Generation Interconnection Feasibility Study Report

For

PJM Generation Interconnection Request Queue Position W3-045

Howell 12kV

March 2011

Preface

The intent of the feasibility study is to determine a plan, with ballpark cost and construction time estimates, to connect the subject generation to the PJM network at a location specified by the Interconnection Customer. The Interconnection Customer may request the interconnection of generation as a capacity resource or as an energy-only resource. As a requirement for interconnection, the Interconnection Customer may be responsible for the cost of constructing: (1) Direct Connections, which are new facilities and/or facilities upgrades needed to connect the generator to the PJM network, and (2) Network Upgrades, which are facility additions, or upgrades to existing facilities, that are needed to maintain the reliability of the PJM system.

In some instances a generator interconnection may not be responsible for 100% of the identified network upgrade cost because other transmission network uses, e.g. another generation interconnection, may also contribute to the need for the same network reinforcement. The possibility of sharing the reinforcement costs with other projects may be identified in the feasibility study, but the actual allocation will be deferred until the impact study is performed.

The Feasibility Study estimates do not include the feasibility, cost, or time required to obtain property rights and permits for construction of the required facilities. The project developer is responsible for the right of way, real estate, and construction permit issues. For properties currently owned by Transmission Owners, the costs may be included in the study.

General

The Interconnection Customer (IC), has proposed a 3.0 MW (1.14 MW capacity) solar generating facility. The facility will be located in Freehold, New Jersey.

Point of Interconnection

W3-045 will interconnect with the Jersey Central Power & Light system at the 12kV circuit #47050 from the Howell substation.

First Energy Analysis and Results

Local Distribution Circuit Information

This area is presently served by Disribution circuit 47050, a 3 phase 12.47kV grounded Wye distribution circuit originating from JCP&L's Howell substation.

Circuit Protection and Coordination

Main Line

To accommodate the proposed 3.0 MW capacity on the 12.5 kV distribution system, JCP&L will install 140 k protective fuses off main line, reconfigure existing mainline fusing for proper coordination and replace the existing current control of one capacitor bank with a programmable control capable of voltage over ride during light load.

At Substation

JCP&L will replace three existing (3) electro-mechanical relays with SEL-351 electronic relays on 2 distribution circuits and on the transformer bank at Howell substation. JCP&L will remove the existing relays and wiring, provide cabling, test switches, auxiliary relays and conduit.

Based on the MW capacity of the customer's system, his generation will backfeed to our 34.5 KV system which will require the installation of a bi-directional LTC control on the bank transformer.

At PV Facility

SCADA control system for the breaker will be designed by the customer, and must be approved by JCP&L/FirstEnergy prior to purchase. Typically, these systems utilize fiber optic or leased phone line. The SCADA control system must communicate with our RDO dispatch center located in Red Bank, NJ.

The customer must install and maintain the SCADA control system equipment. Equipment needed inside JCP&L facilities may be installed by JCP&L personnel. Periodic testing of the system will be required and the system must be configured to fail in a 'trip' condition- i.e. upon loss of communications, the system must trip the generator off line.

Distributed Generation must not interfere with the proper detection and clearing of faults on the First Energy system.

Additional Requirements

- JCP&L will work with the IC to determine the exact Point Of Interconnection (POI) based on existing infrastructure layout.

- IC will install a pole adjacent to JCP&L's new tap pole, as POI. On this pole, the IC will install cutout fuses with load break capability and primary metering transformers bracket per the FirstEnergy Construction Standards, Page No. 10-347. JC&L will purchase and install the revenue metering CTs and PTs. JCP&L will provide the ratio and accuracy specifications based on the IC load and generation levels

- IC provides all trenching, cables and conduit to connect his PV generation facilities into the Point of Interconnection (POI) pole.

- IC must meet all applicable JCP&L/FE standards and requirements which are included in the current JCP&L Tariff for Electric Service.

- IC's inverter-based generation must be UL listed or certified to comply with the requirements of IEEE 1547. JCP&L will require a witness test of this functionality.

- **IC's main breaker shall have an SEL 351 electronic relay which is required for interconnection protection. The main breaker must be on the high side of the IC's transformer. All equipment, breakers, lightning protection, etc., should meet JCP&L/FE's minimum BIL Ratings.**

- The IC's transformer must be grounded Wye to grounded Wye.

- JCP&L shall specify a schedule of appropriate power factor settings for the IC inverters.

