# Facilities Study Report

# For

# Physical Interconnection of

# PJM Generation Interconnection Request

# Project ID AG2-583

# “Bremo - Cartersville 230 kV”

## Introduction

This Facilities Study has been prepared in accordance with the PJM Open Access Transmission Tariff, as well as the Application and Studies Agreement between the Project Developer and PJM Interconnection, LLC (PJM or Transmission Provider (TP)). The Transmission Owner (TO) is Virginia Electric and Power Company d/b/a Dominion Energy Virginia (Dominion).

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 (PD) has proposed a Solar Generating Facility located in, Cumberland County, Virginia with a designated PJM Project ID of AG2-583. The installed facilities will have a total Maximum Facility Output (MFO) of 115 MW with 69 MW of this output being recognized by PJM as Capacity.

### 2. POINT OF INTERCONNECTION (POI)

AG2-583 will interconnect with the Dominion transmission system via a newly constructed 230kV three-breaker ring substation, tapping the Bremo Substation– Sallee Creek Substation 230kV line, 2323, approximately 7.99 miles from Bremo Substation and 7.65 miles from Sallee Creek Substation.

This project serves to cut in 230 kV line 2323 into a new substation called AG2-583, which is to be located in Cumberland County, VA. The line is to be cut-in between existing structures 2323/196 and 2323/197. Line 2323 is being renumbered to 2XXX between AG2-583 Substation and Sallee Creek Substation.

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

### 3. POINT OF CHANGE IN OWNERSHIP

The Point of Change in Ownership between the Project Developer and this station will be the 230kV disconnect switch 4-hole pad inside the Dominion station by the common fence.

### 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 AG2-583 as projects to Dominion transmission system. These facilities shall be designed according to all Dominion Applicable Technical Requirements and Standards in effect March 20th, 2026. Dominion Energy Virginia – Electric Transmission Facility Interconnection Requirements, Procedure Version 25.0, dated October 1, 2025, shall apply. Once built, Energy will own, operate, and maintain these Facilities.

### 1. TRANSMISSION OWNER INTERCONNECTION FACILITIES:

The Transmission Owner Interconnection Facilities include the portion of the interconnection switching station which is associated solely with the single feed to the generating facilities collector station. The equipment associated with the Transmission Owner Interconnection Facilities includes disconnect switch, conductors and connectors.

The proposed Transmission Owner Interconnection Facility scope is detailed in Attachment #3.

The proposed Option to Build (OTB) Transmission Owner Interconnection Facility scope is detailed in Attachment #4.

### 2. STAND ALONE NETWORK UPGRADES

The objective of this project is to build a 230kV three breaker ring bus to support the new solar farm built by Project Developer. The site is located along Virginia Electric and Power Company d/b/a Dominion Energy Virginia (Dominion) existing 230kV, 2027 line from Bremo Substation to Midlothian Substation. The cut line will consume two of the positions in the ring bus. The third position will be for the 230kV feed from Project Developer's Collector Station for the new solar farm.

The proposed Stand Alone Network Upgrade scope is detailed in Attachment #3.
The proposed OTB Stand Alone Network Upgrade scope is detailed in Attachment #4.

## 3. NETWORK UPGRADES

**Transmission Line Tie-in for new interconnection substation:**
The 230kV transmission line will be cut and looped into the new interconnection substation.
The proposed Transmission Line Tie-in scope is shown in Attachment #5.

**Upgrades to neighboring facilities:**
Bremo Substation
The proposed neighboring facility scope is detailed in Attachment #6.

Cartersville Substation
The proposed neighboring facility scope is detailed in Attachment #7.

Midlothian Substation
The proposed neighboring facility scope is detailed in Attachment #8.

Powhatan Substation
The proposed neighboring facility scope is detailed in Attachment #9.

## 4. OTHER SCOPE OF WORK

Other Scope includes metering accuracy CCVT's and metering accuracy CT's.
In the event the PD selects OTB, The proposed OTB scope is detailed in Attachment #4

## 5. MILESTONE SCHEDULE FOR COMPLETION OF [TO] WORK

Facilities outlined in this report are estimated to take 47 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 |
|---|---|---|
| Detailed Design | 1 | 10 |
| Permitting/Procurement | 2 | 37 |
| Construction | 27 | 47 |

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

Assumptions can be found in Attachements #3-7

## 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 AG2-583 GIA, and in PJM Manuals M01 and M14D. The details of applicable revenue metering requirements are given in the Dominion Energy Virginia – Electric Transmission Facility Interconnection Requirements (FIR) Rev 25.0 posted on PJM website.

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

## 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 and NERC Compliance Procedure FAC-001 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.

The Project Developer is responsible for the following expectations in the area Real Estate.

- Land and/or Permitting associated with the Generation Facility and the Generation Line to the Point of Change in Ownership (PCO) structure.

