Generation Interconnection
Facility Study Report

For

PJM Generation Interconnection Request
Queue Position AE1-044

Morrisville 230 kV
111.79 MW Capacity / 200 MW Energy

September, 2021

General

This Facilities Study has been prepared in accordance with the PJM Open Access Transmission Tariff §207, as well as the Facilities Study Agreement between ACE Development Company II, LLC, the Interconnection Customer (IC), and PJM Interconnection, LLC (PJM), Transmission Provider (TP). The Interconnected Transmission Owner (ITO) is Virginia Electric and Power Company (VEPCO).

The IC has proposed a solar generating facility located in Fauquier County, Virginia. The installed facilities will have a total capability of 200 MW with 111.79 MW of this output being recognized by PJM as capacity. The proposed in-service date for this project is 01/30/2025. **This study does not imply an ITO commitment to this in-service date.**

Point of Interconnection

AE1-044 will interconnect with the ITO transmission system via a new breaker bay in the Morrisville 230kV substation.

Cost Summary

The AE1-044 project will be responsible for the following costs:

Description	Total Cost
Attachment Facilities	$2,274,503
Direct Connection Network Upgrades	$5,174,006
Non Direct Connection Network Upgrades	$0
Allocation for New System Upgrades	$0
Contribution for Previously Identified Upgrades	$0
Total Costs	**$7,448,509**

A. Transmission Owner Facilities Study Summary

1. Description of Project

Queue AE1-044 is a request to interconnect a 200 MW new solar generating facility to be located in Fauquier County, Virginia. AE1-044 will interconnect with the ITO transmission system via a new breaker bay in the Morrisville 230 kV substation. Attachment Facility and Network Upgrade construction is estimated to be 18-24 months.

2. Amendments to the System Impact Study data or System Impact Study Results

None

3. Interconnection Customer's Milestone Schedule

- Plan to break ground June 1, 2023
- Permits – state level Permit By Rule and county level final site plan approval complete June 1, 2022
- Substantial site work completed February 28, 2024
- Delivery of major electrical equipment December 31, 2023
- Back Feed Power October 31, 2024
- Commercial Operation January 30, 2025

4. Scope of Customer's Work

Generator Interconnection Request AE1-044 is for a 200 MW Maximum Facility Output (MFO) solar powered generating facility. AE1-044 consists of 65 x 3.15 MW Power Electronics FS3150MU 3.364 MVA solar inverters. The Point of Interconnection (POI) is on the existing Morrisville 230 kV substation in Dominion Virginia Electric and Power Company (DVP) transmission system, Fauquier County, Virginia.

5. Description of Facilities Included in the Facilities Study

The ITO will connect the proposed generator lead via Attachment Facilities to the Morrisville 230kV substation. The objective of this project is to add one new line position and two new 230kV breakers installed at Morrisville Substation to support the new 200MW solar farm built by ACE Development Company II, LLC. Additional modifications will be required to accommodate this additional infrastructure.

It is anticipated that the station expansion will remain on existing Dominion Energy owned property. All permitting, site preparation and grading activity will be performed by Dominion Energy. Complex permitting requirements are anticipated for this site.

Control Enclosure CE1 will be expanded to the North by 10' to allow room for new relaying panels to be installed with project.

Transmission Line Engineering to number the new line between Morrisville and the 230kV Solar Farm interconnect.

Site plan (Attachment 2) was developed by the ITO during PJM's generation queue process. The single line is shown in Attachment 1.

6. Total Costs of Transmission Owner Facilities included in Facilities Study

Work Description	Direct		Indirect		Total Cost
	Labor	Material	Labor	Material	
Attachment Facilities	$244,964	$201,438	$86,065	$35,741	$568,208
Transmission Line #117 (n7422)	$1,180,905	$295,459	$201,378	$28,553	$1,706,295
Total Attachment Facilities Cost	$1,425,869	$496,897	$287,443	$64,294	$2,274,503
New Switching Station (n7423)	$2,752,174	$1,414,258	$812,863	$194,711	$5,174,006
Total Network Upgrades	$2,752,174	$1,414,258	$812,863	$194,711	$5,174,006
Total Project Costs	$4,178,043	$1,911,155	$1,100,306	$259,005	$7,448,509

7. Summary of Milestone Schedules for Completion of Work Included in Facilities Study:

Facilities are estimated to take 18-24 months from ISA execution and is based on the ability to obtain outages to construct and test the proposed facilities.

