

## 2012/2013 ISO Reliability Assessment - Final 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
					2014	2017	2022	
Siera-T-01	Drum - Higgins 115 kV Line	Normal	A	N-0	82%	95%	101%	Drum-Placer area reinforcement
Siera-T-02	Placer 115/60 kV Transformer No. 1	Normal	A	N-0	90%	95%	104%	Drum-Placer area reinforcement
Siera-T-03	Drum - Grass Valley - Weimar 60 kV Line	Colgate-Grass Valley 60 kV Line _ROLLINSF 9.11 Unit ID 1	B	L-1/G-1	110%	118%	131%	Overload due to automatic pick-up of radially served load. Potential mitigation is to disable automatic pick-up scheme.
Siera-T-04	Gold Hill 230/115 kV Transformer No. 1	Gold Hill 230/115 kV Transformer No. 2	B	N-1	87%	91%	101%	Drum-Placer area reinforcement
Siera-T-05	Gold Hill 230/115 kV Transformer No. 2	Gold Hill 230/115 kV Transformer No. 1	B	N-1	87%	91%	101%	Drum-Placer area reinforcement
Siera-T-06	Palermo - Pease 115 kV Line	Pease - Marysville - Harter 60 kV Line _GRNLEAF2 13.80 Unit ID 1	B	L-1/G-1	99%	106%	70%	Interim operation solution.
Siera-T-07	Pease 115/60 kV Transformer No. 2	Pease - Marysville - Harter 60 kV Line _GRNLEAF2 13.80 Unit ID 1	B	L-1/G-1	50%	96%	107%	Add second 115/60 kV bank.
Siera-T-08	Placer 115/60 kV Transformer No. 1	HALSEY F 6.60 Unit ID 1	B	N-1	88%	93%	101%	Drum-Placer area reinforcement
Siera-T-09	Bogue - Rio Oso 115 kV Line	BUS FAULT AT 30330 RIO OSO 230.00 Bus 1	C1	Bus	102%	N/A	N/A	Interim operation solution.
Siera-T-10	Drum - Higgins 115 kV Line	BUS FAULT AT 30337 GOLDHILL 230.00 Bus 2	C1	Bus	84%	98%	110%	Drum-Placer area reinforcement
Siera-T-11	Gold Hill 230/115 kV Transformer No. 2	BUS FAULT AT 32018 GOLDHILL 115.00 Section 1E	C1	Bus	87%	91%	101%	Drum-Placer area reinforcement
Siera-T-12	Pease - Rio Oso 115 kV Line	BUS FAULT AT 30330 RIO OSO 230.00 Bus 1	C1	Bus	110%	N/A	N/A	Interim operation solution.
Siera-T-13	Rio Oso - Atlantic 230 kV Line No. 1	BUS FAULT AT 30337 GOLDHILL 230.00 Bus 2	C1	Bus	101%	60%	65%	Interim operation solution.
Siera-T-14	Bogue - Rio Oso 115 kV Line	RIO OSO 230 kV Bus 1 and 2 - CB 202 Failure	C2	Stuck Bkr	131%	N/A	N/A	Interim operation solution.

