Study Area: **PG&E Greater Bay Area - Sensitivity**

Thermal Overloads

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)								Potential Mitigation Solutions
					2020 SP Heavy Renewable & Min Gas Gen	2025 Retirement of QF Generations	2025 SP Zero East Bay Generation	2025 SP No AAEE	N/A	N/A	N/A	N/A	
GBA-SP-SEN-T-1	Potrero-Mission (AX) 115kV Cable	Potrero-Larkin #2 (AY-2) 115kV Cable	P1	N-1	101.2	101.4	101.3	101.9					Modifying TBC DC Runback Scheme
GBA-SP-SEN-T-2	Jefferson-Stanford #1 60kV Line	Jefferson-Las Pulgas 60kV Line (Jefferson-Woodside)	P1	N-1	96.5	94.0	94.0	100.1					Review Stanford 60 kV system configuration
GBA-SP-SEN-T-3	Metcalf-Llagas 115 kV Line	Metcalf-Morgan Hill 115 kV	P1	N-1	109.6	98.9	98.8	96.1					Reduce Gilroy generation
GBA-SP-SEN-T-4	Bair-Cooley Landing #1 60kV Line	BLHVNTP1-CLY LNDG #1 60 kV	P2-1	Line section w/o fault	99.0	97.0	97.0	108.8					Mitigation under investigation
GBA-SP-SEN-T-5	Bair-Cooley Landing #2 60kV Line	BAIR-REDWDTP2 #2 60 kV	P2-1	Line section w/o fault	98.1	95.1	94.9	106.7					Mitigation under investigation
GBA-SP-SEN-T-6	Birds Landing - Contra Costa Sub 230 kV Line	BUS 2D FAULT AT 30525 C.COSTA 230.00	P2	Bus	102.4	40.2	39.4	47.7					Reduce Contra Costa area generation
GBA-SP-SEN-T-7	Cayetano-Lone Tree (USWP-Cayetano) 230kV Line	BUS-TIE BREAKER FAULT AT 30550 MORAGA 230.00	P2	Bus-tie breaker	101.1	92.7	88.2	97.6					Reduce Contra Costa area generation
GBA-SP-SEN-T-8	Oleum-Christie 115kV Line	BUS-TIE BREAKER FAULT AT 33010 SOBRANTE 115.00	P2	Bus-tie breaker	69.1	157.1	58.2	65.7					SPS or system upgrade
GBA-SP-SEN-T-9	Oleum-El Cerrito STA G #1 115kV Line	BUS-TIE BREAKER FAULT AT 33010 SOBRANTE 115.00	P2	Bus-tie breaker	94.7	173.8	85.0	93.8					SPS or system upgrade
GBA-SP-SEN-T-10	Oleum-El Cerrito STA G #2 115kV Line	BUS-TIE BREAKER FAULT AT 33010 SOBRANTE 115.00	P2	Bus-tie breaker	73.4	133.9	65.7	72.1					SPS or system upgrade
GBA-SP-SEN-T-11	Sobrante-El Cerrito STA G #1 115kV Lin	BUS-TIE BREAKER FAULT AT 32950 PITSBURG 115.00	P2	Bus-tie breaker	78.7	101.9	76.8	83.9					SPS or system upgrade
GBA-SP-SEN-T-12	Christie-Sobrante (Oleum-Sobrante) 115kV Line	BUS-TIE BREAKER FAULT AT 32950 PITSBURG 115.00	P2	Bus-tie breaker	78.7	101.9	76.8	83.9					SPS or system upgrade
GBA-SP-SEN-T-13	Oakland D - Oakland L 115kV Cable	BUS-TIE BREAKER FAULT AT 32790 STATIN X 115.00	P2	Bus-tie breaker	131.3	62.8	132.4	137.4					SPS or system upgrade
GBA-SP-SEN-T-14	Oakland C - Oakland L #1 115kV Cable	BUS-TIE BREAKER 162 FAULT AT 32780 CLARMNT 115.00	P2	Bus-tie breaker	99.2	97.9	99.6	105.7					SPS or system upgrade
GBA-SP-SEN-T-15	Oakland C - Oakland X #2 115kV Cable	BUS-TIE BREAKER 162 FAULT AT 32780 CLARMNT 115.00	P2	Bus-tie breaker	113.3	52.3	113.9	120.3					SPS or system upgrade
GBA-SP-SEN-T-16	Oakland C - Oakland L #1 115kV Cable	BUS-TIE BREAKER FAULT AT 33020 MORAGA 115.00	P2	Bus-tie breaker	42.8	105.8	32.3	33.3					SPS or system upgrade
GBA-SP-SEN-T-17	Grant-Oakland J 115 kV Line	BUS-TIE BREAKER FAULT AT 30550 MORAGA 230.00	P2	Bus-tie breaker	103.7	89.2	100.5	109.4					SPS or system upgrade
GBA-SP-SEN-T-18	Christie-Franklin #2 60kV Line	BUS-TIE BREAKER FAULT AT 33010 SOBRANTE 115.00	P2	Bus-tie breaker	65.2	111.9	58.7	68.6					SPS or system upgrade
GBA-SP-SEN-T-19	Pittsburg-Martinez #2 115kV Line	BUS-TIE BREAKER FAULT AT 33010 SOBRANTE 115.00	P2	Bus-tie breaker	83.2	149.6	76.8	84.3					SPS or system upgrade
GBA-SP-SEN-T-20	Pittsburg-Martinez #1 115kV Line	BUS-TIE BREAKER FAULT AT 33010 SOBRANTE 115.00	P2	Bus-tie breaker	85.8	148.3	80.8	88.3					SPS or system upgrade

Study Area: **PG&E Greater Bay Area - Sensitivity**

Thermal Overloads

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)								Potential Mitigation Solutions
					2020 SP Heavy Renewable & Min Gas Gen	2025 Retirement of QF Generations	2025 SP Zero East Bay Generation	2025 SP No AAEE	N/A	N/A	N/A	N/A	
GBA-SP-SEN-T-21	Martinez-Oleum 115kV Line	BUS-TIE BREAKER FAULT AT 33010 SOBRANTE 115.00	P2	Bus-tie breaker	262.7	586.8	219.6	242.8					SPS or system upgrade
GBA-SP-SEN-T-22	Oleum-Martinez 115kV Line	BUS-TIE BREAKER FAULT AT 33010 SOBRANTE 115.00	P2	Bus-tie breaker	243.7	544.1	203.6	225.1					SPS or system upgrade
GBA-SP-SEN-T-23	Moraga-Claremont #1 115kV Line	BUS 2D FAULT AT 33020 MORAGA 115.00	P2	Bus	125.3	109.9	112.4	120.7					Increase generation in the Oakland Area
GBA-SP-SEN-T-24	Moraga-Claremont #2 115kV Line	BUS-TIE BREAKER FAULT AT 32790 STATIN X 115.00	P2	Bus-tie breaker	135.0	88.4	127.7	136.5					Increase generation in the Oakland Area
GBA-SP-SEN-T-25	Sobrante-Moraga 115kV Line	BUS-TIE BREAKER FAULT AT 30540 SOBRANTE 230.00	P2	Bus-tie breaker	97.6	111.2	96.5	106.1					SPS or system upgrade
GBA-SP-SEN-T-26	Moraga-Station X 115 kV #1 Line	BUS-TIE BREAKER 162 FAULT AT 32780 CLARMNT 115.00	P2	Bus-tie breaker	112.1	64.1	111.9	119.3					Increase generation in the Oakland Area
GBA-SP-SEN-T-27	Moraga-Oakland X #2 115kV Line	BUS-TIE BREAKER 162 FAULT AT 32780 CLARMNT 115.00	P2	Bus-tie breaker	112.1	59.3	111.9	119.3					Increase generation in the Oakland Area
GBA-SP-SEN-T-28	Moraga-Station X 115 kV #3 Line	BUS-TIE BREAKER FAULT AT 33020 MORAGA 115.00	P2	Bus-tie breaker	165.9	117.1	154.2	165.9					Increase generation in the Oakland Area
GBA-SP-SEN-T-29	Moraga-Station X 115 kV #4 Line	BUS-TIE BREAKER FAULT AT 33020 MORAGA 115.00	P2	Bus-tie breaker	165.9	117.1	154.2	165.9					Increase generation in the Oakland Area
GBA-SP-SEN-T-30	Potrero-Larkin #2 (AY-2) 115kV Cable	BUS-TIE BREAKER 102 FAULT AT 33204 POTRERO 115.00	P2	Bus-tie breaker	122.1	119.7	119.7	119.2					Modifying TBC DC Runback Scheme
GBA-SP-SEN-T-31	Potrero-Mission (AX) 115kV Cable	NON-BUS-TIE BREAKER CBXX5 FAILURE AT POTRERO 115 kV	P2	Bus-tie breaker	102.7	102.0	102.0	103.8					Modifying TBC DC Runback Scheme
GBA-SP-SEN-T-32	San Mateo-Belmont 115kV Line	BUS FAULT AT 33321 RVNSWD D 115.00	P2	Bus	99.9	99.0	98.2	107.6					SPS or system upgrade
GBA-SP-SEN-T-33	Cooley Landing-Palo Alto 115kV Line	BUS FAULT AT 33315 RVNSWD E 115.00	P2	Bus	113.8	114.4	114.2	115.4					Palo Alto interim SPS
GBA-SP-SEN-T-34	Ravenswood-Cooley Landing #1 115kV Line	BUS FAULT AT 33315 RVNSWD E 115.00	P2	Bus	127.0	127.3	125.4	134.0					Palo Alto interim SPS
GBA-SP-SEN-T-35	San Mateo-Bair 60kV Line	BUS-TIE BREAKER FAULT AT 33316 CLY LND2 115.00	P2	Bus-tie breaker	131.9	59.5	57.4	65.9					increase peninsula area generation
GBA-SP-SEN-T-36	San Mateo-Hillsdale JCT 60kV Line (Beresford-Hillsdale)	BUS-TIE BREAKER FAULT AT 30705 MONTAVIS 230.00	P2	Bus-tie breaker	109.8	93.4	93.7	108.0					Monta Vista 230 kV Bus Upgrade Project
GBA-SP-SEN-T-37	San Mateo-Hillsdale JCT 60kV Line (Hillsdale-Hillsdale JCT)	BUS-TIE BREAKER FAULT AT 30705 MONTAVIS 230.00	P2	Bus-tie breaker	102.4	86.5	86.9	100.2					Monta Vista 230 kV Bus Upgrade Project
GBA-SP-SEN-T-38	Bair 115/60kV Transformer #1	BUS-TIE BREAKER FAULT AT 33316 CLY LND2 115.00	P2	Bus-tie breaker	157.7	162.5	157.1	178.1					Review Stanford 60 kV system configuration
GBA-SP-SEN-T-39	Bair-Cooley Landing #1 60kV Line	BUS-TIE BREAKER FAULT AT 33316 CLY LND2 115.00	P2	Bus-tie breaker	130.8	132.5	126.1	145.2					Review Stanford 60 kV system configuration
GBA-SP-SEN-T-40	Bair-Cooley Landing #2 60kV Line	BUS-TIE BREAKER FAULT AT 33316 CLY LND2 115.00	P2	Bus-tie breaker	127.1	126.8	122.2	139.8					Review Stanford 60 kV system configuration
GBA-SP-SEN-T-41	Eastshore 230/115kV Transformer #2	NON-BUS-TIE BREAKER CB2222 FAILURE AT EAST SHORE 230 kV	P2	Non Bus-tie breaker	105.9	104.3	104.7	109.1					Action Plan - reduce RCEC generation

