Generation Interconnection

Impact Study Report

for

Queue Project AE2-227

IRON BRIDGE 34 KV

12 MW Capacity / 20 MW Energy

February, 2020

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1 Introduction

This System Impact Study (SIS) has been prepared in accordance with the PJM Open Access Transmission Tariff, 205, as well as the Impact Study Agreement between the Interconnection Customer (IC), and PJM Interconnection, LLC (PJM), Transmission Provider (TP). The Interconnected Transmission Owner (ITO) is Virginia Electric and Power Company (VEPCO).

2 Preface

The intent of the System Impact Study is to determine a plan, with approximate cost and construction time estimates, to connect the subject generation interconnection project to the PJM network at a location specified by the Interconnection Customer. As a requirement for interconnection, the Interconnection Customer may be responsible for the cost of constructing: Network Upgrades, which are facility additions, or upgrades to existing facilities, that are needed to maintain the reliability of the PJM system. All facilities required for interconnection of a generation interconnection project must be designed to meet the technical specifications (on PJM web site) for the appropriate transmission owner.

In some instances an Interconnection Customer may not be responsible for 100% of the identified network upgrade cost because other transmission network uses, e.g. another generation interconnection or merchant transmission upgrade, may also contribute to the need for the same network reinforcement. 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 System Impact Study is performed.

The System Impact 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.

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.

3 General

The Interconnection Customer (IC) has proposed a solar generating facility located in Chesterfield County, Virginia. The installed facilities will have a total capability of 20 MW with 12 MW of this output being recognized by PJM as Capacity. The proposed in-service date for this project is 10/31/2022. This study does not imply a Transmission Owner (TO) commitment to this in-service date.

Attachment facilities and local upgrades (if required) along with terms and conditions to interconnect AE2-227 will be specified in a separate two party Interconnection Agreement (IA) between ITO and the IC as this project is considered FERC non-jurisdictional per the PJM Open Access Transmission Tariff (OATT).

Queue Number	AE2-227
Project Name	IRON BRIDGE 34 KV
Interconnection Customer	TCE Virginia Development, LLC
State	Virginia
County	Chesterfield
Transmission Owner	Dominion
MFO	20
MWE	20
MWC	12
Fuel	Solar
Basecase Study Year	2022

3.1 Point of Interconnection

AE2-227 will interconnect with the Dominion distribution system at the Iron Bridge 34kV substation.

3.2 Cost Summary

The AE2-227 project will be responsible for the following costs:

Description	Total Cost
Attachment Facilities	$ To be provided in IA
Direct Connection Network Upgrade	$ To be provided in IA
Non Direct Connection Network Upgrades	$ To be provided in IA
Total Costs	$ To be provided in IA

In addition, the AE2-227 project may be responsible for a contribution to the following costs

Description	Total Cost
System Upgrades	$ 0

4 Transmission Owner Scope of Work

Attachment facilities and local upgrades (if required) along with terms and conditions to interconnect AE2-227 will be specified in a separate two party Interconnection Agreement (IA) between ITO and the IC as this project is considered FERC non-jurisdictional per the PJM Open Access Transmission Tariff (OATT). From the transmission system perspective, no network reinforcements are required as shown in the Network Impact Section below. The single line is shown below in Attachment 1.

Dominion assessed the impact of the proposed Queue Project AE2-227 was evaluated as a 12.0 MW Capacity (20.0 MW Energy) injection at the Iron Bridge 34.5 kV substation bus in the Dominion Transmission System, for compliance with NERC Reliability Criteria on Dominion Transmission System. The system was assessed

using the summer 2022 AE2 case provided to Dominion by PJM. When performing a generation analysis, Dominion's main analysis will be load flow study results under single contingency (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 Category C Contingency Conditions (Bus Fault, Tower Line, N-1-1, and Stuck Breaker scenarios) 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.

The required Attachment Facilities, Direct Connection and Non-Direct Connection work for the interconnection of the AE2-227 generation project to the Dominion Transmission System is detailed in the following sections. The associated one-line with the generation project attachment facilities and primary direct and non-direct connection are shown in Attachment 1.

Note that the ITO findings were made from a conceptual review of this project. A more detailed review of the connection facilities and their cost will be identified in a future study phases. Further note that the cost estimate data contained in this document should be considered high level estimates since it was produced without a detailed engineering review. The applicant will be responsible for the actual cost of construction. ITO herein reserves the right to return to any issues in this document and, upon appropriate justification, request additional monies to complete any reinforcements to the transmission systems.

