Facilities Study Report

For

Physical Interconnection of

PJM Generation Interconnection Request

Project ID AH1-543

Mulberry – Tazewell 345kV

Introduction

This Facilities Study has been prepared in accordance with the PJM Open Access Transmission Tariff, as well as the Application and Studies Agreement between the Project Developer and PJM Interconnection, LLC (PJM or Transmission Provider (TP)). The Transmission Owner (TO) is ComEd.

This Facility Study was performed to satisfy the Phase 2 Facility Study requirement of the PJM Tariff. The Facility Study is intended to provide scope, cost and schedule estimates for the project as currently defined and approved for Phase 2 study. In the event project changes are made during DP2 that impact this report, updates will be provided as part of the Phase 3 report. Following execution of the project's final agreement, this report will not be updated to account for other changes made as part of the agreements modification clause and instead the scope change process will be followed.

A. Transmission Owner Facilities Study Summary

1. PROJECT DESCRIPTION

The Project Developer (PD) has proposed a solar/storage Generating Facility located in, Livingston County, IL with a designated PJM Project ID of AH1-543. The installed facilities will have a total Maximum Facility Output (MFO) of 157.4 MW with 31.48 MW of this output being recognized by PJM as Capacity.

2. POINT OF INTERCONNECTION (POI)

The Generating Facility will interconnect with the ComEd transmission system via a newly constructed 345kV substation, TSS 904 Vermillion, cutting the Tazewell (Ameren) – TSS 939 Mulberry 345kV line, L.93915, approximately 53.9 miles from Tazewell (Ameren) and 40.9 miles from TSS 939 Mulberry.

The construction of the new interconnection substation will result in the splitting of the existing Tazewell (Ameren) – TSS 939 Mulberry 345kV line, L.93915 into two lines on the transmission system. The new L.90402 will connect TSS 904 Vermillion to Tazewell (Ameren) and L.93915 will connect TSS 904 Vermillion to TSS 939 Mulberry.

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 904 Vermillion substation 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 157.4MW Solar generation. The PD is also responsible for one (1) 345kV circuit breakers, one (1) generator step-up transformers (GSU), and a 345kV generation lead line with associated structures terminating at TSS 904 Vermillion.

4.2. At AH1-543, in general, IPP relaying, etc. to follow section 6.2 (Design E) of latest version of EED interconnection guidelines (for Generator at Transmission Level) Rev. 2 Effective 12/16/2021, with the following project specific notes (where applicable):

- New gas circuit breakers to auto trip and isolate for critical gas level
- New 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 secondary buses.
- 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 DA will be required and must be pre-scheduled at least 90 days in advance.

4.3. IPP Project Developer to provide transformer test reports for 345kV - 34.5kV step up transformers, for ComEd short circuit modeling. Test reports must include %Z impedance and load loss including the type of Inverter's used for ComEd short circuit modeling.

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

Foundations and structures to support all/new equipment

4.5 The PD will be responsible to purchase real estate or obtain the necessary right-of-way easement to install the 345kV transmission line to TSS 904 Vermillion 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):
    i. For a normally-open bus-tie SF6 gas bus-tie 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.
    ii. For a normally-closed bus-tie 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 circuit of the circuit breaker shall be opened.
    iii. For a transformer circuit breaker, when SF6 gas drops to the critical level, the circuit breaker shall be opened, the close circuit of the breaker shall be opened, and motor operator disconnects on the bus side of CB 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 904 Vermillion and AH1-543 Collector Substation that are physically diverse from each other. One path will be for Primary Relays, and the other path will be for Secondary Relays, and there should be a minimum of 48 fibers in each cable. IPP fiber demarcation will be FDP within the Substation control building.