Study Area: **PG&E Greater Bay Area - Sensitivity**

Thermal Overloads

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)								Potential Mitigation Solutions
					2020 SP Heavy Renewable & Min Gas Gen	2025 Retirement of QF Generations	2025 SP Zero East Bay Generation	2025 SP No AAEE	N/A	N/A	N/A	N/A	
GBA-SP-SEN-T-42	Newark-Lawerence 115kV Line	BUS-TIE BREAKER FAULT AT 30705 MONTAVIS 230.00	P2	Bus-tie breaker	442.1	328.3	334.2	458.3					Monta Vista 230 kV Bus Upgrade Project
GBA-SP-SEN-T-43	Newark-Applied Materials 115kV Line	BUS-TIE BREAKER FAULT AT 30705 MONTAVIS 230.00	P2	Bus-tie breaker	297.6	216.0	220.0	307.1					Monta Vista 230 kV Bus Upgrade Project
GBA-SP-SEN-T-44	Newark-Dixon Landing 115kV Line	BUS FAULT AT 35643 MTCALF E 115.00	P2	Bus	113.8	107.9	107.2	116.8					SPS or system upgrade
GBA-SP-SEN-T-45	Mountain View-Monta Vista 115 kV Line	BUS-TIE BREAKER FAULT AT 30705 MONTAVIS 230.00	P2	Bus-tie breaker	116.3	57.4	57.4	73.3					Monta Vista 230 kV Bus Upgrade Project
GBA-SP-SEN-T-46	Lawrence - Monta Vista 115 kV	BUS-TIE BREAKER FAULT AT 30705 MONTAVIS 230.00	P2	Bus-tie breaker	314.8	219.1	223.9	320.5					Monta Vista 230 kV Bus Upgrade Project
GBA-SP-SEN-T-47	Britton-Monta Vista 115 kV Line	BUS-TIE BREAKER FAULT AT 30705 MONTAVIS 230.00	P2	Bus-tie breaker	196.4	139.3	142.3	199.6					Monta Vista 230 kV Bus Upgrade Project
GBA-SP-SEN-T-48	Applied Materials-Britton 115 kV Line	BUS-TIE BREAKER FAULT AT 30705 MONTAVIS 230.00	P2	Bus-tie breaker	267.7	191.8	195.6	275.7					Monta Vista 230 kV Bus Upgrade Project
GBA-SP-SEN-T-49	Monta Vista-Permanente 60 kV Line	BUS-TIE BREAKER FAULT AT 30705 MONTAVIS 230.00	P2	Bus-tie breaker	124.0	99.4	101.9	120.1					Monta Vista 230 kV Bus Upgrade Project
GBA-SP-SEN-T-50	San Jose Sta 'A'-'B' 115 kV Line	BUS FAULT AT 35643 MTCALF E 115.00	P2	Bus	84.3	95.3	98.6	109.3					SPS or system upgrade
GBA-SP-SEN-T-51	El Patio-San Jose Sta. 'A' 115 kV Line	BUS FAULT AT 35643 MTCALF E 115.00	P2	Bus	87.3	96.3	99.1	109.5					SPS or system upgrade
GBA-SP-SEN-T-52	Markham No. 1 115 kV Tap	BUS FAULT AT 35643 MTCALF E 115.00	P2	Bus	94.5	97.7	98.1	106.6					SPS or system upgrade
GBA-SP-SEN-T-53	Metcalf 230/115 kV Trans No. 1	BUS-TIE BREAKER 322 FAULT AT 30735 METCALF 230.00	P2	Bus-tie breaker	127.4	94.4	95.5	105.1					SPS or system upgrade
GBA-SP-SEN-T-54	Metcalf 230/115 kV Trans No. 4	BUS-TIE BREAKER 312 FAULT AT 30735 METCALF 230.00	P2	Bus-tie breaker	118.2	87.4	88.2	96.3					Increase Metcalf area generation
GBA-SP-SEN-T-55	Metcalf-Llagas 115 kV Line	BUS FAULT AT 35648 LLAGAS F 115.00	P2	Bus	15.5	126.6	126.5	123.9					Reduce Gilroy generation
GBA-SP-SEN-T-56	Metcalf 230/115 kV Trans No. 2	BUS-TIE BREAKER 312 FAULT AT 30735 METCALF 230.00	P2	Bus-tie breaker	117.1	87.6	88.4	96.5					Increase Metcalf area generation
GBA-SP-SEN-T-57	Metcalf 230/115 kV Trans No. 3	BUS-TIE BREAKER 322 FAULT AT 30735 METCALF 230.00	P2	Bus-tie breaker	126.1	94.5	95.7	105.2					SPS or system upgrade
GBA-SP-SEN-T-58	Oakland C - Oakland X #2 115kV Cable	DEC CTG1 18.00 Generator ID 1 & Oakland C - Oakland X #3 115kV Cable	P3	G-1/N-1	102.2	<90	93.0	99.3					Increase generation in the Oakland Area
GBA-SP-SEN-T-59	Moraga-Claremont #1 115kV Line	DEC STG1 24.00 Generator ID 1 & Moraga-Claremont #2 115kV Line	P3	G-1/N-1	119.0	99.6	99.6	110.1					Increase generation in the Oakland Area
GBA-SP-SEN-T-60	Moraga-Claremont #2 115kV Line	DEC STG1 24.00 Generator ID 1 & Moraga-Claremont #1 115kV Line	P3	G-1/N-1	119.1	99.7	99.6	110.2					Increase generation in the Oakland Area
GBA-SP-SEN-T-61	Birds Landing - Contra Costa Sub 230 kV Line	Contra Costa-Gateway 230kV Line & Birds Landing-Contra Costa PP 230kV Line	P6	N-1/N-1	113.6	<90	<90	<90					Reduce Contra Costa area generation
GBA-SP-SEN-T-62	Birds Landing - Contra Costa PP 230 kV Line	Birds Landing-CC Sub 230kV Line & Gateway GSU Transformer #1	P6	N-1/N-1	115.5	<90	<90	<90					Reduce Contra Costa area generation

