

Overloaded Facility	Contingency (All and Worst P6)	Category	Category Description	Loading % (Baseline Scenarios)								Loading % (Sensitivity Scenarios)					Project & Potential Mitigation Solutions
				2019 Summer Peak	2022 Summer Peak	2027 Summer Peak	2019 Winter Peak	2022 Winter Peak	2027 Winter Peak	2019 Spring Light Load	2022 Spring Off-Peak	2022 SP High CEC Forecast	2019 SP Peak-Shift	2027 SP Peak-Shift	2022 SP Heavy Renewable & Min Gas Gen	2027 Retirement of QF Generations	
31000 HUMBOLDT 115 31452 TRINITY 115 1 1	P1-1:A1:2:_BLUELKPP 12.47KV GEN UNIT 1 & P1-2:A1:4:_BRIDGEVILLE-COTTONWOOD 115KV [1110]	P3	G-1/N-1	<90	<90	<90	<90	<90	103	<90	<90	<90	<90	<90	<90	<90	System upgrade or preferred resource
	P1-2:A1:1:_HUMBOLDT BAY-HUMBOLDT #2 115KV [7090] & P1-2:A1:4:_BRIDGEVILLE-COTTONWOOD 115KV [1110]	P6	N-1-1	<90	<90	92	NConv	<90	NConv	<90	<90	101	<90	100	<90	96	Severe voltage issue
	P1-2:A1:4:_BRIDGEVILLE-COTTONWOOD 115KV [1110] & P1-2:A1:1:_HUMBOLDT BAY-HUMBOLDT #2 115KV [7090]	P6	N-1-1	<90	<90	92	NConv	NConv	NConv	<90	<90	101	<90	100	<90	99	Severe voltage issue
31080 HUMBOLDT 60.0 31088 HMBLT JT 60.0 1 1	P2-3:A1:9:_HMBLT BY 60KV - MIDDLE BREAKER BAY 3	P2	Non-bus-tie breaker	12	17	9	7	47	8	105	113	8	16	8	46	10	System upgrade or preferred resource
	P7-1:A1:2:_HUMBOLDT BAY-HUMBOLDT #1 & HUMBOLDT BAY-HUMBOLDT #2 LINES	P7	DCTL	24	25	48	38	22	44	100	97	54	23	54	23	55	System upgrade or preferred resource
31084 HARRISST 60.0 31086 EUREKA 60.0 1 1	P1-2:A1:13:_HUMBOLDT BAY-HUMBOLDT #2 60KV [7090] & P1-2:A1:12:_HUMBOLDT BAY-HUMBOLDT #1 60KV [7080]	P6	N-1-1	<90	<90	100	<90	<90	89	81	67	100	<90	100	<90	<90	System upgrade or preferred resource
	P2-3:A1:10:_HMBLT BY 60KV - MIDDLE BREAKER BAY 4	P2	Non-bus-tie breaker	110	111	117	83	79	93	44	36	123	112	123	89	119	Short Term : Action Plan ; Long Term : Preferred resource
31086 EUREKA 60.0 31090 HMBLT BY 60.0 1 1	P1-2:A1:12:_HUMBOLDT BAY-HUMBOLDT #1 60KV [7080] & P1-2:A1:13:_HUMBOLDT BAY-HUMBOLDT #2 60KV [7090]	P6	N-1-1	<90	<90	<90	<90	<90	<90	99	100	<90	<90	<90	<90	<90	System upgrade or preferred resource
	P2-1:A1:14:_HUMBOLDT BAY-EUREKA 60KV [7070] (HUMBOLDT-HARRIS)	P2	Line section w/o fault	92	89	90	71	67	71	37	63	108	92	101	60	91	Sensitivity only
31090 HMBLT BY 60.0 31100 EEL RIVR 60.0 1 1	P2-2:A1:1:_HUMBOLDT 115KV SECTION MA	P2	Bus	54	50	62	NConv	36	NConv	140	133	NConv	58	NConv	52	NConv	Bridgeville - Garberville Revised Scope
	P2-3:A1:1:_HUMBOLDT - MA 115KV & HUMBOLDT-TRINITY LINE	P2	Non-bus-tie breaker	70	64	90	NConv	35	NConv	150	143	NConv	76	NConv	50	NConv	Bridgeville - Garberville Revised Scope
31091 RDGE CBN 60.0 31093 HYMPOMJT 60.0 1 1	P1-2:A1:3:_HUMBOLDT-TRINITY 115KV [1820] & P1-2:A1:4:_BRIDGEVILLE-COTTONWOOD 115KV [1110]	P6	N-1-1	<90	<90	<90	<90	<90	<90	46	<90	NConv	<90	<90	<90	<90	Sensitivity only
31100 EEL RIVR 60.0 31102 NEWBURG 60.0 1 1	P2-2:A1:1:_HUMBOLDT 115KV SECTION MA	P2	Bus	46	45	56	NConv	14	NConv	104	95	NConv	53	NConv	27	NConv	Severe voltage issue
	P2-3:A1:1:_HUMBOLDT - MA 115KV & HUMBOLDT-TRINITY LINE	P2	Non-bus-tie breaker	61	57	78	NConv	16	NConv	113	103	NConv	68	NConv	26	NConv	Severe voltage issue
31102 NEWBURG 60.0 31105 RIODLLTP 60.0 1 1	P2-2:A1:1:_HUMBOLDT 115KV SECTION MA	P2	Bus	76	74	95	NConv	19	NConv	133	113	NConv	85	NConv	18	NConv	Severe voltage issue
	P2-3:A1:1:_HUMBOLDT - MA 115KV & HUMBOLDT-TRINITY LINE	P2	Non-bus-tie breaker	95	91	127	NConv	27	NConv	145	125	NConv	106	NConv	17	NConv	Severe voltage issue
31104 CARLOTTA 60.0 31105 RIODLLTP 60.0 1 1	P2-2:A1:1:_HUMBOLDT 115KV SECTION MA	P2	Bus	93	84	108	NConv	30	NConv	122	104	NConv	96	NConv	9	NConv	Severe voltage issue
	P2-3:A1:1:_HUMBOLDT - MA 115KV & HUMBOLDT-TRINITY LINE	P2	Non-bus-tie breaker	113	102	140	NConv	38	NConv	133	115	NConv	117	NConv	7	NConv	Severe voltage issue

