PJM Facilities Study Report

For

AE2-187 Affected Transmission Ower Facilities Study

Transition Cycle #1

August 2025

Introduction

This affected Tranmission Owner Facilities Study has been prepared in accordance with the PJM Open Access Transmission Tariff and PJM Manuals. The Transmission Owner (TO) is Virginia Electric and Power Company (VEPCO or Dominion).

A. Project Description

The System Impact Study for PJM Interconnection Transition Cycle #1 has identified the need for a Facilities Study for the AE2-187 generation interconnection project. The scope of this Network Upgrade includes the following:

- Add a single tap breaker switchyard on the 69kV 173 line between Chatham Substation and Taylor Mills Substation near structure 3001 the existing tap point to Shockoe D.P. (MEC).

B. Transmission Owner Facilities Study Results

1. Detailed Scope of work for AE2-187 Affected System

The following is a detailed description of Transmission Owner Upgrades for Network Upgrade. 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.

The Preliminary Scoping Document located in the Appendices, Attachment #1-6.

2. MILESTONE SCHEDULE FOR COMPLETION OF DOMINION WORK

Facilities outlined in this report are estimated to take 42 months to construct, from the time of full execution of the Generation Interconnection Agreement and completion of a construction kickoff call. This schedule may be impacted by the timeline for procurement and installation of long lead items and the ability to obtain outages to construct and test the proposed facilities.

Description	Start month	Finish month
Engineering	1	10
Permitting/Procurement	3	34

Construction	32	42

3. ASSUMPTIONS IN DEVELOPING SCOPE/COST/SCHEDULE

- The preliminary construction schedule is dependent on outage availability.
- See Attachment 1, 2, 3, 4, & 5 – Preliminary Scoping Summary – Substation for additional assumptions
- See Attachment 6 – Preliminary Scoping Summary – Transmission line for additional assumptions

4. LAND REQUIREMENTS

Dominion will be responsible for the following expectations in the area of Real Estate:

- Any additional land needed for Storm Water Management, Landscaping, and Wetlands/Wetlands Mitigation.
- Any other Land/Permitting requirements required by the Network Upgrade

5. ENVIRONMENTAL AND PERMITING

The Dominion will be responsible for the following expectations in the area of Environmental and Permitting:

- Assessment of environmental impacts related to the Network Upgrade including:
    - Environmental Impact Study requirements
    - Environmental Permitting
- A stormwater easement and/or specific stormwater design BMP's to allow access to and use of the facilities, including a maintenance agreement for said stormwater facilities.
- Conditional Use Permit for Substation
- Any additional land needed for Storm Water Management, Landscaping, and Wetlands/Wetlands Mitigation
- Any other Permitting requirements required by the Network Upgrade

C. APPENDICES

Attachment #1: Preliminary Scoping Summary – Substation AE2-187

Attachment #2: Preliminary Scoping Summary – Substation Altavista

Attachment #3: Preliminary Scoping Summary – Substation Bearskin

Attachment #4: Preliminary Scoping Summary – Substation Chatham

Attachment #5: Preliminary Scoping Summary – Substation Gretna

Attachment #6: Preliminary Scoping Summary – Transmission

Attachment #1

SCOPE OF WORK

Project Number: GITAE2-187

Project Description: Add New Single Breaker Tap – Network Upgrade

Date: 7/21/2025

Revision Number: 0

Project Summary

Project number GITAE2-187 provides for the initial construction of a new 115kV single breaker tap operating at 69kV near structure 173/3001 in Pittsylvania County, Virginia.

The objective of this project is one new 115kV breaker tap operating at 69kV installed near structure 173/3001 due to the POI for the new GITAE2-187 switching station being around 7.5 miles away. The site is located along Virginia Electric and Power Company d/b/a Dominion Energy Virginia's (Dominion) existing 69kV, 173 line from Chatham Substation to Taylors Mill Substation.

Dominion will provide the property and access to the switching station. Dominion will perform all substation permitting, site preparation, and grading activity.

Transmission line engineering is to renumber the existing segment between the new 115kV single breaker station and MEC's Shockhoe DP Station. The existing line segment between the new 115kV single breaker station and Chatham Substation shall remain line 173.

Additional work is required at Altavista Substation, Bearskin Substation, Gretna Substation, and Chatham Substation.

