Facilities Study Report

For

Physical Interconnection of

PJM Generation Interconnection Request

Project ID AG1-168

Lone Pine 115 kV

June 2025

Introduction

This Facilities Study has been prepared in accordance with the PJM Open Access Transmission Tariff Part VII, and, if applicable, the Application and Studies Agreement between the Project Developer and PJM Interconnection, LLC (PJM or Transmission Provider (TP)). The Transmission Owner (TO) is Virginia Electric and Power Company (VEPCO or Dominion).

A. Transmission Owner Facilities Study Summary

1. PROJECT DESCRIPTION

The Project Developer (PD) has proposed a Solar Generating Facility located in Nottoway, VA with a designated PJM Project ID of AG1-168. The installed facilities will have a total Maximum Facility Output (MFO) of 15 MW with 4.5 MW of this output being recognized by PJM as Capacity.

2. POINT OF INTERCONNECTION (POI)

AG1-168 is a project sharing a Common Use Upgrade that will interconnect with the Dominion transmission system via a direct connection into the Lone Pine 115 kV substation by adding two (2) additional breakers. This substation will serve as the interconnection location for AG1-166, AG1-167, and AG1-168.

The proposed generation interconnection is shown on the single line diagram in Attachment #1.

3. POINT OF CHANGE IN OWNERSHIP

The Point in Change of Ownership will be the 115kV disconnect switch 4-hole pad on the transmission line structure outside the Lone Pine substation fence.

4. SCOPE OF PROJECT DEVELOPER INTERCONNECTION FACILITIES

Project Developer will design, build, own, operate and maintain the Project Developer Interconnection Facilities on Project Developer's side of the Point of Change in Ownership (PCO). This includes, but is not limited to:

- Circuit breakers and associated equipment located between the high side of the MPT(s) or GSU(s) and the Point of Change in Ownership.
- Generator lead line from the Generating Facility to the Point of Change in Ownership.
- Relay and protective equipment, telecommunications equipment, and Supervisory Control and Data Acquisition (SCADA) to comply with the TO's Applicable Technical Requirements and Standards.

B. Transmission Owner Facilities Study Results

The following is a description of the planned Transmission Owner facilities for the physical interconnection of the proposed AG1-166, AG1-167, and AG1-168 projects to the Dominion transmission system. These facilities shall be designed according to Dominion Applicable Technical Requirements and Standards. Once built, Dominion will own, operate, and maintain these Facilities.

1. TRANSMISSION OWNER INTERCONNECTION FACILITIES:

The Transmission Owner Interconnection Facilities will include, but not be limited to, the following:

The proposed structures to be installed are one (1) 115kV single circuit 3-pole deadend structure, and one (1) 115kV single circuit backbone structure outside the fence of the Interconnection Substation, to terminate the Project Developer's generator lead line. The backbone will have a vertically mounted switch serve as the actual point of change of ownership between the Developer and Dominion. The developer will own the 115kV Line from the ahead side of the Point of Change of Ownership structure to their substation.

Line conductor from the backbone structure to the bus position in the switchyard of the interconnection substation. The new conductor and shield wire to be used for line 1XXX will be 3-phase single (1) 768.2 ACSS/TW/HS (20/7) "Maumee" conductor with dual (2) DNO-11410 OPGW and additional 7#7 Alumoweld shielding with this station.

Purchase and install substation material – Transmission Owner Interconnection Facilities:

1. Three (3), 115kV, metering accuracy CCVT
2. Three (3), 115kV, 500:5 metering accuracy CT
3. Conductor, connectors, conduits, control cables, foundations, steel structures and grounding material as per engineering standards

Purchase and install relay material – Transmission Owner Interconnection Facilities:

1. One (1), 1340 – 24" dual SEL-411L CD/Fiber line panel
2. One (1), 1425 – 24" dual SEL-735 transmission and generator interconnect metering panel
3. One (1), 4524 – revenue metering CT make-up box
4. One (1), 4506 – 3-phase CCVT potential make-up box with metering (P4)
5. One (1), 1323 – 24" SEL-487E/735 PMU and PQ monitoring panel

Permanent Facilities to be Installed – Transmission Owner Interconnection Facilities:

1. Install one (1) 115kV engineered steel single circuit 3-pole double deadend structure on foundations as follows:
    a. Structures 1XXX/2
2. Install one (1) 115kV single circuit steel backbone structure with one (1) "2000A" vertically mounted switch on foundations as follows:
    a. Structures 1XXX/3
3. Install approximately 0.11 miles of 3-phase single (1) 768.2 ACSS/TW/HS (20/7) "Maumee" conductor from proposed backbone 1XXX/1 to proposed POI backbone 1XXX/3.
4. Install approximately 0.11 miles of dual (2) DNO-11410 OPGW from proposed backbone 1XXX/1 to proposed POI backbone 1XXX/3.

a. This includes four (4) OPGW splices as follows:
    i. Two (2), one (1) on each leg of proposed backbone 1XXX/1
    ii. Two (2), one (1) on each leg of proposed backbone 1XXX/3

2. STAND ALONE NETWORK UPGRADES

Dominion's Technical Requirements for Generation Interconnect Substation (EP_REF_2200-23-00) prevents this project from having the option to build for the Stand Alone Network Upgrades.

3. NETWORK UPGRADES

The Network Upgrades will include, but not be limited to, the following:

Transmission Line Tie-in for existing substation expansion:

This project serves to expand Lone Pine Substation, located in Nottoway County, VA, in order to accommodate one (1) additional 115kV Line, referred to as 1XXX. The new 115kV Line assets owned by Dominion and installed as part of the scope herein will be from the proposed backbone inside the station out to the proposed Point of Change of Ownership backbone. The proposed structures to be installed within the substation are one (1) 115kV single circuit backbone structures, and one (1) static pole.

Permanent Facilities to be Installed:

1. Install one (1) 115kV single circuit steel backbone structure on foundations as follows:
    a. Structures 1XXX/1
2. Install one (1) steel static pole structure on a foundation as follows:
    a. Structure 1XXX/1A
3. Install approximately 0.06 miles of 7#7 Alumoweld shield as follows:
    a. Approximately 0.02 miles from 1XXX/1 to 1XXX/1A.
    b. Approximately 0.04 miles from 1XXX/1A to existing structure 1/95 (1034/387).

Expanding existing TO substation:

Lone Pine 115 kV substation will be expanded/upgraded to interconnect projects AG1-166, AG1-167, and AG1-168 with the Dominion transmission system by adding (2) new breakers.

The objective of this project is to add one new line position and two new 115kV breakers installed at Lone Pine Substation to support the new solar farm built by Project Developer. Procurement of the required land for the substation expansion and permitting activities will be performed by the project developer.

Substation design and relay protection are based on Dominion's Facility Interconnection Requirements, NERC Compliance Procedure FAC-001 (version 23), that is posted on PJM's website. This standard meets or exceeds the PJM Transmission and Substation Design Subcommittee Technical Requirements and the PJM Protection Standards (PJM Manual 7).

The scope of work includes the following:

Purchase and install substation material – Network Upgrade:

1. Approximately 60’ x 245’ site preparation and grading as required for the expansion of Lone Pine substation (by Dominion)
2. Approximately 1,080 linear ft of 5/8” chain link perimeter fence around the station expansion along with the security cameras and integrators as per existing fence standards.
3. Two (2), 115kV, 3000A, 40kAIC, SF-6 circuit breaker
4. Four (4), 115kV, 2000A, 3-phase center break gang operated switch
5. Three (3), 90kV, 74kV MCOV surge arrester
6. One (1), 38” x 38” x 42” precast yard pull box
7. Station stone as required
8. Station lighting as required
9. Steel structures as required including switch stands, bus supports, and CCVT supports
10. Foundations as required including equipment and bus support stands
11. Conductors, connectors, conduits, control cables, and grounding materials as per engineering standards

Relocate existing substation material – Network Upgrade:

1. Three (3), 90kV, 74kV MCOV surge arrester
2. Three (3), 115kV, metering accuracy CCVT
3. One (1), 1007WT 2000A Wave Trap
4. One (1), Line tuner

Purchase and Install Relay Protection Equipment – Network Upgrade:

1. Two (2), 1510 – 24” dual SEL-351-7 transmission breaker with reclosing panel
2. Two (2), 4510 – SEL-2411 breaker annunciator
3. Two (2), 4526_A – circuit breaker fiber optic make-up box
4. Six (6), 4040 – security fiber/power make-up box
5. One (1), 5603 – station network panel no. 1
6. One (1), 4042_D1B – security utility – utility ATS
7. One (1), 4044 – 225A 1Ø outdoor main security AC NQOD
8. Two (2), 4040 – 100A 1Ø outdoor security AC NQOD
9. One (1), 5616 – station security fence panel

4. OTHER SCOPE OF WORK

The Project Developer 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 GIA.

