Facilities Study Report

For

Physical Interconnection of

PJM Generation Interconnection Request

Project ID AG2-581

“Rawlings-Unity 500 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, Brunswick County, Virginia with a designated PJM Project ID of AG2-581. The installed facilities will have a total Maximum Facility Output (MFO) of 150 MW with 90 MW of this output being recognized by PJM as Capacity.

2. POINT OF INTERCONNECTION (POI)

AG2-581 will interconnect with the Dominion transmission system via a newly constructed 500 kV three-breaker ring substation, tapping the Rawlings Substation – Unity Substation 500kV line, 587, approximately 11.35 miles from Rawlings Substation and 11.76 miles from Unity Substation.

This project serves to cut in 500 kV line 587 into a new substation called AG2-581, which is to be located in Brunswick County, VA. The line is to be cut-in between existing structures 587/171 and 587/172. Line 587 is being renumbered to 5XXX between AG2-581 substation and Rawlings 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 500kV 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 AG2-581 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 500kV three breaker ring bus to support the new solar farm built by Project Developer. The site is located the existing 500kV, 556 line from Clover Substation to Rawlings Substation. The cut line will consume two of the positions in the ring bus. The third position will be for the 500kV 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 500kV 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:

Clover Substation

The proposed neighboring facility scope is detailed in Attachment #6. Unity Substation is currently under construction. If Unity Substation is completed prior to AG2-581

Rawlings 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.

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 96 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	86
Construction	76	96

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 AG2-581 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

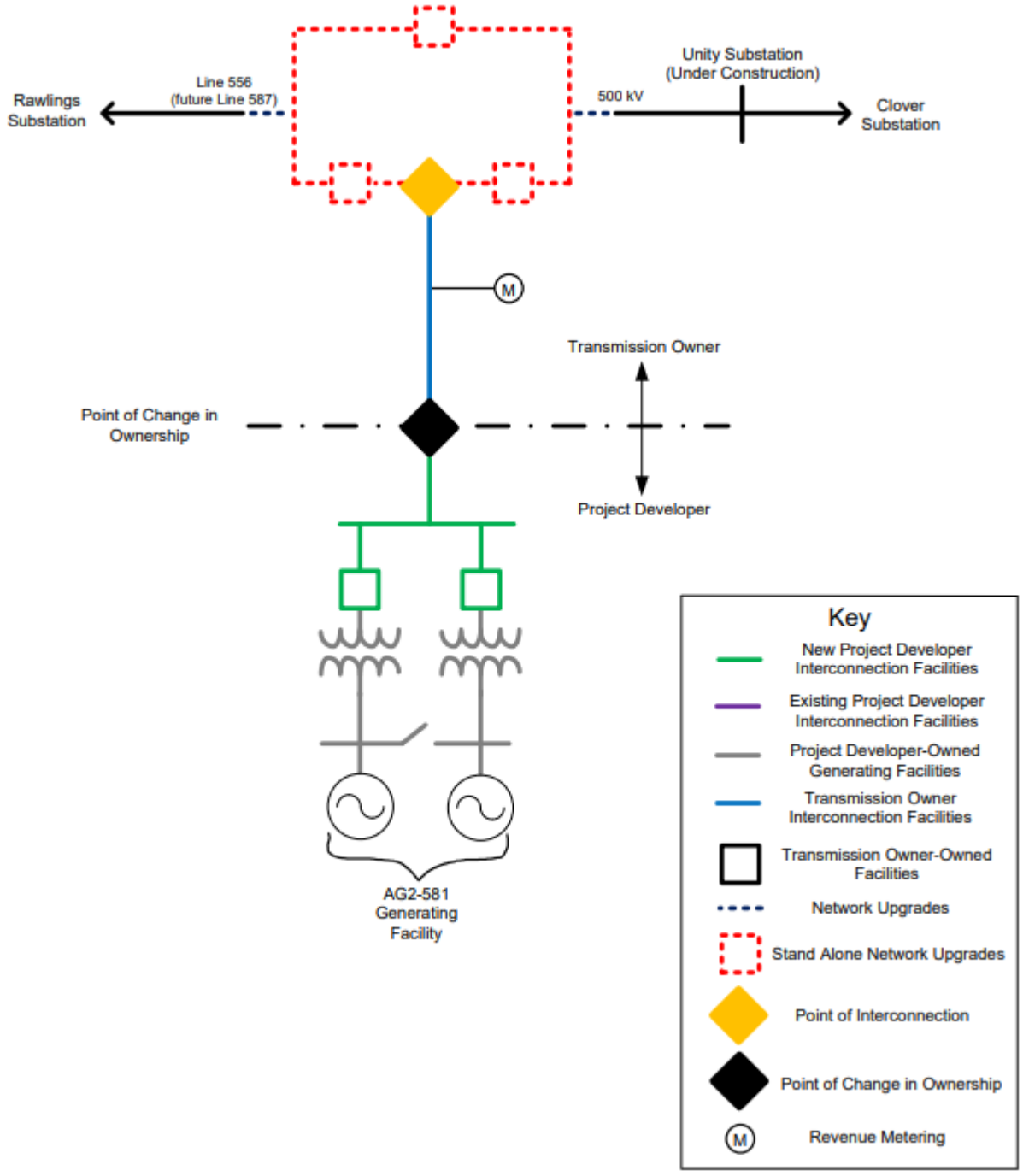
The Project Developer is responsible for the following expectations in the area Environmental and Permitting.

