PJM Facilities Study Report

for

Network Upgrade N9228

"Lallendorf - Monroe Line 345 kV Upgrade"

Revision 0: August 2025

Introduction

This Facilities Study has been prepared in accordance with the PJM Open Access Transmission Tariff and PJM Manuals. The Transmission Owner (TO) is American Transmission Systems, Inc. (ATSI).

A. Project Description

The System Impact Study for PJM Interconnection Cycle TC-1 has identified the need for PJM Network Upgrade N9228. The scope of this Network Upgrade includes the following:

- Rebuild approximately 6.6 miles of the Lallendorf-Monroe 345 kV line from Lallendorf to the state line.
- Transfer and reuse approximately 0.9 miles of existing conductor on the Fostoria Central – Lallendorf 345 kV line to maintain double circuit with Lallendorf – Monroe line.
- Transfer and reuse approximately 5.7 miles of existing conductor on the Lemoyne – Majestic 345 kV line to maintain double circuit with Lallendorf – Monroe line.
- At Lallendorf substation, Replace line drops and (2) wave traps on the Monroe terminal.

Upon completion of the Network Upgrade above, the expected final ratings will be:

Unit	Normal	LTE	STE	LD
MVA	1824	1962	1962	2135

B. Transmission Owner Facilities Study Results

1. Detailed Scope of work for Network Upgrade [N9228]:

The following is a detailed description of Transmission Owner Upgrades for Network Upgrade N9228. These facilities shall be designed according to the Transmission Owner's Applicable Technical Requirements and Standards. Once built the Transmission Owner will own, operate, and maintain these facilities.

1.1 Lallendorf – Monroe 345 kV Line Rebuild

Rebuild approximately 6.6 miles of the Lallendorf-Monroe 345 kV line from Lallendorf to the state line.

- Existing Conditions
    - The existing line from Lallendorf to Monroe is constructed on double circuit lattice towers, a couple wood H-frames and (2) steel structures on concrete foundation deadends.
    - The Lallendorf to Monroe 345kV Line double circuits with the Fostoria Central - Lallendorf 345kV Line and the Lemoyne - Majestic 345kV Line.
    - Per TAMI, the existing conductor is 1024.5 kcmil 24/13 ACAR, shielded by (1) 7#120 alumoweld, per circuit.
    - Per GIS View, there are approximately (14) distribution crossings along this line segment. None appear to be attached to the T-Line.
- Installations
    - (7) engineered steel, mono-pole, double circuit, deadend structures on concrete foundations
    - (4) engineered steel, mono-pole, double circuit, angle structures on concrete foundations

  - (2) engineered steel, 2-pole, double circuit, tangent structures on concrete foundations
  - These structures are over 350' tall and cross the Maumee River.
  - (20) engineered steel, mono-pole, double circuit, tangent structures on concrete foundation
  - 6.6 miles of 3-phase, double bundled 795 kcmil 26/7 ACSS conductor, shielded by (1) OPGW
- Removals
  - (6) lattice tower, deadend structures
  - (1) wood, H-frame, tangent structure
  - (1) laminate, H-frame, tangent structure
  - (25) lattice tower, tangent and angle structures
  - 6.6 miles of (3) 1024.5 kcmil 24/13 ACAR conductor and (1) 7#120 alumoweld shield wire
- Siting and Licensing
  - It is assumed a Full Application will be required.
- Scope of Work Assumptions
  - Existing Str. 1 to be changed from a tangent to a strain deadend to accommodate new conductor transition to the ITC structure to the north across the Michigan/Ohio state line.
  - Assumed that existing structures 5 and 5A which are steel on concrete foundations built in 2016 are to remain and be reused. New insulators are estimated.
  - Assumed the conductor on the Lemoyne - Majestic 345kV Line side and the Fostoria Central - Lallendorf 345kV Line side can be reused.
  - Assumed the structures can handle the different conductor size and type.
  - The Existing conductor is 1024.5 kcmil 24/13 ACAR and the proposed conductor is a double bundled 795 kcmil 26/7 ACSS. An engineering analysis will be required.
  - It is assumed the outage requirements for construction on the line can be met.
  - It is assumed that a Ground Survey will be required.
  - It is assumed that only a Ground Survey (instead of LiDAR) is required for the As Built Survey.
  - It is assumed an Aerial LiDAR survey will be required.
  - It is assumed that the existing right-of-way can be used.
  - The proposed rebuild crosses (6) major roads and (8) other roadways.
  - The proposed rebuild crosses the Canadian National Railroad. This is a major multi-spur crossing.
  - The proposed rebuild crosses the CSX Transportation Railroad (3) times. (1) is a major multi-spur crossing, (1) is a regular crossing, and (1) is a minor rail spur crossing.
  - The proposed rebuild crosses the Norfolk Southern Railroad (2) times. (1) is a major multi-spur crossing, and (1) is a regular crossing.
  - The proposed rebuild crosses (20) registered wetland areas per TAMI and the FWS Wetland Directory in Google Earth.