## 9. APPLICABLE TECHNICAL REQUIREMENTS AND STANDARDS

These facilities shall be designed according to all Dominion Applicable Technical Requirements and Standards in effect March 20th, 2026. Dominion Energy Virginia – Electric Transmission Facility Interconnection Requirements, Procedure Version 25.0, dated October 1, 2025, shall apply.

## 10. 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

The Project Developer is responsible for the following expectations in the area Environmental and Permitting.

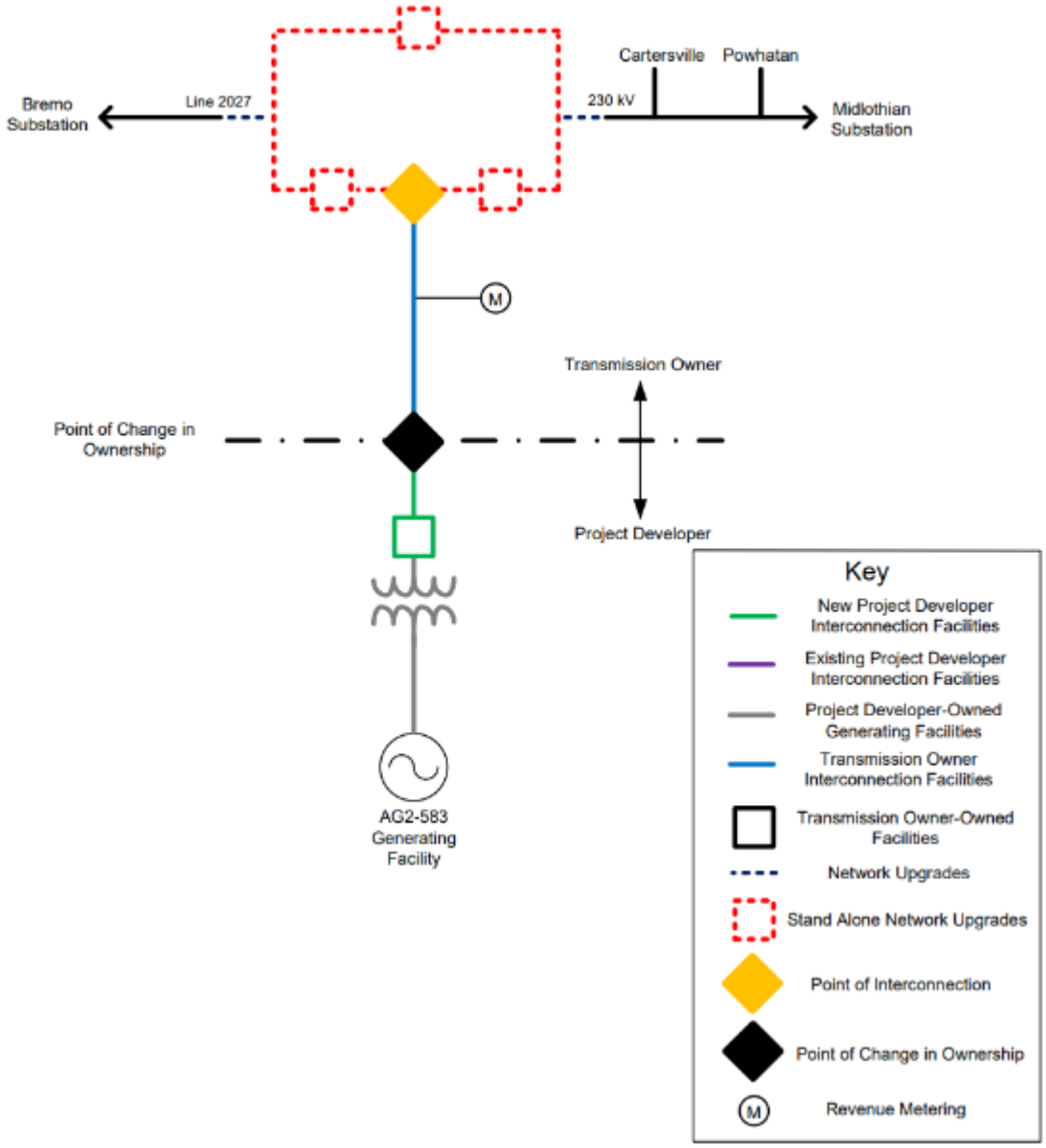
- Environmental and/or Permitting associated with the Generation Facility and the Generation

Line to the Point of Change in Ownership (PCO) structure.

