

Study Area: **SCE North of Lugo**  
*Thermal Overloads*



| Overloaded Facility                        | Contingency (All and Worst P6)                                   | Category | Category Description | Loading % (Baseline Scenarios) |                  |                  |                      |                      | Loading % (Sensitivity Scenarios) |                                  |                                       | ISO Approved Projects & Potential Mitigation Solutions |
|--|--|----------|----------------------|--------------------------------|------------------|------------------|----------------------|----------------------|-----------------------------------|----------------------------------|---------------------------------------|--|
|  |  |          |                      | 2021 Summer Peak               | 2024 Summer Peak | 2029 Summer Peak | 2021 Spring Off-Peak | 2024 Spring Off-Peak | 2024 SP High CEC Forecast         | 2024 SpOP Hi Renew & Min Gas Gen | 2021 SP Heavy Renewable & Min Gas Gen |  |
| Control-Inyokern 115kV Line                | Control EAST BUS   | P2       | Bus Fault            | <100                           | <100             | <100             | 113.26               | 105.68               | <100                              | <100                             | <100                                  | Bishop RAS; SCE Operating Procedure SOB-4              |
| Victor 230/115kV Transformer #3            | Victor 115kV N/S Bus Section Fault                               | P5       | Non-Redundant Relay  | <100                           | <100             | <100             | <100                 | <100                 | 114.69                            | <100                             | <100                                  | Install redundant relay                                |
| The remaining Victor 230/115kV Transformer | Loss of the other two Victor 230/115kV transformers              | P6       | N-1-1                | <100                           | <100             | <100             | <100                 | <100                 | 115.08                            | <100                             | <100                                  | Utilize existing fast Demand Response                  |
| Control-Inyo 115kV Line                    | INYOKERN - KRAMER 115.0 ck 1 and KRAMER-INYOKERN-RANDSB 115 ck 1 | P6       | N-1-1                | Nonconv                        | 135.75%          | Nonconv          | Nonconv              | Nonconv              | <100                              | <100                             | <100                                  | Operating Procedure 7690                               |

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High/Low Voltages



| Substation     | Contingency (All and Worst P6)                                   | Category | Category Description | Voltage PU (Baseline Scenarios) |                  |                  |                      |                      | Voltage PU (Sensitivity Scenarios) |                                  |                                       | ISO Approved Projects & Potential Mitigation Solutions |
|----------------|--|----------|----------------------|---------------------------------|------------------|------------------|----------------------|----------------------|------------------------------------|----------------------------------|---------------------------------------|--|
|                |  |          |                      | 2021 Summer Peak                | 2024 Summer Peak | 2029 Summer Peak | 2021 Spring Off-Peak | 2024 Spring Off-Peak | 2024 SP High CEC Forecast          | 2024 SpOP Hi Renew & Min Gas Gen | 2021 SP Heavy Renewable & Min Gas Gen |  |
| Inyo 115kV     | CONTROL - INYO 115.0 ck 1 and OXBOW B - CONTROL 115.0 ck 1       | P6       | N-1-1                | 1.1204                          | <1.1             | 1.1012           | <1.1                 | 1.1156               | <1.1                               | <1.1                             | 1.1198                                | SCE voltage exception                                  |
|                | Control West Bus or Control East Bus                             | P2       | Bus Fault            | 1.1204                          | <1.1             | 1.1012           | <1.1                 | 1.1156               | <1.1                               | <1.1                             | 1.1198                                |  |
| Inyokern 115kV | INYOKERN - KRAMER 115.0 ck 1 and KRAMER-INYOKERN-RANDSB 115 ck 1 | P6       | N-1-1                | Nonconv                         | >0.9             | Nonconv          | Nonconv              | Nonconv              | <1.1                               | 1.1084                           | <1.1                                  | Operating Procedure 7690                               |
|                | INYOKERN - KRAMER 115.0 ck 1 and CAL GEN - INYOKERN 115 ck 1     | P6       | N-1-1                | 0.8928                          | >0.9             | >0.9             | 0.8839               | 0.8847               | >0.9                               | >0.9                             | >0.9                                  | Install capacitor bank at Inyokern                     |

