

# ***Generation Interconnection Feasibility Study Report Queue Position X2-027***

The Interconnection Customer (IC) has proposed a 2 MWE (0.76 MWC; 2 MW MFO) solar powered generating facility to be located in Quinton Township, New Jersey. PJM studied X2-027 as a 2 MW injection into the Atlantic City Electric (ACE) system 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 March 15, 2012.

## **Point(s) of Interconnection**

The Interconnection Customer requested a Primary and Secondary Point of Interconnection (POI) be evaluated for the X2-027 project. The Primary POI selected was a 12kV distribution level interconnection at the Quinton 69/12kV substation. The Secondary POI selected was a 69kV transmission level interconnection also at the Quinton 69/12kV substation. The study results are provided in the Transmission Network Impacts section below.

## **Direct Connection Requirements**

### **Primary POI Option**

During the evaluation of the Primary POI option, ACE determined that the Quinton 12kV substation was not available due to prior queue projects. As a result, X2-027 will interconnect with the Atlantic City Electric system at a new 69/12 kV substation to be built adjacent to the Deepwater-Laurel 69kV circuit.

### **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 Deepwater - Laurel 69 kV line with an approximate total distance of 1.0 mile to the new substation.
3. Establish one new 12 kV feeder with 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. Perform a detailed time based study.

7. Protection, Planning, and other engineering departments will perform studies, design work, and prepare engineering estimates.
8. Transfer trip may be required.

The estimated cost to perform this work is:

| <b>Estimated Costs</b>                             |         |                    |
|--|---------|--------------------|
| <b>New Substation</b>                              |         |                    |
| New Substation                                     |         | \$4,404,000        |
| Transmission Feed 69 kV                            | 1 Miles | \$900,000          |
| Fiber Installation (5 miles of fiber assumed)      |         | \$250,000          |
| Standard Feeder Get-a-way Including Recloser       | 1       | \$70,000           |
| Utility Grade Metering                             | 1       | \$20,000           |
| SCADA Integration into EMS                         | 1       | \$10,000           |
| Detailed Time Based Study                          |         | \$30,000           |
| Various Departments Work                           |         | \$20,000           |
| <b>Subtotal Cost</b>                               |         | <b>\$5,704,000</b> |
| <b>Subtotal Cost with 18% Overheads</b>            |         | <b>\$6,730,720</b> |
| <b>Approximate Total Cost with 15% Contingency</b> |         | <b>\$7,740,328</b> |

The estimated time to complete this work is **24-36 months** after receipt of a fully executed interconnection agreement.

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

**Special Operating Requirements**

1. The Interconnection Customer will grant its permission to PJM for PJM to send to PHI the following telemetry data that the Interconnection Customer sends to PJM: real time megawatts, megavars, 3 phase volts, 3 phase amperes and status, and interval megawatt-hours, and megavar-hours.
2. The Interconnection Customer will be required to make provisions for a voice quality phone line within approximately 3 feet of each Company metering position to facilitate remote interrogation and data collection.

**Interconnection Customer Scope of Direct Connection 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 Interconnection Customer will be responsible for contributing to future O & M costs associated with

the direct connect facilities.

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 Requirements and Capabilities

The Interconnection Customer's inverter should have the following capabilities:

- Voltage flicker reduction through set non-unity power factor settings between 0.95 lead and 0.95 lag

It is the responsibility of the Developer to obtain inverters that can operate with these requirements while also meeting all applicable requirements of IEEE and UL standards such as but not limited to IEEE 1547 and UL 1741.

### 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

No issues identified.

### **Stability Analysis**

Not required due to project size.

### **Dynamic Analysis**

A time-based dynamic study will commence during the System Impact Study phase of the project. 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.

### **System Protection**

Protective relaying and metering design and installation must comply with PHI'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**

ACE 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 ACE.

### **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.

None

### **Secondary Option**

PJM studied X2-027 as a 2 MW injection at the Quinton 69kV substation.

### **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)*

1. The Conastone-EMORY GR500 500 kV line (from bus 200004 to bus 200101 ckt 1) loads from 100.00% to 100.01% (DC power flow) of its emergency rating (2901 MVA) for the single contingency 'CNSTN\_\_230-4'. This project contributes approximately 0.21 MW to the thermal violation.

#### **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**

No issues identified.

### **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