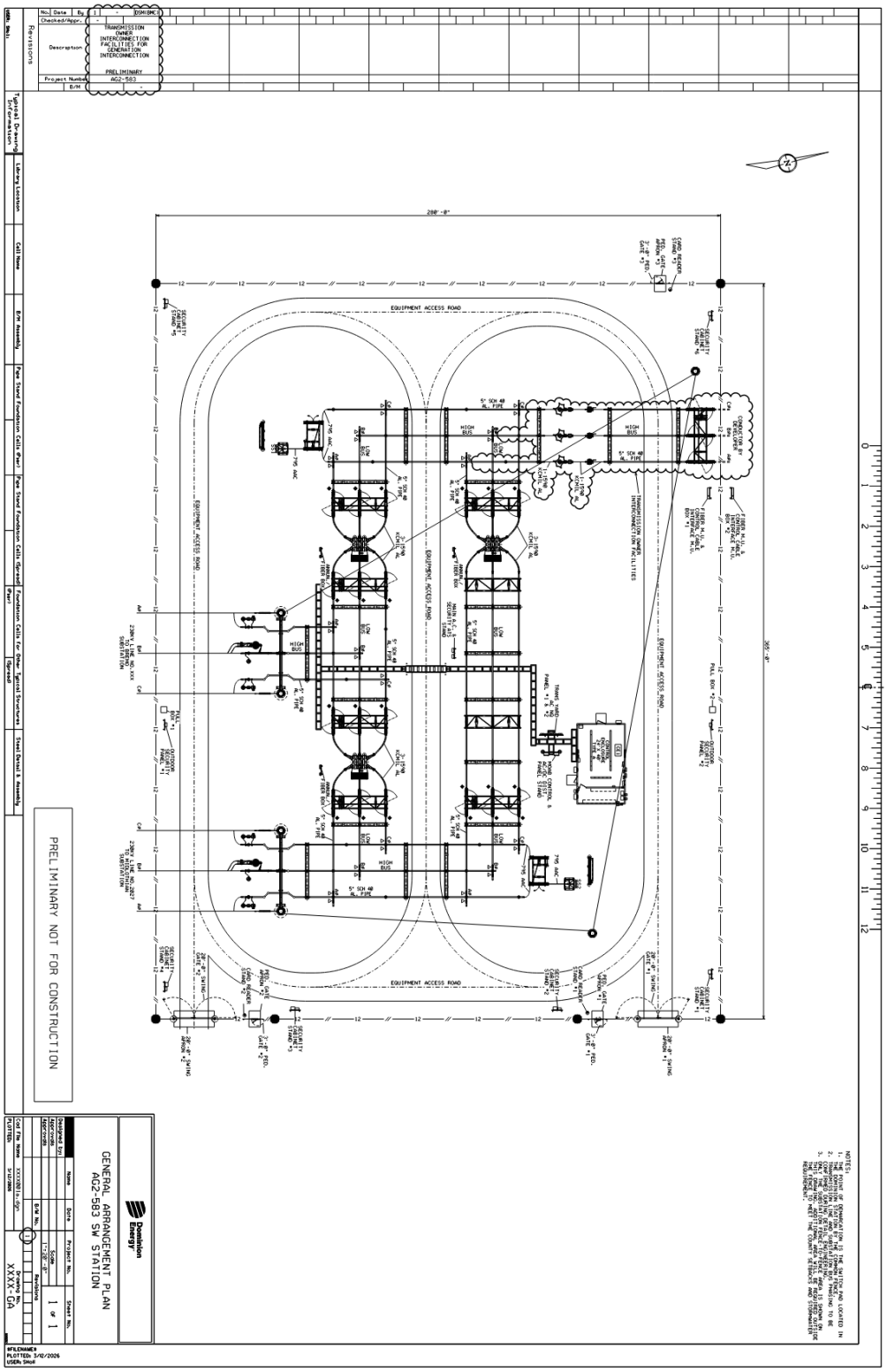
## C. APPENDICES

| | |
|---|---|
| Attachment #1: | Single line Diagram for the Physical Interconnection |
| Attachment #2: | Substation General Arrangement |
| Attachment #3: | Stand Alone Network Upgrade & Transmission Owner Interconnection Facility Scope |
| Attachment #4: | OTB Stand Alone Network Upgrade & OTB Transmission Owner Interconnection Facility Scope |
| Attachment #5: | Network Upgrade – Transmission Tie-in Scope |
| Attachment #6: | Network Upgrade – Bremo Substation |
| Attachment #7: | Network Upgrade – Cartersville Substation |
| Attachment #8: | Network Upgrade – Midlothian Substation |
| Attachment #9: | Network Upgrade – Powhatan Substation |

Attachment #1: Single line Diagram for the Physical Interconnection



Attachment #2: Substation General Arrangement



Attachment #3: Stand Alone Network Upgrade & Transmission Owner Interconnection Facility Scope

## Project Summary

Project number AG2-583 provides for the initial construction of a new 230kV three breaker ring switching station at transmission structures 2027/196 and 2027/197 in Cumberland County, Virginia.

The objective of this project is to build a 230kV three breaker ring bus to support the new solar farm built by Project Developer. The site is located along Virginia Electric and Power Company d/b/a Dominion Energy Virginia (Dominion) existing 230kV, 2027 line from Bremo Substation to Midlothian Substation. The cut line will consume two of the positions in the ring bus. The third position will be for the 230kV feed from Project Developer's Collector Station for the new solar farm.