- The proposed rebuild crosses (2) minor waterways.
- The proposed rebuild crosses over (14) distribution lines per GIS View.
- The proposed rebuild crosses the Dewiler Park.
- The proposed rebuild is assumed to cross over the following transmission lines:
  - Bayview Sewage (Lapier) 69kV Line
  - Citgo - Petroleum (Ironville) 69kV Line
  - Bayshore - GM Powertrain 138kV Line
  - BP Husky - Jackman 138kV Line
  - Bayshore - Jeep No2 Stickney 138kV Line
  - Ironville - Locust 69kV Line
  - Bayshore - Ironville 138kV Line
  - BP Husky - Lemoyne 138kV Line
  - Bayshore - Maclean 138kV Line
  - Ironville - Locust 69kV Line
- Per TAMI there is a FAA Restricted Fly Zone just south of the Lallendorf Station and another one approximately 0.7 miles northwest of Lallendorf Station.
- It is assumed the Lallendorf, Monroe, Fostoria Central, Lemoyne, and Majestic Substations will need to remain energized during construction. Temporary construction may be required.
- Exact structure locations are not yet determined. This rebuild is assumed to be a structure for structure rebuild. An engineering analysis will be required.
- Assumed steel construction for this 345kV rebuild. Deadend structures, angle structures, and tangent structures that are excessively tall assumed to be engineered steel on concrete foundations.
- In the design phase a determination can be made if direct embedded tangent structures are feasible.
- During the network upgrade facility study process, FirstEnergy will make a final determination on whether a full rebuild is required or if only a reconductor is required.
- Assumed line route will need groundline inspection prior to project to ensure justification.

- Ancillary Scope of Work
  - Project Management
    - Provide project management, coordination, administration, scheduling, material management and project development if required.
  - Forestry
    - Tree and grub clearing will be required. Priority tree rights are to be expanded.
  - Real Estate & Right-Of-Way

- It is assumed that all work will take place within the existing ROW.
- A “rights and restrictions” review by Real Estate will be required.
- Georeferenced ROW extents will be required to be provided to engineering.
- Real estate estimate has been included for:
    - Internal support including railroad permitting, document review, project planning meetings, subcontractor oversight and assistance with transfer of assets if required.
    - External support for rights & restrictions reviews, easement digitization and other GIS support, general project support, acquisition, construction support and damage settlements/releases.
    - Cost of purchasing new land rights and associated fees such as recording costs or permits (estimated--actual cost will depend on current market values, land type, location and negotiations and can vary greatly along the route).
    - We have not included acquisition labor or cost of potential priority tree rights unless specified as needed in the scope and assumptions.
    - Direct damage payments not included in estimate.
    - Any assumed ROW width used in this estimate for the calculation of easement area is based on the widest ROW needed for the voltage and does not account for structure configuration or span lengths. Widths needed can vary upon final design.
    - Access roads (direct cost); assumption of 4 off-ROW roads.
    - Laydown yard; assumption of 2 yard for duration of construction (per interview).
    - Modified/new guying rights; assuming of 4 locations.
        - Agent per diem.
    - Assuming 10% of New ROW will be accounted for centerline modifications which may arise due to the rebuild. 12 acres will need to be acquired.
    - Recording fees=10% of total easement/acquisition cost; fees do not include taxes that may be required by specific counties via a "Real Estate Transfer Tax Statement of Value.