5 Transmission Owner Analysis

5.1 Power Flow Analysis

PJM performed a power flow analysis of the transmission system using a 2022 summer peak load flow model and the results were verified by Dominion. Additionally, Dominion performed an analysis of its transmission system. The AE2-227 project contributes to overloads on the Dominion transmission system as shown in the "Network Impact" section of the report. The estimated cost of system reinforcements necessary to mitigate these overloads is also provided.

5.2 Short Circuit Analysis

PJM performed a short circuit analysis and the results were verified by Dominion. The connection of AE2-227 project to the system does not result in any newly overdutied circuit breakers on the Dominion transmission system and does not have a significant fault current contribution to existing overdutied circuit breakers

5.3 Stability Analysis

No transmission system stability analysis was required for this project.

6 Interconnection Customer Requirements

6.1 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.

6.2 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 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.

6.3 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.

7 Revenue Metering and SCADA Requirements

7.1 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.

7.1.1 Meteorological Data Reporting Requirement

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

- Temperature (degrees Fahrenheit)
- Atmospheric pressure (hectopascals)
- Irradiance
- Forced outage data

7.2 Dominion Requirements

See Section 3.4.6 “Metering and Telecommunications” of Dominion’s “Dominion’s Facility Interconnection Requirements” document located at: https://www.dominionenergy.com/company/moving-energy/electrictransmission-access.

8 Network Impacts

The Queue Project AE2-227 was evaluated as a 20.0 MW (Capacity 12.0 MW) injection at the Iron Bridge 34 kV substation in the Dominion area. Project AE2-227 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AE2-227 was studied with a commercial probability of 100%. Potential network impacts were as follows:

Summer Peak Load Flow

9 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
1816710 2	31421 8	6ELMON T	230. 0	DVP	31490 8	8ELMON T	500. 0	DVP	1	DVP_P1 -2: LN 557	singl e	920.9 2	99.77	100.0	AC	2.1

10 Multiple Facility Contingency

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

None

11 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)

None

12 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
397964 69	31430 9	6IRON208	230. 0	DVP	31433 8	6SOUWEST	230. 0	DVP	1	314903(8CHCKAHM)-314908()_1	operati on	663.6 4	132.58	134.02	AC	9.37

13 System Reinforcements

ID	Index	Facility	Upgrade Description	Cost	Cost Allocated to AE1-252	NUN
18167102	1	6ELMONT 230.0 kV - 8ELMONT 500 kV Ckt 1	To resolve the Elmont 500/230 kV overload: **n6127**: Elmont 500 – 230 kV Tx#1: replace the 500-230 kV transformer #1 increase its line rating to 1134 MVA (normal), 1203 MVA (emergency), and 1365 MVA (load dump). **Project Type** : CON **Cost** : $22 million **Time Estimate** : 24-30 months Queue Project AE2-227 presently does not receive cost allocation for this upgrade. Note 1: as changes to the interconnection process occur, such as prior queued projects withdrawing from the queue, reducing in size, etc, Queue Project AE2-227 could receive cost allocation. Note 2: Although Queue Project AE2-227 may not have cost responsibility for this upgrade, Queue Project AE2-227 may need this upgrade in-service to be deliverable to the PJM system. If Queue Project AE2-227 comes into service prior to completion of the upgrade, Queue Project AE2-227 will need an interim study.	$22,000,000	$0	n6127
			Total Cost:	**$22,000,000**	**$0**	

14 Flow Gate Details

The following appendices contain additional information about each flowgate presented in the body of the report. For each appendix, a description of the flowgate and its contingency was included for convenience. However, the intent of the appendix section is to provide more information on which projects/generators have contributions to the flowgate in question. Although this information is not used "as is" for cost allocation purposes, it can be used to gage other generators impact. It should be noted the generator contributions presented in the appendices sections are full contributions, whereas in the body of the report, those contributions take into consideration the commercial probability of each project.

