Generation Interconnection Combined Feasibility/Impact Study Report

For

PJM Generation Interconnection Request Queue Position Z2-085

Mahoning Hydro 25 kV Project

September 2014

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Introduction

This combined Feasibility/Impact Study report provides the documentation of an assessment that has been performed by PJM Interconnection and FirstEnergy (FE) in response to a request made by Mahoning Creek Hydroelectric Company, LLC (the Interconnection Customer or IC) for an increase in the capacity output at their existing generating site located in New Bethlehem, Pennsylvania within the service territory of the West Penn Power Transmission System, a subsidiary of FirstEnergy. The IC has proposed a commercial operation date of April, 2014 for the Project. As per the PJM RTEP study process, the 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 the IC 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, the "FE Requirements for Transmission Connected Facilities", and the "FE Study Guide".

PJM Analysis

Network Impacts

The Queue Project Z2-085 was studied as a 1.5 MW (Capacity 1.5 MW) injection at the Kittanning 138 kV substation in the APS area. Project Z2-085 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project Z2-085 was studied with a commercial probability of 100%. Potential network impacts were as follows:

Summer Peak Analysis - 2018

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

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)

Not required

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

Light Load Analysis - 2018

Not Required

System Reinforcements

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

Short Circuit

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

No overdutied breakers found.

Stability and Reactive Power Requirement

(Results of the dynamic studies should be inserted here)

Not required

Transmission Owner Report

Connection Facilities

In compliance with the Regional Transmission Expansion Planning (RTEP) protocol, IC has submitted a "Form of Generation Interconnection Feasibility Study Agreement" to PJM that identifies its plan to increase the total capacity output of the Generation connected at the Mahoning Hydro 25 kV Substation by 1.5 MW. For purposes of this report, it has been designated as the Mahoning Hydro 25 kV Project. The IC is requesting a capacity uprate to an existing facility of 1.5 MW. The total capacity for the facility will increase to 7.5 MW. This is an increase in capacity at an existing facility resulting in no Direct Connection Costs associated with this project.

This report contains detailed connection requirements, power flow analysis, short circuit analysis, and a cost and schedule for any associated system reinforcements related to the proposed increase at the existing POI.

Power Flow Analysis

A Power Flow analysis was conducted to determine the reliability impact of the proposed IC 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 Power Company transmission system. A simulation contingencies within the NERC and FE Planning Standards was conducted to test for criteria compliance.

The Power Flow analysis identified no new upgrades as a result of the proposed 1.5 MW capacity increase. As such, no system upgrades are required.

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 as a result of the proposed 1.5 MW capacity increase.

System Protection Analysis

An analysis was conducted to assess the impact of the IC on the system protection requirements in the area. No relay changes are required to allow for the 1.5 MW capacity increase.

Metering

The IC will be required to comply with all FE and PJM Revenue Metering Requirements for Generation Interconnection Customers. The FirstEnergy Revenue Metering Requirements may be found in 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

Compliance Issues

The IC will be responsible for meeting all FE connection requirements as defined in the FE Requirements for Transmission Connected Facilities document:

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

The IC will also be responsible for following the requirements of the “FE Approved Vendors and Contractors” document which is also located at the above links.

The IC must also meet all PJM, ReliabilityFirst and NERC reliability criteria and operating procedures required for standards compliance. For example, the IC 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.