The Generating Facilities will share a common footprint and fence line with AG2-583 station. The Point of Change in Ownership between the Project Developer and this station will be the 230kV disconnect switch 4-hole pad inside the Dominion station by the common fence. The Project Developer will bring its conductor to the demarcation point. The bus structures, disconnect switch, protection equipment will be Transmission Owner Interconnection Facilities. The Project Developer will provide the property and access to the switching station. The grounding systems for each station will be tied together. All station permitting, site preparation and grading activities will be performed by the Project Developer.

Transmission line engineering is to renumber the existing line segment between the new 230kV three breaker ring switching station and Bremo Substation. The existing line segment between the new 230kV three breaker ring switching station and Midlothian Substation shall remain line 2027.

Additional work to be required at Bremo Substation, Midlothian Substation, Cartersville Substation and Powhatan 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 280' x 365'. 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 1,290 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. Three (3), 230kV, 4000A, 63kAIC, SF-6 circuit breaker
4. Six (6), 230kV, 4000A, 3-phase double end break switch
5. Six (6), 230kV, relay accuracy CCVT
6. Two (2), 230kV, 4000A wave trap
7. Two (2), line tuner
8. Nine (9), 180kV, 144kV MCOV surge arrester
9. Two (2), 230kV, 3000A, 2-phase center break switch (for PVT’s)
10. Two (2), 230kV, 100KVA power PT's for station service
11. Two (2), 230kV, 20 in-lb., 125VDC motor operator
12. Two (2), 230kV, heavy duty steel backbone (by Transmission)
13. Two (2), shield wire poles and three spans of shield wire (by Transmission)
14. One (1), 24’ x 40’ control enclosure
15. One (1), 125 VDC, 400 Ah station battery and two 50 Amp chargers (size to be verified during detail engineering)
16. Approximately 240 ft of cable trough with a 20 ft road crossing section
17. Two (2), 38” x 38” x 42” precast yard pull box
18. Station stone as required
19. Station lighting as required
20. Steel structures as required including switch stands, bus supports, station service transformers, CCVT and wave trap supports
21. Foundations as required including control house, equipment, and bus support stands
22. Conductors, connectors, conduits, control cables, cable trough, and grounding materials as per engineering standards

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

1. Three (3), 1510 - 24” dual SEL-351-7 transmission breaker with reclosing panel
2. Three (3), 4510 - SEL-2411 breaker annunciator
3. Two (2), 1340 - 24” dual SEL-411L DCB/PLC line panel
4. Two (2), 4506 - 3-phase CCVT potential make-up box
5. One (1), 1603 - 24” SEL-451 islanding control scheme panel
6. Two (2), 4000 - station service potential make-up box
7. Two (2), 4548 - non-earthing switch MOAB control box
8. One (1), 4103 - non-earthing switch MOAB AC/DC distribution box
9. Two (2), 4018 - 500A station service AC distribution panel
10. Two (2), 4007 - 225A outdoor transmission yard AC NQOD
11. Two (2), 4019 - 225A 3-phase throw over switch
12. Two (2), 4016 - 600A PVT disconnect switch
13. One (1), 4153c - wall mount station battery monitor

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. Three (3), 4526_A - circuit breaker fiber optic make-up box
19. One (1), 5202 - 26” APP 601 digital fault recorder
20. Six (6), 4040 - security fiber/power make-up box
21. One (1), 5603 - station network panel no. 1
22. One (1), 5603 - station network panel no. 2
23. One (1), 4051 - power block
24. One (1), 4042_D1B - security utility - utility ATS
25. One (1), 4044 - 225A 1Ø outdoor main security AC NQOD
26. Two (2), 4040 - 100A 1Ø outdoor security AC NQOD
27. One (1), 5616 - station security panel
28. One (1), 5616 - station security fence panel
29. Two (2), 4018 - 225A station service AC distribution panel branch breaker
30. One (1), high voltage protection (HVP) box (provided by IT) (to be verified during detail engineering)
31. One (1), telephone interface box (to be verified during detail engineering)

The Transmission Owner Interconnection Facilities include the portion of the interconnecting switching station which is associated solely with the single feed to the generating facilities collector station. The equipment associated with the Transmission Owner Interconnection Facilities includes disconnect switch, conductors and connectors.

Other scope includes metering accuracy CCVT’s, metering accuracy CT’s.

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

1. One (1), 230kV, 4000A, 3-phase double end break switch
2. Conductor, connectors, conduits, control cables, foundations, steel structures and grounding material as per engineering standards

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

1. One (1), 1340 - 24” dual SEL-411L CD/Fiber line panel
2. One (1), 1323 - 24” SEL-487E/735 PMU and PQ monitoring panel
3. Two (2), 4541 - control cable make-up box
4. Two (2), 4528A - generation fiber make-up box

**Purchase and install metering material – Other:**

1. Three (3), 230kV, metering accuracy CCVT
2. Three (3), 230kV, 500:5 metering accuracy CT
3. One (1), 1425 - 24” dual SEL-735 transmission and generator interconnect metering panel
4. One (1), 4524 - revenue metering CT make-up box
5. One (1), 4506 - 3-phase CCVT potential make-up box with metering (P4)

