Revised
Generation Interconnection
Combined Feasibility/System Impact
Study Report

For

PJM Generation Interconnection Request
Queue Position V3-071

Frenchtown 12.47kV

February 2010

Preface

The intent of the Combined Feasibility/System Impact Study is to determine a plan, with approximate cost and construction time estimates, to connect the subject generation interconnection project to the PJM network at a location specified by the Interconnection Customer. As a requirement for interconnection, the Interconnection Customer may be responsible for the cost of constructing: Network Upgrades, which are facility additions, or upgrades to existing facilities, that are needed to maintain the reliability of the PJM system. All facilities required for interconnection of a generation interconnection project must be designed to meet the technical specifications (on PJM web site) for the appropriate transmission owner.

In some instances an Interconnection Customer may not be responsible for 100% of the identified network upgrade cost because other transmission network uses, e.g. another generation interconnection or merchant transmission upgrade, 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, if any, is included in the System Impact Study.

The 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 associated with them will be addressed when seeking an Interconnection Agreement as outlined below. . Developer will also be responsible for providing and installing metering equipment in compliance with applicable PJM and Transmission Owner standards.

General

The developer has proposed a 2.0 MW (0 MW capacity) solar powered generating facility. The facility will be located at 856 Route 12 E., Frenchtown, New Jersey.

Attachment facilities and local upgrades (if required) along with terms and conditions to interconnect V3-071 will be specified in a separate two party Interconnection Agreement (IA) between the Transmission Owner and the Interconnection Customer as this project is considered FERC non-jurisdictional per the PJM Open Access Transmission Tariff (OATT). . From the transmission system perspective, no network impacts were identified as detailed below.

Point of Interconnection

V3-071 will interconnect with the Jersey Central Power and Light distribution system as a tap of the existing Distribution Circuit 27721, a 3 phase 12.47 kV grounded wye distribution circuit originating from JCP&L's Baptistown Substation located 0.9 miles from the proposed site.

Network Impacts

The queue V3-071 project was studied as a 2.0MW energy injection into JCPL's system at the Baptistown 34.5kV substation. . The project was studied on a combined feasibility-impact basis

which utilizes an AC analysis, and incorporates all contingency types. . Project V3-071 was evaluated for compliance with reliability criteria for summer peak conditions in 2014.

Potential network impacts were as follows:

Generator Deliverability

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

No problems identified.

Multiple Facility Contingency

(Double Circuit Tower Line, Line with Failed Breaker and, Bus Fault contingencies for the Full energy output.

No problems 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 problems identified.

Short Circuit

Available 3 phase fault current on the 12.5 kV distribution system at the proposed interconnection location without proposed generation is 2693 amps and 2571 Line to Ground amps. Addition of the generator contributes an additional 6.7% to the available three phase short circuit current on the 12.5kV circuit at the proposed generator site.

The above fault current value provided is calculated at the 12.5 kV voltage level and is based on the existing power system configuration. Future upgrades can occur on the JCP&L/FE power delivery system. The fault current can vary based on these modifications.

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

Stability Analysis

Not required.

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:

No problems identified.

Equipment Loading:

The output of the proposed 2.0 MW solar panel generation facility represents 99% of the recent summer peak on the Baptistown 27721 circuit and 191% of the minimum daytime load on this distribution circuit.

During an outage of Baptistown 27720 the 2.0 MW generator output exceeds the recorded minimum load on the Substation Transformer feeding this PV facility. Direct Transfer Trip will be required for load monitoring and control. Distributed generation must not interfere or degrade the quality of service to any other FirstEnergy Corp. customers (service voltage, voltage flicker, harmonics, service reliability etc).

Voltage Study:

Analysis study shows no adverse impact on the JCPL System Voltage Profile as a result of the connection of this facility.

Circuit protection and co-ordination:

Main Line: To accommodate the proposed 2.0 MW capacity, JCP&L will install 100 k protective fuses on the three phase primary line to the facility allowing a nominal current of 95 amps of primary current- 2.0 MW of power export. There are no other protective devices along the main line from the IC back to the sub.

At Substation: Implement Transfer Trip scheme. Replace existing electro-mechanical relays with SEL-351 electronic relays on 2 distribution circuits and on one Transformer Bank at Baptistown

Substation. Provide wiring, conduit and RTU configuration to tie into JCP&L's DTT system at our substation entry point.

At Generator Facility: Transfer Trip system will be designed by the customer, and must be approved by JCP&L/FirstEnergy prior to purchase. Typically, these systems utilize fiber optic, leased phone line, or radio communications. The direct transfer trip system must communicate with the distribution circuit breaker located in the JCP&L substation, as well as any in-line fault interrupting devices located between the substation and the point of interconnection (if any). Typically this may involve communication with one or more poletop reclosers.