14.1 Contingency Descriptions

Contingency Name	Contingency Definition
DVP_P1-2: LN 557	CONTINGENCY 'DVP_P1-2: LN 557' OPEN BRANCH FROM BUS 314214 TO BUS 314903 CKT 1 /* 6CHCKAHM 230.00 - 8CHCKAHM 500.00 OPEN BRANCH FROM BUS 314903 TO BUS 314908 CKT 1 /* 8CHCKAHM 500.00 - 8ELMONT 500.00 END

Contingency Name	Contingency Definition
314903(8CHCKAHM)-314908()_1	CONTINGENCY '314903(8CHCKAHM)-314908()_1' OPEN BRANCH FROM BUS 314903 TO BUS 314908 CKT 1 END

14.2 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
18167102	314218	6ELMONT	DVP	314908	8ELMONT	DVP	1	DVP_P1-2: LN 557	single	920.92	99.77	100.0	AC	2.1

Bus #	Bus	MW Impact
314229	6MT RD221	0.1199
314236	6NRTHEST	0.1589
314243	3PROV 92	0.2918
314250	6ROCKVILLE	0.2697
314309	6IRON208	0.3461
315043	1FOUR RIVERA	2.9688
315044	1FOUR RIVERB	2.2998
315045	1FOUR RIVERC	2.9688
315046	1FOUR RIVERD	2.2998
315047	1FOUR RIVERE	2.2998
315048	1FOUR RIVERF	2.9663
315050	1FOURRIVERG	3.7284
315053	**1BELMED1 (Deativation : 04/16/18)**	**16.2723**
315054	**1BELMED2 (Deativation : 04/16/18)**	**16.2723**
315055	**1BELMED3 (Deativation : 04/16/18)**	**13.5058**
315058	**1CHESTF3 (Deativation : 12/13/18)**	**17.2790**
315059	**1CHESTF4 (Deativation : 12/13/18)**	**28.0093**
315060	1CHESTF5	7.4886
315061	1CHESTG7	2.9350
315062	1CHESTS7	1.3341
315063	1CHESTG8	2.8794
315064	1CHESTS8	1.4830
315065	1CHESTF6	14.5913
315067	1DARBY 1	2.1513
315068	1DARBY 2	2.1538
315069	1DARBY 3	2.1614
315070	1DARBY 4	2.1639
315074	**1HOPCGN1 (Deativation : 06/25/19)**	**6.1303**
315075	**1HOPCGN2 (Deativation : 06/25/19)**	**6.0509**
315077	1HOPHCF1	1.7122
315078	1HOPHCF2	1.7122
315079	1HOPHCF3	1.7122
315080	1HOPHCF4	2.5993
315083	**1SPRUNCA (Deativation : 01/12/19)**	**9.5161**
315084	**1SPRUNCB (Deativation : 01/12/19)**	**9.5161**
315090	**1YORKTN1 (Deativation : 09/09/18)**	**16.7829**
315091	**1YORKTN2 (Deativation : 09/09/18)**	**17.4162**
919211	AA1-145	8.5832
923831	AB2-022 C	1.1412
924061	AB2-050	0.5049
924241	AB2-068 O1	96.4791

Bus #	Bus	MW Impact
925051	AB2-160 C O1	3.8752
925061	AB2-161 C O1	1.9635
925331	AB2-190 C	13.4441
925811	AC1-060	0.0529
925861	AC1-065 C	2.3718
926291	AC1-107 O1	145.6288
926411	AC1-112 C	0.2923
926551	AC1-134	1.2622
926661	AC1-147 C	1.1536
926751	AC1-161 C O1	14.7202
926781	AC1-164 C	37.3130
927041	AC1-191 C O1	11.2177
927221	AC1-216 C O1	6.4756
930121	AB1-027 C	0.3754
932041	AC2-012 C	5.2185
932501	AC2-070 C	1.8629
932581	AC2-078 C O1	2.5700
932591	AC2-079 C O1	3.1507
932831	AC2-110 C	0.9487
933061	AC2-130	0.2927
933261	AC2-137 C	2.0168
933271	AC2-138 C	0.4714
933291	AC2-141 C	14.7202
933731	AC2-196 C	0.8989
934011	AD1-025 C	11.1313
934061	AD1-033 C	3.7799
934141	AD1-041 C	3.6799
934571	AD1-082 C	4.4748
934781	AD1-105 C	7.3674
935111	AD1-144 C	0.9106
935161	AD1-151 C O1	10.8033
935211	AD1-156 C	1.3794
936041	AD2-007	1.1817
936051	AD2-008 C	1.9379
936151	AD2-021	0.2300
936301	AD2-039 C	0.9487
936341	AD2-044 C	0.1473
936581	AD2-073 C	1.2168
936591	AD2-074 C	3.4653
936661	AD2-085 C	1.8970
936761	AD2-097 C	1.8048
937221	AD2-160 C O1	2.9294
937251	AD2-164	2.7867
937541	AD2-215 C	0.9200
938031	AE1-004 C	0.9487
938181	AE1-027 C	1.1749
938191	AE1-028 C	0.6816
938531	AE1-072 C O1	8.7590
938551	AE1-074 C	1.6981
938631	AE1-085 C O1	5.5781
938771	AE1-103 C O1	1.7991
939191	AE1-149 C O1	6.8774