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Siera-T-15	East Nicolaus - Rio Oso 115 kV Line	RIO OSO 230 kV Bus 1 and 2 - CB 202 Failure	C2	Stuck Bkr	132%	N/A	N/A	Interim operation solution.
Siera-T-16	Palermo - Bogue 115 kV Line	RIO OSO 230 kV Bus 1 and 2 - CB 202 Failure	C2	Stuck Bkr	111%	N/A	N/A	Interim operation solution.
Siera-T-17	Palermo - Pease 115 kV Line	RIO OSO 230 kV Bus 1 and 2 - CB 202 Failure	C2	Stuck Bkr	118%	N/A	N/A	Interim operation solution.
Siera-T-18	Pease - Rio Oso 115 kV Line	RIO OSO 230 kV Bus 1 and 2 - CB 202 Failure	C2	Stuck Bkr	142%	N/A	N/A	Interim operation solution.
Siera-T-19	Rio Oso - Brighton 230 kV Line	RIO OSO 115 kV Bus 1 and 2 - CB 102 Failure	C2	Stuck Bkr	109%	N/A	N/A	Interim operation solution.
Siera-T-20	Bogue - Rio Oso 115 kV Line	Table Mountain - Rio Oso 230 kV Line _Colgate - Rio Oso 230 kV Line	C3	N-1-1	108%	102%	56%	Interim operation solution.
Siera-T-21	Drum - Higgins 115 kV Line	Placer - Gold Hill 115 kV Line No. 1 _Placer - Gold Hill 115 kV Line No. 2	C3	N-1-1	157%	Diverge	Diverge	Drum-Placer area reinforcement
Siera-T-22	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	149%	173%	172%	Drum-Placer area reinforcement
Siera-T-23	Drum - Rio Oso 115 kV No. 2 Line	Drum - Rio Oso 115 kV No. 1 Line _Higgins - Bell 115 kV Line	C3	N-1-1	131%	154%	156%	Drum-Placer area reinforcement
Siera-T-24	East Nicolaus - Rio Oso 115 kV Line	Table Mountain - Rio Oso 230 kV Line _Colgate - Rio Oso 230 kV Line	C3	N-1-1	104%	84%	37%	Interim operation solution.
Siera-T-25	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	115%	123%	136%	Drum-Placer area reinforcement
Siera-T-26	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%	123%	137%	Drum-Placer area reinforcement
Siera-T-27	Lincoln - Pleasant Grove 115 kV Line	Rio Oso - Atlantic 230 kV Line No. 1 _Atlantic - Gold Hill 230 kV Line	C3	N-1-1	128%	22%	23%	Interim operation solution.
Siera-T-28	Missouri Flat - Gold Hill 115 kV No. 1 Line	Gold Hill - Clarksville 115 kV Line _Missouri Flat - Gold Hill 115 kV No. 2 L	C3	N-1-1	89%	94%	105%	Rerate.
Siera-T-29	Palermo - Pease 115 kV Line	Colgate - Rio Oso 230 kV Line _Pease - Marysville - Harter 60 kV Line	C3	N-1-1	97%	105%	71%	Interim operation solution.

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### Thermal Overloads



ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014	2017	2022	
Siera-T-30	Pease - Rio Oso 115 kV Line	Table Mountain - Rio Oso 230 kV Line _Colgate - Rio Oso 230 kV Line	C3	N-1-1	119%	112%	65%	Interim operation solution.
Siera-T-31	Placer - Gold Hill 115 kV Line No. 1	Placer - Gold Hill 115 kV Line No. 2 _Drum - Higgins 115 kV Line	C3	N-1-1	121%	128%	149%	Drum-Placer area reinforcement
Siera-T-32	Placer - Gold Hill 115 kV Line No. 2	Placer - Gold Hill 115 kV Line No. 1 _Drum - Higgins 115 kV Line	C3	N-1-1	125%	132%	157%	Drum-Placer area reinforcement
Siera-T-33	Rio Oso - Lincoln 115 kV Line	Rio Oso - Atlantic 230 kV Line No. 1 _Atlantic - Gold Hill 230 kV Line	C3	N-1-1	113%	28%	29%	Interim operation solution.
Siera-T-34	Rio Oso 230/115 kV Bank No. 1	Rio Oso - Brighton 230 kV Line _Rio Oso 230/115 kV Bank No. 2	C3	N-1-1	105%	50%	51%	Interim operation solution.
Siera-T-35	Rio Oso 230/115 kV Bank No. 2	Rio Oso - Brighton 230 kV Line _Rio Oso 230/115 kV Bank No. 1	C3	N-1-1	100%	50%	51%	Interim operation solution.
Siera-T-36	Bogue - Rio Oso 115 kV Line	Colgate-Rio Oso 230 kV Line & Table Mountain- Rio Oso 230 kV Line	C5	DCTL	108%	102%	56%	Interim operation solution.
Siera-T-37	Drum - Higgins 115 kV Line	Placer-Gold Hill No. 1 115 kV Line & Placer- Gold Hill No. 2 115 kV Line	C5	DCTL	157%	Diverge	Diverge	Drum-Placer area reinforcement
Siera-T-38	East Nicolaus - Rio Oso 115 kV Line	Colgate-Rio Oso 230 kV Line & Table Mountain- Rio Oso 230 kV Line	C5	DCTL	104%	84%	37%	Interim operation solution.
Siera-T-39	Pease - Rio Oso 115 kV Line	Colgate-Rio Oso 230 kV Line & Table Mountain- Rio Oso 230 kV Line	C5	DCTL	119%	112%	65%	Interim operation solution.
Siera-T-40	Rio Oso - Brighton 230 kV Line	Loss of Rio Oso 115 kV substation	D8	Loss of substation	109%	64%	63%	Under Review
Siera-T-41	Palermo - Pease 115 kV Line	Loss of Rio Oso 230 kV substation	D8	Loss of substation	118%	110%	77%	Under Review
Siera-T-42	Palermo - Pease 115 kV Line	Loss of Rio Oso 230 kV substation	D8	Loss of substation	118%	110%	77%	Under Review
Siera-T-43	Pease - Rio Oso 115 kV Line	Loss of Rio Oso 230 kV substation	D8	Loss of substation	142%	124%	73%	Under Review
Siera-T-44	Palermo - Bogue 115 kV Line	Loss of Rio Oso 230 kV substation	D8	Loss of substation	111%	97%	108%	Under Review

