

***Generation Interconnection  
Feasibility Study Report***

***For***

***PJM Generation Interconnection Request  
Queue Position Y1-044***

***Belmont 138 kV***

**July 2012**

## 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 6.8 MW increase to an existing hydro generating facility located in Pleasants County, West Virginia. The installed facilities will have a total capability of 43.2 MW with 43.2 MW of this output being recognized by PJM as capacity. The proposed in-service date for this project is August 21, 2014. **This study does not imply a First Energy commitment to this in-service date.**

### Point of Interconnection

Y1-044 will interconnect with the Monongahela Power transmission system at the Belmont 138 kV substation.

### Cost Summary

The Y1-044 project will be responsible for the following costs:

Description	Total Cost
Attachment Facilities	\$ 0
Direct Connection Network Upgrades	\$ 0
Non Direct Connection Network Upgrades	\$ 0
<b>Total Costs</b>	<b>\$ 0</b>

In addition, the Y1-044 project may be responsible for a contribution to the following costs:

<b>Description</b>	<b>Total Cost</b>
New System Upgrades	\$ 0
Previously Identified Upgrades	\$ 0
<b>Total Costs</b>	<b>\$ 0</b>

Cost allocations for these upgrades will be provided in the System Impact Study Report.

## **Attachment Facilities**

The Interconnection Customer has submitted a "Form of Generation Interconnection Feasibility Study Agreement" to PJM that identifies its plan to increase the capability of two hydro-electric generators each by 3.4 MW to a total capacity of 43.2 MW designated the Belmont 138 kV (Y1-044) Project. The original interconnection project to tie this generation to the 138kV bus at Belmont Substation is in the process of having an ISA drafted to proceed to construction under queue position S70. The upgrade in capacity is being realized in the performance of the generation units under their initially proposed design as studied under queue position S70. One note of change from Attachment N is that the total capacity indicated was 43.6 MW. In the Feasibility kickoff meeting it was recognized by all parties and noted in the meeting minutes that the output would be studied as 43.2 MW.

The interconnection facilities proposed under S70 are documented in Attachment 1. There are no additional interconnection facilities proposed to accommodate the Belmont 138 kV (Y1-044) Project capacity increase.

The proposed in-service date for the Belmont 138 kV (Y1-044) Project is June 1, 2014 with operation of the first unit by August 21, 2014.

## **Interconnection Customer Requirements**

### **System Protection Analysis**

No additional system protection will be required due to the capacity increase of the Belmont 138 kV (Y1-044) Project over the S70 Project.

### **Compliance Issues**

The Interconnection Customer will be responsible for meeting all FE criteria as defined in the FE Requirements for Transmission Connected Facilities document. This includes 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 .95 leading (absorbing VARs) to .90 lagging (producing VARs).

The 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.

## **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 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.
2. The connecting transformer shall have a wye grounded winding on the high (transmission system) side of the transformer and have a delta connected winding on the low (generation) side.
3. The purchase and installation of a 138 kV interconnection metering instrument transformer. FE will provide the ratio and accuracy specifications based on the customer load and generation levels.
4. The purchase and installation of a revenue class meter to measure the power delivered in compliance with the FE standards.
5. Compliance with the FE and PJM generator power factor and voltage control requirements.
6. The execution of a back-up service agreement to serve the customer load supplied from the Belmont 138 kV switching station when the Belmont 138 kV (Y1-044) Project units are out-of-service.
7. 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.
8. The following status and metering points will be required:
  - a. Breaker position on the Belmont 138 kV (Y1-044) Project electrical system 138 kV breaker.
  - b. Generator real and reactive power output measured at the high-side of the generator step-up transformer.
  - c. Generator voltage at the Belmont 138 kV (Y1-044) Project electrical system 138 kV bus.

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.

## **First Energy 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**

There are no additional direct connection requirements or system upgrade requirements for the Belmont 138 kV (Y1-044) Project anticipated beyond what has been identified in queue S70.

This assumes that the Interconnection Customer will construct all facilities to the point of interconnection as per the arrangements agreed upon for the S70 project. A further assumption is that there will be no environmental issues with any of the new properties associated with this project, that there will be no delays in acquiring the necessary permits for implementing the defined direct connection and network upgrades.

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.

## **Network Impacts**

The Queue Project #Y1-044 was studied as a 6.8MW (Capacity 6.8MW) injection at the 01BELMNT 138 kV substation in the APS area. Project #Y1-044 was evaluated for compliance with reliability criteria for summer peak conditions in 2015. 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.*

None.

# **Attachment 1**

## ***System Configuration***