Facilities Study Report

For

Physical Interconnection of

PJM Generation Interconnection Request Project ID AG1-090/AG1-377/AG1-378

"Philipsburg 115 kV"

Revision 1: May 2025

Introduction

This Facilities Study has been prepared in accordance with the PJM Open Access Transmission Tariff, as well as the Application and Studies Agreement between the Project Developer and PJM Interconnection, LLC (PJM or Transmission Provider (TP)). The Transmission Owner (TO) is Mid-Atlantic Interstate Transmission, LLC (MAIT), a FirstEnergy company.

A. Transmission Owner Facilities Study Summary

1. PROJECT DESCRIPTION

The Project Developer has proposed a solar/storage Generating Facility located in Centre County, Pennsylvania. The installed facilities for AG1-090/AG1-377/AG1-378 will have a total Maximum Facility Output (MFO) of 135 MW with 42 MW of this output being recognized by PJM as Capacity.

2. POINT OF INTERCONNECTION (POI)

The Generating Facility will interconnect with the MAIT transmission system by installing one 115 kV breaker at Philipsburg substation to expand the station from a four-breaker to a five-breaker ring bus.

Philipsburg Substation is planned to be converted to a four-breaker ring bus with supplemental project s1919 (Projected ISD 12/31/2026). Changes, deferral, or cancelation of this supplemental project could result in additional scope for AG1-090 to interconnect at Philipsburg Substation.

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

3. POINT OF CHANGE IN OWNERSHIP (PCO)

The Point of Change in Ownership (PCO) will be located at the Project Developer-owned dead-end structure, outside the Philipsburg substation.

4. SCOPE OF PROJECT DEVELOPER 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:

- Generation step-up (GSU) transformer(s) or final transformation, as applicable.
- Circuit breakers and associated equipment located between the high side of the GSU 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, and Supervisory Control and Data Acquisition (SCADA) and telecommunications equipment to comply with the TO's Applicable Technical Requirements and Standards.
- Revenue metering equipment. Current and voltage transformers shall be installed on the high voltage side of the GSU, on the generation side of the fault-interrupting device, and within the local zone of

fault protection for the facility.

B. Transmission Owner Facilities Study Results

The following is a description of Transmission Owner facilities for physical interconnection of the proposed AG1-090/AG1-377/AG1-378 project to MAIT transmission system. These facilities shall be designed according to FirstEnergy Applicable Technical Requirements and Standards. Once built, MAIT will own, operate, and maintain these Facilities.

1. TRANSMISSION OWNER INTERCONNECTION FACILITIES (TOIF)

1.1 Philipsburg Substation Expansion – New 115kV Generator Tie Line Terminal

Construct one span of 115kV conductor from Philipsburg Substation to the Project Developer-owned dead-end structure outside the substation.

- Installations:
  - Install (0.1) miles of 795 kcmil 26/7 ACSR conductor, shielded by 7#9 Alumoweld.
- Scope of Work Assumptions:
  - Ownership of TO line to terminate at developer-installed dead-end structure outside of Philipsburg substation.
  - Developer is responsible for any required access roads, forestry clearing, right-of-way, permitting, etc. for installation of span between Philipsburg substation and developer-installed dead-end structure.
  - Final conductor size to be determined during detailed design.
- Ancillary Scope of Work
  - Project Management
    - Provide project management, coordination, administration, scheduling, material management and project development as required.

1.2 Energize and integrate generator interconnection facilities to the transmission system.

- Relay and Controls Scope of Work
  - Integrate interconnection facilities protection and controls to the transmission system.
- Ancillary Scope of Work
  - Project Management
    - Project management will be required for this asset.
  - Revenue Metering

        - Provide support for Project Developer installed revenue metering.
    - Testing and Commissioning
        - Test and commission services as required.

2. STAND ALONE NETWORK UPGRADES

None.

