Generation Interconnection

Feasibility Study Report

for

Queue Project AG1-545

W. QUAKER RD-DISPUTANTA 34.5 KV

14 MW Capacity / 20 MW Energy

January 2021

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1 Introduction

This Feasibility Study has been prepared in accordance with the PJM Open Access Transmission Tariff, 36.2, as well as the Feasibility Study Agreement between the Interconnection Customer (IC), and PJM Interconnection, LLC (PJM), Transmission Provider (TP). The Interconnected Transmission Owner (ITO) is Dominion.

2 Preface

The intent of the feasibility study is to determine a plan, with ballpark cost and construction time estimates, to connect the subject generation to the PJM network at a location specified by the Interconnection Customer. The Interconnection Customer may request the interconnection of generation as a capacity resource or as an energy-only resource. As a requirement for interconnection, the Interconnection Customer may be responsible for the cost of constructing: (1) Direct Connections, which are new facilities and/or facilities upgrades needed to connect the generator to the PJM network, and (2) Network Upgrades, which are facility additions, or upgrades to existing facilities, that are needed to maintain the reliability of the PJM system.

In some instances a generator interconnection may not be responsible for 100% of the identified network upgrade cost because other transmission network uses, e.g. another generation interconnection, may also contribute to the need for the same network reinforcement. Cost allocation rules for network upgrades can be found in PJM Manual 14A, Attachment B. The possibility of sharing the reinforcement costs with other projects may be identified in the feasibility study, but the actual allocation will be deferred until the impact study is performed.

The Interconnection Customer seeking to interconnect a wind or solar generation facility shall maintain meteorological data facilities as well as provide that meteorological data which is required per Schedule H to the Interconnection Service Agreement and Section 8 of Manual 14D.

The Feasibility Study estimates do not include the feasibility, cost, or time required to obtain property rights and permits for construction of the required facilities. The project developer is responsible for the right of way, real estate, and construction permit issues. For properties currently owned by Transmission Owners, the costs may be included in the study.

3 General

The Interconnection Customer (IC), has proposed a Solar; Storage generating facility located in Prince George County, Virginia. The installed facilities will have a total capability of 20 MW with 14 MW of this output being recognized by PJM as Capacity. The proposed in-service date for this project is October 01, 2024. This study does not imply a TO commitment to this in-service date.

Queue Number	AG1-545
Project Name	W. QUAKER RD-DISPUTANTA 34.5 KV
State	Virginia
County	Prince George
Transmission Owner	Dominion
MFO	20
MWE	20
MWC	14
Fuel	Solar; Storage
Basecase Study Year	2024

Any new service customers who can feasibly be commercially operable prior to June 1st of the basecase study year are required to request interim deliverability analysis.

4 Point of Interconnection

AG1-545 will interconnect with the Dominion transmission system at the Disputanta 115 kV substation.

5 Cost Summary

The AG1-545 project will be responsible for the following costs:

Description	Total Cost
Total Physical Interconnection Costs	$ To be provided in the two-party IA with ITO
Total System Network Upgrade Costs	$28,055,000[1]
Total Costs	$28,055,000

This cost excludes a Federal Income Tax Gross Up charges. This tax may or may not be charged based on whether this project meets the eligibility requirements of IRS Notice 2016-36, 2016-25 I.R.B. (6/20/2016). If at a future date it is determined that the Federal Income Tax Gross charge is required, the Transmission Owner shall be reimbursed by the Interconnection Customer for such taxes.

Cost allocations for any System Upgrades will be provided in the System Impact Study Report.

[1] This project currently causes and/or contributes to overloads of the Transmission System (see Summer Peak Load Flow Analysis section below) and therefore has potential to have cost allocation for the system reinforcements listed in the report. This will be re-evaluated in the System Impact phase. The results may vary with queue customers withdrawing from the queue and other generators deactivating over time. If a customer is the first to cause the need for a project (causes loading to exceed 100% of rating), then the customer is responsible. If a customer contributes to a facility that is already overloaded by a prior queue, then they may receive cost allocation.

6 Transmission Owner Scope of Work

Remote Terminal Work: During the Facilities Study, ITO's System Protection Engineering Department will review transmission line protection as well as anti-islanding required to accommodate the new generation and interconnection substation. System Protection Engineering will determine the minimal acceptable protection requirements to reliably interconnect the proposed generating facility with the transmission system. The review is based on maintaining system reliability by reviewing ITO's protection requirements with the known transmission system configuration which includes generating facilities in the area. This review may determine that transmission line protection and communication upgrades are required at remote substations.

7 Transmission Owner Analysis

Dominion assessed the impact of the proposed project for compliance with NERC Reliability Criteria on the Dominion Transmission System. The system was assessed using the summer 2024 AG1 case provided to Dominion by PJM.

When performing a generation analysis, Dominion's main analysis includes load flow study results following a single contingency event for both normal and stressed system conditions. Dominion Criteria considers a transmission facility overloaded if it exceeds 94% of its emergency rating under normal and stressed system conditions. A full listing of Dominion's Planning Criteria and interconnection requirements can be found in the Company's Facility Connection Requirements which are publicly available at: http://www.dominionenergy.com.

The results of these studies evaluate the system under a limited set of operating conditions and do not guarantee the full delivery of the capacity and associated energy of this proposed generation facility under all operating conditions. NERC Planning and Operating Reliability Criteria allow for the re-dispatch of generating units to resolve projected and actual deficiencies in real time and planning studies. Specifically, in Planning Studies, NERC Planning Event 3 and 6 Contingency Conditions (Loss of generator, transmission circuit, transformer, shunt device, or Single Pole of a DC line followed by the loss of a generator, transmission circuit, transformer, shunt device or single pole of a DC line) allow for re-dispatch of generating units to resolve potential reliability deficiencies. For Dominion Planning Criteria the re-dispatch of generating units for these contingency conditions is allowed as long as the projected loading does not exceed 100% of a facility Load Dump Rating.

