



Short Circuit Duty Comparisons for Underground Transmission Option using HVDC

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1 Introduction

Northeast Utilities is presently pursuing transmission expansion in their system focused on establishing additional transmission capacity from the Northern parts of the system to Southwestern Connecticut. The present Phase II ac option for this transmission expansion is a combination of overhead and underground ac transmission as shown in Figure 1. It consists of an overhead 345-kV line from Beseck to Devon, followed by 345-kV ac cables from Devon to Singer and then Singer to Norwalk. New 345-kV substations are also included. This is depicted in Figure 1.

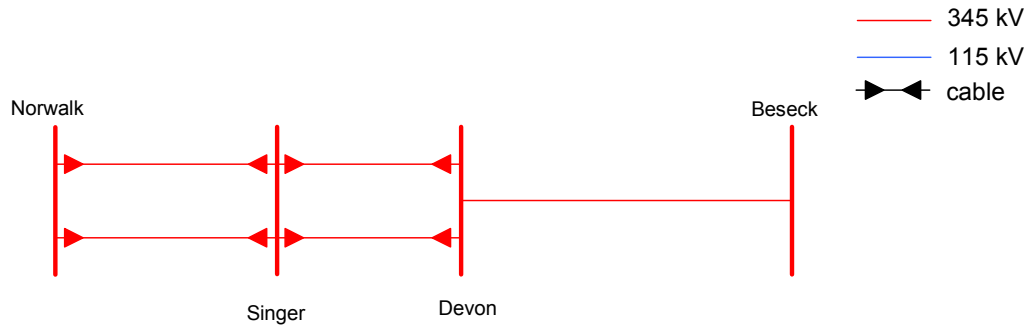


Figure 1: All-AC Phase II Option.

ABB was contracted by Northeast Utilities (NU), United Illuminating Company and the New England ISO to develop a fully underground solution, based on High-Voltage dc (HVDC) Light technology, that has the same or better performance than the all-ac option shown above. A simplified conceptual diagram of the HVDC Light solution examined in this report is shown in Figure 2.

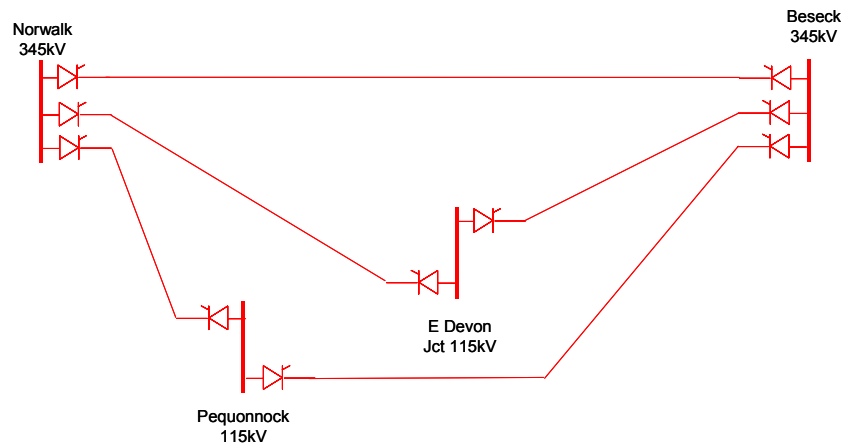


Figure 2: HVDC Light Option 1.

There are thirteen specific requirements set out with respect to the performance criteria of any transmission expansion proposed for Phase II. These requirements are set forth in Appendix A. This report addresses Item 2.

This report provides preliminary information regarding short circuit duties in the general area of the lines comprising the Phase II ac option. The results included in the appendix of the report provide for comparison of the breaker duty results from the Phase II ac option and the HVDC option.

2 Data Source, Methodology and Assumptions

2.1 Data Source

The system data used in the study was provided by Northeast Utilities in the form of an ASPEN OneLiner file titled Phase2xlpe3Kedevnwlk1hpffph1.olr. The file included the Phase II ac solution in the system model as outlined earlier in this report. The data file included models of the southwest Connecticut system, including breaker ratings for comparison to computed short circuit duties.

2.2 Methodology

The ASPEN OneLiner Breaker Rating Module was used to perform the breaker rating analysis. The software automates a significant portion of the system analysis by providing for batch processing of faults and automated comparisons of available fault currents to breaker interrupting duties.

Results were generated for three system topologies, a base case Phase II ac Solution, a base case HVDC Light[®] Solution and a HVDC Light[®] Solution with Increased Bridgeport Energy Reactor Size. Further, results were generated for 1.0 per unit (“flat start”) and 1.035 per unit bus voltage profiles for each of the three system topologies.

Comprehensive available fault duties at substations in the Southwest Connecticut area were developed using the fault batch processing option of the ASPEN package. These results included available three phase and single line to ground fault currents and X/R ratios at each bus in the system. These results are included in the appendices.

The breaker rating module was used to compare breaker ratings to the available fault duties. Breaker ratings were provided in the ASPEN file provided by Northeast Utilities, however, breaker flow models were not included with this data transmittal and therefore, the breaker ratings are assessed relative to the total available fault current, rather than the maximum flow through an individual breaker at a particular bus. The ANSI standard compliance option was chosen for the breaker rating module calculations and the breaker rating module set to compare breaker ratings to the “worst case” (three phase or single line to ground) available fault currents (three phase or single line to ground).

2.2.1 Base Case Phase 2 AC Solution

The base case Phase II ac solution was modeled using the ASPEN file noted above as transmitted from Northeast Utilities. The one line diagram was reviewed in a summary fashion to ensure the Phase II solution appeared in the model. However, detailed review of the system topology away from the proposed lines connecting Beseck to Singer to

Norwalk was not reviewed. Similarly the branch impedances and connections were assumed correct and not independently verified for this analysis.

2.2.2 Base Case HVDC Solution

HVDC systems have no inherent fault current contribution to increase circuit breaker interrupting duty. Fault current contribution is naturally limited to maximum load current but can be reduced even further during faults by fast acting control. The HVDC Light[®] system was assumed to contribute zero fault current under a three phase fault due to the rapid switching capabilities and control inherent with the HVDC Light[®] solution.

There are two converter transformers connected to the Pequonnock bus and they are configured as wye-delta with the wye connection on the ac bus side. They can be either grounded on the ac bus side or ungrounded although they are most commonly grounded. These two transformers were represented in the ASPEN data base as a single 1008 MVA, 12% transformer.

In modeling the system for the HVDC alternative, the Phase II ac system additions were removed and the system was modified as summarized below.

Components Removed from Model

- Beseck to East Devon 345kV Transmission Line
- East Devon to Singer 345kV Transmission Line
- Singer to Norwalk 345kV Transmission Line
- Singer to Bridgeport Energy 345/115kV Transformer
- Singer to Pequonnock 345/115kV Transformer
- Singer 345kV Bus/Substation

Components Replaced in the Model

- Bridgeport Energy to Reactor 115kV Line
- Reactor to Pequonnock 115kV 0.5% Reactor

2.2.3 HVDC Solution and Reactor Addition Options

The HVDC solution outlined in the previous section also investigated replacing the 0.5% reactor connecting the Reactor bus adjacent to the Bridgeport Energy generation to Pequonnock with a 3.5% series reactor. Also adding a 2.5% series reactor in the Bridgeport Harbor 3 circuit was investigated. The purpose of these reactors is to limit the available fault current at the Pequonnock bus to a level equal to or less than 90% of the breaker capability as per the solution requirements outlined in Appendix A.

Components Changed Added to Model for Investigation of Options

- Reactor to Pequonnock 115kV 0.5% Reactor Change to 3.5% Reactor
- Bridgeport Harbor 3 to Pequonnock 115kV 2.5% Reactor

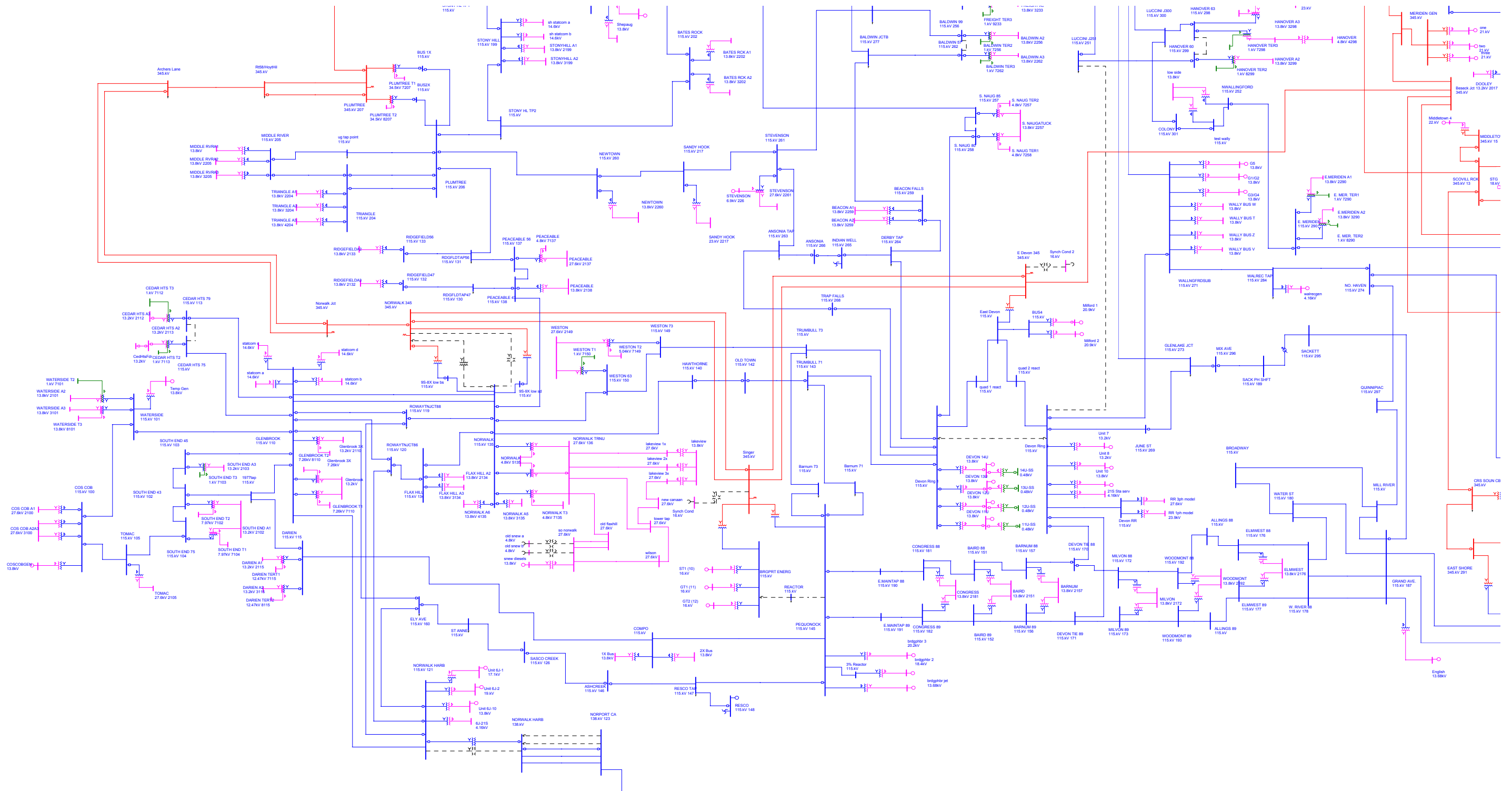


Figure 1 - Southwest Connecticut Phase II AC Option Single Line Diagram



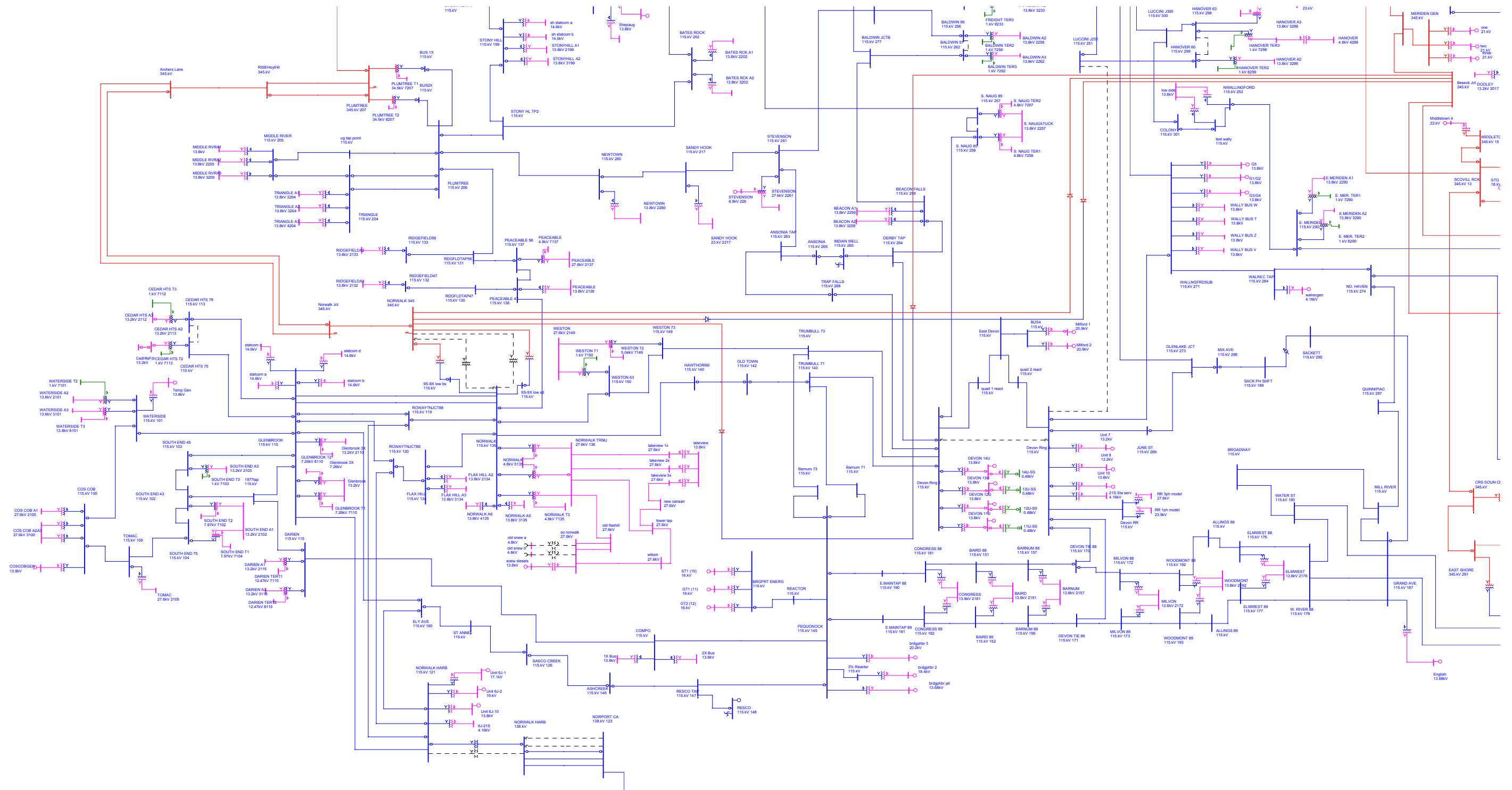


Figure 2 – Southwest Connecticut Proposed System (HVDC Light lines excluded from analysis and not shown)



2.3 Assumptions

General assumptions used in the short circuit analysis studies are discussed in this section. The fault currents were computed based on two different voltage scenarios: a “flat start” (1.0 p.u. voltage) and a 1.035 p.u. for the system bus voltages. Actual system operation will result in bus voltages differing from these assumptions and correspondingly result in differing fault current magnitudes and breaker duties.

The on-line generation included in the model transmitted was unchanged for the short circuit modeling. The model included the Kleen Energy generation that is planned. This generation is connected to the Scovill Rock substation via a 345-kV line. Changes to the size, number, location and/or characteristics of on-line generation and/or system topology will impact the computed short circuit levels.

Implementation of the HVDC Light[®] solution was simulated by the removal of the ac lines associated with the Phase II ac option. Additional sources of fault current or fault current paths were not added to the model to simulate the HVDC Light[®] option as the HVDC Light[®] was assumed to limit currents to protect the system switching electronics, effectively limiting the fault current contribution from the HVDC Light[®] system to minimal levels.

3 Discussion

3.1 General Results

In general, the HVDC option reduced the available short circuit currents and breaker duties on the system as a result of the current limiting aspects of the HVDC control. The HVDC Light[®] option reduced the short circuit currents in all of the station except Pequonnock. This was true of the HVDC Light[®] option whether the converter transformer high-sides were solidly grounded or ungrounded.

Two substations were identified as of particular concern in the criteria for the Middletown to Norwalk project: Devon and Pequonnock. The breaker duties at Devon were consistently and moderately reduced with the HVDC option as compared to the Phase II ac option. Pequonnock is discussed in the next section.

Appendices B and C provides a detailed listing of breaker short circuit duties in the Phase II ac and HVDC cases.

3.2 Pequonnock Substation Results

The duty at the Pequonnock station increases slightly as a result of connecting the Bridgeport Energy generation to the Pequonnock bus rather than to the Singer 345kV bus. For single-line-to-ground faults, the converter transformer grounding connections have an impact. Other options to lower the fault current were described in Section 2.3.3. The Phase II ac option fault current was 95.5% of the breaker duty rating. Several combinations of options were check for the HVDC, which will reduce the fault current to less than the Phase II ac alternative. These options can be combined to even decrease it below the goal of 90%.

The replacement of the branch between the Reactor bus and the Pequonnock bus with a 3.5% reactor and addition of a 2.5% reactor on the branch connecting Bridgeport Harbor 3 to Pequonnock 115kV resulted in reduction of the breaker duty at the Pequonnock station to levels either below 90% or less. Other options were to put reactors in the ground connection of the converter transformers and the Bridgeport Harbor Unit 3. A comparison of these options are contained in Table 3.2.

Table 3.2
Options for Reducing Single-Line-to-Ground Faults at Pequonnock
Pre-fault Voltage 1.035 pu

Phase II AC Alternative had 60144 amps (95.5% Rating)

	Converter Transformer Ground Connection	Bridgeport Energy Series Reactor	Bridgeport Harbor Unit 3 Series Reactor	Bridgeport Harbor Unit 3 Transformer Grnd Reactor	SLG Short Circuit (Amps)	% Short Circuit Rating
1	Solid	0.5%	0.0%	0	69534	110.4%
2	Ungrounded	0.5%	0.0%	0	60833	96.6%
3	4.5 ohms	0.5%	0.0%	0	63567	100.9%
4	4.5 ohms	0.5%	0.0%	2 ohms	60833	96.6%
5	Solid	3.5%	2.5%	0	57137	90.7%
6	4.5 ohms	3.5%	0.0%	0	59122	93.8%
7	4.5 ohms	3.5%	0.0%	2 ohms	57900	91.9%
8	10	2.5%	1.0%	0	57988	92.0%
9	4.5 ohms	3.5%	1.0%	0	57567	91.0%
10	4.5 ohms	3.5%	2.0%	0	56793	90.1%

For the cases using 1.00 pu pre-fault voltage the short circuit currents will be about 3% lower. A combination of alternatives can reduce the short circuit below the Phase II ac Alternative short circuit level and the series reactors can be sized to reduce the fault level below 90% as demonstrated in Case 5 above.

APPENDIX A: System Criteria for Middletown to Norwalk Project

1. To be capable of moving approximately 1200 MW of power into Southwest Connecticut. Approximately 1200MW of power injection (800MW incremental after Phase II, and Phases I & II give 1400MW; comparison of transfer capacity for both AC and DC line outages.)
2. Resolving short circuit issues at Pequonnock 115kV and Devon 115kV and Devon 115kV target of 90% of 63kA or below.
3. Resolve generation interdependencies at Pequonnock, Devon, and Norwalk Harbor.
4. Improve the point of the first system resonance to 3rd harmonic or higher.
5. Provide a means of interconnecting new generation.
6. Have the ability to add new load serving stations as required.
7. Must be able to operate throughout a load cycle and throughout the year with varying dispatches and line outages.
8. The project cannot cause any new overloads on the system.
9. Respect technical and physical limitations.
10. The project needs to result in a dynamically stable system
11. The project needs to provide adequate voltage on the system.
12. Respect existing contracts and system capabilities – cannot degrade capabilities such as the 352 MW (330MW net) capability of the Cross Sound Cable and 200MW across the 1385 submarine cable between Norwalk Harbor and Northport, LI.
13. Adverse Sub-synchronous Torsional Interaction (SSTI) effects should not be present – System must not act to destabilize torsional modes of nearby generators.

