

2012/2013 ISO Reliability Assessment - Study Results

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



Thermal Overloads

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
Diab-SP-T-01	Contra Costa PP - Contra Costa Sub 230 kV Line	Birds Landing-Contra Costa PP 230kV Li_GATEWAY1 18.00 Unit ID 1	B	L-1/G-1	107%	115%	118%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate or reduce Marsh Landing generation
Diab-SP-T-02	Contra Costa PP - Contra Costa Sub 230 kV Line	BUS FAULT AT 30518 MARSHLND 230.00	C1	Bus	97%	102%	102%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Diab-SP-T-03	Pittsburg - Clayton #3 115 kV Line	BUS FAULT AT 32970 CLAYTN 115.00 Bus #2	C1	Bus	105%	105%	107%	Pittsburg-Lakewood SPS
Diab-SP-T-04	Lakewood - Meadow Lane - Clayton 115 kV Line	BUS FAULT AT 32970 CLAYTN 115.00 Bus #1	C1	Bus	144%	144%	147%	Pittsburg-Lakewood SPS
Diab-SP-T-05	Moraga - San Leandro #1 115 kV Line	BUS FAULT AT 33020 MORAGA 115.00 Sec 2E	C1	Bus	129%	98%	103%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Diab-SP-T-06	Moraga - San Leandro #2 115 kV Line	BUS FAULT AT 33020 MORAGA 115.00 Sec 1E	C1	Bus	150%	120%	127%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Diab-SP-T-07	Moraga - San Leandro #3 115 kV Line	BUS FAULT AT 33020 MORAGA 115.00 Sec 2E	C1	Bus	111%	84%	89%	East Shore - Oakland J 115 kV Reconductor Project
Diab-SP-T-08	Oleum - Martinez 115 kV Line	CB FAULT AT 30540 SOBRANTE 230 CB202	C2	Breaker	103%	N/A	N/A	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Diab-SP-T-09	Contra Costa - Brentwood 230 kV Line	CB FAULT AT 30525 C.COSTA 230 CB820	C2	Breaker	105%	94%	91%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Diab-SP-T-10	Contra Costa - Las Positas 230 kV Line	CB FAULT AT 30525 C.COSTA 230 CB600	C2	Breaker	101%	105%	107%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate

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Diab-SP-T-11	Contra Costa PP - Contra Costa Sub 230 kV Line	CB FAULT AT 30525 C.COSTA 230 CB400	C2	Breaker	104%	112%	114%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Diab-SP-T-12	Lone Tree - Cayetano 230 kV Line	CB FAULT AT 30525 C.COSTA 230 CB600	C2	Breaker	129%	133%	136%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Diab-SP-T-13	Pittsburg - Clayton #3 115 kV Line	CB FAULT AT 32950 PITSBURG 115 CB222	C2	Breaker	103%	103%	105%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Diab-SP-T-14	Pittsburg - Clayton #3 115 kV Line	CB FAULT AT 32950 PITSBURG 115 CB222	C2	Breaker	120%	120%	123%	Pittsburg - Lakewood SPS
Diab-SP-T-15	Martinez - Sobrante 115 kV Line	CB FAULT AT 30540 SOBRANTE 230 CB202	C2	Breaker	87%	100%	102%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Diab-SP-T-16	Oleum - Martinez 115 kV Line	CB FAULT AT 30540 SOBRANTE 230 CB202	C2	Breaker	110%	92%	95%	North Tower 115 kV Looping Project
Diab-SP-T-17	Sobrante - Grizzly - Claremont #2 115 kV Line	CB FAULT AT 30550 MORAGA 230 CB202	C2	Breaker	103%	87%	92%	North Tower 115 kV Looping Project
Diab-SP-T-18	Moraga - Oakland X #3 115 kV Line	CB FAULT AT 30540 SOBRANTE 230 CB202	C2	Breaker	88%	93%	100%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Diab-SP-T-19	Moraga - Oakland X #4 115 kV Line	CB FAULT AT 30540 SOBRANTE 230 CB202	C2	Breaker	88%	93%	100%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Diab-SP-T-20	Moraga - Lakewood 115 kV Line	CB FAULT AT 32970 CLAYTN 115 CB102	C2	Breaker	261%	263%	272%	Pittsburg-Lakewood SPS

