS 230-kV Ckt 1	C	N-1-1	132%	Diverged	Diverged	Till 2015 - UVLS will drop 1 load block and will mitigate the issue. 2015 onwards - Operate the 138 kV system in radial with three independent supplies from Amargosa, Pahrump, and Jackass Flat transmission sources after first contingency so that the next 230kV line (N-1) will result in consequential loss of load.

San Onofre Nuclear Generation Station was retired on June 7, 2013 and therefore was removed from the base cases used for the 2013/14 ISO transmission planning process.

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
VEA-SP-VD-1	18023 PAHRUMP 230 kV	PAHRUMP -CRAZY EYE SS 230-kV Ckt 1	B	N-1	-6%	-6%	-8%	Dynamic reactive support or an exception.
VEA-SP-VD-2	18023 PAHRUMP 230 kV	CRAZY EYE SS -BOB SS 230-kV Ckt 1	B	N-1	-5%	-6%	0%	Dynamic reactive support or an exception.
VEA-SP-VD-3	18919 CRAZY EYE SS 230 kV	CRAZY EYE SS -BOB SS 230-kV Ckt 1	B	N-1	-6%	-7%	0%	Dynamic reactive support or an exception.
VEA-SP-VD-4	18023 PAHRUMP 230 kV	NWEST -DESERT VIEW 230-kV Ckt 1 _PAHRUMP -CRAZY EYE SS 230-kV Ckt 1	C3	N-1-1	-27%	Diverged	Diverged	Till 2015 - UVLS will drop 1 load block and will mitigate the issue. 2015 onwards - Operate the 138 kV system in radial with three independent supplies from Amargosa, Pahrump, and Jackass Flat transmission sources after first contingency so that the next 230kV line (N-1) will result in consequential loss of load.
VEA-SP-VD-5	18036 BEATTY 138 kV	NWEST -DESERT VIEW 230-kV Ckt 1 _PAHRUMP -CRAZY EYE SS 230-kV Ckt 1	C3	N-1-1	-19%	Diverged	Diverged	Till 2015 - UVLS will drop 1 load block and will mitigate the issue. 2015 onwards - Operate the 138 kV system in radial with three independent supplies from Amargosa, Pahrump, and Jackass Flat transmission sources after first contingency so that the next 230kV line (N-1) will result in consequential loss of load.
VEA-SP-VD-6	18071 IND SPR 138 kV	NWEST -DESERT VIEW 230-kV Ckt 1 _PAHRUMP -CRAZY EYE SS 230-kV Ckt 1	C3	N-1-1	-10%	Diverged	Diverged	Till 2015 - UVLS will drop 1 load block and will mitigate the issue. 2015 onwards - Operate the 138 kV system in radial with three independent supplies from Amargosa, Pahrump, and Jackass Flat transmission sources after first contingency so that the next 230kV line (N-1) will result in consequential loss of load.

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
VEA-SP-VD-7	18076 LTHRPWLS 138 kV	NWEST -DESERT VIEW 230-kV Ckt 1 _PAHRUMP -CRAZY EYE SS 230-kV Ckt 1	C3	N-1-1	-19%	Diverged	Diverged	Till 2015 - UVLS will drop 1 load block and will mitigate the issue. 2015 onwards - Operate the 138 kV system in radial with three independent supplies from Amargosa, Pahrump, and Jackass Flat transmission sources after first contingency so that the next 230kV line (N-1) will result in consequential loss of load.
VEA-SP-VD-8	18083 NTSCANYN 138 kV	NWEST -DESERT VIEW 230-kV Ckt 1 _PAHRUMP -CRAZY EYE SS 230-kV Ckt 1	C3	N-1-1	-18%	Not Run	Not Run	Till 2015 - UVLS will drop 1 load block and will mitigate the issue. 2015 onwards - Operate the 138 kV system in radial with three independent supplies from Amargosa, Pahrump, and Jackass Flat transmission sources after first contingency so that the next 230kV line (N-1) will result in consequential loss of load.
VEA-SP-VD-9	18085 PAHRUMP 138 kV	NWEST -DESERT VIEW 230-kV Ckt 1 _PAHRUMP -CRAZY EYE SS 230-kV Ckt 1	C3	N-1-1	-21%	Diverged	Diverged	Till 2015 - UVLS will drop 1 load block and will mitigate the issue. 2015 onwards - Operate the 138 kV system in radial with three independent supplies from Amargosa, Pahrump, and Jackass Flat transmission sources after first contingency so that the next 230kV line (N-1) will result in consequential loss of load.

