2015-2015 ISO Reliability Assessment - Study Results

Study Area: **PG&E Humboldt**

Thermal Overloads

ID	Overloaded Facility	Worst Contingency	Category	Category Description	Loading (%)								Potential Mitigation Solutions
					2017 Spring Off-Peak	2020 Spring Light Load	2017 Summer Peak	2020 Summer Peak	2025 Summer Peak	2017 Winter Peak	2020 Winter Peak	2025 Winter Peak	
HUMB-T-1	Humboldt Bay - Rio Dell 60kV (Between NEWBURG - RIODLLTP)	BUS FAULT AT 31080 HUMBOLDT 60.00	P2-2	Bus Fault	96.22	112.78	80.99	74.60	66.24	107.83	102.88	99.54	Adjust Humboldt Bay generation
HUMB-T-2	Humboldt Bay - Rio Dell 60kV (Between NEWBURG - RIODLLTP)	BUS-TIE BREAKER FAULT AT 31080 HUMBOLDT 60.00	P2-4	Bus Tie Breaker	96.22	112.78	80.99	74.60	66.24	107.83	102.88	99.54	Adjust Humboldt Bay generation
HUMB-T-3	Rio Dell Jct - Bridgeville 60kV (Between CARLOTTA - RIODLLTP)	BUS FAULT AT 31080 HUMBOLDT 60.00	P2-2	Bus Fault	54.69	82.21	102.44	95.54	86.96	136.88	131.12	127.87	Adjust Humboldt Bay generation
HUMB-T-4	Rio Dell Jct - Bridgeville 60kV (Between CARLOTTA - RIODLLTP)	BUS-TIE BREAKER FAULT AT 31080 HUMBOLDT 60.00	P2-4	Bus Tie Breaker	54.69	82.21	102.44	95.54	86.96	136.88	131.12	127.87	Adjust Humboldt Bay generation
HUMB-T-5	Rio Dell Jct - Bridgeville 60kV (Between CARLOTTA - SWNS FLT)	BUS FAULT AT 31080 HUMBOLDT 60.00	P2-2	Bus Fault	<100	<100	<100	<100	<100	134.85	129.13	126.01	Adjust Humboldt Bay generation
HUMB-T-6	Rio Dell Jct - Bridgeville 60kV (Between CARLOTTA - SWNS FLT)	BUS-TIE BREAKER FAULT AT 31080 HUMBOLDT 60.00	P2-4	Bus Tie Breaker	<100	<100	<100	<100	<100	134.85	129.13	126.01	Adjust Humboldt Bay generation
HUMB-T-7	Rio Dell Jct - Bridgeville 60kV (Between SWNS FLT - BRDGVLLE)	BUS FAULT AT 31080 HUMBOLDT 60.00	P2-2	Bus Fault	<100	<100	<100	<100	<100	134.52	128.81	125.68	Adjust Humboldt Bay generation
HUMB-T-8	Rio Dell Jct - Bridgeville 60kV (Between SWNS FLT - BRDGVLLE)	BUS-TIE BREAKER FAULT AT 31080 HUMBOLDT 60.00	P2-4	Bus Tie Breaker	<100	<100	<100	<100	<100	134.52	128.81	125.68	Adjust Humboldt Bay generation
HUMB-T-9	Humboldt Bay - Humboldt #1 60kV (Between HUMBOLDT - HMBLT JT)	Humboldt Bay - Eureka 60 kV Line and Humboldt Bay - Humboldt No.2 60 kV Line	P6	L-1-1	<100	101.05	100.98	100.70	101.06	18.87	100.71	<100	Adjust Humboldt Bay generation
HUMB-T-10	Humboldt Bay - Humboldt #1 60kV (Between HUMBOLDT - HMBLT JT)	Humboldt - Eureka 60 kV Line (HUMBOLDT-HARRIS) and Humboldt Bay - Humboldt No.2 60 kV Line	P6	L-1-1	<100	<100	<100	99.01	<100	<100	100.20	<100	Adjust Humboldt Bay generation
HUMB-T-11	Humboldt Bay - Eureka 60kV (EUREKA - HMBLT BY)	Humboldt Bay - Humboldt No.1 60 kV Line (HUMBOLDT-HMBLT JT) and Humboldt Bay - Humboldt No.2 60 kV Line	P6	L-1-1	<100	100.95	100.79	100.62	101.30	15.36	100.89	<100	Adjust Humboldt Bay generation
HUMB-T-12	Humboldt Bay - Rio Dell 60kV (Between NEWBURG - RIODLLTP)	Humboldt 115/60 No.1 Transformer and Humboldt 115/60 No.2 Transformer	P6	T-1-1	98.51	<100	<100	<100	<100	110.55	<100	<100	Adjust Humboldt Bay generation
HUMB-T-13	Rio Dell Jct - Bridgeville 60kV (Between CARLOTTA - RIODLLTP)	Humboldt 115/60 No.1 Transformer and Humboldt - Bridgeville 115 kV Line	P6	T-1/L-1	<100	<100	<100	<100	99.93	16.67	<100	<100	Adjust Humboldt Bay generation
HUMB-T-14	Rio Dell Jct - Bridgeville 60kV (Between CARLOTTA - RIODLLTP)	GRBRVLLE 60.00 SVD ID v and Humboldt - Bridgeville 115 kV Line	P6	SD-1 / L-1	<100	<100	<100	<100	100.10	99.66	<100	<100	Adjust Humboldt Bay generation

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Thermal Overloads

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					2017 Spring Off-Peak	2020 Spring Light Load	2017 Summer Peak	2020 Summer Peak	2025 Summer Peak	2017 Winter Peak	2020 Winter Peak	2025 Winter Peak	
HUMB-T-15	Rio Dell Jct - Bridgeville 60kV (Between CARLOTTA - RIODLLTP)	Humboldt - Bridgeville 115 kV Line and Humboldt - Trinity 115 kV Line	P6	L-1-1	<100	<100	<100	<100	100.10	58.07	<100	<100	Adjust Humboldt Bay generation
HUMB-T-16	Garberville - Laytonville 60kV (Between GRBRVLLE - KEKAWAKA)	GRBRVLLE 60.00 SVD ID v and Bridgeville - Garberville 60 kV Line (BRDGVLLE-FRUTLDJT)	P6	SD-1 / L-1	<100	<100	113.81	<100	<100	<100	<100	<100	New Bridgeville - garberville 115kV line
HUMB-T-17	Garberville - Laytonville 60kV (Between GRBRVLLE - KEKAWAKA)	Bridgeville- Garberville 115 kV Line (New) and Bridgeville - Garberville 60 kV Line (BRDGVLLE-FRUTLDJT)	P6	L-1-1	<100	<100	<100	117.24	<100	<100	<100	<100	New Bridgeville - garberville 115kV line
HUMB-T-18	Garberville - Laytonville 60kV (Between GRBRVLLE - KEKAWAKA)	Bridgeville - Cottonwood 115 kV Line (LOW GAP1-BRDGVLLE) and Humboldt - Trinity 115 kV Line	P6	L-1-1	<100	<100	<100	<100	<100	<100	101.27	<100	New Bridgeville - garberville 115kV line
HUMB-T-19	Bridgeville - Garberville 60kV (Between FRUTLDJT - FTSWRDJT)	Humboldt Bay - Rio Dell Jct 60 kV Line (NEWBURG - RIO DELL JCT) and Bridgeville - Cottonwood 115 kV Line (LOW GAP1-BRDGVLLE)	P6	L-1-1	<100	<100	<100	<100	100.43	2.90	<100	<100	Backdown humboldt bay generation
HUMB-T-20	Laytonville - Willits 60kV	GRBRVLLE 60.00 SVD ID v and Bridgeville - Garberville 60 kV Line (BRDGVLLE-FRUTLDJT)	P6	SD-1 / L-1	<100	<100	126.29	<100	<100	<100	<100	<100	New Bridgeville - garberville 115kV line
HUMB-T-21	Laytonville - Willits 60kV	Bridgeville- Garberville 115 kV Line (New) and Bridgeville - Garberville 60 kV Line (BRDGVLLE-FRUTLDJT)	P6	L-1-1	<100	<100	<100	136.02	<100	<100	<100	<100	New Bridgeville - garberville 115kV line

