# Generation Interconnection

# System Impact Study Report

# for

# Queue Project AG1-221

# POLAND RD-RUNWAY DP 230 KV

# 20 MW Capacity / 50 MW Energy

August 2021

# Table of Contents

# 1 Introduction

This System Impact Study has been prepared in accordance with the PJM Open Access Transmission Tariff, 205, as well as the System Impact 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 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.

## 3 General

The Interconnection Customer (IC), has proposed a Storage generating facility located in Loudoun County, Virginia. The installed facilities will have a total capability of 50 MW with 20 MW of this output being recognized by PJM as Capacity. The proposed in-service date for this project is June 01, 2023. This study does not imply a TO commitment to this in-service date.

| | |
|---|---|
| **Queue Number** | **AG1-221** |
| **Project Name** | POLAND RD-RUNWAY DP 230 KV |
| **State** | Virginia |
| **County** | Loudoun |
| **Transmission Owner** | Dominion |
| **MFO** | 50 |
| **MWE** | 50 |
| **MWC** | 20 |
| **Fuel** | 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

AG1-221 "Poland Rd-Runway DP 230 kV" will interconnect with the Dominion transmission system. The primary POI is a direct connect to the new substation to be constructed for the AF1-147 project.

The IC is responsible for securing right-of-way, permits, and constructing the proposed attachment line from the generating facility site to the Point of Interconnection. The IC may not install any facilities on Dominion's right-of-way without first obtaining the necessary approval from Dominion Energy.

Costs provided are contingent on the AF1-147 project being built. Should the AF1-147 project withdraw from the Interconnection Queue, the AG1-221 project will assume the Attachment, Direct Connection, and Non-Direct Connection costs identified in the AF1-147 study report for connection to the Dominion system.

Attachment 1 shows a one-line diagram of the proposed interconnection facilities.

## 5 Cost Summary

The AG1-221 project will be responsible for the following costs:

| Description | Total Cost |
|---|---|
| **Total Physical Interconnection Costs** | $3,300,000 |
| **Allocation towards System Network Upgrade Costs (PJM Identified - Summer Peak)*** | $0 |
| **Allocation towards System Network Upgrade Costs (PJM Identified - Light Load)*** | $0 |
| **Total Costs** | **$3,300,000** |

*As your project progresses through the study process and other projects modify their request or withdraw, then your cost allocation could change.

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 88-129. 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.

Note 1: PJM Open Access Transmission Tariff (OATT) section 217.3A outline cost allocation rules. The rules are further clarified in PJM Manual 14A Attachment B. The allocation of costs for a network upgrade will start with the first Queue project to cause the need for the upgrade. Later queue projects will receive cost allocation contingent on their contribution to the violation and are allocated to the queues that have not closed less than 5 years following the execution of the first Interconnection Service Agreement which identifies the need for this upgrade.

Note 2: For customers with System Reinforcements listed: If your present cost allocation to a System Reinforcement indicates $0, then please be aware that as changes to the interconnection process occur, such as prior queued projects withdrawing from the queue, reducing in size, etc, the cost responsibilities can change and a cost allocation may be assigned to your project. In addition, although your present cost allocation to a System Reinforcement is presently $0, your project may need this system reinforcement completed to be deliverable to the PJM system. If your project comes into service prior to completion of the system reinforcement, an interim deliverability study for your project will be required.

## 6 Transmission Owner Scope of Work

The required Attachment Facilities, Direct Connection and Non-Direct Connection work for the interconnection of AG1-221 to the Dominion Transmission System is detailed in the following sections. The associated one-line showing the generation project attachment facilities and primary direct and non-direct connection is 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 phase. 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.

The total physical interconnection costs are given in the table below:

| Description | Total Cost |
|---|---|
| ***Attachment Facilities*** | $2,100,000 |
| ***New Breaker*** | $1,200,000 |
| **Total Physical Interconnection Costs** | **$3,300,000** |

AG1-221 "Poland Rd-Runway DP 230 kV" will interconnect with the Dominion transmission system. The primary POI is a direct connect to the new substation to be constructed for the AF1-147 project.

To accommodate the proposed Project, Dominion Energy will add one new 230 kV breaker to the AF1-147 substation to allow for the proposed interconnection. Dominion will install one span of overhead 230 kV line to the point of interconnection ("POI") including 230 kV interconnection metering.

