Facilities Study Report

For

Physical Interconnection of

PJM Generation Interconnection Request
Project ID AH1-247/AH1-248/AH1-249

“Lardin - Lake Lynn 138kV”

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 Keystone Appalachian Transmission Company (KATCO), a FirstEnergy company.

This Facility Study was performed to satisfy the Phase 2 Facility Study requirement of the PJM Tariff. The Facility Study is intended to provide scope, cost and schedule estimates for the project as currently defined and approved for Phase 2 study. In the event project changes are made during DP2 that impact this report, updates will be provided as part of the Phase 3 report. Following execution of the project's final agreement, this report will not be updated to account for other changes made as part of the agreements modification clause and instead the scope change process will be followed.

A. Transmission Owner Facilities Study Summary

1. PROJECT DESCRIPTION

The Project Developer has proposed a solar and storage Generating Facility located in Fayette County, Pennsylvania. The installed facilities for AH1-247/AH1-248/AH1-249 will have a total Maximum Facility Output (MFO) of 145 MW with 119 MW of this output being recognized by PJM as Capacity.

2. POINT OF INTERCONNECTION (POI)

The Generating Facility will interconnect with the KATCO transmission system via a newly constructed 138 kV three (3) breaker ring bus substation, tapping the Lardin – Lake Lynn 138 kV line, Line Number 731, approximately 3.3 miles from Lardin substation.

The construction of the new interconnection substation will result in the splitting of the existing Lardin – Lake Lynn 138 kV line, Line Number 731, into two lines on the transmission system. New line designations are to be determined.

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 first dead-end structure outside the new three (3) breaker ring bus interconnection substation fence line.

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:

- 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.
- The easements and associated rights of way for the TO owned substation along with the 138 kV line taps to the substation will be acquired by the Project Developer and transferred to the TO at no cost. Site preparation for the TO owned substation, including clearing, grading and an access road, as necessary, is assumed to be by the Project Developer. The access road design must be approved by FirstEnergy to ensure it provides adequate access to the substation to support construction and maintenance activities. Route selection, line design, and right-of-way acquisition for the Project Developer's facilities are not included in this report and are the responsibility of the Project Developer.

B. Transmission Owner Facilities Study Results

The following is a description of Transmission Owner facilities for physical interconnection of the proposed AH1-247/AH1-248/AH1-249 project to KATCO transmission system. These facilities shall be designed according to FirstEnergy Applicable Technical Requirements and Standards. Once built, KATCO will own, operate, and maintain these Facilities.

1. TRANSMISSION OWNER INTERCONNECTION FACILITIES (TOIF)

1.1 New Interconnection Substation Line Terminal

Install line terminal equipment within the AH1-247/AH1-248/AH1-249 Interconnection substation. Install one span from AH1-247/AH1-248/AH1-249 Interconnection Substation to the Project Developer-owned dead-end structure outside of FE substation fence.

- Structures Installed
    - 0.1 miles of conductor 795 kcmil 26/7 ACSR shielded by (2) 7#8 Alumoweld .
    - Substation line exit facilities, including dead end structures and disconnect switches, described in the AH1-247/AH1-248/AH1-249 Interconnection substation scope.
- Siting and Permitting
    - Full application will be required.
- Scope of work Assumptions
    - Location of PCO assumed
    - Location of generator substation assumed
    - A ground survey will be required for design and as-built.
    - Cost of mobilization/demobilization shared with line Loop scope of work.
    - Assume minimal social and ecological impacts.
    - Assume no local opposition to the project.

- Ancillary Scope of Work
    - Project Management
        - Provide project management, coordination, administration, scheduling, material management and project development if 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
        - Provide project management, coordination, administration, scheduling, material management and project development as required.
    - Revenue Metering
        - Provide support for Project Developer installed revenue metering.
    - Testing and Commissioning
        - Test and commission new relay settings and metering equipment.

2. STAND ALONE NETWORK UPGRADES

2.1 New Interconnection Substation

A new three (3) breaker ring bus substation will be constructed along the Lardin – Lake Lynn 138 kV transmission line to interconnect AH1-247/AH1-248/AH1-249 with the KATCO transmission system.

The new substation will be located approximately 3.3 miles from Lardin Substation. The Project Developer will be responsible for acquiring all easements, properties, and permits that may be required to construct both the new interconnection switching station and the associated facilities. The Project Developer will also be responsible for the rough grade of the property and an access road to the proposed three-breaker ring bus site.

- Below Grade Scope of Work:
    - Install ground grid.
    - Install cable trench, conduit, and control cables to equipment.
    - Install foundations for all equipment, control house, fences posts, and structures.
- Above Grade Scope of Work:
    - Install (1) 15x39 PCE including (1) 125VDC battery systems
    - Install (3) 138kv CBs with bushing CTs and (6) CB disconnects
    - Install (3) MOAB line switches
    - Install (3) set of 3-phase CCVTs
    - Install (9) single 138kv surge arresters

- Install (3) 138kv deadend/takeoff structures
- Install (1) SSVTs
- Install all equipment stands and 138kv low and high bus, insulators, shield wiring including one mast, and equipment connections
- Install (1) high security fence with (2) sliding gates
- Install security system

- Relay & Control Scope of Work
  - Lake Lynne 138kv Line:
    - Two (2) SEL-411L relay for primary and backup line protection over fiber
    - Additional auxiliaries as needed to support the line protection
  - Interconnection 138kv Line:
    - Two (2) SEL-411L relays for primary and backup line protection over fiber
    - Additional auxiliaries as needed to support the line protection
  - 138kv CBs
    - One (1) SEL-451 relay per CB for a total of 3
    - Additional lockouts and auxiliaries as needed
  - General Relaying support
    - One (1) SEL-3350 RTACs for relay remote access
    - One (1) Arbiter 1094b or similar GPS Clocks for timing
    - One (1) Qualitrol TWS systems for traveling wave monitoring, for networked lines >100kV
    - One (1) DFR for fault recording
    - Install (1) RTU
- Scope of work Assumptions
  - Assumed will need RTAC RTU for control house.
  - Assumed will need power quality SATEC meters for each transmission line.
  - Assumed security system will follow guidance for 138kv stations from the FE OTB Guide.
- Transmission Owner Permits Required:
  - Developer will provide the rough graded site and access road.
- Ancillary Scope of Work
  - Project Management
    - Provide project management, coordination, administration, scheduling, material management and project development as required.
  - Forestry