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				2019 Summer Peak	2022 Summer Peak	2027 Summer Peak	2019 Winter Peak	2022 Winter Peak	2027 Winter Peak	2019 Spring Light Load	2022 Spring Off-Peak	2022 SP High CEC Forecast	2019 SP Peak-Shift	2027 SP Peak-Shift	2022 SP Heavy Renewable & Min Gas Gen	2027 Retirement of QF Generations	
31104 CARLOTTA 60.0 31108 SWNS FLT 60.0 1 1	P1-3:A1:1: _HUMBOLDT 115/60KV TB 2 & P1-3:A1:4: _HUMBOLDT 115/60KV TB 1	P6	N-1-1	98	95	102	NConv	102	NConv	79	68	100	101	100	<90	98	Severe voltage issue
	P2-2:A1:1: _HUMBOLDT 115KV SECTION MA	P2	Bus	98	88	111	NConv	34	NConv	120	102	NConv	100	NConv	10	NConv	Severe voltage issue
	P2-3:A1:1: _HUMBOLDT - MA 115KV & HUMBOLDT-TRINITY LINE	P2	Non-bus-tie breaker	118	105	143	NConv	42	NConv	131	113	NConv	120	NConv	10	NConv	Severe voltage issue
31108 SWNS FLT 60.0 31110 BRDGVLE 60.0 1 1	P1-3:A1:1: _HUMBOLDT 115/60KV TB 2 & P1-3:A1:4: _HUMBOLDT 115/60KV TB 1	P6	N-1-1	98	95	102	NConv	102	NConv	79	67	100	101	100	<90	98	Severe voltage issue
	P2-2:A1:1: _HUMBOLDT 115KV SECTION MA	P2	Bus	98	88	111	NConv	34	NConv	119	102	NConv	100	NConv	9	NConv	Severe voltage issue
	P2-3:A1:1: _HUMBOLDT - MA 115KV & HUMBOLDT-TRINITY LINE	P2	Non-bus-tie breaker	118	105	143	NConv	42	NConv	130	113	NConv	120	NConv	9	NConv	Severe voltage issue
31116 GRBRVLE 60.0 31118 KEKAWAKA 60.0 1 1	P1-2:A1:15: _HUMBOLDT BAY-RIO DELL JCT 60KV [7100] & P1-3:A1:3: _BRDGVLE 115/60KV TB 1	P6	N-1-1	100	<90	<90	<90	<90	<90	<90	<90	90	<90	<90	<90	<90	Significant leading power factor in 2019 [0.7]
	P1-3:A1:3: _BRDGVLE 115/60KV TB 1 & P1-2:A1:15: _HUMBOLDT BAY-RIO DELL JCT 60KV [7100]	P6	N-1-1	101	<90	<90	<90	<90	<90	<90	<90	<90	<90	<90	<90	<90	Significant leading power factor in 2019 [0.7]
31120 FRUTLDJT 60.0 31122 FTSWRDJT 60.0 1 1	P1-2:A1:4: _BRIDGEVILLE-COTTONWOOD 115KV [1110] & P1-2:A1:3: _HUMBOLDT-TRINITY 115KV [1820]	P6	N-1-1	<90	<90	<90	<90	<90	<90	98	101	<90	<90	<90	92	<90	System upgrade or preferred resource

