Generation Interconnection
Facility Study Report

For

PJM Generation Interconnection Request
Queue Position AC1-161

Septa 500kV
168.2 MW Capacity / 240 MW Energy

June, 2020

General

This Facilities Study has been prepared in accordance with the PJM Open Access Transmission Tariff §207, as well as the Facilities Study Agreement between sPower Development Company, LLC, (Interconnection Customer (IC)) and PJM Interconnection, LLC (Transmission Provider (TP)). Virginia Electric and Power Company is the Interconnected Transmission Owner (ITO) and provided the input to develop this study.

The IC has proposed a solar generating facility located in Isle of Wight County, Virginia. The installed facilities will have a total capability of 240 MW with 168.2 MW of this output being recognized by PJM as capacity. The proposed in-service date for this project is 01/01/2023. **This study does not imply an ITO commitment to this in-service date.**

Point of Interconnection

AC1-161 will interconnect with the ITO transmission system will connect into a new bay at Septa 500kV substation.

Cost Summary

The AC1-161 project will be responsible for the following costs:

Description	Total Cost
Attachment Facilities	$ 2,550,168
Direct Connection Network Upgrades	$ 0
Non Direct Connection Network Upgrades	$ 3,928,291
Allocation for New System Upgrades	$ 54,600
Contribution for Previously Identified Upgrades	$ 79,277
Total Costs	**$ 6,612,336**

A. Transmission Owner Facilities Study Summary

1. Description of Project

Queue AC1-161 is a request to interconnect a 240 MW new solar generating facility to be located in Isle of Wight County, Virginia. The proposed generating facility will interconnect via a new breaker position at the ITO's Septa 500kV substation. Attachment Facility and Network Upgrade construction is estimated to be 8 – 12 months.

2. Amendments to the System Impact Study data or System Impact Study Results

None

3. Interconnection Customer's Milestone Schedule

- Plan to break ground April 1, 2021
- Permits – state level Permit By Rule and county level final site plan approval complete March 1, 2022
- Substantial site work completed February 1, 2022
- Delivery of major electrical equipment July 31, 2021
- Back Feed Power October 15, 2022
- Commercial Operation January 1, 2023

4. Scope of Customer's Work

IC will build a solar generating facility in Halifax County, Virginia. The generating facility will be comprised of solar arrays. AC1-161 consists of 120 x Power Electronics 2.2 MW solar inverters and 60 x 34.5/0.44 kV 4.4 MVA GSU transformers. The project is connected to the Point of Interconnection (POI) at Septa 500 kV substation via a 500/34.5/13.8 kV 213/240/267 MVA collector transformer.

5. Description of Facilities Included in the Facilities Study

The scope of the project AC1-161 includes necessary network upgrades and attachment facilities to connect the generation to the ITO 500 kV transmission network. The project will add a 500 kV circuit breaker in the ring bus at Septa substation to create a line position to connect the solar generation. There is no adequate space inside the existing Septa substation to install the necessary equipment which drives the need to expand.

The site plan (Attachment 2) was developed by the ITO during PJM's generation queue process. The single line is shown in Attachment 1.

6. Total Costs of Transmission Owner Facilities included in Facilities Study

Work Description	Direct		Indirect		Total Cost
	Labor	Material	Labor	Material	
Attachment Facilities	$1,410,540	$866,021	$200,027	$73,580	$2,550,168
Total Attachment Facilities Cost					
Septa substation expansion (n6647)	$1,878,170	$1,633,511	$260,141	$156,469	$3,928,291
Replace wave trap at Chickahominy Substation (n5464)	$12,311	$10,222	$3,378	$1,556	$27,467
Replace wave trap at North Anna Substation for Midlothian – North Anna 500 kV line #576 (n6055)	$12,162	$10,098	$3,337	$1,537	$27,133
Replace wave trap at both Ladysmith and Possum Point Substations for the Ladysmith – Possum Pt 500kV line #552 (n6063)	$14,132	$11,734	$3,878	$1,786	$31,530
Replace wave trap on the Elmont - Ladysmith 500kV line (n5483)	$21,401	$17,770	$5,872	$2,704	$47,747
Total Network Upgrades	$1,938,176	$1,683,336	$276,605	$164,051	$4,062,168
Total Project Costs	$3,348,716	$2,549,357	$476,632	$237,631	$6,612,336

7. Summary of Milestone Schedules for Completion of Work Included in Facilities Study:

Facilities are estimated to take 14 - 24 months to construct and this is based on the ability to obtain outages to construct and test the proposed facilities.

