Facilities Study Report

For

Physical Interconnection of

PJM Generation Interconnection Request

Project ID AF2-358 & AG1-450

“Airey – Vienna 69kV”

&

“Airey – Vienna 69kV II”

Revision [4]: [November] [2024]

Introduction

This Facilities Study has been prepared in accordance with the PJM Open Access Transmission Tariff. The Transmission Owner (TO) is Delmarva Power Company (DPL).

A. Transmission Owner Facilities Study Summary

1. PROJECT DESCRIPTION

Scenario-1: For New Generating Facilities

A Project Developer (PD) has proposed a Solar generating facility (AF2-358) located in Dorchester County, MD. The installed facilities will have a total capability of 100 MW with 60 MW of this output being recognized by PJM as capacity.

The same Project Developer has also proposed a Storage generating facility (AG1-450) as a planned uprate to its AF2-358 project. This generating facility will share the same point of interconnection with the AF2-358 project. The AG1-450 queue position is a 25 MW uprate (25 MW Capacity uprate) to the previous project. The total installed facilities will have a capability of 125 MW with 85 MW of this output being recognized by PJM as capacity.

2. POINT OF INTERCONNECTION (POI)

Scenario-1: Interconnection by tapping an existing transmission line:

The Generating Facility will interconnect with the DPL transmission system via a newly constructed 69kV 3-position, 3-breaker ring bus, expandable to 6-position, 6-breaker ring bus, “AF2-358/AG1-450 Interconnection Substation”, tapping the Vienna – West Cambridge 69kV #6709 Line, approximately 7.7 miles from Vienna Substation and 3.16 miles from Airey Substation, and adjacent to the circuit within 500’. Land purchase and construction of “AF2-358/AG1-450 Interconnection Substation” will be completed such that there is adequate space within substation fenceline, stoning, and grounding grid for a 6-position, 6-breaker ring bus.

The construction of the new interconnection substation will result in the splitting of the existing Vienna – West Cambridge 69kV #6709 Line into two lines on the transmission system. The new “#6709 Line” will connect the “AF2-358/AG1-450 Interconnection Substation” to Vienna Substation and the new “#67YY line” will connect “AF2-358/AG1-450 Interconnection Substation” to West Cambridge Substation.

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

3. POINT OF CHANGE IN OWNERSHIP

The Point of Change in Ownership will be located at the first dead-end structure outside the “AF2-358/AG1-450 Interconnection Substation” fence line.

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). Project Developer Interconnection Facilities is the work from the high side of the Project Developer generator step up transformer to the PCO referenced above in Section A-3. This includes, but is not limited to:

- Main Power Transformer (s) (MPT), Generation step-up (GSU) transformer(s) or final transformation, as applicable.
- 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 DPL'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 AF2-358 & AG1-450 project to DPL transmission system. These facilities shall be designed according to applicable DPL Technical Requirements and Standards. Once built, DPL will own, operate, and maintain these Facilities.

1. TRANSMISSION OWNER INTERCONNECTION FACILITIES:

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

- A 69 kV dead-end structure and foundation located outside the fence of the "AF2-358/AG1-450 Interconnection Substation", to terminate the Project Developer's generator lead line.
- Line conductor from the dead-end structure to the bus position in the switchyard of the interconnection substation.

2. STAND ALONE NETWORK UPGRADES

Stand Alone Network Upgrades will include, but not be limited to, the following.

For new interconnection substation:

"AF2-358/AG1-450 Interconnection Substation"

A new 69 kV 3-position, 3-breaker ring bus, expandable to 6-position, 6-breaker ring bus substation, "AF2-358/AG1-450 Interconnection Substation", will be constructed along the #6709 Vienna – West Cambridge 69kV transmission line to interconnect the project with the DPL transmission system.

Major equipment to be installed at the new substation is as follows:

- (3) 72.5kV, 2000A, 40kA circuit breakers
- (9) CCVTs

- (9) 60kV 48kV MCOV lightning arresters
- (2) 100kVA station service transformers
- (6) 72.5kV, 2000A, 100kA, 350kV BIL 3-pole gang operated switches w/ arcing horns
- (2) 72.5kV, 2000A, 100kA, 350kV BIL single-phase switches w/ arcing horns
- (3) 72.5kV, 2000A, 100kA, 350kV BIL 3-pole gang operated switches w/ quick break whips

Full site development and grading will be required for the entire substation. Internal access roads shall be designed to provide operations and maintenance access to substation equipment. Stormwater management design will be necessary during site development. Substation stoning to be installed per grounding study, grading plan, and stormwater management plan.

Perimeter fence and gates are required for the entire substation.