Security and fence type – design level 4.

Assumption:

Currently, the scope and estimate assume Dominion standard spread footer foundations. Once the soil information is available and it is prudent to change the design to “helical pile foundations” the Dominion team should be informed to adjust the project estimate at the earliest possible opportunity.

Purchase and install substation material – Stand Alone Network Upgrade:

1. Approximate station fence line dimensions of 145’ x 140’. At a minimum, site preparation and grading will be required to extend 15’ beyond these dimensions for station grounding. Additional property and site prep may be required for proper grading and stormwater management, etc.
2. Approximately 570 linear ft of 5/8” chain link, 12 ft tall, perimeter fence around the station along with the security cameras and integrators as per design 4 fence standards
3. One (1), One (1), 69kV, 3000A, 40kAIC, SF-6 circuit breaker
4. One (1), 115kV, 2000A, 3-phase center break gang operated switch
5. One (1), 115kV, 2000A, 3-phase center break vertical switch
6. One (1), 69kV, 2000A wave trap
7. One (1), line tuner
8. Three (3), 69kV, relay accuracy CCVT
9. Three (3), 60kV, 48kV MCOV surge arrester
10. One (1), 115kV, 2000A, 1-phase center break switch (for PVT’s)
11. One (1), 69kV, 100KVA power PT's for station service
12. Two (2), 115kV, 10 in-lb., 125VDC motor operator
13. One (1), 18kV, 15.3kV MCOV surge arrester
14. One (1), SMD-20 fused disconnect with BCL fuse (size to be verified during detail engineering)
15. One (1), 100kVA, 14.4 -.12/.24kV transformer (size to be verified during detail engineering)
16. One (1), 24’ x 30’ control enclosure
17. One (1), 115kV, heavy duty steel backbone (by Transmission)
18. One (1), 125 VDC, 300 Ah station battery and 50 Amp charger (size to be verified during detail engineering)
19. Approximately 76 ft of cable trough
20. Two (2), 38” x 38” x 42” precast yard pull box
21. Station stone as required
22. Station lighting as required
23. Steel structures as required including switch stands, bus supports, station service transformers, CCVT and wave trap supports
24. Foundations as required including control house, equipment, and bus support stands
25. Conductors, connectors, conduits, control cables, cable trough, and grounding materials as per engineering standards

Purchase and install relay material – Stand Alone Network Upgrade:

1. One (1), 1510 – 24” dual SEL-351-7 transmission breaker with reclosing panel
2. One (1), 4510 – SEL-2411 breaker annunciator
3. One (1), 1340 – dual SEL-411L DCB/PLC line panel
4. One (1), 4506 – 3-phase CCVT potential make-up box
5. One (1), 1603 – 24” SEL-451 islanding control scheme panel
6. Two (2), 4548 – non-earthing switch MOAB control box
7. One (1), 4103 – non-earthing switch MOAB AC/DC distribution box
8. One (1), 4153c – wall mount station battery monitor
9. One (1), 5613 – annunciator/RTU/communication panel
10. One (1), 5609 – fiber optic management panel
11. One (1), 4526_A – circuit breaker fiber optic make-up box
12. One (1), 5202 – 26” APP 601 digital fault recorder
13. Five (5), 4040 – security fiber/power make-up box
14. One (1), 5603 – station network panel no. 1
15. One (1), 5603 – station network panel no. 2
16. One (1), 5616 – station security panel
17. One (1), 5616 – security fence panel
18. One (1), high voltage protection (HVP) box (provided by IT) (to be verified during detail engineering)
19. One (1), telephone interface box (to be verified during detail engineering)
20. One (1), 4000 – station service potential MU box
21. One (1), 400A 3-phase disconnect switch (Fused @225A)
22. One (1), 4051 – power block box
23. One (1), 60A transmission yard main breaker box
24. One (1), 4019 – 225A 3-phase throwover switch
25. One (1), 4014 – 225A outdoor distribution yard AC NQ
26. One (1), 4044 – 225A 1-phase outdoor main security AC NQOD

Attachment #2

SCOPE OF WORK

Project Number: GITAE2-187

Project Description: Altavista Substation

Date: 07/21/2025

Revision Number: 0

Project Summary

Project GITAE2-187 provides for drawing work, relay resets, and field support necessary for the addition of a new breaker for affected station for AE2-187 station on Line 173. This project is the Non-Direct Connect for the AE2-187 Generator Interconnect Project.