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

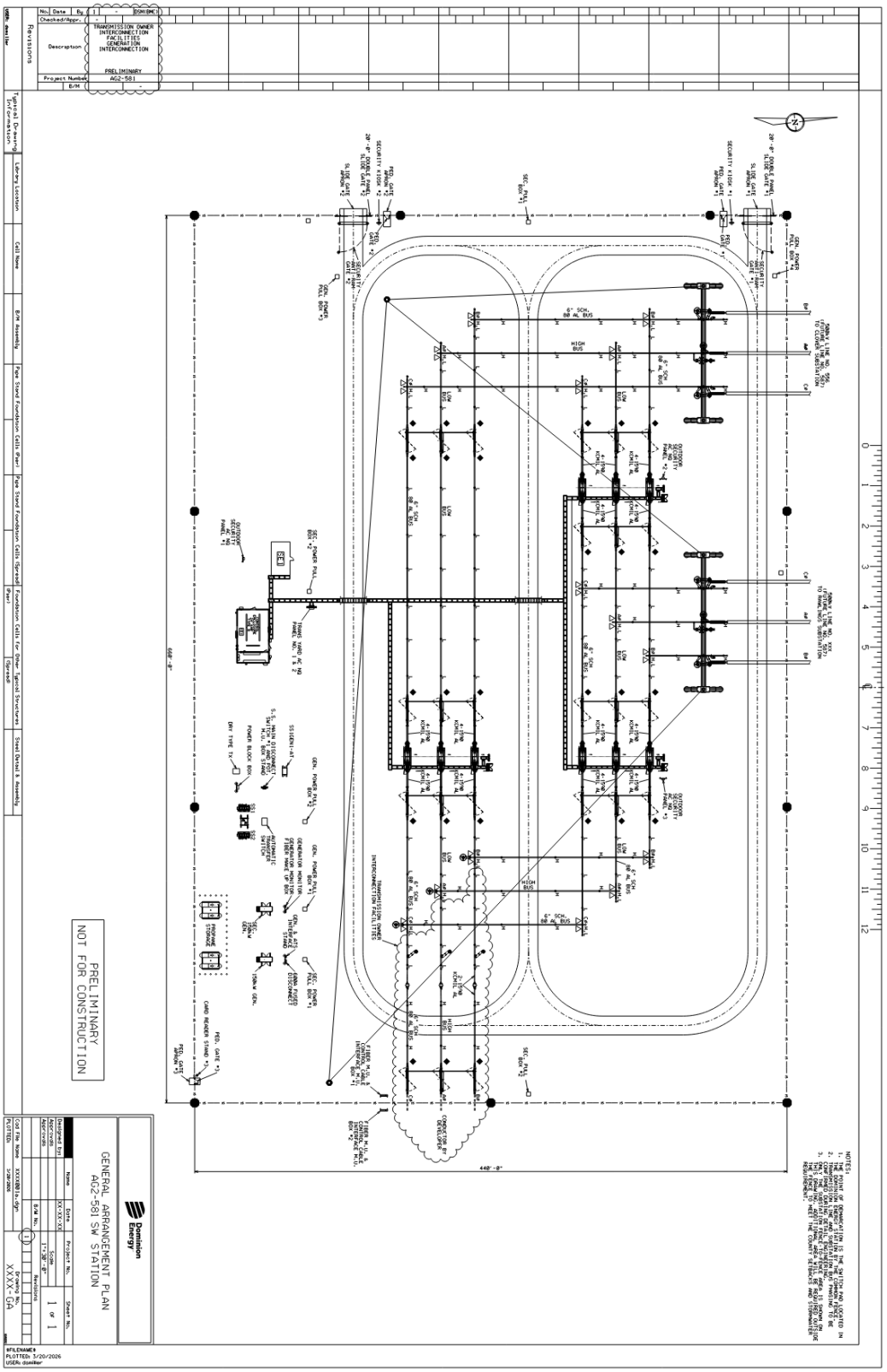
C. APPENDICES

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 – Clover Substation
Attachment #7:	Network Upgrade – Rawlings 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 AG2-581 provides for the initial construction of a new 500kV three breaker ring switching station between transmission structures 556/171 and 556/172 in Chesapeake County, Virginia.

The objective of this project is to build a 500kV three breaker ring bus to support the new solar farm built by Project Developer. The site is located along the existing 500kV, 556 line from Clover Substation to Rawlings Substation. The cut line will consume two of the positions in the ring bus. The third position will be for the 500kV feed from Project Developer's Collector Station for the new solar farm.

The Generating Facilities will share a common footprint and fence line with AG2-581 station. The Point of Change in Ownership between the Project Developer and this station will be the 500kV 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, and 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 500kV three breaker ring switching station and Rawlings Substation. The existing line segment between the new 500kV three breaker ring switching station and Clover Substation shall remain line 556.

Additional work to be required at Clover Substation and Rawlings Substation.

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

Security and fence type – design level 1.

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.

Note: Project 99-2908 is in Approved status. This project will change the line destination of Line 556 at Rawlings Substation going to Clover Substation. Project 99-2908 will connect Rawlings Substation to the future Unity Substation on a future Line 587. At the time of this AG2-581 project submission, location data for where the future Unity Substation will be constructed was not available, nor was pole coordinate information for the future Line 587. When these projects are constructed, islanding and line protection will need to be re-evaluated for all affected stations.

