Facilities Study Report

For

Physical Interconnection of

PJM Generation Interconnection Request
Project ID AH1-680

“Sammis - South Canton 345kV”

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 American Transmission Systems, Inc. (ATSI), 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 Generating Facility located in Carroll County, Ohio. The installed facilities for AH1-680 will have a total Maximum Facility Output (MFO) of 1300 MW with 1300 MW of this output being recognized by PJM as Capacity.

2. POINT OF INTERCONNECTION (POI)

The Generating Facility will interconnect with the ATSI transmission system via a newly constructed 345 kV three (3) breaker ring bus substation, tapping the Sammis - South Canton 345 kV line, Line Code 1014, approximately 25.6 miles from Sammis substation.

The construction of the new interconnection substation will result in the splitting of the existing Sammis - South Canton 345 kV line, Line Code 1014, 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 345 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 AH1-680 project to ATSI transmission system. These facilities shall be designed according to FirstEnergy Applicable Technical Requirements and Standards. Once built, ATSI 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 new interconnection substation. Install one span from interconnection substation to the Project Developer-owned dead-end structure outside of interconnection substation fence.

- Structures Installed
    - 0.1 miles of conductor 795 kcmil 26/7 ACSR conductor, shielded by (1) 7#6 Alumoweld and (1) OPGW.
    - Substation line exit facilities, including dead end structures and disconnect switches, described in the AH1-680 Interconnection substation scope.
- Sitting 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 interconnection facilities to the transmission system.

- Relay and Controls Scope of Work
  - Integrate interconnection facilities protection and controls to the transmission system.
- Ancillary Scope of Work
  - Project Management
    - Project management will be required for this asset.
  - Revenue Metering
    - Provide support for Project Developer installed revenue metering.
  - Testing and Commissioning
    - Test and commission all power assets.

2. STAND ALONE NETWORK UPGRADES

2.1 New Interconnection Substation

A new three (3) breaker ring bus substation will be constructed along the Sammis – South Canton 345 kV transmission line to interconnect AH1-680 with the ATSI transmission system.

The new substation will be located approximately 25.6 miles from Sammis 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 (1) lot of conduit and control cables to equipment
  - Install (1) lot of foundations for all new equipment
- Above Grade Scope of Work:
  - Install (1) Medium control house including relaying
  - Install (3) 345kV 63kA breakers
  - Install (6) 345kv bus disconnect switches
  - Install (3) 345kv MOAB line disconnect switches
  - Install (3) sets of 345kv 3-Phase CCVTs

- Install (9) 345kV surge arresters
- Install (3) 345kv H-frame dead end structures
- Install (2) 345kV wave traps & line tuners on the Sammis line
- Install (2) 345kV wave traps & line tuners on the South Canton line
- Install (1) 345kV SSVT

- Relay & Control Scope of Work
  - (3) 345kV, minimum 63 kAIC breakers.
  - 4 sets of (3) CTs — 2000:5, MR, C800, TRF 2.0 with 0.3B1.8 rating.
  - 3 - set of (3) 345kV CCVTs, 0.15% metering accuracy on the two main secondary windings with ratios 1800/3000:1.
  - 2 - Schweitzer SEL-411L-1X4X-5B8CDXH52424XX relay to be used for primary and backup line protection to AH1-680 Generating Facility.
  - 2 - Schweitzer SEL-4215415XB0X4H224XXXX relays to be used for primary and backup line protection to Sammis.
  - Carrier equipment is appropriate for primary and backup DCB with bi-directional transfer trip. This includes two wave traps, two LTUs, four carrier sets, four PCM carrier monitors, and hybrids.
  - 2 - Schweitzer SEL-4215415XB0X4H224XXXX relays to be used for primary and backup line protection to South Canton.
  - Carrier equipment is appropriate for primary and backup DCB with bi-directional transfer trip. This includes two wave traps, two LTUs, four carrier sets, four PCM carrier monitors, and hybrids.
  - 3 - Schweitzer SEL-04515415XB0X4H224XXXX relays to be used for breaker failure protection.
  - Hand-reset lockout (86BFR) and electrically-reset lockout (86BFRX) for associated breaker failure functions.

- Scope of work Assumptions
  - Assumed 28x32 meduim control house.

