# Generation Interconnection

# System Impact Study Report

# for

# Queue Project AE2-046

# HARWOOD-EAST HAZELTON 69 KV

# 24 MW Capacity / 50 MW Energy

February 2020

# 1 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 project developer 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.

The Interconnection Customer seeking to interconnect a wind or solar generation facility shall maintain meteorological data facilities as well as provide that meteorological data which is required per Schedule H to the Interconnection Service Agreement and Section 8 of Manual 14D.

## 2 General

The Interconnection Customer (IC) has proposed a hybrid Solar and Storage generating facility located in Schuylkill County, McAdoo, Pennsylvania. The installed facilities will have a total capability of 50 MW (20 MW from the solar portion and 30 MW from the battery) with 24 MW (12 MW each from the solar and battery) of this output being recognized by PJM as Capacity.

This project is claiming Capacity Interconnection Rights (CIRS) from the deactivated North Eastern Power Company (NEPCO) facility. The proposed in-service date for this project is December 31, 2020. This study does not imply a TO commitment to this in-service date.

| Queue Number | AE2-046 |
|---|---|
| Project Name | HARWOOD-EAST HAZELTON 69 KV |
| Interconnection Customer | Vistra Operations Company LLC |
| State | Pennsylvania |
| County | Schuylkill |
| Transmission Owner | PPL |
| MFO | 50 |
| MWE | 50 |
| MWC | 24 |
| Fuel | Solar; Storage |
| Basecase Study Year | 2022 |

### 2.1 Point of Interconnection

AE2-046 will interconnect with the PPL transmission system via the existing NEPCO 69 kV Tap line off the Harwood – East Hazleton #1 69 kV line, approximately 7.54 miles from the Harwood 69 kV Substation and approximately 8.05 miles from the East Hazleton 69 kV Substation. The Point of Interconnection (POI) will be at the first dead-end structure inside the IC substation.

The scope of work provided in this Feasibility Study is for facilities to be constructed on the PPL EU side of the POI.

### 2.2 Cost Summary

The AE2-046 project will be responsible for the following costs for the physical interconnection:

| Description | Total Cost |
|---|---|
| Attachment Facilities | $ 0 |
| Direct Connection Network Upgrade | $ 0 |
| Non-Direct Connection Network Upgrades | $ 160,000 |
| Total Costs | $ 160,000 |

In addition, the AE2-046 project may be responsible for a contribution to the following costs for Network Upgrades to mitigate overloads identified in this report:

| Description | Total Cost |
|---|---|
| **System Upgrades** | $0[1] |

# 3 Transmission Owner Scope of Work

PPL EU currently owns the NEPCO Tap 69 kV which is the Attachment Facilities for NQ23. AE2-046 will repurpose these Attachment Facilities for this project. The POI for AE2-046 will remain the same as NQ23. Therefore, the PPL EU scope of work only includes remote end relay work at Harwood 69 kV substation.

Report Assumptions

- Outage feasibility not assessed until Facilities Study
- The existing NEPCO 69 kV Attachment Facilities are sufficient for AE2-046. A field walk-down will be conducted at the Facilities Study Phase
- New DTT equipment will be required at Harwood 69 kV Substation

## 3.1 Attachment Facilities

There are no Attachment Facilities associated with this interconnection. It is assumed that:

- IC will repurpose the existing NEPCO 69 kV tap
- Existing tap's current configuration is sufficient to serve AE2-046

The assumptions above will be evaluated during the Facilities Study.

## 3.2 Direct Connection Cost Estimate

None.

## 3.3 Non-Direct Connection Cost Estimate

Remote End Work – Harwood 69 kV Substation:

- Model IC in CAPE and conduct a wide area short-circuit study two busses away from the IC facilities. Identify affected relays and revise settings as needed.
- Conduct a review of the IC relay settings and engineering package (submitted by IC to PPL EU).
- The following upgrades are required at the Harwood substation:
  - Install new DTT equipment.
  - Connect DTT equipment to the existing communication path installed between the Harwood substation and the IC customer facilities.

[1] Stability Analysis will be performed during the Facilities Study. Additional Network Upgrades may be identified to mitigate any stability concerns.

- Modify the existing Harwood – E. Hazleton 1 69 kV circuit breakers 3T and 3S protection and control schemes.
- Modify the existing protective relay settings.
- Modify the existing SCADA for new alarms.
- Modify the existing Alarm Management System (AMS).
- Install new cables and modify control wiring for the above.
- Perform system checks and test equipment before placing in service.