APPENDIX B: Breaker Short Circuit Duty Comparisons (1.0 p.u. voltage)

Substation	Breaker	Phase 2 ac (1.0 prefault bus voltages)					HVDC Light (1.0 prefault bus voltages)					HVDC Light w Pequonnock Reactors (1.0 prefault bus voltages)				
		Duty (%)	Duty (A)	Brk Cap (A)	Isc (A)	ANSI X/R	Duty (%)	Duty (A)	Brk Cap (A)	Isc (A)	ANSI X/R	Duty (%)	Duty (A)	Brk Cap (A)	Isc (A)	ANSI X/R
BALDWIN 115 kV	13F-2T-2	53.8	10750	20000	10750	3.9	53.6	10729	20000	10729	4.0	53.6	10719	20000	10719	4.0
BATES ROCK 115 kV	21K-1T-2	21.3	5343	25102	5129	8.0	21.0	5282	25102	5065	8.0	21.0	5281	25102	5063	8.0
BEACON FALLS 115 kV	1570-11N-2	20.4	5129	25102	5104	4.7	20.4	5125	25102	5099	4.7	20.4	5123	25102	5098	4.7
	1575-11N-2	20.4	5129	25102	5104	4.7	20.4	5125	25102	5099	4.7	20.4	5123	25102	5098	4.7
BESECK JCT 345 kV	AT-2	57.5	28760	50000	28760	19.0	48.5	24237	50000	24237	18.4	48.4	24216	50000	24216	18.4
	BT-2	57.5	28760	50000	28760	19.0	48.5	24237	50000	24237	18.4	48.4	24216	50000	24216	18.4
	CT-2	57.5	28760	50000	28760	19.0	48.5	24237	50000	24237	18.4	48.4	24216	50000	24216	18.4
	DT-2	57.5	28760	50000	28760	19.0	48.5	24237	50000	24237	18.4	48.4	24216	50000	24216	18.4
	ET-2	57.5	28760	50000	28760	19.0	48.5	24237	50000	24237	18.4	48.4	24216	50000	24216	18.4
	FT-2	57.5	28760	50000	28760	19.0	48.5	24237	50000	24237	18.4	48.4	24216	50000	24216	18.4
	GT-2	57.5	28760	50000	28760	19.0	48.5	24237	50000	24237	18.4	48.4	24216	50000	24216	18.4
BRANFORD 115 kV	11J-1T-2	69.8	16657	23857	14515	10.2	69.8	16646	23857	14504	10.2	69.7	16632	23857	14489	10.2
	11J-1X1-2	58.1	14515	25000	14515	10.2	58.0	14504	25000	14504	10.2	58.0	14489	25000	14489	10.2
	11J-2T-2	63.7	15710	24673	14515	10.2	63.6	15699	24673	14504	10.2	63.6	15686	24673	14489	10.2
	11J-4T-2	64.6	15710	24335	14515	10.2	64.5	15699	24335	14504	10.2	64.5	15686	24335	14489	10.2
BRANFORD RR 115 kV	48R-1T-2	41.4	16544	40000	16544	12.2	41.3	16534	40000	16534	12.2	41.3	16506	40000	16506	12.2
BUNKER HILL 115 kV	12B-1T-2	46.5	18584	40000	18584	12.4	46.3	18526	40000	18526	12.3	46.3	18507	40000	18507	12.3
	12B-1T-75	46.5	18584	40000	18584	12.4	46.3	18526	40000	18526	12.3	46.3	18507	40000	18507	12.3
	12B-2T-2	68.9	17284	25102	15476	12.0	68.7	17234	25102	15443	12.0	68.6	17220	25102	15427	12.0
	12B-2T-68	74.5	17284	23212	15476	12.0	74.2	17234	23212	15443	12.0	74.2	17220	23212	15427	12.0
	12B-3T-2	47.1	18831	40000	18831	12.4	46.9	18769	40000	18769	12.3	46.9	18749	40000	18749	12.3
	12B-3T-72	47.1	18831	40000	18831	12.4	46.9	18769	40000	18769	12.3	46.9	18749	40000	18749	12.3
CAMPVILLE 115 kV	14R-1T-00	59.5	14438	24262	14260	5.7	59.4	14406	24262	14228	5.7	59.4	14401	24262	14222	5.8
	14R-1T-2	57.5	14438	25102	14260	5.7	57.4	14406	25102	14228	5.7	57.4	14401	25102	14222	5.8
	14R-2T-2	46.9	11780	25102	11656	5.5	46.9	11764	25102	11640	5.5	46.9	11761	25102	11637	5.5
	14R-2T-21	48.0	11780	24542	11656	5.5	47.9	11764	24542	11640	5.5	47.9	11761	24542	11637	5.5
	14R-3T-2	55.1	13841	25102	13605	6.2	55.0	13811	25102	13574	6.2	55.0	13805	25102	13569	6.2
	14R-3T-32	55.1	13841	25102	13605	6.2	55.0	13811	25102	13574	6.2	55.0	13805	25102	13569	6.2
	14R-4T-2	57.5	14438	25102	14260	5.7	57.4	14406	25102	14228	5.7	57.4	14401	25102	14222	5.8
CANTON 115 kV	5R-1T-2	23.2	5821	25102	5642	7.3	23.2	5819	25102	5639	7.3	23.2	5819	25102	5639	7.3
	5R-2T-2	14.1	5642	40000	5642	7.3	14.1	5639	40000	5639	7.3	14.1	5639	40000	5639	7.3
COS COB 115 kV	11R-1T-2	31.7	19947	63000	19947	13.4	30.9	19485	63000	19485	13.1	30.8	19407	63000	19407	11.8
	11R-2T-2	31.7	19947	63000	19947	13.4	30.9	19485	63000	19485	13.1	30.8	19407	63000	19407	11.8
	11R-5T-2	106.1	21229	20000	21229	13.4	103.8	20767	20000	20767	13.1	103.4	20690	20000	20690	13.2
	35K-3T-2	106.1	21229	20000	21229	13.4	103.8	20767	20000	20767	13.1	103.4	20690	20000	20690	13.2
	35K-3T-L4	77.6	14756	19022	14756	12.6	76.4	14538	19022	14538	12.4	76.2	14501	19022	14501	12.4
	35K-4T-2	33.7	21229	63000	21229	13.4	33.0	20767	63000	20767	13.1	32.8	20690	63000	20690	13.2

Substation	Breaker	Phase 2 ac (1.0 prefault bus voltages)					HVDC Light (1.0 prefault bus voltages)					HVDC Light w Pequonnock Reactors (1.0 prefault bus voltages)				
		Duty (%)	Duty (A)	Brk Cap (A)	Isc (A)	ANSI X/R	Duty (%)	Duty (A)	Brk Cap (A)	Isc (A)	ANSI X/R	Duty (%)	Duty (A)	Brk Cap (A)	Isc (A)	ANSI X/R
DARIEN 115 kV	13S-10K-2	59.6	23833	40000	23833	12.6	58.5	23394	40000	23394	12.2	58.1	23234	40000	23234	12.3
	13S-1T-16	50.2	20080	40000	20080	12.4	48.7	19481	40000	19481	12.0	48.6	19434	40000	19434	12.0
	13S-1T-2	50.2	20080	40000	20080	12.4	48.7	19481	40000	19481	12.0	48.6	19434	40000	19434	12.0
DEVON RING 1	7R-10T-2	70.8	44606	63000	40836	23.3	67.3	42411	63000	39236	22.2	66.2	41710	63000	38420	22.7
	7R-11T-2	71.2	44886	63000	40930	23.7	67.7	42621	63000	39258	22.7	66.5	41925	63000	38447	23.1
	7R-12T-2	70.5	44386	63000	40634	23.3	67.0	42193	63000	39034	22.2	65.9	41491	63000	38218	22.7
	7R-1T-2	71.2	44886	63000	40930	23.7	67.7	42621	63000	39258	22.7	66.5	41925	63000	38447	23.1
	7R-2T-2	65.6	41326	63000	37210	25.2	61.8	38941	63000	35425	24.0	61.2	38529	63000	34953	24.3
	7R-3T-2	70.5	44386	63000	40634	23.3	67.0	42193	63000	39034	22.2	65.9	41491	63000	38218	22.7
	7R-4T-2	70.4	44377	63000	40627	23.3	67.0	42185	63000	39026	22.2	65.8	41483	63000	38211	22.7
	7R-5T-2	70.2	44253	63000	40319	23.8	66.6	41930	63000	38592	22.7	65.5	41239	63000	37788	23.2
	7R-6T-2	71.2	44886	63000	40930	23.7	67.7	42621	63000	39258	22.7	66.5	41925	63000	38447	23.1
	7R-7T-2	71.2	44886	63000	40930	23.7	67.7	42621	63000	39258	22.7	66.5	41925	63000	38447	23.1
DEVON RING 2	7R-8T-2	70.8	44600	63000	40830	23.3	67.3	42405	63000	39230	22.2	66.2	41704	63000	38414	22.7
	7R-20T-2	85.0	53537	63000	49156	23.0	81.4	51267	63000	47470	22.1	79.6	50121	63000	46131	22.7
	7R-21T-2	58.9	37112	63000	34075	23.0	59.4	37425	63000	34653	22.1	57.8	36401	63000	33503	22.7
	7R-22T-2	82.2	51770	63000	47534	23.0	78.6	49516	63000	45848	22.1	76.8	48359	63000	44509	22.7
	7R-23T-2	82.2	51770	63000	47534	23.0	78.6	49516	63000	45848	22.1	76.8	48359	63000	44509	22.7
	7R-24T-2	73.3	46172	63000	41718	24.8	69.2	43588	63000	39757	23.7	68.1	42930	63000	39002	24.2
	7R-25T-2	82.1	51714	63000	47483	23.0	78.5	49460	63000	45797	22.1	76.7	48303	63000	44458	22.7
	7R-26T-2	82.3	51847	63000	47470	23.3	78.6	49495	63000	45692	22.4	76.7	48347	63000	44357	23.1
	7R-27T-2	82.3	51847	63000	47470	23.3	78.6	49495	63000	45692	22.4	76.7	48347	63000	44357	23.1
	7R-28T-2	84.3	53079	63000	48718	23.0	80.7	50810	63000	47032	22.2	78.8	49664	63000	45693	22.8
E DEVON 345 kV	7R-29T-2	85.0	53537	63000	49156	23.0	81.4	51267	63000	47470	22.1	79.6	50121	63000	46131	22.7
	7R-AT-2	46.4	23196	50000	22495	23.2										
	7R-BT-2	46.4	23196	50000	22495	23.2										
	7R-CT-2	46.4	23196	50000	22495	23.2										
	7R-DT-2	43.9	21964	50000	21435	22.5										
	7R-ET-2	46.4	23196	50000	22495	23.2										
	7R-FT-2	41.0	20492	50000	19873	23.2										
E DEVON 115kV	7R-TT-2	90.1	56750	63000	48645	32.5	74.8	47133.2	63000	40856.7	30.6	73.8	46474.9	63000	40162.9	31.1
	7R-UT-2	90.1	56750	63000	48645	32.5	74.8	47133.2	63000	40856.7	30.6	73.8	46474.9	63000	40162.9	31.1
	7R-VT-2	72.7	45822	63000	38896	34.4	55.0	34672.3	63000	29370.2	34.8	54.6	34401.2	63000	29096.1	35.1
	7R-WT-2	90.1	56750	63000	48645	32.5	74.8	47133.2	63000	40856.7	30.6	73.8	46474.9	63000	40162.9	31.1
	7R-XT-2	90.1	56750	63000	48645	32.5	74.8	47133.2	63000	40856.7	30.6	73.8	46474.9	63000	40162.9	31.1
	7R-YT-2	90.1	56750	63000	48645	32.5	74.8	47133.2	63000	40856.7	30.6	73.8	46474.9	63000	40162.9	31.1
	7R-ZT-2	90.1	56750	63000	48645	32.5	74.8	47133.2	63000	40856.7	30.6	73.8	46474.9	63000	40162.9	31.1
FLAX HILL 115 kV	24A-2T-2	33.8	21268	63000	21268	10.0	33.2	20924.2	63000	20924.2	9.9	33.1	20850	63000	20850	9.9

Substation	Breaker	Phase 2 ac (1.0 prefault bus voltages)					HVDC Light (1.0 prefault bus voltages)					HVDC Light w Pequonnock Reactors (1.0 prefault bus voltages)				
		Duty (%)	Duty (A)	Brk Cap (A)	Isc (A)	ANSI X/R	Duty (%)	Duty (A)	Brk Cap (A)	Isc (A)	ANSI X/R	Duty (%)	Duty (A)	Brk Cap (A)	Isc (A)	ANSI X/R
FREIGHT 115 kV	11W-1T-2	54.2	13598	25102	12466	10.7	54.1	13578.8	25102.2	12454.5	10.6	54	13566.3	25102.2	12440.2	10.7
	11W-1T-2X	54.9	13598	24752	12466	10.7	54.9	13578.8	24752.1	12454.5	10.6	54.8	13566.3	24752.1	12440.2	10.7
	11W-1T-68	54.2	13598	25102	12466	10.7	54.1	13578.8	25102.2	12454.5	10.6	54	13566.3	25102.2	12440.2	10.7
	11W-2T-2	54.2	13598	25102	12466	10.7	54.1	13578.8	25102.2	12454.5	10.6	54	13566.3	25102.2	12440.2	10.7
	11W-2T-21	54.2	13598	25102	12466	10.7	54.1	13578.8	25102.2	12454.5	10.6	54	13566.3	25102.2	12440.2	10.7
	11W-2T-2X	54.2	13598	25102	12466	10.7	54.1	13578.8	25102.2	12454.5	10.6	54	13566.3	25102.2	12440.2	10.7
FRNKLN DR	1B-10K-2	26.6	10621	40000	10621	7.0	26.5	10606.1	40000	10606.1	7	26.5	10603.6	40000	10603.6	7
	1B-1T-2	105.0	7904	7531	7847	5.6	104.8	7895.8	7530.7	7839.2	5.6	104.8	7894.6	7530.7	7837.9	5.6
	1B-1T-32	105.0	7904	7531	7847	5.6	104.8	7895.8	7530.7	7839.2	5.6	104.8	7894.6	7530.7	7837.9	5.6
FROST BRIDGE 115 kV	84-10K-2	65.7	41378	63000	41378	16.2	65.3	41149.4	63000	41149.4	16.1	65.2	41089.4	63000	41089.4	16.1
	8R-14T-2	65.7	41378	63000	41378	16.2	65.3	41149.4	63000	41149.4	16.1	65.2	41089.4	63000	41089.4	16.1
	8R-14T-91	65.4	38911	59472	38911	16.9	65.1	38693.6	59472	38693.6	16.7	65	38634.2	59472	38634.2	16.8
	8R-15T-2	62.2	39192	63000	39192	16.5	61.9	38986.4	63000	38986.4	16.3	61.8	38927.9	63000	38927.9	16.4
	8R-16T-2	65.7	41378	63000	41378	16.2	65.3	41149.4	63000	41149.4	16.1	65.2	41089.4	63000	41089.4	16.1
	8R-16T-63	62.2	39192	63000	39192	16.5	61.9	38986.4	63000	38986.4	16.3	61.8	38927.9	63000	38927.9	16.4
	8R-1X2-2	42.9	27012	63000	27012	9.0	42.8	26978.5	63000	26978.5	9	42.8	26935.7	63000	26935.7	9
	8R-20T-2	65.7	41378	63000	41378	16.2	65.3	41149.4	63000	41149.4	16.1	65.2	41089.4	63000	41089.4	16.1
	8R-20T-38	78.2	39936	51093	39936	16.1	77.8	39749.1	51093	39749.1	16	77.7	39693.7	51093	39693.7	16
	8R-21T-2	63.4	39936	63000	39936	16.1	63.1	39749.1	63000	39749.1	16	63	39693.7	63000	39693.7	16
	8R-22T-2	65.7	41378	63000	41378	16.2	65.3	41149.4	63000	41149.4	16.1	65.2	41089.4	63000	41089.4	16.1
	8R-22T-50	62.2	39191	63000	39191	16.5	61.9	38985.5	63000	38985.5	16.3	61.8	38927	63000	38927	16.4
	8R-23T-2	65.7	41378	63000	41378	16.2	65.3	41149.4	63000	41149.4	16.1	65.2	41089.4	63000	41089.4	16.1
	8R-23T-45	80.1	40921	51093	40921	16.4	79.6	40676.1	51093	40676.1	16.2	79.5	40621.7	51093	40621.7	16.3
	8R-24T-2	65.7	41378	63000	41378	16.2	65.3	41149.4	63000	41149.4	16.1	65.2	41089.4	63000	41089.4	16.1
	8R-26T-2	65.7	41378	63000	41378	16.2	65.3	41149.4	63000	41149.4	16.1	65.2	41089.4	63000	41089.4	16.1
	8R-26T-21	69.3	41226	59472	41226	16.3	68.9	40993.7	59472	40993.7	16.1	68.8	40935.3	59472	40935.3	16.2
	8R-27T-2	65.4	41226	63000	41226	16.3	65.1	40993.7	63000	40993.7	16.1	65	40935.3	63000	40935.3	16.2
	8R-28T-2	65.7	41378	63000	41378	16.2	65.3	41149.4	63000	41149.4	16.1	65.2	41089.4	63000	41089.4	16.1
	8R-28T-90	64.2	38177	59472	38177	17.1	63.8	37938.4	59472	37938.4	17	63.7	37901.8	59472	37901.8	17
8R-2X2-2	42.9	27012	63000	27012	9.0	42.8	26978.5	63000	26978.5	9	42.8	26935.7	63000	26935.7	9	
FROST BRIDGE 345 kV	8R-1T-2	30.3	11229	37000	11229	17.0	29.1	10757.3	37000	10757.3	17.2	29.1	10752.6	37000	10752.6	17.2
	8R-1T-52	30.3	11229	37000	11229	17.0	29.1	10757.3	37000	10757.3	17.2	29.1	10752.6	37000	10752.6	17.2
GLENBROOK 115 kV	1753-1K-2	79.1	49816	63000	48658	17.5	74.1	46712.7	63000	46447.1	16.2	73.8	46471.8	63000	46134.2	16.3
	1792-1K-2	79.1	49816	63000	48658	17.5	74.1	46712.7	63000	46447.1	16.2	73.8	46471.8	63000	46134.3	16.3
	1867-1K-2	76.5	48199	63000	47099	17.4	71.8	45241.6	63000	45006.8	16.1	71.4	45010.3	63000	44706.5	16.2
	1977-1K-2	78.3	49334	63000	48205	17.4	73.3	46183.1	63000	45957.6	16.1	73	45961.2	63000	45668.5	16.2
	1K-10K-2	121.6	48658	40000	48658	17.5	116.1	46447	40000	46447	16.2	115.3	46134.1	40000	46134.1	16.3
	1K-10T-2	78.9	49698	63000	48535	17.5	74.0	46598.9	63000	46323	16.2	73.6	46358.6	63000	46011	16.3
	1K-17T-2	78.9	49698	63000	48535	17.5	74.0	46598.9	63000	46323	16.2	73.6	46358.6	63000	46011	16.3
	1K-18T-2	78.9	49698	63000	48535	17.5	74.0	46598.9	63000	46323	16.2	73.6	46358.6	63000	46011	16.3
1K-19T-2	78.7	49609	63000	48456	17.5	73.8	46508.8	63000	46244.4	16.2	73.4	46268.3	63000	45932.3	16.3	

Substation	Breaker	Phase 2 ac (1.0 prefault bus voltages)					HVDC Light (1.0 prefault bus voltages)					HVDC Light w Pequonnock Reactors (1.0 prefault bus voltages)				
		Duty (%)	Duty (A)	Brk Cap (A)	Isc (A)	ANSI X/R	Duty (%)	Duty (A)	Brk Cap (A)	Isc (A)	ANSI X/R	Duty (%)	Duty (A)	Brk Cap (A)	Isc (A)	ANSI X/R
GLENBROOK 115 kV	1K-20K-2	121.6	48658	40000	48658	17.5	116.1	46447	40000	46447	16.2	115.3	46134.1	40000	46134.1	16.3
	1K-2T-2	78.5	49469	63000	48439	17.3	73.6	46351.6	63000	46227.5	16	73.2	46111.7	63000	45915	16.1
	1K-3T-2	121.1	48439	40000	48439	17.3	115.6	46227.5	40000	46227.5	16	114.8	45915	40000	45915	16.1
	1K-4T-	76.4	48153	63000	47097	17.4	71.7	45200.2	63000	45004.1	16.1	71.4	44969.5	63000	44704.3	16.2
	1K-4X1-2	76.5	48175	63000	47337	17.0	71.7	45160.9	63000	45103.2	15.9	71.3	44928.1	63000	44799.3	16
	1K-5X1-2	76.5	48175	63000	47337	17.0	71.7	45160.9	63000	45103.2	15.9	71.3	44928.1	63000	44799.2	16
	1K-7T-2	79.1	49802	63000	48650	17.4	74.1	46697.7	63000	46438.2	16.2	73.7	46456.9	63000	46125.5	16.3
	1K-8T-2	121.6	48650	40000	48650	17.4	116.1	46438.2	40000	46438.2	16.2	115.3	46125.5	40000	46125.5	16.3
	1K-9T-2	76.3	48089	63000	47046	17.3	71.4	44992.6	63000	44869.7	16	71.1	44766.3	63000	44574.8	16.1
	1K-AT-2	75.2	47345	63000	46694	16.7	70.5	44418.6	63000	44418.6	15.6	70.1	44140	63000	44140	15.7
	1K-BT-2	74.2	46750	63000	45785	17.3	69.9	44013.8	63000	43804.4	16.1	69.5	43798.5	63000	43524.1	16.2
	1K-CT-2	74.0	46639	63000	45839	17.0	69.9	44013.8	63000	43804.4	16.1	69.5	43798.5	63000	43524.1	16.2
	1K-DT-2	78.7	49562	63000	48410	17.5	73.8	46471.8	63000	46291	16	73.4	46232.2	63000	45979.3	16.1
	1K-ET-2	76.5	48199	63000	47099	17.4	71.8	45241.6	63000	45006.8	16.1	71.4	45010.3	63000	44706.5	16.2
LONG MTN 345 kV	13J-4T-2	42.3	21160	50000	21160	16.3	38.1	19058.1	50000	19058.1	15.9	38.1	19026.9	50000	19026.9	15.9
	13J-4T-398	42.3	21160	50000	21160	16.3	38.1	19058.1	50000	19058.1	15.9	38.1	19026.9	50000	19026.9	15.9
	13J-5T-2	36.9	14778	40000	14778	15.9	36.7	14695.2	40000	14695.2	15.9	36.7	14691.3	40000	14691.3	16
	13J-5T-321	36.9	14778	40000	14778	15.9	36.7	14695.2	40000	14695.2	15.9	36.7	14691.3	40000	14691.3	16
	13J-5T-398	32.2	12880	40000	12880	16.6	26.9	10779.3	40000	10779.3	15.9	26.9	10748.5	40000	10748.5	16
	13J-6T-2	36.9	14778	40000	14778	15.9	36.7	14695.2	40000	14695.2	15.9	36.7	14691.3	40000	14691.3	16
	13J-6T-321	36.9	14778	40000	14778	15.9	36.7	14695.2	40000	14695.2	15.9	36.7	14691.3	40000	14691.3	16
	13J-8T-2	42.3	21160	50000	21160	16.3	38.1	19058.1	50000	19058.1	15.9	38.1	19026.9	50000	19026.9	15.9
	13J-8T-352	32.1	16071	50000	16071	15.5	26.8	13399.8	50000	13399.8	15.2	26.8	13383.4	50000	13383.4	15.2
	13J-9T-2	32.1	16071	50000	16071	15.5	26.8	13399.8	50000	13399.8	15.2	26.8	13383.4	50000	13383.4	15.2
13J-9T-352	32.1	16071	50000	16071	15.5	26.8	13399.8	50000	13399.8	15.2	26.8	13383.4	50000	13383.4	15.2	
MIDDLE RIVER 115 kV	28M-1T-2	50.8	20317	40000	20317	7.3	47.5	18986.7	40000	18986.7	7.3	47.4	18957.5	40000	18957.5	7.3
	28M-2T-2	83.4	20947	25102	20317	7.3	78.0	19591.1	25102.2	18986.7	7.3	77.9	19564.1	25102.2	18957.5	7.3
MILLSTONE 345 kV	15G-13T-2	99.1	39655	40000	34594	30.5	97.3	38926.2	40000	33894.1	31	97.3	38918.3	40000	33886	31
	15G-14T-2	89.2	35678	40000	30930	32.0	88.6	35443.5	40000	30702	32.2	88.6	35439.3	40000	30697.7	32.2
	15G-15T-2	98.9	39545	40000	34484	30.6	97.0	38819.5	40000	33787.5	31.1	97	38811.6	40000	33779.5	31.1
	15G-1T-2	67.2	33601	50000	31301	32.0	65.9	32958.6	50000	30616.2	32.5	65.9	32952.1	50000	30608.9	32.5
	15G-2T-2	92.2	36868	40000	34641	30.5	90.5	36215.4	40000	33939.3	30.9	90.5	36208.4	40000	33931.3	30.9
	15G-3T-2	73.7	36868	50000	34641	30.5	72.4	36215.4	50000	33939.3	30.9	72.4	36208.4	50000	33931.3	30.9
	15G-4T-2	73.7	36827	50000	34594	30.5	72.4	36175.7	50000	33894.1	31	72.3	36168.7	50000	33886	31
	15G-5T-2	73.7	36868	50000	34641	30.5	72.4	36215.4	50000	33939.3	30.9	72.4	36208.4	50000	33931.3	30.9
	15G-6T-2	73.7	36868	50000	34641	30.5	72.4	36215.4	50000	33939.3	30.9	72.4	36208.4	50000	33931.3	30.9
15G-7T-2	80.9	36827	45500	34594	30.5	79.5	36175.7	45500	33894.1	31	79.5	36168.7	45500	33886	31	
15G-8T-2	75.7	34464	45500	32264	31.1	74.4	33851	45500	31606.7	31.6	74.4	33845	45500	31599.9	31.6	
15G-9T-2	80.7	36730	45500	34484	30.6	79.3	36082	45500	33787.5	31.1	79.3	36075.1	45500	33779.5	31.1	