Purchase and install relay material – Non-Direct Network Upgrade:

1. Relay settings to be determined

Attachment #3

SCOPE OF WORK

Project Number: GITAE2-187

Project Description: Bearskin Substation

Date: 07/21/2025

Revision Number: 0

Project Summary

Project GITAE2-187 provides for drawing work, relay resets, and field support necessary for the addition of a new breaker for affected station for AE2-187 station on Line 173. This project is the Non-Direct Connect for the AE2-187 Generator Interconnect Project.

Purchase and install relay material – Non-Direct Network Upgrade:

1. Relay settings to be determined

Attachment #4

SCOPE OF WORK

Project Number: GITAE2-187

Project Description: Chatham Substation

Date: 07/21/2025

Revision Number: 0

Project Summary

Project GITAE2-187 provides for drawing work, relay resets, and field support necessary for the addition of a new breaker for affected station for AE2-187 station on Line 173. This project is the Non-Direct Connect for the AE2-187 Generator Interconnect Project.

Purchase and install relay material – Non-Direct Network Upgrade:

1. Relay settings to be determined

Attachment #5

SCOPE OF WORK

Project Number: GITAE2-187

Project Description: Gretna Substation

Date: 07/21/2025

Revision Number: 0

Project Summary

Project GITAE2-187 provides for drawing work, relay resets, and field support necessary for the addition of a new breaker for affected station for AE2-187 station on Line 173. This project is the Non-Direct Connect for the AE2-187 Generator Interconnect Project.

Purchase and install relay material – Non-Direct Network Upgrade:

1. Relay settings to be determined

Attachment #6

69kV LINE #173
AE2-187 SUBSTATION
PROJECT AE2-187

PRELIMINARY SCOPING SUMMARY

This project serves to replace an existing tap span with proposed AE2-187 Affected System Substation. This substation will be tapping into 69kV Line 173 between structures 173/301 and 173/302, which is located in Pittsylvania County, VA. See **Figure 1** for the project location. The proposed work requires no additional land and will all be completed within existing right of way. The project will install a total of three (3) new structures.

The #173 line will continue to operate at 69kV, but is built to 115kV standards. The proposed structures to be installed are two (2) 115kV SC backbone structures and one (1) 115kV SC H-frame double deadend structure. The existing 336.4 ACSR (26-7) "Linnet" conductor for Line 173 will be transferred to the new H-frame along with the existing two (2) 3#6 Alumoweld shield wire. New single (1) 636 ACSR "Rook" conductor and two (2) 7#7 Alumoweld will be installed between the proposed backbones.

Design Considerations:

EXISTING FACILITIES TO BE REMOVED:

1. Remove one (1) existing steel wave trap structure as follows:
    a. Structure 173/301A.

2. Remove one (1) existing 115kV SC steel H-frame double deadend structure as follows:
    a. Structure 173/302

3. Remove one (1) existing 115kV SC steel 3-pole deadend structure as follows:
    a. Structure 173/3000.

4. Remove one (1) 115kV existing SC steel self-supporting double deadend h-frame switch structure as follows:
    a. Structure 173/3001.

5. Remove two (2) steel static pole structures.

6. Remove approximately 0.02 miles of 336.4 ACSR (26-7) "Linnet" conductor from existing structure 173/3000 to existing structure 173/3001.
    a. This includes the removal of one (1) set of 3-phase risers between the main line corridor Line 173 and the Tap Line 173.

EXISTING FACILITIES TO BE MODIFIED:

1. Transfer the existing 336.4 ACSR (26-7) "Linnet" for Line 173 from ahead and back side of existing structure 173/302 to the ahead and back side of proposed structure 173/302. This assumes full tension splices can be utilized if needed.

2. Transfer the existing two (2) 3#6 Alumoweld for Line 173 from ahead and back side of existing structure 173/302 to the ahead and back side of proposed structure 173/302. This assumes full tension splices can be utilized if needed.

3. Cut and transfer the existing conductor for Line 173 from the ahead side of existing switch structure 173/3001 to the ahead side of proposed backbone structure 1XXX/2 outside the new AE2-187 Substation (POI Structure).

