Generation Interconnection Feasibility Study Report

Queue Position AB2-129

Doubs 230 kV

Interconnection Customer has proposed a solar generating facility located between Route 351 and Pleasant View Road, Adamstown, Frederick County, MD. The installed facilities will have a total capability of 80 MW with 30.4 MW of this output being recognized by PJM as capacity. The proposed in-service date for this project is May 1, 2019. **This study does not imply a Potomac Edison Company (or "Potomac Edison") commitment to this in-service date.**

Point of Interconnection

AB2-129 will interconnect with the Potomac Edison transmission system through direct injection into Doubs Substation. The primary point of interconnection will inject into the 230 kV bus. The secondary point of interconnection will inject into the 138 kV bus. Refer to the one-line diagram in Appendix 2.

Cost Summary

Potomac Edison facilities and network upgrades as well as related costs estimates required for this interconnection project are listed below.

(a.) Attachment Facilities: $ 582,000 (Total with Tax: $ 737,600), as follows:

(a.1) AB2-129 Doubs 230 kV Direct Connection at Doubs SS; install new SEL-441L and SEL-311L relays; Remove East Alco Line #205.

- Cost estimate: $ 529,300 (Total with Tax: $ 670,800)
- Number of Months to Complete: 12 Months
- Network Upgrade Number: Not Required

(a.2) Install 0.5 miles Fiber Optic Cable from Doubs SS to AB2-129 Interconnection.
- Cost estimate: $ 52,700 (Total with Tax: $ 66,800)
- Number of Months to Complete: 12 Months
- Network Upgrade Number: Not Required

(b.) Direct Connection Network Upgrades: $ 0 (None)

(c.) Non-Direct Connection Network Upgrades: $ 0 (None)

(d.) Direct Connection Local Upgrades: $ 0 (None)

(e.) Non-Direct Connection Local Upgrades: $ 0 (None)

(f.) Contributions for Previously Identified Upgrades: $ 0 (None)

(g.) Baseline Upgrades: $ 0 (None)

Total costs (a.) to (g.) w/o Tax: $ 582,000

Total costs (a.) to (g.) with Tax: $ 737,600

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 Potomac Edison "Requirements for Transmission Connected Facilities" document including:

1. The purchase and installation of fully rated 230 kV circuit breaker on the high side of the (AB2-129) step-up transformer. A single breaker must be used to protect this line; individual GSU transformer breakers cannot be used to protect this line.

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 a revenue class meter to measure the power delivered in compliance with the FirstEnergy standards.

4. 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.

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

6. A compliance with the FirstEnergy and PJM generator power factor and voltage control requirements.

7. The execution of a back-up service agreement to serve the customer load supplied from the (AB2-129) generation project 230 kV interconnection point when the units are out-of-service. This assumes the intent of 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.

Schedule

Based on the extent of the Potomac Edison attachment facilities and system upgrades required to support the (AB2-129) generation project, it is expected to take a minimum of twelve (12) months from the date of a fully executed Interconnection Construction Service Agreement to complete the installation. This includes the requirement for Interconnection Customer to make a preliminary payment to FirstEnergy which funds the first three months of engineering design that is related to the construction of the attachment facilities and network upgrades. It further assumes that 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 attachment facilities and network upgrades, and that all system outages will be allowed when requested.

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.

Interconnected Transmission Owner 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

A. Primary Point of Interconnection (Option 1 - POI)

The Queue Project AB2-129 was evaluated as a 80.0 MW (Capacity 30.4 MW) injection at the Doubs 230kV substation in the APS area. Project AB2-129 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AB2-129 was studied with a commercial probability of 53%. 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 at later study stages.

Short Circuit

No newly over-dutied breakers were found.

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

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

To be determined at later study stages.

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

B. Secondary Point of Interconnection (Option 2 - POI)

The Queue Project AB2-129 was evaluated as a 80.0 MW (Capacity 30.4 MW) injection at the Doubs 138kV substation in the APS area. Project AB2-129 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AB2-129 was studied with a commercial probability of 53%. 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
(Results of the steady-state voltage studies should be inserted here)

To be determined

Short Circuit
(Summary of impacted circuit breakers)

No newly over-dutied breakers were found.

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

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

To be determined at later study stages.

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)

None