- Ancillary Scope of Work
  - Project Management
    - Provide project management, coordination, administration, scheduling, material management and project development as required
  - Real Estate & Right-Of-Way
    - RE/ROW will be needed for new substation. Developer to provide leased land to FE to build new substation.
    - 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 are 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 is 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 assumed
  - Internal environmental engineering and external project management costs are included
  - A phase 1-A site assessment is included
- Revenue Metering
  - None
- Information Technology
  - Network equipment and scopes described in sections 2.2, 2.3 and 2.4.
- Distribution
  - Distribution allowance to bring in back-up station service power.
- Testing and Commissioning
  - Testing and commissioning of all new substation 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
- ATSI 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 0.19 miles of new 48F/SM ADSS cable from AH1-680 substation control house to STR 420 on the existing Knox-Nottingham 138kV OPGW.
- Underground ADSS will be utilized for this entire run to Structure 420 on the Knox-Nottingham 138kV OPGW line

2.3 MPLS Equipment

- Estimated design, installation, and testing/commissioning for MPLS equipment for SCADA transport at AH1-680 Substation. Assumed SCADA work is included in this cost.
- Estimate SCADA work at AH1-680 Substation.
- Estimated cost associated with Crossbow engineering and materials at AH1-680Substation.
- Estimated cost associated with installation of MW Radio to support the work at AH1-680 Substation.

2.4 In-Sub Fiber

- Estimated (2) in-sub fiber builds for relaying protection from AH1-680 substation control house to the AH1-680 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 sections 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 Sammis – South Canton 345 kV, Line Number 1014

The Sammis – South Canton 345 kV, Line Number 1014, will be cut and looped into the new interconnection substation at a point approximately 25.6 miles from Sammis substation, between structures 40125 and 40124.

- Existing Conditions
    - Per TAMI the existing line is constructed on single circuit, lattice towers and steel H-frame structures. Existing conductor is double bundled 954 kcmil 45/7 ACSR shielded by (2) 7#8 Alumoweld.
    - Per GIS View, there does not appear to be distribution under-build along the length of the project area on the Sammis - South Canton 345kV Line.
- Structures Installed
    - (2) single circuit steel 3-pole dead-end structures on concrete foundations.
    - 0.2 miles of double bundled conductor 795 kcmil 26/7 ACSR shielded by (1) 7#8 Alumoweld and (1) OPGW.
    - Transfer existing conductor and shield wire to new dead-end structures.
- Structures Removed
    - Approximately 0.03 miles of double bundled 954 kcmil 45/7 ACSR conductor and (2) 7#8 Alumoweld shield wire.
- Permitting
    - Full Application will be required.
    - Assume minimal social and ecological impacts.
    - Assume no local opposition to the project.
- 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 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
    - No forestry support is required.
  - Real Estate & Right-Of-Way
    - Rights & restrictions review on existing line
    - 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 are not included in estimate.
      - Kept GIS / R&R for installation of structures.
  - Environmental
    - No wetland/stream crossings.
    - 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 assumed

        - Internal environmental engineering and external project management costs are included
        - A phase 1-A site assessment is included
    - Revenue Metering
        - None
    - Information Technology
        - None
    - Distribution
        - None

3.2 Sammis Substation

Install new (2) wave traps, (2) line tuner units (LTUs), four carrier sets (radio transceivers/receiver units i.e. Ametek UPLC3 or Ametek TC-10B), four PCM Carrier Monitors (PCM), and four hybrids at Sammis Substation. Update relay settings at Sammis Substation.

- Below Grade Scope of Work:
    - Install (1) lot of conduit and control cables to equipment
- Above Grade Scope of Work:
    - Install (2) new wave traps and line tuners
- Relay & Control Scope of Work
    - Install four carrier sets (radio transceivers/receiver units i.e. Ametek UPLC3 or Ametek TC-10B),
    - Install four PCM Carrier Monitors (PCM).
    - Install four hybrids (Ametek RF Hybrids).
    - Update relay settings at Sammis Substation.
- Scope of Work Assumptions:
    - Assumed new wave traps will mount on top of CCVT, no stand or foundation needed.
    - This estimate assumes asbestos remediation is not required in the existing control house. If it is determined that remediation is required, there may be additional cost.
- Ancillary Scope of Work
    - Project Management
        - Provide project management, coordination, administration, scheduling, material management and project development if required.
    - Information Technology
        - SCADA work at Sammis Substation to support relays, wave trap, and PCM installation, as well as the installation of a SAS-DxP-24 Switch with drawing updates.