4. Cut and transfer the existing two (2) shield wire for Line 173 from the ahead side of the existing static poles to the ahead side of proposed backbone structure 1XXX/2 outside the new AE2-187 Substation (POI Structure).

PERMANENT FACILITIES TO BE INSTALLED:

1. Install one (1) 115kV SC engineered steel H-frame double deadend structure [Reference Drawing 12.165] on foundations as follows:
    a. Structure 173/302.
    b. See **Figure 2** for a visual of the proposed structure design.

2. Install one (1) 115kV SC steel backbone structure [Reference Drawing 11.955] on foundations as follows:
    a. Structure 1XXX/1.

3. Install one (1) 115kV SC steel backbone structure with one (1) 2000A vertically mounted switch [Reference Drawing 11.955] on foundations as follows:
    a. Structure 1XXX/2.

4. Install approximately 0.02 miles of 3-phase single (1) 636 ACSR “Rook” conductor from proposed backbone structure 1XXX/1 inside the new AE2-187 Substation to proposed backbone structure 1XXX/2 outside the new AE2-187 Substation (POI Structure).

5. Install approximately 0.02 miles of two (2) 7#7 Alumoweld shield wire from proposed backbone structure 1XXX/1 inside the new AE2-187 Substation to proposed backbone structure 1XXX/2 outside the new AE2-187 Substation (POI Structure).

CONCEPTUAL SCOPE NOTES:

1. No PLS-CADD modeling was done for this project.

2. Structures are designed based off the following NESC 2017 code parameters: NESC Heavy, 90 mph wind, ¾” Ice & 30 mph wind regardless of project location.

3. It is assumed for detailed engineering that a LiDAR survey will be required.

4. Any potential height restrictions were not accounted for in this design.

5. An existing right of way width of 100’ is assumed based on map viewer. This project will be installed in existing ROW.

6. A wetland delineation has not been completed as part of this conceptual package.

7. This Conceptual T-Line Design was done by Burns & McDonnell. Contacts below:
    a. Design Engineer: Carter Wienberg (Email – cwienberg@burnsmcd.com)
    b. Lead Engineer: Kamryn Schlag (Email – kjschlag@burnsmcd.com)

8. It is assumed that backbone structure 1XXX/2 will be installed with a switch and will serve as the demarcation point.

9. It is assumed one (1) set of 3-phase risers between Line 173 and the new AE2-187 Substation shall be included in the Substation Scope of Work.

CONCEPTUAL ESTIMATE NOTES:

1. Engineered steel pole costs were determined based off typical wind and weight spans, line angles, and average structure heights in the typical right of way associated with the structure type.

2. Steel pole foundation costs were based off the projects’ location and structure type in the regional soil profile map. The regional soil profile map used for this project is Piedmont.

