# Facilities Study Report

# For

# Physical Interconnection of

# PJM Generation Interconnection Request

# Project ID AF1-123

# Oceana 230 kV

December 2024

## Introduction

This Facilities Study has been prepared in accordance with the PJM Open Access Transmission Tariff Part VII, and, if applicable, the Application and Studies Agreement between the Project Developer and PJM Interconnection, LLC (PJM or Transmission Provider (TP)). The Transmission Owner (TO) is Virginia Electric and Power Company (VEPCO or Dominion).

## A. Transmission Owner Facilities Study Summary

### 1. PROJECT DESCRIPTION

The Project Developer (PD) has proposed an Offshore Wind Generating Facility located in City of Chesapeake, VA with a designated PJM Project ID of AF1-123. The installed facilities will have a total Maximum Facility Output (MFO) of 833 MW with 253.2 MW of this output being recognized by PJM as Capacity.

### 2. POINT OF INTERCONNECTION (POI)

AF1-123 is a project sharing a Common Use Upgrade that will interconnect with the Dominion transmission system via a direct connection to the new Harpers 230 kV substation. The Harpers 230 kV station will serve as the interconnection location for AF1-123, AF1-124, AF1-125.

The proposed generation interconnection is shown on the single line diagram in Attachment #1.

### 3. POINT OF CHANGE IN OWNERSHIP

The Point of Change in Ownership will be the nine (9) 230 kV disconnect switches within the station security fence at the new Harpers 230 kV Substation.

### 4. SCOPE OF PROJECT DEVELOPER INTERCONNECTION FACILITIES

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

- Circuit breakers and associated equipment located between the high side of the MPT(s) or GSU(s) 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, telecommunications equipment, and Supervisory Control and Data Acquisition (SCADA) to comply with the TO's Applicable Technical Requirements and Standards.

## B. Transmission Owner Facilities Study Results

The following is a description of the planned Transmission Owner facilities for the physical interconnection of the proposed AF1-123, AF1-124, and AF1-125 projects to the Dominion transmission system. These facilities shall be designed according to Dominion Applicable Technical Requirements and Standards. Once built, Dominion will own, operate, and maintain these Facilities.

**1. TRANSMISSION OWNER INTERCONNECTION FACILITIES:**

The Transmission Owner Interconnection Facilities will include, but not be limited to, the following:

A 230 kV backbone structure and foundation within the fence of the Interconnection Substation, to terminate the Project Developer's generator lead line.

Line conductor from the backbone structure to the bus position in the switchyard of the interconnection substation.

**Purchase and install substation material – AF1-123 Transmission Owner Interconnection Facilities Upgrade:**

1. Three (3), 230kV, 4000A, 63kAIC, SF-6, Sync Circuit Breakers
2. Nine (9), 188kV, 144kV MCOV, Surge Arresters
3. Approximately 1350 FT of GIL
4. Foundations as required including bus supports and miscellaneous equipment stands as required.
5. Conductors, connectors, conduits, control cables, cable trough, and grounding materials as per engineering standards.

**Purchase and install substation material – AF1-124 Transmission Owner Interconnection Facilities Upgrade:**

1. Three (3), 230kV, 4000A, 63kAIC, SF-6, Sync Circuit Breakers
2. Nine (9), 188kV, 144kV MCOV, Surge Arresters
3. Approximately 1035 FT of GIL
4. Foundations as required including bus supports and miscellaneous equipment stands as required.
5. Conductors, connectors, conduits, control cables, cable trough, and grounding materials as per engineering standards.

**Purchase and install substation material – AF1-125 Transmission Owner Interconnection Facilities Upgrade:**

1. Three (3), 230kV, 4000A, 63kAIC, SF-6, Sync Circuit Breakers
2. Nine (9), 188kV, 144kV MCOV, Surge Arresters
3. Approximately 480 FT of GIL
4. Foundations as required including bus supports and miscellaneous equipment stands as required.
5. Conductors, connectors, conduits, control cables, cable trough, and grounding materials as per engineering standards.

