Facilities Study Report

For

Physical Interconnection of

PJM Generation Interconnection Request

Project ID AH1-343

“Crystal Hill DP- Perth 115kV”

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, Halifax County, Virginia with a designated PJM Project ID of AH1-343. The installed facilities will have a total Maximum Facility Output (MFO) of 69 MW with 41.4 MW of this output being recognized by PJM as Capacity.

2. POINT OF INTERCONNECTION (POI)

AH1-343 will interconnect with the Dominion transmission system via a newly constructed 115 kV three-breaker ring substation, tapping the Perth Substation – Woodchuck Trail Substation 230kV line, 1016, approximately 8.85 miles from Perth Substation and 3.85 miles from Woodchuck Trail Substation.

This project serves to cut in 115 kV line 1016 into a new substation called AH1-343, which is to be located in Halifax County, VA. The substation is to be cut-in between existing structures 1016/62 and 1016/63. Line 1016 is being renumbered to 1XXX between Woodchuck Trail Substation and AH1-343 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 115kV 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 AH1-343 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, Dominion 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 115kV three breaker ring bus to support the new solar farm built by Project Developer. Thep site is located along the existing 115kV, line 1016 from Perth Substation to Woodchuck Trail Substation. The cut line will consume two of the positions in the ring bus. The third position will be for the 115kV 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 115kV 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:

Woodchuck Trail Substation

The proposed neighboring facility scope is detailed in Attachment #6.

Perth Substation

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

4. OTHER SCOPE OF WORK

Other Scope includes metering accuracy CCVT's and metering accuracy CT's and associated metering equipment.

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 36 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	26

Construction	18	36

6. ASSUMPTIONS IN DEVELOPING SCOPE/COST/SCHEDULE

Assumptions can be found in Attachments #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 AH1-343 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

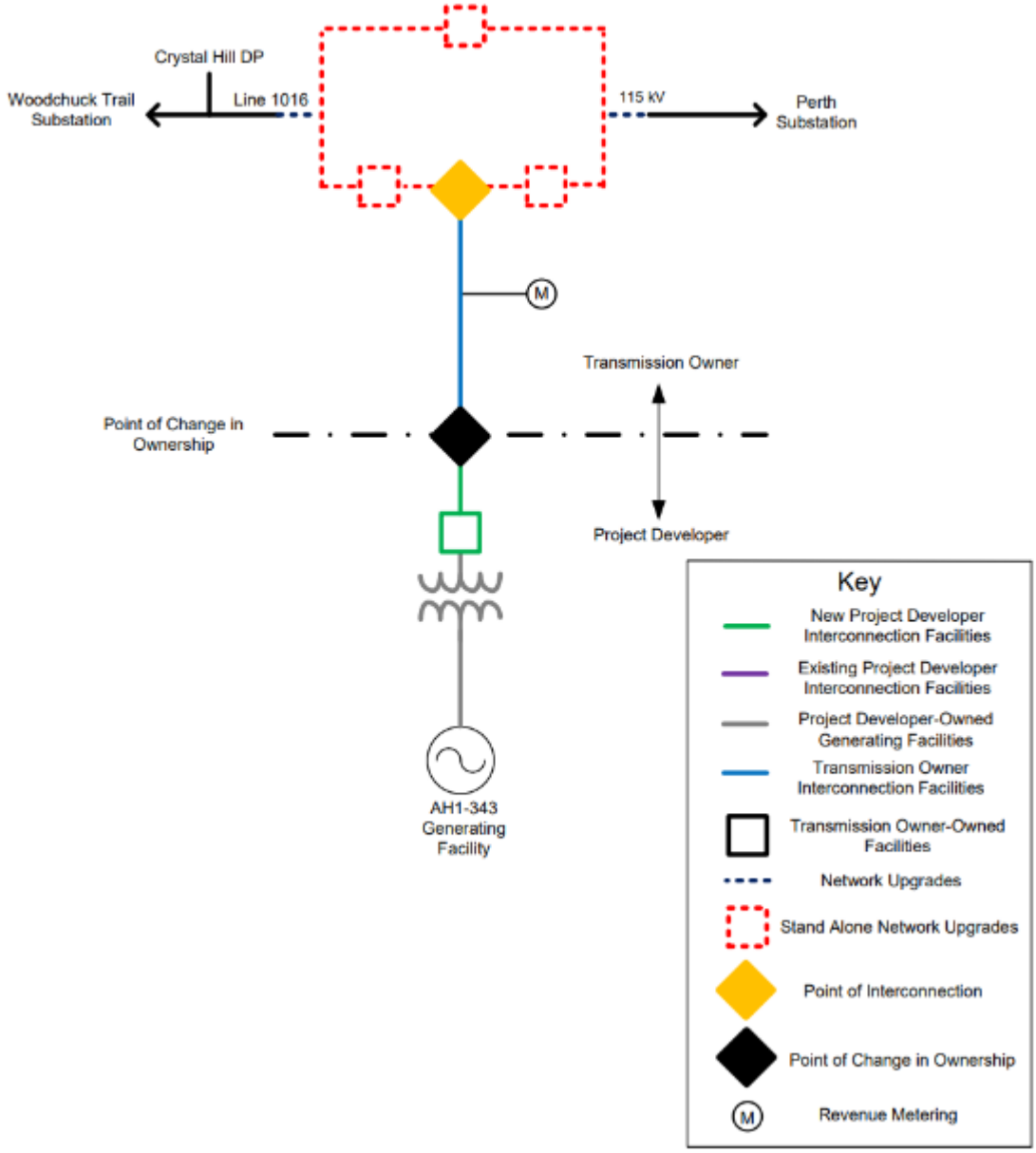
The Project Developer is responsible for the following expectations in the area Environmental and Permitting.

