

Facilities Study Report
For
Physical Interconnection of
PJM Generation Interconnection Request
Project ID AH1-206

“Bethelboro 138 kV”

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 Facilities Study was performed to satisfy the Phase 2 Facilities Study requirement of the PJM Tariff. The Facilities 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 agreement's modification clause and instead the scope change process will be followed.

A. Transmission Owner Facilities Study Summary

1. PROJECT DESCRIPTION

The Project Developer (PD) has proposed a battery energy storage Generating Facility located in Fayette Counties, Pennsylvania with a designated PJM Project ID of AH1-206. The installed facilities will have a total Maximum Facility Output (MFO) of 60 MW with 60 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 as a direct connect at the existing Bethelboro 138 kV 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 Project Developer-owned dead-end structure outside the existing Bethelboro 138kV Substation fence line, as shown on the single line diagram in Attachment #1.

4. SCOPE OF PROJECT DEVELOPER INTERCONNECTION FACILITIES

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

- Circuit breakers and associated equipment located between the high side of the 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.

B. Transmission Owner Facilities Study Results

The following is a description of the planned Transmission Owner facilities for the physical interconnection of the proposed AH1-206 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 Line Terminal at Bethelboro 138 kV Substation

Install one disconnect switch and one span of 138 kV conductor from the existing Bethelboro 138kV substation to the Project Developer-owned dead-end structure at the Point of Change in Ownership (PCO).

- Installations
 - 0.1 miles of conductor 795 kcmil 26/7 ACSR shielded by (1) 7#8 Alumoweld
 - (1) set of insulators for existing 138kV dead-end structure.
- Siting & Licensing
 - 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.
 - Assume minimal social and ecological impacts.
 - Assume no local opposition to the project.
 - Project Developer to perform forestry to bring lead line to PCO and where the TO spans from substation to PCO
- Support Estimates
 - Project Management
 - Provide project management, coordination, administration, scheduling, material management and project development if required.

1.2 Bethelboro 138kV Substation

Interconnect AH1-206 interconnection Generating Facility to existing KATCo Bethelboro 138kV Substation at an open bay in existing middle lattice structure at the western most bay position.

Below Grade:

- Install cable conduit, and control cables for new equipment
- Install foundations for new equipment as noted in the Above Grade scope

Above Grade:

- Add (1) new monopole structure on new foundation
- Add new span of conductor from monopole structure to existing middle lattice structure (estimate ~75 ft per phase of conductor)
- Add new conductor drop to (1) new MOAB line disconnect switch on new stand and foundation (assumed high stand)
- Add (1) 138kV Circuit Breaker
- Add (2) new bus disconnect switches mounted on existing middle lattice structure

- Add (1) new 3-phase Surge Arrestor mounted on existing middle lattice structure
- Relay and Controls Scope of Work
 - Review/revise relay settings as needed.
 - Rewire the bus differential protection, incorporating the new generator line position
 - For the AH1-206 Interconnect 138kV line:
 - Two (2) SEL-411L relays for primary and backup line protection over fiber
 - For one (1) new 138V breaker position:
 - One (1) SEL-451 relay
- Additional Equipment to be Removed:
 - None
- Scope of work Assumptions
 - Allowance included for asbestos abatement inside of control house
 - There is sufficient room in the control house for new relay panels.
 - The existing DC battery system is sufficient for the addition of the new relays and equipment.
- Ancillary Scope of Work
 - Project Management
 - Provide project management, coordination, administration, scheduling, material management and project development if required.
 - Information Technology
 - SCADA work at Bethelboro Substation to support breaker, relay, meter, MOAB, GOAB, and disconnect switch installation.
 - Install/Test approximately 0.07 miles of 48 fiber (single mode) from the Bethelboro 138kV control house to the AH1-206 PCO
 - IT Scope of Work Assumptions
 - The existing SCADA transport at Bethelboro Substation is sufficient for additional SCADA telemetry.
 - Project Developer is responsible for building fiber communications from generator site to PCO.
 - Two separate fiber cables are being run for this build, but no spatial diversity is required.
 - Testing and Commissioning
 - Testing and commissioning of all substation equipment.