        - None
    - Real Estate & Right-Of-Way
        - Real Estate Support will be needed to review drawings and support land transfers, if applicable.
        - Real estate estimate has been included for:
            - Internal support including document review, project planning meetings, subcontractor oversight and assistance with transfer of assets if required.
            - External support for general project support, and minimal construction support and damage settlements/releases.
            - Direct damage payments not included in estimate
            - Kept GIS / R&R for installation of structures.
    - Environmental
        - Review drawings for new foundations and removal of equipment to support any permitting, if applicable, for new equipment.
    - Revenue Metering
        - None
    - Information Technology
        - Network equipment and scopes described in sections 2.2, 2.3 and 2.4.
        - SCADA work at AH1-247/AH1-248/AH1-249 Substation to support HMI, security camera, breaker, relay, RTU, meter, traveling wave monitor, MOAB, GOAB, battery charger, data concentrator, DFR, battery monitor, surge arrestor, and disconnect switch installation, as well as the installation of a SAS-DxP-24 Switch with drawing updates.
    - Distribution
        - Backup station service power from region.
        - Add (2) new tangent wood poles and (1) new dead-end wood pole.
        - Add up to 0.15 miles of new distribution circuit.
    - Testing and Commissioning
        - Testing and Commissioning of all relays and electrical equipment.
- Standard Design References:
    - FirstEnergy's *Requirements for Transmission Connected Facilities*:

      www.pjm.com/planning/design-engineering/to-tech-standards.aspx.
    - PJM Protection Standard (PJM Manual 7):

      https://pjm.com/-/media/documents/manuals/m07.ashx
- KATCO Protection Specification:
    - Refer to *Attachment 4* of this document.

- Material List and Equipment Ratings:
    - Refer to *Attachment 3*.

2.2 ADSS Fiber Installation

- Install/Test approximately 2.61 miles of 48F/SM from the new AH1-247/AH1-248/AH1-249 Substation Control House to a splice point on the existing Lake Lynn-Lardin Fiber line.
- An underground HDD build of ADSS fiber will run for 1.01 miles from the new substation to the distribution structure 354006-WP14.
- Aerial ADSS will be built from structure 354006-WP14 to the structure 497662-WP14, for approximately .94 miles.
- Underground ADSS will be utilized again from structure 497662-WP14 to structure 204803-WP14, for another .16 miles.
- Aerial ADSS fiber will be built for an additional 0.5 miles, to the splice point on the Lake Lynn-Lardin fiber line, near structure 754637-WP14.

2.3 MPLS Equipment

- Estimated design, installation, and testing/commissioning for MPLS equipment for SCADA transport at AH1-247/AH1-248/AH1-249 Substation.
- Estimated cost associated with Crossbow engineering and materials at AH1-247/AH1-248/AH1-249 Substation.

2.4 In – Sub Fibers Run

- Estimated (2) in-sub fiber runs to from AH1-247/AH1-248/AH1-249 Substation to the PCO.

2.5 New Interconnection Substation – FE Option to Build Scope

FirstEnergy work at new Interconnection Substation

- Above Grade
    - Install (1) security system and camera system.
    - Install (1) indoor security AC cabinet.
- Relay and Control Scope of Work
    - Install (1) network fiber termination rack.
    - Programming of SCADA RTU.
- Scope of Work Assumptions
    - Assumed developer will install camera foundations and conduits to FirstEnergy standards.
    - Assumed 2 weeks of testing and commissioning for testing to Transmission Control Centers.

- Assumed Project Developer will install fiber from generator station to OTB station and bring fiber into control house.
- FirstEnergy will be responsible for network fiber.

- Ancillary Scope of Work
  - Project Management
    - Provide project management, coordination, administration, scheduling, material management and project development as required.
  - Information Technology
    - Refer to section 2.2, 2.3 & 2.4 for SCADA backhaul connection and MPLS installation
  - Testing and Commissioning
    - Testing of new site to Transmission Control Center; perform functional testing as required

3. NETWORK UPGRADES

3.1 Lardin – Lake Lynn 138 kV, Line Number 242

The Lardin – Lake Lynn 138 kV, Line Number 731, will be cut and looped into the new interconnection substation at a point approximately 3.3 miles from Lardin substation, between structures 49 and 50.

- Existing Conditions
  - Per TAMI the existing line is constructed on single circuit, monopole and lattice tower structures. Existing conductor is 6-wired 4/0 AWG 7-strand copper shielded by (2) 7#8 copperweld
- Structures Installed
  - (2) double circuit steel monopole dead-end structures on concrete foundations
  - The line is a 6-wired single circuit; custom double circuit structures are assumed
  - 0.2 miles of 795 kcmil 26/7 ACSR conductor shielded by OPGW
  - Transfer existing conductors to new dead-end structures
- Structures Removed
  - Approximately 0.1 miles 6-wired 4/0 AWG 7-strand copper shielded by (2) 7#8 copperweld.
- Permitting
  - Full Application will be required.
- Scope of Work Assumptions
  - Outage can be obtained to perform line construction.
  - A ground survey will be required for design and as-built.

- It is assumed the existing conductor and shield wire are in adequate condition and can be transferred. An engineering analysis during project development will be required.
- It is assumed new dead-end structures will transition from 6-wire to 3-phase conductor attachments.
- It is assumed the adjacent structures are in adequate condition and can handle the new loading. An engineering analysis during project development will be required.
- The loop cut-in and substation location were not provided in detail. A general area was provided. Specific substation location and layout will be required during project development and execution. Scope of project may change.

- Ancillary Scope of Work
  - Project Management
    - Provide project management, coordination, administration, scheduling, material management and project development if required
  - Forestry
    - Forestry will have clearing accomplished prior to access road construction start.
  - Real Estate & Right-Of-Way
    - New ROW will be required
    - Real estate estimate has been included for:
      - Internal support including document review, project planning meetings, subcontractor oversight and assistance with transfer of assets if required.
      - External support for general project support, and minimal construction support and damage settlements/releases.
      - Direct damage payments not included in estimate
      - Kept GIS / R&R for installation of structures.
  - Environmental
    - Road Bonds are required
    - Environmental Filming (Documentation of Existing roads are required).
    - Environmental Access and Road Crossing Permit Fees are required.
    - Environmental Development of Permit Binder is required.
    - Environmental Cultural Resource Consultation is required.
    - Environmental Construction walk down is required.
    - RTE consultation letters are required.
    - Wetland delineations and WDR are required.
    - Stormwater permits and local approvals are included.
    - Internal environmental engineering and external project management costs are included.