Installation of foundations and structures to support construction of new 69 kV 3-position, 3-breaker ring bus, expandable to 6-position, 6-breaker ring bus substation, “AF2-358/AG1-450 Interconnection Substation” will be required.

Installation of grounding conductor, ground rods, and connections from ground grid to equipment, structures, and fence for a complete substation is required. Grounding to be designed per DPL standards. Grounding calculations and associated design are required. Grounding to be installed to accommodate future expansion to 6-position, 6-breaker ring bus.

Total approximate linear footage of bus (of various sizes) will be (3,325).

Total approximate linear footage of conduit (of various sizes) will be (1,350) plus yard lighting conduits to be determined during detailed design.

Installation of new cable trough system is required for the entire substation yard.

Total approximate linear footage of cable (of various sizes) will be (19,500) plus yard lighting cables to be determined during detailed design.

Prefabricated control building to be designed during detailed design will be required. Approximate size will be 40’x17’. Control building to have a main relay protection room and a separate battery room. Control building to have floor penetrations into terminal cabinets for cable entry into the building. Lighting to be installed on the exterior of the control building.

Relays to be installed will include (3) transmission line protection panels, (3) transmission stuck breaker and control panels, (1) annunciator panel and (1) communications panel.

Installation and splicing of OPGW fiber cable from the 6709 and 67YY transmission line into substation control house will be required, as well as creation of fiber communications paths between new “AF2-358/AG1-450 Interconnection Substation” and Vienna and West Cambridge substations, and installation and commissioning of up to (2) 20” UCOMM communications panels.

Outdoor lighting will be required for the purpose of general illumination of the substation yard to permit switching, allow access and maneuverability, and to disclose potential personnel hazards. Extent and configuration of site lighting to be determined by lighting study to be completed during detailed design.

Lightning protection is required for the new substation yard. Lightning masts to be located as needed per lightning protection study.

Size and quantity of AC and DC distribution panels in the control house to be determined during detailed design.

Size of substation battery to be determined during detailed design.

PHI Fire Protection design standards to be used in the development of the control house design.

Security system to be installed by Exelon Security.

All current DPL substation design and engineering standards are to be followed during detailed design.

Local, state, and environmental permits will be required and are the responsibility of the Project Developer.

Installation of fiber cable circuits:

For purposes of fiber communication circuits, it is assumed that the "AF2-358/AG1-450 Interconnection Substation" is not immediately adjacent to Vienna – West Cambridge 69kV #6709 Line. Therefore, OPGW fiber cable should be installed between "AF2-358/AG1-450 Interconnection Substation" and the tie-in location to Vienna – West Cambridge 69kV #6709 Line.

Temporary spans of ADSS Fiber Cable shall be installed during construction as necessary.

Up to (2) 20" UCOMM communications panels shall be installed and commissioned.

3. NETWORK UPGRADES

The Non Stand-Alone Network Upgrades will include, but not be limited to, the following.

Transmission Line Tie-in for new interconnection substation:

The Vienna – West Cambridge 69kV line, #6709 line will be cut and looped into the new "AF2-358/AG1-450 Interconnection Substation." To interconnect the new substation, it is assumed that (4) new transmission monopole deadend structures may be required. These structures will include (2) new deadend structures on the existing Circuit #6709 centerline to cut into the existing conductor, and (2) new deadend structures to interconnect to the new substation takeoff structures. Existing structures on Circuit 6709 will need to be analyzed to confirm that no further modifications or reinforcements are required to support this interconnection and maintain all necessary design clearances. It is assumed that all new conductor shall be 954 ACSR 45/7 "Rail" and new shield wire will be 0.638" 96-count OPGW fiber to be consistent with the existing facilities on Circuit 6709.

It is assumed that the Generation Tie Line circuit is to be designed by the Developer and is not included within the scope of this study.

Fiber/Telecommunications work:

OPGW fiber cable shall be installed and spliced from the 6709 and 67YY transmission lines into the substation control house.

Fiber communications paths shall be created between new "AF2-358/AG1-450 Interconnection Substation" and Vienna and West Cambridge substations for the purposes of end-to-end protective relay communications.

Upgrades to neighboring facilities:

Vienna Substation:

Replace existing 6709F-SEL421 relay with a new SEL-411L relay. Perform wiring as necessary to replace the existing 6709F-SEL421 relay. Perform commissioning & testing on the new SEL-411L relay.

West Cambridge Substation:

Replace existing 6709F-SEL321 relay with a new SEL-411L relay. Perform wiring as necessary to replace the existing 6709F-SEL321 relay. Perform commissioning & testing on the new SEL-411L relay.

4. OTHER SCOPE OF WORK

The Other Scope of Work will include, but not be limited to, the following:

- Metering installation work – see Section B-7 below.
- OTB oversight cost estimates.

