Generation Interconnection
Feasibility Study Report
Queue Position Y1-087

The Interconnection Customer (IC) has proposed a 15 MWE (5.7 MWC; 15 MW MFO) solar powered generating facility to be located in Wicomico County, Maryland. PJM evaluated the Y1-087 project's impact on the transmission system by studying it as a 15 MW injection into the Delmarva Power and Light (DPL) system at the New Hope 69kV substation. The project was evaluated for compliance with reliability criteria for summer peak conditions in 2015. The planned in-service date, as stated in the Attachment N, is December 31, 2016.

Attachment Facilities and local upgrades (if required) along with cost, schedule, and terms and conditions to interconnect Y1-087 will be specified in a separate two party interconnection agreement between the Choptank Electric Cooperative (CEC) and the Interconnection Customer.

Point of Interconnection

Y1-087 will interconnect with the DPL transmission system at the New Hope 69/12 kV substation which is adjacent to DPL's North Salisbury-Worcester 69kV circuit. The New Hope substation is owned by the Choptank Electric Cooperative (CEC). The physical interconnection for the Y1-087 project is at the CEC 12kV distribution system at the New Hope substation.

Direct Connection Requirements

Transmission Owner Scope of Work

There is no direct connection scope of work for Delmarva Power and Light Company.

Interconnection Customer Scope of Work

The Interconnection Customer assumes full responsibility for design and construction of all facilities associated with the Y1-087 generating station and the direct connection line on the IC side of the Point of Interconnection.

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 PHI.

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 BRIDGEVL-GREENWD 69 kV line (from bus 232245 to bus 232244 ckt 1) loads from 102.54% to 102.73% (AC power flow) of its emergency rating (64 MVA) for the line fault with failed breaker contingency outage of CONTINGENCY DESCRIPTION ('DP51_X2-066'). This project contributes approximately 0.75 MW to the thermal violation.

2. The OIL_CITY-CHURCH 138 kV line (from bus 232801 to bus 232100 ckt 1) loads from 105.97% to 106.98% (**DC power flow**) of its emergency rating (159 MVA) for the tower line contingency outage of CONTINGENCY DESCRIPTION ('DBL_1NCB'). This project contributes approximately 1.62 MW to the thermal violation.

3. The STEEL138-OIL_CITY 138 kV line (from bus 232103 to bus 232801 ckt 1) loads from 113.22% to 114.24% (**DC power flow**) of its emergency rating (159 MVA) for the tower line contingency outage of CONTINGENCY DESCRIPTION ('DBL_1NCB'). This project contributes approximately 1.62 MW to the thermal violation.

4. The KENT-NMEREDTH 69 kV line (from bus 232215 to bus 232812 ckt 1) loads from 122.99% to 123.16% (AC power flow) of its emergency rating (93 MVA) for the tower line contingency outage of CONTINGENCY DESCRIPTION ('DBL_4NC'). This project contributes approximately 0.95 MW to the thermal violation.

5. The TAYLOR-BRIDGEVL 69 kV line (from bus 232825 to bus 232245 ckt 1) loads from 127.27% to 127.46% (AC power flow) of its emergency rating (64 MVA) for the line fault with failed breaker contingency outage of CONTINGENCY DESCRIPTION ('DP51_X2-066'). This project contributes approximately 0.75 MW to the thermal violation.

6. The MILF_230-STEELE 230 kV line (from bus 232004 to bus 232000 ckt 1) loads from 127.91% to 128.1% (**DC power flow**) of its emergency rating (551 MVA) for the tower line contingency outage of CONTINGENCY DESCRIPTION ('DBL_4NC'). This project contributes approximately 6.54 MW to the thermal violation.

Short Circuit

No issues identified.

Stability Analysis

Not required due to project size.

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. The costs identified below represent the total to complete the reinforcement, not necessarily this project's cost. Actual cost allocations will be deferred until the System Impact Study is performed.

1. To mitigate the BRIDGEVL-GREENWD 69kV line (from bus 232245 to bus 232244 ckt 1) overload will require reconductoring of the circuit. The estimated cost to perform this work is **$4,575,000** and will require **30 months** to complete.

2. To mitigate the OIL_CITY-CHURCH 138 kV line (from bus 232801 to bus 232100 ckt 1) overload will require reconductoring of the circuit. The estimated cost to perform this work is **$25,100,000** and will require **30 months** to complete.

3. To mitigate the STEEL138-OIL_CITY 138 kV line (from bus 232103 to bus 232801 ckt 1) overload will require reconductoring of the circuit. The estimated cost to perform this work is **$560,000** and will require **30 months** to complete.

4. To mitigate the KENT-NMEREDTH 69 kV line (from bus 232215 to bus 232812 ckt 1) overload will require reconductoring of the circuit. The estimated cost to perform this work is **$4,875,000** and will require **30 months** to complete.

5. To mitigate the TAYLOR-BRIDGEVL 69 kV line (from bus 232825 to bus 232245 ckt 1) overload will require reconductoring of the circuit. The estimated cost to perform this work is **$2,700,000** and will require **30 months** to complete.

6. To mitigate the MILF_230-STEELE 230 kV line (from bus 232004 to bus 232000 ckt 1) overload will require reconductoring of the circuit. The estimated cost to perform this work is **$23,000,000** and will require **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 100.76% to 100.79% (AC power flow) of its normal rating (831 MVA) for non-contingency condition. This project contributes approximately 1.39 MW to the thermal violation.

2. The LINWOOD-CHICHST2 230 kV line (from bus 213750 to bus 213490 ckt 2) loads from 105.66% to 105.69% (AC power flow) of its normal rating (831 MVA) for non-contingency condition. This project contributes approximately 1.45 MW to the thermal violation.

3. The X4-020 TAP-3 MILE I 500 kV line (from bus 912170 to bus 200016 ckt 1) loads from 110.92% to 110.95% (AC power flow) of its emergency rating (2598 MVA) for the single line contingency outage of CONTINGENCY DESCRIPTION ('PJM17'). This project contributes approximately 4.35 MW to the thermal violation.

4. The LINWOOD-CHICHST2 230 kV line (from bus 213750 to bus 213490 ckt 1) loads from 128.04% to 128.09% (AC power flow) of its emergency rating (983 MVA) for the single line contingency outage of CONTINGENCY DESCRIPTION ('220-39'). This project contributes approximately 2.73 MW to the thermal violation.

5. The LINWOOD-CHICHST2 230 kV line (from bus 213750 to bus 213490 ckt 2) loads from 128.5% to 128.54% (AC power flow) of its emergency rating (983 MVA) for the single line contingency outage of CONTINGENCY DESCRIPTION ('220-43'). This project contributes approximately 2.74 MW to the thermal violation.

6. The PINEY GR 230/138 kV transformer (from bus 232128 to bus 232007 ckt 1) loads from 129.73% to 129.78% (**DC power flow**) of its emergency rating (424 MVA) for the single line contingency outage of CONTINGENCY DESCRIPTION ('CKT 13713'). This project contributes approximately 1.39 MW to the thermal violation.