3. NETWORK UPGRADES

3.1 Philipsburg Substation Expansion (Nxxxx)

Install a new 115 kV breaker and associated controls direct connection of AG1-090/AG1-377/AG1-378 Generating facilities to the existing Philipsburg substation.

- Below Grade Scope of Work:
    - Install (1) lot foundations, conduit, and grounding for new equipment.
- Above Grade Scope of Work:
    - Install (1) 115kV, 3000A, 40kAIC breaker
    - Install (2) 115kV, 2000A disconnect switches
    - Install (3) 115kV CCVTs and associated stands
    - Install (3) 115kV surge arresters
    - Install (2) 115kV wide band line traps, tuners, and coax
- Relay & Control Scope of Work
    - Install (1) standard line relaying panel with (2) SEL-411Ls and (1) SEL-451 BFT
    - Install (1) carrier panel with (2) UPLC-II FSK units and (2) PCM-5350s
    - Install (1) fiber distribution panel
    - Revise relay settings
- Additional Equipment to be Removed
    - None.
- Scope of work Assumptions
    - Control building has space for new panels
    - AC/DC systems are adequate for new equipment
    - Additional RTU status points are required, but it is assumed a new RTU will be installed as part of the ring bus project

  - Disconnect switches will not already be installed
  - Disconnect switches will be mounted on the A-frame, so they will not require stands.
- Ancillary Scope of Work
  - Project Management
    - Project management will be required for this asset.
  - Forestry
    - None
  - Real Estate & Right-Of-Way
    - None
  - Environmental
    - None
  - Revenue Metering
    - None
  - Information Technology
    - Estimated SCADA work at Philipsburg Substation to support breaker, relay, meter, wave trap, and PCM installation, as well as the installation of a SAS-K12 Switch with drawing updates.
  - Distribution
    - None.
  - Testing and Commissioning
    - Testing and commissioning services as required.

3.2 Shawville Substation

Install carrier equipment.

- Below Grade Scope of Work:
  - Install (1) lot foundation, conduit, and grounding for new equipment.
- Above Grade Scope of Work:
  - Install (1) 115 kV wide band line trap, tuner, and coax.
- Relay & Control Scope of Work
  - Install (1) carrier panel with (1) UPLC-II FSK unit and (1) PCM-5350.
  - Revise relay settings.
- Scope of Work Assumptions:
  - None

- Ancillary Scope of Work
    - Project Management
        - Project management will be required for this asset.
    - Information Technology
        - Estimated SCADA work at Shawville Substation to support relay, meter, wave trap, and PCM installation, as well as the installation of a SAS-K12 Switch with drawing updates.
    - Testing and Commissioning
        - Testing and commissioning services as required.

3.3 Eagle Valley Substation

Install carrier equipment.

- Below Grade Scope of Work:
    - Install (1) lot foundation, conduit, and grounding for new equipment.
- Above Grade Scope of Work:
    - Install (1) 115 kV wide band line trap, tuner, and coax.
- Relay & Control Scope of Work
    - Install (1) carrier panel with (1) UPLC-II FSK unit and (1) PCM-5350.
    - Revise relay settings.
- Scope of Work Assumptions:
    - None
- Ancillary Scope of Work
    - Project Management
        - Project management will be required for this asset.
    - Information Technology
        - Estimated SCADA work at Eagle Valley Substation to support relay, meter, wave trap, and PCM installation.
    - Testing and Commissioning
        - Testing and commissioning services as required.

