Facilities Study Report

For

Physical Interconnection of

PJM Generation Interconnection Request

Project ID AF2-095

“Davis Creek 138 kV”

December 2024

Introduction

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

A. Transmission Owner Facilities Study Summary

1. PROJECT DESCRIPTION

The Project Developer (PD) has proposed a solar Generating Facility located in, Kankakee County, IL with a designated PJM Project ID of AF2-095.

The installed facilities will have a total Maximum Facility Output (MFO) of 160 MW with 96 MW of this output being recognized by PJM as Capacity.

2. POINT OF CHANGE OF OWNERSHIP (PCO)

The Generating Facility will interconnect with the Commonwealth Edison transmission system via a direct connection into the TSS 86 Davis Creek 138 kV substation.

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

3. POINT OF CHANGE IN OWNERSHIP

The Point in Change of Ownership will be located at the first dead-end structure inside the TSS 86 Davis Creek fence line.

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:

4.1. The PD is responsible for construction of the additional 165MW Solar generation. The PD is also responsible for one (1) 138kV circuit breaker, one (1) generator step-up transformer (GSU), one (1) 138kV motor operated disconnect switches, and a 138kV generation lead line with associated structures terminating at TSS 86 Davis Creek.

4.2. At TSS 86 Davis Creek 138 kV, in general, Project Developer relaying, etc. to follow section 6.1 (Design F) of latest version of ComEd interconnections guidelines (for Generators at Transmission Level) Rev2 Effective date 12/16/21, with the following project specific notes (where applicable):

- New 138kV gas circuit breakers to auto trip and isolate for critical gas level
- New 138kV Tie Line terminal relay types to be the same as ComEd terminal relays. This includes relay firmware versions
- 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.
- Project Developer to include over/under frequency and voltage protection at solar 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.

- Dual TRFM protection and site protection must be compliant with NERC & PJM requirements.
- Metering is required to be installed per ComEd & PJM standards.
- SCADA interface to ComEd will be required.
- Witness testing by ComEd or a Designated Authority will be required and must be pre-scheduled at least 90 days in advance.

4.3. Project Developer to provide transformer test reports for 138kV - 34.5kV step up transformers, for ComEd short circuit modeling. Test reports must include %Z impedance and load loss.

4.4. 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

4.5 The PD will be responsible to purchase real estate or obtain the necessary right-of-way easement to install the 138kV transmission overhead/underground line to TSS 86 Davis Creek substation.

a. New Gas Circuit breaker control for loss of SF6 gas condition should be as follows (see Engineering practice EP-5206E and relay specifications):

- For an open SF6 circuit breaker, when SF6 gas drops to the critical level, the close circuit of breaker shall be opened, and motor operated disconnects on both sides of CB shall be opened
- For a closed SF6 gas circuit breaker, when SF6 gas drops to the critical level, the circuit breaker shall be opened, and motor operated disconnects on both sides of CB shall be opened and the close of the circuit breaker shall be opened.

b. All changes to topology, including generation, must be modeled during the Phase 1 study for PRC-027 compliance. A protection system coordination study is required for new BES buses or when there is a 15% (or greater) change in the fault current for an existing BES bus. Settings changes may be required per the outcome of this coordination study.

c. The PD is to provide two, physically diverse, Single Mode Fiber paths between TSS 86 Davis Creek Substation and Kankakee Solar.

d. PD will be responsible for Line L.8609 Single Mode Fiber from Project Developer's Substation to ComEd's Substation TSS 86 Davis Creek. This will be used for Primary Relay scheme using Direct-on-Fiber connections per the Relay Notes. The minimum Fiber count is 48 Fibers and construction will be in adherence with ComEd Transmission Line standards. The PDwill own and maintain this Fiber cable up to the fiber distribution panel in TSS 86 Davis Creek.

e. PD will be responsible for Line L.8609 Single Mode Fiber from Project Developer's Substation ComEd's Substation TSS 86 Davis Creek. This will be used for Secondary Relay scheme using Direct-on-Fiber connections per the Relay Notes. This Fiber must be built in a physically diverse path from the Fiber path used for the Primary Relay scheme. The minimum Fiber count is 48 Fibers. The PD will own and maintain this Fiber cable up to the fiber distribution panel in TSS 86 Davis Creek.

