Generation Interconnection Feasibility Study Report

For

PJM Generation Interconnection Request Queue Position Y3-109

Nyswaner 25 kV

August 2013

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 natural gas generating facility located in Washington County, Pennsylvania. The installed facilities will have a total capability of 19.9 MW with 19.9 MW of this output being recognized by PJM as capacity. The proposed in-service date for this project is January 1, 2015. **This study does not imply a FirstEnergy commitment to this in-service date.**

Point of Interconnection

Y3-109 will interconnect with the West Penn Power Company's distribution system at Nyswaner substation.

Cost Summary

The Y3-109 project will be responsible for the following costs:

Description	Total Cost
Transmission Owner facilities	$ 409,200
Transmission Upgrades	$ 0
Total Costs	**$ 409,200***

*Costs do not include CIAC gross-up taxes.

Transmission Owner Scope of Work

Connection Facilities

In compliance with the Regional Transmission Expansion Planning (RTEP) protocol, the Interconnection Customer has submitted a "Form of Generation Interconnection Feasibility Study Agreement" to PJM that identifies its plan to construct a natural gas generation installation with six reciprocating engines connected to a common bus with a total capability of 19.9 MW (19.9 MW capacity.) For purposes of this report, it has been designated as the Nyswaner 25kV Y3-109 Project (hereinafter, the "Project") to reflect its interconnection voltage and its proximity to the Nyswaner Substation (see Attachment 2.) The IC has requested the study of a Primary Point of Interconnection (POI) for the Project. This report contains detailed connection requirements, direct connection costs and schedule, power flow analysis, short circuit analysis, and a cost and schedule for any associated system reinforcements for the Primary POI.

Primary Point of Interconnection: Nyswaner 25 kV Substation

The Primary POI for the Project will be accomplished by building a new 25 kV terminal at Nyswaner and providing a 25 kV meter package. The Interconnection Customer will be responsible for acquiring all easements, properties and permits that may be required to construct both the new 25kV line and the associated attachment facilities. A summary of the Project direct connection facilities that will be required for the Primary POI and their estimated costs are shown below. The one-line for the Primary POI is shown in Attachment 1.

Power Flow Analysis

A Power Flow study was conducted to determine the reliability impact of the proposed Project on the FE Transmission System. This included the performance of a contingency analysis to identify any facility overload or voltage condition that violates the FE Planning Criteria. Any such violation that is either directly attributable to this project or for which it will have a shared responsibility is included in this report with a least cost plan identified to mitigate them.

The Power Flow Analysis was performed using a 2015 summer peak load base case provided by the PJM staff. This base case included a detailed representation of the West Penn 25 kV system in the area of the Nyswaner 25kV substation. A simulation of all possible contingencies within the NERC and FE Planning Standards that are impacted by the Project was conducted to test for criteria compliance. The direct connection of the Nyswaner 25 kV (Y3-109) Project to the West Penn transmission system was studied at the Primary POI.

The PJM and FE analysis show that the Project does not cause additional overloads or criteria violations. As such, no new network upgrades are required for the Project.

Short Circuit and Dynamics Analysis

A short circuit analysis has been performed by PJM and the findings were confirmed by FE. The findings show that no circuit breakers are newly over-dutied with the addition of the Project. The

study also showed no significant fault current contribution to the breakers which are near the over-duty limit.

Fault Current at Nyswaner Substation (25 kV bus)

Three Phase: 15,944 Amps
Line to Ground: 16,752 Amps

Z+: 1.57 + j 14.4 %
Z0: 0.52 + j 12.4 %

System Protection Analysis

A System Protection Analysis will be performed during the System Impact Study.

FE Facility Upgrades and Costs

Results from the PJM and FE Power Flow Analysis show that there are no FE criteria violations directly attributable to the capacity of the Project. Therefore in accordance with the RTEP procedures defined in the PJM Open Access Transmission Tariff and PJM Manuals, the Interconnection Customer is not responsible for network upgrades.

Description	Total with Tax	Tax	Total Cost
Nyswaner SS. Install 25 kV breaker, risers, line-side disconnects, free standing metering CT's and VT's and associated control equipment for generation interconnection.	$420,600	$91,100	$324,500
25 kV Metering Package	$19,400	$4,400	$15,400
Engineering Oversight and Commissioning	$89,900	$20,600	$69,300
Totals	**$529,900**	**$116,100**	**$409,200**

Note that all cost estimates contained in this document were produced without a detailed engineering review and are therefore subject to revision. More accurate estimates will be determined as a part of the System Impact Study. The Interconnection Customer will be responsible for the actual cost of the direct connection that is implemented. FE herein reserves the right to return to any issues in this document and, upon appropriate justification, request additional monies to complete any reinforcements to the transmission system.