d. For 345kV L90401 (GIC LINE): GIC Project Developer to install and own standard ComEd 345kV GIC interface relaying for the remote end station consisting of a dual SEL-411L-1 current differential scheme. A ComEd settings template will be provided to the Project Developer for the scheme to work with the relays at TS904:
    i. GIC Project Developer to Install standard ComEd 345kV GIC interface relaying for the remote end station consisting of a dual SEL-411L-1 current differential scheme per GDD1940.
    ii. GIC Project Developer to send a Transfer Trip to TSS904 for Project Developer high-side transformer breaker Breaker Failure. Ability to isolate 87L and DTT functions is required. Example scheme/settings can be provided by ComEd.
    iii. The GIC interface line relaying will be the only point of interface with ComEd relaying. Current contributions from all Project Developer breakers to be combined and wired to 411L for 87L scheme.

e. PD will be responsible for Line L.90401 Single Mode Fiber from IPP's Substation to ComEd's Substation TSS 904 Vermillion. 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 PD will own and maintain this Fiber cable up to the fiber distribution panel in TSS 904 Vermillion.

f. Modify all mimic boards as required.

System 345kV L90401	Function	TSS904 Vermillion		Amber Solar	
System 1 SEL-411L (Direct Fiber)	SEL 411L (87L-1, LTT, BFTT)	T	R	T	R
System 2 SEL-411L (Direct Fiber)	SEL 411L (87L-2, LTT, BFTT)	T	R	T	R

g. Load rejection transfer trip if at TSS904, any of the below conditions occur (logic via 52b breaker aux contacts): BT1-3 and BT2-3 are open.

h. PD will be responsible for Line L.90401 Single Mode Fiber from IPP's Substation ComEd's Substation TSS 904 Vermillion. 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 904 Vermillion.

i. The demarcation of ownership for these Fiber cables will be in the Fiber Distribution Panel (FDP) in the ComEd Substation TSS 904 Vermillion. The Project Developer will own and maintain both Fiber cables from ComEd's TSS 904 Vermillion Road FDP all the way to their generator substation.

j. 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.

k. Option to Build

   i. If the PD selects the Option to Build, the PD shall construct TSS 904 Vermillion.

   ii. The PD shall construct TSS 904 Vermillion and transfer ownership to ComEd prior to commercial operation of AH1-543. The PD shall transfer ownership of the real estate in fee to ComEd.

l. Substation requirements are described below in section B

B. Transmission Owner Facilities Study Results

The following is a description of the planned Transmission Owner facilities for the physical interconnection of the proposed AH1-543 project to Commonwealth Edison transmission system. These facilities shall be designed according to Commonwealth Edison Applicable Technical Requirements and Standards. Once built, Commonwealth Edison will own, operate, and maintain these Facilities.

1. TRANSMISSION OWNER INTERCONNECTION FACILITIES:

The TO Interconnection Facilities will include, but not be limited to, the following.

INTERCONNECT SUBSTATION (NEW) (DIRECT CONNECTION)

TSS 904 Vermillion

A new breaker-and-a-half substation, TSS 904 Vermillion, will be constructed along the L.93915 345kV transmission line to interconnect the AH1-543 project with the ComEd transmission system.

The greenfield new substation will include

- A 345 KV dead end structure and foundation within the fence of the interconnection substation to terminate the project developers generator lead line.
- Line conductor from the dead end structure to the bus position in the switchyard o the interconnect substation

  One (1) line three phase motor disconnect switch, rated for 4000A, ACCC D06, to be installed at PD line
- Nine (9) new 345kV CCVTs to be installed at Busses 1, 2, and 3
- Three (3) metering CT/PTs
- Three (3) CTs for Tie line metering to meet at least 3000:5 with RF 1.33.
- Nine (9) Surge Arrestors
- Foundations and structures to support all/new equipment
- Three (3) 345kV line dead end structures with testing to check proper phase and phase identification is correct.

2. STAND ALONE NETWORK UPGRADES

TSS 904 Vermillion Interconnection Substation

A new breaker and a half substation, TSS 904 Vermillion, 345kV, will be constructed along the L.93915 345kV transmission line to interconnect the project with the Commonwealth Edison transmission system.

INTERCONNECT SUBSTATION (NEW) (DIRECT CONNECTION)

TSS 904 Vermillion

A new breaker-and-a-half substation, TSS 904 Vermillion, will be constructed along the L.93915 345kV transmission line to interconnect the AH1-543 project with the ComEd transmission system.

