Generation Interconnection
Feasibility Study Report
Queue Position X4-017

The Interconnection Customer (IC) has proposed a 20 MWE (7.6 MWC; 20 MW MFO) solar powered generating facility to be located in Wicomico County, Maryland. PJM studied X4-017 as a 20 MW injection into the Delmarva Power and Light (DPL) system at the Fruitland 69kV substation and evaluated the project for compliance with reliability criteria for summer peak conditions in 2015. The planned in-service date, as stated in the Attachment N, is June 1, 2017.

Point(s) of Interconnection

During the kick-off call for queue project X4-017, the Interconnection Customer requested a direct connection into the Delmarva Power and Light (DPL) Fruitland 69kV substation at a new bus position. During the Feasibility Study evaluation DPL determined that it is not possible to add another bus position at Fruitland Substation due to insufficient space both inside and outside of the DPL fence line. Therefore, the requested Point of Interconnection cannot be accommodated.

The next closest 69kV interconnection option is the construction of a new three (3) breaker ring bus substation. As a result, X4-017 will interconnect with the Delmarva Power and Light system at a new 69kV three (3) breaker ring bus substation to be constructed adjacent to the Fruitland-Loretto 69kV circuit.

Direct Connection Requirements

Transmission Owner Scope of Work

The scope of work and estimated costs for the direct connection facilities is as follows:

Substation Engineering Estimate:
Scope: Construct a 69kV three-breaker ring bus substation adjacent to the Fruitland – Loretto 69kV circuit, inclusive of a terminal position for queue project.

Estimate: $3,500,000
Construction Time: 24 – 36 months

Transmission Engineering Estimate:
Scope: Install a self-supporting 69kV steel pole with a concrete foundation, motor operated disconnects, and a short span to the new substation.
Estimate: $125,000
Construction Time: 24 months

Note: If location of generator is greater than 500 feet from substation, circuit breaker will be necessary

Note: the above cost does not include the Contribution in Aid of Construction (CIAC) tax.

Special Operating Requirements

1. DPL will require the capability to remotely trip the generator from its System Operations facility. Such tripping may be facilitated by either a generator breaker, inverter (if so equipped), or a line recloser, depending upon the specific circumstances and the evaluation by DPL.

2. It is the Interconnection Customer's responsibility to send the data that PJM and the Company requires directly to PJM. The Interconnection Customer will grant permission for PJM to send DPL the following telemetry that the Interconnection Customer sends to PJM: real time MW, MVAR, volts, amperes, generator/status, and interval MWH and MVARH.

3. The Interconnection Customer will be required to make provisions for a voice quality phone line within approximately 3 feet of each DPL metering position to facilitate remote interrogation and data collection.

4. A mutually acceptable means of interrupting and disconnecting the generator with a visible break, able to be tagged and locked out, shall be worked out with DPL Engineering.

Interconnection Customer Scope of Work

The Interconnection Customer (IC) is responsible for all design and construction related to activities on their side of the Point of Interconnection. Site preparation, including grading and an access road, as necessary, is assumed to be by the IC. Route selection, line design, and right-of-way acquisition of the direct connect facilities is not included in this report, and is the responsibility of the IC.

The IC will be required to install metering and telemetry equipment to provide revenue metering and real-time telemetry data to PJM. The requirements for this equipment are listed in Appendix 2, Section 8 of Attachment O to the PJM Tariff, as well as PJM Manuals 01 and 14D. Protective relaying and metering design and installation must comply with DPL's Applicable Standards.

The Interconnection Customer will purchase and install all metering instrument transformers as well as construct a metering structure per DPL's specifications. The secondary wiring connections at the instrument transformers will be completed by the Interconnection Customer's contractors and inspected by DPL, while the secondary wiring work at the metering enclosure will be completed by DPL's meter technicians. The metering control cable and meter cabinets will be supplied by DPL and installed by the Interconnection Customer's contractors. DPL's meter technicians will program and install two solid state multi function meters (Primary & Backup) for the new metering position. Each meter will be equipped with load profile, telemetry, and form-c pulse outputs.

Transmission Network Impacts

Potential transmission network impacts are as follows:

Generator Deliverability

*(Single or N-1 contingencies for the **Capacity** portion only of the interconnection)*

None

Multiple Facility Contingency

*(Double Circuit Tower Line, Line with Failed Breaker and, Bus Fault contingencies for the **Full** energy output.*

None

Contribution to Previously Identified Overloads

(This project contributes to the following contingency overloads, i.e. "Network Impacts", identified for earlier generation or transmission interconnection projects in the PJM Queue)

1. The MILF_230-STEELE 230 kV line (from bus 232004 to bus 232000 ckt 1) loads from 157.31% to 157.5% (DC power flow) of its normal rating (551 MVA) for the tower line contingency ('DBL_4NC'). This project contributes approximately 6.41 MW to the thermal violation.

Short Circuit

No issues identified.

Stability Analysis

Not required due to project size.

System Protection

Protective relaying and metering design and installation must comply with DPL's applicable standards. Any other costs determined by system protection as a result of the short circuit studies will be supplied in the near future.

Other Charges

DPL reserves the right to charge the Interconnection Customer Operation and Maintenance expenses to maintain the Interconnection Customer's Attachment Facilities, including metering and telecommunications facilities which are owned by DPL.

New System Reinforcements

(Upgrades required to mitigate reliability criteria violations, i.e. "Network Impacts," initially caused by the addition of this project's generation)

None

Contribution to Previously Identified System Reinforcements

(Overloads initially caused by prior Queue positions with additional contribution to overloading by this project.

1. To mitigate the (DP&L) Milford-Steele 230 kV line (from bus 232004 to bus 232000 ckt 1) overload will require reconductoring the 230kV circuit. The estimated cost to perform this work is **$35,100,000** and will take **30 months** to complete.

Potential Congestion due to Local Energy Deliverability

(PJM also studied the delivery of the energy portion of the surrounding generation. Any potential problems identified below are likely to result in operational restrictions to the project under study. The developer can proceed with Network Upgrades to eliminate the operational restriction at their discretion by submitting a Transmission Interconnection Request. Note: Only the most severely overloaded conditions are listed below. There is no guarantee of full deliverability for this project by fixing only the conditions listed in this section. With a Transmission Interconnection Request, a subsequent analysis will be performed which analyzes all overload conditions associated with the identified overloaded element(s). As a result of the aggregate energy resources in the area, the following violations were identified:

These are ***not*** required reliability upgrades.

1. The LINWOOD-CHICHST2 230 kV line (from bus 213750 to bus 213490 ckt 1) loads from 99.97% to 100.01% (DC power flow) of its normal rating (831 MVA) for non-contingency condition. This project contributes approximately 1.87 MW to the thermal violation.