7.1 Power Flow Analysis

PJM performed a power flow analysis of the transmission system using a 2024 summer peak load flow model and the results were verified by Dominion. Additionally, Dominion performed an analysis of its transmission system and no further deficiencies were identified.

8 Interconnection Customer Requirements

8.1 System Protection

The IC must design its Customer Facilities in accordance with all applicable standards, including the standards in Dominion's "Dominion Energy Electric Transmission Generator Interconnection Requirements" documented in Dominion's Facility Interconnection Requirements "Exhibit C" located at: https://www.dominionenergy.com/company/moving-energy/electric-transmission-access. Preliminary Protection requirements will be provided as part of the Facilities Study. Detailed Protection Requirements will be provided once the project enters the construction phase.

8.2 Compliance Issues and Interconnection Customer Requirements

The proposed Customer Facilities must be designed in accordance with Dominion's "Dominion's Facility Interconnection Requirements" document located at: https://www.dominionenergy.com/company/moving-energy/electric-transmission-access. In particular, the IC is responsible for the following:

1. The purchase and installation of a fully rated protection device (circuit breaker, circuit switcher, fuse) to protect the IC's GSU transformer(s).
2. The purchase and installation of the minimum required Dominion generation interconnection relaying and control facilities as described in the System Protection section noted above. This includes over/under voltage protection, over/under frequency protection, and zero sequence voltage protection relays.
3. The purchase and installation of supervisory control and data acquisition ("SCADA") equipment to provide information in a compatible format to the Dominion Transmission System Control Center.
4. Compliance with the Dominion and PJM generator power factor and voltage control requirements.

The GSU(s) associated with the IC queue request shall meet the grounding requirements as noted in Dominion's "Dominion's Facility Interconnection Requirements" document located at: https://www.dominionenergy.com/company/moving-energy/electric-transmission-access.

The IC will also be required to meet all PJM, SERC, and NERC reliability criteria and operating procedures for standards compliance. For example, the IC will need to properly locate and report the over and under voltage and over and under frequency system protection elements for its units as well as the submission of the generator model and protection data required to satisfy the PJM and SERC audits. Failure to comply with these requirements may result in a disconnection of service if the violation is found to compromise the reliability of the Dominion system.

8.3 Power Factor Requirements

The IC shall design its non-synchronous Customer Facility with the ability to maintain a power factor of at least 0.95 leading (absorbing VARs) to 0.95 lagging (supplying VARs) measured at the high-side of the facility substation transformer(s) connected to the Dominion transmission system.

9 Revenue Metering and SCADA Requirements

9.1 PJM Requirements

The Interconnection Customer will be required to install equipment necessary to provide Revenue Metering (KWH, KVARH) and real time data (KW, KVAR) for IC's generating Resource. See PJM Manuals M-01 and M-14D, and PJM Tariff Section 8 of Attachment O.

9.2 Meteorological Data Reporting Requirements

The solar generation facility shall provide the Transmission Provider with site-specific meteorological data including:

- Back Panel temperature (Fahrenheit) - (Required for plants with Maximum Facility Output of 3 MW or higher)
- Irradiance (Watts/meter^2) - (Required for plants with Maximum Facility Output of 3 MW or higher)
- Ambient air temperature (Fahrenheit) - (Accepted, not required)

- Wind speed (meters/second) - (Accepted, not required)
- Wind direction (decimal degrees from true north) - (Accepted, not required)

9.3 Interconnected Transmission Owner Requirements

The IC will be required to comply with all Interconnected Transmission Owner's revenue metering requirements for generation interconnection customers located at the following link:

http://www.pjm.com/planning/design-engineering/to-tech-standards/

10 Summer Peak - Load Flow Analysis

The Queue Project AG1-545 was evaluated as a 20.0 MW (Capacity 13.0 MW) injection at the Disputanta 115 kV substation in the Dominion area. Project AG1-545 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AG1-545 was studied with a commercial probability of 53.0 %. Potential network impacts were as follows:

10.1 Generation Deliverability

(Single or N-1 contingencies for the Capacity portion only of the interconnection)

ID	FROM BUS#	FROM BUS	kV	FROM BUS AREA	TO BUS#	TO BUS	kV	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
16981147 2	93919 0	AE1-149 TAP	115. 0	DVP	31432 9	3POE	115. 0	DVP	1	DVP_P1 -2: LN 44-A	singl e	110.91999816 9	90.5	102.24	DC	13.02

10.2 Multiple Facility Contingency

(Double Circuit Tower Line, Fault with a Stuck Breaker, and Bus Fault contingencies for the full energy output)

None

10.3 Contribution to Previously Identified Overloads

(This project contributes to the following contingency overloads, i.e. "Network Impacts", identified for earlier generation or transmission interconnection projects in the PJM Queue)

