

Study Area: SCE Metro

Thermal Overload



ID	Overloaded Facility	Worst Contingencies	Category	Category Description	Loading (%)										Potential Mitigation Solutions
					2019 Summer Peak	2022 Summer Peak	2027 Summer Peak	2019 Spring Light Load	2022 Spring Off-Peak	2019SP CEC Peak Shift	2022SP High CEC Load & Peak Shift	2022SP Heavy Renewables & Min Gas Gen	2027SP CEC Peak Shift	2022 Summer Off-Peak with Maximum PV Output	
T-1	Pardee - Sylmar 230 kV #1	Pardee - Sylmar 230 kV #2 & Victorville - Lugo 500 kV	P6	L-1/L-1	<100	<100	124	<100	<100	102	<100	<100	139	<100	System adjustments after initial contingency
T-2	Pardee - Sylmar 230 kV #2	Pardee - Sylmar 230 kV #1 & Victorville Lugo 500 kV	P6	L-1/L-1	<100	<100	124	<100	<100	102	<100	<100	139	<100	System adjustments after initial contingency
T-3	Serrano 500/230 kV Transformer #2	Serrano 500/230 kV Transformer #1 & #3	P6	T-1/T-1	122	<100	<100	<100	<100	124	105	<100	<100	<100	System adjustments after initial or second contingency
T-4	Serrano 500/230 kV Transformer #1	Serrano 500/230 kV Transformer #2 & #3	P6	T-1/T-1	120	<100	<100	<100	<100	122	103	<100	<100	<100	System adjustments after initial or second contingency
T-5	Serrano 500/230 kV Transformer #3	Serrano 500/230 kV Transformer #1 & #2	P6	T-1/T-1	118	<100	<100	<100	<100	120	102	<100	<100	<100	System adjustments after initial or second contingency
T-6	Mira Loma 500/230 kV Transformer #4	Lugo - Rancho Vista & Miara Loma - Serrano 500 kV lines	P6	L-1/L-1	117	<100	<100	<100	<100	120	<100	<100	<100	<100	System adjustments after initial or second contingency
T-7	Mira Loma 500/230 kV Transformer #1	Mira Loma - Serrano 500 kV & Mira Loma 500/230 kV Transformer #2	P6	L-1/T-1	106	<100	<100	<100	<100	108	<100	<100	<100	<100	System adjustments after initial or second contingency
T-8	Mira Loma 500/230 kV Transformer #2	Mira Loma - Serrano 500 kV & Mira Loma 500/230 kV Transformer #1	P6	L-1/T-1	105	<100	<100	<100	<100	106	<100	<100	<100	<100	System adjustments after initial or second contingency
T-9	Eagle Rock - Gould 230 kV	Gould - Sylmar 230 kV & Victorville - Lugo 500 kV	P6	L-1/L-1	105	<100	<100	<100	<100	107	<100	<100	<100	<100	System adjustments after initial contingency
T-10	Mesa - Laguna Bell 230 kV #1	Mesa - Redondo & Mesa - Lighthipe 230 kV lines	P6	L-1/L-1	<100	<100	<100	<100	<100	<100	102	<100	<100	<100	System adjustments after initial contingency



ID	Substation	Worst Contingencies	Category	Category Description	Post Cont. Voltage Deviation %										Potential Mitigation Solutions
					2019 Summer Peak	2022 Summer Peak	2027 Summer Peak	2019 Spring Light Load	2022 Spring Off-Peak	2019SP CEC Peak Shift	2022SP High CEC Load & Peak Shift	2022SP Heavy Renewables & Min Gas Gen	2027SP CEC Peak Shift	2022 Summer Off-Peak with Maximum PV Output	

No voltage deviation issues were identified.



ID	Substation	Worst Contingencies	Category	Category Description	Voltage (PU)										Potential Mitigation Solutions
					2019 Summer Peak	2022 Summer Peak	2027 Summer Peak	2019 Spring Light Load	2022 Spring Off-Peak	2019SP CEC Peak Shift	2022SP High CEC Load & Peak Shift	2022SP Heavy Renewables & Min Gas Gen	2027SP CEC Peak Shift	2022 Summer Off-Peak with Maximum PV Output	