**Purchase and install relay material – AF1-123 Transmission Owner Interconnection Facilities Upgrade:**

1. One (1), 1110 – SEL-587Z/351A Transmission Bus Panel
2. One (1), 4200 – Bus Differential C.T. Makeup Box
3. One (1), 1816 – Triple SEL-787 Gas Zone Differential Panel

4. One (1), 1511 – SEL-351 Transmission Breaker w/o Reclosing Panel

**Purchase and install relay material – AF1-124 Transmission Owner Interconnection Facilities Upgrade:**

1. One (1), 1110 – SEL-587Z/351A Transmission Bus Panel
2. One (1), 4200 – Bus Differential C.T. Makeup Box
3. One (1), 1816 – Triple SEL-787 Gas Zone Differential Panel
4. One (1), 1511 – SEL-351 Transmission Breaker w/o Reclosing Panel

**Purchase and install relay material – AF1-125 Transmission Owner Interconnection Facilities Upgrade:**

1. One (1), 1110 – SEL-587Z/351A Transmission Bus Panel
2. One (1), 4200 – Bus Differential C.T. Makeup Box
3. One (1), 1816 – Triple SEL-787 Gas Zone Differential Panel
4. One (1), 1511 – SEL-351 Transmission Breaker w/o Reclosing Panel

**2. STAND ALONE NETWORK UPGRADES**

The Stand Alone Network Upgrades will include, but not be limited to, the following:

***For new interconnection substation:***

Harpers Switching Substation (NXXXX)

Project numbers AF1-123, AF1-124, and AF1-125 provides for the initial construction of the new 230kV Wind Farm Interconnect, Harpers Switching Station in the city of Virginia Beach, Virginia.

The objective of this project is to build a new 230kV Switching Station in support of the new offshore wind farm built by Dominion Energy. Nine export cables from the offshore substations will terminate at Harpers Switching Station and will consolidate down to three overhead transmission lines that will exit the station to go to the New Fentress 230 kV substation.

Harpers Switching Station will also incorporate the reactive power compensation requirements for this project. The station will include shunt reactors and static synchronous compensators (STATCOM) to enhance the stability, controllability, and power transfer capabilities of the electric grid in this region.

Substation design and relay protection are based on Dominion's Facility Interconnection Requirements, NERC Compliance Procedure FAC-001 (version 23), that is posted on PJM's website. This standard meets or exceeds the PJM Transmission and Substation Design Subcommittee Technical Requirements and the PJM Protection Standards (PJM Manual 7).

The scope of work includes the following:

**Purchase and install substation material – AF1-123 Stand Alone Network Upgrade:**

1. Approximately 1200' x 760' site preparation and grading as required for installation of the switching station.

2. Approximately 3,845 linear FT of High Security Single Mesh Fabric, 15 FT tall, perimeter fence around the station along with the security cameras and integrators as per Design 3 fence standards.
3. Two (2) 24’ x 80’ Control Enclosures
4. One (1) 24’ x 85’ Control Enclosure
5. One (1) 180’ x 120’ GIS Building
    a. Sixteen (16), 230kV, 4000A, 63kAIC Circuit Breakers with PIRs
    b. Six (6), 230kV, 4000A, 63kAIC Circuit Breaker
    c. Fifty-Six (56), 230kV, 4000A, 3-Phase Disconnect Switches
    d. Eighteen (18), 230kV, 4000A, 3-Phase Motor Operated Grounding Switches
    e. Twenty-One (21), 230kV Relaying Accuracy PT’s
    f. Forty-Eight (48), 230kV, 3000/5, Relaying Accuracy CT’s
    g. Twenty-Seven (27), 230kV, Metering Accuracy PT’s
6. One (1), 230kV, 4000A, 63kAIC, SF-6, Circuit Breakers
7. Nine (9), 230kV, 1000/5, Metering Accuracy CT’s
8. Three (3), 230kV, 4000A, 3-Phase, Double End Break Disconnect Switches
9. Twenty-Four (24), 188kV, 144kV MCOV, Surge Arresters
10. Three (3), STATCOMs
    a. Nine (9), 188kV, 144kV MCOV, Surge Arresters
    b. Three (3), 230/34.8kV Transformers
    c. Nine (9), 54kV, 42kV MCOV, Surge Arresters
    d. Three (3), 200A, Fused Disconnects for STATCOM Station Service
    e. Three (3), 23kV, 12A Fuses for STATCOM Station Service
    f. Nine (9), 48kV, 39kV MCOV, Surge Arresters for STATCOM Station Service
    g. Three (3), 34.5kV, 350kVA, 3-Phase Transformers for STATCOM Station Service
    h. Three (3), 1000A Fused Disconnects for STATCOM Station Service
    i. Three (3), 842A, 240VAC, 3- Phase Voltage Regulators for STATCOM Station Service
    j. Three (3), 259kW Three Phase Generators for STATCOM Station Service
    k. Six (6), Propane Storage Tanks for STATCOM Station Service
    l. Three (3), 800A Three Phase Outdoor ATS For STATCOM Station Service
11. Six (6), 230kV, 3000A, 2-Phase Center Break Gang Operated Switches (for PVT’s).
12. Four (4), 230kV, 3000A, 3-Phase Center Break Gang Operated Switches (for PVT’s).
13. Twenty-Five (25), 230kV, 167KVA Power PVT's for Station Service.
14. Three (3), 125 VDC, 580 Ah Station Batteries and 50 Amp Chargers (size to be verified during detail engineering).
15. Five (5) 36” x 36” x 42” Precast Yard pull boxes
16. Thirty (30), 230kV,1-Phase, Gas to Air Structures
17. Three (3), 230kV, 3-Phase, Underground to Air Structures
18. Approximately 1,600 FT of Air Insulated Bus
19. Approximately 15,000 FT of GIL
20. Approximately 6,000 FT of Cable Trough, with a 236 FT road crossing section.
21. Station Stone as required.
22. Station Lighting as required.
23. Steel structures as required including switch stands, bus supports, station service transformers, and Riser Structure Supports.
24. Foundations as required including GIS, control house, equipment, CCVTs, bus supports, and miscellaneous equipment stands as required.