ID	FROM BUS#	FROM BUS	kV	FROM BUS AREA	TO BUS#	TO BUS	kV	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
16701101 6	31431 4	3LOCKS	115. 0	DVP	94043 0	AE2-027 TAP	115. 0	DVP	1	DVP_P7 -1: LN 205-2003	tower	169.0	155.15	155.63	DC	1.81
16701107 7	31432 9	3POE	115. 0	DVP	31429 1	3PRGEORG	115. 0	DVP	1	DVP_P7 -1: LN 2002-2003	tower	301.0	117.51	121.32	DC	11.45
16701107 8	31432 9	3POE	115. 0	DVP	31429 1	3PRGEORG	115. 0	DVP	1	DVP_P7 -1: LN 205-2003	tower	301.0	101.52	103.98	DC	7.42
16701104 0	31607 9	AB2-161 TAP	115. 0	DVP	31387 9	3BELL AVE 2	115. 0	DVP	1	DVP_P7 -1: LN 97-121	tower	136.0	134.42	136.09	DC	2.27
16701098 5	94043 0	AE2-027 TAP	115. 0	DVP	31429 8	3HARROWG	115. 0	DVP	1	DVP_P7 -1: LN 205-2003	tower	169.0	195.11	195.59	DC	1.81

10.4 Potential Congestion due to Local Energy Deliverability

PJM also studied the delivery of the energy portion of this interconnection request. Any problems identified below are likely to result in operational restrictions to the project under study. The developer can proceed with network upgrades to eliminate the operational restriction at their discretion by submitting a Merchant Transmission Interconnection request.

Note: Only the most severely overloaded conditions are listed below. There is no guarantee of full delivery of energy for this project by fixing only the conditions listed in this section. With a Transmission Interconnection Request, a subsequent analysis will be performed which shall study all overload conditions associated with the overloaded element(s) identified.

ID	FROM BUS#	FROM BUS	kV	FROM BUS AREA	TO BUS#	TO BUS	kV	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
168581691	313879	3BELL AVE 2	115.0	DVP	314528	3IVOR106	115.0	DVP	1	Base Case	operation	110.919998169	114.06	114.65	DC	1.47
169504531	314273	3BAKRS P	115.0	DVP	316079	AB2-161 TAP	115.0	DVP	1	DVP_P1-2: LN 44-A	operation	110.919998169	132.29	134.45	DC	2.4
169504533	314273	3BAKRS P	115.0	DVP	316079	AB2-161 TAP	115.0	DVP	1	Base Case	operation	110.919998169	117.67	118.27	DC	1.47
168888337	314280	3NEWBOHE	115.0	DVP	314273	3BAKRS P	115.0	DVP	1	DVP_P1-2: LN 544-A	operation	110.919998169	130.05	130.63	DC	1.44
168888339	314280	3NEWBOHE	115.0	DVP	314273	3BAKRS P	115.0	DVP	1	Base Case	operation	110.919998169	114.7	115.27	DC	1.47
168888383	314292	3DISPUTN	115.0	DVP	939190	AE1-149 TAP	115.0	DVP	1	DVP_P1-2: LN 44-A	operation	110.919998169	102.15	120.18	DC	20.0
168888275	314329	3POE	115.0	DVP	314280	3NEWBOHE	115.0	DVP	1	DVP_P1-2: LN 544-A	operation	110.919998169	140.41	141.0	DC	1.44
168888277	314329	3POE	115.0	DVP	314280	3NEWBOHE	115.0	DVP	1	Base Case	operation	110.919998169	125.16	125.72	DC	1.47
168888386	314329	3POE	115.0	DVP	314291	3PRGEORG	115.0	DVP	1	DVP_P1-2: LN 2003	operation	246.279998779	115.57	118.58	DC	7.42
168888463	314329	3POE	115.0	DVP	314331	6POE	230.0	DVP	1	DVP_P1-2: LN 121	operation	176.531997681	99.97	103.65	DC	6.48
168888477	314329	3POE	115.0	DVP	314331	6POE	230.0	DVP	2	DVP_P1-2: LN 121	operation	179.070007324	97.88	101.47	DC	6.44
168888014	314528	3IVOR106	115.0	DVP	932590	AC2-079 TAP	115.0	DVP	1	Base Case	operation	110.919998169	99.72	100.32	DC	1.47
168887960	314532	3OAKRI23	115.0	DVP	314536	3SUFFOLK	115.0	DVP	1	Base Case	operation	110.919998169	124.46	125.05	DC	1.47
168888404	314536	3SUFFOLK	115.0	DVP	314537	6SUFFOLK	230.0	DVP	1	DVP_P1-3: 6SUFFOLK-TX#5	operation	248.441986084	114.12	115.16	DC	2.6
168888481	314536	3SUFFOLK	115.0	DVP	314537	6SUFFOLK	230.0	DVP	3	DVP_P1-3: 6SUFFOLK-TX#2	operation	273.164001465	99.62	100.53	DC	2.49
168581818	316079	AB2-161 TAP	115.0	DVP	313879	3BELL AVE 2	115.0	DVP	1	DVP_P1-2: LN 121	operation	110.919998169	164.43	166.48	DC	2.27
168581820	316079	AB2-161 TAP	115.0	DVP	313879	3BELL AVE 2	115.0	DVP	1	Base Case	operation	110.919998169	147.38	147.98	DC	1.47
168887957	932590	AC2-079 TAP	115.0	DVP	314532	3OAKRI23	115.0	DVP	1	Base Case	operation	110.919998169	143.84	144.44	DC	1.47
169811945	936660	AD2-085 TAP	115.0	DVP	314531	3MYRTLE	115.0	DVP	1	DVP_P1-4: 3BELL AVE 2_AB2-161 TAP_1	operation	110.919998169	98.97	103.09	DC	4.56
169811469	939190	AE1-149 TAP	115.0	DVP	314329	3POE	115.0	DVP	1	DVP_P1-2: LN 44-A	operation	110.919998169	210.24	228.27	DC	20.0
169811471	939190	AE1-149 TAP	115.0	DVP	314329	3POE	115.0	DVP	1	Base Case	operation	110.919998169	137.99	152.07	DC	15.63

