# Facilities Study Report

# For

# Physical Interconnection of

# PJM Generation Interconnection Request

# Project ID AG1-236

# "LANESVILLE-BROKAW 345 KV"

Revision 2: December 2024

## Introduction

This Facilities Study has been prepared in accordance with the PJM Open Access Transmission Tariff Part VII. The Transmission Owner (TO) is ComEd.

## A. Transmission Owner Facilities Study Summary

### 1. PROJECT DESCRIPTION

The Project Developer has proposed a Wind uprate to a planned Wind Generating Facility located in Logan County, Illinois with a designated PJM Project ID of AG1-236.

This project is an increase to the existing PJM New Service Request Project AC1-053 200 MW Wind Farm project and will share the same Point of Change in Ownership.

The AG1-236 project is a 180 MW (MWE) uprate (23.4 MW Capacity uprate MWC) to the previous project. The total installed facilities will have a capability of 380 MW (MFO) with 49.4 MW of this output being recognized by PJM as Capacity.

### 2. POINT OF INTERCONNECTION (POI)

The new Generating Facility will interconnect with the ComEd transmission system via a direct connection into the TSS 987 Beason 345 kV substation.

The proposed generation interconnection is shown on the single line diagram in Attachment #1.

### 3. POINT OF CHANGE IN OWNERSHIP

The Point of Change in Ownership will be located at the first deadend structure for TSS 987 Beason – TSS 926 Top Hat 345kV line L98701 within the TSS 987 Beason substation.

### 4. SCOPE OF PROJECT DEVELOPER INTERCONNECTION FACILITIES

Project Developer will design, build, own, operate and maintain the Project Developer Interconnection Facilities on Project Developer's side of the Point of Change in Ownership (PCO). This includes, but is not limited to:

At the new TSS 926 Top Hat Substation, in general, the following are project specific notes:

- New 345kV AG1-236 collector substation facilities shall comply with all applicable portions of PJM Protection Standards (PJM Manual 7) and PJM Transmission and Substation Design Subcommittee Technical Requirements.
- New 345kV L98701 generator lead line about 0.1 miles long from the generating facility 345 kV side to the existing L98701.
- The Project Developer shall provide limiting Transmission Facility ratings for their portion of 345KV L98701, in accordance with NERC FAC-008, FERC Order 881 and PJM Operational requirements for normal and emergency ratings from -55F to 130F in 5F increments.

- All Project Developer Interconnection Facilities shall comply with applicable requirements of Exelon Utilities Transmission Facility Interconnection Requirements dated January 1, 2024 and ComEd Interconnection Guidelines (For Generators at Transmission Level) dated December 16, 2021. The ComEd Interconnection Guidelines (For Generators at Transmission Level) dated December 16, 2021 and Exelon Utilities Transmission Facility Interconnection Requirements dated January 1, 2024 are available on the PJM website.
- Two (2) new Project Developer Owned 345 kV gas circuit breakers to auto-trip and isolate for critical gas level.
- Two (2) Main Power Transformers (T3 & T4) rated at 71/94/117 MVA (OA/FA/FA) 3PH 345kV (Primary side Y-Grounded)-34.5 kV (Low side Y-Grounded) with 13.8kV (Tertiary- Delta). Z% = 10% ON 71 MVA base.X/R = 42.2 (High side to low side).
- Project Developer to provide test reports for the Project Developer owned transformers, including the equipment's %Z impedance and load loss, and the impedance and length of the generator lead line from the generating facility to PCO.
- Project Developer shall provide shunt reactive compensation as required by the PJM Interconnection studies.
- At AG1-236 collector station, in general, generation Project Developer to follow section 6.1 (Design F) of the latest version of ComEd Interconnection Guidelines for Generators at Transmission Level (Rev 2: Effective 12/16/2021).
- New gas circuit breakers to auto trip and isolate for critical gas level.
- ComEd Protection and Control Engineering must review all Project Developer relay protection design drawings and relay settings.
- Project Developer equipment impedance and/or test data must be provided to ComEd Protection and Control Engineering to model in a short circuit program. Examples include lines, transformers (include percent impedance and load loss), wind turbines, and inverters.
- Modify 345 kV L98701 relay protection schemes to accommodate new interconnection AG1-236.Line terminal relay types to be the same as ComEd terminal relays. This includes relay firmware versions.
- The Generating Facility shall be designed to remain in service (not trip) for voltages and times as specified for the Eastern Interconnection in Attachment 1 of NERC Reliability Standard PRC-024-1, and successor Reliability Standards, for both high and low voltage conditions, irrespective of generator size, subject to the permissive trip exceptions established in PRC-024-1 (and successor Reliability Standards).
- The Generating Facility shall be designed to remain in service (not trip) for frequencies and times as specified in Attachment 2 of NERC Reliability Standard PRC-024-1, and successor Reliability Standards, for both high and low frequency condition, irrespective of generator size, subject to the permissive trip exceptions established in PRC-024-1 (and successor Reliability Standards).
- The wind, solar or non-synchronous generation facility shall provide SCADA capability to transmit data and receive instructions from the Transmission Provider to protect system reliability. The Transmission Provider and the wind, solar or non-synchronous generation facility Project Developer shall determine what SCADA information is essential for the proposed wind, solar or non-synchronous generation facility, taking into account the size of the facility and its characteristics, location, and importance in maintaining generation resource adequacy and