4. Other Scope of Work

4.1 Support for Project Developer owned revenue metering.

5. MILESTONE SCHEDULE FOR COMPLETION OF MAIT WORK

Facilities outlined in this report are estimated to take 38 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
Preliminary Engineering	1	2
Detailed Engineering	5	28
Siting, Permitting & Real Estate	3	28
Equipment Delivery	30	30
Construction	31	34
Testing and Commissioning	33	35

6. ASSUMPTIONS IN DEVELOPING SCOPE/COST/SCHEDULE

6.1 Scope Assumptions:

- Project Developer will coordinate design and alignment of proposed 115 kV generator lead line with the Transmission Owner for review of any clearance, right-of-way or right-of-way encroachment issues with TO owned facilities.
- Project Developer will coordinate design and construction of proposed 115 kV lead line. For these areas, the Project Developer shall provide TO with proposed drawings prior to construction and as-built drawings, confirmed by as-built survey data post-construction.
- Transmission Owner's preference would be to limit interference and avoid transmission line crossings with new 115 kV terminal positions. As a minimum, Project Developer facilities should not encroach within 100 feet of TO centerline at blowout conditions. If Project Developer's line design does not comply with this requirement TO would need to review this area as a special exception.
- Additional costs will be incurred by the Project Developer, if final alignment of the 115 kV generator lead line causes encroachments, changes, or modifications to any existing or relocated TO facilities.
- Project Developer is responsible for making all arrangements for electric distribution service (if required) for its generation station. No costs or schedule are included herein.
- All new generator only and new generator plus load facilities must be isolated from the MAIT Transmission System by a Power Transformer with a winding configuration meeting the requirements in FirstEnergy's "Requirements for Transmission Connected Facilities" document.
- Philipsburg Substation is planned to be converted to a four-breaker ring bus with supplemental project s1919 (Projected ISD 12/31/2026). Changes, deferral, or cancelation of this supplemental project could result in additional scope for AG1-090 to interconnect at Philipsburg Substation.

6.2 Cost Estimate Assumptions:

- The cost estimates provided in this report were developed as of July 3, 2024, based upon current market conditions. Hence, they are subject to significant changes in the event that project implementation is delayed. Notwithstanding the cost estimates from this report being used in the Generator Interconnection Agreement for the related project, MAIT reserves the right to re-evaluate and provide a more accurate cost estimate during the implementation phase of the project. In accordance with section 217 of the Open Access Transmission Tariff, the Project Developer will be responsible for 100 percent of the actual costs of the facilities required to accommodate its Interconnection Request.
- MAIT reserves the right to charge the Project Developer operation and maintenance expenses to maintain the Project Developer attachment facilities, including metering facilities, owned by MAIT. These costs will be specified in the Generator Interconnection Agreement.

6.3 Schedule Assumptions:

- This schedule assumes that all issues covered by the "Environmental, Real Estate and Permitting Issues" section of this document are resolved. Construction cannot begin until after all applicable permits and/or easements have been obtained.
- MAIT's ability to support this schedule also depends on the feasibility of taking the required outages to support construction. Outages that are determined to negatively impact system reliability or cause congestion may be delayed or denied, at any time, even if they are submitted on time based on the Outage Submittal Rules in section 4.2.1 of PJM Manual 03. This includes, but is not limited to, outages requested between the months of June and September, as well as January and March, which typically get denied due to summer and winter peak conditions. Therefore, the construction schedule will be adjusted as needed to accommodate any outage restrictions that have been identified by MAIT or the Transmission Provider.

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 AG1-090/AG1-377/AG1-378 GIA, and in PJM Manuals M01 and M14D. The details of applicable revenue metering requirements are given in the "Requirements for Transmission Connected Facilities" posted on PJM website.

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

The revenue metering system (particularly the revenue metering current transformers) shall be designed to accurately meter the light loads that will occur when the facility is not generating power and only back-feeding station service from the Transmission Owner. This may require the use of high accuracy extended range current transformers.

Transmission Owner's Revenue Metering Requirements may be found in the FirstEnergy Corporation *Requirements for Transmission Connected Facilities* document which can be found on the PJM website at:

www.pjm.com/planning/design-engineering/to-tech-standards.aspx

These requirements are in addition to any metering required by PJM.

The revenue metering CTs and VTs shall be installed on the transmission voltage side of the Connecting Party's step-up transformer, on the generation side of the fault-interrupting device, and within the local zone of fault protection for the facility.