Substation	Breaker	Phase 2 ac (1.0 prefault bus voltages)					HVDC Light (1.0 prefault bus voltages)					HVDC Light w Pequonnock Reactors (1.0 prefault bus voltages)				
		Duty (%)	Duty (A)	Brk Cap (A)	Isc (A)	ANSI X/R	Duty (%)	Duty (A)	Brk Cap (A)	Isc (A)	ANSI X/R	Duty (%)	Duty (A)	Brk Cap (A)	Isc (A)	ANSI X/R
NORWALK 115 kV	9S-10K-2	121.5	48589	40000	48589	11.5	109.1	43649.5	40000	43649.5	7.6	108.4	43377.9	40000	43377.9	7.7
	9S-10T-2	77.2	48629	63000	46289	19.5	68.8	43374.5	63000	43374.5	7.4	68.4	43104.3	63000	43104.3	7.4
	9S-11T-2	74.2	46768	63000	44200	20.2	66.6	41971.6	63000	41971.6	7.7	66.2	41705.8	63000	41705.8	7.8
	9S-12T-2	77.2	48630	63000	46289	19.5	68.8	43375.1	63000	43375.1	7.4	68.4	43104.9	63000	43104.9	7.4
	9S-13T-2	77.2	48630	63000	46289	19.5	68.8	43375.1	63000	43375.1	7.4	68.4	43104.9	63000	43104.9	7.4
	9S-14T-2	54.0	33996	63000	33996	5.9	54.0	34004.4	63000	34004.4	5.9	53.6	33747.1	63000	33747.1	6
	9S-1T-2	77.2	48630	63000	46289	19.5	68.8	43375.1	63000	43375.1	7.4	68.4	43104.9	63000	43104.9	7.4
	9S-2T-2	77.2	48630	63000	46289	19.5	68.8	43375.1	63000	43375.1	7.4	68.4	43104.9	63000	43104.9	7.4
	9S-3T-2	77.2	48630	63000	46289	19.5	68.8	43375.1	63000	43375.1	7.4	68.4	43104.9	63000	43104.9	7.4
	9S-4T-2	77.2	48629	63000	46289	19.5	68.8	43374.5	63000	43374.5	7.4	68.4	43104.3	63000	43104.3	7.4
	9S-5T-2	74.7	47053	63000	47053	11.6	66.8	42099.5	63000	42099.5	7.6	66.4	41844.7	63000	41844.7	7.6
	9S-6T-2	77.2	48630	63000	46289	19.5	68.8	43375.1	63000	43375.1	7.4	68.4	43104.9	63000	43104.9	7.4
	9S-7T-2	77.2	48629	63000	46289	19.5	68.8	43374.5	63000	43374.5	7.4	68.4	43104.3	63000	43104.3	7.4
	9S-8T-2	74.6	46979	63000	44909	19.2	65.7	41375.9	63000	41375.9	7.7	65.4	41186.6	63000	41186.6	7.8
	9S-8X2-2	67.8	42689	63000	42689	11.0	64.5	40638.5	63000	40638.5	7.8	64.1	40370.8	63000	40370.8	7.9
	9S-9T-2	77.2	48630	63000	46289	19.5	68.8	43375.1	63000	43375.1	7.4	68.4	43104.9	63000	43104.9	7.4
9S-9X2-2	67.8	42689	63000	42689	11.1	64.5	40638.3	63000	40638.3	7.8	64.1	40370.7	63000	40370.7	7.9	
NORWALK 345 kV	9S-AT-2	57.1	22832	40000	22761	20.4	31.9	12748.3	40000	12748.3	15.3	31.8	12710	40000	12710	15.4
	9S-BT-2	57.1	22832	40000	22761	20.4	31.9	12748.3	40000	12748.3	15.3	31.8	12710	40000	12710	15.4
	9S-CT-2	57.1	22832	40000	22761	20.4	31.9	12748.3	40000	12748.3	15.3	31.8	12710	40000	12710	15.4
	9S-DT-2	57.1	22832	40000	22761	20.4	31.9	12748.3	40000	12748.3	15.3	31.8	12710	40000	12710	15.4
	9S-ET-2	57.1	22832	40000	22761	20.4	31.9	12748.3	40000	12748.3	15.3	31.8	12710	40000	12710	15.4
	9S-FT-2	57.1	22832	40000	22761	20.4	31.9	12748.3	40000	12748.3	15.3	31.8	12710	40000	12710	15.4
	9S-GT-2	57.1	22832	40000	22761	20.4	31.9	12748.3	40000	12748.3	15.3	31.8	12710	40000	12710	15.4
	9S-HT-2	53.5	21395	40000	21395	18.7	31.9	12748.3	40000	12748.3	15.3	31.8	12710	40000	12710	15.4
	9S-IT-2	57.1	22832	40000	22761	20.4	31.9	12748.3	40000	12748.3	15.3	31.8	12710	40000	12710	15.4
NORWALK HARB 115 kV	6J-10T-2	77.4	48789	63000	48789	15.3	75.4	47503.1	63000	47503.1	15	74.9	47214.8	63000	47214.8	15.1
	6J-1T-2	107.3	52068	48517	46313	15.5	104.0	50440.8	48516.8	45027.5	15.3	103.6	50278.5	48516.8	44842.2	15.3
	6J-2T-2	108.5	52663	48517	46888	15.4	105.9	51373.1	48516.8	45890.1	15.2	105.4	51142.1	48516.8	45629.1	15.3
	6J-3T-2	74.4	46888	63000	46888	15.4	72.8	45890.1	63000	45890.1	15.2	72.4	45629.1	63000	45629.1	15.3
	6J-4T-2	108.5	52663	48517	46888	15.4	105.9	51373.1	48516.8	45890.1	15.2	105.4	51142.1	48516.8	45629.1	15.3
	6J-5T-2	77.4	48789	63000	48789	15.3	75.4	47503.1	63000	47503.1	15	74.9	47214.8	63000	47214.8	15.1
	6J-6T-2	77.4	48789	63000	48789	15.3	75.4	47503.1	63000	47503.1	15	74.9	47214.8	63000	47214.8	15.1
	6J-7T-2	74.3	46791	63000	46791	15.5	72.7	45801	63000	45801	15.2	72.3	45541.7	63000	45541.7	15.3
6J-9T-2	72.8	45880	63000	45511	16.3	70.8	44613	63000	44439.2	16	70.5	44411.9	63000	44182.2	16.1	
NORWALK HARB 138 kV	6J-9X1-2	49.1	19622	40000	18993	21.0	47.5	19015.5	40000	18498.9	20.6	47.3	18926.1	40000	18386.8	20.7
	6J-AT-2	52.6	33124	63000	33124	14.6	51.8	32635.2	63000	32635.2	14.3	51.6	32524.9	63000	32524.9	14.3
	6J-BT-2	52.6	33124	63000	33124	14.6	51.8	32635.2	63000	32635.2	14.3	51.6	32524.9	63000	32524.9	14.3
	6J-CT-2	52.6	33124	63000	33124	14.6	51.8	32635.2	63000	32635.2	14.3	51.6	32524.9	63000	32524.9	14.3
PEACEABLE 115 kV	12N-1T-2	67.4	16490	24464	15577	8.9	64.4	15761.6	24464	14931.6	8.8	64.3	15736.7	24464	14903.8	8.8

Substation	Breaker	Phase 2 ac (1.0 prefault bus voltages)					HVDC Light (1.0 prefault bus voltages)					HVDC Light w Pequonnock Reactors (1.0 prefault bus voltages)				
		Duty (%)	Duty (A)	Brk Cap (A)	Isc (A)	ANSI X/R	Duty (%)	Duty (A)	Brk Cap (A)	Isc (A)	ANSI X/R	Duty (%)	Duty (A)	Brk Cap (A)	Isc (A)	ANSI X/R
PEQUONOCK 115 kV	8J-1T-2	92.2	58110	63000	52867	25.3	93.3	58781.4	63000	52476.3	27.7	86.8	54660	63000	48124.2	29.7
PLUMTREE 115 kV	30G-1X3-2	35.0	22027	63000	21935	21.1	33.1	20847.7	63000	20847.7	17.4	33	20807	63000	20807	17.4
	30G-23T-2	74.8	29926	40000	28757	24.7	66.6	26635.6	40000	26113.2	22.6	66.5	26604.3	40000	26073.4	22.6
	30G-24T-2	47.5	29927	63000	28757	24.7	42.3	26635.8	63000	26113.5	22.6	42.2	26604.6	63000	26073.7	22.6
	30G-24T-70	51.1	29927	58590	28757	24.7	45.5	26635.8	58590	26113.5	22.6	45.4	26604.6	58590	26073.7	22.6
	30G-25T-2	47.5	29927	63000	28757	24.7	42.3	26635.8	63000	26113.5	22.6	42.2	26604.6	63000	26073.7	22.6
	30G-26T-2	42.8	26943	63000	25588	26.0	37.7	23781.8	63000	23781.8	17.6	37.7	23730.8	63000	23730.8	17.7
	30G-26T-70	46.0	26943	58590	25588	26.0	40.6	23781.8	58590	23781.8	17.6	40.5	23730.8	58590	23730.8	17.7
	30G-27T-2	47.5	29927	63000	28757	24.7	42.3	26635.8	63000	26113.7	22.6	42.2	26604.6	63000	26073.8	22.6
	30G-27T-60	51.1	29927	58590	28757	24.7	45.5	26635.8	58590	26113.7	22.6	45.4	26604.6	58590	26073.8	22.6
	30G-28T-2	47.5	29927	63000	28757	24.7	42.3	26635.8	63000	26113.7	22.6	42.2	26604.6	63000	26073.8	22.6
	30G-29T-2	43.1	27178	63000	25792	26.1	37.7	23781.1	63000	23030.9	23.8	37.7	23761.5	63000	23006.3	23.9
	30G-29T-60	43.1	27178	63000	25792	26.1	37.7	23781.1	63000	23030.9	23.8	37.7	23761.5	63000	23006.3	23.9
	30G-2X3-2	35.1	22095	63000	21904	21.5	33.1	20847.6	63000	20847.6	17.7	33	20806.8	63000	20806.8	17.7
	30G-30T-2	47.5	29927	63000	28757	24.7	42.3	26635.8	63000	26113.7	22.6	42.2	26604.6	63000	26073.8	22.6
	30G-30T-65	51.1	29927	58590	28757	24.7	45.5	26635.8	58590	26113.7	22.6	45.4	26604.6	58590	26073.8	22.6
	30G-31T-2	47.5	29927	63000	28757	24.7	42.3	26635.8	63000	26113.7	22.6	42.2	26604.6	63000	26073.8	22.6
	30G-32T-2	43.3	27275	63000	25732	26.7	38.7	24408.6	63000	23466.5	24.6	38.7	24387.3	63000	23440	24.6
	30G-32T-65	46.6	27275	58590	25732	26.7	41.7	24408.6	58590	23466.5	24.6	41.6	24387.3	58590	23440	24.6
PLUMTREE 345 kV	30G-AT-2	50.1	20050	40000	20050	16.3	36.8	14739.1	40000	14739.1	15	36.8	14700.6	40000	14700.6	15.1
	30G-BT-2	49.3	19723	40000	19723	16.5	36.0	14386.1	40000	14386.1	15.3	35.9	14350.9	40000	14350.9	15.3
	30G-CT-2	50.1	20050	40000	20050	16.3	36.8	14739.1	40000	14739.1	15	36.8	14700.6	40000	14700.6	15.1
	30G-DT-2	50.1	20050	40000	20050	16.3	36.8	14739.1	40000	14739.1	15	36.8	14700.6	40000	14700.6	15.1
	30G-ET-2	50.1	20050	40000	20050	16.3	36.8	14739.1	40000	14739.1	15	36.8	14700.6	40000	14700.6	15.1
	30G-FT-2	50.1	20050	40000	20050	16.3	36.8	14739.1	40000	14739.1	15	36.8	14700.6	40000	14700.6	15.1
	30G-GT-2	50.1	20050	40000	20050	16.3	36.8	14739.1	40000	14739.1	15	36.8	14700.6	40000	14700.6	15.1

Substation	Breaker	Phase 2 ac (1.0 prefault bus voltages)					HVDC Light (1.0 prefault bus voltages)					HVDC Light w Pequonnock Reactors (1.0 prefault bus voltages)					
		Duty (%)	Duty (A)	Brk Cap (A)	Isc (A)	ANSI X/R	Duty (%)	Duty (A)	Brk Cap (A)	Isc (A)	ANSI X/R	Duty (%)	Duty (A)	Brk Cap (A)	Isc (A)	ANSI X/R	
ROCKY RIVER 115 kV	12Y-10K-2	22.4	8951	40000	8951	16.3	22.2	8860.3	40000	8860.3	16.4	22.1	8855.8	40000	8855.8	16.4	
	12Y-1T-2	24.6	6009	24467	4598	24.2	24.5	6005.3	24467.4	4595.1	24.2	24.5	6004.5	24467.4	4594.3	24.2	
	12Y-1T-55	25.7	6009	23399	4598	24.2	25.7	6005.3	23398.7	4595.1	24.2	25.7	6004.5	23398.7	4594.3	24.2	
	12Y-2T-2	24.5	6208	25322	4924	20.6	24.2	6124.1	25322.4	4845.8	20.8	24.2	6122.4	25322.4	4844.1	20.8	
	12Y-2T-55	25.6	6208	24254	4924	20.6	25.3	6124.1	24253.7	4845.8	20.8	25.2	6122.4	24253.7	4844.1	20.8	
	1813-12T-2	13.4	5347	40000	5250	20.6	13.2	5278.7	40000	5171.9	20.8	13.2	5277.3	40000	5170.2	20.8	
S. NAUG	21-1T-2	19.0	4758	25102	4738	5.0	18.9	4753.8	25102.2	4734.2	5	18.9	4752.6	25102.2	4733	5	
	21L-1T-80	19.0	4758	25102	4738	5.0	18.9	4753.8	25102.2	4734.2	5	18.9	4752.6	25102.2	4733	5	
	21L-1T-85	20.1	4758	23702	4738	5.0	20.1	4753.8	23701.9	4734.2	5	20.1	4752.6	23701.9	4733	5	
SASCO CREEK 115 kV	51R-1T-2	25.0	10001	40000	10001	12.4	24.9	9973.3	40000	9973.3	12.5	24.5	9786.6	40000	9786.6	12.7	
SCOVILL RCK 345 kV	22P-4T-2	60.4	30205	50000	29607	22.0	57.9	28934.4	50000	28261.4	22.4	57.8	28905.9	50000	28227	22.5	
	22P-5T-2	60.7	30358	50000	29760	22.0	57.9	28949.1	50000	28241.7	22.6	57.9	28940	50000	28230.3	22.6	
	22P-5T-87	60.7	30358	50000	29760	22.0	57.9	28949.1	50000	28241.7	22.6	57.9	28940	50000	28230.3	22.6	
	22P-7T-2	52.9	26466	50000	25905	22.2	52.3	26127.4	50000	25530.5	22.4	52.2	26105.1	50000	25503	22.4	
	22P-8T-2	57.6	28785	50000	28205	22.1	56.0	27985.9	50000	27332.4	22.4	55.9	27967.9	50000	27310.1	22.5	
	22P-8T-87	57.6	28785	50000	28205	22.1	56.0	27985.9	50000	27332.4	22.4	55.9	27967.9	50000	27310.1	22.5	
	22P-AT-2	66.4	33190	50000	32532	22.0	63.9	31929.2	50000	31186.5	22.4	63.8	31901.4	50000	31152.1	22.5	
	22P-BT-2	66.4	33190	50000	32532	22.0	63.9	31929.2	50000	31186.5	22.4	63.8	31901.4	50000	31152.1	22.5	
	SGTN RING 1	4C-11T--2	98.5	48205	48928	39153	23.2	97.2	47540.2	48928	38669.8	23	97.1	47520.5	48928	38648.9	23
		4C-11T-08	115.5	48205	41746	39153	23.2	113.9	47540.2	41746.1	38669.8	23	113.8	47520.5	41746.1	38648.9	23
4C-12T-10		104.1	46264	44444	40460	23.0	102.7	45640.4	44444.4	39959.6	22.9	102.7	45623.7	44444.4	39941.5	22.9	
4C-12T-2		92.5	46264	50000	40460	23.0	91.3	45640.4	50000	39959.6	22.9	91.2	45623.7	50000	39941.5	22.9	
4C-13T-2		102.8	50279	48928	40969	22.9	101.6	49708.9	48928	40571.6	22.7	101.5	49680.1	48928	40541	22.7	
4C-13T-55		102.8	50279	48928	40969	22.9	101.6	49708.9	48928	40571.6	22.7	101.5	49680.1	48928	40541	22.7	
4C-14T-2		102.8	50290	48928	40999	22.8	101.5	49682.7	48928	40570.1	22.7	101.5	49653.2	48928	40538.7	22.7	
4C-14T-71		102.8	50290	48928	40999	22.8	101.5	49682.7	48928	40570.1	22.7	101.5	49653.2	48928	40538.7	22.7	
4C-15T-2		103.0	50401	48928	41094	22.8	101.8	49793.4	48928	40664.6	22.6	101.7	49764	48928	40633.4	22.7	
4C-15T-70		103.0	50401	48928	41094	22.8	101.8	49793.4	48928	40664.6	22.6	101.7	49764	48928	40633.4	22.7	
4C-16T-2		72.8	45875	63000	42394	22.3	72.0	45331.3	63000	41954	22.2	71.9	45305	63000	41922.7	22.2	
4C-16T-30		72.8	45875	63000	42394	22.3	72.0	45331.3	63000	41954	22.2	71.9	45305	63000	41922.7	22.2	
4C-17T-1X		55.4	34903	63000	32438	21.7	55.0	34672.2	63000	32265.7	21.6	55	34654.1	63000	32243.9	21.6	
4C-17T-2		72.8	45875	63000	42394	22.3	72.0	45331.3	63000	41954	22.2	71.9	45305	63000	41922.7	22.2	
4C-18T-2		55.4	34903	63000	32438	21.7	55.0	34672.2	63000	32265.7	21.6	55	34654.1	63000	32243.9	21.6	
4C-19T-2		106.0	51854	48928	42508	22.3	104.7	51234.6	48928	42066.8	22.1	104.7	51205.3	48928	42035.4	22.1	
4C-20T-2	93.5	46774	50000	40969	22.9	92.5	46255.6	50000	40571.6	22.7	92.5	46227.6	50000	40541	22.7		
4C-20T-4X	75.1	37548	50000	33350	21.3	74.6	37300.3	50000	33169.9	21.2	74.6	37279.8	50000	33147.1	21.2		
SGTN RING 2	4C-10K-2	67.3	42408	63000	40407	22.5	66.4	41852.5	63000	39939.2	22.4	66.4	41830.3	63000	39911.6	22.4	
	4C-21T-2	48.8	30731	63000	30645	21.0	48.4	30489.7	63000	30447.3	20.9	48.4	30474.9	63000	30427.9	20.9	
	4C-21T-2X	48.8	30731	63000	30645	21.0	48.4	30489.7	63000	30447.3	20.9	48.4	30474.9	63000	30427.9	20.9	
	4C-22T-2	69.4	43724	63000	40320	22.5	68.5	43154.7	63000	39853.7	22.4	68.5	43131.5	63000	39826.2	22.4	