3. The conceptual estimate assumes that a laydown yard is required for this project.

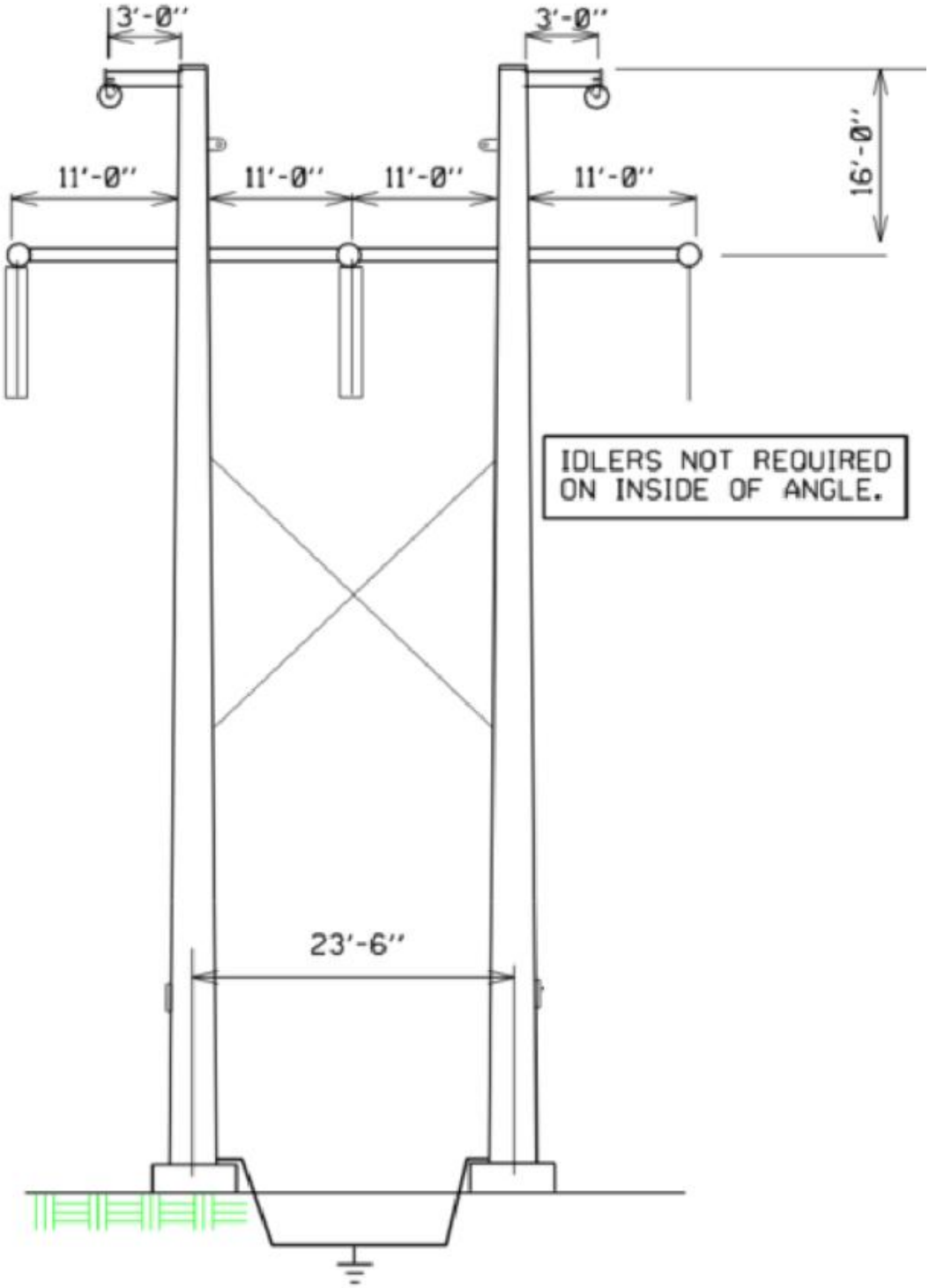
4. Due to the time allotted to create an estimate, stakeholders were not consulted for their respective costs. Stakeholder costs were derived as follows:
    a. DEES permitting costs were based on a cost per mile based off comparable projects in the TC#1 Phase 3 Cycle. Project N9143, which is rebuilding line 35 from AltaVista Sub to Gladys Tap, was used to develop the DEES cost per mile due to similar project location.
    b. Siting and Permitting costs were derived using the permitting spreadsheet but not verified by the permitting team.
    c. Real estate acquisition costs were assumed to be $0 due to no additional land needed to be acquired.
    d. Right of Way Management (Encroachment) costs were based on a cost per mile based off comparable projects in the TC#1 Phase 3 Cycle. Project N9145, which is rebuilding line 65 between Gardner DP and Moon Corner, was used to develop the Encroachment cost per mile due to similar project location.
    e. Forestry, Rehab and Access costs were based on a cost per mile based off comparable projects in the TC#1 Phase 3 Cycle. Project N9145, which is rebuilding line 65 between Gardner DP and Moon Corner, was used to develop the Forestry

and Access cost per mile due to similar project location.

f. Surveying costs were based on the typical cost to acquire approximately two (2) miles of survey. These costs were provided by the surveying team as part of TC#1 Phase 3 process.
g. Communications (Marketing Manager) costs are assumed to be Tier 1 - $25K based off similar linear length and location to project N9211
h. Telecommunications costs are assumed to be $0 due to no fiber being installed for this project.

Figure 1 – Project Location

Figure 2 – Proposed Structure Configuration



Required Material Summary

Item	Qty
Backbones	2
Engineered Structures	1
12,000-Ft Conductor Reels	1
7,100-Ft Shield Wire Reels	1