Combined Feasibility and Impact Study
U2-059, Foul Rift 13kV
2.0 MW Solar Facility

May 2009

General:

Queue U2-059 is a PPL Renewable Energy LLC request to interconnect 2.0 MW (0.76MW capacity) of solar generation (inverter derived) to the 12.47 kV distribution system owned and maintained by Jersey Central Power and Light Co, a FirstEnergy Company. The proposed location is an area of property along the west side of Phillipsburg-Belvidere Rd (Rt. 519) in White Township, New Jersey. The site is just south of Foul Rift Road., and is bounded to the west by the Delaware River.

Local Distribution Circuit Information:

The distribution circuit currently feeding the majority of this site is known as Morris Park 27052, a 12.47 grounded Y distribution circuit. Additionally, a second distribution circuit, Pequest 27666, another 12.47 kV distribution circuit also feeds the Northern portion of the proposed site including Foul Rift Road, along the northern boundary. The current normally open point between these two circuits is currently located at pole NJ298WH on Route 519 just South of Lommason Glen Road. With two distinct circuits serving the general area, at various times JCP&L does rearrange the normal feed to restore service during outages, transfer load to relieve circuit overloads, and conduct maintenance on equipment. Additionally, both the Morris Park and Pequest circuits have historically experienced overloads, as a result of these overloads, coupled with a recent transformer upgrade at the Pequest substation, it is possible that a new circuit will be extended from the Pequest Substation prior to 2013 and could be used to serve the subject area. Consequently, with the above mentioned factors taken into consideration, the proposed project must be evaluated as existing on both the Morris Park 27052 and Pequest 27666 circuits prior to 2013, and the system upgrades needed on both circuits will be a condition for interconnection. Additionally, if the analysis on either circuit produces more restrictive constraints, those constraints will govern the overall project.

The subject property is located approximately 8.5 line miles from the Morris Park Substation. In addition to the load tap changer on the substation transformer, there is one set of three (3) distribution poletop voltage regulators located on the main line of the 27052 circuit.

The site is located approximately 3.5 line miles from the Pequest Substation. There is a load tap changer on the transformer at the substation; however there is no line voltage regulation currently on the 27666 circuit.

The proposed size of the solar facility (2.0 MW) is sufficient to place this request in the Level 3 interconnection procedure, since the capability represents more than 15% of the circuit annual peak load.

Network Impacts Morris Park 27052 Distribution Circuit:

Protective Devices-
To accommodate the proposed 2.0 MW capability, the JCP&L protective fuses on the tap to the facility will be 100K- allowing a nominal current of 100 amps of primary current- 2.16 MW of power export. Higher rated fuses are not possible as they will not properly coordinate with upstream protective devices.

Conductor Loading-
No overloads are caused as a result of the proposed facility.

Direct Transfer Trip-
Not required as this facility is reliant on proper voltage waveform from JCP&L for synchronization.

Short Circuit Analysis-
Minimal contribution- not studied.

Voltage Control-
Voltage control presents the biggest challenge on the Morris Park 27052 circuit. At light load (daytime) the proposed facility will supply approximately 60% of the total circuit load. The circuit was modeled under a variety of loading situations as was the impact of the facility coming on line and dropping off line. Significant voltage variations were observed- as would be expected with the facility located 8.5 miles from the substation. As a result of this modeling, voltages out of Jersey Central Power & Light Tariff limits are predicted at minimum load. This situation can be corrected by reprogramming four (4) existing distribution capacitor controls. In addition three (3) poletop voltage regulators with bi-directional controls are needed.

Network Impacts Pequest 27666 Distribution Circuit:

Protective Devices-
To accommodate the proposed 2.0 MW capacity, the JCP&L protective fuses on the tap to the facility will be 100K- allowing a nominal current of 100 amps of primary current, allowing 2.16 MVA of power export. Higher rated fuses are not possible as they will not properly coordinate with upstream protective devices. Additionally to allow the 100K fuses to coordinate with existing upstream protective devices, one set of three (3) distribution pole top reclosers must be removed and replaced with larger units.

Conductor Loading-
No overloads are caused as a result of the proposed facility.

Direct Transfer Trip-
Not required as this facility is reliant on proper voltage waveform from JCP&L for synchronization.

Short Circuit Analysis-
Minimal contribution- not studied

Voltage Control-
Proposed facility was modeled on the circuit under a variety of loading situations as was the impact of the facility coming on line and dropping off line. Since the facility is located closer to Pequest Substation, lower voltage swings were predicted. At light load (daytime) the proposed facility will supply approximately 67% of the total circuit load. The results of this modeling shows that in order to maintain proper voltage control on the circuit, two (2) existing distribution capacitor controls will need to be reprogrammed, and one new control with voltage override will be needed. No distribution pole top voltage regulators are needed on this circuit.

Additional requirements:

The layout and exact point of interconnection has not been determined. JCP&L will work with the customer to determine the exact interconnection point, based on existing infrastructure layout. The costs associated with this tap line is based on a new two (2) pole line extension with 100K fuses and a manually operable disconnect switch. Primary conductor assumed to be #2 ACSR-300 feet.

Customer must meet all applicable JCP&L/FirstEnergy standards and requirements which are included in the current Tariff for Service.

Primary metering – assumed at this point to be overhead construction.

A customer main breaker with protective relay (SEL-351 or equivalent is required).

Customer must meet requirements of N.J.A.C. 14:4-9 (Net metering and interconnection standards for Class I Renewable Energy Systems), as well as IEEE 1547, and IEEE 1547.1

Infrastructure Upgrade Costs (By JCP&L):

Total approximate costs for Morris Park 27052 and Pequest 27666 circuits:

$ 100,700.00 non-refundable, including two (2) pole tap line for primary metering and interconnection point. Price includes applicable taxes.

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 25 percent, as required by the level 3 interconnection review procedure. Should the customer request to continue with a facilities study, the actual costs for the work described can be developed. The estimate to prepare the work orders is $2500 (non refundable) and would be applicable toward the overall project cost.

Timetable for Construction:

JCP&L will require 60 days after receipt of funds for design work ($2500) to complete the necessary work orders. The final design of the tap line to connect to the proposed site may require additional information that is dependent on the customer to furnish.

After receipt of the balance of the funds for construction, JCP&L estimates it will require an additional 90 days to complete the identified infrastructure upgrades. Construction of the tap line to the proposed site may require additional time based on site conditions and the customer's construction timeline.

Figure 1