Study Area: PG&E Humboldt

High/Low Voltages



Substation	Contingency (All and Worst P6)	Category	Category Description	Voltage PU (Baseline Scenarios)								Voltage PU (Sensitivity Scenarios)					Project & Potential Mitigation Solutions
				2019 Summer Peak	2022 Summer Peak	2027 Summer Peak	2019 Winter Peak	2022 Winter Peak	2027 Winter Peak	2019 Spring Light Load	2022 Spring Off-Peak	2022 SP High CEC Forecast	2019 SP Peak-Shift	2027 SP Peak-Shift	2022 SP Heavy Renewable & Min Gas Gen	2027 Retirement of QF Generations	
BIG_LAGN 60 kV	Base Case	P0	N-0	1.05	1.03	1.03	1.01	1.02	1.01	1.05	1.03	1.01	1.03	1.02	1.03	1.01	Load power factor correction and voltage support if needed
BRDGVLLE 115 kV	Base Case	P0	N-0	1.05	1.04	1.04	1.03	1.04	1.03	1.06	1.07	1.02	1.04	1.03	1.04	1.03	Load power factor correction and voltage support if needed
HMBLDT B 115 kV	Base Case	P0	N-0	1.05	1.04	1.04	1.03	1.04	1.03	1.07	1.09	1.03	1.04	1.03	1.05	1.03	Load power factor correction and voltage support if needed
HOOPA 60 kV	Base Case	P0	N-0	0.96	0.96	0.96	0.96	0.98	0.97	1.02	1.01	0.94	0.96	0.95	0.98	0.97	Load power factor correction and voltage support if needed
HUMB_BS1 115 kV	Base Case	P0	N-0	1.05	1.04	1.04	1.03	1.04	1.03	1.07	1.09	1.03	1.04	1.03	1.05	1.03	Load power factor correction and voltage support if needed
HUMBOLDT 115 kV	Base Case	P0	N-0	1.05	1.04	1.04	1.03	1.05	1.03	1.07	1.09	1.03	1.05	1.03	1.06	1.03	Load power factor correction and voltage support if needed
LOW GAP1 115 kV	Base Case	P0	N-0	1.05	1.04	1.04	1.03	1.04	1.03	1.06	1.07	1.03	1.04	1.03	1.04	1.03	Load power factor correction and voltage support if needed
ORICK 60 kV	Base Case	P0	N-0	1.05	1.03	1.03	1.00	1.02	1.01	1.05	1.03	1.01	1.02	1.02	1.03	1.01	Load power factor correction and voltage support if needed
HOOPA 60 kV	P1-1:A1:10:_HUMB_G2 13.80KV GEN UNIT 7 & P1-2:A1:4:_BRIDGEVILLE-COTTONWOOD 115KV [1110]	P3	G-1/N-1	>0.9	>0.9	>0.9	>0.9	>0.9	0.89	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	Load power factor correction and voltage support if needed
HOOPA 60 kV	P1-1:A1:9:_HUMB_G2 13.80KV GEN UNIT 6 & P1-2:A1:4:_BRIDGEVILLE-COTTONWOOD 115KV [1110]	P3	G-1/N-1	>0.9	>0.9	>0.9	>0.9	>0.9	0.89	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	Load power factor correction and voltage support if needed
HUMBOLDT 115 kV	P1-1:A1:10:_HUMB_G2 13.80KV GEN UNIT 7 & P1-2:A1:4:_BRIDGEVILLE-COTTONWOOD 115KV [1110]	P3	G-1/N-1	<1.05	<1.05	<1.05	<1.05	<1.05	0.89	<1.05	1.12	<1.05	<1.05	<1.05	<1.05	<1.05	Load power factor correction and voltage support if needed
HUMBOLDT 115 kV	P1-1:A1:4:_HUMB_G1 13.80KV GEN UNIT 1 & P1-2:A1:11:_HUMBOLDT BAY-EUREKA 60KV [7070]	P3	G-1/N-1	<1.05	<1.05	<1.05	<1.05	<1.05	<1.05	<1.05	1.12	<1.05	1.10	<1.05	1.11	<1.05	Load power factor correction and voltage support if needed
HUMBOLDT 115 kV	P1-1:A1:4:_HUMB_G1 13.80KV GEN UNIT 1 & P1-2:A1:2:_HUMBOLDT-BRIDGEVILLE 115KV [1810]	P3	G-1/N-1	<1.05	<1.05	<1.05	<1.05	<1.05	<1.05	1.10	1.15	<1.05	<1.05	<1.05	1.12	<1.05	Load power factor correction and voltage support if needed
HUMBOLDT 115 kV	P1-1:A1:4:_HUMB_G1 13.80KV GEN UNIT 1 & P1-2:A1:4:_BRIDGEVILLE-COTTONWOOD 115KV [1110]	P3	G-1/N-1	<1.05	<1.05	<1.05	<1.05	<1.05	0.88	<1.05	1.13	<1.05	<1.05	<1.05	<1.05	<1.05	Load power factor correction and voltage support if needed
WILLWCRK 60 kV	P1-1:A1:4:_HUMB_G1 13.80KV GEN UNIT 1 & P1-2:A1:4:_BRIDGEVILLE-COTTONWOOD 115KV [1110]	P3	G-1/N-1	>0.9	>0.9	>0.9	>0.9	>0.9	0.90	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	Load power factor correction and voltage support if needed
ARCATA 60 kV	P1-3:A1:5:_FPC 60/13.8KV TB 1 & P1-3:A1:2:_HUMB_BS1 115/13.8KV TB 1	P6	N-1-1	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	0.86	>0.9	>0.9	>0.9	>0.9	Voltage support, UVLS and/ or SPS
ARCATA 60 kV	P1-4:A1:1:_HUMBOLDT SHUNT=7H & P1-2:A1:10:_FAIRHAVEN #1 60KV [6850]	P6	N-1-1	>0.9	>0.9	>0.9	>0.9	>0.9	0.88	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	Voltage support, UVLS and/ or SPS