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014	2017	2022	
Siera-T-45	Bogue - Rio Oso 115 kV Line	Loss of Rio Oso 230 kV substation	D8	Loss of substation	131%	114%	63%	Under Review
Siera-T-46	East Nicolaus - Rio Oso 115 kV Line	Loss of Rio Oso 230 kV substation	D8	Loss of substation	132%	93%	40%	Under Review
Siera-T-47	Pease - Rio Oso 115 kV Line	Loss of Rio Oso 230 kV substation	D8	Loss of substation	102%	83%	45%	Under Review
Siera-T-48	Pease - Rio Oso 115 kV Line	Loss of Rio Oso 230 kV substation	D8	Loss of substation	128%	108%	61%	Under Review

**Thermal Overloads**

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Summer Off-Peak	N/A	
Siera-OP-T-01	Pease 115/60 kV Transformer No. 2	Table Mountain - Pease 60 kV Line	B	N-1	103%	96%		Reduce Pease 60 kV generation
Siera-OP-T-02	Table Mountain - Pease 60 kV Line	Pease 115/60 kV Transformer No. 2	B	N-1	115%	104%		Reduce Pease 60 kV generation
Siera-OP-T-03	Drum - Higgins 115 kV Line	GOLDHILL 230 kV Bus 1 and 2 - CB 202 Failure	C2	Stuck Bkr	89%	150%		Drum-Placer area reinforcement.
Siera-OP-T-04	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	59%	108%		Drum-Placer area reinforcement.
Siera-OP-T-05	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	129%	137%		Drum-Placer area reinforcement.
Siera-OP-T-06	Drum - Rio Oso 115 kV No. 2 Line	Drum - Rio Oso 115 kV No. 1 Line _Higgins - Bell 115 kV Line	C3	N-1-1	105%	113%		Drum-Placer area reinforcement.
Siera-OP-T-07	Table Mountain - Pease 60 kV Line	Palermo-Pease 115 kV Line & Pease-Rio Oso 115 kV Line	C5	DCTL	101%	85%		Reduce Pease 60 kV generation

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014	2017	2022	
Siera-DV-01	PLACER 115 kV	Placer-Gold Hill No. 1 115 kV Line & Placer-Gold Hill No. 2 115 kV Line	C5	DCTL	-20%	Diverge	Diverge	Drum-Placer area reinforcement
Siera-DV-02	HIGGINS 115 kV	Placer-Gold Hill No. 1 115 kV Line & Placer-Gold Hill No. 2 115 kV Line	C5	DCTL	-17%	Diverge	Diverge	Drum-Placer area reinforcement
Siera-DV-03	BELL PGE 115 kV	Placer-Gold Hill No. 1 115 kV Line & Placer-Gold Hill No. 2 115 kV Line	C5	DCTL	-19%	Diverge	Diverge	Drum-Placer area reinforcement
Siera-DV-04	PENRYN 60 kV	Placer-Gold Hill No. 1 115 kV Line & Placer-Gold Hill No. 2 115 kV Line	C5	DCTL	-21%	Diverge	Diverge	Drum-Placer area reinforcement
Siera-DV-05	HALSEY 60 kV	Placer-Gold Hill No. 1 115 kV Line & Placer-Gold Hill No. 2 115 kV Line	C5	DCTL	-20%	Diverge	Diverge	Drum-Placer area reinforcement
Siera-DV-06	AUBURN 60 kV	Placer-Gold Hill No. 1 115 kV Line & Placer-Gold Hill No. 2 115 kV Line	C5	DCTL	-20%	Diverge	Diverge	Drum-Placer area reinforcement
Siera-DV-07	MTN_QUAR 60 kV	Placer-Gold Hill No. 1 115 kV Line & Placer-Gold Hill No. 2 115 kV Line	C5	DCTL	-20%	Diverge	Diverge	Drum-Placer area reinforcement