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Voltage Deviation



| Substation | Contingency (All and Worst P6) | Category | Category Description | Post Cont. Voltage Deviation % (Baseline Scenarios) |                  |                  |                      |                      | Post Cont. Voltage Deviation % (Sensitivity Scenarios) |                                  |                                       | ISO Approved Projects & Potential Mitigation Solutions |
|------------|--------------------------------|----------|----------------------|---|------------------|------------------|----------------------|----------------------|--|----------------------------------|---------------------------------------|--|
|            |                                |          |                      | 2021 Summer Peak                                    | 2024 Summer Peak | 2029 Summer Peak | 2021 Spring Off-Peak | 2024 Spring Off-Peak | 2024 SP High CEC Forecast                              | 2024 SpOP Hi Renew & Min Gas Gen | 2021 SP Heavy Renewable & Min Gas Gen |  |
|            |                                |          |                      |   |                  |                  |                      |                      |  |                                  |                                       |  |

No violations

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Transient Stability



| Contingency  | Category | Category Description | Transient Stability Performance |                          |                          |                           |                                  | Potential Mitigation Solutions |
|--|----------|----------------------|---------------------------------|--------------------------|--------------------------|---------------------------|----------------------------------|--------------------------------|
|  |          |                      | Baseline Scenarios              |                          |                          | Sensitivity Scenarios     |                                  |                                |
|  |          |                      | 2024 Summer Peak                | 2029 Summer Peak         | 2024 Spring Off-Peak     | 2024 SP High CEC Forecast | 2024 SpOP Hi Renew & Min Gas Gen |                                |
| Control-Casa Diablo 1150kV (1PH fault at Control)                        | P4.2     | Stuck Breaker        | Stable/WECC criteria met        | Stable/WECC criteria met | Stable/WECC criteria met | Stable/WECC criteria met  | Stable/WECC criteria met         | No violation                   |
| Control-Casa Diablo 1150kV (1PH fault at Casa Diablo)                    | P4.2     | Stuck Breaker        | Stable/WECC criteria met        | Stable/WECC criteria met | Stable/WECC criteria met | Stable/WECC criteria met  | Stable/WECC criteria met         | No violation                   |
| Control-Coso-Haiwee-Inyokern 115kV (1PH fault at Inyokern)               | P4.2     | Stuck Breaker        | Stable/WECC criteria met        | Stable/WECC criteria met | Stable/WECC criteria met | Stable/WECC criteria met  | Stable/WECC criteria met         | No violation                   |
| Control-Coso-Haiwee-Inyokern 115kV (1PH fault at Control)                | P4.2     | Stuck Breaker        | Stable/WECC criteria met        | Stable/WECC criteria met | Stable/WECC criteria met | Stable/WECC criteria met  | Stable/WECC criteria met         | No violation                   |
| Control-Haiwee-Inyokern (Fault at Control)                               | P4.2     | Stuck Breaker        | Stable/WECC criteria met        | Stable/WECC criteria met | Stable/WECC criteria met | Stable/WECC criteria met  | Stable/WECC criteria met         | No violation                   |
| Control-Haiwee-Inyokern (Fault at Inyokern)                              | P4.2     | Stuck Breaker        | Stable/WECC criteria met        | Stable/WECC criteria met | Stable/WECC criteria met | Stable/WECC criteria met  | Stable/WECC criteria met         | No violation                   |
| Control-Inyo 115kV (Fault at Control)                                    | P4.2     | Stuck Breaker        | Stable/WECC criteria met        | Stable/WECC criteria met | Stable/WECC criteria met | Stable/WECC criteria met  | Stable/WECC criteria met         | No violation                   |