Proposed Schedule

- Detailed design: 6-12 months
- Permitting: 6-12 months (Timeline runs concurrent with design)
- Construction 8-12 months

B. Transmission Owner Facilities Study Results

1. Attachment Facilities

The Attachment Facilities include the portion of the interconnecting switching station which is associated solely with the single feed to the generating facilities collector station.

There is no adequate space inside the existing Septa substation to install metering equipment (including metering accuracy CT's and metering accuracy CCVT's). Substation will be expanded adjacent to the #578 line right-of-way to accommodate the new metering infrastructure and a line switch. ITO will build and own one span of the transmission line between the new backbone and new structures near the property line.

The point of demarcation will be the first transmission line structure outside the substation. The developer will build the line from the demarcation point to the generation substation.

Purchase and install substation material:

1. Three (3), 500 kV, 1000/5 current transformers, metering class
2. Three (3), 500 kV, 2512:1 coupling capacitor voltage transformers, metering class
3. Three (3), 396 kV, MO, 318 kV MCOV station class lightning arresters
4. One (1), 500 kV, 3000A double end break disconnect switch
5. Site expansion and ground grid extension
6. Expand the Level 1 Security Fence and add security infrastructure as required
7. Conductor, connectors, conduit, control cable, foundations, steel structures and grounding material as per engineering standards

Purchase and install relay material:

1. One (1), 1809 – 24" Dual SEL-311L Line Diff. w/ Reclosing Panel
2. One (1), 1809 – 24" Dual SEL-311L Line Diff. w/ Reclosing Panel (Note: This panel to be installed on opposite end of line and assumed it will be owned by the developer).
3. One (1), 1425 – 24" Dual SEL-735 Transmission & Gen. Interconnect Metering Panel
4. One (1), 4524 – Revenue Metering C.T. M.U. Box
5. One (1), 4506 – 3 phase CCVT Potential M.U. Box
6. One (1), 1323 – 24" Dual SEL-487E/735 PMU & PQ Monitoring Panel

2. Transmission Line – Upgrades

None

3. New Substation/Switchyard Facilities

None

4. Upgrades to Substation / Switchyard Facilities

PJM Network Upgrade #n6647 – Expand Septa 500kV substation:

The project will add a 500 kV circuit breaker in the ring bus at Septa substation to create a line position to connect the solar generation. The existing #578 line will be terminated right inside the station to allow for the new backbone to be installed on the tie line to the customer.

Purchase and install substation material at Septa substation:

1. One(1), 500 kV, 5000A dead tank circuit breaker
2. Two (2), 500 kV, 5000A double break disconnect switches
3. Conductor, connectors, conduit, control cable, foundations, steel structures and grounding material as per engineering standards
4. Remove – 500 kV bus section to install breaker and switches

Purchase and install relay material at Septa substation:

1. One (1), 4510 - SEL-2411 breaker annunciator
2. One (1), 1510 w/1515 – 24" Dual SEL-351 500kV trans. breaker w/ reclosing panel
3. One (1), 500kV breaker condition monitor
4. One (1), 4526_D – C.B. w/ BCM fiber optic M.U. box

Conductor/shield wire removals:

1. Remove one span of existing 2-2500 ACAR from back side of existing 5DEA tower 562/61, 578/61 and transfer to proposed 3-pole dead-end structure.