- IC must meet the requirements of N.J.A.C. 14:4-9 ("In front of meter" all power sold to PJM and interconnection standards for Class I Renewable Energy Systems.

- IC must maintain reactive power capability sufficient to maintain a composite power delivery for the facility at the interconnection point at a power factor between .95 leading and .90 lagging. If this capability cannot be provided by the solar units, a dynamic device such as a STATCOM or SVC must be installed at the project substation at the customer's cost.

Network Impacts

Queue project W3-045 was studied as a(n) 3.0 MW (1.14 MW of which was Capacity) injection into JCPL's system at the Howell 34.5 kV substation. Project W3-045 was evaluated for compliance with reliability criteria for summer peak conditions in 2014.

Potential transmission network impacts 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

Not 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.

Infrastructure Upgrade Costs (by JCP&L)

Total Estimated cost is $ 289,600.

Breakdown is as follows:

- Approximate cost to install one span of three phase 1/0 ACSR conductor , one new tap pole, two sets 140K fuses, one set 300A solid, and one capacitor bank time controller is $51,500.00 non-refundable.

- Substation upgrade cost is $215,100.00 non-refundable.

- Metering cost is $23,000.00 non-refundable based on JCP&L installing and owning the equipment.

- **Note: The above costs do not include taxes. This tax is approximately an additional 36% to the Project Cost.**

- All JCPL costs are not subject to refundable provisions of the NJ-BPU Tariff for Electric service.

- All Rights of Way (ROW) are the responsibility of the IC to obtain.

- This price is based on 2012 and 2013 labor costs and material costs. If project has work performed in 2014 additional escalation costs could occur.

Note: This is an estimate based on similar work orders previously worked by JCP&L for the types of work described in the analysis above. It is accurate to within plus or minus 50 percent. Should the customer want to proceed with the connection of this facility, a contract with JCP&L will be developed based on these costs and a true-up of actual charges will be made at the completion of the project.

Timetable for Construction:

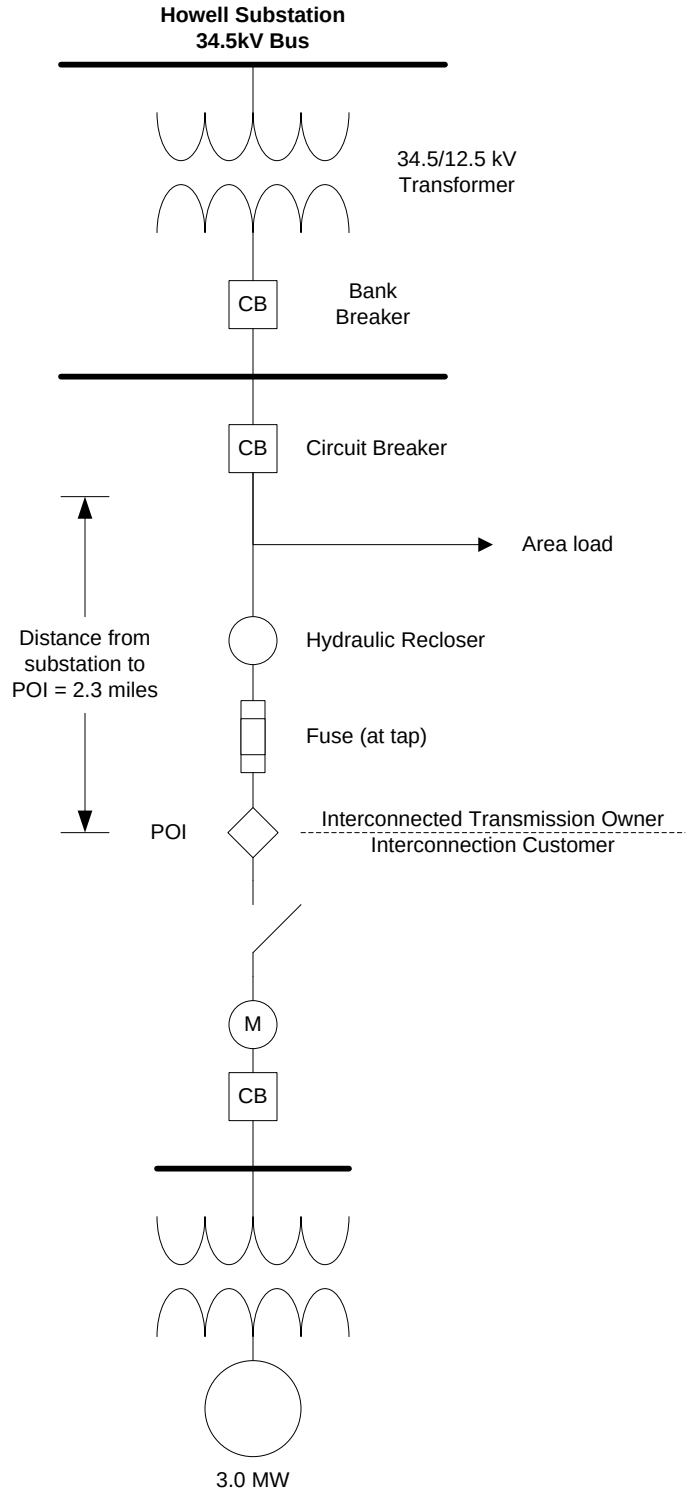
Total time to complete this project is 10-11 months from receipt of "Interconnect Agreement", "Construction Agreement" and receipt of "Estimated Project Costs".