Proposed Schedule

- Detailed design: 8-12 months
- Permitting: 6-12 months (Timeline runs concurrent with design)
- Construction 10-12 months

ITO requires the site to be fully graded and permitted site so they can start construction by June 2023.

B. Transmission Owner Facilities Study Results

1. Attachment Facilities

The Attachment Facilities include the portion of the interconnecting switching station which is associated solely with the single feed to the generating facilities collector station. The equipment associated with the Attachment Facilities include the metering accuracy CCVT's, metering accuracy CT's, disconnect switch, conductors and connectors. This also includes PJM Network

Upgrade #n7422 which constructs a line between the Morrisville substation and AE1-044 Transition station.

Purchase and install substation material:

1. Three (3), 230kV, Metering Accuracy CCVT's.
2. Three (3), 230kV,500:5 Metering Accuracy CT's.
3. Conductor, connectors, conduits, control cables, foundations, steel structures and grounding material as per engineering standards.

Purchase and install relay material:

1. One (1), 1340 – 24" Dual SEL-411L CD/Fiber Line Panel
2. One (1), 1425 – 24" Dual SEL-735 Transmission & Generator Interconnect Metering Pnl.
3. One (1), 4200 – Bus Differential C.T. M.U. Box
4. One (1), 4506 – CCVT Potential M.U. Box
5. One (1), 1323 – 24" SEL-487E/735 PMU & PQ Monitoring Panel

PJM Network Upgrade # n7422 - Construct line #2XXX between Morrisville substation and AE1-044 Transition station.

The line connection will require the installation of (1) backbone structure, one (1) 3 pole structure and two (2) H-frame structure.

Project AE1-044 will interconnect into Dominion's Morrisville 230kV substations.

The project work summary is described below:

PERMANENT FACILITIES TO BE INSTALLED

1. Install one (1) 230 kV SC Heavy-Duty Steel DDE Backbone structure (no switches) with foundations (Str. 2XXX/1).
2. Install two (1) 3 pole DDE Poles with foundations (Strs. 2XXX/2).
3. Install two (2) H-Frame DDE Poles with foundations (Strs. 2XXX/3 and 2XXX/4).
4. Install one (1) OPGW cables, of approximately 0.25 miles from Backbone Str. 2XXX/1 to Str. 2XXX/4.
5. Install one (1) 7#7 ALWD cable, of approximately 0.5 miles from Backbone structure 2XXX/1 to str 2XXX/2
6. Install one (1) 3#6 ALWD cables, of approximately 0.20 miles from Str. 2XXX/2 to Str. 2XXX/4.
7. Install one (1) 2-636 ACSR conductor , of approximately 0.25 miles from Backbone Str. 2XXX/1 to Str. 2XXX/4).

2. Transmission Line – Upgrades

None.

3. New Substation/Switchyard Facilities

None.

4. Upgrades to Substation / Switchyard Facilities

PJM Network Upgrade # n7423 – Build a new 230kV Solar Farm to interconnect into Morrisville station.

The objective of this project is to add one new line position and two new 230kV breakers installed at Morrisville Substation to support the new 200MW solar farm built by ACE Development Company II, LLC. Additional modifications will be required to accommodate this additional infrastructure.

It is anticipated that the station expansion will remain on existing Dominion Energy owned property. All permitting, site preparation and grading activity will be performed by Dominion Energy. Complex permitting requirements are anticipated for this site.

Control Enclosure CE1 will be expanded to the North by 10' to allow room for new relaying panels to be installed with project.

Transmission Line Engineering to number the new line between Morrisville and the 230kV Solar Farm interconnect.

Security and Fence Type – Match existing fence level.

