Generation Interconnection Facilities Study Report

for

PJM Generation Interconnection Request Queue Position AB2-120

Piney Grove - New Church 138 kV

December 2020

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A. Transmission Owner Facilities Study Summary

1. Description of Project

Nextera Energy Resources , LLC, the Interconnection Customer (IC), has proposed a **100** MW Maximum Facility Output (MFO) (**38** MWC; **100** Megawatt of Electricity (MWE)) solar generating facility to be located in Worcester County, MD. PJM studied AB2-120 as a 100 MW injection into the Delmarva Power and Light Company (DPL) system at the new three terminal 138 kV substation. This was evaluated for compliance with reliability criteria for summer peak conditions in 2020. The planned in-service date, as calculated by the transmission owner's schedule, is May 1, 2025.

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

The scope of the project as stated in the Impact Study, submitted on April 2017, has remained relatively unchanged. In addition, the estimates herein provided were performed in more detail than those provided in the Impact Study.

Delmarva Power & Light Company's (DPL) portion of the project is projected to be completed approximately 36-48 months following receipt of a fully-executed interconnection agreement. This schedule assumes design, permitting and construction.

3. Interconnection Customer's Milestone Schedule

The planned in-service date, as calculated by the transmission owner's schedule, is May 1, 2025.

4. Customer's Scope of Work

The IC assumes full responsibility for the design, permitting, and construction of all facilities associated with the AB2-120 generating station on their side of the Point of Interconnection (POI). The AB2-120 project will connect to the DPL transmission system at a new 138 kV three breaker ring bus substation to be constructed adjacent to the Piney Grove-New Church 138 kV circuit. A mutually agreed upon access route to the facility and any easements or permits required for access is the responsibility of the IC customer. The access road design must be approved by DPL to ensure it provides adequate access to the substation to support construction and maintenance activities. The IC customer's breaker will be 500 ft. or less away from the new ring bus. Backup station service power will be provided by distribution power circuits, assumed to be 25 kV.

The proposed interconnection will be required to satisfy the requirements outlined in DPL's "Technical Considerations Covering Parallel Operations of Customer Owned Generation" document for units greater than 1 MW. DPL's system protection group will need to receive the proposed settings and associated schemes for review to ensure compliance with this standard.

Step-up Transformer Requirements

If the IC elects to use a step-up transformer with a delta high side winding, additional measures are required in order to prevent Temporary-Over-Voltage (TOV) during abnormal conditions. Three phase voltage sensing must be installed on the high side of the generator's transformer. PT's cannot be installed on lower voltage bus. This requirement can be avoided by using a grounded-wye/grounded-wye step-up transformer.

Inverter Requirements

For the safety and reliability of the Transmission System, the Interconnection Customer shall design a non-synchronous generation facility with the ability to maintain a power factor of at least 0.95 leading to 0.95 lagging measured at the generator's terminals.

5. Description of Facilities Included in the Facilities Study (DPL's Scope of Work)

This report describes the electrical interconnection facilities and upgrades to existing DPL facilities necessary to support the IC's generation. The IC's interconnection circuit construction and the IC's generation facilities are not included in this study.

Attachment Facilities – Substation

- Build a new 138 kV, 3 terminal position ring bus substation.
    - Two positions of the ring bus will be transmission line terminals for the tie-ins of Line 13764 to the substation.
    - The other position will be a terminal configured for the interconnection of a generator. The IC's interconnection will be at 138 kV

Attachment Facilities – Transmission

- None

Attachment Facilities – Telecommunication

- OPGW fiber will provide relaying commination channels between the new ring bus station and Piney Grove and New Church substations.
- OPGW terminations will be added to the Piney Grove line takeoff structure
- OPGW terminations will be added to the New Church line takeoff structure
- Fiber in conduit will provide the communications channels to the IC's 138 kV breaker to be located within 500 ft. of the new ring bus substation.

DPL reserves the right to review the electrical protection design and relay settings for interconnecting customer facilities to ensure that the protective relaying equipment will be compatible with that installed at the remote substations. DPL personnel must be present at the time of commissioning to witness proper function of the protection scheme and related coordination.

