# APPENDIX C: Reliability Assessment Study Results

# APPENDIX C-1

# PG&E Bulk System Reliability Assessment Study Results

**2013/2014 ISO Reliability Assessment - Study Results**

**Study Area:** **PG&E BULK SYSTEM**

***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 |

**Study Area:** **PG&E BULK SYSTEM**

***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-Metclf 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 |

**Study Area:** **PG&E BULK SYSTEM**

***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 |

**Study Area:** **PG&E BULK SYSTEM**

***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 |

**Study Area:** **PG&E BULK SYSTEM**

***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 |

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

***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 |

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

***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 |

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

***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

**2013/2014 ISO Reliability Assessment - Study Results**

**Study Area:** **PG&E Humboldt - 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 | |
| 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% | |

**Study Area:** **PG&E Humboldt - 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 | |
| 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 |

**Study Area:** **PG&E Humboldt - 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 | Select.. | |
| | | | | | | | | |

No thermal violations reported

**Study Area:** **PG&E Humboldt - 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 | |
| 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 | BRDGVLLE 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 BRDGVLLE 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 | GRBRVLLE 60kV | | C1 | Bus | Not Solved | <5% | <5% | |
| HUMB-SP-VD-14 | KEKAWAKA 60kV | | C1 | Bus | Not Solved | <5% | <5% | |
| HUMB-SP-VD-15 | LYTNVLLE 60kV | | C1 | Bus | Not Solved | <5% | <5% | |

**Study Area:** **PG&E Humboldt - 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 | |
| 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% | |

**Study Area:** **PG&E Humboldt - 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 | |
| HUMB-SP-VD-24 | BRDGVLLE 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 | GRBRVLLE 60kV | | C3 | L-1/T-1 | 28.51% | 27.71% | <5% | |
| HUMB-SP-VD-29 | LYTNVLLE 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% | |

**Study Area:** **PG&E Humboldt - 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 | |
| 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 | GRBRVLLE 60kV | | B | L-1 | <5% | <5% | 5.38% | |
| HUMB-WP-VD_9 | MPLE 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% | |

**Study Area:** **PG&E Humboldt - 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 | |
| HUMB-WP-VD_14 | COVELO6 60kV | BUS FAULT AT 31110 BRDGVLLE 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 | GRBRVLLE 60kV | | C1 | Bus | <5% | Not Solved | <5% | |
| HUMB-WP-VD_18 | KEKAWAKA 60kV | | C1 | Bus | <5% | Not Solved | <5% | |
| HUMB-WP-VD_19 | LYTNVLLE 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% | |

**Study Area:** **PG&E Humboldt - 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 | |
| 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 | BRDGVLLE 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 | GRBRVLLE 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 | LYTNVLLE 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% | |

**Study Area:** **PG&E Humboldt - 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 | |
| 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% | |

**Study Area:** **PG&E Humboldt - 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 | |
| HUMB-NP-VD-1 | BRDGVLLE | 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 | BRDGVLLE 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 | GRBRVLLE 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 | LYTNVLLE 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% | | |

**Study Area:** **PG&E Humboldt - 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 | |
| HUMB-SP-V-1 | COVELO6 60kV | BUS FAULT AT 31110 BRDGVLLE 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 | GRBRVLLE 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 | LYTNVLLE 60kV | | C1 | Bus | 0.88 | >0.9 | >0.9 | |

**Study Area:** **PG&E Humboldt - 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 | |
| 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 | BRDGVLLE 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 | GRBRVLLE 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 | LYTNVLLE 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 | |

**Study Area:** **PG&E Humboldt - 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 | |
| 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 | >0.9 | Bridgeville - Garberville 115kV line |
| 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 | |

**Study Area:** **PG&E Humboldt - 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 | |
| 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 | |

| 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 | GRBRVLLE 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 | LYTNVLLE 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 | BRDGVLLE 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 | GRBRVLLE 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 | LYTNVLLE 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 | |

**Study Area:** **PG&E Humboldt - 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 | |
| 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 | |

**Study Area:** **PG&E Humboldt - 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 | |
| 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 | |

**Study Area:** **PG&E Humboldt - 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 | |
| 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 | BRDGVLLE 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 | GRBRVLLE 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 | LYTNVLLE 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 | | |