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				2019 Summer Peak	2022 Summer Peak	2027 Summer Peak	2019 Winter Peak	2022 Winter Peak	2027 Winter Peak	2019 Spring Light Load	2022 Spring Off-Peak	2022 SP High CEC Forecast	2019 SP Peak-Shift	2027 SP Peak-Shift	2022 SP Heavy Renewable & Min Gas Gen	2027 Retirement of QF Generations	
BCHIPMIL 60 kV	P1-2:A1:10:_FAIRHAVEN #1 60KV [6850] & P1-2:A1:1:_HUMBOLDT BAY-HUMBOLDT #2 115KV [7090]	P6	N-1-1	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	0.86	>0.9	>0.9	>0.9	>0.9	Voltage support, UVLS and/ or SPS
BIG_LAGN 60 kV	P1-2:A1:10:_FAIRHAVEN #1 60KV [6850] & P1-2:A1:1:_HUMBOLDT BAY-HUMBOLDT #2 115KV [7090]	P6	N-1-1	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	0.87	>0.9	>0.9	>0.9	>0.9	Voltage support, UVLS and/ or SPS
BIG_LAGN 60 kV	P1-2:A1:10:_FAIRHAVEN #1 60KV [6850] & P1-3:A1:2:_HUMB_BS1 115/13.8KV TB 1	P6	N-1-1	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	0.89	>0.9	>0.9	>0.9	>0.9	Voltage support, UVLS and/ or SPS
BIG_LAGN 60 kV	P1-4:A1:11:_HUMBOLDT SVD=V & P1-2:A1:2:_HUMBOLDT-BRIDGEVILLE 115KV [1810]	P6	N-1-1	1.10	<1.05	<1.05	<1.05	<1.05	<1.05	<1.05	<1.05	<1.05	<1.05	<1.05	<1.05	<1.05	Voltage support, UVLS and/ or SPS
BLUE LKE 60 kV	P1-2:A1:10:_FAIRHAVEN #1 60KV [6850] & P1-2:A1:1:_HUMBOLDT BAY-HUMBOLDT #2 115KV [7090]	P6	N-1-1	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	0.87	>0.9	>0.9	>0.9	>0.9	Voltage support, UVLS and/ or SPS
BLUE LKE 60 kV	P1-2:A1:10:_FAIRHAVEN #1 60KV [6850] & P1-3:A1:2:_HUMB_BS1 115/13.8KV TB 1	P6	N-1-1	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	0.88	>0.9	>0.9	>0.9	>0.9	Voltage support, UVLS and/ or SPS
BLUE LKE 60 kV	P1-3:A1:5:_FPC 60/13.8KV TB 1 & P1-2:A1:1:_HUMBOLDT BAY-HUMBOLDT #2 115KV [7090]	P6	N-1-1	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	0.87	>0.9	>0.9	>0.9	>0.9	Voltage support, UVLS and/ or SPS
BRDGVLLE 60 kV	P1-3:A1:3:_BRDGVLLE 115/60KV TB 1 & P1-2:A1:15:_HUMBOLDT BAY-RIO DELL JCT 60KV [7100]	P6	N-1-1	>0.9	0.46	0.50	0.45	0.44	0.45	>0.9	0.86	0.48	0.52	0.48	0.56	0.43	Voltage support, UVLS and/ or SPS
BRDGVLLE 60 kV	P1-4:A1:11:_HUMBOLDT SVD=V & P1-2:A1:15:_HUMBOLDT BAY-RIO DELL JCT 60KV [7100]	P6	N-1-1	1.11	<1.05	<1.05	<1.05	<1.05	<1.05	<1.05	<1.05	<1.05	<1.05	<1.05	<1.05	<1.05	Voltage support, UVLS and/ or SPS
BRDGVLLE 115 kV	P1-2:A1:10:_FAIRHAVEN #1 60KV [6850] & P1-2:A1:1:_HUMBOLDT BAY-HUMBOLDT #2 115KV [7090]	P6	N-1-1	>0.9	>0.9	>0.9	0.87	>0.9	0.87	>0.9	>0.9	0.81	>0.9	>0.9	>0.9	>0.9	Voltage support, UVLS and/ or SPS
BRDGVLLE 115 kV	P1-4:A1:10:_GRBRVLLE SVD=V & P1-2:A1:4:_BRIDGEVILLE-COTTONWOOD 115KV [1110]	P6	N-1-1	<1.05	<1.05	<1.05	<1.05	<1.05	0.87	1.14	1.15	<1.05	<1.05	<1.05	1.11	<1.05	Voltage support, UVLS and/ or SPS
BRDGVLLE 115 kV	P1-4:A1:10:_GRBRVLLE SVD=V & P1-3:A1:5:_FPC 60/13.8KV TB 1	P6	N-1-1	<1.05	<1.05	<1.05	<1.05	<1.05	<1.05	1.12	<1.05	<1.05	<1.05	<1.05	<1.05	<1.05	Voltage support, UVLS and/ or SPS
CARLOTTA 60 kV	P1-2:A1:15:_HUMBOLDT BAY-RIO DELL JCT 60KV [7100] & P1-3:A1:3:_BRDGVLLE 115/60KV TB 1	P6	N-1-1	>0.9	0.45	0.45	0.41	0.41	0.39	>0.9	>0.9	0.45	0.48	0.42	0.49	0.39	Voltage support, UVLS and/ or SPS
EUREKA 60 kV	P1-2:A1:10:_FAIRHAVEN #1 60KV [6850] & P1-2:A1:1:_HUMBOLDT BAY-HUMBOLDT #2 115KV [7090]	P6	N-1-1	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	0.83	>0.9	>0.9	>0.9	>0.9	Voltage support, UVLS and/ or SPS