Interconnection Customer Requirements

Compliance Issues

The Interconnection Customer will be responsible for meeting all FE criteria as defined in the FE Requirements for Distribution Connected Facilities document:

www.firstenergycorp.com/feconnect
www.pjm.com/planning/design-engineering/to-tech-standards.aspx

While the voltage analysis is not performed for the feasibility study, any voltage criteria violations that would require the plant to provide reactive power, that determination of reactive power requirements will be determined in the system impact study, which will include the low voltage ride through analysis.

The Interconnection Customer will also be responsible for following the requirements of the "FirstEnergy Wholesale Generation Interconnection (WGI) manual and the "FE Approved Vendors and Contracotrs" documents which are also located at the above links.

The Interconnection Customer must also meet all PJM, ReliabilityFirst and NERC reliability criteria and operating procedures required for standards compliance. For example, the Interconnection Customer will need to properly locate and report the over and under-voltage and over and under-frequency system protection elements for its units as well as the submission of the generator model and protection data required to satisfy the PJM and ReliabilityFirst audits. Failure to comply with these requirements may result in a disconnection of service if the violation is found to compromise the reliability of the FE system.

Other Requirements

In addition to the FE facilities, the Interconnection Customer will also be responsible for meeting all criteria as specified in the applicable sections of the "FE Requirements for Transmission Connected Facilities" document including:

1. The purchase and installation of a fully rated circuit breaker on the high side of the Y3-109 step-up transformer.

2. The purchase and installation of a lockable load-break switch at the point of interconnection. This switch must be accessible by First Energy.

3. The purchase and installation of the minimum required FE generation interconnection relaying and control facilities. This includes over/under voltage protection, over/under frequency protection, and zero sequence voltage protection relays.

4. The purchase and installation of a 25kV interconnection metering instrument transformer. FE will provide the ratio and accuracy specifications based on the customer load and generation levels.

5. The purchase and installation of a revenue class meter for each unit to measure the power delivered in compliance with the FE standards.

6. The purchase and installation of 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.

7. The establishment of dedicated communication circuits for SCADA report to the FE Transmission System Control Center.

8. A compliance with the FE and PJM generator power factor and voltage control requirements.

9. The execution of a back-up service agreement to serve the customer load supplied from the Y3-109 25kV interconnection substation when the units are out-of-service. This assumes the intent of the Interconnection Customer is to net the generation with the load.

10. The rough grade of the property for the Y3-109 25kV interconnection substation and an access road for the delivery of equipment to this site.

The above requirements are in addition to any metering required by PJM.

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

Summary

The Project direct connection will require the facility upgrades defined above. As shown, the total estimated cost of the 25kV line direct connect facilities (i.e. 25 kV breaker, disconnects,

CTs, VTs, etc.) is $529,900. This cost includes Federal Income Tax Gross Up charge of $116,100. This tax may or may not be charged based on whether or not this project meets the eligibility requirements of IRS Notice 88-129. The Project does not have any required network upgrades.

Based on the scope of the direct connection, it is expected to take a minimum of eighteen months (18) years from the signing of an Interconnection Service Agreement/Construction Service Agreement to complete the installation required for the Project. Full payment of the estimated cost of the project will be required upon execution of the Construction Service Agreement (CSA). A true up of the actual cost versus estimated cost of the project will be performed by FE at the end of the project.

Network Impacts

The Queue Project #Y3-109 was studied as a 19.9MW (Capacity 19.9MW) injection at the MARK WEST 138 kV substation in the APS area. Project #Y3-109 was evaluated for compliance with reliability criteria for summer peak conditions in 2017. Potential network impacts were as follows:

Contingency Descriptions

The following contingencies resulted in overloads:

None.

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)

New circuit breakers found to be over-duty:

None.

Contributions to previously identified circuit breakers found to be over-duty:

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)

None.

Steady-State Voltage Requirements

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

To be determined.

Stability and Reactive Power Requirement for Low Voltage Ride Through

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

To be determined.

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.

Not applicable.

Attachment 1

System Configuration

Attachment 2

Project Location