**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.

**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.

**Study Area:** **PG&E Humboldt - 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.. | |
| X-NP-SLD-1 | | | | | | | |

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

**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

**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

**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% | |

**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 Lucern 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% | |

**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-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 |

***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 |

**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-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 |

**Study Area:** **PG&E North Coast & North Bay- 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 | |
| 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% | |

**Study Area:** **PG&E North Coast & North Bay- 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 | |
| NCNB-NP-T-1 | Clear Lake - Hopland 60kV line (between Clearlake - Granite) | Geyser #3 - Eagle Rock 115 kv & Ukiah-Hopland-Cloverdale 115 kV (Ukiah sub 115kv to City of Ukaiah) | 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 |

**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 | GRBRVLLE 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 | KONOCTI6 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 |

**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-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 (Middltwn 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 |

**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-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 | KONOCTI6 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 | GRBRVLLE 60 | BUS FAULT AT LYTNVLLE 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% | |

**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-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 | GRBRVLLE 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 | LYTNVLLE 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 | |

**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 | MNDCNO 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 | KONOCTI6 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% | |

**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-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% | |

**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-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 | LYTNVLLE 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 | MNDCNO 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% | |

**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-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% | |

**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-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 |

**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 | KONOCTI6 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% | |
| 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 - Saulsalito # 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 | EGLE RCK 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 |

**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-13 | EGLE RCK 60 kV | BUS FAULT AT 31220 EGLE RCK 115.00 | C1 | Bus | 14.14% | < 10% | < 10% | Middle town 115kV project |
| NCNB-WP-VD-14 | KONOCTI6 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 | GRBRVLLE 60 kV | | C2 | Breaker | 11.59% | 19.65% | < 10% | |
| NCNB-WP-VD-27 | KEKAWAKA 60 kV | | C2 | Breaker | 11.93% | 20.34% | < 10% | |

**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-28 | LYTNVLLE 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 | KONOCTI6 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% | |

**Study Area:** **PG&E North Coast & North Bay- 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 | |
| | | | | | | | | |

No violations reported

| 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 | GRBRVLLE 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 | KONOCTI6 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 | KONOCTI6 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 | |

| 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 LYTNVLLE 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 | GRBRVLLE 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 | GRBRVLLE 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 | |

***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 | LYTNVLLE 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 | LYTNVLLE 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 | KONOCTI6 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 | |

| 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 LUCERN 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 | |

**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-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 | LYTNVLLE 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 | |

| 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 | KONOCTI6 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 | 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 | 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 | LYTNVLLE 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 | |

**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 |

| 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 | GRBRVLLE 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 | LYTNVLLE 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 | |

**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 | KONOCTI6 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 | |

**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

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

***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.

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

***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.

**Study Area:** **PG&E North Coast & North Bay- 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 violations reported.

**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.

**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.

**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.

**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

**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

**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 |

**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-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 |

**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 | DIRYVLLE 60 kV | NewBus 230/60 kV Transformer | B | T-1 | NA | <5.0 | 5.1 | Dispatch local generator |
| NV-SP-VD-8 | DIRYVLLE 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 |

**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-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 | DIRYVLLE 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 |

**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 | DIRYVLLE 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 | DIRYVLLE 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 |

**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-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 | CNTRVLLE 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 | DIRYVLLE 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 |

**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 |

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

***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.

**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

**2013/2014 ISO Reliability Assessment - Study Results**

**Study Area:** **PG&E North Valley - 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 | |
| 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 |

**Study Area:** **PG&E North Valley - 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 | |
| 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 |

**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 | CARBERY 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 |

**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 | DIRYVLLE 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 |

**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 | SMPSN-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 |

**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.

**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.

**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 |

**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 |

**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.

**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 |

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

***Voltage Deviations***

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

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

***Voltage Deviations***

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

**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 |

**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 |

**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-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 |

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

***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.

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

***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.

**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 |

**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) |

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

**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 |

**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 |

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

***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 |

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

***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.

**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 |

**2013/2014 ISO Reliability Assessment - Study Results**

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

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

**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 |

**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 |

**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 | NEWCSTLE 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 |

**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-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 |

**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 |

**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 |

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

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

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

***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.

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

***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.

**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 |

**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 |

**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 |

**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 | CAMANCH 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- | LAMMERS 115 kV | Normal | A | N-0 | <1.05 | 1.06 | | Under review for possible exemption |
| STOC-NP-V- | 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 |

**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 |

**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 |

**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 |

**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-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 |

**Study Area:** **PG&E Central Valley Stockton - 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 | 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<br>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 |

**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-El Cerrito STA G #1 115kV Line _Sobrante-El 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-El 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-El 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.