Study Area: **PG&E Greater Bay Area - Sensitivity**

Thermal Overloads

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)								Potential Mitigation Solutions
					2020 SP Heavy Renewable & Min Gas Gen	2025 Retirement of QF Generations	2025 SP Zero East Bay Generation	2025 SP No AAEE	N/A	N/A	N/A	N/A	
GBA-SP-SEN-T-63	Cayetano-Lone Tree (USWP-Cayetano) 230kV Line	Contra Costa-Las Positas 230kV Line & Tesla-Newark #1 230kV Line	P6	N-1/N-1	102.8	99.5	99.5	99.5					Reduce Contra Costa area generation
GBA-SP-SEN-T-64	Metcalf 500/230 kV Trans No. 11	Metcalf 500/230 kV Transformer #13 & Metcalf 500/230 kV Transformer #12	P6	N-1/N-1	119.4	102.9	104.9	117.1					Increase Metcalf area generation
GBA-SP-SEN-T-65	Metcalf 500/230 kV Trans No. 12	Metcalf 500/230 kV Transformer #13 & Metcalf 500/230 kV Transformer #11	P6	N-1/N-1	122.5	105.4	107.5	120.0					Increase Metcalf area generation
GBA-SP-SEN-T-66	Metcalf 500/230 kV Trans No. 13	Metcalf 500/230 kV Transformer #12 & Metcalf 500/230 kV Transformer #11	P6	N-1/N-1	124.6	107.3	109.4	122.3					Increase Metcalf area generation
GBA-SP-SEN-T-67	Christie-Sobrante (Oleum-Sobrante) 115kV Line	Sobrante-El Cerrito STA G #1 115kV Line & Sobrante-El Cerrito STA G #2 115kV Line	P6	N-1/N-1	121.1	154.1	115.9	128.0					SPS or system upgrade
GBA-SP-SEN-T-68	Sobrante-El Cerrito STA G #1 115kV Lin	Sobrante-El Cerrito STA G #2 115kV Line & Christie-Sobrante (Oleum-Sobrante) 115kV Line	P6	N-1/N-1	95.9	116.7	92.9	101.7					SPS or system upgrade
GBA-SP-SEN-T-69	Sobrante-El Cerrito STA G #2 115kV Line	Sobrante-El Cerrito STA G #1 115kV Line & Christie-Sobrante (Oleum-Sobrante) 115kV Line	P6	N-1/N-1	95.9	116.6	92.9	101.9					SPS or system upgrade
GBA-SP-SEN-T-70	Oakland D - Oakland L 115kV Cable	Oakland C - Oakland X #3 115kV Cable & Oakland C - Oakland X #2 115kV Cable	P6	N-1/N-1	131.8	<90	133.3	138.5					Increase generation in the Oakland Area
GBA-SP-SEN-T-71	Oakland C - Oakland L #1 115kV Cable	Claremont K - Oakland D #1 115kV Cable & Claremont K - Oakland D #2 115kV Cable	P6	N-1/N-1	99.6	98.2	99.9	106.0					SPS or system upgrade
GBA-SP-SEN-T-72	Oakland C - Oakland X #2 115kV Cable	Oakland D - Oakland L 115kV Cable & Oakland C - Oakland X #3 115kV Cable	P6	N-1/N-1	130.8	99.5	132.7	137.9					Increase generation in the Oakland Area
GBA-SP-SEN-T-73	San Leandro - Oakland J #1 115kV Line	Moraga-Oakland J 115kV Line & Oakland C - Alameda 115kV Cable	P6	N-1/N-1	95.1	93.9	94.3	101.7					SPS or system upgrade
GBA-SP-SEN-T-74	Pittsburg 230/115kV Transformer #12	LMEC GSU CC1 & Pittsburg 230/115kV Transformer #13	P6	N-1/N-1	125.7	<90	<90	<90					Increase Pittsburg area generation
GBA-SP-SEN-T-75	Pittsburg 230/115kV Transformer #13	LMEC GSU CC1 & Pittsburg 230/115kV Transformer #12	P6	N-1/N-1	145.8	<90	<90	<90					Increase Pittsburg area generation
GBA-SP-SEN-T-76	Martinez-Oleum 115kV Line	Sobrante-El Cerrito STA G #2 115kV Line & Sobrante-El Cerrito STA G #1 115kV Line	P6	N-1/N-1	107.2	130.6	96.5	106.9					SPS or system upgrade
GBA-SP-SEN-T-77	Oleum-Martinez 115kV Line	Sobrante-El Cerrito STA G #1 115kV Line & Sobrante-El Cerrito STA G #2 115kV Line	P6	N-1/N-1	99.7	121.3	<90	99.3					SPS or system upgrade
GBA-SP-SEN-T-78	Moraga-Claremont #1 115kV Line	Moraga-Claremont #2 115kV Line & Oakland C - Oakland L #1 115kV Cable	P6	N-1/N-1	120.0	123.9	96.8	102.0					Increase generation in the Oakland Area
GBA-SP-SEN-T-79	Moraga-Claremont #1 115kV Line	Oakland C - Oakland X #2 115kV Cable & Oakland C - Oakland X #3 115kV Cable	P6	N-1/N-1	132.1	<90	120.4	123.7					Increase generation in the Oakland Area
GBA-SP-SEN-T-80	Moraga-Claremont #2 115kV Line	Moraga-Claremont #1 115kV Line & Oakland C - Oakland L #1 115kV Cable	P6	N-1/N-1	120.1	124.0	96.7	102.0					Increase generation in the Oakland Area

Study Area: PG&E Greater Bay Area - Sensitivity

California ISO
Shaping a Renewed Future

Thermal Overloads

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)								Potential Mitigation Solutions
					2020 SP Heavy Renewable & Min Gas Gen	2025 Retirement of QF Generations	2025 SP Zero East Bay Generation	2025 SP No AAEE	N/A	N/A	N/A	N/A	
GBA-SP-SEN-T-81	Moraga-Claremont #2 115kV Line	Oakland C - Oakland X #2 115kV Cable & Oakland C - Oakland X #3 115kV Cable	P6	N-1/N-1	132.3	<90	120.6	123.8					Increase generation in the Oakland Area
GBA-SP-SEN-T-82	Sobrante-Moraga 115kV Line	Sobrante 230/115kV Transformer #1 & Sobrante 230/115kV Transformer #2	P6	N-1/N-1	96.6	107.2	93.1	98.7					SPS or system upgrade
GBA-SP-SEN-T-83	Moraga-Station X 115 kV #1 Line	Claremont K - Oakland D #1 115kV Cable & Claremont K - Oakland D #2 115kV Cable	P6	N-1/N-1	112.5	<90	112.2	119.6					Increase generation in the Oakland Area
GBA-SP-SEN-T-84	Moraga-Oakland X #2 115kV Line	Claremont K - Oakland D #1 115kV Cable & Claremont K - Oakland D #2 115kV Cable	P6	N-1/N-1	112.5	<90	112.2	119.6					Increase generation in the Oakland Area
GBA-SP-SEN-T-85	Moraga-Station X 115 kV #3 Line	Claremont K - Oakland D #1 115kV Cable & Claremont K - Oakland D #2 115kV Cable	P6	N-1/N-1	112.5	<90	112.2	119.6					Increase generation in the Oakland Area
GBA-SP-SEN-T-86	Moraga-Station X 115 kV #4 Line	Claremont K - Oakland D #1 115kV Cable & Claremont K - Oakland D #2 115kV Cable	P6	N-1/N-1	112.5	<90	112.2	119.6					Increase generation in the Oakland Area
GBA-SP-SEN-T-87	Moraga-San Leandro #2 115kV Line	Moraga-San Leandro #3 115kV Line & Moraga-San Leandro #1 115kV Line	P6	N-1/N-1	97.8	94.3	<90	100.0					Action plan or rerate
GBA-SP-SEN-T-88	Contra Costa-Balfour 60kV Line	Willow Pass-Contra Costa 60kV Line & CC Sub 230/115kV Transformer #3	P6	N-1/N-1	256.3	<90	<90	<90					increase peninsula area generation
GBA-SP-SEN-T-89	Balfour-MDLRVRJT 60 kV	Willow Pass-Contra Costa 60kV Line & CC Sub 230/115kV Transformer #3	P6	N-1/N-1	271.2	<90	<90	<90					increase peninsula area generation
GBA-SP-SEN-T-90	Herdlyn - Balfour 60 kV Line	Willow Pass-Contra Costa 60kV Line & CC Sub 230/115kV Transformer #3	P6	N-1/N-1	289.9	<90	<90	<90					increase peninsula area generation
GBA-SP-SEN-T-91	Potrero-Larkin #1 (AY-1) 115kV Cable	Martin-Larkin (HY-1) 115kV Cable & Mission-Larkin (XY-1) 115kV Cable	P6	N-1/N-1	153.3	152.2	152.2	152.3					Modifying TBC DC Runback Scheme
GBA-SP-SEN-T-92	Potrero-Mission (AX) 115kV Cable	Potrero-Larkin #1 (AY-1) 115kV Cable & Potrero-Larkin #2 (AY-2) 115kV Cable	P6	N-1/N-1	124.4	125.0	124.8	125.5					Modifying TBC DC Runback Scheme
GBA-SP-SEN-T-93	Martin-Larkin (HY-1) 115kV Cable	Potrero-Larkin #1 (AY-1) 115kV Cable & Mission-Larkin (XY-1) 115kV Cable	P6	N-1/N-1	150.3	150.5	150.4	150.6					Modifying TBC DC Runback Scheme
GBA-SP-SEN-T-94	San Mateo-Belmont 115kV Line	Ravenswood 230/115kV Transformer #1 & Ravenswood 230/115kV Transformer #2	P6	N-1/N-1	114.5	107.6	107.2	113.8					SPS or system upgrade
GBA-SP-SEN-T-95	Ravenswood-Palo Alto #1 115kV Line	Ravenswood-Cooley Landing #1 115kV Line & Ravenswood-Palo Alto #2 115kV Line	P6	N-1/N-1	107.0	107.6	106.6	111.1					Palo Alto interim SPS
GBA-SP-SEN-T-96	Ravenswood-Palo Alto #2 115kV Line	Ravenswood-Cooley Landing #1 115kV Line & Ravenswood-Palo Alto #1 115kV Line	P6	N-1/N-1	106.9	107.5	106.5	110.9					Palo Alto interim SPS
GBA-SP-SEN-T-97	Cooley Landing-Palo Alto 115kV Line	Ravenswood-Palo Alto #1 115kV Line & Ravenswood-Palo Alto #2 115kV Line	P6	N-1/N-1	111.6	112.2	112.2	112.9					Palo Alto interim SPS