| Inyokern-Downs 115kV (Fault at Inyokern)                                 | P4.2     | Stuck Breaker        | Stable/WECC criteria met        | Stable/WECC criteria met | Stable/WECC criteria met | Stable/WECC criteria met  | Stable/WECC criteria met         | No violation                   |
| Inyokern-McGen-Searles 15kV (Fault at Inyokern)                          | P4.2     | Stuck Breaker        | Stable/WECC criteria met        | Stable/WECC criteria met | Stable/WECC criteria met | Stable/WECC criteria met  | Stable/WECC criteria met         | No violation                   |
| Kramer-Roadway 115kV (Fault 20% from Kramer)                             | P4.2     | Stuck Breaker        | Stable/WECC criteria met        | Stable/WECC criteria met | Stable/WECC criteria met | Stable/WECC criteria met  | Stable/WECC criteria met         | No violation                   |
| Kramer-Roadway 115kV (Fault 20% from Roadway)                            | P4.2     | Stuck Breaker        | Stable/WECC criteria met        | Stable/WECC criteria met | Stable/WECC criteria met | Stable/WECC criteria met  | Stable/WECC criteria met         | No violation                   |
| Kramer-Victor 115kV (Fault 20% from Kramer)                              | P4.2     | Stuck Breaker        | Stable/WECC criteria met        | Stable/WECC criteria met | Stable/WECC criteria met | Stable/WECC criteria met  | Stable/WECC criteria met         | No violation                   |
| Kramer-Victor 115kV (Fault 20% from Victor)                              | P4.2     | Stuck Breaker        | Stable/WECC criteria met        | Stable/WECC criteria met | Stable/WECC criteria met | Stable/WECC criteria met  | Stable/WECC criteria met         | No violation                   |
| Control 115/55kV Transforemer Banks                                      | P6       | Normal clearing      | Stable/WECC criteria met        | Stable/WECC criteria met | Stable/WECC criteria met | Stable/WECC criteria met  | Stable/WECC criteria met         | No violation                   |
| Kramer 230/115kV Transformer Banks                                       | P6       | Normal clearing      | Stable/WECC criteria met        | Stable/WECC criteria met | Stable/WECC criteria met | Stable/WECC criteria met  | Stable/WECC criteria met         | No violation                   |
| Lugo 500/230kkV Transformer Banks no RAS                                 | P6       | Normal clearing      | Unstable                        | Unstable                 | Stable/WECC criteria met | Unstable                  | Stable/WECC criteria met         | HDPP RAS                       |
| Lugo 500/230kV Transformer Banks RAS                                     | P6       | Normal clearing      | WECC Criteria Not Met           | Stable/WECC criteria met | Stable/WECC criteria met | WECC Criteria Not Met     | Stable/WECC criteria met         | Review RAS scheme              |
| Kramer-Inyokern-Randsburg Nos.1 & 3 115kV                                | P6       | Normal clearing      | Unstable                        | Unstable                 | Unstable                 | Stable/WECC criteria met  | Stable/WECC criteria met         | Operating Procedure 7690       |
| Coolwater-Kramer & Coolwater-Seg2-Tortilla 115kV (Fault at Coolwater)    | P6       | Normal clearing      | Stable/WECC criteria met        | Stable/WECC criteria met | Stable/WECC criteria met | Stable/WECC criteria met  | Stable/WECC criteria met         | No violation                   |
| Coolwater-Kramer & Coolwater-Seg2-Tortilla 115kV_OP (Fault at Coolwater) | P6       | Normal clearing      | Stable/WECC criteria met        | Stable/WECC criteria met | Stable/WECC criteria met | Stable/WECC criteria met  | Stable/WECC criteria met         | No violation                   |
| Coolwater-Kramer & Kramer-Tortilla 115kV (Fault at Kramer)               | P6       | Normal clearing      | Stable/WECC criteria met        | Stable/WECC criteria met | Stable/WECC criteria met | Stable/WECC criteria met  | Stable/WECC criteria met         | No violation                   |