Purchase and install substation material – Stand Alone Network Upgrade:

1. Approximate station fence line dimensions of 660’ x 440’. 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 2,200 linear ft of 5/8” chain link, 15 ft tall, perimeter fence around the station along with the security cameras and integrators as per design 1 fence standards
    a. Eleven (11), 20 ft tall super post
    b. Anti-dig barrier footing between the perimeter fence foundations
    c. Foundations for the fence posts, super posts, etc.
    d. Ground tail, and miscellaneous grounding materials for fence posts, panel to panel connections, security and communication boxes as per the current engineering standards
    e. Security integrations for fence
3. Three (3), 500kV, 5000A, 63kAIC, SF-6 circuit breaker
4. Six (6), 500kV, 5000A, 3-phase double end break switch
5. Six (6), 500kV, relay accuracy CCVT
6. Two (2), 500kV, 5000A wave tap
7. Two (2), line turner
8. Six (6), 396kV, 318kV MCOV surge arrester (For Terminal)
9. Three (3), 396kV, 318kV MCOV surge arrester (For Bus)
10. Two (2), 10kV, 8.4kV MCOV surge arrester
11. Two (2), SMD-20 fused disconnects with BCL fuse (to be verified during detail engineering)
12. Two (2), 167kVA, 13.2 - .12/.24kV transformer (to be verified during detail engineering)
13. One (1), dry type TX for security enclosure
14. One (1), 800A manual throwover switch
15. Three (3), 100A outdoor security AC NQ panel
16. One (1), 800A, 3-phase, outdoor utility distribution panel
17. Two (2), 150kW generator
18. Four (4), 1000-gallon liquid propane tank
19. Four (4), rosemount tank level monitor
20. Three (3) ATS (ratings to be verified during detail engineering)
21. Two (2), 500kV, heavy duty steel backbone (by Transmission)
22. Two (2), shield wire poles and four spans of shield wires (by Transmission)