25. Conductors, connectors, conduits, control cables, cable trough, and grounding materials as per engineering standards.
26. Three (3), 230kV, 4000A, 3-Phase Motor Operated Center Break Switches
27. Three (3), 230kV, 4000A, 3-Phase Motor Operated Disconnect Switch with 3-Phase Motor Operated Ground Switch
28. Twenty-Seven (27), 188kV, 144kV MCOV, Surge Arresters
29. Nine (9), 230kV, 1000/5, Metering Accuracy CT's
30. Three (3), 230kV, 3-Phase, Underground to Air Structures

**Purchase and install substation material – AF1-124 Stand Alone Network Upgrade:**

1. Three (3), 230kV, 4000A, Motor Operated Center Break Switches
2. Three (3), 230kV, 4000A, 3-Phase Motor Operated Disconnect Switch with 3-Phase Motor Operated Ground Switch
3. Nine (9), 230kV, 1000/5, Metering Accuracy CT's
4. Nine (9), 188kV, 144kV MCOV, Surge Arresters
5. Three (3), 230kV, 3-Phase, Underground to Air Structures
6. Approximately 750 FT of Air Insulated Bus
7. Steel structures as required including switch stands, bus supports, and riser structure Supports.
8. Foundations as required including bus supports and miscellaneous equipment stands as required.
9. Conductors, connectors, conduits, control cables, cable trough, and grounding materials as per engineering standards.

**Purchase and install substation material – AF1-125 Stand Alone Network Upgrade:**

1. Three (3), 230kV, 4000A, Motor Operated Center Break Switches
2. Three (3), 230kV, 4000A, 3-Phase Motor Operated Disconnect Switch with 3-Phase Motor Operated Ground Switch
3. Nine (9), 230kV, 1000/5, Metering Accuracy CT's
4. Nine (9), 188kV, 144kV MCOV, Surge Arresters
5. Three (3), 230kV, 3-Phase, Underground to Air Structures
6. Approximately 750 FT of Air Insulated Bus
7. Steel structures as required including switch stands, bus supports, and riser structure Supports.
8. Foundations as required including bus supports and miscellaneous equipment stands as required.
9. Conductors, connectors, conduits, control cables, cable trough, and grounding materials as per engineering standards.

**Project Developer Purchase and install substation material– AF1-123:**

1. Three (3), 230kV, 170MVAR, 3-Phase Shunt Reactors
2. Foundations as required including bus supports and miscellaneous equipment stands as required.

**Project Developer Purchase and install substation material– AF1-124:**

1. Three (3), 188kV, 144kV MCOV, Surge Arresters

2. Three (3), 230kV, 170MVAR, 3-Phase Shunt Reactors
3. Foundations as required including bus supports and miscellaneous equipment stands as required.
4. Conductors, connectors, conduits, control cables, cable trough, and grounding materials as per engineering standards.

**Project Developer Purchase and install substation material– AF1-125:**

1. Three (3), 188kV, 144kV MCOV, Surge Arresters
2. Three (3), 230kV, 170MVAR, 3-Phase Shunt Reactors
3. Foundations as required including bus supports and miscellaneous equipment stands as required.
4. Conductors, connectors, conduits, control cables, cable trough, and grounding materials as per engineering standards.