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Transient Stability



| Contingency   | Category | Category Description | Transient Stability Performance |                          |                          |                           |                                  | Potential Mitigation Solutions |
|---|----------|----------------------|---------------------------------|--------------------------|--------------------------|---------------------------|----------------------------------|--------------------------------|
|   |          |                      | Baseline Scenarios              |                          |                          | Sensitivity Scenarios     |                                  |                                |
|   |          |                      | 2024 Summer Peak                | 2029 Summer Peak         | 2024 Spring Off-Peak     | 2024 SP High CEC Forecast | 2024 SpOP Hi Renew & Min Gas Gen |                                |
| Coolwater-Kramer & Kramer-Tortilla 115kV_OP (Fault at Kramer) | P6       | Normal clearing      | Stable/WECC criteria met        | Stable/WECC criteria met | Stable/WECC criteria met | Stable/WECC criteria met  | Stable/WECC criteria met         | No violation                   |
| Kramer-Victor 230kV Nos.1 & 2 no RAS                          | P7       | Normal clearing      | Unstable                        | Unstable                 | Unstable                 | Stable/WECC criteria met  | Stable/WECC criteria met         | Mojave RAS                     |
| Kramer-Victor 230kV Nos.1 & 2 RAS                             | P7       | Normal clearing      | Stable/WECC criteria met        | Stable/WECC criteria met | Stable/WECC criteria met | Stable/WECC criteria met  | Stable/WECC criteria met         | No violation                   |
| Lugo-Victor 230kV Nos.1 & 2 no RAS                            | P7       | Normal clearing      | Stable/WECC criteria met        | Stable/WECC criteria met | Stable/WECC criteria met | Stable/WECC criteria met  | Stable/WECC criteria met         | No violation                   |
| Lugo-Victor 230kV Nos.1 & 2 RAS                               | P7       | Normal clearing      | Stable/WECC criteria met        | Stable/WECC criteria met | Stable/WECC criteria met | Stable/WECC criteria met  | Stable/WECC criteria met         | No violation                   |
| Control-Coso-Inyokern & Control-Inyokern 115kV no RAS         | P7       | Normal clearing      | WECC Criteria Not Met           | WECC Criteria Not Met    | WECC Criteria Not Met    | WECC Criteria Not Met     | WECC Criteria Not Met            | Bishop RAS                     |
| Control-Coso-Inyokern & Control-Inyokern 115kV RAS            | P7       | Normal clearing      | Stable/WECC criteria met        | Stable/WECC criteria met | Stable/WECC criteria met | Stable/WECC criteria met  | Stable/WECC criteria met         | No violation                   |
| Kramer-Victor & Roadway-Victor 115kV                          | P7       | Normal clearing      | Stable/WECC criteria met        | Stable/WECC criteria met | Stable/WECC criteria met | Stable/WECC criteria met  | Stable/WECC criteria met         | No violation                   |
| Kramer-Victor & Kramer-Roadway 115kV                          | P7       | Normal clearing      | Stable/WECC criteria met        | Stable/WECC criteria met | Stable/WECC criteria met | Stable/WECC criteria met  | Stable/WECC criteria met         | No violation                   |
| Kramer 230kV Sub with RAS                                     | Extreme  | Normal clearing      | Stable/WECC criteria met        | Stable/WECC criteria met | Stable/WECC criteria met | Stable/WECC criteria met  | Stable/WECC criteria met         | No violation                   |
| Kramer-Victor 115kV (Fault at Kramer)                         | P4.2     | Stuck Breaker        | Stable/WECC criteria met        | Stable/WECC criteria met | Stable/WECC criteria met | Stable/WECC criteria met  | Stable/WECC criteria met         | No violation                   |
| Roadway-Victor 115kV (Fault at Roadway)                       | P4.2     | Stuck Breaker        | Stable/WECC criteria met        | Stable/WECC criteria met | Stable/WECC criteria met | Stable/WECC criteria met  | Stable/WECC criteria met         | No violation                   |
| Control-SilverPeak 55kV (Fault at Silver Peak)                | P4.2     | Stuck Breaker        | Stable/WECC criteria met        | Stable/WECC criteria met | Stable/WECC criteria met | Stable/WECC criteria met  | Stable/WECC criteria met         | No violation                   |
| Coolwater-Kramer 115kV (Fault on Kramer 115kV bus)            | P5.2     | Delayed clearing     | Stable/WECC criteria met        | Stable/WECC criteria met | Stable/WECC criteria met | Stable/WECC criteria met  | Stable/WECC criteria met         | No violation                   |
| Coolwater-SEGS-Tortilla (Fault on Tortilla 115kV bus)         | P5.2     | Delayed clearing     | Stable/WECC criteria met        | Stable/WECC criteria met | Stable/WECC criteria met | Stable/WECC criteria met  | Stable/WECC criteria met         | No violation                   |
| Roadway 115kV bus   | P5.5     | No Redundant Relay   | Stable/WECC criteria met        | Stable/WECC criteria met | Stable/WECC criteria met | Stable/WECC criteria met  | Stable/WECC criteria met         | No violation                   |
| Tortilla 115kV bus  | P5.5     | No Redundant Relay   | Stable/WECC criteria met        | Stable/WECC criteria met | Stable/WECC criteria met | Stable/WECC criteria met  | Stable/WECC criteria met         | No violation                   |
| Victor 115kV bus  | P5.5     | No Redundant Relay   | Stable/WECC criteria met        | Stable/WECC criteria met | Stable/WECC criteria met | Stable/WECC criteria met  | Stable/WECC criteria met         | No violation                   |

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Single Contingency Load Drop

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

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

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Single Source Substation with more than 100 MW Load

| Substation | Load Served (MW) |          |          |          |          |          |          |          |          |          | Potential Mitigation Solutions |
|------------|------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|--------------------------------|
|            | Select..         | Select.. | Select.. | Select.. | Select.. | Select.. | Select.. | Select.. | Select.. | Select.. |                                |
|            |                  |          |          |          |          |          |          |          |          |          |                                |

No single source substation with more than 100 MW