Generation Interconnection Combined Feasibility and System Impact Study Report

For

PJM Generation Interconnection Request Queue Position AC2-136

East Hagerstown 12 kV

August 2017

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

Urban Grid Solar Projects, LLC ("Interconnection Customer") has proposed a new solar generation facility of 11.8 MW Maximum Facility Output in the Potomac Edison ("Transmission Owner") zone. PJM recognizes 5.5 MW as Capacity Interconnection Rights. This new facility is located in Smithsburg, Maryland; this project will inject directly into the East Hagerstown substation; The proposed in-service date for the AC2-136 project is June 30, 2019. **This study does not imply a Potomac Edison commitment to this in-service date.** Attachment facilities and local upgrades (if required) along with terms and conditions to interconnect AC2-136 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 ("POI")

The proposed project site will be located on Kieffer Funk Rd, Smithsburg, MD. This project will inject directly into East Hagerstown substation - 12.5 kV substation bus (which is located on Mt. Aetna Road in Hagerstown, Maryland). GPS coordinates of the POI are Lat./Lon. 39.6284750, -77.6419580. The POI will be built just outside the East Hagerstown Substation. Please refer to the one-line diagram in Appendix 2 for more details.

Costs Summary and Transmission Owner Scope of Work

The Potomac Edison facilities and network upgrades required to support AC2-136 project are:

(a) Attachment Facilities: $ 0.00

(b) Direct Connection Network Upgrades:

(b1) Install (1)-12.5 kV 600A disconnect switch and one span 336 ACSR span to dead end.
Estimated cost: ..... **$ 22,000**

(b2) Procure and install 12.5 kV metering equipment in the Interconnection Customer's collector substation. Interconnection Customer will provide mounting structures and phone line.
Estimated cost: ..... **$ 33,000**

(b3) Add SCADA to spare feeder to be used in East Hagerstown substation.
Estimated cost: ..... **$ 10,000**

(b4) Install 200ft 750 AL underground substation exit.
Estimated cost: ..... **$ 10,000**

(c) Non-Direct Network Upgrades:

(c1) Change the No. 1 XFMR LTC controller.
Estimated cost: ..... **$ 20,300**

(d) Direct Connection Local Upgrades: $ 0.0

(e) Non-Direct Connection Local Upgrades: $ 0.0

(f) Option to Build Upgrades: $ 0.0

Estimated Total Costs (a) to (f): ..... ***$ 95,300***

NOTE: The above shown Estimated Total Costs do not include Contribution in Aid of Construction (CIAC) Federal Income Tax Gross Up charge. The total tax amount of $29,162 may or may not be charged to this project depending upon whether this project meets the eligibility requirements of the latest IRS Safe Harbor provisions for non-taxable status.

Interconnection Customer Requirements

In addition to the Potomac Edison facilities, Interconnection Customer will also be responsible for meeting all criteria as specified in the applicable sections of the FirstEnergy "Requirements for Transmission Connected Facilities" document, effective 10-3-2016, which can be found under this link: http://www.pjm.com/~/media/planning/plan-standards/private-fe/fcr-facilities-connection-requirements.ashx, including:

1. The purchase and installation of a fully rated 12.5 kV circuit breaker or fuse to permit tripping of the entire plant;
2. The purchase and installation of the minimum required Potomac Edison 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, and to provide tripping control to the FirstEnergy Transmission System Control Center;
4. The establishment of dedicated communication circuits for SCADA report to the FirstEnergy Transmission System Control Center;
5. The execution of a back-up service agreement to serve the customer load supplied from the AC2-136 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;
6. The proposed interconnection facilities must be designed in accordance with the FirstEnergy "Requirements for Transmission Connected Facilities" document located at: http://www.pjm.com/planning/design-engineering/to-tech-standards/private-firstenergy.aspx;
7. Urban Grid Solar Projects, LLC will also be required to meet all PJM, ReliabilityFirst and NERC reliability criteria and operating procedures for standards compliance. For example, Urban Grid Solar Projects, LLC will need to properly locate and report the over and under voltage and over and under frequency system protection elements for its units as well as the submission of the generator model and protection data required to satisfy the PJM and ReliabilityFirst audits. Failure to comply with these requirements may result in a disconnection of service if the violation is found to compromise the reliability of the FirstEnergy system; and
8. A compliance with the FirstEnergy and PJM generator power factor and voltage control requirements; this means that the AC2-136 Project must have a range of dynamic reactive capability that supports its operation from a 0.95 lead to 0.95 lag power factor and to maintain the power factor as close as possible to unity. This power factor requirement shall be measured at the point of interconnection. Without a continuous regulation, the studies show that the addition of solar projects can cause voltage swings as their output oscillates with moving clouds and system voltages can exceed the established limits. Should Urban Grid Solar Projects, LLC fail to provide a dynamic reactive capability from the East Hagerstown 12.5 kV (AC2-136) Project for any reason once interconnected, the Potomac Edison and/or PJM Dispatchers may need to take action to curtail both the energy and capacity portion of its output to prevent a non-compliance with voltage criteria.