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
VEA-SP-VD-10	18098 SANDY 138 kV	NWEST -DESERT VIEW 230-kV Ckt 1 _PAHRUMP -CRAZY EYE SS 230-kV Ckt 1	C3	N-1-1	-17%	Diverged	Diverged	Till 2015 - UVLS will drop 1 load block and will mitigate the issue. 2015 onwards - Operate the 138 kV system in radial with three independent supplies from Amargosa, Pahrump, and Jackass Flat transmission sources after first contingency so that the next 230kV line (N-1) will result in consequential loss of load.
VEA-SP-VD-11	18111 VALLEYVE 138 kV	NWEST -DESERT VIEW 230-kV Ckt 1 _PAHRUMP -CRAZY EYE SS 230-kV Ckt 1	C3	N-1-1	-19%	Diverged	Diverged	Till 2015 - UVLS will drop 1 load block and will mitigate the issue. 2015 onwards - Operate the 138 kV system in radial with three independent supplies from Amargosa, Pahrump, and Jackass Flat transmission sources after first contingency so that the next 230kV line (N-1) will result in consequential loss of load.
VEA-SP-VD-12	18296 VISTA 138 kV	NWEST -DESERT VIEW 230-kV Ckt 1 _PAHRUMP -CRAZY EYE SS 230-kV Ckt 1	C3	N-1-1	-21%	Diverged	Diverged	Till 2015 - UVLS will drop 1 load block and will mitigate the issue. 2015 onwards - Operate the 138 kV system in radial with three independent supplies from Amargosa, Pahrump, and Jackass Flat transmission sources after first contingency so that the next 230kV line (N-1) will result in consequential loss of load.

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
VEA-SP-VD-13	18910 INNOVATION 230 kV	NWEST -DESERT VIEW 230-kV Ckt 1 _PAHRUMP -CRAZY EYE SS 230-kV Ckt 1	C3	N-1-1	-26%	Diverged	Diverged	Till 2015 - UVLS will drop 1 load block and will mitigate the issue. 2015 onwards - Operate the 138 kV system in radial with three independent supplies from Amargosa, Pahrump, and Jackass Flat transmission sources after first contingency so that the next 230kV line (N-1) will result in consequential loss of load.
VEA-SP-VD-14	18924 GAMEBIRD 138 kV	NWEST -DESERT VIEW 230-kV Ckt 1 _PAHRUMP -CRAZY EYE SS 230-kV Ckt 1	C3	N-1-1	-21%	Diverged	Diverged	Till 2015 - UVLS will drop 1 load block and will mitigate the issue. 2015 onwards - Operate the 138 kV system in radial with three independent supplies from Amargosa, Pahrump, and Jackass Flat transmission sources after first contingency so that the next 230kV line (N-1) will result in consequential loss of load.
VEA-SP-VD-15	18928 THSNDAIR 138 kV	NWEST -DESERT VIEW 230-kV Ckt 1 _PAHRUMP -CRAZY EYE SS 230-kV Ckt 1	C3	N-1-1	-21%	Diverged	Diverged	Till 2015 - UVLS will drop 1 load block and will mitigate the issue. 2015 onwards - Operate the 138 kV system in radial with three independent supplies from Amargosa, Pahrump, and Jackass Flat transmission sources after first contingency so that the next 230kV line (N-1) will result in consequential loss of load.