FE Facility Upgrades and Costs

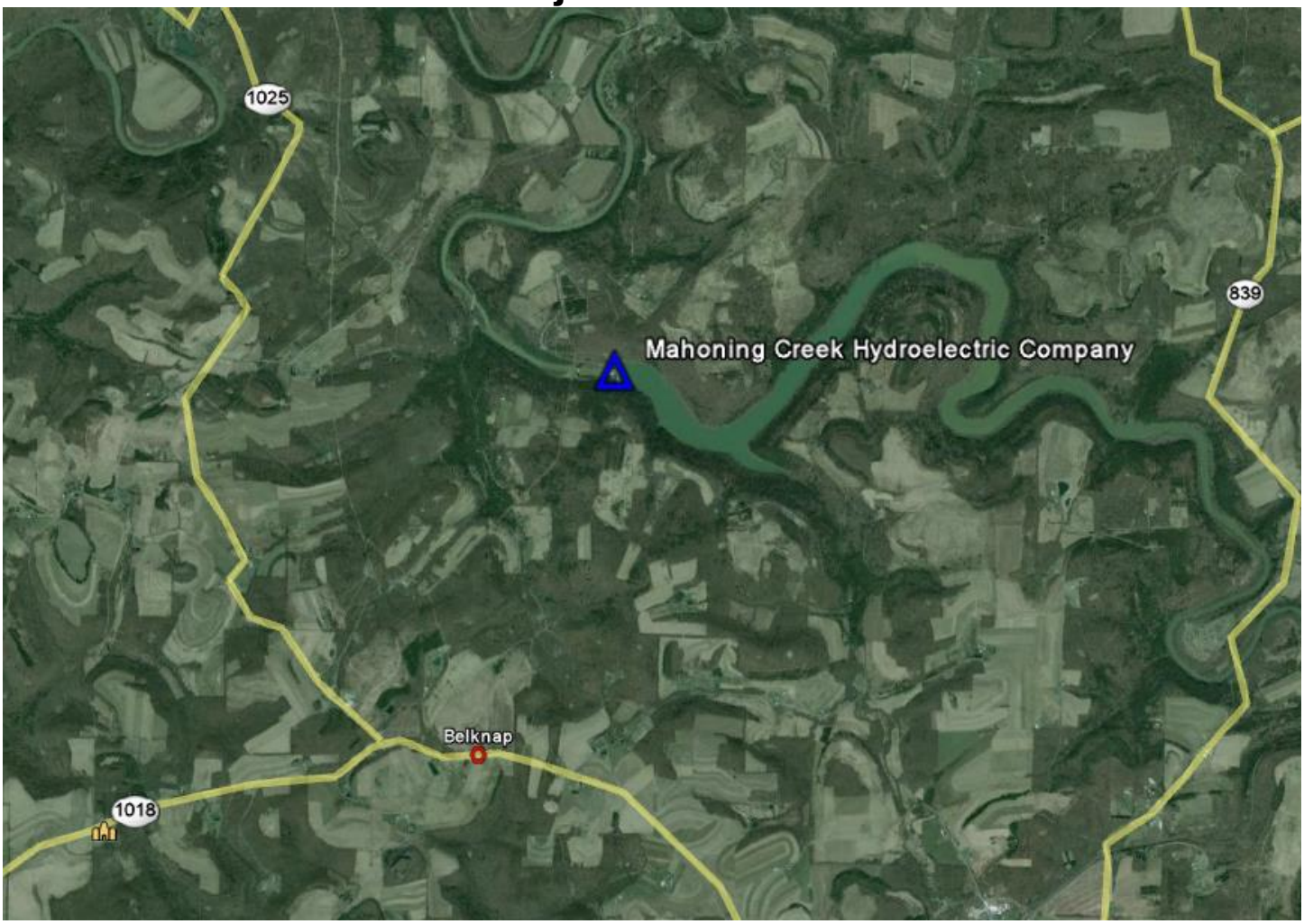
Results from the PJM and FE Power Flow Analysis show that there are no FE criteria violations that are directly attributable to the proposed 1.5 MW capacity increase. Therefore, the IC is not responsible for network upgrades. In addition, PJM findings show there are no criteria violations which may have an impact on network congestion and local energy deliverability for the POI.

The proposed 1.5 MW project is an increase to an existing facility. As a result, no associated direct connection costs are included within this report. The total estimated costs without taxes associated with FE protection verification, inspection and oversight is $10,000. FE 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.

Summary

The proposed 1.5 MW capacity increase to an existing facility did not result in FirstEnergy Transmission Planning criteria violations. As a result, no direct connection facilities or network upgrade costs are required. The increase in generation associated with this queue request requires compliance with FirstEnergy reactive power requirements defined in the FirstEnergy Requirements For Transmission Connected Facilities.

Attachment 1
Project Location



Attachment 2
Primary POI Substation Configuration

Mahoning Creek Hydro Electric, LLC
PJM Queue T155

2 hydro turbine generators will be connected for a total generating capability of 6 MW.

WEST PENN POWER
Tap the Seminole Road Jct. – Belknap 25kV line at a point approximately 0.80 miles from Belknap substation. Install 3-25kV normally closed airswitches at the tap. Overbuild the existing 12kV distribution circuit with 1.12 miles of 25kV line to the point of interconnection (existing West Penn pole 155778). Install a power line carrier based anti-islanding (transfer trip) scheme between the breakers at Burma and Templeton and the developer's breaker.

MAHONING CREEK HYDRO ELECTRIC
Construct a 25kV switching station consisting of 1-25kV breaker, 25kV revenue metering conforming to FE specifications, and necessary equipment to receive a transfer trip signal from West Penn's remote substations. Install communication circuits to provide West Penn with remote access to the revenue meter data and SCADA status indication of the 25kV breaker, as well as real-time plant MW, MVAR, and voltage readings. Install a FE accessible, lockable air switch outside of the switching station.