23. One (1), 24' x 40' control enclosure
24. One (1), 14' x 24' security enclosure
25. One (1), 125 VDC, 400 Ah station battery and two 50 Amp chargers (size to be verified during detail engineering)
26. Approximately 860 ft of cable trough, with two (2) 20 ft road crossing section
27. One (1), 600A 1-phase outdoor security manual throwover switch (to be verified during detail engineering)
28. Eight (8), 38” x 38” x 42” precast concrete pull box
29. Station stone as required
30. Station lightning 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, and bus support stands
33. 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. Three (3), 1515 – 500KV breaker panel (use with 1510)
4. Three (3), 4536 – 500KV breaker condition monitor
5. Two (2), 1340 – 24” dual SEL-411L DCB/PLC line panel
6. Two (2), 4506 – 3-phase CCVT potential make-up box
7. One (1), 1603 – 24” SEL-451 islanding control scheme panel
8. Two (2), 4007 – 225A outdoor transmission yard AC NQOD
9. Five (5), 4016 – 600A disconnect switch
10. One (1), 4018 – 800A I-line AC distribution panel
11. One (1), 4019 – 225A 3-phase throw over switch
12. One (1), 4042 – security utility ATS (level 1,2)
13. One (1), 4042 – security generator ATS (level 1,2)
14. Two (2), 4000 – station service potential make-up box
15. One (1), 4153 – wall mount station battery monitor
16. One (1), 5618 – SEL-3555 communications panel
17. One (1), 1255 – station annunciator panel
18. One (1), 5021 – SEL-2411 RTU panel
19. One (1), 5609 – fiber optic management panel
20. Three (3), 4526_D – breaker with BCM fiber make-up box
21. One (1), 5202 – 26” APP 601 digital fault recorder
22. One (1), 5203 – traveling wave fault locator panel - TWS (to be verified during detail engineering)
23. One (1), 5603 – station network panel no. 1
24. One (1), 5603 – station network panel no. 2
25. One (1), 5616 – station security panel
26. One (1), 3102 – security enclosure alarm box
27. One (1), 4821 – generator and ATS interface box

28. One (1), 4533 – security generator monitor
29. One (1), 4526_G – generator monitor fiber make-up box
30. Two (2), 4800 – generator
31. Three (3), 4040 – 100A 2Ø outdoor security AC NQOD (Prov. by Sub Eng)
32. Two (2), 4040 – 100A 2Ø indoor security AC NQOD (Prov. by Sub Eng)
33. One (1), 4041 – security enclosure 600A 2Ø I-Line AC distribution panel (Provided w/ Enclosure)
34. Two (2), 4018 – 225A station service AC distribution panel branch breaker
35. One (1), 4051 - power block
36. One (1), high voltage protection (HVP) box (provided by IT) (to be verified during detail engineering)
37. One (1), telephone interface box (to be verified during detail engineering)
38. One (1), 800A auto transfer switch (Provided by Sub Eng)
39. One (1), 800A disconnect switch

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.