**Purchase and install relay material – AF1-123 Stand Alone Network Upgrade:**

1. Eight (8), 1110 – SEL-587Z/351A Transmission Bus Panel
2. Eight (8), 4200 – Bus Differential C.T. Makeup Box
3. Seven (7), 4515 – 3Ø Transmission Potential Makeup Box
4. Three (3), 1510 – Dual SEL-351 Transmission Breaker w/ Reclosing Panel
5. Nineteen (19), 1511 – SEL-351 Transmission Breaker w/o Reclosing Panel
6. Three (3), 1340 – Dual SEL-411L DCB/PLC Line Panel
7. One (1), 1816 – Single SEL-787 Gas Zone Differential Panel
8. Two (2), 1816 – Triple SEL-787 Gas Zone Differential Panel
9. Two (2), SPR Relay Auxiliary Package
10. Two (2), 7614 – Transformer Critical Low Oil Assembly
11. Two (2), 4510 - SEL-2411 Equipment Annunciator
12. Two (2), 4526_C – >= 84MVA Transformer or RX Fiber Makeup Box
13. Two (2), 4506 – 3Ø CCVT Potential Makeup Box
14. One (1), 5618 – SEL-3555 Communications Panel
15. One (1), 1255 – Station Annunciator Panel
16. One (1), 5021 – SEL-2411 RTU Panel
17. One (1), 5609 – Fiber Optic Management Panel
18. One (1), XXXX – Digital Fault Recorder Cabinet (Verify Mfg. w/ Fault Analysis)
19. Two (2), 4153 – Wall Mounted Station Battery Monitor
20. One (1), 5603 – Station Network Panel No. 1
21. One (1), 5603 – Station Network Panel No. 2
22. One (1), 5616 – Station Security Panel
23. One (1), 5616 – Station Security Fence Panel
24. One (1), 3102 – Security Building Alarm Box
25. Ten (10), 4548 – Non-Earthing Switch MOAB Control Box
26. Five (5), 4103 – Non-Earthing Switch MOAB AC/DC Distribution Box
27. See Standard's Recommendations for Station Service

**Purchase and install relay material – AF1-123 Stand Alone Network Upgrade For Three Statcoms (BY STATCOM VENDOR)**

1. Nine (9), 1217 – 28" Dual SEL 487E Transmission Tx Diff Pnl

2. Three (3), 7614 - Transformer Critical Low Oil Trip Assembly
3. Three (3), 4510 - SEL-2411 Equipment Annunciator
4. Three (3), 4515 - 3Ø Leads PT Potential MU Box
5. Three (3), 5616 – Station Security Panel
6. Six (6), 4514 – CT MU Box
7. Three (3), 4153c – Wall Mount Station Battery Monitor
8. Three (3), 5618 - SEL-3555 Communications Panel
9. Three (3), 1255 – Station Annunciator Panel
10. Three (3), 5609 – Fiber Optic Management Panel
11. Three (3), 5202 – 26" APP 601 Digital Fault Recorder
12. Three (3), 4526_C – Transmission TX Fiber Optic M.U. Box
13. Three (3), 5603 – Station Network Panel No. 1

Dominion has already elected to construct these Facilities via an Interim ISA & Interim CSA, so an Option to Build Estimate has not been included.

## 3. NETWORK UPGRADES

The Network Upgrades will include, but not be limited to, the following:

### *Expanding existing TO substation:*

**Fentress Substation (new 230 kV and 500 kV)**

Project numbers AF1-123 and AF1-124 provides for the expansion of the existing Fentress Substation located in the city of Chesapeake, Virginia. Project number AF1-125 also provides for the construction of New Fentress 230 kV Substation and of a 230kV GIS building.

The objective of this project is to terminate three new 230 kV transmission lines and connect them to the 500 kV system at Fentress Substation. This is in support of the new offshore wind farm built by Dominion Energy. Additional modifications will be required to accommodate this project.

Station Modifications:

- Expansion of 230 kV & 500 kV Yards
- Expansion and modifications of Level 1 Security fence
- Expansion of Station Service Power
- Relocation of 230 kV Line 279 and Line Idle-2128
- Relocation of 500 kV Line 588
- Relocation of surrounding distribution circuits
- Relocation of adjacent telecom cellular tower

The scope of work includes the following:

**Purchase and install substation material – AF1-123 Network Upgrade:**

1. Approximately 9 acres of site preparation and grading as required for the expansion of Fentress Station (by Dominion Energy).
2. Level 1 high security fence expansion
    a. Approximately 2,000 linear FT of 20 ft. tall Design Level 1 High Security fence.
    b. Eight 25 ft. tall super posts.
    c. Anti-dig barrier footing between the perimeter fence foundations.