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

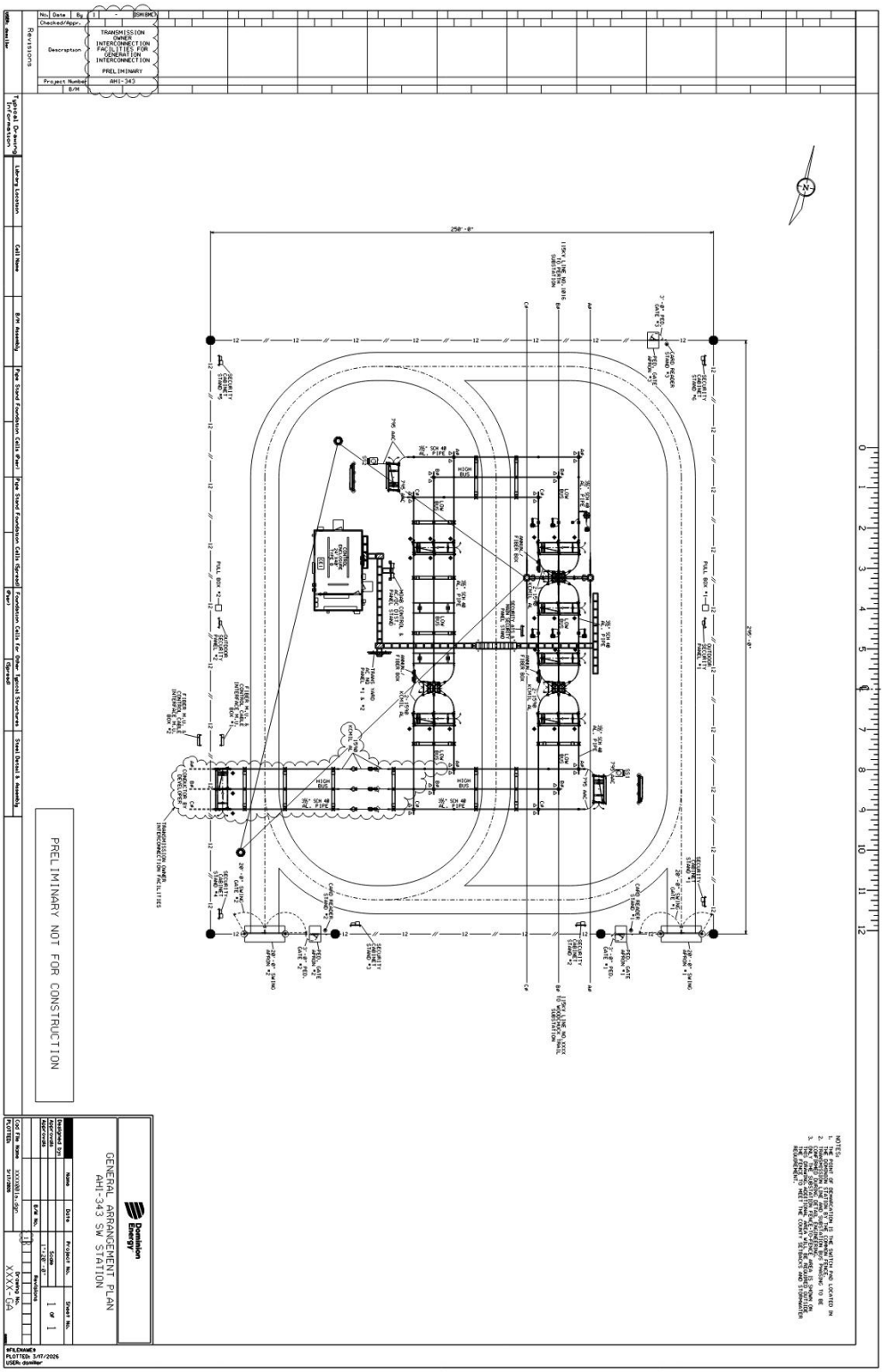
C. APPENDICES

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 – Woodchuck Trail Substation
Attachment #7:	Network Upgrade – Perth 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 AH1-343 provides for the initial construction of a new 115kV three breaker ring switching station between transmission structures 1016/62 and 1016/63 in Halifax County, VIRGINIA.

The objective of this project is to build a 115kV three breaker ring bus to support the new solar farm built by Project Developer. The site is located along the existing 115kV, line 1016 from Perth Substation to Woodchuck Trail Substation. The cut line will consume two of the positions in the ring bus. The third position will be for the 115kV feed from Project Developer's Collector Station for the new solar farm.

The Generating Facilities will share a common footprint and fence line with AH1-343 station. The Point of Change in Ownership between the Project Developer and this station will be the 115kV 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 115kV three breaker ring switching station and Woodchuck Trail Substation. The existing line segment between the new 115kV three breaker ring switching station and Perth Substation shall remain line 1016.

