Generation Interconnection Facilities Study Report

for

PJM Generation Interconnection Request Queue Position AB2-136

Cambridge – West Cambridge 69kV

February 2021
Revised: May 2021

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Revision History

This report was revised to update the project name from "West Cambridge – Vienna 69 kV" to "Cambridge – West Cambridge 69 kV" to reflect the correct POI location.

A. Transmission Owner Facilities Study Summary

1. Description of Project

Egypt Road Solar LLC, the Interconnection Customer (IC), has proposed a **51.1** MW Maximum Facility Output (MFO) (**24.8** MWC; **51.1** Megawatt of Electricity (MWE)) solar generating facility to be located in Cambridge, MD. PJM studied AB2-136 as a 51.1 MW injection into the Delmarva Power and Light Company's (DPL) system at the new three terminal 69 kV substation that will tie in from line 6783 and evaluated it for compliance with reliability criteria for summer peak conditions in 2020. The IC has exercised Option to Build, as described in PJM's Open Access Transmission Tariff and will design and construct the substation to DPL standards and with DPL oversight. This project includes upgrading relay protection at the remote ends of the 69 kV line at the Cambridge and West Cambridge substations, which will be designed and constructed by DPL. The revised in-service date, as determined by the IC's schedule, is December 30, 2022.

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 June 2017, has remained relatively unchanged. In addition, the estimates herein provided were performed in more detail than those provided in the Impact Study.

3. Interconnection Customer's Milestone Schedule

The revised in-service date, as determined by the IC's schedule, is December 30, 2022.

4. Customer's Scope of Work

The IC assumes full responsibility for the design, permitting, and construction of all facilities associated with the AB2-136 generating station on their side of the Point of Interconnection (POI). DPL requires that an IC circuit breaker is located within 500 feet of the DPL substation to facilitate the relay protection scheme between DPL and the IC at POI. Additionally, the IC has chosen to exercise Option to Build and so assumes full responsibility for the design, permitting and construction of a new 69 kV three terminal ring bus switchyard bifurcating 69 kV line 6783 between the West Cambridge and Bayly substations. The IC will design and construct the new 69 kV three terminal ring bus switchyard to DPL's standards with DPL's oversight and turn over the new substation to DPL after substantial completion and DPL acceptance. The access road design must be approved by DPL to ensure it provides adequate access to the substation to support maintenance activities. AB2-136 will interconnect with the DPL transmission system at a new terminal in the substation. 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 IC customer's 69 kV breaker will be 500 ft. or less away from the new 69 kV ring bus. Backup station service power will be provided by distribution power circuits, assumed to be 25 kV. Remote end relay upgrades at the West Cambridge and Cambridge substations will be designed and constructed by DPL and the IC's new three terminal ring bus design must coordinate with the remote end relay upgrade design.

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.

Attachment and Direct Connect Facilities – Substation

- Build a new 69 kV, 3 terminal position ring bus substation.
- Transfer trip and remote trip will be required. Testing by DPL to occur.
- Install a short transmission line to connect the IC's POI which will be located at an interface breaker located no further than 500ft from the Option to Build Substation's ring bus.
- Install ADSS fiber optic cable in conduit from the new 69kV Substation to the POI, Testing in coordination with DPL

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 (69 kV) 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 on the IC side of the POI are not included in this study. Additionally, this description of DPL's Scope of Work does not include the facilities covered by Option to Build.

Attachment and Direct Connect Facilities – Substation

- DPL oversight of the IC's design and construction to ensure DPL's standards are met.

Non-Direct Connect Facilities – Substation

- Cut-in work to connect Option to Build substation to DPL 69kV lines.
- Relay upgrades will need to be performed on the remote ends at West Cambridge and Cambridge substations.

Attachment Facilities – Telecommunication

- Generation meter telemetry (MWH & MVARH) and remote trip capability will be provided to DPL's Energy Management System with future capability to adjust output and power factor if needed

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.

A three phase 69 kV revenue metering point needs to be established on the IC side of the recloser at the POI. See Section B.7 of this report for a detailed scope of work. DPL will send meter interval data (MWH and MVARH) to its control center via the fiber path.

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

Item	*Total Cost*
AB2 – 136	
• Substation Remote End Upgrades:	$ 411,673
• Substation Oversight Estimate:	$ 474,991
• ADSS	$ 900,000
• TL Cut In	$1,037,999
Total Cost	**$2,824,663**

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

The estimated timeline for engineering, procurement and construction will be approximately 12-18 months following receipt of a fully executed interconnection agreement. DPL's schedule for completion of work will be dependent on the IC's construction schedule, availability of required outages, TO resources, and optimal electric system conditions. In some cases, cut in construction may not begin until Direct Connection Facilities are deemed suitable for final tie in.

Attachment Facility	*Timeframe*
Engineering, Procurement, and Construction	12-18 months

B. Transmission Owner Facilities Study Results

This section describes facilities identified to be installed, 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

- Not Applicable

2. Transmission Lines – Upgrade

- Not applicable

3. Distribution Lines – Upgrade

- Not applicable

4. New Substation/Switchyard Facilities

- Not applicable

5. Substation/Switchyard Facility Upgrades

- Remote ends protection upgrades.

6. Telecommunications Facility Upgrades

- Install 48SM ADSS fiber optic cable to support communication with the new Option to Build substation.
- ADSS will provide relaying communication channels between the substations.

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
A three phase 69 kV revenue metering point will need to be established within the Interconnection Customer Facilities at the Point of Interconnection. The Interconnection Customer will purchase and install all metering instrument transformers as well as construct a metering structure per the Interconnected Transmission Owner's specifications. The secondary wiring connections at the instrument transformers will be completed by the interconnection Customer. the secondary wiring connection at the metering enclosure will be completed by the Interconnected Transmission Owner. The metering control cable and meter cabinets will be supplied and installed by the Interconnected Transmission Owner. The Interconnection Customer will install conduit for the control cable between the instrument transformers and the metering enclosure. The location of the metering enclosure will be determined during construction. The Interconnection Customer will provide 120V power to the meter cabinet. The Interconnected Transmission Owner will provide both the primary and backup meters. The Interconnected Transmission Owner will

program, install, and own the primary & backup solid state multi-function meters for the new metering position.

Each meter will be equipped with load profile, telemetry, and DNP outputs. The Interconnection Customer will be provided with one-meter DNP output for each meter. DPL will supply a wireless modem for remote meter 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. It is the Interconnection Customer's responsibility to send the data that PJM and Interconnected Transmission Owner require directly to PJM. The Interconnection Customer will grant permission for PJM to send Interconnected Transmission Owner the following telemetry that the Interconnection Customer sends to PJM: real time MW, MVAR, volts, amperes, generator status, and interval MWH and MVARH.

The Interconnected Transmission Owner's revenue meters will be the official meters and must be the source for reporting generation output to PJM. The Interconnection Customer is responsible for installing telemetry equipment necessary to obtain the revenue meter data and submitting the data to PJM.

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 AB2-136 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 Remote End Upgrades: $ 411,673
- Substation Oversight Estimate: $ 474,991
- TL Cut In: $1,037,999
- ADSS: $ 900,000

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 will be dependent on the IC schedule and will include 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.

Scheduling of DPL's relay upgrade work at the remote ends of the 69 kV line is dependent on the IC schedule and will assume standard land use environmental permitting and approval process.

It is important to note that this project will be incorporated into the existing project workload 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.

Attachment #1

AB2-136
West Cambridge - Bayly 69kV Ckt. 6783
New 69kV Substation