

***Generation Interconnection  
Feasibility Study Report (Web Version)***

***For***

***PJM Generation Interconnection Request  
Queue Position W3-169***

***North Hanover 13.2kV Project***

**January 2011**

## **Scope**

Generation Interconnection Feasibility Study W3-169 for the Interconnection Customer (IC), examines the capability of Metropolitan Edison Co.'s (Met-ED) electric distribution system, and associated transmission system, to accept the output of the proposed 12.0 MW solar panel generation. The project has a scheduled in service date of June 2012.

## **Transmission System Network Impacts**

Queue project W3-169 was studied as a 12.0 MW (4.56 MW of which was Capacity) injection into ME's system at the North Hanover substation at both 13.2kV (Primary POI) and 115kV (Secondary POI). Project W3-169 was evaluated for compliance with reliability criteria for summer peak conditions in 2014.

Potential transmission network impacts or both Points of Interconnection at the North Hannover substation are as follows:

### **Generator Deliverability**

*(Single or N-1 contingencies for the Capacity portion only of the interconnection)*

No violations identified.

### **Multiple Facility Contingency**

*(Double Circuit Tower Line contingencies only with full energy output. Stuck Breaker and Bus Fault contingencies will be applied during the Impact Study)*

No violations identified.

### **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.)*

No violations identified.

### **New System Reinforcements**

*(Upgrades required to mitigate reliability criteria violations, i.e. "Network Impacts", initially caused by the addition of this project generation.)*

None required.

### **Contribution to Previously Identified System Reinforcements**

*(Overloads initially caused by prior Queue positions with additional contribution to overloading by this project. This project may have a % allocation cost responsibility which will be calculated and reported for the Impact Study.)*

None required.

## **Short Circuit**

*(Report over-dutied breakers.)*

None Required.

## **Energy Portion of Interconnection Request**

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. There is no guarantee of full delivery of energy 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 overloaded element(s) identified. As a result of the aggregate energy resources in the area, the following violations were identified.*

No violations identified.

## **FirstEnergy (MetEd )Distribution System Impacts**

### **Local Distribution Circuit Information**

This area is presently served by Distribution Circuit 00510-4, a three phase 13.2 kV grounded wye distribution circuit originating from Met-Ed's North Hanover Substation. The interconnection will be considered at the 13.2 kV bus as per customer request.

A Load Flow analysis was conducted to determine the impact of the generation project on the North Hanover substation 13.2 kV Bus. The study was completed using both a projected 2011 summer peak and a spring load level case. The findings and recommendations from this study are based on identifying abnormal conditions that violate either the FE Planning Criteria or the FE Interconnection Policy and are associated with this project.

FE cannot accommodate 12 MW of generation on one circuit. There is a FirstEnergy limit of 4 MVA solar and wind generation per circuit.

Furthermore, should one of the transformer banks at North Hanover fail, it would be replaced with several, electrically separate, 14 MVA transformers as per FirstEnergy's standard. The proposed 12 MW of solar generation would create unacceptable voltage swings on a 14 MVA transformer due to varying output levels from the array. This is due to varying sunlight intensities, (i.e. cloudiness). The voltage swings would cause excessive operation of the new 14 MVA distribution transformer's load tap changer.

A short circuit analysis was conducted to determine the fault duty contribution by the generator. The study found that no Met-Ed interrupting device will exceed its interrupting capacity due to

the fault duty contribution from the generator. Therefore no reinforcements will be required due to increased duty.

**Primary Point of Interconnection:** North Hanover substation 13.2 kV Bus

It was concluded based on the foregoing that interconnection at this POI is not feasible. Therefore no cost estimates were provided.

**Secondary Point of Interconnection:** North Hanover substation 115 kV Bus

Interconnection Customer LLC has chosen a Secondary POI of connecting directly to the 115 kV 990 line between the North Hanover substation and the Hunterstown substation, as shown on Attachment 3. While it has been determined that this connection is feasible, because it is the Secondary POI, a cost estimate for this option will not be provided in this Feasibility Study Report. However, in compliance with the FE Requirements for Transmission Connected Facilities document, if the Secondary POI is chosen, the Interconnection Customer must build a three breaker ring bus to split the 990 line and to accept the proposed generation. Interconnection Customer will also be responsible for constructing a radial attachment line to the 115 kV substation.