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

***High/Low Voltage***

| ID | Substation | Worst Contingency | Category | Category Description | Voltage (PU) | | | Potential Mitigation Solutions |
|---|---|---|---|---|---|---|---|---|
| | | | | | 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 |

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

**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.

**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.

**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

**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

**2013/2014 ISO Reliability Assessment - Study Results**

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

***Thermal Overloads***

| ID | Overloaded Facility | Worst Contingency | Category | Category Description | Loading (%) | | | Potential Mitigation Solutions |
|---|---|---|---|---|---|---|---|---|
| | | | | | 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<br>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<br>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<br>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<br>Long Term: Moraga 230/115 kV Transfomrer Replacement project |
| Diab-SP-T-07 | Pittsburg - Clayton #3 115 kV Line | C2-16_CB FAULT AT 32950 PITSBURG 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 Diabl-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<br>Long Term: North Tower 115 kV Looping project |

**Study Area:** **PG&E Greater Bay Area Diablo- 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 | |
| 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<br>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<br>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<br>Long Term: Moraga 230/115 kV Transfomrer 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<br>Long Term: Sobrante-R 115 kV Reconductor and Loop project |

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

**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<br>Long Term: North Tower 115 kV Looping project |

**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 |

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

***High/Low Voltage***

| ID | Substation | Worst Contingency | Category | Category Description | Voltage (PU) | | | Potential Mitigation Solutions |
|---|---|---|---|---|---|---|---|---|
| | | | | | 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 |

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

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

***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 |

**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.

**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.

**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

**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

**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-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<br>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 - cutail load at Larkin<br>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 - cutail load at Larkin<br>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<br>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<br>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 renergize 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 |

**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.

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

***Thermal Overloads***

| ID | Overloaded Facility | Worst Contingency | Category | Category Description | Loading (%) | | | Potential Mitigation Solutions |
|---|---|---|---|---|---|---|---|---|
| | | | | | 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 renergize 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 |

**Study Area:** PG&E Greater Bay Area San Francisco - 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 | |
| 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<br>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 |

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

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

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

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

***High/Low Voltage***

| ID | Substation | Worst Contingency | Category | Category Description | Voltage (PU) | | | Potential Mitigation Solutions |
|---|---|---|---|---|---|---|---|---|
| | | | | | 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 |

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

***High/Low Voltage***

| ID | Substation | Worst Contingency | Category | Category Description | Voltage (PU) | | | Potential Mitigation Solutions |
|---|---|---|---|---|---|---|---|---|
| | | | | | 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 |

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

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

**Study Area:** PG&E Greater Bay Area San Francisco - 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 | |
| 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 | MISSON 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 |

**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.

**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.

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

**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

**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<br>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<br>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<br>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<br>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 |

**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<br>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 |

**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<br>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<br>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 |

**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-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<br>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<br>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<br>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<br>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<br>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<br>Long Term: Jefferson-Stanford No. 2 60 kV Line |

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

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

***Voltage Deviations***

| ID | Substation | Worst Contingency | Category | Category Description | Post Cont. Voltage Deviation % | | | Potential Mitigation Solutions |
|---|---|---|---|---|---|---|---|---|
| | | | | | 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<br>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<br>Long Term: Install reverse power relay on Millbrae 115/60 Transformer No. 5 |

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

***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 MNBY 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 |

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

**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 |

**Study Area:** **PG&E Greater Bay Area Peninsula - 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 | |
| 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 l | 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 |

**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.

**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.

**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.

**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

**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

**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 |

**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 | Radum - 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 | Radum - 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 - Radum 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 |

**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 |

**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 |

**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 |

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

**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 |

**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 |

**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 |

**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.

**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.

**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

**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 |

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

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

***High/Low Voltage***

| ID | Substation | Worst Contingency | Category | Category Description | Voltage (PU) | | | Potential Mitigation Solutions |
|---|---|---|---|---|---|---|---|---|
| | | | | | 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 |