Study Area: PG&E Humboldt

High/Low Voltages



Substation	Contingency (All and Worst P6)	Category	Category Description	Voltage PU (Baseline Scenarios)								Voltage PU (Sensitivity Scenarios)					Project & Potential Mitigation Solutions
				2019 Summer Peak	2022 Summer Peak	2027 Summer Peak	2019 Winter Peak	2022 Winter Peak	2027 Winter Peak	2019 Spring Light Load	2022 Spring Off-Peak	2022 SP High CEC Forecast	2019 SP Peak-Shift	2027 SP Peak-Shift	2022 SP Heavy Renewable & Min Gas Gen	2027 Retirement of QF Generations	
EUREKA 60 kV	P1-2:A1:10:_FAIRHAVEN #1 60KV [6850] & P1-3:A1:2:_HUMB_BS1 115/13.8KV TB 1	P6	N-1-1	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	0.84	>0.9	>0.9	>0.9	>0.9	Voltage support, UVLS and/ or SPS
EUREKA 60 kV	P1-4:A1:1:_HUMBOLDT SHUNT=7H & P1-2:A1:10:_FAIRHAVEN #1 60KV [6850]	P6	N-1-1	>0.9	>0.9	>0.9	>0.9	>0.9	0.87	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	0.87	Voltage support, UVLS and/ or SPS
EUREKA 60 kV	P1-4:A1:1:_HUMBOLDT SHUNT=7H & P1-3:A1:5:_FPC 60/13.8KV TB 1	P6	N-1-1	>0.9	>0.9	>0.9	>0.9	>0.9	0.87	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	0.87	Voltage support, UVLS and/ or SPS
EUREKA 60 kV	P1-4:A1:11:_HUMBOLDT SVD=V & P1-2:A1:2:_HUMBOLDT-BRIDGEVILLE 115KV [1810]	P6	N-1-1	1.10	<1.05	<1.05	<1.05	<1.05	<1.05	<1.05	<1.05	<1.05	<1.05	<1.05	<1.05	<1.05	Voltage support, UVLS and/ or SPS
FAIRHAVN 60 kV	P1-2:A1:10:_FAIRHAVEN #1 60KV [6850] & P1-2:A1:1:_HUMBOLDT BAY-HUMBOLDT #2 115KV [7090]	P6	N-1-1	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	0.85	>0.9	>0.9	>0.9	>0.9	Voltage support, UVLS and/ or SPS
FAIRHAVN 60 kV	P1-2:A1:10:_FAIRHAVEN #1 60KV [6850] & P1-3:A1:2:_HUMB_BS1 115/13.8KV TB 1	P6	N-1-1	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	0.86	>0.9	>0.9	>0.9	>0.9	Voltage support, UVLS and/ or SPS
FAIRHAVN 60 kV	P1-4:A1:1:_HUMBOLDT SHUNT=7H & P1-2:A1:10:_FAIRHAVEN #1 60KV [6850]	P6	N-1-1	>0.9	>0.9	>0.9	>0.9	>0.9	0.88	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	Voltage support, UVLS and/ or SPS
FAIRHAVN 60 kV	P1-4:A1:1:_HUMBOLDT SHUNT=7H & P1-3:A1:5:_FPC 60/13.8KV TB 1	P6	N-1-1	>0.9	>0.9	>0.9	>0.9	>0.9	0.88	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	Voltage support, UVLS and/ or SPS
FRUITLND 60 kV	P1-2:A1:15:_HUMBOLDT BAY-RIO DELL JCT 60KV [7100] & P1-3:A1:3:_BRDGVLLE 115/60KV TB 1	P6	N-1-1	>0.9	0.57	0.56	0.52	0.52	0.50	>0.9	>0.9	0.55	0.58	0.53	0.61	0.50	Voltage support, UVLS and/ or SPS
FRUITLND 60 kV	P1-4:A1:10:_GRBRVLE SVD=V & P1-2:A1:20:_GARBERVILLE-LAYTONVILLE 60KV [8365]	P6	N-1-1	1.13	<1.05	<1.05	<1.05	<1.05	<1.05	<1.05	<1.05	<1.05	<1.05	<1.05	<1.05	<1.05	Voltage support, UVLS and/ or SPS
FRUITLND 60 kV	P1-4:A1:10:_GRBRVLE SVD=V & P1-2:A1:4:_BRIDGEVILLE-COTTONWOOD 115KV [1110]	P6	N-1-1	<1.05	<1.05	<1.05	<1.05	<1.05	<1.05	1.13	1.11	<1.05	<1.05	<1.05	<1.05	<1.05	Voltage support, UVLS and/ or SPS
GRBRVLE 60 kV	P1-3:A1:3:_BRDGVLLE 115/60KV TB 1 & P1-2:A1:15:_HUMBOLDT BAY-RIO DELL JCT 60KV [7100]	P6	N-1-1	>0.9	0.59	0.62	0.58	0.57	0.57	>0.9	>0.9	0.59	0.63	0.59	0.68	0.56	Voltage support, UVLS and/ or SPS
GRBRVLE 60 kV	P1-4:A1:10:_GRBRVLE SVD=V & P1-2:A1:15:_HUMBOLDT BAY-RIO DELL JCT 60KV [7100]	P6	N-1-1	1.13	<1.05	<1.05	<1.05	<1.05	<1.05	1.16	<1.05	<1.05	<1.05	<1.05	<1.05	<1.05	Voltage support, UVLS and/ or SPS
GRBRVLE 60 kV	P1-4:A1:10:_GRBRVLE SVD=V & P1-2:A1:20:_GARBERVILLE-LAYTONVILLE 60KV [8365]	P6	N-1-1	1.20	<1.05	<1.05	<1.05	1.16	<1.05	<1.05	<1.05	<1.05	<1.05	<1.05	<1.05	<1.05	Voltage support, UVLS and/ or SPS