Substation	Breaker	Phase 2 ac (1.0 prefault bus voltages)					HVDC Light (1.0 prefault bus voltages)					HVDC Light w Pequonnock Reactors (1.0 prefault bus voltages)				
		Duty (%)	Duty (A)	Brk Cap (A)	Isc (A)	ANSI X/R	Duty (%)	Duty (A)	Brk Cap (A)	Isc (A)	ANSI X/R	Duty (%)	Duty (A)	Brk Cap (A)	Isc (A)	ANSI X/R
SGTN RING 2	4C-22T-20	69.4	43724	63000	40320	22.5	68.5	43154.7	63000	39853.7	22.4	68.5	43131.5	63000	39826.2	22.4
	4C-23T-00	112.9	49245	43608	40242	22.6	111.4	48596.3	43608.1	39774.8	22.4	111.4	48570.7	43608.1	39747.4	22.4
	4C-23T-2	100.8	49320	48928	40320	22.5	99.5	48673.3	48928	39853.7	22.4	99.4	48647.7	48928	39826.2	22.4
	4C-24T-10	112.5	49047	43608	40052	22.6	111.0	48398.4	43608.1	39584.3	22.5	110.9	48373.1	43608.1	39557.2	22.5
	4C-24T-2	100.6	49245	48928	40242	22.6	99.3	48596.3	48928	39774.8	22.4	99.3	48570.7	48928	39747.4	22.4
	4C-25T-2	100.2	49047	48928	40052	22.6	98.9	48398.4	48928	39584.3	22.5	98.9	48373.1	48928	39557.2	22.5
	4C-25T-3X	71.0	34720	48928	28474	22.2	70.4	34457	48928	28299.9	22.1	70.4	34441.6	48928	28283.2	22.1
	4C-26T-10	74.1	39153	52857	38037	23.5	73.1	38612.2	52857	37562.5	23.4	73	38595.4	52857	37541.1	23.4
	4C-26T-2	62.1	39153	63000	38037	23.5	61.3	38612.2	63000	37562.5	23.4	61.3	38595.4	63000	37541.1	23.4
	4C-28T-2	96.0	46983	48928	38037	23.5	94.7	46334.7	48928	37562.5	23.4	94.7	46314.5	48928	37541.1	23.4
	4C-28T-50	107.7	46983	43608	38037	23.5	106.3	46334.6	43608.1	37562.4	23.4	106.2	46314.4	43608.1	37541	23.4
	4C-29T-2	101.0	49420	48928	40407	22.5	99.7	48770.7	48928	39939.2	22.4	99.6	48744.9	48928	39911.6	22.4
	4C-29T-90	118.4	49420	41746	40407	22.5	116.8	48770.7	41746.1	39939.2	22.4	116.8	48744.9	41746.1	39911.6	22.4
	4C-30T-2	101.0	49420	48928	40407	22.5	99.7	48770.7	48928	39939.2	22.4	99.6	48744.9	48928	39911.6	22.4
	4C-31T-2	101.0	49419	48928	40407	22.5	99.7	48770.6	48928	39939.2	22.4	99.6	48744.9	48928	39911.6	22.4
4C-3X3-2	67.3	42408	63000	40407	22.5	66.4	41852.5	63000	39939.2	22.4	66.4	41830.3	63000	39911.6	22.4	
SHEPAUG 69 kV	13A-1X1-2	31.7	7561	23857	5700	28.5	31.5	7504.7	23857.4	5653.1	28.7	31.5	7503.3	23857.4	5651.8	28.7
	13A-21X-2	59.2	10683	18042	7899	28.5	58.8	10617.7	18042.2	7844.1	28.7	58.8	10616.1	18042.2	7842.6	28.7
SHEPAUG 115 kV	1887-13A-2	35.2	7043	20000	7043	4.5	34.5	6899.5	20000	6899.5	4.6	34.5	6895.8	20000	6895.8	4.6
	1887-13A-22	37.5	7043	18800	7043	4.5	36.7	6899.5	18800	6899.5	4.6	36.7	6895.8	18800	6895.8	4.6
	1887-13A-87	36.2	7043	19467	7043	4.5	35.4	6899.5	19466.7	6899.5	4.6	35.4	6895.8	19466.7	6895.8	4.6
SINGER 345 kV	AT-2	60.3	24110	40000	23272	23.8										
	BT-2	58.9	23569	40000	22825	23.4										
	CT-2	60.3	24110	40000	23272	23.8										
	DT-2	60.3	24110	40000	23272	23.8										
	ET-2	58.9	23569	40000	22825	23.4										
	FT-2	60.3	24110	40000	23272	23.8										
	GT-2	60.3	24110	40000	23272	23.8										
	HT-2	60.3	24110	40000	23272	23.8										
	IT-2	60.3	24110	40000	23272	23.8										
	JT-2	60.3	24110	40000	23272	23.8										
	KT-2	60.3	24110	40000	23272	23.8										
	LT-2	60.3	24110	40000	23272	23.8										
SOUTH END 45	1G-6T-2	42.0	26434	63000	26434	13.2	40.8	25678.4	63000	25678.4	12.7	40.6	25550.5	63000	25550.5	12.8
	1G-5T-2	47.9	30152	63000	30152	13.6	46.3	29140.4	63000	29140.4	12.9	46	28971.5	63000	28971.5	13
SOUTHINGTON 345 kV	4C-1T-2	77.6	28718	37000	28718	18.8	73.4	27147.9	37000	27147.9	18.9	73.3	27110.5	37000	27110.5	19
	4C-3T-2	77.6	28718	37000	28718	18.8	73.4	27147.9	37000	27147.9	18.9	73.3	27110.5	37000	27110.5	19
	4C-4T-2	54.4	20125	37000	20125	14.6	53.9	19947.2	37000	19947.2	14.5	53.8	19914.1	37000	19914.1	14.5
	4C-5T-2	57.4	28720	50000	28720	18.8	54.3	27150.9	50000	27150.9	18.9	54.2	27113.5	50000	27113.5	19
	4C-6T-2	71.8	28720	40000	28720	18.8	67.9	27150.9	40000	27150.9	18.9	67.8	27113.5	40000	27113.5	19

Substation	Breaker	Phase 2 ac (1.0 prefault bus voltages)					HVDC Light (1.0 prefault bus voltages)					HVDC Light w Peguonnock Reactors (1.0 prefault bus voltages)				
		Duty (%)	Duty (A)	Brk Cap (A)	Isc (A)	ANSI X/R	Duty (%)	Duty (A)	Brk Cap (A)	Isc (A)	ANSI X/R	Duty (%)	Duty (A)	Brk Cap (A)	Isc (A)	ANSI X/R
STATCOM A 14.6kV	4C-7T-2	56.6	28293	50000	28293	19.0	53.5	26728.1	50000	26728.1	19.2	53.4	26692.5	50000	26692.5	19.2
	4C-7T-48	45.2	22622	50000	22622	18.4	42.9	21428.7	50000	21428.7	18.5	42.8	21410.2	50000	21410.2	18.5
STEVENSON 115 kV	statcom	105.8	66682	63000	60317	26.0	104.1	65612.2	63000	59791.5	25.1	104	65533.7	63000	59701.7	25.1
	1560-14A-2	55.7	13858	24886	13417	7.4	55.6	13839.2	24885.8	13398.1	7.4	55.5	13803.6	24885.8	13359.6	7.4
	1560-14A-60	55.0	13308	24198	12429	9.6	54.1	13099.3	24197.7	12239.5	9.6	54.1	13093.5	24197.7	12232.9	9.6
	1876-14A-2	59.2	14129	23857	13804	7.4	59.1	14109.6	23857.4	13785	7.4	59	14073.6	23857.4	13746.5	7.4
	1876-14A-76	63.8	14129	22150	13804	7.4	63.7	14109.6	22149.9	13785	7.4	63.5	14073.6	22149.9	13746.5	7.4
	1990-14A-2	56.6	14084	24886	12929	10.6	56.0	13939.6	24885.8	12799.9	10.6	55.9	13903.6	24885.8	12759.2	10.6
	1990-14A-BUS	56.6	14084	24886	12929	10.6	56.0	13939.6	24885.8	12799.9	10.6	55.9	13903.6	24885.8	12759.2	10.6
	48C-10K-2	46.2	18495	40000	18495	13.5	44.7	17865	40000	17865	13.4	44.6	17849.2	40000	17849.2	13.4
STONY HILL 115 kV	48C-1T-2	78.3	18673	23857	17034	12.1	75.1	17926.6	23857.4	16402	11.9	75.1	17913.8	23857.4	16387.6	11.9
TRIANGLE 115 kV	11A-2T-2	85.4	21250	24886	20229	9.3	79.7	19839.4	24885.8	18910.2	9.2	79.6	19813.1	24885.8	18881.1	9.3
	11A-3T-2	94.6	23533	24886	22006	10.5	87.6	21803.6	24885.8	20454	10.3	87.5	21773.1	24885.8	20419.8	10.3
	11A-4T-2	94.6	23533	24886	22006	10.5	87.6	21803.6	24885.8	20454	10.3	87.5	21773.1	24885.8	20419.8	10.3
	14H-1T-18	66.1	11501	17396	10644	10.1	64.8	11276.6	17395.8	10420.6	10.2	64.8	11270.2	17395.8	10413.3	10.2
W. BROOKFLD 115 kV	14H-1T-2	65.5	11501	17572	10644	10.1	64.2	11276.6	17571.5	10420.6	10.2	64.1	11270.2	17571.5	10413.3	10.2
	14H-1T-87	46.1	8108	17572	7504	10.1	44.9	7884.4	17571.5	7285.9	10.2	44.8	7879.3	17571.5	7280.3	10.2
WALLNGFRDSUB 115 kV	13M-1T-2	60.3	24112	40000	22209	22.7	60.3	24100.6	40000	22197.8	22.7	60.2	24071.7	40000	22163.9	22.7
	13M-1X1-2	88.8	22209	25000	22209	22.7	88.8	22197.8	25000	22197.8	22.7	88.7	22163.9	25000	22163.9	22.7
	13M-2T-2	60.3	24112	40000	22209	22.7	60.3	24100.6	40000	22197.8	22.7	60.2	24071.7	40000	22163.9	22.7
	13M-2X1-2	88.8	22209	25000	22209	22.7	88.8	22197.8	25000	22197.8	22.7	88.7	22163.9	25000	22163.9	22.7
	13M-3T-2	60.3	24112	40000	22209	22.7	60.3	24100.6	40000	22197.8	22.7	60.2	24071.7	40000	22163.9	22.7
	13M-3X1-2	88.8	22209	25000	22209	22.7	88.8	22197.8	25000	22197.8	22.7	88.7	22163.9	25000	22163.9	22.7
	13M-4T-2	56.0	22386	40000	20619	22.7	55.9	22374.3	40000	20607.8	22.7	55.9	22344.9	40000	20573.9	22.7
	13M-4X1-2	88.8	22209	25000	22209	22.7	88.8	22197.8	25000	22197.8	22.7	88.7	22163.9	25000	22163.9	22.7
	13M-5T-2	53.9	21569	40000	19867	22.7	53.9	21557.8	40000	19855.8	22.7	53.8	21528.1	40000	19821.8	22.7
	1630-13M-5	60.9	15218	25000	15218	28.0	60.9	15215.3	25000	15215.3	28	60.8	15206.1	25000	15206.1	28.1
	1640-13M-5	77.8	19453	25000	19453	24.3	77.7	19435.3	25000	19435.3	24.3	77.7	19423.6	25000	19423.6	24.3
	22M-10K-2	58.7	23461	40000	23461	13.7	57.2	22888.4	40000	22888.4	13.3	57	22792.7	40000	22792.7	13.4
WATERSIDE 115 kV	22M-2T-L2	29.6	18640	63000	18640	12.8	28.9	18226.4	63000	18226.4	11.7	28.8	18157.3	63000	18157.3	11.7
	22M-2T-L3	33.6	19711	58590	19711	12.8	32.9	19297.6	58590	19297.6	12.5	32.8	19228.5	58590	19228.5	12.5
WESTON 115 kV	21M-1T-2	55.6	11119	20000	11119	5.8	54.3	10856.8	20000	10856.8	5.8	54.2	10835.9	20000	10835.9	5.8

APPENDIX C: Breaker Short Circuit Duty Comparisons (1.035 p.u. voltage)

Substation	Breaker	Phase 2 ac (1.035 prefault bus voltages)					HVDC Light (1.035 prefault bus voltages)					HVDC Light w Pequonnock Reactors (1.035 prefault bus voltages)				
		Duty (%)	Duty (A)	Brk Cap (A)	Isc (A)	ANSI X/R	Duty (%)	Duty (A)	Brk Cap (A)	Isc (A)	ANSI X/R	Duty (%)	Duty (A)	Brk Cap (A)	Isc (A)	ANSI X/R
BALDWIN 115 kV	13F-2T-2	55.6	11126	20000	11126	3.9	55.5	11104	20000	11104	4.0	55.5	11094	20000	11094	4.0
BATES ROCK 115 kV	21K-1T-2	22.0	5530	25102	5309	8.0	21.8	5467	25102	5242	8.0	21.8	5466	25102	5240	8.0
BEACON FALLS 115 kV	1570-11N-2	21.1	5309	25102	5282	4.7	21.1	5304	25102	5278	4.7	21.1	5303	25102	5276	4.7
	1575-11N-2	21.1	5309	25102	5282	4.7	21.1	5304	25102	5278	4.7	21.1	5303	25102	5276	4.7
BESECK JCT 345 kV	AT-2	59.5	29766	50000	29766	19.0	50.2	25085	50000	25085	18.4	50.1	25064	50000	25064	18.4
	BT-2	59.5	29766	50000	29766	19.0	50.2	25085	50000	25085	18.4	50.1	25064	50000	25064	18.4
	CT-2	59.5	29766	50000	29766	19.0	50.2	25085	50000	25085	18.4	50.1	25064	50000	25064	18.4
	DT-2	59.5	29766	50000	29766	19.0	50.2	25085	50000	25085	18.4	50.1	25064	50000	25064	18.4
	ET-2	59.5	29766	50000	29766	19.0	50.2	25085	50000	25085	18.4	50.1	25064	50000	25064	18.4
	FT-2	59.5	29766	50000	29766	19.0	50.2	25085	50000	25085	18.4	50.1	25064	50000	25064	18.4
	GT-2	59.5	29766	50000	29766	19.0	50.2	25085	50000	25085	18.4	50.1	25064	50000	25064	18.4
BRANFORD 115 kV	11J-1T-2	72.3	17240	23857	15023	10.2	72.2	17228	23857	15011	10.2	72.2	17215	23857	14996	10.2
	11J-1X1-2	60.1	15023	25000	15023	10.2	60.0	15011	25000	15011	10.2	60.0	14996	25000	14996	10.2
	11J-2T-2	65.9	16260	24673	15023	10.2	65.9	16249	24673	15011	10.2	65.8	16235	24673	14996	10.2
	11J-4T-2	66.8	16260	24335	15023	10.2	66.8	16249	24335	15011	10.2	66.7	16235	24335	14996	10.2
BRANFORD RR 115 kV	48R-1T-2	42.8	17123	40000	17123	12.2	42.8	17112	40000	17112	12.2	42.7	17084	40000	17084	12.2
BUNKER HILL 115 kV	12B-1T-2	48.1	19234	40000	19234	12.4	47.9	19175	40000	19175	12.3	47.9	19154	40000	19154	12.3
	12B-1T-75	48.1	19234	40000	19234	12.4	47.9	19175	40000	19175	12.3	47.9	19154	40000	19154	12.3
	12B-2T-2	71.3	17889	25102	16018	12.0	71.1	17837	25102	15983	12.0	71.0	17823	25102	15967	12.0
	12B-2T-68	77.1	17889	23212	16018	12.0	76.8	17837	23212	15983	12.0	76.8	17823	23212	15967	12.0
	12B-3T-2	48.7	19490	40000	19490	12.4	48.6	19426	40000	19426	12.3	48.5	19405	40000	19405	12.3
	12B-3T-72	48.7	19490	40000	19490	12.4	48.6	19426	40000	19426	12.3	48.5	19405	40000	19405	12.3
CAMPVILLE 115 kV	14R-1T-00	61.6	14944	24262	14759	5.7	61.5	14910	24262	14726	5.7	61.4	14905	24262	14720	5.8
	14R-1T-2	59.5	14944	25102	14759	5.7	59.4	14910	25102	14726	5.7	59.4	14905	25102	14720	5.8
	14R-2T-2	48.6	12192	25102	12064	5.5	48.5	12176	25102	12048	5.5	48.5	12173	25102	12044	5.5
	14R-2T-21	49.7	12192	24542	12064	5.5	49.6	12176	24542	12048	5.5	49.6	12173	24542	12044	5.5
	14R-3T-2	57.1	14325	25102	14081	6.2	56.9	14294	25102	14049	6.2	56.9	14289	25102	14044	6.2
	14R-3T-32	57.1	14325	25102	14081	6.2	56.9	14294	25102	14049	6.2	56.9	14289	25102	14044	6.2
	14R-4T-2	59.5	14944	25102	14759	5.7	59.4	14910	25102	14726	5.7	59.4	14905	25102	14720	5.8
CANTON 115 kV	5R-1T-2	24.0	6025	25102	5839	7.3	24.0	6022	25102	5836	7.3	24.0	6022	25102	5836	7.3
	5R-2T-2	14.6	5839	40000	5839	7.3	14.6	5836	40000	5836	7.3	14.6	5836	40000	5836	7.3
COS COB 115 kV	11R-1T-2	32.8	20645	63000	20645	13.4	32.0	20167	63000	20167	13.1	31.9	20087	63000	20087	11.8
	11R-2T-2	32.8	20645	63000	20645	13.4	32.0	20167	63000	20167	13.1	31.9	20087	63000	20087	11.8
	11R-5T-2	109.9	21972	20000	21972	13.4	107.5	21494	20000	21494	13.1	107.1	21414	20000	21414	13.2
	35K-3T-2	109.9	21972	20000	21972	13.4	107.5	21494	20000	21494	13.1	107.1	21414	20000	21414	13.2
	35K-3T-L4	80.3	15272	19022	15272	12.6	79.1	15047	19022	15047	12.4	78.9	15008	19022	15008	12.4
	35K-4T-2	34.9	21972	63000	21972	13.4	34.1	21494	63000	21494	13.1	34.0	21414	63000	21414	13.2

Substation	Breaker	Phase 2 ac (1.035 prefault bus voltages)					HVDC Light (1.035 prefault bus voltages)					HVDC Light w Pequonnock Reactors (1.035 prefault bus voltages)				
		Duty (%)	Duty (A)	Brk Cap (A)	Isc (A)	ANSI X/R	Duty (%)	Duty (A)	Brk Cap (A)	Isc (A)	ANSI X/R	Duty (%)	Duty (A)	Brk Cap (A)	Isc (A)	ANSI X/R
DARIEN 115 kV	13S-10K-2	61.7	24667	40000	24667	12.6	60.5	24213	40000	24213	12.2	60.1	24047	40000	24047	12.3
	13S-1T-16	52.0	20783	40000	20783	12.4	50.4	20163	40000	20163	12.0	50.3	20114	40000	20114	12.0
DEVON RING 1	13S-1T-2	52.0	20783	40000	20783	12.4	50.4	20163	40000	20163	12.0	50.3	20114	40000	20114	12.0
	7R-10T-2	73.3	46167	63000	42265	23.3	69.7	43895	63000	40609	22.2	68.5	43170	63000	39765	22.7
	7R-11T-2	73.7	46457	63000	42363	23.7	70.0	44113	63000	40632	22.7	68.9	43393	63000	39793	23.1
	7R-12T-2	72.9	45939	63000	42057	23.3	69.3	43670	63000	40400	22.2	68.2	42943	63000	39556	22.7
	7R-1T-2	73.7	46457	63000	42363	23.7	70.0	44113	63000	40632	22.7	68.9	43393	63000	39793	23.1
	7R-2T-2	67.9	42772	63000	38512	25.2	64.0	40304	63000	36665	24.0	63.3	39878	63000	36176	24.3
	7R-3T-2	72.9	45939	63000	42057	23.3	69.3	43670	63000	40400	22.2	68.2	42943	63000	39556	22.7
	7R-4T-2	72.9	45931	63000	42049	23.3	69.3	43661	63000	40392	22.2	68.2	42935	63000	39548	22.7
	7R-5T-2	72.7	45802	63000	41731	23.8	68.9	43398	63000	39943	22.7	67.7	42682	63000	39110	23.2
	7R-6T-2	73.7	46457	63000	42363	23.7	70.0	44113	63000	40632	22.7	68.9	43393	63000	39793	23.1
	7R-7T-2	73.7	46457	63000	42363	23.7	70.0	44113	63000	40632	22.7	68.9	43393	63000	39793	23.1
DEVON RING 2	7R-8T-2	73.3	46161	63000	42260	23.3	69.7	43889	63000	40603	22.2	68.5	43164	63000	39759	22.7
	7R-20T-2	88.0	55411	63000	50876	23.0	84.2	53061	63000	49131	22.1	82.3	51875	63000	47746	22.7
	7R-21T-2	61.0	38411	63000	35268	23.0	61.5	38735	63000	35866	22.1	59.8	37675	63000	34676	22.7
	7R-22T-2	85.1	53582	63000	49198	23.0	81.3	51249	63000	47453	22.1	79.4	50052	63000	46067	22.7
	7R-23T-2	85.1	53582	63000	49198	23.0	81.3	51249	63000	47453	22.1	79.4	50052	63000	46067	22.7
	7R-24T-2	75.9	47788	63000	43178	24.8	71.6	45114	63000	41148	23.7	70.5	44432	63000	40367	24.2
	7R-25T-2	85.0	53524	63000	49144	23.0	81.3	51191	63000	47400	22.1	79.4	49994	63000	46014	22.7
	7R-26T-2	85.2	53661	63000	49131	23.3	81.3	51227	63000	47291	22.4	79.4	50039	63000	45910	23.1
	7R-27T-2	85.2	53661	63000	49131	23.3	81.3	51227	63000	47291	22.4	79.4	50039	63000	45910	23.1
	7R-28T-2	87.2	54937	63000	50423	23.0	83.5	52589	63000	48678	22.2	81.6	51402	63000	47292	22.8
E DEVON 345 kV	7R-29T-2	88.0	55411	63000	50876	23.0	84.2	53061	63000	49131	22.1	82.3	51875	63000	47746	22.7
	7R-AT-2	48	24008	50000	23283	23.2										
	7R-BT-2	48	24008	50000	23283	23.2										
	7R-CT-2	48	24008	50000	23283	23.2										
	7R-DT-2	45.5	22733	50000	22185	22.5										
	7R-ET-2	48	24008	50000	23283	23.2										
	7R-FT-2	42.4	21209	50000	20568	23.2										
E DEVON 115kV	7R-TT-2	93.2	58736	63000	50348	32.5	77.4	48782.9	63000	42286.7	30.6	76.4	48101.5	63000	41568.6	31.1
	7R-UT-2	93.2	58736	63000	50348	32.5	77.4	48782.9	63000	42286.7	30.6	76.4	48101.5	63000	41568.6	31.1
	7R-VT-2	75.3	47426	63000	40258	34.4	57.0	35885.9	63000	30398.2	34.8	56.5	35605.2	63000	30114.5	35.1
	7R-WT-2	93.2	58736	63000	50348	32.5	77.4	48782.9	63000	42286.7	30.6	76.4	48101.5	63000	41568.6	31.1
	7R-XT-2	93.2	58736	63000	50348	32.5	77.4	48782.9	63000	42286.7	30.6	76.4	48101.5	63000	41568.6	31.1
	7R-YT-2	93.2	58736	63000	50348	32.5	77.4	48782.9	63000	42286.7	30.6	76.4	48101.5	63000	41568.6	31.1
	7R-ZT-2	93.2	58736	63000	50348	32.5	77.4	48782.9	63000	42286.7	30.6	76.4	48101.5	63000	41568.6	31.1
FLAX HILL 115 kV	24A-2T-2	34.9	22012	63000	22012	10.0	34.4	21656.5	63000	21656.5	9.9	34.3	21579.8	63000	21579.8	9.9