Transmission Owner will obtain real-time, site-specific, generation data from PJM, via the required communication link from Project Developer to PJM. Transmission Owner will work with PJM and Project Developer to ensure the generation data provided to PJM meets Transmission Owner's requirements.

Communications for transmission line protection between the new interconnection substation, and Project Developer's generation (collector) substation, will be via fiber optics (see "Telecommunication Facilities" section above).

8. LAND REQUIREMENTS FOR INTERCONNECTION SUBSTATION

Not Applicable.

9. ENVIRONMENTAL AND PERMITING

The following are possible environmental, real estate and permitting issues:

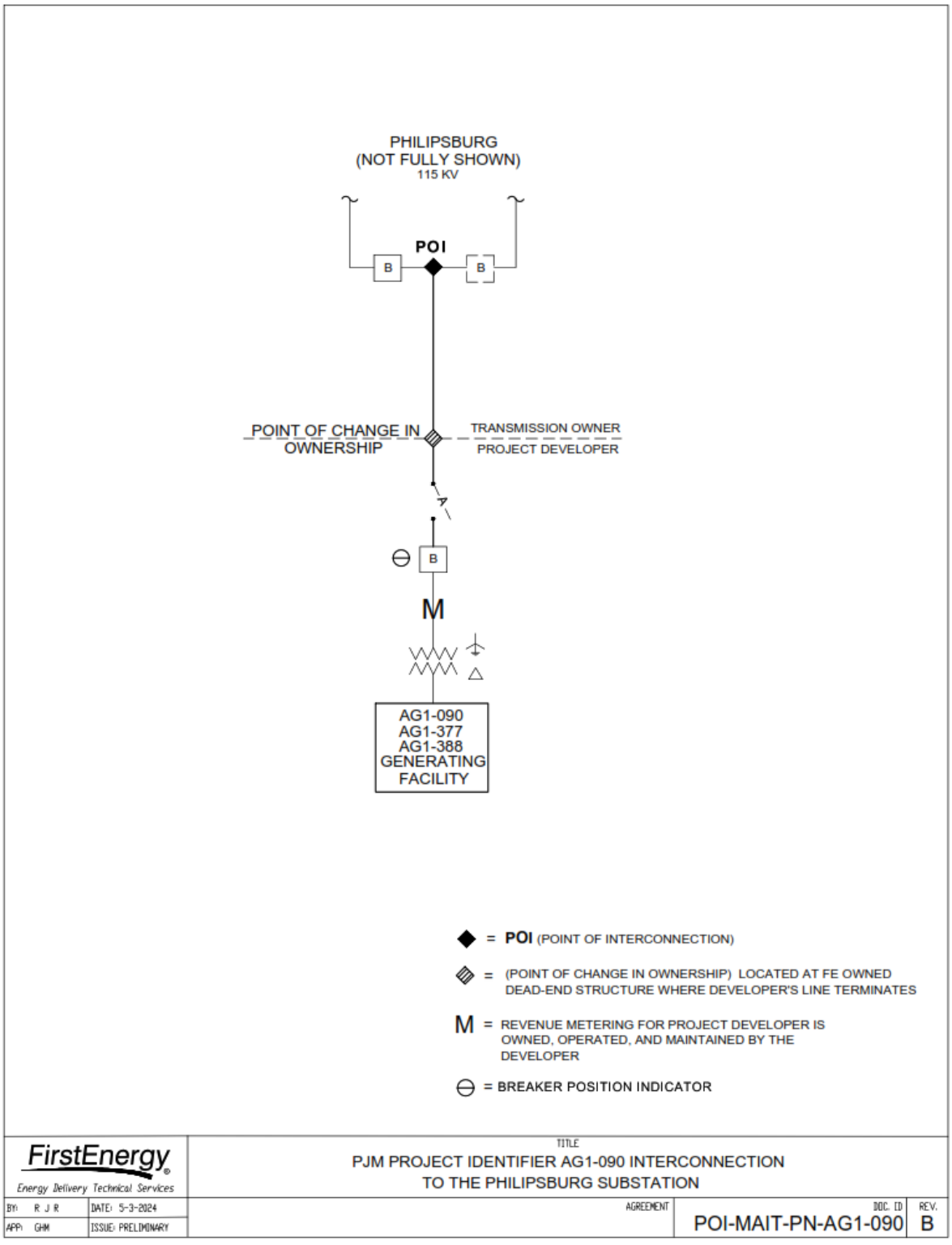
- Environmental permitting, Real Estate acquisition, and Pennsylvania Public Utility Commission (PaPUC) notifications vary, some up to twelve (12) months after preliminary engineering is completed to secure the required approvals.
- Prior to agreement by Project Developer to purchase the property, a Phase 1 Environmental Assessment should be conducted for the entire site to avoid assumption of environmental liabilities by Project Developer or Transmission Owner.
- The Transmission Owner interconnection substation may involve environmental surveys, permits, approvals and plans with federal, state, and/or local agencies.
- Assumed Project Developer is to provide all access rights, easements, ROW and permits necessary to complete the Project to the satisfaction of Transmission Owner. Environmental permitting shall encompass all federal, state, and local requirements, consultations, and agency coordination. Confirmation of meeting all permitting requirements shall be provided to Transmission Owner, prior to start of construction. Following construction and energization, confirmation of permit closeout shall be provided to the satisfaction of Transmission Owner, prior to transfer of ownership. If any of these elements are not included in the final agreement between Transmission Owner and Project Developer, twelve (12)-to-eighteen (18) months should be added to the Project Schedule to secure necessary permits, and additional costs would apply.
- Project Developer will provide copies of all the relative environmental permits and other necessary approvals to Transmission Owner before Transmission Owner accepts the interconnection facilities.
- Project Developer is required to install an access road from the new interconnection substation to the nearest public road (must be approved by Transmission Owner) and obtain access rights for Transmission Owner. Project Developer is responsible to maintain access road and ensure unimpeded access for Transmission Owner at all times.
- Project Developer is responsible for all property acquisition (including easements/rights-of-way (ROW)) for transmission, distribution and communication facilities needed for the generator interconnection.