- Testing and Commissioning
  - Testing and commissioning of all new substation equipment.

3.3 Toronto Substation

Review and Update Relay Settings

- Below Grade Scope of Work:
  - None
- Above Grade Scope of Work:
  - None
- Relay & Control Scope of Work
  - Review and revise relay settings
- Scope of Work Assumptions:
  - None
- Ancillary Scope of Work
  - Project Management
    - Provide project management, coordination, administration, scheduling, material management and project development if required.
  - Testing and Commissioning
    - Testing and commissioning services as required for revised relay settings.

3.4 Star Substation

Review and Update Relay Settings

- Below Grade Scope of Work:
  - None
- Above Grade Scope of Work:
  - None
- Relay & Control Scope of Work
  - Review and revise relay settings
- Scope of Work Assumptions:
  - None
- Ancillary Scope of Work
  - Project Management
    - Provide project management, coordination, administration, scheduling, material

management and project development if required.

- Testing and Commissioning
  - Testing and commissioning services as required for revised relay settings.

3.5 Wellsville Substation

Review and Update Relay Settings

- Below Grade Scope of Work:
  - None
- Above Grade Scope of Work:
  - None
- Relay & Control Scope of Work
  - Review and revise relay settings
- Scope of Work Assumptions:
  - None
- Ancillary Scope of Work
  - Project Management
    - Provide project management, coordination, administration, scheduling, material management and project development if required.
  - Testing and Commissioning
    - Testing and commissioning services as required for revised relay settings.

3.6 South Canton Substation (AEP Ohio Transmission Company Inc.)

Review and Revise (as needed) the protective relay settings.

4. Other Scope of Work

4.1 Revenue metering.

Provide revenue metering panel within new AH1-680 Control House. Integrate revenue metering to Interconnection Substation. Provide new 3-phase 345 kV 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 345 kV Combo Unit.
- Above Grade Scope of Work:

- (1) set of 3-phase Free Standing CT/VT Combo Unit 345 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 AH1-680 Interconnection substation scope.
  - Assumes enough room in AH1-680 Control house to support a new revenue metering panel.
  - Assumes enough room in AH1-680 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 AH1-680 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 AH1-680.
  - 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 ATSI WORK

Facilities outlined in this report are estimated to take 60 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	3	48

Siting, Permitting & Real Estate	5	48
Equipment Delivery	50	50
Construction	51	57
Testing and Commissioning	57	60

6. ASSUMPTIONS IN DEVELOPING SCOPE/COST/SCHEDULE

6.1 Scope Assumptions:

- Project Developer will coordinate design and alignment of proposed 345 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 345 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 345 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 345 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 ATSI 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 25, 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, ATSI 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.
- ATSI reserves the right to charge the Project Developer operation and maintenance expenses to maintain the Project Developer attachment facilities, including metering facilities, owned by ATSI. 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.
- ATSI'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 ATSI 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 AH1-680 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 AH1-680. 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)
345kV	400x385	3.7	500x485	5.8	0.5	6.3

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 7, dated January 27, 2026, shall apply.

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

The FirstEnergy Approved Vendor List, dated February 6, 2026, shall apply.

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

Applicable Technical Requirements and Standard: The Connection Requirements for the AEP Transmission System Rev 7 dated 12/31/2025 shall apply.