The greenfield new substation will include

- Three (3) new three phase SF6 345kV circuit breakers BT 1-2, BT 2-3, and BT 1-3, with accommodation for future breakers BT 4-5, BT 5-6, and BT 1-6 rated for 4000A, 3000:5 MR CT with RF 2.0.
- Two (2) new three phase 345kV motor-operated disconnect switches, rated for 4000A, ACCC D06, to be installed at each new breaker
- Two (2) line three phase motor disconnect switches, rated for 4000A, ACCC D06, to be installed at each line

  One (1) line three phase motor disconnect switch, rated for 4000A, ACCC D06, to be installed at PD line

- Nine (9) new 345kV CCVTs to be installed at Busses 1, 2, and 3
- Three (3) metering CT/PTs
- Three (3) CTs for Tie line metering to meet at least 3000:5 with RF 1.33.
- Nine (9) Surge Arrestors
- Foundations and structures to support all/new equipment
- Three (3) 345kV line dead end structures with testing to check proper phase and phase identification is correct.

Two (2) new 12kV-208/120V AC auxiliary transformer to be installed. This will be fed via a nearby 12kV distribution line(s) to be determined during detailed design; new 12kV UG cable will be run to allow access to TSS 904 Vermillion. The distribution line connection will require construction of new 12kV overhead lines and poles from an existing distribution line to TSS 904 Vermillion. Connection details and length will be determined during detailed engineering and may exceed the assumptions in this study. If a lower cost option is found during engineering, the cost estimate would be reduced. It is assumed that no new ROW for the new distribution line will be required, but this will be determined during detailed engineering. One (1) propane 120/208V back-up generator to be installed as the emergency station service AC source.

New masonry control building to be installed to accommodate new relaying and relaying for future breaker-and-a-half bus expansion. Control enclosure shall meet latest ComEd standards. If NERC Low Impact, install BSC/IT UCOMM router and firewall. If Medium Impact, use serial communication. The new control building will contain:

- Two (2) 125VDC battery systems
- DC distribution panels
- Relay panels
- Auxiliary AC power panels
- Building HVAC system
- Fire/security system
- SCADA
- Metering equipment.

One (1) SCADA Cabinet:

- One (1) SEL-2731 SCADA WAN Switch (2731#KR58)
- One (1) SEL-3355 RTU RTAC (3555#QP5W)
    - Install one pair of serial fiber connections for each Project Developer RTU data exchange to be coordinated with ComEd SCADA Engineering:
        - Breaker statuses
        - Line analog values
- One (1) SEL-3355 ENG RTAC (3555#QP5W)
    - with mouse, keyboard, and monitor on the engineering desk
- One (1) SEL-3355 PDC RTAC (3555#QP5W)
- Two (2) SEL-3355 HMI RTAC (3555#QP5W)
    - with mouse, keyboard, and monitor on the operator desk
- One (1) Omicron Station Scout RBX1
- One (1) Local/Remote Switch, wired to I/O DPAC 1 IN101
- One (1) SEL-3350 Blueframe with DMA

- If a new ComEd-owned revenue meter is required by Metering Group, connect to IP switch architecture.

Two (2) Station Bus Cabinets, each with:
- One (1) SEL-2488 GPS Clock
- One (1) SEL-3350 Blueframe with Flow Controller
- SEL-2741 Station Bus Switches
    - Relay Engineering to determine the topology and number of switches
- One (1) SEL-2440 I/O DPAC, 48 Digital Inputs
- One (1) RSG-910C Access Switch

One (1) Desk Hoffman Box with:
- DC to AC Inverter
- One (1) 2x2 Ethernet RJ45 Patch Box with connections to:
    - Station Bus A via RSG-910C
    - Station Bus B via RSG-910C
    - SCADA WAN via SEL-2731
    - Cooperate Access via UCOMM patch panel

One (1) Operator Desk with:
- Two (2) 27” Monitors (HMI 1 and HMI 2 RTACs)
- Two (2) Keyboard and Mouse
- One (1) Ergotron LX Dual Mount Stacking Arm

One (1) Engineer Desk with:
- Two (2) 27” Monitors (ENG RTAC and Spare)
- Two (2) Keyboard and Mouse
- One (1) Ergotron LX Dual Mount Stacking Arm

One (1) UCOMM Rack (If station is designated Low Impact by Transmission Planning)
- One (1) Nokia 7705 SAR-H MPLS Router
- One (2) Check Point 1570R Firewall
- One (1) SEL-2730U Corporate Access Switch

- Connect metering group-provided revenue meter to station IP architecture.
- Confirm latest device model numbers and GDD with the assigned SCADA engineer.