Additional work to be required at Perth Substation and Woodchuck Trail Substation.

Other scope includes the metering accuracy CCVT's, metering accuracy CT's, and associated metering equipment.

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 250’ x 295’. 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 1,090 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), 115kV, 3000A, 40kAIC, SF-6 circuit breaker
4. Six (6), 115kV, 2000A, 3-phase center break gang operated switch
5. Six (6), 115kV, relay accuracy CCVT
6. One (1), 115kV, 2000A wave trap
7. One (1), line tuner
8. Nine (9), 90kV, 74kV MCOV surge arrester
9. Two (2), 115kV, 2000A, 2-phase center break switch (for PVT’s)
10. Two (2), 115kV, 100KVA power PT's for station service
11. Two (2), 115kV, 10 in-lb., 125VDC motor operator
12. One (1), 115kV, 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, 300 Ah station battery and 50 Amp charger (size to be verified during detail engineering)
16. Approximately 204 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. One (1), 1340 - 24” dual SEL-411L DCB/PLC line panel
4. One (1), 1340 - 24” dual SEL-411L CD/Fiber line panel
5. Two (2), 4506 - 3-phase CCVT potential make-up box
6. One (1), 1603 - 24” SEL-451 islanding control scheme panel
7. Two (2), 4000 - station service potential make-up box
8. Two (2), 4548 - non-earthing switch MOAB control box