10. ENVIRONMENTAL AND PERMITING

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

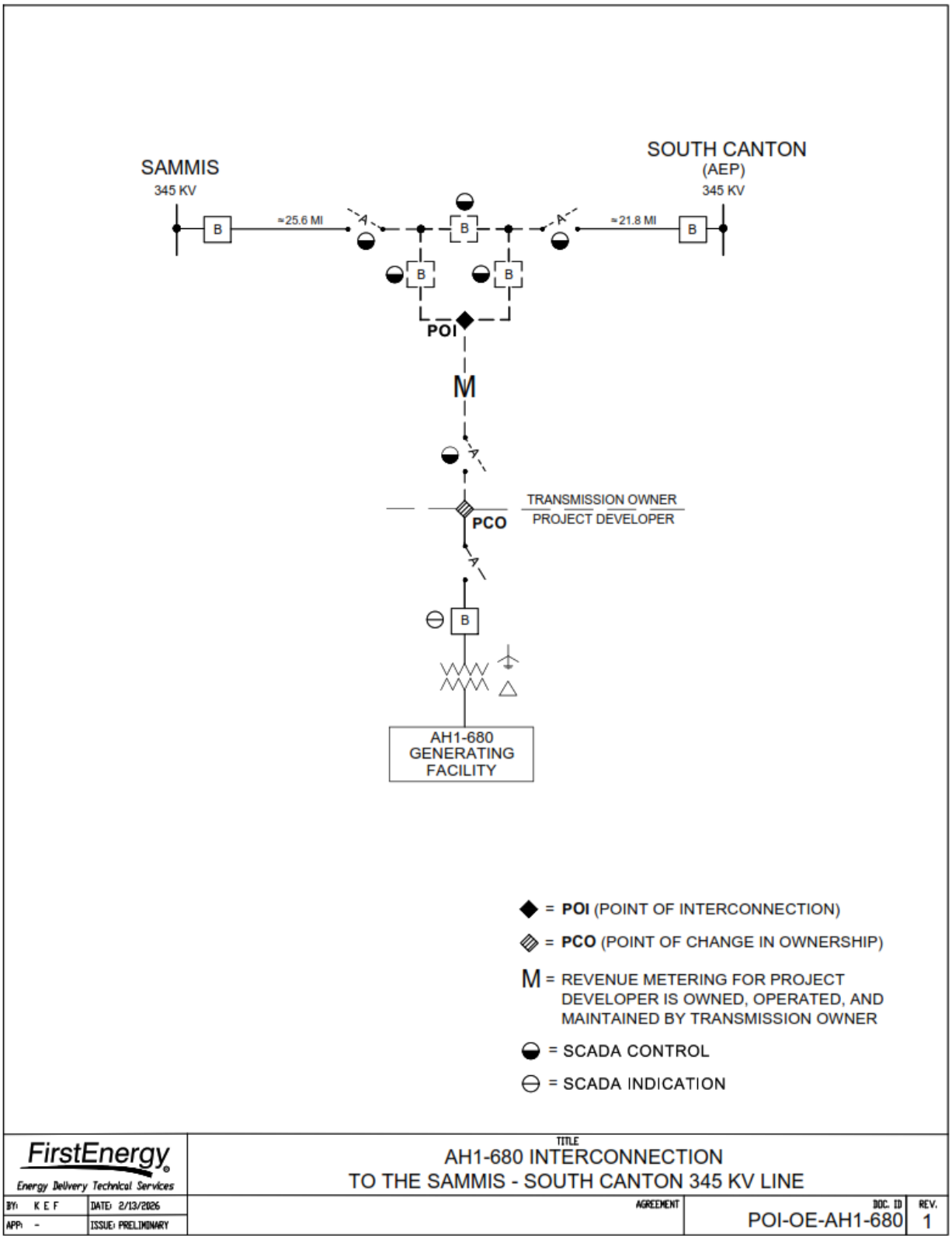
- Environmental permitting, Real Estate acquisition, and notifications to the state's Public Utilities Commission (PUC) vary, some up to twelve (12) months after preliminary engineering is completed to secure the required approvals.
- Prior to agreement by Project Developer to purchase the property,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