**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
VEA-SP-VD-16	18932 CHARLSTN 138 kV	NWEST -DESERT VIEW 230-kV Ckt 1 _PAHRUMP -CRAZY EYE SS 230-kV Ckt 1	C3	N-1-1	-21%	Diverged	Diverged	Till 2015 - UVLS will drop 1 load block and will mitigate the issue. 2015 onwards - Operate the 138 kV system in radial with three independent supplies from Amargosa, Pahrump, and Jackass Flat transmission sources after first contingency so that the next 230kV line (N-1) will result in consequential loss of load.
VEA-SP-VD-17	18911 INNOVATION 138 kV	NWEST -DESERT VIEW 230-kV Ckt 1 _PAHRUMP -CRAZY EYE SS 230-kV Ckt 1	C3	N-1-1	-17%	Diverged	Diverged	Till 2015 - UVLS will drop 1 load block and will mitigate the issue. 2015 onwards - Operate the 138 kV system in radial with three independent supplies from Amargosa, Pahrump, and Jackass Flat transmission sources after first contingency so that the next 230kV line (N-1) will result in consequential loss of load.
VEA-SP-VD-18	18913 JOHNNIE 138 kV	NWEST -DESERT VIEW 230-kV Ckt 1 _PAHRUMP -CRAZY EYE SS 230-kV Ckt 1	C3	N-1-1	-21%	Diverged	Diverged	Till 2015 - UVLS will drop 1 load block and will mitigate the issue. 2015 onwards - Operate the 138 kV system in radial with three independent supplies from Amargosa, Pahrump, and Jackass Flat transmission sources after first contingency so that the next 230kV line (N-1) will result in consequential loss of load.
VEA-SP-VD-19	18296 VISTA 138 kV	PAHRUMP -VISTA 138-kV Ckt 1 _GAMEBIRD -THSNDAIR 138-kV Ckt 1	C3	N-1-1	-14%	-14%	Diverged	Open Charlston - Thousandaire 138kV line after the first N-1
VEA-SP-VD-20	18928 THSNDAIR 138 kV	PAHRUMP -VISTA 138-kV Ckt 1 _GAMEBIRD -THSNDAIR 138-kV Ckt 1	C3	N-1-1	-16%	-16%	Diverged	Open Charlston - Thousandaire 138kV line after the first N-1
VEA-SP-VD-21	18932 CHARLSTN 138 kV	PAHRUMP -VISTA 138-kV Ckt 1 _GAMEBIRD -THSNDAIR 138-kV Ckt 1	C3	N-1-1	-15%	-15%	Diverged	Open Charlston - Thousandaire 138kV line after the first N-1

2013/2014 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
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
VEA-SP-VD-22	18913 JOHNNIE 138 kV	PAHRUMP -VISTA 138-kV Ckt 1 _GAMEBIRD -THSNDAIR 138-kV Ckt 1	C3	N-1-1	-13%	-13%	Diverged	Open Charlston - Thousandaire 138kV line after the first N-1

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2015 Summer Off-Peak	2018 Summer Light Load	N/A	
VEA-NP-VD-1	18919 CRAZY EYE SS 230 kV	CRAZY EYE SS -BOB SS 230-kV Ckt 1 _INNOVATION -DESERT VIEW 230-kV Ckt 1	C3	N-1-1	-14%	9%		Lock/adjust the 230/138kV and 138/24kV taps after the first N-1 or set the UVLS to monitor HV side
VEA-NP-VD-2	18919 CRAZY EYE SS 230 kV	CRAZY EYE SS -BOB SS 230-kV Ckt 1 _PAHRUMP -INNOVATION 230-kV Ckt 1	C3	N-1-1	-14%	-14%		Lock/adjust the 230/138kV and 138/24kV taps after the first N-1 or set the UVLS to monitor HV side
VEA-NP-VD-3	18919 CRAZY EYE SS 230 kV	NWEST -DESERT VIEW 230-kV Ckt 1 _CRAZY EYE SS -BOB SS 230-kV Ckt 1	C3	N-1-1	-14%	9%		Lock/adjust the 230/138kV and 138/24kV taps after the first N-1 or set the UVLS to monitor HV side
VEA-NP-VD-4	18910 INNOVATION 230 kV	CRAZY EYE SS -BOB SS 230-kV Ckt 1 _INNOVATION -DESERT VIEW 230-kV Ckt 1	C3	N-1-1	-14%	9%		Lock/adjust the 230/138kV and 138/24kV taps after the first N-1 or set the UVLS to monitor HV side
VEA-NP-VD-5	18910 INNOVATION 230 kV	NWEST -DESERT VIEW 230-kV Ckt 1 _CRAZY EYE SS -BOB SS 230-kV Ckt 1	C3	N-1-1	-14%	9%		Lock/adjust the 230/138kV and 138/24kV taps after the first N-1 or set the UVLS to monitor HV side
VEA-NP-VD-6	18910 INNOVATION 230 kV	NWEST -DESERT VIEW 230-kV Ckt 1 _PAHRUMP -CRAZY EYE SS 230-kV Ckt 1	C3	N-1-1	-15%	-14%		Lock/adjust the 230/138kV and 138/24kV taps after the first N-1 or set the UVLS to monitor HV side
VEA-NP-VD-7	18910 INNOVATION 230 kV	NWEST -DESERT VIEW 230-kV Ckt 1 _PAHRUMP -INNOVATION 230-kV Ckt 1	C3	N-1-1	-11%	3%		Lock/adjust the 230/138kV and 138/24kV taps after the first N-1 or set the UVLS to monitor HV side
VEA-NP-VD-8	18910 INNOVATION 230 kV	PAHRUMP -CRAZY EYE SS 230-kV Ckt 1 _INNOVATION -DESERT VIEW 230-kV Ckt 1	C3	N-1-1	-15%	-14%		Lock/adjust the 230/138kV and 138/24kV taps after the first N-1 or set the UVLS to monitor HV side
VEA-NP-VD-9	18910 INNOVATION 230 kV	PAHRUMP -INNOVATION 230-kV Ckt 1 _INNOVATION -DESERT VIEW 230-kV Ckt 1	C3	N-1-1	-11%	1%		Lock/adjust the 230/138kV and 138/24kV taps after the first N-1 or set the UVLS to monitor HV side
VEA-NP-VD-10	18023 PAHRUMP 230 kV	CRAZY EYE SS -BOB SS 230-kV Ckt 1 _INNOVATION -DESERT VIEW 230-kV Ckt 1	C3	N-1-1	-14%	9%		Lock/adjust the 230/138kV and 138/24kV taps after the first N-1 or set the UVLS to monitor HV side

