

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

For

***PJM Generation Interconnection Request
Queue Position AB2-014***

Lakewood 230kV

August 2016

Preface

The intent of the Combined Feasibility/System Impact Study is to determine a plan, with approximate cost and construction time estimates, to connect the subject generation interconnection project to the PJM network at a location specified by the Interconnection Customer. As a requirement for interconnection, the Interconnection Customer may be responsible for the cost of constructing: Network Upgrades, which are facility additions, or upgrades to existing facilities, that are needed to maintain the reliability of the PJM system. All facilities required for interconnection of a generation interconnection project must be designed to meet the technical specifications (on PJM web site) for the appropriate transmission owner.

In some instances an Interconnection Customer may not be responsible for 100% of the identified network upgrade cost because other transmission network uses, e.g. another generation interconnection or merchant transmission upgrade, 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, if any, is included in the System Impact Study.

The 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 associated with them will be addressed when seeking an Interconnection Agreement as outlined below. . Developer will also be responsible for providing and installing metering equipment in compliance with applicable PJM and Transmission Owner standards.

General

Essential Power LLC, the Interconnection Customer (IC), has proposed an uprate to an existing natural gas generating facility located in Ocean County, New Jersey. This projects requests an increase to the install capability of 8.1 MW recognized by PJM as capacity. The installed facilities will have a total capability of 280 MW with 250.1 MW of this output being recognized by PJM as capacity.

Point of Interconnection

AB2-014 will interconnect with the Jersey Central Power & Light transmission system at the Lakewood 230kV substation.

Cost Summary

The AB2-014 project will be responsible for the following costs:

Description	Total Cost
Attachment Facilities	\$ 0
Direct Connection Network Upgrades	\$ 0
Non Direct Connection Network Upgrades	\$ 10,000
Transmission System Upgrades	\$ 0
Total Costs	\$ 10,000

Attachment Facilities

No Attachment Facilities are required to support this request.

Direct Connection Cost Estimate

No Direct Connection Facilities are required to support this request.

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	Total Cost
Adjust remote end relay and meter settings	\$ 10,000
Total Non-Direct Connection Cost Estimate	\$ 10,000

Interconnection Customer Requirements

PJM Requirements

1. 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.

In addition to the JCP&L 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. A compliance with the FE and PJM generator power factor and voltage control requirements.

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

The Queue Project AB2-014 was evaluated as a 8.1 MW (Capacity 8.1 MW) injection at the Lakewood 230kV substation in the JCPL area. Project AB2-014 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AB2-014 was studied with a commercial probability of 100%. Potential network impacts were as follows:

Base Case Used

Summer Peak Analysis – 2020 Case

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

Steady-State Voltage Requirements

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

None

Short Circuit

(Summary of impacted circuit breakers)

None

FirstEnergy System Protection Analysis

An analysis was conducted to assess the impact of the (AB2-014) generation project on the system protection requirements in the area. The results of this review have identified the following as a result of the (AB2-014) generation project ring bus direct connection.

For an 8.1 MW Capacity increase in generation output there are no additional system protection upgrades.

The fault currents at 230 kV Lakewood Cogen substation are listed below.

Three phase fault current:	27,900 Amps
Single line to ground fault current:	29,050 Amps
Positive Sequence thevenin (ohms):	$0.3067 + j 4.7485$
Zero Sequence thevenin (ohms):	$0.5158 + j 4.1700$

These values are for the future system configuration without the (AB2-014) generation project contribution. 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 FE "Requirements for Transmission Connected Facilities."

Affected System Analysis & Mitigation

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

Light Load Analysis

Light Load Studies to be conducted during later study phases (as required by PJM Manual 14B).

None

Stability and Reactive Power Requirement

(Results of the dynamic studies should be inserted here)

None