No high/low voltage issues were identified



ID	Contingency	Category	Category Description	Transient Stability Performance							Potential Mitigation Solutions
				2019 Summer Peak	2022 Summer Peak	2027 Summer Peak	2019 Spring Light Load	2022 Spring Off-Peak	2022SP High CEC Load & Peak Shift	2022 Summer Off-Peak with Maximum PV Output	
TS-1	Alamitos 230 kV South Bus Section A G-1 with stuck breaker; 1-PH fault @ ALMITOSW 230 kV, Delayed Clearing	P4.5	Stuck breaker	Stable	Stable	Stable	Stable	Stable	Stable	N/A	
TS-2	Alamitos 230 kV South Bus Section B G-1 with stuck breaker; 1-PH fault @ ALMITOSE 230 kV, Delayed Clearing	P4.5	Stuck breaker	Stable	Stable	Stable	Stable	Stable	Stable	N/A	
TS-3	Alamitos 230 kV North Bus Section A L-1 with stuck breaker; 1-PH fault @ ALMITOSW 230 kV, Delayed Clearing	P4.5	Stuck breaker	Stable	Stable	Stable	Stable	Stable	Stable	N/A	
TS-4	Alamitos 230 kV North Bus Section B L-1 with stuck breaker; 1-PH fault @ ALMITOSE 230 kV, Delayed Clearing	P4.5	Stuck breaker	Stable	Stable	Stable	Stable	Stable	Stable	N/A	
TS-5	Redondo 230 kV West Bus G-1 with stuck breaker; 1-PH fault @ REDONDO 230 kV, Delayed Clearing	P4.5	Stuck breaker	Stable	Stable	Stable	Stable	Stable	Stable	N/A	
TS-6	Redondo 230 kV East Bus L-1 with stuck breaker; 1-PH fault @ REDONDO 230 kV, Delayed Clearing	P4.5	Stuck breaker	Stable	Stable	Stable	Stable	Stable	Stable	N/A	
TS-7	Walnut 230 kV North Bus Section A L-2 with stuck breaker ; 1-PH fault @ WALNUTW 230 kV, Delayed Clearing	P4.5	Stuck breaker	Stable	Stable	Stable	Stable	Stable	Stable	N/A	
TS-8	El Segundo 230 kV North Bus L-1&G-1 with stuck breaker ; 1-PH fault @ ELSEGND0 230 kV, Delayed Clearing	P4.5	Stuck breaker	Stable	Stable	Stable	Stable	Stable	Stable	N/A	
TS-9	El Segundo 230 kV South Bus L-1&G-1 with stuck breaker; 1-PH fault @ ELSEGND0 230 kV, Delayed Clearing	P4.5	Stuck breaker	Stable	Stable	Stable	Stable	Stable	Stable	N/A	
TS-10	Etiwanda North Bus L-1 with stuck breaker; 1-PH fault @ ETIWANDA 230 kV, Delayed Clearing	P4.5	Stuck breaker	Stable	Stable	Stable	Stable	Stable	Stable	N/A	
TS-11	Etiwanda 230 kV South Bus G-1 with stuck breaker; 1-PH fault @ ETIWANDA 230 kV, Delayed Clearing	P4.5	Stuck breaker	Stable	Stable	Stable	Stable	Stable	Stable	N/A	
TS-12	Hinson 230 kV North Bus L-1 with stuck breaker; 1-PH fault @ HINSON 230 kV, Delayed Clearing	P4.5	Stuck breaker	Stable	Stable	Stable	Stable	Stable	Stable	N/A	
TS-13	Ellis 230 kV North Bus L-1 with stuck breaker; 1-PH fault @ ELLIS 230 kV, Delayed Clearing	P4.5	Stuck breaker	Stable	Stable	Stable	Stable	Stable	Stable	N/A	
TS-14	Huntington Beach 230 kV South Bus Section A G-1&L-1 with stuck breaker ; 1-PH fault @ HUNTGBCH 230 kV, Delayed Clearing	P4.5	Stuck breaker	Stable	Stable	Stable	Stable	Stable	Stable	N/A	
TS-15	Alamitos 230 kV North Bus Section A stuck bus-tie breaker; 1-PH fault @ ALMITOSW 230 kV, Delayed Clearing	P4.6	Stuck breaker	Stable	Stable	Stable	Stable	Stable	Stable	N/A	
TS-16	Huntington Beach 230 kV North Bus Section A G-1 stuck bus-tie breaker; 1-PH fault @ HUNTGBCH 230 kV, Delayed Clearing	P4.6	Stuck breaker	Stable	Stable	Stable	Stable	Stable	Stable	N/A	
TS-17	Walnut 230 kV North Bus Section A L-1&T-1 stuck bus-tie breaker; 1-PH fault @ WALNUTW 230 kV, Delayed Clearing	P4.6	Stuck breaker	Stable	Stable	Stable	Stable	Stable	Stable	N/A	
TS-18	Alamitos 230 kV (Sec. "A") station bus differential relay failure; 1-PH fault @ ALMITOSW 230 kV, Delayed clearing	P5.5	Relay failure	Stable	Stable	Stable	Stable	Stable	Stable	N/A	
TS-19	Alamitos 230 kV (Sec. "B") station bus differential relay failure; 1-PH fault @ ALMITOSE 230 kV, Delayed clearing	P5.5	Relay failure	Stable	Stable	Stable	Stable	Stable	Stable	N/A	
TS-20	Barre 230 kV station bus differential relay failure; 1-PH fault @ BARRE 230 kV, Delayed clearing	P5.5	Relay failure	Stable	Stable	Stable	Stable	Stable	Stable	N/A	
TS-21	Center 230 kV station bus differential relay failure; 1-PH fault @ CENTER 230 kV, Delayed clearing	P5.5	Relay failure	Stable	Stable	Stable	Stable	Stable	Stable	N/A	
TS-22	Chino 230 kV station bus differential relay failure; 1-PH fault @ CHINO 230 kV, Delayed clearing	P5.5	Relay failure	Stable	Stable	Stable	Stable	Stable	Stable	N/A	
TS-23	Eagle Rock 230 kV station bus differential relay failure; 1-PH fault @ EAGLROCK 230 kV, Delayed clearing	P5.5	Relay failure	Stable	Stable	Stable	Stable	Stable	Stable	N/A	
TS-24	El Nido 230 kV station bus differential relay failure; 1-PH fault @ EL NIDO 230 kV, Delayed clearing	P5.5	Relay failure	Stable	Stable	Stable	Stable	Stable	Stable	N/A	
TS-25	El Segundo 230 kV station bus differential relay failure; 1-PH fault @ ELSEGND0 230 kV, Delayed clearing	P5.5	Relay failure	Stable	Stable	Stable	Stable	Stable	Stable	N/A	
TS-26	Etiwanda 230 kV station bus differential relay failure; 1-PH fault @ ETIWANDA 230 kV, Delayed clearing	P5.5	Relay failure	Stable	Stable	Stable	Stable	Stable	Stable	N/A	
TS-27	Goodrich 230 kV station bus differential relay failure; 1-PH fault @ GOODRICH 230 kV, Delayed clearing	P5.5	Relay failure	Stable	Stable	Stable	Stable	Stable	Stable	N/A	
TS-28	Harborgen 230 kV station bus differential relay failure; 1-PH fault @ HARBOR 230 kV, Delayed clearing	P5.5	Relay failure	Stable	Stable	Stable	Stable	Stable	Stable	N/A	
TS-29	Hinson 230 kV station bus differential relay failure; 1-PH fault @ HINSON 230 kV, Delayed clearing	P5.5	Relay failure	Stable	Stable	Stable	Stable	Stable	Stable	N/A	
TS-30	Laguna Bell 230 kV station bus differential relay failure; 1-PH fault @ LAGUBELL 230 kV, Delayed clearing	P5.5	Relay failure	Stable	Stable	Stable	Stable	Stable	Stable	N/A	
TS-31	Lewis 230 kV station bus differential relay failure; 1-PH fault @ LEWIS 230 kV, Delayed clearing	P5.5	Relay failure	Stable	Stable	Stable	Stable	Stable	Stable	N/A	
TS-32	Lighthipe 230 kV station bus differential relay failure; 1-PH fault @ LITEHIPE 230 kV, Delayed clearing	P5.5	Relay failure	Stable	Stable	Stable	Stable	Stable	Stable	N/A	
TS-33	Mesa 230 kV station bus differential relay failure; 1-PH fault @ MESA CAL 230 kV, Delayed clearing	P5.5	Relay failure	Stable	Stable	Stable	Stable	Stable	Stable	N/A	
TS-34	Olinda 230 kV station bus differential relay failure; 1-PH fault @ OLINDA 230 kV, Delayed clearing	P5.5	Relay failure	Stable	Stable	Stable	Stable	Stable	Stable	N/A	