Study Area: PG&E Humboldt

High/Low Voltages



Substation	Contingency (All and Worst P6)	Category	Category Description	Voltage PU (Baseline Scenarios)								Voltage PU (Sensitivity Scenarios)					Project & Potential Mitigation Solutions
				2019 Summer Peak	2022 Summer Peak	2027 Summer Peak	2019 Winter Peak	2022 Winter Peak	2027 Winter Peak	2019 Spring Light Load	2022 Spring Off-Peak	2022 SP High CEC Forecast	2019 SP Peak-Shift	2027 SP Peak-Shift	2022 SP Heavy Renewable & Min Gas Gen	2027 Retirement of QF Generations	
GRBRVLE 60 kV	P1-4:A1:10:_GRBRVLE SVD=V & P1-2:A1:4:_BRIDGEVILLE-COTTONWOOD 115KV [1110]	P6	N-1-1	<1.05	<1.05	<1.05	<1.05	<1.05	<1.05	1.16	1.15	<1.05	<1.05	<1.05	<1.05	<1.05	Voltage support, UVLS and/ or SPS
HARRIS 60 kV	P1-3:A1:5:_FPC 60/13.8KV TB 1 & P1-3:A1:2:_HUMB_BS1 115/13.8KV TB 1	P6	N-1-1	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	0.85	>0.9	>0.9	>0.9	>0.9	Voltage support, UVLS and/ or SPS
HARRIS 60 kV	P1-4:A1:1:_HUMBOLDT SHUNT=7H & P1-2:A1:10:_FAIRHAVEN #1 60KV [6850]	P6	N-1-1	>0.9	>0.9	>0.9	>0.9	>0.9	0.88	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	0.88	Voltage support, UVLS and/ or SPS
HOOPA 60 kV	P1-3:A1:5:_FPC 60/13.8KV TB 1 & P1-2:A1:1:_HUMBOLDT BAY-HUMBOLDT #2 115KV [7090]	P6	N-1-1	>0.9	>0.9	>0.9	0.86	>0.9	0.86	>0.9	>0.9	0.74	>0.9	>0.9	>0.9	0.86	Voltage support, UVLS and/ or SPS
HOOPA 60 kV	P1-4:A1:1:_HUMBOLDT SHUNT=7H & P1-2:A1:10:_FAIRHAVEN #1 60KV [6850]	P6	N-1-1	>0.9	>0.9	>0.9	>0.9	>0.9	0.81	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	0.81	Voltage support, UVLS and/ or SPS
HUMB_BS1 115 kV	P1-1:A1:4:_HUMB_G1 13.80KV GEN UNIT 1 & P1-2:A1:4:_BRIDGEVILLE-COTTONWOOD 115KV [1110]	P6	N-1-1	<1.05	<1.05	<1.05	<1.05	<1.05	0.89	<1.05	1.13	<1.05	<1.05	<1.05	<1.05	<1.05	Voltage support, UVLS and/ or SPS
HUMB_BS1 115 kV	P1-2:A1:2:_HUMBOLDT-BRIDGEVILLE 115KV [1810] & P1-2:A1:11:_HUMBOLDT BAY-EUREKA 60KV [7070]	P6	N-1-1	<1.05	1.13	1.12	<1.05	<1.05	<1.05	1.15	1.17	1.12	1.16	1.14	1.13	<1.05	Voltage support, UVLS and/ or SPS
HUMB_BS1 115 kV	P1-2:A1:5:_ESSEX JCT-ORICK 60KV [6810] & P1-2:A1:4:_BRIDGEVILLE-COTTONWOOD 115KV [1110]	P6	N-1-1	>0.9	>0.9	>0.9	>0.9	>0.9	0.87	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	0.87	Voltage support, UVLS and/ or SPS
HUMBOLDT 60 kV	P1-4:A1:11:_HUMBOLDT SVD=V & P1-2:A1:2:_HUMBOLDT-BRIDGEVILLE 115KV [1810]	P6	N-1-1	1.11	<1.05	<1.05	<1.05	<1.05	<1.05	<1.05	<1.05	<1.05	<1.05	<1.05	<1.05	<1.05	Voltage support, UVLS and/ or SPS
MPLE CRK 60 kV	P1-3:A1:5:_FPC 60/13.8KV TB 1 & P1-2:A1:1:_HUMBOLDT BAY-HUMBOLDT #2 115KV [7090]	P6	N-1-1	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	0.82	>0.9	>0.9	>0.9	>0.9	Voltage support, UVLS and/ or SPS
MPLE CRK 60 kV	P1-4:A1:1:_HUMBOLDT SHUNT=7H & P1-2:A1:10:_FAIRHAVEN #1 60KV [6850]	P6	N-1-1	>0.9	>0.9	>0.9	>0.9	>0.9	0.86	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	0.86	Voltage support, UVLS and/ or SPS
NEWBURG 60 kV	P1-2:A1:10:_FAIRHAVEN #1 60KV [6850] & P1-2:A1:1:_HUMBOLDT BAY-HUMBOLDT #2 115KV [7090]	P6	N-1-1	>0.9	>0.9	>0.9	0.90	>0.9	0.89	>0.9	>0.9	0.81	>0.9	>0.9	>0.9	0.89	Voltage support, UVLS and/ or SPS
NEWBURG 60 kV	P1-2:A1:10:_FAIRHAVEN #1 60KV [6850] & P1-3:A1:2:_HUMB_BS1 115/13.8KV TB 1	P6	N-1-1	>0.9	>0.9	>0.9	0.90	>0.9	0.89	>0.9	>0.9	0.82	>0.9	>0.9	>0.9	0.89	Voltage support, UVLS and/ or SPS
ORICK 60 kV	P1-2:A1:10:_FAIRHAVEN #1 60KV [6850] & P1-2:A1:1:_HUMBOLDT BAY-HUMBOLDT #2 115KV [7090]	P6	N-1-1	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	0.88	>0.9	>0.9	>0.9	>0.9	Voltage support, UVLS and/ or SPS

