

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

***For***

***PJM Generation Interconnection Request  
Queue Position AB2-097***

***Antietam 34.5 kV***

***October 2016***

## Preface

The intent of the Combined Feasibility and 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. Interconnection Customer 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. Interconnection Customer will also be responsible for providing and installing metering equipment in compliance with applicable PJM and Transmission Owner standards.

## General

Holcim (US) Inc. (“Interconnection Customer”) has proposed a solar generating facility located inside Holcim Cement plant, 1260 Security Road, Hagerstown, Washington County, MD. The installed facilities will have a total capability of 10.0 MW with 0.0 MW of this output being recognized by PJM as capacity. The proposed in-service date for this project is June 5, 2017. **This study does not imply a Potomac Edison (“Transmission Owner”) commitment to this in-service date.**

Attachment facilities and local upgrades (if required) along with terms and conditions to interconnect AB2-097 will be specified in a separate two party Interconnection Agreement (IA) between Potomac Edison and the Interconnection Customer as this project is considered FERC non-jurisdictional per the PJM Open Access Transmission Tariff (OATT). From the transmission system perspective, no network impacts were identified as detailed below.

## Point of Interconnection

AB2-097 will interconnect with the Potomac Edison distribution system through tapping the Holcim Cement 34.5 kV line as shown in the simplified single-line diagram in Appendix 2.

## Costs Summary

Transmission Owner facilities and network upgrades required to support this interconnection project are listed below. All Upgrades shown are New System Upgrades unless otherwise specified and are *handled under state jurisdictional tariff*. Contributions in Aid of Construction (CIAC) tax gross-up is not included.

- (a.) Attachment Facilities:
  - (a.1) Install 34.5 kV Metering and 34.5 kV SCADA controlled switch.  
Estimated costs: \$ 38,900  
Estimated time to complete: 1 month
- (b.) Direct Connection Local Upgrades: \$ 0.0
- (c.) Direct Connection Network Upgrades: \$ 0.0
- (d.) Non-Direct Connection Local Upgrades: \$ 0.0
- (e.) Non-Direct Connection Network Upgrades: \$ 0.0
- (f.) Option to Build Upgrades for Attachment Facilities, Direct Connection Local Upgrades, and Direct Connection Network Upgrades: \$ 0.0

Total Costs (a.) to (f.): **\$ 38,900**

## **Transmission Owner Scope of Work**

The results of the FE power flow analysis show that the (AB2-097) generation project does not attribute to any planning criteria violations.

The direct connection requirements for the (AB2-097) generation project to the Potomac Edison transmission system are detailed in Attachment 3. The associated one-line with the generation project direct connection is shown in Attachment 2.

Note that all cost estimates contained in this document were produced without a detailed engineering review and are therefore subject to change. Holcim (US) Inc. will be responsible for the actual cost of the direct connection that is implemented. In addition, Holcim (US) Inc. is responsible to provide metering, disconnect switches and high-side breakers for each unit, as Holcim (US) Inc. will own this equipment. FE herein 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 systems.

## **Interconnection Customer Requirements**

In addition to the Potomac Edison facilities, Holcim (US) Inc. will also be responsible for meeting all criteria as specified in the applicable sections of the FirstEnergy "Requirements for Transmission Connected Facilities" document including:

1. The purchase and installation of fully rated interrupting device on the high side of the (AB2-097) step-up transformer.
2. The purchase and installation of the minimum required FirstEnergy generation interconnection relaying and control facilities. This includes over/under voltage protection, over/under frequency protection, and zero sequence voltage protection relays.
3. The purchase and installation of supervisory control and data acquisition ("SCADA") equipment to provide information in a compatible format to the FirstEnergy Transmission System Control Center.
4. A compliance with the FirstEnergy and PJM generator power factor and voltage control requirements of 0.95 leading to 0.95 lagging measured at the generator's terminals.
5. The execution of a revised Retail Service Rate Agreement with the electric distribution company to serve the customer load at times when the generator does not export power.

The above requirements are in addition to any metering or other requirements imposed 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.

