

Study Area: **SCE North of Lugo**

Thermal Overloads

Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Loading % (Baseline Scenarios)								Loading % (Sensitivity Scenarios)			Project & Potential Mitigation Solutions
				2025 Summer Peak	2028 Summer Peak	2035 Summer Peak	2028 Summer-Off Peak	2035 Winter Peak	2025 Spring Off-Peak	2028 Spring Off-Peak	2035 Spring Off-Peak	2028 SP High CEC Forecast	2025 SP Heavy Renewable & Min Gas Gen	2025 OP BESS Charging	
Lugo 500/230kV Transformer No.1	Lugo 500/230kV Transformer No.2	P1	N-1	113.19	<100	<100	<100	<100	<100	<100	<100	<100	124.5	<100	Short term: HDPP RAS and Mojave Desert RAS Long term: Previously approved Lugo 500/230kV Transformer No.3
Lugo 500/230kV Transformer No.2	Lugo 500/230kV Transformer No.1	P1	N-1	113.26	<100	<100	<100	<100	<100	<100	<100	<100	124.57	<100	Short term: HDPP RAS and Mojave Desert RAS Long term: Previously approved Lugo 500/230kV Transformer No.3
Lugo 500/230kV Transformer No.3	Lugo 500/230kV transformers Nos. 1&2	P6	N-1-1	N/A	113.94	<100	<100	<100	N/A	<100	<100	<100	N/A	N/A	Generation redispatch after the first contingency
Lugo-Pisgah 230kV Line	Lugo 500/230kV transformers Nos. 1&2	P6	N-1-1	Diverge	<100	<100	<100	<100	<100	<100	<100	<100	Diverge	<100	Short term: HDPP RAS and Mojave Desert RAS Long term: Previously approved Lugo 500/230kV Transformer No.3
Kramer-Victor 230kV No.1 or 2 Line	Kramer-Victor 230kV No.2 or 1 line	P1	N-1	121.69	120.82	<100	<100	<100	<100	111.15	<100	<100	108.73	<100	Short term: Mojave Desert RAS Long term: Previously approved Victor-Kramer 115kV conversion
	Victor-Roadway 115kV and Kramer-Victor 230kV No.2 or 1 lines	P6	N-1-1	146.89	146.94	<100	<100	<100	<100	139.36	<100	114.29	131.41	<100	Short term: Mojave Desert RAS Long term: Previously approved Victor-Kramer 115kV conversion
	Kramer-Roadway 115kV and Kramer-Victor 230kV No.2 or 1 lines	P6	N-1-1	137.85	138.03	<100	<100	<100	<100	125.57	<100	110.16	122.95	<100	Short term: Mojave Desert RAS Long term: Previously approved Victor-Kramer 115kV conversion
Lugo-Victor 230kV No.1 and No.2 lines	Lugo-Victor 230kV Nos. 3&4 lines	P7	DCTL	120.04	<100	<100	<100	<100	<100	<100	<100	<100	132.72	<100	Short term: HDPP RAS Long term: Previously approved Lugo-Victor 230kV lines upgrade
Lugo-Victor 230kV No.3 and No.4 lines	Lugo-Victor 230kV Nos. 1&2 lines	P7	DCTL	120.04	<100	<100	<100	<100	<100	<100	<100	<100	132.72	<100	Short term: HDPP RAS Long term: Previously approved Lugo-Victor 230kV lines upgrade
Victor-Kramer 115kV Line	Victor-Roadway 115kV and Kramer-Victor 230kV No.2 lines	P6	N-1-1	102.52	106.48	<100	<100	<100	<100	102.81	<100	<100	<100	<100	Short term: Mojave Desert RAS Long term: Previously approved Victor-Kramer 115kV conversion
Victor-Roadway 115kV Line	Kramer-Victor 230kV Nos. 1&2 lines	P7	DCTL	Diverge	Diverge	<100	<100	<100	<100	Diverge	<100	Diverge	Diverge	Diverge	Short term: Mojave Desert RAS Long term: Previously approved Victor-Kramer 115kV conversion
	Victor-Kramer 115kV and Victor-Kramer 230kV No.1 or 2 lines	P6	N-1-1	104.44	110.07	<100	<100	<100	<100	117.53	<100	<100	<100	<100	Short term: Generation redispatch after the first contingency Long term: Previously approved Victor-Kramer 115kV conversion
Kramer-Coolwater 230kV Line	Sandlot-Kramer 230kV line and Coolwater 230/115kV transformer	P6	N-1-1	N/A	<100	<100	<100	<100	N/A	109.05	<100	<100	N/A	<100	Generation redispatch after the first contingency
Coolwater 230/115kV Transformer	Sandlot-Kramer 230kV and Kramer-Coolwater 230kV lines	P7	DCTL	N/A	144.69	<100	<100	<100	N/A	Diverge	<100	146.18	N/A	N/A	Future Kramer CRAS will include this contingency
Remaining Victor 230/115kV Transformer	Loss of the other two Victor 230/115kV transformers	P6	N-1-1	<100	<100	187.43	<100	115.44	<100	<100	<100	166.36	<100	<100	Utilize existing spare transformer
Control-Inyokern 115kV Line	Control-Coso-Inyokern 115kV line	P1	N-1	<100	<100	<100	117.3	<100	<100	<100	<100	<100	<100	<100	Operating Procedure 7690 reduce preselected generation output
	Control 115kV East Bus	P2	Bus Fault	104.17	<100	<100	Diverge	<100	<100	<100	<100	<100	110.11	<100	Operating Procedure 7690 reduce preselected generation output
Control-Inyo 115kV Line	Kramer-Inyokern 115kV and Inyokern-Kramer-Randsburg 115kV lines	P6	N-1-1	125.77	<100	<100	Diverge	<100	<100	<100	<100	<100	163.67	<100	Operating Procedure 7690 reduce preselected generation output
	Kramer 115kV East Bus	P5	Non-Redundant Relay	125.85	<100	<100	Diverge	<100	<100	<100	<100	<100	161.16	<100	Install redundant bus differential relay
Inyo 115kV PST	Control-Inyokern 115kV and Control-Coso-Inyokern 115kV lines	P7	DCTL	<100	<100	<100	Diverge	<100	<100	<100	<100	<100	Diverge	<100	Bishop RAS
Control 115/55kV Transformer	Loss of the other Control 115/55kV transformer	P1	N-1	<100	<100	109.2	<100	<100	<100	<100	<100	<100	<100	<100	New Control 115/55kV transformer