Study Area: PG&E Humboldt

Voltage Deviations

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %								Potential Mitigation Solutions
					2017 Spring Off-Peak	2020 Spring Light Load	2017 Summer Peak	2020 Summer Peak	2025 Summer Peak	2017 Winter Peak	2020 Winter Peak	2025 Winter Peak	
HUMB-VD-1	COVELO6 60 kV	Bridgeville - Garberville 60 kV Line (BRDGVLLE-FRUTLDJT)	P1-2	Line	0.154	4.367	3.474	9.484	Cont not found	-0.861	1.795	Cont not found	New Bridgeville-Garberville 115kV line
HUMB-VD-2	FRT SWRD 60 kV	Bridgeville - Garberville 60 kV Line (BRDGVLLE-FRUTLDJT)	P1-2	Line	-0.89	8.3	2.548	16.265	Cont not found	-2.386	2.872	Cont not found	New Bridgeville-Garberville 115kV line
HUMB-VD-3	FRUITLND 60 kV	Bridgeville - Garberville 60 kV Line (BRDGVLLE-FRUTLDJT)	P1-2	Line	-0.599	8.617	2.951	17.058	Cont not found	-1.962	2.87	Cont not found	New Bridgeville-Garberville 115kV line
HUMB-VD-4	GRBRVLLE 60 kV	Bridgeville - Garberville 60 kV Line (BRDGVLLE-FRUTLDJT)	P1-2	Line	-1.319	7.848	2.321	15.478	Cont not found	-2.542	3.274	Cont not found	New Bridgeville-Garberville 115kV line
HUMB-VD-5	KEKAWAKA 60 kV	Bridgeville - Garberville 60 kV Line (BRDGVLLE-FRUTLDJT)	P1-2	Line	-0.832	7.26	3.084	14.815	Cont not found	-2.16	3.075	Cont not found	New Bridgeville-Garberville 115kV line
HUMB-VD-6	LYTNVLLE 60 kV	Bridgeville - Garberville 60 kV Line (BRDGVLLE-FRUTLDJT)	P1-2	Line	0.155	4.345	3.446	9.402	Cont not found	-0.859	1.792	Cont not found	New Bridgeville-Garberville 115kV line
HUMB-VD-7	GRBRVLLE 60 kV	Garberville - Laytonville 60 kV Line (GRBRVLLE-KEKAWAKA)	P1-2	Line	2.485	2.54	-1.836	-5.151	Cont not found	-2.55	-2.939	Cont not found	New Bridgeville-Garberville 115kV line
HUMB-VD-8	BRDGVLLE 115 kV	Humboldt 115/60 No.2 Transformer	P1-3	Transformer	-4.771	-6.746	-0.48	-0.773	-0.847	0.943	0.623	1.263	Turn on humboldt bay generation during light load conditions for voltage support
HUMB-VD-9	HMBLDT B 115 kV	Humboldt 115/60 No.2 Transformer	P1-3	Transformer	-5.769	-9.5	-0.498	-0.86	-0.962	0.996	0.633	0.858	Turn on humboldt bay generation during light load conditions for voltage support
HUMB-VD-10	HUMBOLDT 115 kV	Humboldt 115/60 No.2 Transformer	P1-3	Transformer	-6.211	-9.517	-0.637	-1.099	-1.23	1.276	0.811	1.098	Turn on humboldt bay generation during light load conditions for voltage support
HUMB-VD-11	BRDGVLLE 60 kV	Bridgeville 60/12 kV Transformer	P1-3	Transformer	2.375	2.493	5.485	5.654	1.147	4.101	4.05	0.215	New Bridgeville-Garberville 115kV line
HUMB-VD-12	FRT SWRD 60 kV	GRBRVLLE 60.00 SVD ID v	P1-4	Shunt Device	4.142	4.186	8.051	7.965	4.014	5.948	7.899	3.821	New Bridgeville-Garberville 115kV line
HUMB-VD-13	FRUITLND 60 kV	GRBRVLLE 60.00 SVD ID v	P1-4	Shunt Device	3.39	3.446	6.491	6.421	3.546	4.744	6.301	3.332	New Bridgeville-Garberville 115kV line
HUMB-VD-14	GRBRVLLE 60 kV	GRBRVLLE 60.00 SVD ID v	P1-4	Shunt Device	5.254	5.303	10.461	10.353	4.705	7.756	10.299	4.504	New Bridgeville-Garberville 115kV line
HUMB-VD-15	KEKAWAKA 60 kV	GRBRVLLE 60.00 SVD ID v	P1-4	Shunt Device	4.543	4.594	9.18	9.055	4.175	6.889	9.041	3.966	New Bridgeville-Garberville 115kV line
HUMB-VD-16	GRBRVLLE 60 kV	GRBRVLLE-KEKAWAKA #1 60 kV	P2-1	Line Section Open	2.485	2.539	-1.836	-5.151	Cont not found	-2.55	-2.939	Cont not found	New Bridgeville-Garberville 115kV line
HUMB-VD-17	GRBRVLLE 60 kV	KEKAWAKA-LYTNVLLE #1 60 kV	P2-1	Line Section Open	2.285	2.336	-2.065	-5.393	Cont not found	-2.764	-3.165	Cont not found	New Bridgeville-Garberville 115kV line
HUMB-VD-18	KEKAWAKA 60 kV	KEKAWAKA-LYTNVLLE #1 60 kV	P2-1	Line Section Open	1.731	1.759	-2.729	-5.873	Cont not found	-3.219	-3.802	Cont not found	New Bridgeville-Garberville 115kV line
HUMB-VD-19	BRDGVLLE 60 kV	BUS FAULT AT 31015 BRDGVLLE 115.00	P2-2	Bus	2.639	2.871	4.53	5.955	7.649	6.105	5.607	5.999	Turn on Kekawaka unit
HUMB-VD-20	FRT SWRD 60 kV	BUS FAULT AT 31015 BRDGVLLE 115.00	P2-2	Bus	2.414	2.545	0.869	1.802	9.293	1.998	3.202	6.728	Turn on Kekawaka unit
HUMB-VD-21	FRUITLND 60 kV	BUS FAULT AT 31015 BRDGVLLE 115.00	P2-2	Bus	2.48	2.625	1.689	2.717	9.215	3.13	3.877	6.961	Turn on Kekawaka unit
HUMB-VD-22	GRBRVLLE 60 kV	BUS FAULT AT 31015 BRDGVLLE 115.00	P2-2	Bus	2.315	2.447	-0.253	0.579	9.099	0.155	2.07	5.821	Turn on Kekawaka unit
HUMB-VD-23	GRBRVLLE 115 kV	BUS FAULT AT 31015 BRDGVLLE 115.00	P2-2	Bus					8.801			5.477	Turn on Kekawaka unit
HUMB-VD-24	KEKAWAKA 60 kV	BUS FAULT AT 31015 BRDGVLLE 115.00	P2-2	Bus	2.17	2.313	-0.321	0.388	7.436	0.06	1.732	4.269	Turn on Kekawaka unit