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

1. One (1), 500kV, 5000A, 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), 500kV, metering accuracy CCVT
2. Three (3), 500kV, 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 AG2-581 provides for the initial construction of a new 500kV three breaker ring switching station between transmission structures 556/171 and 556/172 in Chesapeake 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 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 AG2-581 provides for the initial construction of a new 500kV three breaker ring switching station to support the new solar farm built by Project Developer. The site is located along Dominion's existing 500kV, 556 line from Clover Substation to Rawlings Substation. The cut line will consume two of the positions in the ring bus. The third position will be for the 500kV feed from Project Developer's Collector Station.

The Generating Facilities will share a common footprint and fence line with the AG2-581 station. The Point of Change in Ownership between the Project Developer and this station will be the 500kV 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 500kV three breaker ring switching station and Rawlings Substation. The existing line segment between the new 500kV three breaker ring switching station and Clover Substation shall remain line 556.

Additional work to be required at Clover Substation and Rawlings Substation.

Security and fence type – design level 1.

Note: Project 99-2908 is in Approved status. This project will change the line destination of Line 556 at Rawlings Substation going to Clover Substation. Project 99-2908 will connect Rawlings Substation to the future Unity Substation on a future Line 587. At the time of this AG2-581 project submission, location data for where the future Unity Substation will be constructed was not available, nor was pole coordinate information for the future Line 587. When these projects are constructed, islanding and line protection will need to be re-evaluated for all affected stations.

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 660’ x 440’. 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 2,200 linear ft of 5/8” chain link, 15 ft tall, perimeter fence around the station along with the security cameras and integrators as per design 1 fence standards
    a. Eleven (11), 20 ft tall super post
    b. Anti-dig barrier footing between the perimeter fence foundations
    c. Foundations for the fence posts, super posts, etc.

d. Ground tail, and miscellaneous grounding materials for fence posts, panel to panel connections, security and communication boxes as per the current engineering standards
e. Security integrations for fence

3. Three (3), 500kV, 5000A, 63kAIC, SF-6 circuit breaker
4. Six (6), 500kV, 5000A, 3-phase double end break switch
5. Six (6), 500kV, relay accuracy CCVT
6. Two (2), 500kV, 5000A wave tap
7. Two (2), line turner
8. Six (6), 396kV, 318kV MCOV surge arrester (For Terminal)
9. Three (3), 396kV, 318kV MCOV surge arrester (For Bus)
10. Two (2), 10kV, 8.4kV MCOV surge arrester
11. Two (2), SMD-20 fused disconnects with BCL fuse (to be verified during detail engineering)
12. Two (2), 167kVA, 13.2 - .12/.24kV transformer (to be verified during detail engineering)
13. One (1), dry type TX for security enclosure
14. One (1), 800A manual throwover switch
15. Three (3), 100A outdoor security AC NQ panel
16. One (1), 800A, 3-phase, outdoor utility distribution panel
17. Two (2), 150kW generator
18. Four (4), 1000-gallon liquid propane tank
19. Four (4), rosemount tank level monitor
20. Three (3) ATS (ratings to be verified during detail engineering)
21. Two (2), 500kV, heavy duty steel backbone (by Transmission)
22. Two (2), shield wire poles and four spans of shield wires (by Transmission)
23. One (1), 24' x 40' control enclosure
24. One (1), 14' x 24' security enclosure
25. One (1), 125 VDC, 400 Ah station battery and two 50 Amp chargers (size to be verified during detail engineering)
26. Approximately 860 ft of cable trough, with two (2) 20 ft road crossing section
27. One (1), 600A 1-phase outdoor security manual throwover switch (to be verified during detail engineering)
28. Eight (8), 38” x 38” x 42” precast concrete pull box
29. Station stone as required
30. Station lightning 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, and bus support stands
33. 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), 5603 – station network panel no. 1
6. One (1), 5603 – station network panel no. 2
7. One (1), high voltage protection (HVP) box (Provided by IT) (to be verified during detail engineering)
8. 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. Three (3), 1515 – 500KV breaker panel (use with 1510)
4. Three (3), 4536 – 500KV breaker condition monitor
5. Two (2), 1340 – 24” dual SEL-411L DCB/PLC line panel
6. Two (2), 4506 – 3-phase CCVT potential make-up box
7. One (1), 1603 – 24” SEL-451 islanding control scheme panel
8. Two (2), 4007 – 225A outdoor transmission yard AC NQOD
9. Five (5), 4016 – 600A disconnect switch
10. Two (2), 4018 – 800A I-line AC distribution panel
11. Two (2), 4019 – 225A 3-phase throw over switch
12. One (1), 4042 – security utility ATS (level 1,2)
13. One (1), 4042 – security generator ATS (level 1,2)
14. Two (2), 4000 – station service potential make-up box
15. One (1), 4153 – wall mount station battery monitor
16. One (1), 5618 – SEL-3555 communications panel
17. One (1), 1255 – station annunciator panel
18. One (1), 5021 – SEL-2411 RTU panel
19. One (1), 5609 – fiber optic management panel
20. Three (3), 4526_D – breaker with BCM fiber make-up box
21. One (1), 5202 – 26” APP 601 digital fault recorder
22. One (1), 5203 – traveling wave fault locator panel - TWS (to be verified during detail engineering)
23. One (1), 3102 – security enclosure alarm box
24. One (1), 4821 – generator and ATS interface box
25. One (1), 4533 – security generator monitor
26. One (1), 4526_G – generator monitor fiber make-up box
27. Two (2), 4800 – generator
28. Three (3), 4040 – 100A 2Ø outdoor security AC NQOD (Prov. by Sub Eng)
29. Two (2), 4040 – 100A 2Ø indoor security AC NQOD (Prov. by Sub Eng)
30. One (1), 4041 – security enclosure 600A 2Ø I-Line AC distribution panel (Provided w/ Enclosure)