    d. Foundations for the fence posts, super posts, etc.
    e. Ground tails, and miscellaneous grounding materials for fence posts, panel to panel connections, and security and communication boxes as per the current engineering standards.
    f. Security Integrations for fence.
3. One (1) 230’ x 85’ GIS Building
    a. Fourteen (14), 500kV, 5000A, 63kAIC Circuit Breakers
    b. Twenty-eight (28), 500kV, 5000A, Three Phase Breaker Disconnect Switches
    c. Thirty-six (36) Ground Switches.
    d. Eighteen (18), 500kV, 3000:5, Relaying Accuracy CT’s
    e. Twelve (12), 500kV, Relaying Accuracy PT’s
    f. Eighteen (18), 396kV, 318kV MCOV Arresters
4. One (1) 24’ x 80’ Control Enclosure
5. Approximately 1000 ft Distribution Ductbank and associated pullboxes
6. Ten (10), 230kV, 167kVA Power PT’s for Station Service for new 500kV & 230kV Additions
7. Two (2), 230kV, 167kVA Power PTs for Security Equipment Expansion
8. Two (2), 230kV, 3000A, 2-Phase Center Break Gang Operated Switches (for PVT’s). for 500kV & 230kV Additions.
9. Two (2) 230kV, 3000A, 2-Phase Center Break Gang Operated Switches (For Security PVT’s)
10. Two (2) 230KV, 3000A, 3-Phase Center Break Gang Operated Switches (For PVT’s)
11. One (1) 800A Three phase outdoor ATS.
12. Two (2) 600A Three Phase outdoor ATS for GIS service.
13. One (1), 600A Single Phase Outdoor ATS for additional Security Loading
14. One (1) 150kW Single Phase Generator for additional Security Loading
15. Two (2) Propane Storage Tanks
16. Eighteen (18), 500kV GIS to Air Transition Structures
17. One (1), 500 kV, 5000A Wave Trap.
18. One (1), Line Tuner.
19. Two (2), 125 VDC, 330 Ah Station Battery and two (2) 50 Amp Charger (size to be verified during detail engineering).
20. Three (3) 36” x 36” x 42” Precast Yard Pull Boxes
21. Approximately 3,000 FT of Air Insulated Bus
22. Approximately 5,200 FT of GIL
23. Approximately 1000 FT of Cable Trough, with a 20FT road crossing section.
24. Thirteen (13), 180kV, 144kV MCOV Surge Arresters
25. Seven (7), 396kV, 318kV MCOV Surge Arresters
26. Twelve (12), 230kV, Relaying Accuracy CCVT’s
27. Six (6), 500/230KV, 480MVA, 1550/900kV BIL, Single Phase Transformers
28. One (1), Spare 500/230KV, 480MVA, 1550/900kV BIL, Single Phase Transformers
29. Station Stone as required.
30. Station Lighting as required.
31. Steel structures as required including switch stands, bus supports, station service transformers, CCVT and wave trap supports.
32. Foundations as required including control house, equipment, bus supports, and miscellaneous equipment stands as required.
33. Conductors, connectors, conduits, control cables, cable trough, and grounding materials as per engineering standards.

**Removal substation material – AF1-123 Network Upgrade:**

1. Approximately 755’ of Level 1 high security fence.
2. One (1), Level 1 Drive Gate.
3. Six (6) 25 ft. tall super posts.
4. One (1), 500kV SF6 Circuit Breaker.
5. One (1), 500kV Disconnect Switch.
6. Approximately 730’ feet of 500kV Buswork and connectors.
7. One (1), 500kV Circuit Breaker Foundation.
8. One (1), Switch Support Structure.
9. One (1), Switch Support Foundation.
10. Nine (9) Bus Support Structures.
11. Nine (9) Bus Support Foundations.
12. Conduits and control cables for associated equipment.
13. Grounding Materials for associated equipment and Bus Supports.

**Purchase and install substation material – AF1-124 Network Upgrade:**

1. Seven (7), 180kV, 144kV MCOV Surge Arresters
2. Four (4), 396kV, 318kV MCOV Surge Arresters
3. Four (4), 500/230KV, 480MVA, 1550/900kV BIL, Single Phase Transformers