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Diab-SP-T-21	Moraga - Sobrante 115 kV Line	CB FAULT AT 30550 MORAGA 230 CB202	C2	Breaker	128%	99%	105%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Diab-SP-T-22	Moraga - San Leandro #1 115 kV Line	CB FAULT AT 33020 MORAGA 115 CB442	C2	Breaker	129%	95%	101%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Diab-SP-T-23	Moraga - San Leandro #2 115 kV Line	CB FAULT AT 33020 MORAGA 115 CB432	C2	Breaker	154%	114%	120%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Diab-SP-T-24	Moraga - San Leandro #3 115 kV Line	CB FAULT AT 33020 MORAGA 115 CB442	C2	Breaker	111%	82%	86%	East Shore - Oakland J 115 kV Reconductor Project
Diab-SP-T-25	MORAGA 115/ 230 Bank 2	CB FAULT AT 33020 MORAGA 115 CB432	C2	Breaker	137%	N/A	N/A	Moraga 230/115 kV Transformer Replacement Project
Diab-SP-T-26	Oleum - Martinez 115 kV Line	Sobrante-El Cerrito STA G #1 115kV Lin_Sobrante-El Cerrito STA G #2 115kV Line	C3	N-1-1	112%	N/A	N/A	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Diab-SP-T-27	Contra Costa - Balfour 60 kV Line	CC PP - CC Sub 230kV Line _Willow Pass-Contra Costa 60kV Line	C3	N-1-1	124%	125%	120%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Diab-SP-T-28	Contra Costa - Delta Pumps 230 kV Line	Contra Costa-Brentwood 230kV Line _Contra Costa-Las Positas 230kV Line	C3	N-1-1	111%	N/A	N/A	Oakley Generating Station Network Upgrades
Diab-SP-T-29	Christie - Sobrante 115 kV Line	Sobrante-El Cerrito STA G #1 115kV Lin_Sobrante-El Cerrito STA G #2 115kV Line	C3	N-1-1	112%	89%	96%	North Tower 115 kV Looping Project
Diab-SP-T-30	Pittsburg - Clayton #3 115 kV Line	Pittsburg-Clayton #1 115kV Line _Pittsburg- Clayton #4 115kV Line	C3	N-1-1	117%	118%	120%	Pittsburg - Lakewood SPS
Diab-SP-T-31	Lakewood - Meadow Lane - Clayton 115 kV Line	Clayton-Meadow Lane 115kV Line _Lakewood-Clayton 115kV Line	C3	N-1-1	146%	146%	150%	North Tower 115 kV Looping Project

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					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
Diab-SP-T-32	Contra Costa - Balfour 60 kV Line	CC PP - CC Sub 230kV Line _Willow Pass-Contra Costa 60kV Line	C3	N-1-1	122%	123%	118%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Diab-SP-T-33	Lakewood - Meadow Lane - Clayton 115 kV Line	Pittsburg-San Ramon 230kV Line _Lakewood-Clayton 115kV Line	C3	N-1-1	98%	98%	100%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Diab-SP-T-34	Moraga - Lakewood 115 kV Line	Lakewood-Clayton 115kV Line _Lakewood-Meadow Lane-Clayton 115kV Line	C3	N-1-1	124%	125%	129%	Pittsburg - Lakewood SPS
Diab-SP-T-35	Lone Tree - Cayetano 230 kV Line	Contra Costa-Delta Switching Yard 230k_Contra Costa-Las Positas 230kV Line	C3	N-1-1	104%	106%	109%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Diab-SP-T-36	Martinez - Sobrante 115 kV Line	Sobrante 230/115kV Transformer #1 _Sobrante 230/115kV Transformer #2	C3	N-1-1	88%	101%	103%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Diab-SP-T-37	Oleum - Martinez 115 kV Line	Sobrante-El Cerrito STA G #1 115kV Lin_Sobrante-El Cerrito STA G #2 115kV Line	C3	N-1-1	120%	101%	106%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Diab-SP-T-38	Moraga - Lakewood 115 kV Line	Lakewood-Clayton 115kV Line _Lakewood-Meadow Lane-Clayton 115kV Line	C3	N-1-1	131%	133%	136%	Pittsburg - Lakewood SPS
Diab-SP-T-39	Moraga - San Leandro #1 115 kV Line	Moraga-San Leandro #2 115kV Line _Moraga-San Leandro #3 115kV Line	C3	N-1-1	150%	123%	130%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Diab-SP-T-40	Moraga - San Leandro #2 115 kV Line	Moraga-San Leandro #1 115kV Line _Moraga-San Leandro #3 115kV Line	C3	N-1-1	150%	124%	130%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate

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Thermal Overloads



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Diab-SP-T-41	Moraga - San Leandro #3 115 kV Line	Moraga-San Leandro #1 115kV Line _Moraga-San Leandro #2 115kV Line	C3	N-1-1	120%	100%	106%	East Shore - Oakland J 115 kV Reconductor Project & Moraga - Oakland J SPS
Diab-SP-T-42	MORAGA 115/230kV Bank 2	Moraga 230/115kV Transformer #1 _Moraga 230/115kV Transformer #3	C3	N-1-1	136%	N/A	N/A	Moraga 230/115 kV Transformer Replacement Project
Diab-SP-T-43	Pittsburg - Clayton #1 115 kV Line	Pittsburg-Clayton #3 115kV Line _Pittsburg-Clayton #4 115kV Line	C3	N-1-1	111%	112%	115%	Pittsburg - Lakewood SPS
Diab-SP-T-44	Pittsburg - Clayton #4 115 kV Line	Pittsburg-Clayton #3 115kV Line _Pittsburg-Clayton #1 115kV Line	C3	N-1-1	126%	127%	130%	Pittsburg - Lakewood SPS
Diab-SP-T-45	Pittsburg - Clayton #3 115 kV Line	Pittsburg-Clayton #1 115kV Line _Pittsburg-Clayton #4 115kV Line	C3	N-1-1	100%	101%	103%	Pittsburg - Lakewood SPS
Diab-SP-T-46	PITSBURG 115/230kV Bank 12	Pittsburg 230/115kV Transformer #13 _LMEC GSU CC2	C3	N-1-1	127%	N/A	N/A	Pittsburg Transformer No. 14 Addition
Diab-SP-T-47	PITSBURG 115/230kV Bank 13	Pittsburg 230/115kV Transformer #12 _LMEC GSU CC2	C3	N-1-1	147%	85%	87%	Pittsburg Transformer No. 14 Addition
Diab-SP-T-48	Contra Costa - Delta Pumps 230 kV Line	Contra Costa-Brentwood 230kV Line _Contra Costa-Las Positas 230kV Line	C3	N-1-1	104%	N/A	N/A	Oakley Generating Station Network Upgrades
Diab-SP-T-49	Contra Costa - Delta Pumps 230 kV Line	Contra Costa - Las Positas 230 kV and Contra Costa-Lonetree 230 kV lines	C5	DCTL	111%	N/A	N/A	Oakley Generating Station Network Upgrades
Diab-SP-T-50	Lone Tree - Cayetano 230 kV Line	Contra Costa-Moraga Nos. 1 & 2 230 kV lines	C5	DCTL	95%	99%	103%	Re-rate or reconductor line. Drop load either manually or thru SPS as appropriate
Diab-SP-T-51	Moraga - Lakewood 115 kV Line	Lakewood-Clayton and Lakewood-Meadow Lane-Clayton 115 kV lines	C5	DCTL	131%	133%	136%	Pittsburg - Lakewood SPS
Diab-SP-T-52	Moraga - San Leandro #1 115 kV Line	Moraga-Oakland J 115 kV and Moraga-San Leandro No. 3 115 kV lines	C5	DCTL	135%	101%	107%	East Shore - Oakland J 115 kV Reconductor Project & Moraga - Oakland J SPS

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					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
Diab-SP-T-53	Moraga - San Leandro #2 115 kV Line	Moraga-Oakland J 115 kV and Moraga-San Leandro No. 3 115 kV lines	C5	DCTL	137%	102%	108%	East Shore - Oakland J 115 kV Reconductor Project & Moraga - Oakland J SPS
Diab-SP-T-54	Moraga - San Leandro #3 115 kV Line	Moraga-San Leandro Nos. 1 & 2 115 kV lines	C5	DCTL	120%	100%	104%	East Shore - Oakland J 115 kV Reconductor Project & Moraga - Oakland J SPS
Diab-SP-T-55	Pittsburg - Clayton #1 115 kV Line	Pittsburg-Clayton Nos. 3 & 4 115 kV lines	C5	DCTL	111%	112%	104%	Pittsburg - Lakewood SPS
Diab-SP-T-56	Contra Costa - Delta Pumps 230 kV Line	Contra Costa - Las Positas 230 kV and Contra Costa-Lonetree 230 kV lines	C5	DCTL	104%	N/A	N/A	Oakley Generating Station Network Upgrades

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



Thermal Overloads

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)			Potential Mitigation Solutions
					2014 Summer Light Load	2017 Summer Off-Peak	N/A	
Diab-OP-T-01	MORAGA 115/230kV Bank 2	CB FAULT AT 33020 MORAGA 115 CB432	C2	Breaker	109%	N/A		Moraga Transformer Replacement Project