31. Two (2), 4018 – 225A station service AC distribution panel branch breaker
32. One (1), 4051 - power block
33. One (1), 800A auto transfer switch (Provided by Sub Eng)
34. One (1), 800A disconnect switch

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), 500kV, 5000A, 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), 500kV, metering accuracy CCVT
2. Three (3), 500kV, 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 500 kV line 587 into a new substation called AG2-581, which is to be located in Brunswick County, VA. The line is to be cut-in between existing structures 587/171 and 587/172. Line 587 is being renumbered to 5XXX between AG2-581 substation and Rawlings substation. See **Figure 1** for the project location.

The proposed structures to be installed are two (4) 500 kV single circuit steel double deadend 3-poles, two (2) 500kV single circuit backbones, and two (2) steel static pole. The new conductor and shield wire to be used will be triple bundled (3) 1351 ACSS/TW (Type 13) "Martin" conductor and DNO-10100 OPGW. 7#7 Alumoweld will also be utilized for shielding within AG2-581 Substation.

Length of Route	**0.71 miles**
Location of the subject line (County/State)	**Brunswick County, VA**
Total Number of Permanent Structures	**8**
Total Number of Temporary Structures	**0**
CPCN/SCC Required?	**Yes**
New ROW Required?	**Yes**

New ROW Required:

ROW Length	ROW Width
0.33 Miles	275 ft.

This project will utilize current Dominion 500 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. All structures will be galvanized steel.

Structure Type	Dwg Number	Str. Qty.
500 kV SC DDE ENGR 3-Poles	15.241	2
500 kV SC DDE ENGR 3-Poles	15.242	2
500 kV SC Steel Backbone Structure	15.900	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 8 fiber splices

Length (Miles)	Circuit	# if Bundled-Wire Type "Name"	Start-End
0.35	587	Triple bundled (3) 1351 ACSS/TW (Type 13) "Martin" Conductor	Proposed Str. 587/172 – Proposed Str. 587/174
0.36	5XXX	Triple bundled (3) 1351 ACSS/TW (Type 13) "Martin" Conductor	Proposed Str. 5XXX/169 – Proposed Str. 5XXX/171