Attachment #4: OTB Stand Alone Network Upgrade & OTB Transmission Owner Interconnection Facility Scope

## Project Summary

Project number AG2-583 provides for the initial construction of a new 230kV three breaker ring switching station between transmission structures 2027/196 and 2027/197 in Cumberland County, Virginia. The Project Developer has selected 'Option to Build' as is their right to do so under the PJM Interconnection Service Agreement. By selecting this construction process method, the Project Developer shall secure all required real estate, obtain all necessary permits, perform site work including site preparation and grading, furnish equipment, construction personnel and ancillary materials as found in the facility study for construction of the switching station in compliance with Dominion Standards. Oversight by Virginia Electric and Power Company d/b/a Dominion Energy Virginia (Dominion) will include, but is not limited to, project management, engineering, permitting, survey, real estate, and construction methods when on site.

All equipment procured by Project Developer will be reviewed and approved by Dominion engineering teams.

The details of the Project Developer and Dominion responsibilities and approval processes are described in the associated "Dominion Option to Build Execution Plan" document.

### Project Description

Project number AG2-583 provides for the initial construction of a new 230kV three breaker ring switching station to support the new solar farm built by Project Developer. The site is located along Dominion's existing 230kV, 2027 line from Bremo Substation to Midlothian Substation. The cut line will consume two of the positions in the ring bus. The third position will be for the 230kV feed from Project Developer's Collector Station.

The Generating Facilities will share a common footprint and fence line with the AG2-583 station. The Point of Change in Ownership between the Project Developer and this station will be the 230kV disconnect switch 4-hole pad inside the Dominion station by the common fence. The grounding systems for each station will be tied together.

Dominion is to renumber the existing line segment between the new 230kV three breaker ring switching station and Bremo Substation. The existing line segment between the new 230kV three breaker ring switching station and Midlothian Substation shall remain line 2027.

Additional work to be required at Bremo Substation, Midlothian Substation, Cartersville Substation and Powhatan Substation.

Security and fence type – design level 4.

**Option to Build, Stand Alone Network Upgrade Physical Facilities & Oversight – Dominion:**

1. All Physical Engineering related oversight and approvals of activities related to equipment procurement, design, construction, and energization of switching station
2. All Real Estate related oversight and approval of activities related to construction of switching station
3. All Permitting related oversight and approval of activities related to construction of switching station
4. All Survey related oversight and approval of activities related to construction of switching station
5. All Construction and Methods oversight and approval of activities related to construction and energization of switching station
6. All Project Management oversight activities related to construction and energization of switching station
7. Review and approve all riser conductor, connectors, spacers, and bolts related to connection of the switching station to the Bulk Electric Transmission System
8. Review and approve all material related to the integration of the security fence software package back to the Corporate Security Fusion Center

**Option to Build, Stand Alone Network Upgrade Physical Facilities – Project Developer:**

1. Approximate station fence line dimensions of 280' x 365'. 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 1,290 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. Three (3), 230kV, 3000A, 40kAIC, SF-6 circuit breaker
4. Six (6), 230kV, 2000A, 3-phase double end break switch
5. Six (6), 230kV, relay accuracy CCVT
6. Two (2), 230kV, 2000A wave trap
7. Two (2), line tuner
8. Nine (9), 180kV, 144kV MCOV surge arrester
9. Two (2), 230kV, 2000A, 2-phase center break switch (for PVT’s)
10. Two (2), 230kV, 100KVA power PT's for station service
11. Two (2), 230kV, 10 in-lb., 125VDC motor operator
12. Two (2), 230kV, heavy duty steel backbone (by Transmission)
13. Two (2), shield wire poles and three spans of shield wire (by Transmission)
14. One (1), 24’ x 40’ control enclosure
15. One (1), 125 VDC, 400 Ah station battery and 50 Amp charger (size to be verified during detail engineering)
16. Approximately 240 ft of cable trough with a 20 ft road crossing section

17. Two (2), 38” x 38” x 42” precast yard pull box
18. Station stone as required
19. Station lighting as required
20. Steel structures as required including switch stands, bus supports, station service transformers, CCVT and wave trap supports
21. Foundations as required including control house, equipment, and bus support stands
22. Conductors, connectors, conduits, control cables, cable trough, and grounding materials as per engineering standards

**Option to Build, Stand Alone Network Upgrade Relay Protection Equipment – Dominion:**

1. All Protection & Controls Engineering oversight and approval of activities related to equipment procurement, design, construction, and energization of switching station
2. All relay panel installation methods oversight and approval of activities related to construction and energization of switching station
3. All relay, communications, security settings related to the connection of the switching station to the Bulk Electric Transmission System
4. One (1), 5616 – station security panel
5. One (1), 5616 – station security fence panel
6. One (1), 5603 – station network panel no. 1
7. One (1), 5603 – station network panel no. 2
8. One (1), high voltage protection (HVP) box (Provided by IT) (to be verified during detail engineering)
9. One (1), telephone interface box (to be verified during detail engineering)