Substation	Breaker	Phase 2 ac (1.035 prefault bus voltages)					HVDC Light (1.035 prefault bus voltages)					HVDC Light w Pequonnock Reactors (1.035 prefault bus voltages)				
		Duty (%)	Duty (A)	Brk Cap (A)	Isc (A)	ANSI X/R	Duty (%)	Duty (A)	Brk Cap (A)	Isc (A)	ANSI X/R	Duty (%)	Duty (A)	Brk Cap (A)	Isc (A)	ANSI X/R
FREIGHT 115 kV	11W-1T-2	56.1	14073	25102	12902	10.7	56.0	14054.1	25102.2	12890.4	10.6	55.9	14041.1	25102.2	12875.6	10.7
	11W-1T-2X	56.9	14073	24752	12902	10.7	56.8	14054.1	24752.1	12890.4	10.6	56.7	14041.1	24752.1	12875.6	10.7
	11W-1T-68	56.1	14073	25102	12902	10.7	56.0	14054.1	25102.2	12890.4	10.6	55.9	14041.1	25102.2	12875.6	10.7
	11W-2T-2	56.1	14073	25102	12902	10.7	56.0	14054.1	25102.2	12890.4	10.6	55.9	14041.1	25102.2	12875.6	10.7
	11W-2T-21	56.1	14073	25102	12902	10.7	56.0	14054.1	25102.2	12890.4	10.6	55.9	14041.1	25102.2	12875.6	10.7
	11W-2T-2X	56.1	14073	25102	12902	10.7	56.0	14054.1	25102.2	12890.4	10.6	55.9	14041.1	25102.2	12875.6	10.7
FRNKLN DR	1B-10K-2	27.5	10993	40000	10993	7.0	27.4	10977.3	40000	10977.3	7	27.4	10974.8	40000	10974.8	7
	1B-1T-2	108.6	8180	7531	8122	5.6	108.5	8172.2	7530.7	8113.5	5.6	108.5	8170.9	7530.7	8112.2	5.6
	1B-1T-32	108.6	8180	7531	8122	5.6	108.5	8172.2	7530.7	8113.5	5.6	108.5	8170.9	7530.7	8112.2	5.6
FROST BRIDGE 115 kV	84-10K-2	68	42826	63000	42826	16.2	67.6	42589.7	63000	42589.7	16.1	67.5	42527.5	63000	42527.5	16.1
	8R-14T-2	68	42826	63000	42826	16.2	67.6	42589.7	63000	42589.7	16.1	67.5	42527.5	63000	42527.5	16.1
	8R-14T-91	67.7	40273	59472	40273	16.9	67.3	40047.9	59472	40047.9	16.7	67.2	39986.4	59472	39986.4	16.8
	8R-15T-2	64.4	40563	63000	40563	16.5	64.0	40350.9	63000	40350.9	16.3	64	40290.4	63000	40290.4	16.4
	8R-16T-2	68	42826	63000	42826	16.2	67.6	42589.7	63000	42589.7	16.1	67.5	42527.5	63000	42527.5	16.1
	8R-16T-63	64.4	40563	63000	40563	16.5	64.0	40350.9	63000	40350.9	16.3	64	40290.4	63000	40290.4	16.4
	8R-1X2-2	44.4	27957	63000	27957	9.0	44.3	27922.8	63000	27922.8	9	44.3	27878.4	63000	27878.4	9
	8R-20T-2	68	42826	63000	42826	16.2	67.6	42589.7	63000	42589.7	16.1	67.5	42527.5	63000	42527.5	16.1
	8R-20T-38	80.9	41334	51093	41334	16.1	80.5	41140.3	51093	41140.3	16	80.4	41082.9	51093	41082.9	16
	8R-21T-2	65.6	41334	63000	41334	16.1	65.3	41140.3	63000	41140.3	16	65.2	41082.9	63000	41082.9	16
	8R-22T-2	68	42826	63000	42826	16.2	67.6	42589.7	63000	42589.7	16.1	67.5	42527.5	63000	42527.5	16.1
	8R-22T-50	64.4	40562	63000	40562	16.5	64.0	40350	63000	40350	16.3	64	40289.5	63000	40289.5	16.4
	8R-23T-2	68	42826	63000	42826	16.2	67.6	42589.7	63000	42589.7	16.1	67.5	42527.5	63000	42527.5	16.1
	8R-23T-45	82.9	42353	51093	42353	16.4	82.4	42099.7	51093	42099.7	16.2	82.3	42043.4	51093	42043.4	16.3
	8R-24T-2	68	42826	63000	42826	16.2	67.6	42589.7	63000	42589.7	16.1	67.5	42527.5	63000	42527.5	16.1
	8R-26T-2	68	42826	63000	42826	16.2	67.6	42589.7	63000	42589.7	16.1	67.5	42527.5	63000	42527.5	16.1
	8R-26T-21	71.7	42669	59472	42669	16.3	71.3	42428.5	59472	42428.5	16.1	71.2	42368.1	59472	42368.1	16.2
	8R-27T-2	67.7	42669	63000	42669	16.3	67.3	42428.5	63000	42428.5	16.1	67.3	42368.1	63000	42368.1	16.2
	8R-28T-2	68	42826	63000	42826	16.2	67.6	42589.7	63000	42589.7	16.1	67.5	42527.5	63000	42527.5	16.1
	8R-28T-90	66.4	39514	59472	39514	17.1	66.0	39266.2	59472	39266.2	17	66	39228.3	59472	39228.3	17
8R-2X2-2	44.4	27957	63000	27957	9.0	44.3	27922.8	63000	27922.8	9	44.3	27878.4	63000	27878.4	9	
FROST BRIDGE 345 kV	8R-1T-2	31.4	11622	37000	11622	17.0	30.1	11133.8	37000	11133.8	17.2	30.1	11129	37000	11129	17.2
	8R-1T-52	31.4	11622	37000	11622	17.0	30.1	11133.8	37000	11133.8	17.2	30.1	11129	37000	11129	17.2
GLENBROOK 115 kV	1753-1K-2	81.8	51559	63000	50361	17.5	76.7	48347.6	63000	48072.7	16.2	76.3	48098.3	63000	47748.9	16.3
	1792-1K-2	81.8	51559	63000	50361	17.5	76.7	48347.6	63000	48072.7	16.2	76.3	48098.3	63000	47749	16.3
	1867-1K-2	79.2	49886	63000	48748	17.4	74.3	46825	63000	46582	16.1	73.9	46585.7	63000	46271.2	16.2
	1977-1K-2	81	51061	63000	49893	17.4	75.9	47799.5	63000	47566.2	16.1	75.5	47569.8	63000	47266.9	16.2
	1K-10K-2	125.9	50361	40000	50361	17.5	120.2	48072.6	40000	48072.6	16.2	119.4	47748.8	40000	47748.8	16.3
	1K-10T-2	81.6	51438	63000	50234	17.5	76.6	48229.8	63000	47944.3	16.2	76.2	47981.2	63000	47621.4	16.3
	1K-17T-2	81.6	51438	63000	50234	17.5	76.6	48229.8	63000	47944.3	16.2	76.2	47981.2	63000	47621.4	16.3
	1K-18T-2	81.6	51438	63000	50234	17.5	76.6	48229.8	63000	47944.3	16.2	76.2	47981.2	63000	47621.4	16.3

Substation	Breaker	Phase 2 ac (1.035 prefault bus voltages)					HVDC Light (1.035 prefault bus voltages)					HVDC Light w Pequonnock Reactors (1.035 prefault bus voltages)				
		Duty (%)	Duty (A)	Brk Cap (A)	Isc (A)	ANSI X/R	Duty (%)	Duty (A)	Brk Cap (A)	Isc (A)	ANSI X/R	Duty (%)	Duty (A)	Brk Cap (A)	Isc (A)	ANSI X/R
GLENBROOK 115 kV	1K-19T-2	81.5	51345	63000	50152	17.5	76.4	48136.6	63000	47862.9	16.2	76	47887.7	63000	47539.9	16.3
	1K-20K-2	125.9	50361	40000	50361	17.5	120.2	48072.6	40000	48072.6	16.2	119.4	47748.8	40000	47748.8	16.3
	1K-2T-2	81.3	51201	63000	50135	17.3	76.1	47973.9	63000	47845.5	16	75.8	47725.6	63000	47522	16.1
	1K-3T-2	125.3	50135	40000	50135	17.3	119.6	47845.5	40000	47845.5	16	118.8	47522	40000	47522	16.1
	1K-4T-	79.1	49838	63000	48745	17.4	74.3	46782.2	63000	46579.2	16.1	73.9	46543.5	63000	46268.9	16.2
	1K-4X1-2	79.1	49861	63000	48993	17.0	74.2	46741.6	63000	46681.8	15.9	73.8	46500.6	63000	46367.2	16
	1K-5X1-2	79.1	49861	63000	48993	17.0	74.2	46741.5	63000	46681.8	15.9	73.8	46500.5	63000	46367.2	16
	1K-7T-2	81.8	51545	63000	50352	17.4	76.7	48332.1	63000	48063.5	16.2	76.3	48082.9	63000	47739.8	16.3
	1K-8T-2	125.9	50352	40000	50352	17.4	120.2	48063.5	40000	48063.5	16.2	119.3	47739.8	40000	47739.8	16.3
	1K-9T-2	79	49772	63000	48692	17.3	73.9	46567.3	63000	46440.1	16	73.5	46333.1	63000	46134.9	16.1
	1K-AT-2	77.8	49002	63000	48328	16.7	73.0	45973.2	63000	45973.2	15.6	72.5	45684.9	63000	45684.9	15.7
	1K-BT-2	76.8	48386	63000	47387	17.3	72.3	45554.3	63000	45337.6	16.1	72	45331.5	63000	45047.4	16.2
	1K-CT-2	76.6	48272	63000	47443	17.0	72.3	45554.3	63000	45337.6	16.1	72	45331.5	63000	45047.4	16.2
	1K-DT-2	81.4	51297	63000	50105	17.5	76.3	48098.3	63000	47911.2	16	76	47850.3	63000	47588.6	16.1
	1K-ET-2	79.2	49886	63000	48748	17.4	74.3	46825	63000	46582	16.1	73.9	46585.7	63000	46271.2	16.2
LONG MTN 345 kV	13J-4T-2	43.8	21901	50000	21901	16.3	39.5	19725.1	50000	19725.1	15.9	39.4	19692.8	50000	19692.8	15.9
	13J-4T-398	43.8	21901	50000	21901	16.3	39.5	19725.1	50000	19725.1	15.9	39.4	19692.8	50000	19692.8	15.9
	13J-5T-2	38.2	15295	40000	15295	15.9	38.0	15209.5	40000	15209.5	15.9	38	15205.4	40000	15205.4	16
	13J-5T-321	38.2	15295	40000	15295	15.9	38.0	15209.5	40000	15209.5	15.9	38	15205.4	40000	15205.4	16
	13J-5T-398	33.3	13330	40000	13330	16.6	27.9	11156.6	40000	11156.6	15.9	27.8	11124.7	40000	11124.7	16
	13J-6T-2	38.2	15295	40000	15295	15.9	38.0	15209.5	40000	15209.5	15.9	38	15205.4	40000	15205.4	16
	13J-6T-321	38.2	15295	40000	15295	15.9	38.0	15209.5	40000	15209.5	15.9	38	15205.4	40000	15205.4	16
	13J-8T-2	43.8	21901	50000	21901	16.3	39.5	19725.1	50000	19725.1	15.9	39.4	19692.8	50000	19692.8	15.9
	13J-8T-352	33.3	16634	50000	16634	15.5	27.7	13868.8	50000	13868.8	15.2	27.7	13851.9	50000	13851.9	15.2
	13J-9T-2	33.3	16634	50000	16634	15.5	27.7	13868.8	50000	13868.8	15.2	27.7	13851.9	50000	13851.9	15.2
13J-9T-352	33.3	16634	50000	16634	15.5	27.7	13868.8	50000	13868.8	15.2	27.7	13851.9	50000	13851.9	15.2	
MIDDLE RIVER 115 kV	28M-1T-2	52.6	21028	40000	21028	7.3	49.1	19651.3	40000	19651.3	7.3	49.1	19621	40000	19621	7.3
	28M-2T-2	86.4	21680	25102	21028	7.3	80.8	20276.8	25102.2	19651.3	7.3	80.7	20248.9	25102.2	19621	7.3
MILLSTONE 345 kV	15G-13T-2	102.6	41043	40000	35805	30.5	100.7	40288.6	40000	35080.4	31	100.7	40280.4	40000	35072.1	31
	15G-14T-2	92.3	36926	40000	32012	32.0	91.7	36684	40000	31776.5	32.2	91.7	36679.6	40000	31772.1	32.2
	15G-15T-2	102.3	40929	40000	35691	30.6	100.4	40178.2	40000	34970.1	31.1	100.4	40170	40000	34961.8	31.1
	15G-1T-2	69.6	34777	50000	32396	32.0	68.2	34112.1	50000	31687.8	32.5	68.2	34105.4	50000	31680.2	32.5
	15G-2T-2	95.4	38159	40000	35853	30.5	93.7	37482.9	40000	35127.2	30.9	93.7	37475.7	40000	35118.9	30.9
	15G-3T-2	76.3	38159	50000	35853	30.5	75.0	37482.9	50000	35127.2	30.9	75	37475.7	50000	35118.9	30.9
	15G-4T-2	76.2	38116	50000	35805	30.5	74.9	37441.8	50000	35080.4	31	74.9	37434.6	50000	35072.1	31
	15G-5T-2	76.3	38159	50000	35853	30.5	75.0	37482.9	50000	35127.2	30.9	75	37475.7	50000	35118.9	30.9
	15G-6T-2	76.3	38159	50000	35853	30.5	75.0	37482.9	50000	35127.2	30.9	75	37475.7	50000	35118.9	30.9
15G-7T-2	83.8	38116	45500	35805	30.5	82.3	37441.8	45500	35080.4	31	82.3	37434.6	45500	35072.1	31	
15G-8T-2	78.4	35671	45500	33393	31.1	77.0	35035.7	45500	32712.9	31.6	77	35029.6	45500	32705.9	31.6	
15G-9T-2	83.6	38016	45500	35691	30.6	82.1	37344.9	45500	34970.1	31.1	82.1	37337.7	45500	34961.8	31.1	

Substation	Breaker	Phase 2 ac (1.035 prefault bus voltages)					HVDC Light (1.035 prefault bus voltages)					HVDC Light w Pequonnock Reactors (1.035 prefault bus voltages)				
		Duty (%)	Duty (A)	Brk Cap (A)	Isc (A)	ANSI X/R	Duty (%)	Duty (A)	Brk Cap (A)	Isc (A)	ANSI X/R	Duty (%)	Duty (A)	Brk Cap (A)	Isc (A)	ANSI X/R
NORWALK 115 kV	9S-10K-2	125.7	50290	40000	50290	11.5	112.9	45177.2	40000	45177.2	7.6	112.2	44896.1	40000	44896.1	7.7
	9S-10T-2	79.9	50331	63000	47909	19.5	71.3	44892.6	63000	44892.6	7.4	70.8	44612.9	63000	44612.9	7.4
	9S-11T-2	76.8	48404	63000	45747	20.2	69.0	43440.6	63000	43440.6	7.7	68.5	43165.5	63000	43165.5	7.8
	9S-12T-2	79.9	50332	63000	47910	19.5	71.3	44893.2	63000	44893.2	7.4	70.8	44613.5	63000	44613.5	7.4
	9S-13T-2	79.9	50332	63000	47910	19.5	71.3	44893.3	63000	44893.3	7.4	70.8	44613.6	63000	44613.6	7.4
	9S-14T-2	55.9	35186	63000	35186	5.9	55.9	35194.5	63000	35194.5	5.9	55.4	34928.3	63000	34928.3	6
	9S-1T-2	79.9	50332	63000	47910	19.5	71.3	44893.3	63000	44893.3	7.4	70.8	44613.6	63000	44613.6	7.4
	9S-2T-2	79.9	50332	63000	47910	19.5	71.3	44893.3	63000	44893.3	7.4	70.8	44613.6	63000	44613.6	7.4
	9S-3T-2	79.9	50332	63000	47910	19.5	71.3	44893.2	63000	44893.2	7.4	70.8	44613.5	63000	44613.5	7.4
	9S-4T-2	79.9	50331	63000	47909	19.5	71.3	44892.6	63000	44892.6	7.4	70.8	44612.9	63000	44612.9	7.4
	9S-5T-2	77.3	48699	63000	48699	11.6	69.2	43573	63000	43573	7.6	68.7	43309.2	63000	43309.2	7.6
	9S-6T-2	79.9	50332	63000	47910	19.5	71.3	44893.2	63000	44893.2	7.4	70.8	44613.5	63000	44613.5	7.4
	9S-7T-2	79.9	50331	63000	47909	19.5	71.3	44892.6	63000	44892.6	7.4	70.8	44612.9	63000	44612.9	7.4
	9S-8T-2	77.2	48623	63000	46481	19.2	68.0	42824	63000	42824	7.7	67.7	42628.2	63000	42628.2	7.8
	9S-8X2-2	70.1	44183	63000	44183	11.0	66.8	42060.8	63000	42060.8	7.8	66.3	41783.8	63000	41783.8	7.9
	9S-9T-2	79.9	50332	63000	47910	19.5	71.3	44893.2	63000	44893.2	7.4	70.8	44613.5	63000	44613.5	7.4
	9S-9X2-2	70.1	44183	63000	44183	11.1	66.8	42060.7	63000	42060.7	7.8	66.3	41783.6	63000	41783.6	7.9
NORWALK 345 kV	9S-AT-2	59.1	23631	40000	23557	20.4	33.0	13194.5	40000	13194.5	15.3	32.9	13154.9	40000	13154.9	15.4
	9S-BT-2	59.1	23631	40000	23557	20.4	33.0	13194.5	40000	13194.5	15.3	32.9	13154.9	40000	13154.9	15.4
	9S-CT-2	59.1	23631	40000	23557	20.4	33.0	13194.5	40000	13194.5	15.3	32.9	13154.9	40000	13154.9	15.4
	9S-DT-2	59.1	23631	40000	23557	20.4	33.0	13194.5	40000	13194.5	15.3	32.9	13154.9	40000	13154.9	15.4
	9S-ET-2	59.1	23631	40000	23557	20.4	33.0	13194.5	40000	13194.5	15.3	32.9	13154.9	40000	13154.9	15.4
	9S-FT-2	59.1	23631	40000	23557	20.4	33.0	13194.5	40000	13194.5	15.3	32.9	13154.9	40000	13154.9	15.4
	9S-GT-2	59.1	23631	40000	23557	20.4	33.0	13194.5	40000	13194.5	15.3	32.9	13154.9	40000	13154.9	15.4
	9S-HT-2	55.4	22144	40000	22144	18.7	33.0	13194.5	40000	13194.5	15.3	32.9	13154.9	40000	13154.9	15.4
	9S-IT-2	59.1	23631	40000	23557	20.4	33.0	13194.5	40000	13194.5	15.3	32.9	13154.9	40000	13154.9	15.4
NORWALK HARB 115 kV	6J-10T-2	80.2	50497	63000	50497	15.3	78.0	49165.7	63000	49165.7	15	77.6	48867.3	63000	48867.3	15.1
	6J-1T-2	111.1	53891	48517	47934	15.5	107.6	52206.2	48516.8	46603.4	15.3	107.3	52038.2	48516.8	46411.7	15.3
	6J-2T-2	112.3	54506	48517	48529	15.4	109.6	53171.1	48516.8	47496.3	15.2	109.1	52932	48516.8	47226.1	15.3
	6J-3T-2	77	48529	63000	48529	15.4	75.4	47496.3	63000	47496.3	15.2	75	47226.1	63000	47226.1	15.3
	6J-4T-2	112.3	54506	48517	48529	15.4	109.6	53171.1	48516.8	47496.3	15.2	109.1	52932	48516.8	47226.1	15.3
	6J-5T-2	80.2	50497	63000	50497	15.3	78.0	49165.7	63000	49165.7	15	77.6	48867.3	63000	48867.3	15.1
	6J-6T-2	80.2	50497	63000	50497	15.3	78.0	49165.7	63000	49165.7	15	77.6	48867.3	63000	48867.3	15.1
	6J-7T-2	76.9	48429	63000	48429	15.5	75.2	47404	63000	47404	15.2	74.8	47135.6	63000	47135.6	15.3
	6J-9T-2	75.4	47485	63000	47104	16.3	73.3	46174.4	63000	45994.6	16	73	45966.3	63000	45728.6	16.1
NORWALK HARB 138 kV	6J-9X1-2	50.8	20308	40000	19658	21.0	49.2	19681	40000	19146.4	20.6	49	19588.5	40000	19030.4	20.7
	6J-AT-2	54.4	34283	63000	34283	14.6	53.6	33777.4	63000	33777.4	14.3	53.4	33663.3	63000	33663.3	14.3
	6J-BT-2	54.4	34283	63000	34283	14.6	53.6	33777.4	63000	33777.4	14.3	53.4	33663.3	63000	33663.3	14.3
	6J-CT-2	54.4	34283	63000	34283	14.6	53.6	33777.4	63000	33777.4	14.3	53.4	33663.3	63000	33663.3	14.3
PEACEABLE 115 kV	12N-1T-2	69.8	17067	24464	16123	8.9	66.7	16313.3	24464	15454.2	8.8	66.6	16287.5	24464	15425.5	8.8

Substation	Breaker	Phase 2 ac (1.035 prefault bus voltages)					HVDC Light (1.035 prefault bus voltages)					HVDC Light w Pequonnock Reactors (1.035 prefault bus voltages)				
		Duty (%)	Duty (A)	Brk Cap (A)	Isc (A)	ANSI X/R	Duty (%)	Duty (A)	Brk Cap (A)	Isc (A)	ANSI X/R	Duty (%)	Duty (A)	Brk Cap (A)	Isc (A)	ANSI X/R
PEQUONOCK 115 kV	8J-1T-2	95.5	60144	63000	54717	25.3	96.6	60838.8	63000	54313	27.7	89.8	56573.1	63000	49808.5	29.7
PLUMTREE 115 kV	30G-1X3-2	36.2	22798	63000	22703	21.1	34.2	21577.4	63000	21577.4	17.4	34.2	21535.2	63000	21535.2	17.4
	30G-23T-2	77.4	30974	40000	29763	24.7	68.9	27567.8	40000	27027.2	22.6	68.8	27535.5	40000	26986	22.6
	30G-24T-2	49.2	30974	63000	29763	24.7	43.8	27568.1	63000	27027.5	22.6	43.7	27535.7	63000	26986.2	22.6
	30G-24T-70	52.9	30974	58590	29763	24.7	47.1	27568.1	58590	27027.5	22.6	47	27535.7	58590	26986.2	22.6
	30G-25T-2	49.2	30974	63000	29763	24.7	43.8	27568.1	63000	27027.5	22.6	43.7	27535.7	63000	26986.2	22.6
	30G-26T-2	44.3	27886	63000	26484	26.0	39.1	24614.1	63000	24614.1	17.6	39	24561.4	63000	24561.4	17.7
	30G-26T-70	47.6	27886	58590	26484	26.0	42.0	24614.1	58590	24614.1	17.6	41.9	24561.4	58590	24561.4	17.7
	30G-27T-2	49.2	30974	63000	29763	24.7	43.8	27568.1	63000	27027.6	22.6	43.7	27535.7	63000	26986.4	22.6
	30G-27T-60	52.9	30974	58590	29763	24.7	47.1	27568.1	58590	27027.6	22.6	47	27535.7	58590	26986.4	22.6
	30G-28T-2	49.2	30974	63000	29763	24.7	43.8	27568.1	63000	27027.6	22.6	43.7	27535.7	63000	26986.4	22.6
	30G-29T-2	44.6	28129	63000	26695	26.1	39.1	24613.4	63000	23836.9	23.8	39	24593.2	63000	23811.6	23.9
	30G-29T-60	44.6	28129	63000	26695	26.1	39.1	24613.4	63000	23836.9	23.8	39	24593.2	63000	23811.6	23.9
	30G-2X3-2	36.3	22868	63000	22671	21.5	34.2	21577.2	63000	21577.2	17.7	34.2	21535.1	63000	21535.1	17.7
	30G-30T-2	49.2	30974	63000	29764	24.7	43.8	27568.1	63000	27027.6	22.6	43.7	27535.7	63000	26986.4	22.6
	30G-30T-65	52.9	30974	58590	29764	24.7	47.1	27568.1	58590	27027.6	22.6	47	27535.7	58590	26986.4	22.6
	30G-31T-2	49.2	30974	63000	29764	24.7	43.8	27568.1	63000	27027.6	22.6	43.7	27535.7	63000	26986.4	22.6
	30G-32T-2	44.8	28229	63000	26633	26.7	40.1	25263	63000	24287.8	24.6	40.1	25240.8	63000	24260.4	24.6
	30G-32T-65	48.2	28229	58590	26633	26.7	43.1	25263	58590	24287.8	24.6	43.1	25240.8	58590	24260.4	24.6
	PLUMTREE 345 kV	30G-AT-2	51.9	20751	40000	20751	16.3	38.1	15255	40000	15255	15	38	15215.1	40000	15215.1
30G-BT-2		51	20413	40000	20413	16.5	37.2	14889.6	40000	14889.6	15.3	37.1	14853.2	40000	14853.2	15.3
30G-CT-2		51.9	20751	40000	20751	16.3	38.1	15255	40000	15255	15	38	15215.1	40000	15215.1	15.1
30G-DT-2		51.9	20751	40000	20751	16.3	38.1	15255	40000	15255	15	38	15215.1	40000	15215.1	15.1
30G-ET-2		51.9	20751	40000	20751	16.3	38.1	15255	40000	15255	15	38	15215.1	40000	15215.1	15.1
30G-FT-2		51.9	20751	40000	20751	16.3	38.1	15255	40000	15255	15	38	15215.1	40000	15215.1	15.1
30G-GT-2		51.9	20751	40000	20751	16.3	38.1	15255	40000	15255	15	38	15215.1	40000	15215.1	15.1
ROCKY RIVER 115 kV	12Y-10K-2	23.2	9264	40000	9264	16.3	22.9	9170.5	40000	9170.5	16.4	22.9	9165.7	40000	9165.7	16.4
	12Y-1T-2	25.4	6219	24467	4759	24.2	25.4	6215.5	24467.4	4755.9	24.2	25.4	6214.6	24467.4	4755	24.2
	12Y-1T-55	26.6	6219	23399	4759	24.2	26.6	6215.5	23398.7	4755.9	24.2	26.6	6214.6	23398.7	4755	24.2
	12Y-2T-2	25.4	6425	25322	5097	20.6	25.0	6338.4	25322.4	5015.4	20.8	25	6336.7	25322.4	5013.6	20.8
	12Y-2T-55	26.5	6425	24254	5097	20.6	26.1	6338.4	24253.7	5015.4	20.8	26.1	6336.7	24253.7	5013.6	20.8
	1813-12T-2	13.8	5534	40000	5434	20.6	13.7	5463.4	40000	5352.9	20.8	13.7	5462	40000	5351.2	20.8
S. NAUG	21-1T-2	19.6	4924	25102	4904	5.0	19.6	4920.2	25102.2	4899.9	5	19.6	4918.9	25102.2	4898.6	5
	21L-1T-80	19.6	4924	25102	4904	5.0	19.6	4920.2	25102.2	4899.9	5	19.6	4918.9	25102.2	4898.6	5
	21L-1T-85	20.8	4924	23702	4904	5.0	20.8	4920.2	23701.9	4899.9	5	20.8	4918.9	23701.9	4898.6	5
SASCO CREEK 115 kV	51R-1T-2	25.9	10351	40000	10351	12.4	25.8	10322.3	40000	10322.3	12.5	25.3	10129.1	40000	10129.1	12.7