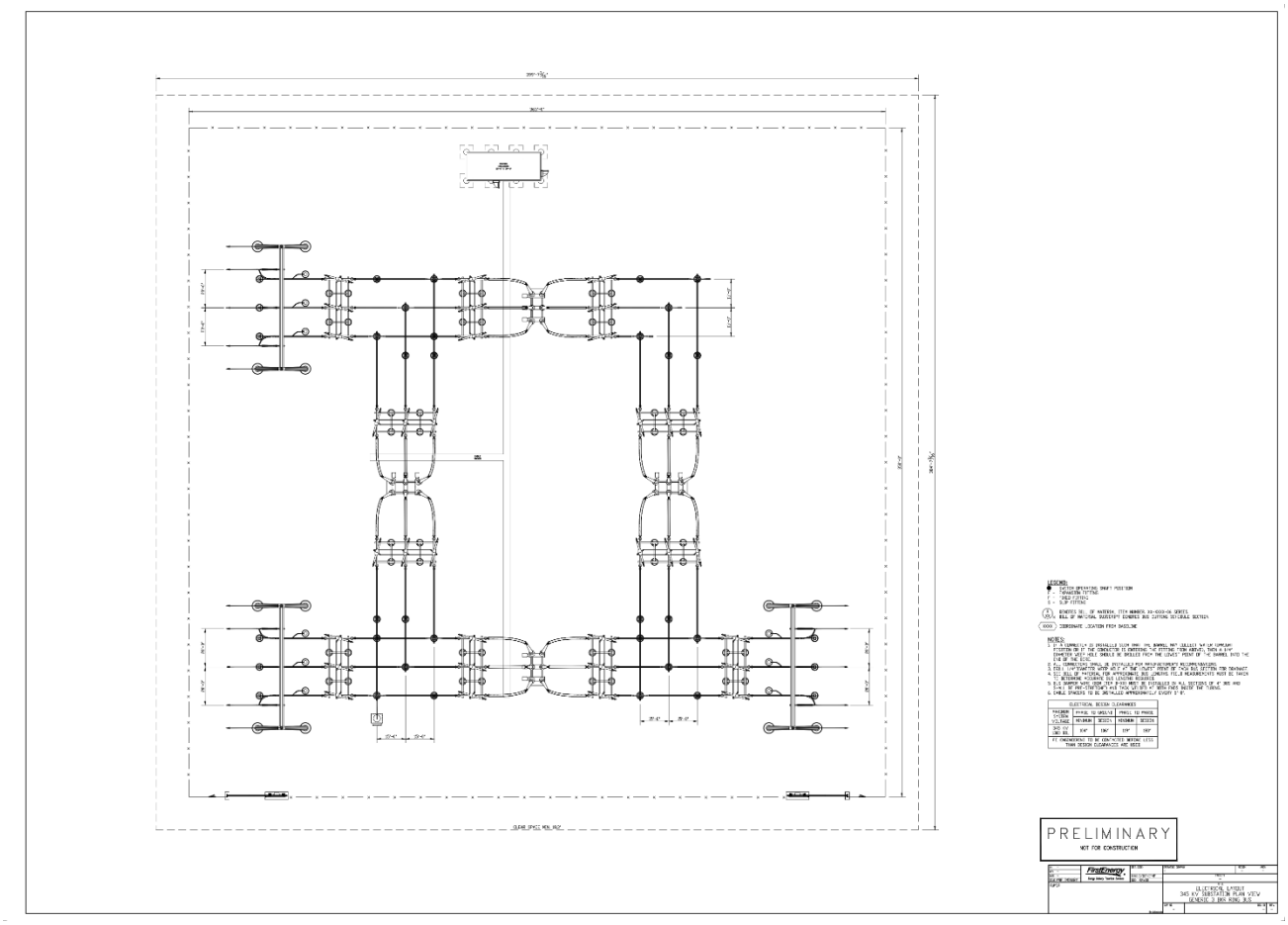
  https://www.firstenergycorp.com/help/safety/real-estate-power-lines/transmission-right-of-way.html#ROWform

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)	340
Battery Charger (ea)	1
Remote Terminal Unit (RTU) (ea)	2
Insulator - Line - Porcelain/Glass (ea)	1989
Engineered Steel Poles (ea)	6
Steel Support Structure (ea)	26
Battery Monitor (ea)	1
Package Control Enclosure - Prefabricated (ea)	1
Relay - Individual (ea)	20
Relay Panel (ea)	9
Circuit Breaker - 362 kV 63 kA (ea)	3
Anchor Bolt - Substation (ea)	304
Line Trap - 345 kV (ea)	6
Surge Arrester - 345 kV (ea)	9
Capacitor Coupled Voltage Transformer (CCVT) - 345 kV (ea)	9
Current Transformer - Slip Over (CT) - 345 kV (ea)	3
Potential Transformer (PT) - 345 kV (ea)	3
Station Service Voltage Transformer (SSVT) - 230 kV (ea)	1
Security - Camera (ea)	25
Security - Physical Access Control (Badge Reader) (ea)	1
Battery - 125V (ea)	1
AC/DC Panelboard (ea)	2
Disconnect Switch - Substation - 345 kV (ea)	9
Switch - Motor Operator - Substation (ea)	3
Cable - Control/Communication (lf)	18510
Conductor - AAC (ft)	1360
Conductor - ACSR (ft)	10454.4
Conduit - Rigid (lf)	1203
Wire - Fiber - ADSS (ft)	1616.332
Wire - Fiber - Underground (ft)	1528.5
Wire - Shield - OHGW (lf)	2323.2
Wire - Shield - OPGW (lf)	1161.6

ATTACHMENT #4: PROTECTION SCOPE

Short Circuit Analysis

Short Circuit Values

The preliminary 345kV fault values at the approximate AH1-680 interconnecting ring bus location are:

Three phase = 18.9kA

Single line to ground = 12.9kA

Z1= (0.1 + j 0.9)%

Z0= (0.1 + j 2.1)%

These values are provided for bolted, symmetrical faults under present normal system conditions and are provided on a 345kV, 100MVA base. 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. Fault values do not include proposed generation.