5. MILESTONE SCHEDULE FOR COMPLETION OF TO WORK

Facilities outlined in this report are estimated to take 37 months to construct, from the time the Generator Interconnection Agreement is fully executed. This schedule may be impacted by the timeline for procurement and installation of long lead items, the ability to obtain outages to construct and test the proposed facilities.

Description	Start month	Finish month
Detailed Design	1	8
Permitting	3	29
Construction	27	37

6. ASSUMPTIONS IN DEVELOPING SCOPE/COST/SCHEDULE

General Assumptions:

1. The estimated procurement lead time for breakers is based on current Dominion pre-ordered breaker production slots. These production slots will be assigned after the agreement is executed.
2. The preliminary construction schedule is dependent on outage availability.
3. Currently, the scope and estimate assume “low impedance bus protection”. If it is determined that a relay accurate CT can be added to the existing transformer, and it is prudent to change the design to “high impedance bus protection” the Dominion team should be informed to adjust the project estimate at the earliest possible opportunity.
4. Projects AG1-166, AG1-167, and AG1-168 will share a generation interconnection point.
5. The Point of Change of Ownership structure will be located outside of Lone Pine Substation.

Conceptual Design Notes:

1. Currently, the scope and estimate assume Dominion standard spread footer foundations. Once the soil information is available and it is prudent to change the design to “helical pile foundations” the Dominion team should be informed to adjust the project estimate at the earliest possible opportunity.
2. Security and fence type – Upgraded to design level 4.
3. Engineered steel pole costs were determined based off typical wind and weight spans, line angles, and average structure heights for each voltage.
4. Steel pole foundation costs were based off the projects’ location and structure type in the regional soil profile map. The regional soil profile map used for this project is Piedmont.
5. Survey costs were determined based on substation proposed expansion location, fiber installation, and impacts on existing line.

6. The conceptual estimate assumes that a laydown yard is required for this project.

7. REVENUE METERING REQUIREMENTS

All revenue metering needed for this interconnection project must meet the metering requirements stated in Appendix 2, section 8 of the AG1-168 GIA, and in PJM Manuals M01 and M14D. The details of applicable revenue metering requirements are given in section 4.1.6 Metering and Telecommunications of Dominion's Facility Interconnection Connection Requirement NERC Standard FAC-001 posted on PJM website.

The revenue metering will be installed on the Transmission Owner side of the Point of Change in Ownership will be installed, owned and maintained by Transmission Owner.

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

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

8. LAND REQUIREMENTS FOR INTERCONNECTION SUBSTATION

Land requirements for the Interconnection Substation needed for this interconnection project must meet the requirements in Dominion's Facility Interconnection Requirements, NERC Compliance Procedure FAC-001 (version 23), that is posted on PJM's website.

The Project Developer would be responsible for the following expectations in the area of Real Estate.

- The land required for Dominion's substation and project specific areas around must be deeded over title-in-fee.
- Any additional land needed for Storm Water Management, Landscaping, and Wetlands/Wetlands Mitigation.
- Dominion Real Estate and Counsel will provide standard real estate checklist word document. Process needs to start at least 6 months prior to closing date.
- Required subdivision plat and associated documentation to be reviewed prior to subdividing parcel with the county.
- Suitable Access Road from Substation to a Virginia/North Carolina State Maintained Roadway.
- Dominion will require access road, transmission line and utilities easement to the Substation.
- Any other Land/Permitting requirements required by the Substation.

9. ENVIRONMENTAL AND PERMITING

The Project Developer would be responsible for the following expectations in the area of Environmental and Permitting.