Substation	Breaker	Phase 2 ac (1.035 prefault bus voltages)					HVDC Light (1.035 prefault bus voltages)					HVDC Light w Pequonnock Reactors (1.035 prefault bus voltages)				
		Duty (%)	Duty (A)	Brk Cap (A)	Isc (A)	ANSI X/R	Duty (%)	Duty (A)	Brk Cap (A)	Isc (A)	ANSI X/R	Duty (%)	Duty (A)	Brk Cap (A)	Isc (A)	ANSI X/R
SCOVILL RCK 345 kV	22P-4T-2	62.5	31262	50000	30643	22.0	59.9	29947.1	50000	29250.5	22.4	59.8	29917.6	50000	29215	22.5
	22P-5T-2	62.8	31420	50000	30802	22.0	59.9	29962.4	50000	29230.1	22.6	59.9	29952.9	50000	29218.4	22.6
	22P-5T-87	62.8	31420	50000	30802	22.0	59.9	29962.4	50000	29230.1	22.6	59.9	29952.9	50000	29218.4	22.6
	22P-7T-2	54.8	27392	50000	26812	22.2	54.1	27041.8	50000	26424.1	22.4	54	27018.8	50000	26395.6	22.4
	22P-8T-2	59.6	29792	50000	29192	22.1	57.9	28965.4	50000	28289	22.4	57.9	28946.7	50000	28266	22.5
	22P-8T-87	59.6	29792	50000	29192	22.1	57.9	28965.4	50000	28289	22.4	57.9	28946.7	50000	28266	22.5
	22P-AT-2	68.7	34351	50000	33671	22.0	66.1	33046.7	50000	32278	22.4	66	33017.9	50000	32242.5	22.5
	22P-BT-2	68.7	34351	50000	33671	22.0	66.1	33046.7	50000	32278	22.4	66	33017.9	50000	32242.5	22.5
SGTN RING 1	4C-11T--2	102	49892	48928	40523	23.2	100.6	49204.1	48928	40023.3	23	100.5	49183.7	48928	40001.7	23
	4C-11T-08	119.5	49892	41746	40523	23.2	117.9	49204.1	41746.1	40023.3	23	117.8	49183.7	41746.1	40001.7	23
	4C-12T-10	107.7	47883	44444	41876	23.0	106.3	47237.8	44444.4	41358.2	22.9	106.2	47220.6	44444.4	41339.5	22.9
	4C-12T-2	95.8	47883	50000	41876	23.0	94.5	47237.8	50000	41358.2	22.9	94.4	47220.6	50000	41339.5	22.9
	4C-13T-2	106.4	52039	48928	42403	22.9	105.2	51448.7	48928	41991.6	22.7	105.1	51418.9	48928	41960	22.7
	4C-13T-55	106.4	52039	48928	42403	22.9	105.2	51448.7	48928	41991.6	22.7	105.1	51418.9	48928	41960	22.7
	4C-14T-2	106.4	52050	48928	42434	22.8	105.1	51421.6	48928	41990	22.7	105	51391.1	48928	41957.6	22.7
	4C-14T-71	106.4	52050	48928	42434	22.8	105.1	51421.6	48928	41990	22.7	105	51391.1	48928	41957.6	22.7
	4C-15T-2	106.6	52165	48928	42533	22.8	105.3	51536.2	48928	42087.9	22.6	105.3	51505.8	48928	42055.5	22.7
	4C-15T-70	106.6	52165	48928	42533	22.8	105.3	51536.2	48928	42087.9	22.6	105.3	51505.8	48928	42055.5	22.7
	4C-16T-2	75.4	47480	63000	43877	22.3	74.5	46917.9	63000	43422.3	22.2	74.4	46890.6	63000	43390	22.2
	4C-16T-30	75.4	47480	63000	43877	22.3	74.5	46917.9	63000	43422.3	22.2	74.4	46890.6	63000	43390	22.2
	4C-17T-1X	57.3	36124	63000	33573	21.7	57.0	35885.8	63000	33394.9	21.6	56.9	35867	63000	33372.5	21.6
	4C-17T-2	75.4	47480	63000	43877	22.3	74.5	46917.9	63000	43422.3	22.2	74.4	46890.6	63000	43390	22.2
	4C-18T-2	57.3	36124	63000	33573	21.7	57.0	35885.8	63000	33394.9	21.6	56.9	35867	63000	33372.5	21.6
	4C-19T-2	109.7	53669	48928	43996	22.3	108.4	53027.8	48928	43539.1	22.1	108.3	52997.5	48928	43506.6	22.1
4C-20T-2	96.8	48411	50000	42403	22.9	95.7	47874.6	50000	41991.6	22.7	95.7	47845.5	50000	41960	22.7	
4C-20T-4X	77.7	38863	50000	34518	21.3	77.2	38605.8	50000	34330.8	21.2	77.2	38584.6	50000	34307.2	21.2	
SGTN RING 2	4C-10K-2	69.7	43892	63000	41821	22.5	68.8	43317.4	63000	41337	22.4	68.7	43294.4	63000	41308.5	22.4
	4C-21T-2	50.5	31807	63000	31718	21.0	50.1	31556.9	63000	31512.9	20.9	50.1	31541.6	63000	31492.8	20.9
	4C-21T-2X	50.5	31807	63000	31718	21.0	50.1	31556.9	63000	31512.9	20.9	50.1	31541.6	63000	31492.8	20.9
	4C-22T-2	71.8	45254	63000	41731	22.5	70.9	44665.1	63000	41248.6	22.4	70.9	44641.1	63000	41220.1	22.4
	4C-22T-20	71.8	45254	63000	41731	22.5	70.9	44665.1	63000	41248.6	22.4	70.9	44641.1	63000	41220.1	22.4
	4C-23T-00	116.9	50969	43608	41651	22.6	115.3	50297.2	43608.1	41166.9	22.4	115.3	50270.7	43608.1	41138.5	22.4
	4C-23T-2	104.3	51046	48928	41731	22.5	103.0	50376.9	48928	41248.6	22.4	102.9	50350.4	48928	41220.1	22.4
	4C-24T-10	116.4	50763	43608	41454	22.6	114.9	50092.4	43608.1	40969.8	22.5	114.8	50066.2	43608.1	40941.7	22.5
	4C-24T-2	104.2	50969	48928	41651	22.6	102.8	50297.2	48928	41166.9	22.4	102.7	50270.7	48928	41138.5	22.4
	4C-25T-2	103.8	50763	48928	41454	22.6	102.4	50092.4	48928	40969.8	22.5	102.3	50066.2	48928	40941.7	22.5
4C-25T-3X	73.4	35935	48928	29471	22.2	72.9	35663	48928	29290.4	22.1	72.9	35647	48928	29273.1	22.1	
4C-26T-10	76.7	40523	52857	39368	23.5	75.6	39963.7	52857	38877.2	23.4	75.6	39946.3	52857	38855.1	23.4	
4C-26T-2	64.3	40523	63000	39368	23.5	63.4	39963.7	63000	38877.2	23.4	63.4	39946.3	63000	38855.1	23.4	

Substation	Breaker	Phase 2 ac (1.035 prefault bus voltages)					HVDC Light (1.035 prefault bus voltages)					HVDC Light w Pequonnock Reactors (1.035 prefault bus voltages)				
		Duty (%)	Duty (A)	Brk Cap (A)	Isc (A)	ANSI X/R	Duty (%)	Duty (A)	Brk Cap (A)	Isc (A)	ANSI X/R	Duty (%)	Duty (A)	Brk Cap (A)	Isc (A)	ANSI X/R
SGTN RING 2	4C-28T-2	99.4	48628	48928	39368	23.5	98.0	47956.4	48928	38877.2	23.4	98	47935.5	48928	38855.1	23.4
	4C-28T-50	111.5	48628	43608	39368	23.5	110.0	47956.3	43608.1	38877.1	23.4	109.9	47935.4	43608.1	38855	23.4
	4C-29T-2	104.5	51149	48928	41821	22.5	103.2	50477.6	48928	41337	22.4	103.1	50451	48928	41308.5	22.4
	4C-29T-90	122.5	51149	41746	41821	22.5	120.9	50477.6	41746.1	41337	22.4	120.9	50451	41746.1	41308.5	22.4
	4C-30T-2	104.5	51149	48928	41821	22.5	103.2	50477.6	48928	41337	22.4	103.1	50451	48928	41308.5	22.4
	4C-31T-2	104.5	51149	48928	41821	22.5	103.2	50477.6	48928	41337	22.4	103.1	50450.9	48928	41308.5	22.4
	4C-3X3-2	69.7	43892	63000	41821	22.5	68.8	43317.4	63000	41337	22.4	68.7	43294.4	63000	41308.5	22.4
SHEPAUG 69 kV	13A-1X1-2	32.8	7826	23857	5900	28.5	32.6	7767.3	23857.4	5851	28.7	32.6	7765.9	23857.4	5849.7	28.7
	13A-21X-2	61.3	11057	18042	8175	28.5	60.9	10989.3	18042.2	8118.6	28.7	60.9	10987.7	18042.2	8117.1	28.7
SHEPAUG 115 kV	1887-13A-2	36.4	7289	20000	7289	4.5	35.7	7141	20000	7141	4.6	35.7	7137.2	20000	7137.2	4.6
	1887-13A-22	38.8	7289	18800	7289	4.5	38.0	7141	18800	7141	4.6	38	7137.2	18800	7137.2	4.6
	1887-13A-87	37.4	7289	19467	7289	4.5	36.7	7141	19466.7	7141	4.6	36.7	7137.2	19466.7	7137.2	4.6
SINGER 345 kV	AT-2	62.4	24954	40000	24086	23.8										
	BT-2	61	24393	40000	23624	23.4										
	CT-2	62.4	24954	40000	24086	23.8										
	DT-2	62.4	24954	40000	24086	23.8										
	ET-2	61	24393	40000	23624	23.4										
	FT-2	62.4	24954	40000	24086	23.8										
	GT-2	62.4	24954	40000	24086	23.8										
	HT-2	62.4	24954	40000	24086	23.8										
	IT-2	62.4	24954	40000	24086	23.8										
	JT-2	62.4	24954	40000	24086	23.8										
	KT-2	62.4	24954	40000	24086	23.8										
	LT-2	62.4	24954	40000	24086	23.8										
SOUTH END 45	1G-6T-2	43.4	27359	63000	27359	13.2	42.2	26577.1	63000	26577.1	12.7	42	26444.8	63000	26444.8	12.8
	1G-5T-2	49.5	31207	63000	31207	13.6	47.9	30160.3	63000	30160.3	12.9	47.6	29985.5	63000	29985.5	13
SOUTHINGTON 345 kV	4C-1T-2	80.3	29723	37000	29723	18.8	75.9	28098.1	37000	28098.1	18.9	75.8	28059.4	37000	28059.4	19
	4C-3T-2	80.3	29723	37000	29723	18.8	75.9	28098.1	37000	28098.1	18.9	75.8	28059.4	37000	28059.4	19
	4C-4T-2	56.3	20829	37000	20829	14.6	55.8	20645.3	37000	20645.3	14.5	55.7	20611.1	37000	20611.1	14.5
	4C-5T-2	59.5	29725	50000	29725	18.8	56.2	28101.2	50000	28101.2	18.9	56.1	28062.5	50000	28062.5	19
	4C-6T-2	74.3	29725	40000	29725	18.8	70.3	28101.2	40000	28101.2	18.9	70.2	28062.5	40000	28062.5	19
	4C-7T-2	58.6	29283	50000	29283	19.0	55.3	27663.6	50000	27663.6	19.2	55.3	27626.8	50000	27626.8	19.2
	4C-7T-48	46.8	23414	50000	23414	18.4	44.4	22178.7	50000	22178.7	18.5	44.3	22159.6	50000	22159.6	18.5
STATCOM A 14.6kV	statcom	109.5	69016	63000	62428	26.0	107.8	67908.7	63000	61884.2	25.1	107.7	67827.4	63000	61791.3	25.1
STEVENSON 115 kV	1560-14A-2	57.6	14343	24886	13886	7.4	57.6	14323.6	24885.8	13867.1	7.4	57.4	14286.8	24885.8	13827.2	7.4
	1560-14A-60	56.9	13774	24198	12864	9.6	56.0	13557.8	24197.7	12667.9	9.6	56	13551.8	24197.7	12661	9.6
	1876-14A-2	61.3	14623	23857	14287	7.4	61.2	14603.4	23857.4	14267.4	7.4	61.1	14566.2	23857.4	14227.6	7.4
	1876-14A-76	66	14623	22150	14287	7.4	65.9	14603.4	22149.9	14267.4	7.4	65.8	14566.2	22149.9	14227.6	7.4
	1990-14A-2	58.6	14577	24886	13381	10.6	58.0	14427.5	24885.8	13247.9	10.6	57.8	14390.2	24885.8	13205.7	10.6
	1990-14A-BUS	58.6	14577	24886	13381	10.6	58.0	14427.5	24885.8	13247.9	10.6	57.8	14390.2	24885.8	13205.7	10.6

Substation	Breaker	Phase 2 ac (1.035 prefault bus voltages)					HVDC Light (1.035 prefault bus voltages)					HVDC Light w Pequonnock Reactors (1.035 prefault bus voltages)				
		Duty (%)	Duty (A)	Brk Cap (A)	Isc (A)	ANSI X/R	Duty (%)	Duty (A)	Brk Cap (A)	Isc (A)	ANSI X/R	Duty (%)	Duty (A)	Brk Cap (A)	Isc (A)	ANSI X/R
STONY HILL 115 kV	48C-10K-2	47.9	19142	40000	19142	13.5	46.2	18490.3	40000	18490.3	13.4	46.2	18473.9	40000	18473.9	13.4
	48C-1T-2	81	19327	23857	17630	12.1	77.8	18554	23857.4	16976.1	11.9	77.7	18540.8	23857.4	16961.2	11.9
TRIANGLE 115 kV	11A-2T-2	88.4	21993	24886	20938	9.3	82.5	20533.8	24885.8	19572.1	9.2	82.4	20506.6	24885.8	19541.9	9.3
	11A-3T-2	97.9	24356	24886	22776	10.5	90.7	22566.8	24885.8	21169.9	10.3	90.6	22535.2	24885.8	21134.5	10.3
	11A-4T-2	97.9	24356	24886	22776	10.5	90.7	22566.8	24885.8	21169.9	10.3	90.6	22535.2	24885.8	21134.5	10.3
W. BROOKFLD 115 kV	14H-1T-18	68.4	11904	17396	11017	10.1	67.1	11671.3	17395.8	10785.3	10.2	67.1	11664.6	17395.8	10777.8	10.2
	14H-1T-2	67.7	11904	17572	11017	10.1	66.4	11671.3	17571.5	10785.3	10.2	66.4	11664.6	17571.5	10777.8	10.2
	14H-1T-87	47.8	8392	17572	7767	10.1	46.4	8160.4	17571.5	7540.9	10.2	46.4	8155.1	17571.5	7535.1	10.2
WALLNGFRDSUB 115 kV	13M-1T-2	62.4	24956	40000	22987	22.7	62.4	24944.1	40000	22974.7	22.7	62.3	24914.2	40000	22939.6	22.7
	13M-1X1-2	91.9	22987	25000	22987	22.7	91.9	22974.7	25000	22974.7	22.7	91.8	22939.6	25000	22939.6	22.7
	13M-2T-2	62.4	24956	40000	22987	22.7	62.4	24944.1	40000	22974.7	22.7	62.3	24914.2	40000	22939.6	22.7
	13M-2X1-2	91.9	22987	25000	22987	22.7	91.9	22974.7	25000	22974.7	22.7	91.8	22939.6	25000	22939.6	22.7
	13M-3T-2	62.4	24956	40000	22987	22.7	62.4	24944.1	40000	22974.7	22.7	62.3	24914.2	40000	22939.6	22.7
	13M-3X1-2	91.9	22987	25000	22987	22.7	91.9	22974.7	25000	22974.7	22.7	91.8	22939.6	25000	22939.6	22.7
	13M-4T-2	57.9	23169	40000	21341	22.7	57.9	23157.4	40000	21329.1	22.7	57.8	23126.9	40000	21293.9	22.7
	13M-4X1-2	91.9	22987	25000	22987	22.7	91.9	22974.7	25000	22974.7	22.7	91.8	22939.6	25000	22939.6	22.7
	13M-5T-2	55.8	22324	40000	20563	22.7	55.8	22312.4	40000	20550.8	22.7	55.7	22281.6	40000	20515.6	22.7
	1630-13M-5	63	15751	25000	15751	28.0	63.0	15747.9	25000	15747.9	28	63	15738.3	25000	15738.3	28.1
WATERSIDE 115 kV	1640-13M-5	80.5	20134	25000	20134	24.3	80.5	20115.6	25000	20115.6	24.3	80.4	20103.5	25000	20103.5	24.3
	22M-10K-2	60.7	24282	40000	24282	13.7	59.2	23689.5	40000	23689.5	13.3	59	23590.5	40000	23590.5	13.4
	22M-2T-L2	30.6	19292	63000	19292	12.8	29.9	18864.4	63000	18864.4	11.7	29.8	18792.8	63000	18792.8	11.7
WESTON 115 kV	22M-2T-L3	34.8	20401	58590	20401	12.8	34.1	19973	58590	19973	12.5	34	19901.5	58590	19901.5	12.5
	21M-1T-2	57.5	11508	20000	11508	5.8	56.2	11236.8	20000	11236.8	5.8	56.1	11215.1	20000	11215.1	5.8

APPENDIX D: On Line Generation

This appendix lists the on line generation in each of the study cases. The same generation was on line for each case.

