Generation Interconnection System Impact Study Report

For

PJM Generation Interconnection Request Queue Position AD2-076

“Centreville 69 kV”

March 2019

Preface

The intent of the 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 will be deferred until the System Impact Study is performed.

The System Impact Study estimates do not include the feasibility, cost, or time required to obtain property rights and permits for construction of the required facilities. The Interconnection Customer is responsible for the right of way, real estate, and construction permit issues. For properties currently owned by Transmission Owners, the costs may be included in the study.

General

Concho Solar I, LLC, the Interconnection Customer (IC), has proposed a 49.0 MW (18.6 MW Capacity) solar generating facility to be located at Latitude: 38.9995833, Longitude: -76.0044444 in Queen Anne's County, Maryland. PJM studied the AD2-076 project as an injection into the Delmarva Power and Light Company (DPL) transmission system at the future Carville 138 kV Substation and evaluated it for compliance with reliability criteria for summer peak conditions in 2021. The project was studied at a commercial probability of 100%. The planned in-service date, as requested by the IC during the project kick-off call, is November 30, 2021. This date may not be attainable due to additional required PJM studies and the Transmission Owner's construction schedule.

Point of Interconnection

The AD2-076 project will connect with the DPL transmission system at the future three-breaker ring bus Carville 138 kV Substation adjacent to the Wye Mills (13769) to Church (13723) circuit (see Attachment 1).

Transmission Owner Scope of Work

Substation Interconnection Estimate

Scope: Construct a new terminal position at the future Carville 138 kV Substation.

Estimate: $1,600,000

Construction Time: 24-36 months

Major Equipment Included in Estimate:

- Power Circuit Breaker, 138 kV, 2000A, 40kA, 3 cycle Qty. 1
- Disconnect Switch, 138 kV, 2000A, Manual Wormgear, Arcing Horns Qty. 3
- CVT Units, 138 kV Qty. 3
- CVT Stand, Single Phase, High, 138 kV, Steel Qty. 1
- Relay Panel, Bus Line, FL/BU (20") Qty. 1
- Control Panel, 138 kV Circuit Breaker (10") Qty. 1
- Take-off structure, 138 kV Qty. 1

Estimate Assumptions:

- Existing AC&DC systems are adequate
- No new land will need to be purchased
- Existing Ground grid and storm water management are adequate
- No additional lightning masts

Required Relaying and Communications

New protection relays are required for the new terminals.

An SEL-487 will be required for primary protection and an SEL-387 will be required for back-up protection. One 20" relay panel for each generator terminal will be required for front line and back-up protection.

An SEL-451 relay on a 20" breaker control panel will be required for the control and operation of each new 138 kV circuit breaker (1 total).

The cost of the required relay and communications is included in the Substation Interconnection Estimate.

Metering

Three phase 138 kV revenue metering points will need to be established within the IC facility between the POI disconnect switch and the IC generation breaker.

The metering instrument transformers will be specified by DPL but all equipment and labor will be supplied by the IC. The DPL scope would include the programming and installation of the meters, both primary and backup, and all required wiring work needed to connect the secondary wiring conductors at the metering enclosure. The materials that DPL's Meter Department provides will be the meter enclosures, control cable, the meters, the output devices, and miscellaneous material at the cabinet.

The location of the metering enclosure will be determined in the construction phase. Each meter will be equipped with load profile, telemetry, and DNP outputs. The IC will be provided with one meter DNP output for each meter. DPL will own the metering equipment for the interconnection point, unless the IC asserts its right to install, own, and operate the metering system.

The IC will be required to make provisions for a voice quality phone line within approximately 3 feet of each Company metering position to facilitate remote interrogation and data collection.

It is the IC's responsibility to send the data that PJM and DPL requires directly to PJM. The IC will grant permission for PJM to send DPL the following telemetry that the IC sends to PJM: real time MW, MVAR, volts, amperes, generator status, and interval MWH and MVARH.

Interconnection Customer Scope of Direct Connection Work

The IC 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. Protective relaying and metering design and installation must comply with DPL's applicable standards. The IC is also 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.

DPL Interconnection Customer Scope of Direct Connection Work Requirements:

- DPL requires that an IC circuit breaker is located within 500 feet of the DPL substation to facilitate the relay protection scheme between DPL and the IC at the Point of Interconnection (POI).

Inverter Requirements

- For the safety and reliability of the Transmission System, the Interconnection Customer shall design is non-synchronous generation facility with the ability to maintain a power factor of at least 0.95 leading to 0.95 lagging measured at the Point of Interconnection.

Special Operating Requirements

1. DPL will require the capability to remotely disconnect the generator from the grid by communication from its System Operations facility. Such disconnection may be facilitated by a generator breaker, or other method depending upon the specific circumstances and the evaluation by DPL.

2. DPL reserves the right to charge the Interconnection Customer operation and maintenance expenses to maintain the Interconnection Customer attachment facilities, including metering and telecommunications facilities, owned by DPL.

Summer Peak Analysis - 2021

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 as required.

Short Circuit

No issues identified.

Stability and Reactive Power Requirement

To be completed during Facilities Study phase.

Light Load Analysis - 2021

No issues identified.

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

Delmarva Power and Light Costs

Cost estimates will further be refined as a part of the Facilities Study for this project. The Interconnection Customer will be responsible for all costs incurred by DPL in connection with the AD2-076 project. Such costs may include, but are not limited to, any transmission system assets currently in DPL's rate base that are prematurely retired due to the AD2-076 project. PJM shall work with DPL to identify these retirement costs and any additional expenses. DPL reserves the right to reassess issues presented in this document and, upon appropriate justification, submit additional costs related to the AD2-076 project.

AD2 – 076
"Centreville 69 kV" (PJM Identifier)
Interconnection at Planned Carville Substation 138 kV