<u>Relay Installs at TSS 904 Vermillion</u>

Design station per DSS G2 whitepaper.

a. 345kV lines L93915 and L90402 to have dual 411L current differential protection per GDD8040. System 1 SEL-411L relay will be on direct fiber (pending UCOMM confirmation), and System 2 relay will be fiber over JMUX.
b. For new 345kV GIC line L90401:
    i. For 345kV line L90401, install standard ComEd 345kV GIC interface relaying consisting of a Primary 87L-1/SEL-411L-1 (with standard 1300nm 87L port) current differential scheme and a Secondary 87L-2/SEL-411L-1 current differential scheme per GDD8040. Use full tap CT ratio for both systems of

line relaying. Project Developer to install, own, and maintain two Single Mode Fiber paths that are physically diverse from each other, and to connect TSS904 Vermillion, Fiber distribution Cabinet. One path will be for Primary Relays and the other path will be for Secondary Relays, and there should be a minimum of 48 fibers in each cable. IPP fiber demarcation will be FDP'ed within the TSS904 Vermillion control building. Fiber installation requirements will be specified by the P&CE Communication Engineering. Refer to GDD 8040 for direct fiber connection. In addition, install load rejection logic such that transfer trip is initiated on both Primary and Secondary relaying to GIC site if Line CB/CBs at TSS904 Vermillion is/are opened (refer to GDD 4003 for load rejection design).

ii. Project Developer to install, own, maintain Primary and Secondary SEL-411L-1 relays to interface with ComEd per GDD1940 at their site.

Iii. Create new SB diagram for new 345kV L90401.

c. Relays will be connected to SCADA RTAC's. SCADA architecture requirements and SCADA Notes will be issued separately.
d. Check if Anti-Islanding is present or required. Transmission Planning to provide guidelines ahead of the Engineering design
e. Create new SB diagram for L90401 and L90402.
f. Update SB Diagram for L.93915 to reflect the new line configuration and setpoint changes.

Yard cable trench to be installed from control building to breakers and line terminal structures. Cable Trough to have a drainage system, be road rated, and installed below the trough per ComEd standards. A lift station may be needed.

New substation to require installation of new fence and (2) sliding vehicular gates that are positioned no less than one half of the yard diagonal apart, as well as site development and grading. Preliminary security classification for the proposed substation indicates that fencing will be 7' with 1' barbed wire; fencing must adhere to all ComEd specifications and requirements. Security requirements including fencing may change. New station grounding, lightning protection, and lighting to be evaluated by studies, designed, and installed.

The developer ground grid shall not be tied to the TSS 904 Vermillion ground grid. New property will need to be purchased.

The access road to the main public road should be a minimum of 28 feet and have an asphalt or concrete approach. The radius transition to the main road to be in accordance with the requirements of the government having jurisdiction of the public road.

- Minimum width of road is 20'-0"
- Minimum turning radius (horizontal curve) of road to be 40'-0" to the center of the road.
- Maximum slope of road is to be 4.5%

Stormwater detention and any other required stormwater management features to be constructed outside of the substation fence. These must satisfy all local, county, state, and federal requirements for stormwater management.

Security system will need to be installed to meet ComEd standards.

If any utilities are routed under the substation these will need to be re-routed outside of the substation.