6. Total Cost of Transmission Owner Facilities Included in the Facilities Study

Item	*Total Cost*
Attachment Facilities	
AB2-120 Substation & OPGW	$10,649,241
AB2-120 Transmission lie tie in	$ 1,159,517
Total Cost	**$11,808,758**

7. Summary of the Schedule for Completion of Work for the Facilities Study

The overall estimated timeline for this project, including upgrades, is approximately 36-48 months from the date of the PJM release for design/construction. This timeline may be able to be improved with preferred system outages.

Attachment Facility	*Timeframe*
Engineering, Procurement, and Construction	36-48 months

B. Transmission Owner Facilities Study Results

This section describes facilities identified to be installed (attachment facilities), replaced, and/or upgraded (upgrade facilities) by DPL to accommodate the project. During detailed design and analysis other components may be identified for installation or replacement due to this interconnection.

1. Transmission Lines – New

- Install a new short transmission line (no longer than 500 feet) to connect the IC's POI station to the new ring bus substation.

2. Transmission Lines – Upgrade

Not applicable

3. Distribution Lines – Upgrade

Not applicable

4. Substation/Switchyard Facilities

New Substation

- Protection and Control Systems:

- Major Equipment (and Long Lead Time material):
    - 138kV, 2000A, 40kA Circuit Breaker
    - 138kV, 2000A, 3-Pole Disconnect Switch
    - 138kV CVTs
    - 138kV Arresters
    - 138kV Combination meeting units
    - 50kVA, 138kV-120/240V, 1 ϕ, Station Serv. PT
    - 50kVA, 25kV-120/240V, 1 ϕ, Station Serv. Xfmr
    - Distribution connector for backup station service
    - Yard Lights
    - Control House and associated equipment
- 8' Chain link fence
- 8’ x 20’ Swing gates
- Precast cable trench
- 65’ Static Masts

- Grounding System:
    - New 138 kV Three Terminal Ring Bus Substation:
    - Install new ground grid throughout yard. Grid spacing to be determined by detailed ground grid studies. Estimate grid conductors using a 10’ x 10’ grid pattern and provide a grounding conductor ring around each breaker and the control house, including 3’ beyond the fence 162’.

- Foundations, steel structures, bus and duct banks:

- Site Work , including site preparation, and below grade construction

5. ***Substation/Switchyard Facility Upgrades***

- Not Applicable

6. Telecommunications Facility Upgrades

- OPGW fiber will provide relaying commination channels between the new ring bus station and Piney Grove and New Church substations.
- OPGW terminations will be added to the Piney Grove line takeoff structure
- OPGW terminations will be added to the New Church line takeoff structure
- Fiber in conduit will provide the communications channels to the IC’s 138 kV breaker to be located within 500 ft. of the new ring bus substation.

Drawing Review and Relay Test

DPL will review the IPR cabinet drawing prior to the purchase of equipment then test for proper relay operation after installation of the required protection equipment at IC site.

7. Metering & Communications

Metering

The IC will purchase and install all metering instrument transformers as well as construct a metering structure per DPL specifications. Also, due to large lead times DPL suggest purchasing a spare CT/PT combo unit. The secondary wiring connections at the instrument transformers will be completed by the IC's contractors and inspected by DPL, while the secondary wiring work at the metering enclosure will be completed by DPL meter technicians. The metering control cable and meter cabinets will be supplied and installed by DPL at a mutually agreeable location accessible by DPL. DPL meter technicians will program and install two solid state multi-function meters (Primary & Backup) for the new metering position. The Primary meter will be equipped with load profile, telemetry, and DNP. The IC will be provided with the Primary meters DNP output via RS485.

Transmission Owner will supply a wireless modem for MV90 interrogation. In the event that a wireless modem is unable to reliably communicate, the IC will be required to make provisions for a POTS (Plain Old Telephone Service) line or equivalent technology approved by DPL within approximately three feet of the DPL metering position to facilitate remote interrogation and data collection.

