

PJM Facilities Study Report
For
Network Upgrade N6872
Transition Cycle #1

June 2025

Introduction

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

A. Project Description

The System Impact Study for PJM Interconnection Transition Cycle #1 has identified the need for PJM Network Upgrade N6872. The scope of this Network Upgrade includes the following:

- Upgrade 15.05 Miles of 230kV transmission line 238 from 238/126 to Clubhouse Substation

B. Transmission Owner Facilities Study Results

1. Detailed Scope of work for Network Upgrade N6872:

The following is a detailed description of Transmission Owner Upgrades for Network Upgrade N6872. These facilities shall be designed according to the Transmission Owner's Applicable Technical Requirements and Standards. Once built the Transmission Owner will own, operate, and maintain these facilities.

See Preliminary Scoping Summaries located in the Appendices, Attachment #1, #2 and #3.

2. MILESTONE SCHEDULE FOR COMPLETION OF DOMINION WORK

Facilities outlined in this report are estimated to take 46 months to construct, from the time of full execution of the Generation Interconnection Agreement and completion of a construction kickoff call. This schedule may be impacted by the timeline for procurement and installation of long lead items and the ability to obtain outages to construct and test the proposed facilities.

Description	Start month	Finish month
Engineering	1	30
Permitting/Procurement	3	38
Construction	36	46

Due to outage congestion, Network Upgrades and/or internal Dominion projects have been identified as having possible outage conflicts with this network upgrade that may affect the estimated milestones listed above. Additional outage sequencing may be required that includes, but not limited to, the following projects:

3. ASSUMPTIONS IN DEVELOPING SCOPE/COST/SCHEDULE

- Coordination with projects on Line 238
- It is assumed that an outage for Line 238 will be required for the work specified in this scope, and no temporary line configurations will be necessary for this project
- The conceptual estimate assumes that a laydown yard is required for this project.
- It is assumed for detailed engineering that a LiDAR survey will be required.
- This project scope assumes that N6872 will be completed prior to N6114, which involves the installation of an additional 230/115kV transformer at Clubhouse Substation.

4. LAND REQUIREMENTS

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

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

5. ENVIRONMENTAL AND PERMITTING

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

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

C. APPENDICES

- Attachment #1: Preliminary Scoping Summary – Substation AF2-033
- Attachment #2: Preliminary Scoping Summary – Substation Clubhouse
- Attachment #3: Preliminary Scoping Summary – Transmission



Project Number: N6872 – AE2-033 Station

Project Description: ***SUBSTATION SCOPE OF WORK*** Replace Line Lead for Line 238

Date: 06/20/2025

Revision Number: 0

Project Summary

Network upgrade N6872 provides for the upgrade of line 238 at AE2-033 Station in Sussex county, Virginia.

Assumptions & Clarifications:

- 1. The scope of work depicted on the drawings assumes that there is no overlap with other designs and construction activities, except if mentioned in this Project Summary.*

Purchase and install substation material – Network Upgrade:

1. Conductors, connectors, and grounding materials as per engineering standards



Project Number: N6872 – Clubhouse Substation
SUBSTATION SCOPE OF WORK
Project Description: Replace Line Lead for Line 238

Date: 06/20/2025

Revision Number: 0

Project Summary

Network upgrade N6872 provides for the uprate of line 238 at Clubhouse Substation in Greensville County, Virginia.

Assumptions & Clarifications:

- 2. The scope of work depicted on the drawings assumes that there is no overlap with other designs and construction activities, except if mentioned in this Project Summary.*

Purchase and install substation material – Network Upgrade:

2. Conductors, connectors, and grounding materials as per engineering standards

Purchase and install relay material – Network Upgrade:

1. One (1), 1340 – 24” dual SEL-411L DCB/PLC line panel

Remove relay material – Network Upgrade:

1. Remove Panel No. 1

230kV LINE 238
CLUBHOUSE – AE2-033
PROJECT N6872

PRELIMINARY SCOPING SUMMARY

This project serves to wreck and rebuild 230kV Line 238 between structure 238/126, outside of the AE2-033 Tap and Clubhouse Substation for approximately 15.05 miles, which is located between Sussex and Greensville County, VA. See **Figure 1** for the project location. The proposed work will require approximately 68.41 acres of additional land along the existing right of way. The project will install a total of one hundred and thirty-six (136) new structures. A Certificate of Public Convenience and Necessity (CPCN) filing is expected due to the quantity of structures that will need to be replaced as part of this project.

