

***Generation Interconnection
Feasibility Study Report***

For

***PJM Generation Interconnection Request
Queue Position Y1-020***

Sussex

July 2012

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 an increase in 3.99 MW of Capacity Interconnection Rights for a previously proposed solar generating facility located in Lafayette, New Jersey. The installed facilities will have a total capability of 10.5 MW with 3.99 MW of this output being recognized by PJM as capacity. This means that the remaining 6.51 MW will be curtailable should a system reliability constraint occur.

Point of Interconnection

Y1-020 will interconnect with the Sussex Rural Electric Cooperative system, which is located inside of Jersey Central Power and Light territory.

Due to its tie line impact, the installation of the Y1-020 Project by the Interconnection Customer will also impact on the existing Jersey Central wheeling and supply interconnection agreement with the Sussex REC.

The Interconnection Customer will be required to fund all of the Sussex REC interconnection and FE network upgrades that will be required for the Y1-020 Project. This includes the provision of any permits, easements and properties that may be required.

Cost Summary

The Y1-020 project will be responsible for the following costs:

Description	Total Cost
Connection Facilities	\$ 22,100
Transmission Upgrades	\$ 0
Total Costs	\$ 22,100

Transmission Owner Scope of Work

FirstEnergy will be required to perform several SCADA updates and administrative work to complete this project. The total cost of this work is estimated to be \$22,100. This does not include the CIAC (Contribution in Aid of Construction) Federal Income Tax Gross Up charge of \$7,200.

The completion of this project is dependent on the interconnection of a prior project. If the prior project is removed from the queue, Y1-020 will be responsible for additional charges.

Interconnection Customer Requirements

The Interconnection Customer will be responsible for the following:

- Install a supervisory control and data acquisition (SCADA) equipment to provide information in a compatible format to the FE Transmission System Control Center. The RTU, the communications channel and all related equipment will be furnished and maintained by the Interconnection Customer. The RTU must communicate with the FirstEnergy EMS via DNP 3.0 protocol.

The following status, control and metering points will be required:

- Interconnection breaker position status and trip control.
 - Generator real and reactive power output measured at the high-side of the generator step-up transformer.
 - Generator voltage at the point of interconnection.
- Meet all criteria specified in the applicable FirstEnergy standards:
 - FE Requirements for Transmission Connected Facilities
 - Technical Requirements for the Interconnection of Parallel-Operated Generation to the FirstEnergy Distribution System
 - FirstEnergy Wholesale Generation Interconnection (WGI) Manual
 - FE Approved Vendors and Contractors

These documents can be found on the FirstEnergy or PJM websites:

- <http://www.firstenergycorp.com/feconnect>
 - <http://www.pjm.com/planning/design-engineering/to-tech-standards.aspx>
- Comply with the inverter standard UL1741 and IEEE 1547, “Standard for Interconnecting Distributed resources with Electrical Power Systems”
 - The Interconnection Customer will not excavate, construct facilities or locate solar panels under the existing FE transmission facilities or on FE right-of-ways without the express permission of FE.

Revenue Metering and SCADA Requirements

PJM Requirements

The Interconnection Customer will be required to install equipment necessary to provide Revenue Metering (KWH, KVARH) and real time data (KW, KVAR) for IC's generating Resource. See PJM Manuals M-01 and M-14D, and PJM Tariff Sections 24.1 and 24.2.

FirstEnergy Requirements

The Interconnection Customer will be required to comply with all FE Revenue Metering Requirements for Generation Interconnection Customers. The Revenue Metering Requirements may be found within the "FirstEnergy Requirements for Transmission Connected Facilities" document located at the following links:

<http://www.firstenergycorp.com/feconnect>

<http://www.pjm.com/planning/design-engineering/to-tech-standards.aspx>

Network Impacts

The Queue Project #Y1-020 was studied as a 12.5MW (Capacity 4.0MW) injection at the REA Q745 34.5 kV substation in the JCPL area. Project #Y1-020 was evaluated for compliance with reliability criteria for summer peak conditions in 2015. Potential network impacts were 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 contingencies were studied for the full energy output. The contingencies of Line with Failed Breaker and Bus Fault will be performed for the Impact Study.)

None.

Short Circuit

(Summary of impacted circuit breakers)

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)

The results of the FE analysis show that a network upgrade is required for the Capacity deliverability of the Y1-020 Project generation to the Jersey Central transmission systems. Specifically, the FE study results show that with all area solar projects at their Capacity output the Newton - Mohawk (Z702) 34.5 kV line section could load up to 122.7% of its emergency rating of 27 MVA upon loss of the Newton - Montville (N2214) 230 kV line.

Steady-State Voltage Requirements

(Summary of the VAR requirements based upon the results of the steady-state voltage studies)

None.

Stability and Reactive Power Requirement for Low Voltage Ride Through

(Summary of the VAR requirements based upon the results of the dynamic studies)

It will be mandatory for the Y1-020 Project to have a range of dynamic reactive capability that supports its operation from a .95 lead to .95 lag power factor. Without a continuous regulation, the FE studies show that the addition of solar projects can cause voltage swings as their output oscillates with moving clouds and system voltages that can exceed the established limits. Should the Interconnection Customer fail to provide a dynamic reactive capability from the Y1-0 Project

for any reason once interconnected, the Jersey Central and/or PJM Dispatchers may need to take action to curtail both the energy and capacity portion of its output to prevent a non-compliance with voltage criteria.

New System Reinforcements

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

None.

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.

Potential Congestion due to Local Energy Deliverability

PJM also studied the delivery of the energy portion of this interconnection request. Any 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 Merchant Transmission Interconnection request.

Note: Only the most severely overloaded conditions are listed below. 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 shall study all overload conditions associated with the overloaded element(s) identified.

The results of the FE analysis shows that the energy output of the Y1-020 Project may be curtailed. The Newton - Mohawk (Z702) 34.5 kV line section could load up to 134.4% of its emergency rating of 27 MVA upon loss of the Newton - Montville (N2214) 230 kV line.

Attachment 1. Aerial View

Attachment 2. Single Line Diagram