9. One (1), 4103 - non-earthing switch MOAB AC/DC distribution box
10. Two (2), 4018 - 500A station service AC distribution panel
11. Two (2), 4007 - 225A outdoor transmission yard AC NQOD
12. Two (2), 4019 - 225A 3-phase throw over switch
13. Two (2), 4016 - 600A PVT disconnect switch
14. One (1), 4153c - wall mount station battery monitor
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. Three (3), 4526_A - circuit breaker fiber optic make-up box
20. One (1), 5202 - 26" APP 601 digital fault recorder
21. Six (6), 4040 - security fiber/power make-up box
22. One (1), 5603 - station network panel no. 1
23. One (1), 5603 - station network panel no. 2
24. One (1), 4051 - power block
25. One (1), 4042_D1B - security utility - utility ATS
26. One (1), 4044 - 225A 1Ø outdoor main security AC NQOD
27. Two (2), 4040 - 100A 1Ø outdoor security AC NQOD
28. One (1), 5616 - station security panel
29. One (1), 5616 - station security fence panel
30. Two (2), 4018 - 225A station service AC distribution panel branch breaker
31. One (1), high voltage protection (HVP) box (provided by IT) (to be verified during detail engineering)
32. 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 and metering accuracy CT's and associated metering equipment.

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

1. One (1), 115kV, 2000A, 3-phase center break gang operated 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), 115kV, metering accuracy CCVT
2. Three (3), 115kV, 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 AH1-343 provides for the initial construction of a new 115kV three breaker ring switching station between transmission structures 1016/62 and 1016/63 in Halifax 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 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 AH1-343 provides for the initial construction of a new 115kV three breaker ring switching station to support the new solar farm built by Project Developer. The site is located along Dominion's existing 115kV, 1016 line from Woodchuck Trail Substation to Perth Substation. The cut line will consume two of the positions in the ring bus. The third position will be for the 115kV feed from Project Developer's Collector Station.

The Generating Facilities will share a common footprint and fence line with the AH1-343 station. The Point of Change in Ownership between the Project Developer and this station will be the 115kV 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 115kV three breaker ring switching station and Woodchuck Trail Substation. The existing line segment between the new 115kV three breaker ring switching station and Perth Substation shall remain line 1016.

Additional work to be required at Perth Substation and Woodchuck Trail 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 250’ x 295’. 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 1,090 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), 115kV, 3000A, 40kAIC, SF-6 circuit breaker
4. Six (6), 115kV, 2000A, 3-phase center break gang operated switch
5. Six (6), 115kV, relay accuracy CCVT
6. One (1), 115kV, 2000A wave trap
7. One (1), line tuner
8. Nine (9), 90kV, 74kV MCOV surge arrester
9. Two (2), 115kV, 2000A, 2-phase center break switch (for PVT’s)
10. Two (2), 115kV, 100KVA power PT's for station service
11. Two (2), 115kV, 10 in-lb., 125VDC motor operator
12. Two (2), 115kV, 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, 300 Ah station battery and 50 Amp charger (size to be verified during detail engineering)
16. Approximately 204 ft 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 required include 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. One (1), 1340 - 24” dual SEL-411L DCB/PLC line panel
4. One (1), 1340 - 24” dual SEL-411L CD/Fiber line panel
5. Two (2), 4506 - 3-phase CCVT potential make-up box
6. One (1), 1603 - 24” SEL-451 islanding control scheme panel
7. Two (2), 4000 - station service potential make-up box
8. Two (2), 4548 - non-earthing switch MOAB control box
9. One (1), 4103 - non-earthing switch MOAB AC/DC distribution box
10. Two (2), 4018 - 500A station service AC distribution panel
11. Two (2), 4007 - 225A outdoor transmission yard AC NQOD
12. Two (2), 4019 - 225A 3-phase throw over switch
13. Two (2), 4016 - 600A PVT disconnect switch