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Voltage Deviations

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HUMB-VD-25	SWNS FLT 60 kV	BUS FAULT AT 31015 BRDGVLLE 115.00	P2-2	Bus	2.187	2.422	4.004	5.203	6.638	5.42	4.982	5.317	Turn on Kekawaka unit
HUMB-VD-26	CARLOTTA 60 kV	BUS FAULT AT 31080 HUMBOLDT 60.00	P2-2	Bus	6.602	8.236	1.661	1.296	1.182	3.278	3.143	3.068	Turn on some humboldt bay generation during light load for voltage support
HUMB-VD-27	EEL RIVR 60 kV	BUS FAULT AT 31080 HUMBOLDT 60.00	P2-2	Bus	10.965	12.758	1.05	0.866	0.822	2.184	2.122	2.102	Turn on some humboldt bay generation during light load for voltage support
HUMB-VD-28	EUREKA 60 kV	BUS FAULT AT 31080 HUMBOLDT 60.00	P2-2	Bus	16.361	17.752	1.85	1.881	1.992	1.857	1.931	1.969	Turn on some humboldt bay generation during light load for voltage support
HUMB-VD-29	EUREKA A 60 kV	BUS FAULT AT 31080 HUMBOLDT 60.00	P2-2	Bus	16.368	17.757	1.851	1.882	1.993	1.858	1.932	1.971	Turn on some humboldt bay generation during light load for voltage support
HUMB-VD-30	HARRIS 60 kV	BUS FAULT AT 31080 HUMBOLDT 60.00	P2-2	Bus	17.414	18.73	2.81	2.878	3.038	2.676	2.785	2.827	Turn on some humboldt bay generation during light load for voltage support
HUMB-VD-31	HMBLT BY 60 kV	BUS FAULT AT 31080 HUMBOLDT 60.00	P2-2	Bus	14.743	16.33	0.435	0.415	0.452	0.611	0.634	0.661	Turn on some humboldt bay generation during light load for voltage support
HUMB-VD-32	HOOPA 60 kV	BUS FAULT AT 31080 HUMBOLDT 60.00	P2-2	Bus	2.964	-2.645	8.671	-0.251	-0.093	-1.158	7.406	-1.596	New Bridgeville-Garberville 115kV line
HUMB-VD-33	HRCSCOTIA 60 kV	BUS FAULT AT 31080 HUMBOLDT 60.00	P2-2	Bus	4.995	6.653	1.037	0.809	0.738	2.069	1.985	1.936	New Bridgeville-Garberville 115kV line
HUMB-VD-34	MPLE CRK 60 kV	BUS FAULT AT 31080 HUMBOLDT 60.00	P2-2	Bus	2.858	-2.596	8.218	-0.238	-0.042	-1.082	7.038	-1.501	New Bridgeville-Garberville 115kV line
HUMB-VD-35	NEWBURG 60 kV	BUS FAULT AT 31080 HUMBOLDT 60.00	P2-2	Bus	9.313	11.172	1.034	0.796	0.732	2.239	2.158	2.1	Turn on some humboldt bay generation during light load for voltage support
HUMB-VD-36	PCLUMBER 60 kV	BUS FAULT AT 31080 HUMBOLDT 60.00	P2-2	Bus	6.602	8.236	1.661	1.296	1.182	3.278	3.143	3.068	Turn on some humboldt bay generation during light load for voltage support
HUMB-VD-37	RDGE CBN 60 kV	BUS FAULT AT 31080 HUMBOLDT 60.00	P2-2	Bus	2.168	-2.239	6.72	0.279	0.408	-0.556	5.631	-0.775	New Bridgeville-Garberville 115kV line
HUMB-VD-38	RIO DELL 60 kV	BUS FAULT AT 31080 HUMBOLDT 60.00	P2-2	Bus	5.135	6.791	1.07	0.835	0.761	2.137	2.05	1.999	Turn on some humboldt bay generation during light load for voltage support
HUMB-VD-39	RUSS RCH 60 kV	BUS FAULT AT 31080 HUMBOLDT 60.00	P2-2	Bus	2.878	-2.605	8.304	-0.241	-0.05	-1.096	7.109	-1.519	New Bridgeville-Garberville 115kV line
HUMB-VD-40	WILLWCRK 60 kV	BUS FAULT AT 31080 HUMBOLDT 60.00	P2-2	Bus	2.935	-2.632	8.556	-0.247	-0.076	-1.138	7.318	-1.571	New Bridgeville-Garberville 115kV line
HUMB-VD-41	COVELO6 60 kV	BUS FAULT AT 31110 BRDGVLLE 60.00	P2-2	Bus	0.154	4.367	3.477	9.438	-0.62	-0.862	1.794	-0.272	New Bridgeville-Garberville 115kV line
HUMB-VD-42	FRT SWRD 60 kV	BUS FAULT AT 31110 BRDGVLLE 60.00	P2-2	Bus	-0.891	8.299	2.553	16.186	-1.269	-2.387	2.871	-0.785	New Bridgeville-Garberville 115kV line
HUMB-VD-43	FRUITLND 60 kV	BUS FAULT AT 31110 BRDGVLLE 60.00	P2-2	Bus	-0.599	8.617	2.957	16.979	-1.339	-1.964	2.87	-1.138	New Bridgeville-Garberville 115kV line
HUMB-VD-44	GRBRVLLE 60 kV	BUS FAULT AT 31110 BRDGVLLE 60.00	P2-2	Bus	-1.32	7.847	2.326	15.401	-1.153	-2.544	3.273	-0.232	New Bridgeville-Garberville 115kV line
HUMB-VD-45	KEKAWAKA 60 kV	BUS FAULT AT 31110 BRDGVLLE 60.00	P2-2	Bus	-0.832	7.259	3.088	14.745	-1.061	-2.161	3.074	-0.279	New Bridgeville-Garberville 115kV line
HUMB-VD-46	LYTNVLLE 60 kV	BUS FAULT AT 31110 BRDGVLLE 60.00	P2-2	Bus	0.155	4.345	3.449	9.357	-0.616	-0.86	1.791	-0.272	New Bridgeville-Garberville 115kV line
HUMB-VD-47	BRDGVLLE 115 kV	NON-BUS-TIE BREAKER CB6422 FAULT AT 31080 HUMBOLDT 60.00	P2-3	Breaker	-4.496	-6.602	-0.541	-0.938	-0.896	0.853	0.525	1.178	Turn on some humboldt bay generation during light load for voltage support
HUMB-VD-48	HMBLDT B 115 kV	NON-BUS-TIE BREAKER CB6422 FAULT AT 31080 HUMBOLDT 60.00	P2-3	Breaker	-5.524	-9.344	-0.565	-0.964	-1.019	0.901	0.529	0.766	Turn on some humboldt bay generation during light load for voltage support
HUMB-VD-49	HUMBOLDT 115 kV	NON-BUS-TIE BREAKER CB6422 FAULT AT 31080 HUMBOLDT 60.00	P2-3	Breaker	-5.967	-9.361	-0.722	-1.232	-1.303	1.155	0.677	0.98	Turn on some humboldt bay generation during light load for voltage support