1.3 AH1-206 Generator Substation

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 if required.
- Revenue Metering
 - Revenue Metering to be installed by KATCo.
- Testing and Commissioning
 - Testing and commissioning services as required.

2. STAND ALONE NETWORK UPGRADES

- None.

3. NETWORK UPGRADES

- None.

4. OTHER SCOPE OF WORK

4.1 Revenue Metering

Provide revenue metering panel within existing Bethelboro Control House. Integrate revenue metering to FE Bethelboro 138 kV substation.

- Below Grade Scope of Work:
 - (1) Lot of excavation, conduit, backfill, grounding, and wiring, between free standing CT/VT combo and revenue metering.
 - (1) Lot of foundations for free-standing 138kV CT/VT Combo Unit.
- Above Grade Scope of Work:
 - (1) set of 3-phase Free Standing 138kV CT/VT Combo Unit.
- Relay & Control Scope of Work
 - (1) New Revenue Metering Panel with test switches.
- Scope of Work Assumptions:
 - It is assumed current and voltage signals will be pulled from new 3-phase free-standing CT/VT Combo Units.
 - Assumes enough room in Bethelboro 138 kV Control house to support a new revenue metering panel.
 - Assumes enough room in Bethelboro 138 kV substation to add in free standing CT/VT Combo Units.
 - Assumes the same crew that is doing the expansion will be doing the metering and temp construction facilities are not needed.
- Support Estimates
 - Project Management
 - Provide project management, coordination, administration, scheduling, material management and project development as required
 - Environmental

- Review drawings and provide support for environmental or permitting requirements for new foundations and excavation within Bethelboro Substation.
- Revenue Metering
 - Provide high end revenue meter and engineering support for revenue metering at KATCo Substation Bethelboro.
- Testing and Commissioning
 - Testing and commissioning services as required

5. MILESTONE SCHEDULE FOR COMPLETION OF KATCo WORK

Facilities outlined in this report are estimated to take 37 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
Siting, Permitting & Real Estate	5	26
Detailed Engineering	3	26
Equipment Delivery	28	28
Construction	29	35
Testing and Commissioning	33	37

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

6.2 Cost Estimate Assumptions:

- The cost estimates provided in this report were developed as of February 20, 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 Transmission Owner Interconnection 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 AH1-206 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 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

- No additional land is required for the substation expansion.

9. APPLICABLE TECHNICAL REQUIREMENTS AND STANDARDS

- The Requirements for Transmission Connected Facilities, Revision 7, dated January 27, 2026, shall apply.
- The TPP-REF-003 Transmission Planning Criteria, Revision 10, dated December 19, 2023, shall apply.