It is estimated to take 24-30 months to complete this work upon execution of an Interconnection Construction Service Agreement (ICSA). These preliminary cost estimates are based on typical engineering costs. A more detailed engineering cost estimates are normally done when the IC provides an exact site plan location for the generation substation during the Facility Study phase.

*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 Schedule

Based on the scope of work for the interconnection facilities, it is expected to take a minimum of 24-30 months after the signing of an Interconnection Construction Service Agreement (or "Interconnection Agreement" if non-FERC) and construction kickoff call to complete the installation of the physical connection work. This assumes that there will be no environmental issues with any of the new properties associated with this project, that there will be no delays in acquiring the necessary permits for implementing the defined interconnection work, and that all system outages will be allowed when requested.

The schedule for any required Network Impact Reinforcements will be more clearly identified in future study phases. The estimated time to complete each of the required reinforcements is identified in the "System Reinforcements" section of the report.

## 8 Transmission Owner Analysis

Dominion assessed the impact of the proposed AG1-221 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.

### 8.1 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.

## 9 Interconnection Customer Requirements

### 9.1 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.

### 9.2 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.

### 9.3 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.

## 10 Revenue Metering and SCADA Requirements

### 10.1 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.

### 10.2 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/

## 11 Summer Peak Analysis

The Queue Project AG1-221 was evaluated as a 50.0 MW (Capacity 20.00 MW) injection tapping the Poland Rd to Runway DP 230 kV line in the Dominion area. Project AG1-221 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AG1-221 was studied with a commercial probability of 100.0 %. Potential network impacts were as follows:

### 11.1 Generation Deliverability

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

None

### 11.2 Multiple Facility Contingency

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

None

## 11.3 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)

None

## 11.4 Steady-State Voltage Requirements

To be determined

## 11.5 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **167634385** | 223938 | DICKH230 | 230.0 | PEPCO | 223937 | DICK 230 | 230.0 | PEPCO | 2 | PEPCO_P1_PP1 | operation | 680.0 | 98.77 | 99.88 | AC | 7.57 |
| **167634388** | 223938 | DICKH230 | 230.0 | PEPCO | 223937 | DICK 230 | 230.0 | PEPCO | 1 | PEPCO_P1_PP2 | operation | 680.0 | 98.77 | 99.88 | AC | 7.57 |
| **185664255** | 314171 | 6BRAMBL | 230.0 | DVP | 313827 | 6EVERGR MILL | 230.0 | DVP | 1 | DVP_P1-2: LN 2137-B | operation | 984.2 | 83.68 | 85.92 | AC | 22.19 |

## 11.6 System Reinforcements

None

## 11.7 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 |
|---|---|---|
| **AC1-056** | PJM-AMIL | Confirmed |
| **AC1-131** | PJM-CPLE | Confirmed |
| **AG1-221** | Poland Rd-Runway DP 230 kV | Active |
| **AG1-534** | Evergreen Mills 230 kV | Active |

## 11.8 Contingency Descriptions

| Contingency Name | Contingency Definition |
|---|---|
| **PEPCO_P1_PP1** | CONTINGENCY 'PEPCO_P1_PP1'<br>OPEN BRANCH FROM BUS 223937 TO BUS 223938 CKT 1 / 223937 DICK 230 230 223938 DICKH230 230 1<br>END |
| **PEPCO_P1_PP2** | CONTINGENCY 'PEPCO_P1_PP2'<br>OPEN BRANCH FROM BUS 223937 TO BUS 223938 CKT 2 / 223937 DICK 230 230 223938 DICKH230 230 2<br>END |
| **DVP_P7-1: LN 227-274** | CONTINGENCY 'DVP_P7-1: LN 227-274' /* .<br>OPEN BRANCH FROM BUS 313859 TO BUS 314170 CKT 1 /* 6BELMONT 230.00 - 6COHMIL 230.00<br>OPEN BRANCH FROM BUS 314006 TO BUS 314010 CKT 1 /* 6ASHBURA 230.00 - 6BEAMEAD 230.00<br>OPEN BRANCH FROM BUS 314006 TO BUS 314170 CKT 1 /* 6ASHBURA 230.00 - 6COHMIL 230.00<br>OPEN BUS 314006 /* ISLAND: 6ASHBURA 230.00<br>OPEN BUS 314170 /* ISLAND: 6COHMIL 230.00<br>OPEN BRANCH FROM BUS 314004 TO BUS 314010 CKT 1 /* 6ASHBURN 230.00 - 6BEAMEAD 230.00<br>OPEN BRANCH FROM BUS 314004 TO BUS 314072 CKT 1 /* 6ASHBURN 230.00 - 6PL VIEW 230.00<br>OPEN BUS 314004 /* ISLAND: 6ASHBURN 230.00<br>OPEN BUS 314354 /* ISLAND: 6ASHBURN_2 230.00<br>OPEN BUS 314359 /* ISLAND: 6ASHBU_1 230.00<br>END |

