Generation Interconnection Feasibility Study Report

For

PJM Generation Interconnection Request Queue Position AB1-163

Glidden-Van Hiseville 34.5 kV

February 2016

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 solar generating facility located in Ocean County, NJ. The installed facilities will have a total capability of 5 MW with 0 MW of this output being recognized by PJM as capacity. The proposed in-service date for this project is December 2016. **This study does not imply a Jersey Central Power & Light Company (JCPL) commitment to this in-service date.**

Point of Interconnection

AB1-163 will interconnect with the JCPL system along the Lakehurst – Van Hiseville 34 kV line.

Cost Summary

The AB1-163 project will be responsible for the following costs:

Description	Cost	Tax (if applicable)	Total Cost
Attachment Facilities	$ 0	$ 0	$ 0
Direct Connection Network Upgrades	$ 345,900	$ 112,200	$ 458,100
Non Direct Connection Network Upgrades	$ 25,800	$ 8,400	$ 34,200
Total Costs	**$ 371,700**	**$ 120,600**	**$ 492,300**

Attachment Facilities

No Attachment Facilities are required to support this interconnection request.

Direct Connection Cost Estimate

The total preliminary cost estimate for the Direct Connection work is given in the table below. These costs do not include CIAC Tax Gross-up.

Description	Activity Cost	Tax (if applicable)	Total Cost
Lakehurst – Van Hiseville (N-223) 34.5 kV Line: Tap the Lakehurst – Van Hiseville (N-223) 34.5 kV line and install 3 SCADA controlled load break switches, 34.5 kV Meter Package and associated facilities.	$ 345,900	$ 112,200	$ 458,100
Total Direct Connection Facility Costs	**$ 345,900**	**$ 112,200**	**$ 458,100**

Non-Direct Connection Cost Estimate

The total preliminary cost estimate for the Non-Direct Connection work is given in the table below. These costs do not include CIAC Tax Gross-up.

Description	Activity Cost	Tax (if applicable)	Total Cost
Lakehurst and Van Hiseville Substations: Revise relay settings on the Lakehurst - Van Hiseville 34.5 kV (N-223) line for AB1-163 Interconnection.	$ 25,800	$ 8,400	$ 34,200
Total Non-Direct Connection Facility Costs	**$ 25,800**	**$ 8,400**	**$ 34,200**

Interconnection Customer Requirements

1. An Interconnection Customer entering the New Services Queue on or after October 1, 2012 with a proposed new Customer Facility that has a Maximum Facility Output equal to or greater than 100 MW shall install and maintain, at its expense, phasor measurement units (PMUs). See Section 8.5.3 of Appendix 2 to the Interconnection Service Agreement as well as section 4.3 of PJM Manual 14D for additional information.

2. The Interconnection Customer may be required to install and/or pay for metering as necessary to properly track real time output of the facility as well as installing metering which shall be used for billing purposes. See Section 8 of Appendix 2 to the Interconnection Service Agreement as well as Section 4 of PJM Manual 14D for additional information.

3. The purchase and installation of fully rated 34.5 kV circuit breaker on the high side of the (AB1-163) step-up transformer.

4. 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.

5. 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.

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

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

8. The execution of a back-up service agreement to serve the customer load supplied from the (AB1-163) generation project interconnection point when the units are out-of-service. This assumes the intent of the Interconnection Customer is to net the generation with the load.

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.

JCPL 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

Network Impacts

Generator Deliverability

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

None.

Multiple Facility Contingency

(Double Circuit Tower Line, Fault with a Stuck 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.

Short Circuit

(Summary of impacted circuit breakers)

None.

FirstEnergy System Protection Analysis

An analysis was conducted to assess the impact of the (AB1-163) generation project on the system protection requirements in the area. The results of this review have identified that all current relaying and protection at Lakehurst and Van Hiseville substation is sufficient in protecting the transmission system. The Interconnection Customer will still be responsible for meeting the generator interconnection requirements in FE's "Requirements for Transmission Connected Facilities" document.

The fault currents on the Lakehurst –Van Hiseville (N-223) 34.5 kV are listed below.

Three phase fault current:	7,810 Amps
Single line to ground fault current:	4,320 Amps
Positive Sequence thevenin (ohms):	0.7867 + j 2.4271
Zero Sequence thevenin (ohms):	2.3835 + j 8.3922

These values are for the current system configuration. Any system changes in the area could have a significant impact on these values. It will be the responsibility of the Interconnection Customer to make any protection upgrades required should this occur. The proposed interconnection facilities must be designed in accordance with the "FirstEnergy Requirements for Transmission Connected Facilities" document.

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.

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.