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Voltage Deviations

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
Diab-SP-DV-01	MEDW LNE 115kV	CB FAULT AT 32970 CLAYTN 115 CB102	C2	Breaker	-20%	-20%	-21%	Add reactive support
Diab-SP-DV-02	EBMUDGRY 115kV	CB FAULT AT 32970 CLAYTN 115 CB102	C2	Breaker	-20%	-19%	-20%	Add reactive support
Diab-SP-DV-03	LAKEWD-C 115kV	CB FAULT AT 32970 CLAYTN 115 CB102	C2	Breaker	-19%	-19%	-20%	Add reactive support
Diab-SP-DV-04	LAKEWD-M 115kV	CB FAULT AT 32970 CLAYTN 115 CB102	C2	Breaker	-19%	-19%	-20%	Add reactive support
Diab-SP-DV-05	LK_REACT 115kV	CB FAULT AT 32970 CLAYTN 115 CB102	C2	Breaker	-11%	-10%	-11%	Add reactive support
Diab-SP-DV-06	LKWD_JCT 115kV	CB FAULT AT 32970 CLAYTN 115 CB102	C2	Breaker	-19%	-19%	-20%	Add reactive support

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



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	
Diab-OP-DV-01	RVEC 115kV	Contra Costa #1 115kV Line	B	N-1	-5%	-5%		Add reactive support
Diab-OP-DV-02	BIXLER 60kV	Bixler Tap	B	N-1	-7%	-5%		Add reactive support

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High/Low Voltage



ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)			Potential Mitigation Solutions
					2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	
Diab-SP-V-01	MEDW LNE 115kV	CB FAULT AT 32970 CLAYTN 115 CB102	C2	Bus	0.78	0.79	0.78	Add reactive support
Diab-SP-V-02	EBMUDGRY 115kV	CB FAULT AT 32970 CLAYTN 115 CB102	C2	Bus	0.79	0.80	0.79	Add reactive support
Diab-SP-V-03	LAKEWD-C 115kV	CB FAULT AT 32970 CLAYTN 115 CB102	C2	Bus	0.80	0.80	0.79	Add reactive support
Diab-SP-V-04	LAKEWD-M 115kV	CB FAULT AT 32970 CLAYTN 115 CB102	C2	Bus	0.80	0.81	0.80	Add reactive support
Diab-SP-V-05	LK_REACT 115kV	CB FAULT AT 32970 CLAYTN 115 CB102	C2	Bus	0.88	0.89	0.89	Add reactive support
Diab-SP-V-06	LKWD_JCT 115kV	CB FAULT AT 32970 CLAYTN 115 CB102	C2	Bus	0.80	0.80	0.79	Add reactive support

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Study Area: **PG&E Greater Bay Area Diablo - 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	
Diab-OP-V-01	CC SUB 115kV	Normal	A	N-0	1.05	1.05		Add reactive support
Diab-OP-V-02	DOMTAR 115kV	Normal	A	N-0	1.05	1.05		Add reactive support
Diab-OP-V-03	CROWN Z 115kV	Normal	A	N-0	1.05	1.05		Add reactive support
Diab-OP-V-04	RVEC 115kV	Normal	A	N-0	1.05	1.05		Add reactive support
Diab-OP-V-05	CC SUB 60kV	Normal	A	N-0	1.05	1.05		Add reactive support
Diab-OP-V-06	BIXLER 60kV	Normal	A	N-0	1.06	1.03		Add reactive support
Diab-OP-V-07	ANTIOCH 60kV	Normal	A	N-0	1.05	1.05		Add reactive support
Diab-OP-V-08	SFPP CNC 60kV	Normal	A	N-0	1.05	1.05		Add reactive support
Diab-OP-V-09	URICH 60kV	Normal	A	N-0	1.05	1.05		Add reactive support
Diab-OP-V-10	STAUFFER 60kV	Normal	A	N-0	1.05	1.05		Add reactive support
Diab-OP-V-11	PCBRICK 60kV	Normal	A	N-0	1.06	1.06		Add reactive support



ID	Contingency	Category	Category Description	Transient Stability Performance			Potential Mitigation Solutions
				2014 Summer Peak	2017 Summer Peak	2022 Summer Peak	



Transient Stability

ID	Contingency	Category	Category Description	Transient Stability Performance			Potential Mitigation Solutions
				2014 Summer Light Load	2017 Summer Off-Peak	N/A	

No transient stability issues identified.

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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.

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Single Source Substation with more than 100 MW Load



ID	Substation	Load Served (MW)			Potential Mitigation Solutions
		2014	2017	2022	

No single source substation with more than 100 MW Load