Bus #	Bus	MW Impact
939241	AE1-155 C	7.9447
939281	AE1-159 C O1	6.5840
939311	AE1-162 C	1.2184
939421	AE1-174 C	0.2359
939431	AE1-175 C	1.5689
939611	AE1-191 C	7.3598
939751	AE1-206 C O1	34.6737
940061	AE1-248 C O1	9.3009
940071	AE1-249 C	5.1117
940231	AE2-005 C	0.9487
940251	AE2-007 O1	88.3404
940431	AE2-027 C O1	11.4422
940481	AE2-033 C	8.3260
940541	AE2-040 O1	1.6747
940551	AE2-041	5.0463
940651	AE2-052	2.2924
940891	AE2-078 C	1.4181
940901	AE2-079 C	1.4181
940911	AE2-080 C	1.4181
941101	AE2-104 C O1	1.8003
941141	AE2-108 C	1.3622
941151	AE2-109 C	0.4768
941281	AE2-122 C O1	14.3966
941291	AE2-123 C O1	14.7952
941301	AE2-124 C O1	13.4392
941501	AE2-147 C	7.8129
941531	AE2-150	0.1116
941581	AE2-155 C	0.7087
941591	AE2-156 O1	9.1469
941601	AE2-157 C	6.3857
942001	AE2-212 C	1.5425
942131	AE2-225 C	1.0800
942151	AE2-227 C	2.1048
942161	AE2-228 C	1.9150
942171	AE2-229 C	0.8100
942191	AE2-231 C O1	2.9187
942341	AE2-247 C	0.8222
942371	AE2-250 C O1	6.8836
942401	AE2-253 C	3.0812
942471	AE2-260 C O1	7.0738
942551	AE2-270 S C	10.6802
942552	AE2-270 B C	7.1201
942851	AE2-304 C	0.3083
LGEE	LGEE	0.0506
CIN	CIN	0.1715
CPLE	CPLE	3.0667
IPL	IPL	0.0646
CBM-W2	CBM-W2	15.1148
CBM-W1	CBM-W1	0.0811
WEC	WEC	0.0419
CBM-S2	CBM-S2	5.4628
CARR	CARR	0.4866

Bus #	Bus	MW Impact
CBM-S1	CBM-S1	2.7177
AA2-074	AA2-074	2.0862
MEC	MEC	1.3075
RENSSELAER	RENSSELAER	0.3849

14.3 Queue Dependencies

Queue Number	Project Name	Status
AE2-079	Poolesville 34.5 kV	Active
AE2-124	Landstown 230 kV	Active
AE1-072	Shawboro-Sligo 230 kV	Active
AE2-250	Purdy Sw.-Reams 115 kV	Active
AE2-007	Chesapeake 230 kV	Active
AE1-103	Holland-Union Camp 115 kV	Active
AE1-149	Disputanta-Poe 115 kV	Active
AE2-033	Clubhouse-Sappony 230 kV	Active
AE2-155	Old Church 34.5 kV	Active
AE2-122	Birdneck-Landstown 230 kV	Active
AB2-161	Waverly #2 DP 115kV	Engineering and Procurement
AC2-141	Septa 500kV	Active
AC1-134	Four Rivers 230kV	In Service
AD1-144	Kings Fork 34.5 kV	Engineering and Procurement
AE2-027	Harrowgate-Locks 115kV	Active
AE1-085	Bakers Pond-Bell Ave 115 kV	Active
AE2-229	Suffolk 34 kV	Active
AE1-248	Bell Avenue 115 kV	Active
AB1-027	Old Church 34.5 KV	Under Construction
AC1-164	Chickahominy 230kV	Active
AC1-107	Chickahominy 500kV	Engineering and Procurement
AD1-025	Hopewell-Surry 230 kV	Active
AD2-039	Harmony Village-Shackleford 115 kV	Engineering and Procurement
AD2-085	Myrtle-Windsor DP 115kV	Active
AD2-044	Northern Neck 34.5 kV	Engineering and Procurement
AC2-078	Disputanta-Waverly 115kV	Active
AE1-028	Hickory 34.5 kV	Engineering and Procurement
AC2-012	Grassfield-Great Bridge 115kV	Active
AE2-123	Birdneck-Landstown 230 kV	Active
AC1-065	Harmony Village-Shackleford 115kV	Engineering and Procurement
AD2-160	Hickory-Moyock 230kV	Active
AE1-159	Fredericksburg-Pinewood 115 kV	Active
AC2-079	Ivor-Oakridge 115kV	Active
AD1-082	Bakers Pond-Ivor 115kV	Active
AB2-050	Four Rivers 230kV	In Service
AE2-156	Yadkin 115 kV	Active
AE2-304	South Hertford 34 kV	Engineering and Procurement
AD1-156	Poe 34.5 kV	Engineering and Procurement
AB2-160	Reams 115kV	Engineering and Procurement
AE2-005	Harmony Village-Shackleford 115 kV	Active
AE2-104	Suffolk 115 kV	Active
AC2-130	Chesterfield 230kV 5	In Service
AE2-078	Poolesville 34.5 kV	Active
AE1-174	Light Foot 34.5 kV	Active
AD2-215	Kings Fork 34.5 kV	Engineering and Procurement
AC1-216	Hopewell-Surry 230kV	Active
AE2-040	Sapony 34.5 kV	Active
AB2-022	Elizabeth City 34.5kV	Engineering and Procurement
AE1-074	Winterpock 34.5 kV	Engineering and Procurement