10.5 System Reinforcements - Summer Peak Load Flow - Primary POI

ID	Idx	Facility	Upgrade Description	Cost
167011077,167011078	3	3POE 115.0 kV - 3PRGEORG 115.0 kV Ckt 1	DVP dom-043 (1392) : Rebuild 3.45 miles of 115 kV Line 121 from Poe to Prince George with 768 ACSS. Project Type : FAC Cost : $4,485,000 Time Estimate : 30-36 Months	$4,485,000
167011040	4	AB2-161 TAP 115.0 kV - 3BELL AVE 2 115.0 kV Ckt 1	DVP dom-381 (1779) : Reconductor 13.5 miles of 115 kV Line 106 from AB2-161 Tap to Bell Avenue with 636 ACSR 150 C. Project Type : FAC Cost : $8,100,000 Time Estimate : 36-40 Months	$8,100,000
167010985	5	AE2-027 TAP 115.0 kV - 3HARROWG 115.0 kV Ckt 1	DVP n6387 (1459) : Rebuild 0.90 miles of 115 kV Line 100 from AE2-027 Tap to Harrowgate with 768 ACSS. Project Type : FAC Cost : $1,170,000 Time Estimate : 30-36 Months	$1,170,000
167011016	2	3LOCKS 115.0 kV - AE2-027 TAP 115.0 kV Ckt 1	DVP n6404 (1461) : Rebuild 4.4 miles of 115 kV Line 100 from Locks to AE2-027 Tap with 768 ACSS. Project Type : FAC Cost : $5,720,000 Time Estimate : 30-36 Months	$5,720,000
169811472	1	AE1-149 TAP 115.0 kV - 3POE 115.0 kV Ckt 1	DVP n6154 (1568) : Rebuild 6.6 miles of 115 kV Line 15 from AE1-149 Tap to Poe with 636 ACSR. Project Type : FAC Cost : $8,580,000 Time Estimate : 30-36 Months	$8,580,000
			TOTAL COST	$28,055,000[1]

10.6 Flow Gate Details

The following indices contain additional information about each facility presented in the body of the report. For each index, a description of the flowgate and its contingency was included for convenience. The intent of the indices is to provide more details on which projects/generators have contributions to the flowgate in question. All New Service Queue Requests, through the end of the Queue under study, that are contributors to a flowgate will be listed in the indices. Please note that there may be contributors that are subsequently queued after the queue under study that are not listed in the indices. Although this information is not used "as is" for cost allocation purposes, it can be used to gage the impact of other projects/generators. It should be noted the project/generator MW contributions presented in the body of the report are Full MW Impact contributions which are also noted in the indices column named "Full MW Impact", whereas the loading percentages reported in the body of the report, take into consideration the PJM Generator Deliverability Test rules such as commercial probability of each project as well as the ramping impact of "Adder" contributions. The MW Impact found and used in the analysis is shown in the indices column named "Gendeliv MW Impact".

10.6.1 Index 1

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
169811472	939190	AE1-149 TAP	DVP	314329	3POE	DVP	1	DVP_P1-2: LN 44-A	single	110.92	90.5	102.24	DC	13.02

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
932581	AC2-078 C O1	22.8000	80/20	22.8000
936661	AD2-085 C	19.3800	80/20	19.3800
939195	AE1-149 C	60.0000	80/20	60.0000
940651	AE2-052	20.0000	80/20	20.0000
942341	AE2-247 C	8.4000	80/20	8.4000
943461	AF1-017 C	7.6000	80/20	7.6000
966741	AG1-545 C	13.0200	80/20	13.0200

10.6.2 Index 2

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
167011016	314314	3LOCKS	DVP	940430	AE2-027 TAP	DVP	1	DVP_P7-1: LN 205-2003	tower	169.0	155.15	155.63	DC	1.81

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
314314	3LOCKS	0.5884	50/50	0.5884
314331	6POE	0.8296	Adder	0.98
316083	AB2-161 C	1.4110	Adder	1.66
316084	AB2-161 E	2.3022	Adder	2.71
316108	AB2-160 C	11.3380	50/50	11.3380
316109	AB2-160 E	18.4988	50/50	18.4988
923852	AB2-025 E	0.3367	Adder	0.4
932581	AC2-078 C O1	1.7322	Adder	2.04
932582	AC2-078 E O1	2.8262	Adder	3.32
932591	AC2-079 C O1	1.6004	Adder	1.88
932592	AC2-079 E O1	2.6111	Adder	3.07
934575	AD1-082 C	3.2157	Adder	3.78
934576	AD1-082 E	1.8343	Adder	2.16
938634	AE1-085 C	3.8713	Adder	4.55
938635	AE1-085 E	1.9357	Adder	2.28
939195	AE1-149 C	5.0832	Adder	5.98
939196	AE1-149 E	3.3888	Adder	3.99
940061	AE2-000BC O1	4.2835	Adder	5.04
940062	AE2-000BE O1	2.8557	Adder	3.36
940481	AE2-033 C	4.6767	Adder	5.5
940482	AE2-033 E	3.1528	Adder	3.71
940541	AE2-040	0.8526	Adder	1.0
940651	AE2-052	1.6944	Adder	1.99
942371	AE2-250 C O1	20.1398	50/50	20.1398
942372	AE2-250 E O1	10.6294	50/50	10.6294
946011	AF1-266	3.9148	Adder	4.61
958141	AF2-108	1.3323	50/50	1.3323
959681	AF2-259 C	1.9985	50/50	1.9985
959682	AF2-259 E	1.3323	50/50	1.3323
962271	AG1-075 C O1	34.7599	50/50	34.7599
962272	AG1-075 E O1	21.1841	50/50	21.1841
966731	AG1-544 C	1.6025	Adder	3.56
966732	AG1-544 E	0.8597	Adder	1.91
966741	AG1-545 C	0.5295	Adder	1.18
966742	AG1-545 E	0.2839	Adder	0.63
WEC	WEC	0.0756	Confirmed LTF	0.0756
LGEE	LGEE	0.1552	Confirmed LTF	0.1552
CPLE	CPLE	0.8552	Confirmed LTF	0.8552
CBM-W2	CBM-W2	3.3958	Confirmed LTF	3.3958
NY	NY	0.1095	Confirmed LTF	0.1095
TVA	TVA	0.6454	Confirmed LTF	0.6454