14. One (1), 4153c - wall mount station battery monitor
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. Three (3), 4526_A - circuit breaker fiber optic make-up box
20. One (1), 5202 - 26" APP 601 digital fault recorder
21. Six (6), 4040 - security fiber/power make-up box
22. One (1), 4051 - power block
23. One (1), 4042_D1B - security utility - utility ATS
24. One (1), 4044 - 225A 1Ø outdoor main security AC NQOD
25. Two (2), 4040 - 100A 1Ø outdoor main security AC NQOD
26. 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), 115kV, 2000A, 3-phase center break gang operated 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), 115kV, metering accuracy CCVT
2. Three (3), 115kV, 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 115 kV line 1016 into a new substation called AH1-343, which is to be located in Halifax County, VA. The substation is to be cut-in between existing structures 1016/62 and 1016/63. Line 1016 is being renumbered to 1XXX between Woodchuck Trail Substation and AH1-343 Substation. See **Figure 1** for the project location.

The proposed structures to be installed are two (2) 115 kV single circuit steel double deadend H-frame, one (1) 115 kV single circuit steel backbone, and two (2) steel static poles. The new conductor and shield wire to be used will be single (1) 768.2 ACSS/TW (20/7) "Maumee" conductor, two (2) DNO-11410 OPGW and one (1) DNO-11410 OPGW from Woodchuck Trail substation – proposed str. 1XXX/62. 7#7 Alumoweld will be utilized for shielding within AH1-343 substation.

Length of Route	**3.91 miles**
Location of the subject line (County/State)	**Halifax County, VA**
Total Number of Permanent Structures	**5**
Total Number of Temporary Structures	**0**
CPCN/SCC Required?	**No**
New ROW Required?	**No**

This project will utilize current Dominion 115 kV standards. The conceptual estimate includes cost for the following:

Transmission Owner Build - Existing Facilities to be Removed

Structures: 1016/62 and 1016/63 to be removed.

Structure Type	Dwg Number	Str. Qty.
115 kV SC SUS H-frame	20310100045	2

Wire: Mileage listed is per circuit.

Length (Miles)	Circuit	# if Bundled-Wire Type "Name"	Start-End
0.12	1	Twin bundled (2) 545.6 ACAR (15/7)	Str. 1XXX/62 – Str. 1016/63
3.79	1	3#6 Alumoweld Shield Wire	Woodchuck Trail Substation – Str. 1XXX/62
0.12	2	3#6 Alumoweld Shield Wire	Str. 1XXX/62 – Str. 1016/63

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.
115 kV SC DDE ENGR H-frame	12.165 – 115 kV Configuration	2

115 kV SC Steel Backbone Structure	11.955	1
Steel Static Poles	9.008	2

Wire:

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

Length (Miles)	**Circuit**	**# if Bundled-Wire Type "Name"**	**Start-End**
0.06	1	Single (1) 768 ACSS/TW (20/7) "Maumee" Conductor	Proposed Str. 1XXX/62 – Proposed BB 1XXX/63 (1016/62)
0.06	1	Single (1) 768 ACSS/TW (20/7) "Maumee" Conductor	Proposed BB 1016/62 (1XXX/63) – Proposed Str. 1016/63
0.06	2	DNO-11410 OPGW	Proposed Str. 1XXX/62 – Proposed BB 1XXX/63 (1016/62)
0.06	2	DNO-11410 OPGW	Proposed BB 1016/62 (1XXX/63) – Proposed Str. 1016/63
3.79	1	DNO-11410 OPGW	Woodchuck Trail Substation – Str. 1XXX/62

0.10	1	7#7 Alumoweld Shield Wire	Between proposed static poles and backbones in AH1-343 Substation