Note: Currently, the scope and estimate assume DVP standard spread footer foundations. Once the soil information is received and if it is decided to change that to "pile foundations" then DVP team should be informed at the earliest to adjust the project estimate.

The work required is as follows:

Purchase and install substation material – Direct Network Upgrade:

1. Approximately 344' x 73'-6" site preparation and grading as required for the expansion of the existing station.
2. Level 1 high security fence expansion
   a. Approximately 413 linear FT of 20ft tall Design Level 1 High Security fence.
   b. Three (3) 25 ft. tall super posts.
   c. Anti-dig barrier footing between the perimeter fence foundations.
   d. Foundations for the fence posts, super posts, etc.
   e. Ground tails, and miscellaneous grounding materials for fence posts, panel to panel connections, and security and communication boxes as per the current engineering standards.
   f. Security Integrations for fence.
3. Two (2), 230 kV, 3000A, 63kAIC, SF-6 Circuit Breakers.
4. Five (5), 230 kV, 3000A, 3-Phase Center Break Gang Operated Switches.
5. Three (3), 180 kV, 144 kV MCOV surge arresters.
6. Three (3), 230kV, 4000:5, Free Standing CT's.
7. One (1), 10' x 20' Control House Expansion.
8. One (1), 230kV, 100kVA Power PT (Relocate)
9. Station Stone as required.

10. Station Lighting as required.
11. Steel structures as required including switch stands, bus supports, current transformers, and CCVT supports.
12. Foundations as required including control house, equipment, and bus support stands.
13. Conductors, connectors, conduits, control cables, and grounding materials as per engineering standards.

Purchase and install relay material – Direct Network Upgrade:

1. Two (2), 1510 – 24" Dual SEL-351-7 Transmission Breaker w/ Reclosing Panel
2. Two (2), 4510 - SEL-2411 Breaker Annunciator
3. Two (2), 4526_A – Circuit Breaker Fiber Optic M.U. Box
4. One (1), 1109 – 24" Dual SEL-587Z Transmission Bus Panel
5. One (1), 4200 – Bus Differential C.T. M.U. Box

5. Metering & Communications

PJM Requirements

The IC 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 Appendix 2.

ITO Requirements

Metering and SCADA/Communication equipment must meet the requirements outlined in section 3.1.6 Metering and Telecommunications of ITO's Facility Interconnection Connection Requirement NERC Standard FAC-001 which is publicly available at www.dom.com.

At the IC's expense, the ITO will supply and own at the Point of Interconnection bi-directional revenue metering equipment that will provide the following data:

a. Hourly compensated MWh received from the Customer Facility to the ITO;
b. Hourly compensated MVARh received from the Customer Facility to the ITO;
c. Hourly compensated MWh delivered from the ITO to the Customer Facility; and
d. Hourly compensated MVARh delivered from the ITO to the Customer Facility.

The IC will supply and own metering equipment that will provide Instantaneous net MW and MVar per unit values in accordance with PJM Manuals M-01 and M-14D, and Sections 8.1 through 8.5 of Appendix 2 to the ISA.

The IC will access revenue meter via wireless transceivers or fiber cabling to meter with RS-485 or Ethernet communication port for dial-up reads. IC must provide revenue and real time data to PJM from Interconnection Customer Market Operations Center per "PJM Telemetry Data Exchange Summary" document available at PJM.com.