- Environmental
    - Several wetland areas along the rebuild line route have been identified and all applicable permits are required.
    - An environmental review will be required to identify any additional construction constraints or additional permitting requirements
- Revenue Metering
    - None
- Information Technology

        - Estimated cost associated with new OPGW build on Lallendorf - Monroe 345 kV line.
    - Access Road Construction
        - Access roads will be required along a portion of the line route (approximately 4.5 miles) and the terrain is flat.
    - Distribution
        - None

1.2 Fostoria Central – Lallendorf 345 kV Line Conductor Transfer

Transfer and reuse approximately 0.9 miles of existing conductor on the Fostoria Central – Lallendorf 345 kV line to maintain double circuit with Lallendorf – Monroe line.

- Existing Conditions
    - The existing line from Lallendorf to Monroe is constructed on double circuit lattice towers, a couple wood H-frames and (2) steel structures on concrete foundation deadends.
    - The Lallendorf to Monroe 345kV Line double circuits with the Fostoria Central - Lallendorf 345kV Line and the Lemoyne - Majestic 345kV Line.
    - Per TAMI, the existing conductor is 1024.5 kcmil 24/13 ACAR, shielded by (1) 7#120 alumoweld, per circuit.
    - Per GIS View, there are approximately (14) distribution crossings along this line segment. None appear to be attached to the T-Line.
- Installations
    - Transfer and reuse existing conductor ~ 0.9 miles of (3) 1024.5 kcmil 24/13 ACAR conductor and (1) 7#120 alumoweld shield wire
    - New insulators to be installed on new structures detailed in Lallendorf – Monroe estimate
- Removals
    - 0.9 miles of (3) 1024.5 kcmil 24/13 ACAR conductor and (1) 7#120 alumoweld shield wire ~ to be reused
- Siting and Licensing
    - It is assumed a Full Application will be required.
- Scope of Work Assumptions
    - Assumed the conductor on the Lemoyne - Majestic 345kV Line side and the Fostoria Central - Lallendorf 345kV Line side can be reused.
    - Assumed the structures can handle the different conductor size and type.
    - The Existing conductor is 1024.5 kcmil 24/13 ACAR and the proposed conductor is a double bundled 795 kcmil 26/7 ACSS. An engineering analysis will be required.
    - It is assumed the outage requirements for construction on the line can be met.
    - It is assumed that a Ground Survey will be required.

- It is assumed that only a Ground Survey (instead of LiDAR) is required for the As Built Survey.
- It is assumed an Aerial LiDAR survey will be required.
- It is assumed that the existing right-of-way can be used.
- The proposed rebuild/reconductor crosses (6) major roads and (8) other roadways.
- The proposed rebuild/reconductor crosses the Canadian National Railroad. This is a major multi-spur crossing.
- The proposed rebuild/reconductor crosses the CSX Transportation Railroad (3) times. (1) is a major multi-spur crossing, (1) is a regular crossing, and (1) is a minor rail spur crossing.
- The proposed rebuild/reconductor crosses the Norfolk Southern Railroad (2) times. (1) is a major multi-spur crossing, and (1) is a regular crossing.
- The proposed rebuild/reconductor crosses (20) registered wetland areas per TAMI and the FWS Wetland Directory in Google Earth.
- The proposed rebuild crosses (2) minor waterways.
- The proposed rebuild crosses over (14) distribution lines per GIS View.
- The proposed rebuild crosses the Dewiler Park.
- The proposed rebuild is assumed to cross over the following transmission lines:
  - Ironville - Locust 69kV Line
- Per TAMI there is a FAA Restricted Fly Zone just south of the Lallendorf Station and another one approximately 0.7 miles northwest of Lallendorf Station.
- It is assumed the Lallendorf, Monroe, Fostoria Central, Lemoyne, and Majestic Substations will need to remain energized during construction. Temporary construction may be required.
- During the network upgrade facility study process, FirstEnergy will make a final determination on whether a full rebuild is required or if only a reconductor is required.
- Assumed line route will need groundline inspection prior to project to ensure justification.