Study Area: PG&E Humboldt

Voltage Deviations

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					2017 Spring Off-Peak	2020 Spring Light Load	2017 Summer Peak	2020 Summer Peak	2025 Summer Peak	2017 Winter Peak	2020 Winter Peak	2025 Winter Peak	
HUMB-VD-50	HOOPA 60 kV	NON-BUS-TIE BREAKER CB6622 FAULT AT 31080 HUMBOLDT 60.00	P2-3	Breaker	3.642	-1.68	-0.202	-0.163	0.07	-0.964	7.665	-1.579	New Bridgeville-Garberville 115kV line
HUMB-VD-51	MPLE CRK 60 kV	NON-BUS-TIE BREAKER CB6622 FAULT AT 31080 HUMBOLDT 60.00	P2-3	Breaker	3.559	-1.649	-0.192	-0.155	0.113	-0.897	7.284	-1.485	New Bridgeville-Garberville 115kV line
HUMB-VD-52	RDGE CBN 60 kV	NON-BUS-TIE BREAKER CB6622 FAULT AT 31080 HUMBOLDT 60.00	P2-3	Breaker	2.793	-1.306	0.327	0.357	0.552	-0.383	5.863	-0.759	New Bridgeville-Garberville 115kV line
HUMB-VD-53	RUSS RCH 60 kV	NON-BUS-TIE BREAKER CB6622 FAULT AT 31080 HUMBOLDT 60.00	P2-3	Breaker	3.575	-1.655	-0.194	-0.157	0.106	-0.909	7.357	-1.502	New Bridgeville-Garberville 115kV line
HUMB-VD-54	WILLWCRK 60 kV	NON-BUS-TIE BREAKER CB6622 FAULT AT 31080 HUMBOLDT 60.00	P2-3	Breaker	3.624	-1.672	-0.199	-0.161	0.085	-0.946	7.573	-1.554	New Bridgeville-Garberville 115kV line
HUMB-VD-55	BRDGVLLE 60 kV	BUS-TIE BREAKER FAULT AT 31015 BRDGVLLE 115.00	P2-4	Bus Tie Breaker	2.639	2.871	4.53	5.955	7.649	6.105	5.607	5.999	Mendocino area may need additional reactive support in the 5-10 year timeframe
HUMB-VD-56	FRT SWRD 60 kV	BUS-TIE BREAKER FAULT AT 31015 BRDGVLLE 115.00	P2-4	Bus Tie Breaker	2.414	2.545	0.869	1.802	9.293	1.998	3.202	6.728	Mendocino area may need additional reactive support in the 5-10 year timeframe
HUMB-VD-57	FRUITLND 60 kV	BUS-TIE BREAKER FAULT AT 31015 BRDGVLLE 115.00	P2-4	Bus Tie Breaker	2.48	2.625	1.689	2.717	9.215	3.13	3.877	6.961	Mendocino area may need additional reactive support in the 5-10 year timeframe
HUMB-VD-58	GRBRVLLE 60 kV	BUS-TIE BREAKER FAULT AT 31015 BRDGVLLE 115.00	P2-4	Bus Tie Breaker	2.315	2.447	-0.253	0.579	9.099	0.155	2.07	5.821	Mendocino area may need additional reactive support in the 5-10 year timeframe
HUMB-VD-59	KEKAWAKA 60 kV	BUS-TIE BREAKER FAULT AT 31015 BRDGVLLE 115.00	P2-4	Bus Tie Breaker	2.17	2.313	-0.321	0.388	7.436	0.06	1.732	4.269	Mendocino area may need additional reactive support in the 5-10 year timeframe
HUMB-VD-60	SWNS FLT 60 kV	BUS-TIE BREAKER FAULT AT 31015 BRDGVLLE 115.00	P2-4	Bus Tie Breaker	2.187	2.422	4.004	5.203	6.638	5.42	4.982	5.317	Mendocino area may need additional reactive support in the 5-10 year timeframe
HUMB-VD-61	CARLOTTA 60 kV	BUS-TIE BREAKER FAULT AT 31080 HUMBOLDT 60.00	P2-4	Bus Tie Breaker	6.602	8.236	1.661	1.296	1.182	3.278	3.143	3.068	Turn on some humboldt bay generation during light load for voltage support
HUMB-VD-62	EEL RIVR 60 kV	BUS-TIE BREAKER FAULT AT 31080 HUMBOLDT 60.00	P2-4	Bus Tie Breaker	10.965	12.758	1.05	0.866	0.822	2.184	2.122	2.102	Turn on some humboldt bay generation during light load for voltage support
HUMB-VD-63	EUREKA 60 kV	BUS-TIE BREAKER FAULT AT 31080 HUMBOLDT 60.00	P2-4	Bus Tie Breaker	16.361	17.752	1.85	1.881	1.992	1.857	1.931	1.969	Turn on some humboldt bay generation during light load for voltage support
HUMB-VD-64	EUREKA A 60 kV	BUS-TIE BREAKER FAULT AT 31080 HUMBOLDT 60.00	P2-4	Bus Tie Breaker	16.368	17.757	1.851	1.882	1.993	1.858	1.932	1.971	Turn on some humboldt bay generation during light load for voltage support
HUMB-VD-65	HARRIS 60 kV	BUS-TIE BREAKER FAULT AT 31080 HUMBOLDT 60.00	P2-4	Bus Tie Breaker	17.414	18.73	2.81	2.878	3.038	2.676	2.785	2.827	Turn on some humboldt bay generation during light load for voltage support
HUMB-VD-66	HMBLT BY 60 kV	BUS-TIE BREAKER FAULT AT 31080 HUMBOLDT 60.00	P2-4	Bus Tie Breaker	14.743	16.33	0.435	0.415	0.452	0.611	0.634	0.661	Turn on some humboldt bay generation during light load for voltage support
HUMB-VD-67	HOOPA 60 kV	BUS-TIE BREAKER FAULT AT 31080 HUMBOLDT 60.00	P2-4	Bus Tie Breaker	2.964	-2.645	8.671	-0.251	-0.093	-1.158	7.406	-1.596	Maple Creek reactive support project
HUMB-VD-68	HRCSCOTIA 60 kV	BUS-TIE BREAKER FAULT AT 31080 HUMBOLDT 60.00	P2-4	Bus Tie Breaker	4.995	6.653	1.037	0.809	0.738	2.069	1.985	1.936	Turn on some humboldt bay generation during light load for voltage support
HUMB-VD-69	MPLE CRK 60 kV	BUS-TIE BREAKER FAULT AT 31080 HUMBOLDT 60.00	P2-4	Bus Tie Breaker	2.858	-2.596	8.218	-0.238	-0.042	-1.082	7.038	-1.501	New Bridgeville-Garberville 115kV line
HUMB-VD-70	NEWBURG 60 kV	BUS-TIE BREAKER FAULT AT 31080 HUMBOLDT 60.00	P2-4	Bus Tie Breaker	9.313	11.172	1.034	0.796	0.732	2.239	2.158	2.1	Turn on some humboldt bay generation during light load for voltage support
HUMB-VD-71	PCLUMBER 60 kV	BUS-TIE BREAKER FAULT AT 31080 HUMBOLDT 60.00	P2-4	Bus Tie Breaker	6.602	8.236	1.661	1.296	1.182	3.278	3.143	3.068	Turn on some humboldt bay generation during light load for voltage support
HUMB-VD-72	RDGE CBN 60 kV	BUS-TIE BREAKER FAULT AT 31080 HUMBOLDT 60.00	P2-4	Bus Tie Breaker	2.168	-2.239	6.72	0.279	0.408	-0.556	5.631	-0.775	Maple Creek reactive support project
HUMB-VD-73	RIO DELL 60 kV	BUS-TIE BREAKER FAULT AT 31080 HUMBOLDT 60.00	P2-4	Bus Tie Breaker	5.135	6.791	1.07	0.835	0.761	2.137	2.05	1.999	Turn on some humboldt bay generation during light load for voltage support
HUMB-VD-74	RUSS RCH 60 kV	BUS-TIE BREAKER FAULT AT 31080 HUMBOLDT 60.00	P2-4	Bus Tie Breaker	2.878	-2.605	8.304	-0.241	-0.05	-1.096	7.109	-1.519	Maple Creek reactive support project

Voltage Deviations

ID	Substation	Worst Contingency	Category	Category Description	Post Cont. Voltage Deviation %								Potential Mitigation Solutions
					2017 Spring Off-Peak	2020 Spring Light Load	2017 Summer Peak	2020 Summer Peak	2025 Summer Peak	2017 Winter Peak	2020 Winter Peak	2025 Winter Peak	
HUMB-VD-75	WILLWCRK 60 kV	BUS-TIE BREAKER FAULT AT 31080 HUMBOLDT 60.00	P2-4	Bus Tie Breaker	2.935	-2.632	8.556	-0.247	-0.076	-1.138	7.318	-1.571	Maple Creek reactive support project
HUMB-VD-76	COVELO6 60 kV	BUS-TIE BREAKER FAULT AT 31110 BRDGVLLE 60.00	P2-4	Bus Tie Breaker	0.154	4.367	3.477	9.438	-0.62	-0.862	1.794	-0.272	New Bridgeville-Garberville 115kV line
HUMB-VD-77	FRT SWRD 60 kV	BUS-TIE BREAKER FAULT AT 31110 BRDGVLLE 60.00	P2-4	Bus Tie Breaker	-0.891	8.299	2.553	16.186	-1.269	-2.387	2.871	-0.785	New Bridgeville-Garberville 115kV line
HUMB-VD-78	FRUITLND 60 kV	BUS-TIE BREAKER FAULT AT 31110 BRDGVLLE 60.00	P2-4	Bus Tie Breaker	-0.599	8.617	2.957	16.979	-1.339	-1.964	2.87	-1.138	New Bridgeville-Garberville 115kV line
HUMB-VD-79	GRBRVLLE 60 kV	BUS-TIE BREAKER FAULT AT 31110 BRDGVLLE 60.00	P2-4	Bus Tie Breaker	-1.32	7.847	2.326	15.401	-1.153	-2.544	3.273	-0.232	New Bridgeville-Garberville 115kV line
HUMB-VD-80	KEKAWAKA 60 kV	BUS-TIE BREAKER FAULT AT 31110 BRDGVLLE 60.00	P2-4	Bus Tie Breaker	-0.832	7.259	3.088	14.745	-1.061	-2.161	3.074	-0.279	New Bridgeville-Garberville 115kV line
HUMB-VD-81	LYTNVLLE 60 kV	BUS-TIE BREAKER FAULT AT 31110 BRDGVLLE 60.00	P2-4	Bus Tie Breaker	0.155	4.345	3.449	9.357	-0.616	-0.86	1.791	-0.272	New Bridgeville-Garberville 115kV line
HUMB-VD-82	ARCATA 60 kV	Humboldt No.1 60 kV and Arcata - Humboldt 60 kV Lines	P7-1	DCTL	0.964	0.986	3.813	5.081	5.298	3.001	3.549	4.055	Arcata pocket may need additional reactive support in the 5-10 year time frame
HUMB-VD-83	BCHIPMIL 60 kV	Humboldt No.1 60 kV and Arcata - Humboldt 60 kV Lines	P7-1	DCTL	1.011	1.026	3.939	5.336	5.527	3.102	3.659	4.145	Arcata pocket may need additional reactive support in the 5-10 year time frame
HUMB-VD-84	BIG_LAGN 60 kV	Humboldt No.1 60 kV and Arcata - Humboldt 60 kV Lines	P7-1	DCTL	1.048	1.063	4.009	5.401	5.601	3.169	3.729	4.221	Arcata pocket may need additional reactive support in the 5-10 year time frame
HUMB-VD-85	BLUE LKE 60 kV	Humboldt No.1 60 kV and Arcata - Humboldt 60 kV Lines	P7-1	DCTL	0.922	0.936	3.862	5.325	5.508	3.007	3.576	4.071	Arcata pocket may need additional reactive support in the 5-10 year time frame
HUMB-VD-86	BLUELKPP 60 kV	Humboldt No.1 60 kV and Arcata - Humboldt 60 kV Lines	P7-1	DCTL	0.897	0.911	3.838	5.317	5.497	2.979	3.551	4.047	Arcata pocket may need additional reactive support in the 5-10 year time frame
HUMB-VD-87	JANS CRK 60 kV	Humboldt No.1 60 kV and Arcata - Humboldt 60 kV Lines	P7-1	DCTL	0.965	1.192	4.394	5.895	6.024	3.391	4.025	4.564	Arcata pocket may need additional reactive support in the 5-10 year time frame
HUMB-VD-88	ORICK 60 kV	Humboldt No.1 60 kV and Arcata - Humboldt 60 kV Lines	P7-1	DCTL	1.049	1.064	4.014	5.41	5.611	3.173	3.735	4.228	Arcata pocket may need additional reactive support in the 5-10 year time frame
HUMB-VD-89	SIMPSON 60 kV	Humboldt No.1 60 kV and Arcata - Humboldt 60 kV Lines	P7-1	DCTL	0.911	0.925	3.854	5.325	5.507	2.995	3.567	4.062	Arcata pocket may need additional reactive support in the 5-10 year time frame
HUMB-VD-90	TRINIDAD 60 kV	Humboldt No.1 60 kV and Arcata - Humboldt 60 kV Lines	P7-1	DCTL	1.047	1.062	4.003	5.394	5.592	3.165	3.724	4.214	Arcata pocket may need additional reactive support in the 5-10 year time frame