Study Area: PG&E Humboldt

High/Low Voltages



Substation	Contingency (All and Worst P6)	Category	Category Description	Voltage PU (Baseline Scenarios)								Voltage PU (Sensitivity Scenarios)					Project & Potential Mitigation Solutions
				2019 Summer Peak	2022 Summer Peak	2027 Summer Peak	2019 Winter Peak	2022 Winter Peak	2027 Winter Peak	2019 Spring Light Load	2022 Spring Off-Peak	2022 SP High CEC Forecast	2019 SP Peak-Shift	2027 SP Peak-Shift	2022 SP Heavy Renewable & Min Gas Gen	2027 Retirement of QF Generations	
ORICK 60 kV	P1-2:A1:10:_FAIRHAVEN #1 60KV [6850] & P1-3:A1:2:_HUMB_BS1 115/13.8KV TB 1	P6	N-1-1	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	0.89	>0.9	>0.9	>0.9	>0.9	Voltage support, UVLS and/ or SPS
ORICK 60 kV	P1-4:A1:11:_HUMBOLDT SVD=V & P1-2:A1:2:_HUMBOLDT-BRIDGEVILLE 115KV [1810]	P6	N-1-1	1.11	<1.05	<1.05	<1.05	<1.05	<1.05	<1.05	<1.05	<1.05	<1.05	<1.05	<1.05	<1.05	Voltage support, UVLS and/ or SPS
PCLUMBER 60 kV	P1-2:A1:10:_FAIRHAVEN #1 60KV [6850] & P1-2:A1:1:_HUMBOLDT BAY-HUMBOLDT #2 115KV [7090]	P6	N-1-1	>0.9	>0.9	>0.9	>0.9	>0.9	0.90	>0.9	>0.9	0.82	>0.9	>0.9	>0.9	0.90	Voltage support, UVLS and/ or SPS
PCLUMBER 60 kV	P1-2:A1:15:_HUMBOLDT BAY-RIO DELL JCT 60KV [7100] & P1-3:A1:3:_BRDGVLLE 115/60KV TB 1	P6	N-1-1	>0.9	0.45	0.45	0.41	0.41	0.39	>0.9	>0.9	0.45	0.48	0.42	0.49	0.39	Voltage support, UVLS and/ or SPS
RDGE CBN 60 kV	P1-3:A1:5:_FPC 60/13.8KV TB 1 & P1-3:A1:2:_HUMB_BS1 115/13.8KV TB 1	P6	N-1-1	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	0.84	>0.9	>0.9	>0.9	>0.9	Voltage support, UVLS and/ or SPS
RDGE CBN 60 kV	P1-4:A1:1:_HUMBOLDT SHUNT=7H & P1-2:A1:10:_FAIRHAVEN #1 60KV [6850]	P6	N-1-1	>0.9	>0.9	>0.9	>0.9	>0.9	0.88	>0.9	>0.9		>0.9	>0.9	>0.9	0.88	Voltage support, UVLS and/ or SPS
RIO DELL 60 kV	P1-2:A1:10:_FAIRHAVEN #1 60KV [6850] & P1-2:A1:1:_HUMBOLDT BAY-HUMBOLDT #2 115KV [7090]	P6	N-1-1	>0.9	>0.9	>0.9	0.89		0.88	>0.9	>0.9	0.80	>0.9	>0.9	>0.9	0.88	Voltage support, UVLS and/ or SPS
RIO DELL 60 kV	P1-2:A1:15:_HUMBOLDT BAY-RIO DELL JCT 60KV [7100] & P1-3:A1:3:_BRDGVLLE 115/60KV TB 1	P6	N-1-1	>0.9	0.44	0.44	0.40	0.40	0.38	>0.9	>0.9	0.43	0.46	0.41	0.48	0.38	Voltage support, UVLS and/ or SPS
RIO DELL 60 kV	P1-3:A1:3:_BRDGVLLE 115/60KV TB 1 & P1-2:A1:15:_HUMBOLDT BAY-RIO DELL JCT 60KV [7100]	P6	N-1-1	>0.9	0.39	0.44	0.39	0.38	0.38	>0.9	0.80	0.41	0.46	0.41	0.49	0.36	Voltage support, UVLS and/ or SPS
RUSS RCH 60 kV	P1-2:A1:10:_FAIRHAVEN #1 60KV [6850] & P1-2:A1:1:_HUMBOLDT BAY-HUMBOLDT #2 115KV [7090]	P6	N-1-1	>0.9	>0.9	>0.9	>0.9	>0.9	0.90	>0.9	>0.9	0.80	>0.9	>0.9	>0.9	0.90	Voltage support, UVLS and/ or SPS
SCOTIATP 60 kV	P1-2:A1:1:_HUMBOLDT BAY-HUMBOLDT #2 115KV [7090] & P1-2:A1:10:_FAIRHAVEN #1 60KV [6850]	P6	N-1-1	>0.9	>0.9	>0.9	0.89	>0.9	0.89	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	Voltage support, UVLS and/ or SPS
SCOTIATP 60 kV	P1-2:A1:10:_FAIRHAVEN #1 60KV [6850] & P1-3:A1:2:_HUMB_BS1 115/13.8KV TB 1	P6	N-1-1	>0.9	>0.9	>0.9	0.89	>0.9	0.88	>0.9	>0.9	0.81	>0.9	>0.9	>0.9	0.88	Voltage support, UVLS and/ or SPS
SCOTIATP 60 kV	P1-2:A1:15:_HUMBOLDT BAY-RIO DELL JCT 60KV [7100] & P1-3:A1:3:_BRDGVLLE 115/60KV TB 1	P6	N-1-1	>0.9	0.44	0.44	0.40	0.40	0.38	>0.9	>0.9	0.43	0.46	0.41	0.48	0.38	Voltage support, UVLS and/ or SPS
SCOTIATP 60 kV	P1-3:A1:3:_BRDGVLLE 115/60KV TB 1 & P1-2:A1:15:_HUMBOLDT BAY-RIO DELL JCT 60KV [7100]	P6	N-1-1	>0.9	0.39	0.44	0.39	0.38	0.38	>0.9	0.80	0.41	0.46	0.41	0.49	0.36	Voltage support, UVLS and/ or SPS



Substation	Contingency (All and Worst P6)	Category	Category Description	Voltage PU (Baseline Scenarios)								Voltage PU (Sensitivity Scenarios)					Project & Potential Mitigation Solutions
				2019 Summer Peak	2022 Summer Peak	2027 Summer Peak	2019 Winter Peak	2022 Winter Peak	2027 Winter Peak	2019 Spring Light Load	2022 Spring Off-Peak	2022 SP High CEC Forecast	2019 SP Peak-Shift	2027 SP Peak-Shift	2022 SP Heavy Renewable & Min Gas Gen	2027 Retirement of QF Generations	
SWNS FLT 60 kV	P1-2:A1:15:_HUMBOLDT BAY-RIO DELL JCT 60KV [7100] & P1-3:A1:3:_BRDGVILLE 115/60KV TB 1	P6	N-1-1	>0.9	0.50	0.49	0.45	0.45	0.43	>0.9	>0.9	0.48	0.51	0.46	0.54	0.43	Voltage support, UVLS and/ or SPS
SWNS FLT 60 kV	P1-4:A1:11:_HUMBOLDT SVD=V & P1-2:A1:15:_HUMBOLDT BAY-RIO DELL JCT 60KV [7100]	P6	N-1-1	1.11	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	Voltage support, UVLS and/ or SPS
TRINIDAD 60 kV	P1-2:A1:10:_FAIRHAVEN #1 60KV [6850] & P1-2:A1:1:_HUMBOLDT BAY-HUMBOLDT #2 115KV [7090]	P6	N-1-1	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	0.87	>0.9	>0.9	>0.9	>0.9	Voltage support, UVLS and/ or SPS
TRINIDAD 60 kV	P1-4:A1:11:_HUMBOLDT SVD=V & P1-2:A1:2:_HUMBOLDT-BRIDGEVILLE 115KV [1810]	P6	N-1-1	1.10	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	Voltage support, UVLS and/ or SPS
WILLWCRK 60 kV	P1-2:A1:10:_FAIRHAVEN #1 60KV [6850] & P1-2:A1:1:_HUMBOLDT BAY-HUMBOLDT #2 115KV [7090]	P6	N-1-1	>0.9	>0.9	>0.9	0.88	>0.9	0.87	>0.9	>0.9	0.76	>0.9	>0.9	>0.9	0.87	Voltage support, UVLS and/ or SPS
WILLWCRK 60 kV	P1-2:A1:3:_HUMBOLDT-TRINITY 115KV [1820] & P1-2:A1:1:_HUMBOLDT BAY-HUMBOLDT #2 115KV [7090]	P6	N-1-1	>0.9	>0.9	>0.9	0.90	0.89	0.89	>0.9	>0.9	0.85	>0.9	>0.9	>0.9	0.89	Voltage support, UVLS and/ or SPS