| Contingency Name | Contingency Definition |
|---|---|
| **DVP_P1-2: LN 2137-B** | CONTINGENCY 'DVP_P1-2: LN 2137-B'<br>OPEN BRANCH FROM BUS 944820 TO BUS 313864 CKT 1 /* AF1-147 TAP 230.00 - 6POLAND RD 230.00<br>END |

## 12 Light Load Analysis

The Queue Project AG1-221 was evaluated as a 50.1 MW (Capacity 50.1 MW) injection tapping the Poland Rd to Runway DP 230 kV line in the Dominion area. Project AG1-221 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AG1-221 was studied with a commercial probability of 100.0 %. Potential network impacts were as follows:

### 12.1 Light Load Deliverability

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

None

### 12.2 Multiple Facility Contingency

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

None

### 12.3 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)

None

### 12.4 Steady-State Voltage Requirements

To be determined

### 12.5 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 | CONTNAME | Type | Rating MVA | PRE PROJECT LOADING % | POST PROJECT LOADING % | AC\|DC | MW IMPACT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **178590595** | 223937 | DICK 230 | 230.0 | PEPCO | 314290 | 6EDFERRY | 230.0 | DVP | 1 | AP-P1-2-PE-500-407T | operation | 1417.0 | 91.21 | 92.56 | DC | 14.53 |
| **178590470** | 314290 | 6EDFERRY | 230.0 | DVP | 314072 | 6PL VIEW | 230.0 | DVP | 1 | AP-P1-2-PE-500-407T | operation | 1327.2800293 | 96.27 | 97.71 | DC | 14.53 |

## 12.6 System Reinforcements

None

## 12.7 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 |
|---|---|---|
| **AA1-038** | Lexington-Low Moor 230kV | Engineering and Procurement |
| **AA2-017** | East Palmerton-Acahela 69kV | Suspended |
| **AA2-048** | Allenwood-Larrabee 34kV | Engineering and Procurement |
| **AA2-060** | Branchville-Sussex #1 34kV | Engineering and Procurement |
| **AA2-061** | Branchville-Sussex #2 34.5kV | Engineering and Procurement |
| **AB1-182** | Bear Creek | Suspended |
| **AC1-071** | Paupack-Lackawanna 230kV | Suspended |
| **AC2-053** | Germantown 115kV | Suspended |
| **AD1-143** | Hauto-Siegfried 69 kV | Suspended |
| **AD2-025** | Hillsborough 13 kV | Suspended |
| **AD2-059** | Chapel Street 138 kV | Active |
| **AD2-077** | Buxmont 69 kV | Active |
| **AE1-051** | East Carbondale-Lackawanna 69kV | Active |
| **AE1-060** | Kittatinny-Newton 34.5 kV | Active |
| **AE1-061** | Minotola 12 kV | Active |
| **AE1-062** | Silver Lake 69 kV | Active |
| **AE1-087** | Todd 69 kV | Engineering and Procurement |
| **AE1-104** | BL England 138 kV | Active |
| **AE1-115** | Churchtown 69 kV | Active |
| **AE1-145** | Wallops Island 69 kV | Active |