Study Area: PG&E Humboldt

High/Low Voltage

California ISO

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)								Potential Mitigation Solutions
					2017 Spring Off-Peak	2020 Spring Light Load	2017 Summer Peak	2020 Summer Peak	2025 Summer Peak	2017 Winter Peak	2020 Winter Peak	2025 Winter Peak	
HUMB-V-1	BRDGVLLE 115 kV	Humboldt - Bridgeville 115 kV Line	P1-2	Line	1.0902	1.1057	1.0214	1.0152	Cont not found	0.9785	0.9999	Cont not found	Turn on some Humboldt bay generation during light load conditions for reactive support.
HUMB-V-2	LOW GAP1 115 kV	Humboldt - Bridgeville 115 kV Line	P1-2	Line	1.0915	1.1069	1.0256	1.0209	Cont not found	0.992	1.0103	Cont not found	Turn on some Humboldt bay generation during light load conditions for reactive support.
HUMB-V-3	COVELO6 60 kV	Bridgeville - Garberville 60 kV Line (BRDGVLLE-FRUTLDJT)	P1-2	Line	1.0076	0.9659	0.9587	0.8903	Cont not found	1.0109	0.995	Cont not found	New Bridgeville-Garberville 60kV line
HUMB-V-4	FRT SWRD 60 kV	Bridgeville - Garberville 60 kV Line (BRDGVLLE-FRUTLDJT)	P1-2	Line	1.0449	0.9574	0.9958	0.8459	Cont not found	1.031	0.9951	Cont not found	New Bridgeville-Garberville 60kV line
HUMB-V-5	FRUITLND 60 kV	Bridgeville - Garberville 60 kV Line (BRDGVLLE-FRUTLDJT)	P1-2	Line	1.0413	0.9516	0.9897	0.8387	Cont not found	1.0313	0.9956	Cont not found	New Bridgeville-Garberville 60kV line
HUMB-V-6	GRBRVLLE 60 kV	Bridgeville - Garberville 60 kV Line (BRDGVLLE-FRUTLDJT)	P1-2	Line	1.0501	0.9625	1.0052	0.8573	Cont not found	1.0407	1.0051	Cont not found	New Bridgeville-Garberville 60kV line
HUMB-V-7	KEKAWAKA 60 kV	Bridgeville - Garberville 60 kV Line (BRDGVLLE-FRUTLDJT)	P1-2	Line	1.0398	0.9628	0.9911	0.8593	Cont not found	1.0325	1.0009	Cont not found	New Bridgeville-Garberville 60kV line
HUMB-V-8	LYTNVLLE 60 kV	Bridgeville - Garberville 60 kV Line (BRDGVLLE-FRUTLDJT)	P1-2	Line	1.0111	0.9713	0.9653	0.8975	Cont not found	1.0115	0.9954	Cont not found	New Bridgeville-Garberville 60kV line
HUMB-V-9	BRDGVLLE 115 kV	Humboldt 115/60 No.2 Transformer	P1-3	Transformer	1.1044	1.1339	1.0451	1.045	1.0539	1.024	1.0331	1.037	Turn on some Humboldt bay generation during light load conditions for reactive support.
HUMB-V-10	HMBLDT B 115 kV	Humboldt 115/60 No.2 Transformer	P1-3	Transformer	1.1039	1.1469	1.0535	1.0562	1.0578	1.0406	1.045	1.043	Turn on some Humboldt bay generation during light load conditions for reactive support.
HUMB-V-11	HUMBOLDT 115 kV	Humboldt 115/60 No.2 Transformer	P1-3	Transformer	1.1078	1.1468	1.0522	1.0556	1.0577	1.0338	1.0395	1.0379	Turn on some Humboldt bay generation during light load conditions for reactive support.
HUMB-V-12	LOW GAP1 115 kV	Humboldt 115/60 No.2 Transformer	P1-3	Transformer	1.1028	1.1297	1.0449	1.0451	1.0518	1.0265	1.0351	1.0382	Turn on some Humboldt bay generation during light load conditions for reactive support.
HUMB-V-13	LOW GAP1 115 kV	LOW GAP1-BRDGVLLE #1 115 kV	P2-1	Line section open	1.0954	1.1108	1.0409	1.0428	Cont not found	1.0441	1.0495	Cont not found	Turn on some Humboldt bay generation during light load conditions for reactive support.
HUMB-V-14	LOW GAP1 115 kV	BUS FAULT AT 31015 BRDGVLLE 115.00	P2-2	Bus	1.0954	1.1107	1.0402	1.0423	1.0408	1.0432	1.0487	1.0399	Turn on some Humboldt bay generation during light load conditions for reactive support.
HUMB-V-15	EUREKA 60 kV	BUS FAULT AT 31080 HUMBOLDT 60.00	P2-2	Bus	0.865	0.8582	1.013	1.0121	1.0104	1.0133	1.0123	1.0118	Turn on some Humboldt bay generation during light load conditions for reactive support.
HUMB-V-16	EUREKA A 60 kV	BUS FAULT AT 31080 HUMBOLDT 60.00	P2-2	Bus	0.8646	0.8578	1.0124	1.0115	1.0098	1.0126	1.0116	1.0111	Turn on some Humboldt bay generation during light load conditions for reactive support.
HUMB-V-17	HARRIS 60 kV	BUS FAULT AT 31080 HUMBOLDT 60.00	P2-2	Bus	0.8595	0.8525	1.0056	1.0045	1.0025	1.0063	1.0052	1.0047	Turn on some Humboldt bay generation during light load conditions for reactive support.
HUMB-V-18	HMBLT BY 60 kV	BUS FAULT AT 31080 HUMBOLDT 60.00	P2-2	Bus	0.8832	0.8729	1.0375	1.0373	1.0363	1.0372	1.0367	1.0361	Turn on some Humboldt bay generation during light load conditions for reactive support.
HUMB-V-19	COVELO6 60 kV	BUS FAULT AT 31110 BRDGVLLE 60.00	P2-2	Bus	1.0077	0.9659	0.9587	0.8907	1.0032	1.011	0.995	1.0155	New Bridgeville-Garberville 60kV line
HUMB-V-20	FRT SWRD 60 kV	BUS FAULT AT 31110 BRDGVLLE 60.00	P2-2	Bus	1.0449	0.9574	0.9957	0.8467	1.063	1.031	0.9951	1.062	New Bridgeville-Garberville 60kV line

