Generation Interconnection
Feasibility Study Report
Queue Position AE1-231

The Interconnection Customer (IC) has proposed a 20.0 MW (9.0 MWC) combined solar and battery storage generating facility to be located in Charles County, Maryland. PJM studied AE1-231 as a 20.0 MW injection into the Southern Maryland Electric Cooperative (SMECO) system at the Hughesville 69 kV Substation and evaluated it for compliance with reliability criteria for summer peak conditions in 2022. The planned in-service date, as requested by the IC during the project kick-off call, is July 31, 2020. This date may not be attainable due to required PJM studies (System Impact and Facilities) and the Transmission Owner's construction schedule.

Point of Interconnection

The Interconnection Customer requested a transmission level Point of Interconnection (POI). As a result, AE1-231 will interconnect with the SMECO system at the existing 69 kV Hughesville sub/switching station. The physical interconnection proposes to utilize an existing open 69 kV bay within Hughesville sub/switching station.

Transmission Owner Scope of Direct Connection Work

No SMECO site work, permitting, or associated real estate costs are anticipated within the defined SMECO scope of work for this proposed interconnection project; however, this project will require one or more planned SMECO facility outages. The physical interconnection itself will include a 69 kV line breaker with protective relaying and control circuits, communications, revenue metering units, and disconnect switches. The IC owned and installed self-supporting dead-end structure outside SMECO's Hughesville switching station is the POI and physical demarcation between SMECO and the IC. Overhead line conductor will complete the physical connection between the new breaker position and the IC dead-end structure.

SMECO Scope of Work Clarifications

- SMECO will coordinate the following planned 69 kV line or bus outages as necessary to facilitate the proposed interconnection work.: 1) Hughesville switching station side #2 69 kV bus outage, 2) existing 69 kV line #6610 line outage, and 3) existing 69 kV line #6701 line outage.

  The planned Hughesville switching station side #2 69 kV bus outage may be required to facilitate adding breaker line, load, and bypass disconnect switches to the existing bus and to provide safe access for pouring the new breaker pad.

  The planned #6610 outage is required to facilitate moving the circuit to a new 69 kV bay position. This move is necessary to allow sufficient room to add and route a new interconnection circuit exit to the IC owned and installed dead end structure outside Hughesville switching station.

  Existing line #6701 crosses line #6610 within the surrounding Hughesville switching station yard area. A planned line #6701 outage may be required for SMECO construction crews to safely float and swing the rerouted line #6610 underneath the line

#6701 crossing area.

- SMECO will make necessary 69 kV bus modifications to add a new 69 kV breaker and associated line, load, and bypass disconnect switches to Hughesville switching station.
- SMECO will reconfigure the existing Hughesville switching station 69 kV circuit exits to facilitate installing the new 69 kV interconnection circuit exit from the switching station bus to the IC owned and installed dead end structure outside Hughesville switching station.
- SMECO will engineer, specify, procure, install, and maintain all associated facilities on its side of the POI.
- The project POI is the IC owned and installed dead end structure outside Hughesville switching station. SMECO is responsible for the OH conductor, equipment, and associated jumpers from the dead end structure to the Hughesville switching station 69 kV bus.
- Protective relaying is installed within the existing SMECO Hughesville switching station control building. New raceway will be installed to the new 69 kV breaker position.

Project Schedule

The estimated project schedule is 15 months after receiving the signed interconnection agreement. SMECO does not anticipate any associated permit needs for its in-scope work since all of the required SMECO facility upgrades appear to be within existing SMECO property boundaries. SMECO prefers that construction be scheduled between March and October if possible to do so.