| Queue Number | Project Name | Status |
|---|---|---|
| **AE1-147** | Bellefonte 46 kV | Engineering and Procurement |
| **AE1-161** | Landis 138 kV | Active |
| **AE1-243** | Warren Glen Storage 34.5 kV | Active |
| **AE2-000** | N/A | N/A |
| **AE2-019** | New Road 230 kV | Active |
| **AE2-020** | Cardiff 230 kV I | Active |
| **AE2-021** | Cardiff 230 kV II | Active |
| **AE2-022** | Cardiff 230 kV III | Active |
| **AE2-024** | Larrabee 230 kV I | Active |
| **AE2-025** | Larrabee 230 kV II | Active |
| **AE2-040** | Sapony 34.5 kV | Active |
| **AE2-041** | Harmony Village 230 kV | Active |
| **AE2-046** | Harwood-East Hazelton 69 kV | Active |
| **AE2-052** | Disputanta-Poe 115 kV | Active |
| **AE2-053** | Kerr Dam-Ridge Road 115 kV | Active |
| **AE2-150** | Bakers Pond-Bell Ave 115 kV | Active |
| **AE2-156** | Yadkin 115 kV | Active |
| **AE2-222** | Higbee 69 kV | Active |
| **AE2-237** | Vernon-Sugar Loaf #2 115 kV | Active |
| **AE2-251** | Cardiff 230 kV | Active |
| **AE2-257** | Cedar Neck 69 kV | Active |
| **AE2-270** | Hopewell-Surry 230 kV | Active |
| **AE2-295** | Eldred 230 kV | Active |
| **AF1-007** | Indian River 230 kV I | Active |
| **AF1-018** | Harmony Village 230 kV | Active |
| **AF1-019** | Branchville-Holiday Lakes 34.5 kV | Active |
| **AF1-026** | Edge Road Battery Storage (CIRs) | In Service |
| **AF1-027** | Plumsted 537 Energy Storage (CIRs) | In Service |
| **AF1-040** | Gratz Tap 69 kV | Active |
| **AF1-059** | Brodnax-South Hill 115 kV | Active |
| **AF1-066** | New Road 230 kV | Active |
| **AF1-082** | Heartsease-Mayo Dunbar DP | Active |
| **AF1-099** | Moshannon-Milesburg 230 kV | Active |
| **AF1-101** | Oyster Creek 230 kV III | Active |
| **AF1-105** | Glen Gardner 34.5 kV | Active |
| **AF1-106** | East Sayre 34.5 kV | Active |
| **AF1-108** | East Flemington 34.5 kV | Active |
| **AF1-109** | Pleasant Valley 230 kV | Active |
| **AF1-142** | Moshannon-Milesburg 230 kV | Active |
| **AF1-160** | Silver Lake 69 kV | Active |
| **AF1-201** | Hayes-White Marsh 115 kV | Active |
| **AF1-208** | Quinton-Roadstown 69 kV | Active |
| **AF1-222** | Oceanview Wind 2 230 kV | Active |
| **AF1-231** | New Church 138 kV | Active |
| **AF1-237** | Mercer 230 kV | Active |
| **AF1-238** | Sherman Ave. 69 kV | Active |
| **AF1-239** | Sherman Ave-Vineland 69 kV | Active |
| **AF1-244** | Kingston 12 kV | Active |
| **AF1-245** | Hudson 230 kV | Active |
| **AF1-265** | Four Rivers-Hanover 230 kV | Active |
| **AF1-266** | Clubhouse-Sapony 230 kV | Active |
| **AF1-293** | Kidds Store-Fort Union 115 kV | Active |