### **FirstEnergy 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>

## **Schedule**

Based on the scope of interconnection attachment facilities, direct and non-direct system upgrades, it is expected to take a minimum of one (1) month from the date of a fully executed Interconnection Construction Service Agreement to complete the installation. This includes a preliminary payment that compensates the Interconnected Transmission Owner for the first three months of the engineering design work that is related to the interconnection facilities of the Project. It also assumes that the Interconnection Customer will provide the property for the Project direct connection facilities and all right-of-way, permits, easements, etc. that will be needed. 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 facilities and that transmission system outages will be possible when requested.

## **Other Supporting Facilities Charges**

Subject to any required regulatory approvals or acceptance, Interconnection Customer shall be responsible for and shall pay the monthly Other Supporting Facilities Charge of \$669 which will be contained in Attachment H-11A of the PJM Tariff for those sub-transmission facilities used to deliver energy and capacity at sub-transmission voltage from the Customer Facility to the Transmission System in the Allegheny Power System.

## **Network Impacts**

The Queue Project AB2-097 was evaluated as a 10.0 MW (Capacity 0.0 MW) injection at the MD Metal 34.5kV substation in the APS area. Project AB2-097 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AB2-097 was studied with a commercial probability of 100%. Potential network impacts were as follows:

### **Summer Peak Analysis - 2020**

#### **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**

None

#### **Short Circuit**

None

### **Affected System Analysis & Mitigation**

#### **NYISO Impacts:**

NYISO Impacts to be determined during later study phases (as applicable).

#### **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 - 2020**

Not required

## **System Reinforcements**

### **Short Circuit**

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

None

### **Stability and Reactive Power Requirement**

*(Results of the dynamic studies should be inserted here)*

None

## **Summer Peak Load Flow Analysis 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)*

None

## **Light Load Load Flow Analysis 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)*

None

# Appendix 1

Facility Location

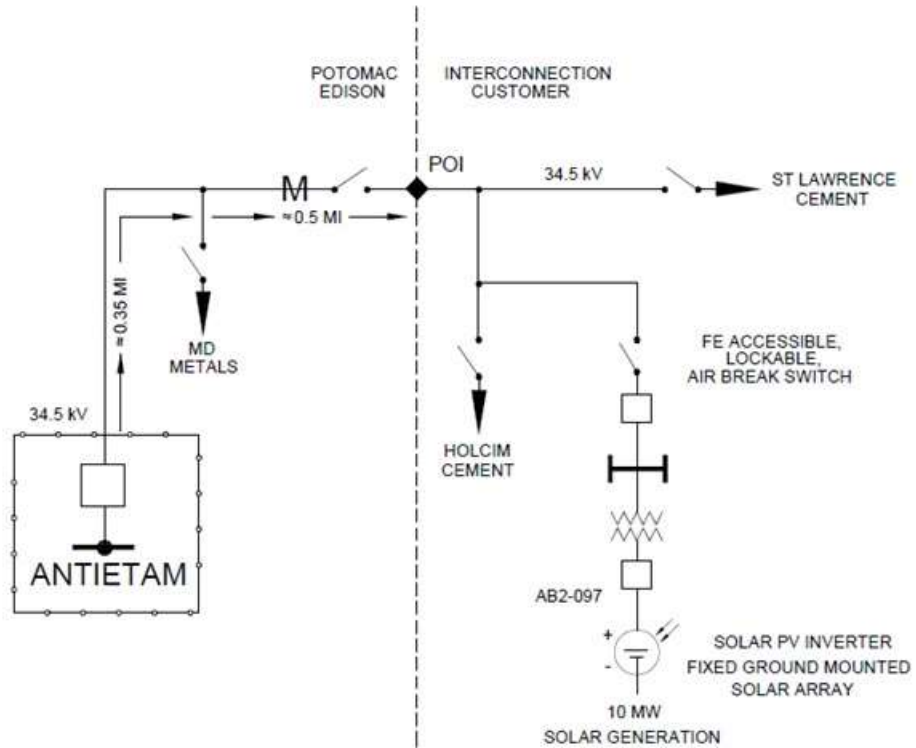
PJM Queue Position: AB2-097



# Appendix 2

## Interconnection One-Line Diagram

### PJM Queue Position: AB2-097



◆ = POI (POINT OF INTERCONNECTION)  
 LOCATED AT POTOMAC EDISON STRUCTURE  
 WHERE POTOMAC EDISON AND CUSTOMER'S  
 34.5 kV LINES DEAD-END

M = BI-DIRECTIONAL METERING FOR INTER-  
 CONNECTION CUSTOMER