BUS	0 2A-11U	13.8KV	AREA=551	ZONE=1						
	GENERATOR:	On-Line	0.00RefAng	Regulate	V=	1.00p.u.	at bus:	0 2A-11U	13.8KV	
	Unit 11	On-Line	47.00MVA	0.00140R	0.11500X	0.00140R0	0.11500X0	0.00140R2	0.11500X2	
BUS	0 2A-12U	13.8KV	AREA=551	ZONE=1						
	GENERATOR:	On-Line	0.00RefAng	Regulate	V=	1.00p.u.	at bus:	0 2A-12U	13.8KV	
	Unit 12	On-Line	47.00MVA	0.00140R	0.11500X	0.00140R0	0.11500X0	0.00140R2	0.11500X2	
BUS	0 2A-13U	13.8KV	AREA=551	ZONE=1						
	GENERATOR:	On-Line	0.00RefAng	Regulate	V=	1.00p.u.	at bus:	0 2A-13U	13.8KV	
	Unit 13	On-Line	47.00MVA	0.00140R	0.11500X	0.00140R0	0.11500X0	0.00140R2	0.11500X2	
BUS	0 2A-14U	13.8KV	AREA=551	ZONE=1						
	GENERATOR:	On-Line	0.00RefAng	Regulate	V=	1.00p.u.	at bus:	0 2A-14U	13.8KV	
	Unit 14	On-Line	47.00MVA	0.00140R	0.11500X	0.00140R0	0.11500X0	0.00140R2	0.11500X2	
BUS	595 ADAMS	115.KV	AREA=5	ZONE=1						
	GENERATOR:	Off-Line	0.00RefAng	Regulate	V=	1.00p.u.	at bus:	595 ADAMS	115.KV	
	Unit 1	Off-Line	100.00MVA	0.00000R	9999.00000X	0.00380R0	0.12050X0	0.00000R2	9999.00000X2	
BUS	950 ADAMS	115	115.KV	AREA=5	ZONE=1					
	GENERATOR:	On-Line	0.00RefAng	Regulate	V=	1.00p.u.	at bus:	950 ADAMS	115 115.KV	
	Unit 1	On-Line	100.00MVA	0.05935R	0.46075X	0.01514R0	0.17683X0	0.06045R2	0.49655X2	
BUS	0 aes gen	20.KV	AREA=1	ZONE=1						
	GENERATOR:	On-Line	0.00RefAng	Regulate	V=	1.00p.u.	at bus:	0 aes gen	20.KV	
	Unit 1	On-Line	229.35MVA	0.00416R	0.20790X	0.00416R0	0.20790X0	0.00416R2	0.20790X2	
BUS	0 ALPS EQ	345.KV	AREA=5	ZONE=6						
	GENERATOR:	On-Line	30.00RefAng	Regulate	V=	1.00p.u.	at bus:	0 ALPS EQ	345.KV	
	Unit 1	On-Line	100.00MVA	0.00080R	0.03186X	0.00582R0	0.03139X0	0.00081R2	0.03184X2	
BUS	516 ALTRSCO U1	13.8KV	AREA=17	ZONE=1						
	GENERATOR:	On-Line	0.00RefAng	Regulate	V=	1.00p.u.	at bus:	516 ALTRSCO U1	13.8KV	
	Unit 1	On-Line	100.00MVA	0.00000R	0.27447X	0.00000R0	9999.00000X0	0.00000R2	0.27447X2	
BUS	517 ALTRSCO U2	13.8KV	AREA=17	ZONE=1						
	GENERATOR:	On-Line	0.00RefAng	Regulate	V=	1.00p.u.	at bus:	517 ALTRSCO U2	13.8KV	
	Unit 1	On-Line	100.00MVA	0.00000R	0.27447X	0.00000R0	9999.00000X0	0.00000R2	0.27447X2	
BUS	518 ALTRSCO U3	13.8KV	AREA=17	ZONE=1						
	GENERATOR:	On-Line	0.00RefAng	Regulate	V=	1.00p.u.	at bus:	518 ALTRSCO U3	13.8KV	
	Unit 1	On-Line	100.00MVA	0.00000R	0.27447X	0.00000R0	9999.00000X0	0.00000R2	0.27447X2	
BUS	519 ALTRSCO U4	13.8KV	AREA=17	ZONE=1						
	GENERATOR:	On-Line	0.00RefAng	Regulate	V=	1.00p.u.	at bus:	519 ALTRSCO U4	13.8KV	
	Unit 1	On-Line	100.00MVA	0.00000R	0.18124X	0.00000R0	9999.00000X0	0.00000R2	0.18124X2	
BUS	911 BEAR SW	115	115.KV	AREA=5	ZONE=1					
	GENERATOR:	On-Line	0.00RefAng	Regulate	V=	1.00p.u.	at bus:	911 BEAR SW	115 115.KV	
	Unit 1	On-Line	100.00MVA	-0.02592R	1.25236X	0.09067R0	0.63871X0	-0.02550R2	1.24935X2	
BUS	598 BEARSWMP	23	230.KV	AREA=5	ZONE=1					
	GENERATOR:	On-Line	0.00RefAng	Regulate	V=	1.00p.u.	at bus:	598 BEARSWMP	23 230.KV	
	Unit 1	On-Line	100.00MVA	0.00090R	0.04290X	0.00090R0	0.04290X0	0.00090R2	0.04290X2	
BUS	0 BERK POWER	21.KV	AREA=1	ZONE=1						
	GENERATOR:	On-Line	0.00RefAng	Regulate	V=	1.00p.u.	at bus:	0 BERK POWER	21.KV	
	Unit 1	On-Line	340.00MVA	0.00220R	0.14000X	0.00080R0	0.05900X0	0.01400R2	0.15000X2	

Short Circuit Duty Comparisons for HVDC

10-01-04

BUS	0 brdgphbr 2	18.4KV	AREA=1	ZONE=1									
	GENERATOR:	On-Line	0.00RefAng	Regulate	V=	1.00p.u.	at bus:	0 brdgphbr 2	18.4KV				
	Unit 2	On-Line	100.00MVA	0.00291R	0.10150X	0.00291R0	0.10150X0	0.00291R2	0.10150X2				
BUS	0 brdgphbr 3	20.2KV	AREA=1	ZONE=1									
	GENERATOR:	On-Line	0.00RefAng	Regulate	V=	1.00p.u.	at bus:	0 brdgphbr 3	20.2KV				
	Unit 3	On-Line	100.00MVA	0.00068R	0.05550X	0.00068R0	0.05550X0	0.00068R2	0.05550X2				
BUS	0 brdgphbr jet	13.68KV	AREA=1	ZONE=1									
	GENERATOR:	On-Line	0.00RefAng	Regulate	V=	1.00p.u.	at bus:	0 brdgphbr jet	13.68KV				
	Unit jt	On-Line	100.00MVA	0.00800R	0.44161X	0.00800R0	0.44161X0	0.00800R2	0.44161X2				
BUS	2213 BULLS BRIDGE	27.6KV	AREA=7	ZONE=1									
	GENERATOR:	Off-Line	0.00RefAng	Regulate	V=	1.00p.u.	at bus:	2213 BULLS BRIDGE	27.6KV				
	Unit 1	Off-Line	100.00MVA	0.00000R	2.07039X	0.01651R0	0.14447X0	0.00000R2	2.07039X2				
BUS	0 CABOT GEN	13.8KV	AREA=551	ZONE=1									
	GENERATOR:	On-Line	0.00RefAng	Regulate	V=	1.00p.u.	at bus:	0 CABOT GEN	13.8KV				
	Unit 6	On-Line	12.92MVA	0.00810R	0.29300X	0.00810R0	0.29300X0	0.00810R2	0.29300X2				
	Unit 5	On-Line	12.92MVA	0.00810R	0.29300X	0.00810R0	0.29300X0	0.00810R2	0.29300X2				
	Unit 4	On-Line	12.92MVA	0.00810R	0.29300X	0.00810R0	0.29300X0	0.00810R2	0.29300X2				
	Unit 3	On-Line	12.92MVA	0.00810R	0.29300X	0.00810R0	0.29300X0	0.00810R2	0.29300X2				
	Unit 2	On-Line	12.92MVA	0.00810R	0.29300X	0.00810R0	0.29300X0	0.00810R2	0.29300X2				
	Unit 1	On-Line	12.92MVA	0.00810R	0.29300X	0.00810R0	0.29300X0	0.00810R2	0.29300X2				
BUS	450 CDEC UNIT 1	13.8KV	AREA=17	ZONE=1									
	GENERATOR:	On-Line	0.00RefAng	Regulate	V=	1.00p.u.	at bus:	450 CDEC UNIT 1	13.8KV				
	Unit 1	On-Line	100.00MVA	0.00572R	0.28502X	0.00000R0	9999.00000X0	0.00572R2	0.28502X2				
BUS	451 CDEC UNIT 2	13.8KV	AREA=17	ZONE=1									
	GENERATOR:	On-Line	0.00RefAng	Regulate	V=	1.00p.u.	at bus:	451 CDEC UNIT 2	13.8KV				
	Unit 1	On-Line	100.00MVA	0.00529R	0.52245X	0.00000R0	9999.00000X0	0.00529R2	0.52245X2				
BUS	1528 COBBLE MT	69.KV	AREA=19	ZONE=1									
	GENERATOR:	On-Line	0.00RefAng	Regulate	V=	1.00p.u.	at bus:	1528 COBBLE MT	69.KV				
	Unit 1	On-Line	100.00MVA	0.00000R	1.01102X	0.00690R0	0.26410X0	0.00000R2	1.01102X2				
BUS	0 COSCOBGEN	13.8KV	AREA=9	ZONE=1									
	GENERATOR:	On-Line	0.00RefAng	Regulate	V=	1.00p.u.	at bus:	0 COSCOBGEN	13.8KV				
	Unit 3	On-Line	25.00MVA	0.00270R	0.12000X	0.00270R0	0.06000X0	0.00270R2	0.13000X2				
	Unit 2	On-Line	25.00MVA	0.00270R	0.12000X	0.00270R0	0.06000X0	0.00270R2	0.13000X2				
	Unit 1	On-Line	25.00MVA	0.00270R	0.12000X	0.00270R0	0.06000X0	0.00270R2	0.13000X2				
BUS	0 CTG-1	18.KV	AREA=551	ZONE=1									
	GENERATOR:	On-Line	0.00RefAng	Regulate	V=	1.00p.u.	at bus:	0 CTG-1	18.KV				
	Unit 1	On-Line	250.00MVA	0.00400R	0.17700X	0.00800R0	0.11400X0	0.01500R2	0.16900X2				
BUS	0 CTG-2	18.KV	AREA=551	ZONE=1									
	GENERATOR:	On-Line	0.00RefAng	Regulate	V=	1.00p.u.	at bus:	0 CTG-2	18.KV				
	Unit 2	On-Line	250.00MVA	0.00400R	0.17700X	0.00800R0	0.11400X0	0.01500R2	0.16900X2				
BUS	0 DEVON 11U	13.8KV	AREA=7	ZONE=1									
	GENERATOR:	On-Line	30.00RefAng	Regulate	V=	1.00p.u.	at bus:	0 DEVON 11U	13.8KV				
	Unit 1	On-Line	100.00MVA	0.00280R	0.22500X	0.00280R0	99999.00000X0	0.00280R2	0.22500X2				
BUS	0 DEVON 12U	13.8KV	AREA=7	ZONE=1									
	GENERATOR:	On-Line	30.00RefAng	Regulate	V=	1.00p.u.	at bus:	0 DEVON 12U	13.8KV				
	Unit 1	On-Line	100.00MVA	0.00280R	0.22500X	0.00280R0	99999.00000X0	0.00280R2	0.22500X2				
BUS	0 DEVON 13U	13.8KV	AREA=7	ZONE=1									
	GENERATOR:	On-Line	30.00RefAng	Regulate	V=	1.00p.u.	at bus:	0 DEVON 13U	13.8KV				
	Unit 1	On-Line	100.00MVA	0.00280R	0.22500X	0.00280R0	99999.00000X0	0.00280R2	0.22500X2				
BUS	0 DEVON 14U	13.8KV	AREA=7	ZONE=1									
	GENERATOR:	On-Line	30.00RefAng	Regulate	V=	1.00p.u.	at bus:	0 DEVON 14U	13.8KV				
	Unit 1	On-Line	100.00MVA	0.00280R	0.22500X	0.00280R0	99999.00000X0	0.00280R2	0.22500X2				

BUS 492 DEXTER	13.8KV	AREA=17	ZONE=1								
GENERATOR:	On-Line	0.00RefAng	Regulate	V=	1.00p.u.	at bus:	492 DEXTER	13.8KV			
Unit 1	On-Line	100.00MVA	0.00452R		0.18075X	999999.00000R0	999999.00000X0	0.00452R2	0.18075X2		
BUS 2521 DOREEN	23.KV	AREA=21	ZONE=1								
GENERATOR:	On-Line	0.00RefAng	Regulate	V=	1.00p.u.	at bus:	2521 DOREEN	23.KV			
Unit 1	On-Line	100.00MVA	0.01663R		0.70561X	0.00000R0	9999.00000X0	0.01663R2	0.70561X2		
BUS 0 English	13.68KV	AREA=1	ZONE=1								
GENERATOR:	On-Line	0.00RefAng	Regulate	V=	1.00p.u.	at bus:	0 English	13.68KV			
Unit 8	On-Line	100.00MVA	0.00237R		0.18979X	0.00237R0	0.18979X0	0.00237R2	0.18979X2		
Unit 7	On-Line	100.00MVA	0.00294R		0.23049X	0.00294R0	0.23049X0	0.00294R2	0.23049X2		
BUS 0 ESHOREGEN	13.8KV	AREA=24	ZONE=1								
GENERATOR:	On-Line	0.00RefAng	Regulate	V=	1.00p.u.	at bus:	0 ESHOREGEN	13.8KV			
Unit 1	On-Line	100.00MVA	0.00051R		0.03599X	0.00000R0	99999.00000X0	0.00051R2	0.03599X2		
BUS 72 EXETER	115.KV	AREA=1	ZONE=1								
GENERATOR:	On-Line	0.00RefAng	Regulate	V=	1.00p.u.	at bus:	72 EXETER	115.KV			
Unit 1	On-Line	100.00MVA	0.01529R		0.77501X	0.00000R0	9999.00000X0	0.01529R2	0.77501X2		
BUS 419 FALLSVILLAGE	6.6KV	AREA=17	ZONE=1								
GENERATOR:	On-Line	0.00RefAng	Regulate	V=	1.00p.u.	at bus:	419 FALLSVILLAGE	6.6KV			
Unit 1	On-Line	100.00MVA	0.00000R		1.48192X	0.00000R0	9999.00000X0	0.00000R2	1.48192X2		
BUS 2246 FORESTVIL A1	13.8KV	AREA=16	ZONE=1								
GENERATOR:	On-Line	0.00RefAng	Regulate	V=	1.00p.u.	at bus:	2246 FORESTVIL A1	13.8KV			
Unit 1	On-Line	100.00MVA	0.21100R		1.31660X	11.60210R0	3.20630X0	0.21100R2	1.31660X2		
BUS 2409 FRNKLN DRIVE	13.2KV	AREA=7	ZONE=1								
GENERATOR:	On-Line	0.00RefAng	Regulate	V=	1.00p.u.	at bus:	2409 FRNKLN DRIVE	13.2KV			
Unit 1	On-Line	100.00MVA	0.01314R		0.52571X	9999999.00000R0	999999.00000X0	0.01314R2	0.52571X2		
BUS 0 G1/G2	13.8KV	AREA=1	ZONE=1								
GENERATOR:	On-Line	0.00RefAng	Regulate	V=	1.00p.u.	at bus:	0 G1/G2	13.8KV			
Unit 1	On-Line	71.18MVA	0.00064R		0.07200X	0.00064R0	0.04750X0	0.00064R2	0.08800X2		
BUS 0 G3/G4	13.8KV	AREA=1	ZONE=1								
GENERATOR:	On-Line	0.00RefAng	Regulate	V=	1.00p.u.	at bus:	0 G3/G4	13.8KV			
Unit 1	On-Line	71.18MVA	0.00064R		0.07200X	0.00064R0	0.04750X0	0.00064R2	0.08800X2		
BUS 0 G5	13.2KV	AREA=1	ZONE=1								
GENERATOR:	On-Line	0.00RefAng	Regulate	V=	1.00p.u.	at bus:	0 G5	13.2KV			
Unit 1	On-Line	75.00MVA	0.00300R		0.11000X	0.00300R0	0.11000X0	0.00300R2	0.11000X2		
BUS 0 G5	13.8KV	AREA=1	ZONE=1								
GENERATOR:	On-Line	0.00RefAng	Regulate	V=	1.00p.u.	at bus:	0 G5	13.8KV			
Unit 1	On-Line	71.18MVA	0.00127R		0.14400X	0.00127R0	0.09500X0	0.00127R2	0.17600X2		
BUS 0 G6	22.KV	AREA=1	ZONE=1								
GENERATOR:	On-Line	0.00RefAng	Regulate	V=	1.00p.u.	at bus:	0 G6	22.KV			
Unit 1	On-Line	461.00MVA	0.00440R		0.18000X	0.00225R0	0.14500X0	0.00230R2	0.18000X2		
BUS 0 Gen #1	13.8KV	AREA=1	ZONE=1								
GENERATOR:	On-Line	0.00RefAng	Regulate	V=	1.00p.u.	at bus:	0 Gen #1	13.8KV			
Unit U1	On-Line	100.00MVA	0.00137R		0.11040X	0.00137R0	999999.00000X0	0.00137R2	0.11040X2		
BUS 0 Gen #10	13.2KV	AREA=9	ZONE=7								
GENERATOR:	On-Line	0.00RefAng	Regulate	V=	1.00p.u.	at bus:	0 Gen #10	13.2KV			
Unit 10	On-Line	21.88MVA	0.00270R		0.11500X	0.00270R0	0.11500X0	0.00270R2	0.11500X2		
BUS 0 Gen #2	13.2KV	AREA=9	ZONE=7								
GENERATOR:	On-Line	0.00RefAng	Regulate	V=	1.00p.u.	at bus:	0 Gen #2	13.2KV			
Unit 2	On-Line	113.69MVA	0.00140R		0.11400X	0.00140R0	0.07000X0	0.00140R2	0.11400X2		
BUS 0 Gen #3	20.9KV	AREA=9	ZONE=7								
GENERATOR:	On-Line	0.00RefAng	Regulate	V=	1.00p.u.	at bus:	0 Gen #3	20.9KV			
Unit 3	On-Line	256.00MVA	0.00290R		0.20000X	0.00290R0	0.20000X0	0.00290R2	0.20000X2		

BUS	0 GT1 (11)	16.KV	AREA=24	ZONE=1									
GENERATOR:		On-Line	0.00RefAng	Regulate	V=	1.00p.u.	at bus:	0 GT1 (11)	16.KV				
	Unit 1	On-Line	100.00MVA	0.00078R	0.06250X	0.00078R0	0.06250X0	0.00078R2	0.06250X2				
BUS	0 GT2 (12)	16.KV	AREA=24	ZONE=1									
GENERATOR:		On-Line	0.00RefAng	Regulate	V=	1.00p.u.	at bus:	0 GT2 (12)	16.KV				
	Unit 1	On-Line	100.00MVA	0.00078R	0.06250X	0.00078R0	0.06250X0	0.00078R2	0.06250X2				
BUS	555 HOLYOKE	115.KV	AREA=19	ZONE=1									
GENERATOR:		On-Line	0.00RefAng	Regulate	V=	1.00p.u.	at bus:	555 HOLYOKE	115.KV				
	Unit 1	On-Line	100.00MVA	0.02485R	0.99404X	0.02485R0	0.99404X0	0.02485R2	0.99404X2				
BUS	0 HOOSICK EQ	115.KV	AREA=5	ZONE=6									
GENERATOR:		On-Line	30.00RefAng	Regulate	V=	1.00p.u.	at bus:	0 HOOSICK EQ	115.KV				
	Unit 1	On-Line	100.00MVA	0.03316R	0.25711X	0.02924R0	0.25658X0	0.03317R2	0.25711X2				
BUS	583 INDECK	115.KV	AREA=9	ZONE=1									
GENERATOR:		Off-Line	0.00RefAng	Regulate	V=	1.00p.u.	at bus:	583 INDECK	115.KV				
	Unit 1	Off-Line	100.00MVA	0.00000R	0.84710X	0.00000R0	9999.00000X0	0.00000R2	0.84710X2				
BUS	0 Lake Road 1	20.9KV	AREA=1	ZONE=1									
GENERATOR:		On-Line	0.00RefAng	Regulate	V=	1.00p.u.	at bus:	0 Lake Road 1	20.9KV				
	Unit 1	On-Line	340.00MVA	0.00220R	0.14000X	0.00080R0	0.05900X0	0.14000R2	0.15000X2				
BUS	0 Lake Road 2	20.9KV	AREA=1	ZONE=1									
GENERATOR:		On-Line	0.00RefAng	Regulate	V=	1.00p.u.	at bus:	0 Lake Road 2	20.9KV				
	Unit 1	On-Line	340.00MVA	0.00220R	0.14000X	0.00080R0	0.05900X0	0.14000R2	0.15000X2				
BUS	0 Lake Road 3	20.9KV	AREA=1	ZONE=1									
GENERATOR:		On-Line	0.00RefAng	Regulate	V=	1.00p.u.	at bus:	0 Lake Road 3	20.9KV				
	Unit 1	On-Line	340.00MVA	0.00220R	0.14000X	0.00080R0	0.05900X0	0.01400R2	0.15000X2				
BUS	60 LISBON	4.16KV	AREA=17	ZONE=1									
GENERATOR:		On-Line	0.00RefAng	Regulate	V=	1.00p.u.	at bus:	60 LISBON	4.16KV				
	Unit 1	On-Line	100.00MVA	0.00000R	1.10041X	9999.00000R0	9999.00000X0	0.00000R2	1.10041X2				
BUS	16 MIDDLETOWN	115.KV	AREA=2	ZONE=1									
GENERATOR:		Off-Line	0.00RefAng	Regulate	V=	1.00p.u.	at bus:	16 MIDDLETOWN	115.KV				
	Unit 1	Off-Line	100.00MVA	0.00045R	0.06811X	0.00028R0	0.02554X0	0.00045R2	0.06811X2				
BUS	0 Middletown 4	22.KV	AREA=1	ZONE=1									
GENERATOR:		On-Line	0.00RefAng	Regulate	V=	1.00p.u.	at bus:	0 Middletown 4	22.KV				
	Unit 1	On-Line	461.00MVA	0.00460R	0.15500X	0.00460R0	0.12000X0	0.02300R2	0.15500X2				
BUS	0 Milford 1	20.9KV	AREA=24	ZONE=1									
GENERATOR:		On-Line	0.00RefAng	Regulate	V=	1.00p.u.	at bus:	0 Milford 1	20.9KV				
	Unit 1	On-Line	340.00MVA	0.00220R	0.14000X	0.00080R0	0.05900X0	0.01400R2	0.15000X2				
BUS	0 Milford 2	20.9KV	AREA=1	ZONE=1									
GENERATOR:		On-Line	0.00RefAng	Regulate	V=	1.00p.u.	at bus:	0 Milford 2	20.9KV				
	Unit 1	On-Line	340.00MVA	0.00220R	0.14000X	0.00080R0	0.05900X0	0.01400R2	0.15000X2				
BUS	701 MILLBURY2	115.KV	AREA=3	ZONE=1									
GENERATOR:		On-Line	0.00RefAng	Regulate	V=	1.00p.u.	at bus:	701 MILLBURY2	115.KV				
	Unit 1	On-Line	100.00MVA	0.00678R	0.04910X	0.01515R0	0.05538X0	0.00676R2	0.04898X2				
BUS	700 MILLBURY3	345.KV	AREA=3	ZONE=1									
GENERATOR:		On-Line	0.00RefAng	Regulate	V=	1.00p.u.	at bus:	700 MILLBURY3	345.KV				
	Unit 1	On-Line	100.00MVA	0.00051R	0.01617X	0.00887R0	0.02669X0	0.00051R2	0.01619X2				
BUS	22 MILLSTONE U2	22.8KV	AREA=17	ZONE=1									
GENERATOR:		On-Line	0.00RefAng	Regulate	V=	1.00p.u.	at bus:	22 MILLSTONE U2	22.8KV				
	Unit 1	On-Line	100.00MVA	0.00048R	0.02540X	0.00048R0	9999.00000X0	0.00048R2	0.02540X2				
BUS	23 MILLSTONE U3	22.8KV	AREA=17	ZONE=1									
GENERATOR:		On-Line	0.00RefAng	Regulate	V=	1.00p.u.	at bus:	23 MILLSTONE U3	22.8KV				
	Unit 1	On-Line	100.00MVA	0.00037R	0.02370X	0.00037R0	9999.00000X0	0.00037R2	0.02370X2				
BUS	116 MONSANTO U1	13.8KV	AREA=17	ZONE=1									