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
O-066	O-066	1.5344	Confirmed LTF	1.5344
SIGE	SIGE	0.0519	Confirmed LTF	0.0519
CBM-S2	CBM-S2	9.9806	Confirmed LTF	9.9806
CBM-S1	CBM-S1	0.1604	Confirmed LTF	0.1604
G-007	G-007	0.2404	Confirmed LTF	0.2404
MEC	MEC	0.4576	Confirmed LTF	0.4576
LAGN	LAGN	0.8033	Confirmed LTF	0.8033
CBM-W1	CBM-W1	3.1545	Confirmed LTF	3.1545

10.6.3 Index 3

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
167011077	314329	3POE	DVP	314291	3PRGEORG	DVP	1	DVP_P7-1: LN 2002-2003	tower	301.0	117.51	121.32	DC	11.45

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
314539	3UNCAMP	2.1973	Adder	2.59
316083	AB2-161 C	10.4872	50/50	10.4872
316084	AB2-161 E	17.1108	50/50	17.1108
316103	AB2-015 C	2.9401	Adder	3.46
316104	AB2-015 E	2.4109	Adder	2.84
932581	AC2-078 C O1	12.9110	50/50	12.9110
932582	AC2-078 E O1	21.0652	50/50	21.0652
932591	AC2-079 C O1	11.1293	50/50	11.1293
932592	AC2-079 E O1	18.1583	50/50	18.1583
934575	AD1-082 C	23.8999	50/50	23.8999
934576	AD1-082 E	13.6334	50/50	13.6334
936661	AD2-085 C	4.7041	50/50	4.7041
936662	AD2-085 E	7.6751	50/50	7.6751
938634	AE1-085 C	28.9230	50/50	28.9230
938635	AE1-085 E	14.4615	50/50	14.4615
938771	AE1-103 C	1.4130	Adder	1.66
938772	AE1-103 E	1.9513	Adder	2.3
939195	AE1-149 C	38.3790	50/50	38.3790
939196	AE1-149 E	25.5860	50/50	25.5860
940061	AE2-000BC O1	31.6722	50/50	31.6722
940062	AE2-000BE O1	21.1148	50/50	21.1148
940651	AE2-052	12.7930	50/50	12.7930
941101	AE2-104 C O1	1.9813	50/50	1.9813
941102	AE2-104 E O1	3.1500	50/50	3.1500
942341	AE2-247 C	2.0556	50/50	2.0556
942342	AE2-247 E	2.8386	50/50	2.8386
943461	AF1-017 C	1.8598	50/50	1.8598
943462	AF1-017 E	3.0344	50/50	3.0344
958161	AF2-110 C	0.8168	50/50	0.8168
958162	AF2-110 E	1.2776	50/50	1.2776
961091	AF2-400 C	0.1588	Adder	0.19
961092	AF2-400 E	0.2605	Adder	0.31
961851	AG1-027 C	4.1212	Adder	9.15
961852	AG1-027 E	2.2782	Adder	5.06
966731	AG1-544 C	22.5889	50/50	22.5889
966732	AG1-544 E	12.1187	50/50	12.1187
966741	AG1-545 C	7.4567	50/50	7.4567
966742	AG1-545 E	3.9975	50/50	3.9975
WEC	WEC	0.0318	Confirmed LTF	0.0318
LGEE	LGEE	0.0653	Confirmed LTF	0.0653
CPLE	CPLE	0.3795	Confirmed LTF	0.3795

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
CBM-W2	CBM-W2	1.4426	Confirmed LTF	1.4426
NY	NY	0.0465	Confirmed LTF	0.0465
TVA	TVA	0.2744	Confirmed LTF	0.2744
O-066	O-066	0.6528	Confirmed LTF	0.6528
SIGE	SIGE	0.0219	Confirmed LTF	0.0219
CBM-S2	CBM-S2	4.3013	Confirmed LTF	4.3013
CBM-S1	CBM-S1	0.0680	Confirmed LTF	0.0680
G-007	G-007	0.1029	Confirmed LTF	0.1029
MEC	MEC	0.1939	Confirmed LTF	0.1939
LAGN	LAGN	0.3412	Confirmed LTF	0.3412
CBM-W1	CBM-W1	1.3319	Confirmed LTF	1.3319

10.6.4 Index 4

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
167011040	316079	AB2-161 TAP	DVP	313879	3BELL AVE 2	DVP	1	DVP_P7-1: LN 97-121	tower	136.0	134.42	136.09	DC	2.27