- If Project Developer owns the project property, in fee title, Transmission Owner will require a fee property transfer for the interconnection substation site which may require subdivision approval, together with permanent access rights to and from the substation, as well as a perpetual easement for any transmission lines to the substation. Project Developer is responsible for all costs, including but not limited to subdivision, associated with the property transfer.
- If Project Developer leases the project property, the Project Developer will be required to obtain fee property from the underlying fee property owner, on behalf of Transmission Owner, for the interconnection substation site, together with permanent access rights to and from the substation, as well as a perpetual easement for any transmission lines to the substation.
- All property rights must be surveyed and metes and bounds descriptions prepared for incorporation into Transmission Owner's document forms, for transfer of title.
- The Transmission Owner interconnection substation and transmission line loop will involve PUC notification/approval.
- All work occurs within an existing transmission line right-of-way or on Project Developer's property with access to all existing structures possible via that property and the right-of- way following established access routes that do not cross wetlands or streams.
- Project Developer will develop, and secure regulatory approval for, all necessary Erosion and Sediment Control (E&SC) plans and National Pollutant Discharge Elimination System (NPDES) permits.
- Project Developer will obtain all necessary permits.
- Project Developer will conduct all necessary wetlands and waterways studies and permits.
- Project Developer will conduct all necessary historical and archaeological studies.
- If the Project Developer plans to cross the transmission line right of way with facilities or access roads, please refer to the Transmission Rights-of-Way Restrictions information located at:

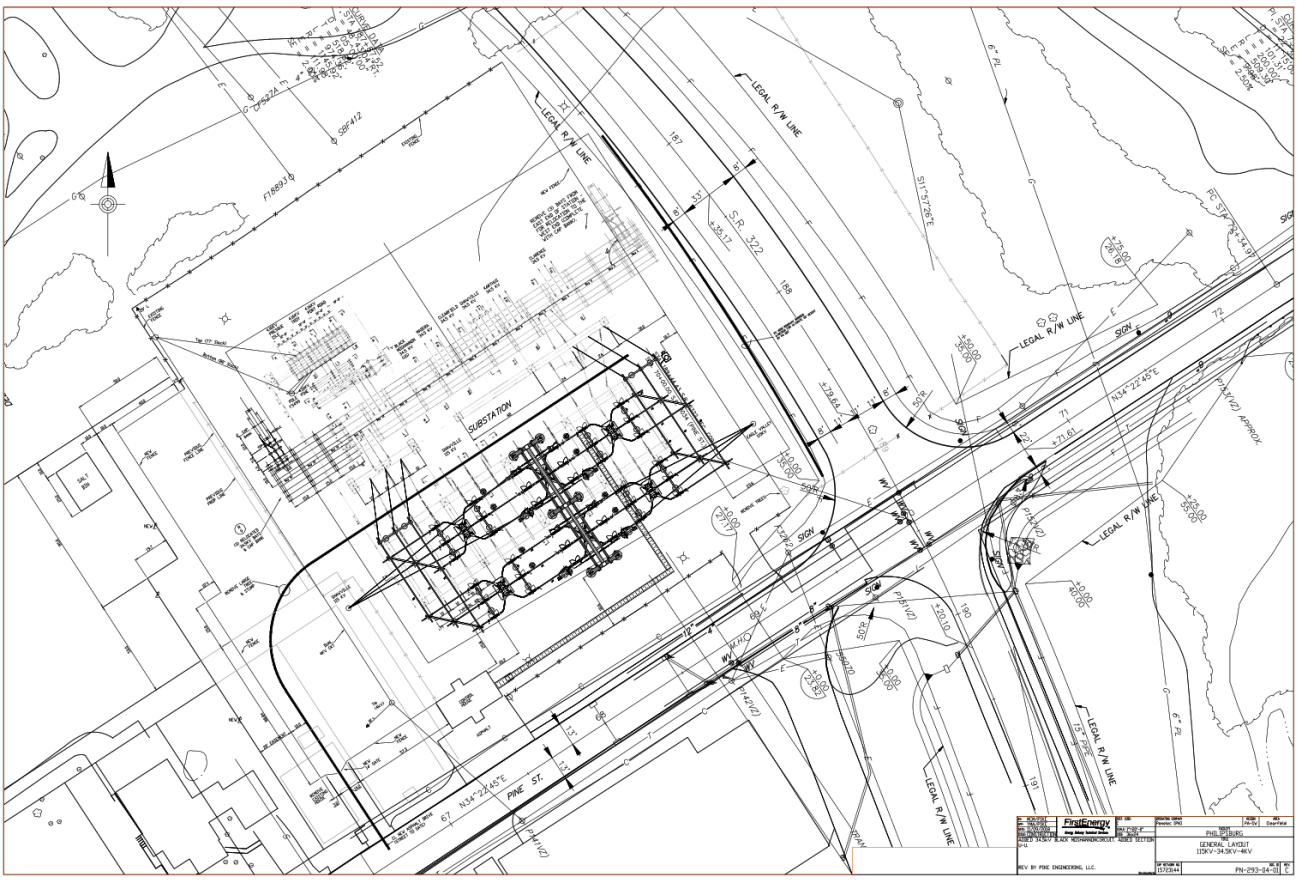
  https://www.firstenergycorp.com/help/safety/real-estate-power-lines/transmission-right-of-way.html#ROWform