Protection Requirements

The AH1-680 facility shall consist of two gas turbine generators and connect into a new ring bus which will loop in the existing Sammis-South Canton 345kV line. It is understood that the Project Developer will be using two 345-25kV transformers rated 500/667/833 MVA.

AH1-680 345kV Collector Bus Station

345/34.5kV Transformers

- The interconnecting 345-25kV transformers shall have a wye-grounded configuration on the transmission (345kV) side of the transformer and a delta-connected configuration on the generator (25kV) side.
    - Transformer is required to be two-winding (i.e. no tertiary winding)
- One 345kV, three-phase circuit breaker will be required on the high side of each 345/25kV transformer.
- The circuit breaker shall be fully rated to interrupt available fault current when calculated according to the latest ANSI standard.
    - Bypass switches shall NOT be installed across the breaker. If the Project Developer desired the added reliability benefit of being able to keep the substation energized while performing breaker maintenance, a ring bus or dedicated sparing circuit breaker is required.
    - If the circuit breaker uses gas as an interrupting medium, the device shall be equipped with a low gas pressure alarming/tripping/lockout scheme (as appropriate for the particular device) in order to minimize the possibility of a transmission fault resulting from a loss of insulating gas.
- Each 345kV interconnecting transformer at the generator substation shall have redundant, high-speed protection inclusive of their respective 345kV breaker and shall trip, at minimum, this breaker. Separate CTs and tripping paths are required between the primary and backup relaying.
    - Primary Overall Transformer Differential Protection Relay – minimum functions: 87OA. (FE standard device is SEL-487E)

        - The 345kV source for overall transformer differential protection shall be CTs on the utility side of the transformer breaker. The low side source for primary differential protection shall be CTs on the low side transformer bushings
    - Backup Overall Transformer Differential Protective Relay - minimum functions: 87T. (FE standard device is SEL-487E)
        - The 345kV source for primary transformer differential protection shall be CTs on the utility side of the transformer breaker separate from the overall differential relay. The low side source for primary differential protection shall be CTs on the low side transformer bushings separate from the overall differential relay.
    - Transformer Neutral relay - minimum functions: High-side - 51G. (FE standard device is SEL-451)
        - The source for the high-side backup transformer protection shall be CTs from the transformer high-side neutral.
    - Breaker Failure (BF) Relay – Dedicated breaker failure relay with associated hand-reset lock out relay (LOR). Will be wired to trip the breaker at the AH1-680 Interconnecting Station to isolate from the transmission system if there is a failure to trip operation. (FE standard device is SEL-451)
        - Direct transfer trip for breaker failure, anti-islanding, and other functions as needed shall be communicated via fiber using the associated SEL-411L primary and backup relays. Trip on loss of channel to both the primary and backup schemes.
- CTs used for the zones of protection covering the high voltage portion of the Generator system shall use C800 relay accuracy CTs. These CTs should not saturate for the maximum through-fault current that can be experienced by the relay for the tap ratio in use.
- The relaying system shall have a reliable source of power independent from or immune to disturbances/loss of the AC system (e.g. DC battery and charger) to ensure proper operation of the protection schemes and tripping of the circuit breakers.
- The Project Developer will be required to coordinate with upstream protection. It is solely the Project Developer's responsibility to install and design their relaying to ensure adequate protection of their equipment.
- Detailed one-line diagrams with proposed protection should be provided well in advance of design and engineering to allow for approval of the protection scheme and preliminarily validate coordination with FE system.

345/34.5kV Transformers

- The line between the AH1-680 Interconnecting Station and AH1-680 Collector Bus will require redundant and independent fiber optic based communications channels to be installed and maintained by the Project Developer between the facilities for use with high-speed line current differential protection.
    - Separate primary and backup SEL-411L relays at the AH1-680 station will be required. Separate primary and backup SEL-411L relays will also be required at the AH1-680 Interconnecting Station.
    - Any identified Intertie relay functionality (e.g. overfrequency, underfrequency, phase and ground overvoltage, directional overcurrent, and directional power) will be incorporated into the SEL-411L line relaying at AH1-680.