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2015 Summer Off-Peak	2018 Summer Light Load	N/A	
VEA-NP-VD-11	18023 PAHRUMP 230 kV	CRAZY EYE SS -BOB SS 230-kV Ckt 1 _PAHRUMP -INNOVATION 230-kV Ckt 1	C3	N-1-1	-14%	-14%		Lock/adjust the 230/138kV and 138/24kV taps after the first N-1 or set the UVLS to monitor HV side
VEA-NP-VD-12	18023 PAHRUMP 230 kV	NWEST -DESERT VIEW 230-kV Ckt 1 _CRAZY EYE SS -BOB SS 230-kV Ckt 1	C3	N-1-1	-14%	9%		Lock/adjust the 230/138kV and 138/24kV taps after the first N-1 or set the UVLS to monitor HV side
VEA-NP-VD-13	18023 PAHRUMP 230 kV	NWEST -DESERT VIEW 230-kV Ckt 1 _PAHRUMP -CRAZY EYE SS 230-kV Ckt 1	C3	N-1-1	-15%	-14%		Lock/adjust the 230/138kV and 138/24kV taps after the first N-1 or set the UVLS to monitor HV side
VEA-NP-VD-14	18023 PAHRUMP 230 kV	PAHRUMP -CRAZY EYE SS 230-kV Ckt 1 _INNOVATION -DESERT VIEW 230-kV Ckt 1	C3	N-1-1	-15%	-14%		Lock/adjust the 230/138kV and 138/24kV taps after the first N-1 or set the UVLS to monitor HV side
VEA-NP-VD-15	18023 PAHRUMP 230 kV	PAHRUMP -CRAZY EYE SS 230-kV Ckt 1 _PAHRUMP -INNOVATION 230-kV Ckt 1	C3	N-1-1	-15%	-15%		Lock/adjust the 230/138kV and 138/24kV taps after the first N-1 or set the UVLS to monitor HV side

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
VEA-SP-V-1	18023 PAHRUMP 230 kV	NWEST -DESERT VIEW 230-kV Ckt 1 _PAHRUMP -CRAZY EYE SS 230-kV Ckt 1	C3	N-1-1	0.74	Diverged	Diverged	Till 2015 - UVLS will drop 1 load block and will mitigate the issue. 2015 onwards - Operate the 138 kV system in radial with three independent supplies from Amargosa, Pahrump, and Jackass Flat transmission sources after first contingency so that the next 230kV line (N-1) will result in consequential loss of load.
VEA-SP-V-2	18036 BEATTY 138 kV	NWEST -DESERT VIEW 230-kV Ckt 1 _PAHRUMP -CRAZY EYE SS 230-kV Ckt 1	C3	N-1-1	0.83	Diverged	Diverged	Till 2015 - UVLS will drop 1 load block and will mitigate the issue. 2015 onwards - Operate the 138 kV system in radial with three independent supplies from Amargosa, Pahrump, and Jackass Flat transmission sources after first contingency so that the next 230kV line (N-1) will result in consequential loss of load.
VEA-SP-V-3	18076 LTHRPWLS 138 kV	NWEST -DESERT VIEW 230-kV Ckt 1 _PAHRUMP -CRAZY EYE SS 230-kV Ckt 1	C3	N-1-1	0.83	Diverged	Diverged	Till 2015 - UVLS will drop 1 load block and will mitigate the issue. 2015 onwards - Operate the 138 kV system in radial with three independent supplies from Amargosa, Pahrump, and Jackass Flat transmission sources after first contingency so that the next 230kV line (N-1) will result in consequential loss of load.