- Assessment of environmental impacts related to the Interconnection Facility and/or Network Upgrades including:

  Environmental Impact Study requirements

  Environmental Permitting

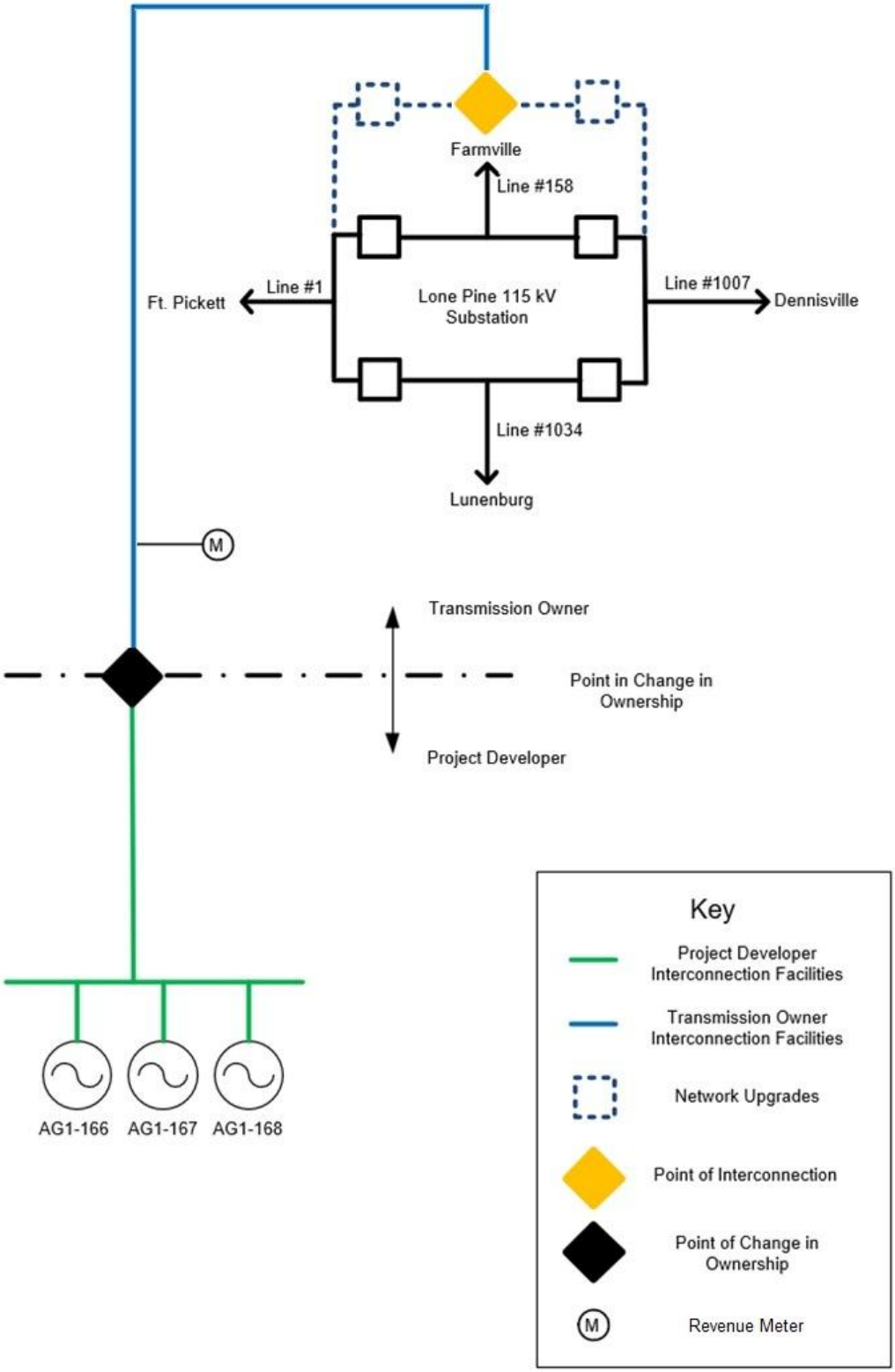
- Dominion will require a stormwater easement for substation specific stormwater design BMP's to allow access to and use of the facilities.

  A maintenance agreement should be in place in perpetuity for said stormwater facilities.