[illegible]



Substation	Contingency (All and Worst P6)	Category	Category Description	Post Cont. Voltage Deviation % (Baseline Scenarios)								Post Cont. Voltage Deviation % (Sensitivity Scenarios)			Project & Potential Mitigation Solutions
				2025 Summer Peak	2028 Summer Peak	2035 Summer Peak	2028 Summer-Off Peak	2035 Winter Peak	2025 Spring Off-Peak	2028 Spring Off-Peak	2035 Spring Off-Peak	2028 SP High CEC Forecast	2025 SP Heavy Renewable & Min Gas Gen	2025 OP BESS Charging	

No P1 or P3 contingencies resulted in voltage deviation greater than 8%

Contingency	Category	Category Description	Transient Stability Performance					Potential Mitigation Solutions
			Baseline Scenarios			Sensitivity Scenarios		
			2028 Summer Peak	2035 Summer Peak	2025 Spring Off-Peak	2028 SP High CEC Forecast	2025 OP BESS Charging	
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 Issues
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 Issues
Control-Coso-Inyokern 115kV (1PH fault at Inyokern)	P4.2	Stuck Breaker	Stable/WECC criteria met	WECC criteria not met	Stable/WECC criteria met	WECC criteria not met	WECC criteria not met	Install shunt capacitor at Inyokern
Control-Coso-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 Issues
Control-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 Issues
Control-Inyokern (Fault at Inyokern)	P4.2	Stuck Breaker	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	WECC criteria not met	Install shunt capacitor at Inyokern
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 Issues
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 Issues
Inyokern-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 Issues
Kramer-Roadway 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 Issues
Kramer-Roadway 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 Issues
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 Issues
Kramer-Victor 115kV (Fault at 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 Issues
Control 115/55kV 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 Issues
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 Issues
Lugo 500/230kV Transformer Banks no RAS	P6	Normal clearing	Stable/WECC criteria met	Stable/WECC criteria met	Unstable	Stable/WECC criteria met	Unstable	HDPP RAS and Mojave Desert RAS Long term: Previously approved Lugo 500/230kV No.3 transformer
Lugo 500/230kV Transformer Banks RAS	P6	Normal clearing	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	WECC criteria not met	Previously approved Lugo 500/230kV No.3 transformer
Kramer-Inyokern-Randsburg Nos.1 & 3 115kV	P6	Normal clearing	Unstable	Stable/WECC criteria met	Stable/WECC criteria met	Unstable	Diverge	Operating procedure 7690
Coolwater-Kramer & Coolwater-SEGS-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 Issues
Coolwater-Kramer & Coolwater-SEGS-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 Issues
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 Issues
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 Issues
Kramer-Victor 230kV Nos.1 & 2 no RAS	P7	Normal clearing	Unstable	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Mojave Desert 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 Issues
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 Issues
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 Issues
Control-Coso-Inyokern & Control-Inyokern 115kV no RAS	P7	Normal clearing	Unstable	Unstable	Unstable	Unstable	Stable/WECC criteria 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 Issues
Kramer-Victor & Roadway-Victor 115kV	P7	Normal clearing	Stable/WECC criteria met	N/A	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No Issues
Kramer-Victor & Kramer-Roadway 115kV	P7	Normal clearing	Stable/WECC criteria met	N/A	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No Issues
Control 115kV East Bus	P5	Non-Redundant Relay	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No Issues
Cool Water 115kV East Bus	P5	Non-Redundant Relay	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No Issues
Kramer 115kV East Bus	P5	Non-Redundant Relay	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No Issues
Tortilla 115kV East Bus	P5	Non-Redundant Relay	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No Issues