- Revenue Metering
  - None
- Information Technology
  - None
- Access Road Construction
  - Access roads will be required, terrain is flat, approximately 0.2 miles.
- Distribution
  - None

3.2 Lardin Substation

- Description of Work
  - Install new relays, trip coils, slip-on CTs and revise relay settings at Lardin.
  - Remove wavetrap, line tuner, relays, and associated accessories.
- Below Grade Scope of Work:
  - None
- Above Grade Scope of Work:
  - None
- Relay & Control Scope of Work
  - For Lake Lynn Terminal
    - Install (1) standard relay panel with Primary and Backup SEL411L over fiber.
  - For 138kv L-3 (138C) CB
    - Install (1) new trip coil.
    - Install (1) SEL451 relay and associated LORs and Aux relays for BFR and CB trip.
  - For 138kv L-6 (138P) CB
    - Install (1) new trip coil.
    - Install (1) SEL451 relay and associated LORs and Aux relays for BFR and CB trip.
    - Install (1) set of (3) slip over/bushing CTs.
- Additional Equipment to be Removed
  - (1) Wavetrap, (1) line tuner, associated line and BFR relays and accessories
- Scope of Work Assumptions:
  - Assume reusing cables from CB to control house
  - Assume removing (2) relay panels
  - Assume allowance for material and labor per CB trip coil

- Ancillary Scope of Work
    - Project Management
        - Provide project management, coordination, administration, scheduling, material management and project development if required.
    - Environmental
        - Review drawings for new foundations and removal of equipment to support any permitting, if applicable, for new equipment. Costs split across 3 estimates: 19021-R1, 19020-R1 and 23122.
        - Environmental Development of Permit Binder is required.
        - Environmental Cultural Resource Consultation is required.
        - Environmental Construction walk down is required.
        - RTE consultation letters are required.
        - Wetland delineations and WDR are required.
        - Stormwater permits and local approvals are included.
        - Internal environmental engineering and external project management costs are included.
    - Information Technology
        - SCADA work at Lardin Substation to support relay and meter installation.
    - Testing and Commissioning
        - Testing new equipment is required.

3.3 Lake Lynn Substation

- Description of Work
    - Install new relays, replace circuit breaker, and revise relay settings at Lake Lynn.
    - Remove wavetrap, line tuner, relays, and associated accessories.
- Below Grade Scope of Work:
    - Replace 138kv CB foundation
- Above Grade Scope of Work:
    - Replace (1) 138kv CB with bushing CT (2 per bushing)
- Relay & Control Scope of Work
    - Install (1) standard relay panel with Primary and Backup SEL411L over fiber.
    - Install (1) SEL451 relay and associated LORs and Aux relays for BFR and CB trip.
- Additional Equipment to be Removed
    - (1) Wavetrap, (1) line tuner, associated line and BFR relays and accessories

- Scope of Work Assumptions:
    - Assume new foundation, reusing existing underground conduit, cable trench and cables from Circuit Breaker to Control House.
    - Assume removing (2) relay panels
    - Assume 40kA Circuit Breaker
- Ancillary Scope of Work
    - Project Management
        - Provide project management, coordination, administration, scheduling, material management and project development if required.
    - Environmental
        - Review drawings for new foundations and removal of equipment to support any permitting, if applicable, for new equipment. Costs split across 3 estimates: 19021-R1, 19020-R1 and 23122.
        - Environmental Development of Permit Binder is required.
        - Environmental Cultural Resource Consultation is required.
        - Environmental Construction walk down is required.
        - RTE consultation letters are required.
        - Wetland delineations and WDR are required.
        - Stormwater permits and local approvals are included.
        - Internal environmental engineering and external project management costs are included.
    - Information Technology
        - Estimate SCADA work at Lake Lynn Substation to support relay and meter installation.
    - Testing and Commissioning
        - Testing new equipment is required.

4. Other Scope of Work

4.1 Revenue metering.

- Description of Work
    - Provide revenue metering panel within new AH1-247/AH1-248/AH1-249 Control House. Integrate revenue metering to Interconnection Substation.
    - Provide new 3-phase 138kV Free-standing CT/VT Combo Units.
- Below Grade Scope of Work:

- (1) Lot of excavation, conduit, backfill, grounding, and wiring between Free Standing CT/VT Combo units to revenue metering.
- (1) Lot of foundations for Free-standing CT/VT 138 kV Combo Unit.

- Above Grade Scope of Work:
  - (1) set of 3-phase Free Standing CT/VT Combo Unit 138 kV.
- Relay & Control Scope of Work
  - (1) New Revenue Metering Panel with test switches. The material for the Revenue Meter to be included in revenue metering support estimate.
- Scope of Work Assumptions:
  - It is assumed current and voltage signals will be pulled from new 3-phase free standing CT/VT Combo Units. Costs for these combo units are included in the AH1-247/AH1-248/AH1-249 Interconnection substation scope.
  - Assumes enough room in AH1-283 Control house to support a new revenue metering panel.
  - Assumes enough room in AH1-283 substation to add in free standing CT/VT Combo Units.
  - Assumes the same crew that is constructing the OTB FE Work scope will be adding the revenue metering panel and freestanding CT/VT combo units.
  - Temp const facilities and construction general conditions (Scope Capture) are included in AH1-247/AH1-248/AH1-249 Interconnection substation scope.
- Ancillary Scope of Work
  - Project Management
    - Provide project management, coordination, administration, scheduling, material management and project development if required.
  - Revenue Metering
    - Provide high end revenue meter and engineering support for revenue metering at new Interconnection Substation AH1-247/AH1-248/AH1-249.
  - Testing and Commissioning
    - Testing and commissioning services as required.

4.2 Option to Build Oversight

FirstEnergy oversight of developer design and construction of new interconnection substation

- Below Grade
  - Must meet FirstEnergy standards - Option to Build.
- Above Grade
  - Must meet FirstEnergy standards - Option to Build.