**Voltage Deviations**

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Summer Off-Peak	N/A	
Siera-OP-DV-01	MRYSVLE 60 kV	Pease 115/60 kV Transformer No. 2	B	N-1	-6%	-5%		Reduce Pease area 60 kV generation
Siera-OP-DV-02	MRYSVLE 60 kV	Pease 115/60 kV Transformer No. 2	B	N-1	-6%	-5%		Reduce Pease area 60 kV generation
Siera-OP-DV-03	ENCINAL 60 kV	Pease 115/60 kV Transformer No. 2	B	N-1	-7%	-6%		Reduce Pease area 60 kV generation
Siera-OP-DV-04	HARTER 60 kV	Pease 115/60 kV Transformer No. 2	B	N-1	-7%	-4%		Reduce Pease area 60 kV generation
Siera-OP-DV-05	LIVE OAK 60 kV	Pease 115/60 kV Transformer No. 2	B	N-1	-8%	-6%		Reduce Pease area 60 kV generation

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**High/Low Voltage**



ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014	2017	2022	
Siera-V-01	GRSS VLY 60 kV	Colgate-Grass Valley 60 kV Line _ROLLINSF 9.11 Unit ID 1	B	L-1/G-1	0.902	0.897	0.879	Drum-Placer area reinforcement
Siera-V-02	FORST HL 60 kV	Colgate-Grass Valley 60 kV Line _OXBOW F 9.11 Unit ID 1	B	L-1/G-1	0.903	0.896	0.876	Drum-Placer area reinforcement
Siera-V-03	Diverge	BUS FAULT AT 32018 GOLDHILL 115.00 Section 2E	C1	Bus	Diverge	Diverge	Diverge	Drum-Placer area reinforcement
Siera-V-04	Diverge	GOLDHILL 230 kV Bus 1 and 2 - CB 202 Failure	C2	Stuck Bkr	Diverge	Diverge	Diverge	Drum-Placer area reinforcement
Siera-V-05	Diverge	GOLDHILL 115 kV Bus 1 and Bus 2 - CB 102 Failure	C2	Stuck Bkr	Diverge	Diverge	Diverge	Drum-Placer area reinforcement
Siera-V-06	PLACER 115 kV	Placer - Gold Hill 115 kV Line No. 1 _Placer - Gold Hill 115 kV Line No. 2	C3	N-1-1	0.776	Diverge	Diverge	Drum-Placer area reinforcement
Siera-V-07	HORSESHE 115 kV	Placer - Gold Hill 115 kV Line No. 1 _Drum - Higgins 115 kV Line	C3	N-1-1	0.904	0.916	0.867	Drum-Placer area reinforcement
Siera-V-08	HIGGINS 115 kV	Placer - Gold Hill 115 kV Line No. 1 _Placer - Gold Hill 115 kV Line No. 2	C3	N-1-1	0.816	Diverge	Diverge	Drum-Placer area reinforcement
Siera-V-09	FLINT 115 kV	Placer - Gold Hill 115 kV Line No. 1 _Drum - Higgins 115 kV Line	C3	N-1-1	0.838	0.844	0.772	Drum-Placer area reinforcement
Siera-V-10	BELL PGE 115 kV	Placer - Gold Hill 115 kV Line No. 1 _Placer - Gold Hill 115 kV Line No. 2	C3	N-1-1	0.783	Diverge	Diverge	Drum-Placer area reinforcement
Siera-V-11	ROCKLIN 60 kV	Rio Oso - Atlantic 230 kV Line No. 1 _Atlantic - Gold Hill 230 kV Line	C3	N-1-1	0.71	0.975	0.98	Interim operating solution.
Siera-V-12	TAYLOR 60 kV	Rio Oso - Atlantic 230 kV Line No. 1 _Atlantic - Gold Hill 230 kV Line	C3	N-1-1	0.712	0.977	0.982	Interim operating solution.
Siera-V-13	PENRYN 60 kV	Placer - Gold Hill 115 kV Line No. 1 _Placer - Gold Hill 115 kV Line No. 2	C3	N-1-1	0.801	Diverge	Diverge	Drum-Placer area reinforcement
Siera-V-14	DEL MAR 60 kV	Rio Oso - Atlantic 230 kV Line No. 1 _Atlantic - Gold Hill 230 kV Line	C3	N-1-1	0.688	0.961	0.965	Interim operating solution.
Siera-V-15	SIERRAPI 60 kV	Rio Oso - Atlantic 230 kV Line No. 1 _Atlantic - Gold Hill 230 kV Line	C3	N-1-1	0.688	0.961	0.965	Interim operating solution.
Siera-V-16	LINCLN 115 kV	Rio Oso - Atlantic 230 kV Line No. 1 _Atlantic - Gold Hill 230 kV Line	C3	N-1-1	0.894	1.024	1.027	Interim operating solution.