GENERATOR:	On-Line	0.00RefAng	Regulate	V=	1.00p.u.	at bus:	116 MONSANTO U1	13.8KV	
BUS 117 MONSANTO U2	Unit 1	On-Line	100.00MVA	0.00220R	0.17465X	0.00220R0	99999.00000X0	0.00220R2	0.17465X2
GENERATOR:	On-Line	0.00RefAng	Regulate	V=	1.00p.u.	at bus:	117 MONSANTO U2	13.8KV	
BUS 118 MONSANTO U3	Unit 1	On-Line	100.00MVA	0.00220R	0.17465X	0.00220R0	9999.00000X0	0.00220R2	0.17465X2
GENERATOR:	On-Line	0.00RefAng	Regulate	V=	1.00p.u.	at bus:	118 MONSANTO U3	13.8KV	
BUS 547 MT. TOM	Unit 1	On-Line	100.00MVA	0.00220R	0.17488X	0.00220R0	9999.00000X0	0.00220R2	0.17488X2
GENERATOR:	On-Line	0.00RefAng	Regulate	V=	1.00p.u.	at bus:	547 MT. TOM	115.KV	
BUS 591 NORTHFLD U1	Unit 1	On-Line	100.00MVA	0.00250R	0.14200X	0.00000R0	0.07400X0	0.00250R2	0.14200X2
GENERATOR:	On-Line	0.00RefAng	Regulate	V=	1.00p.u.	at bus:	591 NORTHFLD U1	13.8KV	
BUS 592 NORTHFLD U2	Unit 1	On-Line	100.00MVA	0.00000R	0.12070X	0.00000R0	9999.00000X0	0.00000R2	0.12070X2
GENERATOR:	On-Line	0.00RefAng	Regulate	V=	1.00p.u.	at bus:	592 NORTHFLD U2	13.8KV	
BUS 1593 NORTHFLD U3	Unit 1	On-Line	100.00MVA	0.00000R	0.12070X	0.00000R0	9999.00000X0	0.00000R2	0.12070X2
GENERATOR:	On-Line	0.00RefAng	Regulate	V=	1.00p.u.	at bus:	592 NORTHFLD U3	13.8KV	
BUS 1594 NORTHFLD U4	Unit 1	On-Line	100.00MVA	0.00000R	0.12070X	0.00000R0	9999.00000X0	0.00000R2	0.12070X2
GENERATOR:	On-Line	0.00RefAng	Regulate	V=	1.00p.u.	at bus:	1593 NORTHFLD U3	13.8KV	
BUS 1594 NORTHFLD U4	Unit 1	On-Line	100.00MVA	0.00000R	0.12070X	0.00000R0	9999.00000X0	0.00000R2	0.12070X2
GENERATOR:	On-Line	0.00RefAng	Regulate	V=	1.00p.u.	at bus:	1594 NORTHFLD U4	13.8KV	
BUS 5053 NRTHPT P EQ	Unit 1	On-Line	100.00MVA	0.00000R	0.12070X	0.00000R0	9999.00000X0	0.00000R2	0.12070X2
GENERATOR:	On-Line	0.00RefAng	Regulate	V=	1.00p.u.	at bus:	5053 NRTHPT P EQ	138.KV	
BUS 0 old snow a	Unit 1	On-Line	100.00MVA	0.00064R	0.02369X	0.00071R0	0.02116X0	0.00085R2	0.02369X2
GENERATOR:	Off-Line	0.00RefAng	Regulate	V=	1.00p.u.	at bus:	0 old snow a	4.8KV	
BUS 0 old snow b	Unit 1	Off-Line	100.00MVA	0.06570R	1.90600X	0.06570R0	99999.00000X0	0.06570R2	1.90600X2
GENERATOR:	Off-Line	0.00RefAng	Regulate	V=	1.00p.u.	at bus:	0 old snow b	4.8KV	
BUS 0 one	Unit 1	Off-Line	100.00MVA	0.10760R	3.12000X	0.10760R0	99999.00000X0	0.10760R2	3.12000X2
GENERATOR:	On-Line	0.00RefAng	Regulate	V=	1.00p.u.	at bus:	0 one	21.KV	
BUS 0 OO Sherman	Unit 1	On-Line	234.00MVA	0.00375R	0.15000X	0.00375R0	0.15000X0	0.00375R2	0.15000X2
GENERATOR:	On-Line	0.00RefAng	Regulate	V=	1.00p.u.	at bus:	0 OO Sherman	2.3KV	
BUS 3571 ORCHARD A2A3	Unit 1	On-Line	100.00MVA	0.03695R	2.95600X	0.03695R0	2.95600X0	0.03695R2	2.95600X2
GENERATOR:	On-Line	0.00RefAng	Regulate	V=	1.00p.u.	at bus:	3571 ORCHARD A2A3	13.8KV	
BUS 730 PALMER 115	Unit 1	On-Line	100.00MVA	0.08710R	2.87299X	0.08710R0	9999.00000X0	0.08710R2	2.87299X2
GENERATOR:	On-Line	0.00RefAng	Regulate	V=	1.00p.u.	at bus:	730 PALMER 115	115.KV	
BUS 717 PLATSBRGH EQ	Unit 1	On-Line	100.00MVA	0.59618R	4.35517X	0.00078R0	0.19151X0	0.59803R2	4.35608X2
GENERATOR:	On-Line	0.00RefAng	Regulate	V=	1.00p.u.	at bus:	717 PLATSBRGH EQ	115.KV	
BUS 0 PLSNT VAL EQ	Unit 1	On-Line	100.00MVA	0.00345R	0.04416X	0.00386R0	0.03014X0	0.00345R2	0.04422X2
GENERATOR:	On-Line	0.00RefAng	Regulate	V=	1.00p.u.	at bus:	0 PLSNT VAL EQ	345.KV	
BUS 602 PRATTS 230	Unit 1	On-Line	100.00MVA	0.00025R	0.00554X	0.00365R0	0.01323X0	0.00025R2	0.00554X2
GENERATOR:	On-Line	0.00RefAng	Regulate	V=	1.00p.u.	at bus:	602 PRATTS 230	230.KV	

BUS	2544 PROSPECT A1	Unit 1	On-Line	100.00MVA	0.03546R	0.26901X	0.00180R0	0.05949X0	0.03539R2	0.26904X2
	GENERATOR:		On-Line	13.8KV	AREA=21	ZONE=1				
			On-Line	0.00RefAng	Regulate	V=	1.00p.u. at bus:	2544 PROSPECT A1	13.8KV	
BUS	2545 PROSPECT A2	Unit 1	On-Line	100.00MVA	0.02679R	0.95190X	99999.00000R0	99999.00000X0	0.02679R2	0.95190X2
	GENERATOR:		On-Line	13.8KV	AREA=21	ZONE=1				
			On-Line	0.00RefAng	Regulate	V=	1.00p.u. at bus:	2545 PROSPECT A2	13.8KV	
BUS	148 RESCO	Unit 1	On-Line	100.00MVA	0.08244R	2.11104X	99999.00000R0	99999.00000X0	0.08244R2	2.11104X2
	GENERATOR:		On-Line	115.KV	AREA=666	ZONE=1				
			On-Line	0.00RefAng	Regulate	V=	1.00p.u. at bus:	148 RESCO	115.KV	
	SHUNT:	Unit 1	On-Line	100.00MVA	0.00645R	0.41050X	99999.00000R0	9999.00000X0	0.00645R2	0.41050X2
BUS	208 ROCKY RVR U1	Unit 1	On-Line	0.00000G	0.00000B	0.14050G0	-5.58620B0			
	GENERATOR:		On-Line	13.8KV	AREA=17	ZONE=1				
			On-Line	0.00RefAng	Regulate	V=	1.00p.u. at bus:	208 ROCKY RVR U1	13.8KV	
BUS	209 ROCKY RVR U2	Unit 1	On-Line	100.00MVA	0.00000R	3.79750X	0.00000R0	9999.00000X0	0.00000R2	3.79750X2
	GENERATOR:		On-Line	13.8KV	AREA=17	ZONE=1				
			On-Line	0.00RefAng	Regulate	V=	1.00p.u. at bus:	209 ROCKY RVR U2	13.8KV	
BUS	210 ROCKY RVR U3	Unit 1	On-Line	100.00MVA	0.00000R	3.79750X	0.00000R0	9999.00000X0	0.00000R2	3.79750X2
	GENERATOR:		On-Line	13.8KV	AREA=17	ZONE=1				
			On-Line	0.00RefAng	Regulate	V=	1.00p.u. at bus:	210 ROCKY RVR U3	13.8KV	
BUS	0 ROTTERDAM EQ	Unit 1	On-Line	100.00MVA	0.00000R	1.00000X	0.00000R0	9999.00000X0	0.00000R2	1.00000X2
	GENERATOR:		On-Line	230.KV	AREA=5	ZONE=6				
			On-Line	30.00RefAng	Regulate	V=	1.00p.u. at bus:	0 ROTTERDAM EQ	230.KV	
BUS	500 SANDY 345	Unit 1	On-Line	100.00MVA	0.00401R	0.03636X	0.00283R0	0.03023X0	0.00401R2	0.03637X2
	GENERATOR:		On-Line	345.KV	AREA=3	ZONE=1				
			On-Line	0.00RefAng	Regulate	V=	1.00p.u. at bus:	500 SANDY 345	345.KV	
BUS	0 SCOBIE POND	Unit 1	On-Line	100.00MVA	0.00097R	0.01663X	0.00247R0	0.01602X0	0.00097R2	0.01663X2
	GENERATOR:		On-Line	345.KV	AREA=1	ZONE=1				
			On-Line	0.00RefAng	Regulate	V=	1.00p.u. at bus:	0 SCOBIE POND	345.KV	
BUS	59 SCRRA	Unit 1	On-Line	100.00MVA	0.00062R	0.01230X	0.00270R0	0.01312X0	0.00065R2	0.01228X2
	GENERATOR:		Off-Line	69.KV	AREA=1	ZONE=1				
			Off-Line	0.00RefAng	Regulate	V=	1.00p.u. at bus:	59 SCRRA	69.KV	
BUS	0 scrra gen	Unit 1	Off-Line	100.00MVA	0.00000R	1.41030X	0.00000R0	9999.00000X0	0.00000R2	1.41030X2
	GENERATOR:		On-Line	13.8KV	AREA=1	ZONE=1				
			On-Line	0.00RefAng	Regulate	V=	1.00p.u. at bus:	0 scrra gen	13.8KV	
BUS	0 Shepaug Gen	Unit 1	On-Line	19.50MVA	0.00490R	0.17000X	0.00490R0	99999.00000X0	0.00490R2	0.17000X2
	GENERATOR:		On-Line	13.8KV	AREA=24	ZONE=1				
			On-Line	0.00RefAng	Regulate	V=	1.00p.u. at bus:	0 Shepaug Gen	13.8KV	
BUS	804 SHERMAN 345	Unit 1	On-Line	100.00MVA	0.00771R	0.61710X	0.00540R0	0.36570X0	0.00771R2	0.61710X2
	GENERATOR:		On-Line	345.KV	AREA=4	ZONE=1				
			On-Line	0.00RefAng	Regulate	V=	1.00p.u. at bus:	804 SHERMAN 345	345.KV	
BUS	0 snow diesels	Unit 1	On-Line	100.00MVA	0.00036R	0.01133X	0.00122R0	0.00988X0	0.00036R2	0.01134X2
	GENERATOR:		On-Line	13.8KV	AREA=9	ZONE=1				
			On-Line	0.00RefAng	Regulate	V=	1.00p.u. at bus:	0 snow diesels	13.8KV	
		Unit 3	On-Line	20.12MVA	0.00339R	0.18400X	0.00339R0	0.09700X0	0.00339R2	0.18500X2
		Unit 2	On-Line	20.12MVA	0.00339R	0.18600X	0.00339R0	0.09700X0	0.00339R2	0.18500X2
		Unit 1	On-Line	20.12MVA	0.00339R	0.18850X	0.00339R0	0.09700X0	0.00339R2	0.18500X2
BUS	454 SO. MEADOW	Unit 1	Off-Line	115.KV	AREA=14	ZONE=1				
	GENERATOR:		Off-Line	0.00RefAng	Regulate	V=	1.00p.u. at bus:	454 SO. MEADOW	115.KV	
BUS	0 ST1 (10)	Unit 1	Off-Line	100.00MVA	0.00049R	0.08751X	0.00000R0	1999.80005X0	0.00049R2	0.08751X2
	GENERATOR:		On-Line	16.KV	AREA=24	ZONE=1				
			On-Line	0.00RefAng	Regulate	V=	1.00p.u. at bus:	0 ST1 (10)	16.KV	
		Unit 1	On-Line	100.00MVA	0.00100R	0.07720X	0.00100R0	0.07720X0	0.00100R2	0.07720X2

BUS	0 StateLine EQ	69.KV	AREA=9	ZONE=7									
	GENERATOR:	On-Line	30.00RefAng	Regulate	V=	1.00p.u.	at bus:	0 StateLine EQ	69.KV				
	Unit 1	On-Line	100.00MVA	0.75094R	1.27257X	0.71851R0	1.80609X0	0.75064R2	1.27284X2				
BUS	226 STEVENSON	6.9KV	AREA=17	ZONE=1									
	GENERATOR:	On-Line	0.00RefAng	Regulate	V=	1.00p.u.	at bus:	226 STEVENSON	6.9KV				
	Unit 1	On-Line	100.00MVA	0.00000R	0.89000X	0.00000R0	9999.00000X0	0.00000R2	0.89000X2				
BUS	0 STG	18.KV	AREA=551	ZONE=1									
	GENERATOR:	On-Line	0.00RefAng	Regulate	V=	1.00p.u.	at bus:	0 STG	18.KV				
	Unit 3	On-Line	358.00MVA	0.00247R	0.18500X	0.00070R0	0.12300X0	0.01957R2	0.22400X2				
BUS	567 STONY BROOK	115.KV	AREA=19	ZONE=1									
	GENERATOR:	On-Line	0.00RefAng	Regulate	V=	1.00p.u.	at bus:	567 STONY BROOK	115.KV				
	Unit 1	On-Line	100.00MVA	0.00083R	0.05235X	0.00000R0	0.07500X0	0.00083R2	0.05235X2				
BUS	0 Synch Cond	16.KV	AREA=1	ZONE=1									
	GENERATOR:	Off-Line	0.00RefAng	Regulate	V=	1.00p.u.	at bus:	0 Synch Cond	16.KV				
	Unit 1	Off-Line	500.00MVA	0.00300R	0.25000X	0.00300R0	0.25000X0	0.00300R2	0.25000X2				
BUS	0 Synch Cond 2	16.KV	AREA=1	ZONE=1									
	GENERATOR:	Off-Line	0.00RefAng	Regulate	V=	1.00p.u.	at bus:	0 Synch Cond 2	16.KV				
	Unit 1	Off-Line	500.00MVA	0.00300R	0.25000X	0.00300R0	0.25000X0	0.00300R2	0.25000X2				
BUS	0 Temp Gen	13.8KV	AREA=1	ZONE=1									
	GENERATOR:	On-Line	0.00RefAng	Regulate	V=	1.00p.u.	at bus:	0 Temp Gen	13.8KV				
	Unit 3	On-Line	32.24MVA	0.00820R	0.17200X	0.00000R0	0.10500X0	0.00000R2	0.16800X2				
	Unit 2	On-Line	32.24MVA	0.00820R	0.17200X	0.00000R0	0.10500X0	0.00000R2	0.16800X2				
	Unit 1	On-Line	32.24MVA	0.00820R	0.17200X	0.00000R0	0.10500X0	0.00000R2	0.16800X2				
BUS	31 THAMES	115.KV	AREA=1	ZONE=1									
	GENERATOR:	Off-Line	0.00RefAng	Regulate	V=	1.00p.u.	at bus:	31 THAMES	115.KV				
	Unit 1	Off-Line	100.00MVA	0.00000R	0.14250X	0.00000R0	9999.00000X0	0.00000R2	0.14250X2				
BUS	0 three	21.KV	AREA=1	ZONE=1									
	GENERATOR:	On-Line	0.00RefAng	Regulate	V=	1.00p.u.	at bus:	0 three	21.KV				
	Unit 1	On-Line	234.00MVA	0.00375R	0.15000X	0.00375R0	0.15000X0	0.00375R2	0.15000X2				
BUS	417 TORR TERM	69.KV	AREA=13	ZONE=1									
	GENERATOR:	On-Line	0.00RefAng	Regulate	V=	1.00p.u.	at bus:	417 TORR TERM	69.KV				
	Unit 1	On-Line	100.00MVA	0.02063R	0.91608X	0.00000R0	9999.00000X0	0.02063R2	0.91608X2				
BUS	2045 TUNNEL	23.KV	AREA=4	ZONE=1									
	GENERATOR:	On-Line	0.00RefAng	Regulate	V=	1.00p.u.	at bus:	2045 TUNNEL	23.KV				
	Unit 1	On-Line	100.00MVA	0.01322R	0.50823X	9999.00000R0	9999.00000X0	0.01322R2	0.50823X2				
BUS	0 two	21.KV	AREA=1	ZONE=1									
	GENERATOR:	On-Line	0.00RefAng	Regulate	V=	1.00p.u.	at bus:	0 two	21.KV				
	Unit 1	On-Line	234.00MVA	0.00375R	0.15000X	0.00375R0	0.15000X0	0.00375R2	0.15000X2				
BUS	0 Unit 10	13.8KV	AREA=1	ZONE=1									
	GENERATOR:	On-Line	0.00RefAng	Regulate	V=	1.00p.u.	at bus:	0 Unit 10	13.8KV				
	Unit 1	On-Line	100.00MVA	0.00690R	0.48000X	0.00690R0	0.24000X0	0.00690R2	0.52000X2				
BUS	9563 Unit 3	13.8KV	AREA=1	ZONE=1									
	GENERATOR:	On-Line	0.00RefAng	Regulate	V=	1.00p.u.	at bus:	9563 Unit 3	13.8KV				
	Unit 1	On-Line	106.95MVA	0.00120R	0.09500X	0.00120R0	0.09500X0	0.00120R2	0.09500X2				
BUS	0 Unit 6J-1	17.1KV	AREA=1	ZONE=1									
	GENERATOR:	On-Line	0.00RefAng	Regulate	V=	1.00p.u.	at bus:	0 Unit 6J-1	17.1KV				
	Unit 1	On-Line	100.00MVA	0.00150R	0.12000X	0.00150R0	0.12000X0	0.00150R2	0.12000X2				
BUS	0 Unit 6J-10	13.8KV	AREA=1	ZONE=1									
	GENERATOR:	On-Line	0.00RefAng	Regulate	V=	1.00p.u.	at bus:	0 Unit 6J-10	13.8KV				
	Unit 1	On-Line	100.00MVA	0.00690R	0.48000X	0.00690R0	0.24000X0	0.00690R2	0.52000X2				
BUS	0 Unit 6J-2	19.KV	AREA=1	ZONE=1									
	GENERATOR:	On-Line	0.00RefAng	Regulate	V=	1.00p.u.	at bus:	0 Unit 6J-2	19.KV				

Short Circuit Duty Comparisons for HVDC

10-01-04

BUS	0 Unit 7	Unit 1	On-Line	100.00MVA	0.00130R	0.10290X	0.00130R0	0.10290X0	0.00130R2	0.10290X2
	GENERATOR:		On-Line	13.2KV AREA=1 ZONE=1	0.00RefAng	Regulate V=	1.00p.u. at bus:	0 Unit 7	13.2KV	
BUS	0 Unit 8	Unit 1	On-Line	100.00MVA	0.00250R	0.19810X	0.00250R0	0.19810X0	0.00250R2	0.19810X2
	GENERATOR:		On-Line	13.2KV AREA=1 ZONE=1	0.00RefAng	Regulate V=	1.00p.u. at bus:	0 Unit 8	13.2KV	
BUS	581 VT YANKEE	Unit 1	On-Line	100.00MVA	0.00250R	0.19810X	0.00250R0	0.19810X0	0.00250R2	0.19810X2
	GENERATOR:		On-Line	345.KV AREA=9 ZONE=1	0.00RefAng	Regulate V=	1.00p.u. at bus:	581 VT YANKEE	345.KV	
BUS	2562 W.SPRGFLD R2	Unit 1	On-Line	100.00MVA	0.00227R	0.04928X	0.00019R0	0.01652X0	0.00227R2	0.04928X2
	GENERATOR:		On-Line	13.8KV AREA=21 ZONE=1	0.00RefAng	Regulate V=	1.00p.u. at bus:	2562 W.SPRGFLD R2	13.8KV	
BUS	1120 W_KINGSTN	Unit 1	On-Line	100.00MVA	0.01250R	0.52571X	4319.64990R0	0.00000X0	0.01250R2	0.52571X2
	GENERATOR:		On-Line	115.KV AREA=7 ZONE=1	0.00RefAng	Regulate V=	1.00p.u. at bus:	1120 W_KINGSTN	115.KV	
BUS	0 walrecgen	Unit 1	On-Line	100.00MVA	0.04319R	0.30816X	0.01370R0	0.17698X0	0.04320R2	0.30802X2
	GENERATOR:		On-Line	4.16KV AREA=9 ZONE=1	0.00RefAng	Regulate V=	1.00p.u. at bus:	0 walrecgen	4.16KV	
BUS	760 WEB ST 7X TP	Unit 1	On-Line	12.22MVA	0.00514R	0.18000X	0.00514R0	0.12100X0	0.00514R2	0.29500X2
	GENERATOR:		On-Line	115.KV AREA=3 ZONE=1	0.00RefAng	Regulate V=	1.00p.u. at bus:	760 WEB ST 7X TP	115.KV	
BUS	0 WHITEHALL EQ	Unit 1	On-Line	100.00MVA	2.43002R	13.57140X	0.00662R0	0.19286X0	2.37188R2	13.41130X2
	GENERATOR:		On-Line	115.KV AREA=5 ZONE=6	30.00RefAng	Regulate V=	1.00p.u. at bus:	0 WHITEHALL EQ	115.KV	
BUS	2488 WINDSORLOCKS	Unit 1	On-Line	100.00MVA	0.02707R	0.14284X	0.04774R0	0.16316X0	0.02707R2	0.14283X2
	GENERATOR:		On-Line	27.6KV AREA=4 ZONE=1	0.00RefAng	Regulate V=	1.00p.u. at bus:	2488 WINDSORLOCKS	27.6KV	
BUS	2511 WOODLAND	Unit 1	On-Line	100.00MVA	0.04872R	2.86595X	0.13171R0	1.66578X0	0.04872R2	2.86595X2
	GENERATOR:		On-Line	23.KV AREA=21 ZONE=1	0.00RefAng	Regulate V=	1.00p.u. at bus:	2511 WOODLAND	23.KV	
BUS	0 WSPRGF1	Unit 1	On-Line	100.00MVA	0.01657R	0.70418X	0.00000R0	9999.00000X0	0.01657R2	0.70418X2
	GENERATOR:		On-Line	13.8KV AREA=21 ZONE=1	0.00RefAng	Regulate V=	1.00p.u. at bus:	0 WSPRGF1	13.8KV	
BUS	0 WSPRGF2	Unit 1	On-Line	71.18MVA	0.00530R	0.14400X	0.00790R0	0.09500X0	0.02730R2	0.14100X2
	GENERATOR:		On-Line	13.8KV AREA=21 ZONE=1	0.00RefAng	Regulate V=	1.00p.u. at bus:	0 WSPRGF2	13.8KV	
BUS	2563 WSPRNGFLD R1	Unit 1	On-Line	71.18MVA	0.00530R	0.14400X	0.00790R0	0.09500X0	0.02730R2	0.14100X2
	SHUNT:	Unit 1	On-Line	13.8KV AREA=21 ZONE=1	0.00000G	0.00000B	0.00000G0	-0.78925B0		