Generation Interconnection
Feasibility Study Report
Queue Position AE1-115

The Interconnection Customer (IC) has proposed a 20 MW Energy (10 MW Capacity) battery storage facility to be located at Latitude: 39.6736 Longitude: -75.5034 in Salem County, New Jersey. PJM studied the AE1-115 project as an injection into the Atlantic City Electric Company (ACE) transmission system at the Churchtown 69 kV Substation (PSSE bus #228319) and evaluated it for compliance with reliability criteria for summer peak conditions in 2022. The project was studied at a commercial probability of 53%. The planned in-service date, as requested by the IC during the project kick-off call, is June 1, 2021. 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) be evaluated for the AE1-115 project. As a result, the AE1-115 project will connect with the ACE transmission system at the Churchtown 69 kV Substation via a 69 kV line terminal.

Transmission Owner Scope of Attachment Facilities Work

Substation Interconnection Estimate

Scope: At Churchtown Substation, a 69 kV SF6 gas circuit breaker with two (2) 69 kV disconnect switches will be installed at 69 kV ring bus to establish a new bus section for AE1-115. A set of 69 kV CVTs will be installed at the new 69 kv bus section for protective relays. A 69 kV motor operated disconnect switch and lightning arresters will be installed at the 69 kV terminal. A pre-fabricated relay panel with bus primary and backup protective relays and a 69 kV breaker control relay will be installed in the existing 69 kV control building. 600 V control cable will be pulled from the location of 69 kV circuit breaker, CVTs, and motor operated disconnect switch to the 69 kV control building via the existing cable trench.

New foundation will be needed for 69 kV SF6 gas circuit breaker and CVTs stand. A steel stand is needed for a set of 69 kV CVTs.

Grounding to ground grid need to be installed for 69 kV circuit breaker, CVTs and LAs.

Estimate: $2,300,000
Construction Time: 24-36 months

Major Equipment Included in Estimate:

- 69 kV SF6 Gas Circuit Breaker, 2000 A, 40 kA Interrupting Qty. 1
- 69 kV Disconnect Switch, 2000 A Qty. 2
- 69 kV Single Phase CVT Qty. 3
- 69 kV Motor Operated Disc. Switch, 2000A Qty. 1

- 48kV MCOV Station Class Lightning Arresters Qty. 3
- 69kV Bus Support Insulator Qty. 9
- Pre-fabricated Relay Panel (Bus FL/BU relays and CB Control Relay) Qty. 1
- 24”x20”x10” Control Cabinet for 69kV CVT Fuses Qty. 1

Grounding System:
- Two (2) grounding connection to ground grid for 69kV circuit breaker
- One (1) grounding connection to ground grid for 69kV CVTs
- Two (2) grounding connection to ground grid for LAs

Foundations:
- One (1) Foundation for 69kV SF6 gas circuit breaker
- One (1) Foundation for 69kV CVTs stand

Structures:
- One (1) Steel Stand for a set of 69kV CVTs

Bus:
- Approx. 300 ft 954 ACSR Wire
- Approx. 150 ft 477 MCM AL Wire

600V Control Cable:
- Approx. 6500 ft 4/C #10 AWG Cable
- Approx. 500 ft 7/C #10 AWG Cable
- Approx. 1500 ft 12/C #10 AWG Cable

Conduits / Trench:
- Two (2) 4” pvc conduits from 69kV breaker to Cable Trench (Approx. 40 ft)
- One (1) 4” pvc conduits from 69kV CVT stand to Cable Trench (Approx. 30 ft)
- One (1) 4” pvc conduit from 69kV MOD SW to Cable Trench (Approx. 30 ft)

Estimate Assumptions:
- Existing 69kV ring bus spare position will be used, no need to modify the existing bus configuration and 69kV box structure
- Interconnection line will be overhead line and terminate at the existing 69kv Box structure spare position. No need for new 69kV take-off structure or cable riser structure
- 69kV MOD switch will be mounted on the top of the existing 69kV Box structure. No need for new steel structure for 69kV MOD switch
- Fiber optic cable necessary is 1,000 linear feet.
- No new land will need to be purchased
- Existing AC&DC systems are adequate

- Existing communication system is adequate
- Existing Ground grid and storm water management are adequate

Required Relaying and Communications
New protection relays are required for the new terminal.

Front line and back-up line protection will be required. 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 69 kV circuit breaker (1 total).

The project will require re-wiring and adjustment of existing relay schemes to accommodate the new 69 kV bus section for Interconnection Customer.

Interconnection Customer Scope of Direct Connection 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. Protective relaying and metering design and installation must comply with ACE'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.

ACE Interconnection Customer Scope of Direct Connection Work Requirements:

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

Special Operating Requirements

1. ACE 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 ACE.

2. ACE 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 ACE.

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 as required.

Short Circuit

No issues identified.

Stability and Reactive Power Requirement

To be performed during later study phases as required.

Light Load Analysis - 2022

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.

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
658450	219110	GLOUCSTR	PSE&G	219755	CUTHBERT_4	PSE&G	1	Base Case	operation	550.0	99.99	100.2	DC	2.13
658470	228312	PEDRKTWN	AE	228313	BRIDGPRT	AE	1	AE_P1-2 CHUR-ORCH	operation	552.0	97.86	99.46	DC	9.89
658552	228313	BRIDGPRT	AE	228401	MCKLTON	AE	1	AE_P1-2 CHUR-ORCH	operation	805.0	92.46	93.67	DC	9.87

Atlantic City Electric Costs

Cost estimates will further be refined as a part of the Impact Study and Facilities Study for this project. The Interconnection Customer will be responsible for all costs incurred by ACE in connection with the AE1-115 project. Such costs may include, but are not limited to, any transmission system assets currently in ACE's rate base that are prematurely retired due to the AE1-115 project. PJM shall work with ACE to identify these retirement costs and any additional expenses. ACE reserves the right to reassess issues presented in this document and, upon appropriate justification, submit additional costs related to the AE1-115 project.