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)								Potential Mitigation Solutions
					2017 Spring Off-Peak	2020 Spring Light Load	2017 Summer Peak	2020 Summer Peak	2025 Summer Peak	2017 Winter Peak	2020 Winter Peak	2025 Winter Peak	
HUMB-V-21	FRUITLND 60 kV	BUS FAULT AT 31110 BRDGVLLE 60.00	P2-2	Bus	1.0413	0.9516	0.9896	0.8395	1.057	1.0314	0.9956	1.0627	New Bridgeville-Garberville 60kV line
HUMB-V-22	GRBRVLLE 60 kV	BUS FAULT AT 31110 BRDGVLLE 60.00	P2-2	Bus	1.0501	0.9625	1.0051	0.8581	1.0719	1.0407	1.0051	1.0713	New Bridgeville-Garberville 60kV line
HUMB-V-23	KEKAWAKA 60 kV	BUS FAULT AT 31110 BRDGVLLE 60.00	P2-2	Bus	1.0398	0.9628	0.991	0.86	1.0557	1.0325	1.0009	1.055	New Bridgeville-Garberville 60kV line
HUMB-V-24	LYTNVLLE 60 kV	BUS FAULT AT 31110 BRDGVLLE 60.00	P2-2	Bus	1.0111	0.9713	0.9653	0.898	1.0094	1.0115	0.9955	1.0155	New Bridgeville-Garberville 60kV line
HUMB-V-25	BRDGVLLE 115 kV	NON-BUS-TIE BREAKER CB6422 FAULT AT 31080 HUMBOLDT 60.00	P2-3	Breaker	1.1017	1.1325	1.0457	1.0466	1.0544	1.0249	1.0341	1.0379	Turn on some Humboldt bay generation during light load conditions for reactive support.
HUMB-V-26	HMBLDT B 115 kV	NON-BUS-TIE BREAKER CB6422 FAULT AT 31080 HUMBOLDT 60.00	P2-3	Breaker	1.1017	1.1453	1.0542	1.0572	1.0584	1.0416	1.0461	1.044	Turn on some Humboldt bay generation during light load conditions for reactive support.
HUMB-V-27	HUMBOLDT 115 kV	NON-BUS-TIE BREAKER CB6422 FAULT AT 31080 HUMBOLDT 60.00	P2-3	Breaker	1.1017	1.1453	1.0531	1.0569	1.0585	1.035	1.0408	1.0391	Turn on some Humboldt bay generation during light load conditions for reactive support.
HUMB-V-28	LOW GAP1 115 kV	NON-BUS-TIE BREAKER CB6422 FAULT AT 31080 HUMBOLDT 60.00	P2-3	Breaker	1.1017	1.1285	1.0454	1.0465	1.0522	1.0272	1.0359	1.0389	Turn on some Humboldt bay generation during light load conditions for reactive support.
HUMB-V-29	LOW GAP1 115 kV	BUS-TIE BREAKER FAULT AT 31015 BRDGVLLE 115.00	P2-4	Tie-Breaker	1.0954	1.1107	1.0402	1.0423	1.0408	1.0432	1.0487	1.0399	Turn on some Humboldt bay generation during light load conditions for reactive support.
HUMB-V-30	EUREKA 60 kV	BUS-TIE BREAKER FAULT AT 31080 HUMBOLDT 60.00	P2-4	Tie-Breaker	0.865	0.8582	1.013	1.0121	1.0104	1.0133	1.0123	1.0118	Turn on some Humboldt bay generation during light load conditions for reactive support.
HUMB-V-31	EUREKA A 60 kV	BUS-TIE BREAKER FAULT AT 31080 HUMBOLDT 60.00	P2-4	Tie-Breaker	0.8646	0.8578	1.0124	1.0115	1.0098	1.0126	1.0116	1.0111	Turn on some Humboldt bay generation during light load conditions for reactive support.
HUMB-V-32	HARRIS 60 kV	BUS-TIE BREAKER FAULT AT 31080 HUMBOLDT 60.00	P2-4	Tie-Breaker	0.8595	0.8525	1.0056	1.0045	1.0025	1.0063	1.0052	1.0047	Turn on some Humboldt bay generation during light load conditions for reactive support.
HUMB-V-33	HMBLT BY 60 kV	BUS-TIE BREAKER FAULT AT 31080 HUMBOLDT 60.00	P2-4	Tie-Breaker	0.8832	0.8729	1.0375	1.0373	1.0363	1.0372	1.0367	1.0361	Turn on some Humboldt bay generation during light load conditions for reactive support.
HUMB-V-34	COVELO6 60 kV	BUS-TIE BREAKER FAULT AT 31110 BRDGVLLE 60.00	P2-4	Tie-Breaker	1.0077	0.9659	0.9587	0.8907	1.0032	1.011	0.995	1.0155	New Bridgeville-Garberville 60kV line
HUMB-V-35	FRT SWRD 60 kV	BUS-TIE BREAKER FAULT AT 31110 BRDGVLLE 60.00	P2-4	Tie-Breaker	1.0449	0.9574	0.9957	0.8467	1.063	1.031	0.9951	1.062	New Bridgeville-Garberville 60kV line
HUMB-V-36	FRUITLND 60 kV	BUS-TIE BREAKER FAULT AT 31110 BRDGVLLE 60.00	P2-4	Tie-Breaker	1.0413	0.9516	0.9896	0.8395	1.057	1.0314	0.9956	1.0627	New Bridgeville-Garberville 60kV line
HUMB-V-37	GRBRVLLE 60 kV	BUS-TIE BREAKER FAULT AT 31110 BRDGVLLE 60.00	P2-4	Tie-Breaker	1.0501	0.9625	1.0051	0.8581	1.0719	1.0407	1.0051	1.0713	New Bridgeville-Garberville 60kV line
HUMB-V-38	KEKAWAKA 60 kV	BUS-TIE BREAKER FAULT AT 31110 BRDGVLLE 60.00	P2-4	Tie-Breaker	1.0398	0.9628	0.991	0.86	1.0557	1.0325	1.0009	1.055	New Bridgeville-Garberville 60kV line
HUMB-V-39	LYTNVLLE 60 kV	BUS-TIE BREAKER FAULT AT 31110 BRDGVLLE 60.00	P2-4	Tie-Breaker	1.0111	0.9713	0.9653	0.898	1.0094	1.0115	0.9955	1.0155	New Bridgeville-Garberville 60kV line
HUMB-V-40	BRDGVLLE 115 kV	Humboldt - Bridgeville 115 kV Line	P1-2	Line	1.0902	1.1057	1.0214	1.0152	Cont not found	0.9785	0.9999	Cont not found	Turn on some Humboldt bay generation during light load conditions for reactive support.