- Ancillary Scope of Work
  - Project Management
    - Provide project management, coordination, administration, scheduling, material management and project development if required.
  - Forestry
    - Tree and grub clearing will be required. Priority tree rights are to be expanded.
  - Real Estate & Right-Of-Way
    - It is assumed that all work will take place within the existing ROW.
    - A “rights and restrictions” review by Real Estate will be required.
    - Georeferenced ROW extents will be required to be provided to engineering.
  - Environmental

        - Several wetland areas along the rebuild line route have been identified and all applicable permits are required.
        - An environmental review will be required to identify any additional construction constraints or additional permitting requirements
    - Revenue Metering
        - None
    - Information Technology
        - OPGW shielding to be installed.
    - Access Road Construction
        - Access roads will be required along a portion of the line route (approximately 4.5 miles) and the terrain is flat.
    - Distribution
        - None

1.3 Lemoyne – Majestic 345 kV Line Conductor Transfer

Transfer and reuse approximately 5.7 miles of existing conductor on the Lemoyne – Majestic 345 kV line to maintain double circuit with Lallendorf – Monroe line.

- Existing Conditions
    - The existing line from Lallendorf to Monroe is constructed on double circuit lattice towers, a couple wood H-frames and (2) steel structures on concrete foundation deadends.
    - The Lallendorf to Monroe 345kV Line double circuits with the Fostoria Central - Lallendorf 345kV Line and the Lemoyne - Majestic 345kV Line.
    - Per TAMI, the existing conductor is 1024.5 kcmil 24/13 ACAR, shielded by (1) 7#120 alumoweld, per circuit.
    - Per GIS View, there are approximately (14) distribution crossings along this line segment. None appear to be attached to the T-Line.
- Installations
    - Transfer and reuse existing conductor ~ 5.7 miles of (3) 1024.5 kcmil 24/13 ACAR conductor and (1) 7#120 alumoweld shield wire.
    - New insulators to be installed on new structures detailed in Lallendorf – Monroe estimate.
- Removals
    - 5.7 miles of 3-phase 1024.5 kcmil 24/13 ACAR conductor and (1) 7#120 alumoweld shield wire ~ to be reused.
- Siting and Licensing
    - It is assumed a Full Application will be required.
- Scope of Work Assumptions

- Assumed the conductor on the Lemoyne - Majestic 345kV Line side and the Fostoria Central - Lallendorf 345kV Line side can be reused.
- Assumed the structures can handle the different conductor size and type.
- The Existing conductor is 1024.5 kcmil 24/13 ACAR and the proposed conductor is a double bundled 795 kcmil 26/7 ACSS. An engineering analysis will be required.
- It is assumed the outage requirements for construction on the line can be met.
- It is assumed that a Ground Survey will be required.
- It is assumed that only a Ground Survey (instead of LiDAR) is required for the As Built Survey.
- It is assumed an Aerial LiDAR survey will be required.
- It is assumed that the existing right-of-way can be used.
- The proposed rebuild/reconductor crosses (6) major roads and (8) other roadways.
- The proposed rebuild/reconductor crosses the Canadian National Railroad. This is a major multi-spur crossing.
- The proposed rebuild/reconductor crosses the CSX Transportation Railroad (3) times. (1) is a major multi-spur crossing, (1) is a regular crossing, and (1) is a minor rail spur crossing.
- The proposed rebuild/reconductor crosses the Norfolk Southern Railroad (2) times. (1) is a major multi-spur crossing, and (1) is a regular crossing.
- The proposed rebuild/reconductor crosses (20) registered wetland areas per TAMI and the FWS Wetland Directory in Google Earth.
- The proposed rebuild crosses (2) minor waterways.
- The proposed rebuild crosses over (14) distribution lines per GIS View.
- The proposed rebuild crosses the Dewiler Park.
- The proposed rebuild is assumed to cross over the following transmission lines:
  - Bayview Sewage (Lapier) 69kV Line
  - Citgo - Petroleum (Ironville) 69kV Line
  - Bayshore - GM Powertrain 138kV Line
  - BP Husky - Jackman 138kV Line
  - Bayshore - Jeep No2 Stickney 138kV Line
  - Ironville - Locust 69kV Line
  - Bayshore - Ironville 138kV Line
  - BP Husky - Lemoyne 138kV Line
  - Bayshore - Maclean 138kV Line
- Per TAMI there is a FAA Restricted Fly Zone just south of the Lallendorf Station and another one approximately 0.7 miles northwest of Lallendorf Station.
- It is assumed the Lallendorf, Monroe, Fostoria Central, Lemoyne, and Majestic Substations will need to remain energized during construction. Temporary construction may be required.