10. ENVIRONMENTAL AND PERMITTING

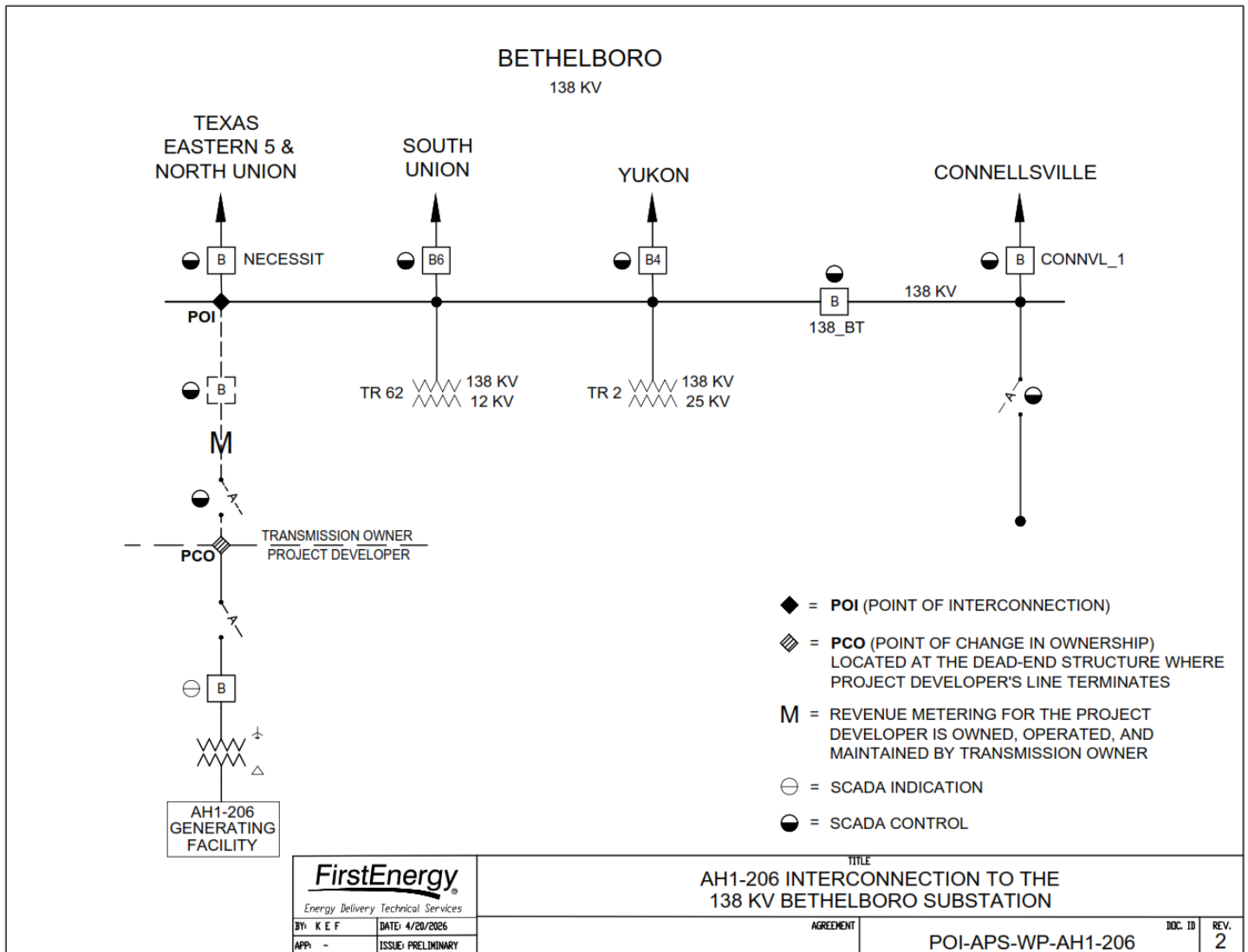
The following are possible environmental, real estate and permitting issues:

- Environmental permitting, Real Estate acquisition, and notifications to the state's Public Service Commission vary, some up to twelve (12) months after preliminary engineering is completed to secure the required approvals.
- 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 responsible for all property acquisition (including easements/rights-of-way (ROW)) for transmission, distribution and communication facilities needed for the generator interconnection.
- All property rights must be surveyed and metes and bounds descriptions prepared for incorporation into Transmission Owner's document forms, for transfer of title.
- 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:

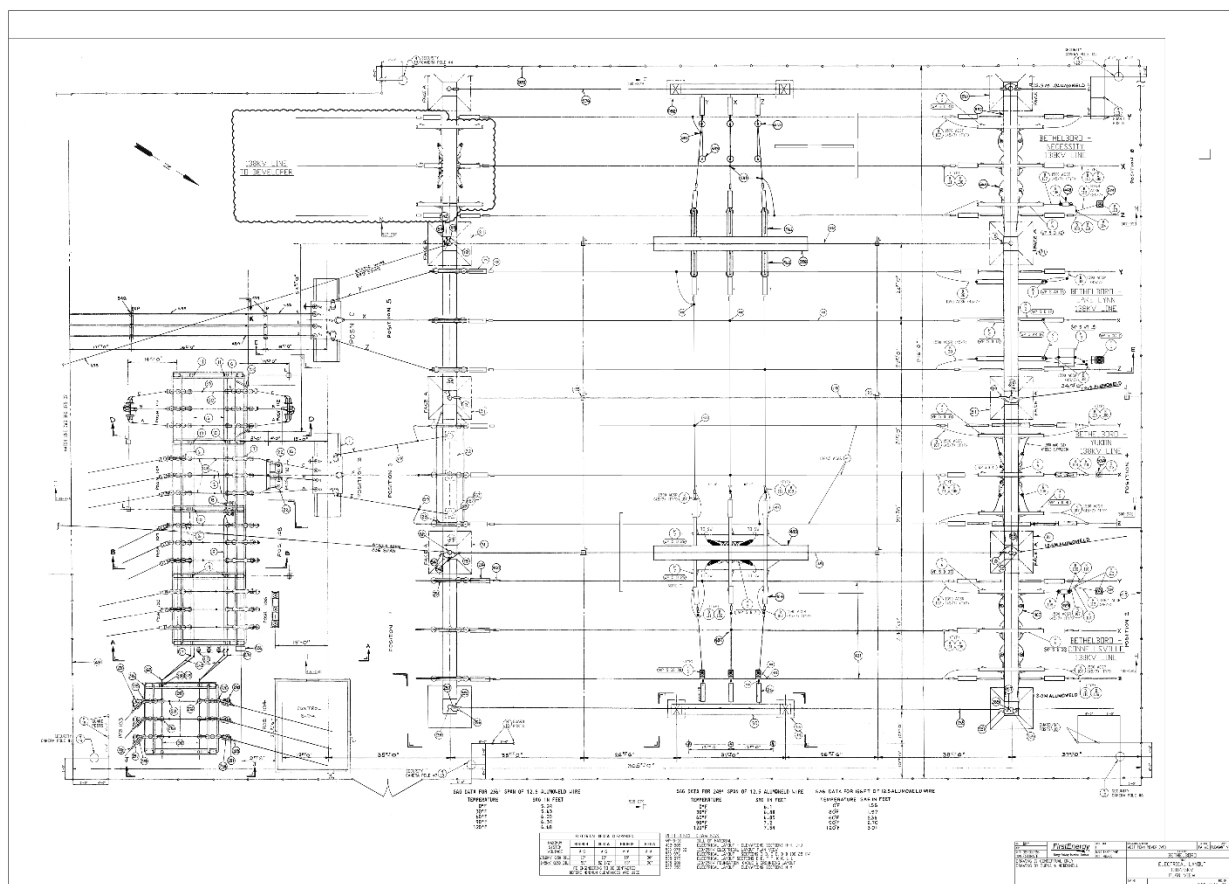
<https://www.firstenergycorp.com/help/safety/real-estate-power-lines/transmission-right-of-way.html#ROWform>