f. The demarcation of ownership for these Fiber cables will be in the Fiber Distribution Panel (FDP) in the ComEd Substation TSS 86 Davis Creek. The Project Developer will own and maintain both Fiber cables from ComEd's TSS 86 Davis Creek FDP all the way to their generator substation.

g. The PD will be responsible to request and bear the cost of any outages required on existing transmission or distribution lines that may be required for the transport of any large equipment, i.e. turbines, rotors, turbine structures, etc.

4.6 The PD to provide limiting Transmission Facility ratings for their portion of 138kV L8609, in accordance with NERC FAC-008 Order 881 and PJM Operational requirements for normal and emergency ratings from -55F to 130F in 5F increments.

4.7 Dual SCADA/AMI meter fitting at the output terminal of the battery storage system to measure the power flow to and from the ComEd transmission system. The dual SCADA/AMI meter and associated instrument transformers shall be sized to properly measure the wholesale power requirement for charging and discharging the battery storage system. The Project Developer shall provide appropriate telemetry from the dual SCADA/AMI meter to the ComEd SCADA system to provide meter data.

B. Transmission Owner Facilities Study Results

1. TRANSMISSION OWNER INTERCONNECTION FACILITIES:

Construct Transmission Owner Interconnection Facilities from the Point of Change in Ownership to the Davis Creek 138 kV. This scope includes:

- One (1) new gas SF6 138kV L8609 circuit breaker rated for 3000A
- Two (2) new 138kV motor-operated disconnect switches, rated for 3000A
- One (1) metering CT/PTs
- One (1) Surge Arrestor
- One (1) 138kV potheads
- Structures and Foundations

2. STAND ALONE NETWORK UPGRADES

None.

3. NETWORK UPGRADES

TSS 86 Davis Creek Upgrade

The existing substation, 138kv TSS Davis Creek, will be expanded/upgraded to interconnect the project with the Commonwealth Edison transmission system.

A new bus section will be added to the existing TSS 86 Davis Creek Substation located off of existing bus 4 to interconnect the AF2-095 project.

The existing control building will have the following added

- Relay panels
- Metering equipment
- Upgrade 138kV bus 4 differential (currently MFAC) to a dual SEL-487B package with dual LORs. Incorporate new 138kV L8609 breaker in the bus 4 differential zone. Reference 138kV bus 3 protection (relay panel 1)
- Install 50BF/79 SEL-451-5 relay and associated LOR per GDD 1930 for 138kV L8609 breaker failure and reclosing. The 138kv L8609 breaker must have sync check for manual close, SCADA close, and automatic reclosing
- Install standard ComEd 138kV Project Developer interface relaying consisting of a primary 87L-1/SEL-411L-1 current differential scheme and secondary 87L-2/SEL-311L-1 current differential scheme. Current differential relay communications to be over direct single mode fiber, with primary and secondary fiber cables diversely routed. Project Developer fiber demarcation will be FDP. Refer to GDD 1930 modified for direct fiber connection SEL-311L-1.
- In addition, install load rejection logic such that transfer trip is initiated on both primary and secondary relaying to Project Developer site if 138kV L8609 breaker is opened (refer to GDD 4003 for load rejection design).
- Sel-3350 RTAC
    - Serial Port 15 used for Remote Access
    - Serial Port 16 used for SCADA Data
- RST-2228 dual aux switch architecture for new relays
- SEL-3350 RTAC for Project Developer data, one pair of serial fiber connections for each Project Developer RTU.
- Connect ComEd owned revenue meter to new IP switch architecture

4. OTHER SCOPE OF WORK

None

5. MILESTONE SCHEDULE FOR COMPLETION OF Commonwealth Edison WORK

Facilities outlined in this report are estimated to take 60 months to construct, from the time the Generation Interconnection Agreement is fully executed. This schedule is 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	12
Permitting	12	18
Construction	36	60

6. ASSUMPTIONS IN DEVELOPING SCOPE/COST/SCHEDULE

6.1 This assumes the completion of AD2-047 Project – 0P240034

6.2 This study is based on the Phase 2 System Impact Report for PJM Generation Interconnection New Service Request Project AF2-095 Kankakee Solar 138 kV. The steady-state voltage study for stability analysis will be performed by PJM during the Facility Phase. The PJM study could identify upgrades to the ComEd system that would become part of this project's scope of work. It is assumed that all associated network upgrades, as listed in the above Phase 2 System Impact, are complete prior to this New Service Request Project being placed in service.