The existing line consists mainly of wood h-frame suspension structures built in 1982. The proposed structures to be installed are engineered single circuit 230kV steel double deadend and suspension h-frame structures. The existing twin bundled (2) 721 ACAR (18/19) conductor will be replaced with twin bundled (2) 768.2 ACSS (20/7) “Maumee” conductor. The existing single (1) 26/39 MM2 Optical Ground Wire (OPGW) and single (1) 3#6 Alumoweld shield wire will be replaced with dual (2) DNO-11410 OPGW.

This scope has an overlap with project AE2-033 which plans to interconnect Line 238 to a new substation by cutting in one (1) single circuit 230kV steel backbone structure mid-span between existing single circuit 230kV wood suspension structure 238/125 and 238/126. Additionally, as part of AE2-033, structure 238/125 and structure 238/126 will be replaced with two (2) engineered single circuit steel double deadend h-frame structures. New 3-phase twin bundled (2) 768.2 ACSS (20/7) “Maumee” conductor and dual (2) DNO-11410 OPGW will be installed between structure 238/125 and structure 238/126. It is assumed that project AE2-033 will be constructed prior to the start of this project.

It is assumed that an outage for Line 238 will be required for the work specified in this scope, and no temporary line configurations will be necessary for this project.

Design Considerations:

EXISTING FACILITIES TO BE REMOVED:

1. Remove one hundred and thirty-three (133) existing 230kV single circuit suspension wood h-frame structures as follows:
 - a. Structures 238/127 to 238/178 and 238/180 to 238/260
2. Remove one (1) existing 230kV single circuit double deadend wood h-frame structure as follows:
 - a. Structure 238/261
3. Remove one (1) existing light duty 3000A switch 23856M from the following self-supported switch structure:

- a. Structure 238/263B
- 4. Remove one (1) existing 230kV single circuit double deadend wood 3-pole structure as follows:
 - a. Structure 238/262
- 5. Remove one (1) existing 230kV single circuit double deadend concrete 3-pole structure as follows:
 - a. Structure 238/263
- 6. Remove approximately 15.05 miles of 3-phase twin bundled (2) 721 ACAR (18/19) conductor from the **ahead side** of structure 238/126 to the **back side** of backbone structure 238/264 (2201/1A) inside Clubhouse Substation.
- 7. Remove two (2) sets of existing 3-phase twin bundled (2) 721 ACAR (18/19) risers from the following existing self-supporting switch structure:
 - a. Structure 238/263B
- 8. Remove approximately 15.05 miles of single (1) 26/39 MM2 OPGW from the **ahead side** of the **east pole** of structure 238/126 to the **back side** of the **east pole** of backbone structure 238/264 (2201/1A) inside Clubhouse Substation.
- 9. Remove approximately 15.05 miles of single (1) 3#6 Alumoweld shield wire from the **ahead side** of the **west pole** of structure 238/126 to the **back side** of the **west pole** of backbone structure 238/264 (2201/1A) inside Clubhouse Substation.

EXISTING FACILITIES TO BE MODIFIED:

- 1. Replace two (2) 230kV bundled conductor I-String suspension assemblies with two (2) 230kV bundled conductor I-String suspension assemblies [32.120] on the following structure:
 - a. Structure 238/179
- 2. Replace one (1) 230kV bundled conductor V-String suspension assembly with one (1) 230kV bundled conductor V-String suspension assembly [32.850] on the following structure:
 - a. Structure 238/179
- 3. Replace one (1) insulated OPGW and one (1) insulated shield wire suspension assembly with two (2) insulated OPGW suspension assemblies [96.020] on the following one (1) structure:
 - a. Structure 238/179
- 4. Replace three (3) 230kV bundled conductor strain assemblies with three (3) 230kV bundled conductor strain assemblies [32.630] as follows:

- a. Three (3) strain assemblies on the **ahead side** of structure 238/126
5. Replace nine (9) 230kV bundled conductor crossing strain assemblies with nine (9) 230kV bundled conductor crossing strain assemblies [32.338] as follows:
 - a. Three (3) strain assemblies on the **back side** of structure 238/263A
 - b. Three (3) strain assemblies on the **ahead side** of structure 238/263A
 - c. Three (3) strain assemblies on the **back side** of backbone structure 238/264 (2201/1A)
6. Replace three (3) 230kV bundled conductor jumper loops with three (3) 230kV bundled conductor jumper loops [39.227] on the following two (2) structures:
 - a. Structures 238/126 and 238/263A
7. Replace one (1) non-insulated OPGW strain assemblies and one (1) non-insulated shield wire strain assemblies with two (2) non-insulated OPGW strain assemblies [96.061] as follows on the **back side** on the following structure:
 - a. Structure 238/264 (2201/1A)
8. Replace two (2) shield wire safety catches and two (2) OPGW safety catches with four (4) OPGW safety catches [96.100] as follows:
 - a. Two (2) safety catches on the **ahead side** of structure 238/263A
 - b. Two (2) safety catches on the **back side** of backbone structure 238/264 (2201/1A)
9. Replace two (2) insulated OPGW and two (2) insulated shield wire strain assemblies with six (6) insulated OPGW strain assemblies [96.060] as follows:
 - a. Two (2) OPGW strain assemblies on the **ahead side** of structure 238/126
 - b. four (4) OPGW strain assemblies on the **back side** of structure 238/263A
10. Replace one (1) OPGW jumper assembly and one (1) shield wire jumper assembly with two (2) OPGW jumper assemblies [96.210] on the following structure:
 - a. Structure 238/263A
11. Replace one (1) shield wire grounding assembly and one (1) OPGW grounding assembly with two (2) OPGW grounding assemblies [61.310] on the following structure:
 - a. Structure 238/264 (2201/1A)

PERMANENT FACILITIES TO BE INSTALLED:

1. Install one hundred and twenty-seven (127) 230kV steel single circuit suspension DOM pole embedded h-frame structures [12.555] as follows:
 - a. Structures 238/127 to 238/144, 238/146 to 238/162, 238/164 to 238/177, 238/180 to 238/196, 238/198 to 238/212, 238/214 to 238/229, 238/231 to 238/245, and 238/247 to 238/261

2. Install nine (9) 230kV custom engineered steel single circuit double deadend h-frame structures [12.165] on foundations as follows:
 - a. Structures 238/145, 238/163, 238/178, 238/197, 238/213, 238/230, 238/246, 238/262, and 238/263
3. Install one (1) 4000A switch replacement for switch 23856M on existing self-supporting switch structure 238/263B.
4. Install approximately 15.05 miles of 3-phase twin bundled (2) 768.2 ACSS/TW/HS (20/7) "Maumee" conductor from the **ahead side** of structure 238/126 to the **back side** of backbone structure 238/264 (2201/1A) inside Clubhouse Substation.
5. Install two (2) sets of 3-phase twin bundled (2) 768.2 ACSS/TW/HS (20/7) "Maumee" risers on the following self-supporting switch structure:
 - a. Structure 238/263B
6. Install approximately 15.05 miles of two (2) DNO-11410 OPGW from the **ahead side** of structure 238/126 to the **back side** of backbone structure 238/264 (2201/1A) inside Clubhouse Substation.
 - a. This includes the installation of sixteen (16) fiber splices as follows:
 - i. Two (2) fiber splices on structures 238/145, 238/163, 238/178, 238/197, 238/213, 238/230, 238/246, and 238/264 (2201/1A)

CONCEPTUAL SCOPE NOTES:

1. The existing line consists primarily of wood suspension h-frame structures installed in 1982. These structures are considered insufficient for the proposed conductor, resulting in the need for the line to be rebuilt. No PLS-CADD modeling was done for this project. Structures were replaced like for like and estimated using typical transmission right of way characteristics.
2. Structures are designed based off the following NESC code parameters: NESC Heavy, 90 mph wind, $\frac{3}{4}$ " Ice & 30 mph wind regardless of project location.
3. It is assumed for detailed engineering that a LiDAR survey will be required.
4. Any potential height restrictions were not accounted for in this design.
5. An existing right of way width of 150 feet is assumed based on existing plan and profiles and map viewer information. An additional 37.5 feet of right of way (ROW) will be required between structure 238/126 and structure 238/263B for approximately 15.05 miles. The necessary ROW extents will be verified during detailed design.
 - a. If additional ROW is unable to be acquired, alternative solutions could be to rebuild

- the line as monopoles or acquire project specific approval to not meet typical minimum right of way requirements.
- b. The additional ROW may shift the proposed centerline from the existing centerline. This project was scoped assuming that the shift would not be substantial enough to require replacing existing structure 238/179, and 238/263A which were replaced within the last five years.
 - c. Typical ROW width for two (2) 230kV lines on h-frame structures adjacent to each other is 200 ft. This scope is only increasing the width to 187.5 ft to account for the existing centerline of the adjacent line being offset 47.5 ft from the ROW edge, rather than the typical 60 ft.
6. A wetland delineation has not been completed as part of this conceptual package.
 7. Deadend structures have been incorporated into the line design to accommodate 12,000-foot wire reels, thereby eliminating the need for tension splices. The exact pull pad locations will be determined during the detailed design phase.
 8. Line 238 crosses Highway 58 and the Norfolk Southern Railroad between structure 238/263 and structure 238/263A, north of Clubhouse Substation. Additionally, Line 238 also crosses the Norfolk Southern Railroad between structure 238/192 and structure 238/193, and the Nottoway River between structure 238/176 and structure 238/177.
 9. This project scope assumes that N6872 will be completed prior to N6114, which involves the installation of an additional 230/115kV transformer at Clubhouse Substation.

CONCEPTUAL ESTIMATE NOTES:

1. Engineered steel pole costs were determined based off typical wind and weight spans, line angles, and average structure heights in the typical right of way associated with the structure type.
2. Steel pole foundation costs were based off the projects' location and structure type in the regional soil profile map. The regional soil profile map used for this project is Piedmont.
3. The conceptual estimate assumes that a laydown yard is required for this project.
4. According to the existing plan and profiles, there is a Columbia Gas line running parallel along the east side of Line 238. This gas line is approximately 35 feet from the center of the Line 238 structures. The project estimate includes a \$50,000 cost for an AC mitigation study for cathodic protection to cross this and any other existing utility.

5. Prior to detailed engineering, a full land rights review would be required. A desktop review was completed to estimate the project cost.
6. Access estimate cost inputs include the following assumptions:
 - a. Work pad totals based on provided SOW and assumptions from kmz file. Assume 15 mats for tangents and 30 mats for angles at each work pad for reconductor work and 50 mats per pull pad.
 - b. DDE structures assumed based off of wire reel lengths - based off of pull pad locations.
 - c. Pull pad locations based on location of major road/water crossings and line mileage.
 - d. Assuming that existing stone in Substations will be used for access per SOW and that access is existing or will be built by others before the start of construction. Assumes that the substations will be constructed with access roads built to and from Substations and work from inside the substations for Backbone installation.
 - e. Assumes no delays due to permitting or real estate issues after work begins. Assume no schedule compressions from SOC/PJM.
 - f. Assumes all clearing and forestry costs have been captured by others. No access costs for forestry activities included in this pricing.
 - g. Stream crossing based on estimates from aerial imagery.
 - h. Assumes that all existing roads may be dressed with stone that can remain at the end of the project. Assumes existing two track roads in many locations will be impermeable. No costs for stone road removal are included.
 - i. This project has elevated costs associated with the use of specialty matting required for access into Wet Swamp/Marsh like conditions.