**Option to Build, Stand Alone Network Upgrade Relay Protection Equipment – Project Developer:**

1. Three (3), 1510 - 24” dual SEL-351-7 transmission breaker with reclosing panel
2. Three (3), 4510 - SEL-2411 breaker annunciator
3. Two (2), 1340 - 24” dual SEL-411L DCB/PLC line panel
4. Two (2), 4506 - 3-phase CCVT potential make-up box
5. One (1), 1603 - 24” SEL-451 islanding control scheme panel
6. Two (2), 4000 - station service potential make-up box
7. Two (2), 4548 - non-earthing switch MOAB control box
8. One (1), 4103 - non-earthing switch MOAB AC/DC distribution box
9. Two (2), 4018 - 500A station service AC distribution panel
10. Two (2), 4007 - 225A outdoor transmission yard AC NQOD
11. Two (2), 4019 - 225A 3-phase throw over switch

12. Two (2), 4016 - 600A PVT disconnect switch
13. One (1), 4153c - wall mount station battery monitor
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. Three (3), 4526_A - circuit breaker fiber optic make-up box
19. One (1), 5202 - 26" APP 601 digital fault recorder
20. Six (6), 4040 - security fiber/power make-up box
21. One (1), 4051 - power block
22. One (1), 4042_D1B - security utility - utility ATS
23. One (1), 4044 - 225A 1Ø outdoor main security AC NQOD
24. Two (2), 4040 - 100A 1Ø outdoor security AC NQOD
25. Two (2), 4018 - 225A station service AC distribution panel branch breaker

**Option to Build, Transmission Owner Interconnection Facilities; Physical Facilities & Oversight – Dominion:**

1. All Physical Engineering related oversight and approvals of activities related to equipment procurement, design, construction, and energization of switching station
2. All Construction and Methods oversight and approval of activities related to construction and energization of switching station
3. All Project Management oversight activities related to construction and energization of switching station

**Option to Build, Transmission Owner Interconnection Facilities; Physical Facilities – Project Developer:**

1. One (1), 230kV, 4000A, 3-phase double end break switch
2. Conductor, connectors, conduits, control cables, foundations, steel structures and grounding material as per engineering standards

**Option to Build, Transmission Owner Interconnection Facilities Relay Protection Equipment – Dominion:**

1. All Protection & Controls Engineering oversight and approval of activities related to equipment procurement, design, construction, and energization of switching station
2. All relay panel installation methods oversight and approval of activities related to construction and energization of switching station
3. All relay, communications, security settings related to the connection of the switching station to the Bulk Electric Transmission System

**Option to Build, Transmission Owner Interconnection Facilities Relay Protection Equipment – Project Developer:**

1. One (1), 1340 - 24” dual SEL-411L CD/Fiber line panel
2. One (1), 1323 - 24” SEL-487E/735 PMU and PQ monitoring panel
3. Two (2), 4541 - control cable make-up box
4. Two (2), 4528A - generation fiber make-up box

**Option to Build, Other – Project Developer:**

1. Three (3), 230kV, metering accuracy CCVT
2. Three (3), 230kV, 500:5 metering accuracy CT
3. One (1), 1425 - 24” dual SEL-735 transmission and generator interconnect metering panel
4. One (1), 4524 - revenue metering CT make-up box
5. One (1), 4506 - 3-phase CCVT potential make-up box with metering (P4)

Attachment #5: Network Upgrade - Transmission Tie-in Scope

## Preliminary Scoping Summary

This project serves to cut in 230 kV line 2323 into a new substation called AG2-583, which is to be located in Cumberland County, VA. The line is to be cut-in between existing structures 2323/196 and 2323/197. Line 2323 is being renumbered to 2XXX between AG2-583 Substation and Sallee Creek Substation. See **Figure 1** for the project location.

The proposed structures to be installed are two (2) 230 kV single circuit steel double deadend 3-poles, two (2) 230 kV single circuit steel backbones and two (2) steel static pole. The new conductor and shield wire to be used will be twin bundled (2) 768 ACSS/TW (20/7) "Maumee" conductor and two (2) DNO-11410 OPGW. 7#7 Alumoweld will be utilized for shielding within AG2-583 Substation.

| | |
|---|---|
| Length of Route | **0.04 miles** |
| Location of the subject line (County/State) | **Cumberland County, VA** |
| Total Number of Permanent Structures | **6** |
| Total Number of Temporary Structures | **0** |
| CPCN/SCC Required? | **No** |
| New ROW Required? | **No** |

This project will utilize current Dominion 230 kV standards. The conceptual estimate includes cost for the following:

## Transmission Owner Build - Permanent Facilities to be Installed

Structures: See attached spreadsheet for heights and loading information. The proposed structure finishes are to be weathering steel within the existing corridor based on existing structure finishes in the area. Otherwise, all structures will be galvanized steel.