- During the network upgrade facility study process, FirstEnergy will make a final determination on whether a full rebuild is required or if only a reconductor is required.
- Assumed line route will need groundline inspection prior to project to ensure justification.

- Ancillary Scope of Work
  - Project Management
    - Provide project management, coordination, administration, scheduling, material management and project development if required.
  - Forestry
    - Tree and grub clearing will be required. Priority tree rights are to be expanded.
  - Real Estate & Right-Of-Way
    - It is assumed that all work will take place within the existing ROW.
    - A "rights and restrictions" review by Real Estate will be required.
    - Georeferenced ROW extents will be required to be provided to engineering.
  - Environmental
    - Several wetland areas along the rebuild line route have been identified and all applicable permits are required.
    - An environmental review will be required to identify any additional construction constraints or additional permitting requirements
  - Revenue Metering
    - None
  - Information Technology
    - OPGW shielding to be installed.
  - Access Road Construction
    - Access roads will be required along a portion of the line route (approximately 4.5 miles) and the terrain is flat.
  - Distribution
    - None

1.4 Lallendorf Substation

Replace line drops and (2) wave traps on the Monroe terminal.

- Below Grade Scope of Work:
  - (1) lot grounding for new equipment.
  - (1) lot conduit for in-sub fiber run.

- Above Grade Scope of Work:
    - Replace line drops on the Monroe terminal with (2) 795.0 kcmil 26/7 ACSS conductors.
    - Replace (2) 345 kV wave traps with (2) 345 kV 4000A wideband wave traps, line tuners, and coax.
- Relay & Control Scope of Work
    - Review and revise relay settings.
- Scope of work Assumptions
    - It is assumed that the existing takeoff structures can accommodate the new loading from the new line conductor.
    - It is assumed that existing wave trap support structures can be reused. Note that Sage item database does not contain 4000A wave trap item.
- Ancillary Scope of Work
    - Project Management
        - Project management will be required for this asset.
    - Forestry
        - None
    - Real Estate & Right-Of-Way
        - None
    - Environmental
        - None
    - Revenue Metering
        - None
    - Information Technology
        - SCADA work at Lallendorf Substation to support wave trap installation.
        - (1) in-sub fiber run to represent ADSS tail extension from Lallendorf substation control house to last T-Line structure for OPGW build.
    - Testing and Commissioning
        - Testing and commissioning services as required for new equipment.

2. MILESTONE SCHEDULE FOR COMPLETION OF ATSI WORK

Facilities outlined in this report are estimated to take 29 months to construct, from the time the Generation Interconnection Agreement is fully executed. This schedule is based on the ability to obtain outages to construct and test the proposed facilities.

Description	Start Month	Finish Month
Preliminary Engineering	1	2
Siting, Permits & Real Estate	5	16
Detailed Engineering	3	16
Equipment Delivery	18	18
Construction	19	27
Testing & Commissioning	25	29

3. ASSUMPTIONS IN DEVELOPING SCOPE/COST/SCHEDULE

4.1 Scope Assumptions:

- N/A

4.2 Cost Estimate Assumptions:

- The cost estimates provided in this report were developed as of April 11, 2025, 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 applicable Interconnection Agreement for the related project, FirstEnergy reserves the right to re-evaluate and provide a more accurate cost estimate during the implementation phase of the project.

4.3 Schedule Assumptions:

- FirstEnergy'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 FirstEnergy or the Transmission Provider.