**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014	2017	2022	
Siera-V-17	FORST HL 60 kV	ROLLINSF 9.11 Unit ID 1 _ OXBOW F 9.11 Unit ID 1	C3	N-1-1	0.892	0.888	0.873	Drum-Placer area reinforcement
Siera-V-18	HALSEY 60 kV	Placer - Gold Hill 115 kV Line No. 1 _ Placer - Gold Hill 115 kV Line No. 2	C3	N-1-1	0.814	Diverge	Diverge	Drum-Placer area reinforcement
Siera-V-19	AUBURN 60 kV	Placer - Gold Hill 115 kV Line No. 1 _ Placer - Gold Hill 115 kV Line No. 2	C3	N-1-1	0.816	Diverge	Diverge	Drum-Placer area reinforcement
Siera-V-20	PLSNT GR 115 kV	Rio Oso - Atlantic 230 kV Line No. 1 _ Atlantic - Gold Hill 230 kV Line	C3	N-1-1	0.847	1.018	1.024	Interim operating solution.
Siera-V-21	MTN_QUAR 60 kV	Placer - Gold Hill 115 kV Line No. 1 _ Placer - Gold Hill 115 kV Line No. 2	C3	N-1-1	0.81	Diverge	Diverge	Drum-Placer area reinforcement
Siera-V-22	Diverge	Gold Hill 230/115 kV Transformer No. 1_Gold Hill 230/115 kV Transformer No. 2	C3	N-1-1	Diverge	Diverge	Diverge	Drum-Placer area reinforcement
Siera-V-23	PLACER 115 kV	Placer-Gold Hill No. 1 115 kV Line & Placer-Gold Hill No. 2 115 kV Line	C5	DCTL	0.776	Diverge	Diverge	Drum-Placer area reinforcement
Siera-V-24	HIGGINS 115 kV	Placer-Gold Hill No. 1 115 kV Line & Placer-Gold Hill No. 2 115 kV Line	C5	DCTL	0.816	Diverge	Diverge	Drum-Placer area reinforcement
Siera-V-25	BELL PGE 115 kV	Placer-Gold Hill No. 1 115 kV Line & Placer-Gold Hill No. 2 115 kV Line	C5	DCTL	0.783	Diverge	Diverge	Drum-Placer area reinforcement
Siera-V-26	PENRYN 60 kV	Placer-Gold Hill No. 1 115 kV Line & Placer-Gold Hill No. 2 115 kV Line	C5	DCTL	0.801	Diverge	Diverge	Drum-Placer area reinforcement
Siera-V-27	HALSEY 60 kV	Placer-Gold Hill No. 1 115 kV Line & Placer-Gold Hill No. 2 115 kV Line	C5	DCTL	0.814	Diverge	Diverge	Drum-Placer area reinforcement
Siera-V-28	AUBURN 60 kV	Placer-Gold Hill No. 1 115 kV Line & Placer-Gold Hill No. 2 115 kV Line	C5	DCTL	0.816	Diverge	Diverge	Drum-Placer area reinforcement
Siera-V-29	MTN_QUAR 60 kV	Placer-Gold Hill No. 1 115 kV Line & Placer-Gold Hill No. 2 115 kV Line	C5	DCTL	0.81	Diverge	Diverge	Drum-Placer area reinforcement
Siera-V-30	Diverge	Placer-Gold Hill No. 1 115 kV Line & Placer-Gold Hill No. 2 115 kV Line	C5	DCTL	Diverge	Diverge	Diverge	Drum-Placer area reinforcement
Siera-V-31	Diverge	Loss of Gold Hill 230 kV substation	D8	Loss of substation	Diverge	Diverge	Diverge	Drum-Placer area reinforcement