6.3 The schedule is based on GIA contract being executed by all parties and the deposit received.

6.4 ComEd cost estimates assume that work will be performed during normal weekdays and with no overtime.

6.5 The PD will be responsible to request and bearing the cost for relocation of existing transmission or distribution lines (including structures) that may be required for transmission line crossings, the transport of any large equipment, such as cranes, etc. The backfeed date identified in earlier sections is not yet approved. Formal submittal of this request to ComEd's TSO for ultimate review by PJM can be made 7 months prior to the back feed request date.

6.6 All upgrades to facilities included in this document will be required to meet the latest ComEd standards.

6.7 Upgrades are subject to change based on detailed design development

6.8 ComEd cost estimate is valid for six (6) months after Phase 3 System Impact release by PJM.

6.9 This Facilities Study is time-dependent. If the project is not into construction within one year of the issuance, the FS will be void and the project re-studied, requiring the completion of a new FS.

6.10 Costs are based on 2024 rates and do not reflect a potential increase in Labor or Material costs.

6.11 Project Developer to upload as-built drawings to ComEd drawing system (Meridian).

6.12 Single fiber routing has not been included in this study.

6.13 This study assumes that any additional right-of-way and/or easement work required will be at the expense of the Project Developer.

6.14 Facilities Study assumes that generator output and plant auxiliary power consumption can both be metered with revenue accuracy as described. The final revenue metering configuration and equipment will be confirmed, and may be revised, during detailed engineering following execution of the GIA.

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 AF2-095 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.

7.1 REVENUE METERING FOR PJM AND COMED:

The primary 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 expense, at the interconnection substation on ComEd side of the Point of Change of Ownership.

ComEd shall own, operate, maintain, inspect, and test all the metering equipment as set forth in 'Testing of Metering Equipment' section of this Generator Interconnection Agreement, at the Project Developer expense.

7.2 REAL-TIME METERING FOR PJM:

The PD 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 Disconnects, in conformance with the requirements listed in PJM Manuals M-01 and M-14D.

8. LAND REQUIREMENTS FOR INTERCONNECTION SUBSTATION

No additional easements, access rights, or temporary or permanent real property rights or acquisitions were identified as required for network upgrades to the ComEd system or for the project to interconnect at this location within this study. However, as further needs are assessed in detailed engineering, design and/or construction activities, if it is determined that there is a need for easements, access rights, or temporary or permanent real property rights or acquisitions, the developer is fully responsible for the costs to acquire these required land rights. Also, as necessary, the schedule will be adjusted accordingly to account for the necessary time to obtain these required land rights. All easements, access rights, or temporary or permanent real property rights or acquisitions shall comply with all ComEd requirements as detailed in "Land requirements for Interconnection Substations".

9. ENVIRONMENTAL AND PERMITING

No environmental concerns and/or permitting requirements were identified as needed by this study. However, should detailed engineering and design and/or construction activities identify the need for

an environmental study and/or permit requirements, the developer is fully responsible for the costs related to any environmental study, any actions to address the identified environmental impacts and the permits. Also, the schedule will be adjusted accordingly to account for the necessary time to perform the environmental study, address the identified environmental impacts and to obtain the permits, if applicable. All environmental studies, actions to address environmental impacts and permit actions shall comply with all ComEd requirements as detailed in "ComEd Environmental Requirements for Third Party Developers", and with all local, city, county, state, and federal requirements.

C. APPENDICES

1) Attachment #1: Oneline Diagram

Attachment #1: One Line Diagram