Generation Interconnection
Feasibility Study Report
W3-059

The Interconnection Customer (IC) has proposed a 10 MWE (3.8 MWC) solar powered generating facility consisting of ground mounted, fixed panel, solar photovoltaic arrays. The project is to be located in Quinton, Salem County, New Jersey. PJM studied W3-059 as a 10 MW injection into the Atlantic City Electric (ACE) system at the Quinton 69/12kV substation and evaluated it for compliance with reliability criteria for summer peak conditions in 2014. The proposed in-service date, as stated in Attachment N, is December 31, 2012.

Point of Interconnection

W3-059 will interconnect with the Atlantic City Electric system at a new substation to be built adjacent to the Quinton-Roadstown Tap 69kV circuit.

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. Design and construct a new 69/12 kV substation at the PV site. This substation will be built to the Company's (the "Company" referring to ACE, DPL, or PEPCO) specifications for a distribution substation and be owned and operated by the Company. *Note: There are no plans to serve any load from this substation, however it will be built so that it can serve load in the future. The developer shall supply adequate land for the installation of the substation. The land shall be in close proximity to roads and be on buildable high land.*
2. Create a transmission loop by cutting into the Quinton – Roadstown 69 kV line with an approximate total distance of 6.3 miles to the new substation.
3. Establish one new 12 kV feeder with PAC overhead conductor from the new substation to the PV site.
4. A utility operated recloser equipped with the proper relaying and communications will be required for each feeder serving the PV generator.
5. Utility grade primary metering will be required for each feeder.
6. Generation telemetry and remote trip capability will be provided to the control center.
7. Perform a detailed time based study.
8. Protection, Planning, and other engineering departments will perform studies, design work, and prepare engineering estimates.
9. Transfer trip may be required.

The estimated cost to perform this work is as follows:

Estimated Costs			
New Substation			
New Substation			$4,404,000
PAC Express Feeder	0.1	Miles	$40,000
Transmission Feed 69 kV	6.3	Miles	$4,095,000
Transmission Feed 138 kV	0	Miles	$0
Fiber Installation (5 miles of fiber assumed)			$250,000
Recloser w/ Relaying and Communications		1	$50,000
Utility Grade Metering		1	$20,000
SCADA Integration into EMS		1	$10,000
Detailed Time Based Study			$30,000
Various Departments Work			$20,000
Subtotal Cost			$8,919,000
Subtotal Cost with 18% Overheads			$10,524,420
Approximate Total Cost with 15% Contingency			$12,103,083

The estimated time to complete this work is **24 - 36 months** 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.

Special Operating Requirements

1. The Transmission Owner 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 of the Company.
2. The Interconnection Customer will grant its permission to PJM for PJM to send the Company all telemetry that the Interconnection Customer sends to PJM.
3. The Interconnection Customer will be required to make provisions for a voice quality phone line within approximately 3 feet of each Transmission Owner metering position to facilitate remote interrogation and data collection.

Interconnection Customer Scope of Direct Connection Work

The Interconnection Customer (IC) assumes full responsibility for design and construction of all facilities associated with the W3-059 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.

Inverter Application

The inverter at the Customer Facility should have the following capabilities:

- Voltage flicker reduction through dynamic VAR response
- Ramp rate control
- SCADA communications
- Curtailment or other mitigation ability if high voltage were to occur
- Low voltage and system disturbance ride through
- Ability to receive and respond to a transfer trip or SCADA signal

The inverter shall operate in accordance with the IEEE 1547 series of standards that have been approved. While inverters should be capable of voltage stabilization thru dynamic VAR response and capable of low voltage and system disturbance ride through, neither of these capabilities shall be implemented until such time that the IEEE 1547 series of standards are revised and approved to include standards for these capabilities. At such time as these revised standards become available, the PV owner/operator shall cooperate with the Company to implement these capabilities with settings acceptable to the Company. Until such time, the inverters shall operate with a fixed power factor schedule as supplied by the Company.

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

Short Circuit

None

Stability Analysis

Not required due to project size.

Dynamic Analysis

A time-based dynamic study will commence during the System Impact Study phase of W3-059. Once complete, the results of the study will be reviewed and the proposed project will be evaluated for protection and coordination issues. Other required upgrades may be identified at that time.

Other Charges

It is anticipated that the Interconnection Customer will be charged for ongoing operation and maintenance of the attachment facilities. The methodology of calculating this charge is still under development.

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.

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.

1. (AE) The Roadstown Tap-W2-035TAP1 69 kV line (from bus 228223 to bus 902480 ckt 1) loads from 83.43% to 100.67% (DC power flow) of its emergency rating (58 MVA) for the operational contingency 'D/W-QUINT'. This project contributes approximately 10.00 MW to the thermal violation.

2. (AE) The W2-035TAP1-Laurel 69 kV line (from bus 902480 to bus 228259 ckt 1) loads from 111.02% to 128.26% (DC power flow) of its emergency rating (58 MVA) for the operational contingency 'D/W-QUINT'. This project contributes approximately 10.00 MW to the thermal violation.

3. (AE) The Quinton-Deepwater 69 kV line (from bus 228329 to bus 228323 ckt 1) loads from 107.52% to 115.86% (DC power flow) of its emergency rating (72 MVA) for the operational contingency 'WOOD-LAUR'. This project contributes approximately 6.00 MW to the thermal violation.

4. (AE) The Laurel-Carlls Corner #1 69 kV line (from bus 228218 to bus 228212 ckt 1) loads from 99.15% to 101.18% (DC power flow) of its emergency rating (130 MVA) for the operational contingency 'USLC-SM_V4-036B_WITH_W1-085B'. This project contributes approximately 2.63 MW to the thermal violation.