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				2019 Summer Peak	2022 Summer Peak	2027 Summer Peak	2019 Spring Light Load	2022 Spring Off-Peak	2022SP High CEC Load & Peak Shift	2022 Summer Off-Peak with Maximum PV Output	
TS-35	Redondo 230 kV station bus differential relay failure; 1-PH fault @ REDONDO 230 kV, Delayed clearing	P5.5	Relay failure	Stable	Stable	Stable	Stable	Stable	Stable	N/A	
TS-36	Walnut 230 kV (Sec. "A") station bus differential relay failure; 1-PH fault @ WALNUTW 230 kV, Delayed clearing	P5.5	Relay failure	Stable	Stable	Stable	Stable	Stable	Stable	N/A	
TS-37	Walnut 230 kV (Sec. "B") station bus differential relay failure; 1-PH fault @ WALNUTE 230 kV, Delayed clearing	P5.5	Relay failure	Stable	Stable	Stable	Stable	Stable	Stable	N/A	
TS-38	Sunrise & SWPL 500 kV; 3-PH fault @ Suncrest 500 kV, Normal clearing	P6	L-1/L-1	Stable	Stable	Stable	Stable	Stable	Stable	N/A	
TS-39	Devers–Valley & Serrano–Valley 500 kV, 3-PH fault @ Valley, Normal clearing	P6	L-1/L-1	Stable	Stable	Stable	Stable	Stable	Stable	N/A	
TS-40	La Fresa–Redondo 230 kV #1 & #2; 1-PH fault @ Redondo, Normal clearing	P7	L-2	Stable	Stable	Stable	Stable	Stable	Stable	N/A	

Study Area: SCE Metro



Single Contingency Load Drop

ID	Worst Contingencies	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.

Study Area: SCE Metro



Single Source Substation with more than 100 MW Load

ID	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 Load