Study Area: PG&E Humboldt

Voltage Deviation



Substation	Contingency (All and Worst P6)	Category	Category Description	Post Cont. Voltage Deviation % (Baseline Scenarios)								Post Cont. Voltage Deviation % (Sensitivity Scenarios)					Project & Potential Mitigation Solutions
				2019 Summer Peak	2022 Summer Peak	2027 Summer Peak	2019 Winter Peak	2022 Winter Peak	2027 Winter Peak	2019 Spring Light Load	2022 Spring Off-Peak	2022 SP High CEC Forecast	2019 SP Peak-Shift	2027 SP Peak-Shift	2022 SP Heavy Renewable & Min Gas Gen	2027 Retirement of QF Generations	
None																	

Study Area: PG&E Humboldt

Transient Stability



Contingency	Category	Category Description	Transient Stability Performance (Number of voltage and frequency violations)										Potential Mitigation Solutions
			2019 Summer Peak	2022 Summer Peak	2027 Summer Peak	2019 Spring Light Load	2022 Spring Off-Peak	Select..	Select..	Select..	Select..	Select..	
LP SAMOA Unit 1 (Bus #31158)	P1-1		0	0	0	0	0						No violation
HMBLDT B - HUMB_BS1 115 kV Line	P1-2		32	46	32	32	46						Under review with PTO .
HUMB_BS1/HUMB_G1 115/13.8 kV No.1 Transformer	P1-3		0	0	0	0	0						No violation
HUMBOLDT 60 kV ID v SVD	P1-4		0	0	0	0	0						No violation
Bus Fault at HUMBOLDT 115 kV	P2-2		12	27	63	63	27						Under review with PTO .
Internal fault at Non-bus-tie-breaker #182 at HUMBOLDT 115 kV	P2-3		63	53	55	53	63						Under review with PTO .
Not Applicable (There is no Bus-Tie-Breaker at HUMBOLDT 115 kV substation)	P2-4		0	0	0	0	0						No violation
LP SAMOA Unit 1 and HUMB_G1 Unit 1	P3-1		0	0	0	0	0						No violation
LP SAMOA Unit 1 and HUMBOLDT - HMBLDT B 115 kV No.1 Line	P3-2		32	50	32	32	49						Under review with PTO .
LP SAMOA Unit 1 and HUMB_BS1/HUMB_G1 115/13.8 kV No.1 Transformer	P3-3		0	0	0	0	0						No violation
LP SAMOA Unit 1 and HUMBOLDT 60 kV ID v SVD	P3-4		0	0	0	0	0						No violation
Breaker stuck for CB #BAE071 protecting HUMB_G1 Unit 1	P4-1		0	0	0	0	0						No violation
Breaker stuck for CB #182 protecting HUMBOLDT-BRDGVLE 115 kV No.1 Line	P4-2		58	57	57	58	57						Under review with PTO .
Breaker stuck for CB #322 protecting HUMBOLDT/HUMBOLDT 60/115 kV No.2 Transformer	P4-3		57	59	61	59	62						Under review with PTO .

Study Area: PG&E Humboldt

Transient Stability



Contingency	Category	Category Description	Transient Stability Performance (Number of voltage and frequency violations)										Potential Mitigation Solutions
			2019 Summer Peak	2022 Summer Peak	2027 Summer Peak	2019 Spring Light Load	2022 Spring Off-Peak	Select..	Select..	Select..	Select..	Select..	
Breaker stuck for CB #6222 protecting HUMBOLDT 60 kV ID v SVD	P4-4		67	59	67	58	64						Under review with PTO .
Breaker stuck for CB #172 protecting Bus Section HUMBOLDT 115 kV	P4-5		24	60	63	63	58						Under review with PTO .
HUMB_G1 Unit 1	P5-1		0	0	0	0	0						No violation
HUMBOLDT -HMBLDT B 115 kV No.1 Line	P5-2		0	0	0	0	0						No violation
HUMBOLDT/HUMBOLDT 115/60 kV No.2 Transformer	P5-3		64	66	65	0	65						Under review with PTO .
HUMBOLDT 60 kV ID v SVD	P5-4		0	0	0	0	0						No violation
HUMBOLDT -HMBLDT B 115 kV No.1 Line and HUMBOLDT -BRDGVLE 115 kV No.1 Line	P6-1		55	55	55	53	55						Under review with PTO .
HUMBOLDT -HMBLDT B 115 kV No.1 Line and HUMBOLDT/HUMBOLDT 115/60 kV No.2 Transformer	P6-2		0	3	10	7	0						Under review with PTO .
HUMBOLDT 60 kV ID v SVD and HUMBOLDT 60 kV ID.7h SVD	P6-3		0	0	0	0	0						No violation
Arcata - Humboldt 60 kV (31067 - 31080) and Humboldt #1 60 kV (31066 - 31080) Lines	P7-1		0	0	0	0	0						No violation

Study Area: PG&E Humboldt



Single Contingency Load Drop

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

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

Study Area: PG&E Humboldt



Single Source Substation with more than 100 MW Load

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

No Single Source Substation with more than 100 MW Load.