0.35	587	(2) DNO-10100 OPGW	Proposed Str. 587/172 – Proposed Str. 587/174
0.36	5XXX	(2) DNO-10100 OPGW	Proposed Str. 5XXX/169 – Proposed Str. 5XXX/171
0.18	1	7#7 Alumoweld Shield Wire	Between proposed static poles and backbones in AG2-581 substation

Transmission Owner Build - Existing Facilities to be Transferred or Modified

1. Cut and transfer the existing (3) 1351.5 ACSR (45/7) for Line 587 from existing structure 587/171 onto proposed structure 587/172.
2. Cut and transfer the existing (3) 1351.5 ACSR (45/7) for Line 5XXX from existing structure 5XXX/172 onto proposed structure 5XXX/171.
3. Cut and transfer the existing dual 7#7 Alumoweld Shield Wire for Line 587 from existing structure 587/171 onto proposed structure 587/172.
4. Cut and transfer the existing dual 7#7 Alumoweld Shield Wire for Line 5XXX from existing structure 5XXX/172 onto proposed structure 5XXX/171.

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 5XXX/172 and 587/171 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 120/95/120 ft for 587/172 and 5XXX/171 structures, 115/105/115 ft for 587/173 and 5XXX/170 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 587/172, 5XXX/171, 587/173, and 5XXX/170) will be designed for full-construction deadend loading for construction conditions.

6. Project area code required loading include: NESC Medium, 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. A right of way width of 150' is assumed based on existing plan and profiles.

10. The transmission team has identified no 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. This design is based on a preliminary substation arrangement based on coordination with the BMcD Substation Engineering team. The mileage of substation shield wire is subject to change pending the receipt of the general arrangement. See **Figure 2** for visual representation of the preliminary arrangement

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 east. As such, the developer switchyard will be directly connected via substation bus.

16. This project scope assumes that it is independent from other projects in the Transition Cycle. The following projects may impact the project scope if this assumption is incorrect.

a. AH1-528 – Line 556 Substation Cut-In between existing structures 556/199 and 556/200

Estimate Notes/Assumptions

1. This scope and estimate for project AG2-581 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. No “developer-option-to-build” estimate is included for this project due to the direct connection.

    a. One estimate has been provided for this scope.

        i. Transmission Owner Build (TO)