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

**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.

**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.

**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 |

**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 unitl 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 |

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

**Study Area:** **PG&E Greater Bay Area San Jose - 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 | |
| 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 Reconductor Project is Completed |

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

**Study Area:** **PG&E Greater Bay Area San Jose - 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 | |
| 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 | EVRGRN&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 | EVRGRN J 115kV | C118_BUS FAULT AT 35633 EVRGRN 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 EVRGRN 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 & Evergreeen - Mabury 115 kV | C5 | DCTL | 1.13 | 1.18 | - | Under review for possible exemption or reactive device |
| SanJ-OP-V-12 | EVRGRN 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 | EVRGRN&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 | SENTER J 60kV | C5_26_Evergreen - San Jose B & Evergreeen - Mabury 115 kV | C5 | DCTL | 1.13 | 1.18 | - | Under review for possible exemption or reactive device |

**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.

**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.

**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

**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

**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-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 |

**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. |

**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-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. |

**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-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)<br>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 |

**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 |

**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-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 |

**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 |

**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.

**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 |

**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-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. |

**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-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)<br>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 |

**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-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 |

**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-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 |

**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 |

**Study Area:** **PG&E Greater Fresno - 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 | |
| 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 |

**Study Area:** **PG&E Greater Fresno - 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 | |
| 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 |

**Study Area:** **PG&E Greater Fresno - 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 | 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 |

**Study Area:** **PG&E Greater Fresno - 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 | 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 |

**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. |

**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-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 |

**Study Area:** **PG&E Greater Fresno - 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 | 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 |

**Study Area:** **PG&E Greater Fresno - 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 | 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 |

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

***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. |

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

***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.

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

***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.

**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. |

**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

**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-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. |

**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.

**Study Area:** **PG&E Kern - 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 | |
| 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 |

**Study Area:** **PG&E Kern - 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 | |
| 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 |

**Study Area:** **PG&E Kern - 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 | |
| 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 |

**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 |

**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 |

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

***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 |

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

***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. |

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

***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 |

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

***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.

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

***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.

**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. |

**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 |

**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 | WTSNVLLE-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 | WTSNVLLE-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 |

**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-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 | WTSNVLLE-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 | WTSNVLLE-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 |

**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. |

**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 | Avtivate 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 | Avtivate 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 | Avtivate 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 | WTSNVLLE 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 | Avtivate 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 | Avtivate 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 | Avtivate 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 | Avtivate 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 | Avtivate Paul Sweet STATCOM |

**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 | WTSNVLLE 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 |

**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-001 | CMP EVRS 115 kV | Moss Landing-Green Valley #1 & 2 115 kV Lines | C3 | L-1-1 | - | 12 | 15 | Avtivate 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 | WTSNVLLE 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 | Avtivate 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 |

**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 | WTSNVLLE 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 |

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

**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 | WTSNVLLE 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 | WTSNVLLE 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 |

**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 | CSTRVLLE 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 |

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

**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.

**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.

**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.

**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

**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

**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

**2013/2014 ISO Reliability Assessment - Study Results**

**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) |

**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-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 | WTSNVLLE-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 | WTSNVLLE-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 |

**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-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 | WTSNVLLE-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 | WTSNVLLE-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 |

**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-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 |

**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 | WTSNVLLE 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 | CSTRVLLE 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 | CAMPHORA 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 | Avtivate 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 |

**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 | WTSNVLLE 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 | Avtivate 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 |

**Study Area:** **PG&E Central Coast - 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 | |
| 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 | Avtivate 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 | WTSNVLLE 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 | Avtivate 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 |

**Study Area:** **PG&E Central Coast - 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 | |
| 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 | WTSNVLLE 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 |

**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.

**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.

**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

**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

**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 |

**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 | TEMPLT7-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 strenghtens 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 |

**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_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 sevice 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 |

**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_024 | 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 sevice in 2019 |
| LP_SP_T_025 | 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 sevice in 2019 |
| LP_SP_T_026 | 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 sevice in 2019 |
| LP_SP_T_027 | 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 sevice in 2019 |
| LP_SP_T_028 | 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_029 | 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_030 | 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_031 | 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 |

**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_032 | 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_033 | 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_034 | 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_035 | 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_036 | 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_037 | 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 sevice in 2019 |
| LP_SP_T_038 | 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 sevice in 2019 |