The total preliminary cost estimate for the Non-Direct Connection work is given in the table below. These costs do not include CIAC Tax Gross-up.

| Description | Total Cost |
|---|---|
| Remote End Work – Harwood 69 kV Substation | $ 160,000 |
| | |
| | |
| **Total Non-Direct Connection Facility Costs** | $ 160,000 |

# 4 Schedule

The estimated time to complete the scope of work is **3 - 6 months** after the PJM three-party Interconnection Service Agreement (ISA) and the Interconnection Construction Service Agreement (ICSA) are signed and PPL EU receives Notice to Proceed from the IC.

# 5 Interconnection Customer Requirements

## 5.1 PPL EU Interconnection Requirements

PPL EU applicable technical standards that address requirements for interconnection of generation, transmission, and end user facilities can be found at the following link:

https://pjm.com/planning/design-engineering/to-tech-standards/private-ppl.aspx

## 5.2 IC Direct Transfer Trip (DTT) Requirements

PPL EU will require an independent communication path, for Direct Transfer Trip (DTT) of the IC Intertie Protective Relaying (IPR) Fault Interrupting Devices (FIDs), consisting of one communication circuit with the Harwood 69 kV Substation. The IC may elect to connect additional DTT capabilities to breakers 2T and 2S at Harwood 69 kV Substation. This would enable AE2-046 to generate in the event the Harwood-East Hazelton #1 69 kV line is ever operated in network or an outage requires AE2-046 to operate from the other radial source. DTT for the additional 2 breakers at Harwood substation is not currently in the scope and estimate of this report. PPL EU can add this at the request of the IC during subsequent study phases.

PPL EU does not have OPGW available on NEPCO Tap line available for DTT to the Harwood 69 kV Substation. PPL EU assumes that the IC will procure the independent communication path through a third-party provider. Upon request, PPL EU will evaluate the feasibility of installing OPGW on the NEPCO Tap line for DTT.

# 6 Revenue Metering and SCADA Requirements

## 6.1 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 IC's generating Resource. See PJM Manuals M-01 and M-14D, and PJM Tariff Section 8 of Attachment O.

## 6.2 PPL Requirements

Installation of revenue grade Bi-directional Metering Equipment will be required in the vicinity of the POI to measure kWh and kVARh. PPL EU will design and supply the required metering equipment; all installation costs would be borne by the IC including CTs/PTs. All metering equipment must meet applicable PPL EU tariff requirements as well as being compliant with all applicable requirements of the PJM agreements. The equipment must provide bidirectional revenue metering (kWh and kVARh) and real-time data (kW, kVAR, circuit breaker status, and generator bus voltages) for the IC's generating resource. The metering equipment should be housed in a control cabinet or similar enclosure and must be accessible to PPL EU metering personnel.

## 7 Network Impacts

AE2-046 project is claiming 24 MW of the 51 MW Capacity Interconnection Rights (CIRS) from the deactivated North Eastern Power Company (NEPCO) facility. As a result, the Queue Project AE2-046 was evaluated as a 27 MW (Capacity 0 MW) injection at the NEPCO substation in the PPL area. Project AE2-046 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AE2-046 was studied with a commercial probability of 1.00. Potential network impacts were as follows:

# Summer Peak Load Flow

## 8 Generation Deliverability

(Single or N-1 contingencies for the Capacity portion only of the interconnection)

None

## 9 Multiple Facility Contingency

(Double Circuit Tower Line, Fault with a Stuck Breaker, and Bus Fault contingencies for the full energy output)

None

## 10 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

## 11 Potential Congestion due to Local Energy Deliverability

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.

Note: Only the most severely overloaded conditions are listed below. 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 shall study all overload conditions associated with the overloaded element(s) identified.

None

## 12 Stability and Reactive Power Requirement for Low Voltage Ride Through

Stability Analysis will be performed during the Facilities Study. **Additional reinforcements may be identified to mitigate stability concerns.**

## 13 Light Load Analysis

No mitigations are required.

## 14 System Reinforcements

None

## 15 Affected Systems

None

# Short Circuit

## 16 Short Circuit

The following Breakers are over duty:

None

## Attachment 1

## Single Line Diagram