| Structure Type | Dwg Number | Str. Qty. |
|---|---|---|
| 230 kV SC DDE ENGR 3-POLE | 12.158 | 2 |
| 230 kV SC Steel Backbone Structure | 12.901 | 2 |
| Steel Static Poles | 9.008 | 2 |

Wire:

1. Mileage listed is per circuit
2. Conductor includes dampers and spacers. Static and Fiber includes dampers and splices.
    - Estimate includes approximately eight (8) fiber splices

| Length (Miles) | Circuit | # if Bundled-Wire Type "Name" | Start-End |
|---|---|---|---|
| 0.02 | 1 | Twin bundled (2) 768 ACSS/TW (20/7) "Maumee" Conductor | Proposed Str. 2XXX/197 – Proposed BB. 2XXX/198 |
| 0.02 | 1 | Twin bundled (2) 768 ACSS/TW (20/7) "Maumee" Conductor | Proposed BB. 2323/195 – Proposed Str. 2323/196 |
| 0.02 | 2 | DNO-11410 OPGW | Proposed Str. 2XXX/197 – Proposed BB. 2XXX/198 |

| | | | |
|---|---|---|---|
| 0.02 | 2 | DNO-11410 OPGW | Proposed BB. 2323/195 – Proposed Str. 2323/196 |
| 0.13 | 1 | 7#7 Alumoweld Shield Wire | Between proposed static poles and backbones in AG2-583 substation |

## Transmission Owner Build - Existing Facilities to be Transferred or Modified

1. Cut and transfer the existing single (1) 1033.5 ACSS (45/7) conductor for Line 2XXX from existing structure 2XXX/196 onto proposed structure 2XXX/197.
2. Cut and transfer the existing single (1) 1033.5 ACSS (45/7) conductor for Line 2323 from existing structure 2323/197 onto proposed structure 2323/196.
3. Cut and transfer the existing two (2) DNO-9700 OPGW's for Line 2XXX from existing structure 2XXX/196 onto proposed structure 2XXX/197.
4. Cut and transfer the existing two (2) DNO-9700 OPGW's for Line 2323 from existing structure 2323/197 onto proposed structure 2323/196.

## Scope Notes/Assumptions

1. Due to allocated amount of time, no PLS-CADD modeling was done for this project, which results in higher level scopes. Projects in the Transition Cycle 2 – Phase 2 will need to go through full conceptual engineering design prior reaching detailed engineering.

2. It is assumed that existing structures 2XXX/196 and 2323/197 can also be re-used as part of this project. More information will need to be obtained on these structures during detailed design to confirm that they do not need to be replaced.

3. This project does require acquisition of a laydown yard.

4. The generalized structure heights for this project are 75/60/75 ft for 2XXX/197 and 2323/196 structures. This was determined for the high-level estimate projects for Dominion Generation Interconnection Projects.

5. All deadend engineered steel structures outside the substation (Structures 2XXX/197 and 2323/196) will be designed for full-construction deadend loading for construction conditions.

6. Project area code required loading include: NESC Heavy, 95 mph wind, ¾" Ice & 30 mph wind.

7. For detailed engineering, it is assumed LiDAR survey is required, including ROW file.

8. Crossing insulators will be used whenever crossing over substation fence.

9. An existing right of way width of 195' is assumed based on existing plan and profiles.

10. The transmission team has identified 0 encroachments within the project area based off the .kmz and DEV MapViewer.

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

12. A non-location specific substation general arrangement was provided by the conceptual substation engineering team. See **Figure 2** for the general arrangement used for this project.

13. The assumed reel lengths for this project are 12,000 feet.

14. Cross slopes are not accounted for in this conceptual design. Structures designed assuming a 1.5' foundation reveal at the center of the structure.

15. The collector station will share a fence and the developer switchyard will be located to the north.

16. Project AC2-165 involves cutting in the existing 230 kV Line 2027 into the new Sallee Creek Substation. As a result, Line 2027 will be split into two separate circuits: Line 2027 from Midlothian Substation to Sallee Creek Substation, and Line 2323 from Sallee Creek Substation to Bremo Substation. It is assumed that AC2-165 will be completed prior to AG2-583.

## Estimate Notes/Assumptions

1. This scope and estimate for project AG2-583 refers to the "transmission-owner-to-build" execution approach. The transmission owner estimate includes the

engineering, project management, and construction costs for the transmission assets on this project.

   a. One estimate has been provided for this scope.

      i. Transmission Owner Build (TO)