**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_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 sevice 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 sevice in 2019 |

**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-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 |

| 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 |

**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-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 |

**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 sevice 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 sevice 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 sevice 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 sevice 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 sevice 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 sevice in 2019 |

**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-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 sevice 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 sevice 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 sevice 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 sevice 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 sevice 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 sevice 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 sevice 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 sevice 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 sevice 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 sevice in 2019 |

**Study Area:** **PG&E Los Padres - 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 | |
| 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 Transformmer 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 |

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

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

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

**Study Area:** **PG&E Los Padres - 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 | |
| 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 sevice 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 sevice 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 sevice 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 sevice 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 sevice 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 sevice in 2019 |

**Study Area:** **PG&E Los Padres - 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 | 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 sevice 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 sevice 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 sevice 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 sevice 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 sevice 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 sevice in 2019 |

**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 |

**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 |

**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 sevice 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 sevice 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 sevice 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 sevice 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 sevice 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 sevice 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 sevice 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 sevice 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 |

**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-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 sevice in 2019 |

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

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

**Study Area:** **PG&E Los Padres - 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 | 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 sevice 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 sevice 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 sevice 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 sevice 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 sevice 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 sevice 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 sevice 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 sevice 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 sevice in 2019 |

**Study Area:** **PG&E Los Padres - 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 | 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 sevice 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 sevice 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 sevice 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 sevice 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 sevice 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 sevice 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 |

**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.

**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.

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

**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

**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

**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

**2013/2014 ISO Reliability Assessment - Study Results**

**Study Area:** **SCE Tehachapi & Big Creek Corridor - 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 | |
| | | | | | | | | |

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.

**Study Area:** **SCE Tehachapi & Big Creek Corridor - 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 thermal overload concerns were identified.

**Study Area:** **SCE Tehachapi & Big Creek Corridor - 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 | |
| | | | | | | | | |

No voltage deviation concerns were identified.

**Study Area:** **SCE Tehachapi & Big Creek Corridor - 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 | |
| | | | | | | | | |

No voltage deviation concerns were identified.

**Study Area:** **SCE Tehachapi & Big Creek Corridor - 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 | |
| | | | | | | | | |

No high/low voltage concerns were identified.

**Study Area:** **SCE Tehachapi & Big Creek Corridor - 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 high/low voltage concerns were identified.

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

***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.

**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.

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

***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.

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

***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.

**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.

**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

**2013/2014 ISO Reliability Assessment - Study Results**

**Study Area:** **SCE Antelope-Bailey - 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 | |
| | | | | | | | | |

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.

**Study Area:** **SCE Antelope-Bailey - 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 thermal overload concerns were identified.

**Study Area:** **SCE Antelope-Bailey - 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 | |
| | | | | | | | | |

No voltage deviation concerns were identified.

**Study Area:** **SCE Antelope-Bailey - 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 | |
| | | | | | | | | |

No voltage deviation concerns were identified.

**Study Area:** **SCE Antelope-Bailey - 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 | |
| | | | | | | | | |

No high/low voltage concerns were identified.

**Study Area:** **SCE Antelope-Bailey - 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 high/low voltage concerns were identified.

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

***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.

**Study Area:** **SCE Antelope-Bailey - 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.

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

***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.

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

***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.

**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.

**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.

**Study Area:** **SCE North of Lugo - 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 | |
| X-NP-T-1 | 24731 INYOKERN 115 - 24702 KRAMER 115 - Ckt 1 | line KRAMER-INYOKERN-RANDSB 115 ck 1 | B | N-1 | 102% | 14% | | Re-adjust generation pre-contingency (Congestion management ) OR Modify Kramer N-1 RAS to protect for both Kramer-Inyoker-Randsberg conitngencies |

**Study Area:** **SCE North of Lugo - 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 | |
| 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 RANDSBRG 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 RANDSBRG 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 |

**Study Area:** **SCE North of Lugo - 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 | |
| NOL-NP-VD-1 | 24728 INYO 115 kV | Line CONTROL 115.0 to INYO 115.0 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 RANDSBRG 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 RANDSBRG 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 curtial 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 curtial 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 |

**Study Area:** **SCE North of Lugo - 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 | |
| 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 |

**Study Area:** **SCE North of Lugo - 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 | |
| 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 RANDSBRG 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 |

