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

# *For*

# *PJM Generation Interconnection Request Queue Position AB1-072*

# *Hancock – Marlowe 34.5 kV*

**March 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

Salt Energy Group, the Interconnection Customer (IC) or "Salt Energy", has proposed a solar generating facility located at 9692 National Pike, Big Pool, Washington County, Maryland. The installed facilities will have a total capability of 2.5 MW with 1.0 MW of this output being recognized by PJM as capacity. The proposed in-service date for this project is June 1, 2016. **This study does not imply a The Potomac Edison Company commitment to this in-service date.**

# Point of Interconnection

For AB1-072 project, the connection from the Potomac Edison distribution system to Salt Energy's facilities will be provided by tapping the nearby Hancock-Marlowe 34.5 kV line and constructing a radial attachment connection line to the Point of Interconnection. See simplified single line diagram in Appendix 2 for system configuration and location of POI. Note that this project's POI is FERC jurisdictional.

## Transmission Owner Scope of Work and Costs Estimation

The Potomac Edison attachment facilities and network upgrades as well as related costs estimates required for AB1-072 interconnection project are shown in below table. Please note that these costs do not include CIAC Tax Gross-up:

| Project Costs Description | Amount |
|---|---|
| **Attachment Facilities**<br>Metering<br>34.5 kV metering package to be installed in Salt Energy facilities.<br>Inline facilities from tap point to POI:<br>Attachment line from tap point at Hancock – Marlowe 34.5 kV line to POI. | $ 60,600 |
| **Direct Connection Network Upgrades**<br>*NUN* — *Description*<br>n4847 — Two (2) fully rated manual disconnect switches to be installed at tap point in the Hancock-Marlowe 34.5 kV Line. | $ 76,900 |
| **Non-Direct Connection Network Upgrades**<br>*NUN* — *Description*<br>n4848 — Adjust remote relay and metering settings. | $ 129,100 |
| **Allocation for New System Upgrades**<br>None. | $ 0.0 |
| **Contributions for Previously Identified Upgrades**<br>None. | $ 0.0 |
| **Total Costs** | **$ 266,600** |

## Schedule

Based on the extent of the Potomac Edison attachment facilities and network upgrades required to support the AB1-072 generation project, it is expected to take a minimum of 12 months from the date of a fully executed Interconnection Construction Service Agreement to complete the installation. This includes the requirement for the Interconnection Customer to make a preliminary payment to Potomac Edison which funds the first three months of engineering design that is related to the construction of the Direct Connection facilities. It further assumes that The Interconnection Customer will provide all rights-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 and network upgrades, and that all system outages will be allowed when requested.

## Interconnection Customer Requirements

In addition to the PE 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 fully rated 34.5 kV circuit breaker on the high side of the AB1-072 step-up transformer.

2. 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.

3. The purchase and installation of supervisory control and data acquisition ("SCADA") equipment.

4. The establishment of dedicated communication circuits for SCADA to the Potomac Edison Transmission System Control Center.

5. A compliance with the Potomac Edison 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 AB1-072 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.

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.

## The Potomac Edison Company 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 AB1-072 was evaluated as a 2.5 MW (Capacity 0.9 MW) injection at the Cherry Run 34.5kV substation in the APS area. Project AB1-072 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AB1-072 was studied with a commercial probability of 100%. Potential network impacts were as follows:

**Study base case** **Summer Peak Analysis - 2019**

**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)*

To be determined

**Short Circuit**
*(Summary of impacted circuit breakers)*

None

## Affected System Analysis & Mitigation

**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 - 2019

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

# 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)*

To be determined

## 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)*
*(Summary form of Cost allocation for transmission lines and transformers will be inserted here if any)*

## 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)*

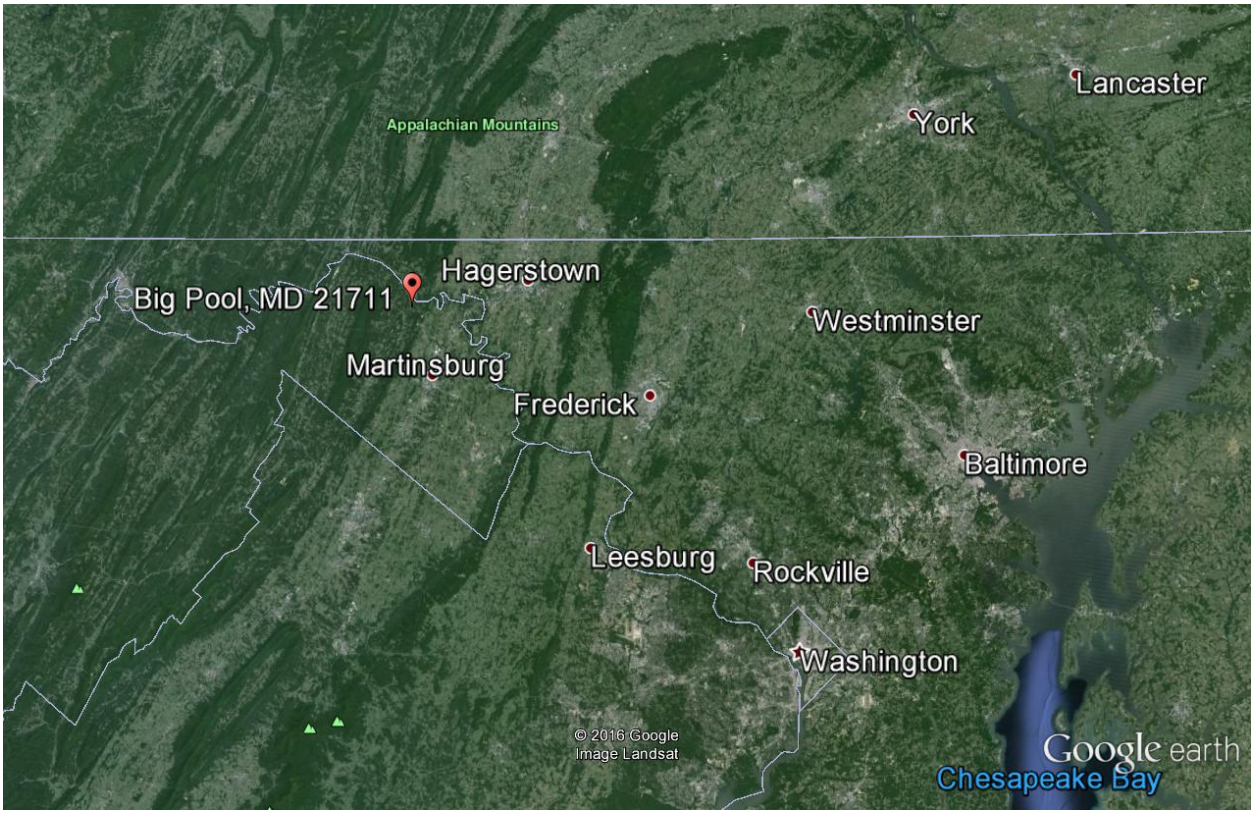
None

**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)*
*(Summary form of Cost allocation for transmission lines and transformers will be inserted here if any)*

None

# Appendix 1

## *Project Location*



# Appendix 2

## *System Configuration – Single Line Diagram*