- The source CTs for the line current differential relays at the generator station shall be separate sets of 2000:5 CTs (C800 or better). These shall be located in the transformer-side bushings of the generator's high-side transformer breakers.
  - Line and transformer zones of protection overlap through the transformer breakers.
- The primary SEL-411L relays shall be sourced from an inner set of CTs and the backup SEL-411L relays sourced from an outer set of CTs on the transformer side of the transformer high-side breakers such that the backup SEL-411L scheme encompasses the primary.
- The 138kV PTs/CCVTs for the SEL-411L relays shall have at minimum two secondary windings and SEL-411L relays shall use separate secondary windings.

Generator Owner's System Protection

- The generator owner (GO) is to design their protective system to clear any fault within their zones of protection with one or more of their local breakers.

Settings for the protection on the 345kV transformer and intertie relaying shall be provided to FE for review and approval well in advance of energization.

The Connecting Party shall provide utility-grade relays for protection of the FE Transmission System. FE shall approve all relays specified for the protection of the FE Transmission System, including time delay and auxiliary relays. Relay operation for any of the listed functions that are required shall initiate immediate separation of the parallel generation from the FE Transmission System:

Relay	**Function**
Frequency	To detect underfrequency and overfrequency operation.
Overvoltage	To detect overvoltage operation.
Undervoltage	To detect undervoltage operation.
Ground Fault Detector	To detect a circuit ground on the FE Transmission System.
Phase Fault Detector	To detect phase to phase faults on the FE Transmission System.
Transfer Trip Receiver	To provide tripping logic to the generation owner for isolation of the generation upon opening of the FE supply circuits.
Directional Power	To detect, under all system conditions, a loss of FE primary source. The relay shall be sensitive enough to detect transformer magnetizing current supplied by the generation.

The Project Developer will be required to comply with all FE Generation Protection Requirements for Generation Interconnection Customers. The Generation Protection Requirements may be found within the "FirstEnergy Requirements for Transmission Connected Facilities" document located at the following links:

www.firstenergycorp.com/feconnect

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

FE System Modifications

System modifications may be required to make settings changes and/or replace existing relays at FirstEnergy remote substation. GEnerator relaying will be required to coordinate with upstream transmission system protection.

AH1-680 Interconnecting Station

- Construct new, 3-breaker ring bus with line exits to Sammis, South Canton, and AH1-680 collector bus
- Loop in existing Sammis-South Canton 345kV line with additional line construction needed from existing line to interconnecting station
- Install new line protection on all three 345kV line exits
- Install breaker failure relaying on all three 345kV breakers
- Install three sets of CCVTs (one for each line exit)
- Dual, independent fiber needed from interconnecting station to the PCO
- Pilot protection for lines to Sammis and South Canton are via PLC

Sammis

- Modify pilot protection on existing South Canton line exit to dual DCB with bidirectional transfer trip. This includes new carrier equipment
- Settings changes may be necessary on other, existing relaying to support system coordination

Settings Changes

Settings changes are possible at, but not limited to, the following stations:

- Star
- Toronto
- Wellsville

ATTACHMENT #5: PRELIMINARY GEOTECHNICAL SUMMARY

Observation & Concern Table:

Category	Source	Risk	Comment
Surficial Soil Survey	USDA Soil Survey	Low to Moderate	Moderately drained, Clayey soils
Geologic Formation/Group	OH/USGS Geologic Survey	Low	This site is part of the Conemaugh formation.
Karst	USGS	Low	Low risk of karst features
Landslide Susceptibility	GIS/Google Earth/FEMA Risk Map	Low	Located in low-risk area
Coal Mining and Oil and Gas Wells	OH Geologic Survey, TAMI 2	Low – Coal Moderate to High - Gas	Low risk of coal mining. Moderate to High due to gas well in immediate area.
Environmental Hazard	US Wetland Maps/FEMA	Low	Low risk of flooding
Past Development	TAMI/GIS MAP/Historic Aerials/ GeoDigital	Low	Undeveloped except for existing T-Line