- Relay and Controls Scope of Work
    - Must meet FirstEnergy standards - Option to Build.
- Scope of Work Assumptions
    - Engineering oversight for review/comment of OTB site design for meeting FirstEnergy Standards.
    - Geotechnical/site/civil oversight for review/comment of OTB site grading design for meeting FirstEnergy standards.
    - Construction Oversight assumed for 6 months (note: potential for additional oversight for Geotech/site/civil site construction for challenging projects).
    - Developer responsible for apparatus testing of devices and supplying results to FirstEnergy
    - FirstEnergy commissioning oversight is assumed for duration of construction
    - Developer responsible for providing final 3D As-builts per FE direction, oversight, and approval.
- Ancillary Scope of Work
    - Project Management
        - Coordinate with developer and provide project management, coordination, administration, scheduling, material management and project development for FirstEnergy scope of work.
        - Provide construction oversight for project construction duration.
    - Forestry
        - Completed by Developer.
    - Real Estate and Right-of-Way
        - Support as required for transfer of property to FirstEnergy upon construction completion
        - Internal support including document review, project planning meetings, assistance with transfer of assets as required.
    - Environmental
        - Environmental review of proposed site.
    - Testing and Commissioning
        - Commissioning review of developer supplied information and witness of critical testing

5. MILESTONE SCHEDULE FOR COMPLETION OF KATCO WORK

Facilities outlined in this report are estimated to take 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
Preliminary Engineering	1	2
Detailed Engineering	5	25
Siting, Permitting & Real Estate	3	25
Equipment Delivery	27	27
Construction	28	34
Testing and Commissioning	32	36

6. ASSUMPTIONS IN DEVELOPING SCOPE/COST/SCHEDULE

6.1 Scope Assumptions:

- Project Developer will coordinate design and alignment of proposed 138 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 138 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 138 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 138 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 KATCO Transmission System by a Power Transformer with a winding configuration meeting the requirements in FirstEnergy's "Requirements for Transmission Connected Facilities" document.

6.2 Cost Estimate Assumptions:

- The cost estimates provided in this report were developed as of February 16, 2026, 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, KATCO 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.

- KATCO reserves the right to charge the Project Developer operation and maintenance expenses to maintain the Project Developer attachment facilities, including metering facilities, owned by KATCO. 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.
- KATCO'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 KATCO 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 AH1-247/AH1-248/AH1-249 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 Transmission Owner side of the Point of Change in Ownership, and will be installed, owned, and maintained by Transmission Owner.

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 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.

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

8. LAND REQUIREMENTS FOR INTERCONNECTION SUBSTATION

Land requirements for the Interconnection Substation needed for this interconnection project must meet the requirements in the following documents posted on PJM website.

- Requirements for Transmission Connected Facilities
- Geotechnical Design Requirements

The appropriate land requirements for a new Interconnection Substation are dependent on several electrical and physical factors/attributes. FirstEnergy will ultimately have to evaluate every property individually to assess

the feasibility of construction, as well as any additional requirements that may be needed to support geotechnical and environmental concerns.

As a preliminary guide for site selection, FirstEnergy has provided a list of specifications for the substation size, Siting and Geotechnical standards, and Environmental requirements. It is important to note that these specifications are general, and as such, no construction activities should be performed on a selected site without prior approval from FirstEnergy.

8.1 Site Dimensions and Layout:

The typical new interconnection substation is a three-breaker-ring bus tapping an existing transmission line. The standard layout and dimensions of the substation are based on the voltage level of the interconnection system.

Below is a table summary of the typical substation dimensions for AH1-545. The standard requirement for a parking area has been included. However, Environmental, Geotechnical, and other factors may significantly increase the area required. For example, sites that require stormwater detention facilities will require area in addition to the typical dimensions provided in the table.

3 breaker Ring Bus Voltage	Dimension Size (ft)	Dimension Acres	Dimension size w/ 100ft buffer (ft)	Acre size w/ 100ft buffer	Parking (15 cars) 230ftx60ft	Total Acres (Buffer + Parking)
138kV	228x228	1.35	328x328	2.7	0.5	3.2

8.2 Real Estate Transfer

The preferred method for conveying a property to the TO is by "fee simple" transfer. If there are subdivisions or other conditions that hinder the ability for the Project Developer to convey the property by "fee simple" transfer, the TO may allow the use of an exclusive easement. These conditions should be discussed with the TO, and the accepted method of transfer should be confirmed early in the Interconnection process.

The Project Developer is required to obtain the following documents in the sequence listed below:

- Acquire the Interconnection Facilities property in fee from the property owner.
- Acquire an easement from the property owner for the Interconnection Facilities to the TO's T-Line (using the TO's template), if the size of property acquired doesn't sufficiently bi-sect the TO's existing right of way. If the property acquired by the Project Developer sufficiently overlaps the TO's existing right of way, this Interconnection Facilities easement is not needed.
- Provide access agreements to the TO from the property owners and Project Developer (this may be required if an exclusive easement is being used instead of conveying property to the TO in "fee simple".
- Provide an assignment of appropriate easement rights to the TO upon project completion. (Note: assignment must include all of TO's language in order to safely, operate and maintain facilities. It's critical that TO's easement templates are used when Project Developer is acquiring easements intended to be assigned to the TO.
- Provide deed conveyance of "fee simple" property for the Interconnection Facilities to the TO upon project completion and prior to transfer of title to personal property.

Document Exhibits:

Project Developer shall provide a survey and legal description detailing the location of the substation (preferably located adjacent to an existing transmission line right of way), ingress-egress to the substation from a dedicated public roadway, and easement for distribution and communication facilities and/or transmission facilities if necessary. This drawing shall be prepared by a licensed and registered surveyor and include at a minimum (ingress-egress, distribution and communication facilities locations may not need to be shown on the survey if property being conveyed is by "fee simple"):

- Legal description and survey of fee property being conveyed, including all lot split requirements
    - When property is conveyed to the TO by fee simple, the Project Developer is required to submit a completed Phase I Environmental Site Assessment (ESA) to the TO in accordance with all the requirements outlined in ASTM E 1527-05 prior to the start of construction of a substation property that will be transferred to the TO. Furthermore, if the Phase I ESA completed for the property documents the presence of any recognized environmental conditions (RECs), the Project Developer shall bear the cost and responsibility to complete a Phase II ESA in accordance with ASTM Standard E 1903-97 (Guide for Environmental Site Assessments: Phase II Environmental Site Assessment Process), however, final approval and property conveyance shall be at the sole discretion of the TO.
- Legal description for new transmission right of way (if "fee simple" conveyance is not used)
- Legal description for new distribution right of way (if "fee simple" conveyance is not used)
- Legal description for any other energy-related facilities that may be required (if "fee simple" conveyance is not used)
- Legal description for ingress-egress to a dedicated public roadway (if fee simple conveyance is not used)
- Survey drawing that shows:
    - New right of way along with the location of existing easements
    - Other existing facilities on the property
    - Names of adjoining property owners
    - Basic drawing features: title block, north arrow, legend, graphic scale