JCP&L estimates 4 months after receipt of above for design work to be completed.

JCP&L estimates it will require an additional 6-7 months to complete the identified infrastructure upgrades.

Attachment 1
Site Plan

Attachment 2
Single Line Diagram



Attachment 3

FirstEnergy Revenue Metering Requirements for Generation Facilities Connected 46 kV and Lower

This document addresses the revenue metering requirements for new generation-only facilities connected to FirstEnergy (FE) system voltages 46 kV and lower. This document is not intended for existing retail or wholesale load facilities where behind-the-meter generation is being installed.

The FE operating company (FEOC) shall provide, own, operate, test, and maintain the revenue metering equipment at the Interconnection Customer's (IC) expense. FE reserves the right to review each proposed generation facility design and determine if the IC shall provide, own, operate, test, and maintain the revenue metering equipment at the IC's expense for engineering reasons.

The revenue metering equipment includes, but is not limited to, current transformers, voltage transformers, secondary wires, meter socket, bidirectional revenue meter, and associated devices.

The revenue metering equipment shall be located at the Point of Interconnection (POI) unless otherwise agreed to by FE and the IC. The revenue metering will be compensated for electrical energy losses if it is not located at the POI.

The IC must provide FE with a facility one line, the estimated bi-directional power flow at the revenue metering point, and any loss compensation data.

The IC shall provide and install the mounting structures (or enclosures) and conduits necessary for the metering installation unless otherwise agreed to by the FEOC. The conduit shall be 1-1/2 inch galvanized rigid steel conduit. Flexible galvanized steel (liquid tight) conduit may be used between instrument transformers. The FEOC will install the wiring in the conduit between the instrument transformers and the meter socket.

The IC shall mount the instrument transformers unless otherwise agreed to by the FEOC. The instrument transformers and meter socket shall be installed in a location that is readily accessible to authorized FEOC representatives. If for any reason the meter socket and/or associated devices must be mounted in a weatherproof enclosure, it shall be provided and installed by the IC. The meter socket shall be installed generally within 50 feet of the instrument transformers unless an alternate design has been approved by the FEOC. The meter socket shall be mounted such that the centerline of the meter is approximately five feet above final grade. Where vehicle traffic may interfere with or damage any revenue metering equipment, the IC must install concrete filled steel barrier posts to protect such equipment.

The bidirectional revenue meter provided and installed by the FEOC will record billing data in intervals typically fifteen minutes or thirty minutes. The IC shall provide, at its sole cost and expense, the installation, operation, and maintenance of the communication link required by the FE billing data collection system for access to the meter. The specifications for the typical telephone communication link are as follows:

- Standard voice grade (analog) with dial tone. No digital telephone lines are permitted.
- Two-pair or four-conductor with RJ-11 / Male termination. The FEOC will make final connection to the meter.
- Must be able to receive incoming calls.
- Must be a direct line to the meter with no operator interception or operation required.
- Install the telephone line and associated conduit between the telephone company source and the meter socket or enclosure.
- The telephone line must be tagged with a phone number, including the area code.
- The telephone line must be installed and operational prior to the IC's service being energized.

The IC shall, at its expense, install, own, operate, test, and maintain any metering and telemetry equipment that may be required to provide real-time meter data to FE or PJM.

The FEOC will provide the IC access to bidirectional kWh and kVARh pulses from the FEOC meter at the IC's expense if requested.

The IC shall provide FE with prior notification of any modifications at the facility that could affect the FEOC revenue meter measurements (substation reconfigurations, generator additions, etc).