transmission system reliability in its area.

- Project Developer to include over/under frequency and voltage protection at wind farm collector bus.
- Suggested settings will be provided by ComEd. Under-frequency settings are to comply with MAIN Guide 1B.
- Dual bus protection for 34.5kV bus.
- Installation of a breaker failure relay and scheme including DTT per standards outlined in PJM manual 7 and ComEd standards for the 345 kV gas circuit breakers.
- The Project Developer will install a SCADA system for interface with ComEd's SCADA system. Install 345 kV standard interconnection metering and telemetry to ComEd TSO including CB status, MW, MVAR, MWh and voltage values. Project Developer to co-ordinate updated metering/breaker status data exchange with ComEd SCADA Engineering.
- Power output from the Project Developer site shall be in accordance with the power quality standards contained in the IEEE Standard 519. The generating units and all associated equipment at the Project Developer site shall not introduce any distortion of ComEd's waveform or telephone or carrier interference that is inconsistent or conflicts with such standard.
- Dual TRFM protection and site protection must be compliant with NERC & PJM requirements.
- Metering is required to be installed per ComEd & PJM standards. Refer to section 7.0.
- Witness testing by ComEd or a DA will be required and must be pre-scheduled at least 90 days in advance.
- Project Developer to send a Transfer Trip to TSS 987 Beason for TR 345kV CB Breaker Failure. Ability to isolate 87L and DTT functions is required. Example scheme/settings can be provided by ComEd.
- For any new equipment connected to the BES (Bulk Electric System rated at 100kV or above) the associated primary/System 1 and secondary/System 2 protective schemes to have a minimum redundant:
    - Connected CTs (where available)
    - PT secondary (where available)
    - DC control circuits
    - Auxiliary trip relays
    - Circuit breaker trip coils (where available)
    - Communication circuitry
- ComEd shall supply and own any AMI meter devices. Project developer shall be responsible for conveying access for any ComEd AMI metering equipment.
- A Project Developer with a proposed new Project Developer Facility that has a Maximum Facility Output equal to or greater than 100 MW shall install and maintain, at its expense, phasor measurement units (PMUs). See Section 8.5.3 of Appendix 2 to the Interconnection Service Agreement as well as section 4.3 of PJM Manual 14D for additional information.
- The wind generation facility shall, at a minimum, be required to provide the Transmission Provider

with site-specific meteorological data including:

- Temperature (degrees Fahrenheit)
- Wind speed (meters/second)
- Wind direction (decimal degrees from True North)
- Atmosphere pressure (hectopascals)
- Forced outage data (wind turbine and MW unavailability)

## B. Transmission Owner Facilities Study Results

The following is a description of the planned Transmission Owner facilities for the physical interconnection of the proposed AG1-236 project to ComEd transmission system. These facilities shall be designed according to ComEd Applicable Technical Requirements and Standards. Once built, ComEd will own, operate, and maintain these Facilities.