8.3 Geotechnical and Siting Requirements:

Project Developer shall refer to Geotechnical Design Requirements provided on PJM's website. In addition, below are a list of standard siting guideline to account for when selecting a property for the interconnection substation:

- Slopes steeper than 2:1 and/or taller than 10' shall have slope stability performed.
- Factor of Safety (FS) shall be 1.5 for permanent condition.
- Minimum road width shall be 16'. AutoTurn Analysis shall be performed to accommodate the design vehicle needed inside the substation curve widening to be provided as necessary.
- Longitudinal slope for main access road to substation shall be 0.5%-10%. This is a mandatory design specification.

- Slope across the substation pad shall be 0.5%-2%.
- Every 20' vertical slope shall require a bench.

Site Grading and Preparation Responsibility:

It is the responsibility of the Project Developer to properly vet a proposed substation location. The proposed location should be reviewed by a Civil Engineer to determine the site's suitability for construction and operation as a substation (refer to Attachment 5 to FE's preliminary Geotechnical summary report). This should include a review of available information regarding the specific site location that should be considered when estimating constructability, risk, cost, and schedule. The substation is considered the substation and all associated FirstEnergy Facilities needed to operate and maintain the site such as, access roads, stormwater management facilities, walls/structures, and utilities. This review should include, but is not limited to:

- Geologic Hazards
    - Karst
    - Geologic formation/group
        - Hard bedrock (shallow bedrock difficult to excavate)
        - Weak bedrock
    - Landslide susceptibility and topography
    - Surficial soils survey
    - Coal resource mapping
- Environmental Hazards
    - Flood mapping
    - Wetland Mapping
    - Any pollution information that could affect construction.
    - Corrosivity
- Past development
    - Mining activity
    - Previously reclaimed site

9. APPLICABLE TECHNICAL REQUIREMENTS AND STANDARDS

The Requirements for Transmission Connected Facilities, Revision 6, dated December 19, 2024, shall apply.

The GeoTechnical Design Requirements, dated July 20, 2022, shall apply.

The FirstEnergy Approved Vendor List, dated October 8, 2025, shall apply.

The TPP-REF-003 Transmission Planning Criteria, Revision 10, dated December 19, 2023, shall apply.

10. ENVIRONMENTAL AND PERMITTING

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

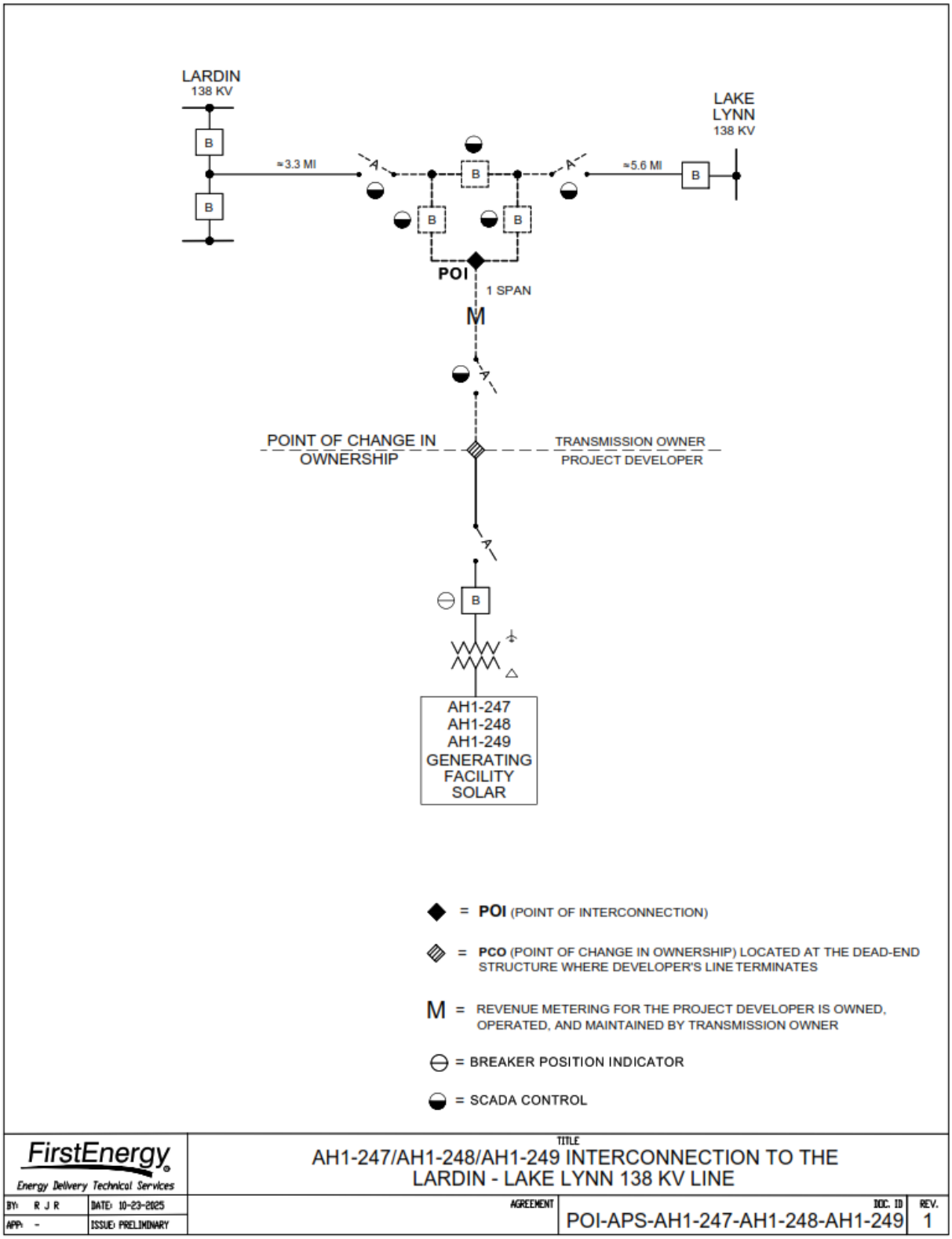
- Environmental permitting, Real Estate acquisition, and notifications to the state's Public Utilities Commission (PUC) vary, some up to twelve (12) months after preliminary engineering is completed to secure the required approvals.
- Prior to agreement by Project Developer to purchase the property, 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:

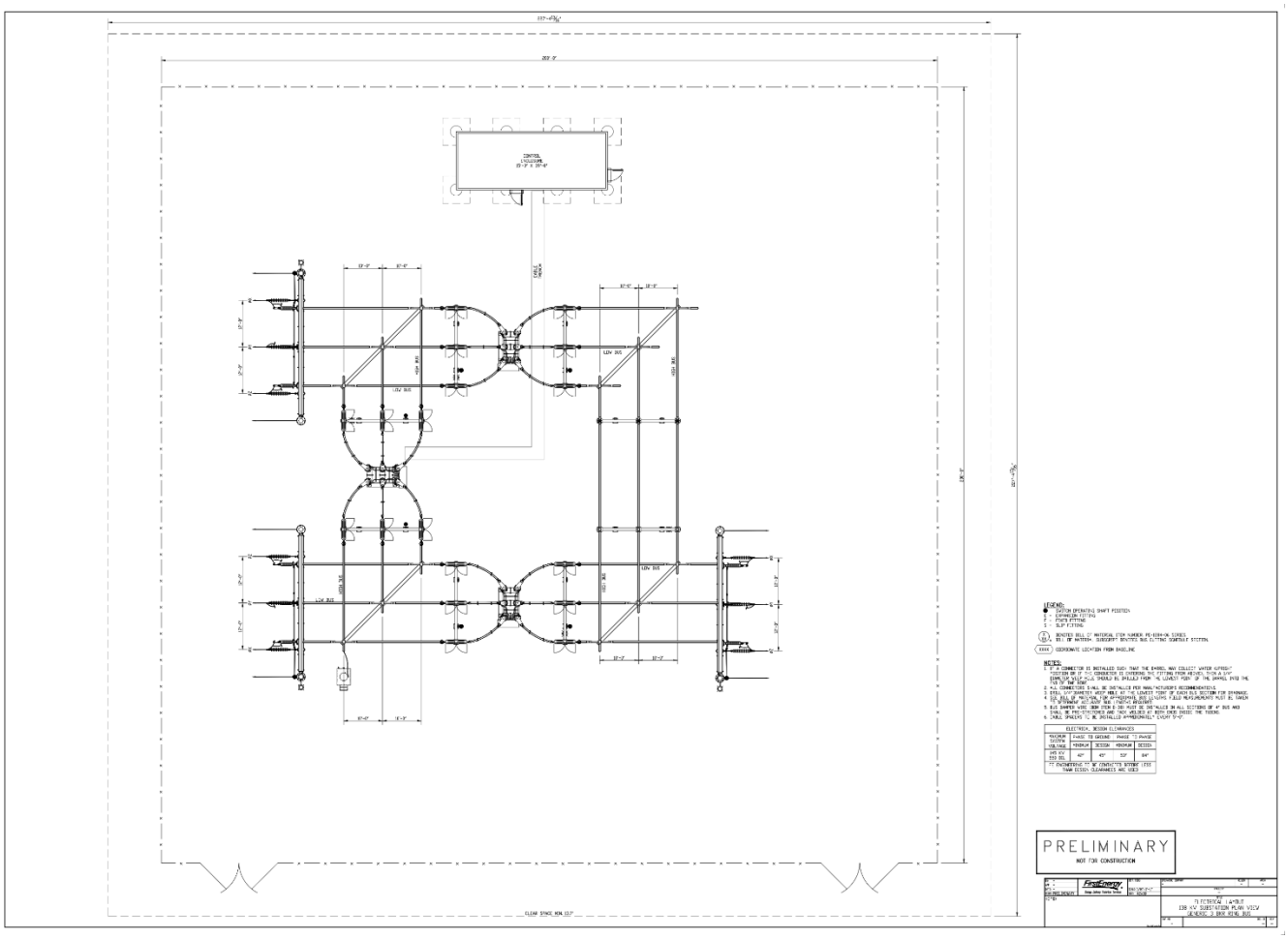
https://www.firstenergycorp.com/help/safety/real-estate-power-lines/transmission-right-of-way.html#ROWform

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
Cable Trench (lf)	125
Battery Charger (ea)	1
Digital Fault Recorder (DFR) (ea)	1
Remote Terminal Unit (RTU) (ea)	3
Insulator - Line - Porcelain/Glass (ea)	432
Engineered Steel Poles (ea)	3
Steel Support Structure (ea)	28
Hard Bus - 1.5 inch (ft)	240
Hard Bus - 4 inch (ft)	820
Package Control Enclosure - Prefabricated (ea)	1
Relay - Individual (ea)	17
Relay Panel (ea)	12
Circuit Breaker - 145 kV 40 kA (ea)	4
Anchor Bolt - Substation (ea)	256
Insulator - Substation - 138 kV (ea)	18
Surge Arrester - 138 kV (ea)	9
Capacitor Coupled Voltage Transformer (CCVT) - 138 kV (ea)	9
Current Transformer - Freestanding (CT) - 138 kV (ea)	3
Current Transformer - Slip Over (CT) - 138 kV (ea)	3
Potential Transformer (PT) - 138 kV (ea)	3
Station Service Voltage Transformer (SSVT) - 138 kV (ea)	1
Security - Camera (ea)	26
Security - Physical Access Control (Badge Reader) (ea)	2
Battery - 125V (ea)	1
AC/DC Panelboard (ea)	2
Disconnect Switch - Substation - 138 kV (ea)	9
Switch - Motor Operator - Substation (ea)	9
Cable - Control/Communication (lf)	34690
Conductor - AAC (ft)	1360
Conductor - ACSR (ft)	5227.2
Conduit - Rigid (lf)	1743
Wire - Fiber - ADSS (ft)	24743.84
Wire - Fiber - Underground (ft)	7571.125
Wire - Shield - OHGW (lf)	1161.6
Wire - Shield - OPGW (lf)	1561.6

ATTACHMENT #4: PROTECTION SCOPE

Description:

- AH1-247/AH1-248/AH1-249 138 kV: Interconnection on Lardin – Lake Lynn 138 kV Line.