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)								Potential Mitigation Solutions
					2017 Spring Off-Peak	2020 Spring Light Load	2017 Summer Peak	2020 Summer Peak	2025 Summer Peak	2017 Winter Peak	2020 Winter Peak	2025 Winter Peak	
HUMB-V-41	LOW GAP1 115 kV	Humboldt - Bridgeville 115 kV Line	P1-2	Line	1.0915	1.1069	1.0256	1.0209	Cont not found	0.992	1.0103	Cont not found	Turn on some Humboldt bay generation during light load conditions for reactive support.
HUMB-V-42	COVELO6 60 kV	Bridgeville - Garberville 60 kV Line (BRDGVLLE-FRUTLDJT)	P1-2	Line	1.0076	0.9659	0.9587	0.8903	Cont not found	1.0109	0.995	Cont not found	New Bridgeville-Garberville 60kV line
HUMB-V-43	FRT SWRD 60 kV	Bridgeville - Garberville 60 kV Line (BRDGVLLE-FRUTLDJT)	P1-2	Line	1.0449	0.9574	0.9958	0.8459	Cont not found	1.031	0.9951	Cont not found	New Bridgeville-Garberville 60kV line
HUMB-V-44	FRUITLND 60 kV	Bridgeville - Garberville 60 kV Line (BRDGVLLE-FRUTLDJT)	P1-2	Line	1.0413	0.9516	0.9897	0.8387	Cont not found	1.0313	0.9956	Cont not found	New Bridgeville-Garberville 60kV line
HUMB-V-45	GRBRVLLE 60 kV	Bridgeville - Garberville 60 kV Line (BRDGVLLE-FRUTLDJT)	P1-2	Line	1.0501	0.9625	1.0052	0.8573	Cont not found	1.0407	1.0051	Cont not found	New Bridgeville-Garberville 60kV line
HUMB-V-46	KEKAWAKA 60 kV	Bridgeville - Garberville 60 kV Line (BRDGVLLE-FRUTLDJT)	P1-2	Line	1.0398	0.9628	0.9911	0.8593	Cont not found	1.0325	1.0009	Cont not found	New Bridgeville-Garberville 60kV line
HUMB-V-47	LYTNVLLE 60 kV	Bridgeville - Garberville 60 kV Line (BRDGVLLE-FRUTLDJT)	P1-2	Line	1.0111	0.9713	0.9653	0.8975	Cont not found	1.0115	0.9954	Cont not found	New Bridgeville-Garberville 60kV line
HUMB-V-48	BRDGVLLE 115 kV	Humboldt 115/60 No.2 Transformer	P1-3	Transformer	1.1044	1.1339	1.0451	1.045	1.0539	1.024	1.0331	1.037	Turn on some Humboldt bay generation during light load conditions for reactive support.
HUMB-V-49	HMBLDT B 115 kV	Humboldt 115/60 No.2 Transformer	P1-3	Transformer	1.1039	1.1469	1.0535	1.0562	1.0578	1.0406	1.045	1.043	Turn on some Humboldt bay generation during light load conditions for reactive support.
HUMB-V-50	HUMBOLDT 115 kV	Humboldt 115/60 No.2 Transformer	P1-3	Transformer	1.1078	1.1468	1.0522	1.0556	1.0577	1.0338	1.0395	1.0379	Turn on some Humboldt bay generation during light load conditions for reactive support.
HUMB-V-51	LOW GAP1 115 kV	Humboldt 115/60 No.2 Transformer	P1-3	Transformer	1.1028	1.1297	1.0449	1.0451	1.0518	1.0265	1.0351	1.0382	Turn on some Humboldt bay generation during light load conditions for reactive support.
HUMB-V-52	LOW GAP1 115 kV	LOW GAP1-BRDGVLLE #1 115 kV	P2-1	Line section open	1.0954	1.1108	1.0409	1.0428	Cont not found	1.0441	1.0495	Cont not found	Turn on some Humboldt bay generation during light load conditions for reactive support.
HUMB-V-53	LOW GAP1 115 kV	BUS FAULT AT 31015 BRDGVLLE 115.00	P2-2	Bus	1.0954	1.1107	1.0402	1.0423	1.0408	1.0432	1.0487	1.0399	Turn on some Humboldt bay generation during light load conditions for reactive support.
HUMB-V-54	EUREKA 60 kV	BUS FAULT AT 31080 HUMBOLDT 60.00	P2-2	Bus	0.865	0.8582	1.013	1.0121	1.0104	1.0133	1.0123	1.0118	Turn on some Humboldt bay generation during light load conditions for reactive support.
HUMB-V-55	EUREKA A 60 kV	BUS FAULT AT 31080 HUMBOLDT 60.00	P2-2	Bus	0.8646	0.8578	1.0124	1.0115	1.0098	1.0126	1.0116	1.0111	Turn on some Humboldt bay generation during light load conditions for reactive support.
HUMB-V-56	HARRIS 60 kV	BUS FAULT AT 31080 HUMBOLDT 60.00	P2-2	Bus	0.8595	0.8525	1.0056	1.0045	1.0025	1.0063	1.0052	1.0047	Turn on some Humboldt bay generation during light load conditions for reactive support.
HUMB-V-57	HMBLT BY 60 kV	BUS FAULT AT 31080 HUMBOLDT 60.00	P2-2	Bus	0.8832	0.8729	1.0375	1.0373	1.0363	1.0372	1.0367	1.0361	Turn on some Humboldt bay generation during light load conditions for reactive support.
HUMB-V-58	COVELO6 60 kV	BUS FAULT AT 31110 BRDGVLLE 60.00	P2-2	Bus	1.0077	0.9659	0.9587	0.8907	1.0032	1.011	0.995	1.0155	New Bridgeville-Garberville 60kV line
HUMB-V-59	FRT SWRD 60 kV	BUS FAULT AT 31110 BRDGVLLE 60.00	P2-2	Bus	1.0449	0.9574	0.9957	0.8467	1.063	1.031	0.9951	1.062	New Bridgeville-Garberville 60kV line
HUMB-V-60	FRUITLND 60 kV	BUS FAULT AT 31110 BRDGVLLE 60.00	P2-2	Bus	1.0413	0.9516	0.9896	0.8395	1.057	1.0314	0.9956	1.0627	New Bridgeville-Garberville 60kV line

Study Area: PG&E Humboldt

High/Low Voltage

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)								Potential Mitigation Solutions
					2017 Spring Off-Peak	2020 Spring Light Load	2017 Summer Peak	2020 Summer Peak	2025 Summer Peak	2017 Winter Peak	2020 Winter Peak	2025 Winter Peak	
HUMB-V-61	GRBRVLLE 60 kV	BUS FAULT AT 31110 BRDGVLLE 60.00	P2-2	Bus	1.0501	0.9625	1.0051	0.8581	1.0719	1.0407	1.0051	1.0713	New Bridgeville-Garberville 60kV line
HUMB-V-62	KEKAWAKA 60 kV	BUS FAULT AT 31110 BRDGVLLE 60.00	P2-2	Bus	1.0398	0.9628	0.991	0.86	1.0557	1.0325	1.0009	1.055	New Bridgeville-Garberville 60kV line
HUMB-V-63	LYTNVLLE 60 kV	BUS FAULT AT 31110 BRDGVLLE 60.00	P2-2	Bus	1.0111	0.9713	0.9653	0.898	1.0094	1.0115	0.9955	1.0155	New Bridgeville-Garberville 60kV line
HUMB-V-64	BRDGVLLE 115 kV	NON-BUS-TIE BREAKER CB6422 FAULT AT 31080 HUMBOLDT 60.00	P2-3	Breaker	1.1017	1.1325	1.0457	1.0466	1.0544	1.0249	1.0341	1.0379	Turn on some Humboldt bay generation during light load conditions for reactive support.
HUMB-V-65	HMBLDT B 115 kV	NON-BUS-TIE BREAKER CB6422 FAULT AT 31080 HUMBOLDT 60.00	P2-3	Breaker	1.1014	1.1453	1.0542	1.0572	1.0584	1.0416	1.0461	1.044	Turn on some Humboldt bay generation during light load conditions for reactive support.
HUMB-V-66	HUMBOLDT 115 kV	NON-BUS-TIE BREAKER CB6422 FAULT AT 31080 HUMBOLDT 60.00	P2-3	Breaker	1.1054	1.1453	1.0531	1.0569	1.0585	1.035	1.0408	1.0391	Turn on some Humboldt bay generation during light load conditions for reactive support.
HUMB-V-67	LOW GAP1 115 kV	NON-BUS-TIE BREAKER CB6422 FAULT AT 31080 HUMBOLDT 60.00	P2-3	Breaker	1.1005	1.1285	1.0454	1.0465	1.0522	1.0272	1.0359	1.0389	Turn on some Humboldt bay generation during light load conditions for reactive support.
HUMB-V-68	LOW GAP1 115 kV	BUS-TIE BREAKER FAULT AT 31015 BRDGVLLE 115.00	P2-4	Tie-Breaker	1.0954	1.1107	1.0402	1.0423	1.0408	1.0432	1.0487	1.0399	Turn on some Humboldt bay generation during light load conditions for reactive support.
HUMB-V-69	EUREKA 60 kV	BUS-TIE BREAKER FAULT AT 31080 HUMBOLDT 60.00	P2-4	Tie-Breaker	0.865	0.8582	1.013	1.0121	1.0104	1.0133	1.0123	1.0118	Turn on some Humboldt bay generation during light load conditions for reactive support.
HUMB-V-70	EUREKA A 60 kV	BUS-TIE BREAKER FAULT AT 31080 HUMBOLDT 60.00	P2-4	Tie-Breaker	0.8646	0.8578	1.0124	1.0115	1.0098	1.0126	1.0116	1.0111	Turn on some Humboldt bay generation during light load conditions for reactive support.
HUMB-V-71	HARRIS 60 kV	BUS-TIE BREAKER FAULT AT 31080 HUMBOLDT 60.00	P2-4	Tie-Breaker	0.8595	0.8525	1.0056	1.0045	1.0025	1.0063	1.0052	1.0047	Turn on some Humboldt bay generation during light load conditions for reactive support.
HUMB-V-72	HMBLT BY 60 kV	BUS-TIE BREAKER FAULT AT 31080 HUMBOLDT 60.00	P2-4	Tie-Breaker	0.8832	0.8729	1.0375	1.0373	1.0363	1.0372	1.0367	1.0361	Turn on some Humboldt bay generation during light load conditions for reactive support.
HUMB-V-73	COVELO6 60 kV	BUS-TIE BREAKER FAULT AT 31110 BRDGVLLE 60.00	P2-4	Tie-Breaker	1.0077	0.9659	0.9587	0.8907	1.0032	1.011	0.995	1.0155	New Bridgeville-Garberville 60kV line
HUMB-V-74	FRT SWRD 60 kV	BUS-TIE BREAKER FAULT AT 31110 BRDGVLLE 60.00	P2-4	Tie-Breaker	1.0449	0.9574	0.9957	0.8467	1.063	1.031	0.9951	1.062	New Bridgeville-Garberville 60kV line
HUMB-V-75	FRUITLND 60 kV	BUS-TIE BREAKER FAULT AT 31110 BRDGVLLE 60.00	P2-4	Tie-Breaker	1.0413	0.9516	0.9896	0.8395	1.057	1.0314	0.9956	1.0627	New Bridgeville-Garberville 60kV line
HUMB-V-76	GRBRVLLE 60 kV	BUS-TIE BREAKER FAULT AT 31110 BRDGVLLE 60.00	P2-4	Tie-Breaker	1.0501	0.9625	1.0051	0.8581	1.0719	1.0407	1.0051	1.0713	New Bridgeville-Garberville 60kV line
HUMB-V-77	KEKAWAKA 60 kV	BUS-TIE BREAKER FAULT AT 31110 BRDGVLLE 60.00	P2-4	Tie-Breaker	1.0398	0.9628	0.991	0.86	1.0557	1.0325	1.0009	1.055	New Bridgeville-Garberville 60kV line
HUMB-V-78	LYTNVLLE 60 kV	BUS-TIE BREAKER FAULT AT 31110 BRDGVLLE 60.00	P2-4	Tie-Breaker	1.0111	0.9713	0.9653	0.898	1.0094	1.0115	0.9955	1.0155	New Bridgeville-Garberville 60kV line
HUMB-V-79	COVELO6 60 kV	Bridgeville - Garberville 60 kV Line (BRDGVLLE-FRUTLDJT)	P6	Overlapping contingencies	>0.9	>0.9	Nconv	Nconv	>0.9	>0.9	0.9156	>0.9	New Bridgeville - Garberville 115kV line

