Generation Interconnection
Feasibility Study Report
Queue Position X2-069

The Interconnection Customer (IC) has proposed a 5 MWE (1.9 MWC; 5 MW MFO) solar powered generating facility to be located in Swedesboro, New Jersey. PJM studied X2-069 as a 5 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 May 31, 2013.

Point(s) of Interconnection

The Interconnection Customer requested a Primary and Secondary Point of Interconnection (POI) be evaluated for the X2-069 project. The Primary POI selected was a 12kV distribution level interconnection at the Nortonville substation. The Secondary POI selected was a 69kV transmission level interconnection also at the Nortonville 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 ACE determined that the Nortonville 12kV substation was not available due to prior queue projects. As a result, X2-069 will interconnect with the Atlantic City Electric system at a new 69/12kV substation to be built adjacent to the Mansanto-Oldmans 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 Mansanto - Oldmans 69 kV line with an approximate total distance of 0.1 miles 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. 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:

Ball Park Costs			
New Substation			
New Substation			$4,404,000
Transmission Feed 69 kV	0.1	Miles	$300,000
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
Subtotal Cost			$5,104,000
Subtotal Cost with 18% Overheads			$6,022,720
Approximate Total Cost with 15% Contingency			$6,926,128

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

2. The Interconnection Customer will grant its permission to PJM for PJM to send the 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. For generation larger than 10 MW, a direct telemetry connection to PHI System Operations will be required via a radial connection to PHI's telecommunications system or a rented data circuit, at the Interconnection Customer's cost.

3. 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.

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 ACE Distribution Engineering.

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 shall have the following capabilities:

1. Voltage flicker reduction through dynamic VAR response
2. Ramp rate control
3. SCADA communications
4. Curtailment or other mitigation ability if high voltage were to occur
5. Low voltage and system disturbance ride through
6. 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 ACE to implement these capabilities with settings acceptable to Pepco Holdings, Inc. (ACE, DPL, and Pepco). Until such time, the inverters shall operate with a fixed power factor schedule as supplied by 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)

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 X2-069 as a 5 MW injection at the Nortonville 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)*

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.

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

None