**1. TRANSMISSION OWNER INTERCONNECTION FACILITIES:**

This section is not applicable.

**2. STAND ALONE NETWORK UPGRADES**

This section is not applicable.

**3. NETWORK UPGRADES**

This section is not applicable.

**4. OTHER SCOPE OF WORK**

- ComEd to review and update existing TSS 987 Beason Relay, Metering & SCADA settings installed for the PJM New Service Request Project AC1-053 New Service Request Project, for incorporation of new AG1-236 project.
- ComEd shall update CAPE model.

## 5. MILESTONE SCHEDULE FOR COMPLETION OF COMED WORK

Facilities outlined in this report are estimated to take 18 months to construct, from the time the Generation Interconnection Agreement is fully executed. This schedule may be impacted by the timeline for procurement and installation of long lead items, the ability to obtain outages to construct and test the proposed facilities.

| Description | Start month | Finish month |
|---|---|---|
| Detailed Design | 1 | 5 |
| Permitting | - | - |
| Construction | 5 | 18 |

## 6. ASSUMPTIONS IN DEVELOPING SCOPE/COST/SCHEDULE

- This facility study report assumes the completion of installations specified in PJM Queue AC1-053 available from PJM website.
- This facility study report assumes the Project Developer 345kV circuit breakers shall be located within the same substation as L98701 Project Developer terminal and line relaying specified in AC1-053.
- ComEd estimate does not include costs of design and construction of TSS 987 Beason Substation, AG1-236 Top Hat upgrades, and transmission in the Project Developer scope of work. ComEd estimated schedule is based on the GIA contract being executed by all parties.
- This cost estimates assume that work will be performed during normal weekdays and with no overtime. Transmission line outages for construction have not been identified, but generally are available from September to May. These outages are controlled by PJM.
- Costs are based on 2024 rates and do not reflect a potential increase in Labor or Material costs after 2024.
- ComEd cost estimate is valid for six (6) months after Facilities Study release by PJM.
- The Project Developer will be responsible to request and bear the cost for relocation of existing transmission or distribution lines (including structures and other facilities) that may be required for transmission line crossings, the transport of any large equipment, such as turbines, rotors, turbine structures, cranes, etc. Formal submittal of this request to ComEd's TSO for ultimate review by PJM can be made 7 months prior to back feed request date.
- Foundation design assumes typical soil conditions at locations and will be subject to change after soil boring tests.
- All upgrades to facilities included in this document will be required to meet latest ComEd standards.
- Upgrades are subject to change based on detailed design development.

- ComEd will complete pre-design and post construction survey for the transmission and substation upgrades, as required. This includes, but is not limited to, the LIDAR survey and video imaging for transmission lines. Costs associated with this are at the expense of the Project Developer. Pre-design survey must be completed prior to detailed engineering.
- This study assumes that there will be no additional right-of-way and/or easement work required.
- This Facilities Study is time dependent. If the project is not into construction within one year of the issuance, the study will be void and the project re-studied, requiring the completion of a new Facility Study.
- It is assumed that all associated network upgrades, as listed in the Phase 1 study, are complete prior to this queue being placed in service.

## 7. REVENUE METERING REQUIREMENTS

All revenue metering needed for this interconnection project must meet the metering requirements stated in Appendix 2, section 8 of the AG1-236 GIA, and in PJM Manuals M01 and M14D. The details of applicable revenue metering requirements are given in the ComEd Interconnection Guidelines posted on PJM website.

The revenue metering will be installed on the ComEd side of the Point of Change in Ownership and will be installed, owned and maintained by ComEd.

This revenue metering is included in AC1-053 (see assumptions in Section 6).

This Facilities Study Report assumes that the initial interconnection, which is PJM Queue AC1-053, will include installation of metering equipment (including CT/PTs) that is designed to accurately meter the additional power output associated with this uprate or expansion. This assumption will be confirmed during engineering after a GIA is executed. Inability of the metering equipment to accurately meter necessary power flow may require additional metering installation.