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
VEA-SP-V-4	18085 PAHRUMP 138 kV	NWEST -DESERT VIEW 230-kV Ckt 1 _PAHRUMP -CRAZY EYE SS 230-kV Ckt 1	C3	N-1-1	0.82	Diverged	Diverged	Till 2015 - UVLS will drop 1 load block and will mitigate the issue. 2015 onwards - Operate the 138 kV system in radial with three independent supplies from Amargosa, Pahrump, and Jackass Flat transmission sources after first contingency so that the next 230kV line (N-1) will result in consequential loss of load.
VEA-SP-V-5	18098 SANDY 138 kV	NWEST -DESERT VIEW 230-kV Ckt 1 _PAHRUMP -CRAZY EYE SS 230-kV Ckt 1	C3	N-1-1	0.85	Diverged	Diverged	Till 2015 - UVLS will drop 1 load block and will mitigate the issue. 2015 onwards - Operate the 138 kV system in radial with three independent supplies from Amargosa, Pahrump, and Jackass Flat transmission sources after first contingency so that the next 230kV line (N-1) will result in consequential loss of load.
VEA-SP-V-6	18111 VALLEYVE 138 kV	NWEST -DESERT VIEW 230-kV Ckt 1 _PAHRUMP -CRAZY EYE SS 230-kV Ckt 1	C3	N-1-1	0.83	Diverged	Diverged	Till 2015 - UVLS will drop 1 load block and will mitigate the issue. 2015 onwards - Operate the 138 kV system in radial with three independent supplies from Amargosa, Pahrump, and Jackass Flat transmission sources after first contingency so that the next 230kV line (N-1) will result in consequential loss of load.

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
VEA-SP-V-7	18113 VALLEYTP 138 kV	NWEST -DESERT VIEW 230-kV Ckt 1 _PAHRUMP -CRAZY EYE SS 230-kV Ckt 1	C3	N-1-1	0.83	Diverged	Diverged	Till 2015 - UVLS will drop 1 load block and will mitigate the issue. 2015 onwards - Operate the 138 kV system in radial with three independent supplies from Amargosa, Pahrump, and Jackass Flat transmission sources after first contingency so that the next 230kV line (N-1) will result in consequential loss of load.
VEA-SP-V-8	18296 VISTA 138 kV	NWEST -DESERT VIEW 230-kV Ckt 1 _PAHRUMP -CRAZY EYE SS 230-kV Ckt 1	C3	N-1-1	0.81	Diverged	Diverged	Till 2015 - UVLS will drop 1 load block and will mitigate the issue. 2015 onwards - Operate the 138 kV system in radial with three independent supplies from Amargosa, Pahrump, and Jackass Flat transmission sources after first contingency so that the next 230kV line (N-1) will result in consequential loss of load.
VEA-SP-V-9	18910 INNOVATION 230 kV	NWEST -DESERT VIEW 230-kV Ckt 1 _PAHRUMP -CRAZY EYE SS 230-kV Ckt 1	C3	N-1-1	0.75	Diverged	Diverged	Till 2015 - UVLS will drop 1 load block and will mitigate the issue. 2015 onwards - Operate the 138 kV system in radial with three independent supplies from Amargosa, Pahrump, and Jackass Flat transmission sources after first contingency so that the next 230kV line (N-1) will result in consequential loss of load.