Study Area: **PG&E Greater Bay Area - Sensitivity**

Thermal Overloads

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)								Potential Mitigation Solutions
					2020 SP Heavy Renewable & Min Gas Gen	2025 Retirement of QF Generations	2025 SP Zero East Bay Generation	2025 SP No AAEE	N/A	N/A	N/A	N/A	
GBA-SP-SEN-T-98	Ravenswood-Cooley Landing #1 115kV Line	Ravenswood-Palo Alto #2 115kV Line & Ravenswood-Palo Alto #1 115kV Line	P6	N-1/N-1	98.6	99.1	98.1	102.6					Palo Alto interim SPS
GBA-SP-SEN-T-99	Millbrae-Sneath Lane 60kV Line	Martin-Sneath Lane 60kV Line & Hillsdale JCT - Half Moon Bay 60kV Line	P6	N-1/N-1	109.9	114.3	114.3	123.8					Action plan or explore potential mitigation
GBA-SP-SEN-T-100	San Mateo 115/60kV Transformer #8	Jefferson 230/60kV Transformer #1 & Jefferson 230/60kV Transformer #2	P6	N-1/N-1	125.2	104.0	103.7	121.1					Review Stanford 60 kV system configuration
GBA-SP-SEN-T-101	San Mateo-Hillsdale JCT 60kV Line	Jefferson 230/60kV Transformer #1 & Jefferson 230/60kV Transformer #2	P6	N-1/N-1	243.9	195.9	195.9	232.2					Review Stanford 60 kV system configuration
GBA-SP-SEN-T-102	San Mateo-Bair 60kV Line	Ravenswood-Cooley Landing #2 115kV Line & Cooley Landing 115/60kV Transformer #1	P6	N-1/N-1	132.0	<90	<90	<90					increase peninsula area generation
GBA-SP-SEN-T-103	San Mateo-Hillsdale JCT 60kV Line (Beresford-Hillsdale)	Jefferson 230/60kV Transformer #1 & Jefferson 230/60kV Transformer #2	P6	N-1/N-1	280.9	224.5	224.5	265.8					Review Stanford 60 kV system configuration
GBA-SP-SEN-T-104	San Mateo-Hillsdale JCT 60kV Line (Hillsdale-Hillsdale JCT)	Jefferson 230/60kV Transformer #1 & Jefferson 230/60kV Transformer #2	P6	N-1/N-1	271.4	215.6	215.6	255.3					Review Stanford 60 kV system configuration
GBA-SP-SEN-T-105	Jefferson-Hillsdale JCT 60kV Line	Jefferson 230/60kV Transformer #1 & Jefferson 230/60kV Transformer #2	P6	N-1/N-1	185.6	166.3	166.4	192.6					Review Stanford 60 kV system configuration
GBA-SP-SEN-T-106	Bair 115/60kV Transformer #1	Ravenswood-Cooley Landing #2 115kV Line & Cooley Landing 115/60kV Transformer #1	P6	N-1/N-1	157.8	162.6	157.1	178.1					Review Stanford 60 kV system configuration
GBA-SP-SEN-T-107	Bair-Cooley Landing #1 60kV Line	Ravenswood-Cooley Landing #2 115kV Line & Cooley Landing 115/60kV Transformer #1	P6	N-1/N-1	130.8	132.6	126.2	145.3					Review Stanford 60 kV system configuration
GBA-SP-SEN-T-108	Bair-Cooley Landing #2 60kV Line	Ravenswood-Cooley Landing #2 115kV Line & Cooley Landing 115/60kV Transformer #1	P6	N-1/N-1	127.1	126.8	122.2	139.8					Review Stanford 60 kV system configuration
GBA-SP-SEN-T-109	Jefferson-Stanford #1 60kV Line	Jefferson 230/60kV Transformer #1 & Jefferson 230/60kV Transformer #2	P6	N-1/N-1	115.2	103.4	103.4	113.2					Review Stanford 60 kV system configuration
GBA-SP-SEN-T-110	Grant-Eastshore #1 115kV Line	Grant-Eastshore #2 115kV Line & Eastshore-San Mateo 230kV Line	P6	N-1/N-1	109.8	99.7	100.1	99.8					Action plan or rerate
GBA-SP-SEN-T-111	Grant-Eastshore #2 115kV Line	Grant-Eastshore #1 115kV Line & Eastshore-San Mateo 230kV Line	P6	N-1/N-1	109.8	99.7	100.1	99.8					Action plan or rerate
GBA-SP-SEN-T-112	Eastshore 230/115kV Transformer #1	Grant-Eastshore #2 115kV Line & San Leandro - Oakland J #1 115kV Line	P6	N-1/N-1	106.2	99.5	99.5	99.5					Action Plan - reduce RCEC generation
GBA-SP-SEN-T-113	Eastshore 230/115kV Transformer #2	Eastshore 230/115kV Transformer #1 & Eastshore-San Mateo 230kV Line	P6	N-1/N-1	105.9	99.5	99.5	99.5					Action Plan - reduce RCEC generation
GBA-SP-SEN-T-114	Newark-Dixon Landing 115kV Line	Piercy-Metcalf 115 kV & Evergreen-Mabury 115 kV	P6	N-1/N-1	123.6	123.3	123.4	133.9					Action plan or rerate
GBA-SP-SEN-T-115	Newark-Milpitas #1 115kV Line	Newark-Milpitas #2 115kV Line & Swift-Metcalf 115 kV	P6	N-1/N-1	137.8	134.2	134.3	146.6					Action plan or explore potential mitigation
GBA-SP-SEN-T-116	Newark-Milpitas #2 115kV Line	Swift-Metcalf 115 kV & Newark-Milpitas #1 115kV Line	P6	N-1/N-1	114.7	111.8	111.8	122.0					Action plan or explore potential mitigation

Study Area: **PG&E Greater Bay Area - Sensitivity**

Thermal Overloads

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)								Potential Mitigation Solutions
					2020 SP Heavy Renewable & Min Gas Gen	2025 Retirement of QF Generations	2025 SP Zero East Bay Generation	2025 SP No AAEE	N/A	N/A	N/A	N/A	
GBA-SP-SEN-T-117	Wind Farms 60kV Line	Contra Costa-Las Positas 230kV Line & Las Positas-Newark 230kV Line	P6	N-1/N-1	158.3	<90	<90	<90					increase peninsula area generation
GBA-SP-SEN-T-118	Trimble-San Jose 'B' 115 kV Line	Los Esteros-Metcalf 230 kV & Newark-Newark Dist 230kV section	P6	N-1/N-1	118.8	98.5	95.8	110.3					Increase Metcalf area generation
GBA-SP-SEN-T-119	Dixon Landing-McKee 115 kV Line	Newark-Dixon Landing 115kV Line & Piercy-Metcalf 115 kV	P6	N-1/N-1	120.7	120.8	120.9	131.9					Action plan or rerate
GBA-SP-SEN-T-120	Mabury-Jennings J. 115 kV Line	Newark-Dixon Landing 115kV Line & Piercy-Metcalf 115 kV	P6	N-1/N-1	141.3	141.3	141.4	153.8					Action plan or rerate
GBA-SP-SEN-T-121	Metcalf 230/115 kV Trans No. 1	Metcalf 230/115 kV Transformer #2 & Metcalf 230/115 kV Transformer #3	P6	N-1/N-1	120.4	<90	<90	96.0					Increase Metcalf area generation
GBA-SP-SEN-T-122	Metcalf 230/115 kV Trans No. 4	Metcalf 230/115 kV Transformer #2 & Metcalf 230/115 kV Transformer #1	P6	N-1/N-1	117.4	<90	<90	96.4					Increase Metcalf area generation
GBA-SP-SEN-T-123	Metcalf-Morgan Hill 115 kV Line	Llagas-Gilroy Foods 115 kV & Metcalf-Llagas 115 kV	P6	N-1/N-1	119.1	<90	<90	<90					Increase Metcalf area generation
GBA-SP-SEN-T-124	Metcalf-Llagas 115 kV Line	Metcalf-Morgan Hill 115 kV & Llagas-Gilroy Foods 115 kV	P6	N-1/N-1	143.5	99.1	99.0	96.2					Reduce Gilroy generation
GBA-SP-SEN-T-125	Metcalf 230/115 kV Trans No. 2	Metcalf 230/115 kV Transformer #3 & Metcalf 115 kV Sectionalizing Breaker	P6	N-1/N-1	118.6	99.5	99.5	104.7					Increase Metcalf area generation
GBA-SP-SEN-T-126	Metcalf 230/115 kV Trans No. 3	Metcalf 230/115 kV Transformer #2 & Metcalf 115 kV Sectionalizing Breaker	P6	N-1/N-1	116.0	98.4	98.4	103.5					Increase Metcalf area generation
GBA-SP-SEN-T-127	Oleum-Christie 115kV Line	Sobrante-G Nos. 1 & 2 115 kV lines	P7	DCTL	99.3	119.0	99.3	108.6					SPS or system upgrade
GBA-SP-SEN-T-128	Christie-Sobrante (Oleum-Sobrante) 115kV Line	Sobrante-G Nos. 1 & 2 115 kV lines	P7	DCTL	121.1	155.8	116.0	128.4					SPS or system upgrade
GBA-SP-SEN-T-129	Martinez-Oleum 115kV Line	Sobrante-G Nos. 1 & 2 115 kV lines	P7	DCTL	107.2	128.6	92.9	97.6					SPS or system upgrade
GBA-SP-SEN-T-130	Oleum-Martinez 115kV Line	Sobrante-G Nos. 1 & 2 115 kV lines	P7	DCTL	99.7	119.5	86.3	90.6					SPS or system upgrade
GBA-SP-SEN-T-131	Moraga-Station X 115 kV #1 Line	Moraga-Oakland Nos. 3 & 4 115 kV lines	P7	DCTL	102.5	59.0	99.1	106.3					Increase generation in the Oakland Area
GBA-SP-SEN-T-132	Moraga-Oakland X #2 115kV Line	Moraga-Oakland Nos. 3 & 4 115 kV lines	P7	DCTL	102.5	59.0	99.1	106.3					Increase generation in the Oakland Area
GBA-SP-SEN-T-133	Moraga-Station X 115 kV #3 Line	Moraga-Oakland X Nos. 1 & 2 115 kV lines	P7	DCTL	102.5	59.0	99.1	106.3					Increase generation in the Oakland Area
GBA-SP-SEN-T-134	Moraga-Station X 115 kV #4 Line	Moraga-Oakland X Nos. 1 & 2 115 kV lines	P7	DCTL	102.5	59.0	99.1	106.3					Increase generation in the Oakland Area
GBA-SP-SEN-T-135	Cooley Landing-Palo Alto 115kV Line	Ravenswood-Palo Alto Nos. 1 & 2 115 kV lines	P7	DCTL	111.6	112.2	112.2	112.9					Palo Alto interim SPS
GBA-SP-SEN-T-136	Ravenswood-Cooley Landing #1 115kV Line	Ravenswood-Palo Alto Nos. 1 & 2 115 kV lines	P7	DCTL	98.6	99.1	98.1	102.6					Palo Alto interim SPS
GBA-SP-SEN-T-137	San Mateo 115/60kV Transformer #8	Monta Vista-Jefferson Nos. 1 & 2 230 kV lines	P7	DCTL	129.7	103.6	103.1	121.9					Review Stanford 60 kV system configuration