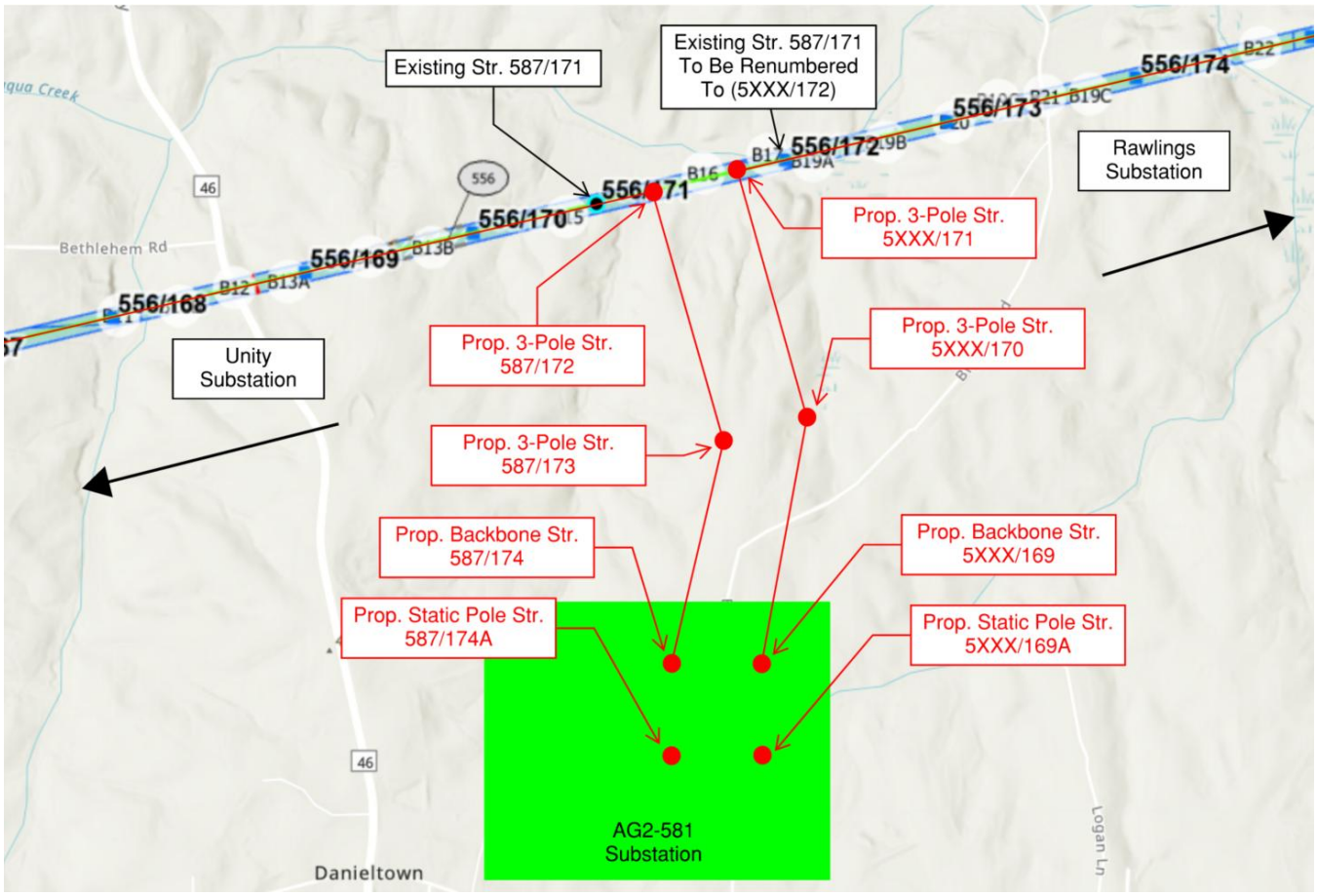
2. Engineered steel pole costs were determined based off typical wind and weight spans, line angles, and average structure heights for each voltage. These inputs were used to derive an estimated steel pole weight, which was used to develop the structure costs. This was determined for the high-level estimate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

Project Summary

Project AG2-581 provides for drawing work, islanding panel addition, relay resets, and field support necessary to change line 556 destination from Rawlings Substation to AG2-581 Generator Interconnect. The line number may be changed. Consult the construction One Line. This project is the Remote End Network Upgrade for the AG2-581 Generator Interconnect Project.

Note: Project 99-2908 is in Approved status. This project will change the line destination of Line 556 at Rawlings Substation going to Clover Substation. Project 99-2908 will connect Rawlings Substation to the future Unity Substation on a future Line 587. At the time of this AG2-581 project submission, location data for where the future Unity Substation will be constructed was not available, nor was pole coordinate information for the future Line 587. When these projects are constructed, islanding and line protection will need to be re-evaluated for all affected stations.

Purchase and install relay material:

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

Attachment #7: Network Upgrade – Rawlings Substation

Project Summary

Project AG2-581 provides for drawing work, relay resets, and field support necessary to change line 556 destination from Clover Substation to AG2-581 Generator Interconnect. The line number may be changed. Consult the construction One Line. This project is the Remote End Network Upgrade for the AG2-581 Generator Interconnect Project.

Note: Project 99-2908 is in Approved status. This project will change the line destination of Line 556 at Rawlings Substation going to Clover Substation. Project 99-2908 will connect Rawlings Substation to the future Unity Substation on a future Line 587. At the time of this AG2-581 project submission, location data for where the future Unity Substation will be constructed was not available, nor was pole coordinate information for the future Line 587. When these projects are constructed, islanding and line protection will need to be re-evaluated for all affected stations.