

2013/2014 ISO Reliability Assessment - Study Results

Study Area: **PG&E Greater Bay Area Peninsula - 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	
Penn-SP-T-01	Jefferson - Stanford 60 kV Line	B1_2_CARDINAL 12.47 Unit ID 1 & B2_52_Cooley Landing-Stanford 60kV Line (Cooley Landing-SRI)	B	N-1-1	130%	<100%	<100%	Short Term: Action Plan Long Term: Jefferson-Stanford No. 2 60 kV Line
Penn-SP-T-02	Cooley Landing - Stanford 60 kV Line	B1_2_CARDINAL 12.47 Unit ID 1 & B2_55_Jefferson-Stanford #1 60kV Line	B	N-1-1	119%	<100%	<100%	Short Term: Action Plan Long Term: Jefferson-Stanford No. 2 60 kV Line
Penn-SP-T-03	Bair 115/60 kV Transformer No. 1	C2-10_CB FAULT AT CLY LNDG 60 CB2	C2	Breaker	112%	121%	127%	Action Plan - curtail load at Bell Haven
Penn-SP-T-04	San Mateo - Belmont 115 kV Line	B3_5_Ravenswood 230/115kV Transformer #2 & B3_4_Ravenswood 230/115kV Transformer #1	C3	N-1-1	116%	111%	114%	Short Term: curtail load at Belmont Long Term: Ames-Palo Alto 115 kV Line and San Mateo-Bair 60 to 115 kV Voltage Conversion projects
Penn-SP-T-05	Millbrae-Sneath Lane 60 kV Line	B2_14_Martin-Millbrae 115kV Line & B2_20_Millbrae-San Mateo #1 115kV Line	C3	N-1-1	109%	112%	119%	Short Term: Action Plan - open Millbrae 115/60 kV Transformer No. 5 after first N-1 contingency Long Term: Install reverse power relay on Millbrae 115/60 Transformer No. 5
Penn-SP-T-06	Millbrae - Pacifica 60 kV Line	B2_48_Hillsdale JCT - Half Moon Bay 60kV Line & B2_17_Martin-Sneath Lane 60kV Line	C3	N-1-1	123%	130%	150%	Action Plan - curtail load at Pacifica
Penn-SP-T-07	Bair 115/60 kV Transformer No. 1	B2_30_Ravenswood-Cooley Landing #2 115kV Line & B3_12_Cooley Landing 115/60kV Transformer #1	C3	N-1-1	105%	116%	121%	Action Plan - curtail load at Bell Haven
Penn-SP-T-08	Cooley Landing 115/60 kV Transformer No. 2	B3_12_Cooley Landing 115/60kV Transformer #1 & B3_10_Bair 115/60kV Transformer #1	C3	N-1-1	106%	<100%	<100%	Action Plan - curtail load at Bell Haven

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					2015 Summer Peak	2018 Summer Peak	2023 Summer Peak	
Penn-SP-T-09	Ravenswood-Cooley Landing 115 kV Line	C5_22_Ravenswood-Palo Alto Nos. 1 & 2 115 kV lines	C5	DCTL	141%	104%	105%	Short Term: Action Plan - curtail load at Palo Alto Sw Sta Long Term: Ames-Palo Alto 115 kV Line project
Penn-SP-T-10	Cooley Landing - Stanford 60 kV Line	C5_4_Monta Vista-Jefferson Nos. 1 & 2 230 kV lines	C5	DCTL	<100%	<100%	103%	Add 230 kV bay position at Jefferson Substation for the Jefferson-Martin 230 kV Line termination