System 345kV L93915	Function	TSS939 Mulberry		TSS904 Vermillion	
System 1 SEL-411L (Direct Fiber)	SEL 411L (87L-1, LTT, BFTT)	T	R	T	R
System 2 SEL-411L (Fiber via JMUX Nx64)	SEL 411L (87L-2, LTT, BFTT)	T	R	T	R

System 345kV L90402	Function	Tazewell (Ameren)		TSS904 Vermillion	
System 1 SEL-411L (Direct Fiber)	SEL 411L (87L-1, LTT, BFTT)	T	R	T	R
System 2 SEL-411L (Fiber via JMUX Nx64)	SEL 411L (87L-2, LTT, BFTT)	T	R	T	R

a) Add two new physically diverse fiber paths (~0.1 miles each), for L90401, between TSS 904 and Project Developer owned AH1-543 Amber Solar. The fiber paths shall be Single Mode Fiber, minimum count of 48 for each, and to be owned and maintained by the project developer.
b) Construct 2 physically diverse fiber paths from TSS 904 to nearest ComEd fiber path (TSS918 to TSS98). Each fiber path shall use a Single Mode fiber with a minimum of 48 strands and will be owned and maintained by ComEd. Fiber paths to be used for:
    i) L90402 System 1 direct-on-fiber relaying
    ii) L93915 System 1 direct-on-fiber relaying (dependent on fiber availability towards TSS 939)
    iii) ComEd Central Illinois multiplexer network for System 2 relaying for L90402 and L93915
c) Install a Maxcom MX-A41 EDFA fiber amplifier to be used for L90402 direct on fiber relays. Fiber losses exceed what the SEL-411L relay is capable of.

d) Install a fiber multiplexer on the ComEd Central Illinois ring to support L93915 and L90402 system 2 relaying.

3. NETWORK UPGRADES

The Network Upgrades will include, but not be limited to, the following.

Transmission Line Tie-in for new interconnection substation:

Cut existing L.93915 345kV transmission line between existing structures 309 and 310 to loop into the new TSS 904 Vermillion Substation. L93915 will be cut into two new lines, L.93915 and L.90402.

a. ComEd will be performing the design, procurement, and construction of the new structures required to cut over to the new TSS 904 Vermillion Substation.

b. Install two (2) new delta double circuit and four (4) new horizontal single circuit 345kV deadend structures on drilled shaft foundations.

   i. Two (2) structures will be similar to EM10436 with 24ft phase spacing.

   ii. Two (2) structures will be similar to EM10495 with an elevated center conductor attachment.

   iii. Two (2) structures will be similar to LS1896 with a phase roll at the structure.

c. Approximately 0.25 new circuit miles of conductor and shield wire will be installed.

   i. New conductor and shield wire for the 345kV lines for TSS 904 will be bundled 1277.2 kcmil (54/7) ACAR and 7#6 Alumoweld, respectively.

   ii. Existing conductor and shield wire on 345kV L.93915 is bundled 1277.2 kcmil (54/7) ACAR and 3#5 Alumoweld, respectively. The existing conductor and shield wire will be transferred to new structures 309 and 310.

Structure Number	**Existing Structure Type**	**Proposed Modifications**
309	ADT-1+25	Install new structure similar to 170ft EM10436 with 24ft phase spacing
309D	N/A	Install new structure similar to 50ft EM10495 with elevated center conductor attachment
309E	N/A	Install new structure similar to 65ft LS1896. Phases B and C will roll on the structure.
310E	N/A	Install new structure similar to 65ft LS1896. Phases B and C will roll on the structure.
310D	N/A	Install new structure similar to 45ft EM10495 with elevated center conductor attachment

310	ADT-2+25	Install new structure similar to 170ft EM10436 with 24ft phase spacing

Upgrades to neighboring facilities:

TSS939 Mulberry – L.93915

a. Replace existing System 2 87L-2 SEL-311L with a SEL-411L per GDD1940 to have dual 411Ls performing current differential. System 1 SEL-411L relay will be on direct fiber (pending UCOMM confirmation), and System 2 relay will be fiber over JMUX. Modify system 1 411L relay to align with GDD1940 if needed.
b. Install two (2) physically diverse fiber paths from TSS 904 to nearest ComEd fiber path. Each fiber path shall use a Single Mode minimum of 48 counts and will be owned and maintained by ComEd. Refer to COMM notes for more details.
c. Convert L93915 System 1 relay to use direct fiber interface.
d. Install a fiber multiplexer on the ComEd Central Illinois ring for L93915 System 2 relaying (dependent on type of multiplexer utilized at TSS 904).
e. Update Fault data in CAPE, check for PRC-027 requirements.