The above requirements are in addition to any metering required 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 Interconnection Customer'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 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/private-firstenergy.aspx

Schedule

Based on the scope of the attachment facilities, direct and non-direct system upgrades, it is expected to take twelve (12) months from the date of a fully executed Construction Agreement (CA) to complete the installation. This includes a full payment for the work that is related to this interconnection 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.

Network Impacts

The Queue Project AC2-136 was evaluated as an 11.8 MW (Capacity 5.5 MW) injection at the East Hagerstown 138 kV substation in the APS area. Project AC2-136 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AC2-136 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

To be determined

Short Circuit

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 - 2020

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

System Reinforcements

Short Circuit

None

Stability and Reactive Power Requirement

Not required

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)

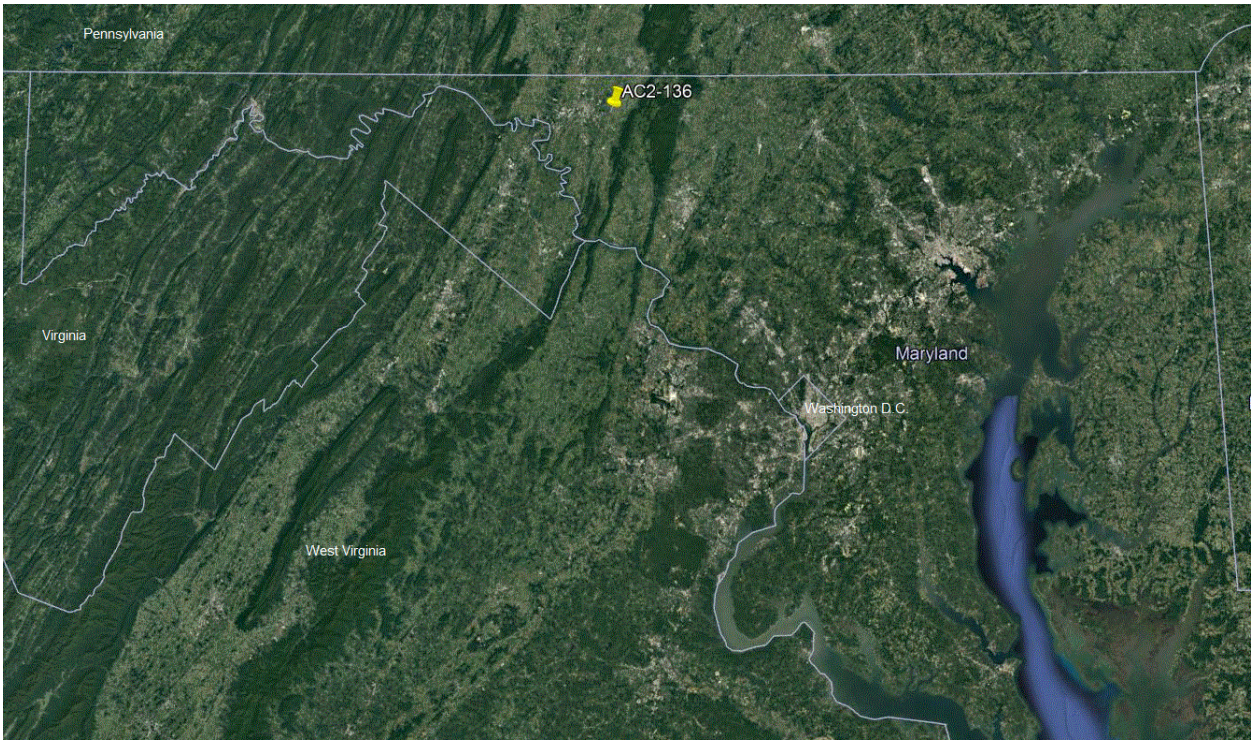
None

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: AC2-136



Appendix 2
Interconnection One-Line Diagram
PJM Queue Position: AC2-136