**Study Area:** **SCE North of Lugo - 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 | |
| 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 |

**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. |

**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-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. |

**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-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 conitngency. (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 conitngency. (including the new RPS generation in the area) OR Modify Kramer RAS to drop generation in Control area. |

**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. |

**Study Area:** **SCE North of Lugo - 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 | |
| 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 |

**Study Area:** **SCE North of Lugo - 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 | |
| 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 |

**Study Area:** **SCE North of Lugo - 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 | |
| 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 |

**Study Area:** **SCE North of Lugo - 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 | |
| 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 RANDSBRG 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 |

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

***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 |

**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.

**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.

**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

**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.

**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

**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

**2013/2014 ISO Reliability Assessment - Study Results**

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

***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.

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

***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 | - | |
| | | 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.

**Study Area:** **SCE Eastern area - 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 | |
| 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 |

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

***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 |

**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.

**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.

**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

**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-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:<br><br>1. Additional local capcity in Western LA Basin and San Diego areas (SONGS Area) as authorized by the CPUC<br><br>2. The Mesa 500 kV Loop-In & Ellis Corridor Upgrade Projects<br><br>3. Other SONGS Area transmission upgrades<br><br>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 | |

**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<br>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.

**Study Area:** **SCE Metro - 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 | |
| | | | | | | | | |

No voltage deviations were identified.

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

***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.

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

***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

**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

**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-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:<br><br>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<br><br>3. Resource need by itself or with combination of the above<br><br>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% | |

**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-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:<br><br>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 |
| 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% | 3. Resource need by itself or with combination of the above |
| 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% | 4. Other mitigation options such as existing SPS modification and/or operating procedures |
| 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 69.00 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 CLAIRMNT 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 DUNHILTP 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 |

**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.

**Study Area:** **San Diego Area- 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 | |
| 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 |

**Study Area:** **San Diego Area - 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 | |
| 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 |

**Study Area:** San Diego Area - 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 | |
| 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 |

**Study Area:** San Diego Area - 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 | |
| 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 |

**Study Area:** San Diego Area - 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 | |
| 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 |

**Study Area:** San Diego Area - 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 | |
| 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 |

**Study Area:** **San Diego Area- 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 | |
| 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 |

**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-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 |

| 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 |

**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-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 |

| 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 |

| 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 |

**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 |

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

***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 |

**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.

**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.

**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

**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

**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-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 |

**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-4 | 18023 PAHRUMP 230 - 18085 PAHRUMP 138 - Ckt 1 | INNOVATION -MERCRYSW 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 -MERCRYSW 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 |

**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-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 -MERCRYSW 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 |

**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-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 |

**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. |

**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<br>RADAR 138 - Ckt 1 | NWEST -DESERT VIEW 230-kV Ckt 1<br>_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<br>MERCRYSW 138 - Ckt 1 | NWEST -DESERT VIEW 230-kV Ckt 1<br>_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. |

**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 - 18091 RADAR 138 - Ckt 1 | 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 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 | 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.

**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-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.<br>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.<br>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.<br>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. |

**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-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.<br>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.<br>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.<br>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. |

**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-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.<br>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.<br>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.<br>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. |

**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-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.<br>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.<br>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.<br>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. |

**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-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.<br>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.<br>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.<br>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 |

**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 |

**Study Area:** **Valley Electric Association - 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 | |
| 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 |

**Study Area:** **Valley Electric Association - 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 | |
| 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 |

**Study Area:** **Valley Electric Association - 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 | |
| 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.<br>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.<br>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.<br>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. |

**Study Area:** **Valley Electric Association - 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 | |
| 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.<br>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.<br>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.<br>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. |

**Study Area:** **Valley Electric Association - 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 | |
| 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.<br>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.<br>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.<br>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. |

**Study Area:** **Valley Electric Association - 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 | |
| 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.<br>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.<br>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.<br>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. |

**Study Area:** **Valley Electric Association - 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 | |
| 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.<br>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.<br>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 Charlston - 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 Charlston - 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 Charlston - 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 Charlston - Thousandaire 138kV line after the first N-1 |

**Study Area:** **Valley Electric Association - 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 | |
| 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 |

**Study Area:** **Valley Electric Association - 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 | |
| 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 |

**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.

**Study Area:** **Valley Electric Association - 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.

**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

**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