Study Area: **PG&E Greater Bay Area - Sensitivity**

Thermal Overloads

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)								Potential Mitigation Solutions
					2020 SP Heavy Renewable & Min Gas Gen	2025 Retirement of QF Generations	2025 SP Zero East Bay Generation	2025 SP No AAEE	N/A	N/A	N/A	N/A	
GBA-SP-SEN-T-138	San Mateo-Hillsdale JCT 60kV Line	Monta Vista-Jefferson Nos. 1 & 2 230 kV lines	P7	DCTL	264.8	200.6	200.5	240.5					Review Stanford 60 kV system configuration
GBA-SP-SEN-T-139	San Mateo-Hillsdale JCT 60kV Line (Beresford-Hillsdale)	Monta Vista-Jefferson Nos. 1 & 2 230 kV lines	P7	DCTL	305.5	230.1	230.0	275.6					Review Stanford 60 kV system configuration
GBA-SP-SEN-T-140	San Mateo-Hillsdale JCT 60kV Line (Hillsdale-Hillsdale JCT)	Monta Vista-Jefferson Nos. 1 & 2 230 kV lines	P7	DCTL	295.6	221.2	221.1	265.0					Review Stanford 60 kV system configuration
GBA-SP-SEN-T-141	Jefferson-Hillsdale JCT 60kV Line	Monta Vista-Jefferson Nos. 1 & 2 230 kV lines	P7	DCTL	204.1	170.8	170.9	200.5					Review Stanford 60 kV system configuration
GBA-SP-SEN-T-142	Jefferson-Stanford #1 60kV Line	Monta Vista-Jefferson Nos. 1 & 2 230 kV lines	P7	DCTL	126.4	106.7	106.3	117.9					Review Stanford 60 kV system configuration
GBA-SP-SEN-T-143	Newark-Lawerence 115kV Line	Newark-Applied Materials & Lawrence-Monta Vista 115 kV Lines	P7	DCTL	110.9	114.0	114.0	119.7					Monta Vista 230 kV Bus Upgrade Project is completetd
GBA-SP-SEN-T-144	Trimble-San Jose 'B' 115 kV Line	Newark - Los Esteros & Los Esteros - Metcalf 230 kV Lines	P7	DCTL	112.6	95.1	93.3	108.5					Increase Metcalf area generation

Study Area: PG&E Greater Bay Area - Sensitivity

Voltage Deviations

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %								Potential Mitigation Solutions
					2020 SP Heavy Renewable & Min Gas Gen	2025 Retirement of QF Generations	2025 SP Zero East Bay Generation	2025 SP No AAEE	N/A	N/A	N/A	N/A	
GBA-SP-SEN-VD-1	EDES 115 kV	Grant-Oakland J 115 kV Line	P1	N-1	5.9	5.2	5.5	6.1					SPS or system upgrade
GBA-SP-SEN-VD-2	GILROY F 115 kV	Metcalf-Morgan Hill 115 kV	P1	N-1	8.2	<5.0	<5.0	<5.0					Increase Metcalf area generation
GBA-SP-SEN-VD-3	LLAGAS 115 kV	Metcalf-Morgan Hill 115 kV	P1	N-1	8.2	<5.0	<5.0	<5.0					Increase Metcalf area generation
GBA-SP-SEN-VD-4	OWNBRKWY 115 kV	Grant-Oakland J 115 kV Line	P1	N-1	5.0	4.4	4.6	5.1					SPS or system upgrade
GBA-SP-SEN-VD-5	PACIFICA 60 kV	Martin 115/60kV Transformer #6	P1	N-1	2.1	6.3	5.1	3.0					increase peninsula area generation
GBA-SP-SEN-VD-6	SN BRNOT 60 kV	Martin 115/60kV Transformer #6	P1	N-1	2.0	6.0	4.9	2.8					increase peninsula area generation
GBA-SP-SEN-VD-7	SNTH LNE 60 kV	Martin 115/60kV Transformer #6	P1	N-1	2.0	6.3	5.1	3.0					increase peninsula area generation
GBA-SP-SEN-VD-8	STATIN J 115 kV	Grant-Oakland J 115 kV Line	P1	N-1	5.0	4.4	4.6	5.1					SPS or system upgrade
GBA-SP-SEN-VD-9	ALHAMBRA 115 kV	MARTNZ D-ALHAMTP1 #1 115 kV	P2-1	Line section w/o fault	5.0	4.7	5.2	5.4					Mitigation under investigation
GBA-SP-SEN-VD-10	EDES 115 kV	EDS GRNT-GRANT #1 115 kV	P2-1	Line section w/o fault	6.3	5.6	5.9	6.6					Mitigation under investigation
GBA-SP-SEN-VD-11	LOCKHD 1 115 kV	NEWARK F-LCKHD J1 #1 115 kV	P2-1	Line section w/o fault	5.4	5.4	5.5	5.7					Mitigation under investigation
GBA-SP-SEN-VD-12	MOFT.FLD 115 kV	NEWARK F-LCKHD J1 #1 115 kV	P2-1	Line section w/o fault	5.4	5.4	5.5	5.6					Mitigation under investigation
GBA-SP-SEN-VD-13	OWNBRKWY 115 kV	EDS GRNT-GRANT #1 115 kV	P2-1	Line section w/o fault	5.1	4.5	4.7	5.4					Mitigation under investigation
GBA-SP-SEN-VD-14	STATIN J 115 kV	EDS GRNT-GRANT #1 115 kV	P2-1	Line section w/o fault	5.1	4.5	4.7	5.4					Mitigation under investigation
GBA-SP-SEN-VD-15	A.M.D 115 kV	BUS-TIE BREAKER FAULT AT 30705 MONTAVIS 230.00	P2	Bus-tie breaker	43.8	23.8	24.8	44.7					Monta Vista 230 kV Bus Upgrade Project
GBA-SP-SEN-VD-16	ALHAMBRA 115 kV	BUS-TIE BREAKER FAULT AT 33010 SOBRANTE 115.00	P2	Bus-tie breaker	9.8	27.0	8.6	9.2					SPS or system upgrade
GBA-SP-SEN-VD-17	AMES BS1 115 kV	BUS-TIE BREAKER FAULT AT 30705 MONTAVIS 230.00	P2	Bus-tie breaker	11.1	5.0	5.3	10.7					Monta Vista 230 kV Bus Upgrade Project
GBA-SP-SEN-VD-18	AMES BS2 115 kV	BUS-TIE BREAKER FAULT AT 30705 MONTAVIS 230.00	P2	Bus-tie breaker	11.1	5.0	5.3	10.7					Monta Vista 230 kV Bus Upgrade Project
GBA-SP-SEN-VD-19	AMES DST 115 kV	BUS-TIE BREAKER FAULT AT 30705 MONTAVIS 230.00	P2	Bus-tie breaker	11.1	5.0	5.3	10.7					Monta Vista 230 kV Bus Upgrade Project
GBA-SP-SEN-VD-20	APP MAT 115 kV	BUS-TIE BREAKER FAULT AT 30705 MONTAVIS 230.00	P2	Bus-tie breaker	45.9	25.0	26.0	46.8					Monta Vista 230 kV Bus Upgrade Project
GBA-SP-SEN-VD-21	BOLLMAN 115 kV	BUS-TIE BREAKER FAULT AT 33010 SOBRANTE 115.00	P2	Bus-tie breaker	11.3	20.4	9.9	10.6					SPS or system upgrade