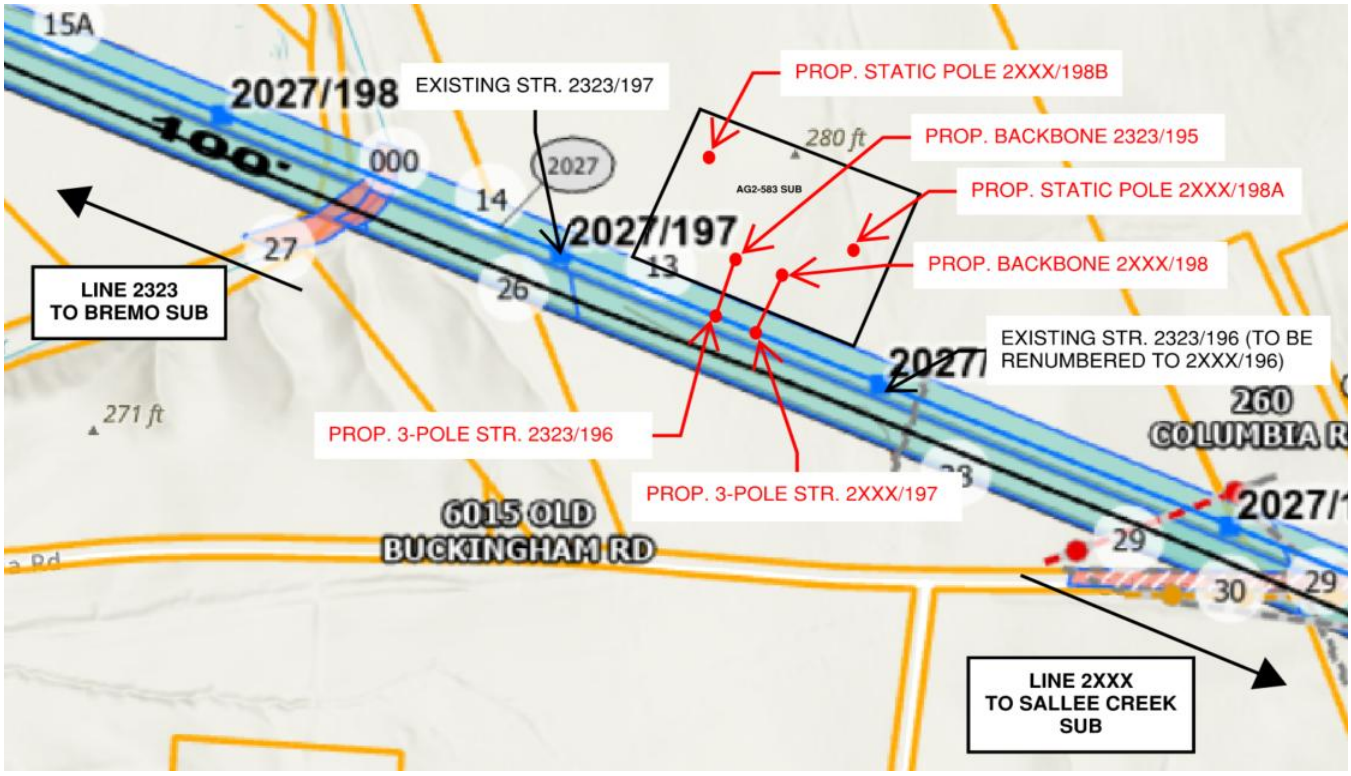
2. Engineered steel pole costs were determined based off typical wind and weight spans, line angles, and average structure heights for each voltage. These inputs were used to derive an estimated steel pole weight, which was used to develop the structure costs. This was determined for the high-level estimate projects for Dominion Generation Interconnection Projects.

3. Engineered 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.

4. Survey cost were determined based on substation proposed location, fiber installation, and impacts on existing line.

5. Transition Cycle 2 - Phase 2 estimates utilize Dominion 2025 labor and material adjustment rates.

## Figure 1 – Project Location



Attachment #6: Network Upgrade – Bremo Substation

## Project Summary

Project AG2-583 provides for drawing work addition, relay resets, and field support necessary to change line 2027 destination from Midlothian Substation to AG2-583 Generator Interconnect. The line number may be changed. Consult the construction One Line. This project is the Remote End Network Upgrade for the AG2-583 Generator Interconnect Project.

**Purchase and install relay materials:**

1. One (1), 1603 – 24” SEL-451 islanding control scheme panel

Attachment #7: Network Upgrade – Carterville Substation

## Project Summary

Project AG2-583 provides for drawing work addition, relay reset, and field support necessary to change line 2027 destination from Bremo Substation to AG2-583 Generator Interconnect. The line number may be changed. Consult the construction One Line. This project is the Remote End Network Upgrade for the AG2-583 Generator Interconnect Project.

Attachment #8: Network Upgrade – Midlothian Substation

## Project Summary

Project AG2-583 provides for drawing work addition, relay resets, and field support necessary to change line 2027 destination from Bremo Substation to AG2-583 Generator Interconnect. The line number may be changed. Consult the construction One Line. This project is the Remote End Network Upgrade for the AG2-583 Generator Interconnect Project.

**Purchase and install relay materials:**

1. One (1), 1603 – 24” SEL-451 islanding control scheme panel

Attachment #9: Network Upgrade – Powhatan Substation

## Project Summary

Project AG2-583 provides for drawing work addition, relay reset, and field support necessary to change line 2027 destination from Bremo Substation to AG2-583 Generator Interconnect. The line number may be changed. Consult the construction One Line. This project is the Remote End Network Upgrade for the AG2-583 Generator Interconnect Project.