Generation Interconnection Feasibility Study Report Web Version

For

PJM Generation Interconnection Request Queue Position W1-045

Roxbury 34.5kV Project

PJM DOCS No. 605676 v1
July, 2010

Preface

The intent of the Feasibility/Impact study is to determine a plan, with estimated costs 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 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, 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 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.

W1-045 Roxbury 23 kV Feasibility Study Report

General

Interconnection Customer (Roxbury Project) has proposed the installation of PV arrays totaling 20.0 MW and 7.6 MW (capacity). The proposed generating unit site is approximately 3.6 miles northeast of Roxbury, PA., off Rt. 997. This is in the PJM queue at W1-045. The project is proposed to be in service by the 3rd quarter of 2011. The POI's chosen for this project would not require this project to be FERC jurisdictional. However, because the developer is seeking QF status for this project, it will be FERC jurisdictional.

This project is being studied for two points of interconnection (POI). The primary choice POI is a 23kV interconnection to a Roxbury Sub distribution circuit, and the secondary choice POI is a 115kV interconnection to the Roxbury Sub 115kV bus.

Direct Connection Primary POI

It was proposed that the project be studied as an interconnection into the First Energy distribution system at Roxbury Substation #2 23kV bus via the 23kV ARCO line at pole # KRB-47.

FirstEnergy has a DG (distributed generation) policy for connecting to distribution circuits. At 23kV the maximum limit of total connected generation to a circuit is 13.5MVA. Therefore, the project was studied as a customer owned express 23kV circuit connected to the Roxbury #2 23kV bus, see Figure 2.

Interconnection Customer is responsible for constructing all of the facilities on its side of the point of interconnection, on the line to the generating plant. Interconnection Customer will also be responsible for the modifications at Roxbury substation that are required due to connecting the facility.

The proposed interconnection facilities must be designed in accordance with the FirstEnergy "Requirements for Transmission Connected Facilities" document and must meet IEEE 1547.

The 23kV interconnection point will require an extension of the Roxbury Sub 23kV bus, the installation of a Penelec installed/owned main line breaker in the newly extended Roxbury 23kV bus (which will act as the disconnect point between First Energy and the generator interconnection) and new disconnect switch situated just outside of the Roxbury substation fence line (POI). A Dynamic Reactive Compensation (either Static VAR Compensator (SVC) or STATCOM) is required to eliminate voltage flicker on 23kV distribution circuits. The SVC or STATCOM shall be sized such that voltage deviation will be less than 3% as measured at the POI under all Solar Gen operating conditions.

Interconnection metering is also required for this generation connection. The 23 kV revenue quality metering equipment shall be designed, furnished and installed by FirstEnergy. The Interconnection Customer will be responsible for designing, furnishing and installing a SCADA RTU in their generation substation and obtaining the telecommunication circuits from the RTU to the Penelec Data Center. The connection to the Penelec Data Center will be to provide MW, MVAR and 23kV voltage at Interconnection Customer generation substation. Please reference the FirstEnergy Metering Requirements for Interconnection Customers, for more details on the metering requirements for FirstEnergy. This document can be found on the FE website at:

http://www.firstenergycorp.com/feconnect/Requirements_for_Transmission_Connected_Facilities.html

Below are conceptual estimates for the engineering/construction associated with Direct Connection requirements.

Item	Description	Conceptual Cost Estimate
1	Roxbury sub. Extend 23kV bus, new 23kV breaker position, breaker, relaying and associated equipment	$651,400
2	RTU programming for connection to the First Energy SCADA and relay support for the generation installation.	$10,000
3	Revenue metering	$18,200
4	Express 3.6 mile 23kV line from Roxbury Sub interconnection disconnect switch to W1-045, plus W1-045 line breaker located at PV generator site	Customer Owned
5	SVC or STATCOM located at W1-045 PV generator site	Customer Owned

Conceptual Estimate: $679,600
Estimated Lead Time: 1.0 year from signed IA

Notes:

- Detailed Engineering & Construction Estimates TBD via Facility Study
- The above estimates do not include 1) tax gross-up, 2) property costs and site development up to rough grade which is to be provided by the developer, 3) generation SCADA to be provided by the developer, and 4) engineering and field activities for design review and commissioning of the developer's facilities.

The attached Figure 2 provides a conceptual one-line of the direct connection facilities needed.

Direct Connection Secondary POI

It was proposed that the project be studied as an interconnection into the First Energy transmission system at Roxbury Substation 115kV bus. Since the Roxbury 115kV bus is configured as a straight bus, in order to accommodate any additional interconnection, the straight bus would need to be reconfigured as a ring bus or breaker and a half configuration, per FE document Requirements For Transmission Connected Facilities, Attachment C, "For generation

connected to the FE system at a nominal voltage greater than 69kV, a ring bus is required regardless of the MVA rating of the generator".

The FE Substation Engineering group has determined that reconfiguring the 115kV bus at Roxbury Substation as either a ring bus or breaker and a half configuration is NOT FEASIBLE. Therefore the Secondary POI cannot be constructed.

Network Impacts

The #W1-045 project was studied as total injection of 20.0 MW (7.6 MW of capacity) into the Roxbury #2 23 kV bus. Project #W1-045 was evaluated for compliance with reliability criteria for summer peak conditions in 2014. Potential network impacts were as follows:

Primary POI: Roxbury 23kV

Generator Deliverability

No problems identified

Multiple Facility Contingency

No problems identified

Contribution to Previously Identified Overloads

No problems identified

New System Reinforcements

No problems identified

Contribution to Previously Identified System Reinforcements

No problems identified

Short Circuit

A short circuit analysis will be performed by the Transmission Owner on its system in the System Impact Study stage.

PJM has performed a Short Circuit study on the 100kV and above system. That analysis found no new breakers to be over-duty in the Penelec and APS transmission areas. The study also showed no significant fault current contribution to the breakers which have already been identified as over-duty.

Secondary POI: Roxbury 115kV

Generator Deliverability

No problems identified

Multiple Facility Contingency

No problems identified

Contribution to Previously Identified Overloads

No problems identified

New System Reinforcements

No problems identified

Contribution to Previously Identified System Reinforcements

No problems identified

Short Circuit

A short circuit analysis will be performed by the Transmission Owner for its system in the System Impact Study stage

PJM has performed a Short Circuit study on the 100kV and above system. That analysis found no new breakers to be over-duty in the Penelec and APS transmission areas. The study also showed no significant fault current contribution to the breakers which have already been identified as over-duty.

Cost Allocation

The W1-045 project will be responsible for 100% of the direct connection costs estimated at $0.68 million. Total costs are estimated to be $0.68 million to accommodate interconnection of the project.

Summary

Conceptual estimates are provided for the assumption that the point of interconnection would be on the #2 23kV bus at Roxbury substation and that the customer interconnection substation would be at a site approximately 3.6 miles northeast of Roxbury, PA.

The 115kV POI at Roxbury Sub, Secondary POI, was determined to be NOT FEASIBLE because the existing 115kV straight bus at Roxbury would need to be reconfigured to a ring bus to accommodate this interconnection, but FE has determined that the reconfiguration is NOT CONSTRUCTIBLE.

Based on the scope of the FE direct connection, it is expected to take approximately one (1) year from the signing of a Connection Service Agreement to complete the installation required for the Roxbury (W1-045) Project.