5. MILESTONE SCHEDULE FOR COMPLETION OF [TO] WORK

Facilities outlined in this report are estimated to take (24-36) months to construct, from the time the Generation 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	16
Permitting	8	24
Construction	25	60

6. ASSUMPTIONS IN DEVELOPING SCOPE/COST/SCHEDULE

- This scope assumes that the Project Developer will have all generation behind one interface breaker as required by Exelon Interconnection Standards. Developer may not have more than one POI.
- Scope and schedule assume that the tie-line between DPL and the Project Developer will be built as an overhead transmission line. If either the Project Developer or DPL need to build the tie-line as an underground transmission line, this scope, schedule, and estimate will need to be revised.
- This scope assumes that the protection package for the AF2-358/AG1-450 terminal will utilize Line Current Differential protection and that the Project Developer's circuit breaker and relays

are capable of being integrated into this package. If the protection package ultimately changes, this scope and estimate may need to be revised.

- Because real estate on which the substation can be built has not yet been identified and purchased, this scope assumes a generic plot of land of unknown size, shape & condition. The actual final location of the substation and existing site conditions may require revisions to the scope detailed within this document.

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 AF2-358 & AG1-450 GIA, and in PJM Manuals M01 and M14D. The details of applicable revenue metering requirements are given in the DPL interconnection guideline document posted on PJM website.

The revenue metering will be installed on the Project Developer side of the Point of Change in Ownership, but will be installed, owned, and maintained by DPL.

Project Developer will be required to install telemetry equipment at the Point of Interconnection identified in Schedule B of the AF2-358/AG1-450 GIA to provide real-time telemetry data to PJM in accordance with the requirements listed in PJM Manuals 01, 14A, 14B, and 14D. Protective relaying and metering design and installation must comply with the Applicable Technical Requirements and Standards identified in Schedule D of the AF2-358/AG1-450 GIA.

A three-phase 69kV revenue metering point will need to be established within the Generating Facility at the Point of Interconnection. Project Developer will purchase and install all metering instrument transformers as well as construct a metering structure per DPL's Applicable Technical Requirements and Standards identified in Schedule D of the AF2-358/AG1-450 GIA. The secondary wiring connections at the instrument transformers will be completed by Project Developer. The secondary wiring connection at the metering enclosure will be completed by DPL. The metering control cable and meter cabinets will be supplied and installed by DPL. Project Developer will install conduit for the control cable between the instrument transformers and the metering enclosure. The location of the metering enclosure will be determined during construction and must be approved by DPL. The meter enclosure must be designed with vehicular access to allow DPL crews the ability to access the location for installation, maintenance, and testing. Project Developer will provide 120V AC uninterruptible power source to the meter cabinet. DPL will provide both the primary and backup meters. DPL will program, install, and own the primary & backup solid-state multi-function meters for the new metering position.

Each meter will be equipped with load profile, telemetry, and DNP outputs. Project Developer will be provided with a single DNP output for each meter. DPL will supply a wireless modem for remote meter interrogation. If a wireless modem is unable to reliably communicate, Project Developer will be required to make provisions with the utility to implement an alternative communication solution. This resulting technology must be approved by DPL and located within approximately three feet of the DPL metering position to facilitate remote interrogation and data collection. It is Project Developer's responsibility to send the data that PJM and DPL require directly to PJM. Project Developer will grant permission for PJM to send DPL the following telemetry that Project Developer sends to PJM: real time MW, MVAR, volts, amperes, generator status, and interval MWH and MVARH.

DPL's revenue meters will be the official meters and must be the source for reporting generation output to PJM. Project Developer is responsible for installing telemetry equipment necessary to obtain the revenue meter data and submitting the data to PJM.

8. LAND REQUIREMENTS FOR INTERCONNECTION SUBSTATION

Acquisition of land associated with new “AF2-358/AG1-450 Interconnection Substation” is the responsibility of the Project Developer.

Substation fenceline dimensions should be approximately 300’ x 242’.

Land requirements for the Interconnection Substation needed for this interconnection project must meet DPL’s requirements. Specifically, a minimum of 5 acres is required for greenfield substation construction.

9. ENVIRONMENTAL AND PERMITING

All work to accommodate the interconnection of the AF2-358/AG1-450 Generating Facility is dependent upon the Project Developer obtaining all necessary permits. Moreover, the Project Developer shall be responsible for acquiring all necessary real property rights and acquisitions, including but not limited to rights of way, easements, and fee simple, in a form approved by DPL. Any setbacks in obtaining the necessary real property rights, acquisitions and permits required for this interconnection may delay the construction schedule.

C. APPENDICES

Appendix #1: Single Line Diagram for Physical Interconnection