**Purchase and install relay material – AF1-123 Network Upgrade:**

1. Seven (7), SPR Relay Auxiliary Package
2. Seven (7), 7614 – Transformer Critical Low Oil Assembly
3. Two (2), 1217 – Dual SEL-487E Transmission Transformer Diff. Panel
4. Four (4), 4506 – 3Ø CCVT Potential Makeup Box
5. Three (3), 4507 - 1Ø CCVT Potential Makeup Box
6. Three (3), 4542 – Transformer Makeup Box
7. Five (5), 1110 – SEL-587Z/351A Transmission Bus Panel
8. Five (5), 4200 – Bus Differential C.T. Makeup Box
9. Four (4), 4515 – 3Ø Transmission Potential Makeup Box
10. Four (4), 1510 – Dual SEL-351 Transmission Breaker w/ Reclosing Panel
11. Ten (10), 1511 – SEL-351 Transmission Breaker w/o Reclosing Panel
12. One (1), 1340 – Dual SEL-411L DCB/PLC Line Panel
13. One (1), 1816 – Double SEL-787 Gas Zone Differential Panel
14. One (1), 1816 – Triple SEL-787 Gas Zone Differential Panel
15. One (1), 5618 – SEL-3555 Communications Panel
16. One (1), 1255 – Station Annunciator Panel
17. One (1), 5021 – SEL-2411 RTU Panel
18. One (1), 5609 – Fiber Optic Management Panel
19. One (1), XXXX – Digital Fault Recorder Cabinet (Verify Mfg. w/ Fault Analysis)
20. One (1), 5203 – Traveling Wave Fault Locator Panel
21. Two (2), 4153 – Wall Mounted Station Battery Monitor
22. One (1), 5603 – Station Network Panel No. 1
23. One (1), 5603 – Station Network Panel No. 2
24. One (1), 5616 – Station Security Panel
25. One (1), 3102 – Security Building Alarm Box
26. One (1), 5616 – Station Security Fence Panel

27. Four (4), 4548 – Non-Earthing Switch MOAB Control Box
28. Two (2), 4103 – Non-Earthing Switch MOAB AC/DC Distribution Box
29. One (1), 4541 – Control Cable Makeup Box
30. See Standard's Recommendations for Station Service

**Purchase and install relay material – AF1-124 Network Upgrade:**

1. One (1), SPR Relay Auxiliary Package
2. One (1), 7614 – Transformer Critical Low Oil Assembly
3. One (1), 1217 – Dual SEL-487E Transmission Transformer Diff. Panel
4. One (1), 4506 – 3Ø CCVT Potential Makeup Box
5. One (1), 4507 - 1Ø CCVT Potential Makeup Box
6. One (1), 4542 – Transformer Makeup Box
7. One (1), 4548 – Non-Earthing Switch MOAB Control Box
8. One (1), 4103 – Non-Earthing Switch MOAB AC/DC Distribution Box
9. See Standard's Recommendations for Station Service

**Purchase and install substation material – AF1-125 Network Upgrade:**

1. One (1) 160'x50' 230kV GIS Building
2. One (1) 24' x 70' Control Enclosure
3. Fifteen (15), 180kV, 144kV MCOV Surge Arresters
4. Sixteen (16), 230kV, 4000A, 63kAIC Circuit Breakers
5. Two (2), 245kV, 4000A, 63kAIC, SF-6, Circuit Breakers
6. Two (2), 230kV, 4000A, 3-Phase, Double End Break Disconnect Switches
7. Two (2), 230kV, 3000A, 3-Phase, Center Break Gang Operated Switches
8. One (1), 125 VDC, 577 Ah Station Battery and One (1) 75 Amp Charger (size to be verified during detail engineering).
9. Six (6), 230kV, 167kVA Power PT's for Station Service 230kV GIS Additions
10. Steel structures as required including switch stands, bus supports, station service transformers, CCVT and wave trap supports.
11. Foundations as required including control house, equipment, bus supports, and miscellaneous equipment stands as required.
12. Conductors, connectors, conduits, control cables, cable trough, and grounding materials as per engineering standards.

**Purchase and install relay material – AF1-125 Network Upgrade:**

1. Seven (7), 1110 – SEL-587Z/351A Transmission Bus Panel
2. Seven (7), 4200 – Bus Differential C.T. Makeup Box
3. Four (4), 4515 – 3Ø Transmission Potential Makeup Box
4. Six (6), 1510 – Dual SEL-351 Transmission Breaker w/ Reclosing Panel
5. Eight (8), 1511 – SEL-351 Transmission Breaker w/o Reclosing Panel
6. Three (3), 1340 – Dual SEL-411L DCB/PLC Line Panel
7. Three (3), 4506 – 3Ø CCVT Potential Makeup Box
8. Two (2), 1816 – Triple SEL-787 Gas Zone Differential Panel
9. One (1), 5618 – SEL-3555 Communications Panel
10. One (1), 1255 – Station Annunciator Panel
11. One (1), 5021 – SEL-2411 RTU Panel

12. One (1), 5609 – Fiber Optic Management Panel
13. One (1), XXXX – Digital Fault Recorder Cabinet (Verify Mfg. w/ Fault Analysis)
14. One (1), 4153 – Wall Mounted Station Battery Monitor
15. One (1), 5603 – Station Network Panel No. 1
16. One (1), 5603 – Station Network Panel No. 2
17. One (1), 5616 – Station Security Panel
18. Two (2), 4548 – Non-Earthing Switch MOAB Control Box
19. One (1), 4103 – Non-Earthing Switch MOAB AC/DC Distribution Box
20. One (1), 4541 – Control Cable Makeup Box
21. See Standard's Recommendations for Station Service

***Transmission Line Tie-in for new interconnection substation:***

This project serves to add a three (3) new overhead 230 kV circuits, Line #2252, #2253, and #2254, from Harpers 230 kV Substation to New Fentress 230 kV Substation.