Transmission Owner Build - Existing Facilities to be Transferred or Modified

1. Cut and transfer the existing twin bundled (2) 545.6 ACAR (15/7) conductor for Line 1XXX from existing structure 1XXX/62 onto proposed structure 1XXX/62.
2. Cut and transfer the existing twin bundled (2) 545.6 ACAR (15/7) conductor for Line 1016 from existing structure 1016/63 onto proposed structure 1016/63.
3. Cut and transfer the existing one (1) 3#6 Alumoweld shield wire for Line 1XXX from existing structure 1XXX/62 onto proposed structure 1XXX/62.
4. Cut and transfer the existing two (2) 3#6 Alumoweld shield wires for Line 1016 from existing structure 1016/63 onto proposed structure 1016/63.
5. Install one (1) new OPGW deadend assembly [Reference Drawing 96.061] on one (1) existing backbone structure 1XXX/35B (1047/35).
6. Install two (2) new OPGW deadend assemblies [Reference Drawing 96.060] on three (3) existing structures 1XXX/36, 1XXX/37 and 1XXX/50.
7. Install one (1) new OPGW safety catch assembly [Reference Drawing 96.100] on two (2) existing structures 1XXX/35B (1047/35) and 1XXX/36.
8. Install one (1) new OPGW suspension assembly [Reference Drawing 96.020] on twenty-three (23) existing structures 1XXX/38 – 1XXX/49 and 1XXX/51 – 1XXX/61.

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 from Woodchuck Trail Substation – Str. 1XXX/61 can also be re-used as part of this project. Structure 1XXX/50 will have one (1) existing suspension shield wire attachment changed to a deadend. 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 65 ft for 1XXX/62 and 1016/63 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 1XXX/62 and 1016/63) 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 120' is assumed based DEV MapViewer.

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 west.