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
VEA-SP-V-10	18924 GAMEBIRD 138 kV	NWEST -DESERT VIEW 230-kV Ckt 1 _PAHRUMP -CRAZY EYE SS 230-kV Ckt 1	C3	N-1-1	0.82	Diverged	Diverged	Till 2015 - UVLS will drop 1 load block and will mitigate the issue. 2015 onwards - Operate the 138 kV system in radial with three independent supplies from Amargosa, Pahrump, and Jackass Flat transmission sources after first contingency so that the next 230kV line (N-1) will result in consequential loss of load.
VEA-SP-V-11	18928 THSNDAIR 138 kV	NWEST -DESERT VIEW 230-kV Ckt 1 _PAHRUMP -CRAZY EYE SS 230-kV Ckt 1	C3	N-1-1	0.81	Diverged	Diverged	Till 2015 - UVLS will drop 1 load block and will mitigate the issue. 2015 onwards - Operate the 138 kV system in radial with three independent supplies from Amargosa, Pahrump, and Jackass Flat transmission sources after first contingency so that the next 230kV line (N-1) will result in consequential loss of load.
VEA-SP-V-12	18932 CHARLSTN 138 kV	NWEST -DESERT VIEW 230-kV Ckt 1 _PAHRUMP -CRAZY EYE SS 230-kV Ckt 1	C3	N-1-1	0.81	Diverged	Diverged	Till 2015 - UVLS will drop 1 load block and will mitigate the issue. 2015 onwards - Operate the 138 kV system in radial with three independent supplies from Amargosa, Pahrump, and Jackass Flat transmission sources after first contingency so that the next 230kV line (N-1) will result in consequential loss of load.



**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
VEA-SP-V-13	18911 INNOVATION 138 kV	NWEST -DESERT VIEW 230-kV Ckt 1 _PAHRUMP -CRAZY EYE SS 230-kV Ckt 1	C3	N-1-1	0.85	Diverged	Diverged	Till 2015 - UVLS will drop 1 load block and will mitigate the issue. 2015 onwards - Operate the 138 kV system in radial with three independent supplies from Amargosa, Pahrump, and Jackass Flat transmission sources after first contingency so that the next 230kV line (N-1) will result in consequential loss of load.
VEA-SP-V-14	18913 JOHNNIE 138 kV	NWEST -DESERT VIEW 230-kV Ckt 1 _PAHRUMP -CRAZY EYE SS 230-kV Ckt 1	C3	N-1-1	0.82	Diverged	Diverged	Till 2015 - UVLS will drop 1 load block and will mitigate the issue. 2015 onwards - Operate the 138 kV system in radial with three independent supplies from Amargosa, Pahrump, and Jackass Flat transmission sources after first contingency so that the next 230kV line (N-1) will result in consequential loss of load.
VEA-SP-V-15	18296 VISTA 138 kV	PAHRUMP -VISTA 138-kV Ckt 1 _GAMEBIRD -THSNDAIR 138-kV Ckt 1	C3	N-1-1	0.88	0.88	Diverged	Open Charleston - Thousandaire 138kV line after the first N-1
VEA-SP-V-16	18928 THSNDAIR 138 kV	PAHRUMP -VISTA 138-kV Ckt 1 _GAMEBIRD -THSNDAIR 138-kV Ckt 1	C3	N-1-1	0.86	0.86	Diverged	Open Charleston - Thousandaire 138kV line after the first N-1
VEA-SP-V-17	18932 CHARLSTN 138 kV	PAHRUMP -VISTA 138-kV Ckt 1 _GAMEBIRD -THSNDAIR 138-kV Ckt 1	C3	N-1-1	0.87	0.87	Diverged	Open Charleston - Thousandaire 138kV line after the first N-1
VEA-SP-V-18	18913 JOHNNIE 138 kV	PAHRUMP -VISTA 138-kV Ckt 1 _GAMEBIRD -THSNDAIR 138-kV Ckt 1	C3	N-1-1	0.89	0.89	Diverged	Open Charleston - Thousandaire 138kV line after the first N-1