C. APPENDICES

ATTACHMENT #1: SINGLE LINE DIAGRAM FOR THE PHYSICAL INTERCONNECTION



ATTACHMENT #2: SUBSTATION GENERAL ARRANGEMENT



ATTACHMENT #3: MATERIAL LIST AND EQUIPMENT RATINGS

Material/Equipment	Quantity
Foundation - Concrete (cy)	12.773
Stone (cy)	4
Panel (ea)	4
Relay (ea)	7
Cable Termination (ea)	1138
Conduit (lf)	291
Insulator Bell (ea)	27
Switch (ea)	4
Structure - Steel Stand (ea)	3
Circuit Breaker (ea)	1
Line Trap (ea)	4
Surge Arrester (ea)	3
Capacitor Coupled Voltage Transformer (CCVT) (ea)	3
Cable Pulls (lf)	6270
Conductor (ft)	2152.4
Grounding (lf)	110
Shield Wire - OHGW (lf)	580.8
Foundation - Concrete (cy)	12.773
Stone (cy)	4

ATTACHMENT #4: PROTECTION SCOPE

Description:

- AG1-090: Interconnection at Philipsburg 115kV

Philipsburg Substation

- Install one 115kV breaker to convert the ring bus to a 5-breaker ring.
- Dual SEL-411L Standard BES line protection for primary and backup line differential schemes communicating over fiber channels for interconnection tie line to generator collector substation.
- (1) set of three, CCVTs for the interconnection terminal.
- (1) SEL-451 for breaker failure protection.
- Reuse existing SEL-421/SEL-411L line protection relays for the Eagle Valley 115kV line. Reuse the SEL-421 with the existing carrier equipment, including carrier transmitter receiver and PCM-5350 power line carrier monitor, dual-frequency line tuner, and dual-frequency line trap for the primary DCB scheme on Z-phase. Install a new UPLC-II FSK unit, wide band line tuner, wide band line trap, and PCM-5350 for use with the SEL-411L for a backup DCUB scheme on X-phase. Review/revise relay settings and wiring. Reuse/reconfigure existing anti-islanding equipment between Philipsburg and Eagle Valley.
- Reuse existing SEL-421/SEL-411L line protection relays for the Shawville 115kV line. Reuse the SEL-421 with the existing carrier equipment, including carrier transmitter receiver and PCM-5350 power line carrier monitor, wide band line tuner, and wide band line trap for the primary DCB scheme on Z-phase. Install a new UPLC-II FSK unit, wide band line tuner, wide band line trap, and PCM-5350 for use with the SEL-411L for a backup DCUB scheme on X-phase. Review/revise relay settings and wiring. Reuse existing anti-islanding equipment between Philipsburg and Shawville.

Eagle Valley Substation

- Reuse existing SEL-421/SEL-411L line protection relays for the Philipsburg 115kV line. Reuse the SEL-421 with the existing carrier equipment, including carrier transmitter receiver and PCM-5350 power line carrier monitor, dual-frequency line tuner, and dual-frequency line trap for the primary DCB scheme on Z-phase. Install a new UPLC-II FSK unit, wide band line tuner, wide band line trap, and PCM-5350 for use with the SEL-411L for a backup DCUB scheme on X-phase. Review/revise relay settings and wiring. Reuse/reconfigure existing anti-islanding equipment between Philipsburg and Eagle Valley.

Shawville Substation

- Reuse existing SEL-421/SEL-411L line protection relays for the Philipsburg 115kV line. Reuse the SEL-421 with the existing carrier equipment, including carrier transmitter receiver and PCM-5350 power line carrier monitor, wide band line tuner, and wide band line trap for the primary DCB scheme on Z-phase. Install a new UPLC-II FSK unit, wide band line tuner, wide band line trap, and PCM-5350 for use with the SEL-411L for a backup DCUB scheme on X-phase. Review/revise relay settings and wiring. Reuse existing anti-islanding equipment between Philipsburg and Shawville.

ATTACHMENT #5: PRELIMINARY GEOTECHNICAL SUMMARY

Not Applicable