Structure Installations:

1. Install two (2) 500KV Galvanized Steel Single Circuit A-frame Backbone Structures and foundations.
2. Install one (1) 3-Pole Galvanized DDE Structure inside Switching Station.
3. Modify Existing Tower 562/61 to support dead-end loads.

Conductor/shield wire installations:

1. Install one span of 2 OPGW (48-fiber) shield wires (approximately 0.13 miles) from Proposed Backbone inside Septa Substation to the Proposed Backbone for interconnection.
2. Install one span of 3-1351 ACSR (approximately 0.13 miles) from Proposed Backbone inside Septa Substation to the Proposed Backbone for interconnection.

PJM Network Upgrade #n5464 – Line #557 Chickahominy – Elmont: Replace wave traps at Chickahominy substation on line #557 to Elmont. Estimated to take 14-16 months to engineer and construct. Costs include the following:

Purchase and install at Chickahominy:

1. Two (2), 500 kV, 5000 amp wave traps
2. Two (2), line tuners, down-leads and conduits
3. Conductor, connectors, steel structures, foundations and grounding material according to current engineering standards.

PJM Network Upgrade #n6055 – Line #576 Midlothian – North Anna: Replace wave trap at North Anna substation on the #576 line. Estimated to take 14-16 months to engineer and construct. Costs include the following:

Purchase and install at North Anna:

1. One (1), 500 kV, 5000 amp wave trap
2. One (1), line tuner, down-leads and conduits
3. Conductor, connectors, steel structures, foundations and grounding material according to current engineering standards

PJM Network Upgrade #n6063 - Line #568 Ladysmith – Possum Point 500kV: Replace wave trap at both Ladysmith and Possum Point Substations for the Ladysmith – Possum Pt 500kV line #568. Estimated to take 14-16 months to engineer and construct. Costs include the following:

Purchase and install at Ladysmith Substation:

1. One (1), 500 kV, 5000 amp wave trap
2. One (1), line tuner, down-leads and conduits
3. Conductor, connectors, steel structures, foundations and grounding material according to current engineering standards.

Purchase and install at Possum Point Substation:

1. One (1), 500 kV, 5000 amp wave trap
2. One (1), line tuner, down-leads and conduits
3. Conductor, connectors, steel structures, foundations and grounding material according to current engineering standards.

PJM Network Upgrade #n5483 – Line #574 Ladysmith – Elmont: Replace wave traps at Ladysmith and Elmont substations on the #574 line. Estimated to take 14-16 months to engineer and construct. Costs include the following:

Purchase and install at Ladysmith:

1. Two (2), 500 kV, 5000 amp wave traps
2. Two (2), line tuners, down-leads and conduits
3. Conductor, connectors, steel structures, foundations and grounding material according to current engineering standards.

Purchase and install at Elmont:

1. Two (2), 500 kV, 5000 amp wave traps
2. Two (2), line tuners, down-leads and conduits

Conductor, connectors, steel structures, foundations and grounding material according to current engineering standards.

5. Metering & Communications

PJM Requirements

The IC will be required to install equipment necessary to provide Revenue Metering (KWH, KVARH) and real time data (KW, KVAR) for IC's generating Resource. See PJM Manuals M-01 and M-14D, and PJM Tariff Section 8 of Attachment O Appendix 2.

ITO Requirements

Metering and SCADA/Communication equipment must meet the requirements outlined in section 3.1.6 Metering and Telecommunications of ITO's Facility Interconnection Connection Requirement NERC Standard FAC-001 which is publically available at www.dom.com.