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
314539	3UNCAMP	-1.5535	Adder	-1.83
316083	AB2-161 C	6.0715	50/50	6.0715
316084	AB2-161 E	9.9061	50/50	9.9061
932581	AC2-078 C O1	2.5258	50/50	2.5258
932582	AC2-078 E O1	4.1210	50/50	4.1210
934575	AD1-082 C	13.8365	50/50	13.8365
934576	AD1-082 E	7.8929	50/50	7.8929
938634	AE1-085 C	14.1870	50/50	14.1870
938635	AE1-085 E	7.0935	50/50	7.0935
939195	AE1-149 C	8.4300	50/50	8.4300
939196	AE1-149 E	5.6200	50/50	5.6200
940063	AE2-000B BAT	64.7910	50/50	64.7910
940651	AE2-052	2.8100	50/50	2.8100
961853	AG1-028 BAT	4.3483	Merchant Transmission	4.3483
966731	AG1-544 C	11.0800	50/50	11.0800
966732	AG1-544 E	5.9444	50/50	5.9444
966741	AG1-545 C	1.4763	50/50	1.4763
966742	AG1-545 E	0.7915	50/50	0.7915
G-007A	G-007A	0.1151	Confirmed LTF	0.1151
VFT	VFT	0.3096	Confirmed LTF	0.3096
CALDERWOOD	CALDERWOOD	0.0368	Confirmed LTF	0.0368
PRAIRIE	PRAIRIE	0.1033	Confirmed LTF	0.1033
CHEOAH	CHEOAH	0.0380	Confirmed LTF	0.0380
CBM-N	CBM-N	0.0564	Confirmed LTF	0.0564
COTTONWOOD	COTTONWOOD	0.1302	Confirmed LTF	0.1302
HAMLET	HAMLET	0.0959	Confirmed LTF	0.0959
GIBSON	GIBSON	0.0153	Confirmed LTF	0.0153
BLUEG	BLUEG	0.0451	Confirmed LTF	0.0451
TRIMBLE	TRIMBLE	0.0145	Confirmed LTF	0.0145
CATAWBA	CATAWBA	0.0445	Confirmed LTF	0.0445

10.6.5 Index 5

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
167010985	940430	AE2-027 TAP	DVP	314298	3HARROWG	DVP	1	DVP_P7-1: LN 205-2003	tower	169.0	195.11	195.59	DC	1.81

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
314314	3LOCKS	0.5884	50/50	0.5884
314331	6POE	0.8296	Adder	0.98
316083	AB2-161 C	1.4110	Adder	1.66
316084	AB2-161 E	2.3022	Adder	2.71
316108	AB2-160 C	11.3380	50/50	11.3380
316109	AB2-160 E	18.4988	50/50	18.4988
923852	AB2-025 E	0.3367	Adder	0.4
932581	AC2-078 C O1	1.7322	Adder	2.04
932582	AC2-078 E O1	2.8262	Adder	3.32
932591	AC2-079 C O1	1.6004	Adder	1.88
932592	AC2-079 E O1	2.6111	Adder	3.07
934575	AD1-082 C	3.2157	Adder	3.78
934576	AD1-082 E	1.8343	Adder	2.16
938634	AE1-085 C	3.8713	Adder	4.55
938635	AE1-085 E	1.9357	Adder	2.28
939195	AE1-149 C	5.0832	Adder	5.98
939196	AE1-149 E	3.3888	Adder	3.99
940061	AE2-000BC O1	4.2835	Adder	5.04
940062	AE2-000BE O1	2.8557	Adder	3.36
940431	AE2-027 C O1	40.5173	50/50	40.5173
940432	AE2-027 E O1	27.0115	50/50	27.0115
940481	AE2-033 C	4.6767	Adder	5.5
940482	AE2-033 E	3.1528	Adder	3.71
940541	AE2-040	0.8526	Adder	1.0
940651	AE2-052	1.6944	Adder	1.99
942371	AE2-250 C O1	20.1398	50/50	20.1398
942372	AE2-250 E O1	10.6294	50/50	10.6294
946011	AF1-266	3.9148	Adder	4.61
958141	AF2-108	1.3323	50/50	1.3323
959681	AF2-259 C	1.9985	50/50	1.9985
959682	AF2-259 E	1.3323	50/50	1.3323
962271	AG1-075 C O1	34.7599	50/50	34.7599
962272	AG1-075 E O1	21.1841	50/50	21.1841
966731	AG1-544 C	1.6025	Adder	3.56
966732	AG1-544 E	0.8597	Adder	1.91
966741	AG1-545 C	0.5295	Adder	1.18
966742	AG1-545 E	0.2839	Adder	0.63
WEC	WEC	0.0756	Confirmed LTF	0.0756
LGEE	LGEE	0.1552	Confirmed LTF	0.1552
CPLE	CPLE	0.8552	Confirmed LTF	0.8552
CBM-W2	CBM-W2	3.3958	Confirmed LTF	3.3958

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
NY	NY	0.1095	Confirmed LTF	0.1095
TVA	TVA	0.6454	Confirmed LTF	0.6454
O-066	O-066	1.5344	Confirmed LTF	1.5344
SIGE	SIGE	0.0519	Confirmed LTF	0.0519
CBM-S2	CBM-S2	9.9806	Confirmed LTF	9.9806
CBM-S1	CBM-S1	0.1604	Confirmed LTF	0.1604
G-007	G-007	0.2404	Confirmed LTF	0.2404
MEC	MEC	0.4576	Confirmed LTF	0.4576
LAGN	LAGN	0.8033	Confirmed LTF	0.8033
CBM-W1	CBM-W1	3.1545	Confirmed LTF	3.1545

10.7 Queue Dependencies

The Queue Projects below are listed in one or more indices for the overloads identified in your report. These projects contribute to the loading of the overloaded facilities identified in your report. The percent overload of a facility and cost allocation you may have towards a particular reinforcement could vary depending on the action of these earlier projects. The status of each project at the time of the analysis is presented in the table. This list may change as earlier projects withdraw or modify their requests.