Queue Number	Project Name	Status
AE1-191	Harmony Village-Shackleford 115 kV	Active
AD2-074	Garner DP-Lancaster 115 kV	Active
AD2-164	Peninsula 34.5kV	Engineering and Procurement
AE2-247	Myrtle-Windsor 115 kV	Active
AB2-068	Chickahominy 500kV	Suspended
AE2-270	Hopewell-Surry 230 kV	Active
AD2-007	Hopewell-Surry 230 kV	Active
AC2-138	Northern Neck 34.5kV	Engineering and Procurement
AE2-225	Suffolk 34 kV	Active
AD1-041	Harmony Village-Shackleford 115 kV	Active
AC1-060	Providence Forge 34.5kV	In Service
AE1-206	Four Rivers-Hanover 230 kV	Active
AD2-008	Hopewell-Surry 230 kV	Active
AD1-033	Fentress-Landstown 230 kV	Active
AE1-155	Garner-Northern Neck 115 kV	Active
AE2-052	Disputanta-Poe 115 kV	Active
AE1-027	Hickory 34.5 kV	Engineering and Procurement
AC1-191	Elmont 115kV	Active
AE1-004	Harmony Village-Shackleford 115 kV	Active
AC2-196	Fentress 34.5kV	Engineering and Procurement
AE2-212	Harrowgate 34 kV	Active
AC1-112	Old Church 34.5kV	In Service
AE2-260	Clubhouse 230 kV	Active
AE2-253	Hickory-Moyock 230 kV	Active
AC1-161	Septa 500kV	Active
AD1-105	Kings Dominion DP 115 kV	Active
AE1-249	Reams 115 kV	Active
AD1-151	Hopewell-Surry 230 kV	Active
AB2-190	Hopewell-Surry 230kV	Engineering and Procurement
AE1-162	Smithfield 34.5 kV	Engineering and Procurement
AE2-147	Swamp 230 kV	Active
AE2-231	St. Johns 115 kV	Active
AE2-041	Harmony Village 230 kV	Active
AE2-108	Kings Dominion DP 115kV	Active
AD2-021	Elko 34.5 kV	Engineering and Procurement
AD2-073	Sanders DP 230 kV	Active
AE2-227	Iron Bridge 34 kV	Active
AE2-157	Wakefield–Waverly 115 kV	Active
AE2-109	Kings Dominion DP 115 kV	Active
AD2-097	Spruance NUG 230kV	Engineering and Procurement
AC2-110	Harmony Village-Shackleford 115kV	Engineering and Procurement
AE2-080	Poolesville 34.5 kV	Active
AE2-270	Hopewell-Surry 230 kV	Active
AA1-145	Four Rivers 230kV	In Service
AC1-147	Grassfield 34.5kV	Engineering and Procurement
AC2-070	Old Church 34.5kV	Engineering and Procurement
AA2-074	CPLE-PJM	Confirmed
AE2-150	Bakers Pond-Bell Ave 115 kV	Active
AC2-137	Elko 34.5kV	Engineering and Procurement
AE1-175	Light Foot 34.5 kV	Active
AE2-228	Tyler 34 kv	Active

Affected Systems

15 Affected Systems

15.1 Duke Energy Progress

No Duke Energy Progress impacts were identified as part of this study.

Short Circuit

16 Short Circuit

The following Breakers are overdutied:

None

Attachment 1

System Configuration