| Queue Number | Project Name | Status |
|---|---|---|
| **AF1-320** | Merrill Creek 115 kV | Active |
| **AF1-325** | Sparta-Woodruff's Gap 34.5 kV | Active |
| **AF1-328** | Hackettstown-Pohatcong 34.5 kV | Active |
| **AF2-013** | Arnold's Corner-Dahlgren 230 kV | Active |
| **AF2-016** | Lewis 138 kV | Active |
| **AF2-019** | Middle 69 kV | Active |
| **AF2-020** | Carll's Corner 69 kV | Active |
| **AF2-021** | Cedar 69 kV | Active |
| **AF2-023** | Churchtown 69 kV | Active |
| **AF2-024** | Mickleton 69 kV | Active |
| **AF2-025** | Missouri Ave 69 kV | Active |
| **AF2-030** | Ontelaunee 230 kV | Active |
| **AF2-038** | Printz 230 kV | Withdrawn |
| **AF2-040** | Elk Run-Gainesville 230 kV | Active |
| **AF2-055** | Plaintation Creek 69 kV | Active |
| **AF2-057** | Grassfield 34.5 kV | Active |
| **AF2-060** | Wattsville 12 kV | Active |
| **AF2-061** | Wattsville 69kV | Active |
| **AF2-071** | Windsor 230 kV | Active |
| **AF2-072** | Larrabee 230 kV | Active |
| **AF2-085** | Midlothian 34.5 kV | Engineering and Procurement |
| **AF2-108** | Locks 34.5 kV | Active |
| **AF2-144** | Powhatan 34.5 kV | Active |
| **AF2-193** | Indian River 230 kV I | Active |
| **AF2-194** | Indian River 230 kV II | Active |
| **AF2-196** | Cedar Neck 69 kV II | Active |
| **AF2-197** | East Towanda 115 kV | Active |
| **AF2-207** | Nelson 69 kV | Active |
| **AF2-208** | Colora 230 kV | Active |
| **AF2-213** | Zions View-Smith Street 115 kV | Active |
| **AF2-232** | Bowmanns Mill Tap-Scott 69 kV | Active |
| **AF2-233** | Penns-Richfield Tie #1 69 kV | Active |
| **AF2-234** | Sunbury Yard #1-Richfield Tie #2 69 kV | Active |
| **AF2-249** | Edgewood 12 kV II | Active |
| **AF2-251** | Susquehanna unit 1 230 kV | Active |
| **AF2-268** | Orrtanna 13.2 kV | Engineering and Procurement |
| **AF2-271** | Pemberton-Sinking Valley 12.47 kV | Engineering and Procurement |
| **AF2-272** | Bernville 13.2 kV | Engineering and Procurement |
| **AF2-275** | Guilford 12.47 kV | Engineering and Procurement |
| **AF2-276** | Guilford 12.47 kV | Active |
| **AF2-277** | Richland 12.47 kV | Engineering and Procurement |
| **AF2-278** | Halifax 12.47 kV | Engineering and Procurement |
| **AF2-279** | Letort 12.47 kV | Engineering and Procurement |
| **AF2-280** | Buck 12.47 kV | Engineering and Procurement |
| **AF2-281** | Lynnville 13.2 kV | Engineering and Procurement |
| **AF2-282** | Edelle 12.47 kV | Engineering and Procurement |
| **AF2-283** | Greenfield 12.47 kV | Engineering and Procurement |
| **AF2-284** | Watson 12.47 kV | Engineering and Procurement |
| **AF2-285** | W. Damascus 12.47 kV | Engineering and Procurement |
| **AF2-286** | Shermansdale 12.47 kV | Engineering and Procurement |
| **AF2-287** | Green Park 12.47 kV | Engineering and Procurement |
| **AF2-288** | Benvenue 12.47 kV | Engineering and Procurement |