Queue Number	Project Name	Status
AB2-015	Franklin 115kV	Engineering and Procurement
AB2-025	Sapony 34.5kV	In Service
AB2-160	Reams 115kV	Engineering and Procurement
AB2-161	Waverly #2 DP 115kV	Engineering and Procurement
AC2-078	Disputanta-Waverly 115kV	Engineering and Procurement
AC2-079	Ivor-Oak Ridge 115kV	Engineering and Procurement
AD1-082	Bakers Pond-Ivor 115kV	Engineering and Procurement
AD2-085	Myrtle-Windsor DP 115kV	Active
AE1-085	Bakers Pond-Bell Ave 115 kV	Active
AE1-103	Holland-Union Camp 115 kV	Active
AE1-149	Disputanta-Poe 115 kV	Active
AE2-000B	N/A	N/A
AE2-027	Harrowgate-Locks 115kV	Active
AE2-033	Clubhouse-Sappony 230 kV	Active
AE2-040	Sapony 34.5 kV	Active
AE2-052	Disputanta-Poe 115 kV	Active
AE2-104	Suffolk 115 kV	Active
AE2-247	Myrtle-Windsor 115 kV	Active
AE2-250	Purdy Sw.-Reams 115 kV	Active
AF1-017	Myrtle-Windsor 115 kV	Active
AF1-266	Clubhouse-Sapony 230 kV	Active
AF2-108	Locks 34.5 kV	Active
AF2-110	Suffolk 115 kV	Active
AF2-259	Locks 34.5 kV	Active
AF2-400	Franklin 13.2 kV	Engineering and Procurement
AG1-027	Suffolk-Holland 115 kV	Active
AG1-028	Suffolk-Holland 115 kV	Active
AG1-075	Purdy-Sapony 115 kV	Active
AG1-544	Bakers Pond DP 115 kV	Active
AG1-545	W. Quaker Rd-Disputanta 34.5 kV	Active

10.8 Contingency Descriptions

Contingency Name	Contingency Definition
DVP_P1-2: LN 544-A	CONTINGENCY 'DVP_P1-2: LN 544-A' OPEN BRANCH FROM BUS 314902 TO BUS 939410 CKT 1 /* 8CARSON 500.00 - AE1-173_POI 500.00 OPEN BRANCH FROM BUS 314928 TO BUS 939410 CKT 1 /* 8SUFFOLK 500.00 - AE1-173_POI 500.00 OPEN BUS 939410 /* ISLAND: AE1-173_POI 500.00 OPEN BUS 939411 /* ISLAND: AE1-173_MAIN500.00 OPEN BUS 939412 /* ISLAND: AE1-173_SEC 34.500 OPEN BUS 939413 /* ISLAND: AE1-173_COL 34.500 OPEN BUS 939414 /* ISLAND: AE1-173_C1 0.5500 OPEN BUS 939415 /* ISLAND: AE1-173_C2 0.5500 OPEN BUS 939416 /* ISLAND: AE1-173_C3 0.5500 OPEN BUS 939417 /* ISLAND: AE1-173_TER113.800 OPEN BUS 939418 /* ISLAND: AE1-173_TER213.800 OPEN BUS 939419 /* ISLAND: AE1-173_TER313.800 OPEN BUS 939423 /* ISLAND: AE1-173_E1 0.5500 OPEN BUS 939424 /* ISLAND: AE1-173_E2 0.5500 OPEN BUS 939425 /* ISLAND: AE1-173_E3 0.5500 END
DVP_P1-3: 6SUFFOLK-TX#2	CONTINGENCY 'DVP_P1-3: 6SUFFOLK-TX#2' OPEN BRANCH FROM BUS 314536 TO BUS 314537 CKT 1 /* 3SUFFOLK 115.00 - 6SUFFOLK 230.00 END
DVP_P7-1: LN 2002-2003	CONTINGENCY 'DVP_P7-1: LN 2002-2003' /* . OPEN BRANCH FROM BUS 314282 TO BUS 314331 CKT 1 /* 6CARSON 230.00 - 6POE 230.00 OPEN BRANCH FROM BUS 314329 TO BUS 314331 CKT 1 /* 3POE 115.00 - 6POE 230.00 OPEN BRANCH FROM BUS 314263 TO BUS 314287 CKT 1 /* 6TYLER1 230.00 - 6CHESTF B 230.00 OPEN BRANCH FROM BUS 314263 TO BUS 314299 CKT 1 /* 6TYLER1 230.00 - 6HARROWG 230.00 OPEN BRANCH FROM BUS 314299 TO BUS 314331 CKT 1 /* 6HARROWG 230.00 - 6POE 230.00 OPEN BRANCH FROM BUS 314329 TO BUS 314331 CKT 2 /* 3POE 115.00 - 6POE 230.00 OPEN BUS 314263 /* ISLAND: 6TYLER1 230.00 OPEN BUS 314299 /* ISLAND: 6HARROWG 230.00 END
DVP_P1-4: 3BELL AVE 2_AB2-161 TAP_1	CONTINGENCY 'DVP_P1-4: 3BELL AVE 2_AB2-161 TAP_1' OPEN BRANCH FROM BUS 313879 TO BUS 316079 CKT 1 /* 3BELL AVE 2 115.00 - AB2-161 TAP 115.00 END