Estimate Notes/Assumptions

1. This scope and estimate for project AH1-343 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.

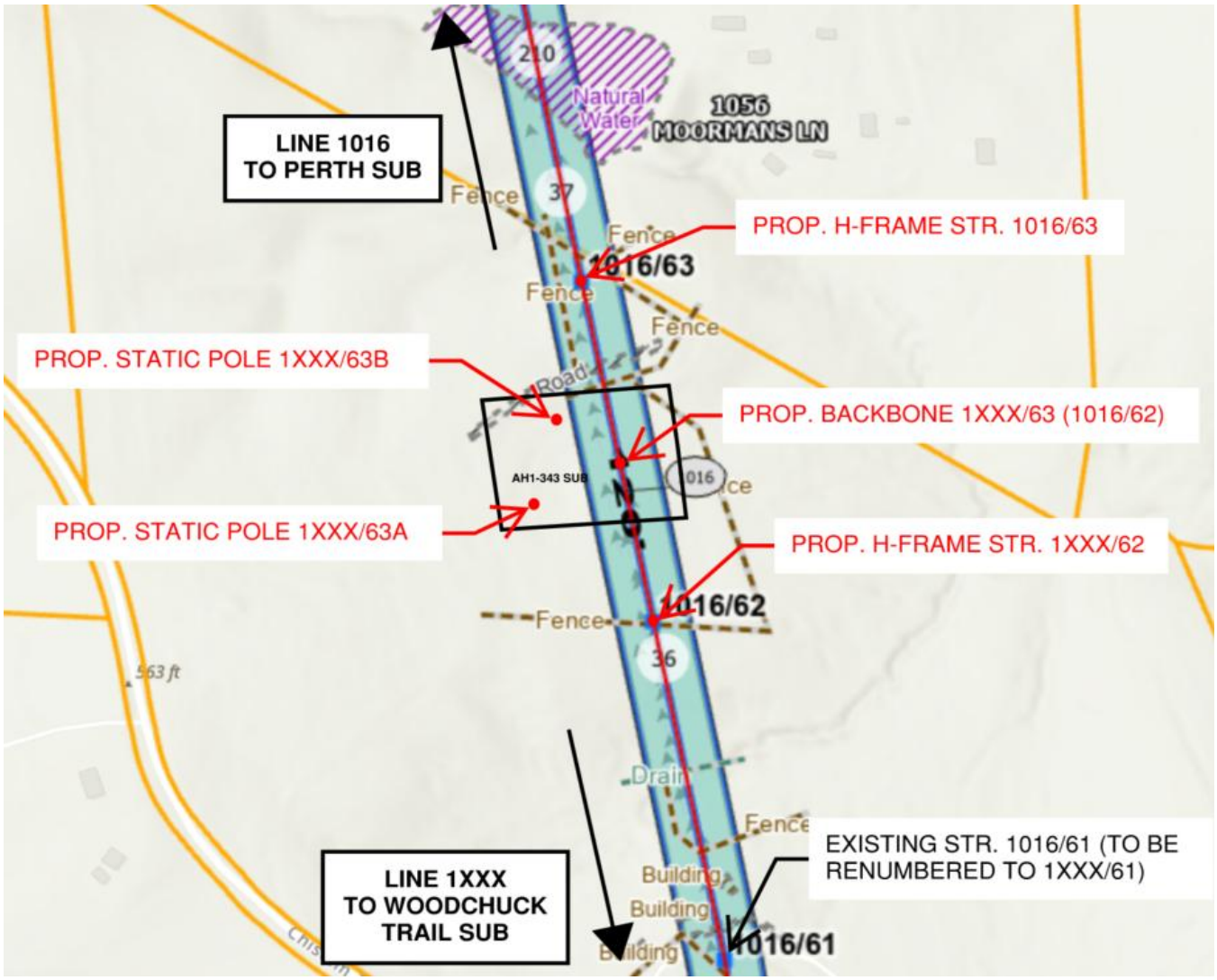
3. Engineered pole foundation costs were based off the projects' location and structure type in the regional soil profile map. The regional soil profile map used for this project is Piedmont.
4. Since the proposed project is less than 5 miles from an existing substation, fiber will need to be installed for communication purposes. An additional $10,000 will be included on the general permitting cost due to the fiber installation.

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

6. It should be determined in detailed engineering if 115 kV over-insulated conductor assemblies are required for this project. For this estimate, over-insulated conductor assemblies were utilized.

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

Figure 1 – Project Location



Attachment #6: Network Upgrade – Woodchuck Trail Substation

Project Summary

Project AH1-343 provides drawing work, relay resets, and field support necessary to change line 1016 destination from Perth Substation to AH1-343 Generator Interconnect. The line number may or may not change. Consult the Construction one line. This project is the Remote End Network Upgrade for the AH1-343 Generator Interconnect project. Also replace the existing line 1016 relay protection with line differential protection utilizing fiber optics due to the shortening of the line and remove line 1016 wave trap due to the powerline carrier function now being performed over fiber optics. Transmission engineering will terminate the fiber at one of the backbone legs and substation engineering will install 2" PVC conduits from the new static pole to the control enclosure.

Purchase and install relay material:

1. Remove - One (1), 115KV, 2000A wave trap
2. Two (2) runs of 2" conduits from backbone leg to the cable trough
3. Conduit tracer wires, 1/C #10, green
4. Foundation as required
5. Conductors, connectors, conduits, control cables, cable trough, and grounding materials as per engineering standards.

Purchase and install relay material:

1. One (1) SEL-2506 fiber modem
2. Convert existing panel 6 to DCB/Fiber

Attachment #7: Network Upgrade – Perth Substation

Project Summary

Project AH1-343 provides for drawing work, relay resets, and field support necessary to change line 1016 destination from Woodchuck Trail Substation to AH1-343 Generator Interconnect. The line number may or may not change. Consult the Construction one line. This project is the Remote End Network Upgrade for the AH1-343 Generator Interconnect project.