Study Area: PG&E Greater Bay Area - Sensitivity

Voltage Deviations

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %								Potential Mitigation Solutions
					2020 SP Heavy Renewable & Min Gas Gen	2025 Retirement of QF Generations	2025 SP Zero East Bay Generation	2025 SP No AAEE	N/A	N/A	N/A	N/A	
GBA-SP-SEN-VD-22	BRITTN 115 kV	BUS-TIE BREAKER FAULT AT 30705 MONTAVIS 230.00	P2	Bus-tie breaker	47.3	25.8	26.8	48.3					Monta Vista 230 kV Bus Upgrade Project
GBA-SP-SEN-VD-23	CON25 115 kV	BUS-TIE BREAKER FAULT AT 33010 SOBRANTE 115.00	P2	Bus-tie breaker	13.3	54.7	6.8	7.6					SPS or system upgrade
GBA-SP-SEN-VD-24	DIXON LD 115 kV	BUS-TIE BREAKER FAULT AT 30705 MONTAVIS 230.00	P2	Bus-tie breaker	12.1	5.7	6.1	11.8					Monta Vista 230 kV Bus Upgrade Project
GBA-SP-SEN-VD-25	EL CRRTO 115 kV	BUS-TIE BREAKER FAULT AT 33010 SOBRANTE 115.00	P2	Bus-tie breaker	15.7	60.5	7.3	9.3					SPS or system upgrade
GBA-SP-SEN-VD-26	FRANKLIN 60 kV	BUS-TIE BREAKER FAULT AT 33010 SOBRANTE 115.00	P2	Bus-tie breaker	15.8	68.3	5.5	7.4					SPS or system upgrade
GBA-SP-SEN-VD-27	FREMNT 115 kV	BUS-TIE BREAKER FAULT AT 30705 MONTAVIS 230.00	P2	Bus-tie breaker	13.5	6.3	6.7	13.2					Monta Vista 230 kV Bus Upgrade Project
GBA-SP-SEN-VD-28	GLENWOOD 60 kV	BUS-TIE BREAKER FAULT AT 33316 CLY LND2 115.00	P2	Bus-tie breaker	9.6	9.6	8.7	10.2					Review Stanford 60 kV system configuration
GBA-SP-SEN-VD-29	GRANT 115 kV	BUS-TIE BREAKER FAULT AT 35105 EASTSHRE 115.00	P2	Bus-tie breaker	10.9	9.8	10.2	11.5					SPS or system upgrade
GBA-SP-SEN-VD-30	LAWRENCE 115 kV	BUS-TIE BREAKER FAULT AT 30705 MONTAVIS 230.00	P2	Bus-tie breaker	41.2	22.4	23.3	42.0					Monta Vista 230 kV Bus Upgrade Project
GBA-SP-SEN-VD-31	LOCKHD 1 115 kV	BUS-TIE BREAKER FAULT AT 30705 MONTAVIS 230.00	P2	Bus-tie breaker	33.1	17.7	18.5	33.5					Monta Vista 230 kV Bus Upgrade Project
GBA-SP-SEN-VD-32	LOCKHD 2 115 kV	BUS-TIE BREAKER FAULT AT 30705 MONTAVIS 230.00	P2	Bus-tie breaker	35.8	19.2	20.0	36.3					Monta Vista 230 kV Bus Upgrade Project
GBA-SP-SEN-VD-33	LOS ALTS 60 kV	BUS-TIE BREAKER FAULT AT 30705 MONTAVIS 230.00	P2	Bus-tie breaker	70.1	39.3	40.8	71.5					Monta Vista 230 kV Bus Upgrade Project
GBA-SP-SEN-VD-34	LOS GATS 60 kV	BUS-TIE BREAKER FAULT AT 30705 MONTAVIS 230.00	P2	Bus-tie breaker	71.3	40.1	41.7	72.7					Monta Vista 230 kV Bus Upgrade Project
GBA-SP-SEN-VD-35	LOYOLA 60 kV	BUS-TIE BREAKER FAULT AT 30705 MONTAVIS 230.00	P2	Bus-tie breaker	69.6	39.0	40.5	71.0					Monta Vista 230 kV Bus Upgrade Project
GBA-SP-SEN-VD-36	MARTNZ D 115 kV	BUS-TIE BREAKER FAULT AT 33010 SOBRANTE 115.00	P2	Bus-tie breaker	10.2	27.0	8.9	9.6					SPS or system upgrade
GBA-SP-SEN-VD-37	MENLO 60 kV	BUS-TIE BREAKER FAULT AT 33316 CLY LND2 115.00	P2	Bus-tie breaker	9.6	9.6	8.8	10.2					Review Stanford 60 kV system configuration
GBA-SP-SEN-VD-38	MENLO G 60 kV	BUS-TIE BREAKER FAULT AT 33316 CLY LND2 115.00	P2	Bus-tie breaker	9.6	9.6	8.8	10.2					Review Stanford 60 kV system configuration
GBA-SP-SEN-VD-39	MILPITAS 115 kV	BUS-TIE BREAKER FAULT AT 30705 MONTAVIS 230.00	P2	Bus-tie breaker	12.6	6.0	6.4	12.3					Monta Vista 230 kV Bus Upgrade Project
GBA-SP-SEN-VD-40	MOFT.FLD 115 kV	BUS-TIE BREAKER FAULT AT 30705 MONTAVIS 230.00	P2	Bus-tie breaker	33.0	17.7	18.5	33.4					Monta Vista 230 kV Bus Upgrade Project
GBA-SP-SEN-VD-41	MT EDEN 115 kV	BUS-TIE BREAKER FAULT AT 30560 E. SHORE 230.00	P2	Bus-tie breaker	10.2	9.6	9.8	11.2					SPS or system upgrade
GBA-SP-SEN-VD-42	MT VIEW 115 kV	BUS-TIE BREAKER FAULT AT 30705 MONTAVIS 230.00	P2	Bus-tie breaker	62.5	34.6	35.9	64.0					Monta Vista 230 kV Bus Upgrade Project
GBA-SP-SEN-VD-43	NRTHGRUM 60 kV	BUS-TIE BREAKER FAULT AT 33316 CLY LND2 115.00	P2	Bus-tie breaker	9.6	9.6	8.8	10.2					Review Stanford 60 kV system configuration
GBA-SP-SEN-VD-44	NUMMI 115 kV	BUS-TIE BREAKER FAULT AT 30705 MONTAVIS 230.00	P2	Bus-tie breaker	13.9	6.6	7.0	13.6					Monta Vista 230 kV Bus Upgrade Project
GBA-SP-SEN-VD-45	PERMNNTE 60 kV	BUS-TIE BREAKER FAULT AT 30705 MONTAVIS 230.00	P2	Bus-tie breaker	69.0	38.8	40.2	70.4					Monta Vista 230 kV Bus Upgrade Project

Study Area: PG&E Greater Bay Area - Sensitivity

Voltage Deviations

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %								Potential Mitigation Solutions
					2020 SP Heavy Renewable & Min Gas Gen	2025 Retirement of QF Generations	2025 SP Zero East Bay Generation	2025 SP No AAEE	N/A	N/A	N/A	N/A	
GBA-SP-SEN-VD-46	PHILLIPS 115 kV	BUS-TIE BREAKER FAULT AT 30705 MONTAVIS 230.00	P2	Bus-tie breaker	43.7	23.8	24.8	44.5					Monta Vista 230 kV Bus Upgrade Project
GBA-SP-SEN-VD-47	PRT CSTA 60 kV	BUS-TIE BREAKER FAULT AT 33010 SOBRANTE 115.00	P2	Bus-tie breaker	15.7	68.0	5.5	7.4					SPS or system upgrade
GBA-SP-SEN-VD-48	SFPP CNC 60 kV	BUS-TIE BREAKER FAULT AT 33010 SOBRANTE 115.00	P2	Bus-tie breaker	16.0	69.3	5.6	7.5					SPS or system upgrade
GBA-SP-SEN-VD-49	STELLING 115 kV	BUS-TIE BREAKER FAULT AT 30705 MONTAVIS 230.00	P2	Bus-tie breaker	61.8	34.4	35.7	63.3					Monta Vista 230 kV Bus Upgrade Project
GBA-SP-SEN-VD-50	URICH 60 kV	BUS-TIE BREAKER FAULT AT 33010 SOBRANTE 115.00	P2	Bus-tie breaker	16.0	69.0	5.6	7.5					SPS or system upgrade
GBA-SP-SEN-VD-51	VALLY VW 115 kV	BUS-TIE BREAKER FAULT AT 33010 SOBRANTE 115.00	P2	Bus-tie breaker	15.0	59.0	6.8	8.8					SPS or system upgrade
GBA-SP-SEN-VD-52	WESTRN_D 115 kV	BUS-TIE BREAKER FAULT AT 30705 MONTAVIS 230.00	P2	Bus-tie breaker	13.9	6.6	7.0	13.6					Monta Vista 230 kV Bus Upgrade Project
GBA-SP-SEN-VD-53	WHISMAN 115 kV	BUS-TIE BREAKER FAULT AT 30705 MONTAVIS 230.00	P2	Bus-tie breaker	62.5	34.6	35.9	64.0					Monta Vista 230 kV Bus Upgrade Project
GBA-SP-SEN-VD-54	WOLFE 115 kV	BUS-TIE BREAKER FAULT AT 30705 MONTAVIS 230.00	P2	Bus-tie breaker	61.9	34.4	35.7	63.3					Monta Vista 230 kV Bus Upgrade Project