Generator Facilities Protection Requirements

At the Generator Tap Substation:

- The generation delivery points must comply with the technical requirements detailed in the FirstEnergy "Requirements for Transmission Connected Facilities" document.

- The Generator Step-Up (GSU) transformer(s) connecting to the FE system shall have a grounded-wye winding configuration on the high side and a delta configuration on the low side. This establishes an effective ground on the transmission system and mitigates overvoltage conditions during ground faults. A delta connected winding on the low side provides isolation of zero-sequence currents such that the FE system will not be exposed to ground faults on the generator system.

- Single fully rated circuit breaker is required at the point of interconnection (POI).

- Two (2) SEL-411L's for primary and backup current differential protection are required for the transmission line connecting the FE interconnection substation to the generator system. These relays will use direct fiber that is routed to the FE interconnection substation. Part number and firmware shall be sent to FE for approval to confirm communications compatibility. It is assumed the 87L channel shall also be used to communicate anti-islanding DTT to the Project Developer. It is assumed the 87L channel shall also be used for breaker failure DTT communications.

- Redundant protection schemes are required to protect the Project Developer owned equipment at POI voltage. Each zone of protection covering the POI voltage portion of the Project Developer's system, the GSU Transformer(s), and the POI voltage interconnection breaker, shall be protected by two independent relay schemes meeting the following redundancy requirements. Primary and backup relaying shall use independent CTs, and independent PTs or independent windings from the same PTs. Primary and backup relaying shall not have any common wiring, isolating switches, or auxiliary tripping relays. Redundancy of a protection system can be achieved by ensuring that there is no single point of failure between two locally independent primary and backup protection schemes for a given element. Relays from the same manufacturer are acceptable for both the primary and backup schemes.

- A protection scheme containing generator Intertie functions is required and must be able to provide tripping for the following functions: overfrequency, underfrequency, phase and zero-sequence overvoltage, phase undervoltage, directional overcurrent, and directional power. The current source and voltage source are to be at the Transmission POI voltage. The current source for the intertie relaying is preferred to be from CTs on the POI voltage interconnection breaker. The voltage source for the intertie relaying is preferred to be located between the high side of the GSU Transformer and the POI voltage interconnection breaker

- C800 CTs must be used on the POI voltage portion of the Project Developer's system, and the CTs should not saturate for the maximum expected through-fault current at the tap ratio in use.

- The relaying system and interrupting device control circuits shall have a reliable source of power independent from the AC system or immune to AC system disturbance or loss (for example - DC battery and charger) to assure proper operation of the protection scheme.

- If there are multiple existing utility feeds, they shall not be paralleled. Either a mechanical or electrical interlock shall be in place to prevent paralleling of service points.

The Project Developer is solely responsible for protecting its own equipment in such a manner that electrical faults or other disturbances on the FE transmission system do not damage its equipment.

FirstEnergy Protection Requirements

- Lardin:
  - Lardin-AH1-247, 248, & 249 Interconnect 138kV line:
    - Install a standard line protection relay panel with Primary and Backup SEL-411L for line protection and transfer trip over dedicated fiber.
    - Install slip over CTs and additional trip coils on the two (2) existing circuit breakers
    - Install one (2) SEL-451 relay for 138kV breaker failure to trip protection.

- Lake Lynn:
  - Lake Lynn-AH1-247, 248, & 249 Interconnect 138kV line:
    - Install a standard line protection relay panel with Primary and Backup SEL-411L for line protection and transfer trip over dedicated fiber.
    - Install one (1) SEL-451 relay for 138kV breaker failure to trip protection.
    - Install one (1) appropriately rated circuit breaker for 138kV application, two (2) CTs per bushing

- New AH1-247/AH1-248/AH1-249 Ring Bus Substation:
  - Project Developer 138kV line:
    - Install a standard line protection relay panel with Primary and Backup SEL-411L. The primary and backup line protection schemes will provide current differential protection and transfer trip over dedicated fiber.
  - Lardin-AH1-247, 248, & 249 Interconnect 138kV line:
    - Install a standard line protection relay panel with Primary and Backup SEL-411L for line protection schemes and transfer trip over dedicated fiber.
  - Lake Lynn-AH1-247, 248, & 249 Interconnect 138kV line:
    - Install a standard line protection relay panel with Primary and Backup SEL-411L for line protection and transfer trip over dedicated fiber.
    - Install three (3) appropriately rated circuit breakers for 138kV application, two (2) CTs per bushing
    - Install three (3) SEL-451 relays for 138kV breaker failure to trip protection.
    - Install three (3) sets of three (3) 138kV CVTs for each line position of the ring bus.

- Install one (1) SEL-3350 RTAC for relay remote access, , one (1) Qualitrol TWS system for traveling wave monitoring, one (1) Arbiter 1094B GPS clock for time synchronization, and (1) DFR for fault and disturbance recording.

Short Circuit Data

The short circuit levels at the line tap to the 138 kV bus are the following:

Short Circuit values at 138 kV:
Three phase faults = 17.2 kA
Single line to ground fault = 11.3 kA
Transmission System Impedances at 138 kV, 100 MVA base:
Positive sequence Z1 = (0.00514 + j0.02373) (per unit)
Zero sequence Z0 = (0.01933 + j0.05892) (per unit)

The fault current and system impedance values are for the proposed location of the new 138 kV ring bus, for the normal system configuration connecting to Lardin and Lake Lynn substations, and do not include the proposed future AH1-247, -248, and -249 generation interconnections. The fault currents provided are bolted, symmetrical values for present, normal transmission system conditions. Future increases in fault currents are possible and it is the Project Developer's responsibility to upgrade their equipment and/or protective equipment coordination when necessary.