Estimated Project Cost

SMECO's estimated project cost is $1,500,000 and includes: engineering, permitting, project management, labor and materials, construction, and construction management. SMECO included 20% contingency on material and labor in the estimated project cost. The estimated project cost breakdown is:

Engineering, Company Labor, and Overhead	$ 350,000
Material	$ 500,000
Construction	$ 650,000
Total	**$ 1,500,000**

Interconnection Customer Scope of Work

The Interconnection Customer is responsible for all design and construction related to activities on their side of the Point of Interconnection. Site preparation, including grading and an access road, as necessary, is assumed to be by the IC. Route selection, line design, and right-of-way acquisition of the direct connect facilities is not included in this report, and is the responsibility of the IC.

The proposed generating facility is interconnecting to the 69 kV SMECO electric system. The

proposed facility consists of PV solar panels mounted to single axis east–to–west facing trackers with one hundred twenty 125 KW rated DC-to–AC inverters. The facility also includes a 5.0 MW / 4 MWH battery ESS with five 1,000 kW rated DC-to–AC inverters.

IC Scope of Work Clarifications

- The project POI is the IC owned and installed dead end structure outside Hughesville switching station. The IC is responsible for installing and terminating the interconnection tap line, surge arrestors, line disconnect switch, and jumpers on the dead end structure.
- The IC is required to install a separate 69 kV line disconnect switch at the IC collector substation.
- The IC is responsible for all aspects of the new 69 kV tap line and collector substation facilities including but not limited to the isolation step-up transformer, substation protection, and associated solar distribution feeder circuits. All such facilities are subject to SMECO review and approval.
- The IC is responsible for securing all permits, right-of-way easements, and any other associated real estate needs for the 69 kV interconnection tap line. Due to apparent physical area constraints, the tap line will likely need to be a concrete encased UG duct bank circuit installation.
- Prior to commencing with any subsequent System Impact Study for this project, the IC is to provide engineering documentation and drawings to SMECO depicting: a) a revised site plan including the proposed collector substation site and interconnection tap line, b) a revised one-line diagram, c) preliminary manufacturer specification information for the major equipment identified in section III of this Feasibility Study document, d) available reactive power compensation limits, e) proposed sequence of operation description for the: solar inverters, battery ESS charge and discharge, and reactive power regulation, and f) preliminary interconnection tap line plan and profile design, line routing, and secured tap line right-of-way information.
- Informational note only at this time: End-use customer (i.e. energy delivered from SMECO to the customer-owned facilities as measured at the POI) power factor shall be in accordance with the "Power Factor" language found in a future TBD SMECO Tariff Schedule. Generation customers (i.e. energy delivered from the customer-owned facilities to SMECO as measured at the POI) interconnected to the SMECO electric system will operate in accordance with applicable PJM Tariff reactive power requirements. If not subject to PJM Tariff requirements, interconnected customer generation may be required to hold a power factor between 0.95 leading (absorbing MVars) and 0.95 lagging (supplying MVars) as specified by SMECO. SMECO will coordinate and confirm the desired reactive control mode for the IC generation facilities at a later date and may instead request the IC operate its generation using a volt-var control strategy to maintain the POI between 1.0 - 1.02 per unit voltage.
- Informational note only at this time: Express written authorization from SMECO is required before any IC facilities are installed or associated improvements made within SMECO's existing property and line easement areas. SMECO access to its facilities and

any associated easement areas must remain clear at all times. Storing or depositing equipment or materials within the SMECO property and easement areas is prohibited.

Metering
The IC is required to provide revenue metering and real-time telemetering data to PJM in conformance with the requirements contained in PJM Manuals M-01 and M-14 and the PJM Tariff.

Required Relaying and Communications
Protective relaying design and installation must comply with SMECO's applicable standards.

Summer Peak Analysis - 2022

Transmission Network Impacts

Potential transmission network impacts are as follows:

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

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

Steady-State Voltage Requirements

To be performed during later study phases.

Short Circuit

No issues identified.

Stability and Reactive Power Requirement

To be performed during later study phases.

Light Load Analysis - 2022
Light Load Studies to be conducted during later study phases (as required by PJM Manual 14B).

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