Generation Interconnection Feasibility Study Report Web Version

For

PJM Generation Interconnection Request Queue Position Y2-054

Oak Grove 138 kV Project

February, 2013

Feasibility Study Report

Oak Grove 138kV Generation Project

Introduction

This Feasibility Study report provides the documentation of an assessment performed by FirstEnergy (FE) in response to a request made by Interconnection Customer for an increase of 13.7 MW, above the existing 321.3 MW capacity capability at Oak Grove Substation for a total capacity of 335 MW. The total capacity plus energy capabilities of these units will remain at 354 MW. This assessment was accomplished by: 1. Evaluating the reliability impact of the proposed facilities and connection on the interconnected transmission system by the performance of a power flow study; 2. Ensuring compliance with the NERC, ReliabilityFirst, PJM and FE Reliability Standards by identifying the system reinforcements that will need to be installed for an interconnection of the proposed project; 3. Coordinating and cooperating with the PJM staff and Interconnection Customer by participating in project meetings and issuing this report as a part of the RTEP study process; 4. Performing a Steady State, Short-Circuit and Dynamics Study as necessary; 5. Conducting all studies in accordance with the PJM Manuals and the "FE Requirements for Transmission Connected Facilities" documents that assure the assessment performed incorporates study assumptions, follows the documented system performance procedures, considers alternative connection and reinforcement plans, and jointly coordinates the study recommendations.

Connection Facilities

Interconnection Customer has submitted a "Form of Generation Interconnection Feasibility Study Agreement" to PJM (see Attachment 1) that identifies its plan to increase the capability of its gas turbine generators for a total capacity of 335 MW and capacity plus energy capability of 354 MW. The 13.7 MW capacity-only increase is designated the Oak Grove 138 kV (Y2-054) Project. The increase in capacity is being realized in the upgrade of software to improve the mechanical performance of the drivers. One note of change from Attachment N is that the capacity increase was listed at 19 MW; this was corrected following the Y2-054 Feasibility Study Kick-Off Meeting to the studied increase of 13.7 MW and documented in an email from Ken Mancini of PJM dated 10/31/2012 to the meeting participants.

There are no additional interconnection facilities proposed to accommodate the Oak Grove 138 kV (Y2-054) Project capacity increase.

FE Connection Facility Costs

There are no interconnection facility costs associated with the capacity increase proposed for this facility

PJM Interconnection Study Results

The following is the report describing the results of the analysis performed by PJM engineers with respect to the transmission system impacts.

Network Impacts

The Queue Project #Y2-054 was studied as a 13.7MW (Capacity 13.7MW) injection at the Oak Grove 138 kV substation in the APS area. Project #Y2-054 was evaluated for compliance with reliability criteria for summer peak conditions in 2016. Potential network impacts were as follows:

Generator Deliverability

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

None

Light Load Analysis

Light Load Studies to be conducted during later study phases (applicable to wind, coal, nuclear, and pumped storage projects).

Multiple Facility Contingency

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

None

Short Circuit

(Summary form of Cost allocation for breakers will be inserted here if any)

To be determined

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

(Results of the steady-state voltage studies should be inserted here)

To be determined

Stability and Reactive Power Requirement

(Results of the dynamic studies should be inserted here)

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)
(Summary form of Cost allocation for transmission lines and transformers will be inserted here if any)

None

Delivery of Energy Portion of Interconnection Request
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.
Only the most severely overloaded conditions are listed. 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 will study all overload conditions associated with the overloaded element(s) identified.

Not Applicable

Interconnected Transmission Owner's Analysis Results

The following was generated by FirstEnergy (Metropolitan Edison) the Interconnected Transmission Owner, based upon its analysis, as well as that of PJM, for mitigation of the project's impacts on the transmission and lower voltage system as applicable. It includes the costs and schedules for any system upgrades.
Costs for affected Transmission owners other than FirstEnergy are included and reported in the "New System Reinforcements" and "Contribution to Previously Identified System Reinforcements" sections of the "PJM Interconnection Study Results" above.

Power Flow Analysis

A Power Flow study was conducted to determine the reliability impact of the proposed Oak Grove 138 kV (Y2-054) Project on the FE Transmission System. This study was completed using a 2016 summer peak load power flow that contains a detailed representation of the Mon Power transmission networks in the area of the proposed Oak Grove 138 kV (Y2-054) Project. The findings and the recommendations from this analysis are based on a contingency review that was performed to identify the facility loadings and/or voltage conditions that violate the ReliabilityFirst, PJM or FE Planning Criteria and are either directly attributable to this project or for which it will have a shared responsibility. As a part of this review, a simulation of all possible contingencies within the NERC, PJM and FE Planning Standards that are impacted by the Oak Grove 138 kV (Y2-054) Project was conducted.

The FE Power Flow analysis shows that there were no criteria violations identified directly attributable to the Oak Grove 138 kV (Y2-054) Project.

Short Circuit and Dynamics Analysis

The proposed generator characteristics are expected not to change from the presently existing machines. Short circuit analysis results should not be impacted by this capacity increase. Therefore no breaker reinforcements will be required.

In accordance with the RTEP Impact Study process, the PJM staff is responsible for the performance of a dynamic analysis for the Oak Grove 138 kV (Y2-054) Project. The results of these studies, if necessary, will be included in the PJM Impact Study report as this project proceeds.

System Protection Analysis

No additional system protection will be required due to the capacity increase of the Oak Grove 138 kV (Y2-054) Project.

Interconnection Customer Requirements

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

The provision of a reactive power capability sufficient to maintain a composite power delivery for the facility at the interconnection point at a power factor from 1.0 (unity) leading (absorbing VARs) to .90 lagging (producing VARs) for the 13.7 MW of increased capacity studied.

The presence 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.

Compliance with the FE and PJM generator power factor and voltage control requirements.

The execution of a back-up service agreement to serve the customer load supplied from the Oak Grove 138 kV switching station when the Oak Grove 138 kV (Y2-054) Project units are out-of-service.

The FirstEnergy Requirements for Transmission Connected Facilities document located at the following links:

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

Interconnection Customer will also be required to meet all FE, PJM, ReliabilityFirst and NERC reliability criteria and operating procedures for standards compliance. For example, the Developer 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.

Summary

There are no additional direct connection requirements or network upgrade requirements for the Oak Grove 138 kV (Y2-054) Project.

Note that the FE findings were made from a conceptual review of this project. A more detailed review of the connection facilities and their cost will be identified in the System Impact Study.