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Summer Off-Peak	N/A	
Siera-OP-V-01	GOLDHILL 115 kV	Normal	A	N-0	1.06	1.04		Under review for possible exemption.
Siera-OP-V-02	E.NICOLS 115 kV	Normal	A	N-0	1.05	1.04		Under review for possible exemption.
Siera-OP-V-03	RIO OSO 115 kV	Normal	A	N-0	1.05	1.04		Under review for possible exemption.
Siera-OP-V-04	DRUM 115 kV	Normal	A	N-0	1.05	1.05		Under review for possible exemption.
Siera-OP-V-05	DTCH FL1 115 kV	Normal	A	N-0	1.05	1.05		Under review for possible exemption.
Siera-OP-V-06	DTCH FL2 115 kV	Normal	A	N-0	1.05	1.05		Under review for possible exemption.
Siera-OP-V-07	CHCGO PK 115 kV	Normal	A	N-0	1.05	1.05		Under review for possible exemption.
Siera-OP-V-08	BRNSWKTP 115 kV	Normal	A	N-0	1.05	1.04		Under review for possible exemption.
Siera-OP-V-09	BRNSWALT 115 kV	Normal	A	N-0	1.05	1.04		Under review for possible exemption.
Siera-OP-V-10	HORSHE1 115 kV	Normal	A	N-0	1.06	1.04		Under review for possible exemption.
Siera-OP-V-11	HORSESHE 115 kV	Normal	A	N-0	1.06	1.04		Under review for possible exemption.
Siera-OP-V-12	HORSHE2 115 kV	Normal	A	N-0	1.06	1.04		Under review for possible exemption.
Siera-OP-V-13	HIGGINS 115 kV	Normal	A	N-0	1.05	1.04		Under review for possible exemption.
Siera-OP-V-14	NEWCSTL1 115 kV	Normal	A	N-0	1.05	1.03		Under review for possible exemption.
Siera-OP-V-15	NEWCSTLE 115 kV	Normal	A	N-0	1.05	1.03		Under review for possible exemption.

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

**High/Low Voltage**



ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Summer Off-Peak	N/A	
Siera-OP-V-16	NEWCSTL2 115 kV	Normal	A	N-0	1.05	1.04		Under review for possible exemption.
Siera-OP-V-17	FLINT 115 kV	Normal	A	N-0	1.05	1.03		Under review for possible exemption.
Siera-OP-V-18	FLINT2 115 kV	Normal	A	N-0	1.05	1.03		Under review for possible exemption.
Siera-OP-V-19	BRNSWCKP 115 kV	Normal	A	N-0	1.05	1.04		Under review for possible exemption.
Siera-OP-V-20	ELDORAD 115 kV	Normal	A	N-0	1.06	1.04		Under review for possible exemption.
Siera-OP-V-21	APPLE HL 115 kV	Normal	A	N-0	1.06	1.04		Under review for possible exemption.
Siera-OP-V-22	PLCRVLB2 115 kV	Normal	A	N-0	1.06	1.04		Under review for possible exemption.
Siera-OP-V-23	PLCRVLT1 115 kV	Normal	A	N-0	1.06	1.04		Under review for possible exemption.
Siera-OP-V-24	PLCRVLB3 115 kV	Normal	A	N-0	1.05	1.04		Under review for possible exemption.
Siera-OP-V-25	PLCRVLT2 115 kV	Normal	A	N-0	1.06	1.04		Under review for possible exemption.
Siera-OP-V-26	DMND SPR 115 kV	Normal	A	N-0	1.06	1.04		Under review for possible exemption.
Siera-OP-V-27	DIMOND_2 115 kV	Normal	A	N-0	1.06	1.04		Under review for possible exemption.
Siera-OP-V-28	MIZOU_T2 115 kV	Normal	A	N-0	1.06	1.04		Under review for possible exemption.
Siera-OP-V-29	MIZOU_T1 115 kV	Normal	A	N-0	1.06	1.04		Under review for possible exemption.
Siera-OP-V-30	SHPRING1 115 kV	Normal	A	N-0	1.06	1.04		Under review for possible exemption.