4. LAND REQUIREMENTS

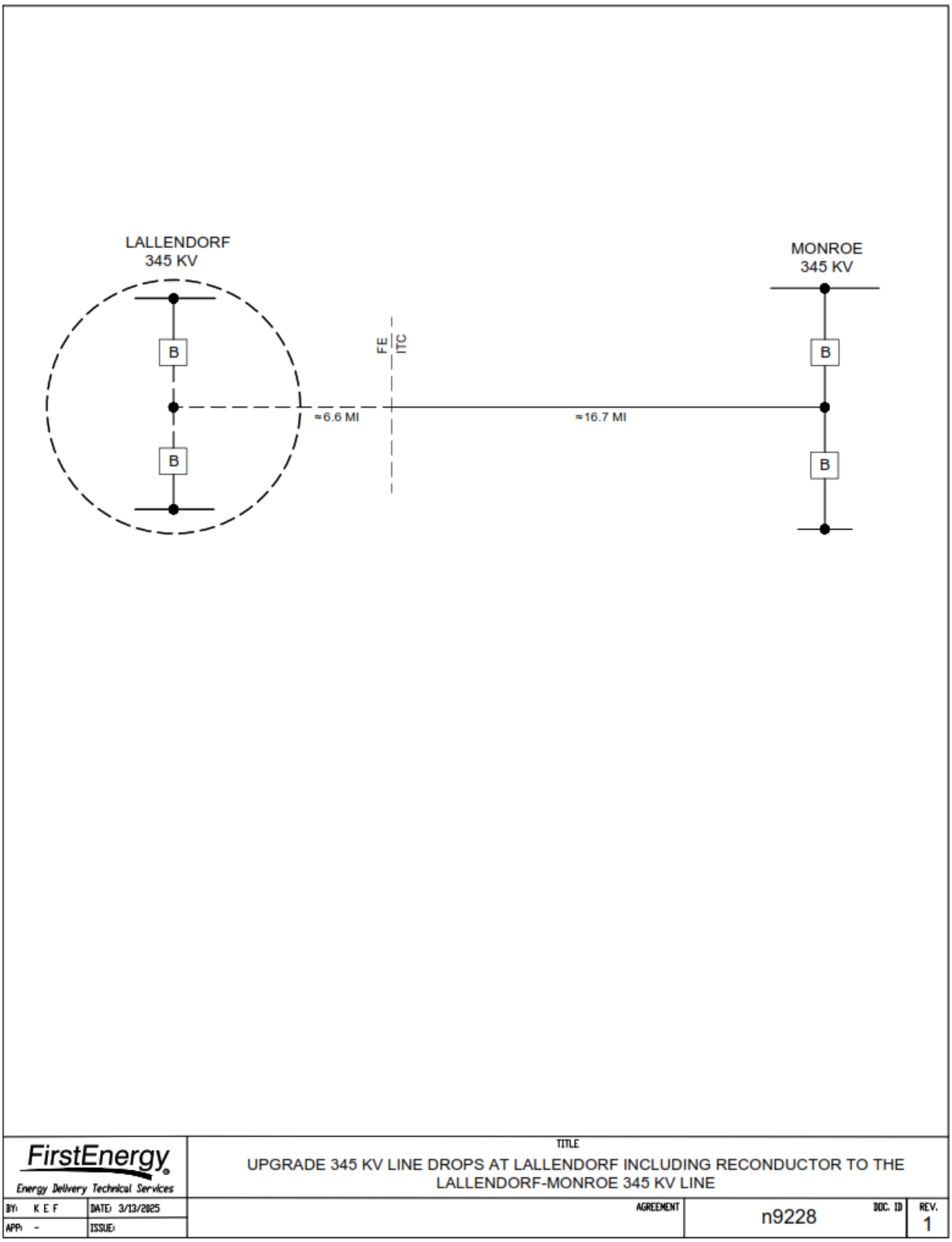
Not Applicable.

5. ENVIRONMENTAL AND PERMITING

Not Applicable.

C. APPENDICES

ATTACHMENT #1: SINGLE LINE DIAGRAM



ATTACHMENT #2: PROTECTION SCOPE

Project Scope:

Upgrade 345kV line drops at Lallendorf including reconductor the Lallendorf - Monroe 345 kV line with 795.0 kcmil 26/7 ACSS

Preliminary Protection Equipment Requirements:

Lallendorf Substation:

Monroe 345 kV exit:

- Revise line relay settings.
- Replace wave traps with 4000 A traps.