| Queue Number | Project Name | Status |
|---|---|---|
| **AF2-289** | Watson 12.47 kV | Engineering and Procurement |
| **AF2-290** | Derry 12.47 kV | Engineering and Procurement |
| **AF2-293** | Beech Creek 12.47 kV | Engineering and Procurement |
| **AF2-315** | Susquehanna Unit 2 500 kV | Active |
| **AF2-325** | Jacktown 12 kV | Active |
| **AF2-378** | Cambridge 12 kV | Engineering and Procurement |
| **AF2-379** | Princess Anne 25 kV | Engineering and Procurement |
| **AF2-383** | Tolna 115 kV | Active |
| **AF2-397** | Fork Union-Mt. Eagle 230 kV | Active |
| **AF2-405** | East Sayre 34.5 kV III | Active |
| **AF2-406** | Sayre 115 kV | Active |
| **AF2-409** | Vienna 138 kV | Active |
| **AF2-412** | Mainesburg 115 kV | Active |
| **AF2-413** | Raritan River 230 kV | Active |
| **AF2-414** | Bergen 345 kV | Active |
| **AF2-415** | Bergen 138 kV | Active |
| **AF2-416** | Bergen 26 kV | Active |
| **AF2-427** | Watson 12.47 kV | Engineering and Procurement |
| **AF2-428** | West Boyertown 13.2 kV | Engineering and Procurement |
| **AF2-429** | South Hamburg 34.5 kV | Engineering and Procurement |
| **AF2-430** | Moselem 13.2 kV | Engineering and Procurement |
| **AF2-431** | Baldy 13.2 kV | Engineering and Procurement |
| **AF2-432** | University 12.47 kV | Engineering and Procurement |
| **AG1-000A** | N/A | N/A |
| **AG1-000B** | N/A | N/A |
| **AG1-009** | Hopewell-Surry 230kV | Active |
| **AG1-010** | Ladysmith-CT-St. Johns 230 kV | Active |
| **AG1-011** | Colonial Trial 230 kV | Active |
| **AG1-013** | Ladysmith CT-St. Johns 230 kV | Active |
| **AG1-014** | Carson-Rogers Rd 500 kV | Active |
| **AG1-015** | Carson-Rogers Rd 500 kV | Active |
| **AG1-019** | Arnold's Corner-Dahlgren 230 kV | Active |
| **AG1-028** | Suffolk-Holland 115 kV | Active |
| **AG1-050** | Milton 69 kV | Active |
| **AG1-052** | Zionsview-Middletown 115 kV II | Active |
| **AG1-053** | Jackson-Three Mile Island 230 kV III | Active |
| **AG1-057** | Harmony Village 230 kV | Active |
| **AG1-060** | Eldred 69 kV | Active |
| **AG1-063** | Fairhaven 13,8 kV | Active |
| **AG1-064** | Plaza 34.5 kV | Engineering and Procurement |
| **AG1-065** | Plaza 34.5 kV | Engineering and Procurement |
| **AG1-072** | Hillsboro-Steele 138 kV II | Active |
| **AG1-087** | Milford-Cartanza 230 kV | Active |
| **AG1-088** | Carll's Corner-Sherman Ave 69 kV | Active |
| **AG1-102** | White Marsh 34.5 kV | Active |
| **AG1-103** | Clayton-Williamstown 69 kV | Active |
| **AG1-104** | Waugh Chapel 230 kV | Active |
| **AG1-108** | Larrabee 230 kV | Active |
| **AG1-110** | Silver Lake 69 kV | Active |
| **AG1-115** | Buxmont 69 kV | Active |
| **AG1-116** | Newport-South Millville 69 kV | Active |
| **AG1-117** | Churchtown-Upper Pittsgrove 138 kV | Active |

| Queue Number | Project Name | Status |
|---|---|---|
| **AG1-130** | Burlington 26 kV | Active |
| **AG1-143** | Gainesville-Loudoun 230 kV | Active |
| **AG1-148** | McCarter 26.4 kV | Active |
| **AG1-149** | Kingston 12 kV II | Active |
| **AG1-150** | Wattsville 69 kV II | Active |
| **AG1-152** | Remington CT 230 kV | Active |
| **AG1-153** | Heritage 500 kV | Active |
| **AG1-154** | Ladysmith CT 230 kV | Active |
| **AG1-160** | Rogers Road 500 kV | Active |
| **AG1-180** | Brunswick-Gasburg 69 kV | Active |
| **AG1-184** | Carson-Suffolk 500 kV | Active |
| **AG1-185** | Pamplin-Chase City 115 kV | Active |
| **AG1-187** | St. Johns DP-REC 115 kV | Active |
| **AG1-210** | Northern Neck 34.5 kV | Active |
| **AG1-213** | St Johns 13.2 kV | Active |
| **AG1-215** | Fort Pickett 13.2 kV | Active |
| **AG1-221** | Poland Rd-Runway DP 230 kV | Active |
| **AG1-248** | York Storage 115 kV | Active |
| **AG1-254** | Salem-Woodstown 69 kV | Active |
| **AG1-255** | Churchtown-Orchard 230 kV | Active |
| **AG1-256** | Northern Neck 230 kV | Active |
| **AG1-262** | Lower Mount Bethel 230 kV | Active |
| **AG1-263** | Gloucester 230 kV | Active |
| **AG1-267** | Martins Creek 69 kV | Active |
| **AG1-268** | Essex 230 kV | Active |
| **AG1-272** | Twitty's Creek 115 kV | Active |
| **AG1-273** | Twitty's Creek 115 kV | Active |
| **AG1-274** | Twitty's Creek 115 kV | Active |
| **AG1-277** | Salem-Beacon Power 69 kV | Active |
| **AG1-278** | Salem-Beacon Power 69 kV | Active |
| **AG1-279** | Salem-Beacon Power 69 kV | Active |
| **AG1-289** | Lake of the Woods DP-Wilderness DP 115 kV | Active |
| **AG1-290** | Wagner 115 kV | Active |
| **AG1-318** | Ocean Bay 12 kV | Active |
| **AG1-322** | Birchwood 230 kV | Active |
| **AG1-330** | Beavertown 12.47 kV | Active |
| **AG1-332** | Oxford 13.2 kV | Withdrawn |
| **AG1-333** | Lake Como-Pine Mills 12.47 kV | Withdrawn |
| **AG1-336** | Hunter 12.47 kV | Active |
| **AG1-337** | Elizabethville 12.47 kV | Active |
| **AG1-342** | Dryburg 115 kV | Active |
| **AG1-343** | Boykins-Murphy 115 kV | Active |
| **AG1-347** | Briery DP-Clover 230 kV | Active |
| **AG1-359** | Fentress 230 kV | Active |
| **AG1-363** | Black Oak-Hatfield 500 kV | Active |
| **AG1-364** | Deep Creek 115 kV | Active |
| **AG1-383** | Hickory 34.5 kV | Active |
| **AG1-384** | Twitty's Creek 115 kV | Active |
| **AG1-397** | Walston 12 kV | Active |
| **AG1-412** | Ladysmith CT-Mine Road 230 kV | Active |
| **AG1-416** | Sleepy Hollow 138 kV | Active |
| **AG1-426** | Bremo-Scottsville 138 kV | Active |