The customer must install and maintain the direct transfer trip 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 customer to determine the exact interconnection point, based on existing infrastructure layout.
- Interconnect Customer (IC) will install a pole adjacent to JCP&L's pole as point of interconnection. On this pole the IC will install cutout fuses with load break capability, primary metering transformer bracket per the FE Construction Standards of page# 10-347. IC will also install the revenue metering CTs and PTs, to be supplied by JCP&L.
- IC provides all trenching, cables, riser and conduit to connect his PV generation facilities into the Point of Interconnection.
- IC must meet all applicable JCP&L/FirstEnergy standards and requirements which are included in the current Tariff for Service.
- IC's inverter-based generation must be UL listed or certified to comply with the requirements of IEEE 1547.
- IC's main breaker shall have a SEL 351 Multi-function relay (or equivalent) required for interconnection protection.
- The IC's transformer must be grounded wye to grounded wye.
- IC must meet 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), as well as IEEE 1547, and IEEE 1547.1

- IC must meet applicable FE Distributed Generation Technical requirements for the interconnection of generation to the FE Distribution system.

Infrastructure Upgrade Costs (By JCP&L):

- Conceptual cost estimate to extend three spans of three phase 1/0 ACSR conductor (about 350 feet), three 100K fuses, manually operable disconnect switch and Primary metering at the interconnection point is $87,500.

- Substation upgrade cost is $160,000

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

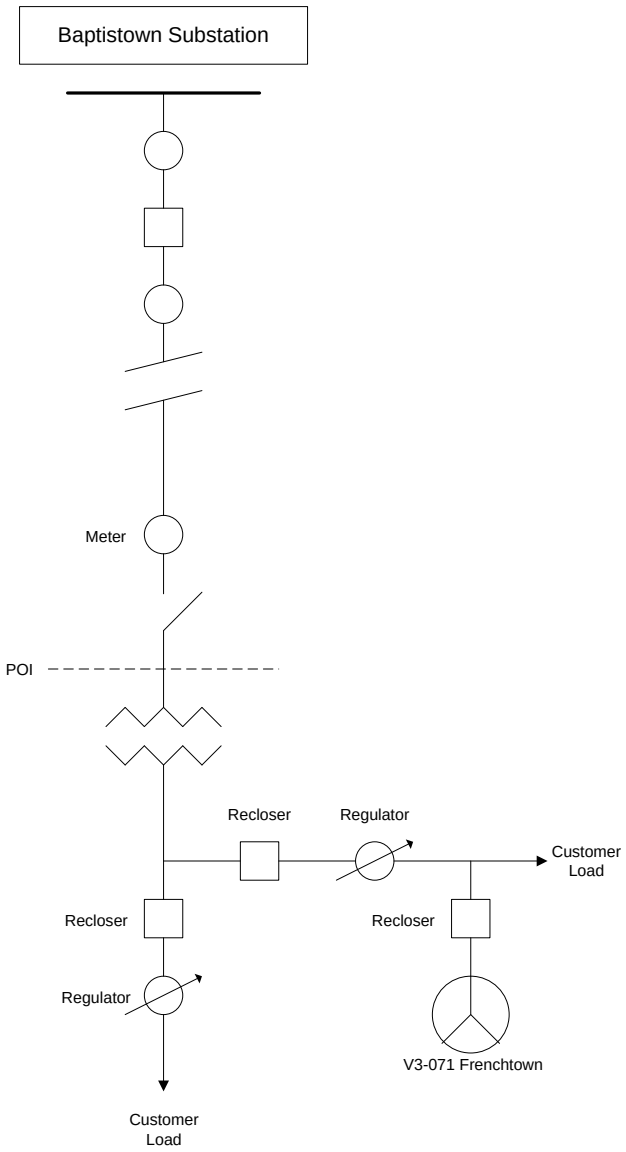
Note- this is an estimate based on similar work orders previously worked by JCP&L for the types of work described in the analysis above. Should the customer want to proceed with the connection of this facility a contract with JCPL will be developed based on these costs and a true-up of actual charges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

Timetable for Construction:

JCP&L estimates 3 months after execution of construction agreement and construction kick off meeting for design work to be completed.

JCP&L estimates it will require an additional 5 months to complete the identified infrastructure upgrades.

Single Line Diagram:



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General

Garden Solar, LLC, the Interconnection Customer (IC), has proposed a 2.0 MW (0 MW capacity) solar powered generating facility. The facility will be located in Frenchtown, New Jersey.

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Point of Interconnection

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