Study Area: PG&E Greater Bay Area - Sensitivity

High/Low Voltage

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)								Potential Mitigation Solutions
					2020 SP Heavy Renewable & Min Gas Gen	2025 Retirement of QF Generations	2025 SP Zero East Bay Generation	2025 SP No AAEE	N/A	N/A	N/A	N/A	
GBA-SP-SEN-V-1	A.M.D 115 kV	BUS-TIE BREAKER FAULT AT 30705 MONTAVIS 230.00	P2	Bus-tie breaker	0.56	0.76	0.75	0.55					Monta Vista 230 kV Bus Upgrade Project
GBA-SP-SEN-V-2	ALHAMBRA 115 kV	BUS-TIE BREAKER FAULT AT 33010 SOBRANTE 115.00	P2	Bus-tie breaker	0.89	0.72	0.92	0.91					SPS or system upgrade
GBA-SP-SEN-V-3	APP MAT 115 kV	BUS-TIE BREAKER FAULT AT 30705 MONTAVIS 230.00	P2	Bus-tie breaker	0.53	0.75	0.74	0.53					Monta Vista 230 kV Bus Upgrade Project
GBA-SP-SEN-V-4	BOLLMAN 115 kV	BUS-TIE BREAKER FAULT AT 33010 SOBRANTE 115.00	P2	Bus-tie breaker	0.89	0.80	0.91	0.90					SPS or system upgrade
GBA-SP-SEN-V-5	BRITTN 115 kV	BUS-TIE BREAKER FAULT AT 30705 MONTAVIS 230.00	P2	Bus-tie breaker	0.52	0.74	0.73	0.51					Monta Vista 230 kV Bus Upgrade Project
GBA-SP-SEN-V-6	Brokaw 60 kV	BUS-TIE BREAKER FAULT AT 30705 MONTAVIS 230.00	P2	Bus-tie breaker	0.89	0.96	0.96	0.91					Monta Vista 230 kV Bus Upgrade Project
GBA-SP-SEN-V-7	CON25 115 kV	BUS-TIE BREAKER FAULT AT 33010 SOBRANTE 115.00	P2	Bus-tie breaker	0.83	0.42	0.92	0.90					SPS or system upgrade
GBA-SP-SEN-V-8	DCJ 60 kV	BUS-TIE BREAKER FAULT AT 30705 MONTAVIS 230.00	P2	Bus-tie breaker	0.89	0.96	0.96	0.91					Monta Vista 230 kV Bus Upgrade Project
GBA-SP-SEN-V-9	DIXON LD 115 kV	BUS-TIE BREAKER FAULT AT 30705 MONTAVIS 230.00	P2	Bus-tie breaker	0.89	0.96	0.95	0.89					Monta Vista 230 kV Bus Upgrade Project
GBA-SP-SEN-V-10	EL CRRTO 115 kV	BUS-TIE BREAKER FAULT AT 33010 SOBRANTE 115.00	P2	Bus-tie breaker	0.80	0.36	0.90	0.88					SPS or system upgrade
GBA-SP-SEN-V-11	FRANKLIN 60 kV	BUS-TIE BREAKER FAULT AT 33010 SOBRANTE 115.00	P2	Bus-tie breaker	0.85	0.32	0.97	0.94					SPS or system upgrade
GBA-SP-SEN-V-12	FREMNT 115 kV	BUS-TIE BREAKER FAULT AT 30705 MONTAVIS 230.00	P2	Bus-tie breaker	0.88	0.96	0.95	0.88					Monta Vista 230 kV Bus Upgrade Project
GBA-SP-SEN-V-13	Homestea 60 kV	BUS-TIE BREAKER FAULT AT 30705 MONTAVIS 230.00	P2	Bus-tie breaker	0.89	0.95	0.95	0.90					Monta Vista 230 kV Bus Upgrade Project
GBA-SP-SEN-V-14	LAWRENCE 115 kV	BUS-TIE BREAKER FAULT AT 30705 MONTAVIS 230.00	P2	Bus-tie breaker	0.58	0.77	0.76	0.57					Monta Vista 230 kV Bus Upgrade Project
GBA-SP-SEN-V-15	LOCKHD 1 115 kV	BUS-TIE BREAKER FAULT AT 30705 MONTAVIS 230.00	P2	Bus-tie breaker	0.66	0.82	0.81	0.66					Monta Vista 230 kV Bus Upgrade Project
GBA-SP-SEN-V-16	LOCKHD 2 115 kV	BUS-TIE BREAKER FAULT AT 30705 MONTAVIS 230.00	P2	Bus-tie breaker	0.64	0.81	0.80	0.64					Monta Vista 230 kV Bus Upgrade Project
GBA-SP-SEN-V-17	LOS ALTS 60 kV	BUS-TIE BREAKER FAULT AT 30705 MONTAVIS 230.00	P2	Bus-tie breaker	0.30	0.62	0.60	0.29					Monta Vista 230 kV Bus Upgrade Project
GBA-SP-SEN-V-18	LOS GATS 60 kV	BUS-TIE BREAKER FAULT AT 30705 MONTAVIS 230.00	P2	Bus-tie breaker	0.28	0.60	0.58	0.27					Monta Vista 230 kV Bus Upgrade Project
GBA-SP-SEN-V-19	LOYOLA 60 kV	BUS-TIE BREAKER FAULT AT 30705 MONTAVIS 230.00	P2	Bus-tie breaker	0.31	0.62	0.61	0.30					Monta Vista 230 kV Bus Upgrade Project
GBA-SP-SEN-V-20	MARTNZ D 115 kV	BUS-TIE BREAKER FAULT AT 33010 SOBRANTE 115.00	P2	Bus-tie breaker	0.90	0.73	0.92	0.91					SPS or system upgrade
GBA-SP-SEN-V-21	Mathew 60 kV	BUS-TIE BREAKER FAULT AT 30705 MONTAVIS 230.00	P2	Bus-tie breaker	0.89	0.96	0.96	0.91					Monta Vista 230 kV Bus Upgrade Project
GBA-SP-SEN-V-22	MILPITAS 115 kV	BUS-TIE BREAKER FAULT AT 30705 MONTAVIS 230.00	P2	Bus-tie breaker	0.88	0.95	0.95	0.89					Monta Vista 230 kV Bus Upgrade Project
GBA-SP-SEN-V-23	MOFT.FLD 115 kV	BUS-TIE BREAKER FAULT AT 30705 MONTAVIS 230.00	P2	Bus-tie breaker	0.67	0.82	0.82	0.66					Monta Vista 230 kV Bus Upgrade Project
GBA-SP-SEN-V-24	MT VIEW 115 kV	BUS-TIE BREAKER FAULT AT 30705 MONTAVIS 230.00	P2	Bus-tie breaker	0.36	0.65	0.64	0.35					Monta Vista 230 kV Bus Upgrade Project

