FERC Technical Conference on Geomagnetic Disturbance

Presentation Materials for

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Effective GIC in transformers for variations in geoelectric field

Effective GIC A/phase for Maine transformers		Degree Amp Max	4.53 V/km NERC 1 in 100 year Benchmark	14 V/km Study team assumed 1 in 50 year event	20 V/km Study team assumed 1 in 100 year event	23.5 V/km Study team assumed 1 in 200 year event	29 V/km Study team assumed 1 in 500 year event
2 winding delta - wye	Chester SVC 18/345 kV	162	76	235	336	395	487
	Yarmouth GSU 22/345 kV #4	144	49	152	217	255	315
	Keene Road GSU 115/345 kV	160	32	98	140	165	204
2 winding Auto Xfmrs	Orrington 345/115 kV #1	64	4	14	20	23	29
	Orrington 345/115 kV #2	64	4	12	17	20	25
	South Gorham 345/115 kV #1	60	1	3	5	6	7
	South Gorham 345/115 kV #2	60	12	36	51	60	74
	Mason 345/115 kV #1	111	6	20	28	33	41
	Macguire Road 345/115 #1	30	27	83	120	139	172
	Keene Road 345/115 kV #1	160	6	18	26	31	38
3 winding Auto xfmrs	Coopers Mill 345/115 kV #3	30	35	109	155	182	225
	Surowiec 345/115 kV #1	38	17	52	75	88	108
	Albion Road 345/115 #1	30	60	186	266	313	386
	Larrabe Rd 345/115 #1	135	48	149	213	250	308

Source: “2014 Maine GMD/EMP Impacts Assessment, A Report Developed for the Maine Public Utilities Commission," Central Maine Power Co., December 2014, page 26.

Transformers with highest GICs

NERC
NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION

PJM Preliminary Thermal Assessment Results

- Transformers with the highest GICs (divide by 3 phases; peak electric field in PJM is ~3V/km)

Transformer Description	Area	Avg Neutral Current, pu (3 phase)	Avg Neutral Amps (3 phase)
765/26 #2	AEP	1.147	86.557
765/26 #1	AEP	1.059	79.952
500/22 #1	PJM	0.645	74.491
765/345 #1	AEP	0.919	69.322
765/138 #2	AEP	0.883	66.610
765/500 #1	AEP	0.870	65.680
500/22 #1	DVP	0.565	65.260
345/25 #5	CE	0.388	64.975
500/25 #1	PJM	0.554	63.982
500/22 #1	PJM	0.554	63.982
500/230 #1	DVP	0.539	62.256
500/22 #1	PJM	0.539	62.219
345/138/34.5 # 1	CE	0.369	61.810
765/345/33 #1	CE	0.726	54.762
345/22 #8	DEO&K	0.320	53.517
500/230 #2	DVP	0.443	51.158
500/230 #1	DVP	0.442	51.062
765/345 #3	AEP	0.651	49.102
345/34.5 #1	AEP	0.283	47.431

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Source: “NERC GMD Reliability Standards,” Frank Koza, PJM, Chair of NERC GMD Standard Drafting Team, INL Space Weather Workshop, Idaho Falls, ID, April 8, 2015, page 19.