The location of the metering enclosure will be determined in the construction phase. The IC will provide 120 V power to the meter cabinet. The ownership of the metering equipment purchased or installed by the IC shall be transferred to the Transmission Owner at Commercial Operation.

Telemetry

It is the IC's responsibility to send the data that PJM and DPL requires directly to PJM. The IC will grant permission for PJM to send DPL the following telemetry that the IC sends to PJM: real time MW, MVAR, volts, amperes, generator status, and interval MWH and MVARH (from revenue meter output), and generator breaker position.

8. Environmental, Real Estate and Permitting

Environmental, Permitting and Real Estate

All work to accommodate the interconnection of AB2-120 is dependent upon the IC obtaining all necessary permits. Moreover, the IC shall be responsible for acquiring all necessary real property rights and acquisitions, including but not limited to: rights of way, easements, and fee simple, in a form approved by DPL. Any setbacks in obtaining the necessary real property rights, acquisitions and permits required for this interconnection may delay the construction schedule.

9. Summary of Results of Study

Substation, OPGW Estimate

WBS	WORK TYPE - DESCRIPTION	INTERNAL LABOR $	EXTERNAL LABOR $	FEES/ EQUIP $	EXTERNAL SUPPLIED MATERIAL $	NON STOCK MATERIAL $	STOCK MATERIAL $	TOTAL $
1.1	PLANNING/STUDY	$19,041	$57,784					$76,825
1.2	PLANNING/DESIG		$872,315			$22,340		$894,655
1.3	EXECUTION	$7,664	$4,493,174	$1,365,449		$2,707,717	$66,355	$8,640,359
1.4	CLOSE-OUT	$1,856	$8,864					$10,720
	SUBTOTAL	$28,560	$5,432,137	$1,365,449	-	$2,730,057	$66,355	$9,622,559
	OHS and Material OHS	$637,756	$17,550	$58,803	-	$302,801	$9,773	$1,026,682
	GRAND PROJECT TOTAL	$666,316	$5,449,687	$1,424,252	-	$3,032,858	$76,129	$10,649,241

New Transmission Line Cutin Estimate

DESCRIPTION	LABOR	MATERIAL	EQUIPMENT	TOTAL
INITIATE	$ 14,862			$ 14,862
DEVELOP	$ 84,714		$ 15,000	$ 99,714
CONSTRUCTION	$ 441,045	$ 231,323	$ 196,845	$ 869,213
CLOSE	$ 4,074			$ 4,074
SUBTOTALS	$ 544,694.63	$ 231,322.66	$ 211,844.76	$ 987,862.05
Project Oversight (aka Project Management)	$ 4,368			$ 4,368.00
OHS (A&G and E&S) and Material OHs	$ 57,028	$ 33,347	$ 22,217	$ 112,592.41
Taxes	$ 30,004	$ 13,102	$ 11,587	$ 54,694.18
GRAND PROJECT TOTAL	$ 636,095	$ 277,772	$ 245,649	$ 1,159,517

Generation projects meeting IRS "Safe Harbor" provisions generally do not incur "CIAC"(Contribution in Aid to Construction), a tax collected by the utility for the state or federal government. DPL does not expect to collect CIAC for this project. If for any reason, "CIAC" would be required for this project, it would be the responsibility of the party owning the generator to pay this cost.

DPL reserves the right to charge the Interconnection Customer operation and maintenance expenses to maintain the Interconnection Customer attachment facilities, including metering facilities, owned by DPL.

10. Schedules and Assumptions

The DPL schedule is based on a 36-48 month lead-time from execution of Interconnection Agreement to in-service date, including the assumption that it would not be impacted by storm damage and restoration, time of year limitations, permitting issues, outage scheduling, system emergencies, and contractor and equipment availability. DPL's component of the transmission line connection into the substation and cost estimate will be evaluated following the identification of IC's collection station and its relation to the new ring bus substation.

It is important to note that this project will be incorporated into the existing project work load at DPL at the time of contract execution. If the workload of existing projects is extensive, resource constraints may cause this project to be delayed beyond the projected in-service date.

Attachment #1

AB2-120
Piney Grove – New Church 138 kV
New 138 kV Substation