# *Generation Interconnection Facilities Study Report*

# *for*

# *PJM Generation Interconnection Request Queue Position AB2-036*

# *Church to Steele 138 kV*

***June 2021***

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## A. Transmission Owner Facilities Study Summary

### *1. Description of Project*

Cherrywood Solar 1, LLC, the Interconnection Customer (IC), has proposed a **92** MW Maximum Facility Output (MFO) (**34.9** MWC; **92** Megawatt of Electricity (MWE)) solar generating facility to be located in Caroline County, MD. PJM studied AB2-036 as a 102 MW injection into the Delmarva Power and Light Company's (DPL) system at the new three terminal 138 kV substation located on the Church-Oil City 138 kV circuit. This was evaluated 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.

### *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. The IC's project schedule includes project design, permitting and construction.

### *3. Interconnection Customer's Milestone Schedule*

The planned in-service date, as dependent on the IC's schedule, is November 15, 2023.

### *4. Customer's Scope of Work*

The IC assumes full responsibility for the design, permitting, and construction of all facilities associated with the AB2-036 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 the 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 138 kV three terminal ring bus switchyard bifurcating 138 kV line 13701 between the Oil City and Church substations. The IC will design and construct the new 138 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. AB2-036 will interconnect with DPL at the new three terminal 138 kV 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 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 138 kV breaker will be 500 ft. or less away from the new 138 kV 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.

***Attachment and Direct Connect 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 13701 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.
    - There is no power transformer changing voltage for the IC's interconnection.
- Install a short transmission line to connect the IC's POI which will be at located at an interface breaker no further than 500ft from the Option to Build Substation's ring bus.
- Installation of fiber to POI.

***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 (138 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 Point of Interconnection (POI).

## *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 138 kV lines.
- Relay upgrades at remote ends.

***Attachment Facilities – Transmission***

- Not applicable

***Attachment Facilities – Telecommunication***

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 138 kV revenue metering point needs to be established on the DPL side of POI. See Section B.7 of this report for a detailed scope of work.

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

| *Item* | *Total Cost* |
|---|---|
| *Attachment Facilities* | |
| *AB2-036* | |
| Substation Oversight Estimate: $ 241,828 | $ 241,828 |
| Substation Remote End Upgrades: $ 411,673 | $ 411,673 |
| TL Cut-In | $ 1,159,517 |
| ADSS | $ 900,000 |
| Total | $2,713,018 |

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

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.

## 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*

- 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*

- Relay upgrades at remote ends

### *6. Telecommunications Facility Upgrades*

- Install 48SM ADSS fiber optic cable to support communication with the new Option to Build 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***
A three phase 138 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 AB2-036 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 Oversight Estimate: $ 241,828
- Substation Remote End Upgrades: $ 411,673
- Cut in work to connect Option to Build Substation: $ 1,159,517
- ADSS fiber: $ 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.

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*

# AB2-036
# Church – Steele 138 kV
# New 138 kV Substation