**Permanent Facilities to be Installed at Harpers Substation:**

1. Three (3) 230kV, Heavy Duty Steel Backbones
2. Three (3) 230kV, Monopole Transmission Structures
3. Nineteen (19) shield wire poles and Fifteen (15) spans of shield wires

**Permanent Facilities to be Installed at Fentress Substation:**

1. One (1), 500kV, Heavy Duty Steel Backbone
2. One (1), shield wire poles and three (3) spans of shield wires
3. Two (2), 230kV, Heavy Duty Steel Backbone

## 4. OTHER SCOPE OF WORK

The Project Developer will supply and own metering equipment that will provide instantaneous net MW and MVar per unit values in accordance with PJM Manuals M-01 and M-14D, and Sections 8.1 through 8.5 of Appendix 2 to the GIA.

## 5. MILESTONE SCHEDULE FOR COMPLETION OF TO WORK

Facilities outlined in this report are estimated to take 10 months to construct, from the time the Generator Interconnection Agreement is fully executed. The design and construction of these projects has been started under an existing interim Interconnection Service Agreement.

| Description | Start month | Finish month |
|---|---|---|
| Detailed Design | Complete | Complete |
| Permitting | Complete | Complete |
| Construction | Started | Completion on 6/29/2026 |

## 6. ASSUMPTIONS IN DEVELOPING SCOPE/COST/SCHEDULE

**General Assumptions:**

1. The estimated procurement lead time for breakers is based on current Dominion pre-ordered breaker production slots. These production slots will be assigned after the agreement is executed.
2. The preliminary construction schedule is dependent on outage availability.

**Conceptual Design Notes:**

1. All equipment quantities and specifications to be confirmed with Transmission Planning during detailed design.
2. Security and Fence Type for Harpers Substation – Design Level 3.
3. Currently, the scope and estimate assume DVP standard spread footer foundations for Harpers Substation. Once the soil information is received and if it is decided to change that to "pile foundations" then DVP team should be informed at the earliest to adjust the project estimate.
4. It is anticipated that the Fentress Substation expansion will remain on existing Dominion Energy owned property. All permitting, site preparation and grading activity will be performed by Dominion Energy.
5. It is anticipated that wetlands near Fentress Substation will be encountered at or near the area designated for site expansion, which may require substantial permitting efforts.
6. Transmission Line Engineering will need to re-route existing 230kV Lines 279 and Line Idle-2128, to make room for the station expansion at Fentress.
7. Transmission Line Engineering to number the new lines between Fentress and the 230 kV Wind Farm interconnect.
8. Security and Fence Type for Fentress Substation – Design Level 1.
9. Dominion Energy standard spread footer foundations are to be used at Fentress Substation.

## 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 AF1-123 GIA, and in PJM Manuals M01 and M14D. The details of applicable revenue metering requirements are given in section 4.1.6 Metering and Telecommunications of Dominion's Facility Interconnection Connection Requirement NERC Standard FAC-001 posted on PJM website.

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

a. Hourly compensated MWh received from the Generating Facility to the TO;

b. Hourly compensated MVARh received from the Generating Facility to the TO;
c. Hourly compensated MWh delivered from the TO to the Generating Facility; and
d. Hourly compensated MVARh delivered from the TO to the Generating Facility.

The Project Developer will access revenue meter via wireless transceivers or fiber cabling to meter with RS-485 or Ethernet communication port for dial-up reads. Project Developer must provide revenue and real time data to PJM from Project Developer Market Operations Center per "PJM Telemetry Data Exchange Summary" document available at PJM.com.

## 8. LAND REQUIREMENTS FOR INTERCONNECTION SUBSTATION

Land requirements for the Interconnection Substation needed for this interconnection project must meet the requirements in Dominion's Facility Interconnection Requirements, NERC Compliance Procedure FAC-001 (version 23), that is posted on PJM's website.

The Project Developer would be responsible for the following expectations in the area of Real Estate.

- The land required for Dominion's substation and project specific areas around must be deeded over title-in-fee.
- Any additional land needed for Storm Water Management, Landscaping, and Wetlands/Wetlands Mitigation.
- Dominion Real Estate and Counsel will provide standard real estate checklist word document. Process needs to start at least 6 months prior to closing date.
- Required subdivision plat and associated documentation to be reviewed prior to subdividing parcel with the county.
- Suitable Access Road from Substation to a Virginia/North Carolina State Maintained Roadway.
- Dominion will require access road, transmission line and utilities easement to the Substation.
- Any other Land/Permitting requirements required by the Substation.