ATTACHMENT #5: PRELIMINARY GEOTECHNICAL SUMMARY

Observation & Concern Table:

Category	Source	Risk	Comment
Surficial Soil Survey	USDA Soil Survey	Moderate	Clarksburg Silt Loam (ClC) or Guernsey Silt Loam (GyC), both fine clayey soils, some plastic clays possible
Geologic Formation/Group	PA/USGS Geologic Survey	Moderate	Anticipated shallow bedrock, coal
Karst	USGS/ TAMI 2	Low to Moderate	Bedrock mapped with minor limestone, TAMI indicates karst features
Landslide Susceptibility	GIS/Google Earth/FEMA Risk Map	Low to Moderate	Site is prone to landslides
Coal Mining and Oil and Gas Wells	PA/WV Geologic Survey/TAMI 2	High	Surrounding site area strip mined and underground mined
Environmental Hazard	US Wetland Maps/FEMA	Low	Low risk of flooding
Past Development	TAMI/GIS MAP/Historic Aerials	Low	Undeveloped except for existing T-Line

Site Background / Geologic Hazards Potential

This review was conducted to determine potential geologic hazards and risk at the proposed generator developer location (AH1-247/AH1-248/AH1-249). The reviewed location is in Nicholson Township, Fayette County, Pennsylvania. This includes the proposed substation located along the Lardin – Lake Lynn 138 kV transmission line. The substation would be located adjacent to and slightly north of Tower 49. The existing transmission line is operated by West Penn Power. The proposed substation would consist of (3) breaker 138kV ring bus with SCADA control. This location was reviewed for surficial soils survey, geologic formation/group, karst, landslide susceptibility, coal mining and oil and gas well resource mapping, environmental hazards, and past development. The review was performed to identify any geologic risks that could affect the project's budget, constructability, and/or schedule.

Surficial Soil Survey

The United States Department of Agriculture Web Soil Survey indicates that the site is currently mapped as either the Clarksburg Silt Loam (ClC) or Guernsey Silt Loam (GyC). The soils are generally fine-grained soils formed in colluvium and residuum. Both soil series are moderately well drained and currently mapped with a dual Hydrologic Soil Group (HSG) C/D classification, indicating the soils have a slow infiltration rate. The depth to the water table is listed as within two feet of the surface in both soil series. Both soil series are generally fine-grained clays (ML, CL, CH) and silts (ML) with varying amounts of sand and gravel. The

Guernsey silt loam series can contain highly plastic clays (CH) which could be problematic for foundation design and/or pad and road stabilization and construction.

Geologic Formation/Group

The site is located in the southern portion of the Pittsburgh Low Plateau Section of the Appalachian Plateaus Physiographic province. The Pittsburgh Low Plateau is an unglaciated region characterized by a deeply dissected plateau surface of rounded hills and narrow, relatively shallow valleys. The geology is defined by low-amplitude folds of Pennsylvanian-aged sedimentary rocks, specifically the Geologic Map of Pennsylvania maps the site to be at the border of the Monongahela Group and Casselman Formation. The Monongahela Group consists of cyclic sequences of limestone, shale, sandstone, and two major coal seams, the Pittsburg coal seam and the Waynesburg coal seam. The Casselman formation consists of alternating layers of shale, siltstone and sandstone with limestone and non-persistent coal. Additional information regarding the Monongahela Group and the Casselman Formations is provided in Appendix B including the bedding, fracturing, weathering, and other features typical of the formations.

Karst

The site is at the border of the Monongahela Group and Casselman Formation, both of which contain limestone beds which are generally flat-lying, typically thin but on occasion locally thick, can be discontinuous in places, and are often interbedded with shale. The Transmission Asset Mapping Interface (TAMI 2) was reviewed, and the site appears to be mapped within an area prone to karst features. Based on the bedrock geology and karst mapping, there appears to be a low to moderate risk of karst related concerns for the site. A determination of karst risk should be discussed in the sites geotechnical report to better understand the risk.

Landslide Susceptibility

The Pittsburgh Low Plateau Section is listed as having a high to moderate landslide susceptibility by the Pennsylvania Geological Survey titled "Landslides in Pennsylvania". FEMA national risk index for the area in which the site is located as a relatively moderate risk to landslides. Transmission Asset Mapping Interface (TAMI) was utilized to generate elevation profiles for the potential site area and are provided in Appendix D. The ground surface slopes downward from east to west and undulates south to north. While no excessively steep slopes are shown on the TAMI profile, the profile should be considered an approximation, and given the strip mining that has occurred at the site, some loose soils could be present which are further susceptible to landslides. Given the mapped risks by FEMA and the Pennsylvania Geological Survey, but relatively level topographic information provided in TAMI, FE believes there to be a low to moderate risk of landslide susceptibility.

Resource mapping

There is significant coal resources and mining activity in this region. Available historic mining maps indicate that strip mining and underground mining by the Republic Iron and Steel Co. occurred at the site and

surrounding area. There is potential for uncontrolled fills, mine subsidence induced by loading and dramatic fluctuation in subsurface water.

Numerous unconventional and conventional natural gas wells are located within Fayette County, but none within the immediate site vicinity.

Environmental Hazards

Based on FEMA and U.S. Fish and Wildlife Service maps there are no wetlands or features that would cause an increased risk of flooding. An environmental study should still be performed to confirm this prior to construction.

Past Development

The past development assessment of the site was based on aerial photography. Based on aerial photography dating back to 1956 this site has largely remained undisturbed indicating that the mining occurred prior to the 1950s. The size and exact extent of the mining is not easily discernible from the available aerial photographs, and it will be difficult to understand what, if any, remedial efforts took place to reclaim the land once the mining stopped.

Recommendations & Geotechnical Opinion

List of Observations/Concerns Interconnection Facilities – Lardin-Lake Lynn AH1-247/AH1-248/AH1-249:

1. The site is mapped with Clarksburg Silt Loam (ClC) or Guernsey Silt Loam (GyC) which are generally clayey soils, potentially high plasticity
2. This site is part of the Monongahela Group and Casselman Formation and contains both limestone and coal
3. Low to moderate potential for karst
4. Low to moderate risk for landslide
5. Low environmental impact risk
6. Mining activity present in the immediate area. Natural gas wells in the surrounding area.

Preliminary Geotechnical Opinion

This opinion is based on the assumption this is a generator developer, option to build project. The geotechnical conditions of this site seem to conclude that it is relatively high-risk location to develop a substation due to the coal mining that has occurred on the site, risk of landslides, and karst related risks. Based on the desktop geologic study and a determination of the site being at high risk to develop. Additional due diligence will be required to determine the extent of the coal mining and additional costs might be expected to determine the extent and any potential interference with the prospective substation site. This would include additional borings. If mining is encountered higher foundation costs would be expected to mitigate mining. The above estimate does not necessarily reflect the below ground extent of the mining, and it should be noted that the mining could potentially extend below the site.