Figure 1 – Project Location

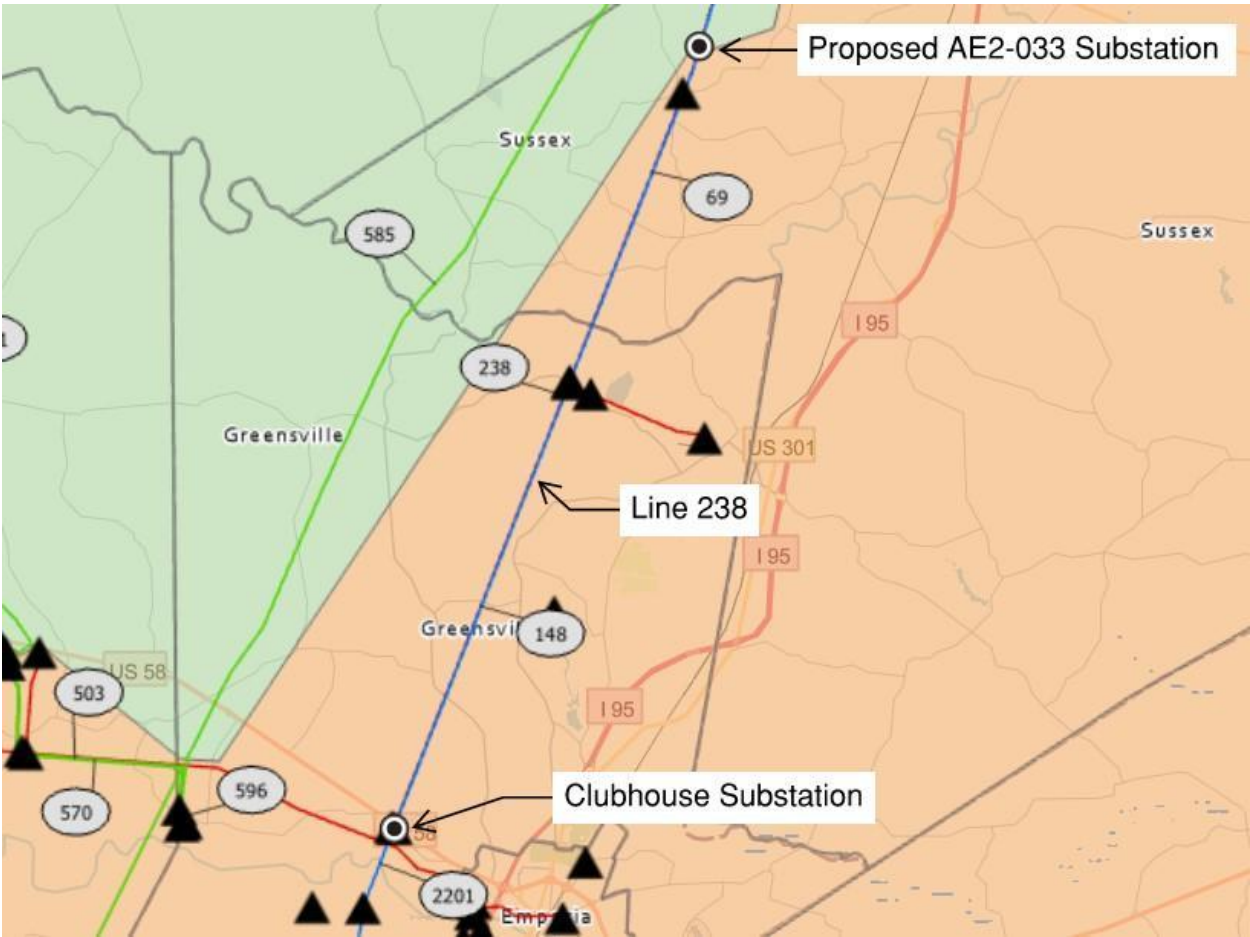
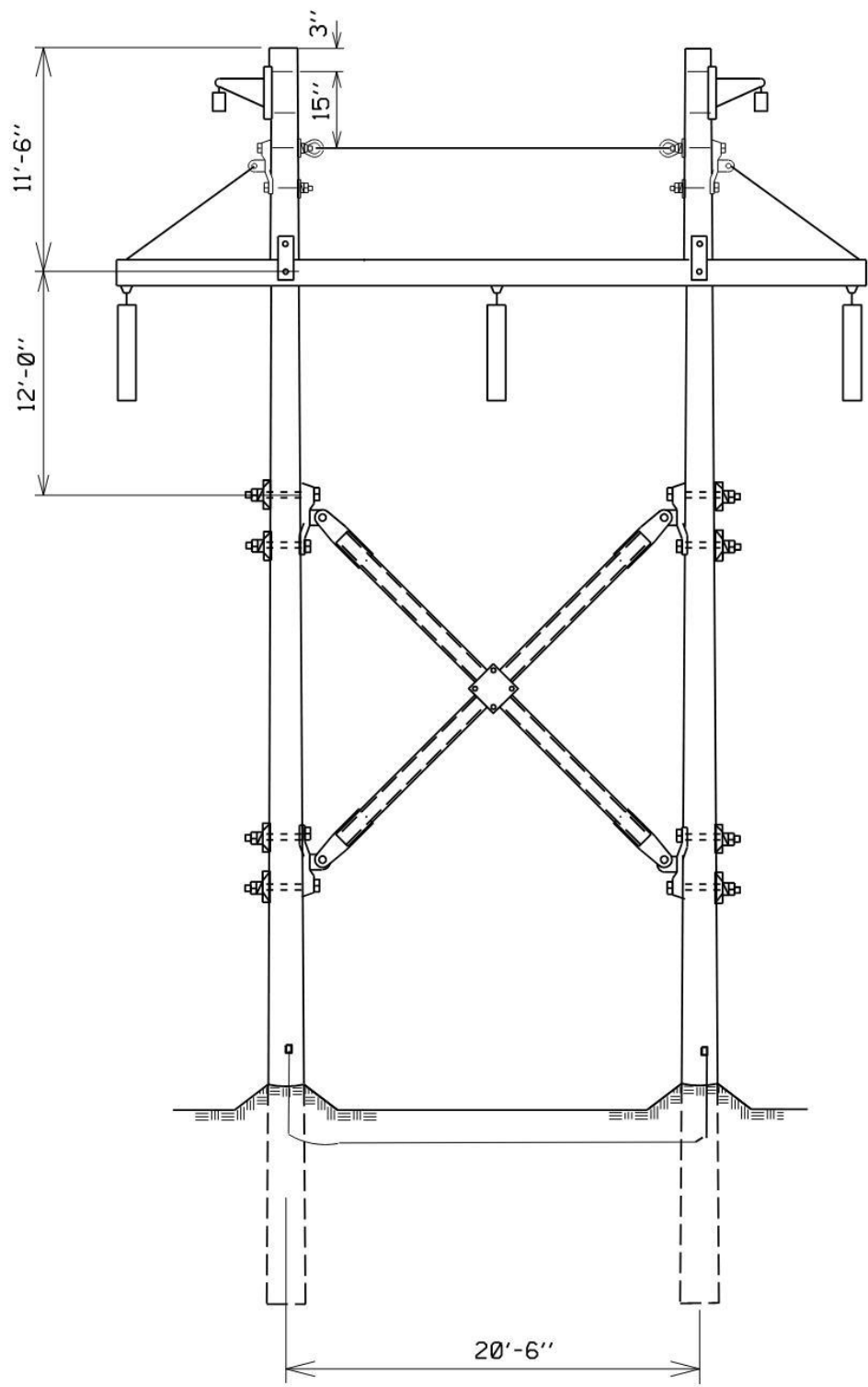


Figure 2 – Proposed Structure Configuration



Required Material Summary

Item	Qty
230kV SC DOM Pole Suspension Steel H-Frames [12.555]	127
230kV SC DDE Steel H-Frames [12.165]	9
12,000-Ft DNO-11410 OPGW Reels	16
12,000-Ft 768.2 ACSS/TW/HS "Maumee" Conductor Reels	48