Tazewell (Ameren) – L.90402 (L.93915)

a. Replace existing System 2 87L-2 SEL-311L with a SEL-411L per ComEd GDD1940 to have dual 411Ls performing current differential. System 1 SEL-411L relay will be on direct fiber (pending UCOMM confirmation), and System 2 relay will be fiber over JMUX. Modify system 1 411L relay to align with ComEd GDD1940 if needed.
b. (ComEd/Ameren) Construct two (2) physically diverse fiber paths from Tazewell to nearest ComEd fiber path (~ 1 mile each). Each fiber path shall use a Single Mode minimum of 48 counts and will be owned and maintained by ComEd. Refer to COMM notes for more details.
c. Convert existing L93915 System 1 relay at Tazewell to direct fiber interface (Ameren owned), this will be used as L90402 System 1 relay. Run Singlemode fiber jumpers to FDP.
d. Convert existing L0304 System 1 relay at Tazewell to direct fiber interface (Ameren owned). Run Singlemode fiber jumpers to FDP.
e. Install a Maxcom MX-A41 EDFA fiber amplifier inside Tazewell relay building to be used for L90402 direct on fiber relays. Fiber losses exceed what the SEL-411L relay is capable of.
a. Remove System 1 fiber multiplexer from ComEd Central Illinois ring (located in microwave building).
b. Install fiber multiplexer on the ComEd Central Illinois ring for L90402 System 2 relaying (dependent on type of multiplexer utilized at TSS 904).
c. Construct two (2) physical diverse fiber paths (~.63 miles each) from Tazewell Microwave Building to nearest ComEd fiber path. Each fiber path shall use a Single Mode fiber with a minimum of 48 strands and will be owned and maintained by ComEd. This will be utilized for
    i. L90402 System 1 direct on fiber relaying

ii. L0304 System 1 direct on fiber relaying between Tazewell and Powerton

STA 3 Powerton:

a. Convert L0304 System 1 relay to use direct on fiber interface, run Singlemode fiber jumpers to FDP.

Fiber cable circuits

Project Developer to provide two, physically diverse, Single Mode Fiber paths between TSS 904 Vermillion Interconnection Substation and AH1-543.

System 1 Relays will use the "System 1" Fiber cable for a Current Differential Relay Scheme, which will also provide Direct Transfer Trip (DTT). This Fiber cable will be owned and maintained by the Project Developer and should have minimum of 48 Fibers. The demarcation for the Fibers in this cable will be in a Fiber Distribution Panel (FDP) inside of the TSS 904 Substation. ComEd will own and maintain the FDP.

System 2 Relays will use the "System 2" Fiber cable for a Current Differential Relay Scheme, which will also provide Direct Transfer Trip (DTT). This Fiber cable will be owned and maintained by the Project Developer and should have a minimum of 48 Fibers. The demarcation for the Fibers in this cable will be in a Fiber Distribution Panel (FDP) inside of the TSS 904 Substation. ComEd will own and maintain the FDP.

The Project Developer will own and maintain both Fiber cables from ComEd's TSS 904 FDP all of the way to their AH1-543.

Spare Fibers may be used for telephony, SCADA, Metering, Fire Protection, or other data purposes.

PM to engage UCOMM Fiber Engineering early in the process.

4. OTHER SCOPE OF WORK

ComEd to provide oversight to the Project Developer at the Project Developer's cost or the engineering and construction of the interconnect substation.

Metering will be required to be installed at the interconnection substation. Metering to be provided for revenue and AMI purposes.

5. MILESTONE SCHEDULE FOR COMPLETION OF [TO] 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	24

Permitting	25	36
Construction	37	60

6. ASSUMPTIONS IN DEVELOPING SCOPE/COST/SCHEDULE

6.1 This study is based on the Phase 2 System Impact Report for PJM Generation Interconnection New Service Request Project AH1-543. 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 Queue Position being placed in service.