6. Environmental, Real Estate and Permitting Issues

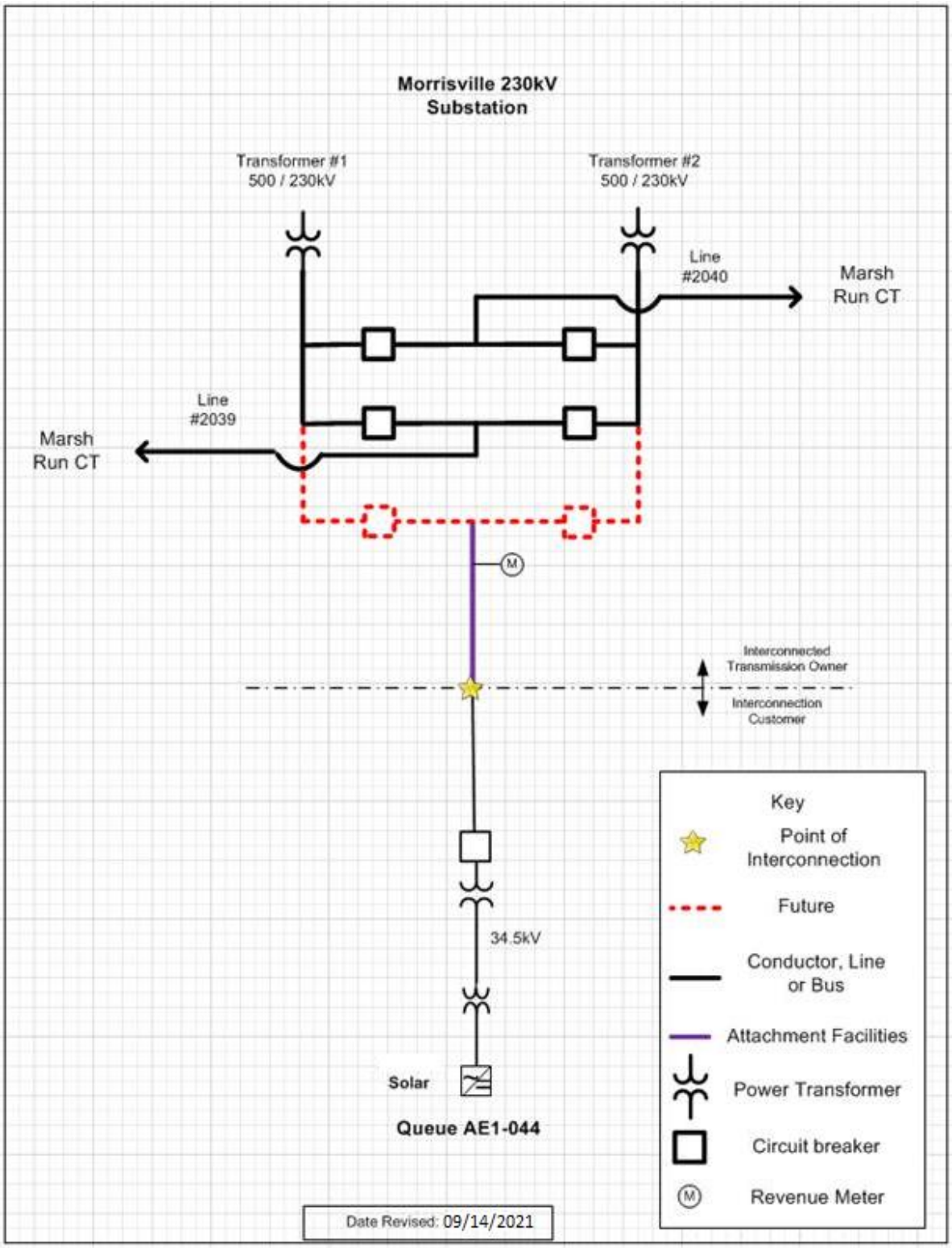
The IC would be responsible for the following expectations in the area of Environmental, Real Estate and Permitting:

- Suitable Access Road from Substation to a Virginia State Maintained Roadway.
- Any additional land needed for Storm Water Management, Landscaping, and Wetlands/Wetlands Mitigation.
- Conditional Use Permit for Substation.
- Any other Land/Permitting requirements required by the Substation.

ITO Real Estate Needs:

- The substation layout is complete and ITO requires a 344' x 73'-6' piece of property (title in fee) to build the substation. The property includes the piece of property between the substation and collector station for the strain bus.
    - ITO requires ownership transfer of the substation site before they start construction. Target for the deed by June 2023.
    - The size of the station assumes ITO will not need a separate storm water management system for the substation. If the county rules differently than the ITO will need to revisit the land requirements.
- ITO will need a letter similar to the zoning letter from the county stating that if the solar farm is retired and / or decommissioned the substation will remain.

Attachment 1.
Single Line



Attachment 2.
AE1-044 Switching Station General Arrangement