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					2015 Winter Peak	2018 Winter Peak	N/A	
Penn-WP-T-01	33401 CLY LN&1 60.0 33382 S.R.I. 60.0 1	B1_2_CARDINAL 12.47 Unit ID 1 & B2_55_Jefferson-Stanford #1 60kV Line	B	L-1/G-1	110%	<100%	-	Short Term: Action Plan - curtail load at Menlo Long Term: Jefferson-Stanford No. 2 60 kV Line
Penn-WP-T-02	33401 CLY LN&1 60.0 33382 S.R.I. 60.0 1	B1_3_CARDINAL 12.47 Unit ID 2 & B2_55_Jefferson-Stanford #1 60kV Line	B	L-1/G-1	110%	<100%	-	Short Term: Action Plan - curtail load at Menlo Long Term: Jefferson-Stanford No. 2 60 kV Line
Penn-WP-T-03	Bair 115/60 kV Transformer No. 1	C2-10_CB FAULT AT CLY LNDG 60 CB2	C2	Breaker	99%	105%	-	Action Plan - curtail load at Bell Haven
Penn-WP-T-04	Millbrae 115/60 kV Transformer No. 5	B2_17_Martin-Sneath Lane 60kV Line & B2_48_Hillsdale JCT - Half Moon Bay 60kV Line	C3	N-1-1	102%	107%	-	Action Plan - curtail load at Half Moon Bay
Penn-WP-T-05	Millbrae 115/60 kV Transformer No. 5	B2_38_Jefferson-Hillsdale JCT 60kV Line & B2_17_Martin-Sneath Lane 60kV Line	C3	N-1-1	<100%	104%	-	Action Plan - curtail load at Pacifica
Penn-WP-T-06	Millbrae-Sneath Lane 60 kV Line	B2_17_Martin-Sneath Lane 60kV Line & B2_48_Hillsdale JCT - Half Moon Bay 60kV Line	C3	N-1-1	104%	111%	-	Action Plan - curtail load at Half Moon Bay
Penn-WP-T-07	Millbrae-Sneath Lane 60 kV Line	B2_38_Jefferson-Hillsdale JCT 60kV Line & B2_17_Martin-Sneath Lane 60kV Line	C3	N-1-1	100%	108%	-	Action Plan - curtail load at Pacifica
Penn-WP-T-08	Millbrae - Pacifica 60 kV Line	B2_17_Martin-Sneath Lane 60kV Line & B2_48_Hillsdale JCT - Half Moon Bay 60kV Line	C3	N-1-1	134%	143%	-	Action Plan - curtail load at Half Moon Bay
Penn-WP-T-09	Millbrae - Pacifica 60 kV Line	B2_38_Jefferson-Hillsdale JCT 60kV Line & B2_17_Martin-Sneath Lane 60kV Line	C3	N-1-1	129%	139%	-	Action Plan - curtail load at Pacifica
Penn-WP-T-10	Bair 115/60 kV Transformer No. 1	B2_30_Ravenswood-Cooley Landing #2 115kV Line & B3_12_Cooley Landing 115/60kV Transformer #1	C3	N-1-1	<100%	102%	-	Action Plan - curtail load at Bell Haven
Penn-WP-T-11	Bair 115/60 kV Transformer No. 1	B3_11_Cooley Landing 115/60kV Transformer #2 & B3_12_Cooley Landing 115/60kV Transformer #1	C3	N-1-1	<100%	102%	-	Action Plan - curtail load at Redwood City

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Thermal Overloads

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2015 Winter Peak	2018 Winter Peak	N/A	
Penn-WP-T-12	Jefferson-Stanford 60 kV Line	B1_2_CARDINAL 12.47 Unit ID 1 & B2_52_Cooley Landing-Stanford 60kV Line (Cooley Landing-SRI)	C3	N-1-1	107%	<100%	-	Short Term: Action Plan - curtail load at Menlo Long Term: Jefferson-Stanford No. 2 60 kV Line
Penn-WP-T-13	Jefferson-Stanford 60 kV Line	B1_3_CARDINAL 12.47 Unit ID 2 & B2_52_Cooley Landing-Stanford 60kV Line (Cooley Landing-SRI)	C3	N-1-1	107%	<100%	-	Short Term: Action Plan - curtail load at Menlo Long Term: Jefferson-Stanford No. 2 60 kV Line
Penn-WP-T-14	Jefferson-Stanford 60 kV Line	B2_52_Cooley Landing-Stanford 60kV Line (Cooley Landing-SRI) & B3_15_Cardinal Cogen GSU Transformer	C3	N-1-1	107%	<100%	-	Short Term: Action Plan - curtail load at Menlo Long Term: Jefferson-Stanford No. 2 60 kV Line
Penn-WP-T-15	Cooley Landing-Stanford 60 kV Line	B2_55_Jefferson-Stanford #1 60kV Line & B3_15_Cardinal Cogen GSU Transformer	C3	N-1-1	110%	<100%	-	Short Term: Action Plan - curtail load at Menlo Long Term: Jefferson-Stanford No. 2 60 kV Line
Penn-WP-T-16	Jefferson-Stanford 60 kV Line	B1_2_CARDINAL 12.47 Unit ID 1 & B2_52_Cooley Landing-Stanford 60kV Line (Cooley Landing-SRI)	C3	N-1-1	107%	<100%	-	Short Term: Action Plan - curtail load at Menlo Long Term: Jefferson-Stanford No. 2 60 kV Line
Penn-WP-T-17	Jefferson-Stanford 60 kV Line	B1_3_CARDINAL 12.47 Unit ID 2 & B2_52_Cooley Landing-Stanford 60kV Line (Cooley Landing-SRI)	C3	N-1-1	107%	<100%	-	Short Term: Action Plan - curtail load at Menlo Long Term: Jefferson-Stanford No. 2 60 kV Line