Contingency	Category	Category Description	Transient Stability Performance					Potential Mitigation Solutions
			Baseline Scenarios			Sensitivity Scenarios		
			2028 Summer Peak	2035 Summer Peak	2025 Spring Off-Peak	2028 SP High CEC Forecast	2025 OP BESS Charging	
TC_Kramer_Kramer-Tortilla 115kV	P5	Non-Redundant Relay	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No Issues
TC_Kramer_Kramer-Victor 115kV No.1	P5	Non-Redundant Relay	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No Issues
TC_Tortilla_Tortilla-SEGS-Coolwater 115kV	P5	Non-Redundant Relay	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No Issues
TC_Tortilla_Tortilla-Kramer 115kV	P5	Non-Redundant Relay	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No Issues
TC_Victor_Victor-Kramer 115kV No.1	P5	Non-Redundant Relay	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No Issues
TC_Victor_Victor-Roadway 115kV	P5	Non-Redundant Relay	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	Stable/WECC criteria met	No Issues
DC_Kramer 230	P5	Non-Redundant Relay	Diverge	Diverge	Diverge	Diverge	Diverge	Install Redundant DC
DC_Sandlot 230	P5	Non-Redundant Relay	Diverge	Diverge	Diverge	Diverge	Diverge	Install Redundant DC
DC_Victor 230	P5	Non-Redundant Relay	Diverge	Diverge	Diverge	Diverge	Diverge	Install Redundant DC
DC_Control 115	P5	Non-Redundant Relay	Diverge	Diverge	Diverge	Diverge	Diverge	Install Redundant DC
DC_Coolwater 115	P5	Non-Redundant Relay	Diverge	Diverge	Diverge	Diverge	Diverge	Install Redundant DC
DC_Inyokern 115	P5	Non-Redundant Relay	Diverge	Diverge	Diverge	Diverge	Diverge	Install Redundant DC
DC_Kramer 115	P5	Non-Redundant Relay	Diverge	Diverge	Diverge	Diverge	Diverge	Install Redundant DC
DC_Tortilla 115	P5	Non-Redundant Relay	Diverge	Diverge	Diverge	Diverge	Diverge	Install Redundant DC
DC_Victor 115	P5	Non-Redundant Relay	Diverge	Diverge	Diverge	Diverge	Diverge	Install Redundant DC

Single Contingency Load Drop

Worst Contingency	Category	Category Description	Amount of Load Drop (MW)											Potential Mitigation Solutions
			2025 Summer Peak	2028 Summer Peak	2035 Summer Peak	2028 Summer-Off Peak	2035 Winter Peak	2025 Spring Off-Peak	2028 Spring Off-Peak	2035 Spring Off-Peak	2028 SP High CEC Forecast	2025 SP Heavy Renewable & Min Gas Gen	2025 OP BESS Charging	

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



Substation	Load Served (MW)											Potential Mitigation Solutions
	2025 Summer Peak	2028 Summer Peak	2035 Summer Peak	2028 Summer-Off Peak	2035 Winter Peak	2025 Spring Off-Peak	2028 Spring Off-Peak	2035 Spring Off-Peak	2028 SP High CEC Forecast	2025 SP Heavy Renewable & Min Gas Gen	2025 OP BESS Charging	

No single source substation with more than 100 MW