Study Area: PG&E Greater Bay Area - Sensitivity

High/Low Voltage

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)								Potential Mitigation Solutions
					2020 SP Heavy Renewable & Min Gas Gen	2025 Retirement of QF Generations	2025 SP Zero East Bay Generation	2025 SP No AAEE	N/A	N/A	N/A	N/A	
GBA-SP-SEN-V-25	Northwes 60 kV	BUS-TIE BREAKER FAULT AT 30705 MONTAVIS 230.00	P2	Bus-tie breaker	0.89	0.95	0.95	0.90					Monta Vista 230 kV Bus Upgrade Project
GBA-SP-SEN-V-26	NUMMI 115 kV	BUS-TIE BREAKER FAULT AT 30705 MONTAVIS 230.00	P2	Bus-tie breaker	0.87	0.95	0.95	0.88					Monta Vista 230 kV Bus Upgrade Project
GBA-SP-SEN-V-27	PERMNNTE 60 kV	BUS-TIE BREAKER FAULT AT 30705 MONTAVIS 230.00	P2	Bus-tie breaker	0.32	0.63	0.61	0.31					Monta Vista 230 kV Bus Upgrade Project
GBA-SP-SEN-V-28	PHILLIPS 115 kV	BUS-TIE BREAKER FAULT AT 30705 MONTAVIS 230.00	P2	Bus-tie breaker	0.56	0.76	0.75	0.55					Monta Vista 230 kV Bus Upgrade Project
GBA-SP-SEN-V-29	PRT CSTA 60 kV	BUS-TIE BREAKER FAULT AT 33010 SOBRANTE 115.00	P2	Bus-tie breaker	0.85	0.32	0.97	0.94					SPS or system upgrade
GBA-SP-SEN-V-30	Serra 60 kV	BUS-TIE BREAKER FAULT AT 30705 MONTAVIS 230.00	P2	Bus-tie breaker	0.89	0.95	0.95	0.90					Monta Vista 230 kV Bus Upgrade Project
GBA-SP-SEN-V-31	SFPP CNC 60 kV	BUS-TIE BREAKER FAULT AT 33010 SOBRANTE 115.00	P2	Bus-tie breaker	0.83	0.29	0.95	0.93					SPS or system upgrade
GBA-SP-SEN-V-32	STELLING 115 kV	BUS-TIE BREAKER FAULT AT 30705 MONTAVIS 230.00	P2	Bus-tie breaker	0.37	0.66	0.64	0.36					Monta Vista 230 kV Bus Upgrade Project
GBA-SP-SEN-V-33	Uranium 60 kV	BUS-TIE BREAKER FAULT AT 30705 MONTAVIS 230.00	P2	Bus-tie breaker	0.89	0.95	0.95	0.90					Monta Vista 230 kV Bus Upgrade Project
GBA-SP-SEN-V-34	URICH 60 kV	BUS-TIE BREAKER FAULT AT 33010 SOBRANTE 115.00	P2	Bus-tie breaker	0.84	0.30	0.96	0.93					SPS or system upgrade
GBA-SP-SEN-V-35	VALLY VW 115 kV	BUS-TIE BREAKER FAULT AT 33010 SOBRANTE 115.00	P2	Bus-tie breaker	0.81	0.37	0.91	0.88					SPS or system upgrade
GBA-SP-SEN-V-36	Walsh 60 kV	BUS-TIE BREAKER FAULT AT 30705 MONTAVIS 230.00	P2	Bus-tie breaker	0.89	0.96	0.96	0.90					Monta Vista 230 kV Bus Upgrade Project
GBA-SP-SEN-V-37	WESTRN_D 115 kV	BUS-TIE BREAKER FAULT AT 30705 MONTAVIS 230.00	P2	Bus-tie breaker	0.87	0.95	0.95	0.88					Monta Vista 230 kV Bus Upgrade Project
GBA-SP-SEN-V-38	WHISMAN 115 kV	BUS-TIE BREAKER FAULT AT 30705 MONTAVIS 230.00	P2	Bus-tie breaker	0.36	0.65	0.64	0.35					Monta Vista 230 kV Bus Upgrade Project
GBA-SP-SEN-V-39	WOLFE 115 kV	BUS-TIE BREAKER FAULT AT 30705 MONTAVIS 230.00	P2	Bus-tie breaker	0.37	0.66	0.64	0.36					Monta Vista 230 kV Bus Upgrade Project
GBA-SP-SEN-V-40	Zeno 60 kV	BUS-TIE BREAKER FAULT AT 30705 MONTAVIS 230.00	P2	Bus-tie breaker	0.89	0.95	0.95	0.90					Monta Vista 230 kV Bus Upgrade Project
GBA-SP-SEN-V-41	GILROY F 115 kV	GLRY COG 13.80 Generator ID 2 & Metcalf-Morgan Hill 115 kV	P3	G-1/N-1	0.87	>0.9	>0.9	>0.9					Increase Metcalf area generation
GBA-SP-SEN-V-42	LLAGAS 115 kV	GLRY COG 13.80 Generator ID 2 & Metcalf-Morgan Hill 115 kV	P3	G-1/N-1	0.87	>0.9	>0.9	>0.9					Increase Metcalf area generation
GBA-SP-SEN-V-43	MRGN HIL 115 kV	GLRY COG 13.80 Generator ID 2 & Metcalf-Morgan Hill 115 kV	P3	G-1/N-1	0.84	>0.9	>0.9	>0.9					Increase Metcalf area generation
GBA-SP-SEN-V-44	BIXLER 60 kV	Willow Pass-Contra Costa 60kV Line & CC Sub 230/115kV Transformer #3	P6	N-1/N-1	0.73	>0.9	>0.9	>0.9					increase peninsula area generation
GBA-SP-SEN-V-45	CAROLNDS 60 kV	Jefferson 230/60kV Transformer #1 & Jefferson 230/60kV Transformer #2	P6	N-1/N-1	0.84	0.89	0.89	0.85					Review Stanford 60 kV system configuration
GBA-SP-SEN-V-46	CRYSTLSG 60 kV	Jefferson 230/60kV Transformer #1 & Jefferson 230/60kV Transformer #2	P6	N-1/N-1	0.72	0.79	0.79	0.73					Review Stanford 60 kV system configuration
GBA-SP-SEN-V-47	EMRLD LE 60 kV	Jefferson 230/60kV Transformer #1 & Jefferson 230/60kV Transformer #2	P6	N-1/N-1	0.73	0.79	0.79	0.74					Review Stanford 60 kV system configuration
GBA-SP-SEN-V-48	HILLSDLE 60 kV	Jefferson 230/60kV Transformer #1 & Jefferson 230/60kV Transformer #2	P6	N-1/N-1	0.89	0.93	0.93	0.90					Review Stanford 60 kV system configuration

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)								Potential Mitigation Solutions
					2020 SP Heavy Renewable & Min Gas Gen	2025 Retirement of QF Generations	2025 SP Zero East Bay Generation	2025 SP No AAEE	N/A	N/A	N/A	N/A	
GBA-SP-SEN-V-49	HLF MNBY 60 kV	Jefferson 230/60kV Transformer #2 & _Jefferson 230/60kV Transformer #1	P6	N-1/N-1	0.84	0.91	0.91	0.87					Review Stanford 60 kV system configuration
GBA-SP-SEN-V-50	LAS PLGS 60 kV	Jefferson 230/60kV Transformer #1 & Jefferson 230/60kV Transformer #2	P6	N-1/N-1	0.71	0.78	0.78	0.72					Review Stanford 60 kV system configuration
GBA-SP-SEN-V-51	LLAGAS 115 kV	Metcalf-Morgan Hill 115 kV & GLRY COG 13.80 Generator ID 2	P6	N-1/N-1	0.87	>0.9	>0.9	>0.9					Increase Metcalf area generation
GBA-SP-SEN-V-52	MRGN HIL 115 kV	Metcalf-Morgan Hill 115 kV & _Llagas-Gilroy Foods 115 kV	P6	N-1/N-1	0.84	>0.9	>0.9	>0.9					Increase Metcalf area generation
GBA-SP-SEN-V-53	RALSTON 60 kV	Jefferson 230/60kV Transformer #1 & Jefferson 230/60kV Transformer #2	P6	N-1/N-1	0.73	0.79	0.79	0.73					Review Stanford 60 kV system configuration
GBA-SP-SEN-V-54	STANFORD 60 kV	Jefferson 230/60kV Transformer #1 & Jefferson 230/60kV Transformer #2	P6	N-1/N-1	0.68	0.75	0.75	0.69					Review Stanford 60 kV system configuration
GBA-SP-SEN-V-55	WATRSHED 60 kV	Jefferson 230/60kV Transformer #1 & Jefferson 230/60kV Transformer #2	P6	N-1/N-1	0.78	0.84	0.84	0.79					Review Stanford 60 kV system configuration
GBA-SP-SEN-V-56	WOODSIDE 60 kV	Jefferson 230/60kV Transformer #1 & Jefferson 230/60kV Transformer #2	P6	N-1/N-1	0.72	0.78	0.78	0.72					Review Stanford 60 kV system configuration
GBA-SP-SEN-V-57	CAROLNDS 60 kV	Monta Vista-Jefferson Nos. 1 & 2 230 kV lines	P7	DCTL	0.80	0.88	0.88	0.84					Review Stanford 60 kV system configuration
GBA-SP-SEN-V-58	CRYSTLSG 60 kV	Monta Vista-Jefferson Nos. 1 & 2 230 kV lines	P7	DCTL	0.67	0.77	0.77	0.71					Review Stanford 60 kV system configuration
GBA-SP-SEN-V-59	EMRLD LE 60 kV	Monta Vista-Jefferson Nos. 1 & 2 230 kV lines	P7	DCTL	0.67	0.78	0.78	0.71					Review Stanford 60 kV system configuration
GBA-SP-SEN-V-60	HILLSDLE 60 kV	Monta Vista-Jefferson Nos. 1 & 2 230 kV lines	P7	DCTL	0.86	0.92	0.92	0.89					Review Stanford 60 kV system configuration
GBA-SP-SEN-V-61	HLF MNBY 60 kV	Monta Vista-Jefferson Nos. 1 & 2 230 kV lines	P7	DCTL	0.80	0.90	0.90	0.85					Review Stanford 60 kV system configuration
GBA-SP-SEN-V-62	LAS PLGS 60 kV	Monta Vista-Jefferson Nos. 1 & 2 230 kV lines	P7	DCTL	0.66	0.76	0.76	0.70					Review Stanford 60 kV system configuration
GBA-SP-SEN-V-63	RALSTON 60 kV	Monta Vista-Jefferson Nos. 1 & 2 230 kV lines	P7	DCTL	0.67	0.77	0.77	0.71					Review Stanford 60 kV system configuration
GBA-SP-SEN-V-64	STANFORD 60 kV	Monta Vista-Jefferson Nos. 1 & 2 230 kV lines	P7	DCTL	0.61	0.73	0.73	0.66					Review Stanford 60 kV system configuration
GBA-SP-SEN-V-65	WATRSHED 60 kV	Monta Vista-Jefferson Nos. 1 & 2 230 kV lines	P7	DCTL	0.73	0.82	0.82	0.77					Review Stanford 60 kV system configuration
GBA-SP-SEN-V-66	WOODSIDE 60 kV	Monta Vista-Jefferson Nos. 1 & 2 230 kV lines	P7	DCTL	0.66	0.77	0.77	0.70					Review Stanford 60 kV system configuration