C. APPENDICES

ATTACHMENT #1: SINGLE LINE DIAGRAM FOR THE PHYSICAL INTERCONNECTION



ATTACHMENT #2: SUBSTATION GENERAL ARRANGEMENT



ATTACHMENT #3: MATERIAL LIST AND EQUIPMENT RATINGS

Item name (unit)	Quantity
Insulator - Line - Polymer (ea)	3.00
Insulator - Line - Porcelain/Glass (ea)	108.00
Engineered Steel Poles (ea)	2.00
Steel Support Structure (ea)	7.00
Relay - Individual (ea)	3.00
Relay Panel (ea)	3.00
Circuit Breaker - 145 kV 40 kA (ea)	1.00
Anchor Bolt - Substation (ea)	62.00
Insulator - Substation - 138 kV (ea)	3.00
Surge Arrester - 138 kV (ea)	3.00
Capacitor Coupled Voltage Transformer (CCVT) - 138 kV (ea)	3.00
Current Transformer - Freestanding (CT) - 138 kV (ea)	3.00
Potential Transformer (PT) - 138 kV (ea)	3.00
Disconnect Switch - Substation - 138 kV (ea)	3.00
Switch - Motor Operator - Substation (ea)	1.00
Cable - Control/Communication (lf)	5,470.00
Conductor - AAC (ft)	600.00
Conductor - ACSR (ft)	1,967.40
Conduit - Rigid (lf)	511.00
Wire - Fiber - ADSS (ft)	1,755.01
Wire - Fiber - Underground (ft)	3,172.22
Wire - Shield - OHGW (lf)	580.80
Wire - Shield - OPGW (lf)	75.00

ATTACHMENT #4: PROTECTION SCOPE

Project Developer Protection Requirements:

At the Generating Facility 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 POI. The Project Developer shall install and maintain direct fiber between the FE Bethelboro substation and the Project Developer substation for use by these relays for primary and backup line protection and direct transfer trip. Part number and firmware of relays shall be sent to FE for approval to confirm communications compatibility. The 87L channel shall also be used for breaker failure DTT communications.
- Redundant high speed 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. If the PTs are located on the line-side of the breaker, PT primary-side fusing is required for isolation of a failed PT to prevent interruption of the FirstEnergy line.
- 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’s protection system shall be designed and constructed in accordance with all mandatory Protection and Control (PRC) standards established by the North American Electric Reliability Corporation (NERC). The Project Developer shall coordinate with FirstEnergy and the Regional Reliability Coordinator to determine all applicable PRC requirements and ensure the facility’s design and operation achieve full compliance.

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.

FE Protection Requirements

To coordinate with proposed Project Developer substation, the relay settings at the following stations will need adjusted (note that in some cases due to limitations of the existing relays, relays may need to be replaced):

The interconnection of the new generator to the Bulk Electric System (BES) transmission network will initiate a review of existing protection schemes and may introduce new requirements to ensure compliance with the PRC standards established by the NERC. Additional protection system upgrades at the interconnecting station, and potentially at other affected stations, will be determined by FirstEnergy and the Regional Reliability Coordinator during subsequent stages of the project, prior to detailed design.

- Bethelboro:
- 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 over dedicated fiber.
- Install one (1) appropriately rated circuit breaker for 138kV application, two (2) CTs per bushing
- Install one (1) SEL-451 relays for 138kV breaker failure to trip protection.
- Install one (1) set of three (3) 138kV CVTs on the Project Developer line.
- Review and revise settings.

Short Circuit Data

The short circuit levels at the Bethelboro 138 kV bus are the following:

Short Circuit values at 138 kV

Three phase faults = 13.1 kA

Single line to ground fault = 8.9 kA

Transmission System Impedances at 138 kV, 100 MVA base

Positive sequence $Z1 = (0.00531 + j 0.03148)$ (per unit)

Zero sequence $Z0 = (0.02193 + j 0.07306)$ (per unit)

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 Melvin and Newark silt loams (Mn) both clays and silts. Shallow water table
Geologic Formation/Group	PA/USGS Geologic Survey	Moderate	Anticipated moderate depth to bedrock, coal
Karst	USGS/ TAMI 2	Low	Not mapped within karst formation
Landslide Susceptibility	GIS/Google Earth/FEMA Risk Map	Moderate	Steeper slopes west of site
Coal Mining and Oil and Gas Wells	PA/WV Geologic Survey/TAMI 2	High	Underground mining has occurred at the site.
Environmental Hazard	US Wetland Maps/FEMA	Low	Low risk of flooding
Past Development	TAMI/GIS MAP/Historic Aerials	Moderate	Limited information available. Known mining has occurred

Site Background/ Geologic Hazards Potential:

