Generation Interconnection Combined Feasibility/System Impact Study Report

For

PJM Generation Interconnection Request Queue Position AB1-096

Carroll-Mt. Airy 34.5kV

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

Pivotal Power Solutions, Inc., the Interconnection Customer, has proposed a solar generating facility located 536 Green Valley Road, Union Bridge, Carroll County, Maryland. The installed facilities will have a capability of 9.9 MW with 3.8 MW of this output being recognized by PJM as capacity. The proposed in-service date for the AB1-078 project is November 1, 2016. **This study does not imply a The Potomac Edison Company commitment to this in-service date.**

Point of Interconnection

AB1-096 will interconnect with the Potomac Power Company transmission system by tapping onto the 34.5 KV line between Carroll and Mt. Airy substations

Project Costs

The AB1-096 project will be responsible for the following costs (These costs do not include CIAC Tax Gross-up):

Project Costs Description	Amount
Attachment Facilities Metering Install 34.5 metering package in interconnection customer's facilities. TO side of the POI to TO Facilities Build single span of 336 ACSR from distribution line to Interconnection Customer's POI.	$ 91,250
Direct Connection Network Upgrades Install two (2) 1200 A, 34.5 kV line switches.	$ 101,450
Non-Direct Connection Network Upgrades Remote end relay, protection and metering settings adjustments.	$ 12,300
Allocation for New System Upgrades None.	$ 0.0
Contributions for Previously Identified Upgrades None.	$ 0.0
Total Costs	**$ 205,000**

Transmission Owner Scope of Work

The Potomac Edison facilities and network upgrades that are required for this interconnection project as well as the associated cost estimate are shown in the Project Costs section of this report.

Interconnection Customer Requirements

The Interconnection Customer will 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 34.5 kV circuit breaker on the high side of the AB1-078 facility 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.

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

5. A compliance with the FirstEnergy 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 AB1-078 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 FirstEnergy 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 AB1-096 was evaluated as a 9.9 MW (Capacity 3.8 MW) injection tapping the Carroll-Mount Airy 34.5kV line in the APS area. Project AB1-096 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AB1-096 was studied with a commercial probability of 100%. Potential network impacts were as follows:

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)

To be determined.

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 identified.

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)

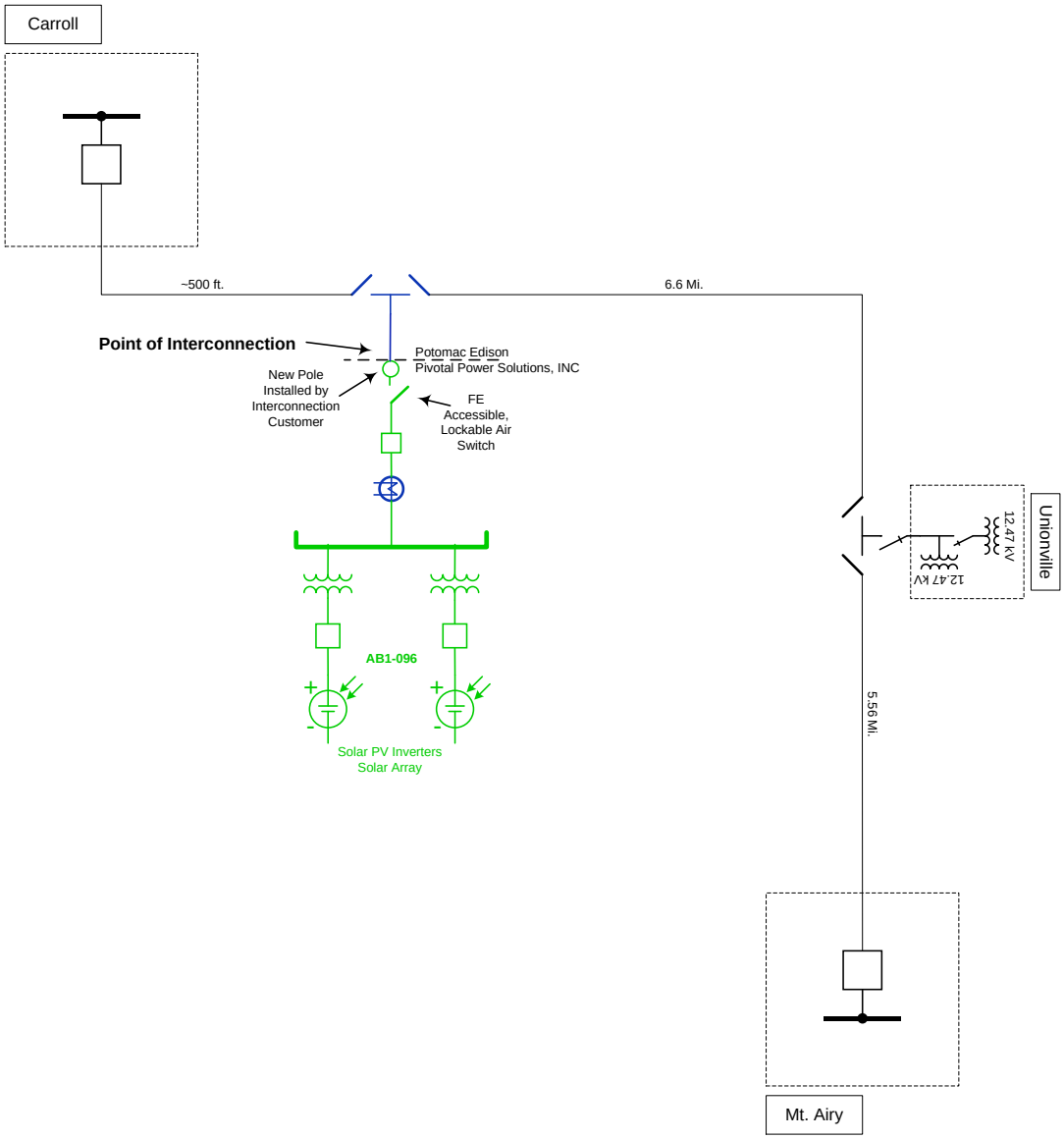
None.

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.

Attachment 1.

Single Line Diagram



ATTACHMENT FACILITIES
Install 2-34.5 kV, 1200 A, load-break air switches on Carroll-Mt. Airy 34.5 kV (MU2) line outside of Carroll substation. Install 34.5 kV metering in customer's facilities and build single span of 336 ACSR to point of interconnection with customer.

EXISTING FACILITIES
POTOMAC EDISON
DEVELOPER