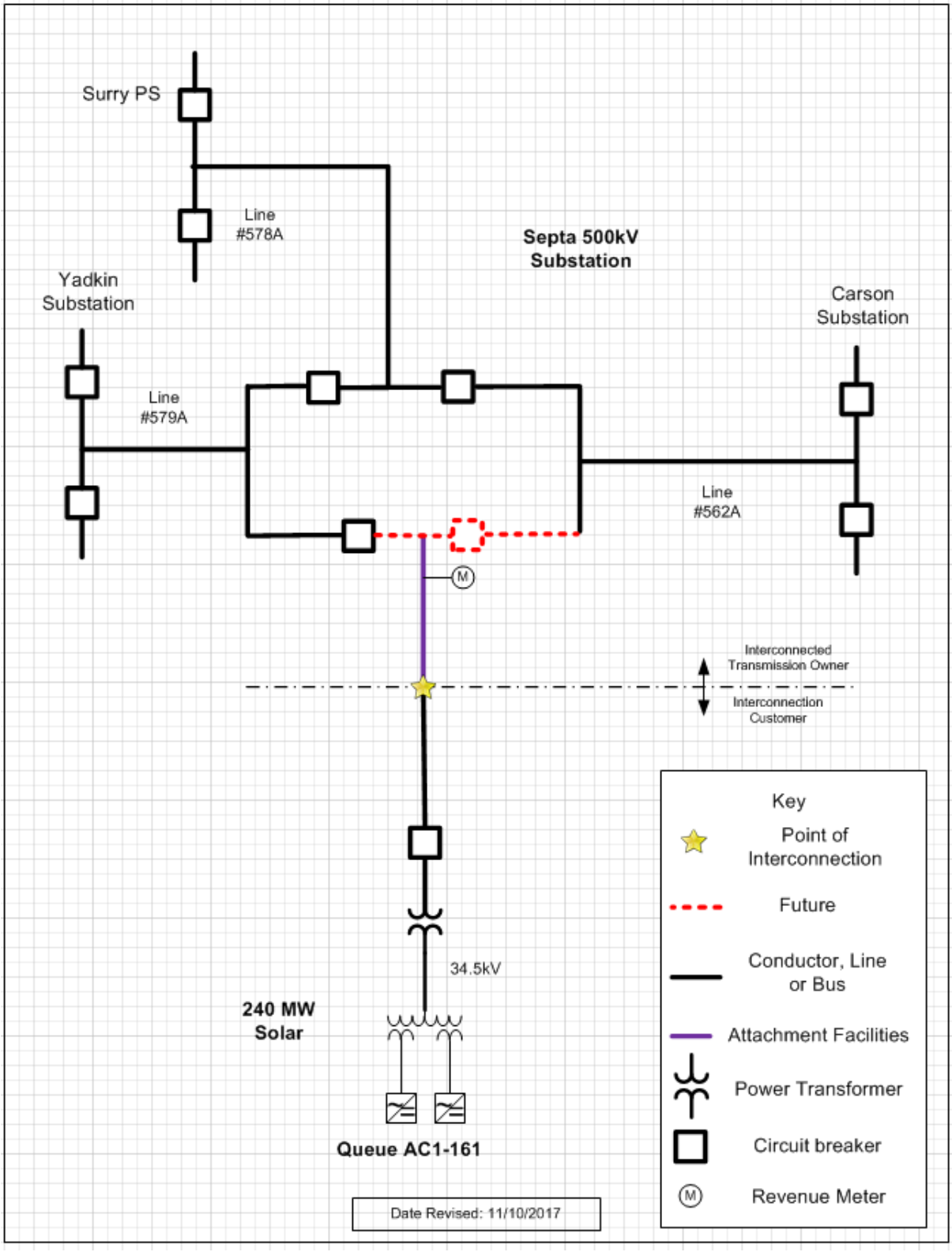
At the IC's expense, the ITO will supply and own at the Point of Interconnection bi-directional revenue metering equipment that will provide the following data:

a. Hourly compensated MWh received from the Customer Facility to the ITO;
b. Hourly compensated MVARh received from the Customer Facility to the ITO;
c. Hourly compensated MWh delivered from the ITO to the Customer Facility; and
d. Hourly compensated MVARh delivered from the ITO to the Customer Facility.

The IC will supply and own metering equipment that will provide Instantaneous net MW and MVar per unit values in accordance with PJM Manuals M-01 and M-14D, and Sections 8.1 through 8.5 of Appendix 2 to the ISA;

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

Attachment 1.
Single Line



Attachment 2.
Septa Substation General Arrangement