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2015 Summer Off-Peak	2018 Summer Light Load	N/A	
VEA-NP-V-1	18023 PAHRUMP 230 kV	Base system (n-0)	A	N-0	1.01	1.06		Adjust taps on Amargosa 230/115 kV transformer and Eldorado 500/230kV transformer
VEA-NP-V-2	18910 INNOVATION 230 kV	Base system (n-0)	A	N-0	1.01	1.05		Adjust taps on Amargosa 230/115 kV transformer and Eldorado 500/230kV transformer
VEA-NP-V-3	18909 BOB SS 230 kV	Base system (n-0)	A	N-0	1.02	1.05		Adjust taps on Amargosa 230/115 kV transformer and Eldorado 500/230kV transformer
VEA-NP-V-4	18919 CRAZY EYE SS 230 kV	Base system (n-0)	A	N-0	1.02	1.06		Adjust taps on Amargosa 230/115 kV transformer and Eldorado 500/230kV transformer
VEA-NP-V-5	18023 PAHRUMP 230 kV	NWEST -DESERT VIEW 230-kV Ckt 1 _PAHRUMP -CRAZY EYE SS 230-kV Ckt 1	C3	N-1-1	0.86	0.91		Lock/adjust the 230/138kV and 138/24kV taps after the first N-1 or set the UVLS to monitor HV side
VEA-NP-V-6	18023 PAHRUMP 230 kV	NWEST -DESERT VIEW 230-kV Ckt 1 _CRAZY EYE SS -BOB SS 230-kV Ckt 1	C3	N-1-1	0.87	1.15		Lock/adjust the 230/138kV and 138/24kV taps after the first N-1 or set the UVLS to monitor HV side
VEA-NP-V-7	18023 PAHRUMP 230 kV	PAHRUMP -CRAZY EYE SS 230-kV Ckt 1 _PAHRUMP -INNOVATION 230-kV Ckt 1	C3	N-1-1	0.87	0.90		Lock/adjust the 230/138kV and 138/24kV taps after the first N-1 or set the UVLS to monitor HV side
VEA-NP-V-8	18023 PAHRUMP 230 kV	PAHRUMP -CRAZY EYE SS 230-kV Ckt 1 _INNOVATION -DESERT VIEW 230-kV Ckt 1	C3	N-1-1	0.86	0.91		Lock/adjust the 230/138kV and 138/24kV taps after the first N-1 or set the UVLS to monitor HV side
VEA-NP-V-9	18023 PAHRUMP 230 kV	CRAZY EYE SS -BOB SS 230-kV Ckt 1 _PAHRUMP -INNOVATION 230-kV Ckt 1	C3	N-1-1	0.88	0.91		Lock/adjust the 230/138kV and 138/24kV taps after the first N-1 or set the UVLS to monitor HV side
VEA-NP-V-10	18023 PAHRUMP 230 kV	CRAZY EYE SS -BOB SS 230-kV Ckt 1 _INNOVATION -DESERT VIEW 230-kV Ckt 1	C3	N-1-1	0.87	1.15		Lock/adjust the 230/138kV and 138/24kV taps after the first N-1 or set the UVLS to monitor HV side

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2015 Summer Off-Peak	2018 Summer Light Load	N/A	
VEA-NP-V-11	18910 INNOVATION 230 kV	NWEST -DESERT VIEW 230-kV Ckt 1 _PAHRUMP -CRAZY EYE SS 230-kV Ckt 1	C3	N-1-1	0.87	0.91		Lock/adjust the 230/138kV and 138/24kV taps after the first N-1 or set the UVLS to monitor HV side
VEA-NP-V-12	18910 INNOVATION 230 kV	NWEST -DESERT VIEW 230-kV Ckt 1 _CRAZY EYE SS -BOB SS 230-kV Ckt 1	C3	N-1-1	0.88	1.15		Lock/adjust the 230/138kV and 138/24kV taps after the first N-1 or set the UVLS to monitor HV side
VEA-NP-V-13	18910 INNOVATION 230 kV	PAHRUMP -CRAZY EYE SS 230-kV Ckt 1 _INNOVATION -DESERT VIEW 230-kV Ckt 1	C3	N-1-1	0.87	0.91		Lock/adjust the 230/138kV and 138/24kV taps after the first N-1 or set the UVLS to monitor HV side
VEA-NP-V-14	18910 INNOVATION 230 kV	CRAZY EYE SS -BOB SS 230-kV Ckt 1 _INNOVATION -DESERT VIEW 230-kV Ckt 1	C3	N-1-1	0.88	1.15		Lock/adjust the 230/138kV and 138/24kV taps after the first N-1 or set the UVLS to monitor HV side

2013/2014 ISO Reliability Assessment - Study Results

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



**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.



**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.

2013/2014 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
		Select..	Select..	Select..	

No single source substation with more than 100 MW Load

2013/2014 ISO Reliability Assessment - Study Results

Study Area: **Valley Electric Association - Summer Off-Peak & Summer Light Load**



**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