This review was conducted to determine potential geologic hazards and risks at the existing generator developer (Bethelboro 138kV Substation) location (AH1-206). The reviewed location is in North Union Township, Fayette County, Pennsylvania. This includes proposed improvements to the existing Bethelboro Substation. The proposed improvements would include the installation of one breaker with SCADA control. The Bethelboro Substation is operated by West Penn Power. The substation expansion was reviewed for surficial soils survey, geologic formation/group, karst, landslide susceptibility, coal mining and oil and gas wells 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 Melvin and Newark silt loams (Mn). The soils are generally fine-grained clays and silts. The Clarksburg silt loam is moderately well drained and currently mapped with a dual Hydrologic Soil Group (HSG) C/D classification, indicating the soils have a slow to very slow infiltration rate. The Melvin and Newark silt loam is poorly drained and currently mapped with a dual Hydrologic Soil Group (HSG) B/D classification, indicating the soils have a moderate or very slow infiltration rate. The depth to the water table is listed as within two feet of the surface in both soil series.

Geologic Formation/Group

The site is located in the Pittsburgh Low Plateau Section at the base of the Allegheny Mountain 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 underlain by the

Waynesburg Formation. The Waynesburg Formation is divided into upper, middle, and lower members, and its rocks occur in cyclic sequences of sandstone, shale, limestone, siltstone, some claystone, and coal. The upper member consists mainly of gray to black, locally calcareous shale containing siderite nodules, and medium- and light-gray sandstone. It ranges in thickness from about 5 to 50 feet, and the Little Washington coal occurs at the base. The middle member is predominantly medium-gray shale, sandstone, and light-gray siltstone and ranges in thickness from about 50 to 110 feet. Its basal unit is the Waynesburg A coal. The lower member is medium-gray shale, sandstone, and siltstone and ranges in thickness from about 50 to 100 feet. The Waynesburg coal is at its base.

Karst

The site is mapped as the Waynesburg Formation, which contains limestone but is not mapped as a karst prone formation. The Transmission Asset Mapping Interface (TAMI 2) was reviewed and the site does not appear to be mapped within an area prone to karst features. Based on the bedrock geology and karst mapping, there appears to be a low risk of karst related concerns for the site. A determination of karst risk should be discussed in the site's 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. A grading plan available from the 1986 substation yard addition (dated April 28, 1986) was available and reviewed as part of the landslide risk assessment. Transmission Asset Mapping Interface (TAMI) was utilized to generate elevation profiles for the potential site area. The site is generally level in a north to south direction, however the site grades from Bethelboro Road downward to the west towards the substation from approximately Elevation (El.)

+1,040 feet at the edge of the road to approximately El. +1,021 at the substation, an almost 20 foot difference over a 115-foot span (17% grade).

Given the existing topography of the site, mapped risks by FEMA, and the Pennsylvania Geological Survey, FE believes there to be a moderate risk of landslide susceptibility.

There is significant coal resources and mining activity in this region. Available historic mining maps indicate that underground mining by the H.C. Frick Coke Company within the Pittsburgh coal seam 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 Wildlife Service Wetland maps there is a small stream located along the western border of the site property, however the National Flood Hazard site does not indicate that the stream is at risk of flooding near the existing substation. FE Region that oversees the substation should be consulted in the history of the site and if any flooding has occurred in the past. 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 1959 this site has been occupied by the existing substation. An expansion to the south was added onto the substation around 1986. No information is available pertaining to the land prior to the substation construction. As a result of the insufficient information, and known mining that has occurred, there appears to be a moderate risk associated with the past development.

Recommendations, Geotechnical Opinion, and Estimating

List of Observations/ Bethelboro 138 kV

The site is mapped with Clarksburg silt loam (ClC) or Melvin and Newark silt loams (Mn) which are generally silty and clayey soils, high water table

This site is part of the Waynesburg Formation and contains three coal seams

Low potential for karst

Moderate risk for landslide

Low environmental impact risk

Mining activity present in the immediate area.

The geotechnical conditions of this site seem to conclude that it is relatively moderate to high-risk location for the substation improvements due to the coal mining that has occurred on the site and risk of landslides. 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.