ID	Substation	Worst Contingency	Category	Category Description	Voltage (PU)								Potential Mitigation Solutions
					2017 Spring Off-Peak	2020 Spring Light Load	2017 Summer Peak	2020 Summer Peak	2025 Summer Peak	2017 Winter Peak	2020 Winter Peak	2025 Winter Peak	
HUMB-V-80	FRT SWRD 60 kV	Bridgeville - Garberville 60 kV Line (BRDGVLLE-FRUTLDJT)	P6	Overlapping contingencies	>0.9	>0.9	Nconv	Nconv	>0.9	>0.9	0.7836	>0.9	New Bridgeville - Garberville 115kV line
HUMB-V-81	FRUITLND 60 kV	Bridgeville - Garberville 60 kV Line (BRDGVLLE-FRUTLDJT)	P6	Overlapping contingencies	>0.9	>0.9	Nconv	Nconv	>0.9	>0.9	0.7842	>0.9	New Bridgeville - Garberville 115kV line
HUMB-V-82	GRBRVLLE 60 kV	Bridgeville - Garberville 60 kV Line (BRDGVLLE-FRUTLDJT)	P6	Overlapping contingencies	>0.9	>0.9	Nconv	Nconv	>0.9	>0.9	0.7969	>0.9	New Bridgeville - Garberville 115kV line
HUMB-V-83	GRBRVLLE 60 kV	Garberville - Laytonville 60 kV Line (FRUITLND - FTSWD)	P6	Overlapping contingencies	>0.9	>0.9	Nconv	Nconv	>0.9	>0.9	0.8839	>0.9	New Bridgeville - Garberville 115kV line
HUMB-V-84	KEKAWAKA 60 kV	Bridgeville - Garberville 60 kV Line (BRDGVLLE-FRUTLDJT)	P6	Overlapping contingencies	>0.9	>0.9	Nconv	Nconv	>0.9	>0.9	0.8228	>0.9	New Bridgeville - Garberville 115kV line
HUMB-V-85	LYTNVLLE 60 kV	Bridgeville - Garberville 60 kV Line (BRDGVLLE-FRUTLDJT)	P6	Overlapping contingencies	>0.9	>0.9	Nconv	Nconv	>0.9	>0.9	0.9162	>0.9	New Bridgeville - Garberville 115kV line
HUMB-V-86	COVELO6 60 kV	Bridgeville - Garberville 60 kV Line (BRDGVLLE-FRUTLDJT)	P6	Overlapping contingencies	>0.9	>0.9	Nconv	Nconv	>0.9	>0.9	0.9156	>0.9	New Bridgeville - Garberville 115kV line
HUMB-V-87	FRT SWRD 60 kV	Bridgeville - Garberville 60 kV Line (BRDGVLLE-FRUTLDJT)	P6	Overlapping contingencies	>0.9	>0.9	Nconv	Nconv	>0.9	>0.9	0.7836	>0.9	New Bridgeville - Garberville 115kV line
HUMB-V-89	GRBRVLLE 60 kV	Bridgeville - Garberville 60 kV Line (BRDGVLLE-FRUTLDJT)	P6	Overlapping contingencies	>0.9	>0.9	Nconv	Nconv	>0.9	>0.9	0.7969	>0.9	New Bridgeville - Garberville 115kV line
HUMB-V-90	GRBRVLLE 60 kV	Garberville - Laytonville 60 kV Line (FRUITLND - FTSWD)	P6	Overlapping contingencies	>0.9	>0.9	Nconv	Nconv	>0.9	>0.9	0.8839	>0.9	New Bridgeville - Garberville 115kV line
HUMB-V-91	KEKAWAKA 60 kV	Bridgeville - Garberville 60 kV Line (BRDGVLLE-FRUTLDJT)	P6	Overlapping contingencies	>0.9	>0.9	Nconv	Nconv	>0.9	>0.9	0.8228	>0.9	New Bridgeville - Garberville 115kV line
HUMB-V-92	LYTNVLLE 60 kV	Bridgeville - Garberville 60 kV Line (BRDGVLLE-FRUTLDJT)	P6	Overlapping contingencies	>0.9	>0.9	Nconv	Nconv	>0.9	>0.9	0.9162	>0.9	New Bridgeville - Garberville 115kV line

ID	Contingency	Category	Category Description	Transient Stability Performance								Potential Mitigation Solutions
				2017 Spring Off-Peak	2020 Spring Light Load	2017 Summer Peak	2020 Summer Peak	2025 Summer Peak	2017 Winter Peak	2020 Winter Peak	2025 Winter Peak	
HUMB-TS-1	Humboldt 115/60 No.2 Transformer	P1-3	Transformer			voltage dip >30%. frequency dip below 59.6 for 6 cycles.	voltage dip >30%. frequency dip below 59.6 for 6 cycles.	voltage dip >30%. frequency dip below 59.6 for 6 cycles.				Reassess with actual fault clearing times and SLG fault impedances where applicable.
HUMB-TS-2	HUMBOLDT 60.00 SVD ID v	P1-4	Shunt Device			voltage dip >30%. frequency dip below 59.6 for 6 cycles.	voltage dip >30%. frequency dip below 59.6 for 6 cycles.	voltage dip >30%. frequency dip below 59.6 for 6 cycles.				Reassess with actual fault clearing times and SLG fault impedances where applicable.
HUMB-TS-3	BUS FAULT AT 31000 HUMBOLDT 115.00	P2-2	Bus			voltage dip >30%. frequency dip below 59.6 for 6 cycles.	voltage dip >30%. frequency dip below 59.6 for 6 cycles.	voltage dip >30%. frequency dip below 59.6 for 6 cycles.				Reassess with actual fault clearing times and SLG fault impedances where applicable.
HUMB-TS-4	NON-BUS-TIE BREAKER CB6522 FAULT AT 31080 HUMBOLDT 60.00	P2-3	Breaker			Load Bus Voltage Dip> 30%; Load Bus Voltage Dip 20% for 40 Cycles; Frequency Dip below 59.0 Hz for 6 Cycles.	Load Bus Voltage Dip> 30%; Load Bus Voltage Dip 20% for 40 Cycles; Frequency Dip below 59.0 Hz for 6 Cycles.	Load Bus Voltage Dip> 30%; Load Bus Voltage Dip 20% for 40 Cycles; Frequency Dip below 59.0 Hz for 6 Cycles.				Reassess with actual fault clearing times and SLG fault impedances where applicable.
HUMB-TS-5	BUS-TIE BREAKER FAULT AT 31000 HUMBOLDT 115.00	P2-4	Tie-Breaker			voltage dip >30%. frequency dip below 59.6 for 6 cycles.	voltage dip >30%. frequency dip below 59.6 for 6 cycles.	voltage dip >30%. frequency dip below 59.6 for 6 cycles.				Reassess with actual fault clearing times and SLG fault impedances where applicable.
HUMB-TS-6	Humb - Humb Bay No.1 and Humb-Bridg 115 kV Lines	P6-1-1	L-1-1			voltage dip >30%.	voltage dip >30%.	voltage dip >30%.				Reassess with actual fault clearing times and SLG fault impedances where applicable.

Study Area: **PG&E Humboldt**

Single Contingency Load Drop

ID	Worst Contingency	Category	Category Description	Amount of Load Drop (MW)								Potential Mitigation Solutions
				Select..	Select..	Select..	Select..	Select..	Select..	Select..	Select..	
X-SLD-1												

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

ID	Substation	Load Served (MW)								Potential Mitigation Solutions
		Select..	Select..	Select..	Select..	Select..	Select..	Select..	Select..	
X-SS-1										

No single source substation with more than 100 MW Load