Contingency Name	Contingency Definition
DVP_P1-3: 6SUFFOLK-TX#5	CONTINGENCY 'DVP_P1-3: 6SUFFOLK-TX#5' OPEN BRANCH FROM BUS 314536 TO BUS 314537 CKT 2 /* 3SUFFOLK 115.00 - 6SUFFOLK 230.00 END
DVP_P1-2: LN 44-A	CONTINGENCY 'DVP_P1-2: LN 44-A' OPEN BRANCH FROM BUS 313803 TO BUS 314531 CKT 1 /* 3OAKRI44 115.00 - 3MYRTLE 115.00 OPEN BRANCH FROM BUS 313803 TO BUS 314536 CKT 1 /* 3OAKRI44 115.00 - 3SUFFOLK 115.00 OPEN BRANCH FROM BUS 314531 TO BUS 936660 CKT 1 /* 3MYRTLE 115.00 - AD2-085 TAP 115.00 OPEN BRANCH FROM BUS 314536 TO BUS 314823 CKT 1 /* 3SUFFOLK 115.00 - 3SUFFO_1 115.00 OPEN BUS 313803 /* ISLAND: 3OAKRI44 115.00 OPEN BUS 314531 /* ISLAND: 3MYRTLE 115.00 OPEN BUS 314823 /* ISLAND: 3SUFFO_1 115.00 END
DVP_P7-1: LN 97-121	CONTINGENCY 'DVP_P7-1: LN 97-121' /* . OPEN BRANCH FROM BUS 314291 TO BUS 314297 CKT 1 /* 3PRGEORG 115.00 - 3F LEE97 115.00 OPEN BRANCH FROM BUS 314297 TO BUS 314340 CKT 1 /* 3F LEE97 115.00 - 3SISISKY 115.00 OPEN BRANCH FROM BUS 314302 TO BUS 314342 CKT 1 /* 3HARVELL 115.00 - 3TEMPLE 115.00 OPEN BRANCH FROM BUS 314340 TO BUS 314342 CKT 1 /* 3SISISKY 115.00 - 3TEMPLE 115.00 OPEN BUS 314297 /* ISLAND: 3F LEE97 115.00 OPEN BUS 314340 /* ISLAND: 3SISISKY 115.00 OPEN BUS 314342 /* ISLAND: 3TEMPLE 115.00 OPEN BRANCH FROM BUS 314291 TO BUS 314329 CKT 1 /* 3PRGEORG 115.00 - 3POE 115.00 END
DVP_P1-2: LN 121	CONTINGENCY 'DVP_P1-2: LN 121' OPEN BRANCH FROM BUS 314291 TO BUS 314329 CKT 1 /* 3PRGEORG 115.00 - 3POE 115.00 END
Base Case	

Contingency Name	Contingency Definition
DVP_P1-2: LN 2003	CONTINGENCY 'DVP_P1-2: LN 2003' OPEN BRANCH FROM BUS 314263 TO BUS 314287 CKT 1 /* 6TYLER1 230.00 - 6CHESTF B 230.00 OPEN BRANCH FROM BUS 314263 TO BUS 314299 CKT 1 /* 6TYLER1 230.00 - 6HARROWG 230.00 OPEN BRANCH FROM BUS 314299 TO BUS 314331 CKT 1 /* 6HARROWG 230.00 - 6POE 230.00 OPEN BRANCH FROM BUS 314329 TO BUS 314331 CKT 2 /* 3POE 115.00 - 6POE 230.00 OPEN BUS 314263 /* ISLAND: 6TYLER1 230.00 OPEN BUS 314299 /* ISLAND: 6HARROWG 230.00 END
DVP_P7-1: LN 205-2003	CONTINGENCY 'DVP_P7-1: LN 205-2003' /* . OPEN BRANCH FROM BUS 314287 TO BUS 314346 CKT 1 /* 6CHESTF B 230.00 - 6TYLER 230.00 OPEN BRANCH FROM BUS 314301 TO BUS 314316 CKT 1 /* 6HARR205 230.00 - 6LOCKS 230.00 OPEN BRANCH FROM BUS 314301 TO BUS 314346 CKT 1 /* 6HARR205 230.00 - 6TYLER 230.00 OPEN BRANCH FROM BUS 314314 TO BUS 314316 CKT 1 /* 3LOCKS 115.00 - 6LOCKS 230.00 OPEN BUS 314301 /* ISLAND: 6HARR205 230.00 OPEN BUS 314346 /* ISLAND: 6TYLER 230.00 OPEN BRANCH FROM BUS 314263 TO BUS 314287 CKT 1 /* 6TYLER1 230.00 - 6CHESTF B 230.00 OPEN BRANCH FROM BUS 314263 TO BUS 314299 CKT 1 /* 6TYLER1 230.00 - 6HARROWG 230.00 OPEN BRANCH FROM BUS 314299 TO BUS 314331 CKT 1 /* 6HARROWG 230.00 - 6POE 230.00 OPEN BRANCH FROM BUS 314329 TO BUS 314331 CKT 2 /* 3POE 115.00 - 6POE 230.00 OPEN BUS 314263 /* ISLAND: 6TYLER1 230.00 OPEN BUS 314299 /* ISLAND: 6HARROWG 230.00 END

11 Short Circuit Analysis

The following Breakers are overdutied:

None

12 Affected Systems

12.1 TVA

TVA Impacts to be determined during later study phases (as applicable).

12.2 Duke Energy Progress

Duke Energy Progress Impacts to be determined during later study phases (as applicable).

13 Attachment 1: One Line Diagram