## 9. ENVIRONMENTAL AND PERMITING

The Project Developer would be responsible for the following expectations in the area of Environmental and Permitting.

- Assessment of environmental impacts related to the Interconnection Facility and/or Network Upgrades including:

  Environmental Impact Study requirements

  Environmental Permitting

- Dominion will require a stormwater easement for substation specific stormwater design BMP's to allow access to and use of the facilities.

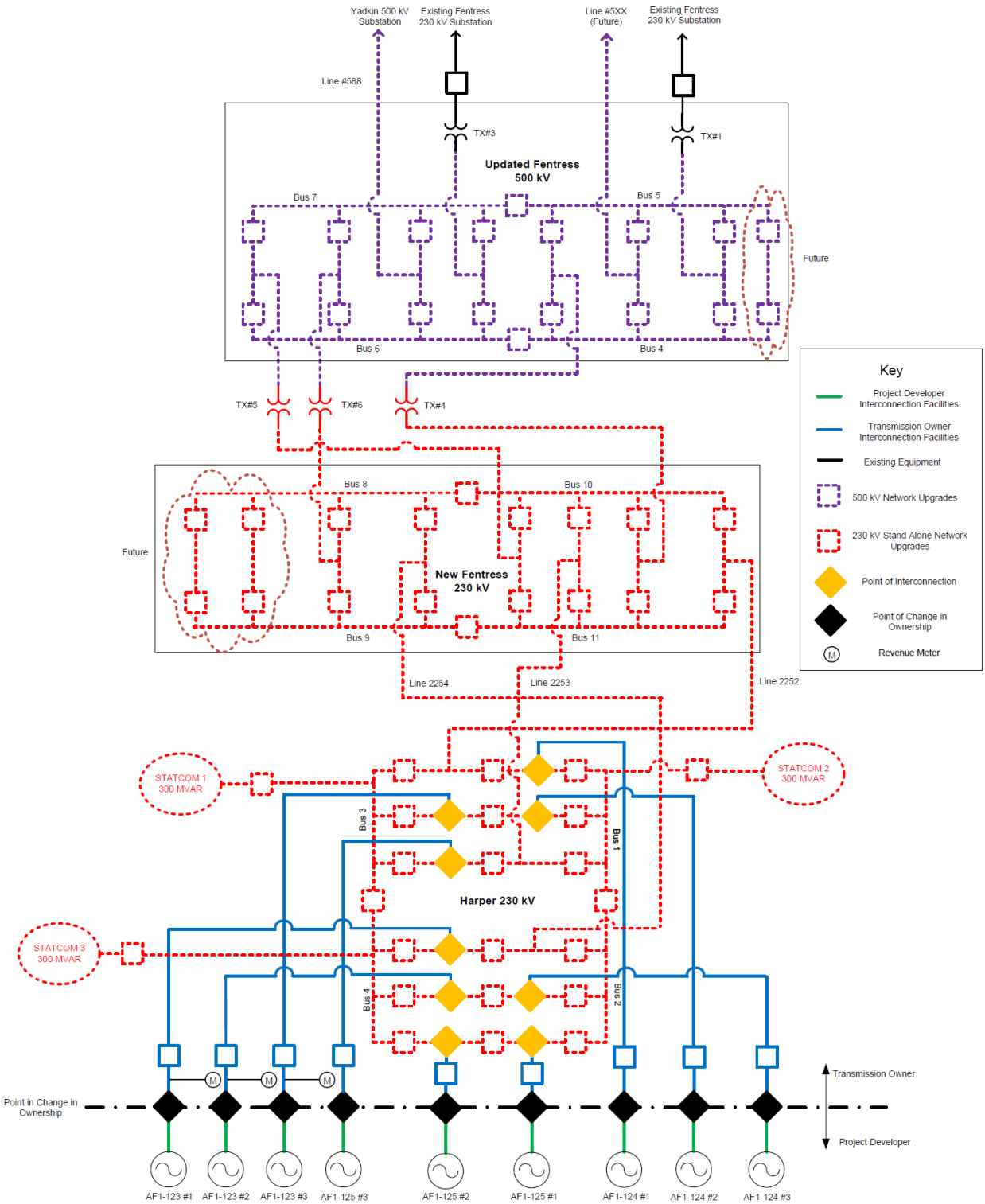
  A maintenance agreement should be in place in perpetuity for said stormwater facilities.

- 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 Substation

## C. APPENDICES

Attachment #1: Single line Diagram for the Physical Interconnection



Attachment #2: Substation General Arrangement