

***Generation Interconnection
Combined Feasibility/Impact Study Report***

For

***PJM Generation Interconnection Request
Queue Position Z2-030***

Double Tollgate 34.5 kV Project

August 2014

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Introduction

This combined Feasibility/System Impact Study report provides the documentation of an assessment that has been performed by FirstEnergy (“FE”) in response to a request made by Hecate Energy Clark County, LLC for the connection of a 20.0 MW (7.6 MW Capacity) Double Tollgate 34.5 kV (Z2-030) Generation Project to the Rappahannock Electric Cooperative (REC) system and the affected Potomac Edison transmission system. This assessment was accomplished by: 1. Evaluating the reliability impact of the proposed facilities and connection on the interconnected subtransmission and transmission systems 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, Rappahannock Electric Cooperative staff, and Hecate Energy Clark County, LLC by conducting meetings and issuing this report as a part of the Regional Transmission Expansion Planning (“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” document to assure that the assessment performed incorporates study assumptions, follows the documented system performance procedures, considers alternative connection and reinforcement plans, and jointly coordinates the study recommendations.

Network Impacts

The Queue Project Z2-030 was studied as a 20.0 MW (Capacity 7.6 MW) injection at the Double Tollgate 138 kV substation in the APS area. Project Z2-030 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project Z2-030 was studied with a commercial probability of 100%. 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, 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)

In accordance with the RTEP process, a short circuit analysis was conducted by PJM and confirmed by the FE staff for the Double Tollgate 34.5 kV (Z2-030) Generation Project. The analysis determined that no transmission FE circuit breaker will exceed its interrupting capability with the interconnection of Double Tollgate 34.5 kV (Z2-030) Generation Project. Therefore no circuit breaker reinforcements will be required.

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)

Not Required

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.

None

Connection Facilities

In compliance with the RTEP protocol, Hecate Energy Clark County, LLC has submitted a "Form of Generation Interconnection Feasibility Study Agreement" to PJM that identifies its plan to construct the Double Tollgate 34.5 kV (Z2-030) Generation Project that will interconnect with the Rappahannock Electric Cooperative ("REC") subtransmission system near the FE owned Double Tollgate substation. The installed facilities will have a total generating capability of 20.0 MW with 7.6 MW of this output being recognized by PJM as capacity.

As defined by Hecate Energy Clark County, LLC, the proposed Double Tollgate 34.5 kV (Z2-030) Generation Project site will be located at a point adjacent to Double Tollgate substation. The direct connection of this project will be accomplished by utilizing the REC 34.5 kV subtransmission system which will interconnect into the FE Double Tollgate 138 kV substation.

Power Flow Analysis

A power flow study was conducted to determine the reliability impact of the proposed Double Tollgate 34.5 kV (Z2-030) Generation Project on the FE transmission system. This study was completed using a 2018 summer peak load power flow model that contains a detailed representation of the Potomac Edison transmission network in the area of the proposed Double Tollgate 34.5 kV (Z2-030) Generation 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 attributable to this project. Note that in accordance with PJM RTEP study procedures, this Double Tollgate 34.5 kV (Z2-030) Generation Project under study and earlier active generation queue projects are considered to be in service. Therefore, all active generation queue projects after Z2-030 are considered not in service.

The point of interconnection (“POI”) of the 20.0 MW Double Tollgate 34.5 kV (Z2-030) Generation Project for FE study purposes was modeled as connected to the Double Tollgate 138 kV bus. The results of the FE analysis show that there are no transmission network upgrades required for the deliverability of the Double Tollgate 34.5 kV (Z2-030) Generation Project generation to the FE transmission system.

Short Circuit Analysis

In accordance with the RTEP process, a short circuit analysis was conducted by PJM and confirmed by the FE staff for the Double Tollgate 34.5 kV (Z2-030) Generation Project. The analysis determined that no transmission FE circuit breaker will exceed its interrupting capability with the interconnection of Double Tollgate 34.5 kV (Z2-030) Generation Project. Therefore no circuit breaker reinforcements will be required.

Compliance Issues

Hecate Energy Clark County, LLC will be responsible for meeting all FE criteria as defined in the FE Requirements for Transmission Connected Facilities document which is found at the following links:

<https://www.firstenergycorp.com/content/fecorp/feconnect/potomacedison/wholesale.html>
<http://www.pjm.com/planning/design-engineering/to-tech-standards/private-firstenergy.aspx>

Hecate Energy Clark County, LLC must also meet all PJM, ReliabilityFirst and NERC reliability criteria and operating procedures required for standards compliance. For example, Hecate Energy Clark County, LLC 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

The results of the FE power flow analysis show that the Double Tollgate 34.5 kV (Z2-030) Generation Project does not attribute to any planning criteria violations. Therefore in accordance with the RTEP procedures defined in the PJM Open Access Transmission Tariff and PJM Manuals, the Hecate Energy Clark County, LLC is not responsible for any network upgrades.

Note that all cost estimates contained in this document were produced without a detailed engineering review and are therefore subject to error. More accurate estimates will be determined as a part of the Facilities Study. FE herein reserves the right to return to any issues in this document and, upon appropriate justification, request additional monies to complete any upgrades to the transmission and/or subtransmission systems.

Single Line Diagram