- REVENUE METERING FOR PJM AND COMED
    - The revenue meter measures the wholesale energy output (Hourly compensated net MWH and Hourly compensated net MVARH) of the Generating Facility.
    - The metering equipment, including revenue meter and CT/PT shall be installed, at Project Developer's expense, at the interconnection substation on ComEd side of the Point of Interconnection.
    - ComEd shall own, operate, maintain, inspect, and test all the metering equipment as set forth in 'Testing of Metering Equipment' section of the PJM Tariff, at the Project Developer's expense.
- REAL-TIME METERING FOR PJM
    - The Project Developer shall install, own, operate, maintain, inspect, and test real-time metering equipment to measure and transmit directly to PJM the real time MW, MVAR, voltage and status of electrical equipment such as circuit breakers and Motor Operated Disconnect switches, in conformance with the requirements listed in PJM Manuals M-01 and M-14D, at the Project Developer's expense.
- RETAIL METERING FOR COMED

- The AMI Meter measures the energy consumption by the Project Developer at transmission level and hence shall be designed to measure low MW flow.
- The metering equipment including AMI Meter and CT/PT shall be installed at the interconnection substation on ComEd side of the POI, at the Project Developer's expense.
- ComEd shall own, operate, maintain, inspect, and test all the metering equipment as set forth in the 'ComEd Interconnection Guidelines'.

- BATTERY TERMINAL AMI METERING FOR COMED
  - FERC Order 841 designates inflow to charge battery storage facility as wholesale power. To separately measure the power inflow to charge the battery and bill it at wholesale rate, the Project Developer needs to install the following equipment.
    - Advanced Metering Infrastructure (AMI) equipment including AMI Meter and Current Transformer/Potential Transformer (CT/PT) at the output terminal of the battery storage facility to measure power flow from transmission system to charge the battery storage facility.
    - Fiber cable to provide communication link to transmit AMI meter data to the ComEd SCADA system.

## 8. LAND REQUIREMENTS FOR INTERCONNECTION SUBSTATION

Land requirements for the Interconnection Substation needed for this interconnection project must meet the requirements in the ComEd Interconnection Guidelines posted on PJM website.

No additional easements or land acquisitions were identified as needed by this study. However, should detailed engineering and design and/or construction activities identify the need for easements or land acquisitions, the developer is fully responsible for the costs to acquire the needed easements and/or land. Also, the schedule will be adjusted accordingly to account for the necessary time to obtain the easements and/or land. All easement and land acquisitions shall comply with all ComEd requirements as specified within ComEd Interconnection Guidelines for Generators at Transmission Level.

## 9. ENVIRONMENTAL AND PERMITING

- ComEd will be responsible to obtain all environmental approvals and permitting required. This includes any endangered species studies and monitoring, as required. Costs associated with this permitting are at the expense of the Project Developer.
- The Project Developer will be responsible for site restoration required for substation and transmission upgrades. This includes, but is not limited to road restoration/improvements, wetland restoration, and farm field restoration/crop damage. Costs associated with this are at the expense of the Project Developer.
- The Project Developer will be responsible for the cost to purchase real estate or obtain the necessary right-of-way easement for all upgrades associated with this project. These associated upgrades are not included in the costs listed in this study.
- The Project Developer will be responsible for remediation costs for locations found to have

environmental contaminations and remediation. This may require contaminated soil disposal as well as lead paint removal for existing structure work.

- It is assumed that all necessary permits will be obtained in a timely manner to allow engineering and construction to proceed according to the Milestone Schedule.
- It is assumed that conveyance of property and rights will be obtained to support the PJM Transmission Outage Schedule.
- It is assumed that the required Environmental Study will yield no impediments to the development of the site.
- ComEd will complete geotechnical soil borings, resistivity study, and analysis for substation and transmission upgrades. Costs associated with this are at the expense of the Project Developer.

## C. APPENDICES

Attachment #1: Single line Diagram for the Physical Interconnection

ATTACHMENT # 1.