Site Background / Geologic Hazards Potential

First Energy conducted this review to determine potential geologic hazards and risks at the proposed generator developer location (AH1-680). The reviewed location is in Carrollton, Carroll County, Ohio. This includes a proposed substation located along the Sammis – South Canton 345kV transmission line. The substation would be located between existing tower structures 40124 and 40125 in existing agricultural lands. The existing transmission line operated by Ohio Edison was installed in 1962. The proposed substation would consist of (3) breaker 345kV 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 prior 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 to be underlain by the Coshocton-Keene silt loams. The Coshocton-Keene silt loams are generally clayey (CL, CL-ML, CH) soils that are moderately well drained soils with a depth to water table typically between 18 to 42 inches. The Coshocton-Keene silt loam is currently mapped as Hydrologic Soil Group (HSG) C classification, indicating the soils generally have a moderate infiltration rate. Higher plastic soils (CH) are very sensitive to moisture and can present foundation related construction difficulties.

The Ohio Department of Natural Resources Division of Geological Survey further identifies the soil as Cenozoic Colluvium. The Cenozoic colluvium refers to loose, unconsolidated sediments deposited at the base of slopes through gravity-driven processes (mass wasting, creep, or sheetwash) during the Cenozoic Era (66 million years ago to the present).

Geologic Formation/Group

The site is located in the Muskingum Pittsburgh Plateau section of the Appalachian Plateaus physiographic province which is described as a well-dissected plateau featuring broad major valleys that contain outwash terraces, and tributaries with lacustrine terraces. The Ohio Department of Natural Resources Division of Geological Survey maps the site to be underlain by the Conemaugh Group of the Pennsylvanian age (approximately 300 million years). The Conemaugh consists of cyclic sequences of sandstone, shale, siltstone, red beds, thin limestones, and non-persistent coal seams.

Karst

he site is underlain by the Conemaugh Group as described previously. The Conemaugh Group primarily consists of thin beds of limestone which is considered a carbonate bedrock and therefore have potential for karst features to be located within the site limits. The karst interactive map of Ohio was reviewed further, and it does not appear that there are any karst related features within the area. Transmission Asset Mapping Interface 2 (TAMI 2) also contains a karst feature layer and was reviewed; no karst related features are identified on TAMI 2. A determination of karst risk should be discussed in the sites geotechnical report to better understand the risk. Based on available mapping there is low risk of karst.

Landslide Susceptibility

The State of Ohio Enhanced Hazard Mitigation Plan identifies Carrol County to be located in a high susceptibility, low to moderate incidence area (zone 3). The FEMA national risk index rates the area as a very low risk to landslides. Transmission Asset Mapping Interface (TAMI) was utilized to generate elevation profiles for the potential site area. The ground surface slopes downward from west to east approximately 6 feet over a 500 foot span, and in a north south direction the ground slopes up to 10 feet downward from north to south over an approximate 500 foot span. Given the relatively gentle sloping conditions, the likely occurrence of a landslide is estimated to be low.

Resource mapping

The site is located in a known geologic formation that contains coal. Coal resource mapping was reviewed in order to determine if mining has occurred at the subject site. The Ohio Department of Natural Resources shows numerous mines located in Carroll County but none within the proposed site location. The risk associated with mining is estimated to be low.

In addition, The Ohio Department of Natural Resources also has a tool to search for oil and natural gas wells located in Ohio. There site is located in the influence area of Wellhead 22476, in which the drill pad is located to the east of the prospective site, and the bore for the well is drilled in a northwest direction. The influence

of the well area should be reviewed further in coordination with the well developer to determine any conflict. Due to the location of the well the risk associated is listed as moderate to high

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 conducted 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 1955 this site has only been developed for the transmission line and farming. A recent photograph of the site from the GeoDigital tool is included in Appendix G.

Recommendations & Geotechnical Opinion

List of Observations/Concerns Interconnection Facilities – Sammis-South Canton 345 kV AH1-680:

1. This site is part of the Conemaugh Group
2. Low potential for karst
3. Low risk for landslide
4. Low environmental impact risk
5. No mining in the area
6. Active natural gas wells in the area
7. No prior development noted

Preliminary Geotechnical Opinion

The geotechnical conditions of this site seem to conclude that it is relatively low to moderate risk location to develop a substation. The location of the gas well bore will need to be determined and additional coordination will need to take place in order to avoid any conflicts. The developer should plan a subsurface investigation and associated geotechnical report commenting on each risk before the site is designed and developed. All findings need to be confirmed with field data. There are no anticipated budget, constructability, or schedule issues. All findings should be confirmed by the developer prior to construction.