Generation Interconnection Facilities Study Report

(Rev 1)

for

PJM Generation Interconnection Request Queue Position AB2-179

"Townsend 138 kV"

August 2019

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A. Transmission Owner Facilities Study Summary

1. Description of Project

Community Energy Solar Development LLC, the Interconnection Customer (IC), has proposed a **50.0** MW Maximum Facility Output (MFO) (**37.6** MWC; **50.0** Megawatt of Electricity (MWE)) solar generating facility to be located in New Castle, DE. PJM studied AB2-179 as an injection into the Delmarva Power and Light Company's (DPL) system at the Townsend 138 kV Substation and evaluated it for compliance with reliability criteria for summer peak conditions in 2020. The planned in-service date, as requested by the IC during the project kick-off call, is December 31st, 2018. This date is not attainable due to additional required PJM studies and the Transmission Owner's construction schedule.

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 May 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 months following receipt of a fully-executed interconnection agreement. This schedule includes project design, permitting and construction.

3. Interconnection Customer's Milestone Schedule

The planned in-service date, as requested by the IC during the project kick-off call, is Dec 2018. This date is not attainable due to additional required PJM studies and the Transmission Owner's construction schedule.

4. Customer's Scope of Work

The IC assumes full responsibility for the design, permitting, and construction of all facilities associated with the AB2-179 generating station on their side of the Point of Interconnection (POI). The POI is required to be within 500 feet of the new substation terminal. AB2-179 will interconnect with the DPL transmission system at a new terminal in the Townsend 138kV substation.

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 (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 are not included in this study.

Attachment Facilities – Substation

- Build a new 7th position onto the 138 kV, 6 position ring bus at Townsend Substation and interconnect a new 50MW Solar Plant in New Castle county, Delaware.

Attachment Facilities – Transmission

- Install a new short transmission line, approximately 100', to connect the IC's POI station to the new ring bus substation.

Attachment Facilities – Telecommunication

- Voice quality phone line Plain Old Telephone Service (POTS) within approximately 3 feet of metering position
- Fiber in conduit will provide the communications channels to the IC's 138 kV breaker to be located within 500 ft. to the west of the existing Townsend 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*
AB2-179 (Substation)	$ 1,942,717
AB2-179 (Attachment Facilities)	$ 35,800
Total Cost	**$1,978,517**

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 months from the date of the signed Interconnection Agreement. This timeline may be able to be improved with preferred system outages.

Attachment Facility	*Timeframe*
Engineering, Procurement, and Construction	36 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, approximately 100', 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. New Substation/Switchyard Facilities

Not applicable

5. Substation/Switchyard Facility Upgrades

- SEL-487 primary customer interconnect bus differential, new 20" panel
- SEL-387 back-up customer interconnect bus differential, same 20" panel as primary
- SEL-451 breaker control, new 20" panel
- 20" Metering rack – IC AB2-179 interconnection metering

Note: additional details will be specified in the system protection specification (not available at this time)

- Major Equipment (and Long Lead Time material):
    - 138kV 2000A, 40kA, Circuit Breaker
    - 138kV, 2000A, 3-Pole Disconnect Switch
    - 138kV CVT for synchronizing
    - 138kV CT/VT Combination Units, for Metering
    - 138kV Surge Arresters

- Revenue metering with 20” rack
- Revenue metering enclosure
- Relay Panel, Transmission Line, FL/BU (20”)
- Control Panel, 138 kV Circuit Breaker (20”)

- Removal of equipment:

- Grounding System:
  - Connect the new structural steel supports, dead end takeoff structure, CT/VT combination units, CVT, 138kV circuit breaker, disconnect switches, surge arresters to the substation ground grid.

- Foundations, steel structures, bus and duct bank

- Site work, including site preparation and below grade construction

6. Telecommunications Facility Upgrades

- 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 suggests 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 agreed upon location accessible to 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.

The IC will be required to make provisions for a POTS (plain old telephone service) line within approximately three feet of each 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.

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

Permitting and Real Estate

All work to accommodate the interconnection of AB2-179 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.

Environmental

Any necessary environmental studies outside of the substation will be the responsibility of the IC. DPL Environmental Planning will be responsible for the environmental permitting covering the work inside the DPL substation.

9. Summary of Results of Study

Substation and Transmission Line Estimate

DESCRIPTION	LABOR	MATERIAL	EQUIPMENT	TOTAL
PLANNING / STUDY	**$ 34,538**	**$ -**	**$ -**	**$ 34,538**
PLANNING / DESIGN	**$ 182,747**	**$ -**	**$ -**	**$ 182,747**
EXECUTION	**$ 808,061**	**$ 579,853**	**$ 224,031**	**$ 1,611,945**
CLOSEOUT	**$ 4,363**	**$ -**	**$ -**	**$ 4,363**
SUBTOTAL	**$ 1,029,709**	**$ 579,853**	**$ 224,031**	**$ 1,833,593**
Project Oversight (aka Project Management)	$ 20,136	$ -	$ -	$ 20,136
OHS (7% A&G and E&S) and Taxes	$ 60,306.03	$ 50,968.74	$ 13,513.30	$ 124,788
GRAND PROJECT TOTAL	**$ 1,110,151**	**$ 630,822**	**$ 237,544**	**$ 1,978,517**

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 an approximate 36 month lead-time from the signed 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.

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.

Project Assumptions:

- The new 138 kV transmission line will enter the Townsend Substation from the West.
- There are no underground services in the area of the new build.
- The transmission line span is approximately 100' with no need for structures.
- The new foundations do not affect the drainage or storm sewers or any other civil condition.
- Existing 138 kV high and low bus future GOAB switch stand foundations are adequate to support the new 138 kV GOAB switches and switch stands.

Attachment #1