| Queue Number | Project Name | Status |
|---|---|---|
| **AG1-431A** | Mackeys 230 kV | Active |
| **AG1-442** | Cashie-Earleys 230 kV | Active |
| **AG1-443** | Cashie-Earleys 230 kV | Active |
| **AG1-444** | Chinquapin 230 kV | Active |
| **AG1-445** | Palmer Spring 115 kV | Active |
| **AG1-446** | Palmer Springs 115 kV | Active |
| **AG1-449** | Rawlings-Carson 500 kV | Active |
| **AG1-450** | Airey-Vienna 69 kV II | Active |
| **AG1-451** | Curdsville DP-Willis Mt. 115 kV | Active |
| **AG1-464** | Harrington 69 kV | Active |
| **AG1-465** | North Hanover-Gitts Run 115 kV | Active |
| **AG1-470** | Ringgold 138 kV | Active |
| **AG1-473** | Shingletown-Lewistown 230 kV | Active |
| **AG1-480** | Shawnee 34.5 kV | Active |
| **AG1-484** | Mountain 115 kV | Active |
| **AG1-486** | Orrtanna 115 kV | Active |
| **AG1-487** | Gilbert 230 kV | Active |
| **AG1-497** | Cartanza 230 kV | Active |
| **AG1-510** | Kittatinny-Blairstown 34.5 kV | Active |
| **AG1-511** | Kittatinny 230 kV | Active |
| **AG1-515** | Guilford 138 kV | Active |
| **AG1-518** | Suffolk 230 kV | Active |
| **AG1-534** | Evergreen Mills 230 kV | Active |
| **AG1-536** | Garner-Northern Neck 115 kV | Active |
| **AG1-538** | Remington-Gordonsville 230 kV | Active |
| **AG1-541** | St. Johns 115 kV | Active |
| **AG1-544** | Bakers Pond DP 115 kV | Active |
| **AG1-545** | W. Quaker Rd-Disputanta 34.5 kV | Active |
| **AG1-560** | Shade Gap-Roxbury 115 kV II | Active |
| **AG1-561** | Roxbury-Greene 138 kV II | Active |
| **V3-051** | Letort | In Service |

## 12.8 Contingency Descriptions

| Contingency Name | Contingency Definition |
|---|---|
| **AP-P1-2-PE-500-407T** | CONTINGENCY 'AP-P1-2-PE-500-407T' /* 01DOUBS 500 8GOOSE CREEK 500 1<br>DISCONNECT BRANCH FROM BUS 235105 TO BUS 314939 CKT 1 /* 01DOUBS 500 8GOOSE CREEK500<br>END |

## 13 Short Circuit Analysis

No violations were identified

### 13.1 System Reinforcements - Short Circuit

None required

## 14 Stability and Reactive Power

To be determined in the Facilities Study Phase.

## 15 Affected Systems

Not Required

## 16 Attachment 1: One Line Diagram