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Study Area: **PG&E Greater Bay Area Peninsula - 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	
Penn-OP-T-01	Millbrae 115/60 kV Transformer No. 5	B2_17_Martin-Sneath Lane 60kV Line & B2_48_Hillsdale JCT - Half Moon Bay 60kV Line	C3	N-1-1	101%	<100%	-	Action Plan - curtail load at Pacifica

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Study Area: **PG&E Greater Bay Area Peninsula - Summer Peak**



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	
Penn-SP-DV-01	CLY LND2 115kV	B2_30_Ravenswood-Cooley Landing #2 115kV Line & B3_12_Cooley Landing 115/60kV Transformer #1	C3	N-1-1	< 10.00%	15.00%	16.00%	Add Reactive Support
Penn-SP-DV-02	MILLBRAE 115kV	B2_20_Millbrae-San Mateo #1 115kV Line & B2_14_Martin-Millbrae 115kV Line	C3	N-1-1	10.00%	10.00%	11.00%	Short Term: Action Plan - open Millbrae 115/60 kV Transformer No. 5 after first N-1 contingency Long Term: Install reverse power relay on Millbrae 115/60 Transformer No. 5
Penn-SP-DV-03	SANPAULA 115kV	B2_14_Martin-Millbrae 115kV Line & B2_20_Millbrae-San Mateo #1 115kV Line	C3	N-1-1	10.00%	10.00%	11.00%	Short Term: Action Plan - open Millbrae 115/60 kV Transformer No. 5 after first N-1 contingency Long Term: Install reverse power relay on Millbrae 115/60 Transformer No. 5

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Voltage Deviations

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2015 Winter Peak	2018 Winter Peak	N/A	
Penn-WP-VD-1	HLF MNBV 60kV	B3_14_Millbrae 115/60kV Transformer #5 & B2_48_Hillsdale JCT - Half Moon Bay 60kV Line	C3	N-1-1	-10.00%	-12.00%	-	Review area transformer tap settings and voltage schedule
Penn-WP-VD-2	MILLBRAE 115kV	B2_20_Millbrae-San Mateo #1 115kV Line & B2_14_Martin-Millbrae 115kV Line	C3	N-1-1	-9.00%	-11.00%	-	Review area transformer tap settings and voltage schedule

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Study Area: **PG&E Greater Bay Area Peninsula - Summer Off-Peak & Summer Light Load**



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	
Penn-OP-DV-1	PACIFICA 60kV	C2-1_CB FAULT AT 30700 SANMATEO 230 CB202	C2	Breaker	-10.00%	< 10.00%	-	Review area transformer tap settings and voltage schedule
Penn-OP-DV-2	SNTH LNE 60kV	C2-1_CB FAULT AT 30700 SANMATEO 230 CB202	C2	Breaker	-10.00%	< 10.00%	-	Review area transformer tap settings and voltage schedule

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High/Low Voltage

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2015 Winter Peak	2018 Winter Peak	N/A	
Penn-WP-V-1	CLY LND2 115kV	B2_30_Ravenswood-Cooley Landing #2 115kV Line & B3_12_Cooley Landing 115/60kV Transformer #1	C3	N-1-1	>0.9	0.87	-	Action Plan - curtail load at Redwood City
Penn-WP-V-2	HLF MNBY 60kV	B3_14_Millbrae 115/60kV Transformer #5 & B2_48_Hillsdale JCT - Half Moon Bay 60kV Line	C3	N-1-1	0.78	0.86	-	Action Plan - curtail load at Pacifica

