Generation Interconnection
Feasibility Study Report
Queue Position W1-093

The Interconnection Customer (IC) has proposed a 20 MWE (7.6 MWC) solar powered generating facility consisting of ground mounted fixed panel solar arrays to be located in Cape May Courthouse, New Jersey. PJM studied W1-093 as a 20 MW injection into the Atlantic City Electric (ACE) system and evaluated it for compliance with reliability criteria for summer peak conditions in 2014.

Point(s) of Interconnection

The IC requested that two (2) Points of Interconnection (POI) be evaluated for W1-093. The Primary POI is a direct connection into the Corson 69/12kV substation. The Secondary POI is a direct connection into the Swainton 69/12kV substation.

ACE study results indicated that the W1-093 project can be connected as follows:

10 MWs will connect to the existing T2 transformer at the Swainton substation; 10 MWs will connect to a new T1 transformer at the Corson substation.

Direct Connection Requirements

Transmission Owner Scope of Direct Connection Work

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

1. Swainton 69/12kV substation
   a. Install a new feeder terminal on the T2 transformer. The estimated cost to perform this work is **$436,000.**
   b. Install one (1) new 12kV feeder approximately 4.91 miles in length from the Swainton substation to the generating site using PAC overhead cable. The estimated cost to perform this work is **$1,972,000.**
   c. Install a utility operated recloser with relaying and communication equipment on the new feeder. The estimated cost to perform this work is **$50,000.**
   d. Install utility grade metering on the new feeder. The estimated cost to perform this work is **$20,000.**
   e. Install SCADA to Control Center for the new feeder. The estimated cost to perform this work is **$10,000.**

   The estimated cost to perform the work at the **Swainton** substation is **$2,488,000.**

2. Corson 69/12kV substation
   a. Install a new T1 transformer. The estimated cost to perform this work is **$1,547,000.**
   b. Install a new feeder terminal for the T1 transformer. The estimated cost to perform this work is **$175,000.**

c. Install one (1) new 12kV feeder approximately 4.81 miles in length from the Corson substation to the generating site using PAC overhead cable. The estimated cost to perform this work is **$1,924,000.**
d. Install a utility operated recloser with relaying and communication equipment. The estimated cost to perform this work is **$50,000.**
e. Install utility grade metering. The estimated cost to perform this work is **$20,000.**
f. Install SCADA to Control Center. The estimated cost to perform this work is **$10,000.**

The estimated cost to perform the work at the **Corson** substation is **$3,726,000.**

3. Perform Dynamic Study of each new feeder. The estimated cost to perform this work is **$60,000.**

4. Perform system protection planning, engineering, and transfer trip work. Transfer trip to be installed in locations where a generator installation could be islandized with a minimum load that is less than 3 times the size of generator capacity. The estimated cost to perform this work is **$30,000.**

The total estimated cost to perform this work is **$6,304,000** and will take an estimated **6 – 12 months** to complete after receipt of a fully executed Interconnection Service Agreement (ISA) and Interconnection Construction Service Agreement (CSA).

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

Interconnection Customer Scope of Direct Connection Work

The Interconnection Customer (IC) assumes full responsibility for design and construction of all facilities associated with the W1-093 generating station. Site preparation including grading and an access road, as necessary, is assumed to be by 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 Atlantic City Electric's Applicable Standards.

Primary Option 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)

Note: The following overloads have the potential to be removed during the System Impact Study phase due to the ACE requirement to use two (2) dedicated 10MW feeders as described in the "Point of Interconnection" section above. If they remain, reinforcements will be provided as part of the Impact Study results.

1. The CORSON#1-TUCKAHOE 69 kV line (from bus 228185 to bus 228130 ckt 1) loads from 155.54% to 159% (DC power flow) of its emergency rating (146 MVA) for the tower line contingency ('AE7TOWER'). This project contributes approximately 5.06 MW to cause the thermal violation.

2. The TUCKAHOE-MILL#2 69 kV line (from bus 228130 to bus 227946 ckt 1) loads from 156.49% to 159.96% (DC power flow) of its emergency rating (146 MVA) for the tower line contingency ('AE7TOWER'). This project contributes approximately 5.06 MW to cause the thermal violation.

Short Circuit

None

Stability Analysis

Not required due to project size.

Dynamic Analysis

A time-based dynamic study will be completed during the System Impact Study phase of W1-093.

AC injection into the grid must follow a ramp up rate that does not negatively affect the distribution system. An inverter capable of dynamic VAR output with Droop and Time Delay settings will be required. Further study will be required to review the impact to the grid under all output scenarios and grid load profiles. The proposed project will be reviewed for protection and coordination issues and any other required upgrades will be identified in future studies.

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.

Will be addressed as part of the System Impact study results.

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.

None

Secondary Option 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)

None

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.

None