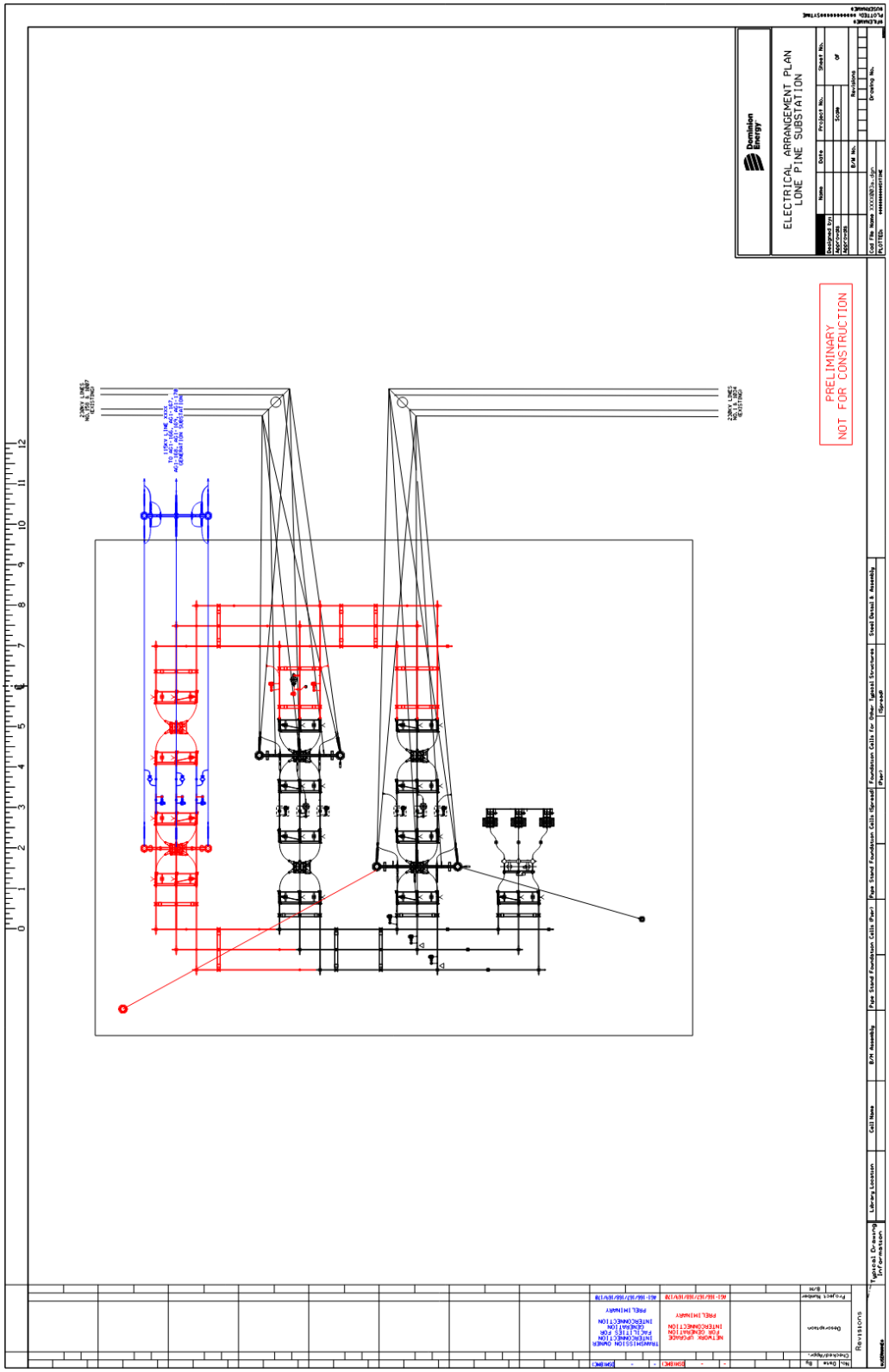
- Conditional Use Permit for Substation
- Any additional land needed for Storm Water Management, Landscaping, and Wetlands/Wetlands Mitigation
- Any other Permitting requirements required by the Substation

C. APPENDICES

Attachment #1: Single line Diagram for the Physical Interconnection



Attachment #2: Substation General Arrangement



Attachment #3: Preliminary Scoping Summary