

2013/2014 ISO Reliability Assessment - Preliminary 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

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.

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Voltage Deviations

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

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



High/Low Voltage

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

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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-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
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

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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-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
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

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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-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
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

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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-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

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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

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



Thermal Overloads

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

2013/2014 ISO Reliability Assessment - Preliminary 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-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
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)

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Voltage Deviations

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

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-16	HIGGINS 115 kV	Placer-Gold Hill No. 1 115 kV Line & Placer-Gold Hill No. 2 115 kV Line	C5	DCTL	16.1	<10.0	<10.0	Interim operating solution
SIERA-SP-VD-17	BELL PGE 115 kV	Placer-Gold Hill No. 1 115 kV Line & Placer-Gold Hill No. 2 115 kV Line	C5	DCTL	18.2	<10.0	<10.0	Interim operating solution
SIERA-SP-VD-18	MTN_QUAR 60 kV	Placer-Gold Hill No. 1 115 kV Line & Placer-Gold Hill No. 2 115 kV Line	C5	DCTL	18.6	<10.0	<10.0	Interim operating solution

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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)

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High/Low Voltage

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

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High/Low Voltage



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

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.

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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

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Single Contingency Load Drop

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

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

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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