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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	
Penn-OP-V-01	CCSF 115kV	C1-1_BUS FAULT AT 30700 SANMATEO 230.00 Sec 1D	C1	Bus	> 0.9	1.10	-	Review area transformer tap settings and voltage schedules
Penn-OP-V-02	SFIA 115kV	C1-7_BUS FAULT AT 33310 SANMATEO 115.00 Sec 1E	C1	Bus	> 0.9	1.10	-	Review area transformer tap settings and voltage schedules
Penn-OP-V-03	BURLNGME 115kV	C1-8_BUS FAULT AT 33310 SANMATEO 115.00 Sec 2E	C1	Bus	> 0.9	1.10	-	Review area transformer tap settings and voltage schedules
Penn-OP-V-04	CLY LND2 115kV	C1-12_BUS FAULT AT 33315 RVNSWD E 115.00 Sec 2E	C1	Bus	> 0.9	1.12	-	Review area transformer tap settings and voltage schedules
Penn-OP-V-05	EST GRND 115kV	C1-6_BUS FAULT AT 33310 SANMATEO 115.00 Sec 2D	C1	Bus	> 0.9	1.10	-	Review area transformer tap settings and voltage schedules
Penn-OP-V-06	MILLBRAE 60kV	C1-5_BUS FAULT AT 33310 SANMATEO 115.00 Sec 1D	C1	Bus	> 0.9	1.13	-	Review area transformer tap settings and voltage schedules
Penn-OP-V-07	CLY LND 115kV	C2-1_CB FAULT AT 30700 SANMATEO 230 CB202	C2	Breaker	> 0.9	1.11	-	Review area transformer tap settings and voltage schedules
Penn-OP-V-08	MLLBRETP 60kV	C2-4_CB FAULT AT 33310 SANMATEO 115 CB402	C2	Breaker	> 0.9	1.15	-	Review area transformer tap settings and voltage schedules
Penn-OP-V-09	CLY LND 115kV	C5_1_Eastshore-San Mateo 230 kV and Pittsburg-San Mateo 230 kV I	C5	DCTL	> 0.9	1.11	-	Review area transformer tap settings and voltage schedules
Penn-OP-V-10	CLY LND2 115kV	C5_20_Ravenswood-Cooley Landing Nos. 1 & 2 115 kV lines	C5	DCTL	> 0.9	1.13	-	Review area transformer tap settings and voltage schedules
Penn-OP-V-11	DALY CTY 115kV	C5_3_Ravenswood-San Mateo Nos. 1 & 2 230 kV lines	C5	DCTL	> 0.9	1.12	-	Review area transformer tap settings and voltage schedules
Penn-OP-V-12	MILLBRAE 60kV	C5_13_Millbrae-San Mateo No. 1 115 kV and East Grand-San Mateo N	C5	DCTL	> 0.9	1.14	-	Review area transformer tap settings and voltage schedules
Penn-OP-V-13	MILLBRAE 115kV	C5_13_Millbrae-San Mateo No. 1 115 kV and East Grand-San Mateo N	C5	DCTL	> 0.9	1.12	-	Review area transformer tap settings and voltage schedules
Penn-OP-V-14	SAN CRLS 60kV	C5_24_Bair-Cooley Landing Nos. 1 & 2 60 kV lines	C5	DCTL	> 0.9	1.10	-	Review area transformer tap settings and voltage schedules
Penn-OP-V-15	SNANDRES 60kV	C5_13_Millbrae-San Mateo No. 1 115 kV and East Grand-San Mateo N	C5	DCTL	> 0.9	1.15	-	Review area transformer tap settings and voltage schedules

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Single Contingency Load Drop

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

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

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Single Contingency Load Drop

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

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

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Study Area: **PG&E Greater Bay Area Peninsula - Summer Off-Peak & Summer Light Load**



Single Contingency Load Drop

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

ID	Substation	Load Served (MW)			Potential Mitigation Solutions
		Select..	Select..	Select..	

No single source substation with more than 100 MW Load

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Single Source Substation with more than 100 MW Load

ID	Substation	Load Served (MW)			Potential Mitigation Solutions
		Select..	Select..	Select..	

No single source substation with more than 100 MW Load

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Single Source Substation with more than 100 MW Load

ID	Substation	Load Served (MW)			Potential Mitigation Solutions
		Select..	Select..	Select..	

No single source substation with more than 100 MW Load