**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Summer Off-Peak	N/A	
Siera-OP-V-31	CLRKSVLE 115 kV	Normal	A	N-0	1.06	1.04		Under review for possible exemption.
Siera-OP-V-32	CLRKSVLT 115 kV	Normal	A	N-0	1.06	1.04		Under review for possible exemption.
Siera-OP-V-33	SHPRING 115 kV	Normal	A	N-0	1.06	1.04		Under review for possible exemption.
Siera-OP-V-34	DIMOND_1 115 kV	Normal	A	N-0	1.06	1.04		Under review for possible exemption.
Siera-OP-V-35	SHPRING2 115 kV	Normal	A	N-0	1.06	1.04		Under review for possible exemption.
Siera-OP-V-36	CPM TAP 115 kV	Normal	A	N-0	1.06	1.04		Under review for possible exemption.
Siera-OP-V-37	CPM 115 kV	Normal	A	N-0	1.06	1.04		Under review for possible exemption.
Siera-OP-V-38	SPICAMIN 115 kV	Normal	A	N-0	1.06	1.04		Under review for possible exemption.
Siera-OP-V-39	LINCLN 115 kV	Normal	A	N-0	1.06	1.04		Under review for possible exemption.
Siera-OP-V-40	ULTRA JT 115 kV	Normal	A	N-0	1.07	1.04		Under review for possible exemption.
Siera-OP-V-41	ULTR-RCK 115 kV	Normal	A	N-0	1.07	1.04		Under review for possible exemption.
Siera-OP-V-42	SPI JCT 115 kV	Normal	A	N-0	1.06	1.04		Under review for possible exemption.
Siera-OP-V-43	PLSNT GR 115 kV	Normal	A	N-0	1.07	1.04		Under review for possible exemption.
Siera-OP-V-44	ATLANTIC 115 kV	Normal	A	N-0	1.08	1.05		Under review for possible exemption.
Siera-OP-V-45	APLHTAP2 115 kV	Normal	A	N-0	1.06	1.04		Under review for possible exemption.

2012/2013 ISO Reliability Assessment - Final Study Results

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



**High/Low Voltage**

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Summer Off-Peak	N/A	
Siera-OP-V-46	APLHTAP1 115 kV	Normal	A	N-0	1.06	1.04		Under review for possible exemption.

## 2012/2013 ISO Reliability Assessment - Final Study Results

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

### Transient Stability



ID	Contingency	Category	Category Description	Transient Stability Performance			Potential Mitigation Solutions
				2014	2017	2022	
Siera-TS-1	Gold Hill 230 kV Bus SLG fault with delayed clearing	C9	Bus SLG fault with delayed clearing	Unstable	Unstable	Unstable	SPS or voltage support.

# 2012/2013 ISO Reliability Assessment - Final Study Results

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



## Transient Stability

ID	Contingency	Category	Category Description	Transient Stability Performance			Potential Mitigation Solutions
				2014 Summer Light Load	2017 Summer Off-Peak	N/A	
Siera-OP-TS-1	Gold Hill 230 kV Bus SLG fault with delayed clearing	C9	Bus SLG fault with delayed clearing	Unstable	Unstable	Unstable	SPS or voltage support.

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



*Single Contingency Load Drop*

ID	Worst Contingency	Category	Category Description	Amount of Load Drop (MW)			Potential Mitigation Solutions
				2014	2017	2022	

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



## 2012/2013 ISO Reliability Assessment - Final Study Results

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
		2014	2017	2022	
Siera-LS-01	Clarksville 115 kV	105.80	111.70	123.60	Loop the station.