6.2 The schedule is based on ISA/CSA contract being executed by all parties and the deposit received.

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

6.4 Transmission line outages for the tap construction have not been identified, but generally are available in spring (March to May) and fall (September to November). These outages are controlled by PJM.

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 Costs are based on 2026 rates and do not reflect a potential increase in Labor or Material costs.

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

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

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

6.12 This Facility 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.

6.13 Both (1) all real property conveyed in fee to ComEd must be remediated to and (2) all real property to which real property rights are transferred to ComEd (as determined in ComEd's discretion) must be remediated to IEPA's Tiered Approach to Corrective Action.

6.14 This Phase 3 System Impact report (FSR) 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 Interconnection Construction Services Agreement (ICSA).

6.15 PD owned line L.90401 is assumed to be exiting the station to the South. Final determination of line exit will be determine during detailed design.

6.16 Final station location and transmission plan and profiles will be determined during detailed design due to any changes in final site location.

6.17 NERC / CIP Security measures to be reviewed with NERC CIP team to ensure compliance. Areas of concern include:

6.17.1 CB & SW connections in the yard. Lock box access

6.17.2 ERC in station control building

6.17.3 Connection to the BPO SCADA Network. Determine if this connection will be IP or serial

6.18 Dependent on completion of the TSS 116 Goodings GIS project fiber build between TSS 196 Katydid and STA 1 LaSalle

6.19 Project dependent on fiber availability between STA 1 LaSalle and TSS 939 Mulberry

6.20 Project dependent on GE JMUX parts availability (EOL product line) as well as the status of ComEd's JMUX replacement program.

6.21 Fiber multiplexer installation at TSS 904 will require ComEd to source JMUX parts internally from available spare parts or the installation of an SEL multiplexer will be utilized. If SEL multiplexers are utilized, then installation of SEL multiplexers is also required at TSS 939 and Tazewell.

6.22 The transmission design assumes that the existing towers, hardware, and wires are in good condition.

6.23 Project dependent on adequate land meeting the requirements in this facility study are met. Intial parcel provided did not meet dimension and location requirements.

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 AH1-543 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, owned and maintained by ComEd.

- 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 Change in Ownership.
    - 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'.

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' and 'Guidelines on Land Requirements for Interconnection Substation' posted on PJM website.

Upon completion of the construction and installation of the interconnection substation, the tie-line, access road, stormwater detention facility and related improvements and facilities, and the satisfactory completion of testing of the interconnection substation acceptable to ComEd, the Project Developer shall transfer all the Property Rights and Permits to ComEd, at no cost or expense to ComEd, pursuant to documentation that is acceptable to ComEd, including (without limitation) the Property Transfer Documents in fee simple.

All real property conveyed in fee to ComEd must be remediated to and all real property to which real property rights are transferred to ComEd (as determined in ComEd's discretion) must be remediated to IEPA's Tiered Approach to Corrective Action Objectives (TACO) Tier 1 residential remediation standards.

Pursuant to PJM's site control requirements, the Project Developer is responsible for the acquisition of any land rights required for construction of a new substation. As such, the estimated total cost and schedule contemplated by this Facilities Study Report does not include the estimated cost and time necessary for the acquisition of any such land rights.

The total assumed fiber route is approximately 2 miles and traverses approximately 14 land parcels. The estimated total cost for acquiring required easements is $25,000

The fiber route identified in this study is preliminary and may change . The acquisition of easement necessary for the assumed fiber route is contingent upon landowner consent and easement rights for fiber installation cannot be assured. Easement acquisition costs may vary by landowner

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.

Both (1) all real property conveyed in fee to ComEd must be remediated to and (2) all real property to which real property rights are transferred to ComEd (as determined in ComEd's discretion) must be remediated to IEPA's Tiered Approach to Corrective Action Objectives (TACO) Tier 1 residential remediation standards

C. APPENDICES

1) Attachment #1: High Level Project Diagram Depicting Interconnection Facilities for Physical Interconnection and Points of Ownership/Demarcation

